SIEMENS

Industrial Controls

Load feeders and motor starters SIRIUS 3RM1 motor starter

Equipment Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1

1.1 Responsibility of the user for system configuration and functionality

The SIRIUS 3RM1 motor starters described here have been developed to carry out switching functions as part of a plant or machine.

The 3RM1 motor starters are available as direct-on-line starters in Standard design without safety-related shutdown (3RM10) and in Failsafe design with safety-related shutdown (3RM11 Failsafe), and also as reversing starters without safety-related shutdown (3RM12) and in Failsafe design with safety-related shutdown (3RM13 Failsafe).

The following must be noted when using 3RM11 Failsafe/3RM13 Failsafe safety-related motor starters:

A complete safety system consists of sensors, evaluation units, signaling devices and methods for safety-related shutdown.

The manufacturer is responsible for ensuring safe overall functioning of a plant or machine with safety-related components.

Siemens AG, its regional offices, and associated companies (hereinafter referred to as "Siemens") cannot guarantee all the properties of an overall installation or machine that has not been designed by Siemens.

Nor can Siemens assume liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the Siemens general terms of supply are to be derived or inferred from the following description.

1.2 Required basic knowledge

A general knowledge of the following areas is needed in order to understand this manual:

- Industrial controls
- Digital circuitry
- Automation technology
- Safety engineering

1.3 Scope

This manual is valid for SIRIUS 3RM1 motor starters. It contains a description of the motor starter and its functions. It provides information about configuration, commissioning and servicing. You will also find information on the infeed system, device connectors and further accessories in the manual.

To facilitate configuration, the manual contains dimension drawings, circuit diagrams and technical data of the system components.

SIEMENS reserves the right of including a Product Information for each new component, and for each component of a later version.

1.4 Definition

In this manual, "3RM1 motor starter" always refers to all variants of the SIRIUS 3RM1 motor starters.

1.5 Conformity

Standards

All 3RM1 motor starters comply with the following standards:

- IEC 60947-4-2
- IEC 60947-4-3
- IEC 60947-5-1

The 3RM11 Failsafe and 3RM13 Failsafe motor starters also comply with the following standards:

- EN 62061 (maximum SIL 3)
- EN ISO 13849-1 (Cat. 4, PL e)
- IEC 61508-1 (SIL 3)
- IEC 61508-2 (SIL 3)
- IEC 61508-3 (SIL 3)

Approvals, test reports, characteristics

Confirmation of approvals, test certificates and characteristic curves is available via the Internet (https://sieportal.siemens.com/su/bkylUhttps://support.industry.siemens.com/cs/ww/en/ps/16311/cert).

Degree of protection

The 3RM1 motor starter's degree of protection is IP20.

The infeed system for the 3RM1 motor starter features IP20 degree of protection.

⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

To ensure protection against an electric shock hazard with the hinged cover open at the signaling contacts 95, 96, 98 at a voltage of ≥ 50 V, screw in all terminal screws that are not needed to clamp conductors.

1.6 Further documentation

Further documents that might be of interest for your configuration:

Title of the manual	Article number[1)]
SIRIUS 3SK1 safety relays (https://support.industry.siemens.com/cs/ww/de/view/67585885)	3ZX1012-0SK11-0AC0
SIRIUS 3SK2 Safety Relays (https://support.industry.siemens.com/cs/ww/de/view/109444336)	3ZX1012-0SK21-1AB1

[1)] The manuals are available in the Service&Support Portal for downloading free of charge.

1.7 Siemens SiePortal Support

At Siemens SiePortal Support you can obtain up-to-date information from our global support database: You can also define your personal workspace.

Support

You can find information and comprehensive know-how covering all aspects of your product here:

- **Solution Guide**
  Our AI functionality answers your questions based on verified technical product information.
- **Manuals/operating instructions**
  Read online or download, available as PDF or individually configurable.
- **Downloads**
  Here you will find updates, service packs, HSPs and much more for your product.
- **Certificates**
  Clearly sorted according to approving authority, type and country.
- **Characteristics**
  For support in planning and configuring your system.
- **Catalogs / Brochures**
  Read online or download, available as PDF.
- **Technical data**
  Technical product data for support in planning and implementing your project
- **Product announcements**
  The latest information and news concerning our products.
- **Forum**
  Harness the potential of our community.
- **FAQs**
  Answers to frequently asked questions
- **Application examples**
  Function blocks, background and system descriptions, performance statements, demonstration systems, and application examples, clearly explained and represented.

Link: Siemens SiePortal Support (https://support.industry.siemens.com/cs/ww/en/)

mySiePortal

The following functions are available in your personal work area "mySiePortal":

- **My conversations**
  Overview of your previous conversations.
- **Installed products**
  Your registered products are displayed here.
- **Service requests**
  Overview of your previous support requests.

- **Lists & notifications**
  Here you can view your search queries, favorites, notifications and lists of products.
- **Product data & documentation**
  Easy access to CAx data, e.g. 3D models, 2D dimension drawings, EPLAN macros, device circuit diagrams
- **My Quicklinks**
  Compile a list of frequently used links to access information more quickly.

Configurator

Various configurators are available on the Internet to assist you with configuration.

The configurator for 3RM1 motor starters and matching accessories is an easy-to-use selection and configuration tool. You can select the individual components and plan your system in accordance with your specific requirements. You can save your selection, export it as a text file or you can order it directly.

The configurator automatically compiles a document list of the information available in Service&Support for every component. You can use it as the basis for putting together your system documentation.

Link: Configurator (http://www.siemens.com/sirius/configurators)

1.8 DataMatrix code

A DataMatrix code is lasered onto the lower terminal cover of all devices of this series.

DataMatrix codes are standardized in ISO/IEC 16022. The DataMatrix codes on Siemens devices use ECC200 coding.

The following device information is encoded in the DataMatrix codes as a bit stream:

- Article number
- Serial number

This information is stored in the following format in the DataMatrix code:

1P	Article number	+	S	Serial number
Data identifier	Net content	Separator	Data identifier	Net content

Note

The information content is displayed without spaces.

This machine-readable information simplifies and accelerates handling of the respective devices.
As well as fast access to the serial numbers of the respective devices for unique identification, the DataMatrix codes simplify communication with Siemens Technical Support.

SIEMENS Industry Support App

DataMatrix codes primarily enable extremely fast and convenient access to all device-specific information relating to an article number in the SIEMENS Service&Support Portal (https://support.industry.siemens.com/cs/ww/en/), such as operating instructions, manuals, data sheets, FAQs, etc.
We provide the SIEMENS Industry Support app free for this purpose and it can be used on most commercially available smart phones and tablets.
The SIEMENS Industry Support app is available for iOS and Android-based devices and can be accessed via the following links:

Link for Android

Link for iOS

Link for Windows phone

1.9 Quick navigation

Note

Reading the manual

The quick navigation is provided to help you find important topics quickly. It is not a substitute for reading the manual.

Always read the entire manual.

Configuring

- Functions (Page 36)
- Technical data (Page 153)
- Derating (temperature, installation altitude, installation) Rated operational current (Page 65)
- Applications Operation with the EMERGENCY-STOP function (Page 94)
- Circuit diagrams (Page 167)
- Product-specific safety information (Page 21)
- Overload trip:
  - Thermal calculation method (motor memory module) (Page 44)
  - Setting the RESET method (Page 137)
- Terminal designations Terminals (Page 62)
- Also note the following: Switching times Switching the 3RM1 motor starter under normal operating conditions (Page 36), idle timesTechnical data (Page 153), minimum current Rated operational current (Page 65) and Minimum load current (Page 77)

Commissioning:

- Diagnosis Alarms, faults and system events (Page 142)
- Fault rectification (Page 144)
- Terminal designation Terminals (Page 62)
- Connection system Device versions (Page 33)
- Removable terminals Terminals (Page 62)
- Setting the rated operational current (Page 136)

Service:

- Diagnosis Alarms, faults and system events (Page 142)
- Setting the rated operational current (Page 136)
- Removable terminals Terminals (Page 62)
- Terminal designation Terminals (Page 62)

FAQ (https://support.industry.siemens.com/cs/ww/en/view/81525494)

1.10 Change documentation

Version	Changes
06/2026	• Standards documentation adapted • Section "Safe tripping up to SIL 1 or PL c" added

Product-specific safety information

2

2.1 General safety notes



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

⚠ WARNING

Hazardous voltage.
Can cause death, serious injury, or damage to property.

Hazardous electrical voltage can cause electric shock, burns and damage to property.

- Turn off and lock out all power supplying the system and device before working on the device.
- To ensure protection against the hazard of electric shock when the terminal cover is open, screw in all terminal screws that are not needed to clamp conductors.
- Close the terminal covers and always keep them closed during operation.

NOTICE

Damage caused by electrostatic charge

When handling and installing the 3RM1 motor starters, ensure that the components are protected from electrostatic charge. Changes to the system configuration and wiring are only permissible in the voltage-free state.
Connection of 3RM11 / 3RM13 Failsafe motor starters is only permissible when the power supply units (PELV and SELV) are switched off.

2.2 Safety information for hazardous areas

⚠ WARNING

Explosion hazard in Class I and Class II Hazardous Locations.
Can cause death or serious injury.

The components of the 3RM1 motor starters are not suitable for installation in Class I and Class II Hazardous Locations.

The device must be installed in a control cabinet with minimum degree of protection of IP 4x.

Please contact your ATEX specialist.

You will find further information in Chapter "ATEX-certified motor overload protection in the case of 3RM11/3RM13 Failsafe (Page 45)."

Note

For safety-oriented applications, please note the safety-relevant technical specifications in the Data Sheet (Page 153).

2.3 Safety instructions for safety-related applications



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

⚠ WARNING

Loss of the safety function

In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

Annual function test

- Actuate the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Activate the safety relay via the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Defective devices must be replaced.

⚠ WARNING

Loss of the safety function in the event of a fault in the case of 3RM11 / 3RM13 Failsafe motor starters with 110 to 230 V AC/110 V DC control supply voltage.
Can cause death or serious injury.

The control signal for the control inputs in the case of 3RM11/3RM13 Failsafe motor starters with 110 to 230 V AC control supply voltage must come from A1. Otherwise, the safety function is bypassed in the event of a fault. Thus, only relay outputs are admissible when using a PLC.

Do not use a separate control voltage. Only use the relay outputs when using a PLC.

⚠ WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When the product is operated with a 3SK safety relay and a device connector, the supply voltage for 3RM1 motor starters is fed in via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM1 motor starters, in order to prevent bypassing of the safety function.

⚠ WARNING

Loss of the safety function during hybrid operation of Failsafe and Standard motor starters.
Can cause death or serious injury.

Hybrid operation of 3RM10/3RM12 Standard motor starters with 3RM11/3RM13 Failsafe motor starters in safety-related applications is not admissible.

Only ever use safety-related motor starters (3RM11 Failsafe and 3RM13 Failsafe) in safety-related applications.

⚠ WARNING

Loss of the safety function when the neutral conductor is connected to a load.
Can cause death or serious injury.

When using the 3RM11 Failsafe and 3RM13 Failsafe motor starters, note that no neutral conductor may be connected if the load circuit contains 3-phase loads, e.g. a 230 V brake or resistive loads.

NOTICE

Electromagnetic interference

The following must be grounded in accordance with regulations to ensure noise immunity of the 3RM11 / 3RM13 Failsafe motor starters:

- PELV / SELV power supply units (please also note the documentation for the respective power supply unit in this regard).

Note

SILCL 3 to EN 62061:2005, PL e/Cat. 4 to EN ISO 13849-1:2008

The 3RM11 Failsafe and 3RM13 Failsafe safety-related motor starters are designed in such a way as to allow implementation of safety-related applications up to SILCL 3 in accordance with EN 62061 and PL e/Cat. 4 in accordance with EN ISO 13849-1.

Note

For safety-oriented applications, please note the safety-relevant technical specifications in the Data Sheet (Page 153).

2.4 Intended use

⚠ WARNING

Improper use of hardware products.
Serious damage to property, can cause death or serious injury.

This equipment is only allowed to be used for the applications described in the catalog and in the technical description, and only in conjunction with non-Siemens equipment and components recommended by Siemens.

Correct transport, storage, installation and assembly, as well as careful operation and maintenance, are required to ensure that the product operates safely and without faults.

EU note: Commissioning is absolutely prohibited until it has been ensured that the machine in which the component described here is to be installed complies with the stipulations of the Directive 2006/42/EC.

2.5 Current information about operational safety

Important note for maintaining operational safety of your system

Please take note of our latest information.

Systems with safety-related characteristics are subject to special operational safety requirements on the part of the operator. The supplier is also obliged to comply with special product monitoring measures. For this reason, we publish a special newsletter containing information on product developments and features that are (or could be) relevant to operation of safety-related systems. By subscribing to the appropriate newsletter, you will ensure that you are always up-to-date and able to make changes to your system, when necessary:

Siemens newsletter (www.siemens.com/safety-integrated)

Sign on to the following newsletter under "Products & Solutions":

- Control Components and System Engineering News
- Safety Integrated Newsletter

2.6 Declaration of conformity

The manufacturer declares that the safety components of the 3RM1 motor starter series in the designs marketed by us comply with the applicable basic health and safety requirements of the EC Directives* stated (including amendments), and that the stated standards* were applied in their design and construction.

* You can download the complete EC Declaration of Conformity from the Internet (http://www.siemens.com/sirius/approvals) as a PDF.

2.7 Recycling and disposal

For environmentally-friendly recycling and disposal of your old device, contact a company certified for the disposal of used electrical and electronic equipment, and dispose of the device as specified in the regulations for your particular country.

Description

3

3.1 Overview

The 3RM1 motor starter is a compact device with a width of 22.5 mm. The 3RM1 motor starter comprises combinations of relay contacts, power semiconductors, and an electronic overload relay for functional switching of three-phase motors up to 3 kW (at 400 V) and single-phase motors up to 7 A, as well as resistive loads up to 10 A (at alternating voltages up to 500 V).



3.2 Applications

In principle, 3RM1 motor starters can be used wherever combinations of contactors and overload relays were previously used.

Thanks to the additional functionality of safety-oriented shutdown, the 3RM11 Failsafe and 3RM13 Failsafe motor starter variants are ideally suited to safety-oriented applications up to SILCL 3 in accordance with EN 62061 and PL e/Cat. 4 in accordance with EN ISO 13849-1.

Short-circuit protection in a load feeder designed in this way must be implemented by appropriate upstream short-circuit protection devices. These can be, for example, circuit breakers or appropriate fuses.

You achieve maximum space-savings benefits by means of a group configuration of the 3RM1 motor starters. This enables several 3RM1 motor starters to be protected by one short-circuit protection device.

The 3RM1 motor starters are used in the following areas, for example:

- Conveyor technology
- Logistics systems
- Production machines
- Machine tools
- Small elevators

3.3 Hybrid technology

The 3RM1 motor starter combines the benefits of semiconductor technology and relay technology.

This combination is known as hybrid technology. The hybrid technology in the 3RM1 motor starter is characterized by the following features:

Switching on

The inrush current in the case of motorized loads is conducted briefly via the semiconductors.

Advantage: The relay contacts are protected. Longer service life is achieved thanks to reduced wear and tear.

Current conducting

The continuous current is conducted via relay contacts.

Advantage: Relay contacts cause less thermal losses than semiconductors.

Switching off

Switch-off is implemented again via the semiconductor.

Advantage: The contacts are only slightly burdened by arcs. This results in increased service life.

Circuit diagram

The semiconductors switch the motor on and off in two phases. In the switched-off state, all three phases are opened by a relay contact.

To achieve the highest safety level SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1 in the case of 3RM11 / 3RM13 fail-safe motor starters, further relay contacts are installed in series with the semiconductors.

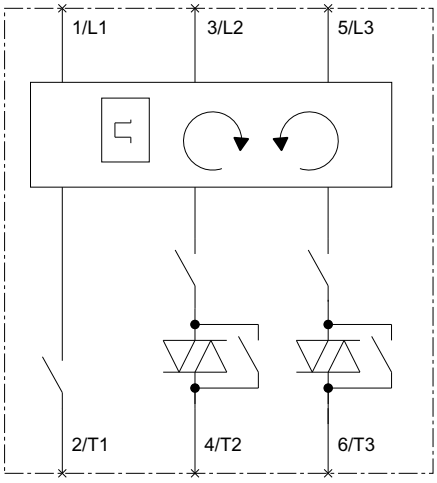


Figure 3-1 Circuit diagram

Note

EMC - Protective circuit

No EMC protective wiring (e.g. RC element or varistor interference suppression module) is necessary for the 3RM1 motor starter. Under normal operating conditions, the motor is always switched off in current zero due to the specific properties of the hybrid switching technology. As result, no critical states in terms of EMC arise in the surrounding environment.

Note

Electromechanical switchgear in series with hybrid motor starters

Switching an inductive load - in particular of motors < 1 kW with high inductance - with an electromechanical switching device (e.g. contactor) can cause high and steep voltage edges. The resulting faults/damage can be prevented by first disconnecting with the hybrid motor starter or by using EMC suppression modules:

- EMC interference suppression modules 3RT2916-1P.. for direct mounting on the contactor
- Motor suppression modules that are fitted in the main circuit

You can find additional information in the FAQ (https://support.industry.siemens.com/cs/ww/en/view/109758696)

3.4 Device versions

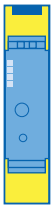
The 3RM1 motor starters are characterized by their compact design and narrow width.

They can be used for easy assembly of fuseless load feeders with SIRIUS motor starter protectors. Alternatively, combinations with fuses or other short-circuit protection devices are possible.

This allows implementation of load feeders with coordination type 1 for short-circuit currents of up to 55 kA at 400 V.

The 3RM1 motor starters are available in four different versions:

Table 3-1 Motor starter version

Feature	3RM10	3RM11	3RM12	3RM13
Product symbol				
Direct starter	✓	✓	-	-
Reversing starter	-	-	✓	✓
Overload protection with wide setting range	✓	✓	✓	✓
ATEX certification overload protection	-	✓	-	✓
Safety-oriented tripping up to SILCL 3 to EN 62061, PL e/Cat. 4 to EN ISO 13849-1	-	✓	-	✓

Connection systems

The 3RM1 motor starters are optionally available with screw connections or push-in connections.

Push-in connections are a form of spring-loaded terminals allowing fast wiring without tools for rigid conductors or conductors equipped with end sleeves. For wiring finely-stranded or stranded conductors without end sleeves on push-in connections, a screwdriver (with 3.0 x 0.5 mm blade) is required. A screwdriver (with 3.0 x 0.5 mm blade) is also required to disconnect a conductor.

The advantages of the push-in terminals are found, as with all spring-loaded terminals, in speed of assembly and disassembly and vibration-proof connection. There is no need for the checking and tightening required with screw connections.

Current ranges

The 3RM1 motor starters are designed for the following rated operational currents of the loads:

Table 3-2 Current ranges

Versions	Adjustable response value current [A]	Maximum permissible motor power of a three-phase motor at 400 V AC [kW]
3RM1.01-.....	0.1 ... 0.5	0.12
3RM1.02-.....	0.4 ... 2	0.75
3RM1.07-.....*	1.6 ... 7	3

* The versions of the 3RM1.07-..... motor starter are also suitable for operating resistive loads (e.g. heaters) up to a rated operational current of I_{AC51} = 10 A.

Control supply voltages

The 3RM1 motor starters are designed for the following control supply voltages:

Table 3-3 Control supply voltages

Versions	Control supply voltage
3RM1...-.AA0.	24 V DC
3RM1...-.AA1.	110 ... 230 V AC 50/60 Hz; 110 V DC

Note the following information for the different device versions:

Note

Ensure that the level of control voltage falls within the limits prescribed in the data sheet. Malfunctions may occur with lower voltages. The motor starter can sustain damage as a result of excessive voltages.

Note

Motor starters with 24 V DC control supply voltage

A buffer capacitor standard for electronic motor starters is installed in the control circuit of 3RM1 Standard and Failsafe motor starters for 24 V DC. This is used to ensure the controlled shutdown of the motor with the semiconductors in the event of a failure or disconnection of the control supply voltage. As a result, charging currents can arise briefly upon activation of the control supply voltage. The buffering capacitance is decoupled by a diode. This means that there is no influence on the dark test of fail-safe digital outputs.

You can find more information on the Internet (https://support.industry.siemens.com/cs/ww/en/view/91372998).

Note

3RM10/3RM12 Standard motor starters with 24 V DC control supply voltage

The same voltage source (potential) must be used for the control supply voltage and the control inputs.

The reference point for the control inputs is terminal A2.

Note

3RM10/3RM12 Standard motor starters with 110 to 230 V AC/110 V DC control supply voltage

The same voltage source (potential) must be used for the control supply voltage and the control inputs.

The reference point for the control inputs is terminal A2.

When controlling with a PLC, control must be via relay outputs.

There must be no parallel load (e.g. a lamp) connected at the control inputs in the case of motor starters with the product version E01.

Note

3RM11/3RM13 Failsafe motor starters with 24 V DC control supply voltage

The control inputs are electrically isolated from the control supply voltage (A1, A2).

The terminals M1 and M2 are the reference point for the control inputs.

For controlling the control inputs, e.g. via the digital outputs of a PLC, a voltage from an SELV/PELV Class 2 supply is required.

Note

3RM11/3RM13 Failsafe motor starters with 110 to 230 V AC/110 V DC control supply voltage

The same voltage source (potential) must be used for the control supply voltage and the control inputs in safety-related applications.

The reference point for the control inputs is terminal A2.

When controlling with a PLC, control must be via relay outputs.

3.5 Functions

3.5.1 Switching the 3RM1 motor starter under normal operating conditions

Maximum cycle and switching frequencies

The conditions set out in Table 3-4 apply.

The idle time indicates the shortest time between the end of current flow following shutdown and the beginning of current flow upon restart, thus taking the switch-on and switch-off delay into account. See also Interlocking of the control inputs (Page 40).

Table 3-4 Idle time of 3RM1 motor starters

Version	Article number	Idle time typical
Standard	3RM10..-....; 3RM12..-....	• 500 ms (E01) • 100 ms (from E02)*
Fail-safe	3RM11..-....; 3RM13..-....	• 500 ms (E01) • 200 ms (from E02)* • 150 ms (from E04)*

* An idle time of > 500 ms must be ensured on the application side (e.g. via the controller (PLC)) for operating voltages > 440 V.

No distinction is made between direct-on-line and reversing starters in terms of idle time.

Table 3-5 ON and OFF delay for the 3RM1 motor starters

Article number	ON delay	OFF delay
3RM10..-.AA04; 3RM12..-.AA04	60 ... 90 ms (E01-E03) 25 ... 32 ms (from E04)	60 ... 90 ms (E01-E03) 30 ... 43 ms (from E04)
3RM10..-.AA14; 3RM12..-.AA14	60 ... 90 ms (E01-E03) 25 ... 45 ms (from E04)	60 ... 90 ms (E01-E03) 55 ... 75 ms (from E04)
3RM11..-.AA04; 3RM13..-.AA04	90 ... 120 ms (E01-E03) 65 ... 76 ms* (from E04)	40 ... 55 ms (E01-E03) 30 ... 43 ms** (from E04)
3RM11..-.AA14; 3RM13..-.AA14	90 ... 120 ms (E01-E03) 65 ... 85 ms* (from E02)	40 ... 55 ms (E01-E03) 55 ... 75 ms** (from E02)

* ON delay upon restart following idle times < 350 ms:85 ... 96 ms

** OFF delay time for safety-related request when

switching off via control inputs, maximum: 43 ms

Switching off via supply voltage, maximum: 120 ms

Starting currents generate high loss lines compared to the respective operating current. Therefore, a cooling time is required. (The semiconductor cools down not only when the motor is off, but also in bypass mode.)

The overload is the ratio [%] of the starting current to the specified rated operating current.

The overload is dependent on the parameterized I_e, e.g. a 2A motor starter operated with I_e 1 A and 8 times the starting current corresponds to 400 %.

Table 3-6 Starting currents

	7 A device		2 A device		0.5 A device	
Overload (%)	**I_rms (A)**	**I_pk (A)**	**I_rms (A)**	**I_pk (A)**	**I_rms (A)**	**I_pk (A)**
400	28	39.5	8	11.3	2	2.8
500	35	49.4	10	14.1	2.5	3.5
600	42	59.2	12	16.9	3	4.2
700	49	69	14	19.74	3.5	4.9
800 max.	**56**	**79**	**16**	**22.6**	**4**	**5.6**

I_rms = RMS value

I_pk = peak value

Two scenarios are considered for operation:

Scenario (1):

The device continuously switches a motor etc. on and off over a longer period of time. Then the following conditions apply:

Table 3-7 Maximum cycle times

	7 A device		2 A device		0.5 A device	
Starting current [%, based on operating current] for 100 ms	Max. cycle time [s]	Max. switching cycles per h	Max. cycle time [s]	Max. switching cycles per h	Max. cycle time [s]	Max. switching cycles per h
100	1	3600	1	3600	1	3600
200	1.8	2000	1	3600	1	3600
300	2.6	1385	1	3600	1	3600
400	3.6	1000	1.6	2250	1	3600
500	4.8	750	2	1800	1	3600
600	7.2	500	2.4	1500	1	3600
700	9.5	368	3	1200	1	3600
800	10	360	3.6	1000	1	3600

For example:

Permissible starting current for 7 A device -> max. 56 A_{rms} / 79 A_{pk} (sine, 50 Hz / 60 Hz) for 100 ms, then 10 min. cooling time.

The cycle time may be reduced depending on the starting current at switch-on in accordance with Table 3-7. The table serves as a guide, as this startup behavior is load/motor dependent during operation of the respective application. The user must ensure compliance with the maximum cycle times.

Scenario (2):

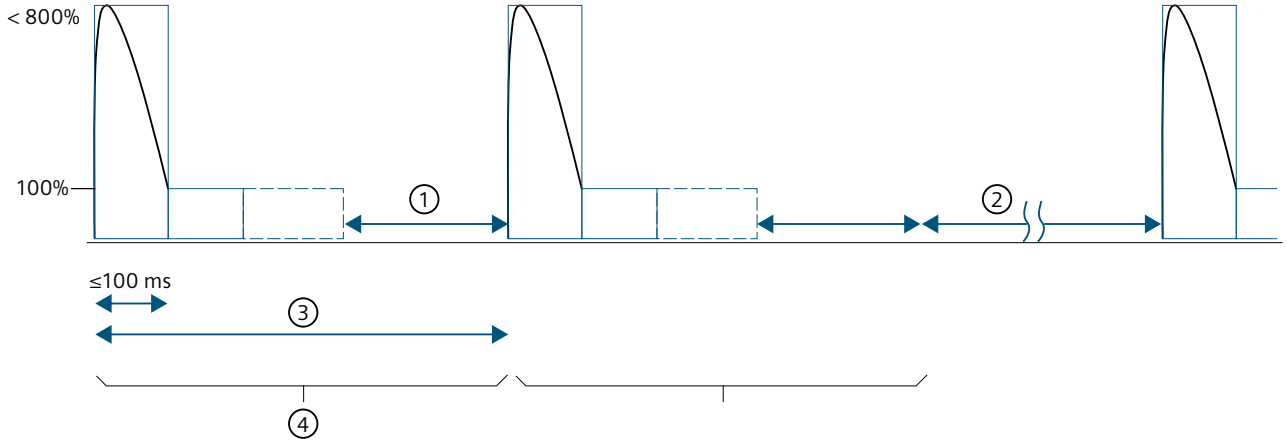
Occurs when the maximum switching frequency (1/s) is necessary (e.g. jogging). At higher starting currents, the number of consecutive switching cycles must be reduced or a cooling time must be observed. The cooling time must be ensured by the user.

From 15A (>20 A_{pk}), a cooling time must be observed or the number of switching cycles must be limited.

Permissible starting current for 7 A device -> max. 56 A_{rms} / 79 A_{pk} (sine, 50 Hz / 60 Hz) for 100 ms, for 10 high-speed switching cycles (1/s), then 15 min. cooling time.

Current curve for Scenario (2)

The highest overcurrents during engine start-up usually occur for shorter periods than 100 ms, so the tables can only be indicative.



① Idle time according to table 3-4
② Cooling time 15 min
③ Max. switching frequency: 1/1 s
④ Max. 10 switch-on cycles

Figure 3-2 Current curve for Scenario (2)

Note

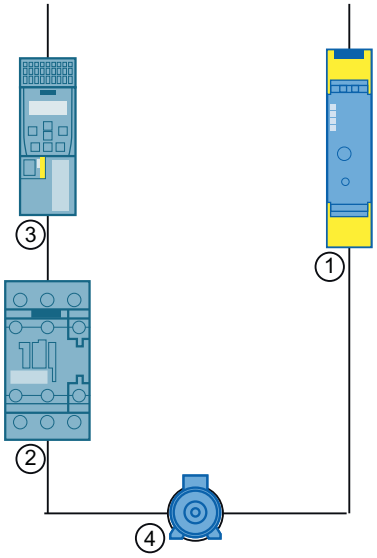
Minimum loads must be observed for the 3RM1 motor starters.

You will find additional information in the chapter "Minimum load current (Page 77)".

NOTICE
Damage to property due to high making currents
When using capacitive loads, the switching components in the 3RM1 motor starter can be damaged by excessively high making currents.
Do not operate capacitive loads such as frequency converters on the 3RM1 motor starter. Operation of single-phase capacitor motors is admissible.

NOTICE
Damage during operation on non-sinusoidal voltages When operating frequency converters, the switching components in the 3RM1 motor starter can be damaged by non-sinusoidal voltages. Do not operate the 3RM1 motor starter on outputs of frequency converters.

NOTICE
Damage to property If you are operating a 3RM1 motor starter in parallel to a frequency converter on the same motor, install an isolating contactor. If the frequency converter has an output filter, the isolating contactor must be installed downstream of this filter.



① SIRIUS 3RM13 Failsafe motor starter
② SIRIUS 3RT2 contactor
③ Frequency converter, e.g. SINAMICS G120 frame size A with BOB-2, 2nd Generation
④ Motor

Figure 3-3 3RM13 as an alternative control to a frequency converter

3.5.1.1 Direct-on-line starter

Using the 3RM1 motor starter as a direct-on-line starter

All 3RM1 motor starters can be used as direct-on-line starters.

To switch the 3RM1 motor starter on, apply the control voltage at input IN1.

After the motor is switched off, the motor starter accepts a new start after a pause time (Page 36).

You can also use the versions of the 3RM1 motor starter with a rated operational current up to 7 A for switching resistive loads up to I_{AC51} = 10 A under normal operating conditions.

3.5.1.2 Reversing starter

Using the 3RM1 motor starter as a reversing starter

The 3RM12 and 3RM13 motor starters can be used as reversing starters.

The reversing starter starts the motor when the control voltage is applied at input IN1 in direction of rotation 1 (no phase swapping), when controlling input IN2 in direction of rotation 2 (phase change from L1 and L3).

Interlocking of the control inputs

After the motor is switched off, the motor starter accepts a new start after a pause time (Page 36).

Note

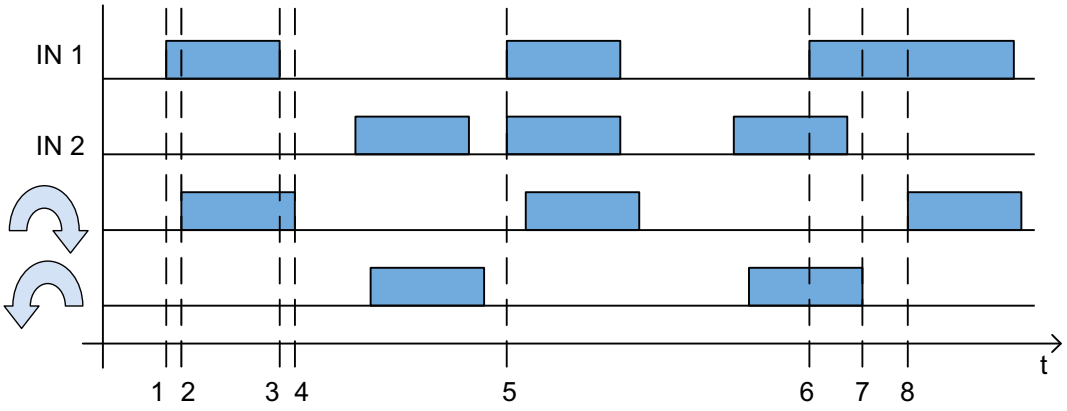
Exception for safety-oriented 3RM11 and 3RM13 motor starters with E02

For the 3RM11 and 3RM13 motor starters with product version E02, the delay of a new starting command must be implemented on the controller side.

If you apply control inputs IN1 and IN2 simultaneously, control input IN1 has priority. The motor starts up in this direction of rotation.

When the motor is running, activation of the second input has no effect.

The figure below shows an example of the effects of the signals at the control inputs on the direction of rotation of the motor:



1	Controller 1 active
2	Motor ON
1-2	Switch-on delay
3	Control input 1 inactive
4	Motor OFF
3-4	Switch-off delay
5	With simultaneous activation of the control inputs, the motor is started in the clockwise direction.
6	Additional activation of the second control input has no influence.
7-8	After motor OFF, the motor starter accepts a new start (motor ON) after a pause time (Page 36). For the 3RM11 and 3RM13 motor starters with product version E02, the delay of a new starting command must be implemented on the controller side.

Note

Please observe the information about the control supply voltage and the control inputs in the chapter "Device versions (Page 33)".

3.5.2 Protective functions

3.5.2.1 Overload protection

The 3RM1 motor starter protects three-phase motors against overload. If the current exceeds the set value, the 3RM1 motor starter switches off within the specified tripping time and signals the fault via the LEDs and the fault signaling output. You will find the tripping characteristic in the chapter "Overload protection/device protection characteristic (Page 154)".

Note

ATEX-certified motor overload protection in the case of 3RM11/3RM13 Failsafe

Overload protection of safety-related 3RM11 Failsafe and 3RM13 Failsafe motor starters is ATEX-certified up to SILCL 2; see Chapter "ATEX-certified motor overload protection in the case of 3RM11/3RM13 Failsafe (Page 45)."

Note

To ensure motor protection, connect only one motor to a motor starter.

3.5.2.2 Equipment protection

In addition to the motor protection function, the 3RM1 motor starters also protect themselves against overload. This means that in the case of 3RM1 motor starters with a rated operational current of 7 A, an overload trip may occur in the upper current range before the motor protection trips.

If, for example, 8-fold current flows in the case of an unloaded motor memory module and a set current of 7 A, tripping takes place after approximately one second.

You will find the tripping characteristic in the chapter "Overload protection/device protection characteristic (Page 154)".

3.5.2.3 Phase failure protection

The 3RM1 motor starter is provided with phase failure protection to prevent excessive temperature rise in the load in double phasing if phase failure occurs.

Depending on whether the phase failure already occurs before the ON command or during the ON state, the devices respond as described in the table and signal a phase failure.

	Standard motor starters 3RM10/3RM12	**Failsafe motor starters 3RM11/3RM13**
Phase failure before the ON command	The motor starter switches off after 5 s.	The motor starter does not switch on.
Phase failure during the ON state	The motor starter switches off after 5 s.	The motor starter switches off after 5 s.

The fault state is indicated by LEDs and the fault signaling output.

Note

In jog mode with switching times shorter than 5 s, additional protection is recommended by way of a thermistor.

NOTICE

Damage due to asymmetrical current consumption by built-in brakes

When connecting and operating motors with built-in brakes, the energy for releasing the brakes is taken from the motor connection cables. This can result in substantial asymmetry in power consumption.

The following applies to 3RM1 Standard and Failsafe motor starters:

- If the current for the braking device is taken from two phases, connect the motor cables that are additionally loaded with braking current to terminals T1 and T3. Observe the additional braking current when setting the motor current.
- Alternatively, the braking device can be fed externally.

An additional braking device can only be installed for Standard 3RM1 motor starters:

- A braking device connected between the phase and N-conductor is only permitted for Standard motor starters.
- If the current for the braking device is taken from just one phase and the N-conductor, connect the motor cable that is loaded with the braking current to terminal T2 of the motor starter.
- Do **not** use 3RM11 Failsafe or 3RM13 Failsafe motor starters for braking devices of this kind.

NOTICE

Damage from incorrect connection

Incorrect connection of the motor can result in damage.

Connect the motor as specified in the typical circuit diagrams.

You can find circuit diagrams for operating motors with brakes in the chapter "Typical circuits (Page 177)".

3.5.2.4 Asymmetry monitoring

Asymmetry detection will only work if all three phases are directly dependent upon one another, i.e. when no external current flow is possible.

Asymmetry is detected as soon as one of the three phases deviates by more than 40 % from the mean value of all phases. As soon as this happens, the 2-pole trip curve CLASS 10 A is applied (see Chapter "Overload protection/device protection characteristic (Page 154)"). This means: The function trips as soon as a minimum value of 85.5 % of the set rated current is reached. If the current is below 85.5 % of the set rated current in all three phases, the function will not trip. For values above 85.5 % of the set current, the higher the current, the faster the function will trip.

For exact values, see the curve in Chapter "Overload protection/device protection characteristic (Page 154)." Some values are provided as examples from this curve in the table.

Table 3-8 Tripping times for tripping due to detected asymmetry

Maximum current in one of the 3 phases with reference to the set rated current [%]	Tripping time [s]
86	132
90	77
100	50
120	32

The asymmetry detection is not active for setting value 10 A for resistive loads; in this case the overload trip occurs according to the table Table 9-1 Tripping for resistive loads at a setting value of 10 A (Page 156)

3.5.2.5 Thermal calculation method (motor memory module)

Principle of operation

The electronics continuously calculate a model of the thermal load on the motor dependent on the operating time and the current load. The motor memory module charges when the motor is switched on. The motor memory module discharges after the motor is switched off.

Following an overload tripping operation, the motor memory module is fully discharged after approximately three minutes. You must wait for this cooling time to elapse before you can acknowledge the fault. If the control supply voltage fails, the 3RM1 motor starter stores the remaining cooling time. When the control supply voltage is restored, the remaining cooling time elapses before the motor can be switched on again.

If you initiate a restart within a very short time after switching off the motor, it may be that the motor memory module has not yet fully discharged. This can result in an extremely fast overload trip after the restart. During continuous operation ("Warm" motor memory module), tripping times are reduced depending on the prior load.

If voltage is present at terminals A1/A2 and at control inputs IN1/IN2 after resetting the overload trip, the 3RM1 motor starter restarts.

The rated current of 10 A must not be set for motorized loads but only for resistive loads. In this setting, the tripping characteristics deviate from Class 10A; see Chapter "Overload protection/device protection characteristic (Page 154)".

You can find information about typical switching frequencies in the Technical Data Sheet in Chapter "Technical specifications (Page 153)" .

⚠ WARNING

Automatic restart following Reset.
Can cause death or serious injury.

If the DEVICE LED shows a yellow light and the FAILURE LED a red light, and a manual RESET or auto RESET takes place following an overload trip, the machine starts up immediately if there is a control command at IN1/IN2. Personnel in the danger area can be injured.

Make sure that the danger area of the machine is kept clear of people.

