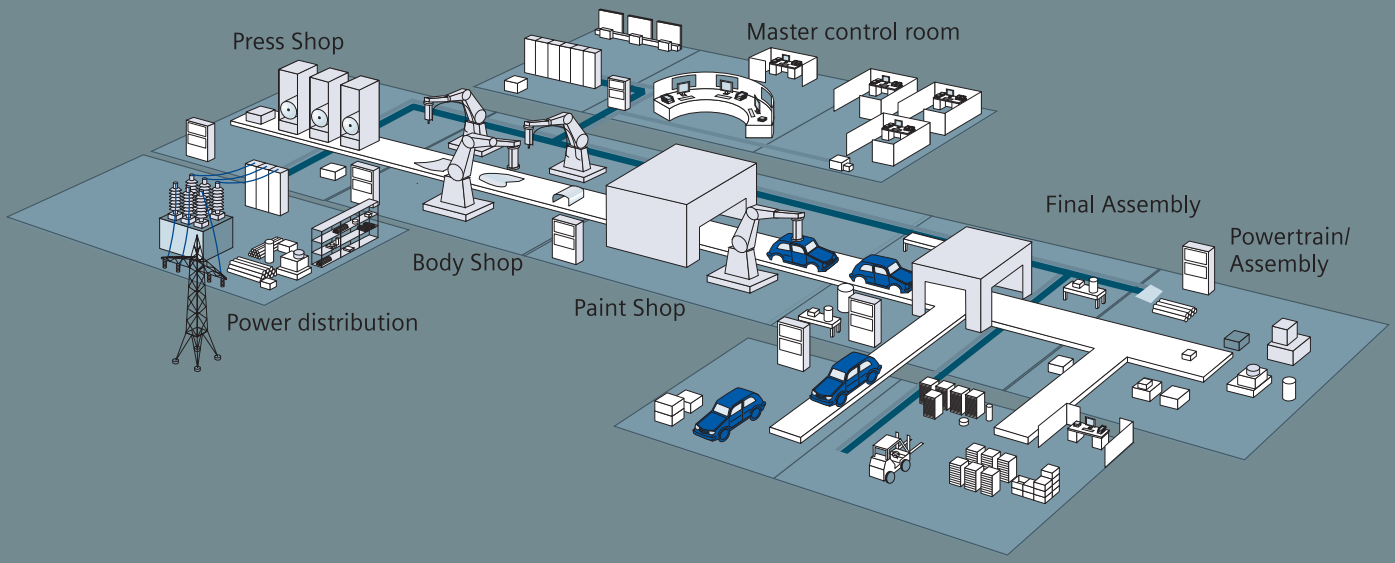
SIRIUS

Datasheet 2009

Low Voltage Controls & Distribution

Answers for industry.

SIEMENS

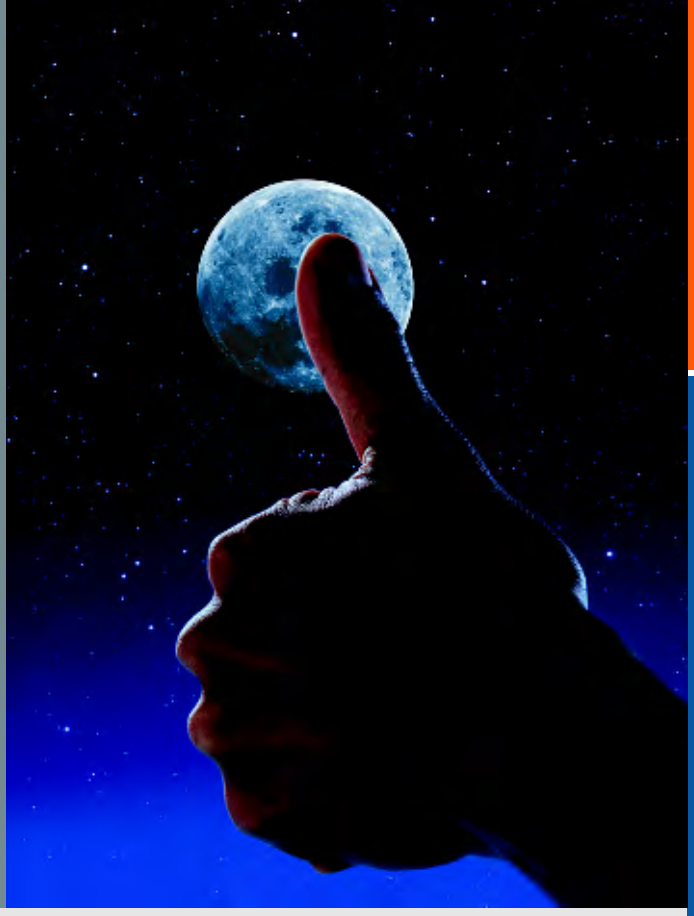


Pressing, equipping, transporting. These functions run in many automated production environments. You'll find everything that you need to switch, protect and start motors with the extensive portfolio of the modular SIRIUS system.

Everything. Easy. SIRIUS

For more than 110 years now we have been developing and manufacturing industrial control products. We have always followed the philosophy to make it easier to use-whether in the electrical cabinet, in the field or directly at the machine. Today we have combined our complete range of industrial controls under one star: SIRIUS

An important element of our SIRIUS industrial controls is the extensive range of products that we can offer associated with protecting, controlling , switching motor loads and systems. From well-proven and reliable contactors through relays that are easy to use to our innovative SIRIUS SC solid-state switching devices for use in the toughest of the conditions. With SIRIUS you always switch simply, safely and reliably. With SIRIUS industrial controls, you can look to the future with confidence.



SIRIUS Industrial Controls

Explanations

General information

Dimensions

All dimensions in mm.

ATEX explosion protection

In many industries the production, processing, transport and storage of combustible substances are accompanied by escaping gases, vapor or spray which find their way into the environment. Other processes result in combustible dust. Together with the oxygen in the air, the result can be an explosive atmosphere which will explode if ignited.

Serious injury to persons and damage to property can result particularly in the chemical and petrochemical industry, mineral oil and natural gas production, mining, mills (e.g. grain, solid materials) and many other sectors.

To guarantee the maximum possible safety in these areas, the legislators of most countries have drawn up requirements in the form of laws, regulations and standards. In the course of globalization, great progress has been made with regard to uniform directives for explosion protection.

With Directive 94/9/EC, the European Union laid the foundations for complete harmonization by requiring that all new devices as from 1st July 2003 have to be approved in accordance with this directive.

In this catalog, special attention is drawn to devices which comply with the ATEX Directive. However, it does not replace intensive study of the relevant fundamentals and directives when planning and installing electrical systems.

Devices approved according to UL standards

UL standards are applied in North America and a number of other countries. This is important in particular for European exports of electrical switchgear and machine-integrated equipment, above all to the USA. Acceptance and delivery are possible only if the relevant UL standards are satisfied.

UL 508A describes the design of control cabinets and the use of builtin components, sometimes with reference to other UL standards. As such, this standard represents the basis for all electrical systems used in North America.

Numerous SIRIUS, SENTRON, SIVACON, ALPHA and BETA devices comply with UL standards and can thus be used world-wide in IEC/EN as well as UL applications within the scope of the defined application.

With our products for low-voltage control and low-voltage circuit protection it is easy to build control cabinets according to UL standard.

The range of low-voltage control products according to UL standard includes our SENTRON circuit breakers and SIRIUS controls - everything from motor-protective circuit breakers and starters to contactors, overload relays, and not forgetting our SIRIUS transformers and filters.

Also in our product range are SENTRON switch disconnectors and various SIRIUS detecting devices and command devices.

Distribution functions can be performed with our busbar systems and terminal blocks.

And of course our offering also includes miniature circuit breakers and fuses.

Introduction

1

Siemens Automation and Drives. Welcome

More than 70,000 people aiming for the same goal: increasing your competitiveness. That's Siemens Automation and Drives.

We offer you a comprehensive portfolio for sustained success in your sector, whether you're talking automation engineering, drives or electrical installation systems. Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) form the core of our offering. TIA and TIP are the basis of our integrated range of products and systems for the manufacturing and process industries as well as building automation. This portfolio is rounded off by innovative services over the entire life cycle of your plants.

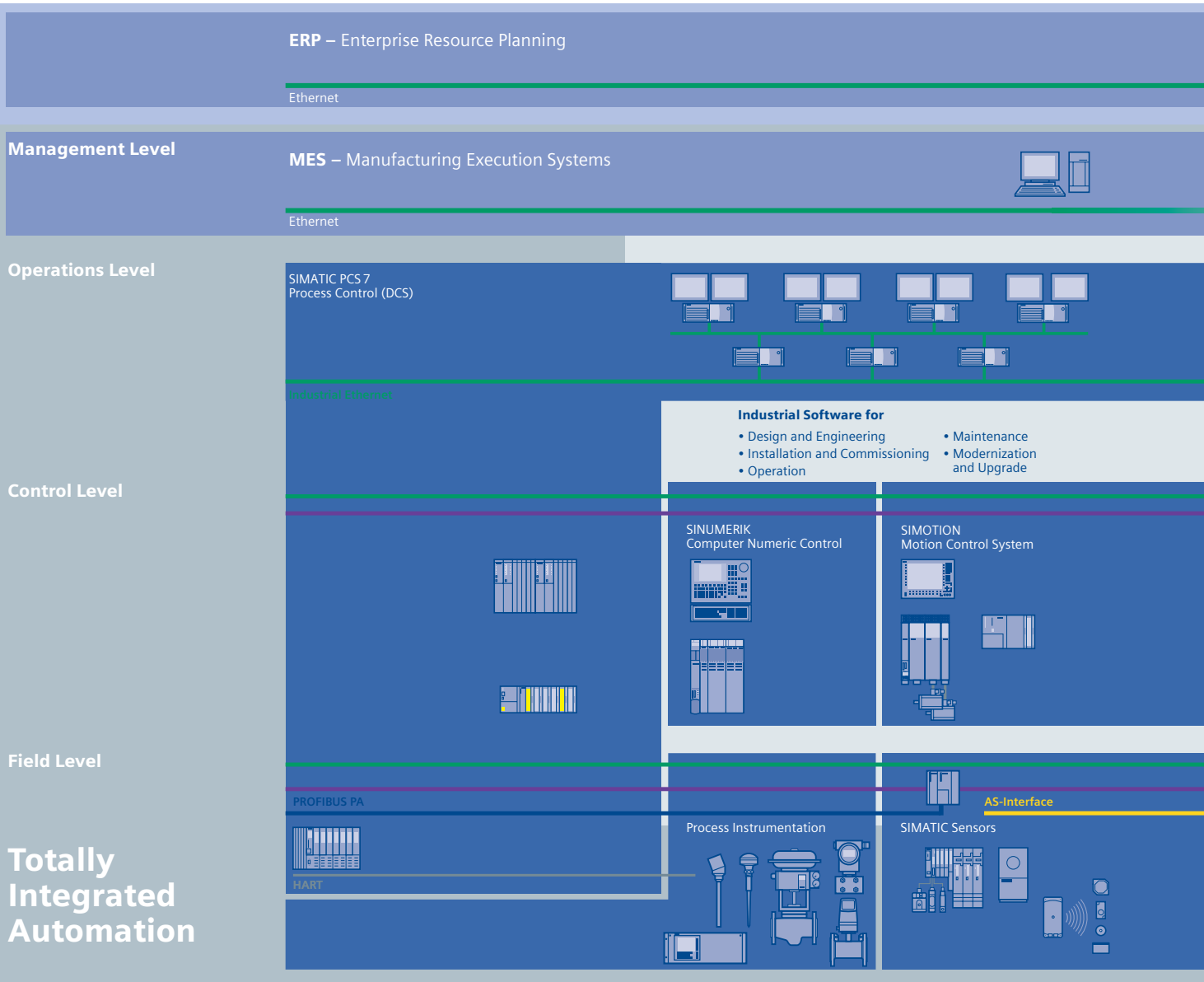
Learn for yourself the potential our products and systems offer. And discover how you can permanently increase your productivity with us.

Your regional Siemens contact can provide more information. He or she will be glad to help.

Sharpen your competitive edge. Totally Integrated Automation

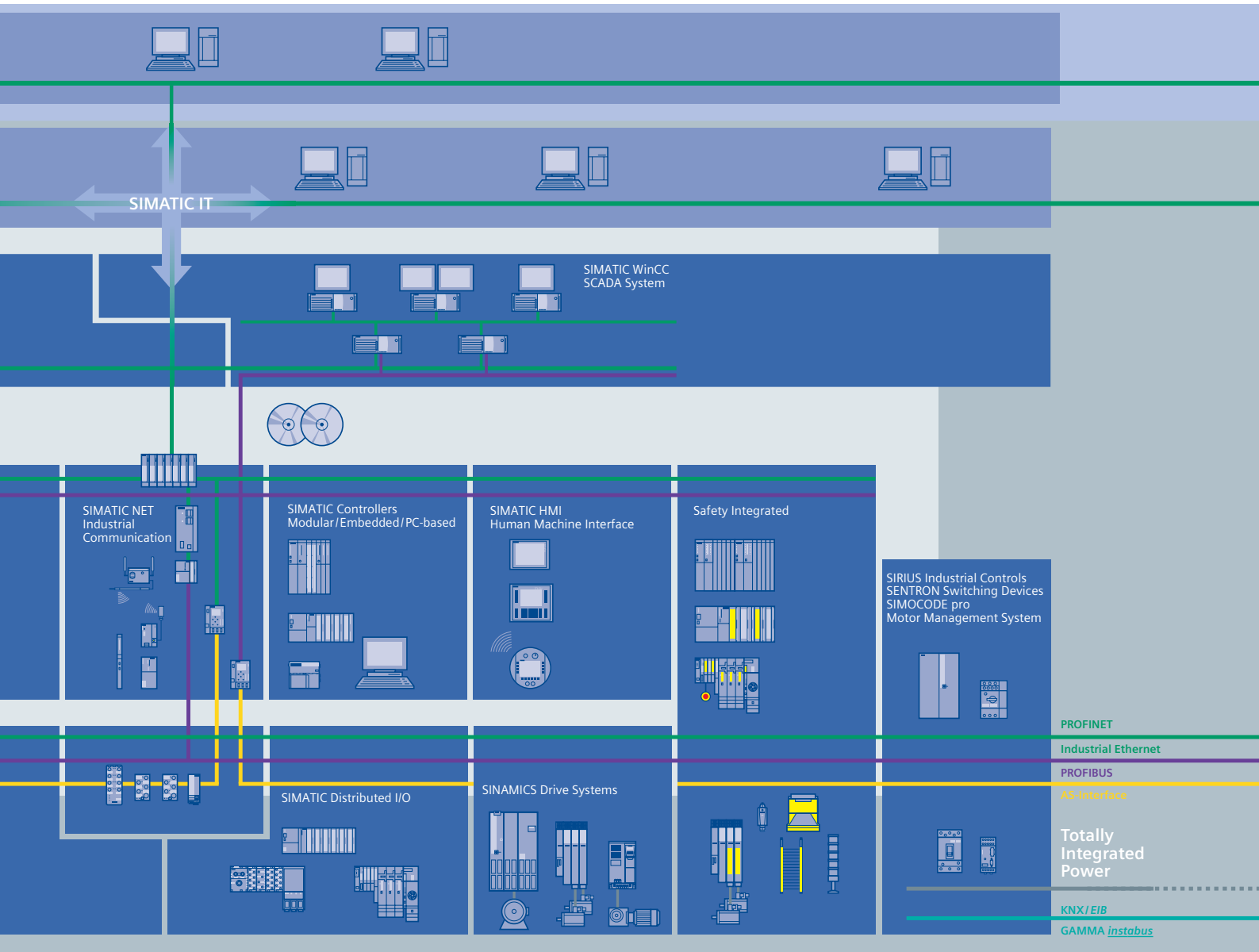
With Totally Integrated Automation (TIA), Siemens is the only manufacturer to offer an integrated range of products and systems for automation in all sectors - from incoming goods to outgoing goods, from the field level through the production control level to connection with the corporate management level.

On the basis of TIA, we implement solutions that are perfectly tailored to your specific requirements and are characterized by a unique level of integration. This integration not only ensures significant reductions in interface costs but also guarantees the highest level of transparency across all levels.



It goes without saying that you profit from Totally Integrated Automation during the entire life cycle of your plants - from the first planning steps, through operation, right up to modernization. Consistent integration in the further development of our products and systems guarantees a high degree of investment security here.

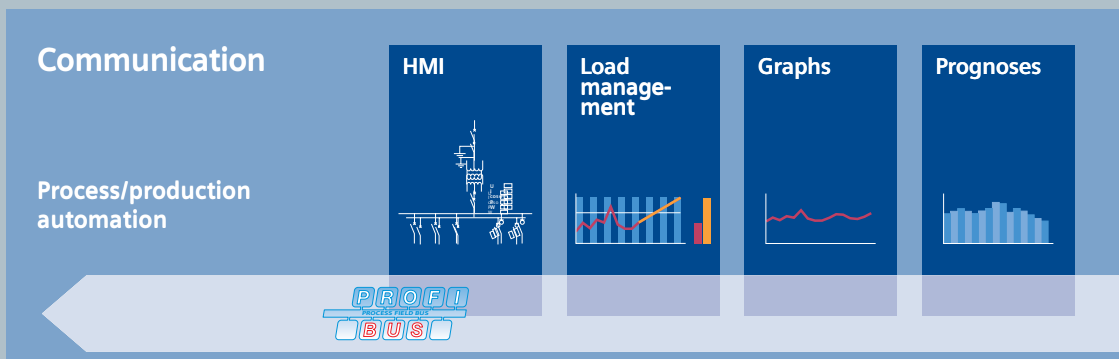
Totally Integrated Automation makes a crucial contribution towards optimizing everything that happens in the plant and thus creates the conditions for a significant increase in productivity.

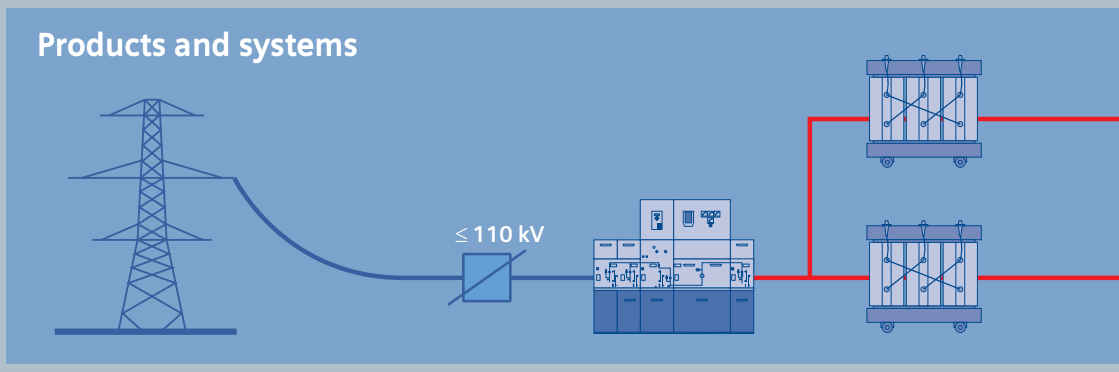


Integrated energy distribution from a single source. Totally Integrated Power

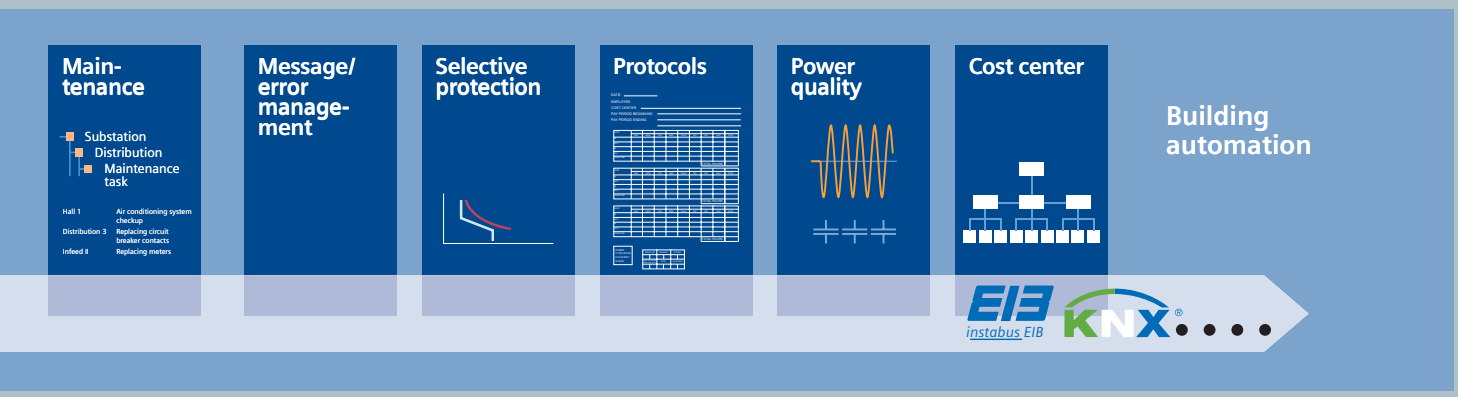
Totally Integrated Power (TIP) brings together all the components of electrical energy distribution into an integrated whole. Thus TIP provides the answer to growing market demands in the planning, construction and use of utility buildings and industrial buildings.

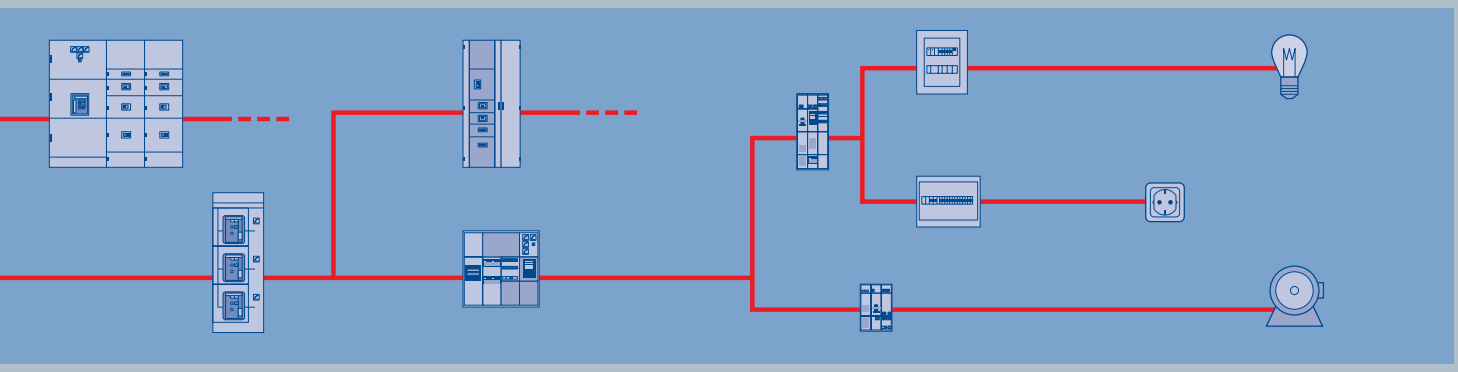
On the basis of TIP, we offer integrated solutions for energy dis-tribution, from medium voltage to the power outlet. Totally Inte-grated Power is based here on integration in planning and configuring as well as on perfectly matched products and systems.

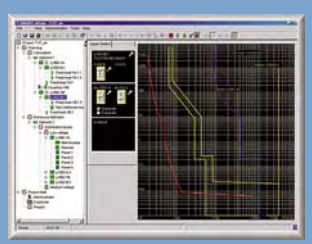


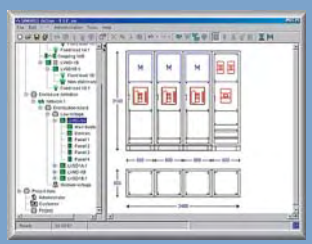


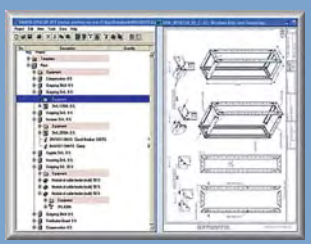
Totally Integrated Power offers communication and software modules for connecting the energy distribution systems to industrial automation and building automation. This enables the implemen-tation of significant savings potential.











Low-Voltage Controls and Distribution. The basis for progressive solutions.

Extremely high demands are made on modern low-voltage controls and distribution: users want cost-effective solutions that are easy to integrate in control cabinets, distribution boards and distributed systems and can communicate perfectly with each other. Siemens has the answer: SIRIUS industrial controls and low-voltage power distribution with SIVACON, SENTRON and SIMARIS.

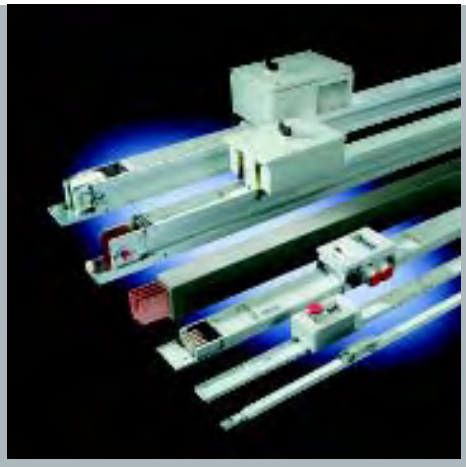
SIRIUS industrial controls

The SIRIUS range has everything you need for switching, protecting and starting loads. Products for monitoring, control, detection, commanding, signaling and power supply round off the spectrum of in-dustrial controls. Combined with Totally Integrated Automation, Safety Integrated and ECOFAST, our product portfolio can be bundled to create optimized systems. All in all, Siemensprovides innovative controls with modern features, such as integrated communication and safety technology that work to your advantage:

The basis for ground-breaking integrated solutions.

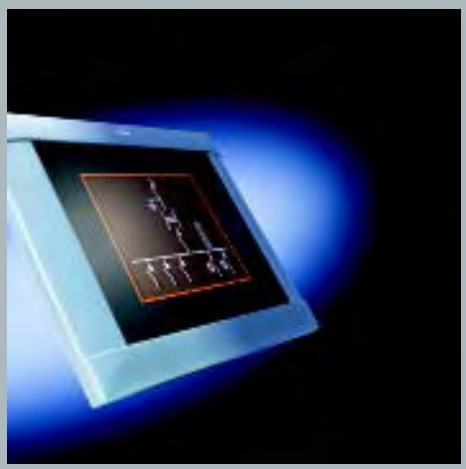
SIRIUS Safety Integrated product range

SIRIUS modular system



SIVACON 8PS busbar trunking systems

SENTRON switching devices



Software for power distribution

Low-voltage power distribution with SIVACON, SENTRON and SIMARIS

Non-residental buildings and industrial plants have one thing in common: without electricity, everything comes to a halt. The availability, safety and cost effectiveness of the power distribution system is of utmost importance – from the medium voltage supply point through to the socket outlet. And only integrated solutions can ensure maximum efficiency for planning, configuration and operation.

The concept is called Totally Integrated Power from Siemens. Total integration in planning and configuration creates synergies and saves costs. Perfectly matched products and systems provide efficient engineering and reliable operation. In the field of low-voltage power distribution, the following product ranges are available:

SIVACON: From flexible busbar trunking systems through to safe power distribution boards and motor control centers.

SENTRON: From well-proven switch disconnectors through to intelligent circuit breakers.

Software for power distribution: Everything for dimensioning, configuring, visualizing and controlling your power distribution.

SIRIUS Industrial Controls.

From tried and tested and reliable contactors, over easy-to-use relays, through to our innovative solid-state switching devices for the harshest of environments - SIRIUS ensures safe and reliable switching.

ON or OFF – you decide – 24/7.
Switching with SIRIUS.

See Chapter 2

SIRIUS protection equipment stands for high system availability and effective motor and installation protection. SIRIUS overload relays ensure consistent motor protection, suitable for all requirements and all budgets. SIRIUS motor starter protectors offer reliable protection against short-circuits and overload. Protect all running equipment.

Everything's in safe hands.
Protection with SIRIUS.

See Chapter 3

Finally a truly comprehensive and perfectly matched range of switching and protection devices from the SIRIUS modular system: from fully mounted direct-on-line starters and reversing starters through to soft starters. And for distributed solutions with AS-Interface or PROFIBUS, please refer to the communication-capable SIRIUS motor starters.

Everything's up and running.
Starting with SIRIUS.

See Chapter 4

Whether you're using our comprehensive SIRIUS monitoring relays, our intelligent and communication-capable motor management system SIMOCODE pro, or our wide range of safety relays - our easy-to-use devices enable extremely reliable monitoring and control of your motors and installations.

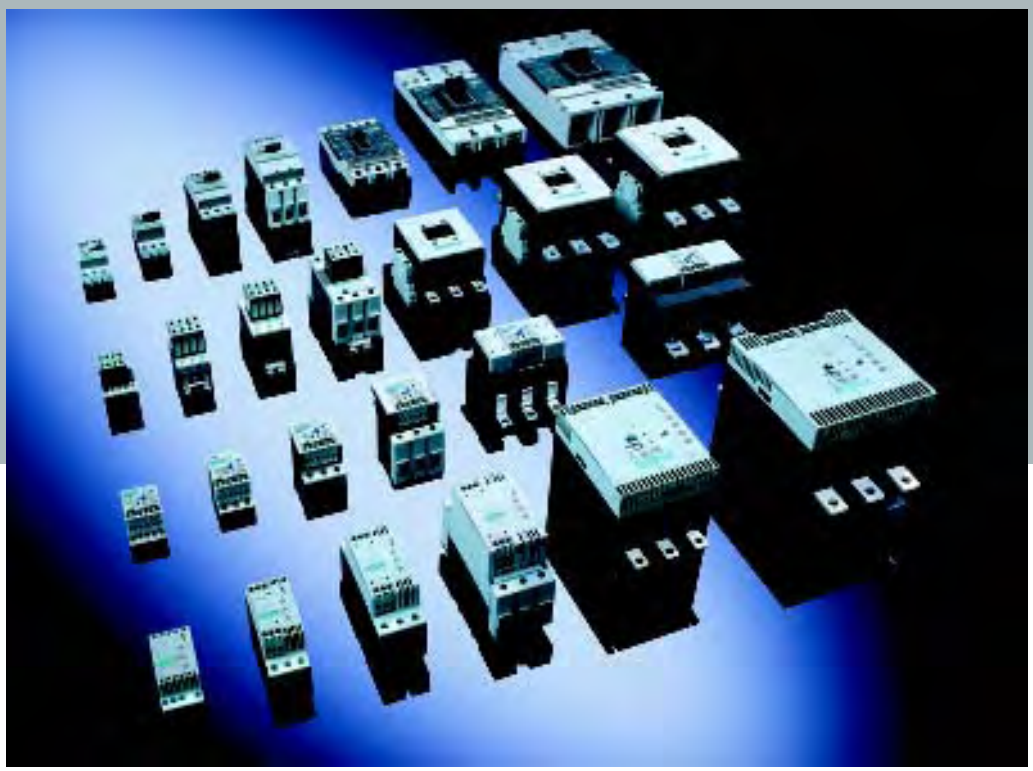
Everything's in sight.
Monitoring and control with SIRIUS.

See Chapter 5

Ultimate modularity for your control cabinet: the SIRIUS modular system

Modular standard components, which are optimally coordinated, can be combined with ease and use the same accessories and maximize synergies. All this is provided by our tried and tested SIRIUS modular system for the simple design and setup of load feeders. Our system provides everything you need for switching, protection and starting of motors and installations. Only seven sizes are needed, for a performance range up to 250 kW/415 V.

The fact that we are continually expanding and improving our SIRIUS modular system means that it is able to provide individual and cost-effective solutions for those everyday problems faced in the field. Key features of all single components are their small footprint and high flexibility. Configuring, installing, wiring and servicing are extremely easy and timesaving to perform. Regardless of whether you want to design load feeders with motor starter protectors or overload relays, contactors or soft starters, the SIRIUS modular system range has the right product for every application.



The SIRIUS modular system has everything you need for switching, protection and starting of motors

SIRIUS Safety Integrated is safety-oriented control and distribution - consistent and innovative

SIRIUS Safety Integrated

As part of our uniform safety systems - Safety Integrated, SIRIUS Safety Integrated covers safety-oriented controls and distribution in the field of industrial automation. For performing safety tasks at cell level - be they failsafe detecting, commanding and signaling, monitoring and evaluating or the startup and reliable shutdown of installations. Combined with standard fieldbus systems, such as AS-Interface and PROFIBUS, SIRIUS Safety Integrated can even solve networked safety tasks of considerable complexity.

Communication-capable ECOFAST motor starters in IP65/76

ECOFAST

Modern field and power bus technologies open up a whole new world of options and up to now unknown saving potential. ECOFAST (Energy and Communication Field Installation System) is the distributed system solution with a standardized connection method for all components on the basis of distributed installation, and is equipped throughout for PROFIBUS DP and AS-Interface.

AS-Interface

As a cost-effective and robust bus system at field level, AS-Interface connects actuators and sensors – from temperature sensor to motor starter – to the higher control level.

For our complete AS-Interface product range for standard or safety applications we can provide you with a consistent and easy connection to PROFIBUS or PROFINET. AS-Interface: easy, safe, consistent!

System overview - AS-Interface

Controls – Contactors and Contactor Assemblies

2

Introduction

Overview



Size		**S00**			**S0**				**S2**			
Type		3RT10 1			3RT10 2				3RT10 3			
3RT10 contactors · 3RT12 and 3TF68/69 vacuum contactors												
Type		**3RT10 15**	**3RT10 16**	**3RT10 17**	**3RT10 23**	**3RT10 24**	**3RT10 25**	**3RT10 26**	**3RT10 34**	**3RT10 35**	**3RT10 36**	
AC, DC operation		(p. 2/12)			(p. 2/13)				(p. 2/13)			
Type		—			—				—			
AC-3												
I_e/AC-3/415 V	A	7	9	12	9	12	17	25	32	40	50	
415 V	**kW**	**3**	**4**	**5.5**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**	
230 V	kW	2.2	3	3	3	3	4	5.5	7.5	11	15	
500 V	kW	3.5	4.5	5.5	4.5	7.5	10	11	18.5	22	30	
690 V	3RT10/12 kW	4	5.5	5.5	5.5	7.5	11	11	18.5	22	22	
1 000 V	3RT10/12 kW	—	—	—	—	—	—	—	—	—	—	
AC-4 (for I_a = 6 x I_e)												
415 V	**kW**	**3**	**4**	**4**	**4**	**5.5**	**7.5**	**7.5**	**15**	**18.5**	**22**	
415 V	3RT10/12 kW	1.15	2	2	2	2.6	3.5	4.4	8.2	9.5	12.6	
(200 000 operating cycles)												
AC-1 (≤ 690 V)												
I_e	3RT10/12 **A**	**18**	**22**	**22**	**40**	**40**	**40**	**40**	**50**	**60**	**60**	
3RT14 AC-1 contactors												
Type		—			—				—			
I_e/AC-1/≤ 690 V	**A**	—			—				—			
Accessories for contactors												
Auxiliary switch blocks	front	**3RH19 11**		(p. 2/47)	**3RH19 21**		(p. 2/47)					
	lateral	—			**3RH19 21**		(p. 2/47)					
Terminal covers		—			—				**3RT19 36-4EA2**		(p. 2/53)	
Box terminal blocks		—			—				—			
Surge suppressors		**3RT19 16**		(p. 2/51)	**3RT19 26**		(p. 2/51)		**3RT19 26/36**		(p. 2/51)	
3RU1 and 3RB2 overload relays (protection equipment: overload relays)												
3RU11, thermal, CLASS 10		**3RU11 16**	0.1 ... 12 A (Chap. 3)		**3RU11 26**	1.8 ... 25 A (Chap. 3)			**3RU11 36**	5.5 ... 50 A (Chap. 3)		
3RB20/21, solid-state, CLASS 5, 10, 20 and 30		**3RB20 16**	0.1 ... 12 A (Chap. 3)		**3RB20 26**	3 ... 25 A	(Chap. 3)		**3RB20 36**			
		3RB21 16			**3RB21 26**				**3RB21 36**	6 ... 50 A	(Chap. 3)	
3RB22/23, solid-state, CLASS 5, 10, 20 and 30		**3RB2. 83 + 3RB29 06**	0.3 ... 25 A (Chap. 3)						**3RB2. 83 + 3RB29 06**	10 ... 100 A	(Chap. 3)	
3RV10 motor starter protectors (protection equipment: motor starter protectors)												
Type		**3RV10 11**	0.18 ... 12 A (Chap. 3)		**3RV10 21**	9 ... 25 A	(Chap. 3)		**3RV10 31**	22 ... 50 A	(Chap. 3)	
Link modules		**3RA19 11**		(Chap. 3)	**3RA19 21**		(Chap. 3)		**3RA19 31**		(Chap. 3)	
3RA13 reversing contactor assemblies												
Complete units	Type	**3RA13 15**	**3RA13 16**	**3RA13 17**		**3RA13 24**	**3RA13 25**	**3RA13 26**	**3RA13 34**	**3RA13 35**	**3RA13 36**	
		(p. 2/19)				(p. 2/20)			(p. 2/21)			
400 V	**kW**		**3**	**4**	**5.5**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**	
Installation kits/wiring modules		**3RA19 13-2A**		(p. 2/24)	**3RA19 23-2A**		(p. 2/24)		**3RA19 33-2A**		(p. 2/24)	
Mechanical interlocks		**3RA19 12-2H**		(p. 2/25)	**3RA19 24-1A/-2B**		(p. 2/23)					
3RA14 contactor assemblies for wye-delta starting												
Complete units	Type	**3RA14 15**	**3RA14 16**		**3RA14 23**		**3RA14 25**		**3RA14 34**	**3RA14 35**	**3RA14 36**	
		(p. 2/28)			(p. 2/29)				(p. 2/30, 2/31)			
400 V	**kW**	**5.5**	**7.5**		**11**		**15/18.5**		**22/30**	**37**	**45**	
Installation kits/wiring modules		**3RA19 13-2B**		(p. 2/33)	**3RA19 23-2B**		(p. 2/33)		**3RA19 33-2B/-2C**		(p. 2/33)	



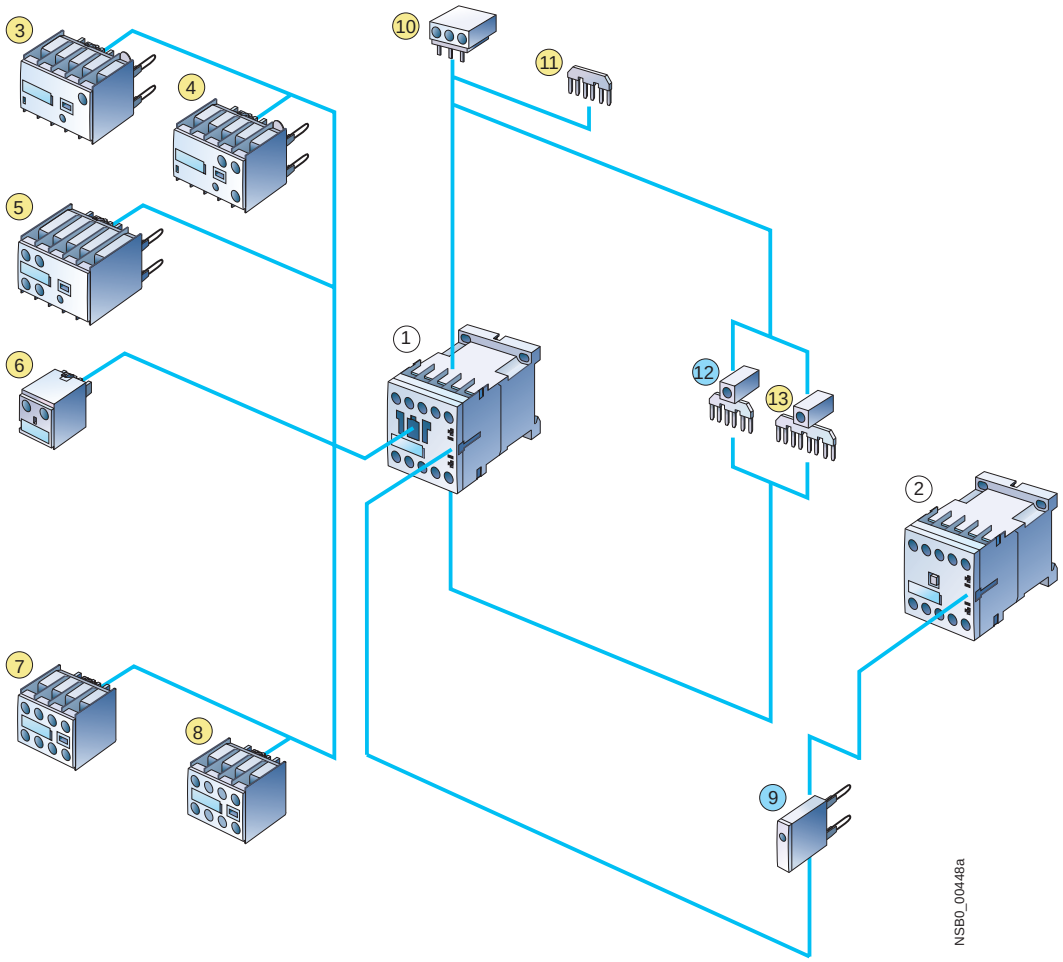


	S3 3RT1. 4			**S6** 3RT1. 5			**S10** 3RT1. 6			**S12** 3RT1. 7		**14** 3TF6	
	3RT10 44 (p. 2/13)	**3RT10 45**	**3RT10 46**	**3RT10 54** (p. 2/14)	**3RT10 55**	**3RT10 56**	**3RT10 64** (p. 2/14)	**3RT10 65**	**3RT10 66**	**3RT10 75** (p. 2/14)	**3RT10 76**	—	
	—		—				**3RT12 64** (p. 2/16)	**3RT12 65**	**3RT12 66**	**3RT12 75** (p. 2/16)	**3RT12 76**	**3TF68** (p. 2/17)	**3TF69**
	65	80	95	115	150	185	225	265	300	400	500	630	820
	30	**37**	**45**	**55**	**75**	**90**	**110**	**132**	**160**	**200**	**250**	**335**	**450**
	18.5	22	22	37	45	55	55	75	90	132	160	200	260
	37	45	55	75	90	110	160	160	200	250	355	434	600
	45	55	55	110	132	160	200	250	250	400	400/500	600	800
	30	37	37	75	90	90	90/315	132/355	132/400	250/560	250/710	600	800
	30	**37**	**45**	**55**	**75**	**90**	**110**	**132**	**160**	**200**	**250**	**355**	**400**
	15.1	17.9	22	29	38	45	54/78	66/93	71/112	84/140	98/161	168	191
	100	**120**	**120**	**160**	**185**	**215**	**275/330**	**330**	**330**	**430/610**	**610**	**700**	**910**
	3RT14 46		(p. 2/34)	**3RT14 56**		(p. 2/34)	**3RT14 66**		(p. 2/34)	**3RT14 76**	(p. 2/34)	—	
	140			**275**			**400**			**690**		—	
												— **3TY7 561**	(p. 2/59)
	3RT19 46-4EA1/2		(p. 2/53)	**3RT19 56-4EA1/2/3**		(p. 2/53)	**3RT19 66-4EA1/2/3**		(p. 2/53)			**3TX7 686/696**	(p. 2/57)
	—			**3RT19 55/56-4G**		(p. 2/53)	**3RT19 66-4G**		(p. 2/53)			—	
				3RT19 56-1C (RC element) (p. 3/108)								—	(p. 2/56)
	3RU11 46	18 ... 100 A (Chap. 3)		—			—			—		—	
	3RB20 46 **3RB21 46**	12.5 ... 100 A (Chap. 3)		**3RB20 56** **3RB21 56**	50 ... 200 A(Chap. 3)		**3RB20 66** **3RB21 66**	55 ... 630 A (Chap. 3)		**3RB20 66** **3RB21 66**	160 ... 630 A (Chap. 3)	**3RB20 66** **3RB21 66**	160 ... 630 A (Chap. 3)
				3RB2. 83 + 3RB29 56	20 ... 200 A(Chap. 3)		**3RB2. 83 + 3RB29 66**	63 ... 630 A (Chap. 3)					
	3RV10 41	45 ... 100 A (Chap. 3)		—			—			—		—	
	3RA19 41	(Chap. 3)		—			—			—		—	
	3RA13 44 (p. 2/22)	**3RA13 45**	**3RA13 46**	—			—			—		—	
	30	**37**	**45**	**55**	**75**	**90**	**110**	**132**	**160**	**200**	**250**	**335**	
	3RA19 43-2A		(p. 2/24)	**3RA19 53-2A**		(p. 2/24)	**3RA19 63-2A**		(p. 2/24)	**3RA19 73-2A**	(p. 2/24)	**3TX7 680-1A**	
				3RA19 54-2A		(p. 2/23)	**3TX7 686-1A**						
	3RA14 44 (p. 2/32)	**3RA14 45**		—			—			—		—	
	55	**75**		—			—			—		**630**	
	3RA19 43-2B/-2C		(p. 2/33)	**3RA19 53-2B**		(p. 2/33)	**3RA19 63-2B**		(p. 2/33)	**3RA19 73-2B**	(p. 2/33)	**3TX7 680-1B**	

Overview

3RT1 contactors and coupling relays
Size S00 with mountable accessories

The SIRIUS generation of controls is a complete, modular system family, logically designed right down to the last detail, from the basic units to the accessories.



① Contactor (page 2/12)
② Coupling relay (page 2/45)

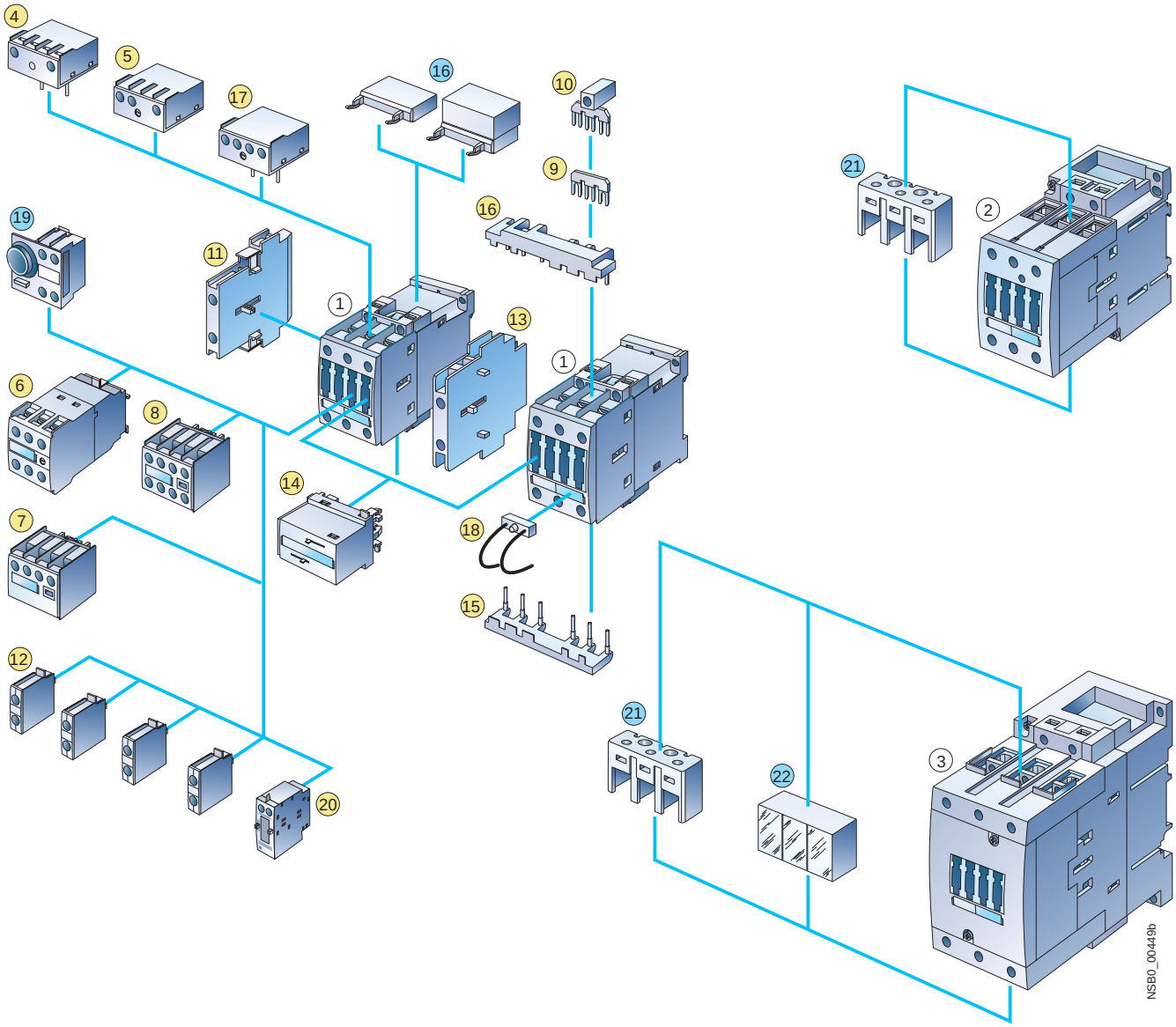
③ Solid-state time-delay block, ON-delay (page 2/50)
④ Solid-state time-delay block, OFF-delay (page 2/50)
⑤ Auxiliary switch block with solid-state time delay (page 2/48) (ON or OFF-delay or wye-delta function)
⑥ 1-pole auxiliary switch block, cable entry from above (page 2/47)
⑦ 4-pole auxiliary switch block (terminal designations according to EN 50005) (page 2/47)
⑧ 2-pole auxiliary switch block, standard version or solid-state time-delay version (pages 2/48) (terminal designations according to EN 50005)
⑨ Surge suppressor with LED (page 2/51)

⑩ 3-phase feeder terminal (page 2/33)
⑪ Link for paralleling (star jumper), 3-pole, without terminal (page 2/33)
⑫ Link for paralleling, 3-pole, with terminal (page 2/52)
⑬ Link for paralleling, 4-pole, with terminal (page 2/52)

For contactors
For contactors and coupling relays (interface)

For contactor assemblies see pages 2/18 to 2/33. For installation kit for reversing contactor assemblies (mech. interlocking, wiring modules) see pages 2/24, 2/25. For mountable overload relays see Protection Equipment: Overload Relays.

3RT1 contactors
Sizes S0 to S3 with mountable accessories



① Contactor, size S0, see page 2/13
② Contactor, size S2, see page 2/13
③ Contactor, size S3, see page 2/13

For sizes S0 to S3:

④ Solid-state time-delay block, ON-delay (page 2/50)
⑤ Solid-state time-delay block, OFF-delay (page 2/50)
⑥ Auxiliary switch block with solid-state time delay (page 2/49) (ON or OFF-delay or wye-delta function)
⑦ 2-pole auxiliary switch block, cable entry from above (page 2/47)
⑧ 4-pole auxiliary switch block (page 2/47)(terminal designations according to EN 50012 or EN 50005)
⑨ Link for paralleling (star jumper), 3-pole, without connection terminal (page 2/33)
⑩ Link for paralleling, 3-pole, with terminal (page 2/52)
⑪ 2-pole auxiliary switch block, laterally mountable left or right (page 2/48) (terminal designations according to EN 50012 or EN 50005)
⑫ Single-pole auxiliary switch block (up to 4 can be snapped on) (page 2/47)
⑬ Mechanical interlock, laterally mountable (page 2/23)
⑭ Mechanical interlock, mountable on the front (page 2/23)
⑮ Wiring modules on the top and bottom (reversing duty) (page 2/24)
⑯ Surge suppressor (page 2/51) (varistor, RC element, diode assembly), can be mounted on the top or bottom (different for S0 and S2/S3)
⑰ Coupling link for mounting directly onto contactor coil (page 2/52)
⑱ LED module for indicating contactor operation (page 2/52)

Only for size S0:

⑲ Pneumatic delay block (page 2/50)

Only for sizes S0 and S2:

⑳ Mechanical latching (page 2/50)

Only for sizes S2 and S3:

㉑ Terminal cover for box terminals (page 2/53)

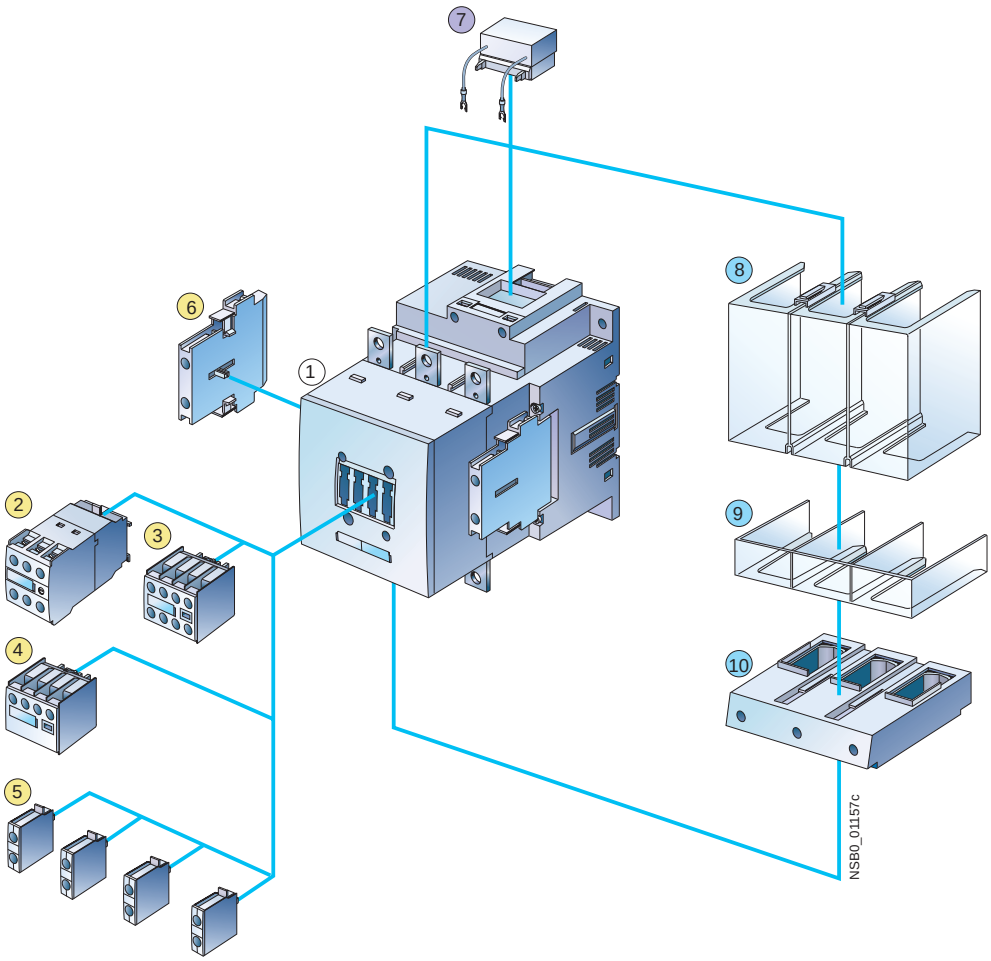
Only for size S3:

㉒ Terminal cover for cable lugs and busbar connections (page 2/53)

○ Accessories identical for sizes S0 to S3
○ Accessories differ according to size

General data

3RT1 contactors
Sizes S6 to S12 with accessories
(illustration for basic unit)



① 3RT10 and 3RT14 air-break contactor, sizes S6, S10 and S12 (page 2/14)

② Auxiliary switch block with solid-state time delay (page 2/49) (ON or OFF-delay or wye-delta function)

③ 4-pole auxiliary switch block (page 2/47) (terminal designations according to EN 50012 or EN 50005)

④ 2-pole auxiliary switch block, cable entry from above (page 2/47)

⑤ Single-pole auxiliary switch block (up to 4 can be snapped on) (page 2/47)

⑥ 2-pole auxiliary switch block, laterally mountable left or right (page 2/48) (terminal designations according to EN 50012 or EN 50005) (identical for S0 to S12)

⑦ Surge suppressor (RC element) (page 2/51), for plugging into top of withdrawable coil

⑧ Terminal cover for cable lug and busbar connection (page 2/53), different for sizes S6 and S10/S12

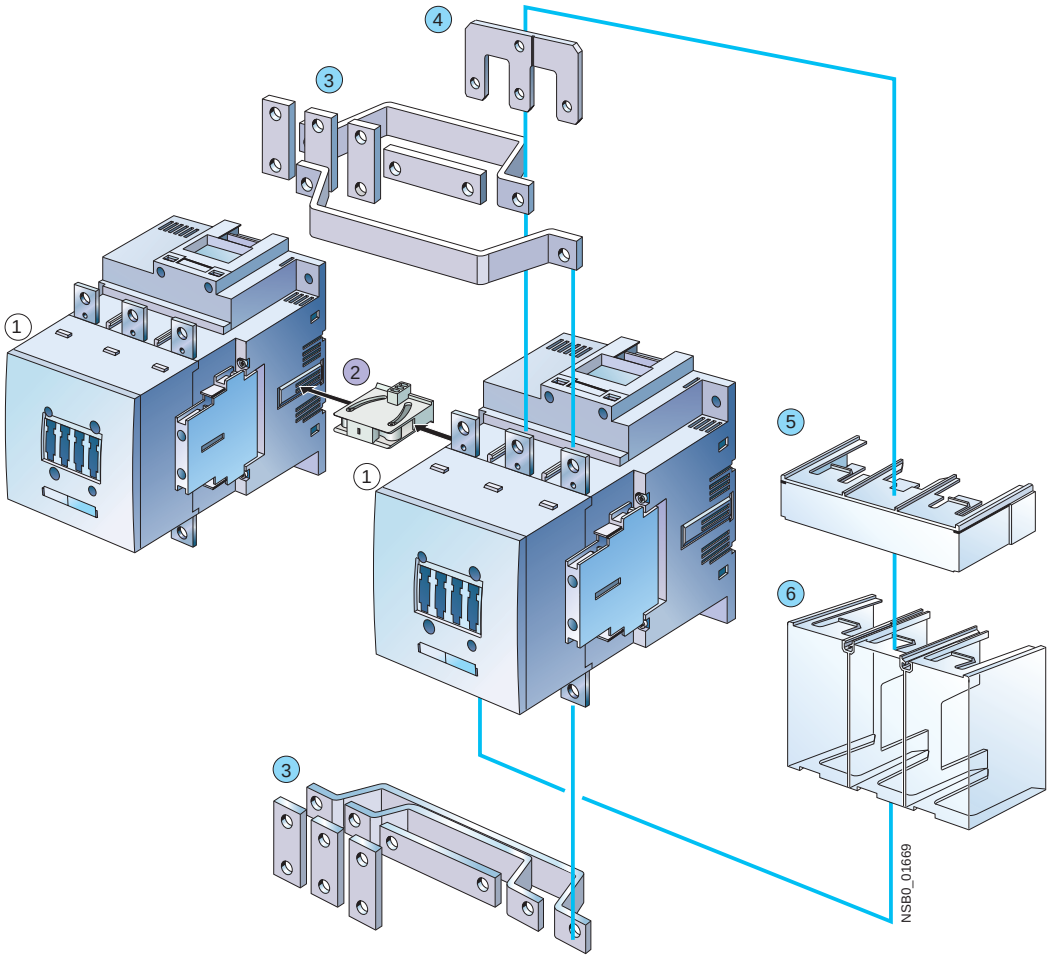
⑨ Terminal cover for box terminal, (page 2/53), different for sizes S6 and S10/S12

⑩ Box terminal block (page 2/53), different for sizes S6 and S10/S12

Accessories identical for sizes S0 to S12
Accessories identical for sizes S6 to S12
Accessories differ according to size

For mountable overload relays see Protection Equipment: Overload Relays.

3RA1 contactor assemblies, 3RT1 contactors
Sizes S6, S10 and S12 with accessories



① 3RT10 and 3RT14 air-break contactor, sizes S6, S10 and S12 (page 2/14 and 2/34) or 3RT12 vacuum contactor, sizes S10 and S12 (page 2/16)

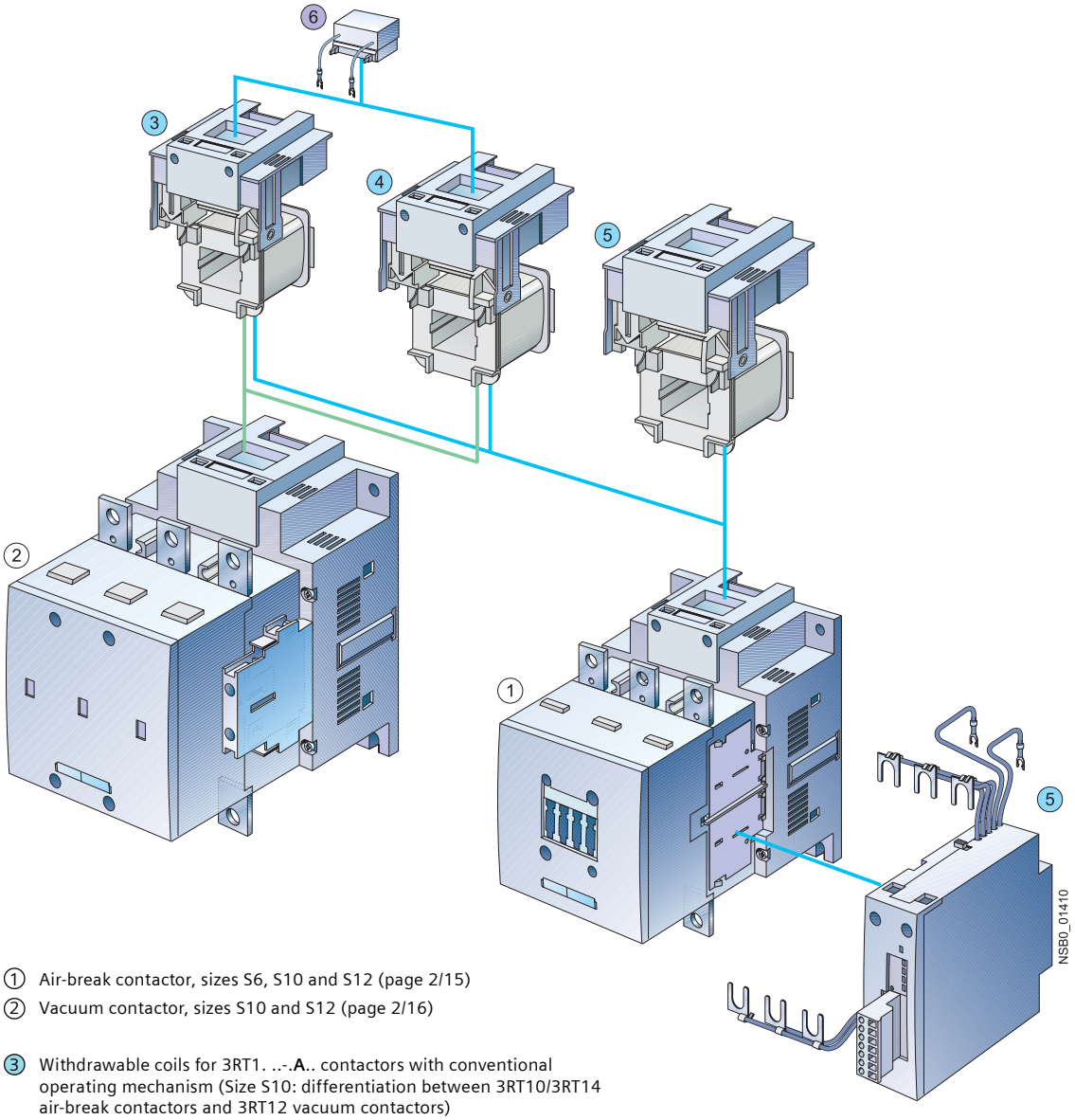
② Mechanical interlock, laterally mountable (page 2/23)
③ 3RA19 wiring modules on the top and bottom (page 2/24)
④ 3RT19 56-4BA31 link for paralleling (star jumper), 3-pole, with through hole (page 2/52)
⑤ Terminal cover for box terminal, (page 2/53), different for sizes S6 and S10/S12
⑥ Terminal cover for cable lug and busbar connection (page 2/53), different for sizes S6 and S10/S12

Accessories identical for sizes S6 to S12
Accessories differ according to size

For mountable overload relays see Protection Equipment: Overload Relays.

General data

3RT1 contactors
Sizes S6 to S12 with accessories



① Air-break contactor, sizes S6, S10 and S12 (page 2/15)
② Vacuum contactor, sizes S10 and S12 (page 2/16)

③ Withdrawable coils for 3RT1. ..-.**A**.. contactors with conventional operating mechanism (Size S10: differentiation between 3RT10/3RT14 air-break contactors and 3RT12 vacuum contactors)
(Size S12: the same for air-break and vacuum contactors)

④ Withdrawable coils for 3RT1. ..-.**N**.. contactors with solid-state operating mech-anism (Size S10: differentiation between 3RT10/3RT14 air-break contactors and 3RT12 vacuum contactors)
(Size S12: the same for air-break and vacuum contactors)

⑤ Withdrawable coils and laterally mountable module (plug-on) for 3RT1. ..-.**P**.. and 3RT1. ..-.**Q**.. air-break contactors with solid-state operating mechanism and remaining lifetime indicator

⑥ Surge suppressor (RC element) (page 2/51), plug-mountable on withdrawable coils
- 3RT1...-.**A**.. with conventional operating mechanism
- 3RT1...-.**N**.. with solid-state operating mechanism

Identical for sizes S6 to S12
Different according to size

For mountable overload relays see Protection Equipment: Overload Relays.

Overview

3RT10 contactors, 3-pole, sizes S00 to S3, up to 45 kW

AC and DC operation

IEC 60947, EN 60947 (VDE 0660)

The 3RT1 contactors are climate-proof. They are finger-safe

according to EN 50274.

Size S00 contactors have an auxiliary contact integrated in the basic unit. The basic units of sizes S0 to S3 contain only the main current paths.

All basic units can be extended with auxiliary switch blocks.

For size S0 and higher, complete units with 2 NO + 2 NC are available (connection designation according to EN 50012). The auxiliary switch block can be removed.

Contact reliability

If voltages ≤ 110 V and current ≤ 100 mA are to be switched, the auxiliary contacts of the 3RT1 contactor or 3RH11 contactor relay should be used as they guarantee a high level of contact reliability.

These auxiliary contacts are suitable for solid-state circuits with currents ≥ 1 mA at a voltage of 17 V.

Short-circuit protection of the contactors

For more information about short-circuit protection of contactors without overload relay, see Technical specifications. For short-circuit protection of the contactors with overload relay, see “Overload Relays”. To assemble fuseless motor feeders you must select combinations of motor starter protector and contactor as explained in “Fuseless Load Feeders”.

Motor protection

3RU11 thermal overload relays or 3RB20 solid-state overload relays can be fitted to the 3RT1 contactors for protection against overload. The overload relays must be ordered separately.

Ratings of induction motors

The quoted rating (in kW) refers to the output power on the motor shaft (according to the nameplate).

Surge suppression

3RT1 contactors can be retrofitted with RC elements, varistors, diodes or diode assemblies (assembly of diode and Zener diode for short break times) for damping opening surges in the coil.

The surge suppressors are plugged onto the front of size S00 contactors. Space is provided for them next to a snap-on auxiliary switch block.

For size S0 to S3 contactors, varistors and RC elements can be snapped on either on the top or directly below the coil terminals. Diode assemblies are available in 2 different versions on account of their polarity. Depending on the application they can be connected either only at the bottom (assembly with motor starter protector) or only at the top (assembly with overload relay).

The plug-in direction of the diodes and diode assemblies is specified by coding.

Exceptions:

3RT19 26-1T . 00 and

3RT19 36-1T . 00, in this case the plug-in direction is marked with “+” and “-”.

Coupling relays are supplied either without surge suppression or with a varistor or diode connected as standard, according to the version.

Note:
The OFF-delay times of the NO contacts and the ON-delay times of the NC contacts increase if the contactor coils are damped against voltage peaks (noise suppression diode 6 to 10 times; diode assemblies 2 to 6 times, varistor +2 to 5 ms).

3RT10 contactors, 3-pole, sizes S6 to S12, > 45 to 250 kW

- 3RT10, contactors for switching motors,
- 3RT12, vacuum contactors for switching motors,
- 3RT14, contactors for AC-1 applications.

Operating mechanism types

Two types of solenoid operation are available:

- Conventional operating mechanism
- Solid-state operating mechanism (with 3 performance levels)

UC operation

The contactors can be operated with AC (40 to 60 Hz) as well as with DC.

Withdrawable coils

For simple coil replacement, e.g. if the application is replaced, the magnetic coil can be pulled out upwards after the release mechanism has been actuated and can be replaced by any other coil of the same size.

Auxiliary contact complement

The contactors can be fitted with up to 8 auxiliary contacts (identical auxiliary switch blocks from S0 to S12). Of these, no more than 4 are permitted to be NC contacts.

3RT10 and 3RT14 contactors:
auxiliary contacts mounted laterally and on front
3RT12 vacuum contactors:
auxiliary contacts mounted laterally

Contactors with conventional operating mechanism

3RT1 . . . - . A version:

The magnetic coil is switched directly on and off with the control supply voltage U_s by way of terminals A1/A2.

Multi-voltage range for the control supply voltage U_s:

Several closely adjacent control supply voltages, available around the world, are covered by just one coil,
for example 110-115-120-127 V UC or 220-230-240 V UC.

In addition, allowance is also made for a coil operating range of 0.8 times the lower ($U_{s\,min}$) and 1.1 times the upper ($U_{s\,max}$) rated control supply voltage within which the contactor switches reliably and no thermal overloading occurs.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactors with solid-state operating mechanism

The magnetic coil is supplied selectively with the power required for reliable switching and holding by upstream control electronics.

- Wide voltage range for the control supply voltage U_s:
  Compared with the conventional operating mechanism, the solid-state operating mechanism covers an even broader range of control supply voltages used worldwide within one coil variant.

  For example, the coil for 200 to 277 V UC ($U_{s\ min}$ to $U_{s\ max}$) covers the voltages 200-208-220-230-240-254-277 V used worldwide.
- Extended operating range 0.7 to 1.25 x U_s:
  The wide range for the rated control supply voltage and the additionally allowed coil operating range of 0.8 x $U_{s\ min}$ to 1.1 x $U_{s\ max}$ results in an extended coil operating range of at least 0.7 to 1.25 x U_s, within which the contactors will operate reliably, for the most common control supply voltages of 24, 110 and 230 V.
- Bridging temporary voltage dips:
  Control voltage failures dipping to 0 V (at A1/A2) are bridged for up to approx. 25 ms to avoid unintentional tripping.
- Defined ON and OFF thresholds:
  For voltages of ≥ 0.8 x $U_{s\ min}$ and higher the electronics will reliably switch the contactor ON, and as of ≤ 0.5 x $U_{s\ min}$ it is reliably switched OFF. The hysteresis in the switching thresholds prevents the main contacts from chattering as well as increased wear or welding when operated in weak, unstable networks. This also prevents thermal overloading of the contactor coil if the voltage applied is too low (contactor does not close properly and is continuously operated with overexcitation).
- Low control power consumption when closing and in the closed state.

Electromagnetic compatibility (EMC)

The contactors with solid-state operating mechanism comply with the requirements for operation in industrial plants.

- Interference immunity
  - burst (IEC 61000-4-4): 4 kV
  - surge (IEC 61000-4-5): 4 kV
  - electrostatic discharge, ESD (IEC 61000-4-2): 8/15 kV
  - electromagnetic field (IEC 61000-4-3): 10 V/m
- Emitted interference
  - limit value class A according to EN 55011

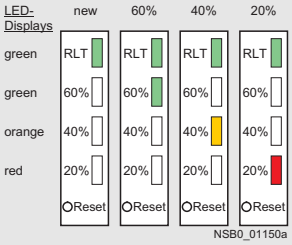
Note:
In connection with converters, the control cables should be installed separately from the load cables of the converter.

Indication of remaining lifetime (RLT)

Main contactor contacts are working parts which must be replaced in good time when the end of their service life has been reached. The degree of contact erosion and thus the electrical endurance (= number of operating cycles) depends on the loading, utilization category, operating mode, etc. Routine checks/visual inspections by the maintenance personnel are needed in order to monitor the state of the main contacts. The remaining lifetime indication function takes over this task. It does not count the number of operating cycles – which does not provide information about contact erosion – but instead electronically identifies, evaluates and stores the actual progress of erosion of each one of the three main contacts, and outputs a warning when specified limits are reached. The stored data are not lost even if the control supply voltage for A1/A2 fails. After replacement of the main contacts, measurement the remaining lifetime must be reset using the "RESET" button (hold down RESET button for about 2 seconds using a pen or similar tool).

Advantages:

- Signaling through relay contact or AS-i when remaining lifetime is 20 %, i.e. contact material wear is 80 %
- Additional visual indication of various levels of erosion by means of LEDs on the laterally mounted solid-state module when remaining lifetime is 60 % (green), 40 % (orange) and 20 % (red)



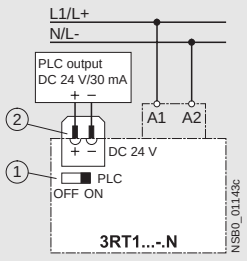
- Early warning to replace contacts
- Optimum utilization of contact material
- Visual inspection of the condition of contacts no longer necessary
- Reduction of ongoing operating costs
- Optimum planning of maintenance measures
- Avoidance of unforeseen plant downtimes

3RT1 . . . - . N version: for 24 V DC PLC output

2 control options:

- Control without a coupling link directly through a 24 V DC/ ≥ 30 mA PLC output (EN 61131-2). Connection by means of 2-pole plug-in connection. The screwless spring-type connection is part of the scope of supply. The control supply voltage which supplies the solenoid operating mechanism must be connected to A1/A2.

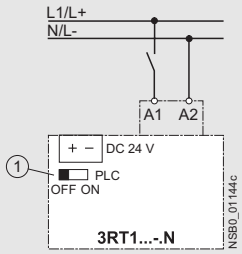
Note:
Before start-up, the slide switch for PLC operation must be moved to the "PLC ON" position (setting ex works: "PLC OFF").



① Slide switch must be in "PLC ON" position
② Plug-in connection, 2-pole

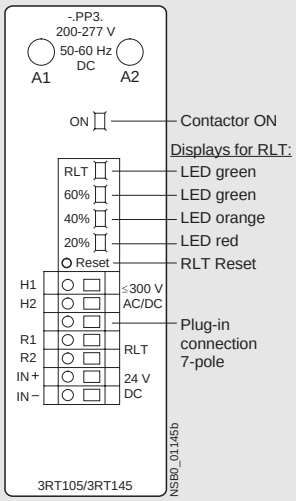
- Conventional control by applying the control supply voltage at A1/A2 through a switching contact.

Note:
The slide switch must be in the "PLC OFF" position (= setting ex works)



① Slide switch must be in "PLC OFF" position

3RT1 . . . - . P version: for 24 V DC PLC output or PLC relay output, with remaining lifetime indicator (RLT).

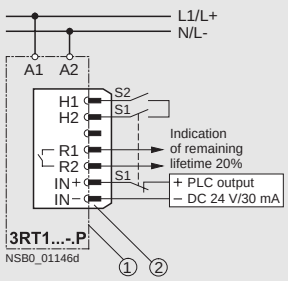


To supply the solenoid and the remaining lifetime indicator with power, the control supply voltage U_s must be connected to terminals A1/A2 of the laterally mounted solid-state module. The control inputs of the contactor are connected to a 7-pole plug-in connection; the screwless spring-operated connector is part of the scope of supply.

- The "Remaining Lifetime RLT" status signal is available at terminals R1/R2 through a floating relay contact (hard gold-plated, enclosed) and can be input to SIMOCODE, PLC or other devices for processing, for example.
  Permissible current-carrying capacity of the R1/R2 relay output:
  - I_e/AC-15/24 to 230 V: 3 A
  - I_e/DC-13/24 V: 1 A
- LED indications
  The following states are indicated by means of LEDs on the laterally mounted solid-state module:
  - contactor ON (energized state): green LED ("ON")
  - indication of remaining lifetime

2 control options:

- Contactor control without a coupling link directly through a 24 V DC/ ≥ 30 mA PLC output (EN 61131-2) by way of terminals IN+/IN-.

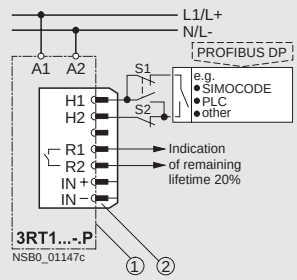


① Solid-state module of 3RT1. ..-.P contactor
② Plug-in connection, 7-pole
S1 Selector switch for switching from automatic control through PLC semiconductor output to local control
S2 Local control option

Possibility of switching from automatic control to local control by way of terminals H1/H2, i.e. automatic control through PLC or SIMOCODE/PROFIBUS DP can be deactivated e.g. at start-up or in the event of a fault and the contactor can be controlled manually.

- Contactor control through relay outputs, e.g. by
  - PLC
  - SIMOCODE

by way of terminals H1/H2. Contact loading: U_s/approx. 5 mA. When operated through SIMOCODE, a communication link to PROFIBUS DP is also provided.



① Solid-state module of 3RT1. ..-.P contactor
② Plug-in connection, 7-pole
S1 Selector switch for switching from automatic control, for example, through SIMOCODE or PLC relay output to local control
S2 Local control option

3RT10 contactors, 3-pole, 3 ... 250 kW

Selection and ordering data

3RT10 1 . -1A . . .

3RT10 1 . -1B . . .

Rated data AC-2 and AC-3, T_u: up to 60 °C		AC-1, T_u: 40 °C	Auxiliary contacts			Rated control supply voltage U_s at 50/60 Hz[2]	AC Operation Screw terminals	Weight per Piece approx.	Rated control supply voltage U_s	DC Operation Screw terminals	Weight per Piece approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 415 V	Operational up to 690 V	Ident. No.	Version			Order No.			Order No.	
A	**kW**	A		NO	NC	V AC		kg	V DC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail											
Size S00[1]											
Terminal designations according to EN 50012											
7	**3**	18	**10 E**	1	—	24	**3RT10 15-1AB01**	0.200	24	**3RT10 15-1BB41**	0.260
						110	**3RT10 15-1AF01**	0.200	110	**3RT10 15-1BF41**	0.260
						230	**3RT10 15-1AP01**	0.200	220	**3RT10 15-1BM41**	0.260
						400[2]	**3RT10 15-1AV01**	0.200			
			01	—	1	24	**3RT10 15-1AB02**	0.200	24	**3RT10 15-1BB42**	0.260
						110	**3RT10 15-1AF02**	0.200	110	**3RT10 15-1BF42**	0.260
						230	**3RT10 15-1AP02**	0.200	220	**3RT10 15-1BM42**	0.260
						400[2]	**3RT10 15-1AV02**	0.200			
9	**4**	22	**10 E**	1	—	24	**3RT10 16-1AB01**	0.200	24	**3RT10 16-1BB41**	0.260
						110	**3RT10 16-1AF01**	0.200	110	**3RT10 16-1BF41**	0.260
						230	**3RT10 16-1AP01**	0.200	220	**3RT10 16-1BM41**	0.260
						400[2]	**3RT10 16-1AV01**	0.200			
			01	—	1	24	**3RT10 16-1AB02**	0.200	24	**3RT10 16-1BB42**	0.260
						110	**3RT10 16-1AF02**	0.200	110	**3RT10 16-1BF42**	0.260
						230	**3RT10 16-1AP02**	0.200	220	**3RT10 16-1BM41**	0.260
						400[2]	**3RT10 16-1AV02**	0.200			
12	**5.5**	22	**10 E**	1	—	24	**3RT10 17-1AB01**	0.200	24	**3RT10 17-1BB41**	0.260
						110	**3RT10 17-1AF01**	0.200	110	**3RT10 17-1BF41**	0.260
						230	**3RT10 17-1AP01**	0.200	220	**3RT10 17-1BM41**	0.260
						400[2]	**3RT10 17-1AV01**	0.200			
			01	—	1	24	**3RT10 17-1AB02**	0.200	24	**3RT10 17-1BB42**	0.260
						110	**3RT10 17-1AF02**	0.200	110	**3RT10 17-1BF42**	0.260
						230	**3RT10 17-1AP02**	0.200	220	**3RT10 17-1BM42**	0.200
						400[2]	**3RT10 17-1AV02**	0.200			

For accessories, see page 3/45

1) For size S00: coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s,
at 60 Hz: 0.85 ... 1.1 x U_s.

2) Coil operating frequency 50 Hz for 400V control supply voltage

3RT10 2 . -1A .00.

3RT10 1 . -1B . . .

Rated data AC-2 and AC-3, T_u: up to 60 °C		AC-1, T_u: 40 °C	Auxiliary contacts		Rated control supply voltage U_s at 50/60 Hz[2]	AC Operation Screw terminals	Weight per Piece approx.	Rated control supply voltage U_s	DC Operation Screw terminals	Weight per Piece approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 415 V	Operational up to 690 V	Version		Order No.			Order No.		
A	kW	A	NO	NC	V AC		kg	V DC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail										
Size S0										
9	**4**	40[1]	—	—	24	**3RT10 23-1AC20**	0.350	24	**3RT10 23-1BB40**	0.580
					110	**3RT10 23-1AG20**	0.350	110	**3RT10 23-1BF40**	0.508
					230	**3RT10 23-1AL20**	0.350	220	**3RT10 23-1BM40**	0.508
					400	**3RT10 23-1AV00**	0.350			
12	**5.5**	40[1]	—	—	24	**3RT10 24-1AC20**	0.350	24	**3RT10 24-1BB40**	0.508
					110	**3RT10 24-1AG20**	0.350	110	**3RT10 24-1BF40**	0.508
					230	**3RT10 24-1AL20**	0.350	220	**3RT10 24-1BM40**	0.508
					400	**3RT10 24-1AV00**	0.350			
17	**7.5**	40[1]	—	—	24	**3RT10 25-1AC20**	0.350	24	**3RT10 25-1BB40**	0.508
					110	**3RT10 25-1AG20**	0.350	110	**3RT10 25-1BF40**	0.508
					230	**3RT10 25-1AL20**	0.350	220	**3RT10 25-1BM40**	0.508
					400	**3RT10 25-1AV00**	0.350			
25	**11**	40[1]	—	—	24	**3RT10 26-1AC20**	0.350	24	**3RT10 26-1BB40**	0.508
					110	**3RT10 26-1AG20**	0.350	110	**3RT10 26-1BF40**	0.508
					230	**3RT10 26-1AL20**	0.350	220	**3RT10 26-1BM40**	0.508
					400	**3RT10 26-1AV00**	0.350			
Size S2										
32	**15**	50	—	—	24	**3RT10 34-1AC20**	0.850	24	**3RT10 34-1BB40**	1.450
					110	**3RT10 34-1AG20**	0.850	110	**3RT10 34-1BF40**	1.450
					230	**3RT10 34-1AL20**	0.850	220	**3RT10 34-1BM40**	1.450
					400	**3RT10 34-1AV00**	0.850			
40	**18.5**	60	—	—	24	**3RT10 35-1AC20**	0.850	24	**3RT10 35-1BB40**	1.450
					110	**3RT10 35-1AG20**	0.850	110	**3RT10 35-1BF40**	1.450
					230	**3RT10 35-1AL20**	0.850	220	**3RT10 35-1BM40**	1.450
					400	**3RT10 35-1AV00**	0.850			
50	**22**	60	—	—	24	**3RT10 36-1AC20**	0.850	24	**3RT10 36-1BB40**	1.450
					110	**3RT10 36-1AG20**	0.850	220	**3RT10 36-1BF40**	1.450
					230	**3RT10 36-1AL20**	0.850	220	**3RT10 36-1BM40**	1.450
					400	**3RT10 36-1AV00**	0.850			
Size S3										
65	**30**	100	—	—	24	**3RT10 44-1AC20**	1.800	24	**3RT10 44-1BB40**	1.800
					110	**3RT10 44-1AG20**	1.800	110	**3RT10 44-1BF40**	1.800
					230	**3RT10 44-1AL20**	1.800	220	**3RT10 44-1BM40**	1.800
					400	**3RT10 44-1AV00**	1.800			
80	**37**	120	—	—	24	**3RT10 45-1AC20**	1.800	24	**3RT10 45-1BB40**	1.800
					110	**3RT10 45-1AG20**	1.800	110	**3RT10 45-1BF40**	1.800
					230	**3RT10 45-1AL20**	1.800	220	**3RT10 45-1BM40**	1.800
					400	**3RT10 45-1AV00**	1.800			
95	**45**	120	—	—	24	**3RT10 46-1AC20**	1.800	24	**3RT10 46-1BB40**	1.800
					110	**3RT10 46-1AG20**	1.800	110	**3RT10 46-1BF40**	1.800
					230	**3RT10 46-1AL20**	1.800	220	**3RT10 46-1BM40**	1.800
					400	**3RT10 46-1AV00**	1.800			

For accessories, see page 2/46
For spare parts, see page 2/55

1) Minimum conductor cross-section 10mm²

2) For size 2 and size 3 operating current I_e upto 500V

3) Operating frequency at 50Hz for 400V control supply voltage

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactors without coils
AC/DC operation *(40 Hz to 60 Hz, DC)*
Conventional operating mechanism / Solid-state operating mechanism for 24 V DC PLC output

3RT1 . 5 .

3RT1 . 6 .

3RT1 . 7 .

Size	Rated data AC-2 and AC-3, T_u: up to 60 °C					AC-1, T_u: 40 °C	Auxiliary contacts, lateral		Screw terminals
	Operational current I_e up to	Ratings of induction motors at 50 Hz and				Operational current I_e up to	Version		
	500 V	230 V	**400 V**	500 V	690 V	690 V			Order No.
	A	kW	**kW**	kW	kW	A	NO	NC	V AC/DC
Conventional operating mechanism									
S6	115	37	**55**	75	110	160	2	2	**3RT10 54-6LA06**
	150	45	**75**	90	132	185	2	2	**3RT10 55-6LA06**
	185	55	**90**	110	160	215	2	2	**3RT10 56-6LA06**
S10	225	55	**110**	160	200	275	2	2	**3RT10 64-6LA06**
	265	75	**132**	160	250	330	2	2	**3RT10 65-6LA06**
	300	90	**160**	200	250	330	2	2	**3RT10 66-6LA06**
S12	400	132	**200**	250	400	430	2	2	**3RT10 75-6LA06**
	500	160	**250**	355	400	610	2	2	**3RT10 76-6LA06**

For coils see page 2/54
For other accessories see page 2/46
For spare parts see page 2/55

AC/DC operation *(40 Hz to 60 Hz, DC)*
Auxiliary and control conductors: screw terminals
Withdrawable coils
Integrated coil circuit *(Varistor)*
Main conductors: busbar connections, for 3RT10 54 (55 kW) box terminals[1)]
Remaining lifetime indicator (RLT)

3RT10 56-6P . .

Size	Rated data AC-2 and AC-3, T_u: up to 60 °C					AC-1, T_u: 40 °C	Auxiliary contacts, lateral		Rated control supply voltage U_s	**Screw terminals**	Weight per PU approx.
	Operational current I_e up to	Ratings of induction motors at 50 Hz and				Operational current I_e up to	Version			Order No.	
	500 V A	230 V kW	**415 V kW**	500 V kW	690 V kW	690 V A	NO	NC	V AC/DC		kg
Solid-state operating mechanism for 24 V DC PLC output/PLC relay output, with remaining lifetime indicator (RLT)											
S6	115	37	**55**	75	110	160	1	1	96 ... 127 200 ... 277	**3RT10 54-6PF35** **3RT10 54-6PP35**	4.000 4.000
	150	45	**75**	90	132	185	1	1	96 ... 127 200 ... 277	**3RT10 55-6PF35** **3RT10 55-6PP35**	4.000 4.000
	185	55	**90**	110	160	215	1	1	96 ... 127 200 ... 277	**3RT10 56-6PF35** **3RT10 56-6PP35**	4.000 4.000
S10	225	55	**110**	160	200	275	1	1	96 ... 127 200 ... 277	**3RT10 64-6PF35** **3RT10 64-6PP35**	7.000 7.000
	265	75	**132**	160	250	330	1	1	96 ... 127 200 ... 277	**3RT10 65-6PF35** **3RT10 65-6PP35**	7.000 7.000
	300	90	**160**	200	250	330	1	1	96 ... 127 200 ... 277	**3RT10 66-6PF35** **3RT10 66-6PP35**	7.000 7.000
S12	400	132	**200**	250	400	430	1	1	96 ... 127 200 ... 277	**3RT10 75-6PF35** **3RT10 75-6PP35**	10.500 10.500
	500	160	**250**	355	400	610	1	1	96 ... 127 200 ... 277	**3RT10 76-6PF35** **3RT10 76-6PP35**	10.500 10.500

For accessories see page 2/46.
For spare parts see page 2/55.

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Overview

- 3RT12 vacuum contactors for switching motors

UC operation

The contactors can be operated with AC (40 to 60 Hz) as well as with DC.

Withdrawable coils

For simple coil replacement, e.g. if the application is replaced, the magnetic coil can be pulled out upwards after the release mechanism has been actuated and can be replaced by any other coil of the same size.

Auxiliary contact complement

The contactors can be fitted with up to 8 lateral auxiliary contacts (identical auxiliary switch blocks from S0 to S12). Of these, no more than 4 are permitted to be NC contacts.

Selection and ordering data

AC/DC operation *(40 Hz to 60 Hz, DC)*
Auxiliary and control conductors: screw terminals
Withdrawable coils
Integrated coil circuit *(Varistor)*
Main conductors: busbar connections

3RT12 7 .

3RT12 7 .

Size	Rated data AC-2 and AC-3, T_u: up to 60 °C					AC-1, T_u: 40 °C	Auxiliary contacts, lateral		Rated control supply voltage U_s	**Screw terminals**	Weight per *piece* approx.
	Operational current I_e up to	Ratings of induction motors at 50 Hz and				Operational current I_e up to	Version			Order No.	
	1000 V A	230 V kW	**415 V kW**	500 V kW	690 V kW	1000 V A	NO	NC	V AC/DC		kg
Conventional operating mechanism											
S10	225	55	**110**	160	200	330	2	2	23 ... 26	**3RT12 64-6AB36**	7.3
									110 ... 127	**3RT12 64-6AF36**	7.3
									220 ... 240	**3RT12 64-6AP36**	7.3
									380 ... 420	**3RT12 64-6AV36**	7.3
	265	75	**132**	160	250	330	2	2	23 ... 26	**3RT12 65-6AB36**	7.3
									110 ... 127	**3RT12 65-6AF36**	7.3
									220 ... 240	**3RT12 65-6AP36**	7.3
									380 ... 420	**3RT12 65-6AV36**	7.3
	300	90	**160**	200	250	330	2	2	23 ... 26	**3RT12 66-6AB36**	7.3
									110 ... 127	**3RT12 66-6AF36**	7.3
									220 ... 240	**3RT12 66-6AP36**	7.3
									380 ... 420	**3RT12 66-6AV36**	7.3
S12	400	132	**200**	250	400	610	2	2	23 ... 26	**3RT12 75-6AB36**	10.5
									110 ... 127	**3RT12 75-6AF36**	10.5
									220 ... 240	**3RT12 75-6AP36**	10.5
									380 ... 420	**3RT12 75-6AV36**	10.5
	500	160	**250**	355	500	610	2	2	23 ... 26	**3RT12 75-6AB36**	10.5
									110 ... 127	**3RT12 76-6AF36**	10.5
									220 ... 240	**3RT12 76-6AP36**	10.5
									380 ... 420	**3RT12 75-6AV36**	10.5

For accessories, see page 2/46
For spare parts, see page 2/55

1) Built-in surge suppression: varistor circuit.

2) For EMC please refer technical details or please contact Sales Office.

Selection and ordering data

Auxiliary and control conductors: screw terminals
Main conductors: busbar connections
Size 14

IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)

The 3TF68/69 contactors are climate-proof.

They are finger-safe according to EN 50274.

Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices (see Accessories and Spare Parts on page 2/56).

3TF68

Rated data AC-2 and AC-3, (up to 55 °C)						AC-1,	Auxiliary contacts,		Rated control	Screw terminals	Weight per *piece* approx.
Operational current I_e up to	Ratings of induction motors at 50 Hz and					Operational current I_e (at 40°C)	Version			Order No.	
690V A	230 V kW	**415 V kW**	500 V kW	690 V kW	1000 V kW	A	NO	NC	V		kg
AC operation[1) 2)] · 50/60 Hz											
630	200	**335**	434	600	—	700	4	4	110 ... 132 AC	**3TF68 44-0CF7**	20.0
									200 ... 240 AC	**3TF68 44-0CM7**	20.0
									380 ... 460 AC	**3TF68 44-0CQ7**	20.0
820	260	**450**	600	800	—	910	4	4	110 ... 132 AC	**3TF69 44-0CF7**	22.2
									200 ... 240 AC	**3TF69 44-0CM7**	22.2
									380 ... 460 AC	**3TF69 44-0CQ7**	22.2
DC operation · DC economy circuit											
630	200	**335**	434	600	—	700	3	3	24 DC	**3TF68 33-1DB4**	19.5
									110 DC	**3TF68 33-1DF4**	19.5
									220 DC	**3TF68 33-1DM4**	19.5
820	260	**450**	600	800	—	910	3	3	24 DC	**3TF69 33-1DB4**	22.5
									110 DC	**3TF69 33-1DF4**	22.5
									220 DC	**3TF69 33-1DM4**	22.5
AC operation · 50/60 Hz · Version for AC controls which are subject to strong interference											
630	200	**335**	434	600	—	700	3	3	110 ... 120 AC	**3TF68 33-1QG7**	21.000
									220 ... 240 AC	**3TF68 33-1QL7**	21.000
									380 ... 420 AC	**3TF68 33-1QV7**	21.000
820	260	**450**	600	800	—	910	3	3	110 ... 120 AC	**3TF69 33-1QG7**	23.000
									220 ... 240 AC	**3TF69 33-1QL7**	23.000
									380 ... 420 AC	**3TF69 33-1QV7**	23.000

For accessories, see page 2/46
For spare parts, see page 2/56

1) Built-in surge suppression: varistor circuit.

2) For EMC please refer technical details or please contact Sales Office.

3TF68/69 for 1000V application is available on request.

3RA13 complete units, 3 ... 45 kW

Overview

The 3RA13 reversing contactor assemblies can be ordered as follows:

Sizes S00 to S3

- Fully wired and tested, with mechanical and electrical interlock. For assemblies with AC operation and 50/60 Hz, a dead interval of 50 ms must be provided when used with voltages ≥ 500 V; a dead interval of 30 ms is recommend for use with voltages ≥ 415 V. These dead times do not apply to assemblies with DC operation.

Sizes S00 to S12

- As individual parts for customer assembly.

There is also a range of accessories (auxiliary switch blocks, surge suppressors, etc.) that must be ordered separately.

For overload relays for motor protection, see "Protection Equipment: Overload Relays".

The 3RA13 contactor assemblies have screw terminals and are suitable for screwing or snapping onto 35 mm standard mounting rails.

Complete units

The fully wired reversing contactor assemblies are suitable for use in any climate. They are finger-safe according to EN 50274.

The contactor assemblies consist of 2 contactors with the same power, with one NC contact in the basic unit. The contactors are mechanically and electrically interlocked (NC contact interlock).

For motor protection, either 3RU11 or 3RB2 . overload relays for direct mounting or stand-alone installation or thermistor motor protection tripping units must be ordered separately.

Components for customer assembly

Installation kits for all sizes are available for customer assembly of reversing contactor assemblies.

Contactors, overload relays, the mechanical interlock (as of size S0) and – for momentary-contact operation – auxiliary switch blocks for latching must be ordered separately.

Rated data AC-2 and AC-3 for AC 50 Hz 415 V		Size	Order No.					
Rating kW	Operational current I_e A		Contactor	Mechanical interlock[1]	Mechanical interlock[2]	Mechanical interlock[3]	Installation kit	**Fully wired and tested contactor assemblies**
3	7	**S00**	3RT10 15	—[4]	—	—	3RA19 13-2A[5]	**3RA13 15-8XB30-1 . .**
4	9		3RT10 16					**3RA13 16-8XB30-1 . .**
5.5	12		3RT10 17					**3RA13 17-8XB30-1 . .**
5.5	12	**S0**	3RT10 24	3RA19 24-1A	3RA19 24-2B	—	3RA19 23-2A[6]	**3RA13 24-8XB30-1 . .**
7.5	17		3RT10 25					**3RA13 25-8XB30-1 . .**
11	25		3RT10 26					**3RA13 26-8XB30-1 . .**
15	32	**S2**	3RT10 34	3RA19 24-1A	3RA19 24-2B	—	3RA19 33-2A[7]	**3RA13 34-8XB30-1 . .**
18.5	40		3RT10 35					**3RA13 35-8XB30-1 . .**
22	50		3RT10 36					**3RA13 36-8XB30-1 . .**
30	65	**S3**	3RT10 44	3RA19 24-1A	3RA19 24-2B	—	3RA19 43-2A[7]	**3RA13 44-8XB30-1 . .**
37	80		3RT10 45					**3RA13 45-8XB30-1 . .**
45	95		3RT10 46					**3RA13 46-8XB30-1 . .**
55	115	**S6**	3RT10 54	—	—	3RA19 54-2A	3RA19 53-2M[8]	—
75	150		3RT10 55					
90	185		3RT10 56					
110	225	**S10**	3RT10 64	—	—	3RA19 54-2A	3RA19 63-2A[8]	—
132	265		3RT10 65					
160	300		3RT10 66					
200	400	**S12**	3RT10 75	—	—	3RA19 54-2A	3RA19 73-2A[8]	—
250	500		3RT10 76					

1) Can be mounted onto the front.

2) Laterally mountable with one auxiliary contact.

3) Laterally mountable without auxiliary contact.

4) Interlock can only be ordered with installation kit.

5) Installation kit contains: mechanical interlock; connecting clips for 2 contactors; wiring modules on the top and bottom.

6) Installation kit contains: wiring modules on the top and bottom.

7) Installation kit contains: 2 connecting clips for contactors; wiring modules on the top and bottom.

8) Installation kit contains: wiring module on the top and bottom.

Selection and ordering data

Fully wired and tested contactor assemblies[2] · Size S00 · up to 5.5 kW

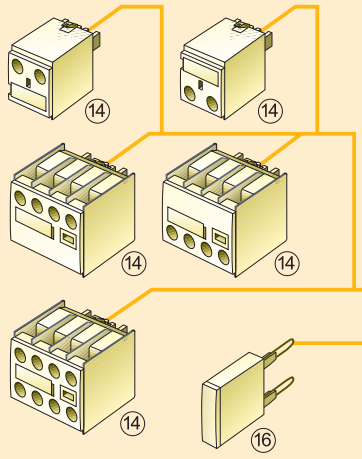
Rated data AC-2 and AC-3					Rated control supply voltage U_s[1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
7	2-2	**3**	3.5	4	110 AC	**3RA13 15-8XB30-1AF0**	0.430
					230 AC	**3RA13 15-8XB30-1AP0**	0.430
9	3	**4**	4.5	5.5	110 AC	**3RA13 16-8XB30-1AF0**	0.430
					230 AC	**3RA13 16-8XB30-1AP0**	0.430
12	3	**5.5**	5.5	5.5	110 AC	**3RA13 17-8XB30-1AF0**	0.430
					230 AC	**3RA13 17-8XB30-1AP0**	0.430
DC operation							
7	2-2	**3**	3.5	4	24 DC	**3RA13 15-8XB30-1BB4**	0.550
9	3	**4**	4.5	5.5	24 DC	**3RA13 16-8XB30-1BB4**	0.550

3RA13 1 . -8XB30-1 . . .

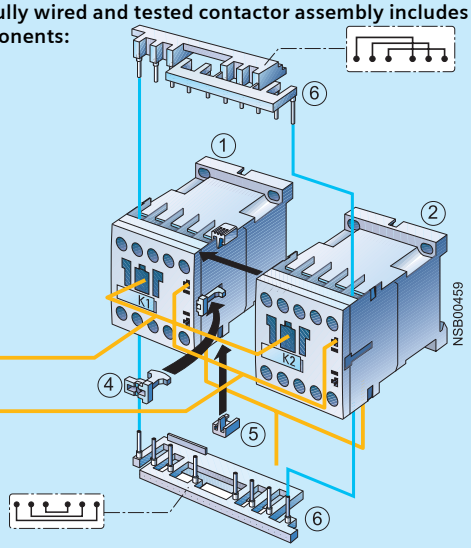
1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s;
at 60 Hz: 0.85 ... 1.1 x U_s.

2) The contactors integrated in the contactor assemblies have no unassigned auxiliary contacts.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



Accessories		Order No.	Page
14	Auxiliary switch block, front (auxiliary switch block according to EN 50005 must be used)	3RH19 11-1....	2/47
16	Surge suppressors	3RT19 16-1....	2/51

Individual parts		Order No.		Page
		K1	K2	
1 2	Contactors, 3 kW	3RT10 15	3RT10 15	2/12
1 2	Contactors, 4 kW	3RT10 16	3RT10 16	2/12
1 2	Contactors, 5.5 kW	3RT10 17	3RT10 17	2/12
4 5 6	Installation kit	3RA19 13-2A		2/24

The installation kit contains:

- 4 Mechanical interlock
- 5 2 connecting clips for 2 contactors
- 6 Wiring modules on the top and bottom for connecting the main current paths, electrical interlock included[1], interruptible (NC contact interlock)

1) 3RT10 1. contactors with one NC contact in the basic unit are required for the electrical interlock.

3RA13 Reversing Contactor Assemblies

3RA13 complete units, 3 ... 45 kW

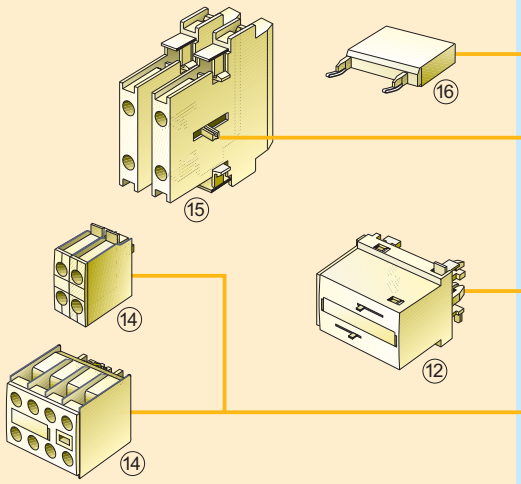
Fully wired and tested contactor assemblies · Size S0 · up to 11 kW

3RA13 1 . -8XB30-1 . . .

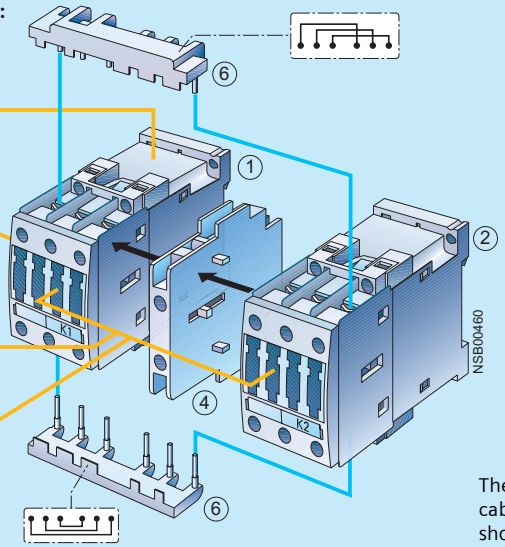
Rated data AC-2 and AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
12	3	**5.5**	7.5	7.5	110 AC	**3RA13 24-8XB30-1AG2**	0.770
					230 AC	**3RA13 24-8XB30-1AL2**	0.770
17	4	**7.5**	10	11	110 AC	**3RA13 25-8XB30-1AG2**	0.770
					230 AC	**3RA13 25-8XB30-1AL2**	0.770
25	5.5	**11**	11	11	110 AC	**3RA13 26-8XB30-1AG2**	0.770
					230 AC	**3RA13 26-8XB30-1AL2**	0.770
DC operation							
12	3	**5.5**	7.5	7.5	24 DC	**3RA13 24-8XB30-1BB4**	1-230
17	4	**7.5**	10	11	24 DC	**3RA13 25-8XB30-1BB4**	1-230
25	5.5	**11**	11	11	24 DC	**3RA13 26-8XB30-1BB4**	1-230

1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories		Order No.	Page
12	Mechanical interlock, front	3RA19 24-1A	2/23
14	Auxiliary switch block, front	3RH19 21-1CA . .	2/47
15	Auxiliary switch block, lateral	3RH19 21-1EA . .	2/48
16	Surge suppressors	3RT19 26-1	2/51

Individual parts		Order No.		Page
		K1	K2	
1 2	Contactors, 5.5 kW	3RT10 24	3RT10 24	2/13
1 2	Contactors, 7.5 kW	3RT10 25	3RT10 25	2/13
1 2	Contactors, 11 kW	3RT10 26	3RT10 26	2/13
4	Mechanical interlock, lateral	3RA19 24-2B		2/23
6	Installation kit	3RA19 23-2A		2/24

The installation kit contains wiring modules on the top and bottom(they also form the mechanical connection between the contactors).

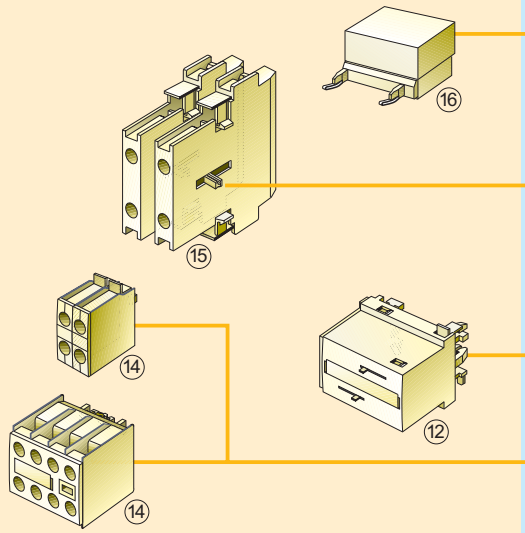
Fully wired and tested contactor assemblies · Size S2 · up to 22 kW

3RA13 3 . -8XB30-1 . . .

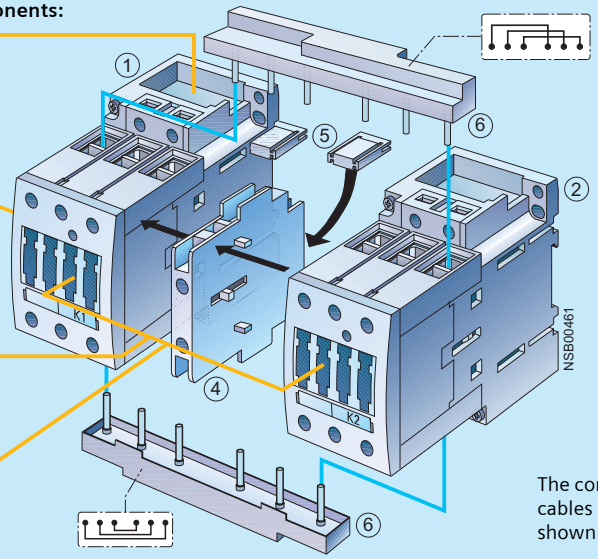
Rated data AC-2 and AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 500 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
32	7.5	**15**	18.5	18.5	110 AC	**3RA13 34-8XB30-1AG2**	2.300
					230 AC	**3RA13 34-8XB30-1AL2**	2.300
40	11	**18.5**	22	22	110 AC	**3RA13 35-8XB30-1AG2**	2.300
					230 AC	**3RA13 35-8XB30-1AL2**	2.300
50	15	**22**	30	22	110 AC	**3RA13 36-8XB30-1AG2**	2.300
					230 AC	**3RA13 36-8XB30-1AL2**	2.300
DC operation							
32	7.5	**15**	18.5	18.5	24 DC	**3RA13 34-8XB30-1BB4**	3.450
40	11	**18.5**	22	22	24 DC	**3RA13 35-8XB30-1BB4**	3.450
50	15	**22**	30	22	24 DC	**3RA13 36-8XB30-1BB4**	3.450

1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories		Order No.	Page
12	Mechanical interlock, front	3RA19 24-1A	2/23
14	Auxiliary switch block, front	3RH19 21-1CA . .	2/47
15	Auxiliary switch block, lateral	3RH19 21-1EA . .	2/47
16	Surge suppressors	3RT19 26-1 . . . . 3RT19 36-1	2/51

Individual parts		Order No. K1	Order No. K2	Page
1 2	Contactors, 15 kW	3RT10 34	3RT10 34	2/13
1 2	Contactors, 18.5 kW	3RT10 35	3RT10 35	2/13
1 2	Contactors, 22 kW	3RT10 36	3RT10 36	2/13
4	Mechanical interlock, lateral	3RA19 24-2B		2/23
5 6	Installation kit	3RA19 33-2A		
	The installation kit contains:			2/24
5	2 connecting clips for 2 contactors with a clearance of 10 mm			
6	Wiring modules on the top and bottom for connecting the main current paths			

3RA13 Reversing Contactor Assemblies

3RA13 complete units, 3 ... 45 kW

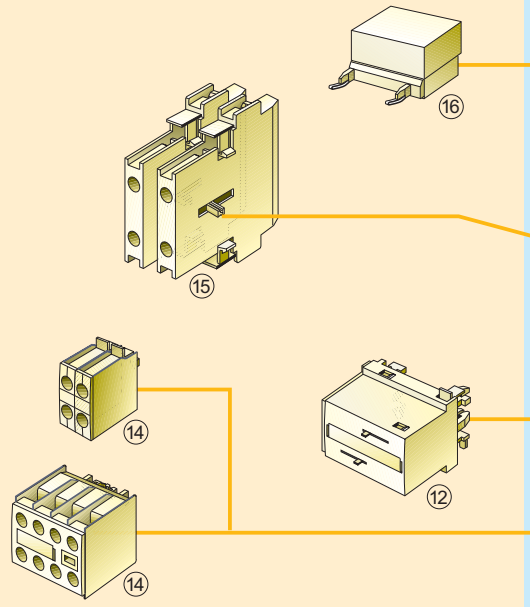
Fully wired and tested contactor assemblies · Size S3 · up to 45 kW

3RA13 4 . -8XB30-1 . . .

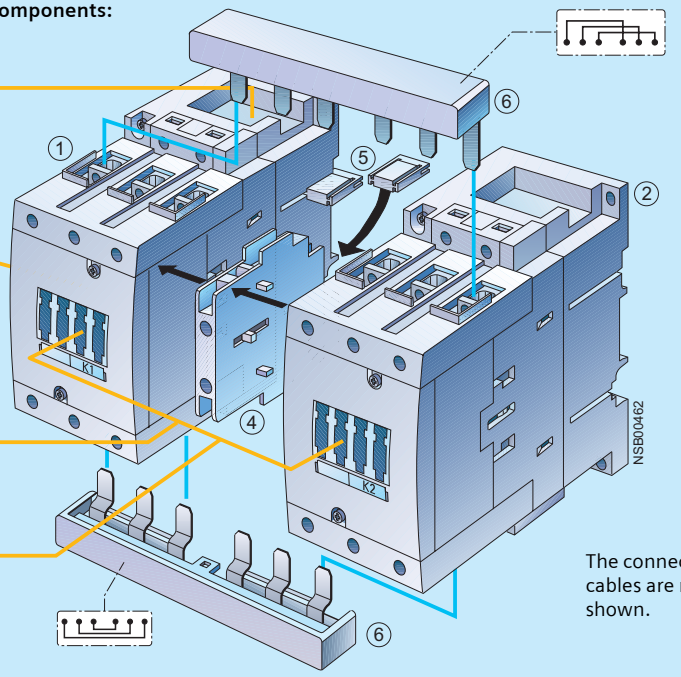
Rated data AC-2 and AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 500 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
65	18.5	**30**	37	45	110 AC	**3RA13 44-8XB30-1AG2**	4.500
					230 AC	**3RA13 44-8XB30-1AL2**	4.500
80	22	**37**	45	55	110 AC	**3RA13 45-8XB30-1AG2**	4.500
					230 AC	**3RA13 45-8XB30-1AL2**	4.500
95	22	**45**	55	55	110 AC	**3RA13 46-8XB30-1AG2**	4.500
					230 AC	**3RA13 46-8XB30-1AL2**	4.500
DC operation							
65	18.5	**30**	37	45	24 DC	**3RA13 44-8XB30-1BB4**	6.500
80	22	**37**	45	55	24 DC	**3RA13 45-8XB30-1BB4**	6.500
95	22	**45**	55	55	24 DC	**3RA13 46-8XB30-1BB4**	6.500

1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories		Order No.	Page
12	Mechanical interlock, front	3RA19 24-1A	2/23
14	Auxiliary switch block, front	3RH19 21-1CA . .	2/47
15	Auxiliary switch block, lateral	3RH19 21-1EA . .	2/47
16	Surge suppressors	3RT19 26-1 . . . . 3RT19 36-1	2/51

Individual parts		Order No.		Page
		K1	K2	
1 2	Contactors, 30 kW	3RT10 44	3RT10 44	2/13
1 2	Contactors, 37 kW	3RT10 45	3RT10 45	2/13
1 2	Contactors, 45 kW	3RT10 46	3RT10 46	2/13
4	Mechanical interlock, lateral	3RA19 24-2B		2/23
5 6	Installation kit	3RA19 43-2A		2/24

The installation kit contains:

5 2 connecting clips for 2 contactors with a clearance of 10 mm

6 Wiring modules on the top and bottom for connecting the main current paths

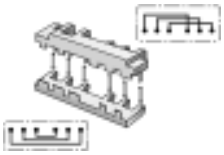
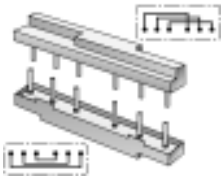
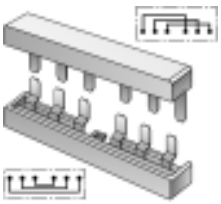
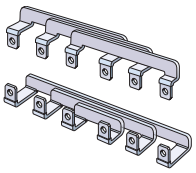
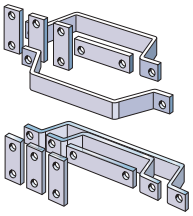
Selection and ordering data

	For contactors Type	Size	Version	Order No.	Weight per PU approx. kg
Mechanical interlocks					
 3RA19 24-1A mounted onto 2 contactors	3RT10 2 3RT10 3 3RT10 4 3RT13 2 3RT13 3 3RT13 4 3RT15 2 3RT15 3	**S0** **S2** **S3**	**For lateral mounting**[1] Each with one auxiliary contact (1 NC contact) per contactor (can only be used to connect contactors which are not more than 1 size larger or smaller. The mounting depth of the smaller contactor has to be adapted.)	**3RA19 24-2B**	0.060
	3RT10 2 3RT10 3 3RT10 4 3RT13 2 3RT15 2	**S0** **S2** **S3** **S0**	**For mounting to the front**[2] Onto contactors with sizes S0 to S3 (for contactors of the same size) *Note:* *Size S0: Wiring modules must be mounted first* *Sizes S2 and S3: Use 3RA19 32-2C mechanical connectors*	**3RA19 24-1A**	0.050
 3RA19 54-2A	3RT1 . 5 to 3RT1 . 7	**S6** **S10** **S12**	**For lateral mounting** Without auxiliary contacts; size S6, S10 and S12 contactors can be interlocked with each other as required; no adaptation of mounting depth is necessary. Contactor clearance 10 mm.	**3RA19 54-2A**	0.050
 3RA19 54-2C	3RT10 4 . -A with 3RT10 5	**S3** with **S6**	**Adapters, laterally mountable** For mechanical interlocking of contactor S3 (only for AC operation) with contactor S6 using 3RA19 54-2A locking device (must be ordered separately) incl. connecting clips.	**3RA19 54-2C**	0.050
Base plates					
	3RT10 5 3RT1 . 6 3RT1 . 7	**S6** **S10** **S12**	For customer assembly of reversing contactor assemblies	**3RA19 52-2A** **3RA19 62-2A** **3RA19 72-2A**	1.300 2.100 2.300

1) Can also be used for 4-pole contactors with sizes S2 and S3.

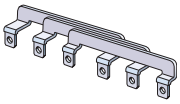
2) Can also be used for size S0 4-pole contactors.

Components for customer assembly

	For contactors Type	Size	Version	Order No.	Weight per PU approx. kg
Installation kits for making 3-pole contactor assemblies					
 3RA19 13-2A 	3RT10 1	**S00**	The installation kit contains: mechanical interlock; 2 connecting clips for 2 contactors; wiring modules on the top and bottom	**3RA19 13-2A**	0.040
 3RA19 23-2A	3RT10 2	**S0**	The installation kit contains: wiring modules on the top and bottom	**3RA19 23-2A**	0.060
 3RA19 33-2A 	3RT10 3	**S2**	The installation kit contains: 2 connecting clips for 2 contactors; wiring modules on the top and bottom	**3RA19 33-2A**	0.120
 3RA19 43-2A 	3RT10 4	**S3**	The installation kit contains: 2 connecting clips for 2 contactors; wiring modules on the top and bottom	**3RA19 43-2A**	0.300
	3RT10 5	**S6**	The installation kit contains: wiring modules on the top and bottom (for connection with box terminal)	**3RA19 53-2A**	1.300
	3RT10 5 3RT1. 6 3RT1. 7	**S6** **S10** **S12**	The installation kit contains: wiring modules on the top and bottom (for connection without box terminal)	**3RA19 53-2M** **3RA19 63-2A** **3RA19 73-2A**	0.900 2.400 3.000

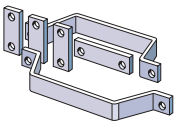
Wiring modules, single

For contactors Type	Size	Contactor clearance mm	Version	Order No.	Weight per PU approx. kg
3RT10 1	**S00-S00**	0	top (in-phase) bottom (with phase reversal)	**3RA19 13-3D** **3RA19 13-3E**	0.015 0.015
3RT10 2	**S0-S0** and **S0-S0**	0 and10	top (in-phase) bottom (with phase reversal)	**3RA19 23-3D** **3RA19 23-3E**	0.020 0.020
3RT10 3	**S2-S2**	10	top (in-phase) bottom (with phase reversal)	**3RA19 33-3D** **3RA19 33-3E**	0.065 0.065
3RT10 4	**S3-S3**	10	top (in-phase) bottom (with phase reversal)	**3RA19 43-3D** **3RA19 43-3E**	0.160 0.160
3RT10 5	**S6-S6**	10	top (in-phase, for connection with box terminal)	**3RA19 53-3D**	0.620



3RA19 53-3D

			top (with phase reversal, for connection without box terminal)	**3RA19 53-3P**	0.440



3RA19 53-3P

Mechanical connectors

For contactors Type	Size	Contactor clearance mm	Interlocking	Version	Order No.	Weight per PU approx. kg
					1 pack = 10 sets for 10 assemblies	
3RT1. 1[1]	**S00-S00**	0	laterally mountable	for 3- and 4-pole contactors	**3RA19 12-2H**	0.010

3RA19 12-2H

3RT1. 2	**S0-S0**	0 10[2]	mountable on front laterally mountable	for 3- and 4-pole contactors	**3RA19 22-2C** **3RT19 22-2D**	0.025 0.110

3RA19 22-2C

3RT1. 3 3RT1. 4	**S2-S2** **S3-S3**	0	mountable on front	for 3-pole contactors	**3RA19 32-2C**	0.010

3RA19 32-2C

3RT1. 3 3RT1. 4 3RT1. 5	**S2-S2** **S3-S3** **S6-S6**	10	laterally mountable	for 3-pole contactors	**3RA19 32-2D**	0.010

3RA19 32-2D

3RT1. 3	**S2-S2**	10	laterally mountable	for 4-pole contactors	**3RA19 32-2G**	0.010

3RA19 32-2G

3RT1. 4	**S3-S3**	10	laterally mountable	for 4-pole contactors	**3RA19 42-2G**	0.010

3RA19 42-2G

1) This pack contains 10 additional interlocks.

2) The connector function can be fulfilled with the wiring modules for size S0, a contactor clearance of 10 mm and a lateral interlock.

3RA14 Contactor Assemblies for Wye-Delta Starting

3RA14 complete units, 3 ... 75 kW

Overview

These 3RA14 contactor assemblies for wye-delta starting are designed for standard applications.

Note:

Contactor assemblies for wye-delta starting in special applications such as very heavy starting or wye-delta starting of special motors must be customized. Help with designing such special applications is available from Technical Assistance.

The 3RA14 contactor assemblies for wye-delta starting can be ordered as follows:

Sizes S00 to S3:

- Fully wired and tested, with electrical interlock, dead interval of up to 10 s on reversing (size S00 with electrical and mechanical interlocks)

Sizes S00 to S12:

- As individual parts for customer assembly.

A dead interval of 50 ms on reversing is already integrated in the time relay function.

There is also a range of accessories (auxiliary switch blocks, surge suppressors, etc.) that must be ordered separately.

For overload relays for motor protection, see "Protection Equipment: Overload Relays -> 3RB2 Solid-State Overload Relays".

The 3RA14 contactor assemblies have screw terminals and are suitable for screwing or snapping onto 35 mm standard mounting rails.

Fully wired and tested 3RA14 contactor assemblies have one unassigned NO contact which is mounted onto the front of the delta contactor.

A solid-state time-delay auxiliary switch block is snapped onto the front of the complete contactor assemblies, size S00 up to 7.5 kW, while a timing relay is mounted onto the side of sizes S0 to S3, 11 kW to 75 kW.

Rated data at AC 50 Hz 415 V			Size				Accessories for customer assembly	
Rating kW	Operational current I_e A	Motor current A		Line/delta contactor	Star contactor	**Order No. complete**	Timing relay	Installation kit A, for double infeed
5.5	12	9.5 ... 13.8	**S00-S00-S00**	3RT10 15	3RT10 15	**3RA14 15-8XB31-1 . . .**	3RT19 16-2G . 51	—
7.5	17	12.1 ... 17		3RT10 17		**3RA14 16-8XB31-1 . . .**	3RP15 74-1N . 30	
11	25	19 ... 25	**S0-S0-S0**	3RT10 24	3RT10 24	**3RA14 23-8XC21-1 . . .**	3RP15 74-1N . 30	—
15	32	24.1 ... 34		3RT10 26		**3RA14 25-8XC21-1 . . .**		
18.5	40	34.5 ... 40						
22	50	31 ... 43	**S2-S2-S0**	3RT10 34	3RT10 26	**3RA14 34-8XC21-1 . . .**	3RP15 74-1N . 30	3RA19 33-2C [3]
30	50	48.3 ... 65		3RT10 35		—		
37	80	62.1 ... 77.8	**S2-S2-S2**		3RT10 34	**3RA14 35-8XC21-1 . . .**		3RA19 33-2B [3]
45	86	69 ... 86		3RT10 36		**3RA14 36-8XC21-1 . . .**		
55	115	77.6 ... 108.6	**S3-S3-S2**	3RT10 44	3RT10 35	**3RA14 44-8XC21-1 . . .**	3RP15 74-1N . 30	3RA19 43-2C [3]
75	150	120.7 ... 150		3RT10 45	3RT10 36	**3RA14 45-8XC21-1 . . .**		
90	160	86 ... 160	**S6-S6-S3**	3RT10 54	3RT10 44	—	3RP15 74-1N . 30	—
110	195	86 ... 195						
132	230	86 ... 230		3RT10 55	3RT10 45			
160	280	86 ... 280		3RT10 56	3RT10 46			
200	350	95 ... 350	**S10-S10-S6**	3RT10 64	3RT10 54	—	3RP15 74-1N . 30	—
250	430	95 ... 430		3RT10 65	3RT10 55			
315	540	277 ... 540	**S12-S12-S10**	3RT10 75	3RT10 64	—	3RP15 74-1N . 30	—
355	610	277 ... 610						
400	690	277 ... 690			3RT10 65			
500	850	277 ... 850		3RT10 76	3RT10 66			

1) Installation kit contains mechanical interlock, 3 connecting clips; wiring modules on the top (connection between line and delta contactor) and on the bottom (connection between delta and star contactor); star jumper.

2) The installation kit contains 5 connecting clips; wiring modules on the top (connection between line and delta contactor) and on the bottom (connection between delta and star contactor); star jumper.

3) Installation kit contains wiring module on the bottom (connection between delta and star contactor) and star jumper.

4) Wiring module on top from reversing contactor assembly (note conductor cross-sections).

Components for customer assembly

Installation kits with wiring modules and, if necessary, mechanical connectors are available for contactor assemblies for wye-delta starting. Contactors, overload relays, wye-delta timing relays, auxiliary switches for electrical interlock – if required also feeder terminals, mechanical interlocks (exception: In the case of the installation kit for size S00 contactor assemblies the mechanical interlock between the delta contactor and the star contactor is included in the kit) and base plates – must be ordered separately.

The wiring kits for sizes S00 and S0 contain the top and bottom main conducting path connections between the line and delta contactors (top) and between the delta and star contactors (bottom).

In the case of sizes S2 to S12 only the bottom main conducting path connection between the delta and star contactors is included in the wiring module, owing to the larger conductor cross-section at the infeed.

Motor protection

Overload relays or thermistor motor protection tripping units can be used for overload protection.

The overload relay can be either mounted onto the line contactor or separately fitted. It must be set to 0.58 times the rated motor current.

			Overload relay, thermal (trip class CLASS 10)		Overload relay, solid-state (trip class CLASS 10)	
Installation kit B, for single infeed	Star jumper	Base plates	Setting range A	Order No.	Setting range A	Order No.
3RA19 13-2B[1]	3RT19 16-4BA31	—	5.5 ... 8 7 ... 10	3RU11 16-1HB0 3RU11 16-1JB0	3 ... 12	3RB20 16-1SB0
3RA19 23-2B[2]	3RT19 26-4BA31	—	11 ... 16 14 .. 20 20 ... 25	3RU11 26-4AB0 3RU11 26-4BB0 3RU11 26-4DB0	6 ... 25	3RB20 26-1QB0
3RV19 35-1A	3RT19 26-4BA31	3RA19 32-2E	18 ... 25 28 ... 40	3RU11 36-4DB0 3RU11 36-4FB0	12.5 ... 50	3RB20 36-1UB0
	3RT19 36-4BA31	3RA19 32-2F	36 ... 45 40 ... 50	3RU11 36-4GB0 3RU11 36-4HB0		
—	3RT19 36-4BA31	3RA19 42-2E	45 ... 63 70 ... 90	3RU11 46-4JB0 3RU11 46-4LB0	25 ...100	3RB20 46-1EB0
3RA19 53-3D[4]	3RT19 46-4BA31	3RA19 52-2E	—	—	50 ...200	3RB20 56-1FC2
—	3RT19 56-4BA31	3RA19 62-2E	—	—	55 ...250	3RB20 66-1GC2
—	3RT19 66-4BA31	3RA19 72-2E	—	—	160 ...630	3RB20 66-1MC2

3RA14 complete units, 3 ... 75 kW

Selection and ordering data

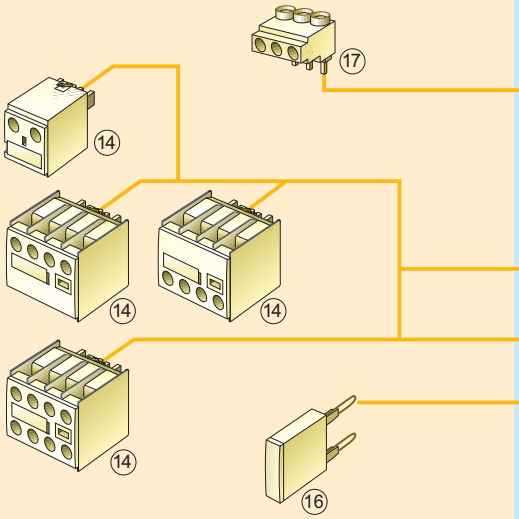
Fully wired and tested contactor assemblies · Size S00-S00-S00 · up to 7.5 kW

3RA14 1 . -8XB31-1 . . .

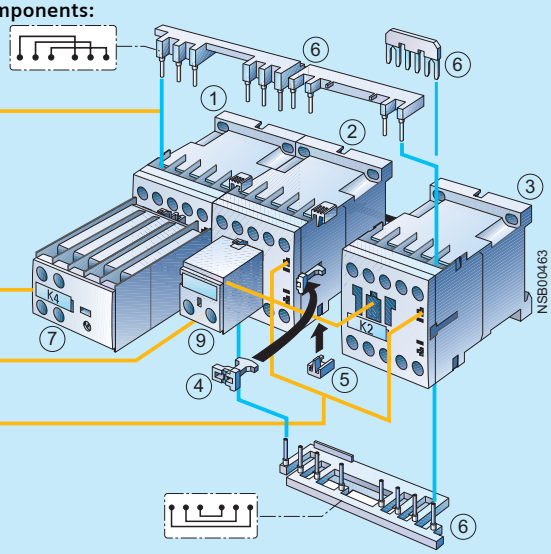
Rated data AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
12	3.3	**5.5**	7-2	9-2	230 AC	**3RA14 15-8XB31-1AP0**	0.950
17	4.7	**7.5**	10.3	9-2	230 AC	**3RA14 16-8XB31-1AP0**	0.990
DC operation							
12	3.3	**5.5**	7-2	9-2	24 DC	**3RA14 15-8XB31-1BB4**	1.120
17	4.7	**7.5**	10.3	9-2	24 DC	**3RA14 16-8XB31-1BB4**	1.120

1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories	Order No.	Page
(14) Auxiliary switch block, front	3RH19 11-1	2/47
(16) Surge suppressors	3RT19 16-1	2/51
(17) 3-phase feeder terminals	3RA19 13-3K	2/33

Individual parts		Order No. K1 [1]	Order No. K3 [2]	Order No. K2 [2]	Page
(1)(2)(3)	Contactors, 5.5 kW	3RT10 15	3RT10 15	3RT10 15	2/12
(1)(2)(3)	Contactors, 7.5 kW	3RT10 17	3RT10 17	3RT10 15	2/12
(7)	Solid-state time-delay auxiliary switch block, front	3RT19 16-2G . 51			2/49
(9)	Auxiliary switch block with 1 unassigned NO contact	3RH19 11-1BA10			2/47
(4)(5)(6)	Installation kit	3RA19 13-2B			2/33

The installation kit contains:

(4) Mechanical interlock

(5) 3 connecting clips

(6) Wiring modules on the top and bottom for connecting the main and control conducting paths

1) Use version with 1 NO.

2) Use version with 1 NC.

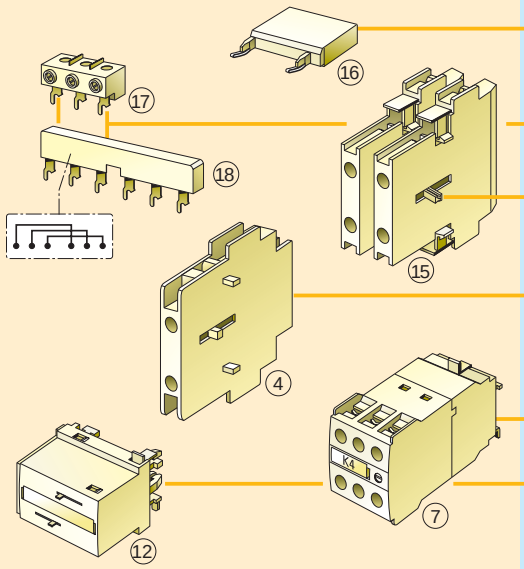
Fully wired and tested contactor assemblies · Size S0-S0-S0 · up to 18.5 kW

3RA14 2 . -8XC21-1 . . .

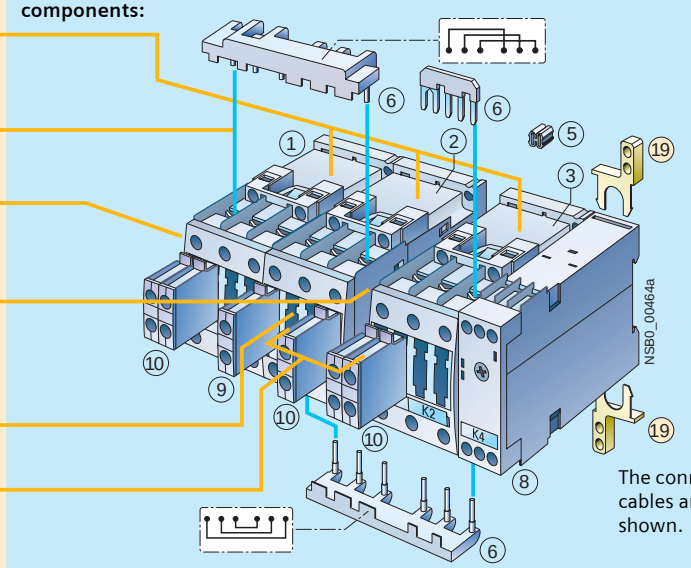
Rated data AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
25	7.1	**11**	15.6	19	230 AC	**3RA14 23-8XC21-1AL2**	1.800
32 / 40	11.4	**15 / 18.5**	19	19	230 AC	**3RA14 25-8XC21-1AL2**	1.800
DC operation							
25	7.1	**11**	15.6	19	24 DC	**3RA14 23-8XC21-1BB4**	2.450
32 / 40	11.4	**15 / 18.5**	19	19	24 DC	**3RA14 25-8XC21-1BB4**	2.450

1) Coil operating range at 50 Hz:
0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories	Order No.	Page
(1) Mechanical interlock, lateral	3RA19 24-2B	2/23
(7) Solid-state time-delay auxiliary switch block, front[1]	3RT19 26-2G . . .	2/49
(12) Mechanical interlock, front	3RA19 24-1A	2/23
(15) Auxiliary switch block, lateral	3RH19 21-1EA . .	2/48
(16) Surge suppressors	3RT19 26-1	2/51
(17) 3-phase feeder terminal[2]	3RV19 15-5A	2/33
(18) 3-phase busbar[2]	3RT19 26-4CC20	2/33
(19) Push-in lug[3] for timing relay screw mounting	3RP19 03	[4]

Individual parts	Order No. K1	K3	K2	Page
(1)(2)(3) Contactors, 11 kW	3RT10 24	3RT10 24	3RT10 24	2/13
(1)(2)(3) Contactors, 15/18.5 kW	3RT10 26	3RT10 26	3RT10 24	2/13
(8) Timing relay, lateral	3RP15 74-1N . 30			[4]
(9) Auxiliary switch block with 1 unassigned NO contact	3RH19 21-1CA10			2/47
(10) Auxiliary switch block for local control 2 units 3 units	 3RH19 21-1CA01 3RH19 21-1CA10			 2/47
(5)(6) Installation kit	3RA19 23-2B			2/33

The installation kit contains:

(5) Connecting clips

(6) Wiring modules on the top and bottom for connecting the main and control conducting paths

1) Generally possible. If a solid-state time-delay auxiliary switch block is mounted onto the front of K3, a standard auxiliary switch block can only be mounted onto the side.

2) (17) and (18) can only be mounted with contactors with screw terminal (coil).

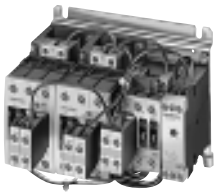
3) Not part of the scope of supply of the preassembled contactor assemblies; can be ordered as an accessory.

4) See Monitoring and Control Devices: 3RP, 7PV timing relays -> 3RP15 timing relays in 22.5 mm industrial enclosure.

3RA14 Contactor Assemblies for Wye-Delta Starting

3RA14 complete units, 3 ... 75 kW

Fully wired and tested contactor assemblies · Size S2-S2-S0 · up to 30 kW

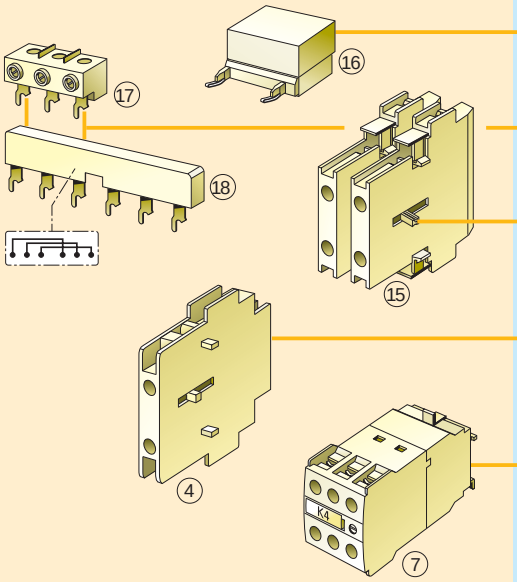


3RA14 34-8XC21-1 . . .

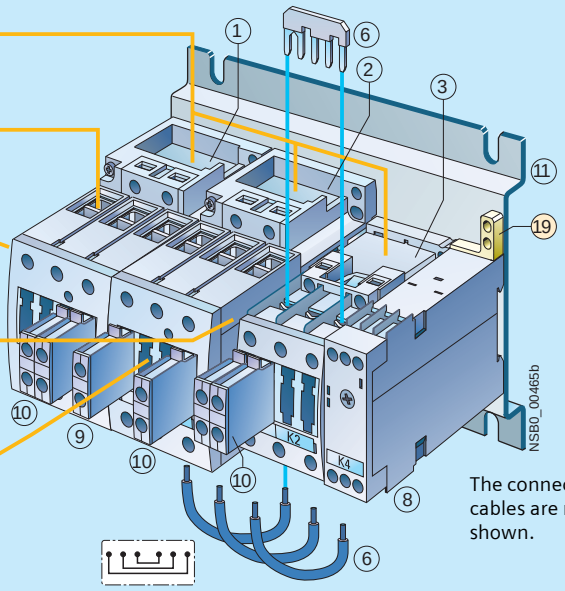
Rated data AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
50 / 65	19.6	**22 / 30**	35	34	230 AC	**3RA14 34-8XC21-1AL2**	3.100
DC operation							
50 / 65	19.6	**22 / 30**	35	34	24 DC	**3RA14 34-8XC21-1BB4**	4.500

1) Coil operating range at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories	Order No.	Page
(4) Mechanical interlock, lateral Depth compensation required K3: 1.5 mm; K2: 0 mm[1]	3RA19 24-2B	2/23
(7) Solid-state time-delay auxiliary switch block, front[2]	3RT19 26-2G . . .	2/49
(15) Auxiliary switch block, lateral	3RH19 21-1EA . .	2/48
(16) Surge suppressors	3RT19 26-1 . . . . 3RT19 36-1	2/51
(17) 3-phase feeder terminal	3RV19 35-5A	2/33
(18) 3-phase busbars	3RV19 35-1A	2/33
(19) Push-in lug[3] for timing relay screw mounting	3RP19 03	[4]

Individual parts		Order No. K1	K3	K2	Page
(1) (2) (3)	Contactors, 22/30 kW	3RT10 34	3RT10 34	3RT10 26	2/13
(8)	Timing relay, lateral	3RP15 74-1N . 30			[4]
(9)	Auxiliary switch block with 1 unassigned NO contact	3RH19 21-1CA10			2/47
(10)	Auxiliary switch block for local control 2 units	3RH19 21-1CA01			2/47
	3 units	3RH19 21-1CA10			
(11)	Base plate	3RA19 32-2E			2/33
(6)	Installation kit	3RA19 33-2C			2/33

The installation kit contains the star jumper on the top and the wiring module on the bottom for connecting the main current paths.

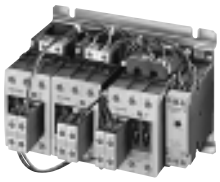
1) Use the 3RA19 32-2B base plate for this configuration.

2) Generally possible. If a solid-state time-delay auxiliary switch block is mounted onto the front of K3, a standard auxiliary switch block can only be mounted onto the side.

3) Not part of the scope of supply of the preassembled contactor assemblies; can be ordered as an accessory.

4) See Monitoring and Control Devices: 3RP, 7PV timing relays -> 3RP15 timing relays in 22.5 mm industrial enclosure.

Fully wired and tested contactor assemblies · Size S2-S2-S2 · up to 45 kW



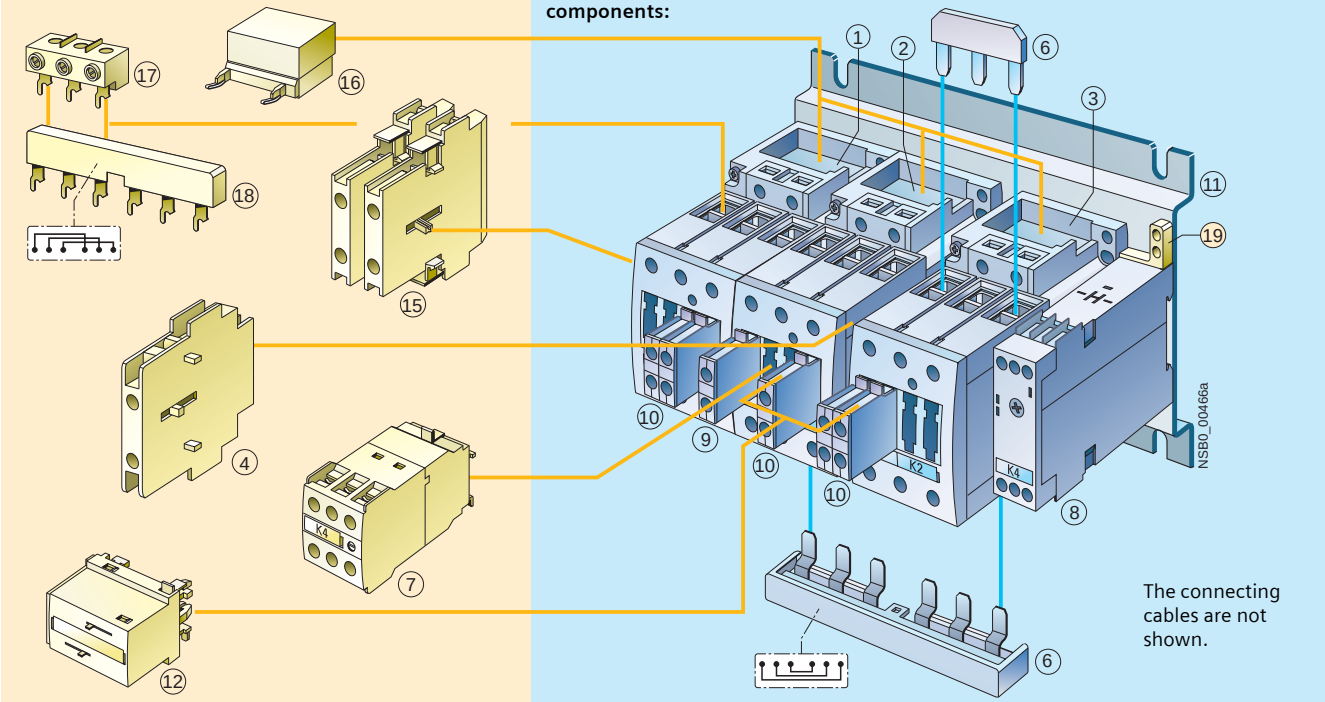
3RA14 3 . -8XC21-1 . . .

Rated data AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
80	25	**37**	51	63	230 AC	**3RA14 35-8XC21-1AL2**	3.700
86	27	**45**	55	63	230 AC	**3RA14 36-8XC21-1AL2**	3.700
DC operation							
80	25	**37**	51	63	24 DC	**3RA14 35-8XC21-1BB4**	5.500
86	27	**45**	55	63	24 DC	**3RA14 36-8XC21-1BB4**	5.500

1) Coil operating range at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):

The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories		Order No.	Page
4	Mechanical interlock, lateral	3RA19 24-2B	2/23
7	Solid-state time-delay auxiliary switch block, front[1]	3RT19 26-2G . . .	2/49
12	Mechanical interlock, front	3RA19 24-1A	2/23
15	Auxiliary switch block, lateral	3RH19 21-1EA . .	2/48
16	Surge suppressors	3RT19 26-1 . . . . 3RT19 36-1	2/51
17	3-phase feeder terminals	3RV19 35-5A	2/33
18	3-phase busbars	3RV19 35-1A	2/33
19	Push-in lug[2] for timing relay screw mounting	3RP19 03	[3]

Individual parts		Order No.			Page
		K1	K3	K2	
1 2 3	Contactors, 37 kW	3RT10 35	3RT10 35	3RT10 34	2/13
1 2 3	Contactors, 45 kW	3RT10 36	3RT10 36	3RT10 34	2/13
8	Timing relay, lateral	3RP15 74-1N . 30			[3]
9	Auxiliary switch block with 1 unassigned NO contact	3RH19 21-1CA10			2/47
10	Auxiliary switch block for local control 2 units 3 units	 3RH19 21-1CA01 3RH19 21-1CA10			2/47
11	Base plate	3RA19 32-2F			2/33
6	Installation kit	3RA19 33-2B			2/33

The installation kit contains the star jumper on the top and the wiring module on the bottom for connecting the main current paths.

1) Generally possible. If a solid-state time-delay auxiliary switch block is mounted onto the front of K3, a standard auxiliary switch block can only be mounted onto the side.

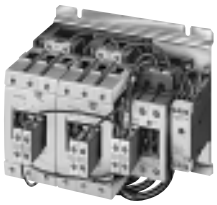
2) Not part of the scope of supply of the preassembled contactor assemblies; can be ordered as an accessory.

3) See Monitoring and Control Devices: 3RP, 7PV timing relays -> 3RP15 timing relays in 22.5 mm industrial enclosure.

3RA14 Contactor Assemblies for Wye-Delta Starting

3RA14 complete units, 3 ... 75 kW

Fully wired and tested contactor assemblies · Size S2-S3-S2 · up to 75 kW

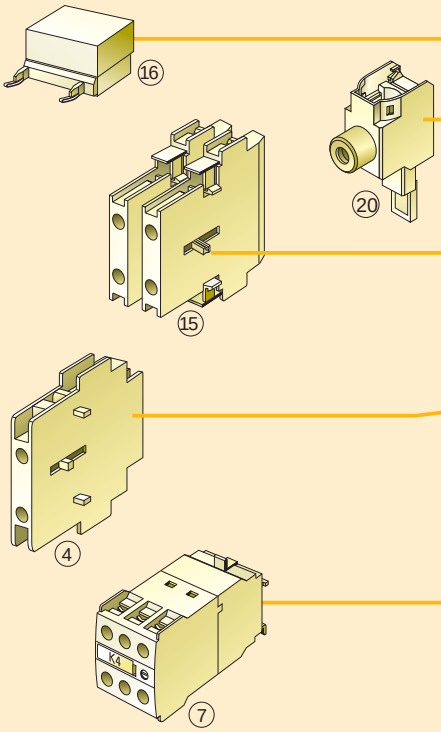


Rated data AC-3					Rated control supply voltage U_s [1]	Screw terminals	Weight per PU approx.
Operational current I_e up to 415 V	Ratings of induction motors at 50 Hz and 230 V	**415 V**	500 V	690 V		Order No.	
A	kW	**kW**	kW	kW	V		kg
AC operation, 50/60 Hz							
115	37	**55**	81	93	230 AC	**3RA14 44-8XC21-1AL2**	6.000
150	47	**75**	103	110	230 AC	**3RA14 45-8XC21-1AL2**	6.000
DC operation							
115	37	**55**	81	93	24 DC	**3RA14 44-8XC21-1BB4**	8.600
150	47	**75**	103	110	24 DC	**3RA14 45-8XC21-1BB4**	8.600

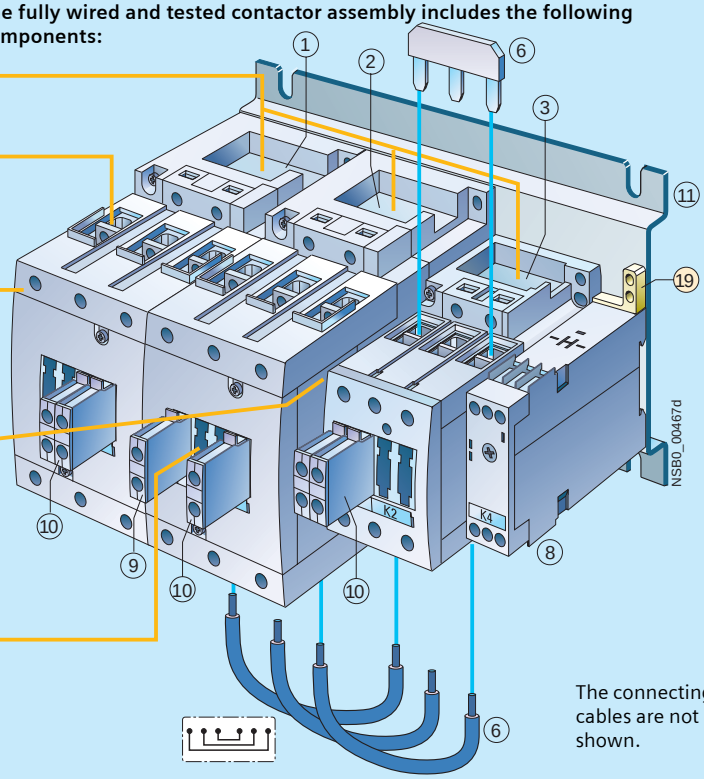
3RA14 4 . -8XC21-1 . . .

1) Coil operating range at 50 Hz: 0.8 ... 1.1 x U_s; at 60 Hz: 0.85 ... 1.1 x U_s.

Mountable accessories (to be ordered separately):



The fully wired and tested contactor assembly includes the following components:



The connecting cables are not shown.

Accessories		Order No.	Page
4	Mechanical interlock, lateral Depth compensation required K3: 0 mm; K2: 27.5 mm [1]	3RA19 24-2B	2/23
7	Solid-state time-delay auxiliary switch block, front [2]	3RT19 26-2G . . .	2/49
15	Auxiliary switch block, lateral	3RH19 21-1EA . .	2/48
16	Surge suppressors	3RT19 . 6-1	2/51
19	Push-in lug [3] for timing relay screw mounting	3RP19 03	[4]
20	1-phase feeder terminal	3RA19 43-3L	2/33

Individual parts		Order No.			Page
		K1	K3	K2	
1 2 3	Contactors, 55 kW	3RT10 44	3RT10 44	3RT10 35	2/13
1 2 3	Contactors, 75 kW	3RT10 45	3RT10 45	3RT10 36	2/13
8	Timing relay, lateral	3RP15 74-1N . 30			[4]
9	Auxiliary switch block with 1 unassigned NO contact	3RH19 21-1CA10			2/47
10	Auxiliary switch block for local control				
	2 units	3RH19 21-1CA01			
	3 units	3RH19 21-1CA10			2/47
11	Base plate	3RA19 42-2E			2/33
6	Installation kit	3RA19 43-2C			2/33

The installation kit contains the star jumper on the top and the wiring module on the bottom for connecting the main current paths.

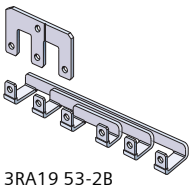
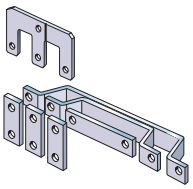
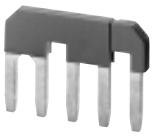
1) Use the 3RA19 42-2B base plate for this configuration.

2) Generally possible. If a solid-state time-delay auxiliary switch block is mounted onto the front of K3, a standard auxiliary switch block can only be mounted onto the side.

3) Not part of the scope of supply of the preassembled contactor assemblies; can be ordered as an accessory.

4) See Monitoring and Control Devices: 3RP, 7PV timing relays -> 3RP15 timing relays in 22.5 mm industrial enclosure.

Selection and ordering data

	Version Type	Size	Order No.	Weight per PU approx. kg
Installation kits				
	The installation kit contains: mechanical interlock; 3 connecting clips star jumper, wiring modules on the top and bottom	**S00-S00-S00**	**3RA19 13-2B**	0.050
	The installation kit contains: 5 connecting clips star jumper, wiring modules on the top and bottom	**S0-S0-S0**	**3RA19 23-2B**	0.060
 3RA19 53-2B	The installation kit contains: star jumper, wiring module on the bottom	**S2-S2-S0** **S2-S2-S2** **S3-S3-S2**	**3RA19 33-2C** **3RA19 33-2B** **3RA19 43-2C**	0.060 0.070 0.140
	(Wiring module on the top is not included in the scope of supply. A double infeed between the line contactor and the delta contactor is recommended.)	**S3-S3-S3** **S6-S6-S6**	**3RA19 43-2B** **3RA19 53-2B**	0.160 0.850
		S6-S6-S6	**3RA19 53-2N**	0.600
 3RA19 53-2N, 3RA19 63-2B, 3RA19 73-2B		**S10-S10-S10**	**3RA19 63-2B**	1.800
		S12-S12-S12	**3RA19 73-2B**	2-200
1-phase feeder terminals				
	Conductor cross-section: 95 mm²	**S3**	**3RA19 43-3L**	0-280
3-phase feeder terminals				
	Feeder terminal block for the line contactor for large conductor cross-sections			
	Conductor cross-section: 6 mm² Conductor cross-section: 25 mm² Conductor cross-section: 50 mm²	**S00** **S0** **S2**	**3RA19 13-3K** **3RV19 15-5A** **3RV19 35-5A**	0.020 0.040 0.110
3-phase busbars				
	Bridging phase-by-phase of all input terminals of			
	The line contactor (K1) and The delta contactor (K3)	**S0** **S2**	**3RT19 26-4CC20** **3RV19 35-1A**	0.030 0.150
Links for paralleling, 3-pole (star jumpers)				
 3RT19 26-4BA31	Without connection terminal (the links for paralleling can be reduced by one pole)	**S00** **S0** **S2** **S3** **S6**[1] **S10, S12**[1]	**3RT19 16-4BA31** **3RT19 26-4BA31** **3RT19 36-4BA31** **3RT19 46-4BA31** **3RT19 56-4BA31** **3RT19 66-4BA31**	0.010 0.010 0.020 0.030 0.160 0.500
Base plates				
	For customer assembly of contactor assemblies for wye-delta starting with a **laterally mounted** timing relay			
	Side-by-side mounting 10 mm distance between K3 and K2 Side-by-side mounting	**S2, S2, S0** **S2, S2, S2** **S3, S3, S2**	**3RA19 32-2E** **3RA19 32-2F** **3RA19 42-2E**	0.450 0.480 0.870
	10 mm distance between K1, K3 and K2	**S6, S6, S6**	**3RA19 52-2F**	1.950
		S10, S10, S10 **S12, S12, S12**	**3RA19 62-2F** **3RA19 72-2F**	3.400 3.700
	For customer assembly of contactor assemblies for wye-delta starting with a **front-mounted** timing relay, 10 mm distance between K1, K3 and K2	**S2, S2, S0** **S2, S2, S2** **S3, S3, S2**	**3RA19 32-2B** **3RA19 32-2B** **3RA19 42-2B**	0.450 0.450 0.700

1) The 3RT19 56-4EA1 (S6) or 3RT19 66-4EA1 (S10, S12) cover can be used for touch protection.

3RT14 Contactors for Switching Resistive Loads (AC-1)

3-pole, 140 ... 690 A

Overview

AC and DC operation (size S3)

UC operation (AC/DC) (sizes S6 to S12)

IEC 60947, EN 60947 (VDE 0660)

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

3RT14 contactors are used for switching resistive loads (AC-1) or as contactors, for example, for variable-speed operating mechanisms that normally only have to carry the current.

The accessories for the 3RT10 contactors can also be used here.

For more detailed descriptions about the sizes S3 to S12, see 3RT10 Contactors, 3-pole, 3 to 250 kW.

Selection and ordering data

Size	Rated data AC-1, T_u: 40 °C					Rated control supply voltage	Screw terminals	Weight per PU approx.
	Operational current I_e up to 690 V	Ratings of AC loads (p.f. = 0.95) at 230 V	400 V	500 V	690 V	U_s	Order No.	
	A	kW	kW	kW	kW	V		kg
For screw and snap-on mounting onto 35 mm and 75 mm standard mounting rail								
	AC operation							
S3	**140**	53	92	115	159	24 AC, 50/60 Hz	**3RT14 46-1AC20**	1.850
						110 AC, 50/60 Hz	**3RT14 46-1AG00**	1.850
						230 AC, 50/60 Hz	**3RT14 46-1AL00**	1.850
						400 AC, 50 Hz	**3RT14 46-1AV00**	1.850
	DC operation · DC solenoid system							
S3	**140**	53	92	115	159	24 DC	**3RT14 46-1BB40**	2.800
						110 DC	**3RT14 46-1BF40**	2.800
						220 DC	**3RT14 46-1BM40**	2.800

3RT14 46-1A..0

AC/DC operation *(40 Hz to 60 Hz, DC)*
Auxiliary and control conductors: screw terminals
Withdrawable coils
Integrated coil circuit *(Varistor)*
Main conductors: busbar connections

Size	Rated data AC-1, T_u: 40 °C					Auxiliary contacts		Rated control supply voltage	Screw terminals	Weight per PU approx.
	Operational current I_e up to 690 V	Ratings of AC loads (p.f. = 0.95) at 230 V	400 V	500 V	690 V	Version NO	NC	U_s	Order No.	
	A	kW	kW	kW	kW			V		kg
Conventional operating mechanisms										
S6	**275**	105	180	225	310	2	2	23 ... 26	**3RT14 56-6AB36**	3.360
						2	2	110 ... 127	**3RT14 56-6AF36**	3.360
						2	2	220 ... 240	**3RT14 56-6AP36**	3.360
S10	**400**	151	263	329	454	2	2	23 ... 26	**3RT14 66-6AB36**	6.600
						2	2	110 ... 127	**3RT14 66-6AF36**	6.600
						2	2	220 ... 240	**3RT14 66-6AP36**	6.600
S12	**690**	261	454	568	783	2	2	23 ... 26	**3RT14 76-6AB36**	10.500
						2	2	110 ... 127	**3RT14 76-6AF36**	10.500
						2	2	220 ... 240	**3RT14 76-6AP36**	10.500

3RT14 6.

For accessories, see page 2/46.
For spare parts, see page 2/55.

Overview

AC and DC operation

EN 60947-4-1 (VDE 0660, Part 102).

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

The accessories for the 3-pole SIRIUS contactors can also be used for the 4-pole versions.

3RT13 1. -1A.00

3RT13 2.-1A.00

3RT13 36-1...0

3RT13 4.-1...0

Rated data AC-2 and AC-3,		AC Operation: Rated control supply voltage	AC Operation: Screw terminals U_s at 50/60 Hz[2] Order No.	AC Operation: Weight per Piece	DC Operation: Rated control supply voltage approx.	DC Operation: Screw terminals U_s Order No.	DC Operation: Weight per Piece approx.
Operational current I_e	Ratings of AC loads (p.f.=0.95) at 50 Hz and 415 V						
A	**kW**	V AC		kg	V DC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail							
Size S00[1]							
18	**12**	24, 50/60 Hz	**3RT13 16-1AB00**	0.200	24	**3RT13 16-1BB40**	0.250
		110, 50/60 Hz	**3RT13 16-1AF00**	0.200	110	**3RT13 16-1BF40**	0.250
		230, 50/60 Hz	**3RT13 16-1AP00**	0.200	220	**3RT13 16-1BM40**	0.250
		400, 50/60 Hz	**3RT13 16-1AV00**	0.200			
22	**14.5**	24, 50/60 Hz	**3RT13 17-1AB00**	0.200	24	**3RT13 17-1BB40**	0.250
		110, 50/60 Hz	**3RT13 17-1AF00**	0.200	110	**3RT13 17-1BF40**	0.250
		230, 50/60 Hz	**3RT13 17-1AP00**	0.200	220	**3RT13 17-1BM40**	0.250
		400, 50/60 Hz	**3RT13 17-1AV00**	0.200			
Size S0							
35[2]	**22**	24, 50 Hz	**3RT13 25-1AB00**	0.400	24	**3RT13 25-1BB40**	0.630
		110, 50 Hz	**3RT13 25-1AF00**	0.400	110	**3RT13 25-1BF40**	0.630
		230, 50 Hz	**3RT13 25-1AP00**	0.400	220	**3RT13 25-1BM40**	0.630
		400, 50 Hz	**3RT13 25-1AV00**	0.400			
40[2]	**26**	24, 50 Hz	**3RT13 26-1AB00**	0.400	24	**3RT13 26-1BB40**	0.630
		110, 50 Hz	**3RT13 26-1AF00**	0.400	110	**3RT13 26-1BF40**	0.630
		230, 50 Hz	**3RT13 26-1AP00**	0.400	220	**3RT13 26-1BM40**	0.630
		400, 50 Hz	**3RT13 26-1AV00**	0.400			
Size S2							
60	**39**	24, 50 Hz	**3RT13 36-1AB00**	0.990	24	**3RT13 36-1BB40**	1.600
		110, 50 Hz	**3RT13 36-1AF00**	0.990	110	**3RT13 36-1BF40**	1.600
		230, 50 Hz	**3RT13 36-1AP00**	0.990	220	**3RT13 36-1BM40**	1.600
		400, 50 Hz	**3RT13 36-1AV00**	0.990			
Size S3							
110	**72**	24, 50 Hz	**3RT13 44-1AB00**	2.200	24	**3RT13 44-1BB40**	3.200
		110, 50 Hz	**3RT13 44-1AF00**	2.200	110	**3RT13 44-1BF40**	3.200
		230, 50 Hz	**3RT13 44-1AP00**	2.200	220	**3RT13 44-1BM40**	3.200
		400, 50 Hz	**3RT13 44-1AV00**	2.200			
140	**92**	24, 50 Hz	**3RT13 46-1AB00**	2.200	24	**3RT13 46-1BB40**	3.200
		110, 50 Hz	**3RT13 46-1AF00**	2.200	110	**3RT13 46-1BF40**	3.200
		230, 50 Hz	**3RT13 46-1AP00**	2.200	220	**3RT13 46-1BM40**	3.200
		400, 50 Hz	**3RT13 46-1AV00**	2.200			

Size S00: Snap-on auxiliary switch blocks according to EN 50005.

Sizes S0 to S3: Snap-on auxiliary switch blocks according to EN 50012 and EN 50005 (for S0 max. 2 auxiliary contacts, please refer to technical information).

For accessories, see page 2/46
For spare parts, see page 2/55

1) For size S00: coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s,
at 60 Hz: 0.85 ... 1.1 x U_s

2) Minimum conductor cross-section 100 mm²

3TK1 Contactors for Switching Resistive Loads (AC-1)

4-pole, 4 NO, 200 ... 1000 A

Overview

EN 60947-4-1 (VDE 0660 Part 102)

The contactors also comply with the requirements of

NFC 63-110 and NFC 20–040.

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274. Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices.

Magnetic coils for 3TK10 to 3TK13 contactors: as withdrawable coils.

Surge suppression

Control circuit

Magnetic coils for 3TK1 contactors: can be retrofitted with

RC elements.

Selection and ordering data

Screw terminals
Screw mounting

3TK13

Rated data AC-1					Auxiliary contacts		Rated control supply voltage U_s	**Screw terminals**	Weight per *piece* approx.
Operational current I_e up to 690V	Ratings of AC loads (p f. = 0.95) at				Version			Order No.	
	230 V	415 V	690 V	1000 V					
A	kW	kW	kW	kW	NO	NC	V AC		kg
AC operation									
200	75	130	225	205	2	2	230 ... 240, 50 Hz 110/120 V, 50/60 Hz 24, 50 Hz	**3TK10 42-0AU0** **3TK10 42-0AF0** **3TK10 42-0AB0**	4.400 4.400 4.400
250	90	165	280	200	2	2	230 ... 240, 50 Hz 110/120 V, 50/60 Hz 24, 50 Hz	**3TK11 42-0AU0** **3TK11 42-0AF0** **3TK11 42-0AB0**	4.700 4.700 4.700
300	110	195	340	325	2	2	230 ... 240, 50 Hz 110/120 V, 50/60 Hz 24, 50 Hz	**3TK12 42-0AU0** **3TK12 42-0AF0** **3TK12 42-0AB0**	7.200 7.200 7.200
350	130	230	395	370	2	2	230 ... 240, 50 Hz 110/120 V, 50/60 Hz 24, 50 Hz	**3TK13 42-0AU0** **3TK13 42-0AF0** **3TK13 42-0AB0**	7.200 7.200 7.200
550	205	360	620	510	2	2	230 ... 240, 50 Hz 110/120, 50/60 Hz	**3TK14 42-0AU0** **3TK14 42-0AF0**	19.000 19.000
800	300	525	905	575	2	2	230 ... 240, 50 Hz 110/120, 50/60 Hz	**3TK15 42-0AU0** **3TK15 42-0AF0**	19.000 19.000
1000	375	655	1135	—	2	2	230 ... 240, 50 Hz 110/120 50/60 Hz	**3TK17 42-0AU0** **3TK17 42-0AF0**	20.100 20.100

For accessories, see page 2/60
For spare parts, see page 2/60

Overview

AC and DC operation

EN 60947-4-1 (VDE 0660, Part 102).

The contactors are suitable for use in any climate. They are finger- safe according to EN 50274.

The accessories for the 3-pole SIRIUS contactors can also be used for the 4-pole versions.

Selection and ordering data

AC and DC operation, 2 NO contacts + 2 NC contacts[1)]

3RT15 1 . -1 . . . .

3RT15 26-1 . . . .

Rated data AC-2/AC-3, T_u: up to 60 °C		AC-1, T_u: 40 °C	Rated control supply voltage U_s	Screw terminals	Weight per *piece* approx.
Operational current I_e at 415 V	Ratings of induction motors at 50 Hz and 415 V	Operational current I_e	Order No.		
A	**kW**	A	V		kg
For screw and snap-on mounting onto 35 mm standard mounting rail					
AC operation					
Size S00[2)]					
9	**4**	18	24, 50/60 Hz	**3RT15 16-1AB00**	0.200
			110, 50/60 Hz	**3RT15 16-1AF00**	0.200
			230, 50/60 Hz	**3RT15 16-1AP00**	0.200
			400, 50/60 Hz	**3RT15 16-1AV00**	0.200
12	**5.5**	22	24, 50/60 Hz	**3RT15 17-1AB00**	0.200
			110, 50/60 Hz	**3RT15 17-1AF00**	0.200
			230, 50/60 Hz	**3RT15 17-1AP00**	0.200
			400, 50/60 Hz	**3RT15 17-1AV00**	0.200
Size S0					
25	**11**	40	24, 50 Hz	**3RT15 26-1AB00**	0.400
			110, 50 Hz	**3RT15 26-1AF00**	0.400
			230, 50 Hz	**3RT15 26-1AP00**	0.400
			400, 50 Hz	**3RT15 26-1AV00**	0.400
Size S2					
40	**18.5**	55	24, 50 Hz	**3RT15 35-1AB00**	1.000
			110, 50 Hz	**3RT15 35-1AF00**	1.000
			230, 50 Hz	**3RT15 35-1AP00**	1.000
			400, 50 Hz	**3RT15 35-1AV00**	1.000
DC operation · DC solenoid system					
Size S00					
9	**4**	18	24 DC	**3RT15 16-1BB40**	0.260
			110 DC	**3RT15 16-1BF40**	0.260
			220 DC	**3RT15 16-1BM40**	0.260
12	**5.5**	22	24 DC	**3RT15 17-1BB40**	0.260
			110 DC	**3RT15 17-1BF40**	0.260
			220 DC	**3RT15 17-1BM40**	0.260
Size S0					
20	**11**	40	24 DC	**3RT15 26-1BB40**	0.630
			110 DC	**3RT15 26-1BF40**	0.630
			220 DC	**3RT15 26-1BM40**	0.630
Size S2					
40	**18.5**	55	24 DC	**3RT15 35-1BB40**	1.590
			110 DC	**3RT15 35-1BF40**	1.590
			220 DC	**3RT15 35-1BM40**	1.590

Size S00: snap-on auxiliary switch blocks according to EN 50005.
Sizes S0 to S3: snap-on auxiliary switch blocks according to EN 50012 and EN 50005
(for S0 max. 2 auxiliary contacts, please note information in the Technical Information).

For accessories, see page 2/46
For spare parts, see page 2/55

1) Single device for pole reversal; not suitable for reversing duty.

2) For size S00: coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s
at 60 Hz: 0.85 ... 1.1 x U_s.

12.5 ... 50 kvar

Overview

AC operation

IEC 60947, EN 60947 (VDE 0660).

The contactors are suitable for use in any climate.

They are finger- safe according to EN 50274.

The 3RT16 capacitor contactors are special versions of the size S00 to S3 SIRIUS contactors. The capacitors are precharged by means of the mounted leading NO contacts and resistors; only then do the main contacts close.

This prevents disturbances in the network and welding of the contactors.

Only discharged capacitors are permitted to be switched on with capacitor contactors.

The auxiliary switch block which is snapped onto the capacitor contactor contains the three leading NO contacts and in the case of S00 one standard NC contact and in the case of S0 and S3 one standard NO contact, which is unassigned. Size S00 also contains another unassigned NO contact in the basic unit.

In addition, a 2-pole auxiliary switch block can be mounted laterally on the 3RT16 47 capacitor contactors (2 NO, 2 NC or 1 NO + 1 NC versions); type 3RH19 21-1EA . . . The fitting of auxiliary switches for 3RT16 17 and 3RT16 27 is not expandable.

Selection and ordering data

AC operation
Screw terminals

3RT16 17-1A . 03

3RT16 27-1A . 01

3RT16 47-1A . 01

Utilization category AC-6b Switching of AC capacitors for an ambient temperature of 60 °C[1]				Auxiliary contacts, unassigned		Rated control supply voltage U_s[2]		**Screw terminals**	Weight per PU approx.
Capacitor rating atoperational voltage 50/60 Hz				Version				Order No.	
at 230 V kvar	at 415 V kvar	at 525 V kvar	at 690 V kvar	NO	NC	V AC	Hz		kg
For screw and snap-on mounting onto 35 mm standard mounting rail									
Size S00									
3 ... 7.5	5 ... 12.5	7.5 ... 15	10 ... 21	1	1	24	50 / 60	**3RT16 17-1AB03**	0.280
						110		**3RT16 17-1AF03**	0.280
						230		**3RT16 17-1AP03**	0.280
Size S0[3]									
3.5 ... 15	6 ... 25	7.8 ... 30	10 ... 42	1	—	24	50	**3RT16 27-1AB01**	0.440
						110		**3RT16 27-1AF01**	0.440
						230		**3RT16 27-1AP01**	0.440
Size S3									
3.5 ... 30	5 ... 50	7.5 ... 60	10 ... 84	1	—	24	50	**3RT16 47-1AB01**	2.040
						110		**3RT16 47-1AF01**	2.040
						230		**3RT16 47-1AP01**	2.040

For accessories see page 2/47

1) For size S3: 55 °C.

2) Operating range: 0.85 ... 1.1 x U_s.

3) For conductor cross-sections > 6 mm² use 3RV19 25-5AB terminals (2 units).

Overview

3TC4 and 3TC5

EN 60947-4-1 (VDE 0660 Part 102).

The contactors are finger-safe according to EN 50274.

Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices.

The DC motor ratings given in the tables are applicable to the DC-3 and DC-5 utilization categories with two-pole switching of the load or with the two conducting paths of the contactor connected in series.

