SIEMENS

Industrial Controls

Load Feeders and Motor Starters

SIRIUS Motor Starter M200D PROFIBUS / PROFINET

Manual

Edition 08/2014

Answers for industry.

SIEMENS

Industrial Controls

SIRIUS motor starters
M200D PROFIBUS/PROFINET

Manual

08/2014

A5E01577426A/RS-AA/004

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.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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 AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

3RK1702-1BB11-1AA1
℗ 08/2014 Subject to change

Table of contents

Product description

1

1.1 What are M200D distributed motor starters?

M200D motor starters are standalone devices with a high degree of protection (IP65) for distributed use near the motor.

Depending on the order variant, they are available as:

- Direct starters, electromechanical (DSte) or electronic (sDSte)
- Reversing starters, electromechanical (RSte) or electronic (sRSte)
- Direct soft starters, electronic (sDSSte)
- Reversing soft starters, electronic (sRSSte)

They are suitable for the following tasks:

- Switching and protecting three-phase loads at 400 V AC up to 5.5 kW
- Controlling via
  - PROFINET IO
  - PROFIBUS DP or
  - AS-Interface

Depending on the order variant, they are equipped with:

- Brake output for 400 / 230 V AC or 180 V DC
- Integrated manual local control with a key-operated switch and keypad (order variant)

Integration of the motor starter into PROFINET, PROFIBUS and AS-Interface

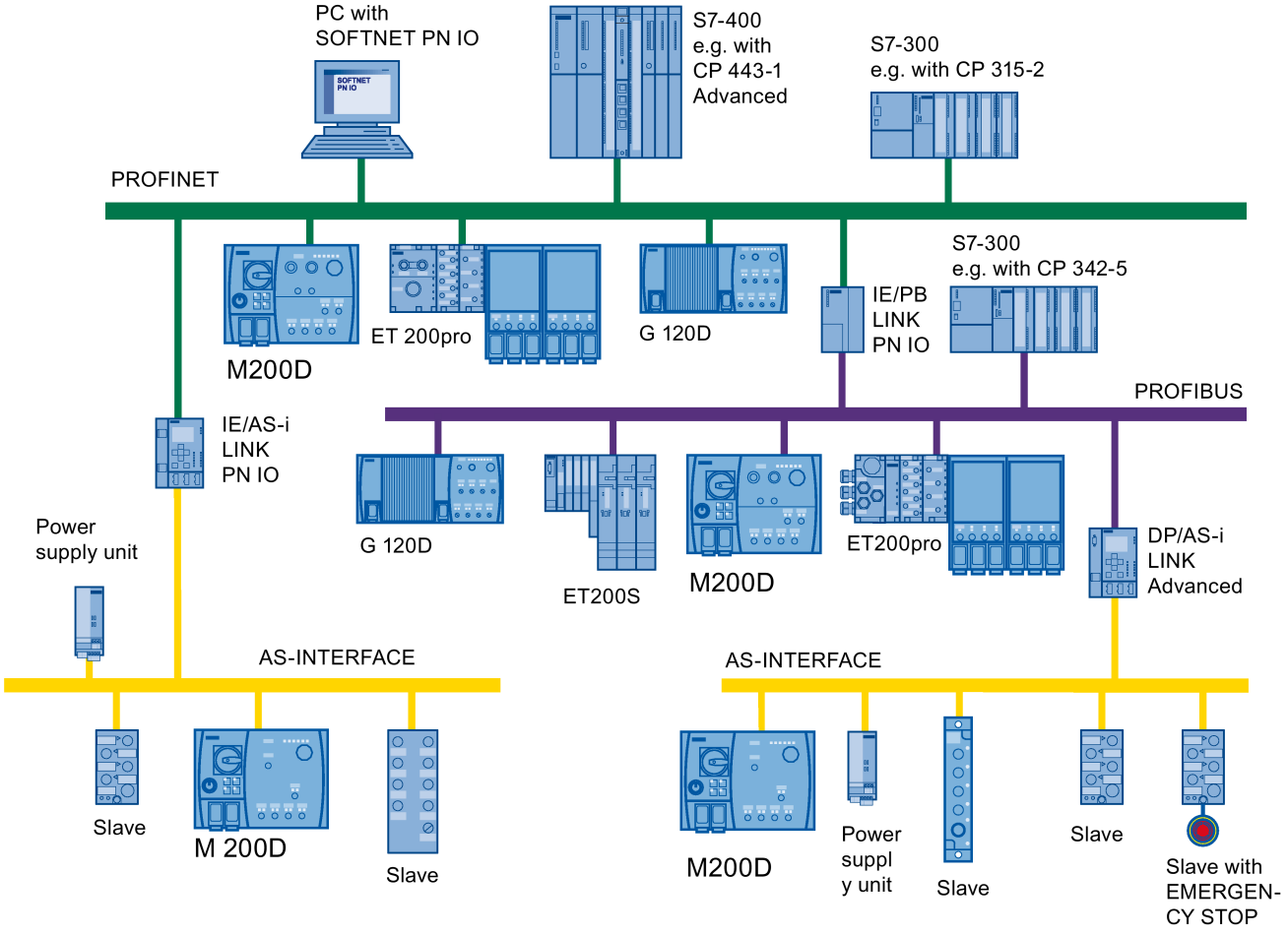


Figure 1-1 Possible fields of application of the M200D motor starter

Motor starter manuals

The following manuals are available for M200D motor starters:

- M200D PROFIBUS/PROFINET Motor Starters
  This (existing) manual describes M200D motor starters controlled via PROFIBUS DP or PROFINET IO.
- M200D AS-Interface Basic Motor Starters
  This manual describes M200D motor starters controlled via the AS-interface, with parameterization at the device.
- M200D AS-Interface Standard Motor Starters
  This manual describes M200D motor starters controlled via the AS-interface, with parameterization by software.

1.2 Fieldbus interfaces

1.2.1 PROFIBUS DP

What is PROFIBUS DP?

PROFIBUS DP is an open bus system in accordance with the standard IEC 61784-1:2002 Ed1 CP 3/1 with the transmission protocol "DP" (DP is the abbreviation of the German term "dezentrale Peripherie" (distributed I/O).

Physically, PROFIBUS DP is an electrical network based on a shielded twisted-pair cable.

The "DP" is a high-speed protocol for cyclic data exchange between the controller CPU and the distributed I/O systems.

What is a DP master and what are DP slaves?

The DP master links the controller CPU with the distributed I/O systems. The DP master exchanges data with the distributed I/O systems via PROFIBUS DP. It also monitors the PROFIBUS DP.

The distributed I/O systems (= DP slaves) prepare the encoder and actuator data on site in such a way that it can be transmitted via the PROFIBUS DP to the controller CPU.

Which devices can be connected to PROFIBUS DP?

PROFIBUS DP supports all DP masters or DP slaves which are compatible with IEC 61784-1:2002 Ed1 CP 3/1 standard.

Operation on redundant systems

An M200D PROFIBUS DP communication module can also be operated on redundant controllers and Y-link (H system).

The GSD file must be used for configuration, however.

DPV1 operation (reading/writing data records and alarms) is also possible behind a Y-link.

Structure of a PROFIBUS DP network

The figure below illustrates a typical PROFIBUS DP network structure. The DP masters are integrated in the corresponding device. The S7-400 or S7-300, for example, are equipped with a PROFIBUS DP interface. The DP slaves are the distributed I/O systems that are linked with the DP masters via the PROFIBUS DP.

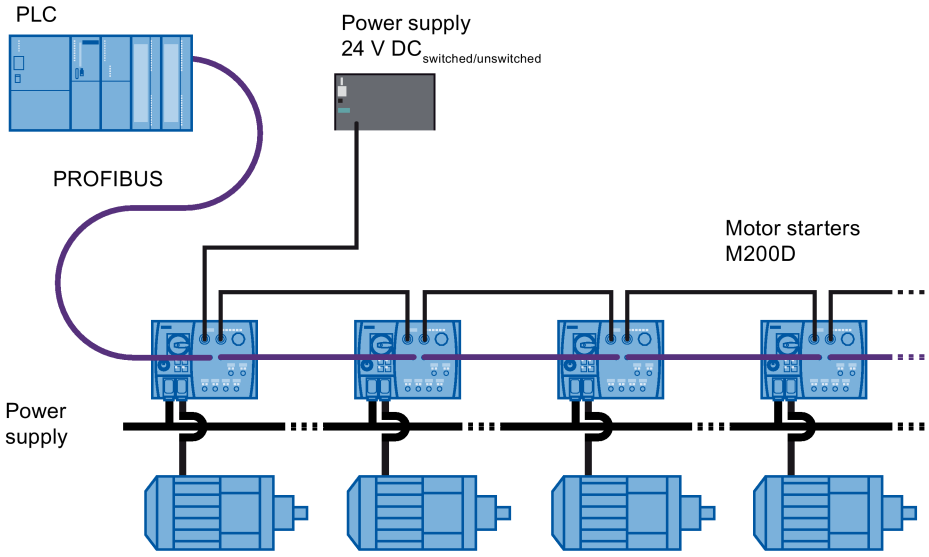


Figure 1-2 Typical structure of a PROFIBUS DP network

Reference

Further information on PROFIBUS can be found on the Internet (www.siemens.com/profibus).

1.2.2 PROFINET IO

What is PROFINET IO?

PROFINET IO is an open transmission system with real-time functionality defined in accordance with the PROFINET standard. This standard defines a manufacturer-independent communication, automation and engineering model.

Accessories for wiring the PROFINET components are available in industrial quality.

- PROFINET discards the hierarchical PROFIBUS master/slave concept and deploys a provider/consumer principle instead. The modules of an I/O device that will be subscribed to by an IO controller are defined within the engineering phase.
- The quantity framework is extended in accordance with the options offered on PROFINET IO. Parameter limits are not exceeded during configuration.
- The transmission rate is 100 Mbps.
- The configuration interface for users is generally the same as that on PROFIBUS DP (the system is configured in STEP 7 > HW CONFIG).

Properties through PROFINET IO

- Integrated switch with 2 ports
- Supported Ethernet services: ping, arp, network diagnostics (SNMP)/MIB-2, LLDP
- Port diagnostics
- IRTtop (Isochronous Real-Time Communication)
- Device replacement without removable medium/programming device
- MRP (Media Redundancy Protocol)
- Supports PROFIenergy

Topology of a PROFINET IO network

The figure below shows a typical PROFINET IO network topology. Existing PROFIBUS slaves can be integrated using an IE/PB link.

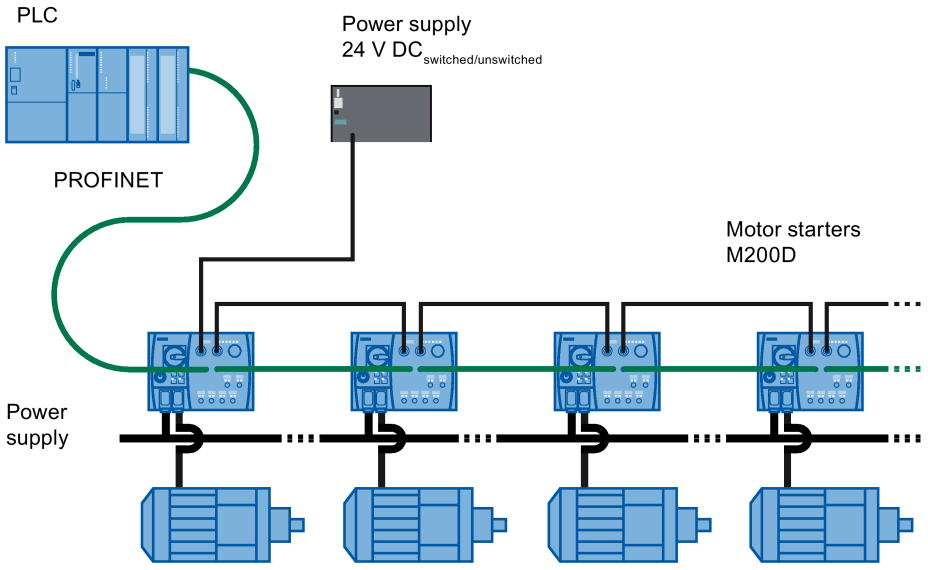


Figure 1-3 Typical structure of a PROFINET IO network

Reference

Further information on PROFINET can be found on the Internet (www.siemens.com/profinet).

1.3 PROFIenergy

What is PROFIenergy?

PROFIenergy is a multi-vendor profile on PROFINET. The profile supports tripping during idle times (energy saving function), measuring the power flow (measured value function) and the status function, with which the current statuses and further information on PROFIenergy can be read out.

PROFIenergy uses tried and tested PROFINET mechanisms to guarantee efficient and simple implementation.

Background

Both standards and laws are focusing more and more on environmental protection and energy management as well as the desire to save energy costs in a production line and thus retain a competitive advantage in the long term. As a result, industry is also aiming to save energy and to actively decrease CO_2 emissions. With the careful use of valuable resources, the multi-vendor PROFIenergy profile, defined on PROFINET, is making an active contribution to environmental protection.

PROFIenergy (version V1.0) in the M200D PROFINET motor starter

PROFIenergy enables consumption data to be read out from the devices in a uniform format. During operation, this data is acquired and displayed on an HMI device, for example, or transferred to higher-level energy management software packages. This ensures that these measured variables are available to users for further processing in a uniform, multi-vendor defined format and structure, in the same way as they are currently found in motor starters. These PROFIenergy functions thereby represent the basis for active load and energy management during operation.

System and device manufacturers provide users with function blocks for PROFIenergy and implement the corresponding commands and status functions in the field devices. System/machine manufacturers and the system operator continue to coordinate the switch-off and switch-on sequences as well as the enabling signals for the process. The controller stores the information on which components are switched off for which type of pause. The system operator does not require a detailed knowledge of the technology.

Product family

2

2.1 M200D PROFIBUS/PROFINET motor starter

Introduction

M200D motor starters with PROFIBUS and PROFINET comprise two modules:

1. Motor starter module
2. Communication module

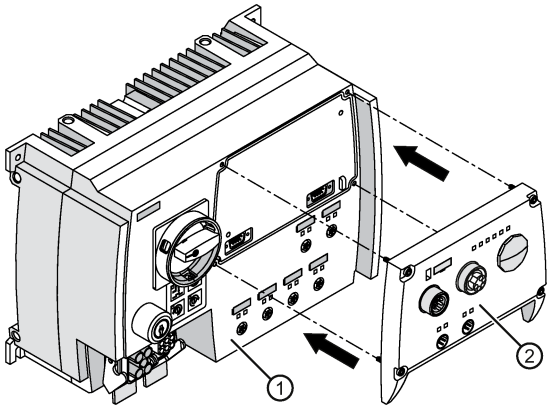


Figure 2-1 Motor starter and communication module

The communication module is screwed onto the motor starter module.
A communication module can be selected for each bus system:

- PROFIBUS communication module
- PROFINET communication module

The following M200D motor starters are available for PROFIBUS/PROFINET:

Motor starter modules

Motor starters with thermistor motor protection and thermal motor model:

- Direct starter, electromechanical (DSte) up to 5.5 kW,
  Current ranges: 0.15 – 2 A and 1.5 – 12 A
- Reversing starter, electromechanical (RSte) up to 5.5 kW,
  Current ranges: 0.15 – 2 A and 1.5 – 12 A
- Direct starter, electronic (sDSSte) up to 5.5 kW,
  Current ranges: 0.15 – 2 A and 1.5 – 12 A
- Reversing starter, electronic (sRSSte) up to 5.5 kW,
  Current ranges: 0.15 – 2 A and 1.5 – 12 A

Variants available to order

- Brake output for:
  - 400 V AC/230 V AC brake coils
  - 180 V DC brake coils
- Integrated manual local control (key-operated switch and keypad)

Connections on the PROFIBUS communication module

- M12 bus connection (IN/OUT)
- 7/8" auxiliary energy connection (IN/OUT)

Connections on the PROFINET communication module

- M12 bus connection (2 ports)
- 7/8" auxiliary energy connection (IN/OUT)

Accessories:

- Connection components (including RS232 cables, connectors, etc.)
- Hand-held device
- Protection guard for the plug connections
- 'Motor Starter ES 2007' diagnostics and commissioning tool

Order numbers: Motor starters and communication modules (Page 218), accessories (Page 219)

2.2 Overview of the device functions

Device function	Electromech. (DSte, RSte)	Electronic (sDSSte, sRSSte)
Fieldbus interface	●	●
Control function reversing starter	○	○
Control function soft starter	—	●
Brake output 400 V / 230 V AC	○	○
Brake output 180 V DC	○	○
Thermal motor model	●	●
Temperature sensor (thermistor motor protection)	●	●
Current limit monitoring	●	●
Asymmetry monitoring	●	●
Blocking protection	●	●
Residual current monitoring	●	●
M12 inputs (input action parameterizable)	4	4
M12 outputs (output action parameterizable)	2	2
Connector monitoring	●	●
Short-circuit protection	●	●
Disconnecting means	●	●
Maintenance	●	●
Communication via PROFIBUS DP/PROFINET IO	○	○
Trace functions	●	●
Emergency start	●	●
Self-test	●	●
Factory settings	●	●
Main power monitoring	—	●
Electronic/mechanical switching technology	○	○
Cold run	●	●
Local device interface	●	●
Integrated manual local control (key-operated switch, keypad with LEDs)	○	○
PROFIenergy	●[1)]	●[1)]
Logbook	●	●

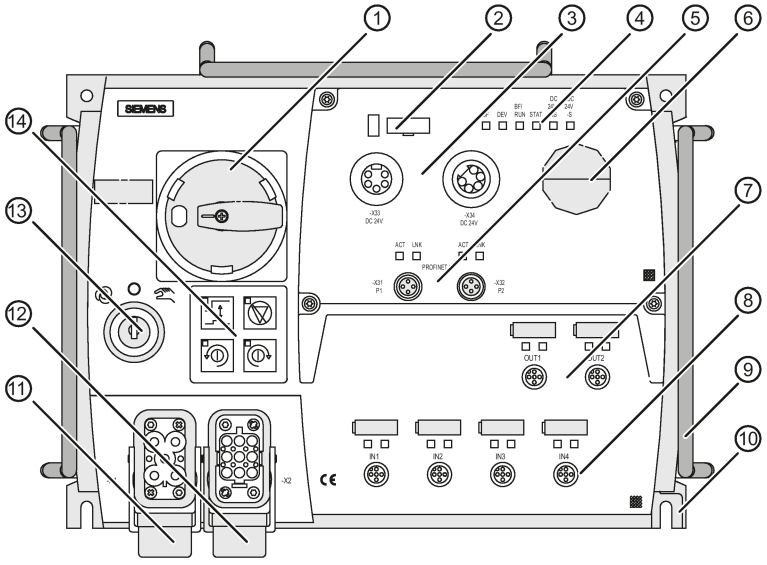
● Integrated

○ Order variant

1) only for PROFINET IO

2.3 Design concept

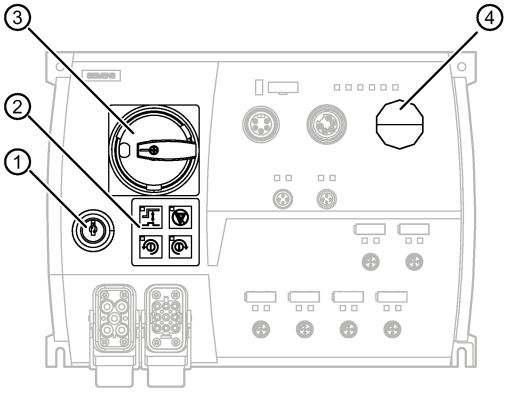
Connections and controls on the motor starter



① Disconnecting means (circuit breaker), can be locked
② Optical device interface
③ 7/8" connection for 2 x 24 V (IN/OUT)
④ Diagnostic LEDs
⑤ PROFIBUS/PROFINET connection M12
⑥ Setting elements on PROFIBUS DP (address, terminating resistor)
⑦ 2 digital outputs M12
⑧ 4 digital inputs M12
⑨ Up to 3 protection guards for cables and connections (accessories)
⑩ 4 fixing holes for mounting/1 connection for FE
⑪ 400 V incoming supply (HAN 4/2)
⑫ Motor connection (HAN 8/0)
⑬ Key-operated switch (order variant)
⑭ Keypad for manual operation (order variant manual local control)

2.3.1 Operator controls

The motor starter is equipped with the following operator controls:



① Key-operated switch (order variant)
② Keypad (order variant manual local control)
③ Disconnecting means (circuit breaker)
④ Setting elements on PROFIBUS communication module

Integrated manual local control (key-operated switch ① and keypad ②; order variant)

A key-operated switch and keypad are used for local operation.
The key can be inserted/removed in three positions.

Disconnecting means ③ (circuit breaker)

The disconnecting means is designed for the following individual functions:

- Disconnecting the series-connected loads from the line voltage
- Short-circuit protection of the series-connected load
- Switching on inhibited via padlock (max. three padlocks possible)

Parameter settings on PROFIBUS ④

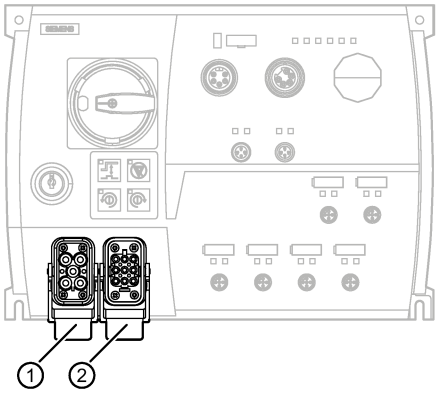
The following setting elements are located under the cover:

- Bus terminating resistor
- DIP switch for setting the PROFIBUS DP address

2.3.2 Connections

The motor starter has the following connections:

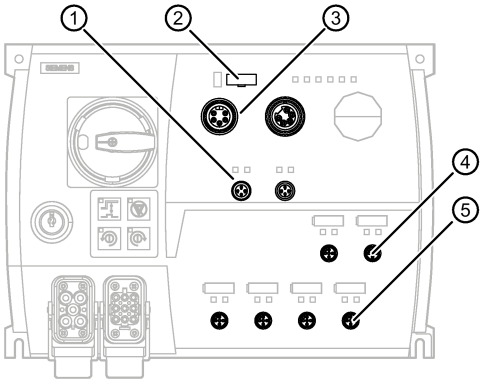
Power connections



① Infeed for the three phases as well as the PE and N conductor via power connectors (Han Q4/2 with ISO23570 assignment)

② Connection of the motor via power connectors (Han Q8/0)

Control circuit / bus



① Bus connections (PROFIBUS or PROFINET)

② Optical device interface (under the labeling strip) for connecting:

- Hand-held device
- PC

③ 7/8" auxiliary voltage connections
Infeed and routing

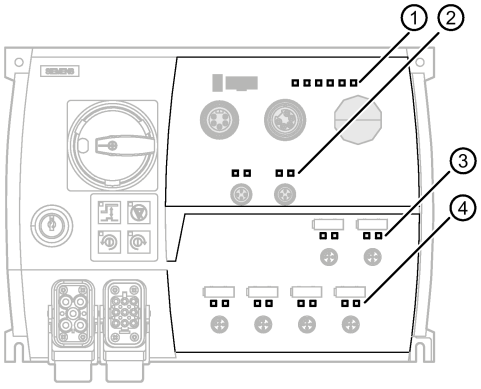
④ 2 x M12 digital outputs

⑤ 4 x M12 digital inputs

A detailed description of the connections can be found in Chapter Connection (Page 102).

2.3.3 Status displays

The following LEDs on the front of the starter indicate the device status:



① Indicators for the device status and communication
② Indicators for the port LEDs on PROFINET
③ Indicators for the outputs OUT1 and OUT2
④ Indicators for inputs IN1 to IN4

At the inputs and outputs, only the right LED is active.

A detailed description of the indicators can be found in Chapter Diagnostics with LED (Page 140).

Functions

3

3.1 Overview of the device functions

Device function	Electromech. (DSte, RSte)	Electronic (sDSSte, sRSSte)
Fieldbus interface (Page 31)	●	●
Control function reversing starter (Page 33)	○	○
Control function soft starter (Page 34)	-	●
Brake output 400 V / 230 V AC (Page 38)	○	○
Brake output 180 V DC (Page 38)	○	○
Thermal motor model (Page 41)	●	●
Temperature sensor (thermistor motor protection) (Page 46)	●	●
Current limit monitoring (Page 48)	●	●
Current asymmetry monitoring (Page 52)	●	●
Blocking protection (Page 48)	●	●
Residual current monitoring (Page 48)	●	●
M12 digital inputs (input action parameterizable) (Page 53)	4	4
M12 digital outputs (output action parameterizable) (Page 60)	2	2
Connector monitoring (Page 62)	●	●
Short-circuit protection (Page 64)	●	●
Disconnecting means (Page 64)	●	●
Maintenance (Page 65)	●	●
Communication via PROFIBUS DP/PROFINET IO (Page 66)	○	○
Trace functions (Page 71)	●	●
Emergency start (Page 74)	●	●
Self-test (Page 75)	●	●
Factory settings (Page 77)	●	●
Main power monitoring (Page 78)	-	●
Electronic/mechanical switching technology (Page 79)	○	○
Cold run (Page 80)	●	●
Local device interface (Page 81)	●	●
Integrated manual local control (Page 82) (key-operated switch, keypad with LEDs)	○	○
PROFIenergy (Page 84)	●[1)]	●[1)]
Logbook (Page 89)	●	●

● Integrated

○ Order variant

1) only for PROFINET IO

3.2 Introduction

Device function

This section describes the device functions. All the device functions are assigned inputs (e.g. device parameters) and outputs (e.g. messages).
The following schematic diagram illustrates the functional principle of the device:

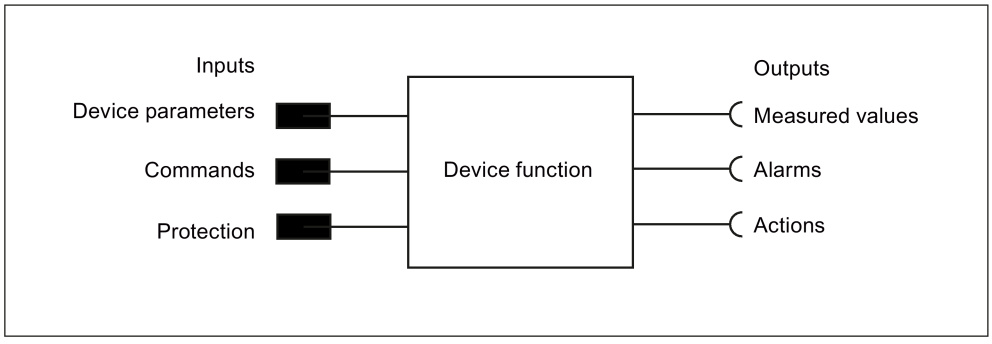


Figure 3-1 Functional principle of the device

Further details regarding device parameters and their change options can be found in the chapter entitled Parameterizing

Self-protection

The motor protects itself against fatal damage by means of the thermal motor model and temperature measurements for electronic switching elements. If the self-protection responds,

- the motor and the brake output are switched off immediately!
- the "switching element overload" signal is generated.

Switching on with "emergency start" is not possible.

Currents

Note

All current values (e.g. blocking current, current limit values) are percentages of the rated operating current set on the device (e.g. I_e = 2 A = 100%).

3.3 Basic functions / parameters

Definition

Basic parameters are "central" parameters required by a range of device functions.

3.3.1 Rated operating current

Here, you can enter the rated operating current that the branch (switchgear and motor) can carry without interruption. This is usually the rated motor current. The setting range depends on the output class of the M200D motor starter (0.15 ... 2 A or 1.5 ... 12 A).

Note

The rated operating current is one of the key parameters.

The rated operating current must **always** be set if motor protection is to be ensured via the electronic overload relay.

The overload relay can be deactivated.

In this case, motor protection must be ensured by means of a thermistor in the motor.

Current motor current

The latest current in the motor starter is returned via the process image for analysis.

The current is measured in all 3 phases and the highest value is calculated. The returned 6-bit value specifies the motor current ratio I_{curr} / I_{rated} (I_{rated} = parameterized rated operating 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 operating current I_{rated} x value (DI 1.0 to DI 1.5)

I_{rated} = rated current of the motor

Instructions

- In the motor starter, the rated operating current is preset at the factory to the **maximum** value. (For testing at startup without fieldbus and without previous parameterization)
- In the GSD and the "Motor Starter ES" software, the rated operating current is preset to the **minimum** value for safety reasons. You must therefore parameterize this value when you configure the system Otherwise the motor starter would trip when it starts for the first time due to overloading.
- The rated operating current depends on the "startup mode" parameter on motor starters with soft starter function. If the startup mode is set as "direct", the choice of rated operating current is restricted to 9 A.

Settings

Device parameter	Default setting	Setting range
Rated operating current	• In the motor starter: Maximum value • In GSD/Motor Starter ES: Minimum value	• 0.15 A to 2.0 A • 1.5 A to 9.0 A[1)] • 1.5 A to 12.0 A Increment: 10 mA
[1)] On soft starters (sDSSte, sRSSte) in the startup mode "direct"		

Note

The setting range depends on the device type!

3.3.2 Load type

Here, you can specify whether the motor starter must protect a single-phase or a three-phase load.

- Asymmetry detection is deactivated in the case of a single-phase load, such as a single-phase AC motor!
  The single-phase load can be connected between any two paths of the motor starter for all mechanically switched motor starters.
- Asymmetry detection is activated for three-phase loads such as three-phase asynchronous motors. The three phase currents are compared to one another.

Note

The load type is only relevant for mechanical motor starters. Only 3-phase load types may be connected to electronic starters.

Note

Only one motor must be connected to a motor starter, otherwise motor protection can no longer be guaranteed.

Settings

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

3.3.3 Protection against voltage failure

You use this device parameter to specify whether or not the overload message must be retained after an electronics voltage failure:

- Overload
- No overload

Settings

Device parameter	Default setting	Setting range
Protection against voltage failure	Yes	• Yes • No

3.3.4 Response to switching element supply voltage cut-off

With this parameter, you determine which message the motor starter is to output if the supply voltage of the switching elements fails.

Note

Supply voltage of the switching elements

The supply voltage of the switching elements (24 V) must be applied via the auxiliary voltage connections (7/8").

Settings

Device parameter	Default setting	Setting range
Response to switching element supply voltage cut-off	Group fault	• Group fault • Group fault only after ON command • Group warning

3.4 Fieldbus interface

3.4.1 Response to CPU/master STOP

This device parameter enables you to specify how the motor starter is to behave in the event of a CPU/Master stop:

- Retain last value
- Switch substitute value

Note

This is only relevant in "automatic" mode.

Substitute values

In the event of a bus failure, the outputs of the motor starters are controlled by a corresponding substitute process image.

Note

This device parameter is only relevant if you have parameterized "response to CPU/master STOP" as "switch substitute value".

Note

Motor CW and motor CCW cannot be set simultaneously.

The substitute value can be switched individually for the following parameters:

- Motor CW
- Motor CCW (on reversing starters only)
- Brake control (only on motor starters with brake output)
- Trip reset
- Emergency start
- Self-test
- Output 1
- Output 2
- Disable quick stop

Settings

Device parameter	Default setting	Setting range
Response to CPU/master STOP	Switch substitute value	• Switch substitute value • Retain last value
Substitute value	0	8 x (0 or 1)

Messages and actions

Message	Action
CPU/master STOP	Dependent on parameterization
Bus error	"Response to CPU/master STOP" depending on parameterization

3.4.2 Group diagnostics

With this parameter, you specify whether diagnostics via the fieldbus interface is to be enabled or blocked. If group diagnostics is parameterized as "block", no error messages are transmitted.

Settings

Device parameter	Default setting	Setting range
Group diagnostics	block	• block • enable

3.5 Motor control

3.5.1 Control function reversing starter

Description

This control function allows the motor starter to control the direction in which motors rotate. Simultaneous activation of both directions of rotation is prevented by the internal logic. Delayed switching from one direction of rotation to the other is implemented by means of the lock-out time.

Note

To reverse the direction of rotation, a mechanically-switching reversing contactor is integrated in reversing starters with electronic switching. The preferred position of this contactor after power-up is "CW rotation". When the direction is changed to "CCW rotation", the reversing contactor is activated first, followed by the electronic contacts after an 80 ms delay.

Lock-out time

The lock-out time results in delayed switching of the direction of rotation. The rotating mass of a drive must come to a standstill during the lock-out time before the next switching command can be executed.

Note

A lock-out time set to 0 is set internally to 150 ms for safety purposes.

Settings

Device parameter	Default setting	Setting range
Lock-out time	0	0 to 60 s Increment: 1 s

Messages and actions

Message	Action
Motor CCW	Motor runs with CCW rotation.
Lock-out time active	ON command suppressed in opposite direction.

3.5.2 Control function soft starter

Description

Soft starters function according to the phase angle control principle. You can specify soft starting and soft run-down using a settable voltage ramp. This function only applies to soft starters.

The figure below illustrates the principle:

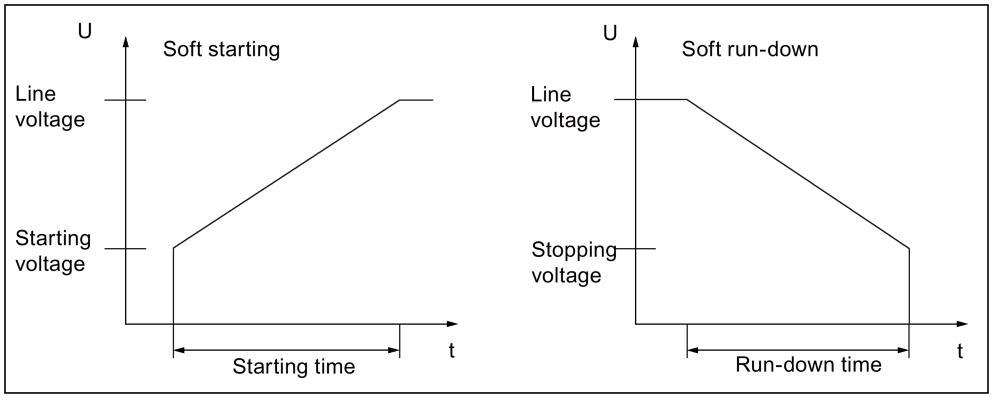


Figure 3-2 Soft starting/soft run-down principle

Termination of soft run-down (regenerative run-down)

Note

Soft run-down is only meaningful if the motor does not run down regeneratively (moving load). If soft run-down is nevertheless activated via parameterization, the motor starter terminates soft run-down and switches the motor off. The brake output is switched off depending on the set parameters.

Soft run-down on motor starters with mechanical braking

In parallel with soft run-down, motor starters with mechanical braking offer the following control options with the parameter "brake holding time on stopping":

- Brake holding time on stopping = 0:
  Motor voltage V is reduced to the stopping voltage during the run-down time. Following this, the motor voltage and the brake output are switched off simultaneously.
  When soft run-down is terminated, the motor voltage and the brake output are switched off simultaneously.
- Brake holding time on stopping > 0:
  Motor voltage V is reduced to the stopping voltage during the run-down time and switched off. The holding time also runs in parallel with the run-down time. On expiry of the holding time, the brake output is switched off independently of the soft run-down.

The figure below shows the principle of the loaded motor:

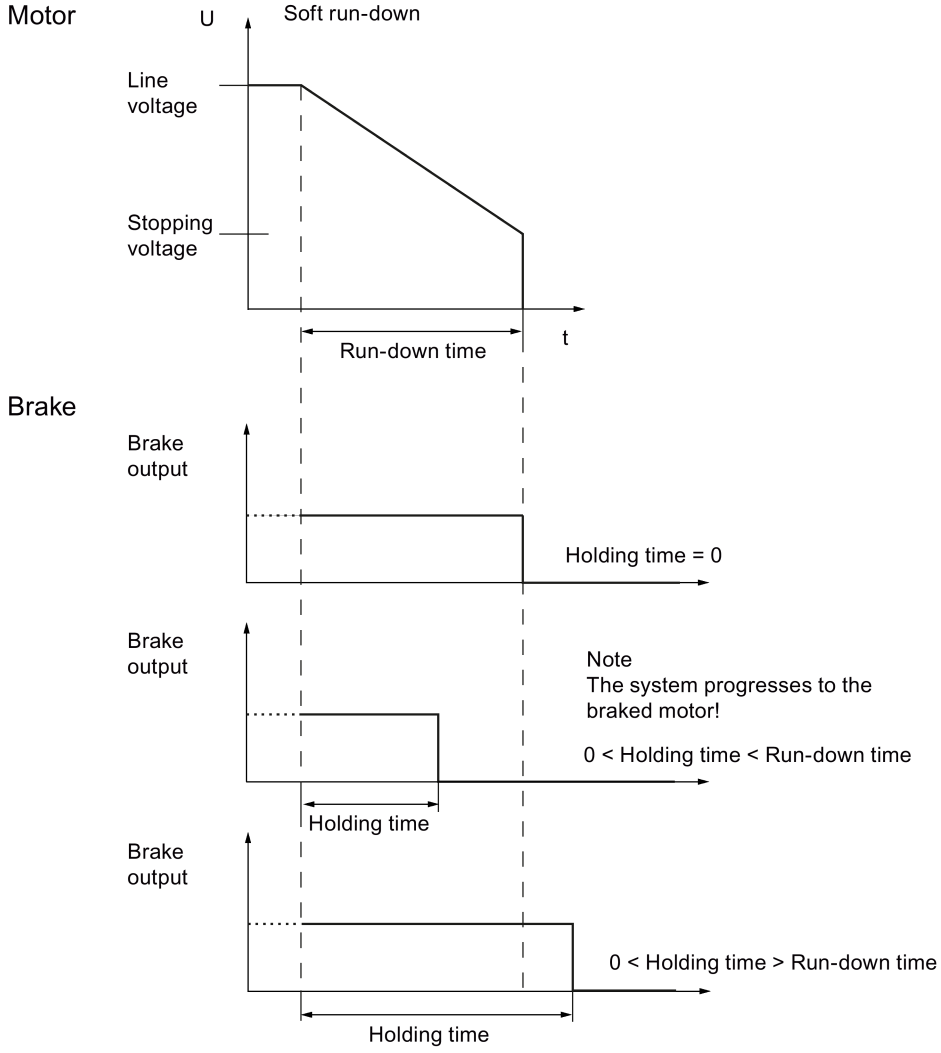


Figure 3-3 Principle of soft run-down on motor starters with mechanical braking

You can find more information on the "Brake holding time on stopping" in the chapter "Mechanical braking".

Start time

During the parameterized starting time, the motor terminal voltage is increased linearly from the starting voltage to the full line voltage. A setting of 0s means that the motor is switched on with a voltage ramp of 100 milliseconds to reduce the peak inrush current.

Run-down time

During the parameterized run-down time, the motor terminal voltage is reduced linearly from the line voltage to the stopping voltage. A setting of 0s means that the motor is switched off directly, without a voltage ramp.

