Load Feeders, Motor Starters and Soft Starters

6

Introduction

Overview


3RW30


3RW40


3RW44


3RA11


3RA12


3RA71

		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 - Ventilators - Compressors and coolers		
3RW30, 3RW31	• SIRIUS 3RW30/31 soft starters for soft starting and smooth ramp-down of three-phase asynchronous motors • Rating range of up to 55 kW (at 400 V)	3RW30, 3RW31	6/5
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 • Rating range from 75 to 250 kW (at 400 V)	3RW40	6/12
For High-Feature applications	• Application areas - Pumps - Compressors - Industrial refrigerating systems - Conveying systems - Machine tools - Ventilators - 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 • Rating range - up to 710 kW (at 400 V) in inline circuit and - up to 1200 kW (at 400 V) in inside-delta circuit	3RW44	6/22
3RA fuseless load feeders			
	• The 3RA1 fuseless load feeders consist of the 3RV1 motor starter protector and the 3RT1 contactor. The motor starter protector and contactor are prewired and mechanically connected in pre-assembled installation sets (link modules, wiring sets and standard mounting rail or busbar adapters). The motor starter protector and contactor are mechanically and electrically connected by means of the link module • 4 sizes (S00, S0, S2, S3) • Can be supplied for direct start or reversing duty as - complete unit or - single units for self-assembly		
3RA11 combination starters, direct-on-line			
For snapping onto a standard mounting rail or for screw mounting	• Rated control supply voltage 50 Hz 230 V AC and 24 V DC for 35 mm standard mounting rail or screw mounting	3RA11	6/48
For busbar systems	• Rated control supply voltage 50 Hz 230 V AC and 24 V DC for 40 mm and 60 mm busbar systems	3RA11	6/48
3RA12 reversing starters			
For snapping onto a standard mounting rail or for screw mounting	• Rated control supply voltage 230 V AC, 50 Hz and 24 V DC for 35 mm standard mounting rail or screw mounting	3RA12	6/48
For busbar systems	• Rated control supply voltage 50 Hz 230 V AC and 24 V DC for 40 mm and 60 mm busbar systems	3RA12	6/48
Infeed system			
3RV19 infeed system	• Convenient means of power supply and distribution	3RV19	6/68
3RA71 load feeders with safety integrated			
Fuseless load feeders	• Safe load feeders for direct start • Actuating voltage 230 V AC, 50/60 Hz • Actuating voltage 24 V DC	3RA71	6/77
Fused load feeders	• Safe load feeders for direct start • Actuating voltage 230 V AC, 50/60 Hz • Actuating voltage 24 V DC	3RA71	6/77


3RK1 322


3RA51


3RA52


3RK1 301


3RK1 304


3RE10

		Order No.	Page
AS-Interface motor starters and soft starters			
Motor starters and load feeders IP65/67			
AS-Interface ompact starters (400 V AC)	• Completely factory-wired load feeders with degree of protection IP65, designed for switching and protecting any type of three-phase loads, in particular standard induction motors in direct-on-line or reversing duty	3RK1 322	6/81
AS-Interface motor starters (24 V DC)	• For the lowest power range up to 70 W, 24 V DC motors and the associated sensor systems can also be directly and locally connected to AS-Interface quickly and easily. Three different versions are available: - Single direct-on-line starter - Double direct-on-line starter - Reversing starter	3RK1 400-1	6/83
IP20 motor starters and load feeders			
	• Quick and cost-effective connection of motor starters to higher-level automation systems • For busbar systems with a busbar center-to-center distance of 40 mm and 60 mm • Completely factory-wired and adaptable to busbar systems		
Combination starters for busbar systems, direct-on-line	• For direct start, a load can be switched on and off with the load feeder	3RA51	6/86
Reversing starters for busbar systems	• The feeder for reversing duty is designed for two directions of rotation of induction motors	3RA52	6/86
ET 200S motor starters			
ET 200S motor starters	• Completely factory-wired motor starters for switching and protecting any three-phase loads, optionally as direct-on-line, reversing or soft starters	3RK1 301	6/88
Power modules for ET 200S motor starters	• For supplying and monitoring the auxiliary voltages for motor starters	3RK1 903-0BA00	6/95
Terminal modules for ET 200S motor starters	• Mechanical modules in which the motor starter and expansion modules are inserted	3RK1 903	6/96
Interface/ solid-state modules	• Interface modules, power modules, reserve modules, digital/analog solid-state modules, F power and F solid-state modules, F terminal modules, 4 IQ-Sense sensor module, SSI module, 1 STEP step module, positioning modules, counter modules, terminal modules for power and solid-state modules	6ES7 1	LV 1
ET 200S Safety motor starters Solutions local / PROFIsafe			
ET 200S Failsafe motor starters	• High-Feature direct-on-line and reversing starters	3RK1 301	6/99
Safety modules local	• For safety category 4 according to EN 954-1	3RK1 903	6/102
Safety modules PROFIsafe	• Sensor and actuator assignment are freely configurable (distributed safety concept)	3RK1 903	6/109
ET 200pro motor starters			
ET 200pro motor starters	• Standard and High-Feature	3RK1 304	6/114
ET 200pro isolator modules	• With switch disconnector function for safe disconnection	3RK1 304	6/116
Safety modules local	• Isolator module and 400 V disconnecting module	3RK1 304	6/117
Accessories for ET 200pro motor starters	• Interface, expansion and power modules	6ES7 1	LV 1
ET 200X motor starters			
ET 200X motor starters	• For switching and protection of any three-phase loads • Direct-on-line or reversing starters, electromechanical or solid-state	3RK1 300	6/119
Basic/ expansion modules	• Intelligent basic modules, ECOFAST basic modules, PM 148 power module, digital/analog expansion modules, PM 148-P pneumatic module, PM 148-P pneumatic interface	6ES7 14	LV 1
ECOFAST motor starters and soft starters			
3RK1 3 ECOFAST motor starters and soft starters	• Distributed motor starters for PROFIBUS and AS-Interface • Functionality ranges from direct-on-line starters, through reversing starters and soft starters as far as frequency converters	3RK1 3	LV 1
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 combination starters, direct-on-line	• Molded-plastic enclosure, degree of protection IP65, including contactor	3RE10	6/122
3RE13 reversing starters	• Molded-plastic enclosure, degree of protection IP65, including contactor assembly	3RE13	6/122
Accessories	• Molded-plastic enclosure, degree of protection IP65, for direct-on-line and reversing starters	3RE19	LV 1

General data

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 3RW30/31 Standard applications	SIRIUS 3RW40	SIRIUS 3RW44 High-Feature applications
Rated current up to 40 °C	A	3 ... 100	134 ... 432	29 ... 1214
Rated operational voltage	V	200 ... 575	200 ... 600	200 ... 690
Motor rating at 400 V				
• Inline circuit	kW	1.1 ... 55	75 ... 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		–	–	✔
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		–	–	✔
Adjustable current limiting		–	✔	✔
Inside-delta circuit		–	–	✔
Breakaway pulse		–	–	✔
Creep speed in both directions		–	–	✔
Pump ramp-down		–	–	✔[7)]
DC braking		–	–	✔[3)7)]
Combined braking		–	–	✔[3)7)]
Motor heating		–	–	✔[4)]
Communication		–	–	with PROFIBUS DP[4)] (option)
External display and operator module		–	–	(option[4)])
Operating measured value display		–	–	✔
Error logbook		–	–	✔[4)]
Event list		–	–	✔[4)]
Slave pointer function		–	–	✔[4)]
Trace function		–	–	✔[5)]
Programmable control inputs and outputs		–	–	✔
Number of parameter sets		1 (2 with 3RW31)	1	3
Parameterization software (Soft Starter ES)		–	–	✔[4)]
Power semiconductors (thyristors)		2 controlled phases	2 controlled phases	3 controlled phases
Spring-loaded terminals		✔ (only 3RW30 03)	✔	✔
Screw terminals		✔	✔	✔
UL/CSA		✔[6)]	✔	✔
CE marking		✔	✔	✔
Soft starting under heavy starting conditions		–	–	✔[7)]
Configuring support		Win-Soft Starter, the electronic selection slider ruler, Technical Assistance ++49 911 895 5900		

✔ Function is available
– Function not available

1) Only soft starting available for 3RW31.
2) Not available for 3RW30 03.
3) Not possible in inside-delta circuit.
4) Start of delivery 2006.
5) Trace function with Soft Starter ES software.
6) For 3RW30 03 up to 230 V.
7) Calculate soft starter and motor with size allowance where required.

More information can be found on the Internet at
http://www.siemens.com/sanftstarter

Overview

Various versions of the 3RW30/31 SIRIUS soft starters are available:

- Standard version for fixed frequency three-phase motors, sizes S00, S0, S2 and S3
- Version for fixed-speed three-phase motors in a 22.5 mm enclosure
- Special-purpose version 3RW31 for Dahlander motors only in size S0
- Version for soft starting single-phase motors of sizes S0, S2 and S3.

SIRIUS 3RW30/31 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. The special feature of the 3RW31 series is that it allows independent definition of two separate acceleration ramps (Dahlander motors).

SIRIUS 3RW30 for single-phase motors

The additional version for standard applications in single-phase networks. Its voltage edge function reduces the motor's inrush current and effectively lowers the torque at the point of starting up. The load and the supplying network are thus protected.

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 UC and 110 to 230 V UC
- Wide temperature range from -25 °C to +60 °C
- Integrated bypass contacts to minimize dissipated power.
- Two built-in auxiliary contacts in sizes S0, S2 and S3 ensure user-friendly control and possible further processing within the system (see status graphs on page 6/11).

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		Hz	50 ... 60 ±10 %			
Permissible installation altitude	Reduction of I_e					
	• Up to 1000 m above sea level	%	100			
	• Up to 2000 m above sea level	%	92			
	• Up to 3000 m above sea level	%	85			
	• Up to 4000 m above sea level[1)]	%	78			
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°)		

1) At an altitude from 2000 m, the max. permissible operational voltage for all 3RW30 is reduced to 460 V.

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3RW30, 3RW31
for standard applications

Type Size			3RW30 03	3RW30 1. S00	3RW30 2. S0	3RW30 3. S2	3RW30 4. S3
Continuous operation (% of I_e)		%	100				
Minimum load[1] (% von I_e); at 40 °C		%	9	4			
Permissible ambient temperature							
	• Operation	°C	-25 ... +60 (derating from 40 °C, see load rating)				
	• Storage	°C	-25 ... +80				
Switching capacity of the auxiliary contacts	230 V/AC-15	A	No auxiliary 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 I_e								
• According to IEC for individual mounting	at 40/50/60 °C, AC-53b	A	--	6/5/4	9/8/7	12.5/11/9	16/14/12	25/21/18
• According to UL/CSA for individual mounting	at 40/50/60 °C, AC-53b	A	--	4.8/4.8/4	7.8/7.8/7	11/11/9	17.5/14/12	25/21/18
• According to IEC/UL/CSA for individual mounting	at 40/50/60 °C, AC-53a	A	3 / 2.6 / 2.2	--				
• According to IEC/UL/CSA for butt-mounting	at 40/50/60 °C, AC-53a	A	2.6 / 2.2 / 1.8	--				
Power loss At uninterrupted rated operational current (40 °C) approx. At utilization of max. operating frequency		W W	6.5 3	5 5	7 6	7 7	9 8	13 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
Pause intervals after continuous duty With I_e before a new start		s	0					200
Degree of protection	according to IEC 60529		IP20 (IP00 terminal enclosure)					
Maximum conductor length between soft starter and motor		m	100[1]					
Conductor cross-sections								
Screw terminals (1 or 2 conductors connectable) For standard screwdriver size 2 and Pozidriv 2	• **Main conductors**							
	- Solid	mm²	1 x (0.5 ... 4); 2 x (0.5 ... 2.5)	2 x (0.5 ... 1.5); 2 x (0.75 ... 2.5)		2 x (1 ... 2.5) 2 x (2.5 ... 6)		
	- 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 x (2.5 ... 6)		
	- Stranded	mm²	--	--		--		
	- AWG conductors, 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 lb.in	0.8 ... 1.2 7.1 ... 8.9	7 ... 10.3		2 ... 2.2 18 ... 22		
	• **Auxiliary conductors**							
	- Solid	mm²	1 x (0.5 ... 4); 2 x (0.5 ... 2.5)	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5) according to IEC 60947; max. 2 x (0.75 ... 4)				
	- Finely stranded with end sleeve	mm²	1 x (0.5 ... 2.5) 2 x (0.5 ... 1.5)	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5)				
	- AWG conductors, solid or stranded	AWG	2 x (20 ... 14)	2 x (18 ... 14)				
	- Terminal screws		M3, PZ2					
	- Tightening torque	Nm lb.in	0.8 ... 1.2 7 ... 8.9	0.8 ... 1 7.1 ... 8.9				
Spring-loaded terminals	**Main and auxiliary conductors**							
	• Solid	mm²	2 x (0.25 ... 1.5)	--				
	• Finely stranded with end sleeve	mm²	2 x (0.25 ... 1)	--				
	• AWG conductors, solid or stranded	mm²	2 x (24 ... 16)	--				

1) If this value is exceeded, problems with line capacities may arise, which can result in false firing.

Type			3RW30 34	3RW30 35	3RW30 36	3RW30 44	3RW30 45	3RW30 46
Power electronics								
Load rating With rated operational current I_e								
• According to IEC for individual mounting	at 40/50/60 °C, AC-53b	A	32/27/23	38/32/27	45/38/32	63/54/46	75/64/54	100/85/72
• According to UL/CSA for individual mounting	at 40/50/60 °C, AC-53b	A	27/27/23	34/32/27	42/38/32	62/54/46	68/64/54	99/85/72
Power loss								
• At uninterrupted rated operational current (40 °C) approx.		W	10	13	17	13	16	26
• (40 °C) at utilization of max. operating frequency		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
Pause intervals after continuous duty With I_e before a new start		s	0		400	0		
Degree of protection	according to IEC 60529		IP20 (IP00 terminal enclosure)			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 conductors, 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) 2 x (0.75 ... 2.5) accord. to IEC 60947; max. 2 x (0.75 ... 4)					
	- Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5) 2 x (0.75 ... 2.5)					
	- AWG conductors, 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.

	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	IEC 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 IEC 60947-4-2 SN-IACS	Frequency range: 80 to 1000 MHz with 80 % at 1 kHz 10 V at 0.15 ... 80 MHz 3 V at 10 kHz ... 80 MHz
Burst **Surge**	IEC 61000-4-4 IEC 61000-4-5	Degree of severity 3: 1/2 kV 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 IEC 60947-4-2	(0.15 ... 30 MHz): Unit Class A (industry)

3RW30, 3RW31 for standard applications

Is an RI suppression filter necessary?

	24 V AC/DC control voltage		110 ... 240 V AC/DC control voltage	
	Main circuit	Control circuit	Main circuit	Control circuit
Degree of noise suppression A (industrial applications)	No	No	No	No
Degree of noise suppression B (applications for residential areas)	No	No	Yes[2] (see table Recommended Filters)	Yes[1)2)]

1) "No" only applies if the control voltage is taken from the main circuit downstream of the RI suppression filter.

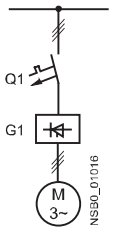
2) It may be preferable to use a device with 24 V AC/DC control voltage here; in that case the control voltage must be adapted with a transformer.

Soft starter type	Rated current Soft starters	Recommended filters					
		Voltage range 200 ... 460 V			Voltage range 460 ... 575 V		
		Filter type	Rated current filter	Terminals	Filter type	Rated current filter	Terminals
	A		A	mm^2		A	mm^2
3RW30 14	6	B84143-G8-R110	8	4	--	--	--
3RW30 16	9	B84143-G20-R110	20	4	--	--	--
3RW30 24	12.5	B84143-G20-R110	20	4	B8413-A25-R21	25	10
3RW30 25	16	B84143-G20-R110	20	4	B8413-A25-R21	25	10
3RW30 26	25	B84143-G36-R110	36	6	B8413-A25-R21	25	10
3RW30 34	32	B84143-G36-R110	36	6	B8413-A36-R21	36	10
3RW30 35	38	B84143-G36-R110	36	6	B8413-A36-R21	36	10
3RW30 36	45	B84143-G50-R110	50	6	B8413-A50-R21	50	10
3RW30 44	63	B84143-G66-R110	66	25	B8413-A80-R21	80	25
3RW30 45	75	B84143-G120-R110	120	50	B8413-A80-R21	80	25
3RW30 46	100	B84143-G120-R110	120	50	B8413-A120-R21	120	50

Fuse assignment

The coordination type to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of circuit-breaker and soft starter) is sufficient. If type 2 coordination is to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

Fuseless version



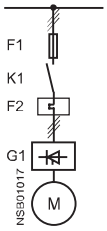
Soft starters	Motor starter protectors[1)]	Link modules[2)]
Type	Type	Type
G1	Q1	
Coordination type 1[3)] : I_q = 50 kA at 400 V		
3RW30 03	3RV10 11	--
3RW30 14	3RV10 11	3RA19 11-1A
3RW30 16	3RV10 11	3RA19 11-1A
3RW30 24/3RW31 24	3RV10 21	3RA19 21-1A
3RW30 25/3RW31 25	3RV10 21	3RA19 21-1A
3RW30 26/3RW31 26	3RV10 21	3RA19 21-1A
3RW30 34	3RV10 31	3RA19 31-1A
3RW30 35	3RV10 31	3RA19 31-1A
3RW30 36	3RV10 31	3RA19 31-1A
3RW30 44	3RV10 41	3RA19 41-1A
3RW30 45	3RV10 41	3RA19 41-1A
3RW30 46	3RV10 41	3RA19 41-1A

1) The rated motor current must be considered when selecting the devices.

2) Pay attention to quantity units.

3) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

Fused version (line protection only)



Soft starters	Line protections			Overload relays		Contactors
				Thermal	Solid-state	
Type	Type	Rated current	Size	Type	Type	Type
G1	F1			F2		K1
		A				
Type of coordination 1:[1] I_q = 50 kA at 400 V						
3RW30 03	3NA3 805[2]	20	000	3RU11 16	3RB10 16	3RT10 15
3RW30 14	3NA3 807	20	000	3RU11 16[3]	3RB10 16[3]	3RT10 15
3RW30 16	3NA3 807	20	000	3RU11 16[3]	3RB10 16[3]	3RT10 16
3RW30 24/3RW31 24	3NA3 807	20	000	3RU11 26[4]	3RB10 26[4]	3RT10 24
3RW30 25/3RW31 25	3NA3 810	25	000	3RU11 26[4]	3RB10 26[4]	3RT10 25
3RW30 26/3RW31 26	3NA3 814	35	000	3RU11 26[4]	3RB10 26[4]	3RT10 26
3RW30 34	3NA3 822	63	000	3RU11 36[4]	3RB10 36	3RT10 34
3RW30 35	3NA3 822	63	000	3RU11 36[4]	3RB10 36	3RT10 35
3RW30 36	3NA3 824	80	000	3RU11 36[4]	3RB10 36	3RT10 36
3RW30 44	3NA3 830	100	000	3RU11 46[4]	3RB10 46	3RT10 44
3RW30 45	3NA3 132	125	1	3RU11 46[4]	3RB10 46	3RT10 45
3RW30 46	3NA3 140	200	1	3RU11 46[4]	3RB10 46	3RT10 46

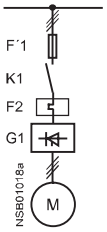
1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

2) 3NA38 05-1 (NH00), 5SB26 1 (DIAZED), 5SE22 01-6 (NEOZED).

3) I_q =50 kA up to max. 400 V

4) I_q =50 kA up to max. 500 V

Fused version with 3NE1 SITOR fuses (semiconductor and line protection)[1]



Soft starters	All-range fuses					
	Minimum (age-free)			Max.		
Type	Type	Rated current	Size	Type	Rated current	Size
G1	F'1			F'1		
		A			A	
Type of coordination 2[2] : I_q = 50 kA at 400 V/500 V						
3RW30 03	3NE1 813-0[3]	16	000	3NE1 813-0[3]	16	000
3RW30 14	3NE1 813-0[3]	16	000	3NE1 814-0[4]	20	000
3RW30 16	3NE1 813-0[3]	16	000	3NE1 815-0[5]	25	000
3RW30 24/3RW31 24	3NE1 814-0[4]	20	000	3NE1 815-0[5]	25	000
3RW30 25/3RW31 25	3NE1 815-0[5]	25	000	3NE1 815-0[5]	25	000
3RW30 26/3RW31 26	3NE1 803-0[5]	35	000	3NE1 802-0[5]	40	000
3RW30 34	3NE1 817-0[5]	50	000	3NE1 818-0[5]	63	000
3RW30 35	3NE1 818-0[5]	63	000	3NE1 820-0[5]	80	000
3RW30 36	3NE1 818-0[5]	63	000	3NE1 820-0[5]	80	000
3RW30 44	3NE1 820-0[5]	80	000	3NE1 820-0[5]	80	000
3RW30 45	3NE1 021-0[5]	100	00	3NE1 021-0[5]	100	00
3RW30 46	--[6]	--	--	--[6]	--	--

1) Contactor and overload relay as in "Fused version (line protection only)" table.

2) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

3) No SITOR fuse required!
Alternatively: 3NA38 03 (NH00), 5SB22 1 (DIAZED), 5SE22 06 (NEOZED).

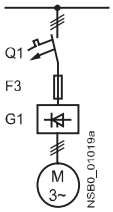
4) Fuse coordination for up to 400 V.

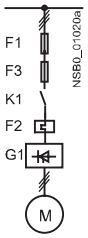
5) Fuse coordination for up to 500 V.

6) Fuse coordination with all-range fuses not possible; it may be necessary to use a pure semiconductor protection fuse plus a motor starter protector.

3RW30, 3RW31
for standard applications

Fused versions with 3NE8 SITOR fuses
(semiconductor protection by fuse, lead and overload protection by motor starter protector; alternatively, installation with contactor and overload relay possible)





Soft starters	Solid-state protection fuses						Semiconductor fuses (cylinder)					
	Min.			Max.			Min.			Max.		
Type	Type	Rated current	Size	Type	Rated current	Size	Type	Rated current	Size	Type	Rated current	Size
G1	F3			F3			F3			F3		
		A			A			A	mm x mm		A	mm x mm
Type of coordination 2[1] : I_q = 50 kA at 400 V												
3RW30 03	3NE8 015-1	25	00	3NE8 015-1	25	00	3NC1 006	6	10 x 38	3NC1 010	10	10 x 38
3RW30 14	3NE8 015-1	25	00	3NE8 003-1	35	00	3NC1 006	6	10 x 38	3NC1 430	30	14 x 51
3RW30 16	3NE8 015-1	25	00	3NE8 003-1	35	00	3NC1 010	10	10 x 38	3NC1 430	30	14 x 51
3RW30 24/3RW31 24	3NE8 015-1	25	00	3NE8 003-1	35	00	3NC1 016	16	10 x 38	3NC1 430	30	14 x 51
3RW30 25/3RW31 25	3NE8 015-1	25	00	3NE8 003-1	35	00	3NC1 025	25	10 x 38	3NC1 430	30	14 x 51
3RW30 26/3RW31 26	--[2]	--	--	--[2]	--	--	--[2]	--	--	--[2]	--	--
3RW30 34	3NE8 002-1	63	00	3NE8 022-1	125	00	3NC1 450	50	14 x 51	3NC2 280	80	22 x 58
3RW30 35	3NE8 020-1	80	00	3NE8 024-1	160	00	3NC2 263	63	22 x 58	3NC2 200	100	22 x 58
3RW30 36	3NE8 021-1	100	00	3NE8 024-1	160	00	3NC2 280	80	22 x 58	3NC2 200	100	22 x 58
3RW30 44	3NE8 021-1	100	00	3NE8 024-1	160	00	3NC2 200	100	22 x 58	3NC2 200	100	22 x 58
3RW30 45	3NE8 022-1	125	00	3NE8 024-1	160	00	--[2]	--	--	--[2]	--	--
3RW30 46	3NE8 024-1	160	00	3NE8 024-1	160	00	--[2]	--	--	--[2]	--	--

Soft starters	Motor starter protectors[3]	Link modules[4]	Overload relays		Contactors
	Type	Type	Thermal	Solid-state	
Type			Type	Type	Type
G1	Q1		F2		K1
Type of coordination 2[1] : I_q = 50 kA at 400 V					
3RW30 03	3RV10 11[5]	3RA19 11-1A	3RU11 16	3RB10 16	3RT10 15
3RW30 14	3RV10 11	3RA19 11-1A	3RU11 16	3RB10 16	3RT10 15
3RW30 16	3RV10 11	3RA19 11-1A	3RU11 16	3RB10 16	3RT10 16
3RW30 24/3RW31 24	3RV10 21	3RA19 21-1A	3RU11 26	3RB10 26	3RT10 24
3RW30 25/3RW31 25	3RV10 21	3RA19 21-1A	3RU11 26	3RB10 26	3RT10 25
3RW30 26/3RW31 26	3RV10 21	3RA19 21-1A	3RU11 26	3RB10 26	3RT10 26
3RW30 34	3RV10 31	3RA19 31-1A	3RU11 36	3RB10 36	3RT10 34
3RW30 35	3RV10 31	3RA19 31-1A	3RU11 36	3RB10 36	3RT10 35
3RW30 36	3RV10 31	3RA19 31-1A	3RU11 36	3RB10 36	3RT10 36
3RW30 44	3RV10 41	3RA19 41-1A	3RU11 46	3RB10 46	3RT10 44
3RW30 45	3RV10 41	3RA19 41-1A	3RU11 46	3RB10 46	3RT10 45
3RW30 46	3RV10 41	3RA19 41-1A	3RU11 46	3RB10 46	3RT10 46

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

2) Fuse coordination with semiconductor fuses not possible; it may be necessary to use pure 3NE1 all-range fuses or the next highest soft starter.

3) The rated motor current defines the selection of devices.

4) Pay attention to quantity units.

5) No SITOR fuse required!
Alternatively: 3NA38 03 (NH00), 5SB22 1 (DIAZED), 5SE22 06 (NEOZED).

More information

Configuration

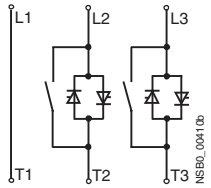
The 3RW solid-state motor controllers are designed for easy starting conditions. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For accurate dimensioning, use the Win-Soft Starter selection and simulation program.

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.

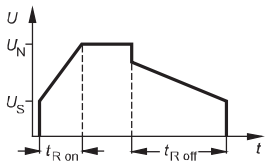
All elements of the main circuit (such as fuses, controls and overload relays) should be dimensioned for direct starting, following the local short-circuit conditions. Fuses, switching devices and overload relays must be ordered separately. Please observe the maximum switching frequencies specified in the technical specifications.

Power electronics circuit diagram[1)]

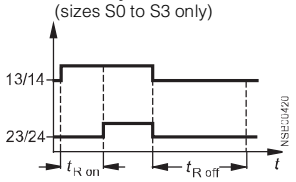


Status graphs

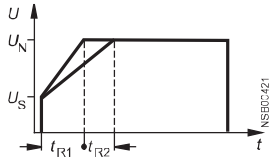
3RW30 – 3-ph. mot.



Auxiliary contacts
(sizes S0 to S3 only)



3RW31



1) Circuit diagram applies to sizes S0 and S2;
for size S00, phase L3 is bridged;
for size S3, phase L2 is bridged.

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.

You can order the CD-ROM under the following order number:

Order No. E20001-D1020-P302-V2-7400.

You can find more information on the Internet at:

http://www.siemens.com/softstarter

3RW40
for standard applications

Overview

SIRIUS 3RW40 soft starters have all the same advantages as the 3RW30/31 soft starters. At the same time they come with additional functions, e.g. solid-state motor overload and intrinsic device protection and adjustable current limiting, as well as a two-phase control method (Polarity Balancing) that is unique in this rating range.

SIRIUS 3RW40 soft starters are part of the SIRIUS modular system. This results in advantages such as identical sizes and a uniform connection system. Thanks to their particularly compact design, SIRIUS 3RW40 soft starters are only half as big as comparable wye-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 connetion.

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.

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 rating 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 DC 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 DC 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. This saves space in the control cabinet and wiring work 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. And even inrush current peaks are reliably avoided thanks to adjustable current limiting. Three LEDs are used to indicate the operating status 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, 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
- Adjustable current limiting
- Integrated bypass contact system to minimize dissipated power
- Setting with three potentiometers
- Simple mounting and commissioning
- Mains voltages 50/60 Hz, 200 to 600 V
- Two control voltage versions 115 V AC and 230 V AC. Control by way of the internal 24 V DC supply and direct control by means of PLC are possible.
- Wide temperature range from -25 to +60 °C
- Built-in auxiliary contacts ensure user-friendly control and possible further processing within the system (for status graphs see page 6/21)

Technical specifications

Type				3RW40 5.		3RW40 7.	
Control electronics							
Rated values		Terminal					
Rated control supply voltage		A1/A2	V AC	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 according to DIN 19240			
Rated operational voltage			V DC	24 from internal supply dc+ or external DC supply (according to DIN 19240) through terminals and IN			
Relay outputs							
Output 1	ON/RUN mode[2]	13/14		Operating indication			
Output 2	BYPASSED	23/24		Bypass indication			
Output 3	OVERLOAD/ FAILURE	95/96/97		Overload/error indication			
Rated operational current			A	3 AC-15/AC-14 at 230 V 1 DC-13 at 24 V			
Rated operational voltage				Protection by means of varistor through contact			
Protection against overvoltages				4 A gL/gG operational class;			
Short-circuit protection				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 presetting: ON mode.

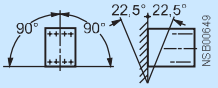
Type			3RW40 ..			
Control electronics						
Operating indications		LED	**DEVICE**	**STATE/BYPASSED**	**FAILURE**	**OVERLOAD**
Off			Green	Off	Off	Off
Start			Green	Green flashing	Off	Off
Bypass			Green	Green	Off	Off
Ramp-down			Green	Green flashing	Off	Off
Alarm indications						
I_e/class setting not permissible			Off	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 error			Red	Off	Red	Off

Type			3RW40 ..	
				Factory presetting
Protective 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 loss sensitivity		%	> 40	
Overload warning			No	
Reset option after tripping			Manual/automatic (MAN/AUTO)	
Recovery time		min	5	
Device protection functions				
Trips in the event of			Thermal overloading of the thyristors	
Reset option after tripping			Manual/automatic (MAN/AUTO)	
Recovery time		s	30	

6

3RW40
for standard applications

Type			3RW40 ..	
				Factory presetting
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		s	30	
Starting parameters				
Starting time		s	0 ... 20	7
Starting voltage		%	40 ... 100	50
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 AUTO		Off	Off
Automatic reset	LED AUTO		Yellow	
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	

Type		3RW40 ..-.BB4.	3RW40 ..-.BB5.
Power electronics			
Rated operational voltage for inline circuit	V AC	200 ... 460	400 ... 600
Tolerance	%	-15/+10	-15/+10
Rated frequency	Hz	50/60	
Tolerance	%	±10	
Continuous operation at 40 °C (% of I_e)	%	115	
Minimum load (% of I_e)	%	20	
Maximum conductor length between soft starter and motor	m	200	
Permissible installation height	m	2000 (derating from 1000); higher on request	
Permissible mounting position			
Permissible ambient temperature			
Operation	°C	-25 ... +60; (derating from +40)	
Storage	°C	-40 ... +80	
Degree of protection		IP00	

Type		3RW40 55	3RW40 56	3RW40 73	3RW40 74	3RW40 75	3RW40 76
Power electronics							
Load rating with rated operational current I_e According to IEC and UL/CSA for individual mounting at 40/50/60 °C, AC-53a	A	134/117/100	162/145/125	230/205/180	280/248/215	356/315/280	432/385/335
Smallest adjustable rated motor current I_M For the motor overload protection	A	59	87	80	130	131	207
Power loss At uninterrupted rated operational current (40 °C) approx. For current limiting at 350% I_M (40 °C)	W W	60 1043	75 1355	75 2448	90 3257	125 3277	165 3600
Permissible rated motor current and starts per hour							
• **For normal starting (Class 10)**							
- Rated motor current I_M [1], starting time 10 s	A	134	162	230	280	356	432
- Starts per hour [2]	1/h	20	8	20	14	16	17
- Rated motor current I_M [1][3], starting time 20 s	A	134	162	230	280	356	432
- Starts per hour [2]	1/h	7	1.4	9	3	5	5
• **For heavy starting (Class 15)**							
- Rated motor current I_M [1], starting time 15 s	A	134	152	230	250	341	402
- Starts per hour [2]	1/h	11	8	13	12	11	12
- Rated motor current I_M [1][3], starting time 30 s	A	134	152	230	250	341	402
- Starts per hour [2]	1/h	1.2	1.7	5	2	1.5	2
• **For heavy starting (Class 20)**							
- Rated motor current I_M [1], starting time 20 s	A	124	142	230	230	311	372
- Starts per hour [2]	1/h	12	9	9	10	10	10
- Rated motor current I_M [1][3], starting time 40 s	A	124	142	230	230	311	372
- Starts per hour [4]	1/h	3	3	1	1	0.1	1

1) Current limit on soft starter set to 350 % I_M.

2) For intermittent duty S4 with ON period = 70 %, T_u = 40 °C, stand-alone installation vertical. The quoted operating frequencies do not apply for automatic mode.

3) Maximum adjustable rated motor current I_M, dependent on CLASS setting.

4) For intermittent duty S4 with ON period = 30 %, T_u = 40 °C, stand-alone installation vertical. The quoted operating frequencies do not apply for automatic mode.

3RW40
for standard applications

Soft starters	Type		3RW40 5.	3RW40 7.
Conductor cross-sections				
Screw terminals	**Main conductors:**			
With box terminal			3RT19 55-4G (55 kW)	3RT19 66-4G
Front clamping point connected 	• Finely stranded with end sleeve	mm^2	16 ... 70	70 ... 240
	• Finely stranded without end sleeve	mm^2	16 ... 70	70 ... 240
	• Stranded	mm^2	16 ... 70	95 ... 300
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8	Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5
	• AWG conductors, solid or stranded	AWG	6 ... 2/0	3/0 ... 600 kcmil
Rear clamping point connected 	• Finely stranded with end sleeve	mm^2	16 ... 70	120 ... 185
	• Finely stranded without end sleeve	mm^2	16 ... 70	120 ... 185
	• Stranded	mm^2	16 ... 70	120 ... 240
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8	Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5
	• AWG conductors, solid or stranded	AWG	6 ... 2/0	250 ... 500 kcmil
Both clamping points connected 	• Finely stranded with end sleeve	mm^2	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Finely stranded without end sleeve	mm^2	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Stranded	mm^2	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 conductors, 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		10 ... 12 90 ... 110	20 ... 22 180 ... 195
Screw terminals	**Main conductors:**			
With box terminal			3RT19 56-4G	
Front or rear clamping point connected  	• 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	Min. 3 x 9 x 0.8 Max. 6 x 15.5 x 0.8	
	• AWG conductors, solid or stranded	AWG	6 ... 250 kcmil	
Both clamping points connected 	• Finely stranded with end sleeve	mm^2	Max. 1 x 95, 1 x 120	
	• Finely stranded without end sleeve	mm^2	Max. 1 x 95, 1 x 120	
	• Stranded	mm^2	Max. 2 x 120	
	• Ribbon cable conductors (number x width x thickness)	mm	Max. 2 x (10 x 15.5 x 0.8)	
	• AWG conductors, solid or stranded	AWG	Max. 2 x 3/0	
Screw terminals	**Main conductors:**			
	Without box terminal/rail connection			
	• Finely stranded with cable lug	mm^2	16 ... 95[1)]	50 ... 240[2)]
	• Stranded with cable lug	mm^2	25 ... 120[1)]	70 ... 240[2)]
	• AWG conductors, 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 lb.in	10 ... 14 89 ... 124	14 ... 24 124 ... 210

1) When connecting cable lugs to DIN 46235 use 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm^2 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 mm^2 and more as well as DIN 46235 for conductor cross-sections of 185 mm^2 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	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 lb.in	0.7 ... 0.9 7 ... 8
	Spring-loaded terminals		
	• Solid	mm^2	2 x 0.25 ... 2.5
	• Finely stranded with end sleeve	mm^2	2 x 0.25 ... 1.5
	• AWG conductors, solid or stranded	AWG	2 x 24 ... 14

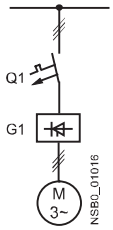
	Standard	Parameters
Electromagnetic compatibility according to EN 60947-4-2		
EMC interference immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	±4 kV contact discharge, ±8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Frequency range: 80 ... 1000 MHz with 80 % at 1 kHz Degree of severity 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 conductors		
Burst	EN 61000-4-4	±2 kV/5 kHz
Surge	EN 61000-4-5	±1 kV line to line
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	

3RW40
for standard applications

Fuse assignment

The coordination type to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of circuit-breaker and soft starter) is sufficient. If type2 coordination is to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

Fuseless version



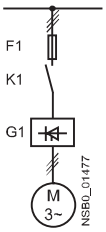
Soft starters		Circuit breakers[1]		
	Rated current	400 V +10 %	575 V +10 %	Rated current
G1 Type	A	Q1 Type	Q1 Type	A
Type of coordination 1[2]: I_q = 65 kA at 400 V/I_q = 35 kA at 600 V[3]				
3RW40 55	134	3VL3 720-2DC36	3VL3 720-1DC36	200
3RW40 56	162	3VL3 720-2DC36	3VL3 720-1DC36	200
3RW40 73	230	3VL4 731-2DC36	3VL5 731-3DC36	315
3RW40 74	280	3VL4 731-2DC36	3VL5 731-3DC36	315
3RW40 75	356	3VL4 740-2DC36	3VL5 740-3DC36	400
3RW40 76	432	3VL5 750-2DC36	3VL5 750-3DC36	500

1) The rated motor current must be considered when selecting the devices.

2) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

3) Except 3RW40 55: I_q = 35 kA at 400 V/I_q = 12 kA at 600 V.

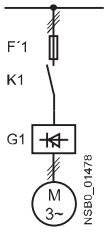
Fused version (line protection only)



Soft starters		Line protection			Line contactors	
	Rated current		Rated current	Size	(optional)	
G1 Type	A	F1 Type	A		K1 Type 115 V	Type 230 V
Type of coordination 1[1]: I_q = 65 kA at 400/600 V						
3RW40 55	134	3NA3 244-6	250	2	3RT10 55-6AF36	3RT10 55-6AP36
3RW40 56	162	3NA3 244-6	250	2	3RT10 56-6AF36	3RT10 56-6AP36
3RW40 73	230	2 x 3NA3 354-6	2 x 355	3	3RT10 65-6AF36	3RT10 65-6AP36
3RW40 74	280	2 x 3NA3 354-6	2 x 355	3	3RT10 66-6AF36	3RT10 66-6AP36
3RW40 75	356	2 x 3NA3 365-6	2 x 500	3	3RT10 75-6AF36	3RT10 75-6AP36
3RW40 76	432	2 x 3NA3 365-6	2 x 500	3	3RT10 76-6AF36	3RT10 76-6AP36

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

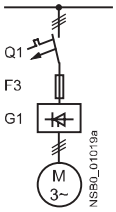
Fused version with 3NE1 SITOR fuses (semiconductor and line protection)

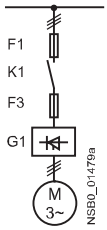


Soft starters		All-range fuses			Line contactors (optional)	
	Rated current		Rated current	Size		
G1 Type	A	F´1 Type	A		K1 Type 115 V	Type 230 V
Type of coordination 2[1]: I_q = 65 kA at 400/600 V						
3RW40 55	134	3NE1 227-2	250	1	3RT10 55-6AF36	3RT10 55-6AP36
3RW40 56	162	3NE1 227-2	250	1	3RT10 56-6AF36	3RT10 56-6AP36
3RW40 73	230	3NE1 331-2	350	2	3RT10 65-6AF36	3RT10 65-6AP36
3RW40 74	280	3NE1 333-2	450	2	3RT10 66-6AF36	3RT10 66-6AP36
3RW40 75	356	3NE1 334-2	500	2	3RT10 75-6AF36	3RT10 75-6AP36
3RW40 76	432	3NE1 435-2	560	3	3RT10 76-6AF36	3RT10 76-6AP36

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

Fused version with 3NE3 SITOR fuses (semiconductor protection by fuse, lead and overload protection by circuit-breaker; alternatively, installation with contactor and overload relay possible)





Soft starters		Semiconductor fuses, minimum			Semiconductor fuses, maximum			Line contactors (optional)	
	Rated current		Rated current	Size		Rated current	Size		
G1 Type	A	F3 Type	A		F3 Type	A		K1 Type 115 V	Type 230 V
Type of coordination 2[1]: I_q = 65 kA at 400/600 V									
3RW40 55	134	3NE3 227	250	1	3NE3 335	560	2	3RT10 55-6AF36	3RT10 55-6AP36
3RW40 56	162	3NE3 227	250	1	3NE3 335	560	2	3RT10 56-6AF36	3RT10 56-6AP36
3RW40 73	230	3NE3 232-0B	400	1	3NE3 333	450	2	3RT10 65-6AF36	3RT10 65-6AP36
3RW40 74	280	3NE3 233	450	1	3NE3 336	630	2	3RT10 66-6AF36	3RT10 66-6AP36
3RW40 75	356	3NE3 335	560	2	3NE3 336	630	2	3RT10 75-6AF36	3RT10 75-6AP36
3RW40 76	432	3NE3 337-8	710	2	3NE3 340-8	900	2	3RT10 76-6AF36	3RT10 76-6AP36

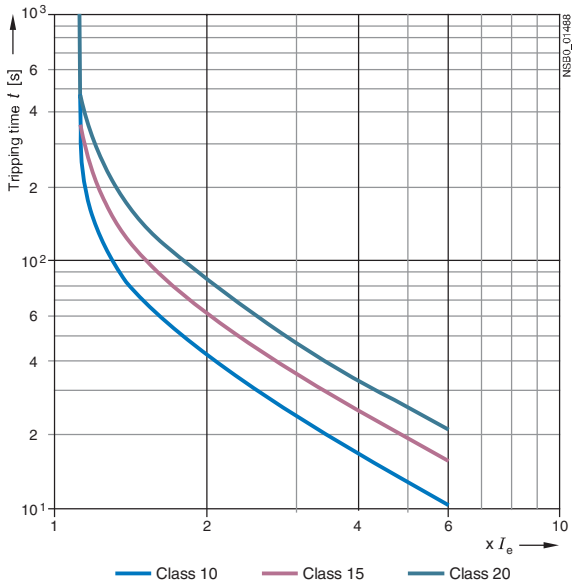
Soft starters		Circuit-breakers					Line protection		
	Rated current	400 V +10 %	Rated current	575 V +10 %	Rated current		Rated current	Size
G1 Type	A	Q1 Type	A	Q1 Type	A	F1 Type	A	
Type of coordination 2[1]: I_q = 65 kA at 400/600 V								
3RW40 55	134	3VL3 720-2DC36	200	3VL3 720-1DC36	200	3NA3 244-6	250	2
3RW40 56	162	3VL3 720-2DC36	200	3VL3 720-1DC36	200	3NA3 244-6	250	2
3RW40 73	230	3VL4 731-2DC36	315	3VL5 731-3DC36	315	2 x 3NA3 354-6	2 x 355	3
3RW40 74	280	3VL4 731-2DC36	315	3VL5 731-3DC36	315	2 x 3NA3 354-6	2 x 355	3
3RW40 75	356	3VL4 740-2DC36	400	3VL5 740-3DC36	400	2 x 3NA3 365-6	2 x 500	3
3RW40 76	432	3VL5 750-2DC36	500	3VL5 750-3DC36	500	2 x 3NA3 365-6	2 x 500	3

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

3RW40
for standard applications

Characteristic curves

Motor protection tripping characteristics for 3RW40 (with symmetry)



More information

Configuration

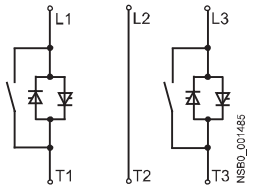
The 3RW solid-state soft starters are designed for easy starting conditions. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. For accurate dimensioning, use the Win-Soft Starter selection and simulation program (Version 2.0 upwards).

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.

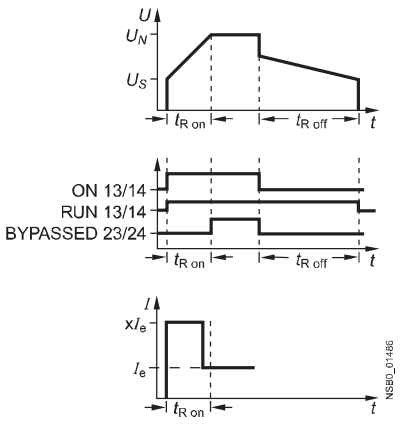
In the motor feeder between the SIRIUS 3RW soft starter and the motor, no capacitive elements are permitted (e.g. no reactive-power compensation equipment). In addition, neither static systems for reactive-power compensation nor dynamic PFC (Power Factor Correction) must be operated in parallel during 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.

Power electronics circuit diagram



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.

You can order the CD-ROM under the following order number:

Order No. E20001-D1020-P302-V2-7400.

More information can be found on the Internet at
http://www.siemens.com/softstarter

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3RW44
for High-Feature applications

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 rating 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.