One contactor conducting path can switch full power up to 220 V. The ratings for higher voltages are available on request.

Application

The contactors are suitable for switching and controlling DC motors as well as all other DC circuits.

A version with an especially large actuating voltage is available for operation in electrically driven vehicles and in switchgear with significant fluctuations in the operational voltage.

Selection and ordering data

3TC44

3TC48

Size	Rated data DC-3 and DC-5							Auxiliary contacts[1]		Rated control supply voltage U_s	Screw terminals	Weight per PU approx.
	Operational current I_e[2]	Ratings of DC motors at						Version			Order No.	
	A	110 V kW	220 V kW	440 V kW	600 V kW	750 kW		NO	NC	V		kg
3TC44 to 3TC56 two-pole contactors												
DC operation												
Screw and snap-on mounting onto 35 mm standard mounting rail												
2	32	2.5	5	9	9	4		2	2	24 DC 110 DC 220 DC	**3TC44 17-0AB4** **3TC44 17-0AF4** **3TC44 17-0AM4**	1.100 1.100 1.100
Screw mounting												
4	75	6.5	13	27	38	45		2	2	24 DC 110 DC 220 DC	**3TC48 17-0AB4** **3TC48 17-0AF4** **3TC48 17-0AM4**	4.700 4.700 4.700
8	220[3]	20	41	82	110	110		2	2	24 DC 110 DC 220 DC	**3TC52 17-0AB4** **3TC52 17-0AF4** **3TC52 17-0AM4**	10.800 10.800 10.800
12	400	35	70	140	200	250		2	2	24 DC 110 DC 220 DC	**3TC56 17-0AB4** **3TC56 17-0AF4** **3TC56 17-0AM4**	19.500 19.500 19.500
AC operation, 50 Hz												
Screw and snap-on mounting onto 35 mm standard mounting rail												
2	32	2.5	5	9	9	4		2	2	220 / 230 AC[4] 110 / 110 AC	**3TC44 17-0BP0** **3TC44 17-0BF0**	0.700 0.700
Screw mounting												
4	75	6.5	13	27	38	45		2	2	220 / 230 AC[4] 110 AC	**3TC48 17-0BP0** **3TC48 17-0BF0**	3.500 3.500
8	220[3]	20	41	82	110	110		2	2	220 / 230 AC[4] 110 AC	**3TC52 17-0BP0** **3TC52 17-0BF0**	7.200 7.200
12	400	35	70	140	200	250		2	2	220 / 230 AC[4] 110 AC	**3TC56 17-0BP0** **3TC56 17-0BF0**	14.500 14.500

1) The fitting of auxiliary switches cannot be altered on DC-operated contactors.

2) The following rated operational currents are permitted for reversing duty with 3TC44 to 3TC56 contactors:

Contactor Type	Rated operational voltage 110 V, 220 V	440 V
3TC44	32 A	7 A
3TC48	75 A	75 A
3TC52	170 A	170 A
3TC56	400 A	400 A

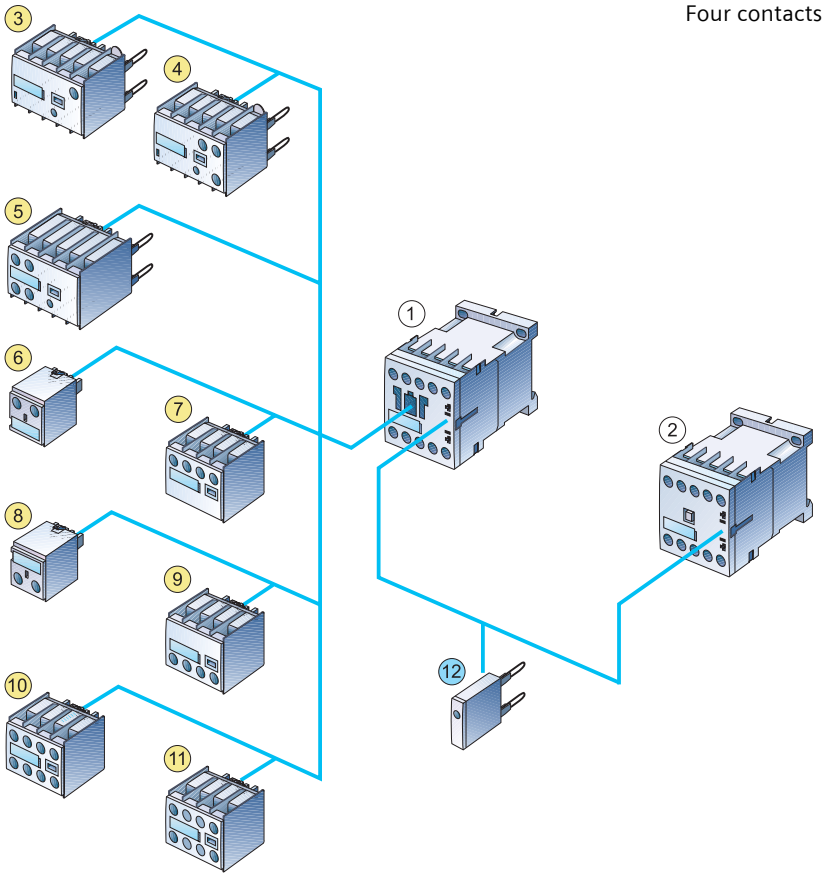
3) At > 600 V: I_e = 170 A.

4) Operating range at 220 V: 0.85 to 1.15 x U_s.

Overview

The SIRIUS generation of controls is a complete, modular system family, logically designed right down to the last detail, from the basic units to the accessories.

Contactor relays and coupling relays Size S00 with accessories



① Contactor relay, see page 2/42
② Coupling relay for auxiliary circuits, see page 2/44
③ Solid-state time-delay block, ON-delay, see page 2/49
④ Solid-state time-delay block, OFF-delay, see page 2/49
⑤ Auxiliary switch block with solid-state time delay, see page 2/48 (versions: ON or OFF-delay)
⑥ 1-pole auxiliary switch block, cable entry from above, see page 2/47
⑦ 2-pole auxiliary switch block, cable entry from above, see page 2/47
⑧ 1-pole auxiliary switch block, cable entry from below, see page 2/47
⑨ 2-pole auxiliary switch block, cable entry from below, see page 2/47
⑩ 4-pole auxiliary switch block, see page 2/47 (terminal designations according to EN 50011 or EN 50005)
⑪ 2-pole auxiliary switch block, standard version or solid-state time-delay version, see page 2/47 (terminal designations according to EN 50005)
⑫ Surge suppressor with LED, see page 2/51

AC and DC operation

IEC 60947, EN 60947 (VDE 0660)

The 3RH1 contactor relays are suitable for use in any climate. They are finger-safe according to EN 50274.

The 3RH1 contactor relays have screw or Cage Clamp terminals. Four contacts are available in the basic unit.

3RH1 contactor relays, 4- and 8-pole

Selection and ordering data

AC and DC operation

Screw terminals

3RH11 . . -1 . . .

Rated data Operational current I_e/ AC-15/AC-14 at 230 V	Contacts			AC Operation: Rated control supply voltage U_s at 50/60 Hz[2]	AC Operation: Screw terminals	AC Operation: Weight per Piece approx.	DC Operation: Rated control supply voltage U_s	DC Operation: Screw terminals	DC Operation: Weight per Piece approx.
	Ident No.	Version			Order No.			Order No.	
A		NO	NC	V AC		kg	V DC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail									
Size S00									
6	**40 E**	4	—	24	**3RH11 40-1AB00**	0.200	24	**3RH11 40-1BB40**	0.260
				110	**3RH11 40-1AF00**	0.200	110	**3RH11 40-1BF40**	0.260
				230	**3RH11 40-1AP00**	0.200	220	**3RH11 40-1BM40**	0.260
				400[2]	**3RH11 40-1AV00**	0.200			
	31 E	3	1	24	**3RH11 31-1AB00**	0.200	24	**3RH11 31-1BB31**	0.260
				110	**3RH11 31-1AF00**	0.200	110	**3RH11 31-1BF31**	0.260
				230	**3RH11 31-1AP00**	0.200	220	**3RH11 31-1BM31**	0.260
				400[2]	**3RH11 31-1AV00**	0.200			
	22 E	2	2	24	**3RH11 22-1AB00**	0.200	24	**3RH11 22-1BB22**	0.260
				110	**3RH11 22-1AF00**	0.200	110	**3RH11 22-1BF22**	0.260
				230	**3RH11 22-1AP00**	0.200	220	**3RH11 22-1BM22**	0.260
				400[2]	**3RH11 22-1AV00**	0.200			

For accessories, see page 2/46

1) Coil operating range
at 50 Hz: 0.8 ... 1.1 x U_s,
at 60 Hz: 0.85 ... 1.1 x U_s

2) Coil operating range at 50 Hz

Overview

AC and DC operation

IEC 60947, EN 60947 (VDE 0660).

The terminal designations comply with EN 50011.

The contactor coil and the coil of the release solenoid are both designed for continuous duty.

The number of auxiliary contacts can be extended by means of auxiliary switch blocks (up to 4 poles).

RC elements, varistors diodes or diode assemblies can be fitted to both coils from the front for damping opening surges in the coil.

The contactor relay can also be switched on and released manually. (For minimum actuating times, see Technical specifications).

Selection and ordering data

3RH14 . -1 . . . .

Rated operational I_e/AC-15/AC-14 at **230 V**	Contacts			Rated control supply voltage U_s	**Screw terminals**	Weight per PU approx.
	Ident. No. acc. to EN 50011	Version			Order No.	
A		NO	NC	V		kg
With screw terminals · for screw and snap-on mounting onto 35 mm standard mounting rail						
AC operation						
				AC 50/60 Hz[1]		
6	**40 E**	4	—	24	**3RH14 40-1AB00**	0.380
				110	**3RH14 40-1AF00**	0.380
				230	**3RH14 40-1AP00**	0.380
	31 E	3	1	24	**3RH14 31-1AB00**	0.380
				110	**3RH14 31-1AF00**	0.380
				230	**3RH14 31-1AP00**	0.380
	22 E	2	2	24	**3RH14 22-1AB00**	0.380
				110	**3RH14 22-1AF00**	0.380
				230	**3RH14 22-1AP00**	0.380
DC operation · DC solenoid system						
				DC		
6	**40 E**	4	—	24	**3RH14 40-1BB40**	0.500
				110	**3RH14 40-1BF40**	0.500
				220	**3RH14 40-1BM40**	0.500
	31 E	3	1	24	**3RH14 31-1BB40**	0.500
				110	**3RH14 31-1BF40**	0.500
				220	**3RH14 31-1BM40**	0.500
	22 E	2	2	24	**3RH14 22-1BB40**	0.500
				110	**3RH14 22-1BF40**	0.500
				220	**3RH14 22-1BM40**	0.500

For accessories, see page 2/46

1) Coil operating range
at 50 Hz: 0.8 to 1.1 x U_s
at 60 Hz: 0.85 to 1.1 x U_s.

3RH11 coupling relays for switching auxiliary circuits, 4-pole

Overview

DC operation

IEC 60947 and EN 60947 (VDE 0660).

The 3RH11 coupling relays for switching auxiliary circuits are tailored to the special requirements of working with electronic controls.

The 3RH11 coupling relays cannot be extended with auxiliary switch blocks.

Selection and ordering data

DC operation
Low power consumption
Extended operating range of the magnetic coils
Integrated coil circuit

3RH11 . .-1.B40

Surge suppressors	Rated operational current I_e/AC-15/AC-14	Auxiliary contacts			Screw terminals	Weight per PU approx.
	at **230 V**	Ident. No. acc. to EN 50011	Version		Order No.	
	A		NO	NC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail						
Size S00						
Terminal designations according to EN 50011						
Rated control supply voltage U_s = 24 V DC, operating range **0.7 to 1.25 x U_s**						
Power consumption of the magnetic coils **2.3 W** at 24 V (no auxiliary switch blocks can be mounted)						
Built-in varistor	**6**	**40 E**	4	—	**3RH11 40-1KB40**	0.260
		31 E	3	1	**3RH11 31-1KB40**	0.260
		22 E	2	2	**3RH11 22-1KB40**	0.260

3RT10 1 .-1.B4.

3RT10 2 .-1KB40

Surge suppressors	Rated data Ac-3 and AC-3, T_u : upto 60°C		Auxiliary contacts			Screw terminals	Weight per PU approx.
	Operational current I_e up to **415 V**	Ratings of induction motor at 50 Hz and **415V**	Ident. No.	Version		Order No.	
	A	**kW**		NO	NC		kg
For screw and snap-on mounting onto 35 mm standard mounting rail							
Size S00							
Terminal designations according to EN 50011							
Rated control supply voltage U_s = 24 V DC, operating range **0.7 to 1.25 x U_s**							
Power consumption of the magnetic coils **2.3 W** at 24 V (no auxiliary switch blocks can be mounted)							
Built-in varistor	7	**3**	10	1	—	**3RT10 15-1JB41**	0.260
			1	—	1	**3RT10 15-1KB42**	0.260
	9	**4**	10	1	—	**3RT10 16-1KB41**	0.260
			1	—	1	**3RT10 16-1KB42**	0.260
	12	**5.5**	10	1	—	**3RT10 17-1KB41**	0.260
			1	—	1	**3RT10 17-1KB42**	0.260
For screw and snap-on mounting onto 35 mm standard mounting rail							
Size S0 [1]							
Varistor mounted	12	**5.5**	—	—	—	**3RT10 24-1KB40**	0.600
	17	**7.5**	—	—	—	**3RT10 25-1KB40**	0.600
	25	**11**	—	—	—	**3RT10 26-1KB40**	0.600

1) Power consumption of the magnetic coils 1.4 W at 24 V (no auxiliary switch blocks can be mounted)

Overview

Snap-on auxiliary switch blocks

The auxiliary switch blocks and the maximum number of blocks that can be mounted are described in the sections "Motor Contactors" and "Contactor relays".

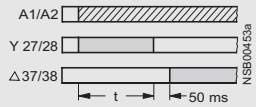
Solid-state time-delay auxiliary switch blocks

The timer module, which is available in the "ON-DELAY" and "OFF-DELAY" versions, allows time-delayed functions up to 100 s (3 distinct delay ranges).

It contains a relay with one NO contact and one NC contact; depending on the version, the relay is switched either after an ON-delay or after an OFF-delay.

The timer module with "WYE-DELTA FUNCTION" is equipped with one delayed and one instantaneous NO contact, with a dead time of 50 ms between the two. The delay time of the NO contact can be adjusted between 1.5 s and 30 s.

Wye-delta function:



The contactor on which the solid-state, time-delay auxiliary switch block is mounted operates without a delay.

Size S00

The solid-state, time-delay auxiliary switch block is fitted onto the front side of the contactor. The timer module is supplied with power directly by plug-in contacts through the coil terminals of the contactor, in parallel with A1/A2. The timing function is activated by closing the contactor on which the auxiliary switch block is mounted. The OFF-delay variant operates without an auxiliary voltage; minimum ON period: 200 ms.

A varistor is integrated in the timer module in order to damp opening surges in the contactor coil.

The solid-state, time-delay auxiliary switch block cannot be mounted on size S00 coupling relays.

Sizes S0 to S12

The solid-state, time-delay auxiliary switch block is fitted onto the front side of the contactor.

The timer module is supplied with power through two terminals (A1/A2); the time delay of the auxiliary switch block can be activated either by a parallel link to any contactor coil or by any power source.

The OFF-delay variant operates without an auxiliary voltage; minimum ON period: 200 ms.

A single-pole auxiliary switch block can be snapped onto the front of the contactor in addition to the timer module.

The timer module has no integrated components for overvoltage damping.

OFF-delay devices for size S00 to S3 contactors

AC and DC operation

IEC 60947, EN 60947.

For screw and snap-on mounting onto 35 mm standard mounting rail. The OFF-delay devices have screw terminals.

The OFF-delay device prevents a contactor from dropping out unintentionally when there is a short-time voltage dip or voltage failure. It supplies a downstream, DC-operated contactor with the necessary energy during a voltage dip, ensuring that the contactor does not trip. The 3RT19 16 OFF-delay devices are specifically designed for operation with the 3RT contactors and 3RH contactor relays of the SIRIUS series.

The OFF-delay device operates without external voltage on a capacitive basis, and can be energized with either AC or DC (24 V version only for DC operation). Voltage matching, which is only necessary with AC operation, is performed using a rectifier bridge.

A contactor opens after a delay when the capacitors of the magnetic coil, built into the OFF-delay device, are switched in parallel. In the event of voltage failures, the capacitors are discharged via the magnetic coil and thereby delay the opening of the contactor.

If the command devices are upstream of the OFF-delay device in the circuit, the OFF-delay takes effect with every opening operation. If the opening operation is downstream of the OFF-delay device, an OFF-delay only applies in the event of failure of the mains voltage.

Operation

In the case of the versions for rated control supply voltages of 110 V and 230 V, either AC voltage or DC voltage can be applied on the line side, whereas the variant for 24 V is designed for DC operation only.

A DC-operated contactor is connected to the output in accordance with the input voltage that is applied.

The mean value of the OFF-delay is approximately 1.5 times the specified minimum time.

Surge suppressors

- Without LED size S0, S2, S3, S6 to S12
- With LED size S00

All 3RT1 contactors and 3RH1 contactor relays can be retrofitted with RC elements or varistors for damping opening surges in the coil. Diodes or diode assemblies (comprising noise suppression diodes and Zener diodes for rapid switch-off) can be used.

The surge suppressors are plugged onto the front of size S00 contactors. Space is provided for them next to a snap-on auxiliary switch block.

With all size S0 to S3 contactors, varistors, RC elements and diode assemblies can be plugged on directly at the coil terminals, either on the top or underneath.

The plug-in direction of the diodes and diode assemblies is determined by a coding device.

Coupling relays are supplied either without surge suppression or with a varistor or diode connected as standard, according to the version.

Note:

The OFF-delay times of the NO contacts and the ON-delay times of the NC contacts increase if the contactor coils are damped against voltage peaks (noise suppression diode 6 to 10 times; diode assemblies 2 to 6 times, varistor +2 to 5 ms).

Coupling links for mounting on contactors of sizes S0 to S3

DC operation

IEC 60947 and EN 60947.

The coupling link is suitable for use in any climate. It is finger-safe according to EN 50274. The terminal designations comply with EN 50005.

System-compatible operation with 24 DC V, operating range 17 to 30 V.

Low power consumption in conformity with the technical specifications of the solid-state systems. A LED indicates the switching state.

Surge suppression

The 3RH19 24-1GP11 coupling link has an integrated surge suppressor (varistor) for the contactor coil being switched.

Mounting

The 3RH19 24-1GP11 coupling link is mounted directly on the contactor coil.

Optionally the adapters can be rotated through 90° before mounting.

Sealable covers for sizes S00 to S12

When contactors and contactor relays are used in safety-oriented applications, it must be ensured that it is impossible to operate the contactors manually.

For SIRIUS contactors there are sealable covers available for this purpose as accessories; these prevent accidental manual operation. These are transparent molded-plastic caps with a bracket that enables the contactor to be sealed.

Selection and ordering data

3RH19 11-1FA . .

3RH19 11-1AA . .

3RH19 11-1LA . .

3RH19 21-1C . .

For contactors	Auxiliary contacts					Screw terminals	Weight per PU approx.
	Ident. No.	Version				Order No.	
Type		NO	NC	NO	NC		kg
Auxiliary switch blocks for snapping onto the front according to EN 50005							
Size S00							
	2- or 4-pole auxiliary switch blocks for assembling contactors with 3 and 5 auxiliary contacts						
3RT1 . 1, 3RH11, 3RH14	**20**	2	—	—	—	**3RH19 11-1FA20**	0.050
	11	1	1	—	—	**3RH19 11-1FA11**	0.050
	02	—	2	—	—	**3RH19 11-1FA02**	0.050
	40	4	—	—	—	**3RH19 11-1FA40**	0.060
	31	3	1	—	—	**3RH19 11-1FA31**	0.060
	22	2	2	—	—	**3RH19 11-1FA22**	0.060
	22 U	—	—	2	2	**3RH19 11-1FC22**	0.060
	11, 11 U	1	1	1	1	**3RH19 11-1FB22**	0.060
	1- and 2-pole auxiliary switch blocks. Cable entry from one side **• Cable entry from above**						
3RT1 . 1, 3RH11, 3RH14	—	1	—	—	—	**3RH19 11-1AA10**	0.015
	—	—	1	—	—	**3RH19 11-1AA01**	0.015
Sizes S0 to S12[1]							
	1-pole auxiliary switch blocks to EN 50005 and EN 50012						
3RT1. 2 ... 3RT1 . 7	—	1	—	—	—	**3RH19 21-1CA10**	0.020
	—	—	1	—	—	**3RH19 21-1CA01**	0.020
	—	—	—	1	—	**3RH19 21-1CD10**	0.020
	—	—	—	—	1	**3RH19 21-1CD01**	0.020

1) Exception: 3RT12, 3RT16.

2) With identification numbers 5, 6, 7, 8.

Accessories for 3RT, 3RH contactors and contactor relays

3RH19 21-1EA . .
3RH19 21-1KA . .

For contactors	Auxiliary contacts		Screw terminals	Weight per PU approx.
	Version		Order No.	
Type	NO	NC		kg
Laterally mountable auxiliary switch blocks according to EN 50005				
Sizes S0 ... S12				
	First laterally mountable auxiliary switch blocks (right or left), 2-pole			
3RT1 . 2 ... 3RT1 . 7	2	—	**3RH19 21-1EA20**	0.050
	1	1	**3RH19 21-1EA11**	0.050
	—	2	**3RH19 21-1EA02**	0.050
Sizes S3 ... S12				
	Second laterally mountable auxiliary switch blocks (right or left), 2-pole			
3RT1 . 4 ... 3RT1 . 7	2	—	**3RH19 21-1KA20**	0.050
	1	1	**3RH19 21-1KA11**	0.050
	—	2	**3RH19 21-1KA02**	0.050

3RH19 11-1NF . .

3RH19 21-1FE22

For contactors	Version	Contacts				Screw terminals	Weight per PU approx.
		Version				Order No.	
Type		NO	NO[1)]	NC[1)]	NC		kg
Solid-state time-delay auxiliary switch blocks for snapping onto the front, according to EN 50005							
Size S00							
3RT1 . 1, 3RH11, 3RH14	For operation in dusty atmosphere and solid-state circuits with rated operational currents I_e/AC-14 and DC-13 from 1 mA to 300 mA at 3 V to 60 V.Hard gold-plated contacts. No mirror contacts.	1 2 —	— — —	— — —	1 — 2	**3RH19 11-1NF11** **3RH19 11-1NF20** **3RH19 11-1NF02**	0.045 0.045 0.045
Sizes S0 ... S12							
3RT1 . 2 ... 3RT1 . 7	For operation in dusty atmosphere and solid-state circuits with rated operational currents I_e/AC-14 and DC-13 from 1 mA to 300 mA at 3 V to 60 V.Hard gold-plated contacts. Mirror contacts according to EN 60947-4-1, Appendix F	1	1	1	1	**3RH19 21-1FE22**	0.070

1) 1 NO + 1 NC standard auxiliary switches:

Solid-state time-delay auxiliary switch blocks for snapping onto the front, terminal designations according to DIN 46199-5

3RT19 16-2 . . . .

Size S00

For contactors Type	Auxiliary contacts	Rated control supply voltage U_s[1] V	Time setting range *t* s	Order No.	Weight per PU approx. kg
ON-delay (varistor integrated)					
3RT1 . 1, 3RH11[2], 3RH14	1 NO + 1 NC	24 AC/DC[3]	0.05 ... 1	**3RT19 16-2EJ11**	0.090
			0.5 ... 10	**3RT19 16-2EJ21**	0.090
			5 ... 100	**3RT19 16-2EJ31**	0.090
		100 ... 127 AC[3]	0.05 ... 1	**3RT19 16-2EC11**	0.090
			0.5 ... 10	**3RT19 16-2EC21**	0.090
			5 ... 100	**3RT19 16-2EC31**	0.090
		200 ... 240 AC[3]	0.05 ... 1	**3RT19 16-2ED11**	0.090
			0.5 ... 10	**3RT19 16-2ED21**	0.090
			5 ... 100	**3RT19 16-2ED31**	0.090
OFF-delay without auxiliary voltage (varistor integrated)[4]					
3RT1 . 1, 3RH11[2], 3RH14	1 NO + 1 NC	24 AC/DC[3]	0.05 ... 1	**3RT19 16-2FJ11**	0.090
			0.5 ... 10	**3RT19 16-2FJ21**	0.090
			5 ... 100	**3RT19 16-2FJ31**	0.090
		100 ... 127 AC/DC[3]	0.05 ... 1	**3RT19 16-2FK11**	0.090
			0.5 ... 10	**3RT19 16-2FK21**	0.090
			5 ... 100	**3RT19 16-2FK31**	0.090
		200 ... 240 AC/DC[3]	0.05 ... 1	**3RT19 16-2FL11**	0.090
			0.5 ... 10	**3RT19 16-2FL21**	0.090
			5 ... 100	**3RT19 16-2FL31**	0.090
OFF-delay with auxiliary voltage					
3RT10 1 3RH11	1 CO	24 AC/DC	0.5 ... 10	**3RT19 16-2LJ21**	0.090
		100 ... 127 AC	0.5 ... 10	**3RT19 16-2LC21**	0.090
		200 ... 240 AC	0.5 ... 10	**3RT19 16-2LD21**	0.090
Wye-delta function (varistor integrated)					
3RT10 1[2]	1 NO, delayed + 1 NO, instantaneous, dead time 50 ms	24 AC/DC[3]	1.5 ... 30	**3RT19 16-2GJ51**	0.090
		100 ... 127 AC[3]	1.5 ... 30	**3RT19 16-2GC51**	0.090
		200 ... 240 AC[3]	1.5 ... 30	**3RT19 16-2GD51**	0.090

3RT19 26-2 . . . .

Sizes S0 ... S12

For contactors Type	Auxiliary contacts	Rated control supply voltage U_s[1] V	Time setting range *t* s	Order No.	Weight per PU approx. kg
ON-delay					
3RT10, 3RT13, 3RT14, 3RT15	1 NO + 1 NC	24 AC/DC[5]	0.05 ... 1	**3RT19 26-2EJ11**	0.090
			0.5 ... 10	**3RT19 26-2EJ21**	0.090
			5 ... 100	**3RT19 26-2EJ31**	0.090
		100 ... 127 AC[5]	0.05 ... 1	**3RT19 26-2EC11**	0.090
			0.5 ... 10	**3RT19 26-2EC21**	0.090
			5 ... 100	**3RT19 26-2EC31**	0.090
		200 ... 240 AC[5]	0.05 ... 1	**3RT19 26-2ED11**	0.090
			0.5 ... 10	**3RT19 26-2ED21**	0.090
			5 ... 100	**3RT19 26-2ED31**	0.090
OFF-delay without auxiliary voltage[4]					
3RT10, 3RT13, 3RT14, 3RT15	1 NO + 1 NC	24 AC/DC[5]	0.05 ... 1	**3RT19 26-2FJ11**	0.090
			0.5 ... 10	**3RT19 26-2FJ21**	0.090
			5 ... 100	**3RT19 26-2FJ31**	0.090
		100 ... 127 AC/DC[5]	0.05 ... 1	**3RT19 26-2FK11**	0.090
			0.5 ... 10	**3RT19 26-2FK21**	0.090
			5 ... 100	**3RT19 26-2FK31**	0.090
		200 ... 240 AC/DC[5]	0.05 ... 1	**3RT19 26-2FL11**	0.090
			0.5 ... 10	**3RT19 26-2FL21**	0.090
			5 ... 100	**3RT19 26-2FL31**	0.090
Wye-delta function					
3RT10, 3RT13, 3RT14, 3RT15	1 NO, delayed + 1 NO, instantaneous, dead time 50 ms	24 AC/DC[5]	1.5 ... 30	**3RT19 26-2GJ51**	0.090
		100 ... 127 AC[5]	1.5 ... 30	**3RT19 26-2GC51**	0.090
		200 ... 240 AC[5]	1.5 ... 30	**3RT19 26-2GD51**	0.090

1) The AC voltages are valid for 50 Hz and 60 Hz.

2) Cannot be fitted onto coupling relays.

3) The terminals for the control supply voltage are connected to the contactor by the integrated spring contacts of the solid-state time-delay auxiliary switch above it when this switch is mounted

4) Setting of output contacts in as-supplied state not defined (bistable relay). Application of the control supply voltage once results in contact changeover to the correct setting.

5) Terminals A1 and A2 for the control supply voltage of the solid-state time-delay auxiliary switch must be connected to the associated contactor by means of connecting cables.

Accessories for 3RT, 3RH contactors and contactor relays

	For contactors	Rated control supply voltage U_s	Time setting range t	Order No.	Weight per PU approx.
	Type	V	s		kg
Solid-state time-delay blocks with semiconductor output					
	Size S00				
		For mounting onto the front side of contactors			
		• ON-delay (varistor integrated)			
 3RT19 16-2C. . .	3RT1. 1, 3RH11[1)] 3RH14	24 ... 66 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 16-2CG11** **3RT19 16-2CG21** **3RT19 16-2CG31**	0.050 0.050 0.050
		90 ... 240 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 16-2CH11** **3RT19 16-2CH21** **3RT19 16-2CH31**	0.050 0.050 0.050
		• OFF-delay with auxiliary voltage (varistor integrated)			
 3RT19 16-2D. . .	3RT1. 1, 3RH11[1)] 3RH14	24 ... 66 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 16-2DG11** **3RT19 16-2DG21** **3RT19 16-2DG31**	0.060 0.060 0.060
		90 ... 240 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 16-2DH11** **3RT19 16-2DH21** **3RT19 16-2DH31**	0.060 0.060 0.060
	Sizes S0 ... S3				
		For mounting onto coil terminals on top of the contactors			
		• ON-delay (varistor integrated)			
 3RT19 26-2C...	3RT10 2, 3RT10 3, 3RT10 4, 3RT13[1)] 3RT15	24 ... 66 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 26-2CG11** **3RT19 26-2CG21** **3RT19 26-2CG31**	0.050 0.050 0.050
		90 ... 240 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 26-2CH11** **3RT19 26-2CH21** **3RT19 26-2CH31**	0.050 0.050 0.050
		• OFF-delay with auxiliary voltage (varistor integrated)			
 3RT19 26-2D...	3RT10 2, 3RT10 3, 3RT10 4, 3RT13[1)] 3RT15	24 ... 66 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 26-2DG11** **3RT19 26-2DG21** **3RT19 26-2DG31**	0.050 0.050 0.050
		90 ... 240 AC/DC	0.05 ... 1 0.5 ... 10 5 ... 100	**3RT19 26-2DH11** **3RT19 26-2DH21** **3RT19 26-2DH31**	0.050 0.050 0.050
OFF-delay devices					
 3RT19 16-2B.01	3RT1. 1, 3RT1. 2, 3RH1. ..-1BF40	110 AC/DC		**3RT19 16-2BK01**	0.150
	3RT1. 1, 3RT1. 2, 3RH1. ..-1BM40	220/230 AC/DC		**3RT19 16-2BL01**	0.150
	3RT1. 1 ... 3RT1. 4, 3RH1. ..-1BB40	24 DC		**3RT19 16-2BE01**	0.150
Pneumatic delay blocks, terminal designation according to EN 50005					
 3RT19 26-2P...	3RT1. 2	**For mounting onto the front side of size S0 contactors[2)3)]** **Auxiliary contacts 1 NO and 1 NC**			
		• ON-delay			
			0.1 ... 30 1 ... 60	**3RT19 26-2PA01** **3RT19 26-2PA11**	0.080 0.080
		• OFF-delay			
			0.1 ... 30 1 ... 60	**3RT19 26-2PR01** **3RT19 26-2PR11**	0.080 0.080
Mechanical latching blocks					
	Sizes S0 and S2				
 3RT19 26-3A.31		**For mounting on 1 contactor,** **contactor remains in the energized state even after a voltage failure**			
	3RT1. 2, 3RT1. 3	24 AC/DC 110 AC/DC 230 AC/DC		**3RT19 26-3AB31** **3RT19 26-3AF31** **3RT19 26-3AP31**	0.130 0.130 0.130

1) Not to be used for 3RT10 4. and 3RT13 4. contactors with $U_s \leq 42$ V.

2) In addition to these, no other auxiliary contacts are permitted.

3) Versions according to DIN VDE 0116 on request.

Surge suppressors with LED

Size S00

For plugging onto the front side of the contactors with and without auxiliary switch blocks


3RT19 16-1..00

For contactors Type	Version	Rated control supply voltage U_s[1)] AC operation V AC	DC operation V DC	Power consumption of LED at U_s	Order No.	Weight per PU approx. kg
3RT1, 3RH1.	**Varistors**	24 ... 48	12 ... 24	10 ... 120	**3RT19 16-1JJ00**	0.010
		48 ... 127	24 ... 70	20 ... 470	**3RT19 16-1JK00**	0.010
		127 ... 240	70 ... 150	50 ... 700	**3RT19 16-1JL00**	0.010
		—	150 ... 250	160 ... 950	**3RT19 16-1JP00**	0.010

1) Can be used for AC operation for 50/60 Hz. Please inquire about further voltages.

Surge suppressors without LED

Size S0

For fitting onto the coil terminals at top or bottom


3RT19 26-1B.00

For contactors Type	Version	Rated control supply voltage U_s[1)] AC operation V AC	DC operation V DC	Order No.	Weight per PU approx. kg
3RT1. 2	**Varistors**	24 ... 48	24 ... 70	**3RT19 26-1BB00**	0.025
		48 ... 127	70 ... 150	**3RT19 26-1BC00**	0.025
		127 ... 240	150 ... 250	**3RT19 26-1BD00**	0.025
		240 ... 400	—	**3RT19 26-1BE00**	0.025
		400 ... 600	—	**3RT19 26-1BF00**	0.025
3RT1. 2	**RC elements**	24 ... 48	24 ... 70	**3RT19 26-1CB00**	0.025
		48 ... 127	70 ... 150	**3RT19 26-1CC00**	0.025
		127 ... 240	150 ... 250	**3RT19 26-1CD00**	0.025
		240 ... 400	—	**3RT19 26-1CE00**	0.025
		400 ... 600	—	**3RT19 26-1CF00**	0.025
3RT1. 2	**Diode assemblies** For DC operation				
	• Connectable at the top	—	24	**3RT19 26-1ER00**	0.025
	(e.g. for contactor with overload relay)	—	30 ... 250	**3RT19 26-1ES00**	0.025
	• Connectable at the bottom	—	24	**3RT19 26-1TR00**	0.025
	(e.g. for fuseless load feeders)	—	30 ... 250	**3RT19 26-1TS00**	0.025

Sizes S2 and S3

For fitting onto the coil terminals at top or bottom


3RT19 26-1B.00


3RT19 36-1C.00

For contactors Type	Version	Rated control supply voltage U_s[1)] AC operation V AC	DC operation V DC	Order No.	Weight per PU approx. kg
3RT1. 3, 3RT1. 4	**Varistors**	24 ... 48	24 ... 70	**3RT19 26-1BB00**	0.025
		48 ... 127	70 ... 150	**3RT19 26-1BC00**	0.025
		127 ... 240	150 ... 250	**3RT19 26-1BD00**	0.025
		240 ... 400	—	**3RT19 26-1BE00**	0.025
		400 ... 600		**3RT19 26-1BF00**	0.025
3RT1. 3[3)], 3RT1. 4	**RC elements**	24 ... 48	24 ... 70	**3RT19 36-1CB00**	0.040
		48 ... 127	70 ... 150	**3RT19 36-1CC00**	0.040
		127 ... 240	150 ... 250	**3RT19 36-1CD00**	0.040
		240 ... 400	—	**3RT19 36-1CE00**	0.040
		400 ... 600	—	**3RT19 36-1CF00**	0.040
3RT1. 3, 3RT1. 4	**Diode assemblies** For DC operation				
	• Connectable at the top (e.g. for contactor with overload relay)		24 30 ... 250	**3RT19 36-1ER00** **3RT19 36-1ES00**	0.025 0.025
	• Connectable at the bottom (e.g. for fuseless load feeders)		24 30 ... 250	**3RT19 36-1TR00** **3RT19 36-1TS00**	0.025 0.025

Sizes S6 ... S12

For connecting to withdrawable coil with screw terminals with contactors with
- **3RT1 ..-.A... conventional operating mechanism**
- **3RT1 ..-.N... solid-state operating mechanism**


3RT19 56-1C.00

For contactors Type	Version	Rated control supply voltage U_s[1)] AC operation V AC	DC operation V DC	Order No.	Weight per PU approx. kg
3RT1. 5, 3RT1. 6, 3RT1. 7	**RC elements**	24 ... 48	24 ... 70	**3RT19 56-1CB00**	0.035
		48 ... 127	70 ... 150	**3RT19 56-1CC00**	0.035
		127 ... 240	150 ... 250	**3RT19 56-1CD00**	0.035
		240 ... 400	—	**3RT19 56-1CE00**	0.035
		400 ... 600		**3RT19 56-1CF00**	0.035

1) Can be used for AC operation for 50/60 Hz. Please inquire about further voltages.

3) Mountable only at the top for 3RT1. 3/AC operating mechanism.

Accessories for 3RT, 3RH contactors and contactor relays

	For contactors Type	Version	Order No.	Weight per PU approx. kg
Coupling links for control by PLC				
	Sizes S0 ... S3			
		For mounting onto the coil terminals of the contactors		
 3RH19 24-1GP11	3RT1. 2, 3RT1. 3, 3RT1. 4	Operating range 17 to 30 V DC Power consumption: 0.5 W at 24 V DC Permissible residual current of the electronics (for 0 signal): 2.5 mA Rated operational current I_e: AC-15/AC-14 at 230 V: 3 A, DC-13 at 230 V: 0.1 A With LED for indicating switching state. With integrated varistor for damping opening surges.	**3RH19 24-1GP11**	0.060
LED modules for indicating the contactor function (also for Cage Clamp terminals)				
	Sizes S0 ... S12[1]			
 3RT19 26-1QT00 mounted to contactor	3RT1. 2, 3RT1. 3, 3RT1. 4	For snapping into the location hole of an inscription label on the front of a contactor either directly on the contactor or on the front auxiliary switch. The LED module is connected to coil terminals A1 and A2 of the contactor and indicates its energized state. Yellow LED. Rated voltage: 24 to 240 V AC/DC, polarized. (1 pack = 5 units)	**3RT19 26-1QT00**	0.010


3RT19 16-4BB31


3RT19 16-4BB41

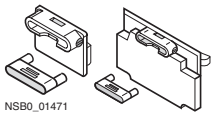

3RT19 36-4BB31


3RT19 56-4BA31

Size	For contactors Type	Max. conductor cross-sections mm²	Order No.	Weight per PU approx. kg
Links for paralleling				
	3-pole, with connection terminal[1)2)]			
S00	3RT10 1	25	**3RT19 16-4BB31**	0.015
S0	3RT10 2	35, stranded	**3RT19 26-4BB31**	0.020
S2	3RT10 3	95	**3RT19 36-4BB31**	0.100
	3-pole, with through hole (star jumpers)[1)2)]			
S3	3RT10 4 3RT14 4	185	**3RT19 46-4BB31**	0.200
S6	3RT1 . 5	—	**3RT19 56-4BA31**	0.160
S10/S12	3RT1 . 6, 3RT1 . 7	—	**3RT19 66-4BA31**	0.500
	4-pole, with connection terminal[1)2)]			
S00	3RT1 . 1	25	**3RT19 16-4BB41**	0.015

1) The links for paralleling can be reduced by one pole.

2) Sizes S00 to S2: The links for paralleling are insulated.
Size S3: A cover plate is included for touch protection.
(Can only be used when the box terminal is removed.)
Sizes S6 to S12: The 3RT19 56-4EA1 (for S6) or 3RT19 66-4EA1 (for S10 and S12) cover can be used for touch protection.

	For contactors		Version	Order No.	Weight per PU approx.
	Size	Type			kg
Box terminal blocks					
			For round and ribbon cables[1]		
 3RT19 5 . -4G	**S6**	3RT1 . 5 (3RB20 5)	Up to 70 mm² [2]	**3RT19 55-4G**	0.230
			Up to 120 mm²	**3RT19 56-4G**	0.260
			Auxiliary conductor connection for box terminals	**3TX7 500-0A**	0.010
	S10/S12	3RT1 . 6, 3RT1 . 7 (3RB20 6, 3RB21 6)	Up to 240 mm² With auxiliary conductorconnection	**3RT19 66-4G**	0.676
Covers					
			Terminal covers for box terminals		
 3RT19 36-4EA2	**S2**	3RT10 3 3RT13 3, 3RT15 3	Additional touch protection to be fitted at the box terminals (2 units required per contactor)	**3RT19 36-4EA2**	0.020
				3RT19 36-4EA4	0.020
	S3	3RT10 4, 3RT14 4		**3RT19 46-4EA2**	0.025
		3RT13 3		**3RT19 46-4EA4**	0.025
	S6	3RT1 . 5	Length: 25 mm	**3RT19 56-4EA2**	0.030
	S10/S12	3RT1 . 6, 3RT1 . 7	Length: 30 mm	**3RT19 66-4EA2**	0.040
			Terminal covers for cable lugs and busbar connection[3]		
 3RT19 46-4EA1	**S3**	3RT10 4, 3RT14 4	For complying with the voltage clearances and as touch protection if box terminal is removed[4] (2 units required per contactor)	**3RT19 46-4EA1**	0.040
	S6	3RT1 . 5	Length: 100 mm	**3RT19 56-4EA1**	0.070
	S10/S12	3RT1 . 6, 3RT1 . 7	Length: 120 mm	**3RT19 66-4EA1**	0.130
			For busbar cover between contactor and 3RB2 . overload relay or wiring module for contactor assemblies		
	S6	3RT1 . 5	Length: 27 mm	**3RT19 56-4EA3**	0.020
	S10/S12 [5]	3RT1 . 6, 3RT1 . 7	Length: 42 mm	**3RT19 66-4EA3**	0.060
			For busbar cover of the flat line connectors for reversing and wye-delta assemblies		
	S6	3RT1 . 5	Length: 38 mm	**3RT19 56-4EA4**	0.030
Sealable covers					
 3RT19 . 6-4MA10	**S00**	3RT1 . 1, 3RH1 .[6]	Sealable cover for preventing manual operation	**3RT19 16-4MA10**	0.010
	S0 ... S12	3RT1 . 2 ... 3RT1 . 7[6]	1 unit required per contactor	**3RT19 26-4MA10**	0.010

1) For connectable cross-sections of the contactors see Technical Information

2) As standard for 3RT10 54-1 contactor (55 kW).

3) Also fits on contactors S6 ... S12 with box terminals.

4) Observe the note in Technical Information, "Technical specifications", "Conductor Cross-Sections".

5) The 3RT19 66-4EA3 cover is required in addition for use in contactor assemblies (reversing/wye-delta).

6) Exception: contactors and contactor relays auxiliary switch block mounted onto the front.

Accessories for 3RT, 3RH contactors and contactor relays


3RT19 24-5A.01


3RT19 34-5A.01


3RT19 44-5A.01


3RT19 45-5A.01


3RT19 45-5A.02


3RT19 55-5A.


3RT19 55.5N..

For contactors		Rated control supply voltage U_s		Screw terminals	Weight per PU approx.		Rated control supply voltage U_s		Screw terminals	Weight per PU approx.
Size	Type			Order No.	kg	Type			Order No.	kg
Magnetic Coils - AC operation						**Magnetic Coils - DC operation**				
S0	3RT10 2.. 3RT13 2.. 3RT15 2..	24V 110V 230V 400V	50/60 Hz 50/60 Hz 50/60 Hz 50 Hz	**3RT19 24-5AC21** **3RT19 24-5AG21** **3RT19 24-5AL21** **3RT19 24-5AV21**	0.100 0.100 0.100 0.100					
S2	3RT10 34	24V 110V 230V 400V	50/60 Hz 50/60 Hz 50/60 Hz 50 Hz	**3RT19 34-5AC21** **3RT19 34-5AG21** **3RT19 34-5AL21** **3RT19 34-5AV21**	0.120 0.120 0.120 0.120	3RT10 3 3RT13 3 3RT15 3	24V DC 110V DC 220V DC		**3RT19 34-5BB41** **3RT19 34-5BF41** **3RT19 34-5BM41**	0.650 0.650 0.650
	3RT10 35 3RT10 36 3RT13 3. 3RT15 3.	24V 110V 230V 400V	50/60 Hz 50/60 Hz 50/60 Hz 50 Hz	**3RT19 35-5AC21** **3RT19 35-5AG21** **3RT19 35-5AL21** **3RT19 35-5AV21**	0.120 0.120 0.120 0.120					
S3	3RT10 44	24V 110V 230V 400V	50/60 Hz 50/60 Hz 50/60 Hz 50 Hz	**3RT19 44-5AC21** **3RT19 44-5AG21** **3RT19 44-5AL21** **3RT19 44-5AV21**	0.190 0.190 0.190 0.190	3RT10 4 3RT13 4 3RT15 4 3RT15 4	24V DC 110V DC 220V DC		**3RT19 44-5BB41** **3RT19 44-5BF41** **3RT19 44-5BM41**	1.000 1.000 1.000
	3RT10 45 3RT10 46 3RT13 4. 3RT14 46 3RT15 4.	24V 110V 230V 400V	50/60 Hz 50/60 Hz 50/60 Hz 50 Hz	**3RT19 45-5AC21** **3RT19 45-5AG21** **3RT19 45-5AL21** **3RT19 45-5AV21**	0.190 0.190 0.190 0.190					
Withdrawable coils										
Conventional operating mechanism						***Solid-state operating mechanism***			**For 24V DC PLC output**	
S6				**3RT19 55-5AB31**						
	3RT10 5 3RT14 5	110...127V AC/DC 220...240V AC/DC		**3RT19 55-5AF31** **3RT19 55-5AP31**	0.650 0.650	3RT10 5 3RT14 5	96...127V AC/DC 200...277V AC/DC		**3RT19 55-5NF31** **3RT19 55-5NP41**	0.650 0.650
S10				**3RT19 65-5AB31**						
	3RT10 6 3RT14 6	110...127V AC/DC 220...240V AC/DC		**3RT19 65-5AF31** **3RT19 65-5AP31** **3RT19 66-5AB31**	0.850 0.850	3RT10 6 3RT14 6	96...127V AC/DC 200...277V AC/DC		**3RT19 55-5NF31** **3RT19 55-5NP31**	0.900 0.900
	3RT12 6 vacuum contactors	110...127V AC/DC 220...240V AC/DC		**3RT19 66-5AF31** **3RT19 66-5AP31**	1.000 1.000	3RT12 6 vacuum contactors	96...127V AC/DC 200...277V AC/DC		**3RT19 66-5NF31** **3RT19 66-5NP31**	0.650 0.650
S12				**3RT19 75-5AB31**						
	3RT10 7 3RT14 7 3RT12 7 vacuum contactors	110...127V AC/DC 220...240V AC/DC		**3RT19 75-5AF31** **3RT19 75-5AP31**	1.300 1.300	3RT14 7 3RT12 7 vacuum contactors	96...127V AC/DC 200...277V AC/DC		**3RT19 75-5NF31** **3RT19 75-5NP31**	0.650 0.650
For 24 V DC PLC output/PLC relay output, with remaining lifetime indicator (RLT)										
(Withdrawable coil with lateral solid-state module)										
S6	3RT10 5 3RT14 5	96...127V AC/DC 200...277V AC/DC		**3RT19 55-5PF31** **3RT19 55-5PP31**	0.650 0.650					
S6	3RT10 6 3RT14 6	96...127V AC/DC 200...277V AC/DC		**3RT19 65-5PF31** **3RT19 65-5PP31**	1.300 1.300					
S612	3RT10 7 3RT14 7	96...127V AC/DC 200...277V AC/DC		**3RT19 75-5PF31** **3RT19 75-5PP31**	1.300 1.300					

For contactor		Version	Order No.	Weight per PU approx.
Size	Type			kg
Arc chutes				
S2	3RT10 3 .	Arc chutes, 3-pole	**3RT19 36-7A**	0.110
S3	3RT10 4 . , 3RT14 46		**3RT19 46-7A**	0.300
S6	3RT10 54 3RT10 55 3RT10 56		**3RT19 54-7A** **3RT19 55-7A** **3RT19 56-7A**	0.760 0.760 0.760
S10	3RT10 64 3RT10 65 3RT10 66		**3RT19 64-7A** **3RT19 65-7A** **3RT19 66-7A**	1.350 1.350 1.350
S12	3RT10 75 3RT10 76		**3RT19 75-7A** **3RT19 76-7A**	1.650 1.650
S6	3RT14 56		**3RT19 56-7B**	0.720
S10	3RT14 66		**3RT19 66-7B**	1.350
S12	3RT14 76		**3RT19 76-7B**	1.400
Contacts with fixing parts				
For contactors with 3 main contacts				
S2	3RT10 34 3RT10 35 3RT10 36	Main contacts (3 NO contacts) for utilization category AC-3 (1 set = 3 movable and 6 fixed switching elements with fixing parts)	**3RT19 34-6A** **3RT19 35-6A** **3RT19 36-6A**	0.050 0.050 0.050
S3	3RT10 44 3RT10 45 3RT10 46		**3RT19 44-6A** **3RT19 45-6A** **3RT19 46-6A**	0.110 0.110 0.110
S6	3RT10 54 3RT10 55 3RT10 56		**3RT19 54-6A** **3RT19 55-6A** **3RT19 56-6A**	0.280 0.280 0.280
S10	3RT10 64 3RT10 65 3RT10 66		**3RT19 64-6A** **3RT19 65-6A** **3RT19 66-6A**	0.550 0.550 0.550
S12	3RT10 75 3RT10 76		**3RT19 75-6A** **3RT19 76-6A**	0.900 0.100
S3	3RT14 46	Main contacts (3 NO contacts)for utilization category AC-1 (1 set = 3 movable and 6 fixed switching elements with fixing parts)	**3RT19 46-6D**	0.900
S6	3RT14 56		**3RT19 56-6D**	0.280
S10	3RT14 66		**3RT19 66-6D**	0.550
S12	3RT14 76		**3RT19 76-6D**	0.900
For 3RT12 vacuum contactors				
S10	3RT12 64 3RT12 65 3RT12 66	3 vacuum interrupters with fixing parts	**3RT19 64-6V** **3RT19 65-6V** **3RT19 66-6V**	1.530 1.530 1.530
S12	3RT12 75 3RT12 76		**3RT19 75-6V** **3RT19 76-6V**	1.780 1.780
For contactors with 4 main contacts				
S2	3RT13 26	Main contacts (4 NO contacts) for utilization category AC-1 (1 set = 4 movable and 8 fixed switching elements with fixing parts)	**3RT19 36-6E**	0.060
S3	3RT13 44 3RT13 46		**3RT19 44-6E** **3RT19 46-6E**	0.150 0.150

Spare parts for 3TC, 3TF, 3TK contactors

Selection and ordering data

	For contactors Size	Type	Version	Rated control supply voltage U_s V AC	V DC	Order No.	Weight per PU approx. kg
Surge suppressors[1] · Varistors							
 3TX7 402-3 .	**2**	3TC44[2]	**Varistors**[3] With line spacer, for mounting onto the coil terminal	24 ... 48 48 ... 127 127 ... 240 240 ... 400 400 ... 600	24 ... 70 70 ... 150 150 ... 250 — —	**3TX7 402-3G** **3TX7 402-3H** **3TX7 402-3J** **3TX7 402-3K** **3TX7 402-3L**	0.015 0.015 0.015 0.025 0.025
 3TX7 462-3 .	**4 and 6**	3TC56	**Varistors**[3] For sticking onto the contactor base or for mounting separately	24 ... 48 48 ... 127 127 ... 240 240 ... 400 400 ... 600	24 ... 70 70 ... 150 150 ... 250 — —	**3TX7 462-3G** **3TX7 462-3H** **3TX7 462-3J** **3TX7 462-3K** **3TX7 462-3L**	0.020 0.020 0.020 0.020 0.020
	8 and 12	3TC52 and 3TC56	**Varistors** For sticking onto the contactor base or for mounting separately	24 ... 48 48 ... 127 127 ... 240 240 ... 400 400 ... 600	— — — — —	**3TX7 462-3G** **3TX7 462-3H** **3TX7 462-3J** **3TX7 462-3K** **3TX7 462-3L**	0.020 0.020 0.020 0.020 0.020
 3TX7 522-3 ., 3TX7 572-3 .	**8 ... 12**	3TC52 and 3TC56	**Varistors**[3] For separate screw connection or snapping onto 35 mm standard mounting rail	— — —	24 ... 70 70 ... 150 150 ... 250	**3TX7 522-3G** **3TX7 522-3H** **3TX7 522-3J**	0.080 0.080 0.080
	14	3TF68 and 3TF69	**Varistors**[3] For DC economy circuit; for snapping onto the side of auxiliary switches	— — —	24 ... 48 48 ... 127 127 ... 240	**3TX7 572-3G** **3TX7 572-3H** **3TX7 572-3J**	0.080 0.080 0.080
Surge suppressors · RC elements							
 3TX7 462-3 . , 3TX7 522-3 .	**4**	3TC48	**RC elements** For lateral snapping onto auxiliary switch or 35 mm standard mounting rail	24 ... 48 — 48 ... 127 — 127 ... 240 — 240 ... 400 400 ... 600	— 24 ... 70 — 70 ... 150 — 150 ... 250 — —	**3TX7 462-3R** **3TX7 522-3R** **3TX7 462-3S** **3TX7 522-3S** **3TX7 462-3T** **3TX7 522-3T** **3TX7 462-3U** **3TX7 462-3V**	0.090 0.090 0.090 0.090 0.090 0.090 0.090 0.090
	6 ... 12	3TC52 and 3TC56	**RC elements** For lateral snapping onto auxiliary switch or 35 mm standard mounting rail	24 ... 48 48 ... 127 127 ... 240 240 ... 400 400 ... 600	— — — — —	**3TX7 522-3R** **3TX7 522-3S** **3TX7 522-3T** **3TX7 522-3U** **3TX7 522-3V**	0.090 0.090 0.090 0.090 0.090
Surge suppressors[4] · Diodes							
 3TX7 462-3 .	**6 ... 12**	3TC48 ... 3TC56	**Diode assemblies** (diode and Zener diode) For DC solenoid system, for sticking onto the contactor base or for mounting separately	—	24 ... 250	**3TX7 462-3D**	0.015

1) The surge suppressor is included in the scope of supply of the following contactors: 3TF68 and 3TF69 (AC operation): varistor circuit.

2) The connection piece for mounting the surge suppressor must be bent slightly.

3) Includes the peak value of the alternating voltage on the DC side.

4) Not for DC economy circuit.

	For contactor Size	Type	Version		Order No.	Weight per PU approx. kg
Solid-state time-delay auxiliary switch blocks with screw terminals						
 5TY7 561-1 .	**14** **2 and 4**	3TF68 and 3TF69 3TC44 ... 3TC48	For mounting onto the side of contactors. For use in dusty atmosphere and solid-state circuits with rated operational currents I_e AC-14 and DC-13 from 1 mA to 300 mA at 3 V to 60 V. With 1 changeover contact.2nd auxiliary switch block, left or right (replacement for 3TY6 561-1U, 3TY6 561-1V)		**3TY7 561-1UA00**	0.060
Coupling links for control by PLC						
	14	3TF68 and 3TF69	Operating range: 17 to 30 V DC. Power consumption: 0.5 W at 24 V DC. Fitted with varistor. For technical specifications see Technical Information For snapping onto the side of auxiliary switch, with surge suppression		**3TX7 090-0D**	0.080
Terminal covers for protection against inadvertent contact with exposed busbar connections						
 3TX7 6 . 6-0A	**14**	3TF68 3TF69	For screwing onto free screw end on middle connecting bar. 2 units required per contactor. (1 set = 2 units)		**3TX7 686-0A** **3TX7 696-0A**	0.410 0.410
 3TX6 526-3B	**6**	3TC48	Can be screwed on free screw end. Covers one busbar connection (1 set = 6 units).	M6	**3TX6 506-3B**	0.100
	8 and SIRIUS S6	3RT1 . 5		M8	**3TX6 526-3B**	0.140
	10 and 14 and SIRIUS S10, S12	3TC52, 3TC56 3RT1 . 6 3RT1 . 7		M10	**3TX6 546-3B**	0.260
Links for paralleling (star jumpers) · 3-pole, without connection terminal[1]						
	14	3TF68			**3TX7 680-0D**	0.250
	Cover plates for links for paralleling					
	14	3TF68	A cover plate must be used in order to protect against inadvertent contact with exposed busbar connections(EN 50274).		**3TX7 680-0E**	0.080
Box terminals for laminated copper bars						
	Without auxiliary conductor connection (1 set = 3 units)					
	14	3TF68	With single covers for protection against inadvertent contact (EN 50274)		**3TX7 570-1E**	0.780
	With auxiliary conductor connection (1 set = 3 units)					
	14	3TF68	With single covers for protection against inadvertent contact (EN 50274)		**3TX7 570-1F**	0.700
	14	3TF69	Conductor cross-sections for auxiliary conductors: Solid wire 2 x (0.75 ... 2.5) mm² Finely stranded with end sleeve 2 x (0.5 ... 2.5) mm² Solid or stranded 2 x (18 ... 12) AWGTightening torque 0.8 ... 1.4 Nm (7 ... 12 lb.in)		**3TX7 690-1F**	2.000

1) The link for paralleling can be reduced by one pole.

For contactor Size	Type	Remarks	Rated control supply voltage U_s V DC	Order No.	Weight per PU approx. kg
Arc chutes					
2	3TC44 17-0L . .	With cutout for mounting resistor		**3TY2 442-0B**	0.160
Magnetic coils					
2	3TC44	With series resistorWithout varistor	24 110	**3TY6 443-0LB4** **3TY6 443-0LF4**	0.400 0.400
4	3TC48		24 110	**3TY6 483-0LB4** **3TY6 483-0LF4**	1.100 1.100

Spare parts for 3TC, 3TF, 3TK contactors

For contactors		Version of auxiliary contacts		Version	Order No.	Weight per PU approx.
Size	Type	NO	NC			kg
Auxiliary switch blocks						
 3TY6 561-1A						
2 and 4	3TC44, 3TC48	1	1	Auxiliary switch block, left or right (replacement for 3TY6 501-1A/-1B)	**3TY6 501-1AA00**	0.055
4	3TC48	1	1	2nd auxiliary switch block, left[1)]	**3TY6 501-1K**	0.055
				2nd auxiliary switch block, right[1)]	**3TY6 501-1L**	0.055
8 and 12	3TC52, 3TC56	1	1	Auxiliary switch block, left	**3TY6 561-1A**	0.075
				Auxiliary switch block, right	**3TY6 561-1B**	0.075
				2nd auxiliary switch block, left[1)]	**3TY6 561-1K**	0.075
				2nd auxiliary switch block, right[1)]	**3TY6 561-1L**	0.075
Contacts with fixing parts						
 3TY2 520-0A				In order to ensure reliable operation of the contactors, only **original replacement contacts from Siemens** should be used.		
2	3TC44			(1 set = 2 moving and 2 fixed contacts)	**3TY2 440-0A**	0.070
4	3TC48				**3TY2 480-0A**	0.100
8	3TC52				**3TY2 520-0A**	0.250
12	3TC56				**3TY2 560-0A**	0.450
Arc chutes						
 3TC2 48						
2	3TC44			1 arc chute, 2-pole	**3TY2 442-0A**	0.170
4	3TC48				**3TY2 482-0A**	0.500
8	3TC52				**3TY2 522-0A**	1.200
12	3TC56				**3TY2 562-0A**	2.130
Magnetic coils						
	DC operation					
2	3TC44				**3TY6 443-0B . .**	0.300
4	3TC48				**3TY6 483-0B . .**	1.000
8	3TC52				**3TY6 523-0B . .**	2.300
12	3TC56				**3TY6 563-0B . .**	4.800
	AC operation					
2	3TC44				**3TY7 403-0A . .**	0.100
4	3TC48				**3TY6 483-0A . .**	0.200
8	3TC52				**3TY6 523-0A . .**	0.350
12	3TC56				**3TY6 566-0A . .**	0.650

For rated control supply voltages for magnetic coils, see page 3/131.

1) Can only be mounted on AC-operated contactors.

AC 50/60 Hz: 3TC44, 3TF68/69

Coil Voltage (V)	24	110	230	110 V...132 V AC	200V...240V AC	380...460V AC
Code	C2	G2	L2	F7	M7	P7

AC Coil codes: 50 Hz for 3TC48, 3TC5

Coil Voltage (V)	24	110	230/220
Code	B0	F0	P0

DC Coil codes: 3TC44, 3TC5, 3TK10/11/12/13

Coil Voltage (V)	24	110	220
Code	B4	F4	M4

Auxiliary switch blocks

3TY7 561-1 . A00

For contactors Size	Type	Contacts Version NO	NC	NC	Version	Order No.	Weight per PU approx. kg
With screw terminals							
14	3TF68 and 3TF69	1	1	—	1st auxiliary switch block, left or right Replacement for: 3TY7 561-1A/ -1B.	**3TY7 561-1AA00**	0.050
		1	—	1	Auxiliary switch block, left or right	**3TY7 561-1EA00**	0.050
		1	1	—	2nd auxiliary switch block, left or right Replacement for: 3TY7 561-1K/ -1L.	**3TY7 561-1KA00**	0.050
For coil reconnection with DC economy circuit, with screw terminals							
14	3TF68 and 3TF69	—	—	1	Auxiliary switch block	**3TY7 681-1G**	0.050

Magnetic coils

3TY7 6 . 3-0 . . .

For contactors Size	Type	Version	Order No.	Weight per PU approx. kg
AC operation				
14	3TF68 3TF69	The magnetic coils are fitted as standard with varistors against overvoltage. The coil is supplied with switch-on electronics.	**3TY7 683-0C . .** **3TY7 693-0C . .**	1.350 1.700
DC operation · DC economy circuit				
14	3TF68 3TF69	Reversing contactors are required for size 14 contactors: Contactor type 3TF68 and 3TF69 Reversing contactor 3TC44 (70 mm wide, 85 mm high) The magnetic coils are supplied without reversing contactor.	**3TY7 683-0D . .** **3TY7 693-0D . .**	0.560 0.560

Vacuum interrupters

In order to ensure reliable operation of the contactors, only **original replacement interrupters from Siemens** should be used.

14	3TF68 3TF69	3 vacuum interrupters with components	**3TY7 680-0B** **3TY7 690-0B**	3.490 3.640

Spare parts for 3TC, 3TF, 3TK contactors

For contactor Type	Version	Rated control supply voltage U_s V AC	Order No.	Weight per PU approx. kg
Surge suppressors · RC elements				
3TK10 to 3TK13		24 ... 48	**3TK19 30-0A**	0.050
		110 ... 415	**3TK19 30-0B**	0.050
3TK14 to 3TK17		48 ... 110	**3TK19 34-0C**	0.050
		220 ... 600	**3TK19 34-0D**	0.050
Terminal covers				
3TK10, 3TK11	For mounting onto contactors		**3TK19 40-0A**	0.150
3TK12, 3TK13			**3TK19 42-0A**	0.150
3TK14, 3TK15			**3TK19 44-0A**	0.200
3TK17			**3TK19 46-0A**	0.200
Auxiliary switch blocks				
3TK1	1st auxiliary switch block, left or right	1 NO + 1 NC	**3TK19 10-3A**	0.050
	2nd auxiliary switch block,left or right	1 NO + 1 NC	**3TK19 10-3B**	0.050
Locking devices				
3TK10, 3TK11	For mechanical interlocking of 2 identical		**3TK19 20-0A**	0.140
3TK12, 3TK13	contactors, auxiliary contacts 2 NC		**3TK19 22-0A**	0.140
3TK14, 3TK15, 3TK17	Mechanical interlock,including mounting plate		**3TK19 24-0A**	6.750
Arc chutes				
3TK10	1 arc chute, 4-pole		**3TK19 50-0A**	0.650
3TK11			**3TK19 51-0A**	0.650
3TK12			**3TK19 52-0A**	1.250
3TK13			**3TK19 53-0A**	1.250
3TK14			**3TK19 54-0A**	3.700
3TK15			**3TK19 55-0A**	3.700
3TK17			**3TK19 57-0A**	3.700
Magnetic coils				
3TK10, 3TK11			**3TK19 70-0A . .**	0.400
3TK12, 3TK13			**3TK19 72-0A . .**	0.500
3TK14, 3TK15, 3TK17			**3TK19 74-0A . .**	1.050
Contacts with fixing parts				
3TK10	4 moving and 8 fixed contacts		**3TK19 60-0A**	0.270
3TK11			**3TK19 61-0A**	0.270
3TK12			**3TK19 62-0A**	0.580
3TK13			**3TK19 63-0A**	0.580
3TK14			**3TK19 64-0A**	2.400
3TK15			**3TK19 65-0A**	2.400
3TK17			**3TK19 67-0A**	2.400

Controls – Contactors and Contactor Assemblies

2a

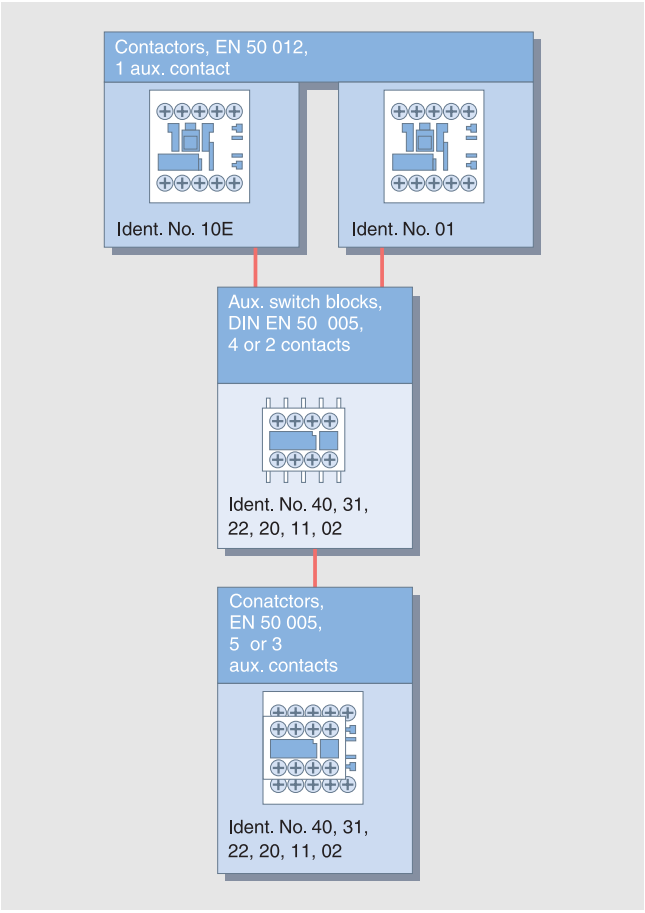
Integration

Auxiliary switch blocks

Various auxiliary switch blocks can be added to the 3RT1 basic units depending on the application:

Size S00

3RT10 1 . contactors



Size S00 contactors have an auxiliary contact integrated in the basic unit.

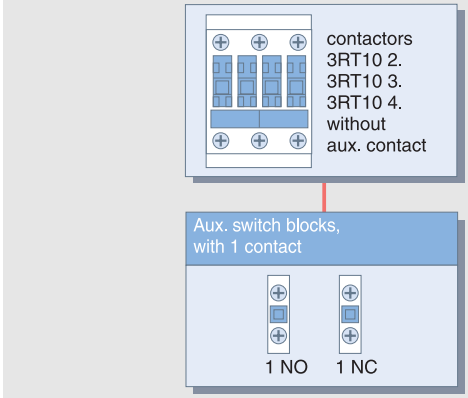
All contactors of size S00 with one auxiliary contact (identification numbers 10E or 01) and the contactors with 4 main contacts can be expanded into contactors with 3 or 5 auxiliary contacts using auxiliary switch blocks with the identification numbers 40 to 02 (in the case of contactors with 4 main contacts: 2 or 4 auxiliary contacts) according to EN 50005.

The electronically-optimized 3RH19 11-1NF . . auxiliary switch blocks for contactors of size S00 include 2 enclosed contacts. They are suitable in particular for switching small voltages and currents (hard gold-plated contacts) and for operation in dusty atmospheres. The NC auxiliary contacts are not mirror contacts.

All the auxiliary switch variants can be snap-fitted onto the front of the contactor. The auxiliary switch block has a centrally positioned release lever for disassembly.

Sizes S0 to S3

3RT10 2 . to 3RT10 4 . contactors,
1-pole auxiliary switch blocks,
terminal designations according to EN 50005 or EN 50012.



The auxiliary switch variants are uniform for the contactors of size S0 to S12.

One 4-pole or up to four single-pole auxiliary switch blocks can be snapped on. When the contactors are switched on, the NC contacts are opened first and then the NO contacts are closed.

The terminal designations of the single-pole auxiliary switch locks are comprised of identification numbers (location identifiers) on the basic unit and of function numbers on the auxiliary switch blocks.

If the installation space is limited in depth, 2-pole auxiliary switch blocks can be attached laterally for use on the left or on the right.

The auxiliary switch blocks attached to the front can be disassembled with the help of a centrally arranged release lever; the laterally attached auxiliary switch blocks are easy to remove by pressing on the checkered surfaces.

Sizes S0 and S2

A maximum of 4 auxiliary contacts can be attached; the auxiliary switch blocks used can be of any version. For reasons of symmetry, when two 2-pole laterally mountable auxiliary switch blocks are used, one block must be attached on the right and one on the left.

More auxiliary contacts are permissible with size S2 under

certain conditions (please ask).

For 4-pole contactors see 3RT13 and 3RT15.

Size S3 to S12

A maximum of 8 auxiliary contacts can be attached; please note the following:

- Of these 8 auxiliary contacts, there must be no more than 4 NC contacts
- Ensure the symmetry of laterally mounted auxiliary switch blocks

For 4-pole contactors see 3RT13 and 3RT15.

Technical specifications

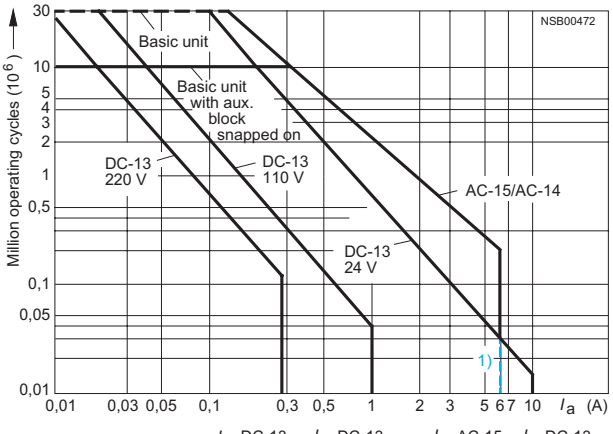
SIRIUS controls are climate-proof and are suitable and tested for use worldwide.

If the devices are used in ambient conditions which deviate from common industrial conditions (EN 60721-3-3 "Stationary Use, Weather-Protected"), the manufacturer must be consulted about possible restrictions with regard to the reliability and endurance of the device and possible protective measures.

Contactor	Type Size			**3RT1** **S00 ... S12**
Rated data of the auxiliary contacts				
Acc. to IEC 60947-5-1/EN 60947-5-1 (VDE 0660 Part 200) The data apply to integrated auxiliary contacts and contacts in the auxiliary switch blocks for contactor sizes S00 to S12[1]				
Rated insulation voltage U_i (degree of pollution 3)			V	690
For 3RH19 21-. laterally mountable auxiliary switch blocks			V	Max. 500
Continuous thermal current I_{th} = **Rated operational current I_e/AC-12**			A	10
AC load				
Rated operational current I_e/AC-15/AC-14				
for rated operational voltage U_e	24 V		A	6
	110 V		A	6
	125 V		A	6
	220 V		A	6
	230 V		A	6
	380 V		A	3
	415 V		A	3
	500 V		A	2
	660 V[2]		A	1
	690 V[2]		A	1
DC load				
Rated operational current I_e/DC-12				
for rated operational voltage U_e	24 V		A	10
	60 V		A	6
	110 V		A	3
	125 V		A	2
	220 V		A	1
	440 V		A	0.3
	600 V[2]		A	0.15
Rated operational current I_e/DC-13				
for rated operational voltage U_e	24 V		A	10[1]
	60 V		A	2
	110 V		A	1
	125 V		A	0.9
	220 V		A	0.3
	440 V		A	0,14
	600 V[2]		A	0,1
• **Contact reliability at 17 V, 1 mA** acc. to EN 60947-5-4				Frequency of contact faults < 10^{-8} i.e. <1 fault per 100 million operating cycles

Endurance of the auxiliary contacts

It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system.
The contact endurance is mainly dependent on the breaking current.
The characteristic curves apply to
- Integrated auxiliary contacts for 3RT10
- 3RH19 11, 3RH19 21 auxiliary switch blocks for contactor sizes S00 to S12.



Legend:
I_a = Breaking current
I_e = Rated operational current

1) Attachable auxiliary switch blocks for size S00 and laterally mountable auxiliary switch blocks for S0 to S12: 6 A.

2) Up to 500 V switching capacity for laterally mountable auxiliary switch blocks.

Endurance of the main contacts

The characteristic curves show the contact endurance of the contactors when switching resistive and inductive AC loads (AC-1/AC-3) depending on the breaking current and rated operational voltage. It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system.

The rated operational current I_e complies with utilization category AC-4 (breaking six times the rated operational current) and is intended for a contact endurance of at least 200 000 operating cycles.

If a shorter endurance is sufficient, the rated operational current I_e/AC-4 can be increased.

If the contacts are used for **mixed operation**, i.e. normal switching (breaking the rated operational current according to utilization category AC-3) in combination with intermittent inching (breaking several times the rated operational current according to utilization category AC-4), the contact endurance can be calculated approximately from the following equation:

$$X = \frac{A}{1 + \frac{C}{100}\left(\frac{A}{B} - 1\right)}$$

Characters in the equation:

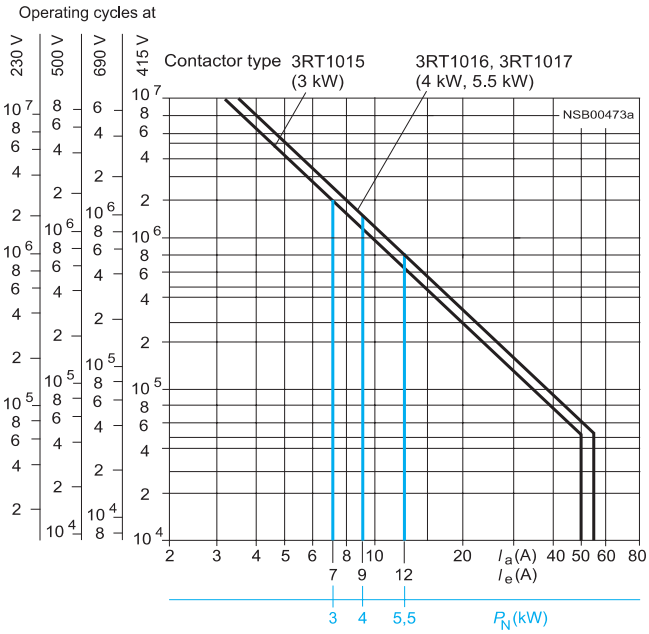
X Contact endurance for mixed operation in operating cycles

A Contact endurance for normal operation ($I_a = I_e$) in operating cycles

B Contact endurance for inching (I_a = multiple of I_e) in operating cycles

C Inching operations as a percentage of total switching operations

Size S00



Size S0

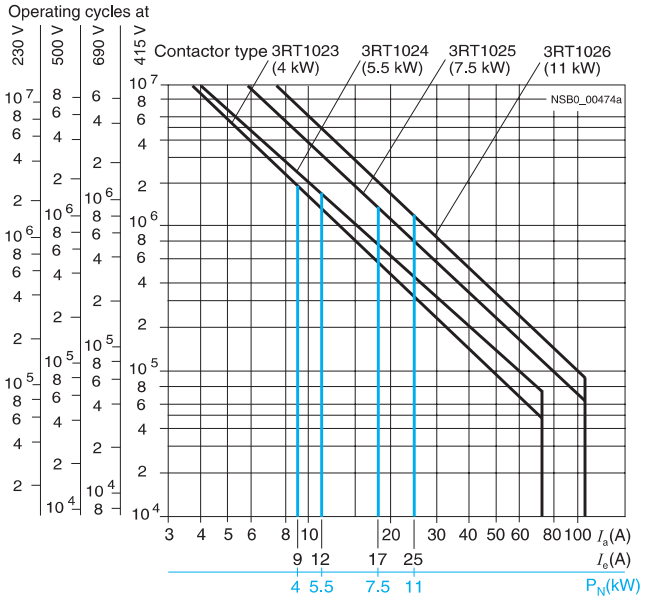


Diagram legend:

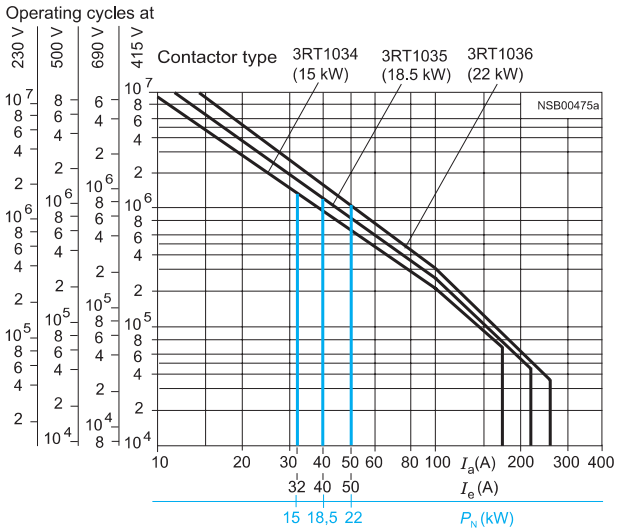
P_N= Rated power for squirrel-cage motors at 415 V

I_a= Breaking current

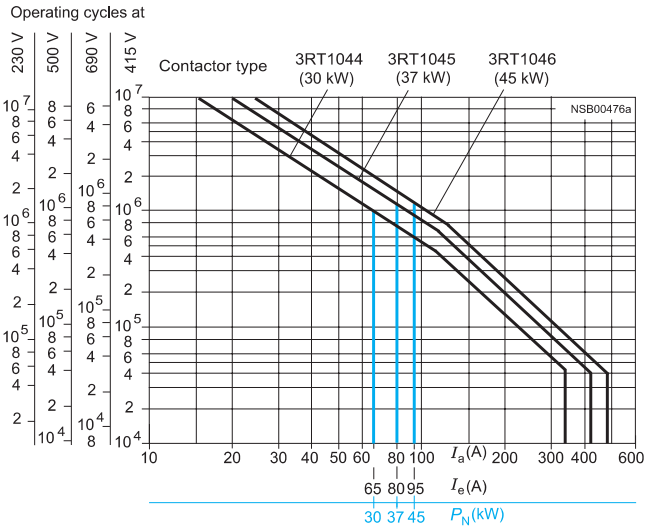
I_e= Rated operational current

Endurance of the main contacts

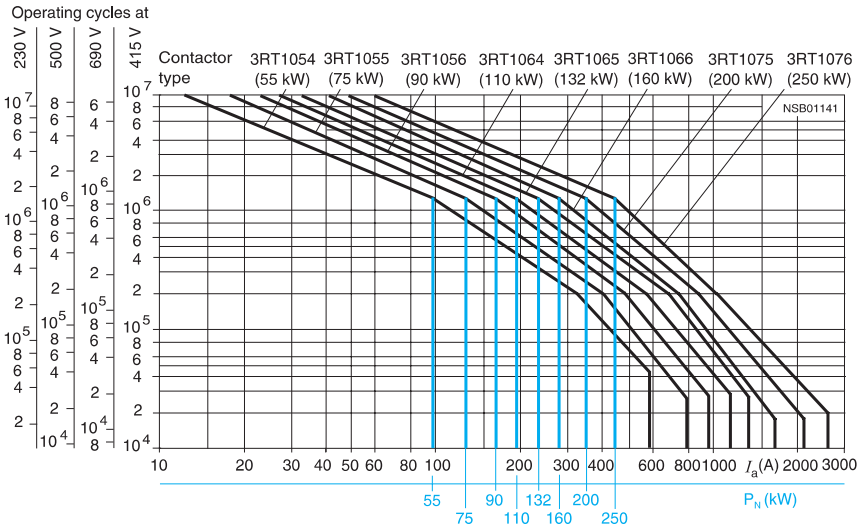
Size S2



Size S3



Sizes S6 to S12



3RT12 vacuum contactors
Sizes S10 and S12

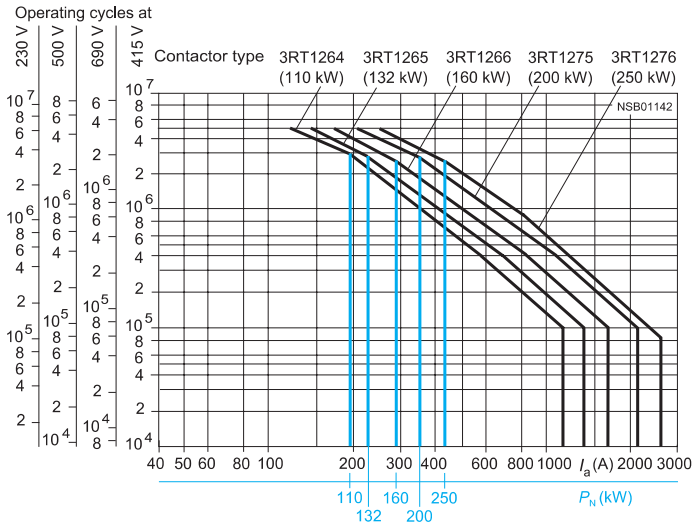


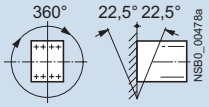
Diagram legend:

P_N= Rated power for squirrel-cage motors at 415 V

I_a= Breaking current

I_e= Rated operational current

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		**3RT10 1 .** **S00**
General data			
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.	AC and DC operation		
Mechanical endurance	Basic unit Basic unit with snap-on auxiliary switch block	Operating cycles	30 million 10 million
Electrical endurance			[1]
Rated insulation voltage U_i (degree of pollution 3)		V	690
Rated impulse withstand voltage U_{imp}		kV	6
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	400/415
Mirror contacts • A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.	3RT10 1 ., 3RT13 1 . (removable auxiliary switch block)		Yes, this applies to both the basic unit as well as to between the basic unit and the mounted auxiliary switch block acc. to EN 60947-1, Appendix F.
Ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP20, coil assembly IP40 Finger-safe
Shock resistance rectangular pulse	AC operation DC operation	*g*/ms *g*/ms	7/5 and 4.2/10 7/5 and 4.2/10
Shock resistance sine pulse	AC operation DC operation	*g*/ms *g*/ms	9.8/5 and 5.9/10 9.8/5 and 5.9/10
Conductor cross-sections			[2]
Short-circuit protection for contactors without overload relays			
			For short-circuit protection for contactors with overload relays see Protection Equipment: Overload Relays For short-circuit protection for fuseless load feeders see Load Feeders, Motor Starters and Soft Starters: -> 3RA Fuseless Load Feeders.
Main circuit			
• Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE			
- Acc. to IEC 60947-4-1/ EN 60947-4-1	Type of coordination "1" Type of coordination "2" Weld-free[3]	A A A	35 20 10
• Miniature circuit breakers (up to 230 V) with C characteristic Short-circuit current 1 kA, type of coordination "1"		A	10
Auxiliary circuit			
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection $I_k \geq 1$ kA)		A	10
• Miniature circuit breakers up to 230 V with C characteristic Short-circuit current $I_k < 400$ A		A	6
Control			
Magnetic coil operating range			
• AC operation	50 Hz 60 Hz		0.8 ... 1.1 x U_s 0.85 ... 1.1 x U_s
• DC operation	up to 50 °C up to 60 °C		0.8 ... 1.1 x U_s 0.85 ... 1.1 x U_s
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)			
AC operation, 50/60 Hz			
Standard version	• Closing • P.f. • Closed • P.f.	VA VA 	27/24.3 0.8/0.75 4.4/3.4 0.27/0.27
DC operation	Closing = Closed	W	3.3

1) For endurance of the main contacts see page 2a/4.

2) For conductor cross-sections see page 2a/9.

3) Test conditions according to IEC 60947-4-1.

Contactor	Type Size		3RT10 1 . S00
Control			
Operating times[1]			
Total break time = Opening delay + Arcing time			
• AC operation at 0.8 ... 1.1 x U_s	Closing delay Opening delay	ms ms	8 ... 35 4 ... 30
• DC operation at 0.85 ... 1.1 x U_s	Closing delay Opening delay	ms ms	25 ... 100 7 ... 10
• Arcing time		ms	10 ... 15
Operating times for 1.0 x U_s[1]			
• AC operation	Closing delay Opening delay	ms ms	10 ... 25 5 ... 30
• DC operation	Closing delay Opening delay	ms ms	30 ... 50 7 ... 9

1) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attenuated against voltage peaks (noise suppression diode 6 to 10 times; diode assemblies 2 to 6 times, varistor +2 to 5 ms).

Contactor	Type Size			3RT10 15 S00	3RT10 16 S00	3RT10 17 S00
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational current I_e	at 40 °C up to 690 V at 60 °C up to 690 V		A A	18 16	22 20	22 20
Rated power for AC loads[1] P.f.= 0.95 (at 60 °C)	400/415 V		kW	11	13	13
Minimum conductor cross-section for loads with I_e	at 40/60 °C		mm^2	2.5	2.5	2.5
Utilization categories AC-2 and AC-3						
Rated operational currents I_e	up to 415 V 500 V 690 V		A A A	7 5 4	9 6.5 5.2	12 9 6.3
Rated power for slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V 415 V 500 V 690 V		kW kW kW kW	2.2 3 3.5 4	3 4 4.5 5.5	3 5.5 5.5 5.5
Thermal load capacity	10 s current[2]		A	56	72	96
Power loss per conducting path	at I_e/AC-3		W	0.42	0.7	1.24
Utilization category AC-4 (for I_a = 6 x I_e)[3]						
Rated operational current I_e	up to 415 V		A	6.5	8.5	8.5
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	up to 415 V		kW	3	4	4
• The following applies to a contact endurance of about 200000 operating cycles:						
- rated operational currents I_e	up to 415 V 690 V		A A	2.6 1.8	4.1 3.3	4.1 3.3
- rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V 415 V 500 V 690 V		kW kW kW kW	0.67 1.15 1.45 1.15	1.1 2 2 2.5	1.1 2 2 2.5

1) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

2) According to IEC 60947-4-1. For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3) The data only apply to 3RT15 16 and 3RT15 17 (2NO + 2NC) upto a rated operational voltage of 400/415V

3RT10 contactors, 3-pole, 3 ... 250 kW

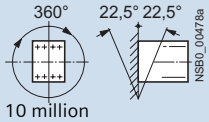
Contactor	Type Size			3RT10 15 S00	3RT10 16 S00	3RT10 17 S00
Main circuit						
AC capacity						
Utilization category AC-5a **Switching gas discharge lamps, inductive ballast** Per main current path at 230 V						
• Uncorrected, rated power per lamp/rated operational current per lamp						
	L 18 W/0.37 A		Units	54	59	59
	L 36 W/0.43 A		Units	46	51	51
	L 58 W/0.67 A		Units	29	32	32
	L 80 W/0.79 A		Units	25	27	27
• DUO switching (two-lamp)						
	L 18 W/0.22 A		Units	90 (≙ 2 x 90 lamps)	100 (≙ 2 x 100 lamps)	100 (≙ 2 x 100 lamps)
	L 36 W/0.42 A		Units	47 (≙ 2 x 47 lamps)	52 (≙ 2 x 52 lamps)	52 (≙ 2 x 52 lamps)
	L 58 W/0.63 A		Units	31 (≙ 2 x 31 lamps)	34 (≙ 2 x 34 lamps)	34 (≙ 2 x 34 lamps)
	L 80 W/0.87 A		Units	22 (≙ 2 x 22 lamps)	25 (≙ 2 x 25 lamps)	25 (≙ 2 x 25 lamps)
Switching gas discharge lamps with correction Per main current path at 230 V						
• Shunt compensation with inductive ballast, rated power per lamp/capacitance/ rated operational current per lamp						
	L 18 W/4.5 µF/0.11 A		Units	17	22	22
	L 36 W/4.5 µF/0.21 A		Units	16	22	22
	L 58 W/7.0 µF/0.32 A		Units	10	14	14
	L 80 W/7.0 µF/0.49 A		Units	6	9	9
• With solid-state ballast[1] single lamp						
	L 18 W/6.8 µF/0.10 A		Units	49	63	63
	L 36 W/6.8 µF/0.18 A		Units	27	35	35
	L 58 W/10 µF/0.29 A		Units	16	23	23
	L 80 W/10 µF/0.43 A		Units	11	14	14
• With solid-state ballast[1] two-lamp						
	L 18 W/10 µF/0.18 A		Units	27 (≙ 2 x 27 lamps)	35 (≙ 2 x 35 lamps)	35 (≙ 2 x 35 lamps)
	L 36 W/10 µF/0.35 A		Units	14 (≙ 2 x 14 lamps)	18 (≙ 2 x 18 lamps)	18 (≙ 2 x 18 lamps)
	L 58 W/22 µF/0.52 A		Units	9 (≙ 2 x 9 lamps)	12 (≙ 2 x 12 lamps)	12 (≙ 2 x 12 lamps)
	L 80 W/22 µF/0.86 A		Units	5 (≙ 2 x 5 lamps)	7 (≙ 2 x 7 lamps)	7 (≙ 2 x 7 lamps)
Utilization category AC-5b, switching incandescent lamps Per main current path at 230/220 V			kW	1.3	1.7	1.7
Utilization category AC-6a **switching AC transformers**						
Rated operational current I_e						
• For inrush current n = 20	up to 415 V		A	3.6	5.1	7.2
• For inrush current n = 30	up to 415 V		A	2.4	3.3	5.1
Rated power P						
• For inrush current n = 20	at 400/415 V		kVA	2.5	3.5	5
• For inrush current n = 30	at 400/415 V		kVA	1.6	2.3	3.5
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n30} \cdot 30/x$						
DC capacity						
Utilization category DC-1 **Switching resistive loads (L/R ≤ 1ms)** Rated operational current I_e (at 60 °C)						
• 1 conducting path	up to 24 V		A	15	20	
	110 V		A	1.5	2.1	
	220 V		A	0.6	0.8	
	440 V		A	0.42	0.6	
• 2 conducting paths in series	up to 24 V		A	15	20	
	110 V		A	8.4	12	
	220 V		A	1.2	1.6	
	440 V		A	1.6	0.8	
• 3 conducting paths in series	up to 24 V		A	15	20	
	110 V		A	15	20	
	220 V		A	15	20	
	440 V		A	0.9	1.3	

1) Depending on the electronic ballast used, higher lamp numbers are also possible.

Contactor	Type Size			3RT10 15 S00	3RT10 16 S00	3RT10 17 S00
Main circuit						
DC capacity						
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors ($L/R \leq$ 15 ms)** Rated operational current I_e (at 60 °C)						
• 1 conducting path		up to 24 V	A	15	20	
		110 V	A	0.1	0.15	
		220 V	A	—	—	
		440 V	A	—	—	
• 2 conducting paths in series		up to 24 V	A	15	20	
		110 V	A	0.25	0.35	
		220 V	A	—	—	
		440 V	A	—	—	
• 3 conducting paths in series		up to 24 V	A	15	20	
		110 V	A	15	20	
		220 V	A	1.2	1.5	
		440 V	A	0.14	0.2	
Switching frequency						
Switching frequency z in operating cycles/hour						
• Contactors without overload relay		No-load switching frequency AC	h^{-1}	10000		
		No-load switching frequency DC	h^{-1}	10000		
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$		Rated operation				
		AC-1 (AC/DC)	h^{-1}	1000		
		AC-2 (AC/DC)	h^{-1}	750		
		AC-3 (AC/DC)	h^{-1}	750		
		AC-4 (AC/DC)	h^{-1}	250		
• Contactors with overload relays (mean value)			h^{-1}	15		
Conductor cross-sections						
• Screw terminals	**Main and auxiliary conductors:**			**Screw terminals**		
(1 or 2 conductors can be connected) For standard screwdriver size 2 and Pozidriv 2	• Solid		mm^2	2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1] acc. to IEC 60947; max. 2 x (1 ... 4)		
	• Finely stranded with end sleeve		mm^2	2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1]		
	• Solid or stranded, AWG cables		AWG	2 x (20 ... 16)[1]; 2 x (18 ... 14)[1]; 1 x 12		
	• Terminal screw			M3		
	- tightening torque		Nm	0.8 ... 1.2 (7 ... 10.3 lb.in)		

1) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified.
If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 23 S0	3RT10 24 S0	3RT10 25 S0	3RT10 26 S0
General data						
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.	AC and DC operation					
Mechanical endurance	Basic unit	Operating cycles	10 million			
	Basic unit with snap-on auxiliary switch block		10 million			
Electrical endurance			1)			
Rated insulation voltage U_i (degree of pollution 3)		V	690			
Rated impulse withstand voltage U_{imp}		kV	6			
Safe isolation between the coil and the main contacts (acc. to EN 60947-1, Appendix N)		V	400			
Mirror contacts • A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.	3RT10 2 . , 3RT13 2 . (removable auxiliary switch block)		Yes, acc. to EN 60947-1, Appendix F			
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80			
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP20, coil assembly IP20 Finger-safe			
Shock resistance rectangular pulse	AC operation DC operation	*g*/ms *g*/ms	8.2/5 and 4.9/10 10/5 and 7.5/10			
Shock resistance sine pulse	AC operation DC operation	*g*/ms *g*/ms	12.5/5 and 7.8/10 15/5 and 10/10			
Conductor cross-sections			2)			
Short-circuit protection for contactors without overload relays						
Main circuit			For short-circuit protection for contactors with overload relays see Protection Equipment: Overload Relays For short-circuit protection for fuseless load feeders see Load Feeders, Motor Starters and Soft Starters: -> 3RA Fuseless Load Feeders.			
• Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE - acc. to IEC 60947-4-1/ EN 60947-4-1	Type of coordination "1" Type of coordination "2" Weld-free[3]	A A A	63 25 10			100 35 16
• Miniature circuit breakers with C characteristic (short-circuit current 3 kA, type of coordination "1")		A	25			32
Auxiliary circuit						
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1$ kA)		A	10			
• Miniature circuit breaker with C characteristic (short-circuit current $I_k < 400$ A)		A	10			

1) For endurance of the main contacts see page 2a/4.

2) For conductor cross-sections see page 2a/13.

3) Test conditions according to IEC 60947-4-1.

Contactor	Type Size		3RT10 2 . S0
Control			
Magnetic coil operating range	AC/DC		0.8 ... 1.1 x U_s
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)			
AC operation, 50 Hz, standard version	• Closing • P.f. • Closed • P.f.	VA VA 	61 0.82 7.8 0.24
AC operation, 50/60 Hz, standard version	• Closing • P.f. • Closed • P.f.	VA VA 	64/63 0.72/0.74 8.4/6.8 0.24/0.28
DC operation	Closing = Closed	W	5.4

Contactor	Type Size		3RT10 2 . S0
Control			
Operating times for 0.8 ... 1.1 x U_s [1]			
Total break time = Opening delay + Arcing time			
• AC operation	Closing delay Opening delay	ms ms	8 ... 44 4 ... 20
• DC operation	Closing delay Opening delay	ms ms	50 ... 170 13.5 ... 15.5
• Arcing time		ms	10
Operating times for 1.0 x U_s [1]			
• AC operation	Closing delay Opening delay	ms ms	10 ... 17 4 ... 20
• DC operation Opening delay	Closing delay	ms ms	55 ... 85 14 ... 15.5

1) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attenuated against voltage peaks (varistor +2 ms to 5 ms, diode assembly: 2 to 6 times).

Contactor	Type Size		3RT10 23 S0	3RT10 24 S0	3RT10 25 S0	3RT10 26 S0
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational current I_e	at 40 °C up to 690 V at 60 °C up to 690 V	A A	40 35			
Rated power for AC loads [1] P.f. = 0.95 (at 60 °C)	415 V	kW	23			
Minimum conductor cross-section for loads with I_e	at 40/60 °C	mm²	10			
Utilization category AC-2 and AC-3						
Rated operational currents I_e	up to 415 V 440 V 500 V 690 V	A A A A	9 9 6.5 5.2	12 12 12 9	17 17 17 13	25 22 18 13
Rated power for slipring or squirrel-cage motors at 50 Hz and 60 Hz	at 110 V 230 V 415 V 500 V 660 V / 690 V	kW kW kW kW kW	1.1 3 4 4.5 5.5	1.5 3 5.5 7.5 7.5	2.2 4 7.5 10 11	3 5.5 11 11 11
Thermal load capacity	10 s current [2]	A	80	110	150	200
Power loss per conducting path	at I_e/AC-3	W	0.4	0.5	0.9	1.6
Utilization category AC-4 (for $I_a = 6 \times I_e$)						
Rated operational current I_e	up to 415 V	A	8.5	12.5	15.5	15.5
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V	kW	4	5.5	7.5	7.5
• The following applies to a contact endurance of about 200000 operating cycles:						
Rated operational currents I_e	up to 415 V 690 V	A A	4.1 3.3	5.5 5.5	7.7 7.7	9 9
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 110 V 230 V 415 V 500 V 690 V	kW kW kW kW kW	0.5 1.1 2 2 2.5	0.73 1.5 2.6 3.3 4.6	1 2 3.5 4.6 6	1.2 2.5 4.4 5.6 7.7

1) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size			3RT10 23 S0	3RT10 24 S0	3RT10 25 S0	3RT10 26 S0
Main circuit							
AC capacity							
Utilization category AC-5a **Switching gas discharge lamps, inductive ballast** Per main current path at 230 V[1]							
Rated power per lamp/rated operational current per lamp							
Uncorrected	L 18 W/0.37 A	Units		108			
	L 36 W/0.43 A	Units		93			
	L 58 W/0.67 A	Units		59			
	L 80 W/0.79 A	Units		50			
DUO switching (two-lamp)	L 18 W/0.22 A	Units		181 (≙ 2 x 181 lamps)			
	L 36 W/0.42 A	Units		95 (≙ 2 x 95 lamps)			
	L 58 W/0.63 A	Units		63 (≙ 2 x 63 lamps)			
	L 80 W/0.87 A	Units		45 (≙ 2 x 45 lamps)			
Switching gas discharge lamps with correction Per main current path at 230 V							
Rated power per lamp/capacitance/rated operational current per lamp							
• Shunt compensation with inductive ballast	L 18 W/4.5 µF/0.11 A	Units		37		41	61
	L 36 W/4.5 µF/0.21 A	Units		30		30	51
	L 58 W/7.0 µF/0.32 A	Units		20		20	33
	L 80 W/7.0 µF/0.49 A	Units		13		13	22
• With solid-state ballast[2] single lamp	L 18 W/6.8 µF/0.10 A	Units		105		119	175
	L 36 W/6.8 µF/0.18 A	Units		58		66	97
	L 58 W/10 µF/0.29 A	Units		36		41	60
	L 80 W/10 µF/0.43 A	Units		24		27	40
• With solid-state ballast[2] two-lamp	L 18 W/10 µF/0.18 A	Units		58 (≙ 2 x 58 lamps)		66 (≙ 2 x 66 l.)	97 (≙ 2 x 97 l.)
	L 36 W/10 µF/0.35 A	Units		30 (≙ 2 x 30 lamps)		34 (≙ 2 x 34 l.)	50 (≙ 2 x 50 l.)
	L 58 W/22 µF/0.52 A	Units		20 (≙ 2 x 20 lamps)		22 (≙ 2 x 22 l.)	33 (≙ 2 x 33 l.)
	L 80 W/22 µF/0.86 A	Units		12 (≙ 2 x 12 lamps)		13 (≙ 2 x 13 l.)	20 (≙ 2 x 20 l.)
Utilization category AC-5b, switching incandescent lamps Per main current path at 230/220 V			kW	2.8		3.2	4.7
Utilization category AC-6a **switching AC transformers**							
Rated operational current I_e							
• For inrush current n = 20	up to 415 V		A	11.4			20.2
• For inrush current n = 30	up to 415 V		A	7.6			13.5
Rating P							
• For inrush current n = 20	415 V		kVA	7.9			13.9
• For inrush current n = 30	415 V		kVA	5.2			9.3
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n30} \cdot 30/x$							
Utilization category AC-6b, **switching low-inductance (low-loss, metallized dielectric) AC capacitors**							
Rated operational currents I_e	up to 415 V		A	5.8			10.8
Rated power for single capacitors or	at 230 V		kvar	2.5			4
banks of capacitors (minimum inductance	400 V		kvar	4			7.5
of 6 µH between capacitors connected	500 V		kvar	4			7.5
in parallel) at 50 Hz, 60 Hz and	690 V		kvar	4			7.5
DC capacity							
Utilization category DC-1Switching resistive loads (*L/R* ≤ 1ms)							
Rated operational current I_e (at 60 °C)							
• 1 conducting path	up to 24 V		A	35			
	110 V		A	4.5			
	220 V		A	1			
	440 V		A	0.4			
• 2 conducting paths in series	up to 24 V		A	35			
	110 V		A	35			
	220 V		A	5			
	440 V		A	1			
• 3 conducting paths in series	up to 24 V		A	35			
	110 V		A	35			
	220 V		A	35			
	440 V		A	2.9			

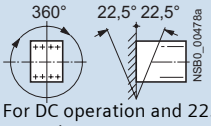
1) For I_e/AC-1 = 35 A (60 °C) and the corresponding minimum conductor cross-section 10 mm².

2) Depending on the electronic ballast used, higher lamp numbers are also possible.

Contactor	Type Size			3RT10 23 S0	3RT10 24 S0	3RT10 25 S0	3RT10 26 S0
Main circuit							
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)** Rated operational current I_e (at 60 °C)							
• 1 conducting path	up to 24 V	A		20			
	110 V	A		2.5			
	220 V	A		1			
	440 V	A		0.09			
• 2 conducting paths in series	up to 24 V	A		35			
	110 V	A		15			
	220 V	A		3			
	440 V	A		0.27			
• 3 conducting paths in series	up to 24 V	A		35			
	110 V	A		35			
	220 V	A		10			
	440 V	A		0.6			
Switching frequency							
Switching frequency *z* in operating cycles/hour							
• Contactors without overload relays	No-load switching frequency AC	h^{-1}		5000			
Dependence of the switching frequency *z'* on the operational current *I'* and operational voltage *U'*:	No-load switching frequency DC	h^{-1}		1500			
$z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1 (AC/DC)	h^{-1}		1000			
	AC-2 (AC/DC)	h^{-1}		1000			750
	AC-3 (AC/DC)	h^{-1}		1000			750
	AC-4 (AC/DC)	h^{-1}		300			250
• Contactors with overload relays (mean value)		h^{-1}		15			
Conductor cross-sections							
Screw terminals	**Main conductors**			**Screw terminals**			
(1 or 2 conductors can be connected)	Conductor cross-section						
	• Solid	mm^2		2 x (1 ... 2.5)[1]; 2 x (2.5 ... 6)[1] acc. to IEC 60947; max. 1 x 10			
	• Finely stranded with end sleeve	mm^2		2 x (1 ... 2.5)[1]; 2 x (2.5 ... 6)[1]			
	• AWG cables, solid	AWG		2 x (16 ... 12)			
	• AWG cables, solid or stranded	AWG		2 x (14 ... 10)			
	• AWG cables, stranded	AWG		1 x 8			
	• Terminal screws			M4 (Pozidriv size 2)			
	- tightening torque	Nm		2 ... 2.5 (18 ... 22 lb.in)			
	Auxiliary conductors						
	Conductor cross-section						
	• Solid	mm^2		2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4)			
	• Finely stranded with end sleeve	mm^2		2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1]			
	• Solid or stranded AWG (2 x)	AWG		2 x (20 ... 16)[1]; 2 x (18 ... 14)[1]; 1 x 12			
	• Terminal screws			M3			
	- tightening torque	Nm		0.8 ... 1.2 (7 ... 10.3 lb.in)			

3RT, 3TF Contactors for Switching Motors

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 34 S2	3RT10 35 S2	3RT10 36 S2
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.	AC and DC operation		 For DC operation and 22.5 ° inclination towards the front, operating range 0.85 ... 1.1 x U_s		
Mechanical endurance	Basic units	Operating cycles	10 million		
	Basic unit with snap-on auxiliary switch block		10 million		
Electrical endurance			[1]		
Rated insulation voltage U_i (degree of pollution 3)		V	690		
Rated impulse withstand voltage U_{imp}		kV	6		
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	415		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.	3RT10 3 . , 3RT13 3 . (removable auxiliary switch block)		Yes, acc. to EN 60947-4-1, Appendix F		
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP20 (terminal compartment IP00), AC coil assembly IP40, DC coil assembly IP30 finger-safe		
Shock resistance					
• Rectangular pulse	AC and DC operation	*g*/ms	10/5 and 5/10		
• Sine pulse	AC and DC operation	*g*/ms	15/5 and 8/10		
Conductor cross-sections			[2]		
Short-circuit protection for contactors without overload relays					
			For short-circuit protection for contactors with overload relays see Protection Equipment: Overload Relays For short-circuit protection for fuseless load feeders see Load Feeders, Motor Starters and Soft Starters: -> 3RA Fuseless Load Feeders.		
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE					
Acc. to IEC 60947-4-1/ EN 60947-4-1	Type of coordination "1"	A	125	125	160
	Type of coordination "2"	A	63	63	80
	Weld-free[3]	A	16	16	50
Auxiliary circuit					
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1$ kA)		A	10		
• Miniature circuit breakers with C characteristic (short-circuit current $I_k \leq 400$ A)		A	10		
Control					
Magnetic coil operating range	AC/DC		0.8 ... 1.1 x U_s		
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)					
AC operation, 50 Hz, standard version	• Closing	VA	104	145	
	• P.f.		0.78	0.79	
	• Closed	VA	9.7	12.5	
	• P.f.		0.42	0.36	
AC operation, 50/60 Hz, standard version	• Closing	VA	127/113	170/155	
	• P.f.		0.73/0.69	0.76/0.72	
	• Closed	VA	11.3/9.5	15/11.8	
	• P.f.		0.41/0.42	0.35/0.38	
DC operation	Closing = Closed	W	13.3	13.3	
Operating times for 0.8 ... 1.1 x U_s[4] (Total break time = Opening delay + Arcing time)					
AC operation	• Closing delay	ms	11 ... 30	10 ... 24	
	• Opening delay	ms	7 ... 10	7 ... 10	
DC operation	• Closing delay	ms	50 ... 95	60 ... 100	
	• Opening delay	ms	20 ... 30	20 ... 25	
Arcing time		ms	10	10	
Operating times for 1.0 x U_s[4]					
AC operation	• Closing delay	ms	13 ... 22	12 ... 20	
	• Opening delay	ms	7 ... 10	7 ... 10	
DC operation	• Closing delay	ms	60 ... 75	70 ... 85	
	• Opening delay	ms	20 ... 30	20 ... 25	

1) For endurance of the main contacts see page 2a/5.
2) For conductor cross-sections see page 2a/17.
3) Test conditions according to IEC 60947-4-1.
4) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attenuated against voltage peaks (varistor +2 ms to 5 ms, diode assembly: 2 to 6 times).

Contactor	Type Size			3RT10 34 S2	3RT10 35 S2	3RT10 36 S2
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational currents I_e	at 40 °C up to 690 V		A	50	60	60
	at 60 °C up to 690 V		A	45	55	55
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	415 V		kW	31	38	38
Minimum conductor cross-section for loads with I_e	at 40 °C		mm^2	16	16	16
	at 60 °C		mm^2	10	16	16
Utilization category AC-2 and AC-3						
Rated operational currents I_e	up to 500 V		A	32	40	50
	690 V		A	20	24	24
Rated power for slipring or squirrel-cage motors at 50 and 60 Hz	230 V		kW	7.5	11	15
	415 V		kW	15	18.5	22
	500 V		kW	18.5	22	30
	690 V		kW	18.5	22	22
Thermal load capacity	10 s current[2]		A	320	400	400
Power loss per conducting path	at I_e/AC-3		W	1.8	2.6	5
Utilization category AC-4 (for $I_a = 6 \times I_e$)						
Rated operational current I_e	up to 415 V		A	29	35	41
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V		kW	15	18.5	22
• The following applies to a contact endurance of about 200000 operating cycles:						
Rated operational currents I_e	up to 415 V		A	15.6	18.5	24
	690 V		A	15.6	18.5	24
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	230 V		kW	4.7	5.4	7.3
	415 V		kW	8.2	9.5	12.6
	500 V		kW	9.8	11.8	15.8
	690 V		kW	13	15.5	21.8
Utilization category AC-5a **Switching gas discharge lamps, inductive ballast** Per main current path at 230 V						
• Uncorrected, rated power per lamp/rated operational current per lamp						
	L 18 W/0.37 A		Units	135	162	162
	L 36 W/0.43 A		Units	116	139	139
	L 58 W/0.67 A		Units	74	89	89
	L 80 W/0.79 A		Units	63	75	75
• DUO switching (two-lamp)						
	L 18 W/0.22 A		Units	227 (≙ 2 x 227 lamps)	272 (≙ 2 x 272 lamps)	272 (≙ 2 x 272 lamps)
	L 36 W/0.42 A		Units	119 (≙ 2 x 119 lamps)	142 (≙ 2 x 142 lamps)	142 (≙ 2 x 142 lamps)
	L 58 W/0.63 A		Units	79 (≙ 2 x 79 lamps)	95 (≙ 2 x 95 lamps)	95 (≙ 2 x 95 lamps)
	L 80 W/0.87 A		Units	57 (≙ 2 x 57 lamps)	68 (≙ 2 x 68 lamps)	68 (≙ 2 x 68 lamps)
Switching gas discharge lamps with correction Per main current path at 230 V						
• Shunt compensation with inductive ballast, rated power per lamp/capacitance/rated operational current per lamp						
	L 18 W/4.5 µF/0.11 A		Units	78	98	123
	L 36 W/4.5 µF/0.21 A		Units	78	98	123
	L 58 W/7 µF/0.32 A		Units	50	63	79
	L 80 W/7 µF/0.49 A		Units	50	63	73
• With solid-state ballast[3] single lamp						
	L 18 W/6.8 µF/0.10 A		Units	224	280	350
	L 36 W/6.8 µF/0.18 A		Units	124	155	194
	L 58 W/10 µF/0.29 A		Units	77	96	120
	L 80 W/10 µF/0.43 A		Units	52	65	81
• With solid-state ballast[3] two-lamp						
	L 18 W/10 µF/0.18 A		Units	124 (≙ 2 x 124 lamps)	155 (≙ 2 x 155 lamps)	194 (≙ 2 x 194 lamps)
	L 36 W/10 µF/0.35 A		Units	64 (≙ 2 x 64 lamps)	80 (≙ 2 x 80 lamps)	100 (≙ 2 x 100 lamps)
	L 58 W/22 µF/0.52 A		Units	43 (≙ 2 x 43 lamps)	54 (≙ 2 x 54 lamps)	67 (≙ 2 x 67 lamps)
	L 80 W/22 µF/0.86 A		Units	26 (≙ 2 x 26 lamps)	32 (≙ 2 x 32 lamps)	40 (≙ 2 x 40 lamps)

1) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

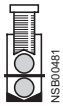
2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3) Depending on the electronic ballast used, higher lamp numbers are also possible.

3RT10 contactors, 3-pole, 3 ... 250 kW

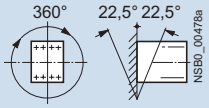
Contactor	Type Size			3RT10 34 S2	3RT10 35 S2	3RT10 36 S2
Main circuit						
AC capacity						
Utilization category AC-5b **Switching incandescent lamps** Per main current path at 230/220 V			kW	6.0	7.6	9.5
Utilization category AC-6a **switching AC transformers**						
Rated operational current I_e						
• For inrush current n = 20	up to 415 V		A	31	36.5	43.2
• For inrush current n = 30	up to 400 V		A	20.7	24.3	28.8
Rating P						
For inrush current n = 20	at 415 V		kVA	21.5	25.3	29.9
For inrush current n = 30	415 V		kVA	14.3	16.8	20
For deviating inrush current factors x, the power must be recalculated as follows. $P_x = P_{n30} \cdot 30/x$						
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C						
Rated operational currents I_e	up to 415 V		A	29	36	36
Rated power for single capacitors or banks of capacitors (minimum inductance of 20 µH between capacitors connected in parallel) at 50 Hz, 60 Hz and	at 230 V 415 V 525 V 690 V		kvar kvar kvar kvar	12 20 25 20	15 25 33 25	15 25 33 25
DC capacity						
Utilization category DC-1 **Switching resistive loads (*L/R* < 1ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path	up to 24 V		A	45	55	55
	110 V		A	4.5	4.5	4.5
	220 V		A	1	1	1
	440 V		A	0.4	0.4	0.4
• 2 conducting paths in series	up to 24 V		A	45	55	55
	110 V		A	25	25	25
	220 V		A	5	5	5
	440 V		A	1	1	1
• 3 conducting paths in series	up to 24 V		A	45	55	55
	110 V		A	45	55	55
	220 V		A	45	45	45
	440 V		A	2.9	2.9	2.9
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path	up to 24 V		A	35	35	35
	110 V		A	2.5	2.5	2.5
	220 V		A	1	1	1
	440 V		A	0.1	0.1	0.1
• 2 conducting paths in series	up to 24 V		A	45	55	55
	110 V		A	25	25	25
	220 V		A	5	5	5
	440 V		A	0.27	0.27	0.27
• 3 conducting paths in series	up to 24 V		A	45	55	55
	110 V		A	45	55	55
	220 V		A	25	25	25
	440 V		A	0.6	0.6	0.6

Contactor	Type Size		3RT10 34 S2	3RT10 35 S2	3RT10 36 S2
Switching frequency					
Switching frequency z in operating cycles/hour					
• Contactors without overload relays	No-load switching frequency AC	h^{-1}	5000	5000	5000
	No-load switching frequency DC	h^{-1}	1500	1500	1500
Dependence of the switching frequency z′ on the operational current I′ and operational voltage U′: $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1 (AC/DC)	h^{-1}	1200	1200	1000
	AC-2 (AC/DC)	h^{-1}	750	600	400
	AC-3 (AC/DC)	h^{-1}	1000	1000	800
	AC-4 (AC/DC)	h^{-1}	250	300	300
• Contactors with overload relays (mean value)		h^{-1}	15	15	15

Contactor	Type Size		3RT10 3 . S2
Conductor cross-sections			
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** with box terminal		**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve	mm²	0.75 ... 25
	• Finely stranded without end sleeve	mm²	0.75 ... 25
	• Stranded	mm²	0.75 ... 35
	• Solid	mm²	0.75 ... 16
	• Ribbon cable conductors (number x width x thickness)	mm	6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG	18 ... 2
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve	mm²	0.75 ... 25
	• Finely stranded without end sleeve	mm²	0.75 ... 25
	• Stranded	mm²	0.75 ... 35
	• Solid	mm²	0.75 ... 16
	• Ribbon cable conductors (number x width x thickness)	mm	6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG	18 ... 2
Both clamping points connected  NSB00481	• Finely stranded with end sleeve	mm²	2 x (0.75 ... 16)
	• Finely stranded without end sleeve	mm²	2 x (0.75 ... 16)
	• Stranded	mm²	2 x (0.75 ... 25)
	• Solid	mm²	2 x (0.75 ... 16)
	• Ribbon cable conductors (number x width x thickness)	mm	2 x (6 x 9 x 0.8)
	• AWG cables, solid or stranded	AWG	2 x (18 ... 2)
	• Terminal screw - tightening torque	Nm	M6 (Pozidriv size 2) 3 ... 4.5 (27 ... 40 lb.in)
	Auxiliary conductors:		
	• Solid	mm²	2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1] acc. to IEC 60947; max. 2 x (0.75 ... 4)
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[1]; 2 x (0.75 ... 2.5)[1]
	• AWG cables, solid or stranded	AWG	2 x (20 ... 16)[1]; 2 x (18 ... 14)[1]; 1 x 12
	• Terminal screw - tightening torque	Nm	M3 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 44 S3	3RT10 45 S3	3RT10 46 S3
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.	AC and DC operation		 For DC operation and 22.5° inclination towards the front, operating range 0.85 ... 1.1 x U_s		
Mechanical endurance	Basic units	Operating cycles	10 million		
	Basic unit with snap-on auxiliary switch block		10 million		
Electrical endurance			[1]		
Rated insulation voltage U_i (degree of pollution 3)		V	1000		
Rated impulse withstand voltage U_{imp}		kV	6		
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.	3RT10 4 . , 3RT13 4 . , 3RT14 4 . (removable auxiliary switch block)		Yes, acc. to EN 60947-4-1, Appendix F		
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP20 (terminal compartment IP00), AC coil assembly IP40, DC coil assembly IP30 finger-safe		
Shock resistance					
• Rectangular pulse	AC and DC operation	g/ms	6.8/5 and 4/10		
• Sine pulse	AC and DC operation	g/ms	10.6/5 and 6.2/10		
Conductor cross-sections			[2]		
Short-circuit protection for contactors without overload relays					
Main circuit • Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE			For short-circuit protection for contactors with overload relays see Protection Equipment: Overload Relays For short-circuit protection for fuseless load feeders see Load Feeders, Motor Starters and Soft Starters: -> 3RA Fuseless Load Feeders.		
- acc. to IEC 60947-4-1/ EN 60947-4-1	Type of coordination "1"	A	250	250	
	Type of coordination "2"	A	125	160	
	Weld-free[3]	A	63	100	
Auxiliary circuit					
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq$ 1 kA)		A	10		
• Miniature circuit breakers with C characteristic (short-circuit current $I_k <$ 400 A)		A	10		
Control					
Magnetic coil operating range	AC/DC		0.8 ... 1.1 x U_s		
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)					
AC operation, 50 Hz, standard version	• Closing	VA	218	270	
	• P.f.		0.61	0.68	
	• Closed	VA	21	22	
	• P.f.		0.26	0.27	
AC operation, 50/60 Hz, standard version	• Closing	VA	247/211	298/274	
	• P.f.		0.62/0.57	0.7/0.62	
	• Closed	VA	25/18	27/20	
	• P.f.		0.27/0.3	0.29/0.31	
DC operation	Closing = Closed	W	15	15	
Permissible residual current of the electronics (with 0 signal)					
	• AC operation		< 25 mA x (230 V/U_s)		
	• DC operation		< 43 mA x (24 V/U_s)		
Operating times for 0.8 ... 1.1 x U_s [1] Total break time = Opening delay + Arcing time					
• AC operation	Closing delay	ms	16 ... 57	17 ... 90	
	Opening delay	ms	10 ... 19	10 ... 25	
• DC operation	Closing delay	ms	90 ... 230	90 ... 230	
	Opening delay	ms	14 ... 20	14 ... 20	
• Arcing time		ms	10 ... 15	10 ... 15	

1) For endurance of the main contacts see page 2a/5.

2) For conductor cross-sections see page 2a/21.

3) Test conditions according to IEC 60947-4-1.

Contactor	Type Size			3RT10 44 S3	3RT10 45 S3	3RT10 46 S3
Control						
Operating times for 1.0 x U_s [1]						
• AC operation	Closing delay		ms	18 ... 34	18 ... 30	
	Opening delay		ms	11 ... 18	11 ... 23	
• DC operation	Closing delay		ms	100 ... 120	100 ... 120	
	Opening delay		ms	16 ... 20	16 ... 20	
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational currents I_e	at 40 °C up to 690 V		A	100	120	120
	1000 V		A	50	60	70
	at 60 °C up to 690 V		A	90	100	100
	1000 V		A	40	50	60
Rated output of AC loads[2] P.f. = 0.95 (at 60 °C)	at 415 V		kW	59	66	66
Minimum conductor cross-section for loads with I_e	At 40 °C		mm^2	35	50	50
	At 60 °C		mm^2	35	35	35
Utilization categories AC-2 and AC-3						
Rated operational currents I_e	up to 500 V		A	65	80	95
	690 V		A	47	58	58
	1000 V		A	25	30	30
Rated power for slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V		kW	18.5	22	22
	415 V		kW	30	37	45
	500 V		kW	37	45	55
	690 V		kW	45	55	55
	1000 V		kW	30	37	37
Thermal load capacity	10 s current[3]		A	600	760	760
Power loss per conducting path	at I_e/AC-3		W	4.6	7.7	10.8
Utilization category AC-4 (for I_a = 6 x I_e)						
Rated operational current I_e	up to 415 V		A	55	66	80
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V		kW	30	37	45
• The following applies to a contact endurance of about 200000 operating cycles:						
- rated operational currents I_e	up to 415 V		A	28	34	42
	690 V		A	28	34	42
	1000 V		A	20	23	23
- rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V		kW	8.7	10.4	12
	415 V		kW	15.1	17.9	22
	500 V		kW	18.4	22.4	27
	690 V		kW	25.4	30.9	38
	1000 V		A	22	30	30
Utilization category AC-5a **Switching gas discharge lamps, inductive ballast** Per main current path at 230 V						
• Uncorrected, rated power per lamp/rated operational current per lamp						
	L 18 W/0.37 A		Units	270	324	
	L 36 W/0.43 A		Units	232	279	
	L 58 W/0.67 A		Units	149	179	
	L 80 W/0.79 A		Units	126	151	
• DUO switching (two-lamp)						
	L 18 W/0.21 A		Units	454 (≙ 2 x 454 lamps)	545 (≙ 2 x 545 lamps)	
	L 36 W/0.42 A		Units	238 (≙ 2 x 238 lamps)	285 (≙ 2 x 285 lamps)	
	L 58 W/0.63 A		Units	158 (≙ 2 x 158 lamps)	190 (≙ 2 x 190 lamps)	
	L 80 W/0.87 A		Units	114 (≙ 2 x 114 lamps)	137 (≙ 2 x 137 lamps)	

1) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attenuated against voltage peaks (varistor +2 ms to 5 ms, diode assembly: 2 to 6 times).

2) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

3) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size			3RT10 44 S3	3RT10 45 S3	3RT10 46 S3
Main circuit						
AC capacity						
Switching gas discharge lamps with correction						
Per main current path at 230 V						
• Shunt compensation with inductive ballast, rated power per lamp/capacitance/rated operational current per lamp						
	L 18 W/4.5 µF/0.11 A		Units	160	197	234
	L 36 W/4.5 µF/0.21 A		Units	160	197	234
	L 58 W/7 µF/0.32 A		Units	103	127	150
	L 80 W/7 µF/0.49 A		Units	103	126	146
• With solid-state ballast[1] single lamp						
	L 18 W/6.8 µF/0.10 A		Units	455	560	665
	L 36 W/6.8 µF/0.18 A		Units	253	311	369
	L 58 W/10 µF/0.29 A		Units	156	193	229
	L 80 W/10 µF/0.43 A		Units	105	130	154
• With solid-state ballast[1] two-lamp						
	L 18 W/10 µF/0.18 A		Units	253 (≙ 2 x 253 lamps)	311 (≙ 2 x 311 lamps)	369 (≙ 2 x 369 lamps)
	L 36 W/10 µF/0.35 A		Units	130 (≙ 2 x 130 lamps)	160 (≙ 2 x 160 lamps)	190 (≙ 2 x 190 lamps)
	L 58 W/22 µF/0.52 A		Units	88 (≙ 2 x 88 lamps)	108 (≙ 2 x 108 lamps)	128 (≙ 2 x 128 lamps)
	L 80 W/22 µF/0.86 A		Units	52 (≙ 2 x 52 lamps)	65 (≙ 2 x 65 lamps)	77 (≙ 2 x 77 lamps)
Utilization category AC-5b **Switching incandescent lamps**						
Per main current path at 230/220 V			kW	12.3	15.2	18.1
Utilization category AC-6a **switching AC transformers**						
Rated operational current I_e (60 °C)						
• For inrush current n = 20		up to 415 V	A	63.5	80	84.4
		up to 690 V	A	47	58	58
• For inrush current n = 30		up to 400 V	A	42.3	56.3	56.3
		up to 690 V	A	42.3	56.3	56.3
Rating *P*						
• For inrush current n = 20		415 V	kVA	43.9	55.4	58
• For inrush current n = 30		415 V	kVA	29.3	39	39
For deviating inrush current factors x, the power must be recalculated as follows. $P_x = P_{n30} \cdot 30/x$						
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors**						
Rated operational currents I_e (60 °C)		up to 415 V	A	57	72	
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 µH between capacitors connected in parallel) at 50 Hz, 60 Hz and		at 230 V	kvar	24	29	
		415 V	kvar	40	50	
		525 V	kvar	50	65	
		690 V	kvar	40	50	
DC capacity						
Utilization category DC-1 **Switching resistive load (*L/R* £ 1 ms)**						
Rated operational current I_e (60 °C)						
• 1 conducting path		up to 24 V	A	90	100	100
		110 V	A	4.5	9	9
		220 V	A	1	2	2
		440 V	A	0.4	0.6	0.6
• 2 conducting paths in series		up to 24 V	A	90	100	100
		110 V	A	90	100	100
		220 V	A	5	10	10
		440 V	A	1	1.8	1.8
• 3 conducting paths in series		up to 24 V	A	90	100	100
		110 V	A	90	100	100
		220 V	A	70	80	80
		440 V	A	2.9	1.8	4.5

1) Depending on the electronic ballast used, higher lamp numbers are also possible.

Contactor	Type / Size			3RT10 44 S3	3RT10 45 S3	3RT10 46 S3
Main circuit						
DC capacity						
Utilization category DC-3 and DC-5 Shunt-wound and series-wound motors ($L/R \leq 15$ ms)						
Rated operational current I_e (60 °C)						
• 1 conducting path	up to 24 V	A		40	40	40
	110 V	A		2.5	2.5	2.5
	220 V	A		1	1	1
	440 V	A		0.15	0.15	0.15
• 2 conducting paths in series	up to 24 V	A		90	100	100
	110 V	A		90	100	100
	220 V	A		7	7	7
	440 V	A		0.42	0.42	0.42
• 3 conducting paths in series	up to 24 V	A		90	100	100
	110 V	A		90	100	100
	220 V	A		35	35	35
	440 V	A		0.8	0.8	0.8
Switching frequency						
Switching frequency z in operating cycles/hour						
• Contactors without overload relays	No-load switching frequency AC		h^{-1}	5000	5000	5000
	No-load switching frequency DC		h^{-1}	1000	1000	1000
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1 (AC/DC)		h^{-1}	1000	900	900
	AC-2 (AC/DC)		h^{-1}	400	400	350
	AC-3 (AC/DC)		h^{-1}	1000	1000	850
	AC-4 (AC/DC)		h^{-1}	300	300	250
• Contactors with overload relays (mean value)			h^{-1}	15	15	15

Contactor	Type / Size			3RT10 4 . S3
Conductor cross-sections				
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** with box terminal			**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve		mm²	2.5 ... 35
	• Finely stranded without end sleeve		mm²	4 ... 50
	• Solid		mm²	2.5 ... 16
	• Stranded		mm²	4 ... 70
	• Ribbon cable conductors (number x width x thickness)		mm	6 x 9 x 0.8
	• AWG cables, solid or stranded		AWG	10 ... 2/0
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve		mm²	2.5 ... 50
	• Finely stranded without end sleeve		mm²	10 ... 50
	• Solid		mm²	2.5 ... 16
	• Stranded		mm²	10 ... 70
	• Ribbon cable conductors (number x width x thickness)		mm	6 x 9 x 0.8
	• AWG cables, solid or stranded		AWG	10 ... 2/0
Both clamping points connected  NSB00481	• Finely stranded with end sleeve		mm²	2 x (2.5 ... 35)
	• Finely stranded without end sleeve		mm²	2 x (4 ... 35)
	• Solid		mm²	2 x (2.5 ... 16)
	• Stranded		mm²	2 x (4 ... 50)
	• Ribbon cable conductors (number x width x thickness)		mm	2 x (6 x 9 x 0.8)
	• AWG cables, solid or stranded		AWG	2 x (10 ... 1/0)
	• Terminal screw - tightening torque		Nm	M6 (hex. socket, A/F 4) 4 ... 6 (36 ... 53 lb.in)
Connection for drilled copper bars[1]	Max. width		mm	10
Without box terminal with cable lugs[2] (1 or 2 conductors can be connected)	• Finely stranded with cable lug		mm²	10 ... 50[3]
	• Stranded with cable lug		mm²	10 ... 70[3]
	• AWG cables, solid or stranded		AWG	7 ... 1/0
	Auxiliary conductors:			
	• Solid		mm²	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4)
	• Finely stranded with end sleeve		mm²	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4]
	• AWG cables, solid or stranded		AWG	2 x (20 ... 16)[4]; 2 x (18 ... 14)[4]; 1 x 12
	• Terminal screw - tightening torque		Nm	M3 0.8 ... 1.2 (7 ... 10.3 lb.in)

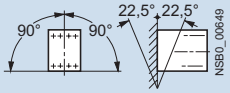
1) If bars larger than 12 x 10 mm are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

2) If conductors larger than 25 mm² are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

3) Only with crimped cable lugs according to DIN 46234. Cable lug max. 20 mm wide.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 54 S6	3RT10 55 S6	3RT10 56 S6
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.					
Mechanical endurance		Operating cycles	10 million		
Electrical endurance			1)		
Rated insulation voltage U_i (degree of pollution 3)		V	1000		
Rated impulse withstand voltage U_{imp}		kV	8		
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-4-1, Appendix F		
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60/+55 with AS-Interface -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP00/open, coil assembly IP20 Finger-safe with cover		
Shock resistance	Rectangular pulse Sine pulse	g/ms g/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10		
Conductor cross-sections			2)		
Electromagnetic compatibility (EMC)			3)		
Short-circuit protection					
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE			For short-circuit protection for contactors with overload relays see Protection Equipment: Overload Relays		
- acc. to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1" • Type of coordination "2" • Weld-free4)	A A A	355 315 80	355 315 160	
Auxiliary circuit					
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1$ kA)		A	10		
• Or miniature circuit breakers with C characteristic ($I_k < 400$ A)					

Contactor	Type Size		3RT10 5 . S6
Control			
Operating range of the solenoid AC/DC (UC)			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)			
• Conventional operating mechanism			
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	250/0.9 300/0.9 4.8/0.8 5.8/0.8
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	300 360 4.3 5.2
• Solid-state operating mechanism			
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	190/0.8 280/0.8 3.5/0.5 4.4/0.4
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	250 320 2.3 2.8
PLC control input (EN 61131-2/type 2)			24 V DC/≤ 30 mA power consumption, (operating range 17 ... 30 V DC)

1) For endurance of the main contacts see page 2a/5.

2) For conductor cross-sections see page 2a/25.

3) For electromagnetic compatibility (EMC) see page 2/10.

4) Test conditions according to IEC 60947-4-1.

Contactor	Type Size			3RT10 5 . S6
Control				
Operating times (Total break time = Opening delay + Arcing time)				
• Conventional operating mechanism				
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	20 ... 95 40 ... 60
- with $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	25 ... 50 40 ... 60
• Solid-state operating mechanism, actuated via PLC input				
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	35 ... 75 80 ... 90
- with $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	40 ... 60 80 ... 90
• Solid-state operating mechanism, actuated via A1/A2				
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	95 ... 135 80 ... 90
- with $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	100 ... 120 80 ... 90
Arcing time			ms	10 ... 15

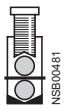
Contactor	Type Size			3RT10 54 S6	3RT10 55 S6	3RT10 56 S6
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational currents I_e	at 40 °C up to 690 V at 60 °C up to 690 V at 60 °C up to 1000 V		A A A	160 140 80	185 160 90	215 185 100
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	at 415 V		kW	92	105	121
Minimum conductor cross-section for loads with I_e	At 40 °C At 60 °C		mm^2 mm^2	70 50	95 70	95 95
Utilization category AC-2 and AC-3						
Rated operational currents I_e	up to 500 V 690 V 1000 V		A A A	115 115 53	150 150 65	185 170 65
Rated power of slipring at or squirrel-cage motors at 50 and 60 Hz	215 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	37 64 81 113 75	50 84 105 146 90	61 104 132 167 90
Thermal load capacity	10 s current[2]		A	1100	1300	1480
Power loss per main current path	at I_e/AC-3/500 V		W	7	9	13
Utilization category AC-4 (for I_a = 6 x I_e)						
Rated operational current I_e	up to 415 V		A	97	132	160
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V		kW	55	75	90
• The following applies to a contact endurance of about 200000 operating cycles:						
- rated operational currents I_e	up to 500 V 690 V 1000 V		A A A	54 48 34	68 57 38	81 65 42
- rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	16 29 37 48 49	20 38 47 55 55	25 45 57 65 60

1) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT10 contactors, 3-pole, 3 ... 250 kW

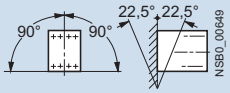
Contactor	Type Size			3RT10 54 S6	3RT10 55 S6	3RT10 56 S6
Main circuit						
AC capacity						
Utilization category AC-6a **switching AC transformers**						
Rated operational current I_e						
• For inrush current n = 20	up to 690 V	A		115	148	148
• For inrush current n = 30	up to 690 V	A		90	99	99
Rating P						
• For inrush current n = 20	at 415 V	kVA		79	102	102
• For inrush current n = 30	at 415 V	kVA		62	68	68
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n\,30} \cdot 30/x$						
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C						
Rated operational currents I_e	up to 500 V	A		105	125	145
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 mH between capacitors connected in parallel) at 50 Hz, 60 Hz	at 230 V 415 V 500 V 690 V	kvar kvar kvar kvar		42 72 90 72	50 86 108 86	58 100 125 100
DC capacity						
Utilization category DC-1 **Switching resistive load ($L/R \leq$ 1 ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path	up to 24 V 110 V 220 V 440 V	A A A A		160 18 3.4 0.8		
• 2 conducting paths in series	up to 24 V 110 V 220 V 440 V	A A A A		160 160 20 3.2		
• 3 conducting paths in series	up to 24 V 110 V 220 V 440 V	A A A A		160 160 160 11.5		
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors ($L/R \leq$ 15 ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path	up to 24 V 110 V 220 V 440 V	A A A A		160 2.5 0.6 0.17		
• 2 conducting paths in series	up to 24 V 110 V 220 V 440 V	A A A A		160 160 2.5 0.65		
• 3 conducting paths in series	up to 24 V 110 V 220 V 440 V	A A A A		160 160 160 1.4		
Switching frequency						
Switching frequency z in operating cycles/hour						
• Contactors without overload relays	No-load switching frequency		h^{-1}	2000	2000	
Dependence of the switching frequency z′ on the operational current I′ and operational voltage U′: $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1 AC-2 AC-3 AC-4		h^{-1} h^{-1} h^{-1} h^{-1}	800 400 1000 130	800 300 750 130	
• Contactors with overload relays (mean value)			h^{-1}	60	60	

Contactor	Type Size		**3RT10 5 .** **S6**
Conductor cross-sections of main conductors with box terminal			
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** with 3RT19 55-4G box terminal (55 kW)		**Screw terminals**
Front or rear clamping point connected  	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded	mm² mm² mm² mm AWG	16 ... 70 16 ... 70 16 ... 70 Min. 3 x 9 x 0.8, max. 6 x 15.5 x 0.8 6 ... 2/0
Both clamping points connected  	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded • Terminal screw - tightening torque	mm² mm² mm² mm AWG Nm	Max. 1 x 50, 1 x 70 Max. 1 x 50, 1 x 70 Max. 2 x 70 Max. 2 x (6 x 15.5 x 0.8) Max. 2 x 1/0 M10 (hexagon socket, A/F 4) 10 ... 12 (90 ... 110 lb.in)
Screw terminals (1 or 2 conductors can be connected)	**Main conductor**: With 3RT19 56-4G box terminal		
Front or rear clamping point connected  	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded	mm² mm² mm² mm AWG	16 ... 120 16 ... 120 16 ... 120 Min. 3 x 9 x 0.8, max. 10 x 15.5 x 0.8 6 ... 250 kcmil
Both clamping points connected  	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded • Terminal screw - tightening torque	mm² mm² mm² mm AWG Nm	Max. 1 x 95, 1 x 120 Max. 1 x 95, 1 x 120 Max. 2 x 120 Max. 2 x (10 x 15.5 x 0.8) Max. 2 x 3/0 M10 (hexagon socket, A/F 4) 10 ... 12 (90 ... 110 lb.in)
Screw terminals	**Main conductors:** without box terminal/busbar connection		
	• Finely stranded with cable lug[1)] • Stranded with cable lug[1)] • AWG cables, solid or stranded • Connecting bar (max. width) • Terminal screw - Tightening torque	mm² mm² AWG mm Nm	16 ... 95 25 ... 120 4 ... 250 kcmil 17 M8 x 25 (A/F 13) 10 ... 14 (89 ... 124 lb.in)
	Auxiliary conductors:		
	• Solid • Finely stranded with end sleeve • AWG cables, solid or stranded • Terminal screw - tightening torque	mm² mm² AWG Nm	2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] 2 x (18 ... 14) M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) When connecting cable lugs to DIN 46235, use 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 64 S10	3RT10 65 S10	3RT10 66 S10
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.					
Mechanical endurance		Operating cycles	10 million		
Electrical endurance			1)		
Rated insulation voltage U_i (degree of pollution 3)		V	1000		
Rated impulse withstand voltage U_{imp}		kV	8		
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-1, Appendix F		
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60/+55 with AS-Interface -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP00/open, coil assembly IP20 Finger-safe with cover		
Shock resistance	Rectangular pulse Sine pulse	*g*/ms *g*/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10		
Conductor cross-sections			2)		
Electromagnetic compatibility (EMC)			3)		
Short-circuit protection					
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE					
- acc. to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1" • Type of coordination "2" • Weld-free4)	A A A	500 400 250		
Auxiliary circuit					
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1$ kA) Or miniature circuit breakers with C characteristic (short-circuit current $I_k < 400$ A)		A	10		
Control					
Operating range of the solenoid AC/DC (UC)			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$		
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)					
• Conventional operating mechanism					
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	490/0.9 590/0.9 5.6/0.9 6.7/0.9		
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	540 650 6.1 7.4		
• Solid-state operating mechanism					
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	400/0.8 530/0.8 4/0.5 5/0.4		
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	440 580 3.2 3.8		
PLC control input (EN 61131-2/type 2)			24 V DC/≤ 30 mA power consumption, (operating range 17 ... 30 V DC)		

1) For endurance of the main contacts see page 2a/5.
2) For conductor cross-sections see page 2a/29.
3) For electromagnetic compatibility (EMC) see page 2/10.
4) Test conditions according to IEC 60947-4-1.

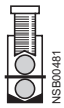
Contactor	Type Size		3RT10 64 S10	3RT10 65 S10	3RT10 66 S10
Control					
Operating times (Total break time = Opening delay + Arcing time)					
• Conventional operating mechanism					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay	ms ms	30 ... 95 40 ... 80		
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay	ms ms	35 ... 50 50 ... 80		
• Solid-state operating mechanism, actuated via A1/A2					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay	ms ms	105 ... 145 80 ... 100		
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay	ms ms	110 ... 130 80 ... 100		
• Solid-state operating mechanism, actuated via PLC input					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay	ms ms	45 ... 80 80 ... 100		
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay	ms ms	50 ... 65 80 ... 100		
• Arcing time		ms	10 ... 15		
Main circuit					
AC capacity					
Utilization category AC-1 **Switching resistive loads**					
Rated operational currents I_e	at 40 °C up to 690 V at 60 °C up to 690 V at 60 °C up to 1000 V	A A A	275 250 100	330 300 150	
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	at 415 V	kW	164	197	
Minimum conductor cross-section for loads with I_e	at 40 °C at 60 °C	mm² mm²	150 120	185 185	
Utilization category AC-2 and AC-3					
Rated operational currents I_e	up to 500 V 690 V 1000 V	A A A	225 225 68	265 265 95	300 280 95
Rated power of slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V	kW kW kW kW kW	73 128 160 223 90	85 151 189 265 132	97 171 215 280 132
Thermal load capacity	10 s current[2]	A	1800	2400	2400
Power loss per main current path	at I_e/AC-3/500 V	W	17	18	22
Utilization category AC-4 (for I_a = 6 x I_e)					
Rated operational current I_e	up to 415 V	A	195	230	280
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V	kW	110	132	160
• The following applies to a contact endurance of about 200000 operating cycles:					
- rated operational currents I_e	up to 500 V 690 V 1000 V	A A A	96 85 42	117 105 57	125 115 57
- rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V	kW kW kW kW kW	30 54 67 82 59	37 66 82 102 80	40 71 87 112 80
Utilization category AC-6a **switching AC transformers**					
Rated operational current I_e					
• For inrush current n = 20 • For inrush current n = 30	up to 690 V up to 690 V	A A	227 151	265 182	273 182
Rated power P					
• For inrush current n = 20 • For inrush current n = 30	at 415 V at 415 V	kVA kVA	157 105	183 126	189 126
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n\,30} \cdot 30/x$					

1) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up has been taken into account).

2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT10 contactors, 3-pole, 3 ... 250 kW

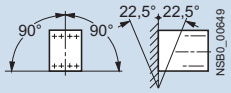
Contactor	Type Size			3RT10 64 S10	3RT10 65 S10	3RT10 66 S10
Main circuit						
AC capacity						
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C						
Rated operational currents I_e		up to 500 V	A	183	220	
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 µH between capacitors connected in parallel) at 50 Hz, 60 Hz and		at 230 V 415 V 500 V 690 V	kvar kvar kvar kvar	73 127 159 127	88 152 191 152	
DC capacity						
Utilization category DC-1 **Switching resistive load ($L/R \leq 1$ ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path		up to 24 V 110 V 220 V 440 V	A A A A	200 18 3.4 0.8	300 33 3.8 0.9	
• 2 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	200 200 20 3.2	300 300 300 4	
• 3 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	200 200 200 11.5	300 300 300 11	
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors ($L/R \leq 15$ ms)**						
Rated operational current I_e (at 60 °C)						
• 1 conducting path		up to 24 V 110 V 220 V 440 V	A A A A	200 2.5 0.6 0.17	300 3 0.6 0.18	
• 2 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	200 200 2.5 0.65	300 300 2.5 0.65	
• 3 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	200 200 200 1.4	300 300 300 1.4	
Switching frequency						
Switching frequency *z* in operating cycles/hour						
• Contactors without overload relays	No-load switching frequency		h^{-1}	2000	2000	2000
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$		AC-1 AC-2 AC-3 AC-4	h^{-1} h^{-1} h^{-1} h^{-1}	750 250 500 130	800 300 700 130	750 250 500 130
• Contactors with overload relays (mean value)			h^{-1}	60	60	60

Contactor	Type Size		3RT10 6 . S10
Conductor cross-sections			
Screw terminals	**Main conductors:** With 3RT19 66-4G box terminal		**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	70 ... 240 70 ... 240 95 ... 300 3/0 ... 600 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	120 ... 185 120 ... 185 120 ... 240 250 ... 500 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Both clamping points connected  NSB00481	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness) • Terminal screws - tightening torque	mm² mm² mm² AWG mm Nm	Min. 2 x 50, max. 2 x 185 Min. 2 x 50, max. 2 x 185 Min. 2 x 70, max. 2 x 240 Min. 2 x 2/0, max. 2 x 500 kcmil Max. 2 x (20 x 24 x 0.5) M12 (hexagon socket, A/F 5) 20 ... 22 (180 ... 195 lb.in)
Screw terminals	**Main conductors:** without box terminal/busbar connection		
	• Finely stranded with cable lug[1] • Stranded with cable lug[1] • AWG cables, solid or stranded • Connecting bar (max. width) • Terminal screws - tightening torque	mm² mm² AWG mm Nm	50 ... 240 70 ... 240 2/0 ... 500 kcmil 25 M10 x 30 (A/F 17) 14 ... 24 (124 ... 210 lb.in)
	Auxiliary conductors:		
	• Solid • Finely stranded with end sleeve • AWG cables, solid or stranded • Terminal screws - tightening torque	mm² mm² AWG Nm	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] 2 x (18 ... 14) M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) When connecting cable lugs to DIN 46234, the 3RT19 66-4EA1 terminal cover must be used for conductor cross-sections of 240 mm² and more as well as DIN 46235 for conductor cross-sections of 185 mm² and more to keep the phase clearance.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size		3RT10 75 S12	3RT10 76 S12
General data				
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.				
Mechanical endurance		Operating cycles	10 million	
Electrical endurance			1)	
Rated insulation voltage U_i (degree of pollution 3)		V	1000	
Rated impulse withstand voltage U_{imp}		kV	8	
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690	
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-1, Appendix F	
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60/+55 with AS-Interface -55 ... +80	
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP00/open, coil assembly IP20 Finger-safe with cover	
Shock resistance	Rectangular pulse Sine pulse	*g*/ms *g*/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10	
Conductor cross-sections			2)	
Electromagnetic compatibility (EMC)			3)	
Short-circuit protection				
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE				
- acc. to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1" • Type of coordination "2" • Weld-free[4]	A A A	630 500 250	630 500 315
Auxiliary circuit				
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection for $I_k \geq 1$ kA) or miniature circuit breakers with C characteristic (short-circuit current $I_k < 400$ A)		A	10	
Control				
Operating range of the solenoid AC/DC (UC)			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)				
• Conventional operating mechanism				
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	700/0.9 830/0.9 7.6/0.9 9.2/0.9	
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	770 920 8.5 10	
• Solid-state operating mechanism				
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. VA/p.f.	560/0.8 750/0.8 5.4/0.8 7/0.8	
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	600 800 4 5	
PLC control input (EN 61131-2/type 2)			24 V DC/≤ 30 mA power consumption, (operating range 17 ... 30 V DC)	

1) For endurance of the main contacts see page 2a/5.

2) For conductor cross-sections see page 2a/33.

3) For electromagnetic compatibility (EMC) see page 2/10.

4) Test conditions according to IEC 60947-4-1.

Contactor	Type Size			3RT10 75 S12	3RT10 76 S12
Control					
Operating times (Total break time = Opening delay + Arcing time)					
• Conventional operating mechanism					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	45 ... 100 60 ... 100	
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	50 ... 70 70 ... 100	
• Solid-state operating mechanism, actuated via A1/A2					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	120 ... 150 80 ... 100	
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	125 ... 150 80 ... 100	
• Solid-state operating mechanism, actuated via PLC input					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	60 ... 90 80 ... 100	
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	65 ... 80 80 ... 100	
• Arcing time			ms	10 ... 15	
Main circuit					
AC capacity					
Utilization category AC-1 **Switching resistive loads**					
Rated operational currents I_e	at 40 °C up to 690 V at 60 °C up to 690 V at 60 °C up to 1000 V		A A A	430 400 200	610 550 200
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	at 415 V		kW	263	362
Minimum conductor cross-section for loads with I_e	at 40 °C at 60 °C		mm^2 mm^2	2 x 150 240	2 x 185 2 x 185
Utilization category AC-2 and AC-3					
Rated operational currents I_e	up to 500 V 690 V 1000 V		A A A	400 400 180	500 450 180
Rated power of slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	132 231 291 400 250	164 291 363 453 250
Thermal load capacity	10 s current[2]		A	3200	4000
Power loss per main current path	at I_e/AC-3/500 V		W	35	55
Utilization category AC-4 (for I_a = 6 x I_e)					
Rated operational current I_e	up to 400 V		A	350	430
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V		kW	200	250
• The following applies to a contact endurance of about 200000 operating cycles:					
- rated operational current I_e	up to 500 V 690 V 1000 V		A A A	150 135 80	175 150 80
- rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	48 85 105 133 113	56 98 123 148 113
Utilization category AC-6a **switching AC transformers**					
Rated operational current I_e					
• For inrush current n = 20 • For inrush current n = 30	up to 690 V up to 690 V		A A	377 251	404 270
Rating P					
• For inrush current n = 20 • For inrush current n = 30	at 415 V at 415 V		kVA kVA	261 173	280 187
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n\,30} \cdot 30/x$					

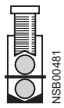
1) Industrial furnaces and electric heaters with resistance heating, etc. increased power consumption on heating up taken into account).

2) According to IEC 60947-4-1.

For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size			3RT10 75 S12	3RT10 76 S12
Main circuit					
AC capacity					
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C					
Rated operational currents I_e		up to 500 V	A	287	407
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 mH between capacitors connected in parallel) at 50 Hz, 60 Hz and		at 230 V 415 V 500 V 690 V	kvar kvar kvar kvar	114 199 248 199	162 282 352 282
DC capacity					
Utilization category DC-1 **Switching resistive load (*L/R* ≤ 1 ms)**					
Rated operational current I_e (at 60 °C)					
• 1 conducting path		up to 24 V 110 V 220 V 440 V	A A A A	400 33 3.8 0.9	
• 2 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	400 400 400 4	
• 3 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	400 400 400 11	
Utilization category DC-3 and DC-5 S **hunt-wound and series-wound motors (*L/R* ≤ 15 ms)**					
Rated operational current I_e (at 60 °C)					
• 1 conducting path		up to 24 V 110 V 220 V 440 V	A A A A	400 3 0.6 0.18	
• 2 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	400 400 2.5 0.65	
• 3 conducting paths in series		up to 24 V 110 V 220 V 440 V	A A A A	400 400 400 1.4	
Switching frequency					
Switching frequency *z* in operating cycles/hour					
• Contactors without overload relays	No-load switching frequency		h^{-1}	2000	2000
Dependence of the switching frequency *z'* on the operational current *I'* and operational voltage *U'*: $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$		AC-1 AC-2 AC-3 AC-4	h^{-1} h^{-1} h^{-1} h^{-1}	700 200 500 130	500 170 420 130
• Contactors with overload relays (mean value)			h^{-1}	60	60

Contactor	Type Size		3RT10 7 . S12
Conductor cross-sections			
Screw terminals	**Main conductors:** With 3RT19 66-4G box terminal		**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve	mm²	70 ... 240
	• Finely stranded without end sleeve	mm²	70 ... 240
	• Stranded	mm²	95 ... 300
	• AWG cables, solid or stranded	AWG	3/0 ... 600 kcmil
	• Ribbon cable conductors (number x width x thickness)	mm²	Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve	mm²	120 ... 185
	• Finely stranded without end sleeve	mm²	120 ... 185
	• Stranded	mm²	120 ... 240
	• AWG cables, solid or stranded	AWG	250 ... 500 kcmil
	• Ribbon cable conductors (number x width x thickness)	mm²	Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Both clamping points connected  NSB00481	• Finely stranded with end sleeve	mm²	Min. 2 x 50, max. 2 x 185
	• Finely stranded without end sleeve	mm²	Min. 2 x 50, max. 2 x 185
	• Stranded	mm²	Min. 2 x 70, max. 2 x 240
	• AWG cables, solid or stranded	AWG	Min. 2 x 2/0, max. 2 x 500 kcmil
	• Ribbon cable conductors (number x width x thickness)	mm²	Max. 2 x (20 x 24 x 0.5)
	• Terminal screws - tightening torque	 Nm	M12 (hexagon socket, A/F 5) 20 ... 22 (180 ... 195 lb.in)
Screw terminals	**Main conductors:** without box terminal/busbar connection		
	• Finely stranded with cable lug[1]	mm²	50 ... 240
	• Stranded with cable lug[1]	mm²	70 ... 240
	• AWG cables, solid or stranded	AWG	2/0 ... 500 kcmil
	• Connecting bar (max. width)	mm	25
	• Terminal screws - tightening torque	 Nm	M10 x 30 (A/F 17) 14 ... 24 (124 ... 210 lb.in)
	Auxiliary conductors:		
	• Solid	mm²	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] acc. to IEC 60947; max. 2 x (0.75 ... 4)
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2]
	• AWG cables, solid or stranded	AWG	2 x (18 ... 14)
	• Terminal screws - tightening torque	 Nm	M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) When connecting cable lugs according to DIN 46234 for conductor cross-sections of 185 mm² and more and according to DIN 46235 for conductor cross-sections of 240 mm² and more, the 3RT19 66-4EA1 terminal cover must be used to keep the phase clearance.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT10 contactors, 3-pole, 3 ... 250 kW

Contactor	Type Size			3RT10 15 S00	3RT10 16 S00	3RT10 17 S00	3RT10 23 S0	3RT10 24 S0	3RT10 25 S0	3RT10 26 S0
CSA and UL rated data										
Rated insulation voltage			V AC	600			600			
Uninterrupted current, at 40 °C	Open and enclosed		A	20			35			
Maximum horsepower ratings (CSA and UL approved values)										
Rated power for induction motors at 60 Hz		at 200 V	hp	1.5	2	3	2	3	5	7.5
		230 V	hp	2	3	3	3	3	5	7.5
		460 V	hp	3	5	7.5	5	7.5	10	15
		575 V	hp	5	7.5	10	7.5	10	15	20
Short-circuit protection		at 600 V	kA	5	5	5	5	5	5	5
(contactor or overload relay)	CLASS RK5 fuse		A	60	60	60	70	70	70	100
	Circuit breakers with overload protection acc. to UL 489		A	50	50	50	70	70	70	100
Combination motor controllers type E acc. to UL 508										
	At 480 V		Type	—	—	—	3RV10 2			
			A	—	—	—	8	10	16	22
			kA	—	—	—	65	65	65	65
	At 600 V		Type	—	—	—	3RV10 2			
			A	—	—	—	8	10	12.5	12.5
			kA	—	—	—	25	25	25	25
NEMA/EEMAC ratings										
NEMA/EEMAC size			hp	—		0	—			1
Uninterrupted current	Open		A	—		18	—			27
	Enclosed		A	—		18	—			27
Rated power for induction motors at 60 Hz		at 200 V	hp	—		3	—			7.5
		230 V	hp	—		3	—			7.5
		460 V	hp	—		5	—			10
		575 V	hp	—		5	—			10
Overload relays	Type			3RU11 16			3RU11 2			
	Setting range		A	0.11 ... 12			1.8 ... 25			

Contactor	Type Size			3RT10 34 S2	3RT10 35 S2	3RT10 36 S2	3RT10 44 S3	3RT10 45 S3	3RT10 46 S3
CSA and UL rated data									
Rated insulation voltage			V AC	600			600		
Uninterrupted current, at 40 °C	Open and enclosed		A	45	55	50	90	105	105
Maximum horsepower ratings (CSA and UL approved values)									
Rated power for induction motors at 60 Hz		at 200 V	hp	10	10	15	20	25	30
		230 V	hp	10	15	15	25	30	30
		460 V	hp	25	30	40	50	60	75
		575 V	hp	30	40	50	60	75	100
Short-circuit protection		at 600 V	kA	5	5	5	10	10	10
(contactor or overload relay)	CLASS RK5 fuse		A	125	150	200	250	300	350
	Circuit breakers with overload protection acc. to UL 489		A	125	150	200	250	300	400
Combination motor controllers type E acc. to UL 508									
	At 480 V		Type	3RV10 3			3RV10 4		
			A	32	40	50	63	75	100
			kA	65	65	65	65	65	65
	At 600 V		Type	3RV10 4			3RV10 4		
			A	32	40	50	63	75	75
			kA	25	25	25	30	30	30
NEMA/EEMAC ratings									
NEMA/EEMAC size			hp	—		2	—		3
Uninterrupted current	Open		A	—		45	—		90
	Enclosed		A	—		45	—		90
Rated power for induction motors with 60 Hz		at 200 V	hp	—		10	—		25
		230 V	hp	—		15	—		30
		460 V	hp	—		25	—		50
		575 V	hp	—		25	—		50
Overload relays	Type			3RU11 3			3RU11 4		
	Setting range		A	5.5 ... 50			18 ... 100		

Contactor	Size			**S00** **Screw terminals** Integrated or snap-on auxiliary switch block	**S0 ... S12** **Screw terminals** 1- and 4-pole snap-on auxiliary switch block	**Screw terminals** Laterally mountable auxiliary switch block
CSA and UL rated data for the auxiliary contacts						
Rated voltage			V AC	600	600	600
Switching capacity				A 600, Q 600	A 600, Q 600	A 300, Q 30
	Uninterrupted current at 240 V AC		A	10	10	10

Contactor	Type Size			**3RT10 54** **S6**	**3RT10 55** **S6**	**3RT10 56** **S6**	**3RT10 64** **S10**	**3RT10 65** **S10**	**3RT10 66** **S10**
CSA and UL rated data									
Rated insulation voltage			V AC	600			600		
Uninterrupted current, at 40 °C	Open and enclosed		A	140	195	195	250	330	330
Maximum horsepower ratings (CSA and UL approved values)									
Rated power for induction motors at 60 Hz		at 200 V	hp	40	50	60	60	75	100
		230 V	hp	50	60	75	75	100	125
		460 V	hp	100	125	150	150	200	250
		575 V	hp	125	150	200	200	250	300
Short-circuit protection		at 600 V	kA	10	10	10	10	18	18
	CLASS RK5/L fuse		A	450	500	500	700	800	800
	Circuit breakers with overload protection acc. to UL 489		A	350	450	500	500	700	800
NEMA/EEMAC ratings									
NEMA/EEMAC size			hp	—	4	—	—	—	5
Uninterrupted current	Open		A	—	150	—	—	—	300
	Enclosed		A	—	135	—	—	—	270
Rated power for induction motors with 60 Hz		at 200 V	hp	—	40	—	—	—	75
		230 V	hp	—	50	—	—	—	100
		460 V	hp	—	100	—	—	—	200
		575 V	hp	—	100	—	—	—	200
Overload relays	Type			3RB20 56			3RB20 66		

Contactor	Type Size			**3RT10 75** **S12**	**3RT10 76** **S12**
CSA and UL rated data					
Rated insulation voltage			V AC	600	
Uninterrupted current, at 40 °C	Open and enclosed		A	400	540
Maximum horsepower ratings (CSA and UL approved values)					
Rated power for induction motors at 60 Hz		at 200 V	hp	125	150
		230 V	hp	150	200
		460 V	hp	300	400
		575 V	hp	400	500
Short-circuit protection		at 600 V	kA	18	30
	CLASS L fuse		A	1000	1200
	Circuit breakers with overload protection acc. to UL 489		A	900	900
NEMA/EEMAC ratings					
NEMA/EEMAC size			hp	—	6
Uninterrupted current	Open		A	—	600
	Enclosed		A	—	540
Rated power for induction motors at 60 Hz		at 200 V	hp	—	150
		230 V	hp	—	200
		460 V	hp	—	400
		575 V	hp	—	400
Overload relays	Type			3RB20 66	

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Overview

- 3RT12 vacuum contactors for switching motors

UC operation

The contactors can be operated with AC (40 to 60 Hz) as well as with DC.

Withdrawable coils

For simple coil replacement, e.g. if the application is replaced, the magnetic coil can be pulled out upwards after the release mechanism has been actuated and can be replaced by any other coil of the same size.

Auxiliary contact complement

The contactors can be fitted with up to 8 lateral auxiliary contacts (identical auxiliary switch blocks from S0 to S12). Of these, no more than 4 are permitted to be NC contacts.

Function

3RT12 vacuum contactors

In contrast with the 3RT10 contactors – the main contacts operate in air under atmospheric conditions – the contact gaps of the 3RT12 vacuum contactors are contained in hermetically enclosed vacuum contact tubes. Neither arcs nor arcing gases are produced. The particular benefit of 3RT12 vacuum contactors, however, is that their electrical endurance is at least twice as long as that of 3RT10 contactors. They are therefore particularly well suited to frequent switching in jogging/mixed operation, for example in crane control systems.

Advantages:

- Very long electrical endurance
- High short-time current-carrying capacity for heavy starting
- No reduction of rated operational currents up to 1000 V
- No open arcs, no arcing gases, i.e. no minimum clearances from grounded parts required either
- Longer maintenance intervals
- Increased plant availability

Notes on operation:

- *Switching motors with operational voltages U_e > 500 V: To damp overvoltages and protect the motor coil insulation against reignition when switching off induction motors, it is recommended to connect the 3RT19 66-1PV surge suppression module – RC varistor – to the outgoing side (2/T1, 4/T2, 6/T3) of the contactors (accessory). This additional equipment is not required for use in circuits with converters. It could be destroyed by the voltage peaks and harmonics which are generated.*
- *Switching DC voltage: Vacuum contactors are basically unsuitable for switching DC voltage.*

Contactors with conventional operating mechanism

3RT1 . . . - . A version:

The magnetic coil is switched directly on and off with the control supply voltage U_s by way of terminals A1/A2.

Multi-voltage range for the control supply voltage U_s: Several closely adjacent control supply voltages, available around the world, are covered by just one coil, for example 110-115-120-127 V UC or 220-230-240 V UC.

In addition, allowance is also made for a coil operating range of 0.8 times the lower ($U_{s\,min}$) and 1.1 times the upper ($U_{s\,max}$) rated control supply voltage within which the contactor switches reliably and no thermal overloading occurs.

Contactors with solid-state operating mechanism

The magnetic coil is supplied selectively with the power required for reliable switching and holding by upstream control electronics.

- Extended voltage range for the control supply voltage U_s: Compared with the conventional operating mechanism, the solid-state operating mechanism covers an even broader range of control supply voltages used worldwide within one coil variant. For example, the coil for 200 to 277 V UC ($U_{s\,min}$ to $U_{s\,max}$) covers the voltages 200-208-220-230-240-254-277 V used worldwide.
- Extended operating range 0.7 to 1.25 × U_s: The wide range of the rated control supply voltage and the additional coil operating range of $0.8 \times U_{s\,min}$ to $1.1 \times U_{s\,max}$ results in an extended coil tolerance of at least 0.7 to $1.25 \times U_s$ for the most common control supply voltages 24, 110 and 230 V for which the contactors operate reliably.
- Bridging temporary voltage dips: Control voltage failures dipping to 0 V (at A1/A2) are bridged for up to approx. 25 ms to avoid unintentional tripping.
- Defined ON and OFF thresholds: For voltages of $\geq 0.8 \times U_{s\,min}$ and higher, the electronics will reliably switch the contactors on and off $\leq 0.5 \times U_{s\,min}$. The hysteresis in the switching thresholds prevents the main contacts from chattering as well as increased wear or welding when operated in weak, unstable networks. This also prevents thermal overloading of the contactor coil if the voltage applied is too low (contactor does not close properly and is continuously operated with overexcitation).
- Low control power consumption when closing and in the closed state.

Electromagnetic compatibility (EMC)

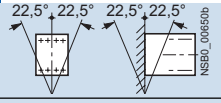
The contactors with solid-state operating mechanism conform to the requirements for operation in industrial plants.

- Interference immunity
  - burst (IEC 61000-4-4): 4 kV
  - surge (IEC 61000-4-5): 4 kV
  - electrostatic discharge, ESD (IEC 61000-4-2): 8/15 kV
  - electromagnetic field (IEC 61000-4-3): 10 V/m
- Emitted interference
  - limit value class A according to EN 55011

Note:

In connection with converters, the control cables must be routed separately from the load cables to the converter.

Technical specifications

Contactor	Type Size		3RT12 64 S10	3RT12 65 S10	3RT12 66 S10
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.					
Mechanical endurance		Operating cycles	10 million		
Electrical endurance			1)		
Rated insulation voltage U_i (degree of pollution 3)		V	1000		
Rated impulse withstand voltage U_{imp}		kV	8		
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-4-1, Appendix F		
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60/+55 with AS-Interface -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP00/open, coil assembly IP20 Finger-safe with cover		
Shock resistance	Rectangular pulse Sine pulse	g/ms g/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10		
Conductor cross-sections			2)		
Electromagnetic compatibility (EMC)			3)		
Short-circuit protection					
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE					
- Acc. to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1" • Type of coordination "2" • Weld-free[4]	A A A	500 500 400		
Auxiliary circuit					
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection for $I_k \geq$ 1 kA) Or miniature circuit breakers with C characteristic (short-circuit current I_k 400 A)		A	10		
Control					
Operating range of the solenoid AC/DC (UC)			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$		
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)					
• Conventional operating mechanism					
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	VA/p.f. VA/p.f. VA/p.f. A/p.f.	530/0.9 630/0.9 6.1/0.9 7.4/0.9		
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$	W W W W	580 700 6.8 8.2		
Operating times (Total break time = Opening delay + Arcing time)					
• Conventional operating mechanism					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay	ms ms	30 ... 95 40 ... 80		
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay	ms ms	35 ... 50 50 ... 80		

1) For endurance of the main contacts see page 2a/5.

2) For conductor cross-sections see page 2a/39.

3) For electromagnetic compatibility (EMC) see page 2/10.

4) Test conditions according to IEC 60947-4-1.

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Contactor	Type Size			3RT12 64 S10	3RT12 65 S10	3RT12 66 S10
Main circuit						
AC capacity						
Utilization category AC-1 **Switching resistive loads**						
Rated operational currents I_e	at 40 °C up to 1000 V at 60 °C up to 1000 V		A A	330 300		
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	at 415 V		kW	197		
Minimum conductor cross-section for loads with I_e	at 40 °C at 60 °C		mm^2 mm^2	185 185		
Utilization category AC-2 and AC-3						
Rated operational currents I_e	up to 1000 V		A	225	265	300
Rated power for slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	73 128 160 223 320	85 151 189 265 378	97 171 215 288 428
Thermal load capacity	10 s current[2]		A	1800	2120	2400
Power loss per conducting path	at I_e/AC-3		W	9	12	14
Utilization category AC-4 (for $I_a = 6 \times I_e$)						
Rated operational current I_e	up to 690 V		A	195	230	280
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V		kW	110	132	160
• The following applies to a contact endurance of about 200000 operating cycles:						
Rated operational currents I_e	up to 690 V 1000 V		A A	97 68	115 81	140 98
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	30 55 68 94 95	37 65 81 112 114	45 79 98 138 140
Utilization category AC-6a **Switching AC transformers**						
Rated operational current I_e						
• For inrush current n = 20 • For inrush current n = 30	up to 690 V up to 690 V		A A	278 185		
Rating P						
• For inrush current n = 20	at 415 V		kVA	193		
• For inrush current n = 30	at 415 V		kVA	128		
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n\,30} \cdot 30/x$						
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C						
Rated operational currents I_e	up to 500 V		A	220		
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 µH between capacitors connected in parallel) at 50 Hz, 60 Hz and	at 230 V 415 V 500 V 690 V		kvar kvar kvar kvar	88 152 191 152		
Switching frequency						
Switching frequency *z* in operating cycles/hour						
Contactors without overload relays	No-load switching frequency		h^{-1}	2000	2000	
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1 AC-2 AC-3 AC-4		h^{-1} h^{-1} h^{-1} h^{-1}	800 300 750 250	750 250 750 250	
Contactors with overload relays (mean value)			h^{-1}	60	60	

1) Industrial furnaces and electric heaters with resistance heating, etc. increased power consumption on heating up taken into account).

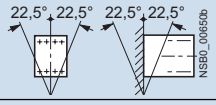
2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

Contactor	Type Size		3RT12 6 . S10
Main conductor cross-sections			
Screw terminals	**Main conductors:** With 3RT19 66-4G box terminal		**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	70 ...240 70 ...240 95 ...300 3/0 ... 600 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	120 ...185 120 ...185 120 ...240 250 ...500 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Both clamping points connected  NSB00481	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	Min. 2 x 50, max. 2 x 185 Min. 2 x 50, max. 2 x 185 Min. 2 x 70, max. 2 x 240 Min. 2 x 1/0, max. 2 x 500 kcmil Max. 2 x (20 x 24 x 0.5)
	• Terminal screws - tightening torque	 Nm	M12 (hexagon socket, A/F 5) 20 ... 22 (180 ... 195 lb.in)
	Main conductors: without box terminal/busbar connection		
	• Finely stranded with cable lug[1)] • Stranded with cable lug[1)] • AWG cables, solid or stranded • Connecting bar (max. width)	mm² mm² AWG mm	50 ...240 70 ...240 2/0 ...500 kcmil 25
	• Terminal screws - tightening torque	 Nm	M12 (hexagon socket, A/F 5) 14 ... 24 (124 ... 210 lb.in)
Screw terminals	**Auxiliary conductors:**		
	• Solid • Finely stranded with end sleeve • AWG cables, solid or stranded	mm² mm² AWG	2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] 2 x (18 ... 14)
	• Terminal screws - tightening torque	 Nm	M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) When connecting cable lugs according to DIN 46234 for conductor cross-sections of 185 mm² and more and according to DIN 46235 for conductor cross-sections of 240 mm² and more, the 3RT19 66-4EA1 terminal cover must be used to keep the phase clearance.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Contactor	Type Size		3RT12 75 S12	3RT12 76 S12
General data				
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.				
Mechanical endurance		Operating cycles	10 million	
Electrical endurance			1)	
Rated insulation voltage U_i (degree of pollution 3)		V	1000	
Rated impulse withstand voltage U_{imp}		kV	8	
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690	
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-1, Appendix F	
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60/+55 with AS-Interface -55 ... +80	
Degree of protection acc. to EN 60947-1, Appendix C **Touch protection** acc. to EN 50274			IP00/open, coil assembly IP20 Finger-safe with cover	
Shock resistance	Rectangular pulse Sine pulse	*g*/ms *g*/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10	
Conductor cross-sections			2)	
Electromagnetic compatibility (EMC)			3)	
Short-circuit protection				
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE				
- acc. to IEC 60947-4-1/ EN 60947-4	• Type of coordination "1" • Type of coordination "2" • Weld-free4)	A A A	800 800 500	
Auxiliary circuit				
• Fuse links gL/gG DIAZED 5SB, NEOZED 5SE (weld-free protection for $I_k \geq 1$ kA) or miniature circuit breakers with C characteristic (short-circuit current $I_k < 400$ A)		A	10	

1) See endurance of the main contacts on page 2a/5.
2) See conductor cross-sections on page 2a/43.
3) See Electromagnetic Compatibility (EMC) on page 2/10.
4) Test conditions according to IEC 60947-4-1.

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Contactor	Type Size			3RT12 75 S12	3RT12 76 S12
Control					
Operating range of the solenoid	AC/DC (UC)			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)					
• Conventional operating mechanism					
- AC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$		VA/p.f. VA/p.f. VA/p.f. VA/p.f.	700/0.9 830/0.9 7.6/0.9 9.2/0.9	
- DC operation	Closing at $U_{s\,min}$ Closing at $U_{s\,max}$ Closed at $U_{s\,min}$ Closed at $U_{s\,max}$		W W W W	770 920 8.5 10	
Operating times (Total break time = Opening delay + Arcing time)					
• Conventional operating mechanism					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay Opening delay		ms ms	45 ... 100 60 ... 100	
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay Opening delay		ms ms	50 ... 70 70 ... 100	
Main circuit					
AC capacity					
Utilization category **AC-1Switching resistive loads**					
Rated operational currents I_e	at 40 °C up to 1000 V at 60 °C up to 1000 V		A A	610 550	
Rated power for AC loads[1] P.f. = 0.95 (at 60 °C)	at 415 V		kW	362	
Minimum conductor cross-section for loads with I_e	At 40 °C At 60 °C		mm² mm²	2 x 185 2 x 185	
Utilization category AC-2 and AC-3					
Rated operational currents I_e	up to 1000 V		A	400	500
Rated power for slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V 415 V 500 V 690 V 1000 V		kW kW kW kW kW	132 231 291 400 578	164 291 363 507 728
Thermal load capacity	10 s current[2]		A	3200	4000
Power loss per conducting path	at I_e/AC-3		W	21	32

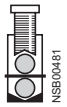
1) Industrial furnaces and electric heaters with resistance heating, etc. increased power consumption on heating up taken into account).