Startup mode

There are four methods of starting the motor:

- Direct: The motor is switched on directly without a voltage ramp or current limitation.
- Voltage ramp: The motor is started up on a linear, positive voltage ramp.
- Current limiting: The inrush current of the motor is limited to a specified value.
- Voltage ramp + current limiting: If the motor current exceeds the specified value at startup, the voltage ramp is aborted and the current is limited.

Note

In the case of "direct" startup mode, you must note the following derating:

- Reduction of the rated operating current from 12 A to 9 A
- Only CLASS 5 or CLASS 10 possible.

Run-down type

There are two methods of running down or stopping the motor:

- Run-down without load: The motor is switched off immediately.
- Voltage ramp: The motor is powered down on a linear, negative voltage ramp.

Starting voltage

The starting voltage is the initial value of the voltage ramp for soft starting. The voltage ramp is started with the appropriate starting voltage and increased linearly to the line voltage.

Stopping voltage

The stopping voltage is the final value of the voltage ramp for soft run-down. The voltage ramp is run to the stopping voltage and then switched off.

Current limit value

With the startup modes "Current limiting" and "Voltage ramp + current limiting", the motor current is limited to a maximum value during starting.

Note

At a rated operating current ≥ 9 A, the motor starter automatically reduces the current limit value to 550%.

Settings

Device parameter	Default setting	Setting range
Start time	5 s	0 to 30 s Increment: 0.25 s
Run-down time	0	0 to 30 s Increment: 0.25 s
Startup mode	direct	• direct • Voltage ramp • Current limiting • Voltage ramp + current limiting
Run-down type	Run-down without load	• Run-down without load • Voltage ramp
Starting voltage	40 %	20 % ... 100 % Increment: 5 %
Stopping voltage	40 %	20 % ... 90 % Increment: 5 %
Current limit value	• 600% (I_e ≤ 9 A) • 550% (I_e > 9 A)	• I_e ≤ 9 A: 125 % ... 600 % • I_e > 9 A: 125 % ... 550 % Increment: 3,125 %

Messages and actions

Message	Action
Starting active	The motor is switched on depending on the "Startup mode" parameter.
Run-down active	The motor is switched on depending on the "Run-down mode" parameter.
No supply voltage	ON command generates faults.
Current limiting active	Motor starting current is limited.

3.5.3 Brake output

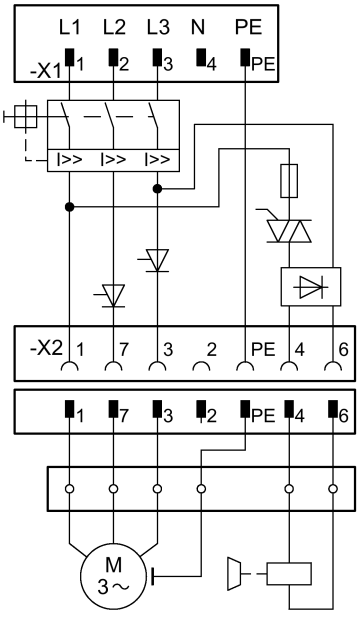
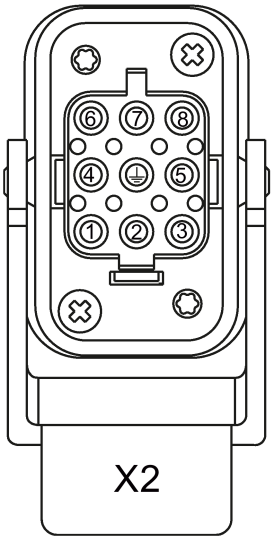
Description

A motor-mounted mechanical disk or spring-loaded brake is used to brake the motor. The brake is controlled via the brake output.

M200D motor starters offer the possibility of switching the brake of a motor separately via an internal electronic output (order variant). This electronic output can be controlled via the process image of the motor starter independently of the switching status of the contactors/thyristors and thus of the motor status.

Typical circuit diagram

The following circuit diagram illustrates the mechanical braking procedure with a 180 V DC brake output:

Circuit diagram	Motor connector		
	Assignment	Pin	Assignment
		1	Phase L1
		2	-
		3	Phase L3
		4	Brake L1 (switched)
		5	Thermistor
		6	Brake L3 (direct)
		7	Phase L2
		8	Thermistor
		⏚	PE (yellow/green)

Brake output

⚠ WARNING

Dangerous voltage
Risk of death or serious injury

The brake is only switched in a single phase. This means that voltage can be applied at pin 6 even when the system is switched off.

Externally supplied motor brakes are usually powered via a jumper on the motor terminal board.

Since switching the motor and brake simultaneously can increase wear and tear to the brake, all M200D motor starters can be fitted with an optional electronic brake controller. (Order variant)

Depending on the order variant, the following externally supplied brake coils can be controlled:

- 400 V AC/230 V AC
  The brake rectifier must be installed in the motor. The rectifier input is controlled via the motor starter.
- 180 V DC
  A rectifier is not required for the brake in the motor because the motor starter provides the 180 V DC. This allows brake coils for 180 V DC to be switched direct.

The brake voltage is fed to the motor together with the motor infeed via a joint cable. For more information about connecting the brake output, see section Brake output (Page 108).

Note

With both brake output versions, the electronic switching element is located on the AC side. Please refer to the technical data of the brake (e.g. Catalog D87.1 "SIEMENS MOTOX Geared Motors") for the resulting engaging time of the brake.

If faster brake engaging times are required (DC side tripping), a 400 V / 230 V AC brake output in conjunction with a function rectifier integrated into the motor is preferable.

Devices with a 180 V DC brake output as of product version E10 are suitable for achieving fast brake engaging times. This means that the time until the motor comes to a standstill is shorter compared with previous product versions.

The integrated free-wheeling diode is deactivated when the brake output switches off and the energy of the brake coil is dissipated using a varistor.

Brake release delay on starting

Note

Only active if an ON command is **simultaneously** present for the brake and the motor.

Positive times: Delayed switch-on of the brake output compared to the motor.
Negative times: Delayed switch-on of the motor compared to the brake output.

In reversing operation, the release delay does not begin until the lock-out time has expired.

Brake holding time on stopping

Note

Only active if an OFF command is **simultaneously** present for the brake and the motor.

This device parameter causes delayed tripping of the brake output compared to the motor. It also works in the event of a PLC failure.

In reversing operation, the holding time and the lock-out time are concurrent.
Switching on in the opposite direction of rotation is not possible until the lock-out time has expired. Switching on in the same direction is possible immediately in this case because the lock-out time is aborted.

Priority rule

"Brake release delay on starting" takes priority over "brake holding time on stopping". An expiring holding time is terminated if the release delay is restarted. (By means of ON command for brake and motor)

Settings

Device parameter	Default setting	Setting range
Brake release delay on starting	0 s	- 2.5 to + 2.5 s Increment: 0.01 s
Brake holding time on stopping	0 s	0 to 25 s Increment: 0.01 s

Messages and actions

Message	Action
Brake output active	Brake coil is controlled, motor can be rotated.

3.6 Motor protection

3.6.1 Thermal motor model

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 functioning in the normal operating range.

Response to overload - thermal motor model

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

- Tripping without restart (AUTO RESET = off)

  Following an overload situation, the trip command cannot be reset until the motor model has fallen below the reset threshold and after a reset command has been issued (trip reset).

- Tripping with restart (AUTO RESET = on)

⚠ WARNING

Motor restarts automatically if AUTO RESET is on.
Can Cause Death, Serious Injury, or Property Damage

The motor starter restarts automatically after the recovery time if a start command is present. (autoreset).
Make sure that you take appropriate measures to exclude the risk of hazardous conditions.

- Warning

Note

If the value of the thermal motor model exceeds the limit of 178% for self-protection of the motor starter, the motor starter itself generates a trip command regardless of the parameterization "Response to overload - thermal motor model".

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). The tripping characteristics represent the time to disengagement as a function of the operating current.

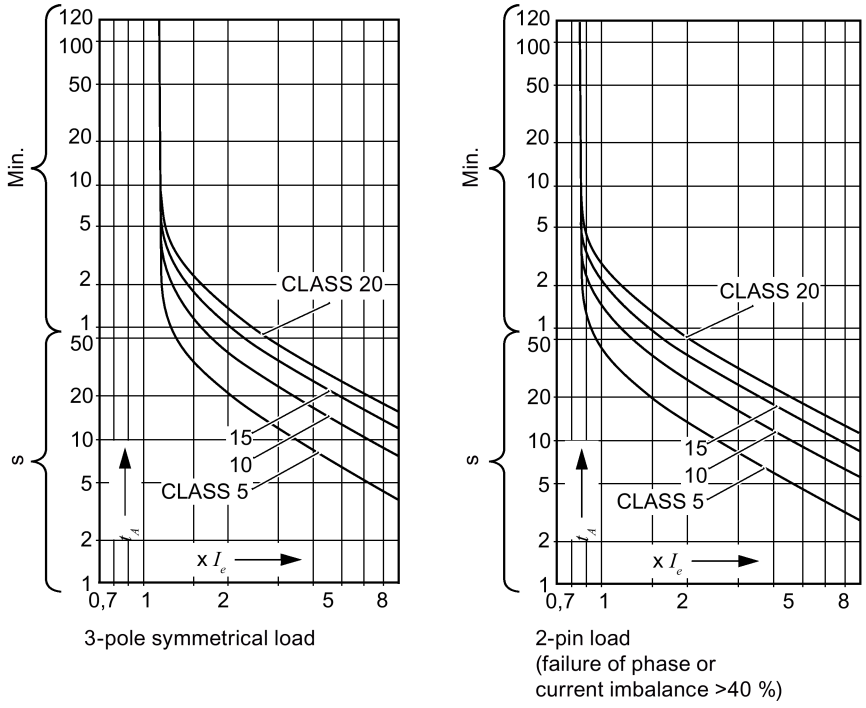


Figure 3-4 Tripping characteristics

Note

The setting options of the trip classes are dependent on the motor starter and the current range.

The following trip classes can be configured:

- CLASS 5 (10a)
- CLASS 10
- CLASS 15
- CLASS 20
- CLASS OFF (deactivates the thermal motor model)

Note

Deactivation rule

To guarantee motor protection, the trip class cannot be deactivated in the case of a deactivated temperature sensor (= CLASS OFF).

See also Chapter Data plausibility check (Page 69).

Note

Parameter dependence of thecontrol function soft starter

If the startup mode "direct" is selected for the device parameter "Control function soft starter", the trip class can only be parameterized to CLASS 5 (10a), CLASS 10 and deactivated by means of CLASS OFF.

Recovery time

The recovery time is the time defined for cooling after which the system can be reset following an overload trip.

Trip reset signals present during the recovery time have no effect.

The recovery time after overload tripping is at least 1 minute. The recovery time can be parameterized and modified between 60 seconds and 1800 seconds. Voltage losses occurring before this time expires can prolong the recovery time if the basic parameter "Protection against voltage failure" is active.

Prewarning limit motor heating

The motor starter also assumes a prewarning role, that is, it issues a warning if the motor temperature limit is exceeded. You use this parameter to preset a percentage motor heating value as a prewarning limit.

This function is deactivated with a motor heating prewarning limit of 0%.

Prewarning limit - remaining time for tripping

You use this parameter to preset a time as a prewarning limit. The motor starter warns against imminent overload tripping within the parameterized time if the present operating conditions are retained. This function is deactivated with a "remaining time for tripping" prewarning limit of 0%.

Idle time

The idle time is a time specification for the cooling characteristics after operational tripping, that is, not in the case of overload tripping.
After expiry of this time, the thermal memory of the motor starter is deleted. Cold restart is possible.

With appropriately adapted dimensioning of the drive, higher switching frequencies are thus possible without exceeding the trip limit of the motor model.

Note

Higher switching frequencies result in higher motor heating. If the motor dimensioning has not been adapted (thermal class), motor protection is no longer guaranteed.

The following schematic shows the cooling characteristics with and without idle time.

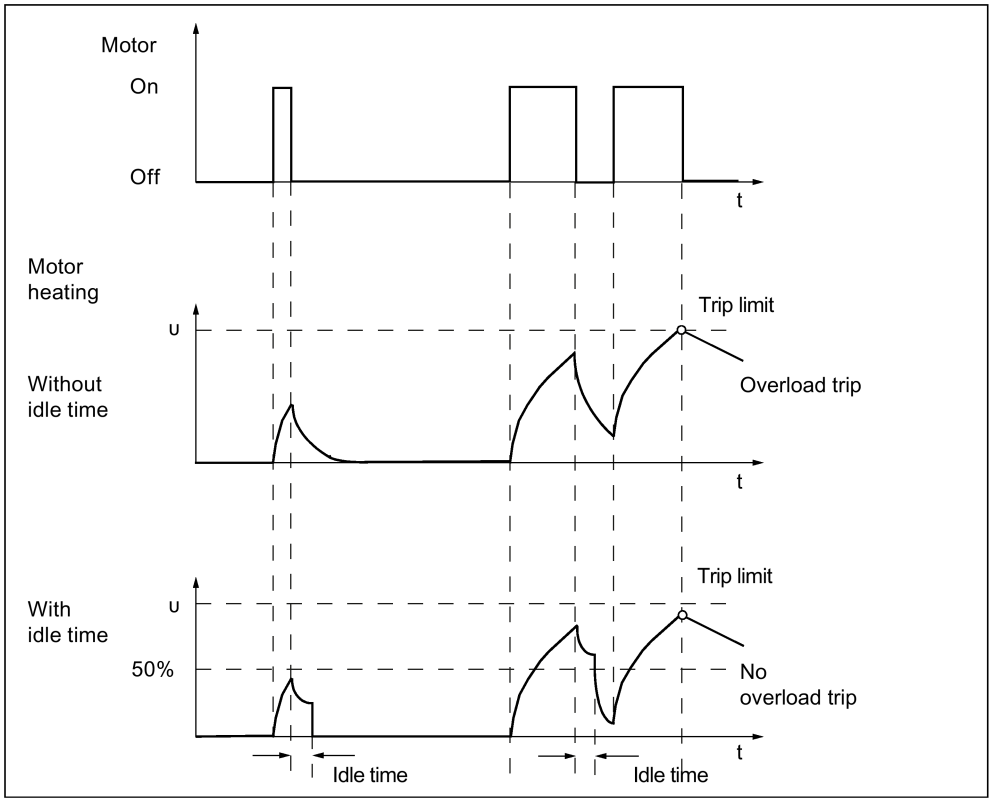


Figure 3-5 Cooling characteristics with and without idle time

Note

Motor heating

- Motor heating > 50 %: After idle time, the save value of the motor model is reduced to 50%.
- Motor heating < 50 %: After idle time, the save value of the motor model is reduced to 0 %.

Settings

Device parameter	Default setting	Setting range
Response to overload - thermal motor model	Tripping without restart	• Tripping without restart • Tripping with restart • Warning
Trip class	CLASS 10	• CLASS 5 (10a) • CLASS 10 • CLASS 15[1)] • CLASS 20[1)] • CLASS OFF
Recovery time	90 s	60 to 1800 s Increment: 30 s
Prewarning limit motor heating	0% (= deactivated)	0 ... 95 % Increment: 5 %
Prewarning limit - remaining time for tripping	0 s (= deactivated)	0 to 500 s Increment: 1 s
Idle time	0 s (= deactivated)	0 to 255 s Increment: 1 s
[1)] In the case of soft starters with startup mode = direct not parameterizable		

Messages and actions

Message	Action
Thermal motor model deactivated	No motor protection via thermal motor model; motor protection required by means of temperature sensor.
Thermal motor model - overload	Dependent on parameterization
Overload tripping	Trip (overload pending)
Idle time active	The motor is reset on expiry of the idle time
Cooling time active	Restart is prevented until the cooling time has expired (recovery time).
Prewarning limit - remaining time for tripping undershot	-
Prewarning limit - motor heating exceeded	-

3.6.2 Temperature sensor

Description

Temperature sensors are used to directly monitor the motor winding temperature. This indicates whether the motor is overloaded or functioning normally. If temperature sensors are installed in the motor stator winding (order option for the motor), the M200D motor starter can use these to monitor the motor.

M200D motor starters can evaluate **one** temperature sensor circuit.

The temperature sensor evaluation electronics are galvanically isolated from the electronics and the auxiliary voltage.

This is beneficial if insulation damage is caused to the motor or the motor supply line, as this does not affect any further system components (see Technical Specifications).

Temperature sensor

You can activate or deactivate this parameter depending on whether or not a temperature sensor is installed in the motor.

Two types of temperature sensor are supported:

- Thermoclick.
  This is a switch that opens at a certain winding temperature.
- PTC type A
  This is a PTC thermistor with a characteristic to IEC 60947-8.

Note

If you parameterize the temperature sensor as "deactivated", the following parameters are ignored:

- Response to overload temperature sensor
- Temperature sensor monitoring (with PTC)

Response to overload temperature sensor

You use this parameter to specify how the motor starter is to respond in an overload temperature sensor situation:

- Tripping without restart (AUTO RESET = off)
- Tripping with restart (AUTO RESET = on)

⚠ WARNING

Motor restarts automatically if AUTO RESET is on.
Can Cause Death, Serious Injury, or Property Damage

The motor starter restarts automatically after the recovery time if a start command is present (autoreset).
Make sure that you take appropriate measures to exclude the risk of hazardous conditions.

- Warning

Temperature sensor monitoring

Temperature sensor monitoring is activated when a PTC type A temperature sensor is parameterized. It is then automatically deactivated if thermoclick is parameterized.

This device parameter monitors the temperature sensor cable for interruptions (wire break) and short circuits. The motor is shut down (depending on the parameterization).

Settings

Device parameter	Default setting	Setting range
Response to overload temperature sensor	Tripping without restart	• Tripping without restart • Tripping with restart • Warning
Temperature sensor	Deactivated	• Deactivated • Themoclick • PTC type A
Temperature sensor monitoring	Yes	• Yes • No

Messages and actions

Message	Action
Temperature sensor - overload	Dependent on parameterization
Temperature sensor wire break	Dependent on parameterization
Temperature sensor short circuit	Dependent on parameterization
Temperature sensor deactivated	No motor protection through temperature sensor; motor protection required by means of motor model.
Overload tripping	Trip (overload, wire break or short circuit pending)

3.7 System monitoring

3.7.1 Current limit values

Description

The motor current and current limit values can be used to determine different system statuses:

System status	Current value	Protection by
Motor operates more sluggishly, e.g. because bearings are damaged. Motor operates more smoothly, e.g. because it has run out of processing material.	Current is higher or lower than normal	Current limit values
Motor blocked	Very high current flowing	Blocking protection
Motor runs at no load (e.g. because system is damaged)	Very low current flowing (< 18.75% of I_e)	Residual current detection

Response to residual current detection

Residual current detection responds if the motor current drops below 18.75% of the set rated operating current in all 3 phases.
With this device parameter, you determine how the motor starter is to behave in the case of residual current detection:

- Warning
- Trip

Note

When the motor is switched on, residual current detection is suppressed for around 1 second.

Response to current limit violation

You use this device parameter to specify how the motor starter is to behave in the event of the current limits being violated:

- Warning
- Trip

Upper/lower current limit

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

Example:

- "Viscosity of mixed mass is too high", that is, the upper current limit has been overshot.
- "No load because drive belt is broken", that is, the lower current limit has been violated.

Note

The current limits are not activated until the class time expires, e.g. after 10 seconds for class 10 (start override).

If the current limits are exceeded or undershot, the motor starter responds by either switching off or issuing a warning.

Note

The current limits can also be deactivated.

Blocking time

The blocking time is the time a block can be present before the motor shuts down. If the blocking time expires and the system is still stalled, the motor starter is switched off.

Blocking current monitoring

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

If the motor current exceeds the parameterized value for the blocking current, the motor starter detects the block. Blocking time monitoring is activated as of the point at which the blocking current is exceeded. If the blocking current flows for longer than the parameterized blocking time, the motor starter automatically generates a trip command.

Blocking protection principle in run-up phase:

The figure below shows the principle of blocking protection during the run-up phase, that is, the interaction of blocking current and blocking time:

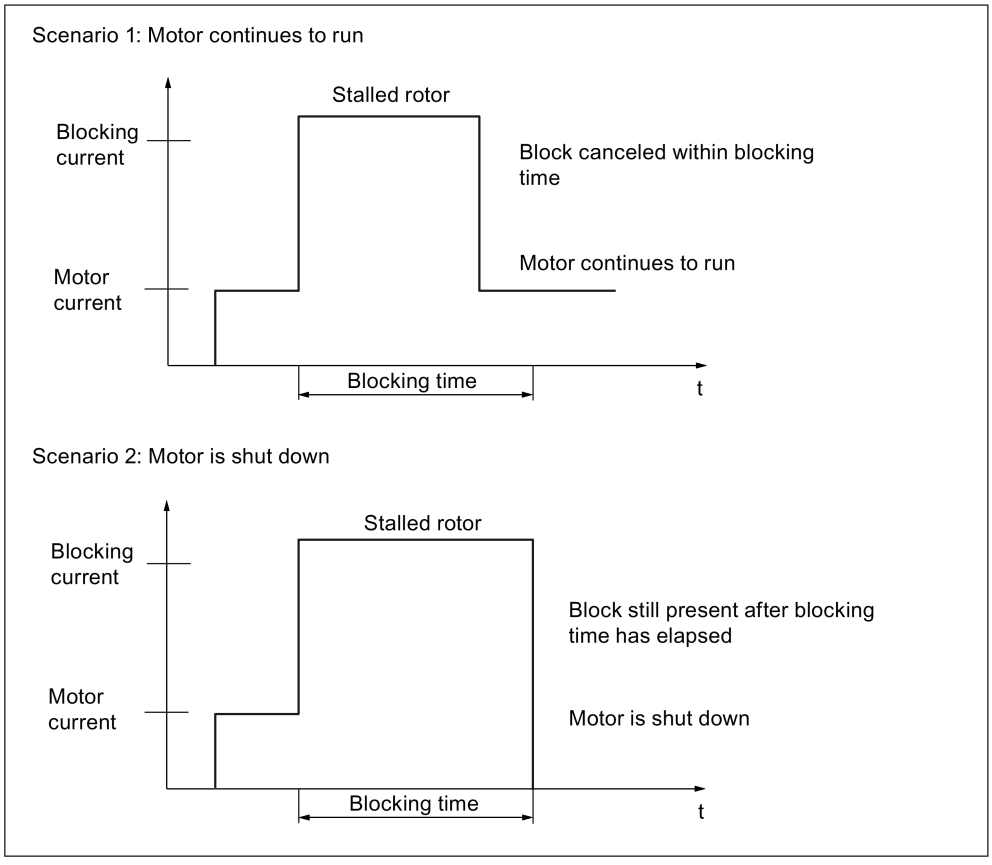


Figure 3-6 Blocking protection principle

Blocking protection principle after run-up

After run-up, blocking protection behaves as follows during continuous operation:

- The blocking time is reduced to 1 s regardless of the parameterized value.
- The blocking current is limited to a maximum of 400%.
  With a parameterized blocking current < 400%, the parameter value is valid.
- When the blocking protection responds, the motor starter itself generates a trip command.
- The messages "Tripping due to motor blocking" and "Group fault" are generated.
- The maximum pointer "Number of motor overload trips" is incremented by 1.

Settings

Device parameter	Default setting	Setting range
Response to residual current detection	Trip	• Warning • Trip
Response to current limit violation	Warning	• Warning • Trip
Lower current limit	18,75 %	• 18.75 to 100% of I_e • 0% (= deactivated) Increment: 3,125 %
Upper current limit	112,5 %	• 50 to 400% of I_e • 0% (= deactivated) Increment: 3,125 %
Blocking current	800 %	• 150 to 1000% of I_e • 150 ... 800% of I_e (sDSSte, sRSSte) Increment: 50 %
Blocking time	1 s	1 to 5 s Increment: 0.5 s

Messages and actions

Message	Action
I_e upper limit violation	-
I_e lower limit violation	Dependent on parameterization
I_e limit tripping	Trip (limit violation pending)
Residual current detected	Dependent on parameterization
Residual current tripping	Trip (residual current detection)
Tripping due to motor blocking	Trip (blocking protection)

3.7.2 Asymmetry monitoring

Description

Three-phase induction motors respond to slight asymmetries in the supply voltage with a higher asymmetric current consumption, which causes the temperature in the stator and rotor windings to increase. In this case, the M200D motor starter protects the motor against overload by shutting it down.

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 exists when the difference between the smallest and the greatest phase current is greater than the parameterized asymmetry limit.
The reference value for the analysis is the maximum phase current in one of the 3 phases!

Response to asymmetry

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

- Warning
- Trip

Settings

Device parameter	Default setting	Setting range
Response to asymmetry	Trip	• Warning • Trip
Asymmetry limit	30%	• 30 ... 60% • 0 = deactivated Increment: 10%

Messages and actions

Message	Action
Asymmetry detected	Dependent on parameterization
Asymmetry tripping	Trip (asymmetry exists)

3.7.3 Inputs

Description

Using the "Inputs" device function, the motor starter can carry out different actions that you can parameterize whereby the signals at the digital inputs are evaluated. You can connect the inputs directly to sensors (PNP) (2 and 3-wire system).

The signal status values are transferred in parallel via the process image.

The input actions of the individual digital inputs affect the motor starter functions (=OR operation) independently of one another.

Input function

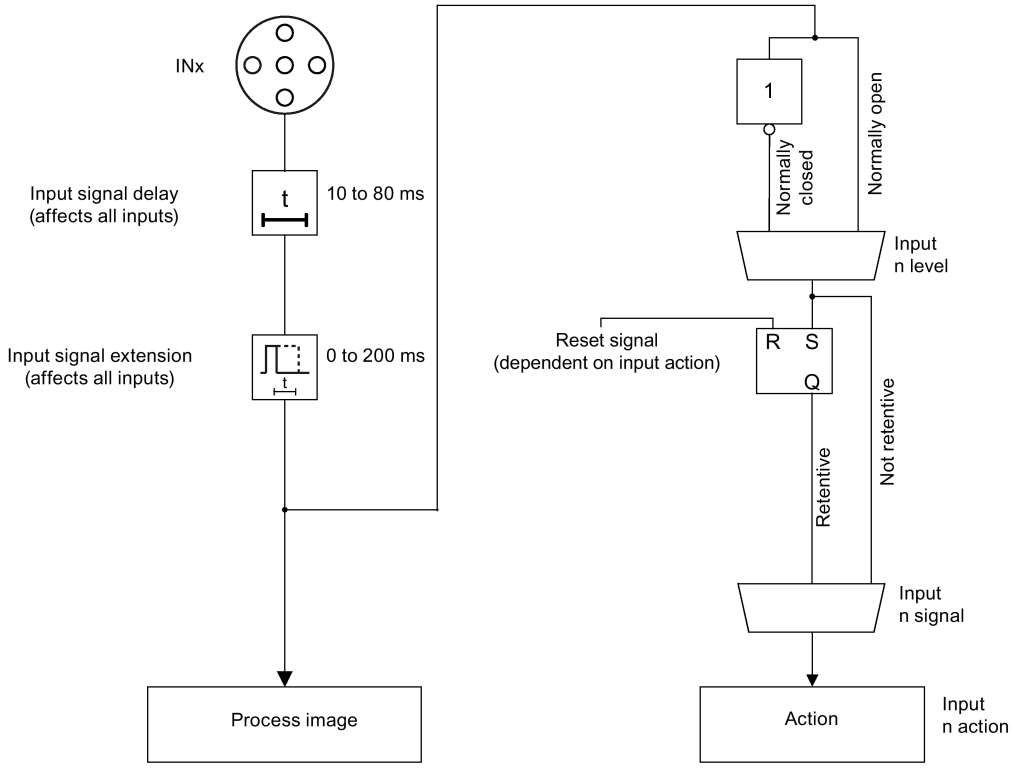


Figure 3-7 Overview of input parameters

Input signal extension

A short input signal can be extended compared to the actual input signal with the help of the "input signal extension" parameter. Reliable transmission to the controller can thus be guaranteed (compensation of bus transfer times and processing time in the controller).

Input signal delay

You can set a debounce time for the inputs in order to achieve interference immunity.

Input n signal

You can use this device parameter to specify whether or not the input level of the digital inputs should 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.

- 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:

- Normally closed
- Normally open

Note

If you specify "Input n action": "Emergency start", "Motor CW", "Motor CCW", "Cold run" and "Trip reset" you can only program "Input n level" as a normally open contact.

Note

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 "Tripping 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

If input voltage is applied (input active), a 1 is transferred to the control regardless of the "Input n level", see the figure "Overview of input parameters".

Input n action

Different actions can be triggered when an input signal is present. You can parameterze 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 diagnostics message!

Input n action	Level	Signal	Mode	Description
No action	NO/NC	n-ret./ret.	All	-
Trip without restart	NO/NC	n.ret./-	All	• Causes the motor and brake to trip. • Must be acknowledged once the cause of the tripping has been rectified (initial status).
Trip with restart (auto reset)	NO/NC	n.ret./-	All	• Causes the motor and brake to trip. • Acknowledged automatically once the cause of the tripping has been rectified (initial status).
Trip end position CW	NO/NC	n.ret./-	All	• The motor and the brake output are tripped regardless of the direction of rotation. • The brake output can be switched on again once the "Brake" and "Motor CW / CCW" control commands have been canceled. • Trip end position CW rotation: The motor can only be switched on again with the opposite command ("Motor CCW"). • Trip end position CCW The motor can only be switched on again with the opposite command ("Motor CW").
Trip end position CCW (RSte/sRSSte only)	NO/NC	n.ret./-	All	
Group warning	NO/NC	n-ret./ret.	All	• The "Group warning" message is set. • The motor starter and the brake output are not tripped! **ret.:** *The input action responds to the active edge of the input signal. Deactivation with a pending active input signal is thus possible.* *Action is deactivated with trip reset.*
Manual mode local	NO/NC	n.ret./-	All	• Control is only possible via "input n action": "Motor CW" and "Motor CCW" (see below) possible! • Control is not possible over the fieldbus ("Automatic" mode)! • "Automatic" mode is only possible again if manual mode local is canceled and "Input n action": "Motor CW" or "Motor CCW" is not active.

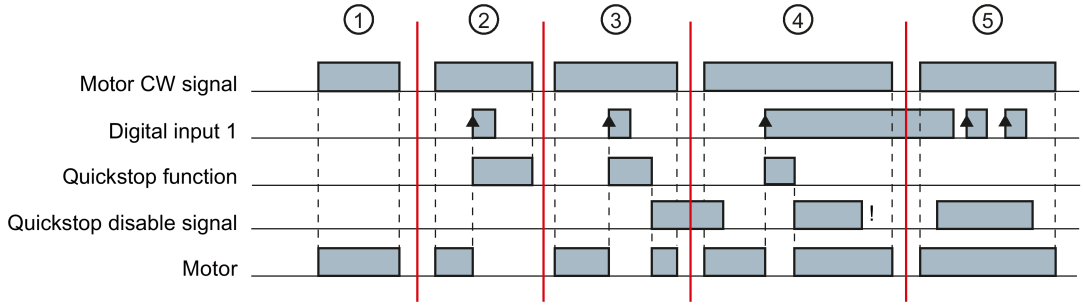
Input n action	Level	Signal	Mode	Description
Emergency start	NO / -	n.ret./-	All	• Starts the motor when an ON command is issued despite the fact that an internal trip command is present. • Switches on the brake output too if an ON switching command is present for this. • Self-protection of the motor starter remains active and prevents the device from being destroyed. • Only allowed as an NO contact!
Motor CW	NO / -	n-ret./ret.	Manual local	• The motor starter must be in "manual local" mode for these actions. • The device parameters of the braking operation are evaluated. • "Motor CW": Switches the motor and the brake output on and off (clockwise) together. • "Motor CCW": Switches the motor and the brake output on and off (counter-clockwise) together. • Only allowed as an NO contact! **ret.:** *The input action is triggered while the active level of the input signal is pending.* *Input trigger is deleted by the input action "Quick stop" or group fault.*
Motor CCW (RSte/sRSSte only)	NO / -	n-ret./ret.	Manual local	
Quick stop	NO/NC	n-ret./ret.	All	• The motor and brake output are tripped without a group fault. • "Quick stop" has priority over "Motor CW" and "Motor CCW". **ret.:** *The input action responds to the active edge of the input signal. Deactivation with pending active input signal is thus possible.* *The input trigger is deleted by removal of the control commands "Motor CW" and "Motor CCW"*
Trip reset	NO / -	n.ret./-	All	• "Trip reset" is triggered once • Only possible as NO contact!
Cold run	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.
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))				

3.7.3.1 Quick stop

- The motor and brake output are tripped without a group fault.
- "Quick stop" has 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 when the "Motor CW" and "Motor CCW" control commands are canceled or by means of "Disable quick stop" (in the process image).

Example 1:

Input 1 signal = retentive/edge-triggered



① 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 action1 = Quickstop). By revoking the "Motor CW" command, the Quickstop function is reset.

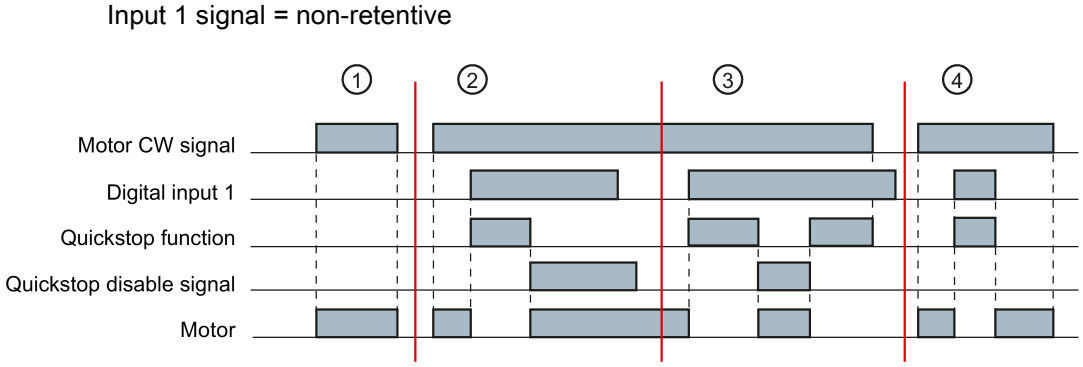
③ Motor is switched on by "Motor CW", then switched off by the rising edge at digital input 1. By setting Quickstop disable, the Quickstop function is reset and the motor runs "CW" again until the "Motor CW" command is revoked.

④ Motor is switched on by "Motor CW", then switched off by the rising edge at digital input 1. By setting Quickstop disable, the Quickstop 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 Quickstop disable continuously overwrites the edges of the signal of digital input 1 (DI2).

Figure 3-8 Quick stop (example 1)

Example 2:



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 = Quickstop). The Quickstop function is reset by Quickstop disable. 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. By setting "Quickstop disable", the Quickstop function is reset and since the level "Motor CW" is still active, the motor runs "CW" again until the "Quickstop disable" command is revoked.

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

Figure 3-9 Quick stop (example 2)

Settings

Device parameter	Default setting	Setting range
Input signal extension	0 ms	0 to 200 ms Increment: 10 ms
Input signal delay	10 ms	10 ... 80 ms Increment: 10 ms
Input 1 level	Normally open	• Normally closed • Normally open
Input 2 level		
Input 3 level		
Input 4 level		
Input 1 action	No action	• No action • Trip without restart • Trip with restart • Trip end position CW • Trip end position CCW (RSte/sRSSte only) • Group warning • Manual mode local • Emergency start • Motor CW • Motor CCW (RSte/sRSSte only) • Quick stop • Trip reset • Cold run
Input 2 action		
Input 3 action		
Input 4 action		
Input 1 signal	Non-retentive	• Retentive • Non-retentive
Input 2 signal		
Input 3 signal		
Input 4 signal		

Messages and actions

Message	Action
Input 1	Dependent on parameterization
Input 2	Dependent on parameterization
Input 3	Dependent on parameterization
Input 4	Dependent on parameterization
Input tripping	Trip
Input tripping - end position CW rotation	Tripping (must be acknowledged with Motor OFF)
Input tripping - end position CCW rotation	
Input control	The motor is controlled via the inputs
Input warning	The motor is controlled via the inputs
Sensor supply overload	Tripping (must be acknowledged with trip reset) The signal states of all inputs are undefined in the event of a "sensor overload".
Quick stop active	Trip

3.7.4 Outputs

Description

The motor starter can use the "outputs" function to control various actuators (e.g. indicator lights or signalling auxiliary switches). Control can take place here from different control sources. Different functions and information can be parameterized for each of the outputs.

The digital outputs are overload-protected and short-circuit-proof and are supplied from the DC24V-S load voltage supply.

Output n level

With this device parameter, you determine whether the control signal of the output is inverted or not dependent on the set parameter.

Output n signal

With this device parameter, you determine how the signal is to be output:

- Continuous signal
- Flashing

Output n action

Different parameterizable actions can be triggered when an output signal is present.

Settings

Device parameter	Default setting	Setting range
Output level 1	Not inverted	• Not inverted • Inverted
Output level 2		
Output 1 signal	Continuous signal	• Continuous signal • Flashing
Output 2 signal		
Output 1 action	Control source PIO DO 1.0	Triggering by means of external control source • Control source PIO DO 1.0 (output 1) • Control source PIO DO 1.1 (output 2) • Control source PIO DO 0.2[1] (brake output) • Control source input 1 • Control source input 2 • Control source input 3 • Control source input 4 Actuation by motor starter • Run-up [2] • Operation/shunting [2] • Coasting down [2] • On time motor (RUN) • Control command motor ON • Brake output • Device ON Actuation by messages from the motor starter • Group prewarning • Group warning • Group fault • Bus error • Device error • Maintenance required • Maintenance requested • Ready for motor ON
Output 2 action	Control source PIO DO 1.1	

1) Brake output only on starters with BO
2) Run-up, operation/shunting, coasting down only on soft starters.