Combinations of various starting, operating and ramp-down possibilities ensure an optimum adaptation to the application-specific requirements. Operation and commissioning can be carried out with the menu-controlled keypad plus menu-controlled, 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 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

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 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 front panel continuously presents measured values and operating values as well as warnings and alarm indications. An external display and operator module can be connected by means of a connecting 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 work 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 semi-conductor fuses from short-circuiting. 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 dissipated power
- 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 stopping, combined DC braking
- Solid-state motor overload and intrinsic device protection
- Thermistor motor protection
- Keypad with a menu-controlled, 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 (start of delivery of the software: end of 2005)
- Simple adaptation to the motor feeder
- Simple mounting and commissioning
- Display of operating states and fault signals
- Connection to PROFIBUS with optional PROFIBUS DP module (start of delivery: 2006).
- External display and operator module (start of delivery: 2006).
- System 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				
• 3RW442.		mA	300	170
• 3RW443.		mA	500	250
• 3RW444.		mA	750	400
Maximum current (pickup bypass)				
• 3RW442.		mA	1000	500
• 3RW443.		mA	2500	1250
• 3RW444.		mA	6000	3000
Rated frequency		Hz	50 ... 60	50 ... 60
• Tolerance		%	±10	±10

Type	Terminal		3RW44 ..	Factory presetting
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 (according 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				
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)	
Protective 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 loss sensitivity		%	> 40	
Overload warning			Yes	
Reset and recovery			Manual/Automatic	Manual
Reset option after tripping			Manual/Automatic	Manual
Recovery time		min.	2 ... 30	2
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	

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3RW44
for High-Feature applications

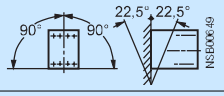
Type		3RW44 ..	Factory presetting
Control times and parameters			
Control times			
Closing delay (with connected control voltage)	ms	< 50	
Closing delay (automatic mode)	ms	< 4000	
Recovery time (closing command in active ramp-down)	ms	< 100	
Mains failure bridging time			
Control supply voltage	ms	100	
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	40
Torque control for starting torque	%	10 ... 100	50
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	450
Breakaway voltage	%	40 ... 100	80
Breakaway time	s	0 ... 2	Deactivated
Motor heat output	%	0 ... 100	0
Creep mode Left/Right running			
Speed factor as function of rated speed ($n = n_{rated}$/factor)		3 ... 21	7
Creep torque (reference variable depends on the motor used but is always smaller than the rated torque of the motor)	%	20 ... 100	50
Setting options for ramp-down			
Torque control for stopping torque	%	10 ... 100	40
Ramp-down time	s	0 ... 360	10
Combined braking	%	20 ... 100	50
DC braking	%	20 ... 100	50
Operating indications		Test voltage Test mains phases Ready to start Start active Motor running Ramp-down active	
Warnings/error signals		Mains voltage missing Wrong start condition 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 elements defective Mains overvoltage Current range exceeded Motor blocking – shutdown Current limit exceeded Power section overheated Power section overtemperature Temperature sensor - Overload - Open-circuit - Short-circuit Ground fault detected Ground fault shutdown Connection abort in manual mode	

3RW44
for High-Feature applications

Type	3RW44 ..	Factory presetting
Control times and parameters		
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 Creep speed 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 Device error Power on Ready to start	
Motor temperature sensor	Deactivated Thermoclick PTC type A	Deactivated

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	V	200 ... 460 AC	400 ... 600 AC	400 ... 690 AC
Tolerance	%	-15/+10	-15/+10	-15/+10
Rated operational voltage for inside-delta circuit	V	200 ... 400 AC	400 ... 600 AC	400 ... 600 AC
Tolerance	%	-15/+10	-15/+10	-15/+10
Rated frequency	Hz	50 ... 60		
Tolerance	%	±10		
Continuous operation at 40 °C (% of I_e)	%	115		
Minimum load (% of I_e)	%	20		
Maximum conductor length between soft starter and motor	m	200		
Permissible installation height	m	2000 (derating from 1000); higher on request		
Permissible mounting position				
Permissible ambient temperature				
Operation	°C	0 ... +60; (derating from +40)		
Storage	°C	-25 ... +80		
Degree of protection		IP00		

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							
• According to IEC and UL/CSA for individual mounting, at 40/50/60 °C, AC-53a	A	29/26/23	36/32/29	47/42/37	57/51/45	77/68/59	93/82/72
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 ramp-up 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[1)], starting time 5 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	41	34	41	41	41	41
- Rated motor current I_M[1)3)], starting time 10 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	20	15	20	20	20	20
• **Normal starting (Class 10)**							
- Rated motor current I_M[1)], starting time 10 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	20	15	20	20	20	20
- Rated motor current I_M[1)3)], starting time 20 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	10	6	10	10	8	8
• **Normal starting (Class 15)**							
- Rated motor current I_M[1)], starting time 15 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	13	9	13	13	13	13
- Rated motor current I_M[1)3)], starting time 30 s	A	29	36	47	57	77	93
- Starts per hour[2)]	1/h	6	4	6	6	6	6
• **For heavy starting (Class 20)**							
- Rated motor current I_M[1)], starting time 20 s	A	29	36	47	57	73	88
- Starts per hour[2)]	1/h	10	6	10	10	10	10
- Rated motor current I_M[1)3)], starting time 40 s	A	29	36	47	57	73	88
- Starts per hour[2)]	1/h	4	2	4	5	1.8	0.8
• **For very heavy starting (Class 30)**							
- Rated motor current I_M[1)], starting time 30 s	A	29	36	44	57	65	77
- Starts per hour[2)]	1/h	6	4	6	6	6	6
- Rated motor current I_M[1)3)], starting time 60 s	A	29	36	44	57	65	77
- Starts per hour[2)]	1/h	1.8	0.8	3.3	1.5	2	1

1) Current limit on soft starter set to 350 % I_M.

2) For intermittent duty S4 with ON period = 70 %, T_u = 40 °C, stand-alone installation vertical. The quoted operating frequencies do not apply for automatic mode.

3) Maximum adjustable rated motor current I_M, 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 • According to IEC and UL/CSA for individual mounting, at 40/50/60 °C, AC-53a	A	113/100/88	134/117/100	162/145/125
Smallest adjustable rated motor current I_M For the motor overload protection	A	22	26	32
Power loss				
• In operation after completed ramp-up with uninterrupted rated operational current (40 °C) approx.	W	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 [1], starting time 5 s	A	113	134	162
- Starts per hour [2]	1/h	41	39	41
- Rated motor current I_M [1][3], starting time 10 s	A	113	134	162
- Starts per hour [2]	1/h	20	15	20
• **Normal starting (Class 10)**				
- Rated motor current I_M [1], starting time 10 s	A	113	134	162
- Starts per hour [2]	1/h	20	15	20
- Rated motor current I_M [1][3], starting time 20 s	A	113	134	162
- Starts per hour [2]	1/h	9	6	7
• **Normal starting (Class 15)**				
- Rated motor current I_M [1], starting time 15 s	A	113	134	162
- Starts per hour [2]	1/h	13	9	12
- Rated motor current I_M [1][3], starting time 30 s	A	113	134	162
- Starts per hour [2]	1/h	6	6	6
• **For heavy starting (Class 20)**				
- Rated motor current I_M [1], starting time 20 s	A	106	125	147
- Starts per hour [2]	1/h	9	9	10
- Rated motor current I_M [1][3], starting time 40 s	A	106	125	147
- Starts per hour [2]	1/h	1.5	2	0.5
• **For very heavy starting (Class 30)**				
- Rated motor current I_M [1], starting time 30 s	A	91	110	120
- Starts per hour [2]	1/h	6	6	6
- Rated motor current I_M [1][3], starting time 60 s	A	91	110	120
- Starts per hour [2]	1/h	2	2	0.5

1) Current limit on soft starter set to 350 % I_M.

2) For intermittent duty S4 with ON period = 70 %, T_u = 40 °C, stand-alone installation vertical. The quoted operating frequencies do not apply for automatic mode.

3) 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 • According to IEC and UL/CSA for individual mounting, at 40/50/60 °C, AC-53a	A	203/180/156	250/215/185	313/280/250	356/315/280	432/385/335
Smallest adjustable rated motor current I_M For the motor overload protection	A	40	50	62	71	86
Power loss • In operation after completed ramp-up with uninterrupted rated operational current (40 °C) approx. • During starting with current limit set to 350 % I_M (40 °C)	W W	89 3350	110 4000	145 4470	174 5350	232 5860
Permissible rated motor current and starts per hour						
• **Normal starting (Class 5)**						
- Rated motor current I_M [1], starting time 5 s	A	203	250	313	356	432
- Starts per hour [2]	1/h	41	40	41	41	39
- Rated motor current I_M [1][3], starting time 10 s	A	203	250	313	356	432
- Starts per hour [2]	1/h	20	20	20	17	16
• **Normal starting (Class 10)**						
- Rated motor current I_M [1], starting time 10 s	A	203	250	313	356	432
- Starts per hour [2]	1/h	20	20	20	17	16
- Rated motor current I_M [1][3], starting time 20 s	A	203	250	313	356	432
- Starts per hour [2]	1/h	10	8	8	4	5
• **Normal starting (Class 15)**						
- Rated motor current I_M [1], starting time 15 s	A	203	240	313	325	402
- Starts per hour [2]	1/h	13	11	13	13	11
- Rated motor current I_M [1][3], starting time 30 s	A	203	240	313	325	402
- Starts per hour [2]	1/h	6	6	6	6	6
• **For heavy starting (Class 20)**						
- Rated motor current I_M [1], starting time 20 s	A	195	215	275	285	356
- Starts per hour [2]	1/h	10	10	10	10	10
- Rated motor current I_M [1][3], starting time 40 s	A	195	215	275	285	356
- Starts per hour [2]	1/h	4	1.5	3	3	1.8
• **For very heavy starting (Class 30)**						
- Rated motor current I_M [1], starting time 30 s	A	162	180	220	240	285
- Starts per hour [2]	1/h	6	6	6	6	6
- Rated motor current I_M [1][3], starting time 60 s	A	162	180	220	240	285
- Starts per hour [2]	1/h	4.3	1.8	3	2	1.6

1) Current limit on soft starter set to 350 % I_M.

2) For intermittent duty S4 with ON period = 70 %, T_u = 40 °C, stand-alone installation vertical. The quoted operating frequencies do not apply for automatic mode.

3) Maximum adjustable rated motor current I_M, dependent on CLASS setting.

Type			3RW44 2.	3RW44 3., 3RW44 4.
Conductor cross-sections				
Screw terminals	**Main conductors:**			
With box terminal			3RT19 55-4G (55 kW)	3RT19 66-4G
Front clamping point connected  NSB00479	• Finely stranded with end sleeve	mm^2	16 ... 70	70 ... 240
	• Finely stranded without end sleeve	mm^2	16 ... 70	70 ... 240
	• Stranded	mm^2	16 ... 70	95 ... 300
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8	Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5
	• AWG conductors, solid or stranded	AWG	6 ... 2/0	3/0 ... 600 kcmil
Rear clamping point connected  NSB00480	• Finely stranded with end sleeve	mm^2	16 ... 70	120 ... 185
	• Finely stranded without end sleeve	mm^2	16 ... 70	120 ... 185
	• Stranded	mm^2	16 ... 70	120 ... 240
	• Ribbon cable conductors (number x width x thickness)	mm	Min. 3 x 9 x 0.8, Max. 6 x 15.5 x 0.8	Min. 6 x 9 x 0.8 Max. 20 x 24 x 0.5
	• AWG conductors, solid or stranded	AWG	6 ... 2/0	250 ... 500 kcmil
Both clamping points connected  NSB00481	• Finely stranded with end sleeve	mm^2	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Finely stranded without end sleeve	mm^2	Max. 1 x 50, 1 x 70	Min. 2 x 50; max. 2 x 185
	• Stranded	mm^2	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 conductors, 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:**			
With box terminal			3RT19 56-4G	
Front or rear clamping point connected  NSB00479  NSB00480	• 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	Min. 3 x 9 x 0.8 Max. 6 x 15.5 x 0.8	
	• AWG conductors, solid or stranded	AWG	6 ... 250 kcmil	
Both clamping points connected  NSB00481	• Finely stranded with end sleeve	mm^2	Max. 1 x 95, 1 x 120	
	• Finely stranded without end sleeve	mm^2	Max. 1 x 95, 1 x 120	
	• Stranded	mm^2	Max. 2 x 120	
	• Ribbon cable conductors (number x width x thickness)	mm	Max. 2 x (10 x 15.5 x 0.8)	
	• AWG conductors, solid or stranded	AWG	Max. 2 x 3/0	
Screw terminals	**Main conductors:**			
	Without box terminal/rail connection			
	• Finely stranded with cable lug	mm^2	16 ... 95[1)]	50 ... 240[2)]
	• Stranded with cable lug	mm^2	25 ... 120[1)]	70 ... 240[2)]
	• AWG conductors, 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 mm^2 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 mm^2 and more as well as DIN 46235 for conductor cross-sections of 185 mm^2 and more to keep the phase clearance.

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	0.7 ... 0.9
		lb.in	7 ... 8
	Spring-loaded terminals		
	• Solid	mm^2	2 x 0.25 ... 2.5
	• Finely stranded with end sleeve	mm^2	2 x 0.25 ... 1.5
	• AWG conductors, solid or stranded	AWG	2 x 24 ... 14

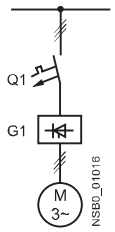
3RW44
for High-Feature applications

	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 conductors Burst Surge	 EN 61000-4-4 EN 61000-4-5	 ±2 kV/5 kHz ±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	

Fuse assignment

The coordination type to which the motor feeder with soft starter is mounted depends on the application-specific requirements. Normally, fuseless mounting (combination of motor starter protector and soft starter) is sufficient. If type 2 coordination is to be fulfilled, semiconductor fuses must be fitted in the motor feeder.

Inline circuit fuseless version

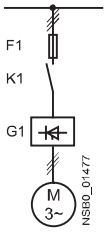


Soft starters		Motor starter protectors/ circuit-breakers[1]	
	Rated current	440 V +10 %	Rated current
G1 Type	A	Q1 Type	A
Type of coordination 1[2]: 3RW44 22 ... 3RW44 27: I_q = 32 kA; 3RW44 34 and 3RW44 35: I_q = 16 kA; 3RW44 36 ... 3RW44 47: I_q = 65 kA			
3RW44 22	29	3RV10 42-4HA10	50
3RW44 23	36	3RV10 42-4JA10	63
3RW44 24	47	3RV10 42-4KA10	75
3RW44 25	57	3RV10 42-4LA10	90
3RW44 26	77	3RV10 42-4MA10	100
3RW44 27	93	3RV10 42-4MA10	100
3RW44 34	113	3VL17 16-2DD36	160
3RW44 35	134	3VL17 16-2DD36	160
3RW44 36	162	3VL37 25-2DC36	250
3RW44 43	203	3VL47 31-3DC36	315
3RW44 44	250	3VL47 31-3DC36	315
3RW44 45	313	3VL47 40-3DC36	400
3RW44 46	356	3VL47 40-3DC36	400
3RW44 47	432	3VL57 50-3DC36	500

1) The rated motor current must be considered when selecting the devices.

2) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

Inline circuit fused version (line protection only)



Soft starters		Line protection			Line contactors up to 400 V	Braking contactors[1)2)]	
	Rated current	690 V +5 %	Rated current	Size	(optional)	(for typical circuit see page 6/46)	
G1		F1			K1	K2	K3
Type	A	Type	A		Type	Type	Type
Type of coordination 1[3)]: I_q = 65 kA							
3RW44 22	29	3NA3 820-6	50	00	3RT10 34	3RT15 26	–
3RW44 23	36	3NA3 822-6	63	00	3RT10 35	3RT15 26	–
3RW44 24	47	3NA3 824-6	80	00	3RT10 36	3RT15 35	–
3RW44 25	57	3NA3 830-6	100	00	3RT10 44	3RT15 35	–
3RW44 26	77	3NA3 132-6	125	1	3RT10 45	3RT10 24	3RT10 35
3RW44 27	93	3NA3 136-6	160	1	3RT10 46	3RT10 25	3RT10 36
3RW44 34	113	3NA3 244-6	250	2	3RT10 54	3RT10 34	3RT10 44
3RW44 35	134	3NA3 244-6	250	2	3RT10 55	3RT10 36	3RT10 45
3RW44 36	162	3NA3 365-6	500	3	3RT10 56	3RT10 44	3RT10 45
3RW44 43	203	2 x 3NA3 354-6	2 x 355	3	3RT10 64	3RT10 44	3RT10 54
3RW44 44	250	2 x 3NA3 354-6	2 x 355	3	3RT10 65	3RT10 44	3RT10 55
3RW44 45	313	2 x 3NA3 365-6	2 x 500	3	3RT10 75	3RT10 54	3RT10 56
3RW44 46	356	2 x 3NA3 365-6	2 x 500	3	3RT10 75	3RT10 54	3RT10 56
3RW44 47	432	2 x 3NA3 365-6	2 x 500	3	3RT10 76	3RT10 55	3RT10 64

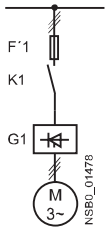
1) If the ramp-down function "Combined braking" is selected, no braking contactor is required.
If the ramp-down function "DC braking" is selected, a braking contactor must be used in addition (see table for type).
For applications with large centrifugal masses ($J_{Load} > J_{Motor}$) we recommend the function "DC braking".

2) Additional auxiliary relay K4:
LZX:RT4A4T30
(3RW44 soft starter with rated control supply voltage 230 V AC),
LZX:RT4A4S15
(3RW44 soft starter with rated control supply voltage 115 V AC).

3) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

3RW44
for High-Feature applications

Inline circuit fused version with 3NE1 SITOR all-range fuse (semiconductor and line protection)



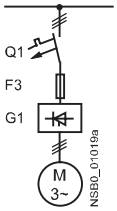
Soft starters		All-range fuses				Line contactors up to 400 V	Braking contactors[1)2)]	
	Rated current		Rated current	Voltage	Size	(optional)	(for typical circuit see page 6/46)	
G1 Type	A	F'1 Type	A	V		K1 Type	K2 Type	K3 Type
Type of coordination 2[3)]: I_q = 65 kA								
3RW44 22	29	3NE1 020-2	80	690 +5 %	00	3RT10 34	3RT15 26	–
3RW44 23	36	3NE1 020-2	80	690 +5 %	00	3RT10 35	3RT15 26	–
3RW44 24	47	3NE1 021-2	100	690 +5 %	00	3RT10 36	3RT15 35	–
3RW44 25	57	3NE1 022-2	125	690 +5 %	00	3RT10 44	3RT15 35	–
3RW44 26	77	3NE1 022-2	125	690 +5 %	00	3RT10 45	3RT10 24	3RT10 35
3RW44 27	93	3NE1 024-2	160	690 +5 %	1	3RT10 46	3RT10 25	3RT10 36
3RW44 34	113	3NE1 225-2	200	690 +5 %	1	3RT10 54	3RT10 34	3RT10 44
3RW44 35	134	3NE1 227-2	250	690 +5 %	1	3RT10 55	3RT10 36	3RT10 45
3RW44 36	162	3NE1 227-2	250	690 +5 %	1	3RT10 56	3RT10 44	3RT10 45
3RW44 43	203	3NE1 230-2	315	600 +10 %	1	3RT10 64	3RT10 44	3RT10 54
3RW44 44	250	3NE1 331-2	350	460 +10 %	2	3RT10 65	3RT10 44	3RT10 55
3RW44 45	313	3NE1 333-2	450	690 +5 %	2	3RT10 75	3RT10 54	3RT10 56
3RW44 46	356	3NE1 334-2	500	690 +5 %	2	3RT10 75	3RT10 54	3RT10 56
3RW44 47	432	3NE1 435-2	560	690 +5 %	3	3RT10 76	3RT10 55	3RT10 64

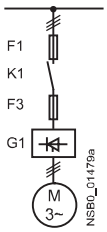
1) If the ramp-down function "Combined braking" is selected, no braking contactor is required.
If the ramp-down function "DC braking" is selected, a braking contactor must be used in addition (see table for type).
For applications with large centrifugal masses ($J_{Load} > J_{Motor}$) we recommend the function "DC braking".

2) Additional auxiliary relay K4:
LZX:RT4A4T30
(3RW44 soft starter with rated control supply voltage 230 V AC),
LZX:RT4A4S15
(3RW44 soft starter with rated control supply voltage 115 V AC).

3) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

Inline circuit fused version with 3NE or 3NC SITOR semiconductor fuse
(semiconductor protection by fuse, lead and overload protection by motor starter protector)





Soft starters		Semiconductor fuses, minimum			Semiconductor fuses, maximum			Semiconductor fuses (cylinder)		
	Rated current		Rated current	Size		Rated current	Size		Rated current	Size
G1 Type	A	F3 Type	A		F3 Type	A		F3 Type	A	
Type of coordination 2[3]: I_q = 65 kA										
3RW44 22	29	3NE4 120	80	0	3NE4 121	100	0	3NC2 280	80	22 x 58
3RW44 23	36	3NE4 121	100	0	3NE4 122	125	0	3NC2 200	100	22 x 58
3RW44 24	47	3NE4 121	100	0	3NE4 122	125	0	3NC2 200	100	22 x 58
3RW44 25	57	3NE4 122	125	0	3NE4 124	160	0			
3RW44 26	77	3NE4 124	160	0	3NE4 124	160	0			
3RW44 27	93	3NE3 224	160	1	3NE3 333	450	2			
3RW44 34	113	3NE3 225	200	1	3NE3 335	560	2			
3RW44 35	134	3NE3 225	200	1	3NE3 335	560	2			
3RW44 36	162	3NE3 227	250	1	3NE3 333	450	2			
3RW44 43	203	3NE3 230-0B	315	1	3NE3 333	450	2			
3RW44 44	250	3NE3 230-0B	315	1	3NE3 333	450	2			
3RW44 45	313	3NE3 233	450	1	3NE3 336	630	2			
3RW44 46	356	3NE3 333	450	2	3NE3 336	630	2			
3RW44 47	432	3NE3 335	560	2	3NE3 338-8	800	2			

Soft starters		Line contactors up to 400 V	Braking contactors[1)2)]		Motor starter protectors/ circuit-breakers		Line protection		
	Rated current	(optional)	(for typical circuit see page 6/46)		440 V +10 %	Rated current	690 V +5 %	Rated current	Size
G1 Type	A	K1 Type			Q1 Type	A	F1 Type	A	
Type of coordination 2[3]: 3RW44 22 ... 3RW44 27: I_q = 32 kA; 3RW44 34 and 3RW44 35: I_q = 16 kA; 3RW44 36 ... 3RW44 47: I_q = 65 kA									
3RW44 22	29	3RT10 34	3RT15 26	–	3RV10 42-4HA10	50	3NA3 820-6	50	00
3RW44 23	36	3RT10 35	3RT15 26	–	3RV10 42-4JA10	63	3NA3 822-6	63	00
3RW44 24	47	3RT10 36	3RT15 35	–	3RV10 42-4KA10	75	3NA3 824-6	80	00
3RW44 25	57	3RT10 44	3RT15 35	–	3RV10 42-4LA10	90	3NA3 830-6	100	00
3RW44 26	77	3RT10 45	3RT10 24	3RT10 35	3RV10 42-4MA10	100	3NA3 132-6	125	1
3RW44 27	93	3RT10 46	3RT10 25	3RT10 36	3RV10 42-4MA10	100	3NA3 136-6	160	1
3RW44 34	113	3RT10 54	3RT10 34	3RT10 44	3VL17 16-2DD36	160	3NA3 244-6	250	2
3RW44 35	134	3RT10 55	3RT10 36	3RT10 45	3VL17 16-2DD36	160	3NA3 244-6	250	2
3RW44 36	162	3RT10 56	3RT10 44	3RT10 45	3VL37 25-2DC36	250	3NA3 365-6	500	3
3RW44 43	203	3RT10 64	3RT10 44	3RT10 54	3VL47 31-3DC36	315	2 x 3NA3 354-6	2 x 355	3
3RW44 44	250	3RT10 65	3RT10 44	3RT10 55	3VL47 31-3DC36	315	2 x 3NA3 354-6	2 x 355	3
3RW44 45	313	3RT10 75	3RT10 54	3RT10 56	3VL47 40-3DC36	400	2 x 3NA3 365-6	2 x 500	3
3RW44 46	356	3RT10 75	3RT10 54	3RT10 56	3VL47 40-3DC36	400	2 x 3NA3 365-6	2 x 500	3
3RW44 47	432	3RT10 76	3RT10 55	3RT10 64	3VL57 50-3DC36	500	2 x 3NA3 365-6	2 x 500	3

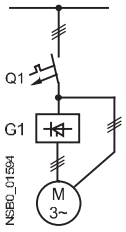
1) If the ramp-down function "Combined braking" is selected, no braking contactor is required.
If the ramp-down function "DC braking" is selected, a braking contactor must be used in addition (see table for type).
For applications with large centrifugal masses ($J_{Load} > J_{Motor}$) we recommend the function "DC braking".

2) Additional auxiliary relay K4:
LZX:RT4A4T30
(3RW44 soft starter with rated control supply voltage 230 V AC),
LZX:RT4A4S15
(3RW44 soft starter with rated control supply voltage 115 V AC).

3) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

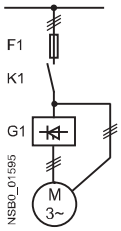
3RW44
for High-Feature applications

Inside-delta circuit fuseless version



Soft starters		Motor starter protectors/ circuit-breakers	
	Rated current	440 V +10 %	Rated current
G1		Q1	
Type	A	Type	A
Type of coordination 1[1]			
3RW44 22	50	3RV10 42-4KA10	75
3RW44 23	62	3RV10 42-4LA10	90
3RW44 24	81	3RV10 42-4MA10	100
3RW44 25	99	3VL27 16-2DC36	160
3RW44 26	133	3VL37 20-2DC36	200
3RW44 27	161	3VL37 20-2DC36	200
3RW44 34	196	3VL37 25-2DC36	250
3RW44 35	232	3VL47 31-3DC36	315
3RW44 36	281	3VL47 40-3DC36	400
3RW44 43	352	3VL47 40-3DC36	400
3RW44 44	433	3VL57 50-3DC36	500
3RW44 45	542	3WL12 08	800
3RW44 46	617	3WL12 08	800
3RW44 47	748	3WL12 10	1000

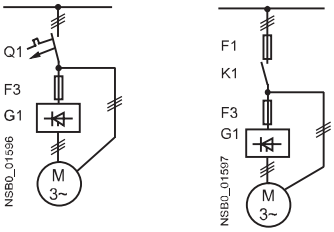
Inside-delta circuit fused version (line protection only)



Soft starters	Rated current	Line protection			Line contactors up to 400 V
	Soft starters	690 V +5 %	Rated current	Size	(optional)
G1		F1			K1
Type	A	Type	A		Type
Type of coordination 1[1]					
3RW44 22	50	3NA3 824-6	80	00	3RT10 36-1AP04
3RW44 23	62	3NA3 830-6	100	00	3RT10 44-1AP04
3RW44 24	81	3NA3 132-6	125	1	3RT10 46-1AP04
3RW44 25	99	3NA3 136-6	160	1	3RT10 54-1AP36
3RW44 26	133	3NA3 240-6	200	2	3RT10 55-6AP36
3RW44 27	161	3NA3 244-6	250	2	3RT10 56-6AP36
3RW44 34	196	3NA3 360-6	400	3	3RT10 64-6AP36
3RW44 35	232	3NA3 360-6	400	3	3RT10 65-6AP36
3RW44 36	281	2 x 3NA3 360-6	2 x 400	3	3RT10 66-6AP36
3RW44 43	352	2 x 3NA3 365-6	2 x 500	3	3RT10 75-6AP36
3RW44 44	433	2 x 3NA3 365-6	2 x 500	3	3RT10 76-6AP36
3RW44 45	542	3 x 3NA3 365-6	3 x 500	3	3TF68 44-0CM7
3RW44 46	617	3 x 3NA3 365-6	3 x 500	3	3TF68 44-0CM7
3RW44 47	748	3 x 3NA3 365-6	3 x 500	3	3TF69

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

Inside-delta circuit fused version with 3NE or 3NC SITOR fuses
(semiconductor protection by fuse, lead and overload protection by motor starter protector)



Soft starters		Semiconductor fuses, minimum			Semiconductor fuses, maximum			Semiconductor fuses (cylinder)		
	Rated current		Rated current	Size		Rated current	Size		Rated current	Size
G1 Type	A	F3 Type	A		F3 Type	A		F3 Type	A	
Type of coordination 2 [1]										
3RW44 22	50	3NE4 120	80	0	3NE4 121	100	0	3NC2 280	80	22 x 58
3RW44 23	62	3NE4 121	100	0	3NE4 122	125	0	3NC2 200	100	22 x 58
3RW44 24	81	3NE4 121	100	0	3NE4 122	125	0	3NC2 200	100	22 x 58
3RW44 25	99	3NE4 122	125	0	3NE4 124	160	0			
3RW44 26	133	3NE4 124	160	0	3NE4 124	160	0			
3RW44 27	161	3NE3 224	160	1	3NE3 333	450	2			
3RW44 34	196	3NE3 225	200	1	3NE3 335	560	2			
3RW44 35	232	3NE3 225	200	1	3NE3 335	560	2			
3RW44 36	281	3NE3 227	250	1	3NE3 333	450	2			
3RW44 43	352	3NE3 230-0B	315	1	3NE3 333	450	2			
3RW44 44	433	3NE3 230-0B	315	1	3NE3 333	450	2			
3RW44 45	542	3NE3 233	450	1	3NE3 336	630	2			
3RW44 46	617	3NE3 333	450	2	3NE3 336	630	2			
3RW44 47	748	3NE3 335	560	2	3NE3 338-8	800	2			

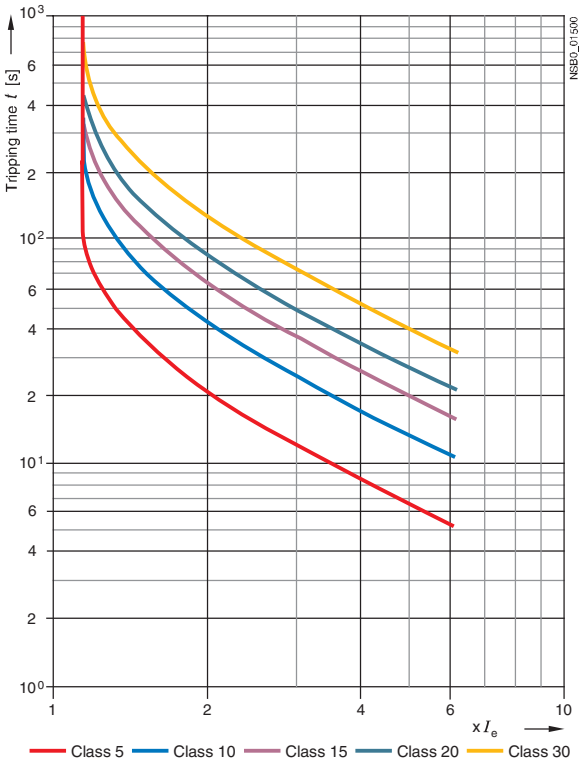
Soft starters		Line contactors up to 400 V	Motor starter protectors/ circuit-breakers		Line protection		
	Rated current	(optional)	440 V +10 %	Rated current	690 V +5 %	Rated current	Size
G1 Type	A	K1 Type	Q1 Type	A	F1 Type	A	
Type of coordination 2 [1]							
3RW44 22	50	3RT10 36-1AP04	3RV10 42-4KA10	75	3NA3 824-6	80	00
3RW44 23	62	3RT10 44-1AP04	3RV10 42-4LA10	90	3NA3 830-6	100	00
3RW44 24	81	3RT10 46-1AP04	3RV10 42-4MA10	100	3NA3 132-6	125	1
3RW44 25	99	3RT10 54-1AP36	3VL27 16-2DC36	160	3NA3 136-6	160	1
3RW44 26	133	3RT10 55-6AP36	3VL27 16-2DC36	160	3NA3 240-6	200	2
3RW44 27	161	3RT10 56-6AP36	3VL37 20-2DC36	200	3NA3 244-6	250	2
3RW44 34	196	3RT10 64-6AP36	3VL37 25-2DC36	250	3NA3 360-6	400	3
3RW44 35	232	3RT10 65-6AP36	3VL47 31-3DC36	315	3NA3 360-6	400	3
3RW44 36	281	3RT10 66-6AP36	3VL47 40-3DC36	400	2 x 3NA3 360-6	2 x 400	3
3RW44 43	352	3RT10 75-6AP36	3VL47 40-3DC36	400	2 x 3NA3 365-6	2 x 500	3
3RW44 44	433	3RT10 76-6AP36	3VL57 50-3DC36	500	2 x 3NA3 365-6	2 x 500	3
3RW44 45	542	3TF68 44-0CM7	3WL12 08	800	3 x 3NA3 365-6	3 x 500	3
3RW44 46	617	3TF68 44-0CM7	3WL12 08	800	3 x 3NA3 365-6	3 x 500	3
3RW44 47	748	3TF69	3WL12 10	1000	3 x 3NA3 365-6	3 x 500	3

1) The types of coordination are explained in more detail under Fuseless Load Feeders on page 6/48.

3RW44
for High-Feature applications

Characteristic curves

Motor protection tripping characteristics for 3RW44 (with symmetry)



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 belts	Roller conveyors	Compressors	Small ventilators	Pumps	Hydraulic pumps
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		Stirrers	Centrifuges	Milling machines
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 ventilators	Mills	Breakers	Circular saw/bandsaws
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 setting values and device sizes. They are intended only for the purposes of information and are not binding. The setting 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.

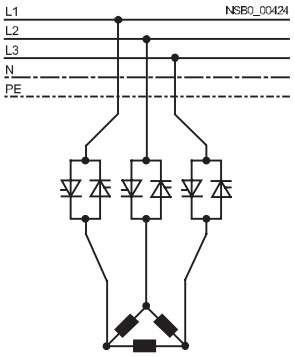
3RW44
for High-Feature applications

Circuit concept

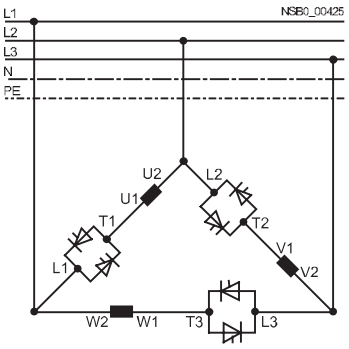
The SIRIUS 3RW44 soft starters can be operated in two different types of circuit.

- Inline circuit
  The switching devices 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 leads.
- Inside-delta circuit
  The wiring is similar to that of wye-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 circuit



Inline circuit:
Rated current I_e corresponds to the rated motor current I_n, 3 leads to the motor



Inside-delta circuit:
Rated current I_e corresponds to approx. 58 % of the rated motor current I_n, 6 leads to the motor (as with wye-delta starters)

Which circuit?

Using the inline circuit involves the lowest wiring complexity. If the soft starter to motor connections are long, this contact sequence 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 possibility of switching between the inline circuit and inside-delta circuit, the most favorable solution can always be chosen.

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, switching devices and overload relays must be ordered separately.

The harmonic component load for starting currents must be taken into consideration for the selection of motor starter protector (selection of release).

Serial PC interface RS 232 and parameterizing and operating software Soft Starter ES

The solid-state 3RW44 soft starters have a PC interface for communicating with the Soft Starter ES smart software and an operating and monitoring module.

Manual for SIRIUS 3RW44

Besides containing all important information on configuring, commissioning and servicing, the manual also contains suggested 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.

You can order the CD-ROM under the following order number:
Order No.: E20001-D1020-P302-V2-7400.

More information can be found on the Internet at
http://www.siemens.com/softstarter

SIRIUS soft starter training course (SD-SIRIUSO)

Siemens offers a 2-day training course on the SIRIUS solid-state soft starters to keep customers and own personnel up-to-date on configuring, commissioning and servicing issues.

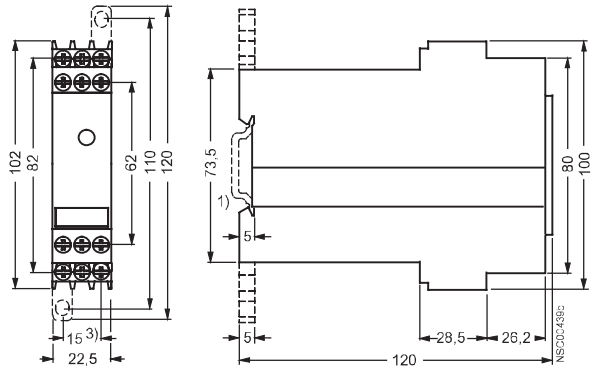
Please direct enquiries and applications to:

Training Center
I&S IS E&C TC
Werner-von-Siemens-Str. 65
D-91052 Erlangen
Telephone: ++49 (0) 9131 729262
Telefax: ++49 (0) 9131 728172
sibrain@erl9.siemens.de
http://www.siemens.com/sibrain

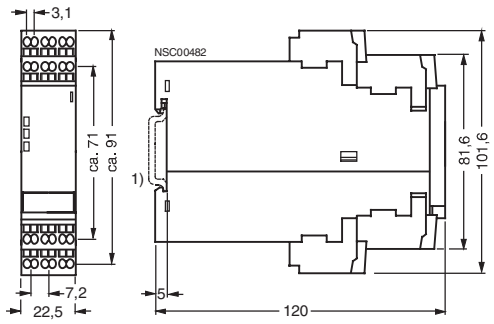
Dimensional drawings

3RW30/3RW31 for standard applications

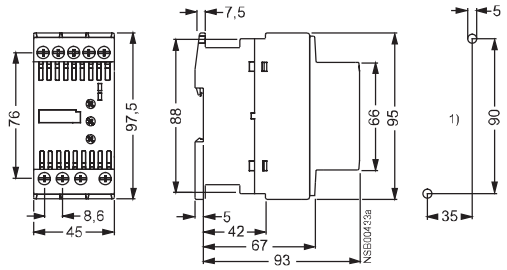
3RW30 03-1.... (screw terminals)



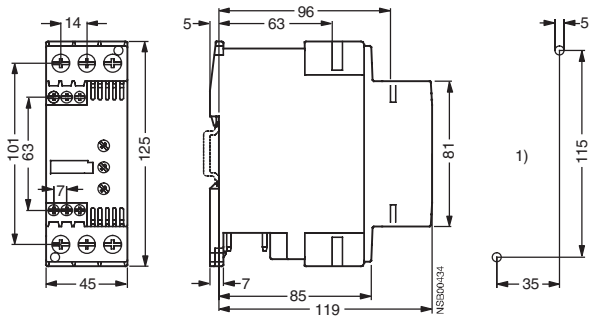
3RW30 03-2.... (spring-loaded terminals)



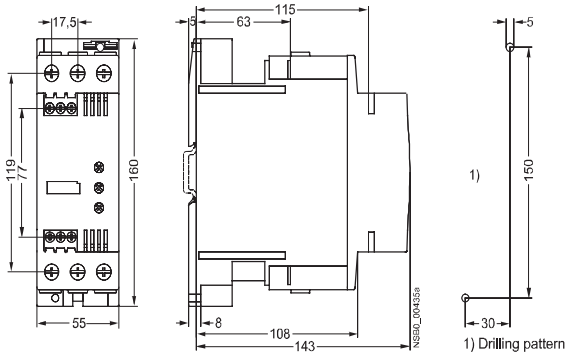
3RW30 1.



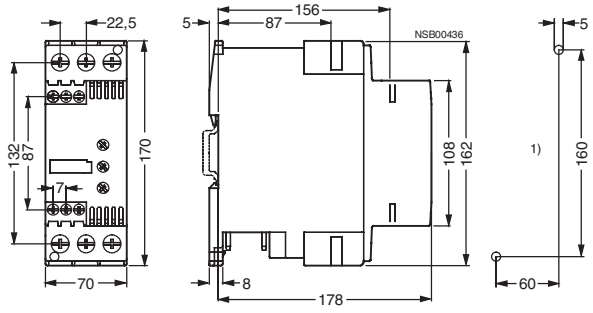
3RW30 2. and 3RW31 2.



3RW30 3.



3RW30 4.

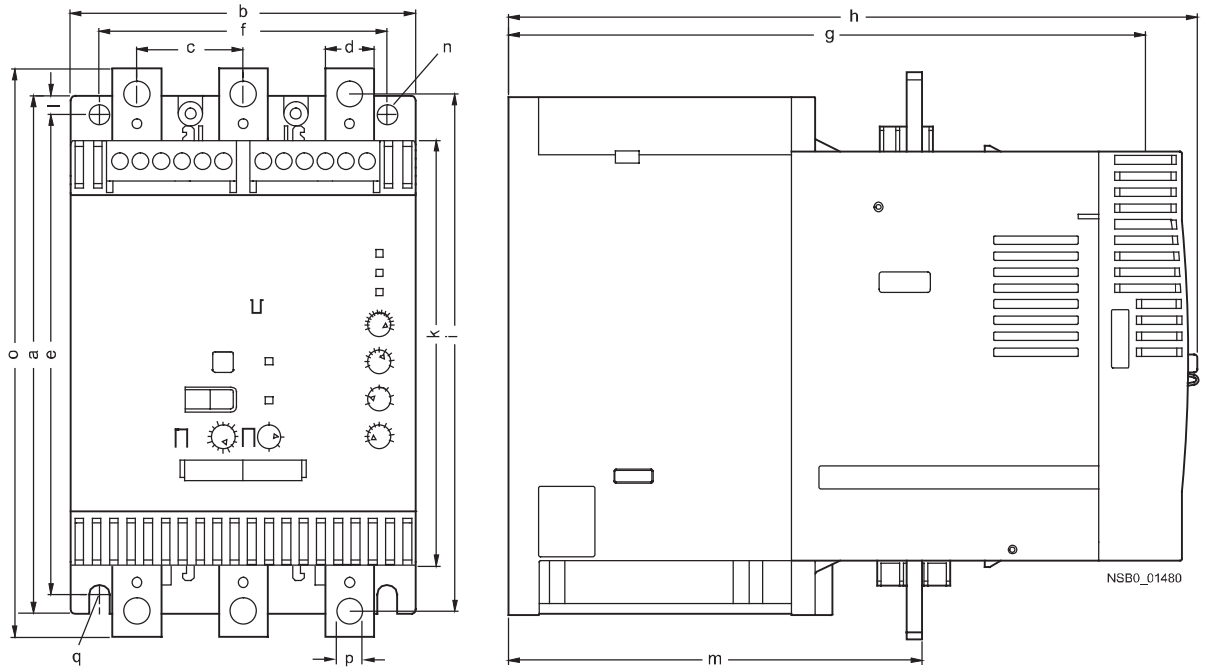


1) Drilling pattern

3) Connection dimension for screw terminals. Screw connection with 2 3RP19 03 push-in lugs for each 3TK28 device.

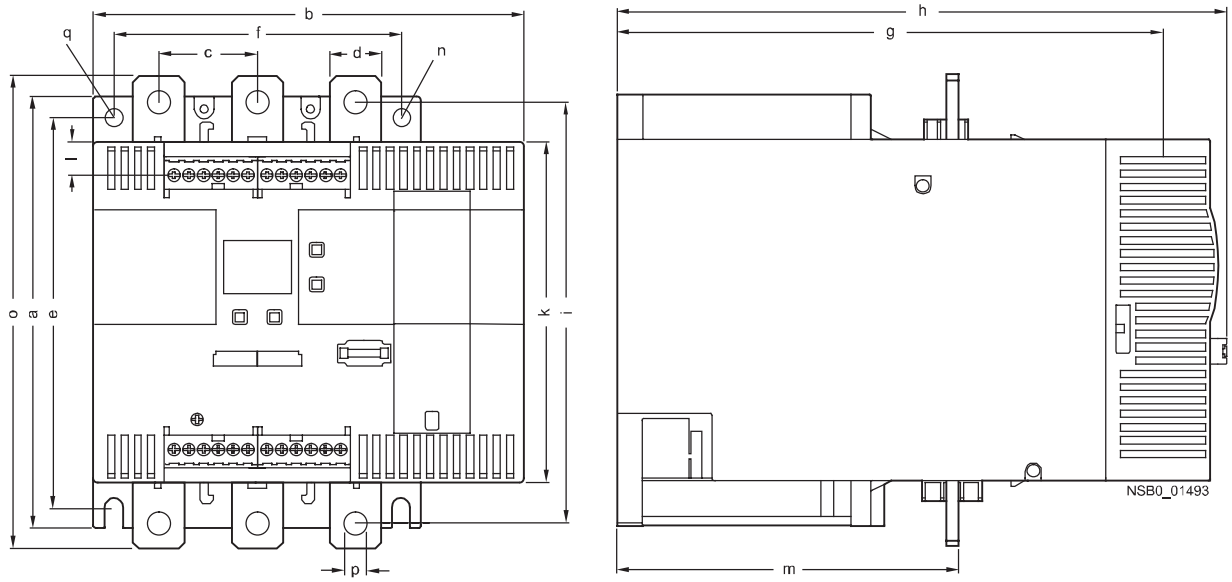
Project planning aids

3RW40 for standard applications



Type/Dimension (mm)	a	b	c	d	e	f	g	h	l	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 for High-Feature applications

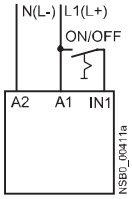


Type/Dimension (mm)	a	b	c	d	e	f	g	h	l	k	l	m	N	o	p	q
3RW44 2.	180	170	37	11	167	100	240	270	180	148	7.5	153	7	184	6.6	M6, 10 Nm
3RW44 3.	180	170	37	17	167	100	240	270	180	148	7.5	153	7	198	9	M6, 10 Nm
3RW44 4.	210	210	48	25	190	140	269	298	205	166	16	166	9	230	11	M8, 15 Nm

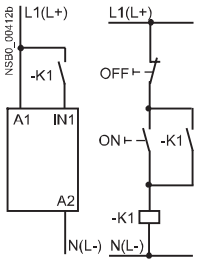
Schematics

3RW30/3RW31 connection examples for actuation with switches or auxiliary contacts

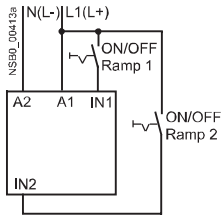
Control using switches



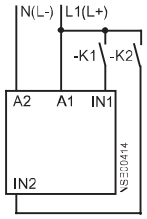
Control using contactor contacts (for control of size S00 with buttons)

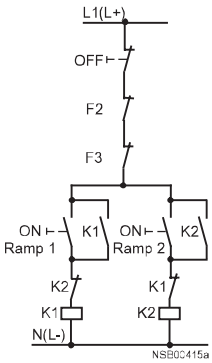


Control using switches on versions for pole-changing motors (for 3RW31 soft starters only)



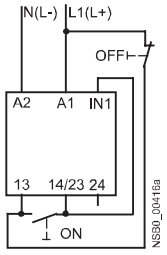
Control using contactor contacts on versions for pole-changing motors (for 3RW31 soft starters only)





3RW30/3RW31 connection example for control with pushbuttons

(sizes S0, S2, and S3 only)

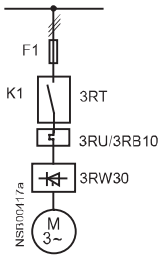


6

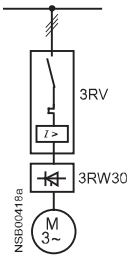
Project planning aids

3RW30/3RW31 connection examples for main circuit[1)]

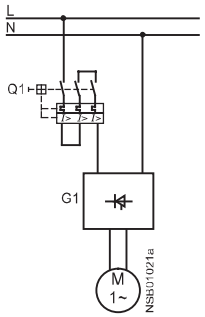
3RW30
3-phase motors



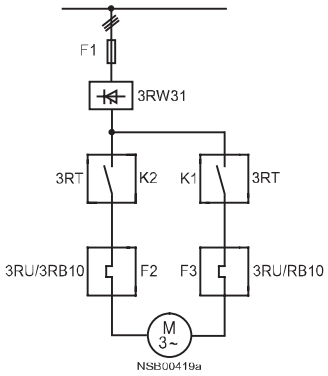
3RW30
3-phase motors
with motor starter protector



3RW30
1-phase motors
with 3RV motor starter protector

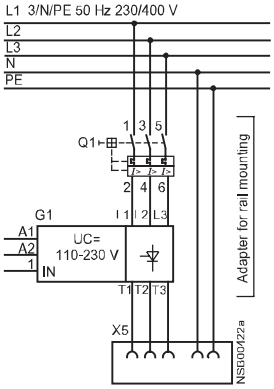


3RW31



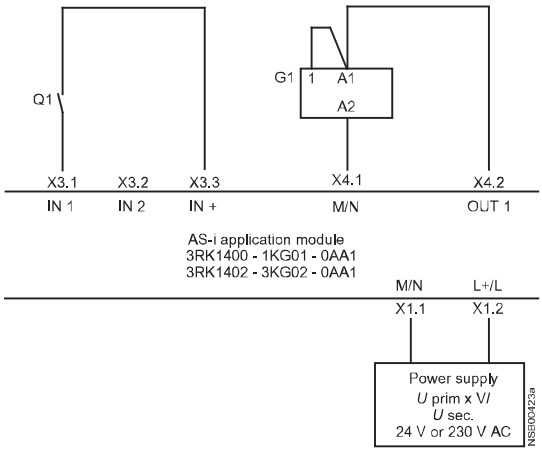
3RW30/3RW31 connection example: AS-Interface load feeder with SIRIUS soft starter

Main circuit



Q1 = Motor starter protector
G1 = 3RW30 1. SIRIUS soft starter
X5 = Power connector

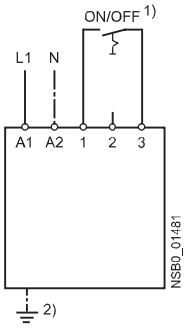
Control circuit



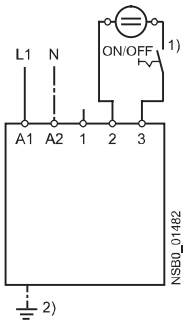
1) As an alternative, the motor feeder can also be installed as a fuseless or as a fused version. Fuse and switching device coordination, see Technical Specifications. The wiring diagrams are provided only as examples.