Reset in manual operation

If the RESET method is set to manual RESET, acknowledge an overload trip as follows:

1. Wait for the cooling time to elapse.
2. Press the "TEST/RESET/RESET MODE" button to acknowledge.
   As an alternative, in the case of the 3RM10/3RM12 Standard motor starters, you can use the RESET control input IN3 for acknowledgment.

Note

If you briefly switch the control supply voltage off and on again, there is no automatic acknowledgment.

3.5.2.6 ATEX-certified motor overload protection in the case of 3RM11/3RM13 Failsafe

Standards

Increased danger in hazardous areas means it is necessary to carefully observe the following standards:

- **EN 60079-14 / VDE 0165-1** Electrical apparatus for explosive gas atmospheres.
- **EN 60079-17** Inspection and maintenance of electrical installations in hazardous areas.
- **EN 50495** Safety devices required for the safe functioning of equipment with respect to explosion risks.

Certification of 3RM11/3RM13 Failsafe motor starters

The 3RM11 Failsafe and 3RM13 Failsafe motor starters are approved under Device Group II, Category (2) in the area "GD" (areas in which potentially explosive gas, steam, mist, air mixtures and combustible dust are present):

BVS 12 ATEX F 002 X
II (2)G [Ex eb Gb] [Ex db Gb] [Ex pxb Gb]*)
II (2)D [Ex tb Db] [Ex pxb Db]
I (M2) [Ex db Mb]

*) For the px applications, pressure and flow rate monitoring are additionally required for the pressurized enclosure systems.

WARNING

Improper handling.
Can cause death, serious injury, or damage to property.

All work involved in connecting, commissioning and maintenance must be carried out by qualified personnel.

Note

For installation altitudes > 1 000 m, the configuration notes in Chapter Derating at high installation altitudes (> 1 000 m) (Page 66) must be considered.

If the restrictions and conditions stated in Chapter Derating at high installation altitudes (> 1 000 m) (Page 66)are met, the 3RM1 motor starter can also be used at installation altitudes up to 4 000 m above sea level.

Failure to implement the measures stated will result in loss of the certified motor overload protection according to ATEX.

Control cabinet degree of protection in hazardous areas

DANGER

Explosion hazard in Class I and Class II Hazardous Locations.
Can cause death or serious injury.

The components of the 3RM1 motor starters are not suitable for installation in Class I and Class II Hazardous Locations.

The device must be installed in a control cabinet with minimum degree of protection of IP 4x.

Please contact your ATEX specialist.

In addition to the motor protection function, the 3RM1 motor starters also protect themselves against overload. This means that in the case of 3RM1 motor starters with a rated operational current of 7 A, an overload trip may occur in the upper current range before the motor protection trips.

If, for example, 8-fold current flows in the case of an unloaded motor memory module and a set current of 7 A, tripping takes place after approximately one second.

You will find the tripping characteristic in the chapter "Overload protection/device protection characteristic (Page 154)".

Setting the rated motor operational current

Set the 3RM1 motor starter to the rated motor operational current (according to the nameplate or prototype test certificate of the motor).

On this topic, refer to the Chapter "Setting the rated operational current (Page 136)".

Note

The set rated operational current of the motor must be controlled. with the function test (see Chapter Carrying out the function test (Page 52)).

Note

Observe the trip class or the tripping characteristic of the 3RM1 motor starter in Chapter "Overload protection/device protection characteristic (Page 154)". The motor and cables must be designed for the selected trip class.

RESET settings

Note

Restriction in the hazardous area

In applications for the protection of motors in hazardous areas, a 3RM11/3RM13 Failsafe motor starter may only be operated with the "Manual RESET" setting. The "RESET Mode" LED must be off.

Short-circuit protection

Short-circuit protection must be handled by separately arranged overcurrent protection devices.

On this topic, refer to the Chapter "Load feeders - protection against short circuit (Page 78)".

Cable protection

Avoid impermissibly high cable surface temperatures by correctly dimensioning the cross sections. Select an adequate cable cross-section.

Cyclic test of the protection functions

The tests are run by means of the "TEST/RESET/RESET MODE" button and can take place when the motor is either on or off. The test consists of four function tests.

Carry out the tests during commissioning and cyclically every 36 months at the latest.

You will find out how to run the test in Chapter "Carrying out the function test (Page 52)".

Ambient conditions

See the chapter "Ambient conditions (Page 72)".

ATEX-specific safety data

The table below shows the safety-related data for the ATEX motor protection function for 3RM11/3RM13 motor starters:

Safety integrity level (SILCL)	2
Hardware fault tolerance (HFT)	0
Interval for testing the protective functions	3 years
Probability of failure on demand (PFD)	$5x10^{-4}$
Probability of a dangerous failure per hour (PFH)	$5x10^{-8}$ 1/h

Note

See the data sheet for other specifications. You will find the data sheet in Service&Support (https://support.industry.siemens.com/cs/ww/en/ps/16311/td).

Maintenance

These devices are maintenance-free.

Note

Repairs to the device may only be carried out by the manufacturer.

Warranty

NOTICE
To meet the conditions of the warranty, you must observe the safety and commissioning instructions.

Further information

You will find further information on the Internet at

- Internet (http://www.siemens.com/sirius)
- Information and Download Center (http://www.siemens.com/sirius/infomaterial)
- Product Support (http://www.siemens.com/sirius/support)
- Service and Support (http://www.siemens.com/sirius/technical-assistance)
- Certificates (http://www.siemens.com/sirius/approvals)

3.5.3 Shutdown on malfunction

Shutdown via integrated monitoring

The 3RM1 motor starter has integrated monitoring of the main circuit components. During operation, the 3RM1 motor starter detects when a switching element fails to switch, or when a phase has failed.

Monitoring before switching on in the case of 3RM11/3RM13 Failsafe motor starters

In the case of the 3RM11 Failsafe and 3RM13 Failsafe motor starters, monitoring prevents the load from switching on in the case of the following malfunctions:

- Damage to the power semiconductors
- Damage to the relay contacts
- Faults in the control electronics

Acknowledging

A malfunction is acknowledged by switching the control supply voltage back on and then pressing the "TEST/RESET/RESET MODE" pushbutton.

⚠ WARNING

Loss of the safety function.
Can cause death or serious injury.

Check the safety function after acknowledging a disruption in the case of 3RM11/3RM13 Failsafe motor starters.

Note

If a malfunction is repeatedly indicated, the 3RM1 motor starter is defective and must be replaced.

Safety-related shutdown in the case of 3RM11/3RM13 Failsafe motor starters

Safety-related shutdown is achieved for the 3RM11 Failsafe and 3RM13 Failsafe motor starters thanks to the special arrangement and checking of the switching elements. Safety-related shutdown takes place when the control supply voltage is deactivated or by switching off the control inputs. Malfunctions result in automatic shutdown. You will find further information in Chapter "Safety-related shutdown with 3RM11/3RM13 Failsafe motor starters (Page 50)."

Display concept

The following events indicate the "Malfunction" status:

- DEVICE LED flashes red
- FAILURE LED shows a red light
- Fault signaling output active

3.5.4 Safety-related shutdown with 3RM11/3RM13 Failsafe motor starters

General description

In the case of 3RM11 / 3RM13 Failsafe motor starters, safety-related shutdown is achieved by removal of the control voltage (A1 / A2). As an alternative in the case of units with a 24 V DC supply voltage, safety-related shutdown can be performed by canceling the ON command (IN1/ IN2).

SILCL 3 to EN 62061, PL e/Cat. 4 to EN ISO 13849-1 can be achieved with both shutdown methods. To achieve SILCL 3/PL e/Cat. 4 for the safety function, all components of the safety function (detecting/evaluating/reacting) must be designed accordingly.

In the case of 3RM11/3RM13 Failsafe motor starters, the OFF state is defined as the safe state. 3RM11/3RM13 Failsafe motor starters are self-monitoring in compliance with SILCL 3/PL e and therefore do not need to be monitored in the feedback circuit of the upstream evaluation unit/control.

⚠ WARNING

Loss of the safety function during hybrid operation of Failsafe and Standard motor starters.
Can cause death or serious injury.

Hybrid operation of 3RM10/3RM12 Standard motor starters with 3RM11/3RM13 Failsafe motor starters in safety-related applications is not admissible.

Only ever use safety-related motor starters (3RM11 Failsafe and 3RM13 Failsafe) in safety-related applications.

Note

Fault signaling output (95-96-98) behavior in the event of safety-related shutdown

The fault signaling output (95-96-98) resumes its original state in the event of safety-related shutdown via the control supply voltage. If the fault is still present after reconnection of the control supply voltage, the fault signaling unit becomes active again. If an overload was detected before shutdown, the remaining cooling time is saved and elapses after reconnection of the control supply voltage.

3.5.4.1 Safety-related shutdown via the control supply voltage

Direct link to the 3SK safety relay

To ensure safety-oriented shutdown via the control supply voltage, you can directly connect up to 5 motor starters to the 3SK safety relay via the device connector. In this case, the 24 V DC control supply voltage is supplied via the device connector. In a safety case, the 3RM11/3RM13 Failsafe motor starters will be shut down by removal of the control supply voltage by the 3SK safety relay. No additional wiring is required between the 3SK safety relay and the 3RM1 motor starter. Nothing may be connected to terminals A1 and A2 of the 3RM1 motor starters.

⚠ WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When operating with a 3SK safety relay and a device connector, the supply voltage for 3RM1 motor starters is established via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM1 motor starters, in order to prevent bypassing of the safety function.

Note

The device connector can only be used in combination with motor starters that have a 24 V DC supply voltage.

Wire connection to a safe output

Shutdown of the 3RM11 / 3RM13 Failsafe motor starter by removal of the control supply voltage can also be performed by wiring to a safe output of a fail-safe control / evaluation unit. This method can be used to shut down a single motor starter or a group of up to 5 motor starters safely. For safe group shutdown, the 3RM11 / 3RM13 Failsafe motor starters are connected to each other via the device connector. In this case, the control supply voltage is wired from the safe output to the first motor starter in the group.

If it can be ensured that the cables are installed short-circuit to power cable/cross-circuit proof, safety-oriented tripping of A1 (I+) via a fail-safe digital output of the control will suffice. If this cannot be ensured, or if a PM-switching output is used, both A1 (L+) and A2 (M) must be shut down via a fail-safe digital output. In both cases, safety-related

shutdown in compliance with SILCL 3 per EN 62061, PL e / Cat. 4 per EN ISO 13849-1 is achieved.

Note

Motor starters with 24 V DC control supply voltage

A buffer capacitor standard for electronic motor starters is installed in the control circuit of 3RM1 Standard and Failsafe motor starters. This is used to ensure the controlled shutdown of the motor with the semiconductors in the event of a failure or disconnection of the control supply voltage. As a result, charging currents can arise briefly upon activation of the control supply voltage. The buffering capacitance is decoupled by a diode. This means that there is no influence on the dark test of fail-safe digital outputs.

You can find more information on the Internet (https://support.industry.siemens.com/cs/ww/en/view/91372998).

Safety-oriented tripping via inputs IN1 and IN2

As an alternative in the case of 3RM11 / 3RM13 Failsafe motor starters with a 24 V DC supply voltage, safety-oriented shutdown via the IN1 and IN2 inputs is possible. The fail-safe digital output of the fail-safe control/evaluation unit performs operational switching.

Depending on peripherals used, shutdown is in one or two channels:

- PM (PPM)-switching: shutdown is in two channels.
- PP-switching: shutdown is in one channel.
  Single-channel switching achieves SILCL 3 per EN 62061, PL e/Cat. 4 per EN ISO 13849-1 if steps are taken to ensure that the cables are installed short-circuit to power cable/cross-circuit proof.

3.5.5 Carrying out the function test

You can start the different individual tests for the function test with the "TEST/RESET/RESET MODE" button.

Procedure

Depending on how long the "TEST/RESET/RESET MODE" button is pushed, a specific test is started:

Actuation time for starting the test	Explanation
< 2 s	**LED-Test** All four LEDs are activated.[1)]
2 s < t < 5 s	**Current measuring test** Current measuring is tested in all 3 phases.

Actuation time for starting the test	Explanation
5 s < t < 8 s [2]	**Visualization of the set Ie** The set rated motor current is displayed coded with the LEDs.
> 8 s	**Motor protection test disconnection** The entire control chain is tested, including the switching elements and the fault signaling output. If the device responds as standard, an overload trip takes place. This can be reset immediately without a cooling time by pressing the "TEST/RESET/RESET MODE" pushbutton again.

[1] Exception in the case of 3RM11/3RM13 Failsafe motor starters: in the case of 3RM11/3RM13 Failsafe motor starters, the LED test is only carried out in the OFF state (without load current). In the ON state (with load current), the LEDs stay unchanged.

[2] This test is only implemented in the fail-safe motor starters version E06 and higher.

Actuation time for starting the test	Status	OK	Fault
LED test			
< 2 s	"DEVICE" LED	Shows a yellow light[1]	Off
	"FAILURE" LED	Shows a red light[1]	Off
	"STATE" LED	Shows a green light[1]	Off
	"RESET MODE" button	Shows a green light[1]	Off
Current measuring test			
2 s < t < 5 s	"DEVICE" LED	• Without load current: Flickering red • With load current: Flashing red	Off
Visualization of the set Ie			
5 s < t < 8 s [2]	The set rated motor current is displayed coded with the LEDs (see table of LED codes for the set Ie).		
Motor protection trip test			
> 8 s	"DEVICE" LED	Shows a yellow light	Flashing red
	"FAILURE" LED	Shows a red light	Shows a red light
	Fault signaling output	Active	Not active
	Switching elements/ motor	Deactivated	Unchanged

[1] Exception in the case of 3RM11/3RM13 Failsafe motor starters: in the case of 3RM11/3RM13 Failsafe motor starters, the LED test is only carried out in the OFF state (without load current). In the ON state (with load current), the LEDs stay unchanged.

[2] This test is only implemented in the fail-safe motor starters version E06 and higher.

Note

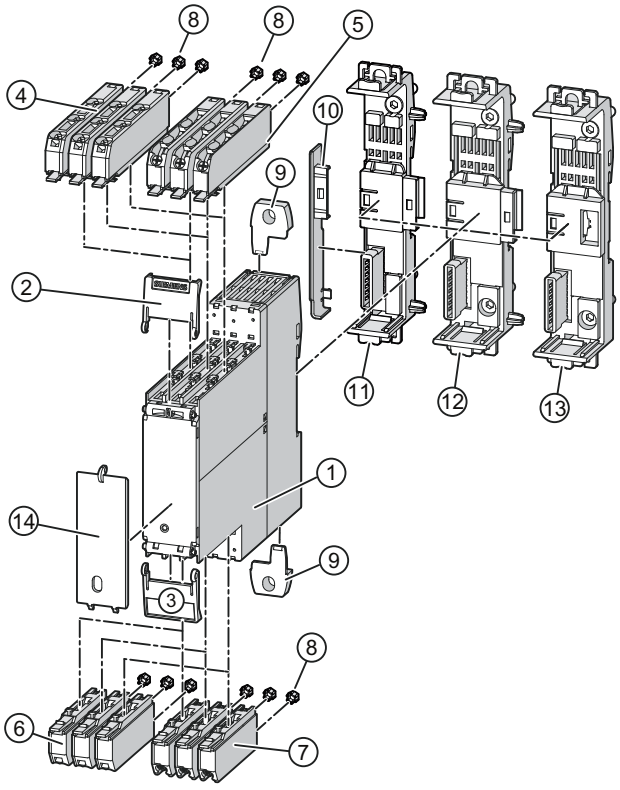
If the 3RM1 motor starter does not respond as in the table above during the function test, check the connections and the supply to the 3RM1 motor starter. If the fault persists even though the connections are correct, or the LED display pattern does not match the set Ie, the device must be replaced.

Table 3-9 LED codes of the set Ie

3RM1.01-.....	**3RM1.02-.....**	**3RM1.07-.....**	**LED display pattern**			
Setting	Setting	Setting	DEVICE	FAILURE	STATE	RESET mode
0.1	0.4	1.6				
0.11	0.45	1.7	Green			
0.12	0.5	1.8	Green	Red		
0.14	0.55	1.9		Red		
0.16	0.6	2		Red	Green	
0.18	0.7	2.2	Green	Red	Green	
0.2	0.8	2.4	Green		Green	
0.22	0.9	2.8			Green	
0.24	1	3.2			Green	Green
0.26	1.1	3.6	Green		Green	Green
0.28	1.2	4	Green	Red	Green	Green
0.32	1.3	4.6		Red	Green	Green
0.36	1.4	5.2		Red		Green
0.4	1.6	6.1	Green	Red		Green
0.44	1.6	7	Green			Green
0.5	2	10				Green

3.6 Accessories and article number scheme

3.6.1 Overview of all device components



① Basic unit/expansion unit, e.g. 3RM1 motor starter
② Top cover flap
③ Bottom cover flap
④ Terminals, 3-pole, push-in, 1 x 2.5 mm²
⑤ Terminals, 3-pole, screw-type, 1 x 2.5 mm²
⑥ Terminals, 3-pole, push-in, 1 x 4 mm²
⑦ Terminals, 3-pole, screw-type, 1 x 4 mm²
For connection, there is an infeed system (not shown in the overview diagram) for these terminals.
⑧ Coding pins
⑨ Push-in lugs for wall mounting
⑩ Cover
⑪ Device connector
⑫ Device connector
⑬ Device termination connector
⑭ Sealable cover

3.6.2 Accessories

The following accessories are offered for the 3RM1 motor starter:

- Infeed system (Page 56)
- Fuse module (Page 57)
- Sealable cover (Page 59)
- Wall mounting (Page 59)
- Device connectors (Page 60)
- Terminals (Page 62)
- Device identification label (Page 63)

3.6.2.1 Infeed system

The infeed system comprises 3-phase busbars, one infeed terminal, and one protective cap for covering unused connections. The infeed system is suitable for 3RM1 motor starters and the adapter for the fuse module, standard rail mounting version, with screw-type connection.

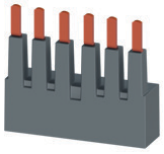
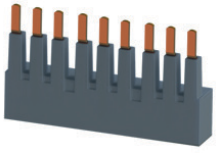
Time-saving wiring between 3RM1 motor starters with screw terminals to the supply connection is possible thanks to the infeed system with 3-phase busbars.

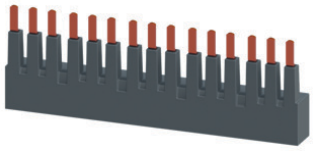
These busbars are available in three lengths, thus allowing 2, 3 or 5 motor starters (arranged side-by-side) to be connected at the same time. More than 5 devices can be connected by clamping the connection tags of an additional busbar rotated by 180° (e.g. 6 devices using one 5-pole busbar and one 2-pole busbar).

A single motor starter can be removed from the assembly without loosening the terminal screws of neighboring motor starters.

The maximum summation current must not exceed 25 A (UL: 16 A). Primary infeed is connected via a three-phase infeed terminal. The three-phase busbars are finger-safe but empty connection tags must be fitted with covers.

Table 3-10 Infeed system article numbers

	Description	Article number
	3-phase busbar for two 3RM1 motor starters	3RM1910-1AA
	3-phase busbar for three 3RM1 motor starters	3RM1910-1BA

	Description	Article number
	3-phase busbar for five 3RM1 motor starters	3RM1910-1DA
	3-phase infeed terminal	3RM1920-1AA
	Cover caps for terminal lugs of the 3-phase busbars	3RM1910-6AA

3.6.2.2 Fuse module

Function

A 3RM1 motor starter can be inserted in the fuse module. Various fuses can be fitted in the fuse module to provide short-circuit protection. The fuse module can only be combined with special 8US adapters. Power can be supplied from busbar systems when these adapters are installed, or by conventional wiring when a special adapter is used.

By using the fuse module, you can create an extremely compact load feeder.

Table 3-11 Article numbers of the 3RM193 fuse module and the adapters

	Description	Article number
	Fuse module with 20 A gG fuse 3NW6007-1[1)]	3RM1932-1AB
	Fuse module without fuse[2)]	3RM1930-1AA
	Busbar adapter for busbar system	8US1216-0AS00

	Description	Article number
	Busbar adapter for compact busbar system	8US1616-0AK02
	Adapter for standard mounting rails[3)]	8US1716-0RK00

1) The fuses used are suitable for use in IEC applications. For use in the UL environment, we recommend the fuse module without fuses and the use of appropriate UL-compliant fuses.

2) For use of alternative fuses.

3) Use of the 3RM19 3-phase infeed system possible.

Note

- You can use cylindrical 10 x 38 fuses, e.g. 3NW6... gG with maximum 25 A, or Class CC with maximum 25 A.
- The maximum load change stability is achieved with a fuse protection of 25 A. In this case, a cable cross-section of 4 mm^2 is required for line protection.
- You can only achieve equipment protection by installing fuse protection according to type of coordination 2. Please refer to chapter "Load feeders - protection against short circuit (Page 78)" for the relevant fuse specifications.

3.6.2.3 Sealable cover

The sealable cover prevents unauthorized access to the rotary coding switch.

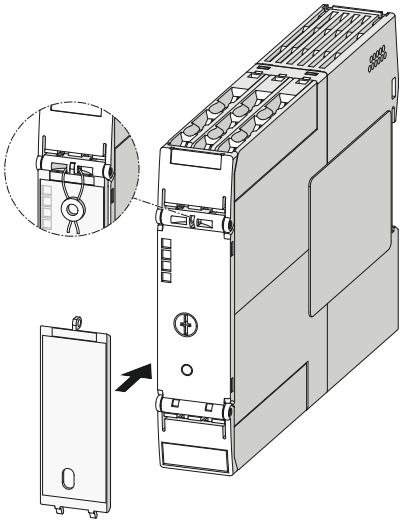


Table 3-12 Article number of the sealable cover

Description	Article number
SIRIUS sealable cover 22.5 mm, cutout for pushbuttons at bottom	3ZY1321-2AA00

3.6.2.4 Wall mounting

The push-in lugs for wall mounting of the 3RM1 motor starter are inserted at the top and bottom of the motor starter enclosure. This method is used to screw the motor starter onto level mounting surfaces.

The wall fixture is inserted into the enclosure at the top and bottom for screw-mounting the 3RM1 motor starter to level mounting surfaces.

Table 3-13 Article numbers of the push-in lugs for wall mounting

Description	Article number
SIRIUS push-in lugs for wall mounting	3ZY1311-0AA00

3.6.2.5 Device connectors

Function

The device connectors can be used to loop through a common control supply voltage of 24 V DC to reduce wiring complexity between the individual motor starters (3RM1...-.AA04). Moreover, Failsafe motor starters with a 24 V DC control supply voltage (3RM11...-.AA04 / 3RM13...-.AA04) can be interfaced to one 3SK safety relay as a group via device connectors. The control signals are connected via the device terminals on the motor starter.

The device connectors can either be snapped onto a standard mounting rail or can be screwed onto a flat mounting wall.

If the motor starters are not to be interconnected side by side, device connectors for looping through signals must be used for the gaps, e.g. for thermal reasons (see "Derating (Page 65)").

Table 3-14 Article numbers for device connectors for 3RM1 motor starters

	Description	Article number
	Device connector for 3RM1 motor starters, 22.5 mm wide	3ZY1212-2EA00
	Device connector for looping through signals, 22.5 mm wide	3ZY1212-2AB00
	Device termination connector for 3RM1 motor starters, 22.5 mm wide including left cover for the first device connector in the system configuration	3ZY1212-2FA00

Use of device connectors exclusively for the 24 V DC control supply voltage

By using device connectors, several 3RM1...-.AA04 motor starters can be jointly supplied with a control supply voltage of 24 V DC. This requires the control supply voltage to be applied to the A1 and A2 terminals of only one motor starter.

Up to ten motor starters can be connected to one 24 V DC control supply voltage with device connectors. The 24 V DC control supply voltage must be within the operating range of 0.9 to 1.1 for this purpose. If the full operating range of 0.8 to 1.25 is to be used, no more than five 3RM1...-.AA04 motor starters can be used. Otherwise, the infeed must be repeated for every 5th 3RM1 motor starter.

The last motor starter in a row can be placed on a device termination connector.

Using device connectors with 3SK safety relays

Multiple 3RM11/3RM13 Failsafe motor starters can be connected in a group for joint safety-related shutdown by a 3SK safety relay. Safety-related applications up to SILCL 3 to EN 62061, PL e/Cat. 4 to EN ISO 13849-1 can be realized.

⚠ WARNING

Loss of the safety function during hybrid operation of Failsafe and Standard motor starters.
Can cause death or serious injury.

Hybrid operation of 3RM10/3RM12 Standard motor starters with 3RM11/3RM13 Failsafe motor starters in safety-related applications is not admissible.

Only ever use safety-related motor starters (3RM11 Failsafe and 3RM13 Failsafe) in safety-related applications.

3RM1 motor starters are shut down by interrupting the control supply voltage by means of the 3SK safety relay. For this reason, the control supply voltage must not also be applied to the 3RM1 motor starters.

⚠ WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When the product is operated with a 3SK safety relay and a device connector, the supply voltage for 3RM1 motor starters is fed in via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM1 motor starters, in order to prevent bypassing of the safety function.

With device connectors, up to five Failsafe motor starters can be operated on one 3SK safety relay. For configuration using 3SK safety relays, also follow the configuration rules in the manuals for the "3SK Safety Relays"; see Chapter "Further documentation (Page 14)."

The last motor starter in a row must be placed on a device termination connector. This closes the circuits that were built up with the connectors.

Overview of all device connectors for 3RM1 motor starters and 3SK safety relays

Article number	Type of device connector	Units
3ZY1212-2EA00	Device connector for 3RM1 motor starters, 22.5 mm wide	• 3RM1 motor starter
3ZY1212-2FA00	Device termination connector for 3RM1 motor starters, 22.5 mm wide	• 3RM1 motor starter
3ZY1212-2AB00	Device connector for looping through signals, 22.5 mm wide	• 3RM1 motor starter
3ZY1212-1BA00	Device connector for 3SK1 safety relay, 17.5 mm wide	• 3SK1120 safety relay • 3SK1220 input expansion

Article number	Type of device connector	Units
3ZY1212-2BA00	Device connector for 3SK1 safety relay, 22.5 mm wide	• 3SK1121 safety relay • 3SK1122 safety relay • 3SK1211 output expansion • 3SK1230 power supply
3ZY1212-2DA00	Device termination connector for 3SK1 safety relay, 22.5 mm wide	• 3SK1121 safety relay • 3SK1122 safety relay • 3SK1211 output expansion
3ZY1212-0FA01	Device termination connector set for 3SK1 safety relay, > 45 mm wide	• 3SK1213 output expansion
3ZY1212-2GA00	Device connectors for 3SK2 safety relay, width 22.5 cm	• 3SK2112 safety relay
3ZY1212-2AB00	Device connectors for 3SK2 safety relay for looping through signals, width 22.5 cm	• 3SK21 safety relay
3ZY1212-4GA01	Device connector set for 3SK2 safety relay, width 45 cm	• 3SK2122 safety relay

Reference

You will find further information on using device connectors in:

- "FAQs on the 3RM1 motor starter (https://support.industry.siemens.com/cs/ww/en/view/81525494)"
- Manual "SIRIUS 3SK1 safety relays (https://support.industry.siemens.com/cs/ww/de/view/67585885)"
- Manual "SIRIUS 3SK2 Safety Relays (https://support.industry.siemens.com/cs/ww/de/view/109444336)"

3.6.2.6 Terminals

Each 3RM1 motor starter has three main current terminals and three control current terminals. The terminals can be replaced with ease.

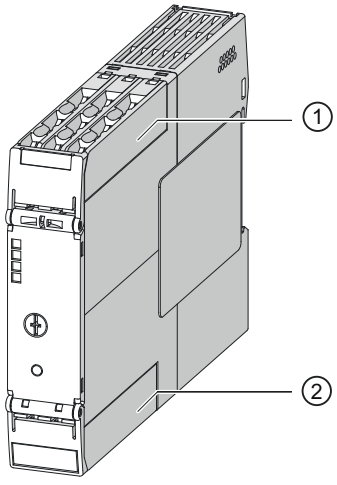


Table 3-15 Article numbers for the terminals

Description			Article number
Control current terminals	①	Detachable terminal, 3-pole, screw terminals up to 1x2.5 mm²	3ZY1131-1BA00
		Detachable 3-pole terminal, push-in terminals up to 2x1.5 mm²	3ZY1131-2BA00
Main current terminals	②	Detachable 2-pole terminal, screw terminals up to 1x4 mm²	3ZY1122-1BA00
		Detachable 2-pole terminal, push-in terminals up to 1x4 mm² or 2x1.5 mm²	3ZY1122-2BA00

3.6.2.7 Device identification label

Table 3-16 Article numbers for the device identification labels

Description	Article number
SIRIUS device identification label, titanium gray, 17 mats each with 20 labels for snapping into place, size 20 x 7 mm, in box	3RT2900-1SB20
SIRIUS device identification label, titanium gray, 10 sheets each with 306 adhesive labels, size 19 x 6 mm, in transparent bag	3RT2900-1SB60

3.6.3 Article number scheme for SIRIUS 3RM1 motor starter

Digit of the Article No.	1. - 3. ❒❒❒	4. ❒	5. ❒	6. ❒	7. ❒	-	8. ❒	9. ❒	10. ❒	11. ❒	12. ❒
SIRIUS 3RM1 motor starter	3RM										
Generation (1)		❒									
Function (Direct-on-line starter = 0, direct-on-line starter Failsafe & ATEX certification = 1; reversing starter = 2; reversing starter Failsafe & ATEX certification = 3; accessories = 9)			❒								
Setting range rated motor current (0.1 ... 0.5 A = 01; 0.4 ... 2.0 A = 02; 1.6 ... 7.0 A = 07)				❒	❒						
Connection type (screw terminal = 1, push-in spring-loaded terminal = 2, hybrid connection method*) = 3)							❒				
Reserved (A)								❒			
Width (22.5 mm = A)									❒		
Rated control supply voltage (24 V DC = 0; 110 ... 230 V AC /110 V DC = 1)										❒	

Digit of the Article No.	**1. - 3.** ❒❒❒	**4.** ❒	**5.** ❒	**6.** ❒	**7.** ❒	-	**8.** ❒	**9.** ❒	**10.** ❒	**11.** ❒	**12.** ❒
Rated operating voltage (48 ... 500 V = 4)											❒
Example	3RM	1	0	0	1	-	1	A	A	0	4

*) Hybrid connection method: control circuit realized as push-in spring-loaded terminal and main circuit as screw terminal

Configuration

4

4.1 Rated operational current

Values for rated operational current I_e

Depending on the current setting range, the following rated operational currents apply for the 3RM1 motor starters:

Motor starter version	3RM1.01-.....	3RM1.02-.....	3RM1.07-.....
Rated operational current I_{eAC53a} [A]	0.5	2	7
Setting range for I_e [A]	0.1 ... 0.5	0.4 ... 2	1.6 ... 7 (10)
Minimum current per phase of the motorized load [A]	0.05	0.14	0.6

As soon as the minimum current limit is violated, fault detection (phase failure) picks up.

Note

The devices with $I_{eAC53a} = 7$ A have in addition to this setting value an I_{eAC51} setting value for 10 A in the highest setting level. This setting is intended for resistive loads to 10 A and is not suitable for operating motors. With this setting, there is no overload trip in accordance with Class 10A. Instead, this takes place in accordance with the description in the chapter "Overload protection/ device protection characteristic (Page 154)".

The maximum current for UL 508 applications is 6.1 A.

Derating factors

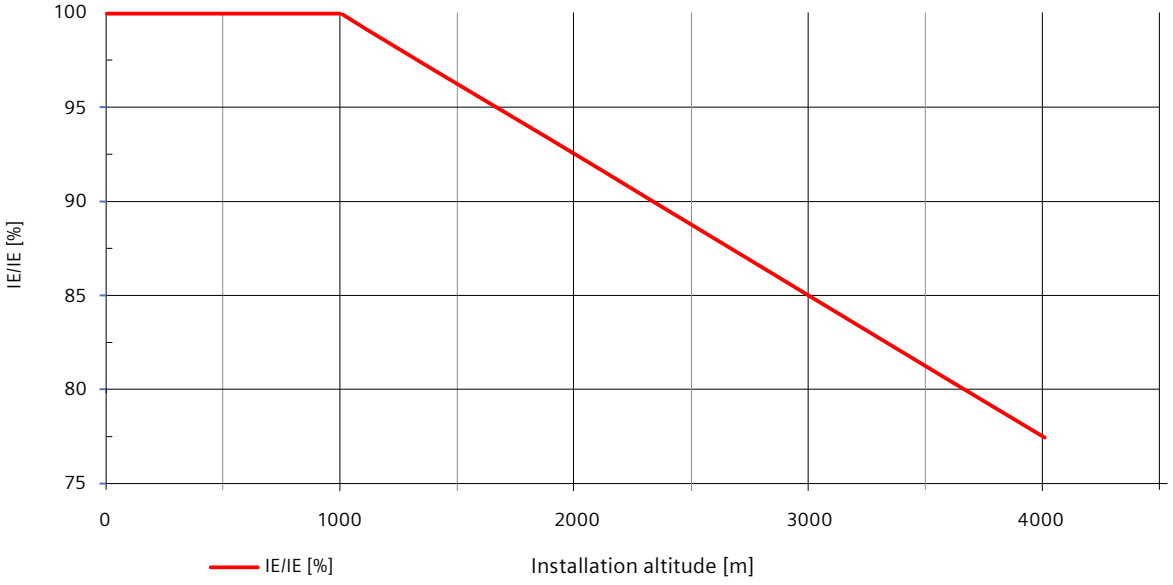
The maximum settable rated operational current decreases depending on the following factors:

- Installation altitude
- High motor starting current (> 8x starting current)
- Ambient temperature
- Mounting position
- Switching frequency

4.2 Derating at high installation altitudes

Dependence of the rated operational current on the installation altitude

The permissible rated operational current of the 3RM1 motor starter is reduced as shown in the diagram, depending on the installation altitude.



Dependency of the max. permissible nominal voltages on the installation altitude

At high installation altitudes (> 2 000 m), the rated value of the impulse withstand voltage of the 3RM1 is only 4 kV instead of 6 kV. If the following conditions are met, you can also use the 3RM1 motor starter at installation altitudes up to 4 000 m above sea level:

Line connection / main energy infeed:

a) Retention of the maximum permissible operating voltage of 500 V with reduced overvoltage category II

Suitable measures must be taken to limit overvoltages to the reduced rated impulse withstand voltage of 4 kV (e.g. isolating transformers or use of surge arresters or line filters),

or

b) Reduction of the nominal voltage of the system to ≤ 277 / 480 V in power systems with grounded current source or ≤ 277 V in all other networks, and reduction of the nominal voltage of the auxiliary circuits to ≤ 127 V while retaining overvoltage category III

Dependency of the max. permissible ambient temperature on the installation altitude

- Reduction of the previous max. ambient temperature to 80%
  Example: The permissible ambient temperature during operation is 45 °C for a 3RM1102-1AA04 in a horizontal mounting position on a vertical DIN rail at an installation altitude of up to 2 000 m. The permissible ambient temperature during operation = 45 °C * 0.8 = 36 °C at an installation altitude of > 2 000 m to 4 000 m.

Dependency of the key safety values on the installation altitude:

With regard to the ATEX safety function, the key safety values stated in the technical specifications apply, irrespective of the installation altitude up to 4 000 m.

For the emergency stop safety function, adapted key safety values must be considered for installation altitudes > 2 000 m.

Adaptation of the key safety values:

Safety characteristic values for both supply voltage versions		**Installation altitude from 2 000 m to 4 000 m**
PFD		2×10^{-5}
PFHD	1/h	2.5×10^{-8}
MTTFd	y	69
Failure rate [FIT] for detectable dangerous failure rate (λdd)	FIT	1615
Failure rate [FIT] for non-detectable dangerous failure rate (λdu)	FIT	18

4.3 Derating with high motor starting current

Motors with a high efficiency and high motor starting currents

High starting currents may have to be taken into consideration when using 3RM1 motor starters on motors with a high efficiency (IE3 or IE4). According to the product standard IEC 60947-4-2, the 3RM1 motor starters are designed for motors with a maximum 8-fold starting current. Observe the maximum starting current, refer to the technical data sheet.

If motors are operated that have a higher starting current, refer to the following table for the maximum adjustable motor current:

Table 4-1 Maximum settable motor current

Motor starter version **I_{eAC53a} [A] at 40 °C max. motor starting current**	**3RM1.01 (0.5 A)**	**3RM1.02 (2 A)**	**3RM1.07 (7 A)**
<= 8-fold I_e	0.5	2	7
8.5-fold I_e	0.47	1.9	6.6
9-fold I_e	0.45	1.8	6.2
9.5-fold I_e	0.42	1.7	5.9
10-fold I_e	0.4	1.6	5.6

The device protection may respond sooner in the case of motors with a higher starting current. You will find details in "Overload protection/device protection characteristic (Page 154)".

4.4 Derating with high ambient temperature

4.4.1 Maximum ambient temperature for 3RM1.01 (0.5 A) and 3RM1.02 (2 A)

For the versions 0.5 A and 2 A, the following ambient temperature limits apply depending on the mounting position:

Mounting position	Max. ambient temperature for 0.5 A and 2 A device for AC 53 a	
	Side-by-side	Individually/with 22.5 mm clearance
Vertically on horizontal rail	50 °C	60 °C
Horizontally on vertical rail	45 °C	60 °C
Upright on horizontal rail/mounting surface	45 °C	60 °C

4.4.2 Maximum ambient temperature for derating for 7 A devices

The maximum settable rated operational current for 3RM1.07 motor starters depends on the following factors:

- The utilization category: AC 53a / AC 51
- The mounting position: Vertical / horizontal / upright
- The design version (Page 71): Individually / Alternately / Side-by-side
- Accessories: Device connector / Fuse module

Note

When using the 3-phase busbar system, you can achieve the necessary clearances by leaving the connections free. Cover the free connections with cover caps (accessories). This will protect the free terminal lugs against touch.

Note

When using device connectors, the required clearances can be achieved with the device connectors to the signal loop-through.

Note

If you are using fuse modules on 8US... busbars, you can achieve the necessary clearances by installing cover profiles for 8US1922... busbars.