Messages and actions

Message	Action
Output 1 active	The output is controlled
Output overloaded	Tripping (acknowledgment via trip reset)
Output BO (brake output) active	The brake output is controlled

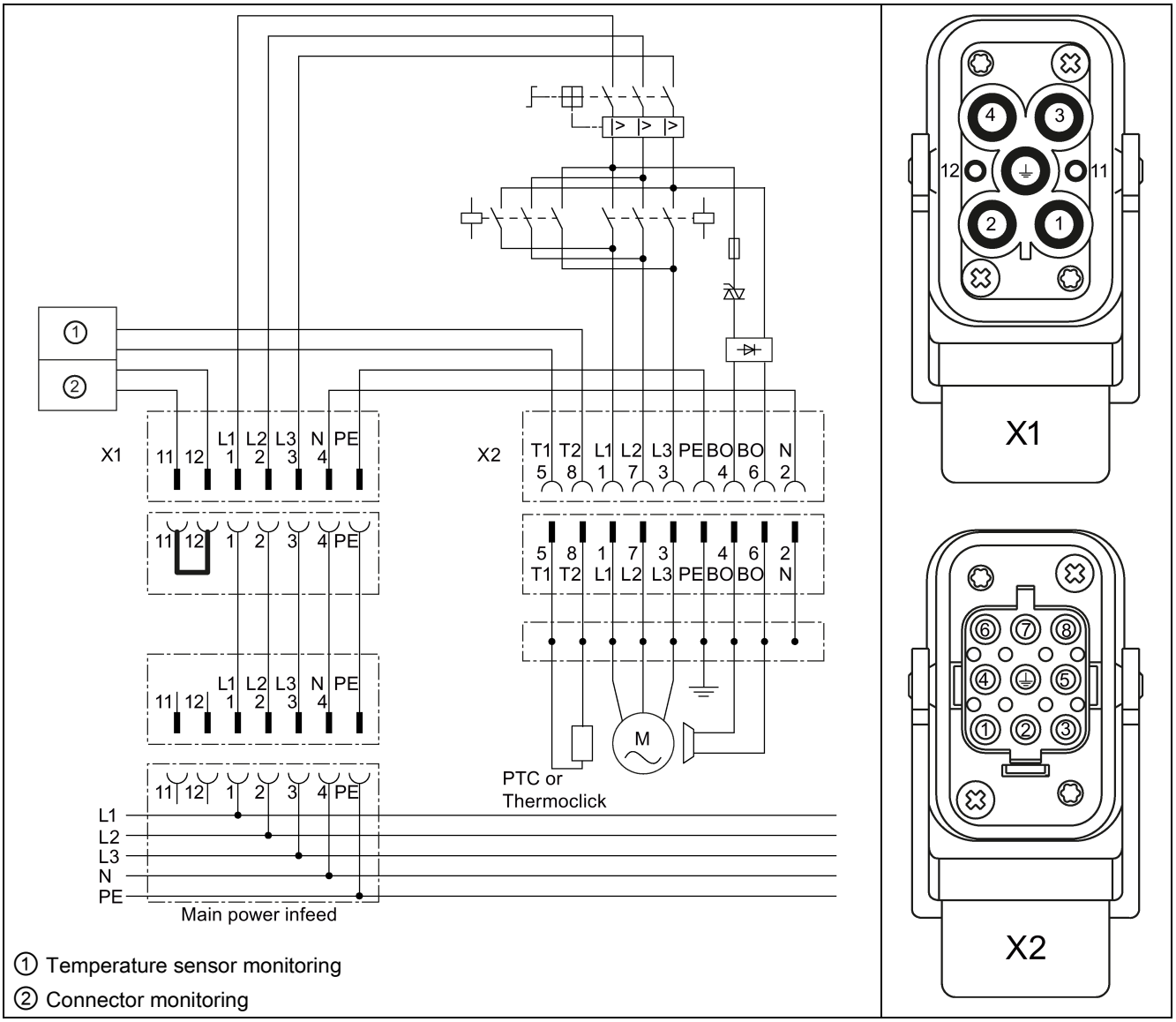
3.7.5 Connector monitoring

3.7.5.1 Power connector

The motor starter monitors whether the infeed connector on the line side of the motor starter is plugged in. Connector monitoring is implemented by means of an input activated via a jumper between pins 11 and 12, which informs the motor starter that the connector is plugged in.

Note

When you use the "connector monitoring" function, you have to connect pin 11 to pin 12 in the connector.



① Temperature sensor monitoring
② Connector monitoring

Connector monitoring

Line side connector monitoring can be deactivated.

Response when connector removed

You use this device parameter to determine how the motor starter is to behave when the connector is unplugged:

- Group fault
- Group fault only after ON command
- Group warning

Settings

Device parameter	Default setting	Setting range
Connector monitoring	Deactivated	• Deactivated • Line side
Response when connector removed	Group fault	• Group fault • Group fault only after ON command • Group warning

Messages and actions

Message	Action
Connector monitoring deactivated	No monitoring on plugged-in connector
Connector disconnected on line side	Dependent on parameterization

3.7.5.2 Motor connector

The "connector monitoring" function is only valid for the infeed connector.

A connector monitoring function for the motor connector can be logically combined with the thermistor cable and/or thermistor evaluation function.

If a motor is operated without a thermistor, you can activate thermistor monitoring (thermoclick) and use it to monitor the connector by means of a wire jumper on the motor terminal board or in the motor connector.

Note

In this case, the "temperature sensor overload" message must be interpreted as a removed motor connector.

3.8 Short-circuit protection (circuit breaker/disconnecting means)

Description

The motor starter is equipped with an integrated circuit breaker for short-circuit protection to ensure that the system is safe and to protect personnel. Short-circuits between one phase and ground (= ground fault) as well as between two phases are monitored.

Properties of the circuit breaker

The circuit breaker / disconnecting means is designed for the following functions:

- Disconnecting the series-connected starter and consumer from the supply voltage
- Closing lockout by means of a padlock on the rotating element
- Short-circuit protection for the series-connected consumer with circuit breaker
- Reset in the event of a restart
- Restoration of factory settings, see Factory settings

Response to circuit breaker OFF:

You can use this parameter to determine how the motor starter is to respond to a short-circuit or to manual switch-off of the circuit breaker:

- Group fault
- Group fault only after ON command
- Group warning

Settings

Device parameter	Default setting	Setting range
Response to circuit breaker OFF	Group fault	• Group fault • Group fault only after ON command • Group warning

Messages and actions

Message	Action
Circuit breaker tripped	Dependent on parameterization

3.9 Maintenance

Description

Maintenance functions are necessary to prevent wear-related failures of devices and systems. System availability is improved as a result. The most important advantage is that the motor starter reports its own imminent failure or that of the motor in good time in a series of steps. Regular inspections by service engineers to determine whether maintenance is required can thus be dispensed with.

Note

The maintenance timer is only incremented when the motor is running.

Device parameter

Two maintenance timers are available to indirectly measure wear as a function of operating time. The maintenance timers are special operating hours counters which can be reset or parameterized with warning limits.

Maintenance timer warning limit 1

First warning. Indicates that maintenance is recommended.

Maintenance timer warning limit 2

First warning. Indicates that maintenance is compulsory.

Settings

Device parameter	Default setting	Setting range
Maintenance timer - warning limit_1	946,080,000 (30 years)	0 to 4,294,967,295 s Increment: 1 s
Maintenance timer - warning limit_2	946.080.000 (30 years)	0 to 4,294,967,295 s Increment: 1 s

Messages and actions

Message	Action
Maintenance required	Group prewarning
Maintenance requested	Group warning
Maintenance timer limit_1 exceeded	-
Maintenance timer limit_2 exceeded	-

3.10 Communication over PROFIBUS/PROFINET

Description

Communication is a higher-level device function comprising a number of sub-functions:

- Mode monitoring
- Fieldbus interface
- Commands
- Data plausibility check
- Message output

3.10.1 Mode monitoring

Data channels

M200D motor starters have 3 different data channels:

- Local optical device interface
- Control with local control station in "Manual mode local".
  - Using integrated manual local control (key-operated switch + keypad, order variant)
  - Input actions of the digital inputs ("Motor CW", "Motor CCW" are parameterized)
- Using the fieldbus interface (PROFIBUS DP/PROFINET IO)

The data channel used for control purposes depends on the mode.

Modes

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

- Automatic (lowest priority)
  The motor starter can only be controlled with the PLC via the fieldbus.
- Manual mode bus
  Control of the motor starter is only possible via fieldbus with an HMI device (e.g. PC with Motor Starter ES software).

- Manual mode local
  The motor starter can be controlled with:
  - Integrated manual local control (key-operated switch + keypad, order variant)
  - Local control station at digital inputs
    (Motor CW, Motor CCW, e.g. with switch module comprising test connector set or with external switches)
    Requirement: Manual mode local set (see below).

Note

A higher-priority mode can return control priority to a lower-priority mode by command or the input action "Manual mode". This can take place using the command "Automatic mode" or by switching off the input action "Manual mode local".

The following message bits in diagnostics data set DS92 clearly indicate which control source currently has control priority:

- Automatic mode
- Manual mode bus
- Manual mode bus, PC controls
- Manual mode local
- Input control
- HMI controls
- PC controls
- Connection abort in manual mode

Automatic	Manual							Control priority
	Manual mode bus		Manual mode local				Connection abort in manual mode	
Automatic mode	Manual mode bus	Manual mode bus, PC controls	Manual mode local	Input control	HMI controls	PC controls		
0	0	0	1	0	0	1	0	PC via device interface or operator panel
0	0	0	1	0	0	0	1	None
0	0	0	1	1	0	0	0	Digital input
0	1	1	0	0	0	0	0	PC via fieldbus
0	1	0	0	0	0	0	1	None
1	0	0	0	0	0	0	0	Controller (PLC)
0	0	0	1	0	1	0	0	HMI device

Connection monitoring

If the motor starter is controlled via the device interface (Motor Starter ES or hand-held device), this connection is monitored. If this connection is broken, the motor shuts down with the message "Connection abort in manual mode".

To exit this state, re-establish the connection and control again using the device interface.

Setting manual mode local for local control station at the digital inputs

You can set manual mode local as follows:

- Parameterize the input n action "Motor CW" or "Motor CCW" and the input n action of another input as "Manual mode local".
- As long as the second input is active, the motor starter remains in "manual mode local" and the motor can be controlled via the digital input "Motor CW" / "Motor CCW".

3.10.2 Commands

Commands and their meaning

Using the commands, you can instruct the motor starter to perform specific actions. You can send the following commands to the motor starter with the Motor Starter ES configuring software, for example:

Command	Meaning
Trip reset	• Resets and acknowledges error messages • Deletes message bits, if no error message is present • No effect
Emergency start ON	Activates the emergency start device function
Emergency start OFF	Deactivates the emergency start device function
Automatic mode	Control via PLC; cyclic and acyclic bus channel (C1)
Manual mode	• Control via PC; acyclic bus channel (C2) • Control via the device interface
Factory settings	All parameters assume the factory settings again except the communication parameters. Only possible in manual mode!
Delete maximum pointer	Deletes the "preventive diagnostics" statistical data
Restart	Motor starter executes restart (same effect as Power OFF/ON). Only possible in manual mode!

Command	Meaning
Parameter block CPU/master OFF	Motor starter accepts the parameters from the master (PLC)
Parameter block CPU/master ON	Motor starter ignores the parameters from the master (PLC)
Delete Logbook - Triggering operations	Delete logbook with recorded fault causes
Delete Logbook - Events	Delete logbook with recorded warnings and specific actions
Cold run ON	Enables activation of the switching contacts without main power
Cold run OFF	Switches the "cold run" function off
Delete maintenance timer	Deletes the timer of the maintenance function

3.10.3 Data plausibility check

Description

The motor starter checks all incoming parameters for validity and plausibility.
In the case of incorrect parameters

- During starting (after Power ON), the messages "Group fault" and "Invalid parameter value" are set.
  The motor and the brake output remain switched off.
- During operation, the messages "Invalid parameter value" or "Parameter assignment not possible in ON state" are set. "Group fault" is not set.
  The motor and the brake output are not switched off.

Note

The currently valid parameter values are retained.

3.10.4 Message output

Message	Meaning
General messages	
Ready (automatic)	Device can be activated via the BUS (e.g. PLC).
Group fault	At least one fault is set.
Group warning	At least one warning is present.
Group prewarning	At least one pre-warning is present.
Process image error	The process image of the outputs contains an illegal bit combination, e.g. motor CW and motor CCW set simultaneously.
Fieldbus interface	
Bus error	Fieldbus interface threshold monitoring expired.
CPU/Master STOP	PLC program is no longer processed.
Acknowledgment	
Trip reset executed	Trip reset accepted; that is, error/fault has been acknowledged.
Trip reset not possible	Fault could not be acknowledged since the cause of the tripping is still pending.
Mode monitoring	
Automatic mode	Automatic (PLC controls)
Manual bus mode	Manual mode via fieldbus (HMI controls)
Manual local mode	Manual local mode: • Manual mode via Motor Starter ES • HMI controls • Input controls
Connection abort in manual mode	During manual mode, the relevant communication connection was interrupted for more than 5 seconds.
Parameter assignment	
Parameter assignment active	Yes/No
Invalid parameter value[1)]	Parameter not correct
Parameters cannot be changed in ON state [1)]	Attempt to change parameters while motor is is running not permissible.
Parameter number error[1)]	Specifies the first unaccepted parameter (object number of the parameter).
Parameters disabled CPU/master active	Motor starter ignores parameters from the PLC but informs the PLC that the parameters are in order.
No external startup parameters received	No new parameters have been received from the PLC after Power ON or restart of the motor starter.
Statistical data	
Maximum pointer deleted[1)]	Preventive diagnosis statistical data has been reset.
[1)] Message bits that can be deleted with trip reset	

3.11 Trace functions

Description

Data, events, measured values, etc. can be recorded and saved in the time history using the trace function. They can then be represented in graphical form with the help of a PC and Motor Starter ES (from SP2).

Tracing can be started/stopped either by command or automatically (Power On).

Up to 4 channels can be recorded.

Sampling rate

The sampling rate defines the time intervals between recordings of the individual measuring points, and thus indirectly also the recording duration.

Memory size

The value of this parameter refers to the percentage of the maximum memory size. In the case of values < 100%, the measured value memory is reduced equally for each channel used. The recording time can be reduced in this way.

Pretrigger

This parameter enables signals to be recorded before a trigger event.

- 0% means no recording of the previous history
- 50% means recording of 50% of the previous history and 50% of the subsequent history
- 100% means recording only before the trigger event

Trigger event

The motor starter supports the following trigger events:

- No trigger event (= deactivated)
- Restart (Power ON)
- Group fault/group warning/group prewarning
- Beginning/end startup
- Beginning/end coasting down
- Input IN1 to IN4
- Output OUT1/OUT2
- Output BO[1)] (physical braking output)
- Motor CW/motor CCW
- Brake[1)]
- Trip reset
- Emergency start
- Self-test
- Cold run

[1)] Only when starting with braking output

Note

The trigger event affects all 4 channels in common, that is, they cannot be triggered differently.

Trigger edge

With the help of this parameter, triggering can take place at a positive signal edge or an incoming event, or at a negative edge or outgoing event.

Trace start monitor

The recording can be started in two different ways:

- Trace start by command
  The trace function can only be started with the help of the trace command.
- Automatic trace start
  The recording is started automatically at switch-on or restart with the currently saved trace parameter values. Otherwise, the trace function behaves in the same way as "Start by command".

Channel x signal type (x = 1 to 4)

It is possible to record up to 4 signals. These 4 parameters enable separate selection of subsequent signals or events for each of the four recording channels.

- No signal (= deactivated)
- Phase current $I_{L1(rms)}$ to $I_{L3(rms)}$
- Asymmetry
- Motor heating
- Input IN1 to IN4
- Output OUT1/OUT2
- Heat sink temperature
- Phase current $I_{Lmax(rms)}$
- Output bypass

Messages

Message	Action
Trace recording in progress	-
Trigger event occurred	-
Trace recording stopped	-
Trace memory deleted	-

3.12 Emergency start

Description

Emergency start enables restart despite an internal trip command.

Emergency start is possible if

- There is an ON 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.
- ON command pending for the brake output. This is switched on (parameter "Brake release delay on starting" taken into account).

Emergency start is not possible if

- An OFF command is pending
- A device error is pending
  Message bit: "Self-test error", "Switching element defective"
- The self-protection function of the motor starter has responded
  Message bit: "Switching element overload"
- Switched/unswitched DC24V-S/DC24V-NS supply voltage missing
  Message bit: "No switching element supply voltage"
  "Electronic supply voltage too low"
- The blocking protection has responded
  Message bit: "Tripping due to motor blocking "
- A process image error is pending
  Message bit: "Process image error"

Control options for emergency start

- Parameter "Input n action" → "Emergency start" parameterized
- Commands "Emergency start ON", "Emergency start OFF"

Messages and actions

Message	Description
Emergency start active	Remains pending while emergency start is active, even if the motor and brake output are switched off.

3.13 Trip reset

Trip reset acknowledges all the faults that are currently present in the starter and that can be acknowledged. A fault can be acknowledged if its cause has been rectified or if it is no longer present.

The trip reset can be triggered by:

- Remote reset via bus interface (PIO DO 0.3 Trip reset)
- Remote reset via input action (if parameterized)
- Local reset via the device interface (hand-held device or ES tool)
- Local reset via the key-operated switch (0 position; order variant)
- Power-On reset (DC24V-NS switched on and off again) only if protection against voltage failure is deactivated (parameterizable).
- Reset via disconnecting means
  Please set the rotary encoding switch from 0 to 1 for this purpose.

You can find more information in Chapter Acknowledging faults (Page 167).

3.14 Self-test

Description

Three types of self-tests can be carried out:

- Self-test at start-up:

  This is automatically selected when the device is switched on or initialized.
- Self-test during operation:

  The motor starter monitors specific device components cyclically and signals any pending faults.
- Self-test on request

  The self-test can be started via the process image (DO 0.5).

Test steps

The self-test comprises 3 test steps. The test steps are followed in dependence of the signal duration of the test command:

Test step	Signal duration	Test scope	Explanations
1	< 2 s	LED test	All LEDs are switched on for 2 seconds! • User check, no message bit
2	2 to 5 s	Hardware test	The hardware of the motor starter is tested; Current measurement indicated by the "DEVICE" LED: • Current flowing: flashing red • Current not flowing: flickering red • User check, no message bit
3 [1)]	> 5 s	Trip	Switching elements are switched off.

[1)] This test step is only executed in manual mode

Self-test error

If an error occurs, the "DEVICE" LED lights up red. The error can only be acknowledged by switching the device off and then on again. If the error is still present, the self-test will return an error again when the device is switched on. In this case, the motor starter must be replaced.

Messages and actions

Messages	Actions
Self-test active	-
Self-test ok	-
Self-test error	-

Note

Specific device components are monitored continuously (internally) by the motor starter and the results signaled with the self-test messages. The message "Self-test error" can also appear in the case of an internal monitoring fault without the self-test having been activated.

3.15 Factory settings

Description

The factory setting restores the settings of the motor starter as supplied, that is, the motor model is deleted, faults are reset (if possible), and the operating hours counter is deleted, etc.

This provides the option of resetting the motor in the event of incorrect parameterization.

Note

Current maximum pointer and statistical data are not deleted.

Restoring factory settings

- With the "Factory settings" command (via data set 93 or Motor Starter ES).

  This is only possible if the "Manual" mode is set and the switching elements are switched off.

- With the disconnecting means
  Turn the knob of the disconnecting means within the specified time window of 2 to 4 seconds to the positions ON and OFF as shown in the time diagram below, and monitor the LEDs on the motor starter as you do so.

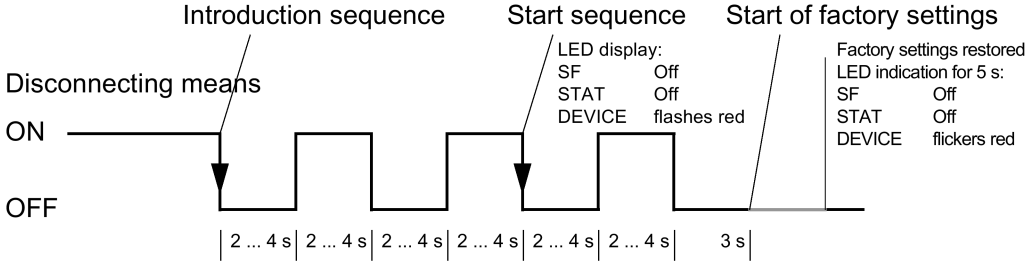


Figure 3-10 Factory settings

The introduction sequence prevents accidental resetting to the factory setting values. The factory setting operation is introduced with the beginning of the start sequence. The LEDs behave as follows here:

- SF off
- STAT off
- DEVICE flashes red

When the factory setting is restored, the LEDs behave as follows for 5 seconds:

- SF off
- STAT off
- DEVICE flickers red

Messages and actions

Messages	Meaning
Factory settings restored [1)]	All parameters now again have the values set at the factory.

[1)] Message bits that can be deleted with trip reset

3.16 Main power monitoring

Description

With electronically switching motor starters with soft starting, the main power is monitored for the following:

- Supply voltage
- Phase failure
- Rotational direction of line frequency

Messages and actions

Message	Action
No supply voltage	ON command generates faults
Phase failure L1	ON command generates faults
Phase failure L2	ON command generates faults
Phase failure L3	ON command generates faults
Rotational direction of line frequency right	—
Rotational direction of line frequency left	—

3.17 Electronic/mechanical switching

Electronic switching

The motor starter controls the motor (two phases) with thyristors. Phase L1 is not switched but is instead looped through from the 400 V power connection to the motor connection via the integrated disconnecting means.

⚠ DANGER

Hazardous Voltage

Can Cause Death or Serious Injury.

If the line voltage is present at the 400 V power connection of the motor starter, hazardous voltage may still be present at the motor starter output even if a start command has not been issued.

When carrying out any work on the branch, make sure that you disconnect it via the disconnecting means.

Mechanical switching

The motor starter controls the motor in 3 phases with contactors.
On device versions with a rated operating current of 0.15 - 2A (3RK13..-6KS41) RC elements for damping interference pulses are integrated on the outgoing side of the motor.

Switching element defective

If a switching element is defective (contactor welded / thyristor failure), the motor starter cannot shut down the motor.

Note

If necessary, evaluate the message "Switching element defective" and shut down the branch on the basis of this by means of an upstream switching element.

Messages and actions

Message	Action
Switching element defective	Trip (if possible)
Switching element short-circuited (e.g. contactor contact welded, power semiconductor fused)	Trip (if possible)
Switching element overload (e.g. power semiconductor too hot)	Trip
Motor CW	—
Motor CCW (on reversing starters only)	—
Electronics supply voltage too low	—
No switching element supply voltage	Trip (acknowledgment of voltage recovery)
Ready for motor ON	Dependent on parameterization

3.18 Cold run

Description

This function enables activation of the motor without main power supply. 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.

Note

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

The "cold run" function can be activated as follows:

- Input action "cold run"
- Commands: Cold run ON /OFF

If the "cold run" function is active, the motor switches off if

- A current flow is detected
- Main power supply is detected.

Messages and actions

Message	Action
Cold start active	—
Cold start tripping	Tripping (acknowledgment via trip reset)

3.19 Local device interface

Description

The local optical device interface can be used to connect the motor starter to a PC or hand-held device (order no.: 3RK1922-3BA00; RS232 interface cable: 3RK1922-2BP00 or USB interface cable 6SL3555-0PA00-2AA0). This control source has the highest priority.

To stop the fiber-optic cable for the device interface from getting dirty, it is located under the removable unit labeling plate.

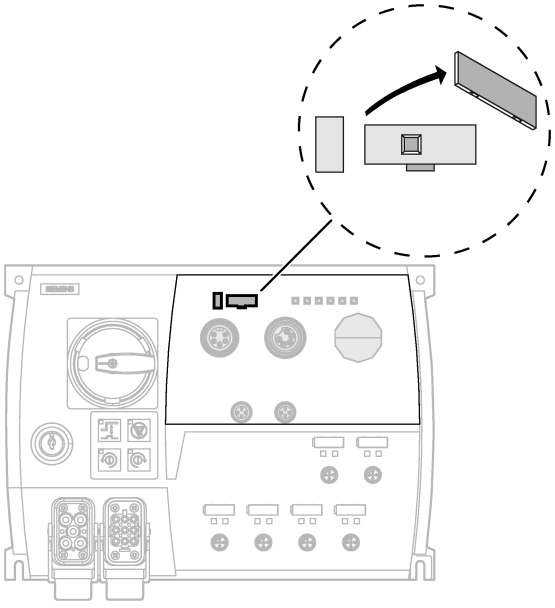


Figure 3-11 Optical device interface

Note

To ensure that data can be transferred without any problems, make sure that the device interface is clean at all times.

3.20 Integrated manual local control

Integrated manual local control (ordering option) for the M200D motor starter involves a key-operated switch and a keypad with four pushbuttons.

Key-operated switch

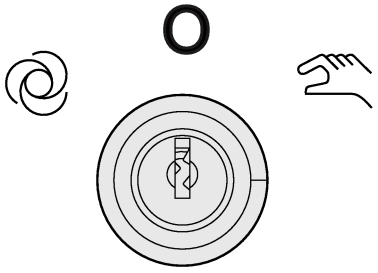


Figure 3-12 Key-operated switch

The key-operated switch can be set to three different positions.

Position	Meaning	Function
	Automatic mode	The pushbuttons on the keypad have no function. The LEDs on the "quick stop disable", "RIGHT", and "LEFT" pushbuttons, however, are active. They are used for indicating the status (= status of control via the PIO).
	Manual mode	Control priority is assumed by a lower-priority control source (automatic mode) and transferred to the keypad. When you switch back to "Automatic mode", control priority is always initially passed to the CPU/master.
	OFF / Reset	When "exiting" this switch position (both after automatic and after manual mode), any pending fault is acknowledged. This reset is carried out regardless of the current operating mode. The motor starter does not execute any control commands in this position (regardless of the control source).

Note

The key can be inserted/removed in any position.

Keypad

The keypad has four pushbuttons arranged in a square.

Note

They are only active when the key-operated switch is set to manual mode.

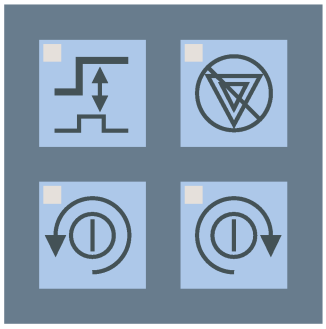
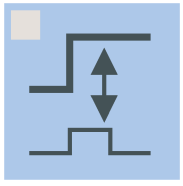
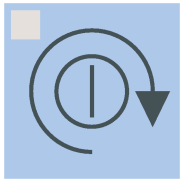
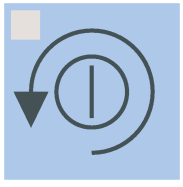


Figure 3-13 Keypad

Pushbutton	Meaning	Function
	Continuous operation / jog mode	The mode switches every time you press this pushbutton (continuous / jog). "Continuous" mode is indicated via the corresponding LED (yellow, lit up) (in manual mode only). When manual mode is deactivated, the system is reset to jog mode.
	Quick stop disable	The "quick stop" input actions are deactivated for all inputs. This pushbutton is active in jog mode and continuous operation. In continuous operation, the "quick stop disable" function can be activated by pressing the pushbutton once and deactivated by pressing it again. The yellow LED lights up regardless of the operating mode (as long as the function is active).
	Clockwise rotation	The main circuit for CW operation is activated. In continuous operation, the main circuit can be activated by pressing the pushbutton once and deactivated by pressing it again. With reversing starters, an ongoing action can also be interrupted in continuous operation by pressing the "CCW rotation" pushbutton. The green LED lights up regardless of the operating mode (as long as the selected function is active).
	Counterclockwise rotation	This pushbutton is only enabled for reversing starters. The main circuit for CCW operation is activated. In continuous operation, the main circuit can be activated by pressing the pushbutton once and deactivated by pressing it again. In continuous operation, an ongoing action can also be interrupted by pressing the "CW rotation" pushbutton. The green LED lights up regardless of the operating mode (as long as the selected function is active).

Note

If the "CW rotation" and "CCW rotation" pushbuttons are pressed simultaneously, this is classed as an operation fault. A function cannot be restarted. A function that is being executed is interrupted (the starter shuts down).

A function cannot be restarted until both pushbuttons have been released.

Note

When the "CCW rotation" or "CW rotation" pushbuttons are actuated, a connected brake is also always actuated.

3.21 PROFIenergy

3.21.1 What is PROFIenergy?

PROFIenergy (PE)

PROFIenergy (PE) supports the following two functions:

- PE_Energy_saving_function

  Supports the purposeful tripping of loads during idle times.

- PE_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 objective of an energy management system is to economically and ecologically optimize the use of energy within a company, from the purchase of energy through to energy consumption. The PE_Measured_value_function provides the measured values required for optimization.

3.21.2 PROFIenergy (version V1.0) in the M200D PROFINET motor starter

The M200D PROFINET motor starter supports the "PE_Energy_saving_function" and "PE_Measured_value_function" for the motor current. These are identified as commands, since they trigger reactions in the M200D motor starter.

In addition, the M200D motor starter also provides so-called services, which provide information on the status of the motor starter as defined in PROFenergy. These can then be evaluated and further processed in the user program.

Commands

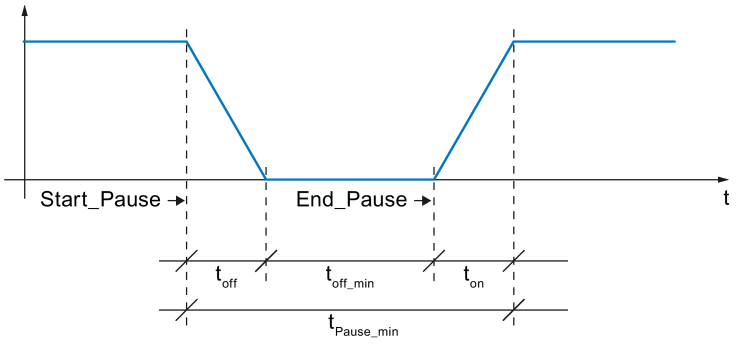
The following commands are supported:

Control commands	
Start_Pause	The starter switches to energy-saving mode.
End_Pause	The starter switches back to operating mode.

Status commands	
PE_Identify	Provides a list of supported PROFIenergy commands/functions.
PEM_Status	Shows the status of the current PE mode.
Query_Modes	
List_Energy_Saving_Modes	Provides a list of supported energy-saving modes.
Get_Mode	Provides the parameter values with which the PE_Energy_saving_function works.
Query_Measurement	
Get_Measurement_List	Provides a list of supported PE_Measured_values
Get_Measurement_Values	Shows the supported PE_Measured_values

The M200D motor starter distinguishes between two different statuses for data transmission:

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 power saving mode. This time is always 100 ms for M200D. A parameterized running down time is added to this in the case of a soft starter (if available and if the starter was in the ON state): t_{off} = 100 ms + running down time If the soft starter was already off before the pause, pause mode will be switched to after 100 ms only.
t_{off_min}	Time_min_length_of_stay	Minimum time that the device spends or should spend in saving mode. For M200D: 0 ms
t_{on}	Time_to_operate	Time that will elapse before the starter changes back to the operating state. Since the process image is evaluated again immediately when the M200D exits power saving mode, this time is 0 ms.
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.

"PE_Measured_value_function" command

To guarantee efficient energy management, measured energy values must be provided. Various measured values are made available for selection from the PROFIenergy specification, which are each assigned a measured value ID. The M200D 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. Measured value IDs 7, 8, 9 and 33 are supported:

- ID = 7: Instantaneous value of the phase current a (L1)
- ID = 8: Instantaneous value of the phase current b (L2)
- ID = 9: Instantaneous 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 under the following tolerances:

- Accuracy Domain (unsigned8) = 0x01 → percent of full-scale reading
- Accuracy Class (unsigned8) = 0x11 → 3 %
- Range (Float32) = I_{e_max} (fixed value parameter)

The result is that the measured values are transferred with an accuracy of 3%, based on the maximum rated operational current I_e that can be set.

Local LED display on the M200D motor starter

The "Energy-saving mode active" status is indicated by the flashing Device LED (flashing frequency: 0.25 s on / 1.75 s off → unique flashing rhythm for energy-saving mode).

Note

A pending fault is not acknowledged by switching to energy-saving mode, i.e. the pending fault is saved internally and can be read out. When exiting energy-saving mode, the fault must be eliminated and acknowledged.

The status display for the bus and the supply voltages and the SF LED are not influenced by the active energy-saving mode.

Reaction of the starter when energy-saving mode is activated:

Shutdown of the motor by suppression (masking) of the PIO bits Motor CW, Motor CCW, BRAKE. The other PIO bits (e.g. Trip Reset) remain active.

Interactions with the various modes

- PE is operative only in Automatic mode.
- Manual mode is not influenced by PE; → it is still possible to switch to manual mode and thereby to control the motor manually.
- Both cyclic and acyclic data transmission (PII, data records, 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.)

It is only possible to switch to the "Pause" energy-saving mode 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 in order to switch off the main energy for the motor.

In the case of a soft starter, a parameterized deceleration ramp for the device-specific minimum idle time must be added.

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

In the Motor Starter ES 2007 diagnostics tool, the switch to energy-saving mode is entered in the logbook with the event ID 1520.

Prerequisites for the "PROFIenergy" function

In order for an M200D PROFINET to be able to communicate via the PROFIenergy PNO profile, the following prerequisites must be met:

Motor starter module	3RK1395-… :	Product version E06 or higher (BS01 Z07)
Communication module	3RK1335-… :	Product version E02 (V41.0.2) or higher

If at least one of the two modules is used with an older product version, PROFIenergy commands are negatively acknowledged.

How do I use PROFIenergy with M200D?

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

These can be found on the Internet under the following link:

Application example for PROFIenergy. See Service & Support on the Internet (http://support.automation.siemens.com/WW/view/en/41986454)

Additional information

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

3.22 Logbook

Description

The logbook contains a chronological list of triggering operations, device errors, and events, which are assigned a time stamp and can be used to create a log. The log is stored internally so that the causes can be evaluated at a later stage.

Logbooks

Three types of logbook are available. They can be read as data sets:

- Logbook - Triggering operations Data set 73
- Logbook - Events: Data set 75
- Logbook - Device errors: Data set 72

The current value "Operating hours - device" is entered as the 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. The entries can be read out with the relevant data sets.
The logbook is designed as a circular buffer. After 21 entries, the oldest entry is overwritten.

Logbook - Triggering operations

The "Logbook - Triggering operations" contains all the group faults. The object numbers of the actual fault causes are entered, e.g. "Switching element overload".
Note that the "Logbook - Triggering operations" is deleted with the command "Delete Logbook - Triggering operations"

Logbook - Events

The "Logbook - Events" contains all the warnings as well as certain actions.

Observe the following:

- "Incoming" and "outgoing" events are entered:
  "Incoming" means: The event is occurring.
  "Outgoing" means: The event is acknowledged.
  The entries are differentiated in the data set by means of the sign:
  (+: Incoming, –: Outgoing).
- The "Logbook - Events" is deleted with the command "Delete logbook - Events".

Logbook - Device errors

The "Logbook - Device errors" records all occurring device errors.
Please note that the "Logbook - Device errors" cannot be deleted.

Mounting / connection

4

4.1 Mounting

4.1.1 Mounting rules

DANGER

Hazardous Voltage

Can Cause Death, Serious Injury, or Property Damage

Before starting work, disconnect the system and devices from the power supply.

Simple mounting

The distributed M200D motor starter is designed for simple mounting. Carry out the following steps:

1. If you use the protection guard (accessory), start with its assembly,
   see Chapter Installing the protection guards (Page 96).
2. Install the motor starter module on a flat surface
   see Chapter Installing the motor starter (Page 97).
3. Connect to functional ground,
   see Chapter Connecting to functional ground (Page 98).
4. Then mount the communication module on the motor starter module (3RK1395), see Chapter Installing the communication module (Page 99).
   - PROFIBUS communication module (3RK1305)
   - PROFINET communication module (3RK1335)

Installation position and dimensions

The M200D motor starter is suitable for the following installation positions on a flat surface:

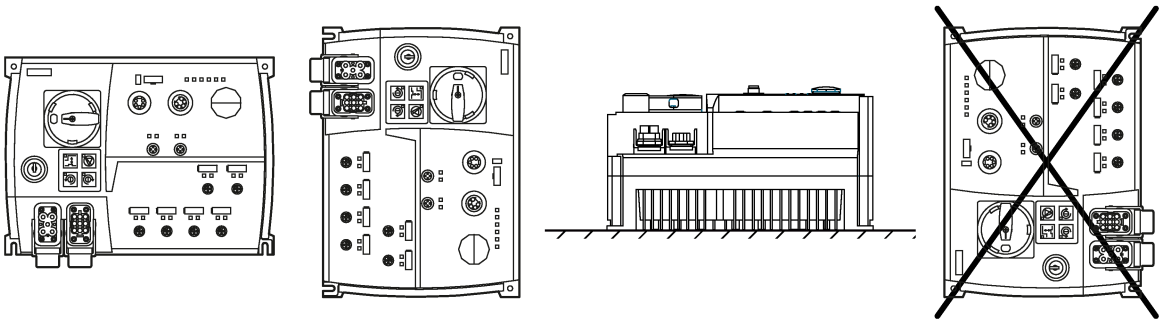


Figure 4-1 Installation positions: horizontal, vertical, flat; must not be positioned as shown on the right

Please note the following external dimensions when mounting the motor starter:
HxWxD: Approx. 294 x 215 x 162 mm

4.1.2 Derating

What is derating?

Derating allows devices to be used even in harsh operating conditions by selectively restricting the output capacity.

Derating factors

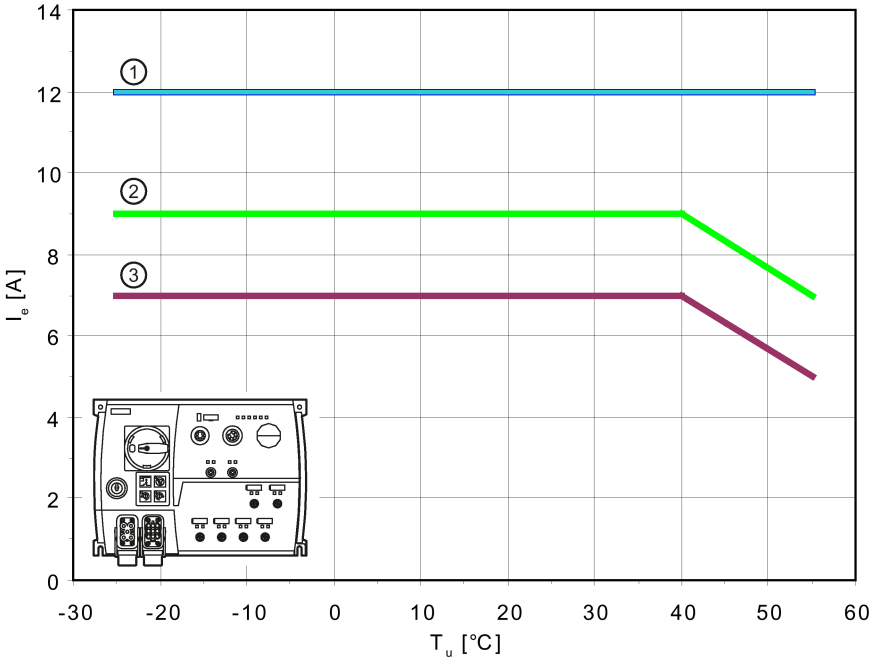
When M200D motor starters are operated under harsh ambient conditions, the following factors must be taken into account:

- Ambient temperature T_a:
  - The ambient temperature T_a is the temperature of the air surrounding the motor starter enclosure.
    The lower the maximum ambient temperature T_a, the higher the current load on the motor starter can be.
  - The installation position affects how quickly the motor starter cools.
- Absolute current load:
  - The lower the current flowing through the motor starter, the lower the power loss (= heat) inside the device. If a small amount of self-heating occurs, the ambient temperature T_a can be higher.
  - In the case of soft starters in which the soft start function has been deactivated, the maximum permissible rated operating current I_e is restricted to 9 A (≡ electronic direct starter; sDSte).
- Installation altitude

  If the installation altitude exceeds 1,000 m, a reduction to the rated operating current is required for thermal purposes. For more details, refer to the technical specifications: Installation altitude (Page 169)

Derating diagrams

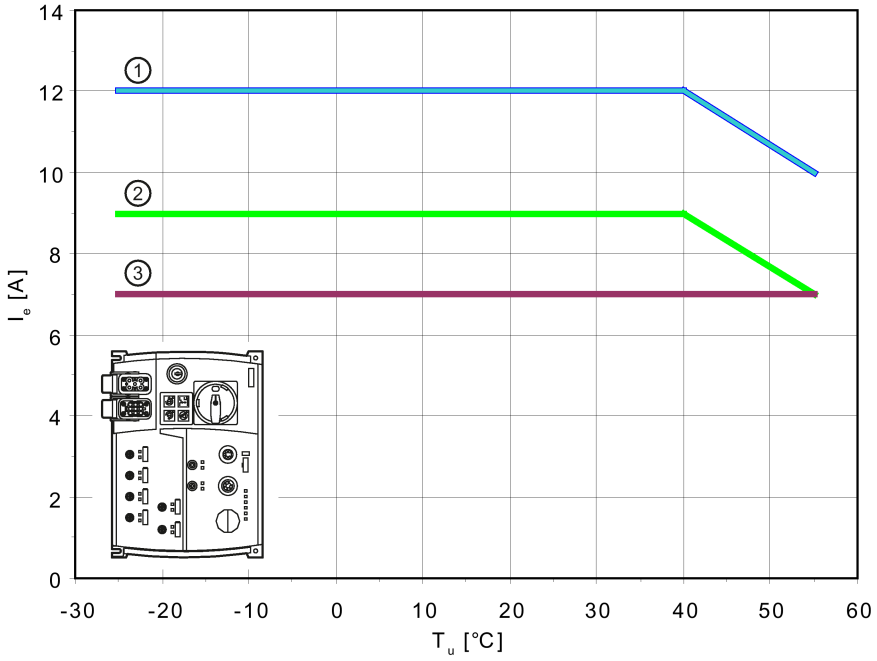
You can use the following diagrams to determine the derating factors for horizontal, vertical, or flat mounting.