2) According to IEC 60947-4-1.
For rated values for various start-up conditions see Protection Equipment: Overload Relays.

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Contactor	Type Size			3RT12 75 S12	3RT12 76 S12
Main circuit					
AC capacity					
Utilization category AC-4 (for $I_a = 6 \times I_e$)					
Rated operational current I_e		up to 690 V	A	350	430
Rated power for squirrel-cage motors with 50 Hz and 60 Hz		at 400 V	kW	200	250
• The following applies to a contact endurance of about 200000 operating cycles:					
Rated operational currents I_e		690 V	A	175	215
		1000 V	A	123	151
Rated power for squirrel-cage motors with 50 Hz and 60 Hz		at 230 V	kW	56	70
		415 V	kW	98	122
		500 V	kW	124	153
		690 V	kW	172	212
		1000 V	kW	183	217
Utilization category AC-6a **Switching AC transformers**					
Rated operational current I_e					
• For inrush current n = 20		up to 690 V	A	419	
• For inrush current n = 30		up to 690 V	A	279	
Rating P					
• For inrush current n = 20		at 415 V	kVA	290	
• For inrush current n = 30		at 415 V	kVA	193	
For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n\,30} \cdot 30/x$					
Utilization category AC-6b **Switching low-inductance (low-loss, metallized dielectric) AC capacitors** Ambient temperature 40 °C					
Rated operational currents I_e		up to 500 V	A	407	
Rated power for single capacitors or banks of capacitors (minimum inductance of 6 µH between capacitors connected in parallel) at 50 Hz, 60 Hz and		at 230 V	kvar	162	
		415 V	kvar	282	
		500 V	kvar	352	
		690 V	kvar	282	
Switching frequency					
Switching frequency *z* in operating cycles/hour					
Contactors without overload relays	No-load switching frequency		h^{-1}	2000	
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$	AC-1		h^{-1}	700	
	AC-2		h^{-1}	250	
	AC-3		h^{-1}	750	
	AC-4		h^{-1}	250	
Contactors with overload relays (mean value)			h^{-1}	60	

3RT12 vacuum contactors, 3-pole, 110 ... 250 kW

Contactor	Type Size		3RT12 7 . S12
Conductor cross-sections			
Screw terminals	**Main conductors:** With 3RT19 66-4G box terminal		**Screw terminals**
Front clamping point connected  NSB00479	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	70 ... 240 70 ... 240 95 ... 300 3/0 ... 600 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	120 ... 185 120 ... 185 120 ... 240 250 ... 500 kcmil Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5
Both clamping points connected  NSB00481	• Finely stranded with end sleeve • Finely stranded without end sleeve • Stranded • AWG cables, solid or stranded • Ribbon cable conductors (number x width x thickness)	mm² mm² mm² AWG mm	Min. 2 x 50, max. 2 x 185 Min. 2 x 50, max. 2 x 185 Min. 2 x 70, max. 2 x 240 Min. 2 x 2/0, max. 2 x 500 kcmil Max. 2 x (20 x 24 x 0.5)
	• Terminal screws - tightening torque	 Nm	M12 (hexagon socket, A/F 5) 20 ... 22 (180 ... 195 lb.in)
	Main conductors: without box terminal/busbar connection		
	• Finely stranded with cable lug[1)] • Stranded with cable lug[1)] • AWG cables, solid or stranded • Connecting bar (max. width)	mm² mm² AWG mm	50 ... 240 70 ... 240 2/0 ... 500 kcmil 25
	• Terminal screws - tightening torque	 Nm	M10 x 30 (hexagon socket, A/F 17) 14 ... 24 (124 ... 240 lb.in)
Screw terminals	**Auxiliary conductors:**		
	• Solid • Finely stranded with end sleeve • AWG cables, solid or stranded	mm² mm² AWG	2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5)[2)]; 2 x (0.75 ... 2.5)[2)] 2 x (18 ... 14)
	• Terminal screws - tightening torque	 Nm	M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3 lb.in)

1) When connecting cable lugs to DIN 46234, the 3RT19 66-4EA1 terminal cover must be used for conductor cross-sections of 240 mm² and more as well as DIN 46235 for conductor cross-sections of 185 mm² and more to keep the phase clearance.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Contactor	Type Size			3RT12 64 S10	3RT12 65 S10	3RT12 66 S10	3RT12 75 S12	3RT12 76 S12
CSA and UL rated data								
Rated insulation voltage			V AC	600			600	
Uninterrupted current, at 40 °C	Open and enclosed		A	330			540	
Maximum horsepower ratings (CSA and UL approved values)								
Rated power for induction motors at 60 Hz		at 200 V	hp	60	75	100	125	150
		230 V	hp	75	100	125	150	200
		460 V	hp	150	200	250	300	400
		575 V	hp	200	250	300	400	500
Short-circuit protection			kA	10	18	18	18	30
	CLASS L fuse		A	700	800	800	1200	1200
	Circuit breakers acc. to UL 489		A	500	700	900	1000	1200
NEMA/EEMAC ratings	NEMA/EEMAC size		hp	—	—	5	—	6
Uninterrupted current	Open		A	—	—	300	—	600
	Enclosed		A	—	—	270	—	540
Rated power for induction motors at 60 Hz		at 200 V	hp	—	—	75	—	150
		230 V	hp	—	—	100	—	200
		460 V	hp	—	—	200	—	400
		575 V	hp	—	—	200	—	400
Overload relays	Type			3RB20 66			3RB20 66	

3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Overview

IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)

The 3TF68/69 contactors are climate-proof. They are finger-safe according to EN 50274. Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices (see Accessories and Spare Parts).

Function

Main contacts

Contact erosion indication with 3TF68/69 vacuum contactors

The contact erosion of the vacuum interrupters can be checked during operation with the help of 3 white double slides on the contactor base. If the distance indicated by one of the double slides is < 0.5 mm while the contactor is in the closed position, the vacuum interrupter must be replaced. To ensure maximum reliability, it is recommended to replace all 3 vacuum interrupters.

Auxiliary contacts

Contact reliability

The auxiliary contacts are suitable for solid-state circuits

- With currents ≥ 1 mA
- And voltages from 17 V.

Surge suppression

Control circuit

Protection of coils against overvoltages:

AC operation

- Fitted with varistors as standard

DC operation

Retrofitting options:

- With varistors

If TF68/TF69 is to be used for DC operation, an additional reversing contactor is required; this is included in the scope of supply in the same packaging as the vacuum contactor.

Electromagnetic compatibility

3TF68/69 . . - . **C** contactors for AC operation are fitted with an electronically controlled solenoid operating mechanism with a high interference immunity.

Contactor type	Rated control supply voltage U_s	Overvoltage type (IEC 60801)	Degree of severity (IEC 60801)	Overvoltage strength
3TF68 44-.C.., 3TF69 44-.C..	110 ... 132 V	Burst Surge	3 4 6 kV	2 kV
	200 ... 277 V	Burst Surge	4 4	4 kV 5 kV
	380 ... 600 V	Burst Surge	4 4	4 kV 6 kV

Note:

*During operation in installations in which the emitted interference limits cannot be observed, e.g. when used for output contactors in converters, 3TF68/69 . . - . **Q** contactors without a main conductor path circuit are recommended (see description below).*

Application

The standard 3TF68 . . - . C and 3TF69 . . - . C contactors with electronically controlled contactor mechanism, have high resistance to electromagnetic interference.

The 3TF68 . . - . Q and 3TF69 . . - . Q contactors have been designed for use in installations in which the AC control supply voltage is subject to very high levels of interference.

Causes for such interference can be, for example:

- Frequency converters which are operated nearby can cause periodic overvoltages at the control level of the contactors.
- High-energy pulses cause by switching operations and atmospheric discharges can cause interference on the control cables.

To reduce interference voltages caused by frequency converters, the manufacturer recommends the use of e.g. input filters, output filters, grounding or shielding in the installation.

Further measures that should be applied for overvoltage damping:

- Feeding the contactors using control transformer according to EN 60204 - rather than directly from the network
- Use of surge arresters, if required

For operating conditions where there are high interference voltages and no measures that reduce interference voltage coupling to the control voltage level have been taken, use of 3TF68 . . - . Q and 3TF69 . . - . Q contactors is highly recommended.

Version

The magnetic systems of the 3TF68 . . - . Q and 3TF69 . . - . Q contactors for AC operation are equipped with rectifiers for DC economy circuit.

A 3TC44 reversing contactor with a mounted series resistor is used to switch to the holding excitation.

The reversing contactor can be fitted separately. The reversing contactors is connected to the 3TF6 main contactor by means of a one-meter connecting cable with plug-in connectors.

Connection

Control circuit

The rectifier bridge is connected to varistors for protection against overvoltages. The built-in rectifier bridge affords sufficient protection for the coils.

Main circuit

As standard 3TF6 contactors with integrated RC varistors.

Protection of the main current paths

An integrated RC varistor connection for the main current paths of the contactors dampens the switching overvoltage rises to safe values. This prevents multiple restriking.

The operator of an installation can therefore rest assured that the motor winding cannot be damaged by switching overvoltages with steep voltage rises.

Important note: The overvoltage damping circuit is not required if 3TF68/69 contactors are used in circuits with DC choppers, frequency converters or speed-variable operating mechanisms, for example. It could be damaged by the voltage peaks and harmonics which are generated. This may cause phase-to-phase short-circuits in the contactors.

*Solution: Order special contactor version without overvoltage damping. The Order No. must include "**-Z**" and the order code "**A02**". Without additional charge.*

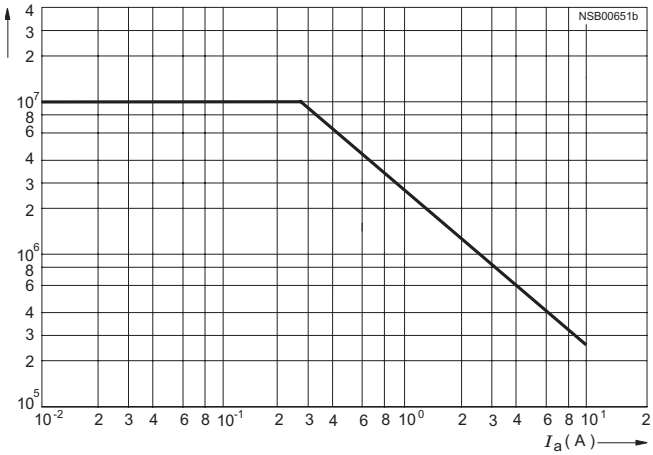
Technical specifications

Contactor Type			3TF68 and 3TF69
Rated data of the auxiliary contacts			Acc. to IEC 60947-5-1 (VDE 0660 Part 200)
Rated insulation voltage U_i (degree of pollution 3)		V	690
Continuous thermal current I_{th} =Rated operational current I_e/AC-12		A	10
AC load **Rated operational current I_e/AC-15/AC-14** for rated operational voltage U_e			
	24 V	A	10
	110 V	A	10
	125 V	A	10
	220 V	A	6
	230 V	A	5.6
	380 V	A	4
	415 V	A	3.6
	500 V	A	2.5
	660 V	A	2.5
	690 V	A	2.3
DC load **Rated operational current I_e/DC-12** for rated operational voltage U_e			
	24 V	A	10
	60 V	A	10
	110 V	A	3.2
	125 V	A	2.5
	220 V	A	0.9
	440 V	A	0.33
	600 V	A	0.22
Rated operational current I_e/DC-13 for rated operational voltage U_e			
	24 V	A	10
	60 V	A	5
	110 V	A	1.14
	125 V	A	0.98
	220 V	A	0.48
	440 V	A	0.13
	600 V	A	0.07
CSA and UL rated data for the auxiliary contacts			
Rated voltage		V AC, max.	600
Switching capacity			A 600, P 600

Endurance of the auxiliary contacts

The contact endurance for utilization category AC-12 or AC-15/AC-14 depends mainly on the breaking current. It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system.

3TF68 and 3TF69 contactors at 230 V AC



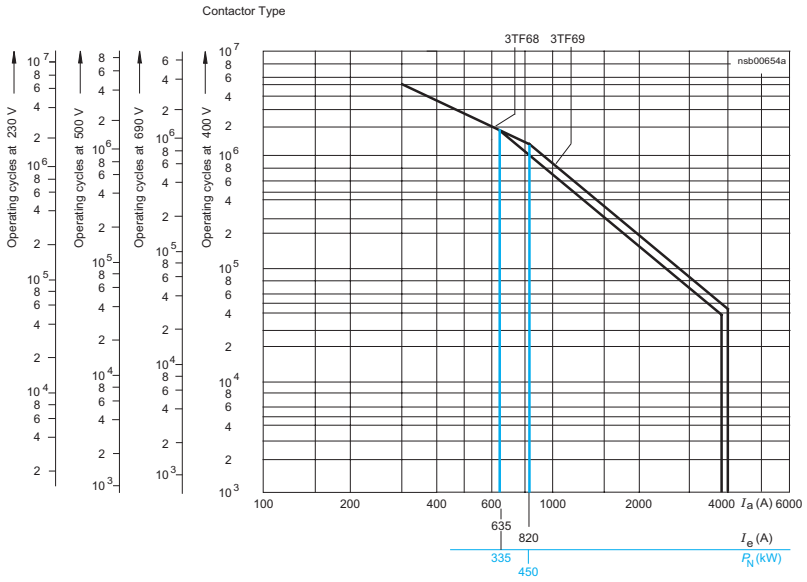
Contact erosion indication with 3TF68 and 3TF69 vacuum contactors

The contact erosion of the vacuum interrupters can be checked during operation with the help of 3 white double slides on the contactor base.

If the distance indicated by one of the double slides is < 0.5 mm while the contactor is in the closed position, the vacuum interrupter must be replaced. To ensure maximum reliability, it is recommended to replace all 3 vacuum interrupters.

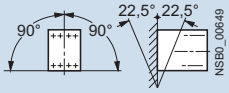
3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Endurance of the main contacts



3TF68 and 3TF69 contactors

Legend for the diagrams:
P_N = Rated power for squirrel-cage motors at 400 V
I_a = Breaking current
I_e = Rated operational current

Contactor	Type		3TF68	3TF69
	Size		14	14
General data				
Permissible mounting position, installation instructions[1) 2)] The contactors are designed for operation on a vertical mounting surface.	AC operation and DC operation			
Mechanical endurance		Operating cycles	5 million	
Electrical endurance		Operating cycles	[3)]	
Rated insulation voltage U_i (degree of pollution 3)		kV	1	
Rated impulse withstand voltage U_{imp}		kV	8	
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		kV	1	
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact. One NC contact each must be connected in series for the right and left auxiliary switch block respectively.			Yes, acc. to EN 60947-1, Appendix F	
Permissible ambient temperature	During operation	°C	-25 ... +55	
	During storage	°C	-55 ... +80	
Degree of protection acc. to EN 60947-1, Appendix C			IP00/open, coil assembly IP40	
Touch protection acc. to EN 50274			Finger-safe with cover	
Shock resistance				
• Rectangular pulse	AC operation	*g*/ms	8.1/5 and 4.7/10	9.5/5 and 5.7/10
	DC operation	*g*/ms	9/5 and 5.7/10	8.6/5 and 5.1/10
• Sine pulse	AC operation	*g*/ms	12.8/5 and 7.4/10	13.5/5 and 7.8/10
	DC operation	*g*/ms	14.4/5 and 9.1/10	13.5/5 and 7.8/10
Conductor cross-sections			See Conductor Cross-Sections	
Electromagnetic compatibility (EMC)			See Electromagnetic compatibility (EMC)	
Short-circuit protection				
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE				
- acc. to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1"	A	1000	1250
	• Type of coordination "2"	A	500	630
	• Weld-free[4)]	A	400	500
Auxiliary circuit				
• Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1$kA)		A	10	
• Or miniature circuit breakers with C characteristic ($I_k < 400$ A)		A	10	

1) To easily replace the laterally mounted auxiliary switches it is recommended to maintain a minimum distance of 30 mm between the contactors.

2) If mounted at a 90° angle (conducting paths are horizontally above each other), the switching frequency is reduced by 80 % compared with the normal values.

3) See endurance of the auxiliary contacts.

4) Test conditions according to IEC 60947-4-1.

3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Contactor	Type Size		3TF68 14	3TF69 14
Control				
Magnetic coil operating range			0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)				
• AC operation, $U_{s\,max}$	- Closing	VA/p.f.	1850/1	950/0.98
	- Closed	VA/p.f.	49/0.15	30.6/0.31
• AC operation, $U_{s\,min}$	- Closing	VA/p.f.	1200/1	600/0.98
	- Closed	VA/p.f.	13.5/0.47	12.9/0.43
• DC economy circuit[1]	- Closing at 24 V	W	1010	960
	- Closed	W	28	20.6
Operating times at 0,8 ... 1.1 x U_s (Total break time = Opening delay + Arcing time)			(Values apply to cold and warm coil)	
• AC operation	- Closing delay	ms	70 ... 120 (22 ... 65)[2]	80 ... 120
	- Opening delay	ms	70 ... 100	70 ... 80
• DC economy circuit	- Closing delay	ms	76 ... 110	86 ... 280
	- Opening delay	ms	50	19 ... 25
• Arcing time		ms	10 ... 15	10
Operating times at 1.0 x U_s (Total break time = Opening delay + Arcing time)				
• AC operation	- Closing delay	ms	80 ... 100 (30 ... 45)[2]	85 ... 100
	- Opening delay	ms	70 ... 100	70
• DC economy circuit	- Closing delay	ms	80 ... 90	90 ... 125
	- Opening delay	ms	50	19 ... 25
Minimum command duration	Standard	ms	120	120
for closing	Reduced make-time	ms	90	—
Minimum interval time between two ON commands		ms	100	300
Main circuit				
AC capacity				
Utilization category AC-1Switching resistive loads				
Rated operational currents I_e	at 40 °C up to 690 V	A	700	910
	at 55 °C up to 690 V	A	630	850
	at 55 °C up to 1000 V	A	450	800
Rated power for AC loads with p.f. = 0.95 at 55°C	415 V	kW	415	558
Minimum conductor cross-sections for loads	at 40°C	mm^2	2 x 240	$I_e \geq$ 800 A: 2 x 60 x 5 (Cu busbars)
with I_e	at 55°C	mm^2	2 x 185	$I_e <$ 800 A: 2 x 240
Utilization category AC-2 and AC-3				
Rated operational currents I_e	up to 690 V	A	630	820
	1000 V	A	435	580
Rated power for slipring or squirrel-cage	at 230 V	kW	200	260
motors at 50 Hz and 60 Hz	415 V	kW	347	450
	500 V	kW	434	600
	690 V	kW	600	800
	1000 V	kW	600	800
Utilization category AC-4 (for I_a = 6 x I_e)				
Rated operational current I_e	up to 690 V	A	610	690
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 415 V	kW	355	400
• The following applies to a contact endurance of about 200000 operating cycles:				
Rated operational currents I_e	up to 690 V	A	300	360
	1000 V	A	210	250
Rated power for squirrel-cage motors	at 230 V	kW	97	110
with 50 Hz and 60 Hz	415 V	kW	168	191
	500 V[3]	kW	210	250
	690 V[3]	kW	278	335
	1000 V[3]	A	290	350
Utilization category AC-6a switching AC transformers				
Rated operational currents I_e	up to 400 V			
• For inrush current n = 20		A	513	675
• For inrush current n = 30		A	342	450
Rating P				
For inrush current n = 20	415 V	kVA	338	445
For inrush current n = 30[4]	415 V	kVA	226	297
Utilization category AC-6b, **switching low-inductance (low-loss, metallized dielectric) AC capacitors**				
Rated operational currents I_e	up to 415 V	A	433	
Rated power for single capacitors	at 230 V	kvar	175	
at 50 and 60 Hz	415 V	kvar	300	
	500 V	kvar	400	
	690 V	kvar	300	
Rated power for banks of capacitors	at 230 V	kvar	145	
(minimum inductance is 6 µH between	415 V	kvar	250	
capacitors connected in parallel)	500 V	kvar	333	
at 50 and 60 Hz	690 V	kvar	250	

1) At 24 V DC; for further voltages, deviations of up to ±10 % are possible.

2) Values in brackets apply to contactors with reduced operating times.

3) Max. permissible rated operational current I_e/AC-4 = I_e/AC-3 up to 500 V, for reduced contact endurance and reduced switching frequency.

4) For deviating inrush current factors x, the power must be recalculated as follows: $P_x = P_{n30} \cdot 30/x$.

3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Contactor	Type Size			3TF68 14	3TF69 14
Main circuit					
AC capacity					
Short-time current carrying capacity (5 ... 30 s)					
• CLASS 5 and 10			A	630	820
• CLASS 15			A	630	662
• CLASS 20			A	536	572
• CLASS 25			A	479	531
• CLASS 30			A	441	500
Thermal current-carrying capacity 10-s-current[1]			A	5040	7000
Power loss per conducting path at I_e/AC-3 /690 V			W	45	70
Switching frequency					
Switching frequency z in operating cycles/hour					
• Contactors without overload relays	No-load switching frequency AC		1/h	2000	1000
	No-load switching frequency DC		1/h	1000	1000
		AC-1	1/h	700	700
		AC-2	1/h	200	200
		AC-3	1/h	500	500
		AC-4	1/h	150	150
• Contactors with overload relays (mean value)			1/h	15	15
Conductor cross-sections					
• **Screw terminals**	**Main conductors:**			**Screw terminals**	
	• Busbar connections				
	- finely stranded with cable lug		mm²	50 ... 240	50 ... 240
	- stranded with cable lug		mm²	70 ... 240	50 ... 240
	- solid or stranded		AWG	2/0 ... 500 MCM	2/0 ... 500 MCM
	- connecting bar (max. width)		mm	50	60 ($U_e \leq$ 690 V) 50 ($U_e >$ 690 V)
	• Terminal screw			M10 x 30	M12 x 40
	- tightening torque		Nm	14 ... 24 (124 ... 210 lb.in)	20 ... 35 (177 ... 310 lb.in)
	• With box terminal[2]				
	- connectable copper bars				
	- width		mm	15 ... 25	15 ... 38
	- max. thickness		mm	1 x 26 or 2 x 11	1 x 46 or 2 x 18
	- terminal screw			A/F 6 (hexagon socket)	A/F 8 (hexagon socket)
	- tightening torque		Nm	25 ... 40 (221 ... 354 lb.in)	35 ... 50 (266 ... 443 lb.in)
	Auxiliary conductors:				
	• Solid		mm²	2 x (0.5 ... 1)[3]/2 x (1 ... 2.5)[3]	
	• Finely stranded with end sleeve		mm²	2 x (0.5 ... 1)[3]/2 x (0.75 ... 2.5)[3]	
	• Pin-end connector to DIN 46231		mm²	2 x (1 ... 1.5)	
	• Solid or stranded		AWG	2 x (18 ... 12)	
	• Tightening torque		Nm	0.8 ... 1.4 (7 ... 12 lb.in)	
CSA and UL rated data					
Rated insulation voltage			V AC	600	600
Uninterrupted current	Open and enclosed		A	630	820
Maximum horsepower ratings (CSA and UL approved values)					
Rated power for induction motors at 60 Hz		at 200 V	hp	231	290
		230 V	hp	266	350
		460 V	hp	530	700
		575 V	hp	664	860
NEMA/EEMAC ratings					
SIZE			hp	6	7
Uninterrupted current	Open		A	600	820
	Enclosed		A	540	810
Rated power for induction motors at 60 Hz		at 200 V	hp	150	—
		230 V	hp	200	300
		460 V	hp	400	600
		575 V	hp	400	600
Overload relays	Type			3RB12	
	Setting range		A	200 ... 820	

For short-circuit protection with overload relays see Protection Equipment: Overload Relays.

1) According to IEC 60947-4-1.

2) See Accessories and Spare Parts.

3) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Function

The operating times of the individual 3RT10 contactors are rated in such a way that no overlapping of the contact making and the arcing time between two contactors can occur on reversing, providing they are interlocked by way of their auxiliary switches (NC contact interlock) and the mechanical interlock. For assemblies with AC operation and 50/60 Hz, a dead interval of 50 ms must be provided when used with voltages ≥ 500 V; a dead interval of 30 ms is recommend for use with voltages ≥ 400 V. These dead times do not apply to assemblies with DC operation.

The operating times of the individual contactors are not affected by the mechanical interlock.

The following points should be noted:

Size S00

- For maintained-contact operation:
  Use contactors with an NC contact in the basic unit for the electrical interlock.
- For momentary-contact operation:
  Use contactors with an NC contact in the basic unit for the electrical interlock; in addition, an auxiliary switch block with at least one NO contact for latching is required per contactor.

Sizes S0 to S3

- For maintained-contact operation:
  The contactors have no auxiliary contact in the basic unit; NC contacts for the electrical interlock are therefore integrated in the mechanical interlock that can be mounted on the side of each contactor (one contact each for the left and right-hand contactors).
- For momentary-contact operation:
  Electrical interlock as for maintained-contact operation; for the purpose of latching an auxiliary contact with an NO contact is additionally required for each contactor. This contact can be snapped onto the top of the contactors. Alternatively, auxiliary switch blocks mounted on the side can be used; they must be fitted onto the outside of each contactor.

If the front-mounted mechanical interlock is used for size S0 to S3 contactors, two location holes for single-pole auxiliary switch blocks are provided on the front of each S0 or S2 contactor, while three additional, single-pole auxiliary switch blocks can be snapped onto S3 contactors. The maximum auxiliary switch fittings per contactor must not be exceeded.

When size S2 and S3 contactors are combined with a front-mounted mechanical interlock, the installation kits for 3RA19 33–2B and 3RA19 43–2B contactor assemblies cannot be used.

Sizes S6 to S12

To insert the mechanical interlock, the prestamped location holes positioned opposite on the contactor must be knocked out. The internal auxiliary contacts (up to 1 NO + 1 NC per contactor) can be used for the electrical interlock and latching. The mechanical interlock itself does not contain any auxiliary contacts. Additional auxiliary contacts can be used on the outside and front (on the front in the case of 3RT10) of the reversing contactor assembly.

Surge suppression

Sizes S00 to S3

All contactor assemblies can be fitted with RC elements or varistors for damping opening surges in the coil.

As with the individual contactors, the surge suppressors can either be plugged onto the top of the contactors (S00) or fitted onto the coil terminals on the top or bottom (S0 to S3).

Sizes S6 to S12

The contactors are fitted with varistors as standard.

Technical specifications

The technical specifications are identical to those of the 3RT10 .. contactors listed on Page 2/3 onwards.

The CSA and UL approvals only apply to the complete contactor assemblies and not to the individual parts for customer assembly.

3RA14 complete units, 3 ... 75 kW

Function

Wye-delta starting can only be used either if the motor normally operates in a D connection or starts softly or if the load torque during Y starting is low and does not increase sharply. On the Y step the motors can carry approximately 50 % (class KL 16) or 30 % (class KL 10) of their rated torque; The tightening torque is approximately 1/3 of that during direct on-line starting. The starting current is approximately 2 to 2.7 times the rated motor current.

The changeover from Y to D must not be effected until the motor has run up to rated speed. Operating mechanisms which require this changeover to be performed earlier are unsuitable for wye-delta starting.

The ratings given in the table are only applicable to motors with a starting current ratio $I_A \leq 8.4 \times I_N$ and using either a

3RT19 16-2G or 3RT19 26-2G solid-state time-delay auxiliary switch block with a wye-delta function or a 3RP15 74. wye-delta timing relay with a dead interval on reversing of approximately 50 ms.

Surge suppression

Sizes S00 to S3:

All contactor assemblies can be fitted with RC elements, varistors or diode assemblies for damping opening surges in the coil.

As with the individual contactors, the surge suppressors can either be plugged onto the top of the contactors (S00) or fitted onto the coil terminals on the top or bottom (S0 to S3).

Sizes S6 to S12:

The contactors are fitted with varistors as standard.

Technical specifications

Short-circuit protection with fuses for motor feeders with short-circuit currents up to 50 kA and 690 V.For overload relays see Protection Equipment: Overload Relays -> 3RB2 Solid-State Overload Relays .

Rating	Sizes of contactors K1-K3-K2	Rated motor current	Overload relay	Setting range (the overload relays must be set to 0.58 times the rated motor current)	Permissible back-up fuses for starters, comprising contactor assemblies and overload relays. Single or double infeed[1] Fuse links					
					LV HRC DIAZED NEOZED gL/gG operational class Type of coordination	Type 3NA Type 5SB Type 5SE	LV HRC TYPE 3ND Operational class aM Type of coordination	UL listed fuses CLASSRK5/L	British Standard Fuses BS88 Type of coordination	
					"1"	"2"	"2"		"1"	"2"
kW		A	Type	A	A	A	A	A	A	A
5.5	S00-S00-S00	12	3RU11 16-1HB0	5.5 ... 8	35	20	10	30	35	20
7.5	S00-S00-S00	16	3RU11 16-1JB0	7 ... 10	35	20	16	40	35	20
11	S0-S0-S0	22	3RU11 26-4AB0	11 ... 16	63	25	20	60	63	25
15	S0-S0-S0	29	3RU11 26-4BB0	14 ... 20	100	35	20	80	100	35
18.5	S0-S0-S0	35	3RU11 26-4DB0	20 ... 25	100	35	20	100	100	35
22	S2-S2-S0	41	3RU11 36-4EB0	22 ... 32	125	63	35	125	125	63
30	S2-S2-S0	55	3RU11 36-4FB0	28 ... 40	125	63	50	150	125	63
37	S2-S2-S2	66	3RU11 36-4GB0	36 ... 45	125	63	50	175	125	63
45	S2-S2-S2	80	3RU11 36-4HB0	40 ... 50	160	80	50	200	160	80
55	S3-S3-S2	97	3RU11 46-4KB0	57 ... 75	250	125	63	300	250	125
75	S3-S3-S2	132	3RU11 46-4LB0	70 ... 90	250	160	80	350	250	160
90	S6-S6-S3	160	3RB20 56-1FC2	50 ... 200	355	315	160	450	355	250
110	S6-S6-S3	195	3RB20 56-1FC2	50 ... 200	355	315	160	450	355	250
132	S6-S6-S3	230	3RB20 56-1FC2	50 ... 200	355	315	160	500	355	315
160	S6-S6-S3	280	3RB20 56-1FC2	50 ... 200	355	315	200	500	355	315
200	S10-S10-S6	350	3RB20 66-1GC2	55 ... 250	500	400	250[2]	700	500	400
250	S10-S10-S6	430	3RB20 66-1MC2	160 ... 630	500	400[2]	315[2]	800	500	400
315	S12-S12-S10	540	3RB20 66-1MC2	160 ... 630	630	500[2]	400[2]	1000	630	450[2]
355	S12-S12-S10	610	3RB20 66-1MC2	160 ... 630	630	500[2]	400[2]	1000	630	450[2]
400	S12-S12-S10	690	3RB20 66-1MC2	160 ... 630	630[2]	500[2]	400[2]	1000	630[2]	450[2]
500	S12-S12-S10	850	3RB20 66-1MC2	160 ... 630	630[2]	500[2]	500[2]	1200	630[2]	500[2]

1) The maximum rated motor current must not be exceeded.

2) Only double infeed with separately fused feeder lines for line and delta contactor is possible because the maximum possible fuse value lies far below the rated motor current.

Starter	Sizes **S..-S..-S..** Type **3RA . . . .**			**00-00-00** **14 15**	**00-00-00** **14 16**	**0-0-0** **14 23**	**0-0-0** **14 25**	**2-2-0** **14 34**	**2-2-2** **14 35**	**2-2-2** **14 36**	**3-3-2** **14 44**	**3-3-2** **14 45**
All technical specifications not mentioned in the table below are identical to those of the individual 3RT contactors and 3RU overload relays												
Mechanical endurance			Opera-ting cycles	3 million								
Short-circuit protection without overload relay				[1]								
Maximum rated current of the fuse												
Main circuit Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE Single or double infeed												
- acc. to IEC 60947-4-1/	Type of coordination “1”		A	35	35	63	100	125	125	160	250	250
EN 60947-4-1	Type of coordination “2”		A	20	20	25	35	63	63	80	125	160
Control circuit Fuse links, gL/gG			A	10								
DIAZED 5SB, NEOZED 5SE (short-circuit current $I_k \leq 1$ kA)			A	6[2], if the auxiliary contact of the overload relay is connected in the contactor coil circuit								
Miniature circuit breaker with C characteristic			A	10								
			A	6[2], if the auxiliary contact of the overload relay is connected in the contactor coil circuit								
Size of individual contactors	K1 line contactor		Type 3RT	10 15	10 17	10 24	10 26	10 34	10 35	10 36	10 44	10 45
	K3 delta contactor		Type 3RT	10 15	10 17	10 24	10 26	10 34	10 35	10 36	10 44	10 45
	K2 star contactor		Type 3RT	10 15	10 15	10 24	10 24	10 26	10 34	10 34	10 35	10 36
Current-carrying capacity with reversing time up to 10 s												
Rated operational current I_e		at 400 V	A	12	17	25	40	65	80	86	115	150
		500 V	A	8.7	11.3	20.8	31.2	55.4	69.3	86	112.6	138.6
		690 V	A	6.9	9	20.8	22.5	53.7	69.3	69.3	98.7	138.6
Rated power for induction motors at		at 230 V	kW	3.3	4.7	7.2	12	20.4	25.5	27.8	37	49
50 Hz and 60 Hz and		415 V	kW	5.8	8.2	12.5	21	35	44	48	65	85
		500 V	kW	5.3	6.9	13	20.5	38	48	60	80	98
		690 V	kW	5.8	7.5	18	20.4	51	66	67	97	136
		1000 V	kW	—	—	—	—	—	—	—	—	—
Switching frequency with overload relay			h^{-1}	15	15	15	15	15	15	15	15	15
Current-carrying capacity with reversing time up to 15 s												
Rated operational current I_e		at 415 V	A	12	17	25	31	44	57	67	97	106
		500 V	A	8.7	11.3	20.8	31	44	57	67	97	106
		690 V	A	6.9	9	20.8	22.5	44	57	67	97	106
Rated power for induction motors at		at 230 V	kW	3.3	4.7	7.2	9.4	13.8	18.2	21.6	32	35
50 Hz and 60 Hz and		415 V	kW	5.8	8.2	12.5	16.3	24	31.6	38	55	60
		500 V	kW	5.3	6.9	13	20.4	30	40	47	69	75
		690 V	kW	5.8	7.5	18	20.4	42	55	65	95	104
		1000 V	kW	—	—	—	—	—	—	—	—	—
Switching frequency with overload relay			h^{-1}	15	15	15	15	15	15	15	15	15
Current-carrying capacity with reversing time up to 20 s												
Rated operational current I_e		at 415 V	A	12	17	25	28	39	51	57	85	92
		500 V	A	8.7	11.3	20.8	28	39	51	57	85	92
		690 V	A	6.9	9	20.8	22.5	39	51	57	85	92
Rated power for induction motors at		at 230 V	kW	3.3	4.7	7.2	8.5	12.2	16.3	18.4	28	30
50 Hz and 60 Hz and		415 V	kW	5.8	8.2	12.5	14.7	21.3	28	32	48	52
		500 V	kW	5.3	6.9	13	18.4	26.7	35	40	60	65
		690 V	kW	5.8	7.5	18	20.4	37	49	55	83	90
		1000 V	kW	—	—	—	—	—	—	—	—	—
Switching frequency with overload relay			h^{-1}	15	15	15	15	15	15	15	15	15

1) Short-circuit protection with overload relays, see Protection Equipment: Overload Relays -> 3RB2 Solid-State Overload Relays.

2) Up to $I_k < 0.5$ kA; ≤ 260 V.

3RT14 Contactors for Switching Resistive Loads (AC-1)

3-pole, 140 ... 690 A

Overview

AC and DC operation (size S3)

UC operation (AC/DC) (sizes S6 to S12)

IEC 60947, EN 60947 (VDE 0660)

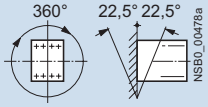
The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

3RT14 contactors are used for switching resistive loads (AC-1) or as contactors, for example, for variable-speed operating mechanisms that normally only have to carry the current.

The accessories for the 3RT10 contactors can also be used here.

For more detailed descriptions about the sizes S6 to S12, see 3RT10 Contactors, 3-pole, 3 ... 250 kW.

Technical specifications

Contactor	Type Size		**3RT14 46** **S3**
General data			
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.	AC and DC operation		 For DC operation and 22.5 °C inclination towards the front, operating range 0.85 ... 1.1 x U_s
Mechanical endurance		Operating cycles	10 million
Electrical endurance in operating cycles **Utilization category AC-1 at** I_e		Operating cycles	0.5 million
Rated insulation voltage U_i (degree of pollution 3)		V	1000
Rated impulse withstand voltage U_{imp}		kV	6
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	690
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.	Removable auxiliary switch block Permanently fitted auxiliary switch block		Yes, acc. to EN 60947-4-1, Appendix F Acc. to Swiss regulations (SUVA) on request
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80
Degree of protection acc. to EN 60947-1, Appendix C			IP20 (terminal compartment IP00), AC coil assembly IP40, DC coil assembly IP30
Touch protection acc. to EN 50274			Finger-safe
Shock resistance			
Rectangular pulse Sine pulse	AC and DC operation AC and DC operation	*g*/ms *g*/ms	6.8/5 and 4/10 10.6/5 and 6.2/10
Conductor cross-sections			1)
Short-circuit protection for contactors without overload relays			
Main circuit			
Fuse links, gL/gG operational class, LV HRC, 3NA	Type of coordination "1"	A	250
Fuse links, gR operational class, SITOR 3NE	Type of coordination "2"	A	250
Auxiliary circuit			
Fuse links gL/gG (weld-free protection at $I_k \geq 1$ kA) DIAZED 5SB, NEOZED 5SE		A	10
or miniature circuit breakers with C characteristic ($I_k < 400$ A)		A	10
Control			
Magnetic coil operating range	AC/DC		0.8 ... 1.1 x U_s
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)			
Standard version, AC operation, 50 Hz	• Closing • P.f.	VA	270 0.68
	• Closed • P.f.	VA	22 0.27
Standard version, AC operation, 50/60 Hz	• Closing • P.f.	VA	298/274 0.7/0.62
	• Closed • P.f.	VA	27/20 0.29/0.31
DC operation	Closing = Closed	W	15

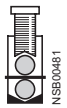
1) For conductor cross-sections see page 2a/54.

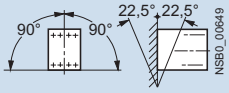
Contactor	Type			3RT14 46
	Size			S3
Control				
Operating times for 0.8 ... 1.1 x U_s[1]				
Total break time = Opening delay + Arcing time				
• AC operation	Closing delay		ms	17 ... 90
	Opening delay		ms	10 ... 25
• DC operation	Closing delay		ms	90 ... 230
	Opening delay		ms	14 ... 20
• Arcing time			ms	10 ... 15
Operating times for 1.0 x U_s[1]				
• AC operation	Closing delay		ms	18 ... 30
	Opening delay		ms	11 ... 23
• DC operation	Closing delay		ms	100 ... 120
	Opening delay		ms	16 ... 20
Main circuit				
AC capacity				
Utilization category AC-1, switching resistive loads				
Rated operational currents I_e		at 40 °C up to 690 V	A	140
		at 60 °C up to 690 V	A	130
		at 1000 V	A	60
Ratings of AC loads		at 415 V	kW	86
P.f. = 0.95 (at 60 °C)				
Minimum conductor cross-section for		at 40 °C	mm^2	50
loads with I_e		at 60 °C	mm^2	50
Utilization category AC-2 and AC-3				
with an electrical endurance of 1.3 million operating cycles				
Rated operational current I_e		up to 690 V	A	44
Rated power of slipring		at 230 V	kW	12.7
or squirrel-cage motors at		415 V	kW	22
50 Hz and 60 Hz(at 60 °C)		500 V	kW	29.9
		690 V	kW	38.2
Power loss per conducting path		at I_e/AC-1	W	12.5
DC capacity				
Utilization category DC-1, switching resistive loads (L/R ≤ 1 ms)				
Rated operational currents I_e (at 60 °C)				
• 1 conducting path		up to 24 V	A	130
		110 V	A	12
		220 V	A	2.5
		440 V	A	0.8
• 2 conducting paths in series		up to 24 V	A	130
		110 V	A	130
		220 V	A	13
		440 V	A	2.4
• 3 conducting paths in series		up to 24 V	A	130
		110 V	A	130
		220 V	A	130
		440 V	A	6
Utilization category DC-3/DC-5				
Shunt-wound and series-wound motors (L/R ≤ 15 ms)				
Rated operational currents I_e (at 60 °C)				
• 1 conducting path		up to 24 V	A	6
		110 V	A	1.25
		220 V	A	0.35
		440 V	A	0.15
• 2 conducting paths in series		up to 24 V	A	130
		110 V	A	130
		220 V	A	1.75
		440 V	A	0.42
• 3 conducting paths in series		up to 24 V	A	130
		110 V	A	130
		220 V	A	4
		440 V	A	0.8
Switching frequency				
Switching frequency *z* in operating cycles/hour				
Contactors without overload relays	No-load switching frequency AC		1/h	5000
	No-load switching frequency DC		1/h	1000
Rated operation		Acc. to AC-1 (AC/DC)	1/h	650
		Acc. to AC-3 (AC/DC)	1/h	1000
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$.				

1) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attenuated against voltage peaks (varistor +2 ms to 5 ms, diode assembly: 2 to 6 times).

3RT14 Contactors for Switching Resistive Loads (AC-1)

3-pole, 140 ... 690 A

Contactor	Type Size		3RT14 46 S3
Conductor cross-sections			
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** With box terminal		Screw terminals
Front clamping point connected 	• Finely stranded with end sleeve • Finely stranded without end sleeve • Solid • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded	mm² mm² mm² mm² mm AWG	2.5 ... 50 4 ... 50 2.5 ... 16 4 ... 70 6 x 9 x 0.8 10 ... 2/0
Rear clamping point connected 	• Finely stranded with end sleeve • Finely stranded without end sleeve • Solid • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded	mm² mm² mm² mm² mm AWG	2.5 ... 50 10 ... 50 2.5 ... 16 10 ... 70 6 x 9 x 0.8 10 ... 2/0
Both clamping points connected 	• Finely stranded with end sleeve • Finely stranded without end sleeve • Solid • Stranded • Ribbon cable conductors (number x width x thickness) • AWG cables, solid or stranded • Terminal screws - tightening torque	mm² mm² mm² mm² mm AWG Nm	Max. 2 x 35 Max. 2 x 35 Max. 2 x 16 Max. 2 x 50 2 x (6 x 9 x 0.8) 2 x (10 ... 1/0) M6 (hex. socket, A/F 4) 4 ... 6 (36 ... 53 lb.in)
Connection for drilled copper bars	Max. width[1]	mm	10
	Main conductors: Without box terminal with cable lugs[2]		
	• Finely stranded with cable lug • Stranded with cable lug • AWG cables, solid or stranded	mm² mm² AWG	10 ... 50[3] 10 ... 70[3] 7 ... 1/0
	Auxiliary conductors:		
	• Solid • Finely stranded with end sleeve • AWG cables, solid or stranded • Terminal screws - tightening torque	mm² mm² AWG Nm	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) 2 x (20 ... 16) 2 x (18 ... 14) 1 x 12 M3 0.8 ... 1.2 (7 ... 10.3 lb.in)

Contactor	Type Size		3RT14 56 S6	3RT14 66 S10	3RT14 76 S12
General data					
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.					
Mechanical endurance		Operating cycles	10 million		
Electrical endurance Utilization category AC-1 at I_e		Operating cycles	0.5 million		
Rated insulation voltage U_i (degree of pollution 3)		V	1000		
Rated impulse withstand voltage U_{imp}		kV	8		
Safe isolation between the coil and the auxiliary contacts and main contacts acc. to EN 60947-1, Appendix N		V	690		
Mirror contacts A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-4-1, Appendix F		
Permissible ambient temperature	During operation °C During storage °C		-25 ... +60/+55 with AS-Interface -55 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C			IP00/open, coil assembly IP20		
Touch protection acc. to EN 50274			Finger-safe with cover		
Shock resistance	Rectangular pulse Sine pulse	g/ms g/ms	8.5/5 and 4.2/10 13.4/5 and 6.5/10		
Conductor cross-sections			4)		
Electromagnetic compatibility (EMC)			5)		

1) If bars larger than 12 x 10 mm are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

2) When connecting rails which are larger than 25 mm², the 3RT19 46-4EA1 terminal cover must be used to keep the phase clearance.

3) Only with crimped cable lugs according to DIN 46234. Cable lug max. 20 mm wide.

4) For conductor cross-sections see pages 2a/56, 2a/57.

5) For electromagnetic compatibility (EMC) see page 2/10.

Contactor	Type Size		3RT14 56 S6	3RT14 66 S10	3RT14 76 S12
Short-circuit protection					
Main circuit					
Fuse links gL/gGLV HRC 3NA	Type of coordination "1"	A	355	500	800
Fuse links gR,SITOR 3NE	Type of coordination "2"	A	350	500	710
Auxiliary circuit					
Fuse links gL/gG (weld-free protection at $I_k \geq 1$ kA) DIAZED 5SB, NEOZED 5SE		A	10		
or miniature circuit breakers with C characteristic (short-circuit current $I_k < 400$ A)					
Control					
Operating range of the solenoid	AC/DC (UC)		0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$		
Power consumption of the solenoid (when coil is cool and rated range $U_{s\,min}$ ... $U_{s\,max}$)					
• Conventional operating mechanism					
- AC operation	Closing at $U_{s\,min}$	VA/p.f.	250/0.9	490/0.9	700/0.9
	Closing at $U_{s\,max}$	VA/p.f.	300/0.9	590/0.9	830/0.9
	Closed at $U_{s\,min}$	VA/p.f.	4.8/0.8	5.6/0.9	7.6/0.9
	Closed at $U_{s\,max}$	VA/p.f.	5.8/0.8	6.7/0.9	9.2/0.9
- DC operation	Closing at $U_{s\,min}$	W	300	540	770
	Closing at $U_{s\,max}$	W	360	650	920
	Closed at $U_{s\,min}$	W	4.3	6.1	8.5
	Closed at $U_{s\,max}$	W	5.2	7.4	10
Operating times (Total break time = Opening delay + Arcing time)					
• Conventional operating mechanism					
- with 0.8 x $U_{s\,min}$ ... 1.1 x $U_{s\,max}$	Closing delay	ms	20 ... 95	30 ... 95	45 ... 100
	Opening delay	ms	40 ... 60	40 ... 80	60 ... 100
- for $U_{s\,min}$ ... $U_{s\,max}$	Closing delay	ms	25 ... 50	35 ... 50	50 ... 70
	Opening delay	ms	40 ... 60	50 ... 80	70 ... 100
Main circuit					
AC capacity					
Utilization category AC-1, switching resistive loads					
Rated operational currents I_e	at 40 °C up to 690 V	A	275	400	690
	at 60 °C up to 690 V	A	250	380	650[1]
	at 1000 V	A	100	150	250
Rated power for AC loads[2] P.f. = 0.95 (at 60 °C)	at 415 V	kW	165	250	430
Minimum conductor cross-section for loads with I_e	at 40 °C	mm²	2 x 70	240	2 x 240
	at 60 °C	mm²	120	240	2 x 240
Power loss per conducting path	at I_e/AC-1 W	20	27	55	
Utilization category AC-2 and AC-3 **for an electrical endurance of 1.3 million operating cycles**					
Rated operational current I_e	up to 690 V	A	97	138	170
Rated power of slipring or squirrel-cage motors at 50 Hz and 60 Hz(at 60 °C) at	230 V	kW	30	37	55
	415 V	kW	55	75	90
	500 V	kW	55	90	110
	690 V	kW	90	132	160
DC capacity					
Utilization category DC-1, switching resistive loads (*L/R* ≤ 1 ms) **Rated operational currents** I_e (at 60 °C)					
• 1 conducting path	up to 24 V	A	250	380	500
	110 V	A	18	33	33
	220 V	A	3.4	3.8	3.8
	440 V	A	0.8	0.9	0.9
• 2 conducting paths in series	up to 24 V	A	250	380	500
	110 V	A	250	380	500
	220 V	A	20	380	500
	440 V	A	3.2	4	4
• 3 conducting paths in series	up to 24 V	A	250	380	500
	110 V	A	250	380	500
	220 V	A	250	380	500
	440 V	A	11.5	11	11

1) 600 A for 3RT14 76-N contactor.

2) Industrial furnaces and electric heaters with resistance heating, etc. (increased power consumption on heating up taken into account).

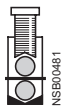
3RT14 Contactors for Switching Resistive Loads (AC-1)

3-pole, 140 ... 690 A

Contactor	Type Size			3RT14 56 S6	3RT14 66 S10	3RT14 76 S12
Main circuit						
DC capacity						
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)** **Rated operational currents I_e** (at 60 °C)						
• 1 conducting path		up to 24 V	A	250	380	500
		110 V	A	2.5	3	3
		220 V	A	0.6	0.6	0.6
		440 V	A	0.17	0.18	0.18
• 2 conducting paths in series		up to 24 V	A	250	380	500
		110 V	A	250	380	500
		220 V	A	2.5	2.5	2.5
		440 V	A	0.65	0.65	0.65
• 3 conducting paths in series		up to 24 V	A	250	380	500
		110 V	A	250	380	500
		220 V	A	250	380	500
		440 V	A	1.4	1.4	1.4
Switching frequency						
Switching frequency *z* in operating cycles/hour						
Contactors without overload relays	No-load switching frequency		h^{-1}	2000		
	AC-1		h^{-1}	600		
	AC-3		h^{-1}	1000		
Dependence of the switching frequency z' on the operational current I' and operational voltage U': $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$						

Contactor	Type Size			3RT14 56 S6
Conductor cross-sections				
Screw terminals	**Main conductors:** With 3RT19 55-4G box terminal			Screw terminals
Front or rear clamping point connected	• Finely stranded with end sleeve		mm^2	16 ... 70
	• Finely stranded without end sleeve		mm^2	16 ... 70
	• Stranded		mm^2	16 ... 70
	• Ribbon cable conductors (number x width x thickness)		mm	3 x 9 x 0.8 ... 6 x 15.5 x 0.8
	• AWG cables, solid or stranded		AWG	6 ... 2/0
Both clamping points connected	• Finely stranded with end sleeves, max.		mm^2	1 x 50, 1 x 70
	• Finely stranded without end sleeve		mm^2	1 x 50, 1 x 70
	• Stranded (max.)		mm^2	2 x 70
	• Ribbon cable conductors (number x width x thickness), max.		mm	2 x (6 x 15.5 x 0.8)
	• AWG cables, solid or stranded, max.		AWG	2 x 1/0
Front or rear clamping point connected	**Main conductor** With 3RT19 56-4G box terminal			
	• Finely stranded with end sleeve		mm^2	16 ... 120
	• Finely stranded without end sleeve		mm^2	16 ... 120
	• Stranded		mm^2	16 ... 120
	• Ribbon cable conductors (number x width x thickness)		mm	3 x 9 x 0.8 ... 10 x 15.5 x 0.8
	• AWG cables, solid or stranded		AWG	6 ... 250 kcmil
Both clamping points connected	• Finely stranded with end sleeves, max.		mm^2	1 x 95, 1 x 120
	• Finely stranded without end sleeve		mm^2	1 x 95, 1 x 120
	• Stranded (max.)		mm^2	2 x 120
	• Ribbon cable conductors (number x width x thickness), max.		mm	2 x (10 x 15.5 x 0.8)
	• AWG cables, solid or stranded, max.		AWG	2 x 3/0
	• Terminal screws			M10 (hexagon socket, A/F4)
	- tightening torque		Nm	10 ... 12 (90 ... 110 lb.in)

Contactor	Type Size		3RT14 56 S6
Conductor cross-sections			
Screw terminals	**Main conductors:** Without box terminal/busbar connection[1]		
	• Finely stranded with cable lug		16 ... 95
	• Stranded with cable lug		25 ... 120
	• AWG cables, solid or stranded		4 ... 250 kcmil
	• Connecting bar (max. width)		17
	• Terminal screw - tightening torque	 Nm	M8 x 25 (A/F 13) 10 ... 14 (90 ... 110) lb.in
	Auxiliary conductors:		
	• Conductor cross-section - solid - finely stranded with end sleeve - solid or stranded AWG (2 x)		 2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] acc. to IEC 60947; max. 2 x (0.75 ... 4) 2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] 2 x (18 ... 14)
	• Terminal screw - tightening torque	 Nm	M3 (PZ 2) 0.8 ... 1.2 (7 ... 10.3) lb.in

Contactor	Type Size		3RT14 66 S10	3RT14 76 S12
Conductor cross-sections				
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** With 3RT19 66-4G box terminal		Screw terminals	
Front clamping point connected  NSB00479	• Finely stranded with end sleeve	mm²	70 ... 240	
	• Finely stranded without end sleeve	mm²	70 ... 240	
	• Stranded	mm²	95 ... 300	
	• AWG cables, solid or stranded	AWG	3/0 ... 600 kcmil	
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5	
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve	mm²	120 ... 185	
	• Finely stranded without end sleeve	mm²	120 ... 185	
	• Stranded	mm²	120 ... 240	
	• AWG cables, solid or stranded	AWG	250 ... 500 kcmil	
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 6 x 9 x 0.8, max. 20 x 24 x 0.5	
Both clamping points connected  NSB00481	• Finely stranded with end sleeve	mm²	Min. 2 x 50, max. 2 x 185	
	• Finely stranded without end sleeve	mm²	Min. 2 x 50, max. 2 x 185	
	• Stranded	mm²	Min. 2 x 70, max. 2 x 240	
	• AWG cables, solid or stranded	AWG	Min. 2 x 2/0, max. 2 x 500 kcmil	
	• Ribbon cable conductors (number x width x thickness)	mm	Max. 2 x (20 x 24 x 0.5)	
	• Terminal screws - tightening torque	 Nm	M12 (hexagon socket, A/F 5) 20 ... 22 (180 ... 195 lb.in)	
Screw terminals	**Main conductors:** Without box terminal/busbar connection [3]			
	• Finely stranded with cable lug	mm²	50 ... 240	
	• Stranded with cable lug	mm²	70 ... 240	
	• AWG cables, solid or stranded	AWG	2/0 ... 500 kcmil	
	• Connecting bar (max. width)	mm	25	
	• Terminal screws - tightening torque	 Nm	M10 x 30 (A/F 17) 14 ... 24 (124 ... 210 lb.in)	
	Auxiliary conductors:			
	• Solid	mm²	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4] acc. to IEC 60947, max. 2 x (0.75 ... 4)	
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4]	
	• AWG cables, solid or stranded	AWG	2 x (18 ... 14)	
	• Terminal screws - tightening torque	 Nm	M3 (PZ 3) 0.8 ... 1.2 (7 ... 10.3 lb.in)	

1) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3) When connecting cable lugs to DIN 46234, the 3RT19 66-4EA1 terminal cover must be used for conductor cross-sections of 240 mm² and more as well as DIN 46235 for conductor cross-sections of 185 mm² and more to keep the phase clearance.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

4-pole, 4 NO, 18 ... 140 A

Overview

AC and DC operation

EN 60947-4-1 (VDE 0660 Part 102).

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

The accessories for the 3-pole SIRIUS contactors can also be used for the 4-pole versions.

Function

- Switching resistive loads
- Isolating systems with ungrounded or poorly grounded neutral conductors
- System transfers when alternative AC power supplies are used
- As contactors, e.g. for variable-speed operating mechanisms which only have to carry current and not switch

Integration

Mountable auxiliary contacts

Size S00

4 auxiliary contacts (according to EN 50005)

Size S0

Maximum 2 auxiliary contacts (either laterally mounted or snapped onto the top).

Size S2 to S3

Max. 4 auxiliary contacts (either laterally mounted or snapped onto the top)

Contactor assembly with mechanical interlock

The 4-pole 3RT13 contactors with 4 NO contacts as the main contacts are suitable for making contactor assemblies with a mechanical interlock, e.g. for system transfers.

Size S00

Contactor assemblies can be constructed from two 3RT13 1 . contactors in conjunction with mechanical interlocks and two connecting clips (Order No.: 3RA19 12-2H, pack with 10 interlock elements and 20 clips for 10 assemblies).

Size S0

When constructing 4-pole contactor assemblies from two 3RT13 2 . contactors, the fourth pole of the left contactor must always be moved to the left side. The contactor assembly can then be made easily with the aid of the 3RA19 24-1A

mechanical interlock fitted onto the front and the 3RA19 22-2C mechanical connectors. The laterally mountable 3RA19 24-2B mechanical interlock can be used if the contactor assembly is mounted on a base plate.

Sizes S2 and S3

Contactor assemblies can be constructed from two 3RT13 3 . or two 3RT13 4 . contactors in conjunction with the laterally mountable 3RA19 24-2B mechanical interlock and the 3RA19 .2-2G mechanical connectors. The mechanical interlock for fitting onto the front cannot be used for size S2 and S3 contactors.

Technical specifications

Contactor	Type Size		3RT13 16 S00	3RT13 17	3RT13 25 S0	3RT13 26	3RT13 36 S2	3RT13 44 S3	3RT13 46 S3
General data									
Permissible mounting position[1]									
Mechanical endurance		Operating cycles	30 million		10 million				
Electrical endurance at I_e/AC-1		Operating cycles	Approx. 0.5 million						
Rated insulation voltage U_i (degree of pollution 3)		V	690						
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80						
Degree of protection Acc. to EN 60947-1, Appendix C	Device Connection range		IP20				IP20 IP00		
Touch protection acc. to EN 50274			Finger-safe						
Short-circuit protection of contactors without overload relays									
Main circuit									
Fuse links,	Type of coordination "1"[1]	A	35		63		160	250	250
gL/gG operational class	Type of coordination "2"[1]	A	20		25/35		63	125	160
LV HRC, 3NA, DIAZED, 5SB, NEOZED, 5SE									
- acc. to IEC 60947-4-1/ EN 60947-4-1	Weld-free	A	10		16		50	63	100
Control									
Magnetic coil operating range									
	AC at 50 Hz AC at 60 Hz		0.8 ... 1.1 x U_s 0.85 ...1.1 x U_s						
	DC at 50 °C DC at 60 °C		0.8 ... 1.1 x U_s 0.85 ... 1.1 x U_s						
	AC/DC				0.8 ... 1.1 x U_s				
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)									
AC operation, 50 Hz	• Closing • P.f.	VA VA			61 0.82		145 0.79	270 0.68	
	• Closed • P.f.	VA VA			7.8 0.24		12.5 0.36	22 0.27	
AC operation, 50/60 Hz	• Closing • P.f.	VA	26.5/24.3 0.79/0.75		64/63 0.82/0.74		170/155 0.76/0.72	298/274 0.72/0.62	
	• Closed • P.f.	VA	4.4/3.4 0.27/0.27		8.4/6.8 0.24/0.28		15/11.8 0.35/0.38	27/20 0.29/0.31	
DC operation	• Closing = Closed	W	3.3		5.6		13.3	15	
Operating times for 0.8 ... 1.1 x U_s[2] Total break time = Opening delay + Arcing time									
• DC operation	Closing delay Opening delay	ms ms	25 ... 100 7 ... 10		30 ... 90 13 ... 40		50 ... 110 15 ... 30	110 ... 200 14 ... 20	
• AC operation	Closing delay Opening delay	ms ms	8 ... 35 4 ... 30		6 ... 30 13 ... 25		4 ... 35 10 ... 30	20 ... 50 10 ... 25	
• Arcing time		ms	10 ... 15		10 ... 15		10 ... 15	10 ... 15	
Main circuit									
AC capacity									
Utilization category AC-1, switching resistive loads									
Rated operational currents I_e	at 40 °C, up to 690 V at 60 °C, up to 690 V	A A	18 16	22 20	35 30	40 35	60 55	110 100	140 120
Rated power for AC loadsP.f. = 0.95 (at 40 °C)	at 415 V	kW	12	14.5	22	26	39	72	92
Minimum conductor cross-section for loads with I_e	at 40/60 °C	mm²	2.5	2.5	10	10	16	50	50
Utilization category AC-2 and AC-3									
Rated operational currents I_e	at 60°C, up to 400 V	A	9	12	17	25	26	—	—
Rated power of slipring or squirrel-cage motors at 50 Hz and 60 Hz	at 230 V 415 V	kW kW	3 4	3 5.5	4 7.5	5.5 11	5.5 11	— —	— —

1) In accordance with the corresponding 3-pole 3RT1 contactors.

2) With size S00, DC operation: Operating times at 0.85 ... 1.1 x U_s.

4-pole, 4 NO, 18 ... 140 A

Contactor	Type Size		3RT13 16 S00	3RT13 17 S0	3RT13 25	3RT13 26
Main circuit						
DC capacity						
Utilization category DC-1, switching resistive loads (*L/R* ≤ 1ms)						
Rated operational currents I_e (at 40 °C)						
• 1 conducting path	up to 24 V	A	18	22	35	
	110 V	A	2.1	2.1	4.5	
	220 V	A	0.8	0.8	1	
	440 V	A	0.6	0.6	0.4	
• 2 conducting paths in series	up to 24 V	A	18	22	35	
	110 V	A	12	12	35	
	220 V	A	1.6	1.6	5	
	440 V	A	0.8	0.8	1	
• 3 conducting paths in series	up to 24 V	A	18	22	35	
	110 V	A	18	22	35	
	220 V	A	18	22	35	
	440 V	A	1.3	1.3	2.9	
• 4 conducting paths in series	up to 24 V	A	18	22	35	
	110 V	A	18	22	35	
	220 V	A	18	22	35	
	440 V	A	1.3	1.3	2.9	

Contactor	Type Size			3RT13 16 S00	3RT13 17 S0	3RT13 25	3RT13 26
Main circuit							
DC capacity							
Utilization category DC-3/DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)**							
Rated operational currents I_e (at 40 °C)							
• 1 conducting path	up to 24 V	A		18	20	20	
	110 V	A		0.15	0.15	2.5	
	220 V	A		—	—	1	
	440 V	A		—	—	0.09	
• 2 conducting paths in series	up to 24 V	A		18	20	35	
	110 V	A		0.35	0.35	15	
	220 V	A		—	—	3	
	440 V	A		—	—	0.27	
• 3 conducting paths in series	up to 24 V	A		18	20	35	
	110 V	A		18	20	35	
	220 V	A		1.5	1.5	10	
	440 V	A		0.2	0.2	0.6	
• 4 conducting paths in series	up to 24 V	A		18	20	35	
	110 V	A		18	20	35	
	220 V	A		1.5	1.5	35	
	440 V	A		0.2	0.2	0.6	
Maximum breaking current AC							
e.g. for isolation of load distributions							
• 50/60 Hz	415 V	A		72	96	200	

Contactor	Type Size			3RT13 36 S2	3RT13 44 S3	3RT13 46 S3
Main circuit						
DC capacity						
Utilization category DC-1, switching resistive loads (*L/R* ≤ 1ms)						
Rated operational currents I_e (at 40 °C)						
• 1 conducting path	up to 24 V	A		50	70	80
	110 V	A		4.5	4.5	9
	220 V	A		1	1	2
	440 V	A		0.4	0.4	0.6
• 2 conducting paths in series	up to 24 V	A		50	70	80
	110 V	A		45	70	80
	220 V	A		5	5	10
	440 V	A		1	1	1.8
• 3 conducting paths in series	up to 24 V	A		50	70	80
	110 V	A		45	70	80
	220 V	A		45	70	80
	440 V	A		2.9	2.9	4.5
• 4 conducting paths in series	up to 24 V	A		50	70	80
	110 V	A		45	70	80
	220 V	A		45	70	80
	440 V	A		2.9	2.9	4.5
Utilization category DC-3/DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)** **Rated operational currents I_e** (at 40 °C)						
• 1 conducting path	up to 24 V	A		20	20	20
	110 V	A		2.5	2.5	2.5
	220 V	A		1	1	1
	440 V	A		0.1	0.15	0.15
• 2 conducting paths in series	up to 24 V	A		45	70	80
	110 V	A		25	70	80
	220 V	A		5	7	7
	440 V	A		0.27	0.42	0.42
• 3 conducting paths in series	up to 24 V	A		45	70	80
	110 V	A		45	70	80
	220 V	A		25	35	35
	440 V	A		0.6	0.8	0.8
• 4 conducting paths in series	up to 24 V	A		45	70	80
	110 V	A		45	70	80
	220 V	A		45	70	80
	440 V	A		0.6	0.8	0.8
Maximum breaking current AC						
e.g. for isolation of load distributions						
• 50/60 Hz	415 V	A		400	520	760

3TK1 Contactors for Switching Resistive Loads (AC-1)

4-pole, 4 NO, 200 ... 1000 A

Overview

EN 60947-4-1 (VDE 0660 Part 102)

The contactors also comply with the requirements of NFC 63-110 and NFC 20–040.

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274. Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices.

Magnetic coils for 3TK10 to 3TK13 contactors: as withdrawable coils.

Surge suppression

Control circuit

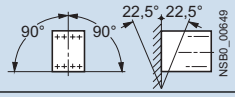
Magnetic coils for 3TK1 contactors: can be retrofitted with RC elements.

Function

- Isolating systems with ungrounded or poorly grounded neutral conductors
- Switching resistive loads
- System transfers when alternative AC power supplies are used

Technical specifications

Contactor Type			3TK1
Rated data of the auxiliary contacts			Acc. to IEC 60947-5-1 (VDE 0660 Part 200)
Rated insulation voltage U_i (degree of pollution 3)		V	690
Continuous thermal current I_{th} = Rated operational current I_e/AC-12		A	10
AC load **Rated operational current I_e/AC-15/AC-14** for rated operational voltage U_e			
	24 V	A	6
	110 V	A	6
	125 V	A	6
	220 V	A	6
	230 V	A	6
	380 V	A	4
	415 V	A	4
	500 V	A	1
	660 V	A	1
	690 V	A	1
DC load **Rated operational current I_e/DC-12** for rated operational voltage U_e			
	24 V	A	—
	60 V	A	—
	110 V	A	—
	125 V	A	—
	220 V	A	—
	440 V	A	—
	600 V	A	—
Rated operational current I_e/DC-13 for rated operational voltage U_e			
	24 V	A	6
	60 V	A	6
	110 V	A	1.8
	125 V	A	—
	220 V	A	0.6
	440 V	A	—
	600 V	A	—
CSA and UL rated data for the auxiliary contacts			
Rated voltage		V AC, max.	600
Switching capacity			A 600, P 600

Contactor	Type		3TK10	3TK11	3TK12	3TK13	3TK14	3TK15	3TK17
General data									
Permissible mounting position Vertical mounting position also permitted.									
Mechanical endurance	Operating cycles	Mill.	10				5		
Electrical endurance for I_e/AC-1 at 55 °C	Operating cycles	Mill.	0.8	0.8	0.8	0.4	0.65	0.5	0.4
Rated insulation voltage U_i (degree of pollution 3)		V	1000						
Ambient temperature	During operation	°C	-25 ... +55						
	During storage	°C	-50 ... +70						
Degree of protection acc. to EN 60947-1, Appendix C			IP00						
Touch protection acc. to EN 50274			Finger-safe with cover						
Shock resistance	Sine pulse	g/ms	10/15						
Main circuit Fuse links, gL/gG, LV HRC 3NA, DIAZED 5SB, NEOZED 5SE									
- acc. to IEC 60947-4-1/	Type of coordination "1"	A	250		355		800	1000	
EN 60947-4-1	Type of coordination "2"	A	250		315		630	850	
Auxiliary circuit (short-circuit current $I_k \geq 1$ kA) fuse links, gL/gG, DIAZED 5SB, NEOZED 5SE		A	10						
Control									
Magnetic coil operating range			0.85 ... 1.1 x U_s						
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)									
50 Hz	Closing	VA	820		1100		3500		
	P.f.		0.4		0.35		0.26		
	Closed	VA	44		52		125		
	P.f.		0.34		0.35		0.4		
60 Hz	Closing	VA	990		1200		4000		
	P.f.		0.35		0.31		0.22		
	Closed	VA	52		65		140		
	P.f.		0.35		0.34		0.43		
Operating times at 1.0 x U_s									
	Closing delay	ms	20 ... 40				30 ... 60		
	Opening delay	ms	7 ... 15				10 ... 20		
Arcing time		ms	10				10		
Main circuit									
AC capacity									
Utilization category AC-1, switching resistive loads									
Rated operational currents I_e	at 40 °C up to 690 V	A	200	250	300	350	550	800	1000
	at 50 °C up to 690 V	A	180	230	270	310	470	650	850
Rated power for AC loads, p.f. = 0.95	at 230 V	kW	76	95	114	132	208	303	378
(at 40°C)	400 V	kW	132	165	197	230	362	527	658
	500 V	kW	165	206	247	288	452	658	828
	690 V	kW	227	284	341	397	624	908	1135
Minimum conductor cross-sections for loads with I_e	at 40° C	mm²	95	150	185	240	185	240	300
Utilization category AC-2 and AC-3									
Rated operational currents I_e	up to 400 V	A	120	145	210	210	400	550	700
Rated power of squirrel-cage	at 230 V	kW	30	45	75	75	110	160	220
or slipring motors at 50 Hz and 60 Hz	400 V	kW	55	75	110	110	200	280	370
Short-time current at 40° C in cold state up to 10 s		A	900	1200	1600	1600	5300	5300	6400
Switching frequency[1)]									
Switching frequency z in operating cycles/hour									
Contactors without	No-load switching frequency	1/h	3600						
overload relays	AC-1	1/h	300						
	AC-3	1/h	300						
Conductor cross-sections									
Main conductors:			Screw terminals						
• Stranded with cable lug		mm²	2 x 70	2 x 120	2 x 120		2 x 300		
• Solid or stranded	AWG	MCM	2 x 00	2 x 250	2 x 250		2 x 600		
• Connecting bar (max. width)		mm	30	30	33		55		
• Terminal screw			M6	M10	M10		M10		
- tightening torque		Nm	5	16	16		16		
		lb.in	42	135	135		135		
Auxiliary conductors:									
• Solid		mm²	2 x (0.5 ... 2.5)						
• Finely stranded with end sleeve		mm²	2 x (0.5 ... 2.5)						
• Solid or stranded	AWG	MCM	20 ... 14						
- tightening torque		Nm	1.2 (10 lb.in)						

1) Dependence of the switching frequency z' on the operational current I' and operational voltage U' : $z' = z \cdot (I_e/I') \cdot (400\ V/U')^{1.5} \cdot 1/h$.

4-pole, 2 NO + 2 NC, 4 ... 18.5 kW

Overview

AC and DC operation

EN 60947-4-1 (VDE 0660 Part 102).

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

The accessories for the 3-pole SIRIUS contactors can also be used for the 4-pole versions.

Function

- Changing the polarity of hoisting gear motors
- Switching two separate loads

Note:

3RT15 contactors are not suitable for switching a load between two current sources.

Integration

Mountable auxiliary contacts

Size S00

4 auxiliary contacts (auxiliary switch blocks)

Size S0

Maximum 2 auxiliary contacts (either laterally mounted or snapped onto the top auxiliary switch blocks).

Size S2

Maximum 4 auxiliary contacts (either laterally mounted or snapped onto the top auxiliary switch blocks).

Technical specifications

Contactor	Type Size		3RT15 16 S00	3RT15 17 S00	3RT15 26 S0	3RT15 35 S2
General data						
Permissible mounting position[1]						
Mechanical endurance		Operating cycles	30 million		10 million	
Electrical endurance at I_e/AC-1		Operating cycles	Approx. 0.5 million			
Rated insulation voltage U_i (degree of pollution 3)		V	690			
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80			
Degree of protection acc. to EN 60947-1, Appendix C			IP20		IP20 (IP00 terminal compartment)	
Touch protection acc. to EN 50274			Finger-safe			
Short-circuit protection of contactors without overload relays						
Main circuit						
Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE	Type of coordination "1" Type of coordination "2" Weld-free	A A A	35 20 10		63 35 16	160 80 50
- acc. to IEC 60947-4-1/EN 60947-4-1						
Control						
Magnetic coil operating range						
	AC at 50 Hz AC at 60 Hz DC at 50 °C DC at 60 °C AC/DC		0.8 ... 1.1 x U_s 0.85 ... 1.1 x U_s 0.8 ... 1.1 x U_s 0.85 ... 1.1 x U_s		0.8 ... 1.1 x U_s	
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)						
AC operation, 50 Hz	Closing P.f. Closed P.f.	VA VA VA VA			61 0.82 7.8 0.24	145 0.79 12.5 0.36
AC operation, 50/60 Hz	Closing P.f. Closed P.f.	VA VA VA VA	26.5/24.3 0.79/0.75 4.4/3.4 0.27/0.27		64/63 0.82/0.74 8.4/6.8 0.24/0.28	170/155 0.76/0.72 15/11.8 0.35/0.38
DC operation	Closing = Closed	W	3.3		5.6	13.3
Operating times for 0.8 ... 1.1 x U_s[2] Total break time = Opening delay + Arcing time						
AC/DC operation						
• DC operation	Closing delay Opening delay	ms ms	25 ... 100 7 ... 10		30 ... 90 13 ... 40	50 ... 110 15 ... 30
• AC operation	Closing delay Opening delay	ms ms	8 ... 35 4 ... 30		6 ... 30 13 ... 25	4 ... 35 10 ... 30
• Arcing time		ms	10 ... 15			

1) In accordance with the corresponding 3-pole 3RT1 contactors.

2) With size S00, DC operation: Operating times at 0.85 ... 1.1 x U_s.

Contactor	Type Size			3RT15 16 S00	3RT15 17 S00	3RT15 26 S0	3RT15 35 S2
Main circuit							
AC capacity							
Utilization category AC-1, switching resistive loads							
Rated operational currents I_e	at 40 °C up to 690 V		A	18	22	40	60
	at 60 °C up to 690 V		A	16	20	35	55
Rated power for AC loads P.f. = 0.95 (at 60 °C)	at 415 V		kW	11	13	26	36
Minimum conductor cross-section for loads with I_e	at 40 °C		mm²	2.5	2.5	10	16
Utilization category AC-2 and AC-3							
Rated operational currents I_e (at 60 °C)	up to 415 V		A	9	12	25 [1]	40
Rated power of slipring or squirrel-cage motors at 50 and 60 Hz	at 230 V		kW	3	3	5.5	9.5
	415 V		kW	4	5.5	11	18.5
DC capacity							
Utilization category DC-1, switching resistive load ($L/R \leq 1$ ms) **Rated operational currents I_e** (at 60 °C)							
• 1 conducting path	up to 24 V		A	16	20	35	50
	110 V		A	2.1	2.1	4.5	4.5
	220 V		A	0.8	0.8	1	1
	440 V		A	0.6	0.6	0.4	0.4
• 2 conducting paths in series	up to 24 V		A	16	20	35	50
	110 V		A	12	12	35	45
	220 V		A	1.6	1.6	5	5
	440 V		A	0.8	0.8	1	1
Utilization category DC-3/DC-5[2], **shunt-wound and series-wound motors ($L/R \leq 15$ ms)** **Rated operational currents I_e** (at 60 °C)							
• 1 conducting path	up to 24 V		A	16	20	20	35
	110 V		A	0.15	0.15	2.5	2.5
	220 V		A	0.75	0.75	1	1
	440 V		A	—	—	0.09	0.1
• 2 conducting paths in series	up to 24 V		A	16	20	35	50
	110 V		A	0.35	0.35	15	25
	220 V		A	—	—	3	5
	440 V		A	—	—	0.27	0.27

1) For AC operation: 25 A
DC operation: 20 A.

2) For U_c >24 V the rated operational currents I_e for the NC contact conducting paths are 50 % of the values for the NO contact conducting paths.

12.5 ... 50 kvar

Overview

AC operation

IEC 60947, EN 60947 (VDE 0660)

The contactors are suitable for use in any climate. They are

finger-safe according to EN 50274.

The 3RT16 capacitor contactors are special version of the size S00 to S3 SIRIUS contactors. The capacitors are precharged by means of the mounted leading NO contacts and resistors; only then do the main contacts close.

This prevents disturbances in the network and welding of the contactors.

Only discharged capacitors are permitted to be switched on with capacitor contactors.

The auxiliary switch block which is snapped onto the capacitor contactor contains the three leading NO contacts and in the case of S00 one standard NC contact and in the case of S0 and S3 one standard NO contact, which is unassigned. Size S00 also contains another unassigned NO contact in the basic unit.

In addition, a 2-pole auxiliary switch block can be mounted laterally on the 3RT16 47 capacitor contactors (2 NO, 2 NC or 1 NO + 1 NC versions); type 3RH19 21-1EA . . . The fitting of auxiliary switches for 3RT16 17 and 3RT16 27 is not expandable.

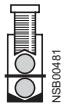
For the capacitor switching capacity of the basic 3RT10 contactor version, see Technical specifications.

Technical specifications

All technical specifications not mentioned in the table below are identical to those of the 3RT10 17 contactors for size S00, to those of the 3RT10 26 contactors for size S0 and to those of the 3RT10 45 contactors for size S3.

Contactor	Type Size			**3RT16 17- . A . . 3** **S00**	**3RT16 27- . A . . 1** **S0**	**3RT16 47- . A . . 1** **S3**
Capacitor rating at **rated power** (utilization category AC-6b)		230 V, 50/60 Hz **415 V, 50/60 Hz** 525 V, 50/60 Hz 690 V, 50/60 Hz	kvar **kvar** kvar kvar	3 ... 7.5 **5 ... 12.5** 7.5 ... 15 10 ... 21	3.5 ... 15 **6 ... 25** 7.8 ... 30 10 ... 42	3.5 ... 30 **5 ... 50** 7.5 ... 60 10 ... 84
Auxiliary contacts mounted (unassigned)				1 NO + 1 NC	1 NO	
Auxiliary contacts mountable (lateral), not for sizes S00 and S0				—		2 NC + 2 NO or 1 NO + 1 NC
Magnetic coil operating range				0.8 ... 1.1 x U_s		
Max. switching frequency			h^{-1}	180	100	
Electrical endurance			Operating cycles	> 250000	> 150000	> 100000
Ambient temperature			°C	60		
Standards				IEC 60947/EN 60947 (VDE 0660)		
Short-circuit protection				1.6 ... 2.2 x I_e		
Conductor cross-sections						
Screw terminals (1 or 2 conductors can be connected)	**Main conductors** • Solid		mm²	Screw terminals 2 x (0.5 ... 1.5); 2 x (0.75 ... 2.5) Acc. to IEC 60947; Max. 2 x (1 ... 4)	2 x (1 ... 2.5); 2 x (2.5 ... 6) Acc. to IEC 60947; Max. 1 x 10[1)]	
	• Finely stranded with end sleeve		mm²	2 x (0.5 ... 1.5); 2 x (0.75 ... 2.5)	2 x (1 ... 2.5); 2 x (2.5 ... 6) [1)]	
	• AWG cables - solid - solid or stranded - stranded		 AWG AWG AWG	 2 x (20 ... 16) 2 x (18 ... 14) 1 x 12	 2 x (16 ... 12) 2 x (14 ... 10) 1 x 8	
	• Terminal screws - tightening torque		 Nm lb.in	M3 0.8 ... 1.2 7 ... 10.3	M4 (Pozidriv size 2) 2 ... 2.5 18 ... 22	

1) 3RV19 25-5AB feeder terminal for 16 mm².

Contactor	Type Size		3RT16 17- . A . . 3 S00	3RT16 27- . A . . 1 S0	3RT16 47- . A . . 1 S3
Conductor cross-sections					
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:** with box terminal		Screw terminals		
Front clamping point connected 	• Finely stranded with end sleeve	mm²			2.5 ... 35
	• Finely stranded without end sleeve	mm²			4 ... 50
	• Solid	mm²			2.5 ... 16
	• Stranded	mm²			4 ... 70
	• Ribbon cable conductors (number x width x thickness)	mm			6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG			10 ... 2/0
Rear clamping point connected 	• Finely stranded with end sleeve	mm²			2.5 ... 50
	• Finely stranded without end sleeve	mm²			10 ... 50
	• Solid	mm²			2.5 ... 16
	• Stranded	mm²			10 ... 70
	• Ribbon cable conductors (number x width x thickness)	mm			6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG			10 ... 2/0
Both clamping points connected 	• Finely stranded with end sleeve	mm²			Max. 2 x 35
	• Finely stranded without end sleeve	mm²			Max. 2 x 35
	• Solid	mm²			Max. 2 x 16
	• Stranded	mm²			Max. 2 x 50
	• Ribbon cable conductors (number x width x thickness)	mm			2 x (6 x 9 x 0.8)
	• AWG cables, solid or stranded	AWG			2 x (10 ... 1/0)
	• Terminal screw - tightening torque	 Nm lb.in			M6 (hex. socket, A/F 4) 4 ... 6 36 ... 53
Connection for drilled copper bars[1]	Max. width	mm			10
Without box terminal with cable lugs[2] (1 or 2 conductors can be connected)	• Finely stranded with cable lug	mm²			10 ... 50[3]
	• Stranded with cable lug	mm²			10 ... 70[3]
	• AWG cables, solid or stranded	AWG			7 ... 1/0
	Auxiliary conductors:				
	• Solid	mm²	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4] acc. to IEC 60947; max. 2 x (1 ... 4)	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4)	
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[4]; 2 x (0.75 ... 2.5)[4]		
	• AWG cables, solid or stranded	AWG	2 x (20 ... 16)[4]; 2 x (18 ... 14)[4]; 1 x 12		
	• Terminal screw - tightening torque	 Nm lb.in	M3 0.8 ... 1.2 7 ... 10.3		
Cage Clamp terminals (1 or 2 conductors can be connected)	**Auxiliary conductors:**				
	• Solid	mm²	2 x (0.25 ... 2.5)		
	• Finely stranded with end sleeve	mm²	2 x (0.25 ... 1.5		
	• Finely stranded without end sleeve	mm²	2 x (0.25 ... 2.5)		
	• AWG cables, solid or stranded	AWG	2 x (24 ... 14)		

1) If bars larger than 12 x 10 mm are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

2) When connecting conductors which are larger than 25 mm², the 3RT19 46-4EA1 terminal cover must be used to keep the phase clearance.

3) Only with crimped cable lugs according to DIN 46234.
Cable lug max. 20 mm wide.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

1- and 2-pole, 32 ... 400 A

Overview

3TC4 and 3TC5

EN 60947-4-1 (VDE 0660 Part 102).

The contactors are finger-safe according to EN 50274.

Terminal covers may have to be fitted onto the connecting bars, depending on the configuration with other devices.

The DC motor ratings given in the tables are applicable to the DC-3 and DC-5 utilization categories with two-pole switching of the load or with the two conducting paths of the contactor connected in series.

One contactor conducting path can switch full power up to 220 V. The ratings for higher voltages are available on request.

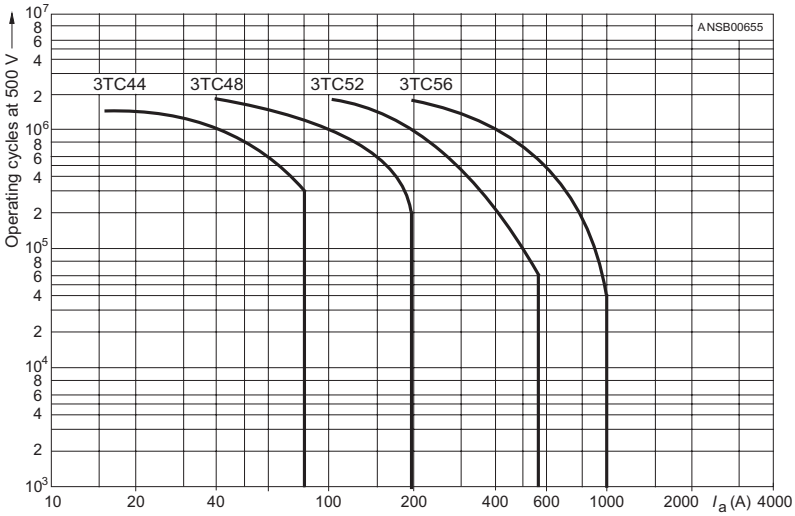
Technical specifications

Contactor	Type			3TC4	3TC5
Rated data of the auxiliary contacts					
Rated insulation voltage U_i (degree of pollution 3)			V	690	
Continuous thermal current I_{th} = Rated operational current I_e/AC-12				10	10
AC load **Rated operational current I_e/AC-15/AC-14** for rated operational voltage U_e					
		24 V	A	10	10
		110 V	A	10	10
		125 V	A	10	10
		220 V	A	6	6
		230 V	A	5.6	5.6
		380 V	A	4	4
		415 V	A	3.6	3.6
		500 V	A	2.5	2.5
		660 V	A	2.5	2.5
		690 V	A	—	—
DC load **Rated operational current I_e/DC-12** for rated operational voltage U_e					
		24 V	A	10	10
		60 V	A	10	10
		110 V	A	3.2	8
		125 V	A	2.5	6
		220 V	A	0.9	2
		440 V	A	0.33	0.6
		600 V	A	0.22	0.4
Rated operational current I_e/DC-13 for rated operational voltage U_e					
		24 V	A	10	10
		60 V	A	5	5
		110 V	A	1.14	2.4
		125 V	A	0.98	2.1
		220 V	A	0.48	1.1
		440 V	A	0.13	0.32
		600 V	A	0.07	0.21

Contactor	Type			3TC44 ... 3TC56
CSA and UL rated data for the auxiliary contacts				
Rated voltage			V AC, max.	600
Switching capacity				A 600, P 600

Contactor	Type	3TC44 ... 3TC56

Endurance of the main contacts



3TC44 and 3TC56 contactors

Legend for the diagrams:
I_a = Breaking current

Contactor	Type Size		3TC44 2	3TC48 4	3TC52 8	3TC56 12
General data						
Permissible mounting position The contactors are designed for operation on a vertical mounting surface.						
Mechanical endurance	Operating cycles		10 million			
Electrical endurance	Operating cycles		[1]			
Rated insulation voltage U_i (degree of pollution 3)		V	800		1000	
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N		V	up to 300		Up to 660	
Mirror contacts[2] A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact.			Yes, acc. to EN 60947-4-1, Appendix F			
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +55 -50 ... +80			
Degree of protection acc. to EN 60947-1, Appendix C			IP00/open, for AC operation, coil assembly IP40			
Shock resistance	Rectangular pulse	g/ms	7.5/5 and 3.4/10	10/5 and 5/10	12/5 and 5.5/10	12/5 and 5.6/10
Short-circuit protection						
Main circuit Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE	 Type of coordination "1" Type of coordination "2"	 A A	 50 35	 160 63	 250 80	 400 250
Auxiliary circuit (short-circuit current $I_k \geq 1$ kA)						
• Fuse links, gL/gG DIAZED 5SB, NEOZED 5SE		A	16			
• Miniature circuit breaker with C characteristic		A	10			

1) See the endurance diagram above.

2) For 3TC44, one NC contact each must be connected in series for the right and left auxiliary switch block respectively.

3TC Contactors for Switching DC Voltage

1- and 2-pole, 32 ... 400 A

Contactor	Type Size		3TC44 2	3TC48 4	3TC52 8	3TC56 12
Control						
Magnetic coil operating range			0.8 ... 1.1 x U_s			
Power consumption of the magnetic coils (for cold coil and 1.0 x U_s)						
DC operation	• Closing = Closed	W	10	19	30	86
AC operation, 50 Hz coil	• Closing	VA/p.f.	68/0.86	300/0.5	640/0.48	1780/0.3
	• Closed	VA/p.f.	10/0.29	26/0.24	46/0.23	121/0.22
AC operation, 60 Hz coil	• Closing	VA/p.f.	95/0.79	365/0.45	730/0.38	2140/0.3
	• Closed	VA/p.f.	12/0.3	35/0.26	56/0.24	140/0.29
AC operation, 50/60 Hz coil	• Closing at 50 Hz/60 Hz	VA/p.f.	79/73/0.83/0.78	—	—	—
	• Closed at 50 Hz/60 Hz	VA/p.f.	11/9/0.28/0.27	—	—	—
Operating times (at 0.8 ... 1.1 x U_s) Total break time = opening delay + Arcing time			(The values apply up to and including 20 % undervoltage, 10 % overvoltage, as well as when the coil is cold and warm)			
• DC operation	Closing delay	ms	35 ... 190	90 ... 380	120 ... 400	110 ... 400
	Opening delay[1]	ms	10 ... 25	17 ... 28	22 ... 35	40 ... 110
• AC operation	Closing delay	ms	10 ... 40	20 ... 50	20 ... 50	20 ... 50
	Opening delay[1]	ms	5 ... 25	5 ... 30	10 ... 30	10 ... 30
• Arcing time	DC-1	ms	20			
	DC-3/DC-5	ms	30			
Main circuit						
DC capacity						
Utilization category DC-1, switching resistive loads (*L/R* ≤ 1 ms)						
Rated operational currents I_e (at 55 °C)	up to U_e 750 V	A	32	75	220	400
Minimum conductor cross-section		mm²	6	25	95	240
Rated power at U_e	at 220 V	kW	7	16.5	48	88
	440 V	kW	14	33	97	176
	600 V	kW	19.2	45	132	240
	750 V	kW	24	56	165	300
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)**						
Rated operational currents I_e (at 55 °C)	up to 220 V	A	32	75	220	400
	440 V	A	29	75	220	400
	600 V	A	21	75	220	400
	750 V	A	7.5	75	170	400
Rated power at U_e	at 110 V	kW	2.5	6.5	20	35
	220 V	kW	5	13	41	70
	440 V	kW	9	27	82	140
	600 V	kW	9	38	110	200
	750 V	kW	4	45	110	250
Switching frequency						
Switching frequency *z* in operating cycles/hour						
AC/DC operation	With resistive load DC-1	h^{-1}	1500	1000		
	For inductive load DC-3/DC-5	h^{-1}	750	600		
Conductor cross-sections						
Screw terminals (1 or 2 conductors can be connected)	**Main conductors:**		Screw terminals			
	• Solid	mm²	2 x (2.5 ... 10)	2 x (6 ... 16)	—	—
	• Finely stranded with end sleeve	mm²	2 x (1.5 ... 4)	—	—	—
	• Stranded with cable lug	mm²	2 x 16	2 x 35	2 x 120	2 x 150
	• Pin-end connector to DIN 46231	mm²	2 x (1 ... 6)	—	—	—
	• Busbars	mm	—	15 x 2.5	25 x 4	2 x (25 x 3)
	• Terminal screw		M5	M6	M10	M10
	Auxiliary conductors:					
	• Solid	mm²	2 x (1 ... 2.5)			
	• Finely stranded with end sleeve	mm²	2 x (0.75 ... 1.5)			

1) The opening delay times can increase if the contactor coils are damped against voltage peaks. Only 3TC44 contactors are allowed to be fitted with diodes.

Function

Contact reliability

High contact stability at low voltages and currents, suitable for solid-state circuits with currents ³ 1 mA at a voltage of 17 V.

Surge suppression

RC elements, varistors, diodes or diode assemblies (combination of a diode and a Zener diode) can be plugged onto all contactor relays from the front for damping opening surges in the coil. The plug-in direction is determined by a coding device.

Note:

The OFF-delay times of the NO contacts and the ON-delay times of the NC contacts increase if the contactor coils are damped against voltage peaks (noise suppression diode 6 to 10 times; diode assemblies 2 to 6 times, varistor +2 to 5 ms).

Integration

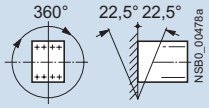
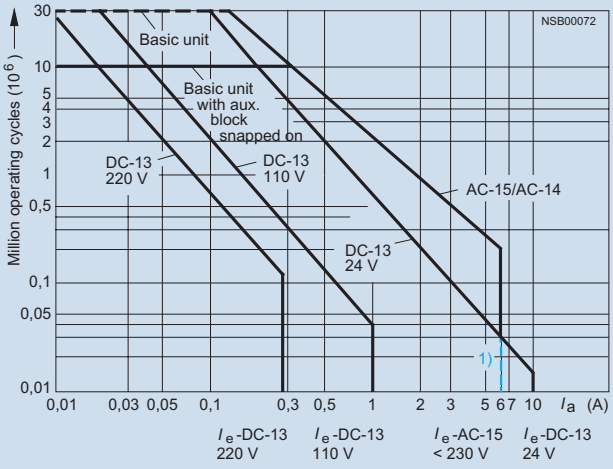
Auxiliary switch blocks

The 3RH1 contactor relays can be expanded by up to four contacts by the addition of mountable auxiliary switch blocks.

The auxiliary switch block can easily be snapped onto the front of the contactors. The auxiliary switch block has a centrally positioned release lever for disassembly.

All contactor relays with 4 contacts according to EN 50011, identification numbers 40E to 22E, can be extended with auxiliary switch blocks 40 to 02 to obtain contactor relays with 6 or 8 contacts in accordance with EN 50005. The identification numbers on the auxiliary switch blocks apply only to the attached auxiliary switch blocks.

Technical specifications

Contactor	Type Size	**3RH1** **S00**
Permissible mounting position		
The contactors are designed for operation on a vertical mounting surface.	AC and DC operation	
Positively-driven operation of contacts in contactor relays		
3RH1: **Yes,** in the basic unit and the auxiliary switch block as well as between the basic unit and the snap-on auxiliary switch block (removable) acc. to: • ZH 1/457 • EN 60947-5-1, Appendix L *Note: 3RH19 11- . NF . solid-state compatible auxiliary switch blocks have no positively-driven contacts.*		Explanations: There is positively-driven operation if it is ensured that the NC and NO contacts cannot be closed at the same time. **ZH1/457** Safety rules for control units on power-operated presses in the metal-working industry. **EN 60947-5-1, Appendix L** Low-voltage controlgear, control equipment, and switching elements. Special requirements for positively-driven contacts
Contact reliability		
Contact reliability at 17 V, 1 mA acc. to EN 60947-5-4		Frequency of contact faults $<10^{-8}$, i.e. <1 fault per 100 million operating cycles
Contact endurance for AC-15/AC-14 and DC-13 utilization categories		
The contact endurance is mainly dependent on the breaking current. It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system. If magnetic circuits other than the contactor coil systems or solenoid valves are present, e.g. magnetic brakes, protective measures for the load circuits are necessary. RC elements and freewheel diodes would be suitable as protective measures. The characteristic curves apply to: • 3RH11, 3RH12 contactor relays • 3RH14 latched contactor relays • 3RH19 11 auxiliary switch blocks.		 Diagram legend: I_a = Breaking current I_e = Rated operational current

1) Snap-on auxiliary switch blocks: I_e/DC-13 max. 6 A.

3RH1 contactor relays, 4- and 8-pole

Contactor	Type Size		3RH11, 3RH12 S00	3RH14
CSA and UL rated data				
Basic units and auxiliary switch blocks				
• Rated control supply voltage		V AC	max. 600	
• Rated voltage		V AC	600	
• Switching capacity			A 600, Q 600	
• Uninterrupted current at 240 V AC		A	10	
General data				
Mechanical endurance	Basic units	Operating cycles	30 million	5 million
	Basic unit with snap-on auxiliary switch block	Operating cycles	10 million	
	Solid-state compatible auxiliary switch block	Operating cycles	5 million	
Rated insulation voltage U_i (degree of pollution 3)		V	690	
Rated impulse withstand voltage U_{imp}		kV	6	
Safe isolation between the coil and the contacts in the basic unit acc. to EN 60947-1, Appendix N		V	400	
Permissible ambient temperature	During operation During storage	°C °C	-25 ... +60 -55 ... +80	
Degree of protection acc. to EN 60947-1, Appendix C			IP20, coil assembly IP40	
Touch protection acc. to EN 50274			Finger-safe	
Shock resistance				
Rectangular pulse Sine pulse	AC/DC operation AC/DC operation	g/ms g/ms	10/5 and 5/10 15/5 and 8/10	
Conductor cross-sections				
Screw terminals	**Auxiliary conductor and coil terminals**		**Screw terminals**	
(1 or 2 conductors can be connected)	• Solid	mm²	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) acc. to IEC 60947; max. 2 x (1 ... 4)	
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5)	
	• AWG cables, solid or stranded	AWG	2 x (20 ... 16) 2 x (18 ... 14) 1 x 12	
	• Terminal screws - tightening torque	 Nm	M3 0.8 ... 1.2 (7 ... 10.3 lb.in)	
Short-circuit protection				
(weld-free protection at $I_k \geq 1$ kA)				
• Fuse links, gL/gG operational class - DIAZED, Type 5SB - NEOZED, Type 5SE		 A A	 10 10	
• Or miniature circuit breakers with C characteristic (short-circuit current Ik < 400 A)		A	6	

Maximum external diameter of the conductor insulation: 3.6 mm

Contactor	Type			3RH1 .
	Size			S00
Control				
Magnetic coil operating range				
AC operation		at 50 Hz		0.8 ... 1.1 x U_s
		at 60 Hz		0.85 ... 1.1 x U_s
DC operation		at +50 °C		0.8 ... 1.1 x U_s
		at +60 °C		0.85 ... 1.1 x U_s
Power consumption of the magnetic coils (when coil is cold and 1.0 x U_s)				
AC operation, 50 Hz	• Closing		VA/p.f.	27/0.8
	• Closed		VA/p.f.	4.6/0.27
AC operation, 60 Hz	• Closing		VA/p.f.	24/0.75
	• Closed		VA/p.f.	3.5/0.27
DC operation	Closing = Closed		W	3.2
Operating times[1] (Total break time = OFF-delay + Arcing time)				
AC operation	Values apply with coil in cold state and at operating temperature for operating range			
Closing				
• ON-delay of NO contact	0.8 ... 1.1 x U_s		ms	8 ... 35
	1.0 x U_s		ms	10 ... 25
	3RH14 minimum operating time		ms	≥ 35
• OFF-delay of NC contact	0.8 ... 1.1 x U_s		ms	6 ... 20
	1.0 x U_s		ms	7 ... 20
Opening				
• OFF-delay of NO contact	0.8 ... 1.1 x U_s		ms	4 ... 30
	1.0 x U_s		ms	5 ... 30
	3RH14 minimum operating time		ms	≥ 30
• ON-delay of NC contact	0.8 ... 1.1 x U_s		ms	5 ... 30
	1.0 x U_s		ms	7 ... 20
DC operation				
Closing				
• ON-delay of NO contact	0.8 ... 1.1 x U_s		ms	25 ... 100
	1.0 x U_s		ms	30 ... 50
	3RH14 minimum operating time		ms	≥ 100
• OFF-delay of NC contact	0.8 ... 1.1 x U_s		ms	20 ... 90
	1.0 x U_s		ms	25 ... 45
Opening				
• OFF-delay of NO contact	0.8 ... 1.1 x U_s		ms	7 ... 10
	1.0 x U_s		ms	7 ... 9
	3RH14 minimum operating time		ms	≥ 30
• ON-delay of NC contact	0.8 ... 1.1 x U_s		ms	13 ... 16
	1.0 x U_s		ms	13 ... 15
Arcing time			ms	10 ... 15
Dependence of the switching frequency z' on the operational current I' and operational voltage U' $z' = z \cdot I_e/I' \cdot (U_e/U')^{1.5} \cdot 1/h$				
Load side				
Rated operational currents I_e				
AC-12			A	10
AC-15/AC-14		up to 230 V	A	6
for rated operational voltage U_s		400 V	A	3
		500 V	A	2
		690 V	A	1
DC-12 for rated operational voltage U_s				
• 1 conducting path		24 V	A	10
		110 V	A	3
		220 V	A	1
		440 V	A	0.3
• 2 conducting paths in series		24 V	A	10
		110 V	A	4
		220 V	A	2
		440 V	A	1.3
• 3 conducting paths in series		24 V	A	10
		110 V	A	10
		220 V	A	3.6
		440 V	A	2.5
DC-13 for rated operational voltage U_s				
• 1 conducting path		24 V	A	10[2]
		110 V	A	1
		220 V	A	0.3
		440 V	A	0.14
• 2 conducting paths in series		24 V	A	10
		110 V	A	1.3
		220 V	A	0.9
		440 V	A	0.2
• 3 conducting paths in series		24 V	A	10
		110 V	A	3
		220 V	A	1.2
		440 V	A	0.5
Switching frequency z				
• In operating cycles/h		AC-12/DC-12		1000
during normal duty		AC-15/AC-14		1000
for utilization category		DC-13		1000
• No-load switching frequency			h^{-1}	10000
Dependence of the switching frequency z' on the operational current I' and operational voltage U' $z' = z \cdot I_e/I' \cdot (U_e/U')^{1.5} \cdot 1/h$				

1) The OFF-delay of the NO contact and the ON-delay of the NC contact are increased if the contactor coils are attentuated against voltage peaks (noise suppression diode 6 to 10 times; diode assemblies 2 to 6 times, varistor +2 to 5 ms).

2) Snap-on auxiliary switch blocks: 6 A.

3RH14 latched contactor relays, 4-pole

Overview

AC and DC operation

IEC 60947, EN 60947 (VDE 0660).

The terminal designations comply with EN 50011.

The contactor coil and the coil of the release solenoid are both designed for continuous duty.

The number of auxiliary contacts can be extended by means of auxiliary switch blocks (up to 4 poles).

RC elements, varistors diodes or diode assemblies can be fitted to both coils from the front for damping opening surges in the coil.

The contactor relay can also be switched on and released manually. (For minimum actuating times, see page 2a/73).

Application

DC operation

IEC 60947 and EN 60947 (VDE 0660).

The 3RH11 coupling relays for switching auxiliary circuits are tailored to the special requirements of working with electronic controls.

The 3RH11 coupling relays cannot be extended with auxiliary switch blocks.

Function

No auxiliary switch blocks can be snapped onto 3RH11 coupling relays.

Coupling relays have a low power consumption, an extended magnetic coil operating range and an integrated surge suppressor for damping opening surges (exceptions: 3RH11 . . - . HB40 and 3RH11 . . - . MB4 . -0KT0).

Technical specifications

All technical specifications not mentioned in the table below are identical to those of the 3RH11 contactor relays (see page 3/69).
The size S00 coupling relays (3RH11) cannot be extended with auxiliary switch blocks.

Contactor type Size		**3RH11 . . - . HB40** S00	**3RH11 . . - . JB40** S00	**3RH11 . . - . KB40** S00
Magnetic coil operating range		0.7 ... 1.25 x U_s		
Power consumption of the magnetic coil (for cold coil) Closing = closed				
At U_s = 17 V	W	1.2		
At U_s = 24 V	W	2.3		
At U_s = 30 V	W	3.6		
Permissible residual current of the electronics for 0 signal		<10 mA x (24 V/U_s)		
Overvoltage configuration of the magnetic coil		No overvoltage damping 	With diode 	With varistor 
Operating times				
• **Closing** at 17 V				
- ON-delay NO	ms	40 ... 120		
- OFF-delay NC	ms	30 ... 70		
• At 24 V				
- ON-delay NO	ms	30 ... 60		
- OFF-delay NC	ms	20 ... 40		
• At 30 V				
- ON-delay NO	ms	20 ... 50		
- OFF-delay NC	ms	15 ... 30		
• **Closing** at 17 ... 30 V				
- OFF-delay NO	ms	7 ... 17	40 ... 60	7 ... 17
- ON-delay NC	ms	22 ... 30	60 ... 70	22 ... 30
Upright mounting position		Please ask		

3RT10 coupling relays (interface), 3-pole, 3 ... 11 kW

Application

DC operation

IEC 60947, EN 60947 (VDE 0660).

The 3RT10 coupling relays for switching motors are tailored to the special requirements of working with electronic controls.

The 3RT10 1 coupling relays cannot be extended with auxiliary switch blocks.

Two single-pole auxiliary switch blocks can be fitted to the 3RT10 2 coupling relays.

Function

Coupling relays have a low power consumption, an extended operating range of the magnetic coil and an integrated surge suppressor for damping opening surges (exceptions: 3RT10 1 . -1HB4 . and 3RT10 1 . - . MB4 . -0KT0).

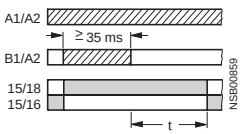
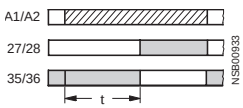
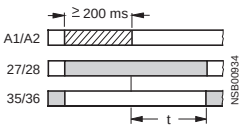
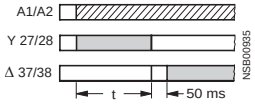
Technical specifications

All technical specifications not mentioned in the table below are identical to those of the 3RT10 contactors for switching motors. (See Page 3/6)The 3RT10 1 . coupling relays cannot be extended with auxiliary switch blocks. Two single-pole auxiliary switch blocks can be fitted to the 3RT10 2 . coupling relays (see Accessories).

Contactors	Type Size			3RT10 1 . - . HB4 . S00	3RT10 1 . - . JB4 . S00	3RT10 1 . - . KB4 . S00	3RT10 2 . - . KB4 . S0
General data							
Mechanical endurance			Operating cycles	30 million			10 million
Safe isolation between the coil and the main contacts acc. to EN 60947-1, Appendix N			V	400			
Control							
Magnetic coil operating range				0.7 ... 1.25 x U_s			
Power consumption of the magnetic coil		at U_s 17 V	W	1.2			2.1
(for cold coil)		24 V	W	2.3			4.2
Closing = closed		30 V	W	3.6			6.6
Permissible residual current of the electronics (for 0 signal)				< 10 mA x (24 V/U_s)			< 6 mA x (24 V/U_s)
Overvoltage configuration of the magnetic coil				No overvoltage damping 	With diode 	With varistor 	With varistor 
Operating times of the coupling relays							
• Closing							
- at 17 V	ON-delay NO		ms	40 ... 120			93 ... 270
	OFF-delay NC		ms	30 ... 70			83 ... 250
- at 24 V	ON-delay NO		ms	30 ... 60			64 ... 87
	OFF-delay NC		ms	20 ... 40			55 ... 78
- at 30 V	ON-delay NO		ms	20 ... 50			53 ... 64
	OFF-delay NC		ms	15 ... 30			45 ... 56
• Opening at 17... 30 V	OFF-delay NO		ms	7 ... 17	40 ... 60	7 ... 17	18 ... 19
	ON-delay NC		ms	22 ... 30	60 ... 70	22 ... 30	24 ... 25

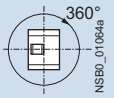
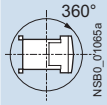
All technical specifications not mentioned in the table below are identical to those of the 3RT10 contactors for switching motors. (See Page 2a/6)The 3RT10 1 . coupling relays cannot be extended with auxiliary switch blocks. Power consumption of the coils 1.4 W at 24 V.

Contactor Type			3RT19 . 6-2E	3RT19 . 6-2F	3RT19 . 6-2G
			Solid-state time-delay auxiliary switch blocks		
Rated insulation voltage U_i Degree of pollution 3 Overvoltage category III acc. to EN 60664-1		V AC	250		
Operating range of excitation			0.85 ... 1.1 x U_s, 0.95 ... 1.05 times rated frequency		
Rated power		W	2		
Power consumption at 230 V AC, 50 Hz		VA	4		
Rated operational currents I_e					
• AC-15, 230 V, 50 Hz		A	3		
• DC-13, 24 V		A	1		
• DC-13, 110 V		A	0.2		
• DC-13, 230 V		A	0.1		
DIAZED protection gL/gG operational class		A	4		
Switching frequency for load					
• With I_e 230 V AC		h^{-1}	2500		
• With 3RT10 16 contactor, 230 V AC		h^{-1}	5000		
Recovery time		ms	150		
Minimum ON period		ms	200 (with OFF-delay)		
Setting accuracy with reference to upper limit of scale	typ.	%	±15		
Repeat accuracy	Max.	%	±1		
Mechanical endurance		Operating cycles	10×10^6		
Permissible ambient temperature					
• During operation		°C	-25 ... +60		
• During storage		°C	-40 ... +80		
Degree of protection acc. to EN 60947-1, Appendix C					
• Cover			IP40		
• Terminals			IP20		
Conductor connections					
• Solid		mm^2	2 x (0.5 ... 1.5), 2 x (0.75 ... 4)		
• Finely stranded with end sleeve		mm^2	2 x (0.5 ... 2.5)		
• AWG cables, solid or stranded		AWG	2 x (18 ... 14)		
Terminal screws			M3		
• Tightening torque		Nm	0.8 ... 1.2		
Permissible mounting position			Any		
Shock resistance Half-sine acc. to IEC 60068-2-27		g/ms	15/11		
Vibration resistance acc. to IEC 60068-2-6		Hz/mm	10 ... 55/0.35		
EMC tests	Basic specification		IEC 61000-6-4		
Overvoltage protection			—		

Function table 3RT19 16, 3RT19 26	Function chart	3RT19 16 timing relays		3RT19 26 timing relays	
Function	Timing relay energized Contact closed Contact open	3RP19 16-2E	3RT19 16-2F	3RT19 16-2G	3RT19 16-2L
1 CO contact					
OFF-delay with auxiliary voltage					■
1 NO + 1 NC					
ON-delay (varistor integrated)		■			
OFF-delay without auxiliary voltage (varistor integrated)			■		
2 NO					
Wye-delta function (varistor integrated) 1 NO delayed, 1 NO instantaneous, dead time 50 ms				■	

■ Function is possible

Accessories for 3RT, 3RH contactors and contactor relays

Versions			3RT19 16-2BE01 OFF-delay devices	3RT19 16-2BK01	3RT19 16-2BL01
Connectable contactor sizes Caution! Only contactors and contactor relays with DC operation can be connected.					
• DC supply			S00 ... S3	S00/S0	S00/S0
• AC supply			—	S00/S0	S00/S0
	Type		3RT10 . . -1BB4 . , 3RH1 . . . -1BB40	3RT10 1 . -1BF4, 3RT10 2 . -1BF4, 3RH1 . . . -1BF40 .	3RT10 1.-1BM4./1BP4., 3RT10 2.-1BM4./1BP4. , 3RH1... -1BM40/1BP40
Permissible mounting position					
Rated control supply voltage U_s Operating range		V	24 (DC) 0.9 ... 1.1 U_s	110 (UC)	220/230 (UC)
Rated frequency/ies with AC supply	f	Hz ±5 %	—	50/ 60	50/ 60
Ambient temperature permissible:					
• During operation - side-by-side mounting without distance	T_u	°C	-25 ... +50		
- series-mounting with 5 mm distance	T_u	°C	-25 ... +60		
• During storage	T_u	°C	-40 ... +80		
OFF-delay[1] (minimum times at U_{sp} = 0.9 x U_s, T_{sp} = 20 °C)			Note: In practice the mean value is 1.5 times the minimum time.		
• S00	t_{off} >	ms	250	130	600
• S0	t_{off} >	ms	150	100	400
• S2 (only for DC supply)	t_{off} >	ms	90	—	—
• S3 (only for DC supply)	t_{off} >	ms	70	—	—
Installed capacity C 3RT19 16-2B . 01 Capacitor voltage		µF V	2000 35	68 180	68 350
ON-delay (maximum at U_{sp} = 0.9 x U_s, T_{sp} = 20 °C)			Note: The total ON-delay = Contactor make-time + t_{on}		
• S00	t_{on} <	ms	10	60	200
• S0	t_{on} <	ms	10	80	250
Mechanical endurance		Operating cycles	30 million		
Endurance, electrical approx.		Operating cycles	>1 million		
Switching frequency z max. (at T_u = 60 °C)		h^{-1}	300		
Power loss P_v max. approx.		W	0.4	0.5	1
Surge suppression			with varistor, integrated		
Conductor cross-sections U_{sp} = Coil voltage T_{sp} = Coil temperature			[2]		

1) Doubling the delay time can be achieved by doubling the capacitance. Commercially available capacitors can be used, which can be connected to terminals C+ and Z−.

2) See 3RT10 1 contactors, Page 2a/8.

Contactor	Type			3RT19 26-2P . Pneumatic delay block[1]
General data				
Mechanical endurance		Operating cycles		5 million
Electrical endurance at I_e		Operating cycles		1 million
Rated insulation voltage U_i (degree of pollution 3)			V	690
Permissible ambient temperature				
• During operation			°C	-25 ... +60
• During storage			°C	-50 ... +80
Rated operational currents I_e acc. to utilization categories EN 60947				
• AC-12			A	10
• AC-15/AC-14 at U_e	up to 230/220 V		A	6
	400/380 V		A	4
	500 V		A	2.5
	690/660 V		A	1.5
• DC-13 at U_e	24 V		A	4
	48 V		A	2
	110 V		A	0.7
	220 V		A	0.3
	440 V		A	0.15
Conductor cross-sections				
• Solid, stranded:			mm^2	2 x 0.5 ... 2.5[2] or 2 x 2.5 ... 4[2]
• Finely stranded with end sleeve			mm^2	2 x 0.5 ... 2.5
• AWG cables			AWG	2 x 22 ... 12
Tightening torque of the terminal screws			Nm	0.8 ... 1.1
Time delay				
• Accuracy				±10 %
CSA and UL rated data				
• Rated voltage			V AC	600
• Switching capacity				A 600, Q 600

1) For size S0.
In addition to the pneumatic delay block, no other auxiliary contacts are permitted.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Accessories for 3RT, 3RH contactors and contactor relays

Contactor	Type		3RH19 24 Coupling links for mounting on contactors acc. to IEC 60947/EN 60947
General data			
Rated insulation voltage U_i (degree of pollution 3)		V	300
Safe isolation between the coil and the contacts acc. to EN 60947-1, Appendix N		V AC	Up to 300
Degree of protection acc. to EN 60947-1, Appendix C			
• Connections			IP20
• Enclosures			IP40
Permissible ambient temperature			
• During operation		°C	-25 ... +60
• During storage		°C	-40 ... +80
Conductor cross-section			
• Solid		mm²	2 x (0.5 ... 2.5)
• Finely stranded with end sleeve		mm²	2 x (0.5 ... 1.5)
Terminal screws			M3
Short-circuit protection (weld-free protection at $I_k \geq 1$ kA) Fuse links, gL/gG operational class LV HRC 3NA, DIAZED 5SB, NEOZED 5SE		A	6
Control side			
Rated control supply voltage U_s		V DC	24
Operating range		V DC	17 ... 30
Power consumption at U_s		W	0.5
Nominal current input		mA	20
Release voltage		V	≥ 4
Function display			Yellow LED
Protection circuit			Varistor
Load side			
Mechanical endurance	in million operating cycles		20
Electrical endurance at I_e	in million operating cycles		0.1
Switching frequency	Operating cycles	h^{-1}	5000
Make-time		ms	Approx. 7
Break-time		ms	Approx. 4
Bounce time		ms	Approx. 2
Contact material			AgSnO
Switching voltage		V AC/DC	24 ... 250
Permissible residual current of the electronics (for 0 signal)		mA	2.5
Rated operational currents[1] Continuous thermal current I_{th}		A	6
Rated operational currents I_e acc. to utilization categories EN 60947			
• AC-15	- at 24 V	A	3
	- at 110 V	A	3
	- at 230 V	A	3
• DC-13	- at 24 V	A	1
	- at 110 V	A	0.2
	- at 230 V	A	0.1
Switching current with resistive load to EN 60255 (relay standard) and EN 60947			
• AC-12	- at 24 V	A	6
	- at 110 V	A	6
	- at 230 V	A	6
• DC-12	- at 24 V	A	6
	- at 110 V	A	0.3
	- at 230 V	A	0.2[1]

1) Capacitive loads can result in micro-weldings on the contacts.

Overview

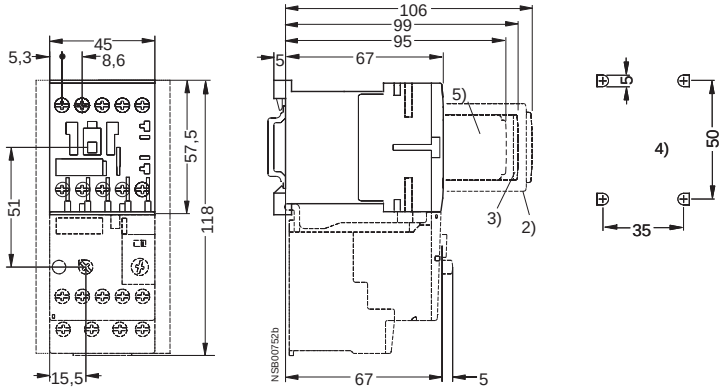
Dimensional drawings

Dimensional drawings

3RT10 contactors, 3-pole

3RT10 1 contactors, size S00

Screw terminals
with surge suppressor, auxiliary switch block and mounted overload relay

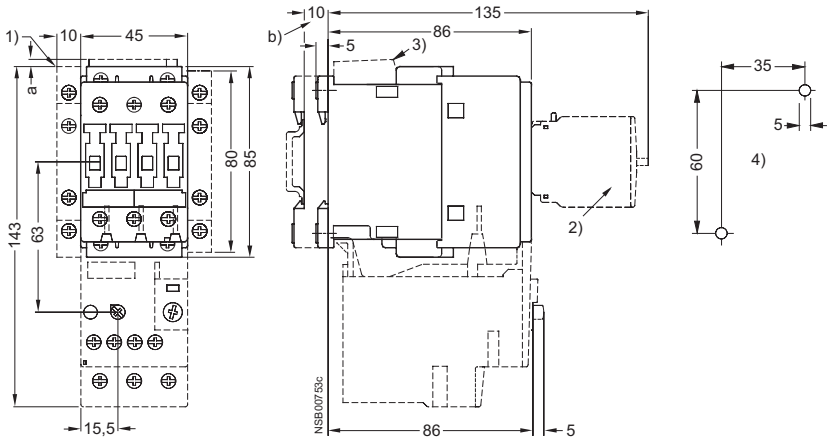


Lateral distance to
grounded components = 6 mm

2) Auxiliary switch block
3) Surge suppressor
4) Drilling pattern
5) Auxiliary switch block
1-pole

3RT10 2 contactors, 3RT10 2 coupling relays, size S0

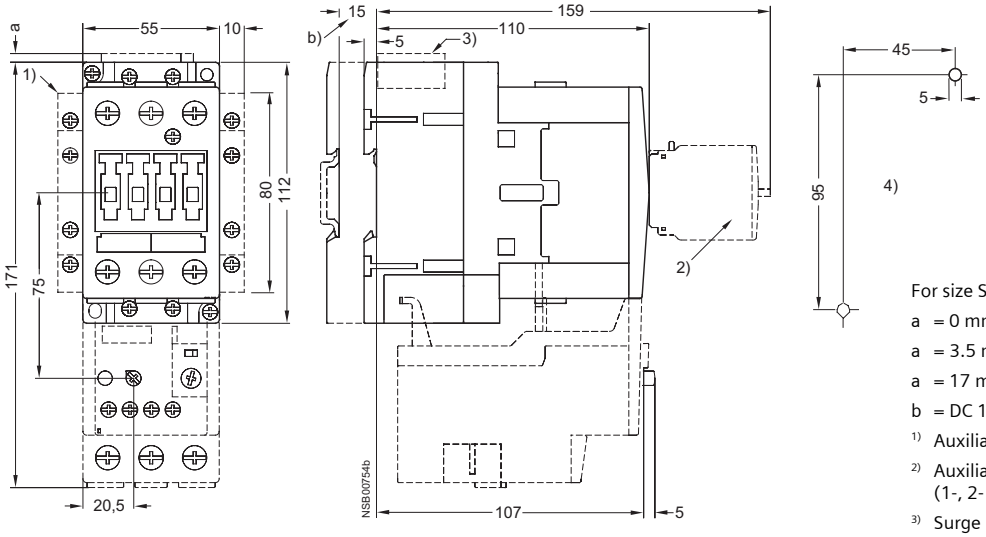
Screw terminals
with surge suppressor, auxiliary switch blocks and mounted overload relay



For size S0:
a = 3 mm at < 240 V
a = 7 mm at > 240 V
b = DC 10 mm deeper than AC
1) Auxiliary switch block, laterally mountable
2) Auxiliary switch block, mountable on the front, 1-, 2- and 4-pole
3) Surge suppressor
4) Drilling pattern

3RT10 3 contactors, size S2

Screw terminals
with surge suppressor, auxiliary switch blocks and mounted overload relay

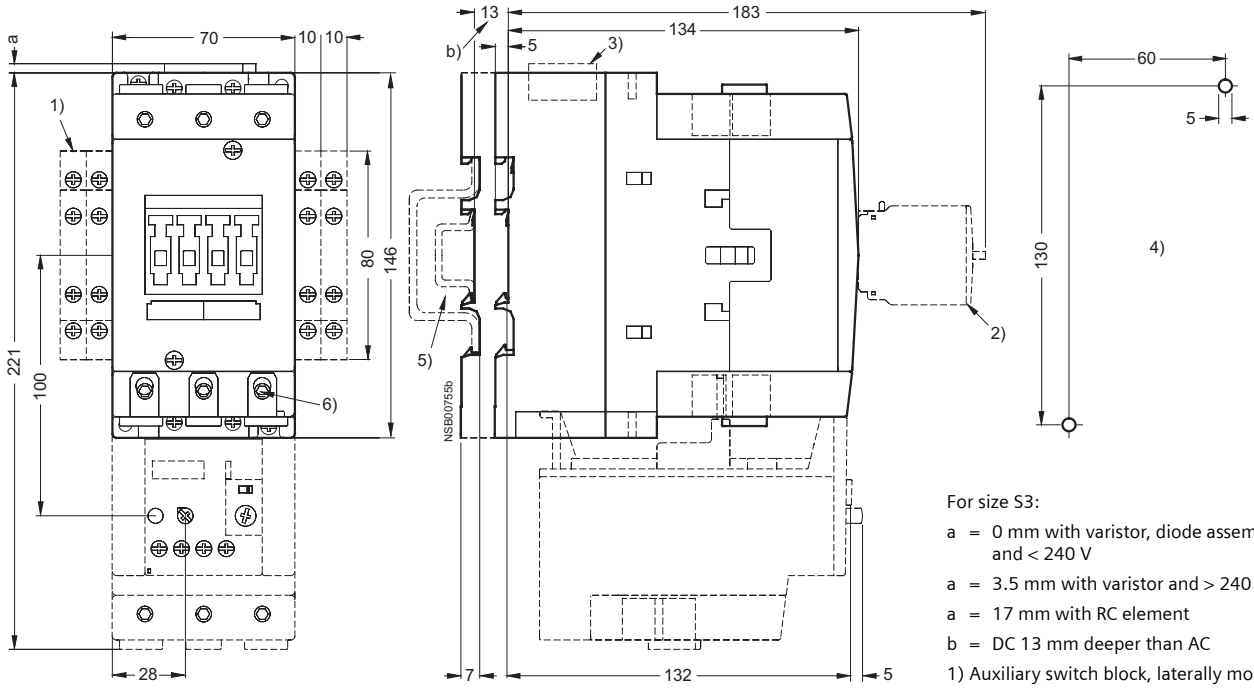


For size S2:
a = 0 mm with varistor < 240 V, diode assembly
a = 3.5 mm with varistor > 240 V
a = 17 mm with RC element
b = DC 15 mm deeper than AC
1) Auxiliary switch block, laterally mountable
2) Auxiliary switch block, mountable on the front, (1-, 2- and 4-pole)
3) Surge suppressor
4) Drilling pattern

3RT10 4, 3RT14 46 contactors, size S3

Screw terminals
with surge suppressor, auxiliary switch blocks and mounted overload relay

Lateral distance to
grounded components = 6 mm



For size S3:

a = 0 mm with varistor, diode assembly and < 240 V

a = 3.5 mm with varistor and > 240 V

a = 17 mm with RC element

b = DC 13 mm deeper than AC

1) Auxiliary switch block, laterally mountable

2) Auxiliary switch block, mountable on the front (1-, 2- and 4-pole),

3) Surge suppressor

4) Drilling pattern

5) For mounting on TH 35 standard mounting rail according to EN 60715 (15 mm deep) or TH 75 standard mounting rail according to EN 60715

6) Allen screw 4 mm

3RT10 coupling relays, size S00

with surge suppressor

Deviating dimensions for coupling relays
with Cage Clamp terminals:
Height: 60 mm

3) Surge suppressor

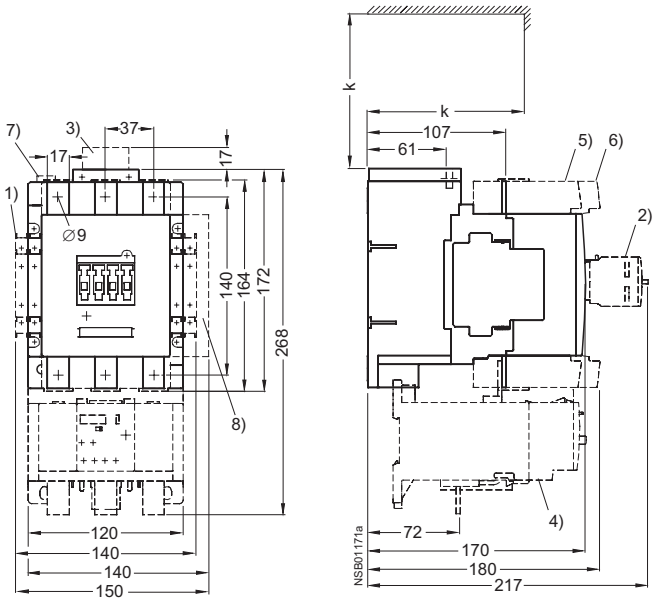
4) Drilling pattern

Project planning aids

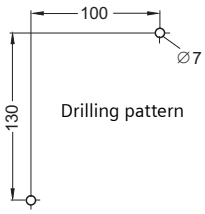
3RT10 and 3RT14 contactors, 3-pole

3RT10 5, 3RT14 5 contactors, size S6

with lateral and front mounted auxiliary switch block
mounted overload relay and box terminals,
lateral solid-state module with remaining lifetime indicator



Distance from grounded parts
Lateral: 10 mm
Front: 20 mm



For size S6:

k = 120 mm (minimum clearance for removing the withdrawable coil)

1) 2nd auxiliary switch block, lateral

2) Auxiliary switch block, mountable on the front

3) RC element

4) 3RB20 overload relay, mounted

5) 3RT19 55-4G box terminal block (Allen screw 4 mm)

6) 3RT19 56-4G box terminal block (Allen screw 4 mm)

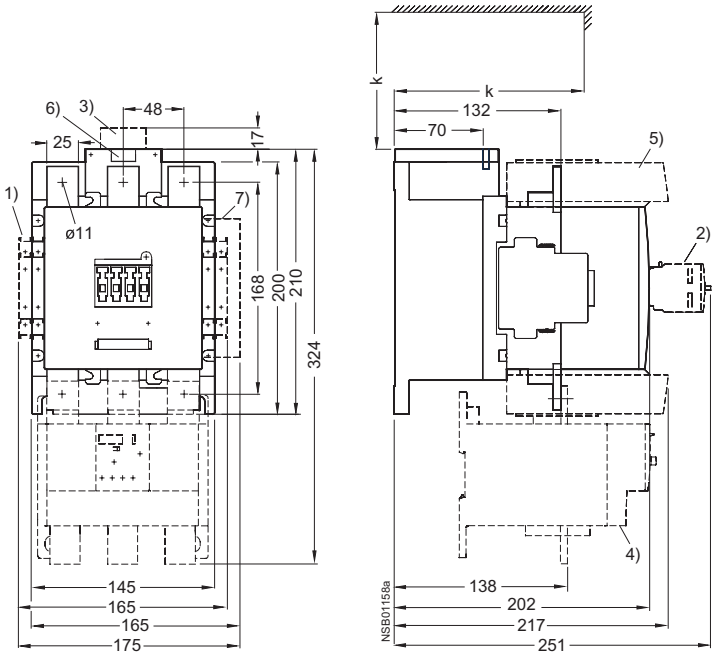
7) PLC connection 24 V DC and changeover switch (for 3RT1 . . . - . N)

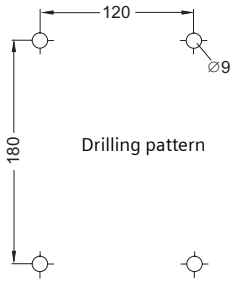
8) Solid-state module with remaining lifetime indicator (auxiliary switch block not mountable on right-hand side)

3RT10 and 3RT14 contactors, 3-pole

3RT10 6, 3RT14 6 contactors, size S10

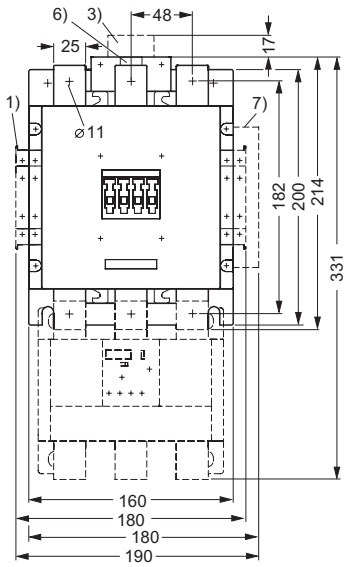
with lateral and front mounted auxiliary switch block
mounted overload relay and box terminals,
lateral solid-state module with remaining lifetime indicator

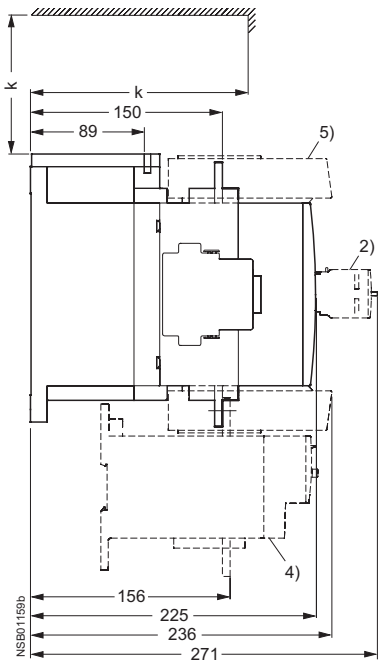


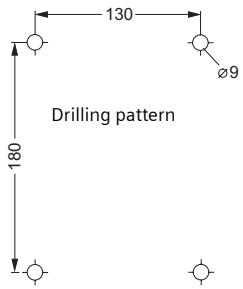


3RT10 7, 3RT14 7 contactors, size S12

with lateral and front mounted auxiliary switch block
mounted overload relay and box terminals,
lateral solid-state module with remaining lifetime indicator







For sizes S10 and S12:
Distance from grounded parts
Lateral: 10 mm
Front: 20 mm

For sizes S10 and S12:

k = 150 mm (minimum clearance for removing the withdrawable coil)

1) 2nd auxiliary switch block, lateral

2) Auxiliary switch block, mountable on the front

3) RC element

4) 3RB20 overload relay, mounted

5) Box terminal block (Allen screw 6 mm)

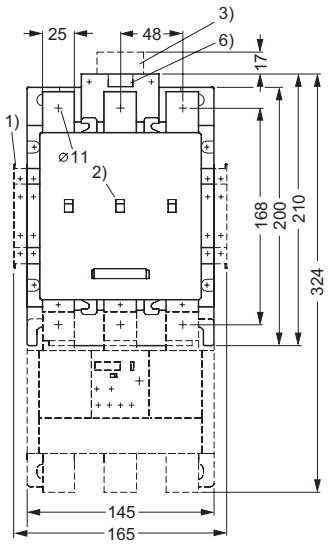
6) PLC connection 24 V DC and changeover switch (for 3RT1 . . . - . N)

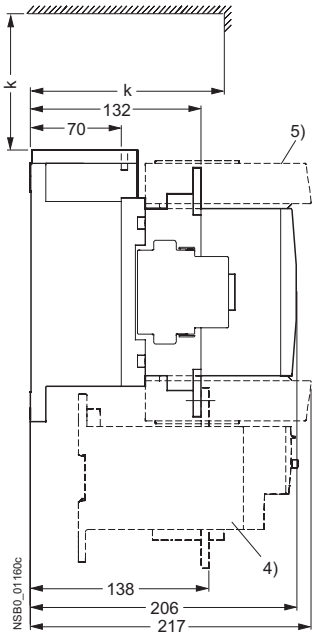
7) Solid-state module with remaining lifetime indicator (auxiliary switch block not mountable on right-hand side)

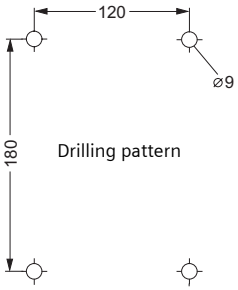
Project planning aids

3RT12 vacuum contactors, 3-pole

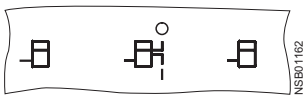
3RT12 6 vacuum contactors, size S10
with lateral auxiliary switch block,
mounted overload relay and box terminals



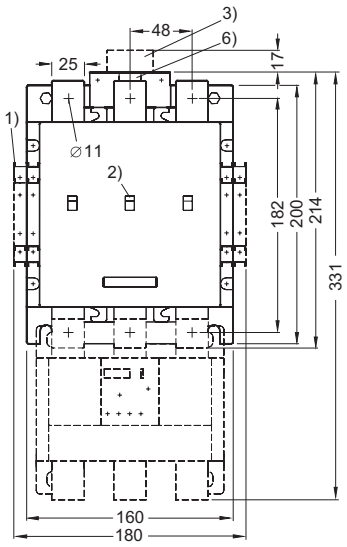


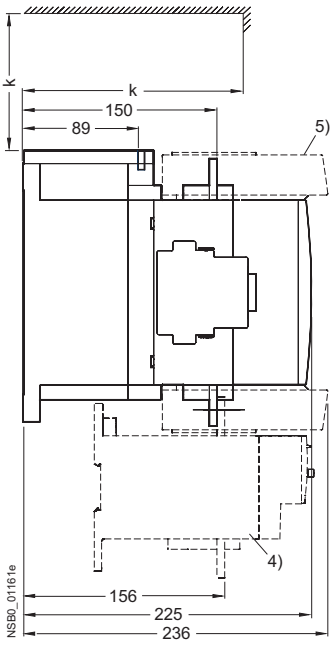


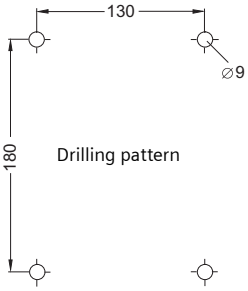
Detail for 2)
Contact erosion indication for vacuum tubes



3RT12 7 vacuum contactors, size S12
with lateral auxiliary switch block,
mounted overload relay and box terminals







For sizes S10 and S12:

k = 150 mm (minimum clearance for removing the withdrawable coil)

1) 2nd auxiliary switch block, lateral

2) Switch position and contact erosion indication

3) RC element

4) 3RB20 overload relay, mounted

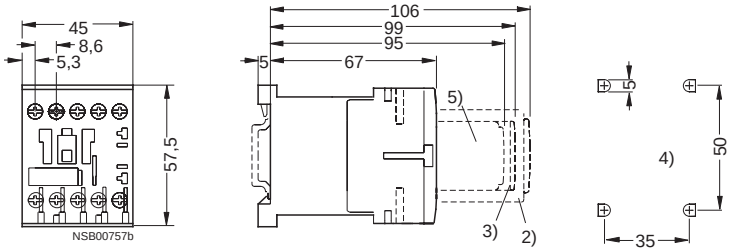
5) Box terminal block (Allen screw 6 mm)

6) PLC connection 24 V DC and changeover switch (for 3RT1 . . . - . N)

3RT13 and 3RT15 contactors, 4-pole

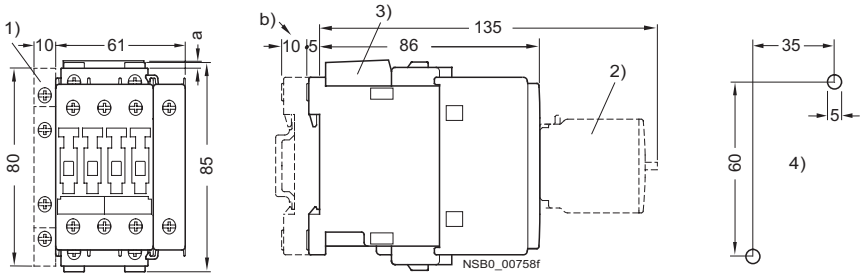
Lateral distance to grounded components = 6 mm

3RT13 1 and 3RT15 1 contactors, size S00,
Screw terminals with surge suppressor and auxiliary switch block



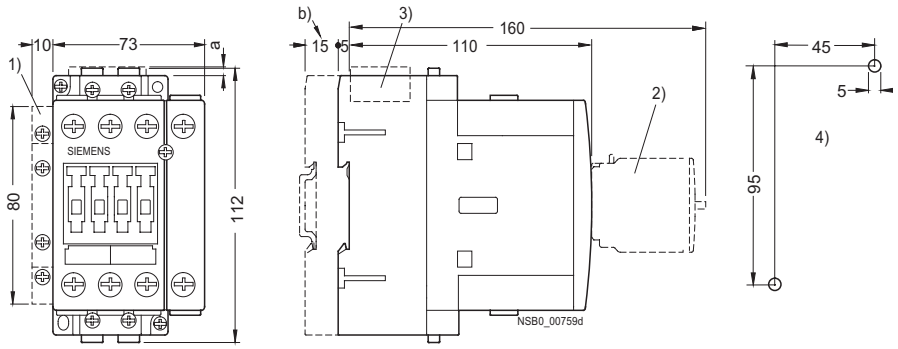
2) Auxiliary switch block
3) Surge suppressor
4) Drilling pattern
5) Auxiliary switch block 1-pole

3RT13 2 and 3RT15 2 contactors, size S0
with surge suppressor and auxiliary switch block



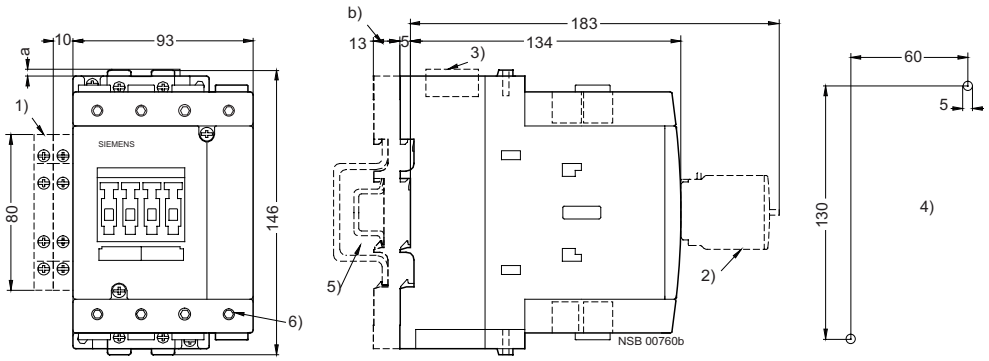
For size S0:
a = 3 mm at < 250 V and mounting of surge suppressor
a = 7 mm at > 250 V and mounting of surge suppressor
b = DC 10 mm deeper than AC
1) Auxiliary switch block, laterally mountable (left)
2) Auxiliary switch block, mountable on the front
3) Surge suppressor
4) Drilling pattern

3RT13 3 and 3RT15 3 contactors, size S2
with surge suppressor and auxiliary switch block



For sizes S2 and S3:
a = 0 mm with varistor < 240 V
a = 3.5 mm with varistor > 240 V
a = 17 mm with RC element and diode assembly
b = S2: DC 15 mm deeper than AC
S3: DC 13 mm deeper than AC
1) Auxiliary switch block, laterally mountable (right or left)
2) Auxiliary switch block, mountable on the front,
(1-, 2- and 4-pole)
3) Surge suppressor
4) Drilling pattern
5) For mounting on TH 35 standard mounting rail according to EN 60715 (15 mm deep) or for size S3 also to
TH 75 standard mounting rail according to EN 60715
6) Allen screw 4 mm

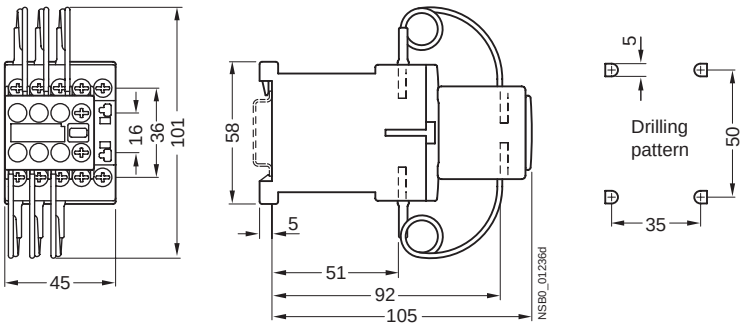
3RT13 4 contactors, size S3
with surge suppressor and auxiliary switch block



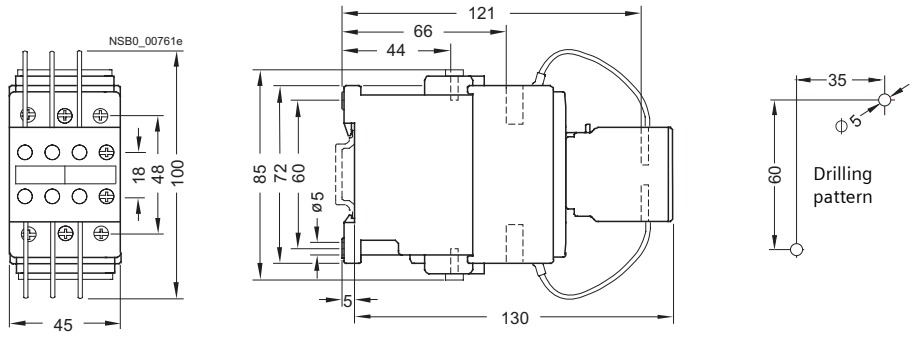
Project planning aids

3RT16 capacitor contactors

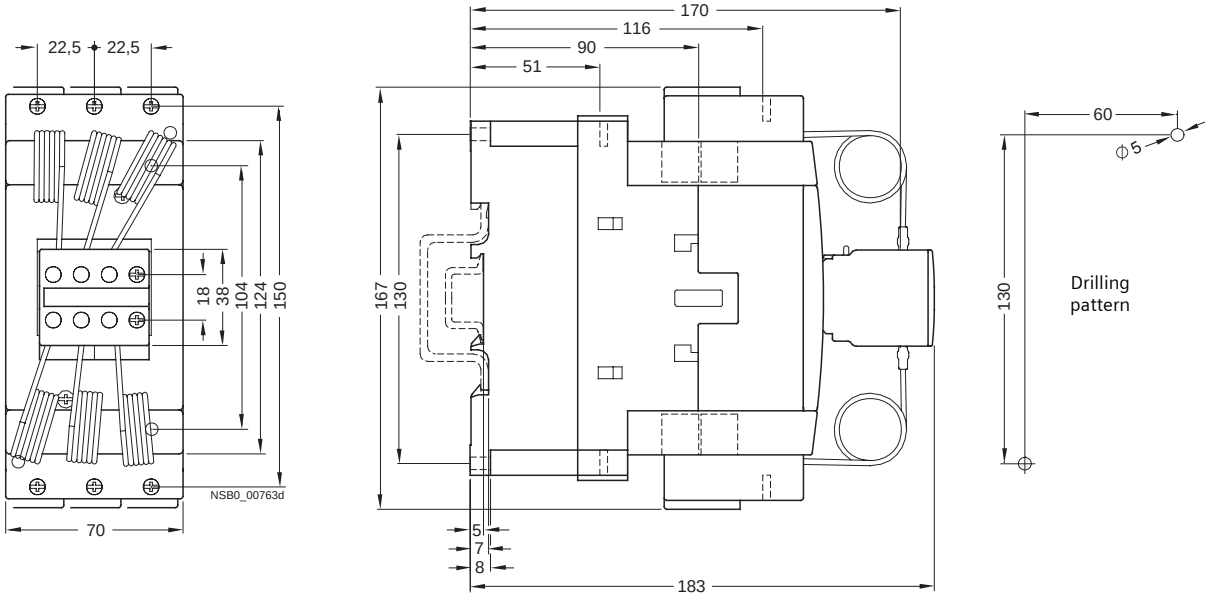
3RT16 17 capacitor contactors, size S00



3RT16 27 capacitor contactors, size S0

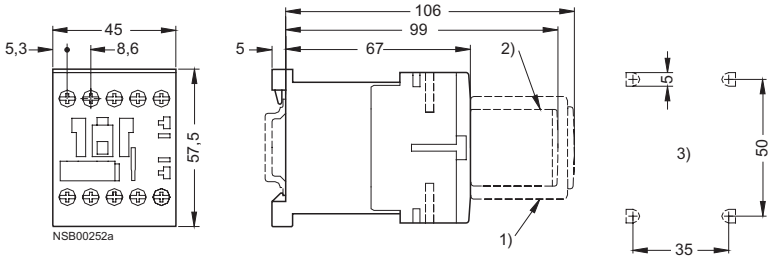


3RT16 47 capacitor contactors, size S3



3RH11 and 3RH14 contactor relays

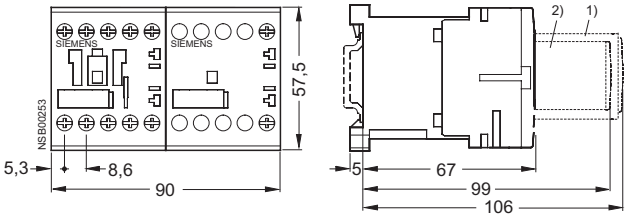
3RH11 contactor relays, size S00
with screw terminals,
with surge suppressor and auxiliary switch block



Lateral distance to
grounded components = 6 mm

1) Auxiliary switch block
2) Surge suppressor
3) Drilling pattern

3RH14 latched contactor relays, size S00
with surge suppressor and auxiliary switch block



3RH11 coupling relays

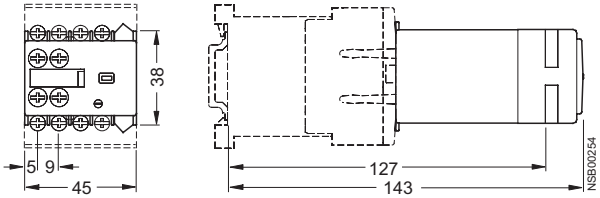
3RH11 coupling relays, size S00
with screw terminals,
with surge suppressor

1) Surge suppressor
2) Drilling pattern

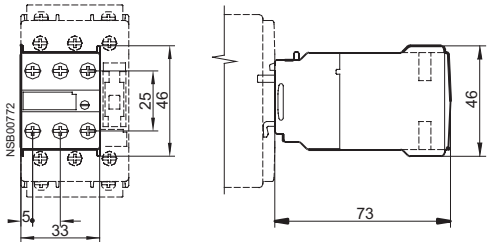
Project planning aids

Accessories for 3RT1 contactors

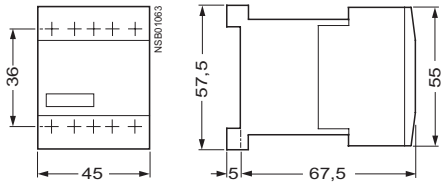
3RT19 16-2E . . ., 3RT19 16-2F . . ., 3RT19 16-2G . . .
solid-state, time-delay auxiliary switch blocks
for contactors, size S00



3RT19 26-2E . . ., 3RT19 26-2F . . ., 3RT19 26-2G . . .
solid-state, time-delay auxiliary switch blocks
for contactors, sizes S0 to S3

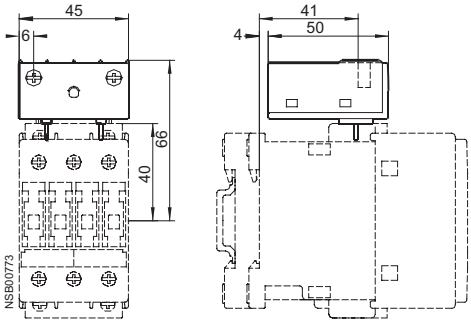


3RT19 16-2B.01
OFF-delay devices
for contactors, sizes S00 to S3



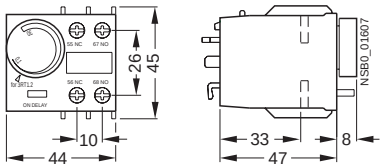
3RT19 26-2 . . .
solid-state time-delay blocks, ON-delay
Sizes S0 to S3

for mounting onto the top of the contactors
(the dimensions are also valid for time-delay blocks with an OFF-delay and for 3RH19 24-1GP11 coupling links)



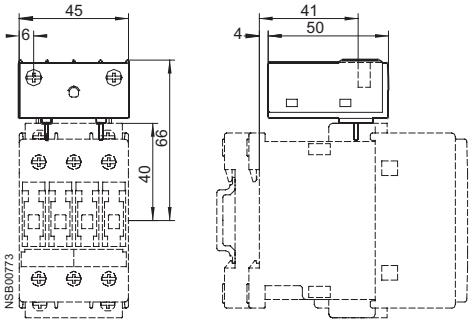
3RT19 26-2P..1
pneumatic delay block
for contactors, size S0

for mounting onto the front of 3RT1. 2 contactors



3RT19 26-2 . . .
solid-state time-delay blocks, ON-delay
Sizes S0 to S3

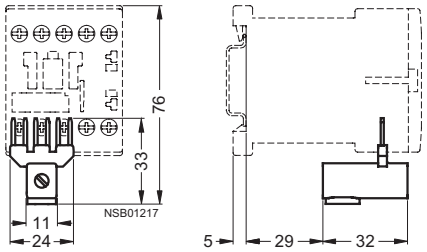
for mounting onto the top of the contactors
(the dimensions are also valid for time-delay blocks with an OFF-delay and for 3RH19 24-1GP11 coupling links)



Accessories for 3RT1 contactors

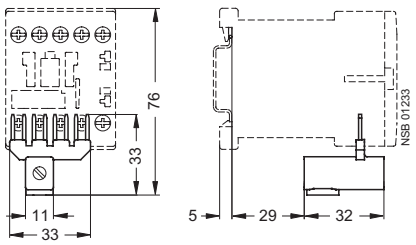
3RT19 16-4BB31
parallel connector
Size S00

3-pole, with terminal



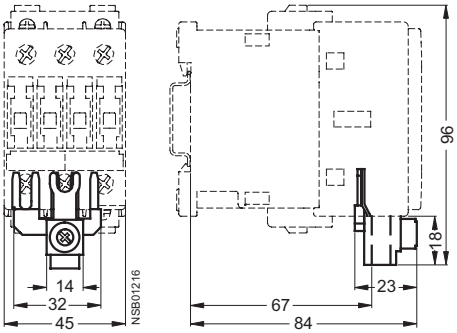
3RT19 16-4BB41
parallel connector
Size S00

4-pole, with terminal



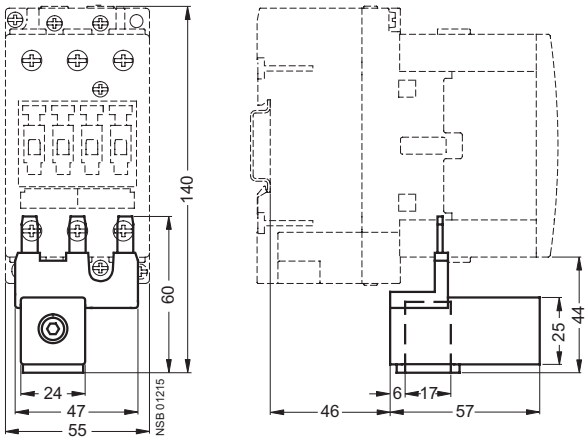
3RT19 26-4BB31
parallel connector
Size S0

3-pole, with terminal



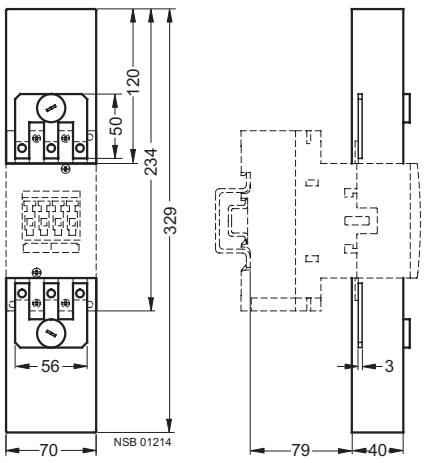
3RT19 36-4BB31
parallel connector
Size S2

3-pole, with terminal

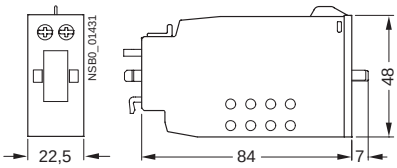


3RT19 46-4BB31
parallel connector
Size S3

3-pole, with through hole and cover for touch protection



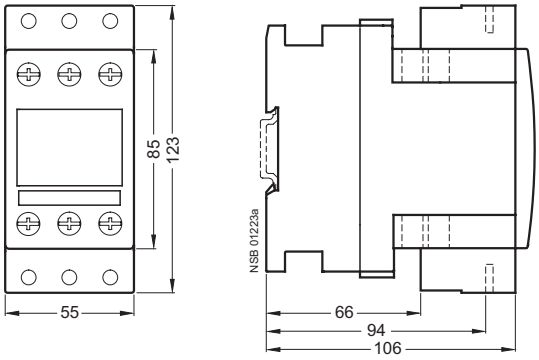
3RT19 26-3A.
mechanical latching block



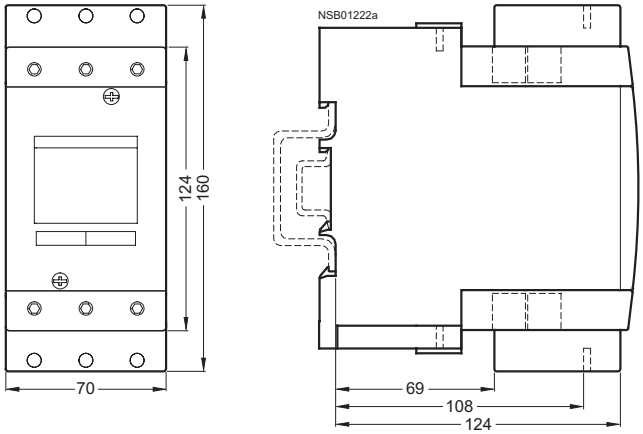
Project planning aids

Accessories for 3RT1 contactors

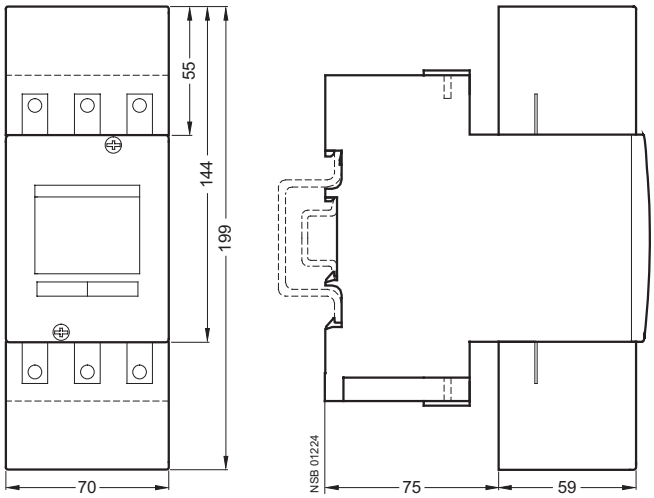
3RT19 36-4EA2 terminal cover for
box terminals
for size S2



3RT19 46-4EA2 terminal cover for
box terminals
for size S3



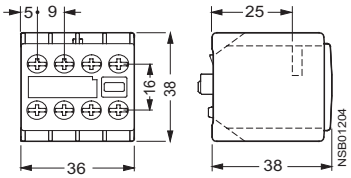
3RT19 46-4EA1 terminal cover for
cable lug and busbar connection
for size S3



Accessories for 3RT1 contactors

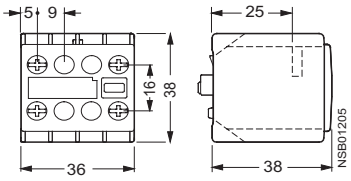
3RH19 11-1F . .
auxiliary switch block according to EN 50005
for size S00

Screw terminals
1- to 4-pole



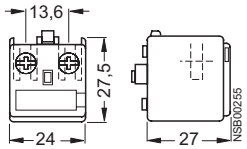
3RH19 11-. NF . .
solid-state compatible auxiliary switch block according to EN 50005
for size S00

Screw terminals



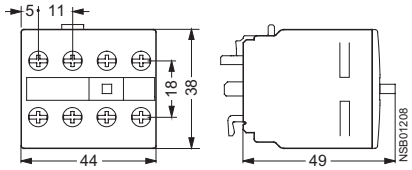
3RH19 11-1AA..
auxiliary switch block, 1-pole
Size S00

Cable entry from one side



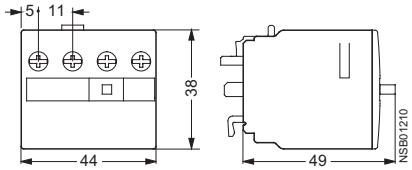
3RH19 21- . F . . .
auxiliary switch block according to EN 50005
for sizes S0 to S12

Screw terminals
4-pole



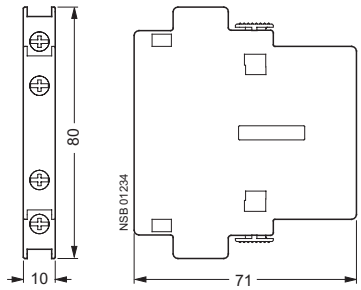
3RH19 21-1LA . .
auxiliary switch block according to EN 50005
for sizes S0 to S12

Screw terminals
2-pole
Cable entry from above



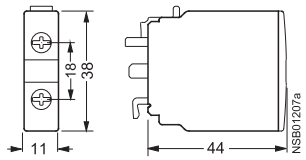
3RH19 21-1E . . ., 3RH19 21-1K . . .
auxiliary switch block, laterally mountable,
for sizes S0 to S12

Screw terminals
2-pole



3RH19 21- . C . . .
auxiliary switch block according to EN 50005
for sizes S0 to S12

Screw terminals
1-pole

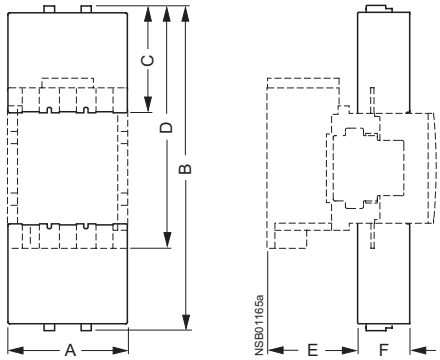


Project planning aids

Accessories for 3RT1 contactors

3RT19 .6-4EA1 terminal cover for busbar connection sizes S6 to S12

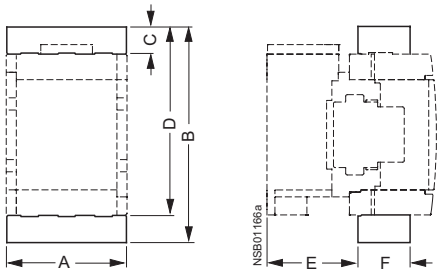
for mounting onto the contactor enclosure



	A	B	C	D	E	F
S6	119	324	107	241	91	52
S10	145	385	128	289	106	66
S12	145	399	128	303	124	66

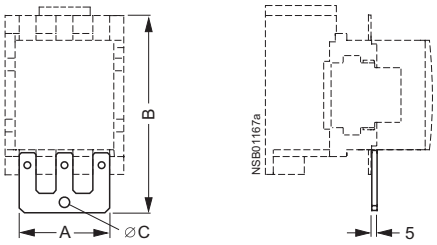
3RT19 .6-4EA2 terminal cover for box terminals sizes S6 to S12

for mounting onto box terminals



	A	B	C	D	E	F
S6	119	215	27	190	91	52
S10	145	265	30	235	106	66
S12	145	279	30	249	124	66

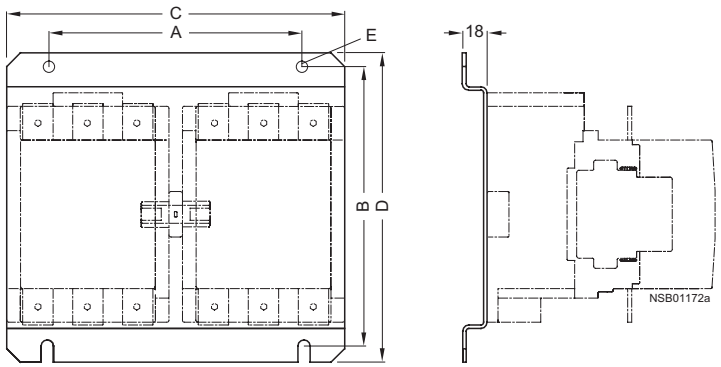
3RT19 .6-4BA31
links for paralleling
sizes S6 to S12



	A	B	ØC
S6	91	199	10.5
S10	121	244	12.5
S12	121	258	12.5

Accessories for 3RA1 contactor assemblies

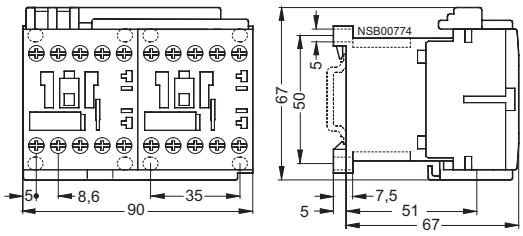
3RA19 .2-2A base plates for reversing contactor assemblies



	A	B	C	D	E
S6	190	205	250	229	9
S10	240	249	300	275	11
S12	280	249	330	275	11

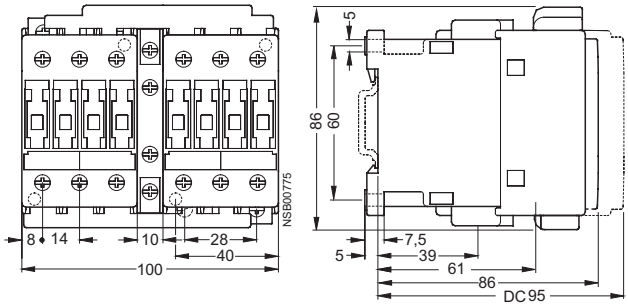
3RA13 reversing contactor assemblies

Size S00



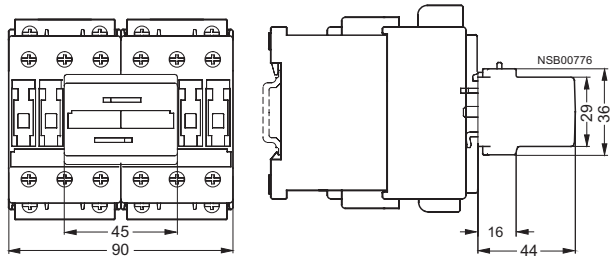
Size S0
with 3RA19 24-2B mechanical interlock

Laterally mountable

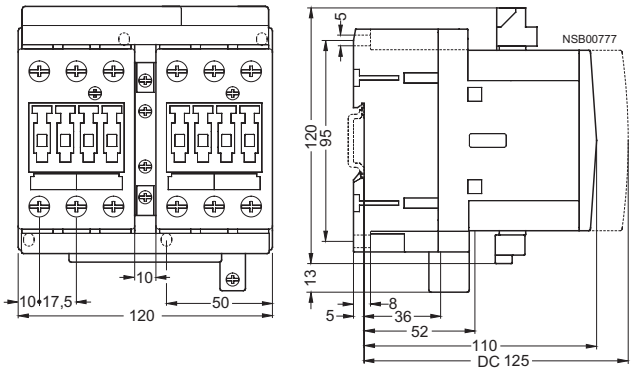


With 3RA19 24-1A mechanical interlock

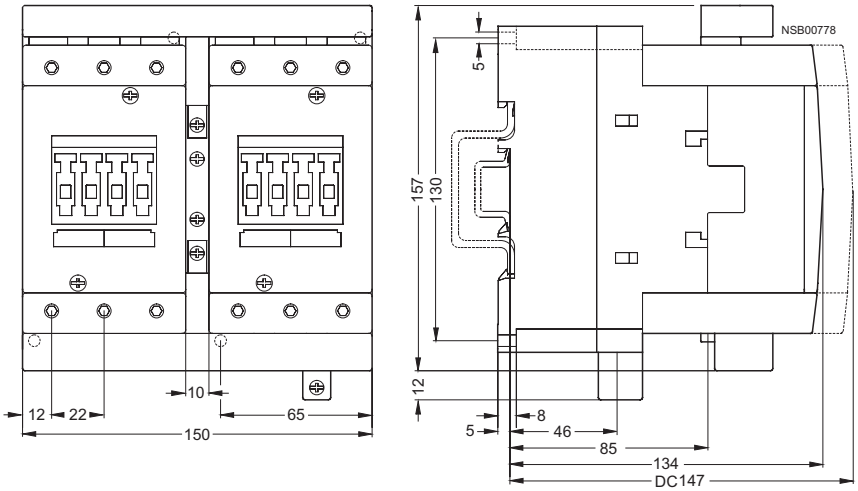
On front



Size S2



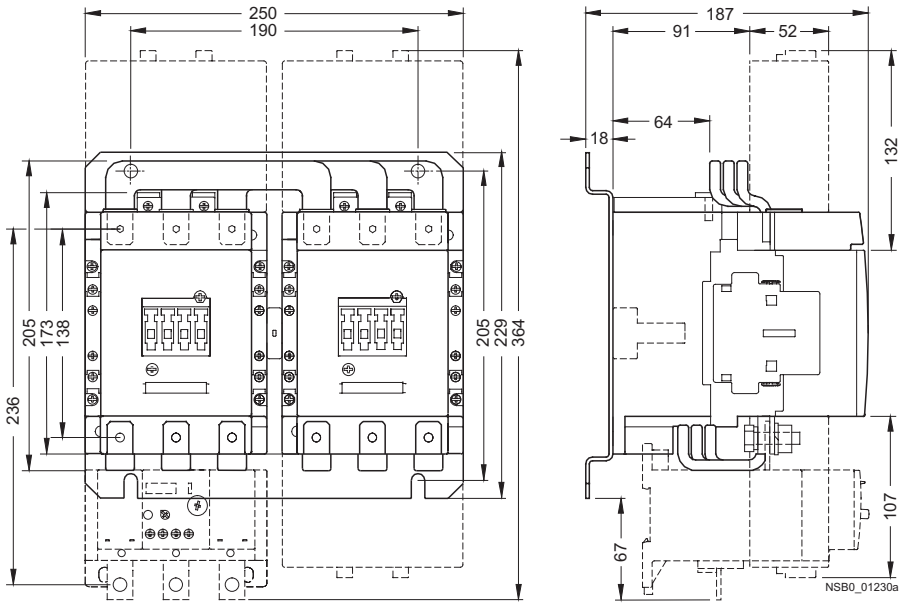
Size S3



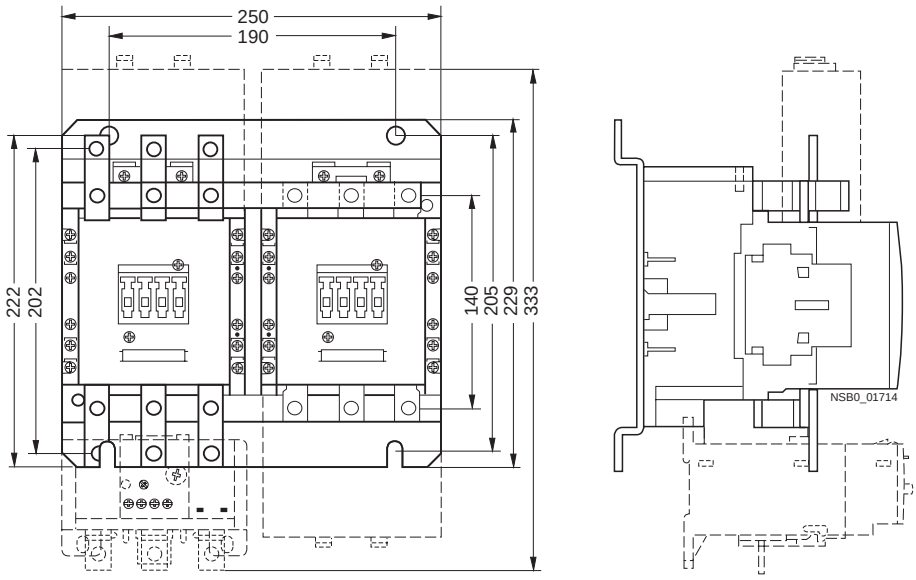
Project planning aids

3RA13 reversing contactor assemblies

Size S6 with 3RA19 53-2A wiring module

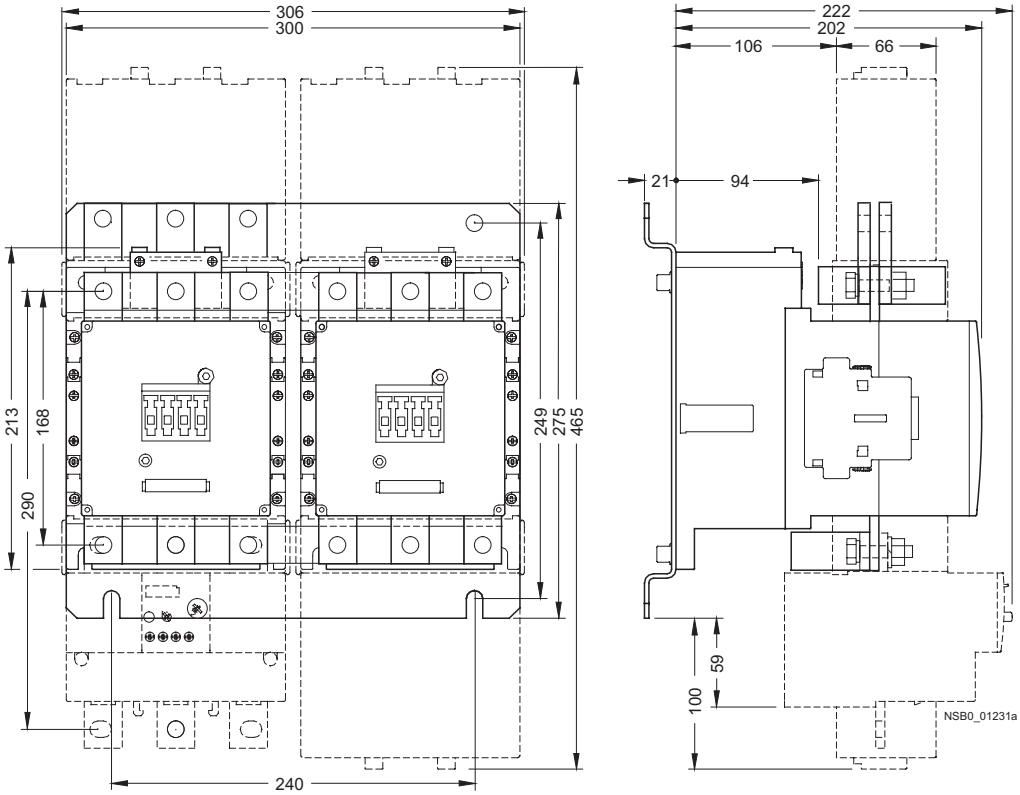


Size S6 with 3RA19 53-2M wiring module

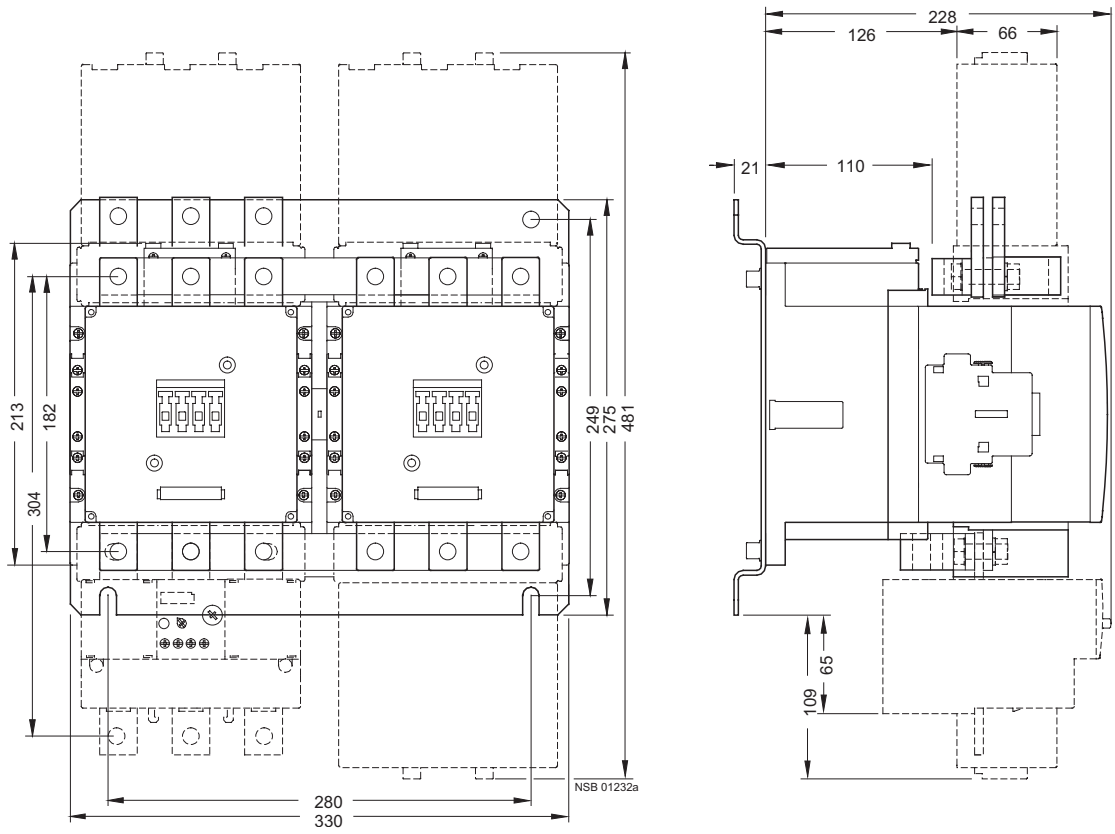


3RA13 reversing contactor assemblies

Size S10



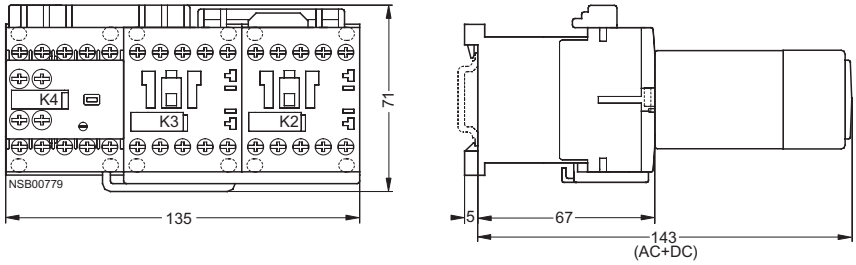
Size S12



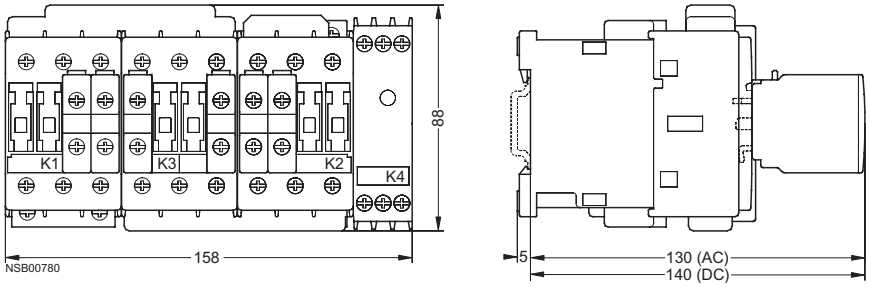
Project planning aids

3RA14 contactor assemblies for wye-delta starting

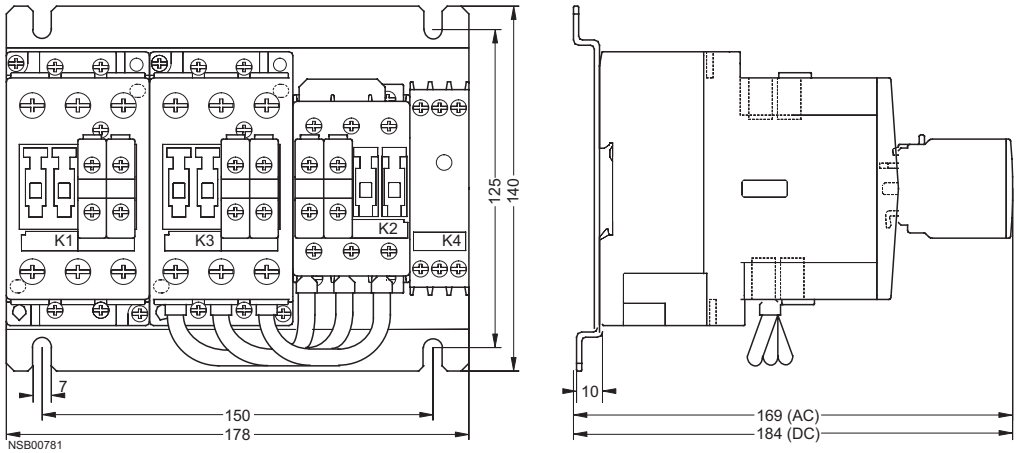
Sizes S00 – S00 – S00



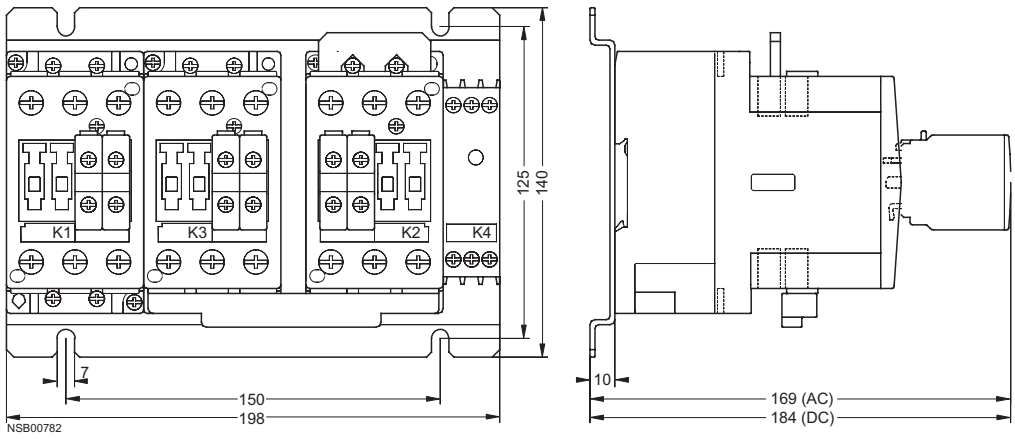
Sizes S0 – S0 – S0



Sizes S2 – S2 – S0

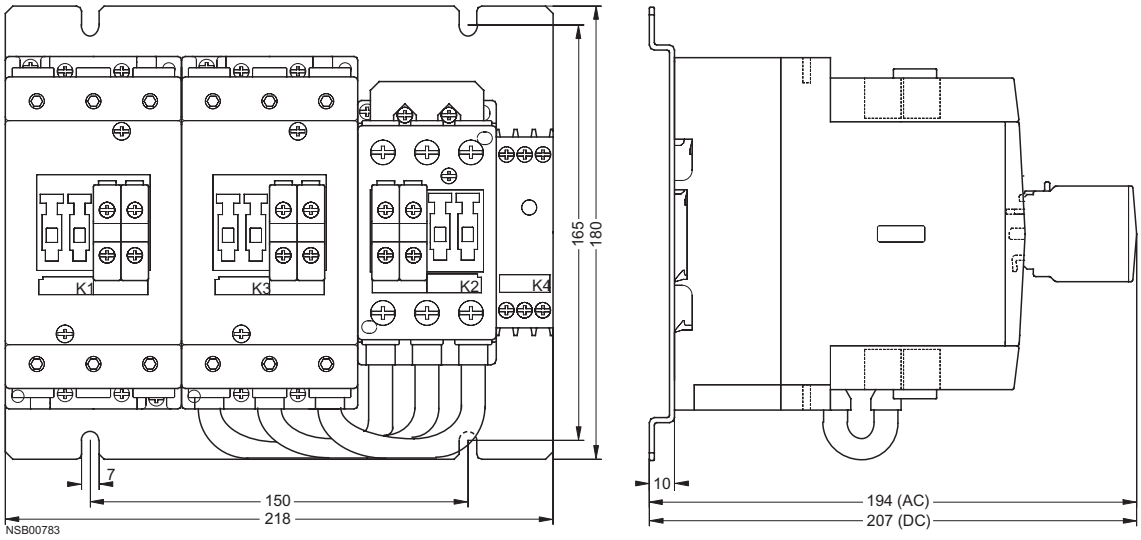


Sizes S2 – S2 – S2



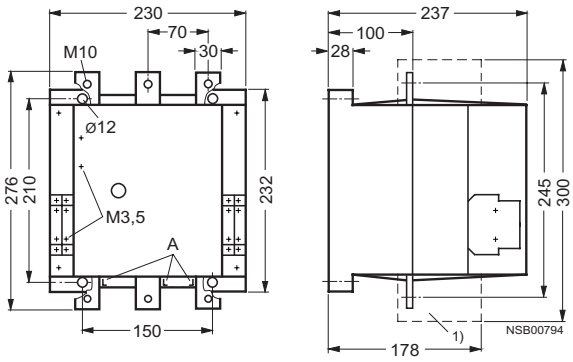
3RA14 contactor assemblies for wye-delta starting

Sizes S3 – S3 – S2

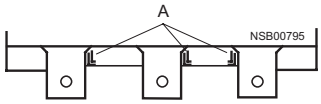


3TF68 and 3TF69 vacuum contactors, 3-pole

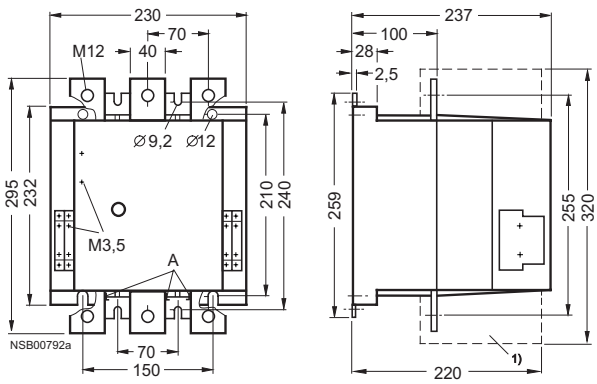
3TF68 vacuum contactors



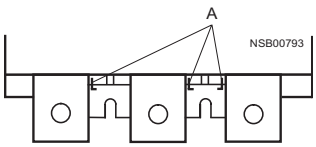
Detail
A = Contact erosion indication for vacuum interrupter contacts



3TF69 vacuum contactors



Detail
A = Contact erosion indication for vacuum interrupter contacts



[1] With box terminals for laminated copper bars (accessories).

