SIEMENS

Industrial Controls

ET 200SP
Motor starter
(3RK1308-0**00-0CP0)

Equipment Manual

03/2025
A5E34821005002A/RS-AE/005

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 personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. 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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Disclaimer of Liability

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.

Siemens Aktiengesellschaft
Smart Infrastructure
Electrical Products
Postfach 10 09 53
93009 Regensburg
GERMANY

℗ 03/2025 Subject to change

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Introduction

1

Purpose of the documentation

This Equipment Manual describes the non-fail-safe and the fail-safe ET 200SP motor starters with firmware version V1.0.0 or higher.

This Equipment Manual supplements the ET 200SP System Manual (http://support.automation.siemens.com/WW/view/en/58649293). Functions affecting the system in general are described in the System Manual. There, you will also find information on installation, connection and the installation conditions of the ET 200SP motor starter.

The information provided in this Equipment Manual, the System Manual and the function manuals enables you to commission the ET 200SP distributed I/O system.

Basic knowledge required

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

- Industrial controls
- Digital circuit logic
- Automation technology
- Safety functions
- PROFINET and PROFIBUS bus topology
- TIA Portal

Definition

In the manual, "ET 200SP motor starter" is used as a synonym for all non-fail-safe and fail-safe variants of the ET 200SP motor starter.

1.1 Responsibility for system configuration and functionality

The products described here have been developed to carry out safety-related functions as part of a complete plant or machine. In general, a complete safety system consists of sensors, evaluation units, signaling devices and methods for safe tripping. It is the responsibility of the manufacturer to ensure that the system or machine is functioning properly as a whole.

Siemens AG, its subsidiaries, and associated companies (hereinafter referred to as "Siemens") are not in a position to guarantee every characteristic of a complete plant or machine not 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 Change documentation

Release number	Changes
03/2025	Incorporation of new firmware functions V1.2.2 such as chatter monitoring and "5-life"

1.3 Siemens Industry Online Support

Information and service

At Siemens Industry Online Support you can obtain up-to-date information from our global support database:

- Product support
- Application examples
- Forum
- mySupport

Link: Siemens Industry Online Support (https://support.industry.siemens.com/cs/de/en)

Product support

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

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

Link: Product support (https://support.industry.siemens.com/cs/ww/en/ps)

mySupport

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

- **Support Request**
  Search for request number, product or subject
- **My filters**
  With filters, you limit the content of the online support to different focal points.

- **My favorites**
  With favorites you bookmark articles and products that you need frequently.
- **My notifications**
  Your personal mailbox for exchanging information and managing your contacts. You can compile your own individual newsletter in the "Notifications" section.
- **My products**
  With product lists you can virtually map your control cabinet, your system or your entire automation project.
- **My documentation**
  Configure your individual documentation from different manuals.
- **CAx data**
  Easy access to CAx data, e.g. 3D models, 2D dimension drawings, EPLAN macros, device circuit diagrams
- **My IBase registrations**
  Register your Siemens products, systems and software.

1.4 Siemens Industry Online Support app

Siemens Industry Online Support app

The Siemens Industry Online Support app provides you access to all the device-specific information available on the Siemens Industry Online Support portal for a particular article number, such as operating instructions, manuals, data sheets, FAQs etc.

The Siemens Industry Online Support app is available for Android and iOS:

Android

iOS

1.5 Support Request

After you have registered, you can use the Support Request form in the online support to send your question directly to Technical Support:

Support Request:	Internet (https://support.industry.siemens.com/My/ww/en/requests)

1.6 Recycling and disposal

These devices can be recycled thanks to their low pollutant content.

Note

For environmentally friendly recycling and disposal of your old device, contact a company certified for the disposal of electronic waste and dispose of the device in accordance with the regulations in your country.

Cybersecurity information

2

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Information about third-party software

3

Note to resellers: Please pass on this document to your customers to avoid license infringements.

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If you like to receive a copy of the source code, please contact SIEMENS at the following address:

Siemens AG

LC TE SL

Werner-von-Siemens Str. 60

91052 Erlangen

Germany

Subject: Open Source Request (please specify Product name and version)

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Product-specific safety instructions

4

4.1 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.

NOTICE

Damage caused by electrostatic charge

The motor starter can become damaged by an electrostatic charge if the unoccupied pins of the motor starter are contacted.

When handling and installing the ET 200SP motor starter, ensure protection against electrostatic charging of the components. Changes to the system configuration and wiring are only permissible after disconnection from the power supply.

It is only permitted to connect ET 200SP motor starters after disconnection of the electronic power supply (PELV and SELV) and of the line power supply (500 V AC).

⚠ WARNING

Use of radio devices or cell phones

Malfunctions are possible when using radio devices or cell phones in the immediate vicinity of fail-safe I/O. This can cause death, serious physical injury or material damage.

If you scan the 2D matrix code/ID link or use the "SIEMENS Industry Support App" when the fail-safe I/O is switched on, deactivate all wireless connections of the radio/cell phone beforehand. Alternatively, switch off the fail-safe I/O before scanning.

Switch off radio devices in the immediate vicinity of fail-safe I/O.

4.2 Safety information for hazardous areas

⚠ WARNING

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

The fail-safe motor starter is permitted for the operation of device group II, Cat (2), area G D.

The fail-safe motor starter itself must not be located in the hazardous area.

4.3 Safety instructions for safety-related applications

⚠ WARNING

Hazardous voltage.
Will cause death or serious injury.

To avoid an electric shock, observe the following safety measures when working on the plant and the device:

- Turn off and lock out all power supplying this device before working on this device.
- Make sure that the device cannot be switched back on.
- Verify that the equipment is not live.
- Ground the plant.
- Cover adjacent live parts or erect barriers around them.

⚠ WARNING

Hazardous Voltage

Work on live parts of the ET 200SP motor starter system can result in death or serious injury.

The device is only allowed to be commissioned and operated by qualified personnel. For the purpose of the safety information in this documentation, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

NOTICE

Loss of the safety function

For the fail-safe ET 200SP motor starter, the key safety values apply in the case of a function test interval (state change of the outputs) ≤ 1 month.

To check functioning of the switching elements, switch the motor on or off at least once every month. For additional information on checking the switching elements, see chapter"Operating motor starters (Page 46)".

⚠ WARNING

Loss of the safety function with incorrect wiring

If wiring is incorrect, the motor starter cannot shut down in the event of a fault and the motor will continue to run. There is a risk of severe injury or death. Material damage is also possible.

To ensure the safety function, in the case of a single-phase load route the phase and the neutral conductor through the motor starter. You will find additional information next to the connection examples in chapter "Single-phase motor (Page 202)". In the case of a three-phase load, do not connect the neutral conductor to the star point of the load.

NOTICE
Electromagnetic interference To ensure interference immunity of the motor starter, ground PELV/SELV power supply units in accordance with regulations. (Please also note the documentation for the respective power supply unit in this regard.)

4.4 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.

4.5 Current information about operational safety

Important note for maintaining operational safety of your system

DANGER

Hazardous voltage

Can cause death, serious injury or property damage

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. We therefore also provide information in the newsletters Industrial controls (https://new.siemens.com/global/en/products/automation/industrial-controls/forms/newsletter.html) and Safety Integrated (https://new.siemens.com/global/en/products/automation/topic-areas/safety-integrated/factory-automation/newsletter.html) about new products, further technical developments as well as standards and guidelines.

4.6 Declaration of conformity

The manufacturer declares that the safety components of the fail-safe ET 200SP 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 entire EC Declaration of Conformity: Declaration of Conformity (http://www.siemens.com/sirius/approvals).

Standards

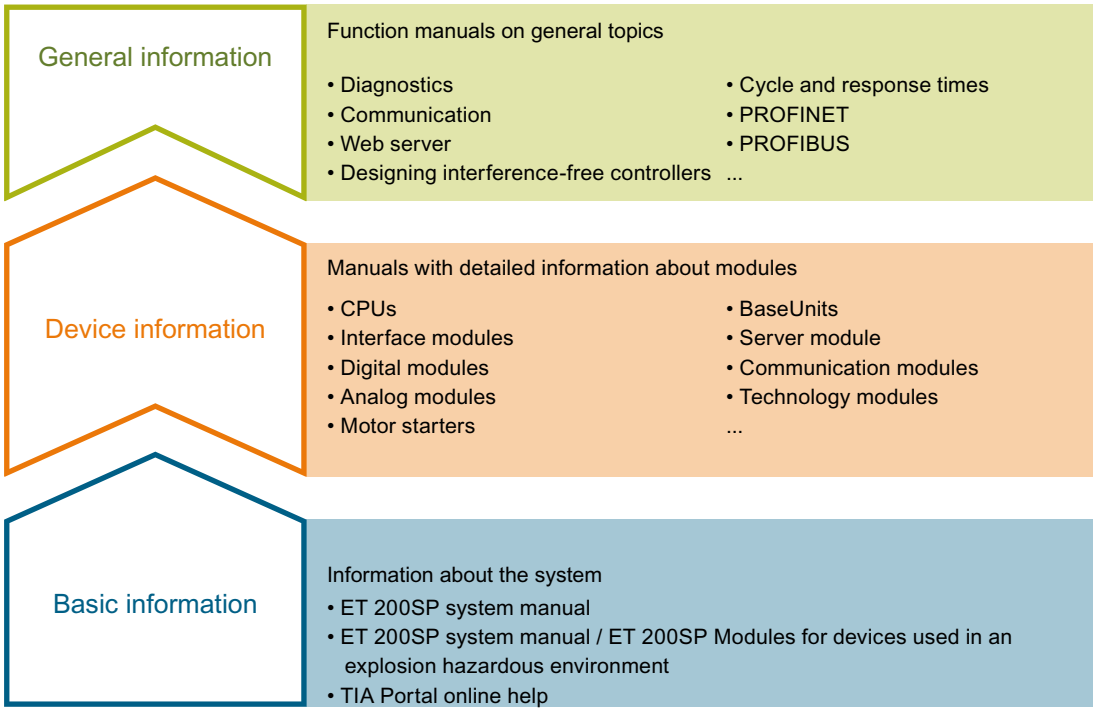
The table below shows the standards that each of the ET 200SP motor starters comply with:

Standard	Direct-on-line starter	Reversing starter	Fail-safe direct-on-line starter	Fail-safe reversing starter
IEC 60947-4-2:2011-05	x	x	x	x
IEC 60947-4-3:2011-07	x	-	-	-
EN 62061: 2005	-	-	x	x
EN ISO 13849-1:2015	-	-	x	x
IEC 61508-1:2010	-	-	x	x
IEC 61508-2:2010	-	-	x	x
IEC 61508-3:2010	-	-	x	x

ET 200SP Documentation Guide

5

The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas. This arrangement enables you to access the specific content you require.



Basic information

The System Manual and Getting Started describe in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP distributed I/O system. The STEP 7 online help supports you in the configuration and programming.

Device information

Product manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC ET 200SP distributed I/O system, e.g. diagnostics, communication, Web server, motion control and OPC UA.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742709).

Changes and supplements to the manuals are documented in a Product Information.

You can download the product information free of charge from the Internet (https://support.industry.siemens.com/cs/us/en/view/73021864).

Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (https://support.automation.siemens.com/WW/view/en/84133942).

"mySupport"

With "mySupport", your personal workspace, you make the best out of your Industry Online Support.

In "mySupport", you can save filters, favorites and tags, request CAx data and compile your personal library in the Documentation area. In addition, your data is already filled out in support requests and you can get an overview of your current requests at any time.

You must register once to use the full functionality of "mySupport".

You can find "mySupport" on the Internet (https://support.industry.siemens.com/My/ww/en).

"mySupport" - Documentation

With "mySupport", your personal workspace, you make the best out of your Industry Online Support.

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You must register once to use the full functionality of "mySupport".

You can find "mySupport" on the Internet (https://support.industry.siemens.com/My/ww/en/documentation).

"mySupport" - CAx data

In the CAx data area of "mySupport", you can access the latest product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files
- Manuals, characteristics, operating manuals, certificates
- Product master data

You can find "mySupport" - CAx data on the Internet (https://support.industry.siemens.com/my/ww/en/CAxOnline).

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

You will find the application examples on the Internet (https://support.industry.siemens.com/cs/ww/en/ps/ae).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).
This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.
With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109767888).

SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to perform commissioning and maintenance activities simultaneously on various SIMATIC S7 stations as a bulk operation independent of TIA Portal.

The SIMATIC Automation Tool provides a multitude of functions:

- Scanning of a PROFINET/Ethernet system network and identification of all connected CPUs
- Address assignment (IP, subnet, gateway) and station name (PROFINET device) to a CPU
- Transfer of the date and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- RUN/STOP mode switchover
- CPU localization by means of LED flashing
- Reading out of CPU error information
- Reading of the CPU diagnostics buffer
- Reset to factory settings
- Firmware update of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98161300).

PRONETA

SIEMENS PRONETA (PROFINET network analysis) allows you to analyze the plant network during commissioning. PRONETA features two core functions:

- The topology overview automatically scans the PROFINET and all connected components.
- The IO check is a fast test of the wiring and the module configuration of a plant, incl. fail-safe inputs and outputs.

You can find SIEMENS PRONETA on the Internet (https://support.industry.siemens.com/cs/ww/en/view/67460624).

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and the optimal use of resources

You can find SINETPLAN on the Internet (https://www.siemens.com/sinetplan).

Product features

6

6.1 Article numbers, properties, accessories

Article numbers

Short code	Article number
Direct-on-line starter	
DS 0.1 - 0.4 A HF	3RK1308-0AA00-0CP0
DS 0.3 - 1 A HF	3RK1308-0AB00-0CP0
DS 0.9 - 3 A HF	3RK1308-0AC00-0CP0
DS 2.8 - 9 A HF	3RK1308-0AD00-0CP0
DS 4.0 - 12 A HF including fan (3RW4928-8VB00)	3RK1308-0AE00-0CP0
Reversing starter	
RS 0.1 - 0.4 A HF	3RK1308-0BA00-0CP0
RS 0.3 - 1 A HF	3RK1308-0BB00-0CP0
RS 0.9 - 3 A HF	3RK1308-0BC00-0CP0
RS 2.8 - 9 A HF	3RK1308-0BD00-0CP0
RS 4.0 - 12 A HF including fan (3RW4928-8VB00)	3RK1308-0BE00-0CP0
Fail-safe direct-on-line starters	
F-DS 0.1 - 0.4 A HF	3RK1308-0CA00-0CP0
F-DS 0.3 - 1 A HF	3RK1308-0CB00-0CP0
F-DS 0.9 - 3 A HF	3RK1308-0CC00-0CP0
F-DS 2.8 - 9 A HF	3RK1308-0CD00-0CP0
F-DS 4.0 - 12 A HF including fan (3RW4928-8VB00)	3RK1308-0CE00-0CP0
Fail-safe reversing starters	
F-RS 0.1 - 0.4 A HF	3RK1308-0DA00-0CP0
F-RS 0.3 - 1 A HF	3RK1308-0DB00-0CP0
F-RS 0.9 - 3 A HF	3RK1308-0DC00-0CP0
F-RS 2.8 - 9 A HF	3RK1308-0DD00-0CP0
F-RS 4.0 - 12 A HF including fan (3RW4928-8VB00)	3RK1308-0DE00-0CP0

Views of the ET 200SP motor starter

The ET 200SP motor starter is a 30-mm-wide compact device with hybrid technology. The ET 200SP motor starter has electronic overload protection for switching of three-phase asynchronous motors and single-phase AC motors up to 5.5 kW (at 500 V) during normal operating conditions. Fail-safe variants of the motor starter are also available.

The figure below shows an ET 200SP HF motor starter:

Figure 6-1 View of the ET 200SP motor starter with mounted 3DI/LC module (optionally available)

The figure below shows a fail-safe ET 200SP motor starter:

Figure 6-2 View of the fail-safe ET 200SP motor starter with mounted 3DI/LC module (optionally available)

Properties of the ET 200SP motor starter

The ET 200SP motor starter has the following technical properties:

- Switching and protection device for three-phase asynchronous motors and single-phase AC motors
- Integrated short-circuit and overload protection
- Direct-on-line or reversing start function

Fail-safe motor starters additionally support safety-related disconnection (Safe Torque Off). The fail-safe variants of the motor starter are therefore suitable for the following uses:

- Safety-related applications up to SIL 3 to EN 61508, PL e/Cat. 4 to EN ISO 13849-1
- Overload protection of motors in hazardous areas

You can find all the functions supported by the ET 200SP motor starter in Chapter Functions (Page 59)

The following system functions of the ET 200SP family remain supported:

- I&M data
- Firmware update

- Maintenance
- PROFIenergy

You will find the descriptions of these functions and also rules and regulations for commissioning in the ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/de/view/58649293/en?dl=en).

Accessories of the ET 200SP motor starter

You can order the following accessories separately:

- BaseUnit with width of 30 mm (3RK1908-0AP00-0xx0)
- Labeling strips in various versions:
  - 500 units light-gray on a roll (6ES7193-6LR10-0AA0)
  - 500 units yellow on a roll (6ES7193-6LR10-0AA0)
  - 1000 units light-gray on DIN A4 sheets (6ES7193-6LA10-0AG0)
  - 1000 units yellow on DIN A4 sheets (6ES7193-6LA10-0AG0)
- 160 reference identification labels (6ES7193-6LF30-0AW0)
- 3DI/LC module (3RK1908-1AA00-0BP0)
- Fan (3RW4928-8VB00); is already included with all 4-12 A motor starters

NOTICE
Blowing direction of the fan Observe the blowing direction of the fan when mounting. The air flow must be directed into the inside of the motor starter. The correct blowing direction is indicated by arrows on the bottom of the fan. See ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/de/view/58649293/en?dl=en), "Installing fans" section.

- Mechanical bracket for BaseUnit (3RK1908-1EA00-1BP0)
- Cover for an empty BaseUnit (3RK1908-1CA00-0BP0)
- Touch protection for infeed bus (3RK1908-1DA00-2BP0); is already provided with all BaseUnits with 500 V AC infeed

You can find further information on accessories in the ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/de/view/58649293/en?dl=en) in the Appendix "Accessories/spare parts".

See also

Introduction (Page 7)

6.2 Electromagnetic compatibility

Definition of EMC

Electromagnetic compatibility (EMC) is the ability of an electrical installation to function satisfactorily in its electromagnetic environment without interfering with that environment.

Designing interference-free motor starters

For interference-free operation of the ET 200SP station in accordance with standard IEC 60947-4-2, use a dummy module before the first motor starter. No dummy module is necessary to the right of the motor starter.

Note the following mounting rules:

Use the following dummy module on the standard mounting rail between the previous module and the ET 200SP motor starter:

BU cover 15 mm: 6ES7133-6CV15-1AM0 with BaseUnit 6ES7193-6BP00-0BA0

For operation of the ET 200SP station with an unused BaseUnit, a cover must be provided for the open BaseUnit plug contacts (power connector, power bus connector, and backplane bus connector).

The cover protects the plug contacts against dirt. The BU cover can be ordered as an accessory.

Note

Use of interference suppressors with hybrid switchgear

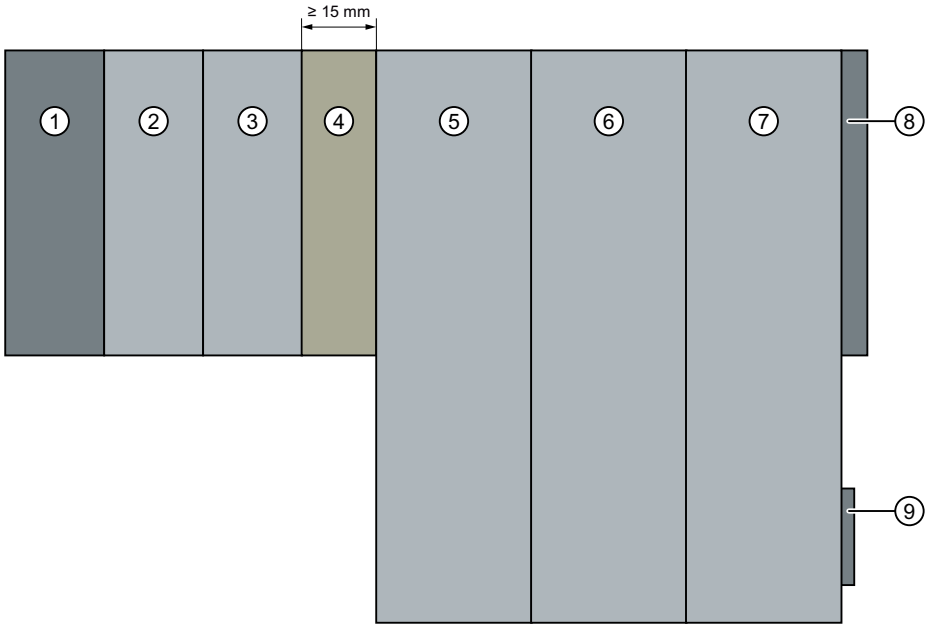
No EMC protective wiring (e.g. RC element or varistor interference suppression module) is ever necessary with the ET 200SP motor starter. Observe the following section in this context Designing motor starters in conjunction with electromechanical switching devices (Page 39).

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 ever arise in the surrounding environment.

If EMC interferences nevertheless arise, an RC element can be connected to the motor (see section Designing motor starters in conjunction with electromechanical switching devices (Page 39), figure "Use of RC elements for reducing voltage peaks").

Mounting the dummy module

The figure below provides a schematic representation of how to implement measures for improving interference immunity.



①	Interface module	⑥	Motor starter
②	Digital input module	⑦	Motor starter
③	Digital output module	⑧	Server module
④	Dummy module	⑨	Infeed bus cover
⑤	Motor starter		

NOTICE
Ensuring interference immunity You must not plug any other module into the BaseUnit of the dummy module, otherwise interference immunity is no longer ensured.

Note

Using a dummy module

The dummy module cannot be configured in all versions of TIA Portal.

In this case, leave this slot unoccupied in TIA Portal.

6.3 Designing motor starters in conjunction with electromechanical switching devices

NOTICE
Use of motor starters in series with mechanical switching devices, e.g. line contactors When using motor starters in series with mechanical switching devices, e.g. line contactors, ensure that voltage peaks are prevented by means of the mechanical shutdown of small motors (high inductance). You can achieve this with a corresponding shutdown sequence or through the use of RC elements.

One advantage of the hybrid motor starters is, among other things, the shutdown in the current zero point, which has the advantage that no voltage peaks or arcing occur in the power circuit. Thus, electromagnetic interferences no longer exists due to the shutdown.

Switching an inductive load, in particular of motors with an output of < 1 kW with correspondingly high inductance, e.g. with a contactor, can cause an inductive voltage of several 1000 V with steep voltage edges, depending on the switching time. This can also occur multiple times due to the bouncing of the contactor contacts and the resultant arcs. For a contactor, this leads to increased contact erosion (wear) and to high electromagnetic load on other components due to coupling into other electric lines.

If a line contactor is also connected upstream or downstream of a motor starter, the shutdown of the line contactor when the motor is running generates a counter-acting self-induction voltage, which can reach a voltage of several 1000 V with a very steep voltage rise.

The motor starter is protected against overvoltage by internal varistors. If, however, the voltage peaks are significantly higher and/or they occur more frequently or in rapid succession (due to contactor bouncing), the varistors become overloaded and can no longer limit the voltage peaks. The voltage peaks are then present directly on the electronic switching element of the motor starter and can ultimately lead to damage and a defective device.

Remedial measures

- Delayed shutdown of the line contactor by the motor starter shutting down before the contact (in current zero point). These voltage peaks do not occur at all and the contactor can be shut down (de-energized) approx. 100 ms later. This also results in an increased service life of the contactor, because it always switches without load.
- Use of RC elements on the 3 motor phases. As a consequence, the voltage peaks and also the steep voltage rise are reduced.

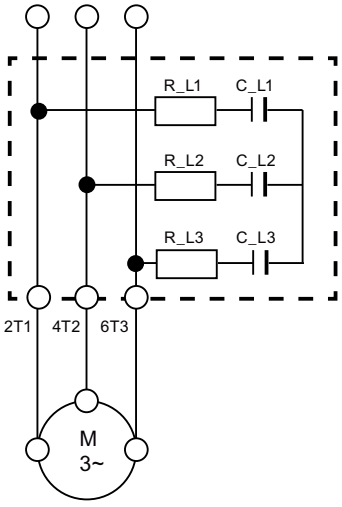


Figure 6-3 Use of RC elements for reducing voltage peaks

The following RC elements are suitable:

- 3RK1911-6EA00 for the direct mounting on standard mounting rail
- 3RK1911-6EB00 for direct attachment to the motor terminal board
- RC elements for direct attachment on the S00 contactor (3RT2916-1P*). RC elements for load contactors larger than size S00 must be obtained through third-party manufacturers.

NOTICE
Connected motors Observe the dimensioning of the connected motors.

If other regenerative components (FU, motors, transformers, etc.) are connected to the motor starter, the FAQ "EMC interference with fail-safe ET 200SP motor starter with a device fault (https://support.industry.siemens.com/cs/us/en/view/109818881)" must be observed.

6.4 Applications

You can use the ET 200SP motor starters wherever you want to switch and protect drives up to 5.5 kW with an ET 200SP system.

The ET 200SP motor starters are used for the following, for example:

- Conveyor technology
- Logistics systems
- Production machines
- Machine tools
- Gas discharge lamps

Fail-safe motor starters are designed exclusively for the switching and protection of motor loads.

6.5 Permissible ambient temperatures up to 1000 m above sea level.

General supplementary conditions

You can install the motor starter in two mounting positions:

- Horizontal mounting position
- Vertical mounting position

The mounting position depends on the position of the standard mounting rail. The following maximum permissible ambient temperatures apply depending on the mounting position:

- Horizontal mounting position: 60 °C
- Vertical mounting position: 50 °C

Observe the following general conditions when using the motor starters:

- Parameterized rated operational current I_e
- Current of the infeed system (500 V AC)
- Current of the power bus (24 V DC)
- Fan operation; the fan switches itself on and off automatically depending on the temperature in the motor starter.

Stand-alone installation

You can operate motor starters equipped with fans with the max. parameterizable I_e within the specified temperature limits.

Use of fans in group configuration (side by side)

1) Operation with infeed system (500 V AC) up to 27 A

See the table below for the cases in which you must use a fan depending on the ambient temperature during operation with a infeed system (500 V AC) up to 27 A:

Set operational current I_e	Direct-on-line starter		Reversing starter	
	Horizontal mounting position	Vertical mounting position	Horizontal mounting position	Vertical mounting position
	Ambient temperature			
1 A	45°... 60 °C [1]	40°... 50 °C [1]	45°... 60 °C [1]	40°... 50 °C [1]
3 A	45 ... 60 °C [1]	40°... 50 °C [1]	45°... 60 °C [1]	40°... 50 °C [1]
5 A	40°... 60 °C [1]	35 ... 50 °C [1]	37°... 60 °C [1]	32°... 50 °C [1]
7 A	35 ... 60 °C [1]	30°... 50 °C [1]	32 ... 60 °C [1]	27°... 50 °C [1]
9 A	30°... 60 °C [1]	25 ... 50 °C [1]	25°... 55 °C [1]	20°... 50 °C [1]
> 9 A	Up to max. 50 °C [1] [2]	Up to max. 50 °C [1] [2]	Up to max. 50 °C [1] [2]	Up to max. 50 °C [1] [2]
> 10 A	Up to max. 45 °C [1] [2]	Up to max. 45 °C [1] [2]	Up to max. 45 °C [1] [2]	Up to max. 45 °C [1] [2]

1) In operation with an infeed system up to 32 A, the maximum usage temperature is reduced by 10 K.

2) Fans are included in the scope of supply

NOTICE
Loadability of the power bus The power bus (24V DC) can only be loaded with up to 7 A when used with the motor starters.

2) Current of the infeed system (500 V AC) in accordance with UL/CSA requirements

NOTICE
A fan is absolutely necessary In this type of operation you always have to use a fan.

See the table below for the maximum ambient temperature at which you can run the motor starter when operating it with a infeed system (500 V AC) in accordance with UL/CSA requirements:

Set operational current I_e	**Direct-on-line starter, reversing starter**	
	Horizontal mounting position	**Vertical mounting position**
	Ambient temperature	
1 A	Up to max. 60 °C	Up to max. 50 °C
3 A	Up to max. 60 °C	Up to max. 50 °C
5 A	Up to max. 60 °C	Up to max. 50 °C
> 5 A	Up to max. 50 °C	Up to max. 50 °C
> 9 A	Up to max. 45 °C [1)]	Up to max. 45 °C [1)]

1) Fans are included in the scope of supply

NOTICE
Loadability of the power bus The power bus (24V DC) can only be loaded with up to 7 A when used with the motor starters.

6.6 Permissible ambient temperatures at more than 1000 m above sea level.

Current derating as a function of the installation altitude is applicable for devices with and without fans.

Possible restrictions through current derating at installation altitudes above 1000 m above sea level can be compensated for by using a fan.

The following table shows the current derating as a function of the altitude of the installation location:

Installation altitude h in m	I_e in %	Max. ambient temperature (vertical/horizontal installation)
1000 m	100 % (see above)	
2000 m	92 %	+ 60 °C ... + 50 °C
3000 m	85 %	+ 54 °C ... + 45 °C
4000 m	78 %	+ 48 °C ... + 40 °C

The I_e values can be interpolated on the basis of the available altitude specifications.

NOTICE

Derating of the nominal/rated data for the insulation coordination beyond specific altitudes above sea level

- Up to an elevation of 2000 m above sea level, operation is possible without derating of the nominal/rated data for the insulation coordination.
- With an installation altitude higher than 2000 m and below 4000 m above sea level, observe the following:
  - Line connection / E-bus: the permitted overvoltage category is reduced from III to II
  - Power bus (24 V power supply): only SELV / PELV supply permitted

NOTICE

Extension of the application range for fail-safe SIMATIC ET 200SP motor starters at installation altitudes of up to 4000 m above sea level

For information on this, please refer to the current product release Extension of the application range for fail-safe SIMATIC ET 200SP motor starters up to an installation altitude of 4000 m (https://support.industry.siemens.com/cs/ww/en/view/109778836).

6.7 Device versions

Current ranges

The table below shows the switchable motor powers depending on the primary voltage, according to DIN EN 60947-4-1: Table G.1. The stated current ranges are valid for the ET 200SP motor starters.

	0.1 ... 0.4 A		0.3 ... 1 A		0.9 ... 3 A		2.8 ... 9 A		4 ... 12 A	
	0.1 A	0.4 A	0.3 A	1 A	0.9 A	3 A	2.8 A	9 A	4 A	12 A
230 V AC	< 0.06 kW	0.09 kW	< 0.06 kW	0.18 kW	0.18 kW	0.55 kW	0.55 kW	2.20 kW	0.75 kW	3.0 kW
400 V AC	< 0.06 kW	0.12 kW	< 0.09 kW	0.25 kW	0.37 kW	1.10 kW	1.50 kW	4.00 kW	1.5 kW	5.5 kW
500 V AC	< 0.06 kW	0.18 kW	< 0.12 kW	0.37 kW	0.55 kW	1.50 kW	1.50 kW	4.00 kW	2.2 kW	5.5 kW

The assignments of the motor currents to the motor powers are recommended values. Due to the introduction of energy-efficient motors (IE3, IE4) to the market, rated currents are falling for any given power. At the same time, the start-up currents rise.

NOTICE

Dimensioning instructions

Take the current characteristics of the connected motor and motor starter into account when dimensioning. The following characteristic values are relevant:

- Ratio of rated current to motor starting current
- The maximum starting current of the motor may deviate from the values specified by the manufacturer by 20% in accordance with EN 60034-1.
- Maximum permissible current range of the motor starter: The permissible current range can be found in the graphic in Chapter "Device protection model (Page 89)".

You will find more information on dimensioning switching devices for IE3/IE4 motors in the Switching devices application manual (http://support.automation.siemens.com/WW/view/en/94770820).

6.8 Operating motor starters

Hardware and software requirements

Fail-safe ET 200SP motor starters are supported by IM155-6PN BA interface modules with firmware V3.2 or higher, IM155-6PN ST with firmware V3.1 or higher, IM155-6PN HF with firmware V3.1 or higher and IM155-6DP HF with firmware V3.0 or higher.

You require SIMATIC STEP 7 V14 or higher for configuring and programming fail-safe ET 200SP motor starters. No additional safety software (e.g. F-Configuration Pack) is required for configuring and programming the fail-safe ET 200SP motor starter.

Note

Requirements for manual bus mode

The device firmware V1.2.0 or higher is required for manual bus mode of the ET 200SP motor starter.

Note

Configuration of the ET 200SP motor starters with the TIA Portal software SIMATIC STEP 7 V13 or higher is possible with a GSD file (GSDML).

Checking switching elements

The switching elements (semiconductors, relays) are checked automatically when the motor is switched off and on via the motor starter.

The switching elements cannot be checked in the following operating states:

- During operation (Motor ON)
- In the switched-off state (Motor OFF)

Therefore ensure that the switching elements are regularly checked by the following actions:

- Monthly self-test of the motor starter if the motor starter has been switched off for more than a month:
  - Self-test by switching the motor on and off

  or alternatively

  - Commissioning of the entire system
- If the motor is operated continuously, disconnect it from the power supply at least once monthly by way of the motor starter.
- In the case of reversing starters, check the switching elements for both directions of rotation: To do this, start the motor once in the clockwise direction and once in the counter-clockwise direction.

The switching on and off routines must be run through without errors. This means:

- Current must flow.
- The motor starter must not display any errors.
- The supply voltage must be stable.

The switching on or off routine is canceled as soon as an error is detected. The motor starter assumes the safe OFF state. Observe to the diagnostic messages in DS72 logbook - Read device error (Page 174). Depending on the error message, you can reset the error by switching off the 24 V supply voltage and then switching it on again.

If you switch on when the line voltage is interrupted or a load is missing, the following messages are generated:

- Residual current detected
- Residual current disconnection

This message can be acknowledged by the Trip Reset / Reset pushbutton.

If the supply voltage is interrupted during switching on or off, this may lead to a device fault (entry 308 in data set 92 (Page 181)). In addition, the following entries in DS72 logbook - Read device error (Page 174) are possible:

- 20017 "Residual current detection during switching on/off routine or bypass element does not close"
- 20018 "Error in switching element diagnostics in the switching off process"

You can reset these faults and subsequently continue operating the motor starter following a fault-free test cycle as described above. If the faults recur, this indicates that the motor starter is defective in spite of the fact that the supply voltage conditions are stable. Replace the motor starter in this case.

Replacing the fail-safe motor starter

When replacing a fail-safe motor starter, pay attention to the commissioning specifications for fail-safe systems.

Fail-safe input F-DI on the BaseUnit

The fail-safe input on the BaseUnit is designated as follows in the manual with "F-DI".