Maximum ambient temperature for 3RM1.07 (7 A)

The permissible rated operational current of the 3RM1.07 motor starter decreases depending on the mounting position, the design version and the ambient temperature $T_{U.}$

Utilization category AC 53 a:

For the 7 A version, the following derating values apply depending on the mounting position and the installation version:

Mounting position	Ambient temperature in °C	Max. setting values for 7 A device in A for AC 53 a with design version		
		Individually/with 22.5 mm clearance[3]	Alternately with 2 A device[3]	Side-by-side[3]
Vertically on horizontal rail	40	7 / 6.5[2]	4.6	4
	45	6.1	4	3.6
	50	6.1	3.2 / 2.8[1]	3.2 / 2.4[1]
	55	5.2	-[4]	-[4]
	60	4.6	-[4]	-[4]
Horizontally on vertical rail	40	5.2	4	3.2
	45	4.6	2	2
	50	4	-[4]	-[4]
	55	3.2	-[4]	-[4]
	60	2.0	-[4]	-[4]
Upright on horizontal rail/mounting surface	40	6.1	4	3.6
	45	5.2	3.6	3.2
	50	5.2	-[4]	-[4]
	55	4	-[4]	-[4]
	60	3.6	-[4]	-[4]

[1] When using device connectors

[2] With fuse module

[3] See Chapter Design versions for 7 A devices (Page 71)

[4] Not possible under these operating conditions

Utilization category AC 51 (resistive loads):

The permissible rated operational current of the 3RM1.07 motor starter decreases for utilization category AC 51 depending on the design version and the ambient temperature T_U as follows:

Ambient temperature in °C	Max. setting values for 7 A device in A for AC 51		
	Individually/with 22.5 mm clearance[2]	Alternately with 2 A device[2]	Side-by-side[2]
40	10 / 8.5[1]	4.6	4.6
45	7	3.2	3.2
50	7	3.2	3.2
55	5.2	-[3]	-[3]
60	5.2	-[3]	-[3]

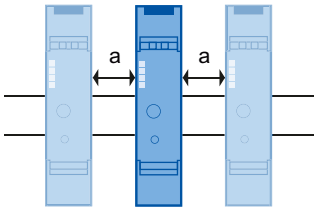
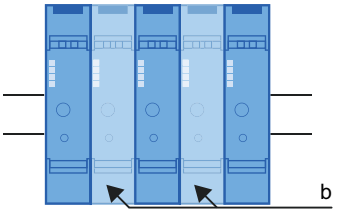
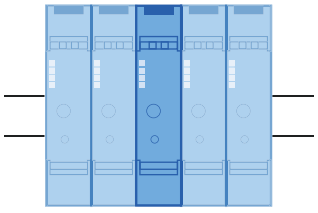
[1] With fuse module

[2] See chapter Design versions for 7 A devices (Page 71)

[3] Not possible under these operating conditions

4.4.3 Design versions for 7 A devices

For 7 A devices without, a distinction is made between the following design versions:

Design version	
Individually with clearance a = 22.5 mm	
7 A device alternately with 2 A device or 0.5 A device (b) without clearance	
Devices with the same rated operational current without clearance: Side-by-side	

Note

Note the configuration examples in the Technical Data Sheet, see chapter "Technical specifications (Page 153)".

4.5 Ambient conditions

4.5.1 Application environment

The 3RM1 motor starters are designed for use in enclosed spaces in which no severe operating conditions prevail (e.g. dust, caustic vapors, hazardous gases).

If they are to be installed in dusty or damp rooms, suitable control cabinets must be provided.

Note

If you operate the 3RM1 motor starter in a control cabinet, ensure that the cabinet is adequately ventilated.

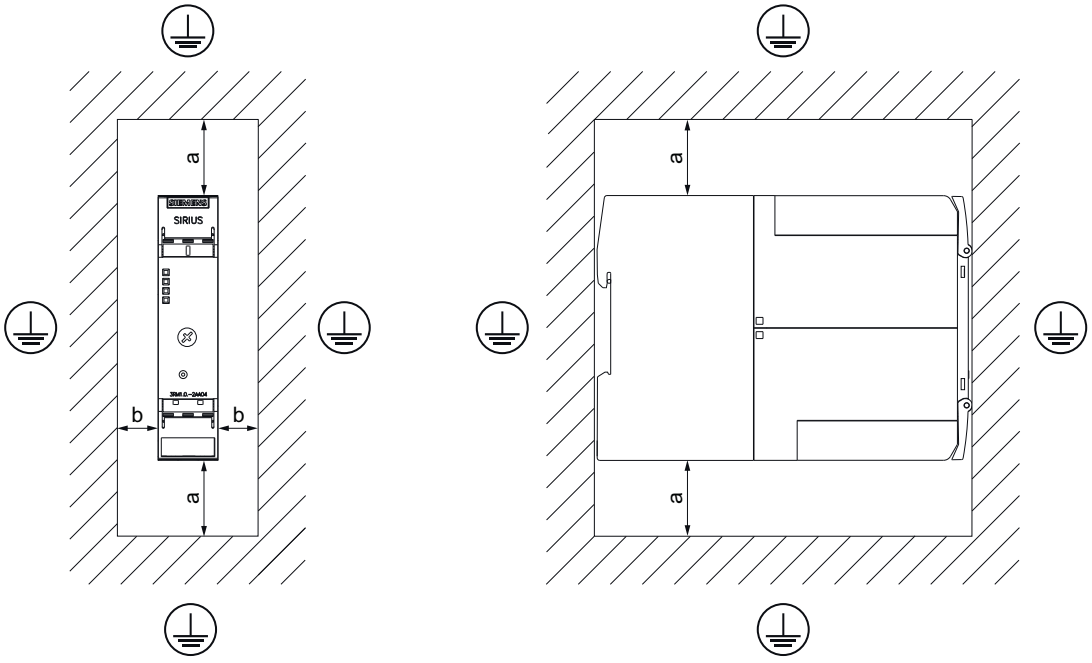
4.5.2 Ambient temperature

The 3RM1 motor starter has been designed for use under ambient temperatures ranging from -25 °C to +40 °C, singly in a vertical mounting position, and without a reduction in the permissible rated operational current. With the deratings given in the section "Rated operational current (Page 65)", you can operate the 3RM1 motor starters at ambient temperatures of up to 60 °C.

4.5.3 Mounting position

Installation on a vertical mounting surface is recommended for the 3RM1 motor starter. Please observe the power reduction levels/deratings for other mounting positions given in the section "Rated operational current (Page 65)".

Dimension drawing showing clearance to be maintained from grounded parts for the RM1 motor starter

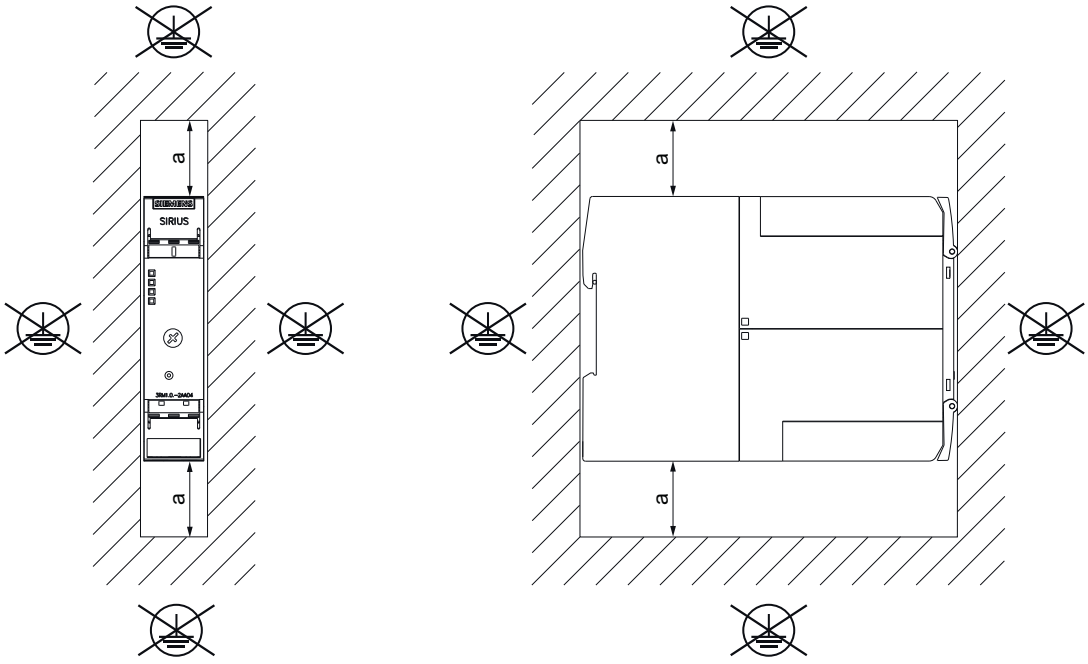


a = 50 mm

b = 3.5 mm

Figure 4-1 Dimension drawing 3RM1 with grounding clearances, side and front

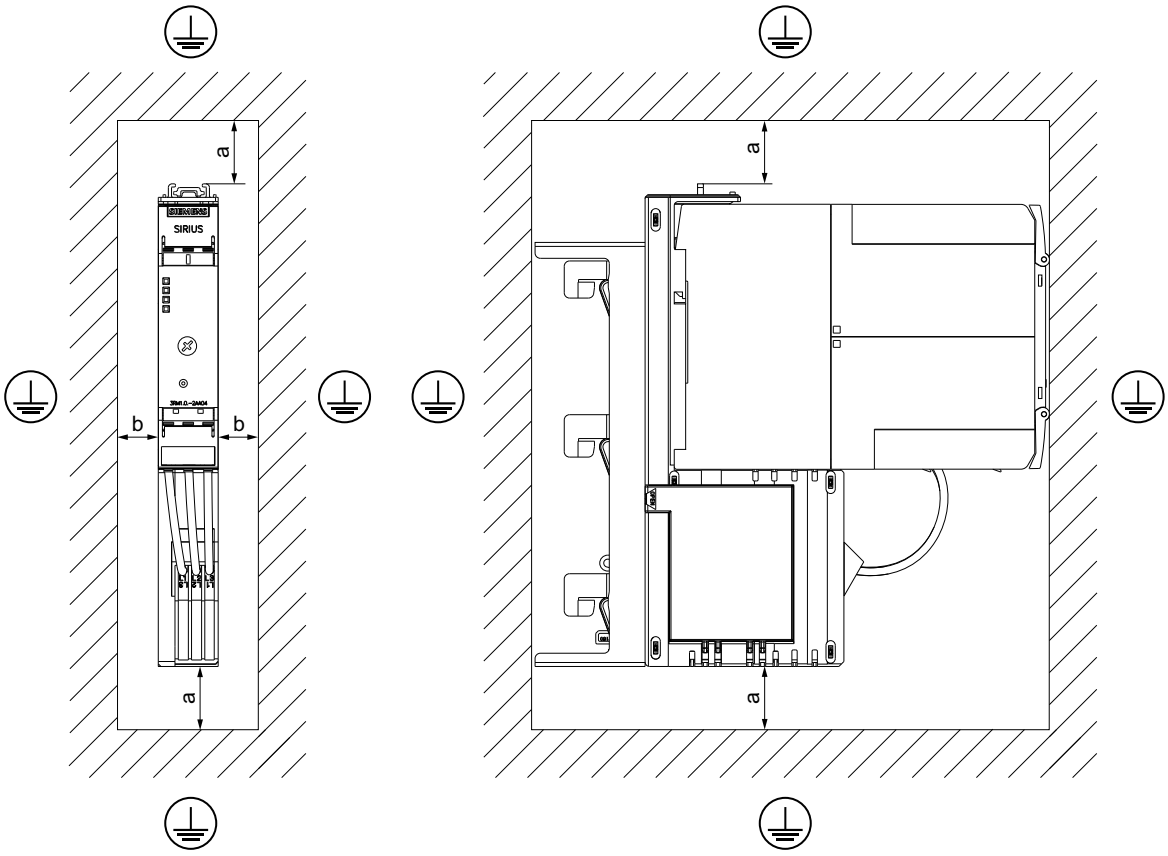
Dimension drawing showing clearances to be maintained with side-by-side mounting of 3RM1 motor starters



a = 50 mm

Figure 4-2 Dimension drawing 3RM1 with clearances for side-by-side mounting, side and front, not grounded

Dimension drawing showing clearance to be maintained from grounded parts for the 3RM19 fuse module with 3RM1 motor starter

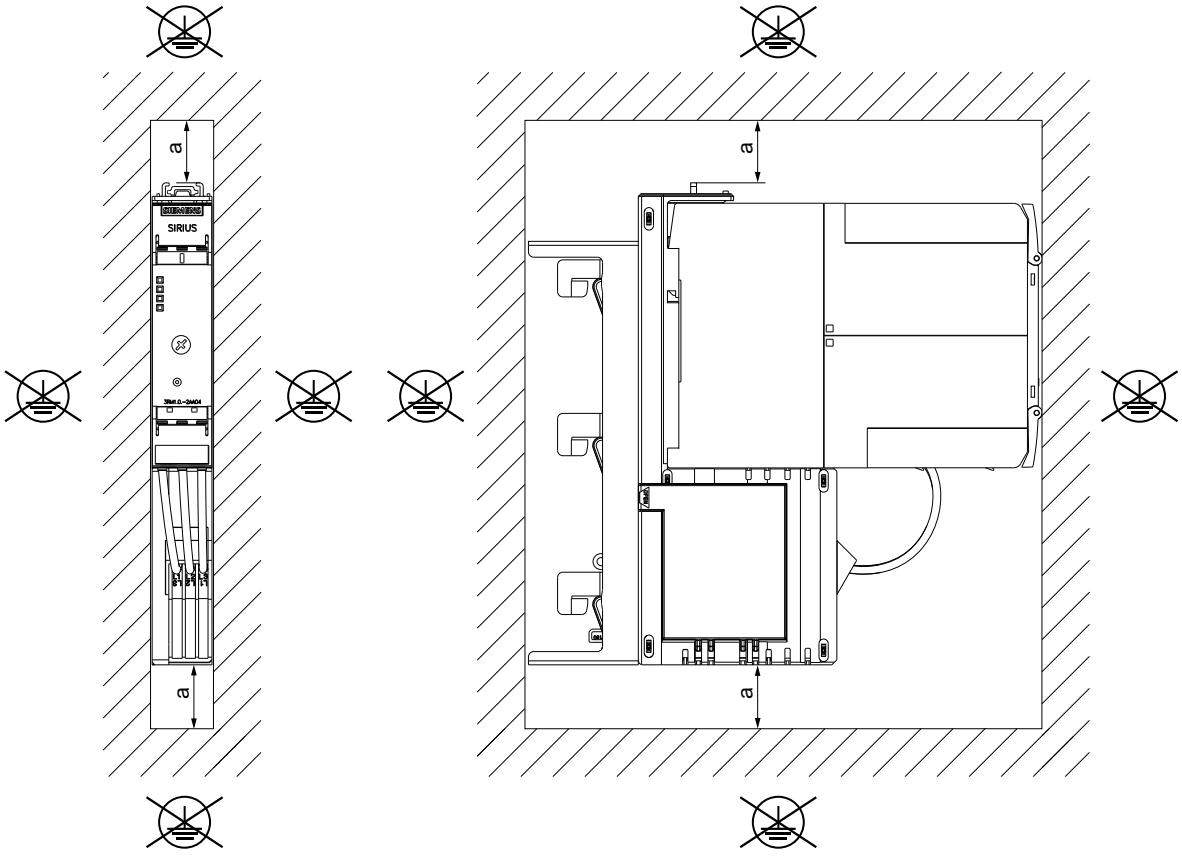


a = 50 mm

b = 3.5 mm

Figure 4-3 Front view and side view

Dimension drawing showing clearance to be maintained with side-by-side mounting of 3RM19 fuse module with 3RM1 motor starter



a = 50 mm

Figure 4-4 Front view and side view

4.5.4 Grounding measures

No grounding measures are required for the 3RM1 motor starter.

4.5.5 Permissible operating voltage

To be able to ensure safe isolation of the circuits from each other in accordance with IEC 60947-1, the following operating voltages are permissible:

Table 4-2 Safe isolation of the 3RM1 motor starters

... to ...	**Control circuit (A1/A2, OUT, IN1-3, M1/M2)**	**Signaling contacts (98/95/96)**	**Main circuit (1L1/3L2/5L3 2T1/4T2/6T3)**
Control circuit (A1/A2, OUT, IN1-3, M1/M2)	-	250 V	500 V
Signaling contacts (98/95/96)	250 V	-	500 V
Main circuit (1L1/3L2/5L3 2T1/4T2/6T3)	500 V	500 V	-

Note

The three phases in the main circuit are not galvanically isolated from each other.

4.5.6 Minimum load current

The minimum load current is 20% of the set motor current, but at least the absolute minimum current specified in the tables below.

The minimum load current differs in the case of Standard 3RM10/3RM12 and Failsafe 3RM11/3RM13 motor starters:

Table 4-3 Minimum load current in the case of Standard 3RM10/3RM12 motor starters

Motor current	**0.5 A**	**2 A**	**7 A**
Motorized load	0.05 A	0.14 A	0.6 A
Resistive load	0.05 A	0.14 A	0.6 A

Table 4-4 Minimum load current in the case of Failsafe 3RM11/3RM13 motor starters

Motor current	**0.5 A**	**2 A**	**7 A**
Motorized load	0.05 A	0.14 A	0.6 A
Resistive load	0.25 A	1 A	3.5 A

As soon as the minimum current limit is violated, fault detection (phase failure) picks up.

4.6 Load feeders - protection against short circuit

4.6.1 Protection against short circuit

The short-circuit strength in combination with fuses is up to 100 kA at 400 V and with SIRIUS 3RV2 motor starter protectors up to 55 kA at 400 V. Type of coordination 1 is maintained here.

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.
Health hazard from automatic hot restart.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

After every short circuit in the case of short-circuit protection according to **type of coordination 1**, a 3RM1 motor starter is defective.
Replace a 3RM1 motor starter including the terminals after a short circuit in the case of short-circuit protection according to type of coordination 1.
With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

With 3RM11 / 3RM13 Failsafe motor starters, also check the safety functions after a short circuit in the case of short-circuit protection according to **type of coordination 2**.

4.6.2 Configuration of load feeders

The 3RM1 motor starters can be combined with any short-circuit protection devices. Using SIRIUS 3RV20 motor starter protectors offers a convenient solution for the configuration of fuseless load feeders. However, combinations with fuses are also possible, mastering particularly high short-circuit currents. Type of coordination 2 (see Glossary (Page 199)) can also be achieved. To achieve a particularly compact design, 3RM193 fuse modules can be installed as well.

4.6.3 Configuration of a load feeder with 3RM1 motor starter in compliance with IEC

Short-circuit protection for load feeders in compliance with IEC can also be realized by motor starter protectors or fuses. Depending on the design of the protection device, the two types of coordination 1 or 2 can be achieved. The protection devices listed are the maximum permissible versions and, as an alternative, protection devices of the same type with a lower rated current can be used. For the protection devices, the protection of one or more motor starters can be implemented in a group.

4.6.3.1 Fuseless design

Combining 3RM1 motor starters with motor starter protectors

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.
Health hazard from automatic hot restart.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

After every short circuit in the case of short-circuit protection according to **type of coordination 1**, a 3RM1 motor starter is defective.
Replace a 3RM1 motor starter including the terminals after a short circuit in the case of short-circuit protection according to type of coordination 1.
With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

With 3RM11 / 3RM13 Failsafe motor starters, check the safety functions after a short circuit in the case of short-circuit protection according to **type of coordination 2**.

The 3RM1 motor starters can be combined with the following motor starter protectors for short circuits according to type of coordination 1:

Table 4-5 Motor starter protectors according to type of coordination 1 for 3RM1 motor starters with 400 V

Motor starter T_A = 40 °C		**Short-circuit current**	**Maximum permitted motor starter protectors for 400 V + 10%**	
Article number	**Rated current [A]**	**Current [kA]**	**Article number**	**Rated current [A]**
3RM1...	0.5 / 2.0 / 7.0	55	3RV20.1-1HA..	8
3RM1...	0.5 / 2.0 / 7.0	12.5	3RV20.1-1KA..	12.5
3RM1...	0.5 / 2.0 / 7.0	10	3RV20.1-4AA..	16
3RM1...	0.5 / 2.0 / 7.0	7.5	3RV20.1-4BA..	20
3RM1...	0.5 / 2.0 / 7.0	5	3RV20.1-4DA..	25

Table 4-6 Motor starter protectors according to type of coordination 1 for 3RM1 motor starters with 500 V

Motor starter T_A = 40 °C		**Short-circuit current**	**Maximum permitted motor starter protectors for 500 V + 10%**	
Article number	**Rated current [A]**	**Current [kA]**	**Article number**	**Rated current [A]**
3RM1.01...	0.5	10	3RV20.1-1HA..[1)]	8
3RM1.02...	2.0	10	3RV201.1-1HA..[1)]	8
3RM1.07...	7.0	10	3RV20.11-1HA..[1)]	8

1) Design without phase failure protection 3RV2...-0DA0 can also be used for the corresponding current ranges.

Combining 3RM1 motor starters with miniature circuit breakers

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.
Health hazard from automatic hot restart.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

After every short circuit in the case of short-circuit protection according to **type of coordination 1**, a 3RM1 motor starter is defective.
Replace a 3RM1 motor starter including the terminals after a short circuit in the case of short-circuit protection according to type of coordination 1.
With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

With 3RM11 / 3RM13 Failsafe motor starters, check the safety functions after a short circuit in the case of short-circuit protection according to **type of coordination 2**.

The 3RM1 motor starters can be combined with the following miniature circuit breakers for short circuits according to type of coordination 1:

Table 4-7 Miniature circuit breakers according to type of coordination 1 for 3RM1 motor starters with 400 V

Motor starter T_A = 40 °C		**Short-circuit current**	**Maximum permitted miniature circuit breakers with 400 V + 10%**	
Article number	**Rated current [A]**	**Current [kA]**	**Article number**	**Rated current [A]**
3RM1.01...	0.5	6	5SY4325-6	25
3RM1.02...	2.0	6	5SY4325-6	25
3RM1.07...	7.0	6	5SY4325-6	25

4.6.3.2 Fused design

On tested assemblies, the type of coordination defines the permissible condition of devices following a short-circuit.

Type of coordination 1 means that the load feeder may be non-operational after a short circuit has been cleared.

Type of coordination 2 means that the 3RM1 motor starter is still operational following a short-circuit.

With the 3RM1 motor starter, short-circuit protection is only provided by fuses up to 400 V (+10%) for type of coordination 2.

Combining 3RM1 motor starters with fuses for type of coordination 1

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

After every short circuit in the case of short-circuit protection according to **type of coordination 1**, a 3RM1 motor starter is defective.
Replace a 3RM1 motor starter including the terminals after a short circuit in the case of short-circuit protection according to type of coordination 1.
With 3RM11/3RM13 Failsafe motor starters, you must check the safety function in addition to replacing the unit.

The 3RM1 motor starters can be combined with the following fuses for short-circuits according to coordination type 1:

Table 4-8 Fuses according to type of coordination 1 for 3RM1 motor starters

Motor starter T_A = 40 °C		**Short-circuit current**	**Maximum permissible fuse links at 500 V +10% Diazed SENTRON, cylindrical fuse-link operating class gG**	
	Rated current [A]	**Current [kA]**	**Article number**	**Rated current [A]**
3RM1.01...	0.5	55	5SB281 / 3NW6010 -1	25
3RM1.02...	2.0	55	5SB281 / 3NW6010 -1	25
3RM1.07...	7.0	55	5SB281 / 3NW6010 -1	25

Note

The 3NW60 SENTRON, cylindrical fuse-links are suitable for use in the 3RM193. fuse module.

Combining 3RM1 motor starters with fuses for type of coordination 2

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.
Health hazard from automatic hot restart.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

With 3RM11/3RM13 Failsafe motor starters, check the safety function after a short circuit in the case of short-circuit protection according to **type of coordination 2**.

The 3RM1 motor starters can be combined with the following fuses for short-circuits according to type of coordination 2. In a fused configuration with 3RM1 motor starters, please observe the dimensioning information of the fuse manufacturer.

Table 4-9 Fuses according to type of coordination 2 for 3RM1 motor starters at 400 V

Motor starter T_A = 40 °C		**Short-circuit current**	**Maximum permissible fuse links at 400 V + 10% operational class gG**	
Article number	**Rated current [A]**	**Current [kA]**	**Article number**	**Rated current [A]**
3RM1.01...	0.5	2	FR10GR69V20 (make: Mersen)	20
3RM1.02...	2.0	2	FR10GR69V20 (make: Mersen)	20
3RM1.07...	7.0	2	FR10GR69V20 (make: Mersen)	20

Note

The FR10 fuse links are suitable for use in the 3RM193. fuse module.

4.6.4 Configuration of a load feeder with 3RM1 motor starter in compliance with UL

4.6.4.1 Function according to UL 508

The 3RM1 motor starters can be combined individually with a circuit breaker (motor starter protector) or fuses. A group installation is also possible according to UL.

4.6.4.2 Configuration of individual load feeders

A circuit breaker or appropriate fuses is/are assigned to each motor starter.

SCCR short circuit current ratings

The SCCR (short circuit current rating) indicates the maximum permissible short-circuit current for a switching device. A higher value can only be achieved in combination with protection devices such as fuses or circuit breakers.

This rating is required for mounting accessories in control cabinets (control panels) conforming to UL 508a. The switching device or switchgear assembly with the lowest value specifies the value for the entire control panel.

A low value makes engineering the supply voltage for the control panel difficult.

According to UL 508a, the 3RM1 motor starters have a standard short circuit current rating of 1 kA for the versions up to 2 A rated current and 5 kA for the version with 7 A.

Tests were also carried out with a short circuit rating of 100 kA (high capacity short circuit current ratings). The UL reports (https://support.industry.siemens.com/cs/ww/en/view/66427510) include details of possible combinations with Class J fuses, as well as with a number of circuit breakers.

Circuit breakers for protecting against short-circuit currents

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.

Health hazard from automatic hot restart.

The 3RM1 motor starter and the safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

Replace a defective 3RM1 motor starter including the terminals after a short circuit. With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

Short circuit current rating according to UL 508 for 480 V

Table 4-10 Circuit breakers for protecting against short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Circuit breaker	
Article number	Rated current [A]	[kA]	Type	Max. size [A]
3RM1.01...	0.5	1	3RV2711	6.3
3RM1.02...	2.0	1	3RV2711	6.3
3RM1.07...	6.1	5	3RV2711 / 2721	22

High capacity short circuit current rating according to UL 508 for 480 V

Table 4-11 Circuit breakers for protecting against high short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Circuit breaker	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	65	3RV2711	2.5
3RM1.02...	2.0	65	3RV2711	2.5
3RM1.07...	6.1	18	3RV2711	10

Fuses for protection from short-circuit currents

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.

Health hazard from automatic hot restart.

The 3RM1 motor starter and the safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

Replace a defective 3RM1 motor starter including the terminals after a short circuit. With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

Short circuit current rating according to UL 508 for 480 V

Table 4-12 Fuses for protecting against short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Fuse	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	5	RK 5	8
3RM1.02...	2.0	5	RK 5	8
3RM1.07...	6.1	5	RK 5	30

High capacity short circuit current rating according to UL 508 for 480 V

Table 4-13 Fuses for protecting against high short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Fuse	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	100	CLASS J	35
3RM1.02...	2.0	100	CLASS J	35
3RM1.07...	6.1	100	CLASS J	35

4.6.4.3 Configuring a group of load feeders (group installation)

A "group installation" is a combination of several 3RM1 motor starters with one common short-circuit protection device (branch circuit protection device). This common branch circuit protection device can be a circuit breaker according to UL489, e.g. a 3RV27 or fuses according to UL248.

The 3RM19 infeed system is suitable for a group installation according to UL because it can be loaded up to a total current of 16 A. As an alternative, distribution of the main circuit can be realized with individual cables that have an AWG 12 cross-section or with infeed system 16 A, with a different distribution, for example, "Power Distribution blocks" 5ST2-5 distribution blocks. Whether loading with a total current of >16 A is possible depends on the tested assembly.

For further information, see Certificate of Compliance CoC (https://support.industry.siemens.com/cs/ww/en/view/66427510).

SCCR short-circuit current rating

The SCCR (short circuit current rating) indicates the maximum permissible short-circuit current for a switching device. A higher value can only be achieved in conjunction with protection devices such as fuses or circuit breakers.

This rating is required for mounting accessories in control cabinets (control panels) conforming to UL 508a. The switchgear assembly with the lowest value specifies the value for the entire control panel.

Circuit breakers for protecting against short-circuit currents

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.

Health hazard from automatic hot restart.

The 3RM1 motor starter and the safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

Replace a defective 3RM1 motor starter including the terminals after a short circuit. With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

Short circuit current rating according to UL 508 for 480 V

Table 4-14 Circuit breakers for protecting against short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Circuit breaker	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	5	3RV2711 / 2721	22
3RM1.02...	2.0	5	3RV2711 / 2721	22
3RM1.07...	6.1	5	3RV2711 / 2721	22

High capacity short circuit current rating according to UL 508 for 480 V

Table 4-15 Circuit breakers for protecting against high short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Circuit breaker	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	10	3RV2711	12.5
3RM1.02...	2.0	10	3RV2711	12.5
3RM1.07...	6.1	10	3RV2711	12.5

Fuses for protection from short-circuit currents

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.

Health hazard from automatic hot restart.

The 3RM1 motor starter and the safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

Replace a defective 3RM1 motor starter including the terminals after a short circuit. With 3RM11 / 3RM13 Failsafe motor starters, you must check the safety functions in addition to replacing the unit.

Short circuit current rating according to UL 508 for 480 V

Table 4-16 Fuses for protecting against short-circuit currents

Motor starter T_A = 50 °C		Short-circuit current	Fuse	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	5	RK 5	30
3RM1.02...	2.0	5	RK 5	30
3RM1.07...	6.1	5	RK 5	30

High capacity short circuit current rating according to UL 508 for 480 V

Table 4-17 Fuses for protecting against high short-circuit currents

Motor starter T_A = 50 ℃		**Short-circuit current**	**Fuse**	
Article number	**Rated current [A]**	**[kA]**	**Type**	**Max. size [A]**
3RM1.01...	0.5	100	CLASS J	35
3RM1.02...	2.0	100	CLASS J	35
3RM1.07...	6.1	100	CLASS J	35

Table 4-18 Fuses to provide protection against high short-circuit currents for use with the 3RM193 fuse module on 8US1216-0AS00 and 8US1616-0AK02 busbar adapters

Motor starter T_A = 50 ℃			**Fuse**	
Article number	**Rated current [A]**	**Short circuit current [kA]**	**Type**	**Max. size [A]**
3RM1...	0.5 / 2.0 / 6.1	100	3NW3250-0HG	25
3RM1...	0.5 / 2.0 / 6.1	50	CLASS CC	20

Table 4-19 Fuses to provide protection against high short-circuit currents for use with the 3RM193 fuse module on the 8US1716-0RK00 standard mounting rail adapter

Motor starter T_A = 50 ℃			**Fuse**		**Connecting cable**
Article number	**Rated current [A]**	**Short circuit current [kA]**	**Type**	**Max. size [A]**	
3RM1...	0.5 / 2.0 / 6.1	50	CLASS CC	20	AWG 24-10 5.5 lb-in

4.7 Infeed for the main circuit

4.7.1 Infeed options

You have the following options for implementing the infeed for the main circuit of the 3RM1 motor starter:

- Infeed via parallel wiring of individual 3RM1 motor starters
- Infeed via the 3RM19 infeed system (for 3RM1...-1AA.4 motor starters with screw connections and 3RM1...-3AA.4 motor starters with hybrid connections)
- Infeed via the 3RM193 fuse module. (for all 3RM1 motor starters)

4.7.2 3RM19 3-phase infeed system

The 3RM19 3-phase infeed system is designed for 3RM1...-1AA.4 motor starters with screw connections and 3RM1...-3AA.4 motor starters with hybrid connections. Push-in terminals can therefore not be connected with this infeed system.

Note

Use of several busbars

More than five devices can be connected by clamping the terminal lugs of a second busbar rotated by 180°.

A motor starter must be plugged into the connection points of the busbars. Observe this in the case of gaps stipulated for derating purposes, and select appropriate busbars.

The special 3-phase busbar enables fault-free and fast main circuit wiring when using several 3RM1 motor starters arranged side-by-side. The energy is routed from an upstream short-circuit protection device to the system via an infeed terminal. The 3-phase busbar is designed in such a way that the maximum number of 3RM1 motor starters is only limited by the rated operational current of the infeed system.

Rated operational current

For the components of the 3RM19 infeed system, the maximum permissible rated operational current is 25 A (UL: 16 A).

If you use several 3RM1 motor starters that together require more than 25 A, form groups that each have a maximum requirement of 25 A (UL: 16 A).

Note

Multiple infeed

If you plan multiple infeed in the case of a respective requirement of more than 25 A, you must observe a potential current asymmetry in the infeeds.

Mounting

Attach the busbar from below to the rear terminals L1, L2 and L3 of the 3RM1 motor starter. The outgoing feeders to the motors thus remain accessible.

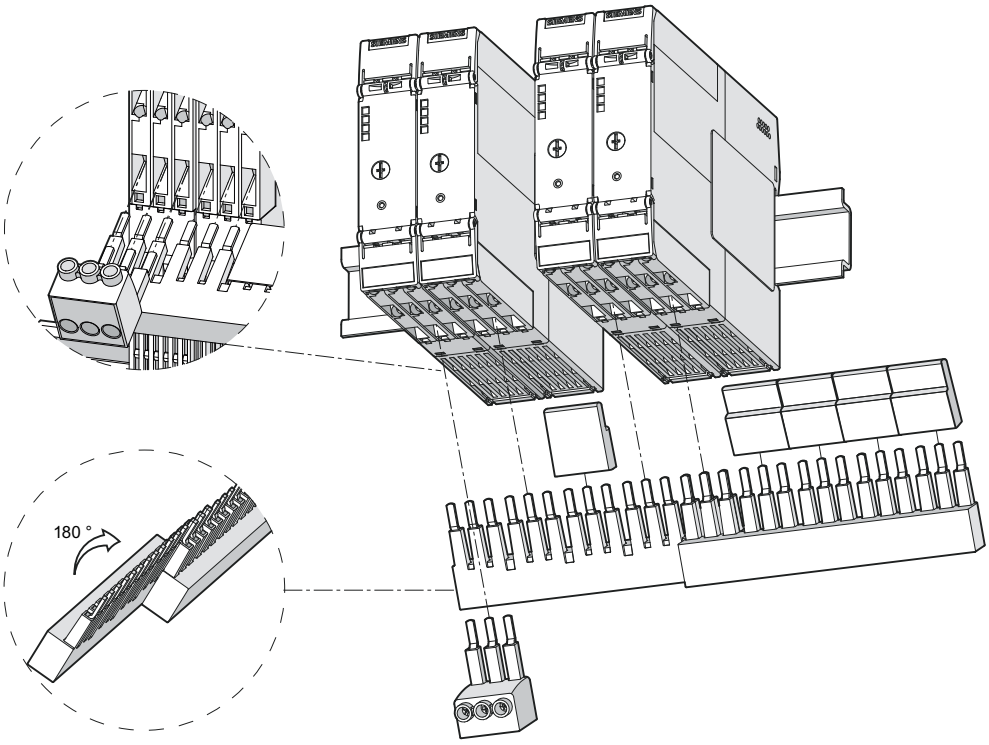


Figure 4-5 Attaching the 3RM19 infeed system to the 3RM1 motor starters



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

If free and uncovered terminal lugs are touched when the load voltage is switched on, death or serious physical injury will result.

For this reason, always cover the free terminal lugs (= free slots that are unassigned for thermal reasons, for example) with a cover cap. The cover caps are available as accessories.

Energy is supplied via the infeed terminal 3RM1920-1AA. This means you can connect conductors with a cross-section of 1.5 mm² to 4 mm².

4.7.3 3RM193 fuse module

A fuse module can be used to create a very compact design of load feeder. The 3RM1 motor starter in combination with the integrated fuses for short-circuit protection can be used on 8US busbar systems or on standard mounting rails.

The fuse module can be installed using a variety of different 8US adapters:

- In all 60 mm busbar systems
- In compact busbar systems
- On standard mounting rails

The interface to the adapter permits simple and safe replacement of the load feeder.

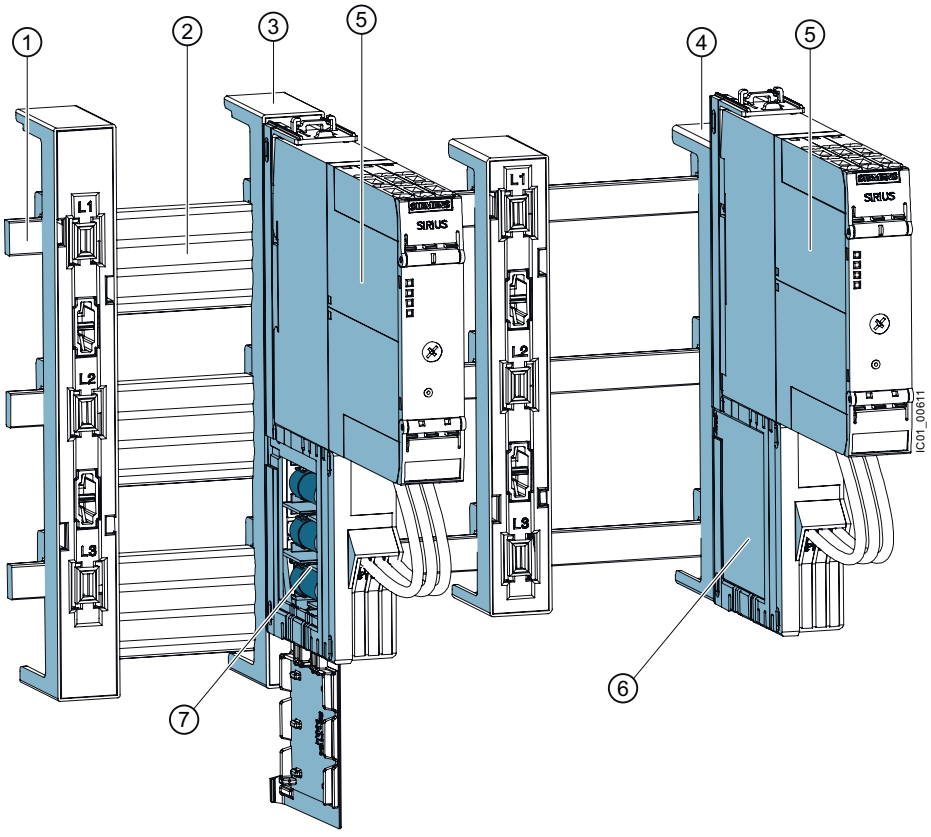
The fuse module can be combined with all 3RM1 motor starters. The easily replaceable fuses protect the motor starter, the connected motor and the cables.

Rated operational current

The maximum permissible rated operational current for the 3RM193 fuse module is 25 A.

Assembly

1. Connect the motor starter to terminals L1, L2 and L3.
2. Connect up the motor feeder cables.
3. Mount the assembled load feeder on an adapter.