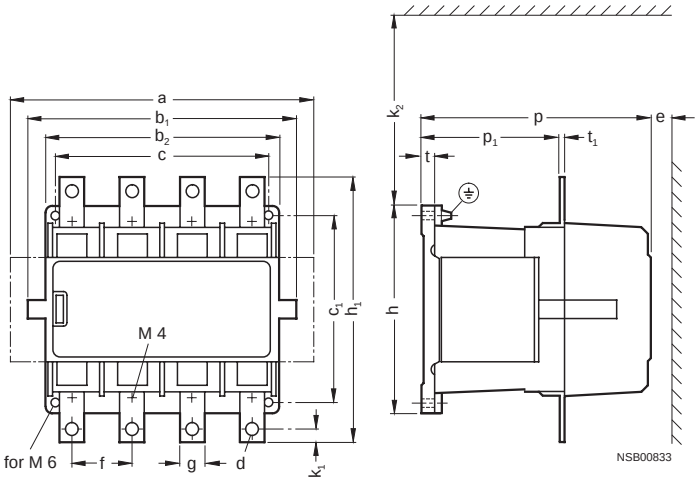
Project planning aids

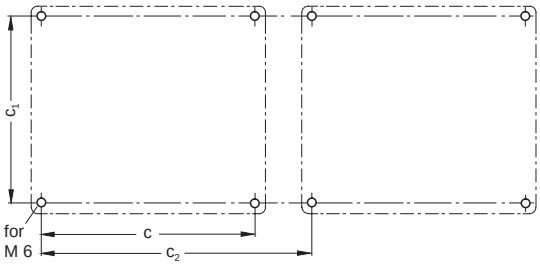
3TK10 to 3TK17 contactors

3TK10 to 3TK17 contactors

The scope of supply includes screws and rubber buffers.

⏚ M10 grounding screw for 3TK14 to 3TK17





Contactor Type	a	b_1	b_2	c	c_1	c_2 [1]	c_2 [2]	d [3]	e min.	f	g	h	h_1	k_1	k_2 [4]	p	p_1	t	t_1
3TK10	186	165	136	120	140	166	187	6,6	40	41	15	156	156	7.5	134	154.5	102.3	10	4
3TK11	186	165	136	120	140	168	187	11	40	42	20	156	172	10	134	154.5	102.3	10	4
3TK12	225	201	176	160	140	202	226	11	15	45	20	156	198	10	134	172	106.7	10	5
3TK13	225	201	176	160	140	202	226	11	15	45	20	156	198	10	134	172	106.7	10	5
3TK14	266	244	244	220	200	271	293	11	40	67	25	223	272	12.5	—	225.5	139.5	23 [5]	6
3TK15	266	244	244	220	200	271	293	11	40	67	25	223	273	12.5	—	225.5	139.5	23 [5]	6
3TK17	266	244	244	220	200	271	293	11	40	67	40	223	273	12.5	—	225.5	139.5	23 [5]	6

[1] Distance when 2 contactors, each with one auxiliary switch block opposite, are mounted.

[2] Distance when 2 contactors, each with two auxiliary switch blocks opposite, are mounted.

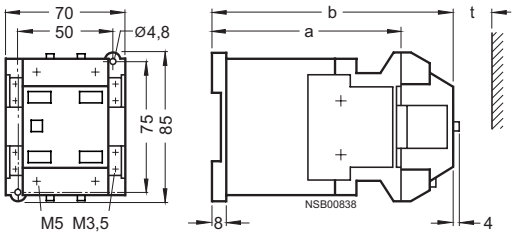
[3] Nuts, bolts, screws and washers are supplied.

[4] Minimum clearance for removing the withdrawable coil.

[5] Damping elements are supplied.

3TC4 and TC5 contactors

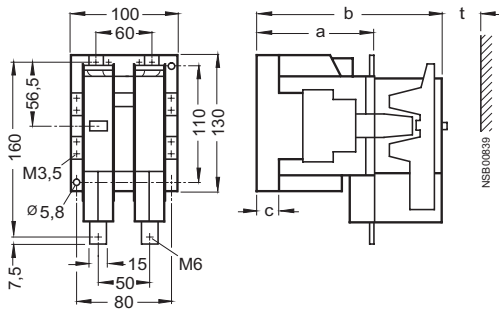
3TC44 contactors
Size 2, AC and DC operation



t = minimum clearance from insulated components: 15 mm (600 V and 750 V)
from grounded components: 30 mm (600 V and 750 V)

	a	b
DC operation	109	141
AC operation	68	100

3TC48 contactors
Size 4, AC and DC operation



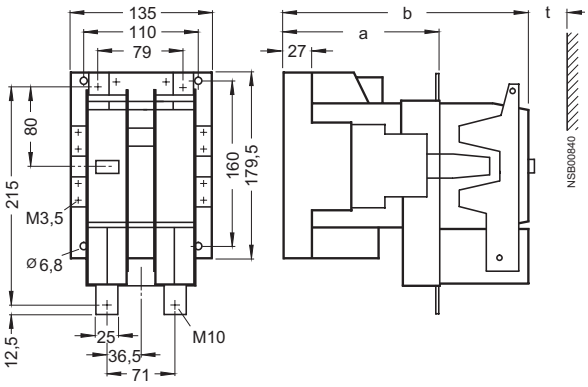
t = minimum clearance from insulated components: 15 mm (600 V), 20 mm (750 V)
from grounded components: 35 mm (600 V), 55 mm (750 V)

	a	b	c
DC operation	112	180	21.5
AC operation	86	154	23.5

Project planning aids

3TC4 and TC5 contactors

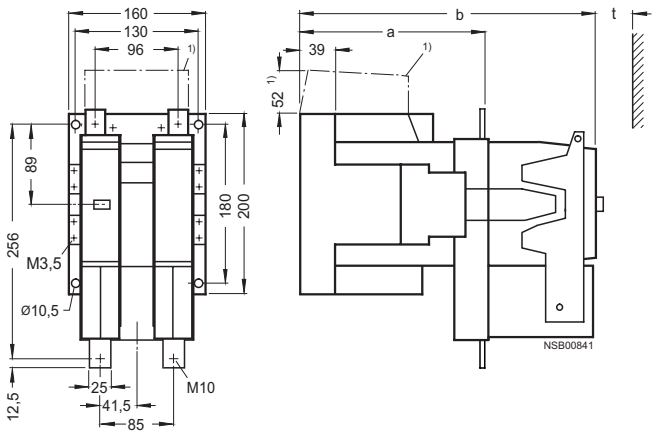
3TC52 contactors
Size 8, AC and DC operation



t = minimum clearance from insulated components: 20 mm (600 V and 750 V)
from grounded components: 70 mm (600 V and 750 V)

	a	b
DC operation	147	232
AC operation	115	200

3TC56 contactors
Size 12, AC and DC operation



t = minimum clearance from insulated components: 25 mm (600 V and 750 V)
from grounded components: 80 mm (600 V), 100 mm (750 V)

	a	b
DC operation	200	310
AC operation	141	251

[1] DC operation only.

Protection Equipment

3

Introduction

Overview







Type		3RV10	3RV11	3RV13	3RV14	3RV16	3RV16	3RV17
3RV1 circuit breakers/motor starter protectors up to 100 A								
Applications								
System protection		✓[1]	✓[1]	—	—	—	—	✓
Motor protection		✓	—	—	—	—	—	—
Motor protection with overload relay function		—	✓	—	—	—	—	—
Starter combinations		—	—	✓	—	—	—	—
Transformer protection		—	—	—	✓	—	—	✓
Fuse monitoring		—	—	—	—	✓	—	—
Voltage transformer circuit breakers for distance protection		—	—	—	—	—	✓	—
Size		S00, S0, S2, S3	S0, S2, S3	S0, S2, S3	S0, S2	S00	S00	S0, S3
Rated current I_n								
Size S00	A	up to 12	—	—	—	up to 0.2	up to 3	—
Size S0	A	up to 25	up to 25	up to 25	up to 20	—	—	up to 22
Size S2	A	up to 50	up to 50	up to 50	up to 40	—	—	—
Size S3	A	up to 100	up to 100	up to 100	—	—	—	up to 70
Rated operational voltage U_e according to IEC	V	690 AC[2]	690 AC[2]	690 AC[2]	690 AC[2]	690 AC[2]	400 AC	690 AC
Rated frequency	Hz	50/60	50/60	50/60	50/60	50/60	$16^2/_3$ ... 60	50/60
Trip class		CLASS 10 CLASS 20	CLASS 10	—	CLASS 10	—	—	—
Thermal overload release	A	0.11 ... 0.16 up to	0.11 ... 0.16 up to	none[3]	0.11 ... 0.16 up to	0.2	1.4 ... 3	0.16 ... 70 non-adjustable
	A	80 ... 100	80 ... 100		28 ... 40			
Electronic trip units A multiple of the rated current		13 times	13 times	13 times	20 times	6 times	4 ... 7 times	13 times
Short-circuit breaking capacity I_{cu} at 400 V AC	kA	50/100	50/100	50/100	50/100	100	50	[4]
Accessories								
For sizes		S00 S0 S2 S3	S0 S2 S3	S0 S2 S3	S0 S2	S00 S00 S0, S3		
Auxiliary switches		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓[5]
Signaling switches		— ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	—	—	—
Undervoltage trip units		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓
Shunt trip units		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	✓
Isolator modules		— ✓ ✓ —	✓ ✓ —	✓ ✓ —	✓ ✓	—	—	—
Insulated three-phase busbar systems		✓ ✓ ✓ —	— ✓ —	✓ ✓ —	✓ ✓	✓	✓	—
Busbar adapters		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	—
Door-coupling rotary operating mechanisms		— ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	—	—	✓
Remote motorized operating mechanisms		— — ✓ ✓	— ✓ ✓	— ✓ ✓	— ✓	—	—	—
Link modules		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	—
Enclosures for surface mounting		✓ ✓ ✓ —	✓ ✓ —	✓ ✓ —	✓ ✓	✓	✓	—
Enclosures for flush mounting		✓ ✓ — —	✓ — —	✓ — —	✓ —	✓	✓	—
Front plates		✓ ✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓	✓	—
Infeed systems		✓ ✓ — —	— — —	✓ — —	✓ —	—	—	—

1) For symmetrical loading of the three phases.

2) 500 V AC with molded-plastic enclosure.

3) For overload protection of the motors, appropriate overload relays must be used.

4) According to UL 489 at AC 480 Y/277 V.: for size S0 50 kA, for size S3 65 kA.

5) Only lateral auxiliary switches.

✓ Has this function or can use this accessory

— Does not have this function or cannot use this accessory




Type		3RU11	3RB20	3RB21	3RB22/3RB23
Overload relays up to 630 A					
Applications					
System protection		✓[1]	✓[1]	✓[1]	✓[1]
Motor protection		✓	✓	✓	✓
Alternating current, 3-phase		✓	✓	✓	✓
Alternating current, 1-phase		✓	—	—	✓
DC current		✓	—	—	—
Size of contactor		S00, S0, S2, S3	S00 ... S12	S00 ... S12	S00 ... S12
Rated operational current I_e					
Size S00 Size S0	A A	up to 12 up to 25	up to 12 up to 25	up to 12 up to 25	} up to 25
Size S2 Size S3	A A	up to 50 up to 100	up to 50 up to 100	up to 50 up to 100	} up to 100
Size S6 Size S10/S12, Size 14 (3TF6)	A A	— —	up to 200 up to 630	up to 200 up to 630	up to 200 up to 630
Rated operational voltage U_e	V	690/1000 AC[2]	690/1000 AC[3]	690/1000 AC[3]	690/1000 AC[4]
Rated frequency	Hz	50/60	50/60	50/60	50/60
Trip class		CLASS 10	CLASS 10, CLASS 20	CLASS 5, 10, 20, 30 adjustable	CLASS 5, 10, 20, 30 adjustable
Thermal overload release	AA	0.11 ... 0.16 up to 80 ... 100	—	—	—
Solid-state overload release	A A	—	0.1 ... 0.4 up to 160 ... 630	0.1 ... 0.4 up to 160 ... 630	0.3 ... 3 up to 63 ... 630
Rating for induction motor at 400 V AC	kW kW	0.04 up to 45	0.04 ... 0.09 up to 90 ... 450	0.04 ... 0.09 up to 90 ... 450	0.09 ... 1.1 up to 37 ... 450

Accessories																							
For sizes	S00	S0	S2	S3	S00	S0	S2	S3	S6	S10/S12	S00	S0	S2	S3	S6	S10/S12	S00	S0	S2	S3	S6	S10/S12
Terminal brackets for stand-alone installation	✓	✓	✓	✓	✓	✓	5)	5)	5)	5)	✓	✓	5)	5)	5)	5)	5)	5)	5)	5)	5)	5)
Mechanical RESET	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	—	—	—	—	—	—
Cable releases for RESET	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	—	—	—	—	—	—
Electrical remote RESET	✓	✓	✓	✓	—	—	—	—	—	—	Integrated in the unit						Integrated in the unit					
Terminal covers	—	—	✓	✓	—	—	—	✓	✓	✓	—	—	—	✓	✓	✓	—	—	—	✓	✓	✓
Sealable covers for setting knobs	Integrated in the unit				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1) The units are responsible in the main circuit for overload protection of the assigned electrical loads (e.g. motors), feeder cable and other switching and protection devices in the respective load feeder.

2) Size S3 up to 1000 V AC.

3) Size S2 (only with straight-through transformer), S3, S6, S10, S12 up to 1000 V AC.

4) With reference to the 3RB29 .6 current measuring modules.

5) Stand-alone installation without accessories is possible.

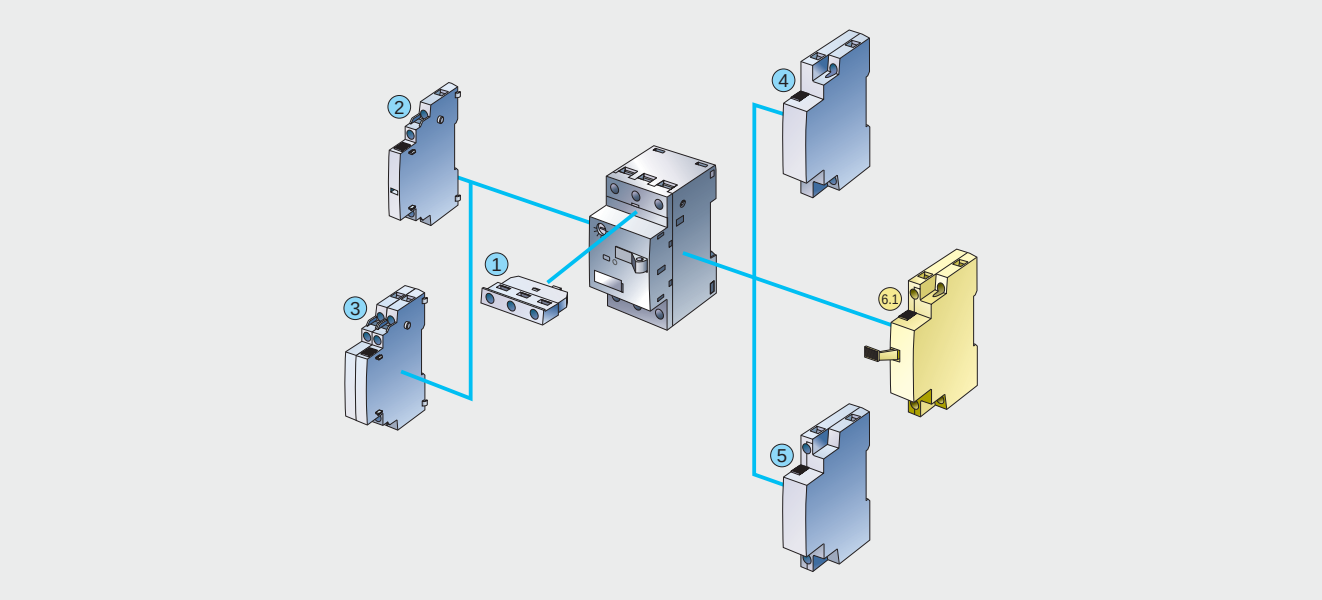
✓ Has this function or can use this accessory

— Does not have this function or cannot use this accessory

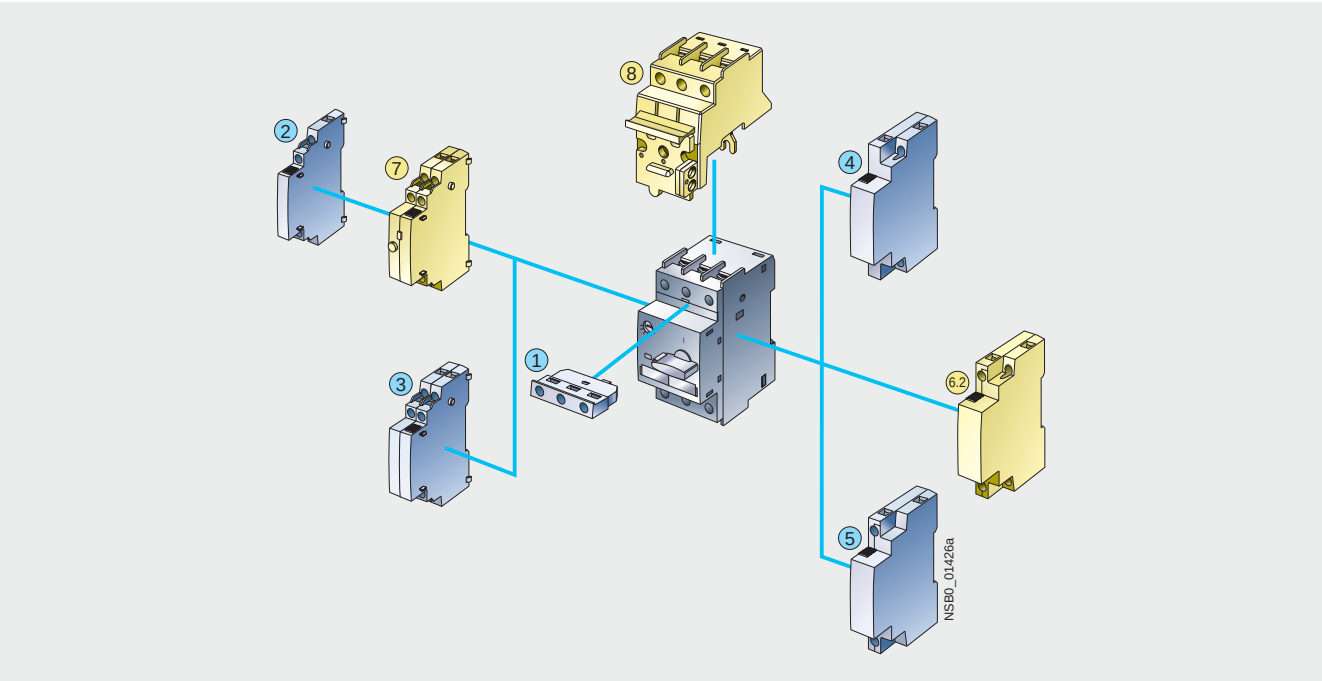
Overview

The following illustrations show our 3RV1 motor starter protectors with the accessories which can be mounted for the various sizes, see also "Introduction" —> "Overview".

S00 motor starter protectors with mountable accessories



Motor starter protectors, sizes S0, S2 or S3, with mountable accessories



Mountable accessories for all sizes S00 ... S3

1. Transverse auxiliary switch (can not be used with 3RV17 and 3RV18 circuit breakers)
2. Lateral auxiliary switch with 2 contacts
3. Lateral auxiliary switch with 4 contacts
4. Shunt release
5. Undervoltage release

Mountable accessories	for sizes
6.1 Undervoltage release with leading auxiliary contacts	S00
6.2 Undervoltage release with leading auxiliary contacts	S0 ... S3
7 Alarm switch	S0 ... S3
8 Isolator module	S0 and S2

For accessories, see page 3/13.

Size S0 motor starter protectors

3RV1 motor starter protectors are compact, current limiting motor starter protectors which are optimized for load feeders. The motor starter protectors are used for switching and protecting three-phase induction motors of up to 45 kW at 415 V AC and for other loads with rated currents of up to 100 A.

Type of construction

The motor starter protectors are available in four sizes:

- Size S00 - width 45 mm,
  max. rated current 12 A,
  at 415 V AC suitable for induction motors up to 5.5 kW.
- Size S0 - width 45 mm,
  max. rated current 25 A,
  at 415 V AC suitable for induction motors up to 11 kW.
- Size S2 - width 55 mm,
  max. rated current 50 A,
  at 415 V AC suitable for induction motors up to 22 kW.
- Size S3 - width 70 mm,
  max. rated current 100 A,
  at 415 V AC suitable for induction motors up to 45 kW.

"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RV10 motor starter protectors for motor protection are suitable for the overload protection of explosion-proof motors with "Increased Safety" type of protection EEx e;

Application

Operating conditions

3RV1 motor starter protectors are suitable for use in any climate. They are intended for use in enclosed rooms in which no severe operating conditions (such as dust, caustic vapors, hazardous gases) prevail. When installed in dusty and damp areas, suitable enclosures must be provided.

3RV1 motor starter protectors can optionally be fed from the top or from below.

The permissible ambient temperatures, the maximum switching capacities, the tripping currents and other boundary conditions can be found in the technical specifications and tripping characteristics.

3RV1 motor starter protectors are suitable for operation in IT systems (IT networks). In this case, the different short-circuit breaking capacity in the IT system must be taken into account.

Since operational currents, starting currents and current peaks are different even for motors with identical power ratings due to the inrush current, the motor ratings in the selection tables are only guide values. The specific rated and start-up data of the motor to be protected is always paramount to the choice of the most suitable motor starter protector. This also applies to motor starter protectors for transformer protection.

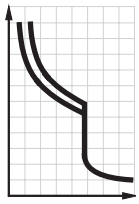
Possible uses

The 3RV1 motor starter protectors can be used:

- For short-circuit protection
- For motor protection (also with overload relay function)
- For system protection
- For short-circuit protection for starter combinations
- For transformer protection
- As main control and EMERGENCY-STOP switches
- For fuse monitoring
- For use in IT systems (IT networks)
- For switching of DC currents
- As voltage transformer circuit breakers
- In areas subject to explosion hazard (ATEX)

Selection and ordering data

CLASS 10, without auxiliary switches

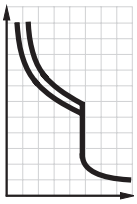


Rated current	Suitable for induction motors[1] with *P*	Setting range for thermal overload release	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	**Screw terminals**	Weight per PU approx.
I_n		⊏	I >	I_{cu}	Order No. [2]	kg
A	kW	A	A	kA		
Size S00						
0.16	0.04	0.11 ... 0.16	2.1	100	**3RV10 11-0AA10**	0.230
0.2	0.06	0.14 ... 0.2	2.6	100	**3RV10 11-0BA10**	0.231
0.25	0.06	0.18 ... 0.25	3.3	100	**3RV10 11-0CA10**	0.233
0.32	0.09	0.22 ... 0.32	4.2	100	**3RV10 11-0DA10**	0.233
0.4	0.09	0.28 ... 0.4	5.2	100	**3RV10 11-0EA10**	0.235
0.5	0.12	0.35 ... 0.5	6.5	100	**3RV10 11-0FA10**	0.232
0.63	0.18	0.45 ... 0.63	8.2	100	**3RV10 11-0GA10**	0.233
0.8	0.18	0.55 ... 0.8	10	100	**3RV10 11-0HA10**	0.235
1	0.25	0.7 ... 1	13	100	**3RV10 11-0JA10**	0.233
1.25	0.37	0.9 ... 1.25	16	100	**3RV10 11-0KA10**	0.279
1.6	0.55	1.1 ... 1.6	21	100	**3RV10 11-1AA10**	0.281
2	0.75	1.4 ... 2	26	100	**3RV10 11-1BA10**	0.280
2.5	0.75	1.8 ... 2.5	33	100	**3RV10 11-1CA10**	0.281
3.2	1.1	2.2 ... 3.2	42	100	**3RV10 11-1DA10**	0.283
4	1.5	2.8 ... 4	52	100	**3RV10 11-1EA10**	0.281
5	1.5	3.5 ... 5	65	100	**3RV10 11-1FA10**	0.285
6.3	2.2	4.5 ... 6.3	82	100	**3RV10 11-1GA10**	0.288
8	3	5.5 ... 8	104	50	**3RV10 11-1HA10**	0.289
10	4	7 ... 10	130	50	**3RV10 11-1JA10**	0.284
12	5.5	9 ... 12	156	50	**3RV10 11-1KA10**	0.280
Size S0						
0.16	0.04	0.11 ... 0.16	2.1	100	**3RV10 21-0AA10**	0.286
0.2	0.06	0.14 ... 0.2	2.6	100	**3RV10 21-0BA10**	0.288
0.25	0.06	0.18 ... 0.25	3.3	100	**3RV10 21-0CA10**	0.287
0.32	0.09	0.22 ... 0.32	4.2	100	**3RV10 21-0DA10**	0.286
0.4	0.09	0.28 ... 0.4	5.2	100	**3RV10 21-0EA10**	0.288
0.5	0.12	0.35 ... 0.5	6.5	100	**3RV10 21-0FA10**	0.287
0.63	0.18	0.45 ... 0.63	8.2	100	**3RV10 21-0GA10**	0.289
0.8	0.18	0.55 ... 0.8	10	100	**3RV10 21-0HA10**	0.287
1	0.25	0.7 ... 1	13	100	**3RV10 21-0JA10**	0.350
1.25	0.37	0.9 ... 1.25	16	100	**3RV10 21-0KA10**	0.353
1.6	0.55	1.1 ... 1.6	21	100	**3RV10 21-1AA10**	0.357
2	0.75	1.4 ... 2	26	100	**3RV10 21-1BA10**	0.356
2.5	0.75	1.8 ... 2.5	33	100	**3RV10 21-1CA10**	0.357
3.2	1.1	2.2 ... 3.2	42	100	**3RV10 21-1DA10**	0.356
4	1.5	2.8 ... 4	52	100	**3RV10 21-1EA10**	0.354
5	1.5	3.5 ... 5	65	100	**3RV10 21-1FA10**	0.358
6.3	2.2	4.5 ... 6.3	82	100	**3RV10 21-1GA10**	0.357
8	3	5.5 ... 8	104	100	**3RV10 21-1HA10**	0.356
10	4	7 ... 10	130	100	**3RV10 21-1JA10**	0.361
12.5	5.5	9 ... 12.5	163	100	**3RV10 21-1KA10**	0.358
16	7.5	11 ... 16	208	50	**3RV10 21-4AA10**	0.366
20	7.5	14 ... 20	260	50	**3RV10 21-4BA10**	0.363
22	11	17 ... 22	286	50	**3RV10 21-4CA10**	0.361
25	11	20 ... 25	325	50	**3RV10 21-4DA10**	0.364

1) Guide value for 4-pole standard motors at 50 Hz 415 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

2) The 12th digit (last) of the MLFB to be changed to '5' for MPCB with 1NO + 1NC block.

CLASS 10, without auxiliary switches



Rated current	Suitable for three-phase induction motors[1] with *P*	Setting range for thermal overload release	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	**Screw terminals**	Weight per PU approx.
I_n			I >	I_{cu}	Order No. [2]	kg
A	kW	A	A	kA		
Size S2						
16	7.5	11 ... 16	208	50	**3RV10 31-4AA10**	1.046
20	7.5	14 ... 20	260	50	**3RV10 31-4BA10**	1.043
25	11	18 ... 25	325	50	**3RV10 31-4DA10**	1.031
32	15	22 ... 32	416	50	**3RV10 31-4EA10**	1.028
40	18.5	28 ... 40	520	50	**3RV10 31-4FA10**	1.047
45	22	36 ... 45	585	50	**3RV10 31-4GA10**	1.039
50	22	40 ... 50	650	50	**3RV10 31-4HA10**	1.027
Size S3						
40	18.5	28 ... 40	520	50	**3RV10 41-4FA10**	2.219
50	22	36 ... 50	650	50	**3RV10 41-4HA10**	2.240
63	30	45 ... 63	819	50	**3RV10 41-4JA10**	2.247
75	37	57 ... 75	975	50	**3RV10 41-4KA10**	2.253
90	45	70 ... 90	1170	50	**3RV10 41-4LA10**	2.280
100	45	80 ... 100	1235	50	**3RV10 41-4MA10**	2.295
Size S3, with increased switching capacity						
16	7.5	11 ... 16	208	100	**3RV10 42-4AA10**	2.174
20	7.5	14 ... 20	260	100	**3RV10 42-4BA10**	2.185
25	11	18 ... 25	325	100	**3RV10 42-4DA10**	2.211
32	15	22 ... 32	416	100	**3RV10 42-4EA10**	2.222
40	18.5	28 ... 40	520	100	**3RV10 42-4FA10**	2.203
50	22	36 ... 50	650	100	**3RV10 42-4HA10**	2.230
63	30	45 ... 63	819	100	**3RV10 42-4JA10**	2.255
75	37	57 ... 75	975	100	**3RV10 42-4KA10**	2.266
90	45	70 ... 90	1170	100	**3RV10 42-4LA10**	2.268
100	45	80 ... 100	1235	100	**3RV10 42-4MA10**	2.275

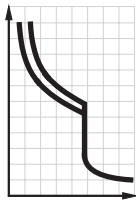
CLASS 20, without auxiliary switches

Size S2						
16	7.5	11 ... 16	208	50	**3RV10 31-4AB10**	1.067
20	7.5	14 ... 20	260	50	**3RV10 31-4BB10**	1.071
25	11	18 ... 25	325	50	**3RV10 31-4DB10**	1.054
32	15	22 ... 32	416	50	**3RV10 31-4EB10**	1.067
40	18.5	28 ... 40	520	50	**3RV10 31-4FB10**	1.076
45	22	36 ... 45	585	50	**3RV10 31-4GB10**	1.073
50	22	40 ... 50	650	50	**3RV10 31-4HB10**	1.071
Size S3, with increased switching capacity						
40	18.5	28 ... 40	520	100	**3RV10 42-4FB10**	2.222
50	22	36 ... 50	650	100	**3RV10 42-4HB10**	2.265
63	30	45 ... 63	819	100	**3RV10 42-4JB10**	2.278
75	37	57 ... 75	975	100	**3RV10 42-4KB10**	2.268
90	45	70 ... 90	1170	100	**3RV10 42-4LB10**	2.313
100	45	80 ... 100	1235	100	**3RV10 42-4MB10**	2.322

1) Guide value for 4-pole standard motors at 50 Hz 415 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

Selection and ordering data

CLASS 10, with overload relay function (automatic RESET), without auxiliary switches



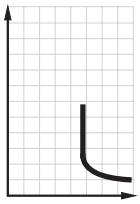
Rated current	Suitable for three-phase induction motors[1] with *P*	Setting range for thermal overload release	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	**Screw terminals**	Weight per PU approx.
I_n		⊏	I >	I_{cu}	Order No.	kg
A	kW	A	A	kA		
Size S0[2]						
0.16	0.04	0.11 ... 0.16	2.1	100	**3RV11 21-0AA10**	0.354
0.2	0.06	0.14 ... 0.2	2.6	100	**3RV11 21-0BA10**	0.358
0.25	0.06	0.18 ... 0.25	3.3	100	**3RV11 21-0CA10**	0.352
0.32	0.09	0.22 ... 0.32	4.2	100	**3RV11 21-0DA10**	0.352
0.4	0.09	0.28 ... 0.4	5.2	100	**3RV11 21-0EA10**	0.355
0.5	0.12	0.35 ... 0.5	6.5	100	**3RV11 21-0FA10**	0.356
0.63	0.18	0.45 ... 0.63	8.2	100	**3RV11 21-0GA10**	0.358
0.8	0.18	0.55 ... 0.8	10	100	**3RV11 21-0HA10**	0.421
1	0.25	0.7 ... 1	13	100	**3RV11 21-0JA10**	0.416
1.25	0.37	0.9 ... 1.25	16	100	**3RV11 21-0KA10**	0.426
1.6	0.55	1.1 ... 1.6	21	100	**3RV11 21-1AA10**	0.422
2	0.75	1.4 ... 2	26	100	**3RV11 21-1BA10**	0.427
2.5	0.75	1.8 ... 2.5	33	100	**3RV11 21-1CA10**	0.422
3.2	1.1	2.2 ... 3.2	42	100	**3RV11 21-1DA10**	0.428
4	1.5	2.8 ... 4	52	100	**3RV11 21-1EA10**	0.420
5	1.5	3.5 ... 5	65	100	**3RV11 21-1FA10**	0.429
6.3	2.2	4.5 ... 6.3	82	100	**3RV11 21-1GA10**	0.426
8	3	5.5 ... 8	104	100	**3RV11 21-1HA10**	0.425
10	4	7 ... 10	130	100	**3RV11 21-1JA10**	0.428
12.5	5.5	9 ... 12.5	163	100	**3RV11 21-1KA10**	0.426
16	7.5	11 ... 16	208	50	**3RV11 21-4AA10**	0.436
20	7.5	14 ... 20	260	50	**3RV11 21-4BA10**	0.430
22	11	17 ... 22	286	50	**3RV11 21-4CA10**	0.427
25	11	20 ... 25	325	50	**3RV11 21-4DA10**	0.432
Size S2[2]						
16	7.5	11 ... 16	208	50	**3RV11 31-4AA10**	1.123
20	7.5	14 ... 20	260	50	**3RV11 31-4BA10**	1.109
25	11	18 ... 25	325	50	**3RV11 31-4DA10**	1.114
32	15	22 ... 32	416	50	**3RV11 31-4EA10**	1.111
40	18.5	28 ... 40	520	50	**3RV11 31-4FA10**	1.123
45	22	36 ... 45	585	50	**3RV11 31-4GA10**	1.101
50	22	40 ... 50	650	50	**3RV11 31-4HA10**	1.106
Size S3, with increased switching capacity[2]						
16	7.5	11 ... 16	208	100	**3RV11 42-4AA10**	2.247
20	7.5	14 ... 20	260	100	**3RV11 42-4BA10**	2.255
25	11	18 ... 25	325	100	**3RV11 42-4DA10**	2.284
32	15	22 ... 32	416	100	**3RV11 42-4EA10**	2.295
40	18.5	28 ... 40	520	100	**3RV11 42-4FA10**	2.288
50	22	36 ... 50	650	100	**3RV11 42-4HA10**	2.320
63	30	45 ... 63	819	100	**3RV11 42-4JA10**	2.333
75	37	57 ... 75	975	100	**3RV11 42-4KA10**	2.368
90	45	70 ... 90	1170	100	**3RV11 42-4LA10**	2.353
100	45	80 ... 100	1235	100	**3RV11 42-4MA10**	2.346

1) Guide value for 4-pole standard motors at 50 Hz 415 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

2) Accessories for mounting on the right (for sizes S0 to S3) and 3RV19 15 three-phase busbars (for size S0) cannot be used.

Selection and ordering data

Without auxiliary switches



Rated current	Suitable for three-phase induction motors[1] with *P*	Thermal overload release[2]	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	**Screw terminals**	Weight per PU approx.
I_n			$I >$	I_{cu}	Order No.	kg
A	kW	A	A	kA		
Size S0						
0.16	0.04	None	2.1	100	**3RV13 21-0AC10**	0.282
0.2	0.06	None	2.6	100	**3RV13 21-0BC10**	0.284
0.25	0.06	None	3.3	100	**3RV13 21-0CC10**	0.285
0.32	0.09	None	4.2	100	**3RV13 21-0DC10**	0.282
0.4	0.09	None	5.2	100	**3RV13 21-0EC10**	0.286
0.5	0.12	None	6.5	100	**3RV13 21-0FC10**	0.283
0.63	0.18	None	8.2	100	**3RV13 21-0GC10**	0.348
0.8	0.18	None	10	100	**3RV13 21-0HC10**	0.283
1	0.25	None	13	100	**3RV13 21-0JC10**	0.345
1.25	0.37	None	16	100	**3RV13 21-0KC10**	0.351
1.6	0.55	None	21	100	**3RV13 21-1AC10**	0.352
2	0.75	None	26	100	**3RV13 21-1BC10**	0.352
2.5	0.75	None	33	100	**3RV13 21-1CC10**	0.352
3.2	1.1	None	42	100	**3RV13 21-1DC10**	0.353
4	1.5	None	52	100	**3RV13 21-1EC10**	0.349
5	1.5	None	65	100	**3RV13 21-1FC10**	0.354
6.3	2.2	None	82	100	**3RV13 21-1GC10**	0.355
8	3	None	104	100	**3RV13 21-1HC10**	0.354
10	4	None	130	100	**3RV13 21-1JC10**	0.357
12.5	5.5	None	163	100	**3RV13 21-1KC10**	0.354
16	7.5	None	208	50	**3RV13 21-4AC10**	0.362
20	7.5	None	260	50	**3RV13 21-4BC10**	0.357
22	11	None	286	50	**3RV13 21-4CC10**	0.358
25	11	None	325	50	**3RV13 21-4DC10**	0.359
Size S2						
16	7.5	None	208	50	**3RV13 31-4AC10**	1.038
20	7.5	None	260	50	**3RV13 31-4BC10**	1.037
25	11	None	325	50	**3RV13 31-4DC10**	1.014
32	15	None	416	50	**3RV13 31-4EC10**	1.018
40	18.5	None	520	50	**3RV13 31-4FC10**	1.033
45	22	None	585	50	**3RV13 31-4GC10**	1.040
50	22	None	650	50	**3RV13 31-4HC10**	1.019
Size S3						
40	18.5	None	520	50	**3RV13 41-4FC10**	2.197
50	22	None	650	50	**3RV13 41-4HC10**	2.227
63	30	None	819	50	**3RV13 41-4JC10**	2.244
75	37	None	975	50	**3RV13 41-4KC10**	2.247
90	45	None	1170	50	**3RV13 41-4LC10**	2.269
100	45	None	1235	50	**3RV13 41-4MC10**	2.292
Size S3, with increased switching capacity						
16	7.5	None	208	100	**3RV13 42-4AC10**	2.175
20	7.5	None	260	100	**3RV13 42-4BC10**	2.188
25	11	None	325	100	**3RV13 42-4DC10**	2.219
32	15	None	416	100	**3RV13 42-4EC10**	2.208
40	18.5	None	520	100	**3RV13 42-4FC10**	2.218
50	22	None	650	100	**3RV13 42-4HC10**	2.218
63	30	None	819	100	**3RV13 42-4JC10**	2.248
75	37	None	975	100	**3RV13 42-4KC10**	2.278
90	45	None	1170	100	**3RV13 42-4LC10**	2.266
100	45	None	1235	100	**3RV13 42-4MC10**	2.293

1) Guide value for 4-pole standard motors at 50 Hz 415 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

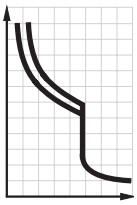
2) For overload protection of the motors, appropriate overload relays must be used.

For transformer protection

Selection and ordering data

CLASS 10, without auxiliary switches

Motor starter protectors for the protection of transformers with high inrush current

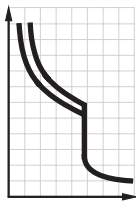


Rated current	Setting range for thermal overload release	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	Screw terminals	Weight per PU approx.
I_n	⊏	I >	I_{cu}	Order No.	kg
A	A	A	kA		
Size S0					
0.16	0.11 ... 0.16	3.3	100	**3RV14 21-0AA10**	0.286
0.2	0.14 ... 0.2	4.2	100	**3RV14 21-0BA10**	0.287
0.25	0.18 ... 0.25	5.2	100	**3RV14 21-0CA10**	0.286
0.32	0.22 ... 0.32	6.5	100	**3RV14 21-0DA10**	0.288
0.4	0.28 ... 0.4	8.2	100	**3RV14 21-0EA10**	0.287
0.5	0.35 ... 0.5	10	100	**3RV14 21-0FA10**	0.286
0.63	0.45 ... 0.63	13	100	**3RV14 21-0GA10**	0.290
0.8	0.55 ... 0.8	16	100	**3RV14 21-0HA10**	0.290
1	0.7 ... 1	21	100	**3RV14 21-0JA10**	0.353
1.25	0.9 ... 1.25	26	100	**3RV14 21-0KA10**	0.354
1.6	1.1 ... 1.6	33	100	**3RV14 21-1AA10**	0.353
2	1.4 ... 2	42	100	**3RV14 21-1BA10**	0.358
2.5	1.8 ... 2.5	52	100	**3RV14 21-1CA10**	0.354
3.2	2.2 ... 3.2	65	100	**3RV14 21-1DA10**	0.358
4	2.8 ... 4	82	100	**3RV14 21-1EA10**	0.354
5	3.5 ... 5	104	100	**3RV14 21-1FA10**	0.357
6.3	4.5 ... 6.3	130	100	**3RV14 21-1GA10**	0.356
8	5.5 ... 8	163	100	**3RV14 21-1HA10**	0.358
10	7 ... 10	208	100	**3RV14 21-1JA10**	0.362
12.5	9 ... 12.5	260	100	**3RV14 21-1KA10**	0.360
16	11 ... 16	286	50	**3RV14 21-4AA10**	0.365
20	14 ... 20	325	50	**3RV14 21-4BA10**	0.365
Size S2					
16	11 ... 16	325	50	**3RV14 31-4AA10**	1.029
20	14 ... 20	416	50	**3RV14 31-4BA10**	1.034
25	18 ... 25	520	50	**3RV14 31-4DA10**	1.038
32	22 ... 32	660	50	**3RV14 31-4EA10**	1.029
40	28 ... 40	836	50	**3RV14 31-4FA10**	1.039

Auxiliary switches can be ordered separately
(see “Mountable accessories”).

Selection and ordering data

Without auxiliary switches



Rated current	Thermal overload release	Instantaneous electronic trip unit	Short-circuit breaking capacity at 415 V AC	**Screw terminals**	Weight per PU approx.
I_n	⊏	I >	I_{cu}	Order No.	kg
A	A	A	kA		
Size S00					
0.2	0.2	1.2	100	**3RV16 11-0BD10**	0.289

Note:

The auxiliary switch required for signaling must be ordered separately.

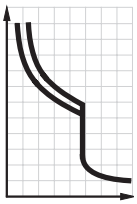
Accessories

	Type	Version	**Screw terminals**	Weight per PU approx.
			Order No.	kg
Mountable auxiliary switches (essential accessories)				
 3RV19 01-1E	**Transverse auxiliary switches** With screw terminals,mountable on front	1 NO + 1 NC	**3RV19 01-1E**	0.018
 3RV19 01-1A	**Lateral auxiliary switches** With screw terminals,mountable on the left	1 NO + 1 NC	**3RV19 01-1A**	0.045

Selection and ordering data

Without auxiliary switches

Circuit breakers for system protection and non-motor loads according to UL/CSA



Rated current	Thermal overload releases (non-adjustable)	Instantaneous electronic trip unit	Short-circuit breaking capacity at AC 480 Y/277 V[1]	**Screw terminals**	Weight per PU approx.
I_n	⊏	I >	I_{bc}	Order No.	kg
A	A	A	kA		
Size S0					
0.16	0.16	2.1	50	**3RV17 21-0AD10**	0.460
0.2	0.2	2.6	50	**3RV17 21-0BD10**	0.460
0.25	0.25	3.3	50	**3RV17 21-0CD10**	0.460
0.32	0.32	4.2	50	**3RV17 21-0DD10**	0.460
0.4	0.4	5.2	50	**3RV17 21-0ED10**	0.460
0.5	0.5	6.5	50	**3RV17 21-0FD10**	0.460
0.63	0.63	8.2	50	**3RV17 21-0GD10**	0.460
0.8	0.8	10	50	**3RV17 21-0HD10**	0.530
1	1	13	50	**3RV17 21-0JD10**	0.530
1.25	1.25	16	50	**3RV17 21-0KD10**	0.530
1.6	1.6	21	50	**3RV17 21-1AD10**	0.530
2	2	26	50	**3RV17 21-1BD10**	0.530
2.5	2.5	33	50	**3RV17 21-1CD10**	0.530
3.2	3.2	42	50	**3RV17 21-1DD10**	0.530
4	4	52	50	**3RV17 21-1ED10**	0.530
5	5	65	50	**3RV17 21-1FD10**	0.530
6.3	6.3	82	50	**3RV17 21-1GD10**	0.530
8	8	104	50	**3RV17 21-1HD10**	0.530
10	10	130	50	**3RV17 21-1JD10**	0.530
12.5	12.5	163	50	**3RV17 21-1KD10**	0.530
15	15	208	50	**3RV17 21-4AD10**	0.530
20	20	260	50	**3RV17 21-4BD10**	0.530
22	22	286	50	**3RV17 21-4CD10**	0.530
Size S3					
10	10	150	65	**3RV17 42-5AD10**	0.460
15	15	225	65	**3RV17 42-5BD10**	0.460
20	20	260	65	**3RV17 42-5CD10**	0.460
25	25	325	65	**3RV17 42-5DD10**	0.460
30	30	390	65	**3RV17 42-5ED10**	0.460
35	35	455	65	**3RV17 42-5FD10**	0.460
40	40	520	65	**3RV17 42-5GD10**	0.460
45	45	585	65	**3RV17 42-5HD10**	0.460
50	50	650	65	**3RV17 42-5JD10**	0.460
60	60	780	65	**3RV17 42-5LD10**	0.460
70	70	910	65	**3RV17 42-5QD10**	0.460

1) For values for AC 600 Y/347 V, see protection equipment, Chapter 3a/10.

Transverse auxiliary switches must not be mounted, lateral auxiliary switches can be ordered separately

Overview

Mounting location and function

The 3RV1 motor starter protectors have three main contact elements. In order to achieve maximum flexibility, auxiliary switches, signaling switches, auxiliary trip units and isolator modules can be supplied separately.

These components can be fitted as required on the motor starter protectors without using tools.

Front side *Notes:* • *A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor starter protector.* • *Transverse auxiliary switches must not be used for the 3RV17 motor starter protectors.*	**Transverse auxiliary switches** 1 NO + 1 NC or 2 NO or 1 CO contact	An auxiliary switch block can be inserted transversely on the front. The overall width of the motor starter protectors remains unchanged.
Left-hand side *Notes:* • *A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor starter protector.* • *Auxiliary switches (2 contacts) and signaling switches can be mounted separately or together.*	**Lateral auxiliary switches (2 contacts)** 1 NO + 1 NC or 2 NO or 2 NC	One of the three auxiliary switches can be mounted laterally for each motor starter protector. The contacts of the auxiliary switch close and open together with the main contacts of the motor starter protector. The overall width of the lateral auxiliary switch with 2 contacts is 9 mm.
	Lateral auxiliary switches (4 contacts) 2 NO + 2 NC	One auxiliary switch can be mounted laterally for each motor starter protector. The contacts of the auxiliary switch close and open together with the main contacts of the motor starter protector. The overall width of the lateral auxiliary switch with 4 contacts is 18 mm.
	Signaling switches for sizes S0, S2 and S3 Tripping 1 NO + 1 NC Short-circuit 1 NO + 1 NC	One signaling switch can be mounted at the side of each motor starter protector with a rotary operating mechanism. The signaling switch has two contact systems. One contact system always signals tripping irrespective of whether this was caused by a short-circuit, an overload or an auxiliary trip unit. The other contact system only switches in the event of a short-circuit. There is no signaling as a result of switching off with the handle. In order to be able to switch on the motor starter protector again after a short-circuit, the signaling switch must be reset manually after the error cause has been eliminated.The overall width of the signaling switch is 18 mm.
Right-hand side *Notes:* • *One auxiliary trip unit can be mounted per motor starter protector.* • *Accessories cannot be mounted at the right-hand side of the 3RV11 motor starter protectors with overload relay function.*	**Shunt trip units**	For remote-controlled tripping of the motor starter protector. The release coil should only be energized for short periods (see schematics).
	or	
	Undervoltage releases	Trips the motor starter protector when the voltage is interrupted and prevents the motor from being restarted accidentally when the voltage is restored. Used for remote-controlled tripping of the motor starter protector. Particularly suitable for EMERGENCY-STOP disconnection by way of the corresponding EMERGENCY-STOP pushbutton according to DIN VDE 0113.
	or	
	Undervoltage trip unit with leading auxiliary contacts (2 NO)	Function and use as for the undervoltage trip unit without leading auxiliary contacts, but with the following additional function: the auxiliary contacts will open in switch position OFF to deenergize the coil of the undervoltage trip unit, thus interrupting energy consumption. In the “tripped” position of the breaker, these auxiliary contacts are not guaranteed to open. The leading contacts permit the motor starter protector to reclose. The overall width of the auxiliary trip unit is 18 mm.
Top *Note:* *The isolator module covers the terminal screws of the transverse auxiliary switch. If the isolator module is used, we therefore recommend that either the lateral auxiliary switches be fitted or that the isolator module not be mounted until the auxiliary switch has been wired.*	**Isolator modules for sizes S0 and S2**	Isolator modules can be mounted to the upper terminal end of motor starter protectors of sizes S0 and S2. The supply cable is connected to the motor starter protector through the isolator module. The plug can only be unplugged when the motor starter protector is open and isolates all 3 poles of the motor starter protector from the network. The shock-protected isolation point is clearly visible and secured with a padlock to prevent reinsertion of the plug.

Mountable accessories

Selection and ordering data

	Type	Version	For motor starter protectors Size	Screw terminals	Weight per PU approx.
				Order No.	kg
Auxiliary switches[1]					
 3RV19 01-1E	**Transverse auxiliary switches** With screw terminals, mountable on front	1 CO 1 NO + 1 NC 2 NO[2]	S00, S0, S2, S3	**3RV19 01-1D** **3RV19 01-1E** **3RV19 01-1F**	0.015 0.018 0.018
 3RV19 01-0H	**Covers for transverse auxiliary switches**	—	S00, S0, S2, S3	**3RV19 01-0H**	0.006
 3RV19 01-1A  3RV19 01-1J	**Lateral auxiliary switches** With screw terminals, mountable on the left	1 NO + 1 NC 2 NO 2 NC 2 NO + 2 NC	S00, S0, S2, S3	**3RV19 01-1A** **3RV19 01-1B** **3RV19 01-1C** **3RV19 01-1J**	0.045 0.045 0.045 0.083
Signaling switches					
 3RV19 21-1M	**Signaling switches** One signaling switch can be mounted on the left per motor starter protector.	Separate tripped and short-circuit alarms, 1 NO + 1 NC each	S0, S2, S3	**3RV19 21-1M**	0.094
Isolator modules					
 3RV19 38-1A with padlock	**Isolator modules**	Visible isolating distance for isolating individual motor starter protectors from the network, lockable in disconnected position.	S0 S2	**3RV19 28-1A** **3RV19 38-1A**	0.157 0.324

1) Each motor starter protector can be fitted with one transverse and one lateral auxiliary switch. The lateral auxiliary switch with 2 NO + 2 NC is used without a transverse auxiliary switch. Transverse auxiliary switches must not be used for the 3RV17 and 3RV18 motor starter protectors.

2) Compatible with the following motor starter protectors:
3RV1. 1 (size S00) as of product version E01
3RV1. 2 (size S0) as of product version E04
3RV1. 3 (size S2) as of product version E04
3RV1. 4 (size S3) as of product version E04

Rated control supply voltage U_s AC 50 Hz	AC 60 Hz	AC 50/60 Hz 100% ON period[1]	AC/DC 50/60 Hz, DC 5 s ON period[2]	DC	For motor starter protectors Size	**Screw terminals** Order No.	Weight per PU approx. kg
V	V	V	V	V			
Auxiliary trip units[3]							
Undervoltage trip units							
230	240	—	—	—	S00, S0, S2, S3	**3RV19 02-1AP0**	0.131
400	440	—	—	—	S00, S0, S2, S3	**3RV19 02-1AV0**	0.127
Undervoltage trip units with leading auxiliary contacts 2 NO							
230	240	—	—	—	S00	**3RV19 12-1CP0**	0.140
415	480	—	—	—	S00	**3RV19 12-1CV1**	0.139
230	240	—	—	—	S0, S2, S3	**3RV19 22-1CP0**	0.139
415	480	—	—	—	S0, S2, S3	**3RV19 22-1CV1**	0.138
Shunt trip units							
—	—	20 ... 24	20 ... 70	—	S00, S0, S2, S3	**3RV19 02-1DB0**	0.133
—	—	90 ... 110	70 ... 190	—	S00, S0, S2, S3	**3RV19 02-1DF0**	0.135
—	—	210 ... 240	190 ... 330	—	S00, S0, S2, S3	**3RV19 02-1DP0**	0.130

3RV19 02-1DP0

3RV19 12-1CP0

1) The voltage range is valid for 100% (infinite) ON period. The response voltage is at 0.9 the lower limit of the voltage range.

2) The voltage range is valid for 5 s ON period at AC 50 Hz/60 Hz and DC. The response voltage is at 0.85 the lower limit of the voltage range.

3) One auxiliary trip unit can be mounted on the right per motor starter protector.

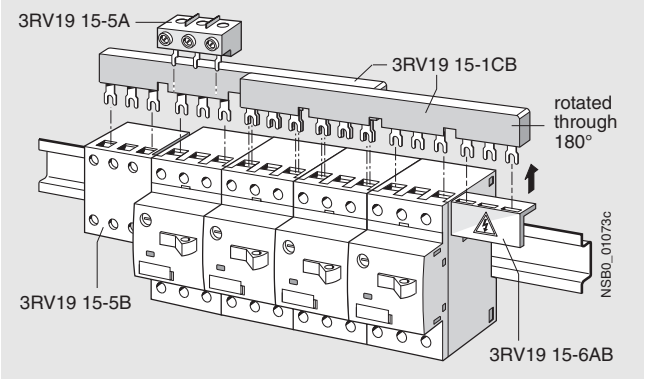
Overview

Insulated three-phase busbar systems

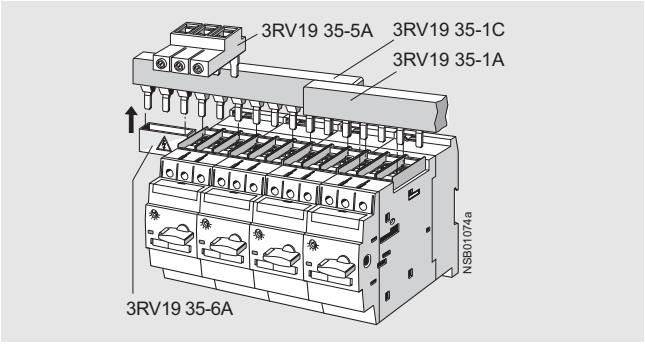
Three-phase busbar systems provide an easy, time-saving and clearly arranged means of feeding 3RV1 circuit breakers/ motor starter protectors with screw terminals. Different versions are available for sizes S00, S0 and S2 and can be used for the various different types of circuit breakers/ motor starter protectors. The only exceptions are the 3RV19 15 three-phase busbar systems, which are not suitable for the 3RV11 motor starter protectors with overload relay function.

The busbars are suitable for between 2 and 5 circuit breakers/ motor starter protectors. However, any kind of extension is possible by clamping the tags of an additional busbar (rotated by 180°) underneath the terminals of the respective last circuit breaker/ motor starter protector.

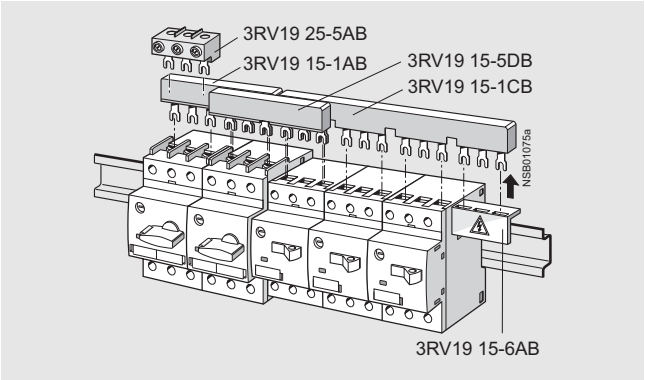
A combination of circuit breakers/ motor starter protectors of different sizes is possible only with sizes S00 and S0. Connectors are available for this purpose. The motor starter protectors are supplied by appropriate feeder terminals.



3-phase busbar system, size S00



3-phase busbar system, size S2



3-phase busbar system, with example for combining sizes S00 and S0

The three-phase busbar systems are finger-safe. They are designed for any short-circuit stress which can occur at the output side of connected motor starter protectors.

The three-phase busbar systems can also be used to construct "Type E Starters" of size S0 or S2 according to UL/CSA.

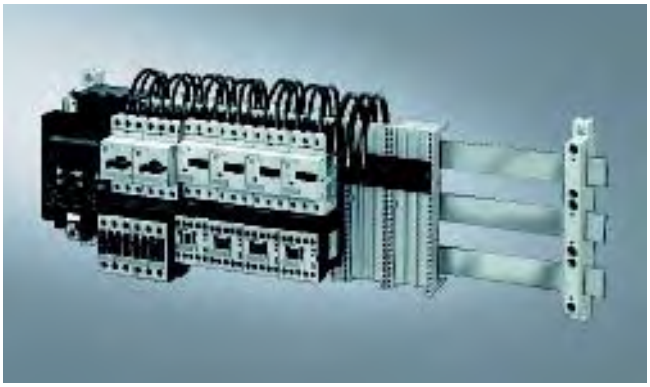
Special feeder terminals must be used for this purpose, however (see "Selection and ordering data").

Busbar adapters for 40 mm and 60 mm systems

The motor starter protectors are mounted directly with the aid of busbar adapters on busbar systems with 40 mm and 60 mm center-to-center clearance in order to save space and to reduce infeed times and costs.

Busbar adapters for busbar systems with 40 mm center-to-center clearance are suitable for copper busbars with a width of 12 mm to 15 mm, while those with 60 mm center-to-center clearance are suitable for copper busbars with a width of 12 mm to 30 mm. The busbars can be 4 to 5 mm or 10 mm thick.

The circuit breakers/ motor starter protectors are snapped onto the adapter and connected on the line side. This prepared unit is then plugged directly onto the busbar system, and is thus connected both mechanically and electrically at the same time.



SIRIUS motor starter protectors and load feeders with busbar adapters snapped onto busbars

SIRIUS 3RV19 infeed system with three 3RV10 11 motor starter protectors, two 3RV10 21 motor starter protectors, three 3RT10 16 contactors and two 3RT10 24 contactors

Selection and ordering data

	Modular spacing	Number of motor starter protectors that can be connected			Rated current I_n at 690 V	For motor starter protectors Size	Order No.	Weight per PU approx.
		Without lateral accessories	Incl.lateral auxiliary switch	With auxiliary trip unit				
	mm				A			kg
3-phase busbar systems								
	For feeding several motor starter protectors with screw terminals, mounted side by side on standard mounting rails, insulated, with touch protection							
 3RV19 15-1AB	45	2	—	—	63	S00, S0[1]	**3RV19 15-1AB**	0.044
		3				S00, S0[1]	**3RV19 15-1BB**	0.071
		4				S00, S0[1]	**3RV19 15-1CB**	0.099
		5				S00, S0[1]	**3RV19 15-1DB**	0.124
 3RV19 15-1BB	55	—	2	—	63	S00, S0[1]	**3RV19 15-2AB**	0.048
			3			S00, S0[1]	**3RV19 15-2BB**	0.079
			4			S00, S0[1]	**3RV19 15-2CB**	0.111
			5			S00, S0[1]	**3RV19 15-2DB**	0.140
 3RV19 15-1CB	63	—	—	2	63	S00, S0[1]	**3RV19 15-3AB**	0.052
				4		S00, S0[1]	**3RV19 15-3CB**	0.120
 3RV19 15-1DB	55	2	—	—	108	S2	**3RV19 35-1A**	0.150
		3				S2	**3RV19 35-1B**	0.214
		4				S2	**3RV19 35-1C**	0.295
	75	—	2	2	108	S2[2]	**3RV19 35-3A**	0.161
			3	3		S2[2]	**3RV19 35-3B**	0.262
			4	4		S2[2]	**3RV19 35-3C**	0.369

1) Not suitable for 3RV11 motor starter protectors with overload relay function. Common clamping of S00 and S0 motor starter protectors is not possible, due to the different modular spacings and terminal heights. The 3RV19 15-DB connector is available for connecting busbars from size S0 to size S00.

2) Auxiliary trip units and lateral auxiliary switches cannot be used in combination.

	Conductor cross-section			For motor starter protectors Size	Order No.	Weight per PU approx.
	Solid or stranded	Finely stranded with end sleeve	AWG cable, solid or stranded			
	mm²	mm²	AWG			kg
3-phase feeder terminals						
	Connection from top					
 3RV19 25-5AB	2.5 ... 25	4 ... 16	12-4	S00	**3RV19 15-5A**	0.040
				S0	**3RV19 25-5AB**	0.041
	Connection from below[1]					
	2.5 ... 25	4 ... 16	12-4	S00, S0	**3RV19 15-5B**	0.110
	Connection from top					
 3RV19 15-5B	2.5 ... 50	1.5 ... 35	14-0	S2	**3RV19 35-5A**	0.110

1) This terminal is connected in place of a switch, please take the space requirement into account.

Busbar accessories

Busbar adapters

8US10 61-5DJ07

8US12 51-5MD07

For motor starter protectors Size	Rated current	Connecting cable	Adapter length	Adapter width	Rated voltage	Order No.	Weight per PU approx.
	A	AWG	mm	mm	V		kg
Busbar adapters for 40 mm systems							
For flat copper profiles according to DIN 46433 Width: 12 mm and 15 mm Thickness: 5 mm and 10 mm							
S00, S0	25	12	121	45	690	**8US10 51-5DJ07**	0.106
S00, S0 + lateral auxiliary switch	25	12	121	55	690	**8US10 61-5DJ07**	0.119
S2	56	8	139	55	690	**8US10 61-5FK08**	0.231
S3	100	4	182	70	400[1)]	**8US11 11-4SM00**	0.541
S3	100	4	182	72	415 ... 690[2)]	**8US10 11-4TM00**	0.478
Busbar adapters for 60 mm systems							
For flat copper profiles according to DIN 46433 Width: 12 mm and 30 mm Thickness: 5 mm and 10 mm also for T and double-T special profiles							
S00, S0	25	12	182	45	690	**8US12 51-5DM07**	0.183
S2	56	8		55	690	**8US12 61-5FM08**	0.263
S3	100	4		70	400[1)]	**8US11 11-4SM00**	0.541
S3	100	4		72	415 ... 690[2)]	**8US12 11-4TM00**	0.498

1) Up to 460 V AC with max. short-circuit breaking capacity 25 kA.

2) Short-circuit breaking capacity 415/500/525 V AC:
- up to I_n = 25 A: max. 30 kA
- up to I_n = 90 A: max. 16 kA
- up to I_n = 100 A: max. 6 kA;

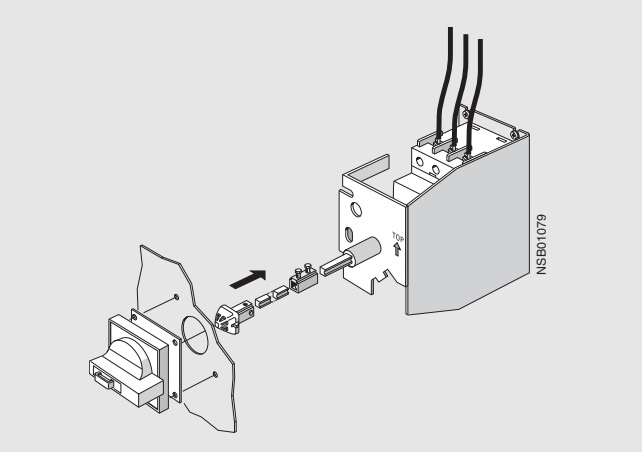
Short-circuit breaking capacity 690 V AC:
- max. 12 kA.

Overview

Door-coupling rotary operating mechanisms

Motor starter protectors with a rotary operating mechanism can be mounted in a control cabinet and operated externally by means of a door-coupling rotary operating mechanism. When the cabinet door with motor starter protector is closed, the operating mechanism is coupled. When the motor starter protector closes, the coupling is locked which prevents the door from being opened unintentionally. This interlock can be defeated by the maintenance

personnel. In the open position, the rotary operating mechanism can be secured against reclosing with up to 3 padlocks. Inadvertent opening of the door is not possible in this case either.



3RV19 26-1B door-coupling rotary operating mechanism for arduous conditions

Remote motorized operating mechanisms

3RV1 motor starter protectors are manually operated controls. They automatically trip in case of an overload or short-circuit. Intentional remote-controlled tripping is possible by means of a shunt trip unit or an undervoltage trip unit. Reclosing is only possible directly at the motor starter protector.

The remote motorized operating mechanism allows the motor starter protectors to be opened and closed by electrical commands. This enables a load or an installation to be isolated from the network or reconnected to it from an operator panel.

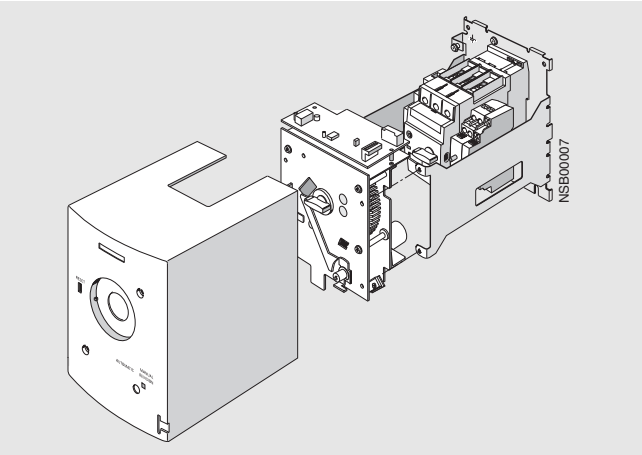
If the motor starter protector is tripped as a result of overload or short-circuit, it will be in tripped position. For reclosing, the remote motorized operating mechanism must first be set manually or electrically to the 0 position (electrically by means of the Open command). Then it can be reclosed.

The remote motorized operating mechanism is available for motor starter protectors of size S2 ($I_{n\,max}$ = 50 A) and S3 ($I_{n\,max}$ =100 A) that are designed for control voltages of 230 V AC and 24 V DC. The motor starter protector is fitted into the remote motorized operating mechanism as shown in the drawing.

In the “MANUAL” position, the motor starter protector in the remote motorized operating mechanism can continue to be switched manually on site. In the “AUTOMATIC” position, the motor starter protector is switched by means of electrical commands. The switching command must be applied for a minimum of 100 ms. The remote motorized operating mechanism closes the motor starter protector after a maximum of 1 second. On voltage failure during the switching operation it is ensured that the motor starter protector remains in the OPEN or CLOSED position.

RESET function

The RESET button on the motorized operating mechanism serves to reset any 3RV19 21-1M signaling switch that might be installed.



3RV19 .6-3A.. remote motorized operating mechanism

Rotary operating mechanisms

Selection and ordering data

Type	Color of knob	Version of extension shaft	For motor starter protectors Size	Order No.	Weight per PU approx.
		mm			kg
Door-coupling rotary operating mechanisms, for arduous conditions					
Door-coupling rotary operating mechanisms	Gray	300	S0	**3RV19 26-1B**	1.180
			S2	**3RV19 36-1B**	1.570
			S3	**3RV19 46-1B**	1.722

The door-coupling rotary operating mechanisms consist of a knob, a coupling driver, an extension shaft of 300 mm in length (8 mm x 8 mm), a spacer and two metal brackets, into which the motor starter protector is inserted. The door-coupling rotary operating mechanisms are designed to degree of protection IP65. The door interlocking reliably prevents opening of the control cabinet door in the ON position of the motor starter protector. The OFF position can be locked with up to 3 padlocks. Laterally mountable auxiliary trip units and two-pole auxiliary switches can be used. The door-coupling rotary operating mechanisms thus meet the requirements for isolating functions according to IEC 60947-2.

3RV19 26-2C

Type	Rated control supply voltage U_s	For motor starter protectors Size	Order No.	Weight per PU approx.
				kg
Remote motorized operating mechanisms				
Remote motorized operating mechanisms	50/60 Hz, 230 V AC	S2	**3RV19 36-3AP0**	3.520
	24 V DC	S2	**3RV19 36-3AB4**	3.420
	50/60 Hz, 230 V AC	S3	**3RV19 46-3AP0**	3.441
	24 V DC	S3	**3RV19 46-3AB4**	3.357

3RV19 .6-3A..

Selection and ordering data

Covers

3RV1 (size S3) with
3RT19 46-4EA1 (left)
3RV19 08-0P (right)

Version	For motor starter protectors Size	Order No.	Weight per PU approx. kg
Terminal covers for box terminals Additional touch protection to be fitted at the box terminals (2 units mountable per device)	S2 S3	**3RT19 36-4EA2** **3RT19 46-4EA2**	0.020 0.025
Terminal covers For cable lug and busbar connection For maintaining the required voltage clearance and as touch protection if box terminal is removed (2 units can be mounted per motor starter protector)	S3	**3RT19 46-4EA1**	0.040
Scale covers Sealable, for covering the set current scale	S00, S0, S2, S3	**3RV19 08-0P**	0.100

Fixing accessories

3RB19 00-0B

Type	Version	For motor starter protectors Size	Order No.	Weight per PU approx. kg
Push-in lugs	For screwing the motor starter protector onto mounting plates. For each motor starter protector, 2 units are required.	S00, S0	**3RB19 00-0B**	0.100

Link modules, single-unit packaging

3RA19 11-1AA00

Version	Method of operation	Size Contactors	Motor starter protectors	Screw terminals Order No.	Weight per PU approx. kg
For mechanical and electrical connection between contactor and motor starter protector with screw terminals	AC/DC	S00 S00	S00 S0	**3RA19 11-1AA00** **3RA19 21-1DA00**	0.027 0.028
	AC	S0 S2 S3	S0 S2 S3	**3RA19 21-1AA00** **3RA19 31-1AA00** **3RA19 41-1AA00**	0.037 0.042 0.090
	DC	S0 S2 S3	S0 S2 S3	**3RA19 21-1BA00** **3RA19 31-1BA00** **3RA19 41-1BA00**	0.039 0.043 0.089

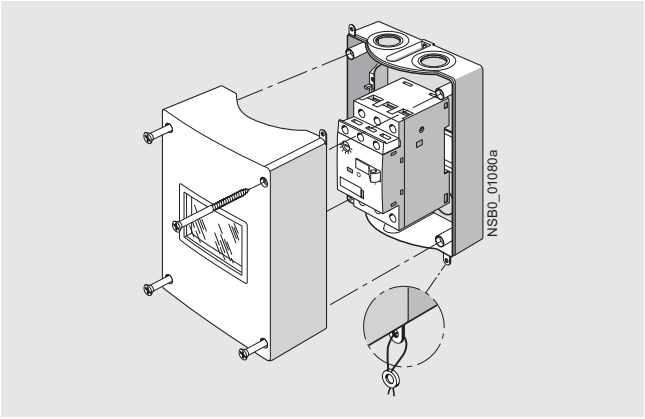
Overview

Enclosures

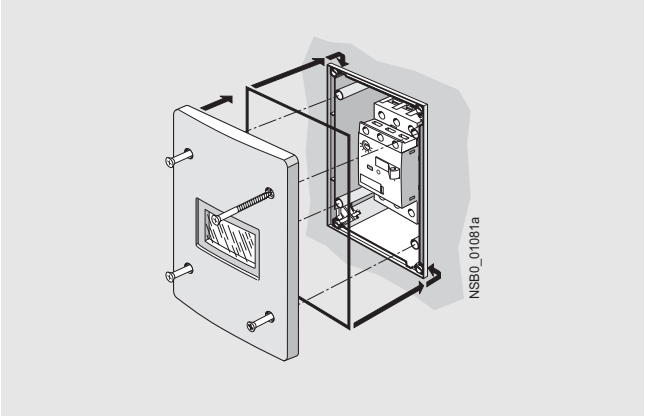
For stand-alone installation of motor starter protectors of sizes S00 ($I_{n\,max}$ = 12 A), S0 ($I_{n\,max}$ = 25 A) and S2 ($I_{n\,max}$ = 50 A), molded-plastic enclosures for surface mounting and molded-plastic enclosures for flush mounting are available in various dimensions.

When installed in a molded-plastic enclosure the motor starter protectors have a rated operational voltage U_e of 500 V.

The enclosures for surface mounting have the degree of protection IP55; the enclosures for flush mounting also comply with the degree of protection IP55 at the front (the flush-mounted section complies with IP20).



Enclosure for surface mounting



Enclosure for flush mounting

All enclosures are equipped with N- and PE- terminals. There are two knock-out cable entries for cable glands at the top and two at the bottom; also on the rear corresponding cable entries are scored. There is a knockout on the top of the enclosure for indicator lights that are available as accessories.

The narrow enclosure can accommodate a motor starter protector without accessories, with transverse and lateral auxiliary switch, whereas wide enclosures and enclosures for S2 motor starter protectors also provide space for a laterally mounted auxiliary trip unit. There is no provision for installing a motor starter protector with a signaling switch.

With S00 motor starter protectors, the switch rocker is operated by means of the actuator diaphragm of the enclosure. A locking device, capable of holding up to three padlocks, can be fitted onto the actuator diaphragm to prevent the motor starter protector from closing during maintenance work, for example.

A mushroom-shaped EMERGENCY-STOP knob can be fitted in place of the locking device. If it is actuated abruptly, the motor starter protector opens and the mushroom-shaped knob latches. The knob can be unlatched again either by turning it or by using a special key. The motor starter protector can subsequently be switched on again.

The molded-plastic enclosures of S0 and S2 motor starter protectors with rotary operating mechanism are fitted with a rotary operating mechanism as well.

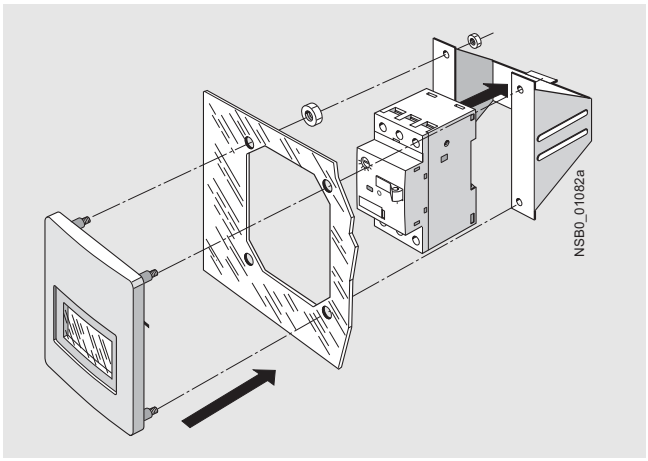
The enclosures can be supplied with a black rotary operating mechanism or with an EMERGENCY-STOP rotary operating mechanism with a red/yellow knob.

All rotary operating mechanisms can be locked in the open position with up to 3 padlocks.

Front plates

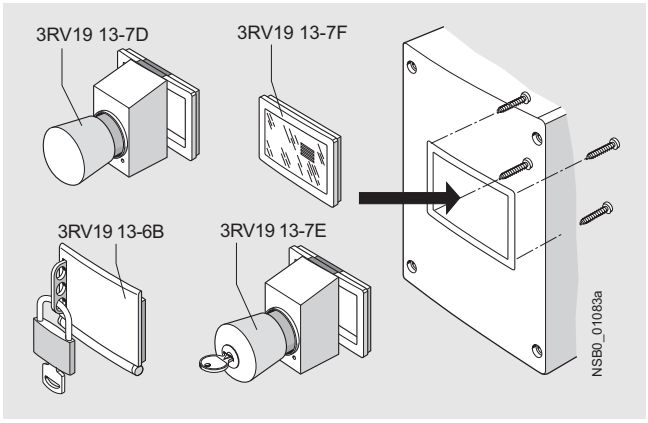
Motor starter protectors are frequently required to be actuated in any enclosure. Front plates equipped with an actuator diaphragm for size S00 motor starter protectors, or rotary operating mechanism for S0 to S3 motor starter protectors are available for this purpose.

The front plates for size S00 have a holder into which the motor starter protectors can be snapped. A holder for size S0 motor starter protectors is available for front plate sizes S0 to S3.



Front plate for size S00

Accessories for enclosures and front plates



Accessories for size S00

Selection and ordering data

Molded-plastic enclosures for surface mounting

	Type	Degree of protection	Integrated terminals	Installation width	For motor starter protectors Size	Order No.	Weight per PU approx. kg
	**With EMERGENCY-STOP rotary operating mechanism,** Lockable in 0 position	IP55	N and PE	54 mm (for switch + lateral auxiliary switch)	S0	**3RV19 23-1FA00**	0.329
				82 mm (for switch + lateral auxiliary switch + auxiliary trip unit)	S2	**3RV19 33-1GA00**	1.136

Indicator lights

	Type	Version	Rated control supply voltage U_s V	For motor starter protectors Size	Order No.	Weight per PU approx. kg
 3RV19 03-5B	**Indicator lights** For all enclosures and front plates	With glow lamp and colored lenses red, green, yellow, orange and clear	110 ... 120 220 ... 240 380 ... 415 480 ... 500	S00, S0, S2	**3RV19 03-5B** **3RV19 03-5C** **3RV19 03-5E** **3RV19 03-5G**	0.027 0.026 0.026 0.027

General data

Overview



Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
General data				
Sizes	• Are coordinated with the dimensions, connections and technical characteristics of the other devices in the SIRIUS modular system (contactors, soft starters, ...) • Permit the mounting of slim and compact load feeders in widths of 45 mm (S00), 45 mm (S0), 55 mm (S2), 70 mm (S3), 120 mm (S6) and 145 mm (S10/S12) • Simplify configuration	S00 ... S3	S00 ... S12	S00 ... S12
Seamless current range	• Allows easy and consistent configuration with one series of overload relays (for small to large loads)	0.11 ... 100 A	0.1 ... 630 A	0.3 ... 630 A (... 820 A)[1]
Protection functions				
Tripping in the event of overload	• Provides optimum inverse-time delayed protection of loads against excessive temperature rises due to overload	✓	✓	✓
Tripping in the event of phase unbalance	• Provides optimum inverse-time delayed protection of loads against excessive temperature rises due to phase unbalance	(✓)	✓	✓
Tripping in the event of phase failure	• Minimizes heating of induction motors during phase failure	✓	✓	✓
Protection of single-phase loads	• Enables the protection of single-phase loads	✓	—	✓
Tripping in the event of overheating by **Integrated thermistor motor protection function**	• Provides optimum temperature-dependent protection of loads against excessive temperature rises, e.g. for stator-critical motors or in the event of insufficient coolant flow, contamination of the motor surface or for long starting or braking operations • Eliminates the need for additional special equipment • Saves space in the control cabinet • Reduces wiring outlay and costs	—[2]	—[2]	✓
Tripping in the event of a ground fault by **Internal ground fault detection (activatable)**	• Provides optimum protection of loads against high-resistance short-circuits or ground faults due to moisture, condensed water, damage to the insulation material, etc. • Eliminates the need for additional special equipment. • Saves space in the control cabinet • Reduces wiring outlay and costs	—	✓ (only 3RB21)	✓
Features				
RESET function	• Allows manual or automatic resetting of the relay	✓	✓	✓
Remote RESET function	• Allows the remote resetting of the relay	✓ (by means of separate module)	✓ (only 3RB21 with 24 V DC)	✓
TEST function for auxiliary contacts	• Allows easy checking of the function and wiring	✓	✓	✓
TEST function for electronics	• Allows checking of the electronics	—	✓	✓
Status displays	• Displays the current operating state	✓	✓	✓
Large current adjustment button	• Makes it easier to set the relay exactly to the correct current value	✓	✓	✓
Integrated auxiliary contacts (1 NO + 1 NC)	• Allows the load to be switched off if necessary • Can be used for signal output	✓	✓	✓ (2 ·)

1) Motor currents up to 820 A can be recorded and evaluated by a current measuring module, e.g. 3RB29 06-2BG1 (0.3 ... 3 A) , in combination with a 3UF18 68-3GA00 (820 A / 1 A) series transformer.

2) The SIRIUS 3RN thermistor motor protection devices can be used to provide additional protection temperature-dependent protection.



Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
Design of load feeders				
Short-circuit strength up to 100 kA at 690 V (in conjunction with the corresponding fuses or the corresponding motor starter protector)	• Provides optimum protection of the loads and operating personnel in the event of short-circuits due to insulation faults or faulty switching operations	✓	✓	✓
Electrical and mechanical matching to 3RT1 contactors	• Simplifies configuration • Reduces wiring outlay and costs • Enables stand-alone installation as well as space-saving direct mounting	✓	✓	✓[1]
Straight-through transformers for main circuit[2] (in this case the cables are routed through the feed-through openings of the overload relay and connected directly to the box terminals of the contactor)	• Reduces the contact resistance (only one point of contact) • Saves wiring costs (easy, no need for tools, and fast). • Saves material costs • Reduces installation costs	—	✓ (S2 ... S6)	✓ (S00 ... S6)
Spring-loaded terminal connection system for main circuit[2]	• Enables fast connections • Permits vibration-resistant connections • Enables maintenance-free connections	✓ (S00)	—	—
Spring-loaded terminal connection system for auxiliary circuits[2]	• Enables fast connections • Permits vibration-resistant connections • Enables maintenance-free connections	✓	✓	✓
Other features				
Temperature compensation	• Allows the use of the relays at high temperatures without derating • Prevents premature tripping • Allows compact installation of the control cabinet without distance between the units/load feeders • Simplifies configuration • Enables space to be saved in the control cabinet	✓	✓	✓
Very high long-term stability	• Provides safe protection for the loads even after years of use in severe operating conditions	(✓)	✓	✓
Wide setting ranges	• Reduce the number of variants • Minimize the engineering outlay and costs • Reduce storage overhead, storage costs, tied-up capital	—	✓ (1:4)	✓ (1:10)
Trip class CLASS 5	• Enables solutions for very fast starting motors requiring special protection (e.g. Ex motors)	—	✓ (only 3RB21)	✓
Trip class > CLASS 10	• Enable heavy starting solutions	—	✓	✓
Low power loss	• Reduces power consumption and energy costs (up 98% less power is used than for thermal overload relays). • Minimizes temperature rises of the contactor and control cabinet – in some cases this may eliminate the need for control cabinet cooling. • Direct mounting to contactor saves space, even for high motor currents (i.e. no heat decoupling is required)	—	✓	✓

1) Exception: up to size S3, only stand-alone installation is possible.

2) Alternatively available for screw terminals.

General data



Features	Benefits	3RU11	3RB20/3RB21	3RB22/3RB23
Other features				
Internal power supply	• Eliminates the need for configuration and connecting an additional control circuit	—[1)]	✓	—
Variable adjustment of the trip classes (The required trip class can be adjusted by means of a rotary switch depending on the current start-up condition.)	• Reduces the number of variants • Minimizes the configuring outlay and costs • Minimizes storage overhead, storage costs, and tied-up capital	—	✓ (only 3RB21)	✓
Overload warning	• Indicates imminent tripping of the relay directly on the device due to overload, phase unbalance or phase failure • Allows the imminent tripping of the relay to be signaled • Allows measures to be taken in time in the event of continuous inverse-time delayed overloads • Eliminates the need for an additional device • Saves space in the control cabinet • Reduces wiring outlay and costs	—	—	✓
Analog output	• Allows the output of an analog output signal for actuating moving-coil instruments, feeding programmable logic controllers or transfer to bus systems • Eliminates the need for an additional measuring transformer and signal converter • Saves space in the control cabinet • Reduces wiring outlay and costs	—	—	✓

1) The SIRIUS 3RU11 thermal overload relays use a bimetal contactor and therefore do not require a control supply voltage.

Overload relays	Current measurement	Current range	**Contactors** (type, size, rating in kW) **3RT10 1**	**3RT10 2**	**3RT10 3**	**3RT10 4**	**3RT10 5**	**3RT10 6**	**3RT10 7**	**3TF68/69**
			S00	S0	S2	S3	S6	S10	S12	Size 14
Type	Type	A	3/4/5.5	5.5/7.5/11	15/18.5/22	30/37/45	55/75/90	110/132/160	200/250	375/450
3RU11 thermal overload relays										
										
3RU11 1	Integrated	0.11 ... 12	✓	—	—	—	—	—	—	—
3RU11 2	Integrated	1.8 ... 25	—	✓	—	—	—	—	—	—
3RU11 3	Integrated	5.5 ... 50	—	—	✓	—	—	—	—	—
3RU11 4	Integrated	18 ... 100	—	—	—	✓	—	—	—	—
3RB20 solid-state overload relays										
										
3RB20 1	Integrated	0.1 ... 12	✓	—	—	—	—	—	—	—
3RB20 2	integrated	0.1 ... 25	—	✓	—	—	—	—	—	—
3RB20 3	Integrated	6 ... 50	—	—	✓	—	—	—	—	—
3RB20 4	Integrated	12.5 ... 100	—	—	—	✓	—	—	—	—
3RB20 5	Integrated	50 ... 200	—	—	—	—	✓	—	—	—
3RB20 6	Integrated	55 ... 630	—	—	—	—	—	✓	✓	✓
3RB20 1 + 3UF18	Integrated	630 ... 820	—	—	—	—	—	—	—	✓
3RB21 solid-state overload relays										
										
3RB21 1	Integrated	0.1 ... 12	✓	—	—	—	—	—	—	—
3RB21 2	Integrated	0.1 ... 25	—	✓	—	—	—	—	—	—
3RB21 3	Integrated	6 ... 50	—	—	✓	—	—	—	—	—
3RB21 4	Integrated	12.5 ... 100	—	—	—	✓	—	—	—	—
3RB21 5	Integrated	50 ... 200	—	—	—	—	✓	—	—	—
3RB21 6	Integrated	55 ... 630	—	—	—	—	—	✓	✓	✓
3RB21 1 + 3UF18	Integrated	630 ... 820	—	—	—	—	—	—	—	✓
3RB22/3RB23 solid-state overload relays										
										
3RB22/3RB23 +	3RB29 0	0.3 ... 25	✓	✓	—	—	—	—	—	—
	3RB29 0	10 ... 100	—	—	✓	✓	—	—	—	—
	3RB29 5	20 ... 200	—	—	—	—	✓	—	—	—
	3RB29 6	63 ... 630	—	—	—	—	—	✓	✓	✓
	3RB29 0 + 3UF18	630 ... 820	—	—	—	—	—	—	—	✓

Connection methods

The 3RB20/3RB21 relays are available with screw terminals (box terminals) on the auxiliary current side; the same applies for the evaluation modules of the 3RB22/3RB23 relays. The 3RU11 relays come with screw terminals.

General data

Conversion aid 3RB12 ––> 3RB22/3RB23

Size	Previous typesReplacement types Overload relays (complete units)		Current measuring module		Evaluation module	Function expansion module
	3RB12	Setting range in A	3RB29	Setting range in A	3RB22/3RB23	3RB29
S00/S0	**3RB12 46-1P □ □□**	1.25 ... 6.3	**3RB29 06-2BG1**[1]	0.3 ... 3		
			3RB29 06-2DG1[1]	2.4 ... 25		
	3RB12 46-1Q □ □□	6.3 ... 25				
S2/S3	**3RB12 46-1E □ □□**	25 ... 100	**3RB29 06-2JG1**[1]	10 ... 100	**3RB2 □ 83-4AA1**	**3RB29 85-2□□□**
S6	**3RB12 53-0F □ □□**	50 ... 205	**3RB29 56-2TG2**[2]	20 ... 200		
			3RB29 56-2TH2[2]			
S10/S12	**3RB12 57-0K □ □□**	125 ... 500	**3RB29 66-2WH2**[2]	63 ... 630 (820)[3]		
	3RB12 62-0L □ □□	200 ... 820				

110 ... 120 V AC	**G**		✓	
220 ... 240 V AC	**M**		✓	
24 V DC	**B**		✓	
Standard version with ground-fault signaling		**0 0**	—	—
Standard version with overload warning		**1 0**	**2**	✓
Version with internal ground fault detection and ground-fault signaling		**2 0**	**2**	**CB1**
Version with internal ground fault detection and overload warning		**3 0**	**2**	**CA1**
Version with analog output		**4 0**	**2**	**AA0**
Bistable version with ground-fault signaling		**0 1**	—	—
Bistable version with overload warning		**1 1**	**3**	✓

1) Use 3RB29 87-2B connecting cable.

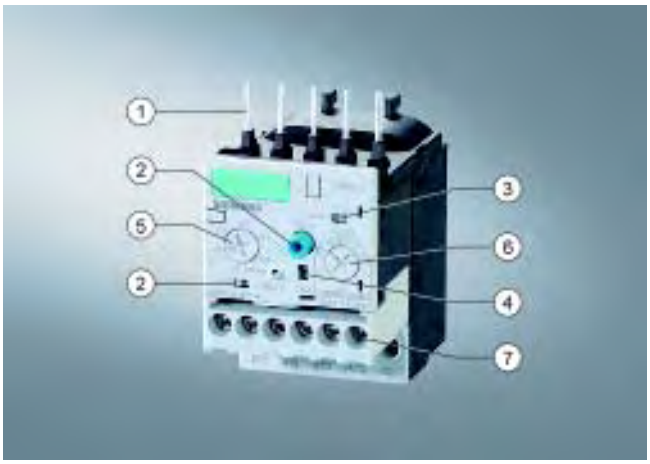
2) Use 3RB29 87-2D connecting cable.

3) Motor currents up to 820 A can be recorded and evaluated by a current measuring module, e.g. 3RB29 06-2BG1 (0.3 ... 3 A), in combination with a 3UF18 68-3GA00 (820 A / 1 A) series transformer.

✓ = Included in the evaluation module (no selection)

— = Not available

Overview



(1) Connection for mounting onto contactors:
Optimally adapted in electrical, mechanical and design terms to the contactors and soft starters, these connecting pins can be used for direct mounting of the overload relays. Stand-alone installation is possible as an alternative (in some cases in conjunction with a stand-alone installation module).

(2) Selector switch for manual/automatic RESET and RESET button:
With the slide switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB21 a solid-state remote RESET is integrated.

(3) Switch position indicator and TEST function of the wiring:
Indicates a trip and enables the wiring test.

(4) Solid-state test (device test):
Enables a test of all important device components and functions.

(5) Motor current setting:
Setting the device to the rated motor current is easy with the large rotary knob.

(6) Trip class setting/internal ground-fault detection (only 3RB21):
Using the rotary switch you can set the required trip class and activate the internal ground-fault detection dependent on the start-up conditions.

(7) Connecting terminals (removable terminal block for auxiliary circuits):
The generously sized terminals permit connection of two conductors with different cross-sections for the main and auxiliary circuits. The auxiliary circuit can be connected with screw connection and alternatively with spring-type connection.

The 3RB20 and 3RB21 solid-state overload relays up to 630 A with internal power supply have been designed for inverse-time delayed protection of loads with normal and heavy starting against excessive temperature rises due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set rated motor current. This current rise is detected by the current transformers integrated into the devices and evaluated by corresponding solid-state circuits which then output a pulse to the auxiliary contacts. The auxiliary contacts then switch off the load by means of a contactor. The break time depends on the ratio between the tripping current and set current I_e and is stored in the form of a long-term stable tripping characteristic.

In addition to inverse-time delayed protection of loads against excessive temperature rises due to overload, phase unbalance and phase failure, the 3RB21 solid-state overload relays also allow internal ground-fault detection (not possible in conjunction with wye-delta assemblies). This provides protection of loads against high-resistance short-circuits due to damage to the insulation material, moisture, condensed water etc.

The "tripped" status is signaled by means of a switch position indicator. Resetting takes place either manually or automatically after the recovery time has elapsed.

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials. They comply with all important worldwide standards and approvals.

"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RB20/3RB21 solid-state overload relays are suitable for the overload protection of explosion-proof motors with "increased safety" type of protection EEx e. The relays meet the requirements of EN 60079-7 (Electrical apparatus for areas subject to explosion hazards – Increased safety "e");

EC type test certificate for Group II, Category (2) G/D exists. It has the number PTB 06 ATEX 3001.

Application

Industries

The 3RB20/3RB21 solid-state overload relays are suitable for customers from all industries who want to guarantee optimum inverse-time delayed protection of their electrical loads (e.g. motors) under normal and heavy starting conditions (CLASS 5 to CLASS 30), minimize project completion times, inventories and power consumption, and optimize plant availability and maintenance management.

Application

The 3RB20/3RB21 solid-state overload relays have been designed for the protection of induction motors in sinusoidal 50/60 Hz voltage networks. The relays are not suitable for the protection of single-phase AC or DC loads.

The 3RU11 thermal overload relay or the 3RB22/3RB23 solid-state overload relay can be used for single-phase AC loads. For DC loads we recommend the 3RU11 thermal overload relay.

Ambient conditions

The devices are insensitive to external influences such as shocks, corrosive environments, ageing and temperature fluctuation.

For the temperature range from –25 C to +60 °C, the 3RB20/3RB21 solid-state overload relays compensate the temperature according to IEC 60947-4-1.

For the 3RB20/3RB21 solid-state overload relays with the sizes S6, S10 and S12, the upper set value of the setting range must be reduced for ambient temperatures > 50 °C by a certain factor (see tables below).

Type	Setting range	Derating factor for the upper set value **for stand-alone installation** at ambient temperature	
		+50 °C	+60 °C
3RB20 56, 3RB21 56	50 ... 200 A	100 %	100 %
3RB20 66, 3RB21 66	55 ... 250 A	100 %	100 %
3RB20 66, 3RB21 66	160 ... 630 A	100 %	90 %

Type	Setting range	Derating factor for the upper set value for **mounting onto contactor** at ambient temperature	
		+50 °C	+60 °C
3RB20 56, 3RB21 56	50 ... 200 A	100 %	70 %
3RB20 66, 3RB21 66	55 ... 250 A	100 %	70 %
3RB20 66, 3RB21 66	160 ... 630 A	100 %	70 %

Accessories

The following accessories are available for the 3RB20/3RB21 solid-state overload relays:

- One terminal bracket each for the overload relays size S00 and S0 (sizes S2 to S12 can be installed as single units without a terminal bracket)
- One mechanical remote RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- One sealable cover for all sizes
- Box terminal blocks for sizes S6 and S10/S12
- Terminal covers for sizes S2 to S10/S12

Selection and ordering data

3RB20 solid-state overload relays with screw terminals on auxiliary current side for direct mounting[1)2)] and stand-alone installation[2)3)], CLASS 10

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Switch position indicator
- TEST function and self-monitoring

	Size of contactor[4)]	Rating for induction motor Rated value[5)]	Set current value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination 2, gL/gG operational class[6)]	**Screw terminals** (on auxiliary current side) Order No.	Weight per PU approx.
		kW	A	A		kg
Size S00[1)]						
 3RB20 16-1RB0	S00	0.04 ... 0.09	0.1 ... 0.4	1	**3RB20 16-1RB0**	0.200
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB20 16-1NB0**	0.200
		0.55 ... 1.5	1 ... 4	10	**3RB20 16-1PB0**	0.200
		1.1 ... 5.5	3 ... 12	20	**3RB20 16-1SB0**	0.200
Size S0[1)]						
 3RB20 26-1QB0	S0	0.04 ... 0.09	0.1 ... 0.4	1	**3RB20 26-1RB0**	0.220
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB20 26-1NB0**	0.220
		0.55 ... 1.5	1 ... 4	10	**3RB20 26-1PB0**	0.220
		1.1 ... 5.5	3 ... 12	20	**3RB20 26-1SB0**	0.220
		3 ... 11	6 ... 25	35	**3RB20 26-1QB0**	0.220
Size S2[1)3)7)]						
 3RB20 36-1UB0	S2	3 ... 11	6 ... 25	63	**3RB20 36-1QB0**	0.360
					3RB20 36-1QW1	0.230
		7.5 ... 22	12.5 ... 50	80	**3RB20 36-1UB0**	0.360
					3RB20 36-1UW1	0.230
Size S3[1)3)7)]						
 3RB20 46-1EB0	S3	7.5 ... 22	12.5 ... 50	160	**3RB20 46-1UB0**	0.560
		11 ... 45	25 ... 100	315	**3RB20 46-1EB0**	0.560
					3RB20 46-1EW1	0.450
Size S6 [2)7)]						
 3RB20 56-1FW2	S6 with busbar connection	22 ... 90	50 ... 200	315	**3RB20 56-1FC2**	1.030
	S6 with box terminals				**3RB20 56-1FW2**	0.690
Size S10/S12[2)]						
 3RB20 66-1MC2	S10/S12 and size 14 (3TF68/ 3TF69)	22 ... 110	55 ... 250	400	**3RB20 66-1GC2**	1.820
		90 ... 450	160 ... 630	800	**3RB20 66-1MC2**	1.820

1) The relays with an Order No. ending with **"0"** are designed for direct mounting. With the matching terminal brackets (see "Accessories", page 5/38), the sizes S00 and S0 can also be installed as stand-alone units.

2) The relays with an Order No. ending with **"2"** are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.

3) The relays with an Order No. ending with **"1"** are designed for stand-alone installation.

4) Observe maximum rated operational current of the devices.

5) Guide value for 4-pole standard motors at 50 Hz 400 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

6) Maximum fuse for overload relay, type of coordination 2.

7) The relays with an Order No. with **"W"** in penultimate position are equipped with a straight-through transformer.

3RB20, 3RB21 for standard applications

3RB20 solid-state overload relays with screw terminals on auxiliary current side for direct mounting[1)2)] and stand-alone installation[2)3)], CLASS 20

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Switch position indicator
- TEST function and self-monitoring

	Size of contactor[4)]	Rating for induction motor Rated value[5)]	Set current value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination 2, gL/gG operational class[6)]	**Screw terminals** (on auxiliary current side) Order No.	Weight per PU approx.
		kW	A	A		kg
Size S00[1)]						
 3RB20 16-2RB0	S00	0.04 ... 0.09	0.1 ... 0.4	1	**3RB20 16-2RB0**	0.200
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB20 16-2NB0**	0.200
		0.55 ... 1.5	1 ... 4	10	**3RB20 16-2PB0**	0.200
		1.1 ... 5.5	3 ... 12	20	**3RB20 16-2SB0**	0.200
Size S0[1)]						
 3RB20 26-2QB0	S0	0.04 ... 0.09	0.1 ... 0.4	1	**3RB20 26-2RB0**	0.220
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB20 26-2NB0**	0.220
		0.55 ... 1.5	1 ... 4	10	**3RB20 26-2PB0**	0.220
		1.1 ... 5.5	3 ... 12	20	**3RB20 26-2SB0**	0.220
		3 ... 11	6 ... 25	35	**3RB20 26-2QB0**	0.220
Size S2[1)3)7)]						
 3RB20 36-2UB0	S2	3 ... 11	6 ... 25	63	**3RB20 36-2QB0**	0.360
					3RB20 36-2QW1	0.230
		7.5 ... 22	12.5 ... 50	80	**3RB20 36-2UB0**	0.360
					3RB20 36-2UW1	0.230
Size S3[1)3)7)]						
 3RB20 46-2EB0	S3	7.5 ... 22	12.5 ... 50	160	**3RB20 46-2UB0**	0.560
		11 ... 45	25 ... 100	315	**3RB20 46-2EB0**	0.560
					3RB20 46-2EW1	0.450
Size S6[2)7)]						
 3RB20 56-2FW2	S6 with busbar connection	22 ... 90	50 ... 200	315	**3RB20 56-2FC2**	1.030
	S6 with box terminals				**3RB20 56-2FW2**	0.690
Size S10/S12[2)]						
 3RB20 66-2MC2	S10/S12 and size 14 (3TF68/ 3TF69)	22 ... 110	55 ... 250	400	**3RB20 66-2GC2**	1.820
		90 ... 450	160 ... 630	800	**3RB20 66-2MC2**	1.820

1) The relays with an Order No. ending with **"0"** are designed for direct mounting. With the matching terminal brackets (see "Accessories", page 5/38) the sizes S00 and S0 can also be installed as stand-alone units.

2) The relays with an Order No. ending with **"2"** are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.

3) The relays with an Order No. ending with **"1"** are designed for stand-alone installation.

4) Observe maximum rated operational current of the devices.

5) Guide value for 4-pole standard motors at 50 Hz 400 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

6) Maximum fuse for overload relay, type of coordination 2.

7) The relays with an Order No. with **"W"** in penultimate position are equipped with a straight-through transformer.

3RB21 solid-state overload relays with screw terminals on auxiliary current side for direct mounting[1)2)] and stand-alone installation[2)3)], CLASS 5, 10, 20 and 30 adjustable

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- Internal ground fault detection (activatable)
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Electrical remote RESET integrated
- Switch position indicator
- TEST function and self-monitoring

	Size of contactor[4)]	Rating for induction motor Rated value[5)]	Set current value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination 2, gL/gG operational class[6)]	**Screw terminals** (on auxiliary current side) Order No.	Weight per PU approx.
		kW	A	A		kg
Size S00[1)]						
 3RB21 13-4RB0	S00	0.04 ... 0.09	0.1 ... 0.4	1	**3RB21 13-4RB0**	0.200
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB21 13-4NB0**	0.200
		0.55 ... 1.5	1 ... 4	10	**3RB21 13-4PB0**	0.200
		1.1 ... 5.5	3 ... 12	20	**3RB21 13-4SB0**	0.200
Size S0[1)]						
 3RB21 23-4QB0	S0	0.04 ... 0.09	0.1 ... 0.4	1	**3RB21 23-4RB0**	0.220
		0.12 ... 0.37	0.32 ... 1.25	2	**3RB21 23-4NB0**	0.220
		0.55 ... 1.5	1 ... 4	10	**3RB21 23-4PB0**	0.220
		1.1 ... 5.5	3 ... 12	20	**3RB21 23-4SB0**	0.220
		3 ... 11	6 ... 25	35	**3RB21 23-4QB0**	0.220
Size S2[1)3)7)]						
 3RB21 33-4UB0	S2	3 ... 11	6 ... 25	63	**3RB21 33-4QB0**	0.360
					3RB21 33-4QW1	0.230
		7.5 ... 22	12.5 ... 50	80	**3RB21 33-4UB0**	0.360
					3RB21 33-4UW1	0.230
Size S3[1)3)7)]						
 3RB21 43-4EB0	S3	7.5 ... 22	12.5 ... 50	160	**3RB21 43-4UB0**	0.560
		11 ... 45	25 ... 100	315	**3RB21 43-4EB0**	0.560
					3RB21 43-4EW1	0.450
Size S6[2)7)]						
 3RB21 53-4FC2	S6 with busbar connection	22 ... 90	50 ... 200	315	**3RB21 53-4FC2**	1.030
	S6 with box terminals				**3RB21 53-4FW2**	0.690
Size S10/S12[2)]						
 3RB21 63-4MC2	S10/S12 and size 14 (3TF68/ 3TF69)	22 ... 110	55 ... 250	400	**3RB21 63-4GC2**	1.820
		90 ... 450	160 ... 630	800	**3RB21 63-4MC2**	1.820

1) The relays with an Order No. ending with **"0"** are designed for direct mounting. With the matching terminal brackets (see "Accessories", page 5/38) the sizes S00 and S0 can also be installed as stand-alone units.

2) The relays with an Order No. ending with **"2"** are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.

3) The relays with an Order No. ending with **"1"** are designed for stand-alone installation.

4) Observe maximum rated operational current of the devices.

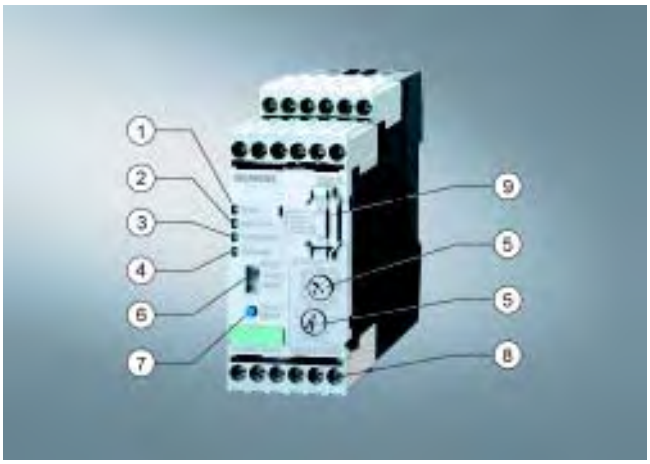
5) Guide value for 4-pole standard motors at 50 Hz 400 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

6) Maximum fuse for overload relay, type of coordination 2.

7) The relays with an Order No. with **"W"** in penultimate position are equipped with a straight-through transformer.

3RB22, 3RB23 for high-feature applications

Overview



3RB22/3RB23 evaluation module

(1) Green "READY" LED:
A continuous green light signals that the device is working correctly.

(2) Red "GND FAULT" LED:
A continuous red light signals a ground-fault tripping.

(3) Red "THERMISTOR" LED:
A continuous red light signals an active thermistor trip.

(4) Red "OVERLOAD" LED:
A continuous red light signals an active overload trip; a flickering red light signals an imminent trip (overload warning).

(5) Motor current and trip class adjustment:
Setting the device to the motor current and to the required trip class dependent on the start-up conditions is easy with the two rotary switches.

(6) Selector switch for manual/automatic RESET:
With this switch you can choose between manual and automatic RESET.

(7) Test/RESET button:
Enables testing of all important device components and functions, plus resetting of the device after a trip when manual RESET is selected.

(8) Connecting terminals (removable terminal block):
The generously sized terminals permit connection of two conductors with different cross-sections for the auxiliary, control and sensor circuits. Connection is possible with screw connection and alternatively with spring-type connection.

(9) 3RB29 85 function expansion module:
Enables more functions to be added, e.g. internal ground fault detection and/or an analog output with corresponding signals.

3RB29 06 current measuring module

The modular, solid-state overload relays with external power supply type 3RB22 (with monostable auxiliary contacts) and type 3RB23 (with bistable auxiliary contacts) up to 630 A (up to 820 A possible with a series transformer) have been designed for inverse-time delayed protection of loads with normal and heavy starting against excessive temperature rises due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set rated motor current. This current rise is detected by means of a current measuring module and electronically evaluated by a special evaluation module which is connected to it. The evaluation electronics sends a signal to the auxiliary contacts. The auxiliary contacts then switch off the load by means of a contactor. The break time depends on the ratio between the tripping current and set current I_e and is stored in the form of a long-term stable tripping characteristic. The "tripped" status is signaled by means of a continuous red "OVERLOAD" LED.

The LED indicates imminent tripping of the relay due to overload, phase unbalance or phase failure by flickering when the limit current has been violated. This warning can also issued as a signal through auxiliary contacts.

In addition to the described inverse-time delayed protection of loads against excessive temperature rises, the 3RB22/3RB23 solid-state overload relays also allow direct temperature monitoring of the motor windings (full motor protection) by connection with broken-wire interlock of a PTC sensor circuit. With this temperature- dependent protection, the loads can be protected against overheating caused indirectly by reduced coolant flow, for example, which cannot be detected by means of the current alone. In the event of overheating, the devices switch off the contactor, and thus the load, by means of the auxiliary contacts. The "tripped" status is signaled by means of a continuously illuminated "THERMISTOR" LED.

To also protect the loads against high-resistance short-circuits due to damage to the insulation, humidity, condensed water, etc., the 3RB22/3RB23 solid-state overload relays offer the possibility of internal ground fault monitoring in conjunction with a function expansion module not possible in conjunction with contactor assembly for Wye-Delta starting). In the event of a ground fault, the 3RB22/3RB23 relays trip instantaneously. The "tripped" status is signaled by means of a continuous red "Ground Fault" LED. Signaling through auxiliary contacts is also possible.

After tripping due to overload, phase unbalance, phase failure, thermistor tripping or ground fault, the relay is reset manually or automatically after the recovery time has elapsed

In conjunction with a function expansion module, the motor current measured by the microprocessor can be output in the form of an analog signal 4 ... 20 mA DC for operating rotary coil instruments or for feeding into analog inputs of programmable logic controllers. With an additional AS-Interface analog module, the current values can also be transferred over the AS-i bus system.

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials.

They comply with all important worldwide standards and approvals.

"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RB22 (monostable) solid-state overload relays are suitable for the overload protection of explosion-proof motors with "Increased safety" type of protection EEx e. The relays meet the requirements of EN 60079-7 (Electrical apparatus for areas subject to explosion hazards – Increased safety "e");

EC type test certificate for Group II, Category (2) G/D exists. It has the number PTB 05 ATEX 3022.

Application

Industries

The 3RB22/3RB23 solid-state overload relays are suitable for customers from all industries who want to guarantee optimum inverse-time delayed and temperature-dependent protection of their electrical loads (e.g. motors) under normal and heavy starting conditions (CLASS 5 to CLASS 30), minimize project completion times, inventories and power consumption, and optimize plant availability and maintenance management.

Application

The 3RB22/3RB23 solid-state overload relays have been designed for the protection of three-phase asynchronous and single-phase AC motors.

If single-phase AC motors are to be protected by the 3RB22/ 3RB23 solid-state overload relays, the main current paths of thecurrent measuring modules must be series-connected

Ambient conditions

The devices are insensitive to external influences such as shocks, corrosive environments, ageing and temperature fluctuation.

For the temperature range from –25 C to +60 °C, the 3RB22/ 3RB23 solid-state overload relays compensate the temperature according to IEC 60947-4-1.

Configuration notes for use of the devices below –25 °C or above +60 °C on request.

Accessories

The following accessories are available for the 3RB22/3RB23 solid-state overload relays:

- A sealable cover for the evaluation module
- Box terminal blocks for the current measuring modules size S6 and S10/S12
- Terminal covers for the current measuring modules size S6 and S10/S12
- Push-in lugs for screw mounting the size S00 to S3 current measuring modules

Selection and ordering data

3RB22/3RB23 solid-state overload relays for full motor protection with screw terminals or spring-loaded terminals for stand-alone installation, CLASS 5, 10, 20 and 30 adjustable

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- External power supply 24 ... 240 V AC/DC
- Auxiliary contacts 2 NO + 2 NC
- Manual and automatic RESET
- Electrical remote RESET integrated
- 4 LEDs for operating and status displays
- TEST function and self-monitoring
- Internal ground fault detection with function expansion module
- Screw terminals or spring-loaded terminals for auxiliary, control and sensor circuits
- Input for PTC sensor circuit
- Analog output with function expansion module

	Size of contactor	Version	Screw terminals Order No.	Weight per PU approx. kg
Evaluation modules				
 3RB2. 83-4AA1	S00 ... S12	Monostable	**3RB22 83-4AA1**	0.300
		Bistable	**3RB23 83-4AA1**	0.300

	Size of contactor	Version	Order No.	Weight per PU approx. kg
Function expansion modules				
		For plugging into evaluation module (1 unit)		
	S00 ... S12	**Analog Basic 1**[1) modules] Analog output DC 4 ... 20 mA, with overload warning	**3RB29 85-2AA0**	0.030
		Analog Basic 1 GF[1)2) modules] Analog output DC 4 ... 20 mA, with internal ground fault detection and overload warning	**3RB29 85-2AA1**	0.030
		Analog Basic 2 GF[1)2) modules] Analog output DC 4 ... 20 mA, with internal ground fault detection and ground-fault signaling	**3RB29 85-2AB1**	0.030
		Basic 1 GF[2] **modules** with internal ground fault detection and overload warning	**3RB29 85-2CA1**	0.030
		Basic 2 GF[2] **modules** with internal ground fault detection and ground-fault signaling	**3RB29 85-2CB1**	0.030

Note: Analog input modules, e.g. SM 331, must be configured for 4-wire measuring transducers. In this case the analog input module must not supply current to the analog output of the 3RB22/ 3RB23 relay.

1) The analog signal DC 4 ... 20 mA can be used for operating rotary coil instruments or for feeding into analog inputs of programmable logic controllers.

2) The following information on ground-fault protection refers to sinusoidal residual currents at 50/60 Hz:

- with a motor current of between 0.3 and 2 times the set current I_e the unit will trip at a ground-fault current equal to 30 % of the set current.
- with a motor current of between 2 and 8 times the set current I_e the unit will trip at a ground-fault current equal to 15 % of the set current.
- the response delay amounts to between 0.5 and 1 second.

Current measuring modules for direct mounting[1] and stand-alone installation[1)2)]

	Size of contactor[3]	Rating for induction motor Rated value[4]	Set current value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination 2, gL/gG operational class[5]	Order No.	Weight per PU approx.
		kW	A			kg
Size S00/S0 [2)6)]						
 3RB29 06-2.G1	S00/S0	0.09 ... 1.1	0.3 ... 3	20	**3RB29 06-2BG1**	0.100
		1.1 ... 11	2.4 ... 25	63	**3RB29 06-2DG1**	0.150
Size S2/S3 [2)6)]						
 3RB29 06-2JG1	S2/S3	5.5 ... 45	10 ... 100	315	**3RB29 06-2JG1**	0.350
Size S6[1)6)]						
 3RB29 56-2TG2	S6 with busbar connection	11 ... 90	20 ... 200	315	**3RB29 56-2TH2**	1.000
	S6 with box terminals				**3RB29 56-2TG2**	0.600
Size S10/S12[1)]						
 3RB29 66-2WH2	S10/S12 and size 14 (3TF68/ 3TF69)	37 ... 450	63 ... 630	800	**3RB29 66-2WH2**	1.750

Note: The connecting cable between the current measuring module and the evaluation module is not included in the scope of supply; please order separately.

1) The current measuring modules with an Order No. ending with **"2"** are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.

2) The current measuring modules with an Order No. ending with **"1"** are designed for stand-alone installation.

3) Observe maximum rated operational current of the devices.

4) Guide value for 4-pole standard motors at 50 Hz 400 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

5) Maximum protection by fuse for overload relay, type of coordination 2.

6) The modules with an Order No. with **"G"** in penultimate position are equipped with a straight-through transformer.

Accessories

	Size of contactor	Version	Order No.	Weight per PU approx.
				kg
Connecting cables (essential accessory)				
 3RB29 87-2.		For connection between evaluation module and current measuring module		
	S00 ... S3	• Length 0.1 m (only for mounting of the evaluation module directly onto the current measuring module)	**3RB29 87-2B**	0.010
	S00 ... S12	• Length 0.5 m	**3RB29 87-2D**	0.020

For more accessories, see page 3/38.

Accessories

Overview

Overload relays for standard applications

The following optional accessories are available for the 3RB20/ 3RB21 solid-state overload relays:

- One terminal bracket each for the overload relays size S00 and S0 (sizes S2 to S12 can be installed as single units without a terminal bracket)
- One mechanical remote RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- One sealable cover for all sizes
- Box terminal blocks for sizes S6 and S10/S12
- Terminal covers for sizes S2 to S10/S12

Overload relays for high-feature applications

The following optional accessories are available for the 3RB22/ 3RB23 solid-state overload relays:

- A sealable cover for the evaluation module
- Box terminal blocks for the current measuring modules size S6 and S10/S12
- Terminal covers for the current measuring modules size S6 and S10/S12
- Push-in lugs for screw mounting the size S00 to S3 current measuring modules

Selection and ordering data

	Version	Size	Order No.	Weight per PU approx. kg
Terminal brackets for stand-alone installation[1]				
 3RB29 .3-0AA1	For separate mounting of the overload relays; screw and snap-on mounting onto TH 35 standard mounting rail	S00	**3RB29 13-0AA1**	0.060
		S0	**3RB29 23-0AA1**	0.080
Mechanical RESET[2]				
 3RU19 00-1A with pushbutton and extension plunger	**Resetting plungers, holders and formers**	S00 ... S10/S12	**3RU19 00-1A**	0.038
	Pushbuttons with extended stroke (12 mm), IP65, Ø 22 mm		**3SB30 00-0EA11**	0.020
	Extension plungers For compensation of the distance between a pushbutton and the unlatching button of the relay		**3SX1 335**	0.004
Cable releases with holder for RESET[2]				
 3RU19 00-1.	For Ø 6.5 mm holes in the control panel; max. control panel thickness 8 mm	S00 ... S10/S12		
	• Length 400 mm		**3RU19 00-1B**	0.063
	• Length 600 mm		**3RU19 00-1C**	0.073

1) Only for 3RB20/3RB21.

2) Only for 3RB20/3RB21. The accessories are identical to those of the 3RU11 thermal overload relays.

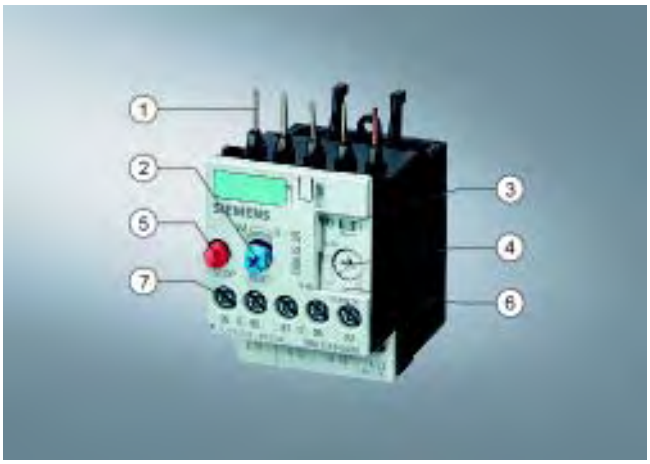
	Version	Size	Order No.	Weight per PU approx. kg
Sealable covers				
	For covering the setting knobs			
	• For 3RB20/3RB21	S00 ... S10/S12	**3RB29 84-0**	0.020
	• For 3RB22/3RB23	–	**3RB29 84-2**	0.050
Terminal covers				
 3RT19 46-4EA1	**Covers for cable lugs and busbar connections**			
	• Length 55 mm[1]	S3	**3RT19 46-4EA1**	0.040
	• Length 100 mm	S6	**3RT19 56-4EA1**	0.070
	• Length 120 mm	S10/S12	**3RT19 66-4EA1**	0.130
 3RT19 36-4EA2 The figures show mounting on the contactor	**Covers for box terminals**			
	• Length 20.6 mm[1]	S2	**3RT19 36-4EA2**	0.020
	• Length 20.8 mm[1]	S3	**3RT19 46-4EA2**	0.025
	• Length 25 mm	S6	**3RT19 56-4EA2**	0.030
	• Length 30 mm	S10/S12	**3RT19 66-4EA2**	0.040
	Covers for screw terminals between contactor and overload relay, without box terminals (1 unit required per combination)	S6	**3RT19 56-4EA3**	0.020
		S10/S12	**3RT19 66-4EA3**	0.060
Box terminal blocks				
 3RT19 5.-4G	For round and ribbon cables			
	• Up to 70 mm²	S6[2]	**3RT19 55-4G**	0.230
	• Up to 120 mm²	S6	**3RT19 56-4G**	0.260
	• Up to 240 mm²	S10/S12	**3RT19 66-4G**	0.676
Push-in lugs				
 3RP19 03	For screw mounting of 3RB22/3RB23 overload relays	—	**3RP19 03**	0.002

1) Only for 3RB20/3RB21. The accessories are identical to those of the 3RU11 thermal overload relays.

2) In the scope of supply for 3RT10 54-1 contactors (55 kW).

3RU11 for standard applications

Overview



(1) Connection for mounting onto contactors:
Optimally adapted in electrical, mechanical and design terms to the contactors, these connecting pins can be used for direct mounting of the overload relays. Stand-alone installation is possible as an alternative (in some cases in conjunction with a stand-alone installation module).

(2) Selector switch for manual/automatic RESET and RESET button:
With this switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. A remote RESET is possible using the RESET modules (accessories), which are independent of size.

(3) Switch position indicator and TEST function of the wiring:
Indicates a trip and enables the wiring test.

(4) Motor current setting:
Setting the device to the rated motor current is easy with the large rotary knob.

(5) STOP button:
If the STOP button is pressed, the NC contact is opened. This switches off the contactor downstream. The NC contact is closed again when the button is released.

(6) Transparent, sealable cover:
Secures the motor current setting, TEST function and the selector switch for manual/automatic RESET against adjustment.

(7) Supply terminals:
The generously sized terminals permit connection of two conductors with different cross-sections for the main and auxiliary circuits. The auxiliary circuit can be connected with screw connection and alternatively with spring-type connection.

The 3RU11 thermal overload relays up to 100 A have been designed for inverse-time delayed protection of loads with normal starting against excessive temperature rises due to overload or phase failure. An overload or phase failure results in an increase of the motor current beyond the set rated motor current. Via heating elements, this current rise heats up the bimetal strips inside the device, which then bend and as a reult trigger the auxiliary contacts by means of a tripping mechanism. The auxiliary contacts then switch off the load by means of a contactor. The break time depends on the ratio between the tripping current and set current I_e and is stored in the form of a long-term stable tripping characteristic

The “tripped” status is signaled by means of a switch position indicator. Resetting takes place either manually or automatically after a recovery time has elapsed.

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials.

They comply with all important worldwide standards and approvals.

“Increased safety” type of protection EEx e according to ATEX directive 94/9/EC

The 3RU11 thermal overload relays are suitable for the overload protection of explosion-proof motors with “increased safety” type of protection EEx e. The relays meet the requirements of EN 60079-7 (Electrical apparatus for areas subject to explosion hazards – Increased safety “e”);

EC type test certificate for Category (2) G/D exists. It has the number DMT 98 ATEX G 001.

Benefits

The most important features and benefits of the 3RU11 thermal overload relays are listed in the overview table

Application

Industries

The 3RU11 thermal overload relays are suitable for customers from all industries who want to guarantee optimum inverse-time delayed protection of their electrical loads (e.g. motors) under normal starting conditions (CLASS 10).

Application

The 3RU11 thermal overload relays have been designed for the protection of three-phase and single-phase AC and DC motors.

If single-phase AC or DC loads are to be protected by the 3RU11 thermal overload relays, all three bimetal strips must be heated. For this purpose, all main current paths of the relay must be connected in series.

Ambient conditions

The 3RU11 thermal overload relays have temperature compensation in accordance with IEC 60947-4-1 for the temperature range of –20 to +60 °C. For temperatures from +60 to +80 °C, the upper set value of the setting range must be reduced by the factor listed in the table below.

Ambient temperature in °C	Derating factor for the upper set value
+60	1.0
+65	0.94
+70	0.87
+75	0.81
+80	0.73

Selection and ordering data

3RU11 thermal overload relays with screw terminals on the auxiliary current side for direct mounting[1], CLASS 10

Features and technical specifications:

- Overload and phase failure protection
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Switch position indicator
- TEST function
- STOP button
- Integrated, sealable cover

	Size of contactor[2]	Rating for induction motor Rated value[3]	Set current value of the inverse-time delayed overload release	Short-circuit protection with fuse, type of coordination 2, gL/gG operational class[4]	**Screw terminals** (on auxiliary current side)	Weight per PU approx.
		kW	A	A	Order No.	kg
Size S00						
 3RU11 16 -..B0	S00	0.04	0.11 ... 0.16	0.5	**3RU11 16-0AB0**	0.150
		0.06	0.14 ... 0.2	1	**3RU11 16-0BB0**	0.150
		0.06	0.18 ... 0.25	1	**3RU11 16-0CB0**	0.150
		0.09	0.22 ... 0.32	1.6	**3RU11 16-0DB0**	0.150
		0.09	0.28 ... 0.4	2	**3RU11 16-0EB0**	0.150
		0.12	0.35 ... 0.5	2	**3RU11 16-0FB0**	0.150
		0.18	0.45 ... 0.63	2	**3RU11 16-0GB0**	0.150
		0.18	0.55 ... 0.8	4	**3RU11 16-0HB0**	0.150
		0.25	0.7 ... 1	4	**3RU11 16-0JB0**	0.150
		0.37	0.9 ... 1.25	4	**3RU11 16-0KB0**	0.150
		0.55	1.1 ... 1.6	6	**3RU11 16-1AB0**	0.150
		0.75	1.4 ... 2	6	**3RU11 16-1BB0**	0.150
		0.75	1.8 ... 2.5	10	**3RU11 16-1CB0**	0.150
		1.1	2.2 ... 3.2	10	**3RU11 16-1DB0**	0.150
		1.5	2.8 ... 4	16	**3RU11 16-1EB0**	0.150
		1.5	3.5 ... 5	20	**3RU11 16-1FB0**	0.150
		2.2	4.5 ... 6.3	20	**3RU11 16-1GB0**	0.150
		3	5.5 ... 8	25	**3RU11 16-1HB0**	0.150
		4	7 ... 10	35	**3RU11 16-1JB0**	0.150
		5.5	9 ... 12	35	**3RU11 16-1KB0**	0.150
Size S0						
 3RU11 26 -..B0	S0	0.75	1.8 ... 2.5	10	**3RU11 26-1CB0**	0.190
		1.1	2.2 ... 3.2	10	**3RU11 26-1DB0**	0.190
		1.5	2.8 ... 4	16	**3RU11 26-1EB0**	0.190
		1.5	3.5 ... 5	20	**3RU11 26-1FB0**	0.190
		2.2	4.5 ... 6.3	20	**3RU11 26-1GB0**	0.190
		3	5.5 ... 8	25	**3RU11 26-1HB0**	0.190
		4	7 ... 10	35	**3RU11 26-1JB0**	0.190
		5.5	9 ... 12.5	35	**3RU11 26-1KB0**	0.190
		7.5	11 ... 16	40	**3RU11 26-4AB0**	0.190
		7.5	14 ... 20	50	**3RU11 26-4BB0**	0.190
		11	17 ... 22	63	**3RU11 26-4CB0**	0.190
		11	20 ... 25	63	**3RU11 26-4DB0**	0.190
Size S2						
 3RU11 36 -..B0	S2	3	5.5 ... 8	25	**3RU11 36-1HB0**	0.320
		4	7 ... 10	35	**3RU11 36-1JB0**	0.320
		5.5	9 ... 12.5	35	**3RU11 36-1KB0**	0.320
		7.5	11 ... 16	40	**3RU11 36-4AB0**	0.320
		7.5	14 ... 20	50	**3RU11 36-4BB0**	0.320
		11	18 ... 25	63	**3RU11 36-4DB0**	0.320
		15	22 ... 32	80	**3RU11 36-4EB0**	0.320
		18.5	28 ... 40	80	**3RU11 36-4FB0**	0.320
		22	36 ... 45	100	**3RU11 36-4GB0**	0.320
		22	40 ... 50	100	**3RU11 36-4HB0**	0.320
Size S3						
 3RU11 46 -..B0	S3	11	18 ... 25	63	**3RU11 46-4DB0**	0.550
		15	22 ... 32	80	**3RU11 46-4EB0**	0.550
		18.5	28 ... 40	80	**3RU11 46-4FB0**	0.550
		22	36 ... 50	125	**3RU11 46-4HB0**	0.550
		30	45 ... 63	125	**3RU11 46-4JB0**	0.550
		37	57 ... 75	160	**3RU11 46-4KB0**	0.550
		45	70 ... 90	160	**3RU11 46-4LB0**	0.550
		45	80 ... 100[5]	200	**3RU11 46-4MB0**	0.550

1) With the suitable terminal brackets (see "Accessories", page 3/42), the 3RU11 overload relays for direct mounting can also be installed as stand-alone units.

2) Observe maximum rated operational current of the devices.

3) Guide value for 4-pole standard motors at 50 Hz 415 V AC. The actual starting and rated data of the motor to be protected must be considered when selecting the units.

4) Maximum fuse for overload relay, type of coordination 2.

5) For overload relays > 100 A, see 3RB2.

Accessories

Overview

The following optional accessories are available for the 3RU11 thermal overload relays:

- For the four overload relay sizes S00 to S3 one terminal bracket each for stand-alone installation
- One electrical remote RESET module in three voltage variants for all sizes
- One mechanical RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- Terminal covers

Selection and ordering data

	Version		Size	Order No.	Weight per PU approx. kg
Terminal brackets for stand-alone installation					
 3RU19 .6-3AA01	For separate mounting of overload relays; screw and snap-on mounting onto TH 35 standard mounting rail; size S3 also for TH 75 standard mounting rail		S00	**3RU19 16-3AA01**	0.060
			S0	**3RU19 26-3AA01**	0.080
			S2	**3RU19 36-3AA01**	0.180
			S3	**3RU19 46-3AA01**	0.280
Mechanical RESET[1]					
 3RU19 00-1A with pushbutton and extension plunger	**Resetting plungers, holders and formers**		S00 ...S3	**3RU19 00-1A**	0.038
	Pushbuttons with extended stroke (12 mm), IP65, Ø 22 mm			**3SB30 00-0EA11**	0.020
	Extension plungers For compensation of the distance between a pushbutton and the unlatching button of the relay			**3SX1 335**	0.004
Cable releases with holder for RESET[1]					
 3RU19 00-1.	For Ø 6.5 mm holes in the control panel; max. control panel thickness 8 mm		S00 ...S3		
	• Length 400 mm			**3RU19 00-1B**	0.063
	• Length 600 mm			**3RU19 00-1C**	0.073
Modules for remote RESET, electrical					
 3RU19 00-2A.71	Operating range 0.85 ... 1.1 x U_s, power consumption AC 80 VA, DC 70 W, ON period 0.2 ... 4 s, switching frequency 60/h	24 ... 30 V AC/DC	S00 ...S3	**3RU19 00-2AB71**	0.066
		110 ... 127 V AC/DC		**3RU19 00-2AF71**	0.067
		220 ... 250 V AC/DC		**3RU19 00-2AM71**	0.066
Terminal covers[1]					
	Covers for cable lugs and busbar connections				
	• Length 55 mm		S3	**3RT19 46-4EA1**	0.040
	Covers for box terminals				
	• Length 20.6 mm		S2	**3RT19 36-4EA2**	0.020
	• Length 20.8 mm		S3	**3RT19 46-4EA2**	0.025

1) The accessories are identical to those of the 3RB2 solid-state overload relays.

Protection Equipment

3a

General data

Design

Screw terminals

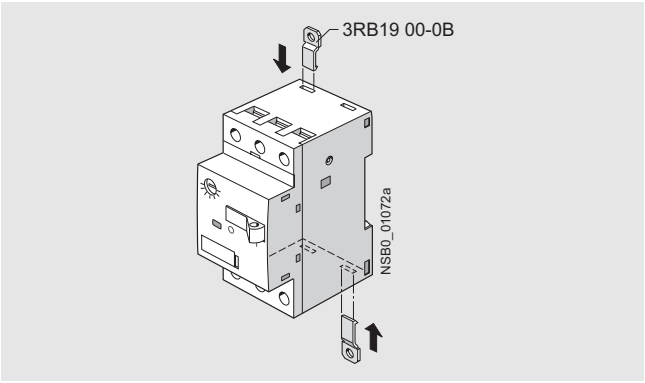
3RV1 motor starter protectors of sizes S00 and S0 are fitted with terminals with captive screws and clamping pieces, allowing the connection of 2 conductors with different cross-sections.

The box terminals of the S2 and S3 motor starter protectors also enable 2 conductors with different cross-sections to be connected. With the exception of S3 motor starter protectors which are equipped with 4 mm Allen screws, all terminal screws are tightened with a Pozidriv screwdriver size 2.

The box terminals of the S3 motor starter protectors can be removed in order to connect conductors with cable lugs or connecting bars. A terminal cover is available as touch protection and to ensure that the required clearances and creepage distances are maintained if the box terminals are removed.

Mounting

The motor starter protectors are snap-fitted on a 35 mm standard mounting rail to EN 60715.



Push-in lugs for screwing the motor starter protector onto mounting plates.

A standard mounting rail with a height of 15 mm is required for size S3 motor starter protectors. A 75 mm standard mounting rail can be used as an alternative for size S3.

S2 and S3 motor starter protectors can also be screwed directly onto a base plate.

The 3RB19 00-0B push-in lugs are available for screw mounting of S00 and S0 motor starter protectors.

Function

Trip units

3RV1 motor starter protectors are equipped with inverse-time delayed overload release based on the bimetal principle and with instantaneous electronic trip units (electromagnetic short-circuit releases).

The overload releases can be adjusted in accordance with the load current. The electronic trip units are permanently set to a value 13 times the rated current and thus enable trouble-free starting of motors.

Motor starter protectors for line-side transformer protection are set to 20 times the rated current to prevent tripping as a result of high transformer inrush current.

The scale cover can be sealed to prevent unauthorized adjustments to the set current.

Trip classes

The trip classes of thermally delayed trip units are based on the tripping time (t_A) at 7.2 times the set current in cold state (excerpt from IEC 60947-4):

- CLASS 10A: 2 s < t_A < 10 s
- CLASS 10: 4 s < t_A < 10 s
- CLASS 20: 6 s < t_A < 20 s
- CLASS 30: 9 s < t_A < 30 s

The motor starter protector must trip within this time!

Operating mechanisms

S00 motor starter protectors are actuated by a rocker operating mechanism and S0, S2 and S3 motor starter protectors by a rotary operating mechanism. If the motor starter protector trips, the rotary operating mechanism switches to the tripped position to indicate this. Before the motor starter protector is reclosed, the rotary operating mechanism must be reset manually to the 0 position. Only then can the motor starter protector be set again to the I position.

In the case of motor starter protectors with rotary operating mechanisms, an electrical signal can be output by a signaling switch to indicate that the motor starter protector has tripped.

All operating mechanisms can be locked in the 0 position with a padlock (shackle diameter 3.5 mm to 4.5 mm).

The motor starter protector isolating function complies with IEC 60947-2.

Configuration

Prevention of unintended tripping

In order to prevent premature tripping due to the integrated phase failure sensitivity, motor starter protectors should always be connected to ensure current flows through all three main current paths.

Short-circuit protection

If a short-circuit occurs, the short-circuit releases of 3RV1 motor starter protectors isolate the faulty load feeder from the network and thus prevent further damage.

Motor starter protectors with a short-circuit breaking capacity of 50 kA or 100 kA are virtually short-circuit resistant at a voltage of 400 V AC, since higher short-circuit currents are not to be expected in practice.

Motor protection

The tripping characteristics of 3RV10/3RV11 motor starter protectors are designed mainly to protect induction motors.

The motor starter protectors are therefore also referred to as motor circuit breakers.

The rated current I_n of the motor to be protected is set on the setting scale. Factory setting of the short-circuit release is 13 times the rated current of the motor starter protector. This permits trouble-free starting and ensures that the motor is properly protected.

The phase failure sensitivity of the motor starter protector ensures that it is tripped in time in the event of a phase failure and overcurrents that occur as a result in the other phases.

Motor starter protectors with thermal overload releases are normally designed in accordance with trip class 10 (CLASS 10). Motor starter protectors of sizes S2 and S3 are also available in

trip class 20 (CLASS 20) and therefore allow motors to be started up under arduous conditions.

Motor protection with overload relay function (automatic RESET)

The 3RV11 motor starter protectors for motor protection with overload relay function are designed for the protection of induction motors.

They are equipped with the same short-circuit release and overload release as motor starter protectors for motor protection without overload relay function.

The motor starter protector always remains closed in the event of an overload. The overload release activates only two auxiliary contacts (1 NO + 1 NC). The overload trip can be signaled to a higher-level control with the help of these auxiliary contacts. Generally, it is also possible to open a downstream contactor directly.

The overload signal is reset automatically. The motor starter protector itself only trips if a short-circuit occurs downstream.

System protection

The 3RV10 and 3RV11 motor starter protectors for motor protection are also suitable for plant protection.

In order to prevent premature tripping due to phase failure sensitivity, the three conducting paths must always be uniformly loaded. The conducting paths must be connected in series in the case of single-phase loads.

The 3RV17 and 3RV18 circuit breakers are suitable for system protection and at the same time they are approved as circuit breakers according to UL 489 and CSA C22.2 No. 5-02.

Short-circuit protection for starter combinations

The 3RV13 motor starter protectors for starter combinations in sizes S0, S2 and S3 provide short-circuit protection with the help of a contactor and overload relay combination.

Like the motor starter protectors for motor protection, they are equipped with short-circuit releases which are permanently set to a value equivalent to 13 times the rated current of the motor starter protectors. They are not equipped with overload releases.

On overload, the overload relay triggers the contactor, the motor starter protector remains closed.

Only when a short-circuit occurs in the feeder does the motor starter protector trip as well.

The motor starter protector for starter combinations must always be used in combination with an overload relay because the motor starter protector alone cannot protect the motor and itself against overload.

Transformer protection

When control transformers are protected on the line side, the high inrush currents generated at the time the transformers are switched on often cause spurious tripping in the protection mechanisms.

3RV14 motor starter protectors in sizes S0 and S2 and 3RV18 circuit breakers in size S0 for protecting transformers are therefore fitted with electronic trip units which are permanently set in the factory to a value equivalent to 20 times the rated current. For the 3RV17 circuit breakers in sizes S0 and S3 these electronic trip units are set in the factory to approximately 13 times the rated current.

Motor starter protectors can thus be used to provide line-side protection for transformers, the inrush peak currents of which are up to 30 times the rated current.

The 3RV17 and 3RV18 are approved as circuit breakers according to UL 489 and CSA 22.2 No. 5-02 for the protection of transformers, the 3RV18 circuit breakers size S0 are designed specially for the protection of transformers with high inrush current.

This version of motor starter protector is not necessary in the case of control-power transformers with low inrush currents, such as control transformers from Siemens. 3RV1 motor starter protectors for motor protection can be used in this case.

Main and EMERGENCY-STOP switches

The 3RV10, 3RV11, 3RV13, 3RV14 and 3RV16 motor starter protectors comply with the isolating function to IEC 60947-2, therefore they can be used – taking IEC 60204-1 into account – as main and EMERGENCY-STOP switches.

3RV19 .6-2. door-coupling rotary operating mechanisms for heavy duty also comply with the requirements for the isolating function.

Fuse monitoring

The 3RV16 11-0BD10 motor starter protector size S00 is used for fuse monitoring.

A fuse is connected in parallel with each conducting path of the motor starter protector. When a fuse blows, the current flows through the parallel conducting path and trips the motor starter protector.

The 3RV16 11-0BD10 motor starter protector must be equipped with a transverse or lateral auxiliary switch (see "Accessories") that signals a tripping operation of the motor starter protector and thus the tripping of the fuse, or switches off all poles of the disrupted electric circuit with the help of an appropriate switching device.

Motor starter protector for fuse monitoring

Notes on safety

When monitoring fuses with safety isolating functions, a warning sign must be affixed near the fuses indicating that voltage may still be present through the parallel circuit of the monitoring equipment assumed to be isolated after the fuse has been removed and if the monitoring equipment is not switched off.

We recommend the following text for this warning:

Important!
For safety isolation, also switch off fuse monitoring equipment with the item code .....

General data

The 3RV16 11-0BD10 motor starter protector for fuse monitoring is suitable for the following voltages: AC 50 Hz/ 60 Hz from 24 V to 690 V and up to 450 V DC. Fuse monitoring with 3RV16 11-0BD10 motor starter protector is not permissible in feeders with power control regulators that can induce DC feedback of higher values when an error occurs.

With parallel cables and meshed systems, the motor starter protector will only trip, and a signal will be output to indicate this, if the voltage difference across the motor starter protector is at least 24 V.

Use of IT systems (IT networks)

3RV1 motor starter protectors are suitable for operation in IT systems according to IEC 60947-2. In the event of a 3-pole short-circuit, their response in this system is the same as in others: Therefore, the same short-circuit breaking capacity I_{cu} and I_{cs} applies, see "Technical specifications".

An initial fault (ground fault) does not necessarily force immediate disconnection of the network when operating IT systems. If a second independent error occurs (ground fault), the switching capacity of the motor starter protector might be reduced.

This is the case if both ground faults occur in different phases and if one of the ground faults occurs on the input side and the other on the outgoing terminal of the motor starter protector.

In order to maintain the short-circuit function of the motor starter protector even with two independent ground faults (double ground faults), the reduced short-circuit breaking capacity with double ground faults must be taken into account in IT systems I_{cuIT} (see "Technical specifications"). If a ground fault is instantaneously recognized and remedied (ground-fault monitoring), the risk of double ground fault and thus reduced short-circuit breaking capacity I_{cuIT} can be minimized.

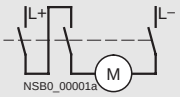
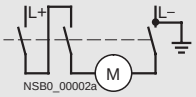
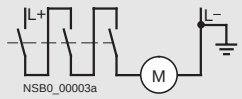
Switching of DC currents

3RV1 motor starter protectors for alternating currents are also suitable for DC switching.

The maximum permissible DC voltage per conducting path must, however, be adhered to. Higher voltages require a series connection with 2 or 3 conducting paths.

The response values of the overload release remain unchanged; the response values of a short-circuit release increase by approximately 30 % for DC. The example circuits for DC switching can be seen in the table below.

Example circuit for size S00 to S3 3RV1 motor starter protectors

Example circuit for size S00 to S3 3RV1 motor starter protectors	Maximum permitted DC voltage U_e	Notes
	150 V DC	2-pole switching, non-grounded system[1)] If there is no possibility of a ground fault, or if every ground fault is rectified immediately (ground-fault monitoring), then the maximum permitted DC voltage can be tripled.
	300 V DC	2-pole switching, grounded system The grounded pole is always assigned to the individual conducting path, so that there are always 2 conducting paths in series in the event of a ground fault.
	450 V DC	1-pole switching, grounded system 3 conducting paths in series. The grounded pole is assigned to the unconnected conducting path.

1) It is assumed that this circuit always provides safe disconnection even in the event of a double ground fault that bridges two contacts.

Technical specifications

Short-circuit breaking capacity I_{cu}, I_{cs} according to IEC 60947-2

This table shows the rated ultimate short-circuit breaking capacity I_{cu} and the rated service short-circuit breaking capacity I_{cs} of the 3RV1 motor starter protectors with different inception voltages dependent of the rated current I_n of the motor starter protectors.

Motor starter protector infeed is permissible at the upper or lower terminals without restricting the rated data. If the short-circuit current at the place of installation exceeds the rated short-circuit breaking capacity of the motor starter protector as specified in the table, a back-up fuse is required. Alternatively, a motor starter protector with a limiter function can be connected upstream.

The maximum rated current for the back-up fuse is specified in the tables. The rated ultimate short-circuit breaking capacity then applies as specified on the fuse.

Fuseless construction

Motor starter protector contactor combinations for short-circuit currents up to 50 kA can be ordered in the form of fuseless load feeders according to Part 6.

Circuit breakers/ Motor starter protectors	Rated current I_n	Up to AC 240 V[1]			Up to AC 400 V[1]/415 V[2]			Up to AC 440 V[1]/460 V[2] (these values do not apply 3RV17 42 circuit breakers)			Up to AC 500 V[1]/525 V[2]			Up to AC 690 V[1]		
		I_{cu}	I_{cs}	max. fuse (gL/gG)	I_{cu}	I_{cs}	Max. fuse (gL/gG)[3]	I_{cu}	I_{cs}	Max. fuse (gL/gG)[3]	I_{cu}	I_{cs}	Max. fuse (gL/gG)[3]	I_{cu}	I_{cs}	Max. fuse (gL/gG)[3][4]
Type	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
Size S00																
3RV10, 3RV16 11-0BD10	0.16 ... 1	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	1.25; 1.6	100	100	°	100	100	°	100	100	°	100	100	°	2	2	20
	2; 2.5	100	100	°	100	100	°	100	100	°	10	10	35	2	2	35
	3.2; 4	100	100	°	100	100	°	50	10	40	3	3	40	2	2	40
	5; 6.3	100	100	°	100	100	°	50	10	50	3	3	50	2	2	50
	8	100	100	°	50	12.5	80	50	10	63	3	3	63	2	2	63
	10	100	100	°	50	12.5	80	10	10	63	3	3	63	2	2	63
	12	100	100	°	50	12.5	80	10	10	80	3	3	80	2	2	80
Size S0																
3RV1. 2, 3RV17 21, 3RV18 21	0.16 ... 1.6	100	100	°	100	100	°	100	100	°	100	100	°	100	100	°
	2; 2.5	100	100	°	100	100	°	100	100	°	100	100	°	8	8	25
	3.2	100	100	°	100	100	°	100	100	°	100	100	°	8	8	32
	4; 5	100	100	°	100	100	°	100	100	°	100	100	°	6	3	32
	6.3	100	100	°	100	100	°	100	100	°	100	100	°	6	3	50
	8	100	100	°	100	100	°	50	25	63	42	21	63	6	3	50
	10	100	100	°	100	100	°	50	25	80	42	21	63	6	3	50
	12.5	100	100	°	100	100	°	50	25	80	42	21	80	6	3	63
	16	100	100	°	50	25	100	50	10	80	10	5	80	4	2	63
	20	100	100	°	50	25	125	50	10	80	10	5	80	4	2	63
	22; 25	100	100	°	50	25	125	50	10	100	10	5	80	4	2	63
Size S2																
3RV1. 3	16	100	100	°	50	25	100	50	25	100	12	6	63	5	3	63
	20	100	100	°	50	25	100	50	25	100	12	6	80	5	3	63
	25	100	100	°	50	25	100	50	15	100	12	6	80	5	3	63
	32	100	100	°	50	25	125	50	15	125	10	5	100	4	2	63
	40; 45	100	100	°	50	25	160	50	15	125	10	5	100	4	2	63
	50	100	100	°	50	25	160	50	15	125	10	5	100	4	2	80
Size S3																
3RV1. 41	40	100	100	°	50	25	125	50	20	125	12	6	100	6	3	63
	50	100	100	°	50	25	125	50	20	125	12	6	100	6	3	80
	63	100	100	°	50	25	160	50	20	160	12	6	100	6	3	80
	75	100	100	°	50	25	160	50	20	160	8	4	125	5	3	100
	90; 100	100	100	°	50	25	160	50	20	160	8	4	125	5	3	125
Size S3, with increased switching capacity																
3RV1. 42 / 3RV17 42[5]	16 / 10	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	20 / 15	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	25 / 20	100	100	°	100	50	°	100	50	°	30	15	80	12	7	63
	32 / 25	100	100	°	100	50	°	100	50	°	22	11	100	12	7	63
	40 / 30	100	100	°	100	50	°	100	50	°	18	9	160	12	6	80
	50 / 35 ... 40	100	100	°	100	50	°	100	50	°	15	7.5	160	10	5	100
	63 / 45 ... 50	100	100	°	100	50	°	70	50	200	15	7.5	160	7.5	4	100
	75 / 60	100	100	°	100	50	°	70	50	200	10	5	160	6	3	125
	90 / 70	100	100	°	100	50	°	70	50	200	10	5	160	6	3	160
	100 / —	100	100	°	100	50	°	70	50	200	10	5	160	6	3	160
	Short-circuit resistant up to at least 50 kA															
°	No back-up fuse required, since short-circuit resistant up to 100 kA															

1) 10 % overvoltage.

2) 5 % overvoltage.

3) Back-up fuse only required if the short-circuit current at the place of installation > I_{cu}.

4) Alternatively, fuseless limiter combinations for 690 V AC can also be used.

5) The values for the 3RV17 42 circuit breakers have been tested only up to 400 V/415 V AC; values > 440 V AC on request.

General data

Limiter function with standard devices for 500 V AC and 690 V AC according to IEC 60947-2

The table shows the rated ultimate short-circuit breaking capacity I_{cu} and the rated service short-circuit breaking capacity I_{cs} with an upstream standard motor starter protector that fulfills the limiter function at 500 V AC and 690 V AC. The short-circuit breaking capacity can be increased significantly with an upstream standard motor starter protector.

The motor starter protector which is connected downstream must be set to the rated current of the load.

With motor starter protector combination assemblies, note the clearance to grounded parts and between the motor starter protectors. Short-circuit resistant wiring between the motor starter protectors must be ensured. The motor starter protectors can be mounted side-by-side in a modular arrangement.

Standard motor starter protectors Type	Standard motor starter protectors with limiter function Type Rated current I_n	Rated current I_n A	Up to AC 500 V[1]/525 V[2] I_{cu} kA	 I_{cs} kA	Up to AC 690 V[1] I_{cu} kA	 I_{cs} kA
Size S0						
3RV10 2	**3RV13 21-4DC10**	up to 1	°	°	°	°
		1.25	°	°	°	°
	I_n = 25 A	1.6	°	°	°	°
		2	°	°	50	25
		2.5	°	°	50	25
		3.2	°	°	50	25
		4	°	°	50	25
		5	°	°	50	25
		6.3	°	°	50	25
		8	100	50	20	10
		10	100	50	20	10
		12.5	100	50	20	10
		16	100	50	20	10
		20	100	50	20	10
		22	100	50	20	10
		25	100	50	20	10
Size S2						
3RV10 3	**3RV13 31-4HC10**	16	100	50	50	25
		20	100	50	50	25
	I_n = 50 A	25	100	50	50	25
		32	100	50	50	25
		40	100	50	50	25
		50	100	50	50	25
Size S3						
3RV10 4	**3RV13 41-4HC10**	32	100	50	50	25
		40	100	50	50	25
	I_n = 50 A	50	100	50	50	25
	3RV13 41-4MC10	50	100	50	50	25
		63	100	50	50	25
	I_n = 100 A	75	100	50	50	25
		90	100	50	50	25
		100	100	50	50	25

Short-circuit resistant up to 100 kA

° No back-up fuse required, since short-circuit resistant up to 100 kA

1) 10 % overvoltage.

2) 5 % overvoltage.

General technical specifications

Type			3RV1. 1[1]	3RV1. 2	3RV1. 3	3RV1. 4	3RV17 21	3RV17 42
Standards								
• IEC 60947-1, EN 60947-1 (VDE 0660 Part 100)			Yes					
• IEC 60947-2, EN 60947-2 (VDE 0660 Part 101)			Yes					
• IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)			Yes				No	
• UL 489, CSA C22.2-No.5-02			No				Yes	
Size			S00	S0	S2	S3	S0	S3
Number of poles			3					
Max. rated current $I_{n\,max}$ (= max. rated operational current I_e)		A	12	25	50	100	22	70
Permissible ambient temperature								
• Storage/transport		°C	–50 ... +80					
• Operation		°C	–20 ... +70[2]					
Permissible rated current at inside temperature of control cabinet								
• +60 °C		%	100					
• +70 °C		%	87					
Motor starter protector/circuit breaker inside enclosure								
Permissible rated current at ambient temperature of enclosure								
• +35 °C		%	100					
• +60 °C		%	87					
Rated operational voltage U_e								
• Acc. to IEC		V AC	690[3]					
• Acc. to UL/CSA		V AC	600					
Rated frequency		Hz	50/60					
Rated insulation voltage U_i		V	690					
Rated impulse withstand voltage U_{imp}		kV	6					
Utilization categories								
• IEC 60947-2 (motor starter protector/circuit breaker)			A					
• IEC 60947-4-1 (motor starter)			AC-3				—	
Trip class CLASS	Acc. to IEC 60947-4-1		10		10/20		—	
DC short-circuit breaking capacity (time constant t = 5 ms)								
• 1 conducting path 150 V DC		kA	10					
• 2 conducting paths in series 300 V DC		kA	10					
• 3 conducting paths in series 450 V DC		kA	10					
Power loss P_v per motor starter protector/circuit breaker Dependent on rated current I_n (upper setting range) $R_{per\ conducting\ path} = P/I^2 \times 3$	I_n: ... 1.25 A	W	5	—				
	I_n: 1.6 ... 6.3 A	W	6	—				
	I_n: 8 ... 12 A	W	7	—				
	I_n: ... 0.63 A	W	—	5	—		5	—
	I_n: 0.8 ... 6.3 A	W	—	6	—		6	—
	I_n: 8 ... 16 A	W	—	7	—		7	—
	I_n: 20 ... 25 A	W	—	8	—		8	—
	I_n: ... 25 A	W	—		12	—		
	I_n: 32 A	W	—		15	—		
	I_n: 40 ... 50 A	W	—		20	—		
	I_n: ... 63 A	W	—			20	—	
	I_n: 75 and 90 A	W	—			30	—	
	I_n: ... 100 A	W	—			38	—	
	I_n: ... 10 A	W	—					8
	I_n: ... 35 A	W	—					12
	I_n: ... 70 A	W	—					21
Shock resistance	Acc. to IEC 60068-2-27	g/ms	25/11 (square and sine pulse)					
Degree of protection	Acc. to IEC 60529		IP20[4]					
Touch protection	Acc. to EN 50274		Finger-safe					
Temperature compensation	Acc. to IEC 60947-4-1	°C	–20 ... +60					
Phase failure sensitivity	Acc. to IEC 60947-4-1		Yes				No	
Explosion protection – Safe operation of motors with "increased safety" type of protection			Yes, for 3RV10 (CLASS 10)				No	
EC type test certificate number acc. to directive 94/9/EC (ATEX)			DMT 02 ATEX F 001 Ex II (2) GD, DMT 02 ATEX F 001 N1 Ex II (2) GD					
Isolating function	Acc. to IEC 60947-2		Yes					
Main and EMERGENCY-STOP switch characteristics[5]	Acc. to IEC 60204-1 (VDE 0113)		Yes					
Safe isolation between main and auxiliary circuits, req. for PELV applications	Acc. to EN 60947-1							
• Up to 400 V + 10 %			Yes					
• Up to 415 V + 5 % (higher voltages on request)			Yes					
Permissible mounting positions			Any, acc. to IEC 60447 start command "I" right-hand side or top					
Mechanical endurance		Operating cycles	100000		50000		100000	50000
Electrical endurance		Operating cycles	100000		25000		100000	25000
Max. switching frequency per hour (motor starts)		1/h	15					

For footnotes see page 3a/8

For short-circuit breaking capacity I_{cu}, I_{cs} see table of same name.

General data

Conductor cross-sections of main circuit

Type		3RV1.	3RV1. 2	3RV1. 3	3RV1. 4/ 3RV17 42	3RV17 21
Connection type		**Screw terminals**		**Screw terminals with box terminals**		
Terminal screw		Pozidriv size 2		Pozidriv size 2	4 mm Allen screw	Pozidriv size 2
Prescribed tightening torque	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5	4 ... 6	2.5 ... 3
Conductor cross-sections (1 or 2 conductors connectable)						
• Solid	mm^2	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4]	2 x (1 ... 2.5)[4], 2 x (2.5 ... 6)[4]	2 x (0.75 ... 16)	2 x (2.5 ... 16)	1 ... 10, max. 2 x 10
• Finely stranded with end sleeve	mm^2	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4]	2 x (1 ... 2.5)[4], 2 x (2.5 ... 6)[4]	2 x (0.75 ... 16), 1 x (0.75 ... 25)	2 x (2.5 ... 35), 1 x (2.5 ... 50)	1 ... 16, max. 6 + 16
• Stranded	mm^2	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4]	2 x (1 ... 2.5)[4], 2 x (2.5 ... 6)[4]	2 x (0.75 ... 25), 1 x (0.75 ... 35)	2 x (10 ... 50), 1 x (10 ... 70)	1.5 ... 25, max. 10 + 25
• AWG cables, solid or stranded	AWG	2 x (18 ... 14)	2 x (14 ... 10)	2 x (18 ... 2), 1 x (18 ... 2)	2 x (10 ... 1/0), 1 x (10 ... 2/0)	2 x (14 ... 10)
Ribbon cable conductors (number x width x thickness)	mm	—		2 x (6 x 9 x 0.8)		—
Removable box terminals[1]						
• With copper bars[2]		—		—	18 x 10	—
• With cable lugs[3]		—		—	up to 2 x 70	—

Footnotes for page 3a/7:

1) For 3RV16 voltage transformer circuit breakers see more "Technical specifications".

2) Above +60 °C current reduction.

3) 500 V with molded-plastic enclosure.

4) Terminal compartment IP00.

5) With appropriate accessories.

1) Cable-lug and busbar connection possible after removing the box terminals.

2) If bars larger than 12 mm x 10 mm are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

3) If conductors larger than 25 mm^2 are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Permissible rated data of devices approved for North America (UL/CSA)

Motor starter protectors of the 3RV1 series are approved for UL/CSA and according to UL 508 and CSA C22.2 No. 14 they can be used on their own or as a load feeder in combination with a contactor.

These motor starter protectors can be used as "Manual Motor Controllers" for "Group Installations", as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations" and as "Self-Protected Combination Motor Controllers" (Type E).

3RV1 motor starter protectors as "Manual Motor Controllers"

If used as a "Manual Motor Controller", the motor starter protector is always operated in combination with an upstream short-circuit protection device. Approved fuses or a circuit breaker according to UL 489/CSA C22.2 No. 5-02 can be used. These devices must be dimensioned according to the National Electrical Code (UL) or Canadian Electrical Code (CSA).

Approval of the 3RV as a Manual Motor Controller can be found under the following file numbers:

- UL File No. 47705, CCN: NLRV,
- CSA Master Contract 165071, Product Class: 3211 05.

Motor starter protectors		hp rating[1] for FLA[2] max.		Rated current I_n	240 V AC		480 V AC		600 V AC	
					UL I_{bc}[3]	CSA I_{bc}[3]	UL I_{bc}[3]	CSA I_{bc}[3]	UL I_{bc}[3]	CSA I_{bc}[3]
Type	V	1-phase	3-phase	A	kA	kA	kA	kA	kA	kA
Size S00										
3RV10 11, 3RV16 11-0BD10				0.16 ... 2	65	65	65	65	10	10
				2.5	65	65	65	65	10	10
FLA[2] max. 12 A,	115	1/2	—	3.2	65	65	65	65	10	10
600 V	200	1 1/2	3	4	65	65	65	65	10	10
NEMA size 00	230	2	3	5	65	65	65	65	10	10
	460	—	7 1/2	6.3	65	65	65	65	10	10
	575/600	—	10	8	65	65	65	65	10	10
				10	65	65	65	65	10	10
				12	65	65	65	65	10	10
Size S0										
3RV10 21 / 3RV11 21, 3RV13 21				0.16 ... 3.2	65	65	65	65	30	30
				4	65	65	65	65	30	30
FLA[2] max. 25 A,	115	2	—	5	65	65	65	65	30	30
600 V	200	3	5	6.3	65	65	65	65	30	30
NEMA size 1	230	3	7 1/2	8	65	65	65	65	30	30
	460	—	15	10	65	65	65	65	30	30
	575/600	—	20	12.5	65	65	65	65	30	30
				16	65	65	65	65	10	10
				20	65	65	65	65	10	10
				22	65	65	65	65	10	10
				25	65	65	65	65	10	10
Size S2										
3RV10 31 / 3RV11 31, 3RV13 31				16	65	65	65	65	30	25
				20	65	65	65	65	30	25
FLA[2] max. 50 A,	115	3	—	25	65	65	65	65	30	25
600 V	200	7 1/2	15	32	65	65	65	65	30	25
NEMA size 2	230	10	20	40	65	65	65	65	30	25
	460	—	40	45	65	65	65	65	30	25
	575/600	—	50	50	65	65	65	65	30	25
Size S3										
3RV10 41 / 3RV10 42, 3RV11 42, 3RV13 41 / 3RV13 42				16	65	65	65	65	30	30
				20	65	65	65	65	30	30
FLA[2] max. 99 A,	115	7 1/2	—	25	65	65	65	65	30	30
600 V	200	20	30	32	65	65	65	65	30	30
NEMA size 3	230	20	40	40	65	65	65	65	30	30
	460	—	75	50	65	65	65	65	30	30
	575/600	—	100	63	65	65	65	65	30	30
				75	65	65	65	65	30	30
				90	65	65	65	65	10	10
				100	65	65	65	65	10	10

1) hp rating = Power rating in horse power (maximum motor rating).