In the case of safety-related applications, control the F-DI on the BaseUnit from a safe output.

NOTICE
Connection of the F-DI input of the BU-30-MS5 to BU-30-MS10 BaseUnits to surge filters If your equipment makes it necessary to protect the contact against overvoltage, you have to connect the F-DI input of the BU-30-MS5 to BU-30-MS10 BaseUnits to surge filters! Refer to Chapter "Electromagnetic compatibility" in ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/de/view/58649293/en?dl=en).

⚠ WARNING

Safety-related shutdown via the F-DI

Depending on peripherals used, the shutdown takes place via one or two output channels (terminals):

- PM switching: The shutdown takes place via two output channels.
- PP switching: The shutdown takes place via one output channel.

Shutdown via one output channel (PP switching) achieves SILCL 3 according to EN 62061, PL e/Cat. 4 according to EN ISO 13849-1 if steps are taken to ensure that the cables are installed in such a way that they are protected against a cross-circuit/line-to-line fault.

For the BU-30-MS7 to BU-30-MS10 F-DI forwarding BaseUnits, only PP switching is possible.

For the single F-DI BaseUnits BU-30-MS5 and BU-30-MS6, PM and PP switching are possible.

Bright and dark tests

With bright and dark tests, safety relays such as ET 200SP F-PM-E (6ES7136-6PA00-0BC0) or SIRIUS 3SK check whether their safe outputs can still be activated and deactivated. The bright and dark tests are run cyclically. The ET 200SP motor starter is intended for operation with an F-PM-E or 3SK connected upstream and is adapted to the bright and dark test times of these devices.

You can find more information on the operating principle and parameter assignment of bright and dark tests in the respective device manual.

To avoid an unintentional response of the fail-safe motor starter during the bright and dark test, these tests must not exceed a certain time. Due to component aging, the permissible read-back time can also decrease throughout the motor starter's service life. The voltage of the power supply unit also has an influence on the permissible read-back time. Increase the power supply unit's output voltage to minimize the risk of incorrect deactivation during dark tests.

By trial and error, set the read-back time as low as possible, but so high that the output channel is not deactivated.

⚠ WARNING

Inadvertent starting of the motor if the bright test lasts too long

The motor can start if the bright test lasts more than 10 ms. There is a risk of severe injury or death. Material damage is also possible.

Make sure that the bright test lasts less than 10 ms on devices that are connected upstream of the motor starter.

Power supply

In the case of a 24 V DC power supply, observe the following safety measures:

- Ensure safe electrical separation and separate routing of cables.
- Ensure increased insulation of the extra-low voltage (SELV/PELV) from circuits with hazardous potentials in accordance with IEC 60364-4-41.
- To deactivate safely via the 24 V power bus, use a suitable power supply in compliance with the requirements of the safety classification used.
- In corner-grounded delta networks, ensure increased insulation of the extra-low voltage (SELV/PELV) from circuits with hazardous potentials in accordance with NFPA 79.

Current consumption of the ET 200SP motor starters in the electric torque

NOTICE
Brief current peak possible In the electric torque of the 24 V DC power supply, a brief current peak can occur depending on the number of motor starters. Ensure an appropriate layout of your voltage source, taking this current peak into consideration.

Selection of a SITOP power supply including selective load circuit monitoring for an ET 200SP station with fail-safe I/O modules and motor starters:

See FAQ ET 200SP motor starter + fail-safe I/O + SITOP including selectivity (https://support.industry.siemens.com/cs/ww/en/view/109781189) in Industry Online Support.

Peak current in the start-stop torque

Number of motor starters	Current in A	Time in ms (until 8 A rated current is reached)
1	25	0.145
2	47	0.24
3	64	0.32
4	78	0.36
5	91	0.42
6	101	0.46
7	111	0.51
8	119	0.56
9	127	0.61
10	134	0.67
11	140	0.71
12	145	0.78
13	150	0.85
14	155	0.90
15	159	0.97

Number of motor starters	Current in A	Time in ms (until 8 A rated current is reached)
16	162	1.05
17	165	1.10
18	168	1.20
19	170	1.30
20	172	1.40
21	174	1.50
22	176	1.60
23	178	1.80
24	179	2.10
25	180	2.50
26	181	3.20
27	182	4.00
28	183	5.00
29	184	6.90
30	186	9.00

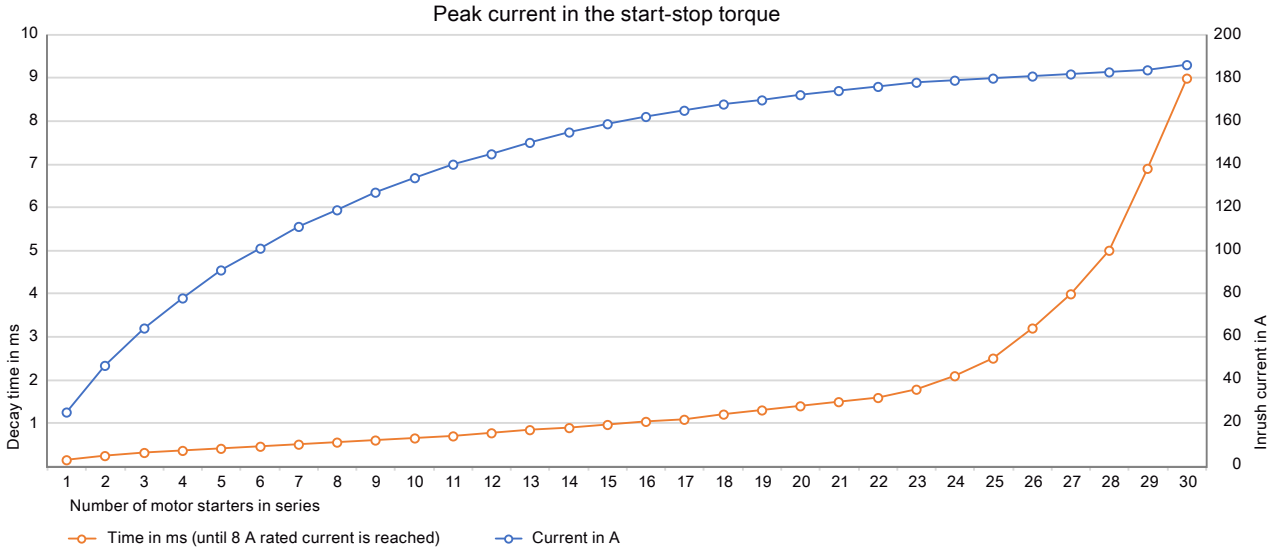


Figure 6-4 Peak current in the start-stop torque

Connecting and operating motor brakes

ET 200SP motor starters can be operated for the following braking applications:

- Variant 1: High Feature DOL starter or reversing starter and F DOL starter or F reversing starter with 400 V brake
- Variant 2: High Feature DOL starter or reversing starter with 230 V brake
- Variant 3: High Feature DOL starter or reversing starter and F DOL starter or F reversing starter with 230 V brake without connection to the neutral conductor

Variant 1. High Feature DOL starter or reversing starter and F DOL starter or F reversing starter with 400 V brake

The current for the braking device is drawn from two phases.

NOTICE
Current drain for the braking device Note that the current for the braking device may only be taken from terminals T1 and T3. Otherwise, the motor starter may be damaged.

The connection of the motor brake leads to phase asymmetry at the motor connection. This is detected by the motor starter, which responds based on its parameter settings and the magnitude of the asymmetry.

Asymmetry limit:

The asymmetry limit is a percentage value by which the motor current is allowed to deviate in each phase. Asymmetry is detected as soon as one of the three phases deviates by more than 40 % from the mean value of all phases.

Response to asymmetry:

You use this device parameter to determine the behavior of the motor starter in the event of asymmetry:

- Warning (not permissible for fail-safe motor starters in ATEX operation)
- Shutdown

Note

Using brake motors

When using brake motors, you have to increase the set rated motor current by the braking current (see example on motor and brake starting current later in this chapter).

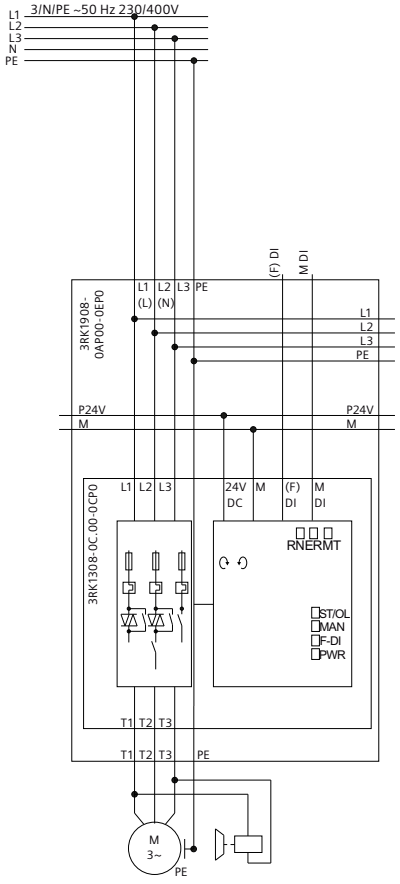


Figure 6-5 Connection of a 400 V brake to an ET 200SP motor starter

Variant 2. High Feature DOL starter or reversing starter with 230 V brake

The current for the braking device is drawn from only one switched phase. Connection is via T1.

The single-phase connection of the motor brake leads to phase asymmetry at the motor connection. This is detected by the motor starter, which responds based on its parameter settings and the magnitude of the asymmetry.

Asymmetry limit:

The asymmetry limit is a percentage value by which the motor current is allowed to deviate in each phase. Asymmetry is detected as soon as one of the three phases deviates by more than 40 % from the mean value of all phases.

Response to asymmetry:

You use this device parameter to determine the behavior of the motor starter in the event of asymmetry:

- Warning (not permissible for fail-safe motor starters in ATEX operation)
- Shutdown

Note

Using brake motors

When using brake motors, you have to increase the set rated motor current by the braking current (see example on motor and brake starting current later in this chapter).

NOTICE
Using this mode This operating mode is **not** suitable for 3RK1308-0C and fail-safe 3RK1308-0D motor starters as there is a connection to the neutral conductor.

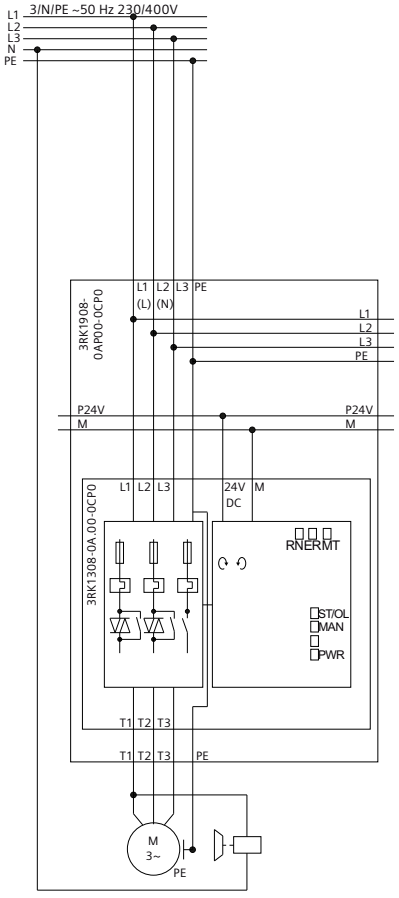


Figure 6-6 Connection of a 230 V brake with connection to the neutral conductor to an ET 200SP motor starter

Variant 3. High Feature DOL starter or reversing starter and F DOL starter or F reversing starter with 230 V brake without connection to the neutral conductor

The current for the braking device is drawn from only one switched phase. Connection is via T1. The second connection of the braking device is made at the neutral point of the motor windings and there is **no** connection to the neutral conductor.

The single-phase connection of the motor brake leads to phase asymmetry at the motor connection. This is detected by the motor starter, which responds based on its parameter settings and the magnitude of the asymmetry.

Asymmetry limit:

The asymmetry limit is a percentage value by which the motor current is allowed to deviate in each phase. Asymmetry is detected as soon as one of the three phases deviates by more than 40 % from the mean value of all phases.

Response to asymmetry:

You use this device parameter to determine the behavior of the motor starter in the event of asymmetry:

- Warning (not permissible for fail-safe motor starters in ATEX operation)
- Shutdown

Note

Using brake motors

When using brake motors, you have to increase the set rated motor current by the braking current (see example on motor and brake starting current later in this chapter).

NOTICE
Using this mode This operating mode is **also** suitable for fail-safe 3RK1308-0C and 3RK1308-0D motor starters as there is no connection to the neutral conductor.

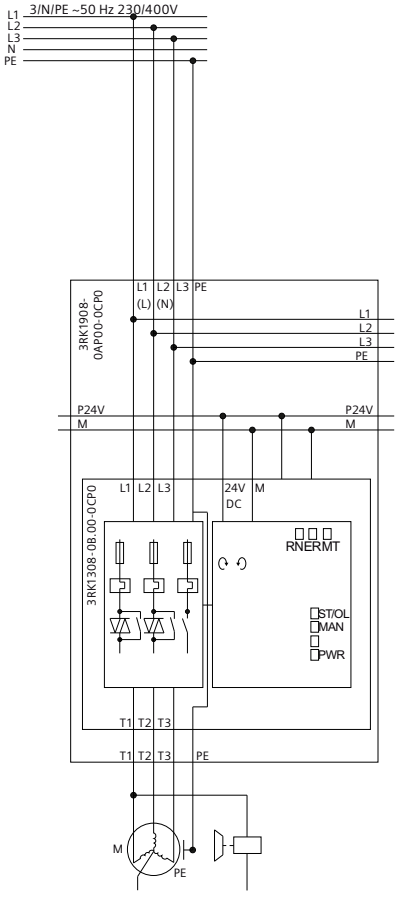


Figure 6-7 Connection of a 230 V brake in star connection and connection to the neutral point on an ET 200SP motor starter

Overview

The table below shows which motor starters can be operated with which of the three variants (✓ = permissible; - = not permissible):

Version	**1** **400 V brake**	**2** **230 V brake with connection to the neutral conductor**	**3** **230 V brake with connection to the neutral point**
Motor connection	Star or delta connection	Star or delta connection	Star connection only
Brake closing time 1)	Long	Very short	Medium
High Feature DOL starter	✓	✓	✓
High Feature reversing starter	✓	✓	✓
High Feature F DOL starter	✓	-	✓
High Feature F reversing starter	✓	-	✓

NOTICE
Brake properties
The brake properties vary depending on the type of connection.
Please observe the information provided by the motor manufacturer.

Note

1)

The brake closing time is influenced accordingly by the type of connection and the selected braking device.

For detailed information, see the documentation provided by the motor manufacturer. The brake configurations described can result in a time response that deviates from the specifications of the motor manufacturer.

Checking the settings

Always check the safety-related parameters during acceptance of the system. Also always check the parameters if a parameter has been changed or if you are commissioning the system for the first time.

Example of the correct engineering of a motor starter

NOTICE
Maximum current-carrying capacity
Note that the sum of the starting current of the motor and the inrush current of the brake must not exceed the maximum current-carrying capacity of the selected motor starter.

- Rated motor current I_{rated}: 2.45 A
- Braking current I_B: 0.50 A
- Setting value on motor starter: $I_e = I_{rated} + I_B = 2.95$ A
- Motor starting current factor: I_{St}/I_{rated} 8-fold
- Brake inrush current factor: 8-fold
- Motor starting current: $I_{St} = I_{rated} * I_{St}/I_{rated} = 2.45$ A * 8 = 19.6 A
- Maximum brake inrush current: $I_B * 8 = 0.5$ A * 8 = 4 A
- Motor starting current + brake inrush current: 19.6 A + 4 A = 23.6 A

- Maximum current-carrying capacity of 3 A motor starter (3RK1308 - 0AC00-0CP0): 30 A; see also data sheet (https://support.industry.siemens.com/cs/ww/en/ps/21800/faq (https://support.industry.siemens.com/cs/ww/en/ps/21800/faq))
- **Result:** The maximum current-carrying capacity is 23.6 A. It is below 30 A for this application. This means that you can use the ET 200SP motor starter (3RK1308 - 0AC00-0CP0) for this application.

Operation by experienced users only

⚠ WARNING

Qualified personnel required

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

Failure to follow proper procedures may result in **personal injury and damage to property**.

ATEX-certified motor overload protection

Fail-safe ET 200SP motor starters are approved under device group II, Category 2) in the "GD" area. This means that the fail-safe motor starters can protect motors that are located in hazardous gas, vapor, mist and air mixtures and also combustible dust.

⚠ WARNING

The motor starter is not suitable for installation in hazardous areas.

Due to the increased danger in hazardous areas, observe the following standards:

- EN 60079-14 / VDE 0165-1 Explosive atmospheres - Part 14: Electrical installations
- EN 60079-17 Explosive atmospheres - Part 17: Electrical installations inspection and maintenance
- EN 50495 Safety devices required for the safe functioning of equipment with respect to explosion risks

See also

FAQ ET 200SP motor starter (https://support.industry.siemens.com/cs/ww/en/ps/21800/faq)

Functions

7

7.1 Overview of functions

The table below shows the functions of the various versions of ET 200SP motor starters:

	Direct-on-line starter	Reversing starter	Fail-safe direct-on-line starter	Fail-safe reversing starter
Basic function/basic parameter (Page 63)				
• Rated operational current (Page 63)	x	x	x	x
• Load type (Page 65)	x	--- (Only 3-phase possible)	x ("1-phase" not possible for ATEX applications)	---
Motor control (Page 66)				
• Electronic switching technology (hybrid switching technology) (Page 66)	x	x	x	x
• Control function (Page 68)	---	x	---	x
• Operating modes (Page 70)	x	x	x	x
Overload protection (Page 72)	x	x	x (Restrictions in ATEX operation)	x (Restrictions in ATEX operation)
Substation monitoring (Page 83)				
• Response to residual current detection (Page 83)	x	x	--- (Only "Deactivate" possible)	--- (Only "Deactivate" possible)
• Upper/lower current warning limit (Page 87)	x	x	x	x
• Upper/lower current limit (Page 88)	x	x	x	x
• Substation monitoring (Page 83)	x	x	x	x
• Blocking time and blocking current (Page 88)	x	x	x	x
• Blocking time and blocking current (Page 88)	x	x	x	x
• Asymmetry monitoring (Page 92)	x	x	x (Restrictions in ATEX operation)	x (Restrictions in ATEX operation)
• Short-circuit protection (fuses) (Page 92)	x	x	x	x
Response to CPU/master STOP (Page 96)	x	x	x	x
Group fault diagnostics/group warning diagnostics (Page 97)	x	x	x	x
TEST/RESET button (Page 158)	x	x	x	x

	Direct-on-line starter	Reversing starter	Fail-safe direct-on-line starter	Fail-safe reversing starter
Emergency start (Page 111)	x	x	x (Not with an ATEX application)	x (Not with an ATEX application)
Trip RESET (Page 118)	x	x	x	x
Cold start (Page 119)	x	x	x [1)]	x [1)]
PROFIenergy (Page 124)	x	x	x	x
Logbook (Page 123)	x	x	x	x
Maintenance (Page 162)	x	x	x	x
Parameter start interlock [1)]	x	x	x	x
Manual bus [1)]	x	x	x	x
Diagnosis "Supply voltage too low"	x	x	x	x

1) From FW Version 1.2.0

The following functions are available when using the 3DI/LC module via the inputs:

	Direct-on-line starter	Reversing starter	Fail-safe direct-on-line starter	Fail-safe reversing starter
Inputs (Page 98)	x	x	x	x
Manual local (local control) (Page 104)	x	x	x	x
Trip without restart (Page 105)	x	x	x	x
Trip with restart (Page 106)	x	x	x	x
Trip emergency end position CW (Page 107)	x	x	x	x
Trip emergency end position CCW (Page 109)	x	x	x	x
Group warning (Page 110)	x	x	x	x
Emergency start (Page 111)	x	x	x (Not with an ATEX application)	x (Not with an ATEX application)
Motor CW (Page 112)	x	x	x	x
Motor CCW (Page 113)	---	x	---	x
Quick Stop direction-independent (Page 114)	x	x	x	x
Quick Stop clockwise (Page 116)	x	x	x	x
Quick Stop counter-clockwise (Page 117)	---	x	---	x
Trip RESET (Page 118)	x	x	x	x
Cold start (Page 119)	x	x	x [1)]	x [1)]
Operational trip end position CW (Page 120)	x	x	x	x
Operational trip end position CCW (Page 121)	x	x	x	x

1) From FW Version 1.2.0

The following functions are safety-related:

	Fail-safe direct-on-line starter	**Fail-safe reversing starter**
Response to safety-related tripping (Page 94) (STO = Safe Torque Off)	x	x
Ex motor application (Page 95)	x	x
Rated operational current (Page 63)	x (ATEX application only)	x (ATEX application only)
Overload protection (Page 72)	x (ATEX application only)	x (ATEX application only)

Note

Restrictions in relation to monitoring and input functions

When you activate safety-related functions, parameterization of the monitoring or input functions may be restricted.

7.2 Intrinsic protection

The ET 200SP motor starter protects itself against overload. Intrinsic device protection cannot be parameterized or switched off. You can find more information on the permissible ambient temperatures in chapter Permissible ambient temperatures up to 1000 m above sea level. (Page 42).

If the intrinsic protection becomes active, the follow responses occur:

- The motor trips.
- Emergency starting is not possible in the case of tripping due to intrinsic device protection.
- The diagnostic message "Switching element overload" is output in DS92 Read device diagnostics (Page 181).
- The entry "Number of switching element overload trips" in DS95 Read statistics (Page 187) is incremented by 1.

As of device firmware V1.2.0, the value of the device protection model can be read out via the DS94 Read measured values (Page 186).

If the intrinsic device protection was active, the device's diagnostics function indicates a device fault.

NOTICE
Damage due to operation of capacitive loads possible When capacitive loads are used, the switching components in the ET 200SP motor starter can be destroyed by high inrush currents.

NOTICE
Material damage due to operation with frequency converters possible Operation in series with a frequency converter is not allowed. The switching components in the motor starter can be destroyed when operating an ET 200SP motor starter in series with a frequency converter.

7.3 Basic function/basic parameter

7.3.1 Basic functions/parameters during first commissioning

The default settings listed in the following two chapters apply to first commissioning and as defaults for the programming devices (exception: rated operational current). When a motor starter is set to the commissioning mode again, it uses the values that were valid when the technology supply voltage was last lost.

7.3.2 Rated operational current

This parameter is used to set the rated operational current that the feeder can carry without interruption. Usually, the rated operational current of the motor is specified on the rating plate of the motor. The adjustment range depends on the performance class of the ET 200SP motor starter.

Note

Rated operational current

The rated operational current is one of the key parameters.

You cannot disable motor protection completely. However, you can prevent the shutdown of the motor by selecting the parameter Overload protection (Page 72).

In this case, motor protection must be ensured by other measures (e.g. a thermistor in the motor).

Note

Functional switching

Observe the minimum loads for the ET 200SP motor starters.

The minimum loads are specified in the technical specifications of the relevant device. You can find more information on the minimum loads in chapter "Minimum load current (Page 68)".

Current motor current

The latest current in the motor starter is returned via the process image for analysis. In addition, you can read out the latest current with phase precision in data set 94.

The current is measured in two phases. The current for the third phase is calculated. The highest of the three values is determined. The returned 6-bit value specifies the motor current ratio I_{curr} / I_{rated} (I_{rated} = parameterized rated operational current).
The value is represented by one digit before the decimal point (DI 1.5) and five digits after the point (DI 1.0 to DI 1.4). This results in a maximum ratio for I_{curr} / I_{rated} of 1.96875 (approx.

197 %).
The resolution is 1/32 per bit (3.125 %).

DI 1.5	DI 1.4	DI 1.3	DI 1.2	DI 1.1	DI 1.0	
2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	
1	0.5	0.25	0.125	0.0625	0.03125	Sum = 1.96875
0	0	0	0	0	0	$I_{curr} = 0$
1	0	0	0	0	0	$I_{curr} = I_{rated}$ x 1
1	0	1	1	0	0	$I_{curr} = I_{rated}$ x 1.375
1	1	1	1	1	1	$I_{curr} = I_{rated}$ x 1.96875

I_{curr} = rated operational current I_{rated} x value (DI 1.0 to DI 1.5)

I_{rated} = rated current of the motor

Default setting

- In the ET 200SP motor starter, the rated operational current is preset at the factory to the maximum value. In the event of renewed parameterization, the parameters last set apply.
- Due to the engineering systems, the rated operational current is preset to the minimum value for safety reasons. You must therefore parameterize this value when you configure the system. The ET 200SP motor starter may otherwise trip due to overload on first starting.

Settings

Table 7-1 Settings for actual motor current

Device parameters	Default settings	Setting range
Rated operational current	• In the motor starter: maximum value or last parameterization • In engineering systems: minimum value	• 0.1 A ... 0.4 A • 0.3 A ... 1 A • 0.9 A ... 3 A • 2.8 A ... 9 A • 4 A ... 12 A Increment: 0.01 A

The setting range depends on the device type.

7.3.3 Load type

This is where you select whether the motor starter should protect a single-phase or a three-phase load.

Note

Reversing starter

1-phase loads are not permissible on the reversing starter. 1-phase operation is also not permissible after activation of the "EX motor" parameter in the case of fail-safe direct motor starters.

Settings

Table 7-2 Settings for load type

Device parameters	Default setting	Setting range
Load type	3-phase	• 3-phase • 1-phase

3-phase operation

In 3-phase operation, you can operate a 3-phase asynchronous motor at the connections of the motor starter.

To ensure motor protection, do not connect more than one motor to one motor starter.

Do not operate several single-phase motors on one motor starter in three-phase operation.

1-phase operation

In 1-phase operation, you can operate a 1-phase asynchronous motor at the connections of the motor starter. 1-phase operation is only possible when using a direct-on-line starter. The relevant three-pole tripping characteristics apply to single-phase operation.

Feed in the line voltage on terminals L1 and L2(N) only and connect the single-phase motor to the terminals T1 and T2 only.

An ATEX application in 1-phase operation is not possible with the motor starter.

7.4 Motor control

7.4.1 Electronic switching technology (hybrid switching technology)

The ET 200SP motor starter combines the advantages of semiconductor technology and relay technology.

The ET 200SP motor starter switches the load in phases L1 and L2 via semiconductors and bypass relays. Phase L3 is always switched via a relay.

⚠ DANGER

Hazardous Voltage
Can Cause Death or Serious Injury

If the line voltage is applied at the infeed bus of the motor starter, a hazardous voltage may be active at the output of the motor starter even without a motor ON command. When working on the feeder, you must ensure disconnection from the power, e.g. by the position "Parking position/OFF".

You will find further information on the "Parking position/OFF" in the System Manual.

This combination is known as hybrid switching technology. Hybrid switching technology in the ET 200SP motor starter is characterized by the following properties:

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 routing

The continuous current is routed via relay contacts.

Advantage: Relay contacts cause lower thermal losses than semiconductors.

Switching off

Switching off is implemented via the semiconductors.

Advantage: The contacts are not stressed with arcs when switching via the semiconductors. This results in increased service life.

Schematic circuit diagram

The following figures show schematic circuit diagrams of the High Feature version and of the fail-safe version of the ET 200SP motor starter (direct-on-line starter version):

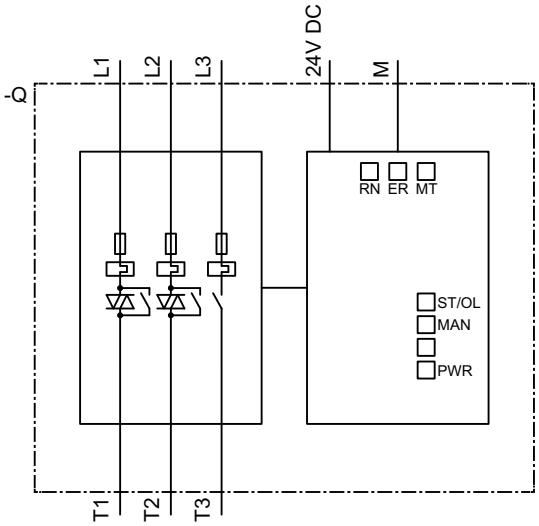


Figure 7-1 Schematic circuit diagram of HF direct-on-line starter

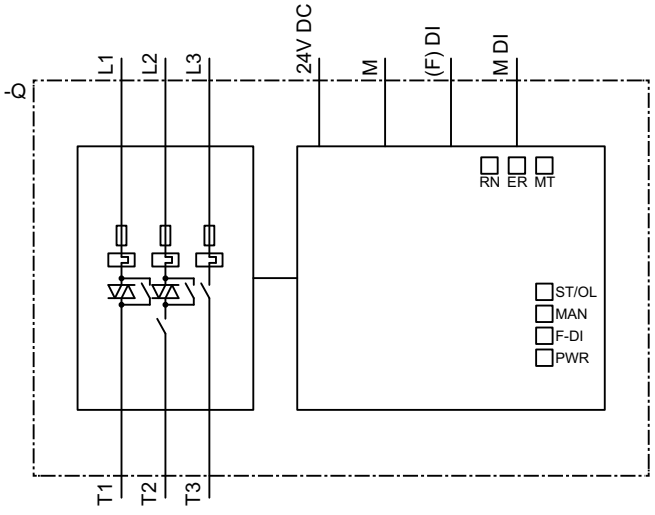


Figure 7-2 Schematic circuit diagram of fail-safe direct-on-line starter

The ET 200SP motor starters do not possess any galvanic isolation of the switching elements in the main circuits. The isolating function in compliance with EN 60947-1 is only warranted in the parking position.

See also

ET 200SP System Manual (http://support.automation.siemens.com/WW/view/en/58649293)

7.4.2 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 between the ET 200SP motor starters and the fail-safe ET 200SP motor starters:

Load current	0.1 ... 0.4 A	0.3 ... 1 A	0.9 ... 3 A	2.8 ... 9 A	4 ... 12 A
Motor/ohmic load of motor starter	0.05	0.15	0.18	0.56	0.8
Motor load of fail-safe motor starter	0.05	0.15	0.45	1.4	2

As soon as the minimum current limit is undershot during operation, the fault detection (residual current detection) picks up.

Disconnection or a warning is triggered depending on the setting of the "Response to residual current detection" parameter.

Residual current detection cannot be parameterized to "Warn" in the case of fail-safe motor starters.

See also

DS72 logbook - Read device error (Page 174)

DS92 Read device diagnostics (Page 181)

7.4.3 Control function

The motor starter controls the direction of rotation of motors with the control function. Internal logic prevents you from activating both directions of rotation simultaneously.

The graphic below shows the reaction times of the motor starter to control commands. The reaction times when restarting and changing direction of rotation are identical.

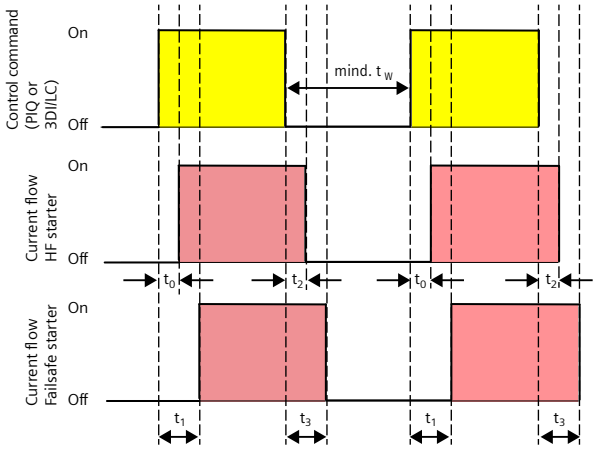


Figure 7-3 Control command reaction times

Timing:

Times t_0 to t_3 for the PIQ include a time dependency on the clock of the fieldbus and the station topology of +5 ms jitter.

For the 3DI/LC modules, a debounce time of 10 ms is included.

Timing (worst case) PIQ

- t_0: Time until current flow after the switch-on command for the HF starter: 30 ms (up to V1.2.0 25ms)
- t_1: Time until current flow after the switch-on command Safety starter: 40 ms (up to V1.2.0 30ms)
- t_2: OFF delay after switch-off command HF starter: 35 ms
- t_3: OFF delay after switch-off command Failsafe starter: 50 ms
- t_W: Recovery time: Time that must elapse due to an internal interlocking time until a repeat switch-off command is accepted after a switch-off command:
  - HF starter 195 ms
  - Failsafe starter: 215 ms

Timing (worst case) 3DI/LC

- t_0: Time until current flow after the switch-on command for the HF starter: 35 ms (up to V1.2.0 30 ms)
- t_1: Time until current flow after the switch-on command Safety starter: 45 ms (up to V1.2.0 35 ms)
- t_2: OFF delay after switch-off command HF starter: 40 ms
- t_3: OFF delay after switch-off command Failsafe starter: 55 ms
- t_W: Recovery time: Time that must elapse due to an internal interlocking time until a repeat switch-off command is accepted after a switch-off command:
  - HF starter 200 ms
  - Failsafe starter: 220 ms

7.4.4 Operating modes

The following modes are available (in ascending order of priority):

- Operating mode: Automatic (lowest priority)
  The motor starter can only be controlled with the PLC via the fieldbus.
  Automatic mode is activated automatically when communication with the interface module or the higher-level CPU is established.
- Operating mode: Manual bus: Controlling the motor starter by means of software, e.g. TIA Portal V16, via fieldbus is possible [1)]
- Operating mode: Manual local via the 3DI/LC module (highest priority)
  The motor starter can be controlled as follows:
  - Set the "Local Control" (LC on the 3DI/LC module) input to activate manual local mode.
  - Also set a digital input on the 3DI/LC module (1, 2 or 3, depending on the parameterization) to "Motor CW" or "Motor CCW", for example.