3RW40 connection examples for control circuit

Control by switch using internal 24 V DC supply

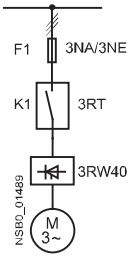


External power supply

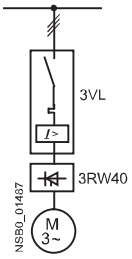


3RW40 connection examples for main circuit [3)]

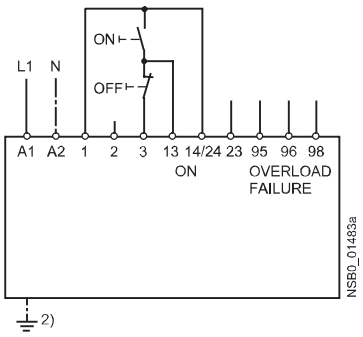
3RW40 – 3-phase motor with fuse 3NA/3NE



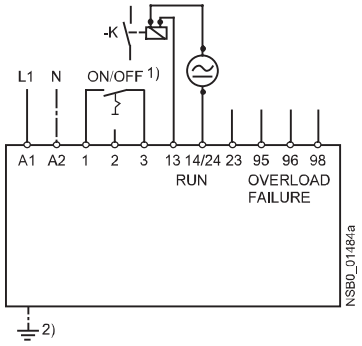
3VL circuit-breakers



Control by pushbutton



of a main contactor



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....

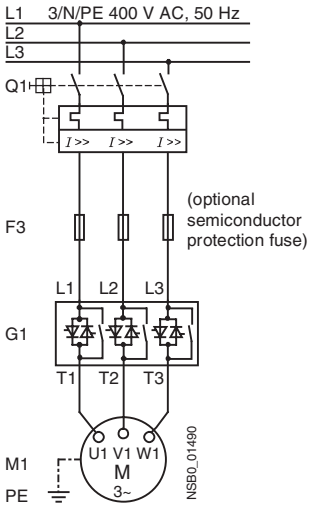
3) As an alternative, the motor feeder can also be installed as a fuseless or as a fused version. Fuse and switching device coordination, see Technical Specifications. The wiring diagrams are provided only as examples.

Project planning aids

3RW44 connection examples for main and control circuits

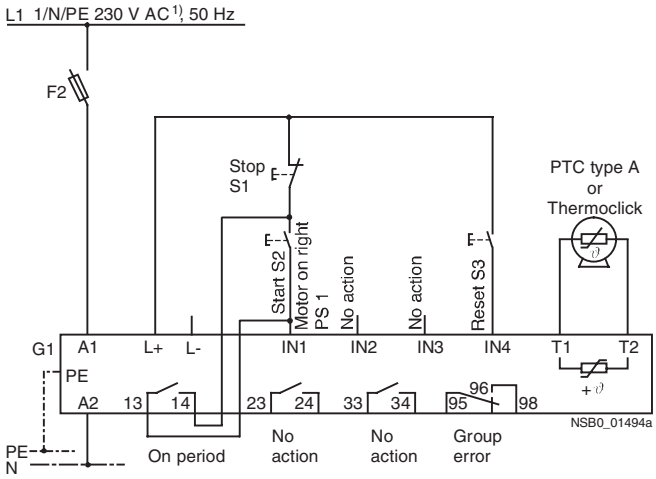
Main circuit

Possibility 1a:
Inline circuit with motor starter protector and SITOR fuse
(semiconductor protection only)



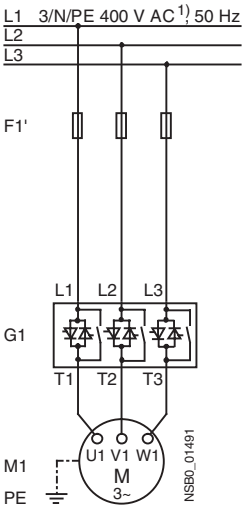
Control circuit

Possibility 1:
Control by pushbutton

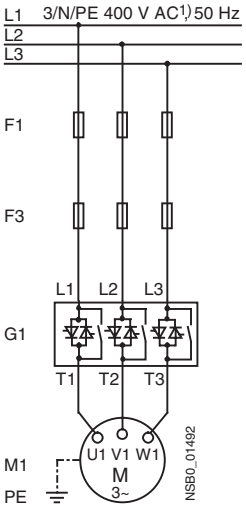


Main circuit

Possibility 1b:
Inline circuit with full-range protection
(line and semiconductor protection)



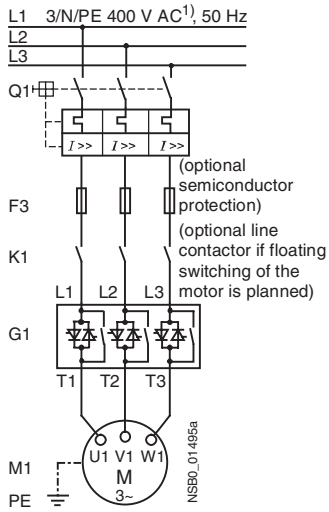
Possibility 1c:
Inline circuit with line and SITOR fuse
(semiconductor protection only)



1) Permissible values for main and control voltage, see Technical Specifications.

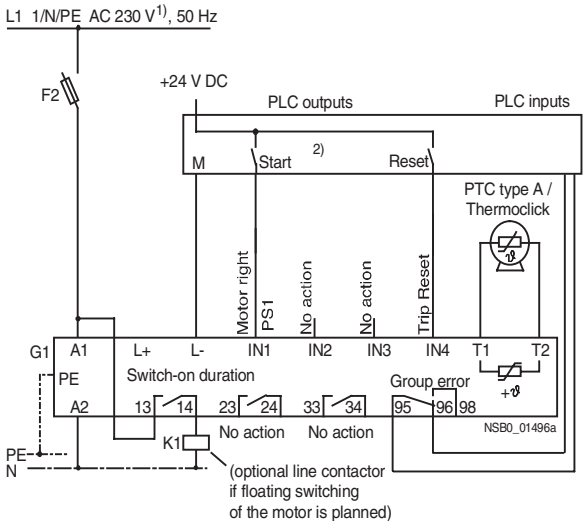
Main circuit

Possibility 2:
Inline circuit with main contactor



Control circuit

Possibility 2:
Control of a main contactor and control by means of PLC



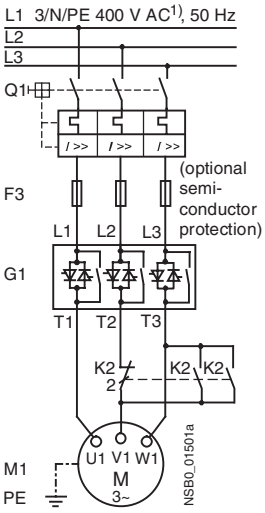
1) Permissible values for main and control voltage, see Technical Specifications.

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

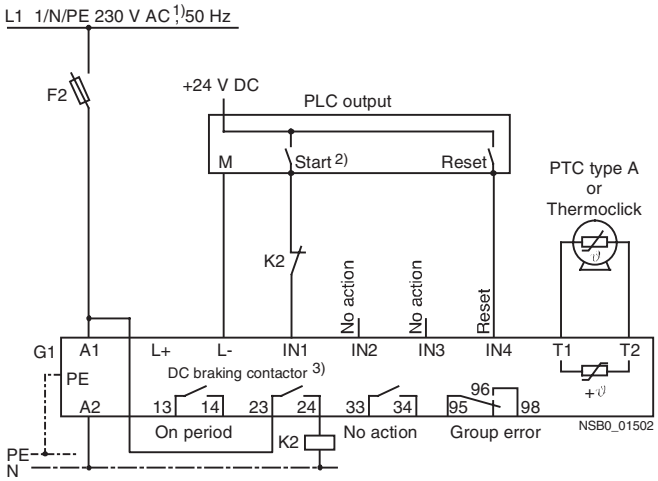
Main circuit

Possibility 3a:
Inline circuit with ramp-down function DC braking[3)]
(for device types 3RW44 22 to 3RW44 25)



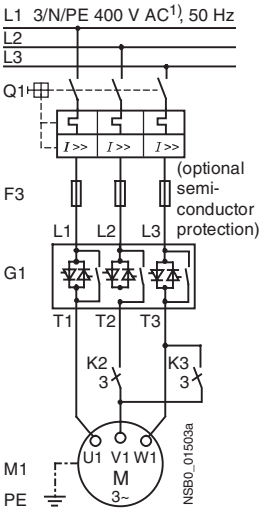
Control circuit

Possibility 3a:
Control of the DC braking contactor[3)]



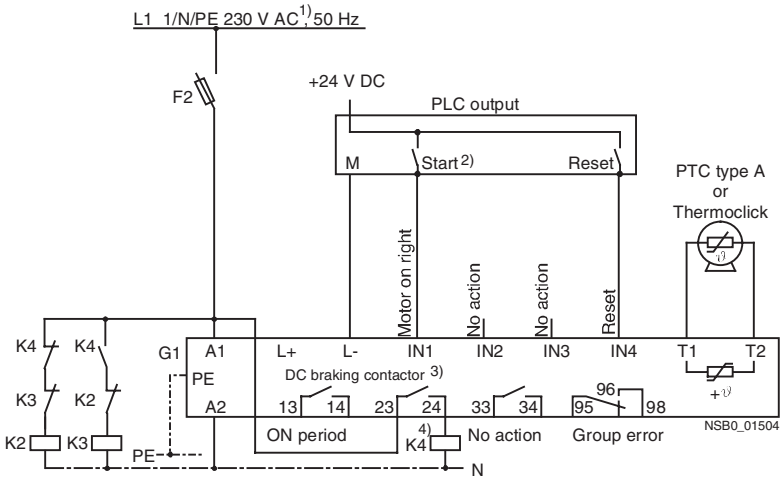
Main circuit

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.

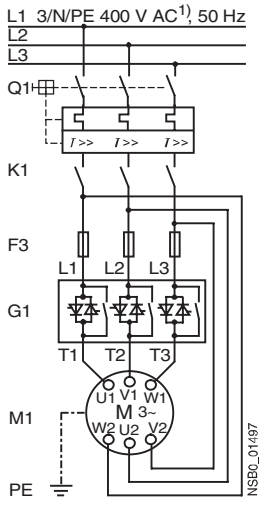
2) **Caution. Risk of restarting!**
The start command (e.g. from the PLC) must be reset prior to a reset command because a new, automatic restart will take place automatically if a start command is active after the reset command. This applies especially in case of motor protection tripping.
For safety 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. Type, see Fuse Coordination (inline circuit) on pages 6/31 to 6/33.
For applications with large centrifugal masses ($J_{Load} > J_{Motor}$) we recommend the function "DC braking".
The output 2 must be switched over to "DC braking contactor".

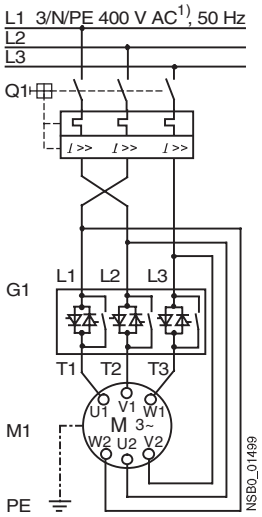
4) Auxiliary relay K4, e.g.:
LZX:RT4A4T30 (230 V AC rated control supply voltage),
LZX:RT4A4S15 (115 V AC rated control supply voltage).

Main circuit

Possibility 4a:
Inside-delta circuit

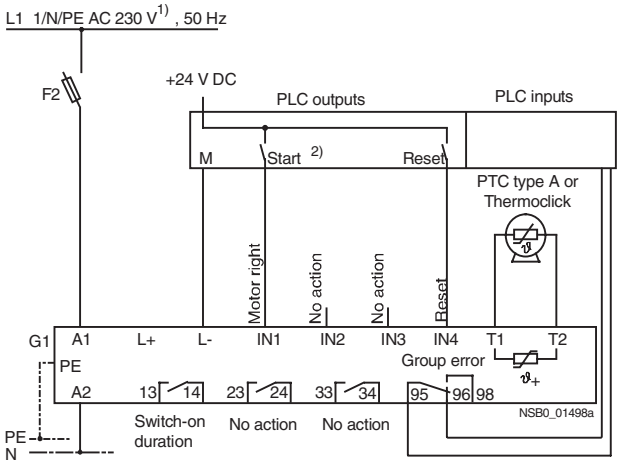


Possibility 4b:
Change of direction of rotation for inside-delta circuit



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

Overview

3RA fuseless load feeders

The 3RA1 fuseless load feeders consist of the 3RV1 motor starter protector and the 3RT1 contactor. Motor starter protectors and contactors are electrically and mechanically connected using pre-assembled sets of components (link modules, wiring sets and standard mounting rail or busbar adapters).

As the 3RA1 fuseless load feeders are constructed from 3RV1 motor starter protectors and 3RT1 contactors, the same accessories can be used for the 3RA fuseless load feeders as for these motor starter protectors and contactors.

Pre-assembled link modules are available as accessories for the power spectrum up to 45 kW. The desired fuseless load feeder can thus be assembled quickly and economically by the customer. A time saving is also achieved in connection with controlgear acceptances, as – unlike with conventional wiring systems – there is no need to rectify possible wiring errors.

The 3RV1 motor starter protector is responsible for overload and short-circuit protection in the fuseless load feeder. Back-up protective devices, such as fuses or limiters, are superfluous here, as the motor starter protector is capable of withstanding short-circuits of up to 50 or 100 kA at 400 V.

The 3RT1 contactor is particularly suitable for extremely complex switching tasks requiring the greatest endurance.

The permissible ambient temperature is 60 °C with butt-mounting and without derating (70 °C possible subject to certain restrictions).

3RA1 fuseless load feeders are available for motors up to 45 kW at AC-3 and 400 V (grounded network) and setting ranges from 0.14 A to 100 A.

3RA1 fuseless load feeders are supplied in four different sizes:

Size	Width	Max. rated current $I_{n\,max}$	For induction motors up to
	mm	A	kW
S00	45	12	5.5
S0	45	25	11
S2	55	50	22
S3	70	100	45

The SENTRON 3VL circuit-breakers and the SIRIUS 3RT contactors can be used for fuseless load feeders > 100 A. The corresponding distances from grounded or live parts, as detailed in the technical specifications, must be observed.

Operating conditions

3RA1 load feeders are climate-proof. They are intended for use in enclosed rooms in which no severe conditions (such as dust, caustic vapors, hazardous gases) prevail. Suitable covers must be provided for installation in dusty and damp locations.

Overload tripping times

All 3RA1 fuseless load feeders described here are designed for normal starting, in other words for overload tripping times of less than 10 s (CLASS 10). At rated-load operating temperature the tripping times are shorter, depending on the particular device and the setting range. The exact values can be derived from the tripping characteristics of the motor starter protectors.

Types of coordination

EN 60947-4-1 (VDE 0660 Part 102) and IEC 60947-4-1 make a distinction between two different types of coordination, which are designated type of coordination "1" and type of coordination "2". Any short-circuits that occur are cleared safely by both types of coordination. The only differences concern the extent of the damage caused to the device by a short-circuit.

- Type of coordination 1

The fuseless load feeder may be non-operational after a short-circuit has been cleared. Damage to the contactor or to the overload relay is permissible. For 3RA1 load feeders, the motor starter protector itself always achieves type "2" coordination.

- Type of coordination 2

There must be no damage to the overload trip or to any other components after a short-circuit has been cleared. The 3RA1 fuseless load feeder can resume operation without needing to be renewed. At most, it is permissible to weld the contactor contacts if they can be disconnected easily without any significant deformation.

Design

Complete unit

The 3RA1 fuseless load feeders can be ordered as complete equipment for direct start or for reversing duty. Control supply voltages of 50 Hz 230 V AC or 24 V DC and assembly on a 35 mm standard mounting rail or in a 40 or 60 mm busbar system are possible.
Special equipment for customer assembly can be ordered if other rated control supply voltages are required. The link modules simplify customer assembly of the load feeders.
The corresponding distances from grounded or live parts, as detailed in the technical specifications, must be observed.

Customer assembly

The standard devices can be combined optimally – in terms of both technical specifications and dimensions, thanks to the modular system of the SIRIUS series.

The fuseless load feeders can thus be assembled easily by the customer. It is simply necessary to assemble the standard 3RV1 motor starter protector and 3RT1 contactor and the appropriate link module together.

For the order numbers for special equipment and link modules, see the selection and ordering data "3RA11 Direct-On-Line Starters and 3RA12 Reversing Starters for Standard Mounting Rail, Screw Mounting or Busbar Systems".

For link modules for direct start or reversing duty for mounting on standard mounting rails or busbars, see ordering data "Accessories for Direct-On-Line Starters and Reversing Starters".

If a motor starter protector with a rotary operating mechanism is required for the lower setting ranges up to 12 A, the S0 motor starter protector can also be assembled with an S00 contactor. A special connecting module is available for this purpose.

For the installation of feeders, it is imperative to use standard rail adapters, as from size S2 for direct start and as from size S0 for reversing duty, to ensure the necessary mechanical strength. A standard rail adapter is not necessary if a busbar adapter is used.

Accessories

The accessories for the special equipment, such as auxiliary contacts and undervoltage trips, can also be used for the 3RA1 fuseless load feeders.

In addition, certain accessories have been optimized for the fuseless load feeders. They include the top-connected, transverse auxiliary contact on the motor starter protector with one changeover contact or one NO contact + one NC contact. Special auxiliary contact blocks that can be snapped on from below are available for the contactor. These two accessories enable the fuseless load feeders to be wired simply without having to route cables through the device.

The special accessories for 3RA fuseless load feeders take the form of link modules for 3RV1 motor starter protectors and 3RT1 contactors.

Mounting

3RA1 fuseless load feeders are available for assembly on standard mounting rails according to EN 50022-35 × 15 or on busbar adapters with a busbar center-line spacing of 40 or 60 mm and a busbar thickness of 5 or 10 mm.

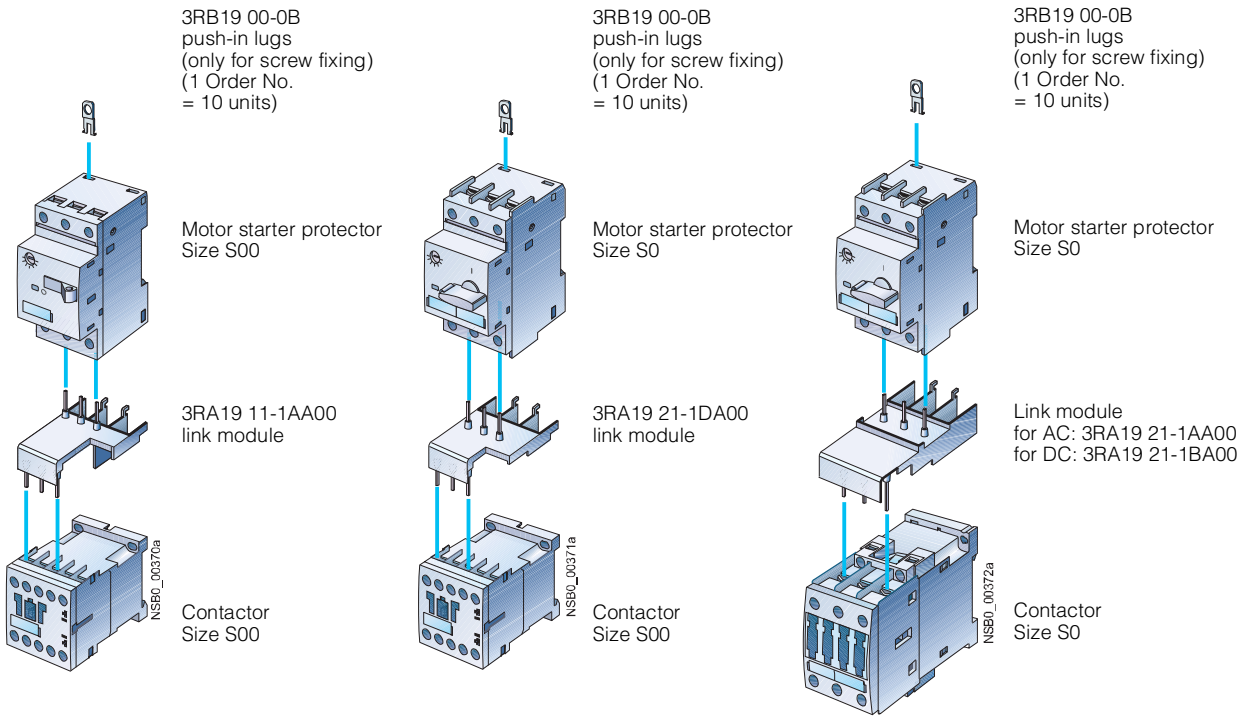
The fuseless load feeders are also suitable for screw fixing.

Up to size S0 the 3RA11 fuseless load feeders can also be configured with the 3RV19 infeed system (see 3RV19 Infeed System).

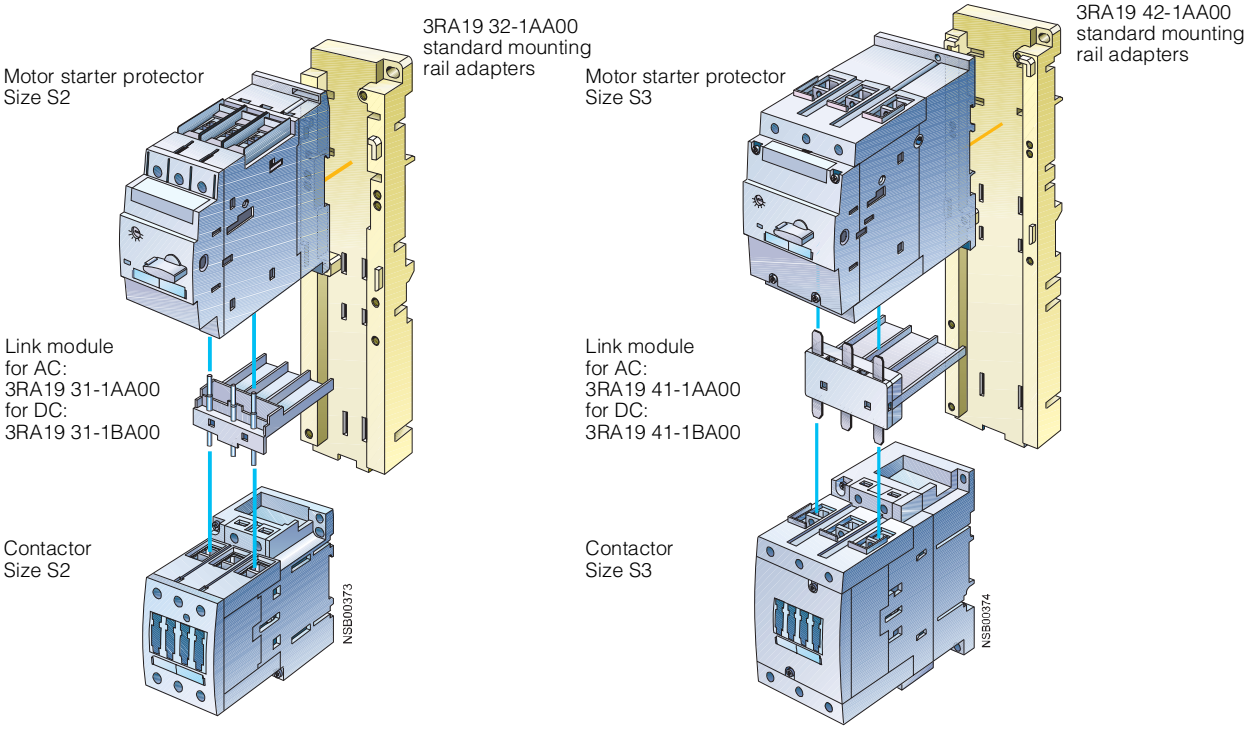
Size S00 and S0 can be screwed on with the aid of plug-in clips (see Accessories for Direct-On-Line and Reversing Starters).

General data

Direct start • For standard rail mounting • Size S00 and S0

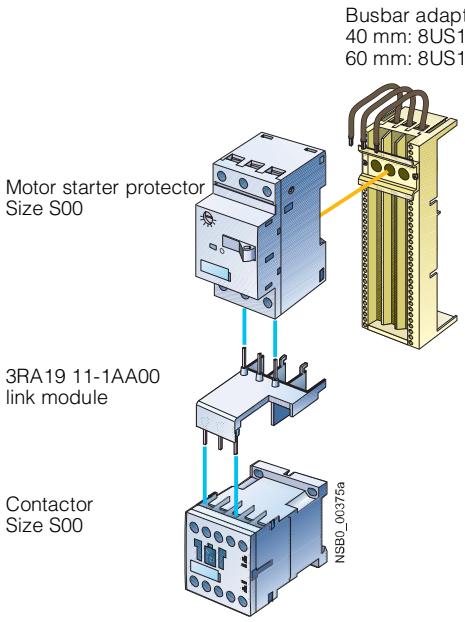


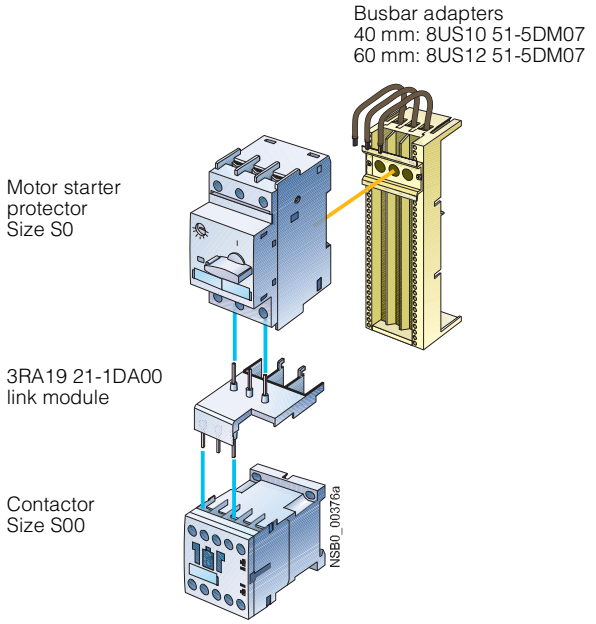
Direct start • For standard rail mounting • Size S2 and S3



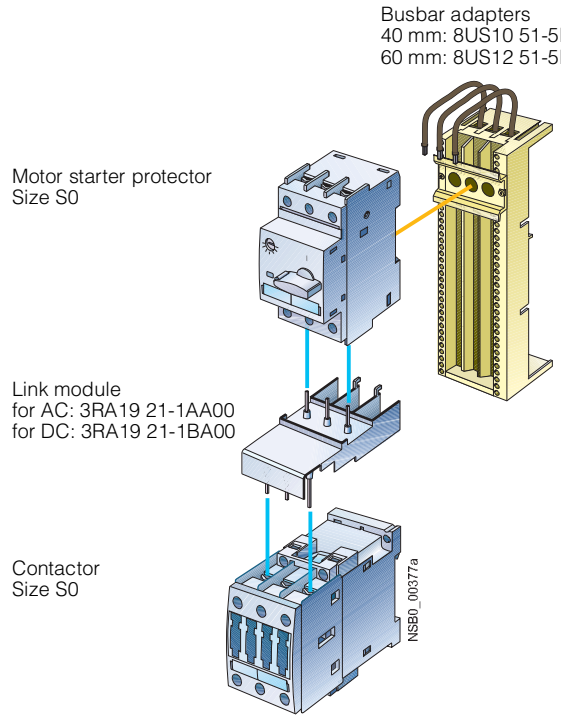
These graphical overviews are shown without small mounting hardware (screws etc.).

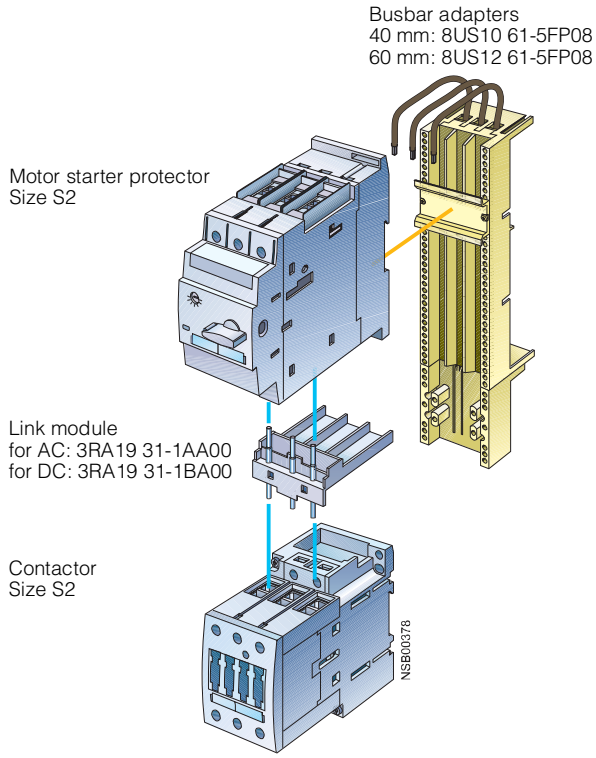
Direct start • For 40 mm and 60 mm busbar systems • Size S00 and S0





Direct start • For 40 mm and 60 mm busbar systems • Size S0 and S2

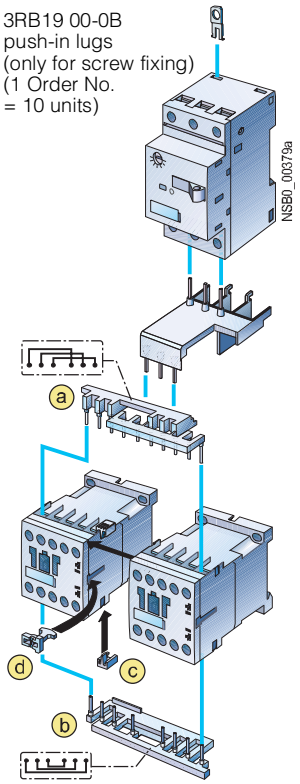


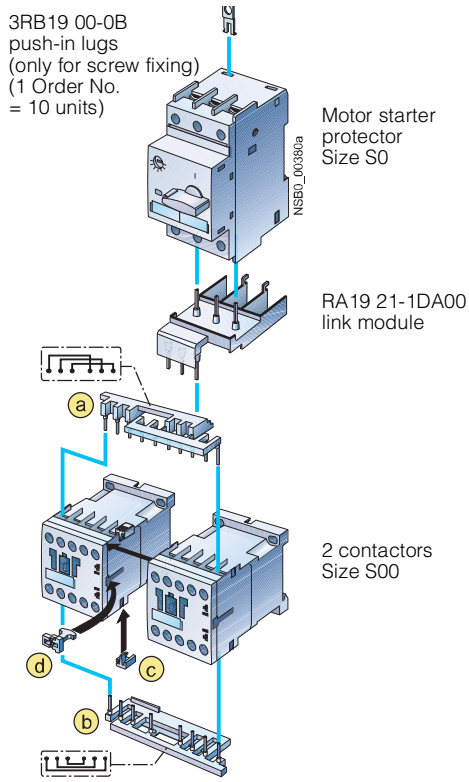


These graphical overviews are shown without small mounting hardware (screws etc.).

General data

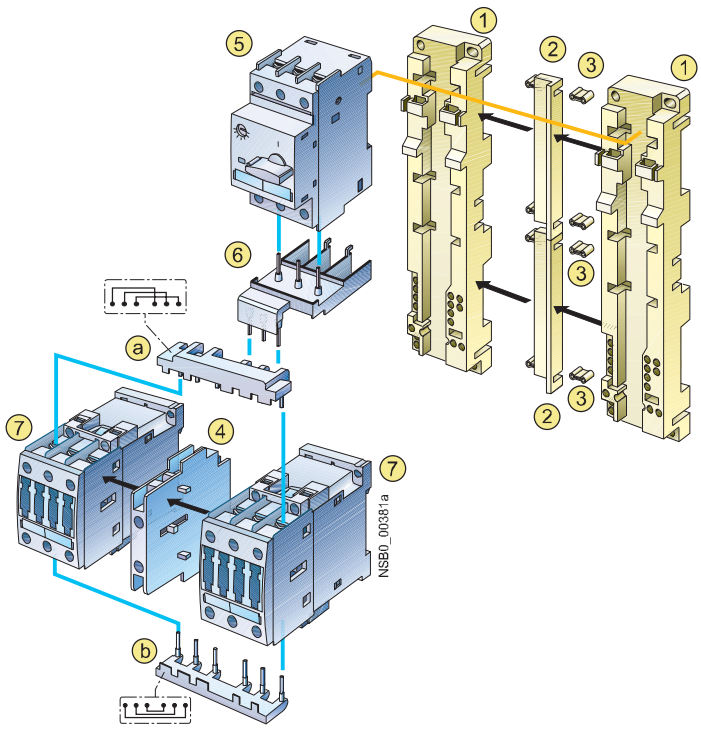
Reversing duty • For standard rail mounting • Size S00 and S0





Reversing duty • For standard rail mounting • Size S0

3RA19 23-1B assembly kit (RH)
for reversing duty
for mounting onto
standard rails
Consisting of:
1 wiring kit
2 adapters for rail mounting ①
2 side modules ②
4 link wedges ③



① 3RA19 22-1AA00
adapter for rail mounting

② 3RA19 02-1B
side modules
for adapter for rail mounting
(1 Order No. = 10 units)

③ 8US19 98-1AA00
link wedges
(1 Order No. = 100 units)

④ 3RA19 24-2B
mechanical interlock

⑤ Motor starter protector
Size S0

⑥ Link module
for AC: 3RA19 21-1AA00
for DC: 3RA19 21-1BA00

⑦ 2 contactors
Size S0

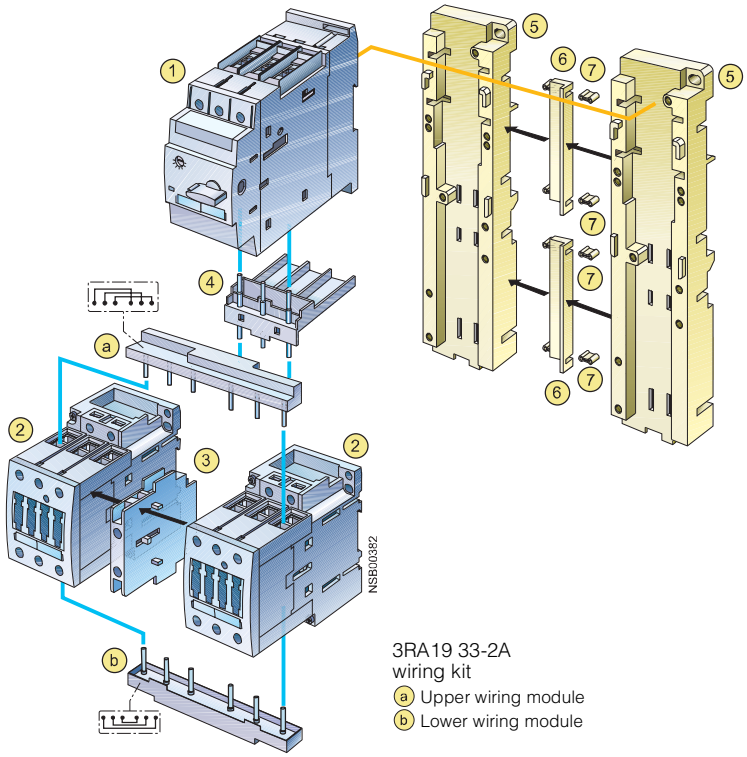
3RA19 23-2A
wiring kit
a Upper wiring module
b Lower wiring module

These graphical overviews are shown without small mounting hardware (screws etc.).

Reversing duty • For standard rail mounting • Size S2

3RA19 33-1 assembly kit (RH)
for reversing duty
for mounting onto
standard rails
Consisting of:
1 wiring kit
2 adapters for rail mounting (5)
2 side modules (6)
4 link wedges (7)

(1) Motor starter protector size S2
(2) 2 contactors size S2
(3) 3RA19 24-2B
mechanical interlock
(4) Link module
for AC: 3RA19 31-1AA00
for DC: 3RA19 31-1BA00
(5) 3RA19 32-1AA00
adapter for rail mounting
(6) 3RA19 02-1B side modules
for adapter for rail mounting
(1 Order No. = 10 units)
(7) 8US19 98-1AA00
link wedges
(1 Order No. = 100 units)

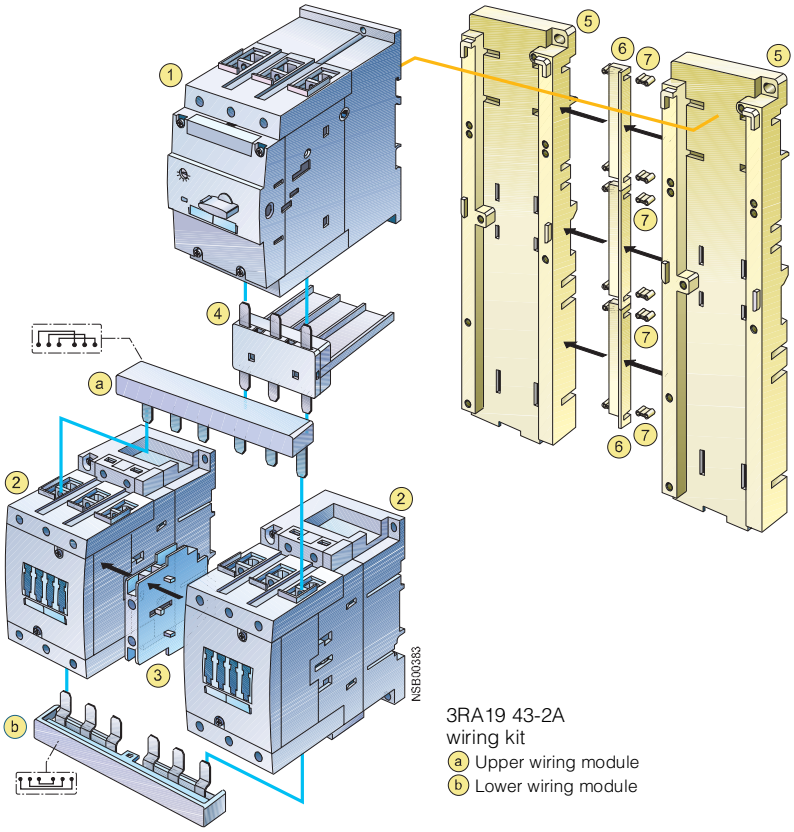


3RA19 33-2A
wiring kit
(a) Upper wiring module
(b) Lower wiring module

Reversing duty • For standard rail mounting • Size S3

3RA19 43-1B assembly kit (RH)
for reversing duty
for mounting onto
standard rails
Consisting of:
1 wiring kit
2 adapters for rail mounting (5)
2 side modules (6)
4 link wedges (7)

(1) Motor starter protector size S3
(2) 2 contactors size S3
(3) 3RA19 24-2B
mechanical interlock
(4) Link module
for AC: 3RA19 41-1AA00
for DC: 3RA19 41-1BA00
(5) 3RA19 42-1AA00
adapter for rail mounting
(6) 3RA19 02-1B side modules
for adapter for rail mounting
(1 Order No. = 10 units)
(7) 8US19 98-1AA00
link wedges
(1 Order No. = 100 units)



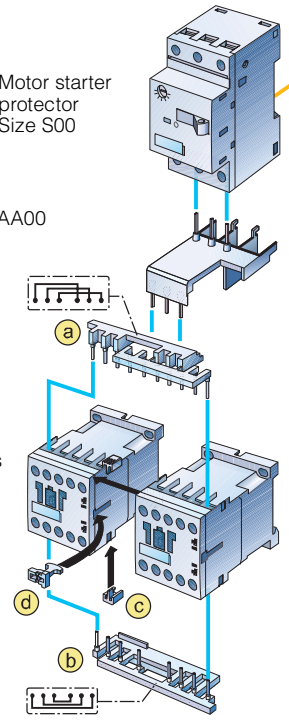
3RA19 43-2A
wiring kit
(a) Upper wiring module
(b) Lower wiring module

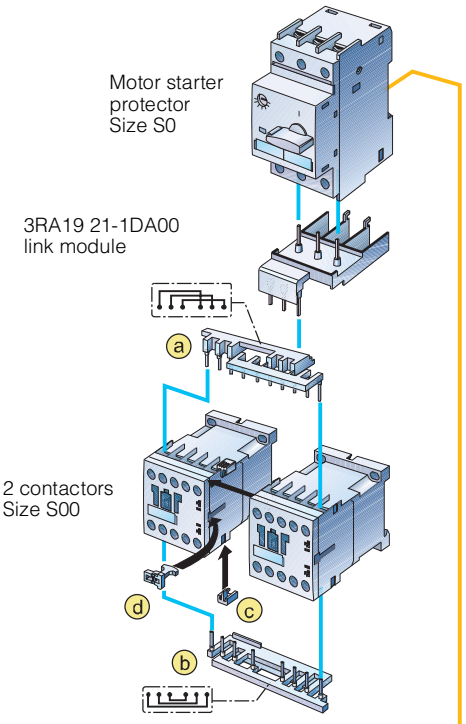
These graphical overviews are shown without small mounting hardware (screws etc.).

General data

Reversing duty • For 40 mm and 60 mm busbar systems • Size S00 and S0

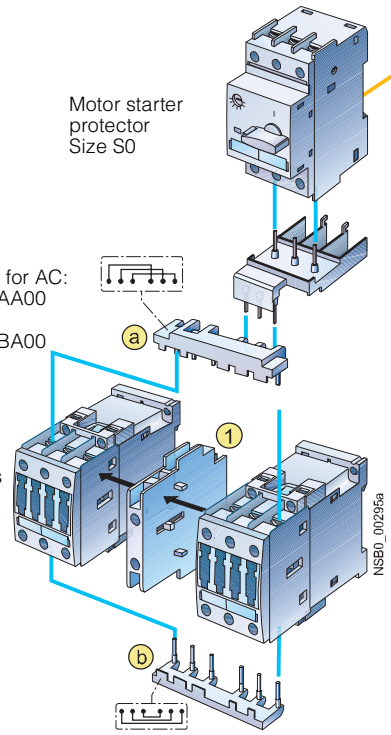
Assembly kit (RH)
for reversing duty
for busbar mounting
40 mm: 3RA19 13-1C
60 mm: 3RA19 13-1D
Consisting of:
1 wiring kit
2 busbar adapters
1 switching device holder
2 link wedges





3RA19 13-2A
wiring kit
(a) Upper wiring module
(b) Lower wiring module
(c) 2 connecting clips
(d) Mechanical interlock (can be removed)

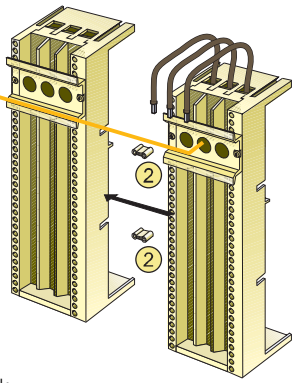
Assembly kit (RS)
for reversing duty
for busbar mounting
40 mm: 3RA19 23-1C
60 mm: 3RA19 23-1D
Consisting of:
1 wiring kit
2 busbar adapters
1 switching device holder
1 side module
2 link wedges



Device holder
for size S00
40 mm: 8US10 50-5AM00
60 mm: 8US12 50-5AM00

Device holder
for size S0
40 mm: 8US10 60-5AM00
60 mm: 8US12 60-5AM00

Busbar adapters
40 mm:
8US10 51-5DM07
60 mm:
8US12 51-5DM07



(1) 3RA19 24-2B
mechanical interlock

(2) 8US19 98-1AA00
link wedges
(1 Order No. = 100 units)

3RA19 23-2A
wiring kit
(a) Upper wiring module
(b) Lower wiring module

These graphical overviews are shown without small mounting hardware (screws etc.).