2) FLA = Full Load Amps/Motor full load current.

3) Complies with "short-circuit breaking capacity" according to UL/CSA.

General data

3RV17 circuit breakers

These circuit breakers are approved according to UL 489 and CSA C22.2 No. 5-02. They can be used therefore as upstream short-circuit protective devices for "Manual Motor Controllers" and "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations".

The 3RV17 circuit breakers are approved under the following file numbers:

- UL File No. E235044, CCN: DIVQ,
- CSA Master Contract 165071, Product Class: 1432 01.

Circuit breakers	Rated current I_n	240 V AC		480 Y/277 V AC		600 Y/347 V AC	
		UL I_{bc} [1]	CSA I_{bc} [1]	UL I_{bc} [1]	CSA I_{bc} [1]	UL I_{bc} [1]	CSA I_{bc} [1]
Type	A	kA	kA	kA	kA	kA	kA
Size S0							
3RV17 21	0.16	50	50	50	50	10	10
	0.2	50	50	50	50	10	10
	0.25	50	50	50	50	10	10
	0.32	50	50	50	50	10	10
	0.4	50	50	50	50	10	10
	0.5	50	50	50	50	10	10
	0.63	50	50	50	50	10	10
	0.8	50	50	50	50	10	10
	1	50	50	50	50	10	10
	1.25	50	50	50	50	10	10
	1.6	50	50	50	50	10	10
	2	50	50	50	50	10	10
	2.5	50	50	50	50	10	10
	3.2	50	50	50	50	10	10
	4	50	50	50	50	10	10
	5	50	50	50	50	10	10
	6.3	50	50	50	50	10	10
	8	50	50	50	50	10	10
	10	50	50	50	50	—	—
	12.5	50	50	50	50	—	—
	15	50	50	50	50	—	—
	20	50	50	50	50	—	—
	22	50	50	50	50	—	—
Size S3							
3RV17 42	10	65	65	65	65	20	20
	15	65	65	65	65	20	20
	20	65	65	65	65	20	20
	25	65	65	65	65	20	20
	30	65	65	65	65	20	20
	35	65	65	65	65	20	20
	40	65	65	65	65	20	20
	45	65	65	65	65	20	20
	50	65	65	65	65	20	20
	60	65	65	65	65	20	20
	70	65	65	65	65	20	20

1) Complies with "short-circuit breaking capacity" according to UL.

Rated data of the auxiliary switches and signaling switches

Type		Lateral auxiliary switches with 1 NO + 1 NC, 2 NO, 2 NC, 2 NO + 2 NC and signaling switch	Transverse auxiliary switches with 1 CO contact	Transverse auxiliary switches with 1 NO + 1 NC, 2 NO
Max. rated voltage				
Acc. to NEMA (UL)	V AC	600		250
Acc. to NEMA (CSA)	V AC	600		250
Uninterrupted current	A	10	5	2.5
Switching capacity		A600	B600	C300
		Q300	R300	R300

Conductor cross-sections, main circuit, 1 or 2 conductors

Type		3RV16 11-1AG14	3RV16 11-1CG14	3RV16 11-1DG14
Connection type		Screw terminals		
Terminal screw		Pozidriv size 2		
Conductor cross-sections				
• Solid	mm^2	2 x (0.5 ... 1.5)[1], 2 x (0.75 ... 2.5)[1], max. 4		
• Finely stranded with end sleeve	mm^2	2 x (0.5 ... 1.5)[1], 2 x (0.75 ... 2.5)[1]		
• Stranded	mm^2	2 x (0.5 ... 1.5)[1], 2 x (0.75 ... 2.5)[1], max. 4		

Auxiliary switch for blocking the distance protection

• With defined lateral assignment for blocking distance protection		1 changeover contact (for use as 1 NO or 1 NC)
• Rated operational voltage U_e (AC voltage)	V	25
• Rated operational current I_e /AC-14 at U_e = 250 V	A	0.5
• Rated operational current I_e /AC-14 at U_e = 125 V	A	1
• Rated operational voltage U_e (DC voltage L/R 200 ms)	V	250
• Rated operational current I_e /DC-13 at U_e = 250 V	A	0.27
• Rated operational current I_e /DC-13 at U_e = 125 V	A	0.44

Short-circuit protection for auxiliary circuit

• Melting fuse gL/gG	A	10
• Miniature circuit breaker, C characteristic	A	6 (prospective short-circuit current < 0.4 kA)

Auxiliary switches for other signaling purposes

For technical specifications see "Mountable Accessories"

1) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Characteristic curves

The time/current characteristic, the current limiting characteristics and the I^2t characteristic curves were determined according to DIN VDE 0660 and IEC 60947.

The tripping characteristic of the inverse-time delayed overload release (thermal overload releases, 'a' releases) for DC and AC with a frequency of 0 Hz to 400 Hz applies for the time/current characteristic.

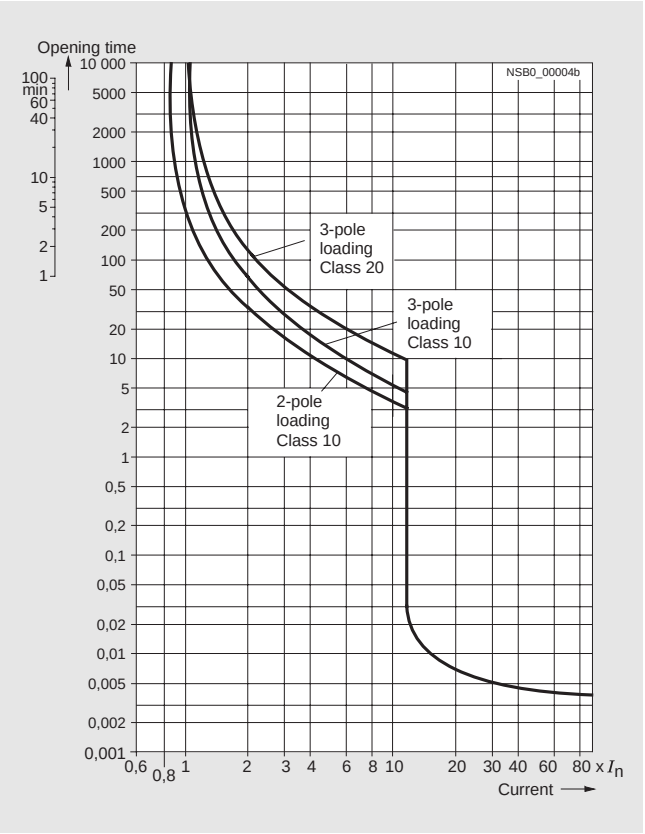
The characteristic curves apply to the cold state; at operating temperature, the tripping times of the thermal trip units are reduced to approximately 25 %.

Under normal operating conditions, all three poles of the device must be loaded. The three main current paths must be connected in series in order to protect single-phase or DC loads.

With 2-pole and 3-pole loading, the maximum deviation in the tripping time of 3 times the set current and upwards is ±20 % and thus in accordance with DIN VDE 0165.

The tripping characteristics for the instantaneous, electromagnetic electronic trip units (short-circuit releases, 'n' releases) are based on the rated current I_n that also represents the maximum value of the setting range for motor starter protectors with adjustable overload releases. If the current is set to a lower value, the tripping current of the 'n' release is increased by a corresponding factor.

The characteristic curves of the electromagnetic electronic trip units apply to frequencies of 50 Hz/60 Hz. Appropriate correction factors must be used for lower frequencies down to 16 $^2/_3$ Hz, for higher frequencies up to 400 Hz and for DC.



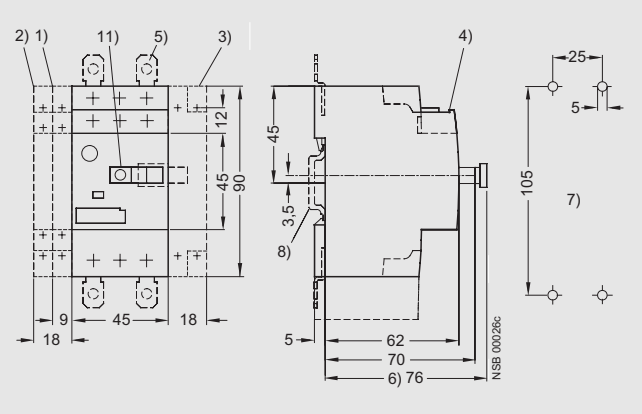
Schematic representation of typical time/current characteristic of 3RV10

The above characteristic curve for the motor starter protector relates to a specific setting range. It is, however, also valid as a schematic representation of motor starter protectors with other current ranges.

Dimensional drawings

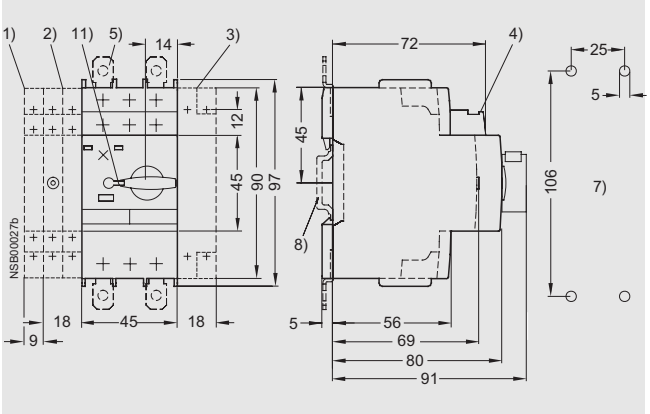
3RV1 motor starter protectors, size S00

3RV10 11, 3RV 16



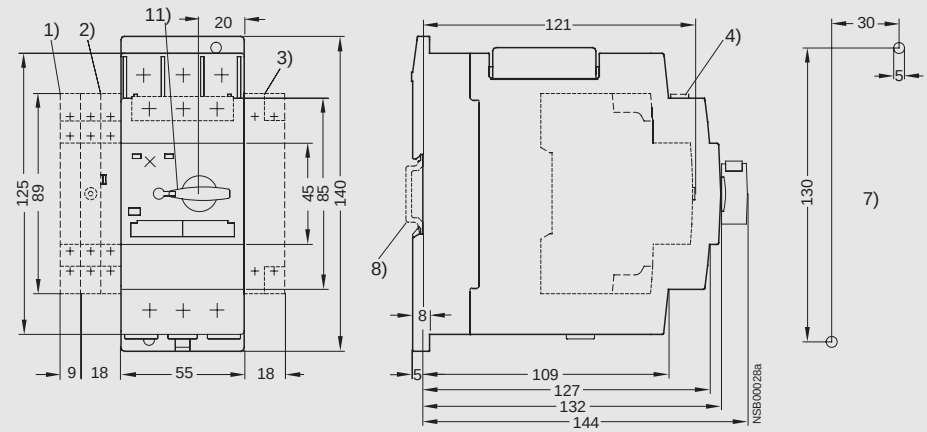
3RV1 motor starter protectors, size S0

3RV10 21, 3RV13 21, 3RV14 21



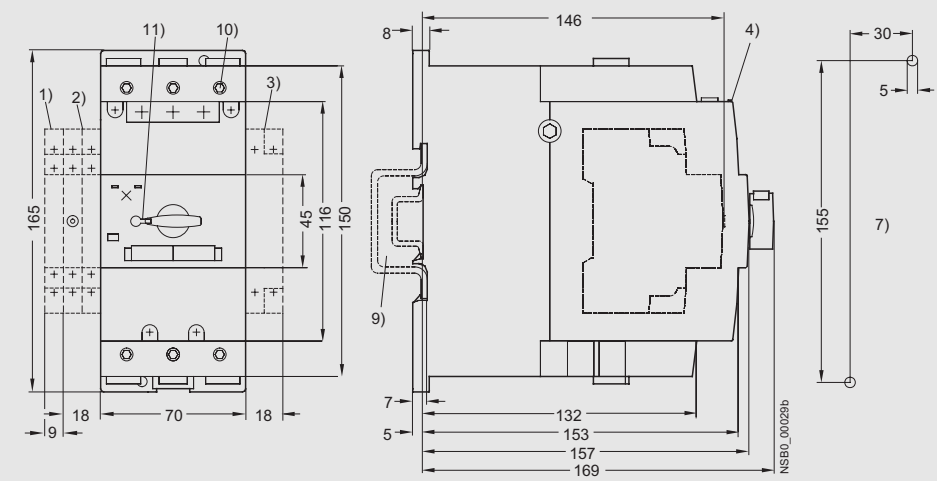
3RV1 motor starter protectors, size S2

3RV10 31, 3RV13 31, 3RV14 31



3RV1 motor starter protectors, size S3

3RV10 4, 3RV13 4

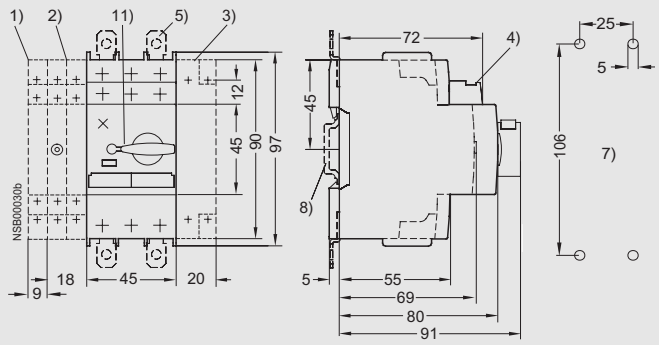


1) Lateral auxiliary switch, 2-pole.
2) Signaling switch (S0 ... S3) or lateral auxiliary switch, 4-pole (S00 ... S3).
3) Auxiliary trip unit.
4) Transverse auxiliary switch.
5) Push-in lugs for screw mounting.
6) With leading auxiliary switch only for undervoltage release.
7) Drilling pattern.
8) Standard mounting rail TH 35 according to EN 60715.
9) For mounting according to EN 60715 on TH 35 standard mounting rail, 15 mm deep, or TH 75 standard mounting rail.
10) Allen screw 4 mm.
11) Lockable in neutral position with 3.5 ... 4.5 mm shackle diameter.

General data

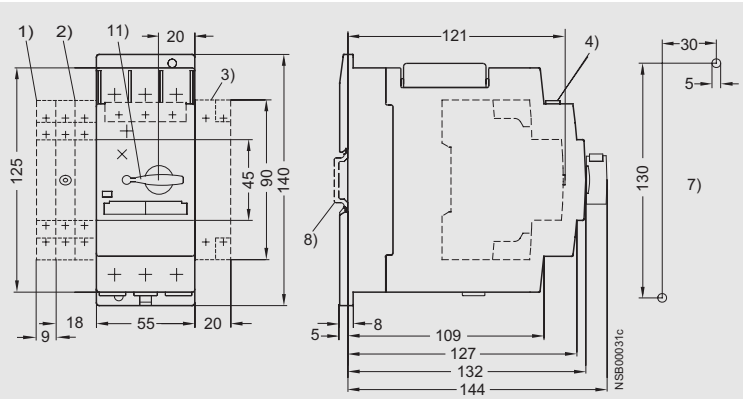
3RV11 motor starter protectors, size S0

3RV11 21



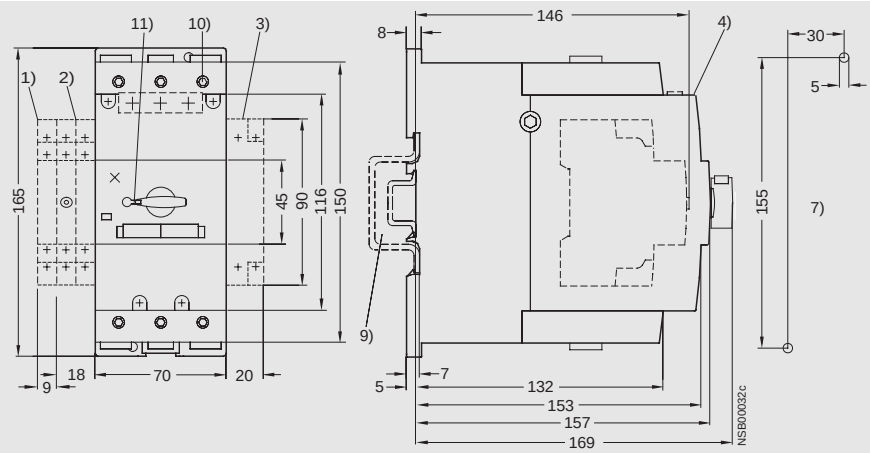
3RV11 motor starter protectors, size S2

3RV11 31



3RV11 motor starter protectors, size S3

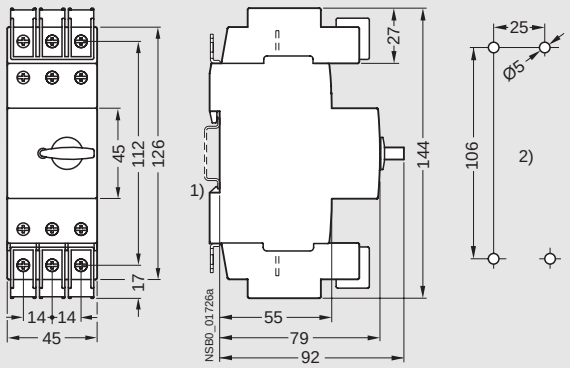
3RV11 42



1) Lateral auxiliary switch, 2-pole.
2) Signaling switch or lateral auxiliary switch, 4-pole.
3) Block for overload relay function.
4) Transverse auxiliary switch.
5) Push-in lugs for screw mounting.
7) Drilling pattern.
8) Standard mounting rail TH 35 according to EN 60715.
9) For mounting according to EN 60715 on TH 35 standard mounting rail, 15 mm deep, or TH 75 standard mounting rail.
10) Allen screw 4 mm.
11) Lockable in neutral position with 3.5 ... 4.5 mm shackle diameter.

3RV17 circuit breakers, size S0

3RV17 21

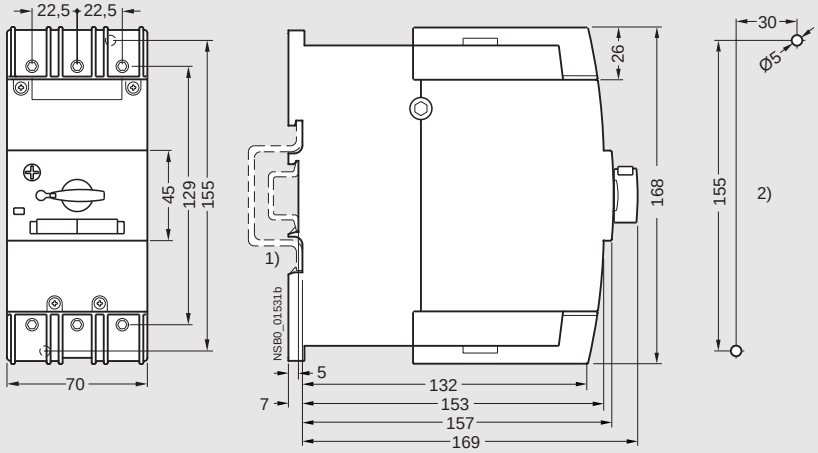


1) For mounting onto standard mounting rail TH 35 according to EN 60715.

2) Drilling pattern.

3RV17 circuit breakers, size S3

3RV17 42



1) For mounting according to EN 60715 on TH 35 standard mounting rail, 15 mm deep, or TH 75 standard mounting rail.

2) Drilling pattern.

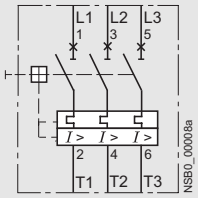
General data

Schematics

Internal circuit diagrams

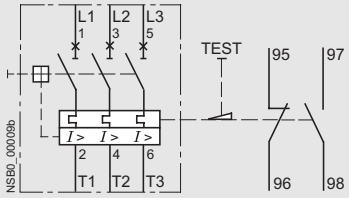
Motor starter protector/ circuit breaker

3RV10 ..,
3RV14 ..,
3RV17 ..



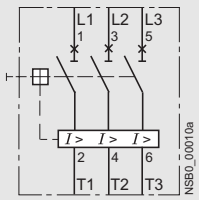
Motor starter protector

3RV11 ..



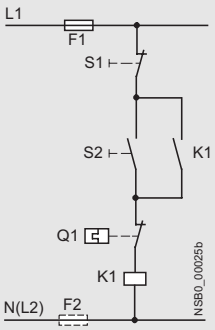
Motor starter protector

3RV13 ..



Switching examples

3RV11 motor starter protector with overload relay function



S1 OFF button
S2 ON button
K1 Latching contact
F1 Fuse gL/gG 6 A
F2 Fuse gL/gG 6 A
Q1 3RV11 motor starter protectors

3a

Technical specifications

Front transverse auxiliary switches

		Switching capacity for different voltages	
		1 CO contact	1 NO + 1 NC, 2 NO
Rated operational current I_e			
• At AC-15, alternating voltage			
- 24 V	A	4	2
- 230 V	A	3	0.5
- 400/415 V	A	1.5	—
- 690 V	A	0.5	—
• At AC-12 = I_{th}, alternating voltage			
- 24 V	A	10	2.5
- 230 V	A	10	2.5
- 400/415 V	A	10	—
- 690 V	A	10	—
• At DC-13, direct voltage *L/R* 200 ms			
- 24 V	A	1	1
- 48 V	A	—	0.3
- 60 V	A	—	0.15
- 110 V	A	0.22	—
- 220 V	A	0.1	—
Minimum load capacity	V	17	
	mA	1	

Lateral auxiliary switches with signaling switch

		Switching capacity for different voltages 1 NO + 1 NC, 2 NO, 2 NC, 2 NO + 2 NC and signaling switch
Rated operational current I_e		
• At AC-15, alternating voltage		
- 24 V	A	6
- 230 V	A	4
- 400/415 V	A	3
- 690 V	A	1
• At AC-12 = I_{th}, alternating voltage		
- 24 V	A	10
- 230 V	A	10
- 400/415 V	A	10
- 690 V	A	10
• At DC, direct voltage *L/R* 200 ms		
- 24 V	A	2
- 110 V	A	0.5
- 220 V	A	0.25
- 440/415 V	A	0.1
Minimum load capacity	V	17
	mA	1

Auxiliary trip units

		Undervoltage releases	Shunt trip units
Power consumption			
• During pick-up			
- AC voltages	VA/W	20.2 / 13	20.2 / 13
- DC voltages	W	20	13 ... 80
• During continuous duty			
- AC voltages	VA/W	7.2 / 2.4	—
- DC voltages	W	2.1	—
Response voltage			
• Tripping	V	0.35 ... 0.7 x U_s	0.7 ... 1.1 x U_s
• Pickup	V	0.85 ... 1.1 x U_s	—
Maximum opening time	ms	20	

Mountable accessories

Short-circuit protection for auxiliary and control circuits

• Melting fuses gL/gG	A	10
• Miniature circuit breaker, C characteristic	A	6[1]

1) Prospective short-circuit current < 0.4 kA.

Conductor cross-sections for auxiliary and control circuits

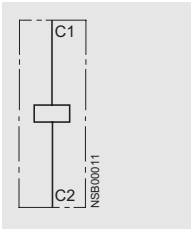
Connection type		**Screw terminals**
Terminal screw		Pozidriv size 2
Prescribed tightening torque	Nm	0.8 ... 1.2
Conductor cross-sections (1 or 2 conductors)		
• Solid	mm²	2 x (0.5 ... 1.5)[1]/2 x (0.75 ... 2.5)[1]
• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[1]/2 x (0.75 ... 2.5)[1]
• Stranded	mm²	2 x (0.5 ... 1.5)[1]/2 x (0.75 ... 2.5)[1]
• AWG cables	AWG	2 x (18 ... 14)

Schematics

Internal circuit diagrams

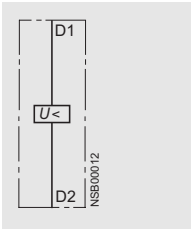
Shunt trip unit

3RV19 02-1D



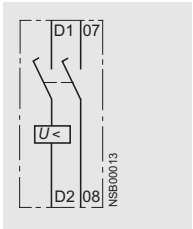
Undervoltage releases

3RV19 02-1A



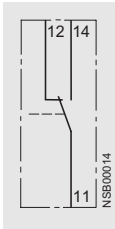
Undervoltage release with leading auxiliary contacts

3RV19 12-1C,
3RV19 22-1C



Transverse auxiliary switches

3RV19 01-1D,
3RV19 01-1G



3RV19 01-1E,
3RV19 01-2E

3RV19 01-1F,
3RV19 01-2F

Lateral auxiliary switches with 2 contacts

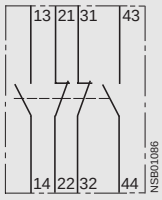
3RV19 01-1A,
3RV19 01-2A

3RV19 01-1B,
3RV19 01-2B

3RV19 01-1C,
3RV19 01-2C

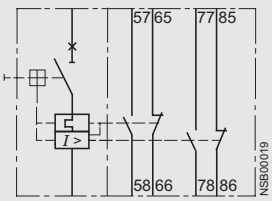
Lateral auxiliary switch with 4 contacts

3RV19 01-1J



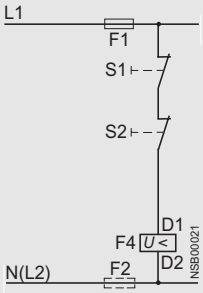
Signaling switches

3RV19 21-1M

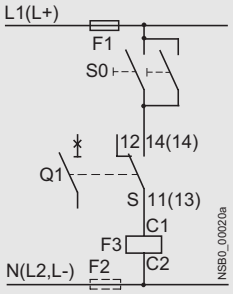


Circuit diagrams

Undervoltage releases



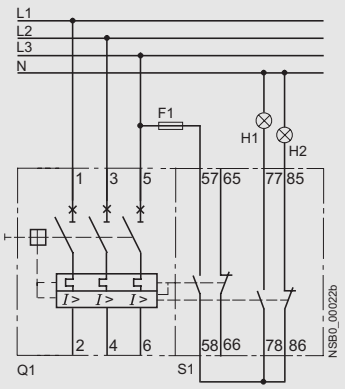
Shunt trip unit



S0, S1, S2	OFF pushbutton in the system
Q1	Motor starter protector
S	Auxiliary switch of the motor starter protector Q1
F1; F2	Fuse (gL/gG) max. 10 A
F3	Shunt trip units
F4	Undervoltage releases

Switching examples

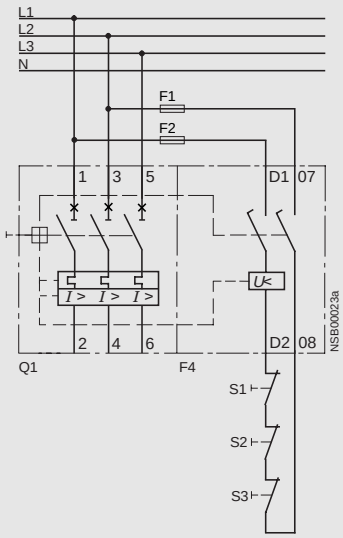
3RV1 motor starter protector with 3RV19 21-1M signaling switch



Separate "tripped" and "short-circuit" signals

S1	Signaling switch
Q1	Motor starter protector
F1	Fuse (gL/gG), max. 10 A
H1	Signal lamp "Short-circuit"
H2	Signal lamp "Overload" or "Tripping by auxiliary trip unit"

Motor starter protectors tripped by means of pushbutton or EMERGENCY-STOP pushbutton in the system



The leading auxiliary contacts will open in switch position "OFF" to deenergize the coil of the undervoltage release, thus avoiding power consumption in the switched off state. In the "tripped" position of the motor starter protector, these contacts are not guaranteed to open.

S1, S2, S3	OFF pushbutton
Q1	Motor starter protector
F1, F2	Fuse (gL/gG), max. 10 A
F4	Undervoltage releases

Rotary operating mechanisms

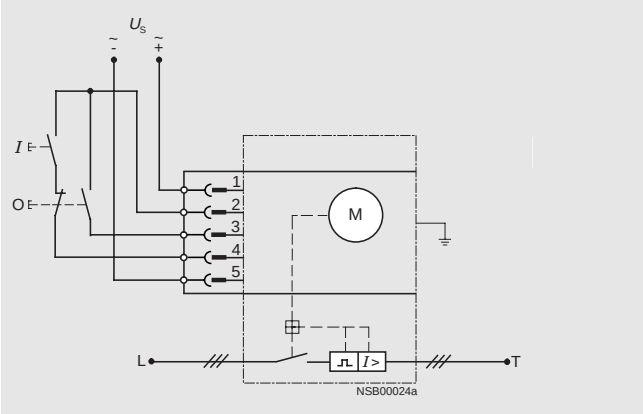
Technical specifications

Remote motorized operating mechanisms		
Type		**3RV19 36, 3RV19 46**
• Max. power consumption at U_s = 24 V DC	W	48
• Max. power consumption at U_s = 230 V AC	VA	170
• Operating range		0.85 ... 1.1 x U_s
• Minimum command duration at U_s	s	0.1
• Max. command duration		Unlimited (uninterrupted operation)
• Max. total break time, remote-controlled	s	2
• Ready to reclose after approx.	s	2.5
• Switching frequency	1/h	25
• Internal back-up fuse		
- 230 V AC	A	0.8
- 24 V DC	A	1.6
Connection type of control cables		Plug-in connectors with screw terminals
Shock resistance acc. to IEC 60068-2-27	*g*/ms	25/11 (square and sine pulse)

Schematics

Switching examples

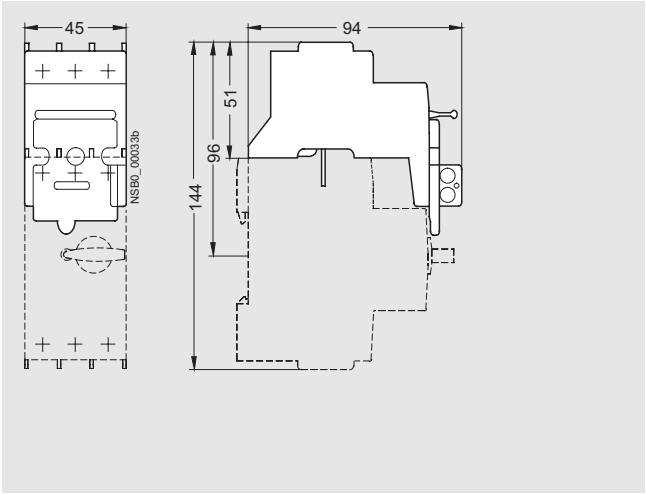
3RV1 motor starter protectors with 3RV19 36/3RV19 46 remote motorized operating mechanisms



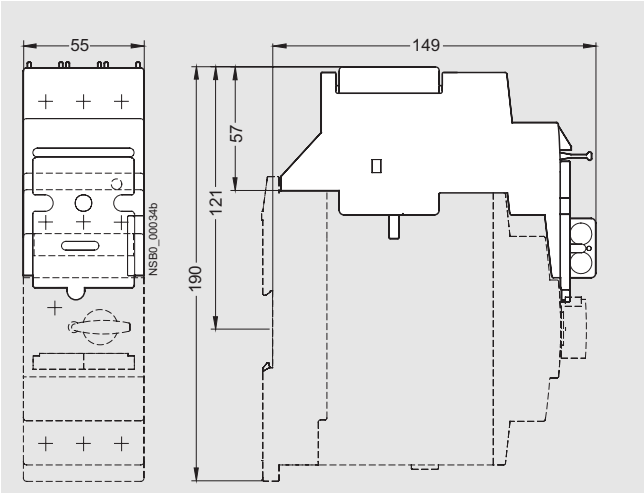
Dimensional drawings

Isolator modules

3RV19 28-1A
For motor starter protector size S0

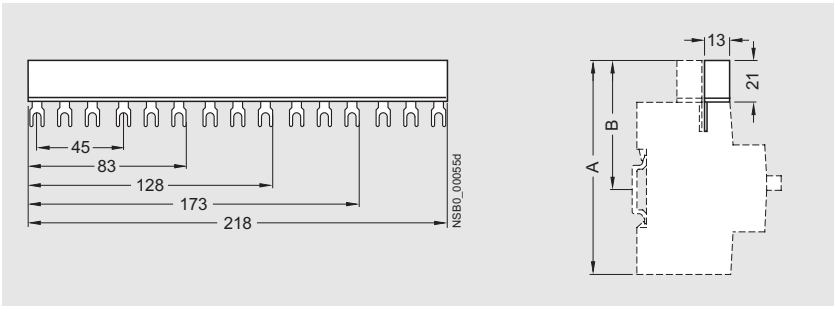


3RV19 38-1A
For motor starter protector size S2



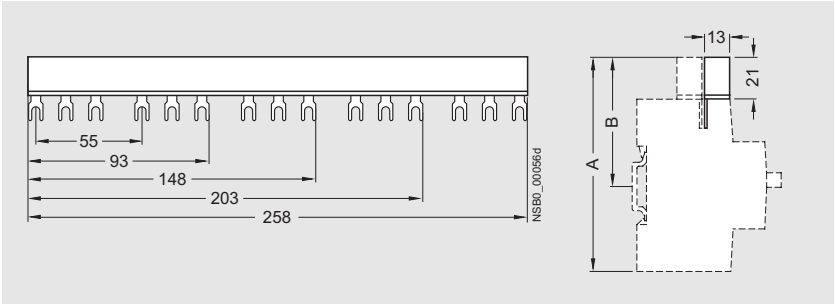
Busbars

3RV19 15-1.. 3-phase busbar
For motor starter protector sizes S00 and S0, modular spacing 45 mm
For two 3RV19 15-1AB motor starter protectors
For three 3RV19 15-1BB motor starter protectors
For four 3RV19 15-1CB motor starter protectors
For five 3RV19 15-1DB motor starter protectors



Size	A	B
S00	111	67
S0	119	70

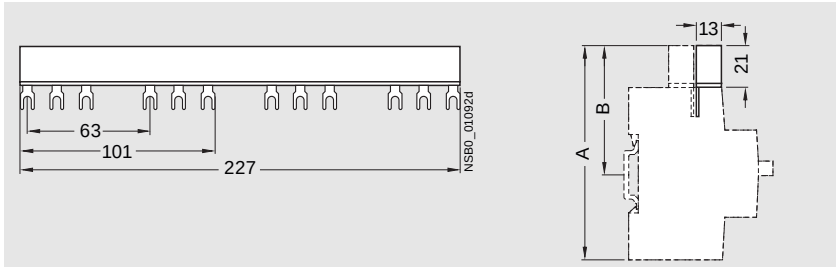
3RV19 15-2.. 3-phase busbar
For motor starter protector sizes S00 and S0, modular spacing 55 mm
For two 3RV19 15-2AB motor starter protectors with accessory
For three 3RV19 15-2BB motor starter protectors with accessory
For four 3RV19 15-2CB motor starter protectors with accessory
For five 3RV19 15-2DB motor starter protectors



Size	A	B
S00	111	67
S0	119	70

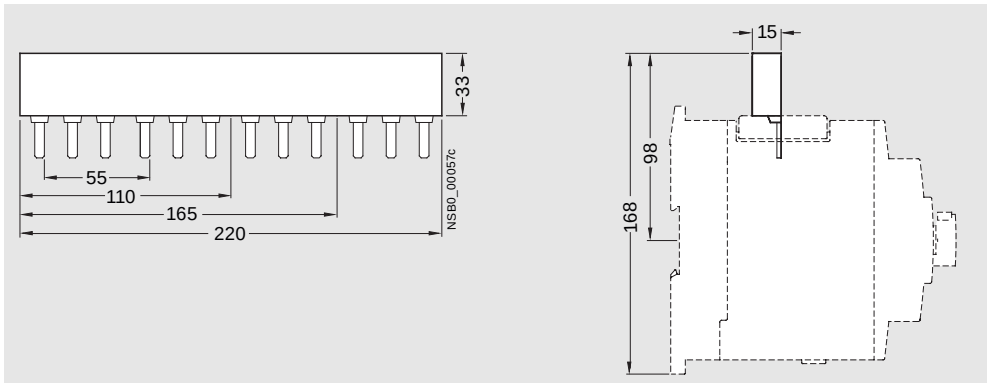
Project planning aids

3RV19 15-3. 3-phase busbar .
For motor starter protector sizes S00 and S0, modular spacing 63 mm
For two 3RV19 15-3AB motor starter protectors with accessory
For four 3RV19 15-3CB motor starter protectors with accessory

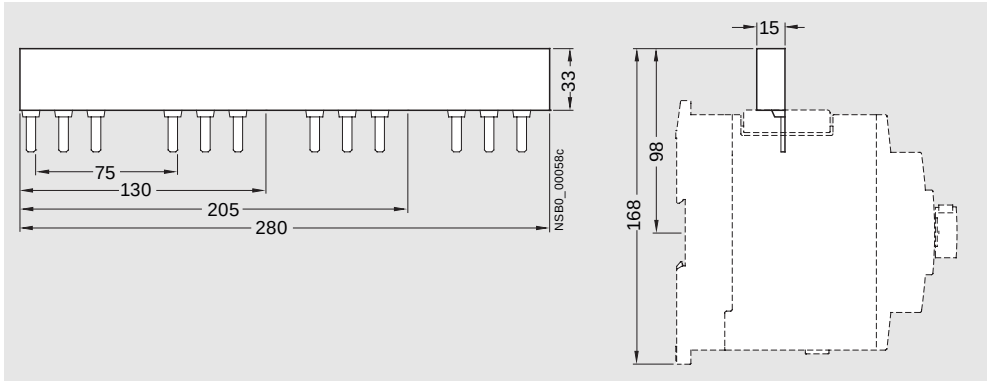


Size	A	B
S00	111	67
S0	119	70

3RV19 35-1. 3-phase busbar
For motor starter protector size S2, modular spacing 55 mm
For two 3RV19 35-1A motor starter protectors
For three 3RV19 35-1B motor starter protectors
For four 3RV19 35-1C motor starter protectors

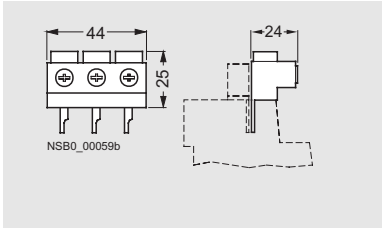


3RV19 35-3. 3-phase busbar
For motor starter protector size S2, modular spacing 75 mm
For two 3RV19 35-3A motor starter protectors with accessory
For three 3RV19 35-3B motor starter protectors with accessory
For four 3RV19 35-3C motor starter protectors with accessory



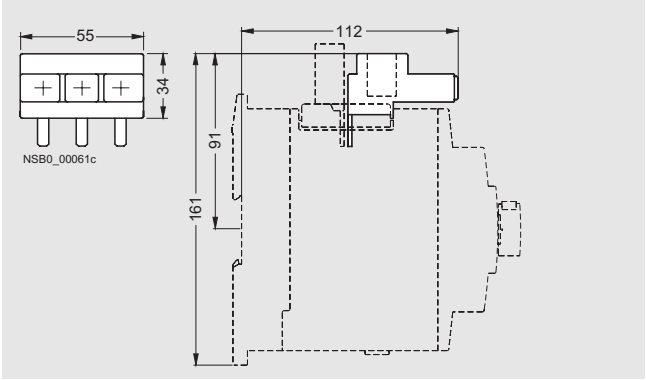
3RV19 15-5. 3-phase feeder terminals

3RV19 15-5A
Connected from top,
for motor starter protector size S00



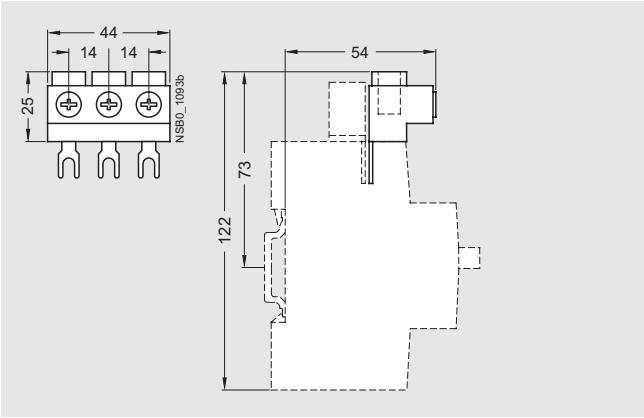
3RV19 35-5A 3-phase feeder terminal

For motor starter protector size S2



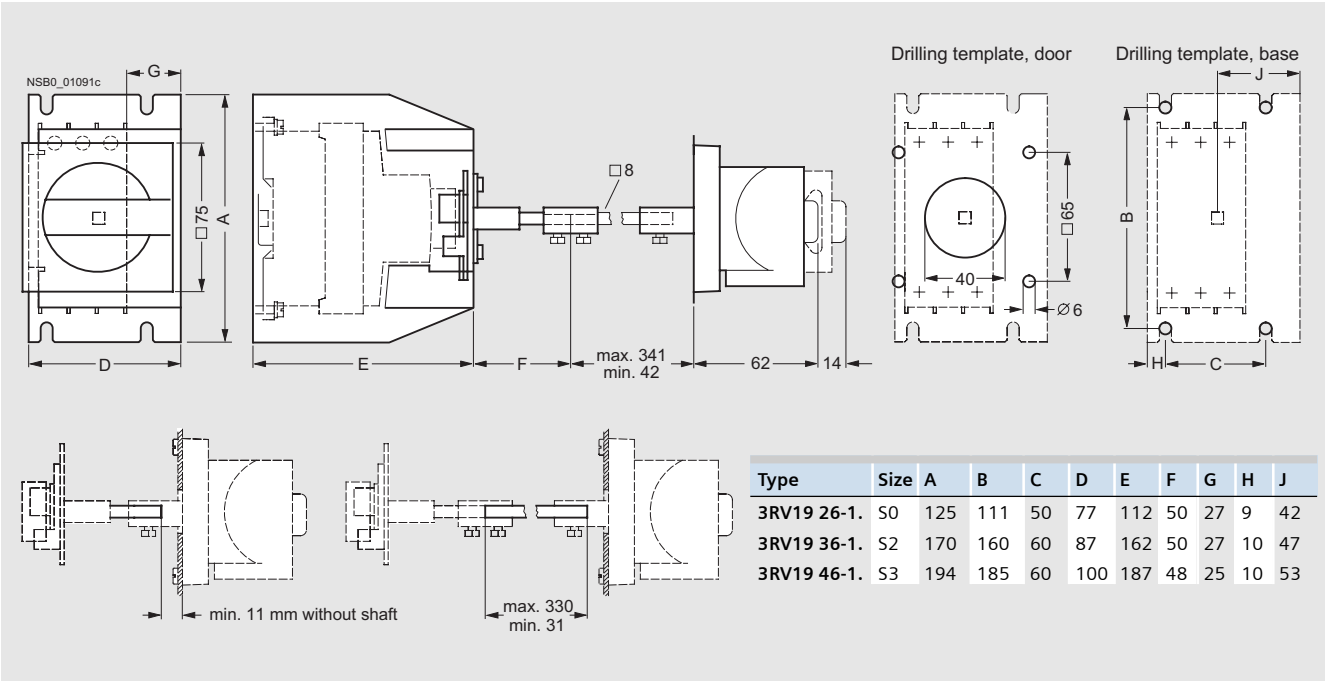
3RV19 25-5AB 3-phase feeder terminal

Connected from top,
for motor starter protector size S0



3RV19 .6-2. door-coupling rotary operating mechanisms for arduous conditions

3RV19 26-1., 3RV19 36-1., 3RV19 46-1.
for motor starter protector size S0, S2 and S3

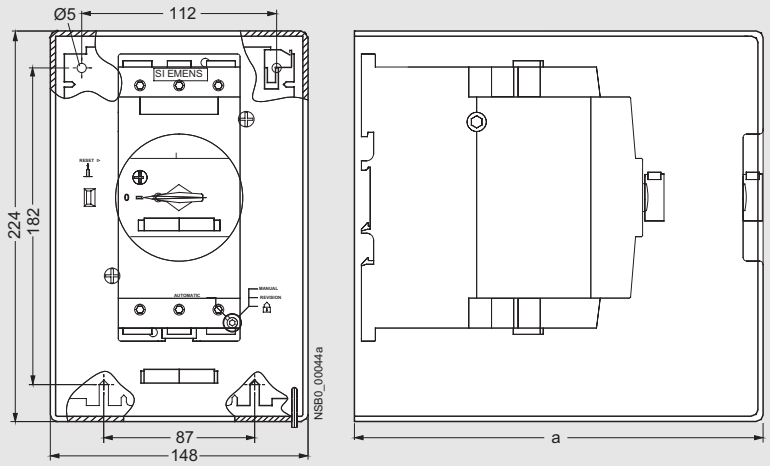


Type	Size	A	B	C	D	E	F	G	H	J
3RV19 26-1.	S0	125	111	50	77	112	50	27	9	42
3RV19 36-1.	S2	170	160	60	87	162	50	27	10	47
3RV19 46-1.	S3	194	185	60	100	187	48	25	10	53

Accessories

Remote motorized operating mechanisms

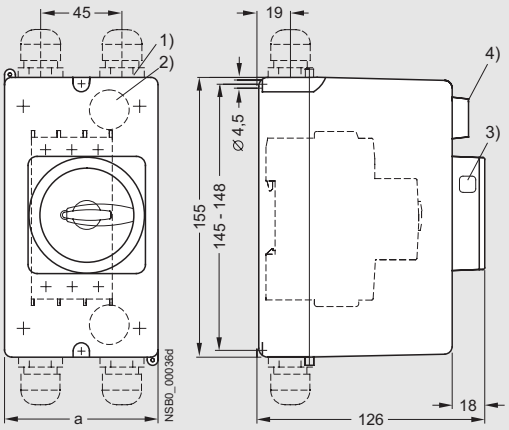
3RV19. 6-3A..
for motor starter protector size S2 and S3



a) 3RV19 36-3AP0, -3AB4: 211 mm,
3RV19 46-3AP0, -3AB4: 236 mm.

3RV19 .3-1.A00 Moulded plastic enclosures for surface mounting dimmed grey

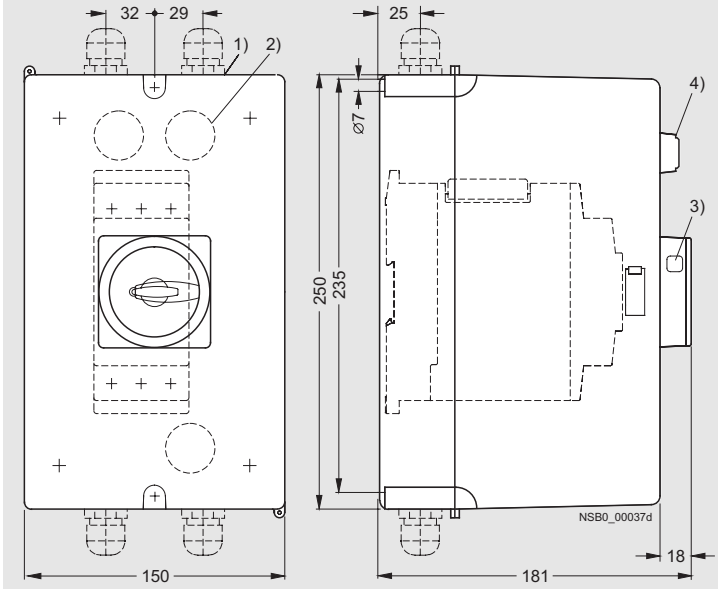
3RV19 23-1.A00
For motor starter protector size S0



a) 3RV19 23-1CA00: 85 mm,
3RV19 23-1DA00: 105 mm.

1) Knock-outs for M25.
2) Knock-outs for rear cable entry M20.
3) Opening for padlock with shackle diameter max. 6 ... 8 mm.
4) 3RV19 03-5 indicator light.

3RV19 33-1.A00
For motor starter protector size S2



1) Knock-outs for M32 (left) and M40 (right).
2) Knock-outs for rear cable entry M32.
3) Opening for padlock with shackle diameter max. 6 ... 8 mm.
4) 3RV19 03-5 indicator light.

Design

Device concept

The 3RB20/3RB21 solid-state overload relays are compact devices, i.e. current measurement (transformer) and the evaluation unit are integrated in a single enclosure.

Mounting options

The 3RB20/3RB21 solid-state overload relays are suitable for direct and space-saving mounting onto 3RT1 contactors and 3RW30/3RW31 soft starters as well as for stand-alone installation.

For more information on the mounting options see “Technical specifications” and “Selection and ordering data”.

Connection method

All sizes of the 3RB20/3RB21 solid-state overload relays can be connected with screw terminals. As an alternative for sizes S3 to S10/S12, the main current paths can be connected with the help of rails. Sizes S2 to S6 of the 3RB20/3RB21 relays are also available with a straight-through transformer. In this case, the cables of the main circuit are routed directly through the feed-through openings of the relay to the contactor terminals.

Overload relays in contactor assemblies for wye-delta starting

When overload relays are used in combination with contactor assemblies for wye-delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

An assignment of the 3RB20 solid-state overload relays to the line contactors of our 3RA contactor assemblies for wye-delta starting can be found under “Controls: Contactors and Contactor Assemblies”.

When 3RB21 solid-state overload relays are used in combination with contactor assemblies for wye-delta starting, the internal ground-fault detection must not be activated.

Operation with frequency converter

The 3RB20/3RB21 solid-state overload relays are suitable for frequencies of 50/60 Hz and the associated harmonics. This permits the 3RB20/3RB21 overload relays to be used on the input side of the frequency converter.

If motor protection is required on the outgoing side of the frequency converter, Siemens recommends the 3RN thermistor motor protection devices or the 3RU11 thermal overload relays for this purpose.

Function

Basic functions

The 3RB20/3RB21 solid-state overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase unbalance
- Inverse-time delayed protection of loads from phase failure
- Protection of loads from high-resistance short-circuits (internal ground-fault detection only with 3RB21).

Control circuit

The 3RB20/3RB21 solid-state overload relays have an internal power supply, i.e. no additional supply voltage is required.

Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection.

For assignments of the corresponding short-circuit protection devices to the 3RB20/3RB21 solid-state overload relays with/without contactor see "Technical specifications" and "Selection and ordering data".

Trip classes

The 3RB20 solid-state overload relays are available for normal starting conditions with trip CLASS 10 or for heavy starting conditions with trip CLASS 20 (fixed setting in each case).

The 3RB21 solid-state overload relays are suitable for normal and heavy starting conditions. The required trip class (CLASS 5, 10, 20 or 30) can be adjusted by means of a rotary switch depending on the current start-up condition.

For details of the trip classes see "Characteristic Curves".

Phase failure protection

The 3RB20/3RB21 solid-state overload relays are fitted with phase failure protection (see "Characteristic Curves") in order to minimize temperature rises of the load during single-phase operation.

Phase failure protection is not effective for loads with star-connection and a grounded neutral point or a neutral point which is connected to a neutral conductor.

Setting

The 3RB20/3RB21 solid-state overload relays are set to the rated motor current by means of a rotary knob. The scale of the rotary knob is shown in ampere.

With the 3RB21 solid-state overload relay it is also possible to select the trip class (CLASS 5, 10, 20 or 30) using a second rotary knob and to switch the internal ground-fault detection on and off.

Manual and automatic reset

In the case of the 3RB20/3RB21 solid-state overload relays, a slide switch can be used to choose between automatic and manual resetting.

If manual reset is set, a reset can be carried out directly on the device after a trip by pressing the blue RESET button. Resetting is possible in combination with the mechanical reset options from the range of accessories (see "Accessories"). As an alternative to the mechanical RESET options, the 3RB21 solid-state overload relays can be equipped with electrical remote RESET by applying a voltage of 24 V DC to the terminals A3 and A4.

If the slide switch is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

Recovery time

With the 3RB20/3RB21 solid-state overload relays the recovery time after inverse-time delayed tripping is 3 minutes when

automatic RESET is set. This recovery time allows the load to cool down.

If the button is set to manual RESET and automatic RESET, the 3RB20/3RB21 devices can be reset immediately after tripping.

TEST function

With motor current flowing, the TEST button can be used to check whether the relay is working correctly (device/solid-state test). Current measurement, motor model and trip unit are tested. If these components are OK, the device is tripped according to the table below. If there is an error, no tripping takes place.

Trip class	Required loading with the rated current prior to pressing the TEST button	Tripping within
CLASS 5	3 min	30 s
CLASS 10	5 min	1 min
CLASS 20	10 min	2 min
CLASS 30	15 min	3 min

Note: The TEST button must be kept pressed throughout the test. In this case the motor current must be equal to more than 80 % of the set current I_e and have at least the value of the lower set current.

Testing of the auxiliary contacts and the control current wiring is possible with the switch position indicator slide. Actuating the slide simulates tripping of the relay. During this simulation the NC contact (95-96) is opened and the NO contact (97-98) is closed. This tests whether the auxiliary circuit has been correctly wired.

After a test trip the relay is reset by pressing the RESET button.

Self-monitoring

The 3RB20/3RB21 solid-state overload relays have a self-monitoring feature, i.e. the devices constantly monitor their own basic functions and trip if an internal fault is detected.

Display of operating state

The respective operating state of the 3RB20/3RB21 solid-state overload relays is displayed by means of the position of the marking on the switch position indicator slide. After tripping due to overload, phase failure, phase unbalance or ground fault (ground fault detection possible only with 3RB21) the marking on the slide is to left on the "O" mark, otherwise it is on the "I" mark.

Auxiliary contacts

The 3RB20/3RB21 solid-state overload relays are fitted with an NO contact for the "tripped" signal, and an NC contact for switching off the contactor.

Technical specifications

Type		3RB20 16, 3RB21 13	3RB20 26, 3RB21 23	3RB20 36, 3RB21 33	3RB20 46, 3RB21 43	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63
Size		S00	S0	S2	S3	S6	S10/S12
Width		45 mm	45 mm	55 mm	70 mm	120 mm	145 mm
General data							
Trips in the event of		Overload, phase failure, and phase unbalance + ground fault (for 3RB21 only)					
Trip class acc. to IEC 60947-4-1	CLASS	10 / 20 / 5, 10, 20 and 30 adjustable (depending on the version)					
Phase failure sensitivity		Yes					
Overload warning		No					
Reset and recovery							
• Reset options after tripping		Manual, automatic and remote RESET (depending on the version)					
• Recovery time							
- for automatic RESET	min.	Approx. 3 min					
- for manual RESET	min.	Immediately					
- for remote RESET	min.	Immediately					
Features							
• Display of operating state on device		Yes, by means of switch position indicator slide					
• TEST function		Yes, test of electronics by pressing the TEST button / test of auxiliary contacts and wiring of control circuit by actuating the switch position indicator slide / self-monitoring					
• RESET button		Yes					
• STOP button		No					
Explosion protection – Safe operation of motors with "increased safety" type of protection							
EC type test certificate number acc. to directive 94/9/EC (ATEX)		PTB 06 ATEX 3001 Ex II (2) GD					
Ambient temperatures							
• Storage/transport	°C	-40 ... +80					
• Operation	°C	-25 ... +60					
• Temperature compensation	°C	+60					
• Permissible rated current at							
- temperature inside control cabinet 60 °C, stand-alone installation	%	100	100[2]	100	100	100	100 or 90[3]
- temperature inside control cabinet 60 °C, mounted on contactor	%	100	100[2]	100	100	70	70
- temperature inside control cabinet 70 °C	%	[1]					
Repeat terminals							
• Coil repeat terminal		Yes	Not required				
• Auxiliary contact repeat terminal		Yes	Not required				
Degree of protection acc. to IEC 60529		IP20		IP20[4]			
Touch protection acc. to IEC 61140		Finger-safe				Finger-safe, for busbar connection with cover	Finger-safe with cover
Shock resistance with sine acc. to IEC 60068-2-27	*g*/ms	15/11[5]					
Electromagnetic compatibility (EMC) – Interference immunity							
• Conductor-related interference							
- burst acc. to IEC 61000-4-4 (corresponds to degree of severity 3)	kV	2 (power ports), 1 (signal ports)					
- surge acc. to IEC 61000-4-5 (corresponds to degree of severity 3)	kV	2 (line to earth), 1 (line to line)					
• Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to degree of severity 3)	kV	8 (air discharge), 6 (contact discharge)					
• Field-related interference acc. to IEC 61000-4-3 (corresponds to degree of severity 3)	V/m	10					
Electromagnetic compatibility (EMC) – Emitted interference		Degree of severity B acc. to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)					
Resistance to extreme climates – air humidity	%	100					
Dimensions		See dimensional drawings					
Installation altitude above sea level	m	Up to 2000					
Mounting position		Any					
Type of mounting		Direct mounting / stand-alone installation with terminal bracket		Direct mounting / stand-alone installation			

1) On request.

2) S0 for 6 ... 25 A, CLASS 20, I_{emax} = 19 A;
S0 for 6 ... 25 A, CLASS 30, I_{emax} = 16 A.

3) 90 % for relay with current setting range 160 ... 630 A.

4) Terminal compartment: degree of protection IP00.

5) Signaling contact 97/98 in position "tripped": 4/11 *g*/ms.

3RB20, 3RB21 for standard applications

Type		3RB20 16, 3RB21 13	3RB20 26, 3RB21 23	3RB20 36, 3RB21 33	3RB20 46, 3RB21 43
Size		S00	S0	S2	S3
Width		45 mm	45 mm	55 mm	70 mm
Main circuit					
Rated insulation voltage U_i (degree of pollution 3)	V	690		690/1000[1]	1000
Rated impulse withstand voltage U_{imp}	kV	6		6/8[2]	8
Rated operational voltage U_e	V	690		690/1000[1]	1000
Type of current					
• Direct current		No			
• Alternating current		Yes, 50/60 Hz ±5 %			
Set current	A	0.1 ... 0.4 to 3 ... 12	0.1 ... 0.4 to 6 ... 25	6 ... 25 and 12.5 ... 50	12.5 ... 50 and 25 ... 100
Power loss per unit (max.)	W	0.05			
Short-circuit protection					
- with fuse without contactor		See "Selection and ordering data"			
- with fuse and contactor		See "Technical specifications" (short-circuit protection with fuses for motor feeders)			
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1 (degree of pollution 2)	V	690[3]			
Connection for main circuit					
Connection type		**Screw terminals with box terminal**			
• Terminal screw		Pozidriv size 2			Allen screw 4 mm
• Tightening torque	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5	4 ... 6
• Conductor cross-sections (min./max.), 1 or 2 conductors					
- solid	mm²	2 × (0.5 ... 1.5)[4], 2 × (0.75 ... 2.5)[4]	2 × (1 ... 2.5)[4], 2 × (2.5 ... 6)[4]	2 × (1 ... 16)	2 × (2.5 ... 16)
- finely stranded without end sleeve	mm²	—			
- finely stranded with end sleeve	mm²	2 × (0.5 ... 1.5)[4], 2 × (0.75 ... 2.5)[4]	2 × (1 ... 2.5)[4], 2 × (2.5 ... 6)[4]	2 × (1 ... 16)[4], 1 × (1 ... 25)[4]	2 × (2.5 ... 35), 1 × (2.5 ... 50)
- stranded	mm²	—		2 × (max. 25), 1 × (1 ... 35)	2 × (10 ... 50), 1 × (10 ... 70)
- AWG cables, solid or stranded	AWG	2 × (18 ... 14)	2 × (14 ... 10)	2 × (max. 4), 1 × (18 ... 2)	2 × (10 ... 1/0), 1 × (10 ... 2/0)
- ribbon cable conductors (number x width x thickness)	mm	—		2 × (6 × 9 × 0.8)	2 × (6 × 9 × 0.8)
Connection type		**Busbar connection**			
• Terminal screw		—			M 6 × 20
• Tightening torque	Nm	—			4 ... 6
• Conductor cross-section (min./max.)					
- finely stranded with cable lug	mm²	—			2 × 70
- stranded with cable lug	mm²	—			3 × 70
- AWG cable, solid or stranded, with cable lug	AWG	—			2/0
- with connecting bar (max. width)	mm	—			12
Connection type		**Straight-through transformers**			
• Diameter of opening	mm	–		15	18

1) For version with straight-through transformer up to 1000 V AC.

2) For version with straight-through transformer up to 8 kV.

3) For grounded networks, otherwise 600 V.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Type		**3RB20 56, 3RB21 53**	**3RB20 66, 3RB21 63**
Size		S6	S10/S12
Width		120 mm	145 mm
Main circuit			
Rated insulation voltage U_i (degree of pollution 3)	V	1000	
Rated impulse withstand voltage U_{imp}	kV	8	
Rated operational voltage U_e	V	1000	
Type of current			
• Direct current		No	
• Alternating current		Yes, 50/60 Hz ±5 %	
Set current	A	50 ... 200	55 ... 250 to 160 ... 630
Power loss per unit (max.)	W	0.05	
Short-circuit protection			
- with fuse without contactor		See "Selection and ordering data"	
- with fuse and contactor		See "Technical specifications" (short-circuit protection with fuses for motor feeders)	
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1 (degree of pollution 2)	V	690[1]	
Connection for main circuit			
Connection type		**Screw terminals with box terminal**	
• Terminal screw		4 mm Allen screw	5 mm Allen screw
• Tightening torque	Nm	10 ... 12	20 ... 22
• Conductor cross-sections (min./max.), 1 or 2 conductors			
- solid	mm²	—	
- finely stranded without end sleeve	mm²	With 3RT19 55-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70) With 3RT19 56-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240) Rear clamping point only: 1 × (120 ... 185)
- finely stranded with end sleeve	mm²	With 3RT19 55-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70) With 3RT19 56-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240) Rear clamping point only: 1 × (120 ... 185)
- stranded	mm²	With 3RT19 55-4G box terminal: 2 × (max. 70), 1 × (16 ... 70) With 3RT19 56-4G box terminal: 2 × (max. 120), 1 × (16 ... 120)	2 × (70 ... 240), Front clamping point only: 1 × (95 ... 300) Rear clamping point only: 1 × (120 ... 240)
- AWG cables, solid or stranded	AWG	With 3RT19 55-4G box terminal: 2 × (max. 1/0), 1 × (6 ... 2/0) With 3RT19 56-4G box terminal: 2 × (max. 3/0), 1 × (6 ... 250 kcmil)	2 × (2/0 ... 500 kcmil), Front clamping point only: 1 × (3/0 ... 600 kcmil) Rear clamping point only: 1 × (250 kcmil ... 500 kcmil)
- ribbon cable conductors (number x width x thickness)	mm	With 3RT19 55-4G box terminal: 2 × (6 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 6 × 15.5 × 0.8) With 3RT19 56-4G box terminal: 2 × (10 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 10 × 15.5 × 0.8)	2 × (20 × 24 × 0.5), 1 × (6 × 9 × 0.8 ... 20 × 24 × 0.5)
Connection type		**Busbar connection**	
• Terminal screw		M 8 × 25	M 10 × 30
• Tightening torque	Nm	10 ... 14	14 ... 24
• Conductor cross-section (min./max.)			
- finely stranded with cable lug	mm²	16 ... 95[2]	50 ... 240[3]
- stranded with cable lug	mm²	25 ... 120[2]	70 ... 240[3]
- AWG cable, solid or stranded, with cable lug	AWG	4 ... 250 kcmil	2/0 ... 500 kcmil
- with connecting bar (max. width)	mm	15	25
Connection type		**Straight-through transformers**	
• Diameter of opening	mm	24.5	—

1) For grounded networks, otherwise 600 V.

2) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.

3) When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm² as well as DIN 46235 for conductor cross-sections from 185 mm², use the 3RT19 56-4EA1 terminal cover to ensure phase spacing.

3RB20, 3RB21 for standard applications

Type		3RB20 16, 3RB21 13	3RB20 26, 3RB21 23	3RB20 36, 3RB21 33	3RB20 46, 3RB21 43	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63
Size		S00	S0	S2	S3	S6	S10/S12
Width		45 mm	45 mm	55 mm	70 mm	120 mm	145 mm
Auxiliary circuit							
Number of NO contacts		1					
Number of NC contacts		1					
Auxiliary contacts – assignment		1 NO for the signal "tripped", 1 NC for disconnecting the contactor					
Rated insulation voltage U_i (degree of pollution 3)	V	300					
Rated impulse withstand voltage U_{imp}	kV	4					
Auxiliary contacts – Contact rating							
• NC contact with alternating current AC-14/AC-15 Rated operational current I_e at U_e:							
- 24 V	A	4					
- 120 V	A	4					
- 125 V	A	4					
- 250 V	A	3					
• NO contact with alternating current AC-14/AC-15: Rated operational current I_e at U_e:							
- 24 V	A	4					
- 120 V	A	4					
- 125 V	A	4					
- 250 V	A	3					
• NC, NO contact with direct current DC-13: Rated operational current I_e at U_e:							
- 24 V	A	2					
- 60 V	A	0.55					
- 110 V	A	0.3					
- 125 V	A	0.3					
- 250 V	A	0.11					
• Continuous thermal current I_{th}	A	5					
• Contact reliability (suitability for PLC control; 17 V, 5 mA)		Yes					
Short-circuit protection							
• With fuse, gL/gG operational class	A	6					
Ground-fault protection (only 3RB21)		The information refers to sinusoidal residual currents at 50/60 Hz					
• Tripping value I_Δ		> 0.75 × I_{motor}					
• Operating range I		Lower set current value ... 3.5 × upper set current value					
• Response time t_{trip} (in steady-state condition)	s	< 1					
Integrated electrical remote reset (only 3RB21)							
• Connecting terminals A3, A4		DC 24 V, 100 mA, 2.4 W short-term					
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1	V	300					
CSA, UL, UR rated data							
Auxiliary circuit – switching capacity		B300, R300					
Connection of the auxiliary circuit							
Connection type		**Screw terminals**					
• Terminal screw		Pozidriv size 2					
• Tightening torque	Nm	0.8 ... 1.2					
• Conductor cross-sections (min./max.), 1 or 2 conductors							
- solid	mm²	1 × (0.5 ... 4), 2 × (0.5 ... 2.5)					
- finely stranded without end sleeve	mm²	–					
- finely stranded with end sleeve	mm²	1 × (0.5 ... 2.5), 2 × (0.5 ... 1.5)					
- stranded	mm²	–					
- AWG cables, solid or stranded	AWG	2 × (20 ... 14)					

Footnotes for page 3a/31:

1) Please observe operational voltage.

2) Type of coordination and short-circuit protective devices acc. to IEC 60947-4-1:
Type of coordination "1": The contactor or the starter may be non-operational after every short-circuit release.
Type of coordination "2": The contactor or the starter must be operational after a release (without replacement of parts). There is a risk of contact welding.

3) U_e = 500 V.

4) Contactor cannot be mounted.

5) Please ensure that the maximum AC-3 operational current has sufficient safety clearance from the rated current of the fuses.

6) With 3UF18 68-3GA00 current transformer.

Short-circuit protection with fuses for motor feeders

For short-circuit currents up to 50 kA or 100 kA at 400 to 690 V

Overload relay	Contactor	CLASS 5 and 10			CLASS 20			CLASS 30			690 V/ 50 kA		690 V/ 100 kA	
											Fuse links[1] LV HRC DIAZED NEOZED Operational class gG		Type 3NA Type 3SB Type 3SE	
Setting range	Type	Rated operational current I_e/AC-3 in A at ... V									I_e/AC-3 in A with type of coordination[2]			
A		400/415	500	690	400/415	500	690	400/415	500	690	1	2	1	2
Size S00														
0.1 ... 0.4	3RT10 15	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	35	1[3]	20	1[3]
0.32 ... 1.25	3RT10 15	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	35	2	20	2
1 ... 4	3RT10 15	4	4	4	4	4	4	4	4	4	35	10	20	10
	3RT10 16	4	4	4	4	4	4	4	4	4	35	10	20	10
	3RT10 17	4	4	4	4	4	4	4	4	4	35	10	20	10
3 ... 12	3RT10 16	9	6.5	5.2	9	6.5	5.2	9	6.5	5.2	35	20	20	20
	3RT10 17	12	9	6.3	10	9	6.3	9	9	6.3	35	20	20	20
Size S0														
0.1 ... 0.4	3RT10 23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	35	1[3]	20	1[3]
0.32 ... 1.25	3RT10 23	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	35	2	20	2
1 ... 4	3RT10 23	4	4	4	4	4	4	—	—	—	63	10	20	10
	3RT10 24	4	4	4	4	4	4	4	4	4	63	10	25	10
3 ... 12	3RT10 23	9	6.5	5.2	9	6.5	5.2	—	—	—	63	25	20	20
	3RT10 24	12	12	9	12	12	9	12	12	9	63	25	25	20
	3RT10 25	12	12	12	12	12	12	12	12	12	63	25	25	20
6 ... 25	3RT10 24	12	12	9	12	12	9	12	12	9	63	25	25	25
	3RT10 25	17	17	13	16	16	13	14	14	13	63	25	25	25
	3RT10 26	25	18	13	16	16	13	14	14	13	100	35	35	35
Size S2														
6 ... 25	3RT10 34	25	25	20	22.3	22.3	20	19.1	19.1	19.1	125	63	63	63
	3RT10 35	25	25	24	25	25	24	25	25	24	125	63	63	63
12.5 ... 50	3RT10 34	32	32	20	22.3	22.3	20	19.1	19.1	19.1	125	63	63	63
	3RT10 35	40	40	24	29.4	29.4	24	26.5	26.5	24	125	63	63	63
	3RT10 36	50	50	24	32.7	32.7	24	26.5	26.5	24	160	80	80	80
Size S3														
12.5 ... 50	3RT10 44	50	50	47	49	49	47	41.7	41.7	41.7	200	125	125	125
	3RT10 45	50	50	50	50	50	50	45	45	45	200	160	160	160
25 ... 100	3RT10 44	65	65	47	49	49	47	41.7	41.7	41.7	200	125	125	125
	3RT10 45	80	80	58	53	53	53	45	45	45	200	160	160	160
	3RT10 46	95	95	58	59	59	58	50	50	50	200	160	160	160
	3RT10 54	100	100	100	81.7	81.7	81.7	69	69	69	355	315	315	315
	3RT10 55	—	—	—	100	100	100	90	90	90	355	315	315	315
Size S6														
50 ... 200	3RT10 54	115	115	115	81.7	81.7	81.7	69	69	69	355	315	315	315
	3RT10 55	150	150	150	107	107	107	90	90	90	355	315	315	315
	3RT10 56	185	185	170	131	131	131	111	111	111	355	315	315	315
Size S10														
55 ... 250	3RT10 64	225	225	225	160	160	160	135	135	135	500	400	400	400
	3RT10 65	250	250	250	188	188	188	159	159	159	500	400	400	400
	3RT10 66	250	250	250	213	213	213	180	180	180	500	400	400	400
Size S12														
160 ... 630	3RT10 64	225	225	225	160	160	160	—	—	—	500	400	400	400
	3RT10 65	265	265	265	188	188	188	—	—	—	500	400	400	400
	3RT10 66	300	300	280	213	213	213	180	180	180	500	400	400	400
	3RT10 75	400	400	400	284	284	284	240	240	240	630	500	500	500
	3RT10 76	500	500	450	355	355	355	300	300	300	630	500	500	500
	3RT12 64	225	225	225	225	225	225	173	173	173	500	500	500	500
	3RT12 65	265	265	265	265	265	265	204	204	204	500	500	500	500
	3RT12 66	300	300	300	300	300	300	231	231	231	500	500	500	500
	3RT12 75	400	400	400	400	400	400	316	316	316	800	800	800	—
	3RT12 76	500	500	500	500	500	500	385	385	385	800	800	800	—
	3TF68[4]	630	630	630	440	440	440	376	376	376	800	500[5]	500[5]	500[5]
	3TF69[4]	630	630	630	572	572	572	500	500	500	800	630[5]	630[5]	—
Size 14														
0.32 ... 1.25[6]	3TF69[4]	820	820	820	572	572	572	500	500	500	800	630[5]	630[5]	—

For footnotes see page 3a/30.

SSCR = Standard Short-Circuit Rating

Characteristic curves

The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current I_e and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the total tripping current for the 3RB20/3RB21 solid-state overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current I_e from the cold state for symmetrical three-pole loads.

The tripping times according to IEC 60947-4-1, tolerance band E, are as follows for:

Trip class	Tripping time
CLASS 5	3 ... 5 s
CLASS 10	5 ... 10 s
CLASS 20	10 ... 20 s
CLASS 30	20 ... 30 s

The tripping characteristic for a three-pole overload relay from the cold state (see illustration 1) only apply if all three phases are simultaneously loaded with the same current. In the event of a phase failure the 3RB20/3RB21 solid-state overload relays switch off the contactor more quickly in order to minimize heating of the load in accordance with the tripping characteristic for two-pole loads from the cold state (see illustration 2). With phase unbalance the devices switch off depending on the degree of the unbalance between the two characteristic curves.

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. The tripping time of the 3RB20/3RB21 solid-state overload relays is reduced therefore to about 30 % when loaded with the set current I_e for an extended period.

Tripping characteristics for 3-pole loads

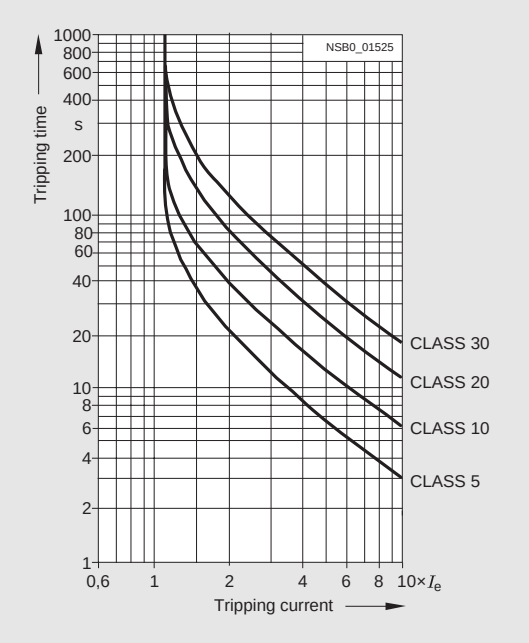


Illustration 1

Tripping characteristics for 2-pole loads

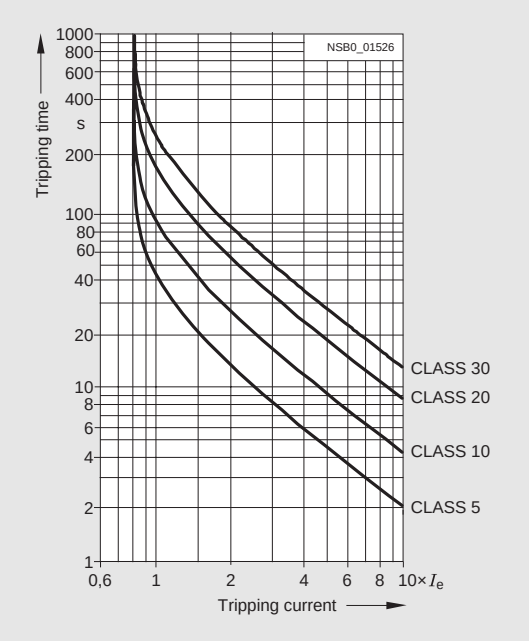
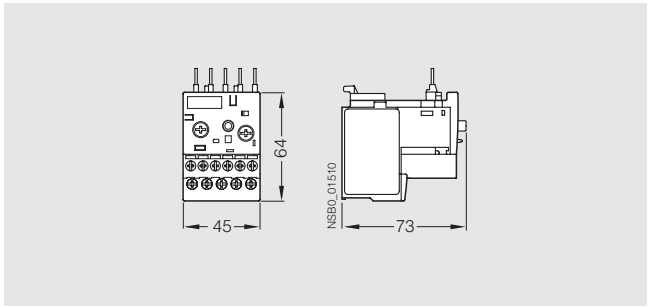


Illustration 2

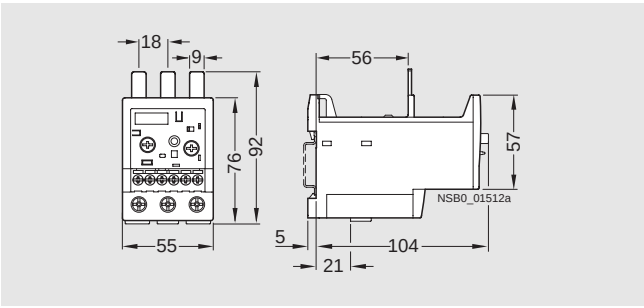
The above illustrations are schematic representations of characteristic curves.

Dimensional drawings

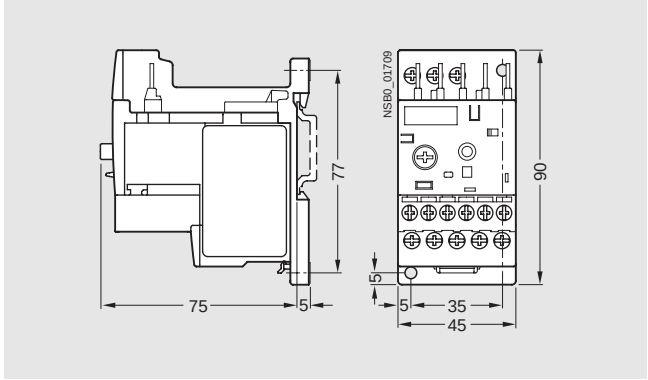
3RB20 16, 3RB21 13, size S00



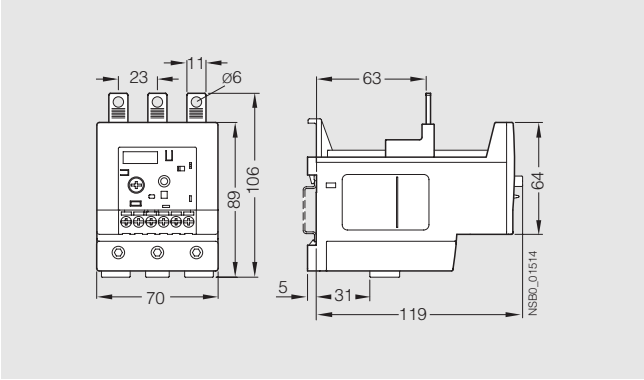
3RB20 36, 3RB21 33, size S2



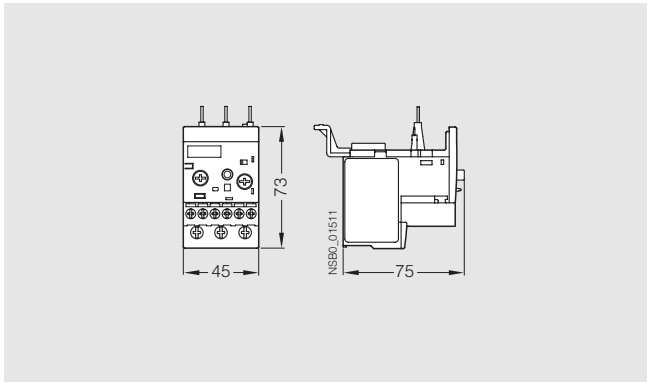
3RB20 16, 3RB21 13, size S00, stand-alone installation



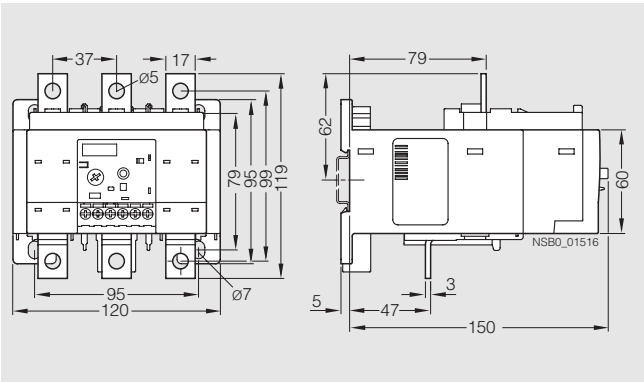
3RB20 46, 3RB21 43, size S3



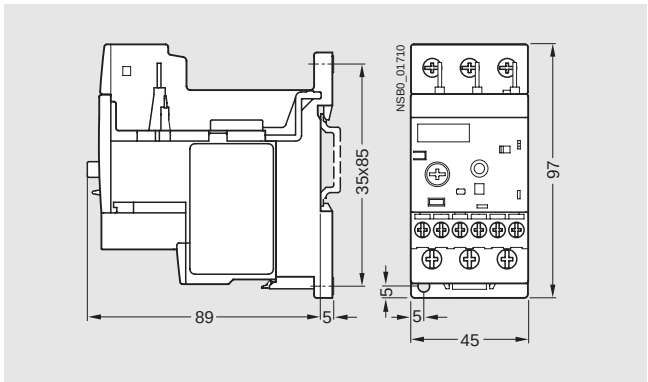
3RB20 26, 3RB21 23, size S0



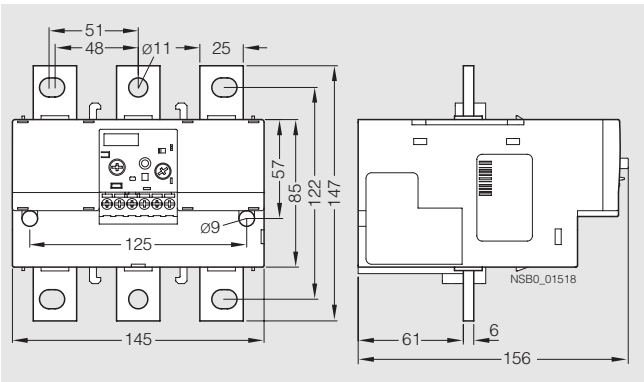
3RB20 56, 3RB21 53, size S6



3RB20 26, 3RB21 23, size S0, stand-alone installation



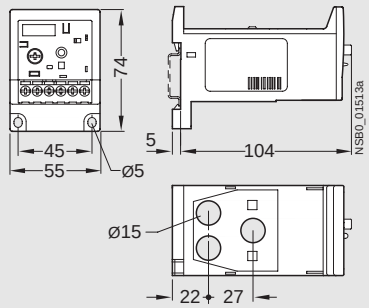
3RB20 66, 3RB21 63, size S10/S12



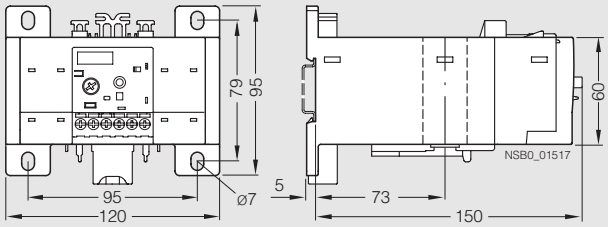
3a

3RB20, 3RB21 for standard applications

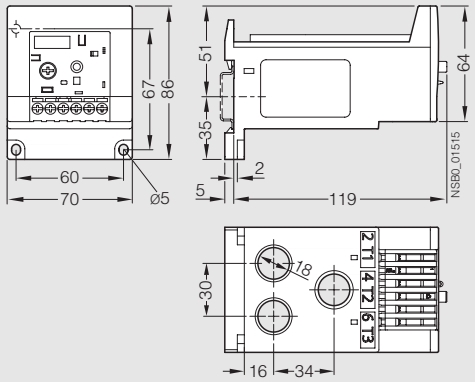
3RB20 36, 3RB21 33, size S2 with straight-through transformer



3RB20 56, 3RB21 53, size S6 with straight-through transformer



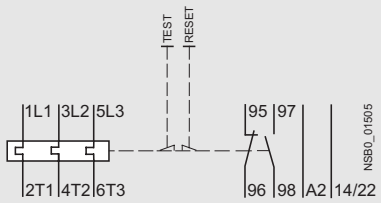
3RB20 46, 3RB21 43, size S3 with straight-through transformer



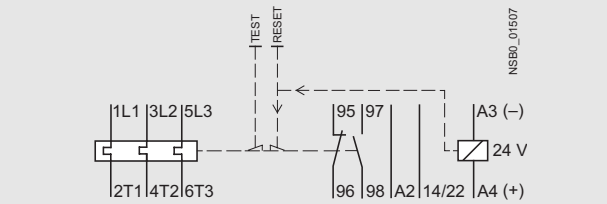
3a

Schematics

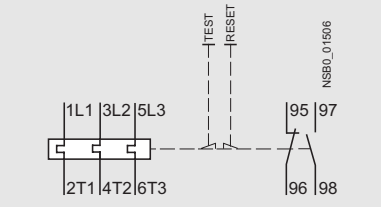
3RB20 16



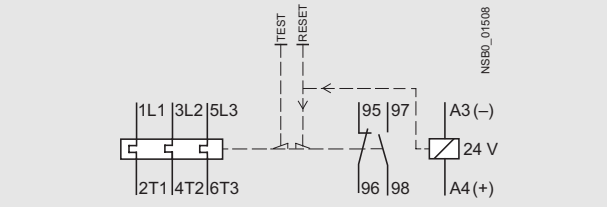
3RB21 13



3RB20 26 to 3RB20 66



3RB21 23 to 3RB21 63



"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RB22 (monostable) solid-state overload relays are suitable for the overload protection of explosion-proof motors with "Increased safety" type of protection EEx e;

Design

Device concept

The 3RB22/3RB23 solid-state overload relays are based on a modular device concept. Each device always comprises an evaluation module, which is independent of the motor current, and a current measuring module, which is dependent on the motor current. The two modules are electrically interconnected by a connection cable through the system interface.

The basic functionality of the evaluation module can be optionally expanded with corresponding function expansion modules. The function expansion modules are integrated in the evaluation module for this purpose through a simple plug-in connection.

Mounting options

Current measuring modules

The current measuring modules size S00/S0 and S2/S3 are designed for stand-alone installation. By contrast, the current measuring modules size S6 and S10/S12 are suitable for stand-alone installation and direct mounting.

Evaluation modules

The evaluation modules can be mounted either on the current measuring module (only sizes S00/S0 and S2/S3) or separately.

For more information on the mounting options see "Technical specifications" and "Selection and ordering data".

Connection method

Main circuit (current measuring module)

For sizes S00/S0, S2/S3 and S6, the main circuit can also be connected by the straight-through transformer method. In this case, the cables of the main circuit are routed directly through the feed-through openings of the relay to the contactor terminals.

For sizes S6 and S10/S12, the main circuit can be connected with the help of rails. In conjunction with the corresponding box terminals, screw connection is also possible.

Auxiliary circuit (evaluation module)

Connection of the auxiliary circuit (removable terminal block) is possible with either screw or spring-loaded terminal connection system (special variants).

For more information on the connection options see "Technical specifications" and "Selection and ordering data".

Overload relays in contactor assemblies for wye-delta starting

When overload relays are used in combination with contactor assemblies for wye-delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

When 3RB22/3RB23 solid-state overload relays are used in combination with contactor assemblies for wye-delta starting, the function expansion modules for internal ground-fault detection must not be used.

Operation with frequency converter

The 3RB22/3RB23 solid-state overload relays are suitable for frequencies of 50/60 Hz and the associated harmonics. This permits the 3RB22/3RB23 overload relays to be used on the input side of the frequency converter.

If motor protection is required on the outgoing side of the frequency converter, Siemens recommends the 3RN thermistor motor protection devices or the 3RU11 thermal overload relays for this purpose.

Function

Basic functions

The 3RB22/3RB23 solid-state overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase unbalance
- Inverse-time delayed protection of loads from phase failure
- Temperature-dependent protection of loads by connecting a PTC sensor circuit
- Protection of loads from high-resistance short-circuits (internal ground-fault detection; detection of fault currents > 30 % of the set current I_e)
- Output of an overload warning
- Output of an analog signal 4 to 20 mA DC as image of the flowing motor current

The basic functions of the evaluation modules in conjunction with function expansion modules are listed in the following table:

Evaluation modules	Function expansion modules	Basic functions
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	None	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning
	3RB29 85-2CA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning
	3RB29 85-2CB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground-fault signal
	3RB29 85-2AA0	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning, analog output
	3RB29 85-2AA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning, analog output
	3RB29 85-2AB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground-fault signal, analog output

Control circuit

The 3RB22/3RB23 solid-state overload relays require an external power supply, i.e. an additional supply voltage is necessary. Power is supplied through a wide-range power supply unit for 24 to 240 V AC/DC.

Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection.

For assignments of the corresponding short-circuit protection devices to the 3RB22/3RB23 solid-state overload relays with/without contactor see “Technical specifications” and “Selection and ordering data”.

Trip classes

The 3RB22/3RB23 solid-state overload relays are suitable for normal and heavy starting conditions. The required trip class (CLASS 5, 10, 20 or 30) can be adjusted by means of a rotary switch depending on the current start-up condition.

For details of the trip classes see “Characteristic Curves”.

Phase failure protection

The 3RB22/3RB23 solid-state overload relays are fitted with phase failure protection (see “Characteristic Curves”) in order to minimize temperature rises of the load during single-phase operation.

Setting

The 3RB22/3RB23 solid-state overload relays are set to the rated motor current by means of two rotary knobs.

- The upper rotary knob (CLASS/I_{emax}) is divided into 4 ranges: 1 A, 10 A, 100 A and 1000 A. The zone must be selected which corresponds to the rated motor current and the current measuring module to be used with it. With the range selected the required trip class (CLASS 5, 10, 20 or 30) can be determined.
- The lower rotary knob with percent scale (10 % ... 100 %) is then used to set the rated motor current in percent of the range selected with the upper rotary knob.

Example

- Rating of induction motor = 45 kW (AC 50 Hz, 400 V)
- Rated motor current = 80 A
- Required trip class = CLASS 20
- Selected transformer: 10 ... 100 A

Solution

- Step 1: Use the upper rotary knob (CLASS) to select the 100 A range
- Step 2: Within the 100 A range set the trip class CLASS 20
- Step 3: Set the lower rotary knob to 80 % (= 0.8) corresponding to 100 A ´ 0.8 = 80 A.

If the current which is set on the evaluation module does not correspond to the current range of the connected current transformer, an error will result.

Manual and automatic reset

In the case of the 3RB22/3RB23 solid-state overload relays, a slide switch can be used to choose between automatic and manual resetting.

If manual reset is set, a reset can be carried out directly on the device after a trip by pressing the blue TEST/RESET button. A remote RESET can be carried out electrically by jumpering the terminals Y1 and Y2.

If the slide switch is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

Recovery time

With the 3RB22/3RB23 solid-state overload relays the recovery time after inverse-time delayed tripping is approx. 3 minutes regardless of the selected reset mode. The recovery time allows the load to cool down.

However, in the event of temperature-dependent tripping by means of a connected PTC sensor circuit, the device can only be manually or automatically reset once the winding temperature at the installation location of the PTC thermistor has fallen 5 Kelvin below its response temperature.

After a ground-fault tripping the 3RB22/3RB23 solid-state overload relay trips can be reset immediately without a recovery time.

TEST function

The combined TEST/RESET button can be used to check whether the relay is working correctly. The test can be aborted at any time by letting go of the TEST/RESET button.

LEDs, the device configuration (this depends on which expansion module is plugged in) and the device hardware are tested while the button is kept pressed for 6 seconds. Simultaneously and for another 18 seconds a direct current proportional in size to the maximum phase of the main current is fed in at the terminals I(+) and I(-). By comparing the analog signal, which is to be measured, with the main current, the accuracy of the current measurement can be determined. In this case 4 mA corresponds to 0 % and 20 mA to 125 % of the set current. After 24 seconds the auxiliary contacts are switched and the feeder switch off as the result, bringing the test to an end.

After a test trip a faultless relay is reset by pressing the TEST/RESET button. If a hardware fault is detected, the device trips and cannot be reset.

Self-monitoring

The 3RB22/3RB23 solid-state overload relays have a self-monitoring feature, i.e. the devices constantly monitor their own basic functions and trip if an internal fault is detected.

Display of the operating state

The particular operating state of the 3RB22/3RB23 solid-state overload relays is displayed by means of four LEDs:

- Green "READY" LED: A continuous green light signals that the overload relay is ready for operation. The 3RB22/3RB23 overload relays are not ready (LED "OFF") if there is no control supply voltage or if the function test was negative.
- Red "GND FAULT" LED: A continuous red light signals a ground fault.
- Red "THERMISTOR" LED: A continuous red light signals a temperature-dependent trip.
- Red "OVERLOAD" LED: A continuous red light signals an inverse-time delayed trip; a flickering red light signals an imminent inverse-time delayed trip (overload warning).

Auxiliary contacts

The 3RB22/3RB23 solid-state overload relays have two outputs, each with one NO contact and one NC contact. Their basic assignment/function may be influenced by function expansion modules.

The 3RB22 and 3RB23 differ with respect to the tripping characteristics of their auxiliary contacts – monostable or bistable:

The monostable 3RB22 solid-state overload relays will enter the "tripped" state if the control voltage fails (> 200 ms), and return to the original state they were in before the control supply voltage failed when the voltage returns. These devices are therefore especially suited for plants in which the control voltage is not strictly monitored.

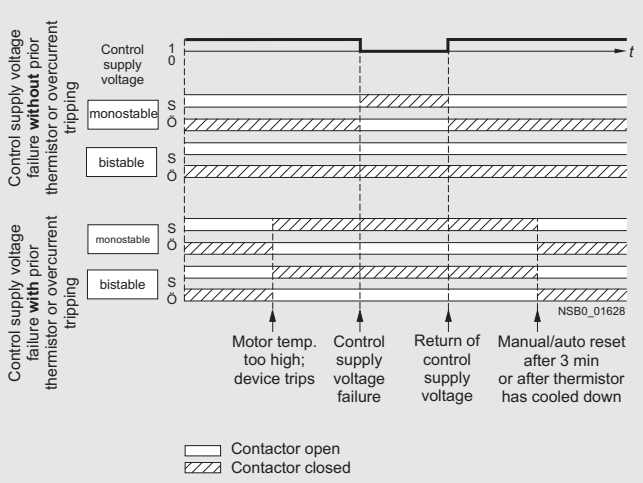
The bistable 3RB23 overload relays do not change their "tripped" or "not tripped" status if the control voltage fails. The auxiliary contacts only switch over in the event of an overload and if the supply voltage is present. These devices are therefore especially suited for plants in which the control voltage is monitored separately.

Response if the control supply voltage fails

If the control supply voltage fails for more than 0.2 s, the output relays respond differently depending on the version: Monostable or bistable.

Response of the output relays in the event of	Monostable 3RB22	Bistable 3RB23
Failure of the control supply voltage	The device trips	No change of the switching state of the auxiliary contacts
Return of the control supply voltage without previous tripping	The device resets	No change of the switching state of the auxiliary contacts
Return of the control supply voltage after previous tripping	The device remains tripped Reset: • For overload tripping, after 3 minutes • For thermistor tripping, after the temperature has fallen 5 K below the response temperature • For ground-fault tripping, immediately	The device remains tripped Reset: • For overload tripping, after 3 minutes • For thermistor tripping, after the temperature has fallen 5 K below the response temperature • For ground-fault tripping, immediately

Monostable and bistable responses of the output relays



Technical specifications

Type – Overload relay of complete system **Size**		**3RB22, 3RB23** S00 ... S10/S12
General data		
Trips in the event of		Overload, phase failure and phase unbalance (> 40 % acc. to NEMA), + ground fault (with corresponding function expansion module) and activation of the thermistor motor protection (with closed PTC sensor circuit)
Trip class acc. to IEC 60947-4-1	CLASS	5, 10, 20 and 30 adjustable
Phase failure sensitivity		Yes
Overload warning		Yes, from 1.125 x I_e for symmetrical loads and from 0.85 x I_e for unsymmetrical loads
Reset and recovery • Reset options after tripping • Recovery time - for automatic RESET - for manual RESET - for remote RESET	 min min min	 Manual, automatic and remote RESET - for tripping due to overcurrent: 3 (stored permanently) - for tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature - for tripping due to a ground fault: no automatic RESET - for tripping due to overcurrent: 3 (stored permanently) - for tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature - for tripping due to a ground fault: immediately - for tripping due to overcurrent: 3 (stored permanently) - for tripping by thermistor: time until the motor temperature has fallen 5 K below the response temperature - for tripping due to a ground fault: immediately
Features • Display of operating state on device • TEST function • RESET button • STOP button		 Yes, with 4 LEDs: Green “Ready” LED, red “Ground Fault” LED, red “Thermistor” LED and red “Overload” LED Yes, test of LEDs, electronics, auxiliary contacts and wiring of control circuit by pressing the button TEST/RESET / self-monitoring Yes, with the TEST/RESET button No
Explosion protection – Safe operation of motors with “increased safety” type of protection EC type test certificate number acc. to directive 94/9/EC (ATEX)		 PTB 05 ATEX 3022 Ex II (2) GD
Ambient temperatures		
Storage/transport	°C	-40 ... +80
Operation	°C	-25 ... +60
Temperature compensation	°C	+60
Permissible rated current - temperature inside control cabinet 60 °C - temperature inside control cabinet 70 °C	 % %	 100 1)
Repeat terminals • Coil repeat terminal • Auxiliary contact repeat terminal		 Not required Not required
Degree of protection acc. to IEC 60529		IP20[2]
Touch protection acc. to IEC 61140		Finger-safe[2]
Shock resistance with sine acc. to IEC 60068-2-27	g/ms	15/11
Electromagnetic compatibility (EMC) **– Interference immunity** • Conductor-related interference - burst acc. to IEC 61000-4-4 (corresponds to degree of severity 3) - surge acc. to IEC 61000-4-5 (corresponds to degree of severity 3) • Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to degree of severity 3) • Field-related interference acc. to IEC 61000-4-3 (corresponds to degree of severity 3)	 kV kV kV V/m	 2 (power ports), 1 (signal ports) 2 (line to earth), 1 (line to line) 8 (air discharge), 6 (contact discharge) 10
Electromagnetic compatiblity (EMC) **– Emitted interference**		Degree of severity A acc. to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)
Resistance to extreme climates – air humidity	%	100
Dimensions		See dimensional drawings
Installation altitude above sea level	m	Up to 2000
Mounting position		Any
Type of mounting		Evaluation module: Stand-alone installation, current measuring module size S00 to S3: Stand-alone installation, current measuring module size S6 and S10/S12: Stand-alone installation andmounting onto contactors

1) On request.

2) Current measuring modules size S6 and S10/S12 with busbar connection in conjunction with cover.

Type – Overload relay of current measuring module Size Width		3RB29 06 S00/S0 45 mm	3RB29 06 S2/S3 55 mm	3RB29 56 S6 120 mm	3RB29 66 S10/S12 145 mm
Main circuit					
Rated insulation voltage U_i (degree of pollution 3)	V	1000			
Rated impulse withstand voltage U_{imp}	kV	6		8	
Rated operational voltage U_e	V	1000			
Type of current • Direct current • Alternating current		 No Yes, 50/60 Hz ±5 %			
Set current	A	0.3 ... 3; 2.4 ... 25	10 ... 100	20 ... 200	63 ... 630
Power loss per unit (max.)	W	0.5			
Short-circuit protection • With fuse without contactor • With fuse and contactor		 See "Selection and ordering data" See "Technical specifications" (short-circuit protection with fuses for motor feeders)			
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1 (degree of pollution 2)		V	690[1)]		
Connection for main circuit					
Connection type		**Screw terminals with box terminal**			
• Terminal screw		—		4 mm Allen screw	5 mm Allen screw
• Tightening torque	Nm	—		10 ... 12	20 ... 22
• Conductor cross-sections (min./max.), 1 or 2 conductors					
- solid	mm^2	—		—	—
- finely stranded without end sleeve	mm^2	—		With 3RT19 55-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70) With 3RT19 56-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240) Rear clamping point only: 1 × (120 ... 185)
- finely stranded with end sleeve	mm^2	—		With 3RT19 55-4G box terminal: 2 × (1 × max. 50, 1 × max. 70), 1 × (10 ... 70) With 3RT19 56-4G box terminal: 2 × (1 × max. 95, 1 × max. 120), 1 × (10 ... 120)	2 × (50 ... 185), Front clamping point only: 1 × (70 ... 240) Rear clamping point only: 1 × (120 ... 185)
- stranded	mm^2	—		With 3RT19 55-4G box terminal: 2 × (max. 70), 1 × (16 ... 70) With 3RT19 56-4G box terminal: 2 × (max. 120), 1 × (16 ... 120)	2 × (70 ... 240), Front clamping point only: 1 × (95 ... 300) Rear clamping point only: 1 × (120 ... 240)
- AWG cables, solid or stranded	AWG	—		With 3RT19 55-4G box terminal: 2 × (max. 1/0), 1 × (6 ... 2/0) With 3RT19 56-4G box terminal: 2 × (max. 3/0), 1 × (6 ... 250 kcmil)	2 × (2/0 ... 500 kcmil), Front clamping point only: 1 × (3/0 ... 600 kcmil) Rear clamping point only: 1 × (250 kcmil ... 500 kcmil)
- ribbon cable conductors (number x width x thickness)	mm	—		With 3RT19 55-4G box terminal: 2 × (6 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 6 × 15.5 × 0.8) With 3RT19 56-4G box terminal: 2 × (10 × 15.5 × 0.8), 1 × (3 × 9 × 0.8 ... 10 × 15.5 × 0.8)	2 × (20 × 24 × 0.5), 1 × (6 × 9 × 0.8 ... 20 × 24 × 0.5)
Connection type		**Busbar connection**			
• Terminal screw		—		M8 × 25	M10 × 30
• Tightening torque	Nm	—		10 ... 14	14 ... 24
• Conductor cross-section (min./max.)					
- solid with cable lug	mm^2	—		16 ... 95 [2)]	50 ... 240 [3)]
- stranded with cable lug	mm^2	—		25 ... 120 [2)]	70 ... 240 [3)]
- AWG cables, solid or stranded, with cable lug	AWG	—		4 ... 250 kcmil	2/0 ... 500 kcmil
- with connecting bar (max. width)	mm	—		15	25
Connection type		**Straight-through transformers**			
Diameter of opening	mm	7.5	14	25	—

1) For grounded networks, otherwise 600 V.

2) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm^2 to ensure phase spacing.

3) When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm^2 as well as DIN 46235 for conductor cross-sections from 185 mm^2, use the 3RT19 56-4EA1 terminal cover to ensure phase spacing.

3RB22, 3RB23 for high-feature applications

Type – Overload relay of evaluation module		**3RB22 83, 3RB23 83**
Size		S00 ... S10/S12
Width		45 mm
Auxiliary circuit		
Number of NO contacts		2
Number of NC contacts		2
Auxiliary contacts – assignment		1 NO for the signal "tripped due to overload and/or thermistor", 1 NC for switching off the contactor 1 NO for the signal "tripped due to ground fault", 1 NC for switching off the contactor or[1)] 1 NO for the signal "tripped due to overload and/or thermistor and/or ground fault", 1 NC for switching off the contactor 1 NO for overload warning, 1 NC for switching off the contactor
Rated insulation voltage U_i (degree of pollution 3)	V	300
Rated impulse withstand voltage U_{imp}	kV	4
Auxiliary contacts – Contact rating		
• NC contact with alternating current AC-14/AC-15 Rated operational current I_e at U_e:		
- 24 V	A	6
- 120 V	A	6
- 125 V	A	6
- 250 V	A	3
• NO contact with alternating current AC-14/AC-15: Rated operational current I_e at U_e:		
- 24 V	A	6
- 120 V	A	6
- 125 V	A	6
- 250 V	A	3
• NC, NO contact with direct current DC-13: Rated operational current I_e at U_e:		
- 24 V	A	2
- 60 V	A	0.55
- 110 V	A	0.3
- 125 V	A	0.3
- 250 V	A	0.2
• Continuous thermal current I_{th}	A	5
• Contact reliability (suitability for PLC control; 17 V, 5 mA)		Yes
Short-circuit protection		
• With fuse, gL/gG operational class	A	6
• With miniature circuit breaker (C characteristic)	A	1.6
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1	V	300
CSA, UL, UR rated data		
Auxiliary circuit – switching capacity		B300, R300
Connection of the auxiliary circuit		
Connection type		**Screw terminals**
• Terminal screw		Pozidriv size 2
• Tightening torque	Nm	0.8 ... 1.2
• Conductor cross-section (min./max.), 1 or 2 conductors		
- solid	mm^2	1 × (0.5 ... 4), 2 × (0.5 ... 2.5)
- finely stranded without end sleeve	mm^2	—
- finely stranded with end sleeve	mm^2	1 × (0.5 ... 2.5), 2 × (0.5 ... 1.5)
- stranded	mm^2	—
- AWG cables, solid or stranded	AWG	2 × (20 ... 14)

1) The assignment of auxiliary contacts may be influenced by function expansion modules.

Type – Overload relay of evaluation module		**3RB22 83, 3RB23 83**
Size		S00 ... S10/S12
Width		45 mm
Control and sensor circuit as well as the analog output		
Rated insulation voltage U_i (degree of pollution 3)[1]	V	300
Rated impulse withstand voltage U_{imp}[1]	kV	4
Rated control supply voltage U_s[1]		
• AC 50/60 Hz	V	24 ... 240
• DC	V	24 ... 240
Operating range[1]		
• AC 50/60 Hz		$0.85 \times U_{s\,min} \leq U_s \leq 1.1 \times U_{s\,max}$
• DC		$0.85 \times U_{s\,min} \leq U_s \leq 1.1 \times U_{s\,max}$
Rated power[1]		
• AC 50/60 Hz	W	0.5
• DC	W	0.5
Mains buffering time[1]	ms	200
Thermistor motor protection (PTC thermistor detector)[2]		
• Summation cold resistance	kW	≤ 1.5
• Response value	kW	3.4 ... 3.8
• Return value	kW	1.5 ... 1.65
Ground fault detection		The information refers to sinusoidal residual currents at 50/60 Hz
• Tripping value I_D[3]		
- for $0.3 \times I_e < I_{motor} < 2.0 \times I_e$		$> 0.3 \times I_e$
- for $2.0 \times I_e < I_{motor} < 8.0 \times I_e$		$> 0.15 \times I_{motor}$
• Response time t_{trip}	ms	500 ... 1000
Analog output[3)4)]		
• Output signal	mA	4 ... 20
• Measuring range		0 to $1.25 \times I_e$ 4 mA corresponds to $0 \times I_e$ 16.8 mA corresponds to $1.0 \times I_e$ 20 mA corresponds to $1.25 \times I_e$
• Load, max.	W	100
Connection for the control and sensor circuit as well as the analog output		
Connection type		**Screw terminals**
• Terminal screw		Pozidriv size 2
• Tightening torque	Nm	0.8 ... 1.2
• Conductor cross-section (min./max.), 1 or 2 conductors		
- solid	mm^2	1 × (0.5 ... 4), 2 × (0.5 ... 2.5)
- finely stranded without end sleeve	mm^2	—
- finely stranded with end sleeve	mm^2	1 × (0.5 ... 2.5), 2 × (0.5 ... 1.5)
- stranded	mm^2	—
- AWG cables, solid or stranded	AWG	2 × (20 ... 14)

1) Control circuit.

2) Sensor circuit.

3) In conjunction with corresponding function expansion module.

4) Analog input modules, e.g. SM 331, must be configured for 4-wire measuring transducers. In this case the analog input module must not supply current to the analog output of the 3RB22/3RB23 relay.

3RB22, 3RB23 for high-feature applications

Short-circuit protection with fuses for motor feeders

For short-circuit currents up to 50 kA or 100 kA at 400 to 690 V

Overload relay	Contactor	CLASS 5 and 10			CLASS 20			CLASS 30			690 V/ 50 kA		690 V/ 100 kA	
											Fuse links[1] LV HRC DIAZED NEOZED Operational class gG		Type 3NA Type 5SB Type 5SE	
Setting range	Type	Rated operational current I_e AC-3 in A at ... V									I_e/AC-3 in A with type of coordination[2]			
A		415	500	690	415	500	690	415	500	690	1	2	1	2
Size S00/S0[3]														
0.3 ... 3	3RT10 15	3	3	3	3	3	3	3	3	3	35	20	20	20
	3RT10 16	3	3	3	3	3	3	3	3	3	35	20	20	20
2.4 ... 25	3RT10 15	7	5	4	7	5	4	7	5	4	35	20	20	20
	3RT10 16	9	6.5	5.2	9	6.5	5.2	9	6.5	5.2	35	20	20	20
	3RT10 17	12	9	6.3	10	9	6.3	9	9	6.3	35	20	20	20
	3RT10 23	9	6.5	5.2	9	6.5	5.2	—	—	—	63	25	25	25
	3RT10 24	12	12	9	12	12	9	12	12	9	63	25	25	25
	3RT10 25	17	17	13	16	16	13	14	14	13	63	25	25	25
	3RT10 26	25	18	13	16	16	13	14	14	13	100	35	35	35
	3RT10 34	25	25	20	22.3	22.3	20	19.1	19.1	19.1	125	63	63	63
	3RT10 35	25	25	24	25	25	24	25	25	24	125	63	63	63
Size S2/S3[3]														
10 ... 100	3RT10 34	32	32	20	22.3	22.3	20	19.1	19.1	19.1	125	63	63	63
	3RT10 35	40	40	24	29.4	29.4	24	26.5	26.5	24	125	63	63	63
	3RT10 36	50	50	24	32.7	32.7	24	26.5	26.5	24	160	80	80	80
	3RT10 44	65	65	47	49	49	47	41.7	41.7	41.7	200	125	125	125
	3RT10 45	80	80	58	53	53	53	45	45	45	200	160	160	160
	3RT10 46	95	95	58	59	59	58	50	50	50	200	160	160	160
	3RT10 54	100	100	100	81.7	81.7	81.7	69	69	69	355	315	315	315
	3RT10 55	—	—	—	100	100	100	90	90	90	355	315	315	315
Size S6														
20 ... 200	3RT10 54	115	115	115	81.7	81.7	81.7	69	69	69	355	315	315	315
	3RT10 55	150	150	150	107	107	107	90	90	90	355	315	315	315
	3RT10 56	185	185	170	131	131	131	111	111	111	355	315	315	315
Size S10/S12														
63 ... 630	3RT10 64	225	225	225	160	160	160	135	135	135	500	400	400	400
	3RT10 65	265	265	265	188	188	188	159	159	159	500	400	400	400
	3RT10 66	300	300	280	213	213	213	180	180	180	500	400	400	400
	3RT10 75	400	400	400	284	284	284	240	240	240	630	500	500	500
	3RT10 76	500	500	450	355	355	355	300	300	300	630	500	500	500
	3RT12 64	225	225	225	225	225	225	173	173	173	500	500	500	500
	3RT12 65	265	265	265	265	265	265	204	204	204	500	500	500	500
	3RT12 66	300	300	300	300	300	300	231	231	231	500	500	500	500
	3RT12 75	400	400	400	400	400	400	316	316	316	800	800	800	—
	3RT12 76	500	500	500	500	500	500	385	385	385	800	800	800	—
	3TF68[3]	630	630	630	440	440	440	376	376	376	800	500[4]	500[4]	500[4]
	3TF69[3]	630	630	630	572	572	572	500	500	500	800	630[4]	630[4]	—
Size 14														
0.3 ... 3[5]	3TF69[3]	630	630	630	572	572	572	500	500	500	800	630[4]	630[4]	—

1) Please observe operational voltage.

2) Assignment and short-circuit protective devices according to IEC 60947-4-1:
The contactor or starter must not endanger persons or the installation in the event of a short-circuit.
Type of coordination "1": The contactor or the starter may be non-operational after every short-circuit release.
Type of coordination "2": The contactor or the starter must be operational after a short-circuit release (without replacement of parts). There is a risk of contact welding.

3) Contactors not mountable.

4) Please ensure that the maximum AC-3 operational current has sufficient safety clearance from the rated current of the fuses.

5) With 3UF18 68-3GA00 current transformer.

SSCR = Standard Short-Circuit Rating

Characteristic curves

The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current I_e and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the minimum tripping current for the 3RB22/3RB23 solid-state overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current I_e from the cold state for symmetrical three-pole loads.

The tripping times according to IEC 60947-4-1, tolerance band E, are as follows for:

Trip class	Tripping time
CLASS 5	3 ... 5 s
CLASS 10	5 ... 10 s
CLASS 20	10 ... 20 s
CLASS 30	20 ... 30 s

The tripping characteristic for a three-pole overload relay from the cold state (see illustration 1) only apply if all three phases are simultaneously loaded with the same current. In the event of a phase failure or a current unbalance of more than 40 %, the 3RB22/3RB23 solid-state overload relays switch off the contactor more quickly in order to minimize heating of the load in accordance with the tripping characteristic for two-pole loads from the cold state (see illustration 2).

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. The tripping time of the 3RB22/3RB23 solid-state overload relays are reduced therefore to about 30 % when loaded with the set current I_e for an extended period.

Tripping characteristics for 3-pole loads

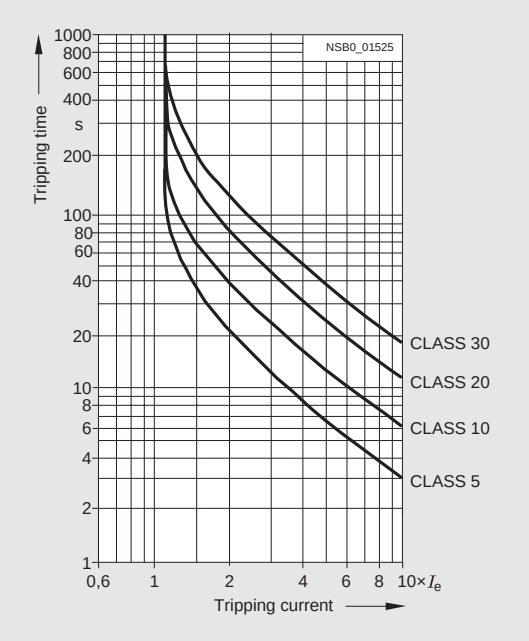


Illustration 1

Tripping characteristics for 2-pole loads

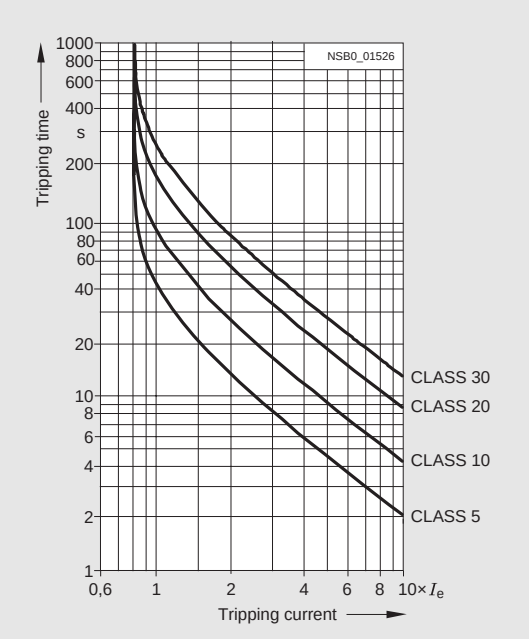
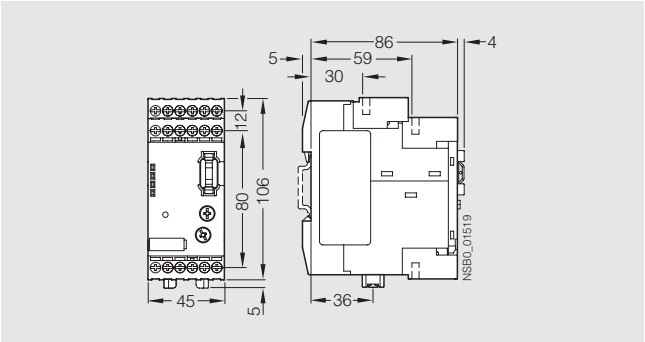


Illustration 2

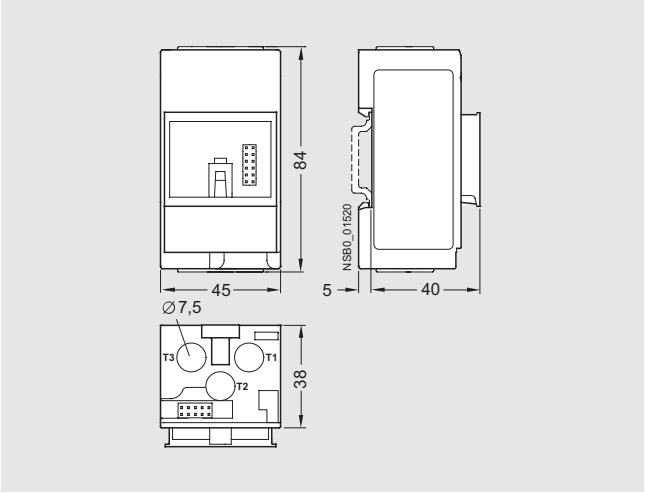
The above illustrations are schematic representations of characteristic curves.

Dimensional drawings

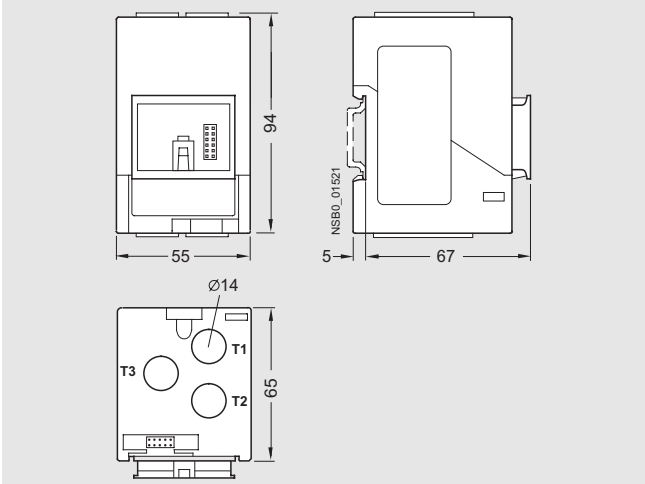
3RB22 83-4, 3RB23 83-4 evaluation module



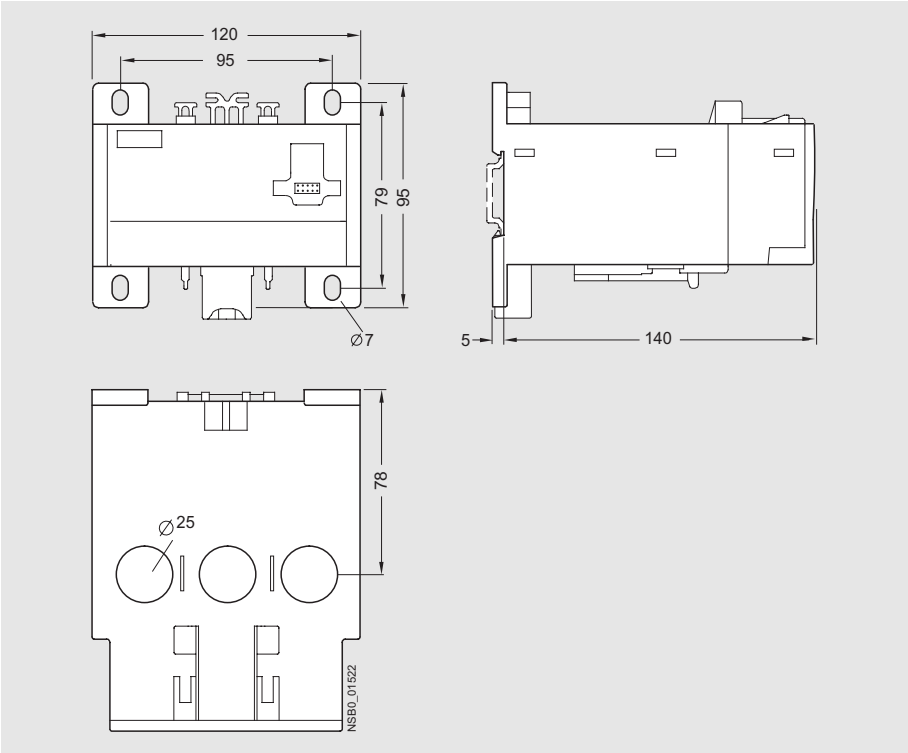
3RB29 06-2BG1, 3RB29 06-2DG1 current measuring module



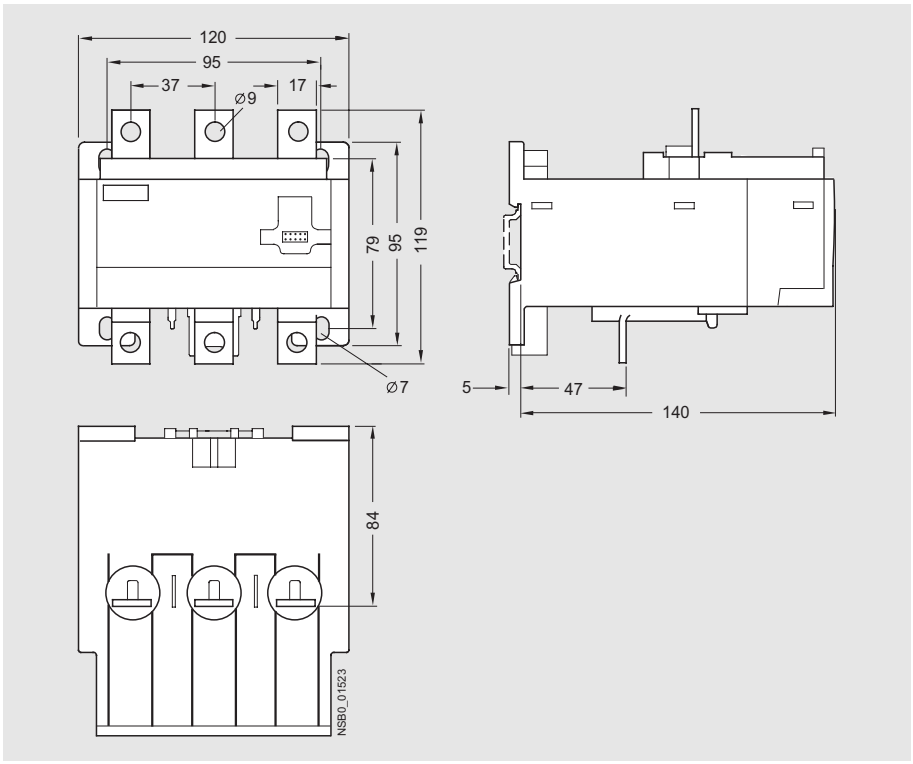
3RB29 06-2JG1 current measuring module



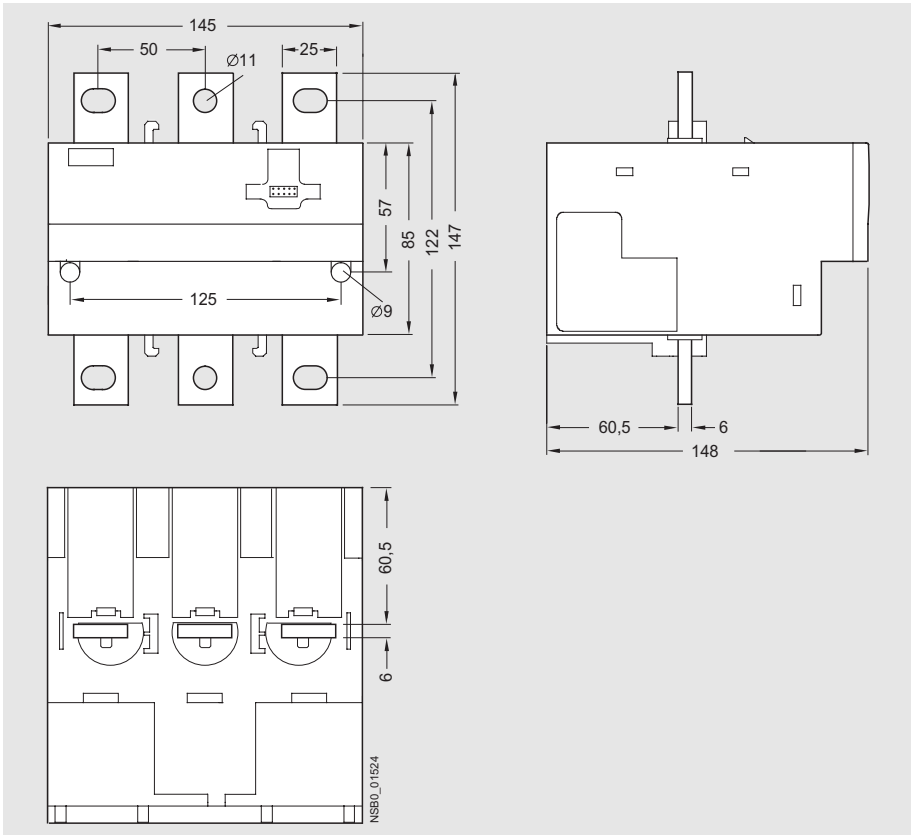
3RB29 56-2TG2 current measuring module



3RB29 56-2TH2 current measuring module



3RB29 66-2WH2 current measuring module

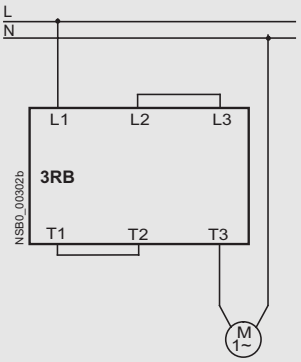


Schematics

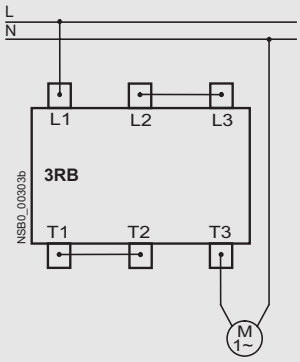
Protection of single-phase motors

(not in conjunction with internal ground-fault detection)

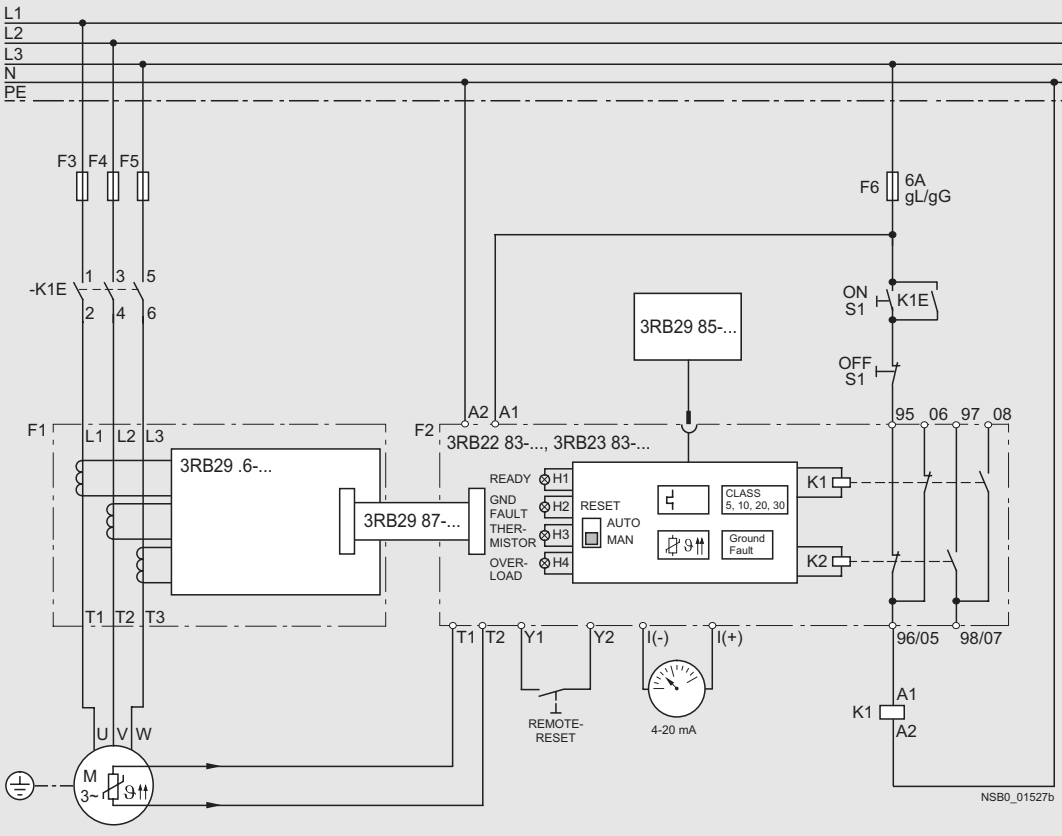
3RB29 06-2.G1, 3RB29 56-2TG2



3RB29 56-2TH2, 3RB29 66-2WH2



Schematic representation of a possible application (3-phase)



Connections

Evaluation modules	With function expansion module	Basic functions	Inputs A1/A2	T1/T2	Y1/Y2
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	—	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2CA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2CB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground-fault signal	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AA0	Inverse-time delayed protection, temperature-dependent protection, electrical remote RESET, overload warning, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AA1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, overload warning, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET
	3RB29 85-2AB1	Inverse-time delayed protection, temperature-dependent protection, internal ground-fault detection, electrical remote RESET, ground-fault signal, analog output	Power supply 24 ... 240 V AC/DC	Connection for PTC sensor	Electrical remote RESET

Evaluation modules	With function expansion module	Outputs I (–) / I (+)	95/96 NC	97/98 NO	05/06 NC	07/08 NO
3RB22 83-4AA1 3RB22 83-4AC1 3RB23 83-4AA1 3RB23 83-4AC1	—	No	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection)	Signal “tripped”	Overload warning	Overload warning warning
	3RB29 85-2CA1	No	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection + ground fault)	Signal “tripped”	Overload warning	Overload warning
	3RB29 85-2CB1	No	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection)	Signal “tripped”	Switching off the contactor (ground fault)	Signal “ground-fault tripping”
	3RB29 85-2AA0	Analog signal	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection)	Signal “tripped”	Overload warning	Overload warning
	3RB29 85-2AA1	Analog signal	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection + ground fault)	Signal “tripped”	Overload warning	Overload warning
	3RB29 85-2AB1	Analog signal	Disconnection of the contactor (inverse-time delayed/temperature-dependent protection)	Signal “tripped”	Switching off the contactor (ground fault)	Signal “ground-fault tripping”

Accessories

Overview

Overload relays for standard applications

The following accessories are available for the 3RB20/3RB21 solid-state overload relays:

- One terminal bracket each for the overload relays size S00 and S0 (sizes S2 to S12 can be installed as stand-alone installation without a terminal bracket)
- One mechanical remote RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- One sealable cover for all sizes
- Box terminal blocks for sizes S6 and S10/S12
- Terminal covers for sizes S2 to S10/S12

Overload relays for high-feature applications

The following accessories are available for the 3RB22/3RB23 solid-state overload relays:

- A sealable cover for the evaluation module
- Box terminal blocks for the current measuring modules size S6 and S10/S12
- Terminal covers for the current measuring modules size S6 and S10/S12

Technical specifications

Terminal brackets for stand-alone installation

Type		**3RB29 13-0AA1**	**3RB29 23-0AA1**
For overload relay		**3RB20 16, 3RB21 13**	**3RB20 26, 3RB21 23**
Size		S00	S0
General data			
Type of mounting		For screw and snap-on mounting onto TH 35 standard mounting rail	
Connection for main circuit			
Connection type		**Screw terminals**	
• Terminal screw		Pozidriv size 2	
• Tightening torque	Nm	0.8 ... 1.2	2 ... 2.5
• Conductor cross-section (min./max.), 1 or 2 conductors			
- solid	mm^2	1 × (0.5 ... 2.5), max. 1 × (... 4)	1 × (1 ... 6), max. 1 × (... 10)
- finely stranded without end sleeve	mm^2	—	—
- finely stranded with end sleeve	mm^2	1 × (0.5 ... 2.5)	1 × (1 ... 6)
- stranded	mm^2	1 × (0.5 ... 2.5), max. 1 × (... 4)	1 × (1 ... 6), max. 1 × (... 10)
- AWG cables, solid or stranded	AWG	1 × (18 ... 14)	1 × (14 ... 10)

Design

Device concept

The 3RU11 thermal overload relays are compact devices, i.e. current measurement and the evaluation unit are integrated in a single enclosure.

Mounting options

The 3RU11 thermal overload relays can be mounted directly onto the 3RT1 contactors. The devices can also be installed as stand-alone installations with the corresponding terminal brackets.

For more information on the mounting options see "Technical specifications" and "Selection and ordering data".

Connection method

All sizes of the 3RU11 thermal overload relays with screw terminal can be connected to the auxiliary and main current paths. Rails can be connected to the main conductor connections of size S3 overload relays if the box terminals are removed.

As an alternative, the devices are also available with Cage Clamp terminals. The auxiliary conductor connections of these devices, and for size S00 the main conductor connections as well, are fitted with Cage Clamp terminals.

For more information on the connection options see "Technical specifications" and "Selection and ordering data".

Overload relays in contactor assemblies for wye-delta starting

When overload relays are used in combination with contactor assemblies for wye-delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

An assignment of the 3RU11 thermal overload relays to the line contactors of our 3RA contactor assemblies for wye-delta starting can be found under "Controls: Contactors and Contactor Assemblies".

Operation with frequency converter

The 3RU11 thermal overload relays are suitable for operation with frequency converters. Depending on the frequency of the converter, a higher current than the motor current must be used in some cases due to eddy-currents and skin effects.

Function

Basic functions

The 3RU11 thermal overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase failure

Control circuit

The 3RU11 thermal overload relays do not require an additional supply voltage for operation.

Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection.

For assignments of the corresponding short-circuit protection devices to the 3RU11 thermal overload relays with/without contactor see "Technical specifications" and "Selection and ordering data".

Trip classes

The 3RU11 thermal overload relays are available for normal starting conditions with trip class CLASS 10. For heavy starting conditions see 3RB2 solid-state overload relays.

For details of the trip classes see "Characteristic Curves".

Phase failure protection

The 3RU11 thermal overload relays are fitted with phase failure sensitivity (see "Characteristic Curves") in order to minimize temperature rises of the load in the case of a phase failure during single-phase operation.

Setting

The 3RU11 thermal overload relays are set to the rated motor current by means of a rotary knob. The scale of the rotary knob is shown in ampere.

Manual and automatic reset

Automatic and manual reset is selected by pressing and turning the blue button (RESET button). If the button is set to manual reset, the overload relay can be reset directly by pressing the RESET button. Resetting is possible in combination with mechanical and electrical reset options from the range of accessories (see "Accessories"). If the blue button is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

Recovery time

After tripping due to overload, the 3RU11 thermal overload relays require some time until the bimetal strips have cooled down. The device can only be reset after the bimetal strips have cooled down. This time (recovery time) depends on the tripping characteristics and strength of the tripping current.

The recovery time allows the load to cool down after tripping due to overload.

TEST function

The TEST slide can be used to check whether the operational 3RU11 thermal overload relay is working properly. Actuating the slide simulates tripping of the relay. During this simulation the NC contact (95-96) is opened and the NO contact (97-98) is closed. This tests whether the auxiliary circuit has been correctly connected to the overload relay. If the 3RU11 thermal overload relay has been set to automatic RESET, the overload relay is automatically reset when the TEST slide is released. The relay must be reset with the RESET button if it has been set to manual RESET.

STOP function

If the STOP button is pressed, the NC contact is opened. This switches off the contactor downstream and thus the load. The load is switched on again when the STOP button is released.

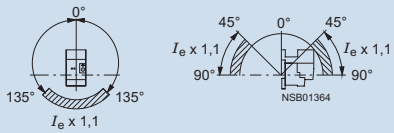
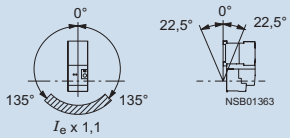
Display of the operating state

The respective operating state of the 3RU11 thermal overload relay is displayed by means of the position of the marking on the TEST function/switch position indicator slide. After tripping due to overload or phase failure, the marking on the slide is to left on the "O" mark, otherwise it is on the "I" mark.

Auxiliary contacts

The 3RU11 thermal overload relays are fitted with an NO contact for the "tripped" signal, and an NC contact for disconnecting the contactor.

Technical specifications

Type		**3RU11 16**	**3RU11 26**	**3RU11 36**	**3RU11 46**
Size		S00	S0	S2	S3
Width		45 mm	45 mm	55 mm	70 mm
General data					
Trips in the event of		Overload and phase failure			
Trip class acc. to IEC 60947-4-1	CLASS	10			
Phase failure sensitivity		Yes			
Overload warning		No			
Reset and recovery					
• Reset options after tripping		Manual, automatic and remote RESET[1])			
• Recovery time					
- for automatic RESET	min	Depends on the strength of the tripping current and characteristic			
- for manual RESET	min	Depends on the strength of the tripping current and characteristic			
- for remote RESET	min	Depends on the strength of the tripping current and characteristic			
Features					
• Display of operating state on device		Yes, by means of TEST function/switch position indicator slide			
• TEST function		Yes			
• RESET button		Yes			
• STOP button		Yes			
Safe operation of motors with "increased safety" type of protection					
EC type test certificate number acc. to directive 94/9/EC		DMT 98 ATEX G 001 Ex II (2) GD, DMT 98 ATEX G 001 N1			
Ambient temperature					
• Storage/transport	°C	-55 ... +80			
• Operation	°C	-20 ... +70			
• Temperature compensation	°C	Up to 60			
• Permissible rated current at					
- temperature inside control cabinet 60 °C	%	100 (over +60 °C current reduction is not required)			
- temperature inside control cabinet 70 °C	%	87			
Repeat terminals					
• Coil repeat terminal		Yes	Not required		
• Auxiliary contact repeat terminal		Yes	Not required		
Degree of protection acc. to IEC 60529		IP20		IP20[2])	
Touch protection acc. to IEC 61140		Finger-safe			
Shock resistance with sine acc. to IEC 60068-2-27	g/ms	8/10			
Electromagnetic compatibility (EMC) – Interference immunity					
• Conductor-related interference					
- burst acc. to IEC 61000-4-4 (corresponds to degree of severity 3)	kV	EMC interference immunity is not relevant for thermal overload relays			
- surge acc. to IEC 61000-4-5 (corresponds to degree of severity 3)	kV	EMC interference immunity is not relevant for thermal overload relays			
• Electrostatic discharge acc. to IEC 61000-4-2 (corresponds to degree of severity 3)	kV	EMC interference immunity is not relevant for thermal overload relays			
• Field-related interference acc. to IEC 61000-4-3 (corresponds to degree of severity 3)	V/m	EMC interference immunity is not relevant for thermal overload relays			
Electromagnetic compatibility (EMC) – Emitted interference		EMC interference immunity is not relevant for thermal overload relays			
Resistance to extreme climates – Air humidity	%	100			
Dimensions		See dimensional drawings			
Installation altitude above sea level	m	Up to 2000; above this, please enquire			
Mounting position		The diagrams show the permissible mounting positions for direct mounting and stand-alone installation. For installation in the hatched area, a setting correction of 10 % must be implemented. Stand-alone installation:  Contactor + overload relay:  			
Type of mounting		Direct mounting[3])/stand-alone installation with terminal bracket[4])	Direct mounting/stand-alone installation with terminal bracket[4])		

3RU11 for standard applications

Type		**3RU11 16**	**3RU11 26**	**3RU11 36**	**3RU11 46**
Size		S00	S0	S2	S3
Width		45 mm	45 mm	55 mm	70 mm
Main circuit					
Rated insulation voltage U_i (degree of pollution 3)	V	690			1000
Rated impulse withstand voltage U_{imp}	kV	6			8
Rated operational voltage U_e	V	690			1000
Type of current • Direct current • Alternating current		 Yes Yes, frequency range up to 400 Hz			
Set current	A	0.11 ... 0.16 to 9 ... 12	1.8 ... 2.5 to 20 ... 25	5.5 ... 8 to 40 ... 50	18 ... 25 to 80 ... 100
Power loss per unit (max.)	W	3.9 ... 6.6	3.9 ... 6	6 ... 9	10 ... 16.5
Short-circuit protection • With fuse without contactor • With fuse and contactor		 See "Selection and ordering data" See "Technical specifications" (short-circuit protection with fuses/motor starter protectors for motor feeders)			
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1	V	500	690		
Connection for main circuit					
Connection type		**Screw terminals with box terminal**			
• Terminal screw		Pozidriv size 2			Allen screw 4 mm
• Tightening torque	Nm	0.8 ... 1.2	2 ... 2.5	3 ... 4.5	4 ... 6
• Conductor cross-sections (min./max.), 1 or 2 conductors					
- solid	mm^2	2 x (0.5 ... 1.5)[2] 2 x (0.75 ... 2.5)[2] Max. 2 x (1 ... 4)[2]	2 x (1 ... 2.5)[2] 2 x (2.5 ... 6)[2] Max. 2 x (2.5 ... 10[2])	2 x (0.75 ... 16)	2 x (2.5 ... 16)
- finely stranded with end sleeve	mm^2	2 x (0.5 ... 1.5)[2] 2 x (0.75 ... 2.5)[2]	2 x (1 ... 2.5)[2] 2 x (2.5 ... 6)[2]	2 x (0.75 ... 16) 1 x (0.75 ... 25)	2 x (2.5 ... 35) 1 x (2.5 ... 50)
- stranded	mm^2	2 x (0.5 ... 1.5)[2] 2 x (0.75 ... 2.5)[2] Max. 2 x (1 ... 4)[2]	2 x (1 ... 2.5)[2] 2 x (2.5 ... 6)[2] Max. 2 x (2.5 ... 10)[2]	2 x (0.75 ... 25) 1 x (0.75 ... 35)	2 x (10 ... 50) 1 x (10 ... 70)
- AWG cables, solid or stranded	AWG	2 x (18 ... 14)	2 x (14 ... 10)	2 x (18 ... 3) 1 x (18 ... 1)	2 x (10 ... 1/0) 1 x (10 ... 2/0)
- ribbon cable conductors (number x width x thickness)	mm	—		2 x (6 x 9 x 0.8)	2 x (6 x 9 x 0.8)
Busbar connection		**Busbar connection**[1]			
• Terminal screw		—			M6 x 20
• Tightening torque	Nm	—			4 ... 6
• Conductor cross-sections (min./max.)					
- finely stranded with cable lug	mm^2	—			2 x 70
- stranded with cable lug	mm^2	—			3 x 70
- AWG cables, solid or stranded, with cable lug	AWG	—			2/0
- with connecting bar (max. width)	mm	—			12

Footnotes for page 3a/51:

1) Remote RESET in combination with the corresponding accessories.

2) Terminal compartment: degree of protection IP00.

3) The 3RU11 16 overload relay with Cage Clamp terminals can only be installed as a stand-alone installation.

4) For screw and snap-on mounting TH 35 standard mounting rail; size S3 also for TH 75 standard mounting rail. For more detailed information about terminal brackets see "Accessories" —> "Technical specifications".

Footnotes for page 3a/52:

1) The box terminal is removable. Rail and cable lug connections are possible if the box terminal is removed.

2) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Type		**3RU11 16**	**3RU11 26**	**3RU11 36**	**3RU11 46**
Size		S00	S0	S2	S3
Width		45 mm	45 mm	55 mm	70 mm
Auxiliary circuit					
Number of NO contacts		1			
Number of NC contacts		1			
Auxiliary contacts – assignment		1 NO for the signal "tripped", 1 NC for disconnecting the contactor			
Rated insulation voltage U_i (degree of pollution 3)	V	690			
Rated impulse withstand voltage U_{imp}	kV	6			
Contact rating of the auxiliary contacts					
• NC contact with alternating current AC-14/AC-15, rated operational current I_e at U_e:					
- 24 V	A	4			
- 120 V	A	4			
- 125 V	A	4			
- 230 V	A	3			
- 400 V	A	2			
- 600 V	A	0.6			
- 690 V	A	0.5			
• NO contact with alternating current AC-14/AC-15, rated operational current I_e at U_e:					
- 24 V	A	3			
- 120 V	A	3			
- 125 V	A	3			
- 230 V	A	2			
- 400 V	A	1			
- 600 V	A	0.6			
- 690 V	A	0.5			
• NC contact, NO contact with direct current DC-13, rated operational current I_e at U_e:					
- 24 V	A	1			
- 60 V	A	[1]			
- 110 V	A	0.22			
- 125 V	A	0.22			
- 220 V	A	0.11			
• Continuous thermal current I_{th}	A	6[2]			
• Contact reliability (suitability for PLC control; 17 V, 5 mA)		Yes			
Short-circuit protection					
• With fuse					
- gL/gG operational class	A	6			
- Quick	A	10			
• With miniature circuit breaker (C characteristic)	A	6			
Safe isolation between main and auxiliary conducting path acc. to IEC 60947-1	V	415			
CSA, UL, UR rated data					
Auxiliary circuit – switching capacity		B600, R300			
Connection of the auxiliary circuit					
Connection type		**Screw terminals**			
• Terminal screw		Pozidriv size 2			
• Tightening torque	Nm	0.8 ... 1.2			
• Conductor cross-sections (min./max.), 1 or 2 conductors					
- solid	mm^2	2 x (0.5 ... 1.5)[3], 2 x (0.75 ... 2.5)[3]			
- finely stranded without end sleeve	mm^2	—			
- finely stranded with end sleeve	mm^2	2 x (0.5 ... 1.5)[3], 2 x (0.75 ... 2.5)[3]			
- stranded	mm^2	2 x (0.5 ... 1.5)[3], 2 x (0.75 ... 2.5)[3]			
- AWG cables, solid or stranded	AWG	2 x (18 ... 14)			
Connection type		**Cage Clamp terminals**			
• Conductor cross-sections (min./max.)					
- solid		2 x (0.25 ... 2.5)			
- finely stranded without end sleeve		2 x (0.25 ... 2.5)			
- finely stranded with end sleeve		2 x (0.25 ... 1.5)			
- stranded		—			
- AWG cables, solid or stranded		2 x (24 ... 14)			

1) On request.

2) Up to $I_k \leq$ 0.5 kA; $\leq$ 260 V.

3) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RU11 for standard applications

Short-circuit protection with fuses/motor starter protectors for motor feeders

With short-circuit currents up to 50 kA at 50/60 Hz 690 V AC
Permissible short-circuit protection fuse for motor starters comprising overload relay and contactor, type of coordination "2"[1)]

Overload relays	3 kW ≙ 3RT10 15			4 kW ≙ 3RT10 16			5.5 kW ≙ 3RT10 17			UL-listed fuses RK5	Motor starter protectors for starter combinations at I_q = 50 kA/400/415 V AC
Setting range	$I_{e\,max}$ = 7 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 9 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 12 A (at 50 Hz 415 V AC)				
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
Size S00											
0.11 ... 0.16	0.5	—	—	0.5	—	–	0.5	–	–	1	—
0.14 ... 0.2	1	—	—	1	—	–	1	–	–	1	3RV13 21-0BC10
0.18 ... 0.25	1	—	—	1	—	–	1	–	–	1	3RV13 21-0CC10
0.22 ... 0.32	1.6	—	2	1.6	—	2	1.6	–	2	1	3RV13 21-0DC10
0.28 ... 0.4	2	—	2	2	—	2	2	–	2	1.6	3RV13 21-0EC10
0.35 ... 0.5	2	—	2	2	—	2	2	–	2	2	3RV13 21-0FC10
0.45 ... 0.63	2	—	4	2	—	4	2	–	4	2.5	3RV13 21-0GC10
0.55 ... 0.8	4	—	4	4	—	4	4	–	4	3	3RV13 21-0HC10
0.7 ... 1	4	—	6	4	—	6	4	–	6	4	3RV13 21-0JC10
0.9 ... 1.25	4	—	6	4	—	6	4	–	6	5	3RV13 21-0KC10
1.1 ... 1.6	6	—	10	6	—	10	6	–	10	6	3RV13 21-1AC10
1.4 ... 2	6	—	10	6	—	10	6	–	10	8	3RV13 21-1BC10
1.8 ... 2.5	10	—	10	10	—	10	10	–	10	10	—
2.2 ... 3.2	10	—	16	10	—	16	10	–	16	12	—
2.8 ... 4	16	—	16	16	—	16	16	–	16	16	—
3.5 ... 5	20	6	20	20	6	20	20	6	20	20	—
4.5 ... 6.3	20	6	20	20	6	20	20	6	20	25	—
5.5 ... 8	20	10	20	20	10	20	20	10	20	30	—
7 ... 10	—	—	—	20	16	20	20	16	20	40	—
9 ... 12	—	—	—	—	—	—	20	16	25	45	—

Overload relays	5.5 kW ≙ 3RT10 24			7.5 kW ≙ 3RT10 25			11 kW ≙ 3RT10 26			UL-listed fuses RK5	Motor starter protectors for starter combinations at I_q = 50 kA/400/415 V AC
Setting range	$I_{e\,max}$ = 12 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 17 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 25 A (at 50 Hz 400/415 V AC)				
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
Size S0											
1.8 ... 2.5	10	–	10	10	–	10	10	–	10	10	3RV13 21-1CC10
2.2 ... 3.2	10	–	16	10	–	16	10	–	16	12	3RV13 21-1DC10
2.8 ... 4	16	–	16	16	–	16	16	–	16	16	3RV13 21-1EC10
3.5 ... 5	20	6	20	20	6	20	20	6	20	20	3RV13 21-1FC10
4.5 ... 6.3	20	6	25	20	6	25	20	6	25	25	3RV13 21-1GC10
5.5 ... 8	25	10	25/32[2)]	25	10	25/32[2)]	25	10	32	30	3RV13 21-1HC10
7 ... 10	25	16	25/32[2)]	25	16	25/32[2)]	32	16	35	40	3RV13 21-1JC10
9 ... 12.5	25	20	25/32[2)]	25	20	25/32[2)]	35	20	35	45	3RV13 21-1KC10
11 ... 16	25	20	25/32[2)]	25	20	25/32[2)]	35	20	35	60	3RV13 21-4AC10
14 ... 20	—	—	—	25	20	25/32[2)]	35	20	35	80	3RV13 21-4BC10
17 ... 22	—	—	—	—	—	—	35	20	35	80	3RV13 21-4CC10
20 ... 25	—	—	—	—	—	—	35	20	35	100	—

For type of coordination "1"[1)] see short-circuit protection of the contactors without overload relay under "Controls - Contactors and Contactor Assemblies".

1) Assignment and short-circuit protective devices according to IEC 60947-4-1:
The contactor or starter must not endanger persons or the installation in the event of a short-circuit.
Type of coordination 1: The contactor or the starter may be non-operational after every short-circuit release.
Type of coordination 2: The contactor or the starter must be operational after a short-circuit release (without replacement of parts). Welding of the contacts is permissible however.

2) At max. 415 V.

Short-circuit protection with fuses/motor starter protectors for motor feeders

With short-circuit currents up to 50 kA at 50/60 Hz 690 V AC
Permissible short-circuit protection fuse for motor starters comprising overload relay and contactor, type of coordination "2"[1)]

Overload relays	15 kW ≙ 3RT10 34			18.5 kW ≙ 3RT10 35			22 kW ≙ 3RT10 36			UL-listed fuses RK5	Motor starter protectors for starter combinations at I_q = 50 kA/400/415 V AC
Setting range	$I_{e\,max}$ = 32 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 40 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 50 A (at 50 Hz 400/415 V AC)				
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
Size S2											
5.5 ... 8	25	10	25	25	10	25	25	10	25	30	—
7 ... 10	32	16	32	32	16	32	32	16	32	40	—
9 ... 12.5	35	16	35	35	16	35	35	16	35	50	—
11 ... 16	40	20	40	40	20	40	40	20	40	60	—
14 ... 20	50	25	50	50	25	50	50	25	50	80	—
18 ... 25	63	32	63	63	32	63	63	32	63	100	3RV13 31-4DC10
22 ... 32	63	35	63	63	35	63	80	35	80	125	3RV13 31-4EC10
28 ... 40	63	50	63	63	50	63	80	50	80	150	3RV13 31-4FC10
36 ... 45	—	—	—	63	50	80	80	50	80	175	3RV13 31-4GC10
40 ... 50	—	—	—	—	—	—	80	50	80	200	3RV13 31-4HC10

Overload relays	15 kW ≙ 3RT10 44			37 kW ≙ 3RT10 45			45 kW ≙ 3RT10 46			UL-listed fuses RK5	Motor starter protectors for starter combinations at I_q = 50 kA/400/415 V AC
Setting range	$I_{e\,max}$ = 65 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 80 A (at 50 Hz 400/415 V AC)			$I_{e\,max}$ = 95 A (at 50 Hz 400/415 V AC)				
A	gL/gG	aM	BS 88	gL/gG	aM	BS 88	gL/gG	aM	BS 88	A	
Size S3											
18 ... 25	63	32	63	63	32	63	63	32	63	100	—
22 ... 32	80	35	80	80	35	80	80	35	80	125	—
28 ... 40	80	50	80	80	50	80	80	50	80	150	—
36 ... 50	125	50	125	125	50	125	125	50	125	200	—
45 ... 63	125	63	125	160	63	160	160	63	160	250	3RV13 41-4JC10
57 ... 75	—	—	—	160	80	160	160	80	160	300	3RV13 41-4KC10
70 ... 90	—	—	—	—	—	—	160	100	160	350	3RV13 41-4LC10
80 ... 100	—	—	—	—	—	—	160	100	160	350	3RV13 41-4MC10

For type of coordination "1"[1)] see short-circuit protection of the contactors without overload relay under "Controls - Contactors and Contactor Assemblies".

1) Assignment and short-circuit protective devices according to IEC 60947-4-1:
The contactor or starter must not endanger persons or the installation in the event of a short-circuit.
Type of coordination 1: The contactor or the starter may be non-operational after every short-circuit release.
Type of coordination 2: The contactor or the starter must be operational after a short-circuit release (without replacement of parts). Welding of the contacts is permissible however.

Characteristic curves

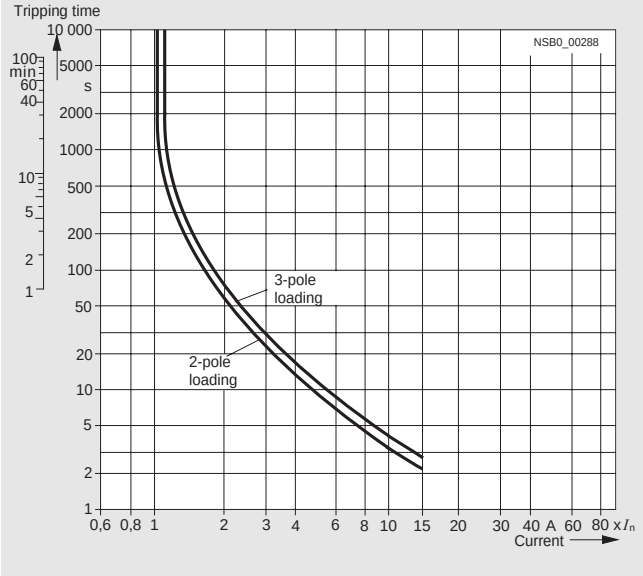
The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current I_e and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the minimum tripping current for the 3RU11 thermal overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current I_e from the cold state for symmetrical three-pole loads.

The tripping times are as follows for:

Trip class	Tripping time
CLASS 10A	2 s ... 10 s
CLASS 10	4 s ... 10 s
CLASS 20	6 s ... 20 s
CLASS 30	9 s ... 30 s



This is the schematic representation of a characteristic curve.

The tripping characteristic for a three-pole 3RU11 thermal overload relay (see characteristic curve for symmetrical three-pole loads from the cold state) only applies if all three bimetal strips are simultaneously loaded with the same current. If only two bimetal strips are heated due to a phase failure, these two strips alone must generate the necessary force to trigger the tripping mechanism which would result in a longer tripping time or require a higher current. If these higher currents are applied over a longer period, they usually cause damage to the load. To avoid damage, the 3RU11 thermal overload relays are fitted with phase failure sensitivity which ensures faster tripping in accordance with the characteristic curve for double-pole loads from the cold state by means of a suitable mechanical mechanism.

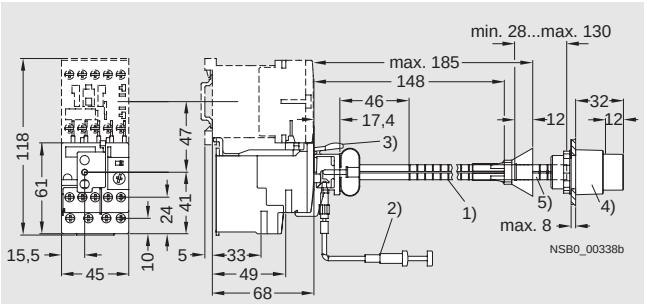
Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. This is taken into account by the 3RU11 thermal overload relays by reducing the tripping time to about 25 % when loaded with the set current I_e for an extended period.

Dimensional drawings

Screw connection

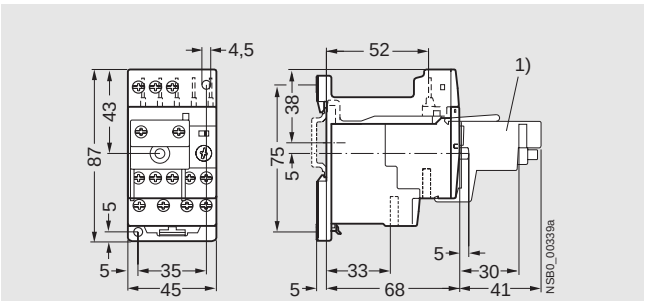
Lateral distance to grounded components: at least 6 mm.

3RU11 16-..B0
Size S00, with mechanical RESET



1) Mechanical RESET
2) Cable release (400 mm or 600 mm long, mounting on the front or laterally on the holder)
3) Holder for RESET
4) Pushbutton
5) Extension plunger

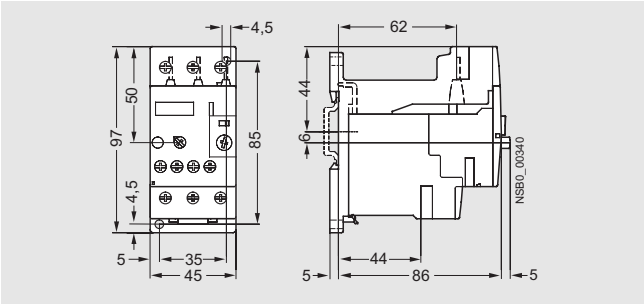
3RU11 16-..B.
Size S00, with terminal bracket for stand-alone installation, with remote RESET



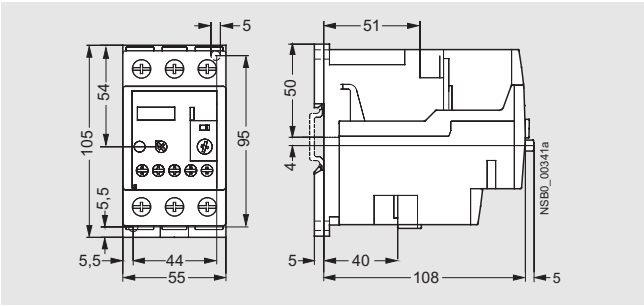
1) Module for remote RESET

For dimensional drawings of overload relays mounted onto contacts see Contactors and Contactor Assemblies.

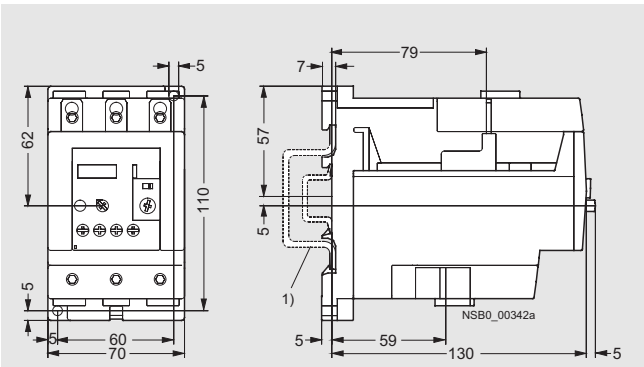
3RU11 26-..B.
Size S0, with terminal bracket for stand-alone installation



3RU11 36-..B.
Size S2, with terminal bracket for stand-alone installation



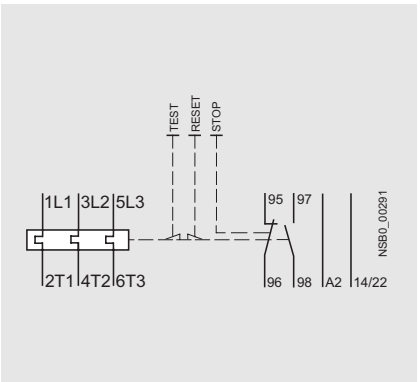
3RU11 46-..B.
Size S3, with terminal bracket for stand-alone installation



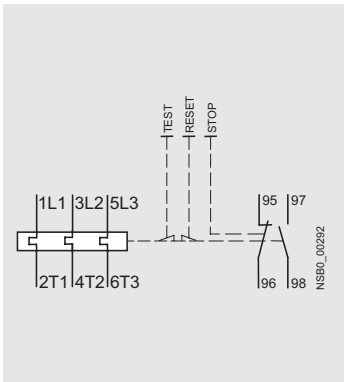
1) For mounting on TH 35 - 15 or TH 75 standard mounting rail acc. to EN 60715

Schematics

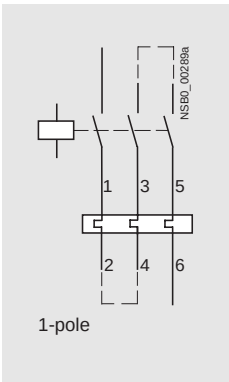
3RU11 16



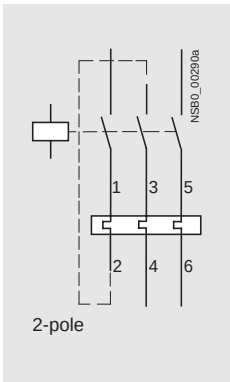
3RU11 26 to 3RU11 46



Protection of DC motors



1-pole



2-pole

Accessories

Overview

The following accessories are available for the 3RU11 thermal overload relays:

- For the four overload relay sizes S00 to S3 one terminal bracket each for stand-alone installation
- One electrical remote RESET module in three voltage variants for all sizes
- One mechanical RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- Terminal covers

Technical specifications

Terminal brackets for stand-alone installation

Type		3RU19 16-3AA01	3RU19 26-3AA01	3RU1 936-3AA01	3RU19 46-3AA01
For overload relays		3RU11 16	3RU11 26	3RU11 36	3RU11 46
Mounting type		For screw and snap-on mounting onto TH 35 standard mounting rails, size S3 also for TH 75 standard mounting rails.			
Connection for main circuit					
Connection type		Screw terminals		Screw terminals with box terminal	
• Terminal screw		Pozidriv size 2			Allen screw 4 mm
• Conductor cross-section (min./max.), 1 or 2 conductors					
- solid	mm^2	1 x (0.5 ... 2.5), max. 1 x (... 4)	1 x (1 ... 6), max. 1 x (... 10)	2 x (0.75 ... 16)	2 x (2.5 ... 16)
- finely stranded without end sleeve	mm^2	—			
- finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5)	1 x (1 ... 6)	2 x (0.75 ... 16), 1 x (0.75 ... 25)	2 x (2.5 ... 35), 1 x (2.5 ... 50)
- stranded	mm^2	1 x (0.5 ... 2.5), max. 1 x (... 4)	1 x (1 ... 6), max. 1 x (... 10)	2 x (0.75 ... 25), 1 x (0.75 ... 35)	2 x (10 ... 50), 1 x (10 ... 70)
- AWG cables, solid or stranded	AWG	1 x (18 ... 14)	1 x (14 ... 10)	2 x (18 ... 3), 1 x (18 ... 1)	2 x (10 ... 1/0), 1 x (10 ... 2/0)
- ribbon cable conductors (number x width x thickness)	mm	—	—	2 x (6 x 9 x 0.8)	2 x (6 x 9 x 0.8)

Motor Starters and Soft Starters

4

Introduction

Overview

3RW30

3RW40

3RW44

3RE10

		Order No.	Page
3RW soft starters			
For standard applications	• Application areas - fans - building/construction machines - escalators - air conditioning systems - assembly lines - operating mechanisms - pumps - presses - transport systems - fans - compressors and coolers		
3RW30	• SIRIUS 3RW30 soft starters for soft starting and smooth ramp-down of three-phase asynchronous motors • Performance range of up to 55 kW (at 400 V)	**3RW30**	4/4
3RW40	• SIRIUS 3RW40 soft starters with the integral functions - solid-state motor overload and intrinsic device protection and - adjustable current limiting for the soft starting and stopping of three-phase asynchronous motors • Performance range of up to 250 kW (at 400 V)	**3RW40**	4/8
For High-Feature applications	• Application areas - pumps - compressors - industrial refrigerating systems - conveying systems - machine tools - fans - cooling systems - water transport - hydraulics - mills		
3RW44	• In addition to soft starting and soft ramp-down, the solid-state SIRIUS 3RW44 soft starters provide numerous functions for higher-level requirements • Performance range - up to 710 kW (at 400 V) in inline circuit and - up to 1200 kW (at 400 V) in inside-delta circuit	**3RW44**	4/15
3RE encapsulated starters			
	• The 3RE1 encapsulated starters are used for switching and for the inverse-time delayed protection of load feeders up to 22 kW at 400 V AC • The starters are available as direct-on-line starters for motors with a single direction of rotation and as reversing starters for motors with two directions of rotation		
3RE10 direct-on-line starters	• Molded-plastic enclosure, degree of protection IP65, including contactor	**3RE10**	4/24
3RE13 reversing starters	• Molded-plastic enclosure, degree of protection IP65, including contactor assembly	**3RE13**	4/24
Accessories	• Molded-plastic enclosure, degree of protection IP65, for direct-on-line and reversing starters	**3RE19**	4/25

Overview

The advantages of the SIRIUS soft starters at a glance:

- Soft starting and smooth ramp-down[1)]
- Stepless starting
- Reduction of current peaks
- Avoidance of mains voltage fluctuations during starting
- Reduced load on the power supply network
- Reduction of the mechanical load in the operating mechanism
- Considerable space savings and reduced wiring compared with conventional starters
- Maintenance-free switching
- Very easy handling
- Fits perfectly in the SIRIUS modular system

		SIRIUS 3RW30 Standard applications	SIRIUS 3RW40 Standard applications	SIRIUS 3RW44 High-Feature applications
Rated current up to 40 °C	A	3 ... 100	12.5 ... 432	29 ... 1214
Rated operational voltage	V	200 ... 575	200 ... 600	200 ... 690
Motor rating at 400 V				
• Inline circuit	kW	1.1 ... 55	5.5 ... 250	15 ... 710
• Inside-delta circuit	kW	—	—	22 ... 1200
Temperature range	°C	-25 ... +60	-25 ... +60	0 ... +60
Soft starting/ramp-down		✓[1)]	✓	✓
Voltage ramp		✓	✓	✓
Starting/stopping voltage	%	40 ... 100	40 ... 100	20 ... 100
Starting and ramp-down time	s	0 ... 20	0 ... 20	1 ... 360
Torque control		—	—	4
Starting/stopping torque	%	—	—	20 ... 100
Torque limit	%	—	—	20 ... 200
Ramp time	s	—	—	1 ... 360
Integral bypass contact system		✓[2)]	✓	✓
Intrinsic device protection		—	✓	✓
Motor overload protection		—	✓	✓
Thermistor motor protection		—	✓[3)]	✓
Integrated remote RESET		—	✓[4)]	✓
Adjustable current limiting		—	✓	✓
Inside-delta circuit		—	—	✓
Breakaway pulse		—	—	✓
Creep speed in both directions		—	—	✓
Pump ramp-down		—	—	✓[5)]
DC braking		—	—	✓[5) 6)]
Combined braking		—	—	✓[5) 6)]
Motor heating		—	—	✓
Communication		—	—	with PROFIBUS DP (optional)
External display and operator module		—	—	(optional)
Operating measured value display		—	—	✓
Error logbook		—	—	✓
Event list		—	—	✓
Slave pointer function		—	—	✓
Trace function		—	—	✓[7)]
Programmable control inputs and outputs		—	—	✓
Number of parameter sets		1	1	3
Parameterization software (Soft Starter ES)		—	—	✓
Power semiconductors (thyristors)		2 controlled phases	2 controlled phases	3 controlled phases
Spring-loaded terminals		✓ (only 3RW30 03)	✓	✓
Screw terminals		✓	✓	✓
UL/CSA		✓[8)]	✓	✓
CE marking		✓	✓	✓
Soft starting under heavy starting conditions		—	—	✓[5)]

✓ Function is available; — Function is not available.

1) Only soft starting available for 3RW30 ..-1AA12 and 3RW31.
2) Not available for 3RW30 03.
3) Optional up to size S3 (device variant).
4) Available for 3RW40 2. to 3RW40 4.; optional for 3RW40 5. and 3RW40 7..
5) Calculate soft starter and motor with size allowance where required.
6) Not possible in inside-delta circuit.
7) Trace function with Soft Starter ES software.
8) For 3RW30 03 up to 230 V.

3RW30
for standard applications

Overview

Various versions of the SIRIUS 3RW30 soft starters are available:

- Standard version for fixed speed three-phase motors, sizes S00, S0, S2 and S3
- Version for fixed-speed three-phase motors in a 22.5 mm enclosure

SIRIUS 3RW30 for three-phase motors

Soft starters rated up to 55 kW (at 400 V) for standard applications in three-phase networks. Extremely small sizes, low power losses and simple commissioning are just a few of the many advantages of this soft starter.

Application

The SIRIUS 3RW30 solid-state soft starters are suitable for soft starting and stopping of three-phase asynchronous machines.

Due to two-phase control, the current is kept at minimum values in all three phases throughout the entire starting time. Due to continuous voltage influencing, current and torque peaks, which are unavoidable in the case of star-delta starters, for instance, do not occur.