① DSte, RSte, sDSSte, sRSSte with bypass in "soft start" startup mode (from 7 A)
② sDSSte, sRSSte with bypass in "direct" startup mode (from 7 A)
③ sDSSte, sRSSte without bypass in startup mode "Direct" and "Soft start"

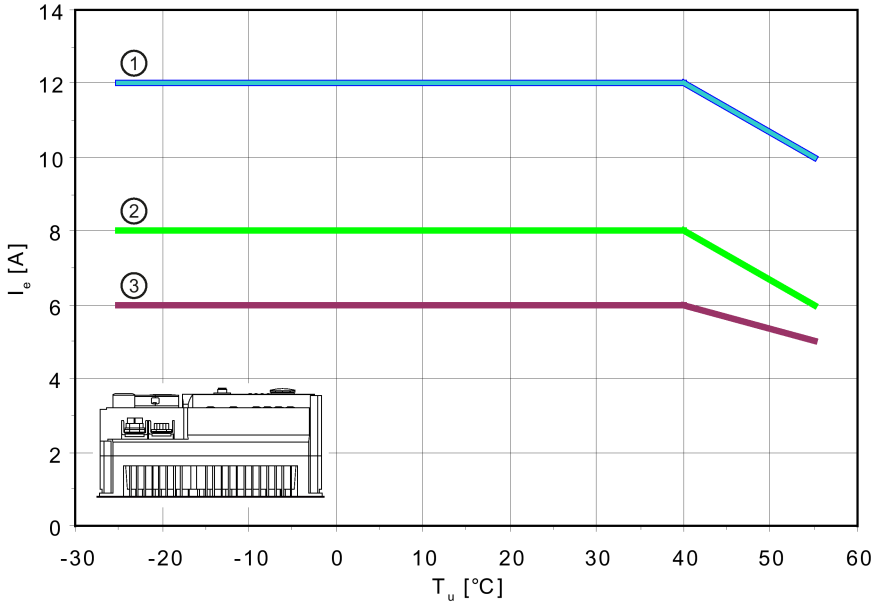
DSte, RSte = electronic starter
sDSSte, sRSSte = electromechanical starter

Figure 4-2 Derating for horizontal mounting



① DSte, RSte, sDSSte, sRSSte with bypass in "soft start" startup mode (from 7 A)
② sDSSte, sRSSte with bypass in "direct" startup mode (from 7 A)
③ sDSSte, sRSSte without bypass in startup mode "Direct" and "Soft start"

Figure 4-3 Derating for vertical mounting



① DSte, RSte, sDSSte, sRSSte with bypass in "soft start" startup mode (from 7 A)
② sDSSte, sRSSte with bypass in "direct" startup mode (from 7 A)
③ sDSSte, sRSSte without bypass in startup mode "Direct" and "Soft start"

Figure 4-4 Derating for flat mounting

Motors with a high efficiency and high motor starting currents

High starting currents may have to be taken into consideration when using motor starters on high-efficiency motors. Motor starters are designed for motors with a maximum 8-fold starting current in accordance with IEC 60947-4-2.

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

Motor starter version I_e [A] at 40 °C max. motor starting current	3RK1395-6KS*	3RK1395-6LS41*	3RK1395-6LS71*
<= 8-fold I_e	2 A	12 A	12 A
9-fold I_e	1.7 A	10 A	8 A
10-fold I_e	1.5 A	9 A	7 A

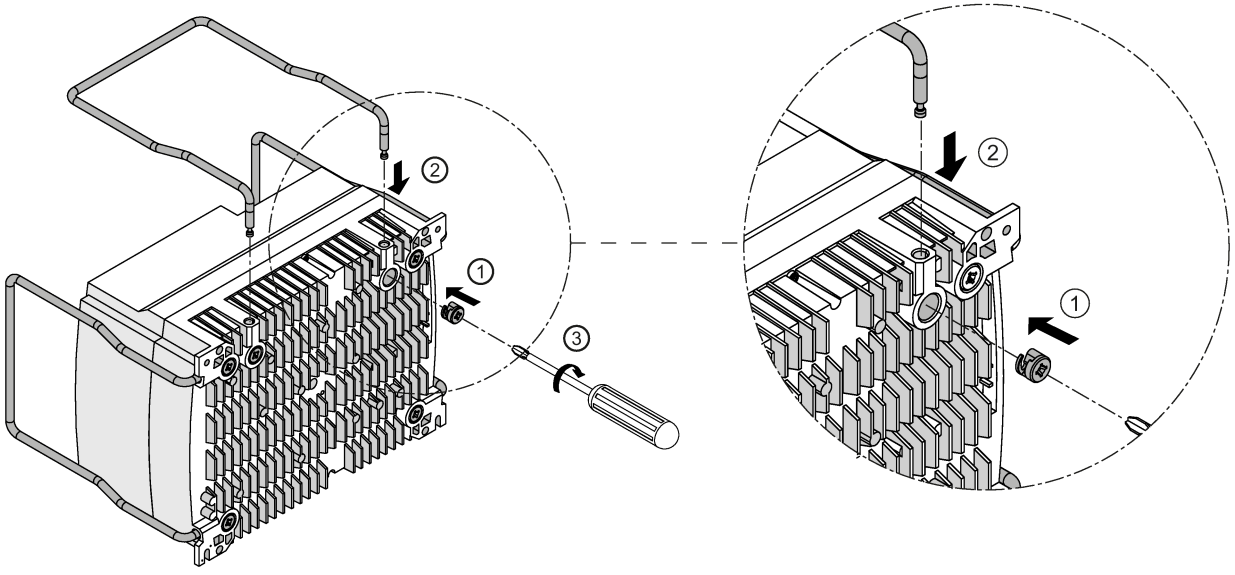
4.1.3 Installing the protection guards

Protection guard (accessory)

NOTICE
The protection guards are designed for a maximum load of 10 kg.

To prevent mechanical damage to the motor starter cables and connections, you can install protection guards on the side and top (order no.: 3RK1911-3BA00).

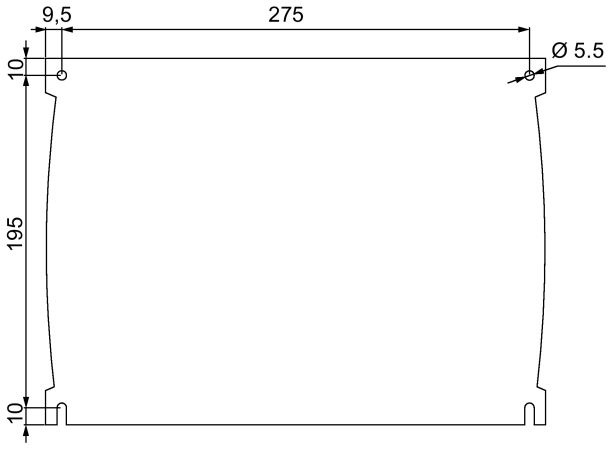
To secure the protection guards, the angled ends can be used as clamping bolts, which are secured in the device base by means of eccentric elements.



①	Insert the eccentric elements in the locating holes on the bottom of the motor starter. Make sure that the holes are aligned for the protection guards.
②	Push the ends of the protection guards into the holder until they engage.
③	Turn the eccentric elements clockwise until the protection guard is secure.

4.1.4 Installing the motor starter

Carry out the following steps to install the motor starter:

Step	Description
1	Find a flat surface for mounting the device.
2	Drill four holes for the screws. 
3	Secure the motor starter using four screws (M5). If necessary, use plain washers and spring washers. The tightening torque must not exceed a maximum of 2.5 Nm.

4.1.5 Connecting to functional ground

The motor starter must be connected to functional ground. The connection to functional ground is required to discharge interference and ensure EMC resistance. Unlike the protective conductor, functional ground does not offer protection against electric shock. It is crucial for the EMC of the motor starter and must be laid separately.

The contact plate at the fixing point on the bottom right is connected to functional ground within the device. This connection must be connected to the ground potential with as little resistance as possible.

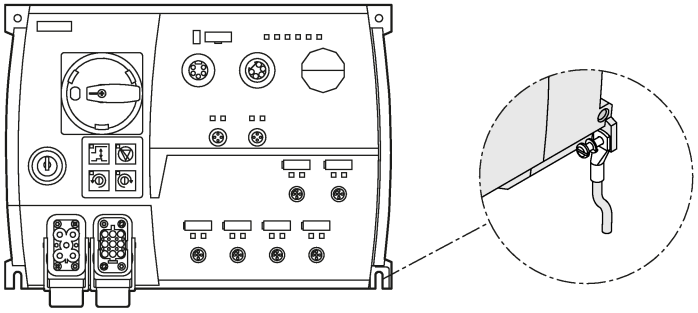
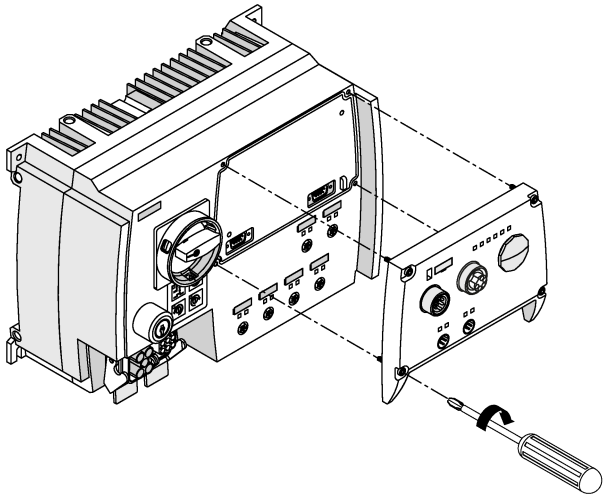


Figure 4-5 Connection for functional ground

If you do not install the motor starter on a grounded, conductive base, you have to establish a connection with the ground potential (grounding cable with cable lug, spring washer, and plain washer).

4.1.6 Installing the communication module

Carry out the following steps to install the communication module:

Step	Description
1	Insert the connection module onto the motor starter module.
2	Secure the communication module on the motor starter module with the 4 captive screws.  PZ 2; 2 Nm

4.1.7 Replacing the communication module

Device replacement

It is possible to replace a communication module during operation.

In so doing, the system behaves as follows:

- The device is disconnected from the bus. Communication with downstream devices is not interrupted.
- Forwarding of the supply voltage is not interrupted.
- In the case of M200D PROFINET, a removal interrupt is generated in the unplugged state. When reconnected to a motor starter module, an insertion interrupt is generated.

Indicators on the device

When unplugged, the following LEDs light up:

- SF (red)
- DC 24V-S
- DC 24V-NS

4.1.8 Setting the PROFIBUS DP address and terminating resistor

Introduction

Set the PROFIBUS DP address and terminating resistor at the communication module.

- The PROFIBUS DP address defines the point of access to the motor starter on PROFIBUS DP.
- Each PROFIBUS DP segment must be terminated at both ends with a wave impedance, i.e. at the first and last node of the segment. If the M200D PROFIBUS motor starter is the last PROFIBUS DP node, you must enable the integral terminating resistor. If you activate the terminating resistor in the middle of a DP segment all the following DP nodes will be disconnected. If you are servicing the system you can use this function to locate errors by a selective activating / deactivating of the terminating resistors of the other DP nodes.

Requirements

- Valid PROFIBUS DP addresses are 1 to 125.
- All PROFIBUS DP addresses must be unique.
- The set PROFIBUS DP address must correspond with that defined in the configuration for the M200D PROFIBUS motor starter.

Required tools

- 2.5-mm screwdriver
- 32-mm open-ended spanner

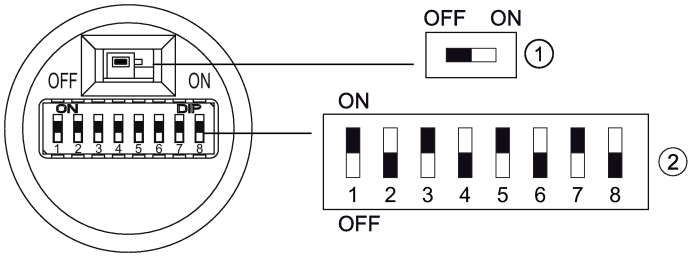
Setting the PROFIBUS DP address at the communication module and activating the terminating resistor

1. Remove the screw cap from the communication module.
2. Set the PROFIBUS DP address using the DIP switches (see the example).
3. If the PROFIBUS DP is the last node on this system, enable the terminating resistor using the DIP switch.
4. Turn the cap on the communication module again (torque: 1 Nm to 1.5 Nm).

Note

If the terminating resistor is enabled, PROFIBUS DP is terminated.

Example



① Enabling and disabling the terminating resistor

② Setting PROFIBUS DP address 1 to 125

Figure 4-6 Setting the PROFIBUS DP address and the terminating resistor

The following PROFIBUS DP address is set on the DIP switch: 1 + 4 + 16 + 64 = 85

1 (≙ 1)	2 (≙ 2)	3 (≙ 4)	4 (≙ 8)	5 (≙ 16)	6 (≙ 32)	7 (≙ 64)
ON	OFF	ON	OFF	ON	OFF	ON

Note

Any modification of the PROFIBUS DP address is not validated unless you cycle the electronic/encoder power supply off and on.

Note

Invalid address 127

If the invalid address 127 is set using the DIP switch, the motor starter signals "Group fault" and "Invalid parameter value".
Please set a valid address (1 to 125) to acknoweldge the error!

4.2 Connection

4.2.1 Solution Partner

More connection technology products can be found in "Siemens Solution Partners" (www.siemens.com/automation/partnerfinder) under "Distributed Field Installation System".

The **Solution Partner Program** provides you with a complete range of connection methods in all the versions available from your preferred suppliers. This gives you the competitive edge with cost-effective cables in any length and design.

4.2.2 Required components/cables

Selecting the power cables

⚠ DANGER

Hazardous Voltage
Can Cause Death, Serious Injury, or Property Damage

Before starting work, disconnect the system and devices from the power supply.

The cross-section of the power cables must be suitable for the prevailing ambient conditions. The following factors determine the cross-section:

- The current set on the device
- The cable installation type
- The ambient temperature
- The type of material (PVC, rubber)

The following maximum current-carrying capacities apply for PVC power cables when installed, for example, in the cable duct (depending on the ambient temperature):

Cross-section	T_U = 30 °C	T_U = 40 °C	T_U = 45 °C	T_U = 50 °C	T_U = 55 °C
1.5 mm^2	14 A	12.2 A	11.1 A	9.9 A	8.5 A
2.5 mm^2	19 A	16.5 A	15.0 A	13.5 A	11.6 A
4.0 mm^2	26 A	22.6 A	20.5 A	18.5 A	15.9 A
6.0 mm^2	33 A	28.7 A	26.1 A	23.4 A	18.2 A

Unused connections

Note
Unused connections

Seal unused connections with sealing caps since this is the only way to ensure degree of protection IP65. The sealing caps of the digital inputs and outputs are mounted on the motor starter module as delivered.

The sealing caps are also available as accessories:

Item	Number	Order number
Sealing cap M12	10 pieces	3RK1901-1KA00
Sealing cap 7/8"	10 pieces	6ES7194-3JA00-0AA0

4.2.3 Prefabricating power cables

To prefabricate power cables, you require the following:

- A crimping tool for attaching the sockets and pins on the individual wires
- For infeed on motor starters
  Assignment of X1: see section Power terminal (Page 106):
  - A flexible Cu cable with 4 x 2.5 mm² / 4 mm² / 6 mm² (3 wire + PE)
    (for motor starters with 230 V AC brake output: 5-core cable; 3 wire + N + PE)
  - Han Q4/2 socket power connector

Item	Quantity	Order no.
Contact socket 2.5 mm², for Han Q4/2 sockets	5	3RK1911-2BE50
Contact socket 4 mm², for Han Q4/2 sockets	5	3RK1911-2BE10
Contact socket 6 mm², for Han Q4/2 sockets	5	3RK1911-2BE30
Crimping tool 4 / 6 mm²	1	3RK1902-0CW00

Consumer connection on the motor starter

For the assignment of X2, see Power terminal (Page 106):

- A flexible Cu cable with 1.5 mm² or 2.5 mm²
  - Without brake control: 3 wire + PE
  - With brake control: 5 wire + PE
  - With temperature sensor: 2 additional wires
  - Han Q8/0 pin power connector

Item	Order no.
Connector set, 8 X 1.5 mm², 9 pin, complete with PG16 cable entry	3RK1902-0CE00
Connector set, 8 X 2.5 mm², 9 pin, complete with PG16 cable entry	3RK1902-0CC00

4.2.4 Installing and wiring power connectors

⚠ DANGER

Hazardous voltage

Can Cause Death, Serious Injury, or Property Damage

Before starting work, disconnect the system and devices from the power supply.

Installa and wire the power connectors as follows:

Step	Procedure	
1	Route the cable through the cable gland, sealing insert (enclosed), and the connector housing. The sealing insert is available in the following gradings:	
	Permissible external diameter of the cable	Sealing insert
	7.0 to 10.5 mm 9.0 to 13.0 mm 11.5 to 15.5 mm	Green Red White
2	Strip the cable over a length of 20 mm.	
3	Strip the cores over a length of 8 mm.	
4	Secure the contact sockets/pins on the cores by crimping or soldering them.	
5	Sort the contact sockets/pins in the socket/pin insert in accordance with the assignments (see section Power terminal (Page 106)). The contact sockets/pins should not engage yet. Make sure that they are correctly assigned. Push the contact sockets/pins into the socket/pin insert until they engage. Use a suitable tool to remove contact sockets/pins that have already been installed (Han Q4/2: 3RK1902-0AB00, Han Q8/0: 3RK1902-0AJ00).	
6	Make sure that the position of the coding is correct, pull the cable back, and secure the socket/pin insert in the connector housing using the cross-recessed screws enclosed.	
7	Secure the cable gland. When doing so, make sure that the cable is not twisted against the connector housing.	

4.2.5 Power terminal

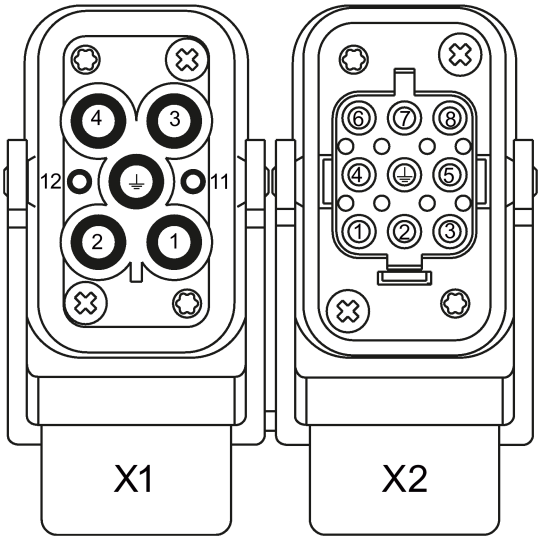
Wiring X1 (power supply) and X2 (motor connection)

The supply voltage is fed via power connector X1.

The motor is supplied via power connector X2.

Note

When inserting the pin/female contact insert into the connector housing, make sure that the coding is positioned correctly.

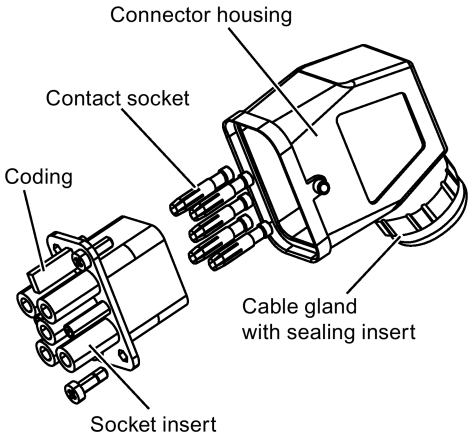
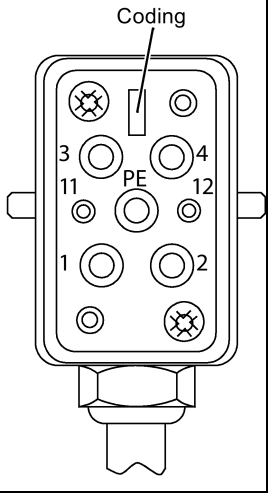


Pin	Connector X1	Socket X2 without brake	Socket X2 with 400 V / 230 V AC brake	Socket X2 with 180 V DC brake
1	Phase L1	L1 out	L1 out	L1 out
2	Phase L2	---	N (for 230 V AC brake)	---
3	Phase L3	L3 out	L3 out	L3 out
4	N	---	Brake L1 (switched)	Brake L1 (switched) "-"
5	---	2)	2)	2)
6	---	---	Brake L3 (direct, for 400 V AC brake)	Brake L3 (direct) "+"
7	---	L2 out	L2 out	L2 out
8	---	2)	2)	2)
11	1)	---	---	---
12	1)	---	---	---
⏚	PE	PE	PE	PE

1) Connector monitoring

2) Temperature sensor

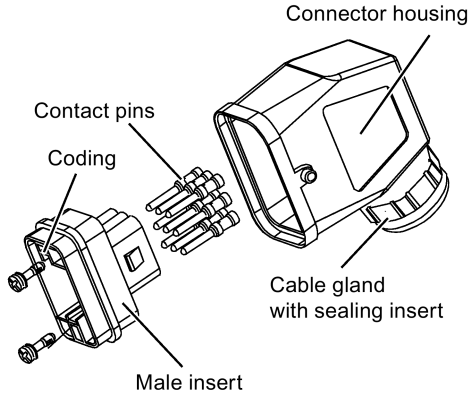
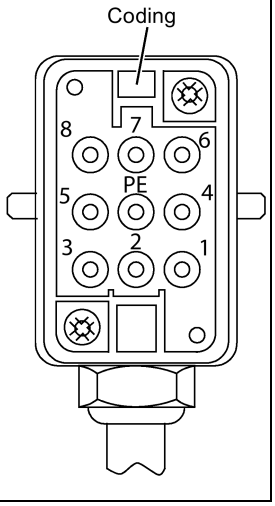
Power supply: Han Q4/2 socket (connection for X1)

	Socket	Assignment	
	1	Phase L1	
	2	Phase L2	
	3	Phase L3	
	4	N	
	11	Connector monitoring	
	12	Connector monitoring	
	⏚	PE (yellow/green)	

Note

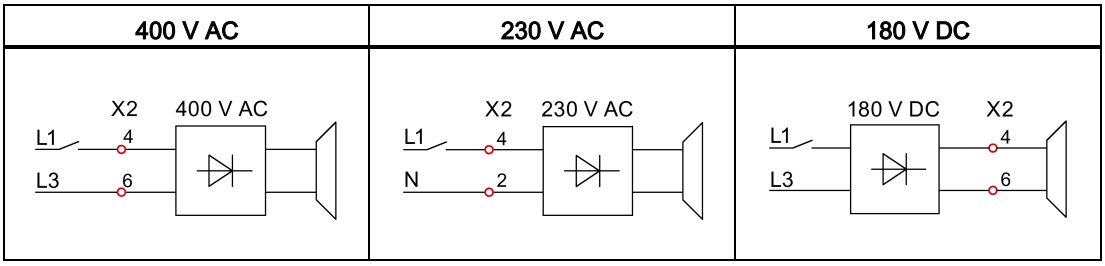
When you use the "connector monitoring" function, you have to connect pin 11 to pin 12 in the connector.

Motor connection Han Q8/0 pin (connection for X2)

	Pin	Assignment	
	1	L1 out	
	2	N[1)]	
	3	L3 out	
	4	Brake L1 (switched)[1)]	
	5	Temperature sensor	
	6	Brake L3 (direct)[1)]	
	7	L2 out	
	8	Temperature sensor	
	⏚	PE (yellow/green)	

[1)] See brake variants

Brake variants



Note

Please note the different pin assignment in the case of the operating voltages of the brake.

4.2.6 Brake output

M200D motor starters can be equipped with an optional electronic brake control (order variant). The brake control is suitable for externally-suppled brakes with the coil voltages shown below:

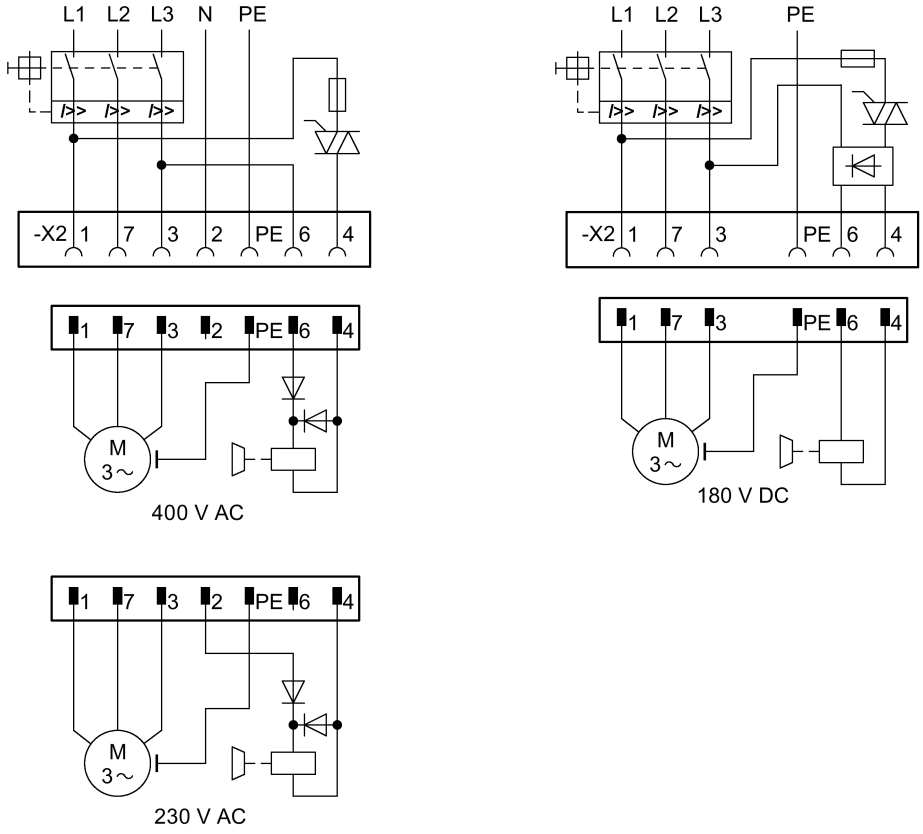
- 400 V AC / 230 V

  The brake rectifier must be installed in the motor. The rectifier input is controlled via the motor starter.

- 180 V DC

  A rectifier is not required for the brake in the motor because the 180 V DC is provided by the motor starter. In this way, brake coils for 180 V DC can be switched directly.

The brake output for the M200D motor starter



The brake voltage is fed to the motor together with the motor infeed via a joint cable (e.g. 6 x 1.5 mm^2).

⚠ WARNING

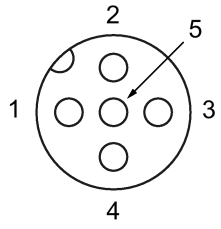
Hazardous Voltage

Can Cause Death or Serious Injury.

The brake is only switched in a single phase. This therefore means that voltage can be applied at pin 6 even when the system is switched off.

4.2.7 Inputs / outputs

Assignment of the digital inputs and outputs (M12 socket)

	Pin	Input assignment	Output assignment
	1	+ 24 V DC24V-NS (+)	N/C
	2	N/C	N/C
	3	0 V DC24V-NS (-)	0 V DC24V-S (-)
	4	DIx	OUTx
	5	FE	FE

4.2.7.1 Digital inputs IN1 to IN4

The motor starters are equipped with four digital inputs, which you can connect directly to sensors (PNP) (2 and 3-wire system).

Connectors (M12, 5-pin, A-coded) are used for this purpose. The motor starter is equipped with a range of sockets.

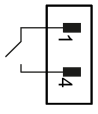
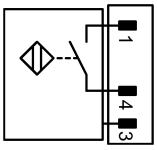
Note

Short-circuit hazard

Do not use an external power supply since this can result in a short-circuit.

Pin assignment

The following diagrams show examples of circuits (2 and 3-wire system):

2-wire system	3-wire system
	

Note

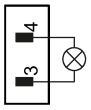
The supply voltage for the digital inputs is short-circuit proof. The current is limited to max. 200 mA. If a short-circuit or overload situation occurs in the sensor supply, the switching element (motor) and brake output are shut down and a group fault is output. You must acknowledge this fault with a trip reset.

4.2.7.2 Digital outputs OUT1, OUT2

The motor starter is equipped with two digital outputs that you can connect direct to an actuator.

The outputs can be loaded to max. 0.5 A and protected electronically against short circuits.

A connector (M12, 4 or 5 pin) is used for establishing the connection. The motor starter is equipped with a range of sockets.

Example: Connecting the digital output


4.2.8 Communication modules

4.2.8.1 PROFIBUS DP

Introduction

You connect the supply voltage and PROFIBUS DP at the M200D PROFIBUS communication module.

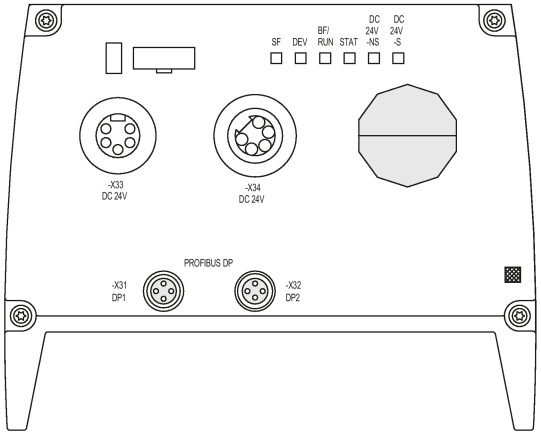


Figure 4-7 PROFIBUS DP communication module

-X33 24V DC	7/8" circular socket connector (with pin insert) for infeed of the DC 24V-NS electronic/encoder supply and the DC 24V-S load voltage supply
-X34 24V DC	7/8" circular socket connector (with socket insert) for looping through the DC 24V-NS electronic/encoder supply and the DC 24V-S load voltage supply
-X31 DP1	M12 circular socket connector (with pin insert) for supplying PROFIBUS DP
-X32 DP2	M12 circular socket connector (with socket insert) for looping through PROFIBUS DP

Requirements

- The communication module is mounted on the motor starter module as shown in Chapter Installing the communication module (Page 99)
- You have set the PROFIBUS DP address on the DIP switch according to your configuration. Further information: Setting the PROFIBUS DP address and terminating resistor (Page 100)

Required tools

- Screwdriver, (PZ 2; 2 Nm)
- Stripping tool for wiring the M12 and 7/8" cable connectors, if you are fabricating your own cables.

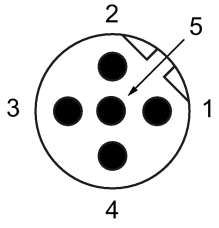
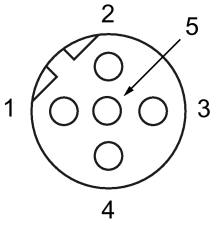
Required accessories

- Prefabricated cable with M12 and 7/8" cable connectors The cables are available in different lengths.
- If you are fabricating your own cable:
  - M12: 2-core, shielded bus cable, and b-coded M12 cable connectors
  - 7/8": 4-core cable with 7/8" cable connectors

Pin assignment of the M12 and 7/8" cable connectors

PROFIBUS connection (M12)

Coding (M12 B-coded)

Pin (infeed)	Socket (routing)	Pin	Assignment
 M12-B		1	Power supply plus (5 V)
		2	Data line A
		3	Data reference potential (0 V)
		4	Data line B
		5	Functional ground (FE)

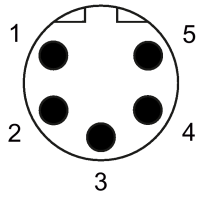
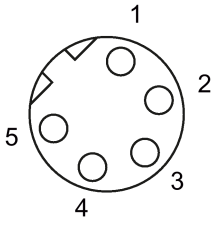
Note

The voltage must not be looped through to the next plug connector using a cable.

Note

The functional ground is to be connected via the M12 thread (because it has a larger surface area than terminal 5).

Auxiliary voltage connection (7/8")

Pin (infeed)	Socket (routing)	Pin	Assignment
		1	Switched 0 V (24V-S DC (-))
		2	Unswitched 0 V (24V-NS DC (-))
		3	—
		4	Unswitched + 24 V (24V-NS DC (+))
		5	Switched + 24 V (DC 24V-S (+))

Connecting M12 and 7/8" cable connectors

Note

The current of the 7/8" connectors must not exceed 7 A!

1. Plug the M12 and 7/8" cable connectors into the corresponding circular socket connectors on the communication module. Ensure that the locking mechanism between the connector and socket is properly applied.
2. Secure the connectors by tightening the knurled ring nut.

NOTICE

It is not permissible to remove the 7/8" cable connectors while M200D PROFIBUS is in operation! Always switch off the 24V-NS DC electronic/encoder supply and the DC 24V-S load voltage supply before you remove or insert the 7/8" cable connector.

Note

Removal of the 7/8" cable connector interrupts the supply to downstream modules.

Note

Sealing unused sockets

Always seal all unused sockets using M12 and 7/8" caps in order to achieve degree of protection IP65.

4.2.8.2 PROFINET IO

Introduction

You connect the supply voltage and PROFINET IO at the M200D PROFINET communication module. The communication module is equipped with a PROFINET switch This allows direct looping through of PROFINET IO, or the direct connection of a further IO device.

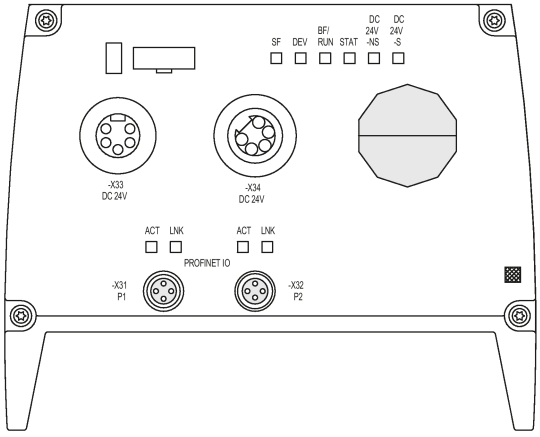


Figure 4-8 PROFINET IO communication module

-X33 24V DC	7/8" circular socket connector (with pin insert) for infeed of the DC 24V-NS electronic/encoder supply and the DC 24V-S load voltage supply
-X34 24V DC	7/8" circular socket connector (with socket insert) for looping through the DC 24V-NS electronic/encoder supply and the DC 24V-S load voltage supply
-X31 P1	M12 circular socket connector (with socket insert) for connection of PROFINET IO
-X32 P2	M12 circular socket connector (with socket insert) for connection of PROFINET IO

⚠ CAUTION

PROFINET

Modules with PROFINET interfaces may only be operated in LANs (Local Area Network) in which all nodes are equipped with SELV / PELV power supplies or protection systems of equal quality.

A data transfer terminal (modem, for example) is required to access the WAN (Wide Area Network) in order to ensure compliance with this safety standard.

Requirements

- The communication module is mounted on the motor starter module as shown in Chapter Installing the communication module (Page 99).
- You have assigned the device name according to your configuration. Further information: Assigning IO device names (PROFINET IO) (Page 123)

Required tools

- Screwdriver (PZ 2; 2 Nm)
- Stripping tool for wiring the M12 and 7/8" cable connectors, if you are fabricating your own cables.

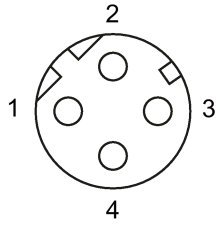
Required accessories

- Prefabricated cable with M12 and 7/8" cable connectors. The cables are available in different lengths.
- If you are fabricating your own cable:
  - M12: 4-core, shielded bus cable, and decoded M12 cable connector (PROFINET)
  - 7/8": 4-core cable with 7/8" cable connectors

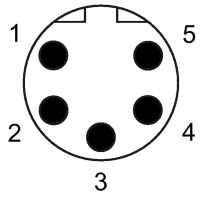
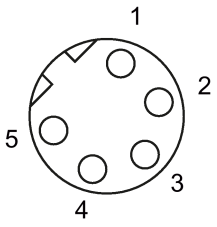
Pin assignment of the M12 and 7/8" cable connectors

PROFINET connection (M12)

Each port is connected via an M12 socket (D coding).

	Pin	Assignment
 M12-D	1	Transmission data + (TD+)
	2	Receive data + (RD+)
	3	Transmission data – (TD–)
	4	Receive data – (RD–)

Auxiliary voltage connection (7/8")

Pin (infeed)	Socket (routing)	Pin	Assignment
		1	Switched 0 V (24 V-S DC (-))
		2	Unswitched 0 V (24 V-NS DC (-))
		3	—
		4	Unswitched + 24 V (24 V-NS DC (+))
		5	Switched + 24 V (DC 24V-S (+))

Connecting M12 and 7/8" cable connectors

Note

The current of the 7/8" connectors must not exceed 7 A!