Reversing duty • For 40 mm and 60 mm busbar systems • Size S2

Assembly kit (RS)
for reversing duty
for busbar mounting
40 mm: 3RA19 33-1C
60 mm: 3RA19 33-1D
Consisting of:
1 wiring kit
2 busbar adapters
1 switching device holder
1 side module
2 link wedges ③

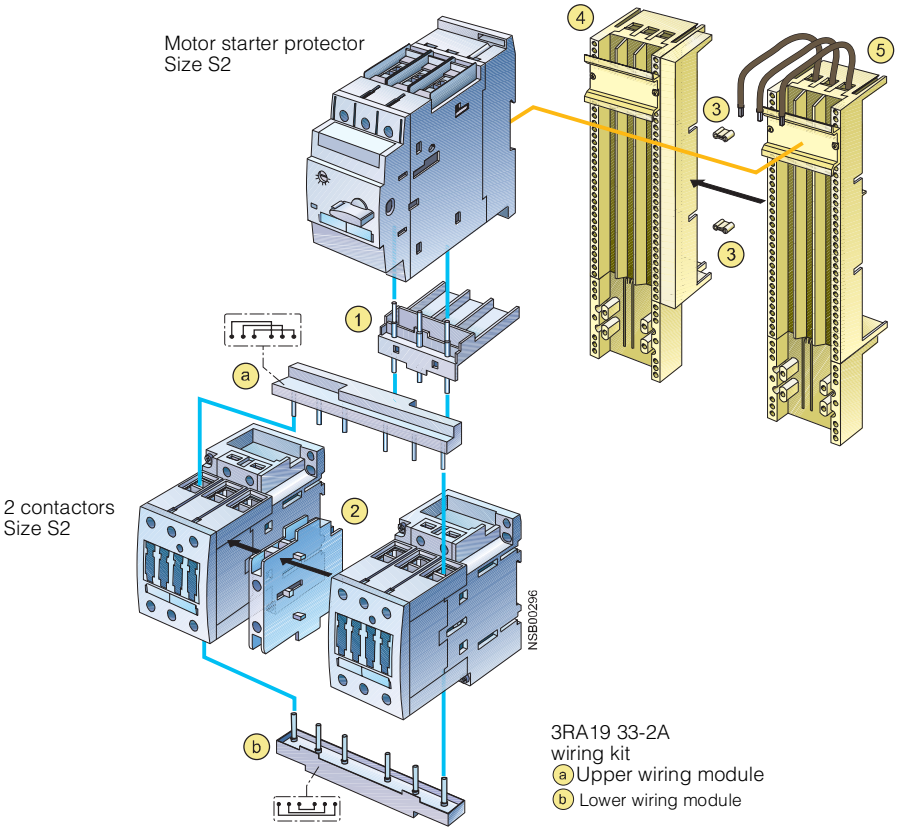
① Link module
for AC: 3RA19 31-1AA00
for DC: 3RA19 31-1BA00

② 3RA19 24-2B
mechanical interlock

③ 8US19 98-1AA00
link wedges
(1 Order No. = 100 units)

④ Switching device holders
40 mm: 8US10 60-5AP00
60 mm: 8US12 60-5AP00
with 8US19 98-2BM00
side module
for busbar adapter

⑤ Busbar adapter
40 mm: 8US10 61-5FP08
60 mm: 8US12 61-5FP08



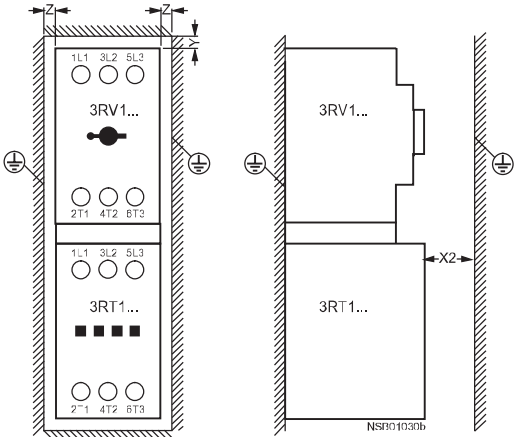
These graphical overviews are shown without small mounting hardware (screws etc.).

General data

Installation guidelines for 400/500 V AC

The following distances from grounded components must be observed when installing combinations:

Motor starter protectors in combination with contactors			Distance to grounded or live parts acc. to IEC 60947-4		
Motor starter protector	Contactor	Rated operational voltage	Y mm	X2[1] mm	Z mm
3RV1. 1 with	3RT10 1	400/500 V	20	10	9
3RV1. 2 with	3RT10 1	400/500 V	30	10	9
	3RT1. 2	400/500 V	30	10	9
	3RT1. 3	400/500 V	30	10	9
3RV1. 3 with	3RT10 2	400/500 V	50	10	10
	3RT1. 3	400/500 V	50	10	10
	3RT10 4	400/500 V	50	10	10
3RV1. 4 with	3RT10 4	400 V	90	10	12
	3RT10 4	500 V	220	10	20



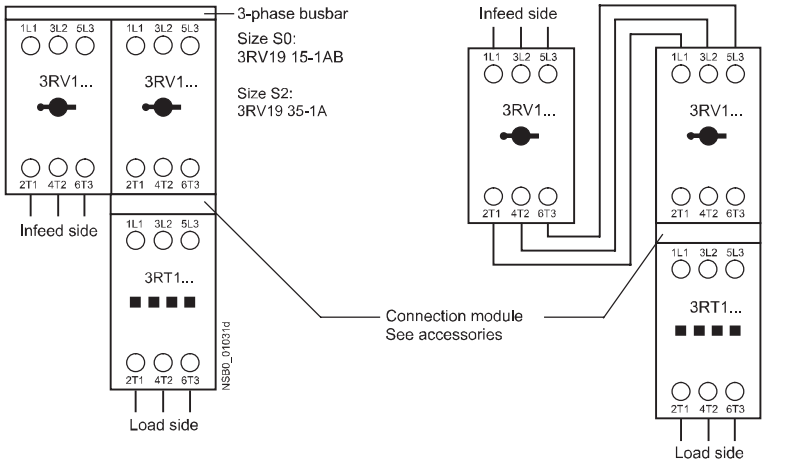
1) Minimum distance to contactor at front. For the motor starter protector, no minimum distance at the front must be maintained.

Installation guidelines for 690 V AC

For assembling fuseless load feeders for 690 V, one upstream and one downstream motor starter protector are required. If the sum of the set currents does not exceed the rated or set current of the upstream motor starter protector, several downstream motor starter protectors can also be used in parallel. The motor starter protectors must be placed adjacent to each other and can be connected with the wiring modules specified below.

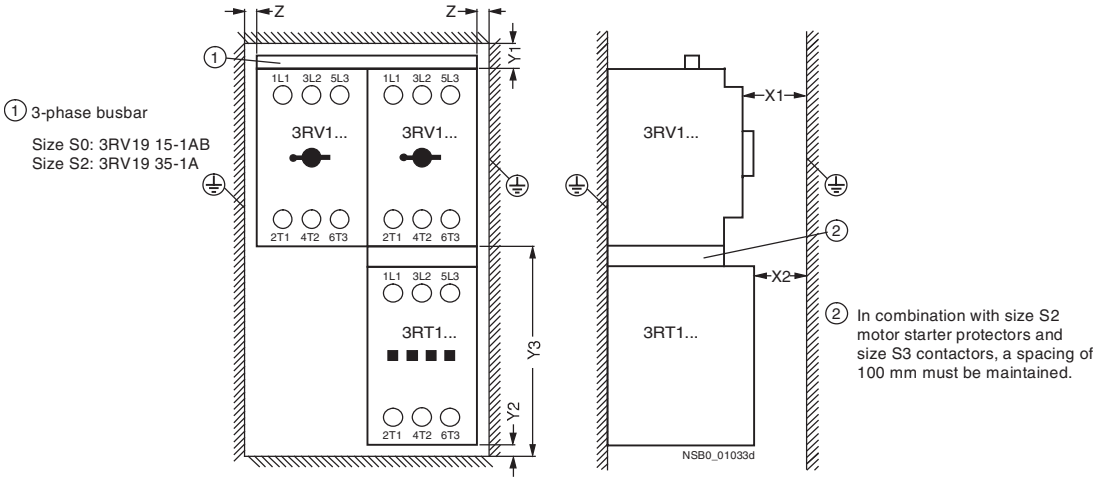
The contactor can be fitted with a connecting module under the downstream motor starter protector. If contactor assemblies are used for reversing duty, the assembly must be mounted so that the space beneath the upstream motor starter protector (infeed side) remains free.

Size	Mounting methods	Standard mounting for size S0 ... 5.5 kW, S2 and S3	Mounting for size S0 from 7.5 ... 11 kW
S0	Mounting on an insulated base plate. If screws are used for fixing, the screws must not be grounded. Alternatively, the adapter for rail mounting can be used without restriction.		
S2/S3	Mounting on an insulated base plate. Alternatively, the adapter for rail mounting can also be used.		



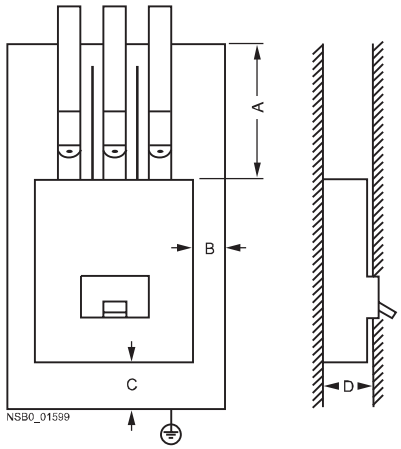
The following distances from grounded components must be observed when installing combinations:

Two motor starter protectors in combination with contactors			Distance to grounded or live parts acc. to IEC 60947-4					
Motor starter protector	Contactor	Rated operational voltage	Y1 mm	Y2 mm	Y3 mm	X1 mm	X2 mm	Z mm
3RV1. 2 with	**3RT10 2**	690 V	80	10	95	20	14	20
3RV1. 3 with	**3RT10 3**	690 V	50	10	120	10	32	10
	3RT10 4	690 V	50	10	120	10	40	10



Clearances to grounded parts for 3VL circuit-breakers

Circuit-breakers	Rated operational voltage U_e	Distance from grounded parts			
	V	A	B	C	D
3VL2/3VL3[1)]	max. 400	100	25	30	87
3VL2/3VL3[2)]	400 ... 525	100	25	30	87
3VL4/3VL5[1)]	max. 525	100	35	30	106.5



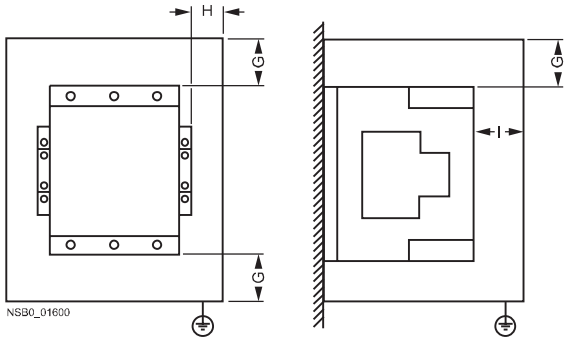
1) The 3VL9 300-8CE00 phase barriers (for 3VL2/3VL3) or 3VL9 600-8CE00 phase barriers (for 3VL4/3VL5) must be used.

2) The 3VL9 300-8C..0 terminal cover must be used.

General data

Distances from grounded parts for 3RT10 5./3RT10 6./3RT10 7. and 3RT12 6./3RT12 7. contactors

Contactors	Distance from grounded parts, rated operational voltage up to 690 V		
	G	H	I
3RT10 5.	40	10	20
3RT10 6./3RT12 6.	20	10	20
3RT10 7./3RT12 7.	20	10	20



G = Distance from box terminal.

In applications with cable lugs or busbar connection the 3RT19 56-4EA1 (3RT10 5) or 3RT19 66-4EA1 (3RT10 6., 3RT12 6., 3RT10 7. or 3RT12 7.) terminal cover must be used!

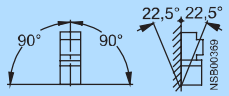
Technical specifications

Type			**3RA1. 1**	**3RA1. 2**	**3RA1. 3**	**3RA1. 4**
Size			**S00**	**S0**	**S2**	**S3**
Number of poles			**3**	**3**	**3**	**3**
General data						
Standards			IEC 60947-1, EN 60947-1 (VDE 0660 Part 100) IEC 60947-2, EN 60947-2 (VDE 0660 Part 101) IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)			
Max. rated current $I_{n\,max}$ (= max. rated operational current I_e)		A	12	25	50	100
Permissible ambient temperature		°C °C	-20 ... +70 for operation (up to +60 °C without restriction) -55 ... +80 during storage/transport			
Rated operational voltage U_e		V	690			
Rated frequency		Hz	50/60			
Rated insulation voltage U_i (pollution degree 3)		V	690			
Rated impulse withstand voltage U_{imp}		kV	6			
Trip class (CLASS)	According to IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)		10			
Rated short-circuit current I_q at AC 50/60 Hz 400 V according to IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)		kA	50			
Types of coordination according to IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)			1)			
Power loss $P_{v\,max}$ of all main conducting paths Dependent on the rated current I_n (upper setting range)	Up to 1.25 A 1.6 ... 6.3 A 8 ... 12 A 2 ... 6.3 A 8 ... 16 A 20 ... 25 A 25 ... 32 A 40 A 45 ... 50 A 63 A 75 ... 90 A 100 A	W W W W W W W W W W W W	6 7 10.5	7 9.5 13	19 28 35	29 45 60
Power consumption of the coils in the case of contactors (for cold coil and U_s, 50 Hz)						
• AC operation	Closing P.f. Closed P.f.	VA VA 	27 0.8 4.6 0.27	61 0.82 7.8 0.24	127 0.82 13.5 0.34	270 0.68 22 0.27
• DC operation	Closing = Closed	W	3.2	5.4	11.5	15
Coil operating range for contactors			0.8 ... 1.1 x U_s			
	low limit at 55 °C at 60 °C		0.8 x U_s 0.85 x U_s	-- --		
Endurance of the motor starter protector						
• Mechanical endurance	Operating cycles		100000		50000	
• Electrical endurance	Operating cycles		100000		50000	
• Max. switching frequency per hour (motor starts)		1/h	15		15	
Endurance of contactor						
• Mechanical endurance	Operating cycles		30 million	10 million		
• Electrical endurance	Operating cycles		2)			
Shock resistance (sine-wave pulse)	According to IEC 60086 Part 2-27	g	Up to 9.8	Up to 12.5	Up to 8	Up to 6
Degree of protection	According to IEC 60947-1		IP20			
Touch protection	According to EN 50274		Finger-safe			
Phase failure sensitivity of the motor starter protector	According to IEC 60947-1, EN 60947-1 (VDE 0660 Part 102)		Yes			
Insulation characteristics of the motor starter protector	According to IEC 60947-2, EN 60947-2 (VDE 0660 Part 101)		Yes			
Main control and EMERGENCY-STOP switch characteristics of the motor starter protector and accessories	According to IEC 60204-1, EN 60204-1 (VDE 0113 Part 1)		Yes, (with overvoltage releases of category 1 under conditions of proper use)			
Safe isolation between main and auxiliary circuits	According to EN 60947-1, Appendix N	V	Up to 400			
Positively driven operation at contactors			Yes	Yes, from main contact to auxiliary NC contact		

1) See Selection and Ordering Data.

2) See endurance characteristics of the contactors under Controlgear: Contactors and Contactor Assemblies.

General data

Type		**3RA1. 1**	**3RA1. 2**	**3RA1. 3**	**3RA1. 4**
Size		**S00**	**S0**	**S2**	**S3**
Number of poles		**3**	**3**	**3**	**3**
Conductor cross-sections of main circuit					
Standards		IEC 60947-1, EN 60947-1 (VDE 0660 Part 100) IEC 60947-2, EN 60947-2 (VDE 0660 Part 101) IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102)			
Connection type		Screw terminal	Screw terminal	Box terminal	Box terminal
Terminal screw		Pozidriv size 2	Pozidriv size 2	Pozidriv size 2	Allen screw
Minimum/maximum conductor cross-sections					
Finely stranded with end sleeve					
• 1-wire	mm^2	0.5 / 2.5	1 / 6	0.75 / 25	2.5/50[1)]
• 2-wire	mm^2	0.5 / 2.5	1 ... 2.5 / 2.5 ... 6	0.75 / 16	2.5/35
Solid or stranded					
• 1-wire	mm^2	0.5 / 4	1 / 6	0.7 / 35	2.5/70
• 2-wire	mm^2	0.75 / 2.5	1 ... 2.5 / 2.5 ... 6	0.75 / 25	2.5/50
Connection, main contacts, ribbon cable conductors				Yes	Yes
Busbar connections					Yes
• Solid or stranded	AWG	2 x (18 ... 14)	2 x (14 ... 10)	2 x (30 ... 2)	--
• Stranded	AWG	--	--	--	2 x (10 ... 1/0)
Connection type		Cage Clamp terminal			
	mm^2	2 x (0.5 ... 2.5)	--		
	AWG	2 x (18 ... 14)	--		
Permissible mounting position					
		Caution: according to DIN 43602 Start-up command "I" at the right or top			

6

Standard induction motor[1] 4-pole at 400 V AC		Setting range for thermal overload release	Motor starter protector/circuit-breaker[2]	Contactor[3]	Short-circuit breaking capacity	Size[4]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I					
kW	A	A			kA	
Selection tables						
Type of coordination "1" at 400 V AC Normal starting Class 10						
0.06	0.2	0.14 ... 0.2	3RV10 11-0BA10	3RT10 15-1AP01	50	**S00**
0.06	0.2	0.18 ... 0.25	3RV10 11-0CA10	3RT10 15-1AP01		
0.09	0.3	0.22 ... 0.32	3RV10 11-0DA10	3RT10 15-1AP01		
0.09	0.3	0.28 ... 0.4	3RV10 11-0EA10	3RT10 15-1AP01		
0.12	0.4	0.35 ... 0.5	3RV10 11-0FA10	3RT10 15-1AP01		
0.18	0.6	0.45 ... 0.63	3RV10 11-0GA10	3RT10 15-1AP01		
0.18	0.6	0.55 ... 0.8	3RV10 11-0HA10	3RT10 15-1AP01		
0.25	0.85	0.7 ... 1	3RV10 11-0JA10	3RT10 15-1AP01		
0.37	1.1	0.9 ... 1.25	3RV10 11-0KA10	3RT10 15-1AP01		
0.55	1.5	1.1 ... 1.6	3RV10 11-1AA10	3RT10 15-1AP01		
0.75	1.9	1.4 ... 2	3RV10 11-1BA10	3RT10 15-1AP01		
1.1	2.7	2.2 ... 3.2	3RV10 11-1DA10	3RT10 15-1AP01		
1.5	3.6	3.5 ... 5	3RV10 11-1FA10	3RT10 15-1AP01		
1.5	3.6	2.8 ... 4	3RV10 11-1EA10	3RT10 15-1AP01		
2.2	4.9	4.5 ... 6.3	3RV10 11-1GA10	3RT10 15-1AP01		
3	6.5	5.5 ... 8	3RV10 11-1HA10	3RT10 15-1AP01		
4	8.5	7 ... 10	3RV10 11-1JA10	3RT10 16-1AP01		
5.5	11.5	9 ... 12	3RV10 11-1KA10	3RT10 17-1AP01		
7.5	15.5	11 ... 16	3RV10 21-4AA10	3RT10 25-1AP00	50	**S0**
7.5	15.5	14 ... 20	3RV10 21-4BA10	3RT10 25-1AP00		
11	22	17 ... 22	3RV10 21-4CA10	3RT10 26-1AP00		
11	22	20 ... 25	3RV10 21-4DA10	3RT10 26-1AP00		
15	29	22 ... 32	3RV10 31-4EA10	3RT10 34-1AP00	50	**S2**
18.5	35	28 ... 40	3RV10 31-4FA10	3RT10 35-1AP00		
22	41	36 ... 45	3RV10 31-4GA10	3RT10 36-1AP00		
22	41	40 ... 50	3RV10 31-4HA10	3RT10 36-1AP00		
30	55	45 ... 63	3RV10 41-4JA10	3RT10 44-1AP00	50	**S3**
37	66	57 ... 75	3RV10 41-4KA10	3RT10 45-1AP00		
45	80	70 ... 90	3RV10 41-4LA10	3RT10 46-1AP00		
45	80	80 ... 100	3RV10 41-4MA10	3RT10 46-1AP00		
55	97	40 ... 100	3VL27 10-2AP33	3RT10 54-1AP36	50	**S6**
75	132	64 ... 160	3VL27 16-2AP33	3RT10 55-6AP36		
90	160	80 ... 200	3VL37 20-2AP36	3RT10 56-6AP36		
110	195	80 ... 200	3VL37 20-2AP36	3RT10 64-6AP36	50	**S10**
		80 ... 200	3VL37 20-2AP36	3RT12 64-6AP36		**S10V**
132	230	100 ... 250	3VL37 25-2AP36	3RT10 65-6AP36		**S10**
		100 ... 250	3VL37 25-2AP36	3RT12 65-6AP36		**S10V**
160	280	125 ... 315	3VL47 31-2AP36	3RT10 66-6AP36		**S10**
		125 ... 315	3VL47 31-2AP36	3RT12 66-6AP36		**S10V**
200	350	200 ... 500	3VL57 50-2AP36	3RT10 75-6AP36	50	**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 75-6AP36		**S12V**
250	430	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**

1) Selection depends on the concrete startup and rated data of the protected motor.

2) The motor starter protector remains fully operable and always conforms to type of coordination "2".

3) Rated control supply voltage 230 V AC. Further voltages are possible.

4) The abbreviation "V" stands for vacuum contactor.

General data

Standard induction motor[1] 4-pole at 400 V AC		Setting range for thermal overload release	Motor starter protector/circuit-breaker[2]	Contactor[3]	Short-circuit breaking capacity	Size[4]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I					
kW	A	A			kA	
Type of coordination "2" at 400 V AC Normal starting Class 10						
0.04	0.16	0.11 ... 0.16	3RV10 11-0AA10	3RT10 15-1AP01	130	**S00**
0.06	0.2	0.14 ... 0.2	3RV10 11-0BA10	3RT10 15-1AP01		
0.06	0.2	0.18 ... 0.25	3RV10 11-0CA10	3RT10 15-1AP01		
0.09	0.3	0.22 ... 0.32	3RV10 11-0DA10	3RT10 15-1AP01		
0.09	0.3	0.28 ... 0.4	3RV10 11-0EA10	3RT10 15-1AP01		
0.12	0.4	0.35 ... 0.5	3RV10 11-0FA10	3RT10 15-1AP01		
0.18	0.6	0.45 ... 0.63	3RV10 11-0GA10	3RT10 15-1AP01		
0.18	0.6	0.55 ... 0.8	3RV10 11-0HA10	3RT10 15-1AP01		
0.25	0.85	0.7 ... 1	3RV10 11-0JA10	3RT10 15-1AP01		
0.37	1.1	0.9 ... 1.25	3RV10 11-0KA10	3RT10 15-1AP01		
0.55	1.5	1.1 ... 1.6	3RV10 11-1AA10	3RT10 15-1AP01		
0.75	1.9	1.4 ... 2	3RV10 11-1BA10	3RT10 15-1AP01		
1.1	2.7	2.2 ... 3.2	3RV10 21-1DA10	3RT10 24-1AP00	130	**S0**
1.5	3.6	2.8 ... 4	3RV10 21-1EA10	3RT10 24-1AP00		
1.5	3.6	3.5 ... 5	3RV10 21-1FA10	3RT10 24-1AP00		
2.2	4.9	4.5 ... 6.3	3RV10 21-1GA10	3RT10 24-1AP00		
3	6.5	5.5 ... 8	3RV10 21-1HA10	3RT10 24-1AP00		
4	8.5	7 ... 10	3RV10 21-1JA10	3RT10 26-1AP00		
5.5	11.5	9 ... 12.5	3RV10 21-1KA10	3RT10 26-1AP00		
7.5	15.5	11 ... 16	3RV10 21-4AA10	3RT10 26-1AP00		
7.5	15.5	14 ... 20	3RV10 21-4BA10	3RT10 26-1AP00		
11	22	18 ... 25	3RV10 31-4DA10	3RT10 34-1AP00	100	**S2**
15	29	22 ... 32	3RV10 31-4EA10	3RT10 34-1AP00		
18.5	35	28 ... 40	3RV10 31-4FA10	3RT10 35-1AP00		
22	41	36 ... 45	3RV10 31-4GA10	3RT10 36-1AP00		
22	41	40 ... 50	3RV10 31-4HA10	3RT10 36-1AP00		
30	55	45 ... 63	3RV10 42-4JA10	3RT10 54-1AP36	100	**S3/S6**
37	66	57 ... 75	3RV10 42-4KA10	3RT10 54-1AP36		
45	80	70 ... 90	3RV10 42-4LA10	3RT10 54-1AP36		
45	80	80 ... 100	3RV10 42-4MA10	3RT10 54-1AP36		
55	97	40 ... 100	3VL27 10-2AP33	3RT10 54-1AP36	50	**S6**
75	132	64 ... 160	3VL27 16-2AP33	3RT10 55-6AP36		
90	160	80 ... 200	3VL37 20-2AP36	3RT10 56-6AP36		
110	195	80 ... 200	3VL37 20-2AP36	3RT10 64-6AP36	50	**S10**
		80 ... 200	3VL37 20-2AP36	3RT12 64-6AP36		**S10V**
132	230	100 ... 250	3VL37 25-2AP36	3RT10 65-6AP36		**S10**
		100 ... 250	3VL37 25-2AP36	3RT12 65-6AP36		**S10V**
160	280	125 ... 315	3VL47 31-2AP36	3RT10 66-6AP36		**S10**
		125 ... 315	3VL47 31-2AP36	3RT12 66-6AP36		**S10V**
200	350	200 ... 500	3VL57 50-2AP36	3RT10 75-6AP36	50	**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 75-6AP36		**S12V**
250	430	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**

1) Selection depends on the concrete startup and rated data of the protected motor.

2) The motor starter protector remains fully operable and always conforms to type of coordination "2".

3) Rated control supply voltage 230 V AC. Further voltages are possible.

4) The abbreviation "V" stands for vacuum contactor.

Standard induction motor[1] 4-pole at 400 V AC		Setting range for thermal overload release of the motor starter protctor (max. current)	Motor starter protector/circuit-breaker[2]	Contactor[3]	Short-circuit breaking capacity	Size[4]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I					
kW	A	A			kA	
Type of coordination "1" and "2" at 400 V AC Heavy-duty starting conditions with Class 20						
7.5	15.5	11 ... 16	3RV10 31-4AB10	3RT10 34-1AP00	50	**S2**
		14 ... 20	3RV10 31-4BB10	3RT10 34-1AP00		
11	22	18 ... 25	3RV10 31-4DB10	3RT10 34-1AP00		
15	29	22 ... 32	3RV10 31-4EB10	3RT10 34-1AP00		
18.5	35	28 ... 40	3RV10 31-4FB10	3RT10 36-1AP00		
22	41	36 ... 45	3RV10 31-4GB10	3RT10 44-1AP00	50	**S2/S3**
		40 ... 50	3RV10 31-4HB10	3RT10 44-1AP00		
30	55	45 ... 63	3RV10 42-4JB10	3RT10 45-1AP00	50	**S3**
37	66	57 ... 75	3RV10 42-4KB10	3RT10 45-1AP00		
37	66	70 ... 90	3RV10 42-4LB10	3RT10 54-1AP36	50	**S3/S6**
45	80	80 ... 100	3RV10 42-4MB10	3RT10 54-1AP36		
55	97	40 ... 100	3VL27 10-2AS33	3RT10 55-6AP36	50	**S6**
75	132	64 ... 160	3VL27 16-2AS33	3RT10 56-6AP36		
90	160	80 ... 200	3VL37 20-2AS36	3RT10 64-6AP36	50	**S10**
		80 ... 200	3VL37 20-2AS36	3RT10 65-6AP36		
110	195	80 ... 200	3VL37 20-2AS36	3RT10 66-6AP36		
		80 ... 200	3VL37 20-2AS36	3RT12 64-6AP36	50	**S10V**
132	230	100 ... 250	3VL37 25-2AS36	3RT12 65-6AP36		
160	280	125 ... 315	3VL47 31-2AS36	3RT12 66-6AP36		
160	280	125 ... 315	3VL47 31-2AS36	3RT10 75-6AP36	50	**S12**
200	350	200 ... 500	3VL57 50-2AS36	3RT10 76-6AP36		
		200 ... 500	3VL57 50-2AS36	3RT12 75-6AP36	50	**S12V**
250	430	200 ... 500	3VL57 50-2AS36	3RT12 76-6AP36		

1) Selection depends on the concrete startup and rated data of the protected motor.

2) The motor starter protector must be set to the maximum value to ensure that only the overload relay trips in the event of an overload. The motor starter protector remains fully operable and always conforms to type of coordination "2".

3) Rated control supply voltage 230 V AC. Further voltages are possible.

4) The abbreviation "V" stands for vacuum contactor.

Note:
Assemblies for heavy-duty starting conditions with Class 30 can be found in the configuration documentation SIRIUS Configuration, Order No. E20001–A580–P302-V2.

General data

Standard induction motor[1] 4-pole at 500 V AC		Setting range for thermal overload release	Motor starter protector/circuit-breaker	Contactor[2]	Short-circuit breaking capacity	Size[3]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I					
kW	A	A			kA	
Type of coordination "1" at 500 V AC Normal starting Class 10						
0.06	0.16	0.14 ... 0.2	3RV10 11-0BA10	3RT10 15-1AP01	50	**S00**
0.09	0.24	0.18 ... 0.25	3RV10 11-0CA10	3RT10 15-1AP01		
0.12	0.32	0.22 ... 0.32	3RV10 11-0DA10	3RT10 15-1AP01		
0.12	0.32	0.28 ... 0.4	3RV10 11-0EA10	3RT10 15-1AP01		
0.18	0.48	0.35 ... 0.5	3RV10 11-0FA10	3RT10 15-1AP01		
0.18	0.48	0.45 ... 0.63	3RV10 11-0GA10	3RT10 15-1AP01		
0.25	0.68	0.55 ... 0.8	3RV10 11-0HA10	3RT10 15-1AP01		
0.37	0.88	0.7 ... 1	3RV10 11-0JA10	3RT10 15-1AP01		
0.55	1.2	0.9 ... 1.25	3RV10 11-0KA10	3RT10 15-1AP01		
0.75	1.5	1.1 ... 1.6	3RV10 11-1AA10	3RT10 15-1AP01		
0.75	1.5	1.4 ... 2	3RV10 11-1BA10	3RT10 15-1AP01		
1.1	2.2	1.8 ... 2.5	3RV10 11-1CA10	3RT10 15-1AP01		
1.5	2.9	2.2 ... 3.2	3RV10 11-1DA10	3RT10 15-1AP01		
1.5	2.9	2.8 ... 4	3RV10 11-1EA10	3RT10 15-1AP01		
2.2	3.9	3.5 ... 5	3RV10 11-1FA10	3RT10 15-1AP01		
3	5.2	4.5 ... 6.3	3RV10 11-1GA10	3RT10 15-1AP01		
4	6.8	5.5 ... 8	3RV10 11-1HA10	3RT10 16-1AP01		
5.5	9.2	7 ... 10	3RV10 11-1JA10	3RT10 17-1AP01		
7.5	12.4	9 ... 12.5	3RV10 21-1KA10	3RT10 25-1AP00	50	**S0**
7.5	12.4	11 ... 16	3RV10 21-4AA10	3RT10 25-1AP00		
11	17.6	14 ... 20	3RV10 21-4BA10	3RT10 26-1AP00		
15	23	18 ... 25	3RV10 31-4DA10	3RT10 34-1AP00	50	**S2**
18.5	28	22 ... 32	3RV10 31-4EA10	3RT10 34-1AP00		
22	33	28 ... 40	3RV10 31-4FA10	3RT10 35-1AP00		
30	44	36 ... 45	3RV10 31-4GA10	3RT10 36-1AP00		
30	44	40 ... 50	3RV10 31-4HA10	3RT10 36-1AP00		
37	53	45 ... 63	3RV10 41-4JA10	3RT10 44-1AP00	50	**S3**
45	64	57 ... 75	3RV10 41-4KA10	3RT10 44-1AP00		
55	78	70 ... 90	3RV10 41-4LA10	3RT10 45-1AP00		
75	106	64 ... 160	3VL27 16-2AP33	3RT10 54-1AP36	50	**S6**
90	128	64 ... 160	3VL27 16-2AP33	3RT10 55-6AP36		
110	156	64 ... 160	3VL27 16-2AP33	3RT10 56-6AP36		
132	184	80 ... 200	3VL37 20-2AP36	3RT10 64-6AP36	50	**S10**
		80 ... 200	3VL37 20-2AP36	3RT12 64-6AP36		**S10V**
160	224	100 ... 250	3VL37 25-2AP36	3RT10 65-6AP36		**S10**
		100 ... 250	3VL37 25-2AP36	3RT12 65-6AP36		**S10V**
200	280	125 ... 315	3VL47 31-2AP36	3RT10 66-6AP36		**S10**
		125 ... 315	3VL47 31-2AP36	3RT12 66-6AP36		**S10V**
250	344	200 ... 500	3VL57 50-2AP36	3RT10 75-6AP36	50	**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 75-6AP36		**S12V**
315	432	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**
355	488	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**

1) Selection depends on the concrete startup and rated data of the protected motor.

2) Rated control supply voltage 230 V AC. Further voltages are possible.

3) The abbreviation "V" stands for vacuum contactor.

Standard induction motor[1] 4-pole at 500 V AC		Setting range for thermal overload release	Motor starter protector/circuit-breaker	Contactor[2]	Short-circuit breaking capacity	Size[3]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I					
kW	A	A			kA	
Type of coordination "2" at 500 V AC Normal starting Class 10						
0.06	0.16	0.14 ... 0.2	3RV10 11-0BA10	3RT10 15-1AP01	50	**S00**
0.09	0.24	0.18 ... 0.25	3RV10 11-0CA10	3RT10 15-1AP01		
0.12	0.32	0.22 ... 0.32	3RV10 11-0DA10	3RT10 15-1AP01		
0.12	0.32	0.28 ... 0.4	3RV10 11-0EA10	3RT10 15-1AP01		
0.18	0.48	0.35 ... 0.5	3RV10 11-0FA10	3RT10 15-1AP01		
0.18	0.48	0.45 ... 0.63	3RV10 11-0GA10	3RT10 15-1AP01		
0.25	0.68	0.55 ... 0.8	3RV10 11-0HA10	3RT10 15-1AP01		
0.37	0.88	0.7 ... 1	3RV10 11-0JA10	3RT10 15-1AP01		
0.55	1.2	0.9 ... 1.25	3RV10 11-0KA10	3RT10 15-1AP01		
0.75	1.5	1.1 ... 1.6	3RV10 11-1AA10	3RT10 15-1AP01		
0.75	1.5	1.4 ... 2	3RV10 21-1BA10	3RT10 24-1AP00	50	**S0**
1.1	2.2	1.8 ... 2.5	3RV10 21-1CA10	3RT10 26-1AP00		
1.5	2.9	2.2 ... 3.2	3RV10 21-1DA10	3RT10 34-1AP00	50	**S0/S2**
1.5	2.9	2.8 ... 4	3RV10 21-1EA10	3RT10 34-1AP00		
2.2	4.0	3.5 ... 5	3RV10 21-1FA10	3RT10 34-1AP00		
3	5.2	4.5 ... 6.3	3RV10 21-1GA10	3RT10 34-1AP00		
4	6.8	5.5 ... 8	3RV10 21-1HA10	3RT10 34-1AP00		
5.5	9.2	7 ... 10	3RV10 21-1JA10	3RT10 34-1AP00		
7.5	12.4	9 ... 12.5	3RV10 21-1KA10	3RT10 34-1AP00		
7.5	12.4	11 ... 16	3RV10 31-4AA10	3RT10 34-1AP00	50	**S2**
11	17.6	14 ... 20	3RV10 31-4BA10	3RT10 34-1AP00		
15	23	18 ... 25	3RV10 31-4DA10	3RT10 34-1AP00		
18.5	28	22 ... 32	3RV10 31-4EA10	3RT10 34-1AP00		
22	33	28 ... 40	3RV10 31-4FA10	3RT10 35-1AP00		
30	44	36 ... 45	3RV10 31-4GA10	3RT10 36-1AP00		
30	44	40 ... 50	3RV10 31-4HA10	3RT10 36-1AP00		
37	53	45 ... 63	3RV10 41-4JA10	3RT10 44-1AP00	50	**S3**
45	64	57 ... 75	3RV10 41-4KA10	3RT10 44-1AP00		
55	78	70 ... 90	3RV10 41-4LA10	3RT10 45-1AP00		
75	106	64 ... 160	3VL27 16-2AP33	3RT10 54-1AP36	50	**S6**
90	128	64 ... 160	3VL27 16-2AP33	3RT10 55-6AP36		
110	156	64 ... 160	3VL27 16-2AP33	3RT10 56-6AP36		
132	184	80 ... 200	3VL37 20-2AP36	3RT10 64-6AP36	50	**S10**
		80 ... 200	3VL37 20-2AP36	3RT12 64-6AP36		**S10V**
160	224	100 ... 250	3VL37 25-2AP36	3RT10 65-6AP36		**S10**
		100 ... 250	3VL37 25-2AP36	3RT12 65-6AP36		**S10V**
200	280	125 ... 315	3VL47 31-2AP36	3RT10 66-6AP36		**S10**
		125 ... 315	3VL47 31-2AP36	3RT12 66-6AP36		**S10V**
250	344	200 ... 500	3VL57 50-2AP36	3RT10 75-6AP36	50	**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 75-6AP36		**S12V**
315	432	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**
355	488	200 ... 500	3VL57 50-2AP36	3RT10 76-6AP36		**S12**
		200 ... 500	3VL57 50-2AP36	3RT12 76-6AP36		**S12V**

1) Selection depends on the concrete startup and rated data of the protected motor.

2) Rated control supply voltage 230 V AC. Further voltages are possible.

3) The abbreviation "V" stands for vacuum contactor.

General data

Standard induction motor[1] 4-pole at 500 V AC		Setting range for thermal overload release of the motor starter protector (max. current)	Motor starter protector/circuit-breaker	Contactor[2]	Short-circuit breaking capacity	Size[3]
Standard output	Motor current (guide value)		Type	Type	I_q	
P	I	⊏				
kW	A	A			kA	
Type of coordination "1" and "2" at 500 V AC Heavy-duty starting conditions with Class 20						
7.5	12.4	11 ... 16	3RV10 31-4AB10	3RT10 34-1AP00	50	**S2**
11	17.6	14 ... 20	3RV10 31-4BB10	3RT10 34-1AP00		
11	17.6	18 ... 25	3RV10 31-4DB10	3RT10 34-1AP00		
15	23	22 ... 32	3RV10 31-4EB10	3RT10 35-1AP00		
18.5	28	22 ... 32	3RV10 31-4EB10	3RT10 44-1AP00	50	**S2/S3**
18.5	28	28 ... 40	3RV10 42-4FB10	3RT10 44-1AP00	50	**S3**
22	33	28 ... 40	3RV10 42-4FB10	3RT10 44-1AP00		
30	44	36 ... 50	3RV10 42-4HB10	3RT10 44-1AP00		
30	44	45 ... 63	3RV10 42-4JB10	3RT10 44-1AP00		
37	53	45 ... 63	3RV10 42-4JB10	3RT10 45-1AP00		
37	53	57 ... 75	3RV10 42-4KB10	3RT10 45-1AP00		
45	64	57 ... 75	3RV10 42-4KB10	3RT10 54-1AP36	50	**S3/S6**
55	79	70 ... 90	3RV10 42-4LB10	3RT10 54-1AP36		
75	106	64 ... 160	3VL27 16-2AS33	3RT10 55-6AP36		**S6**
90	128	64 ... 160	3VL27 16-2AS33	3RT10 56-6AP36		
110	156	64 ... 160	3VL27 16-2AS33	3RT10 64-6AP36	50	**S10**
132	184	80 ... 200	3VL37 20-2AS36	3RT10 65-6AP36		
		80 ... 200	3VL37 20-2AS36	3RT12 64-6AP36	50	**S10V**
160	224	100 ... 250	3VL37 25-2AS36	3RT12 65-6AP36		
200	280	125 ... 315	3VL47 31-2AS36	3RT12 66-6AP36		
200	280	125 ... 315	3VL47 31-2AS36	3RT10 75-6AP36	50	**S12**
250	344	200 ... 500	3VL57 50-2AS36	3RT10 76-6AP36		
		200 ... 500	3VL57 50-2AS36	3RT12 75-6AP36	50	**S12V**
315	432	200 ... 500	3VL57 50-2AS36	3RT12 76-6AP36		
355	488	200 ... 500	3VL57 50-2AS36	3RT12 76-6AP36		

1) Selection depends on the concrete startup and rated data of the protected motor.

2) Rated control supply voltage 230 V AC. Further voltages are possible.

3) The abbreviation "V" stands for vacuum contactor.

Note:
Assemblies for heavy-duty starting conditions with Class 30 can be found in the configuration documentation SIRIUS Configuration, Order No. E20001–A580–P302-V2.

Standard induction motor 4-pole at 690 V AC[1]		Setting range of motor starter protector	Standard motor starter protector with limit function	Downstream motor starter protector	Contactor[2]	Short-circuit breaking capacity	Size
Standard output	Motor current (guide value)		Type	Type	Type	I_q	
P	I						
kW	A	A				kA	
Type of coordination "1" and "2" at 690 V AC Normal starting Class 10							
0.09	0.17	0.14 ... 0.2	None	3RV10 21-0BA10	3RT10 24-1AP00	100[3]	**S0**
0.12	0.23	0.18 ... 0.25		3RV10 21-0CA10	3RT10 24-1AP00		
0.12	0.23	0.22 ... 0.32		3RV10 21-0DA10	3RT10 24-1AP00		
0.18	0.35	0.28 ... 0.4		3RV10 21-0EA10	3RT10 24-1AP00		
0.18	0.35	0.35 ... 0.5		3RV10 21-0FA10	3RT10 24-1AP00		
0.25	0.49	0.45 ... 0.63		3RV10 21-0GA10	3RT10 24-1AP00		
0.37	0.64	0.55 ... 0.8		3RV10 21-0HA10	3RT10 24-1AP00		
0.55	0.87	0.7 ... 1		3RV10 21-0JA10	3RT10 24-1AP00		
0.75	1.1	0.9 ... 1.25		3RV10 21-0KA10	3RT10 24-1AP00		
0.75	1.1	1.1 ... 1.6		3RV10 21-1AA10	3RT10 24-1AP00		
1.1	1.6	1.4 ... 2	3RV13 21-4DC10	3RV10 21-1BA10	3RT10 24-1AP00	50	**S0**
1.5	2.1	1.8 ... 2.5	Size S0	3RV10 21-1CA10	3RT10 24-1AP00		
2.2	2.8	2.2 ... 3.2	I_n = 25 A	3RV10 21-1DA10	3RT10 24-1AP00		
3.0	3.8	3.5 ... 5		3RV10 21-1FA10	3RT10 24-1AP00		
4.0	4.9	4.5 ... 6.3		3RV10 21-1GA10	3RT10 24-1AP00		
5.5	6.7	5.5 ... 8	3RV13 31-4HC10	3RV10 21-1HA10	3RT10 24-1AP00	50	**S0**
11	8.9	7 ... 10	Size S2	3RV10 21-1JA10	3RT10 24-1AP00		
	12.8	11 ... 16	I_n = 50 A	3RV10 21-4AA10	3RT10 25-1AP00		
11	12.8	11 ... 16	3RV13 31-4HC10	3RV10 31-4AA10	3RT10 34-1AP00	50	**S2**
15	17	14 ... 20	Size S2	3RV10 31-4BA10	3RT10 34-1AP00		
18.5	21	18 ... 25	I_n = 50 A	3RV10 31-4DA10	3RT10 35-1AP00		
22	24	22 ... 32		3RV10 31-4EA10	3RT10 35-1AP00		
30	32	28 ... 40		3RV10 31-4FA10	3RT10 44-1AP00[4]	50	**S2/S3**
37	39	36 ... 45		3RV10 31-4GA10	3RT10 44-1AP00[4]		
45	47	40 ... 50		3RV10 31-4HA10	3RT10 45-1AP00[4]		

1) Selection depends on the concrete startup and rated data of the protected motor.

2) Rated control supply voltage 230 V AC. Further voltages are possible.

3) An upstream motor starter protector is not required.

4) With these combinations, the distance between the downstream motor starter protector and the contactor must be at least 10 cm.

Infeed System

3RV19 infeed system

Overview

The 3RV19 infeed system is a convenient means of power supply and distribution for a group of several motor starter protectors or complete load feeders with a screw or spring-loaded terminal system up to size S0.

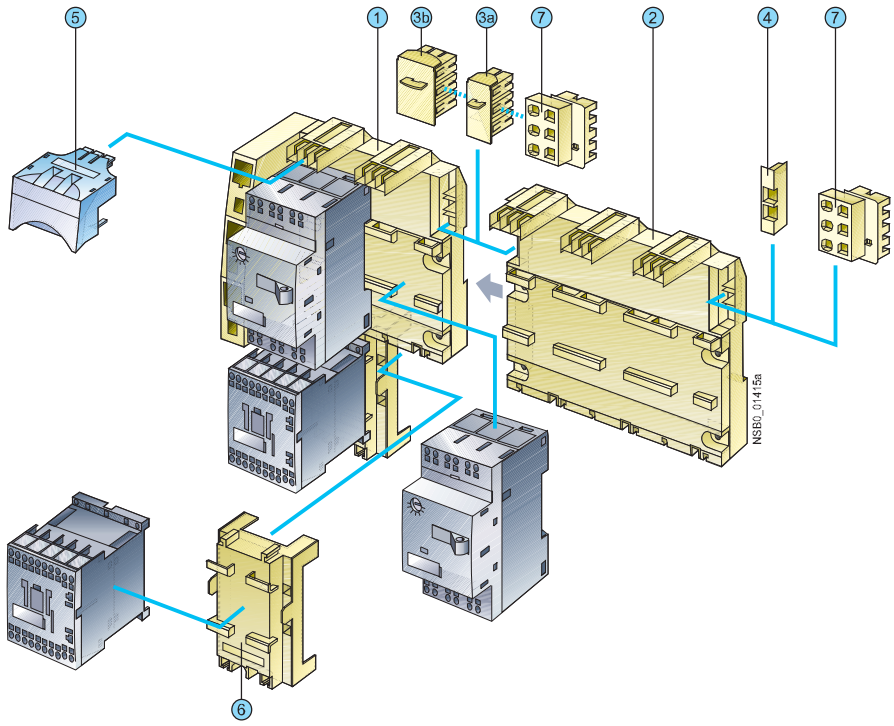
The devices with spring-loaded terminals are available in the SIRIUS modular system up to 5.5 kW at 400 V AC. The motor starter protectors and load feeders with screw terminals for sizes S00 and S0 can also be integrated in the system at the same time.

The system is based on a basic module complete with a lateral incoming unit (3-phase busbar with infeed). This incoming unit with spring-loaded terminals is mounted on the right or left depending on the version and can be supplied with a maximum conductor cross-section of 25 mm^2 (with end sleeve). A basic module has two sockets onto each of which a motor starter protector can be snapped.

Expansion modules are available for extending the system (3-phase busbars for system expansion). The individual modules are connected through an expansion plug.

Electrical connection between the 3-phase busbars and the motor starter protectors is implemented through plug-in connectors. The complete system can be mounted on a 35 mm standard mounting rail according to EN 50022 and can be expanded as required up to a maximum current carrying capacity of 80 A.

The system is mounted extremely quickly and easily thanks to the simple plug-in technique. Thanks to the lateral infeed, the system also saves space in the control cabinet. The additional overall height required for the infeed unit is only 30 mm. The alternative infeed possibilities on each side offer a high degree of flexibility for configuring the control cabinet: Infeed on left-hand or right-hand side, ring infeed or infeed on one side and loop-through from the other side to supply further loads are all possible. A terminal block with spring-loaded terminals in combination with a standard mounting rail enables the integration of not only SIRIUS motor starter protectors but also single-phase, 2-phase and 3-phase components such as 5SY miniature circuit-breakers or SIRIUS relay components.