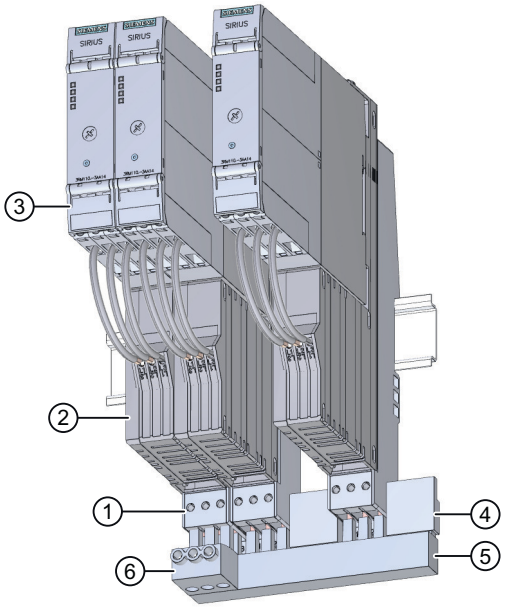
① Busbar system
② Cover profiles for busbars
③ Busbar adapter
④ Compact busbar adapter
⑤ 3RM1 motor starter
⑥ 3RM19 fuse module
⑦ 3RM19 fuse module with open flap

The flap cannot be opened when the fuse module is inserted. The fuse module must be removed to change the fuses.

Figure 4-6 An assembled busbar system with fuse modules

4.7.4 Combination of the 3RM19 3-phase infeed system with the fuse module

When using the 8US adapter for fitting the fuse module onto standard mounting rails, the 3RM19 3-phase infeed system can be used for the infeed of energy at the adapter.



① 8US adapter for fitting the fuse module onto standard mounting rails
② 3RM19 fuse module
③ 3RM1 motor starter
④ Covers for connection tags of the 3-phase busbars
⑤ 3-phase busbar for five 3RM1 motor starters
⑥ 3-phase infeed terminal

Figure 4-7 Combination of the 3RM19 3-phase infeed system with the fuse module

4.8 Configuration with device connectors

The device connector may be used only with the 24 V DC version of the motor starter. There must be no mixing of the Standard and Failsafe variants of the 3RM1 motor starter via the device connector. If both variants are used, these must be fitted on separate device connector systems. This has no influence on the infeed system for the 3RM19 main circuit, which can still be used without restriction for a combination of the variants.

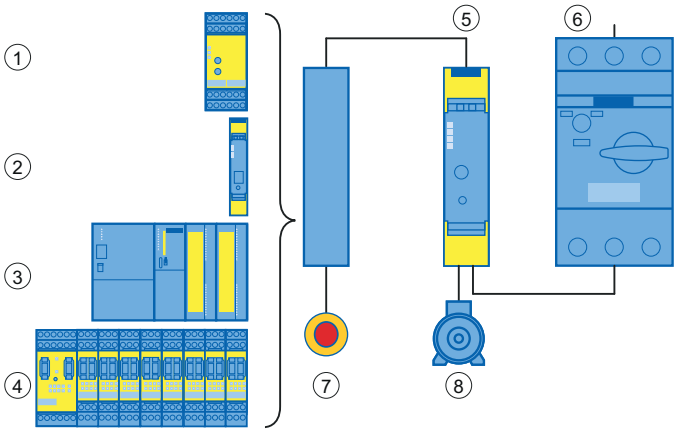
For additional information on using device connectors, refer to "FAQs on the 3RM1 motor starter (https://support.industry.siemens.com/cs/ww/en/view/81525494)".

4.9 Examples/applications

4.9.1 Operation with the EMERGENCY-STOP function

The 3RM11 Failsafe and 3RM13 Failsafe safety-related motor starters can be used with any safety relays and safety-related controllers in safety-related applications up to SILCL 3 in accordance with IEC 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1.

Basic configuration



① ... ④ Instead of the black box, one of the modules ① ... ④ can be used
① SIRIUS 3TK28 safety relay
② SIRIUS 3SK safety relay
③ SIMATIC S7 fail-safe modules
④ SIRIUS 3RK3 modular safety system
⑤ SIRIUS 3RM11 Failsafe or SIRIUS 3RM13 Failsafe safety-related motor starter
⑥ SIRIUS 3RV2 motor starter protector
⑦ EMERGENCY-STOP button
⑧ Motor

Figure 4-8 Basic configuration with safety relay or safety-related controller

Configuration with 3SK safety relay and device connectors

If you use safety-related motor starters (3RM11..-.AA04 / 3RM13..-.AA04) with a control supply voltage of 24 V DC with the 3SK safety relay, you can establish safe connection of the safety-related wiring using the device connectors. Use of device connectors avoids errors when setting up the control circuit wiring and offers savings in cable laying. In addition, the test overhead following completion of the control cabinets is reduced. The 3RM11/3RM13 safety-related motor starters can be used optimally as output expansions in the 3SK system.

When the EMERGENCY-STOP is actuated, the motor starters' control supply voltage is shut down and the motor is isolated from the power supply. Due to the internal self-monitoring of

the 3RM11/13 Failsafe motor starters in compliance with SILCL 3/PL e, there is no need for a feedback signal to the 3SK safety relay.

WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When the product is operated with a 3SK safety relay and a device connector, the supply voltage for 3RM11 / 3RM13 motor starters is fed in via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM11/3RM13 Failsafe motor starters, in order to prevent bypassing of the safety function.

WARNING

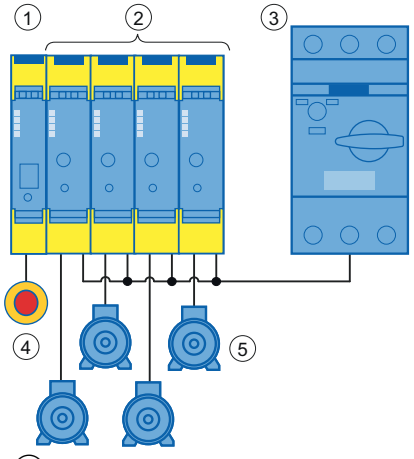
Loss of the safety function during hybrid operation of Failsafe and Standard motor starters.
Can cause death or serious injury.

Hybrid operation of 3RM10/3RM12 Standard motor starters with 3RM11/3RM13 Failsafe motor starters in safety-related applications is not admissible.

Only ever use safety-related motor starters (3RM11 Failsafe and 3RM13 Failsafe) in safety-related applications.

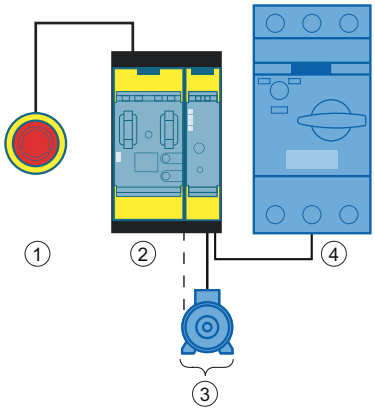
Note

Please observe the information about the control supply voltage and the control inputs in Chapter "Device versions (Page 33)" and in the "Technical Data Sheet (https://support.industry.siemens.com/cs/ww/en/ps/16311/td)."



1 SIRIUS 3SK1 Advanced basic unit
2 SIRIUS 3RM1 Failsafe (3RM11 Failsafe or 3RM13 Failsafe) safety-related motor starters
3 SIRIUS 3RV2 motor starter protector
4 SIRIUS 3SU1 EMERGENCY STOP
5 Motor

Figure 4-9 Configuration with 3SK1 safety relay and device connectors



① SIRIUS 3SU1 EMERGENCY STOP
② 3SK2 safety relay
③ 3RM1 Failsafe motor starter and motor
④ SIRIUS RV2 motor starter protector

Figure 4-10 Configuration with 3SK2 safety relay and device connectors

You will find further information on operation in safety-related applications in the 3SK safety relay manuals, see Chapter "Further documentation (Page 14)." Follow the safety instructions and information contained there.

Reference

You will find more typical circuits in the Appendix "Typical circuits (Page 177)."

Mounting

5

5.1 Warning notices

Warning notices before installation, wiring, and commissioning



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

NOTICE

Damage caused by electrostatic charge

When handling and installing the 3RM1 motor starters, ensure that the components are protected from electrostatic charge. Changes to the system configuration and wiring are only permissible in the voltage-free state.
Connection of 3RM11 / 3RM13 Failsafe motor starters is only permissible when the power supply units (PELV and SELV) are switched off.

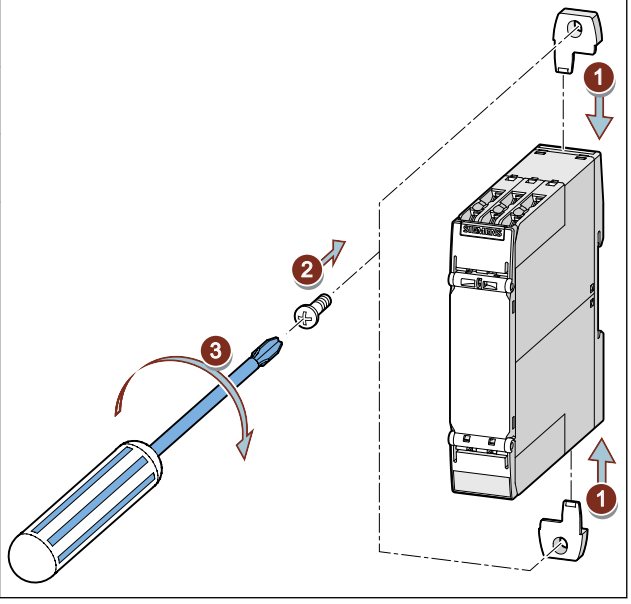
5.2 Mounting the devices on a level surface

Requirements

Please note the following requirements for mounting on a level surface:

- Please observe the information about the mounting position in the chapter "Mounting position (Page 72)".
- Two properly executed drill holes with thread or plug on the level surface
  For details of the distances between the drilled holes, please refer to the relevant dimension drawings in the chapter "Dimension drawings (Page 157)".
- Two screws to fit the holes M4 x 12 in accordance with DIN 784
- Two plastic securing brackets
  Refer to the accessories list for the relevant article number in the chapter "Accessories and article number scheme (Page 55)".

Procedure

Step	Operating instruction	Figure
1	Insert the securing brackets into the openings provided on the device until they engage.	
2	Hold the device up to the level surface prepared for screw fastening.	
3	Insert the screws through the oblong holes in the securing brackets.	
4	Screw the device onto the level surface so that it is secure. Tightening torque: 1 Nm	

5.3 Disassembling the devices from a level surface



DANGER

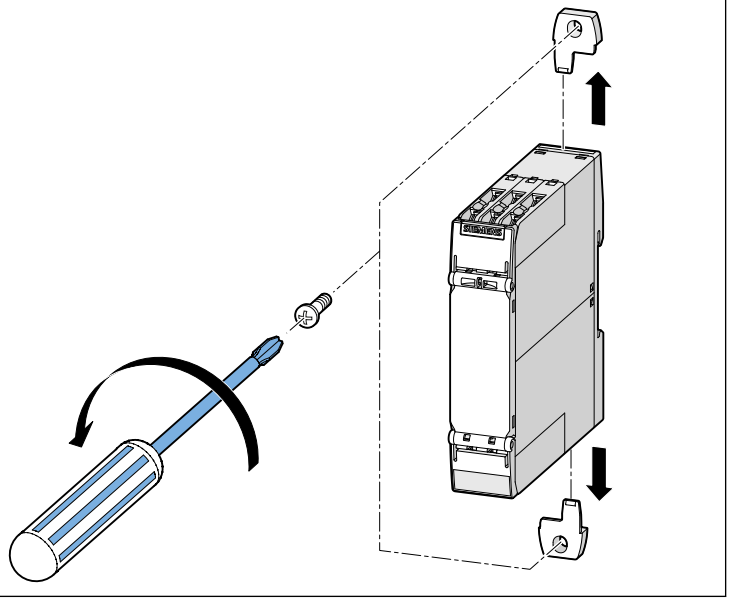
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- The terminals have been removed or disconnected.

Procedure

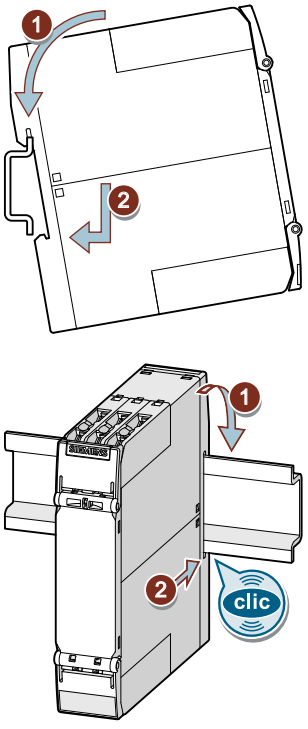
Step	Operating instruction	Figure
1	Hold the device firmly.	
2	Unscrew the cap screws.	
3	Lift the device from the level surface.	
4	Remove the securing brackets from the device.	

5.4 Mounting the devices on a standard mounting rail

Requirements

- At the installation location, a horizontal 35 mm mounting rail in accordance with DIN EN 60715 is properly secured
- Please observe the information about the mounting position in chapter "Mounting position (Page 72)"

Procedure

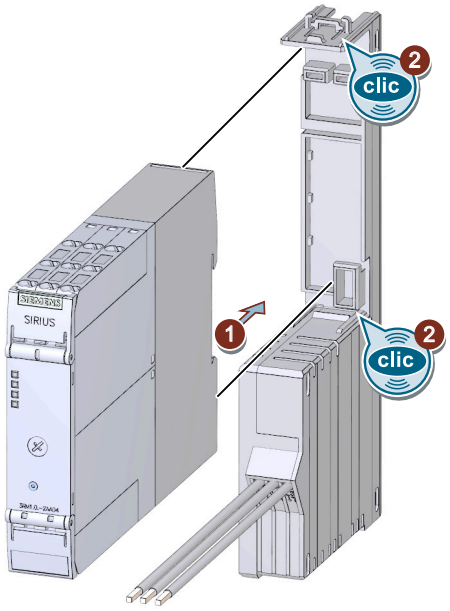
Step	Operating instruction	Figure
1	Hang the back of the device onto the upper edge of the standard mounting rail	
2	Press the lower half of the device against the rail until the device engages	

5.5 Mounting the devices on a fuse module

Requirements

Make sure the rated operational current of the fuses fitted in the module is less than 25 A.

Procedure

Step	Description	Figure
1 and 2	• Push the 3RM1 motor starters into the fuse module until the upper and lower latches on the motor starter enclosure snap into position. • Pull the device gently to check that it is firmly seated.	

5.6 Disassembling devices from a fuse module



DANGER

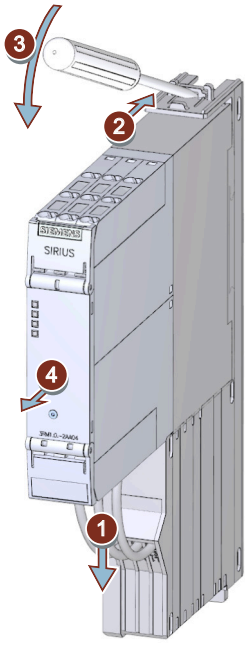
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

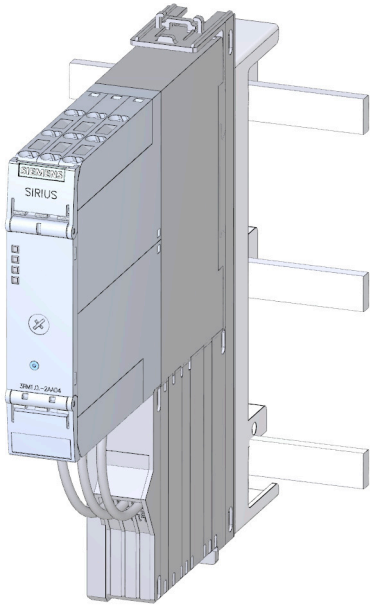
- The fuse module has been removed from the adapter.
- The control circuit terminals have been removed or disconnected.

Procedure

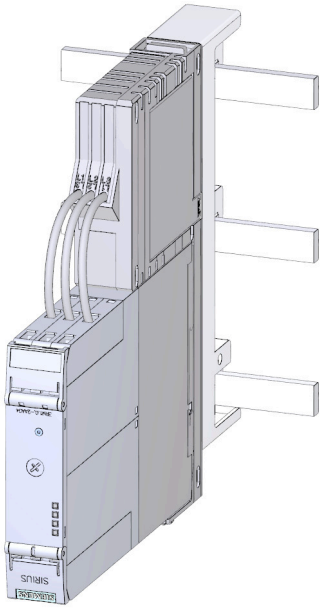
Step	Description	Figure
1	Detach the cables marked L1 to L3.	
2 to 3	Use a screwdriver to unlatch the motor starter at the top.	
4	Pull the 3RM1 motor starter out of the fuse module.	

5.7 Mounting the fuse module

There are two possible mounting positions for the fuse module/motor starter assembly:



Motor feeder at bottom

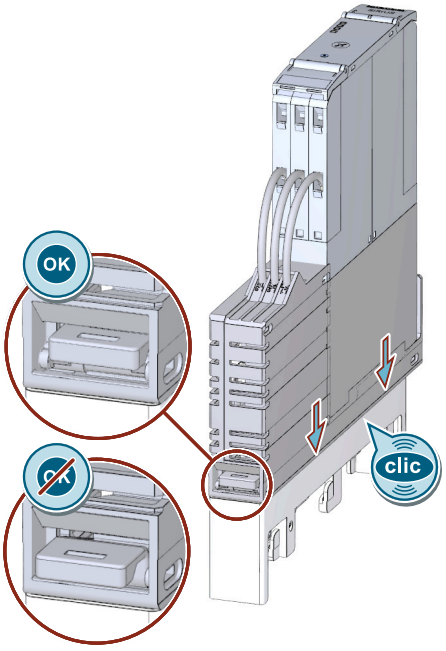


Motor feeder at top

Requirements

- The fuses have been fitted in the fuse module.
- The cover over the fuse compartment is closed.
- The motor starter has been installed and connected up.

Procedure

Step	Description	Figure
1	• Push the fuse module down onto the adapter until it snaps into position. • Check whether the fuse module is securely engaged in the adapter. • Check the lower narrow side of the fuse module to make sure that the plastic lug is not protruding.	

5.8 Dismantling the fuse module



DANGER

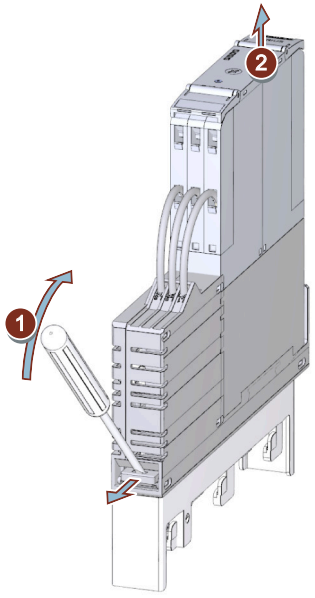
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- The control circuit terminals have been removed or disconnected.

Procedure

Step	Description	Figure
1 and 2	1. Use a screwdriver to press down the plastic lug on the narrow side of the fuse module. 2. Pull the module upwards out of the adapter.	

5.9 Modifying the fuse module to a 1-pole connection

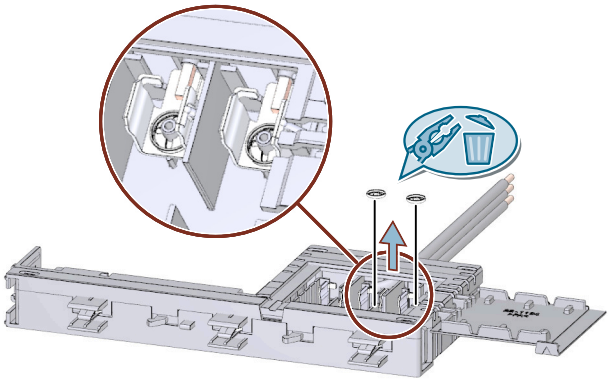
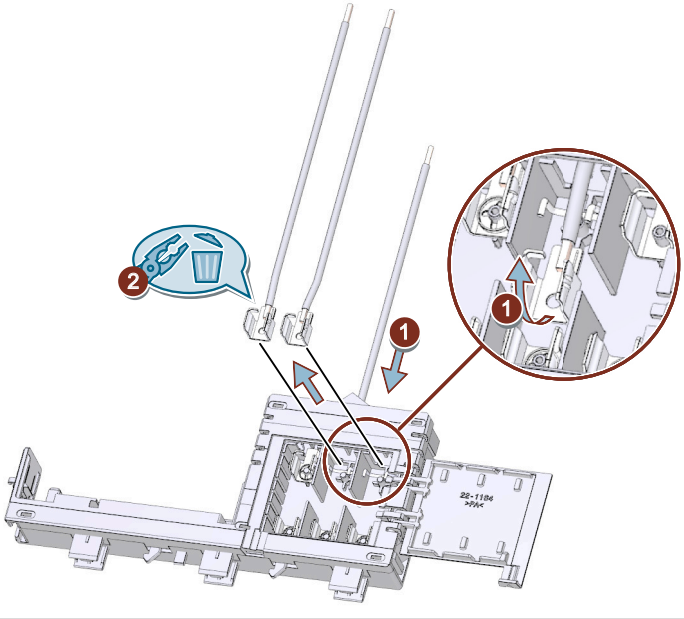
Requirements

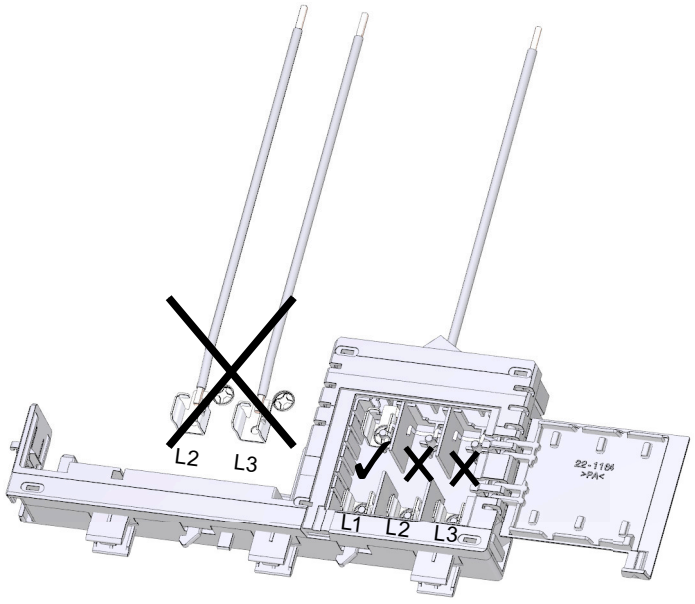
- The fuse module has been detached from the busbar system.
- The fuse compartment is open and the fuses removed from the compartment. "Replacing the fuses in the 3RM19 fuse module (Page 150)"

Procedure

Note

Modify the fuse module before you install it.

Step	Description	Figure
1	Use a pair of pliers to remove the snap rings at phases L2 and L3. • Bottom • Top	
2	1. Pick up each of the fuse holders. 2. Pull each of the leads with the fuse holder facing inwards out of the housing.	

Step	Description	Figure
3	Insert the fuse into the fuse holder at phase 1.	
4	Close the fuse compartment.	
5	Mount the motor starter on the fuse module.	

5.10 Disassembling devices from a standard mounting rail



DANGER

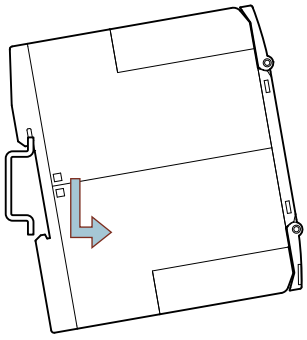
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- The terminals have been removed or disconnected.

Procedure

Step	Operating instruction	Figure
1	Press the device downwards.	
2	Pull the lower half of the device away from the standard mounting rail.	
3	Lift the device from the upper edge of the standard mounting rail.	

5.11 Mounting the devices with device connectors on a standard mounting rail

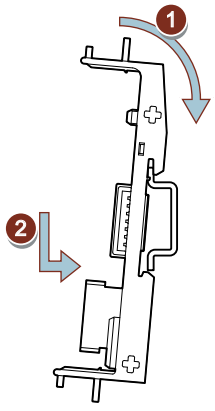
Requirements

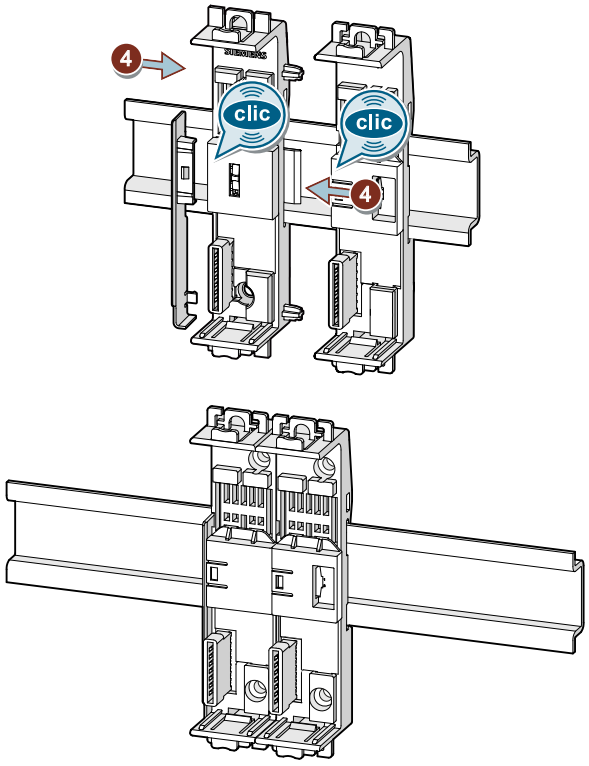
- At the installation location, a horizontal 35 mm mounting rail in accordance with DIN EN 60715 is properly secured
- Please observe the information about the mounting position in chapter "Mounting position (Page 72)"

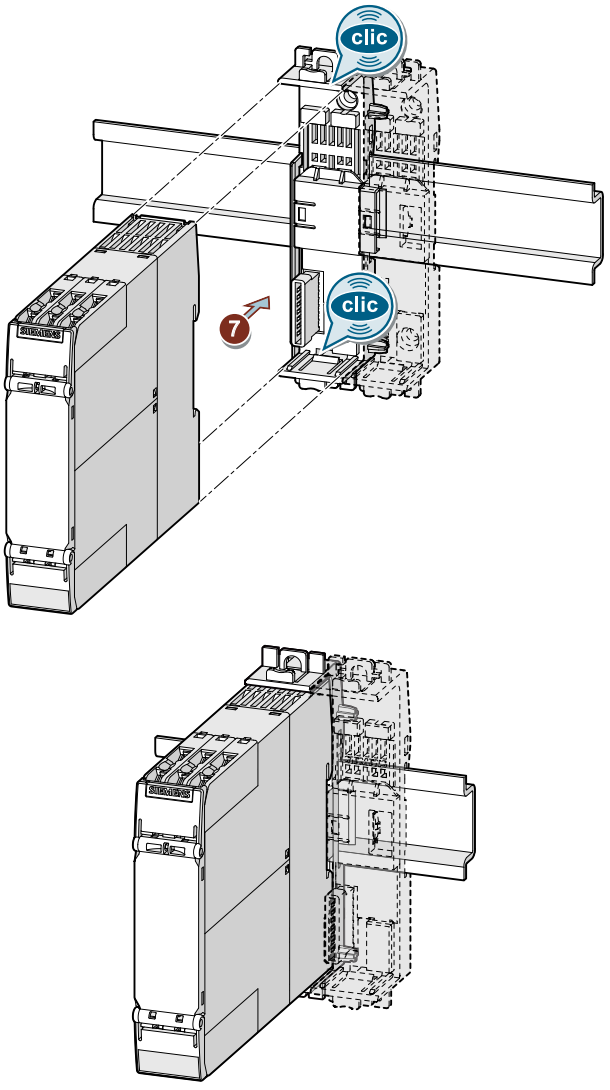
Note

Under more difficult conditions, such as intense vibrations or when mounting onto a vertical DIN rail, it is recommended that an end retainer be fitted at the beginning and the end of the device assembly respectively. The 8WA1808 end retainers, for example, can be used in this regard.

Procedure

Step	Operating instruction	Figure
1	Place the back of the device connector on the upper edge of the standard mounting rail.	
2	Press the lower half of the device connector against the standard mounting rail until it engages.	
3	Repeat the procedure with all the required device connectors.	

Step	Operating instruction	Figure
4	Push the device connectors together until they engage.	
5	Mount the cover on the left on the first device connector in the system configuration. The cover is included in the scope of supply of the device terminator.	

Step	Operating instruction	Figure
6	Mount the device on the device connector.	
7	Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors.	

5.12 Disassembling the devices with device connectors from a standard mounting rail



DANGER

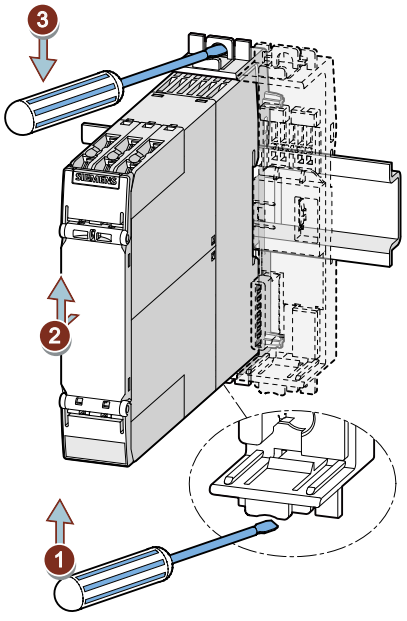
Hazardous voltage.
Will cause death or serious injury.

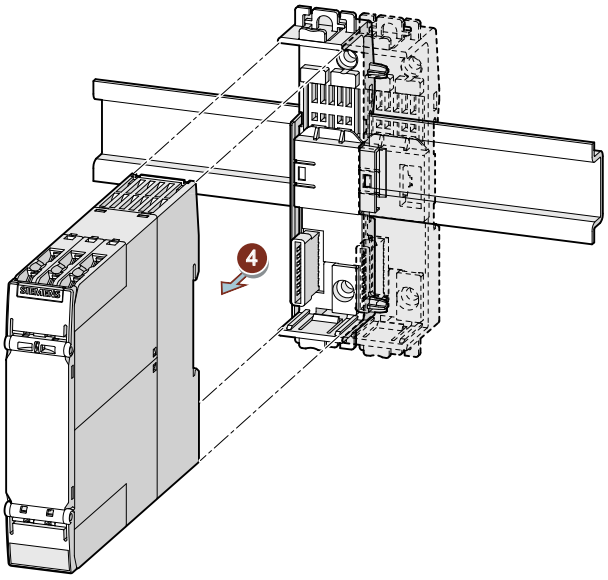
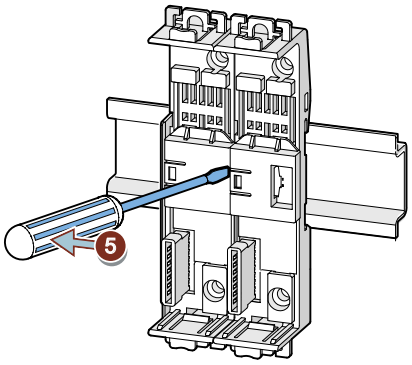
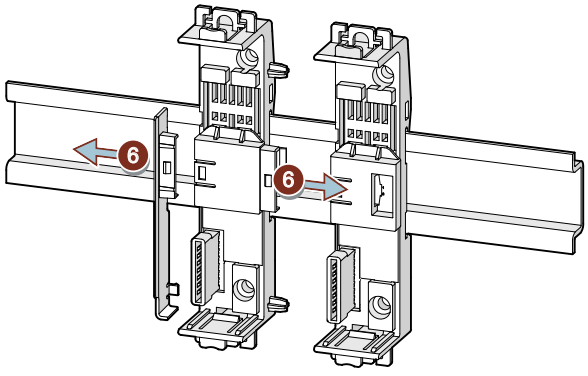
Turn off and lock out all power supplying this device before working on this device.

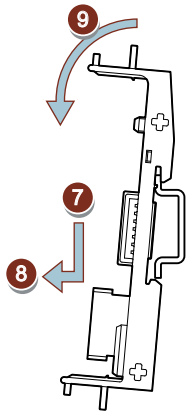
Requirements

- The terminals have been removed or disconnected.

Procedure

Step	Operating instruction	Figure
1	Unlock the device using a screwdriver.	
2	Pull the lower half of the device away from the device connector.	
3	Unlock the device using a screwdriver.	

Step	Operating instruction	Figure
4	Pull the device away from the device connector.	
5	Separate the device connectors using a screwdriver.	
6	Remove the cover to the left of the first device connector.	

Step	Operating instruction	Figure
7	Press the device connector down.	
8	Pull the lower half of the device connector away from the standard mounting rail.	
9	Lift the device connector from the upper edge of the standard mounting rail.	

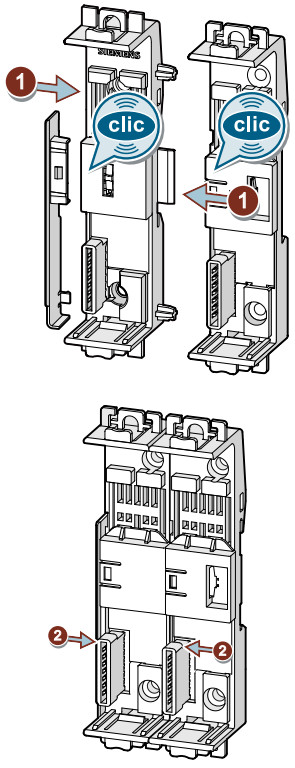
5.13 Mounting the devices with device connectors on a wall

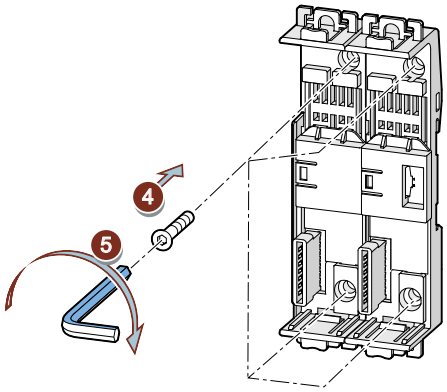
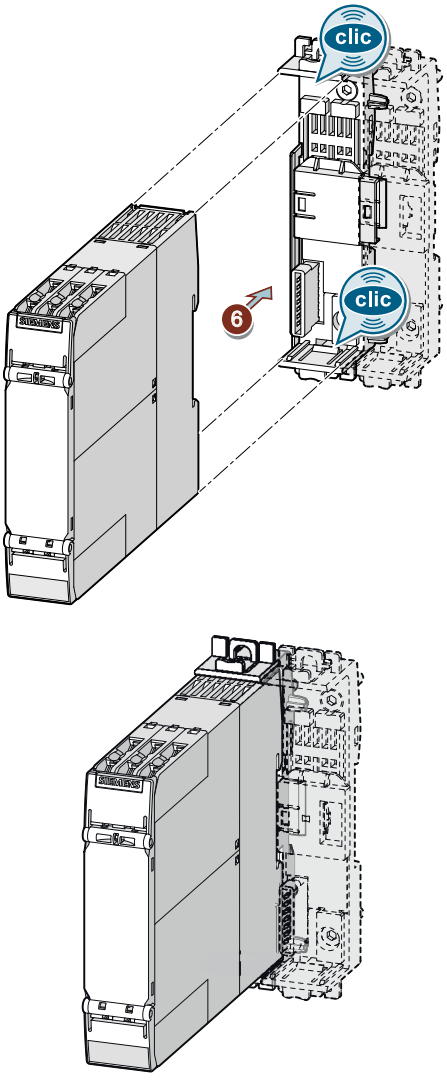
Requirements

Please note the following requirements for mounting on a level surface:

- Please observe the information about the mounting position in the chapter "Mounting position (Page 72)".
- Two properly executed drill holes with thread or plug on the level surface
  For details of the distances between the drilled holes, please refer to the relevant dimension drawings in the chapter "Dimension drawings (Page 157)".
- Two screws to fit the M4 x 12 holes in accordance with DIN 784.
- Device connector
  Refer to the accessories list for the relevant article number in the chapter "Accessories and article number scheme (Page 55)".

Procedure

Step	Operating instruction	Figure
1	Push the device connectors together until they engage.	
2	Mount the cover on the left on the first device connector in the system configuration. The cover is included in the scope of supply of the device terminator.	

Step	Operating instruction	Figure
3	Hold the device connector against the level surface prepared for screw fastening.	
4	Insert the screws through the holes in the device connectors.	
5	Screw the device connector securely onto the level surface. Tightening torques: • Top: < 0.1 Nm • Bottom: 1 Nm	
6	Mount the device on the device connector.	
7	Mount all the devices required for the system configuration in accordance with the respective installation guidelines on the device connectors.	

5.14 Disassembling the devices with device connectors from a wall



DANGER

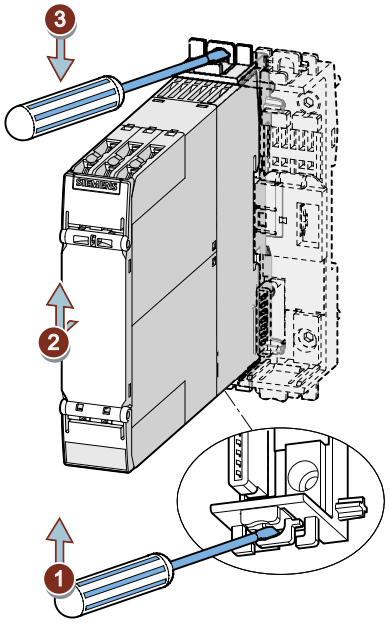
Hazardous voltage.
Will cause death or serious injury.

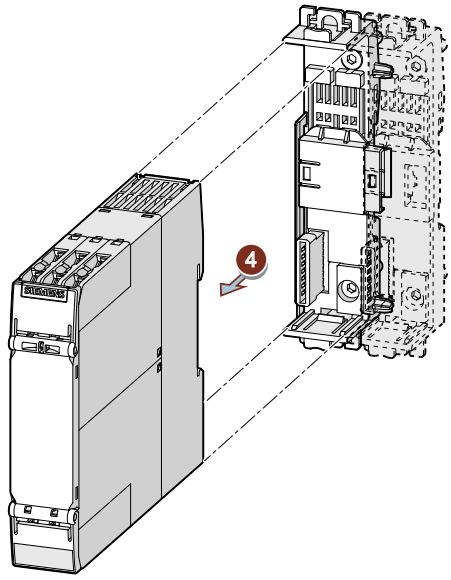
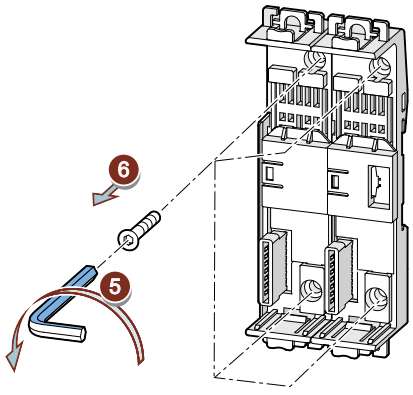
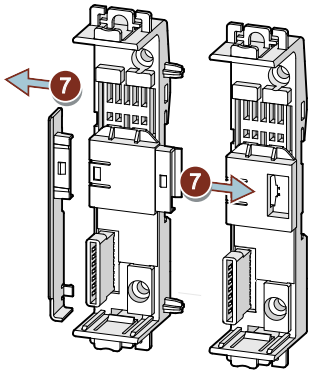
Turn off and lock out all power supplying this device before working on this device.