Using the LED "MAN", the message bits in the Address space (Page 151) and the DS92 Read device diagnostics (Page 181), you detect which control source currently has control priority:

- Operating mode: Automatic ("MAN" LED off)
- Operating mode: Manual local ("MAN" LED on)

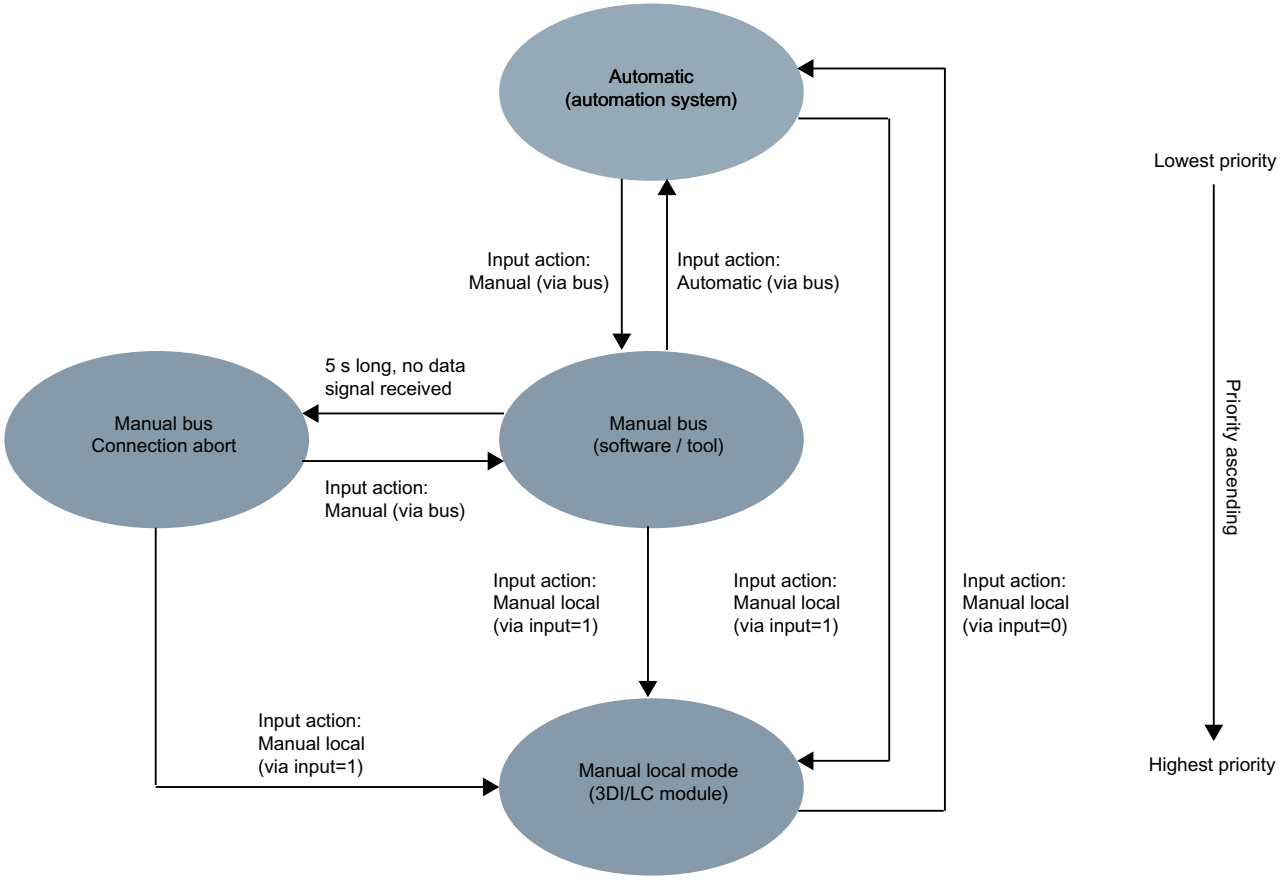


Figure 7-4 Operating modes

1) possible as of firmware version 1.2.0

7.5 Overload protection

Description

The approximate temperature of the motor is calculated using the measured motor currents and device parameters "Rated operating current" and "Tripping class". This indicates whether the motor is overloaded or is functioning in the normal operating range.

Note

Ensuring overload protection

Do not connect multiple motors to one motor starter due to overload protection, mutual interference between the motors, etc.

Response of the thermal motor model on restart

You set the response of the thermal motor model on restart with this parameter:

- Retention of the thermal motor model on restart
  If the motor starter has been disconnected from the 24 V power supply, the thermal motor model is at the same motor temperature rise state when the power supply is restored as it was before disconnection. This behavior protects the motor against overload in the case of brief failures of the 24 V power supply. With this setting, you can therefore specify that the motor starter retains the thermal motor model when the power supply is restored.
- Deletion of the thermal motor model on restart
  If the motor starter has been disconnected from the 24 V power supply for a longer period, for maintenance purposes, for example, the saved values can result in an incorrect interpretation of the motor state. With this setting, you can therefore specify that the motor starter deletes the thermal motor model when the power supply is restored.

In ATEX operation, fail-safe motor starters can only be parameterized to "Retention of the thermal motor model on restart", however.

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 model charges when the motor is switched on. The motor memory model discharges after the motor is switched off.

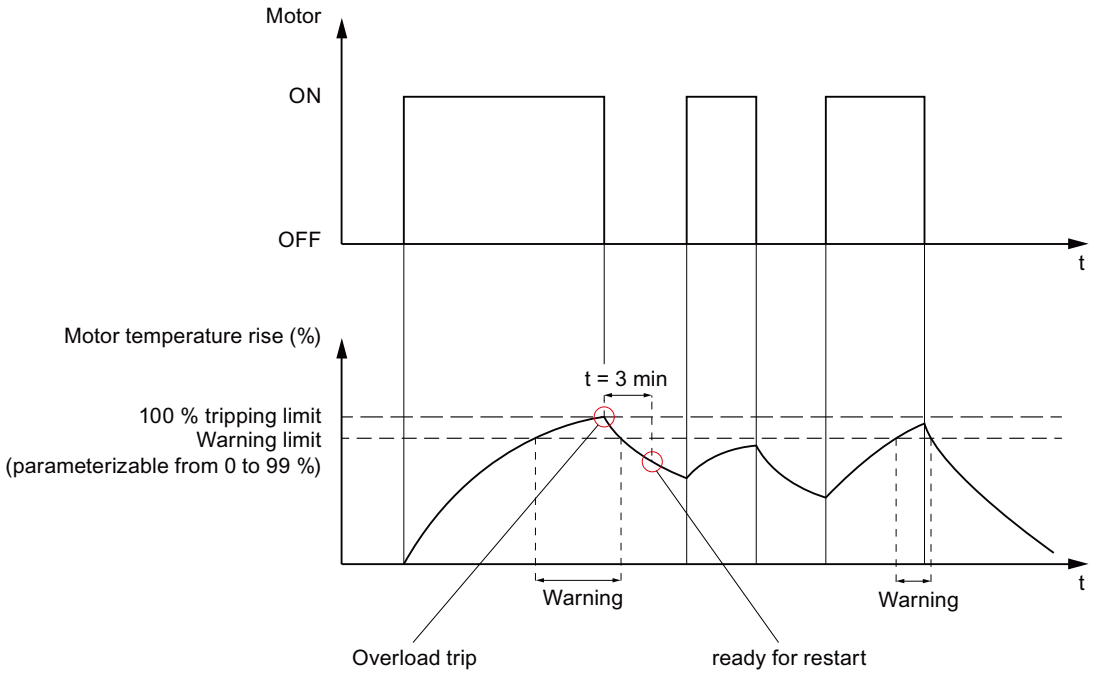


Figure 7-5 Principle of operation

Following an overload tripping operation, the motor memory model 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 motor starter can store the remaining cooling time if the relevant parameters have been set. When the control supply voltage is restored, the remaining cooling time elapses before the load 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 model has not yet fully discharged. This can result in an extremely fast overload trip after the restart. In continuous operation (partially charged motor memory model), the tripping times are reduced depending on the pre-charge.

Warning limit motor heating

The motor starter displays a warning if the motor heating limit is overshot. You use this parameter to preset a motor heating value in percent as a warning limit.

This function is deactivated with a warning limit for motor temperature rise of 0%.

If the warning limit for motor heating is exceeded, a group warning and the "Thermal motor model overload" maintenance alarm are output.

Response to overload - thermal motor model

You use this device parameter to specify how the motor starter is to respond to overload:

- Trip without restart
- Trip with restart

> **⚠ WARNING**
>
> **Hazardous Voltage.**
> **Can Cause Death, Serious Injury, or Property Damage.**
>
> When the cooling time has expired following an overload trip, and a RESET takes place, or automatic restart has been parameterized, the machine starts up immediately if a control command is active. People in the danger area may be injured.
>
> Make sure that the danger area of the machine is kept clear of people.

- Warning: a general warning is set.

In ATEX operation, you can only parameterize fail-safe motor starters to "Trip without restart".

Trip class

The trip class (CLASS) specifies the maximum time within which a protective device must trip from a cold state at 7.2 x the setting current (motor protection to IEC 60947-2).

The tripping characteristics represent the time to trip as a function of the current multiple. The continuous black line in the following diagrams illustrates the tripping characteristic curve for three-pole symmetrical loads and for single-phase loads. The continuous red line illustrates the tripping characteristic curve for three-pole loads when one phase fails.

The following diagram shows the overload protection for CLASS OFF:

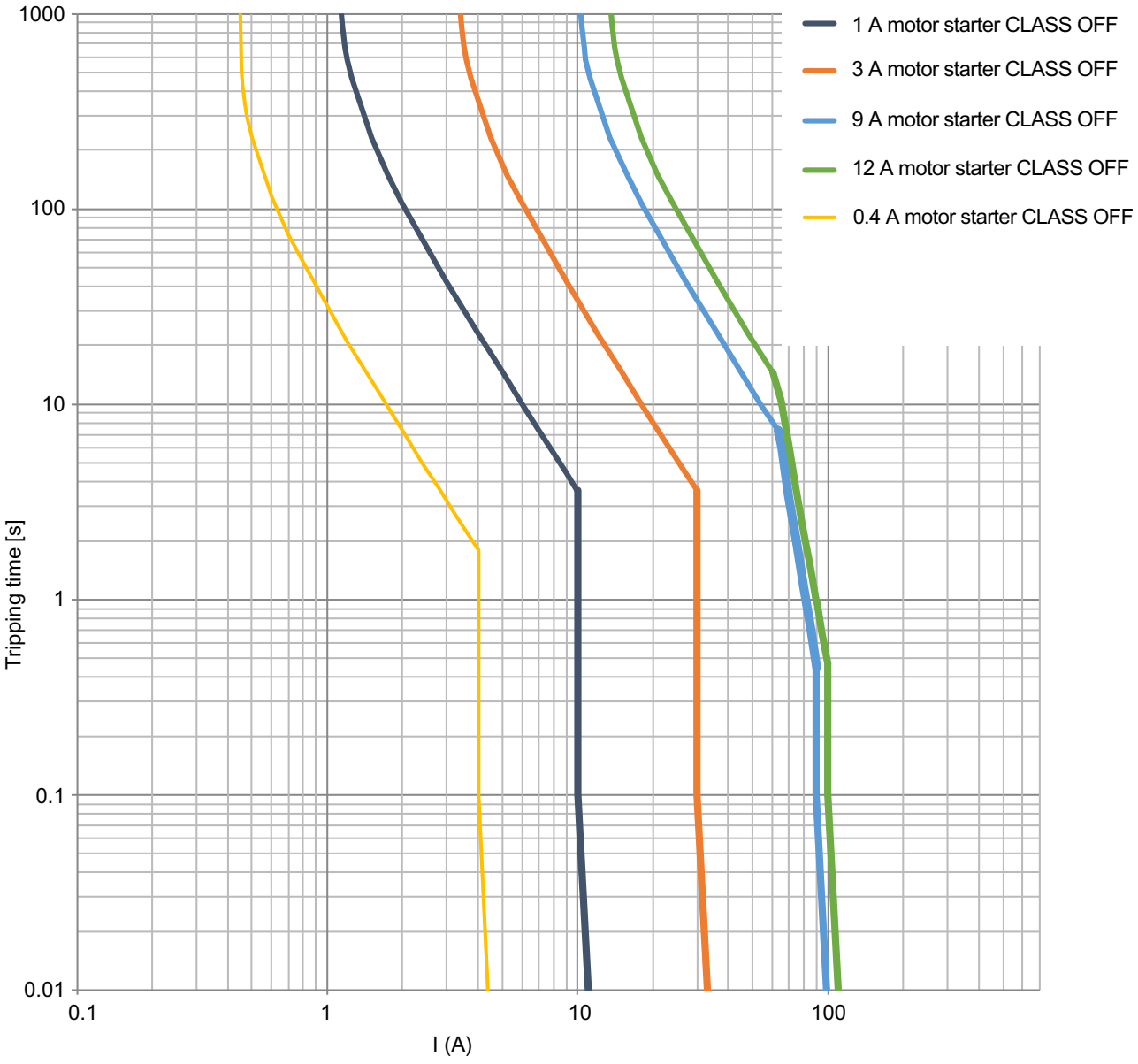


Figure 7-6 CLASS OFF overload protection

The following diagram shows the overload protection for CLASS 5:

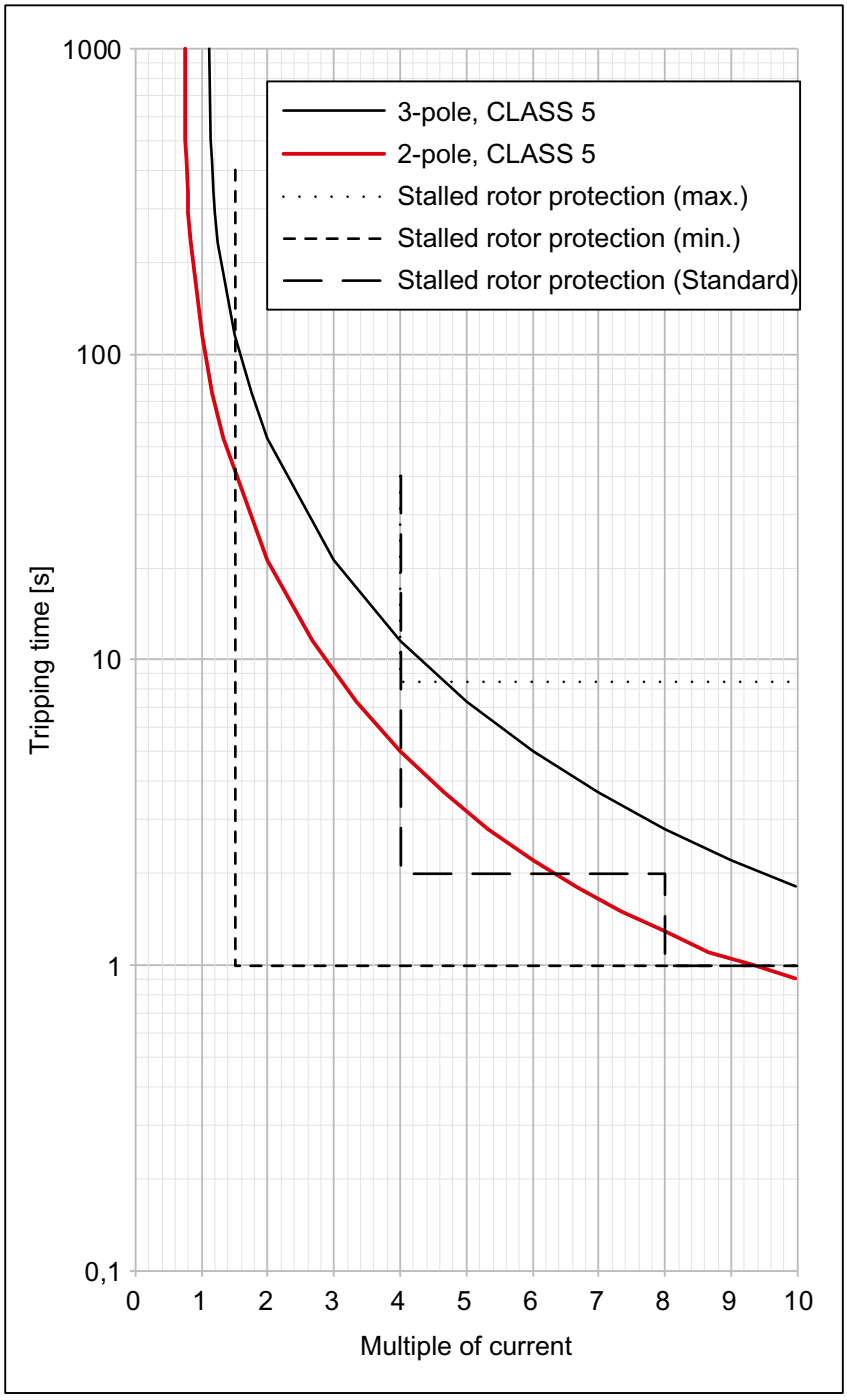


Figure 7-7 CLASS 5 overload protection

The following diagram shows the overload protection for CLASS 10:

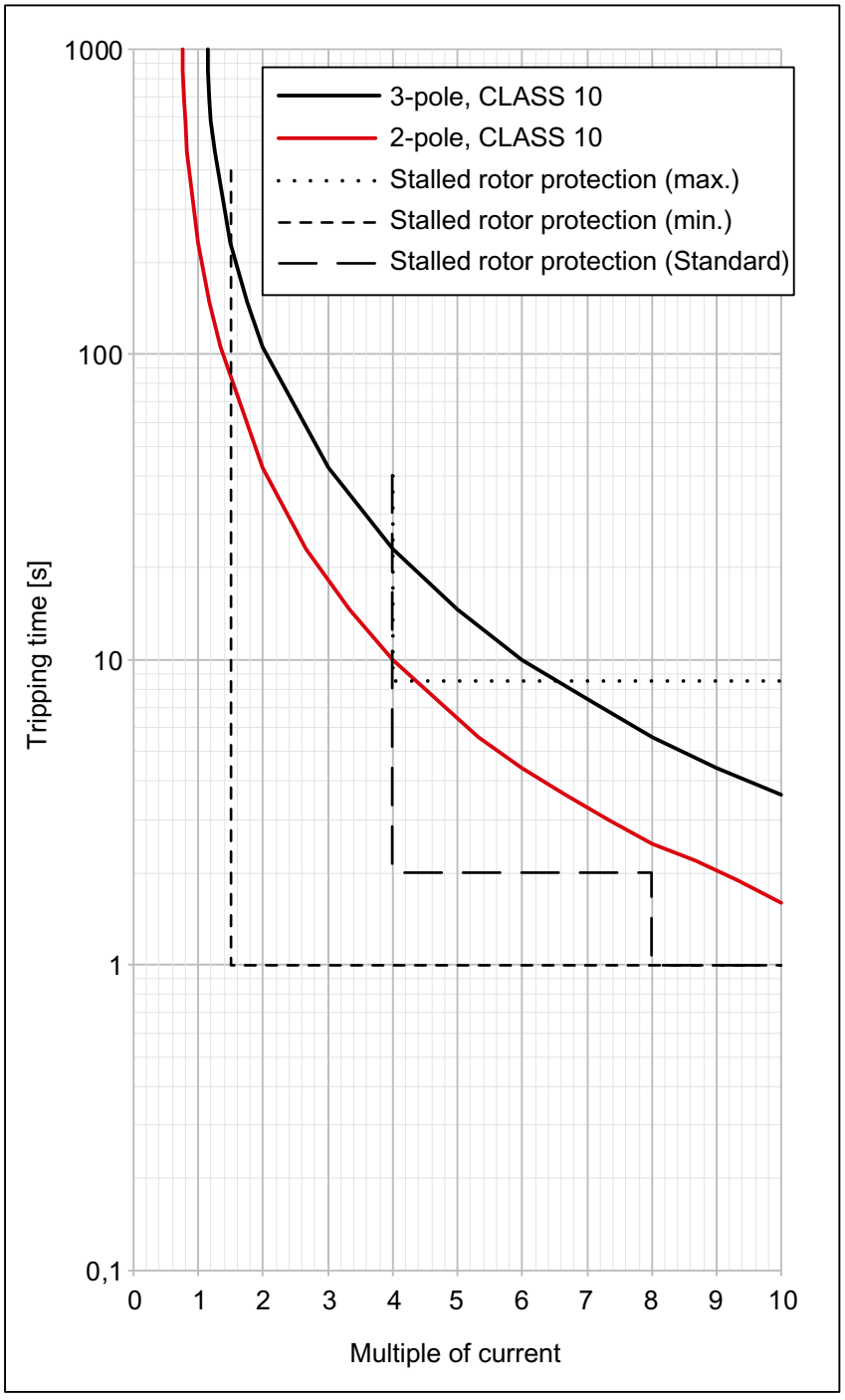


Figure 7-8 CLASS 10 overload protection

You can find out how to calculate the switching cycles in chapter Calculating switching cycles (Page 79).

The following trip classes can be parameterized according to IEC 60947-4-2:

- CLASS OFF
- CLASS 5 (10 A)
- CLASS 10

To protect the switching elements in the main circuit against impermissible operating states, an integrated intrinsic device protection is provided in the upper load range. At overload currents greater than 65 A, shutdown becomes effective earlier than with the motor protection function (intrinsic device protection model).

The setting range of the overload protection is 1:3.

You can find more information about intrinsic device protection in chapter Device protection model (Page 89).

7.6 Calculating switching cycles

The switching cycles attainable by the ET200 SP motor starter are determined by the root-mean-square of the motor current I_{rms_motor}. The switching cycle considered is admissible if the following criterion is met:

$I_{rms\_motor} \leq I_e * 1.05$

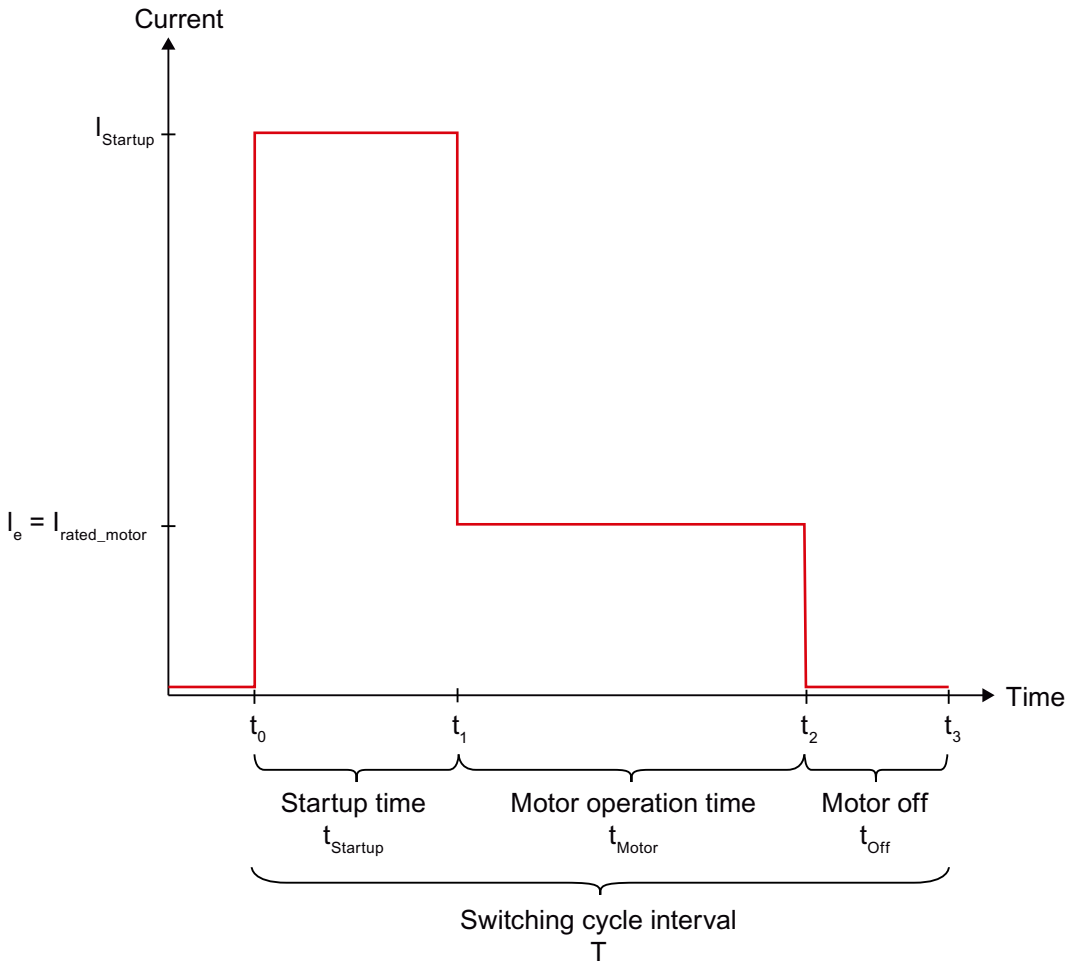
I_{rms_motor} is determined on the basis of the root-mean-squares of the motor currents during the startup time and the motor operation time taking the motor OFF time into account. In the following formula, I_e corresponds to the rated current of the connected motor.

x = starting current factor $I_{Startup}/I_e$

Table 7-3 Switching frequency per hour of the 3RK1308 motor starter for the switch-on duration of 0.5 s:

Current setting [A]		0.4	1	3	9	10	12
x = starting current factor $I_{Startup}/I_e$	Startup time [s]	Number of starting operations per h					
2.5	0.1	4131	4131	4131	4131	4131	4131
2.5	0.3	1377	1377	1377	1377	1377	1377
2.5	0.5	826	826	826	826	826	826
2.5	0.7	590	590	590	590	590	590
2.5	2	207	207	207	207	207	207
4	0.1	1446	1446	1446	1446	1446	1446
4	0.3	482	482	482	482	482	482
4	0.5	289	289	289	289	289	289
4	0.7	207	207	207	207	207	207
4	2	72	72	72	72	72	72
6	0.1	620	620	620	620	620	620
6	0.3	207	207	207	207	207	207
6	0.5	124	124	124	124	124	123
6	0.7	89	89	89	89	89	86
6	2	31	31	31	31	31	25
8	0.1	344	344	344	339	292	75
8	0.3	115	115	115	108	93	20
8	0.5	69	69	69	62	53	8
8	0.7	49	49	49	43	36	0
8	2	17	17	17	9	6	0
10	0.1	219	219	219	51	54	0
10	0.3	73	73	73	12	13	0
10	0.5	44	44	44	0	0	0
10	0.7	31	31	31	0	0	0
10	2	11	11	11	0	0	0

$$I_{rms\_motor} = \sqrt{\frac{1}{T}\left[(x * I_e)^2 * t_{Startup} + I_e^{\,2} * t_{Motor}\right]}$$



Switching cycle parameters

The following table shows all the parameters that you have to consider for calculation of the permissible switching cycle:

Parameters		Description	Conditions
Starting time	$t_{Startup}$ [s]	Time during which the motor accelerates up to its operating speed from standstill	The maximum is determined by the parameterized tripping class and the intrinsic device protection (see also Overload protection (Page 72)).
Starting current	$I_{Startup}$ [A]	Root-mean-square of the motor current that flows during the starting time. It is considered as a multiple x of the rated value of the motor I_{rated_motor} or of the parameterized rated operational current I_e. $I_{Startup}$ [A] = x * I_e [A]	The maximum is the permissible current of the relevant device class. Consider additional idle times in the case of starting currents in excess of 65 A (see example graphics). (Also see: Overload protection (Page 72) and the example graphics)
Motor operation time	t_{Motor}[s]	Time in which the motor is in operation after startup.	-

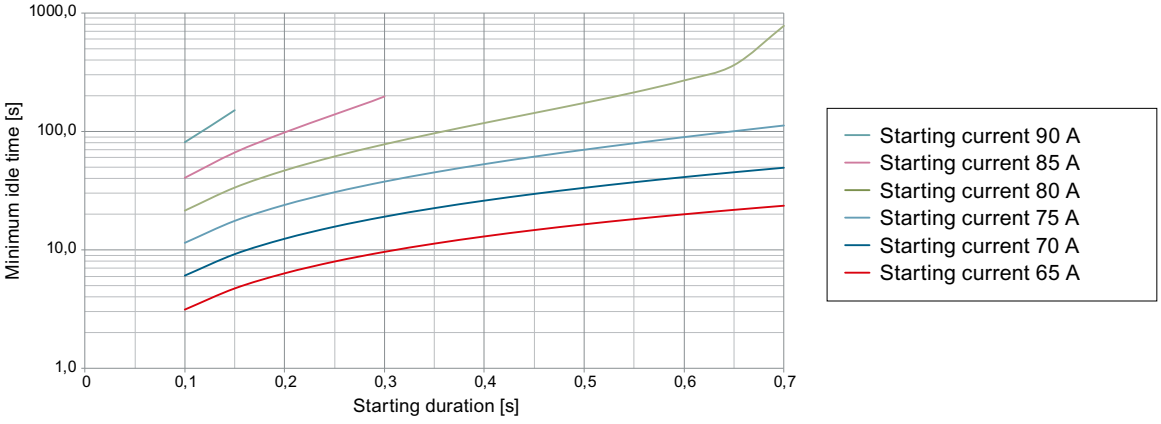
Rated operational current	I_e [A]	Root-mean-square of the motor current in the operating phase after the starting time or the parameterized value I_e of the motor starter	The permissible I_e is determined by the adjustment range of the motor starter used and its ambient temperature (see also: Overload protection (Page 72)).
Motor OFF time:	t_{Off} [s]	Idle time of the motor within the switching cycle	Consider additional idle times in the case of starting currents in excess of 65 A (see example graphics).
Switching cycle interval	T [s]	Total of t_{Off}, t_{Motor} and $t_{Startup}$	The maximum time is 300 s.

You use the switching cycle interval time to determine the permissible starting frequency per hour as follows:

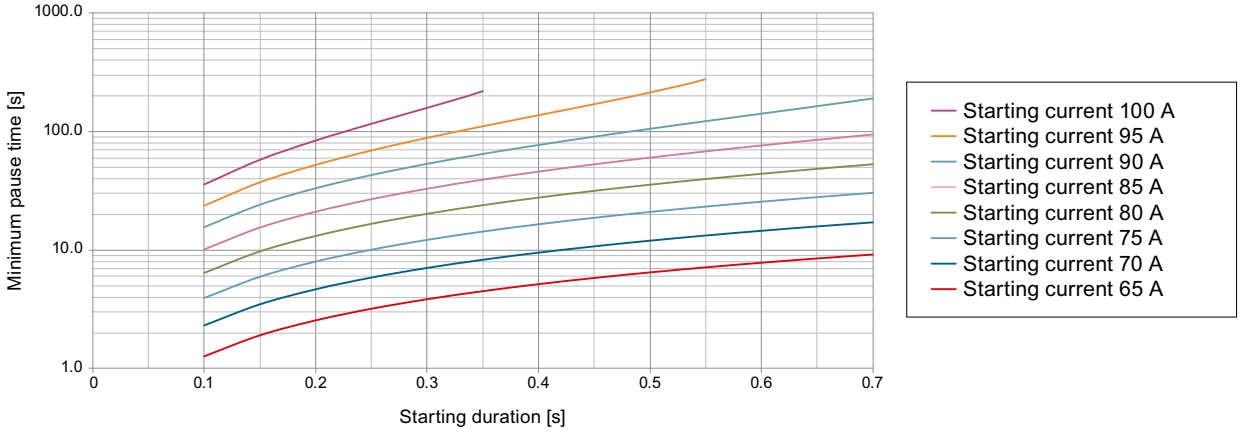
$$\text{Switching cycles [1/h]} = \frac{1}{T} * 3600$$

As from a starting current of 65 A in the case of the 9 A and 12 A motor starters, consider the device protection model for calculation of the switching cycles. The following graphics show the minimum idle time depending on the starting current:

Minimum idle time (T_{Off}) 9 A motor starter at $I_{Startup}/I_{rated\_motor}$ = 8



Minimum idle time (T_{Off}) 12 A motor starter at $I_{Startup}/I_{rated\_motor}$ = 8



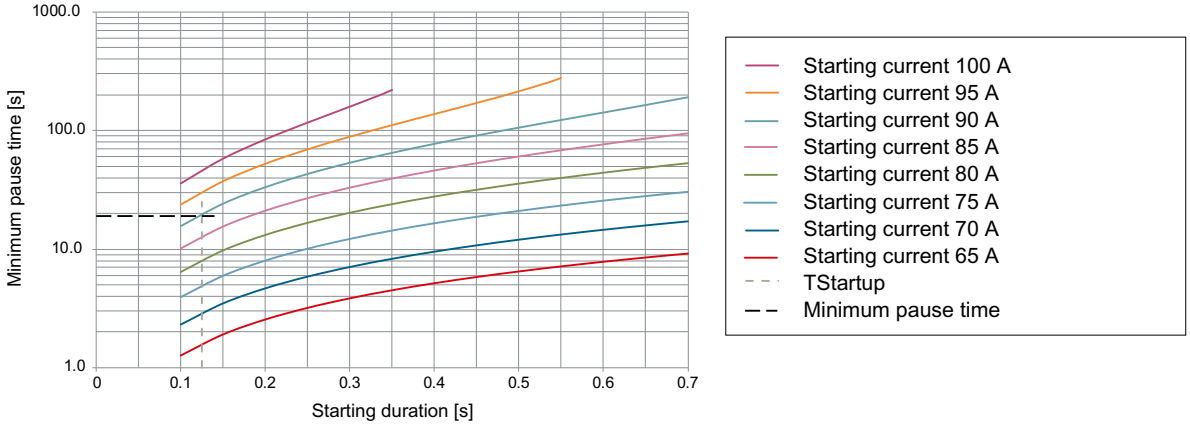
Example for the minimum idle time (T_{Off}) 12 A motor starter at $I_{Startup}/I_{rated}$ = 8

The graphic below shows the minimum idle time of a 12 A motor starter with the following parameters:

I_{rated_motor} = 10.4 A

$I_{startup/Irated\_motor}$ = 8.6; thus: $I_{Startup} \approx 89$ A

$T_{Startup}$ = 0.125 s $T_{Off} \geq 19$ s



7.7 Substation monitoring

You can determine various system states with the help of the motor current and the current limits.

System state	Current value	Protection by:
Motor operates more sluggishly, e. g. due to bearing damage	Current is higher than normal	Upper current limit Upper current warning limit
Motor operates more smoothly, e. g. because the system has run out of processing material.	Current is lower than normal	Lower current limit Lower current warning limit
Motor is blocked	Very high current flowing	Blocking protection
• Open circuit • Defective fuse • Motor idling • Power failure • No load connected	Very low current flowing Minimum load undershot	Residual current detection

7.7.1 Response to residual current detection

If the motor current drops to under 20% from the set operational current or below the minimum load limit in one of the phases, residual current detection responds. You use this device parameter to specify how the motor starter is to behave in the event of residual current being detected:

- Warning (not in the case of fail-safe motor starters)
- Tripping

Note

When the motor is switched on, residual current detection is suppressed for approximately 1 s.

This does not apply to fail-safe motor starters.