1 3-phase busbar with infeed
2 3-phase busbar for system expansion
3a Expansion plug
3b Extra-wide expansion plug
4 End cover
5 Plug-in connector
6 Contactor base
7 Terminal block

① *3-phase busbars with infeed*

A 3-phase busbar with infeed unit is required for connecting the incoming supply. This module comprises one infeed module and 2 sockets which each accept one motor starter protector. A choice of two versions with infeed on the left or right is available. The incoming supply is connected using spring-loaded terminals. The Cage Clamp springs permit conductor cross-sections of up to 25 mm^2 with end sleeves. An end cover is supplied with each module.

② *3-phase busbars for system expansion*

The 3-phase busbars for system expansion support expansion of the system. There is a choice of modules with 2 or 3 sockets. The system can be expanded as required up to a maximum current carrying capacity of 63 A. An expansion plug is supplied with each module.

③a *Expansion plug*

The expansion plug is used for electrical connection of adjacent 3-phase busbars. The current carrying capacity of this plug equals 63 A. One expansion plug is supplied with each 3-phase busbar for system expansion. Additional expansion plugs are therefore only required as spare parts.

③b *Extra-wide expansion plug*

The extra-wide expansion plug makes the electrical connection between two 3-phase busbars, thus performing the same function as the 3RV19 17-5BA00 expansion plug; the electrical characteristics (e.g. a current carrying capacity of 63 A) are identical.

The 3RV19 17-5E expansion plug is 10 mm wider than the 3RV19 17-5BA00 expansion plug, hence in the plugged state there is a distance of 10 mm between the connected 3-phase busbars. This distance can be used to lay the auxiliary current and control current wiring ("wiring duct"). As the result, the motor starter protector and contactor can be wired from underneath, which means that the complete cable duct above the system can be omitted.

④ *End cover*

The end cover is used to cover the 3-phase busbar at the open end of the system. This cover is therefore only required once for each system. An end cover is supplied with each 3-phase busbar system with infeed. Further end covers are therefore only required as spare parts.

⑤ *Plug-in connector*

The plug-in connector is used for the electrical connection between the 3-phase busbar and the motor starter protector. There are three different versions:

- One version for 3RV motor starter protectors size S00 with screw terminals
- One version for 3RV motor starter protectors size S0 with screw terminals
- One version for 3RV motor starter protectors size S00 with spring-loaded terminals

⑥ *Contactor base*

Load feeders can be assembled in the system using the contactor base. The contactor bases are suitable for contactors of size S00 with spring-loaded terminals and are simply snapped onto the 3-phase busbars. Direct-on-line starters and reversing starters are possible. One contactor base is required for direct-on-line starters and two are required for reversing starters. To assemble load feeders for reversing starters, the contactor bases can be arranged either below each other (45 mm overall width) or alongside each other (90 mm overall width). It is important to note that mechanical interlocking of the contactors is only possible when they are arranged vertically.

The infeed system is designed for mounting on a 35 mm standard mounting rail with 7.5 mm overall depth. This standard mounting rail gives the contactor base a stable mounting surface to sit on. If standard mounting rails with a depth of 15 mm are used, the spacer connected to the bottom of the contactor base must be knocked out and plugged into the mating piece that is also on the underside. Then the contactor base also has a stable mounting surface. When standard mounting rails with a depth of 7.5 mm are used, the spacer has no function and can be removed.

As an alternative to using a contactor base, the 3RA19 11-2E electrical link modules can also be used for load feeders for direct start load feeders of size S00. Motor starter protector and contactor assemblies can then be directly snapped into the sockets of the 3-phase busbars. For feeders of size S00 and S0, the corresponding 3RA19 11-1.... or 3RA19 21-1... link modules should generally be used. For size S0, it is only possible integrate direct start load feeders and they must be integrated in the system as complete assemblies.

⑦ *Terminal block*

The 3RV19 17-5D terminal block enables the integration of not only SIRIUS motor starter protectors but also single-phase, 2-phase and 3-phase components in addition. Using the terminal block the 3 phases can be fed out of the system; single-phase loads can also be integrated in the system as the result. The terminal block is plugged into the slot of the expansion plug and thus enables outfeeding from the middle or end of the infeed system. The terminal block can be rotated through 180 ° and be locked to the support modules of the infeed system. The 3RV19 17-7B 45 mm standard mounting rail for screwing onto the support plate is available in addition in order to be able to plug the single-phase, 2-phase and 3-phase components onto the infeed system.

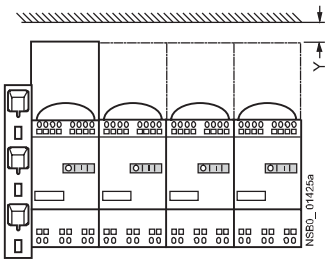
3RV19 infeed system

Design

Installation guidelines

Distance in Y direction from live, earthed or insulated parts according to IEC 60947-4: 10 mm.

In addition, the installation guidelines for motor starter protectors or fuseless load feeders including the clearances must be complied with.



Installation guidelines for 3RV19 17-5D terminal block

The short-circuit device which is connected upstream from the infeed system must be configured in accordance with the conductor cross-section on the infeed block.

Conductor cross-section on 3RV19 17-1A/-1E infeed block	**Upstream short-circuit device**		
	Recommendation (for 400 V)	$I_{d\,max}$	I^2t
mm²		kA	kA²s
4	3RV10 21-4DA10	< 9.5	85
6	3RV10 31-4EA10	< 12.5	140
10	3RV10 31-4HA10	< 15	180
16/25	3RV10 42-4JA10	19	440

The short-circuit device which is connected downstream from the terminal block must be configured in accordance with the conductor cross-section on the terminal block as per the following table.

Conductor cross-section on the 3RV19 17-1D terminal block	**Downstream short-circuit device, e.g. 5SY**	
	$I_{d\,max}$	
mm²	kA	
1.5	< 7.5	To prevent short-circuits, the leads on the terminal block must be installed so that they are short-circuit proof according to EN 60439-1 Section 7.5.5.1.2.
2.5	< 9.5	
4	< 9.5	
6	< 12.5	

Technical specifications

Type		**3RV19 .7**
Rated operational voltage U_e		
• IEC		
- 10% overvoltage	V	500
- 5% overvoltage	V	525
• UL/CSA	V	600
Rated frequency	Hz	50/60
Rated current I_n	A	63
Permissible ambient temperature		
• During storage/transport	°C	-50 ... +80
• During operation	°C	-20 ... +60
Permissible rated current of the 3RV10 11 motor starter protectors (size S00) at control cabinet internal temperature		
• +60 °C	%	100
Permissible rated current of the 3RV10 21 motor starter protectors (size S0) up to 16 A at control cabinet internal temperature		
• +60 °C	%	100
Permissible rated current for 3RV1. 21 motor starter protectors (size S0) from 16 A at control cabinet internal temperature		
• +40 °C	%	100
• +60 °C	%	87
Degree of protection according to IEC 60529		IP20[1)]
Touch protection according to DIN VDE 0106 Part 100		Finger-safe
Conductor cross-sections for main circuit infeed		
• Solid	mm²	4 ... 25
• Finely stranded with end sleeve	mm²	4 ... 25
• Finely stranded without end sleeve	mm²	6 ... 25
• AWG conductors, solid or stranded	AWG	10 ... 3
Conductor cross-sections of terminal block		
• Solid	mm²	1.5 ... 6
• Finely stranded with end sleeve	mm²	1.5 ... 4
• Finely stranded without end sleeve	mm²	1.5 ... 6
• AWG conductors, solid or stranded	AWG	15 ... 10

1) In infeed terminal compartment without a conductor connected: IP00.

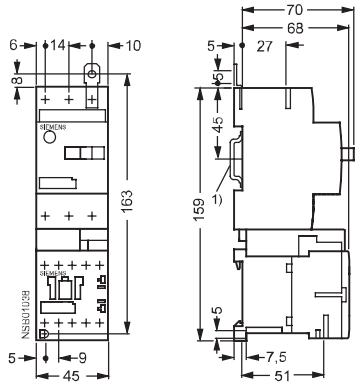
Dimensional drawings

3RA fuseless load feeders

Size S00 · For standard rail mounting

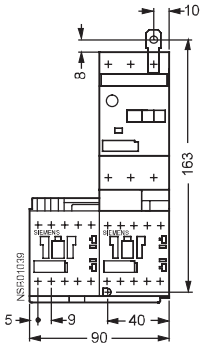
3RA11 10-. . A . .

Direct start



3RA12 10-. . A . .

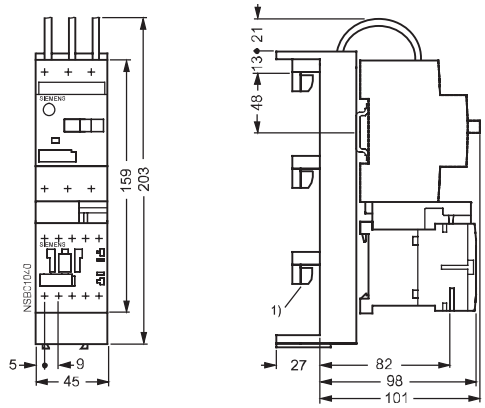
Reversing duty



Size S00 · For 40 mm and 60 mm busbar systems

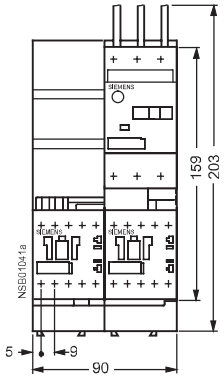
3RA11 10-. . C . .
3RA11 10-. . D . .

Direct start



3RA12 10-. . C . .
3RA12 10-. . D . .

Reversing duty



1) Busbar adapters suitable for a busbar thickness of 5 and 10 mm with chamfered edges.

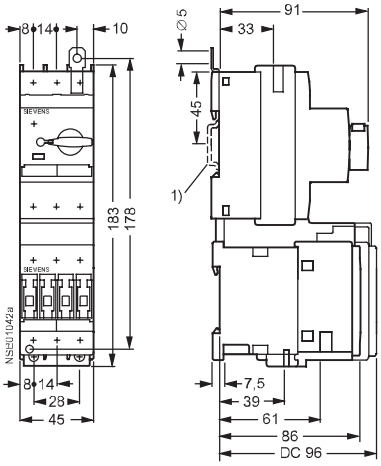
6

Project planning aids

Size S0 · For standard rail mounting

3RA11 20-. . A . .

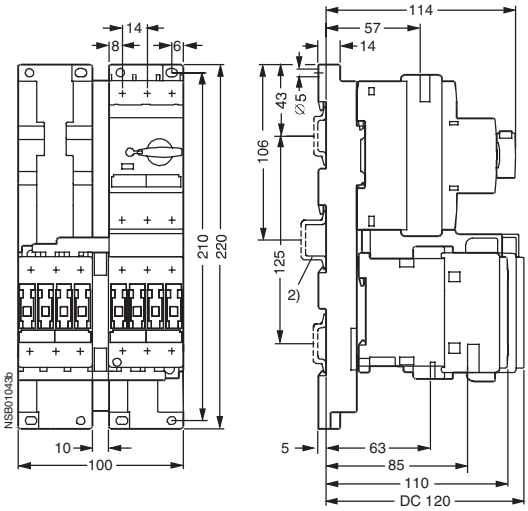
Direct start



1) Mounting with one 35 mm standard mounting rail according to EN 50022
Depth: 7.5 or 15 mm.

3RA12 20-. . A . .

Reversing duty

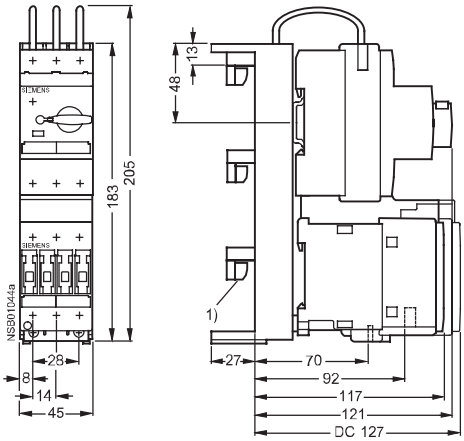


2) Alternative mounting methods
a)
Two 35 mm standard mounting rails according to EN 50022
Distance: 125 mm
Depth: 7.5 or 15 mm.
b)
One 35 mm standard mounting rail according to EN 50022
Depth: 15 mm.

Size S0 · For 40 mm and 60 mm busbar systems

3RA11 20-. . C . .
3RA11 20-. . D . .

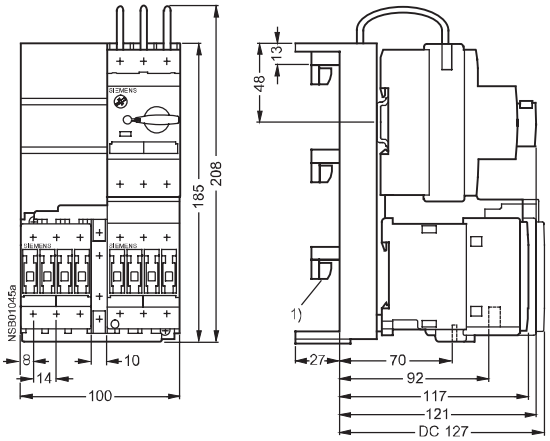
Direct start



1) Busbar adapters suitable for a busbar thickness of 5 and 10 mm with chamfered edges.

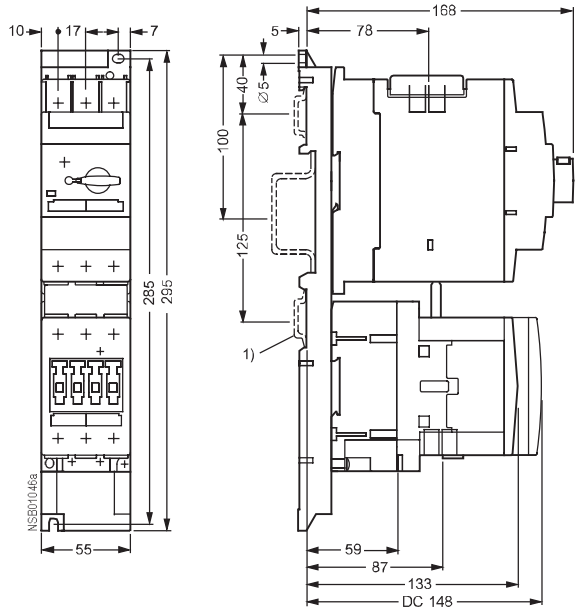
3RA12 20-. . C . .
3RA12 20-. . D . .

Reversing duty

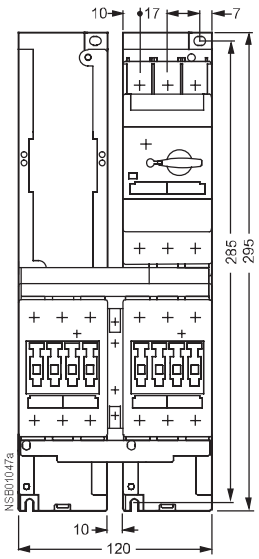


Size S2 · For standard rail mounting

Direct start



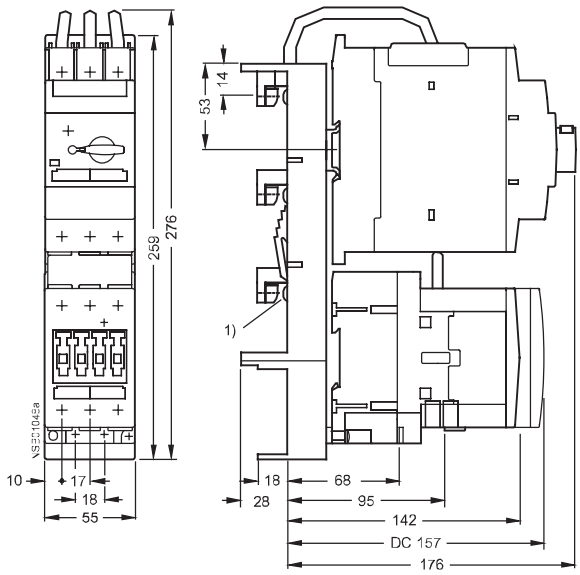
Reversing duty



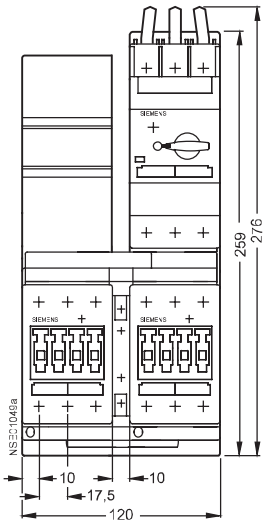
1) Alternative mounting methods
a)
Two 35 mm standard mounting rails according to EN 50022
Distance: 125 mm
Depth: 7.5 or 15 mm.
b)
One 75 mm standard mounting rail according to EN 50023
Depth: 15 mm.

Size S2 · For 40 mm and 60 mm busbar systems

Direct start



Reversing duty

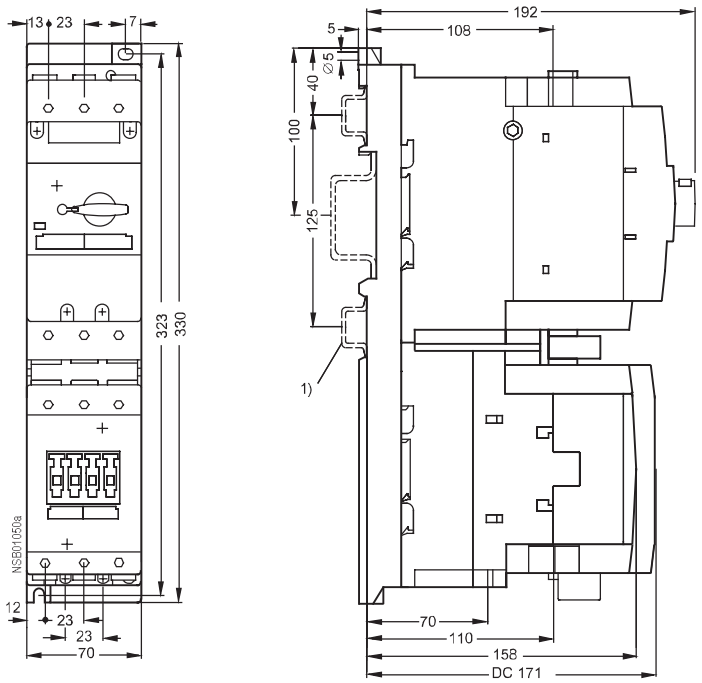


1) Busbar adapters suitable for a busbar thickness of 5 and 10 mm with chamfered edges.

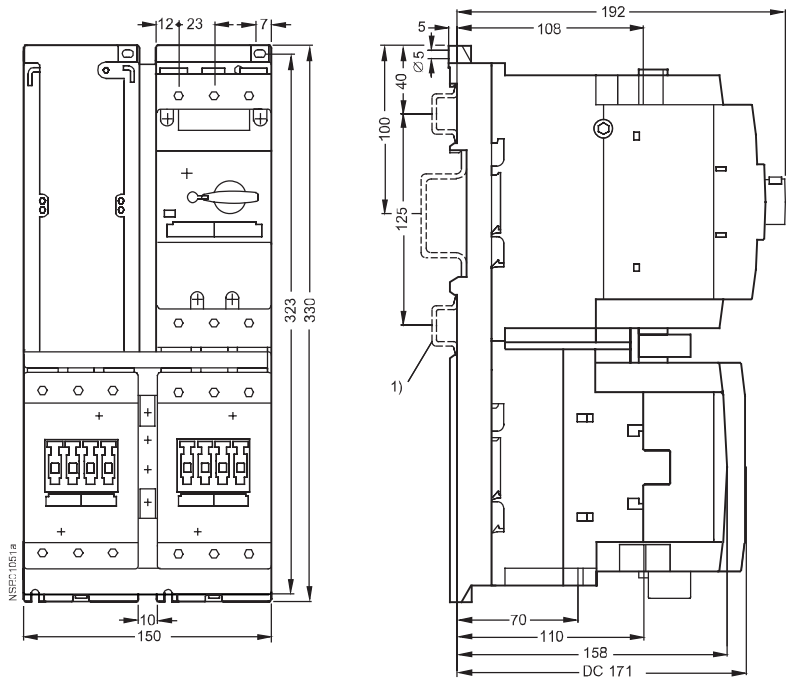
Project planning aids

Size S3 · For standard rail mounting

Direct start



Reversing duty

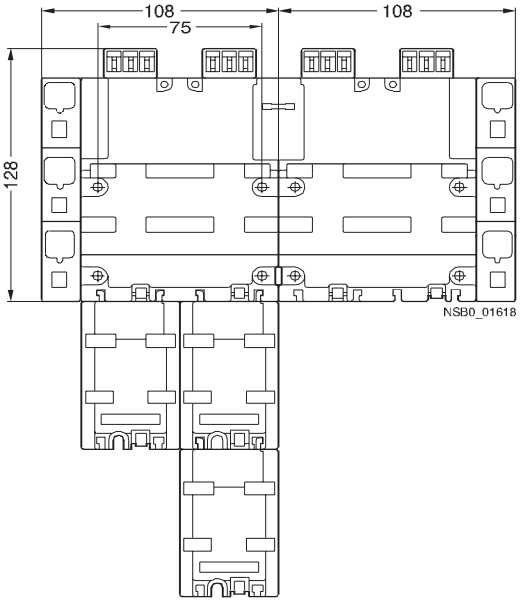


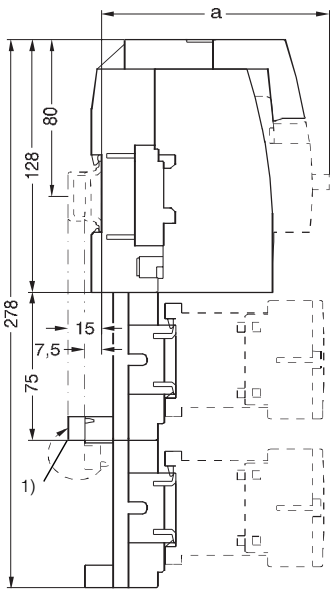
1) Alternative mounting methods
a)
Two 35 mm standard mounting rails according to EN 50022
Distance: 125 mm
Depth: 7.5 or 15 mm.
b)
One 75 mm standard mounting rail according to EN 50023
Depth: 15 mm.

3RV19 infeed system

3-phase busbars with infeed

For 2 motor starter protectors size S00 aund S0, with expansion plug
3RV19 17-1. + 3RV19 17-5BA00

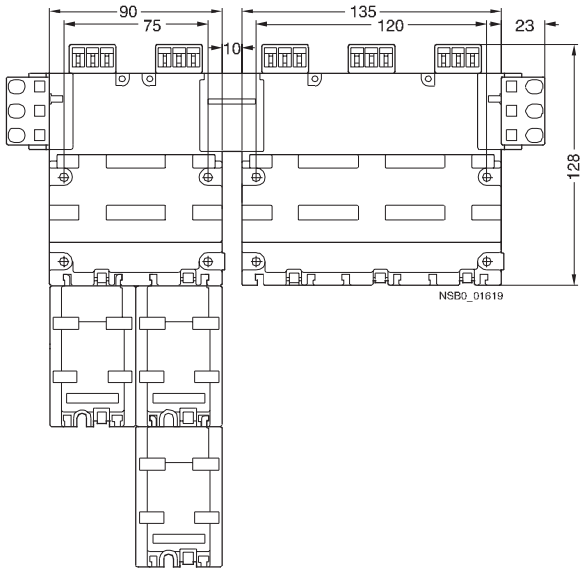


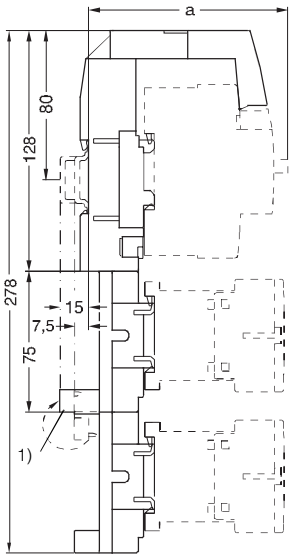


	S00	S0
a	104	125

3-phase busbars for system expansion

For 2 and 3 motor starter protectors size S00 and S0 with extra-wide expansion plug
3RV19 17-4. + 3RV19 17-5E and 3RV19 17-5D terminal block





	S00	S0
a	104	125

1) Alternative mounting methods (see 3RV19 Infeed System, Design)
a)
One 35 mm standard mounting rail according to EN 50022
Depth: 7.5 mm
Spacer not used.
b)
One 35 mm standard mounting rail according to EN 50022
Depth: 15 mm
Spacer plugged into mating piece.

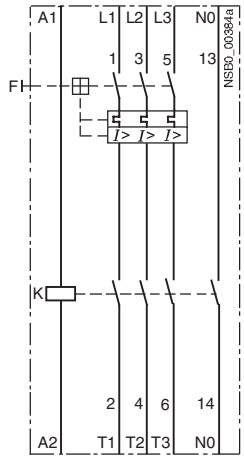
Project planning aids

Schematics

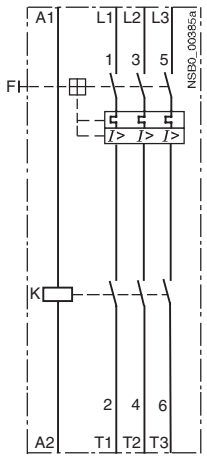
3RA fuseless load feeders

Direct start

Size S00
3RA11 1

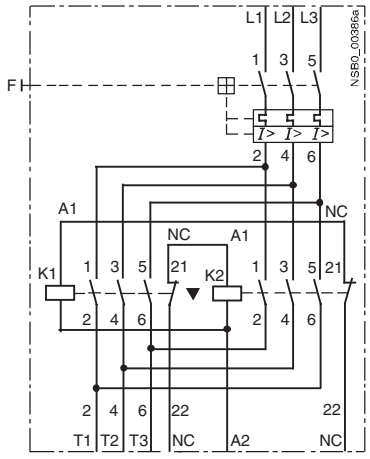


Size S0, S2 and S3
3RA11 2,
3RA11 3

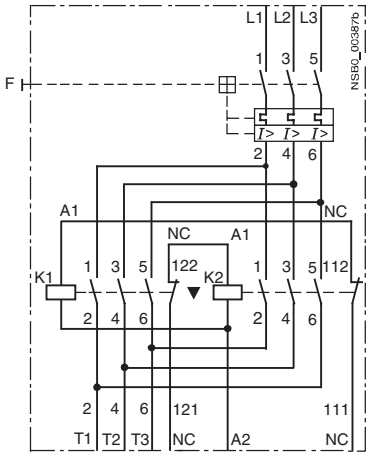


Reversing duty

Size S00
3RA12



Size S0
3RA12



Design

The 3RA71 safety load feeders comprise an adapter for standard rail mounting with integrated safety electronics (as used for the 3TK28 solid-state safety combinations), a motor starter protector and two redundant contactors connected in series. The combination of safety electronics, motor starter protectors and contactors result in a pre-assembled and pre-wired fuseless load feeder with type of coordination 1 or 2, that is tested and certified as a complete safety load feeder.

The 3RA71 .0 safety load feeder is an exception; it does not have a motor starter protector. To build up a complete load feeder, it must be connected in series with a fuse or motor starter protector.

The load feeder has a safe solid-state output, a safe input for cascading and an input for normal switching duty. Three LEDs on the front indicate the operating state.

Expansion units as well as actuators or load feeders can be connected to safe output 2. Safe output 2 can also be used for cascading with 3TK2841, 3TK2842, 3TK2845, 3TK2853 and 3RA711 devices. The load feeder and the actuator or load must have the same ground potential.

Power supply for DC operation

In the version with a 24 V DC control supply voltage, a power supply according to DIN VDE 0106 (PELV) of safety class III must be used to supply the electronics.

Accessories

Since the safety load feeder is made up of the 3RV1 motor starter protectors and the 3RT1 contactors, accessories, e.g. auxiliary switches, from the SIRIUS modular system can be used.

Mounting

The 3RA71 safety load feeders can be snapped onto a standard mounting rail to EN 50022 – 35 × 15.

Function

Fault monitoring

During start-up, the device runs through a self-test in which the internal electronics is checked for correct functioning. During operation, all internal circuit components are monitored cyclically for faults.

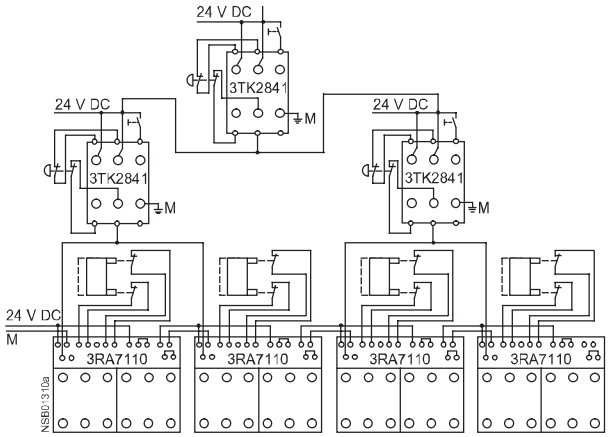
Cascading, expanding

The devices for Category 4 support easy connection (cascading) and expansion of several safety devices to form hard-wired safety logic. The devices for Category 4 have one solid-state safe output (terminal 2) and one cascading input (terminal 1).

On terminal 1, the devices expect a safe 24 V signal which is safely evaluated. If this signal is missing, the device switches off safely. The switch-on conditions are the same as the conditions for sensor switch-off (EMERGENCY-STOP actuation).

Normal switching duty

In the devices for Category 4, terminals 3 and 4 can be used for normal switching duty (On/Off) of the contactors. There are two possibilities for normal switching duty, either using a floating contact (terminals 3 and 4) or a contact connected to a potential (24 V DC), e.g. through a PLC (terminal 4 only). Normal switching duty is subordinate to the safety function.



Typical circuit diagram for cascading with 3TK2841 and 3RA71 safety electronics (Category 4 with expansion units)

General data

Technical specifications

Technical specifications of the **safety electronics** of the 3RA7 load feeders.
The technical specifications of the power section (motor starter protectors, contactors) can be found in the table for "3RA1 Fuseless Load Feeders".

Type		AC basic unit Category 3	DC basic unit Category 3	DC basic unit Category 4	Expansion	Expansion unit, time-delayed
Standards		EN 60204-1, EN 292, EN 954-1, IEC 61508				
Test certificate		TÜV, UL, CSA				
Category according to EN 954-1		3	3	4	As basic unit	As basic unit
Safety Integrated Level (SIL) According to IEC 61508		2	2	3	As basic unit	As basic unit
Rated insulation voltage U_i	V	690				
Rated impulse withstand voltage U_{imp}	kV	6				
Rated output power • AC/DC operation at 1.0 x U_s	W	2[1]				
Operating range • AC operation • DC operation		0.85 – 1.1 x U_s 0.9 – 1.1 x U_s				
Response time • Monitored start • Autostart	ms ms	125 typical[2] 250 typical[2]		400 typical[2] 400 typical[2]		
Release time • EMERGENCY-STOP • Power failure	ms ms	20 typical[3] 100		25 typical 100		After time has elapsed 100
Recovery time • EMERGENCY-STOP • Power failure	ms ms s	20 typical 20 typical		400 typical 4		
Mains buffering time	ms	5 (see technical specifications for contactors used)				
Minimum command duration • EMERGENCY-STOP • ON button	ms ms	> 20 typical > 20 typical		> 25 typical > 100 typical		
Conductor cross-section • Finely stranded with end sleeve • Solid	mm^2 mm^2	1 x 0.25 ... 2.5 1 x 0.2 ... 2.5				
Tightening torque, M3 connecting screw	Nm	0.5 ... 0.6				
Ambient temperature • During operation • During storage	°C °C	-20 ... +60 -40 ... +80				
Degree of protection		IP20				
Touch protection		Finger-safe				

1) Note the power losses of the respective unit (see Technical Specifications of the motor starter protectors /contactors).

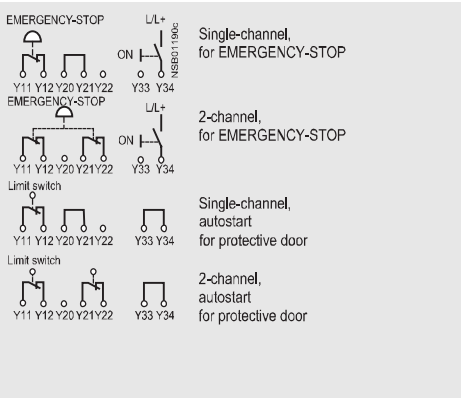
2) Note the pick-up time for the respective contactor (see Technical Specifications of the contactors).

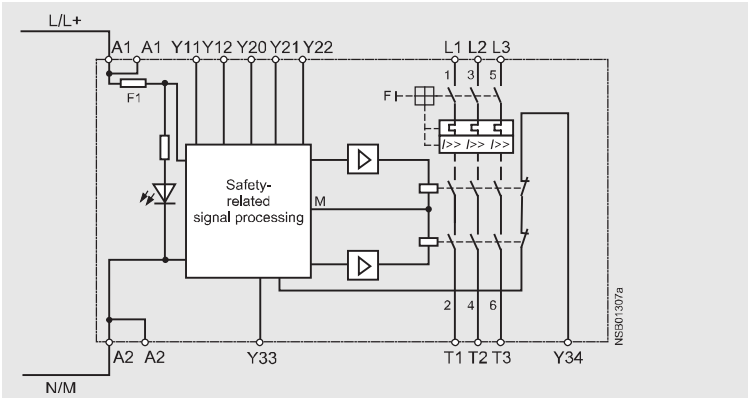
3) Note the drop-out time for the respective contactor (see Technical Specifications of the contactors).

Schematics

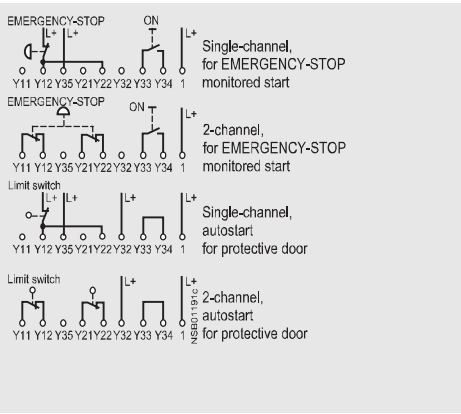
Connection examples

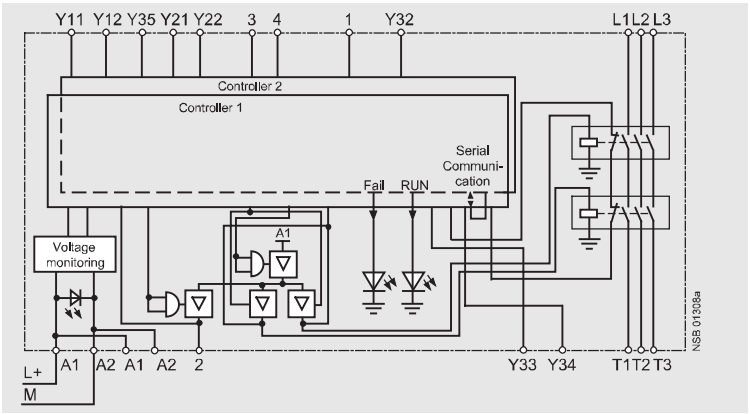
3RA71 01 and 3RA71 02 fuseless load feeders
Basic unit, Category 3[1)]



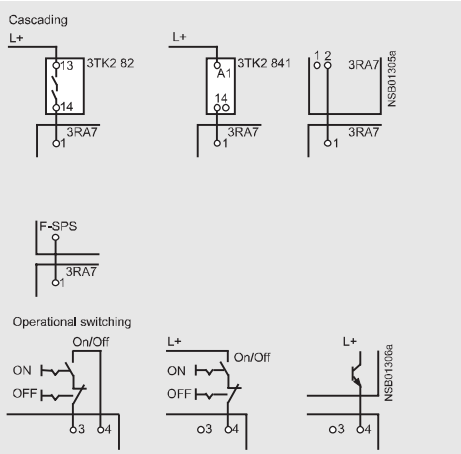


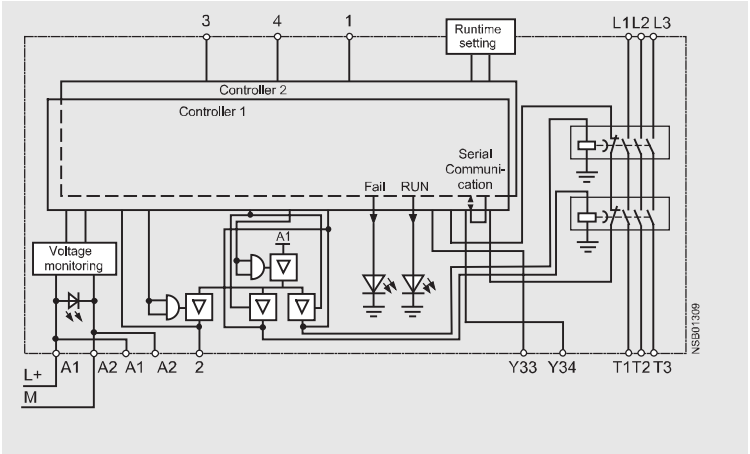
3RA71 10 fused load feeders
Basic unit, Category 4[2)]





3RA71 20, 3RA71 30 and 3RA71 40 fused load feeders
Expansion unit[2)]



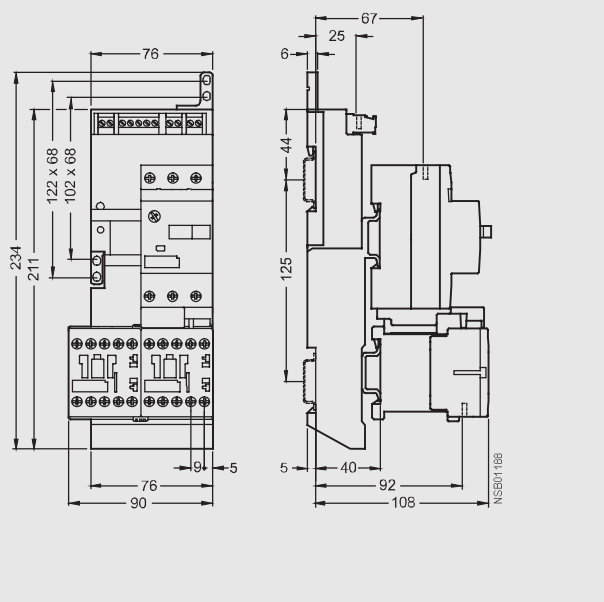


1) Also available as safety-oriented load feeder without motor starter protector.
2) Also available as fuseless load feeder with motor starter protector.

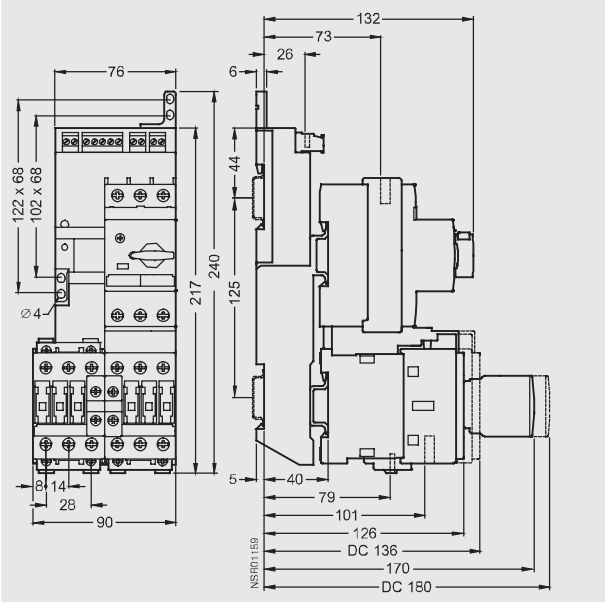
Project planning aids

Dimensional drawings

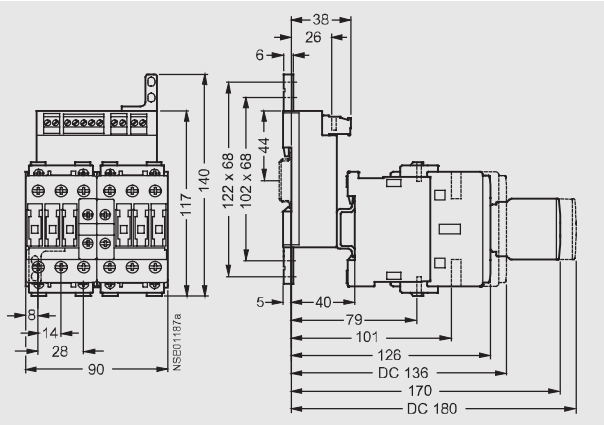
3RA71 .1 fuseless load feeders, size S00



3RA71 .2 fuseless load feeders, size S0



3RA71 .0 fused load feeders, size S0



6

Overview

The AS-Interface compact starter is a load feeder with degree of protection IP65, which is fully prewired inside, for switching and protecting any three-phase loads up to 5.5 kW at 400/500 V AC (electromechanical compact starter) or up to 2.2 kW (solid-state compact starter) – mostly standard induction motors in direct start and reversing duty. It consists either of an electromechanical controlgear combination or a solid-state overload relay and motor starter protector unit. The overload or short-circuit protection is located below a sealable, transparent cover and is therefore available for diagnostics. Two LEDs are provided to the left of the cover for diagnostic purposes for the AS-Interface and the auxiliary power.

It is not possible for live parts to be touched even when the cover is open. The control elements are activated through the integrated outputs. The status of the device is scanned through the inputs, e.g. checkbacks from the auxiliary contacts of the motor starter protector and contactor(s). A further input is used to detect the operating state of the optional hand-held device. The three power connectors are used to feed and loop through to the load supply voltage (power bus) and to connect to the load itself. Prefabricated power supply lines can be used to connect compact starters which are directly adjacent to each other. Prefabricated power supply lines can be used to connect compact starters which are directly adjacent to each other. The maximum number of starters that can be supplied with one power supply cable is limited by the maximum permissible total current (up to max. 4 mm^2 corresponds to ~ 35 A).

DS/RS compact starters (electromechanical)

The electromechanical compact starters consist of a conventional controlgear combination with a SIRIUS motor starter protector for protection against short-circuits and overloading and SIRIUS contactor(s) for normal switching. The advantages of the electromechanical starters are the reliable isolation during disconnection and tripping, the integrated fuseless protection against short-circuits and the favorable price. What is more, direct currents can also be switched with the electromechanical starters.

Configuring note: In the case of temperature-critical applications, we recommend operation in the lower setting range of the motor starter protector.

EDS/ERS compact starters (solid-state)

The solid-state compact starters EDS (direct-on-line starter) and ERS (reversing starter) consist of a solid-state overload relay and a solid-state motor starter protector unit.

The advantages of these solid-state compact starters are the broad limits within which the overload protection can be adjusted (the power range up to 2.2 kW at 400/500 V AC is covered with just 2 variants), the fact that the solid-state contact elements in the power section are non-wearing, current detection (used for monitoring the energy connector), emergency operation in the event of an overload as well as remote resetting through the AS-Interface after overload tripping.

The ERS compact starter is designed for direct start in reversing duty. The solid-state overload protection and the shutdown response in the event of overload can be adjusted directly at the device.

Version with brake contact

All compact starters are available optionally with a separately activated brake contact for electrically operated motor brakes. For externally fed motor brakes, 24 V DC is supplied jointly with the load voltage through the power connector on -X1. It is looped through via -X3 for supplying the next compact starter on -X1. The 24 V DC supply for the brakes is only linked in those devices equipped with a brake contact. At the project planning stage, it is important to ensure that these starters are located alongside each other.

All compact starters with a brake contact for 500 V DC can be equipped with an 400 V AC brake contact.

Hand-held device

The hand-held device enables the compact starter to be operated locally and autonomously, providing that the auxiliary voltage supply is connected. Thus, assuming that the automation level is functioning correctly, local switching operations can be carried out in addition to normal manual operations in the event of a programmable controller / bus system failure (emergency mode) or during test runs before commissioning, e.g. for testing the direction of rotation of the motor. The hand-held device can be connected to the compact starter by means of a connecting cable through a socket underneath the transparent cover.

Spare inputs

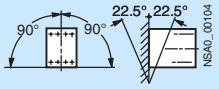
The compact starters are also equipped with two spare inputs.

The M12 socket is a "Y" connector. The signal inputs are applied to PIN 2 and 4. In this manner, it is possible, for example, to connect an optical proximity switch that supplies a signal and the "fouling" alarm.

A "T" adapter can be used to split the signal inputs onto two M12 sockets. Compact starters modified in this way offer additional advantages. At no extra cost, it is possible to save AS-i addresses, reduce the space requirement and to build up logical groupings.

AS-Interface compact starters (400 V AC)

Technical specifications

		DS/RS	EDS/ERS
Degree of protection		IP65 (with closed connection elements and cover)	
Material		Thermoplastic (glass-fiber reinforced)	
Color		Anthracite RAL 7016	
Cover		Latching, sealable	
Dimensions (W x H x D)	mm	120 x 265 x 134	
Temperature range			
• Operating temperature	°C	-25 ... +55; (note derating: see manual)	
• Storage temperature	°C	-40 ... +70	
Permissible mounting position		 Important: in accord. with DIN 43 602 Start-up command "I" at the right or top	
Shock resistance			
Rectangular pulse	g/ms g/ms	2/unlimited, 10/5 or 5/10	
Sine pulse	g/ms g/ms	2/unlimited, 8/10 or 5/15	
External power supply			
For output supply (contactor control) **rated operational voltage U_e**	V DC	24 (PELV – must be grounded)	
For electronics and inputs (feedback of controlgear states) **using AS-Interface data line**	V DC	26.5 ... 31.6 (according to AS-Interface Specification)	
I/O configuration	Hex	7	
ID code	Hex	D	E
AS-Interface current input	mA	Max. 100	
Power consumption U_{aux}	mA	Approx. 100	
Watchdog function (disconnects outputs in the event of AS-Interface fault)		Built-in	
Diagnostics			
Using AS-Interface		Feedback from motor starter protectors and contactor(s) through positively driven auxiliary contacts and separate inputs	
Through LED on the enclosure		Auxiliary voltage applied AS-Interface communication OK AS-Interface communication faulty Station address = 0 (module not addressed)	
Through LED on the hand-held device		On or Clockwise or Counterclockwise	
Main circuit			
Rated operational voltage	V AC	500 according to DIN VDE 0106 Part 1014, 600 according to CSA and UL	
Safe isolation between main and auxiliary circuits (according to DIN VDE 0106, Part 101)	V	Up to 400	--
Rated output power	kW	5.5	2.2
Permissible operating modes		Continuous duty, temporary duty, periodic duty, periodic intermittent duty (50 % relative ON-time at 80 1/h at 5.5 A)	
Permissible switching frequency with a starting time t_A = 0.1 s and a relative ON-time t_{EP} = 50 %	1/h	≤ 80	≤ 600
Trip class		Class 10	
Conductor cross-sections of power connector for infeed/feeder/9-pole loop	mm^2	≤ 4, AWG (15 ... 11)	
Max. permissible current through power connector (dependent on cable cross-section)			
• T_u = 60 °C	A A A	30 (4 mm^2), AWG (11); 20 (2.5 mm^2), AWG (15); 12 (1.5 mm^2), AWG (13)	
• T_u = 40 °C	A A A	35 (4 mm^2), AWG (11); 25 (2.5 mm^2), AWG (15); 15 (1.5 mm^2), AWG (13)	
Short-circuit strength of the starter combination	kA	65 (according to type of coordination "1")	100
Electrical endurance of the motor starter protector element under load I_a (AC-3)	Operating cycles	See endurance characteristic curves of the 3RT10 contactors	≥ 10 million

Overview

Connection of a drive roller with integrated DC motor to an AS-Interface 24 V DC motor starter

With the K60 AS-Interface 24 V DC motor starters for the low-end performance range up to 70 W, it is now possible to connect 24 V DC motors and the associated sensors directly to the AS-Interface quickly and easily.