1. Plug the M12 and 7/8" cable connectors into the corresponding circular socket connectors on the M200D PROFINET communication module. Ensure that the locking mechanism between the connector and socket is properly applied.
2. Secure the connectors by tightening the knurled ring nut.

NOTICE

It is not permissible to remove the 7/8" cable connectors while M200D PROFINET is in operation! Always switch off the 24 V-NS DC electronic/encoder supply and the 24 V-S DC load voltage supply before you remove or insert the 7/8" cable connector.

Note

Removal of the 7/8" cable connector interrupts the supply to downstream modules.

Note

Closing unused sockets

Always seal all unused sockets using M12 and 7/8" caps in order to achieve degree of protection IP65.

Configuration / parameterization

5

5.1 Configuring

Introduction

Configuration involves configuring and assigning parameters to the motor starters.

Configuration: Systematic arrangement of individual motor starters (configuration).

Parameterization: Definition of parameters using the configuration software.

The M200D motor starters can be parameterized, and they allow access to extensive diagnostics and statistics data. The PC configuring tool "Motor Starter ES" is optionally available for this purpose.

A connection to the motor starter can be established in the following ways:

- PROFIBUS DP bus interface
  - DPV0/DPV1 master with GSD (also for operation behind Y-link)
  - DPV0/DPV1-S7 master with M200D IP65-HSP (STEP 7 HSP) or Motor Starter ES
- PROFINET IO bus interface
  - PROFINET controller with GSDML
  - PROFINET-S7 controller with M200D IP65-HSP (STEP 7 HSP) or Motor Starter ES
- Locally or via the device interface with Motor Starter ES

The motor starter is configured/parameterized at start-up via PROFIBUS DP/PROFINET IO by data set start-up.

Parameters can be modified during operation via the bus or the device interface (Motor Starter ES).

Note

If parameters are modified during operation, they will be overwritten by the configured values during a restart. If this is not desired, a command must be issued to disable parameterization.

5.1.1 Configuring with STEP 7

Introduction

The M200D motor starter is listed in the hardware catalog of HW Config after you start STEP 7.

Requirements

- STEP 7 Version 5.4 + SP5 or higher
- Current software (STEP 7 HSP) for M200D PROFIBUS or M200D PROFINET
- PROFINET IO: Assigning a name to the IO device (see Assigning IO device names (PROFINET IO) (Page 123))

Updating software (STEP 7 HSP)

Proceed as follows to update your software over the Internet:

1. Open the STEP 7 software HW Config.
2. Select "Options" > "Install HW Updates".
3. In the screen form that then appears, activate the option "Download from the Internet". (Make sure there is an active connection to the Internet.)
4. Click on the required updates in the table and then on "Select all".
5. Click on "Execute".
6. The updates are installed.

Configuration and parameterizing

1. Start the SIMATIC Manager.
2. Create a new project.
3. Configure the M200D motor starter with HW Config.
4. Double-click on the M200D motor starter in the configuration table and set the parameters.
5. Save the configuration, or download it to the DP master/IO controller.

Reference

For further information, refer to the STEP 7 Online Help.

5.1.2 Configuring using the GSD file (PROFIBUS DP)

Introduction

The GSD file allows you to configure the M200D PROFIBUS using a (previous) STEP 7 version, COM PROFIBUS, or other software. The GSD file must be installed accordingly in the configuration software.

Requirements

A GSD file, available for download from the Internet at:

(www.siemens.com/profibus-gsd)

→ PROFIBUS communication module: GSD file SIEM8166.GSG

Configuring the M200D on PROFIBUS DP with STEP 7

1. Start STEP 7 and select "Options" > "Install New GSD Files" in HW Config.
2. Select the GSD file to install from the next dialog and confirm with "OK". Result: The M200D PROFIBUS appears in the hardware catalog of the PROFIBUS DP folder.
3. The subsequent procedure is identical to that described in Chapter Configuring with STEP 7 (Page 120).

Configuring M200D on PROFIBUS DP using COM PROFIBUS or another configuration tool.

1. Copy the GSD file from M200D PROFIBUS to the COM PROFIBUS folder:...COMPB5\GSD (default). Copy the bitmap file to the folder ...COMPB5\BITMAPS.
2. Start COM PROFIBUS, then select "File" > "Read GSD File". Result: The M200D PROFIBUS appears in the slave configuration of the hardware catalog.
3. Run COM PROFIBUS or the configuration software.
4. Integrate the GSD file into COM PROFIBUS or into the configuration software (see requirements).
5. Configure the M200D PROFIBUS with COM PROFIBUS or your configuring software.
6. Parameterize the M200D PROFIBUS with COM PROFIBUS or your configuring software.
7. Save the configuration, or download it to the DP master.

Note

For installation instructions when using other configuration software, refer to the corresponding documentation.

5.1.3 Configuring using the GSDML file (PROFINET IO)

Introduction

The GSDML file can be used to configure M200D PROFINET in STEP 7 V5.4 + SP 4 or higher. The GSDML file must have been installed in the configuration software.

Requirements

A GSDML file, available for download from the Internet at:

(www.siemens.com/profinet-gsd)

→ PROFINET communication module:
GSDML-V2.2-Siemens-M200D-"Datum im Formatyyyymmdd".xml

Configuring the M200D PROFINET on PROFINET IO with STEP 7

1. Start STEP 7 and select "Options" > "Install GSD File" in HW Config.
2. Select the GSDML file to install from the next dialog and confirm with "OK". Result: The M200D motor starter appears in the hardware catalog of the PROFINET IO folder.
3. The subsequent procedure is identical to Configuring with STEP 7 (Page 120).

Note

For installation instructions when using other configuration software, refer to the corresponding documentation.

5.1.4 Assigning IO device names (PROFINET IO)

Introduction

Each PROFINET IO device is assigned a unique device ID at the factory (MAC address).

Each M200D PROFINET I/O device is addressed during configuration and in the user program on the basis of its device name.

For detailed information on addressing in PROFINET IO, refer to the PROFINET System Description.

Requirements

- The programming device must be online on PROFINET to the IO device to let you assign a device name to the interface module.
- The I/O device is configured in HW Config and assigned an IP address.
- M200D PROFINET communication module (3RK1335-0AS01-0AA0)

Assigning device names

1. Switch on the power supplies on the M200D PROFINET.
2. Open the "Properties" window in HW Config. Enter the device name for the I/O device and confirm your entry with "OK".
   Do not use the device name "noname".
3. In HW Config, select "PLC" > "Ethernet" > "Assign Device Name".
4. Click "Assign Name" in the "Assign Device Name" window.

Result

The device name is saved internally in the PROFINET communication module (3RK1335-0AS01-0AA0).

Node flash test

The "Assign device name" dialog box displays all I/O devices used. In this case, you should compare the MAC address of the device with the indicated MAC address and select the proper IO device.

Identification of the I/O devices in a plant is facilitated by a node flash test. Enable the flash test as follows:

1. Select one of the displayed I/O devices from the "Assign Device Name" dialog box.
2. Select the flash duration.
3. Click the "Flash on" button.

Both LINK LEDs flash on the selected I/O device.

5.1.5 Firmware update of the PROFINET communication module

Introduction

After you have implemented (compatible) functional expansions or enhanced performance at the PROFINET communication module, you must update it with the latest firmware version.

You can obtain the most recent firmware versions from your Siemens representative, or download them from the Internet. (http://www.siemens.com/automation/service&support)

Note

If the new firmware cause any problems, you can restore the previous firmware to the communication module. You can also download this from the Internet.

Requirements

- Prior to the update note down the current version of your firmware. You can read the version number in HW Config.
- Online FW updates can be performed in STEP 7 V5.4 + SP5 or higher.
- The communication module whose firmware is to be updated must be accessible online.
- The files ("*.UPD") containing the current firmware version must be available in the file system on your PG/PC. A folder may contain only the files of one firmware version.

Performing a firmware update

1. Start Step 7 (SIMATIC Manager).
2. Select the menu command "PLC" > "Display Accessible Nodes".
3. Highlight the motor starter you wish to update.
4. Select the "PLC" > "Update Firmware" menu command.
5. On the "Update Firmware" dialog box, select the path to the firmware update files (*.UPD) using the "Search" button.
6. After you have selected a file, the information in the bottom boxes of the "Update Firmware" dialog box indicates the module for which the file is suitable and from which firmware version.
7. Click on "Run." STEP 7 verifies that the selected file can be interpreted by the communication module and then downloads the file to the communication module. If this requires changing the operating state of the communication module, you will be asked to perform these tasks in the relevant dialog boxes. The communication module then automatically updates the firmware.
8. Use STEP 7 (reading the CPU diagnostics buffer) to verify that the communication module can start with the new firmware. You can read out the current firmware version via the module status of the communication module.

Result

You updated your PROFINET communication module online with a new firmware version.

Note

When configuring via HSP, you can also carry out the firmware update with HW Config using "PLC" > "Update Firmware".

For additional information, refer to the STEP 7 Online Help.

5.2 Parameterize

5.2.1 Parameter dependencies in the GSD/GSDML

Note

When parameterizing with the GSD/GSDML file, values can be selected that are mutually dependent and are not permissible in combination! The relevant parameter is reported as "Invalid parameter value" in data set 92!

The following table shows which parameters are mutually dependent and how they must be set:

Dependent parameters	Setting
Current limit values	Lower current limit < upper current limit
Temperature sensor deactivated CLASS OFF	With CLASS OFF: "Temperature sensor deactivated" not possible with "Temperature sensor deactivated": "CLASS OFF" not possible
Startup mode Max. rated operating current I_e	(only for sDSSte, sRSSte with $I_{e,\,max}$ = 12 A) with direct startup mode: $I_{e,max}$ = 9.0 A
Startup mode Trip class CLASS	(only for sDSSte, sRSSte) with direct startup mode: Restriction to CLASS 5 (10a), 10 and CLASS OFF
Maintenance timer warning limits	Maintenance timer warning limit 1 < maintenance timer warning limit 2
Input n signal Input n level Input n action	Dependencies, see Chapter Inputs (Page 53)

5.2.2 Parameter overview

More information on the individual parameters can be found in Chapter Functions (Page 25).

The table below provides an overview of all parameters of the M200D PROFIBUS/PROFINET motor starter.

Device parameter	Default setting	Setting range
Basic functions / parameters (Page 27)		
Rated operating current	• In the motor starter: maximum value • In GSD/Motor Starter ES: minimum value	• 0.15 A to 2.0 A • 1.5 A to 9.0 A [1)] • 1.5 A to 12.0 A Increment: 10 mA
Load type	3-phase	• 3-phase • 1-phase
Protection against voltage failure	Yes	• Yes • No
Response to no switching element supply voltage	Group fault	• Group fault • Group fault only after ON command • Group warning
Fieldbus interface (Page 31)		
Response to CPU/master STOP	Switch substitute value	• Switch substitute value • Retain last value
Substitute value	0	8 bits (0 or 1)
Group diagnostics	block	• block • enable
Motor control (Page 33)		
Lock-out time	0	0 to 60 s increment: 1 s
Starting time (x 0.25 s)	5 s	0 to 30 s increment: 0.25 s
Run-down time	0	0 to 30 s increment: 0.25 s
Startup mode	direct	• direct • Voltage ramp • Current limiting • Voltage ramp + current limiting
Run-down type	Run-down without load	• Run-down without load • Voltage ramp
Starting voltage	40 %	20 % to 100 % increment: 5 %
Stopping voltage	40 %	20 % to 90 % increment: 5 %

Device parameter	Default setting	Setting range
Current limit value (x 3.125%)	• 600% (Ie ≤ 9 A) • 550% (Ie ≤ 9 A)	• Ie ≤ 9 A: 125 % ... 600 % • Ie > 9 A: 125 % ... 550 % Increment: 3.125 %
Brake release delay on starting	0 s	- 2.5 to + 2.5 s Increment: 0.01 s
Brake holding time on stopping	0 s	0 to 25 s Increment: 0.01 s
Motor protection (Page 41)		
Response to overload - thermal motor model	Tripping without restart	• Tripping without restart • Tripping with restart • Warning
Trip class (DSte / RSte, sDSSTe, sRSSte in startup mode ≠ direct)	CLASS 10	• CLASS 5 (10a), • CLASS 10 • CLASS 15, • CLASS 20 • CLASS OFF
Trip class (sDSSte / sRSSte in startup mode = direct)	• CLASS 10 in startup mode = direct • CLASS 5 (10a) in startup mode ≠ direct	• CLASS 5 (10a), • CLASS 10 • CLASS OFF
Recovery time	90 s	60 to 1800 s Increment: 30 s
Prewarning limit motor heating	0% (= deactivated)	0 ... 95 % Increment: 5 %
Prewarning limit - remaining time for tripping	0 s (= deactivated)	0 to 500 s Increment: 1 s
Idle time	0 s (= deactivated)	0 to 255 s increment: 1 s
Response to overload temperature sensor	Tripping without restart	• Tripping without restart • Tripping with restart • Warning
Temperature sensor	Deactivated	• Deactivated • Themoclick • PTC type A
Temperature sensor monitoring	Yes	• Yes • No
Response to residual current detection	Trip	• Warning • Trip

Device parameter	Default setting	Setting range
System monitoring (Page 48)		
Response to current limit violation	Warning	• Warning • Trip
Lower current limit	18,75 %	• 18.75 to 100% of I_e • 0% (= deactivated) Increment: 3,125 %
Upper current limit	112,5 %	• 50 to 400% of I_e • 0% (= deactivated) Increment: 3,125 %
Blocking current	800 %	• 150 to 1000% von Ie • 150 ... 800% of Ie (sDS..., sRS...) Increment: 50 %
Blocking time	1 s	1 to 5 s Increment: 0.5 s
Response to asymmetry	Trip	• Warning • Trip
Asymmetry limit	30 %	30 ... 60% (0 = deactivated) Increment: 10 %
Input signal extension	0 ms	0 to 200 ms Increment: 10 ms
Input signal delay	10 ms	10 ... 80 ms Increment: 10 ms
Input 1 level	Normally open	• Normally closed • Normally open
Input 2 level		
Input 3 level		
Input 4 level		
Input 1 action	No action	• No action • Trip without restart • Trip with restart • Trip end position CW • Trip end position CCW (RSte/sRSSte only) • Group warning • Manual operation local • Emergency start • Motor CW • Motor CCW (RSte/sRSSte only) • Quick stop • Trip reset • Cold run
Input 2 action		
Input 3 action		
Input 4 action		

Device parameter	Default setting	Setting range
Input 1 signal	Non-retentive	• Retentive • Non-retentive
Input 2 signal		
Input 3 signal		
Input 4 signal		
Output level 1	Not inverted	• Not inverted • Inverted
Output level 2		
Output 1 signal	Continuous signal	• Continuous signal • Flashing
Output 2 signal		
Output 1 action	Control source PIO DO 1.0	Triggering by means of external control source • Control source PIO DO 1.0 (output 1) • Control source PIO DO 1.1 (output 2) • Control source PIO DO 0.2 (brake output) • Control source input 1 • Control source input 2 • Control source input 3 • Control source input 4 Actuation by motor starter • Run-up • Operation/shunting • Coasting down • On time motor (RUN) • Control command motor ON • Brake output • Device ON Actuation by messages from the motor starter • Group prewarning • Group warning • Group fault • Bus error • Device error • Maintenance required • Maintenance requested • Ready for motor ON

Device parameter	Default setting	Setting range
Output 1 action	Control source PIO DO 1.1	
Connector monitoring	Deactivated	• Deactivated • Line side
Response when connector removed	Group fault	• Group fault • Group fault only after ON command • Group warning
Short-circuit protection (Page 64)		
Response to circuit breaker OFF	Group fault	• Group fault • Group fault only after ON command • Group warning
Maintenance (Page 65)		
Maintenance timer - warning limit_1	946.080.000 (30 years)	0 to 4,294,967,295 s Increment: 1 s
Maintenance timer - warning limit_2	946.080.000 (30 years)	0 to 4,294,967,295 s Increment: 1 s
[1] On soft starters (sDSSte, sRSSte) in the startup mode "direct"		

5.3 Process images

Definition of process image

The process image is a component of the system memory of the DP master/IO controller.

At the start of the cyclic program, the signal states of the inputs are transferred to the process image for the inputs. At the end of the cyclic program, the process output image is transferred to the motor starter as a signal state.

Input signals

Byte / bit	Meaning	Byte / bit	Meaning
DI 0.0	**Ready (automatic)** 0 Starter not ready via host/PLC 1 Starter ready via host	**DI 1.0**	**Current motor current I_{curr} [%]**[2]Bit 0
DI 0.1	**Motor on**[1] 0 off 1 on (CW/CCW)	**DI 1.1**	**Current motor current I_{curr} [%]** Bit 1
DI 0.2	**Group fault**[3] 0 no fault 1 fault	**DI 1.2**	**Current motor current I_{curr} [%]** Bit 2
DI 0.3	**Group warning** 0 No warning 1 Warning	**DI 1.3**	**Current motor current I_{curr} [%]** Bit 3
DI 0.4	**Input 1** 0 Not active 1 Active	**DI 1.4**	**Current motor current I_{curr} [%]** Bit 4
DI 0.5	**Input 2** 0 Not active 1 Active	**DI 1.5**	**Current motor current I_{curr} [%]** Bit 5
DI 0.6	**Input 3** 0 Not active 1 Active	**DI 1.6**	**Manual mode local mode** 0 Not active 1 Manual local
DI 0.7	**Input 4** 0 Not active 1 Active	**DI 1.7**	**Ramp operation**[4] 0 Not active 1 Active

[1] Signal is 1 if the motor current is > 18.75% of the set rated current
[2] See Chapter Rated operating current (Page 27)
[3] The occurrence of one or more faults results in "Group fault" being set, regardless of whether the parameter "Group diagnostics" is set to "block" or "enable".
[4] For soft starters only

Output signals

Byte / bit	Meaning	Byte / bit	Meaning
DO 0.0	**Motor CW** 0 Motor off 1 Motor on	DO 1.0	**Output 1** 0 Not active 1 Active
DO 0.1	**Motor CCW (for RSte and sRSSte)** 0 Motor off 1 Motor on	DO 1.1	**Output 2** 0 Not active 1 Active
DO 0.2	**Control for brake** [1] 0 No control (brake active) 1 Control (brake released)	DO 1.2	**Unassigned**
DO 0.3	**Trip reset** (edge 0 ⌐↑⌐ 1) 0 Trip reset inactive 1 Trip reset active	DO 1.3	**Unassigned**
DO 0.4	**Emergency start** 0 Not active 1 Active	DO 1.4	**Unassigned**
DO 0.5	**Self-test** 0 Not active 1 Active	DO 1.5	**Unassigned**
DO 0.6	**Unassigned**	DO 1.6	**Unassigned**
DO 0.7	**Unassigned**	DO 1.7	**Disable quick stop** 0 Not activated 1 Activated
[1] For motor starters with brake output			

5.4 Motor Starter ES software

Properties

The Motor Starter ES diagnostics and commissioning tool (Version 2007 SP2 and higher) offers you the following:

- Structured, tool-based configuration of low-voltage switching devices
- Fast diagnostics
- Local commissioning and monitoring, such as:
  - Parameterization during operation of the controller and the control system
  - Monitoring
  - Diagnostics and testing
  - Factory settings
  - Read-out of individual phase currents as direct values
  - Residual current detection
  - Setting a parameter block function
  - Integrated online help
  - Read-out of statistical values and measured values

Motor Starter ES order number: 3ZS1310-5CC10-0YA5

Application

Motor Starter ES is operated via the local device interface.

The connection between the PC or programming device and the motor starter is established using an infrared RS232 PC cable for the optical device interface (see Local device interface (Page 81)).

Commissioning

6

6.1 Commissioning

The motor starter is parameterized using the PROFIBUS DP/PROFINET IO standard procedure at startup. Modification of parameters and HMI (human machine interfacing) can take place during operation, either via the bus and the acyclic mechanism or locally via the optical device interface.

The "Group diagnostics" parameter can be parameterized to block or enable. If block is selected, error messages are not sent.

A device error can only be acknowledged by switching the power off and then on again. If faults are repeated, the motor starter is defective.
All other faults can be acknowledged via trip reset.

Note

Please be sure to note the voltage tolerance for the load voltage supply (contactors and power electronics) to 55 °C: 20,4 V to 28,8 V.

Current setting

On the motor starter, you parameterize the setting current using the Motor Starter ES software, GSD/GSDML file (device master data file) or HSP.

Unplug the load from the mains.

You can actuate the integral disconnecting means in the OFF position to disconnect the motor starter from the mains.

NOTICE
Connecting/disconnecting a load during operation (that is, under power) is not permissible.

Reversing starter

Make sure, via the user program, that before a change of direction, the drive is switched to "STOP" long enough to come to a standstill.

6.2 Requirements

Software requirements

Configuration software used	Explanations
Configuring software for the master/controller used	See the manual of the master/controller
Configuring software Motor Starter ES (optional accessories)	Order No.: 3ZS1310-6CC10-0YA5 For parameterizing, operating and monitoring using a local device interface or fieldbus interface (See online help of Motor Starter ES)

Commissioning requirements

Prior activity		For more information, see ...
1.	Motor starter and communication module mounted and connected	Chapter Mounting/connection
2.	PROFIBUS address set on the motor starter (on PROFIBUS only)	Chapter Mounting (Page 100)
3.	Supply voltage for motor starter switched on	
4.	Supply voltage for load switched on (if necessary)	Motor manual
5.	Motor starter configured (configured and parameterized)	Chapter Configuration/parameterization (Page 119)
6.	Assign device name for motor starter (on PROFINET only)	Chapter Configuration (Page 123)
7.	Supply voltage for master/controller switched on	Manual for master/controller
8.	Master/controller is switched to RUN mode	Manual for master/controller

6.3 M200D components

Required components

For this example, you need the following components:

- A higher-level controller (e.g. S7 series)
- The motor starter (motor starter module and communication module)
- Power supplies for the 24 V auxiliary voltage
- Connection material:
  - PROFIBUS DP/PROFINET IO connection
  - Electronics power supply 7/8"
  - Power connection cable (X1)
  - Motor connection cable (X2)

Minimum configuration

The overview shows the components you need for operation with PROFIBUS DP:

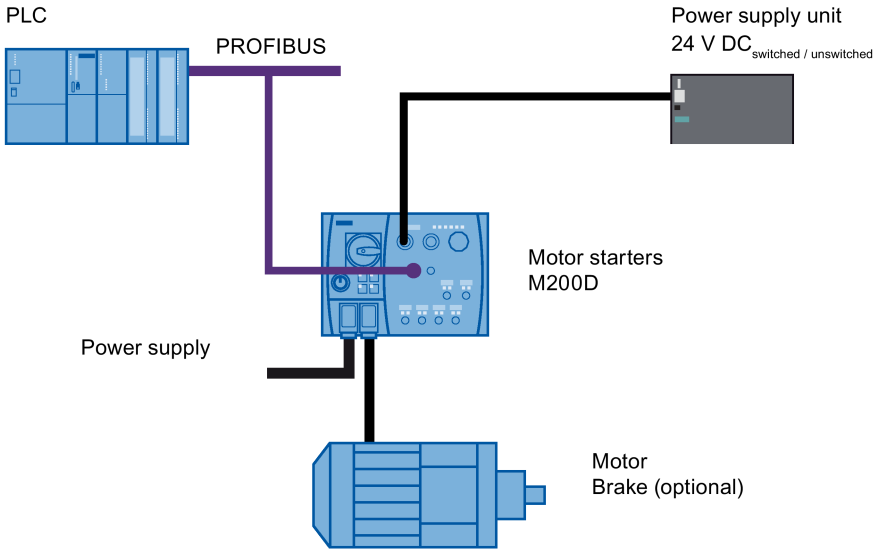


Figure 6-1 Minimal PROFIBUS configuration

The overview shows the components you need for operation with PROFINET IO:

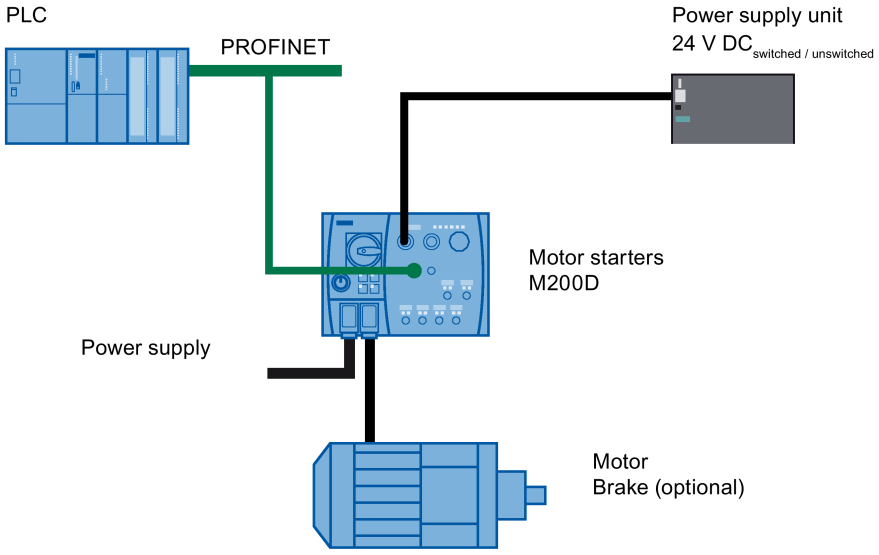


Figure 6-2 Minimal PROFINET configuration

Procedure at commissioning

1. Addressing (PROFIBUS only)
2. Mounting all components
   - Bus cable
   - Power supply
   - Sensors/actuators
   - Power supply
   - Motor
3. Connecting all components
4. Parameterizing/programming
5. Commissioning
6. Monitoring/diagnostics

Diagnostics

7

The M200D motor starter has the following diagnostics modes:

- Diagnostics with LED (Page 140)
- Diagnostics as device diagnostics
- Diagnostics via system diagnostics
  The structure of system diagnostics is manufacturer-independent (PROFIBUS standard diagnostics).
  The contents of individual bytes, however, are defined by the manufacturer.
- Diagnostics via data sets
  Diagnostics can be read out from data sets regardless of the system diagnostics.

Actions after a diagnostics message

Each diagnostic message triggers the following actions:

- The SF LED (red) of the I/O device lights up.
- Several simultaneous diagnostic messages are possible.
- Diagnostics data is reported as diagnostics interrupts and can be read from data sets (if group diagnostics are enabled).
- Diagnostics messages are saved to the diagnostics buffer of the I/O controller.
- OB 82 is called. If OB 82 is not available, the I/O controller switches to the STOP operating state.
- Acknowledgment of the diagnostics interrupt to enable new interrupts.

7.1 Diagnostics with LED

7.1.1 Statuses of the individual LEDs

The following LEDs indicate the status of the motor starter:

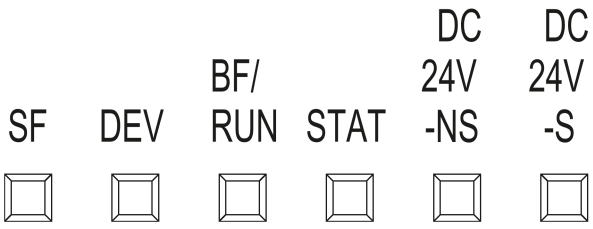


Figure 7-1 Diagnostic LEDs

SF LED (possible colors: red / OFF)

Status	Meaning	Possible causes
Off	No error	No error is present
Red	Device detects error	Device error: • Current flowing with no ON command • Self-test error
		System error: • Current not flowing despite ON command (residual current detected) • Thermal motor model overload[1)] • Temperature sensor overload[1)] • Asymmetry detected[1)] • Current limit violation[1)] • Connector monitoring[1)] • Circuit breaker tripped/switched off[1)] • Group fault via output action • External encoder supply short-circuit • Internal trip • No switching element supply voltage (DC24V S)[1)] • No electronics supply voltage (D24-V-NS)[1)]
		Start-up fault: • Start-up parameters missing
[1)] Depends on the parameter assignment		

DEVICE LED (possible colors: red / green / yellow / OFF)

Status	Meaning	Possible cause
Off	Device not ready	System error: • No electronics supply voltage (DC24V-NS) or supply is < 18 V • Start-up parameters missing
Green	Device OK	
Flashing green	Device not starting	No start-up parameters received
Green flashing (0.25 s on / 1.75 s off)	Energy-saving mode active	—
Yellow	Internal trip	—
Flashing yellow	Group warning	Group warning due to: • Thermal motor model overload[1)] • Temperature sensor overload[1)] • Asymmetry detected[1)] • Current limit violation[1)] • Connector monitoring[1)] • Circuit breaker tripped/switched off[1)] • Group warning via input action • Maintenance timer limit violation
Red	Device defective	—
Flashing red	Firmware updates	—
	Self-test	Motor current flowing
Flickering red	Self-test	No current flow
	Factory settings	—
[1)] Depends on the parameter assignment		

BF/RUN LED (possible colors: red / green / OFF)

Status	Meaning	Possible cause
Off	Device not in data exchange or CPU / master in Stop	e.g. motor starter module disconnected
Green	Device in data exchange	
Red	Bus error	Fieldbus interface unclear
Flashing red	Parameterization error Configuration error	Incorrect or invalid parameters received

STATE LED (possible colors: red / green / yellow / OFF)

Status	Meaning	Possible cause
Off	No activation	Switching element OFF
Green	Activation	Switching element ON by means of controller or human machine interfacing
Flashing green	Control and motor in soft start-up/soft run-down	Switching element ON with ramp operation (sDSSte and sRSSte only)
Flickering green	Input controls	Switching element ON by input action
Flashing yellow	Mode fault	Switching element OFF manual mode connection interruption without reset to automatic mode
Flickering yellow	Control and external disconnection	Switching element OFF by input control function (e.g. quick stop)
Red	Switching element defective	Switching status ≠ switching command

D24V-NS LED (possible colors: green / OFF)

Status	Meaning	Possible cause
Off	D24V-NS not present	Supply voltage not OK
Green	D24V-NS present	Supply voltage OK

D24V-S LED (possible colors: green / OFF)

Status	Meaning	Possible cause
Off	D24V-S not present	Supply voltage not OK
Green	D24V-S present	Supply voltage OK

Input LEDs IN1 ... IN4 (possible colors: green / OFF)

Status	Meaning	Possible cause
Off	No 24 V DC	No input signal
Green	24 V present	Input signal present

Output LEDs OUT1 to OUT2 (possible colors: green / OFF)

Status	Meaning	Possible cause
Off	No 24 V DC	No output signal
Green	24 V present	Output signal present

PROFINET port LEDs P1/P2 (possible colors LNK: Green/Off; ACT: Yellow / Off)

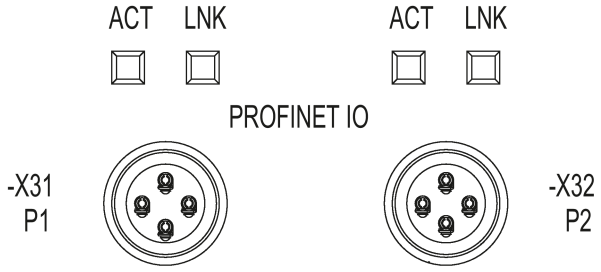


Figure 7-2 Port LEDs

LNK LED	ACT LED	Possible cause
Off	Not relevant	No connection to the IO Controller No IO Controller available on the line
Green	Not relevant	Autonegotiation completed and PROFINET transmission rate accepted
Green	Yellow	Transmission/reception is in progress
Flashing green	Not relevant	Flash test has been activated (e.g. via STEP 7)

7.1.2 LED display combinations

Additional diagnostics options are created from combining the indicator statuses:

Device status / operating mode

SF LED	STATE LED	DEVICE LED	Device status / operating mode
Off	Green	Green	Motor ON; no fault
Off	Off	Green	Motor OFF; no fault
Off	Flashing green	Green	Motor in soft start-up; no fault (sDSSte, sRSSte only)
Off	Flashing green	Green	Motor in soft run-down; no fault (sDSSte, sRSSte only)
Off	Flickering green	Green	Motor on; input controls
Off	Flashing yellow	Green	Manual mode connection interruption without reset to automatic mode
Off	Flickering yellow	Green	Tripping by input control function (e.g. quick stop)
Off	Off	Flickering red	Self-test in progress
Off	Off	Green flashing (1 s / 1 s)	No start-up parameters received
Off	Off	Green flashing (0.25 s / 1.75 s)	Energy-saving mode active

Device error

Note

Acknowledging device errors

A device error can only be acknowledged by switching the power off and then on again.

If the error occurs again, however, the motor starter must be replaced.

SF LED	STATE LED	DEVICE LED	Device error
Red	Red	Red	Current flowing with no ON command (e.g.: contact welded, thyristor failure)
Red	Off	Red	Electronics defective, self-test error

System error / warning

SF LED	STATE LED	DEVICE LED	System error / warning
Red	Off	Yellow	• Current not flowing despite ON command (residual current detected) • Internal trip
Off	Green (when switching element is ON)	Flashing yellow	Group warning due to: • Thermal motor model overload[1)] • Temperature sensor overload[1)] • Asymmetry detected[1)] • Current limit violation[1)] • Connector monitoring[1)] • Circuit breaker tripped/switched off[1)] • Group warning via input action • Maintenance timer limit violation • Invalid parameter value
Off	Off	Yellow	No switching element supply voltage (DC24V S)[1)] Parameterization: (0): Group fault (1): Group fault only after ON command
Red	Off	Flashing yellow	No switching element supply voltage (DC24V S)[1)] Parameterization: (2): Group warning
Off	Off	Off	No electronics supply voltage (DC24V NS)
Red	Off	Yellow	External encoder supply short-circuit

[1)] Depends on the parameter assignment

Group fault

SF LED	STATE LED	DEVICE LED	Group fault
Red	Off	Off	Device diagnostics pending with enabled group diagnostics • Thermal motor model overload[1)] • Temperature sensor overload[1)] • Asymmetry detected[1)] • Current limit violation[1)] • Connector monitoring[1)] • Circuit breaker tripped/switched off[1)] • Group fault via input action • Communication module removed from motor starter module

1) Depends on the parameter assignment

Device diagnostics

In the process input image of the starter, any pending group faults (DI 0.2) and group warning messages (DI 0.3) are transferred cyclically. Further information about the type of error can be accessed via a diagnostics call (system diagnostics).

All device-specific diagnostics are collected in data set 92 (29 bytes). The content of DS 92 can be read out with the help of "Motor Starter ES" via the device interface or also online via PROFIBUS/PROFINET with the help of the "Read data set" function.

7.2 System diagnostics

System diagnostics

In the M200D PROFIBUS/PROFINET, device-specific diagnostics are recorded via assigned PROFIBUS/PROFINET error codes.

System diagnostics indicate the existence of a channel fault. The existence of further channel-related information is also indicated.

The stored values are extracted by the starter from the diagnostics captured in data set 92. Since there are not sufficient uniquely defined DP/PN error codes available for the starter, different DS 92 diagnoses must be mapped to one and the same error code (= multiple assignment; see table).

Channel-specific diagnostics: Single error	DP/PN Error code	DS 92 Byte.Bit	Meaning of the error	+ F24[1)]
Short-circuit	1	2.2 3.2	Temperature sensor short-circuit Circuit breaker tripped	X X
Overload	4	2.0 2.3	Temperature sensor overload Thermal motor model overload	X X
Overtemperature	5	0.3	Switching element overload	X
Wire break	6	2.1	Temperature sensor wire break	X
Upper limit exceeded	7	4.2	I_e upper limit violation	X
Lower limit exceeded	8	4.3	I_e lower limit violation	X
Error	9	0.4 9.2 19.2	Switching element defective Self-test error Switching element short-circuited	—
Parameter assignment error	16	8.1 8.2	Invalid parameter value (at startup only) Parameters cannot be changed in ON state	— —
No encoder or load voltage	17	1.0 1.1 6.7 29.1	No switching element supply voltage No supply voltage Electronics supply voltage too low Mains connector removed on line side	X X X X
Actuator disconnection	24	2.4 4.1 4.4 4.6 4.7 14.1	Overload tripping Asymmetry tripping I_e limit value tripping Residual current tripping Circuit breaker tripped Tripping due to motor blocking Cold run tripping	— — — — — —
External error	26	5.4 5.5 5.7 7.7 6.2 6.3 18.4-5	Input tripping Input trip end position CW Input trip end position CCW Process image error Quick stop active Sensor supply overload Output overloaded	X X X X X X X

[1)] In addition to the error code, error code 24 is set.

7.3 Diagnostics via data sets

Process data consists of analog and digital values, which are obtained from a technical process by means of sensors. Process data represents the current state of the process in control technology. Process data is displayed to the operator and then archived, and is used to automatically influence the process (see Process image (Page 132)).

Logbook entries

The following logbook entries are stored in the starter and can be read out via "Motor Starter ES", Version 2007 SP2 and higher:

- Device errors DS 72 (Page 197)
- Triggering operations DS 73 (Page 198)
- Events DS 75 (Page 199)

The 3 logbooks are organized as ring buffers of 126 bytes each. The entries are made together with the current device operating hours in each case. Six bytes are requried per entry, so that the last 21 entries remain readable in each case.

Format of the entries:

Byte	Meaning
0 ... 3	Device operating hours (h:mm:ss; saving in 1-s steps)
4 ... 5	Object no. (device error, triggering operation, event)

Measured values (DS 94)

The current operating state of the motor can be read from the measured values. Measured values are volatile variables.

The following data is stored in data set 94 (Page 205) of the motor starter:

- Remaining motor cooling time
- Motor heating
- Asymmetry
- Phase current I_{L1} (rms)
- Phase current I_{L2} (rms)
- Phase current I_{L3} (rms)
- Phase current I_{L1} (%)
- Phase current I_{L2} (%)
- Phase current I_{L3} (%)
- Remaining time for tripping for thermal motor model
- Heat sink temperature (only on sDSSte/sRSSte 12 A)
- Line and output frequency (only on sDSSte and sRSSte)

Statistical data (DS 95)

The following data is stored in data set 95 (Page 206) of the starter:

- Operating hours device
- Operating hours motor
- Operating hours motor current= 18 to 49.9% of $I_{e\ max}$
- Operating hours motor current= 50 to 89.9 % of $I_{e\ max}$
- Operating hours motor current= 90 to 119.9 % of $I_{e\ max}$
- Operating hours motor current= 120 to 1000 % of $I_{e\ max}$
- Number of starts motor CW
- Number of starts motor CCW (RSte/sRSSte only)
- Number of motor overload trips
- Number of switching element overload trips
- Number of starts output 1
- Number of starts output 2
- Number of stops with mechanical braking[1)]
- Number of short-circuit trips
- Last tripping current I_A (%)
- Last tripping current I_A (eff)
- Motor current I_{max} (%)
- Motor current I_{max} (rms)
- Number of starts output BO[1)]
- Maintenance timer

[1)] For all motor starters with brake output

On M200D PROFIBUS/PROFINET motor starters, the operating hours are saved in the event of power failure (a maximum of 6 minutes can be lost). Statistical data can be read out via "Motor Starter ES" or the PLC with SFC59 or SFB 53.