Residual current detection for motor starters with 0.1 ... 0.4 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.1 to 0.4 A:

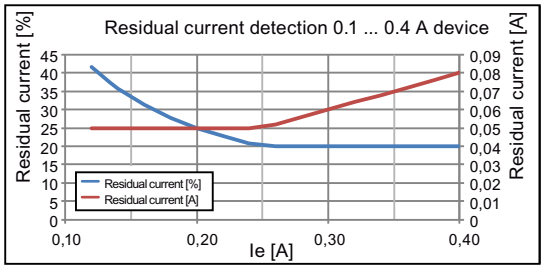


Figure 7-9 Residual current detection 0.1-0.4 A device

Residual current detection for motor starters with 0.3 ... 1 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.3 to 1 A:

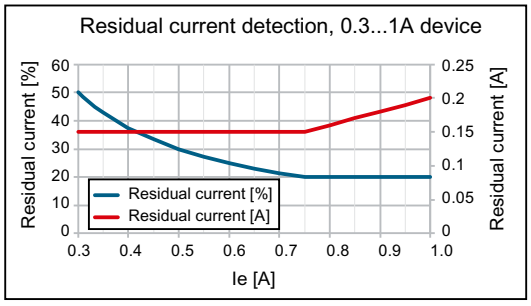


Figure 7-10 Residual current detection 0.3-1 A device

Residual current detection for motor starters with 0.9 ... 3 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.9 to 3 A:

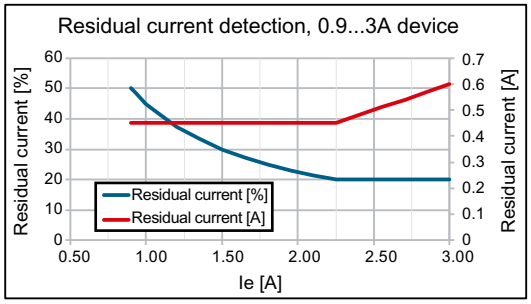


Figure 7-11 Residual current detection 0.9-3 A device

Residual current detection for motor starters with 2.8 ... 9 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 2.8 to 9 A:

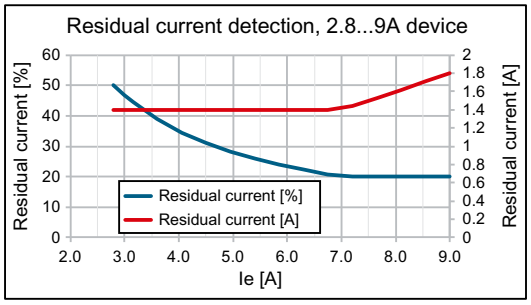


Figure 7-12 Residual current detection 2.8-9 A device

Residual current detection for motor starters with 4 ... 12 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 4 to 12 A:

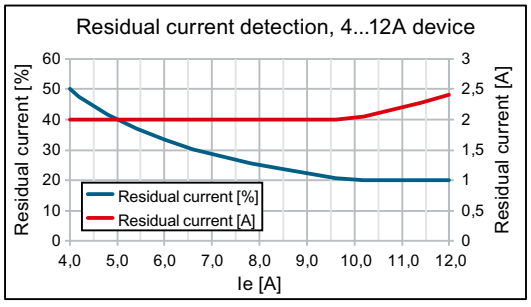


Figure 7-13 Residual current detection 4-12 A device

Residual current detection for fail-safe motor starters with 0.1 ... 0.4 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.1 to 0.4 A:

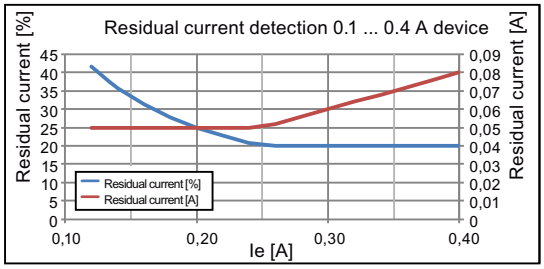


Figure 7-14 Residual current detection 0.1-0.4 A device

Residual current detection for fail-safe motor starters with 0.3 ... 1 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.3 to 1 A:

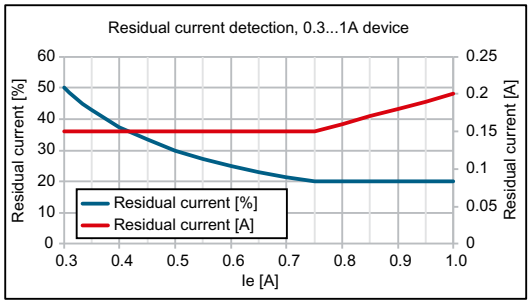


Figure 7-15 Residual current detection 0.3-1 A device

Residual current detection for fail-safe motor starters with 0.9 ... 3 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 0.9 to 3 A:

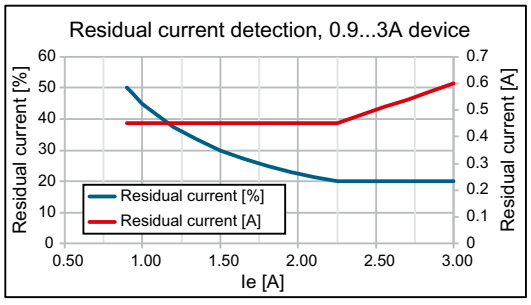


Figure 7-16 Residual current detection 0.9-3 A device

Residual current detection for fail-safe motor starters with 2.8 ... 9 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 2.8 to 9 A:

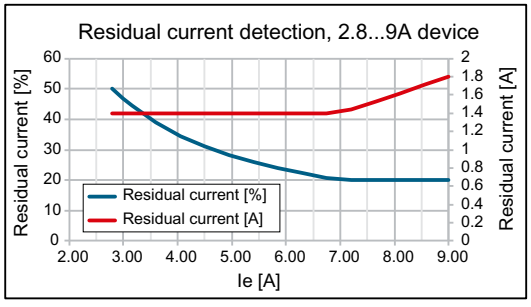


Figure 7-17 Residual current detection 2.8-9 A device

Residual current detection in the case of fail-safe motor starters with 4 ... 12 A

The following graphic shows the dependence of residual current detection on the set motor current in the case of motor starters with 4 to 12 A:

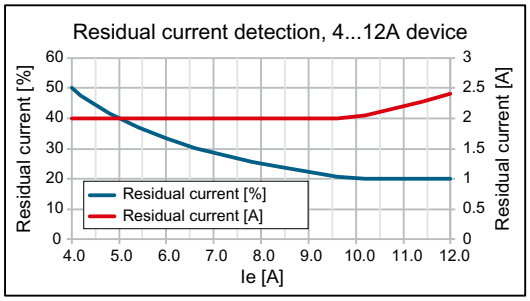


Figure 7-18 Residual current detection 4-12 A device

7.7.2 Upper/lower current warning limit

You can enter an upper and/or a lower current warning limit value. If the current warning values are exceeded or undershot, the motor starter responds with a warning message without tripping. The warning message is acknowledged as soon as the warning threshold is exceeded or undershot by 5%.

Note

The current warning thresholds are activated by default. You can deactivate the current warning thresholds, however. The current warning thresholds are not activated until the CLASS time expires.

Setting ranges

The table below shows the possible setting range for the lower and upper current warning limits:

Device parameters	Default setting	Setting range
Lower current warning limit	21.875%	• 18.75 ... 100% of I_e • 0% (= deactivated) Increment: 3.125%
Upper current warning limit	112.5%	• 50 to 400% of I_e • 0% (= deactivated) Increment: 3.125%

7.7.3 Upper/lower current limit

You can enter an upper and/or a lower current limit. The current limits are deactivated by default. If the current limits are overshot or undershot, the motor starter responds by tripping. The "I_e upper limit value violation" or "I_e lower limit value violation" message is issued. If the current exceeds the maximum rated operational current by a factor of ten, the motor starter shuts down the motor even if the current limit values are deactivated. An entry in the logbook (data set 73 (Page 177)) is generated.

Example

The following example shows an application for the upper and lower current limit:

- The viscosity of the mixed mass is too high, that is, the upper current limit has been overshot.
- No load because drive belt is broken. In other words, the lower current limit has been violated.

Note

The parameterized current warning thresholds are not activated until the CLASS time expires.

Setting ranges

The table below shows the possible setting range for the lower and upper current warning limits:

Device parameters	Default setting	Setting range
Lower current limit	Deactivated	• 18.75 ... 100 % of I_e • 0 % (= deactivated) Increment: 3.125 %
Upper current limit	Deactivated	• 50 to 400 % of I_e • 0 % (= deactivated) Increment: 3.125 %

7.7.4 Blocking time and blocking current

The blocking current specifies how much current is consumed by the motor (at rated voltage) when the drive is blocked.

If the motor current exceeds 400 % of the set motor current I_e for a time > 1 s after the motor ramps up, the blocking protection is tripped and a trip command is generated.

After the motor is switched on, the parameterized values for the blocking current and blocking time apply. A switchover to the fixed values (400 %, 1 s) takes place depending on the set motor protection class (CLASS 5/ 10 A → 5 s, CLASS 10, off → 10 s).

- The "Tripping due to motor blocking" and "Group fault" diagnostic messages are generated
- The statistic "Number of motor overload trips" is incremented by 1

If the parameter "Group fault diagnostics" is set to "Enabled", a corresponding diagnostic interrupt is set if blocking protection responds.

Setting ranges

The table below shows the possible setting range for the blocking current and the blocking time:

Device parameters	Default setting	Setting range
Blocking current	800 %	150 ... 1500 % of I_e Increment: 50 %
Blocking time	1 s	1 ... 7.5 s Increment: 0.5 s

7.7.5 Device protection model

To protect the switching elements in the main circuit against impermissible operating states, an integrated intrinsic device protection is provided in the upper load range. The device protection model consists of the relay protection model (dotted line) and the thermal motor model (continuous line) with the highest permissible current setting. The device protection is active 20 ms after the ON command. This means that, in the case of ET 200SP motor starters, an overload trip may occur in the upper current range before the motor protection trips. The device protection is active even when the overload protection is set to "Warn" and the "Response of the thermal motor model on restart" parameter is set to "Delete".

The motor starter operates within a permissible current range. The following graphic shows the permissible current range:

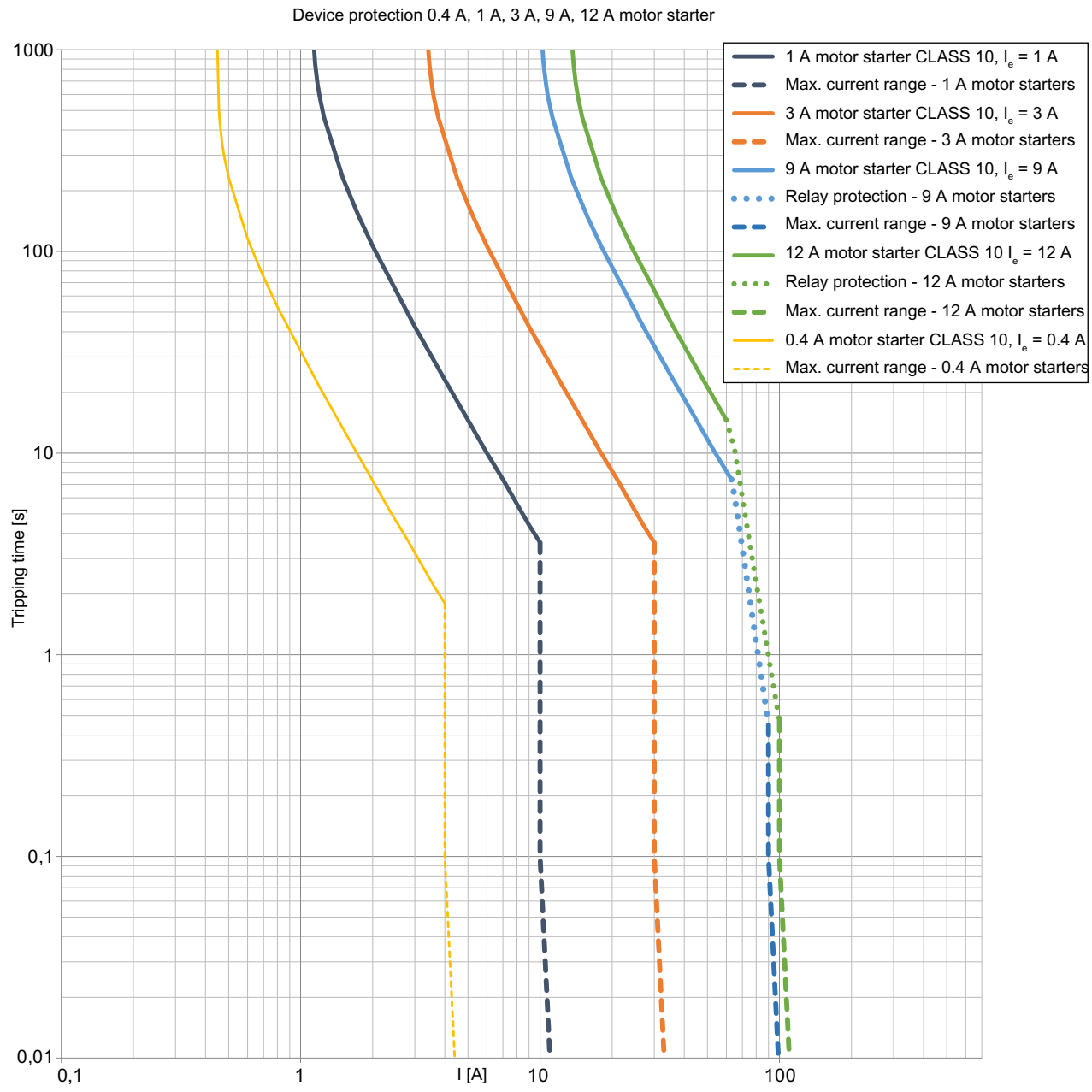


Figure 7-19 Device protection

How the motor starter's device protection works is described below.

Shutting down the motor starter within the permissible current range

The motor starter switches off in the following cases:

- The motor starter is too hot.
- The CLASS 10 tripping characteristic for the maximum current setting has been exceeded.
- The relay protection characteristic in the case of 9 A and in the case of 12 A motor starters has been exceeded.

Wait at least three minutes after shutting down the motor starter. Then trigger a trip reset. The motor starter is operable again.

Violation of the permissible current range

Switching elements may be damaged if the permissible current range (represented by the vertical line in the graphic) is exceeded. The motor starter switches off. The "Current measuring range overshot" message is issued. 9 A and 12 A motor starters switch off without the support of the semiconductors. This is referred to as "hard switching" and is output as a fault diagnosis.

To prevent response of the device protection, a motor's maximum starting current must not be higher than the motor starter's max. permissible current range.

NOTICE
Violation of the permissible current range
Fail-safe motor starters are defective after overshoot of the permissible current range and cannot be activated again.
Reactivation of **non-fail-safe motor starters** is possible. The service life of a non-fail-safe motor starter is, however, limited.

7.7.6 Temperature monitoring

The motor starter has an internal temperature monitoring function. If the motor starter exceeds its internal temperature warning threshold, the "Switching element hot" alarm is issued in data set 75 (Page 179). The motor starter switches off if the temperature continues to rise. The "Switching element overload" diagnostic message (object number 309) is issued in data set 92 (Page 181) if temperature monitoring responds.

You can trigger trip reset on the motor starter after a cooling time of at least three minutes. You can activate the motor starter again once it has sufficiently cooled down.

Fan control

The fan is controlled temperature-based by the internal temperature monitoring function. The thermal device protection model can also lead to the activation of the fan.

7.7.7 Asymmetry monitoring

Description

Three-phase asynchronous motors respond to slight asymmetries in the supply voltage with a higher asymmetric current consumption. As a result, the temperature in the stator and rotor windings of the drive increases. The ET 200SP motor starter protects the load against overload by issuing a warning or by tripping. You can parameterize whether a warning is output or tripping occurs.

Note

When the motor is switched on, asymmetry evaluation is suppressed for approx. 0.5 s.

Asymmetry limit

The asymmetry limit is a percentage value by which the motor current is allowed to deviate in each phase. Asymmetry is detected as soon as one of the three phases deviates by more than 40 % from the mean value of all phases.

Response to asymmetry

You use this device parameter to determine the behavior of the motor starter in the event of asymmetry:

- Warning (not permissible for fail-safe motor starters in ATEX operation)
- Tripping

Settings

Table 7-4 Settings for asymmetry monitoring

Device parameters	Default setting	Setting range
Response to asymmetry	Tripping	• Warn • Tripping

7.7.8 Short-circuit protection (fuses)

Description

The ET 200SP motor starter is equipped with integrated safety fuses as short-circuit protection. Short-circuit protection is implemented both between a phase and ground (= ground fault), and between two phases.

Switching performance

The ET 200SP motor starter switches off short-circuits in the motor or in the cables. The ET 200SP motor starter complies with the requirements of type of coordination 1 (IEC 60947-4-2).

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 is non-operational after a short circuit has been cleared.

Messages and actions

After the fuse responds, the "Residual current detection" message is output in the case of non-fail-safe motor starters. The "Switching element defective" message is issued in the case of fail-safe motor starters. Then replace the starter.

7.8 Safety-related functions

7.8.1 Self-test

ET 200SP fail-safe motor starters run a self-test of the switching elements every time they are switched on and off.

Ensure a stable line power supply. An unstable power supply may lead to a situation in which the motor starter incorrectly signals a fault.

7.8.2 Response to safety-related tripping

The STO (Safe Torque Off) function is the safety function integrated in the fail-safe motor starter. It ensures the safe disconnection of torque-generating energy on the motor. Safety Torque Off prevents unintentional start-up in compliance with EN 60204-1, Section 5.4. The drive is safely free from torque. This state is monitored in the motor starter.

Safety-related tripping is achieved for the fail-safe motor starters thanks to the special arrangement and checking of the switching elements.

Safety-related tripping is performed by a low level ("0" signal) at the F-DI. As an alternative, safety-related tripping can be achieved by removing the 24 V supply voltage from the power bus.

In the case of fail-safe ET 200SP motor starters, the OFF state is defined as the safe state (Safety torque off). ET 200SP Failsafe motor starters are self-monitoring. A diagnostic message can be sent to the controller in the event of tripping via F-DI.

The signal (F-DI) is provided via the corresponding BaseUnit with F-DI-infeed or F-DI forwarding.

Settings

Table 7-5 Response to safety-related tripping

Device parameters	Default setting	Setting range
Response to safety-related tripping	No warning	• No warning • Warning

7.8.3 Ex motor application

Set the "Ex motor application" parameter if the fail-safe motor starter is to switch and protect an explosion-proof motor.

Note

ATEX Ex II (2) G D zones

You can use the fail-safe motor starter for explosion-proof motors that are situated in ATEX Ex II (2) G D zones.

An ATEX approval is not possible with the motor starter when it is used in 1-phase operation. An ATEX approval is possible by means of further measures such as thermoclick.

Note

It is not possible to set the motor protection to Class OFF in EX operation.

Settings

Table 7-6 Settings for Ex motor application

Device parameters	Default setting	Setting range
Ex motor application	No	• No • Yes

The maintenance alarm 0x1036, "New safety-related parameters received", is issued if you have activated the "EX motor" parameter. Before the "EX motor" parameter is accepted, you must confirm it on the device with the blue button.

See also

Setting safety-related parameters (Page 143)

7.9 Response to CPU/master STOP

With this parameter, you set the response of the PIQ following a CPU STOP:

- Retain last value
  The last received and valid value of the process image of the outputs is retained.
- Switch substitute value 0
  The process image of the outputs is assigned the value "0". "Switch substitute value 0" is active even if the header module of the ET 200SP station is deenergized.

Note

The response to CPU/master STOP is only relevant in "Automatic" mode.

7.10 Group fault diagnostics/group warning diagnostics

You can use these parameters to determine whether diagnostics are enabled or disabled. If you set the group diagnostics parameter to "Disable", no diagnostic messages are output to the CPU. If you set the group warning diagnostics parameter to "Disable", no maintenance alarms are output.

You will find the requirements for the use of maintenance alarms in an Maintenance FAQ (https://support.industry.siemens.com/cs/ww/en/view/109485777).

Settings

Table 7-7 Settings for group fault/group warning diagnostics

Device parameter	Default setting	Setting range
Group fault diagnostics	Enable	• Disable • Enable
Group warning diagnostics	Disable	• Disable • Enable

7.11 Inputs

If you use the optional 3DI/LC module (3RK1908-1AA00-0BP0), the motor starter can execute various actions with the "Inputs" device function. The actions are parameterizable. The signals are evaluated on the 3DI/LC module for this purpose. Inputs 1 to 3 (DI 0.4 to 0.6) can be connected directly with contact elements or sensors.

The bit 2.5 in the process image of the inputs indicates whether a 3DI/LC module is inserted.

The signal states are transferred in parallel via the process image. In addition, the signal states in DS92 Read device diagnostics (Page 181) can be read out. The input actions of the individual digital inputs affect the motor starter functions independently of one another.

The input LC (local control) switches over to manual local mode. You cannot change the parameterization of the input. This input is always implemented as an NO contact. You can detect whether or not manual local is active if bits 0.7 and 1.6 are active in the process image input.

For information on this topic, see Chapter "Connecting the 3DI/LC module for the motor starter" in the ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/de/view/58649293/en?dl=en).

Inputs for commissioning

To ensure operation of a motor in the unparameterized state of the ET 200SP motor starter with the aid of the 3DI/LC module, the input parameters in data set 201 are permanently assigned the following values by default:

- DI1: Motor CW
- DI2: Motor CCW
- DI3: Cold start (fail-safe motor starters as of V1.2.0)

This pre-parameterization is overwritten when the ET 200SP motor starter is parameterized.

Response to sensor supply overload

The supply voltage for the digital inputs is short-circuit proof. The current is limited to a maximum of 100 mA. If a short-circuit or overload situation occurs in the sensor supply, the switching elements (motor) are shut down and a group fault is output. Acknowledge the fault with Trip Reset.

⚠ WARNING

The digital inputs (1 to 4) are not isolated. The reference potential is M (5), and therefore SELV/PELV. Only supply the inputs with the 24 V DC output (6).
Do not connect any temperature sensors for winding control of motors if they do not have protective separation. Otherwise, in the event of a fault, a dangerous voltage may be transmitted to the sensor cables and thus to the SELV/PELV circuits. If these cables are then touched, it can lead to death, serious injury and enormous material damage.

You will find more information in chapter Connecting 3DI/LC module (Page 208).

Response to removal of the 3DI/LC module:

Bit 2.5 is reset in the process image input if you remove the 3DI/LC module during operation. You can evaluate the bit and thus indicate unintentional removal. The inputs are not open-circuit-proof.

⚠ WARNING

The motor can continue to run with the corresponding parameterization

When you remove the 3DI/LC module, the motor can continue to run with the appropriate parameterization.

Input signal delay

The input signal delay is fixed at 10 ms.

Input n signal

You can use this device parameter to determine whether or not the input level of the inputs is to be saved.

- Retentive, i.e. latching mode (edge evaluation)
  Regardless of the input signal present, the action can only be deactivated again by a further event and remains active even after cancellation until it is overwritten by another action (e.g. process image of the outputs).
- Non-retentive, that is, jog (level evaluation)
  This input action is active as long as the input is active.

Input n level

You use this device parameter to specify the input logic:

- NC contact
- NO contact

Note

Parameterization only as NO contact.

For "Input n action": "Emergency start", "Motor CW", "Motor CCW", "Cold start" and "Trip reset", "Input n level" can only be parameterized as an NO contact.

Note

Change from NC contact to NO contact

If "Input n level" is changed from a normally closed contact to a normally open contact and the associated "Input n action" is parameterized as "Trip without restart", the "Input tripping" message bit is set and shut down accordingly in the case of an open input due to the input delay!

Note

Applied input voltage

If input voltage is applied (input active), the value "1" is transferred to the controller regardless of the "Input n level" parameter.

Input n action

Different actions can be triggered when an input signal is present. You can parameterize the following actions dependent on "Input n level", "Input n signal" and "Mode".

Note

If "Input n-signal" = retentive, and "Input n-action" = motor CW/CCW, at least one input must always be parameterized with input action "Tripping ..." or "Quick Stop". If this rule is violated, the motor starter will reject the parameters with the relevant diagnostic message.

Table 7-8 Input n action

Input n action	Input n level	Input n signal	Operating mode	Description
No action	NO/NC	n. ret./ret.	All	No direct action on the motor starter. Evaluation und further processing possible using the process image.
Trip without restart	NO/NC	n. ret.	All	• Results in tripping of the motor. • Must be acknowledged once the cause of the tripping has been rectified (initial status).
Trip with restart (AUTO RESET)	NO/NC	n. ret.	All	• Results in tripping of the motor. • Acknowledged automatically after the cause of the trip has been rectified (initial status).
Trip end position CW	NO/NC	n. ret.	All	• The motor is switched off regardless of the direction of rotation. • A fault is generated and reported. • The motor can only be switched on with "Motor CCW"
Trip end position CCW	NO/NC	n. ret.	All	• The motor is switched off regardless of the direction of rotation. • A fault is generated and reported. • The motor can only be switched on with "Motor CW"
Group warning	NO/NC	n. ret./ret.	All	• The diagnosis "Group warning" is output. • The motor starter is not switched off.

Input n action	Input n level	Input n signal	Operating mode	Description
Emergency start	NO	n. ret.	All	• Starts the load when an ON command is issued despite the fact that an internal trip command is present. • Intrinsic device protection of the motor starter remains active and prevents the device from being destroyed. • Only allowed as an NO contact • Not parameterizable when the "EX motor" parameter is active.
Motor CW Motor CCW (with reversing starters only)	NO	n. ret./ret.	Manual local mode	• The motor starter must be in "manual local" mode for these actions. • Motor CW: Switching the motor on or off • Motor CCW: Switching the motor on or off • Only allowed as an NO contact • n. ret. The input action is active while the input signal is pending. • ret.: The action becomes active by means of the rising edge of the input and remains active regardless of the level. The action is reset by the input action "Quick Stop" or "group fault".
Quick Stop	NO/NC	n. ret./ret.	All	• Motor is switched off direction-independently without group fault. • "Quick Stop" takes priority over "Motor CW" and "Motor CCW"
Quick Stop clockwise	NO/NC	n. ret./ret.	All	• Motor is switched off with "Motor CW" without group fault. • "Quick Stop" takes priority over "Motor CW"
Quick Stop counterclockwise	NO/NC	n. ret./ret.	All	• Motor is switched off with "Motor CCW" without group fault. • "Quick Stop" takes priority over "Motor CCW" • The action is only available for reversing starters.
Trip RESET	NO	n. ret.	All	• "Trip RESET" is triggered once. • "Trip RESET" is only possible as NO contact.
Cold start	NO	n. ret.	All	Enables switch-on without main power. If the main power supply is nevertheless present (current flowing), an internal trip command is generated. For fail-safe motor starters as of firmware version V1.2.0

Input n action	Input n level	Input n signal	Operating mode	Description
Operational trip end position CW	NO/NC	n. ret.	All	The motor is tripped regardless of the direction of rotation (CW or CCW). • The motor can only be switched on with "Motor CCW". • The parameter can only be implemented as "non-retentive". • A group fault is not generated, but a diagnostic message is set in data set 92.
Operational trip end position CCW	NO/NC	n. ret.	All	The motor is tripped regardless of the direction of rotation (CW or CCW). • The motor can only be switched on with "Motor CW". • The parameter can only be implemented as "non-retentive". • A group fault is not generated, but a diagnostic message is set in data set 92.
NO: NO contact NC: NC contact ret.: Retentive n. ret.: non-retentive (activation and deactivation of the input action follows the status of the input signal (= jog))				

Settings

Table 7-9 Settings for inputs

Device parameters	Default setting	Setting range
Input signal delay	• 10 ms	-
Input 1 level	• NO contact	• NC contact • NO contact
Input 2 level		
Input 3 level		

Device parameters	Default setting	Setting range
Input 1 action	• Motor CW	• No action • Trip without restart • Trip with restart • Trip end position CW • Trip end position CCW • Group warning • Emergency start • Motor CW • Motor CCW • Quick Stop (direction-independent) • Quick Stop clockwise • Quick Stop counter-clockwise • Trip RESET • Cold start • Operational trip end position CW • Operational trip end position CCW
Input 2 action	• Motor CCW (RS) • No action (DS)	
Input 3 action	• Cold start	
Input 1 signal	• Non-retentive	• Retentive • Non-retentive
Input 2 signal		
Input 3 signal		

7.12 Manual local (local control)

Manual local control with the ET 200SP motor starter is only possible when the 3DI/LC module is inserted. A digital input is permanently assigned the function "Manual local" (LC connection). If the digital input is active, that is, "manual local" is requested, the ET 200SP motor starter changes to manual local mode even in the case of motor ON. To exit manual local mode, the manual local input must be inactive and the motor must be switched off via the DI module. That is, with active input action "Motor CCW" or "Motor CW", the ET 200SP motor starter remains in manual local mode and thus in the "Motor ON" state as long as the input action is not interrupted.

Note

Removal during operation

If the 3DI/LC module is removed from the ET 200SP motor starter during manual local mode, this results immediately in shutdown of the running motor and then to exiting of manual local mode.

If a removed 3DI/LC module is plugged onto the ET 200SP motor starter while "manual local" is active, a changeover is made to manual local mode.

The motor starter assumes automatic mode when manual local mode is ended, i.e. the motor starter switches to the control priority of the CPU. The motor can start immediately when CW or CCW command is pending via the process image of the outputs.

7.13 Trip without restart

The action "Trip without restart" results in the following behavior:

- The motor is tripped. Acknowledge disconnection via Trip Reset after remedying the cause of tripping. You can then switch on the motor again.
- The parameter can only be implemented as "non-retentive".
- A group fault is generated and a diagnostics entry created.

7.14 Trip with restart

The action "Trip with restart" results in the following behavior:

- The motor is tripped.
- Acknowledged automatically after the cause of the trip has been rectified (input status).
- The parameter can only be implemented as "non-retentive".
- A group fault is generated and a diagnostics entry created.

7.15 Trip emergency end position CW

If the motor control command is not equal to "Motor OFF", the diagnostic interrupt "Trip end position CW responded" incoming is triggered when a 0 → 1 edge is detected at the digital input. This diagnostic interrupt results in internal tripping of the motor when emergency start is deactivated. The interrupt "Trip end position CW" is reported as outgoing (DS92 entry is deleted) if the motor control command is "Motor OFF". If the motor control command "Motor CW" is issued in the case of trip end position CW DI static "1", an incoming diagnostic message "trip end position CW" is triggered (only if the diagnostic message was already outgoing or has been deleted). This diagnostic message prevents renewed switch-on of the motor in the CW direction of rotation (emergency start deactivated).

The action "Trip end position CW" results in the following behavior:

- The motor is tripped regardless of the direction of rotation (CW or CCW).
- You can switch the motor back on again after deletion of the control command "Motor CW/ CCW".
- The motor can only be switched on with "Motor CCW".
- The parameter can only be implemented as "non-retentive".
- A group fault is generated and a diagnostics entry created.
- Emergency trip end position CW can be overridden by emergency starting.

Example

The following example shows the "trip end position CW" with digital input 1 parameterized to "Trip end position CW":

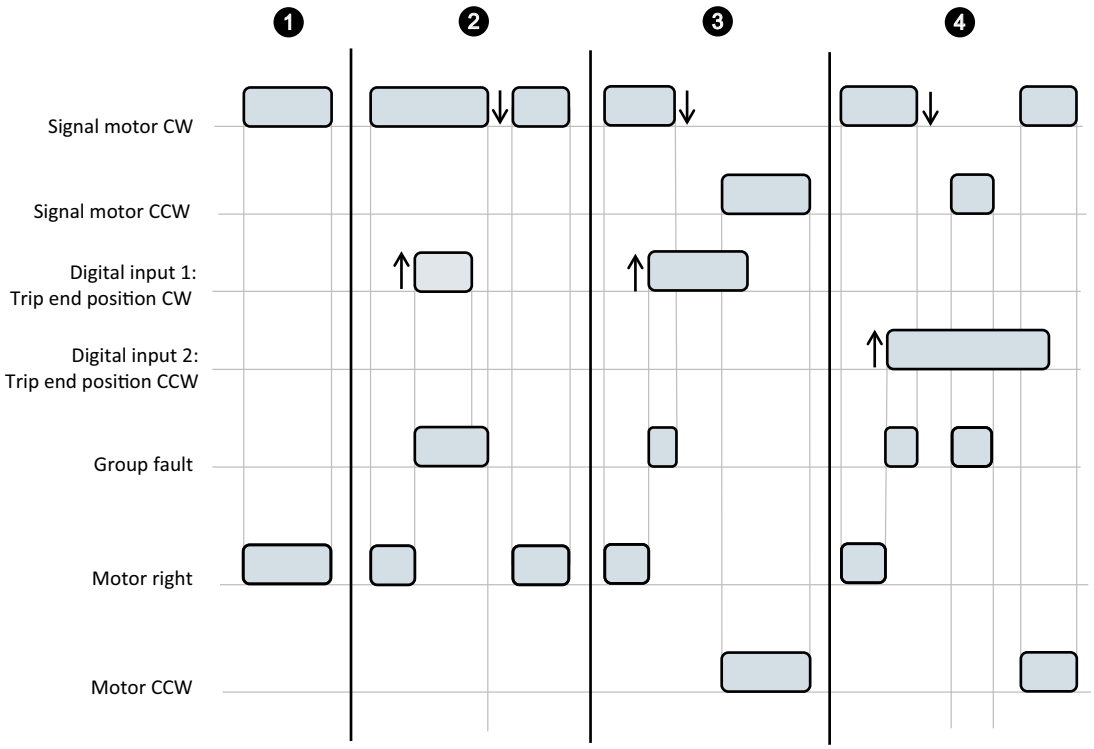


Figure 7-20 Example of trip end position CW

① You switch the motor on by means of "Motor CW". The motor is running.

② You switch the motor on by means of "Motor CW". The motor is running. The motor is switched off by setting the digital input 1 (parameterized to input action 1 = Trip end position CW). A group fault is generated at the same time by the starter. To switch the motor back on again, digital input 1 and the signal "Motor CW" must be reset again. Thereafter you can start the motor again via the signal "Motor CW". The group fault is deleted when the signal "Motor CW" is canceled.

③ You switch the motor on by means of "Motor CW". The motor is switched off by setting the digital input 1 (parameterized to input action 1 = Trip end position CW). A group fault is generated at the same time by the starter. While digital input 1 is set, you can only run the motor counter-clockwise. The group fault is deleted when the signal "Motor CW" is canceled.

④ You switch the motor on by means of "Motor CW". The motor is also switched off by setting the digital input 2 (parameterized to input action 1 = Trip end position CCW). A group fault is generated at the same time by the starter. While digital input 2 is set, you can only run the motor clockwise. To switch the motor back on again, digital input 2 and the signal "Motor CW" or "Motor CCW" must be reset again. Thereafter you can start the motor again via the signal "Motor CW". The group fault is deleted when the signal "Motor CW" is canceled.