Three different versions are available:

- Single direct-on-line starters (without brake and reversible quick-stop function)
- Double direct-on-line starters (with brake and reversible quick-stop function)
- Reversing starters (with brake and reversible quick-stop function)

DC motors are connected to the module using M12 plug-in connectors. The sensors and the module electronics can be supplied from the yellow AS-Interface cable. An auxiliary voltage (24 V DC) is only required for supplying the outputs, which can be provided via the black AS-Interface cable.

Quick-stop function

All AS-Interface 24 V DC motor starters feature a quick-stop function which can be switched on and off as required using a switch integrated into the module. The quick-stop function allows a connected motor to be shut down immediately using an applied sensor signal (High). The switch for the quick-stop function is located alongside the input sockets and is protected by an M12 sealing cap.

Brake

The double direct-on-line starter and the single reversing starter versions feature an integrated permanently set brake function, i.e. as soon as the output signal is set to "0", the motor is braked.

Start-up using integrated buttons

Buttons integrated into the module (below the output sockets) can be used to set the motor used. The buttons are protected by an M12 sealing cap.

Note concerning double and reversing starters: *If an input with the quick-stop function receives a "High" signal, the corresponding output (e.g. quick-stop input 1 → output 1) is switched off within the device (the motor is braked) The manual key function (Key 1/2) for local operation is only permitted to be used during "CPU Stop" in the higher-level PLC.*

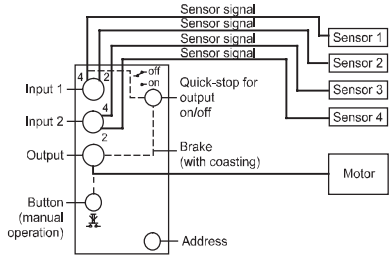
Note concerning single direct-on-line starters: *If an input with the quick-stop function receives a "High" signal, the corresponding output (e.g. quick-stop input 1 → output 1) is switched off within the device (the motor runs down without being braked) The manual key function (Key 1) for local operation is only permitted to be used during "CPU Stop" in the higher-level PLC.*

AS-Interface motor starters (24 V DC)

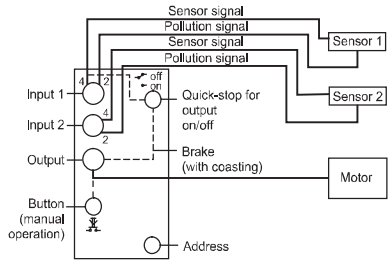
Applications

Single direct starter without brake
(with adjustable quick-stop function)

1st possibility: Connection to a maximum of four sensors without pollution indication

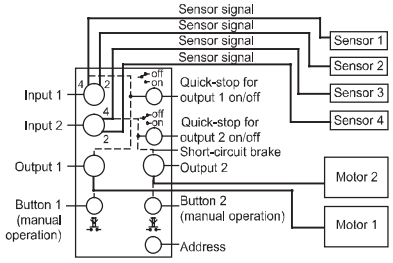


2nd possibility: Connection to a maximum of two sensors with pollution indication

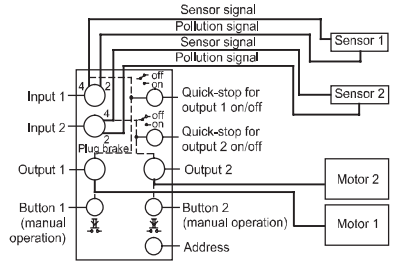


Double direct starter with brake
(with adjustable quick-stop function)

1st possibility: Connection to a maximum of four sensors without pollution indication

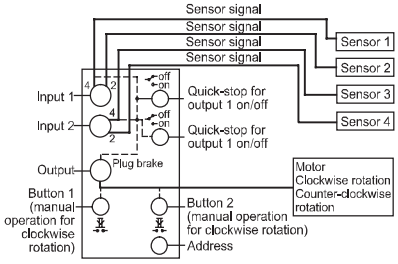


2nd possibility: Connection to a maximum of two sensors with pollution indication

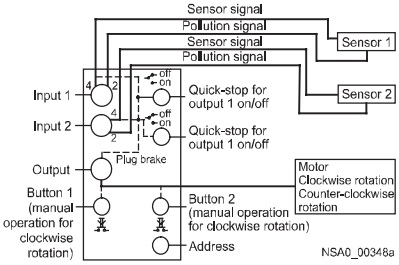


Single reversing starter with brake
(with adjustable quick-stop function)

1st possibility: Connection to a maximum of four sensors without pollution indication



2nd possibility: Connection to a maximum of two sensors with pollution indication



Overview

The AS-Interface load feeder module adds an input/output module to the conventional busbar and standard mounting rail adapters. With this module the control current circuit of a load feeder is available completely factory-wired. The series has been optimized for operation in conjunction with the SIRIUS load feeders size S00 and S0. Connection to the higher level automation system is made through the AS-Interface interface of the load feeder module. A non-shielded flexible lead can be used as data line and for the auxiliary current supply. Connection to the AS-Interface load feeder module is made using two connectors with the insulation displacement method.

Four different AS-Interface load feeder modules are available: Differences exist in the number of inputs and outputs and in the type of outputs. The devices with solid-stated outputs are designed for 24 V DC, those with relay outputs are suitable for voltages of max. 230 AC. Direct-on-line and reversing starters as well as double direct-on-line starters and starter combinations can be wired therefore for pole reversal. The inputs can be used to separately scan the checkbacks from motor starter protectors and contactors. The outputs can be used for direct control of the contactor coils.

As the outputs already have overvoltage protection integrated, no additional measures for the contactors are required.

The outputs are supplied with separate auxiliary voltage – a selectively configured EMERGENCY-STOP concept is possible therefore. The inputs are supplied from the AS-Interface data line. Inputs and outputs have to be wired using integrated, spring-loaded terminals, each connected to a common potential.

3RA5 fuseless load feeder with connection to AS-Interface

The 3RA5 fuseless load feeder, comprised of the AS-Interface load module, motor starter protector, contactor and all necessary connectors (AS-Interface, auxiliary power and 5-pole power connector), is delivered completely assembled, factory-wired and tested. The user can thus save valuable time when mounting, wiring and servicing.

Direct-on-line starters as well as reversing starters are available with SIRIUS switching devices size S00 up to 10 A and size S0 – on account of the power connector – up to 16 A. The complete feeders are available with AS-Interface load feeder modules with solid-state outputs for 24 V DC auxiliary voltage.

Load feeders with this type of configuration are used to control standard induction motors for example. The load feeders can be installed in central control cabinets as well as in local control boxes. They are particularly suitable for highly automated machines and plants that place high demands on availability.

Design

The AS-Interface load feeder module is snapped onto the matching support. As an option, a 5-pole power plug can be installed between the load feeder module and the support.

When this power plug is used, all connections of the load feeder can be plugged in. Should it become necessary to replace the unit, this can be done in a minimum of time. When this power plug is used, the current is limited to 16 A.

The support is available in different versions and must be selected to fit the width of the controlgear combination (45 mm or 54 mm) and the busbar system used (busbar center-to-center distance 40 mm or 60 mm). Depending on the variant, the N conductor and/or the PE conductor or neither are brought out as well. It is thus possible for pre-assembled connecting cables of the loads to be routed right up to the AS-Interface load feeder module and for them to be fitted there without any additional wiring work. Hence it is extremely easy to replace the loads, e.g. a standard induction motor.

A unique address must be assigned to each AS-Interface station at the latest for start-up. For the AS-Interface load feeder module this can be done either by using the master and successively plugging on the connectors which are connected to the data line (only one station in the network is allowed to log on with the default address 0) or by the individual addressing method using an addressing unit and an addressing cable. This type of addressing is also possible with the load feeder module fully wired, as the module is separated from the AS-Interface network when the addressing plug is connected.

The addressing socket is positioned underneath the equipment label on the front of the load feeder module. The indicator lamps (LEDs) for the diagnostics of the AS-Interface load feeder module are fitted in the same place. The following states are indicated:

- 24 V DC auxiliary voltage applied or output/outputs activated (variant 230 V AC)
- AS-Interface communication OK
- AS-Interface communication faulty

Station address equals 0 (module not addressed)

Combination starters for busbar systems, direct-on-line

Overview

The 3RA5 fuseless load feeders with AS-Interface offer the possibility of linking motor starters swiftly and at low cost to higher-level automation systems. The integrated 3RV1 motor starter protector for motor protection protects the motor against overloads and provides short-circuit protection for the cables. The 3RT1 contactor is used for operational switching. The switching state is triggered and signaled using the 3RK14 load feeder module on the AS-Interface.

- For direct start, a load can be switched on and off with the load feeder.
- The feeder for reversing duty is designed for two directions of rotation of induction motors. On these devices, there is no electrical interlock between the two contactors. Exception: Size S00 features a mechanical interlock.

Design

The devices are completely prewired and can be adapted to busbars. The devices are offered for busbar systems with a busbar centerline spacing of 40 mm and 60 mm.

The 24 V DC auxiliary power and the AS-Interface data line are fed in through two communication connectors. Standard stranded conductors from 0.5 mm to 0.75 mm^2 can be connected to these connectors using insulation displacement. The communication connectors (2 per unit) are included as standard.

The outgoing side is wired to the load through the power supply connector. Thus, the main conductors L1, L2 and L3 and the N or PE/ground conductor are connected to the load in plug-in fashion. The power supply connector is included in the scope of delivery.

Indicator lamps

Two LEDs are integrated in the load feeder module. They permit simple diagnostics of the auxiliary power (PWR) and the communication unit (AS-Interface).

Accessories

The standard accessories pertaining to the single units consisting of the 3RV1 motor starter protector, the 3RT1 contactors and the 3RK14 load feeder modules can be used.

More information

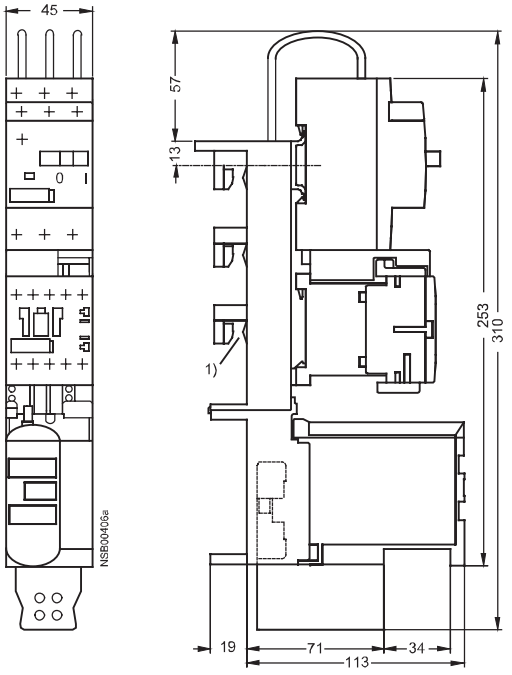
Types of coordination

The response of the device to short-circuits is described by the type of coordination according to EN 60947-4-1 (VDE 0660 Part 102), IEC 60947-4-1.
The 3RA5 fuseless load feeders with AS-Interface achieve the type 1 coordination at I_q = 50 kA. This ensures that short-circuits of 50 kA will be deactivated without posing a hazard to persons and systems. The contactor may be damaged at such high short-circuit currents.

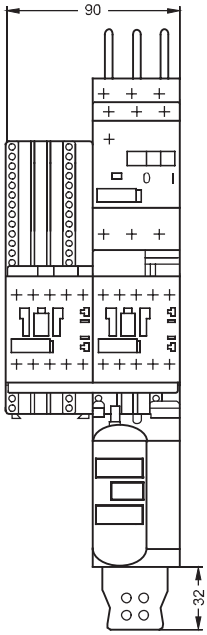
Dimensional drawings

Size S00 · For 40 mm and 60 mm busbar systems

Direct start



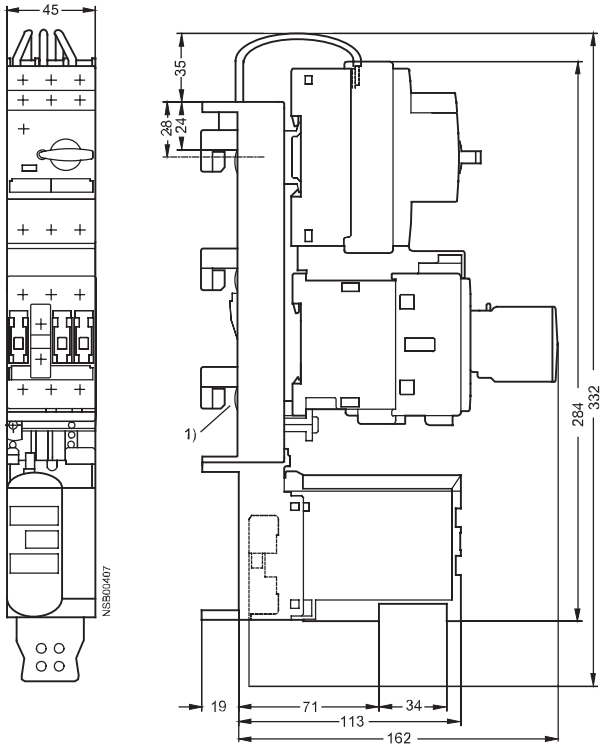
Reversing duty



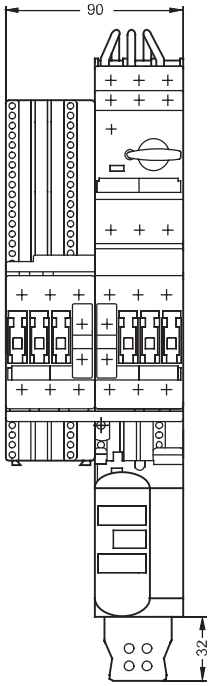
1) Busbar adapters suitable for a busbar thickness of 5 and 10 mm with chamfered edges.

Size S0 · For 40 mm and 60 mm busbar systems

Direct start



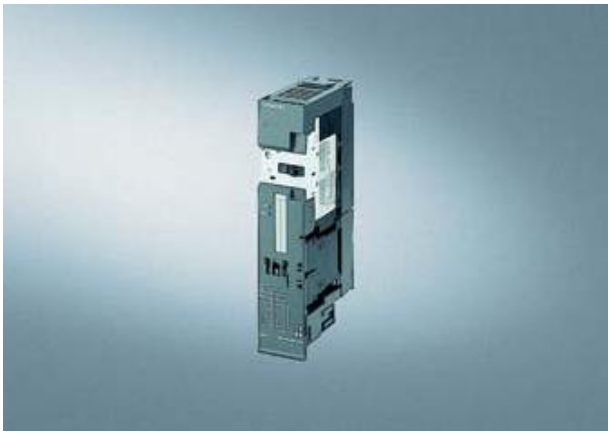
Reversing duty



1) Busbar adapters suitable for a busbar thickness of 5 and 10 mm with chamfered edges.

ET 200S motor starters

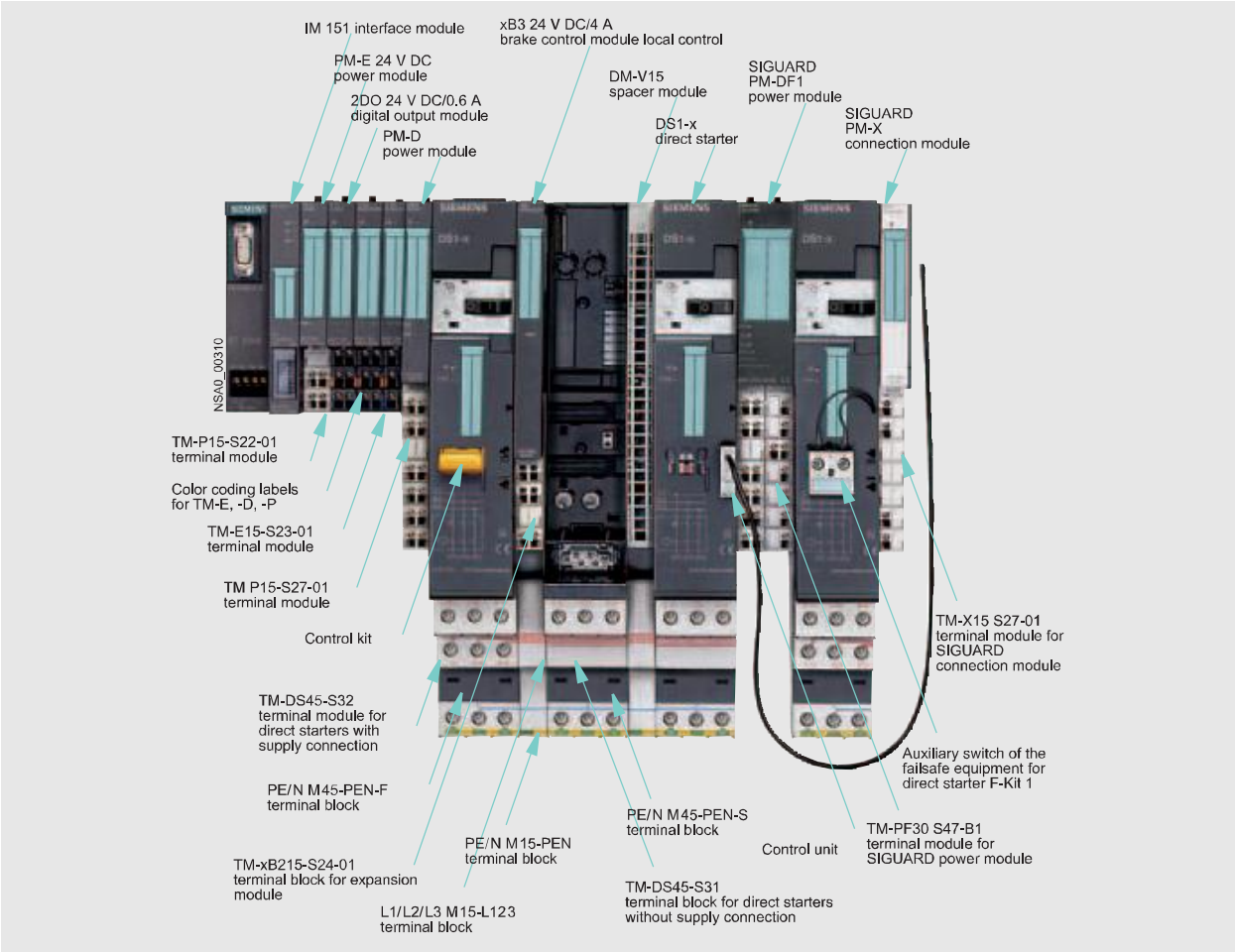
Overview



Motor starters, Standard, DS1-x direct-on-line starter

Motor starters, High-Feature, DS1e-x direct-on-line starter

- Completely factory-wired motor starters for switching and protecting any three-phase loads
- Can be used as a direct-on-line, reversing or soft starter
- Standard motor starter with motor starter protector and contactor assembly up to 5.5 kW
- High-Feature motor starter with a combination comprising a starter circuit-breaker, solid-state overload protection and contactor or soft starter up to 7.5 kW
- With self-assembling 40/50 A power bus, i.e. the load voltage is only supplied once for a group of motor starters
- Hot swapping is permissible
- Inputs and outputs for activating and signaling the statistics have been integrated
- Diagnostics capability for active monitoring of the switching and protection functions
- Can be combined with expansion modules: Brake control module for controlling electromechanical brakes in induction motors and with two optional inputs for special functions (for quick stop with the standard motor starter and for parameterizable special functions with the High-Feature motor starter)
- For combining with safety systems (see ET 200S Safety motor starters Solutions local/PROFIsafe, page 6/99 onwards) for use in safety-related subsystems (EN 954-1).

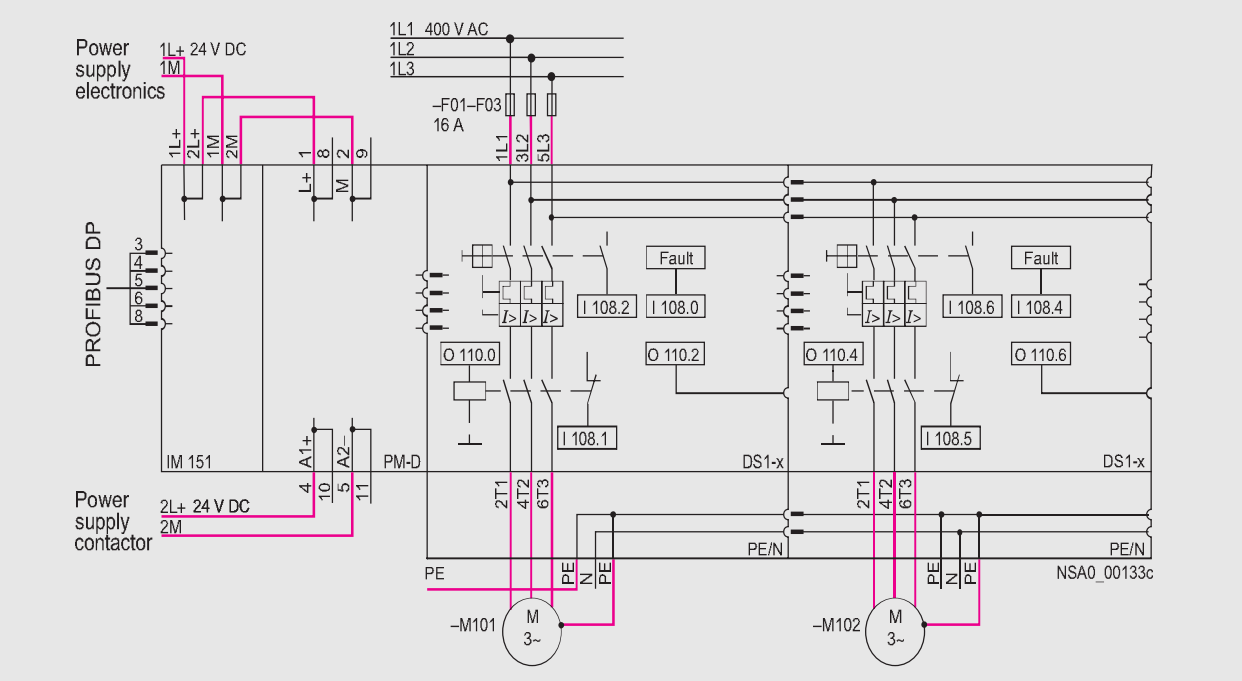


Interplay of ET 200S motor starter components

Design

Power is supplied through the terminal modules for motor starters. While the auxiliary voltages must be fed in once through the PM-D or PM-DFx power module, which is to be plugged in on the left side of the first motor starter, the load voltage must be fed in at the first TM-xxxxS32 terminal module (on the left) of a motor starter. The other TM-xxxxS31 terminal modules are automatically supplied as well through the integrated power bus when they are mounted side by side. If the power bus is utilized to its full capacity of 40 A (standard motor starters) or 50 A (High-Feature motor starters), a new supply is fed in through an additional TM-xxxxS32 terminal module. This also applies when transferring from a standard motor starter to a High-Feature motor starter and vice versa. In this case, however, no PM-D power module must be placed in between.

ET 200S motor starters



Sample illustration of an ET 200S – station with PM-D power module and two standard motor starters

Accessories for motor starters, Standard

Control unit

With the control unit the contactor coils of the standard motor starter can be directly controlled using 24 V DC. The motor starter can thus be started as normal using a local control point without PLC or bus.

Note: The control unit cannot be used in combination with the safety system or a brake control module.

Control kit

The control kit for the standard motor starter provides the possibility of testing the motor during start-up or service by actuating the motor starter protector. Using the control kit with the motor starter protector tripped, the contactor is mechanically locked in ON position.

Accessories for motor starters, High-Feature

2DI control module

The 2DI control module is plugged onto the interface on the front of the motor starter. The module provides two inputs which can receive signals from the process and be assigned directly to the starter.

The functionality can be selected from a list of various control functions as part of the PROFIBUS parameterization. Local control point, emergency start and quick stop, for example, are available as functions. The signal levels can also be parameterized (NO/NC). For more extensive control functions the two inputs of a xB3 or x4 brake control module, which is plugged in alongside on the right, can be integrated in addition. The signal states of all inputs are transmitted in parallel with the internal use to the higher level control system.

When a motor starter is replaced, the parameterization is automatically transmitted by download to the new starter. The inputs on the motor starter ensure autonomous operation, e.g. in the event of PLC failure, on the one hand and short response times through direct processing in the starter on the other hand. Another advantage results from the direct assignment of functions to modular machine concepts.

2DI COM control module

The 2DI COM control module has in addition a PC interface for connecting the Switch ES Motor Starter parameterization and diagnostics software (Version 2.0 and higher). The module works solely on High-Feature motor starters with Switch ES interface (3RK1301-.....-.AA3). The Logo!-PC cable is used as connecting lead between the 2 DI COM control module and the High-Feature motor starter.

DM-V15

- Significant only in conjunction with a standard motor starter
- Passive module without bus connection and terminals
- Does not need a separate terminal module
- Follows a TM-DS45 or TM-RS90 or TM-xB if required
- Does not need to be taken into account when configuring the GSD file

Function

All ET 200S motor starters are set up without fuses. Contactors and soft starters are activated through the integrated outputs. If a brake control module is arranged next to a motor starter, its solid-state brake switch is operated by an output of the motor starter. This module must always be arranged next to the motor starter on the right-hand side. The inputs of the motor starters evaluate the signal states of the protective devices (short-circuit or overload), the switching states of contactor(s) or soft starters, and system faults.

Technical specifications

		Motor starters Standard DS1-x, RS1-x	Motor starters High-Feature DS1e-x, RS1e-x	Motor starters High-Feature DSS1e-x
Motor starters for connection to ET 200S		Max. 20 (including power modules)		
Mounting dimensions (W x H x D)				
• Combination starters, direct-on-line	mm	45 x (265 + 45) x (120 +27); (45: PE/N module; 27: Auxiliary switch contactor from F-Kit)	65 x (290 + 45) x (150 +23); (45: PE/N module; 23: Control module)	
• Reversing starters	mm	90 x (265 + 45) x (120 +27); (45: PE/N module; 27: Auxiliary switch contactor from F-Kit)	130 x (290 + 45) x (150 +23); (45: PE/N module; 23: Control module)	
Permissible ambient temperature				
• During operation	°C	0 ... +60 From +40 with derating	0 ... +60 With horizontal mounting up to +40	
• During storage	°C	-40 ... +70	-40 ... +70	
• Permissible mounting position	°C	Vertical, horizontal With derating	Vertical, horizontal	
Vibration resistance according to IEC 60068, Part 2-6	g	2		
Shock resistance according to IEC 60068, Part 2-27	g/ ms	Square 5/11		
Current consumption				
• From auxiliary circuit L+/M (U_1)	mA	Approx. 20	Approx. 40	Approx. 40
• From auxiliary circuit A1/A2 (U_2)	mA	Approx. 100	Approx. 1700 (80 ms long) Approx. 350 (after 80 ms)	Approx. 30
Rated operat. current for TM-D terminal modules I_e	A	40	50	50
Rated operational voltage U_e	V	400		
• Approval to DIN VDE 0106 Part 101	V	Yes, up to 500	Yes, up to 500	Yes, up to 480
• CSA approval and U_L	V	Yes, up to 600	Yes, up to 600	Yes, up to 480
Conductor cross-section				
• Solid	mm^2	2 x (1 ... 2.5) 2 x (2.5 ... 6)		
• Solid with end sleeve	mm^2	2 x (1 ... 2.5) 2 x (2.5 ... 6), according to IEC 60947: max. 1 x 10		
• AWG conductors, solid or stranded	mm^2	2 x (14 ... 19) AWG		
Degree of protection		IP20		
Touch protection		Finger-safe (this also applies to terminal modules on a dismounted motor starter)		
Degree of pollution				
• At 400 V		3, IEC 60664 (IEC 61 131)		
• At 500 V		2, IEC 60664 (IEC 61 131)		
Rated impulse withstand voltage U_{imp}	kV	6		
Rated insulation voltage U_i	V	500		
Rated operational current I_e for motor starters				
• AC-1/2/3 at 60 °C				
- at 400 V	A	12	16	3 / 8 / 16
- at 500 V	A	9	11	--
• AC-4 at 60 °C				
- at 400 V	A	4.1	9	--
Rated short-circuit breaking capacity	kA	50 at 400 V		
Power of induction motors at 500 V	kW	5.5	7.5	
Utilization categories		AC-1, AC-2, AC-3, AC-4		
Safe isolation between main and auxiliary conducting circuits	V	400, according to DIN VDE 0106, Part 101		
Positively driven operation of contactor relay (NC)		Yes	Yes	--
Trip class		Class 10	Class 10/20, can be parameterized	0.3 ... 3 A: Class 10/10A, can be parameterized 2.4 ... 8 A: Class 10A 2.4 ... 16 A: Class 10A
Stall protection		No	Yes, 8 x I_e / 1 s	
Overload warning		No, only tripping	Yes	
Emergency start function		No	Yes	
Type of coordination		Up to 1.6 A: 2 Up to 12 A: 1	Up to 16 A: 2	Up to 16 A: 1
Mechanical endurance				
• Motor starter protector	Operating cycles	100000		
• Contactor	Operating cycles	30 million	10 million	--
• Contactor with safety functionality (F-Kit)	Operating cycles	10 million	--	--

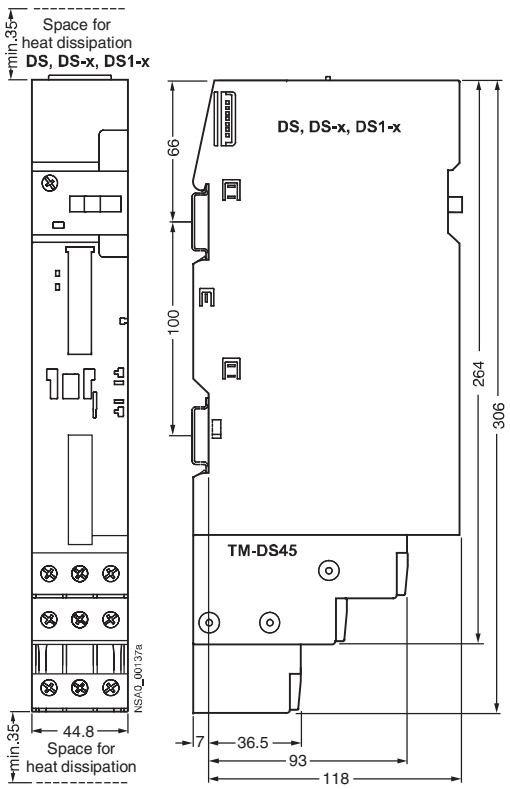
ET 200S motor starters

		Motor starters Standard DS1-x, RS1-x	Motor starters High-Feature DS1e-x, RS1e-x	Motor starters High-Feature DSS1e-x
Electrical endurance				
• Motor starter protector	h	100000		
• Contactor		See manual	See manual	--
Permissible switching frequency with a starting time t_A = 0.1 s and a relative ON-time t_{EP} = 50%		< 80	See manual	
• Induction protection	1/h	Already installed		
Operating times (Total break time = Opening delay + Arcing time)				
• Operating times at 0.85 ... 1.1 x U_e				
- Closing delay	ms	25 ... 100	25 ... 100	--
- Opening delay	ms	7 ... 10	20 ... 50	--
• Operating times at 1.0 x U_e				
- Closing delay	ms	30 ... 50	typ. 25	--
- Opening delay	ms	7 ... 9	typ. 20	--
• Arcing time	ms	10 ... 15	10 ... 15	--
Number of outputs		4	16	16
Number of inputs		4	16	16
Address space required per module				
• With summary	Bit	4	--	--
• Without summary	byte	1	2	2
Diagnostics functions				
• Group fault "SF"		Red LED		
• Switching state "C-STAT"		Red/green/yellow LED		
• Device state "DEVICE"		--	Red/green/yellow LED	
Configurable through PROFIBUS DP		Yes		
Auxiliary switch for enabling circuit of the ET 200S – safety system already integrated (up to max. category 4 EN 954-1)		No, F-Kit required	Yes	No (max. Category 1 attainable)
Setting options for soft starters (locally on the device)				
• Starting time	s	--	--	0 ... 20
• Starting voltage	%	--	--	30 ... 100 of U_e
• Ramp-down time	s	--	--	0 ... 20
Input/output bit				
• DO 0		Motor on (clockwise)		
• DO 1		Motor on (counterclockwise)		
• DO 2		Control of brake (1 = tripped, motor without being braked)		
• DO 3		Reserved	Remote reset (e.g. in case of overload)	
• DO 4		Reserved	Emergency start	
• DO 5-8		Reserved		
• DI 0		Ready	Ready	
• DI 1		Motor on (checkback from contactor)	Motor on (checkback current is flowing)	
• DI 2		Motor starter protection tripped	Actuator shutdown (short-circuit, overload) / Device fault	
• DI 3		Reserved	Overload group warning	
• DI 4		Reserved	Input 1 (from brake control module)	
• DI 5		Reserved	Input 2 (from brake control module)	
• DI 6		Reserved	Input 3 (from brake control module 2DI)	
• DI 7		Reserved	Input 4 (from brake control module 2DI)	
• DI 8 ... DI 13		n/a	Motor current I_{actual}	
• DI 14		n/a	Reserved	
• DI 15		n/a	--	Ramp mode
Fault type (PROFIBUS diagnostics)				
• 00001: Short-circuit		--	Starter motor starter protection has tripped	
• 00100: Overload		--	Thermal motor model overload	
• 00111: Upper limit overshot		--	I_e limit value overshoot	
• 01000: Lower limit value undershot		--	I_e limit value undershoot	
• 01001: Fault		Internal fault / Device fault / Fault during self-test		
• 10000: Parameterizing fault		--	Wrong parameter value	
• 11000: Actuator shutdown		All designated faults / Unbalance / Motor blocking (possibly with an additional fault entry describing the fault in more detail)		
• 11010: External fault		--	Input shutdown / Input shutdown limit / Process image fault	

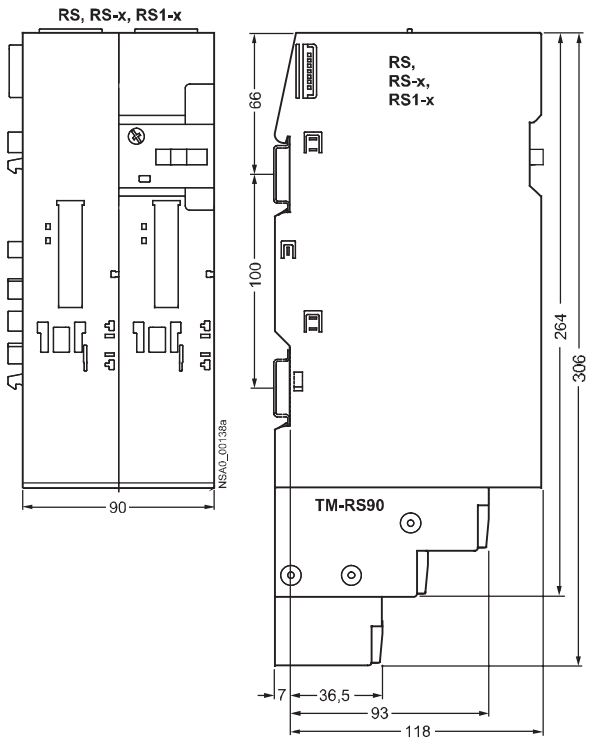
Accessories

		Brake control module XB1	Brake control module XB3	Brake control module XB2	Brake control module XB4
Dimensions (W x H x D)	mm	15 x 196.5 x 125.5 including terminal module on 7.5 mm standard sectional rail			
Number of assigned outputs for the (left-hand) motor starter		1			
Rated operational voltage	V	DC 24		DC 500 (min. 100)	
Power supply		Externally through terminal module		From brake rectifier through terminal module	
Rated operational current	A	4		0.7	
Reverse polarity protection		No, in the event of polarity reversal the brake is released and the overload/short-circuit protection is not effective			
Overload/short-circuit protection		Yes, solid-state			
Conductor cross-section of the terminal module for the brake control module	mm^2	1 x 2.5 without end sleeve 1 x 1.5 with end sleeve			
Number of outputs		0	1 (used internally)	0	1 (used internally)
Number of inputs		0	2	0	2
Address space required per module					
• With summary		0	2 bits	0	2 bits
• Without summary		0	1 byte	0	1 byte
Diagnostics functions					
• Group fault "SF"		Red LED			
• Switching state for brake "STAT"		Yellow LED			
• Inputs 1 and 5		--	Green LED	--	Green LED
Parameters (default values underlined)					
• Brake overload diagnostics		--	Disable/Enable	--	Disable/Enable
• Input delay	ms	--	0 / 0.1 / 0.5 / 3 / 15	--	0 / 0.1 / 0.5 / 3 / 15
Module width	mm	15			

Dimensional drawings

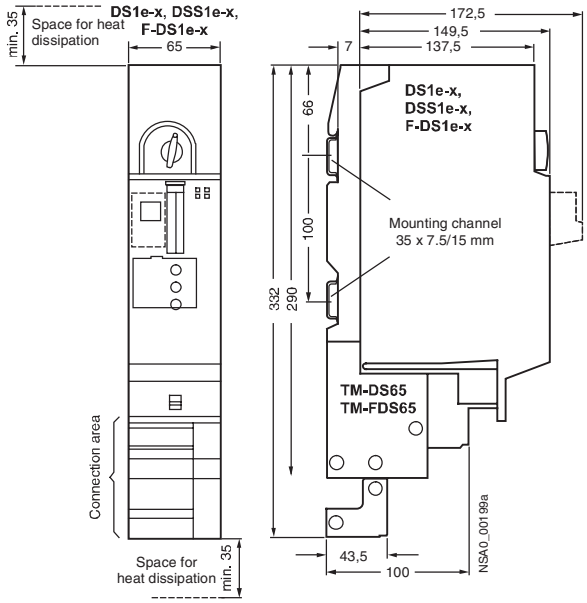


DS1-x direct-on-line starter with TM-DS 45 terminal module

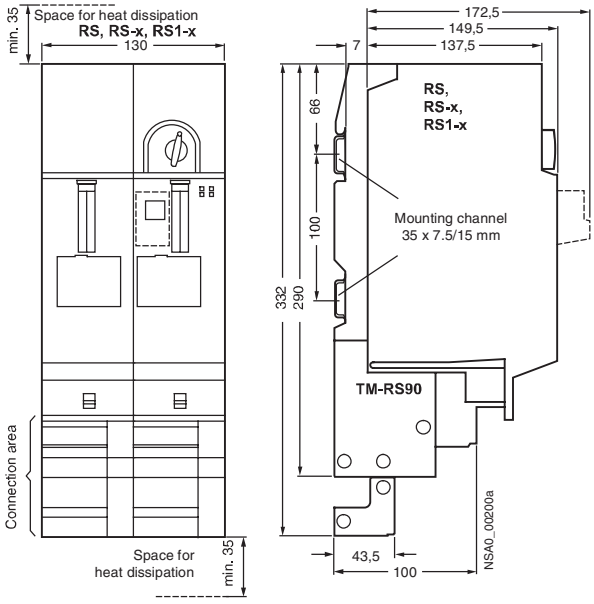


RS1-x reversing starter with TM-RS 90 terminal module

ET 200S motor starters

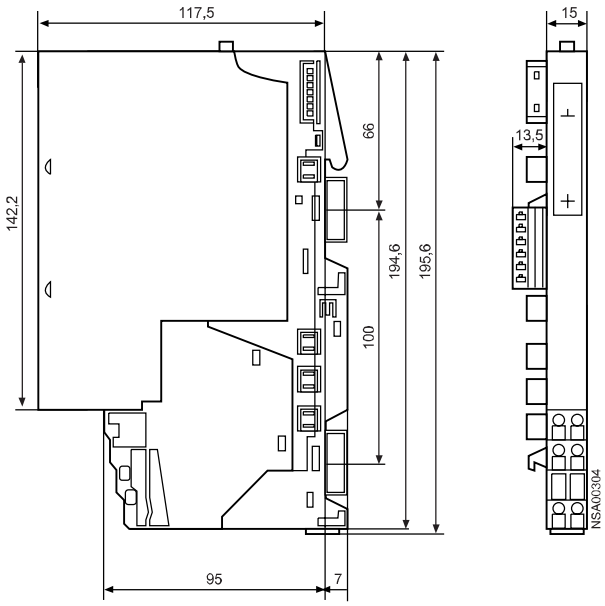


DS1e-x direct-on-line starter, DSS1e-x sort starter and TM-DS65 terminal module



RS1e-x reversing starters and TM-RS130 terminal module

Accessories



Brake control module xB1 ... 4 with TM-xB215 terminal module

Power modules for ET 200S motor starters

Overview

- For supplying and monitoring the auxiliary voltages for motor starters
- Deactivation of a complete group of motor starters is possible without any additional outlay (safety category 1 according to EN 954-1)
- For plugging into TM-P15 terminal module
- For supplying and monitoring the voltage supply for the ET 200S FC frequency converter

Design

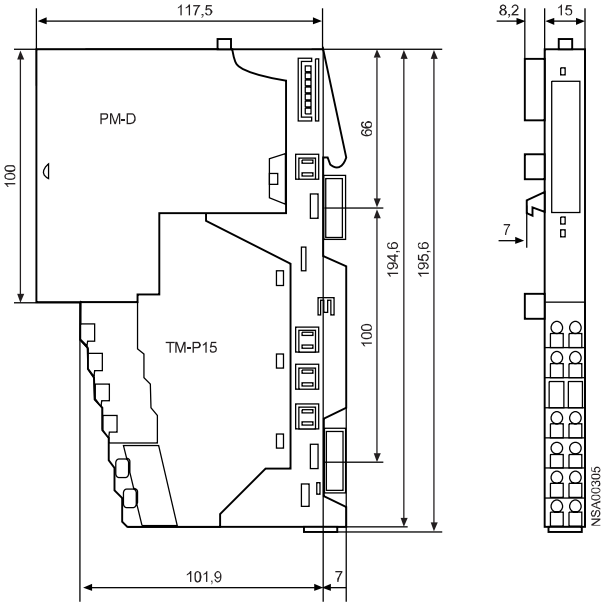
PM-D power modules are plugged onto the TM-P15 terminal modules.

A PM-D power module must be followed by at least one motor starter or one frequency converter.

Technical specifications

		PM-D Power module 3RK1 903-0BA00
Rated control supply voltage U_s Up to 60 °C	V	20.4 ... 28
Rated operational current I_e		
• Recommended short-circuit protection	A	10
• Melting fuse	A	10
• Miniature circuit-breaker	A	10 Tripping characteristic B
Power consumption from the backplane bus	mA	≤ 10
Supplying		
• Motor starters		Yes
• Frequency converters		Yes
• Motor starters for SIGUARD safety systems		No
• Solid-state modules		No
• Ex(i) modules		No
Alarms		none
Diagnostics functions		Yes
• System fault/device fault		Red "SF" LED
• Monitoring the power supply for solid-state modules U_1		Green "PWR" LED
• Monitoring the power supply for contactors U_2		Green "CON" LED
• Diagnostics information can be read out		Yes
Conductor cross-sections		
• Flexible with end sleeve	mm^2	1.5
• Rigid	mm^2	2.5
Mounting dimensions (W x H x D)	mm	15 x 195.5 x 117.5

Dimensional drawings



PM-D power module and TM-P15 terminal module

Terminal modules for ET 200S motor starters

Overview

Terminal modules for motor starters

- Mechanical modules in which the motor starter and expansion modules are inserted
- For constructing the permanent wiring and self-assembling voltage bus
- For connecting the motor connection cables
- Positive-locking connection to ensure enhanced vibration resistance

Terminal modules for frequency converters

- Mechanical modules in which the components of the frequency converter are inserted
- For constructing the permanent wiring and self-assembling voltage bus
- For connecting the motor cables
- Integrated shield attachments for receiving the busbar 3 x 10 mm

Terminal module for power module

- Connection by means of screw terminals
- Light colored enclosure for visual distinction
- Always before the first TM-DS/TM-RS

Design

TM-DS, TM-RS

- "–S32" variant with supply terminals: 2 x 3 x 10 mm^2 screw terminals for power bus and motor outgoing feeder
- "–S31" variant without supply terminals: 1 x 3 x 10 mm^2 screw terminals for motor outgoing feeder
- Optionally expandable with PE/N modules (see Accessories)
- Applies only to standard motor starters: For applications with high motor currents (> 6.3 A) or high ambient temperatures (> 40 °C) it is recommended to use the DM-V15 distance module (See Accessories) between two DS1-x motor starters

TM-ICU

- For ICU24 / ICU24F control modules of the frequency converter

TM-IPM

- "TM-IPM65" variant for IPM25 power section of the frequency converter with 0.75 kW
- "TM-IPM130" variant for IPM25 power section of the frequency converter with 2.2 or 4.0 kW
- "–S32" variant with supply terminals: 2 x 3 x 10 mm^2 screw terminals for power bus and motor outgoing feeder
- "–S31" variant without supply terminals: 1 x 3 x 10 mm^2 screw terminals for motor outgoing feeder
- All TM-IPM units have an integrated shield attachment
- Optionally expandable with PE/N modules (see Accessories)

TM-xB

- Can be combined with standard motor starters as well as High-Feature motor starters and frequency converters
- Connection by means of screw terminals
- Always next to the TM-DS/TM-RS on the right-hand side

Terminal module for power module

For supplying load and sensor voltage to the self-assembling potential bars of the standard motor starters, High-Feature starters and frequency converters. Power modules for voltage monitoring are plugged onto TM-P modules. TM-P modules can be used any number of times within the ET 200S. A power module must always be plugged upstream from the first motor starter/frequency converter.