Maximum pointer (DS 96)

The extreme values of individual values measured in the elapsed time are stored in the maximum pointers. Maximum pointers can be deleted or set to "0" by the user with the command "Delete maximum pointers".

The following data is saved in DS 96 (Page 207):

- Number of motor overload trips
- Operating hours motor current = 18 to 49.9% of I_e
- Operating hours motor current = 50 to 89.9 % of I_e
- Operating hours motor current = 90 to 119.9 % of I_e
- Operating hours motor current = 120 to 1000 % of I_e
- Maximum tripping current $I_{A\ max}$ (%)
- Maximum tripping current $I_{A\ max}$ (rms)
- Phase current $I_{L1\ max}$ (rms)
- Phase current $I_{L2\ max}$ (rms)
- Phase current $I_{L3\ max}$ (rms)
- Phase current $I_{L1\ min}$ (rms)
- Phase current $I_{L2\ min}$ (rms)
- Phase current $I_{L3\ min}$ (rms)
- Phase current $I_{L1\ max}$ (%)
- Phase current $I_{L2\ max}$ (%)
- Phase current $I_{L3\ max}$ (%)
- Phase current $I_{L1\ min}$ (%)
- Phase current $I_{L2\ min}$ (%)
- Phase current $I_{L3\ min}$ (%)
- Maximum heat sink temperature (only on sDSSte/sRSSte 12 A)

7.4 Diagnostics with STEP 7 on PROFIBUS DP

7.4.1 Reading out the diagnostic data

Length of the diagnostics frame

The maximum message frame length is 32 bytes.

Options for reading diagnostics data

Reading diagnostics data with STEP 7

Automation system with DP master	Blocks or registers in STEP 7	Application	Reference
SIMATIC S7/M7	SFC 13 "DP NRM_DG"	Reading slave diagnostic data (stored in the data area of the user program)	Section "Structure of the slave diagnostics"; SFC see online help in STEP 7

Example of reading out S7 diagnostics using SFC 13 "DP NRM_DG"

This is an example of how to use the SFC 13 to read out the slave diagnostics for a DP slave in the STEP 7 user program.

Assumptions

Exceptions for this STEP 7 user program:

- Diagnostics address is 1022 (3FEH).
- Slave diagnostic data must be stored in DB82: from address 0.0, length 32 bytes.
- The slave diagnostic data has a length of 32 bytes

STEP 7 user program

```
STL                                  Explanation
CALL SFC 13
REQ :=TRUE                           //Request to read
LADDR :=W#16#3FE                     // Diagnostics address
RET_VAL := MW0                       //RET_VAL of SFC 13
RECORD :=P#DB82.DBX 0.0 BYTE 32      //Mailbox for diagnostics data in DB82
BUSY :=M2.0                          //Read process runs over several OB1 cycles
```

7.4.2 Evaluation of interrupts with PROFIBUS DP

Introduction

Certain errors cause the DP slave to trigger an interrupt.

The M200D PROFIBUS supports the following interrupts:

- Diagnostics interrupts

Evaluating interrupts with the DPV1 master

The CPU of the DP master automatically calls the interrupt OBs after an interrupt was generated.

For further information, refer to the *System Software for S7-300/S7-400, Program Design* programming manual.

Note

The system does not generate any interrupts when M200D PROFIBUS motor starter is operated with a DPV0 master, or in DPV0 mode (as standard DP slave).

Triggering of a diagnostics interrupt

The module triggers a diagnostics interrupt with "Enable: Diagnostics interrupt" when it registers incoming or outgoing events, such as a wire break.

The CPU interrupts the user program and executes the diagnostics block OB 82. The interrupt triggering event will be logged in the start information of OB 82.

7.4.3 Structure of the slave diagnostics

The figure below shows the structure of the slave diagnostics:

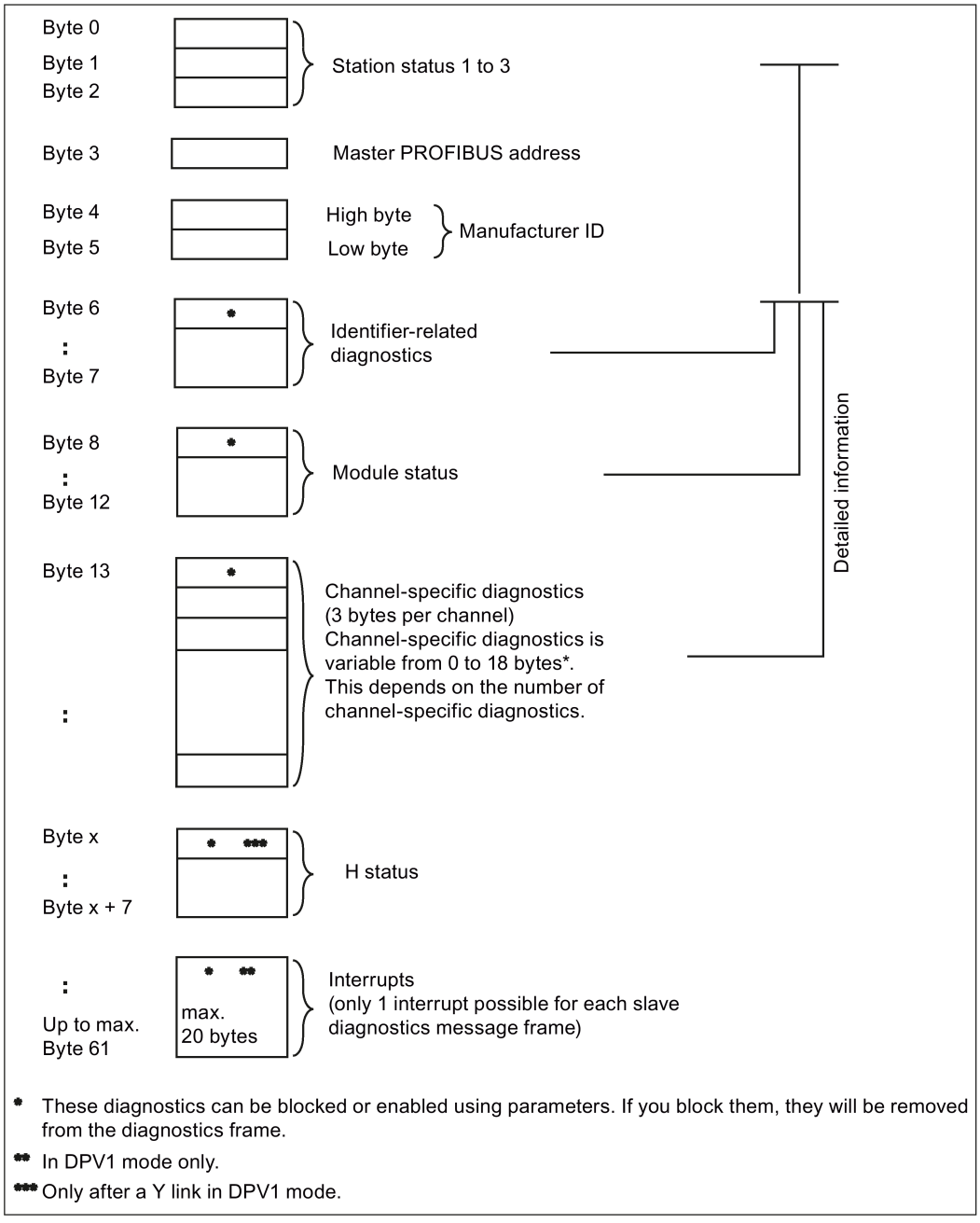


Figure 7-3 Structure of the slave diagnostics

7.4.3.1 Station status 1 to 3

Definition

The stations status 1 to 3 provides an overview of the status of a DP slave.

Station Status 1

Structure of station status 1 (byte 0)

Bit	Meaning	Cause/remedy
0	1: The DP slave cannot be addressed by the DP master.	• Is the correct PROFIBUS address set on the DP slave? • Is the bus connector in place? • Does the DP slave have power? • Correct configuration of the RS485 rpeater? • Has the DP slave been reset?
1	1: DP slave is not ready for the data exchange.	• Wait, the DP slave is currently starting up.
2	1: The configuration data sent to the DP slave by the DP master does not match the actual configuration of the DP slave.	• Has the correct station type or the correct DP slave configuration been entered in the configuration software?
3	1: External diagnostics information is pending. (Group diagnostics indication)	• Evaluate the ID-specific diagnostics information, the module status, and/or the channel-specific diagnostics information. As soon as all errors are remedied the bit 3 is reset. The bit will be set again when there is a new diagnostics message in the bytes of the aforementioned diagnostics.
4	1: The required function is not supported by the DP slave (for example, changing the PROFIBUS address by means of software).	• Check configuration data.
5	1: The DP master cannot interpret the response of the DP slave.	• Check the bus installation.
6	1: The DP slave type does not match the software configuration.	• Has the correct station type been entered in the configuration software?
7	1: DP slave was configured by a different DP master (not by the DP master that currently has access to the DP slave).	• The bit is always 1 if, for example, you are currently accessing the DP slave via PG or a different DP master. The "master PROFIBUS address" diagnostic byte contains the PROFIBUS address of the DP master that assigned parameters to the DP slave.

Station status 2

Structure of station status 2 (byte 1)

Bit	Meaning
0	1: The DP slave parameters need to be reassigned.
1	1: A diagnostics message is pending. The DP slave will not operate until the problem is eliminated (static diagnostics message).
2	1: The bit is always set to "1" if the DP slave with this PROFIBUS address is present.
3	1: The watchdog is activated for this DP slave.
4	1: The DP slave has received the "FREEZE" control command [1].
5	1: The DP slave has received the "SYNC" control command [1].
6	0: Bit is always "0".
7	1: The DP slave is disabled, i.e. it is isolated from the current process.
[1] The bit is updated only if another diagnostics message changes also.	

Station status 3

Structure of station status 3 (byte 2)

Bit	Meaning
0 to 6	0: Bits are always "0".
7	1: • There are more diagnostics messages pending than the DP slave is able to store. • The DP master cannot enter all the diagnostics messages sent by the DP slave in its diagnostics buffer (channel-specific diagnostics).

7.4.3.2 Master PROFIBUS address

Definition

The diagnostic byte master PROFIBUS address contains the PROFIBUS address of the DP master:

- Which the DP slave has configured and
- That has read and write access to the DP slave

The master PROFIBUS address is located in byte 3 of the slave diagnostics.

7.4.3.3 Manufacturer ID

Definition

The manufacturer ID contains a code specifying the type of the DP slave.

Manufacturer ID

Structure of the manufacturer ID

Byte 4	Byte 5	Manufacturer ID for
81_H	66_H	Motor starter

7.4.3.4 Identifier-related diagnostics

Definition

Identifier-related diagnostics data indicates whether motor starters are faulty or not.
Identifier-related diagnostics data start at byte 6 and consist of 2 bytes.

Identifier-related diagnostics

Identifier-related diagnostics for motor starters are structured as follows:

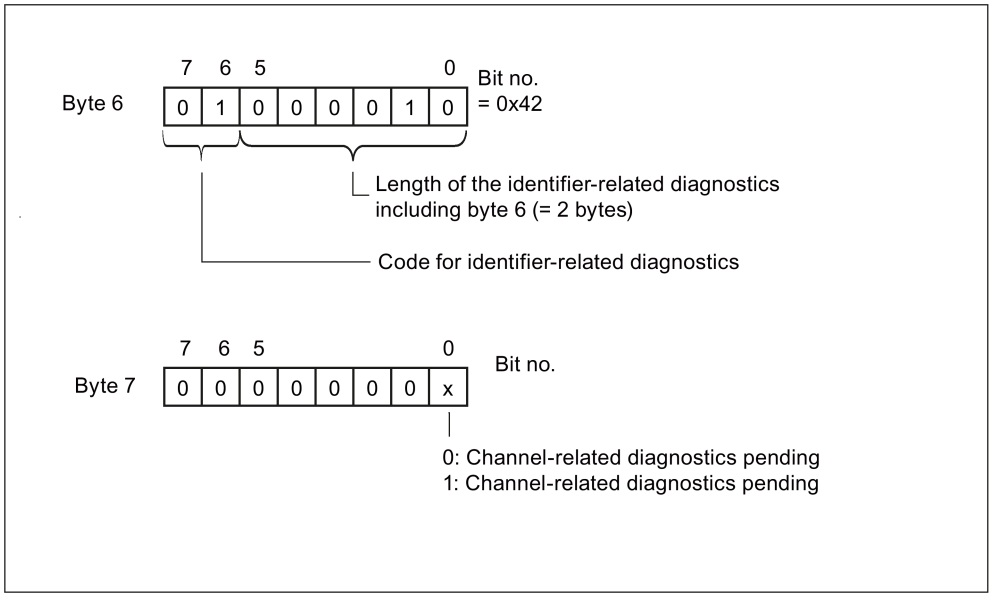


Figure 7-4 Structure of identifier-related diagnostics

7.4.3.5 Module status

Definition

The module status represents the status of the configured modules (in this case: motor starters) and provides details of the identifier-related diagnostics. The module status begins after the identifier-related diagnostics and comprises 5 bytes.

Structure of the module status

The module status is structured as follows:

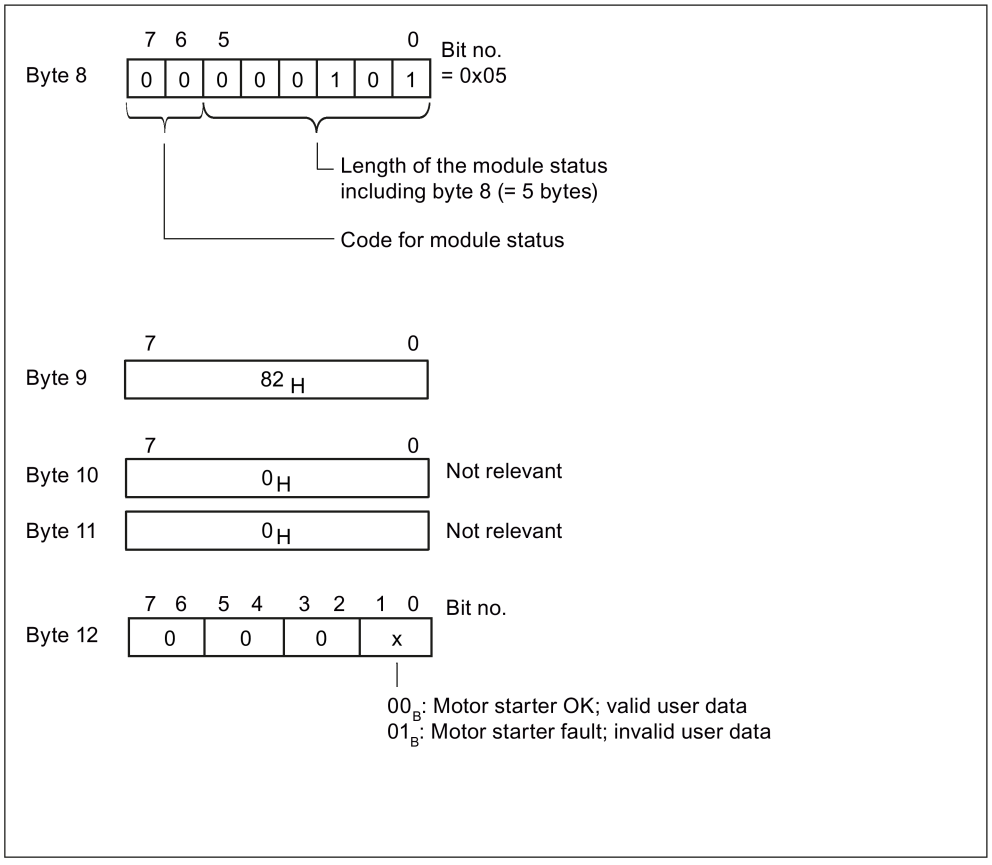


Figure 7-5 Structure of the module status

7.4.3.6 Channel-specific diagnostics

Definition

Channel-specific diagnostics provides information about channel faults in modules (in this case: motor starters) and provides details of the identifier-related diagnostics. Channel-specific diagnostics begin after the module status. The maximum length is limited by the maximum total length of slave diagnostics of 62 bytes. Channel-specific diagnostics do not affect the module status. Up to 9 channel-specific diagnostics messages are possible (see also station status 3, bit 7).

Channel-specific diagnostics

Channel-specific diagnostics are structured as follows:

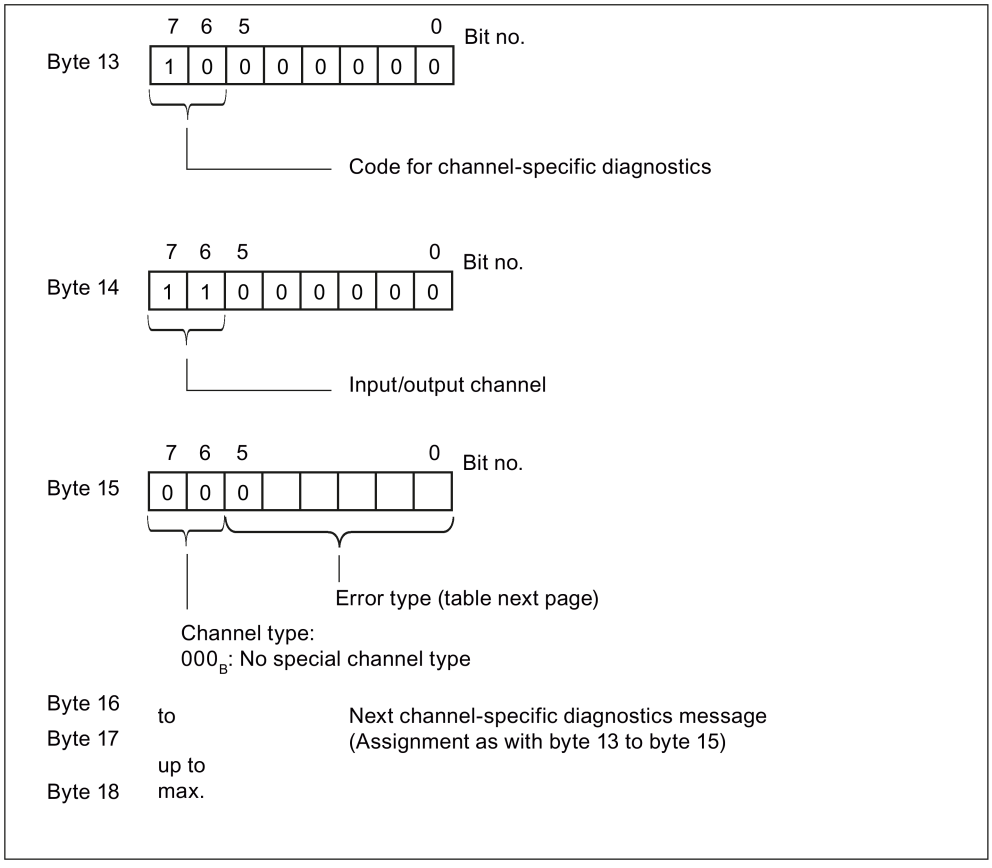


Figure 7-6 Structure of channel-specific diagnostics

Note

Channel-specific diagnostics is always updated up to the current diagnostics message in the diagnostics message frame. Subsequent, older diagnostics messages are not deleted. Remedy: Evaluate the valid, current length of the diagnostics message frame:

- STEP7 from the parameter RET_VAL of SFC 13.

Fault types

The diagnostics message is signaled on channel 0.

Fault type		Error text	Meaning / cause	Delete/acknowledge message bit
1_{dec}	00001_B	Short-circuit	• Temperature sensor - short circuit • Circuit breaker tripped	Message bit is automatically deleted when the cause of the fault has been removed and acknowledged with "trip reset"
4_{dec}	00100_B	Overload	• Temperature sensor - overload • Thermal motor model - overload	Message bit is updated continually
5_{dec}	00101_B	Overtemperature	• Overload power semiconductor • Switching element overload	Message bit is automatically deleted when the cause of the fault has been removed and acknowledged with "trip reset"
6_{dec}	00110_B	Wire break	• Temperature sensor wire break	Message bit is updated continually
7_{dec}	00111_B	Upper limit exceeded	• I_e upper limit violation	
8_{dec}	01000_B	Lower limit undershot	• I_e lower limit violation	
9_{dec}	01001_B	Error	• Internal error/device error • Self-test error • Switching element defective • Switching element short-circuited	Message bit can be deleted when the cause of the fault has been removed by • Switching the supply voltage (DC24 V-NS) on/off • "Restart" command if possible
16_{dec}	10000_B	Parameter assignment error	• Invalid parameter value • Parameters cannot be changed in ON state	Message bit is always deleted when acknowledged with "trip reset"
17_{dec}	10001_B	No encoder or load voltage	• Electronics supply voltage too low (< 18 V) • No contact block supply voltage • No supply voltage • Connector disconnected on line side	Message bit is deleted when the cause of the trip has been removed or automatically acknowledged.
24_{dec}	11000_B	Actuator disconnection	• Overload tripping • Residual current tripping • Asymmetry tripping • Circuit breaker tripped • I_e limit tripping • Cold start tripping • Tripping due to motor blocking	Message bit is always deleted when acknowledged with "trip reset". Additional acknowledgment in combination with another fault
26_{dec}	11010_B	External error	• Input tripping • Input tripping - end position (CW / CCW) • Quick stop active • Sensor supply overload • Process image error • Output overloaded	Message bit is always deleted when acknowledged with "trip reset".

7.4.4 H status

Requirement

The motor starter only supplies the H status in the diagnostics frame when operated behind a Y link (e. g. IM 157) in DPV1 mode. This block can be passed over during the evaluation of the diagnostics frame. The structure is described below.

Structure of the H status

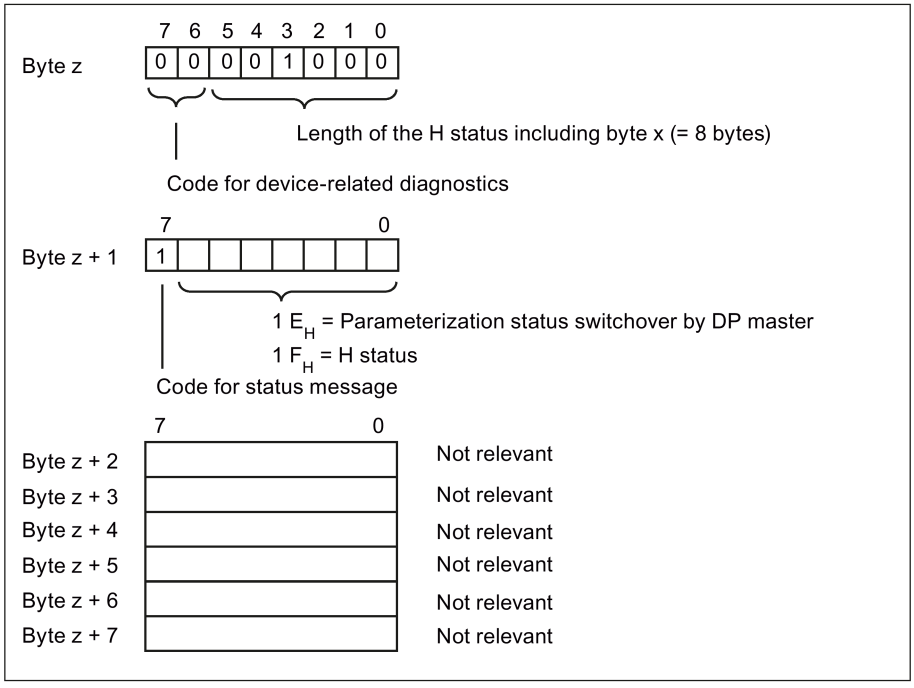


Figure 7-7 Structure of the H status

7.4.5 Interrupts

Definition

The interrupt section of the slave diagnostics provides information on the type of interrupt and what triggered it. The interrupt part consists of a maximum of 20 bytes.

Position in the diagnostics frame

The interrupt section comes after the channel-specific diagnostics (only in DPV1 mode).

Data sets

The diagnostic data of a motor starter can be up to 16 bytes in length and is located in data sets 0 and 1:

- Data set 0 contains 4 bytes of diagnostic data describing the current status of an automation system.
- Data set 1 contains the 4 bytes of diagnostic data that are also contained in data set 0 and 12 bytes of module-specific diagnostic data.

DS0 and DS1 can be read out with SFC 59 "RD_REC."

Contents

The contents of the interrupt information depend on the interrupt type:

- In the case of diagnostics interrupts, diagnostic data set 1 (16 bytes) is sent as the interrupt status information (starting at byte x + 4).

Structure of the interrupts

Once configuration with STEP 7 is completed the interrupt data is evaluated and transferred to the relevant organization blocks (OBs).

The interrupt section has the following structure:

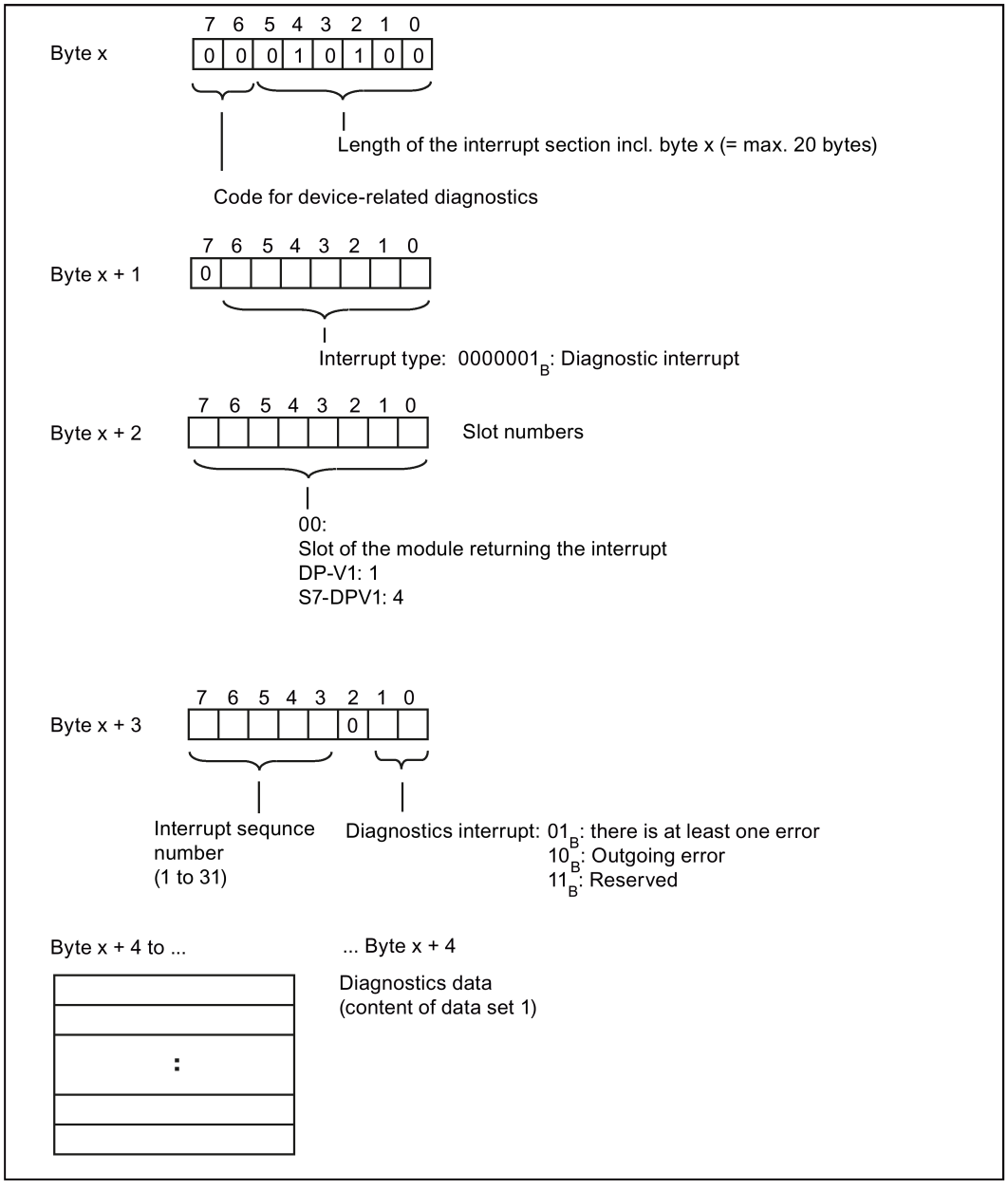


Figure 7-8 Structure of the interrupt status of the interrupt section

Diagnostics interrupt, byte x+4 to x+7

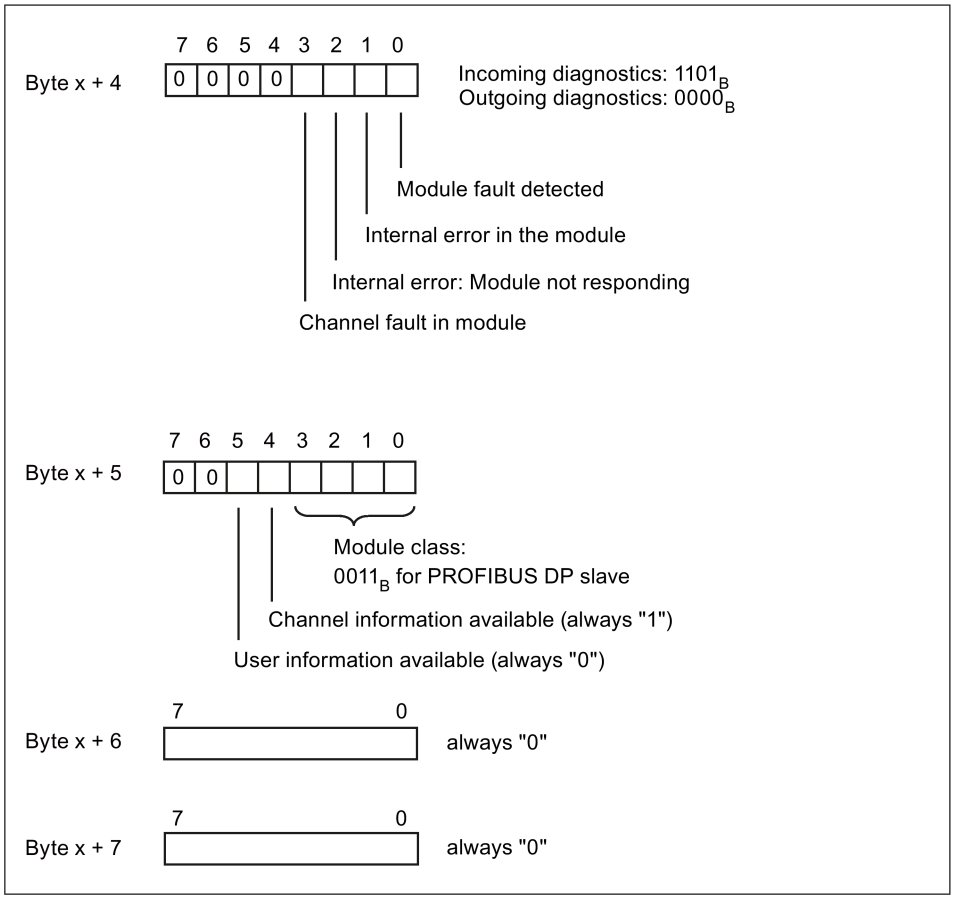


Figure 7-9 Structure of byte x + 4 to byte x + 7 for diagnostics interrupt

Diagnostics interrupt from the modules, bytes x+8 to x+11

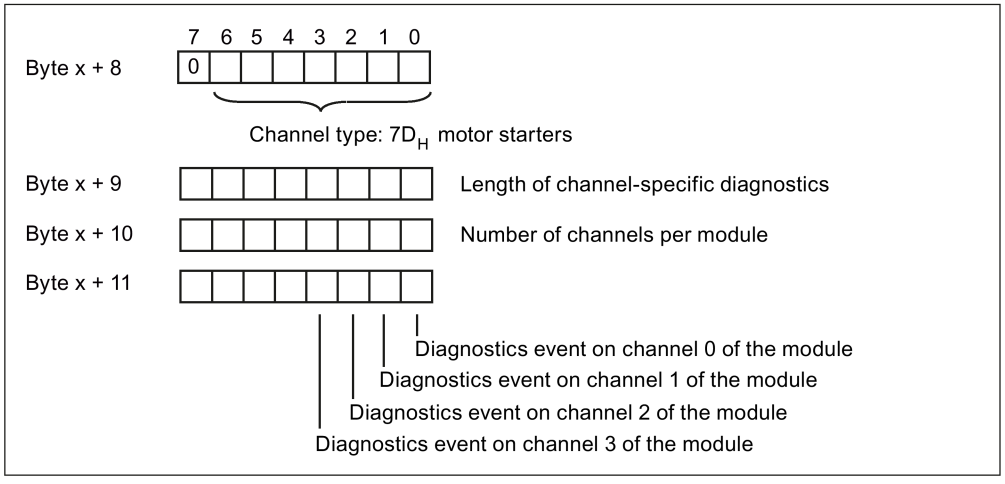


Figure 7-10 Structure of byte x + 8 to byte x + 11 for diagnostics message frame

Diagnostics interrupt from the modules, bytes x+12 to x+15

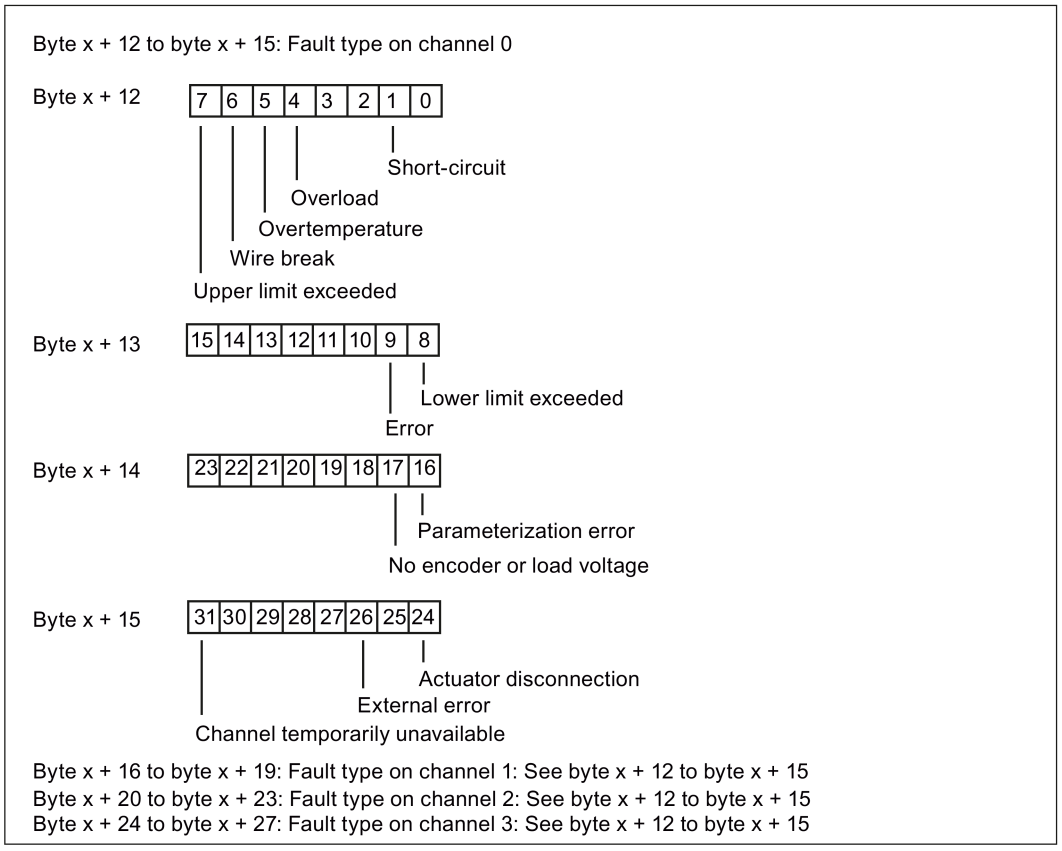


Figure 7-11 Structure of byte x + 12 to byte x + 15 for diagnostics frame

7.5 Diagnostics with STEP 7 on PROFINET IO

Additional information regarding the data records for PROFINET IO

The structure of the diagnostic data records and examples for programming can be found in the From PROFIBUS DP to PROFINET IO programming manual.
(http://support.automation.siemens.com/WW/view/en/19289930)

Reading out the diagnostic data

Options for reading diagnostics data

Automation system with I/O controller	Blocks or registers in STEP 7	Application	Reference
SIMATIC S7	e.g. in HW Config by selecting "Station" > "Open online"	Device diagnostics data in plain text on the STEP 7 user interface (in the Quick View, Diagnostics View, or Module Status windows)	"Hardware diagnostics" in the STEP 7 Online Help
	SFB 52 "RDREC"	Reading data sets from the I/O device	SFB, refer to the STEP 7 Online Help (System functions/Function blocks)
	SFB 54 "RALRM"	Receiving interrupts from the I/O device	SFB, refer to the STEP 7 Online Help (System functions/Function blocks)

7.5.1 Evaluation of interrupts with PROFINET IO

Introduction

The I/O device generates interrupts as a reaction to specific error events. Interrupts are evaluated depending on the I/O controller used.

Evaluating interrupts using an IO controller

The M200D PROFINET motor starter supports the following interrupts:

- Diagnostics interrupts
- Swapping interrupts

An interrupt automatically initiates execution of the interrupt OBs in the CPU of the I/O controller (see the *System Software for S7-300/S7-400 Programming Manual*, chapter "Program design".

Information on the cause and class of the error is already available based on the OB number and start information.

You can obtain detailed information on the error event in the error OB by calling SFB 54 RALRM (read supplementary interrupt information).

Triggering of a diagnostics interrupt

When an incoming or outgoing event (e.g., a wire break) is registered, the module triggers a diagnostics interrupt Diagnostics interrupt" is set.

The CPU interrupts the user program and executes the diagnostics block OB 82. The interrupt triggering event will be logged in the start information of OB 82.

Triggering a swapping interrupt

The CPU interrupts the user program and executes the diagnostics block OB 83. The interrupt triggering event will be logged in the start information of OB 83.

7.6 Troubleshooting

7.6.1 Response to faults

Description

In some cases, the device can be set in such a way that it responds to faults by either issuing a warning or by tripping. Examples: "Response to asymmetry", "response to temperature sensor overload".

The following table shows how the motor starter responds (depending on how it has been parameterized):

	Fault	
	Response 1	Response 2
Response:	Warning	Trip
Message bit:	Group warning set	Group fault set
LED display:	DEVICE flashes yellow	DEVICE lights up yellow SF lights up red
Motor and brake:	Not shut down	Shut down

Note

With certain faults (e.g. "process image error" or device errors, such as "Switching element defective"), however, the device always responds by tripping.
This response cannot be changed!