7.16 Trip emergency end position CCW

If the motor control command is not equal to "Motor OFF", the diagnostic interrupt "Trip end position CCW responded" incoming is triggered when a 0 → 1 edge is detected at the digital input. This diagnostic interrupt results in internal tripping of the motor when emergency start is deactivated. The interrupt "Trip end position CCW" is reported as outgoing (entry 92 is deleted) if the motor control command is "Motor OFF". If the motor control command "Motor CCW" is issued in the case of trip limit CCW DI static "1", an incoming diagnostic message "trip end position CCW" is triggered (only if the diagnostic message was already outgoing or has been deleted). This diagnostic message prevents renewed switch-on of the motor in the CCW direction of rotation (emergency start deactivated).

The action "Trip end position CCW" results in the following behavior:

- The motor is tripped regardless of the direction of rotation (CW or CCW).
- You can switch the motor back on again after deletion of the control command "Motor CW/ CCW".
- The motor can only be switched on with "Motor CW".
- The parameter can only be implemented as "non-retentive".
- A group fault is generated and a diagnostics entry created.
- Emergency trip end position CCW can be overridden by emergency starting.

7.17 Group warning

The action "Group warning" results in the following behavior:

- A "group warning" is generated.
- An entry with the object number 304 (byte 0, bit 7) is generated in the DS92 Read device diagnostics (Page 181).
- A logbook entry is created in the DS75 logbook - Read events (Page 179).
- The motor is not tripped.
- A maintenance alarm is generated when group warning diagnostics is enabled.

7.18 Emergency start

Description

Emergency start enables restart despite an internal trip command. Emergency start is possible if there is an ON switching command for the motor. The motor is switched on despite a pending trip cause. At a limit trip, the motor starts in the opposite direction.

Emergency starting is not possible in the following situations:

- When you are using a fail-safe motor starter in ATEX operation
- If a device fault is active
- If there is no switched/unswitched 24 V DC supply voltage, or if the supply voltage is outside the specified range.
- The blocking protection has responded
- If a process image error is active

You can activate the function "Emergency start" as follows:

- PIQ 0.4 "Emergency start"
- Via the 3DI/LC module
- Via manual bus mode
- In manual bus mode via DS68

Messages and actions

Table 7-10 Messages and actions emergency start

Message	Action
Emergency start active	Remains pending while emergency start is active, even if the motor is switched off.

7.19 Motor CW

In automatic mode, the motor is activated or deactivated in the CW direction with the aid of the process image of the outputs. If you would like to control the motor via the 3DI/LC module, activate the LC input on the 3DI/LC module (manual local mode). Bit 0.0 "Motor CW" in the process image of the outputs is ignored in manual local mode.

The parameter can only be implemented as an "NO contact".

If "Input n-signal" = retentive, and "Input n-action" = Motor-CW/CCW, at least one input must always be parameterized with the "Tripping ... " or "Quick Stop" input action.
If this rule is violated, the motor starter will reject the parameters with the relevant diagnostic message.

7.20 Motor CCW

In automatic mode, the motor is activated or deactivated in the CCW direction with the aid of the process image of the outputs. If you would like to control the motor via the 3DI/LC module, activate the LC input on the 3DI/LC module (manual local mode). Bit 0.1 "Motor CCW" in the process image of the outputs is ignored in manual local mode.

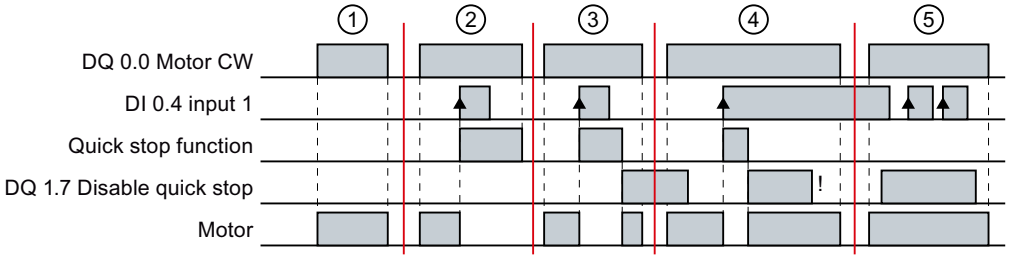
The parameter can only be implemented as an "NO contact".

If "Input n-signal" = retentive, and "Input n-action" = Motor-CW/CCW, at least one input must always be parameterized with the "Tripping ... " or "Quick Stop" input action.
If this rule is violated, the motor starter will reject the parameters with the relevant diagnostic message.

7.21 Quick Stop direction-independent

- Motor is tripped without group fault.
- "Quick Stop" takes priority over "Motor CW" and "Motor CCW"
- The input action responds to the active edge of the input signal, which means that deactivation is possible when the static input signal "Quick stop" is present.
- The input trigger is reset through cancelation of the "Motor CW" and "Motor CCW" control commands, or by means of "Disable quick stop" (in the process image). This applies only in the case of control via manual local mode or in the case of a retentive Quick Stop signal.
- The motor is tripped regardless of the direction of rotation.

Example 1: Input 1 signal = retentive/edge-triggered



① The motor is switched on by "Motor CW".

② Motor is switched on by "Motor CW", then switched off by the rising edge at digital input 1 (parameterized to input action 1 = Quick Stop). By revoking the "Motor CW" command, the Quick Stop function is reset.

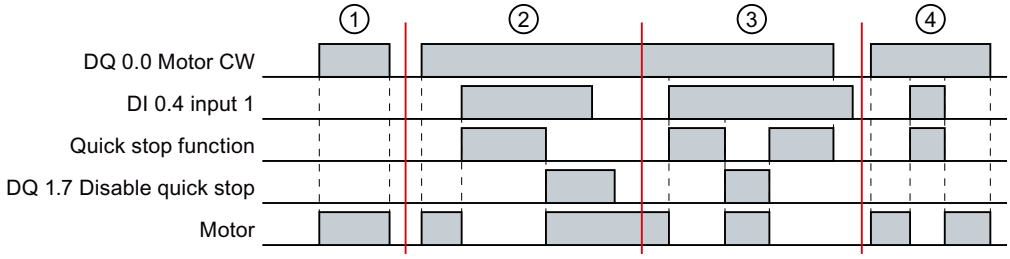
③ Motor is switched on by "Motor CW", then switched off by the rising edge at digital input 1. By setting Disable quick stop, the Quick Stop function is reset and the motor runs "CW" again until the "Motor CW" command is revoked.

④ Motor is switched on by "Motor CW", then switched off by the rising edge at digital input 1. By setting Disable quick stop, the Quick Stop function is reset and the motor runs "CW" again. Although the static digital input signal 1 (DI2) is still present, the motor continues to run and is only reset by revoking the "Motor CW" command.

Reason: The input action is edge-triggered.

⑤ Motor is switched on by "Motor CW" and continues to run uninterrupted since Disable quick stop continuously overwrites the edges of the signal of digital input 1 (DI2).

Example 2: Input 1 signal = non-retentive



① The motor is switched on and off by "Motor CW".

② The motor is switched on by "Motor CW", then switched off by the level at digital input 1 (parameterized with input action 1 = Quick Stop). The Quick Stop function is reset by Disable quick stop. The motor is switched on again since "Motor CW" is still active.

③ The motor is switched off by the level at digital input 1. The "Quick Stop" function is reset by setting "Disable quick stop". As the level "Motor CW" is still active, the motor runs "CW" again until the "Disable quick stop" command is revoked.

④ Motor is switched on by "Motor CW", then switched off by the level at digital input 1. While the "Quick Stop" function is active, the motor remains switched off and starts up again when "Quick Stop" is revoked until "Motor CW" is switched off.

7.22 Quick Stop clockwise

The action "Quick Stop CW" results in the following behavior:

- The motor is switched off with pending signal "Motor CW" without group fault
- The motor is not switched off with pending signal "Motor CCW"
- "Quick Stop CW" takes priority over "Motor CW"
- The input action responds to the active edge of the input signal, which means deactivation is possible when the static input signal "Quick Stop" is present.
- The input trigger is reset through cancelation of the control commands "Motor CW" or "Disable quick stop" (in the process image). This applies only in the case of control via manual local mode or in the case of a retentive Quick Stop signal.

7.23 Quick Stop counter-clockwise

The action "Quick Stop CCW" results in the following behavior:

- The motor is switched off with pending signal "Motor CCW" without group fault
- The motor is not switched off with pending signal "Motor CW"
- "Quick Stop CCW" takes priority over "Motor CCW"
- The input action responds to the active edge of the input signal, Deactivation is possible when the static input signal "Quick Stop" is present.
- The input trigger is reset through cancelation of the commands "Motor CCW" or "Disable quick stop" (in the process image). This applies only in the case of control via manual local mode or in the case of a retentive Quick Stop signal.

Note

No quick stop CW in the case of direct-on-line starters

You cannot use quick stop CCW in combination with direct-on-line starters.

7.24 Trip RESET

"Trip RESET" acknowledges all the errors/faults that are currently active and that can be acknowledged. An error/fault can be acknowledged if its cause has been rectified or if it is no longer present.

Trip RESET is triggered by:

- Loading a valid parameterization
- Remote RESET via PLC (PIQ bit 0.3 Trip RESET)
- Remote RESET via input actions (if parameterized)
- TEST/RESET button on the ET 200SP motor starter
- Power-on reset (switching off and on again of the 24 V supply voltages on the device)

Note

TRIP RESET as input n signal

The "Trip Reset" action is only possible as an "input n signal" (non-retentive).

7.25 Cold start

Description

The "cold start" function enables control of a motor without error messages. The motor starter responds here as if the main power supply were connected to the system. Thus, in the commissioning phase, for example, the relevant control commands are accepted from the controller and the relevant messages are sent.

The "cold start" function enables activation of the motor starter without a main power supply. The motor starter responds here as if the main power supply were connected to the system. The error message "Residual current detection/tripping" is suppressed. Thus, in the commissioning phase, for example, the relevant control commands are accepted from the controller and the relevant messages are sent.

Note

The "cold start" function is not possible for the command "Motor on" in an ATEX configuration.

Note

If the main power supply is nevertheless present (current flowing), an internal trip command is generated.

Note

The "cold start" action is only permissible as an "input n level" (NO contact) and only as an "input n signal" (non-retentive).

You can activate the "cold start" function as follows:

- PIQ 0.7 "Cold start"
- Via the 3DI/LC module
- In manual bus mode via DS68

7.26 Operational trip end position CW

If the motor control command is not equal to "Motor OFF", an operational trip of the motor is triggered when a signal change at the operational trip end position CW DI is detected. This motor tripping triggered by the operational trip end position is revoked by the motor control command "Motor OFF". If the motor control command "Motor CW" is issued in the case of operational trip end position CW DI static "1", an operational trip is triggered again. This motor tripping triggered by the operational trip end position prevents renewed switch-on of the motor in the CW direction of rotation.

The action "Operational trip end position CW" results in the following behavior:

- The motor is tripped regardless of the direction of rotation (CW or CCW).
- The motor can only be switched on with "Motor CCW".
- The parameter can only be implemented as "non-retentive".
- A group fault is not generated, but a diagnostic message is set in data set 92.
- Operational trip end position CW cannot be overridden by emergency start.

7.27 Operational trip end position CCW

If the motor control command is not equal to "Motor OFF", an operational trip of the motor is triggered when a signal change at the operational trip end position CCW DI is detected. This motor tripping triggered by the operational trip end position is revoked by the motor control command "Motor OFF". If the motor control command "Motor CCW" is issued in the case of operational trip end position CW DI static "1", an operational trip is triggered again. This motor tripping triggered by the operational trip end position prevents renewed switch-on of the motor in the CCW direction of rotation.

The action "Operational trip end position CCW" results in the following behavior:

- The motor is tripped regardless of the direction of rotation (CW or CCW).
- The motor can only be switched on with "Motor CW".
- The parameter can only be implemented as "non-retentive".
- A group fault is not generated, but a diagnostics message is set in data set 92.
- Operational trip end position CCW cannot be overridden by emergency start.

7.28 Chatter monitoring

- The following two events trigger the chatter monitoring (it does not matter which channel is used for the switch-on command):
  - There is a new switch-on command within 500 ms after the last switch-on command.
  - There is a switch-on command within the interlock time (standard: 55 to 170 ms after switch-off command, safety: 95 ms to 195 ms after switch-off command).
- The number of new switch-on commands within 500 ms is stored in the statistics data (Page 187).
- 0x311 is sent as a diagnostic interrupt (frequency too high).
- The warning 0x311 (frequency too high) is canceled if no further switch-on command has occurred within 1.5 s.

7.29 Logbook

Description

The logbooks contain a chronological list of device faults, trips and events that are assigned a time stamp, thus creating a log. The log is stored internally so that the causes can be evaluated at a later stage.

Logbooks

Three logbooks that can be read as a data set are available:

- DS72: DS72 logbook - Read device error (Page 174)
- DS73: DS73 logbook - Read triggering operations (Page 177)
- DS75: DS75 logbook - Read events (Page 179)

The operating hours (see Chapter DS95 Read statistics (Page 187)) of the device in seconds are used as a time stamp. You can find the object numbers of the relevant messages in the relevant data sets. The last 21 entries are stored in the logbooks. You can read out the entries with the relevant data sets. The logbook is designed as a circular buffer. After 21 entries, the oldest entry is overwritten. The latest entry is at the first location.

In case of a retentive error "Fail-safe motor starter defective" (see DS72 logbook - Read device error (Page 174), "Assignment of object number to device fault message" table), the DS72, DS73 and DS75 logbooks are frozen when the supply voltage (24 V DC) is removed, i.e. no further entries are permitted.

Logbook - Read device errors

The logbook "Read device errors" contains all device errors/faults. The object numbers of the actual fault causes are entered, e.g. object number 476, "Current measurement defective".

Logbook - Read trips

The logbook "Read trips" contains all group faults. The object numbers of the actual fault causes are entered, e.g. "Switching element defective".

Logbook - Read events

The logbook "Read events" contains all warnings as well as certain actions. Incoming events are reported as incoming. In addition, some events are also reported as outgoing. Incoming entries are marked "+". Outgoing events are marked "-".

7.30 PROFIenergy

7.30.1 What is PROFIenergy?

PROFIenergy supports the following two functions:

- Energy saving function
  Supports targeted shutdown of loads during idle times.
- Measured value function
  Energy management is an instrument which is ideally suited to reducing energy consumption and thereby energy costs within a company both systematically and on a long term basis. The aim of energy management is to optimize the use of energy in a company - from the purchasing of energy through to the consumption of energy - economically and ecologically. The measured value function provides the measured values required for optimization.

7.30.2 PROFIenergy in the motor starter

The ET 200SP motor starter supports the "Energy saving function" and "Measured value function" for the motor current. These are identified as commands, since they trigger reactions in the ET 200SP motor starter.

In addition, the ET 200SP motor starter also provides so-called services that provide information on the status of the motor starter as defined in PROFIenergy. These can then be evaluated and further processed in the user program.

Using PROFIenergy with the ET 200SP motor starter

SIEMENS provides two function blocks for using PROFIenergy:

- PE_START_END (FB815) supports the switch to an energy-saving mode.
- PE_CMD (FB816) supports the reading out of measured values and the switch to an energy-saving mode

You will find further information in the document entitled "Common Application Profile PROFIenergy, Technical Specification for PROFINET Version V1.1 Edition 2, Dec. 2013, Order Number 3802" published by PROFIBUS International (PI).

Note

PROFIenergy is not possible with PROFIBUS interface modules.

Note

The PROFIenergy function is available with firmware version V3.3 of the interface modules.

Commands

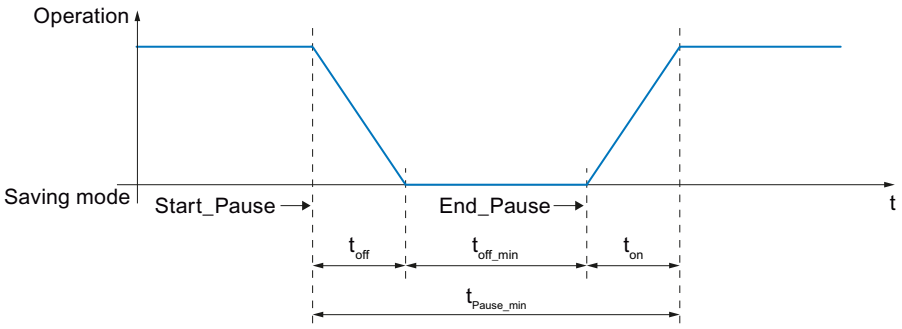
The following tables show the supported commands:

Control commands	
Start_Pause	The starter switches to energy-saving mode.
Start_Pause_with_time_response	The starter switches to energy-saving mode and signals its minimum idle times.
End_Pause	The starter switches back to operating mode.

Status commands	
PE_Identify	Provides a list of supported PROFIenergy commands/functions.
PEM_Status	Returns the current mode.
PEM_Status_with_time_response	Returns the extended status of the current mode.
Query_Modes	
List_Energy_Saving_Modes	Provides a list of supported energy-saving modes.
Get_Mode	Provides the parameter values with which the energy-saving function works.
Query_Version	Shows the implemented PROFIenergy profile.
Query_Measurement	
Get_Measurement_List	Provides a list of supported measured values.
Get_Measurement_List_with_object_number	Provides a list of supported measured values and the associated object number.
Get_Measurement_Values	Provides the requested measured values.
Get_Measurement_Values_with_object_number	Provides the requested measured values together with the object number.

The ET 200SP motor starter operates with the following PROFIenergy modes (PE modes):

PE_Mode_ID = 255	Ready to operate
PE_Mode_ID = 01	Energy-saving mode



t_{off}	Time_to_Pause	Time the starter requires in order to change to energy saving mode. With the ET 200SP motor starter, this time is always 100 ms.
t_{off_min}	Time_min_length_of_stay	Minimum time that the device spends or should spend in saving mode. For the ET 200SP motor starter: 150 ms
t_{on}	Time_to_operate	Time that will elapse before the starter changes back to the operating state. For the ET 200SP motor starter: 100 ms (due to startup sequence)
t_{Pause_min}	Time_min_Pause	Time that is compared with t_{Pause} (is transferred together with the "Start_Pause" command to the motor starter); if $t_{Pause} \geq t_{Pause\_min}$, the device switches to saving mode.

"Measured value function" command

Measured values for energy need to be supplied for efficient energy management. The PROFIenergy specification offers various measured values from which to choose, each of which is assigned a measured value ID. The ET 200SP motor starter supports the instantaneous values of the phase current and the mean value of the phase currents as measured values.

The measured values are uniquely identified by IDs. The following measured value IDs 7, 8, 9, and 33 are supported:

- ID = 7: Current rms value of the phase current a (L1)
- ID = 8: Current rms value of the phase current b (L2)
- ID = 9: Current rms value of the phase current c (L3)
- ID = 33: Mean value of the three phase currents (a+b+c)/3

The current values are transferred with the following tolerances:

- Domain = 0x03 → IEC 61557-12
- Class = 0x0B → 5 %

The result is that the measured values are transferred with an accuracy of 5 % relative to the maximum configurable rated operational current I_e.

Reaction of the starter when energy-saving mode is activated

Shutdown of the motor by suppression of the PIQ bits (Motor CW, Motor CCW). The other PIQ bits (e.g. Trip RESET) remain active.

Interactions with the various operating modes

- PROFIenergy is operative only in Automatic mode
- Manual local mode is not influenced by PROFIenergy; it is still possible to switch to manual mode and thereby to control the motor manually
- Both cyclic and acyclic data transmission (PIQ, PII, data sets, diagnostics, alarms, etc.) to and from the motor starter are still possible

Prerequisites for the starter to switch to energy-saving mode (min. idle time, etc.)

The changeover to "Pause" energy-saving mode only becomes effective when the idle time sent is greater than the device-specific minimum idle time. This means that a switch is only performed when the pause is longer than the motor starter requires to switch the main energy for the load off and on again.

The switch to energy-saving mode is recorded in the "Events" logbook. Entry: "Energy saving mode active"

See also

Application example (https://support.industry.siemens.com/cs/ww/en/view/109478388)

PROFINET system description (http://support.automation.siemens.com/WW/view/en/19292127)

7.31 Firmware update

Introduction

During operation it may be necessary to update the firmware (e.g. to extend the available functions). You update the firmware of the motor starter with the help of firmware files.

Note

Note the preconditions for a firmware update/downgrade

You can find the preconditions for a firmware update/downgrade in the Siemens Industry Online Support under the entry Firmware update for ET 200SP motor starter (https://support.industry.siemens.com/cs/ww/en/view/109486088).

Loading and installing a firmware update

- Click "Product Support" on the Siemens Industry Online Support (https://support.industry.siemens.com/) page.
- In the product tree selection field, select "Automation engineering → Automation systems → SIMATIC industrial automation systems → Controllers → IO systems → ET 200 systems for the control cabinet → ET 200SP".

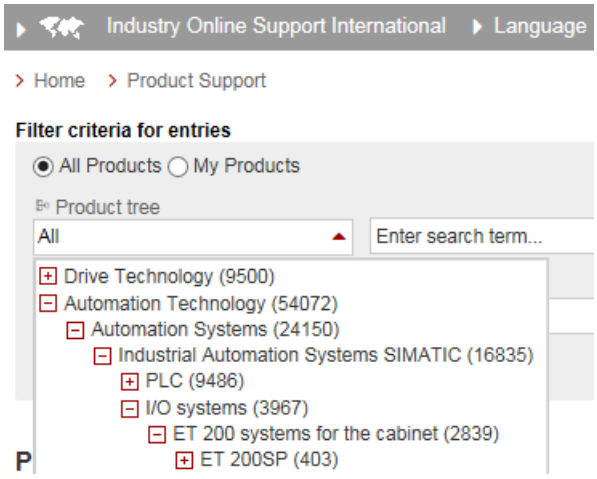


Figure 7-21 ET 200SP in the product tree

- Navigate to the specific type of module that you want to update.
- Under "Product information → Support", click on the "Software downloads" link.
- Download the required firmware update files.

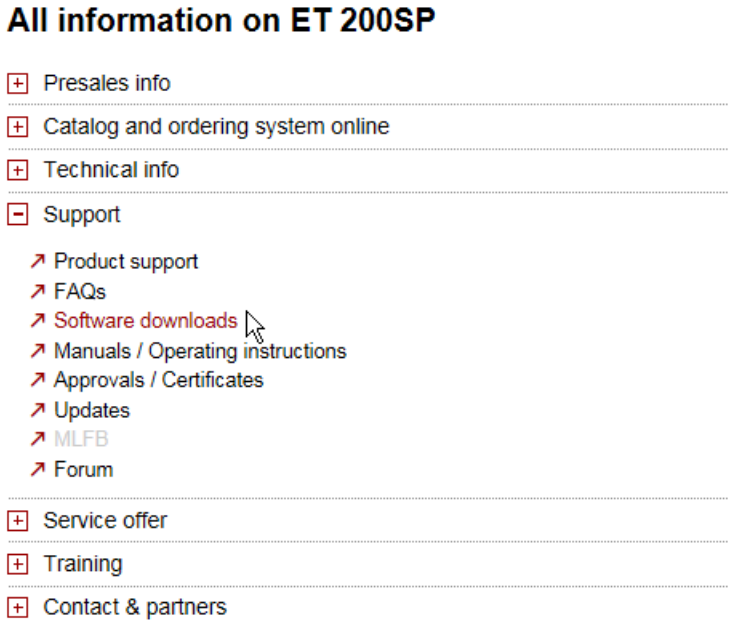


Figure 7-22 Selecting the software downloads

- Before installing the firmware update, make sure that the modules are not being used.

NOTICE
Firmware update for fail-safe motor starters In the case of fail-safe motor starters, the firmware update is permissible only if the motor starter is the only module on a rack. Make sure before a firmware downgrade of fail-safe motor starters with a F-DI BaseUnit (MS5-MS10) that the associated F-DI is on 1-signal (=value of "1"). Also make sure that the motor starter is only connected to the device on which the firmware is being updated (e.g. PG/PC or CPU).

NOTICE
Loss of the safety function after an incorrect firmware update The safety functions can be lost if you inadvertently install a firmware update on a motor starter for which the update was not intended. Make sure that the PG/PC or the CPU is exclusively connected to the motor starter on which the firmware is being updated.

Note

Securing the supply voltage

On starting, and during the firmware update, the 24 V DC supply voltage must be applied at the header module and the motor starter.

Note

Interrupted firmware update

If a firmware update has been interrupted, remove and reconnect the affected module before a renewed firmware update.

⚠ WARNING

Risk of impermissible system states

The CPU switches to STOP mode or the interface module to "station failure" as a result of the firmware update being installed. STOP or station failure due to a firmware update can cause an unpredictable motor starter state. After completion of the update, the current PIO and the input actions take effect again.

Unexpected operation of a process or a machine can lead to fatal or severe injuries and/or to property damage.

Before installing the firmware update, ensure that the motor starter, the CPU and the interface module are not executing an active process.

More options for the firmware update

The following options are available for updating firmware:

- Online via PROFINET IO/PROFIBUS DP (with STEP 7), see below
- Via the integrated Web server (possible for CPU as well as centralized and distributed I/O modules), see below
- With the TIA Portal:
  - Non-fail-safe ET 200SP motor starter, SIMATIC STEP 7 V13 SP1 or higher with installed HSP
  - Fail-safe ET 200SP motor starter, SIMATIC STEP 7 V14 or higher with installed HSP
- Via a SIMATIC memory card, see below
- With SIMATIC STEP 7 Version V5.5 SP4 or higher

Procedure using STEP 7

Proceed as follows to perform an online firmware update with STEP 7:

1. Select the module in the device view.
2. Select the "Online & diagnostics" command from the shortcut menu.
3. Select the "Firmware update" group in the "Functions" folder.
4. Click the "Browse" button to select the path to the firmware update files in the "Firmware update" area.
5. Select the suitable firmware file. The table in the firmware update area lists all modules for which an update is possible with the selected firmware file.
6. Click the "Run update" button. If the module can interpret the selected file, the file is downloaded to the module.

Note

If a firmware update is interrupted, you need to remove and insert the module before starting the firmware update again.

Procedure using a SIMATIC memory card

Proceed as follows to perform a firmware update via the SIMATIC memory card:

1. Insert a SIMATIC memory card into the SD card reader of your programming device / computer.
2. To save the update file on the SIMATIC memory card, mark the SIMATIC memory card in the project navigator under "Card reader/USB memory".
3. In the "Project" menu, select the command "Card Reader/USB memory → Create firmware update memory card".
4. Use a file selection dialog to navigate to the firmware update file. In a further step you can decide whether you want to delete the content of the SIMATIC memory card or whether you want to add the firmware update files to the SIMATIC memory card.
5. Insert the SIMATIC memory card containing the firmware update files in the CPU.

Procedure using the Web server

The procedure is described in the Function Manual Web server (http://support.automation.siemens.com/WW/view/en/59193560).

Behavior during the firmware update

Note the following behavior during the firmware update of the motor starter:

- The LEDs flash as described in chapter "Status and error displays (Page 153)".
- The motor starter powers up again after completion of the firmware update. Diagnoses are reset. The firmware update does not affect the thermal motor type and the cooling time.
- The sensor supply of the DI module remains active.

Behavior after the firmware update

After the firmware update, check the firmware version of the updated module. A successfully loaded firmware update is activated immediately.

If a fail-safe motor starter is in "Manual local" mode during the firmware update, the motor starter switches to Commissioning mode (Page 135) after the successful firmware update operation. You must first confirm ATEX parameters before you can perform manual local control (see Configuring ATEX operation (Page 144)).

Online help for STEP 7

You can find more information on the procedure in the STEP 7 online help.

Parameters/address space

8

8.1 Parameter assignment

When configuring an ET 200SP motor starter, the full parameterization scope is set and automatically transferred to the motor starter. When parameterizing in the user program, the parameters are transferred to the module via the data sets with the statement "WRREC". If the CPU initiates a new parameter assignment, e.g. if communication breaks down, the parameterization is overwritten by the system parameterization via the user program.

The modules of the ET 200SP distributed I/O system support the full parameterization scope of the ET 200SP motor starters.

Note

List of supported ET 200SP header modules

You will find a list of the compatible ET 200SP header modules in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/view/109485777).

Note

Reduction to default parameters

In the following cases, the full scope of parameterization is reduced by the configuring software to the standard parameters (DS201) for system reasons:

- Activated DPV0 alarm mode (in the case of PROFIBUS IMs)
- Activated option handling (in the case of PROFIBUS IMs)
- When configuring using a GSD (for parameters, see Read/write DS201 device parameter 1 (Page 189))

Note

Trip RESET

When you send valid parameters to the motor starter, a trip RESET is triggered. Acknowledgeable active faults are deleted.

Parameters for ET 200SP motor starter

The effective range of the adjustable parameters depends on the type of configuration. The following configurations are possible:

- Centralized operation with an ET 200SP CPU and the ET 200SP Open Controller
- Distributed operation on the PROFINET IO in an ET 200SP system
- Distributed operation on the PROFIBUS IO in an ET 200SP system

When you assign parameters in the user program, transfer the parameters to the module via the data sets with the "WRREC" statement.

The parameters that can be set can be found in the Appendix in Read/write DS201 device parameter 1 (Page 189) and Read/write DS202 device parameter 2 (Page 193).

You will find an explanation of the parameters in Chapter Declaration of parameters (Page 140).

Note

Changing the parameters during operation

If parameters are modified during operation, they will be overwritten by the parameters configured in the hardware configuration during a restart of the control system.

If this is not desired, a command must be issued to disable parameterization.

You set the parameter block in theDS93 Write command (Page 185).

8.2 Commissioning mode

Commissioning mode is available for fail-safe ET 200SP motor starters.

When setting up a system, you can test the wiring without the functioning PROFINET or PROFIBUS connection. Perform the test in commissioning mode.

The motor starter switches to commissioning mode in the following cases:

- After the power supply has been activated, the motor starter does not receive any parameterization via the backplane bus.
- The DI module's "Local Control" switch is activated.
  As soon as Local Control is active, the parameterization saved last is used when the power supply is activated. Control via the DI module is possible after confirmation via the TEST/ RESET button.

To switch to commissioning mode in the case of fail-safe motor starters, confirm the change with the blue button. During ATEX operation, additionally confirm the current parameters, as described in chapter "Configuring ATEX operation (Page 144)".

If the motor starter receives valid parameterization via the backplane bus in commissioning mode, the parameterization is placed in intermediate storage. The parameterization becomes active when "Local Control" is terminated (motor OFF). The commissioning mode is exited.

Inputs for commissioning

To ensure operation of a motor in the unparameterized state of the ET 200SP motor starter with the aid of the 3DI/LC module, the input parameters in data record 201 are permanently assigned the following values by default:

- DI1: Motor CW
- DI2: Motor CCW
- DI3: Cold start (fail-safe motor starters as of V1.2.0)

This pre-parameterization is overwritten when the ET 200SP motor starter is parameterized.

8.3 Parameterization using a GSD file

For the ET 200SP-IM155 interface module of the ET 200SP system, there are two different GSD files, one for operation with PROFINET and one for operation with PROFIBUS. The GSD and GSDML files can be used with STEP 7 V5.5 SP4 and higher, and TIA Portal V13 SP1 and higher.

If you configure the ET 200SP motor starter in the PROFIBUS environment with GSD, and the standard values in data set 202 have to be changed, then you create data set 202 via the user program on initial commissioning of the starter. Transfer the data set to the PLC.

Parameterization with the PROFINET GSDML file

The ET 200SP motor starter can be fully configured with all parameters with the GSDML file for PROFINET.

Parameterization with the PROFIBUS GSD file

Two parameter data sets (DS201 and DS202) are used for configuring the ET 200SP motor starter. Only data set DS 201 is ever transferred as the startup data set when using a PROFIBUS GSD.

8.4 Slot rules

You can find further information on the structure of a system with an ET 200SP motor starter in the ET 200SP System Manual (http://support.automation.siemens.com/WW/view/en/58649293).

8.5 Data plausibility check

Check of the incoming parameters in the "Automatic" and "Manual bus" modes

The motor starter checks all incoming parameters for validity and plausibility, provided manual local mode is not active. The valid parameters are stored in data set 203 and 204.

In the case of incorrect parameters during startup (after power ON):

- The diagnoses "Group fault" and "Invalid parameter value" are set in the DS92 Read device diagnostics (Page 181).
- The motor remains shut down.
- An "Invalid parameter value" logbook entry (object number 365) is created in DS73 logbook - Read triggering operations (Page 177).
- The currently valid parameter values are retained and can be read via the Read DS203 device parameter 1 (Page 194). Incorrect parameters can be read back and verified in the Read/write DS201 device parameter 1 (Page 189).

In the case of incorrect parameters from the user program and when the motor is switched off:

- The "Group warning" and "Invalid parameter value" diagnoses are set and the number of the invalid parameter is entered in DS92 Read device diagnostics (Page 181).
- A logbook entry is created in the DS75 logbook - Read events (Page 179).
- The currently valid parameter values are retained and can be read via the Read DS203 device parameter 1 (Page 194). Incorrect parameters can be read back and verified in data set 201.

For parameters when the motor is running:

- The parameters are not accepted by the starter.
- The "Parameters cannot be changed in ON state" maintenance alarm is set if the maintenance alarm is enabled in the current parameterization.
- The "Group warning" and "Invalid parameter value" entries are set in DS92 Read device diagnostics (Page 181) and the number of the invalid parameter is entered.
- The motor is not switched off.
- A logbook entry is created in the DS75 logbook - Read events (Page 179).
- The currently valid parameter values are retained and can be read via the Read DS203 device parameter 1 (Page 194). Incorrect parameters can be read back and verified in the Read/write DS201 device parameter 1 (Page 189).

Checking incoming parameters in "Manual local" mode

The incoming parameters are checked as follows in "Manual local" mode:

- When the motor is switched off:
  The motor starter saves the parameter and accepts it only when the motor starter has switched over to "Automatic" mode again. Only after changing to "Automatic" are the parameters checked.
- When the motor is running:
  - The parameters are not accepted by the motor starter, even if the motor starter changes later to "Automatic" mode.
  - The diagnosis "Parameters cannot be changed in ON state" is set in the DS75 logbook - Read events (Page 179).
  - The diagnosis "Group warning" is set.
  - The motor is not switched off.
  - A logbook entry is created
  - The currently valid parameter values are retained.

Checking incoming parameters in "Manual bus" mode

The incoming parameters are not accepted and saved in "Manual bus" mode.

8.6 Declaration of parameters

Trip class

The trip class (CLASS) specifies the maximum time within which a protective device must trip from a cold state at 7.2x the setting current (motor protection to IEC 60947).

For more information, see Chapter Overload protection (Page 72).

Rated operational current I_e

This is where you can enter the rated operational current that the branch (switchgear and motor) can carry without interruption. The setting range depends on the relevant device's rating class.

For more information, see Chapter Rated operational current (Page 63).

Blocking current

If the blocking current is overshot, the motor starter detects stalling.

For more information, see Chapter Blocking time and blocking current (Page 88).