Technical specifications

TM-P15 S27-01 terminal module

Dimensions		
Mounting dimensions (W x H x D)	mm	15 x 196.5 x 102
Depth with power module	mm	117.5
Insulation voltages and rated currents		
Insulation voltage	V	500
Rated operational voltage	V	24 DC
Rated operational current	A	10
Conductor cross-sections		
Solid	mm^2	1 x (0.14 ... 2.5) according to IEC 60947 1 x 2.5
Finely stranded with end sleeve	mm^2	1 x (0.14 ... 1.5) to IEC 60947
AWG conductors, solid or stranded		AWG 1 x (18 ... 22)
Wiring		
Required tool		Standard screw driver size 1
Tightening torque	Nm	0.4 ... 0.7

TM-DS45 and TM-DS65/TM-FDS65 terminal module

		TM-DS45	TM-DS65/TM-FDS65
Dimensions			
Mounting dimensions (W x H x D)	mm	45 x 264 x 100	65 x 290 x 100
Height with PE/N terminal block	mm	306	332
Depth with motor starter	mm	127	150
Depth with motor starter and F-Kit (SIGUARD safety system)	mm	152	--
Depth with motor starter and 2DI control module	mm	--	173
Rated voltages, currents and frequencies for the power bus			
Rated insulation voltage U_i	V	690	
Rated operational voltage U_e	V	500 AC	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated operational current I_e	A	40	50
Rated frequency	Hz	50/60	
Conductor cross-sections			
Solid	mm^2	2 x (1 ... 2.5) or 2 x (2.5 ... 6)	
Finely stranded with end sleeve	mm^2	1 x 10 or 2 x (1 ... 2.5) or 2 x (2.5 ... 6) According to IEC 60947	
AWG conductors, AWG solid or stranded		2 x (14 ... 10)	
With additional 3-phase feeder terminal if required			
• Solid or stranded	mm^2	1 x 2.5 ... 25	
• Finely stranded with end sleeve	mm^2	1 x 2.5 ... 25	
• AWG conductors, AWG solid or stranded		1 x 12 ... 4	
Wiring			
Required tool		Standard screw driver size 2 and Pozidriv 2	
Tightening torque	Nm	2.0 ... 2.5	

Terminal modules for ET 200S motor starters

TM-RS90 and TM-RS130/TM-FRS130 terminal module

		TM-RS90	TM-RS130/TM-FRS130
Dimensions			
Mounting dimensions (W x H x D)	mm	90 x 264 x 100	130 x 290 x 100
Height with PE/N	mm	306	332
Depth with motor starter	mm	127	150
Depth with motor starter and F-Kit (SIGUARD safety system)	mm	152	--
Depth with motor starter and 2DI control module	mm	--	173
Rated voltages, currents and frequencies for the power bus			
Rated insulation voltage U_i	V	690	
Rated operational voltage U_e	V	500 AC	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated operational current I_e	A	40	50
Rated frequency	Hz	50/60	
Conductor cross-sections			
Solid	mm^2	2 x (1 ... 2.5) or 2 x (2.5 ... 6)	
Finely stranded with end sleeve	mm^2	1 x 10 or 2 x (1 to 2.5) or 2 x (2.5 to 6) According to IEC 60947	
AWG conductors, AWG solid or stranded		2 x (14 ... 10)	
With additional 3-phase feeder terminal if required			
• Solid or stranded	mm^2	1 x 2.5 ... 25	
• Finely stranded with end sleeve	mm^2	1 x 2.5 ... 25	
• AWG conductors, AWG solid or stranded		1 x 12 ... 4	
Wiring			
Required tool		Standard screw driver size 2 and Pozidriv 2	
Tightening torque	Nm	2.0 ... 2.5	

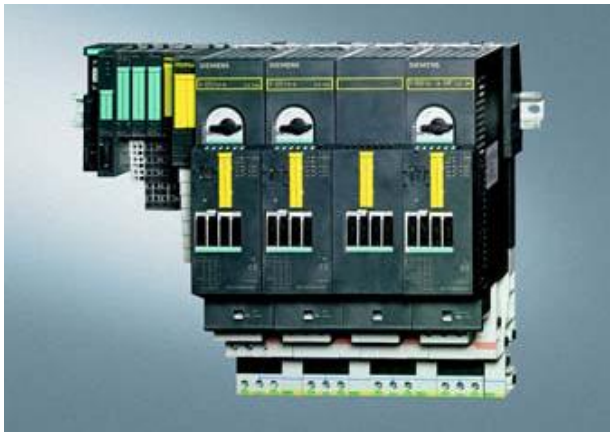
TM-ICU15 terminal module

Dimensions		
Mounting dimensions (W x H x D)	mm	15 x 195 x 52 (depth with control module 154)
Rated voltages and currents		
Rated insulation voltage U_i	V	500 AC
Rated operational voltage U_e	V	24 DC
Rated operational current I_e	A	10

TM-IPM65 and TM-IPM130 terminal module

		TM-IPM65 terminal module	TM-IPM130 terminal module
Dimensions			
Mounting dimensions (W x H x D)	mm	65 x 290 x 100	130 x 290 x 100
Height with PE/N terminal block	mm	332	
Depth with frequency converter power section	mm	150	
Rated voltages, currents and frequencies for the power bus			
Rated insulation voltage U_i	V	690	
Rated operational voltage U_e	V	500 AC	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated operational current I_e	A	50	
Rated frequency	Hz	50/60	
Conductor cross-sections			
Solid	mm^2	2 x (1 ... 2.5) or 2 x (2.5 ... 6)	
Finely stranded with end sleeve	mm^2	1 x 10 or 2 x (1 to 2.5) or 2 x (2.5 to 6) According to IEC 60947	
AWG conductors, AWG solid or stranded	mm^2	2 x (14 ... 10)	
With additional 3-phase feeder terminal if required			
• Solid or stranded	mm^2	1 x 2.5 ... 25	
• Finely stranded with end sleeve	mm^2	1 x 2.5 ... 25	
• AWG conductors, AWG solid or stranded	mm^2	1 x 12 ... 4	
Wiring			
Required tool		Standard screw driver size 2 and Pozidriv 2	
Tightening torque	Nm	2.0 ... 2.5	

Overview



The ET 200S Safety motor starters Solutions comprise:

- Safety modules
- Standard motor starters
- High-Feature motor starters
- Failsafe motor starters

With the ET 200S Safety motor starters Solutions there is no complicated and hence cost-intensive configuring and wiring compared to the conventional safety systems. The ET 200S Safety motor starter Solutions are designed for Category 4 according to EN 954- or SIL 3 IEC 61508.

They enable the use of safety-oriented direct-on-line starters or reversing starters in the SIMATIC ET 200S distributed peripherals system on PROFINET or PROFIBUS. The fine modular architecture of the system enables optimum imaging of machine or plant applications.

Within an ET 200S station the Safety motor starters Solutions can also be combined with standard motor starters or High-Feature motor starters without safety functions or the SIMATIC ET 200S FC frequency converter up to max. 4 kW up to Category 3 according to EN 954-1 or SIL 2 according to IEC 61508.

Standard and High-Feature ET 200S motor starters can be found on page 6/88 onwards.

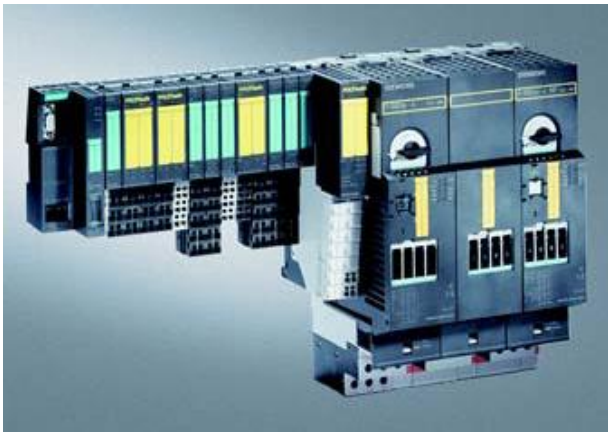
The ET 200S configurator software can be found in catalog CA 01 on CD or DVD (Motor Starter Selection Aid). You can also download the ET 200S configurator software from the Internet:

http://www.siemens.com/sirius-starten

http://www.siemens.com/ET200S

ET 200S Failsafe motor starters

Overview



The Failsafe motor starter has been developed on the basis of the High-Feature motor starter. It differs in that, in addition to a motor starter protector and contactor assembly, a safe solid-state evaluation circuit is installed for error detection purposes which makes the motor starter failsafe.

If the contactor to be switched fails in an EMERGENCY-STOP case, the evaluation electronics detects a fault and opens the motor starter protector in the motor starter through a shunt release in a failsafe manner. The second redundant shutdown components is therefore no longer a main contactor, as is generally the case, but the motor starter protector installed in the motor.

All functions of the High-Feature starter are already integrated

The new Failsafe motor starters are characterized by easy, space-saving assembly as well as minimal wiring outlay. Like the High-Feature starters, the Failsafe motor starters have a switching capacity of up to 7.5 kW (16 A) which is achieved with just two motor starter versions. Another important feature is the high availability due to the high short-circuit withstand capability (type of coordination 2).

Design

High degree of flexibility with safety engineering

- Solution PROFIsafe:
  In EMERGENCY-STOP applications, the Failsafe motor starters are selectively switched off through the upstream safety module PM-D F PROFIsafe. For each safety module, six shutdown groups can be formed. In the first delivery stage, the failsafe freely-programmable logic of the SIMATIC controller is used to interface with the relevant failsafe sensors. The interface between PROFIsafe and installations that use conventional safety systems is implemented through the F-CM failsafe contact multiplier with four floating contacts.
- Solution local
  Failsafe motor starter with safety relay (Variant 1) or ASIsafe (Variant 2): Signals with relevance for safety can be input to ET 200S through a PM-D F X1 infeed terminal module through the enabling circuits of the AS-i Safety Monitor or the safety relay to control the Failsafe motor starters which then selectively switch off the downstream motors.

Technical specifications

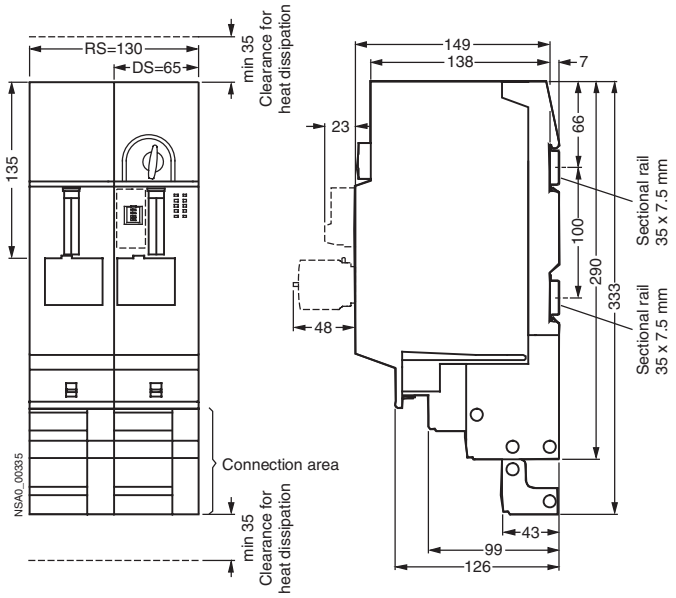
F-DS1e-x direct-on-line starters / F-RS1e-x reversing starters

			Combination starters, direct-on-line	Reversing starters
Dimensions				
Dimensions (W x H x D)		mm	65 x 290 x 150 (incl. terminal module)	130 x 290 x 150 (incl. terminal module)
Height with PE/N module		mm	332	
Depth with 2DI control module (not safe)		mm	173	
Module-specific specifications				
Type of coordination			Type 2 up to $I_e \leq 16$ A at 400 V	
Internal power supply			U1 (from PM-D F / PM-DF X1)	
Maximum achievable safety class				
• According to IEC 61508			SIL 3	
• According to DIN VDE 0801			Shutdown class 6 (AK6)	
• According to EN 954-1			Category 4	
Safety characteristics				
• Low demand	PFD_{AVG} (10a)			
- Test interval 3 months			3.5×10^{-5}	
- Test interval 6 months			8.0×10^{-5}	
• High demand/continuous mode	PFH			
- Test interval 3 months		1/h	8.1×10^{-10}	
- Test interval 6 months		1/h	1.8×10^{-9}	
• Proof-test interval		years	10	
Voltages, currents, potentials				
Switching capacity			Up to 7.5 kW at 400 V AC in three setting ranges:	
		A	0.3 ... 3	
		A	2.4 ... 8	
		A	2.4 ... 16	
Status, alarms, diagnostics				
Status display			SF, DEVICE and C-STAT, SG1 ... SG6	
Diagnostics functions				
• Group fault display			Red LED (SF)	
• Diagnostics information can be read out			Available	

ET 200S Failsafe motor starters

		Combination starters, direct-on-line	Reversing starters
Control circuit			
Rated operational voltage for electronics U_1	V	24 DC (20.4 ... 28.8 DC)	24 DC (21.6 ... 26.4 DC)
Reverse polarity protection for electronics U_1		Yes	
Rated operational voltage for contactor U_2	V	24 DC (20.4 ... 28.8 V DC)	
Reverse polarity protection for contactor U_2		Yes	
Current consumption			
• From electronics supply U_1	mA	Approx. 40	Approx. 100
• From contactor supply U_2			
- Pickup	A	1.7 (for 80 ms)	--
- Hold	mA	Max. 350	--
• From SG1 up to 6			
- Pickup	mA	250 (for 200 ms)	
- Hold	mA	Max. 55	
• Test function of the shunt release/starter protector (50 ms) from U_1	A	Approx. 1.5	
• From the backplane bus	mA	Approx. 20	
Main circuit			
Rated operational voltage U_e			
• According to DIN VDE 0106, Part 1014, IEC 60947-1, EN 60947-1	V	AC 500	
• Safe isolation between main and auxiliary conducting circuits	V	400	
UL, CSA	V	AC 600	
Rated insulation voltage U_i	V	AC 500	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated frequency	Hz	50/60	

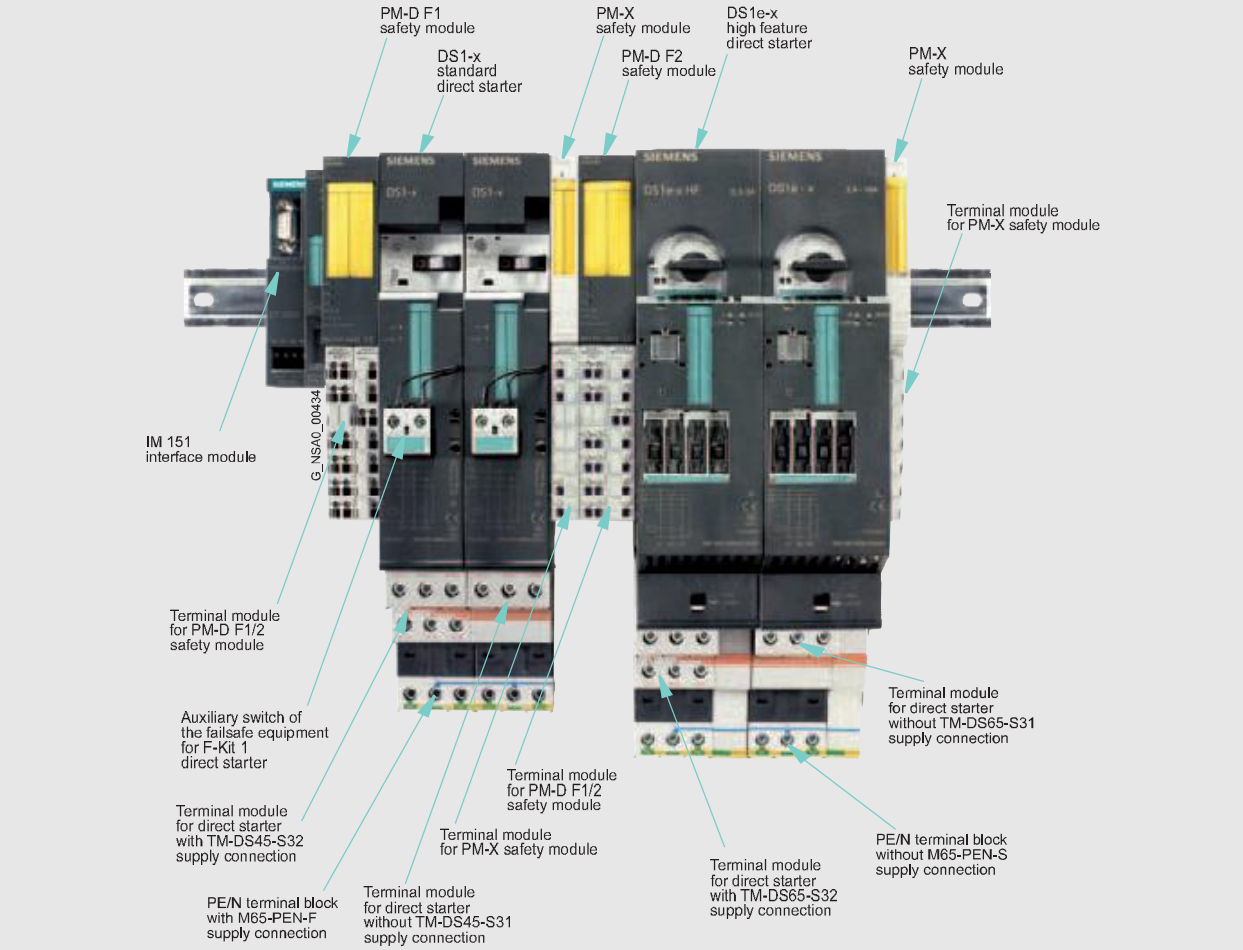
Dimensional drawings



F-DS1e-x direct-on-line starters / F-RS1e-x reversing starters

Safety modules local

Overview



Interplay of ET 200S Safety motor starters Solutions local components

PM-D F1 safety module

Safety motor starters Solutions local

- For use of standard, High-Feature or Failsafe motor starters in systems with safety categories 2 to 4 (according to EN 954-1)
- No complex wiring for conventional safety systems
- Can also be used in combination with external safety relays
- Can also be used to activate external safety systems
- Safety module available for function-monitored and automatic starting
- Safety module available for stop category 0 and 1
- Safety module for monitoring the auxiliary voltages for motor starters
- Safety modules can be plugged into the TM-PF30 terminal modules.

PM-D F1/F2/F3/F4/F5 safety modules

- PM-D F1/F2/F3/F4 safety modules monitor auxiliary voltages and contain the complete functionality of a safety relay:
  - PM-D F1
    For evaluation of EMERGENCY-STOP circuits with the function "monitored start".
  - PM-D F2
    For evaluation of protective doors with the function "automatic start".
  - PM-D F3
    Expansion to PM-D F1/F2 for time-delayed shutdown.
  - PM-D F4
    For expansion of safety circuits with other ET 200S motor starters, e.g. in a different line.
  - PM-D F5
    Transmits the status from PM-D F1 ... 4 through four floating enabling circuits to external safety equipment (contact mulitpliers)
- The PM-D F1 and PM-D F2 modules can be combined with the PM-D F3 or PM-D F4 modules.
- A PM-D F5 can be positioned at any point between a PM-D F1 ... 4 and a PM-X.
- Safety modules monitor the U1 and U2 auxiliary voltages. A voltage failure is relayed as a diagnostics signal over the bus.
- No additional PM-D safety module is required when the safety modules are used.
- Each safety circuit, beginning with a PM-D F1 ... 4, must be terminated with one PM-X each.

Failsafe Kit

The Failsafe Kit (F-Kit) must be added to each standard motor starter in a safety segment in order to monitor the switching function.

F-Kit 1 supplements the DS1-x direct-on-line starter, F-Kit 2 the RS1-x reversing starter.

The F-Kits are comprised of:

- Contact supports for the terminal modules
- One or two auxiliary switch blocks for the contactor/contactors of the motor starter
- Connecting leads

High-Feature motor starters and their terminal modules come as standard with the functionality of the F-Kits integrated.

Examples

The diverse possible uses of the Safety motor starters Solutions local are presented in the manual SIMATIC ET 200S motor starters in the context of typical sample applications.

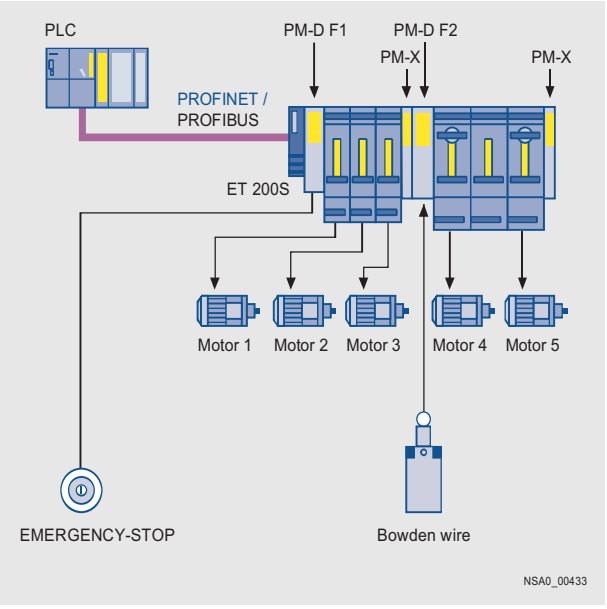
Safety functional examples for easy, quick and low-cost implementations of applications with Safety motor starters Solutions local are available on the Internet:

You can find more information on the Internet at:

http://www.siemens.com/sirius-starting

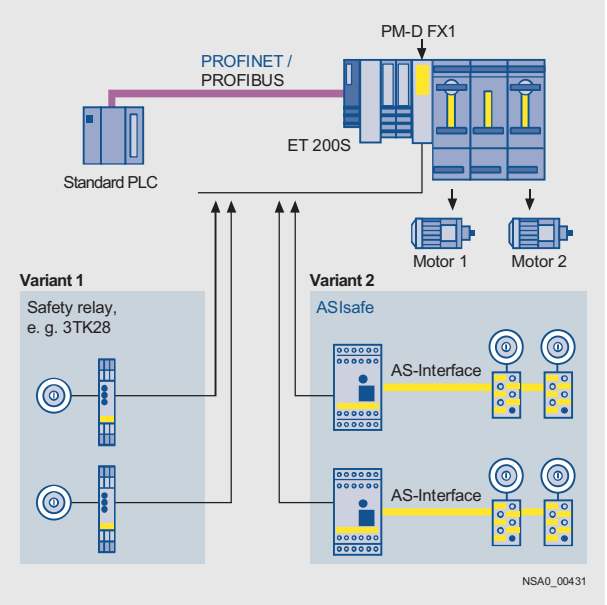
http://www.siemens.com/ET200S

Example 1:



ET 200S Safety motor starter Solutions local with 2 safety circuits (= shutdown groups), standard motor starters and High-Feature motor starters.

Example 2:



ET 200S Safety motor starter Solutions local with 2 external safety assemblies (= safety relays or ASIsafe monitors) and with Failsafe motor starters (PM-DFX1 application). 2 of the 6 available safe shutdown groups are used.

Signals with relevance for safety can be input to ET 200S through a PM-DFX1 infeed terminal module through the enabling circuits of the ASIsafe monitor or the safety relay to control the Failsafe motor starters which then selectively switch off the downstream motors.

Safety modules local

Design

Components needed for applications with safety requirement

Components needed	Safety category according to EN 954-1			
	1	2	3	4
PM-D	X	--	--	--
PM-D F1/-F2/-F4	--	X	X	X
PM-D F3	--	X	X	--
F-Kit 1/2	--	X [1)]	X [1)]	X [1)]
PM-X	--	X	X	X
PM-DFX1	--	X	X	X
External infeed contactor	--	--	X	X

1) F-Kit needed only for standard motor starter; already integrated in High-Feature motor starter

Possible combinations of safety and terminal modules

Terminal module	PM-D F1	PM-D F2	PM-D F3	PM-D F4	PM-D F5	PM-X	PM-DFX1	FCM
TM-PF30 S47-B0	X	X	--	--	--	--	--	--
TM-PF30 S47-B1	X	X	--	--	--	--	--	--
TM-PF30 S47-C0	--	--	X	X	--	--	--	--
TM-PF30 S47-C1	--	--	X	X	--	--	--	--
TM-PF30 S47-D0	--	--	--	--	X	--	--	--
TM-X15 S27-01	--	--	--	--	--	X	--	--
TM-PFX30 S47-G0	--	--	--	--	--	--	X	--
TM-PFX30 S47-G1	--	--	--	--	--	--	X	--
TM-FCM30 S47	--	--	--	--	--	--	--	X

Terminal module for safety module

For supplying load and sensor voltage to the self-assembling potential bars of the standard motor starters, High-Feature starters and frequency converters. Safety modules for voltage monitoring are plugged onto TM-P modules. TM-P modules can be used any number of times within the ET 200S. A safety module must always be plugged upstream from the first motor starter/frequency converter.
Different safety circuits can be functionally separated or else cascaded using different terminal modules. Each group in such a case must be terminated with a PM-X connection module.

- TM-PF30 S47-B1

The terminal module is always positioned at the beginning of a safety segment and accommodates the PM-DF1 safety module for EMERGENCY-STOP applications or the PM-DF2 safety module for protective door monitorings. The 24 V power supplies for the electronics (U1) and those for supplying the contactors (U2) of the motor starters must be connected along with the 2-channel connection of the safety sensors (e.g. EMERGENCY-STOP pushbuttons) to this terminal module. Connections for the ON button (enabling) and safe output of the safety module are available in addition.

- TM-PF30 S47-B0

The terminal module is used to cascade lower level safety segments and accommodates the PM-DF1 safety module for EMERGENCY-STOP applications or the PM-DF2 safety module for protective door monitorings. No other auxiliary voltage has to be connected to this terminal module. The supply comes from the preceding PM-DF1 or PM-DF2 module over the potential bars of the terminal modules. Once the potential of the preceding safety module is disconnected, this sub-potential also has no voltage.

- TM-PF30 S47-C1

The terminal module is always positioned at the beginning of a safety segment expansion in a new station, e.g. at an interlace point. It accommodates the PM-D F3 safety module for time-delayed shutdown or the PM-D F4 safety module for direct shutdown in separately located ET 200S stations. The 24 V power supplies for the electronics (U1) and those for supplying the contactors (U2) are fed in new.
The shutdown command from an upstream ET 200S station is received through a safe input. Separate terminals are available to connect the feedback circuit to the upstream ET 200S station. No safety sensors can be connected to this terminal module.

- TM-PF30 S47-C0

The terminal module is used to cascade lower level safety segments and accommodates the PM-D F3 safety module for time-delayed shutdown or the PM-D F4 safety module. Only the U2 power supply for the contactors must be connected to this terminal module. The U1 supply comes from the preceding safety module (sub-potential group) over the potential bars of the terminal modules. No safety sensors can be connected to this terminal module.

- TM-PF30 S47-D0

The terminal module is used to accommodate the PM-D F5 safety module. On this terminal, safe signals can be relayed to external systems through four groups, each with two safety relay contacts configured with redundancy. The terminal module must always be positioned between one of the above mentioned terminal modules and a terminal module for the TM-X connection module. No safety sensors can be connected to this terminal module.

Terminal module for connection module (TM-X)

For connection of an external infeed contactor (second shutdown option) for category 3 and 4. The connection module is plugged on the right alongside the last motor starter of a safety segment. On the TM-X terminal module there are the terminals for connecting the positively driven NC contact of the contactors as well as the terminals for connecting the contactor coil. If no contactor with redundant switching is required, e.g. for category 2 (EN 954-1), the feedback circuit has to be closed at these terminals with a bridge. In applications with external safety relays it is also used instead of the safety module as interface to the external safety relay.

Function

Safety motor starters Solutions local

The safety module evaluates the signal state of the connected safety sensors and, using the integrated safety relays, shuts down the group(s) of downstream motor starters. The shutdown function is monitored by the module, and the auxiliary functions likewise.

Safety-relevant system signals, e.g. due to an actuated EMERGENCY-STOP switch or a missing auxiliary voltage, are automatically generated and notified to the interface module. The latter assigns an unambiguous ID to the fault. Using the PROFIBUS DP diagnostics module, faults of this type can be identified and localized without a great deal of programming work.

The PM-D F X1 safety module is used for feeding in 1 to 6 shut-down groups. The infeed voltage can be switched using 1 to 6 external safety shutdown devices (either AS-Interface safety monitors or 3TK28 safety assemblies). This safety module is used in applications with external safety shutdown devices where there is a need for the fully selective safety shutdown of Failsafe motor starters/frequency converters.

- Terminal modules for connection modules (TM-xB)

The TM-xB terminal modules are used to accommodate the xB1, xB2, xB3 and xB4 brake control modules. The TM-terminal module must always follow directly after a terminal module for standard motor starters, High-Feature motor starters or frequency converters as control of the solid-state braking switch is provided through an output of the motor starter/frequency converter. The xB215 terminal modules for the brake control modules have not only the terminals for connecting the line for the motor braking unit but also the terminals of the two local acting inputs. These local inputs are not evaluated by a frequency converter; for this reason the xB215 terminal module may be plugged in only downstream from a motor starter.

- Terminal modules for (TM-PF30) safety module

For supplying load and sensor voltage to the potential bars of the motor starters, and for connection of the 2-channel sensor circuit (e.g. EMERGENCY-STOP button) and a reset button. Different terminal modules are available for the configuring of separate safety circuits or for the cascading of safety circuits, and for applications with time-delayed shutdown.

- Terminal module for (TM-X) connection safety module

For connection of an external infeed contactor (2nd shutdown possibility). With terminals for contactor coil and feedback contact. Is always required to terminate a group of safety-oriented motor starters.

Technical specifications

PM-D F1, F2, F3, F4 and F5 safety modules		
Mechanical endurance	Operating cycles	10 x 10^6
Electrical endurance	Operating cycles	200 000 with I_e
Utilization categories		DC-13
Control times		
• Minimum command duration	ms	200
• Recovery time	s	< 1
• Off-delay	ms	30
Control current circuit U_1		
• Rated control supply voltage U_S	V	24 DC
• Operating range DC up to 60 °C		0.85 ... 1.2 x U_s
• Power consumption	W	2.4
• Recommended short-circuit protection		(gG) gL 2 A
Output OUT+/OUT- for control of expansion modules		24 V DC / < 50 mA (PTC fuse)
Switched auxiliary circuit U_2		
• Rated control supply voltage U_S	V	24 DC
• Operating range DC up to 60 °C		0.85 ... 1.2 x U_s
• Rated operational current I_e (DC-13 up to 24 V)	A	4
• Uninterrupted thermal current I_{th}	A	5
Recommended short-circuit protection for enabling and signaling circuits		Fuse links: LV HRC type 3NA DIAZED type 5SB NEOZED type 5SE gL (gG) operational class 6 A
Supplying		
• Motor starters		Yes
• Solid-state modules		No
• Ex(i) modules		No
• BG certification		Yes
• UL-, CSA certification		Yes
Cable length for EMERGENCY-STOP and ON pushbuttons	m	Max. 1000
Mounting dimensions (W x H x D)	mm	30 x 196.5 x 117.5 (incl. terminal module)
Enabling circuits with PM-D F5		4 (floating)
PM-X safety module		
Control current circuit U_1		
• Rated control supply voltage U_S	V	24 DC
Mounting dimensions (W x H x D)	mm	15 x 196.5 x 117.5 (incl. terminal module)

Safety modules local

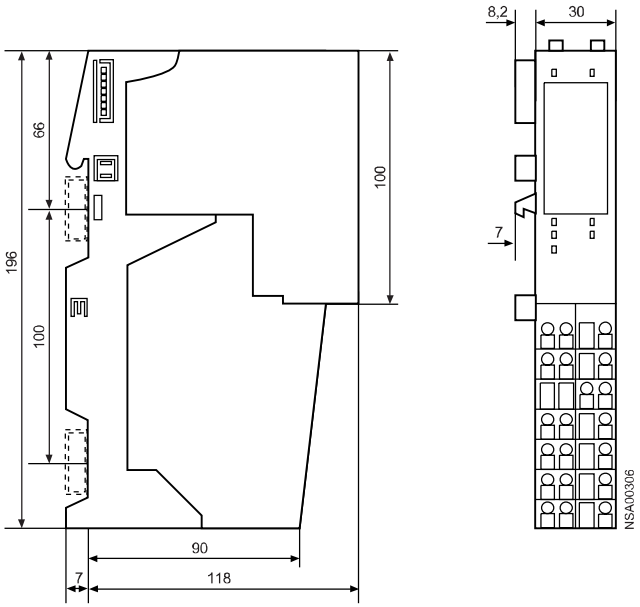
Diagnostic messages with safety modules

Fault type	Meaning	PM-D power modules				
		F1	F2	F3	F4	F5
01001: Fault	A module fault has occurred	X	X	X	X	X
10001: Sensor or load voltage missing	U_1 or U_2 not available or too low	X	X	X	X	X
11000: Actuator shutdown	Safety relay has dropped	X	X	X	X	X
11001: Safety-oriented shutdown	EMERGENCY-STOP has been actuated; crossover between the EMERGENCY-STOP leads has occurred	X	X			

TM-PFX30 S47/TM-PF30 S47 terminal modules		
Dimensions		
Mounting dimensions (W x H x D)	mm	30 x 196.5 x 102
Depth with power module	mm	117.5
Insulation voltages and rated currents		
Insulation voltage	V	500
Rated operational voltage	V	24 DC
Rated operational current	A	10
Conductor cross-sections		
Solid	mm^2	1 x (0.14 ... 2.5) according to IEC 60947 1 x (2.5
Finely stranded with end sleeve	mm^2	1 x (0.14 ... 1.5) according to IEC 60947
AWG conductors, AWG solid or stranded		1 x (18 ... 22)
Wiring		
Required tool		Standard screw driver size 1
Tightening torque	Nm	0.4 ... 0.7
PM-D FX1 safety module (infeed terminal module)		
Dimensions		
• Mounting dimensions (W x H x D)	mm	30 x 196.5 x 117.5 (incl. terminal module)
Module-specific specifications		
Ambient temperature	°C	0 ... +60
Degree of protection		IP20
Maximum achievable safety classes		
• IEC 62508 • DIN V 19250 • EN 954-1		SIL 3 Shutdown class 5 and 6 Category 4
Safety characteristics		
• Proof-test interval		10 years
Voltages, currents, potentials		
Rated control supply voltage U_s	V	21.6 ... 26.4 DC up to 60 °C
Rated operational current I_e	A	6 Internal protection with 7 A fuse (quick)
Recommended upstream short-circuit protection	A	Fuse gL/gG 6.3
Supplying		
• Failsafe motor starters • Failsafe frequency converters • Motor starters for SIGUARD safety systems • Solid-state modules • Ex[i] modules		Yes Yes No No No
Current consumption		
• From the backplane bus • From U_1 • From SGx	mA mA mA	≤ 10 ≤ 35 ≤ 15
Status, alarms, diagnostics		
Alarms		None
Diagnostics functions		
• Group fault/device fault • Monitoring the power supply for solid-state modules U1 (PWR) • Monitoring of six shutdown groups • Diagnostics information can be read out		Red "SF" LED Green PWR LED Green SG1 … SG6 LED Yes
Standards, approvals		
• TÜV • UL-, CSA certification		Yes Yes

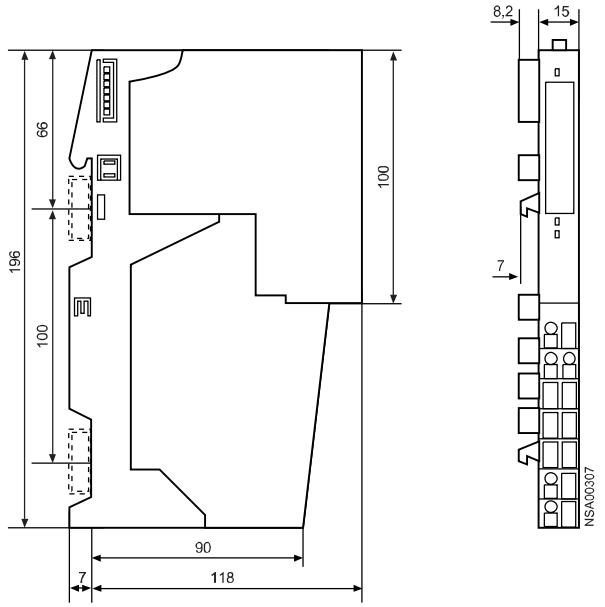
F-CM contact multiplier		
Dimensions		
• Dimensions (W x H x D)	mm	30 x 196.5 x 117.5 (incl. terminal module)
Module-specific specifications		
Number of relay outputs		4 (4 x 1-channel or 2 x 2-channel safe coupling/contact multiplication)
Internal power supply for bar		U1 (from PM-D F / PM-D FX1)
Maximum achievable safety class		
• According to IEC 61508		SIL3
• According to DIN VDE 0801		AK 6
• According to EN 954		Cat. 4
Voltages, currents, potentials		
Switching capacity of the relay outputs		Utilization category DC-13 (I_e / U_e): 1.5 A / 24 V
Electrical isolation		
• Between outputs and backplane bus		Yes
• Between outputs and power supply		Yes
• Between outputs		Yes
• Between outputs/power supply and shield		Yes
Status, alarms, diagnostics		
Status display		PWR and STAT
Alarms: Diagnostics alarm		none
Diagnostics functions		Yes
• Group fault display		Red LED (SF)
• Diagnostics information can be read out		Available
• Monitoring the power supply for solid-state modules U_1 (PWR)		Green PWR LED
• Monitoring the switching status of the enabling circuit		Red/green STAT LED

Dimensional drawings



PM-D F1 ... 4 safety module and TM-PF30 terminal module

Safety modules local



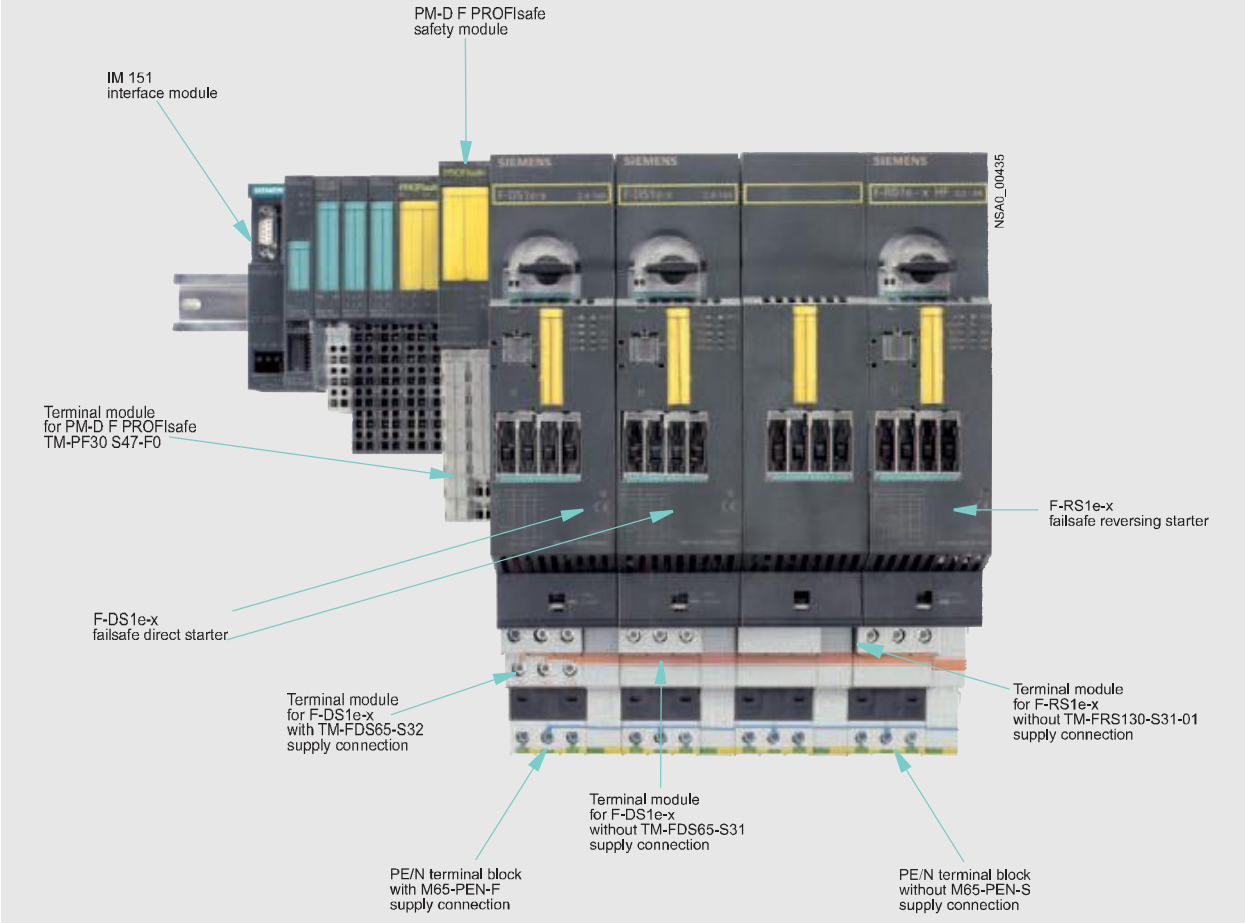
PM-X safety module and TM-X15 terminal module

Schematics

Terminal assignment of TM-PFX30 S47-G0/G1 terminal modules (for PM-D F X1)

Terminal	Short designation	Meaning
1, 8	+ IN/OUT	U_1: fused 24 V DC, limited to SIMATIC range
2, 9	M IN/OUT	
3, 10	--	Not assigned
4, 11	--	Not assigned
5, 12	--	Not assigned
6, 13	L+	U_{in}: for connecting an external power supply
7, 14	M	24 V DC SELP/PELV
--	AUX1	Is passed through without a terminal
15, 22	SG1	
16, 23	SG2	
17, 24	--	Not assigned
18, 25	SG3	
19, 26	SG4	
20, 27	SG5	
21, 28	SG6	

Overview



Interplay of ET 200S Safety motor starter Solutions PROFIsafe components

Safety motor starters Solutions PROFIsafe

Sensor and actuator assignment are freely configurable within the framework of the distributed safety concept:

The logic of the safety functions is implemented by software. Safety-oriented PROFIsafe communication and the use of a safety-oriented control system are required. Integration of the safety system in the standard automation is realized through a single bus system (see Advantages of PROFIsafe), using PROFIBUS as well as PROFINET.

- For the use of Failsafe motor starters in plants with safety category 2 to 4 according to EN 954-1 and SIL 2 and 3 according to IEC 61508. The use of standard or High-Feature motor starters is also possible with certain assemblies
- High flexibility (any assignment of sensors to motor starters using the PLC)
- Full selectivity of disconnection of the Failsafe motor starters
- No complex wiring for conventional safety systems, e.g. no infeed contactors even in the highest safety category
- Can also be used in combination with external safety relays
- Can also be used to activate external safety systems
- Safety module available for any safety function
- Safety module available for stop category 0 and 1
- Safety module for monitoring the auxiliary voltages for motor starters
- Safety modules can be plugged into the TM-PF30 terminal modules.

Safety modules PROFIsafe

Safety motor starter Solutions PROFIsafe

High degree of flexibility with safety engineering

Failsafe motor starters for PROFIsafe:
In EMERGENCY-STOP applications, the Failsafe motor starters are selectively switched off through the upstream PM-D F PROFIsafe safety module. For each safety module, six shutdown groups can be formed. In the first delivery stage, the failsafe freely-programmable logic of the SIMATIC controller is used to interface with the relevant failsafe sensors. The interface between PROFIsafe and installations that use conventional safety systems is implemented through the F-CM Failsafe contact multiplier with four floating contacts.

Example:

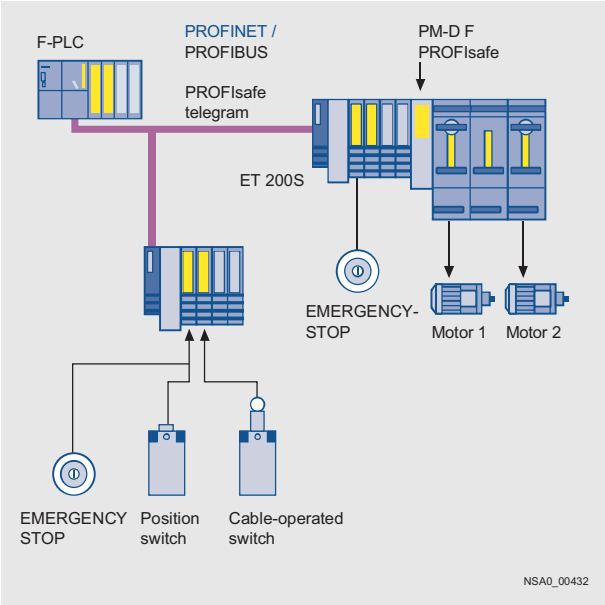
The diverse possible uses of the Safety motor starter Solutions PROFIsafe are presented in the manual SIMATIC ET 200S Motor Starters in the context of typical sample applications.

Safety functional examples for easy, quick and low-cost implementations of applications with Safety motor starters Solutions local are available on the Internet:

You can find more information on the Internet at:

http://www.siemens.com/sirius-starting

http://www.siemens.com/ET200S



ET 200S Safety motor starter Solutions PROFIsafe with Failsafe motor starters and fully selective shutdown (PM-DF PROFIsafe application)

Within an ET 200S station the Failsafe motor starters are assigned to one of 6 safety segments. For plants with distributed configuration the shutdown signals of these safety segments are preferably issued by a higher level, safety-oriented control system through PROFIsafe. This permits the greatest flexibility for assigning the motor starters to different safety circuits.

Alternatively, an ET 200S F-CPU can also be used for control purposes.

6

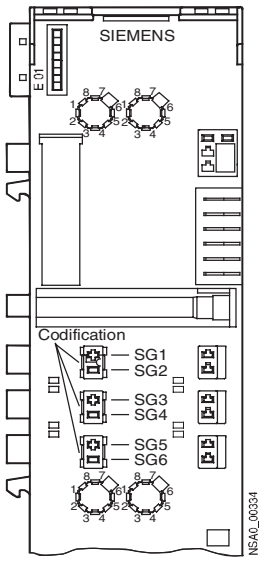
Function

Each safety module switches up to 6 shutdown groups for Failsafe motor starters/frequency converters.

The PM-D F PROFIsafe safety module receives the shutdown signal from the interface module of the ET 200S and safely switches off 1 to 6 shutdown groups. This safety module is used in PROFIsafe applications where there is a need for the selective safety shutdown of Failsafe motor starters/frequency converters.

The terminal assignment of the terminal modules for safe motor starters corresponds to the terminal assignment of the 45 and 65 mm terminal modules. The terminal modules for safe motor starters have a coding module in addition. This enables the safe motor starter to be assigned to one of the six shutdown groups.