Requirements

- The terminals have been removed or disconnected.

Procedure

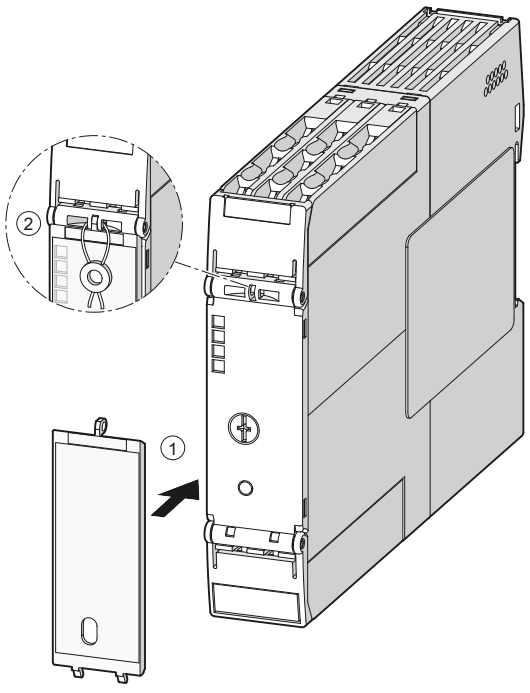
Step	Operating instruction	Figure
1	Unlock the device on the underside using a screwdriver.	
2	Pull the lower half of the device away from the device connector.	
3	Unlock the device on the top using a screwdriver.	

Step	Operating instruction	Figure
4	Pull the device away from the device connector.	
5	Release the screws.	
6	Separate the device connectors.	
7	Remove the cover to the left of the first device connector.	

5.15 Mounting the sealable cover

The sealable cover is used to protect the set rated operational current of the load (current setting I_e) against unauthorized or unintentional manipulation.

Procedure

Step	Operating instruction	Figure
1	Attach the two bottom hooks on the cover to the openings on the device and fold the cover up	
2	Seal the cover to secure it against unauthorized removal.	

Connection

6

6.1 Connecting the screw-type terminals



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

NOTICE

Damage to property due to loss of overvoltage protection if wiring is wrong.

Observe the wiring's terminal assignment:

For optimum response in the event of short circuits and for protection against overvoltages, the main circuit's infeed must be at terminals 1/L1 to 5/L3.

Requirements

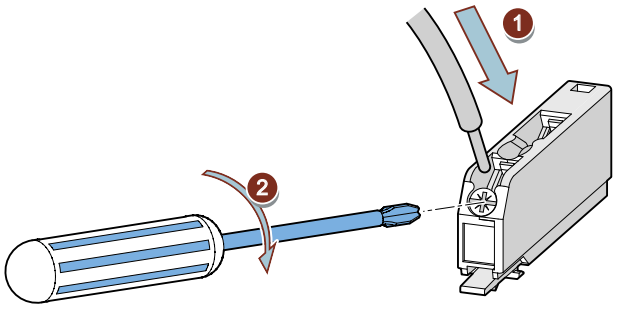
- Cross-tip screwdriver size PZ 1 x 80
- You can find matching conductor cross-sections in the Technical Data Sheet, see chapter Technical specifications (Page 153).

Procedure

⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

To ensure protection against an electric shock hazard with the hinged cover open at the signaling contacts 95, 96, 98 at a voltage of ≥ 50 V, screw in all terminal screws that are not needed to clamp conductors.

Step	Operating instruction	Figure
1	Insert the relevant cable into square on the screw terminal until it engages.	
2	Hold the cable in the screw terminal.	
3	Tighten the screw with a torque of 0.6 to 0.8 Nm.	
4	Pull on the cable to ensure it is screwed tight.	

6.2 Disconnecting the screw-type terminals



DANGER

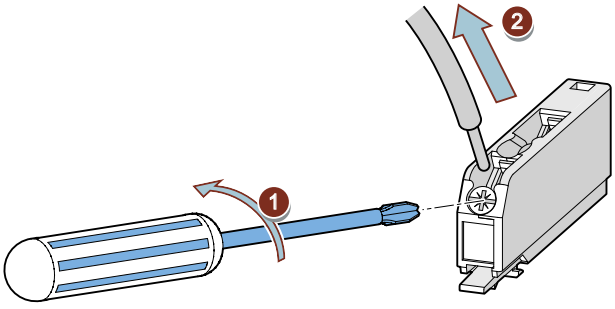
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- Cross-tip screwdriver size PZ 1 x 80

Procedure

Step	Operating instruction	Figure
1	Unscrew the screw of the screw-type terminal.	
2	Remove the cable from the unscrewed screw-type terminal.	

6.3 Connecting the push-in terminals

6.3.1 Wiring rules for spring-loaded terminals (with push-in technology)

Wiring rules for ...		Control current terminals (top of enclosure):	Main current terminals (bottom of enclosure)
Connectable cross-sections for solid cables		2 x 0.5 ... 2 x 1.5 mm²	0.5 ... 4 mm²
		(AWG[1]: 20 ... 16)	AWG[1]: 20 ... 12
Connectable cross-sections for flexible cables	Without end sleeve	2 x 0.5 ... 2 x 1.5 mm²	0.5 ... 4 mm²
		(AWG[1]: 20 ... 16)	AWG[1]: 20 ... 12
	With end sleeve (with and without plastic sleeve)	2 x 0.5 ... 2 x 1.0 mm² [2]	0.5 ... 2.5 mm²
		(AWG[1]: 20 ... 18)	(AWG[1]: 20 ... 14)
	With TWIN end sleeve	---	2 x 0.5 ... 2x1.5 mm²
		---	(AWG[1]: 20 ... 16)
Cable stripping length		10 ... 11 mm	
End sleeves according to DIN 46228-4 with plastic sleeve		10 mm	

[1] AWG: American Wire Gauge (AWG does not define use of end sleeves)

[2] When 2 x 1.0 mm² end sleeves with a plastic sleeve are used, space problems may arise with the sleeves; as an alternative, you are advised to use end sleeves without plastic sleeves

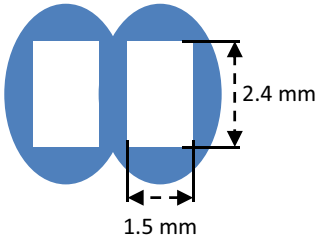
Notes on handling spring-loaded terminals with push-in technology

The terminal area of the spring-loaded terminals is rectangular, and the maximum overall dimensions of a conductor to be wired must not exceed 1.5 x 2.4 mm (control current terminals) or 2.4 x 2.8 mm (main current terminals).

Attention must be paid to the orientation of the terminal area, which may call for vertical fitting of rectangularly crimped cables.
To make optimum use of available terminal area, you are advised to choose a form of crimping that creates a corresponding rectangular contour. Trapezoidal crimping is generally very highly suitable in this case.

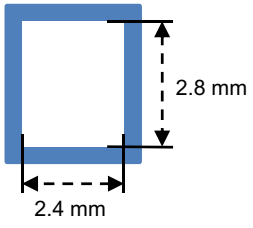
When use is made of a cable that utilizes the full overall height, the terminal's spring is deflected to the maximum. Therefore, removal of this cable may become a problem because it requires further deflection of the spring.

Control current terminals



Terminal area of control current terminals

Main current terminals



Terminal area of main current terminals

6.3.2 Connecting the push-in terminals



DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

NOTICE

Damage to property due to loss of overvoltage protection if wiring is wrong.

Observe the wiring's terminal assignment:

For optimum response in the event of short circuits and for protection against overvoltages, the main circuit's infeed must be at terminals 1/L1 to 5/L3.

Push-in connections are a form of spring-loaded terminals allowing wiring without tools for rigid conductors or conductors equipped with end sleeves.

For wiring finely stranded or stranded conductors without end sleeves on push-in connections, a screwdriver is required.

Requirements

- Screwdriver DIN 5264 of the size 0.5 x 3 mm (for finely-stranded conductors only)
- For suitable connection cross-sections of the cables and notes on end sleeve finishing, see chapter Technical specifications (Page 153).

Procedure

Table 6-1 Rigid conductors or conductors equipped with end sleeves

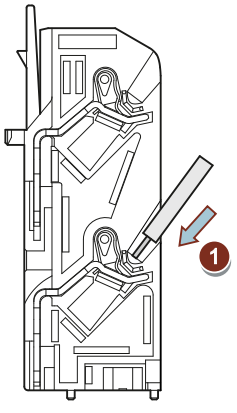
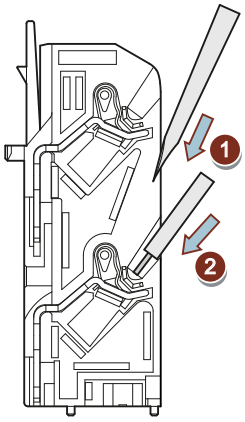
Step	Operating instruction	Figure
1	Insert the cable into the oval opening as far as it will go.	
2	Pull on the cable to ensure it is tight.	

Table 6-2 Finely-stranded conductors

Step	Operating instruction	Figure
1	Insert the screwdriver in the rectangular opening to open the terminal (oval opening).	
2	Insert the cable as far as it will go into the oval opening and remove the screwdriver.	
3	Pull on the cable to ensure it is tight.	

6.4 Disconnecting the push-in terminals



DANGER

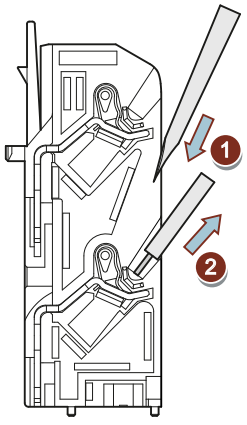
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- Screwdriver DIN 5264 of the size 0.5 x 3 mm

Procedure

Step	Operating instruction	Figure
1	Insert the flat-head screwdriver into the rectangular opening of the spring-loaded terminal until it engages.	
2	Remove the cable from the oval opening.	
3	Remove the screwdriver.	

6.5 Attaching the terminals



DANGER

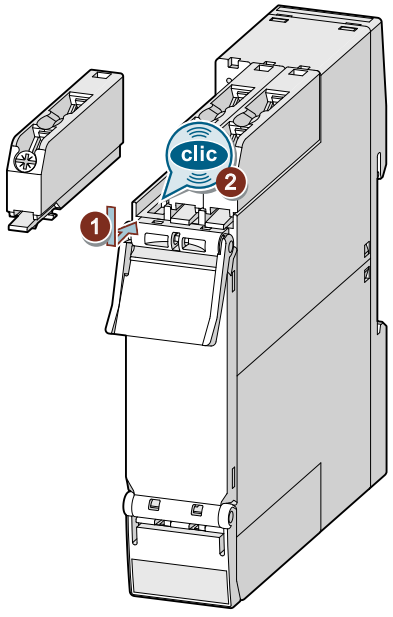
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- You must have removed the terminals, for the purpose of replacing a device, for example.

Procedure

Step	Operating instruction	Figure
1	Insert the terminal into the guide rail of the device.	
2	Slide the terminal back until it audibly engages.	

6.6 Removing the terminals

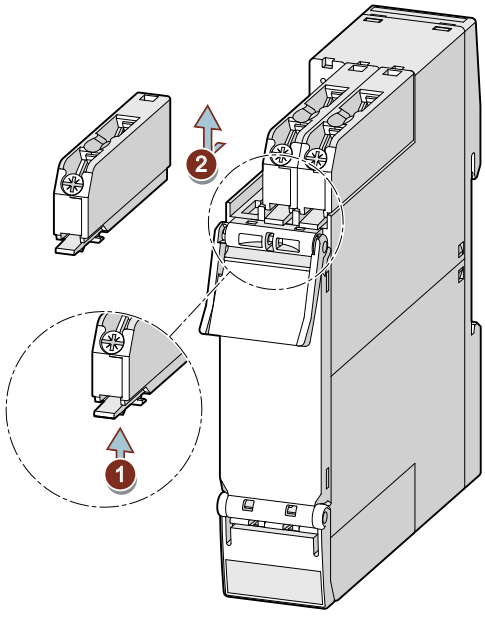


DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Procedure

Step	Operating instruction	Figure
1	Press the clip of the terminal block upwards.	
2	Pull the terminal out to the front.	
3	Lift the terminal out of the guide rail of the device.	

Terminal coding

You can provide the terminals with coding pins (3ZY1440-1AA00). These help you to avoid errors when replacing the terminals.

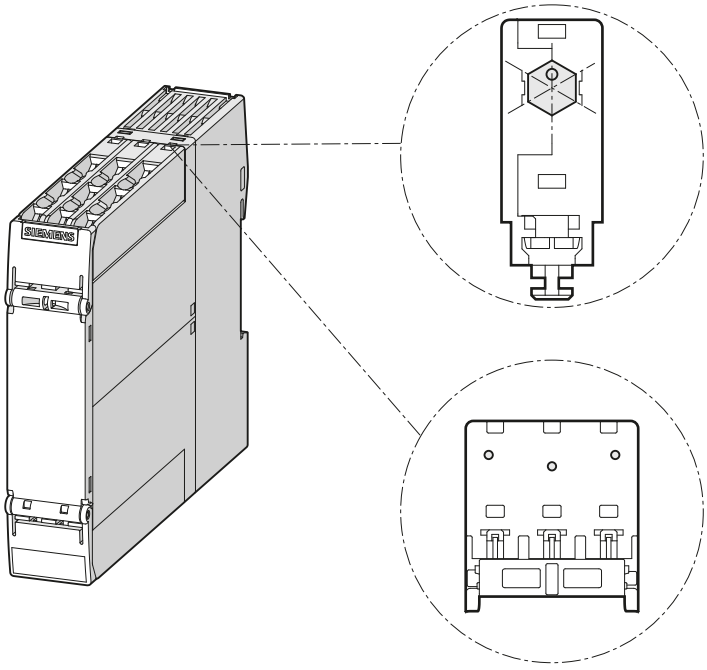


Figure 6-1 Safety with terminal coding

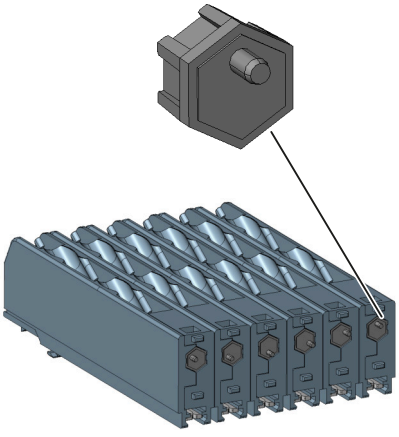


Figure 6-2 Terminal coding

6.7 Connecting the infeed system (option)



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

Please note the following requirements for mounting the 3RM19 infeed system:

- Make sure the rated operational current of the infeed system (IEC: 25 A; UL: 16 A) is not exceeded.
- The 3RM1 motor starters are mounted next to each other on a mounting rail or a level mounting surface.
- The mounting system is only suitable for main current terminals with screw connections.
- Cross-tip screwdriver size PZ 1 x 80
- For suitable connection cross-sections of the cables for the infeed terminal, see the chapter "Technical specifications (Page 153)".

Procedure

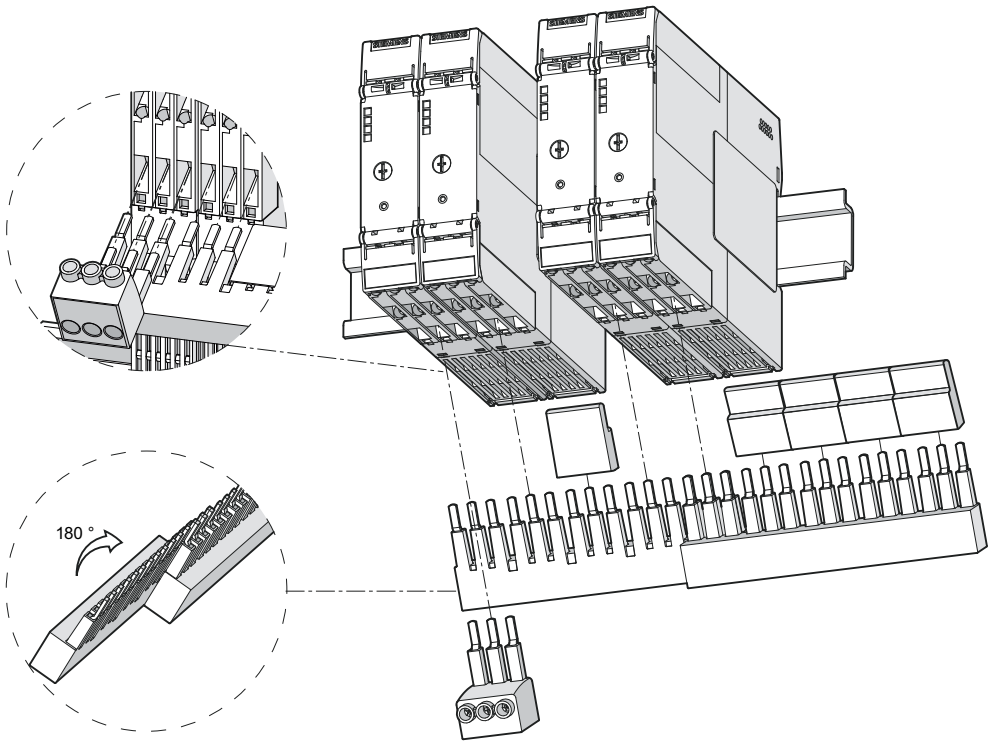


Figure 6-3 Mount the 3RM19 infeed system



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

If free and uncovered terminal lugs are touched when the load voltage is switched on, death or serious physical injury will result.

For this reason, always cover the free terminal lugs (= free slots that are unassigned for thermal reasons, for example) with a cover cap. The cover caps are available as accessories.

Step	Operating instruction
1	Connect the main circuit L1, L2 and L3 to the infeed terminal. Tighten the screw terminals with 0.6 to 0.8 Nm. Pull on the cables to ensure they are screwed tight.
2	Plug the first busbar into the rear screw terminals on the underside of the device. The first three terminal lugs must be assigned here to the first device on the extreme left.
3	Plug the infeed terminal into the screw terminals of the first device together with the busbar from Step 1.

Step	Operating instruction
5	Mount the second busbar rotated through 180°. The first three terminal lugs overlap here with the last three terminal lugs of the first busbar, and are mounted in the same device.
4	Tighten the screw terminals with 0.6 to 0.8 Nm. Pull on the busbars to ensure they are screwed tight.

Note

Third busbar

If you use a third busbar, you must rotate it in the same way as the first busbar, and mount it so that it overlaps the second busbar.

Note

Free slots due to derating

If a clearance is left between the devices for thermal reasons, three terminal lugs (= one slot) must always remain free.

Note

Busbar connection points

A motor starter must be plugged into the connection points of the busbars. Observe this in the case of gaps stipulated for derating purposes, and select appropriate busbars.

6.8 Connecting the fuse module (option)



DANGER

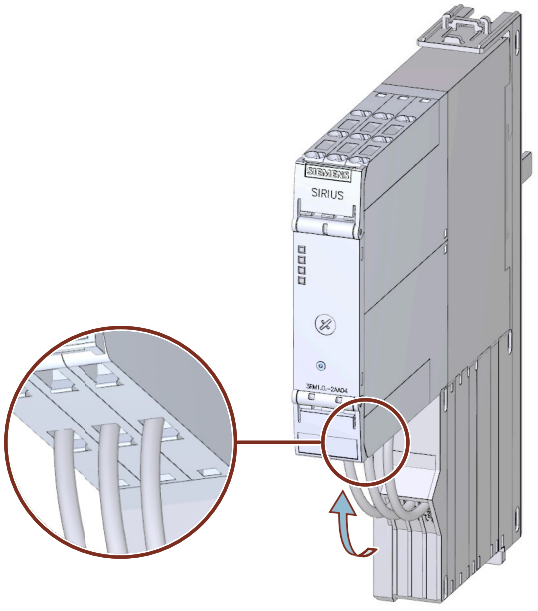
Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

Requirements

- Make sure the rated operational current of the fuses fitted in the module is less than 25 A.

Procedure

Step	Description	Figure
1	Connect the infeed end of the cables marked L1 to L3 at the 3RM1 motor starter using the connection system provided. For further information, see the following chapters: "Connecting the screw-type terminals (Page 121)" "Connecting the push-in terminals (Page 124)"	

Operator control and monitoring

7

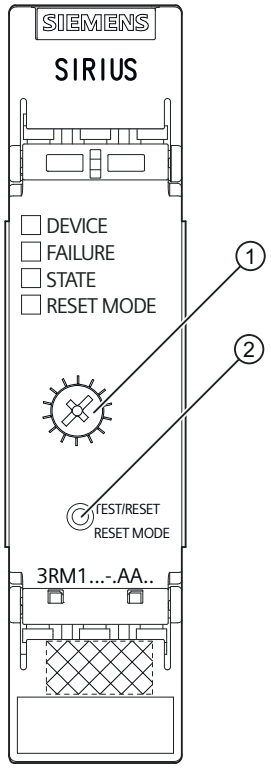
7.1 Operator controls

The following operator controls are available on the 3RM1 motor starter for parameter assignment and operation:

- Rotary coding switch with adjusting scale for current setting "I_e":
  You set the rated operational current of the load "I_e" with the rotary coding switch.
- "TEST/RESET/RESET MODE" button:
  You can start different function tests with the "TEST/RESET/RESET MODE" button. You can find details about this in the section "Carrying out the function test (Page 52)".
  Following an overload trip, the 3RM1 motor starter can be reset using the button after three minutes have elapsed. You can find details about this in the section "Setting the RESET method (Page 137)".

7.1.1 Parameterizing the 3RM1 motor starter

All the settings are made directly at the 3RM1 motor starter:



① Rotary coding switch for rated operational current of the load
② TEST/RESET/RESET MODE button

Figure 7-1 Front view of the 3RM1 motor starter

7.1.2 Setting the rated operational current

Use a screwdriver to set the load's rated operational current (current setting I_e) on the rotary coding switch.

A change takes effect immediately. The sealable cover (accessory) prevents unauthorized access to the rotary coding switch.

Note

If brakes are also to be controlled by the motor starter in addition to the motor, the braking currents are also to be considered when setting the rated operational current.

7.1.3 Setting the RESET method

On the 3RM1 motor starter, you can select either manual RESET or auto RESET for resetting following an overload trip.

Manual RESET

After an overload trip, reset the 3RM1 motor starter manually after a cooling time of three minutes using the "TEST/RESET/RESET MODE" button. As an alternative, in the case of the 3RM10/3RM12 Standard motor starters, you can use the RESET control input IN3 for acknowledgment.

Note

Resetting Failsafe motor starters via a controller (remote reset)

Set the motor starter to the auto-reset function. Read in the error message in the event of an error and reset the inputs. When the cooling time of 3 minutes has expired, the motor starter is automatically reset and is ready for the next start.

Auto RESET

After an overload trip, the 3RM1 motor starter is reset automatically after a cooling time of three minutes.

⚠ WARNING

Automatic restart following reset.
Can cause death or serious injury.

If the DEVICE LED shows a yellow light and the FAILURE LED a red light, and a manual RESET or auto RESET takes place following an overload trip, the machine starts up immediately if there is a control command at IN1/IN2. Personnel in the danger area can be injured.

Make sure that the danger area of the machine is kept clear of people.

Note

Restriction in the hazardous area

In applications for the protection of motors in hazardous areas, a 3RM11 / 3RM13 Failsafe motor starter may only be operated with the "Manual RESET" setting. The "RESET Mode" LED must be off.

Procedure

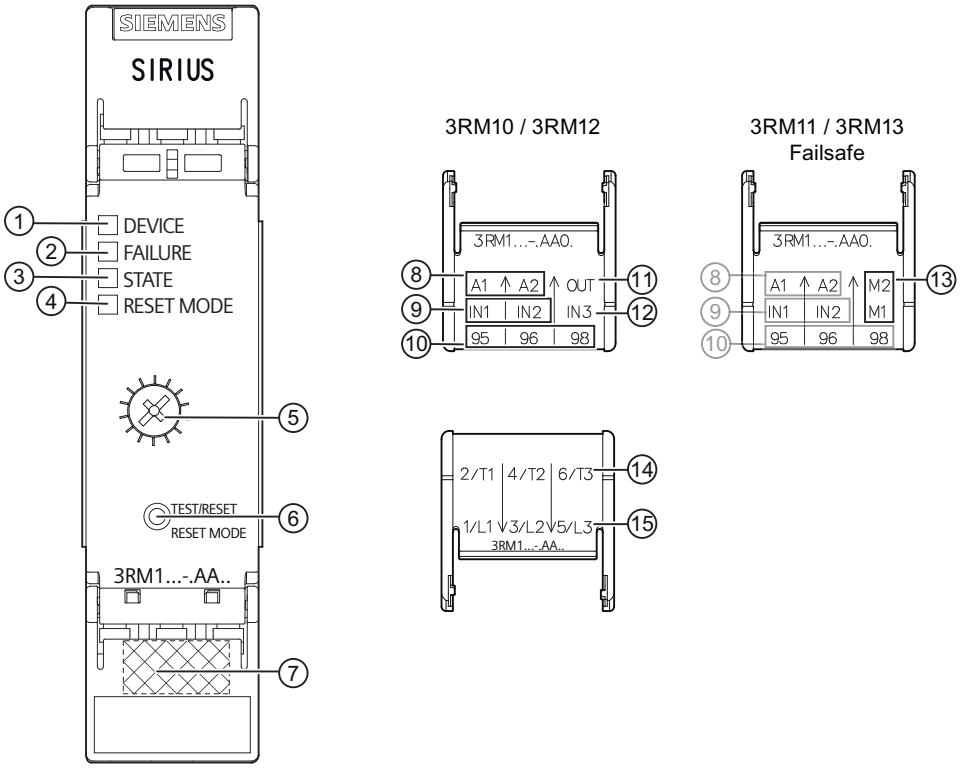
When it is delivered, the 3RM1 motor starter is set to manual RESET. You can change the setting as follows:

1. Press the "TEST/RESET/RESET MODE" button and hold it down. Switch on the supply voltage via A1-A2.
2. The set RESET method is changed to the other RESET method.
   - "RESET MODE" LED lit: Auto RESET selected
   - "RESET MODE" LED not lit: Manual RESET selected

Note

Briefly switching the supply voltage off and on again does not shorten the cooling time and there is no automatic acknowledgment.

7.2 Displays and location of the connections



① LED DEVICE (red/green/yellow)
② LED FAILURE (red)
③ LED STATE (green)
④ LED RESET MODE (green)
⑤ Rotary coding switch for the rated operational current "I_e" of the load
⑥ TEST/RESET/RESET MODE button
⑦ Data matrix code for unique identification of the 3RM1 motor starter
⑧ Control circuit control supply voltage (A1, A2)
⑨ Control circuit start input direction of rotation 1 (IN1) and start input direction of rotation 2 (IN2; on 3RM12 and 3RM13 reversing starters only)
⑩ Control circuit fault signaling output (95,96,98)
⑪ Control circuit signaling output OUT (only on Standard motor starters with 24 V DC rated control voltage) 3RM10 .-...0. and 3RM12.-...0.)
⑫ Control circuit RESET input (IN3) in the case of 3RM10/3RM12 Standard motor starters
⑬ Ground inputs (M1, M2) in the case of Failsafe motor starters with a 24 V DC control supply voltage (3RM11.-...0. and 3RM13.-...0.); M2 only in the case of Failsafe reversing starters with a 24 V DC control supply voltage (3RM13.-...0.)
⑭ Main circuit outgoing load feeder (T1, T2, T3)
⑮ Main circuit infeed (L1, L2, L3)

Figure 7-2 Front elements of the 3RM1 motor starter

Location of the connections

The terminal covers for the control and main circuit are labeled on the inside with the designations of the relevant terminals. The position of the label corresponds to the position of the respective terminal.

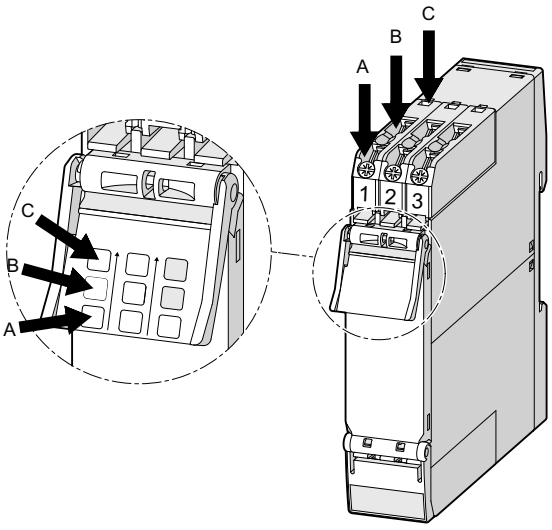


Figure 7-3 Upper terminal cover

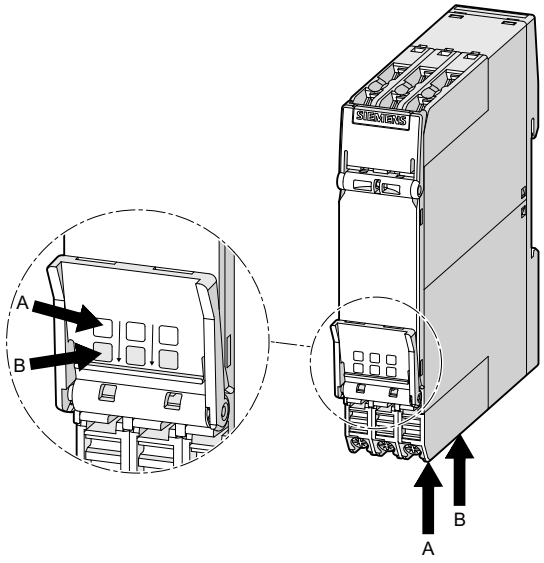
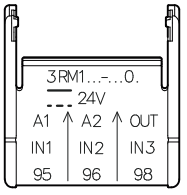
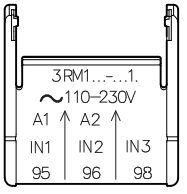
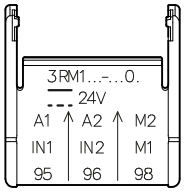
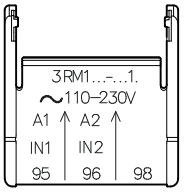
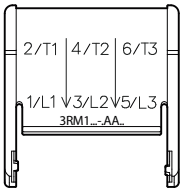


Figure 7-4 Lower terminal cover

Terminal cover

Depending on the version of the 3RM1 motor starter, the device will have the following connections:

Motor starter version		Inscription of the terminal cover
Control circuit (at the top of the device)		
Standard	• **24 V DC** • 3RM10.-...0. direct-on-line starter (IN1) • 3RM12.-...0. reversing starter. (IN1 and IN2)	 *)
	• **110-230 V AC/110 V DC** • 3RM10.-...1. direct-on-line starter (IN1) • 3RM12.-...1. reversing starter. (IN1 and IN2)	 *)
Failsafe	• **24 V DC** • Direct-on-line starter (3RM11.-...0.) (IN1, M1) • Reversing starter (3RM13.-...0.) (IN1 and IN2, M1 and M2)	 *) **)
	• **110-230 V AC/110 V DC** • 3RM11.-...1. direct-on-line starter (IN1) • 3RM13.-...1. reversing starter (IN1 and IN2)	 *)
Main circuit (at the bottom of the device)		
All motor starters	**All motor starters**	

*) IN2 for reversing starters only (3RM12 and 3RM13)

**) M2 for failsafe reversing starter only (3RM13)

7.2.1 Alarms, faults and system events

7.2.1.1 LEDs

The 3RM1 motor starter provides device status information via four LEDs:

LED	Displayable colors
DEVICE	Red/green/yellow
FAILURE	Red
STATE	Green
RESET MODE	Green

7.2.1.2 Status indicators of the 3RM1 motor starter

The 3RM1 motor starter indicates the status messages for operation, fault and test via the LEDs:

Operation

LED				Fault signaling output	Reaction of feedback circuit	Device status / operating mode
DEVICE	FAILURE	STATE	RESET MODE			
Green	Off	Off	Green/off*	-	-	• Control supply voltage (A1, A2) present; • Motor off; • No fault
Green	Off	Green	Green/off*	-	-	• Motor on; • No fault
X	X	X	Green	-	-	RESET MODE: Automatic
X	X	X	Off	-	-	RESET MODE: Manual

X = LED status not relevant; * = depending on the selected RESET MODE

Fault

LED				Fault signaling output	Reaction of feedback circuit	Possible cause/corrective measure
DEVICE	**FAILURE**	**STATE**	**RESET MODE**			
Yellow	Red	Off	Green/off*	Active	-	• Overload trip motor protection • Motor blocks during starting or operation
Flashing yellow	Red	Off	Green/off*	Active	-	• No current flow despite ON command: Check whether the connected load fulfills the minimum current (Page 77). • Phase failure: Check whether all three phases are applied.
Flashing red	Red	Off	Green/off*	Active	Active	Malfunction: For information about correcting faults, please refer to the section "Fault rectification (Page 144)".

* = depending on the selected RESET MODE

Note

Difference between Standard and Failsafe

3RM11 Failsafe and 3RM13 Failsafe motor starters signal a phase failure immediately on switch-on.

3RM10 and 3RM12 Standard motor starters signal a phase failure after 5 s.

Test

LED				Fault signaling output	Reaction of feedback circuit	Device status / operating mode	
DEVICE	**FAILURE**	**STATE**	**RESET MODE**				
Yellow	Red	Green	Green			Self-test: Indicator test	2 s
Flickering red						Current flow test: Current not flowing	3 s
Flashing red						Current flow test: Current flowing	
Illuminated yellow	Red	Off	Off	Active		Self-test: Overload tripping	>5 s
Flashing red	Red	Off	Off	Active	Active	Overload trip failed	

7.2.1.3 Signaling faults on external I/O

Fault signaling output

Faults are signaled via relay outputs as well as via the LEDs.

In the event of a fault, the fault signaling output becomes active, contact (95-98) closes and contact (95-96) opens. The fault signaling output resumes its original state (contact 95-98 open, contact 95-96 closed) when there are no faults and the control supply voltage is not present.

The faults that result in pick-up of the relays are listed in the chapter "Status indicators of the 3RM1 motor starter (Page 142)".

Note

Behavior in the event of a safety-related shutdown

The fault signaling output resumes its original state in the event of a safety-related shutdown via the control supply voltage.

Feedback output

The Standard motor starters with a control voltage of 24 V DC (3RM10..-.AA0. and 3RM12..-.AA0.) have a feedback output (OUT Run) referred to M (A2) that outputs a high level when the motor is in operation. Since the current flow is not monitored in the first five seconds after switching on the device, the feedback output outputs the high level at least for this time.

The output is non-floating and can be loaded with up to one control input of a PLC. The maximum continuous current of the output is 15 mA.

The safety-related motor starters (3RM11 Failsafe/3RM13 Failsafe) and the Standard motor starters (3RM10/3RM12) with a control voltage of 110 to 230 V/110 V DC (3RM1...-.AA1.) do not have a feedback output.

7.2.1.4 Fault rectification

Malfunction

A malfunction (Page 49) is acknowledged by switching the control supply voltage back on and then pressing the "TEST/RESET/RESET MODE" pushbutton.

The following malfunctions can occur:

- Damage to the power semiconductors
- Damage to the relay contacts
- Faults in the control electronics

⚠ WARNING

Loss of the safety function.
Can cause death or serious injury.

Check the safety function after acknowledging a disruption in the case of 3RM11/3RM13 Failsafe motor starters.

Note

If a malfunction is repeatedly indicated, the 3RM1 motor starter is defective and must be replaced.

Other faults

You acknowledge all other faults using the "TEST/RESET/RESET MODE" button. As an alternative, in the case of the 3RM10/3RM12 Standard motor starters, you can use the RESET control input IN3 for acknowledgment. You will find information about setting the reset method in the chapter Setting the RESET method (Page 137).

Note

If the possible fault causes have been rectified and resetting is still not possible, the 3RM1 motor starter must be replaced.

Service and maintenance

8

8.1 Maintenance and service

The 3RM1 motor starters and accessories are maintenance-free.

The motor starter indicates a detected malfunction with LEDs and the fault output.

Note

If a malfunction is repeatedly indicated, the 3RM1 motor starter is defective and must be replaced.

You will find information about the status indicators of the 3RM1 motor starter in the chapter Alarms, faults and system events (Page 142).

8.2 Test interval for safety-related applications

⚠ WARNING

Loss of the safety function

In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

Annual function test

- Actuate the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Activate the safety relay via the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Defective devices must be replaced.

8.3 Device replacement



DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

When replacing a device, you do not need to re-wire it. The terminals can be disconnected from the defective device and then connected to the new device.

Replace device

WARNING

Loss of the safety function through changes to the system.
Can cause death or serious injury.

To ensure the safety of the system, a complete function test on the system must be conducted and successfully completed following any modifications to the system or replacement of defective components, such as 3RM11 and 3RM13 Failsafe motor starters.

Note

A defective device must only be replaced with a device that has exactly the same article number.

1. Disconnect the defective device at the terminals.
2. Remove the defective device.
3. Mount the new device.
4. Connect the new device at the terminals.

You can find more information on disassembling/mounting and disconnecting/connecting in the chapters "Mounting (Page 97)" and "Connection (Page 121)".

8.4 Replacing the fuses in the 3RM19 fuse module

Requirements

- The motor is switched off.

Procedure



⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

Turn off and lock out all power supplying this device before working on this device.

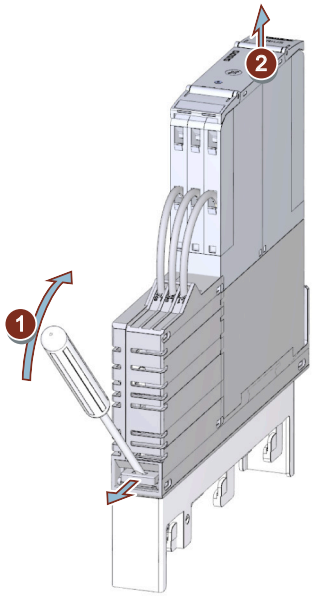
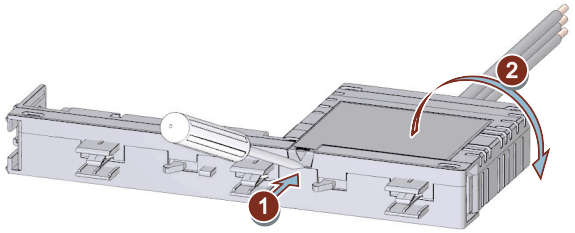
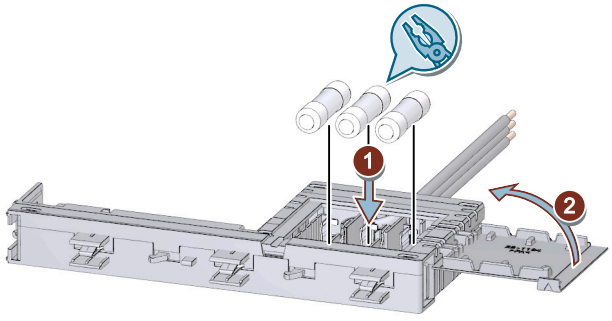
Note

A defective device must only be replaced with a device that has exactly the same article number.