Blocking time

The blocking time is the time a motor block can be permitted without tripping the motor. If the blocking time expires and the system is still stalled, the motor starter switches off.

For more information, see Chapter Blocking time and blocking current (Page 88).

Diagnosis Electronics supply voltage too low

With this device parameter, you define whether a message is to be displayed if the supply voltage is too low (as of firmware V1.2.0).

Input n action

Different actions can be triggered when an input signal is present.

You can find out which actions you can parameterize depending on "Input n level", "Input n signal" and "Mode" in chapter Inputs (Page 98).

Input n level

You use this device parameter to specify the input logic.

For more information, see Chapter Inputs (Page 98).

Input n signal

You use this device parameter to determine whether or not the input level of the digital inputs is to be saved.

For more information, see Chapter Inputs (Page 98).

Load type

Here, you can specify whether the motor starter must protect a 1-phase load (direct-on-line starters only) or a 3-phase load.

For more information, see Chapter Load type (Page 65).

Upper/lower current limit

You can enter a lower and/or an upper current limit value.

Note

The current limits are not activated for startup override until the CLASS time expires, e.g. after 10 seconds for CLASS 10.

For more information, see Chapter Upper/lower current limit (Page 88).

Upper/lower current warning limit

You can enter a lower and/or an upper current warning limit value.

Note

The current limits are not activated for startup override until the CLASS time expires, e.g. after 10 seconds for CLASS 10.

For more information, see Chapter Upper/lower current warning limit (Page 87).

Group error diagnostics

You use this parameter to determine whether diagnostics via PROFINET or PROFIBUS DP (fault type) are enabled or disabled.

For more information, see Chapter Group fault diagnostics/group warning diagnostics (Page 97).

General warning diagnostics

You use this device parameter to determine whether or not a maintenance alarm is forwarded to the higher-level CPU.

For more information, see Chapter Group fault diagnostics/group warning diagnostics (Page 97).

Thermal motor model (response to overload)

You use this device parameter to determine how the motor starter is to respond to overload.

For more information, see Chapter Overload protection (Page 72).

Response to CPU/master STOP

Determines the module's response to CPU STOP.

For more information, see Chapter Response to CPU/master STOP (Page 96).

Response to residual current detection

You use this device parameter to specify how the motor starter is to respond to residual current detection.

For more information, see Chapter Response to residual current detection (Page 83).

Response to asymmetry

You use this device parameter to determine how the motor starter is to behave in the event of asymmetry.

For more information, see Chapter Asymmetry monitoring (Page 92).

Warning limit motor heating

The motor starter displays a warning if the motor heating limit is overshot. You use this parameter to preset a motor heating value in percent as a warning limit. At a warning limit of 0 %, the function is deactivated.

For more information, see Chapter Overload protection (Page 72).

8.7 Assigning fail-safe motor starter parameters

8.7.1 Explanation of safety-related parameters

Ex motor

The motor starter can switch and protect loads in an EX protection zone (see Ex motor application (Page 95)).

Response to safety-related tripping

The motor starter can send a warning to the CPU if tripping has been triggered through the fail-safe input (see Response to safety-related tripping (Page 94)).

8.7.2 Setting safety-related parameters

Fail-safe motor starters possess the following safety-related parameters:

- Ex motor
- Rated operational current
- Trip class

Response to modified safety-related parameters

If modified safety-related parameters are received during run-up, the parameters are displayed. Confirm the modified parameters by pressing the Reset button twice before continuing work.

If modified safety-related parameters are received after run-up has been completed, the motor starter responds as follows depending on its status:

- Motor OFF in automatic mode
  The motor starter accepts the new parameters. The parameters are indicated by the LEDs' flashing sequence. To activate the parameters, confirm them with the blue button. The motor cannot be switched on before the parameters are activated.
- Motor ON in automatic mode and in manual local mode
  The motor starter rejects the parameters. The "Parameter changes not allowed in motor ON state" message is issued. As communication is not secure, the motor starter does not respond to the modified parameters. Depending on the parameterization, entries in data set "DS92" or diagnostic interrupts are generated. The entries in data set "DS92" are deleted as soon as the modified parameters are active.

- Manual local mode
  The motor starter accepts the new parameters and saves them. As soon as manual local mode is ended, the parameters are activated and indicated by means of the LEDs' flashing sequence. Confirm the parameters with the blue button. The motor cannot be switched on before the parameters are activated.
- Manual bus mode
  The motor starter accepts the new parameters. The parameters are indicated by the LEDs' flashing sequence. To activate the parameters, confirm them with the blue button. The motor cannot be switched on before the parameters are activated.

The motor starter remains in the safe state (STO) until you have confirmed the parameters. Before you have confirmed the parameters, they can already be read out in data set "DS203". Data set "DS201" is accepted. A group warning in the DS92 Read device diagnostics (Page 181) and in the process image input is triggered. Moreover, a maintenance alarm, "New safety-related parameters received" (0x1036), can be generated.

Response to invalid parameterization

If inconsistent or invalid parameterization is detected, the applicable parameters are discarded. Entries in data set "DS92" or diagnostic interrupts are generated. To narrow down the invalid parameterization, compare the parameter values from the data sets "DS201" and "DS203" or "DS202" and "DS204".

Reading back the data sets "DS201" and "DS202" returns the last correctly transferred data set, even if it is rejected later due to inadmissible content.

Data sets with incorrect lengths are rejected and discarded. The starter continues to operate with the last valid parameter.

8.7.3 Configuring ATEX operation

ET 200SP fail-safe motor starters protect motors in an ATEX environment. The following parameters are considered to be safety-related in ATEX operation:

- Rated operational current (I_e)
- Trip class

You set the parameters via the data sets or using the engineering software.

Before the new safety-related parameters are accepted, however, check and confirm the new parameters. The parameter settings are indicated by means of a flashing sequence of the LEDs on the fail-safe motor starter. As soon as you have ensured with the aid of the LEDs that all parameters are correctly set, confirm the new parameters on the device by means of the blue button. The parameters are not accepted until you have confirmed and the motor starter is "Ready for motor ON". Changes to parameters that are not safety-related do not require confirmation.

LED flashing sequence

The following graphic shows the order in which the LEDs flash:

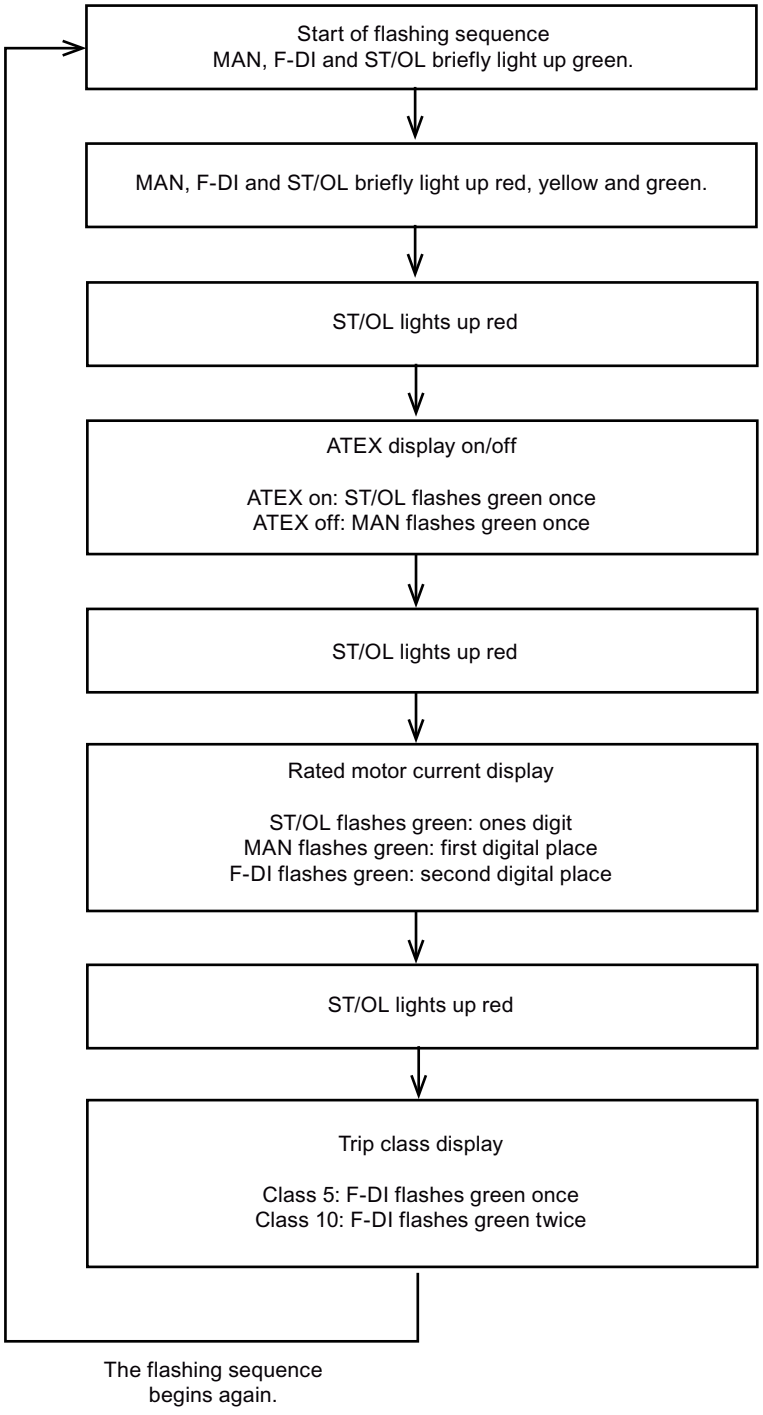


Figure 8-1 Flashing sequence during ATEX operation

The start of the flashing sequence is indicated by the "MAN", "F-DI" and "ST/OL" LEDs, which light up briefly in green all at the same time. The multi-colored LEDs then light up in red and yellow. Lighting up also serves to verify that all LEDs are functioning correctly.

To signal display of the next parameter, the "ST/OL" LED briefly lights up in red between every flashing signal for a set parameter.

The flashing sequence ends as soon as you press the blue button twice and confirm the set parameters.

Note

Receiving several parameter assignments

If safety-related parameters are received during a flashing sequence, conform the first parameters (or reject them) first. Only then are the parameters that have been sent last indicated. The motor cannot be started until the parameters last sent are valid and you have confirmed them.

Note

ATEX operation is not possible in connection with an activated parameter block

If the parameter block is activated and an ATEX parameter assignment is received, the device fault 461 and the diagnostic interrupt 0x1095 are output.

Disable the parameter block of the corresponding motor starter before you send ATEX parameters.

Rejecting ATEX parameterization

Proceed as follows if you want to reject the set parameterization:

1. Press the blue button for longer than five seconds.
   A group fault is output and the "Invalid parameter value" diagnostic message in data set 92 is set. A logbook entry is also created in data set 73. The diagnostic interrupt 0x1095 is also triggered if group fault diagnostics is enabled. In this state you cannot trigger any of the other functions.
2. Send the correct parameterization via the data set "DS201".
3. Confirm the correct parameterization.

Displaying ATEX parameters

To display the safety-related parameter settings during normal operation, press the TEST/RESET button for at least five seconds.

8.7.4 Examples of LED flashing sequences

Below you see a few examples of the LED flashing sequence.

Example of I_e = 5 A and CLASS 10

The following figure shows the LED flashing sequence with a fail-safe motor starter that has trip class I_e = 5 A and CLASS 10:

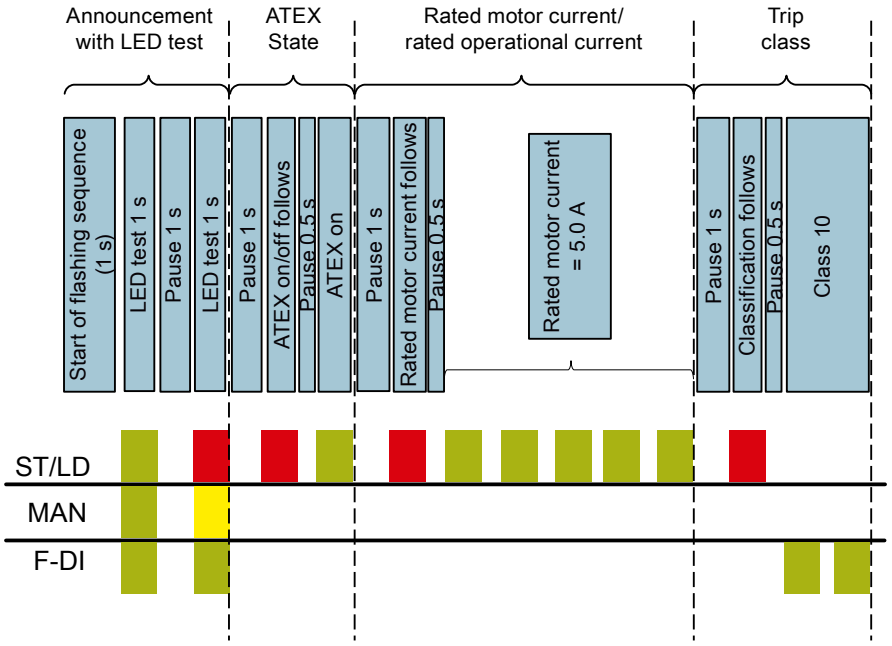


Figure 8-2 Display example I_e = 5.0 A CLASS 10

Example of I_e = 0.34 A and CLASS 5

The following figure shows the LED flashing sequence with a fail-safe motor starter that has trip class I_e = 0.34 A and CLASS 5:

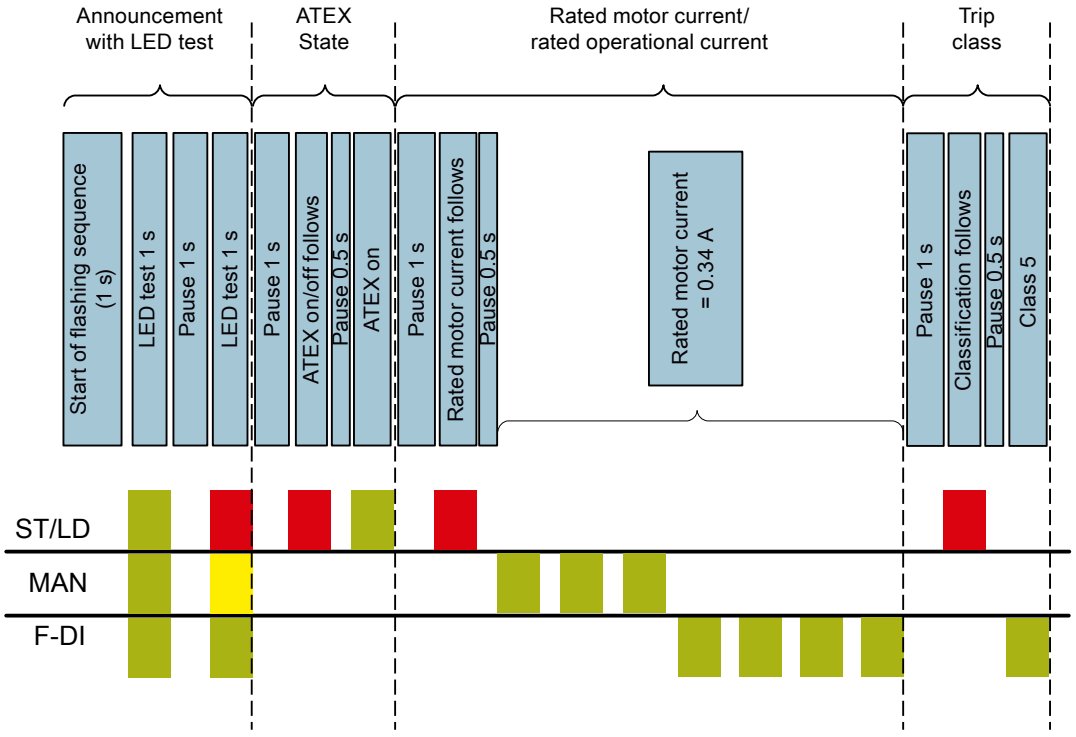


Figure 8-3 Display example I_e = 0.34 A CLASS 5

Example of I_e = 11.4 A and CLASS 5

The following figure shows the LED flashing sequence with a fail-safe motor starter that has trip class I_e = 11.4 A and CLASS 5:

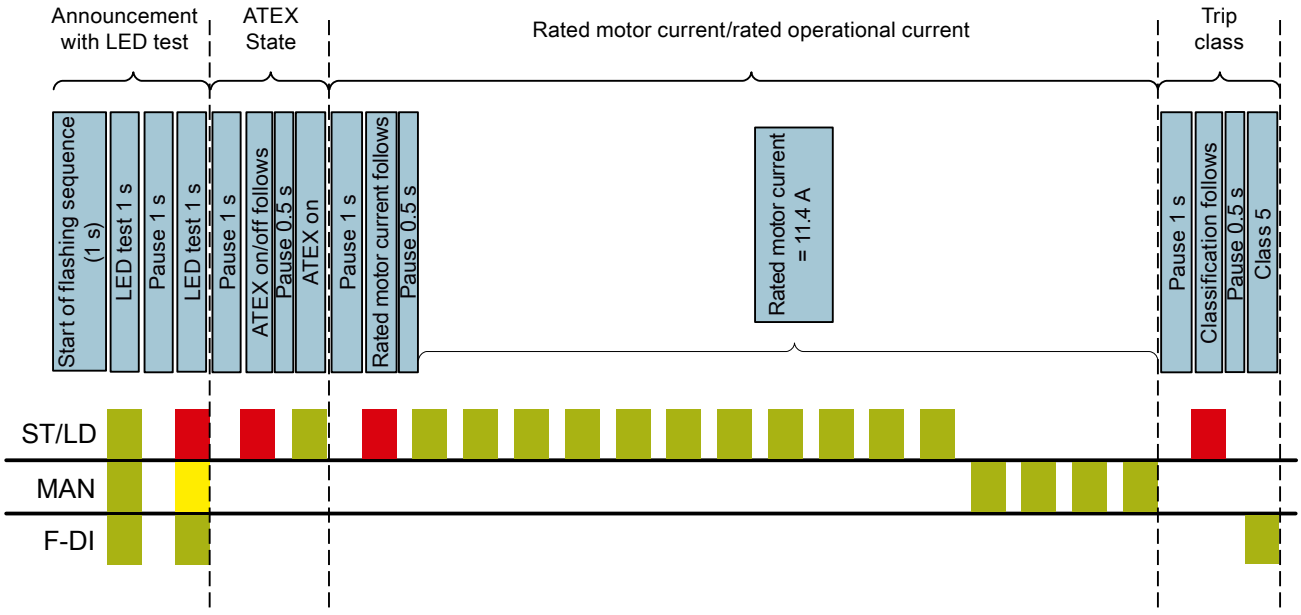


Figure 8-4 Display example 11.4 A CLASS 5

Example of I_e = 3.75 A and CLASS 5

The following figure shows the LED flashing sequence with a fail-safe motor starter that has trip class I_e = 3.75 A and CLASS 5:

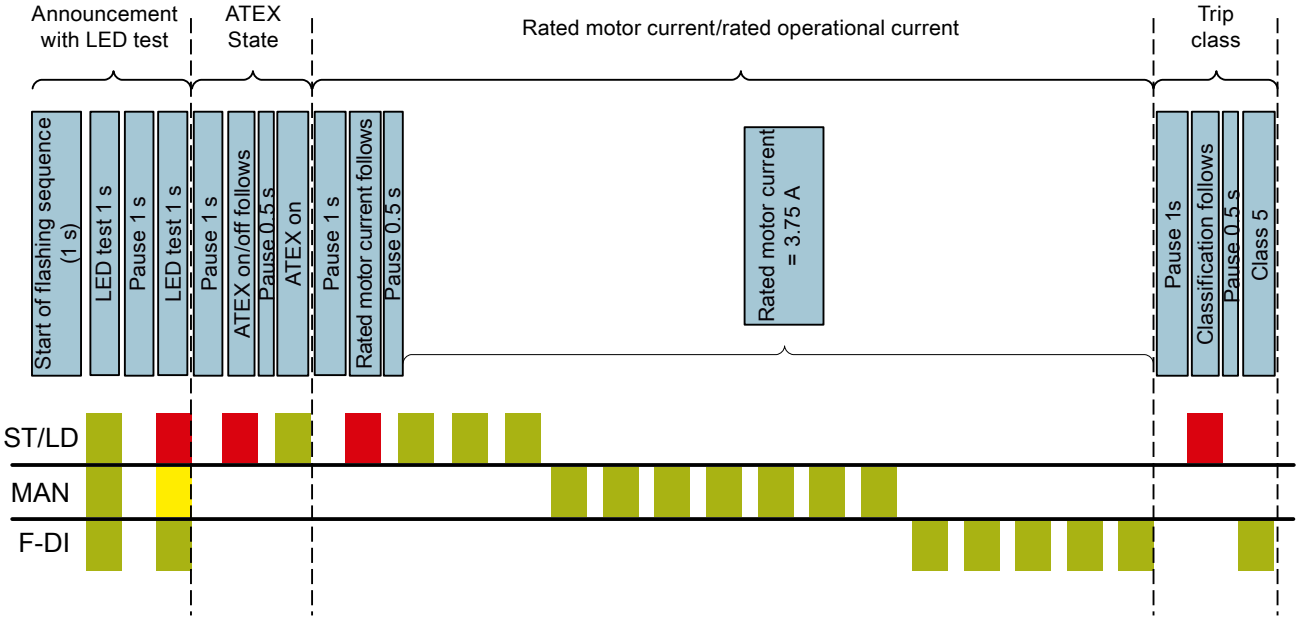


Figure 8-5 Display example Ie = 3.75 A CLASS 5

ATEX off display

The following figure shows the LED flashing sequence when ATEX operation for a fail-safe motor starter is deactivated:

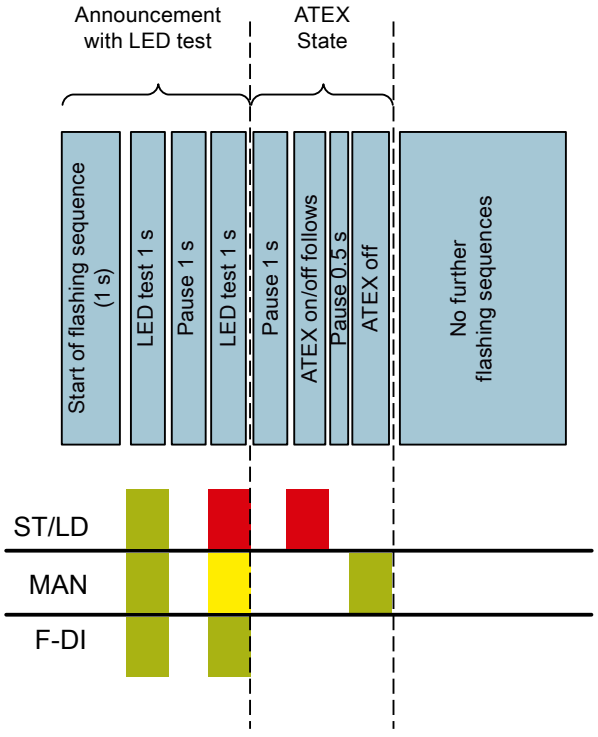


Figure 8-6 ATEX off display

8.8 Address space

Process image of the outputs

Table 8-1 Contents of process image of the outputs (in bytes 0 to 1)

Process data	Meaning	Relevant for
DQ 0.0	Motor CW	All
DQ 0.1	Motor CCW	Reversing starters only
DQ 0.2	-	-
DQ 0.3	Trip RESET	All
DQ 0.4	Emergency start	All (except activate "EX motor" parameter)
DQ 0.5	-	-
DQ 0.6	-	-
DQ 0.7	Cold start	All
DQ 1.0	-	-
DQ 1.1	-	-
DQ 1.2	-	-
DQ 1.3	-	-
DQ 1.4	-	-
DQ 1.5	-	-
DQ 1.6	-	-
DQ 1.7	Disable quick stop	All

Process image of the inputs

Table 8-2 Process image of the inputs (in bytes 0 to 3)

Process data	Meaning	Relevant for
DI 0.0	Ready (automatic)	All
DI 0.1	Motor ON	All
DI 0.2	Group fault	All
DI 0.3	Group warning	All
DI 0.4	Input 1	All (with 3DI/LC module)
DI 0.5	Input 2	All (with 3DI/LC module)
DI 0.6	Input 3	All (with 3DI/LC module)
DI 0.7	Input LC	All (with 3DI/LC module)
DI 1.0	Motor current I_{curr} [%] bit 0	All
DI 1.1	Motor current I_{curr} [%] bit 1	All
DI 1.2	Motor current I_{curr} [%] bit 2	All
DI 1.3	Motor current I_{curr} [%] bit 3	All
DI 1.4	Motor current I_{curr} [%] bit 4	All
DI 1.5	Motor current I_{curr} [%] bit 5	All
DI 1.6	Manual local mode	All (with 3DI/LC module)

Process data	Meaning	Relevant for
DI 1.7	-	-
DI 2.0	Ready to start for motor ON	All
DI 2.1	Motor ON - RIGHT	All
DI 2.2	Motor ON - LEFT	Reversing starters only
DI 2.3	Quick stop active	All
DI 2.4	Energy saving mode active	All
DI 2.5	DI module inserted	All
DI 2.6	Explosion protection of the motor active	Fail-safe starters only
DI 2.7	Parameter block active	All [1)]
DI 3.0	Thermal motor model overload	All
DI 3.1	-	-
DI 3.2	I_e current limit tripping	All
DI 3.3	F-DI status	Fail-safe starters only
DI 3.4	Residual current detected	All
DI 3.5	Asymmetry detected	All
DI 3.6	Overtemperature	All
DI 3.7	-	-

1) From FW Version 1.2.0

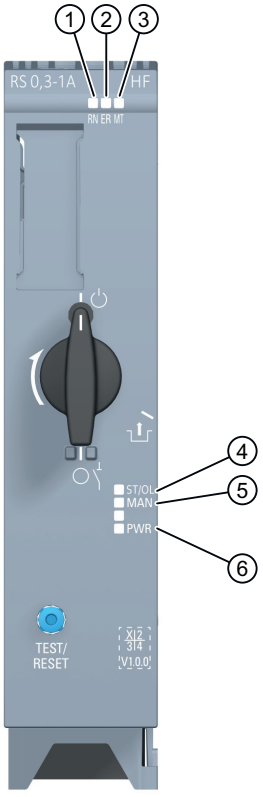
Alarms/diagnostic messages

9

9.1 Status and error displays

LED display

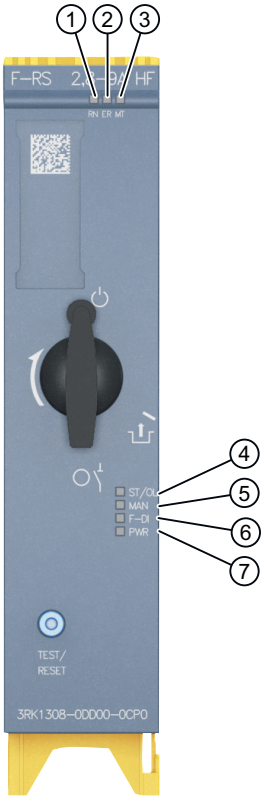
The figure below shows the LED display on the ET 200SP motor starter:



①	RN	(green)	- Run
②	ER	(red)	- Error
③	MT	(yellow)	- Maintenance
④	ST/OL	(red/green)	- State/overload
⑤	MAN	(yellow)	- Manual (manual local mode)
⑥	PWR	(green)	- Power

Figure 9-1 LED display on the ET 200SP motor starter

The figure below shows the LED display on the fail-safe ET 200SP motor starter:



①	RN	(green)	- Run
②	ER	(red)	- Error
③	MT	(yellow)	- Maintenance
④	ST/OL	(red/green)	- State/overload
⑤	MAN	(yellow)	- Manual (manual local mode)
⑥	F-DI	(green)	- Fail-safe digital input
⑦	PWR	(green)	- Power

Figure 9-2 LED display on the ET 200SP Failsafe motor starter

Meaning of the LEDs

The tables below give the meanings of the status and fault displays:

RN/ER/MT LED

Table 9-1 RN/ER/MT status and error displays

LEDs			Meaning	Explanation
RN (RUN)	ER (ERROR)	MT (MAINT)		
■ On	Not relevant	Not relevant	Operating state "RUN", the ET 200SP motor starter is in a "normal" application and executes the control commands. The current operating mode is not relevant.	-
☼ Flashes	Not relevant	Not relevant	Startup (Cfg + Par.) Self-test Module deactivated Parameterization error	System operating state "System startup" A parameterization fault during startup prevents exiting of this state. The SIMATIC ET 200SP motor starter reports a fault.
				Wait until the ET 200SP motor starter is ready.
				Firmware update
				The module has been deconfigured.
Not relevant	Not relevant	■ On	Maintenance demanded (warning)	Group warning At least one Maintenance demanded alarm has been transferred to the controller. Possible causes: • Motor model has exceeded warning limit • Current value has exceeded or undershot warning limit • Start disabled, ET 200SP motor starter too warm (without ON command)
Not relevant	☼ Flashes at ≥ 2 Hz	Not relevant	Error	Group fault At least one Error alarm has been transferred to the controller. Possible causes: • Electronics supply voltage too low or too high • Motor protection disconnection • Thermal overload of the ET 200SP motor starter • Missing load voltage, phase failure/ missing load • The mechanical rotary interlock is not in the READY position.
■ On	OFF	☼ Flashes	PROFIenergy active	-
☼ Flashes	OFF	☼ Flashes	Action required	Ex motor (ATEX): New safety-related parameters are available for release.

ST/OL (STATE/OVERLOAD) LED

Table 9-2 Status display ST/OL

ST/OL LED	Motor operating state	Meaning
■ On	Operation	ON command for motor active
□ Off	STOP	The motor is switched off. It is not known whether the motor is still rotating or not.
☼ Flashes at 0.5 Hz	Overload	The thermal motor model or device protection model has tripped.

MAN (MANUAL) LED

Table 9-3 Status display MAN

MAN LED	Meaning	Remedy
□ Off	Manual local mode deactivated	-
■ On	Manual local mode activated	-
☼ Flashes at 1 Hz	Connection abort in manual bus mode	-

PWR (POWER) LED

Table 9-4 Status display PWR

PWR LED	Meaning	Remedy
□ Off	Supply voltage not present or too low	Check the supply voltage.
■ On	Supply voltage present	-

LED F-DI for fail-safe motor starters

Table 9-5 Status display F-DI

LED F-DI	Meaning	Remedy
□ Off	LOW level at the fail-safe digital input on the BaseUnit in the case of a fail-safe motor starter.	-
■ On	HIGH level at the fail-safe digital input on the BaseUnit in the case of a fail-safe motor starter.	-

LED combinations

Table 9-6 Status displays ST/OL/MAN/PWR

LEDs			Meaning	Explanation
ST/OL (State/ Overload)	**MAN (Manual)**	**PWR (Power)**		
Lights up for 4 s	Lights up for 4 s	Lights up for 4 s	LED/fan test	All LEDs are switched on for 4 s (triggered by pressing the blue button).
Flashes	Flashes	■ Lights up	Firmware update active or canceled	-
OFF	OFF	OFF	No supply voltage	No supply voltage available A detected undervoltage (in the case of still functioning electronics) is not reported as power OFF, but as a fault.
Flashes at 1 Hz	Flashes	■ Lights up	Device fault	Non-correctable fault detected following self-diagnostics (contactor contacts, switching element, etc.). Remedy: Check the wiring and, if necessary, replace the device.

9.2 TEST/RESET button

The RESET button has the following functions:

Designation	Tripping	Description
LED/fan test	Press of a button for less than two seconds	The LED/fan test is activated. All LEDs (ST/OL, MAN, PWR) light up and the fan is switched on for 4 s. An LED/fan test is not possible in the case of fail-safe motor starters with F-DI deactivated (safety-related shutdown by low level).
RESET function	Press of a button	If a group fault is active, you can acknowledge this fault using the blue button. You can acknowledge device faults in principle only via ON/OFF of the control voltage. Note: If a fault is active, you cannot execute the LED/fan test.

Additional functions in the case of fail-safe motor starters

Confirming ATEX parameters	Press of a button	You confirm display of the parameters via an LED flashing sequence by pressing the RESET button twice.
Discarding ATEX parameterization	Press of a button for longer than five seconds.	By pressing the button for longer than five seconds, you discard newly set ATEX parameters and you return to the original parameterization.
Displaying ATEX parameterization	Press of a button for longer than five seconds.	By pressing the button for longer than five seconds, you can display the currently set ATEX parameters during operation.
Switching to commissioning mode	Press of a button	In "Manual local" mode, confirm the change to commissioning mode by the fail-safe motor starter by pressing the button.

9.3 Interrupts

The ET 200SP motor starter supports diagnostic interrupts and maintenance. You can read out the diagnoses of the motor starter in the following data sets:

- DS72 logbook - Read device error (Page 174)
- DS73 logbook - Read triggering operations (Page 177)
- DS75 logbook - Read events (Page 179)
- DS92 Read device diagnostics (Page 181)

A diagnostic message is output for each diagnostics event and the ER LED flashes on the module when group fault diagnostics are enabled. You can read out the diagnostic messages in the diagnostics buffer of the CPU, for example. You can evaluate the error codes via the user program. The following table shows the individual diagnostic messages:

Error type channel diagnostics	Fault text	Generated at data record object number	Remedial measures
0003_h (3_{dec})	Overvoltage	1407	Cause: The supply voltage is above the tolerance limit. Remedy: Change the power supply.
1000_h (4096_{dec})	Zero current after ON command	338	No current flow is detected in the motor feeder after an ON command. Possible cause: main circuit interrupted (energy supply missing, internal fuse defective, load missing)
1021_h (4129_{dec})	Phase unbalance	340, 341	The limit value for phase unbalance has been exceeded. Phase unbalance can cause an overload. Possible causes: Failure of the phase, fault in the motor windings Remedy: Check the motor feeder and the motor.
1022_h (4130_{dec})	Thermal motor model overload	327, 328	The motor feeder has been overloaded. The motor temperature rise has exceeded a limit. Remedy: Please check the motor and the applications that are being driven by the motor. After a trip, you can switch the motor on again after the cooling time has expired, or after the thermal motor model has been deleted.
1036_n (4150_{dec})	Parameters for EX motor protection received	1537	Parameters for the EX motor protection have been received. Remedy: Remedy: Confirm the correctness of the parameters directly on the device.
1040_h (4160_{dec})	Threshold I exceeded	334, 1541	The current has exceeded a limit. Remedy: Please check the application that is being driven by the motor.
1041_h (4161_{dec})	Threshold I undershot	335, 1542	The current has undershot a limit. Remedy: Please check the application that is being driven by the motor.
1093_h (4243_{dec})	Sensor supply overload	354	The output driver for the sensor supply is overloaded. Remedy: Check the cabling and the sensor.