Application areas

- Fans
- Pumps
- Building/construction machines
- Presses
- Escalators
- Transport systems
- Air conditioning systems
- Fans
- Assembly lines
- Compressors and coolers
- Operating mechanisms

Selection and ordering data

3RW30 03-2CB54

3RW30 25-1AB14

3RW30 35-1AB14

3RW30 35-1AA12

Ambient temperature 40 °C					Ambient temperature 50 °C						Size	Order No.
Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e				Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e						
	115 V	230 V	400 V	500 V		115 V	200 V	230 V	460 V	575 V		
A	kW	kW	kW	W	A	hp	hp	hp	hp	hp		
Soft starters for easy starting conditions and high switching frequency, rated operational voltage U_e 200 ... 400 V												
3	—	0.55	**1.1**	—	2.6	—	0.5	**0.5**	—	—	22.5 mm	**3RW30 03-□CB54**

Order No. supplement for connection types

With screw terminals	**1**
With spring-loaded terminals	**2**

Ambient temperature 40 °C					Ambient temperature 50 °C						Size	Order No.
Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e				Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e						
	115 V	230 V	400 V	500 V		115 V	200 V	230 V	460 V	575 V		
A	kW	kW	kW	W	A	hp	hp	hp	hp	hp		
Soft starters for three-phase aynchronous motors, rated operational voltage U_e 200 ... 460 V												
6	—	1.5	**3**	—	4.8	—	1	1	**3**	—	**S00**	**3RW30 14-1CB□4**
9	—	2.2	**4**	—	7.8	—	2	2	**5**	—	**S00**	**3RW30 16-1CB□4**
12.5	—	3	**5.5**	—	11	—	3	3	**7.5**	—	**S0**	**3RW30 24-1AB□4**
16	—	4	**7.5**	—	14	—	3	3	**10**	—	**S0**	**3RW30 25-1AB□4**
25	—	5.5	**11**	—	21	—	5	5	**15**	—	**S0**	**3RW30 26-1AB□4**
32	—	7.5	**15**	—	27	—	7.5	7.5	**20**	—	**S2**	**3RW30 34-1AB□4**
38	—	11	**18.5**	—	32	—	7.5	10	**20**	—	**S2**	**3RW30 35-1AB□4**
45	—	11	**22**	—	38	—	10	10	**25**	—	**S2**	**3RW30 36-1AB□4**
63	—	18.5	**30**	—	54	—	15	20	**40**	—	**S3**	**3RW30 44-1AB□4**
75	—	22	**37**	—	64	—	20	20	**40**	—	**S3**	**3RW30 45-1AB□4**
100	—	30	**55**	—	85	—	25	30	**60**	—	**S3**	**3RW30 46-1AB□4**
Soft starters for three-phase asynchronous motors, rated operational voltage U_e 460 ... 575 V												
12.5	—	—	—	**7.5**	11	—	—	—	7.5	**10**	**S0**	**3RW30 24-1AB□5**
16	—	—	—	**11**	14	—	—	—	10	**10**	**S0**	**3RW30 25-1AB□5**
25	—	—	—	**15**	21	—	—	—	15	**15**	**S0**	**3RW30 26-1AB□5**
32	—	—	—	**18.5**	27	—	—	—	20	**25**	**S2**	**3RW30 34-1AB□5**
38	—	—	—	**22**	32	—	—	—	20	**30**	**S2**	**3RW30 35-1AB□5**
45	—	—	—	**30**	38	—	—	—	25	**30**	**S2**	**3RW30 36-1AB□5**
63	—	—	—	**37**	54	—	—	—	40	**50**	**S3**	**3RW30 44-1AB□5**
75	—	—	—	**55**	64	—	—	—	40	**60**	**S3**	**3RW30 45-1AB□5**
100	—	—	—	**70**	85	—	—	—	60	**75**	**S3**	**3RW30 46-1AB□5**

Order No. supplement for rated control supply voltage U_s

24 V AC/DC	**0**
110 ... 230 V AC/DC	**1**

Note:

Selection of the soft starter depends on the rated motor current. The SIRIUS 3RW3 solid-state soft starters are designed for easy starting conditions. $J_{Load} < 10 \times J_{Motor}$. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. Siemens recommends the use of the selection and simulation program Win-Soft Starter. For information about rated currents for ambient temperatures > 40 °C, see Technical Information.

Accessories

	For soft starters Type	Size	Version		Order No.	Weight per PU approx. kg
Fans[1]						
 3RW39 26-8A	3RW3. 2. 3RW30 3. and 3RW30 4.	**S0** **S2** **S3**	To increase switching frequency and for device mounting in positions different from the normal position. The fan is snapped into the enclosure from below. During operation, (control input "IN" at potential A1), the fan is running. After a stop, the fan continues to run for about another 60 minutes.		**3RW39 26-8A** **3RW39 36-8A**	0.008 0.030
 3RW39 36-8A						
Covers						
	Terminal covers for box terminals					
 3RT19 36-4EA2	3RW30 3. 3RW30 4.	**S2** **S3**	Additional touch protection to be fitted at the box terminals (2 units required per device)		**3RT19 36-4EA2** **3RT19 46-4EA2**	0.020 0.025
	Terminal covers for cable lugs and busbar connection					
 3RT19 46-4EA1	3RW30 4.	**S3**	For complying with the phase clearances and as touch protection if box terminal is removed (2 units required per contactor)		**3RT19 46-4EA1**	0.040
Link modules						
 3RA19 11-1A			Electrical and mechanical link between motor starter protector and soft starter.			
	Single-unit packaging					
	3RW30 1.. 3RW30 2.. 3RW30 3.. 3RW30 4..	**S00** **S0** **S2** **S3**			**3RA19 11-1AA00** **3RA19 21-1AA00** **3RA19 31-1AA00** **3RA19 41-1AA00**	0.027 0.037 0.042 0.090
 3RA19 21-1A						
Covers and push-in lugs (only for 3RW30 03)						
 3RP1 902	**Sealable covers**		For securing against unauthorized adjustment of setting knobs	For devices with1 or 2 CO contacts	**3RP1 902**	0.004
 3RP1 903	**Push-in lugs** for screw mounting			For devices with 1 or 2 CO contacts	**3RP1 903**	0.002

More information

Configuration

The 3RW solid-state motor controllers are designed for easy starting conditions. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For accurate dimensioning, use the Win-Soft Starter selection and simulation program.

If necessary, an overload relay for heavy starting must be selected where long starting times are involved. PTC sensors are recommended. This also applies for the smooth ramp-down because during the ramp-down time an additional current loading applies in contrast to free ramp-down.

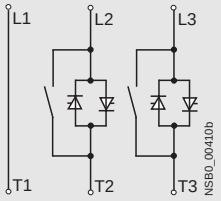
In the motor feeder between the SIRIUS 3RW soft starter and the motor, no capacitive elements are permitted (e.g. no reactive-power compensation equipment). In addition, neither static systems for reactive-power compensation nor dynamic PFC (Power Factor Correction) must be operated in parallel during starting and ramp-down of the soft starter. This is important to prevent faults arising on the compensation equipment and/or the soft starter.

All elements of the main circuit (such as fuses, controls and overload relays) should be dimensioned for direct starting, following the local short-circuit conditions. Fuses, switching devices and overload relays must be ordered separately. Please observe the maximum switching frequencies specified in the technical specifications.

Note:

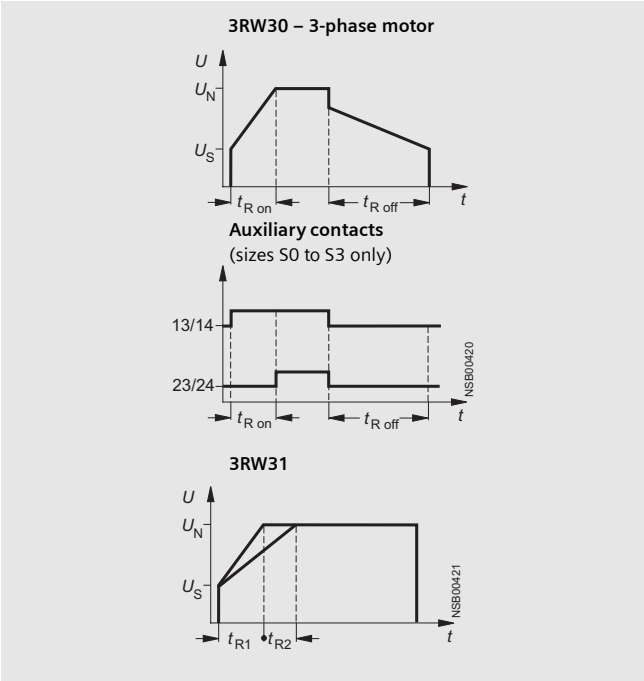
When induction motors are switched on, voltage drops occur as a rule on starters of all types (direct starters, star-delta starters, soft starters). The infeed transformer must always be dimensioned such that the voltage dip when starting the motor remains within the permissible tolerance. If the infeed transformer is dimensioned with only a small margin, it is best for the control voltage to be supplied from a separate circuit (independently of the main voltage) in order to avoid the potential switching off of the soft starter.

Power electronics circuit diagram[1)]



1) Schematic circuit diagram applies to sizes S0 and S2;
for size S00, phase L3 is bridged;
for size S3, phase L2 is bridged.

Status graphs



Control with a PLC

When a 3RW30 is operated with a triac output or thyristor output, the leakage current at the PLC output should be < 1 mA because otherwise the 3RW30 will interpret the resultant voltage drop at the input as an "On command". As a corrective measure for PLC outputs with a higher leakage current, an RC element with > 100 nF and 220 W can be connected in series between "IN1" and terminal "A2" of the 3RW30 (Order No.: 3TX7 462-3T, see Selection and Ordering Data).

Win-Soft Starter selection and simulation program

With this software, you can simulate and select all Siemens soft starters, taking into account various parameters such as mains properties, motor and load data, and special application requirements.

The software is a valuable tool, which makes complicated, lengthy manual calculations for determining the required soft starters superfluous.

The Win-Soft Starter CD-ROM can be downloaded free of charge from
www.siemens.com/lowvoltage/demosoftware

3RW40
for standard applications

Overview

SIRIUS 3RW40 soft starters offer all the same advantages as the 3RW30 soft starters. This also applies to the integrated bypass contact system. At the same time they come with additional functions, e.g. solid-state motor overload and intrinsic device protection and adjustable current limiting, optional thermistor motor protection (up to size S3), integrated remote RESET (up to size S3), as well as a two-phase control method (Polarity Balancing) that is unique in this performance range.

SIRIUS 3RW40 soft starters are part of the SIRIUS modular system. This results in advantages such as identical sizes and a uniform connection method. Thanks to their particularly compact design, SIRIUS 3RW40 soft starters are only half as big as comparable star-delta starters. Hence, they can be mounted in minimum space in the control cabinet. Configuring and mounting are carried out quickly and easily thanks to the 3-wire connection.

SIRIUS 3RW40 for three-phase motors

Soft starters rated up to 250 kW (at 400 V) for standard applications in three-phase networks. Extremely small sizes, low power losses and simple commissioning are just three of the many advantages of the SIRIUS 3RW40 soft starters.

"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RW40 soft starters size S6, S10 and S12 are suitable for starting explosion-proof motors with "increased safety" type of protection EEx e.

Application

The SIRIUS 3RW40 solid-state soft starters are suitable for soft starting and stopping of three-phase asynchronous motors.

Due to two-phase control, the current is kept at minimum values in all three phases throughout the entire starting time and disturbing direct current components are eliminated in addition. This not only enables the two-phase starting of motors up to 250 kW (at 400 V) but also avoids the current and torque peaks which occur e.g. with star-delta starters.

Application areas

- Fans
- Pumps
- Building/construction machines
- Presses
- Escalators
- Transport systems
- Air conditioning systems
- Fans
- Assembly lines
- Compressors and coolers
- Operating mechanisms

Selection and ordering data

3RW40 28-1BB14

3RW40 38-1BB14

3RW40 47-1BB14

Ambient temperature 40 °C				Ambient temperature 50 °C					Size	Order No.	Weight per PU approx.
Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e			Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e						
	230 V	400 V	500 V		200 V	230 V	460 V	575 V			
A	kW	kW	kW	A	hp	hp	hp	hp			kg
Inline circuit, rated operational voltage 200 ... 480 V											
12.5	3	**5.5**	—	11	3	3	**7.5**	—	**S0**	**3RW40 24-□□B□4**	0.770
25	5.5	**11**	—	23	5	5	**15**	—		**3RW40 26-□□B□4**	0.770
32	7.5	**15**	—	29	7.5	7.5	**20**	—		**3RW40 27-□□B□4**	0.770
38	11	**18.5**	—	34	10	10	**25**	—		**3RW40 28-□□B□4**	0.770
45	11	**22**	—	42	10	15	**30**	—	**S2**	**3RW40 36-□□B□4**	1.350
63	18.5	**30**	—	58	15	20	**40**	—		**3RW40 37-□□B□4**	1.350
72	22	**37**	—	62	20	20	**40**	—		**3RW40 38-□□B□4**	1.350
80	22	**45**	—	73	20	25	**50**	—	**S3**	**3RW40 46-□□B□4**	1.900
106	30	**55**	—	98	30	30	**75**	—		**3RW40 47-□□B□4**	1.900
Inline circuit, rated operational voltage 400 ... 600 V											
12.5	—	5.5	**7.5**	11	—	—	7.5	**10**	**S0**	**3RW40 24-□□B□5**	0.770
25	—	11	**15**	23	—	—	15	**20**		**3RW40 26-□□B□5**	0.770
32	—	15	**18.5**	29	—	—	20	**25**		**3RW40 27-□□B□5**	0.770
38	—	18.5	**22**	34	—	—	25	**30**		**3RW40 28-□□B□5**	0.770
45	—	22	**30**	42	—	—	30	**40**	**S2**	**3RW40 36-□□B□5**	1.350
63	—	30	**37**	58	—	—	40	**50**		**3RW40 37-□□B□5**	1.350
72	—	37	**45**	62	—	—	40	**60**		**3RW40 38-□□B□5**	1.350
80	—	45	**55**	73	—	—	50	**60**	**S3**	**3RW40 46-□□B□5**	1.900
106	—	55	**75**	98	—	—	75	**75**		**3RW40 47-□□B□5**	1.900

Order No. supplement for connection types

- With screw terminals — **1**

Order No. supplement for rated control supply voltage U_s

- 24 V AC/DC — **0**
- 110 ... 230 V AC/DC — **1**

Order No. supplement for option of thermistor motor protection

- With thermistor motor protection — **T**
- With thermistor motor protection — **B**

Note:
Selection of the soft starter depends on the rated motor current.
The SIRIUS 3RW40 solid-state soft starters are designed for easy starting conditions. $J_{Load} < 10 \times J_{Motor}$. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. Siemens recommends the use of the selection and simulation program Win-Soft Starter. For information about rated currents for ambient temperatures > 40 °C, see technical specifications (see Technical Information).

3RW40
for standard applications

3RW40 56-6BB44

3RW40 76-6BB44

Ambient temperature 40 °C				Ambient temperature 50 °C					Size	Order No.	Weight per PU approx.
Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e			Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e						
	230 V	400 V	500 V		200 V	230 V	460 V	575 V			
A	kW	kW	W	A	hp	hp	hp	hp			kg
Inline circuit, rated operational voltage 200 ... 460 V											
134	37	**75**	—	117	30	40	**75**	—	**S6**	**3RW40 55-□BB□4**	4.900
162	45	**90**	—	145	40	50	**100**	—		**3RW40 56-□BB□4**	6.900
230	75	**132**	—	205	60	75	**150**	—	**S12**	**3RW40 73-□BB□4**	8.900
280	90	**160**	—	248	75	100	**200**	—		**3RW40 74-□BB□4**	8.900
356	110	**200**	—	315	100	125	**250**	—		**3RW40 75-□BB□4**	8.900
432	132	**250**	—	385	125	150	**300**	—		**3RW40 76-□BB□4**	8.900
Inline circuit, rated operational voltage 400 ... 600 V											
134	—	75	**90**	117	—	—	75	**100**	**S6**	**3RW40 55-□BB□5**	4.900
162	—	90	**110**	145	—	—	100	**150**		**3RW40 56-□BB□5**	6.900
230	—	132	**160**	205	—	—	150	**200**	**S12**	**3RW40 73-□BB□5**	8.900
280	—	160	**200**	248	—	—	200	**250**		**3RW40 74-□BB□5**	8.900
356	—	200	**250**	315	—	—	250	**300**		**3RW40 75-□BB□5**	8.900
432	—	250	**315**	385	—	—	300	**400**		**3RW40 76-□BB□5**	8.900

Order No. supplement for connection types

- With spring-loaded terminals **2 6**
- With screw terminals **3 4**

Order No. supplement for the rated control supply voltage U_s[1)]

- 115 V AC
- 230 V AC

1) Control by way of the internal 24 V DC supply and direct control by means of PLC possible.

Note:

Selection of the soft starter depends on the rated motor current.

The SIRIUS 3RW40 solid-state soft starters are designed for easy starting conditions. $J_{Load} < 10 \times J_{Motor}$. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. Siemens recommends the use of the selection and simulation program Win-Soft Starter. For information about rated currents for ambient temperatures > 40 °C, see technical specifications (see Technical Information).

Accessories

	For soft starters Type	Size	Version	Order No.	Weight per PU approx. kg
Box terminal blocks for soft starters					
	**For round and ribbon cables**				
	3RW40 5.	**S6**	• Up to 70 mm² • Up to 120 mm²	**3RT19 55-4G** **3RT19 56-4G**	0.230 0.260
	3RW40 7.	**S12**	• Up to 240 mm²	**3RT19 66-4G**	0.676
Auxiliary terminals					
	Auxiliary terminals, 3-pole				
	3RW40 4.	**S3**		**3RT19 46-4F**	0.035
Covers for soft starters					
	**Terminal covers for box terminals** Additional touch protection to be fitted at the box terminals (2 units required per device)				
	3RW40 3.	**S2**		**3RT19 36-4EA2**	0.020
	3RW40 4.	**S3**		**3RT19 46-4EA2**	0.025
	3RW40 5.	**S6**		**3RT19 56-4EA2**	0.030
	3RW40 7.	**S12**		**3RT19 66-4EA2**	0.040
	**Terminal covers for cable lugs and busbar connection**				
	3RW30 4.	**S3**	For complying with the phase clearances and as touch protection if box terminal is removed (2 units required per contactor)	**3RT19 46-4EA1**	0.040
	3RW40 5.	**S6**		**3RT19 56-4EA1**	0.070
	3RW40 7.	**S12**		**3RT19 66-4EA1**	0.130
	**Sealing covers**				
	3RW40 2. to 3RW40 4.	**S0, S2, S3**		**3RW49 00-0PB10**	0.005
	3RW40 5. and 3RW40 7.	**S6, S12**		**3RW49 00-0PB00**	0.010
Modules for RESET[1]					
	**Modules for remote RESET, electrical** Operating range 0.85 ... 1.1 x U_s, power consumption AC 80 VA, DC 70 W, ON period 0.2 s ... 4 s, switching frequency 60/h				
	3RW40 5. and 3RW40 7.	**S6, S12**	• 24 V ... 30 V AC/DC • 110 V ... 127 V AC/DC • 220 V ... 250 V AC/DC	**3RU19 00-2AB71** **3RU19 00-2AF71** **3RU19 00-2AM71**	0.066 0.067 0.066
	3RW40 5. and 3RW40 7.	**S6, S12**	• Resetting plunger, holder and former • Suitable pushbutton IP65, Ø 22 mm, 12 mm stroke • Extension plunger	**3RU19 00-1A** **3SB30 00-0EA11** **3SX13 35**	0.038 0.020 0.004
	**Cable releases with holder for RESET** For Ø 6.5 mm holes in the control panel; max. control panel thickness 8 mm				
	3RW40 5. and 3RW40 7.	**S6, S12**	• Length 400 mm • Length 600 mm	**3RU19 00-1B** **3RU19 00-1C**	0.063 0.073

1) Remote RESET already integrated in the 3RW40 2. to 3RW40 4. soft starters.

3RW40
for standard applications

For soft starters Type	Size	Motor protection circuit breaker - 3RV Size	Order No.	Weight per PU approx. kg
Link modules for motor protection circuit breaker - 3RV				
				
3RW40 24, 3RW40 26	**S0**	**S0**	**3RA19 21-1A**	0.028
3RW40 27, 3RW40 28		**S2**	**3RA19 31-1D**	0.041
3RW40 36	**S2**	**S2**	**3RA19 31-1A**	0.033
3RW40 37, 3RW40 38		**S3**	**3RA19 41-1D**	0.042
3RW40 46, 3RW40 47	**S3**	**S3**	**3RA19 41-1A**	0.072
Fans (to increase switching frequency and for device mounting in positions different from the normal position)				
				
3RW40 2.	**S0**		**3RW49 28-8VB00**	0.010
3RW40 3., 3RW40 4.	**S2, S3**		**3RW49 47-8VB00**	0.020
Operating instructions[1]				
For soft starters				
3RW40 2.	**S0**		**3ZX10 12-0RW40-1AA1**	on req.
3RW40 3.	**S2**			
3RW40 4.	**S3**			
3RW40 5.	**S6**			
3RW40 7.	**S12**		**3ZX10 12-0RW40-2DA1**	on req.

1) The operating instructions are included in the scope of supply.

Spare parts

For soft starters Type	Size	Version Rated control supply voltage U_s	Order No.	Weight per PU approx. kg
Fans				
				
Fans				
3RW40 5.-.BB3.	**S6**	115 V AC	**3RW49 36-8VX30**	0.300
3RW40 5.-.BB4.	**S6**	230 V AC	**3RW49 36-8VX40**	0.300
3RW40 7.-.BB3.	**S12**	115 V AC	**3RW49 47-8VX30**	0.500
3RW40 7.-.BB4.	**S12**	230 V AC	**3RW49 47-8VX40**	0.500

More information

Application examples for normal starting (Class 10)

Normal starting Class 10 (up to 20 s with 350 % $I_{n\,motor}$),
The soft starter rating can be selected to be as high as the rating of the motor used

Application		Conveyor belt	Roller conveyor	Compressor	Small fan	Pump	Hydraulic pump
Starting parameters							
• Voltage ramp and current limiting							
- starting voltage	%	70	60	50	40	40	40
- starting time	s	10	10	10	10	10	10
- current limit value		5 x I_M	5 x I_M	4 x I_M	4 x I_M	4 x I_M	4 x I_M
Ramp-down time	s	5	5	0	0	10	0

Application examples for heavy starting (Class 20)

Heavy starting Class 20 (up to 40 s with 350 % $I_{n\,motor}$),
The soft starter has to be selected one rating class higher than the motor used

Application		Stirrer	Centrifuge
Starting parameters			
• Voltage ramp and current limiting			
- starting voltage	%	40	40
- starting time	s	20	20
- current limit value		4 x I_M	4 x I_M
Ramp-down time		0	0

Note:
These tables present sample set values and device sizes. They are intended only for the purposes of information and are not binding. The set values depend on the application in question and must be optimized during commissioning. The soft starter dimensions should be checked where necessary with the Win-Soft Starter software or with the help of Technical Assistance.

Configuration

The 3RW solid-state soft starters are designed for easy starting conditions. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For accurate dimensioning, use the Win-Soft Starter selection and simulation program.

Where long starting times are involved, the integrated solid-state overload relay for heavy starting should not be disconnected. PTC sensors are recommended. This also applies for the smooth ramp-down because during the ramp-down time an additional current loading applies in contrast to free ramp-down.

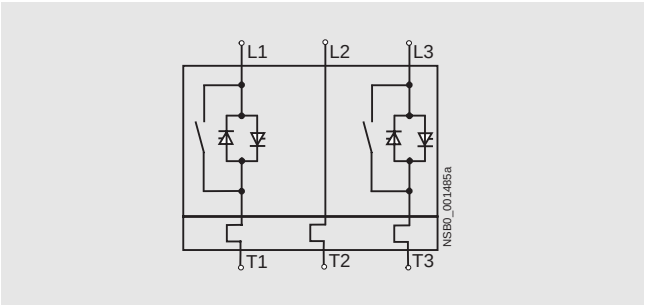
In the motor feeder between the SIRIUS 3RW soft starter and the motor, no capacitive elements are permitted (e.g. no reactive-power compensation equipment). In addition, neither static systems for reactive-power compensation nor dynamic PFC (Power Factor Correction) must be operated in parallel during starting and ramp-down of the soft starter. This is important to prevent faults arising on the compensation equipment and/or the soft starter.

All elements of the main circuit (such as fuses and controls) should be dimensioned for direct starting, following the local short-circuit conditions. Fuses, controls and overload relays must be ordered separately. Please observe the maximum switching frequencies specified in the technical specifications.

Note:

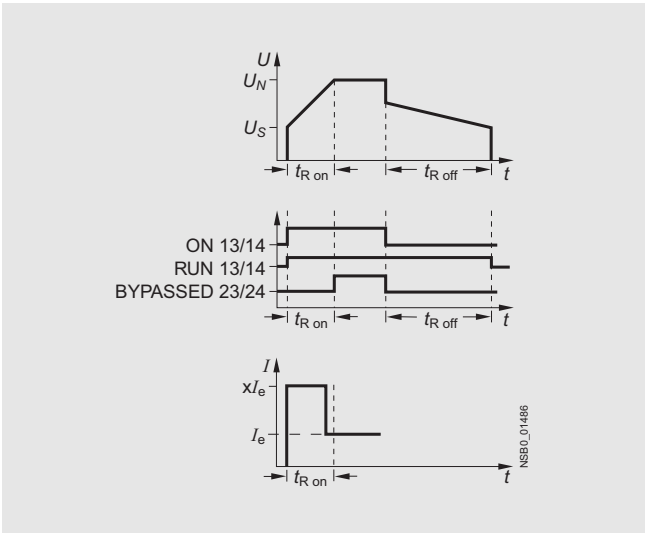
When induction motors are switched on, voltage drops occur as a rule on starters of all types (direct starters, star-delta starters, soft starters). The infeed transformer must always be dimensioned such that the voltage dip when starting the motor remains within the permissible tolerance. If the infeed transformer is dimensioned with only a small margin, it is best for the control voltage to be supplied from a separate circuit (independently of the main voltage) in order to avoid the potential switching off of the soft starter.

Schematic circuit diagram



A bypass contact system and solid-state overload relay are already integrated in the 3RW40 soft starter and therefore do not have to be ordered separately.

Status graphs



Win-Soft Starter selection and simulation program

With this software, you can simulate and select all Siemens soft starters, taking into account various parameters such as mains properties, motor and load data, and special application requirements.

The software is a valuable tool, which makes complicated, lengthy manual calculations for determining the required soft starters superfluous.

The Win-Soft Starter CD-ROM can be downloaded free of charge from

www.siemens.com/lowvoltage/demosoftware

You can find more information on the Internet at:
http://www.siemens.com/softstarter

Overview

In addition to soft starting and soft ramp-down, the solid-state SIRIUS 3RW44 soft starters provide numerous functions for higher-level requirements. They cover a performance range up to 710 kW (at 400 V) in the inline circuit and up to 1200 kW (at 400 V) in the inside-delta circuit.

The SIRIUS 3RW44 soft starters are characterized by a compact design for space-saving and clearly arranged control cabinet layouts. For optimized motor starting and stopping the innovative SIRIUS 3RW44 soft starters are an attractive alternative with considerable savings potential compared to applications with a frequency converter. The new torque control and adjustable current limiting enable the High-Feature soft starters to be used in nearly every conceivable task. They guarantee the reliable avoidance of sudden torque applications and current peaks during motor starting and stopping. This creates savings potential when calculating the size of the switchgear and when servicing the machinery installed. Be it for inline circuits or inside-delta circuits – the SIRIUS 3RW44 soft starter offers savings especially in terms of size and equipment costs.

The bypass contacts already integrated in the soft starter bypass the thyristors after a motor ramp-up is detected. This results in a further great reduction in the heat loss occuring during operation of the soft starter at rated value.

Combinations of various starting, operating and ramp-down possibilities ensure an optimum adaptation to the application-specific requirements. Operating and commissioning can be performed by means of the user-friendly keypad and a menu-prompted, multi-line graphic display with background lighting. The optimized motor ramp-up and ramp-down can be effected by means of just a few settings with a previously selected language. Four-key operation and plain-text displays for each menu point guarantee full clarity at every moment of the parameterization and operation.

Applicable standards

- IEC 60947-4-2
- UL/CSA

Application

The SIRIUS 3RW44 solid-state soft starters are suitable for the torque-controlled soft starting and smooth ramp-down as well as braking of three-phase asynchronous motors.

Application areas, e.g.

- Pumps
- Fans
- Compressors
- Water transport
- Conveying systems and lifts
- Hydraulics
- Machine tools
- Mills
- Saws
- Breakers
- Mixers
- Centrifuges
- Industrial cooling and refrigerating systems

3RW44
for High-Feature applications

Selection and ordering data

3RW44 27-1BC44

3RW44 36-6BC44

3RW44 47-6BC44

3RW44 58-6BC44

3RW44 66-6BC44

Ambient temperature 40 °C						Ambient temperature 50 °C					Order No.	Weight per PU approx.
Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e					Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e					
	230 V	400 V	500 V	690 V	1000 V		200 V	230 V	460 V	575 V		
A	kW	kW	kW	kW	kW	A	hp	hp	hp	hp		kg
Inline circuit, rated operational voltage 200 ... 460 V												
29	5.5	**15**	—	—	—	26	7.5	7.5	**15**	—	**3RW44 22-☐BC☐☐**	6.500
36	7.5	**18.5**	—	—	—	32	10	10	**20**	—	**3RW44 23-☐BC☐☐**	6.500
47	11	**22**	—	—	—	42	10	15	**25**	—	**3RW44 24-☐BC☐☐**	6.500
57	15	**30**	—	—	—	51	15	15	**30**	—	**3RW44 25-☐BC☐☐**	6.500
77	18.5	**37**	—	—	—	68	20	20	**50**	—	**3RW44 26-☐BC☐☐**	6.500
93	22	**45**	—	—	—	82	25	25	**60**	—	**3RW44 27-☐BC☐☐**	6.500
Order No. supplement for connection types												
• With spring-loaded terminals											**3**	
• With screw terminals											**1**	
113	30	**55**	—	—	—	100	30	30	**75**	—	**3RW44 34-☐BC☐☐**	7.900
134	37	**75**	—	—	—	117	30	40	**75**	—	**3RW44 35-☐BC☐☐**	7.900
162	45	**90**	—	—	—	145	40	50	**100**	—	**3RW44 36-☐BC☐☐**	7.900
203	55	**110**	—	—	—	180	50	60	**125**	—	**3RW44 43-☐BC☐☐**	11.500
250	75	**132**	—	—	—	215	60	75	**150**	—	**3RW44 44-☐BC☐☐**	11.500
313	90	**160**	—	—	—	280	75	100	**200**	—	**3RW44 45-☐BC☐☐**	11.500
356	110	**200**	—	—	—	315	100	125	**250**	—	**3RW44 46-☐BC☐☐**	11.500
432	132	**250**	—	—	—	385	125	150	**300**	—	**3RW44 47-☐BC☐☐**	11.500
551	160	**315**	—	—	—	494	150	200	**400**	—	**3RW44 53-☐BC☐☐**	50.000
615	200	**355**	—	—	—	551	150	200	**450**	—	**3RW44 54-☐BC☐☐**	50.000
693	200	**400**	—	—	—	615	200	250	**500**	—	**3RW44 55-☐BC☐☐**	50.000
780	250	**450**	—	—	—	693	200	250	**600**	—	**3RW44 56-☐BC☐☐**	50.000
880	250	**500**	—	—	—	780	250	300	**700**	—	**3RW44 57-☐BC☐☐**	50.000
970	315	**560**	—	—	—	850	300	350	**750**	—	**3RW44 58-☐BC☐☐**	50.000
1076	355	**630**	—	—	—	970	350	400	**850**	—	**3RW44 65-☐BC☐☐**	78.000
1214	400	**710**	—	—	—	1076	350	450	**950**	—	**3RW44 66-☐BC☐☐**	78.000
Order No. supplement for connection types												
• With spring-loaded terminals											**2**	
• With screw terminals											**6**	
Order No. supplement for the rated control supply voltage U_s[1]												
• 115 V AC											**3**	
• 230 V AC											**4**	
Order No. supplement for operational voltage												
• 200 ... 460 V											**4**	
• 400 ... 600 V											**5**	
• 400 ... 690 V											**6**	

1) Control by way of the internal 24 V DC supply and direct control by means of PLC possible.

Note:

Soft starter selection depends on the rated motor current.

The 3RW44 solid-state soft starters are designed for normal starting (Class 10). (Inertia load of the overall operating mechanism J_{Load} <10 x J_{Motor}; starting current 350 % x I_e for 20 s similar load). For any other conditions of use, the devices should be selected using the Win-Soft Starter selection and simulation program.
See Technical Specifications for information about rated currents for ambient temperatures >40 °C and switching frequency.


3RW44 27-1BC44


3RW44 36-6BC44


3RW44 47-6BC44


3RW44 58-6BC44


3RW44 66-6BC44

Ambient temperature 40 °C						Ambient temperature 50 °C					Order No.	Weight per PU approx.
Rated operational current I_e [1]	Rated power of induction motors for rated operational voltage U_e					Rated operational current I_e	Rated power of induction motors for rated operational voltage U_e					
	230 V	400 V	500 V	690 V	1000 V		200 V	230 V	460 V	575 V		
A	kW	kW	kW	kW	kW	A	hp	hp	hp	hp		kg
Inside-delta circuit, rated operational voltage 200 ... 460 V												
50	15	**22**	—	—	—	45	10	15	**30**	—	**3RW44 22-□BC□□**	6.500
62	18.5	**30**	—	—	—	55	15	20	**40**	—	**3RW44 23-□BC□□**	6.500
81	22	**45**	—	—	—	73	20	25	**50**	—	**3RW44 24-□BC□□**	6.500
99	30	**55**	—	—	—	88	25	30	**60**	—	**3RW44 25-□BC□□**	6.500
133	37	**75**	—	—	—	118	30	40	**75**	—	**3RW44 26-□BC□□**	6.500
161	45	**90**	—	—	—	142	40	50	**100**	—	**3RW44 27-□BC□□**	6.500
Order No. supplement for connection types												
• With spring-loaded terminals											**3**	
• With screw terminals											**1**	
196	55	**110**	—	—	—	173	50	60	**125**	—	**3RW44 34-□BC□□**	7.900
232	75	**132**	—	—	—	203	60	75	**150**	—	**3RW44 35-□BC□□**	7.900
281	90	**160**	—	—	—	251	75	100	**200**	—	**3RW44 36-□BC□□**	7.900
352	110	**200**	—	—	—	312	100	125	**250**	—	**3RW44 43-□BC□□**	11.500
433	132	**250**	—	—	—	372	125	150	**300**	—	**3RW44 44-□BC□□**	11.500
542	160	**315**	—	—	—	485	150	200	**400**	—	**3RW44 45-□BC□□**	11.500
617	200	**355**	—	—	—	546	150	200	**450**	—	**3RW44 46-□BC□□**	11.500
748	250	**400**	—	—	—	667	200	250	**600**	—	**3RW44 47-□BC□□**	11.500
954	315	**560**	—	—	—	856	300	350	**750**	—	**3RW44 53-□BC□□**	50.000
1065	355	**630**	—	—	—	954	350	400	**850**	—	**3RW44 54-□BC□□**	50.000
1200	400	**710**	—	—	—	1065	350	450	**950**	—	**3RW44 55-□BC□□**	50.000
1351	450	**800**	—	—	—	1200	450	500	**1050**	—	**3RW44 56-□BC□□**	50.000
1524	500	**900**	—	—	—	1351	450	600	**1200**	—	**3RW44 57-□BC□□**	50.000
1680	560	**1000**	—	—	—	1472	550	650	**1300**	—	**3RW44 58-□BC□□**	50.000
1864	630	**1100**	—	—	—	1680	650	750	**1500**	—	**3RW44 65-□BC□□**	78.000
2103	710	**1200**	—	—	—	1864	700	850	**1700**	—	**3RW44 66-□BC□□**	78.000
Order No. supplement for connection types												
• With spring-loaded terminals											**2**	
• With screw terminals											**6**	
Order No. supplement for the rated control supply voltage U_s [2]												
• 115 V AC											**3**	
• 230 V AC											**4**	
Order No. supplement for rated operational voltage												
• 200 ... 400 V											**4**	
• 400 ... 600 V											**5**	

1) In the selection table, the unit rated current I_e refers to the induction motor's rated operational current in the inside-delta circuit. The actual current of the device is approx. 58% of this value.

2) Control by way of the internal 24 V DC supply and direct control by means of PLC possible.

Note:

Soft starter selection depends on the rated motor current.

The 3RW44 solid-state soft starters are designed for normal starting (Class 10). (Inertia load of the overall operating mechanism J_{Load} <10 x J_{Motor}; starting current 350 % x I_e for 20 s similar load). For any other conditions of use, the devices should be selected using the Win-Soft Starter selection and simulation program.

See Technical Specifications for information about rated currents for ambient temperatures >40 °C and switching frequency.

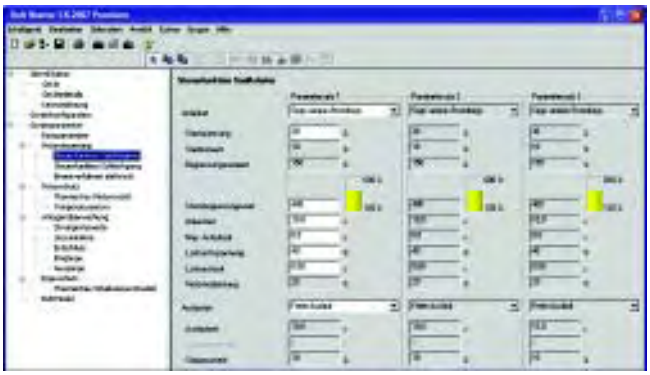
3RW44
for High-Feature applications

Accessories

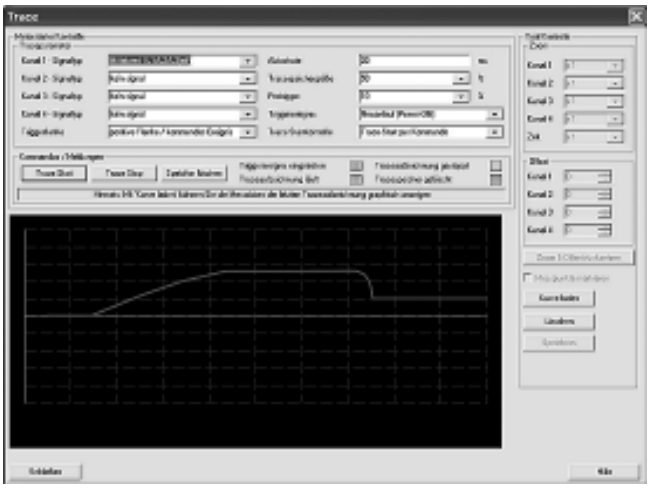
	For soft starters / Type	Version	Order No.	Weight per PU approx. kg
PC cables				
 3UF7 940-0AA00-0	**For PC/PG communication with SIRIUS 3RW44 soft starters**			
	Through the system interface, for connecting to the serial interface of the PC/PG		**3UF7 940-0AA00-0**	0.150
PROFIBUS communications modules				
 3RW49 00-0KC00	Modules can be plugged into the soft starters for integrating the starters in the PROFIBUS network with DPV1 slave functionality. On Y-link the soft starter has only DPV0 slave functionality.		**3RW49 00-0KC00**	0.320
External display and operator modules				
 3RW49 00-0AC00	For indicating and operating the functions provided by the soft starter using an externally mounted display and operator module (e.g. in the control cabinet door)		**3RW49 00-0AC00**	0.320
	Connection cables			
	From the device interface (serial) of the 3RW44 soft starter to the external display and operator module			
	• Length 0.5 m, flat		**3UF7 932-0AA00-0**	0.020
	• Length 0.5 m, round		**3UF7 932-0BA00-0**	0.050
	• Length 1.0 m, round		**3UF7 937-0BA00-0**	0.100
	• Length 2.5 m, round		**3UF7 933-0BA00-0**	0.150
Box terminal blocks for soft starters				
 3RT19	**Box terminal blocks**			
	3RW44 2.	included in the scope of supply		
	3RW44 3.	• Up to 70 mm²	**3RT19 55-4G**	0.230
		• Up to 120 mm²	**3RT19 56-4G**	0.260
	3RW44 4.	• Up to 240 mm²	**3RT19 66-4G**	0.676
Covers for soft starters				
	Terminal covers for box terminals			
	Additional touch protection to be fitted at the box terminals (2 units required per device)			
	3RW44 2. and 3RW44 3.		**3RT19 56-4EA2**	0.030
	3RW44 4.		**3RT19 66-4EA2**	0.040
 3RT19 .6-4EA1	**Terminal covers for cable lugs and busbar connections**			
	3RW44 2. and 3RW44 3.		**3RT19 56-4EA1**	0.070
	3RW44 4.		**3RT19 66-4EA1**	0.130
Operating instructions[1]				
	For 3RW44 soft starters		**3ZX10 12-0RW44-1AA1**	

1) The operating instructions are included in the scope of supply.

Overview



Easy and clearly arranged parameter setting of the 3RW44 soft starter with Soft Starter ES 2007



Graphic presentation of measured values with the trace function (oscilloscope function) of Soft Starter ES 2007 Standard and Premium

Soft Starter ES 2007

Soft Starter ES software enables the quick and easy parameterization, monitoring and service-related diagnostics of SIRIUS 3RW44 High Feature soft starters . The device parameters can be set directly on the PC and transferred through a serial cable or optional PROFIBUS connection to the soft starter.

The advantages of Soft Starter ES:

- Clear and easily manageable setting of device functions and their parameters – online and offline
- Effective diagnostics function of the soft starter and display of all key measured values
- Trace function (oscilloscope function) for recording measured values and events (in the Soft Starter ES Standard and Premium software versions)

Efficient engineering with new program versions

The Soft Starter ES software program is available in three versions which differ in user-friendliness, scope of functions and price.

Soft Starter ES	Basic	Standard	Premium
Access through local interface on the device	✓	✓	✓
Parameterizing	✓	✓	✓
Operating	✓	✓	✓
Diagnostics	✓	✓	✓
Creating typicals	—	✓[1)]	✓
Exporting parameters	—	✓	✓
Comparative functions	—	✓	✓
Standard-conform printout according to EN ISO 7200	—	✓	✓
Service data (slave pointer, statistics data)	—	✓	✓
Access through PROFIBUS	—	—	✓
Group function	—	—	✓
Teleservice via MPI	—	—	✓
S7 routing	—	—	✓
STEP7 Object Manager	—	—	✓

1) Typicals with Service Pack 1 and higher.

More functions

- Standard-conform printouts
  The software tool makes machine documentation far easier. Parameterization printouts according to EN ISO 7200 are possible. The elements to be printed are easy to select and compile as required.
- Easy creating of typicals
  Typicals can be created for devices and applications with parameters which differ only slightly. These typicals contain all the parameters needed for the parameterization. In addition it is possible to specify which of these parameters are fixed default values and which can still be adapted by the start-up engineer.
- Group function
  For the user-friendly parameterization of numerous devices or applications of the same type, the programs of the SIRIUS ES software family provide a group function which enables the parameterization of several devices to be read out or written through PROFIBUS. In conjunction with typicals it is even possible to selectively adapt the parameters in any number of parameterizations.
- Teleservice via MPI
  The Soft Starter ES premium version supports the use of MPI Teleservice (consisting of the Teleservice software and various Teleservice adapters) for remote diagnostics of the devices. This facilitates diagnostics and maintenance and shortens the response time for service purposes.

3RW44
for High-Feature applications

Types of delivery and license

Soft Starter ES is available as follows:

- Floating license – the license for any one user at any one time
  - Authorizes any one user
  - Independent of the number of installations (unlike the single license which is allowed to be installed once only)
  - Only the actual use of the program has to be licensed
  - Trial license (free use of all program functions for 14 days for test and evaluation purposes, included on every product CD, available in the download file of the SIRIUS ES program in the Service&Support portal).

Following delivery versions are available in addition for Soft Starter ES 2007:

- Upgrade
  Upgrade from an old to a new version with expanded functions, e.g. upgrade from Soft Starter ES 2006 to Soft Starter ES 2007
- Powerpack
  Special pack for switching within the same software version to a more powerful version with more functionality, e.g. Powerpack Soft Starter ES 2007 for switching from Standard to Premium
- Software Update Service
  To keep you up to date at all times we offer a special service which supplies you automatically with all service packs and upgrades
- License download
  User-friendly license key download from the A&D Mall (currently only for customers from Germany) as an easy and quick way for you to receive additional licenses for your software

New licensing procedure

To make licensing easier, the three versions of Soft Starter ES are available with immediate effect with the following license:

14 day trial license for Premium functions:
for test and evaluation purposes, included on every product CD, available also in the download file of the SIRIUS Soft Starter ES 2007 program in the Service&Support portal.

System requirements

Soft Starter ES 2007 parameterization, start-up and diagnostics software for the SIRIUS 3RW44 soft starter	**Basic/Standard**	**Premium**
	Firmware version ≥ *E04* [1]	**Firmware version ≥ *E06*** [2]
Operating system	Windows 2000 (Service Pack 3 or 4), Windows XP Professional (Service Pack 2)	
Processor	≥ Pentium 800 MHz / 1 GHz (Windows VISTA)	
Free space on hard disk	≥ 150 MB	
CD-ROM/DVD drive	Yes (only when installing from CD)	
Serial interface (COM)	Yes	
PC cable/parameterizing cable/connection cable	Yes	
PROFIBUS communication module (optional)	—	Yes

1) SIRIUS 3RW44 with firmware version ≥ *E04*. Installed in starters delivered after December 2005.

2) SIRIUS 3RW44 with firmware version ≥ *E06*. Installed in starters delivered after May 2006.

Selection and ordering data

Parameterization and service software for SIRIUS 3RW44 soft starters

- Runs on WIN 2000/WIN XP PROF
- Without PC cable

Version	Order No.	Weight per PU approx. kg
Soft Starter ES 2007 Basic		
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface		
• License key on USB stick, Class A, including CD	**3ZS1 313-4CC10-0YA5**	0.230
• License key download, Class A, no CD	**3ZS1 313-4CE10-0YB5**	0.230
Soft Starter ES 2007 Standard		
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface		
• License key on USB stick, Class A, including CD	**3ZS1 313-5CC10-0YA5**	0.230
• License key download, Class A, no CD	**3ZS1 313-5CE10-0YB5**	0.230
Upgrade for Soft Starter ES 2006 Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A, 3 languages (German/English/French), communication through system interface	**3ZS1 313-5CC10-0YE5**	0.230
Powerpack for Soft Starter ES 2007 Basic Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A, 3 languages (German/English/French), communication through system interface	**3ZS1 313-5CC10-0YD5**	0.230
Software Update Service For 1 year with automatic extension, assuming the current software version is in use, E-SW, software and documentation on CD, communication through system interface	**3ZS1 313-5CC10-0YL5**	0.230
Soft Starter ES 2007 Premium		
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface		
• License key on USB stick, Class A, including CD	**3ZS1 313-6CC10-0YA5**	0.230
• License key download, Class A, no CD	**3ZS1 313-6CE10-0YB5**	0.230
Upgrade for Soft Starter ES 2006 Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A, 3 languages (German/English/French), communication through system interface	**3ZS1 313-6CC10-0YE5**	0.230
Powerpack for Soft Starter ES 2007 Standard Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A, 3 languages (German/English/French), communication through system interface	**3ZS1 313-6CC10-0YD5**	0.230
Software Update Service For 1 year with automatic extension, assuming the current software version is in use, E-SW, software and documentation on CD, communication through system interface	**3ZS1 313-6CC10-0YL5**	0.230
Accessories		
PC cables for PC/PG communication, through the system interface on the device, for connecting to the serial interface on the PC/PG	**3UF7940-0AA00-0**	0.150
Optional PROFIBUS communication modules for SIRIUS 3RW44	**3RW4 900-0KC00**	0.320

3RW44
for High-Feature applications

Spare parts

	For soft starters	Version	Order No.	Weight per PU approx.
	Type			kg
Fans				
	Fans			
 3RW49	3RW44 2. and 3RW44 3.	115 V AC	**3RW49 36-8VX30**	0.300
		230 V AC	**3RW49 36-8VX40**	0.300
	3RW44 4.	115 V AC	**3RW49 47-8VX30**	0.500
		230 V AC	**3RW49 47-8VX40**	0.500
	3RW44 5. and 3RW44 6.[1]	115 V AC	**3RW49 57-8VX30**	0.800
		230 V AC	**3RW49 57-8VX40**	0.800
	3RW44 6.[2]	115 V AC	**3RW49 66-8VX30**	0.300
		230 V AC	**3RW49 66-8VX40**	0.300

1) 3RW44 6. mounting on output side.

2) For mounting on front side.

More information

Application examples for normal starting (Class 10)

Normal starting Class 10 (up to 20 s with 350 % $I_{n\ motor}$),
The soft starter rating can be selected to be as high as the rating of the motor used

Application		Conveyor belt	Roller conveyor	Compressor	Small fan	Pump	Hydraulic pump
Starting parameters							
• Voltage ramp and current limiting							
- starting voltage	%	70	60	50	30	30	30
- starting time	s	10	10	10	10	10	10
- current limit value		Deactivated	Deactivated	4 x I_M	4 x I_M	Deactivated	Deactivated
• Torque ramp							
- starting torque		60	50	40	20	10	10
- end torque		150	150	150	150	150	150
- starting time		10	10	10	10	10	10
• Breakaway pulse		Deactivated (0 ms)	Deactivated (0 ms)	Deactivated (0 ms)	Deactivated (0 ms)	Deactivated (0 ms)	Deactivated (0 ms)
Ramp-down mode		Smooth ramp-down	Smooth ramp-down	Free ramp-down	Free ramp-down	Pump ramp-down	Free ramp-down

Application examples for heavy starting (Class 20)

Heavy starting Class 20 (up to 40 s with 350 % $I_{n\ motor}$),
The soft starter has to be selected one rating class higher than the motor used

Application		Stirrer	Centrifuge	Milling machine
Starting parameters				
• Voltage ramp and current limiting				
- starting voltage	%	30	30	30
- starting time	s	30	30	30
- current limit value		4 x I_M	4 x I_M	4 x I_M
• Torque ramp				
- starting torque		30	30	30
- end torque		150	150	150
- starting time		30	30	30
• Breakaway pulse		Deactivated (0 ms)	Deactivated (0 ms)	Deactivated (0 ms)
Ramp-down mode		Free ramp-down	Free ramp-down	Free ramp-down or DC braking

Application examples for very heavy starting (Class 30)

Very heavy starting Class 30 (up to 60 s with 350 % $I_{n\ motor}$),
The soft starter has to be selected two rating classes higher than the motor used

Application		Large fan	Mill	Breakers	Circular saw/bandsaw
Starting parameters					
• Voltage ramp and current limiting					
- starting voltage	%	30	50	50	30
- starting time	s	60	60	60	60
- current limit value		4 x I_M	4 x I_M	4 x I_M	4 x I_M
• Torque ramp					
- starting torque		20	50	50	20
- end torque		150	150	150	150
- starting time		60	60	60	60
• Breakaway pulse		Deactivated (0 ms)	80 %, 300 ms	80 %, 300 ms	Deactivated (0 ms)
Ramp-down mode		Free ramp-down	Free ramp-down	Free ramp-down	Free ramp-down

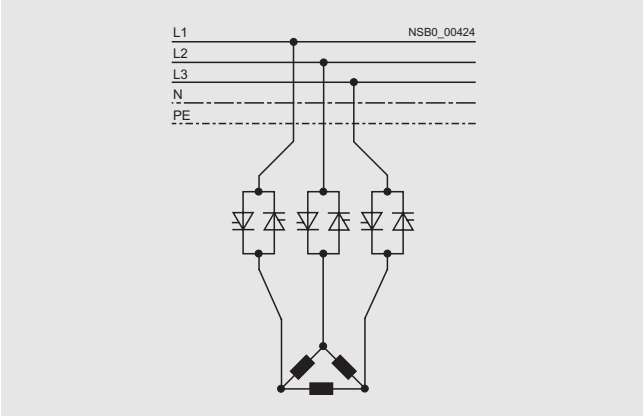
Note:
These tables present sample set values and device sizes.
They are intended only for the purposes of information and are not binding. The set values depend on the application in question and must be optimized during commissioning.
The soft starter dimensions should be checked where necessary with the Win-Soft Starter software or with the help of Technical Assistance.

Circuit concept

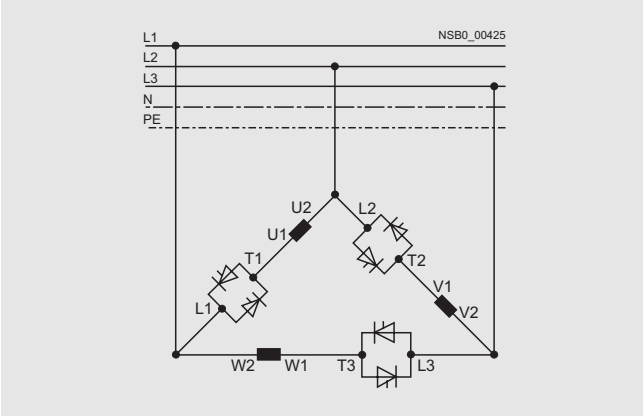
The SIRIUS 3RW44 soft starters can be operated in two different types of circuits.

- Inline circuit
  The controls for isolating and protecting the motor are simply connected in series with the soft starter. The motor is connected to the soft starter with three cables.
- Inside-delta circuit
  The wiring is similar to that of star-delta starters. The phases of the soft starter are connected in series with the individual motor windings. The soft starter then only has to carry the phase current, amounting to about 58 % of the rated motor current (conductor current).

Comparison of the types of circuits.



Inline circuit:
Rated current I_e corresponds to the rated motor current I_n,
3 cables to the motor



Inside-delta circuit:
Rated current I_e corresponds to approx. 58 % of the rated motor current I_n,
6 cables to the motor (as with star-delta starters)

Which circuit?

Using the inline circuit involves the lowest wiring outlay. If the soft starter to motor connections are long, this circuit is preferable.
With the inside-delta circuit there is double the wiring complexity but a smaller size of device can be used at the same rating.

Thanks to the choice of operating mode between the inline circuit and inside-delta circuit, it is always possible to select the most favorable solution.

The braking function is possible only in the inline circuit.

Configuration

The 3RW44 solid-state soft starters are designed for normal starting. In case of heavy starting or increased starting frequency, a larger device must be selected.

For long starting times it is recommended to have a PTC thermistor detector in the motor. This also applies for the ramp-down modes smooth ramp-down, pump ramp-down and DC braking, because during the ramp-down time in these modes, an additional current loading applies in contrast to free ramp-down.

In the motor feeder between the SIRIUS 3RW soft starter and the motor, no capacitive elements are permitted (e.g. no reactive-power compensation equipment). In addition, neither static systems for reactive-power compensation nor dynamic PFC (Power Factor Correction) must be operated in parallel during starting and ramp-down of the soft starter. This is important to prevent faults arising on the compensation equipment and/or the soft starter.

All elements of the main circuit (such as fuses and controls) should be dimensioned for direct starting, following the local short-circuit conditions. Fuses, controls and overload relays must be ordered separately.

A bypass contact system and solid-state overload relay are already integrated in the 3RW44 soft starter and therefore do not have to be ordered separately.

The harmonic component load for starting currents must be taken into consideration for the selection of motor starter protectors (selection of release).

Note:

When induction motors are switched on, voltage drops occur as a rule on starters of all types (direct starters, star-delta starters, soft starters). The infeed transformer must always be dimensioned such that the voltage dip when starting the motor remains within the permissible tolerance. If the infeed transformer is dimensioned with only a small margin, it is best for the control voltage to be supplied from a separate circuit (independently of the main voltage) in order to avoid the potential switching off of the soft starter.

Device interface, PROFIBUS DP communication module, Soft Starter ES parameterizing and operating software

The 3RW44 electronic soft starters have a PC interface for communicating with the Soft Starter ES software or for connecting the external display and operator module. If the optional PROFIBUS communications module is used, the 3RW44 soft starter can be integrated in the PROFIBUS network and communicate using the GSD file or Soft Starter ES 2007 premium software.

Manual for SIRIUS 3RW44

Besides containing all important information on configuring, commissioning and servicing, the manual also contains example circuits and the technical specifications for all devices.

Win-Soft Starter selection and simulation program

With this software, you can simulate and select all Siemens soft starters, taking into account various parameters such as mains properties, motor and load data, and special application requirements.

The software is a valuable tool, which makes complicated, lengthy manual calculations for determining the required soft starters superfluous.

The Win-Soft Starter CD-ROM can be downloaded free of charge from **www.siemens.com/lowvoltage/demosoftware**

More information can be found on the Internet at
http://www.siemens.com/softstarter

Overview

The 3RE1 encapsulated starters are available as direct-on-line starters and as reversing starters.

Direct-on-line starters

The direct-on-line starters are available in three sizes:

- Size **S00** is suitable for induction motors up to 5.5 kW with 415 V AC and a maximum rated motor current of 12 A.
- Size **S0** is suitable for induction motors up to 11 kW with 415 V AC and a maximum rated motor current of 25 A.
- Size **S2** is suitable for induction motors up to 22 kW with 400 V AC and a maximum rated motor current of 50 A. The starters are available molded-plastic enclosure for direct-on-line starters (without contactor) – in this case the contactor, auxiliary switch and overload relay must be selected and ordered separately.

Reversing starters

The reversing starters are available in two sizes:

- Size **S00** is suitable for induction motors up to 5.5 kW with 400 V AC and a maximum rated motor current of 12 A. The starters are available
- Size **S0** is suitable for induction motors up to 11 kW with 400 V AC and a maximum rated motor current of 25 A. The starters are available molded-plastic enclosure for reversing starters (without contactor assembly) – in this case the contactor assembly, auxiliary switch and overload relay must be selected and ordered separately.

Benefits

The 3RE1 encapsulated starters are enclosed with a high degree of protection (IP65) and are used for the switching and inverse-time delayed protection of loads. They are ideally suited for implementation directly at the machine.

Application

The 3RE1 encapsulated starters are used for switching and for the inverse-time delayed protection of load feeders up to 22 kW at 400 V AC.

The starters are available as direct-on-line starters for motors with a single direction of rotation and as reversing starters for motors with two directions of rotation.

Accessories

Selection and ordering data

	Version	For contactor overload relay Size	Order No.	Weight per PU approx. kg
Enclosures for direct-on-line starters				
	**Molded-plastic enclosures for surface mounting** Degree of protection IP65, with actuators, with metric cable gland			
3RE19 23-1CB2	• With PE terminal	S00	**3RE19 13-1CB1**	0.320
	• With N- and PE-terminals	S0	**3RE19 23-1CB2**	0.450
	• With N- and PE-terminals	S2	**3RE19 33-1CB3**	1.000
Enclosures for reversing starters				
	**Molded-plastic enclosures for surface mounting** Degree of protection IP65, with actuators, with metric cable gland			
3RE19 23-2CB3	• With N- and PE-terminals	S00/S0	**3RE19 13-2CB3**	1.020

Motor Starters and Soft Starters

4a

3RW30
for standard applications

Function

- Soft starting with voltage ramp; the starting voltage setting range U_s is 40 % to 100 % and the ramp time t_R can be set from 0 s to 20 s.
- Smooth ramp-down with voltage ramp; the running down time t_{off} can be set between 0 s to 20 s. The switch-off voltage U_{off} is then dependent on the selected starting voltage U_s
- Setting with three potentiometers
- Simple mounting and commissioning
- Mains voltages at 50/60 Hz 200 to 575 V
- Two control voltage versions 24 V AC/DC and 110 to 230 V AC/DC
- Wide temperature range from -25 °C to +60 °C
- Integrated bypass contacts to minimize power loss
- Two built-in auxiliary contacts in sizes S0, S2 and S3 ensure user-friendly control and possible further processing within the system

Technical specifications

Type		3RW30 03	3RW3. ..-1.B0.	3RW3. ..-1.B1.
Control electronics				
Rated control supply voltage	V	24 ... 230 AC/DC (±10 %)	24 AC/DC (+10 %/-15 %)	110 ... 230 AC/DC (+10 %/-15 %)
Rated control supply current Without fan/with fan	mA	25 ... 4	Approx. 50/approx. 180	Approx. 25 ... 20/ approx. 85 ... 80
Rated frequency for AC	Hz	50/60 ±10 %		
Starting time	s	0.1 ... 20 (adjustable)		
Starting voltage	%	40 ... 100 (adjustable)		
Ramp-down time	s	0 ... 20 (adjustable)		

Type		3RW3003	3RW3. ..-1.B.4	3RW3. ..-1.B.5	3RW30 ..-1AA12
Power electronics					
Rated operational voltage	V	200 ... 400 AC, 3-phase (±10 %)	200 ... 460 AC, 3-phase (±10 %)	460 ... 575 AC, 3-phase (+10 %/-15 %)	115 ... 240 AC, 1-phase (±10 %)
Rated frequency Tolerance	Hz %	50 ... 60 ±10			
Permissible installation altitude	m	5000 (derating from 1000, see characteristic curves); higher on request			
Mounting position					
• Without auxiliary fan		The soft starters have been designed for operation on a vertical mounting surface (+10°/-10°).			
• With auxiliary fan		—	Any mounting position (except vertical, rotated by 180°)		

Type Size		3RW30 03	3RW30 1. S00	3RW3. 2. S0	3RW30 3. S2	3RW30 4. S3
Continuous duty (% of I_e)	%	100				
Minimum load[1] (% of I_e); at 40 °C	%	9	4			
Permissible ambient temperature						
• Operation	°C	-25 ... +60; (derating from +40, see load rating)				
• Storage	°C	-25 ... +80				
Switching capacity of the auxiliary contacts						
• 230 V/AC-15	A	No aux. contacts available		3	3	3
• 230 V/DC-13	A			0.1	0.1	0.1
• 24 V/DC-13	A			1	1	1

[1] The rated motor current (specified on the motor's name plate) should at least amount to the specified percentage of the SIRIUS soft starter unit's rated operational current *I*e.

Type			3RW30 03	3RW30 14	3RW30 16	3RW3. 24	3RW3. 25	3RW3. 26
Load capacity								
Rated operational current *Ie*								
• Acc. to IEC for individual mounting, AC-53a								
- at 40 °C		A	—	6	9	12.5	16	25
- at 50 °C		A	—	5	8	11	14	21
- at 60 °C		A	—	4	7	9	12	18
• Acc. to UL/CSA for individual mounting, AC-53a								
- at 40 °C		A	—	4.8	7.8	11	17.5	25
- at 50 °C		A	—	4.8	7.8	11	14	21
- at 60 °C		A	—	4	7	9	12	18
• Acc. to IEC/UL/CSA for individual mounting, AC-53a								
- at 40 °C		A	3	—				
- at 50 °C		A	2.6	—				
- at 60 °C		A	2.2	—				
• Acc. to IEC/UL/CSA for butt-mounting, AC-53a								
- at 40 °C		A	2.6	—				
- at 50 °C		A	2.2	—				
- at 60 °C		A	1.8	—				
Power loss								
At uninterrupted rated operational current (40 °C) approx.		W	6.5	5	7	7	9	13
At utilization of max. switching frequency		W	3	5	6	7	8	9
Permissible starts per hour when not using a fan								
• For intermittent duty S4, T_u = 40 °C, stand-alone installation vertical		1/h	1500	60	40	30		12
• ON period = 30 %		% I_e/s	—	250/2		300/2		
• ON period = 70 %		% I_e/s	300/0.2	—				
Permissible starts per hour when using a fan for intermittent duty S4, T_u = 40 °C ON period = 30 %; stand-alone installation		1/h	Fans cannot be fitted			54		21
Dead time intervals after continuous duty with *Ie* before a new start		s	0					200
Degree of protection	Acc. to IEC 60529		IP20 (IP00 terminal compartment)					
Maximum conductor length between soft starter and motor		m	100[1]					
Conductor cross-sections								
Screw terminals	• **Main conductors**							
(1 or 2 conductors connectable)	- solid	mm²	1 x (0.5 ... 4); 2 x (0.5 ... 2.5)	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2]		2 x (1 ... 2.5)[2]; 2 x (2.5 ... 6)[2]		
For standard screwdriver size 2 and Pozidriv 2	- finely stranded with end sleeve	mm²	1 x (0.5 ... 2.5); 2 x (0.5 ... 1.5)	2 x (0.5 ... 2.5)		2 x (1 ... 2.5)[2]; 2 x (2.5 ... 6)[2]		
	- stranded	mm²	—	—		—		
	- AWG cables solid or stranded	AWG	2 x (20 ... 14)	2 x (18 ... 14)		2 x (14 ... 10)		
	- terminal screws		M3, PZ2	M3, PZ2		M4, PZ2		
	- tightening torque	Nm	0.8 ... 1.2			2 ... 2.2		
		lb.in	7.1 ... 8.9	7 ... 10.3		18 ... 22		
	• **Auxiliary conductors**							
	- solid	mm²	1 x (0.5 ... 4); 2 x (0.5 ... 2.5)	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2] 0.75) acc. to IEC 60947; max. 2 x (0.75 ... 4)				
	- finely stranded with end sleeve	mm²	1 x (0.5 ... 2.5)[2] 2 x (0.5 ... 1.5)	2 x (0.5 ... 1.5)[2]; 2 x (0.75 ... 2.5)[2]				
	- AWG cables, solid or stranded	AWG	2 x (20 ... 14)	2 x (18 ... 14)				
	- terminal screws		M3, PZ2					
	- tightening torque	Nm	0.8 ... 1.2	0.8 ... 1				
		lb.in	7 ... 8.9	7.1 ... 8.9				

[1] If this value is exceeded, problems with line capacities may arise, which can result in false firing.

[2] If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

3RW30
for standard applications

Type			3RW30 34	3RW30 35	3RW30 36	3RW30 44	3RW30 45	3RW30 46
Power electronics								
Load rating								
With rated operational current I_e								
• Acc. to IEC for individual mounting, AC-53a								
- at 40 °C		A	32	38	45	63	75	100
- at 50 °C		A	27	32	38	54	64	85
- at 60 °C		A	23	27	32	46	54	72
• Acc. to UL/CSA for individual mounting, AC-53a								
- at 40 °C		A	27	34	42	62	68	99
- at 50 °C		A	27	32	38	54	64	85
- at 60 °C		A	23	27	32	46	54	72
Power loss								
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.		CO	10	13	17	13	16	26
• With utilization of max. switching frequency (40 °C)		W	11	11	10	18	29	26
Permissible starts per hour when not using a fan								
• For intermittent duty S4, T_u = 40 °C, stand-alone installation vertical		1/h	20	15	5	20	30	15
• ON period = 30 %		% I_e/s	300 /3			300 /4		
Permissible starts per hour when using a fan For intermittent duty S4, T_u = 40 °C, ON period = 30 %; stand-alone installation		1/h	44	27	9	32	48	24
Dead time intervals after continuous duty With I_e before a new start		s	0		400	0		
Degree of protection	Acc. to IEC 60529		IP20 (IP00 terminal compartment)			IP20[1]		
Maximum conductor length between soft starter and motors		m	100					
Conductor cross-sections								
Screw terminals (1 or 2 conductors connectable) For standard screwdriver size 2 and Pozidriv 2	• **Main conductors:**							
	- solid	mm²	2 x (0.75 ... 16)					
	- finely stranded with end sleeve	mm²	2 x (0.75 ... 16) 1 x (0.75 ... 25)					
	- stranded	mm²	2 x (0.75 ... 25) 1 x (0.75 ... 35)			2 x (10 ... 50) 1 x (10 ... 70)		
	- AWG cables, solid or stranded	AWG	2 x (18 ... 3) 1 x (18 ... 2)			2 x (10 ... 1/0); 1 x (10 ... 2/0)		
	- terminal screws		M6, box terminal, PZ2			M6, hexagon socket		
	- tightening torque	Nm lb.in	3 ... 4.5 27 ... 40			4 ... 6 35 ... 53		
	• **Auxiliary conductors:**							
	- solid	mm²	2 x (0.5 ... 1.5)[3]; 2 x (0.75 ... 2.5)[3] acc. to IEC 60947; max. 2 x (0.75 ... 4)					
	- finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[3]; 2 x (0.75 ... 2.5)[3]					
	- AWG cables, solid or stranded	AWG	2 x (18 ... 14)					
	- terminal screws		M3					
	- tightening torque	Nm lb.in	0.8 ... 1 7.1 ... 8.9					

[1] IP20 only with installed box terminal ('as-delivered').Without box terminal IP00.

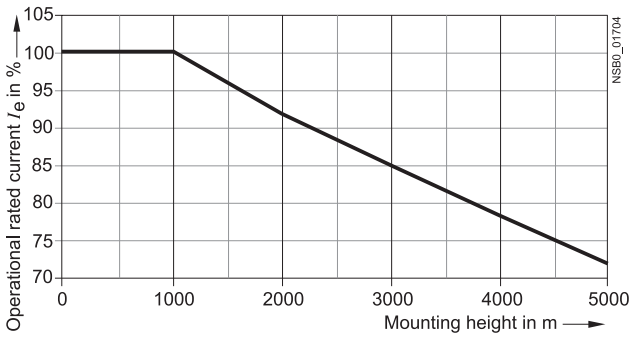
[2] If this value is exceeded, problems with line capacities may arise, which can result in false firing.

[3] If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

	Standard	Parameters
Electromagnetic compatibility according to EN 60947-4-2		
EMC interference immunity		
Electrostatic discharge (ESD)	IEC 61000-4-2	Degree of severity 3: 6/8 kV
Electromagnetic RF fields	EN 60947-4-2	Frequency range: 80 to 1000 MHz with 80 % at 1 kHz Degree of severity 3, 10 V/m
Conducted RF interference	IEC 61000-4-6 EN 60947-4-2 SN-IACS	Frequency range: 80 to 1000 MHz with 80 % at 1 kHz 10 V bei 0.15 ... 80 MHz 3 V at 10 kHz ... 80 MHz
Burst	IEC 61000-4-4	Degree of severity 3: 1/2 kV
Surge	IEC 61000-4-5	Degree of severity 3: 1/2 kV
EMC interference emission		
EMC interference field strength	CISPR 11/09. 1990	Limit value of Class B at 30 to 1000 MHz
Radio interference voltage	CISPR 11/09. 1990 EN 60947-4-2	(0.15 ... 30 MHz): Unit Class A (industry)

Characteristic curves

Permissible installation height



At an installation height above 2000 m, the max. permissible operational voltage is reduced to 460 V.

More information

Configuration

The 3RW solid-state motor controllers are designed for easy starting conditions. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For accurate dimensioning, use the Win-Soft Starter selection and simulation program.

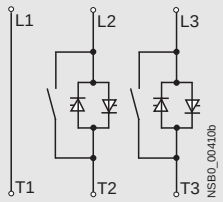
If necessary, an overload relay for heavy starting must be selected where long starting times are involved. PTC sensors are recommended. This also applies for the smooth ramp-down because during the rampdown time an additional current loading applies in contrast to free rampdown.

In the motor feeder between the SIRIUS 3RW soft starter and the motor, no capacitive elements are permitted (e.g. no reactive-power compensation equipment). In addition, neither static systems for reactive-power compensation nor dynamic PFC (Power Factor Correction) must be operated in parallel during starting and ramp-down of the soft starter. This is important to prevent faults arising on the compensation equipment and/or the soft starter.

All elements of the main circuit (such as fuses, controls and overload relays) should be dimensioned for direct starting, following the local short-circuit conditions. Fuses, controls and overload relays must be ordered separately. Please observe the maximum switching frequencies specified in the technical specifications.

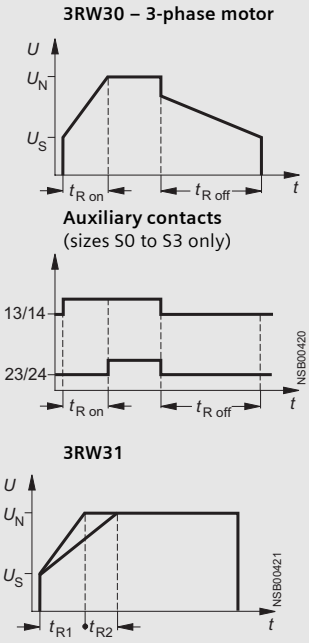
Note:
When induction motors are switched on, voltage drops occur as a rule on starters of all types (direct starters, star-delta starters, soft starters). The infeed transformer must always be dimensioned such that the voltage dip when starting the motor remains within the permissible tolerance. If the infeed transformer is dimensioned with only a small margin, it is best for the control voltage to be supplied from a separate circuit (independently of the main voltage) in order to avoid the potential switching off of the soft starter.

Power electronics circuit diagram[1)]



[1)] Schematic circuit diagram applies to sizes S0 and S2;
for size S00, phase L3 is bridged;
for size S3, phase L2 is bridged.

Status graphs



Control with a PLC

When a 3RW30 is operated with a Triac output or thyristor output, the leakage current at the PLC output should be < 1 mA because otherwise the 3RW30 will interpret the resultant voltage drop at the input as an "On command". As a corrective measure for PLC outputs with a higher leakage current, an RC element with > 100 nF and 220 W can be connected in series between "IN1" and terminal "A2" of the 3RW30.

Win-Soft Starter selection and simulation program

With this software, you can simulate and select all Siemens soft starters, taking into account various parameters such as mains properties, motor and load data, and special application requirements.

The software is a valuable tool, which makes complicated, lengthy manual calculations for determining the required soft starters superfluous.

The Win-Soft Starter CD-ROM can be downloaded free of charge from

www.siemens.com/lowvoltage/demosoftware

You can find more information on the Internet at:
http://www.siemens.com/softstarter

3RW40
for standard applications

Function

SIRIUS 3RW40 soft starters have all the same advantages as the 3RW30/31 soft starters. At the same time they come with additional functions and a two-phase control method (Polarity Balancing) that is unique in the performance range up to 250 kW. Starting voltage, starting and ramp-down time of the voltage ramp and current limit are all easy to set using stepless rotary potentiometers, the same as on the SIRIUS 3RW30/31. The rated motor current, the setting of the tripping time and the resetting of the motor overload function are controlled like the SIRIUS overload relays by means of potentiometers and keys. Once again there is nothing new to get used to.

SIRIUS 3RW40 comes with the new, patented control method called "Polarity Balancing", which is designed to prevent direct current components in two-phase controlled soft starters. On two-phase controlled soft starters the current resulting from superimposition of the two controlled phases flows in the uncontrolled phase. This results for physical reasons in an asymmetric distribution of the three phase currents during the starting operation of the motor. This phenomenon cannot be influenced, but in most applications it is non-critical. Controlling the power semiconductors in the two controlled phases results not only in this asymmetry, however, but also in the previously mentioned direct current components which can cause severe noise generation on the motor at starting voltages of less than 50 %. "Polarity Balancing" reliably eliminates these direct current components during the ramp-up phase. It creates a motor ramp-up that is uniform in speed, torque and current rise. At the same time the acoustic quality of the starting operation comes close to the quality of a three-phase controlled starting operation. This is made possible by the on-going dynamic balancing of current half-waves of different polarity during the motor ramp-up.

The SIRIUS 3RW40 is equipped with optimum functionality. An integral bypass contact system reduces the power loss of the soft starter during operation. This reliably prevents heating of the switchgear environment. Using a 4-step rotary potentiometer it is possible to set different overload tripping times. Thanks to the integral motor overload protection to IEC 60947-4-2 there is no need of an additional overload relay. Device variants with integrated thermistor motor protection (PTC type A of Thermoclick) are available as an option for the sizes S0 to S3. This saves space in the control cabinet and wiring outlay in the feeder. Internal intrinsic device protection prevents in addition the thermal overloading of the thyristors and the power section defects this can cause.

As an option the thyristors can also be protected by SITOR semiconductor fuses from short-circuiting so that the soft starter is still functional after a short-circuit (coordination type 2). And even inrush current peaks are reliably avoided thanks to adjustable current limiting. Three LEDs are used to indicate the operating state as well as possible errors, e.g. non-permissible tripping time (CLASS setting), mains or phase failure, missing load, thermal overloading or device faults.

We offer a comprehensive range of accessories for our soft starters. Examples include box terminal blocks, accessories for mechanical reset and a module for remote reset (size S6 or larger) or a sealing cover or easy-to-fit terminal covers for optimum touch protection.

- Soft starting with voltage ramp; the starting voltage setting range U_s is 40 to 100 % and the ramp time t_R can be set from 0 to 20 s.
- Smooth ramp-down with voltage ramp; the running down time t_{off} can be set between 0 s to 20 s. The switch-off voltage U_{off} is then dependent on the selected starting voltage U_s.
- Solid-state motor overload and intrinsic device protection
- Optional thermistor motor protection (up to size S3)
- Remote reset (integrated up to size S3, optional for size S6 and larger)
- Adjustable current limiting
- Integrated bypass contact system to minimize power loss
- Setting with potentiometers
- Simple mounting and commissioning
- Integrated status monitoring and fault monitoring
- Mains voltages 50/60 Hz, 200 to 600 V
- Various control voltage versions
  - sizes S0 to S3:
    24 VAC/DC and
    110 ... 230 VAC/DC
  - sizes S6 to S12:
    115 VAC and 230 VAC.
    Control by way of the internal 24 V DC supply and direct control by means of PLC possible.
- Wide temperature range from -25 to +60 °C
- Built-in auxiliary contacts ensure user-friendly control and possible further processing within the system

Technical specifications

Type				3RW40 2.		3RW40 3., 3RW40 4.	
Control electronics							
Rated values		Terminal					
Rated control supply voltage		A1/A2	V	24	110 ... 230	24	110 ... 230
• Tolerance			%	±20	-15/+10	±20	-15/+10
Rated control supply current							
• STANDBY			mA	< 150	< 50	< 200	< 50
• During pick-up			mA	< 200	< 100	< 5000	< 1500
• ON without fan			mA	< 250	< 50	< 200	< 50
• ON with fan			mA	< 300	< 70	< 250	< 70
Rated frequency			Hz	50/60			
• Tolerance			%	±10			
Control inputs							
IN				ON/OFF			
Rated operational current							
• AC			mA	Approx. 12	3/6	Approx. 12	3/6
• DC			mA	Approx. 12	1.5/3	Approx. 12	1.5/3
Relay outputs							
Output 1	ON/RUN mode[1]	13/14		Operating indication (NO)			
Output 2	BYPASSED	23/24		Bypass indication (NO)			
Output 3	OVERLOAD/FAILURE	95/96/98		Overload/error indication (NC/NO)			
Rated operational current			A	3 AC-15/AC-14 at 230 V,			
			A	1 DC-13 at 24 V			
Protection against overvoltages				Protection by means of varistor through contact			
Short-circuit protection				4 A gL/gG operational class; 6 A quick (fuse is not included in scope of supply)			

[1] Factory default: ON mode.

Type				3RW40 5.		3RW40 7 .	
Control electronics							
Rated values		Terminal					
Rated control supply voltage		A1/A2	VAC	115	230	115	230
• Tolerance			%	-15/+10		-15/+10	
Rated control supply current STANDBY			mA	15		15	
Rated control supply current ON[1]			mA	440	200	660	360
Rated frequency			Hz	50/60		50/60	
• Tolerance			%	±10		±10	
Control inputs							
IN				ON/OFF			
Rated operational current			mA	Approx. 10 acc. to DIN 19240			
Rated operational voltage			V DC	24 from internal supply dc+ or external DC supply (acc. to DIN 19240) through terminals and IN			
Relay outputs							
Output 1	ON/RUN mode[2]	13/14		Operating indication (NO)			
Output 2	BYPASSED	23/24		Bypass indication (NO)			
Output 3	OVERLOAD/FAILURE	95/96/98		Overload/error indication (NC/NO)			
Rated operational current			A	3 AC-15/AC-14 at 230 V,			
			A	1 DC-13 at 24 V			
Protection against overvoltages				Protection by means of varistor through contact			
Short-circuit protection				4 A gL/gG operational class; 6 A quick (fuse is not included in scope of supply)			

[1] Values for the coil power consumption at +10 % *U*n, 50 Hz.

[2] Factory default: ON mode.

Type			3RW40 2., 3RW40 3., 3RW40 4.		
Control electronics					
Operating indications	LED		**DEVICE**	**STATE/BYPASSED/FAILURE**	**OVERLOAD**
Off			Green	Off	Off
Start			Green	Green	flashing Off
Bypass			Green	Green	Off
Ramp-down			Green	Green flashing	Off
Alarm signals					
I_e/class setting not permissible			Green	Not relevant	Red flashing
Start inhibited/thyristors too hot			Yellow flashing	Not relevant	Off
Error signals					
• 24V:	$U < 0.75 \times U_s$ or $U > 1.25 \times U_s$		Off	Red	Off
• 110 ... 230 V:	$U < 0.75 \times U_s$ or $U > 1.15 \times U_s$		Off	Red	Off
Non-permissible I_e/Class setting for edge 0 –> 1 on input IN			Green	Red	Red flashing
Motor protection shut-down			Green	Off	Red
Thermistor motor protection disconnection			Green	Off	Red flickering
Thermal overloading of the thyristors			Yellow	Red	Off
Missing mains voltage, phase failure, missing load			Green	Red	Off
Device fault			Red	Red	Off

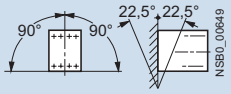
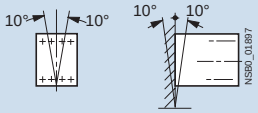
3RW40
for standard applications

Type			3RW40 5. and 3RW40 7.			
Control electronics						
Operating indications		LED	**DEVICE**	**STATE/BYPASSED**	**FAILURE**	**OVERLOAD**
Off			Green	Off	Off	Off
Start			Green	Green flashing	Off	Off
Bypass			Green	Green	Off	Off
Ramp-down			Green	Green flashing	Off	Off
Alarm signals						
I_e/class setting not permissible			Green	Not relevant	Not relevant	Red flashing
Start inhibited/thyristors too hot			Yellow flashing	Not relevant	Not relevant	Off
Error signals						
$U < 0.75 \times U_s$ or $U > 1.15 \times U_s$			Off	Off	Red	Off
Non-permissible I_e/Class setting for edge 0 –> 1 on input IN			Green	Off	Red	Red flashing
Motor protection shut-down			Green	Off	Off	Red
Thermal overloading of the thyristors			Yellow	Off	Red	Off
Missing mains voltage, phase failure, missing load			Green	Off	Red	Off
Device fault			Red	Off	Red	Off

Type			3RW40 . .	
				Factory default
Protection functions				
Motor protection functions				
Trips in the event of			Thermal overloading of the motor	
Trip class to IEC 60947-4-1		Class	10/15/20	10
Phase failure sensitivity		%	> 40	
Overload warning			No	
Thermistor protection acc. to IEC 60947-8, type A/IEC 60947-5-1			Yes[1]	
Reset option after tripping			Manual/automatic/remote reset[2] (MAN/AUTO/REMOTE[2])	
Recovery time		min	5	
Device protection functions				
Trips in the event of			Thermal overloading of the thyristors or bypass	
Reset option after tripping			Manual/automatic/remote reset[2] (MAN/AUTO/REMOTE[2])	
Recovery time				
• During overloading of the thyristors		s	30	
• During overloading of the bypass		s	60	
Control times and parameters				
Control times				
Closing delay (with connected control voltage)		ms	< 50	
Closing delay (automatic/mains contactor mode)		ms	< 300	
Recovery time (closing command in active ramp-down)		ms	100	
Mains failure bridging time				
Control supply voltage		ms	50	
Mains failure response time				
Load current circuit		ms	500	
Reclosing lockout after overload trip				
Motor protection trip		min	5	
Device protection trip				
• During overloading of the thyristors		s	30	
• During overloading of the bypass		s	60	
Starting parameters				
Starting time		s	0 ... 20	7.5
Starting voltage		%	40 ... 100	40
Starting current limit			1.3 ... 5 x I_e	5 x I_e
Ramp-down parameters				
Ramp-down time		s	0 ... 20	0
Reset mode parameters (for motor/device protection shut-down)				
Manual reset	LED		Off	Off
Automatic reset	LED		Yellow	
Remote reset (REMOTE)[2]	LED		Green	
Start-up detection			Yes	
Operating mode output 13/14				
Rising edge at	Start command			
Falling edge at	Off command		ON	ON
	Ramp-down end		RUN	

[1] Optional up to size S3 (device variant).

[2] Integrated remote reset (REMOTE) available only for 3RW40 2. to 3RW40 4.; remote reset with 3RU19 accessory module available for 3RW40 5. and 3RW40 7..

Type		3RW40 2.-. .B.4, 3RW40 3.-. .B.4, 3RW40 4.-. .B.4	3RW40 2.-. .B.5, 3RW40 3.-. .B.5, 3RW40 4.-. .B.5	3RW40 5.-.BB.4, 3RW40 7.-.BB.4	3RW40 5.-.BB.5, 3RW40 7.-.BB.5
Power electronics					
Rated operational voltage Tolerance	VAC %	200 ... 480 -15/+10	400 ... 600 -15/+10	200 ... 460 -15/+10	400 ... 600 -15/+10
Rated frequency Tolerance	Hz %	50/60 ±10			
Continuous duty at 40 °C (% of I_e)	%	115			
Minimum load (% of set motor current I_M)	%	20		15	
Maximum cable length between soft starter and motor	m	300			
Permissible installation height	m	5000 (derating from 1000, see characteristic curves); higher on request			
Permissible mounting position					
• With auxiliary fan (for 3RW40 2. ... 3RW40 4.)					
• Without auxiliary fan (for 3RW40 2. ... 3RW40 4.)				— (fan integrated in the soft starter)	
Permissible ambient temperature Operation Storage	 °C °C	 -25 ... +60; (derating from +40) -40 ... +80			
Degree of protection		IP20 for 3RW40 2.; IP00 for 3RW40 3. and 3RW40 4.		IP00	

Type		3RW40 24	3RW40 26	3RW40 27	3RW40 28
Power electronics					
Load rating with rated operational current I_e • Acc. to IEC and UL/CSA[1], for individual mounting, AC-53a					
- at 40 °C	A	12.5	25.3	32.2	38
- at 50 °C	A	11	23	29	34
- at 60 °C	A	10	21	26	31
Smallest adjustable rated motor current I_M For the motor overload protection	A	5	10	17	23
Power loss					
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	W	2	8	13	19
• During starting with current limit set to 300 % I_M (40°C)	W	17	47	55	64
Permissible rated motor current and starts per hour					
• For normal starting (Class 10)					
- rated motor current I_M[2], starting time 3 s	A	12.5	25	32	38
- starts per hour[3]	1/h	50	23	23	19
- rated motor current I_M[2][4], starting time 4 s	A	12.5	25	32	38
- starts per hour[3]	1/h	36	15	16	12
• For heavy starting (Class 15)					
- rated motor current I_M[2], starting time 4.5 s	A	11	23	30	34
- starts per hour[3]	1/h	49	21	18	18
- rated motor current I_M[2][4], starting time 6 s	A	11	23	30	34
- starts per hour[3]	1/h	36	14	13	13
• For heavy starting (Class 20)					
- rated motor current I_M[2], starting time 6 s	A	10	21	27	31
- starts per hour[3]	1/h	47	21	20	18
- rated motor current I_M[2][4], starting time 8 s	A	10	21	27	31
- starts per hour[3]	1/h	34	15	14	13

[1] Measurement at 60 °C according to UL/CSA not required.

[2] Current limit on soft starter set to 300 % I_M.

[3] For intermittent duty S4 with ON period = 30 %, T_u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4] Maximum adjustable rated motor current I_M, dependent on CLASS setting.

3RW40
for standard applications

Type		3RW40 36	3RW40 37	3RW40 38	3RW40 46	3RW40 47
Power electronics						
Load rating with rated operational current I_e						
• Acc. to IEC and UL/CSA1), for individual mounting, AC-53a						
- at 40 °C	A	45	63	72	80	106
- at 50 °C	A	42	58	62,1	73	98
- at 60 °C	A	39	53	60	66	90
Smallest adjustable rated motor current I_M						
For the motor overload protection	A	23	26	35	43	46
Power loss						
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	W	6	12	15	12	21
• During starting with current limit set to 300 % IM (40°C)	W	79	111	125	144	192
Permissible rated motor current and starts per hour						
• For normal starting (Class 10)						
- rated motor current I_M[2)], starting time 3 s	A	45	63	72	80	106
- starts per hour[3)]	1/h	38	23	22	22	15
- rated motor current I_M[2)4)], starting time 4 s	A	45	63	72	80	106
- starts per hour3)	1/h	26	15	15	15	10
• For heavy starting (Class 15)						
- rated motor current I_M[2)], starting time 4.5 s	A	42	50	56	70	84
- starts per hour[3)]	1/h	30	34	34	24	23
- rated motor current I_M[2)4)], starting time 6 s	A	42	50	56	70	84
- starts per hour[3)]	1/h	21	24	24	16	17
• For heavy starting (Class 20)						
- rated motor current I_M[2)], starting time 6 s	A	38	46	50	64	77
- starts per hour[3)]	1/h	30	31	34	23	23
- rated motor current I_M[2)4)], starting time 8 s	A	38	46	50	64	77
- starts per hour[3)]	1/h	21	22	24	16	16

[1)] Measurement at 60 °C according to UL/CSA not required.

[2)] Current limit on soft starter set to 300 % IM.

[3)] For intermittent duty S4 with ON period = 30 %, T_u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4)] Maximum adjustable rated motor current I_M, dependent on CLASS setting.

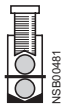
Type		3RW40 55	3RW40 56	3RW40 73	3RW40 74	3RW40 75	3RW40 76
Power electronics							
Load rating with rated operational current I_e							
• Acc. to IEC and UL/CSA1), for individual mounting, AC-53a							
- at 40 °C	A	134	162	230	280	356	432
- at 50 °C	A	117	145	205	248	315	385
- at 60 °C	A	100	125	180	215	280	335
Smallest adjustable rated motor current I_M							
For the motor overload protection	A	59	87	80	130	131	207
Power loss							
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	W	60	75	75	90	125	165
• During starting with current limit set to 350 %[2)] I_M (40°C)	W	1043	1355	2448	3257	3277	3600
Permissible rated motor current and starts per hour							
• For normal starting (Class 10)							
- rated motor current I_M[2)], starting time 10 s	A	134	162	230	280	356	432
- starts per hour[3)]	1/h	20	8	14	20	16	17
- rated motor current I_M[2)4)], starting time 20 s	A	134	162	230	280	356	432
- starts per hour[3)]	1/h	7	1.4	3	8	5	5
• For heavy starting (Class 15)							
- rated motor current I_M[2)], starting time 15 s	A	134	152	210	250	341	402
- starts per hour[3)]	1/h	11	8	11	13	11	12
- rated motor current I_M[2)4)], starting time 30 s	A	134	152	210	250	341	402
- starts per hour[3)]	1/h	1.2	1.7	1	6	2	2
• For heavy starting (Class 20)							
- rated motor current I_M[2)], starting time 20 s	A	124	142	200	230	311	372
- starts per hour[3)]	1/h	12	9	10	10	10	10
- rated motor current I_M[2)4)], starting time 40 s	A	124	142	200	230	311	372
- starts per hour[3)]	1/h	2	2	1	5	1	1

[1)] Measurement at 60 °C according to UL/CSA not required.

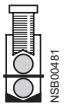
[2)] Current limit on soft starter set to 350 % I_M.

[3)] For intermittent duty S4 with ON period = 70 %, Tu = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4)] Maximum adjustable rated motor current I_M, dependent on CLASS setting.

Soft starters	Type		3RW40 2.	3RW40 3.	3RW40 4.
Conductor cross-sections					
Both clamping points connected	• Solid	mm²	2 x (1.5 ... 2.5); 2 x (2.5 ... 6) acc. to IEC 60947; max. 1 x 10	2 x (1.5 ... 16)	2 x (2.5 ... 16)
	• With end sleeve	mm²	2 x (1.5 ... 2.5); 2 x (2.5 ... 6)	2 x (1.5 ... 16)	2 x (2.5 ... 35)
	• Stranded	mm²	—	2 x (1.5 ... 25)	2 x (10 ... 50)
	• AWG cables				
	- solid or stranded (finely stranded)	AWG	2 x (14 ... 10)	2 x (16 ... 2)	1 x (10 ... 2/0)
	- stranded	AWG	1 x 8	—	—
	• Tightening torque	Nm lb.in	2 ... 2.5 18 ... 22	4.5 40	6.5 58
	Tools		PZ 2	PZ 2	Allen screw 4 mm
	Degree of protection		IP20	IP20 (IP00 terminal compartment)	IP20 (IP00 terminal compartment)
Busbar connections	**Main conductor**				
	• With cable lug acc. to DIN 46234 or max. 20 mm wide				
	- stranded	mm²	—		2 x (10 ... 70)
	- finely stranded	mm²	—		2 x (10 ... 50)
	• AWG cables, solid or stranded	AWG	—		2 x (7 ... 1/0)

3RW40
for standard applications

Soft starters	Type		3RW40 5.	3RW40 7.
Conductor cross-sections				
Both clamping points connected 	• Finely stranded with end sleeve	mm²	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Finely stranded without end sleeve	mm²	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Stranded	mm²	Max. 2 x 70	Max. 2 x 70; max. 2 x 240
	• Ribbon cable conductors (number x width x thickness)	mm	Max. 2 x (6 x 15.5 x 0.8)	Max. 2 x (20 x 24 x 0.5)
	• AWG cables, solid or stranded	AWG	Max. 2 x 1/0	Min. 2 x 2/0 Max. 2 x 500 kcmil
	• Terminal screws		M10 (hexagon socket, A/F4)	M12 (hexagon socket, A/F5)
	- tightening torque	Nm	10 ... 12	20 ... 22
		lb.in	90 ... 110	180 ... 195
Screw terminals	**Main conductors:**			
	Without box terminal/busbar connection			
	• Finely stranded with cable lug	mm²	16 ... 95[1]	50 ... 240[2]
	• Stranded with cable lug	mm²	25 ... 120[1]	70 ... 240[2]
	• AWG cables, solid or stranded	AWG	4 ... 250 kcmil	2/0 ... 500 kcmil
	• Connecting bar (max. width)	mm	17	25
	• Terminal screws		M8 x 25 (A/F13)	M10 x 30 (A/F17)
	- tightening torque	Nm	10 ... 14	14 ... 24
		lb.in	89 ... 124	124 ... 210

[1] When connecting cable lugs to DIN 46235, use 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.

[2] When connecting cable lugs to DIN 46234, the 3RT19 66-4EA1 terminal cover must be used for conductor cross-sections of 240 mm² and more as well as DIN 46235 for conductor cross-sections of 185 mm² and more to keep the phase clearance.

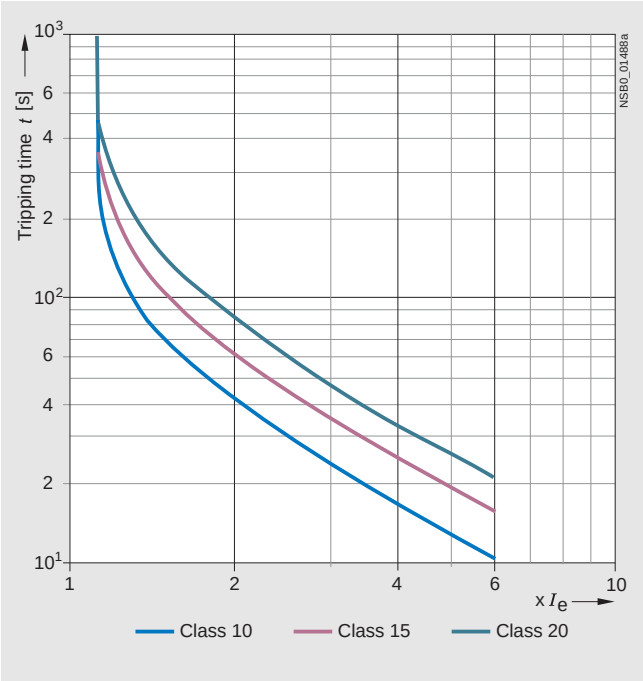
Soft starters	Type		3RW40 . .
Conductor cross-sections			
Auxiliary conductors (1 or 2 conductors can be connected)**:**			
	Screw terminals		
	• Solid	mm²	2 x (0.5 ... 2.5)
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)
	• AWG cables		
	- solid or stranded	AWG	2 x (20 ... 14)
	- finely stranded with end sleeve	AWG	2 x (20 ... 16)
	• Terminal screws		
	- tightening torque	Nm	0,8 ... 1.2
		lb.in	7 ... 10.3

	Standard	Parameters
Electromagnetic compatibility acc. to EN 60947-4-2		
EMC interference immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	±4 kV contact discharge, ±8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Frequency range: 80 ... 1000 MHz with 80 % at 1 kHz Degree of severity 3: 10 V/m
Conducted RF interference	EN 61000-4-6	Frequency range: 150 kHz ... 80 MHz with 80 % at 1 kHz Interference 10 V
RF voltages and RF currents on cables		
• Burst	EN 61000-4-4	±2 kV/5 kHz
• Surge	EN 61000-4-5	±1 kV line to line ±2 kV line to earth
EMC interference emission		
EMC interference field strength	EN 55011	Limit value of Class A at 30 ... 1000 MHz, limit value of Class B with 3RW40 2. 24 VAC/DC
Radio interference voltage	EN 55011	Limit value of Class A at 0.15 ... 30 MHz, limit value of Class B with 3RW40 2. 24 VAC/DC
Is an RI suppression filter necessary?		
Degree of noise suppression A (industrial applications)	No	
Degree of noise suppression B (applications for residential areas) Control voltage • 230 V AC/DC • 24V AC/DC	Not available[1)] No for 3RW40 2.; yes for 3RW40 3. and 3RW40 4.	

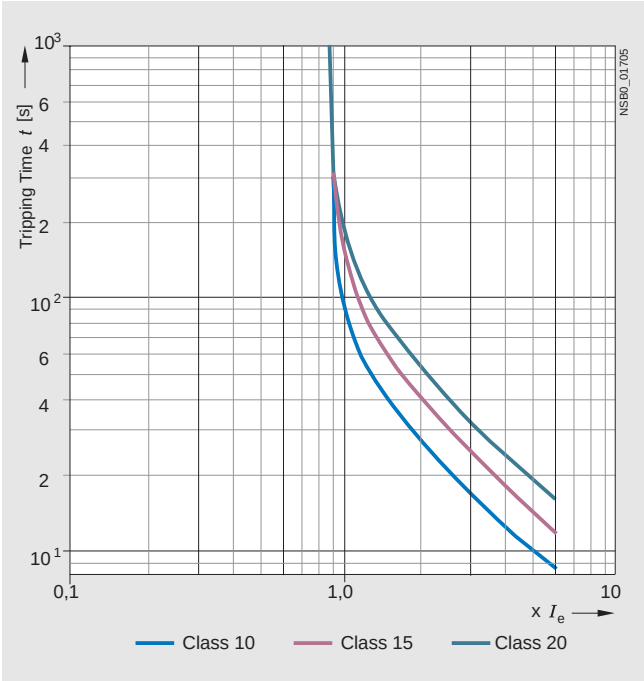
[1)] Degree of noise suppression B cannot be obtained through the use of filters as the strength of the electromagnetic field is not attenuated by the filter.

Characteristic curves

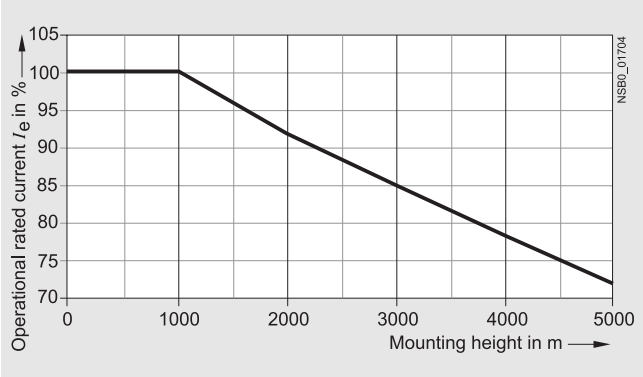
Motor protection tripping characteristics for 3RW40 (with symmetry)



Motor protection tripping characteristics for 3RW40 (with asymmetry)



Permissible installation height



At an installation height above 2000 m, the max. permissible operational voltage is reduced to 460 V.

More information

Application examples for normal starting (Class 10)

Normal starting Class 10 (up to 20 s with 350 % $I_{n\ motor}$),
The soft starter rating can be selected to be as high as the rating of the motor used.

Application		Conveyor belt	Roller conveyor	Compressor	Small fan	Pump	Hydraulic pump
Starting parameters							
• Voltage ramp and current limiting							
- starting voltage	%	70	60	50	40	40	40
- starting time	s	10	10	10	10	10	10
- current limit value		5 x *I*M	5 x *I*M	4 x *I*M	4 x I_M	4 x I_M	4 x I_M
Ramp-down time	s	5	5	0	0	10	0

Application examples for heavy starting (Class 20)

Heavy starting Class 20 (up to 40 s with 350 % $I_{n\ motor}$),
The soft starter has to be selected at least one rating class higher than the motor used.

Application		Stirrer	Centrifuge
Starting parameters			
• Voltage ramp and current limiting			
- starting voltage	%	40	40
- starting time	s	20	20
- current limit value		4 x I_M	4 x I_M
Ramp-down time		0	0

Note:

These tables present sample set values and device sizes. They are intended only for the purposes of information and are not binding. The set values depend on the application in question and must be optimized during commissioning.

The soft starter dimensions should be checked where necessary with the Win-Soft Starter software or with the help of Technical Assistance.

Function

Equipped with modern, ergonomic user prompting the SIRIUS 3RW44 soft starters can be commissioned quickly and easily using a keypad and a menu-prompted, multi-line graphic display with background lighting. The optimized motor ramp-up and ramp-down can be effected quickly, easily and reliably by means of just a few settings with a selectable language. Four-key operation and plain-text displays for each menu point guarantee full clarity at every moment of the parameterization and operation. During operation and when control voltage is applied, the display field continuously presents measured values and operating values as well as warnings and fault messages. An external display and operator module can be connected by means of a connection cable to the soft starter, thus enabling active indications and the like to be read directly from the control cabinet door.

The SIRIUS 3RW44 soft starters are equipped with optimum functionality. An integral bypass contact system reduces the power loss of the soft starter during operation.

This reliably prevents heating of the switchgear environment. The SIRIUS 3RW44 soft starters have internal intrinsic device protection. This prevents thermal overloading of the power section's thyristors, e.g. due to unacceptably high closing operations.

Wiring outlay for installing an additional motor overload relay is no longer needed as the SIRIUS 3RW44 soft starters perform this function too. In addition they offer adjustable trip classes and a thermistor motor protection function. As an option the thyristors can also be protected by SITOR semiconductor fuses from short-circuiting so that the soft starter is still functional after a short-circuit (coordination type 2). And even inrush current peaks are reliably avoided thanks to adjustable current limiting.

As a further option the SIRIUS 3RW44 soft starters can be upgraded with a PROFIBUS DP module. Thanks to their communication capability and their programmable control inputs and relay outputs the SIRIUS 3RW44 soft starters can be very easily and quickly integrated in higher-level controllers.

In addition a creep speed function is available for positioning and setting jobs. With this function the motor can be controlled in both directions of rotation with reduced torque and an adjustable, low speed.

On the other hand the SIRIUS 3RW44 soft starters offer a new, combined DC braking function for the fast stopping of driving loads.

Highlights

- Soft starting with breakaway pulse, torque control or voltage ramp, adjustable torque or current limiting as well as any combination of these, depending on load type
- Integrated bypass contact system to minimize power loss
- Various setting options for the starting parameters such as starting torque, starting voltage, ramp-up and ramp-down time, and much more in three separate parameter sets
- Start-up detection
- Inside-delta circuit for savings in terms of size and equipment costs
- Various ramp-down modes selectable: free ramp-down, torque-controlled pump ramp-down, combined DC braking
- Solid-state motor overload and intrinsic device protection
- Thermistor motor protection
- Keypad with a menu-prompted, multi-line graphic display with background lighting
- Interface for communication with the PC for more accurate setting of the parameters as well as for control and monitoring
- Simple adaptation to the motor feeder
- Simple mounting and commissioning
- Display of operating states and fault messages
- Connection to PROFIBUS with optional PROFIBUS DP module
- External display and operator module
- Mains voltages from 200 to 690 V, 50 to 60 Hz
- Applicable up to 60 °C (derating from 40 °C)

Technical specifications

Type	Terminal		3RW44 . .-.BC3.	3RW44 . .-.BC4.
Control electronics				
Rated values				
Rated control supply voltage	A1/A2/PE	V	115 AC	230 AC
• Tolerance		%	-15/+10	-15/+10
Rated control supply current STANDBY		mA	30	20
Rated control supply current ON				
• 3RW44 2.		mA	300	170
• 3RW44 3.		mA	500	250
• 3RW44 4.		mA	750	400
• 3RW44 5.		mA	450	200
• 3RW44 6.		mA	650	300
Maximum current (pickup bypass)				
• 3RW44 2.		mA	1000	500
• 3RW44 3.		mA	2500	1250
• 3RW44 4.		mA	6000	3000
• 3RW44 5.		mA	4500	2500
• 3RW44 6.		mA	4500	2500
Rated frequency		Hz	50 ... 60	50 ... 60
• Tolerance		%	±10	±10

Type	Terminal		3RW44 . .	Factory default
Control electronics				
Control inputs				
Input 1	IN1			Start motor right parameter set 1
Input 2	IN2			No action
Input 3	IN3			No action
Input 4	IN4			Trip reset
Supply	L+/L-			
• Rated operational current		mA	Approx. 10 per input to DIN 19240	
• Rated operational voltage	L+		Internal voltage: 24 V DC from internal supply through terminal L+ to IN1 ... IN4. Maximum load at L+ approx. 55 mA	
	L-		External voltage: DC external voltage (acc. to DIN 19240) through terminals L- and IN1 ... IN4 (min. 12 V DC, max. 30 V DC)	
Thermistor motor protection input				
Input	T1/T2		PTC type A or Thermoclick	Deactivated
Relay outputs (floating auxiliary contacts)				
Output 1	13/14			ON period
Output 2	23/24			No action
Output 3	33/34			No action
Output 4	95/96/98			Group fault
Switching capacity of the relay outputs (auxiliary contacts)				
230 V/AC-15		A	3 at 240 V	
24 V/DC-13		A	1 at 24 V	
Protection against overvoltages			Protection by means of varistor through relay contact	
Short-circuit protection			4 A gL/gG operational class; 6 A quick (fuse is not included in scope of supply)	
Protection functions				
Motor protection functions				
Trips in the event of			Thermal overloading of the motor	
Trip class to IEC 60947-4-1		Class	5/10/15/20/30	10
Phase failure sensitivity		%	>40	
Overload warning			Yes	
Reset and recovery			Manual/Automatic	Manual
Reset option after tripping			Manual/Automatic	Manual
Recovery time		min.	1 ... 30	1
Device protection functions				
Trips in the event of			Thermal overloading of the thyristors	
Reset option after tripping			Manual/Automatic	Manual
Recovery time		min.	0.5	
Bypass protection functions				
Trips in the event of			Thermal overloading of the bypass contacts	
Reset option after tripping			Manual	
Recovery time min.			1	

Type		3RW44 . .	Factory default
Control times and parameters			
Control times			
Closing delay (with connected control voltage)	ms	<50	
Closing delay (automatic mode)	ms	<4000	
Recovery time (closing command in active ramp-down)	ms	<100	
Mains failure bridging time			
Control supply voltage	ms	100	
Mains failure response time			
Load current circuit	ms	100	
Reclosing lockout after overload trip			
Motor protection trip	min.	1 ... 30	1
Device protection trip	s	30	
Setting options for starting			
Voltage ramp for starting voltage	%	20 ... 100	30
Torque control for starting torque	%	10 ... 100	10
Torque control for limit torque	%	20 ... 200	150
Starting time	s	0 ... 360	20
Maximum starting time	s	1 ... 1000	Deactivated
Current limit value	%	125 ... 550[1]	450
Breakaway voltage	%	40 ... 100	80
Breakaway time	s	0 ... 2	Deactivated
Motor heat output	%	1 ... 100	20
Creep mode Left/Right running			
Speed factor as function of rated speed ($n = n_{rated}$/factor)		3 ... 21	7
Creep torque[2]	%	20 ... 100	50
Setting options for ramp-down			
Torque control for stopping torque	%	10 ... 100	10
Ramp-down time	s	0 ... 360	10
Dynamic braking torque	%	20 ... 100	50
DC braking torque	%	20 ... 100	50
Operating indications		Test voltage Test mains phases Ready to start Start active Motor running Ramp-down active Emergency start active	
Warnings/error signals		Mains voltage missing Leading-edge phase error Phase failure • L1 • L2 • L3 Missing load phase • T1 • T2 • T3 Failure • Contact element 1 (thyristor) • Contact element 2 (thyristor) • Contact element 3 (thyristor) Flash memory faulty Supply voltage • Below 75 % • Below 85 % • Over 110 % Current unbalance exceeded Thermal motor model overload Prewarning limit exceeded • Motor heating • Time-related trip reserve Bypass element defective Mains voltage too high Device not named Wrong naming version Current measuring range exceeded Bypass element protection disconnection Power section • Overheated • Overheating	

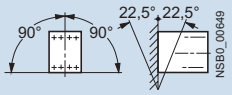
[1] Max. current limit value for 3RW44 53 ... 3RW44 57: 500 % and for 3RW44 58 ... 3RW44 66 :450 %.

[2] Reference variable depends on the motor used but is always smaller than the rated torque of the motor.

Type	3RW44 . .	
		Factory default
Control times and parameters		
Warnings/error signals (continued)		
	Temperature sensor • Overload • Open circuit • Short-circuit	
	Ground fault • Detected	
	Connection abort in manual operating mode Max. number of starts exceeded I_e limit value overshoot/undershoot	
	Heat sink sensor • Open circuit • Short-circuit	
	Quick-stop active Switching block defective I_e/class setting not permissible	
	No external start-up parameters received PAA fault	
Control inputs		
Input 1		Motor right parameter set 1
Input 2		No action
Input 3		No action
Input 4		Trip reset
Parameterizing options for control inputs 1 ... 4	No action Local manual mode Emergency start Creep speed Quick-stop Trip reset	
	Motor right parameter set 1 Motor left parameter set 1[1)] Motor right parameter set 2 Motor left parameter set 2[1)] Motor right parameter set 3 Motor left parameter set 3[1)]	
Relay outputs		
Output 1		ON period
Output 2		No action
Output 3		No action
Output 4		Group fault
Parameterizing options for relay outputs 1 ... 3	No action PAA output 1 PAA output 2	
	Input 1 Input 2 Input 3 Input 4	
	Starting Operation/Bypass Ramp-down	
	ON period Command motor on DC braking contactor	
	Group warning Group fault Bus fault Device fault	
	Power on Ready to start	
Motor temperature sensor	Deactivated Thermoclick PTC type A	

[1)] Parameter motor left possible only in conjunction with creep mode.

3RW44
for High-Feature applications

Type		3RW44 . .-.BC.4	3RW44 . .-.BC.5	3RW44 . .-.BC.6
Power electronics				
Rated operational voltage for inline circuit	VAC	200 ... 460	400 ... 600	400 ... 690
Tolerance	%	-15/+10	-15/+10	-15/+10
Rated operational voltage for inside-delta circuit	VAC	200 ... 460	400 ... 600	400 ... 600
Tolerance	%	-15/+10	-15/+10	-15/+10
Rated frequency	Hz	50 ... 60		
Tolerance	%	±10		
Continuous duty at 40 °C (% of I_e)	%	115		
Minimum load (% of set motor current I_M)	%	8		
Maximum cable length between soft starter and motor	m	500[1]		
Permissible installation height	m	5000 (derating from 1000, see characteristic curves); higher on request		
Permissible mounting position				
Permissible ambient temperature				
Operation	°C	0 ... +60; (derating from +40)		
Storage	°C	-25 ... +80		
Degree of protection		IP00		

[1] At the project configuration stage, it is important to make allowance for the voltage drop on the motor cable up to the motor connection. If necessary, higher values for the rated operational voltage or current must be calculated accordingly for the soft starter.

Type		3RW44 22	3RW44 23	3RW44 24	3RW44 25	3RW44 26	3RW44 27
Power electronics							
Rated operational current I_e		29	36	47	57	77	93
Load rating with rated operational current I_e							
• Acc. to IEC and UL/CSA1), for individual mounting, AC-53a							
- at 40 °C	A	29	36	47	57	77	93
- at 50 °C	A	26	32	42	51	68	82
- at 60 °C	A	23	29	37	45	59	72
Smallest adjustable rated motor current I_M For the motor overload protection	A	5	7	9	11	15	18
Power loss							
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	W	8	10	32	36	45	55
• During starting with current limit set to 350 % I_M (40 °C)	W	400	470	600	725	940	1160
Permissible rated motor current and starts per hour							
• Normal starting (Class 5)							
- rated motor current I_M[2], starting time 5 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	41	34	41	41	41	41
- rated motor current I_M[2)4)], starting time 10 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	20	15	20	20	20	20
• Normal starting (Class 10)							
- rated motor current I_M[2], starting time 10 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	20	15	20	20	20	20
- rated motor current I_M[2)4)], starting time 20 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	10	6	10	10	8	8
• Normal starting (Class 15)							
- rated motor current I_M[2], starting time 15 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	13	9	13	13	13	13
- rated motor current I_M[2)4)], starting time 30 s	A	29	36	47	57	77	93
- starts per hour[3]	1/h	6	4	6	6	6	6
• For heavy starting (Class 20)							
- rated motor current I_M[2], starting time 20 s	A	29	36	47	57	73	88
- starts per hour[3]	1/h	10	6	10	10	10	10
- rated motor current I_M[2)4)], starting time 40 s	A	29	36	47	57	73	88
- starts per hour[3]	1/h	4	2	4	5	1.8	0.8
• For very heavy starting (Class 30)							
- rated motor current I_M[2], starting time 30 s	A	29	36	44	57	65	77
- starts per hour[3]	1/h	6	4	6	6	6	6
- rated motor current I_M[2)3)], starting time 60 s	A	29	36	44	57	65	77
- starts per hour[3]	1/h	1.8	0.8	3.3	1.5	2	1

[1] Measurement at 60 °C according to UL/CSA not required.

[2] Current limit on soft starter set to 350 % IM.

[3] For intermittent duty S4 with ON period = 70 %, Tu = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4] Maximum adjustable rated motor current IM, dependent on CLASS setting.

Type		3RW44 34	3RW44 35	3RW44 36
Power electronics				
Rated operational current I_e		113	134	162
Load rating with rated operational current I_e				
• Acc. to IEC and UL/CSA1), for individual mounting, AC-53a				
- at 40 °C	A	113	134	162
- at 50 °C	A	100	117	145
- at 60 °C	A	88	100	125
Smallest adjustable rated motor current I_M For the motor overload protection	A	22	26	32
Power loss				
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	CO	64	76	95
• During starting with current limit set to 350 % I_M (40 °C)	W	1350	1700	2460
Permissible rated motor current and starts per hour				
• Normal starting (Class 5)				
- rated motor current I_M[2], starting time 5 s	A	113	134	162
- starts per hour[3]	1/h	41	39	41
- rated motor current I_M[2)4)], starting time 10 s	A	113	134	162
- starts per hour[3]	1/h	20	15	20
• Normal starting (Class 10)				
- rated motor current I_M[2], starting time 10 s	A	113	134	162
- starts per hour[3]	1/h	20	15	20
- rated motor current I_M[2)4)], starting time 20 s	A	113	134	162
- starts per hour[3]	1/h	9	6	7
• Normal starting (Class 15)				
- rated motor current I_M[2], starting time 15 s	A	113	134	162
- starts per hour[3]	1/h	13	9	12
- rated motor current I_M[2)4)], starting time 30 s	A	113	134	162
- starts per hour[3]	1/h	6	6	1
• For heavy starting (Class 20)				
- rated motor current I_M[2], starting time 20 s	A	106	125	147
- starts per hour[3]	1/h	9	9	10
- rated motor current I_M[2)4)], starting time 40 s	A	106	125	147
- starts per hour[3]	1/h	1.5	2	1
• For very heavy starting (Class 30)				
- rated motor current I_M[2], starting time 30 s	A	91	110	120
- starts per hour[3]	1/h	6	6	6
- rated motor current I_M[2)4)], starting time 60 s	A	91	110	120
- starts per hour[3]	1/h	2	2	2

1) Measurement at 60 °C according to UL/CSA not required.

2) Current limit on soft starter set to 350 % *I*M.

3) For intermittent duty S4 with ON period = 70 %, *T*u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

4) Maximum adjustable rated motor current *I*M, dependent on CLASS setting.

3RW44
for High-Feature applications

Type		3RW44 43	3RW44 44	3RW44 45	3RW44 46	3RW44 47
Power electronics						
Rated operational current I_e		203	250	313	356	432
Load rating with rated operational current I_e						
• Acc. to IEC and UL/CSA[1], for individual mounting, AC-53a						
- at 40 °C	A	203	250	313	356	432
- at 50 °C	A	180	215	280	315	385
- at 60 °C	A	156	185	250	280	335
Smallest adjustable rated motor current I_M For the motor overload protection	A	40	50	62	71	86
Power loss						
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	CO	89	110	145	174	232
• During starting with current limit set to 350 % I_M (40 °C)	W	3350	4000	4470	5350	5860
Permissible rated motor current and starts per hour						
• Normal starting (Class 5)						
- rated motor current I_M[2], starting time 5 s	A	203	250	313	356	432
- starts per hour[3]	1/h	41	41	41	41	39
- rated motor current I_M[2)4)], starting time 10 s	A	203	250	313	356	432
- starts per hour[3]	1/h	20	20	19	17	16
• Normal starting (Class 10)						
- rated motor current I_M[2], starting time 10 s	A	203	250	313	356	432
- starts per hour[3]	1/h	20	20	19	17	16
- rated motor current I_M[2)4)], starting time 20 s	A	203	250	313	356	432
- starts per hour[3]	1/h	9	10	6	4	5
• Normal starting (Class 15)						
- rated motor current I_M[2], starting time 15 s	A	203	240	313	325	402
- starts per hour[3]	1/h	13	13	10	13	11
- rated motor current I_M[2)4)], starting time 30 s	A	203	240	313	325	402
- starts per hour[3]	1/h	3	6	1	2	1
• For heavy starting (Class 20)						
- rated motor current I_M[2], starting time 20 s	A	195	215	275	285	356
- starts per hour[3]	1/h	10	10	10	10	10
- rated motor current I_M[2)4)], starting time 40 s	A	195	215	275	285	356
- starts per hour[3]	1/h	1	5	1	3	1
• For very heavy starting (Class 30)						
- rated motor current I_M[2], starting time 30 s	A	162	180	220	240	285
- starts per hour[3]	1/h	6	6	6	6	6
- rated motor current I_M[2)4)], starting time 60 s	A	162	180	220	240	285
- starts per hour[3]	1/h	3	3	3	2	1

[1] Measurement at 60 °C according to UL/CSA not required.

[2] Current limit on soft starter set to 350 % *I*M.

[3] For intermittent duty S4 with ON period = 70 %, *T*u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4] Maximum adjustable rated motor current *I*M, dependent on CLASS setting.

Type		3RW44 53	3RW44 54	3RW44 55	3RW44 56	3RW44 57	3RW44 58
Power electronics							
Rated operational current I_e		551	615	693	780	880	970
Load rating with rated operational current I_e							
• Acc. to IEC and UL/CSA1), for individual mounting, AC-53a							
- at 40 °C	A	551	615	693	780	880	970
- at 50 °C	A	494	551	615	693	780	850
- at 60 °C	A	438	489	551	615	693	760
Smallest adjustable rated motor current I_M For the motor overload protection	A	110	123	138	156	176	194
Power loss							
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	CO	159	186	220	214	250	270
• During starting with current limit set to 350 % I_M (40 °C)	W	7020	8100	9500	11100	13100	15000
Permissible rated motor current and starts per hour							
• Normal starting (Class 5)							
- rated motor current I_M[2], starting time 5 s	A	551	615	693	780	880	970
- starts per hour[3]	1/h	41	41	37	33	22	17
- rated motor current I_M[2)4)], starting time 10 s	A	551	615	693	780	880	970
- starts per hour[3]	1/h	20	20	16	13	8	5
• Normal starting (Class 10)							
- rated motor current I_M[2], starting time 10 s	A	551	615	693	780	880	970
- starts per hour[3]	1/h	20	20	16	13	8	5
- rated motor current I_M[2)4)], starting time 20 s	A	551	615	693	780	880	970
- starts per hour[3]	1/h	10	9	6	4	0.3	0.3
• Normal starting (Class 15)							
- rated motor current I_M[2], starting time 15 s	A	551	615	666	723	780	821
- starts per hour[3]	1/h	13	13	11	9	8	8
- rated motor current I_M[2)4)], starting time 30 s	A	551	615	666	723	780	821
- starts per hour[3]	1/h	6	4	3	1	0,4	0.5
• For heavy starting (Class 20)							
- rated motor current I_M[2], starting time 20 s	A	551	591	633	670	710	740
- starts per hour[3]	1/h	10	10	7	8	8	9
- rated motor current I_M[2)4)], starting time 40 s	A	551	591	633	670	710	740
- starts per hour[3]	1/h	4	2	1	1	0,4	1
• For very heavy starting (Class 30)							
- rated motor current I_M[2], starting time 30 s	A	500	525	551	575	600	630
- starts per hour[3]	1/h	6	6	6	6	6	6
- rated motor current I_M[2)4)], starting time 60 s	A	500	525	551	575	600	630
- starts per hour[3]	1/h	2	1	1	1	1.5	1

[1] Measurement at 60 °C according to UL/CSA not required.

[2] Current limit on soft starter set to 350 % *I*M.

[3] For intermittent duty S4 with ON period = 70 %, *T*u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4] Maximum adjustable rated motor current *I*M, dependent on CLASS setting.

3RW44
for High-Feature applications

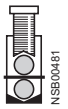
Type		3RW44 65	3RW44 66
Power electronics			
Rated operational current I_e		1076	1214
Load rating with rated operational current I_e			
• Acc. to IEC and UL/CSA[1], for individual mounting, AC-53a			
- at 40 °C	A	1076	1214
- at 50 °C	A	970	1076
- at 60 °C	A	880	970
Smallest adjustable rated motor current I_M For the motor overload protection	A	215	242
Power loss			
• In operation after completed starting with uninterrupted rated operational current (40 °C) approx.	CO	510	630
• During starting with current limit set to 350 % I_M (40 °C)	W	15000	17500
Permissible rated motor current and starts per hour			
• Normal starting (Class 5)			
- rated motor current I_M[2], starting time 5 s	A	1076	1214
- starts per hour[3]	1/h	30	20
- rated motor current I_M[2][4], starting time 10 s	A	1076	1214
- starts per hour[3]	1/h	10	6
• Normal starting (Class 10)			
- rated motor current I_M[2], starting time 10 s	A	1076	1214
- starts per hour[3]	1/h	11	6
- rated motor current I_M[2][4], starting time 20 s	A	1076	1214
- starts per hour[3]	1/h	3	0.5
• Normal starting (Class 15)			
- rated motor current I_M[2], starting time 15 s	A	1020	1090
- starts per hour[3]	1/h	7	5
- rated motor current I_M[2][4], starting time 30 s	A	1020	1090
- starts per hour[3]	1/h	1	1
• For heavy starting (Class 20)			
- rated motor current I_M[2], starting time 20 s	A	970	1030
- starts per hour[3]	1/h	7	5
- rated motor current I_M[2][4], starting time 40 s	A	970	1030
- starts per hour[3]	1/h	1	1
• For very heavy starting (Class 30)			
- rated motor current I_M[2], starting time 30 s	A	880	920
- starts per hour[3]	1/h	6	6
- rated motor current I_M[2][4], starting time 60 s	A	880	920
- starts per hour[3]	1/h	1	1

[1] Measurement at 60 °C according to UL/CSA not required.

[2] Current limit on soft starter set to 350 % *I*M.

[3] For intermittent duty S4 with ON period = 70 %, *T*u = 40 °C, stand-alone installation vertical. The quoted switching frequencies do not apply for automatic mode.

[4] Maximum adjustable rated motor current *I*M, dependent on CLASS setting.

Type			3RW44 2.	3RW44 3.	3RW44 4.	3RW44 5. 3RW44 6.
Conductor cross-sections						
Screw terminals	**Main conductors:**					
Both clamping points connected	• Finely stranded with end sleeve	mm²	2 x (2.5 ... 35)	Max. 1 x 50, 1 x 70	Min. 2 x 50 Max. 2 x 185	—
	• Finely stranded without end sleeve	mm²	2 x (4 ... 35)	Max. 1 x 50, 1 x 70	Min. 2 x 50 Max. 2 x 185	—
	• Solid	mm²	2 x (2.5 ... 16)	—	—	—
	• Stranded	mm²	2 x (4 ... 50)	Max. 2 x 70	Max. 2 x 70 Max. 2 x 240	—
	• Ribbon cable conductors (number x width x thickness)	mm	2 x (6 x 9 x 0.8)	Max. 2 x (6 x 15.5 x 0.8)	Max. 2 x (20 x 24 x 0.5)	—
	• AWG cables, solid or stranded	AWG	2 x (10 ... 1/0)	Max. 2 x 1/0	Min. 2 x 2/0 Max. 2 x 500 kcmil	—
	• Terminal screws		M6 (hexagon socket, A/F4)	M10 (hexagon socket, A/F4)	M12 (hexagon socket, A/F5)	—
	- tightening torque	Nm lb.in	4 ... 6 36 ... 53	10 ... 12 90 ... 110	20 ... 22 180 ... 195	— —
Screw terminals	**Main conductors:**					
	Without box terminal/busbar connection					
	• Finely stranded with cable lug	mm²	—	16 ... 95[1]	50 ... 240[2]	50 ... 240[2]
	• Stranded with cable lug	mm²	—	25 ... 120[1]	70 ... 240[2]	70 ... 240[2]
	• AWG cables, solid or stranded	AWG	—	4 ... 250 kcmil	2/0 ... 500 kcmil	2/0 ... 500 kcmil
	• Connecting bar (max. width)	mm	—	17	25	60
	• Terminal screws		—	M8 x 25 (A/F13)	M10 x 30 (A/F17)	M12 x 40
	- tightening torque	Nm lb.in	— —	10 ... 14 89 ... 124	14 ... 24 124 ... 210	20 ... 35 177 ... 310

[1] When connecting cable lugs to DIN 46235, use 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.

[2] When connecting cable lugs to DIN 46234, the 3RT19 66-4EA1 terminal cover must be used for conductor cross-sections of 240 mm² and more as well as DIN 46235 for conductor cross-sections of 185 mm² and more to keep the phase clearance.

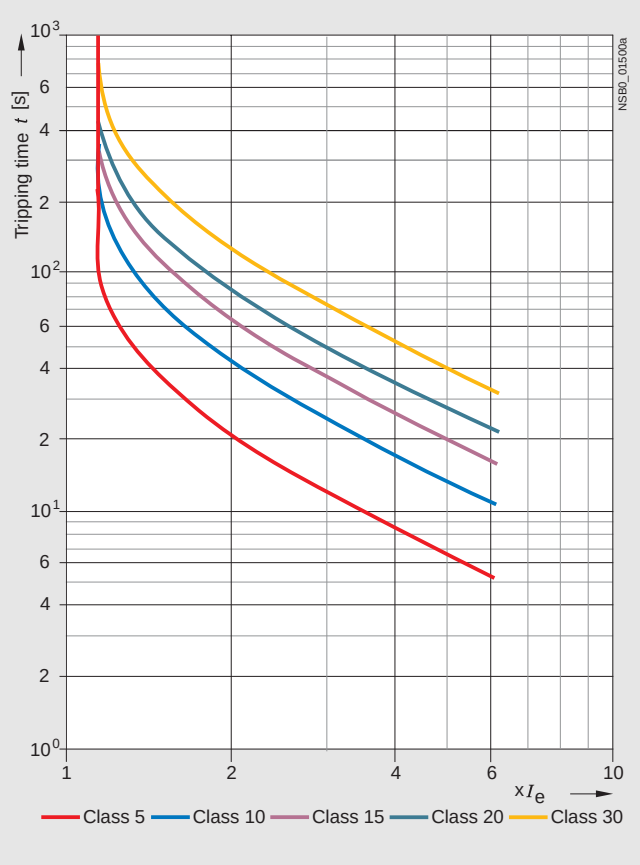
3RW44
for High-Feature applications

Soft starters	Type		3RW44. .
Conductor cross-sections			
Auxiliary conductors (1 or 2 conductors can be connected):			
	Screw terminals		
	• Solid	mm^2	2 x (0.5 ... 2.5)
	• Finely stranded with end sleeve	mm^2	2 x (0.5 ... 1.5)
	• AWG cables		
	- solid or stranded	AWG	2 x (20 ... 14)
	- finely stranded with end sleeve	AWG	2 x (20 ... 16)
	• Terminal screws		
	- tightening torque	Nm	0.8 ... 1.2

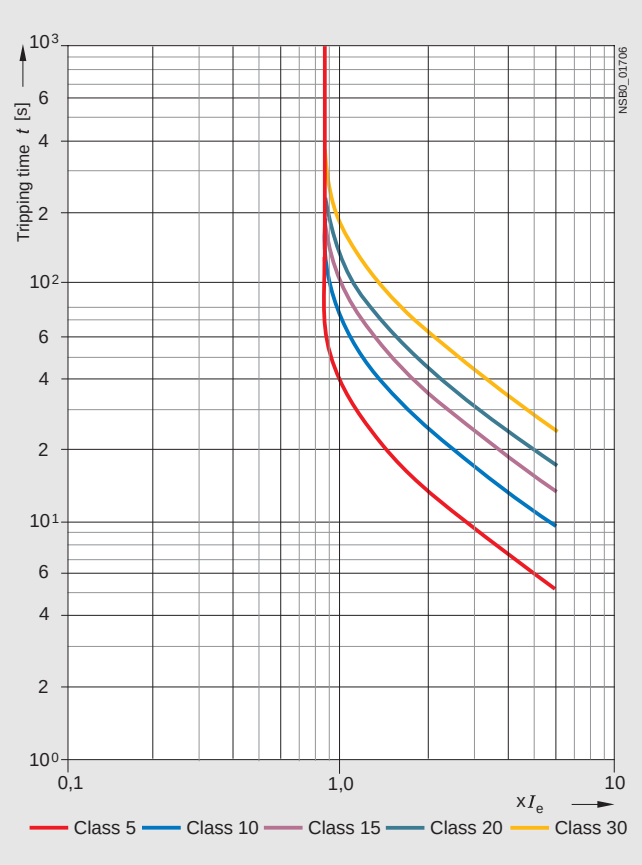
	Standard	Parameters
Electromagnetic compatibility according to EN 60947-4-2		
EMC interference immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	±4 kV contact discharge, ±8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Frequency range: 80 ... 1000 MHz with 80 % at 1 kHz Degree of severity 3, 10 V/m
Conducted RF interference	EN 61000-4-6	Frequency range: 150 kHz ... 80 MHz with 80 % at 1 kHz Interference 10 V
RF voltages and RF currents on cables		
• Burst	EN 61000-4-4	±2 kV/5 kHz
• Surge	EN 61000-4-5	±1 kV line to line ±2 kV line to ground
EMC interference emission		
EMC interference field strength	EN 55011	Limit value of Class A at 30 ... 1000 MHz
Radio interference voltage	EN 55011	Limit value of Class A at 0.15 ... 30 MHz
Is an RI suppression filter necessary?		
Degree of noise suppression A (industrial applications)	No	

Characteristic curves

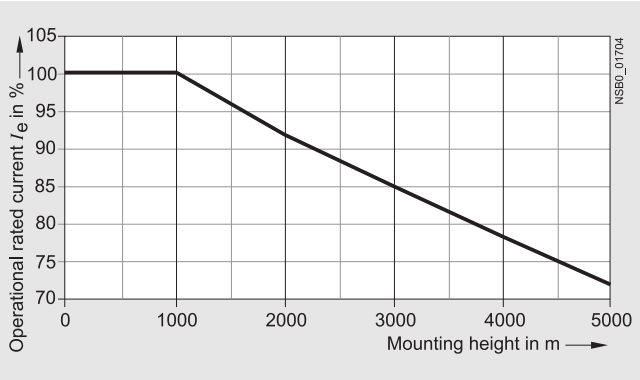
Motor protection tripping characteristics for 3RW44 (with symmetry)



Motor protection tripping characteristics for 3RW44 (with asymmetry)



Permissible installation height

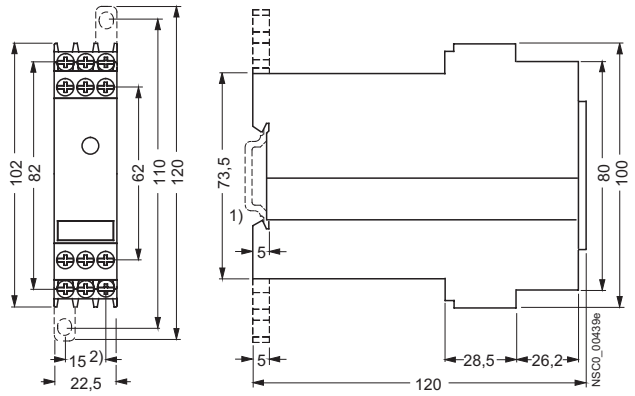


At an installation height above 2000 m, the max. permissible operational voltage is reduced to 460 V.

Dimensional drawings

3RW30/3RW31 for standard applications

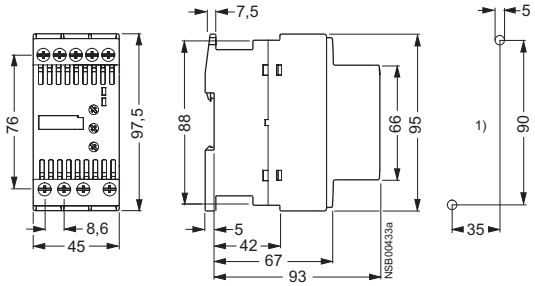
3RW30 03-1. . . . (screw terminals)



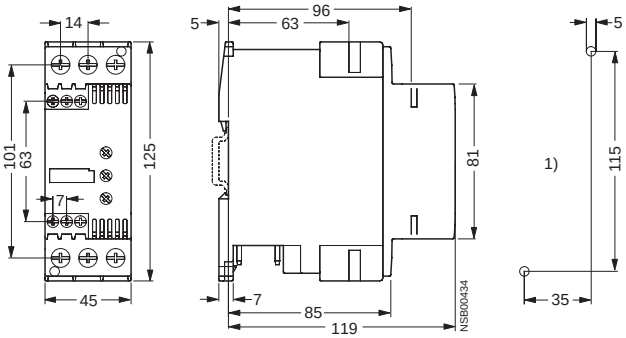
1) For mounting onto standard mounting rail TH 35 according to EN 60715.

2) Dimension for screw mounting.
Screw mounting with two 3RP1 903 push-in lugs per 3RW30 03 device.

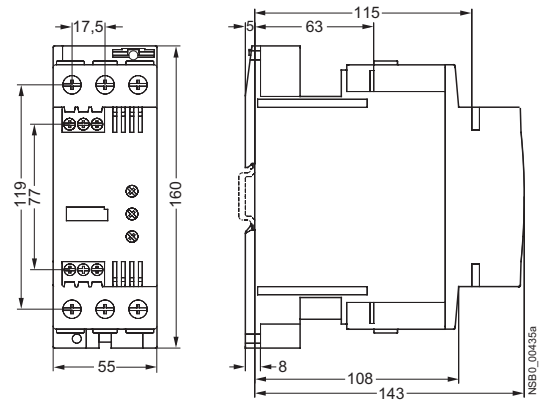
3RW30 1.



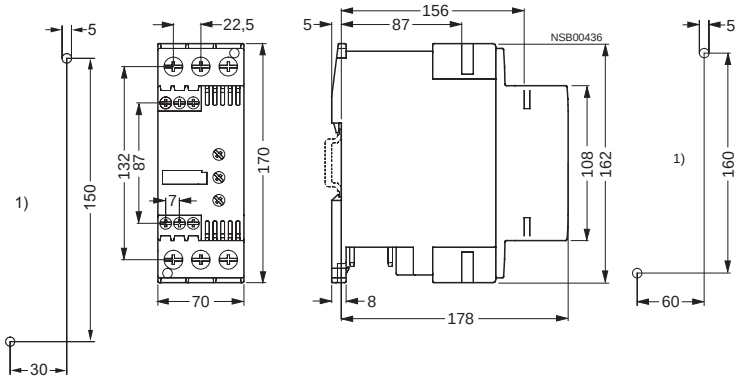
3RW30 2. and 3RW31 2.



3RW30 3.

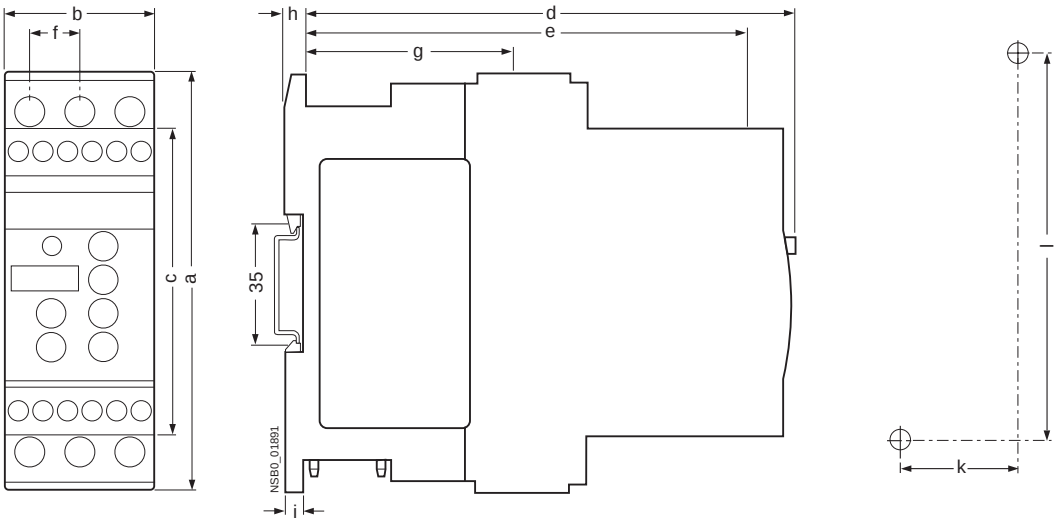


3RW30 4.

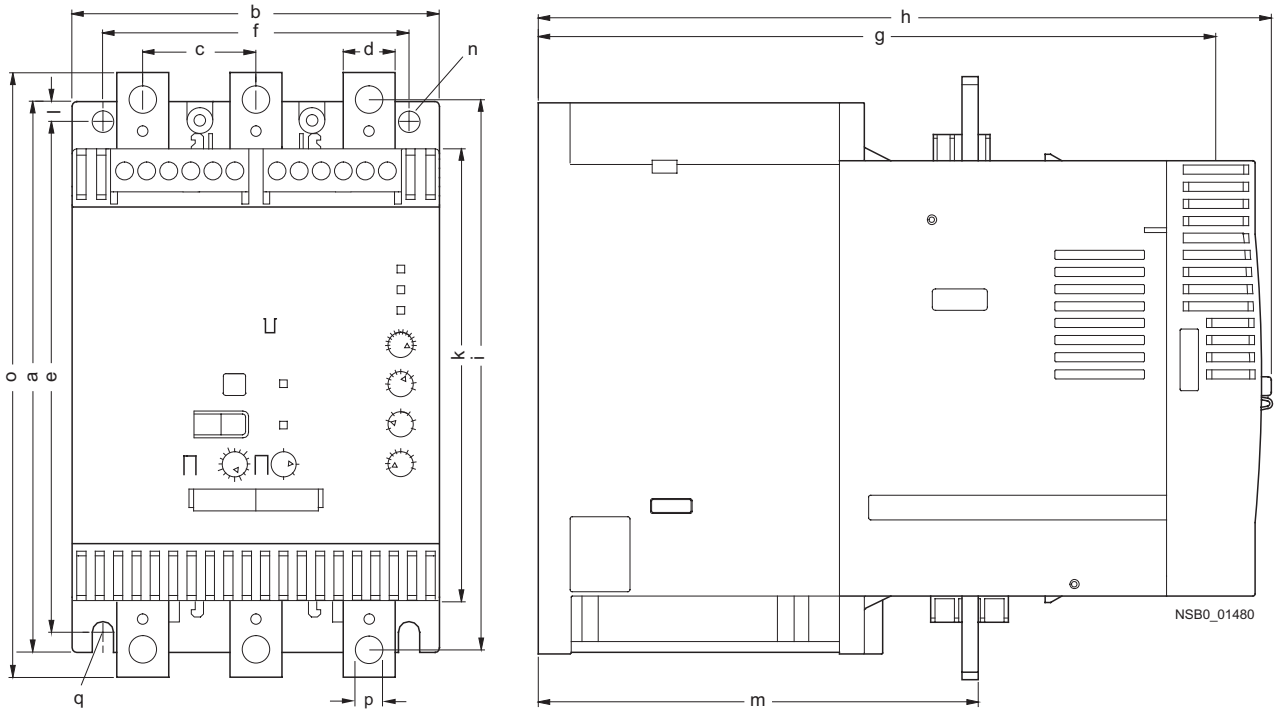


1) Drilling pattern.

3RW40 for standard applications

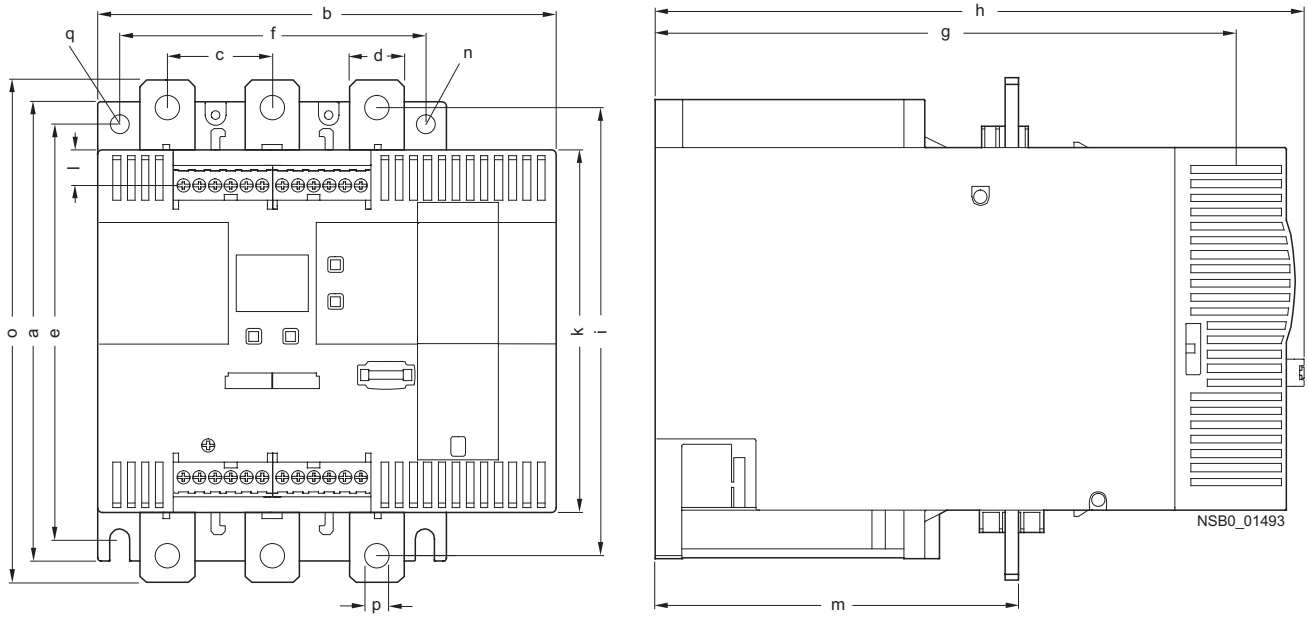


Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l
3RW40 2.	125	45	92	149	126	14.4	63	5	6.5	35	115
3RW40 3.	170	55	110	165	140	18	63	5	6.5	30	150
3RW40 4.	170	70	110	183	158	22.5	85	5	10	60	160



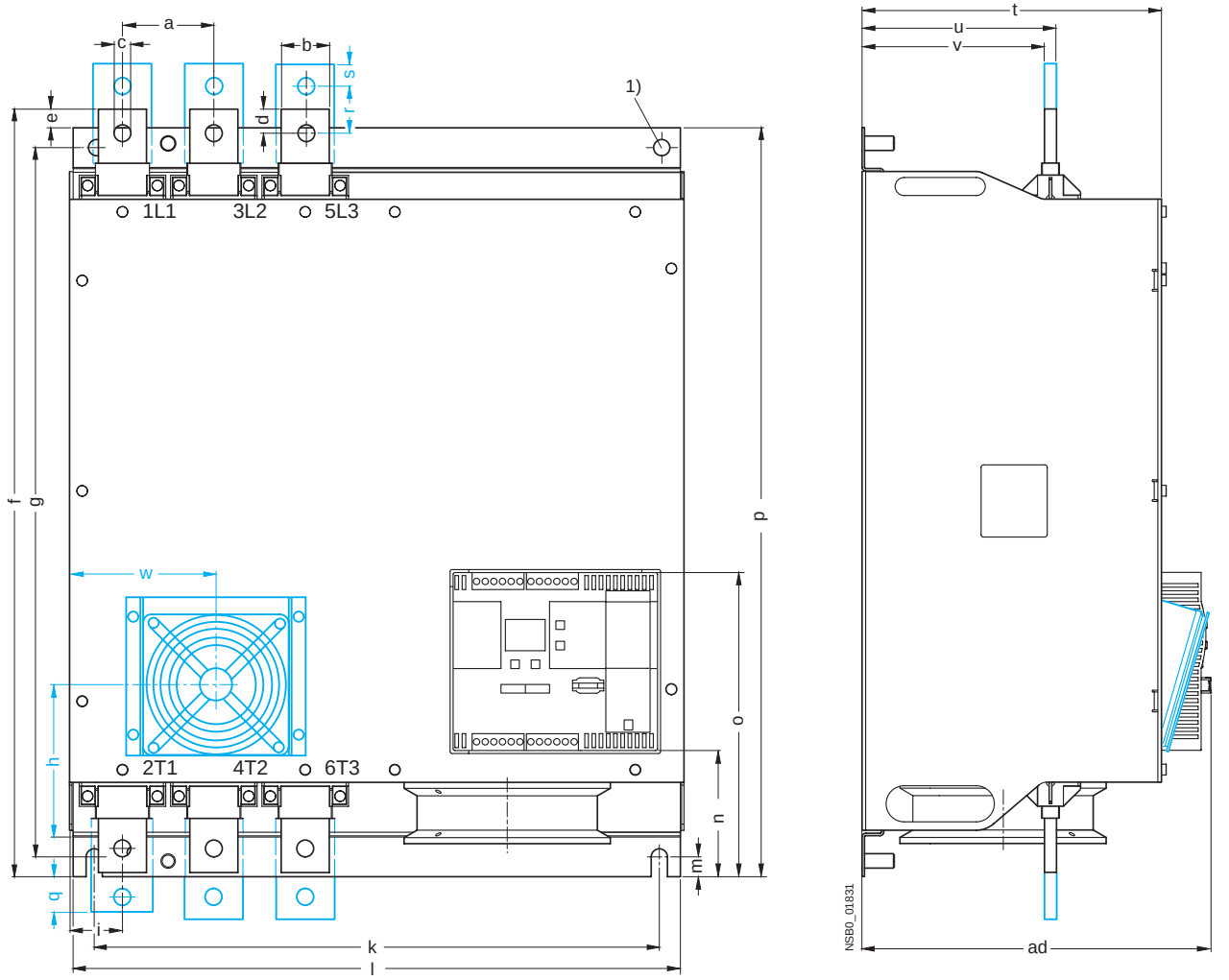
Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l	m	N	o	p	q
3RW40 5.	180	120	37	17	167	100	223	250	180	148	6.5	153	7	198	9	M6, 10 Nm
3RW40 7.	210	160	48	25	190	140	240	278	205	166	10	166	9	230	11	M8, 15 Nm

3RW44 2., 3RW44 3. and 3RW44 4. for High-Feature applications



Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l	m	N	o	p	q
3RW44 2.	180	170	37	11	167	100	240	270	180	148	7.5	153	7	184	6.6	M6, 10 Nm
3RW44 3.	180	170	37	17	167	100	240	270	180	148	7.5	153	7	198	9	M6, 10 Nm
3RW44 4.	210	210	48	25	190	140	269	298	205	166	16	166	9	230	11	M8, 15 Nm

3RW44 5. and 3RW44 6. for High-Feature applications

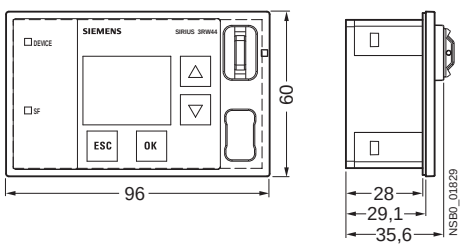


[1] For M12 screw, tightening torque max. 35 Nm (310 lb.in).

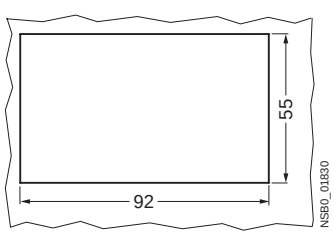
Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l	m
3RW44 5.	76	40	14	20	15.5	638.5	590	—	44	470	510	16.5
3RW44 6.	85	50	14	—	—	667	660	160	37.5	535	576	16.5

Type/Dimension (mm)	N	o	p	q	r	s	t	u	v	W	ad
3RW44 5.	105	253	623	—	—	—	249	162	152	—	290
3RW44 6.	103	251	693	43.5	40	20	249	162	151.4	123	290

3RW49 00-0AC00 external display and operator module



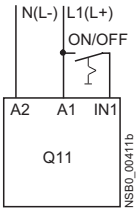
Installation cutout for 3RW49 00-0AC00 external display and operator module



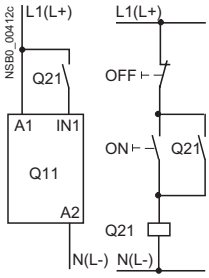
Schematics

3RW30/3RW31 connection examples for actuation with switches or auxiliary contacts

Control using switches

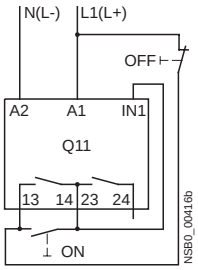


Control using contactor contacts (for control of size S00 with pushbuttons)



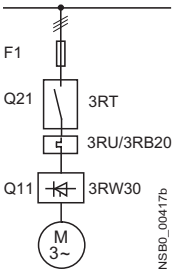
3RW30 connection example for control with pushbuttons

(sizes S0, S2, and S3 only)

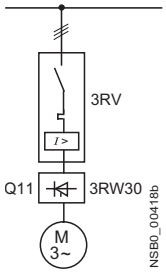


3RW30/3RW31 connection examples for main circuit[1)]

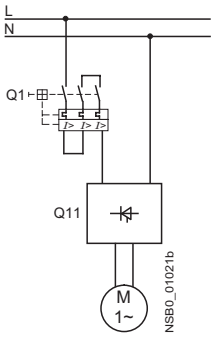
3RW30
3-phase motors



3RW30
3-phase motors
with motor starter protector



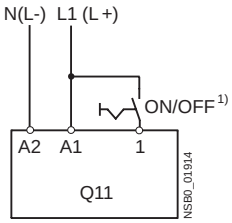
3RW30
1-phase motors
with 3RV motor starter protector



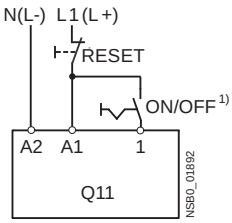
Project planning aids

3RW40 2. ... 3RW40 4. connection examples for control circuit

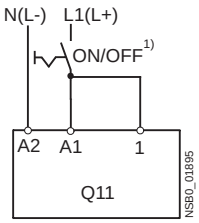
Control using switches

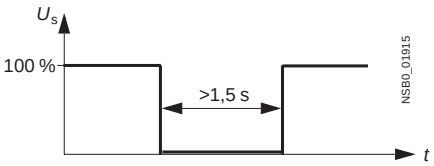


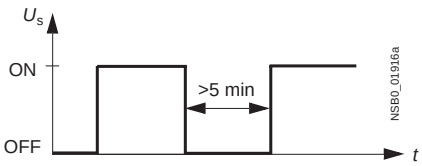
With remote reset



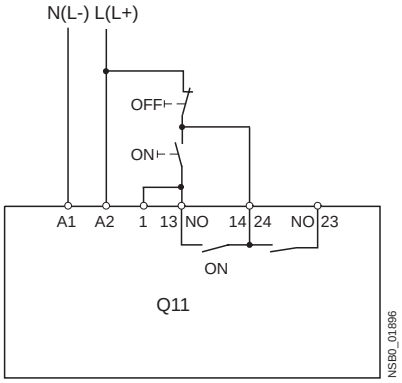
Automatic mode





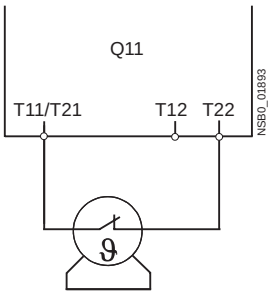


Control of 3RW40 2. ... 3RW40 4. by pushbutton

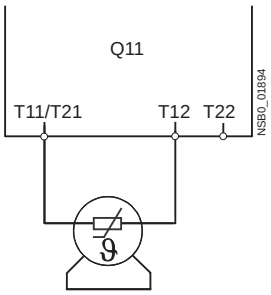


Connection example of 3RW40 2. ... 3RW40 4. for PTC sensors (thermistor motor protection)

Thermoclick



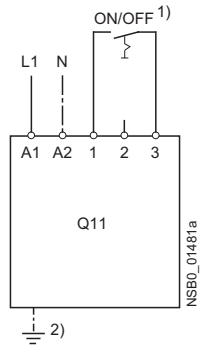
PTC type A



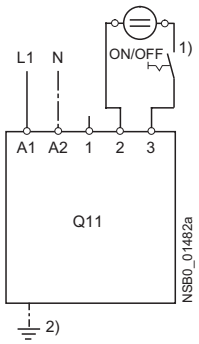
[1] **Caution: Risk of restarting**
When operating with a switch (ON/OFF) a new, automatic restart will take place automatically if the start command is still active at terminal 1.

3RW40 5. and 3RW40 7. connection examples for control circuit

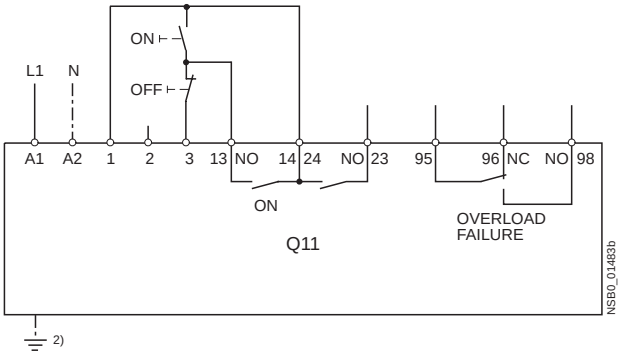
Control by switch using internal 24 V DC supply



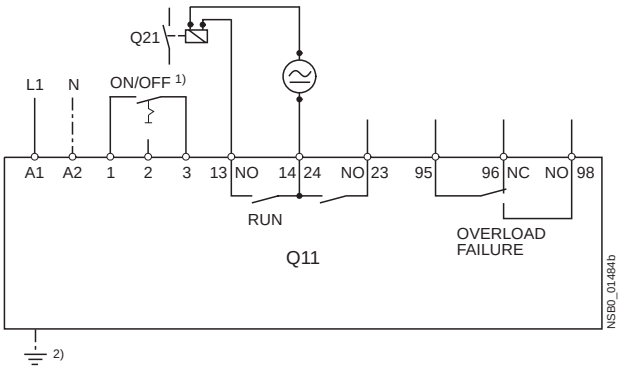
external power supply



Control by pushbutton

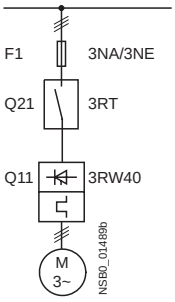


Control of a main contactor

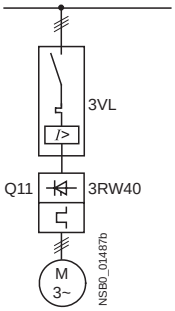


3RW40 connection examples for main circuit[3)]

3RW40 – 3-phase motor with 3NA/3NE fuse



3RV motor starter protectors/ 3VL circuit breakers



[1)] **Caution: Risk of restarting**
When operating with a switch (ON/OFF) a new, automatic restart will take place automatically if the start command is still active at terminal 3.

[2)] Grounding necessary for fan connection to 3RW40 5...

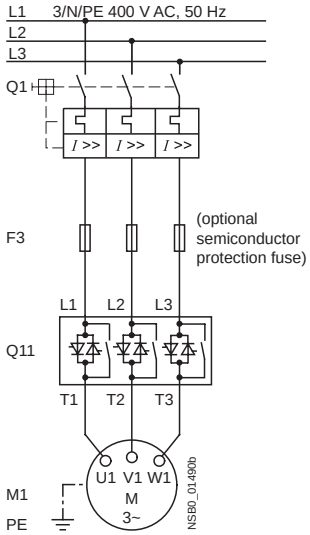
[3)] As an alternative, the motor feeder can also be installed as a fuseless or as a fused version. For fuse and switching device coordination, see "Technical specifications".
The wiring diagrams are provided only as examples.

Project planning aids

3RW44 connection examples for main and control circuits

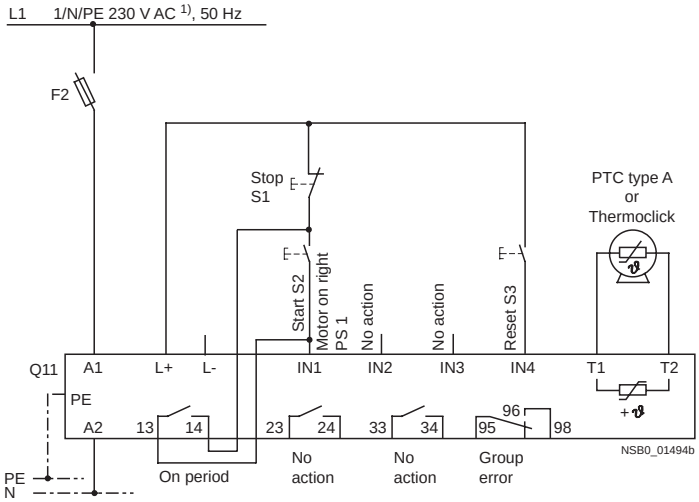
Main circuit

Possibility 1a:
Inline circuit with motor starter protector and SITOR fuse
(semiconductor protection only)



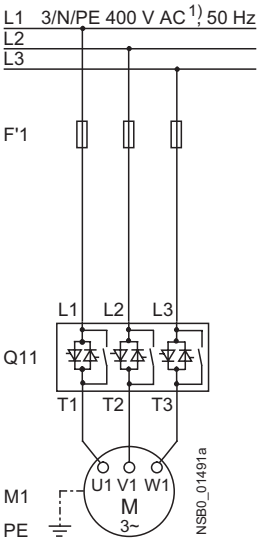
Control circuit

Possibility 1:
Control by pushbutton

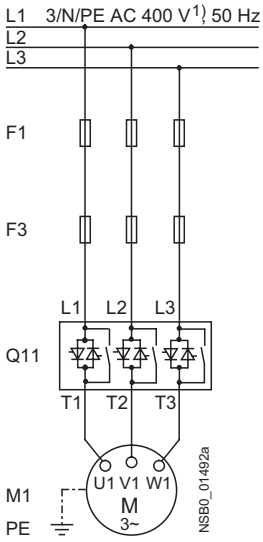


Main circuit

Possibility 1b:
Inline circuit with full-range
protection
(line and semiconductor protection)



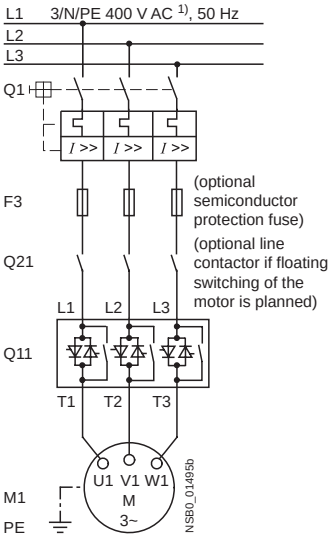
Possibility 1c:
Inline circuit with line and
SITOR fuse
(semiconductor protection only)



1) Permissible values for main and control voltage, see "Technical specifications".

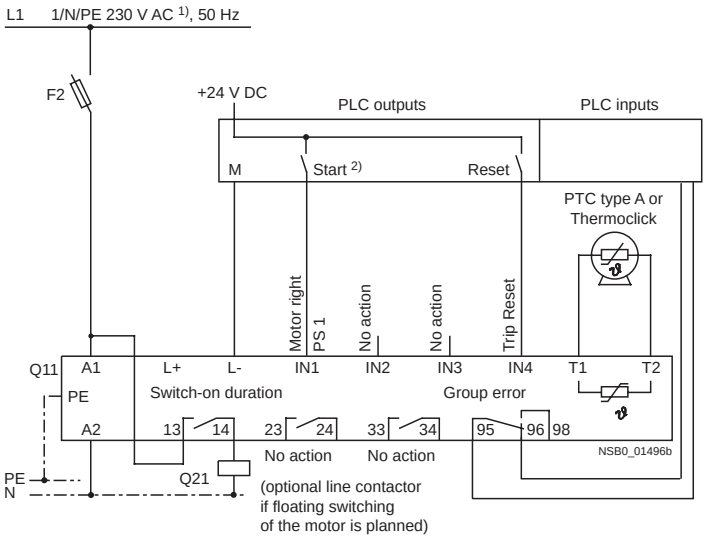
Main circuit

Possibility 2:
Inline circuit with main contactor



Control circuit

Possibility 2:
Control of a main contactor and control by means of PLC



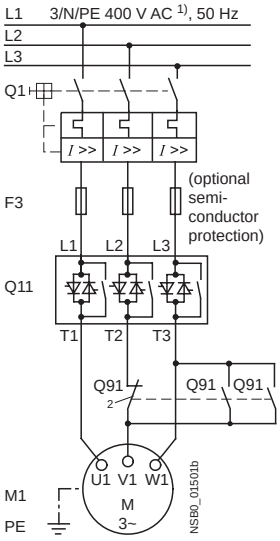
1) Permissible values for main and control voltage, see "Technical specifications".

2) **Caution. Risk of restarting!**
The start command (e.g. from the PLC) must be reset prior to a reset command because a new, automatic restart will take place automatically if a start command is active after the reset command. This applies especially in case of motor protection tripping.
For safety reasons we recommend incorporating the group error output (terminals 95 and 96) in the controller.

Project planning aids

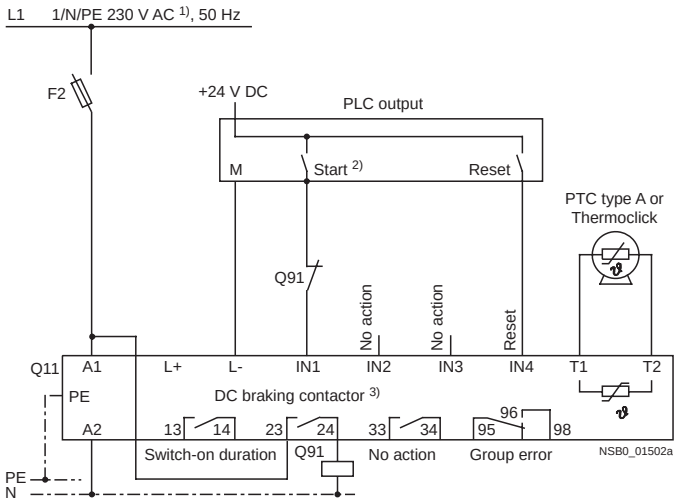
Main circuit

Possibility 3a:
Inline circuit with ramp-down function DC braking[3)]
(for device types 3RW44 22 to 3RW44 25)



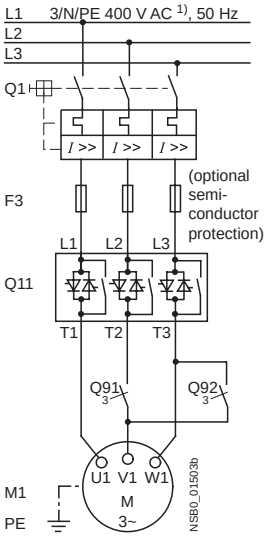
Control circuit

Possibility 3a:
Control of the DC braking contactor[3)]



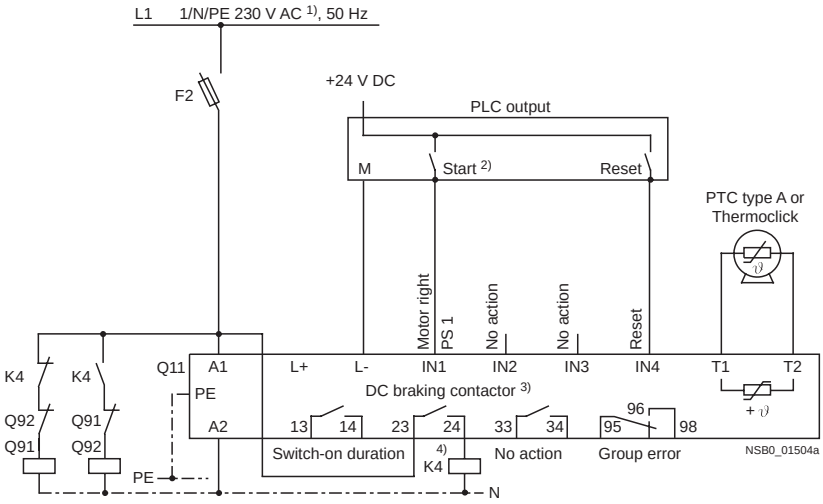
Main circuit

Possibility 3b:
Inline circuit with ramp-down function DC braking[3)]
(for device types 3RW44 26 to 3RW44 47)



Control circuit

Possibility 3b:
Control of the DC braking contactor[3)]



1) Permissible values for main and control voltage, see "Technical specifications".

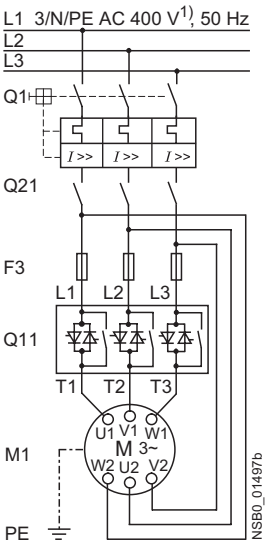
2) **Caution. Risk of restarting!**
The start command (e.g. from the PLC) must be reset prior to a reset command because a new, automatic restart will take place automatically if a start command is active after the reset command. This applies especially in case of motor protection tripping.
For safety reasons we recommend incorporating the group error output (terminals 95 and 96) in the controller.

3) If the ramp-down function "Combined braking" is selected, no braking contactor is required.
If the ramp-down function "DC braking" is selected, a braking contactor must be used in addition. For type see "Fuse Assignment (Inline Circuit)" on pages 6/38 to 6/40.
For applications with large centrifugal masses (JLoad > JMotor) we recommend the function "DC braking".
The output 2 must be switched over to "DC braking contactor".

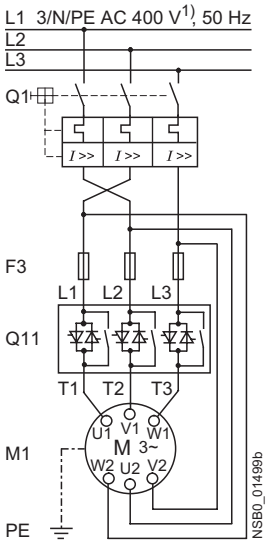
4) Auxiliary relay K4, e.g.:
LZX:RT4A4T30 (230 VAC rated control supply voltage),
LZX:RT4A4S15 (115 VAC rated control supply voltage).

Main circuit

Possibility 4a:
Inside-delta circuit

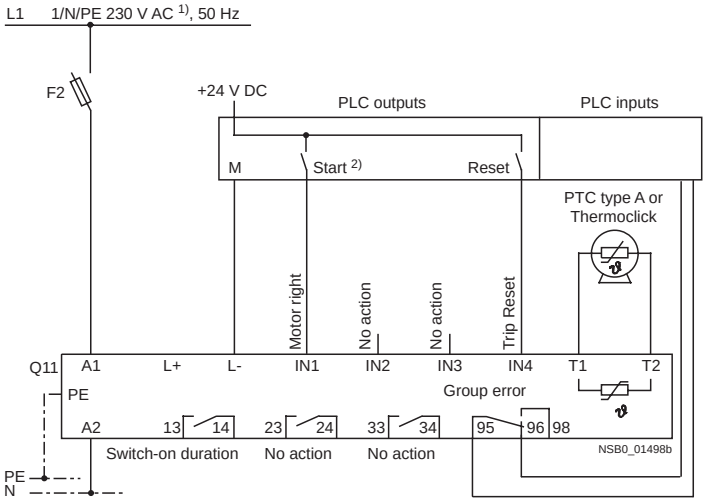


Possibility 4b:
Change of direction of rotation for inside-delta circuit



Control circuit

Possibility 4:
Control by means of PLC

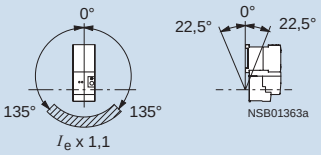


1) Permissible values for main and control voltage, see "Technical specifications".

2) **Caution. Risk of restarting!**
The start command (e.g. from the PLC) must be reset prior to a reset command because a new, automatic restart will take place automatically if a start command is active after the reset command. This applies especially in case of motor protection tripping.
For safety reasons we recommend incorporating the group error output (terminals 95 and 96) in the controller.