Note

Example involving replacement of motor starter

The example described here involves replacement of the motor starter. If the motor starter has appropriate fuse protection, it might be fully functional and need not necessarily be replaced.

Step	Operating instruction	Figure
1	Remove the 3RM19 fuse module from the adapter. 1. Use a screwdriver to press down the plastic lug on the narrow side of the module. 2. Pull the module out of the adapter. 3. Disconnect the motor starter and take it out of the fuse module.	
2	Turn the module onto its side so that the cover of the fuse compartment is facing upwards. 1. Use a screwdriver to lift up the locking device on the fuse compartment. 2. Open the flap of the fuse compartment.	
3	1. Use a pair of pliers to remove the defective fuses from the fuse compartment. Use a pair of pliers to insert new fuses of an identical type. 2. Close the fuse compartment. 3. Install and connect up the motor starter again. 4. Place the fuse module on the adapter again.	

For further information about dismantling and installation procedures, see the following chapters:

- "Disassembling devices from a fuse module (Page 102)"
- "Dismantling the fuse module (Page 105)".
- "Mounting the fuse module (Page 103)"
- "Mounting the devices on a fuse module (Page 101)"

For further information about connection and disconnection procedures, see chapter "Connecting the fuse module (option) (Page 134)".

9 Technical data

9.1 Technical specifications in the Siemens SiePortal

Technical data sheet

You can find the technical specifications for the product in Siemens SiePortal (https://support.industry.siemens.com/cs/ww/en/ps/16311/td).

1. Enter the article number of the desired device in the "Products" field.
2. Click the "Technical specifications" link in the result.

Overview tables technical data

You will find overview tables with technical data in the "Product information" tab in our online ordering system (https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10143170?tree=CatalogTree#Technische Daten).

9.2 Overload protection/device protection characteristic

Overload protection

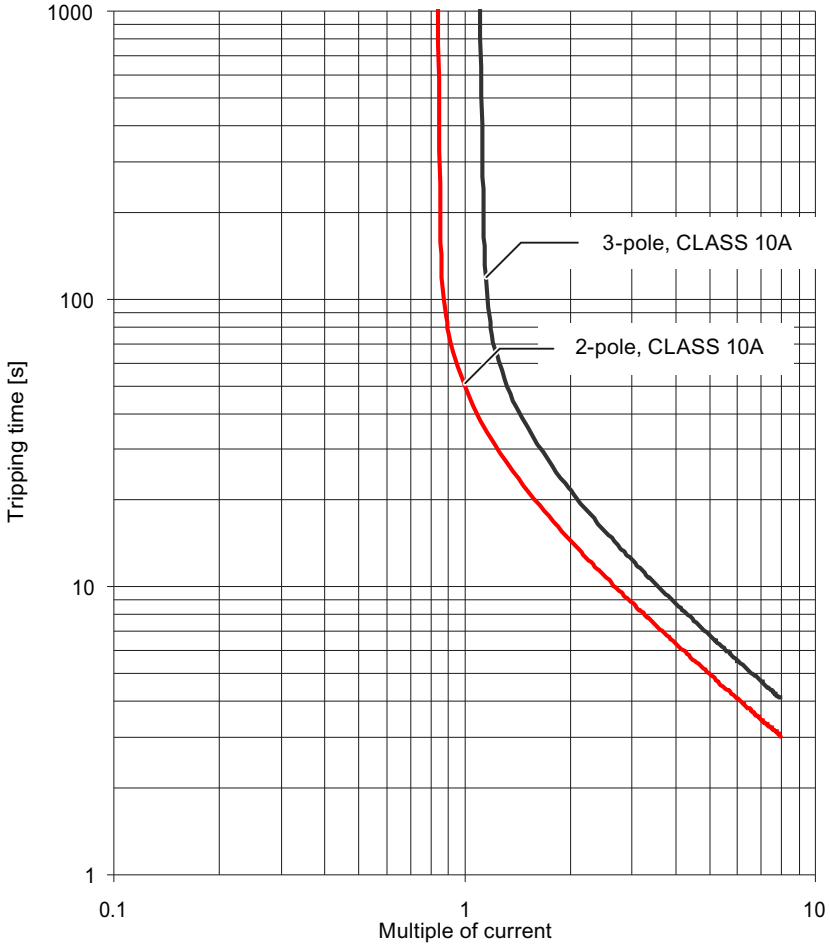
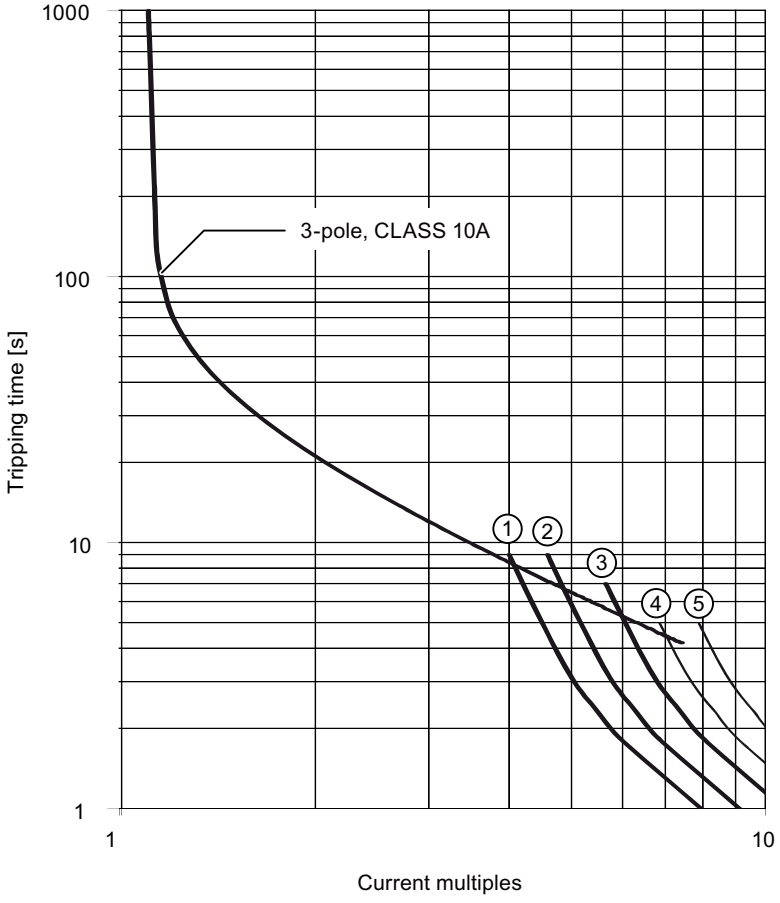


Figure 9-1 Motor overload protection characteristic

Device protection against overload trips at current setting values from 4.6 A. This results in shorter tripping times; see figure below.

Equipment protection

In addition to the motor protection function, the 3RM1 motor starters also protect themselves against overload. This means that in the case of 3RM1 motor starters with a rated operational current of 7 A, an overload trip may occur in the upper current range before the motor protection trips. If, for example, 8-fold current flows in the case of an unloaded motor memory model and a set current of 7 A, tripping takes place after approximately one second.



① Device protection 7 A
② Device protection 6.1 A
③ Device protection 5.2 A
④ Device protection 4.6 A
⑤ Device protection 4.0 A

Figure 9-2 Device protection characteristic

Resistive loads

The tripping characteristic shown does not apply for resistive loads at a setting value of 10 A.

In this case, tripping takes place as follows:

Table 9-1 Tripping for resistive loads at a setting value of 10 A

	Tripping after
10 A < load current < 15 A	20 s
Load current > 15 A	1 s

10 Dimension drawings

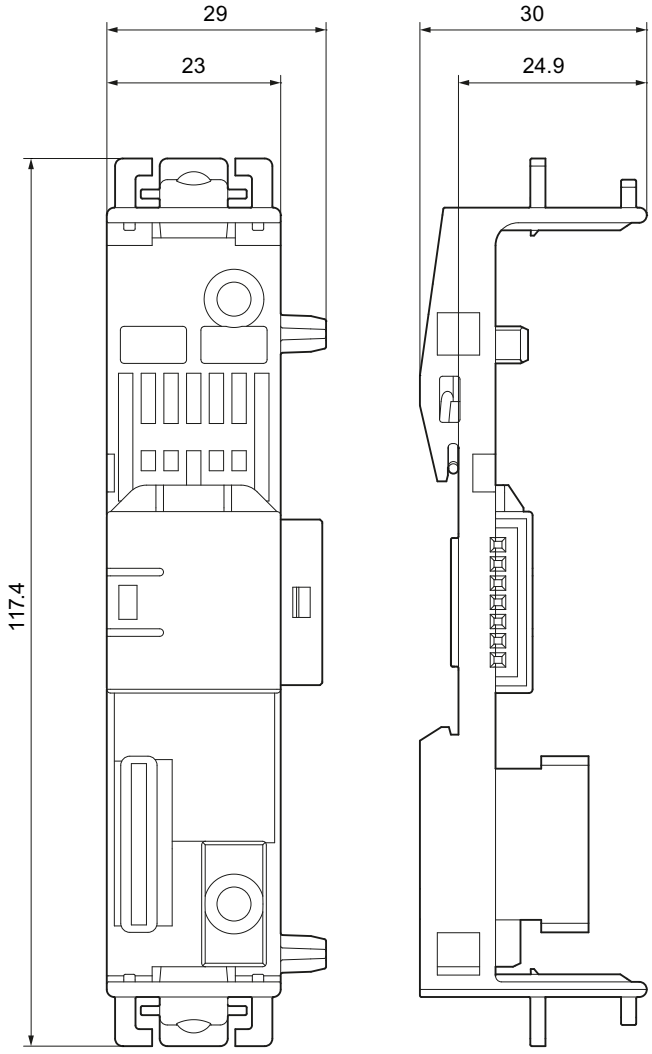
10.1 CAx data in the Siemens SiePortal

You can find CAx data for the product in the SiePortal (https://support.industry.siemens.com/cs/ww/en/ps/).

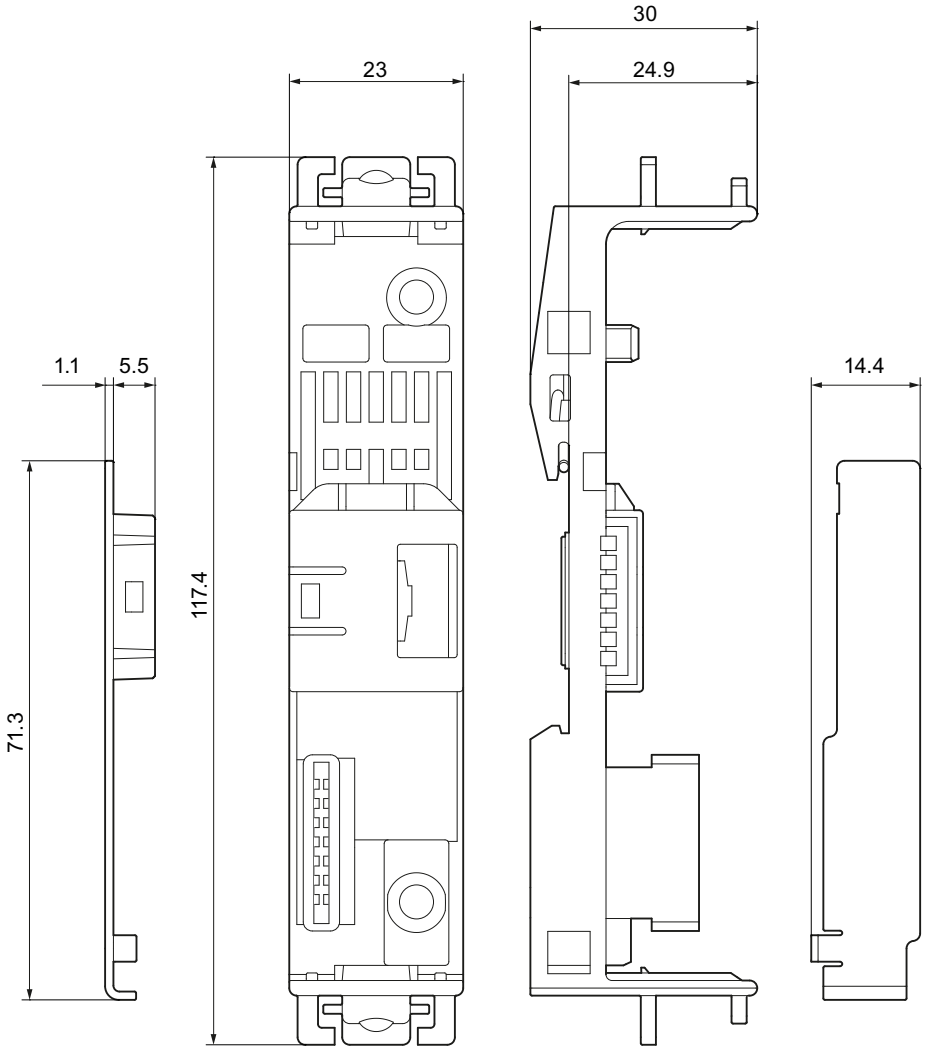
1. Enter the article number of the desired device in the "Products" field.
2. Click the "CAx data" link in the result.

10.2 Dimension drawings for 3RM1 device connectors

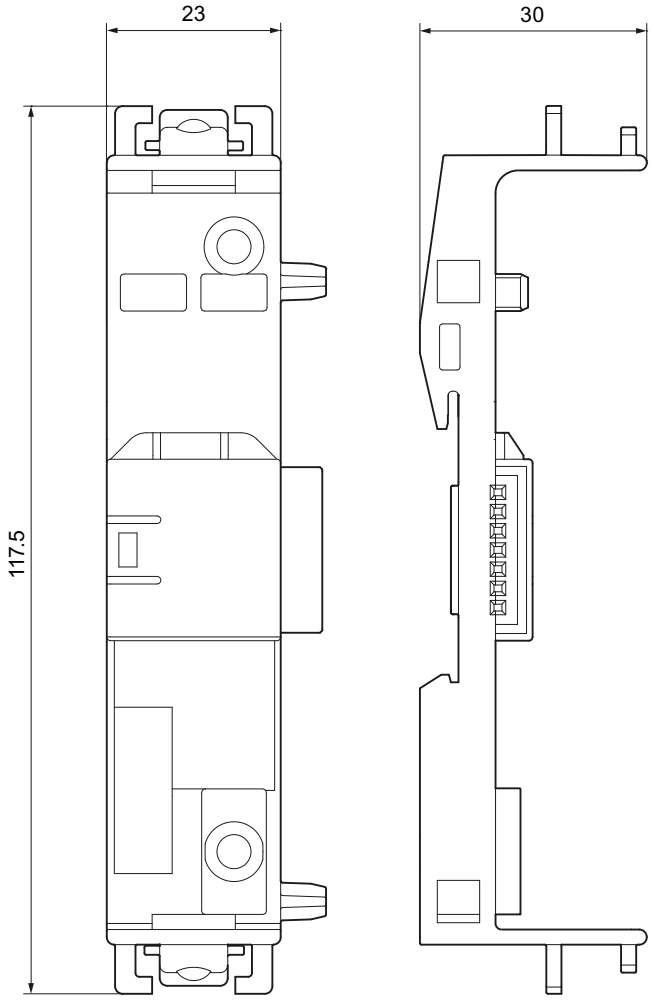
Dimension drawing of device connectors for 3RM1 motor starter



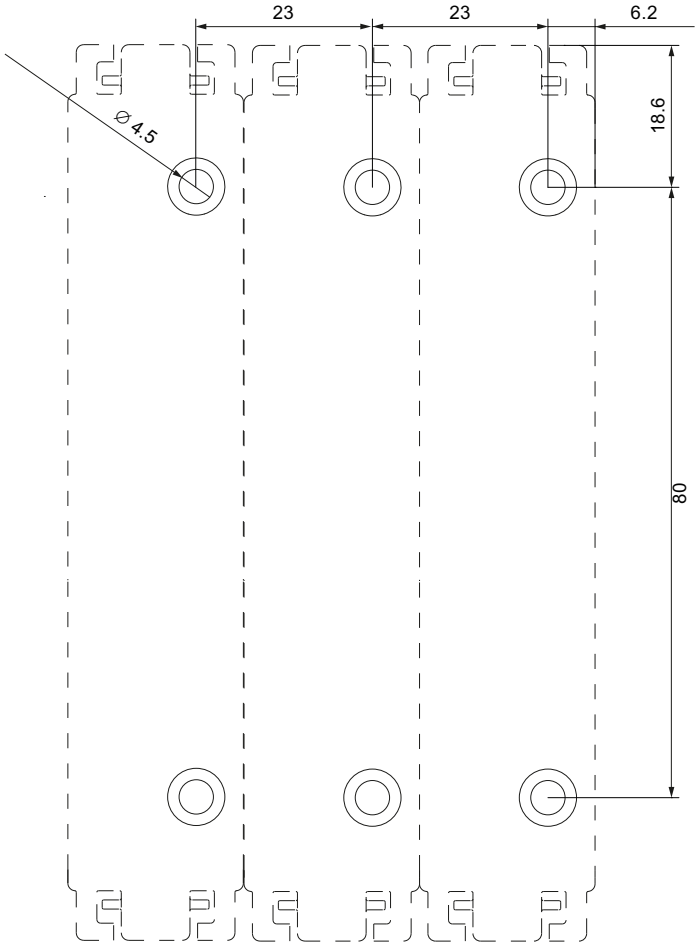
Dimension drawing of device termination connectors for 3RM1 motor starter



Dimension drawing of device connectors for signal loop-through

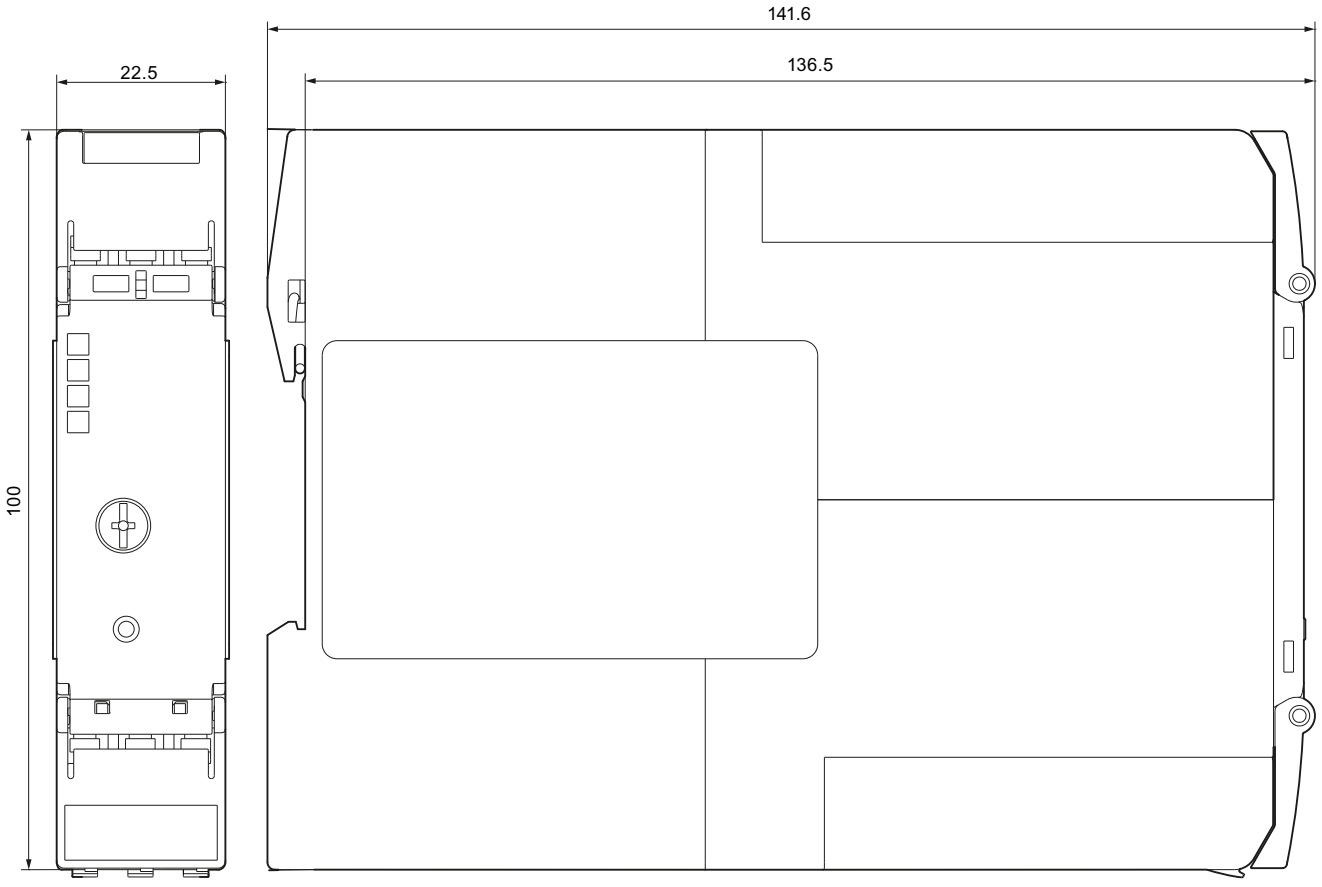


Drilling diagram for device connectors with 22 mm width

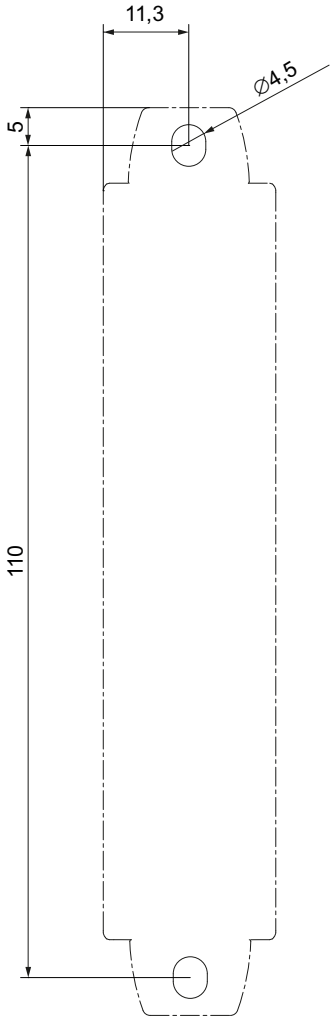


10.3 3RM1 dimension drawings

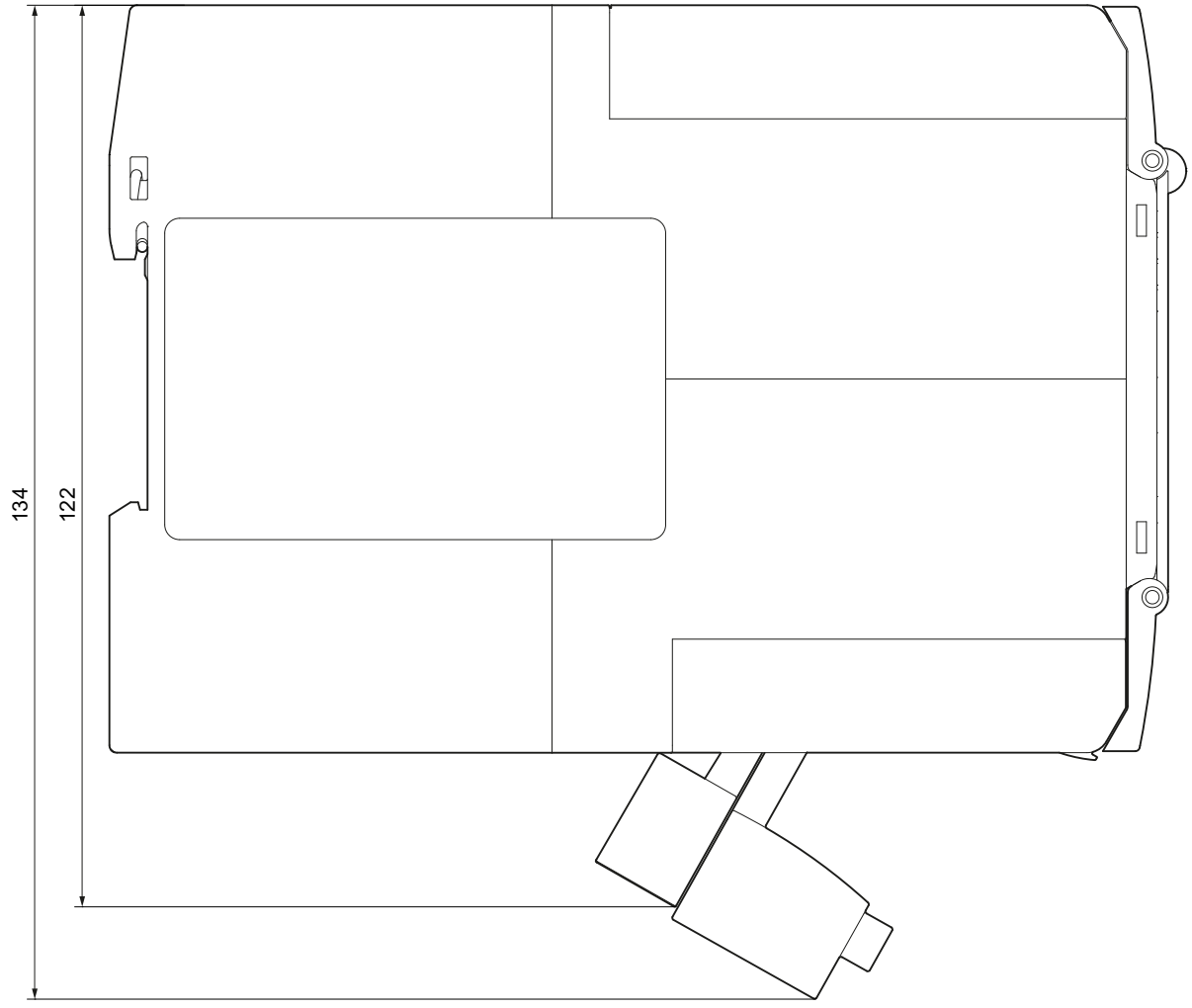
Dimension drawing for 3RM1 motor starter



Drilling diagram for push-in lugs for wall mounting

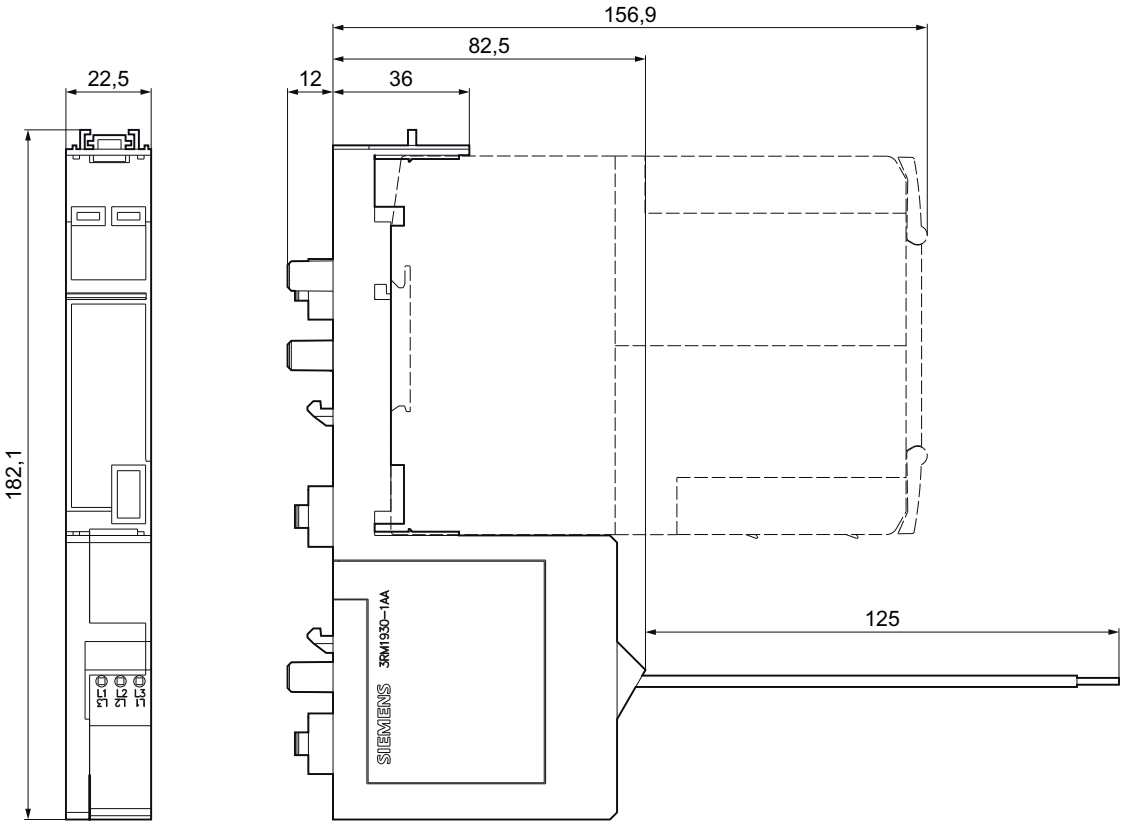


Dimension drawing for 3RM1 motor starter with infeed terminal and system



10.4 Dimension drawings 3RM19 fuse module

Dimension drawing of the fuse module with 3RM1 motor starter



Circuit diagrams

11

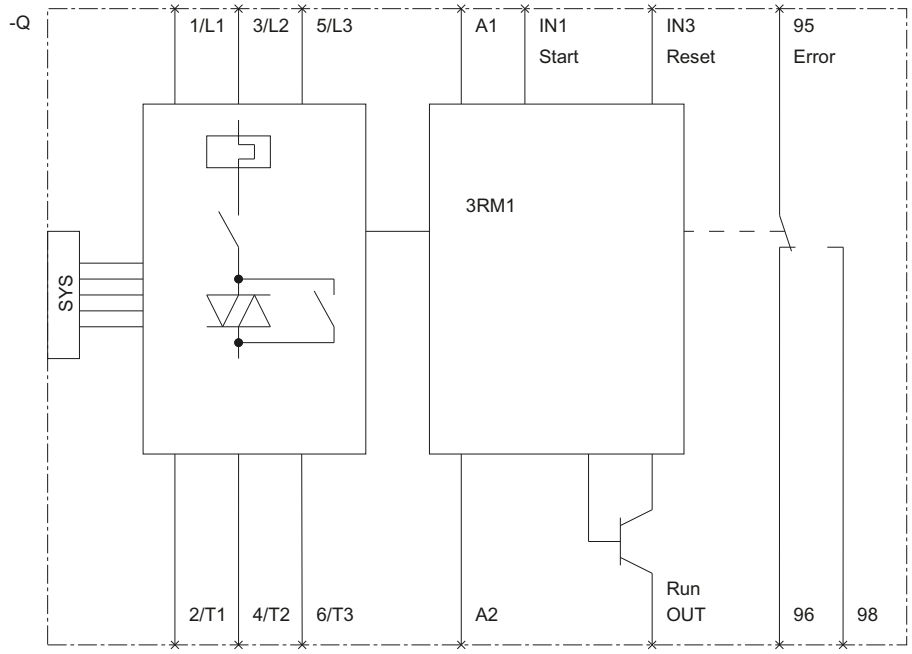
11.1 CAx data in the Siemens SiePortal

You can find CAx data for the product in the SiePortal (https://support.industry.siemens.com/cs/ww/en/ps/).

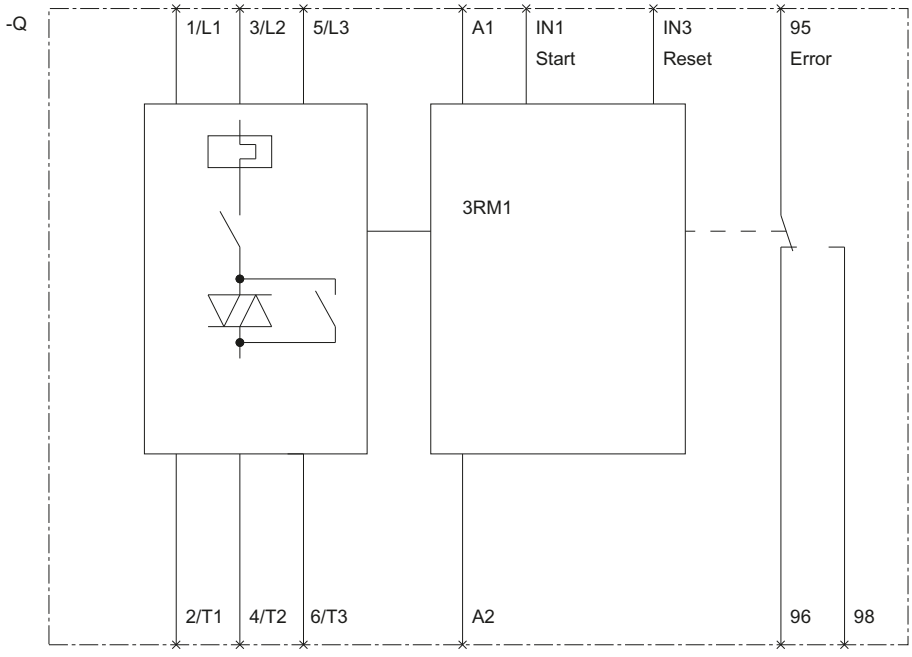
1. Enter the article number of the desired device in the "Products" field.
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11.2 3RM10 circuit diagrams (direct-on-line starter, Standard)

Versions with 24 V DC control supply voltage



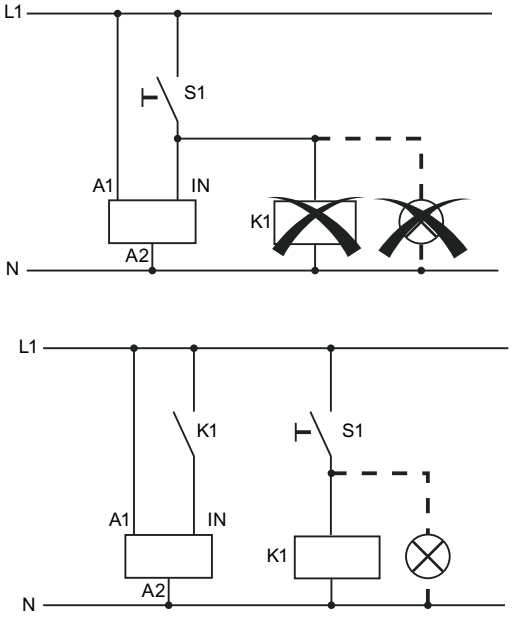
Versions with 110 ... 230 V AC; 110 V DC control supply voltage



Note

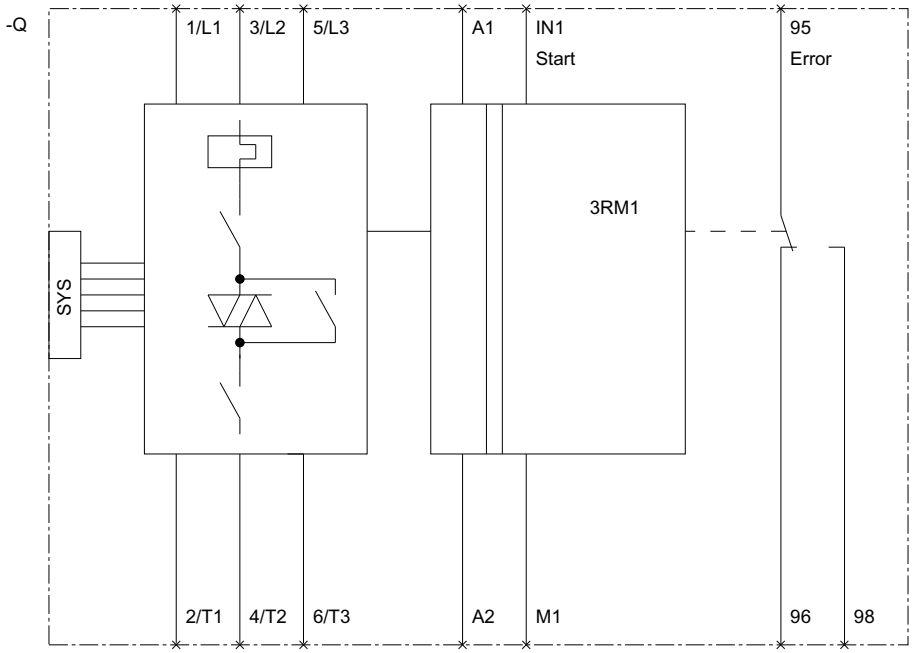
Parallel loads in the case of motor starters with product version E01

In the case of motor starters with product version E01, no parallel loads can be connected to the IN terminal; see diagram below. This is admissible as of product version E02.