Other methods of indicating faults

Faults in the system can also be indicated as follows:

- When using Motor Starter ES, the relevant fault message appears in plaintext.
- On the fieldbus, the relevant bis is set in the cyclic message frame and/or on the diagnostics channel.

7.6.2 Acknowledging faults

Restart after device-internal shutdown

If the motor starter trips the switching elements automatically, it does not restart until:

- The fault has been rectified
- The fault has been acknowledged
- Device function "emergency start" activated, that is, despite a pending group fault, the motor can be switched on and off with the control commands (not in the case of a device error!)

Acknowledgement

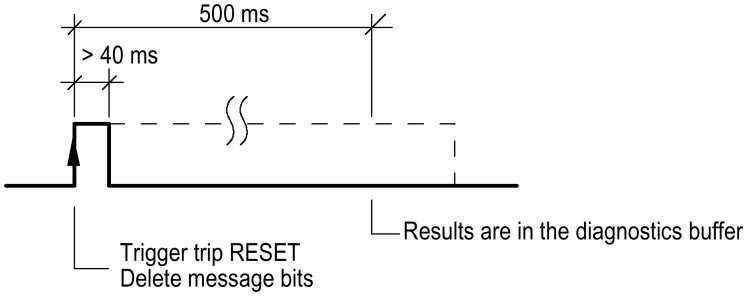
You can acknowledge system faults / warnings as follows:

- With "trip reset"
  - Bit DO 0.3 "Trip reset" via fieldbus
  - "Trip reset" command
  - Parameterized input action "Trip reset"
  - Key-operated switch (order variant) in position O
  - Circuit breaker 0 → 1
  - Device interface (handheld operator panel, Motor Starter ES)
- Parameterized "Tripping with restart" (autoreset)
- With the opposite command, e.g. "motor OFF" (process image errors only)

Note

Trip reset is edge-triggered!

If trip reset is present permanently, acknowledgement is only triggered once.



Note

Acknowledging device errors

A device error can only be acknowledged by switching the power off and then on again.

If the error occurs again, however, the motor starter must be replaced.

Technical data

8

8.1 General technical specifications

Location	In the plant	Wall mounted (near motor)	
Permissible mounting positions		Vertical, horizontal, flat	
Degree of protection	IP65 Type 12	According to IEC 529 (DIN 40050) According to UL	
Protection class	1	IEC 60364-4-41 (DIN VDE 0100-410)	
Touch protection	Finger-safe		
Degree of pollution	3	To IEC 60664	
Cooling	Convection	No additional cooling required	
Operating temperature	–25°C to + 40°C max. 55°C	With reduction of I_e (see "Derating")	
Transport and storage temperature	–40°C to + 70°C	—	
Air humidity	10 % to 95 %	Condensation must not be allowed to form	
Max. temperature change	1 K / min	IEC 60068, Part 2-14	
Chemical environment conditions	3C3	conforming to IEC 60721-3-3	
Installation altitude	1000 m 2000 m	No restrictions With restrictions (reduction of I_e by 1 % every 100 m up to 2000 m)	
Vibration resistance	2 g	To IEC 60 068, Part 2-6	
Shock	12 g with 11 ms without influencing point of contact: 9.8 g / 5 ms or 5.9 g / 10 ms	To IEC 60 068, Part 2-27 half-sine	
Free fall	0.6 m	In product packaging	
ESD	8 kV air discharge 4 kV contact discharge	IEC 61000-4-2	Severity grade 3
Electromagnetic fields	10 V/m	IEC 61000-4-3	Severity grade 3
BURST	2 kV / 5 kHz supply voltage 2 kV / 5 kHz data cables 2 kV / 5 kHz process cables	IEC 61000-4-4	Severity grade 3
SURGE Installation class 1 to 3 [1)]	1 / 2 kV	IEC 61000-4-5	Severity grade 3
Emitted interference	Limit value class A	EN 55011	

[1)] If the starter is used in installation class 3 (increased overvoltage due to parallel cable installation), an overvoltage protection module (3RK1901-1GA00 and 3RG9030-0AA00) must be used.

Note

This product is designed for environment A (industrial environments). In household environments, this device can cause unwanted radio interference. The user may be required to implement appropriate measures in this case.

8.2 Motor starters

Motor starter version		PROFIBUS/PROFINET	
		DSte / RSte	sDSSte/sRSSte
Mounting dimensions	Width Height Depth	294 mm 215 mm 162 mm	
Weight		2820 g / 3080 g	3160 g / 3360 g
Control circuit			
Operating voltage $U_{DC24V-NS}$		20.4 to 28.8 V DC	
Current consumption from $U_{DC24V-NS}$			
without sensors connected with sensors connected		max. 100 mA max. 300 mA (total sensor current consumption < 200 mA)	
Operating voltage $U_{DC24V-S}$		20.4 to 28.8 V DC	
Current consumption from $U_{DC24V-S}$		< 100 mA	
Main circuit			
Max. power of three-phase motors at 400 V		5.5 kW	
Rated operating current			
AC 1/2/3	At 400 V At 500 V	12 A 9 A	— —
AC-4	At 400 V	4 A	—
AC-53a (8h operation)	At 400 V	—	12 A (soft start) 9 A (direct start)
Rated operating voltage Certification to EN 60947-1 Appendix N Certification to UL508 and CSA C22.2 No. 14		 400 V AC, 50 / 60 Hz 600 V AC, 50 / 60 Hz	 400 V AC, 50 / 60 Hz 480 V AC, 50 / 60 Hz
Product category according to UL		NLDX	NMFT

Motor starter version		PROFIBUS/PROFINET	
		DSte / RSte	sDSSte/sRSSte
Motor ratings according to UL / CSA			
3RK13.5- .K (2 A) power (3ph /hp) / max. FLA	At 460/480 V AC	0.75 hp / 1.6 A	0.75 hp / 1.6 A
	At 575/600 V AC	1 hp / 1.7 A	—
3RK13.5- .L (12 A) power (3ph /hp) / max. FLA	At 230/240 V AC	3 hp / 9.6 A	3 hp / 9.6 A
	At 460/480 V AC	7.5 hp / 11 A	7.5 hp / 11
	At 575/600 V AC	10 hp / 11 A	—
Typical switching times incl. internal signal processing at 0.85 to 1.1 x U_e	Closing delay Opening delay	50 to 85 ms 40 to 65 ms	25 / 105 ms 35 / 35 ms
Mechanical service life of contactor		10 million	—
Electrical service life of contactor		Electrical service life of contactor (Page 183)	—
B10 value		1000000[1)]	—
Permissible switching frequency		Electrical service life of contactor (Page 183)	Switching frequency (Page 175)
Isolation stability			
Rated surge capacity U_{imp}		6 kV	
Rated insulation voltage U_i		500 V	
Safe isolation between main and control circuits to IEC 60947-1 Appendix N		400 V	
Short-circuit protection			
Instantaneous overcurrent release $I_{e\ max}$ = 2 A $I_{e\ max}$ = 9 / 12 A		26 A 208 A	
Rated short-circuit¬breaking capacity I_{CU} at 400 V in accordance with IEC 60947			
At 400 V At 500 V		50 kA 50 kA	50 kA 20 kA
Short circuit ratings according to UL / CSA		65 kA / 480 V / Any circuit breaker or any fuse	5 kA / 480 V / fuse: 60 A class J
		10 kA / 600 V / Any circuit breaker or any fuse	42 kA / 480 V / fuse: 45 A class J
Group installation		Suitable for Group installation	
Motor disconnect		Suitable as motor disconnect	

1) This specification refers exclusively to the mechanical switching element under its reference conditions.

Note

Electromagnetic compatibility with pulse-shaped disturbance variables

With surges, you require a lightning protection element on the 24 V power supply. (see DP master manual and description of SIMATIC NET PROFIBUS networks)

Note

To change the direction of rotation, a mechanically-switching reversing contactor is integrated in reversing starters with solid-state switching. The preferred position of this contactor is "CW rotation". When the direction is changed to "CCW rotation", the reversing contactor is activated first, followed by the electronic contacts after an 80 ms delay.

8.3 Brake control

Brake version	400 V AC / 230 V	180 V DC
Rated operating voltage	AC 220 ... 600 V (-10% / +5%), 50 / 60 Hz	
Output voltage	-	0.45 x U_e e. g. 180 V DC at 400 V AC 215 V DC at 480 V AC
Shutdown delay	-	50 ms
Continuous current	< 0.5 A	< 0.8 A
Voltage drop during continuous current	7 V	3.5 V
Inrush current at t < 120 ms	< 5 A	< 5 A
Switching capacity to IEC60947-5-1 - AC 15, at 400 V AC - DC 13, at 180 V DC	 0.4 A -	 - 0.8 A
Fault message with non-controlled brake	No	
Protective measures		
Short-circuit protection	Yes, 1 A melting fuse	
Inductive interference protection	Integrated varistors	
Max. energy absorption of switching voltage limit		> 43 J (for 2 ms)

8.4 Inputs

Input characteristic to IEC60947-1 Appendix S and IEC61131-2		Type 1
Input voltage	- Rated value - for signal "0" - for signal "1"	24 V DC -3 to +5 V 11 to 30 V
Input current for signal "1"		7 mA, typ.
Connection of 2-wire BEROs		Possible
Permissible residual current		1.5 mA, max.
Sensor supply		max.: Operating voltage DC24V-NS min. : Operating voltage DC24V-NS - 2 V Short-circuit and overload resistant
Total current sensor supply		Max. 200 mA (sensor supply is short-circuit proof)
Connection		M12 connectors
Assignment of inputs		
IN1 IN2 IN3 IN4		Input 1 (DI 0.4) Input 2 (DI 0.5) Input 3 (DI 0.6) Input 4 (DI 0.7)

8.5 Outputs

Number of digital outputs		2
Switching capacity		0.5 A continuous current
Cable length	Shielded Unshielded	30 m, max.
Short-circuit protection Response threshold		Electronic > 0.7 A, typ.
Limiting of inductive shutdown voltage		Integrated free-wheeling diode
Lamp load		5 W, max.
Voltage drop	For signal 1	$U_{DC24V-S}$ + (- 0,8 V), min.
Residual current	For signal 0	0.5 mA max.
Connection		M12 connectors
Assignment of output		
OUT1 OUT2		Output 1 (DO 1.0) Output 2 (DO 1.1) Depending on the parameter "Output n - action"

8.6 Thermistor motor protection

Temperature sensor		PTC	Thermoclick
Evaluation characteristic curve in accordance with IEC60947-8		Type A	—
Summation cold resistance sensor circuit			< 1.5 kΩ
No-load voltage of sensor circuit			< 30 V
Short-circuit current sensor circuit			< 1.2 mA
Trip level			3.4 to 3.8 kΩ
Reset level			1.5 to 1.65 kΩ
Short-circuit detection		< 30 Ω	No
Electrical isolation vis-à-vis	Main current path		Yes (U_i = 400 V)
	$U_{DC24V-NS}$		Yes (U_i = 400 V)
	$UV_{DC24V-S}$		Yes (U_i = 400 V)

8.7 Switching frequency

The switching frequency specifies how many switching cycles can be performed in one time unit (e.g. in 1 hour) with the switching device under normal operating conditions.

If motors are switched too often, this causes the thermal motor model to respond.

The maximum permissible switching frequency depends on the following operating data:

- Rated current I_e of the motor
- ON duration ED
- Degree and category of protection
- Ambient conditions such as
  - Temperature
  - Installation position

ON duration ED

The relative ON duration ED in % is the ratio between the load duration and the cycle duration on loads that are switched on and off frequently.
The ON duration ED can be calculated using the following formula:

$$ED = \frac{t_s + t_b}{t_s + t_b + t_p}$$

ED ON duration [%]
t_s Starting time [s]
t_b Operating time [s]
t_p Idle time [s]

Graphics-based representation:

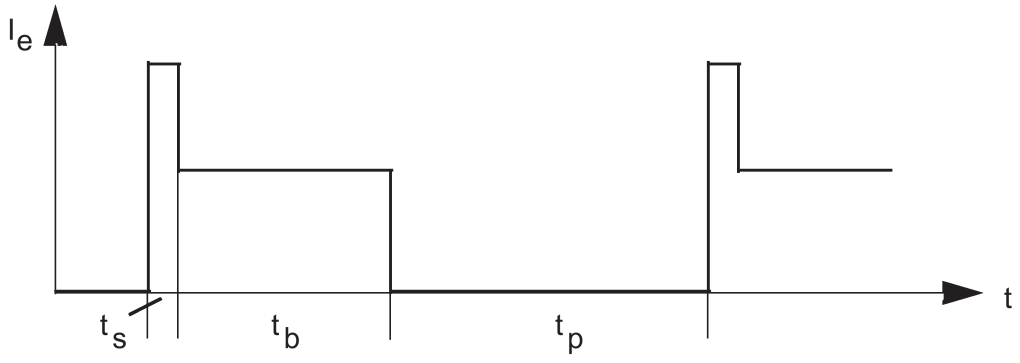


Figure 8-1 ON duration ED

The following tables provide an overview of the switching cycles/hour according to influencing factors.

Direct and reversing starters, electronic (sDSSte / sRSSte) up to 5.5 kW

Switching frequencies with active soft start function

Switching cycles/hour for 3RK1395-6KS71-.AD. (0.15 A to 2 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**2 A**		**2 A**		**2 A**		**2 A**		**2 A**		**2 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 %, Start 4 x I_e/ 1 s	250	910	250	910	250	910	250	910	250	910	250	910
ED=70 %, Start 4 x I_e / 1 s	150	460	150	460	150	460	150	460	150	460	150	460
ED=30 %, Start 4 x I_e/ 2 s	120	420	120	420	120	420	120	420	120	420	120	420
ED=70 %, Start 4 x I_e / 2 s	70	210	70	210	70	210	70	210	70	210	70	210
Class 10												
ED=30 %, Start 4 x I_e/ 2 s	120	450	120	450	120	450	120	450	120	450	120	450
ED=70 %, Start 4 x I_e / 2 s	70	230	70	230	70	230	70	230	70	230	70	230
ED=30%, Start 4 x I_e/ 4 s	60	210	60	210	60	210	60	210	60	210	60	210
ED=70%, Start 4 x I_e / 4 s	37	100	37	100	37	100	37	100	37	100	37	100
Class 15												
ED=30%, Start 4 x I_e/ 3 s	80	300	120	450	120	450	120	450	120	450	120	450
ED=70%, Start 4 x I_e / 3 s	50	150	70	230	70	230	70	230	70	230	70	230
ED=30%, Start 4 x I_e/ 6 s	40	140	60	210	60	210	60	210	60	210	60	210
ED=70%, Start 4 x I_e / 6 s	25	70	37	100	37	100	37	100	37	100	37	100
Class 20												
ED=30%, Start 4 x I_e/ 4 s	60	220	60	220	60	220	60	220	60	220	60	220
ED=70%, Start 4 x I_e / 4 s	37	110	37	110	37	110	37	110	37	110	37	110
ED=30%, Start 4 x I_e/ 8 s	30	100	30	100	30	100	30	100	30	100	30	100
ED=70%, Start 4 x I_e / 8 s	18	50	18	50	18	50	18	50	18	50	18	50

1) Duty cycle current rms value =1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**5 A**		**5 A**		**5 A**		**5 A**		**5 A**		**4.5 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 %, Start 4 x I_e/ 1 s	250	910	250	780	250	650	250	860	250	650	250	650
ED=70 %, Start 4 x I_e / 1 s	150	460	150	400	150	300	150	460	150	280	150	280
ED=30 %, Start 4 x I_e/ 2 s	120	420	120	370	120	320	120	420	120	320	120	320
ED=70 %, Start 4 x I_e / 2 s	70	210	70	190	70	150	70	210	70	140	70	140
Class 10												
ED=30 %, Start 4 x I_e/ 2 s	120	450	120	380	120	320	120	430	120	320	120	320
ED=70 %, Start 4 x I_e / 2 s	70	230	70	180	70	130	70	230	70	140	70	140
ED=30 %, Start 4 x I_e / 4 s	60	210	60	190	60	160	60	210	60	160	60	160
ED=70 %, Start 4 x I_e / 4 s	37	100	37	100	37	70	37	100	37	70	37	70
Class 15												
ED=30 %, Start 4 x I_e / 3 s	80	300	80	250	80	220	80	280	80	210	80	210
ED=70 %, Start 4 x I_e / 3 s	50	150	50	130	50	100	50	150	50	95	50	95
ED=30 %, Start 4 x I_e / 6 s	40	140	40	130	40	110	40	140	40	105	40	105
ED=70 %, Start 4 x I_e / 6 s	25	70	25	65	25	50	25	70	25	50	25	50
Class 20												
ED=30 %, Start 4 x I_e / 4 s	60	220	60	190	60	160	60	210	60	160	60	160
ED=70 %, Start 4 x I_e / 4 s	37	110	37	100	37	70	37	115	37	70	37	70
ED=30 %, Start 4 x I_e / 8 s	30	100	30	95	30	80	30	105	30	80	30	80
ED=70 %, Start 4 x I_e / 8 s	18	50	18	50	18	35	18	50	18	35	18	35

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**7 A**		**5.8 A**		**5 A**		**6 A**		**5 A**		**4.5 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 %, Start 4 x I_e/ 1 s	250	580	250	600	250	650	250	650	250	650	250	650
ED=70 %, Start 4 x I_e / 1 s	150	260	150	260	150	300	150	280	150	280	150	280
ED=30 %, Start 4 x I_e/ 2 s	120	290	120	300	120	320	120	320	120	320	120	320
ED=70 %, Start 4 x I_e / 2 s	70	130	70	130	70	150	70	140	70	140	70	140
Class 10												
ED=30 %, Start 4 x I_e/ 2 s	120	290	120	300	120	320	120	320	120	320	120	320
ED=70 %, Start 4 x I_e / 2 s	70	130	70	130	70	130	70	140	70	140	70	140
ED=30 %, Start 4 x I_e / 4 s	60	145	60	150	60	160	60	160	60	160	60	160
ED=70 %, Start 4 x I_e / 4 s	37	65	37	65	37	70	37	70	37	70	37	70
Class 15												
ED=30 %, Start 4 x I_e / 3 s	80	190	80	200	80	220	80	210	80	210	80	210
ED=70 %, Start 4 x I_e / 3 s	50	85	50	85	50	100	50	95	50	95	50	95
ED=30 %, Start 4 x I_e / 6 s	40	95	40	100	40	110	40	105	40	105	40	105
ED=70 %, Start 4 x I_e / 6 s	25	45	25	45	25	50	25	50	25	50	25	50
Class 20												
ED=30 %, Start 4 x I_e / 4 s	60	145	60	150	60	160	60	160	60	160	60	160
ED=70 %, Start 4 x I_e / 4 s	37	65	37	65	37	70	37	70	37	70	37	70
ED=30 %, Start 4 x I_e/ 8 s	30	72	30	75	30	80	30	80	30	80	30	80
ED=70 %, Start 4 x I_e / 8 s	18	33	18	33	18	35	18	35	18	35	18	35

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**9 A**		**9 A**		**9 A**		**9 A**		**9 A**		**9 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 %, Start 4 x I_e/ 1 s	250	340	250	250	210	210	250	290	210	210	170	170
ED=70 %, Start 4 x I_e / 1 s	150	290	150	200	150	160	150	240	150	170	125	125
ED=30 %, Start 4 x I_e/ 2 s	120	170	120	120	105	105	120	145	105	105	88	88
ED=70 %, Start 4 x I_e / 2 s	70	140	70	100	70	80	70	120	70	82	63	63
Class 10												
ED=30 %, Start 4 x I_e/ 2 s	120	170	120	120	105	105	120	145	105	105	88	88
ED=70 %, Start 4 x I_e / 2 s	70	140	70	100	70	80	70	120	70	82	63	63
ED=30 %, Start 4 x I_e / 4 s	60	85	60	60	53	53	60	72	53	53	44	44
ED=70 %, Start 4 x I_e / 4 s	38	72	38	50	38	38	38	60	38	41	31	31
Class 15												
ED=30 %, Start 4 x I_e/ 3 s	80	115	80	85	70	70	80	97	71	71	58	58
ED=70 %, Start 4 x I_e / 3 s	50	95	50	65	50	52	50	80	50	55	42	42
ED=30 %, Start 4 x I_e / 6 s	40	57	40	42	35	35	40	48	35	35	29	29
ED=70 %, Start 4 x I_e / 6 s	26	48	26	33	26	26	25	40	25	27	21	21
Class 20												
ED=30 %, Start 4 x I_e / 4 s	60	85	60	60	53	53	60	72	53	53	44	44
ED=70 %, Start 4 x I_e / 4 s	38	72	38	50	38	38	38	60	38	41	31	31
ED=30 %, Start 4 x I_e / 8 s	30	42	30	30	26	26	30	36	26	26	22	22
ED=70 %, Start 4 x I_e / 8 s	18	36	18	25	18	18	19	30	19	20	15	15

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**12 A**		**12 A**		**12 A**		**12 A**		**12 A**		**11 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 %, Start 4 x I_e/ 1 s	215	215	155	155	125	125	175	175	125	125	120	120
ED=70 %, Start 4 x I_e / 1 s	150	150	100	100	70	70	125	125	70	70	70	70
ED=30 %, Start 4 x I_e/ 2 s	107	107	77	77	63	63	88	88	63	63	60	60
ED=70 %, Start 4 x I_e / 2 s	70	80	50	50	35	35	62	62	36	36	33	33
Class 10												
ED=30 %, Start 4 x I_e/ 2 s	107	107	77	77	63	63	88	88	63	63	60	60
ED=70 %, Start 4 x I_e / 2 s	70	80	50	50	35	35	62	62	36	36	33	33
ED=30 %, Start 4 x I_e / 4 s	54	54	38	38	312	31	44	44	31	31	31	31
ED=70 %, Start 4 x I_e / 4 s	38	40	25	25	18	18	31	31	18	18	18	18
Class 15												
ED=30 %, Start 4 x I_e / 3 s	72	72	52	52	42	42	59	59	42	42	40	40
ED=70 %, Start 4 x I_e / 3 s	50	54	34	34	24	24	41	41	24	24	24	24
ED=30 %, Start 4 x I_e / 6 s	36	36	26	26	21	21	29	29	21	21	20	20
ED=70 %, Start 4 x I_e / 6 s	25	27	17	17	12	12	20	20	12	12	12	12
Class 20												
ED=30 %, Start 4 x I_e / 4 s	54	54	38	38	31	31	44	44	31	31	31	31
ED=70 %, Start 4 x I_e / 4 s	38	40	25	25	18	18	31	31	18	18	18	18
ED=30 %, Start 4 x I_e / 8 s	27	27	19	19	15	15	22	22	15	15	15	15
ED=70 %, Start 4 x I_e / 8 s	18	20	12	12	9	9	15	15	9	9	9	9

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching frequencies with deactivated soft start function (direct start)

Switching cycles/hour for 3RK1395-6KS71-.AD. (0.15 A to 2 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**2 A**		**2 A**		**2 A**		**2 A**		**2 A**		**2 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30% (8 x Ie) / 0.1 s	600	3600	600	3600	600	3600	600	3600	600	3600	600	3600
ED=70% (8 x Ie) / 0.1 s	360	2000	360	2000	360	2000	360	2000	360	2000	360	2000
ED=30 % (8 x I_e) / 0.2 s	300	2000	300	2000	300	2000	300	2000	300	2000	300	2000
ED=70 % (8 x I_e) / 0.2 s	180	1000	180	1000	180	1000	180	1000	180	1000	180	1000
ED=30 % (8 x I_e) / 0.4 s	150	1000	150	1000	150	1000	150	1000	150	1000	150	1000
ED=70 % (8x I_e) / 0.4 s	90	520	90	520	90	520	90	520	90	520	90	520
Class 10												
ED=30% (8 x Ie) / 0.1 s	600	3600	600	3600	600	3600	600	3600	600	3600	600	3600
ED=70% (8 x Ie) / 0.1 s	360	2000	360	2000	360	2000	360	2000	360	2000	360	2000
ED=30% (8 x Ie) / 0.2 s	300	2000	300	2000	300	2000	300	2000	300	2000	300	2000
ED=70% (8 x Ie) / 0.2 s	180	1000	180	1000	180	1000	180	1000	180	1000	180	1000
ED=30 % (8 x I_e) / 0.4 s	150	1000	150	1000	150	1000	150	1000	150	1000	150	1000
ED=70 % (8 x I_e) / 0.4 s	90	500	90	500	90	500	90	500	90	500	90	500
ED=30 % (8 x I_e) / 0.8 s	75	490	75	490	75	490	75	490	75	490	75	490
ED=70 % (8 x I_e) / 0.8 s	45	250	45	250	45	250	45	250	45	250	45	250

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current I_e	**5 A**		**5 A**		**5 A**		**5 A**		**5 A**		**4.5 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30% (8 x I_e) / 0.1 s	600	3400	600	2500	600	2000	600	2800	600	2100	600	2100
ED=70% (8 x I_e) / 0.1 s	380	2000	380	1250	380	880	380	1600	380	900	380	900
ED=30% (8 x I_e) / 0.25 s	240	1300	240	1000	240	800	240	1150	240	840	240	840
ED=70 % (8 x I_e) / 0.25 s	150	800	150	500	150	350	150	650	150	380	150	380
ED=30% (8 x I_e) / 0.5 s	120	700	120	500	120	400	120	580	120	430	120	430
ED=70 % (8 x I_e) / 0.5 s	70	380	70	270	70	200	70	340	70	200	70	200
Class 10												
ED=30% (8 x I_e) / 0.25 s	240	1300	240	1000	240	820	240	1100	240	820	240	820
ED=70% (8 x I_e) / 0.25 s	160	760	160	500	160	350	160	640	160	350	160	350
ED=30 % (8 x I_e) / 0.5 s	120	700	120	520	120	420	120	580	120	430	120	430
ED=70 % (8 x I_e) / 0.5 s	70	400	70	280	70	200	70	340	70	200	70	200
ED=30 % (8 x I_e) / 1 s	60	350	60	260	60	220	60	290	60	220	60	220
ED=70 % (8 x I_e) / 1 s	37	190	37	140	37	100	37	170	37	100	37	100

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current Ie	**7 A**		**5.8 A**		**5 A**		**6 A**		**5 A**		**4.5 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 % (8 x I_e) / 0.3 s	200	630	200	670	200	740	200	700	200	700	200	700
ED=70 % (8 x I_e) / 0.3 s	120	280	120	290	120	330	120	320	120	320	120	320
ED=30 % (8 x I_e) / 0.6 s	100	320	100	330	100	370	100	350	100	350	100	350
ED=70 % (8 x I_e) / 0.6 s	60	140	60	140	60	160	60	160	60	160	60	160
Class 10												
ED=30 % (8 x I_e) / 0.6 s	100	320	100	330	100	370	100	350	100	350	100	350
ED=70 % (8 x I_e) / 0.6 s	60	140	60	140	60	160	60	160	60	160	60	160
ED=30 % (8 x I_e) / 1.2 s	50	160	50	170	50	190	50	170	50	170	50	170
ED=70 % (8 x I_e) / 1.2 s	30	70	30	70	30	80	30	80	30	80	30	80

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

Switching cycles/hour for 3RK1395-6LS71-.AD.(1.5 A to 12 A)												
Installation position	**Vertical**						**Horizontal**					
Rated current Ie	**9 A**		**9 A**		**9 A**		**9 A**		**9 A**		**9 A**	
Ambient temperature	**40 °C**		**50 °C**		**55 °C**		**40 °C**		**50 °C**		**55 °C**	
Motor protection	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)	1)	2)
Class 5 (10a)												
ED=30 % (8 x I_e) / 0.35 s	170	330	170	240	170	200	170	280	170	200	170	170
ED=70 % (8 x I_e) / 0.35 s	100	280	100	190	100	150	100	230	100	155	100	120
ED=30 % (8 x I_e) / 0.7 s	85	170	85	120	85	100	85	140	85	105	85	85
ED=70 % (8 x I_e) / 0.7 s	52	140	52	95	52	75	52	120	52	82	52	62
Class 10												
ED=30 % (8 x I_e) / 0.75 s	85	160	85	115	85	95	80	130	80	95	80	80
ED=70 % (8 x I_e) / 0.75 s	52	130	52	90	52	70	50	110	50	75	50	57
ED=30 % (8 x I_e) / 1.5 s	40	80	40	59	40	48	40	67	40	48	40	40
ED=70 % (8 x I_e) / 1.5 s	25	67	25	47	25	37	25	56	25	38	25	29

1) Duty cycle current rms value = 1.15 x I_e → motor protection

2) Duty cycle limit for motor starter. The motor should be protected against overload here by means of a thermistor.

8.8 Electrical service life of contactor

Service life of main contacts (DSte / RSte) to 5.5 kW

The curves show the contact service life of contactors when switching ohmic and inductive three-phase loads (AC-1/AC-3) as a function of breaking current and rated operating voltage. The prerequisite for this are command devices that switch at random, i.e. not synchronously to the phase angle of the line.

The rated operating current I_e in accordance with utilization category AC-4 (breaking of 6 times the rated operating current) is determined for a contact service life of at least 200 000 operating cycles.

If a smaller contact service life is sufficient, the rated operating current I_e/AC-4 can be increased.

If **mixed operation** is available, i.e. if normal switching operation (breaking of rated operating current in accordance with utilization category AC-3) is mixed with occasional inching (breaking of the multiple rated operating current in accordance with utilzation category AC-4), the service life of the contacts can be calculated approximately with the following formula:

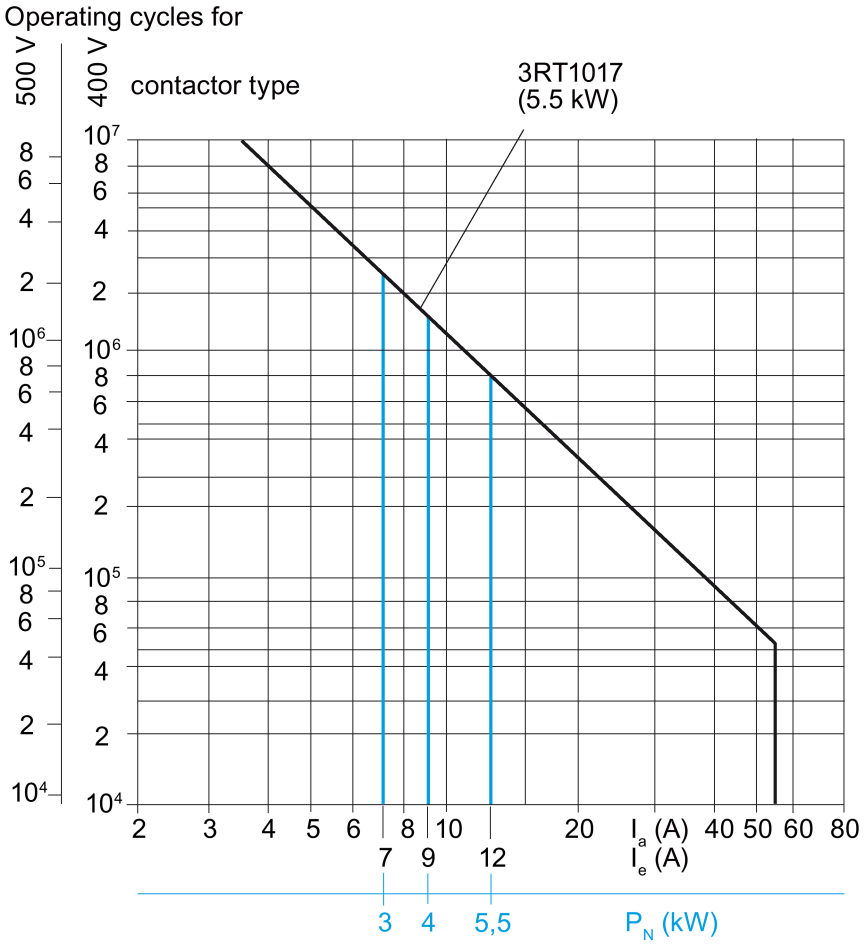
$$X = \frac{A}{1+\frac{C}{100} * \left(\frac{A}{B} - 1\right)}$$

X Contact service life for mixed operation in operating cycles

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

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

C Proportion of inching operations in the total operations as a percentage



P_N Rated power of three-phase motors at 400 V

I_a Breaking current

I_e Rated operating current

Figure 8-2 Service life of main contacts for contactor 3RT1017

8.9 Dimension drawings

8.9.1 M200D motor starter module

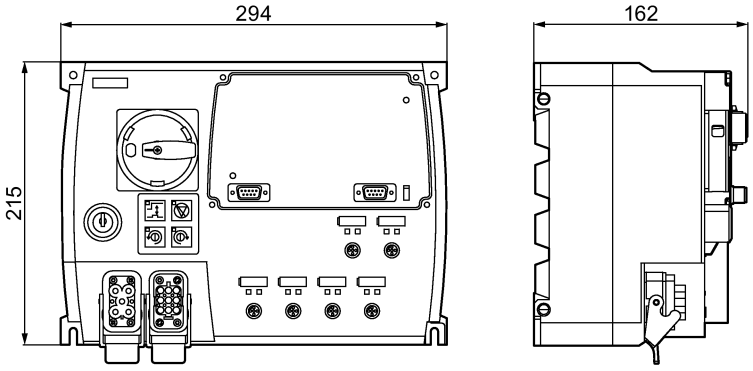


Figure 8-3 Dimensions of the M200D motor starter module without protection guard

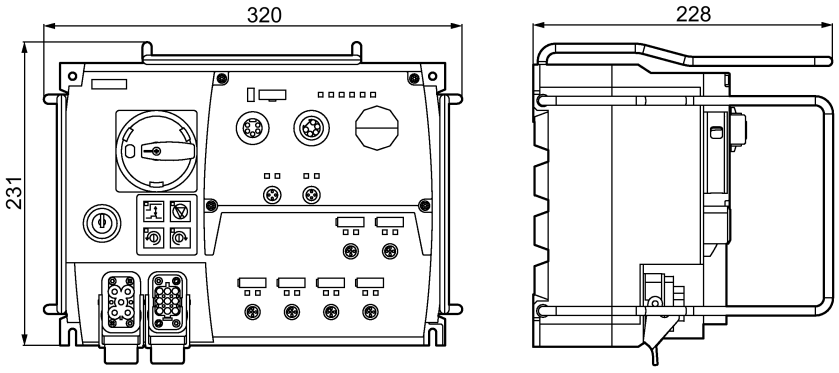


Figure 8-4 Dimensions of the M200D motor starter module with protection guard

8.9.2 M200D PROFIBUS communication module

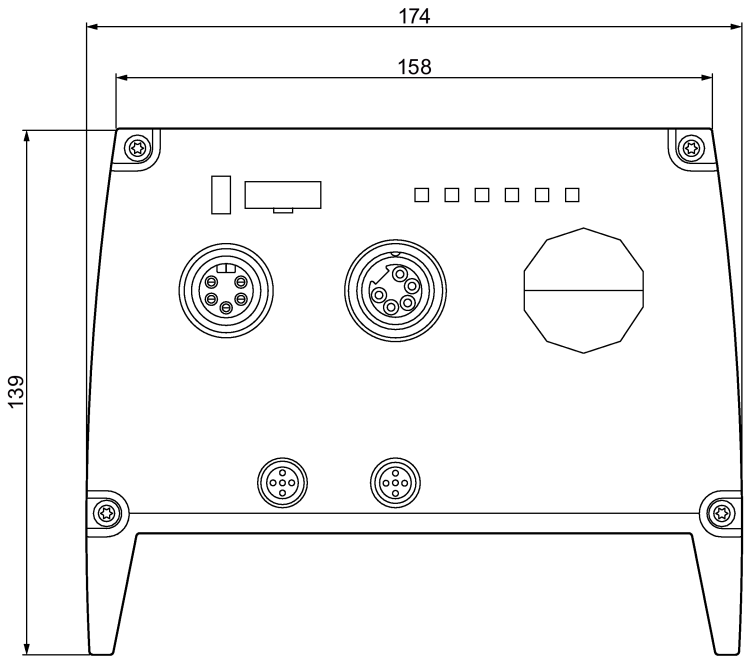


Figure 8-5 Dimensions of the M200D PROFIBUS communication module

8.9.3 M200D PROFINET communication module

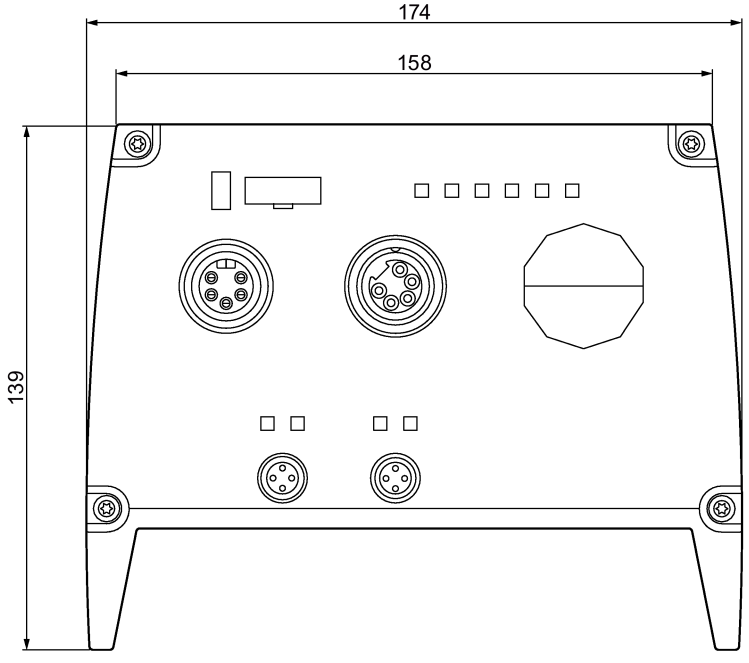


Figure 8-6 Dimensions of the M200D PROFINET communication module

Appendix A

A.1 Data formats and data sets

A.1.1 Data formats

Properties

The motor starter calculates a host of operating, diagnostic, and statistical data. Control data is transferred to the motor starter.

Control data

Data that is transferred to the motor starter, e.g. switching command motor CCW, trip reset, etc.

Data format: Bit

Messages

Data that is transferred from the motor starter and that indicates the current operating status, e.g. motor CCW, etc.

Data format: Bit

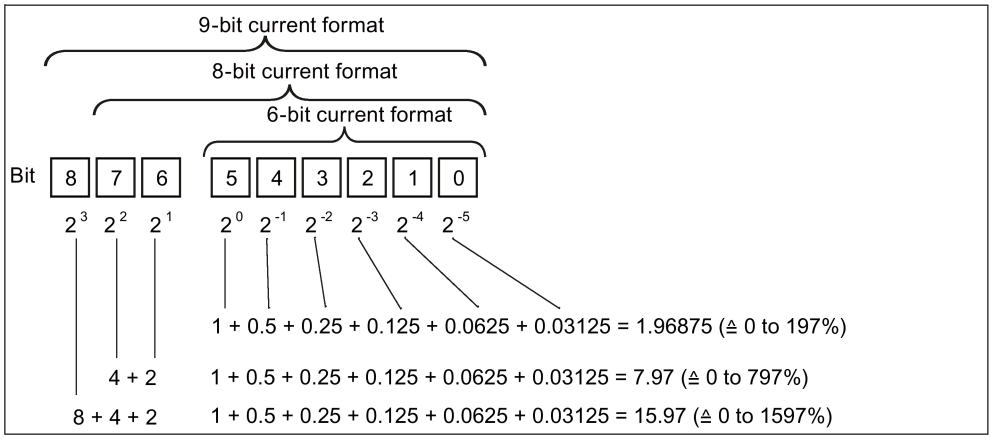
Diagnostics

Data that is transferred from the motor starter and that indicates the current operating status, e.g. fault overload, etc.