General data

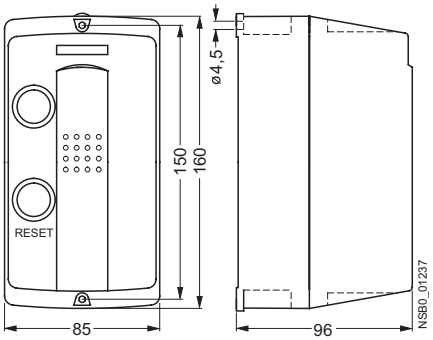
Technical specifications

		3RE19 13	3RE19 23	3RE19 33
General data				
Standards				
• IEC 60947-1, EN 60947-1 (VDE 0660 Part 100)		Yes		
• IEC 60947-5, EN 60947-5 (VDE 0660 Part 200)		Yes		
• IEC 60947-2, EN 60947-2 (VDE 0660 Part 101)		Yes		
Size		S00	S0	S0
Max. rated current $I_{n\,max}$ = (Max. rated operational current I_e)	A	12	25	50
Rated insulation voltage U_i (degree of pollution 3)	V	400		
Rated impulse withstand voltage U_{imp}	kV	4		
Ambient temperature				
• Operation	°C	-20 ... +35 (current reduction is necessary above +35 °C)		
• Storage	°C	-55 ... +80		
Degree of protection acc. to IEC 60947-1		IP65		
Touch protection acc. to EN 50274 (VDE 0660 Part 514)		Finger-safe		
Installation altitude	m	Up to 2000 above sea level; above this, please enquire		
Permissible rated current I_n				
• Overload relay for ambient temperature: +35 °C	%	100		
• Overload relay for ambient temperature: +45 °C	%	87		
Mounting position		For installation in the hatched area, a setting correction of 10 % must be implemented.  Contactor + overload relay		
Conductor cross-sections		[1]		
Short-circuit protection				
Main circuit		[2]		
Auxiliary circuit		[1]		

Dimensional drawings

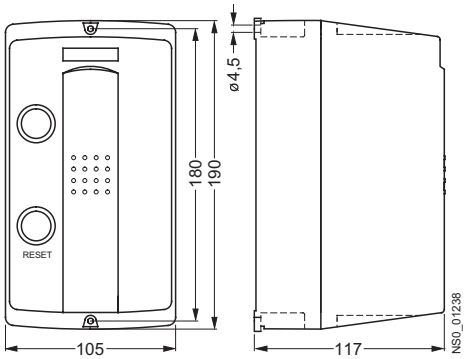
Direct-on-line starter, size S00

3RE19 13-1CB1
metric cable gland M25



Direct-on-line starter, size S0

3RE19 23-1CB2
metric cable gland M25

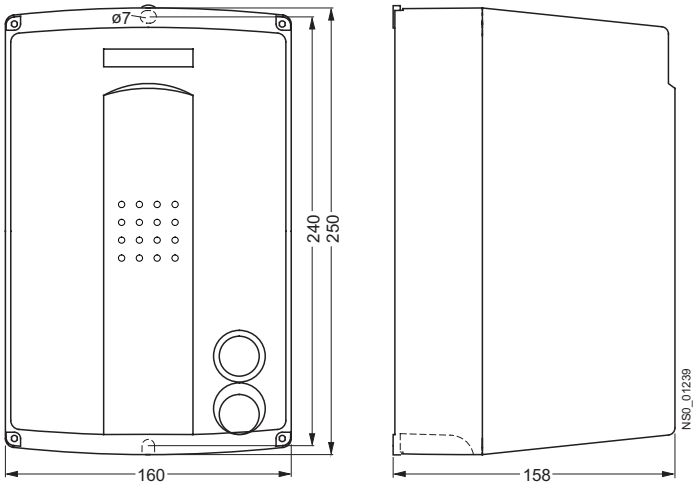


Direct-on-line starter, size S2

3RE19 33-1CB3

Reversing starter, size S00/S0

3RE19 23-2CB3
metric cable gland M32

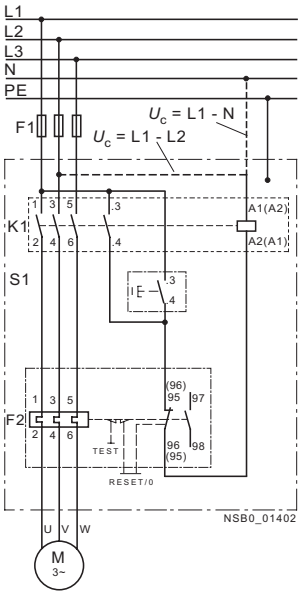


4a

Schematics

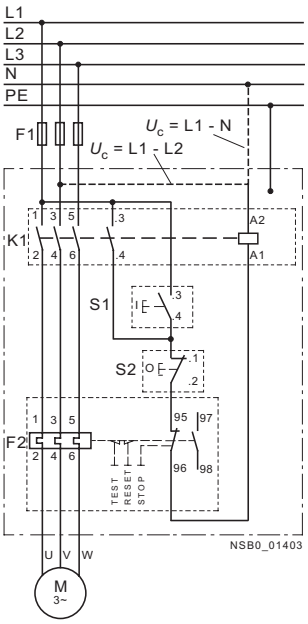
Direct-on-line starter, size S00/S0

3RE19 13-1CB1 (see Accessories)
3RE19 23-1CB2 (see Accessories)



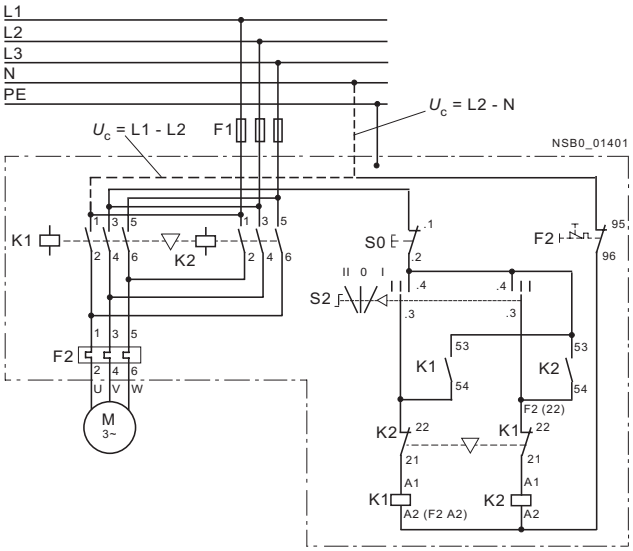
Direct-on-line starter, size S2

3RE19 33-1CB3 (see Accessories)



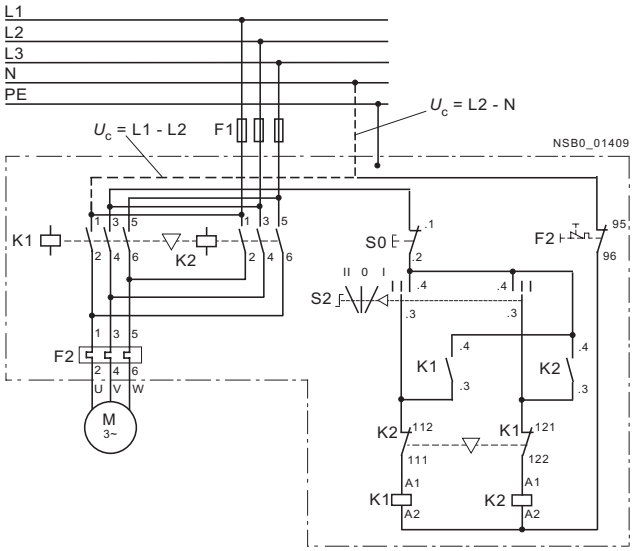
Reversing starter, size S00

3RE19 13-2CB3 (see Accessories)



Reversing starter, size S0

3RE19 13-2CB3



4a

Monitoring and Control Devices

5

Introduction

Overview

The advantages at a glance


3UF7


3PR15


3UG45 11


3UG46 16

		Type	Page
SIMOCODE 3UF motor management and control devices			
SIMOCODE pro 3UF7	• Compact, modular design • Unique flexibility in terms of functionality and hardware configuration • Wide functional range from the distributed I/O system to the autonomous motor management system • All control functions from the direct-on-line starter to the pole-changing switch with reversing contactor • All motor sizes • Integration in all PROFIBUS-capable automation systems	3UF7	5/14
3RP, 3RT19 timing relays			
3RP15 timing relay in industrial enclosure, 22.5 mm	• Low-cost solution with monofunctions such as response delay, OFF-delay, clock-pulse, wye-delta function, multifunction • Wide-range voltage designs	3RP15	5/14
3UG monitoring relays for electrical and additional measurements			
Line monitoring			
Phase sequence	• Low-cost solution for monitoring the phase sequence	3UG45 11	5/19
Phase sequence, phase failure, phase unbalance	• Wide voltage range from 160 ... 690 V	3UG45 12	5/19
Phase sequence, phase failure, phase unbalance and undervoltage	• Analogically adjustable • Wide voltage range from 160 ... 690 V	3UG45 13	5/19
	• Digitally adjustable with LCD display for indication of ACTUAL value and device status • Wide voltage range from 160 ... 690 V	3UG46 14	5/19
Phase sequence, phase failure, phase unbalance over limit values, overvoltage and undervoltage	• Digitally adjustable with LCD display for indication of ACTUAL value and device status	3UG46 15	5/19
Phase sequence, phase and N conductor failure, phase unbalance over limit values, overvoltage and undervoltage	Wide voltage range from 160 ... 690 V	3UG46 16	5/19
Power factor and active current monitoring (motor load monitoring)			
Power factor and active current monitoring with internal power supply for overshoot, undershoot or window monitoring	• For monitoring over the entire torque range • Digitally adjustable with LCD display for indication of ACTUAL value and device status • Wide voltage range from 90 ... 690 V	3UG46 41	5/21
Residual current monitoring			
Residual-current monitoring relays	• Digitally adjustable with LCD display for indication of ACTUAL value and device status • Adjustable threshold values for warning and disconnection • For plant monitoring • Wide voltage range from 90 ... 690 V	3UG46 24	5/22
Summation current transformers	• For detection of fault currents in machines and plants	3UL22	5/23
Insulation monitoring			
Monitoring of the insulation resistance for ungrounded AC or DC networks from 1 ... 110 kΩ	• Test button • With or without storage • Switchable measuring range	3UG30 81,	5/24

5

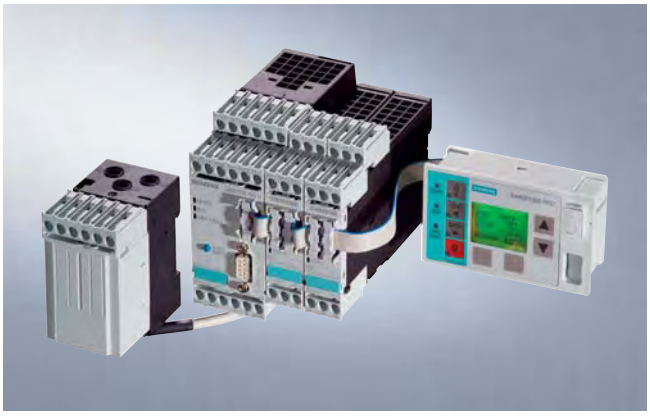
The advantages at a glance

3RN1

3TK28

		Type	Page
3RN1 thermistor motor protection			
For PTC sensors	• Relays for monitoring motor winding temperatures with type A PTC sensors • Integrated with ATEX approval • Closed-circuit principle • Depending on the version: With short-circuit and open-circuit detection, zero voltage safety, manual/auto/remote RESET, 1 CO, 1 NO + 1 NC, 2 CO, 1 NO + 1 CO or 2 CO hard gold-plating	3RN1	5/26
3TK28 safety relays			
With electronic enabling circuits	• Permanent function checking • No wear because switched electronically • High switching frequency • Long electrical endurance • Evaluation of solid-state sensors • Sensor lead up to max. 2000 m • Cascading possible • Insensitive to vibrations and dirt • Compact design, low weight • Approved for the world market	3TK28 4	5/30
With relay enabling circuits	• Compact design • Floating safe outputs • Also suitable for press and punch controls • Can be used up to an ambient temperature of max. 70 °C	3TK28 2, 3TK28 3	5/33
With contactor relay enabling circuits	• Enabling circuits, floating • AC-15/DC-13 switching capacity • Safe isolation • Long mechanical and electrical endurance • Certified as a complete unit • Fault minimization and cost reduction through factory wiring • Low installation costs	3TK28 5	5/35
With special functions	• Floating safe outputs • Signaling outputs for status and diagnostics signals • Safe standstill monitoring	3TK28 1	5/37

Overview



SIMOCODE pro V with current/voltage measuring module, expansion modules and operator panel with display

SIMOCODE pro is a flexible, modular motor management system for constant speed motors in the low-voltage range. It optimizes the connection between installation & control and motor feeder. It increases plant availability and allows significant savings to be made for start-up, operation and maintenance of a system.

When SIMOCODE pro is installed in the low-voltage switchboard, it is the intelligent interface between the higher-level automation system and the motor feeder and includes the following:

- Multifunctional, solid-state full motor protection which is independent of the automation system
- Flexible software instead of hardware for the motor control
- Detailed operating, service and diagnostics data
- Open communication through PROFIBUS DP, the standard for fieldbus systems

SIMOCODE ES is the software package for SIMOCODEpro parameterization, start-up and diagnostics.

Benefits

General customer benefits

- Integrating the whole motor feeder into the process control by means of a bus significantly reduces the wiring outlay between the motor feeder and PLC
- Decentralization of the automated processes by means of configurable control and monitoring functions in the feeder saves resources in the automation system and ensures full functionality and protection of the feeder even if the automotion system or bus system fails
- The acquisition and monitoring of operational, service and diagnostics data in the feeder and process control system increases plant availability as well as maintenance and service-friendliness
- The high degree of modularity allows users to perfectly implement their plant-specific requirements for each motor feeder
- The SIMOCODE pro system offers functionally graded and space-saving solutions for each customer application
- The replacement of the control circuit hardware with software decreases the number of hardware components and wiring required and hence limits stock keeping costs and potential wiring errors
- The use of solid-state full motor protection permits better utilization of the motors and ensures long-term stability of the tripping characteristic and reliable tripping even after years of service

Multifunctional, solid-state full motor protection for rated motor currents up to 820 A

SIMOCODE pro offers comprehensive protection of the motor feeder by means of a combination of different, multi-step and delayable protection and monitoring functions:

- Inverse-time delayed solid-state overload protection (Class 5 ... 40)
- Thermistor motor protection
- Phase failure / unbalance protection
- Stall protection
- Monitoring of adjustable limit values for the motor current
- Voltage and power monitoring
- Monitoring of the power factor (motor idling/load shedding)
- Ground-fault monitoring
- Temperature monitoring, e.g. over PT100/PT1000
- Monitoring of operating hours, downtime and number of starts etc.

Recording of measuring curves

SIMOCODE pro can record measuring curves and therefore, for example, can present the progression of motor current during motor start-up.

Flexible motor control implemented with software (instead of comprehensive hardware interlocks)

Many predefined motor control functions have already been integrated into SIMOCODE pro, including all necessary logic operations and interlocks:

- Overload relays
- Direct-on-line and reversing starters
- Star/delta starters (also with direction reversal)
- Two speeds, motors with separate windings (pole-changing switch); also with direction reversal
- Two speeds, motors with separate Dahlander windings (also with direction reversal)
- Positioner actuation
- Solenoid valve actuation
- Activation of a circuit breaker
- Soft starter actuation (also with direction reversal)

These control functions have been implemented in SIMOCODE pro by means of software and can be freely assigned to the inputs and outputs of the device (including PROFIBUS DP).

These predefined control functions can also be flexibly adapted to each customized configuration of a motor feeder by means of freely configurable logic modules (truth tables, counters, timers, edge evaluation ...) and with the help of standard functions (power failure monitoring, emergency start, external faults ...), without additional auxiliary relays being necessary in the control circuit.

SIMOCODE pro makes a lot of additional hardware and wiring in the control circuit unnecessary which results in a high level of standardization of the motor feeder in terms of its design and circuit diagrams.

Detailed operational, service and diagnostics data

SIMOCODE pro makes different operational, service and diagnostics data available and helps to detect potential faults in time and to prevent them by means of preventative measures. In the event of a malfunction, a fault can be diagnosed, localized and rectified very quickly - there are no or very short downtimes.

Operating data

- Motor switching state derived from the current flow in the main circuit
- All phase currents
- All phase voltages
- Active power, apparent power and power factor
- Phase unbalance and phase sequence
- Time to trip
- Motor temperature
- Remaining cooling time etc.

Service data

- Motor operating hours
- Motor stop times
- Number of motor starts
- Number of overload trips
- Consumed power
- Internal comments stored in the device etc.

Diagnostics data

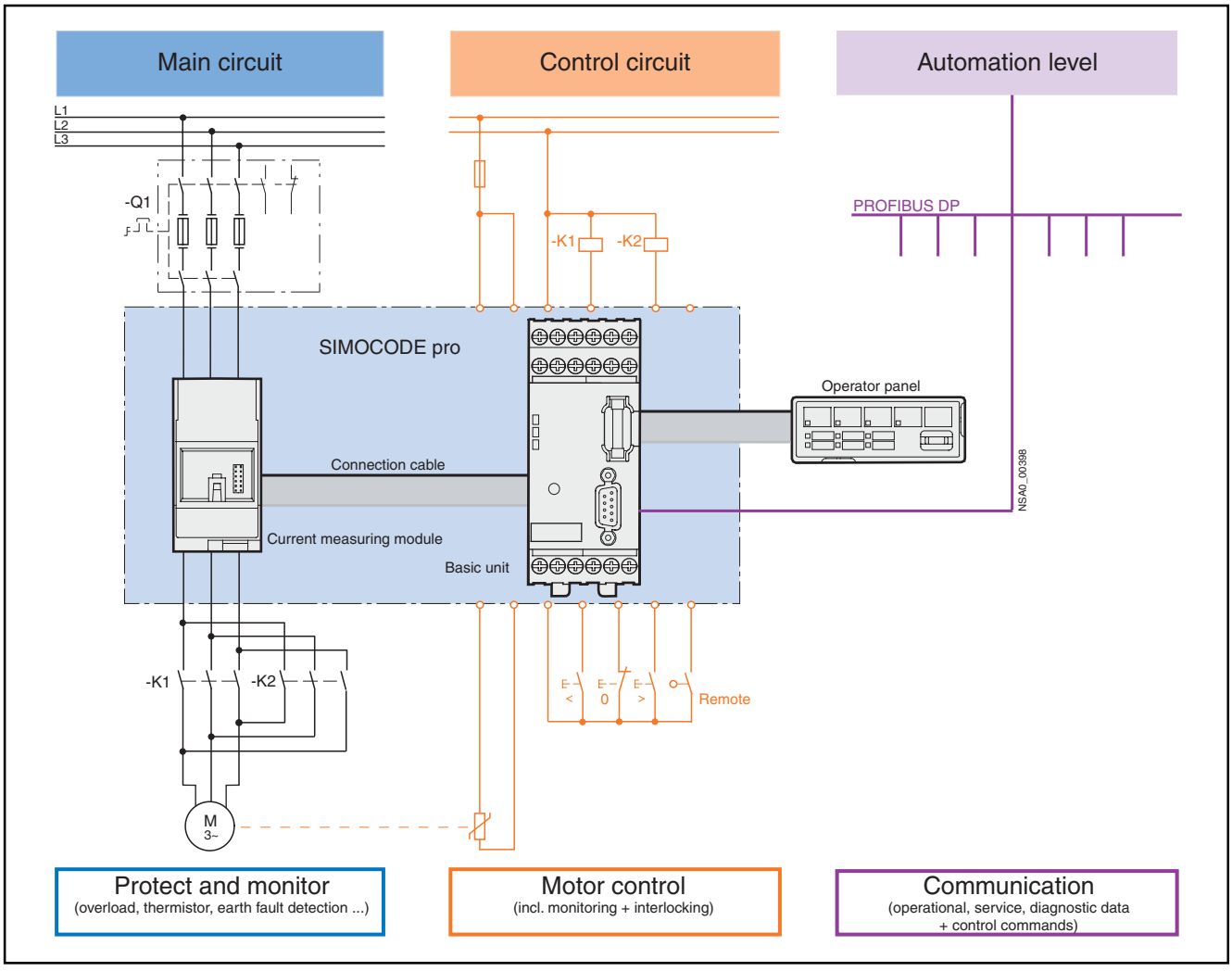
- Numerous detailed early warning and fault messages
- Internal device fault logging with time stamp
- Time stamping of freely selectable status, alarm or fault messages etc.

Communication

SIMOCODE pro is equipped with an integral PROFIBUS DP interface (SUB-D or terminal connection) and can therefore replace all individual wiring (including modular terminals), which would usually be required for exchanging data with the higher-level automation system, with a single 2-wire cable.

SIMOCODE pro supports among other things:

- Baud rates up to 12 Mbit/s
- Automatic baud rate detection
- Communication with up to 3 masters
- Time synchronization over PROFIBUS
- Cyclic services (DPV0) and acyclic services (DPV1)
- DPV1 communication after the Y-Link etc.



SIMOCODE pro combines all the necessary functions for the motor feeder in a compact system.

Application

SIMOCODE pro is often used for automated processes where plant downtimes are very expensive (e.g. steel or cement industry) and where it is important to prevent plant downtimes through detailed operational, service and diagnostics data or to localize the fault very quickly in the event of a fault.

SIMOCODE pro is modular and space-saving and suited especially for operation in motor control centers in the process industry and for power plant technology.

Applications

Protection and control of motors

- In hazardous areas for types of protection EEx e/d according to ATEX directive 94/9/EC
- With heavy starting (paper, cement, metal and water industries)
- In high-availability plants (chemical, oil, raw material processing industry, power plants)

Industries

Today, SIMOCODE pro is mainly used in the chemical (incl. oil and gas), steel, water, paper, pharmaceutical, cement, and glass industry. It is also used for applications in power plants and large diamond, gold and platinum mines.

An essential requirement in these industries is the availability of the motors and thus the availability of the whole process. Plant downtimes caused by faults frequently result in high costs. For this reason, it is very important to detect potential faults early on and to initiate targeted countermeasures. SIMOCODE pro offers users an up-to-date motor management system based on years of experience.

More Information

Important ordering notes

SIMOCODE pro is a modularly constructed motor management system which is subdivided into two device series with different functional scopes:

SIMOCODE pro C,
as a compact system for direct-on-line starters and reversing starters

SIMOCODE pro V,
as a variable system with all control functions and with the possibility of expanding the inputs, outputs and functions of the system at will using expansion modules.

Expansion possibilities	SIMOCODE pro C, Basic Unit 1	SIMOCODE pro V, Basic Unit 2
Operator panel	✓	✓
Operator panel with display	--	✓
Current measuring modules	✓	✓
Current/voltage measuring modules	--	✓
Decoupling module	--	✓
Expansion modules:	--	✓
Digital modules (max. 2)	--	✓
Analog module (max. 1)	--	✓
Earth-lealcase module (max. 1)	--	✓
Temperature module (max. 1)	--	✓

✓ Possible

-- Not available

Note:

When an operator panel with display and/or a decoupling module is used, restrictions on the number of expansion modules connectable per basic unit must be observed see Technical Information!

Selection and ordering data

	Version	Current setting	Width	Screw terminals Order No.	Weight Per PU approx.
		A	mm		kg.
SIMOCODE pro					
 3UF7 000-1A.00-0	**SIMOCODE pro C, basic units 1** PROFIBUS DP interface, 12 Mbit/s, RS 485 4 I/3 O freely assignable, input for thermistor connection, monostable relay outputs, rated control supply voltage *Us*:				
	• 24 V DC			**3UF7 000-1AB00-0**	0.350
	• 110 ... 240 V AC/DC			**3UF7 000-1AU00-0**	0.350
 3UF7 010-1A.00-0	**SIMOCODE pro V, basic units 2** PROFIBUS DP interface, 12 Mbit/s, RS 485 4 I/3 O freely assignable, input for thermistor connection, monostable relay outputs, can be expanded with expansion modules, rated control supply voltage Us:				
	• 24 V DC			**3UF7 010-1AB00-0**	0.350
	• 110 ... 240 V AC/DC			**3UF7 010-1AU00-0**	0.350
 3UF7 100-1AA00-0	**Current measuring modules**				
	Straight-through transformers	0.3 ... 3	45	**3UF7 100-1AA00-0**	0.100
		2.4 ... 25	45	**3UF7 101-1AA00-0**	0.150
		10 ... 100	55	**3UF7 102-1AA00-0**	0.350
		20 ... 200	120	**3UF7 103-1AA00-0**	0.600
	Busbar connections	20 ... 200	120	**3UF7 103-1BA00-0**	1.000
		63 ... 630	145	**3UF7 104-1BA00-0**	1.750
 3UF7 110-1AA00-0	**Current/voltage measuring modules** Voltage measuring up to 690 V if required in connection with a decoupling module				
	Straight-through transformers	0.3 ... 3	45	**3UF7 110-1AA00-0**	0.150
		2.4 ... 25	45	**3UF7 111-1AA00-0**	0.200
		10 ... 100	55	**3UF7 112-1AA00-0**	0.400
		20 ... 200	120	**3UF7 113-1AA00-0**	0.700
	Busbar connections	20 ... 200	120	**3UF7 113-1BA00-0**	1.000
		63 ... 630	145	**3UF7 114-1BA00-0**	1.750
 3UF7 150-1AA00-0	**Decoupling modules** For connecting upstream from a current/voltage measuring module on the system interface when using voltage detection in non-earthed networks			**3UF7 150-1AA00-0**	0.150
 3UF7 200-1AA00-0	**Operator panels** Installation in control cabinet door or front plate, for plugging into basic unit, 10 LEDs for status indication and user-assignable buttons for controlling the motor			**3UF7 200-1AA00-0**	0.100
 3UF7 210-1AA00-0	**Operator panels with display for SIMOCODE pro V**[1)] Installation in control cabinet door or front plate, for plugging into basic unit 2, 7 LEDs for status indication and user-assignable buttons for controlling the motor, multilingual display, e.g. for indication of measured values, status information or fault messages			**3UF7 210-1AA00-0**	0.150

[1)] Only possible with basic unit 2, product version EO3 and higher (from 12/2006)

Selection and ordering data

Version	Current setting	Width	**Screw terminals** Order No.	Weight Per PU approx.
	A	mm		kg.
Expansion modules				

Note:
Expansion modules can only be used in combination with basic unit 2! A total of up to 5 expansion modules can be connected in any order to one basic unit. When an operator panel with display and/or a decoupling module is used, more restrictions on the number of expansion modules connectable per basic unit must be observed!

3UF7 300-1AU00-0

Digital modules
4 binary inputs and 2 relay outputs,
up to 2 digital modules can be connected per basic unit 2

Relay outputs	Input voltage		
Monostable	24 V DC	**3UF7 300-1AB00-0**	0.150
	110 ... 240 V AC/DC	**3UF7 300-1AU00-0**	0.150
Bistable	24 V DC	**3UF7 310-1AB00-0**	0.150
	110 ... 240 V AC/DC	**3UF7 310-1AU00-0**	0.150

3UF7 400-1AA00-0

Analog modules
2 inputs (passive) for input and 1 output for output of 0/4 ...20 mA signals,
max. 1 analog module can be connected per basic unit 2

3UF7 400-1AA00-0 0.150

3UF7 500-1AA00-0

Earth-leakage modules
1 input for connecting a summation current transformer 3UL22,
up to 1 ground-fault module can be connected per basic unit 2
Note:
For the corresponding summation current transformers for rated fault currents of 0.3 A, 0.5 A or 1 A
see page 7/55.

3UF7 500-1AA00-0 0.150

3UF7 700-1AA00-0

Temperature modules
3 inputs for connecting up to 3 analog temperature sensors, up to 1 temperature module can be connected per basic unit 2

3UF7 700-1AA00-0 0.150

Accessories

	Version	Order No.	Weight Per PU approx. kg.
Connection cables (essential accessory)			
 3UF7 932-0AA00-0	**Connection cables** In different lengths for connecting basic unit, current measuring module, current/voltage measuring module, operator panel or expansion modules or decoupling module: Length 0.025 m (flat) Note: Only suitable for connecting basic unit 2 to its expansion modules or for connecting expansion modules to each other; only when the front plates finish at the same height!	**3UF7 930-0AA00-0**	0.010
	• Length 0.1 m (flat)	**3UF7 931-0AA00-0**	0.010
	• Length 0.3 m (flat)	**3UF7 935-0AA00-0**	0.020
	• Length 0.5 m (flat)	**3UF7 932-0AA00-0**	0.020
	• Length 0.5 m (round)	**3UF7 932-0BA00-0**	0.050
	• Length 1.0 m (round)	**3UF7 937-0BA00-0**	0.100
	• Length 2.5 m (round)	**3UF7 933-0BA00-0**	0.150
PC cables			
 3UF7 940-0AA00-0	**For PC/PG communication with SIMOCODE pro** through the system interface, for connecting to the serial interface of the PC/PG	**3UF7 940-0AA00-0**	0.150
Memory modules			
 3UF7 900-0AA00-0	The memory module enables the complete parameter assignment of a system to be saved and transferred to a new system, e.g. when a device is replaced, without the need for additional aids or detailed knowledge of the the system interface	**3UF7 900-0AA00-0**	0.010
Interface covers			
 3UF7 950-0AA00-0	**For system interface**	**3UF7 950-0AA00-0**	0.100
Addressing plugs			
 3UF7 920-0AA00-0	**For assigning the PROFIBUS addresses without using a PC/PG** on SIMOCODE pro through the system interface	**3UF7 910-0AA00-0**	0.030
Door adapters			
 3UF7 920-0AA00-0	**For external connection of the system interface** outside, for example, a control cabinet	**3UF7 920-0AA00-0**	0.030
Adapters for operator panel			
 3UF7 922-0AA00-0	The adapter enables the smaller 3UF7 20 operator panel from SIMOCODE pro to be used in a front panel cutout in which previously, e.g. after a change of system, a larger 3UF5 2 operator panel from SIMOCODE-DP had been used; degree of protection IP54	**3UF7 922-0AA00-0**	0.150

Accessories

	Version	Order No.	Weight Per PU approx. kg.
Labelling strips			
 3UF7 925-0AA02-0	• For pushbuttons of the 3UF7 20 operator panel • For pushbuttons of the 3UF7 21 operator panel with display For LEDs of the 3UF7 20 operator panel *Note: Pre-punched labeling strips for user-specific printing using the free inscription software "SIRIUS Label Designer" on a laser printer. Note the software version! Download from www.siemens.de/simocode.*	**3UF7 925-0AA00-0** **3UF7 925-0AA01-0** **3UF7 925-0AA02-0**	15.000 15.000 15.000
Push-in lugs			
 3RB19 00-0B	**For screw mounting** e.g. on mounting plate, 2 units required per device • Can be used with 3UF7 1.0, 3UF7 1.1 and 3UF7 1.2 • Can be used with 3UF7 0, 3UF7 3, 3UF7 4, 3UF7 5 and 3UF7 7	**3RB19 00-0B** **3RP19 03**	0.100 0.002
Terminals covers			
 3RT 19 56-4EA1	**Covers for cable lugs and busbar connections** • Length 100 mm, can be used for 3UF7 1.3-1BA00-0 • Length 120 mm, can be used for 3UF7 1.4-1BA00-0	**3RT19 56-4EA1** **3RT19 66-4EA1**	0.170 0.130
 3RT 19 56-4EA2	**Covers for box terminals** • Length 25 mm, can be used for 3UF7 1.3-1BA00-0 • Length 30 mm, can be used for 3UF7 1.4-1BA00-0	**3RT19 56-4EA2** **3RT19 66-4EA2**	0.030 0.040
	Covers for screw terminals between contactor and current measuring module or current/voltage measuring module for direct mounting • Can be used for 3UF7 1.3-1BA00-0 • Can be used for 3UF7 1.4-1BA00-0}	**3RT19 56-4EA3** **3RT19 66-4EA3**	0.020 0.060
Boc terminal blocks			
 3RT 19 5.-4G	**For round and ribbon cables** • Up to 70 mm2, can be used for 3UF7 1.3-1BA00-0 • Up to 120 mm2, can be used for 3UF7 1.3-1BA00-0 • Up to 240 mm2, can be used for 3UF7 1.4-1BA00-0 For conductor cross-sections, see Technical Information.	**3RT19 55-4G** **3RT19 56-4G** **3RT19 66-4G**	0.230 0.260 0.676
System manuals			
 3UF7 970-0AA01-0	**SIMOCODE pro** With token fee, languages: • German • English • French	**3UF7 970-0AA01-0** **3UF7 970-0AA00-0** **3UF7 970-0AA02-0**	0.850 0.850 0.850

Accessories

Version	Order No.	Weight Per PU approx. kg.
PCS 7 function block library for SIMOCODE pro		
 3UF7 982-0AA00-0		
For integrating SIMOCODE pro into the PCS 7 process control system		
• **PCS 7 function block library for SIMOCODE pro, V6.0** Scope of supply: AS modules and faceplates for integrating SIMOCODE pro into the PCS 7 process control system, for PCS 7 version V6.0 Engineering software for one engineering station (single license) including runtime software for execution of the AS module in an automation system (single license), German/English/French, Type of delivery: CD incl. electronic documentation	**3UF7 982-0AA00-0**	0.240
• **PCS 7 function block library for SIMOCODE pro, V6.1** Scope of supply: AS modules and faceplates for integrating SIMOCODE pro into the PCS 7 process control system, for PCS 7 version V6.1 Engineering software for one engineering station (single license) including runtime software for execution of the AS module in an automation system (single license), German/English/French, Type of delivery: CD incl. electronic documentation	**3UF7 982-0AA02-0**	0.240
• **PCS 7 function block library for SIMOCODE pro, V7.0** Scope of supply: AS modules and faceplates for integrating SIMOCODE pro into the PCS 7 process control system, for PCS 7 version V7.0 Engineering software for one engineering station (single license) including runtime software for execution of the AS module in an automation system (single license), German/English/French, Type of delivery: CD incl. electronic documentation	**3UF7 982-0AA10-0**	0.240
• **AS modules for integrating SIMOCODE pro into the PCS 7 process control system, for PCS 7 version V6.x** Runtime software for execution of the AS module in an automation system (single license), Type of delivery: license without software and documentation	**3UF7 982-0AA01-0**	0.001
• AS modules for integrating SIMOCODE pro into the PCS 7 process control system, for PCS 7 version V7.x Runtime software for execution of the AS module in an automation system (single license), Type of delivery: license without software and documentation	**3UF7 982-0AA11-0**	0.001
• **Upgrade for the PCS 7 function block library SIMOCODE pro, V6.0 or V6.1 to the version SIMOCODE pro V7.0** for integrating SIMOCODE pro in the PCS 7 process control system, for the PCS 7 Version V7.0 (single license), German/English/French, Type of delivery: CD incl. electronic documentation	**3UF7 982-0AA13-0**	0.240

Overview

SIMOCODE ES engineering software (E-SW)

SIMOCODE ES is the software package for SIMOCODE pro parameterization, start-up and diagnostics.

Selection and ordering data

Parameterization and service software for SIMOCODE pro 3UF7

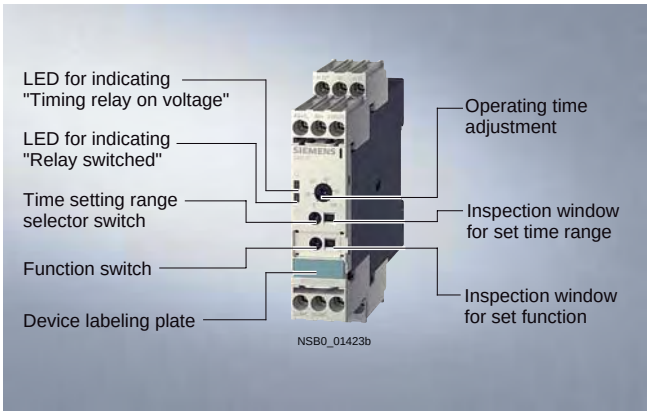
- Runs on WIN 2000/Win XP PROF
- Without PC cable

Version	DT	Order No.	Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx. kg
SIMOCODE ES 2007 Basic							
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface							
• License key on USB stick, Class A	▶	**3ZS1 312-4CC10-0YA5**		1	1unit	131	0.230
• License key download, Class A	▶	**3ZS1 312-4CE10-0YB5**		1	1unit	131	0.001
SIMOCODE ES 2007 Standard							
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface							
• License key on USB stick, Class A	▶	**3ZS1 312-5CC10-0YA5**		1	1unit	131	0.230
• License key download, Class A	▶	**3ZS1 312-5CE10-0YB5**		1	1unit	131	0.001
Upgrade for SIMOCODE ES 2004 and later Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A 3 languages (German/English/French), communication through system interface	▶	**3ZS1 312-5CC10-0YE5**		1	1unit	131	0.230
Powerpack for SIMOCODE ES 2007 Basic Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A 3 languages (German/English/French), communication through system interface	▶	**3ZS1 312-5CC10-0YD5**		1	1unit	131	0.230
Software Update Service For 1 year with automatic extension, assuming the current software version is in use, E-SW, software and documentation on CD. communication through system interface	▶	**3ZS1 312-5CC10-0YL5**		1	1unit	131	0.230

Version	DT	Order No.	Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx. kg
SIMOCODE ES 2007 Premium							
Floating license for one user E-SW, software and documentation on CD, 3 languages (German/English/French), communication through system interface							
• License key on USB stick, Class A	▸	**3ZS1 312-6CC10-0YA5**		1	1unit	131	0.230
• License key download, Class A	▸	**3ZS1 312-6CE10-0YB5**		1	1unit	131	0.001
Upgrade for SIMOCODE ES 2004 and later Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A 3 languages (German/English/French), communication through system interface	▸	**3ZS1 312-6CC10-0YE5**		1	1unit	131	0.230
Powerpack for SIMOCODE ES 2007 Basic Floating license for one user, E-SW, software and documentation on CD, License key on USB stick, Class A 3 languages (German/English/French), communication through system interface	▸	**3ZS1 312-6CC10-0YD5**		1	1unit	131	0.230
Software Update Service For 1 year with automatic extension, assuming the current software version is in use, E-SW, software and documentation on CD. communication through system interface	▸	**3ZS1 312-6CC10-0YL5**		1	1unit	131	0.230

3RP15 timing relays in industrial enclosure, 22.5 mm

Overview



Standards

The timing relays comply with:

- EN 60721-3-3 "Environmental conditions"
- EN 61812-1/DIN VDE 0435 Part 2021 "Electrical relays, timing relays"
- EN 61000-6-2 and EN 61000-6-4 "Electromagnetic compatibility"
- EN 60947-5-1; (VDE 0660 Part 200) "Low-voltage controlgear"

Application

Timing relays are used in control, starting, and protective circuits for all switching operations involving time delays. They guarantee a high level of functionality and a high repeat accuracy of timer settings.

Selection and ordering data

Solid-state timing relays for general use in control systems and mechanical engineering with:

- 1 Changeover contact or 2 changeover contacts
- Single or selectable time setting rangers
- Switch position indication by LED
- Voltage indication by LED

Version	Time setting range *t* adjustable by rotary switch to	Rated control supply voltage U_s AC 50/60 Hz V	Rated control supply voltage U_s DC V	DT	Screw terminals Order No.	Screw terminals Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx. kg
3RP15 05 timing relays, multifunction, 15 time setting ranges										
 3RP 15 05-1BP30	The functions can be adjusted by means of rotary switches. Insert labels can be used to adjust different functions of the 3RP15 05 timing relay clearly and unmistakably. The corresponding labels can be ordered as an accessory. The same potential must be applied to terminals A. and B.[1]									
With LED and										
1 CO contact, 8 functions	1.5... 30 s	24 ... 240[6]	24 ... 240[3]	▸	3RP15 05-1AW30		1	1 unit	101	0.136
3RP15 1. timing relays, ON-delay, 1 time setting range										
 3RP 15 05-1AP30										
With LED and 1 CO contact,	0.5 ... 10 s	24/100 ...127	24	▸	3RP15 11-1AQ30		1	1 unit	101	0.108
		24/200 ... 240	24	▸	3RP15 11-1AP30		1	1 unit	101	0.108
	5 ... 100 s	24/100 ... 127	24	▸	3RP15 13-1AQ30		1	1 unit	101	0.107
		24/200 ... 240	24	▸	3RP15 13-1AP30		1	1 unit	101	0.108
3RP15 25 timing relays, ON-delay, 15 time setting ranges										
 3RP 15 25-1BW30										
With LED and										
1 CO contact	0.05 ... 1 s 0.15 ... 3 s 0.5 ... 10 s	24/100 ... 127 24/200 ... 240	24 24	▸ ▸	3RP15 25-1AQ30 3RP15 25-1AP30		1 1	1 unit 1 unit	101 101	0.109 0.104
2 CO contacts	1.5 ... 30 s 0.05 ... 1 min 5 ... 100 s 0.15 ... 3 min 0.5 ... 10 min 1.5 ... 30 min 0.05 ... 1 h 5 ... 100 min 0.15 ... 3 h 0.5 ... 10 h 1.5 ... 30 h 5 ... 100 h ∞2)	24 ... 2406)	60[6] 24... 2403)	▸	3RP15 25-1BW30		1	1 unit	101	0.159

1) For functions, see 3RP 19 01-0. label set.
2) With switch position ∞, no timing. For test purposes (ON/OFF function) on site. Relay is constantly on when activated, or relay remains constantly off when activated. Depending on which function is set.
3) Operating range 0.7 ... 1.1 x *U*s.
4) Positively driven: NO and NC are never closed simultaneously; contact gap ≥ 0.5 mm is ensured, minimum make-break capacity 12 V, 3 mA.
5) The changeover contacts are actuated simultaneously, as a result of which only 8 functions are selectable (no wye-delta, no instantaneous contact).
6) Operating range 0.8 ... 1.1 x *U*s.

*** You can order this quantity or a multiple thereof.**

3RP15 timing relays in industrial enclosure, 22.5 mm

Solid-state timing relays for general use in control systems and **mechanical engineering with:**

- **1 Changeover contact or 2 changeover contacts**
- **Single or selectable time setting rangers**
- **Switch position indication by LED**
- **Voltage indication by LED**

Version	Time setting range *t* adjustable by rotary switch to	Rated control supply voltage U_s AC 50/60 Hz V	DC V	DT	Screw terminals Order No.	Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx. kg
3RP15 05 timing relays, multifunction, 15 time setting ranges										
										
With LED and 1 CO contact, The same potential must be applied to terminals A and B	0.5 ... 10 s	24/100 ... 127	24	A	3RP15 31-1AQ30		1	1 unit	101	0.140
		24/200 ... 240	24	▶	3RP15 31-1AP30		1	1 unit	101	0.140
	5 ... 100 s	24/100 ... 127	24	A	3RP15 33-1AQ30		1	1 unit	101	0.139
		24/200 ... 240	24	▶	3RP15 33-1AP30		1	1 unit	101	0.140
3RP15 33-1AP30										
3RP15 7. timing relays, wye-delta function6), dead interval 50 ms, 1 time setting range										
										
1 NO contact instantaneous and 1 NO contact delayed		380 ...440								
(common contact root terminal 17)	3 ... 60 s	24/100 ... 127	24	▶	3RP15 76-1NQ30		1	1unit	101	0.112
		24/200 ... 240	24	▶	3RP15 76-1NP30		1	1 unit	101	0.113
		200 ... 240/ 380 ...440	--	B	3RP15 76-1NM20		1	1 unit	101	0.113
3RP15 76-1NP30										

1) Setting of output contacts in as-supplied state not defined (bistable relay). Application of the control voltage once results in contact changeover to the correct setting.

2) Operating range 0.7 ... 1.25 x *Us*.

3) Operating range 0.85 ... 1.1 x *Us*.

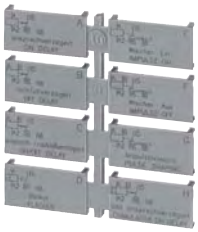
4) With switch position •, no timing. For test purposes (ON/OFF function) on site. For dead time "infinite", the relay is always off. For pulse time "infinite", the relay is always on.

5) Operating range 0.8 ... 1.1 x Us.

*** You can order this quantity or a multiple thereof.**

Accessories

Label sets



3RP 19 01-0A

Accessory for 3RP15 05 (not included in the scope of supply).
The label set offers the possibility of labeling timing relays with the set function in English and German.

Version	Function	Identification	Use	DT	Order No.	Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
1 label set (1 unit) with 8 functions	With ON-delay	A	for devices with 1 CO contact and 3RP15 05-RW30		**3RP19 01-0A**		1	5 units	101	0.003
	OFF-delay with auxiliary voltage									
	ON-delay and OFF-delay with auxiliary voltage	C								
	Flashing, starting with interval	D								
	Passing make contact	E								
	Passing break contact with auxiliary voltage	F								
	Pulse-forming with auxiliary voltage	G								
	Additive ON-delay with auxiliary voltage	H								

Covers and push-in-lugs

3RP 19 03

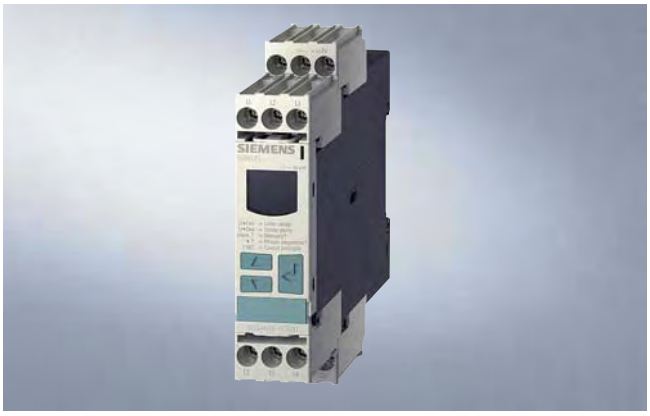
Push-In lugs For screw mounting, 2 units are required for each device			for devices with 1 or 2 CO contacts		**3RP19 03**		1	10units	101	0.002

5

* You can order this quantity or a multiple thereof.

Line monitoring

Overview



Solid-state line monitoring relays provide maximum protection for mobile machines and plants or for unstable networks. Network and voltage faults can be detected early and rectified before far greater damage ensues.

Depending on the version, the relays monitor phase sequence, phase failure with and without N conductor monitoring, phase unbalance, undervoltage or overvoltage.

Phase unbalanced is evaluated as the difference between the greatest and the smallest phase voltage relative to the greatest phase voltage. Undervoltage or overvoltage exists when at least one phase voltage deviates by 20 % from the set rated system voltage or the directly set limit values are overshot or undershot. The rms value of the voltage is measured.

Benefits

- Can be used without auxiliary voltage in any network from 160 ... 600 V AC worldwide thanks to wide voltage range
- Variably adjustable to overvoltage, undervoltage or window monitoring
- Freely configurable delay times and reset response
- Width 22.5 mm
- Permanent display of ACTUAL value and network fault type on the digital variants
- Automatic correction of the direction of rotation by distinguishing between power system faults and wrong phase sequence
- All versions with removable terminals
- All versions with screw terminals or alternatively with innovative spring-loaded terminals

Application

The relays are used above all for mobile equipment, e.g. air conditioning compressors, refrigerating containers, building site compressors and cranes.

Function	Application
Phase sequence	• Direction of rotation of the operating mechanism
Phase failure	• A fuse has tripped • Failure of the control supply voltage • Broken cable
Phase unbalance	• Overheating of the motor due to asymmetrical voltage • Detection of asymmetrically loaded networks
Undervoltage	• Increased current on a motor with corresponding overheating • Unintentional resetting of a device • Network collapse, particularly with battery power
Overvoltage	• Protection of a plant against destruction due to overvoltage

Selection and ordering data

3UG45 11-1AP20

3UG46 15-1CR20

3UG46 16-1CR20

3UG46 17-1CR20

3UG46 18-1CR20

Hysteresis	Under voltage detec-	Over voltage detec-	ON-delay	Tripping delay	Version of auxillary contacts	Rated control supply voltage *Us*	DT	**Screw terminals** Order No.	Price per PU	PU (UNIT. SET.M)	PS*	PG	Weight per PU approx. kg
Monitoring of phase sequence													
Auto-RESET													
--	No	No	--	--	1	320...500AC	A	**3UG45 11-1AP20**		1	1 unit	101	0.147
							A	**3UG45 11-1BP20**		1	1 unit	101	0.147
Monitoring of phase sequence, phase failure and phase unbalance													
Auto-RESET, closed-circuit principle, unbalance threshold 10 %													
--	No	No	--	--	1	160 ... 690 AC	A	**3UG45 12-1AR20**		1	1 unit	101	0.147
					2		A	**3UG45 12-1BR20**		1	1 unit	101	0.147
Monitoring of phase sequence, phase failure, unbalance and undervoltage													
Analogically adjustable, Auto-RESET, closed-circuit principle, fixed unbalance threshold 20 %													
5 % of set value	Yes	No	--	0.1 ... 20	2	160 ... 690 AC	A	**3UG45 13-1BR20**		1	1 unit	101	0.147
Monitoring of phase sequence, phase failure, overvoltage and undervoltage													
Digitally adjustable, Auto-RESET or manual RESET, open-circuit or closed-circuit principle													
Adjustable 1 ... 20 V	Yes	Yes	--	0.1 ... 20[2)]	2[2)]	160 ... 690 AC	A	**3UG46 15-1CR20**		1	1 unit	101	0.147
Monitoring of phase sequence, phase and N conductor failure, overvoltage and undervoltage													
Digitally adjustable, Auto-RESET or manual RESET, open-circuit or closed-circuit principle													
Adjustable 1 ... 20 V	Yes	Yes	--	0.1 ... 20[2)]	2[2)]	160 ... 690 AC	A	**3UG46 16-1CR20**		1	1 unit	101	0.147

1) Absolute limit values.
2) 1 CO contact each and 1 tripping delay time each for U_{min} and U_{max}.

*** You can order this quantity or a multiple thereof.**

Power factor and active current monitoring

Overview

The 3UG46 41 power factor and active current monitoring device enables the load monitoring of motors.

Whereas power factor monitoring is used above all for monitoring no-load operation, the active current monitoring option can be used to observe and evaluate the load factor over the entire torque range.

Benefits

- Can be used world-wide thanks to wide voltage range from 90 ... 690 V1)
- Monitoring of even small single-phase motors with a no-load supply current below 0.5 A
- Simple determination of threshold values through the direct collection of measured variables on motor loading
- Window monitoring and active current measurement enable detection of cable breaks between control cabinets and motors, as well as phase failures
- Power factor or active current can be selected as measurement principle

[1] Absolute limit values.

Application

- No-load monitoring and load shedding, such as in the event of a V-belt tear
- Underload monitoring in the low performance range, e.g. in the event of pump no-load operation
- Monitoring of overload, e.g. due to a dirty filter system
- Simple power factor monitoring in networks for control of compensation equipment
- Broken cable between control cabinet and motor

Selection and ordering data

Relay for monitoring the power factor and the active current (p.f. x Ires),
overshoot, undershoot or window monitoring,
single and three-phase, overall width 22.5 mm

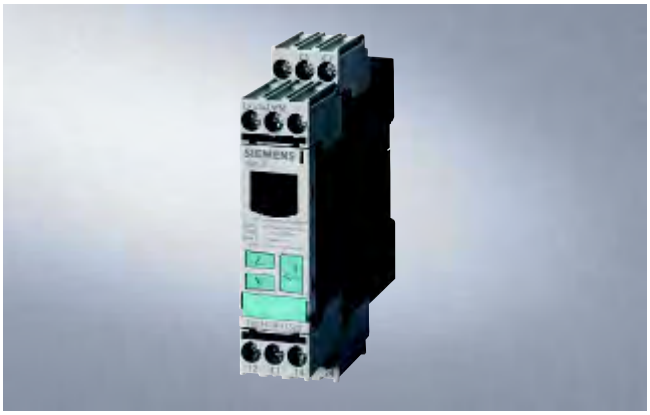
Digitally adjustable, with LCD display

- Upper and lower threshold value can be adjusted separately
- 1 changeover contact each for undershoot/overshoot
- Permanent display of actual value and tripping state

Measuring range		Hysteresis		ON-delay	OFF-delay supply voltage *Us*[1] AC 50/60 Hz	Rated control	DT	**Screw terminals**		PU (UNIT. SET.M)	PS*	PG	Weight per PU approx.
For power factor	For active current	For power factor	For active current I_{res}					Order No.	Price per PU				
p.f.	A	p.f.	A	s	s	V							kg
0.10 ... 0.99	0.2 ... 10.0	0.1	0.1 ... 2.0	0 ... 99	0.1 ... 20.0	90 ... 690	A	**3UG46 41-1CS20**		1	1 unit	101	0.147

Residual-current monitoring summation current transformers

Overview



The 3UG46 24 residual-current monitoring relay is used together with the 3UL22 summation current transformer for plant monitoring.

Application

- Plant monitoring

Selection and ordering data

Residual-current monitoring relays

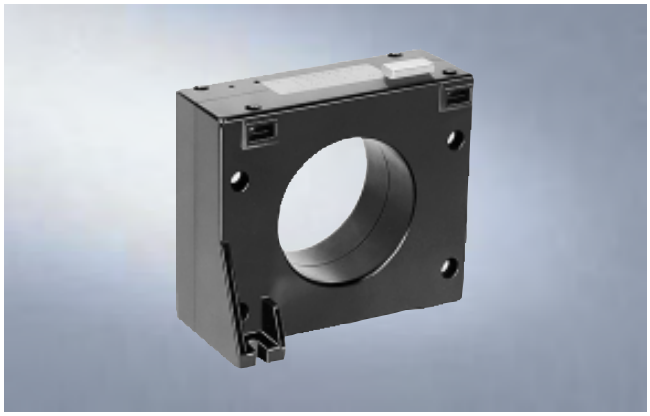
Standard rail mounting
Width 22.5 mm
Relay for monitoring residual currents for 3UL22 summation current transformers with rated residual current IDn 0.3 ... 40 A

- Digitally adjustable with three buttons, illuminated LCD
- Adjustable limit value and warning threshold
- Permanent display of actual value and tripping state
- 1 CO contact each for limit violation and warning threshold

Display range	Setting range	Hystersis Limit value	Warning value	ON / tripping delay time	Rated control supply voltage *Us*[1]	DT	Screw terminals		PU (UNIT. SET.M)	PS*	PG	Weight per PU approx.
							Order No.	Price per PU				
A	A	A	A	s	V							kg
10...120 % of $I_{\Delta n}$	10 ... 100 % of $I_{\Delta n}$	LSB1) up to 50% of $I_{\Delta n}$	5 % of $I_{\Delta n}$	0.1 ... 20	90 ... 690	A	3UG46 24-1CS20		1	1 unit	101	0.147

5

Overview



The 3UL22 summation current transformers sense fault currents in machines and plants. Together with the 3UG46 24 residual-current monitoring relay or the SIMOCODE 3UF motor management and control device they enable residual-current and ground-fault monitoring.

Application

- Plant monitoring

Selection and ordering data

	Feed-through Opening diameter	Rated insulation voltage *Us*	Rated fault current $I_{\Delta n}$	DT	Screw terminals Order No.	Price per PU	PU (UNIT. SET.M)	PS*	PG	Weight per PU approx.
	mm	V	A							kg
Summation current transformers (essential accessory for 3UG46 24 or SIMOCODE 3UF)										
 3UL22	40	690	0.3	B	**3UL22 01-1A**		1	1 unit	101	0.571
		0.5		B	**3UL22 01-2A**		1	1 unit	101	0.408
		1		C	**3UL22 01-3A**		1	1 unit	101	0.324
	65	690	0.3	B	**3UL22 02-1A**		1	1 unit	101	0.900
			0.5	B	**3UL22 02-2A**		1	1 unit	101	0.713
		1		B	**3UL22 02-3A**		1	1 unit	101	0.568
		6		C	**3UL22 02-1B**		1	1 unit	101	0.561
		10		C	**3UL22 02-2B**		1	1 unit	101	0.563
		16		C	**3UL22 02-3B**		1	1 unit	101	0.573
		25		C	**3UL22 02-4B**		1	1 unit	101	0.575
		40		C	**3UL22 02-5B**		1	1 unit	101	0.564
	120	1000	0.3	B	**3UL22 03-1A**		1	1 unit	101	3.435
		0.5		B	**3UL22 03-2A**		1	1 unit	101	2.810
		1		B	**3UL22 03-3A**		1	1 unit	101	1.965
		6		C	**3UL22 03-1B**		1	1 unit	101	1.955
		10		C	**3UL22 03-2B**		1	1 unit	101	1.990
		16		C	**3UL22 03-3B**		1	1 unit	101	1.917
		25		C	**3UL22 03-4B**		1	1 unit	101	1.851
		40		C	**3UL22 03-5B**		1	1 unit	101	1.905

Insulation monitoring for ungrounded AC networks

Overview

Relay for monitoring the insulation resistance between the ungrounded single or three-phase AC supply and a protective conductor

- Measuring principle with superimposed DC voltage
- Two selectable measuring ranges of 1 ... 110 kW
- Stepless setting within the measuring range
- Selectable:
  - auto reset function with fixed hysteresis or
  - storage of the tripping operation
- Test function with test button and terminal connections on the front
- Switching output: 1 CO contact
- Insulation fault indication with a red LED
- Supply voltage indication with a green LED
- Electro-magnetically compatible according to EN 50081 and EN 61000-6-2

Application

The 3UG30 81 monitoring device is suitable for insulation monitoring of AC systems with one or three phases in ungrounded networks (IT networks).

Supply voltage

The 3UG30 81-1AK20 has alternative voltage terminals. Only one supply voltage is permitted to be connected to it! Terminals A1 and A2 are used to connect 230 V AC and terminals A1 and B2 are used to connect 115 V AC.

The 3UG30 81-1AW30 has a wide-range input of 24 V ... 240 V AC/DC on terminals A1 and A2.

Selection and ordering data

	Measuring range U_s	Rated control supply voltage U_s	DT	Screw terminals		PU (UNIT. SET.M)	PS*	PG	Weight per PU approx.
				Order No.	Price per PU				
	kΩ	V							kg
Insulation monitors for ungrounded AC networks									
	1 ... 110	115 / 230 AC	A	**3UG30 81-1AK20**		1	1 unit	101	0.327
		24 ... 240 AC/DC	B	**3UG30 81-1AW30**		1	1 unit	101	0.242

3UG30 81-1AK20

Accessories

	Version	DT	Screw terminals		PU (UNIT. SET.M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
								kg
Covers								
	Sealable, transparent covers	C	**3UG32 08-1A**		1	1 unit	101	0.010

Overview

Thermistor motor protection devices are used for direct monitoring of the motor winding temperature. For this purpose, the motors are equipped with temperature-dependent resistors (PTC) that are directly installed in the motor winding and abruptly change their resistance at their limit temperature.

Benefits

- Thanks to direct motor protection, overdimensioning of the motors is not necessary
- No additional overload protection equipment is necessary
- No settings on the device are necessary
- Solid-state time-delay output thanks to variants with hard gold-plated contacts
- Rapid error diagnosis thanks to variants that indicate open- and short-circuit in the sensor circuit
- All versions with removable terminals
- All versions with screw terminals or alternatively with innovative spring-loaded terminals

Application

Direct motor protection through temperature monitoring of the motor winding offers 100 % motor protection even under the most difficult ambient conditions, without the need to make adjustments on the device. Versions with hard gold-plated contacts ensure, in addition, a high switching reliability that is even higher than an electronic control.

Motor protection:

- At increased ambient temperatures
- For high switching frequency
- For long start-up and braking procedures
- Used together with frequency converters (low speeds)

ATEX approval for operation in areas subject to explosion hazard

The SIRIUS 3RN1 thermistor motor protection relay for PTC sensors is certified according to ATEX Ex II (2) G and GD for gases and dust.

For PTC sensors

Selection and ordering data

Thermistor motor protection relays for PTC thermistors (Type A PTCs)

Solid-state timing relays for general use in control systems and Monostable version with closed-circuit principle, triggers in the event of control supply voltage failure

PTB01 ATEX approval

- 3RN10 13-.BW01: bistable version, does not trigger in the event of control supply voltage failure
- All devices except for 24V AC/DC feature electrical isolation

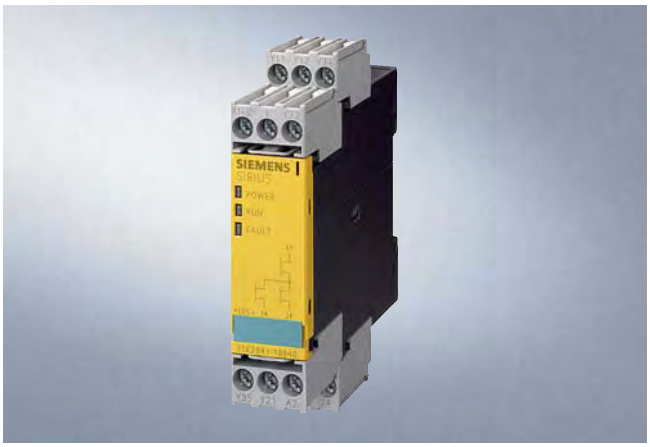
RESET	Contacts	Rated control supply voltage U_s 50/60 Hz	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
				Order No.	Price per PU				
		V							kg
Compact signal evaluation units, width 22.5 mm, 1 LED									
Terminal A1 is jumpered with the root of the changeover contact									
Auto	1 CO	24 AC/DC	▸	**3RN10 00-1AB00**		1	1 unit	101	0.114
		110 AC	A	**3RN10 00-1AG00**		1	1 unit	101	0.157
		230 AC	▸	**3RN10 00-1AM00**		1	1 unit	101	0.156

Accessories

Use	Version		DT	Order No.	Price per PU	PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
									kg
Blank labels									
	Blank labels, 20 mm x 7 mm, pastel turquoise1)		C	**3RT19 00-1SB20**		100	340 units	101	22.000
Push-in lugs									
 3RP19 03	For devices with 1 or 2 COcontacts	**Push-In lugs** For screw mounting, 2 uits are requiredfor each device	▶	**3RP19 03**		1	10 units	101	0.002

General Data

Overview



SIRIUS safety relays are the key elements of a consistent and cost-effective safety chain. Be it EMERGENCY-STOP disconnection, protective door monitoring or the protection of presses or punches – with SIRIUS safety relays every safety application can be implemented to optimum effect in terms of engineering and price.

SIRIUS safety relays provide numerous safety-related functions:

- Monitoring the safety functions of sensors
- Monitoring the sensor cables
- Monitoring the correct operation of the safety relay
- Monitoring the actuators (contactors) in the shutdown circuit
- Safety-oriented disconnection when dangers arise

SIRIUS safety relays meet the highest requirements (Category 4) according to EN 954-1 and achieve the highest safety integrity level (SIL 3) according to IEC 61508.

Benefits

General

- Can be used for all safety applications thanks to compliance with the highest safety standards (Category 4 according to EN 954-1 or SIL 3 according to IEC 61508)
- Suitable for use all over the world through compliance with all globally established certifications
- Compact, service-proven SIRIUS design creates more space in the control cabinet
- Flexible connectability and expendability make subsequent changes easy
- Removable terminals for greater plant availability
- Yellow front plate clearly identifies the device as an item of safety equipment
- Sensor cable up to 2000 m long enables use in large-scale plants

Relay outputs

- Different voltages can be switched through the floating contacts
- Higher currents can be switched with relay contacts

Solid-state outputs

- Wear-free
- Suitable for operation in fast switching applications
- Insensitive to vibrations and dirt
- Good electrical endurance

Microprocessor systems

- Flexible use thanks to many different integrated functions
- Easy parameterization using DIP switches on the front
- High functional reliability based on extensive monitoring functions
- Operated by the machine control
- Also connection of non-contact sensors (light arrays, light barriers etc.)

Application

SIRIUS safety relays are used mainly in autonomous safety applications which are not connected to a safety-oriented bus system. Their function here is to evaluate the sensors and the safety-oriented shutdown of hazards. Also they check and monitor the sensors, actuators and safety-oriented functions of the safety relay.

Selection and ordering data

Type	3TK28 40 Basic units	3TK28 41 Basic units	3TK28 42 Basic units t_v	3TK28 45 Multi-function unit "automatic and monitored start"	Multi-function t_v	Multi-function	Multi-function t_v	Multi-function	Multi-function t_v	Multi-function t_v	Multi-function t_v
Sensors											
• Input	1	1	1	2	2	2	2	2	2	2	2
• Solid-state	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
• With contacts	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Safety mats	--	✓	✓	✓	✓	✓	✓	--	--	--	--
Start											
• Auto	✓	✓	✓	1	1	--	--	1	1	--	--
• Monitored	✓	✓	✓	1	1	2	2	1	1	2	2
Cascading Input 24 V DC	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Key-operated switches	--	--	--	✓	✓	✓	✓	✓	✓	✓	✓
Enabling circuit, floating											
• Stop category 0	--	--	--	2NO	1NO	2NO	1NO	2NO	1NO	1NO	1NO
• Stop category 1	--	--	--	--	1NO	--	1NO	--	1NO	1NO	1NO
Enabling circuit, solid-state											
• Stop category 0	2[1)]	2	1	2	1	2	1	2	1	1	1
• Stop category 1	--	--	1	--	1	--	1	--	1	1	1
Signalling outputs											
• **Floating**	--	--	--	--	--	--	--	--	--	--	--
• **Solid-state**	--	--	--	1	1	1	1	1	1	1	1
Category according to EN 954-1 max	3	4	4	4	4	4	4	4	4	4	4
SIL level max.	2	3	3	3	3	3	3	3	3	3	3
Performance level PL accoring to EN ISO 13849	d	e	e	e	e	e	e	e	e	e	e
Rated control supply voltage 24 V DC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ = Available
-- = Not available

1) The outputs are only safe when an external contactor is used.

with electronic enabling circuits

Rated control supply voltage U_s	OFF-delay t_v	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
V	s							kg
Rated control supply voltage U_s 24 V DC								
3TK28 40 basic units								
24 DC	--	A	**3TK28 40-1BB40**		1	1 unit	102	0.180
3TK28 41 basic units								
24 DC	--	A	**3TK28 41-1BB40**		1	1 unit	102	0.166
3TK28 42 basic units tv								
24 DC	0.05 ... 3	A	**3TK28 42-1BB41**		1	1 unit	102	0.168
	0.5 ... 30	A	**3TK28 42-1BB42**		1	1 unit	102	0.166
	5 ... 300	A	**3TK28 42-1BB44**		1	1 unit	102	0.166
3TK28 45 multi-function units "automatic and monitored start"								
24 DC	--	A	**3TK28 45-1HB40**		1	1 unit	102	0.350
3TK28 45 multi-function units tv "automatic and monitored start"								
24 DC	0.05 ... 3	A	**3TK28 45-1HB41**		1	1 unit	102	0.350
	0.5 ... 30	A	**3TK28 45-1HB42**		1	1 unit	102	0.350
	5 ... 300	A	**3TK28 45-1HB44**		1	1 unit	102	0.350
3TK28 45 multi-function units "monitored start"								
24 DC	--	A	**3TK28 45-1DB40**		1	1 unit	102	0.350

3TK28 41-1BB40

3TK28 42-1BB41

3TK28 45-1HB40

Rated control supply voltage U_s	OFF-delay t_v	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
V	s							kg
Rated control supply voltage U_s 24 V DC								
3TK28 45 multi-function units tv "monitored start"								
24 DC	0.05 ... 3	A	**3TK28 45-1DB41**		1	1 unit	102	0.350
	0.5 ... 30	A	**3TK28 45-1DB42**		1	1 unit	102	0.350
	5 ... 300	A	**3TK28 45-1DB44**		1	1 unit	102	0.350
3TK28 45 multi-function units "OK button"								
24 DC	--	A	**3TK28 45-1EB40**		1	1 unit	102	0.350
3TK28 45 multi-function units tv "OK button"								
24 DC	0.05 ... 3	A	**3TK28 45-1EB41**		1	1 unit	102	0.350
	0.5 ... 30	A	**3TK28 45-1EB42**		1	1 unit	102	0.350
	5 ... 300	A	**3TK28 45-1EB44**		1	1 unit	102	0.350
3TK28 45 multi-function units tv "spring-locked tumbler"								
24 DC	0.05 ... 3	A	**3TK28 45-1FB41**		1	1 unit	102	0.350
	0.5 ... 30	A	**3TK28 45-1FB42**		1	1 unit	102	0.350
	5 ... 300	A	**3TK28 45-1FB44**		1	1 unit	102	0.350
3TK28 45 multi-function units tv "magnet-locked tumbler"								
24 DC	0.05 ... 3	A	**3TK28 45-1GB41**		1	1 unit	102	0.350
	0.5 ... 30	A	**3TK28 45-1GB42**		1	1 unit	102	0.350
	5 ... 300	A	**3TK28 45-1GB44**		1	1 unit	102	0.350

3TK28 45-1HB41

3TK28 45-1DB40

3TK28 45-1DB41

with electronic enabling circuits

Selection and ordering data

Type	3TK28 21 Basic units	3TK28 22 Basic units	3TK28 23 Basic units	3TK28 24 Basic units	3TK28 25 Basic units	3TK28 26 Basic units 24 V DC	Basic units Wide voltage range
Sensors							
• Input	1	1	1	1	1	1	1
• Solid-state	--	--	--	--	--	✓	✓
• With contacts	✓	✓[1)]	✓	✓	✓	✓	✓
Safety mats	--	--	--	--	--	✓	✓
Start							
• Auto	✓	✓	--	✓	✓	✓	✓
• Monitored	--	--	✓	--	✓	✓	✓
Cascading Input 24 V DC	--	--	--	--	--	✓	✓
Key-operated switches	--	--	--	--	--	--	--
Enabling circuit, floating							
• Stop category 0	3 NO	2 NO	2 NO	2NO	3 NO	4 NO	4NO
• Stop category 1	--	--	--	--	--	--	--
Enabling circuit, solid-state							
• Stop category 0	--	--	--	--	--	--	--
• Stop category 1	--	--	--	--	--	--	--
Signalling outputs							
• **Floating**	1 NC	--	--	--	2 NC	1 NC	1 NO + 1 NC
• **Solid-state**	--	--	--	--	--	2	--
Category according to EN 954-1 max	3[2)]	4	4	3[2)]	4	4	4
SIL level max.	2	3	3	2	3	3	3
Performance level PL accoring to EN ISO 13849	--	--	--	--	--	e	e
Rated control supply voltage							
• 24 V DC	--	--	--	✓	✓	✓	--
• 24 V AC/DC	✓	✓	✓	✓	--	--	--
• 24 V AC	--	--	--	--	✓	--	--
• 115 V AC	--	--	--	✓	✓	--	--
• 230 V AC	--	--	--	✓	✓	--	--
• 24...240 V AC/DC	--	--	--	--	--	--	✓

✓ = Available
-- = Not available

1) **The ON button is not monitored.**
2) **Depending on the hazard assessment, additional measures may be necessary in the sensor circuit (e.g. protected laying).**

Selection and ordering data

Type	**3TK28 27** Basic units t_v	**3TK28 28** Basic units t_v	**3TK28 30** Expansion units[2]	**3TK28 34** Two-hand control units	**3TK28 35** Slowing down test apparatus
Sensors					
• Input	1	1	--	1	--
• Solid-state	--	--	--	--	--
• With contacts	✓	✓	--	✓	--
Safety mats	--	--	--	--	--
Start					
• Auto	--	✓	--	--	--
• Monitored	✓	--	--	--	--
Cascading Input 24 V DC	--	--	--	--	--
Key-operated switches	--	--	--	--	--
Enabling circuit, floating					
• Stop category 0	2 NO	2 NO	4 NO	2NO+2NC	3 NO+2NC
• Stop category 1	2 NO	2 NO	--	--	--
Enabling circuit, solid-state					
• Stop category 0	--	--	--	--	--
• Stop category 1	--	--	--	--	--
Signalling outputs					
• **Floating**	1NC	1NC	--	2	--
• **Solid-state**	--	--	--	--	--
Category according to EN 954-1 max	4[1]	4[1]	As basic unit	4	4
SIL level max.	3	3	As basic unit	3	3
Performance level PL accoring to EN ISO 13849	--	--	--	--	--
Rated control supply voltage					
• 24 V DC	✓	✓	--	✓	✓
• 24 V AC/DC	--	--	✓	--	--
• 24 V AC	✓	✓	--	✓	✓
• 115 V AC	✓	✓	✓	✓	✓
• 230 V AC	✓	✓	✓	✓	✓
• 24…240 V AC/DC	--	--	--	--	--

✓ = Available
-- = Not available

1) Only possible for instantaneous enabling contacts, otherwise Category 3.
2) For expansion of Siemens safety products.

3TK28 Safety Relays

with relay enabling circuits

3TK28 21-1CB30

3TK28 25-1BB40

3TK28 26-1BB40

3TK28 27-1BB41

3TK28 30-1CB30

Rated control supply voltage U_s	OFF-delay t_v	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
V	s							kg
Rated control supply voltages Us 24 V DC and 50/60 Hz, 24, 115, 230 V AC								
3TK28 21 basic units								
24 AC/DC	--	▸	**3TK28 21-1CB30**		1	1 unit	102	0.276
3TK28 22 basic units								
24 AC/DC	--	▸	**3TK28 22-1CB30**		1	1 unit	102	0.271
3TK28 23 basic units								
24 AC/DC	--	▸	**3TK28 23-1CB30**		1	1 unit	102	0.271
3TK28 24 basic units								
24 AC/DC	--	▸	**3TK28 24-1CB30**		1	1 unit	102	0.254
24 DC	--	▸	**3TK28 24-1BB40**		1	1 unit	102	0.249
115 AC	--	A	**3TK28 24-1AJ20**		1	1 unit	102	0.294
230 AC	--	▸	**3TK28 24-1AL20**		1	1 unit	102	0.288
3TK28 25 basic units								
24 DC	--	▸	**3TK28 25-1BB40**		1	1 unit	102	0.423
24 AC	--	A	**3TK28 25-1AB20**		1	1 unit	102	0.421
115 AC	--	▸	**3TK28 25-1AJ20**		1	1 unit	102	0.519
230 AC	--	▸	**3TK28 25-1AL20**		1	1 unit	102	0.516
3TK28 26 basic unit								
24 DC	--	▸	**3TK28 26-1BB40**		1	1 unit	102	0.370
24 ... 240 AC/DC	--	▸	**3TK28 26-1CW30**		1	1 unit	102	0.400
3TK28 27 basic units tv								
24 DC	0.05 ... 3	▸	**3TK28 27-1BB41**		1	1 unit	102	0.495
24 AC		B	**3TK28 27-1AB21**		1	1 unit	102	0.499
115 AC		B	**3TK28 27-1AJ21**		1	1 unit	102	0.650
230 AC		A	**3TK28 27-1AL21**		1	1 unit	102	0.650
24 DC	0.5 ... 30	▸	**3TK28 27-1BB40**		1	1 unit	102	0.497
24 AC		A	**3TK28 27-1AB20**		1	1 unit	102	0.496
115 AC		▸	**3TK28 27-1AJ20**		1	1 unit	102	0.650
230 AC		▸	**3TK28 27-1AL20**		1	1 unit	102	0.650
3TK28 28 basic units tv								
24 DC	0.05 ... 3	▸	**3TK28 28-1BB41**		1	1 unit	102	0.499
24 AC		B	**3TK28 28-1AB21**		1	1 unit	102	0.501
115 AC		B	**3TK28 28-1AJ21**		1	1 unit	102	0.657
230 AC		A	**3TK28 28-1AL21**		1	1 unit	102	0.650
24 DC	0.5 ... 30	▸	**3TK28 28-1BB40**		1	1 unit	102	0.496
24 AC		B	**3TK28 28-1AB20**		1	1 unit	102	0.500
115 AC		A	**3TK28 28-1AJ20**		1	1 unit	102	0.650
230 AC		A	**3TK28 28-1AL20**		1	1 unit	102	0.650
3TK28 30 expansion units								
24 AC/DC	--	▸	**3TK28 30-1CB30**		1	1 unit	102	0.267
115 AC		A	**3TK28 30-1AJ20**		1	1 unit	102	0.306
230 AC		A	**3TK28 30-1AL20**		1	1 unit	102	0.306
3TK28 34 two-hand control units								
24 DC	--	▸	**3TK28 34-1BB40**		1	1 unit	102	0.432
24 AC		A	**3TK28 34-1AB20**		1	1 unit	102	0.424
115 AC		A	**3TK28 34-1AJ20**		1	1 unit	102	0.519
230 AC		A	**3TK28 34-1AL20**		1	1 unit	102	0.519
3TK28 35 slowing down test apparatus								
24 DC	--	B	**3TK28 35-1BB40**		1	1 unit	102	0.495
115 AC	--	B	**3TK28 35-1AJ20**		1	1 unit	102	0.572
230 AC	--	B	**3TK28 35-1AL20**		1	1 unit	102	0.574

Selection and ordering data

Type	**3TK28 50** Basic units	**3TK28 51** Basic units	**3TK28 52** Basic units	**3TK28 53** Basic units	**3TK28 56** Expansion units [1]	**3TK28 56** Expansion units [1] t_v
Sensors						
• Input	1	1	1	1	--	--
• Solid-state	--	--	--	✓	--	--
• With contacts	✓	✓	✓	✓	--	--
Safety mats	✓	✓	✓	✓	--	--
Start						
• Auto	✓	✓	✓	✓	--	--
• Monitored	✓	✓	✓	✓	--	--
Cascading Input 24 V DC	--	--	--	✓	✓	✓
Key-operated switches	--	--	--	--	--	
Enabling circuit, floating						
• Stop category 0	3 NO	2 NO	6 NO	3 NO	6 NO	--
• Stop category 1	--	--	--	--	--	3 NO
Enabling circuit, solid-state						
• Stop category 0	--	--	--	1	1	1
• Stop category 1	--	--	--	--	--	--
Signalling outputs						
• **Floating**	--	1NC	1NC	--	1NC	--
• **Solid-state**	--	--	--	--	--	
Category according to EN 954-1 max	3	3	3	4	Corresponds to basic unit	Corresponds to basic unit
SIL level max.	2	2	2	3	3	3
Performance level PL accoring to EN ISO 13849	d	d	d	e	e	e
Rated control supply voltage						
• 24 V DC	✓	✓	✓	✓	✓	✓
• 24 V AC/DC	--	--	--	--	--	--
• 24 V AC	✓	✓	--	--	--	--
• 115 V AC	✓	✓	--	--	--	--
• 230 V AC	✓	✓	✓	--	--	--
• 24…240 V AC/DC	--	--	--	--	--	--
Rated operational voltage						
24 V DC	✓	✓	✓	✓	✓	✓
230 V AC	✓	✓	✓	✓	✓	✓
600 V AC	✓	✓	✓	✓	✓	✓
Switching capacity						
AC-15 at U = 230 V	✓	✓	✓	✓	✓	✓
DC-13 at U = 24 V	✓	✓	✓	✓	✓	✓

✓ = Available
-- = Not available

1) For expansion of Siemens safety products.

with contactor relay enabling circuits

Rated control supply voltage U_s	OFF-delay t_v	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
V	s							kg
Rated control supply voltages Us 24 V DC and 50/60 Hz, 115, 230 V AC								
3TK28 50 basic units								
24 DC	--	A	**3TK28 50-1BB40**		1	1 unit	102	0.819
115 AC		B	**3TK28 50-1AJ20**		1	1 unit	102	0.765
230 AC		B	**3TK28 50-1AL20**		1	1 unit	102	0.770
3TK28 51 basic units								
24 DC	--	B	**3TK28 51-1BB40**		1	1 unit	102	0.821
115 AC		B	**3TK28 51-1AJ20**		1	1 unit	102	0.770
230 AC		B	**3TK28 51-1AL20**		1	1 unit	102	0.767
3TK28 52 basic units								
24 DC	--	A	**3TK28 52-1BB40**		1	1 unit	102	0.919
230 AC		B	**3TK28 52-1AL20**		1	1 unit	102	0.870
3TK28 53 basic units								
24 DC	--	A	**3TK28 53-1BB40**		1	1 unit	102	0.714
3TK28 56 expansion units								
24 DC	--	B	**3TK28 56-1BB40**		1	1 unit	102	0.785
3TK28 57 expansion units t_v								
24 DC	0.05 ... 3	B	**3TK28 57-1BB41**		1	1 unit	102	0.682
24 DC	0.5 ... 30	B	**3TK28 57-1BB42**		1	1 unit	102	0.679
24 DC	5 ... 300	B	**3TK28 57-1BB44**		1	1 unit	102	0.684

Selection and ordering data

Type	**3TK28 10** Stoppage monitors
Sensors	
• Input	3
• Solid-state	--
• With contacts	--
• Without sensors (measuring inputs)	3
Safety mats	--
Start	
• Auto	✓
• Monitored	--
Cascading Input 24 V DC	--
Key-operated switches	--
Enabling circuit, floating	
• Stop category 0	3 NO + 1 NO
• Stop category 1	--
Enabling circuit, solid-state	
• Stop category 0	--
• Stop category 1	--
Signalling outputs	
• Floating	1 CO
• Solid-state	2
Category according to EN 954-1 max	4
SIL level max.	3
Performance level PL accoring to EN ISO 13849	--
Rated control supply voltage	
• 24 V DC	✓
• 230 V AC	✓
• 400 V AC/DC	✓

✓ = Available
-- = Not available

With special functions

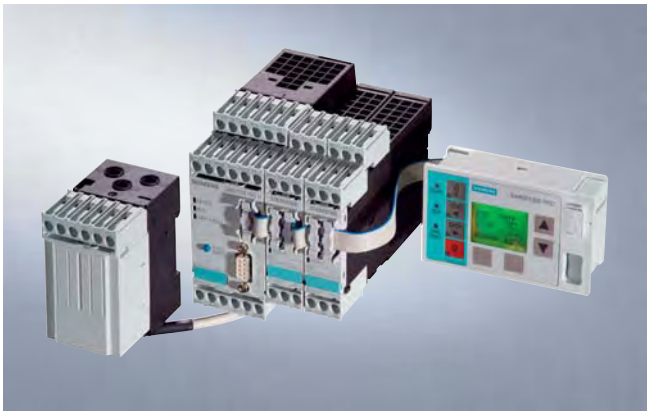
Rated control supply voltage U_s	OFF-delay t_v	DT	Screw terminals		PU (Unit. SET. M)	PS*	PG	Weight per PU approx.
			Order No.	Price per PU				
V	s							kg
Rated control supply voltages Us 24 V DC and 50/60 Hz, 230, 400 V AC								
3TK28 10 stoppage monitors								
24 DC	0.2... 6	A	**3TK28 10-0BA01**		1	1 unit	102	0.500
230 AC		A	**3TK28 10-0GA01**		1	1 unit	102	0.500
400 AC		A	**3TK28 10-0JA01**		1	1 unit	102	0.500

3TK28 10-0BA01

Monitoring and Control Devices

5a

Overview



SIMOCODE pro V with current/voltage measuring module, expansion modules and operator panel with display

SIMOCODE pro is a flexible, modular motor management system for constant speed motors in the low-voltage range. It optimizes the connection between instunmentation & control and motor feeder. It increases plant availability and allows significant savings to be made for start-up, operation and maintenance of a system.

When SIMOCODE pro is installed in the low-voltage switchboard, it is the intelligent interface between the higher-level automation system and the motor feeder and includes the following:

- Multifunctional, solid-state full motor protection which is independent of the automation system
- Flexible software instead of hardware for the motor control
- Detailed operating, service and diagnostics data
- Open communication through PROFIBUS DP, the standard for fieldbus systems

SIMOCODE ES is the software package for SIMOCODEpro parameterization, start-up and diagnostics.

Design

General

SIMOCODE pro is a modularly constructed motor management system which is subdivided into two device series with different functional scopes:

- SIMOCODE pro C and
- SIMOCODE pro V.

Both series (systems) are made up of different hardware components (modules):

System	SIMOCODE pro C	SIMOCODE pro V
Modules	• Basic unit 1 Current measuring module • Operator panel (optional)	• Basic unit 2 Current measuring module or current/voltage measuring module • Decoupling module (optional) • Operator panel or operator panel with display (optional) • Expansion modules (optional)

Each feeder always comprises of one basic unit and one separate current measuring module. The two modules are connected together electrically through the system interface with a connection cable and can be mounted mechanically connected as a unit (one behind the other) or separately (side by side). The motor current to be monitored is used only for choosing the current measuring module.

An optional operator panel for mounting in the control cabinet door can be connect through a second system interface on the basic unit. Both the current measuring module and the operator panel are electrically supplied by the basic unit through the connection cable. More inputs, outputs and functions can be added to basic unit 2 (SIMOCODE pro V) by means of optional expansion modules, thus supplementing the inputs and outputs already existing on the basic unit.

All modules are connected by connection cables. The connection cables are available in various lengths. The maximum distance between the modules (e.g. between the basic unit and the current measuring module) must not exceed 2.5 m. The total length of all the connection cables in a single system must not be more than 3 m.

SIMOCODE pro designed for mixed operation

Depending on functional requirements, the two systems SIMOCODE pro V & pro can be used simultaneously without any problems and without any additional outlay in a low-voltage system. SIMOCODE pro C is fully upward-compatible to SIMOCODE pro V. The same components are used. The parameterization of SIMOCODE pro C can be transferred without any problems. Both systems have the same removable terminals and the same terminal designations.

SIMOCODE pro C, basic unit 1

The compact system for

- Direct-on-line and reversing starters
- For actuation of a circuit breaker (MCCB)

with up to 4 binary inputs, up to 3 monostable relay outputs and one thermistor connection (binary PTC)

The basic unit 1 is available in two different versions for the following supply voltages:

- 24 V DC
- 110 ... 240 V AC/DC

SIMOCODE pro C, basic unit 1

Inputs:
4 binary inputs, with internal supply from 24 V DC

Outputs:
3 (2+1) monostable relay outputs

Thermistor connection for binary PTC

PROFIBUS interface:
- 9-pole SUB-D or
- Terminal connection

Connection of the supply voltage:
- 24 V DC or
- 110 ... 240 V AC/DC

Test/Reset button

3 LEDs

- 2 system interfaces for connecting
- A current measuring module and
- An operator panel

Basic unit 1 is suitable for standard rail mounting with additional push-in lugs it is also suitable for fixing to a mounting plate.

SIMOCODE pro V, basic unit 2

The variable system offers all SIMOCODE pro C functions plus many additional functions. Basic unit 2 supports the following control functions:

- Direct-on-line and reversing starters
- Wye/delta starters, also with direction reversal
- Two speeds, motors with separate windings (pole-changing switch); also with direction reversal
- Two speeds, motors with separate Dahlander windings (also with direction reversal)
- Positioner actuation
- Solenoid valve actuation
- Actuation of a circuit breaker (MCCB)
- Soft starter actuation (also with direction reversal)

Basic unit 2 has 4 binary inputs, 3 monostable relay outputs and one thermistor connection (binary PTC). The type and number of inputs and outputs can be increased by means of additional expansion modules.

Basic unit 2 is available in two different versions for the following supply voltages:

- 24 V DC
- 110 ... 240 V AC/DC

SIMOCODE pro V, basic unit 2

Inputs:
4 binary inputs, with internal supply from 24 V DC

Outputs:
3 (2+1) monostable relay outputs

Thermistor connection for binary PTC

PROFIBUS interface:
9-pole SUB-D or
Terminal connection

Connection of the supply voltage:
24 V DC or
110 ... 240 V AC/DC

Test/Reset button

3 LEDs

2 system interfaces for connecting
- A current measuring module or current/voltage measuring module
- Expansion modules and
- An operator panel

Basic unit 2 is suitable for standard rail mounting. With additional push-in lugs it is also suitable for fixing to a mounting plate.

SIMOCODE pro 3UF7 motor management and control devices

Current measuring modules (current ranges)

The current measuring module is selected for each feeder according to the rated motor current to be monitored. Various current measuring modules for current ranges from 0.3 ... 630 A are available for this purpose. The current measuring module is connected to the basic unit by a connection cable and is supplied with electricity by the basic unit through this connection cable. Current measuring modules up to 100 A are suitable for standard rail mounting or can be fixed directly to the mounting plate by means of additional push-in lugs. Similarly, current measuring modules up to 200 A can also be mounted on standard mounting rails or be fixed directly to mounting plates by means of fixtures integrated in the enclosure. Finally, current measuring modules up to 630 A can only be mounted with the integrated screw fixtures.

Note:

Current measuring modules for up to 100 A set current can be mechanically connected to the corresponding basic unit and mounted with it as a unit (one behind the other). For larger current measuring modules, only separate mounting is possible.

Current measuring modules for the following current ranges are offered:

- 0.3 ... 3 A with straight-through current transformer
- 2.4 ... 25 A with straight-through current transformer
- 10 ... 100 A with straight-through current transformer
- 20 ... 200 A with straight-through current transformer or busbar connection
- 63 ... 630 A with busbar connection

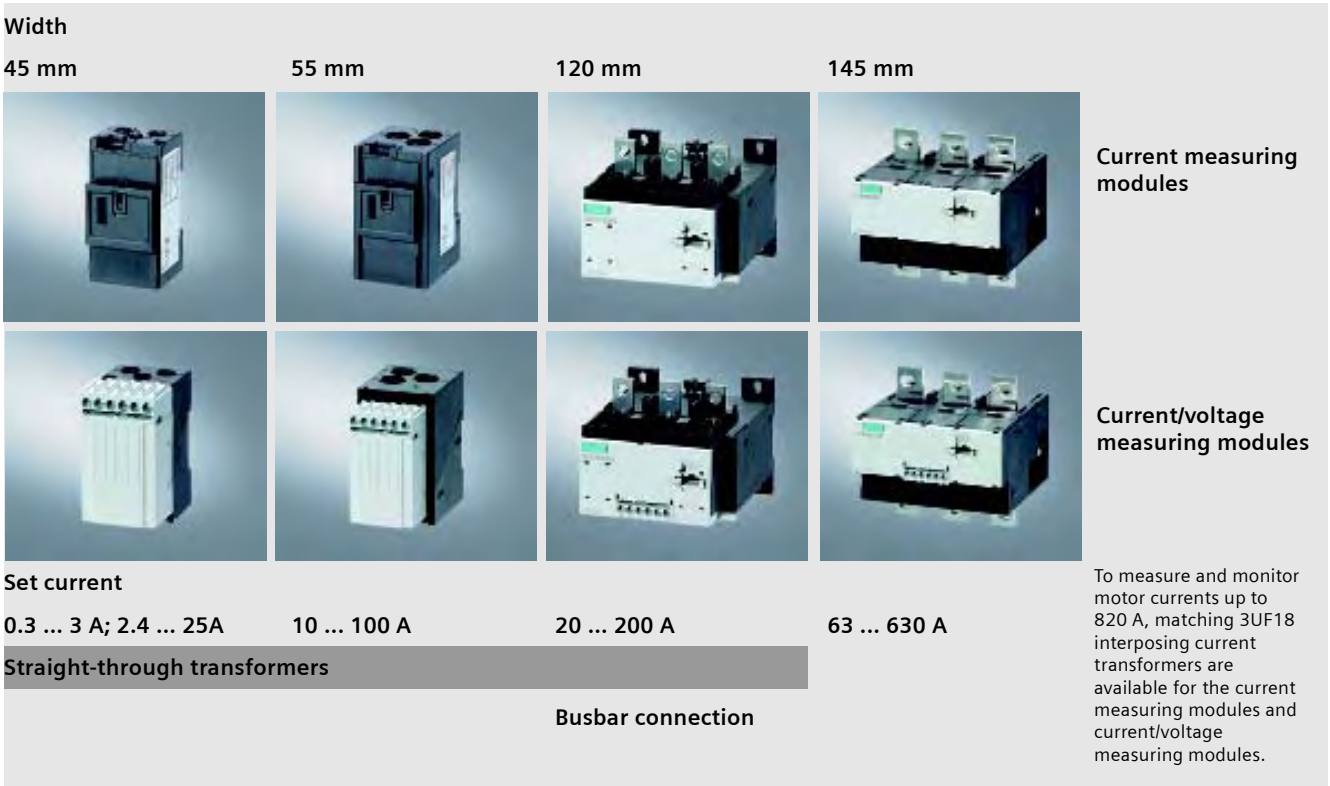
For motor currents up to 820 A, a current measuring module for 0.3 ... 3 A, for example, can be used in combination with a 3UF1 8 interposing/current transformer.

Current/voltage measuring modules (voltage range)

Current/voltage measuring modules have the same functions as the current measuring modules. However, they can only be used in combination with basic unit 2. They offer the same current ranges for the rated motor current. Mounting on standard mounting rails, on mounting plates or directly on the contactor is also the same as with the current measuring modules. They can also measure voltages up to 690 V in the main circuit, which is necessary for calculating or monitoring power-related measured variables. Current/voltage measuring modules have additional removable terminals, to which the voltages of all three phases of the main circuit are connected (3-pole). An additional 3-core cable can be used, for example, to directly connect the main circuit from the busbar terminals of the current/voltage measuring modules to the voltage measuring terminals.

Note:

Current/voltage measuring modules can only be mounted separately from the associated basic unit 2. If the current/voltage measuring module is used in non-grounded networks or in networks with insulation measurement or monitoring, then a decoupling module must be used in addition.



Sizes and set current of the current measuring modules and the current / voltage measuring modules

Decoupling module for current/voltage measuring modules

Decoupling module

If the voltage and power measuring module from SIMOCODE pro is used in non-grounded networks, then a decoupling module must be installed on the system interface upstream from each current/voltage measuring module. If the voltage and power measuring module from SIMOCODE pro is used in networks with additional insulation measurement or insulation monitoring, then a decoupling module must be installed likewise upstream from each current/voltage measuring module. If 3UF7 10 current-only measuring modules are used in these networks, then additional decoupling modules must not be used under any circumstances.

Note:

When a decoupling module is used, restrictions on the number of connectable expansion modules must be observed

Operator panel

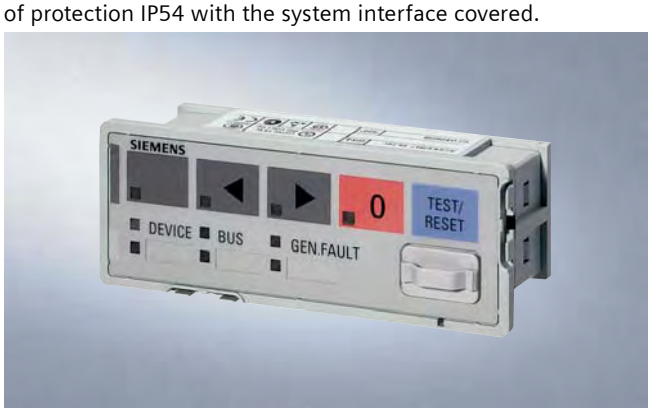
The operator panel is used to control the motor feeder and can replace all conventional pushbuttons and indicator lights to save space. This means that SIMOCODE pro or the feeder can be operated directly at the control cabinet and that the system interface is connected externally for easier parameterization or diagnostics using a PC/PG.

The operator panel is connected to the basic unit over a connection cable from its rear system interface and is supplied electrically from the basic unit.

The operator panel has 5 freely assignable buttons and a total of 10 LEDs, of which 7 LEDs can be used as required and assigned to any status signal.

A PC/PG can be connected to the front system interface over the PC cable.

The operator panel is mounted in the control cabinet door or the front plate of, for example, a withdrawable unit. It satisfies degree of protection IP54 with the system interface covered.



Operator panel for SIMOCODE pro

- 10 LEDs
- Test/reset button
- 4 control keys
- 2 system interfaces on the front with interface covers

Operator panel with display

Operator panel with display for SIMOCODE pro V

As an alternative to the 3UF7 20 standard operator panel for SIMOCODE pro V there is also an operator panel with display: the 3UF7 21 is thus able in addition to indicate current measured values, operational and diagnostics data or status information of the motor feeder at the control cabinet. This operator panel can be used solely with basic unit 2 (SIMOCODE pro V), product version E03 and higher. It includes all the status LEDs also found on the basic unit and provides access to the system interface outside the control cabinet. The pushbuttons of the operator panel can be used to control the motor while at the same time the display indicates current measured values, status information, fault messages or the device-internal fault protocol. Overview of features:

- 7 LEDs, 4 of them user-assignable (4 green LEDs are integrated in the motor control pushbuttons, preferably for the feedback of switching states, e.g. On, Off, Left, Right, etc.)
- 4 user-assignable buttons for controlling the motor feeder
- 4 buttons for navigating in the display menu, 2 of them as softkeys with function options (e.g. Test/Reset)
- 2 system interfaces on the front with interface covers

Using the display settings each user can select for himself how the measured values are presented as standard and how the displayed unit is converted (e.g. °C -> °F). The menu language is also switchable. Following options are available:

- English
- German
- French
- Polish
- Spanish
- Portuguese
- Italian
- Finnish

Note:

The operator panel with display can be used solely with basic unit 2, product version E03 and higher. Furthermore, if the operator panel with display is used, restrictions on the number of connectable expansion modules must be observed.

Inscription software for pushbuttons and LEDs on the operator panels

All operator panels come with prefabricated labeling strips. Using the latest version of the labeling software "SIRIUS Label Designer" it is also possible to produce user-specific inscription for the keys and LEDs of the operator panels from SIMOCODE pro.

Three different types of prepunched labeling strips are available for printing and can be ordered as an accessory part. With the help of a laser printer it is then easy to label the keys or LEDs of the 3UF7 20 operator panel or the keys of the 3UF7 21 operator panel with display.

Expansion modules for additional I/Os and functions

With basic unit 2 (SIMOCODE pro V), it is possible to expand the number and type of inputs and outputs in order to implement additional functions, for example. Each expansion module has two system interfaces on the front. Through the one system interface the expansion module is connected to the system interface of basic unit 2 using a connection cable, for example; through the second system interface, further expansion modules or the operator panel can be connected. The power supply for the expansion modules is provided by the connection cable through basic unit 2.

All expansion modules are suitable for standard rail mounting or can be directly fixed to a mounting plate using additional push-in lugs. Basic unit 2 can be extended on the whole with up to 5 expansion modules.

Expansion with additional binary I/Os through digital modules

Up to two digital modules can be used to add additional binary inputs and relay outputs to basic unit 2. The input circuits of the digital modules are supplied from an external power supply. The following versions are available:

- 4 inputs, supplied externally with 24 V DC and 2 monostable relay outputs
- 4 inputs, supplied externally with 110 ... 240 V AC/DC and
- 2 monostable relay outputs
- 4 inputs, supplied externally with 24 V DC and 2 bistable relay outputs
- 4 inputs, supplied externally with 110 ... 240 V AC/DC and 2 bistable relay outputs

Up to two digital modules can be connected to one basic unit 2. All versions can be combined with each other.

3UF7 300-1AB00-0 (left) and 3UF7 300-1AU00-0 (right) digital modules

4 binary inputs, externally supplied with
- 24 V DC or
- 110 ... 240 V AC/DC
- 2 relay outputs
- Monostable or
  Bistable (the switching state of the relay outputs is also maintained following failure of the supply voltage on basic unit 2)

1 Ready LED

2 system interfaces for connection
- To basic unit 2
- Of expansion modules
- Of a current measuring module or current/voltage measuring module
- of an operator panel

Note:
For the implementation of some motor control functions, in addition to the relay outputs on basic unit 2, at least one further digital module is required.

***Expansion with a ground-fault monitoring module** with an external summation current transformer*

Instead of ground-fault monitoring using the current measuring modules or current/voltage measuring modules, it may be necessary, especially in high-impedance grounded networks, to implement ground-fault monitoring for smaller ground fault currents using a summation current transformer. A earth-leakag module can be used to add an additional input to basic unit 2 for connection of a summation current transformer (3UL2 20.-.A).

Maximum one earth-leakag module can be connected to one basic unit 2.

3UF7 500-1AA00-0 ground-fault module

1 input for connecting a summation current transformer (3UL2 20.-.A)

1 Ready LED

2 system interfaces for connection
- To basic unit 2
- Of expansion modules
- Of a current measuring module or current/voltage measuring module
- Of an operator panel

Expansion of analog temperature monitoring with a temperature module

Independently of the thermistor motor protection of the basic units, up to 3 analog temperature sensors can be evaluated using a temperature module.

The temperatures measured here can be completely integrated in the process, monitored and supplied to a higher-level automation system through Profibus. The temperature module can be used, for example, for analog monitoring of the temperature of the motor windings or bearings or for monitoring the coolant or gear oil temperature. Various sensor types are supported (resistance sensors) for use in solid, liquid or gaseous media:

- PT100/PT1000
- KTY83/KTY84
- NTC

Maximum one temperature module can be connected to one basic unit 2. The same sensor type must be used in all sensor measuring circuits.

3UF7 700-1AA00-0 temperature module

3 inputs for connecting up to 3 resistance sensors in 2-wire or 3-wire circuits

1 Ready LED

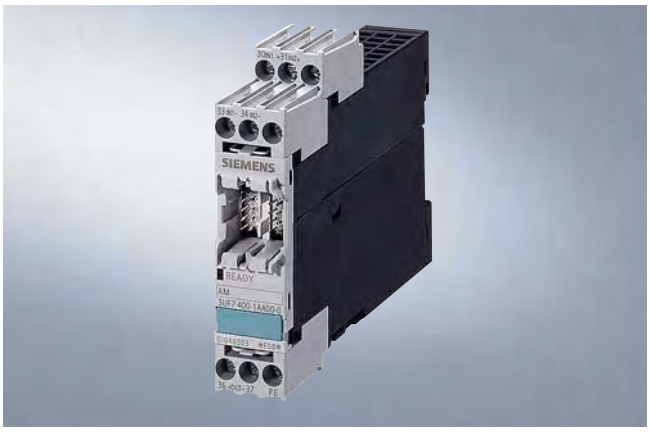
2 System interfaces for connection

- To basic unit 2
- Of expansion modules
- Of a current measuring module or current/voltagemeasuring module
- Of an operator panel

Expansion with additional inputs/outputs by means of an analog module

Basic unit 2 can be optionally expanded with analog inputs and outputs (0/4 ... 20 mA) by means of the analog module. It is then possible to measure and monitor any process variable that can be mapped on a 0/4 ... 20 mA signal. Typical applications are, for example, level monitoring for the implementation of dry running protection for pumps or monitoring the degree of pollution of a filter using a differential pressure transducer. In this case the automation system has free access to the measured process variables. The analog output can be used, for example, to visualize process variables on a pointer instrument. The automation system also has free access to the output through PROFIBUS.

Maximum one analog module can be connected to one basic unit 2. Both inputs are set to a measuring range of either 0 ... 20 mA or 4 ... 20 mA.



3UF7 400-1AA00-0 analog module

Inputs:
2 inputs, passive, for measuring 0/4 ... 20 mA signals

Outputs:
1 output to output a 0/4 ... 20 mA signal

1 Ready LED

2 system interfaces for connection

- To basic unit 2
- Of expansion modules
- Of a current measuring module or current/voltage measuring module
- Of an operator panel

Safe isolation

All circuits in SIMOCODE pro are safely isolated from each other in according to IEC 60947-1. That is, they are designed with double creepages and clearances. In the event of a fault, therefore, no parasitic voltages can be formed in neighboring circuits. The instructions of Test Report No. 2668 must be complied with.

EEx e and EEx d types of protection

The overload protection and the thermistor motor protection of the SIMOCODE pro system comply with the requirements for overload protection of explosion-protected motors to the degree of protection:

- EEx d "flameproof enclosure" e.g. according to EN 50018 or EN 60079-1
- EEx e "increased safety" e.g. according to EN 50019 or EN 60079-7.

When using SIMOCODE pro devices with a 24 V DC control voltage, electrical isolation must be ensured using a battery or a safety transformer according to EN 61558-2-6.

EC type test certificate: BVS 06 ATEX F 001
Test log: BVS PP 05.2029 EG.

Configuration instructions when using an operator panel with display and/or a decoupling module

If you want to use an operator panel with display and/or a decoupling module in the SIMOCODE pro V system, then the following configuration instructions concerning the type and number of connectable expansion modules must be observed.

The following tables show the maximum possible configuration of the expansion modules for the various combinations.

Use of an operator panel with display

Digital module	Digital module	Analog module	Temperature modules	Ground-fault modules
Only operator panel with display for basic unit 2 (24 V DC or 110 ... 240 V AC/DC)				
Max. 4 expansion modules can be used				
Operator panel with display and current/voltage measurement with basic unit 2 (110 ... 240 V AC/DC)				
Max. 3 expansion modules can be used or:				
--	--	✓	✓	--

Use of a decoupling module
(voltage measurement in insulated networks)

Digital module	Digital module	Analog module	Temperature modules	Ground-fault modules
Basic unit 2 (24 V DC)				
✓[1]	✓[1]	✓	✓	✓
Basic unit 2 (110 ... 240 V AC/DC)				
✓	✓	--	✓	✓
✓[1]	✓[1]	✓	✓	--
✓	--	✓	✓	--
✓	--	✓	--	✓

Use of a decoupling module
(voltage measurement in insulated networks)
in combination with an operator panel with display

Digital module	Digital module	Analog module	Temperature modules	Ground-fault modules
Basic unit 2 (24 V DC)				
✓	--	✓	✓	✓
✓	✓	✓	✓	✓
Basic unit 2 (110 ... 240 V AC/DC)				
✓[2]	✓	--	✓	✓
✓	✓	--	--	--
✓[1]	✓[1]	✓[3]	--	--
✓	--	--	✓	✓

✓ Possible
-- Not available

[1] No bistable relay outputs and no more than 5 of 7 relay outputs active simultaneously (> 3 s).

[2] No bistable relay outputs and no more than 3 of 5 relay outputs active simultaneously (> 3 s).

[3] Analog module output is not used.

Functions

Multifunctional, solid-state full motor protection

Inverse-time delayed overload protection with adjustable tripping characteristics (Classes 5, 10, 15, 20, 25, 30, 35 and 40)

SIMOCODE pro protects induction or AC motors according to IEC 60947-4-1 requirements. The trip class can be adjusted in eight steps from Class 5 to Class 40. In this way, the break time can be adapted very accurately to the load torque which allows the motor to be utilized more effectively. In addition, the time until the overload trip is performed is calculated and can be made available to the instrumentation & control system. After an overload trip, the remaining cooling time can be displayed (characteristic curves for 2-pole and 3-pole loading in SIMOCODE pro System Manual).

Phase failure/unbalance protection

The level of the phase unbalance can be monitored and transmitted to the instrumentation & control system. If a specified limit value is violated, a defined and delayable response can be initiated. If the phase unbalance is larger than 50 %, the tripping time is also automatically reduced according to the overload characteristic since the heat generation of the motors increases in unbalanced conditions.

Stall protection

If the motor current rises above an adjustable blocking threshold (current threshold), a defined and delayable response can be configured for SIMOCODE pro. In this case, for example, the motor can be shut down independent of the overload protection. The stall protection is only enabled after the configured class time has elapsed and avoids unnecessarily high thermal and mechanical stress as well as wear of the motor.

Thermistor motor protection

This protection function is based on direct temperature measurements by means of temperature sensors in the stator windings or in the enclosure of the motor. These protection functions should be used, in particular, in motors with high switching frequencies, heavy starting, intermittent and/or braking operation, but also in the case of speeds lower than the rated speed. SIMOCODE pro supports connection and evaluation of several PTC sensors connected in series on the basic unit. In addition, the sensor measuring circuit can be monitored for short-circuits and open-circuits. If the temperature of the motor increases beyond a defined limit or if there is a fault in the sensor measuring circuit, a defined response can be configured.

Ground-fault monitoring (internally) with a current measuring module or current/voltage measuring module

SIMOCODE pro acquires and monitors all three phase currents. With vector addition of the phase currents, the motor feeder can be monitored for possible residual currents or ground faults with the help of internal calculations. Internal ground-fault monitoring is only available for motors with three-phase connections in directly grounded networks or in networks grounded with low impedance. The response of SIMOCODE pro when a ground fault is detected can be parameterized and delayed as required.

Earth Leakage monitoring (external) with summation current transformer[1)3)]

External earth leakage monitoring is normally implemented for networks that are grounded with high impedance. Using an additional summation current transformer (3UL2 20.-.A), even extremely low ground-fault currents can be measured. The response of SIMOCODE pro when a ground fault is detected can be parameterized and delayed as required. Fault current measurement is performed for each summation current transformer for the following fault currents: 0.3/0.5/1 A

Monitoring of adjustable limit values for the motor current

Current limit monitoring is used for process monitoring . It is independent of overload protection. Violation of a current limit value below the overload threshold can be an indication of a dirty filter in a pump or an increasingly sluggish motor bearing, Violation of the lower current limit value can be a first indication of a worn drive belt. SIMOCODE pro supports two-step monitoring of the motor current for freely selectable upper and lower current limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold.

Voltage monitoring[2)]

By measuring the voltage directly at the circuit breaker or at the fuses in the main circuit, even when the motor is deactivated, SIMOCODE pro can also obtain information about the reclosing capability of the feeder and signal it if required.

SIMOCODE pro supports two-stage undervoltage monitoring for freely selectable limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold.

Monitoring the active power[2)]

The active power characteristic of a motor provides an accurate statement of the actual loading over the complete range. Excessive loading will cause increased wear in the motor and can result in early failure. Insufficient active power can be an indication of, for example, motor idling.

SIMOCODE pro supports two-step monitoring of the active power for freely selectable upper and lower current limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold.

Monitoring the power factor[2)]

Especially in the low-end performance range of a motor, the power factor varies more than the motor current or active power. Monitoring of the power factor is therefore particularly useful for distinguishing between motor idling and fault events such as a tear in a drive belt or a crack in a drive shaft.

SIMOCODE pro supports two-stage monitoring of power factor undershoot for freely selectable limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold.

1) Using basic unit 2.

2) Using basic unit 2 with current/voltage measuring module.

3) An additional ground-fault module with a 3UL22 summation current transformer is required.

Temperature monitoring[1)3)]

The temperature can be monitored, for example, in the motor windings or at the bearings through up to three resistance sensors connected to the temperature module.

SIMOCODE pro supports two-stage monitoring of overheating for freely selectable limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold. Temperature monitoring is always performed with reference to the highest temperature of all sensor measuring circuits used.

Monitoring additional process variables over analog inputs (0/4 ... 20 mA)[1)4)]

The analog module enables SIMOCODE pro to measure additional process variables and monitor them. A pump can, for example, be protected against dry running in this manner with level monitoring or the degree of pollution of a filter can be measured using a differential pressure transducer. When a specified level is undershot, the pump can be deactivated and when a specified differential pressure is overshot, the filter can be cleaned.

SIMOCODE pro supports two-step monitoring of the corresponding process variable for freely selectable upper and lower current limit values. The response of SIMOCODE pro can be freely parameterized and delayed if it reaches an alarm or tripping threshold.

Phase sequence detection[2)]

By detecting the phase sequence, SIMOCODE pro is able to make a statement about the direction of rotation of a motor. If the direction is incorrect, this can be reported or it can result in immediate disconnection of the affected motor.

Monitoring of operating hours, downtime and number of starts

In order to prevent plant downtime caused by motor failure due to

excessive motor operating times (wear) or excessive motor downtimes, SIMOCODE pro can monitor the operating hours and downtime of a motor. When an adjustable limit value is violated, a message or alarm can be generated which can indicate that the corresponding motor must be serviced or replaced. After the motor has been replaced, the operating hours and downtimes can be reset, for example.

To avoid excessive thermal loads and early wear of the motor, it is possible to limit the number of motor startups for a specifiable period. Alarms can indicate that only a small number of possible starts remain.

Flexible motor control implemented with software

Many typical motor control functions have been predefined in SIMOCODE pro and are available for use:

- Overload relay
- Direct-on-line and reversing starters
- Wye-delta starters (also with direction reversal)[1)]
- Two speeds, motors with separate windings (pole-changing switch); also with direction reversal[1)]
- Two speeds, motors with separate Dahlander windings (also with direction reversal)[1)]
- Positioner actuation[1)]
- Solenoid valve actuation[1)]
- Actuation of a circuit breaker (MCCB)
- Actuation of a 3RW soft starter also with direction reversal[1)]

These control programs already include all the software interlocks and logic operations required for operation of the required motor control functions.

It is also monitored whether the current checkback of the motor feeder corresponds with the control command. If not, SIMOCODE pro opens the motor contactor and generates a fault message. Depending on the application, motor control can be switched over or carried out simultaneously from several control stations, e.g.:

- From the I&C system through PROFIBUS DP
- From a PC/PG through PROFIBUS DP
- From the control cabinet door through the operator panel
- From a PC/PG on the system interface through SIMOCODE pro
- From a local control station on the motor. In this case, the buttons, switches and indicator lights are connected to the inputs and outputs of SIMOCODE pro.

Regardless of whether a control command is sent to SIMOCODE pro via PROFIBUS DP using the operator panel or via the buttons connected to the binary SIMOCODE pro inputs, SIMOCODE pro can execute these control commands simultaneously or in

accordance with the enabled commands defined during parameterization.

These predefined control functions can also be flexibly adapted to each customized configuration of a motor feeder by means of freely configurable logic modules (truth tables, counters, timers, edge evaluation etc.).

In addition, special standard functions are stored in SIMOCODE pro which can also be used to extend the protection and control functions, e.g.:

- Power failure monitoring1) for automatic, time-staggered restart of motors following a mains failure e.g. with the help of a separate voltage relay (voltage controller).
- Fault signaling modules for external faults with or without manual or automatic acknowledgement for generating internal messages or for tripping SIMOCODE pro in response to freely definable events (e.g. overspeed monitor has been activated). Designations/ names can also be assigned to the external faults which are stored in the device and which are therefore also available to the instrumentation & control system.
- Emergency start function and reset of the thermal memory of SIMOCODE pro after tripping, i.e. immediate restart is possible (important, for example, for pumps used to extinguish fires).
- Test function for the load feeder circuit when the main control switch is open to test the control circuit while the main circuit is de-energized.

Detailed operational, service and diagnostics data

SIMOCODE pro provides a variety of operating, service and diagnostics data, such as:

Operating data

- The switching state of the motor (On, Off, clockwise, counterclockwise, fast, slow) is derived from the current flow in the main circuit, so feedbacks are not required through auxiliary contacts from circuit breakers and contactors
- Current in Phase 1, 2, 3 and maximum current in % of the set current
- Voltage in phases 1, 2, 3 in V[2)]
- Active power in W[2)]
- Apparent power in VA[2)]
- Power factor in %[2)]
- Phase unbalance in %
- Phase sequence[2)]
- Temperature in sensor measuring circuits 1, 2, 3 and maximum temperature in K[1)3)]
- Current values of the analog signals[1)4)]
- Time until tripping in sec.
- Temperature rise for motor model in %
- Remaining cooling time of the motor in sec. etc.

Freely configurable logic modules (calculators[5)]) can be used for the device-internal conversion of the measured values in SIMOCODE pro V. This means, for example, that temperatures can be transmitted to the automation system in °C or °F.

Service data

- Motor operating hours (can be reset)
- Motor stop times (can be reset)
- Number of motor starts (can be reset)
- Number of remaining permissible motor starts
- Number of overload trips (can be reset)
- Feeder-related power consumption in kWh (can be reset)6)
- Internal comments, stored in the device for each feeder, e.g. notes for maintenance events etc.

Diagnostics data

- Numerous detailed early warning and fault messages (can also be used for further processing in the device or instrumentation & control system)
- Internal device fault logging with time stamp
- Value of the previous tripping current
- Checkback error (e.g. no current flow in the main circuit following ON control command) etc.

Safety-oriented Emergency-Stop monitoring

In principle it is possible with SIMOCODE pro to equip various control functions in addition with Emergency-Stop monitoring in order for them to be safely deactivated according to EM954 Category 2 or 4.
Note:
Examples of functions can be found at:
http://www.siemens.com/simocode

Autonomous operation

An essential feature of SIMOCODE pro is independent execution of all protection and control functions even if communication with the instrumentation & control system breaks down. If the bus or automation system fails, the full functionality of the feeder is ensured or a pre-defined response can be initiated, e.g. the feeder can be shut down in a controlled manner or certain configured control mechanisms can be performed (e.g. the direction of rotation can be reversed).

[1)] Using basic unit 2.

[2)] Using basic unit 2 with current/voltage measuring module.

[3)] An additional temperature is required.

[4)] An additional analog module is required.

[5)] When using basic unit 2, product version E03 and higher.

[6)] When using basic unit 2, product version E03 and higher, with current/ voltage measuring module.

Integration

General

In addition to device function and hardware design, a great deal of emphasis is placed on the case of communication-capable controls on the user-friendliness of the parameterization software and the ability of the system to be integrated easily into various different system configurations and process automation systems. For this reason, the SIMOCODE pro system provides suitable software tools for consistent, time-saving parameterization, configuration and diagnostics:

- SIMOCODE ES for totally integrated start-up and service
- OM SIMOCODE pro object manager for total integration into SIMATIC S7
- PCS 7 function block library SIMOCODE pro for total integration into PCS 7

SIMOCODE ES

The parameterization software for SIMOCODE pro can be run on a PC/PG under Windows 2000 or Windows XP. It is available in two functionally graded versions:

- **SIMOCODE ES Smart,** for direct connection to SIMOCODE pro via the system interface on the device (point-to-point)
- **SIMOCODE ES Professional,** for connection to one or several devices over PROFIBUS DP or point-to-point through the system interface

With SIMOCODE ES, the SIMOCODE motor management system provides a user-friendly and clear-cut user interface with which to configure, operate, monitor and test SIMOCODE pro in the field or from a central location. By displaying all operating, service and diagnostics data, SIMOCODE ES supplies important information on whether maintenance work is required or, in the event of a fault, helps to prevent faults or to localize and rectify them once they have occurred.

Unnecessary plant downtimes can be prevented by changing parameters online (even during operation). The flexible printing function integrated into SIMOCODE ES allows comprehensive documentation of all parameters or partial documentation of selected or changed parameters.

- **SIMOCODE ES Graphic** is an optional software package for SIMOCODE ES Smart or SIMOCODE ES Professional. It expands the user interface with a graphical editor and supports extremely user-friendly parameterization with Drag & Drop. Inputs and outputs of function blocks can be graphically linked and parameters can be set. The configured functions can be described in greater detail using comments and the device parameterization can be documented graphically - this speeds up start-up and simplifies the plant documentation.

The OM SIMOCODE pro object manager
(as standard element of SIMOCODE ES Professional)

The **OM SIMOCODE** pro object manager is a standard element of **SIMOCODE ES Professional**. In contrast to a conventional GSD file, it enables SIMOCODE ES to be integrated into STEP 7 for convenient device parameterization. By installing SIMOCODE ES Professional and OM SIMOCODE pro on a PC/PG, which is used to configure the hardware of the SIMATIC S7, SIMOCODE ES Professional can be called directly from the hardware configuration. This allows easy and consistent S7 configuration.

PCS 7 function block library for SIMOCODE pro

The SIMOCODE pro PCS 7 function block library can be used for simple and easy integration of SIMOCODE pro into the SIMATIC PCS 7 V6 process control system. The SIMOCODE pro PCS 7 function block library contains the diagnostics and driver blocks corresponding with the diagnostics and driver concept of SIMATIC PCS 7 as well as the elements (symbols and faceplate) required for operator control and process monitoring. The application is integrated by graphic interconnection using the CFC Editor.

The technological and signal processing functions of the SIMOCODE pro PCS 7 function block library are based on the SIMATIC PCS 7 standard libraries (driver blocks, technological blocks) and are optimally tailored to SIMOCODE pro. Users who previously configured motor feeder circuits using conventional technology by means of signal blocks and motor or valve blocks, can now easily switch to the SIMOCODE pro PCS 7 function block library.

The SIMOCODE pro PCS 7 function block library supplied on CD-ROM allows the user to run the required engineering software on the engineering station (single license) including the runtime software for executing the AS modules in an automation system (single license). If the AS modules are to be used in additional automation systems, the corresponding number of runtime licenses are required which are supplied without a data carrier.

System manual for SIMOCODE pro

The SIMOCODE pro system manual describes the motor management system and its functions in detail. It contains information about configuration and commissioning as well as servicing and maintenance. A typical example of a reversing starter application is used to teach the user quickly and practically how to use the system. In addition to help on how to identify and rectify faults in the event of a malfunction, the manual also contains special information for servicing and maintenance.

Furthermore, the manual contains schematics, dimensional drawings and technical specifications of the system components as project planning aids.

SIMOCODE pro 3UF7
motor management and control devices

Technical Specifications

General data applicable to the basic units, current measuring modules, current/voltage measuring modules, expansion modules, decoupling module and operator panel		
Permissible ambient temperature		
• During operation	°C	-25 ... +60[1]
• Storage and transport	°C	-40 ... +80[2]
Installation height above sea level	m	≤2000
• Permissible ambient temperature max. +50 °C (no safe isolation)	m	≤3000
• Permissible ambient temperature max. +40 °C (no safe isolation)	m	≤4000
Degree of protection (acc. to IEC 60529)		
• All components, (except for current measuring modules or current/voltage measuring modules for busbar connection, operator panel and door adapter)		IP20
• Current measuring modules or current/voltage measuring module with busbar connection		IP00
• Operator panel (front) and door adapter (front) with cover		IP54
Shock resistance (sine pulse)	g/ms	15/11
Mounting position		Any
Frequency	Hz	50/60 ±5 %
Immunity to electromagnetic interferences (acc. to IEC 60947-1)		Corresponds to degree of severity 3
• Line-induced interference, burst acc. to IEC 61000-4-4	kV	2 (power ports)
	kV	1 (signal ports)
• Line-induced interference, high frequency acc. to IEC 61000-4-6	V	10
• Line-induced interference, surge acc. to IEC 61000-4-5	kV	2 (line to earth)
	kV	1 (line to line)
• Electrostatic discharge, ESD acc. to IEC 61000-4-2	kV	8 (air discharge)
	kV	6[3] (contact discharge)
• Field-related interference acc. to IEC 61000-4-3	V/m	10
Immunity to electromagnetic interference (acc. to IEC 60947-1)		
• Line-conducted and radiated interference emission		DIN EN 55011/DIN EN 55022 (CISPR 11/CISPR 22) (corresponds to degree of severity A)
Safe isolation (acc. to IEC 60947-1)		All circuits in SIMOCODE pro are safely isolated from each other acc. to IEC 60947-1, they are designed with doubled creepage paths and clearances In this context, compliance with the instructions in the test report "Safe Isolation" No. 2668 is required.

Basic units	
Mounting	Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Displays	
• Red/green/yellow LED "DEVICE"	• Green: "Ready" • Red: "Function test not OK; device is disabled" • Yellow: "Memory module or addressing plug detected" • Off: "No control supply voltage"
• Green "BUS" LED	• Continuous light: "Communication with PLC/PCS" • Flashing: "Baud rate recognized/communicating with PC/PG"
• Red "GEN. FAULT" LED	• Continuous light/flashing: "Feeder fault", e.g. overload trip
Test/Reset buttons	• Resets the device after tripping • Function test • Operation of a memory module or addressing plug
System interface	
• Front	Connection of an operator panel or expansion modules; the memory module, addressing plug or a PC cable can also be connected to the system interface for parameterizing
• Bottom	Connection of a current measuring module or current/voltage measuring module
PROFIBUS DP interface	Connection of the PROFIBUS DP cable through terminal connection or through a 9-pin sub D socket

1) For 3UF7 21: 0 ... +60 °C.
2) For 3UF7 21: -20 ... +70°C.
3) For 3UF7 21: 4 kV.

Basic units

Control circuits						
Rated control supply voltage Us (acc. to EN 61131-2)		110 ... 240 V AC/DC; 50/60 Hz			24 V DC	
Operating range		0.85 ... 1.1 x U_s			0.80 ... 1.2 × Us	
Power consumption						
• Basic unit 1 (3UF7 000)		7 VA			5 W	
• Basic unit 2 (3UF7 010) incl. two expansion modules connected to basic unit 2		10 VA			7 CO	
Rated insulation voltage U_i	V	300 (at degree of pollution 3)				
Rated impulse withstand voltage U_{imp}	kV	4				
Relay outputs						
• Number		3 monostable relay outputs				
• Auxiliary contacts of the 3 relay outputs		Floating NO contacts (NC contact response can be parameterized with internal signal conditioning), 2 relay outputs are jointly and 1 relay output is separately connected to a common potential; they can be freely assigned to the control functions (e.g. for line, star and delta contactors and for signaling the operating state)				
• Specified short-circuit protection for auxiliary contacts (relay outputs)		• Fuse links, gL/gA operational class 6 A, quick-acting 10 A (IEC 60947-5-1) • Miniature circuit breaker 1.6 A, C characteristic (IEC 60947-5-1) • Miniature circuit breaker 6 A, C characteristic (Ik < 500 A)				
• Rated uninterrupted current	A	6				
• Rated short-circuit capacity		**AC-15**	6 A 24 V/AC	6 A 120 V/AC	3 A 230 V/AC	
		DC-13	2 A 24 V/DC	0.55 A 60 V/DC	0.25 A 125 V/DC	
Inputs (binary)		4 inputs supplied internally by the device electronics (24 V DC) and connected to a common potential for acquiring process signals (e.g. local control station, key-operated switch, limit switch, ...), freely assignable to the control functions				
Thermistor motor protection (binary PTC)						
• Summation cold resistance	kΩ	≤1.5				
• Response value	kΩ	3.4 ... 3.8				
• Return value	kΩ	1.5 ... 1.65				
Conductor cross-sections						
• Tightening torque	Nm	0.8 ... 1.2				
• Solid	mm2	1 × (0.5 ... 4.0); 2 × (0.5 ... 2.5)				
• Finely stranded with end sleeve	mm2	1 × (0.5 ... 2.5); 2 × (0.5 ... 1.5)				
• AWG cable (solid)	AWG	1 x AWG 20 to 12/2 x AWG 20 to 14				
• AWG cable (finely stranded)	AWG	1 x AWG 20 to 14/2 x AWG 20 to 16				

Current measuring modules or current/voltage measuring modules

Mounting						
• Set current Ie = 0.3 ... 3 A; 2.4 ... 25 A; 10 ... 100 A (3UF7 1.0, 3UF7 1.1, 3UF7 1.2)		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs				
• Set current Ie = 20 ... 200 A (3UF7 103, 3UF7 113)		Snap-on mounting onto 35 mm standard mounting rail, screw mounting on mounting plate or direct fixing on contactor				
• Set current Ie = 63 ... 630 A (3UF7 104, 3UF7 114)		Screw mounting on mounting plate or direct fixing on contactor				
System interface		For connection to a basic unit or decoupling module				
Main circuits						
		3UF7 1.0	**3UF7 1.1**	**3UF7 1.2**	**3UF7 1.3**	**3UF7 1.4**
Set current I_e	A	0.3 ... 3	2.4 ... 25	10 ... 100	20 ... 200	63 ... 630
Rated insulation voltage U_i	V	690[1]				
(degree of pollution 3)						
Rated operational voltage U_e	V	690				
Rated impulse withstand voltage U_{imp}	kV	6[2]				
Rated frequency	Hz	50/60				
Type of current		Three-phase current				
Short-circuit		Additional short-circuit protection is required in main circuit				
Accuracy of current measurement (in the range 1 x minimum set current Iu to 8 x max. set current I_o)	%	±3				
Typical voltage measuring ranges						
Phase-to-phase voltage/line-to-line voltage (e.g. UL1 L2)	V	110 ... 690 (only the phase voltages are available in SIMOCODE pro as measured values)				
Phase voltage (e.g. UL1)	V	65 ... 400				
Accuracy						
Of voltage measurement (phase voltage UL in the range 230 ... 400 V)	%	±3 (typical)				
Of power factor measurement (in the rated load range power factor = 0.4 ... 0.8)	%	±5 (typical)				
Of apparent power measurement (in the rated load range)	%	±5 (typical)				
Notes on voltage measurement						
• In non-grounded networks or in networks with integrated insulation measurement or monitoring		In these networks the current/voltage measuring module can be used only with an upstream decoupling module on the system interface.				
• Feeder lines for voltage measurement		In the feeder lines from the main circuit for voltage measurement of SIMOCODE pro it may be necessary to provide additional line protection!				

[1] For 3UF7 103 or 3UF7 104 up to 1000 V.
[2] For 3UF7 103 or 3UF7 104 up to 8 kV.

SIMOCODE pro 3UF7
motor management and control devices

Current measuring modules or current/voltage measuring modules

Connection for main circuit			
Feed-through opening (diameter)			
Set current I_e = 0.3 ... 3 A; 2.4 ... 25 A	mm	7.5	
Set current I_e = 10 ... 100 A	mm	14.0	
Set current I_e = 20 ... 200 A	mm	25.0	
Busbar connections[1]		3UF7 100, 3UF7 101, 3UF7 102	3UF7 103, 3UF7 104
Set current I_e	A	20 ... 200	63 ... 630
Terminal screw		M8 x 25	M10 x 30
Tightening torque	Nm	10 ... 14	14 ... 24
Solid with cable lug	mm^2	16 ... 95[2]	50 ... 240[3]
Stranded with cable lug	mm^2	25 ... 120[2]	70 ... 2403)
AWG cable	AWG	6 ... 3/0 kcmil	1/0 ... 500 kcmil
Conductor cross-sections for voltage measurement			
Tightening torque	Nm	0.8 ... 1.2	
Solid	mm^2	1 x (0.5 ... 4.0); 2 x (0.5 ... 2.5)	
Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5); 2 x (0.5 ... 1.5)	
AWG cable (solid)	AWG	1 x AWG 20 to 12/2 x AWG 20 to 14	
AWG cable (finely stranded)	AWG	1 x AWG 20 to 14/2 x AWG 20 to 16	

Decoupling modules

Mounting		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Display		
Green "READY" LED		• Continuous light: "Ready"
System interfaces		Left interface for connecting to a basic unit or to an expansion module, right interface only for connecting to a current/voltage measuring module.
Conductor cross-sections		
Tightening torque	Nm	0.8 ... 1.2
Solid	mm^2	1 x (0.5 ... 4.0); 2 x (0.5 ... 2.5)
Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5); 2 x (0.5 ... 1.5)
AWG cable (solid)	AWG	1 x AWG 20 to 12/2 x AWG 20 to 14
AWG cable (finely stranded)	AWG	1 x AWG 20 to 14/2 x AWG 20 to 16

Digital modules

Mounting		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Display		
• Green "READY" LED		• Continuous light: "Ready" • Flashing: "No connection to the basic unit"
System interfaces		For connecting to a basic unit, another expansion module, a current measuring module or current/voltage measuring module or to the operator panel
Control circuit		
Rated insulation voltage U_i	V	300 (at degree of pollution 3)
Rated impulse withstand voltage Uimp	kV	4
Relay outputs		
• Number		2 monostable or bistable relay outputs (depending on the version)
• Auxiliary contacts of the 2 relay outputs		Floating NO contacts (NC contact response can be parameterized with internal signal conditioning), all relay outputs are jointly connected to a common potential, they can be freely assigned to the control functions (e.g. for line, wye and delta contactors and for signaling the operating state)
• Specified short-circuit protection for auxiliary contacts (relay outputs)		• Fuse links, gL/gG operational class 6 A, quick-acting 10 A (IEC 60947-5-1) • Miniature circuit breaker 1.6 A, C characteristic (IEC 60947-5-1) • Miniature circuit breaker 6 A, C characteristic (Ik<500 A)
Rated uninterrupted current	A	6
Rated short-circuit capacity		**AC-15** 6 A/24 V AC; 6 A/120 V AC; 3 A/230 V AC **DC-13** 2 A/24 V DC; 0.55 A/60 V DC; 0.25 A/125 V DC
Inputs (binary)		4 externally supplied floating inputs, 24 V DC or 110 ... 240 V AC/DC depending on the version; inputs jointly connected to common potential for sensing process signals (e.g.: local control station, key-operated switch, limit switch ...), freely assignable to the control functions
Conductor cross-sections		
• Tightening torque	Nm	0.8 ... 1.2
• Solid	mm^2	1 × (0.5 ... 4.0); 2 × (0.5 ... 2.5)
• Finely stranded with end sleeve	mm^2	1 × (0.5 ... 2.5); 2 × (0.5 ... 1.5)
• AWG cable (solid)	AWG	1 x AWG 20 to 12/2 x AWG 20 to 14
• AWG cable (finely stranded)	AWG	1 x AWG 20 to 14/2 x AWG 20 to 16

[1] Screw terminal is possible using a suitable 3RT19 ... box terminal.
[2] When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm2 to ensure phase spacing.
[3] When connecting cable lugs according to DIN 46234 for conductor cross sections from 240 mm^2 as well as DIN 46235 for conductor cross-sections from 185 mm^2, use the 3RT19 66-4EA1 terminal cover to ensure phase spacing.

Earth leakage modules

Mounting		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Display • Green "READY" LED		• Continuous light: "Ready" • Flashing: "No connection to the basic unit"
System interfaces		For connecting to a basic unit, another expansion module, a current measuring module or current/voltage measuring module or to the operator panel
Control circuit		
Connectable 3UL22 summation current transformer with rated fault currents I_N • *I*Ground fault ≤50 % I_N • *I*Ground fault ≥100 % I_N	A	0.3/0.5/1 No tripping Tripping
Response delay (conversion time)	ms	300 ... 500, additionally delayable
Conductor cross-sections • Tightening torque • Solid • Finely stranded with end sleeve • AWG cable (solid) • AWG cable (finely stranded)	 Nm mm2 mm2 AWG AWG	 0.8 ... 1.2 1 × (0.5 ... 4.0); 2 × (0.5 ... 2.5) 1 × (0.5 ... 2.5); 2 × (0.5 ... 1.5) 1 x AWG 20 to 12/2 x AWG 20 to 14 1 x AWG 20 to 14/2 x AWG 20 to 16

Temperature modules

Mounting		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Display • Green "READY" LED		• Continuous light: "Ready" • Flashing: "No connection to the basic unit"
System interfaces		For connecting to a basic unit, another expansion module, a current measuring module or current/voltage measuring module or to the operator panel
Sensor circuits		
Typical sensor circuits • PT100 • PT1000/KTY83/KTY84/NTC	 mA mA	 1 (typical) 0.2 (typical)

Open-circuit/short-circuit detection					
• For sensor type		PT100/PT1000	KTY83-110	KTY84	NTC
• Open circuit		✓	✓	✓	--
• Short-circuit		✓	✓	✓	✓
• Measuring range	°C	-50 ... +500	-50 ... +175	-40 ... +300	+80 ... +160

Measuring accuracy at 20 °C ambient temperature (T20)	K	<±2
Deviation due to ambient temperature (in % of measuring range)	%	0.05 per K deviation from T20
Conversion time	ms	500
Connection type		2- or 3-conductor connection
Conductor cross-sections • Tightening torque • Solid • Finely stranded with end sleeve • AWG cable (solid) • AWG cable (finely stranded)	 Nm mm^2 mm^2 AWG AWG	 0.8 ... 1.2 1 × (0.5 ... 4.0); 2 × (0.5 ... 2.5) 1 × (0.5 ... 2.5); 2 × (0.5 ... 1.5) 1 x AWG 20 to 12/2 x AWG 20 to 14 1 x AWG 20 to 14/2 x AWG 20 to 16

Analog modules

Mounting		Snap-on mounting onto 35 mm standard mounting rail or screw mounting with additional push-in lugs
Display • Green "READY" LED		• Continuous light: "Ready" • Flashing: "No connection to the basic unit"
System interfaces		For connecting to a basic unit, another expansion module, a current measuring module or current/voltage measuring module or to the operator panel

✓ Possible

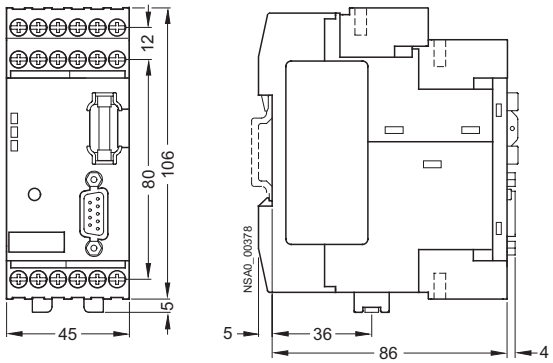
-- Not available

SIMOCODE pro 3UF7
motor management and control devices

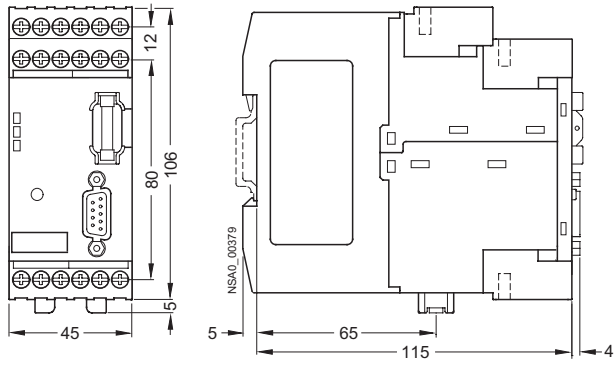
Analog modules		
Control circuit		
Inputs		
• Channels		2 (passive)
• Parameterizable measuring ranges	mA	0/4...20
• Shielding		Up to 30 m shield recommended, from 30 m shield required
• Max. input current (destruction limit)	mA	40
• Accuracy	%	±1
• Input resistance	W	50
• Conversion time	ms	150
• Resolution	bit	12
• Open-circuit detection		With measuring range 4 ... 20 mA
Output		
• Channels		1
• Parameterizable output range	mA	0/4...20
• Shielding		Up to 30 m shield recommended, from 30 m shield required
• Max. voltage at output		30 V DC
• Accuracy	%	±1
• Max. output load	W	500
• Conversion time	ms	25
• Resolution	bit	12
• Short-circuit resistant		Yes
Connection type		2-conductor connection
Voltage isolation of inputs/output to the device electronics		No
Conductor cross-sections		
• Tightening torque	Nm	0.8...1.2
• Solid	mm2	1 x (0.5..4.0); 2 x (0.5..2.5)
• Finely stranded with end sleeve	mm2	1 x (0.5...2.5); 2 x (0.5...1.5)
• AWG cable (solid)	AWG	1 x AWG 20 to 12/2 x AWG 20 to 14
• AWG cable (finely stranded)	AWG	1 x AWG 20 to 14/2 x AWG 20 to 16
Operator panels		
Mounting		Mounted in a control cabinet door or in a front panel, IP54 with system interface cover
Display		
• Red/green/yellow LED "DEVICE"		• Green: "Ready" • Green flashing: "No connection to the basic unit" • Red: "Function test not OK; device is disabled" • Yellow: "Memory module or addressing plug detected" • Off: "No control supply voltage"
• Green "BUS" LED		• Continuous light: "Communication with PLC/PCS" • Flashing: "Baud rate recognized/communicating with PC/PG"
• Red "GEN. FAULT" LED		• Continuous light/flashing: "Feeder fault", e.g. overload trip
• Green or yellow LEDs		For assigning to any status signals, as required
Keys		
• Test/Reset		• Resets the device after tripping • Function test • Operation of a memory module or addressing plug
• Control keys		for controlling the motor feeder, user-assignable
System interface		
• Front		For plugging in a memory module, an addressing plug or a PC cable for parameterization
• Rear		Connection to the basic unit or to an expansion module
Operator panels		
Mounting		Mounted in a control cabinet door or in a front panel, IP54 with system interface cover
Display		
• Red/green/yellow LED "DEVICE"		• Green: "Ready" • Green flashing: "No connection to the basic unit" • Red: "Function test not OK; device is disabled" • Yellow: "Memory module or addressing plug detected" • Off: "No control supply voltage"
• Green "BUS" LED		• Continuous light: "Communication with PLC/PCS" • Flashing: "Baud rate recognized/communicating with PC/PG"
• Red "GEN. FAULT" LED		• Continuous light/flashing: "Feeder fault", e.g. overload trip
• 4 green LEDs		For assigning to any status signals as required (preferably for the feedback of switching states, e.g. On, Off, Left, Right, etc.)
Display		Graphic display for indicating current measured values, operational and diagnostics data or staus information
Keys		
• Control keys		for controlling the motor feeder, user-assignable
• Arrow keys		Navigation in the display menu
• Softkeys		Various menu-dependent functions, e.g. test, reset, operation of a memory module or addressing plug
System interface		
• Front		For plugging in a memory module, an addressing plug or a PC cable for parameterization
• Rear		Connection to the basic unit or to an expansion module

Dimensional drawings

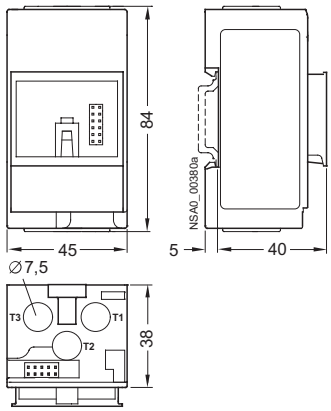
Basic unit 1, SIMOCODE pro C,3UF7 000



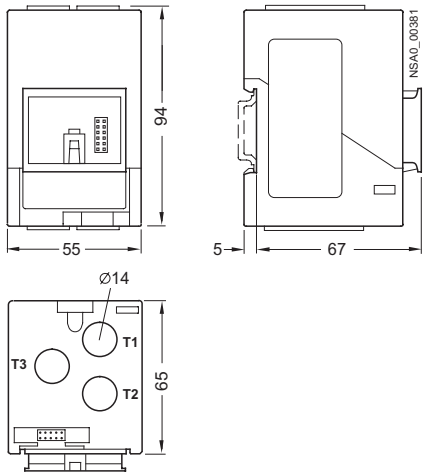
Basic unit 2, SIMOCODE pro V, 3UF7 010



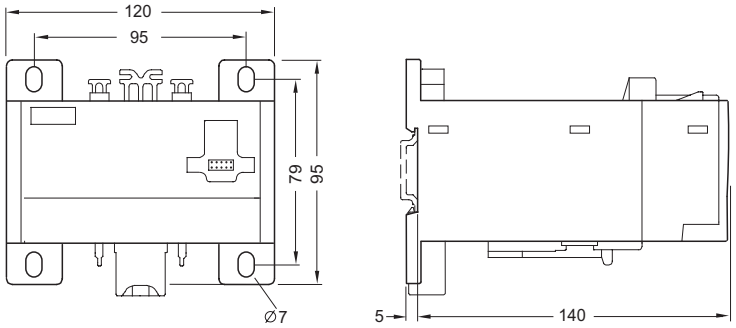
3UF7 100, 3UF7 101 current measuring module (straight-through transformer)

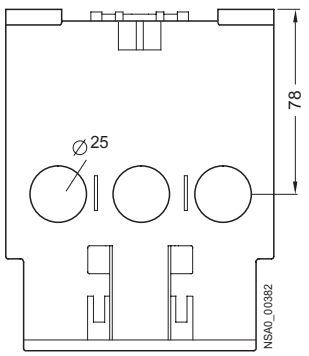


3UF7 102 current measuring module (straight-through transformer)



3UF7 103 current measuring module (straight-through transformer)





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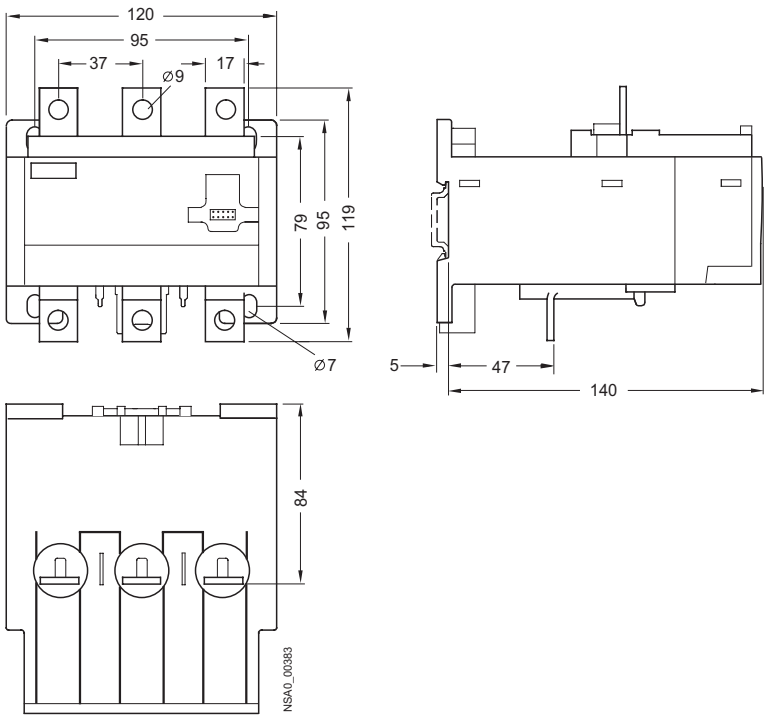
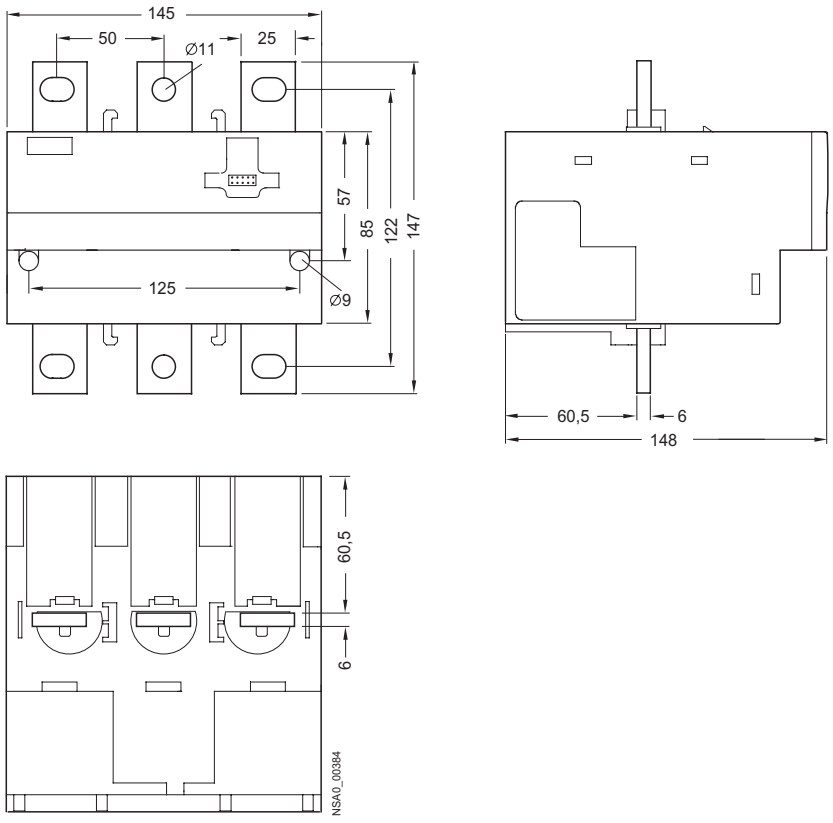
SIMOCODE pro 3UF7
motor management and control devices

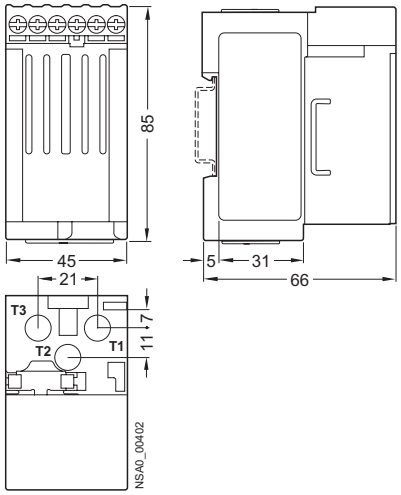
3UF7 103 current measuring module (busbar connection)



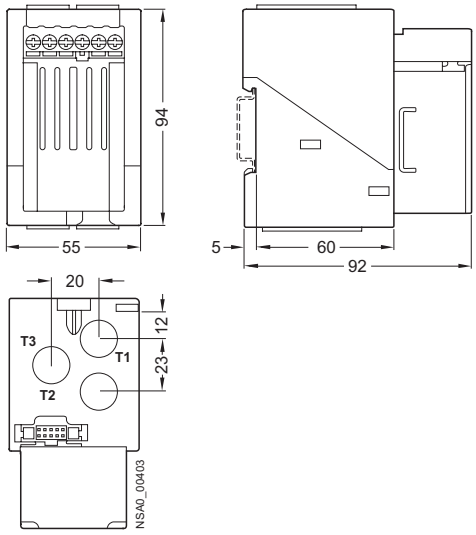
3UF7 104 current measuring module (busbar connection)



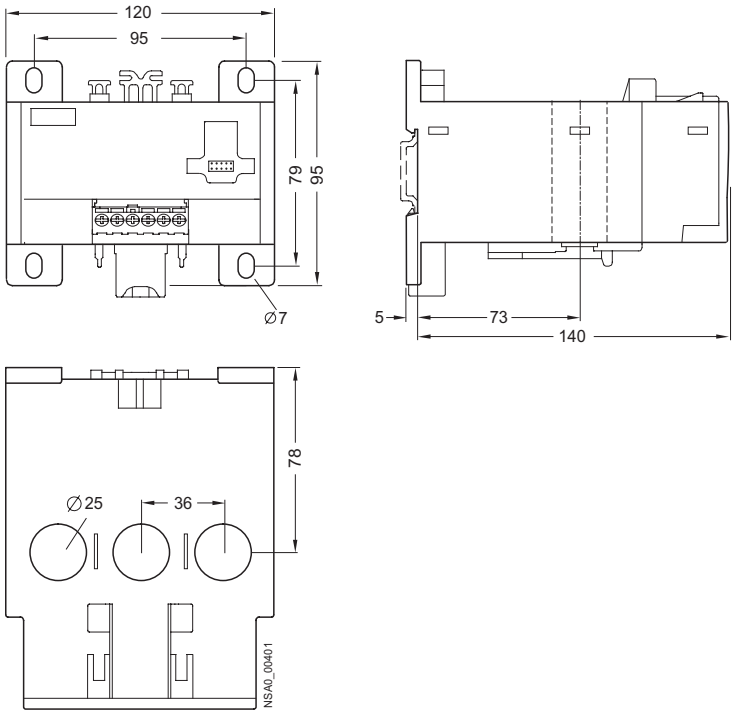
3UF7 110, 3UF7 111 current/voltage measuring module (straight-through transformer)



3UF7 112 current/voltage measuring module (straight-through transformer)



3UF7 113 current/voltage measuring module (straight-through transformer)



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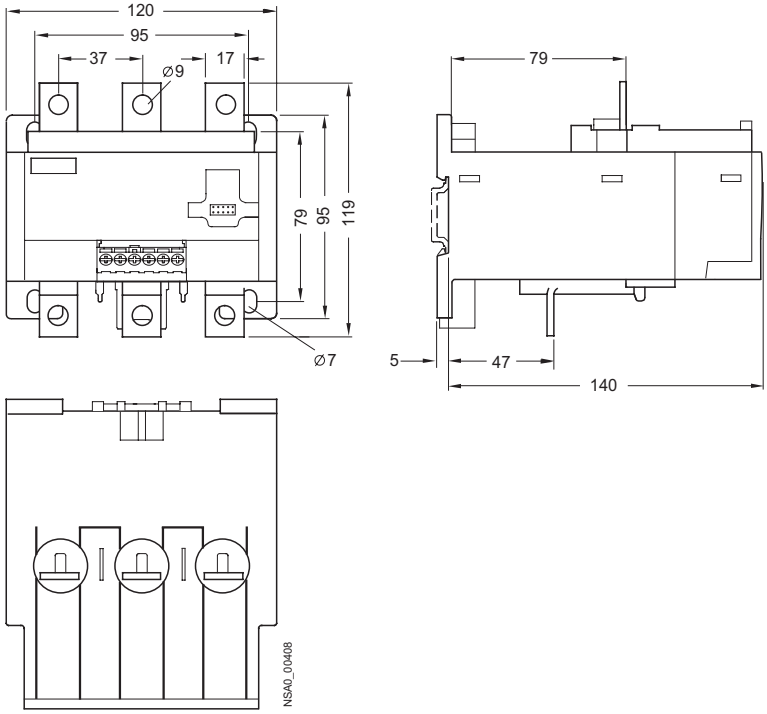
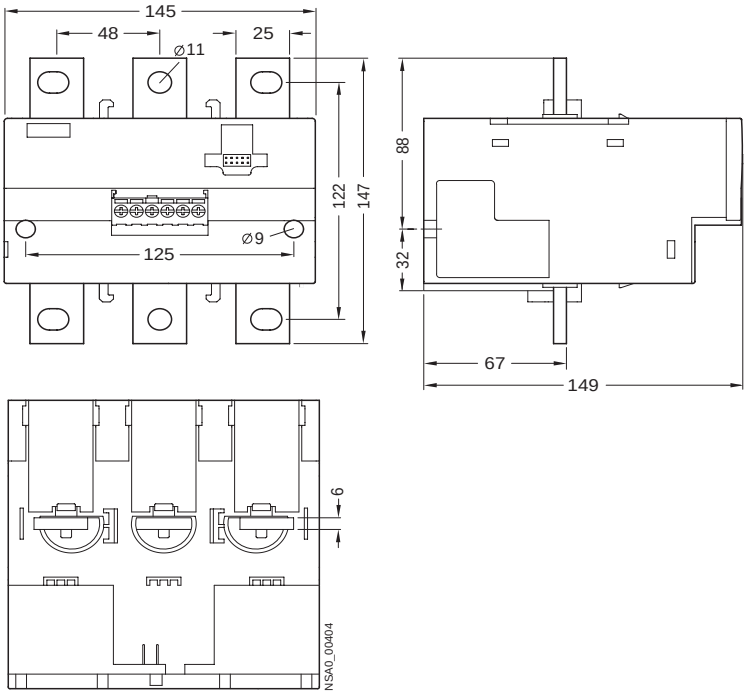
SIMOCODE pro 3UF7
motor management and control devices

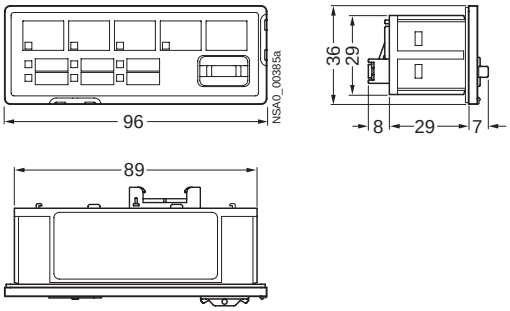
3UF7 113 current measuring module (busbar connection)



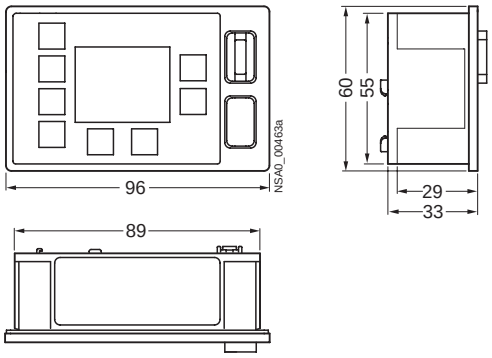
3UF7 114 current/voltage measuring module (busbar connection)



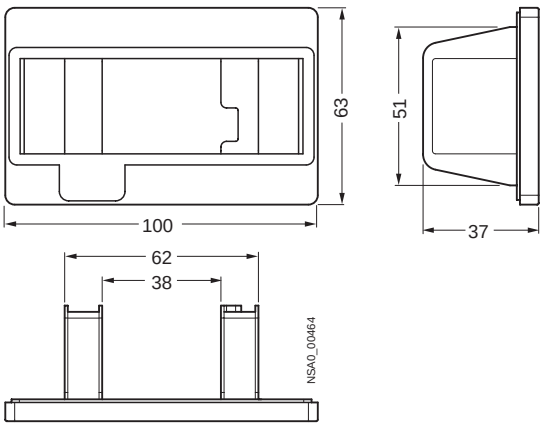
3UF7 200 operator panel



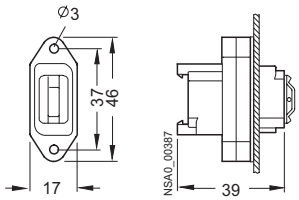
3UF7 210 operator panel with display



3UF7 922 adapter for operator panel



3UF7 920 door adapter



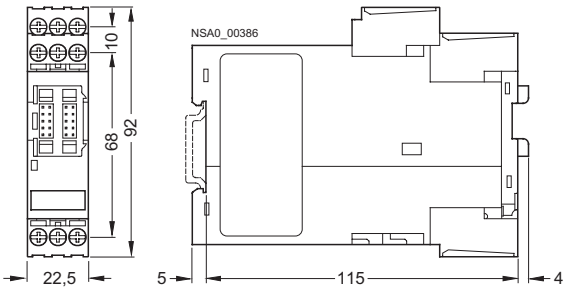
3UF7 3 digital modules

3UF7 4 analog module

3UF7 5 ground-fault module

3UF7 7 temperature module

3UF7 15 decoupling module



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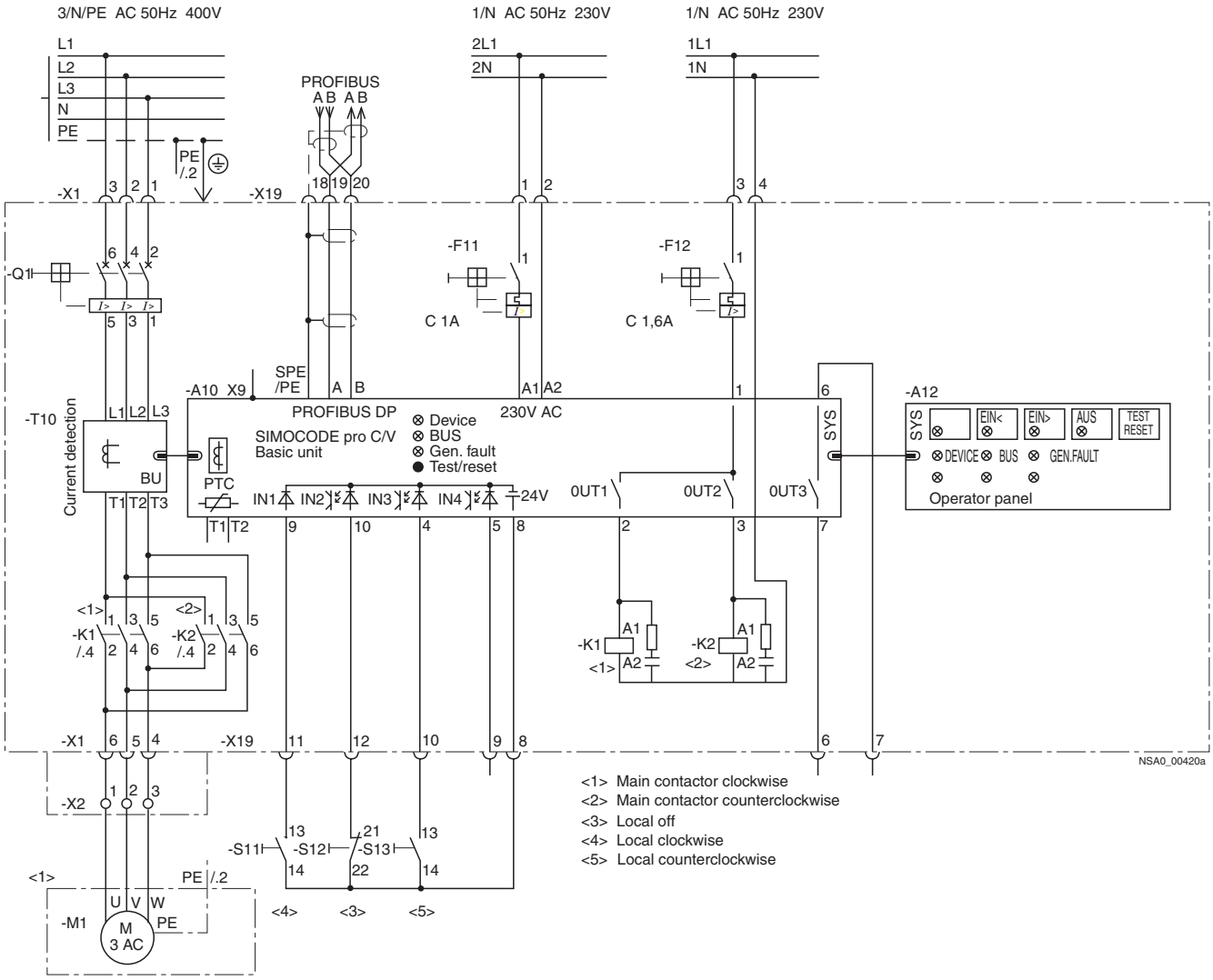
Schematics

Reversing starter with SIMOCODE pro



<1> Main contactor clockwise
<2> Main contactor counterclockwise
<3> Local off
<4> Local clockwise
<5> Local counterclockwise

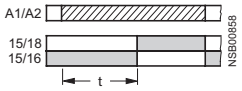
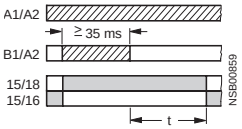
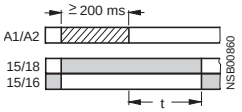
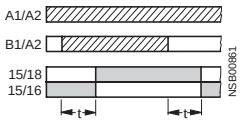
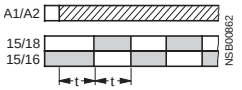
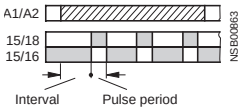
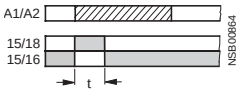
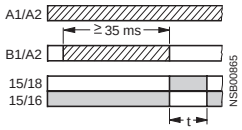
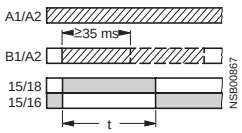
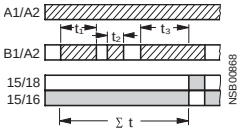
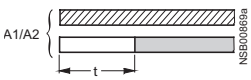
Circuit diagrams for additional control functions can be referred to in the SIMOCODE pro system manual

More Information

System manual

For selection of equipment and for planning, it is recommended that the 3UF7 970-0AA0 . -0 system manual is consulted.

Function

Function	Function chart	3RP 15 timing relay and 3RP 19 01 label set								
	Timing relay energized Contact closed Contact open	3RP15 05-.A 3RP19 01-0A	Identification letter	3RP15 1.	3RP15 25	3RP15 27	3RP15 3.	3RP15 40	3RP15 55	3RP15 7.
1 CO contact										
With ON-delay		■	A	■	■					
OFF-delay with auxiliary voltage		■	B[1]				■			
OFF-delay with auxiliary voltage								■		
ON-delay and OFF-delay with auxiliary voltage ($t = t_{on} = t_{off}$)		■	C[1]							
Flashing, starting with interval (pulse/interval 1:1)		■	D							
Clock-pulse, starting with interval (dead time, pulse time, and time setting ranges each separately adjustable)								■		
Passing make contact		■	E							
Passing break contact with auxiliary voltage		■	F[1]							
Pulse-forming with auxiliary voltage (pulse generation at the output does not depend on duration of energizing)		■	G[1]							
Additive ON-delay with auxiliary voltage		■	H[1]							
1 CO contact										
ON-delay The two-wire timing relay is connected in series with the load. Timing begins after application of the exciting voltage. The semiconductor output then becomes conducting, and the load is under power.						■				

1) Note on function with start contact: A new control signal at terminal B, after the operating time has started, resets the operating time to zero. This does not apply to G, G• and H, H•, which are not retriggerable.

■ Function is possible

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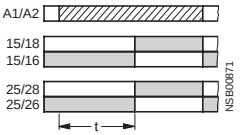
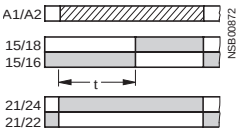
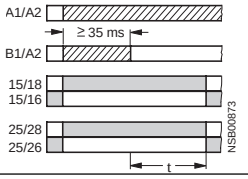
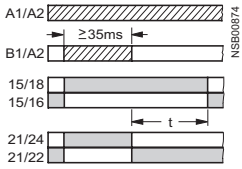
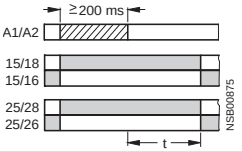
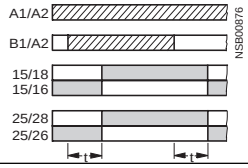
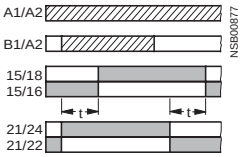
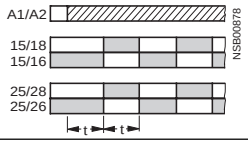
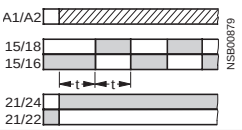
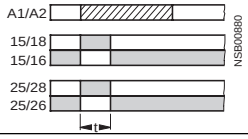
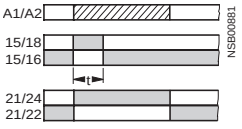
General data

Function	Function chart	3RP 15 timing relay and 3RP 19 01 label set											
	Timing relay energized Contact closed Contact open	3RP15 05-.B 3RP19 01-0B	3RP15 05-.R 3RP19 01-0A	Identification letter	3RP15 1.	3RP15 25	3RP15 27	3RP15 3.	3RP15 40	3RP15 55	3RP 15 60	3RP15 7.
2 CO contact												
With ON-delay		■	■	A	■							
ON-delay and instantaneous contact		■		A●								
OFF-delay with auxiliary voltage		■	■	B[1]								
OFF-delay with auxiliary voltage and instataneous contact		■		B[1]								
OFF-delay without auxiliary voltage									■			
ON-delay and OFF-delay with auxiliary voltage ($t = t_{on} = t_{off}$)		■	■	C[1]								
ON-delay and OFF-delay with auxiliary voltage and instantaneous contact ($t = t_{on} = t_{off}$)		■		C●[1]								
Flashing, starting with interval (pulse/interval 1:1)		■	■	D								
Flashing starting with interval (pulse/interval 1:1) and instantaneous contacts		■		D●								
Passing make contact		■	■	E								
Passing break contact with instantaneous contact		■		E●								

■ Function is possible

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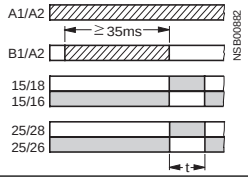
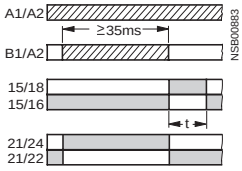
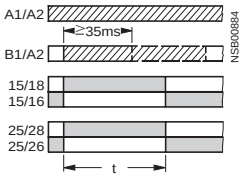
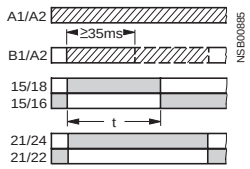
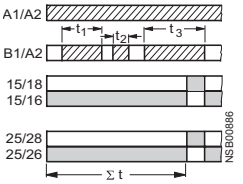
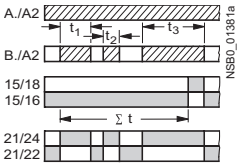
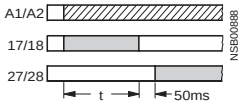
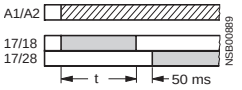
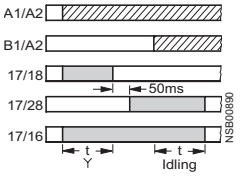
Function	Function chart	3RP 15 timing relay and 3RP 19 01 label set											
	Timing relay energized Contact closed Contact open	3RP15 05-.B 3RP19 01-0B	3RP15 05-.R 3RP19 01-0A	Identification letter	3RP15 1.	3RP15 25	3RP15 27	3RP15 3.	3RP15 40	3RP15 55	3RP 15 60	3RP15 7.
2 CO contact												
Passing break contact with auxiliary voltage		■	■	F[1]								
Passing break contact with auxiliary voltage and instantaneous contact		■		F•[1]								
Pulse-forming with auxiliary voltage (pulse generation at the output does not depend on duration of energizing)		■	■	G[1]								
Pulse-forming with auxiliary voltage and instataneous contact (pulse generation at the output does not depend on duration of energizing)		■		G•[1]								
Additive ON-delay with auxiliary voltage				H[1]					■			
Additive ON-delay with auxiliary voltage and instantaneous contact		■	■	H•[1]								
Wye-delta function		■		YΔ								
2 NO contact												
Wye-delta function YΔ												■
3 NO contact												
Wye-delta function with overtravel function[2] (idling)											■	

[1] Note on function with start contact: A new control signal at terminal B, after the operating time has started, resets the operating time to zero. This does not apply to G, G• and H, H•, which are not retriggerable.

[2] For function diagrams showing the various possibilities of operation of the 3RP15 60-1S.30, see page 5/26.

■ Function is possible

5a

General data

3RP15 function table

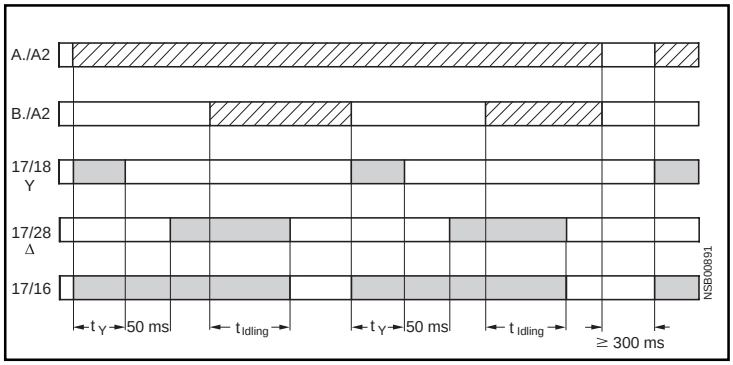
Possibilities of operation of the 3RP15 60-1S.30 timing relay

Timing relay energized

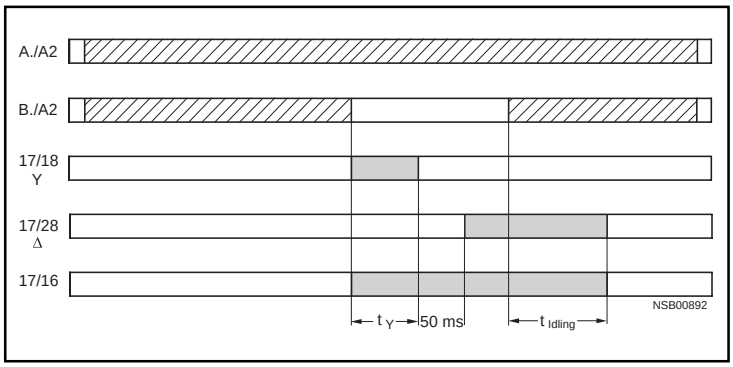
Contact closed

Contact open

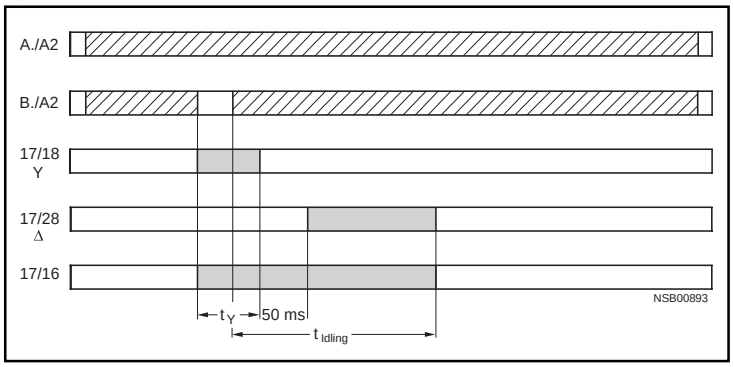
Operation 1



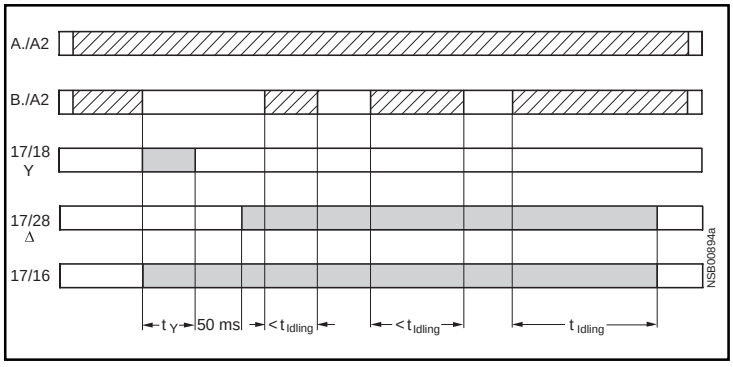
Operation 2



Operation 3



Operation 4



Note:
The following applies to all operations: The pressure switch controls the timing via *B/A2*.

t_Y = Star time 1 ... 20 s

t_{Idling} = Idling time (overtravel time) 30 ... 600 s

Operation 1:

Start contact B./A2 is opened when supply voltage A./A2 is applied.

The supply voltage is applied to A./A2 and there is no control signal on B./A2. This starts the YΔ timing. The idling time (overtravel time) is started by applying a control signal to B./A2. When the set time tIdling (30 ... 600 s) has elapsed, the output relays (17/16 and 17/28) are reset. If the control signal on B./A2 is switched off (minimum OFF period 270 ms), a new timing is started.

Comments:

Observe response time (dead time) of 400 ms on energizing supply voltage until contacts 17/18 and 17/16 close.

Operation 2:

Start contact B./A2 is closed when supply voltage A./A2 is applied.

If the control signal B./A2 is already present when the supply voltage A./A2 is applied, **no** timing is started. The timing is only started when the control signal B./A2 is switched off.

Operation 3:

Start contact B./A2 closes while star time is running.

If the control signal B./A2 is applied again during the star time, the idling time starts and the timing is terminated normally.

Operation 4:

Start contact B./A2 opens while delta time is running and is applied again.