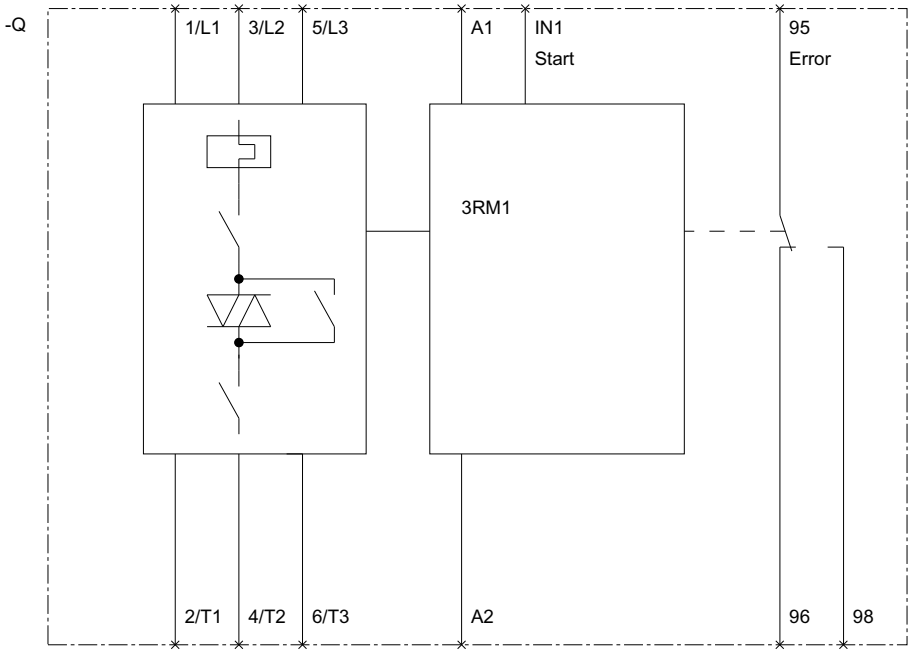


11.3 3RM11 circuit diagrams (direct-on-line starter, Failsafe)

Versions with 24 V DC control supply voltage

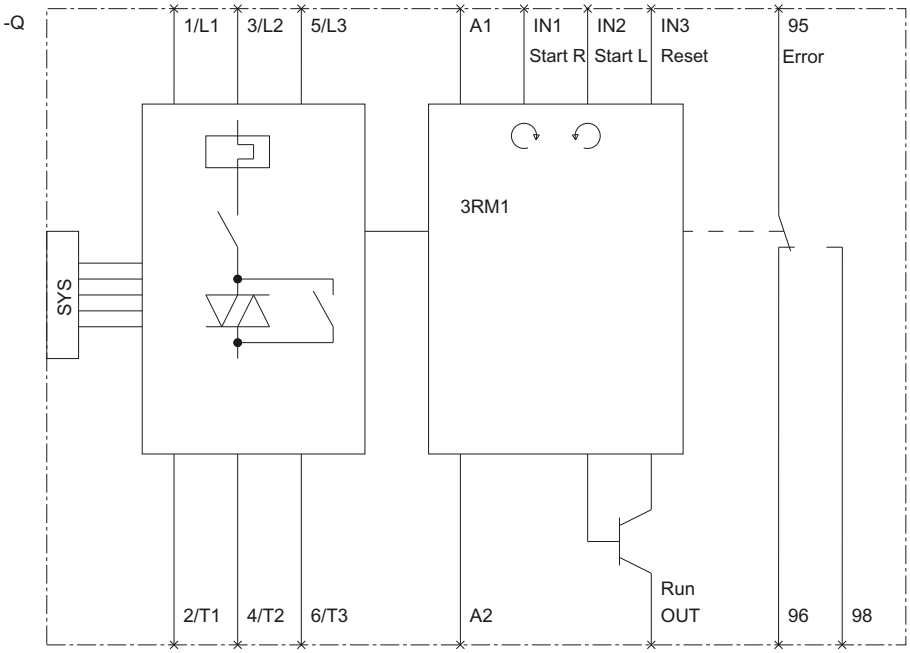


Versions with 110 ... 230 V AC; 110 V DC control supply voltage

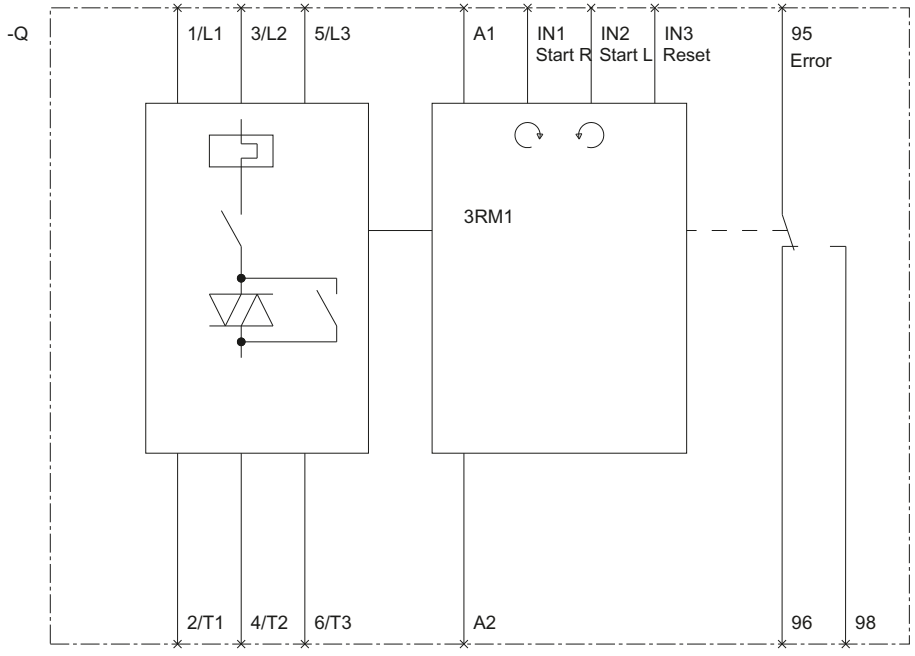


11.4 3RM12 circuit diagrams (reversing starter, Standard)

Versions with 24 V DC control supply voltage



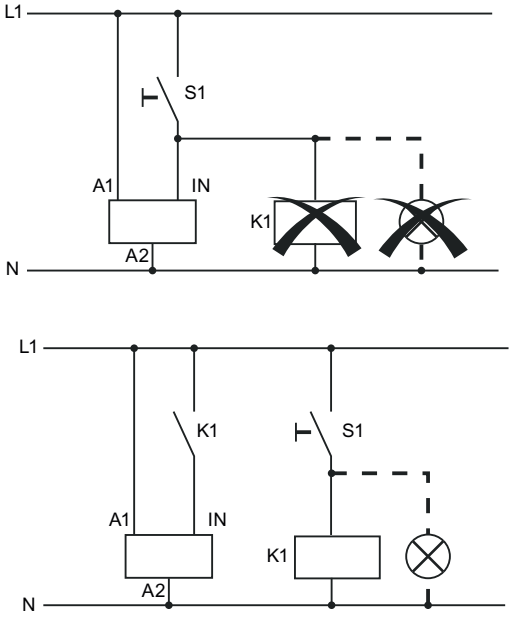
Versions with 110 ... 230 V AC; 110 V DC control supply voltage



Note

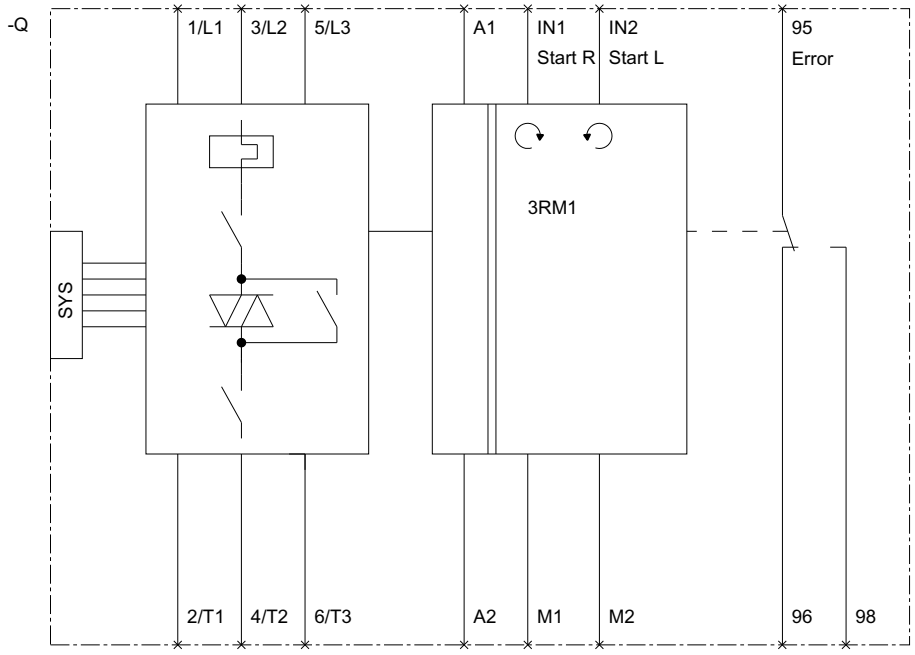
Parallel loads in the case of motor starters with product version E01

In the case of motor starters with product version E01, no parallel loads can be connected to the IN terminal; see diagram below. This is admissible as of product version E02.

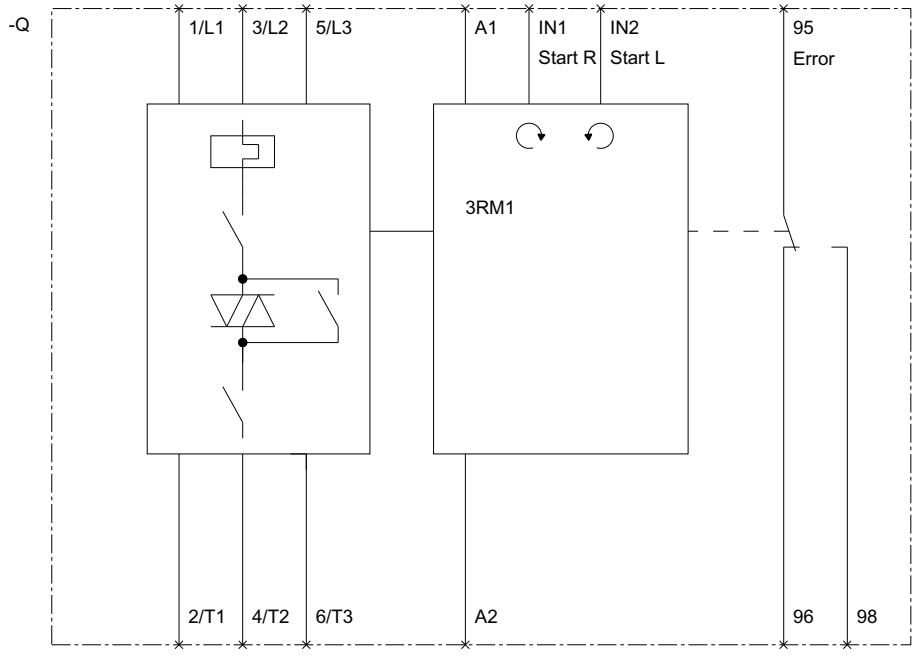


11.5 3RM13 circuit diagrams (reversing starter, Failsafe)

Versions with 24 V DC control supply voltage



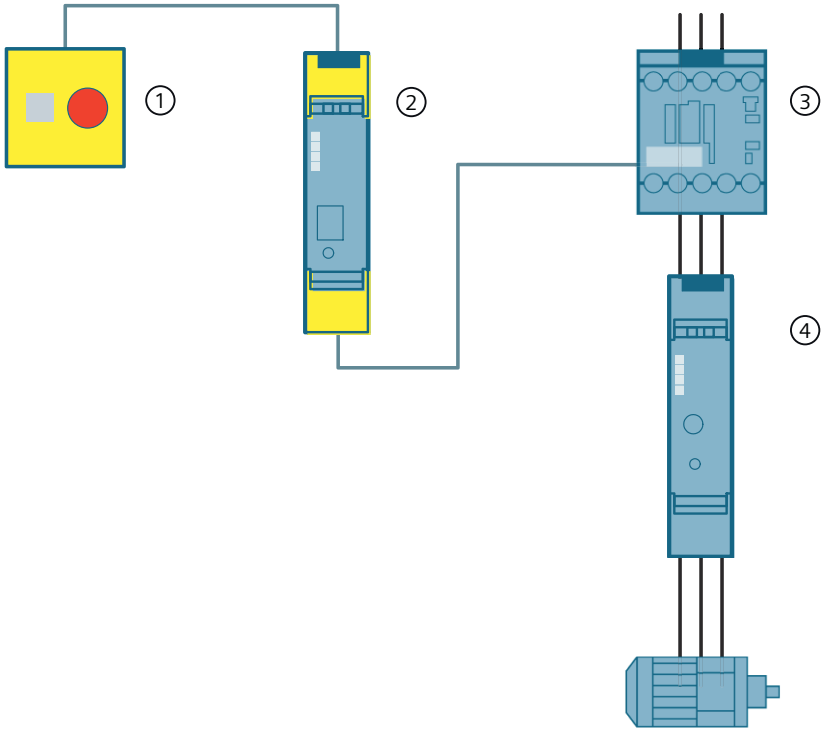
Versions with 110 ... 230 V AC; 110 V DC control supply voltage



11.6 Safe tripping up to SIL 1 or PL c

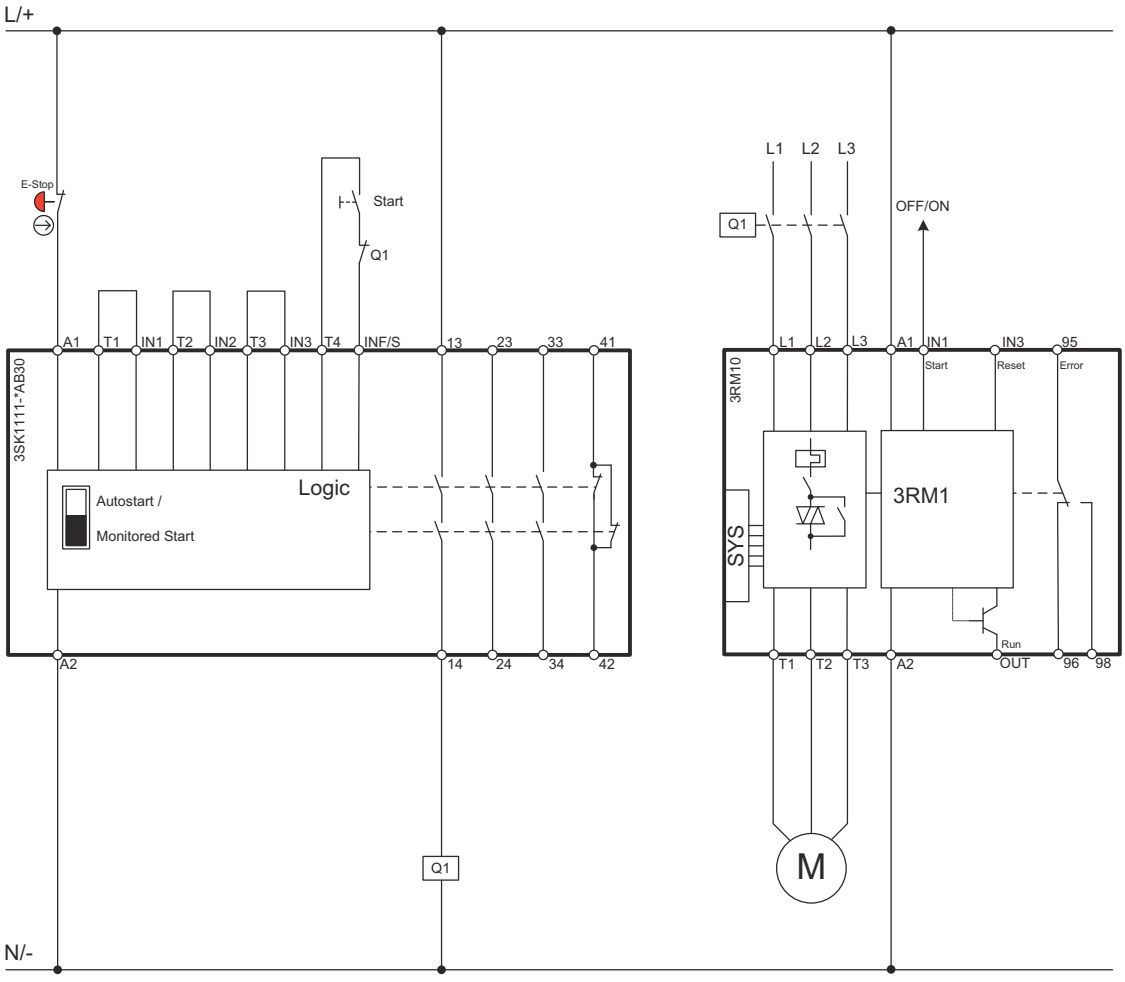
For achieving SIL 1 according to IEC 62061 or PL c according to ISO 13849-1, the series connection of an additional contactor with the 3RM1 motor starter, in conjunction with a suitable safety relay (e.g. 3SK1111) is required, as well as monitoring of the contactor's auxiliary contacts.

Basic configuration



① Emergency stop
② Safety relay
③ Power contactor
④ Motor current

Circuit diagram



See also

3RM1 motor starter – Safe tripping (https://support.industry.siemens.com/cs/us/en/view/67478946)

Typical circuits

A

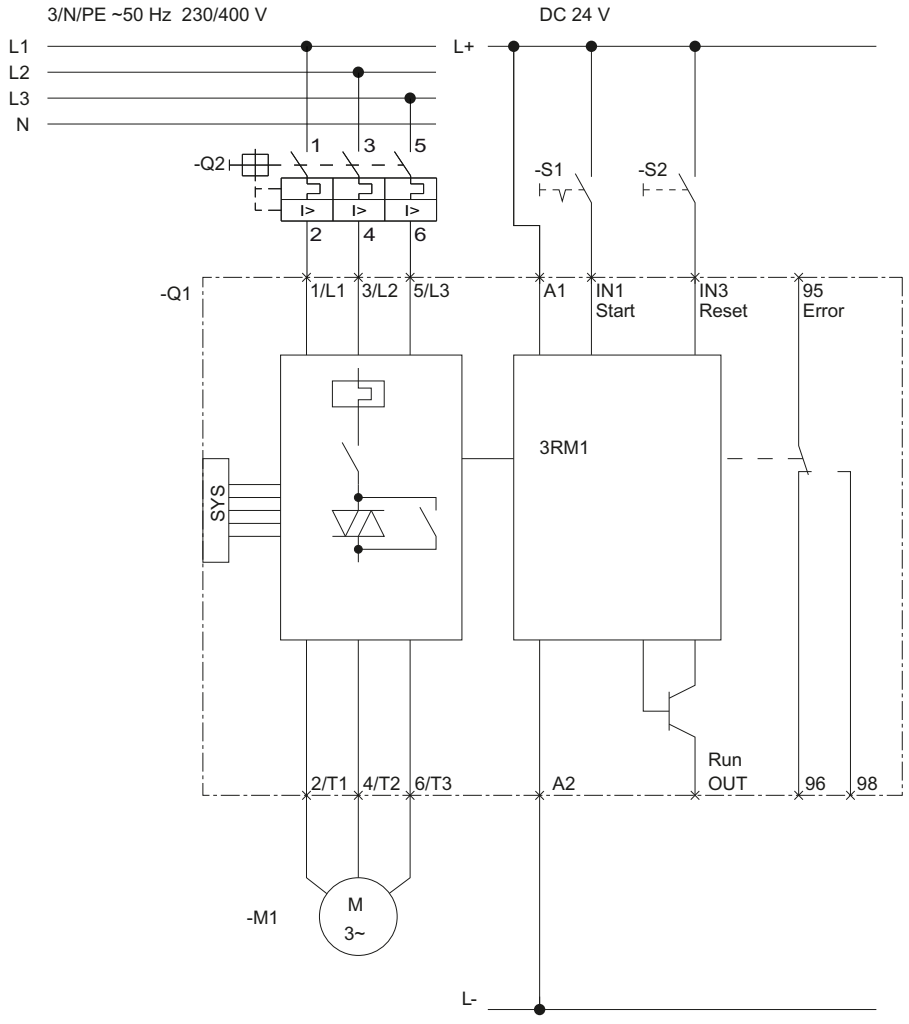
A.1 Typical circuits for 3RM1

You can find further application examples in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/16311/ae),

where you can also find answers to frequently asked questions in the FAQs (https://support.industry.siemens.com/cs/ww/en/ps/16311/faq).

A.1.1 Direct-on-line starter 24 V DC with switch operation

The 3RM1 motor starter is controlled with a switch. The 3RM1 motor starter is operated as a direct-on-line starter.



-S1 ON

-S2 Remote reset

Figure A-1 Standard 24 V DC direct-on-line starter with switch operation

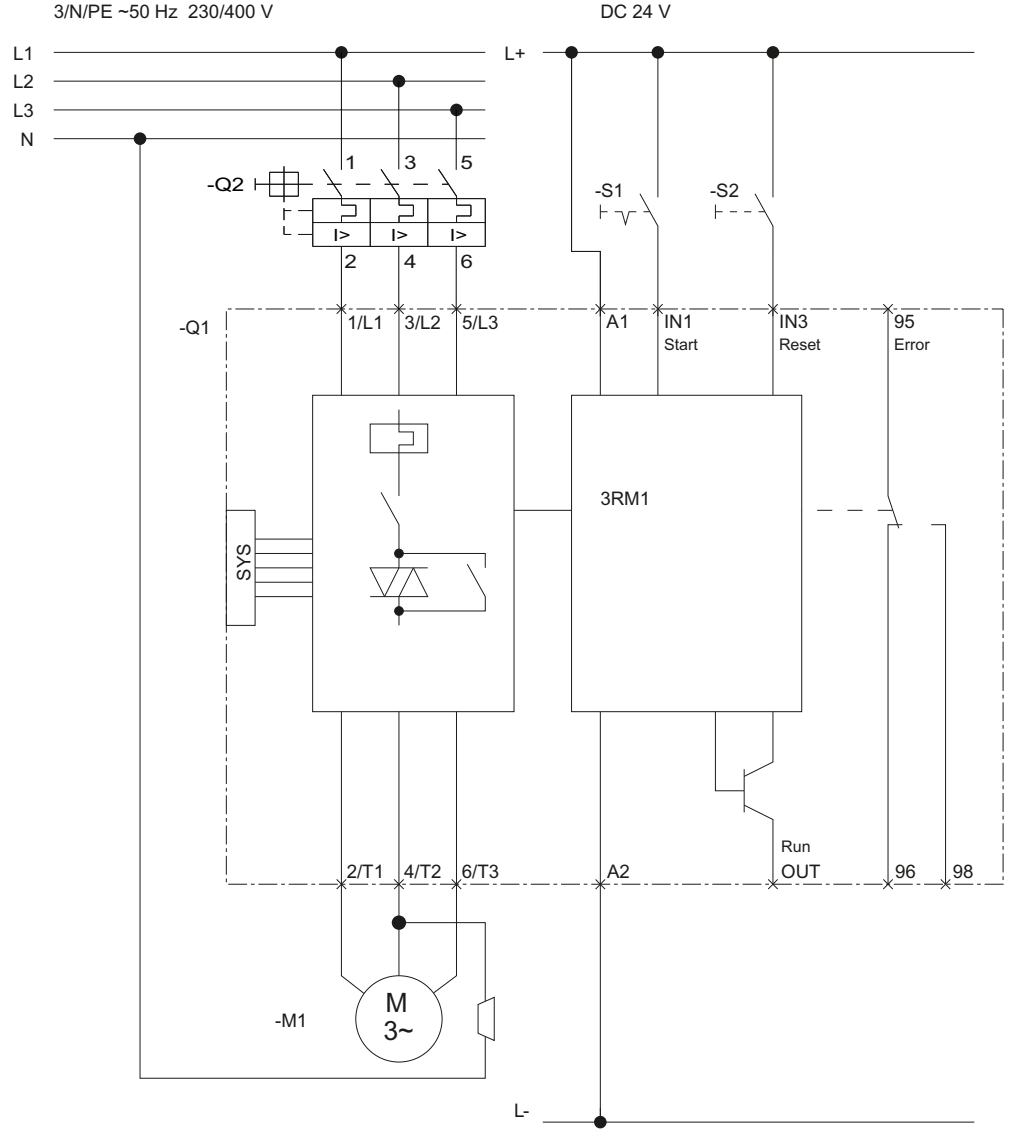
A.1.2 Direct-on-line starter 24 V DC with switch operation and 230 V brake

The current for the brake facility is drawn via only one phase. Connection is via T2.

Note

This configuration is admissible for standard variants 3RM10 and 3RM12 only.

This operating mode is not suitable for 3RM11 Failsafe and 3RM13 Failsafe motor starters since there is a connection to the neutral conductor.



-S1 ON

-S2 -Remote reset

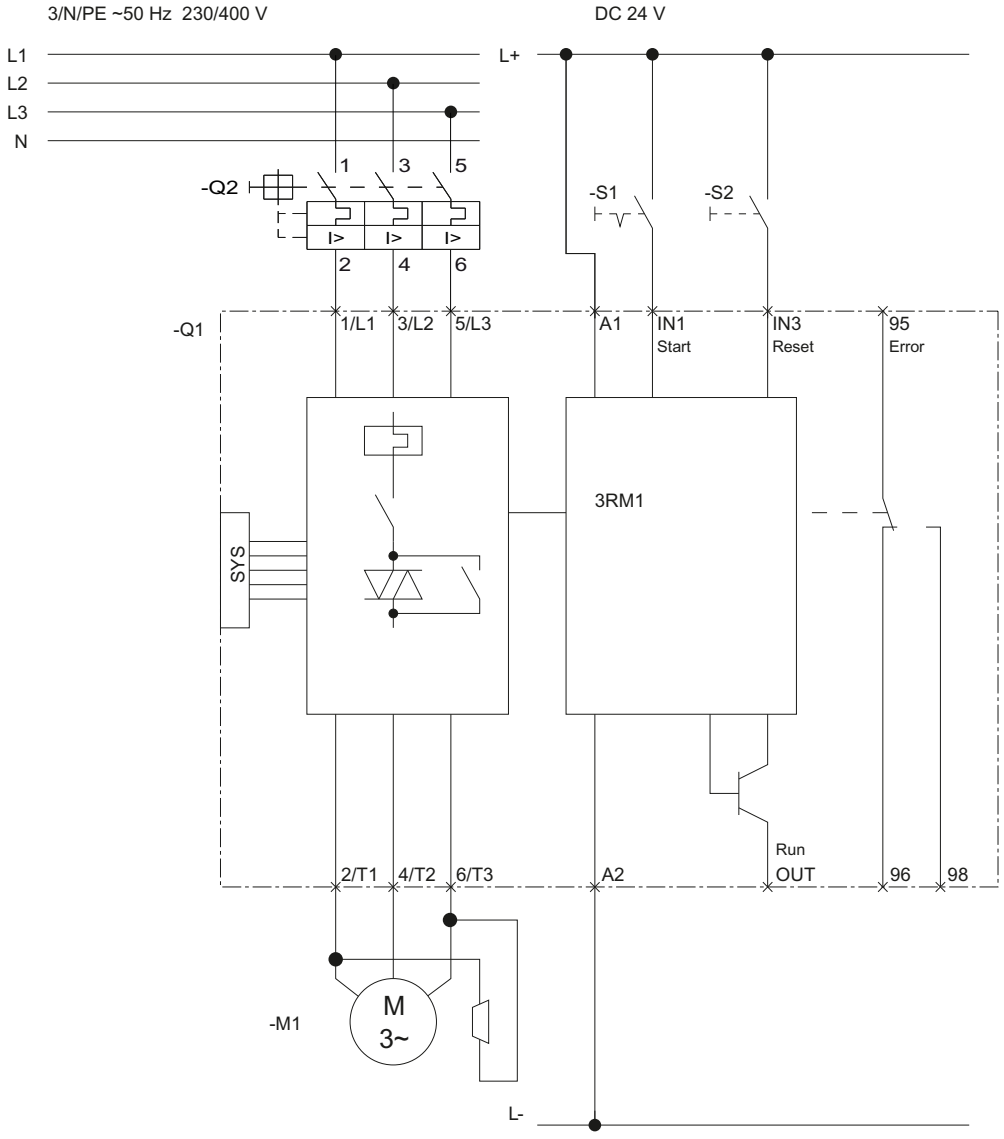
Figure A-2 Standard 24 V DC direct-on-line starter with switch operation and 230 V brake

A.1.3 Direct-on-line starter 24 V DC with switch operation and 400 V brake

The current for the brake facility is drawn via two phases. Connection is via T1 and T3.

Make allowance for the additional current in the current setting value.

The configuration is shown based on the example of a standard motor starter. The configuration with a 400 V brake is also admissible for the Failsafe variants 3RM11 and 3RM13. The notes on safety-related shutdown (Page 185) must be observed.



-S1 ON

-S2 Remote reset

Figure A-3 Standard 24 V DC direct-on-line starter with switch operation and 400 V brake

A.1.4 Direct-on-line starter 24 V DC with switch operation and single-phase motor

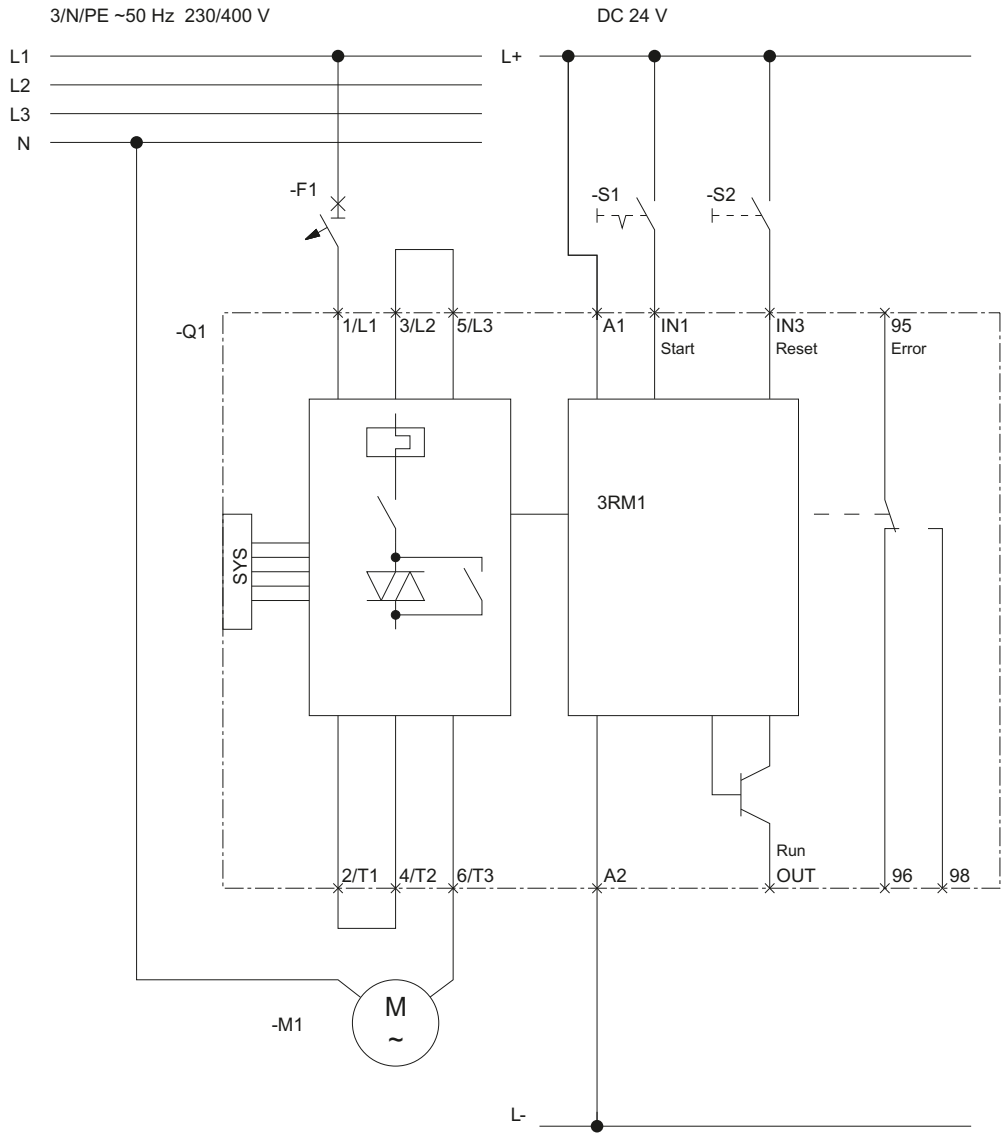
The current is drawn via only one phase. The motor is connected at T3. The second connection is directly at the neutral conductor. On the 3RM1 motor starter, T1 is wired direct with T2, and L2 direct with L3.

The configuration is shown based on the example of a standard motor starter. The configuration for single-phase loads is also admissible for the Failsafe variants 3RM11 and 3RM13. The notes on safety-related shutdown (Page 185) must be observed.

NOTICE
Damage to property can occur
Connection IN2 on reversing starters must not be used in the case of single-phase motors.

NOTICE
Damage to property due to high making currents
When using capacitive loads, the switching components in the 3RM1 motor starter can be damaged by excessively high making currents.
Do not operate capacitive loads such as frequency converters on the 3RM1 motor starter. Operation of single-phase capacitor motors is admissible.

In this operating mode, switching on and off is carried out only with connection IN1.



-S1 ON
-S2 Remote reset

Figure A-4 Standard direct-on-line starter 24 V DC with switch operation and single-phase motor

A.1.5 Direct-on-line starter with group protection, 24 V DC and PLC operation

Several 3RM1 motor starters can be connected by means of 3-phase busbars on the main current side. Control takes place via digital outputs.

The configuration is shown based on the example of standard motor starters. In the main circuit, this configuration is also admissible for the Failsafe variants 3RM11 and 3RM13. The notes on safety-related shutdown (Page 185) must be observed.

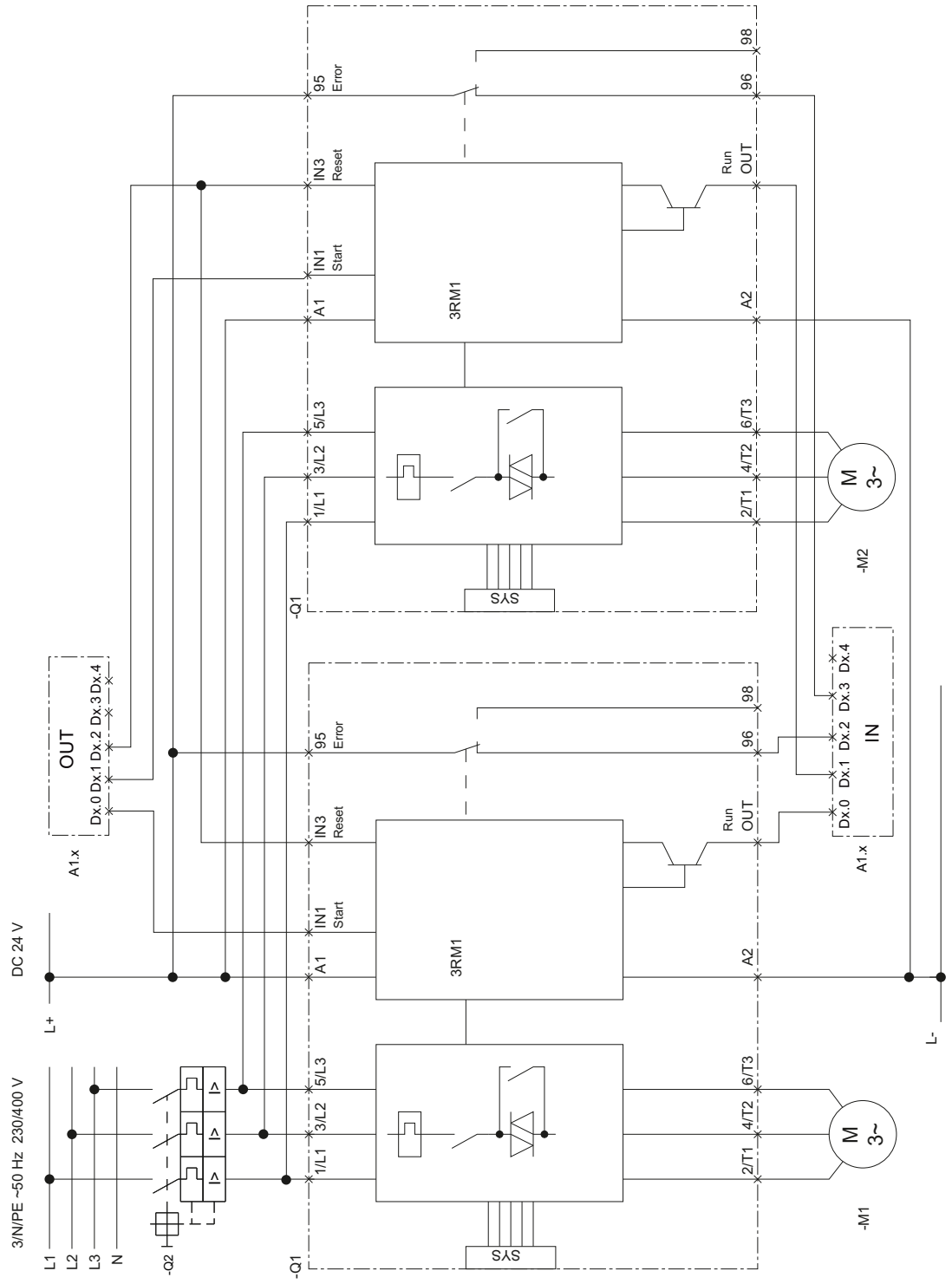


Figure A-5 Standard direct-on-line starter with group protection, 24 V DC and PLC operation

A.1.6 Reversing starter 24 V DC with PLC operation

The motor is controlled via a PLC. The 3RM1 motor starter is operated as a reversing starter.

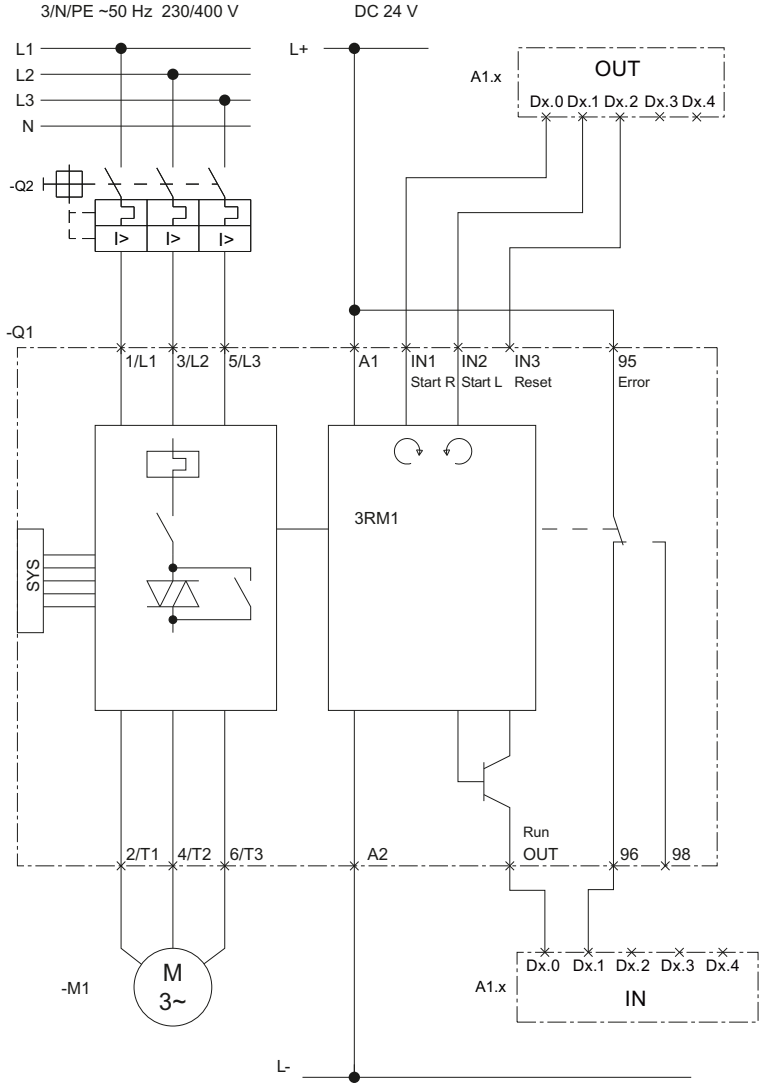


Figure A-6 Reversing starter 24 V DC with PLC operation

A.2 Typical circuits for safety-related shutdown

A.2.1 General safety notes

Note

SILCL 3 in accordance with EN 62061/PL e in accordance with EN ISO 13849-1

The 3RM11/3RM13 motor starters are designed in such a way as to allow implementation of applications up to SILCL 3 in accordance with EN 62061 and PL e/Cat. 4 in accordance with EN ISO 13849-1.