The terminal module contains three coding elements which fully cover the three coding openings in the terminal module. The labeled coding element contains (in the chamber marked with the dash) the busbar tap; the non-labeled coding elements are used only to cover the coding openings. Shutdown group 1 (AG1 or SG1) is coded in the as-delivered state. The coding can be changed to shutdown group 2 by releasing the coding element and turning it through 180°. Changing the coding to shutdown group 3 is possible by exchanging the labeled and non-labeled coding elements. In this case the dash on the labeled coding
element must correlate with the dash of the required shutdown group (symbolized busbar).

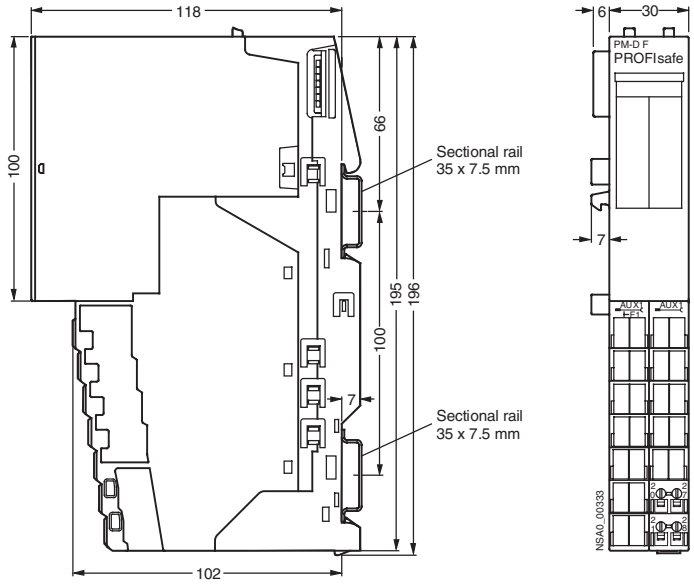


Technical specifications

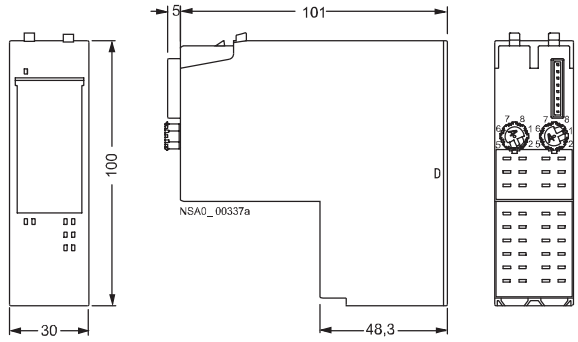
PM-D F PROFIsafe safety module		
Dimensions		
• Dimensions (W x H x D)	mm	30 x 196.5 x 117.5 (incl. terminal module)
Module-specific specifications		
Number of outputs, source input		6 shutdown groups (safety group 1 ... 6)
Internal power supply for bar		U1
Assigned address range		
• In PAE	byte	5
• In PAA	byte	5
Maximum achievable safety class		
• According to IEC 61508		SIL3
• According to DIN VDE 0801		AK 6
• According to EN 954		Cat. 4
Voltages, currents, potentials		
Supply voltage	V	24 DC
Electrical isolation		
• Between outputs and backplane bus		Yes
• Between outputs and power supply		No
• Between outputs		No
• Between outputs/power supply and shield		Yes
Status, alarms, diagnostics		
Status display		Green LED per SG Green LED for electronics supply Green LED for load voltage
Alarms: Diagnostics alarm		"TO"
Diagnostics functions		
• Group fault display		Red LED (SF)
• Diagnostics information can be read out		Available
Settings		
Module address		Diverse: 1. Using a safety-oriented parameter in the parameterization message frame over the backplane bus 2. Using the 10-pole DIL switch (binary-coded) on the left side of the module The received address is then compared with the DIL switch setting
F-CM contact multiplier		
Dimensions		
• Dimensions (W x H x D)	mm	30 x 196.5 x 117.5 (incl. terminal module)
Module-specific specifications		
Number of relay outputs		4 (4 x 1-channel or 2 x 2-channel safe coupling/contact multiplication)
Internal power supply for bar		U1 (from PM-D F / PM-D FX1)
Maximum achievable safety class		
• According to IEC 61508		SIL3
• According to DIN VDE 0801		AK 6
• According to EN 954		Cat. 4
Voltages, currents, potentials		
Switching capacity of the relay outputs		Utilization category DC-13 (I_e / U_e): 1.5 A / 24 V
Electrical isolation		
• Between outputs and backplane bus		Yes
• Between outputs and power supply		Yes
• Between outputs		Yes
• Between outputs/power supply and shield		Yes
Status, alarms, diagnostics		
Status display		PWR and STAT
Alarms: Diagnostics alarm		none
Diagnostics functions		Yes
• Group fault display		Red LED (SF)
• Diagnostics information can be read out		Available
• Monitoring the power supply for solid-state modules U_1 (PWR)		Green PWR LED
• Monitoring the switching status of the enabling circuit		Red/green STAT LED

Safety modules PROFIsafe

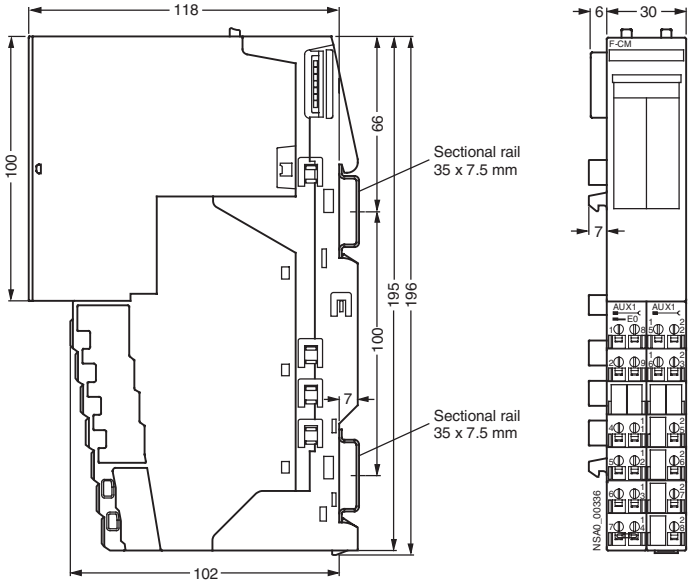
Dimensional drawings



PM-D F PROFIsafe power module



PM-D F X1 power module (infeed terminal module)



F-CM contact multiplier

Schematics

Terminal assignment of TM-PF30 S47-F0 terminal module (for PM-DF PROFIsafe)

Terminal	Short designation	Meaning
20, 27	24 V DC	24 V DC infeed (terminals internally bridged)
21, 28	M	Infeed ground (terminals internally bridged)

Terminal assignment of TM-FCM30 S47-F01 terminal module (for F-CM)

The table shows the terminal assignment of the TM-FCM30 S47-F01 terminal module for the F-CM contact multiplier. The left half of the terminal module is used to assign the contact multiplier outputs to the desired safety group. It can be coded for only one safety group. The PM-D F treats multiple coding as crossover. The F-CM can also be configured in connection with the PM-D F X1 power module.

Terminal	Short designation	Meaning
1, 8	SG1	Bridge for coding to safety group 1
2, 9	SG2	Bridge for coding to safety group 2
4, 11	SG3	Bridge for coding to safety group 3
5, 12	SG4	Bridge for coding to safety group 4
6, 13	SG5	Bridge for coding to safety group 5
7, 14	SG6	Bridge for coding to safety group 6
15	OUT1.1	Floating relay output 1.1
16	OUT1.2	Floating relay output 1.2
22	OUT2.1	Floating relay output 2.1
23	OUT2.2	Floating relay output 2.2
25	OUT3.1	Floating relay output 3.1
26	OUT3.2	Floating relay output 3.2
27	OUT4.1	Floating relay output 4.1
28	OUT4.2	Floating relay output 4.2

Standard and High-Feature

Overview

Motor starters

- Only two variants up to 5.5 kW
- All settings can be parameterized by bus
- Comprehensive diagnostics signals
- Overload can be acknowledged by remote reset
- Current unbalance monitoring
- Stall protection
- Emergency start function in the event of overload
- Current value transmission by bus
- Current limit monitoring
- Direct-on-line or reversing starters
- Power bus can be plugged in using the new HAN Q4/2 plug-in connectors
- Conductor cross-sections up to 6 x 4 mm²
- 25 A per segment (power looped through using jumper plug)
- Supplied with 400 V AC brake contact as an option

Isolator module

The isolator module with switch disconnector function is used for safe disconnection of the 400 V operational voltage during repair work in the plant and provides an integrated group fusing function (i.e. additional group short-circuit protection for all subsequently supplied motor starters).

Depending on the power distribution concept, all stations can be equipped with an isolator module as an option.

Safety local isolator module

With the Safety local modules
- Safety local isolator module and
- 400 V disconnecting module

it is possible to achieve safety category 4 with an appropriate circuit.

The Safety local isolator module is a maintenance switch with integrated safety evaluation functions that can be parameterized using DIP switches.

It is used for:
- Connection of a 1 or 2-channel EMERGENCY-STOP circuit up to category 3-4/Sil3 (protective door or EMERGENCY-STOP buttons) and parameterizable start behavior
- Control of the 400 V disconnecting module by means of a safety rail signal

6

Technical specifications

		Motor starters, Standard DSe, RSe	Motor starters, High-Feature DSe, RSe
General data			
Motor starters that can be connected to ET 200pro or modules with width of 110 mm		Max. 8	
Mounting dimensions (W x H x D) • Direct starter and reversing starter	 mm	 110 x 230 x 150	
Permissible ambient temperature • During operation • During storage	 °C °C	 -25 ... +55, from +40 with derating -40 ... +70	
Permissible mounting position		Vertical, horizontal	
Vibration resistance according to IEC 60068, Part 2-6		2 g	
Shock resistance to IEC 60068 Part 2-27		Half-sine 15 g/11 ms	
Current consumption • From auxiliary circuit L+/M (U1) • From auxiliary circuit A1/A2 (U2)	 mA mA	 Approx. 40 Approx. 200	
Rated operational current for power bus I_e	A	25	
Rated operational voltage U_e	V	400	
Approval to DIN VDE 0106, Part 101	V	Up to 500	
CSA and UL approval	V	Up to 600	
Conductor cross-sections • Incoming energy supply	 mm²	 Max. 6 x 4	
Degree of protection		IP65	
Touch protection		Finger-safe	
Degree of pollution		3, IEC 60664 (IEC 61131)	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated insulation voltage U_i	V	400	

		Motor starters, Standard DSe, RSe	Motor starters, High-Feature DSe, RSe
General data (continued)			
Rated operational current for starter I_e			
• AC-1/2/3 at 40 °C			
- at 400 V	A	0.15 ... 2.0/1.5 ... 12.0	
- at 500 V	A	0.15 ... 2.0/1.5 ... 9.0	
• AC-4 at 40 °C			
- at 400 V	A	0.15 ... 2.0/1.5 ... 4.0	
Rated short-circuit breaking capacity	kA	100 at 400 V	
Type of coordination to IEC 60947-4-1		1	
Power of induction motors at 400 V	kW	Max. 5.5	
Utilization categories		AC-1, AC-2, AC-3, AC-4	
Safe isolation between main and auxiliary conducting circuits	V	400 according to DIN VDE 0106, Part 101	
Mechanical endurance of contactor		30 million operating cycles	
Electrical endurance of contactor		Up to 10 million operating cycles; dependent on the current load (see Manual)	
Reliable operating frequency		Dependent on the current load, motor starting time and relative ON period (see Manual)	
Operating times at 0.85 ... 1.1 x U_e			
• Closing delay	ms	25 ... 100	
• Opening delay	ms	7 ... 10	
Device functions			
Parameterizable rated operational current		Yes	
Parameterizable current limit values		No	Yes, 2 limit values
Parameterizable response in case of current limit violation		No	Yes
Zero current monitoring		Yes	
Parameterizable response in case of zero current violation		Yes	
Parameterizable current unbalance limit		No, fixed limit value (30 % x I_e)	Yes, 30 % ... 60 % x I_e
Parameterizable response in case of unbalance limit violation		Yes	
Motor blocking monitoring		No	Yes
Parameterizable blocking current limit		No	Yes, 150 % ... 1000 % x I_e
Parameterizable blocking time limit	s	No	Yes, 1 ... 5
Current value transmission		Yes	
Group warning diagnostics		No	Yes, parameterizable
Group diagnostics		Yes, parameterizable	
Emergency start		Yes	
Digital inputs		No	Yes, 4 inputs
• Parameterizable input signal		No	Yes, latching/ non-latching
• Parameterizable input level		No	Yes, NC contacts/NO contacts
• Parameterizable input signal delay	ms	No	Yes, 10 ... 80
• Parameterizable input signal extension	ms	No	Yes, 0 ... 200
• Parameterizable input control actions		No	Yes, 12 different actions
400 V brake output		Yes, ordering option	
Parameterizable brake enabling delay	s	Yes, -2.5 .. 2.5	
Parameterizable holding time of the brake during stopping	s	Yes, 0 ... 25	
Local device interface		Yes	
Firmware update		Yes, by trained personnel	
Thermal motor model		Yes	
Parameterizable trip class		No, CLASS 10 fixed	Yes, CLASS 5, 10, 15, 20
Parameterizable response in case of overload of thermal motor model		No	Yes, 3 possible states
Advance warning limit for motor heating	%	No	Yes, parameterizable 0 ... 95
Advance warning limit time-related trip reserve	s	No	Yes, parameterizable 0 ... 500
Parameterizable recovery time	min	No	Yes, 1 ... 30
Parameterizable zero voltage safety		No, permanently integrated	Yes
Reversing start function		Yes, ordering option	
Parameterizable interlock time for reversing starters		No, 150 ms fixed	Yes, 0 ... 60 s
Integrated logbook functions		Yes, 3 device logbooks	
Integrated statistics data memory		Yes	
Parameterizable response in case of CPU / master stop		Yes	
Device indications			
• Group fault		SF LED (red)	
• Switching state		STATE LED (red, yellow, green)	
• Device status		DEVICE LED (red, yellow, green)	
• Digital inputs		No	IN 1 ... IN 4, LED

ET 200pro isolator modules

Overview

The isolator module with integrated group fusing function (i.e. additional group short-circuit protection for all subsequently supplied motor starters) and switch disconnector function is used for safe disconnection of the 400 V operational voltage in the plant.

Depending on the power distribution concept, all stations can be equipped with an isolator module as an option.

The isolator module is available in addition in a safety version. See Safety local Isolator Modules.

Function

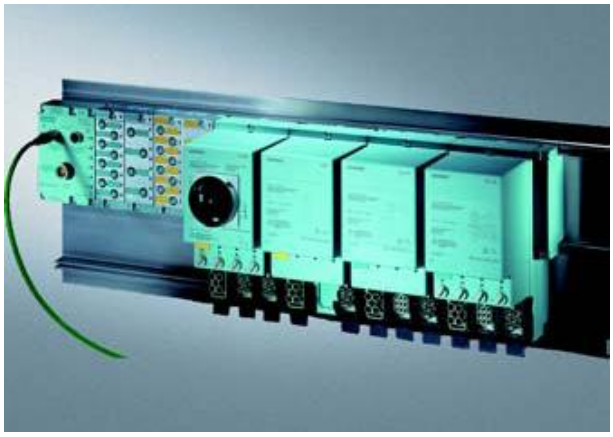
The isolator module is designed for the following individual functions:

- Disconnection of the downstream starters from the mains voltage
- Closing lockout using a padlock on the rotating element
- Short-circuit protection for the downstream loads with 25 A motor starter protection

Technical specifications

		Isolator module
General data		
Mounting dimensions (W x H x D) in mm • Direct starter and reversing starter	mm	 110 x 230 x 170
Permissible ambient temperature • During operation • During storage	 °C °C	 -25 ... +55 -40 ... +70
Permissible mounting position		Any
Vibration resistance to IEC 60068, Part 2-6		2 g
Shock resistance to IEC 60068, Part 2-27		Half-sine 15 g/11 ms
Current consumption • From auxiliary circuit L+/M (U1) • From auxiliary circuit A1/A2 (U2)	 mA	 Approx. 20 --
Rated operational current for power bus I_e	A	25
Rated operational voltage U_e	V	400
Approval to DIN VDE 0106, Part 101	V	Up to 500
CSA and UL approval	V	Up to 600
Conductor cross-sections • Incoming energy supply	 mm^2	 Max. 6 x 4
Degree of protection		IP65
Touch protection		Finger-safe
Degree of pollution		3, IEC 60664 (IEC 61131)
Rated impulse withstand voltage U_{imp}	kV	6
Rated insulation voltage U_i	V	400
Rated operational current for starters I_e • AC-1/2/3 at 40 °C - at 400 V - at 500 V	 A A	 25 25
Rated short-circuit breaking capacity	kA	50 at 400 V
Type of coordination to IEC 60947-4-1		2
Safe isolation between main and auxiliary conducting circuits	V	400 according to DIN VDE 0106, Part 101
Device functions • Group diagnostics		 Yes, parameterizable
Device indications • Group fault		 SF LED (red)

Overview



Safety local isolator module

The Safety local isolator module is a maintenance switch with integrated safety evaluation functions that can be parameterized using DIP switches.

It is used for:

- Connection of a 1 or 2-channel EMERGENCY-STOP circuit up to category 3-4/Sil3 (protective door or EMERGENCY-STOP buttons) and parameterizable start behavior
- Control of the 400 V disconnecting module by means of a safety rail signal

400 V disconnecting module

The 400 V disconnecting module enables the safe disconnection of the operational voltage of 400 V up to category 3-4/Sil3. It only functions in combination with the safety local isolator module.

Function

Safety local isolator module

The module with local safety function is designed for the following individual functions:

- Functions as for the isolator module, plus:
- 2 safe inputs for:
  - EMERGENCY-STOP or protective door contacts, 2-channel
  - Monitored start
- 2 slide swiches for adjusting the basic functions
  - 1-channel/2-channel
  - Autostart/monitored start.

400 V disconnecting module

The 400 V disconnecting module is designed for the following individual functions:

- Double disconnection of the main circuit supply (Category 4)
- Feedback of the module's functional state over bus.

Safety modules local

Technical specifications

		Safety local isolator module	400 V disconnecting module
General data			
Mounting dimensions (W x H x D) in mm • Direct starter and reversing starter	mm	110 x 230 x 170	110 x 230 x 150
Permissible ambient temperature • During operation • During storage	°C °C	-25 ... +55 -40 ... +70	
Permissible mounting position		Any	
Vibration resistance to IEC 60068, Part 2-6		2 g	
Shock resistance to IEC 60068 Part 2-27		Half-sine 15 g/11 ms	
Current consumption • From auxiliary circuit L+/M (U1) • From auxiliary circuit A1/A2 (U2)	mA	Approx. 20 --	
Rated operational current for power bus I_e	A	25	16
Rated operational voltage U_e	V	400	
Approval to DIN VDE 0106, Part 101	V	Up to 500	
CSA and UL approval	V	Up to 600	
Conductor cross-sections Incoming energy supply	mm^2	Max. 6 x 4	
Degree of protection		IP65	
Touch protection		Finger-safe	
Degree of pollution		3, IEC 60664 (IEC 61131)	
Rated impulse withstand voltage U_{imp}	kV	6	
Rated insulation voltage U_i	V	400	
Rated operational current for starter I_e • AC-1/2/3 at 40 °C - at 400 V - at 500 V	 A A	 25 25	 16 16
Rated short-circuit breaking capacity	kA	50 at 400 V	
Type of coordination to IEC 60947-4-1		2	
Safe isolation between main and auxiliary conducting circuits	V	400 according to DIN VDE 0106, Part 101	
Operating times at 0.85 ... 1.1 x U_e • Closing delay • Opening delay	 ms ms	 -- --	 25 ... 100 7 ... 10
Device functions • Group diagnostics		Yes, parameterizable	
Device indications • Group fault		SF LED (red)	

Overview

- For switching and protection of any three-phase loads
- Direct-on-line or reversing starters
- Electromechanical or solid-state
- Power bus can be plugged in using the new HAN Q8 plug-in connectors
- Conductor cross-sections up to 4 mm^2
- 35 A per segment
- Supplied with different brake contacts as an option

Design

Motor starters generally include:

- Digital outputs for controlling the motor starters.
- Digital inputs for checkback of operating states and faults.
- Integrated plug-in power connections for power infeed and power loop. This permits configuration of a power bus system in which several motor starters are connected to one power cable.
- A starter combination consisting of a motor starter protector and contactor(s) from the SIRIUS controlgear range in the case of electromechanical motor starters (solid-state motor starters have a setting option for overload protection and behavior in case of overload).

Mounting

The electrical connection of the motor starters to the adjacent modules is made using the integrated plug connector. Special mounting rails (6ES7 194-1GB.0-0XA0) for screwing on the ET 200X station (see the secdtion *Accessories / Mounting Accessories*) must be used. The motor starters must be fastened to the mounting rail using all three screws and in addition must be secured to the preceding module with the three screws supplied. Note: The permissible electrical and mechanical load limits must be observed.

Accessories

The following accessories are required for each ET 200X configuration:

Basic and expansion modules with inputs and outputs	**EM 300 DS/RS and EM 300 EDS/ERS motor starters**			**Tools**
	For power infeed (-X1)	**to the load connection (-X2)**	**to the power loop-through connection (-X3)**	
Per basic station: three plug connectors for PROFIBUS DP, control and auxiliary voltage Per digital input and output used: one 5-pole M12 coupler plug Per digital input and output used: one 4-pole shielded M12 coupler plug Per digital or analog input and output not used: one M12 sealing cap	Per electromechanical or solid-state motor starter: 9-pole plug set for power infeed: • 6 x 4 mm^2 or • 6 x 2.5 mm^2	Per electromechanical or solid-state motor starter: • 9-pole plug set for load connection (1.5 mm^2) or • Preassembled load connection cable: - 4 x 1.5 mm^2 or - 6 x 1.5 mm^2 with 9-pole power connector	Per electromechanical or solid-state motor starter: • 9-pole plug set for power loop-through connection: - 6 x 4 mm^2 or - 6 x 2.5 mm^2 or • Power supply cable: - 4 x 4 mm^2 or - 6 x 4 mm^2 with 9-pole power connector Per socket not required: • one sealing cap	As required: • Crimp tongs • Disassembly tool for 9-pole power connector • Hand-held device[1)]

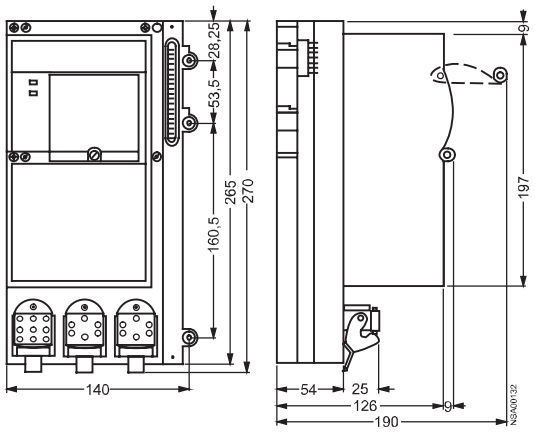
1) The hand-held device enables the motor starter to be operated locally and autonomously, providing that the auxiliary voltage supply is connected. Thus, assuming that the automation level is functioning correctly, local switching operations can be carried out in addition to normal manual operations in the event of a programmable controller / bus system failure (emergency mode) or during test runs for pre-commissioning, e.g. for testing the direction of rotation of the motor. The hand-held device can be connected to the motor starter by means of a connecting cable directly through a socket underneath the transparent cover.

ET 200X motor starters

Technical specifications

		ET 200X motor starters	
		DS/RS	**EDS/ERS**
Rated operational voltage	V		
• According to DIN VDE 0106, Part 1014		500 AC	
• According to CSA and UL		600 AC	
Safe isolation between main and auxiliary circuits (according to DIN VDE 0106, Part 101)	V	Up to 400	--
Rated output power	kW	5.5	2.2
Permissible operating modes		Continuous duty, temporary duty, periodic duty, periodic intermittent duty (50 % relative ON-time at 80 1/h at 5.5 kW)	
Permissible switching frequency with a starting time t_A = 0.1 s and a relative ON-time t_{EP} = 50 %	Operating cycles/h	≤ 80	≤ 600
Trip class		Class 10	
Conductor cross-sections of power connector for infeed/loop/feeder 9-pole	mm^2	≤ 4 AWG (15-11)	
Max. permissible current through power connector (dependent on cable cross-section)			
• T_u = 60 °C	A	30 (4 mm^2), AWG (11) 20 (2.5 mm^2), AWG (15) 12 (1.5 mm^2), AWG (13)	
• T_u = 40 °C	A	35 (4 mm^2), AWG (11) 25 (2.5 mm^2), AWG (15) 15 (1.5 mm^2), AWG (13)	
Short-circuit strength of the starter combination	kA	50 (according to type of coordination "1")	100
Electrical endurance of the motor starter protector element under load I_a (AC-3)	Operating cycles	See endurance characteristic curves of the 3RT10 contactors	≤ 10 million

Dimensional drawings

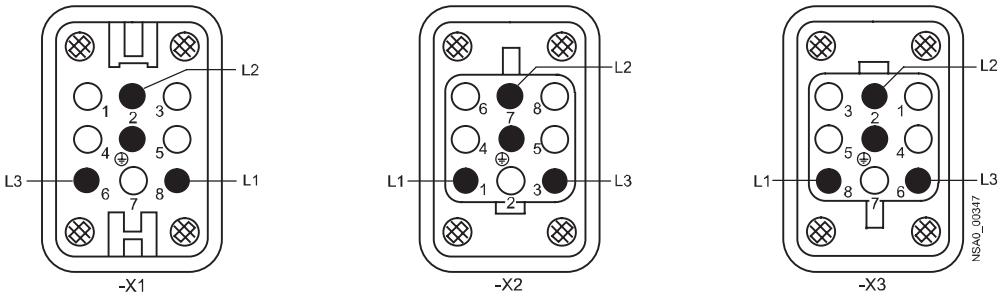


EM 300
3RK1 300-..S..-.AA expansion modules.

Schematics

Connector assignment for power connector on EM 300 expansion module

PIN	X1: Power infeed (plug of the starter)	X2: Load feeder (socket of the starter)	X3: Power loop-through connection (socket of the starter)
1	unused	Phase L1	unused
2	Phase L2	unused	Phase L2
3	unused	Phase L3	unused
4	GND for brake[1] optional	Brake output	+ DC 24 V for brake [1]
5	+ DC 24 V for brake[1] optional	Brake input	GND for brake [1]
6	Phase L1	unused	Phase L3
7	unused	Phase L2	unused
8	Phase L3	unused	Phase L1
Centre	PE	PE	PE



1) Only with EM300 with DC 24 V brake contact (3RK1 300-..S..-.AA1)

6

General data

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 400 V AC and a maximum rated motor current of 12 A.
  The starters are available in the following two variants:
  - Molded-plastic enclosure for direct-on-line starters including contactor – in this case the overload relay must be selected and ordered according to the rated motor current.
  - Molded-plastic enclosure for direct-on-line starters (without contactor) – in this case the contactor and overload relay must be selected and ordered separately.
- 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 in the following two variants:
  - Molded-plastic enclosure for direct-on-line starters including contactor – in this case the overload relay must be selected and ordered according to the rated motor current.
  - 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.
- 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 in the following variants:
  - 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 in the following two variants:
  - Molded-plastic enclosure for reversing starters including contactor assembly – in this case the overload relay must be selected and ordered according to the rated motor current.
  - 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.
- 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 in the following variants:
  - Molded-plastic enclosure for direct-on-line starters (without contactor assembly) – in this case the contactor assembly, auxiliary switch and overload relay must be selected and ordered separately.

Design

Components

The 3RE1 enclosed starters consist of a 3RT10 contactor or 3RA13 contactor assembly (fully mounted) for switching, a 3RU11 thermal overload relay for inverse-time delayed protection, auxiliary switch(es) and molded-plastic enclosure including the necessary actuators.

Mounting options

There are two options for mounting the 3RE1 enclosed starters:

- The first option is to use a 3RE10 direct-on-line starter or a 3RE13 reversing starter consisting of a molded-plastic enclosure with actuators, integrated contactor or integrated contactor assembly and auxiliary switches. Only the overload relay (to be ordered separately) needs to be mounted on the contactor or contactor assembly. Wiring is carried out quickly and easily according to the schematics thanks to prefabricated cabling.
- The second option is to use a 3RE19 molded-plastic enclosure with integrated actuators. The contactor or contactor assembly, which is available fully mounted or in the form of individual components for self-assembly, the auxiliary switches (in the case of the size S00 direct-on-line starter these are already integrated in the contactor) and the overload relay must be ordered separately. In this case, too, the overload relay is mounted directly on the contactor or contactor assembly and wired up. The complete assembly is snapped onto the standard mounting rail in the molded-plastic enclosure.

In the case of the second mounting option, the following components must be ordered:

	Components for mounting	Size	Order No.	Number	Alternative components for mounting	Size	Order No.	Number
Direct-on-line starters Size S00	Molded-plastic enclosure	S00	3RE19 13-1CB1	1				
	Contactor with integrated auxiliary switch 1 NO	S00	3RT10 1.-....1	1				
	Thermal overload relay	S00	3RU11 16	1				
Direct-on-line starters Size S0	Molded-plastic enclosure	S0	3RE19 23-1CB2	1				
	Contactor	S0	3RT10 2	1				
	Thermal overload relay	S0	3RU11 26	1				
	Lateral auxiliary switch 1 NO / 1 NC	--	3RH19 21-1DA11	1				
Direct-on-line starters Size S2	Molded-plastic enclosure	S2	3RE19 33-1CB3	1				
	Contactor	S2	3RT10 3	1				
	Thermal overload relay	S2	3RU11 36	1				
	Lateral auxiliary switch 1 NO / 1 NC	--	3RH19 21-1DA11	1				
Reversing starters Size S00	Molded-plastic enclosure	S00/S0	3RE19 13-2CB3	1				
	Contactor	S00	3RT10 1	2	Reversing assembly	S00	3RA13 17-8XC17-0..	1
	Wiring kit for reversing assemblies	S00	3RH19 13-2A	1				
	Thermal overload relay	S00	3RU11 16	1				
	Front auxiliary switch 1 NO	--	3RH19 11-1BA10	2				
Reversing starters Size S0	Molded-plastic enclosure	S00/S0	3RE19 13-2CB3	1				
	Contactor	S0	3RT10 2	2	Reversing assembly	S0	3RA13 2.-8XB30-0..	1
	Wiring kit for reversing assemblies	S0	3RH19 23-2A	1				
	Mechanical interlock	--	3RH19 24-2B	1				
	Thermal overload relay	S00	3RU11 26	1				
	Front auxiliary switch 1 NO	--	3RH19 21-1CA10	2				

Function

The 3RE1 enclosed starters, which are available as direct-on-line starters and reversing starters, are used for the switching and inverse-time delayed protection of loads. The switching of loads is taken care of by 3RT10 contactors. Inverse-time delayed protection is achieved with 3RU11 thermal overload relays.

These starter combinations consisting of a contactor or contactors and overload relay(s) are contained in a molded-plastic enclosure that provides effective protection against dust and splashwater with its high degree of protection IP65. This high degree of protection also applies to the actuators, which are used for manual switching on and off locally.

Control circuit

The enclosed starters including contactor or contactor assembly are available with the following rated control supply voltages:

- Size S00: 230 V, 50/60 Hz and 400 V, 50/60 Hz
- Size S0: 230 V, 50 Hz and 400 V, 50 Hz

Short-circuit protection

Fuses (fused construction) or motor starter protectors (fuseless construction) are to be used for short-circuit protection.

Details of the assignment of appropriate short-circuit devices for the combinations of 3RT contactor with 3RU11 thermal overload relay are given in the technical specifications.

When the load feeders are selected from the table, the types of coordination must also be taken into account.

Overload protection

Detailed information about the 3RU11 thermal overload relays (e.g. about recovery time, trip classes, tripping characteristics and phase loss protection) is given in the corresponding sections relating to Protection Equipment: Overload relays -> 3RU1 thermal overload relays.

General data

Manual/automatic resetting

In the case of the size S00 and S0 direct-on-line starters, a choice can be made between automatic and manual resetting on the overload relay. If manual resetting is chosen, the black button (O) is also the reset button. This button must be actuated after an overload tripping operation before the load can be restarted.

The only type of resetting possible with the other starters is an automatic reset.

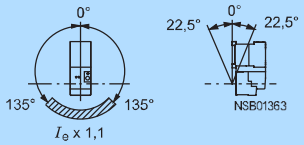
Details about setting the overload relays to automatic/manual resetting are given in the corresponding section describing the overload relays.

Switching on and off

With the direct-on-line starters, the load is switched on using the white button (I). The black button (O) is used for switching the load off.

With the reversing starters, the load can be started in the relevant direction of rotation by turning the upper switch clockwise or anticlockwise, as appropriate. The direction of rotation can be changed by pressing the black button (O).

Technical specifications

		3RE1. 10 3RE19 13	3RE1. 20 3RE19 23	3RE1. 30 3RE19 33
General data				
Standards • IEC 60947-1, EN 60947-1 (VDE 0660 Part 100) • IEC 60947-5, EN 60947-5 (VDE 0660 Part 200) • IEC 60947-2, EN 60947-2 (VDE 0660 Part 101)		 Yes Yes 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 (pollution degree 3)	V	400		
Rated impulse withstand voltage U_{imp}	kV	4		
Ambient temperature • Operation • Storage	 °C °C	 -20 ... +35 (derating is necessary above +35 °C) -55 ... +80		
Degree of protection according to IEC 60947-1		IP65		
Touch protection according to EN 50274 (VDE 0660 Part 514)		Finger-safe		
Site altitude	m	Up to 2,000 above sea level; above this, please enquire		
Permissible rated current I_n • Overload relay for ambient temperature: +35 °C • Overload relay for ambient temperature: +45 °C	 % %	 100 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)		

1) See part 5, section "SIRIUS Thermal Overload Relays".

2) When using the 3RU11 thermal overload release, see "Selection of Overload Relays and Short-Circuit Protection".

Selection of overload relays and short-circuit protection

With short-circuit currents up to 50 kA at 400 V, 50/60 Hz
Permissible short-circuit protection for enclosed motor starters comprising contactor/contactor assembly and overload relay

Size S00

Setting range	3RU11 thermal overload relay	Fuses for type of coordination "1"[1]		Fuses for type of coordination "2"[1]		Motor starter protectors for type of coordination "2"[1]
		5.5 kW = 3RE1. 10-8XC17 (3RT10 17 contactor) $I_{e\ max}$ = 12 A (at 400 V, 50/60 Hz)		5.5 kW = 3RE1. 10-8XC17 (3RT10 17 contactor) $I_{e\ max}$ = 12 A (at 400 V, 50/60 Hz)		at I_q = 50 kA / 400 V, 50/60 Hz
		gL/gG	BS88	gL/gG	BS88	
A		A	A	A	A	
0.11 ... 0.16	3RU11 16-0AB0	25	25	0.5	--	--
0.14 ... 0.2	3RU11 16-0BB0	25	25	1	--	3RV13 21-0BC10
0.18 ... 0.25	3RU11 16-0CB0	25	25	1	--	3RV13 21-0CC10
0.22 ... 0.32	3RU11 16-0DB0	25	25	1.6	2	3RV13 21-0DC10
0.28 ... 0.4	3RU11 16-0EB0	25	25	2	2	3RV13 21-0EC10
0.35 ... 0.5	3RU11 16-0FB0	25	25	2	2	3RV13 21-0FC10
0.45 ... 0.63	3RU11 16-0GB0	25	25	2	4	3RV13 21-0GC10
0.55 ... 0.8	3RU11 16-0HB0	25	25	4	4	3RV13 21-0HC10
0.7 ... 1	3RU11 16-0JB0	25	25	4	6	3RV13 21-0JC10
0.9 ... 1.25	3RU11 16-0KB0	25	25	4	6	3RV13 21-0KC10
1.1 ... 1.6	3RU11 16-1AB0	35	35	6	10	3RV13 21-1AC10
1.4 ... 2	3RU11 16-1BB0	35	35	6	10	3RV13 21-1BC10
1.8 ... 2.5	3RU11 16-1CB0	35	35	10	10	--
2.2 ... 3.2	3RU11 16-1DB0	35	35	10	16	--
2.8 ... 4	3RU11 16-1EB0	35	35	16	16	--
3.5 ... 5	3RU11 16-1FB0	35	35	20	20	--
4.5 ... 6.3	3RU11 16-1GB0	35	35	20	20	--
5.5 ... 8	3RU11 16-1HB0	35	35	20	20	--
7 ... 10	3RU11 16-1JB0	35	35	20	20	--
9 ... 12	3RU11 16-1KB0	35	35	--	--	--

Size S0

Setting range	3RU11 thermal overload relay	Fuses for type of coordination "1"[1]				Fuses for type of coordination "2"[1]				Motor starter protectors for type of coordination "2"[1]
		7.5 kW = 3RE1. 20-8XC25 (3RT10 25 contactor) $I_{e\ max}$ = 17 A (at 400 V, 50/60 Hz)		11 kW = 3RE1. 20-8XC26 (3RT10 26 contactor) $I_{e\ max}$ = 25 A (at 400 V, 50/60 Hz)		7.5 kW = 3RE1. 20-8XC25 (3RT10 25 contactor) $I_{e\ max}$ = 17 A (at 400 V, 50/60 Hz)		11 kW = 3RE1. 20-8XC26 (3RT10 26 contactor) $I_{e\ max}$ = 25 A (at 400 V, 50/60 Hz)		at I_q = 50 kA / 400 V, 50/60 Hz
		gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	
A		A	A	A	A	A	A	A	A	
1.8 ... 2.5	3RU11 26-1CB0	63	63	63	63	10	10	10	10	3RV13 21-1CC10
2.2 ... 3.2	3RU11 26-1DB0	63	63	63	63	10	16	10	16	3RV13 21-1DC10
2.8 ... 4	3RU11 26-1EB0	63	63	63	63	16	16	16	16	3RV13 21-1EC10
3.5 ... 5	3RU11 26-1FB0	63	63	63	63	20	20	20	20	3RV13 21-1FC10
4.5 ... 6.3	3RU11 26-1GB0	63	63	63	63	20	25	20	25	3RV13 21-1GC10
5.5 ... 8	3RU11 26-1HB0	63	63	63	63	25	32	25	32	3RV13 21-1HC10
7 ... 10	3RU11 26-1JB0	63	63	63	63	25	32	32	35	3RV13 21-1JC10
9 ... 12.5	3RU11 26-1KB0	63	63	63	63	25	32	35	35	3RV13 21-1KC10
11 ... 16	3RU11 26-4AB0	63	63	63	63	25	32	35	35	3RV13 21-4AC10
14 ... 20	3RU11 26-4BB0	63	63	63	63	25	32	35	35	3RV13 21-4BC10
17 ... 22	3RU11 26-4CB0	--	--	100	100	--	--	35	35	3RV13 21-4CC10
20 ... 25	3RU11 26-4DB0	--	--	100	100	--	--	35	35	--

1) Coordination and short-circuit equipment according to EN 60947-4-1:
Type of coordination 1: In the short-circuit case, the contactor or starter must not put equipment or personnel at risk. They do not have to be suitable for further operation (without repair and the replacement of parts).

Type of coordination 2: In the short-circuit case, the contactor or starter must not put equipment or personnel at risk. This must be capable of further operation. There is a risk of contact welding.

General data

Size S2

Setting range	3RU11 thermal overload relay	Fuses for type of coordination "1"[1] 15 kW = 3RT10 34 $I_{e\ max}$ = 32 A (at 400 V, 50/60 Hz)		18.5 kW = 3RT10 35 $I_{e\ max}$ = 40 A (at 400 V, 50/60 Hz)		22 kW = 3RT10 36 $I_{e\ max}$ = 50 A (at 400 V, 50/60 Hz)		Fuses for type of coordination "2"[1] 15 kW = 3RT10 34 $I_{e\ max}$ = 32 A (at 400 V, 50/60 Hz)		18.5 kW = 3RT10 35 $I_{e\ max}$ = 40 A (at 400 V, 50/60 Hz)		22 kW = 3RT10 36 $I_{e\ max}$ = 50 A (at 400 V, 50/60 Hz)		Motor starter protectors for type of coordination "2"[1] at I_q = 50 kA / 400 V, 50/60 Hz
		gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	gL/gG	BS88	
A		A	A	A	A	A	A	A	A	A	A	A	A	
5.5 ... 8	3RU11 36-1HB0	125	125	125	125	125	125	25	25	25	25	25	25	--
7 ... 10	3RU11 36-1JB0	125	125	125	125	125	125	32	32	32	32	32	32	--
9 ... 12.5	3RU11 36-1KB0	125	125	125	125	125	125	35	35	35	35	35	35	--
11 ... 16	3RU11 36-4AB0	125	125	125	125	125	125	40	40	40	40	40	40	--
14 ... 20	3RU11 36-4BB0	125	125	125	125	125	125	50	50	50	50	50	50	--
18 ... 25	3RU11 36-4DB0	125	125	125	125	125	125	63	63	63	63	63	63	3RV13 31-4DC10
22 ... 32	3RU11 36-4EB0	125	125	125	125	125	125	63	63	63	63	80	80	3RV13 31-4EC10
28 ... 40	3RU11 36-4FB0	125	125	125	125	125	125	63	63	63	63	80	80	3RV13 31-4FC10
36 ... 45	3RU11 36-4GB0	--	--	125	125	125	125	--	--	63	80	80	80	3RV13 31-4GC10
40 ... 50	3RU11 36-4HB0	--	--	--	--	160	160	--	--	--	--	80	80	3RV13 31-4HC10

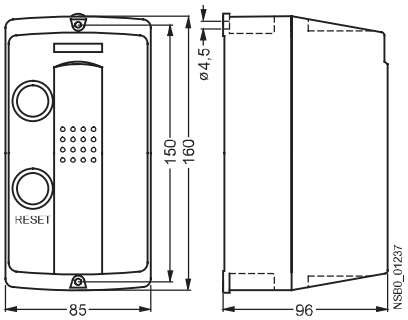
1) Coordination and short-circuit equipment according to EN 60947-4-1:
Type of coordination 1: In the short-circuit case, the contactor or starter must not put equipment or personnel at risk. They do not have to be suitable for further operation (without repair and the replacement of parts).

Type of coordination 2: In the short-circuit case, the contactor or starter must not put equipment or personnel at risk. This must be capable of further operation. There is a risk of contact welding.

Dimensional drawings

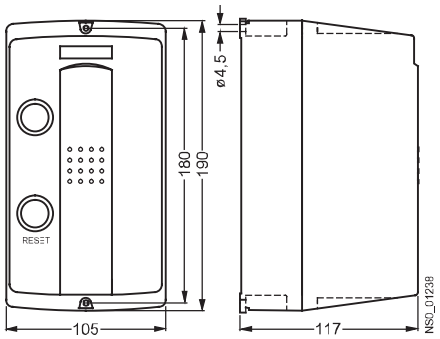
Direct-on-line starter, size S00

3RE10 10
3RE19 13-1CB1
metric cable gland M25



Direct-on-line starter, size S0

3RE10 20
3RE19 23-1CB2
metric cable gland M25

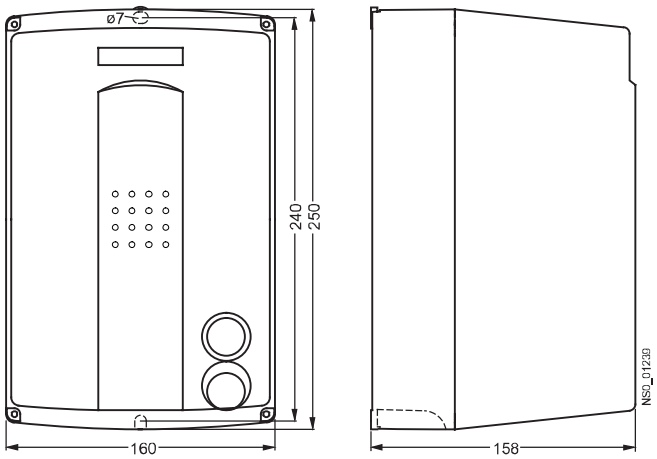


Direct-on-line starter, size S2

3RE19 33-1CB3

Reversing starter, size S00/S0

3RE13 10, 3RE19 23-2CB3
metric cable gland M32



6

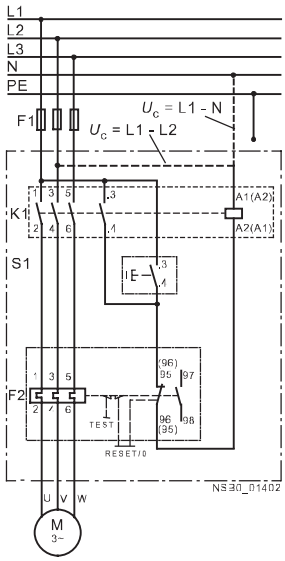
Project planning aids

Schematics

Direct-on-line starter, size S00/S0

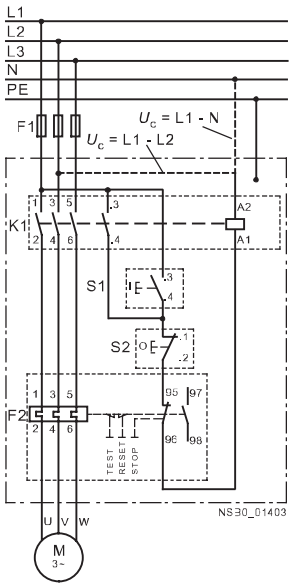
3RE10 10

3RE10 20
3RE19 13-1CB1 (see Accessories)
3RE19 23-1CB2 (see Accessories)



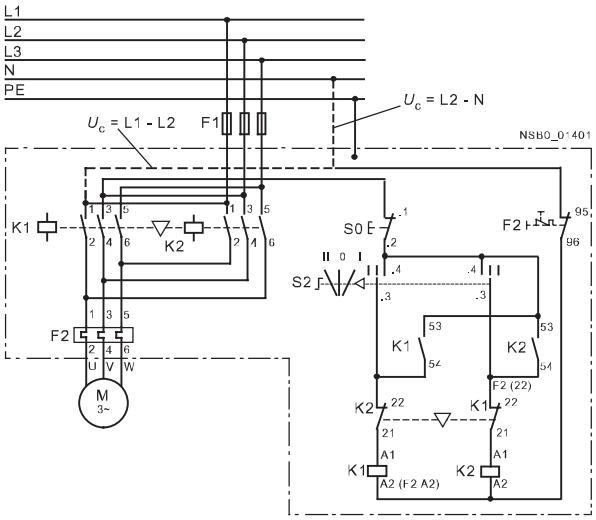
Direct-on-line starter, size S2

3RE19 33-1CB3 (see Accessories)



Reversing starter, size S00

3RE13 10
3RE19 13-2CB3 (see Accessories)



Reversing starter, size S0

3RE19 13-2CB3