If the control signal on B./A2 is applied and switched off again during the delta time, although the idling time has not yet elapsed, the idling time (overtravel time) is reset to zero. If the control signal is re-applied to B./A2, the idling time is restarted.

Application example based on standard operation (operation 1): For example, use of 3RP15 60 for compressor control

Frequent starting of compressors strains the network, the machine, and the increased costs for the operator. The new timing relay prevents frequent starting at times when there is high demand for compressed air. A special control circuit prevents the compressor from being switched off immediately when the required air pressure in the tank has been reached. Instead, the valve in the intake tube is closed and the compressor runs in "Idling" mode for a specific time which can be set from 30 ... 600 s.

If the pressure falls within this time, the motor does not have to be restarted again, but can return to nominal load operation from no-load operation.

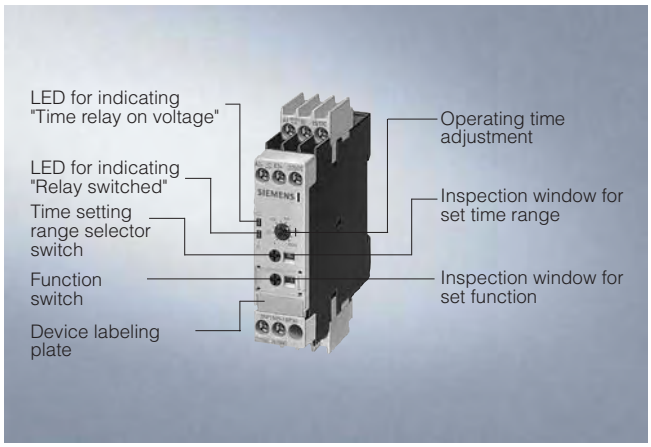
If the pressure does not fall within this idling time, the motor is switched off.

The pressure switch controls the timing via B./A2.

The supply voltage is applied to A./A2 and the start contact B./A2 is open, i.e. there is no control signal on B./A2 when the supply voltage is applied. The pressure switch signals "too little pressure in system" and starts the timing by way of terminal B./A2. The compressor is started, enters YΔ operation, and fills the pressure tank.

When the pressure switch signals "sufficient pressure", the control signal B./A2 is applied, the idling time (overtravel time) is started, and the compressor enters no-load operation for the set period of time between 30 ... 600 s. The compressor is then switched off. The compressor is only restarted if the pressure switch responds again (low pressure).

Overview

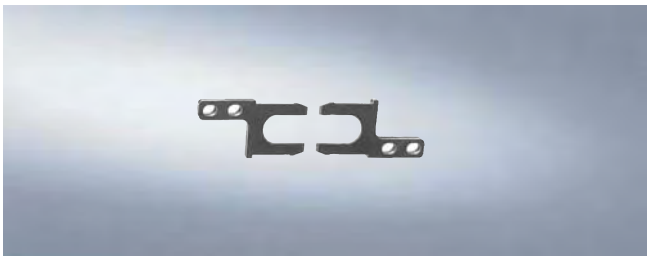


Standards

The timing relays comply with:

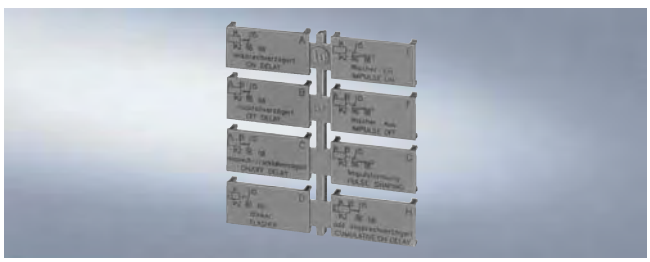
- EN 60721-3-3 "Environmental conditions"
- EN 61812-1/DIN VDE 0435 Part 2021
- "Electrical relays, timing relays"
- EN 61000-6-2 and EN 61000-6-4
- "Electromagnetic compatibility"
- EN 60947-5-1; (VDE 0660 Part 200) "Low-voltage controlgear, switchgear and systems – Electromechanical controlgear"

Accessories



Push-in lugs for screw mounting

Sealable covers

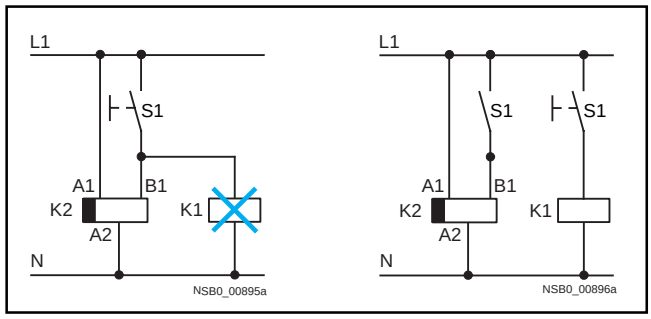


Lable set for making the multifunction relay

Functions

- Changes to the time setting ranges and the functions must be carried out in the de-energized state.
- Start input B1 or B3 must only be triggered when the supply voltage is applied.
- The same potential must be applied to A1 and B1 or A3 and B3. With two-voltage version, only one voltage range must be connected.
- The activation of loads parallel to the start input is not permissible when using AC control voltage (see diagrams).
- Surge suppression is integrated in the timing relay. This prevents the generation of voltage peaks on the supply voltage when the relay is switched on and off. No additional damping measures are necessary.
- 3RP15 05-.R must not be operated next to heat sources > 60 °C.

Parallel load on start input



5a

3RP15 timing relays in industrial enclosure, 22.5 mm

Technical specifications

Type		3RP15 05 3RP15 31 3RP15 32 3RP15 33	3RP15 11 3RP15 12 3RP15 13 3RP15 25 3RP15 55	3RP15 40	3RP15 60	3RP15 74 3RP15 76	3RP15 27
Rated insulation voltage Degree of pollution 3 Overvoltage category III	V AC	300; 500 for 3RP15 05-1BT10					
Operating range at excitation[1]		0.85 ... 1.1 x *Us* at AC. 0.8 ... 1.25 x *Us* at DC; 0.95 ... 1.05 times rated frequency					
Rated power	W	2					1
Power consumption at 230 V AC, 50 Hz	VA	6		2[2]	6		1
Rated operational current I_e							
• AC-140, DC-13	A	--					0.01 ... 0.6
• AC-15 at 24 ... 400 V, 50 Hz	A	3[3]					--
• DC-13 at							
- 24 V	A	1					--
- 125 V	A	0.2					--
- 250 V	A	0.1					--
Uninterrupted thermal current I_{th}	A	5					--
DIAZED protection[4]							
gL/gG operational class	A	4					--
Switching frequency							
• When loaded with I_e 230 V AC	1/h	2500					5000
• When loaded with 3RT10 16 contactor, 230 V AC	1/h	5000					
Recovery time	ms	150			300	150	50
Minimum ON period	ms	35[5]	--	200[6]	--		
Residual current							
with non-conducting output	mA	--					5
Voltage drop							
with conducting output	VA	--					3.5
Short-time loading capacity	A	--				(up to 10 ms)	10
Setting accuracy							
with reference to scale value		Typical ±5 %					
Repeat accuracy		≤ ±1 %					
Mechanical endurance Operating cycles		30 x 10^6				100 x 10^6	
Permissible ambient temperature During operation	°C	-25 ... +60					
During storage	°C	-40 ... +85					
Degree of protection							
acc. to EN 60529		IP40 cover, IP20 terminals					
Connection type		**Screw terminals**					
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)					
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)					
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)					
• AWG cables, solid or stranded	AWG	2 x (20 ... 14)					
• Tightening torque	Nm	0.8 ... 1.2					
Connection type		**Spring-loaded terminals**					
• Solid	mm^2	2 x (0.25 ... 1.5)					
• Finely stranded, with end sleeves acc. to DIN 46228	mm^2	2 x (0.25 ... 1.5)					
• Finely stranded	mm^2	2 x (0.25 ... 1.5)					
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)					
Permissible		Any					
Shock resistance acc. to IEC 60068 for half-sine shock type	g/ ms	15/11					
Vibration resistance acc. to IEC 60068-2-6		10 ... 55 Hz: 0.35 mm					
Electromagnetic compatibility (EMC) Tests acc. to basic specification		EN 61000-6-2/EN 61000-6-4					

1) If nothing else is stated.

2) Maximum inrush current 1A/100 ms.

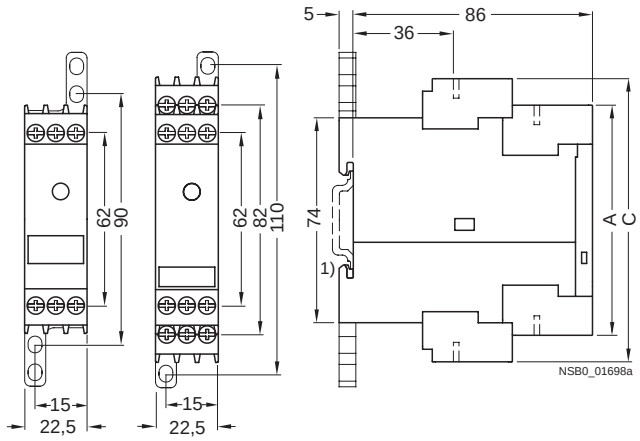
3) For 3RP15 05-.R: NC contact -> I_e = 1 A.

4) I_k ≥1 kA weld-free according to IEC 60947-5-1.

5) Minimum ON period with 3RP15 05-.BW30, 150 ms, until instantaneous contact has switched.

6) For correct operation, observe minimum ON period.

Dimensional drawings



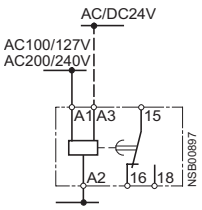
Type	3RP15 1 3RP15 25-.A 3RP15 27 3RP15 40-A 3RP15 55 3RP15 7	3RP15 05 3RP15 25-.B 3RP15 3 3RP15 40-.B 3RP15 60
	A	C
Removable terminal		
Screw-type terminal	83	102
Spring-loaded terminal	84	103

1) For standard mounting rail according to EN 60715.

Schematics

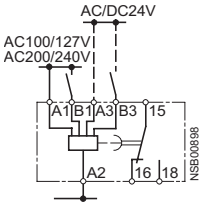
3RP15 internal circuit diagrams (terminal designation to DIN 46199, Part 5)

3RP15 05-.A
3RP15 1.
3RP15 25-.A



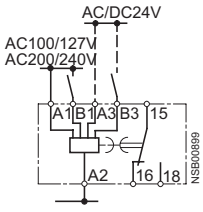
With ON-delay

3RP15 05-.A



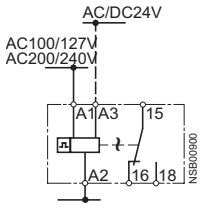
OFF-delay
with auxiliary voltage

3RP15 05-.A
3RP15 3.-.A



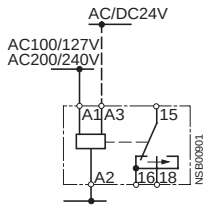
ON-delay and OFF-delay
with auxiliary voltage

3RP15 05-.A



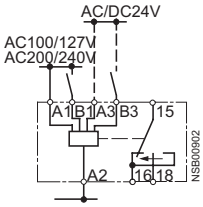
Flashing

3RP15 05-.A



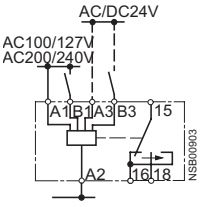
Passing make contact

3RP15 05-.A



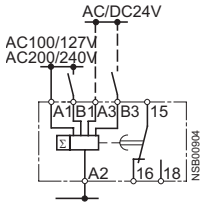
Passing break contact
with auxiliary voltage

3RP15 05-.A



Pulse-forming
with auxiliary voltage

3RP15 05-.A



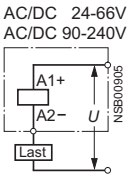
Additive ON-delay
with auxiliary voltage

3RP15 timing relays in industrial enclosure, 22.5 mm

Schematics

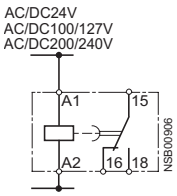
3RP15 27

U = 24 ... 66 V AC/DC
90 ... 240 V AC/DC



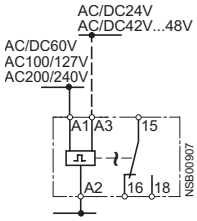
ON-delay
two-wire version

3RP15 40-.A



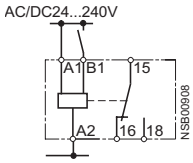
OFF-delay
with auxiliary voltage

3RP15 55



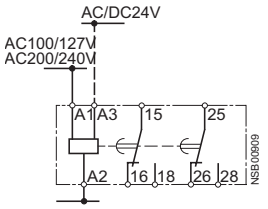
Clock-pulse relay

3RP15 05-.AW30



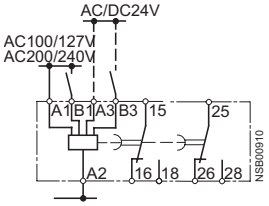
Multi-function relay
(same functions as 3RP15 05-1A)

3RP15 05-.B, 3RP15 25-1B



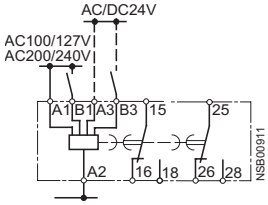
ON-delay
two-wire version

3RP15 05-.B



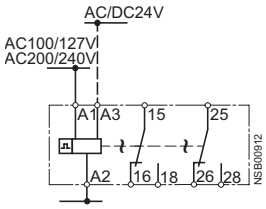
OFF-delay
with auxiliary voltage

3RP15 05-.B



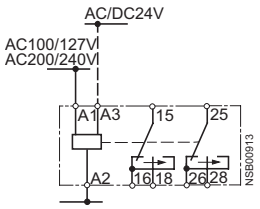
ON-delay and OFF-delay
with auxiliary voltage

3RP15 05-.B



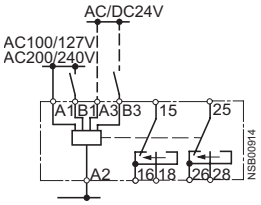
Flashing

3RP15 05-.B



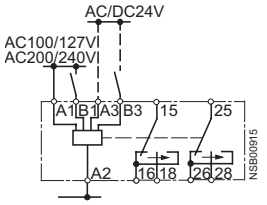
Passing make contact

3RP15 05-.B



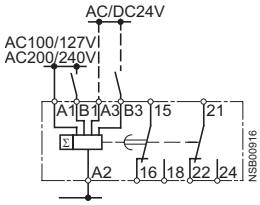
Passing break contact
with auxiliary voltage

3RP15 05-.B



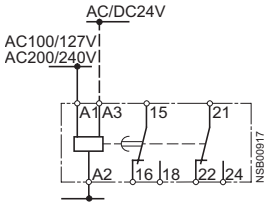
Pulse-forming with
auxiliary voltage

3RP15 05-.B



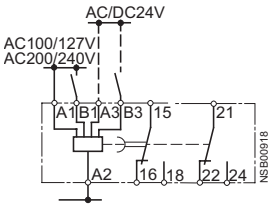
Additive ON-delay with
auxiliary voltage and
instantaneous contact

3RP15 05-.B



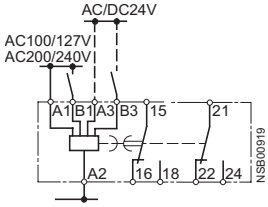
ON-delay and instantaneous
and instantaneous contact

3RP15 05-.B



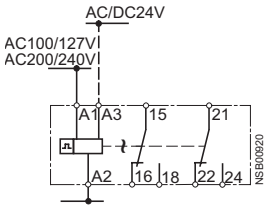
OFF-delay with auxiliary voltage
voltage and instantaneous

3RP15 05-.B



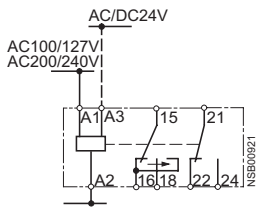
ON-delay and OFF-delay
with auxiliary voltage
and instantaneous contact

3RP15 05-.B



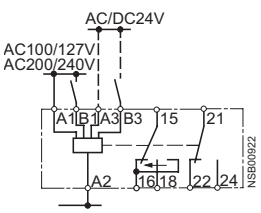
Flashing and instantaneous
contact

3RP15 05-.B



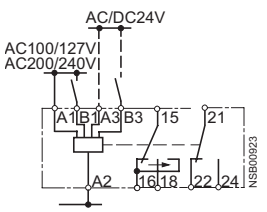
Passing make contact
and instantaneous contact

3RP15 05-.B



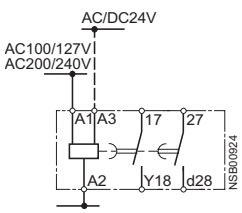
Passing break contact
with auxiliary voltage
and instantaneous contact

3RP15 05-.B



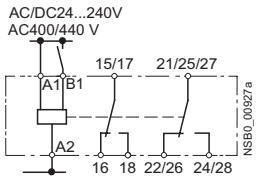
Pulse-forming
with auxiliary voltage
and instantaneous contact

3RP15 05-.B



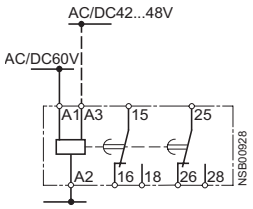
Wye-delta function

3RP15 05-.BW30/-1BT20/-.RW30



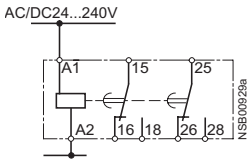
Multi-fuction relay
(for funcions see function table)

3RP15 25-. BR30



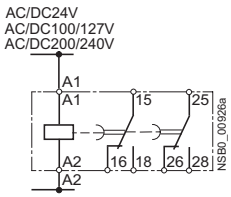
With ON-delay

3RP15 25-. BW30



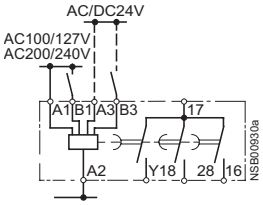
With ON-delay

3RP15 40-.B



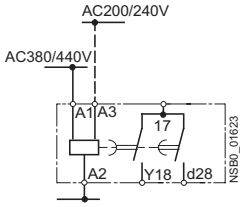
OFF-delay without auxiliary voltage

3RP15 60-.S



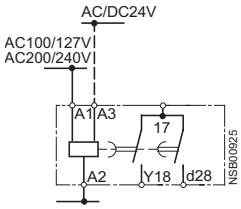
Wye-delta timing relay with overtravel function (idling)

3RP15 7.-.M20



Wye-delta timing relay

3RP15 76



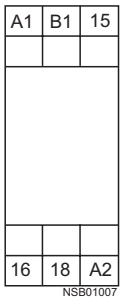
Wye-delta timing relay

Position of the connection terminals

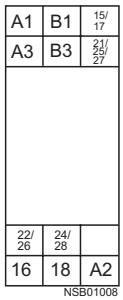
3RP15 05-.A

3RP15 05-.AA40

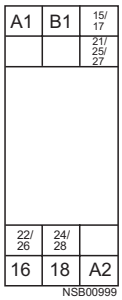
3RP15 05-.AW



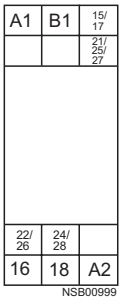
3RP15 05-.BP/-.BQ



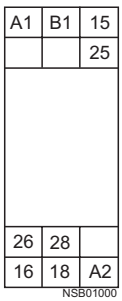
3RP15 05-.BW



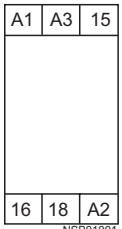
3RP15 05-1BT



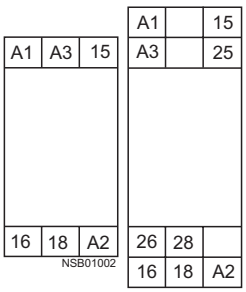
3RP15 05-.RW



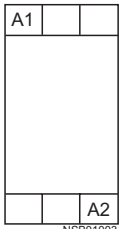
3RP15 1.



3RP15 25-1A. or -1B. 1)

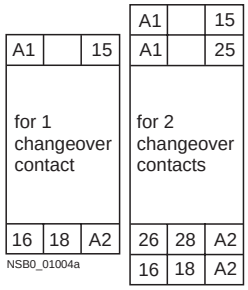


3RP15 27

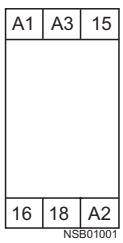


3RP15 3 .

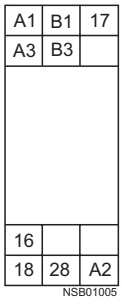
3RP15 40



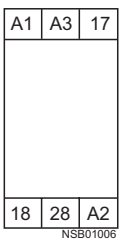
3RP15 55



3RP15 60



3RP15 7.



Note : All the diagrams show the view onto the connection terminals.

[1] Depending on the version

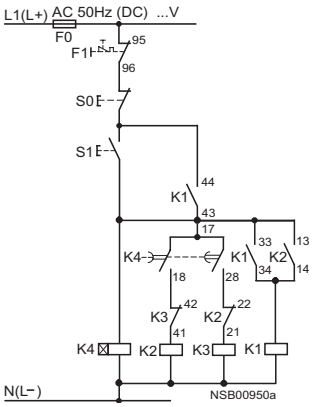
3RP15 timing relays in industrial enclosure, 22.5 mm

3RP15 circuit diagrams

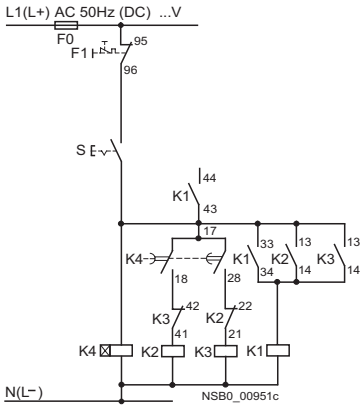
Control circuits (example circuits)

with 3RP15 74 and 3RP15 76 wye-delta timing relays

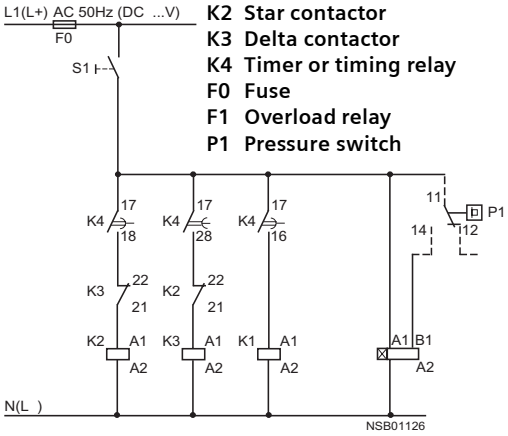
For momentary-contact operation
Size S00 to S3



For maintained-contact operation
Size S00 to S3



Control circuit (example circuit)
with 3RP15 60 wye-delta timing relays



Legend:
S0 Button "OFF"
S1 Button "ON"
S Maintained-contact button
K1 Line contactor
K2 Star contactor
K3 Delta contactor
K4 Timer or timing relay
F0 Fuse
F1 Overload relay
P1 Pressure switch

Note:

The contact element 17/18 is only closed in the wye stage; the contact element is open in the delta stage as well as in the de-energized state.

5a

Overview

Solid-state line monitoring relays provide maximum protection for mobile machines and plants or for unstable networks. Network and voltage faults can be detected early and rectified before far greater damage ensues.

Depending on the version, the relays monitor phase sequence, phase failure with and without N conductor monitoring, phase unbalance, undervoltage or overvoltage.

Phase unbalance is evaluated as the difference between the greatest and the smallest phase voltage relative to the greatest phase voltage. Undervoltage or overvoltage exists when at least one phase voltage deviates by 20 % from the set rated system voltage or the directly set limit values are overshot or undershot. The rms value of the voltage is measured.

With the 3UG46 17 or 3UG46 18 relay, a wrong direction of rotation can also be corrected automatically.

Function

3UG45 11 monitoring relays

The 3UG45 11 phase sequenced relay monitors the phase sequence in a three-phase network. No adjustments are required for operation. The device has an internal power supply and work using the closed-circuit principle. If the phase sequence at the terminals L1-L2-L3 is correct, the output relay picks up after the delay time has elapsed and the LED is lit. If the hase sequence is wrong, the output relay remains in its rest position.

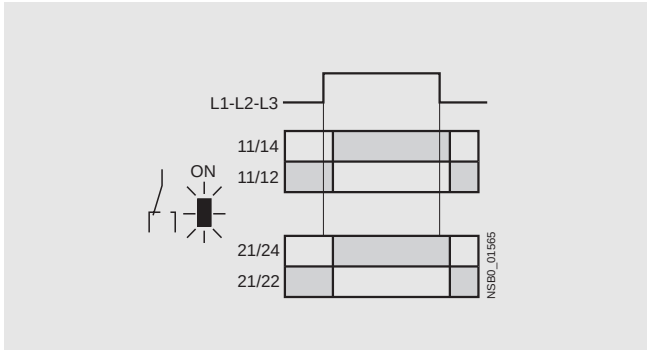
Note: When one phase fails, connected loads (motor windings, lamps, transformers, coils, etc.) create a feedback voltage at the terminal of the failed phase due to the network coupling. Because the 3UG45 11 relays are not resistant to voltage feedback, such a phase failure is not detected. Should this be required, then the 3UG45 12 monitoring relay must be used.

3UG45 12 monitoring relays

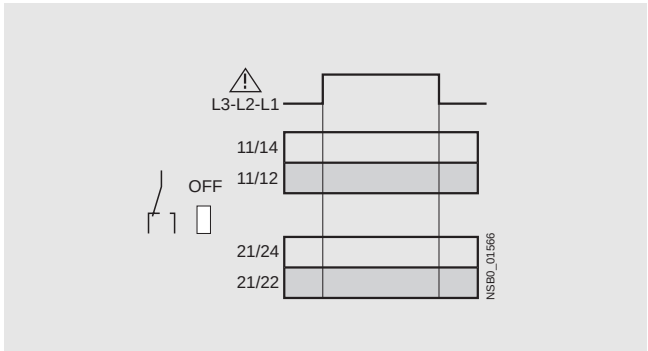
The 3UG45 12 line monitoring relay monitors three-phase networks with regard to phase sequence, phase failure and phase unbalance of 10 %. Thanks to a special measuring method, a phase failure is reliably detected in spite of the wide voltage range from 160 ... 690 V AC and feedback through the load of up to 90 %. The device has an internal power supply and works using the closed-circuit principle. No adjustments are required. When the mains voltage is switched on, the green LED is lit. If the phase sequence at the terminals L1-L2-L3 is correct, the output relay picks up. If the phase sequence is wrong, the red LED flashes and the output relay remains in its rest position. If a phase fails, the red LED is permanently lit and the output relay drops.

Note: The red LED is a fault diagnostic indicator and does not show the current relay status. The 3UG45 12 monitoring relay is suitable for line frequencies of 50/60 Hz.

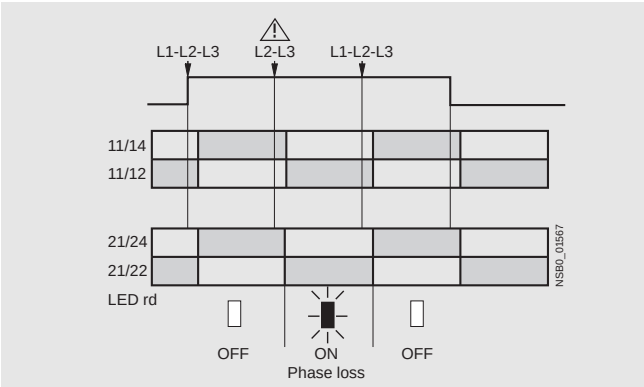
Correct phase sequence



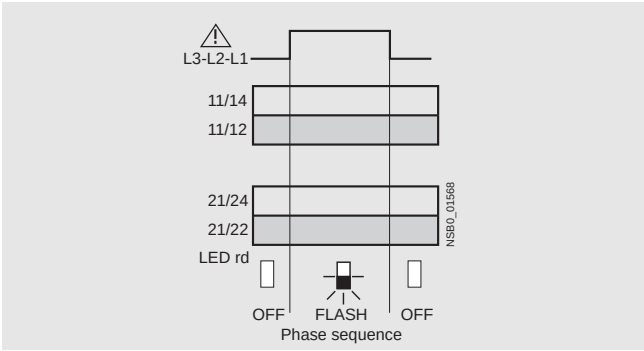
Wrong phase sequence



Phase failure



Wrong phase sequence



5a

Line Monitoring

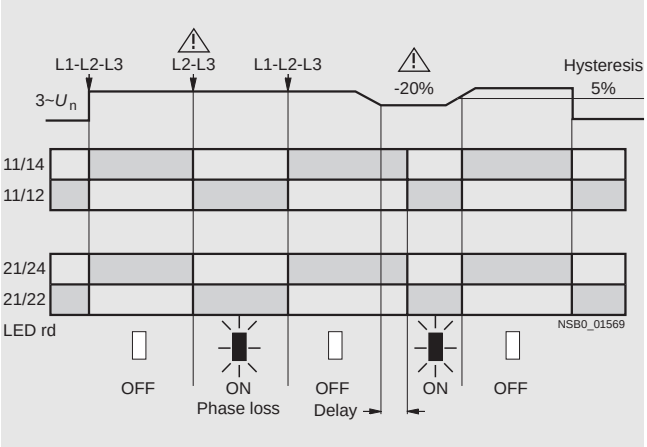
Overview

3UG45 11 monitoring relays

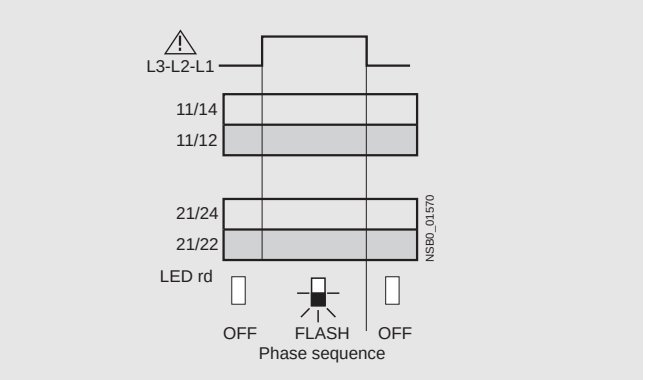
The 3UG45 13 line monitoring relay monitors three-phase networks with regard to phase sequence, phase failure, phase unbalance and undervoltage of 20 %. The device has an internal power supply and works using the closed-circuit principle. The hysteresis is 5 %. The integrated response delay time is adjustable from 0 ... 20 s and responds to undervoltage. If the direction is incorrect, the device switches off immediately. Thanks to a special measuring method, a phase failure is reliably detected in spite of the wide voltage range from 160 ... 690 V AC and feedback up to 80 % through the load. When the mains voltage is switched on, the green LED is lit. If the phase sequence at the terminals L1-L2-L3 is correct, the output relay picks up. If the phase sequence is wrong, the red LED flashes and the output relay remains in its rest position. If a phase fails, the red LED is permanently lit and the output relay drops.

Note: The red LED is a fault diagnostic indicator and does not show the current relay status. The 3UG45 13 monitoring relay is suitable for line frequencies of 50/60 Hz.

Phase failure and undervoltage



Wrong phase sequence



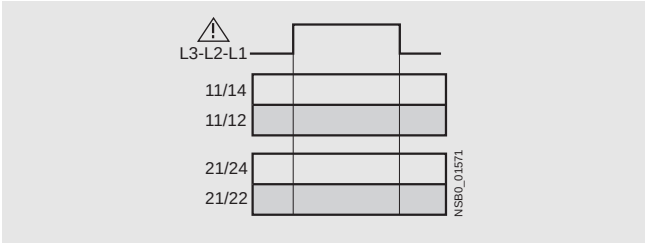
3UG46 15/3UG46 16 monitoring relays

The 3UG46 15/3UG46 16 line monitoring relay has a wide voltage range and an internal power supply. The device is equipped with a display and is parameterized using three buttons. The 3UG46 15 device monitors three-phase networks with regard to phase failure, undervoltage, overvoltage and phase sequence. The 3UG46 16 monitoring relay monitors the neutral conductor as well. The hysteresis is adjustable from 1 ... 20 V. In addition the device has two separately adjustable delay times for overvoltage and undervoltage from 0 ... 20 s in each case. If the direction is incorrect, the device switches off immediately. Thanks to a special measuring method, a phase failure is reliably detected in spite of the wide voltage range from 160 ... 690 V AC and feedback through the load of up to 80 %.

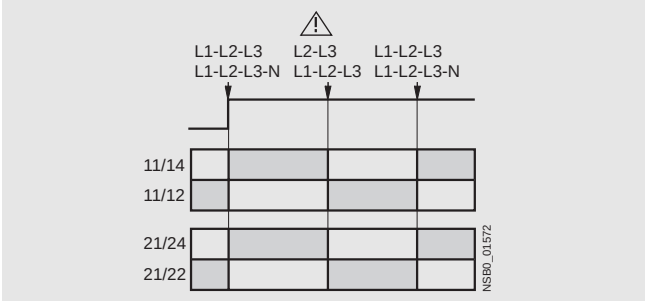
The 3UG46 15/ 3UG46 16 monitoring relay can be operated on the basis of either the open-circuit or closed-circuit principle and with manual or auto RESET.

With the closed-circuit principle selected

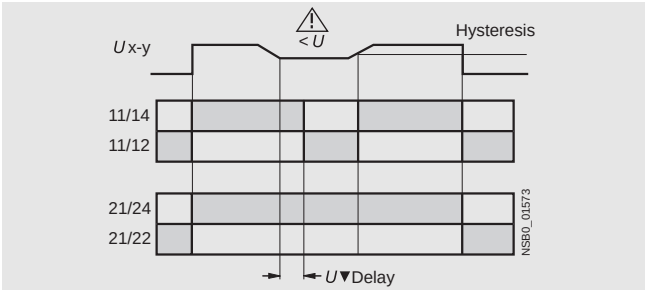
Wrong phase sequence



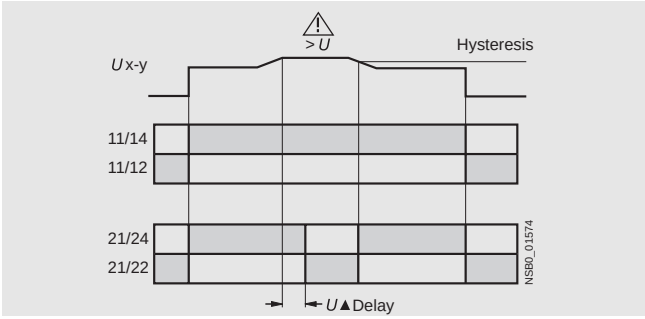
Phase failure



Undervoltage



Overvoltage



5a

Technical specifications

		3UG45 11-..N20	3UG45 11-..P20	3UG45 11-..Q20	3UG45 12	3UG45 13	3UG46 14	3UG46 15	3UG46 16
General data									
Rated control supply voltage U_s[1]	V	160 ... 260	320 ... 500	420 ... 690	160 ... 690				90 ... 400
Rated frequency	Hz	50/60							
Rated power, typical									
• At 230 V AC	W/VA	2/4	--	--	2/2.5				
• At 400 V AC	W/VA	--	2/8	--	2/3.5				
• At 460 V AC	W/VA	--	--	2/8	2/4				
Installation width	mm	22.5							
RESET		Auto-RESET					automatic/manual		
Principle of operation		Closed-circuit					Closed-circuit, open-circuit (3UG46 17/3UG46 18: closed-circuit)		
Availability time after application of Us	ms	200			1.000				
Response time once a switching threshold is reached	ms	max. 450							
Unbalance	%	--			10	20	0; 5 ... 20	3UG46 15/3UG46 16: Through threshold values 3UG46 17/3UG46 18: 0; 5 ... 20	
Adjustable tripping delay time	s	--				0.1 ... 20			
Adjustable ON-delay time	s	--					0.1 ... 20	--	
Mains buffering time, minimum	ms	10			30				
Rated insulation voltage U_i Degree of pollution 3 Overvoltage category III acc. to VDE 0110	V	690							
Rated impulse withstand voltage	kV	6							
Permissible ambient temperature									
• During operation	°C	-25 ... +60							
• During storage	°C	-40 ... +85							
EMC tests[2]		IEC 60947-1/ IEC 61000-6-2 / IEC 61000-6-4							
Degree of protection									
• Enclosure	IP40								
• Terminals	IP20								
Vibration resistance acc. to IEC 60068-2-6		1 ... 6 Hz: 15 mm; 6 ... 500 Hz: 2 *g*							
Shock resistance acc. to IEC 60068-2-27		12 shocks (half-sine 15 *g*/11 ms)							
Connection type		**Screw terminals**							
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)							
• Solid	mm2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)							
• Finely stranded with end sleeve	mm2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)							
• AWG cables, solid or stranded	AWG	2 x (20 ... 14)							
• Tightening torque	Nm	0.8 ... 1.2							
Measuring circuit									
Measuring range AC 50/60 Hz rms value	V	160 ... 260	320 ... 500	420 ... 690	160 ... 690				
Setting range	V					200...690	160...690		90...400
Measuring accuracy	%	--				±5			
Repeat accuracy at constant parameters	%	--				±1			
Setting accuracy		--				±10 % referred to set value	±1V		
Accuracy of digital display		--					±1 digit		
Deviations for temperature fluctuations	%/°C	--				±0.1			
Hysteresis for voltage	V	--				5 % of set value	1 ... 20 V		
Hysteresis for unbalance	%	--					(set value - 2)	3UG46 17/3UG46 18: (set value - 2)	
Deviation for frequency fluctuation	%	--				±1			

[1] Absolute limit values.

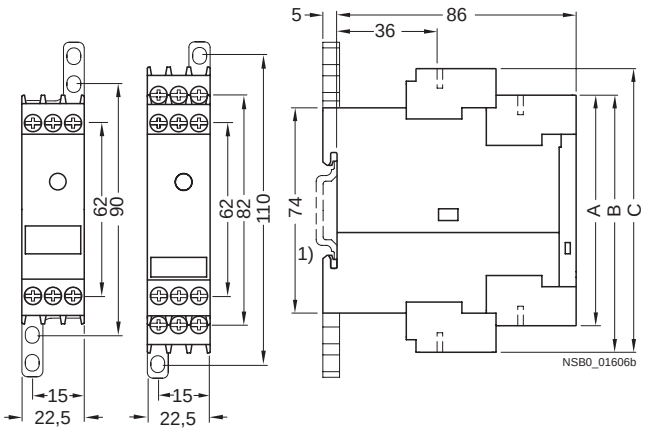
[1] Note: This is a Class A product. In the household environment this device may cause radio interference. In this case the user must introduce suitable measures.

Line Monitoring

Technical specifications

		3UG45 11-..N20	3UG45 11-..P20	3UG45 11-..Q20	3UG45 12	3UG45 13	3UG46 14	3UG46 15	3UG46 16
General data									
Load capacity of the output relay									
• Thermal current Ith	A	5							
Rated operational current I_e at									
• AC-15/24 ... 400 V	A	3							
• DC-13/24 V	A	1							
• DC-13/125 V	A	0.2							
• DC-13/250 V	A	0.1							
Minimum contact load at 17 V DC	mA	5							
Output relay with DIAZED fuse gL/gG operational class	A	4							
Electrical endurance AC-15	Million 0.1 operating cycles								
Mechanical endurance	Million operating cycles	10							

Dimensional drawings

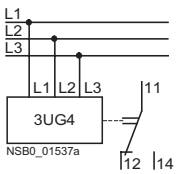


Type	3UG45 11-.A 3UG45 12-.A	3UG45 11-.B 3UG45 12-.B 3UG45 13 3UG46 14 3UG46 15 3UG46 17	3UG46 16 3UG46 18
	A	B	C
Removable terminal			
Screw-type terminal	83	92	102

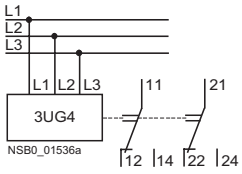
1) For standard mounting rail according to EN 60715.

Schematics

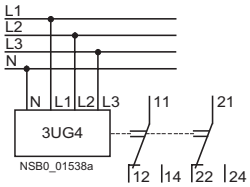
3UG45 11-.A
3UG45 12-.A



3UG45 11-.B
3UG45 12-.B
3UG45 13
3UG46 14
3UG46 15
3UG46 17



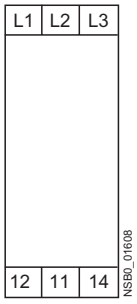
3UG46 16
3UG46 18



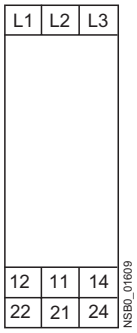
Note: It is not necessary to protect the measuring circuit for device protection. The protective device for line protection depends on the cross-section used.

Position of the connection terminals

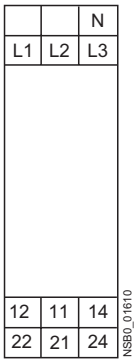
3UG45 11-.A
3UG45 12-.A



3UG45 11-.B
3UG45 12-.B
3UG45 13
3UG46 14
3UG46 15
3UG46 17



3UG46 16
3UG46 18



Power factor and active current monitoring

Overview

The 3UG46 41 power factor and active current monitoring device enables the load monitoring of motors.

Whereas power factor monitoring is used above all for monitoring no-load operation, the active current monitoring option can be used to observe and evaluate the load factor over the entire torque range.

Function

3UG46 41 monitoring relays

The 3UG46 41 monitoring relay is self-powered and serves the single-phase monitoring of the power factor or performs overshoot, undershoot or window monitoring of the active current depending on how it is parameterized.

The load to be monitored is connected in front of the IN terminal. The load current flows over the IN and Ly/N terminals. The setting range for the power factor is 0.1 ... 0.99 and for the active current Ires 0.2 ... 10 A.

If the supply voltage is switched on and no load current is flowing, the display indicates $I < 0.2$ and a symbol for overshoot, undershoot or window monitoring.

If the motor is now switched on and the current exceeds 0.2 A, the set ON-delay time begins. During this time, an undershooting or overshooting of the set limit values will not lead to a relay response of the changeover contact.

If the operational flowing active current and/or the power factor value falls below or exceeds the respective set threshold value, the spike delay begins. When this time has expired, the relay changes its switch position. The relevant measured variables for overshooting and undershooting in the display flashes. If the monitoring of active current overshooting is deactivated (I_{res}▼ = OFF) and the load current drops below the lower measurement range threshold (0.2 A), then the CO contacts remain unchanged. If a threshold value is set for the monitoring of active current undershooting, then undershooting of the measurement range threshold (0.2 A) will result in a response of the CO contacts.

The relay operates either according to the open-circuit or closed-circuit principle.

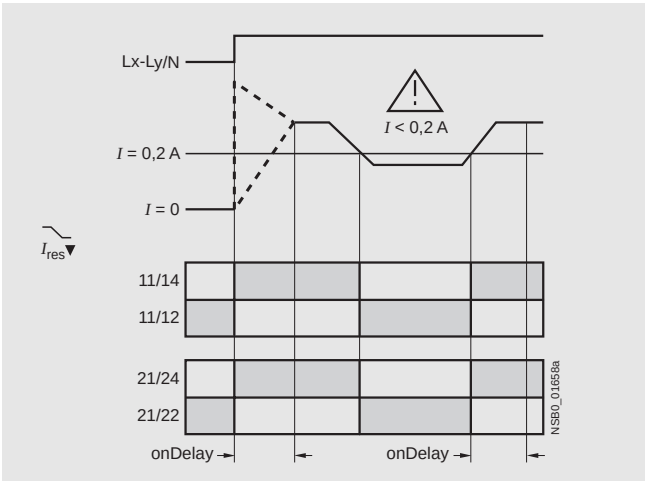
If the device is set to Auto-RESET (Memory = No), depending on the set principle of operation, the switching relay returns to its

initial state and the flashing ends when the hysteresis threshold is reached.

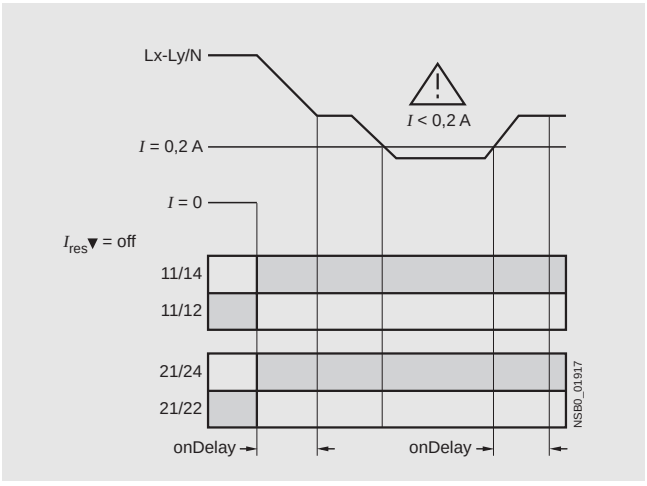
If manual reset is selected in the menu (Memory = Yes), the switching relay remains in its current switching state and the current measured value and the symbol for undershooting and overshooting continues to flash, even when the measured variable reaches a permissible value again. This stored fault status can be reset by pressing the UP▲ and DOWN▼ key simultaneously for 2 seconds, or by switching the supply voltage off and back on again.

<u>With the closed-circuit principle selected</u>

Behavior upon undershooting of the measurement range limit with activated monitoring of I_{res}▼

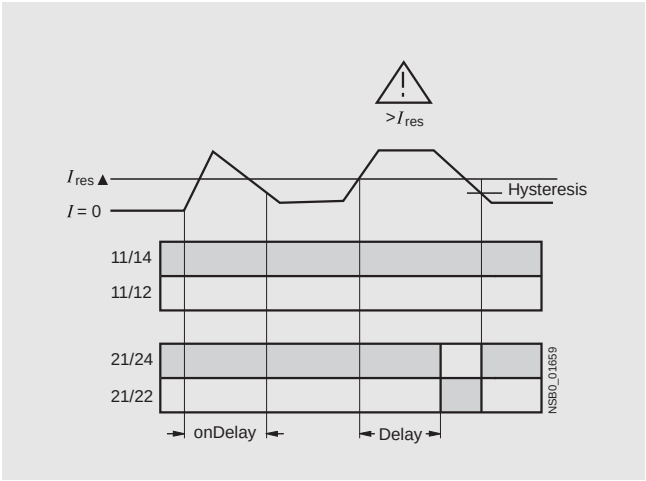


Behavior upon undershooting of the measurement range limit with deactivated monitoring of active current undershooting

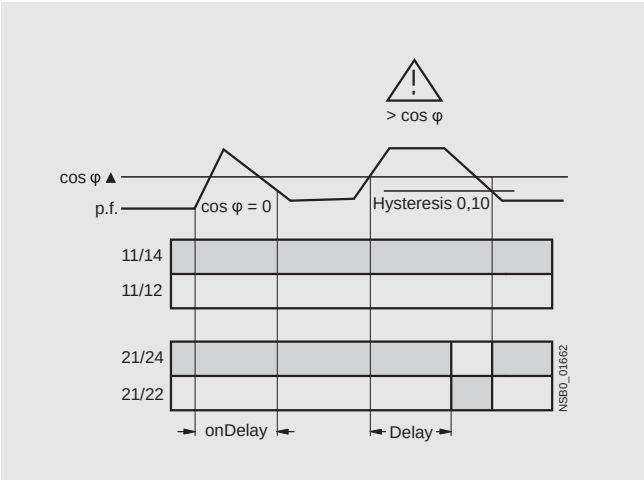


5a

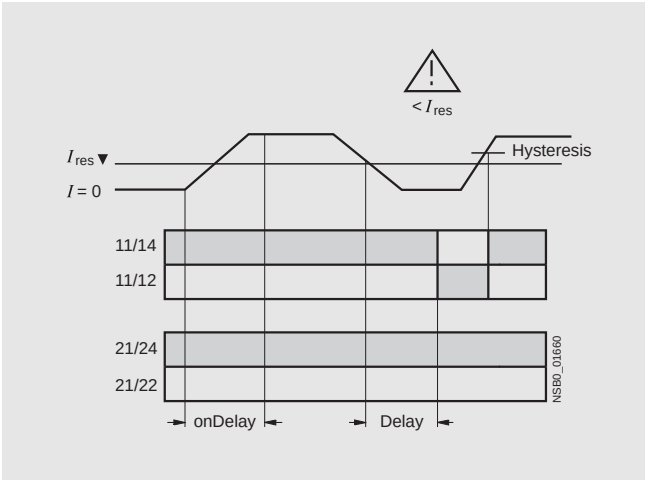
Overshooting of active current



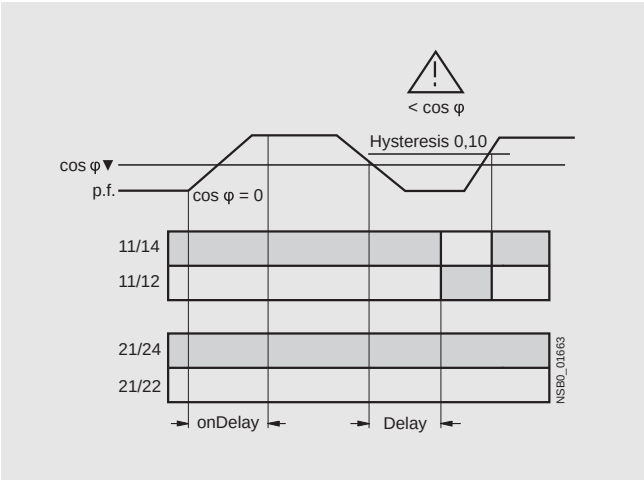
Overshooting of power factor



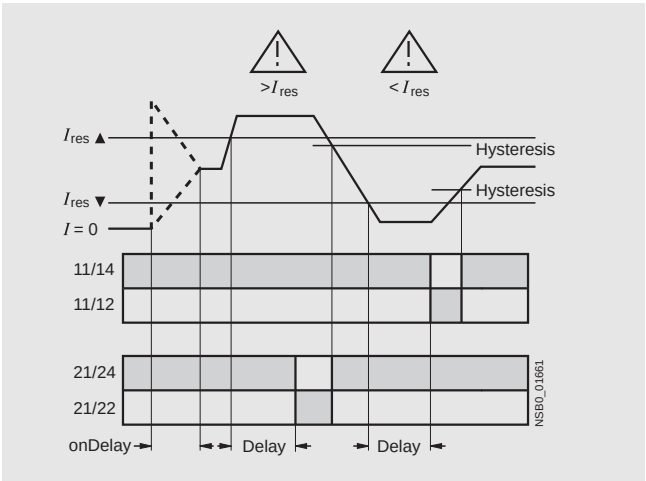
Undershooting of active current



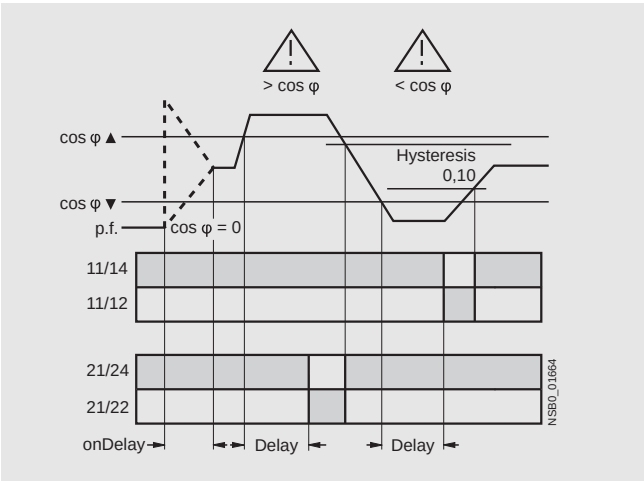
Undershooting of Power factor



Window monitoring of active current



Window monitoring of power factor



Legend

cos φ: p.f.

Power factor and active current monitoring

Technical specifications

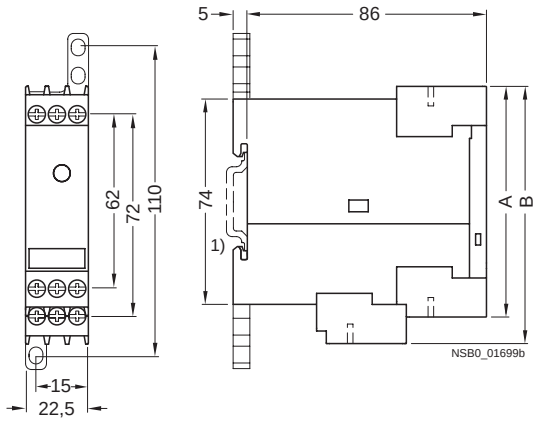
Type		3UG46 41
General data		
Rated control supply voltage U_s	V	90 ... 690
Rated frequency	Hz	50/60
Rated power, typical		
• At 200 V AC	VA	2.0
• At 400 V AC	VA	2.7
• At 460 V AC	VA	3.1
Width	mm	22.5
RESET		Automatic/ manual
Principle of operation		Closed-circuit principle, open-circuit principle
Availability time after application of U_s	ms	1000
Response time once a switching threshold is reached	ms	Max. 450
Adjustable tripping delay time	s	0.1 ... 20
Adjustable ON-delay time	s	0 ... 99
Mains buffering time, minimum	ms	10
Rated insulation voltage U_i		
Degree of pollution 3		
Overvoltage category III acc. to VDE 0110	V	690
Rated impulse withstand voltage	kV	6
Permissible ambient temperature		
• During operation	°C	-25 ... +60
• During storage	°C	-40 ... +85
EMC tests[1)]		IEC 60947-1/ IEC 61000-6-2 / IEC 61000-6-4
Degree of protection		
• Enclosure		IP40
• Terminals		IP20
Vibration resistance acc. to IEC 60068-2-6		1 ... 6 Hz: 15 mm; 6 ... 500 Hz: 2 g
Shock resistance acc. to IEC 60068-2-27		12 shocks (half-sine 15 g/11 ms)
Connection type		Screw terminals
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)
• AWG cables, solid or stranded	AWG	2 x (20 ... 14)
• Tightening torque	Nm	0.8 ... 1.2
Measuring circuit		
Measurable active current I_{res}	A	0.2 ... 10
Max. permissible load current	A	10
Peak current < 1 s	A	50
Adjustable response value		
Phase displacement angle		0.1 ... 0.99
DIAZED protection, gL/gG operational class	A	16
Measuring accuracy	%	10
Repeat accuracy at constant parameters	%	1
Accuracy of digital display		± 1 digit
Deviations for temperature fluctuations	%/°C	±0.1
Hysteresis Phase angle		0.10
Hysteresis Active current monitoring	A	0.1 ... 2.0

Note: This is a Class A product. In the household environment this device may cause radio interference. In this case the user must introduce suitable measures.

Technical specifications

Type		3UG46 41
Control circuits		
Number of CO contacts for auxillary contacts		
Load capacity of the output relay • Thermal current I_{th}		
Rated operational current Ie at • AC-15/24 ... 400 V • DC-13/24 V • DC-13/125 V • DC-13/250 V	 A A A A	 3 1 0.2 0.1
Minimum contact load at 17 V DC	mA	5
Output relay with DIAZED fuse gL/gG operational class	A	4
Electrical endurance AC-15	Million operating cycles	0.1
Mechanical endurance	Million operating cycles	10

Dimensional drawings



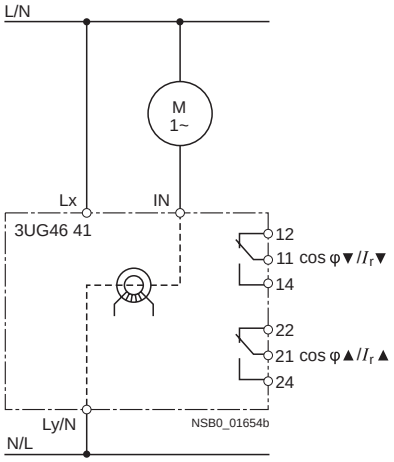
Type	3UG46 41 A	B
Removable terminal		
Screw-type terminal	83	92

1) For standard mounting rail according to EN 60715.

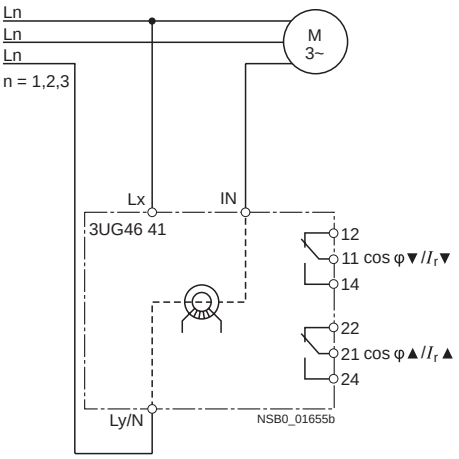
Power factor and active current monitoring

Schematics

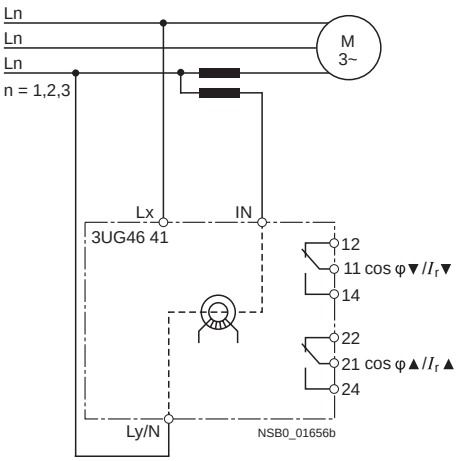
1-phase motors



3-phase motors

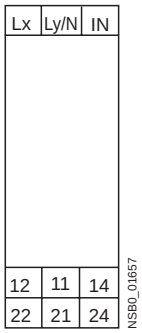


3-phase motors with transformers for currents > 10 A



Position of the connection terminals

3UG46 41



Overview

The 3UG46 24 residual-current monitoring relay is used together with the 3UL22 summation current transformer for plant monitoring.

Function

3UG46 24 monitoring relays

The main conductor and any neutral conductor to which a load is connected, are routed through the opening of the annular strip wound core of a summation current transformer. A secondary winding is placed around this annular strip-wound core to which the monitoring relay is connected.

If operation of a plant is fault-free, the sum of the inflowing and outward currents equals zero. In this case, no voltage is induced in the secondary winding of the summation current transformer.

However, if an insulation fault occurs downstream of the residual current operated circuit breaker, the sum of the inflowing currents is greater than that of the outward currents.

The differential current - the residual current - induces a secondary current in the secondary winding of the transformer. This current is evaluated in the monitoring relay and is used on the one hand to display the actual residual current and on the other, to switch the relay if the set warning or tripping threshold is overshot.

If the measured residual current exceeds the set warning value, the associated changeover contact instantly changes the switching state and an indication appears on the display. If the measured residual current exceeds the set tripping value, the set delay time begins and the associated relay symbol flashes. On expiry of this time, the associated changeover contact changes the switching state.

ON-delay time for motor start

To be able to start an operating mechanism, once the auxiliary voltage has been applied for an adjustable ON-delay time, and depending on whether the open-circuit or closed-circuit principle is selected, the output relay switches to the GO state.

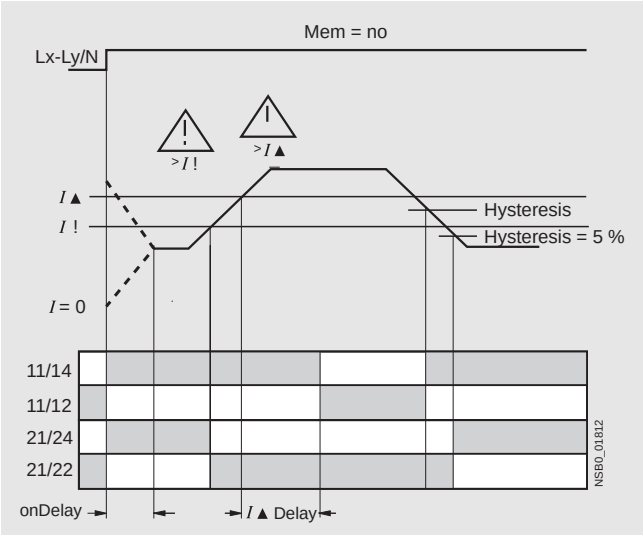
The changeover contacts do not react if the set threshold value is overshot during this period.

Residual current monitoring: Residual-current monitoring relays

With the closed-circuit principle selected

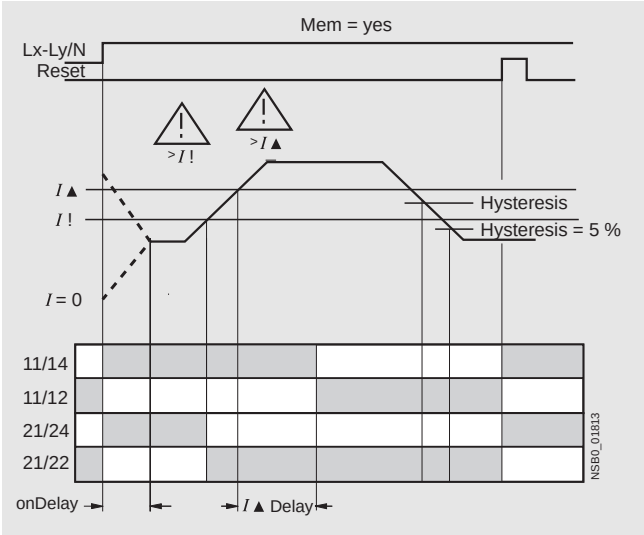
Residual current monitoring with Auto-RESET (Memory = no)

If the device is set to Auto-RESET (Memory = No), the relay switches for the tripping value once the value falls below the set hysteresis threshold and the display stops flashing. The associated relay changes its switching state if the value falls below the fixed hysteresis value of 5 % of the warning value. Any overshoots are therefore not stored.



Residual current monitoring with Manual-RESET (Memory = yes)

If Manual-RESET is selected in the menu, the output relay remains in its current switching state and the current measured value and the symbol for overshooting continues to flash, even when the measured residual current returns to a permissible value. This stored fault status can be reset by pressing the UP ▲ and DOWN ▼ key simultaneously for > 2 seconds, or by switching the supply voltage off and back on again.



Note:

The neutral conductor must not be grounded downstream of the summation current transformer as this may impair the function of the residual current monitoring device.

Technical specifications

Type		3UG46 24
General data		
Rated control supply voltage U_s	V	90 ... 690[1]
Rated frequency	Hz	50/60
Rated power, typical		
• At 90 V AC	VA	2.8
• At 200 V AC	VA	2.4
• At 400 V AC	VA	3.1
• At 460 V AC	VA	3.2
• At 690 V AC	VA	4.7
Width	mm	22.5
RESET		Automatic/ manual
Principle of operation		Closed-circuit principle, open-circuit principle
Availability time after application of U_s	ms	1000
Response time once a switching threshold is reached	ms	Max. 300
Adjustable delay time	s	0.1 ... 20
Mains buffering time, minimum	ms	10
Rated insulation voltage U_i Degree of pollution 3 Overvoltage category III acc. to VDE 0110	V	690
Rated impulse withstand voltage	kV	6
Permissible ambient temperature		
• During operation	°C	-25 ... +60
• During storage	°C	-40 ... +85
EMC tests[2]		IEC 60947-1/ IEC 61000-6-2 / IEC 61000-6-4
Degree of protection		
• Enclosure		IP40
• Terminals		IP20
Vibration resistance acc. to IEC 60068-2-6		1 ... 6 Hz: 15 mm; 6 ... 500 Hz: 2 *g*
Shock resistance acc. to IEC 60068-2-27		12 shocks (half-sine 15 *g*/11 ms)
Connection type		**Screw terminals**
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)
• AWG cables, solid or stranded	AWG	2 x (20 ... 14)
• Tightening torque	Nm	0.8 ... 1.2
Connection type		**Spring-loaded terminals**
• Solid	mm^2	2 x (0.25 ... 1.5)
• Finely stranded with end sleeve	mm^2	2 x (0.25 ... 1.5)
• Finely standed	mm^2	2 x (0.25 ... 1.5)
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)
Measuring circuit		
Measurable active current I_{res}	A	10 ... 120 % $I_{\Delta n}$ ($I_{\Delta n}$: rated residual current of the transformer)
Adjustable response value		
Residual current		10 ... 100 % $I_{\Delta n}$
Warning		10 ... 100 % $I_{\Delta n}$
Measuring accuracy	%	±5
Repeat accuracy at constant parameters	%	±1
Accuracy of digital display		± 1 digit
Deviations for temperature changes	%/°C	±0.1
Hysteresis for residual current		LSB[3] up to 50 % $I_{\Delta n}$
Hysteresis for warning threshold	A	5 % $I_{\Delta n}$

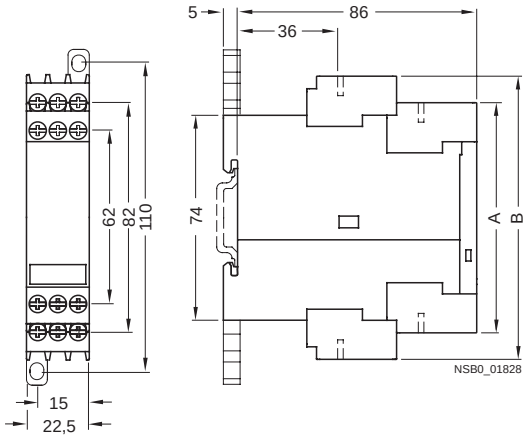
1) Absolute limit values.
2) Note: This is a Class A product. In the household environment this device may cause radio interference. In this case the user must take suitable precautions.
3) LSB: Smallest adjustable value, transformer-dependent, ≤1 % of $I_{\Delta n}$.

Residual current monitoring: Residual-current monitoring relays

Technical specifications

Type		3UG46 24
Control circuits		
Number of CO contacts for auxillary contacts		
Load capacity of the output relay • Thermal current I_{th}		
Rated operational current I_e at • AC-15/24 ... 400 V • DC-13/24 V • DC-13/125 V • DC-13/250 V	 A A A A	 3 1 0.2 0.1
Minimum contact load at 17 V DC	mA	5
Output relay with DIAZED fuse gL/gG operational class	A	4
Electrical endurance AC-15	Million operating cycles	0.1
Mechanical endurance	Million operating cycles	10

Dimensional drawings

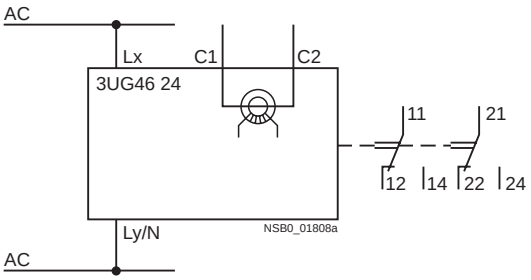


Type	3UG46 24 A	B
Removable terminal		
Screw-type terminal	83	102
Spring-loaded terminal	84	103

1) For standard mounting rail according to EN 60715.

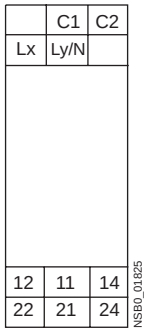
Schematics

3UG46 24

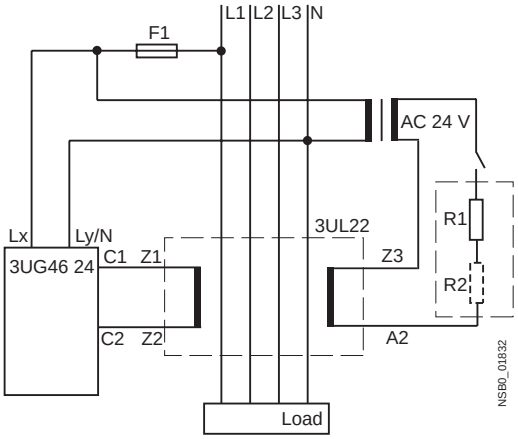


Note: It is not necessary to protect the measuring circuit for device protection. The protective device for line protection depends on the cross-section used.

Position of the connection terminals



Switching example



Type	$I_{\Delta n}$	R1	R2
3UL22 0.-1A	0,3 A	220 Ω ≥ 3 W	--
3UL22 0.-2A	0,5 A		
3UL22 0.-3A	1 A		
3UL22 0.-1B	6 A	22 Ω ≥ 6 W	22 Ω ≥ 6 W
3UL22 0.-2B	10 A		
3UL22 0.-3B	16 A		
3UL22 0.-4B	25 A		
3UL22 0.-5B	40 A		

3UL22 summation current transformers

Overview

The 3UL22 summation current transformers sense fault currents in machines and plants. Together with the 3UG46 24 residual current monitoring relay or the SIMOCODE 3UF motor management and control device they enable residual-current and ground-fault monitoring.

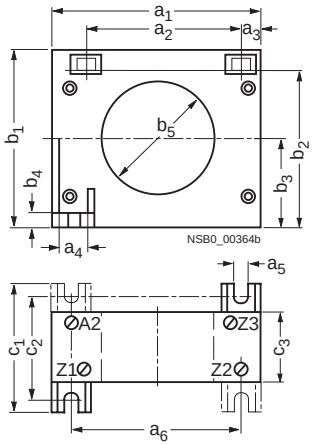
Technical specifications

Summation current transformers

Type		3UL22 01	3UL22 02	3UL22 03
Rated Insulation voltage U_i	AC 50/60 Hz	690 V		1000 V
Rated residual current $I_{\Delta n}$				
Without response delay	A	0.3 ... 1	0.3 ... 40	0.3 ... 40
Permissible ambient temperature	°C	-20 ... +70		
Feed-through openings	mm	40	65	120
For Protodur cables				
Can be fed through	Max. mm²	4 x 95	4 x 240	8 x 300

Dimensional drawings

3UL22 summation current transformer



Type	a_1	a_2	a_3	a_4	a_5	a_6	b_1	b_2	b_3	b_4	b_5	c_1	c_2	c_3
3UL22 01	100	75	10	15	for M4	80	85	72.5	42.5	7.5	40	65	50	40
3UL22 02	125	95	10	15	for M4	100	110	97.5	55	7.5	65	70	60	45
3UL22 03	200	165	20	20	for M4	170	200	100	100	10	120	85	70	55

Overview

Relay for monitoring the insulation resistance between the ungrounded single or three-phase AC supply and a protective conductor

- Measuring principle with superimposed DC voltage
- Two selectable measuring ranges of 1 ... 110 kW
- Stepless setting within the measuring range
- Selectable:
  - auto reset function with fixed hysteresis or
  - storage of the tripping operation
- Test function with test button and terminal connections on the front
- Switching output: 1 CO contact
- Insulation fault indication with a red LED
- Supply voltage indication with a green LED
- Electro-magnetically compatible according to EN 50081 and EN 61000-6-2

Function

The monitoring relay measures the insulation resistance between the ungrounded AC supply and an associated protective conductor.

A superposed DC measuring voltage is used to perform the measurement.

The monitoring relay is divided into two ranges for an insulation resistance range from 1 ... 100 kW. A range switch on the front can be used to switch over between a 1 ... 11 kW range and a 10 ... 110 kW range. Within the selected range, the monitoring relay can be steplessly adapted to the respective insulation conditions.

If the insulation resistance undershoots the set response value, the output relay is excited and the red LED (fault indication) is lit.

If the insulation resistance exceeds 1.6 times (corresponding to 60 % hysteresis) the set response value, the output relay will return to the rest position.

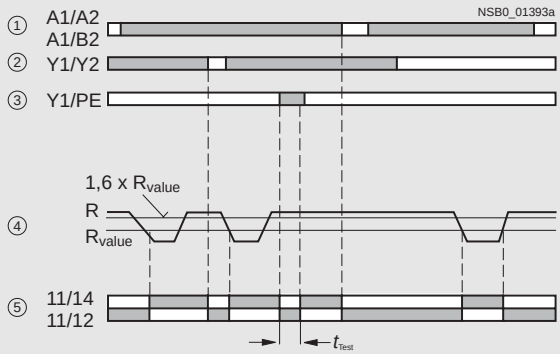
Test functions

The "Test" button on the front can be used to simulate a ground fault. If the "Test" button is pressed for at least 300 ms, the output relay is energized and the fault LED lights up. An external test button, which is connected to PE, can also be connected to terminal Y1. The function is activated by closing (> 300 ms).

Fault storage and RESET

If terminals Y1 and Y2 are jumpered, the monitoring relay is set to fault storage mode. If the set insulation resistance is undershot, the output relay is excited and remains tripped even after the insulation resistance rises above 1.6 times the set value again. Fault storage can be reset by briefly pressing the RESET button, briefly jumpering (< 300 ms) the Y1 and PE/ground terminals or by switching off and on the supply voltage.

Note:
The monitoring relay is designed for AC voltage systems. Series-connected rectifiers must be electrically isolated from the measuring relay.



① = Supply voltage
A1-B2/A1-A2 for AC 115V/230V
A1-A2 for AC/DC 24 … 240V
② = Remote connection-Save-Reset
③ = Button on the front Test/Reset
④ = Insulation resistance R of the network
⑤ = Normally open contact

t_{Test} = > approx. 300 ms

5a

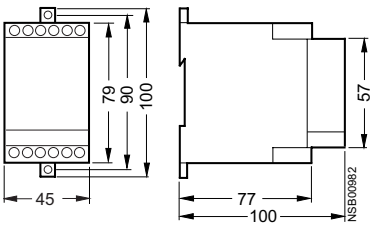
Insulation monitoring for ungrounded AC networks

Technical specifications

			3UG30 81
Control circuits			
Operating range of the control supply voltage			-15 %... +10 %
Rated power	24 ... 240 V AC/DC	VA/W	8 / 2
	110 ... 130 V AC	VA	3
	220 ... 240 V AC	VA	3
Frequency of the rated control supply voltage			Hz 50 ... 60
Measuring circuit L/PE			
• Response value		k	1...110
• Minimum internal resistance for AC			k 100
• Minimum internal resistance for DC			k 100
• DC measurement voltage		V	30 DC
• Insulation voltage		V	415 AC
• Reset/test function terminals (max. 10 m)			Y1-Y2
• Delay time in case of response		s	1
Output relay			1 CO contact, open-circuit principle
General data			
Rated insulation voltage U_i	between supply, measurement and output circuit	V	400 acc. to IEC 60947-1
Overvoltage category	Acc. to IEC 664		III
Degree of pollution	Acc. to IEC 664		3
Impulse withstand voltage U_{imp}	Acc. to VDE 0435, Part 303	kV	4
Degree of protection	Acc. to EN 60529		IP50 enclosure, IP20 terminals
Shock resistance	Acc. to IEC 60068 Part 2-27	g/ms	10
Vibration resistance	Acc. to IEC 60068-2-6		10 ... 55 Hz: 0.35 mm
Permissible ambient temperature			
• During operation		°C	-25 ... 65
• During storage		°C	-40 ... 85
Permissible mounting positions			Any
Conductor cross-section	Solid	mm2	2 x 0.75 ... 2.5
	Finely stranded with end sleeve	mm2	2 x 0.75 ... 2.5

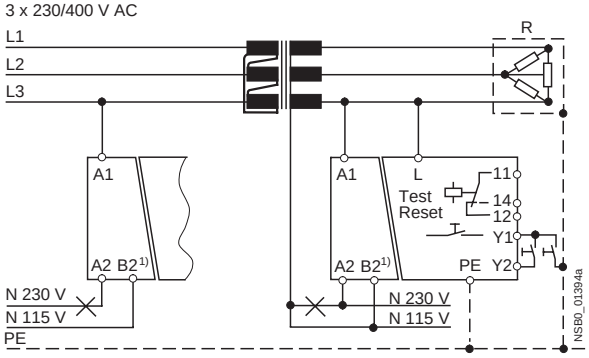
5a

Dimensional drawings



Schematics

Connection diagram for networks up to 400 V AC



A1-B2/A1-A2 for AC 115 V/230 V
A1-A2 for AC/DC 24...240 V

1) Only 3UG3081-1AK20.

Overview

Thermistor motor protection devices are used for direct monitoring of the motor winding temperature. For this purpose, the motors are equipped with temperature-dependent resistors (PTC) that are directly installed in the motor winding and abruptly change their resistance at their limit temperature.

Design

The 3RN1 tripping units are suitable for use in any climate and finger-safe according to EN 50274. They comply with:

- EN 61000-6-2 and EN 61000-6-4, "Electromagnetic compatibility of I&C equipment in industrial process engineering"
- EN 60947-8

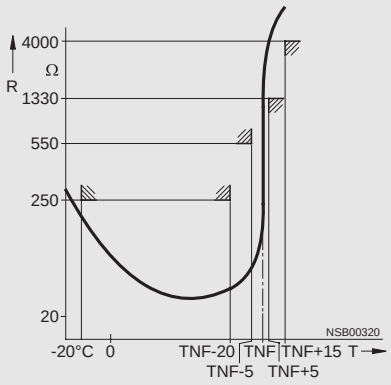
The terminals of the auxiliary contacts are designated in accordance with EN 50005.

The 3RN1 tripping units are suitable for snap-on mounting onto TH 35 standard mounting rails according to EN 60715 or for screw mounting using an adapter (Accessories).

Any mounting position is possible.

For devices with the "Manual RESET" function, the test function can be activated and a trip simulated by pressing the blue Test/ RESET button for longer than 2 seconds.

If a Type A temperature sensor is connected to a Type A tripping unit, compliance with the operating temperatures is assured (on pick-up and reset) according to IEC 60034-11-2 (EN 60947-8).



The characteristic curves of the Type A temperature sensors are described in EN 60947-8, DIN 44081 and DIN 44082.

Use in areas subject to explosion hazard for gases

All devices are approved for Equipment Group II, Category (2) in Area "G" (areas that contain explosive gases, vapor, spray and air mixtures).

With PTB 01 ATEX 3218 ex II (2) G, compliance with directive 94/ 9 EC Appendix II is confirmed. The safety devices must be selected with suitable settings for the safe operation of motors of the "Increased safety" (EEx e) and "Flameproof enclosure" (EEx d) degrees of protection and are used outside the area subject to explosion hazard.

PTB 01 ATEX 3218 ex II (2) G

The increased danger in areas subject to explosion hazard demands careful analysis of the operator's guide, the safety and commissioning instructions and the standard (EN 60079-14 / VDE 0165) for electronic equipment in areas subject to gas explosion hazards.

A risk analysis must be performed for the complete plant or machine. If this risk analysis results in a minimal potential for danger (Safety Category 1), all 3RN1 TMS tripping units can be implemented taking into account the safety notes. In the case of plants or machines with a high potential risk, versions with integrated short-circuit detection in the sensor circuit are necessary.

Use in areas subject to explosion hazard for dust

PTB 01 ATEX 3218 ex II (2) G

3RN10 11-.B/-.G, 3RN10 12-.B/-.G and 3RN10 13-...0 tripping units can be used as protective devices for motors in areas subject to gas explosion hazard for protection against impermissible overheating due to overload. If the ATEX marking has the extension "D:=Dust", these units can also be used as protective devices for motors in areas subject to dust explosion hazard (EN 50281-1-1).

Additional information is provided in the EC type test certificate which can be obtained from the Internet. The units comply with the requirements of the following classes:

Device	Class
3RN10 00, 3RN10 10, 3RN10 11-.C, 3RN10 12-.C, 3RN10 22, 3RN10 62	EN 954-1: Category 1

For PTC sensors

The measuring circuit leads must be routed as separate control cables. It is not permitted to use cores from the supply line of the motor or any other main supply cables. If extreme inductive or capacitive interference is expected as a result of power lines routed in parallel, shielded control cables must be used.

Cable routing

Maximum cable length for sensor circuit cables

Conductor cross-section	**Cable length for tripping units** Without short-circuit detection 3RN10 00, 3RN10 10 3RN10 11-.C, 3RN10 12-.C 3RN10 22, 3RN10 62	With short-circuit detection[1] 3RN10 11-.B/-.G 3RN10 12-.B/-.G 3RN10 13
mm²	m	m
2.5		2 x 2800 2 x 250
1.5		2 x 1500 2 x 150
0.5		2 x 500 2 x 50

[1] A short-circuit in the sensor circuit will be detected up to this maximum cable length.

Notes:

Tripping of the thermistor motor protection relay even in combination with a converter must directly result in disconnection. This must be implemented with circuitry.

Mounting and installation must only be performed by qualified personnel who observe the applicable regulations! For mounting, use mounting instruction No.: 3ZX1012-0RN10-1AA1.

The 3RN10 is not intended for installation in hazardous areas. For installation in areas subject to explosion hazards, the 3RN10 must be enclosed in a flameproof casing.

For tripping units with a 24 V AC/DC control voltage, electrical isolation must be secured with a battery network or a safety transformer according to DIN VDE 0551.

When tripping units with Auto-RESET function are used, a reset is performed automatically after the cooling time has expired. It must be ensured by means of an external interlock (latching with a separate ON and OFF button) that the machine to be monitored does not start up again spontaneously.

Units with the "Auto-RESET" function must not be used in applications in which the unexpected restart can lead to personal injury or property damage.

In the case of tripping units without short-circuit detection, during commissioning or after modifications or maintenance work (assembly, disassembly) on the equipment, the sensor resistance must be measured using a suitable measuring device. For resistances of < 50 W, the sensor circuit must be checked for a short-circuit.

If 3RN10 00 units are used to protect EEx e motors, separate monitoring of the control voltage is recommended because there is no Ready LED to indicate connection to the supply voltage.

If 3RN10 13-.BW01 units are used to protect EEx e motors, separate monitoring of the control voltage is recommended because the switching state of the auxiliary contacts does not change if the control voltage fails (use of a bistable relay is recommended).

Before commissioning, the effectiveness of the protection function must be checked.

Function

The 3RN1 tripping units operate in accordance with the closed-circuit principle and therefore monitor themselves for open circuit (except: warning output in the case of 3RN10 22). A momentary voltage failure of less than 50 ms does not change the status of the auxiliary contacts. The 3RN10 11, 3RN10 12 and 3RN10 13 units with 2 changeover contacts are also equipped with short-circuit detection in the sensor circuit. The unit will trip in the event of a short-circuit in the sensor circuit (resistance in sensor circuit < 20 Ω).

All tripping units (except for 24 V AC/DC) feature electrical isolation between the control circuit and the sensor circuit.

3RN10 00 compact tripping units

The compact tripping unit is equipped with a red LED (TRIPPED) for the tripped indicator and a changeover contact.

After the unit has tripped, it is automatically reset once the thermistors have cooled down. The root of the changeover contact is connected to the control voltage (95 is connected to terminal A1).

This unit is particularly suitable in circuits in which the control circuit and signaling circuit have the same potential, e.g. in local control cabinets.

Response of the tripping units in the event of control voltage failure

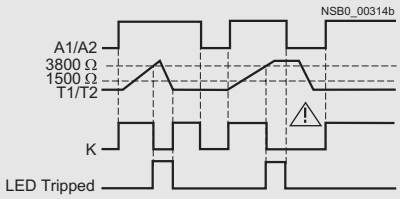
Behavior	Monostable 3RN10 00 3RN10 10 3RN10 11	Non-volatile, monostable 3RN10 12 3RN 10 13-...0 3RN10 22 3RN10 62
In case of failure of the control voltage	Device trips	Device trips
In case of return of the control voltage without a preceding tripping operation	Device resets	Device resets
In case of return of the control voltage after a preceding tripping operation	Device resets	The device remains tripped

Safe electrical isolation

All circuits (outputs, control circuits, sensor and RESET circuits) of the multifunction tripping units 3RN10 13-1BW10 and 3RN10 13-1GW10 (wide voltage range, monostable output relay and screw connection) are safely isolated from each other up to a rated voltage of 300 V according to DIN VDE 0100 Part 410/EN 60947-1.

Function diagrams

3RN10 00
(Auto-RESET)



[1] For versions with 2 CO (3RN10 1.G...): For short-circuit response of sensor circuit see 3RN10 13. function diagram.

For PTC sensors

Technical specifications

Type		Compact units 3RN10 00
General data		
Width	mm	22.5
Number of connectable sensor circuits		1
Response in the event of control voltage failure		1)
Manual RESET		No
Automatic RESET		Yes
Remote RESET		No
TEST pushbutton		No
Short-circuit detection for sensor circuit		No
Short-circuit and open-circuit indication		No
Warning and disconnection in one unit		No
Tripping units		
Rated insulation voltage U_i (degree of pollution 3)	V	300
Permissible ambient temperature	°C	-25 ... +60
Permissible storage temperature	°C	-40 ... +80
EMC tests		EN 61000-6-2, EN 61000-6-4
Degree of protection acc. to EN 60529 / VDE 0470-1		IP20
Connection type		**Screw terminals**
• Terminal screw		M3 (for standard screw driver size 2 and Pozidriv 2)
• Solid	mm^2	1 x (0.5 ... 4)/2 x (0.5 ... 2.5)
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5)/2 x (0.5 ... 1.5)
• AWG cables solid or stranded	AWG	2 x (20 ... 14)
• Tightening torque	Nm	0.8 ... 1.2
Sensor circuit		
Measuring circuit load at $R_F \leq 1.5$ mW		≤ 5
Voltage in sensor circuit at $R_F \leq 1.5$ mW	V	≤ 2
Response temperature (depends on sensor)	°C	60 ... 180
Coupling time (depends on sensor)	s	About 5
Summation PTC resistance R_F	kΩ	≤ 1.5 (per sensor loop)
Response value	kΩ	3.4 ... 3.8
Return value	kΩ	1.5 ... 1.65
Response tolerance	°C	±6

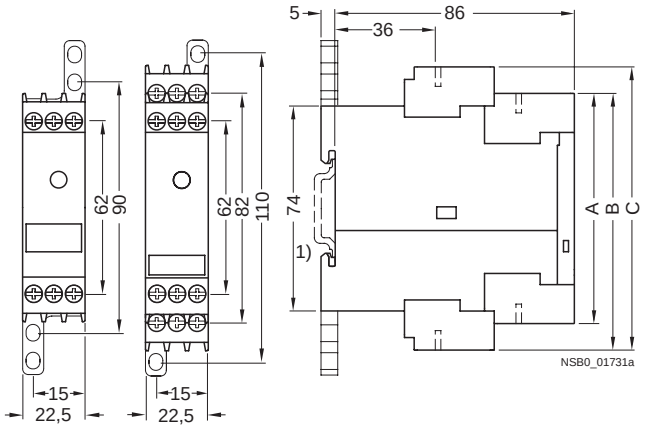
1) See Selection and ordering data.
2) Remote RESET possible by disconnecting control voltage.
3) Open circuits are only indicated by monostable versions (3RN10 13-....0).

Type		Compact units 3RN10 00
Control Circuit		
Rated insulation voltage U_s (degree of pollution 3)		1)
Operating range		
• 110/230 V AC • 24 ... 240 V • 24 V AC/DC		0.85 ... 1.1 x U_s 0.85 ... 1.1 x U_s 0.85 ...1.2 x U_s for DC operation, 0.85 ...1.1 x Us for AC operation
Rated power AC/DC	W	< 2
Max. mains buffering time	ms	50
Auxiliary circuit		
Continuous thermal current current Ith	A	5
Rated operational current I_e • AC-15 240 V • DC-13 24 V	 A A	 3 1
DIAZED fuse	A	6[2]
CSA and UL rated data, control circuit		
Rated control voltage 50/60 Hz • AC • DC	 V V	 300 300
Switching capacity		R 300/B 300
Safe isolation up to 300 V Acc. to DIN 60947-1		--

1) See Selection and ordering data.
2) I_n > 1 kA weld-free according to EN 60947-5-1.

Dimensional drawings

3RN1 with 1 ... 2 sensor circuits



Type	3RN10 00 A
Removable terminal	
Screw-type terminal	83

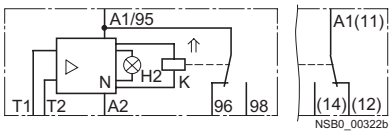
1) For standard mounting rail according to EN 60715.

For PTC sensors

Schematics

Illustrated with control voltage applied

3RN10 00, 1 CO



Illustrated with control voltage not applied

Illustrated with control voltage applied

Illustrated with control voltage not applied

General item codes

A1, A2 , A3	Connections of the control voltage
N	Amplifier
T/R	TEST/RESET button
Y1, Y2	Connections for remote RESET (jumpered = Auto-RESET)
⇑	The double arrow indicates an operating state which deviates from the standard representation of the contact according to DIN 40900, Part 7 (Here: Position of the contacts when control voltage is applied to terminals A1 and A2)

Item codes for 3RN10

H1	"READY" LED
H2	"TRIPPED" LED
K	Output relay
T1, T2	the sensor loop

Overview

SIRIUS safety relays are the key modules of a consistent and cost-effective safety chain. They are designed for versatile and flexible use in safety-oriented applications such as:

- EMERGENCY-STOP disconnection
- Protective door, light array and laser scanner monitoring
- Press and punch applications
- Safety-oriented standstill monitoring

SIRIUS safety relays provide a perfect technical and cost-effective solution for every safety application.

SIRIUS safety relays ensure monitoring of the entire safety chain:

- Monitoring the safety functions of sensors
- Monitoring the sensor cables
- Monitoring the correct operation of the safety relay
- Monitoring the actuators (contactors) in the shutdown circuit
- Safety-oriented disconnection when dangers arise

SIRIUS safety relays meet the highest requirements (Category 4) according to EN 954-1 and IEC 13849 and achieve the highest safety integrity level (SIL 3) according to IEC 61508.

Functions

SIRIUS safety relays and the safety chain

A safety chain normally comprises the following functions: sensing, evaluating and shutdown.

Sensing

The detection of a safety requirement, e.g. when an EMERGENCY-STOP is actuated or someone enters a hazardous area which is protected by sensors such as light arrays or laser scanners.

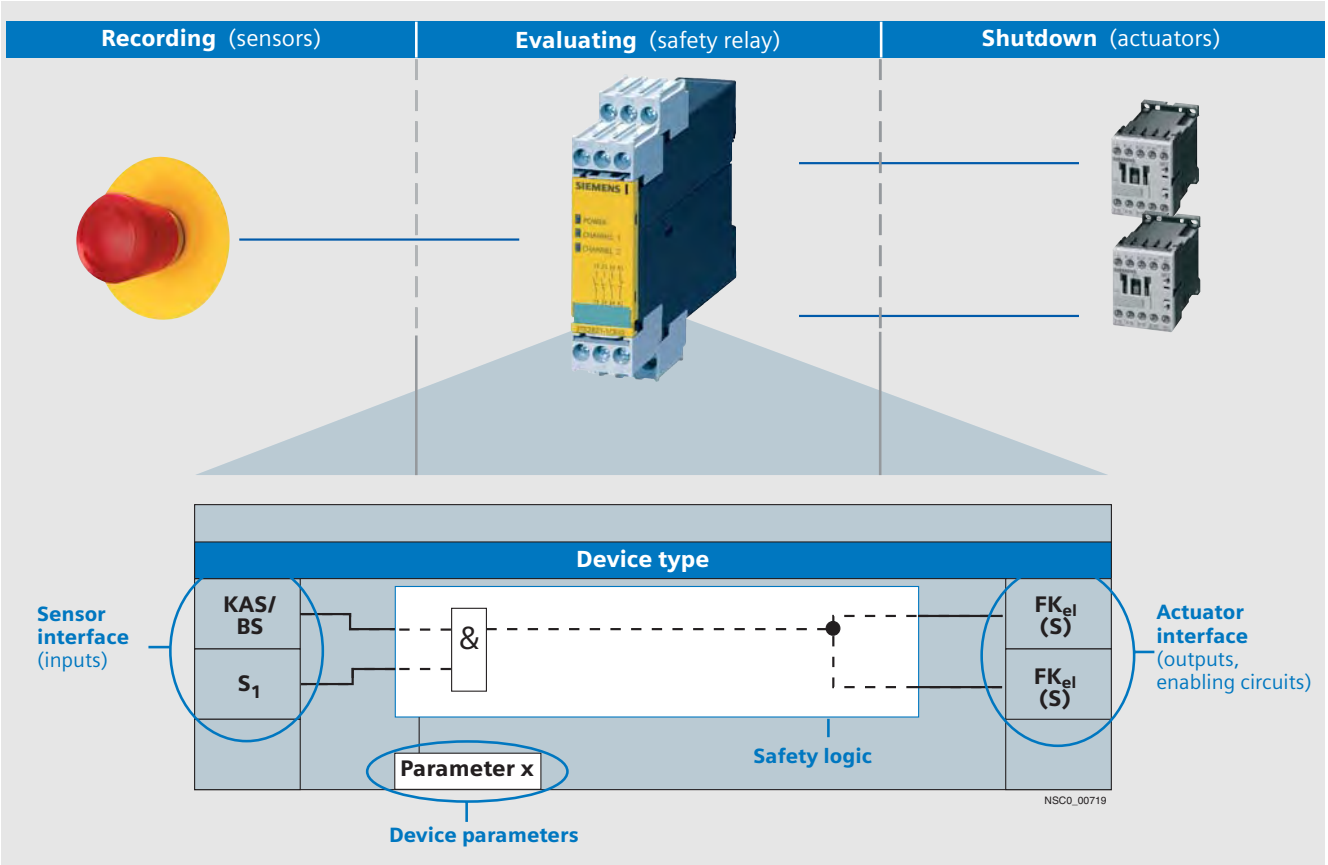
Evaluating

The evaluation of a safety requirement and the reliable initiation of a reaction, e.g. shutting down the enabling circuits.

Shutdown

The shutting down of hazards, e.g. a power supply, using the downstream contactors.

SIRIUS safety relays are active in the evaluating and shutdown links of this safety chain.



The inputs of the device (number and type) are portrayed in the sensor interface. The safety logistics is shown at the center. The mode of operation of the device and the way the inputs act on the outputs are explained with the help of this safety logistics. The type and number of enabling circuits or signaling outputs are shown in the actuator interface, and the setting options (parameters) of the device are shown at the lower edge of the graphic.

Notes on the function diagrams on pages 7/127 to 7/154

In the interest of simplicity, the function diagrams show only the inputs and outputs which are required to explain the safety function. The power supply inputs and the sensors and actuators which can be connected to the interfaces are disregarded because they are not relevant for illustrating the function.

The legends explain the meaning of the symbols.

Design

The 3TK28 21 to 28, 3TK28 30 and 3TK28 34 safety relays operate with internal contactor relays with positively-driven contacts. The contacts of the controls comply with the requirement for positively-driven operation laid down in ZH 1/457, Edition 2, 1978. NO and NC contacts are not allowed to be closed at the same time.

In a redundant circuit, operation of the internal controls is monitored. If a safety relay fails, it will always switch to the de-energized and consequently safe state. The fault is detected and the safety relay can no longer be switched on.

This product series is characterized by its space-saving width (22.5 mm or 45 mm). The usual BIA, BG and SUVA approvals and test certificates have been awarded.

Enabling contacts (FK)

Safety related operation must be performed by safe output contacts, known as enabling contacts. Enabling contacts are always NO contacts and switch without delay.

Signaling contacts (MK)

NC contacts are used as signaling contacts but they are not permitted to perform functions with relevance for safety. An enabling contact can also be used as a signaling contact. A signaling contact cannot, however, be used as an enabling contact.

Delayed enabling contacts

Machine operating mechanisms that overrun for a long time must be externally braked in the event of danger. For this purpose, the energy infeed for electrical braking can be maintained (Stop Category 1 according to EN 60204-1).

The basic units have off-delay enabling contacts in addition to instantaneous enabling contacts. Delay time of between 0.5 and 30 s are available with the different versions. A 3RP19 02 sealable cover can be fitted to protect against unauthorized adjustment of the set delay time.

Expansion units

If the enabling contacts of the basic unit are inadequate, expansion units can be used. An expansion unit has 4 enabling contacts.

Expansion units are not allowed to be operated separately in safety-related switching circuits; they must be combined with a basic unit. One enabling contact of the basic unit is required for connecting an expansion unit. The category of a control system with expansion unit corresponds to that of the basic unit.

Mounting

The equipment is designed for snap-on mounting on a TH 35 standard mounting rail according to EN 60715. Screw mounting is also possible for the devices by means of 2 additional 3RP19 03 push-in lugs.

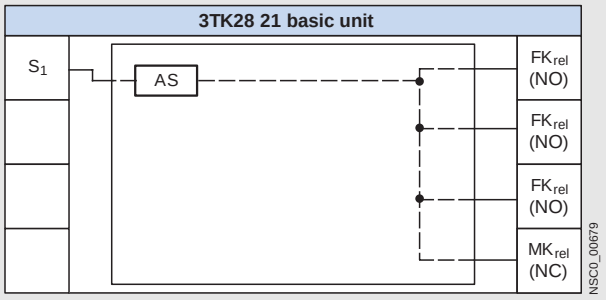
With relay enabling circuits

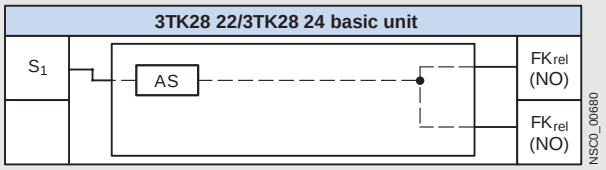
Functions

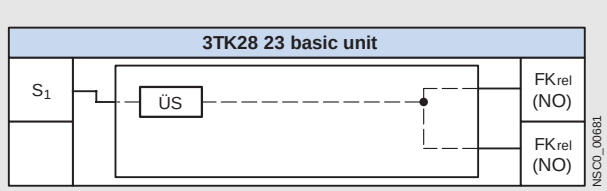
Basic units

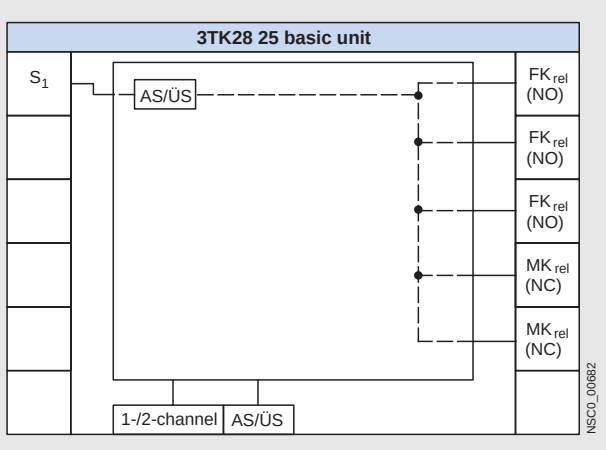
3TK28 21 to 3TK28 28 (without 3TK28 26)

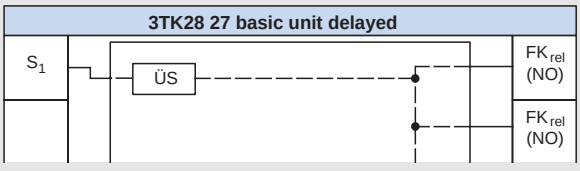
The devices 3TK28 21 to 3TK28 28 (without 3TK28 26) each have one sensor input and a varying number of contactor relay enabling circuits and signaling outputs. If the signal is no longer applied to the sensor input, the enabling circuits are disconnected immediately or according to the set delay timed.

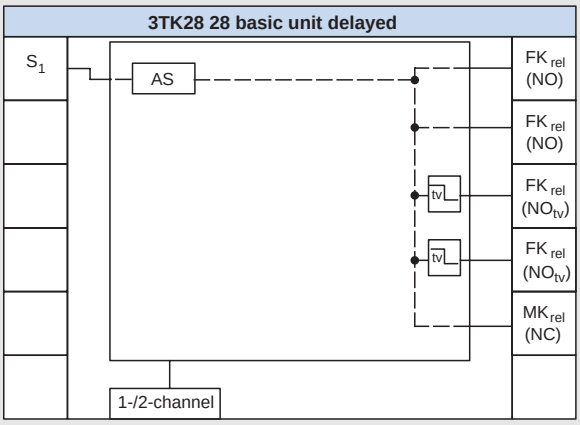












Legend

Sensor interface

S_x: Sensor input

Safety logic

AS: Automatic start Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).

AS/ÜS: Automatic or monitored start depending on the parameterization

ÜS: Monitored start. Device does not start until after the enabling conditions are fulfilled and a start signal is issued.

tv Time delay, OFF-delay

Parameters

AS/ÜS: Automatic or monitored start depending on the parameterization

1-/2-channel: One-channel / two-channel sensor connection

Actuator interface

FK_{rel}: Enabling circuit, relay contact (floating)

MK_{rel}: Signaling circuit, relay contact (non-floating)

NC: NC contact

NO: NO contact

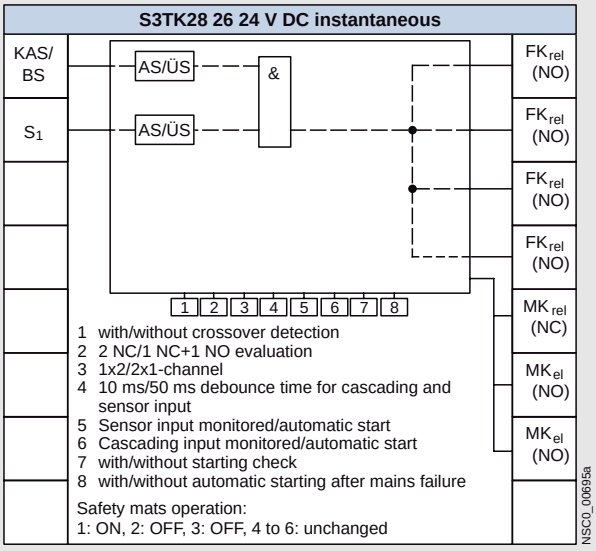
NO_{tv}: NO contact, time-delayed

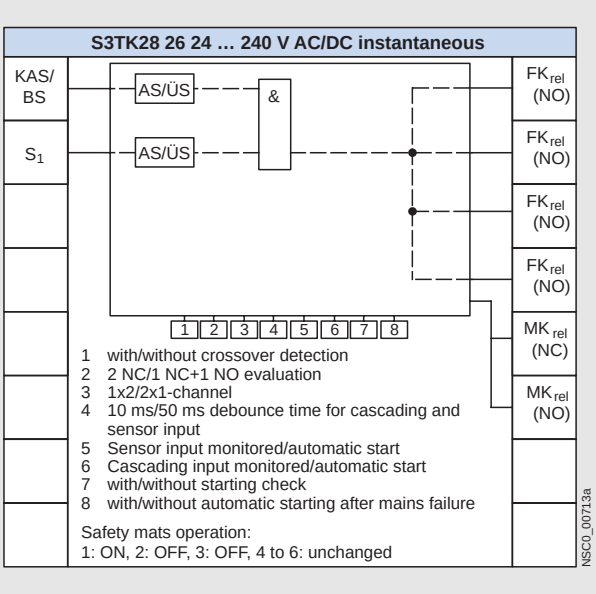
Basic units

3TK28 26

The 3TK28 26 safety relay combines several functions in one unit. The sensor input S1 and the cascading input KAS are suitable for connecting sensors with contacts, non-contact sensors (electronic sensors), safety mats and NC/NO magnetically operated switches.

DIP switches mounted on the front can be used to adapt the functions of the device to the functions required.

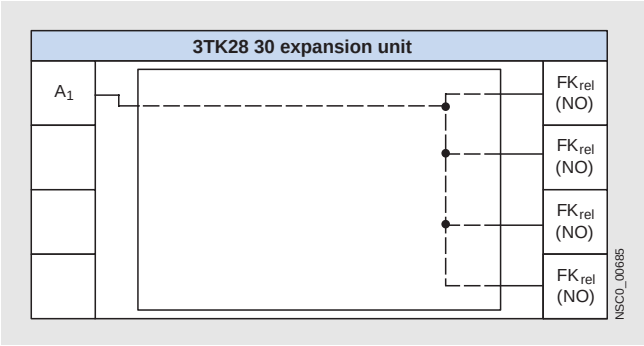




Expansion units

3TK28 30

The 3TK28 30 is activated through the power supply input A1. On the output side are four contactor relay enabling circuits. If the signal is no longer applied to the input, the enabling circuits are isolated immediately.



Legend

Sensor interface

Sx:	Sensor input
A1:	Power supply input as sensor input or cascading input
KAS/BS:	Cascading input or normal switching duty.. Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control. The safety function is on a higher level.

Safety logic

AS/ÜS:	Automatic or monitored start depending on the parameterization

Parameters

1 to 8	see drawing

Actuator interface

FK_{rel}:	Enabling circuit, relay contact (floating)
MK_{rel}:	Signaling circuit, relay contact (non-floating)
NC:	NC contact
NO:	NO contact

With relay enabling circuits

Technical specifications

Type		3TK28 21	3TK28 22	3TK28 23	3TK28 24-..B0.0	3TK28 24-.A.20	3TK28 25
General data							
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508					
Test certificates		BG, SUVA , UL , CSA					
Safety-oriented output contacts							
• Instantaneous FK_{rel}		3	2				3
• Time-delayed $FK_{rel\ (tv)}$		--	--				--
Safety-oriented semiconductor outputs							
• Instantaneous FK_{el}		--					
• Time-delayed $FK_{el\ (tv)}$		--					
Signaling contacts MK_{rel}		1	--				2
Semiconductor signaling outputs MK_{rel}		--					
Sensor inputs S		1					
Cascading inputs KAS/BS		--					
Degree of protection acc. to EN 60529							
• Enclosures		IP40					
• Terminals		IP20					
Shock resistance sine wave	g/ms	8/10					
Permissible mounting positions		Any					
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe					
Height	mm	102: Screw terminals; 104: Spring-loaded terminals					
Width	mm	22.5					
Depth	mm	115					
Weight	g	0.240					0.460
Connection type		**Screw terminals**					
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)					
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)					
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)					
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)					
• Tightening torque	Nm	0.8 ... 1.2					
Electrical specifications							
Rated control supply voltage U_s	V	24 AC/DC				115/230 AC 24 DC	24 AC/115/230,
Operating range							
• AC operation	V	0.85 ... 1.1 × U_s				0.85 ... 1.1×U_s	0.85 ... 1.1 ×U_s
• DC operation	V	0.85 ... 1.2 × U_s				--	0.85 ... 1.1 × U_s
Measurement voltage	V	--					
Response value U_{resp}	mV	--					
Rated insulation voltage U_i							
• For control circuit	V	--					
• For outputs	V	300					
Rated impulse withstand voltage U_{imp}							
• For control circuit	V	--					
• For outputs	V	4000					
Rated power	W	1.5					3
Frequency ranges	Hz	50/60					
Rated operational current I_e (relay outputs) at							
• AC-15 at 115 V	A	5					6
• AC-15 at 230 V	A	5					6
• DC-13 at 24 V	A	5					6
• DC-13 at 115 V	A	0.2					0.2
• DC-13 at 230 V	A	0.1					0.1
Rated operational current I_e (semiconductor outputs) at							
• DC-13 at 24 V	A	--					
• DC-13 at 230 V	A	--					

Type		3TK28 21	3TK28 22	3TK28 23	3TK28 24-..B0.0	3TK28 24-.A.20	3TK28 25
Electrical specifications (continued)							
Electrical endurance	Operating cycles	10^5					
Mechanical endurance	Operating cycles	10^7					
Switching frequency *z*	1/h	1000					
Continuous thermal current I_{th}	A	5					6
Continuous thermal current I_{th}							
• 1 contact	A	--					
• 2 contacts	A	--					
• 3 contacts	A	--					
• 4 contacts	A	--					
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE, gL/gG operational class							
• gL/gG		6	6		6		6
• Quick		10; Signaling circuit: 6	10		10; Signaling circuit: 6		10
Maximum line resistance	Ω	30					
Cable length from terminal to terminal	m	1000					
Times							
Bridging of voltage dips, supply voltage (only internal, no outputs)	ms	60	30	80	60		100
Make-time t_E							
• For automatic start typ.	ms	--	--	--	--	--	--
• For automatic start max.	ms	AC: 300, DC: 200	125	--	AC: 300, DC: 200	300	150
• For automatic start after mains failure typ.	ms	--	--	--	--	--	--
• For automatic start after mains failure max.	ms	--	--	--	--	--	--
• For monitored start typ.	ms	--	--	--	--	--	--
• For monitored start max.	ms	--	--	30	--	--	25
Release time t_R							
• For sensor typ.	ms	--	--	--	--		--
• For sensor max.	ms	200	20	20	200		25
• For mains failure typ.	ms	--	--	--	--		--
• For mains failure max.	ms	200	100	150	200		350
Recovery time t_W							
• After sensor	ms	Min. 200		Min. 400	Min. 200		Min. 200
• After mains failure	s	Min. 200		Min. 600	Min. 200		Min. 500
Minimum command duration t_B							
• Sensor input	ms	Min. 200	Min. 25	Min. 25	Min. 200	Min. 300	Min. 25
• ON button	s	Min. 150	Min. 40	Min. 25	Min. 150	Min. 300	Min. 25
• Cascading input	s	--	--	--	--	--	--
Simultaneity t_G	ms	∞					
Temperatures							
Permissible ambient temperature							
• During operation	°C	–25 ... +60					
• During storage	°C	–40 ... +80					
Safety specifications							
Safety integrity level SIL CL acc. to EN 61508 (11.02)		2	3		2		3
Performance level PL acc. to EN ISO 13849 (02.07)		--					
Safety category CAT acc. to EN 954-1		3	4		3		4
Requirement category acc. to EN 574		--					
Probability of a dangerous failure							
• Per hour (PFH_D)	1/h	3×10^{-7}	3×10^{-8}		$3x\ 10^{-7}$		3×10^{-8}
• On demand (PFD)		--	--		--		--
Proof-test interval T1	a	20					
Environmental data							
EMC		EN 60947-5-1					
Vibrations acc. to EN 60068-2-6							
• Frequency	Hz	5 .. 500					
• Amplitude	mm	0.075					
Climatic withstand capability		EN 60068-2-1, EN 60068-2-2, EN 60068-2-14, EN 60068-2-30					
Clearances in air and creepage distances		EN 60947-1					

With relay enabling circuits

Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41 3TK28 26-.BB42 3TK28 26-.BB43	3TK28 26-.CW31 3TK28 26-.CW32 3TK28 26-.CW44	3TK28 27
General data						
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508				
Test certificates		TÜV, UL , CSA				BG, SUVA , UL , CSA
Safety-oriented output contacts						
• Instantaneous FK_{rel}		4		2		
• Time-delayed $FK_{rel\ (tv)}$		--		2		
Safety-oriented semiconductor outputs						
• Instantaneous FK_{el}		--				
• Time-delayed $FK_{el\ (tv)}$		--				
Signaling contacts MK_{rel}		1	2		3	1
Semiconductor signaling outputs MK_{rel}		2	--	2	--	
Sensor inputs S		1				
Cascading inputs KAS/BS		1				-
Degree of protection acc. to EN 60529						
• Enclosures		IP40				
• Terminals		IP20				
Shock resistance sine wave	g/ms	8/10				
Permissible mounting positions		Any				
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe				
Height	mm	106: Screw terminals; 108: Spring-loaded terminals				
Width	mm	45				
Depth	mm	116				115
Weight	g	0.350				0.580
Connection type		**Screw terminals**				
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)				
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)				
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)				
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)				
• Tightening torque	Nm	0.8 ... 1.2				
Electrical specifications						
Rated control supply voltage U_s	V	24 AC/DC	24 ... 240AC/DC	24DC	24 ... 240AC/DC	24 DC 24/115/230 AC
Operating range						
• AC operation	V	--	0.9 ... 1.1 × U_s		0.9 ... 1.1 × U_s	0.85 ... 1.1 ×U_s
• DC operation	V	0.85 ... 1.2 × U_s	0.9 ... 1.1 × U_s	0.85 ... 1.2 × U_s	0.9 ... 1.1 × U_s	0.85 ... 1.1 × U_s
Measurement voltage	V	--				
Response value U_{resp}	mV	--				
Rated insulation voltage U_i						
• For control circuit	V	--				
• For outputs	V	300				
Rated impulse withstand voltage U_{imp}						
• For control circuit	V	--				
• For outputs	V	4000				
Rated power	W	3				
Frequency ranges	Hz	50/60				
Rated operational current I_e **(relay outputs) at**						
• AC-15 at 115 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	--
• AC-15 at 230 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24 47/48, 57/58: 4 31/32, 61/62: 3 73/74: 1
• DC-13 at 24 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 2	13/14, 23/24, 33/34, 43/44: 4 51/52: 2, 63/64: 1	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 2	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 2 73/74: 1	13/14, 23/24: 5 47/48, 57/58: 2
• DC-13 at 115 V	A	0.2	0.2	0.2	0.2	0.2
• DC-13 at 230 V	A	0.1	0.1	0.1	0.1	0.1
Rated operational current I_e **(semiconductor outputs) at**						
• DC-13 at 24 V	A	64, 75: 0.5	--	74, 84: 0.5	--	--
• DC-13 at 230 V	A	--	--	--	--	--

Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41 3TK28 26-.BB42 3TK28 26-.BB43	3TK28 26-.CW31 3TK28 26-.CW32 3TK28 26-.CW44	3TK28 27
Electrical specifications (continued)						
Electrical endurance	Operating cycles	--				10^5
Mechanical endurance	Operating cycles	10^7				
Switching frequency z	1/h	2000				1000
Continuous thermal current I_{th} 5	A	Summation current max. 12				
Continuous thermal current I_{th}						
• 1 contact	A	4				
• 2 contacts	A	4				
• 3 contacts	A	3				
• 4 contacts	A	3				
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE, gL/gG operational class						
• gL/gG		4				6 (control) Voltage: 2
• Quick		6				10
Maximum line resistance	Ω	1000				30
Cable length from terminal to terminal with Cu 1.5 mm2 and 150 nF/km	m	2000				1000
Times						
Bridging of voltage dips, supply voltage (only internal, no outputs)	ms	Min. 10				30
Make-time t_E						
• For automatic start typ.	ms	50 + debounce time				--
• For automatic start max.	ms	50 + debounce time				--
• For automatic start after mains failure typ.	ms	Approx. 8000 starting time				Approx. 8000 starting time
• For automatic start after mains failure max.	ms	Approx. 8000 starting time				Approx. 8000 staring time
• For monitored start typ.	ms	50 + debounce time				--
• For monitored start max.	ms	50 + debounce time				80
Release time t_R						
• For sensor typ.	ms	50 + deb. time	50 + deb. time	--	--	--
• For sensor max.	ms	--	--	50+ debounce	50+ debounce	≤ 30 adjustable
• For mains failure typ.	ms	75	--	75	--	--
• For mains failure max.	ms	125	300	125	320	100
Recovery time t_W						
• After sensor	ms	Min. 250		Min. 250	Min. 250	After time has elapsed
• After mains failure	s	Min. 200		Min. 600	Min. 200	Min. 200
Minimum command duration t_B						
• Sensor input	ms	30				Min. 25
• ON button	s	0.2 ... 5				Min. 25
• Cascading input	s	--				--
Simultaneity t_G	ms	∞				
Temperatures						
Permissible ambient temperature						
• During operation	°C	–25 ... +60				
• During storage	°C	–40 ... +80				
Safety specifications						
Safety integrity level SIL CL acc. to EN 61508 (11.02)		3				Stop cat. 0: 3 Stop cat. 1: 2
Performance level PL acc. to EN ISO 13849 (02.07)			e			--
Safety category CAT acc. to EN 954-1		4				Stop cat. 0: 4 Stop cat. 1: 3
Requirement category acc. to EN 574		--				
Probability of a dangerous failure						
• Per hour (PFH_D)	1/h	7.8×10^{-9}	7.8×10^{-9}	7.8×10^{-9}	7.8×10^{-9}	3×10^{-8}
• On demand (PFD)		--	--		--	--
Proof-test interval T1	a	20				
Environmental data						
EMC		EN 60947-5-1				
Vibrations acc. to EN 60068-2-6						
• Frequency	Hz	5 .. 500				
• Amplitude	mm	0.075				
Climatic withstand capability		EN 60068-2-1, EN 60068-2-2, EN 60068-2-14, EN 60068-2-30				
Clearances in air and creepage distances		EN 60947-1				

[1] Time-delayed enabling circuit: ≤ 300 ms adjustable.

With relay enabling circuits

Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41 3TK28 26-.BB42 3TK28 26-.BB43	3TK28 26-.CW31 3TK28 26-.CW32 3TK28 26-.CW44	3TK28 27
General data						
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508				
Test certificates		TÜV, UL , CSA				BG, SUVA , UL , CSA
Safety-oriented output contacts						
• Instantaneous FK_{rel}		4	2			
• Time-delayed $FK_{rel\ (tv)}$		--	2			
Safety-oriented semiconductor outputs						
• Instantaneous FK_{el}		--				
• Time-delayed $FK_{el\ (tv)}$		--				
Signaling contacts MK_{rel}		1	2		3	1
Semiconductor signaling outputs MK_{rel}		2	--	2	--	
Sensor inputs S		1				
Cascading inputs KAS/BS		1				-
Degree of protection acc. to EN 60529						
• Enclosures		IP40				
• Terminals		IP20				
Shock resistance sine wave	g/ms	8/10				
Permissible mounting positions		Any				
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe				
Height	mm	106: Screw terminals; 108: Spring-loaded terminals				
Width	mm	45				
Depth	mm	116				115
Weight	g	0.350				0.580
Connection type		**Screw terminals**				
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)				
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)				
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)				
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)				
• Tightening torque	Nm	0.8 ... 1.2				
Electrical specifications						
Rated control supply voltage U_s	V	24 AC/DC	24 ... 240AC/DC	24DC	24 ... 240AC/DC	24 DC 24/115/230 AC
Operating range						
• AC operation	V	--	0.9 ... 1.1 × U_s		0.9 ... 1.1 × U_s	0.85 ... 1.1 ×U_s
• DC operation	V	0.85 ... 1.2 × U_s	0.9 ... 1.1 × U_s	0.85 ... 1.2 × U_s	0.9 ... 1.1 × U_s	0.85 ... 1.1 × U_s
Measurement voltage	V	--				
Response value U_{resp}	mV	--				
Rated insulation voltage U_i						
• For control circuit	V	--				
• For outputs	V	300				
Rated impulse withstand voltage U_{imp}						
• For control circuit	V	--				
• For outputs	V	4000				
Rated power	W	3				
Frequency ranges	Hz	50/60				
Rated operational current I_e **(relay outputs) at**						
• AC-15 at 115 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	--
• AC-15 at 230 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 3	13/14, 23/24, 33/34, 43/44: 4 51/52: 3	13/14, 23/24 47/48, 57/58: 4 31/32, 61/62: 3 73/74: 1
• DC-13 at 24 V	A	13/14, 23/24, 33/34, 43/44: 4 51/52: 2	13/14, 23/24, 33/34, 43/44: 4 51/52: 2, 63/64: 1	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 2	13/14, 23/24, 47/48, 57/58: 4 31/32, 61/62: 2 73/74: 1	13/14, 23/24: 5 47/48, 57/58: 2
• DC-13 at 115 V	A	0.2	0.2	0.2	0.2	0.2
• DC-13 at 230 V	A	0.1	0.1	0.1	0.1	0.1
Rated operational current I_e **(semiconductor outputs) at**						
• DC-13 at 24 V	A	64, 75: 0.5	--	74, 84: 0.5	--	--
• DC-13 at 230 V	A	--	--	--	--	--

Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41 3TK28 26-.BB42 3TK28 26-.BB43	3TK28 26-.CW31 3TK28 26-.CW32 3TK28 26-.CW44	3TK28 27
Electrical specifications (continued)						
Electrical endurance	Operating cycles	--				10^5
Mechanical endurance	Operating cycles	10^7				
Switching frequency *z*	1/h	2000				1000
Continuous thermal current I_{th} 5	A	Summation current max. 12				
Continuous thermal current I_{th}						
• 1 contact	A	4				
• 2 contacts	A	4				
• 3 contacts	A	3				
• 4 contacts	A	3				
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE, gL/gG operational class						
• gL/gG		4				6 (control) Voltage: 2
• Quick		6				10
Maximum line resistance	Ω	1000				30
Cable length from terminal to terminal with Cu 1.5 mm2 and 150 nF/km	m	2000				1000
Times						
Bridging of voltage dips, supply voltage (only internal, no outputs)	ms	Min. 10				30
Make-time t_E						
• For automatic start typ.	ms	50 + debounce time				--
• For automatic start max.	ms	50 + debounce time				--
• For automatic start after mains failure typ.	ms	Approx. 8000 starting time				Approx. 8000 starting time
• For automatic start after mains failure max.	ms	Approx. 8000 starting time				Approx. 8000 staring time
• For monitored start typ.	ms	50 + debounce time				--
• For monitored start max.	ms	50 + debounce time				80
Release time t_R						
• For sensor typ.	ms	50 + deb. time	50 + deb. time	--	--	--
• For sensor max.	ms	--	--	50+ debounce	50+ debounce	≤ 30 adjustable
• For mains failure typ.	ms	75	--	75	--	--
• For mains failure max.	ms	125	300	125	320	100
Recovery time t_W						
• After sensor	ms	Min. 250		Min. 250	Min. 250	After time has elapsed
• After mains failure	s	Min. 200		Min. 600	Min. 200	Min. 200
Minimum command duration t_B						
• Sensor input	ms	30				Min. 25
• ON button	s	0.2 ... 5				Min. 25
• Cascading input	s	--				--
Simultaneity t_G	ms	∞				
Temperatures						
Permissible ambient temperature						
• During operation	°C	–25 ... +60				
• During storage	°C	–40 ... +80				
Safety specifications						
Safety integrity level SIL CL acc. to EN 61508 (11.02)		3				Stop cat. 0: 3 Stop cat. 1: 2
Performance level PL acc. to EN ISO 13849 (02.07)			e			--
Safety category CAT acc. to EN 954-1		4				Stop cat. 0: 4 Stop cat. 1: 3
Requirement category acc. to EN 574		--				
Probability of a dangerous failure						
• Per hour (PFH_D)	1/h	7.8×10^{-9}	7.8×10^{-9}	7.8×10^{-9}	7.8×10^{-9}	3×10^{-8}
• On demand (PFD)		--	--		--	--
Proof-test interval T1	a	20				
Environmental data						
EMC		EN 60947-5-1				
Vibrations acc. to EN 60068-2-6						
• Frequency	Hz	5 .. 500				
• Amplitude	mm	0.075				
Climatic withstand capability		EN 60068-2-1, EN 60068-2-2, EN 60068-2-14, EN 60068-2-30				
Clearances in air and creepage distances		EN 60947-1				

[1] Time-delayed enabling circuit: ≤ 300 ms adjustable.

With relay enabling circuits

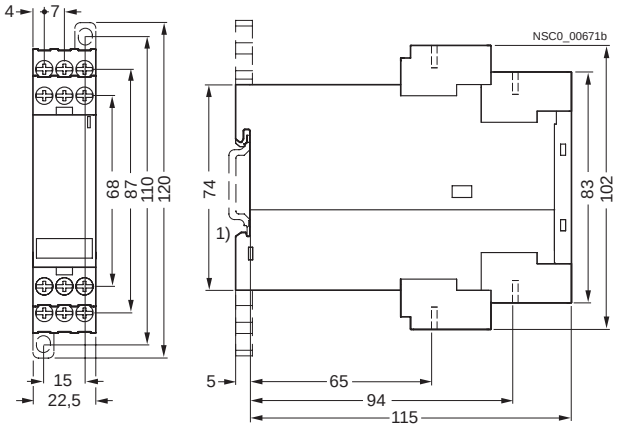
Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41	3TK28 26-.CW31
General data					
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508 IEC 574	
Test certificates		BG, SUVA , UL , CSA, TÜV			
Safety-oriented output contacts					
• Instantaneous FK_{rel}		2	4	2	4
• Time-delayed $FK_{rel\ (tv)}$		2	--	--	--
Safety-oriented semiconductor outputs					
• Instantaneous FK_{el}		--			
• Time-delayed $FK_{el\ (tv)}$		--			
Signaling contacts MK_{rel}		1		2	--
Semiconductor signaling outputs MK_{rel}		--			
Sensor inputs S		1	--	1	
Cascading inputs KAS/BS		--			
Degree of protection acc. to EN 60529					
• Enclosures		IP40	IP20		
• Terminals		IP20	IP20		
Shock resistance sine wave	g/ms	8/10			
Permissible mounting positions		Any			
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe			
Height	mm	106 (3TK28 30: 102): Screw terminals; 108 (3TK28 30: 104): Spring-loaded terminals			
Width	mm	45	22.5	45	
Depth	mm	115			
Weight	g	0.580	0.260	0.450	0.500
Connection type		**Screw terminals**			
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)			
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)			
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)			
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)			
• Tightening torque	Nm	0.8 ... 1.2			
Connection type		**Spring-loaded terminals**			
• Solid	mm^2	2 x (0.25 ... 1.5)			
• Finely stranded, with end sleeves acc. to DIN 46228	mm^2	2 x (0.25 ... 1.0)			
• Finely stranded	mm^2	2 x (0.25 ... 1.5)			
• Stripped length	mm	10			
Electrical specifications					
Rated control supply voltage U_s	V	24 ... 240AC/115/230			
Operating range					
• AC operation	V	0.85 ... 1.1 × U_s	0.85 ... 1.1 ×U_s	0.85 ... 1.1 × U_s	
• DC operation	V	0.85 ... 1.1 × U_s	0.85 ... 1.1 × U_s	0.85 ... 1.1 × U_s	
Measurement voltage	V	--			
Response value U_{resp}	mV	--			
Rated insulation voltage U_i					
• For control circuit	V	--			
• For outputs	V	300			
Rated impulse withstand voltage U_{imp}					
• For control circuit	V	--			
• For outputs	V	4000			
Rated power	W	3	2	3	
Frequency ranges	Hz	50/60			
Rated operational current I_e (relay outputs) at					
• AC-15 at 115 V	A	--	--	--	--
• AC-15 at 230 V	A	13/14, 23/24: 5 47/48, 57/58: 3	5 5	5	23/24, 33/34, 41/42: 5 13/14: 3
• DC-13 at 24 V	A	13/14, 23/24: 5 47/48, 57/58: 3	5 5	5	23/24, 33/34, 41/42: 5 13/14: 3
• DC-13 at 115 V	A	0.2	0.2	0.2	0.2
• DC-13 at 230 V	A	0.1	0.1	0.1	0.1
Rated operational current I_e (semiconductor outputs) at					
• DC-13 at 24 V	A	--			
• DC-13 at 230 V	A	--			

Type		3TK28 26-.BB40	3TK28 26-.CW30	3TK28 26-.BB41	3TK28 26-.CW31
Electrical specifications (continued)					
Electrical endurance	Operating cycles	10^5			
Mechanical endurance	Operating cycles	10^7			
Switching frequency z	1/h	1000			
Continuous thermal current I_{th}	A	5		5	5
Continuous thermal current I_{th}					
• 1 contact	A	--			
• 2 contacts	A	--			
• 3 contacts	A	--			
• 4 contacts	A	--			
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE, gL/gG operational class					
• gL/gG		6, control voltage: 2	6	6, control voltage: 2	
• Quick		10	10	10	
Maximum line resistance	Ω	30		--	
Cable length from terminal to terminal with Cu 1.5 mm2 and 150 nF/km	m	1000	3TK28 30-.CB30:1000 3TK28 30-.AJ20: 300 3TK28 30-.AJ20: 80	1000	--
Times					
Bridging of voltage dips, supply voltage (only internal, no outputs)	ms	30	3TK28 30-.CB30:10 3TK28 30-.A.20:35	40	
Make-time t_E					
• For automatic start typ.	ms	--	--	--	--
• For automatic start max.	ms	80	3TK28 30-.CB30: 30 3TK28 30-.A.20:200	100	50
		--	--	--	--
• For automatic start after mains failure typ.	ms	--	3TK28 30-.CB30: 30 3TK28 30-.A.20:200	--	--
• For automatic start after mains failure max.	ms				
• For monitored start typ.	ms	--	--	--	--
• For monitored start max.	ms	--	--	--	--
Release time t_R					
• For sensor typ.	ms	--	--	--	--
• For sensor max.	ms	Up to 30 adjustable	--	20	50
• For mains failure typ.	ms	--	--	--	--
• For mains failure max.	ms	100	3TK28 30-.CB20: 25 3TK28 30-.A.20: 80	--	--
Recovery time t_W					
• After sensor	ms	After time has elapsed	--	Min 250	Min. 250
• After mains failure	s	Min. 1	3TK28 30-.CB20: 50 3TK28 30-.A.20: 120	--	--
Minimum command duration t_B					
• Sensor input	ms	Min. 25	--		
• ON button	s	Min. 25	--		
• Cascading input	s	--	--		
Simultaneity t_G	ms	∞			
Temperatures					
Permissible ambient temperature					
• During operation	°C	–25 ... +60			
• During storage	°C	–40 ... +80			
Safety specifications					
Safety integrity level SIL CL acc. to EN 61508 (11.02)		Stop cat. 0: 3 Stop cat. 1: 2	3		
Performance level PL acc. to EN ISO 13849 (02.07)		--			
Safety category CAT acc. to EN 954-1		Stop cat. 0: 4 Stop cat. 1: 3	As basic unit	4	As basic unit
Requirement category acc. to EN 574		--	--	Type III C	As basic unit
Probability of a dangerous failure					
• Per hour (PFH_D)	1/h	3×10^{-8}	2.6×10^{-9}	3×10^{-8}	
• On demand (PFD)		--	--		-- --
Proof-test interval T1	a	20			
Environmental data					
EMC		EN 60947-5-1			
Vibrations acc. to EN 60068-2-6					
• Frequency	Hz	5 .. 500			
• Amplitude	mm	0.075			
Climatic withstand capability		EN 60068-2-1, EN 60068-2-2, EN 60068-2-14, EN 60068-2-30			
Clearances in air and creepage distances		EN 60947-1			

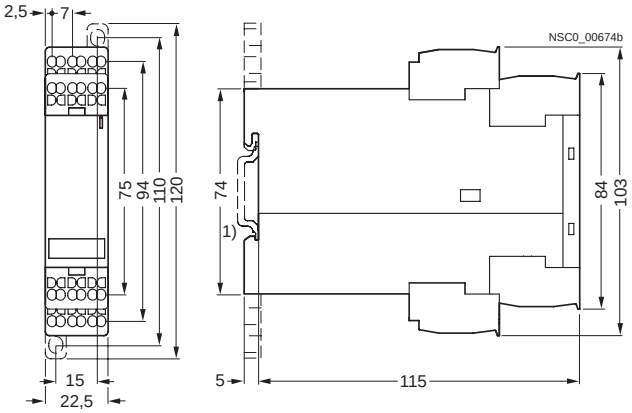
With relay enabling circuits

Dimenstional drawings

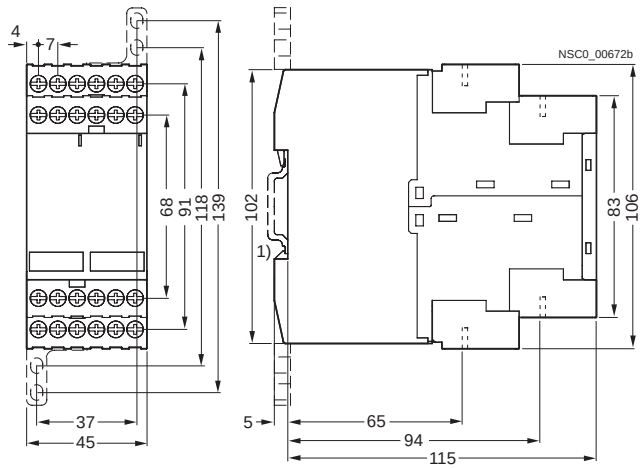
3TK28 21 to 3TK28 24, 3TK28 30 with screw terminals



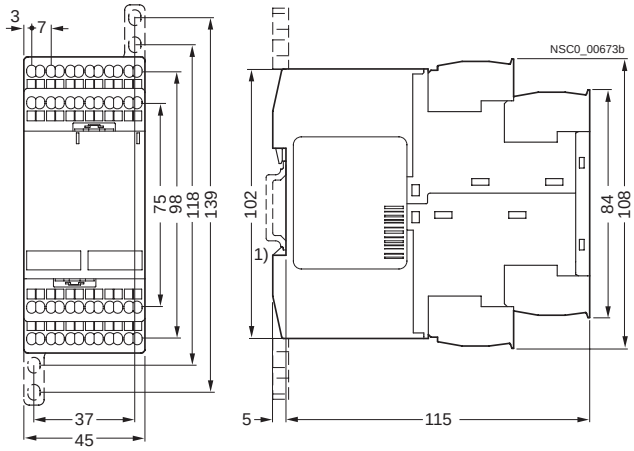
3TK28 21 to 3TK28 24, 3TK28 30 with spring-loaded terminals



3TK28 25 up to 3TK28 28, 3TK28 34, 3TK28 35 with screw terminals



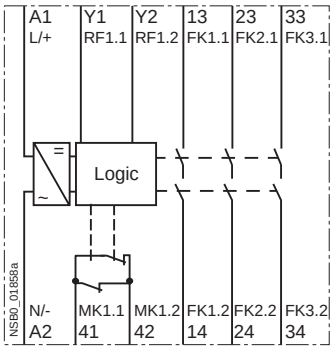
3TK28 25 up to 3TK28 28, 3TK28 34, 3TK28 35 with spring-loaded terminals



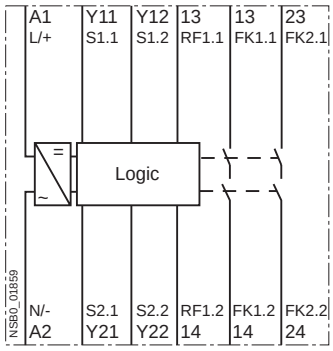
[1] **For standard mounting rail TH 35 according to EN 60715.**

Schematics

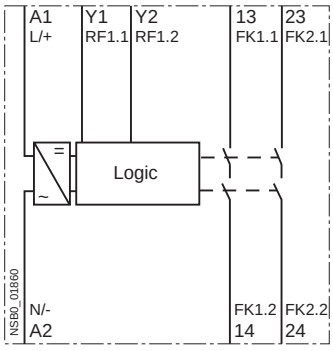
3TK28 21



3TK28 23



3TK28 24

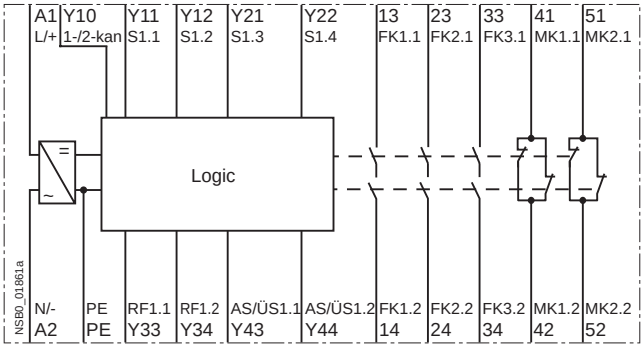


Legend

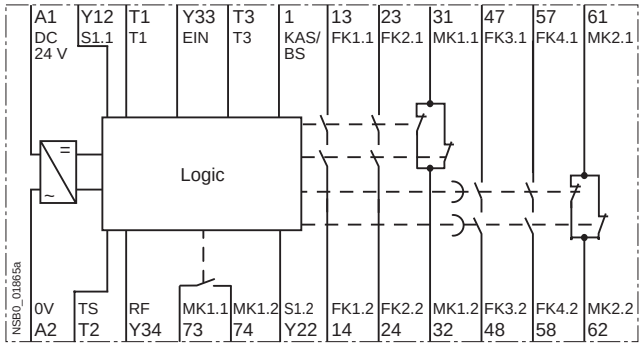
$FK_{x.x}$:	Enabling circuits
$S_{x.x}$:	Sensor terminals (test connectors)
$RF_{x.x}$:	Feedback circuit terminals
$MK_{x.x}$:	Indicating circuit terminals
PE:	PE conductor terminal
Tx:	Test signal terminal
ON:	Start signal terminal
1-/2-kan:	Parameter terminal switchover, one/two-channel
QS:	Parameter terminal with crossover monitoring (ON/OFF)
AS/ÜS:	Parameter terminal switchover, automatic/monitored start
KAS/BS:	Terminal, cascading input

Schematics

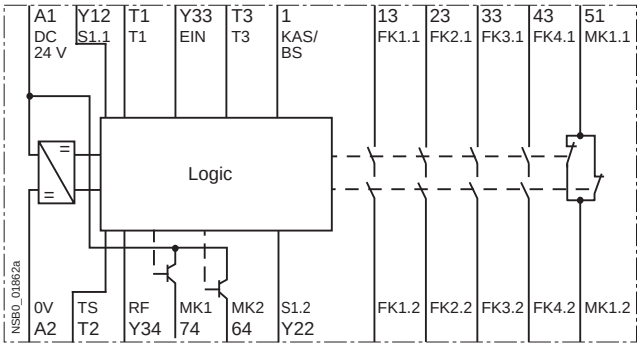
3TK28 25



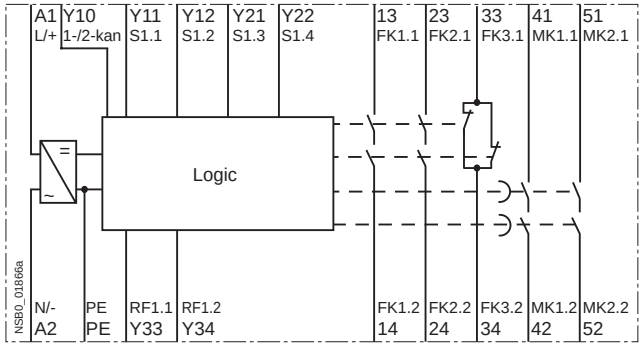
3TK28 26-.CW3.



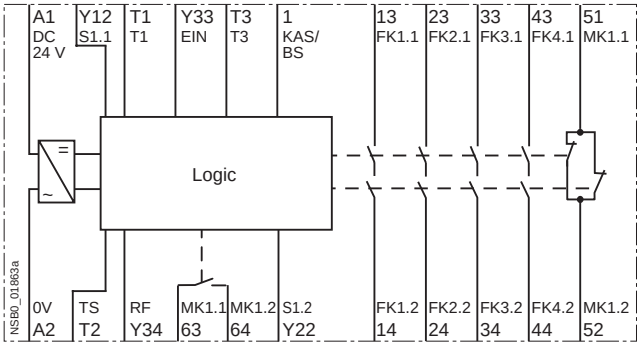
3TK28 26-.BB40



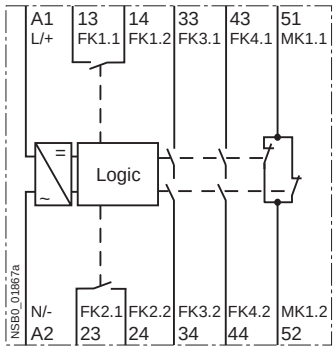
3TK28 27, 3TK28 28



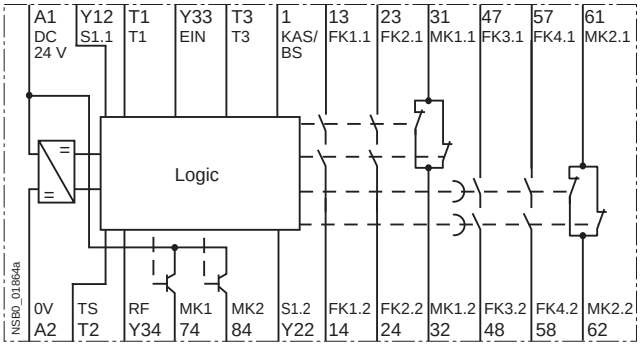
3TK28 26-.CW30



3TK28 30



3TK28 26-.BB4.



Legend

$FK_{x.x}$:	Enabling circuits
$Sx_{.x}$:	Sensor terminals (test connectors)
$RF_{x.x}$:	Feedback circuit terminals
$MK_{x.x}$:	Indicating circuit terminals
PE:	PE/ground conductor terminal
Tx:	Test signal terminal
ON:	Start signal terminal
1-/2-kan:	Parameter terminal switchover, one/two-channel
QS:	Parameter terminal with crossover monitoring (ON/OFF)
AS/ÜS:	Parameter terminal switchover, automatic/monitored start
KAS/BS:	Terminal, cascading input

With contactor relay enabling circuits

Design

The solid-state safety relays can be used in EMERGENCY-STOP devices according to EN 418 and in safety circuits according to EN 60204-1 (11.98), for example, for moving covers and protective doors. Depending on the device type and the external circuit, the maximum category that can be achieved is Category 4 of EN 954-1 or SIL 3 according to IEC 61508.

With these devices, solid-state safety relays are connected with contactor relays. The combination is supplied as a complete unit, fully wired up and tested, for snapping onto a standard mounting rail. This unit combines the advantages of a solid-state safety relay and those of contactor relays with positively-driven contacts in a single device. It has been certified by the appropriate authorities as a complete unit.

Basic units, Category 3

The 3TK28 50, 3TK28 51 and 3TK28 52 solid-state safety relays have two contactor relays snapped onto the safety solid-state unit as floating switching blocks. Three LEDs indicate the operating state and the function. During operation, all internal circuit elements are monitored cyclically for faults. Up to Category 3 according to EN 954-1 is achieved, depending on the external circuit.

Basic units, Category 4

The 3TK28 53 solid-state safety relay has two contactor relays snapped onto the safety solid-state units as floating switching blocks, as well as a safe solid-state output, a safe input for cascading and one input for normal switching duty. Three LEDs indicate the operating state and the function.

During start-up, the device runs through a self-test in which the internal electronics are checked for correct functioning. During operation, all internal circuit elements are monitored cyclically for faults.

Expansion units, namely 3TK28 30, 3TK28 56, 3TK28 57, 3RA7 11 to 3RA7 14, as well as external actuators or loads can be connected using the safe solid-state output (terminal 2). Cascading with the 3TK28 41, 3TK28 42, 3TK28 45 and 3TK28 53 safety relays as well as with the 3RA7 11 load feeder is also possible using the safe solid-state output (terminal 2).

Mounting

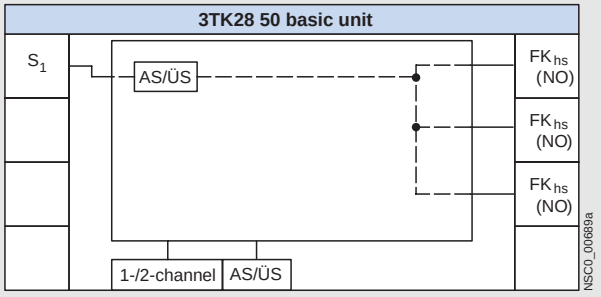
For snap-on mounting on TH 35 standard mounting rail according to EN 60715. Screw mounting is also possible for the devices by means of 2 additional 3RP19 03 push-in lugs.

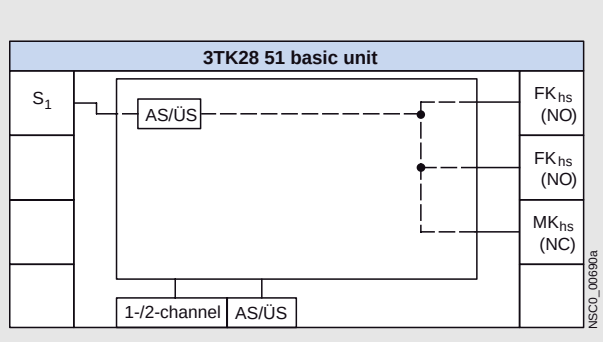
Function

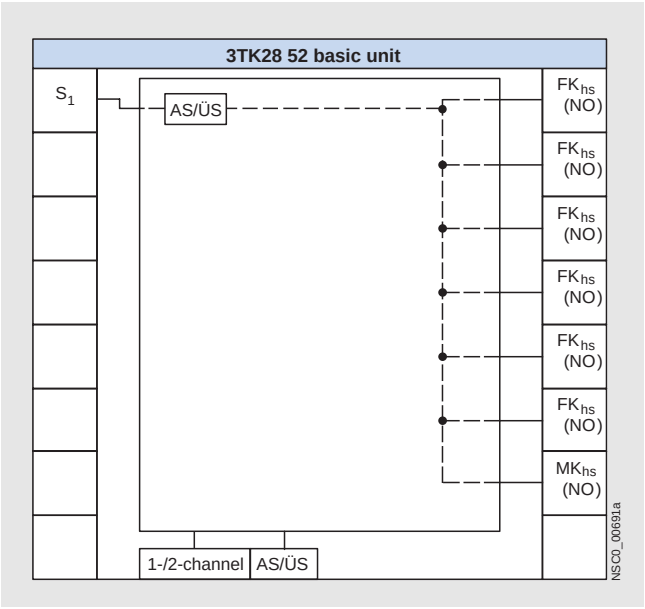
Basic units

3TK28 50 to 3TK28 52

The devices 3TK28 50 to 3TK28 52 each have one sensor input and a varying number of contactor relay enabling circuits and signaling outputs. If the signal is no longer applied to the sensor input, the enabling circuits are isolated immediately.







Legend

Sensor interface

S_x:	Sensor input

Safety logic

AS/ÜS:	Automatic or monitored start depending on the parameterization

Parameters

1-/2-channel:	One-channel / two-channel sensor connection
AS/ÜS:	Automatic or monitored start depending on the parameterization

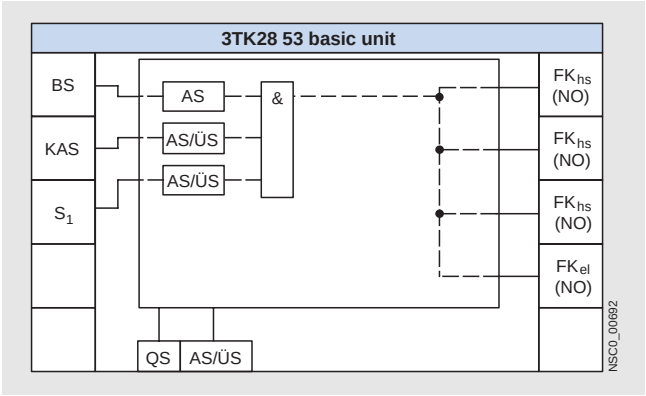
Actuator interface

FK_{hs}:	Enabling circuit, contactor relay (floating)
MK_{hs}:	Signaling circuit, contactor relay (floating)
NO:	NO contact
NC:	NC contact

Basic units

3TK28 53

The 3TK28 53 has one sensor input and one input for normal switching duty and one cascading input. On the output side is a varying number of solid-state enabling circuits or contactor relay enabling circuits. If the signal is no longer applied to one of the inputs, the enabling circuits are isolated immediately. Autostart or monitored start can be selected in the parameterization.



Legend

Sensor interface

S_x:	Sensor input
KAS/BS:	Cascading input or normal switching duty. Normal switching duty: Connection of a PLC output for example. The enabling circuits and hence the connected loads can then be operated by the machine control. The safety function is on a higher level.

Safety logic

AS:	Automatic start. Device starts automatically once the enabling conditions are fulfilled. If a START button is integrated in the feedback circuit, a manual start is also possible (up to Category 3 according to EN 954-1).
AS/ÜS:	Automatic or monitored start depending on the parameterization

Parameters

QS:	With or without crossover monitoring
AS/ÜS:	Automatic or monitored start depending on the parameterization
	Time delay, OFF-delay

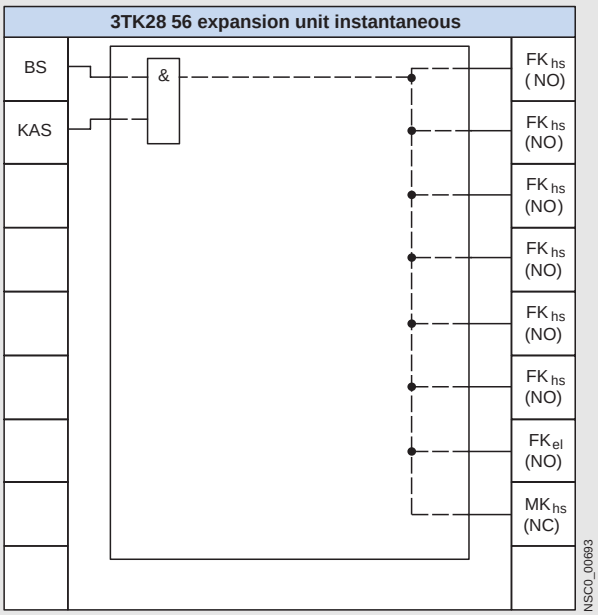
Actuator interface

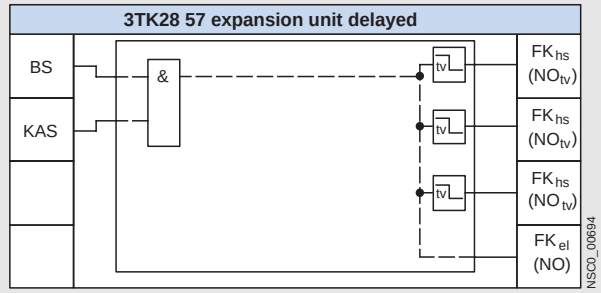
FK_{el}:	Enabling circuit, solid-state (non-floating)
FK_{hs}:	Enabling circuit, contactor relay (floating)
MK_{hs}:	Signaling circuit, contactor relay (floating)
NO:	NO contact
NO_{tv}:	NO contact, time-delayed
NC:	NC contact

Expansion units

3TK28 56 and 3TK28 57

The 3TK28 56 and 3TK28 57 devices each have one one input for normal switching duty and one cascading input. On the output side is a varying number number of solid-state enabling circuits or contactor relay enabling circuits and signaling outputs. If the signal is no longer applied to one of the inputs, the enabling circuits are isolated immediately or according to the set delay time.





5a

With contactor relay enabling circuits

Technical specifications

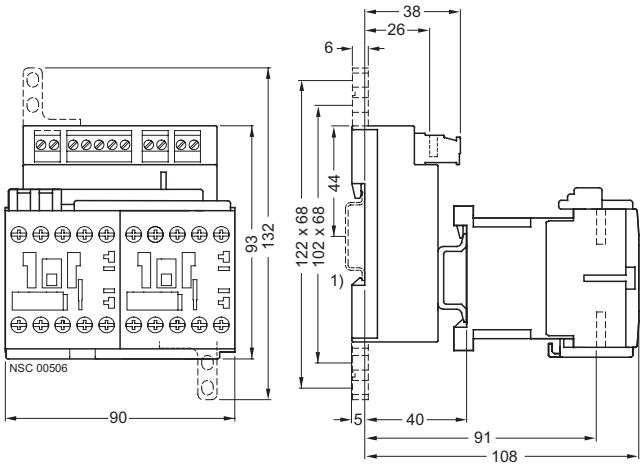
Type		3TK28 50	3TK28 51	3TK28 52	3TK28 53	3TK28 53-0AB1	3TK28 56	3TK28 57
General data								
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508						
Test certificates		TÜV, UL, CSA						
Safety-oriented output contacts								
• Instantaneous FK_{rel}		3	2	6	3	6		3
• Time-delayed $FK_{rel\ (tv)}$		--	--	--	--	--		--
Safety-oriented semiconductor outputs								
• Instantaneous FK_{el}		--			1			
• Time-delayed $FK_{el\ (tv)}$		--			--			
Signaling contacts MK_{rel}		--	1		--	1		--
Semiconductor signaling outputs MK_{rel}		--						
Sensor inputs S		1					--	
Cascading inputs KAS/BS		--			2			
Degree of protection acc. to EN 60529								
• Enclosures		IP20						
• Terminals		IP20						
Shock resistance sine wave	g/ms	5/11					8/10 and 15 /5	
Permissible mounting positions		Any						
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe						
Height	mm	89						
Width	mm	90						
Depth	mm	112		150	112		150	112
Weight	g	0.850			0.750			
Connection type		**Screw terminals**						
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)						
• Solid	mm^2	1 x (0.2 ... 2.5) / 2 x (0.2 ... 1.0)						
• Finely stranded with end sleeve	mm^2	1 x (0.25 ... 2.5) / 2 x (0.25 ... 1.0)						
• AWG cables, solid or stranded	AWG	2 x (24 ... 12)						
• Tightening torque	Nm	0.8 ... 1.2						
Electrical specifications								
Rated control supply voltage U_s	V	24 DC, 24/115/230 AC			24 DC			
Measurement voltage	V	--						
Response value U_{resp}	mV	--						
Operating range								
• AC operation	V	0.9 ... 1.15 x U_s			--			
• DC operation	V	0.85 ... 1.1 x U_s			0.85 ... 1.1 x U_s			
Rated insulation voltage U_i								
• For control circuit	V	50						
• For outputs	V	690						
Rated impulse withstand voltage U_{imp}								
• For control circuit	V	500						
• For outputs	V	6000						
Rated power at U_s	W	8.5						
Frequency ranges	Hz	50/60			--			
Rated operational current I_e (relay outputs) at								
• AC-15 at 115 V	A	--		--	--			--
• AC-15 at 230 V	A	6		6	--			--
• DC-13 at 24 V	A	10		10, Auxiliary switch blcoks: 6	10			10, Auxiliary switch blcoks: 6
• DC-13 at 115 V	A	--		--	--			--
• DC-13 at 230 V	A	--		--	--			--
Rated operational current I_e (semiconductor outputs) at								
• DC-15 at 24 V	A	--						
• DC-15 at 230 V	A	--						

Type		3TK28 50	3TK28 51	3TK28 52	3TK28 53	3TK28 53-0AB1	3TK28 56	3TK28 57
Electrical specifications (continued)								
Electrical endurance	Operating cycles	See "3RH1 Characteristic Curves"						
Mechanical endurance	Operating cycles	3 x 10^7						
Switching frequency z	1/h	10^3						
Continuous thermal current I_{th}	A	--						
Continuous thermal current I_{th}								
• 1 contact	A	--						
• 2 contacts	A	--						
• 3 contacts	A	--						
• 4 contacts	A	--						
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE class								
• gL/gGt	A	10						
• Quick	A	--						
Maximum line resistance	Ω	250			500			
Cable length from terminal to terminal with Cu 1.5 mm² and 150 nF/km	m	2000						
Times								
Bridging of voltage dips, supply voltage (only internal, no outputs)	ms	5						
Make-time t_E								
• For automatic start typ.	ms	100			60		--	
• For automatic start max.	ms	200			100		--	
• For automatic start after mains failure typ.	ms	350			6000		6000	
• For automatic start after mains failure max.	ms	500			7000		7000	
• For monitored start typ.	ms	60			60		--	
• For monitored start max.	ms	100			100		--	
Release time t_R								
• For sensor typ.	ms	30			50			--
• For sensor max.	ms	50			60			300 adjustable
• For mains failure typ.	ms	100			120			120
• For mains failure max.	ms	120			120			120
Recovery time t_W								
• After sensor	ms	20			500			
• After mains failure	s	0.02			7			
Minimum command duration t_B								
• Sensor input	ms	20			45		--	
• ON button	s	20			0.2 ... 5		--	
• Cascading input	s	20			45		45	
Simultaneity t_G	ms	∞						
Temperatures								
Permissible ambient temperature								
• During operation	°C	–25 ... +60						
• During storage	°C	–40 ... +80						
Safety specifications								
Safety integrity level SIL CL acc. to EN 61508 (11.02)		2			3			
Performance level PL acc. to EN ISO 13849 (02.07)		d			e		--	
Safety category CAT acc. to EN 954-1		3			4		As basic unit	
Requirement category acc. to EN 574		--						
Probability of a dangerous failure								
• Per hour (PFH_D)	1/h	1.3 x 10^{-8}	1.4 x 10^{-8}	1.6x 10^{-8}	5 x 10^{-11}		9.8 x 10^{-11}	
• On demand (PFD)	--	--	--	--	--		--	
Proof-test interval T1	a	10						
Environmental data								
EMC		IEC 60947-5-1, IEC 60000-4-3, IEC 60000-4-5, IEC 60000-4-6						
Vibrations acc. to EN 60068-2-6								
• Frequency	Hz	5 .. 500						
• Amplitude	mm	0.075						
Climatic withstand capability		EN 60068-2-78						
Clearances in air and creepage distances		EN 60947-1						

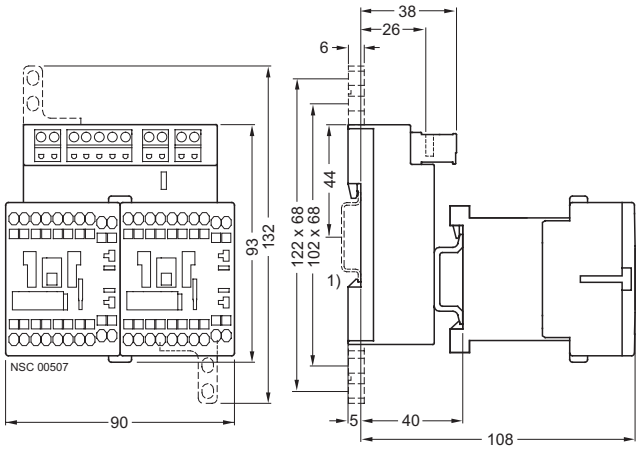
With contactor relay enabling circuits

Dimenstional drawings

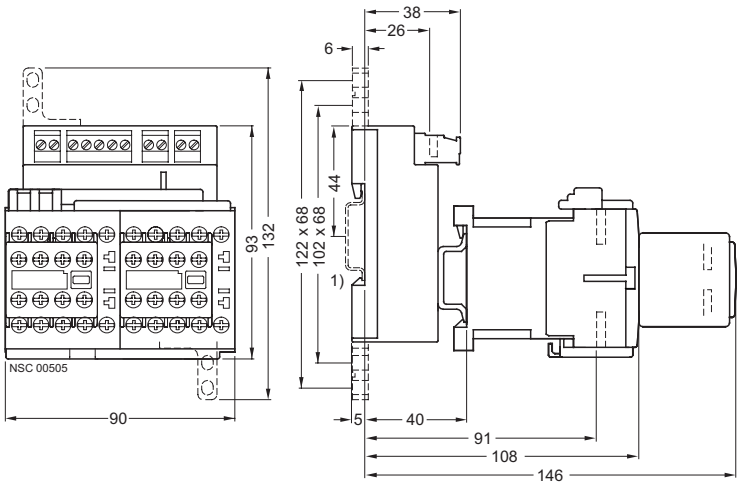
3TK28 50, 3TK28 51, 3TK28 53, 3TK28 57 with screw terminals



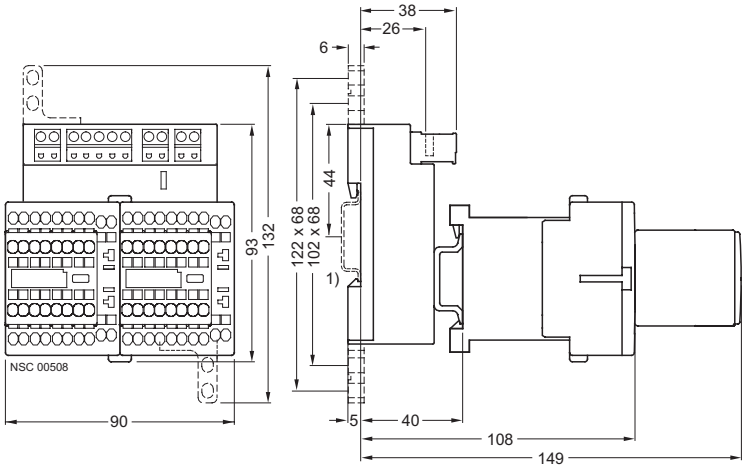
3TK28 50, 3TK28 51, 3TK28 53, 3TK28 57 with spring-loaded terminals



3TK28 52, 3TK28 56 with screw terminals



3TK28 52, 3TK28 56 with spring-loaded terminals



[1] For standard mounting rail TH 35 according to EN 60715.

Design

The 3TK28 10 safety relays with special functions operate with internal contactor relays with positively-driven contacts.

In a redundant circuit, operation of the internal controls is monitored. If a safety relay fails, it will always switch to the de-energized and consequently safe state. The fault is detected and the safety relay can no longer be switched on.

Enabling contacts (FK)

Safety related operation must be performed by safe output contacts, known as enabling contacts. Enabling contacts are always NO contacts and switch without delay.

Signaling contacts (MK)

NC contacts are used as signaling contacts but they are not permitted to perform functions with relevance for safety. An enabling contact can also be used as a signaling contact. A signaling contact cannot, however, be used as an enabling contact.

Expansion units

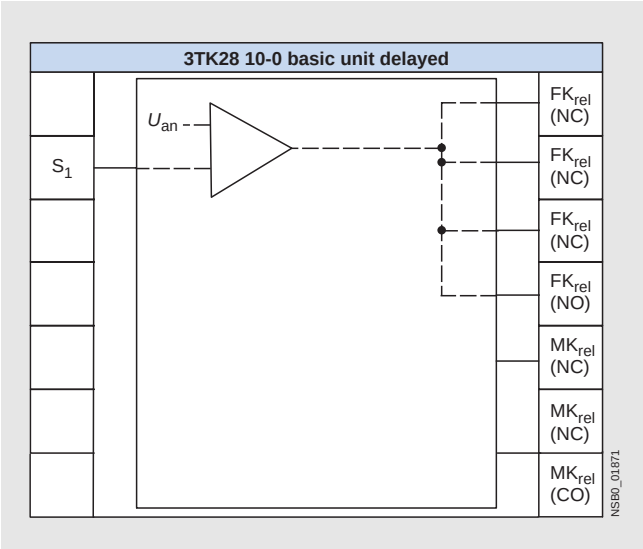
If the enabling contacts of the basic unit are inadequate, expansion units can be used. An expansion unit has 4 enabling contacts. Expansion units are not allowed to be operated separately in safety related switching circuits; they must be combined with a basic unit. One enabling contact of the basic unit is required for connecting an expansion unit. The category of a control system with expansion unit corresponds to that of the basic unit.

Function

3TK28 10-0 standstill monitor

The 3TK2810-0 safe standstill monitor measures a voltage of the decelerating motor, which is induced by residual magnetism, at 3 terminals of the stator winding. When the induction voltage approximates to 0, the monitor interprets this to mean that the motor has stopped and the output relay is activated. To be able to adapt the monitor to different motors and applications, it is possible to adjust the voltage threshold U_{an} below which the 3TK2810-0 detects a stoppage. Also adjustable is the length of time over which U_{an} must be undershot in order for a stoppage to be detected and the output circuit enabled (downtime t_s).

The device also detects wire breaks between the measuring inputs L1/L2/L3. If a wire break is detected, the output relay will adopt the safe position (the same as with a running motor).



Legend

Sensor interface

S_x: Sensor input

Actuator interface

FK_{rel}: Enabling circuit, relay contact (floating)
MK_{el}: Signaling circuit, solid-state output (non-floating)
MK_{rel}: Signaling circuit, relay contact (floating)
NO: NO contact
NC: NC contact
CO: Changeover contact

With special functions

Technical specifications

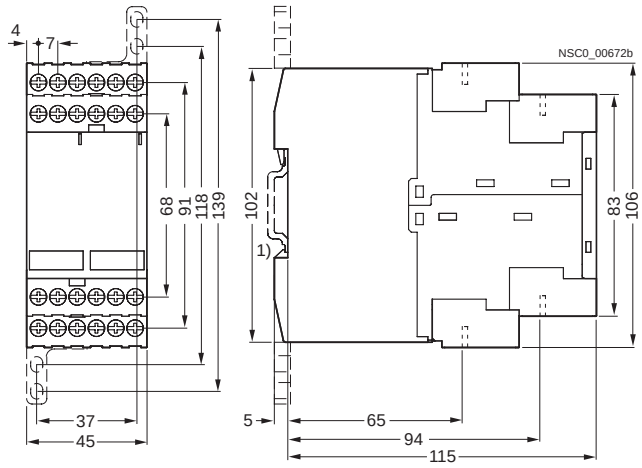
Type		3TK28 10
General data		
Standards		EN 60204-1, EN ISO 12100, EN 954-1, IEC 61508
Test certificates		TÜV, UL, CSA
Safety-oriented output contacts		
• Instantaneous FK_{el}		4
• Time-delayed $FK_{el\ (tv)}$		--
Safety-oriented semiconductor outputs		
• Instantaneous FK_{el}		--
• Time-delayed $FK_{el\ (tv)}$		--
Signaling contacts MK_{rel}		1
Semiconductor signaling outputs MK_{rel}		2
Sensor inputs S		1
Cascading inputs KAS/BS		--
Degree of protection acc. to EN 60529		
• Enclosures		IP40
• Terminals		IP20
Shock resistance sine wave	g/ms	8/10
Permissible mounting positions		Any
Touch protection Acc. to DIN VDE 0106 Part 100 or EN 60900		Finger-safe
Height	mm	106: Screw terminals; 108: Spring-loaded terminals
Width	mm	45
Depth	mm	116
Weight	g	0.500
Connection type		**Screw terminals**
• Terminal screw		M 3 (standard screwdriver, size 2 and Pozidriv 2)
• Solid	mm^2	1 x (0.5 ... 4) / 2 x (0.5 ... 2.5)
• Finely stranded with end sleeve	mm^2	1 x (0.5 ... 2.5) / 2 x (0.5 ... 1.5)
• AWG cables, solid or stranded	AWG	2 x (24 ... 16)
• Tightening torque	Nm	0.8 ... 1.2
Electrical specifications		
Rated control supply voltage U_s	V	24 DC, 230/400 AC
Operating range		
• AC operation	V	0.8 ... 1.1 x U_s
• DC operation	V	0.9 ... 1.15 x U_s
Measurement voltage	V	Max. 690
Response value U_{resp}	mV	20 ... 400 adjustable
Rated insulation voltage U_i		
• For control circuit	V	300
• For outputs	V	690
Rated impulse withstand voltage U_{imp}		
• For control circuit	V	6/4
• For outputs	V	6
Rated power at U_s	W	3
Frequency ranges	Hz	50/60
Rated operational current I_e (relay outputs) at		
• AC-15 at 115 V	A	--
• AC-15 at 230 V	A	3 (NO contacts); 2 (NC contacts)
• DC-13 at 24 V	A	2
• DC-13 at 115 V	A	--
• DC-13 at 230 V	A	--
Rated operational current I_e (semiconductor outputs) at		
• DC-13 at 115 V	A	0.1
• DC-13 at 230 V	A	--

Type		3TK28 10
Electrical specifications (continued)		
Electrical endurance	Operating cycles	2 x 10^5
Mechanical endurance	Operating cycles	5 x 10^7
Switching frequency *z*	1/h	1200
Continuous thermal current I_{th}	A	5, summation current max. 8
Continuous thermal current I_{th}		
• 1 contact	A	5
• 2 contacts	A	5
• 3 contacts	A	5
• 4 contacts	A	--
Fusing for output contacts Fuse links LV HRC Type 3NA, DIAZED Type 5SB, NEOZED Type 5SE class		
• gL/gGt	A	--
• Quick	A	5
Maximum line resistance	Ω	--
Cable length from terminal to terminal with Cu 1.5 mm^2 and 150 nF/km	m	--
Times		
Release time t_R		
• For sensor typ.	ms	--
• For sensor max.	ms	6 adjustable
• For mains failure typ.	ms	--
• For mains failure max.	ms	--
Simultaneity t_G	ms	∞
Temperatures		
Permissible ambient temperature		
• During operation	°C	–25 ... +60
• During storage	°C	–40 ... +75
Safety specifications		
Safety integrity level SIL CL acc. to EN 61508 (11.02)		3
Performance level PL acc. to EN ISO 13849 (02.07)		--
Safety category CAT acc. to EN 954-1		4
Requirement category acc. to EN 574		--
Probability of a dangerous failure		
• Per hour (PFH_D)	1/h	1.49 x 10^{-9}
• On demand (PFD)	--	--
Proof-test interval T1	a	20

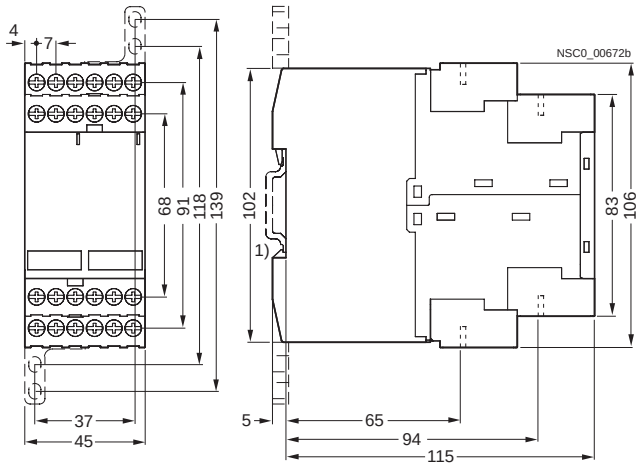
With special functions

Dimenstional drawings

3TK28 10
with screw terminals



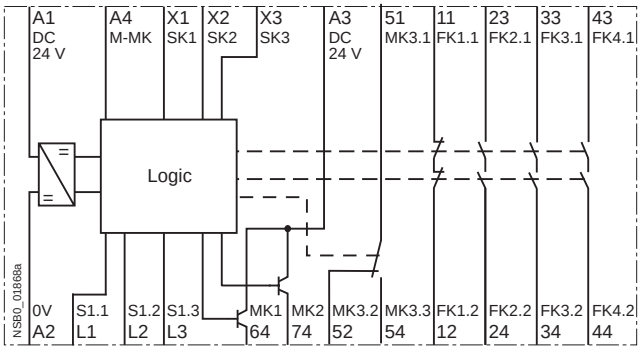
3TK28 10
with spring-loaded terminals



[1] For standard mounting rail TH 35 according to EN 60715.

Schematics

3TK28 10-0BA0.



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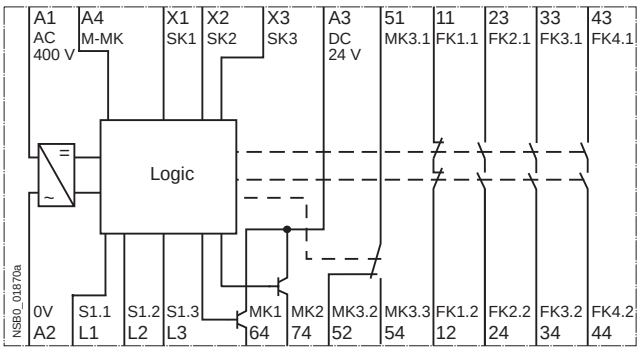

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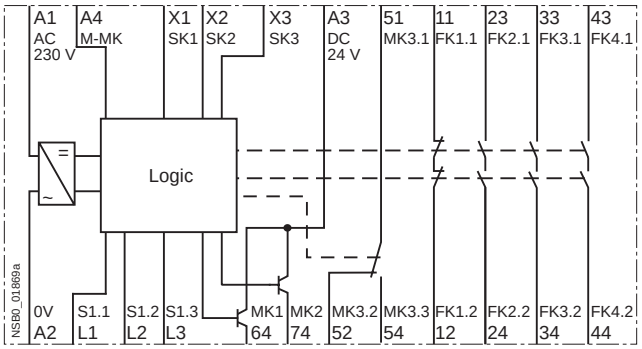

Legend

$FK_{x.x}$:	Enabling circuits
$MK_{x.x}$:	Indicating circuit terminals
MK_{MK}:	Ground signaling circuits
$S_{x.x}$:	Sensor terminals (test connectors)
SK_x:	Control terminals

Notes

Notes

Notes

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