To achieve SILCL 3/PL e/Cat. 4 for the safety-related application, all components of the safety functions (detecting/evaluating/reacting) must be designed accordingly.

Note

Safe state

The basis of the safety function is the definition of the safe state. In the case of the 3RM11 and 3RM13 Failsafe motor starters, this is the "OFF state".

⚠ DANGER

Hazardous voltage at the motor
Will cause death, serious injury, or damage to property.
Health hazard from automatic hot restart.

The safety function must be checked after every tripping of the motor starter protector (also in the case of overload).

After every short circuit in the case of short-circuit protection according to **type of coordination 1**, a 3RM1 motor starter is defective.
Replace a 3RM1 motor starter including the terminals after a short circuit in the case of short-circuit protection according to type of coordination 1.
With 3RM11/3RM13 Failsafe motor starters, you must check the safety function in addition to replacing the unit.

With 3RM11/3RM13 Failsafe motor starters, also check the safety function after a short circuit in the case of short-circuit protection according to **type of coordination 2**.

⚠ DANGER

Hazardous voltage.
Will cause death or serious injury.

To ensure protection against an electric shock hazard with the hinged cover open at the signaling contacts 95, 96, 98 at a voltage of ≥ 50 V, screw in all terminal screws that are not needed to clamp conductors.

⚠ WARNING

Loss of the safety function

In continuous operation, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 year.

Annual function test

- Actuate the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Activate the safety relay via the connected sensors.
- Check their effect on the safety relay and the downstream actuators.
- Defective devices must be replaced.

⚠ WARNING

Loss of the safety function in the event of a fault in the case of 3RM11 / 3RM13 Failsafe motor starters with 110 to 230 V AC/110 V DC control supply voltage.
Can cause death or serious injury.

The control signal for the control inputs in the case of 3RM11/3RM13 Failsafe motor starters with 110 to 230 V AC control supply voltage must come from A1. Otherwise, the safety function is bypassed in the event of a fault. Thus, only relay outputs are admissible when using a PLC.

Do not use a separate control voltage. Only use the relay outputs when using a PLC.

⚠ WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When the product is operated with a 3SK safety relay and a device connector, the supply voltage for 3RM1 motor starters is fed in via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM1 motor starters, in order to prevent bypassing of the safety function.

⚠ WARNING

Loss of the safety function during hybrid operation of Failsafe and Standard motor starters.
Can cause death or serious injury.

Hybrid operation of 3RM10/3RM12 Standard motor starters with 3RM11/3RM13 Failsafe motor starters in safety-related applications is not admissible.

Only ever use safety-related motor starters (3RM11 Failsafe and 3RM13 Failsafe) in safety-related applications.

⚠ WARNING

Risk from conductive contamination.
Can cause death, serious injury, or damage to property.

The devices must be protected against conductive contamination while taking account of the ambient conditions. One way you can do this is to install the devices in a control cabinet with the appropriate degree of protection. You will find further information in IEC 60529, for example.

⚠ WARNING

Safe functional extra-low voltage
Can cause death or serious injury.

The 3RM11/3RM13 Failsafe motor starters with a supply voltage of 24 V DC must be operated with safe functional extra-low voltage (SELV, PELV). This means these modules must only be subjected to a voltage of Um even in the event of a fault. The following applies to these 3RM1 motor starters: **Um < 60.0 V DC**.
You will find more detailed information about safe functional extra-low voltage in the data sheets of the power supplies to be used.

⚠ WARNING

Loss of the safety function when the neutral conductor is connected to a load.
Can cause death or serious injury.

When using the 3RM11 Failsafe and 3RM13 Failsafe motor starters, note that no neutral conductor may be connected if the load circuit contains 3-phase loads, e.g. a 230 V brake or resistive loads.

NOTICE

Damage caused by electrostatic charge

When handling and installing the 3RM11/3RM13 Failsafe motor starters, ensure that the components are protected against electrostatic charge. Changes to the system configuration and wiring are only permissible in the voltage-free state.
Connection of 3RM11/3RM13 Failsafe motor starters is only permissible when the power supply units (PELV and SELV) are switched off.

NOTICE

Electromagnetic interference

The following must be grounded in accordance with regulations to ensure noise immunity of the 3RM11/3RM13 Failsafe motor starters:

- PELV / SELV power supply units (please also note the documentation for the respective power supply unit in this regard).

Note

Operational faults and malfunctions in communication

If the EMC Directive 2014/30/EC is not complied with when plants and devices are installed, communication breaks may occur.

Note

Cover the 3ZY12 device connector on the left-hand side using the cover supplied with the device termination connector.

A.2.2 3SK1 safety relay with 3RM13 motor starter via device connector

The 3RM13 Failsafe motor starter is connected to a 3SK1 safety relay via a 3ZY1 device connector.

The two directions of rotation are switched on and off operationally via IN1 and IN2, e.g. with a PLC.

The control supply voltage (L+ and L-) to the motor starters is deactivated by the 3SK1 safety relay and the system is in a safe state.

Note

SILCL 3 in accordance with EN 62061/PL e in accordance with EN ISO 13849-1

A safety-related application up to SILCL 3 to EN 62061, PL e/Cat. 4 to EN ISO 13849-1 can be realized in this way.

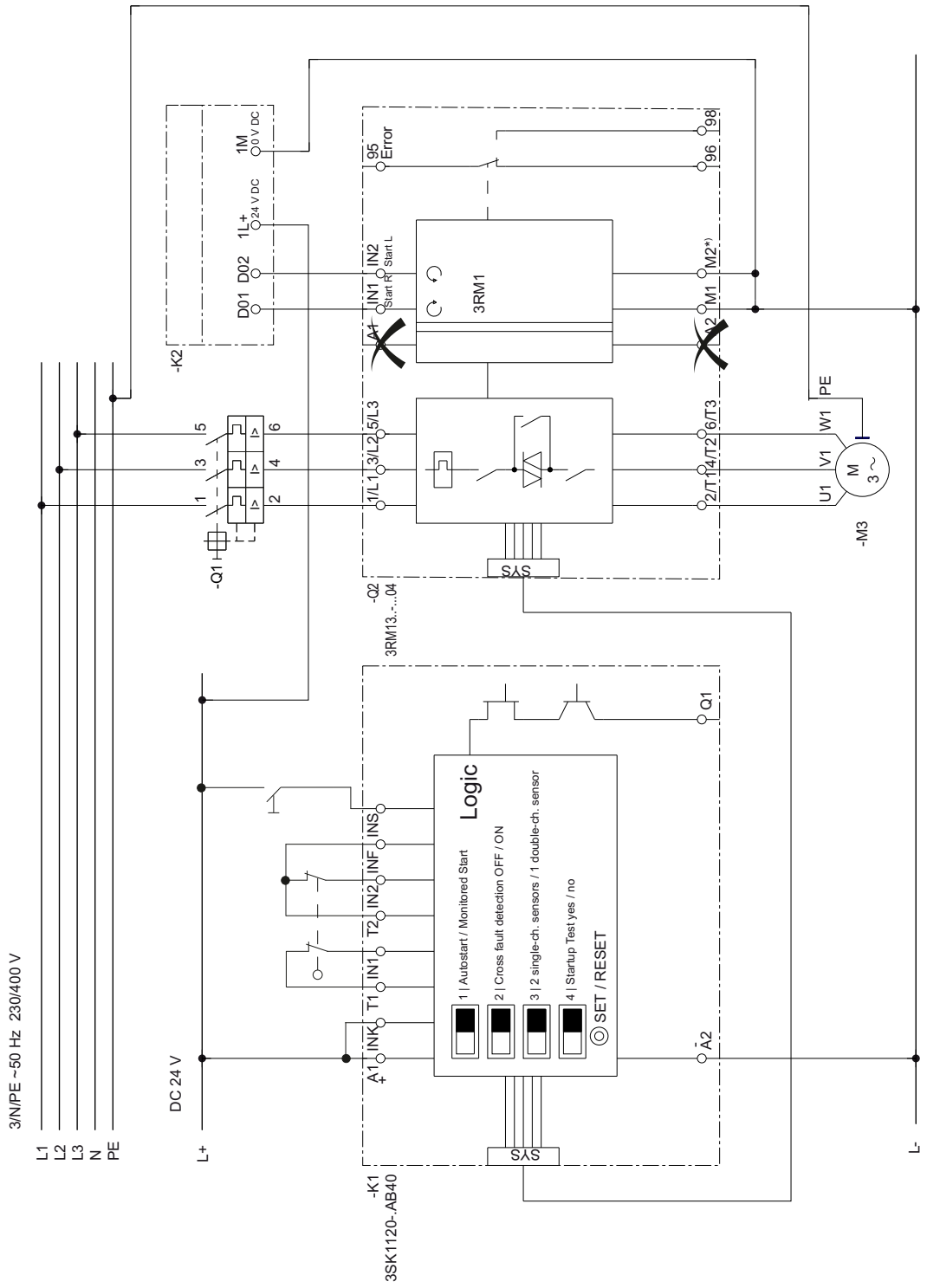
To achieve SILCL 3/PL e/Cat. 4 for the safety-related application, all components of the safety functions (detecting/evaluating/reacting) must be designed accordingly.

⚠ WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When operating with a 3SK1 safety relay and a device connector, the supply voltage for 3RM1 motor starters is established via the device connectors.

In this case, do not connect anything to terminals A1 and A2 of the 3RM1 motor starters, in order to prevent bypassing of the safety function.



*) If there is a common reference potential for the two inputs, it is sufficient to establish a ground connection.

If there are separate potentials or controls, both connections must be assigned.

Figure A-7 3SK1 safety relay with 3RM13 reversing starter via device connector

A.2.3 3SK1 safety relay wired with 3RM13 motor starter

The 3RM13 Failsafe motor starter (230 V supply voltage) is connected to a 3SK1 safety relay.

The two directions of rotation are switched on and off operationally via IN1 and IN2, e.g. with separate switches.

⚠ WARNING

Loss of the safety function in the event of a fault in the case of 3RM11 / 3RM13 Failsafe motor starters with 110 to 230 V AC/110 V DC control supply voltage.
Can cause death or serious injury.

The control signal for the control inputs in the case of 3RM11/3RM13 Failsafe motor starters with 110 to 230 V AC control supply voltage must come from A1. Otherwise, the safety function is bypassed in the event of a fault. Thus, only relay outputs are admissible when using a PLC.

Do not use a separate control voltage. Only use the relay outputs when using a PLC.

The control supply voltage (L1 and N) to the motor starters is deactivated by the 3SK1 safety relay and the system is in a safe state.

Note

SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1

A safety-related application up to SILCL 3 to EN 62061, PL e/Cat. 4 to EN ISO 13849-1 can be realized in this way.

To achieve SILCL 3/PL e/Cat. 4 for the safety-related application, all components of the safety functions (detecting/evaluating/reacting) must be designed accordingly.

Note

A fuse must be fitted as short-circuit protection (4 A gL/gG) in the supply line to the supply voltage of 3RM1 (L1).

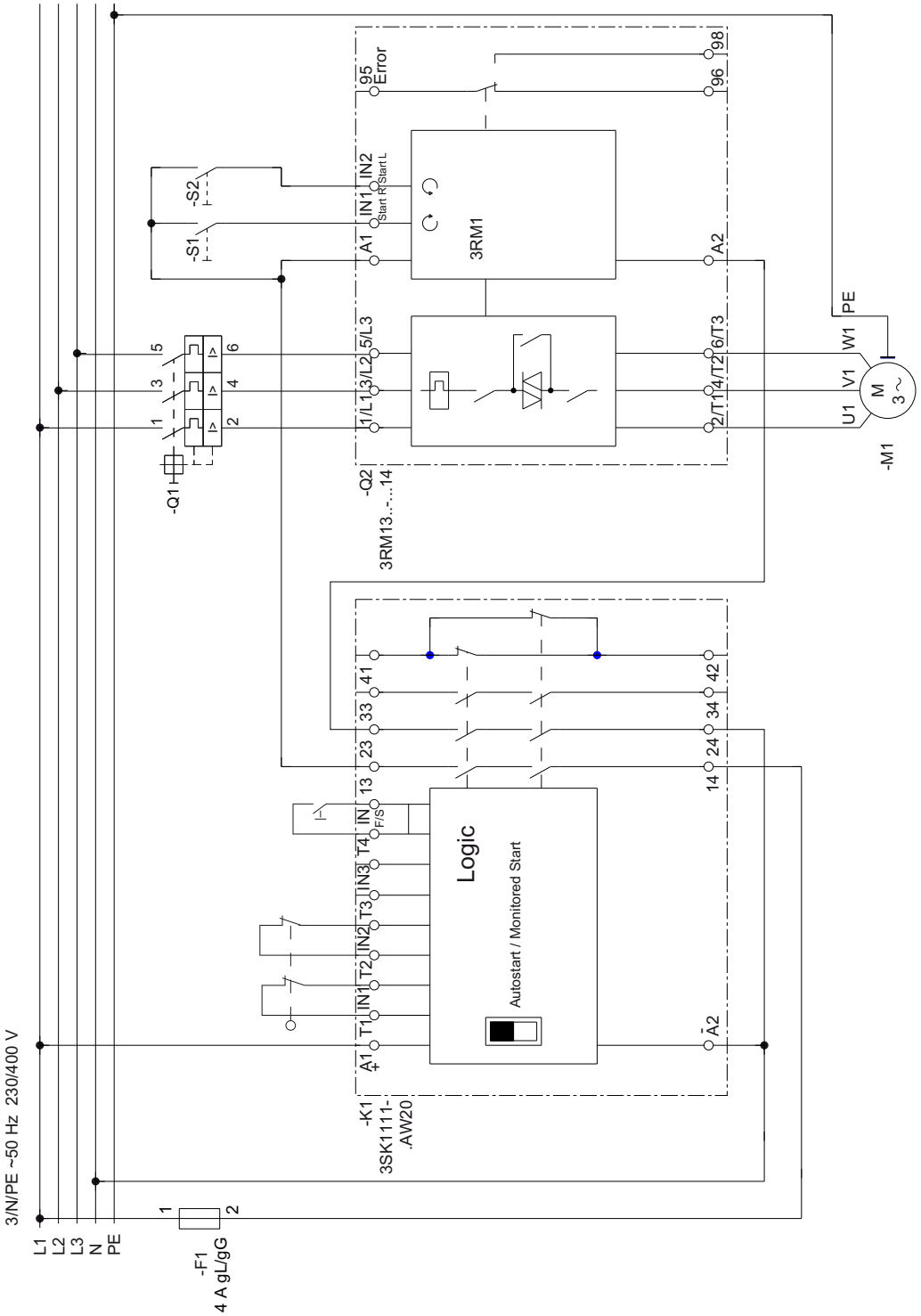


Figure A-8 3SK1 safety relay with 3RM13 reversing starter

A.2.4 3SK2 safety relay with 3RM11 motor starter via device connector

Description

- Shutdown via 3RM1 Failsafe motor starter
- "Reacting" subsystem up to SILCL 3 as per EN 62061 and PL e / Cat. 4 as per EN ISO 13849-1
- Safety-related control of up to five 3RM1 Failsafe motor starters via 3ZY12 device connectors
- Operational, non-safety-related switching of the 3RM1 Failsafe motor starter through its local input IN1 by means of the 3SK2 safety relay

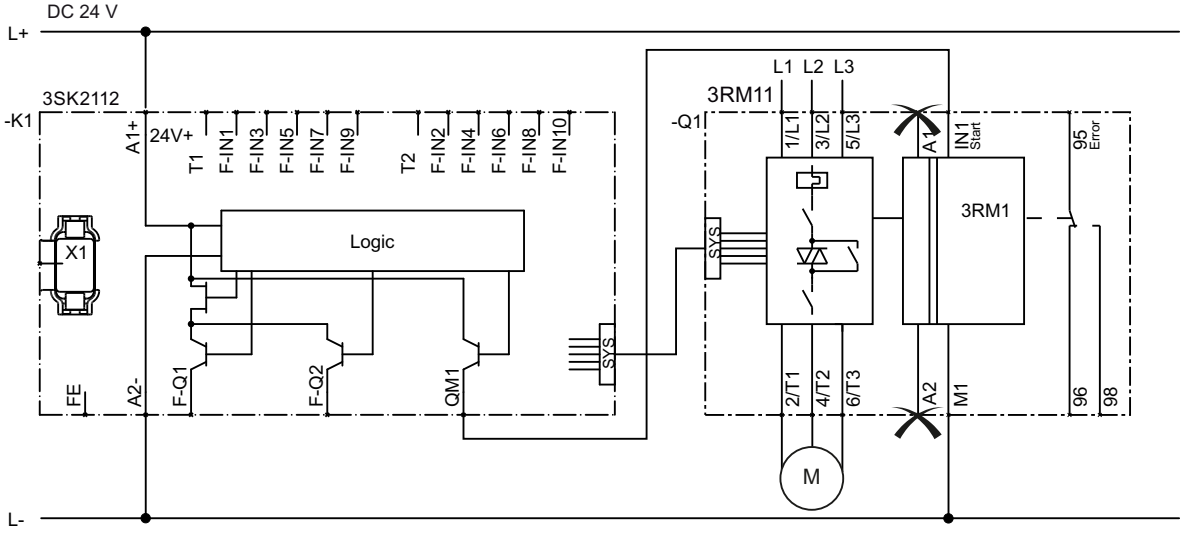
WARNING

Loss of the safety function when using device connectors.
Can cause death or serious injury.

When operating with a 3SK2 safety relay and 3ZY12 device connectors, the supply voltage for 3RM1 Failsafe motor starters is established via the 3ZY12 device connectors.

To prevent bypassing of the safety function, do not connect anything to terminals A1 and A2 of the 3RM1 Failsafe motor starters in this case.

Circuit diagram



-K1 3SK2 safety relay 22.5 mm

-Q1 3RM11 Failsafe motor starters (direct-on-line starters)

You will find detailed information, for example, about "logic" or "parameters" in the manual "SIRIUS 3SK2 Safety Relays (https://support.industry.siemens.com/cs/ww/de/view/109444336)."

A.2.5 3SK2 safety relay wired to 3RM11 motor starter

Description

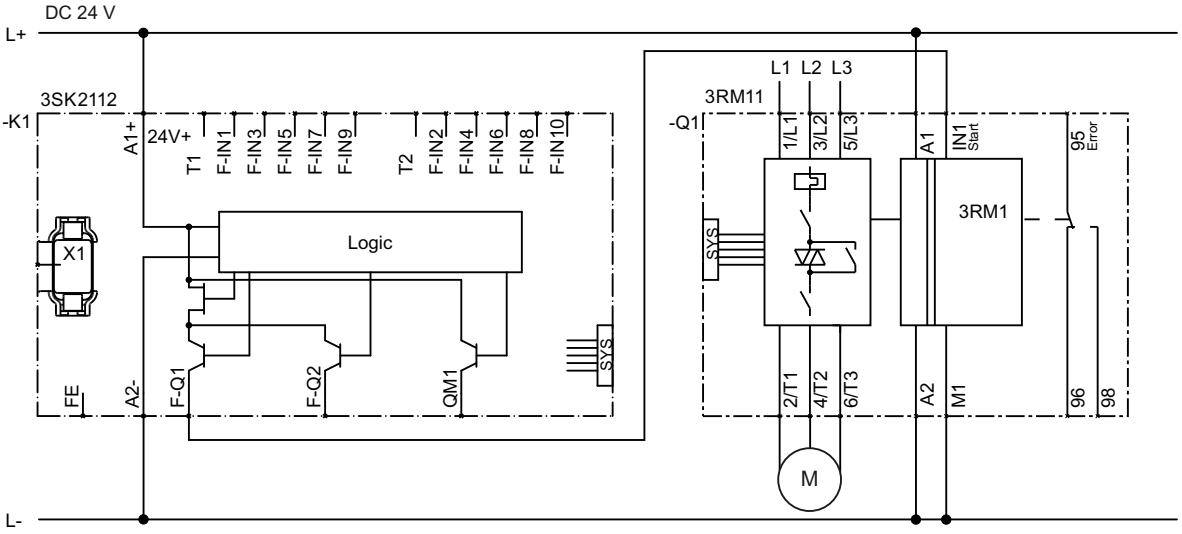
- Shutdown via 3RM1 Failsafe motor starter
- "Reacting" subsystem up to SILCL 3 as per EN 62061 and PL e / Cat. 4 as per EN ISO 13849-1
- Component certified in accordance with EN 62061/EN ISO 13849-1 in the actuator circuit (3RM1 Failsafe motor starter)
- Device supply of the 3RM1 Failsafe motor starter via the terminals A1/A2
- Safety-related switching of the local input of the 3RM1 Failsafe motor starter via fail-safe output of the 3SK2 safety relay

Note

Alternatively, safety-related switching can also be realized at the device supply of the motor starter (terminals A1 / A2). The correspondingly longer restart times for the motor starter are to be observed in this regard.

- Suitable for frequently requested safety functions (e.g. on indexing tables)
- No use of device connectors
- Protected laying of signal lines between the 3SK2 safety relay and 3RM1 Failsafe motor starter (in the same control cabinet or in armored conduit)

Circuit diagram



-K1 3SK2 safety relay 22.5 mm

-Q1 3RM11 Failsafe motor starters (direct-on-line starters)

You will find detailed information, for example, about "logic" or "parameters" in the manual SIRIUS 3SK2 Safety Relays (https://support.industry.siemens.com/cs/ww/de/view/109444336)

A.2.6 3RM13 reversing starter with PLC control, F-DO pp-switching

As an alternative to the 3SK safety relay, 3RM11/3RM13 Failsafe motor starters can be controlled by an F-DO module. In this typical circuit, shutdown is realized by a pp-switching F-DO module in 1 channel.

Up to SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1 can be achieved. To this end, the controlling outputs must also fulfill SILCL3 in accordance with EN 62061/PL e/Cat. 4 in accordance with EN ISO 13849-1.

Note

SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1

SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1 can be achieved by laying the control lines from the safe output to IN1 and IN2 of the 3RM1 motor starter in such a way that they are protected against a cross-circuit or short-circuit to a power cable, e.g. as separately sheathed cable or by laying in separate cable ducts.

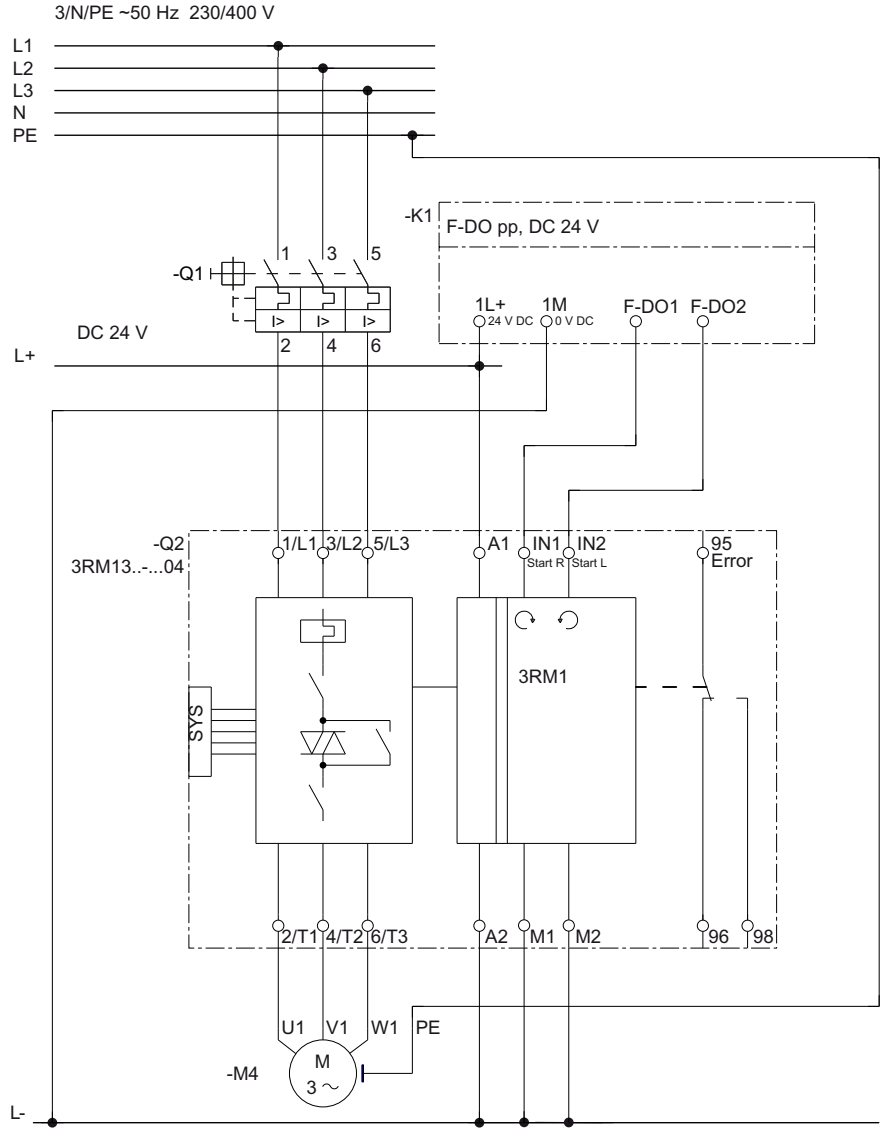


Figure A-9 3RM13 reversing starter with PLC control, F-DO pp-switching

A.2.7 3RM13 reversing starter with PLC control, F-DO pm-switching

As an alternative to the 3SK safety relay, 3RM11/3RM13 Failsafe motor starters can be controlled by an F-DO module. In this typical circuit, shutdown is realized by a pm-switching F-DO module in 2 channels.

Up to SILCL 3 in accordance with EN 62061, PL e/Cat. 4 in accordance with EN ISO 13849-1 can be achieved. To this end, the controlling outputs must also fulfill SILCL3 in accordance with EN 62061/PL e/Cat. 4 in accordance with EN ISO 13849-1.

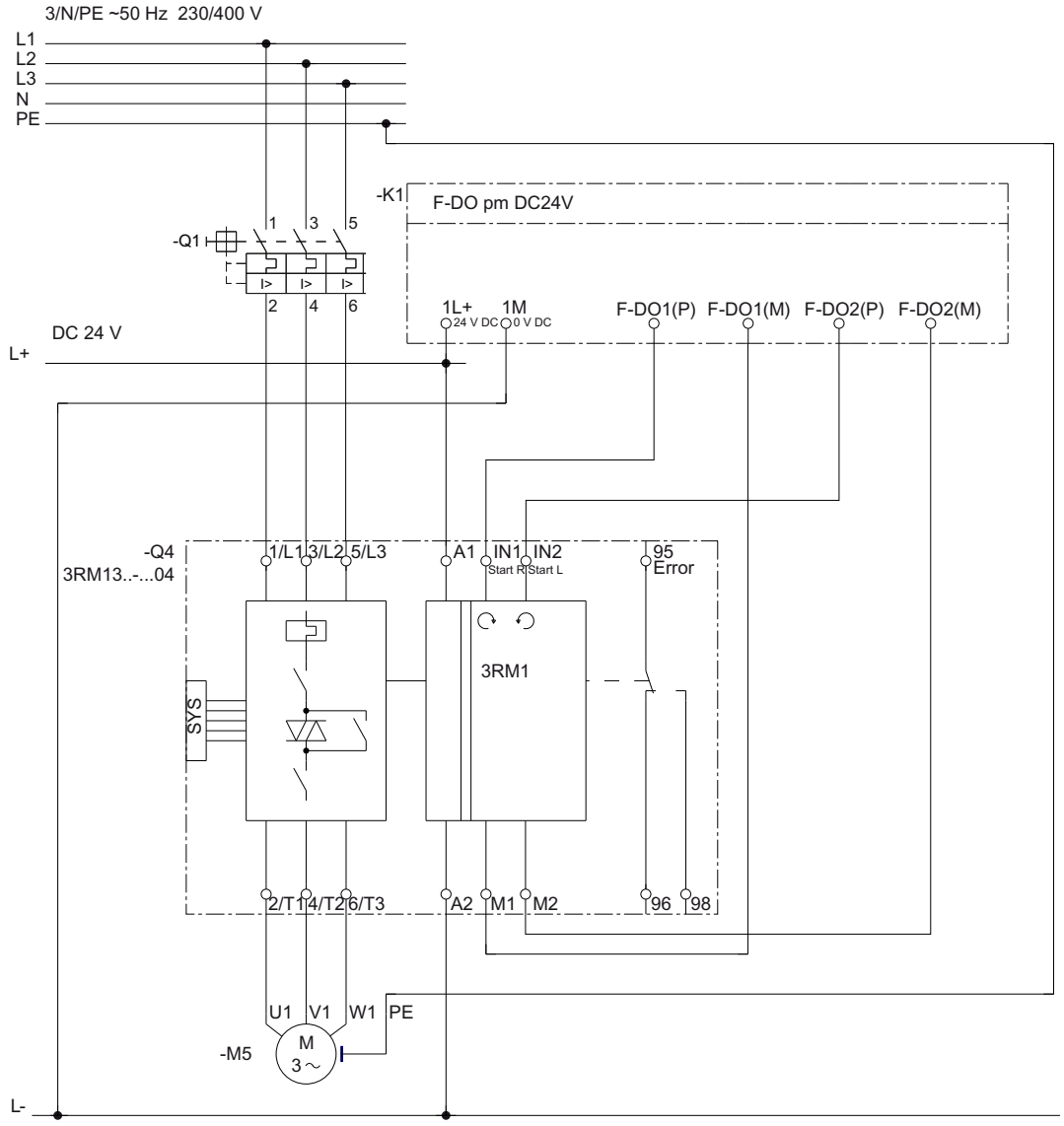


Figure A-10 3RM13 reversing starter with PLC control, F-DO pm-switching

Directives

B

B.1 ESD Guidelines

What does ESD mean?

All electronic modules are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are highly sensitive to overvoltage, and thus to any electrostatic discharge.

The acronym ESD has become the established designation for such Electrostatic Sensitive Devices. This is also the international abbreviation for such devices.

ESD modules are identified by the following symbol:



NOTICE
Damage caused by electrostatically charged persons ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having discharged your own body. The electrostatic discharge current may lead to latent failure of a module, that is, this damage may not be apparent immediately, but in operation may cause malfunction.

Electrostatic charging

Anyone who is not connected to the electrical potential of their surroundings might become electrostatically charged.

The figure below shows the maximum electrostatic voltage which may build up on a person coming into contact with the materials specified in the diagram. These values correspond to IEC 801-2 specifications.

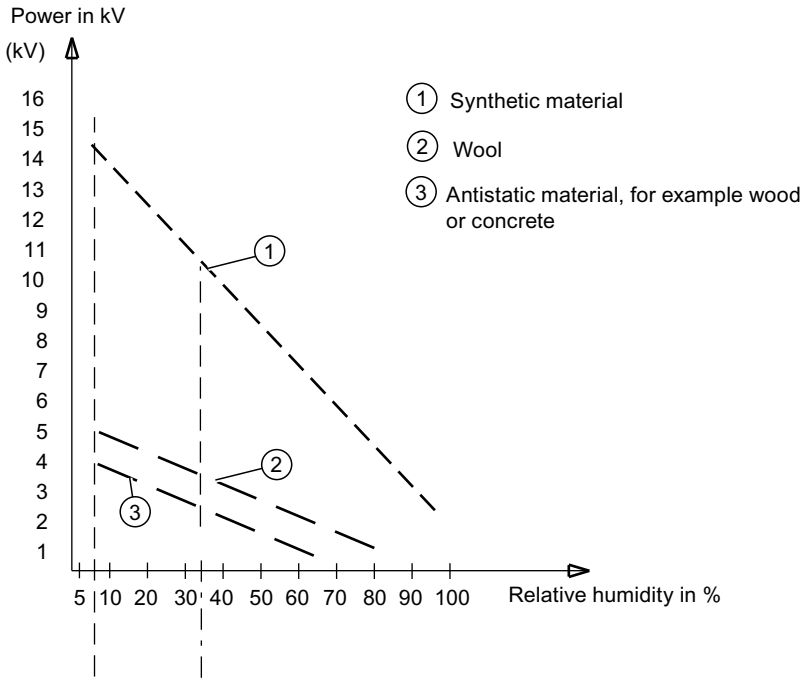


Figure B-1 Electrostatic voltages on an operator

Basic protective measures against electrostatic discharge

- Ensure good equipotential bonding:
  When handling electrostatic sensitive devices, ensure that your body, the workplace and the packaging are grounded. In this way, you can avoid becoming electrostatically charged.
- Avoid direct contact:
  As a general rule, only touch electrostatic sensitive devices when this is unavoidable (e.g. during maintenance work). Handle the modules without touching any chip pins or PCB traces. In this way, the discharged energy cannot reach or damage sensitive devices. Discharge your body before you start taking any measurements on a module. Do so by touching grounded metallic parts. Use only grounded measuring instruments.

Glossary

3-phase busbar

The 3-phase busbar enables several 3RM1 motor starters to be supplied using a single infeed terminal.

Approval

Approval of switching devices and switchgear in accordance with national standards, some of which must be met on a mandatory basis, which exist in addition to "IEC", "CENELEC", and "CEE" guidelines, for example. The North American market (the USA and Canada), for example, requires UL or CSA approvals. There is also an obligation to label the equipment accordingly, i.e. the approval mark must be inscribed on the device itself.

AWG (American Wire Gauge)

A standard measure for conductors used in the USA, which is assigned to a specific cross-sectional area of a conductor or wire. Each AWG number represents a jump of 26% in the cross-sectional area. The thicker the wire, the smaller the AWG number.

CLASS (time)

See "Trip class".

Connection system

The 3RM1 motor starter is connected using screw terminals, push-in connections and hybrid connection technology.

Explosion protection

Prerequisite for using electrical equipment in hazardous areas conforming to DIN EN 50014 (VDE 0170/0171). For explosion protection, you must ensure that equipment which may generate explosive arcs (plasma) during operation is enclosed in a flameproof casing. This means that, although the potentially explosive mixture could penetrate the enclosure, if an explosion were to occur inside it then no explosive flame could escape.

Infeed system for 3RM1

The infeed system for 3RM1 enables simple and fast establishment of the main circuit connections when using several 3RM1 motor starters arranged side-by-side.

Main switch

Every industrial machine which falls under the scope of DIN EN 60204 Part 1 (VDE 0113, Part 1) must be equipped with a main switch which disconnects all electrical equipment from the network while cleaning, maintenance, and repair work is being carried out, as well as during long periods of downtime. Usually a switch which can be operated by hand is stipulated in order to prevent electrical or mechanical hazards. The main switch can also function as an EMERGENCY-OFF device.

It must meet the following requirements:

1. Externally accessible handle.
2. Only one "Off" position and one "On" position with allocated stops.
3. Two positions labeled "0" and "I".
4. Lockable "Off" position.
5. Cover for the power supply terminals to protect against accidental contact.
6. The switching capacity must correspond to AC-23 for motor switches and AC-22 for load-break switches (utilization category).
7. Switch position displayed automatically.

Motor protection

Motor protection protects electric motors against thermal overload due to mechanical overload or in the event of failure of a single or two phase(s).

Motor starter protector/circuit breaker

Generally a latch-operated switch that can make, carry, and break currents in the circuit under normal operating conditions; and that can make current under specified conditions that are not normal up to the point of a short circuit, conduct the current for a defined period, and break it.

Operating range

Range within which the control circuit voltage of a switching device may deviate from the rated control circuit voltage without impairing the operational reliability of the switching device (e.g. shutdown of the 3RM1 motor starter).

Overload relay

Inverse-time delayed relay which responds to an overload in accordance with a time/current characteristic, thus protecting the switching device and any load against overloads.

Overload release

Overcurrent release that provides protection against overload.

Push-in lugs for wall mounting

The adapters for screw mounting enable the 3RM1 motor starter to be mounted on a level surface.

Rated conditional short-circuit current I_q

The assured short-circuit breaking capacity of switchgear assemblies and load feeders, also called "rated conditional short-circuit current".

Rating data for the main circuit

The most important rating data for the main circuit in terms of selecting a switching device are the rated operational current I_e (current specified by the conditions of use) or the rated power (motor power), as well as the corresponding rated voltage U_e.

Recovery time

When a protection function in a switching device has been tripped (e.g. 3RM1 motor starter) the motor cannot be restarted until a recovery time has elapsed. The recovery time is dependent on the cause of the fault. For further information, refer to the relevant product documentation.

Response delay

The response delay is the time from the start of entering a command until the time that the first contact connection is made, at the contactor, for example. The switch-on delay is the time between application of the control voltage and the first current flow. The switch-off delay is the time between removal of the control voltage and interruption of the current flow.

RoHS

EC Directive 2002/95/EC concerning the restriction of the use of certain hazardous substances in electrical and electronic equipment regulates the use of hazardous substances in devices and components. The English abbreviation RoHS is used to refer to this directive: (Restriction of the use of certain hazardous substances), as well as all related measures for implementing it into national legislation.

Service life

Period of time for which the switching device will work properly under normal operating conditions. This is specified as the number of operating cycles, the electrical durability (e.g. contact erosion), and the mechanical durability (e.g. operating cycles without load).

SIL (Safety Integrity Level)

Discrete level (one of a possible three) for the determination of the safety integrity requirements of safety-related control functions. Safety integrity level 3 is the highest possible level, level 1 the lowest.

Trip class (CLASS)

The trip class of an inverse time-delay overload relay specifies the maximum tripping time from cold at a particular load. The trip class number (e.g. CLASS 10A) represents the maximum permissible tripping time in seconds when the 3RM1 motor starter is subjected to a symmetrical 3-pole load from cold with 7.2 times the current setting (IEC 60947-4-1; DIN VDE 0660 Part 107).

Tripping characteristic

The tripping characteristic (curve) is the graphical representation of the relationship between the tripping time and the influencing variable. The time/current diagram can be used to find out, for example, how long it will take for the release or the tripping relay to operate at a particular current.

Tripping current (of an overload release)

The current value at which a release trips within a certain time.

Type of coordination 1

The load feeder may be non-operational after a short circuit has been cleared. Damage to the 3RM1 motor starter is permissible.

Type of coordination 2

The 3RM1 motor starter remains functional after a short-circuit.

Types of coordination

The IEC 60947-4-1 (VDE 0660 Part 102) standard distinguishes between two types of coordination (type of coordination) referred to as coordination type "1" and coordination type "2". The short circuit that needs to be dealt with is cleared reliably and safely with both types of coordination; the only differences are in the extent of the damage sustained by the device following a short circuit.

Utilization category

According to IEC 60947-4-1, the application area of and the load applied to 3RM1 motor starters can be identified by looking at the specified utilization category in conjunction with the specified rated operational current or the motor power and the rated voltage. An example is utilization category AC 53 a for starting and switching off squirrel-cage motors.