Error type channel diagnostics	Fault text	Generated at data record object number	Remedial measures
$104C_h$ (4172_{dec})	Motor blocking	339	The maximum motor current has exceeded a limit for blocking protection. Possible cause: The motor is blocked. Remedy: Please check the application that is being driven by the motor.
1080_h (4224_{dec})	Device fault	308, 338, 381,456, 458, 460, 476, 480, 490, 1414, 1417, 1466, 1467, 1482, 20010, 20011, 20012, 20013, 20015, 20018, 20017 (up to V1.2.0)	Non-correctable fault detected following self-diagnostics (contactor contacts, switching element, etc.). Remedy: Check the logbook entries. Check the wiring and, if necessary, replace the device.
1083_h (4227_{dec})	Switching element overload	309, 1580	Switching element (switching contact, power semiconductor) too hot. Check the ambient conditions linked to cooling. You might have to take derating into consideration. Check the number of switching operations. Also check whether the fan is working properly.
1084_h (4228_{dec})	Electronics supply voltage too low	317	The supply voltage is below the permissible value. Remedy: Check the power supply (load measurement, voltage range)
1088_h (4232_{dec})	No switching element supply voltage	333	No supply voltage has been detected or the mechanical rotary interlock is not in the READY position. Remedy: Check the power supply to the switching elements and the cabling or turn the mechanical rotary interlock to the READY position.
1095_h (4245_{dec})	Parameter error	365, 366, 384, 461	The module is not yet parameterized or is incorrectly parameterized or the safety-related parameters have been rejected. Remedy: Correct the parameterization.
1096_h (4246_{dec})	Process image error	355	The process image output (PIQ) contains invalid control bit combinations (e.g. control bits for clockwise and counter-clockwise set simultaneously). Remedy: Check and correct the process image output (PIQ).
$10A5_h$ (4261_{dec})	Residual current	337, 338	No current flow is detected in the motor feeder after an ON command. Possible causes: Phase failure, fault in the motor winding, fuse in the device defective Remedy: Check the motor feeder (main circuit) and the motor. Clear the short-circuit in the system and replace the device.
$100A_h$ (4106_{dec})	Test mode current flow	1406	Current is flowing in the motor feeder although the motor feeder is in test mode or the test position. Possible causes: The main circuit is not interrupted in test operation. The cold start function of the ET 200SP motor starter is activated. Remedy: Check the wiring or deactivate the cold start function

Error type channel diagnostics	Fault text	Generated at data record object number	Remedial measures
$109D_h$ (4253_{dec})	Input Action	348, 351	A warning or trip signal is active on at least one input. Remedy: Check the application.
$109E_h$ (4254_{dec})	Emergency end position CW	349	The "CW" emergency end position has been passed. Remedy: Check the end position of the drive.
$001F_h$ (31_{dec})	Channel temporarily unavailable		Wait until the firmware update is completed.
$109F_h$ (4255_{dec})	Emergency trip end position CCW	350	The "CCW" emergency end position has been passed. Remedy: Check the end position of the drive.
$134B_h$ (4939_{dec})	Trip Reset not possible		Trip reset is currently not possible (e.g. because the cooling phase is in progress). Remedy: Repeat the action later (e.g. after the cooling time has elapsed).
1080_h		20013, 1466, 1417, 20010, 1467 (as of V1.2.2)	When the error occurs for the 1st to 4th time. On the 5th occurrence, error type channel diagnostics 1080_h is reported again.

9.4 Maintenance

A maintenance alarm is output for each group warning and the MT LED lights up on the module when group warning diagnostics are enabled. You can read out the diagnostic messages in the diagnostics buffer of the CPU, for example. You read the maintenance alarms in data set 75 (Page 179) of the motor starter.

Extended maintenance

You will find general information on extended maintenance in "Diagnostics" in the SIMATIC PROFINET Function Manual (https://support.industry.siemens.com/cs/de/de/view/49948856/en).

The PROFINET interfaces of the interface module support the diagnostics concept and maintenance concept in PROFINET according to the standard IEC 61158-6-10. The aim is early detection and correction of potential faults. The motor starter's full functionality (maintenance) is available with firmware version V3.3 of the interface module.

The maintenance information is generated in STEP 7 with the following system messages:

- Maintenance request - symbolized by a yellow screwdriver.
- Faults - symbolized by a red screwdriver

See also

SIMATIC ET 200SP System Manual (http://support.automation.siemens.com/WW/view/en/58649293)

Technical data

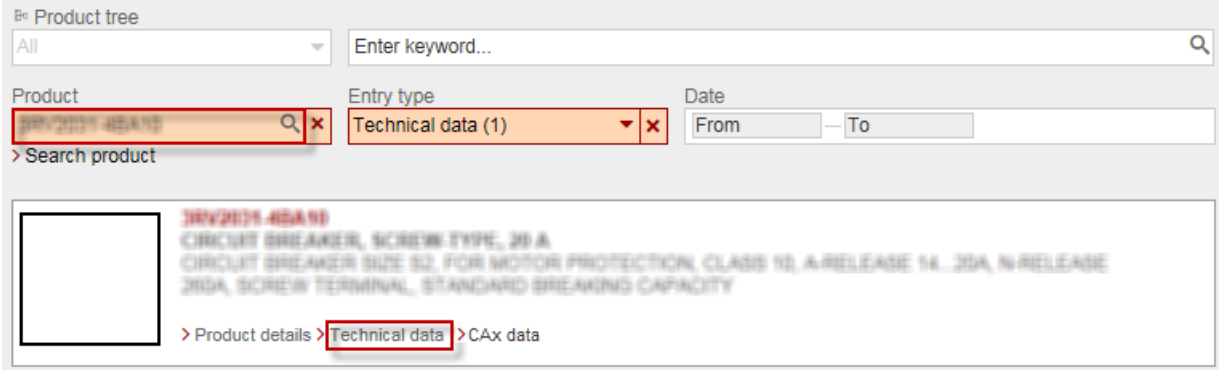
10

10.1 Technical data in Siemens Industry Online Support

Technical data sheet

You can also find the technical data of the product at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "Technical data" link.



10.2 Final conditions for safety-related parameters

Safety-related parameters

The safety-related parameters in the data sheet have been determined on the basis of the following final conditions:

- Side-by-side mounting at rated current I_n
- 100% ON period of electronics
- 40 °C ambient temperature
- DIN EN 60721-3-7 noxious gas environment: class 3C2

B10d value

NOTICE
Consider the B10d value stated for the motor starter in your application. The maximum number of operating cycles (B10d) may not be exceeded within the mission time T1. If the expected number of operating cycles exceeds the B10d value during the device's service life, you must set correspondingly shorter replacement intervals.

You can calculate the maximum service life of the device as follows: T10D = B10d / nop;
nop: Operating cycles/year

Validity of safety engineering data

The safety engineering data specified in the data sheet is valid under the following prerequisites:

The specified PFH/PFD value is valid until the electrical endurance (B10) or the mission time has been reached. Replace the device if either the electrical endurance or the mission time has been exceeded. The application is outside of the specification if the maximum number of starting operations is exceeded.

Note

Definition of "number of starting operations"

The "number of starting operations" stands for the frequency of switching of the main conducting path switching elements, i.e. switching on and off of the connected motor and not requesting of STO via the power supply or the fail-safe digital input.

NOTICE
Use of ET 200SP motor starters at installation altitudes higher than 2000 m above sea level Refer to the current product information for use at an altitude higher than 2000 m above sea level (Extension of the application range for fail-safe SIMATIC ET 200SP motor starters up to an installation altitude of 4000 m (https://support.industry.siemens.com/cs/ww/en/view/109778836)).

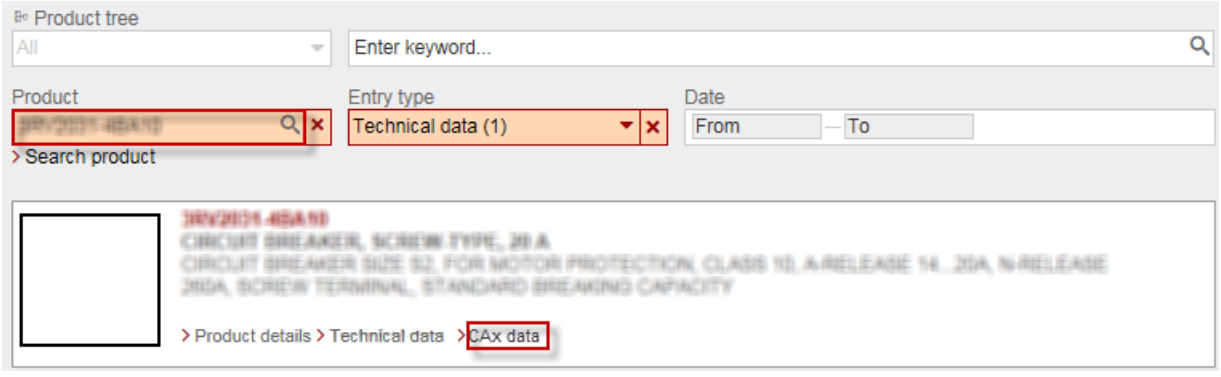
CAx data

11

11.1 CAx data

You can find the CAx data in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/).

1. Enter the full article number of the desired device in the "Product" field, and confirm with the Enter key.
2. Click the "CAx data link.



Data sets

A

A.1 Reading and writing of data records

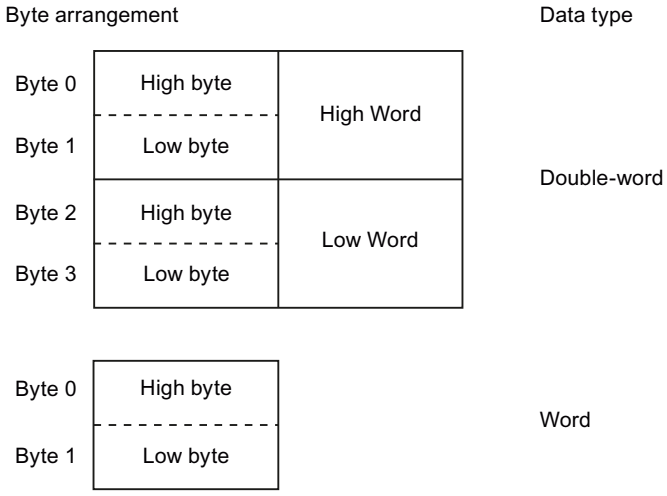
You can access the data sets of the motor starter from STEP 7:

- Writing data sets by calling SFB 53 "WRREC"
- Reading data sets by calling SFB 52 "RDREC"

You will find further information about the SFB in the STEP 7 online help.

A.2 Byte arrangements

When data longer than one byte is stored, the bytes are arranged as follows ("big endian"):



A.3 DS68 Read/write process image output

Note

Please note that data set 68 is overwritten by the cyclic process image in automatic mode!

Byte	Content	Value / value range	Meaning
0	Coordination	0x21	Write via acyclic bus channel (PLC)
1	Reserved	0x00	-
2	Reserved	0x00	-
3	Reserved	0x00	-
Process image of the outputs			
4	Process data	DQ 0.0 to DQ 0.7	See table below
5	Process data	DQ 1.0 to DQ 1.7	See table below

Table A-1 Content of process image of the outputs (in bytes 4 and 5)

Byte.Bit	Encoding	Process data	Meaning	Relevant for
4.0	Bit (1 = active)	DQ 0.0	Motor CW	All
4.1		DQ 0.1	Motor CCW	Reversing starters only
4.2		DQ 0.2	-	-
4.3		DQ 0.3	Trip reset	All
4.4		DQ 0.4	Emergency start	All [1]
4.5		DQ 0.5	-	-
4.6		DQ 0.6	-	-
4.7		DQ 0.7	Cold start	All [2]
5.0	Bit (1 = active)	DQ 1.0	-	-
5.1		DQ 1.1	-	-
5.2		DQ 1.2	-	-
5.3		DQ 1.3	-	-
5.4		DQ 1.4	-	-
5.5		DQ 1.5	-	-
5.6		DQ 1.6	-	-
5.7		DQ 1.7	Disable quick stop	All

1) Not for EX motor

2) F starter as of FW V 1.2.0

A.4 DS69 Read process image input

Byte	Content	Value / value range	Meaning
0	Process data	DI 0.0 to DI 0.7	See table below
1	Process data	DI 1.0 to DI 1.7	See table below
2	Process data	DI 2.0 to DI 2.7	See table below
3	Process data	DI 3.0 to DI 3.7	See table below

Table A-2 Process image input (in bytes 0 and 3)

Byte.Bit	Encoding	Process data	Meaning	Relevant for
0.0	Bit (1 = active)	DI 0.0	Ready (automatic)	All
0.1		DI 0.1	Motor ON	All
0.2		DI 0.2	Group fault	All
0.3		DI 0.3	Group warning	All
0.4		DI 0.4	Input 1	All
0.5		DI 0.5	Input 2	All
0.6		DI 0.6	Input 3	All
0.7		DI 0.7	Input 4	All
1.0	Bit (1 = active)	DI 1.0	Motor current I_{act}-bit0	All
1.1		DI 1.1	Motor current I_{act}-bit1	All
1.2		DI 1.2	Motor current I_{act}-bit2	All
1.3		DI 1.3	Motor current I_{act}-bit3	All
1.4		DI 1.4	Motor current I_{act}-bit4	All
1.5		DI 1.5	Motor current I_{act}-bit5	All
1.6		DI 1.6	Manual local mode	All
1.7		DI 1.7	-	-
2.0	Bit (1 = active)	DI 2.0	Ready to start for motor ON	All
2.1		DI 2.1	Motor CW	All
2.2		DI 2.2	Motor CCW	Reversing starters only
2.3		DI 2.3	Quick stop active	All
2.4		DI 2.4	Energy saving mode active	All
2.5		DI 2.5	DI module inserted	All
2.6		DI 2.6	Ex motor active	F starters only
2.7		DI 2.7	Parameters disabled CPU/master active	All

Byte.Bit	Encoding	Process data	Meaning	Relevant for
3.0	Bit (1 = active)	DI 3.0	Thermal model overload	All
3.1		DI 3.1	-	-
3.2		DI 3.2	I_e current limit tripping	All
3.3		DI 3.3	F-DI status	F starters only
3.4		DI 3.4	Residual current detected	All
3.5		DI 3.5	Asymmetry detected	All
3.6		DI 3.6	Overtemperature	All
3.7		DI 3.7	-	-

A.5 DS72 logbook - Read device error

Byte	Data type	Meaning	Range of values	Increment
Entry 1 (= latest entry)				
0 ... 3	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
4 ... 5	Signed 16	Object number	0 ... ±32767	1
Entry 2 (= second-latest entry)				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
10 - 11	Signed 16	Object number	0 ... ±32767	1
... ...				
Entry 21 (last, oldest entry)				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
124 ... 125	Signed 16	Object number	0 ... ±32767	1

The data set call "Logbook device fault" returns the operating hour of the event that has occurred and an associated object number for each entry. This data set can accommodate 21 entries. When all locations have been overwritten, the oldest entry is overwritten again.

Following a retentive device fault (fail-safe motor starter defective), new entries are no longer entered into the logbook as soon as the 24 V supply voltage has been interrupted (e.g. pulling/plugging in the device).

Note

The latest entry is entered at the first location of the data set. The remaining entries are moved one entry down. You cannot delete logbooks yourself.

The supported object numbers and their meanings are shown in the table below: In the case of HF motor starters, you can acknowledge faults by switching off the supply voltage and by switching it on again. Replace the motor starter if the fault occurs again.

Note

In the case of fail-safe motor starters, there are some faults that you cannot acknowledge. If the relevant message in the "Fail-safe motor starter defective" column is marked with an "x", you can reset this error a maximum of 5 times. After that, the motor starter must be replaced.

Table A-3 Assignment of error types to device faults

Object No.	Device fault messages	Fail-safe motor starter defective	5-life Error	F	Unit	Comment
308	Switching element defective	x	-	x	x	-
417	Stack overflow	-	-	x	x	These messages are used for the exact analysis of the cause of the error, in DS92 all are mapped to object number 381 "Error during self-test". The failure type defined there also applies.
418	Stack underflow	-	-	x	x	
423	Invalid command	-	-	x	x	
434	Error in system software	-	-	x	x	
437	Watchdog overflow	-	-	x	x	
456	EEPROM: memory defective	x	-	x	x	
458	EEPROM: CRC error "Device parameter"	x	-	x	x	
460	EEPROM: Contains invalid data	x	-	x	x	
462	EEPROM: Invalid pointer for device parameter buffer	x	-	x	x	
464	ROM error	x	-	x	x	
465	RAM error	x	-	x	x	
476	Current measuring defective	x	-	x	x	These messages are used for the exact analysis of the cause of the error, in DS92 all are mapped to object number 308 "Switching element defective". The failure type defined there also applies.
478	Bypass element does not close	-	-	x	x	
479	Bypass element does not open	x	-	x	x	
480	Bypass element protection has opened unintentionally during operation	- [2]	-	x	x	
486	Program execution check: Sequential program execution error	-	-	x	x	These messages are used for the exact analysis of the cause of the error, in DS92 all are mapped to object number 381 "Error during self-test". The failure type defined there also applies.
487	Program execution check: Logical programming error	-	-	x	x	
490	Incorrect power section detected	x	-	x	x	-
1414	Switching element short-circuited	x	-	x	x	-
1417	Bypass element defective	- [1] [4]	**x**	x	x	-

Object No.	Device fault messages	Fail-safe motor starter defective	5-life Error	F	Unit	Comment
1466	Contact 1 failed	- [4]	**x**	x	x	These messages are used for the exact analysis of the cause of the error, in DS92 all are mapped to object number 308 "Switching element defective". The failure type defined there also applies.
1467	Contact 2 failed	- [4]	**x**	x	x	
381	Error during self-test		-	x	x	-
1407	Electronics supply voltage too high	-	-	x	x	Previously in D73
1482	Current measuring range overshot	x [3]	-	x	x	Previously in D73
20010	Direct-on-line or reversing relay defective	- [4]	**x**	x	-	These messages are used for the exact analysis of the cause of the error, in DS92 all are mapped to object number 308 "Switching element defective". The failure type defined there also applies.
20011	12 V supply defective	x	-	x	-	
20012	F-DI defective	x	-	x	-	
20013	Hard switching of relays	- [4]	**x**	x	-	
20015	Relay control defective feedback message	x	-	x	-	
20018	Bypass relay hard switched in the permissible current range (< 1 A at 0.4 A, < 3 A at 1 A MS and 3 A MS, < 8 A at 9 A MS and 12 A MS)	-	-	x	-	

[1] Defective fail-safe ET200 SP motor starters up to V1.0.1 with error code 1417 can be reset once to V1.0.2 by means of a firmware update.

[2] The error is present if the bypass relay could no longer be closed during the on/off routine of the fail-safe motor starter.

[3] In case of error 1482, the last measured current value is stored in data set 95 as object number 608 as of firmware version V1.2.0.

[4] **Defective fail-safe ET200 SP motor starters as of V1.0.1 can be reset to V1.2.2 by means of a firmware update. These errors are now tolerated 4 times.**

A.6 DS73 logbook - Read triggering operations

Byte	Data type	Meaning	Range of values	Increment
Entry 1 (latest entry)				
0 ... 3	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
4 ... 5	Signed 16	Object number	0 ... ±32767	
Entry 2 (second-latest entry)				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
10 ... 11	Signed 16	Object number	0 ... ±32767	
... ...				
Entry 21 (last, oldest entry)				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
124 ... 125	Signed 16	Object number	0 ... ±32767	

The data set call "Logbook trips" returns the operating hour of the event that has occurred and an associated object number for each entry. This data set can accommodate 21 entries. When all locations have been overwritten, the oldest entry is overwritten again.

Note

The latest entry is entered at the first location of the data set. The remaining entries are moved one entry down. You cannot delete the logbook.

Following a retentive device fault (fail-safe motor starter defective), new entries are no longer entered into the logbook as soon as the 24 V supply voltage has been interrupted (e.g. pulling/plugging in the device).

The supported object numbers and their meaning are shown in the table below:

Table A-4 Assignment of object number to trips message

Object No.	Trips message	Comment
305	Safety-related tripping	Fail-safe motor starters only
309	Switching element overload	-
317	Electronics supply voltage too low	-
328	Motor overload trip	Tripping of the thermal motor model
333	Mechanical rotary interlock is not in the READY position	-
334	I_e upper limit violation	-
335	I_e lower limit violation	-
338	Residual current tripping	-
339	Tripping due to motor blocking	-
341	Asymmetry tripping	-
348	Input tripping	-
349	Input trip CW	-
350	Input trip CCW	-

Object No.	Trips message	Comment
354	Sensor supply overload	
355	Process image error	-
365	Invalid parameter value	Group fault only on startup
384	No external startup parameters received	-
1406	Cold start tripping	For all motor starters
20016	Insufficient temperature	-

A.7 DS75 logbook - Read events

Byte	Data type	Meaning	Range of values	Increment
User data (technology data)				
Entry 1 (latest entry)				
0 ... 3	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
4 ... 5	Signed 16	Object number	0 ... ±32767	
Entry 2 (second-latest entry)				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
10 ... 11	Signed 16	Object number	0 ... ±32767	
... ...				
Entry 21 (oldest entry)				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 2^{32}-1	1 s
124 ... 125	Signed 16	Object number	0 ... ±32767	

The data set call "Logbook events" returns the operating hour of the event that has occurred and an associated object number for each entry. This data set can accommodate 21 entries. When all locations have been overwritten, the oldest entry is overwritten again.

Note

The latest entry is entered at the first location of the data set. The remaining entries are moved one entry down. You cannot delete the logbook.

Following a retentive device fault (fail-safe motor starter defective), new entries are no longer entered into the logbook as soon as the 24 V supply voltage has been interrupted (e.g. pulling/plugging in the device).

The supported object numbers and their meaning are shown in the table below:

Table A-5 Assignment of object number to event message

Object No.	Event messages	Comment
Warnings		
327	Thermal motor model overload	In the case of a group fault, the message "Motor overload trip" is also queued.
337	Residual current detected	-
340	± Asymmetry detected	-
351	Input warning	-
365	Invalid parameter value	Not in the case of startup since it is a group fault
366	Parameters cannot be changed in ON state	-
1541	± I_e warning threshold exceeded	-
1542	± I_e warning threshold undershot	-
Actions		
310	± Emergency start active	-

Object No.	Event messages	Comment
357	Automatic mode	Enter at the time of changeover
358	Manual bus mode	Enter at the time of changeover
359	Manual local mode	Enter at the time of changeover
360	Manual bus mode	Connection abort
368	± Parameters block CPU/master active	-
376	Firmware update successful	-
378	Firmware update has errors	-
454	Internal communication fault	-
1520	± Energy-saving mode active	-
1580	Switching element hot	-

±: Event is entered as "incoming" (+) and "outgoing" (-) event. Other messages are entered only as "incoming" messages

A.8 DS92 Read device diagnostics

Object number	Byte.Bit	Meaning	Relevant for
		User data (technology data) **Switching/controlling**	
301	0.0	Ready (automatic) The device is ready for operation via the controller. There is no connection to the mechanical rotary interlock.	All
306	0.1	Motor CW	All
307	0.2	Motor CCW	Reversing starter
309	0.3	Switching element overload	All
308	0.4	Switching element defective	All
310	0.5	Emergency start active	All
302	0.6	Group fault	All
304	0.7	Group warning	All
-	1.01.7	Reserved	-
		Protection function (motor, cable, short-circuit)	
-	2.0-2	Reserved	
327	2.3	Thermal motor model overload	All
328	2.4	Overload tripping	All
-	2.5	Reserved	-
330	2.6	Cooling time active	All
305	2.7	F-DI status	Fail-safe motor starters
-	3.0-1	Reserved	-
333	3.2	Mechanical rotary interlock is not in the READY position	All
-	3.3-6	Reserved	-
352	3.7	Input control	All
340	4.0	Asymmetry detected	All
341	4.1	Asymmetry tripping	All
334	4.2	I_e upper limit violation	All
335	4.3	I_e lower limit violation	All
-	4.4	-	-
337	4.5	Residual current detected	All
338	4.6	Residual current tripping	All
339	4.7	Tripping due to motor blocking	All
344	5.0	Input 1	All
345	5.1	Input 2	All
346	5.2	Input 3	All
347	5.3	Input LC	All
348	5.4	Input tripping	All
349	5.5	Input trip CW	All
351	5.6	Input warning	All
350	5.7	Input trip CCW	All

Object number	Byte.Bit	Meaning	Relevant for
-	6.0-1	Reserved	-
353	6.2	Quick stop active	All
354	6.3	Sensor supply overload	All
-	6.4-6	Reserved	-
317	6.7	Electronics supply voltage too low	All
Communication			
-	7.0	Reserved	-
356	7.1	CPU or master STOP	All
357	7.2	Automatic mode	All
358	7.3	Manual bus mode	All
359	7.4	Manual local mode (local control)	All
	7.5	Reserved	-
360	7.6	Connection abort in manual mode	All
-	7.5-6	Reserved	-
355	7.7	Process image error	Reversing starter
-	8.0	Reserved	-
358		Manual bus mode	All
365	8.1	Invalid parameter value • During operation • During starting • Rejected safety-related parameters	All
366	8.2	Parameters cannot be changed in ON state	All
368	8.3	Parameters disabled CPU/master active	All
384	8.4	No external startup parameters received	All
-	8.5-7	Reserved	-
-	9.0-1	Reserved	-
381	9.2	Error during self-test	Fail-safe motor starters only
-	9.3-7	Reserved	-
367	10-11	Incorrect parameter number (as word)	All
	12-13	Reserved	All
Device functions			
1405	14.0	Cold start active	All; F starters as of V1.2.0
1406	14.1	Cold start tripping	All; F starters as of V1.2.0
-	14.2-7	Reserved	-
-	15-18	Reserved	-
Switching/controlling			
1407	19.0	Electronics supply voltage too high	All
1470	19.1	Ready for motor ON	All
1414	19.2	Switching element short-circuited	All
1417	19.3	Bypass element defective	All
-	19.4-7	Reserved	-
1422	20.0	Thermal motor model deactivated	All

Object number	Byte.Bit	Meaning	Relevant for
-	21.0-1	Reserved	-
Protection function			
1482	21.2	Current measuring range exceeded [1)]	All
-	21.3-7	Reserved	-
Communication (operating modes)			
357	22.0	Automatic mode (redundant to bit 7.2)	All
-	22.1-2	Manual bus mode (redundant to bit 7.3)	All, as of Firmware V1.2.0
359	22.3	Manual local mode (redundant to bit 7.4)	All
-	22.4-7	Reserved	-
-	23	Reserved	-
Prewarnings			
-	24-25	Reserved	-
Maintenance			
-	26-31	Reserved	-
Quick Stop			
1508	32.0	Quick Stop 1 - direction-independent	All
1509	32.1	Quick Stop 1 - clockwise	All
1510	32.2	Quick Stop 1 - counter-clockwise	Reversing starter
-	32.3-7	Reserved	-
-	33	Reserved	-
End position			
1507	34.0	Input operational trip - end position CW	All
1506	34.1	Input operational trip - end position CCW	All
-	34.2-7	Reserved	-
-	35	Reserved	-
Energy saving function			
-	36.0-5	Reserved	-
1522	36.6	Start_Pause command is pending	All
1520	36.7	Energy saving mode active	All
-	37	Reserved	-
Operating states			
-	38-49	Reserved	-
Ex motor protection			
1535	50.0	Explosion protection of the motor active	Fail-safe motor starters only
-	50.1	Reserved	-
1537	50.2	New safety-related parameters received	Fail-safe motor starters only
-	50.3-7	Reserved	-
-	51	Reserved	-
Warnings			
1580	52.0	Switching element hot; as of firmware version V1.2.1	-
1573	52.3	Chatter monitoring	All

Object number	Byte.Bit	Meaning	Relevant for
1541	52.4	I_e warning limit exceeded	All
1542	52.5	I_e warning limit undershot	All
-	52.6-7	Reserved	-
-	53	Reserved	-

1) As of Firmware version V1.2.0. If the starting current exceeds the maximum current measuring range (see technical data sheet), this bit is set and the measured value is stored in data set 95.

A.9 DS93 Write command

Write structure of data set 93 command

Byte	Content	Value / value range	Meaning
0	Coordination	0x21	Write via acyclic bus channel
1	Reserved	0x00	-
2	Reserved	0x00	-
3	Reserved	0x00	-
Command			
4	Number of commands	0 ... 1	Number of subsequent valid commands
5	Command 1	Command number	Optional; for meaning see the following table
6	Reserved	Reserved	Reserved
7	Reserved	Reserved	Reserved
8	Reserved	Reserved	Reserved
9	Reserved	Reserved	Reserved

Assignment of command to command number and their meaning (byte 5 to 9)

Object number	Command number	Command	Meaning
0	0	Reserved	No function
703	1	Trip reset	Resets and acknowledges error messages
709	4	Automatic mode	Transition to automatic mode (control by DP master)
711	5	Manual bus mode	Transition to manual mode. The motor starter switches to manual bus mode depending on the interface via which the command is received.
707	10	Parameters disabled CPU/ master ON	Parameterization by parameterizing master not possible, or its parameters are ignored
708	11	Parameters disabled CPU/ master OFF	Parameterization by parameterizing master is possible

A.10 DS94 Read measured values

Object number	Byte.Bit	Coding	Meaning	Range of values	Increment
	User data (technology data)				
	Measured values (volatile)				
504	0	Unsigned 8	Phase current I_{L1} (%)	0 ... 796 %	3.125 %
505	1	Unsigned 8	Phase current I_{L2} (%)	0 ... 796 %	3.125 %
506	2	Unsigned 8	Phase current I_{L3} (%)	0 ... 796 %	3.125 %
-	3 ... 6	0x00	Reserved	-	-
503	7	Unsigned 8	Unbalance	0 ... 255 %	1 %
502	8 ... 9	Unsigned 16	Motor heating	0 ... 1,000 %	1 %
518	10, 11		Switching element heating	0 ... 1,000 %	1 %
-	12 ... 27	0x00	Reserved	-	-
513	28 ... 31	Signed 32	Phase current $I_{L1(rms)}$	±0 ... 20,000 A	0.01 A
514	32 ... 35	Signed 32	Phase current $I_{L2(rms)}$	±0 ... 20,000 A	0.01 A
515	36 ... 39	Signed 32	Phase current $I_{L3(rms)}$	±0 ... 20,000 A	0.01 A
516	40 ... 41	Unsigned 16	Electronics supply voltage	0 ... 1,500 V	0.1 V
-	42 ... 43	0x00	Reserved	-	-
531	44 ... 47	Signed 32	I_{max} current motor switch-on cycle	±0 ... 20,000 A	0.01 A (as of V.1.2.1)
-	48 ... 63	0x00	Reserved	-	-

A.11 DS95 Read statistics

Object number	Byte.Bit	Coding	Meaning	Range of values	Increment
	User data (technology data)				
-	0	0	Reserved	-	-
-	1.0-5	0	Reserved	-	-
-	1.6-7	11_B	Bit 6 operating hours resolution 1 second Bit 7 operating hours selection 1 operating hour - device	11 (fixed)	1
-	2 ... 3	0x00	Reserved	-	-
682	4 ... 7	Unsigned 32	Device operating hours in seconds	0 ... (2^{32}-1)	1 s
603	8 ... 11	Unsigned 32	Number of motor CW starts	0 ... (2^{32}-1)	1
604	12 ... 15	Unsigned 32	Number of starts motor CCW	0 ... (2^{32}-1)	1
605	16 ... 17	Unsigned 16	Number of motor overload trips Is incremented on tripping by: • Blocking current monitoring • Overload protection	0 ... (2^{16}-1)	1
20051	18	Unsigned 8	Number of chatter monitoring errors	0 ... (2^8 - 1)	1 [1]
-	18 ... 19	0x00	Reserved	-	-
609 [2]	20 ... 23	Signed 32	Motor current $I_{max\ (rms)}$	±0 ... 20 000	0.01 A
608 [3]	24 ... 27	Signed 32	Last tripping current $I_{A\ (rms)}$	±0 ... 20 000	0.01 A
602	28 ... 31	Unsigned 32	Motor operating hours in seconds	0 ... (2^{32}-1)	1 s
615	32 ... 49	0x00	Reserved	-	-
616	50 ... 51	Unsigned 16	Number of switching element overload trips	0 ... (2^{16}-1)	1
2013 [4]	52 ... 53	Unsigned 16	Number of hard switching operations of the relay	0 ... (2^{16}-1)	1
-	54 ... 89	0x00	Reserved	-	-
20050	54	Unsigned 8	Number of 5 life errors	0 ... 5	1 [1]

[1] As of firmware version V1.2.2

[2] The motor current $I_{max\ (rms)}$ shows the maximum rms value present in a phase over the operating period (min/max pointer function). It is calculated every 10 ms. Excluded are the first 20 ms after start (inrush current).

[3] The last tripping current $I_{A\ (rms)}$ is updated for each trip, irrespective of the magnitude of the current that was present there beforehand (no min/max pointer function).

[4] Previously, the object number could only contain a maximum of "1". Now the motor starter can be reset for values from "1" to "4". The starter should only be replaced at "5"

Up to firmware version V1.2.0 the value is entered if

- the motor is blocked,
- the maximum value of the motor model is exceeded,
- the maximum value of the device or relay model is exceeded.

As of firmware version V1.2.0, an additional entry is made if a measured value is exceeded or if hard switching occurs with the fail-safe motor starter.

Note

Operating hours counter

The operating hours counter runs as soon as the motor starter is supplied with 24 V.

A.12 Read/write DS201 device parameter 1

DS201 contains the second part of the device parameters.

If incorrect parameters are sent to the motor starter in DS201, these incorrect parameters will also be reported back when reading DS201. In the case of incorrect parameters, the object number of the first incorrect parameter is output in WORD 10 of DS92.

The defaults for factory settings of the motor starter appear in italics in the Value range column. In the engineering system, a distinction is made between the default values of the input actions and the current range of the defaults of the motor starter.

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
-	0.0	[0]	Reserved	-
3	0.1	*[0]: 3-phase* [1]: 1-phase	Load type (only for direct-on-line starters)	Load type (Page 65)
2209	0.2-0.3	*[0]: No* [1]: Yes	EX motor application (ATEX operation)	Ex motor application (Page 95)
6	0.4 - 0.7	[3]: CLASS 5 (10a) [0]: CLASS 10 [15]: CLASS OFF (not in ATEX mode) [1)]	Trip class [1)]	Overload protection (Page 72)
5	1.0 - 1.1	*[0]: Trip without restart* [1]: Tripping with restart (not during ATEX operation) [2]: Warning (not during ATEX operation)	Response to overload - TMM	Overload protection (Page 72)
4	1.2	*[0]: Retention of the thermal motor model on restart* [1]: Deletion of the thermal motor model on restart (not during ATEX operation)	The charge state of the thermal motor model is deleted at run-up. In this way, unintentional early trips can be prevented if the motor starter has been switched off for an extended period.	Overload protection (Page 72)
20000	1.3	*[0]: No warning in the case of safety-related tripping [0019H]* [1]: Warning in the case of safety-oriented tripping	Response to safety-related tripping with F-DI	Response to safety-related tripping (Page 94)
34	1.4	*[0]: Switch substitute value* [1]: Retain last value	Response to CPU/master STOP	Response to CPU/master STOP (Page 96)

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
19	1.5	[0]: Warning (not in the case of fail-safe motor starters) *[1]: Tripping*	Response to residual current detection	Response to residual current detection (Page 83)
20	1.6	[0]: Warning (not during ATEX operation) *[1]: Tripping*	Response to asymmetry	Asymmetry monitoring (Page 92)
317	1.7	Diagnosis Supply voltage too low [1)]	[0] released (default) [1] block	Diagnosis supply voltage too low (Data plausibility check (Page 138))
25	2.0	[0]: NC contact *[1]: NO contact*	Input 1 level	Inputs (Page 98)
27	2.1	See input 1 level	Input 2 level	Inputs (Page 98)
29	2.2	See input 1 level	Input 3 level	Inputs (Page 98)
193	2.3	*[0]: Enable* [1]: Disable	Group fault diagnostics	Group fault diagnostics/group warning diagnostics (Page 97)
80	2.4	*[0]: Non-retentive* [1]: Retentive	Input 1 signal	Inputs (Page 98)
81	2.5	See input 1 signal	Input 2 signal	Inputs (Page 98)
82	2.6	See input 1 signal	Input 3 signal	Inputs (Page 98)
191	2.7	[0]: Enable *[1]: Disable*	Group warning diagnostics	Group fault diagnostics/group warning diagnostics (Page 97)

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
194	3	[0]: No action [1]: Trip without restart [2]: Trip with restart [3]: Trip end position CW [4]: Trip end position CCW [5]: Group warning [7]: Emergency start (not during ATEX operation) *[8]: Motor CW* [9]: Motor CCW [11]: Quick Stop (direction-independent) [12]: Trip RESET [13]: Cold start (not during ATEX operation) [14]: Quick Stop clockwise [15]: Quick Stop counter-clockwise [37]: Operational trip end position CW [38]: Operational trip end position CCW	Input 1 action	Inputs (Page 98)
195	4	See input 1 - action *[9]: Motor CCW (default for reversing starters)*	Input 2 action	Inputs (Page 98)
196	5	See input 1 - action *[13]: Cold start (default for HF motor starters)*	Input 3 action	Inputs (Page 98)
2	6 - 7	0.1 ... 12 A/10 mA *The maximum current is preset.*	Rated operational current I_e The rated operational current is MLFB-dependent, and thus also the maximum setting range.	Rated operational current (Page 63)

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
15	8	18.75 ... 100%/ 3.125% [6 ... 32] *[0]: Deactivated*	Lower current limit	Upper/lower current limit (Page 88)
16	9	50 ... 400%/3.125% [16 ... 128] *[0]: Deactivated*	Upper current limit	Upper/lower current limit (Page 88)

1) As of Firmware version V1.2.0

A.13 Read/write DS202 device parameter 2

DS202 contains the second part of the device parameters.

If incorrect parameters are sent to the motor starter in DS202, these incorrect parameters will also be reported back when reading DS202. In the case of incorrect parameters, the object number of the first incorrect parameter is output in WORD 10 of DS92.

The defaults appear in italics in the Value range column.

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
18	0.0 - 0.3	*1* ... 7.5 s/0.5 s [2 ... 15] *Default value is [2]: 1 s.*	Blocking time	Blocking time and blocking current (Page 88)
-	0.4 - 0.7	[0]: Reserved	Reserved	-
2210	1	0 ... 99 %/1 % [0 ... 99] [0]: *Deactivated*	Warning limit - motor heating	Overload protection (Page 72)
-	2 - 3	[0]: Reserved	Reserved	-
-	4 - 5	[0]: Reserved	Reserved	-
17	6	150 ... 1500 %/50 % [3 ... 20] *Default value is [16]: 800 %* As of firmware version V1.2.0	Blocking current	Blocking time and blocking current (Page 88)
-	7	[0]: Reserved	Reserved	-
2213	8	18.75 ... 100 %/3.125 % [6 ... 32] [0]: Deactivated *Default value is [7]: 21.875 %*	Lower current warning limit	Upper/lower current warning limit (Page 87)
2214	9	50 ... 400 %/3.125 % [16 ... 128] [0]: Deactivated *Default value is [36]: 112.5 %*	Upper current warning limit	Upper/lower current warning limit (Page 87)

A.14 Read DS203 device parameter 1

DS203 contains the second part of the incorrect parameter with which the motor starter is working. The defaults appear in italics in the Value range column.

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
-	0.0	[0]	Reserved	-
3	0.1	*[0]: 3-phase* [1]: 1-phase	Load type (only for direct-online starters)	Load type (Page 65)
2209	0.2-0.3	*[0]: No* [1]: Yes	EX motor application (ATEX operation)	Ex motor application (Page 95)
6	0.4-0.7	[3]: CLASS 5 (10a) [0]: CLASS 10 [15]: CLASS off (as of firmware version V1.2.0)	Trip class [1)]	Overload protection (Page 72)
5	1.0-1.1	*[0]: Trip without restart* [1]: Tripping with restart (not during ATEX operation) [2]: Warning (not during ATEX operation)	Response to overload - TMM	Overload protection (Page 72)
4	1.2	*[0]: Retention of the thermal motor model on restart* [1]: Deletion of the thermal motor model on restart (not during ATEX operation)	The charge state of the thermal motor model is deleted at run-up. In this way, unintentional early trips can be prevented if the motor starter has been switched off for an extended period.	Overload protection (Page 72)
20000	1.3	*[0]: No warning in the case of safety-related tripping [0019H]* [1]: Warning in the case of safety-related tripping [0019H]	Response to safety-related tripping with F-DI	Response to safety-related tripping (Page 94)
34	1.4	*[0]: Switch substitute value* [1]: Retain last value	Response to CPU/master STOP	Group fault diagnostics/group warning diagnostics (Page 97)
19	1.5	[0]: Warning (not in the case of fail-safe motor starters) *[1]: Tripping*	Response to residual current detection	Response to residual current detection (Page 83)
20	1.6	[0]: Warning (not during ATEX operation) *[1]: Tripping*	Response to asymmetry	Asymmetry monitoring (Page 92)
317	1.7	Diagnosis Supply voltage too low (all motor starters as of firmware version V1.2.0)	[0] released (default) [1] block	-
25	2.0	[0]: NC contact *[1]: NO contact*	Input 1 level	Inputs (Page 98)
27	2.1	See input 1 level	Input 2 level	Inputs (Page 98)

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
29	2.2	See input 1 level	Input 3 level	Inputs (Page 98)
193	2.3	*[0]: Enable* [1]: Disable	Group fault diagnostics	Group fault diagnostics/group warning diagnostics (Page 97)
80	2.4	*[0]: Non-retentive* [1]: Retentive	Input 1 signal	Inputs (Page 98)
81	2.5	See input 1 signal	Input 2 signal	Inputs (Page 98)
82	2.6	See input 1 signal	Input 3 signal	Inputs (Page 98)
191	2.7	[0]: Enable *[1]: Disable*	Group warning diagnostics	Group fault diagnostics/group warning diagnostics (Page 97)
194	3	[0]: No action [1]: Trip without restart [2]: Trip with restart [3]: Trip end position CW [4]: Trip end position CCW [5]: Group warning [7]: Emergency start (not during ATEX operation) *[8]: Motor CW* [9]: Motor CCW [11]: Quick Stop (direction-independent) [12]: Trip RESET [13]: Cold start (not during ATEX operation) [14]: Quick Stop clockwise [15]: Quick Stop counter-clockwise [37]: Operational trip end position CW [38]: Operational trip end position CCW	Input 1 action	Inputs (Page 98)
195	4	See input 1 - action *[9]: Motor CCW (default for reversing starters)*	Input 2 action	Inputs (Page 98)
196	5	See input 1 - action *[13]: Cold start (default for HF motor starters)*	Input 3 action	Inputs (Page 98)
2	6 - 7	0.1 ... 12 A/10 mA *The maximum current is preset.*	Rated operational current I_e The rated operational current is MLFB-dependent, and thus also the maximum setting range.	Rated operational current (Page 63)

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
15	8	18.75 ... 100 %/3.125 % [6 ... 32] *[0]: Deactivated*	Lower current limit	Upper/lower current limit (Page 88)
16	9	50 ... 400 %/3.125 % [16 ... 128] *[0]: Deactivated*	Upper current limit	Upper/lower current limit (Page 88)

A.15 Read DS204 device parameter 2

DS204 contains the second part of the incorrect parameters with which the motor starter is working.

The defaults appear in italics in the Value range column.

Object number	Byte.Bit	Range of values	Meaning	See Chapter ...
18	0.0 - 0.3	*1* ... 7.5 s/0.5 s [2 ... 15] *Default value is [2]: 1 s.*	Blocking time	Blocking time and blocking current (Page 88)
-	0.4 - 0.7	[0]: Reserved	Reserved	-
2210	1	0 ... 99 %/1 % [0 ... 99] [0]: *Deactivated*	Warning limit - motor heating	Overload protection (Page 72)
-	2 - 3	[0]: Reserved	Reserved	-
-	4 - 5	[0]: Reserved	Reserved	-
17	6	150 ... 1500 %/50 % [3 ... 20] *Default value is [16]: 800 %* As of firmware version V1.2.0	Blocking current	Blocking time and blocking current (Page 88)
-	7	[0]: Reserved	Reserved	-
2213	8	18.75 ... 100 %/3.125 % [6 ... 32] [0]: Deactivated *Default value is [7]: 21.875 %*	Lower current warning limit	Upper/lower current warning limit (Page 87)
2214	9	50 ... 400 %/3.125 % [16 ... 128] [0]: Deactivated *Default value is [36]: 112.5 %*	Upper current warning limit	Upper/lower current warning limit (Page 87)

A.16 I&M data

A.16.1 I&M data

The following I&M data (Identification & Maintenance function) are supported by all ET 200SP motor starters:

Number	Name	Comment
I&M 0	Device identification	This is stored in the device on initialization
I&M 1	Equipment identifier	These are entered in the engineering system.
I&M 2	Installation	
I&M 3	Description	

Note

With PROFINET, the I&M data can be accessed via data sets 0xAFF0 - 0xAFF3 (PNO).

With PROFIBUS, the I&M data can be accessed via data set 255.

A.16.2 I&M 0: Read device identification

The following data are saved:

Byte	Data type	Content	Meaning
I&M header			
0 ... 1	Unsigned16	0x0020	Block type
2 ... 3	Unsigned16	0x0038	Block length = 56
4 ... 5	Unsigned16	0x0100	Block version = 1.0
I&M0 data block 0			
6 ... 7	Unsigned16	MANUFACTURER_ID	42 = Manufacturer ID SIEMENS
8 ... 27	Char[20]	ORDER_ID	Article number (MLFB)
28 ... 43	Char[16]	SERIAL_NUMBER	Serial number
44 ... 45	Unsigned16	HARDWARE REVISION	Hardware revision or product version
46 ... 49	Char	SOFTWARE_REVISION	Firmware version
50 ... 51	Unsigned16	REV_COUNTER	Provides information about the parameterized changes on the module. The "REV_ COUNTER" is incremented after each change.
52 ... 53	Unsigned16	PROFILE_ID	Gives information about the PROFIBUS profile supported by the device and the line of products belonging to the device.
54 ... 55	Unsigned16	PROFILE_SPECIFIC_TYPE	Used to supplement the object "PROFILE_ID" and contains further information on the profile.

Byte	Data type	Content	Meaning
56 ... 57	Unsigned16	IM_VERSION	Provides information about the version of the identification data (01 01hex = Version 1.1).
58 ... 59	Unsigned16	IM_SUPPORTED	Provides information about the available identification data (Index 2 to 4).

A.16.3 I&M 1: Read/write equipment identifier

The following data are saved:

Byte	Length	Content	Meaning
I&M header			
0 ... 1	Unsigned16	0x0021	Block type
2 ... 3	Unsigned16	0x0038	Block length = 56
4 ... 5	Unsigned16	0x0100	Block version = 1.0
I&M data block 1			
6 ... 37	Char[32]	TAG FUNCTION	Plant identifier Fill unused positions with blanks (0x20)
38 ... 59	Char[22]	TAG LOCATION	Location designation Fill unused positions with blanks (0x20)

A.16.4 I&M 2: Read/write installation

The following data are saved:

Byte	Data type	Content	Meaning
I&M header			
0 ... 1	Unsigned16	0x0022	Block type
2 ... 3	Unsigned16	0x0012	Block length = 18
4 ... 5	Unsigned16	0x0100	Block version = 1.0
I&M data block 2			
6 ... 21	Char[16]	IM_DATE	Specification of an input date (YYYY-MM-DD HH:MM)

A.16.5 I&M 3: Read/write description

The following data are saved:

Byte	Data type	Content	Meaning
I&M header			
0 ... 1	Unsigned16	0x0023	Block type
2 ... 3	Unsigned16	0x0038	Block length = 56
4 ... 5	Unsigned16	0x0100	Block version = 1.0

Byte	Data type	Content	Meaning
I&M data block 3			
6 ... 59	Char[54]	IM_DESCRIPTOR	Comment Fill unused positions with blanks (0x20)

Circuit examples

B

B.1 Connection examples for motor starters

B.1.1 Connecting and operating motor brakes

See Chapter Operating motor starters (Page 46).

B.1.2 Example of the correct engineering of a motor starter

See Chapter Operating motor starters (Page 46).

B.1.3 Induction machine

Direct-on-line starter

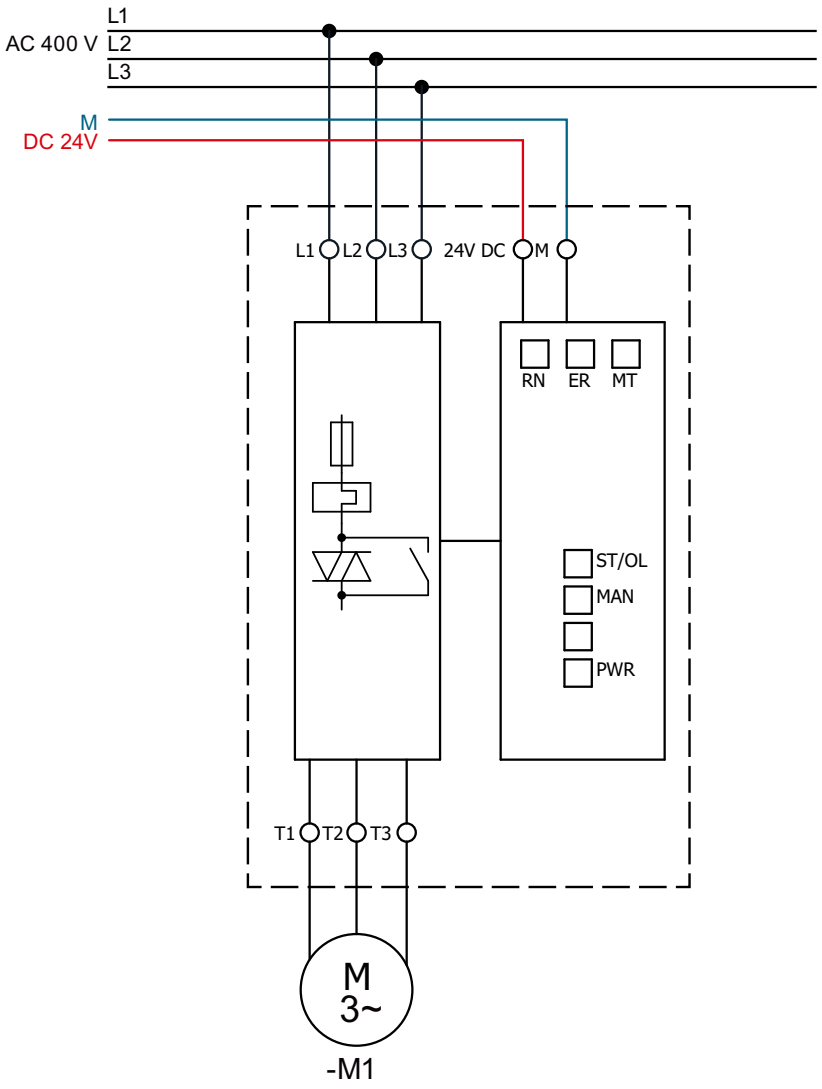
Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starter: 3RK1308-0A*00-0CP0

Reversing starter

Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starter: 3RK1308-0B*00-0CP0



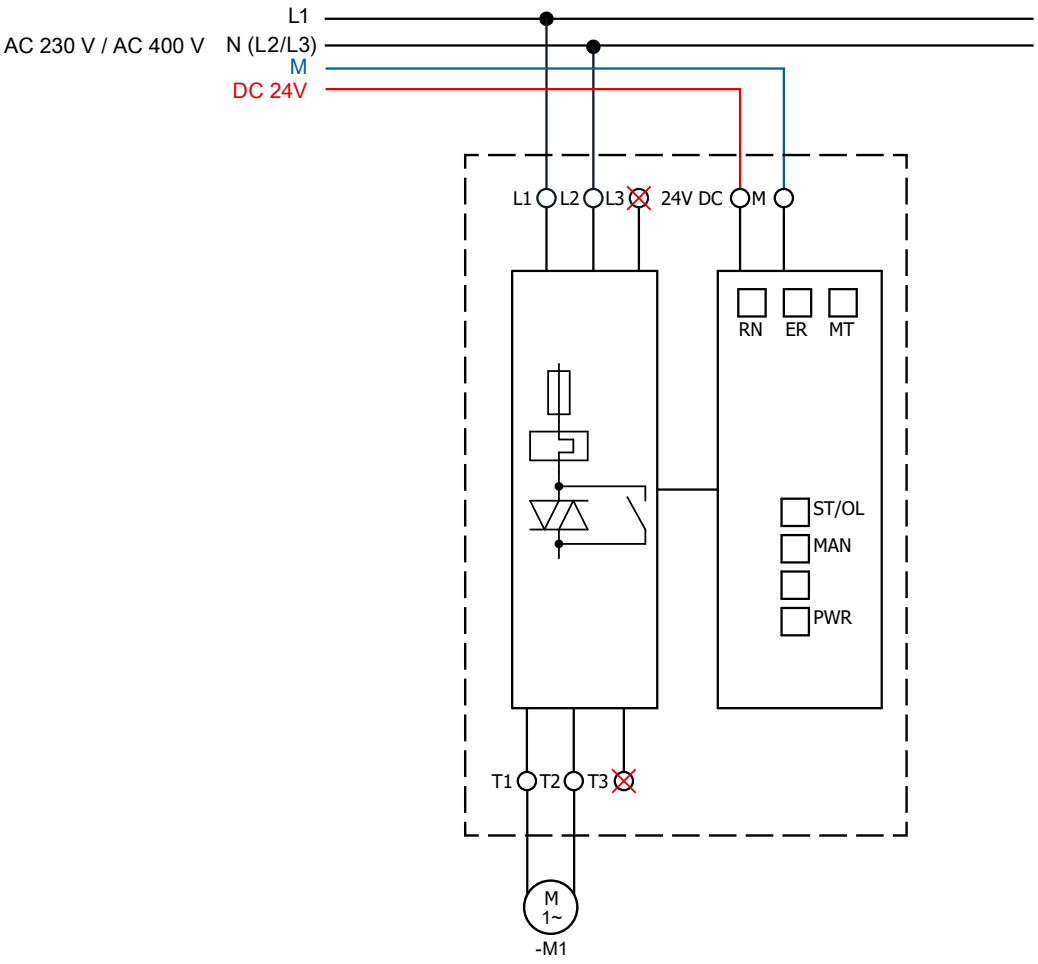
In the multi-pole representation, the N and PE conductors are not shown separately.

Do not connect PE or N to the neutral point.

B.1.4 Single-phase motor

Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starters: 3RK1308-0A*00-0CP0.
- Alternatively, this wiring can also be performed using a fail-safe 3RK1308-0C*00-0CP0 direct starter.



In the multi-pole representation, the PE conductor is not shown separately.

B.1.5 Resistive load

Star connection

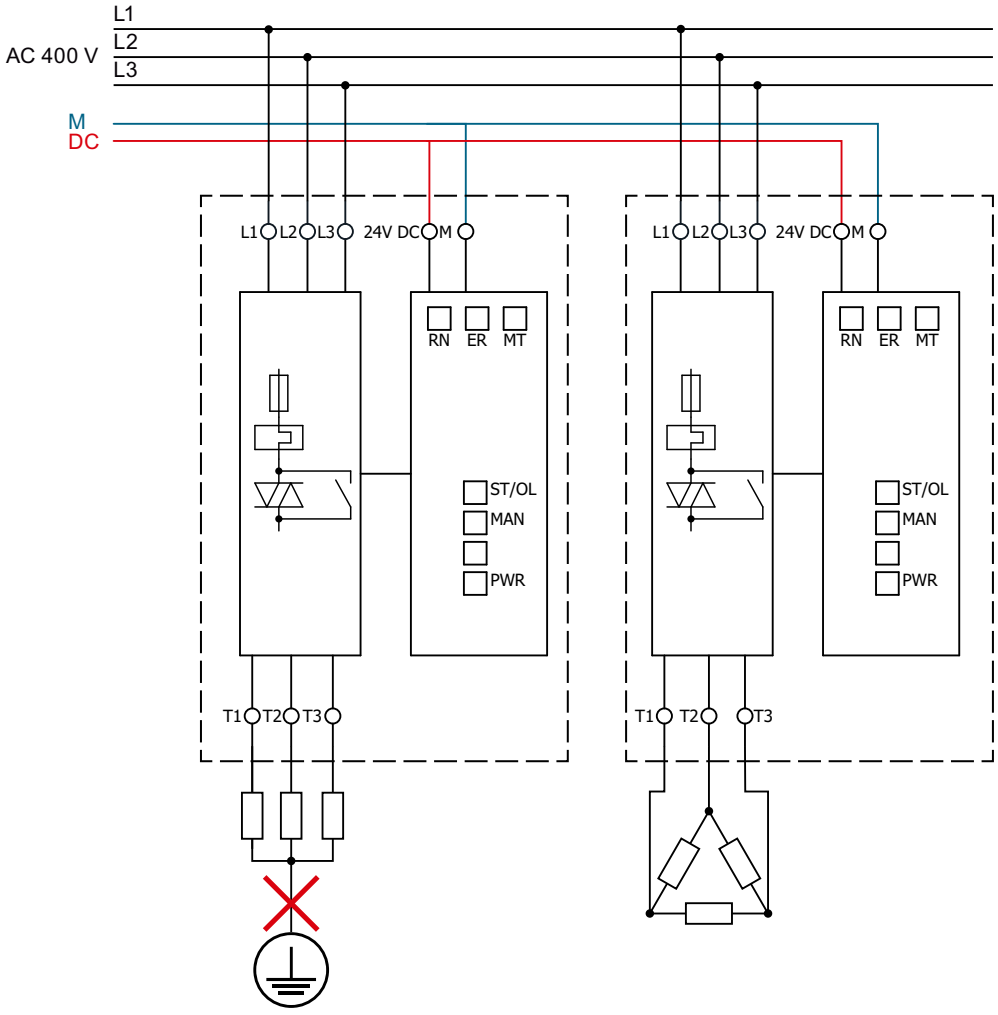
Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starters: 3RK1308-0A*00-0CP0

Delta connection:

Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starters: 3RK1308-0A*00-0CP0



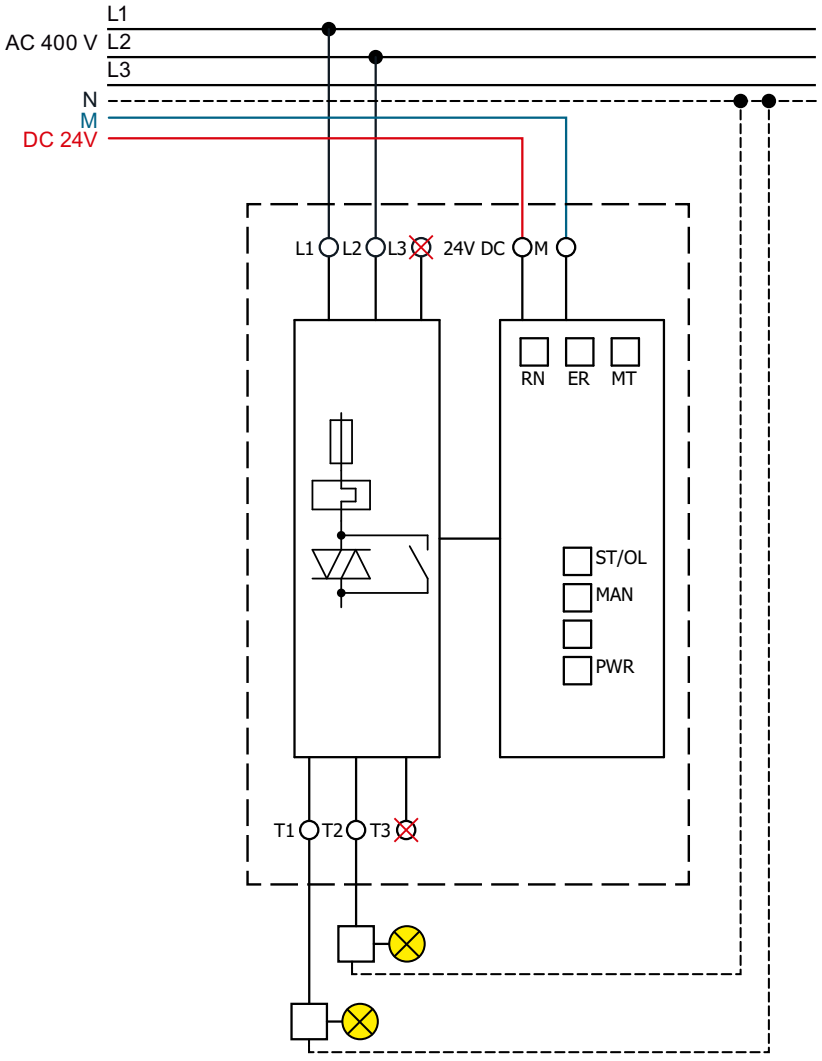
Do not connect PE or N to the neutral point.

In the multi-pole representation, the N and PE conductors are not shown separately.

B.1.6 Gas discharge lamps

Article numbers:

- BaseUnit: 3RK1908-0AP00-0AP0
- Motor starters: 3RK1308-0A*00-0CP0



In the multi-pole representation, the PE conductor is not shown separately.

Note

Motor model und response to overload of the gas discharge lamp

Observe the set motor model and the overload response of the gas discharge lamp for the parameterization of the motor starter.

B.2 Connection examples for fail-safe motor starters

B.2.1 General information

Shutdown options

The safe tripping of the ET 200SP motor starter can take place in various ways, e.g.

- With a 3SK safety relay
- With a fail-safe ET 200SP F-DQ digital output module
- With a fail-safe ET 200SP F-PM E power module

Documentation and sample projects

You will find an entry Safe shutdown of ET 200SP motor starters (https://support.industry.siemens.com/cs/ww/en/view/109748128) in the Industry Online Support. This entry describes methods of switching off one or more ET 200SP F motor starters in a safety-oriented manner.

The attached documentation "Power module F PM-E" contains a decision-making matrix, which illustrates the various switch-off variants.

Shutdown principle ET 200SP F motor starter		Application example with SK safety relay	Application example with fail-safe digital output F-DQ	Application example with fail-safe power module F-PM-E
Hardware variety	Suitable for group shutdown	Yes	Yes	Yes
	Suitable for single shutdown	Yes	Yes	No
Use in cyclically requested safety functions (e.g. protective door, light curtain)		Yes	Yes	No
Use in acyclically requested safety functions (e.g. emergency stop)		Yes	Yes	Yes
Motor starter can still be addressed by CPU after fail-safe shutdown		Yes	Yes	No
Suitable for immediate recovery		Yes	Yes	No (recovery time ≥ 2.2 s)
External wiring effort		Yes	Yes	No
Standard and safety engineering		Separate	Integrated into a device	Integrated into a device

Further information

See"SIRIUS Safety Integrated" Application Manual (https://support.industry.siemens.com/cs/ww/en/view/83150405).

B.2.2 Safety-related shutdown

Single shutdown

With the BaseUnits BU30-MS5 to BU30-MS6, a single shutdown can be implemented with the aid of the F-DI. Single shutdown in SIL3 Cat. 4 PL e is possible here with fail-safe control modules with pp-switching or pm-switching.

For the single use of the BU30-MS7 and BU30-MS10, a fail-safe control module with pp-switching is basically to be used.

			1)	2)	3)	4)	5)	6)	7)	8)	9)
BU30-MS1	BU with 24 V and 500 V infeed	3RK1908-0AP00-0AP0	x	-	x	x	-	x	-	-	-
BU30-MS2	BU with 500 V infeed	3RK1908-0AP00-0CP0	-	x	x	x	-	x	-	-	-
BU30-MS3	BU with 24 V infeed	3RK1908-0AP00-0BP0	x	-	x	-	x	x	-	-	-
BU30-MS4	BU without infeed	3RK1908-0AP00-0DP0	-	x	x	-	x	x	-	-	-
BU30-MS5	BU F-DI (without forwarding) with 500 V infeed	3RK1908-0AP00-0EP0	-	x	x	x	-	x	x	-	-
BU30-MS6	BU F-DI (without forwarding) without infeed	3RK1908-0AP00-0FP0	-	x	x	-	x	x	x	-	-
BU30-MS7	BU F-DI infeed with 500 V infeed	3RK1908-0AP00-0GP0	-	x	x	x	-	x	x	-	x
BU30-MS8	BU F-DI forwarding with 500 V infeed	3RK1908-0AP00-0HP0	-	x	x	x	-	x	-	x	x
BU30-MS9	BU F-DI forwarding without infeed	3RK1908-0AP00-0JP0	-	x	x	-	x	x	-	x	x
BU30-MS10	BU F-DI infeed without 500 V infeed	3RK1908-0AP00-0KP0	-	x	x	-	x	x	x	-	x

1) 24 V infeed

2) 24 V import from left module

3) 24 V forwarding

4) 500 V infeed

5) 500 V import from left

6) 500 V forwarding

7) F-DI infeed

8) F-DI import from left

9) F-DI forwarding

Group shutdown

With the BaseUnits BU30-MS7 to BU30-MS10, a group shutdown can be implemented with the aid of the F-DI.

The group shutdown in SIL3 Cat 4 PL e is only possible with fail-safe control modules with pp-switching. A group shutdown is also possible by a fail-safe shutdown of the supply voltage with all motor starter BaseUnits.

WARNING

Safety-related shutdown using the F-DI

Depending on the I/O used, the shutdown takes place via one or two output channels (terminals):

- PM-switching: The shutdown takes place via two output channels.
- PP-switching: The shutdown takes place via one output channel.

Shutdown via one output channel (PP switching) achieves SILCL 3 according to EN 62061, PL e/Cat. 4 according to EN ISO 13849-1 if steps are taken to ensure that the cables are installed in such a way that they are protected against a cross-circuit/line-to-line fault.

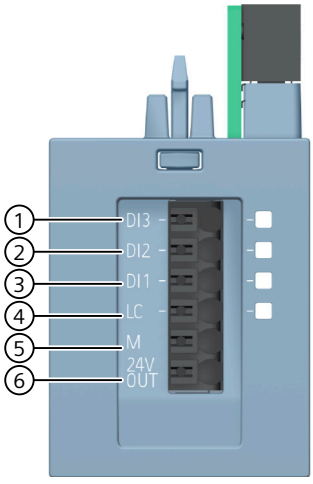
For the BU-30-MS7 to BU-30-MS10 F-DI forwarding BaseUnits, only PP switching is possible.

For the single F-DI BaseUnits BU-30-MS5 and BU-30-MS6, PM and PP switching are possible.

B.2.3 Connecting the 3DI/LC module for the motor starter

Procedure

The figure below shows the connections of the 3DI/LC module:



① Digital input 3
② Digital input 2
③ Digital input 1
④ Local control (manual local)
⑤ Ground
⑥ 24 V DC/ 100 mA output

Note

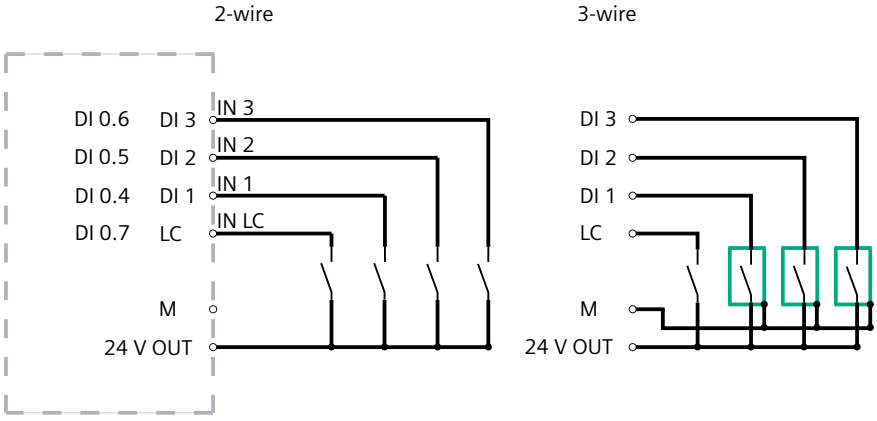
The digital inputs (1 to 4) are not isolated. The reference potential is M (5). Control the digital inputs only via a unit supplied from the 24 V DC output (6).

Connect only cables of maximum 30 m to the 3DI/LC module.

The supply (5 and 6) is protected against short circuits.

Terminal sketch of the 3DI/LC module

The following diagram shows a terminal sketch of the 3DI/LC module:



DI 1.4 to DI 1.7: Bit in PII

Figure B-1 Connection example of inputs

WARNING

The digital inputs (1 to 4) are not isolated. The reference potential is M (5), and therefore SELV/PELV. Only supply the inputs with the 24 V DC output (6).
Do not connect any temperature sensors for winding control of motors if they do not have protective separation. Otherwise, in the event of a fault, a dangerous voltage may be transmitted to the sensor cables and thus to the SELV/PELV circuits. If these cables are then touched, it can lead to death, serious injury and enormous material damage.