Data format: Bit

Current values

Current values are encoded in different formats: 6-bit current format, 8-bit current format, and 9-bit current format:



Current values are

- Motor current I_{max} (6-bit current format)
- Phase currents $I_{L1\ max}$, $I_{L2\ max}$, $I_{L3\ max}$ (8-bit current format)
- Last tripping current (9-bit current format)
- Maximum tripping current (9-bit current format)

Statistical data on device service life

- Operating hours
  The motor starter records 2 operating hours values:
  - The operating hours of the motor.
    This indicates how long the motor was switched on.
  - The operating hours of the device (motor starter).
    Indicates how long the 24 V DC LV power supply of the motor starter was switched on

Both operating hours values are recorded in data set 95 – Statistics. They are entered in the data field "Operating hours" alternately at 5-second intervals. The bit "Operating hours selection" specifies which of the two operating hours values has been transferred.

[0]: Operating hours - motor

[1]: Operating hours - device

The operating hours are recorded in the range from 0 to 16,777,215 minutes in 1-second steps.

- Number of overload trips
  The motor starter counts the number of overload trips in the range 0 to 65,535.
- Number of starts motor CW/CCW
  The motor starter counts the number of starts in the range 0 to 16,777,215.
  Example: The value is incremented by 1 when the current is flowing in the main circuit after the "Motor ON" command has been issued.
- Motor current I_{max}.
  The motor starter measures the current in all 3 phases and displays the current of the phase under the greatest load as a percentage [%] of the setting current I_e.
  Data format: 1 byte, 8-bit current format
  Example: Setting current I_e = 10 A
  Indicated motor current 110%
  then corresponds to 10 A x 1.1 = 11 A
  All 3 phase currents are available in data set 94
- Last tripping current
  The motor starter measures the current in all 3 phases and displays the current that is flowing in the phase under the greatest load when the trip occurs as a percentage [%] of the current setting I_e and in amperes [A]
  Data format: 2 bytes, 9-bit current format
  Example: Setting current I_e = 10 A
  Indicated motor current 455% then corresponds to 10 A x 4.55 = 45.5 A

Statistical data maximum pointers

Maximum pointers are used for preventive diagnostics:
The maximum measured value is stored in the device.
The higher-level PLC can fetch the measured value at any time.
The higher-level PLC can delete the measured value at any time.

The following data is available in the form of a maximum pointer:

- Number of motor overload trips
- Operating hours - motor current = 18 to 49.9 % of I_e
- Operating hours - motor current = 50 to 89.9 % of I_e
- Operating hours - motor current = 90 to 119.9 % of I_e
- Operating hours - motor current = 120 to 1000 % of I_e
- Maximum tripping current $I_{A\ max}$ (%)
- Maximum tripping current $I_{A\ max}$ (rms)
- Phase current $I_{L1\ max}$ to $I_{L3\ max}$. Maximum phase current as a percentage [%] of the current setting I_e and in amperes [A]
  Data format: 1 byte each, 8-bit current format.
  The measured maximum phase current in each case is stored per phase.
- Maximum heat sink temperature (only on sDSSte/sRSSte 12 A)

A.1.2 Object number, error codes

Object number

The object number is used for unique identification of all the information available in the motor starter (parameters, control commands, diagnostics, commands, etc.).

The object number is returned in the case of the logbook data records. The object number uniquely identifies the meaning. It is located in the left-hand column of the data set tables.

Coordination

Coordination is an identifier in the data record header that identifies the "sender" of the data record.

Error codes with negative data set acknowledgment

Description

If a data set is rejected, an error code is sent with the negative acknowledgment, both via the device interface and via the bus interface. This provides information about the reason for the negative acknowledgment.

The error codes comply with the PROFIBUS-DPV1 standard in as far as it applies to the motor starter.

Evaluation via local device interface with Motor Starter ES

The error codes are evaluated by the Motor Starter ES parameterization and diagnostics software and output in plaintext.

More information on this can be found in the online help of Motor Starter ES.

Evaluation via PROFIBUS DP

The error codes are output via PROFIBUS DP Layer 2.

More information can be found in the relevant manuals for the PROFIBUS DP protocol description.

Error codes

The following error codes are generated by the motor starter:

Error codes byte		Error messages	Cause
high	Low		
00 H	00 H	No error	—
Communication interface			
80 H	A0 H	Negative acknowledgment in the case of "Read data set"	Data set write-only
80 H	A1 H	Negative acknowledgment in the case of "Write data set"	Data set read-only
80 H	A2 H	Protocol error	• Layer 2 (fieldbus) • Device interface • Incorrect coordination
80 H	A9 H	This function is not supported	DPV1 service does not support Read/write data set
Access to technology			
80 H	B0 H	Unknown data set number (DS No)	DS No. not known in motor starter
80 H	B1 H	Incorrect data set length when writing	DS length and specified DS length different
80 H	B2 H	Incorrect slot number	Slot not 1 or 4
80 H	B6 H	Communication partner has rejected data transfer	• Incorrect operating mode (automatic, manual bus, manual local) • Data set is read-only • Parameters cannot be changed in ON state
80 H	B8 H	Invalid parameter	Invalid parameter value
Device resources			
80 H	C2 H	Temporary lack of resources in the device	• No free receive buffer • The data set is currently being updated • The dataset request is currently active on another interface.

A.1.3 Data sets

Reading/writing data sets with STEP 7

You can access the data sets of the motor starter from the user program.

- Writing data sets:
  S7-DPV1 master: by calling SFB 53 "WR_REC" or SFC 58
  S7 master: by calling SFC 58
- Reading data sets:
  S7-DPV1 master: by calling SFB 52 "RD_REC" or SFC 59
  S7 master: by calling SFC 59

Note

SFC 58 and 59 cannot be used with PROFINET. The blocks **only** function with PROFIBUS.

Blocks SFB 52 or 53 are to be used for PROFINET. These also function with PROFIBUS.

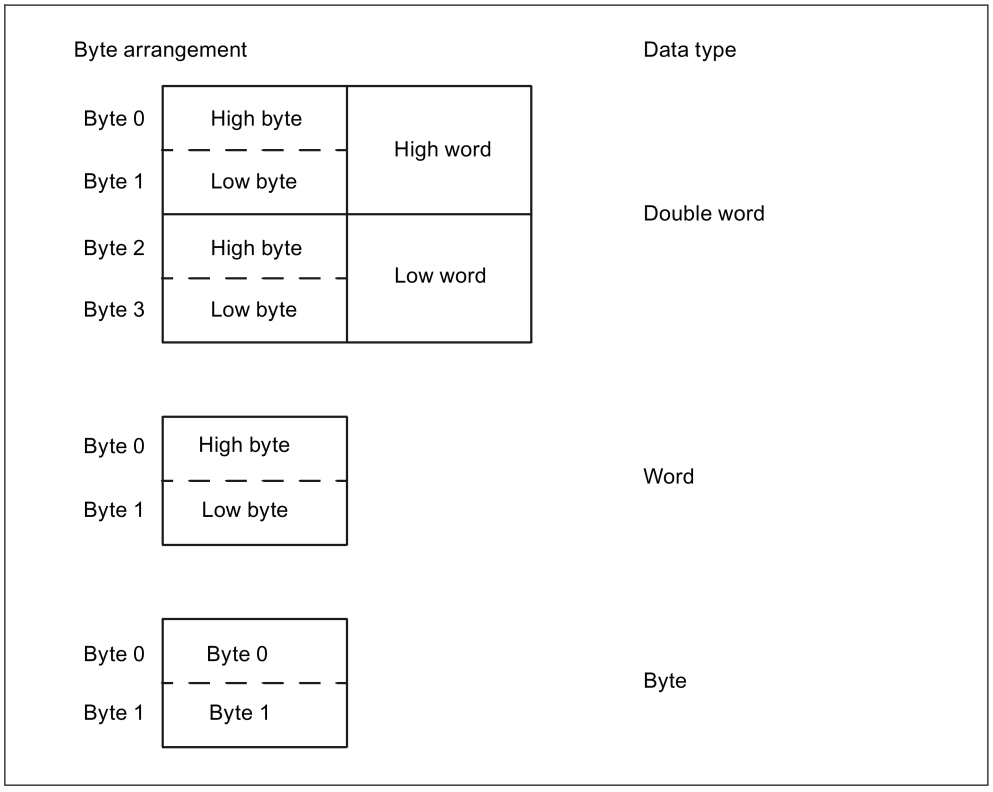
Further information

For more information about the SFBs, see:

- "System Software for S7-300/400, System and Standard Functions" reference manual
- The STEP 7 online help

Byte arrangements

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



A.1.4 DS68 - Read/write process output image

Note

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

Byte	Content	Value / value range	Meaning
Preamble			
0	Coordination	0x21	Write via acyclic bus channel (PLC)
1	Reserved	0x00	—
2	Reserved	0x00	—
3	Reserved	0x00	—
Process output image			
4	Process data	DO 0.0 to DO 0.7	See table below
5	Process data	DO 1.0 to DO 1.7	See table below
6	Reserved	0x00	—
7	Reserved	0x00	—

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)	DO 0.0	Motor CW	All
4.1		DO 0.1	Motor CCW	.RS..
4.2		DO 0.2	Activation of brake	All with BO[1)]
4.3		DO 0.3	Trip reset	All
4.4		DO 0.4	Emergency start	All
4.5		DO 0.5	Self-test	All
4.6		DO 0.6	—	—
4.7		DO 0.7	—	—
5.0	Bit (1 = active)	DO 1.0	Output 1	All
5.1		DO 1.1	Output 2	All
5.2		DO 1.2	—	—
5.3		DO 1.3	—	—
5.4		DO 1.4	—	—
5.5		DO 1.5	—	—
5.6		DO 1.6	—	—
5.7		DO 1.7	Disable quick stop	All

[1)] BO: Brake output

A.1.5 DS69 - Read process image of the inputs

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	Reserved	—	—
3	Reserved	—	—

Table A- 2 Process image of the inputs (in bytes 0 and 1)

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	Current motor current I_{curr} [%] bit 0	All
1.1		DI 1.1	Current motor current I_{curr} [%] bit 1	All
1.2		DI 1.2	Current motor current I_{curr} [%] bit 2	All
1.3		DI 1.3	Current motor current I_{curr} [%] bit 3	All
1.4		DI 1.4	Current motor current I_{curr} [%] bit 4	All
1.5		DI 1.5	Current motor current I_{curr} [%] bit 5	All
1.6		DI 1.6	Manual local mode	All
1.7		DI 1.7	Ramp mode	sRSSte/sDSSte

A.1.6 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 ... 4 294 967 295	1 s
4 ... 5	Unsigned 16	Object number	0 ... 32767	1
Entry 2				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
10 ... 11	Unsigned 16	Object number	0 ... 32767	1
... ...				
Entry 21				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
124 ... 125	Unsigned 16	Object number	0 ... 32767	1

The data record call "Logbook" 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.

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

Table A- 3 Assignment of object number to device error message

Object No.	Device error - Messages
451	Temperature sensor not ready for operation
452	Heat sink thermistor defective
453	Faulty interface to current detection
454	Faulty SSC interface
456	EEPROM: memory defective
457	EEPROM: CRC error "Fixed-value parameter"
458	EEPROM: CRC error "Device parameter"
460	EEPROM: contains invalid data!
461	EEPROM: Invalid value for "Parameters disabled CPU/master"
462	EEPROM: Invalid pointer for device parameter buffer
308	Switching element defective
1414	Switching element short-circuited
483	HMI module defective

A.1.7 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 ... 4 294 967 295	1 s
4 ... 5	Unsigned 16	Object number	0 ... 32767	1
Entry 2				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
10 ... 11	Unsigned 16	Object number	0 ... 32767	1
... ...				
Entry 21				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
124 ... 125	Unsigned 16	Object number	0 ... 32767	1

The data record call "Logbook" 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 up.

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

Object No.	Trips - Messages
309	Switching element overload
317	Electronics supply voltage too low
318	No switching element supply voltage
319	No supply voltage
324	Temperature sensor - overload
325	Temperature sensor wire break
326	Temperature sensor - short circuit
327	Thermal motor model overload
333	Circuit breaker tripped
334	I_e upper limit violation
335	I_e lower limit violation
338	Residual current tripping
341	Asymmetry tripping
348	Input tripping
354	Sensor supply overload
1496	Output 1 overloaded
1497	Output 2 overloaded

Object No.	Trips - Messages
355	Process image error
365	Invalid parameter value
381	Self-test error (= device error)
1406	Cold start tripping
1201	Blocking protection has responded at startup
1202	Blocking protection has responded during operation

A.1.8 DS75 logbook - Read events

Byte	Data type	Meaning	Range of values	Increment
Entry 1 (= latest entry)				
0 ... 3	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
4 ... 5	Unsigned 16	Object number	± 0 ... 32767	1
Entry 2				
6 ... 9	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
10 ... 11	Unsigned 16	Object number	± 0 ... 32767	1
... ...				
Entry 21				
120 ... 123	Unsigned 32	Operating hours - device	0 ... 4 294 967 295	1 s
124 ... 125	Unsigned 16	Object number	± 0 ... 32767	1

The data record call "Logbook" 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 up.

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

Object No.	Event - Messages
	Prewarnings
1419	± Prewarning limit - remaining time for tripping undershot
1420	± Prewarning limit - motor heating exceeded
1457	± Maintenance required
	Warnings
324	± Temperature sensor overload
325	± Temperature sensor wire break
326	± Temperature sensor short-circuit
327	± Thermal motor model overload
333	± Circuit breaker tripped
334	± I_e upper limit violation
335	± I_e lower limit violation
337	± Residual current detected
340	± Asymmetry detected
351	± Input warning
318	± No switching element supply voltage
1486	± Connector disconnected on line side
1458	± Maintenance requirement
	Actions
310	± Emergency start active
357	Automatic mode
358	Manual mode bus
1443	Manual bus - PC controls
359	Manual local mode
1444	Manual local - input controls
1445	Manual local - HMI controls
1446	Manual local - PC controls
360	± Manual operation connection abort
363	Maximum pointer deleted
365	Invalid parameter value
366	Parameters cannot be changed in ON state
368	± Parameters disabled CPU/master active
369	Factory settings restored
1422	± Thermal motor model deactivated
1484	± Temperature sensor deactivated
1302	Logbook - Triggering operations deleted
1303	Logbook - Events deleted
1520	± Energy-saving mode active

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

A.1.9 DS81 Read factory setting

Data set 81 corresponds in structure and content to data set 131. Data set 81 supplies the default values for all parameters of DS131.

A.1.10 DS92 Read device diagnostics

Object No.	Byte.Bit	Encoding	Meaning	Relevant for	
				DSte / RSte	sDSSte/sRSSte
301	0.0	Bit (1 = active)	Ready (automatic)	All	All
306	0.1		Motor CW	All	All
307	0.2		Motor CCW	RS only	RS only
309	0.3		Switching element overload	All	All
308	0.4		Switching element defective	All	All
310	0.5		Emergency start active	All	All
302	0.6		Group fault	All	All
304	0.7		Group warning	All	All
318	1.0	Bit (1 = active)	No switching element supply voltage	All	All
319	1.1		No supply voltage	—	All
311	1.2		Lock-out time active	RS only	RS only
312	1.3		Starting active	—	All
313	1.4		Run-down active	—	All
315	1.5		Brake output active	All with BO	All with BO
324	2.0	Bit (1 = active)	Temperature sensor - overload	All	All
325	2.1		Temperature sensor - open circuit	All	All
326	2.2		Temperature sensor - short circuit	All	All
327	2.3		Thermal motor model overload	All	All
328	2.4		Overload tripping	All	All
329	2.5		Idle time active	All	All
330	2.6		Cooling time active	All	All
333	3.2	Bit (1 = active)	Circuit breaker tripped	All	All
320	3.3		Current limiting active	—	All
352	3.7		Input control	All	All
340	4.0	Bit (1 = active)	Asymmetry detected	All	All
341	4.1		Asymmetry tripping	All	All
334	4.2		I_e upper limit violation	All	All
335	4.3		I_e lower limit violation	All	All
336	4.4		I_e limit tripping	All	All
337	4.5		Residual current detected	All	All
338	4.6		Residual current tripping	All	All
339	4.7		Tripping due to motor blocking	All	All

Object No.	Byte.Bit	Encoding	Meaning	Relevant for	
				DSte / RSte	sDSSte/sRSSte
344	5.0	Bit (1 = active)	Input 1	All	All
345	5.1		Input 2	All	All
346	5.2		Input 3	All	All
347	5.3		Input 4	All	All
348	5.4		Input tripping	All	All
349	5.5		Input tripping limit position CW rotation	All	All
351	5.6		Input warning	All	All
350	5.7		Input tripping limit position CCW rotation	All	All
354	6.3	Bit (1 = active)	Sensor supply overload	All	All
361	6.4		Trip reset executed	All	All
362	6.5		Trip reset not possible	All	All
363	6.6		Maximum pointer deleted	All	All
317	6.7		Electronics supply voltage too low	All	All
303	7.0	Bit (1 = active)	Bus error	All	All
356	7.1		CPU/master STOP	All	All
357	7.2		Automatic mode	All	All
358	7.3		Manual bus mode (remote control)	All	All
359	7.4		Manual local mode (local control)	All	All
360	7.6		Manual operation connection abort	All	All
355	7.7		Process mapping error	All	All
364	8.0	Bit (1 = active)	Parameter assignment active	All	All
365	8.1		Invalid parameter value	All	All
366	8.2		Parameters cannot be changed in ON state	All	All
368	8.3		Parameters disabled CPU/master active	All	All
384	8.4		No external start-up parameters received	All	All
379	9.0	Bit (1 = active)	Self-test active	All	All
380	9.1		Self-test ok	All	All
381	9.2		Self-test error	All	All
369	9.3		Factory settings restored	All	All
367	10		Object No. (low byte) (= errored parameter number)	All	All
	11	0x00	Object No. (high byte)	All	All
1484	12.4	Bit (1 = active)	Temperature sensor deactivated	All	All
1405	14.0	Bit (1 = active)	Cold start active	All	All
1406	14.1		Cold start tripping	All	All

Object No.	Byte.Bit	Encoding	Meaning	Relevant for	
				DSte / RSte	sDSSte/sRSSte
1409	15.2	Bit (1 = active)	Phase failure L1	---	All
1410	15.3		Phase failure L2	---	All
1411	15.4		Phase failure L3	---	All
1412	15.5		Rotational direction of line frequency right	---	All
1413	15.6		Rotational direction of line frequency left	---	All
1435	17.0	Bit (1 = active)	Output 1 active	All	All
1436	17.1		Output 2 active	All	All
1469	18.0	Bit (1 = active)	Output BO active	All with BO	All with BO
	18.4		Output 1 overloaded	All	All
	18.5		Output 2 overloaded	All	All
Switch / Control					
1470	19.1	Bit (1 = active)	Ready for motor ON	All	All
1414	19.2		Switching element short-circuited	All	All
Protection function (motor, cable, short-circuit)					
1422	20.0	Bit (1 = active)	Thermal motor model deactivated	All	All
Communication					
357	22.0	Bit (1 = active)	Automatic mode (redundant to bit 7.2)	All	All
358	22.1		Manual bus mode (redundant to bit 7.3)	All	All
1443	22.2		Manual bus - PC controls	All	All
359	22.3		Manual local mode (redundant to bit 7.4)	All	All
1444	22.4		Manual local - input controls	All	All
1445	22.5		Manual local - HMI controls	All	All
1446	22.6		Manual local - PC controls	All	All
Prewarnings					
1401	24.0	Bit (1 = active)	Group prewarning	All	All
1419	24.2		Prewarning limit - remaining time for tripping undershot	All	All
1420	24.3		Prewarning limit - motor heating exceeded	All	All
Maintenance					
1457	26.0	Bit (1 = active)	Maintenance required	All	All
1458	26.1		Maintenance requested	All	All
1460	27.0	Bit (1 = active)	Maintenance timer limit_1 exceeded	All	All
1461	27.1		Maintenance timer limit_2 exceeded	All	All
1485	29.0	Bit (1 = active)	Connector monitoring deactivated	All	All
1486	29.1	Bit (1 = active)	Connector disconnected on line side	All	All

A.1.11 DS93 Write command

Structure of the command data set:

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

Write command

Table A- 4 Assignment of command to command number and their meaning (byte 5 to 9)

Object No.	Command number	Command	Meaning
0	0	Reserved	No function
703	1	Trip reset	Resets and acknowledges error messages
713	2	Emergency start ON	—
714	3	Emergency start OFF	—
709	4	Automatic mode	Transition to automatic mode (control by DP master)
710 711 712	5	Manual local bus mode	Transition to manual mode. The motor starter switches to manual bus mode or manual local mode depending on the interface via which the command has been received.
701	6	Factory settings	Restore the factory setting of the parameters from DS131. (Only possible in "manual" mode.)
704	7	Maximum pointer deleted	The measured values for preventive diagnostics are deleted (= 0).
702	9	Restart	Trigger restart (as after power ON), e.g. after reassignment of the station address. (Only possible in "manual" mode.)
707	10	Parameters disabled CPU/master ON	Parameterization by parameterizing master not possible, or its parameters are ignored

Object No.	Command number	Command	Meaning
708	11	Parameters disabled CPU/master OFF	Parameterization by parameterizing master is possible
705	13	Delete Logbook - Triggering operations	Delete logbook with recorded fault causes.
706	14	Delete Logbook - Events	Delete logbook with recorded warnings and specific actions.
717	15	Cold start - ON	Enables activation of the switching contacts without main power
718	16	Cold start - OFF	Switches the "cold start" function off
719	17	Delete maintenance timer	Deletes the timer of the maintenance function
	18 ... 255	Reserved	

A.1.12 DS94 Read measured values

Object No.	Byte.Bit	Meaning	Value range/[encoding]	Increment	Relevant for
504	0	Phase current $I_{L1(\%)}$	0 ... 797 % / [unsigned 8]	3.125 %	All
505	1	Phase current $I_{L2(\%)}$	0 ... 797 % / [unsigned 8]	3.125 %	All
506	2	Phase current $I_{L3(\%)}$	0 ... 797 % / [unsigned 8]	3.125 %	All
501	4 ... 5	Remaining motor cooling time	0 ... 30 min / [unsigned 16]	100 ms	All
502	6.0 ... 6.6	Motor heating	0 ... 200 % / [0 ... 100]	2 %	All
	6.7	Asymmetry	[0]: No asymmetry [1]: asymmetry (≥ 40%)	—	All
503	7	Asymmetry value	0 ... 100 % / [0 ... 100]	1 %	All
508	16	Output frequency	0 ... 100 Hz / [unsigned 8]	0.5 Hz	sDSSte/sRSSte
509	20	Line frequency	0 to 100 Hz	0.5 Hz	sDSSte/sRSSte
513	28 ... 31	Phase current $I_{L1(rms)}$	0 ... 20 000 A / [signed 32]	0.01 A	All
514	32 ... 35	Phase current $I_{L2(rms)}$	0 ... 20 000 A / [signed 32]	0.01 A	All
515	36 ... 39	Phase current $I_{L3(rms)}$	0 ... 20 000 A / [signed 32]	0.01 A	All
517	42	Heat sink temperature	-40 ... +127 °C / [unsigned 16]	1 °C	sDsste/sRSSte 12 A
520	46 ... 47	Remaining time for tripping for thermal motor model	0 ... 6 500 s / [unsigned 16]	0.1 s	sDsste/sRSSte

A.1.13 DS95 Read statistics

Object No.	Byte.Bit	Meaning	Value range/[encoding]	Increment	Relevant for
607	0	Motor current I_{max}	0 ... 797 %	3.125 %	All
—	1	Reserved	—	—	—
606	2 ... 3	Last trip current	0 ... 1 000 % / [unsigned 16]	3.125 %	All
602	4 ... 7	Operating hours device	0 ... 16777215 / [unsigned 32]	1 min	All[1)]
603	8 ... 11	Number of starts motor CW	0 ... 16777215 / [unsigned 32]	1	All
604	12 ... 15	Number of starts motor CCW	0 ... 16777215 / [unsigned 32]	1	.RS... only
605	16 ... 17	Number of overload trips	0 ... 65535 / [unsigned 16]	1	All
609	20 ... 23	Motor current $I_{max\ (rms)}$	0 ... 20000 A / [signed 32]	0.01 A	All
608	24 ... 27	Last tripping current $I_{A(rms)}$	0 ... 20000 A / [signed 32]	0.01 A	All
602	28 ... 31	Operating hours motor	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All
611	32 ... 35	Operating hours motor current = 18 to 49.9% of I_{emax}	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
612	36 ... 39	Operating hours motor current = 50 to 89.9% of I_{emax}	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
613	40 ... 43	Operating hours motor current = 90 to 119.9 % of I_{emax}	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
614	44 ... 47	Operating hours motor current = 120 to 1000% of I_{emax}	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
616	50 ... 51	Number of switching element overload trips	0 ... 65535 / [unsigned 16]	1	All
618	54 ... 55	Number of short-circuit trips	0 ... 65535 / [unsigned 16]	1	All
619	56 ... 59	Number of stops with mechanical braking	0 ... 4 294 967 295 / [unsigned 32]	1	All with BO[2)]
621	64-67	Number of starts output 1	0 ... 4 294 967 295 / [unsigned 32]	1	All
622	68-71	Number of starts output 2	0 ... 4 294 967 295 / [unsigned 32]	1	All
625	80-83	Number of starts output BO	0 ... 4 294 967 295 / [unsigned 32]	1	All with BO[2)]
626	84-87	Maintenance timer	0 ... 4 294 967 295 / [unsigned 32]	1 s	All

[1)] **Special feature of operating hours**
The motor starter records 2 operating hour values:
The operating hours of the motor indicate how long the switching elements and thus the motor were switched on.
The operating hours of the device (motor starter) indicate how long the power supply 24 V-NS DC of the motor starter was switched on.
Both operating hour values are recorded in data set 95 - Read statistics. They are entered in the data field "Operating hours" alternately at 5-second intervals. The bit "Operating hours selection" specifies which of the two operating hours values has been transferred.
[0]: Operating hours motor
[1]: Operating hours - device.
The operating hours are recorded in the range from 0 to 16,777,215 minutes in 1-second steps.

[2)] BO: Brake output

A.1.14 DS96 Read maximum pointer

The extreme values of individual values measured in the elapsed time are stored in the maximum pointers. Maximum pointers can be deleted or set to "0" by the user with the command "Delete maximum pointers".

Statistics data for for preventive diagnostics (maximum pointer)

Object No.	Byte.Bit	Maximum pointer	Value range/[encoding]	Increment	Relevant for
	0 ... 3	Reserved (0x00)			
656	4	Phase current $I_{L1\ min}$ (%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
657	5	Phase current $I_{L2\ min}$(%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
658	6	Phase current $I_{L3\ min}$(%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
653	8	Phase current $I_{L1\ max}$ (%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
654	9	Phase current $I_{L2\ max}$ (%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
655	10	Phase current $I_{L3\ max}$ (%)	0 ... 796.9 % / [unsigned 8]	3.125 %	All
652	12 ... 13	Maximum tripping current $I_{A\ max}$(%)	0 ... 1 000 % / [unsigned 16]	3.125 %	All
651	14 ... 15	Number of motor overload trips	0 ... 65535 / [unsigned 16]	1	All
659	16 ... 19	Maximum tripping current $I_{A\ max}$(rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
660	20 ... 23	Phase current $I_{L1\ min}$ (rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
661	24 ... 27	Phase current $I_{L2\ min}$ (rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
662	28 ... 31	Phase current $I_{L3\ min}$ (rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
663	32 ... 35	Phase current $I_{L1\ max}$(rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
664	36 ... 39	Phase current $I_{L2\ max}$(rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
665	40 ... 43	Phase current $I_{L3\ max}$(rms)	± 0 ... 20000 A / [signed 32]	0.01 A	All
674	60	Maximum heat sink temperature	-40 ... +127 °C / [signed 8]	1°C	sRSSte/sDSSte 12 A
678	64 ... 67	Operating hours motor current = 18 to 49.9% x I_e	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
679	68 ... 71	Operating hours motor current = 50 to 89.9 % x I_e	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
680	72 ... 75	Operating hours motor current = 50 to 119.9 % x I_e	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]
681	76 ... 79	Operating hours motor current = 120 to 1000 % x I_e	0 ... 4 294 967 295 / [unsigned 32]	1 s / 1 min	All[1)]

[1)] Resolution is signaled via infobit "Operating hours resolution" in DS 94.

A.1.15 DS 100 Read device identification

Object No.	Byte	Length	Value	Meaning
900	0 ... 3	4	0x00	Reserved
Device identification (TF)				
901	4 ... 11	8	...	Time stamp[1)]
902	12 ... 31	20	"SIEMENS AG"	Manufacturer
903	32 ... 55	24	"3RK13..."	Order number (MLFB) of the device
904	56	1	0x01	Device family: Load feeders
905	57	1	0x01	Device subfamily: Motor starters
906	58	1	0x01/0x02	Device class: e.g. direct starters/reversing starters
907	59	1	0x48	System: M200D PROFIBUS/PROFINET
908	60	1	0x4B	Function group
909	61	1	0x00	Reserved
910	62 ... 77	16	—	Product order code
911	78 ... 81	1	´V...	Hardware version (byte 0 ... byte 3)
912	82	1	0x00	Object number (byte0)
	83	1	0x00	Object number (byte1)
	84	1	0x00	Object number (byte2)
	85	1	0x00	Object number (byte3)
915	88 ... 95	8	...	Service number:

[1)] Time stamp: Time of initialization to factory settings, see table below

Table A- 5 Structure of the time stamp (bytes 4 to 11)

Bits	8	7	6	5	4	3	2	1	Range of values
Byte									
1	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	0 to 59 999 milliseconds
2	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	
3	res	res	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0 to 59 minutes
4	SU	Res	Res	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0 to 23 hours SU: 0: Normal time, 1: Daylight Saving
	Weekday			Day of the month					1 to 7 ; 1 = Monday, 7= Sunday
5	2^{2}	2^{1}	2^{0}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	1 to 31
6	res	res	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	1 to 12 months
7	res	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	0 to 99 years; 0 = 2000 (The number indicates the offset to the year 2000.)
8	Res	Res	Res	Res	Res	Res	Res	Res	Reserved

The information in the table is bit-coded.

Example: Minutes specified in byte 3
00000110 means 6 minutes

A.1.16 DS131 Read/write device parameters

Complete data sets can be exchanged with the starters during operation via the acyclic channel (PROFIBUS) and the NRT channel (PROFINET).

We recommend initially reading out data set 131 from the motor starter with the current parameters, changing the corresponding parameters and then rewriting these to the motor starter.

Please be aware that the coordination (Byte 0) is to be set to 0x21 prior to writing the data set.

The following elements of data set 131 (138 bytes) are used to parameterize the M200D PROFIBUS/PROFINET motor starters.

Object No.	Byte.Bit	Parameters / content	Range of values	Increment	Default setting	Relevant for
Preamble						
—	0	Coordination	0x21 Write via acyclic bus channel (PLC)			
—	1	Reserved	0x00			
—	2	Reserved	0x00			
—	3	Reserved	0x00			
Device parameter						
120	4 ... 7	Device functions_2	MLFB-specific content, see table 'Device functions' in connection with data set 131			
1	8 ... 11	Device functions_1				
130	14.0 ... 7 and 15.0 to 7	Rated operating current I_e A	0.15 ... 2.0 A 1.5 ... 12 A	10 mA	0.15 / 2.0 1.5 / 12.0	All starters
3	16.0	Load type	[0] 3-phase motor [1] 1-phase motor	—	[0]	DSte / RSte
4	16.1	Protection against voltage failure	[0] No [1] Yes	—	[1]	All starters
136	17.0 ... 7	Prewarning limit – motor heating	0 ... 95 %; [0] = deactivated	5 %	[0]	All starters
5	18.0 ... 1	Response to overload Thermal motor model	[0] Tripping without restart [1] Tripping with restart [2] Warning	—	[0]	All starters
6	19.0 ... 3	Trip class (2 A, 12 A)	[0] CLASS 10 [1] CLASS 20 [3] CLASS 5 (10a) [4] CLASS 15 [15] CLASS OFF	5 (10a), 10, 15, 20, CLASS OFF	[0]	All starters
7	20.0 ... 7	Recovery time	1 min … 30 min	0.5 min	1.5 min	All starters
8	21.0 ... 7	Idle time	0 s to 255 s ; 0 = deactivated	1 s	0	All starters
137	22 ... 23	Prewarning limit – remaining time for tripping	0 s to 500 s; 0 = deactivated	1 s	0 s	All starters
10	24.0 ... 1	Response to overload temperature sensor	[0] Tripping without restart [1] Tripping with restart [2] Warning	—	[0]	All starters

Object No.	Byte.Bit	Parameters / content	Range of values	Increment	Default setting	Relevant for
9	24.4 ... 6	Temperature sensor	[0] Deactivated [1] Thermoclick [2] PTC Typ A	—	[0]	All starters
12	24.7	Temperature sensor monitoring	[0] No [1] Yes	—	[1]	All starters
15	28.0 ... 7	Lower current limit	[6 ... 32] 18,75 ... 100 % [0] deactivated	3.125 %	18.75 %	All starters
16	29.0 ... 7	Upper current limit	[16 ... 128] 50 % ... 150, 400 % [0] deactivated	3.125 %	112.5 %	All starters
17	30.0 ... 7	Blocking current	150 % .... 1000 % With sDS.., sRS…: 150 % ... 800 %	50 %	800 %	All starters
18	32.0 ... 3	Blocking time	1 s to 5 s	0.5 s	1 s	All starters
114	32.4 ... 5	Response to switching element supply voltage cut-off	[0] Group fault [1] Group fault only with ON command [2] Group warning	—	[0]	All starters
14	32.6	Response to current limit violation	[0] Warning [1] Trip	—	[0]	All starters
19	32.7	Response to residual current detection	[0] Warning [1] Trip	—	[1]	All starters
139	33.0 ... 1	Response to circuit breaker OFF	[0] Group fault [1] Group fault only with ON command [2] Group warning	—	[0]	All starters
21	34.0 ... 2	Asymmetry limit	30 % ... 60 % [0] deactivated	10 %	30 %	All starters
20	34.6	Response to asymmetry	[0] Warning [1] Trip	—	[1]	All starters
37	36.0 ... 7	Lock-out time	0 s to 60 s Note: Lock-out time = 0 means a min. time of approx. 150 ms for safety reasons!	1 s	0 s	.RS..
190	37.0 ... 7	Input signal extension	0 ms to 200 ms	10 ms	0 ms	All starters
24	38.0 ... 2	Input signal delay	10 ms to 80 ms	10 ms	10 ms	All starters
25	38.4	Input 1 – level	[0] NC contact [1] NO contact	—	[1]	All starters
27	38.5	Input 2 – level	[0] NC contact [1] NO contact	—	[1]	
29	38.6	Input 3 – level	[0] NC contact [1] NO contact	—	[1]	
31	38.7	Input 4 – level	[0] NC contact [1] NO contact	—	[1]	

Object No.	Byte.Bit	Parameters / content	Range of values	Increment	Default setting	Relevant for
26	39.0 ... 3	Input 1 – action NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact NO contact NO contact NO contact/NC contact NO contact NO contact	[0] No action [1] Tripping without restart [2] Tripping with restart [3] Trip end position CW [4] Trip end position CCW [5] Group warning [6] Manual local mode [7] Emergency start [8] Motor CW [9] Motor CCW (on RS only) [11] Quick stop [12] Trip reset [13] Cold start	—	[0]	All starters
28	39.4 ... 7	Input 2 – action NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact NO contact NO contact NO contact/NC contact NO contact NO contact	[0] No action [1] Tripping without restart [2] Tripping with restart [3] Trip end position CW [4] Trip end position CCW [5] Group warning [6] Manual local mode [7] Emergency start [8] Motor CW [9] Motor CCW (on RS only) [11] Quick stop [12] Trip reset [13] Cold start	—	[0]	All starters
30	40.0 ... 3	Input 3 – action NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact NO contact NO contact NO contact/NC contact NO contact NO contact	[0] No action [1] Tripping without restart [2] Tripping with restart [3] Trip end position CW [4] Trip end position CCW [5] Group warning [6] Manual local mode [7] Emergency start [8] Motor CW [9] Motor CCW (on RS only) [11] Quick stop [12] Trip reset [13] Cold start	—	[0]	All starters
32	40.4 ... 7	Input 4 – action NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact/NC contact NO contact NO contact NO contact NO contact/NC contact NO contact NO contact	[0] No action [1] Tripping without restart [2] Tripping with restart [3] Trip end position CW [4] Trip end position CCW [5] Group warning [6] Manual local mode [7] Emergency start [8] Motor CW [9] Motor CCW (on RS only) [11] Quick stop [12] Trip reset [13] Cold start	—	[0]	All starters

Object No.	Byte.Bit	Parameters / content	Range of values	Increment	Default setting	Relevant for
80	41.0	Input 1 signal	[0] Non-retentive / [1] Retentive	—	[0]	All starters
81	41.1	Input 2 – Signal	[0] Non-retentive [1] Retentive	—	[0]	
82	41.2	Input 3 – Signal	[0] Non-retentive [1] Retentive	—	[0]	
83	41.3	Input 4 signal	[0] Non-retentive [1] Retentive	—	[0]	
38	46.0 ... 7	Start time	0 to 30 s [0] Minimum ramp (100 ms)	0.25 s	5 s [20]	sDSSte sRSSte
39	47.0 ... 7	Run-down time	0 to 30 s [0] Function deactivated	0.25 s	0 s	
40	48.0 ... 7	Starting voltage	20 ... 100 % [4 ... 20]	5 %	40 %	
41	49.0 ... 7	Stopping voltage	20 ... 90 % [4 ... 18]	5 %	40 %	
42	50.0 ... 7	Current limit value	125 ... 600 % For $I_e \geq 9$ A → 125 % to 50 %	3.125 %	600 %	
167	51.0 ... 3	Startup mode	[0] Direct [1] Voltage ramp [4] Current limiting [5] Voltage ramp + Current limiting	—	[0]	sDSSte sRSSte
168	51.4 ... 7	Run-down type	[0] Run-down without load [1] Voltage ramp	—	[0]	sDSSte sRSSte
35	52 ... 53	Substitute value	→ See PIO	—	[0]	All starters
36	56.6	Group diagnostics	[0] Block [1] Enable	—	[0]	All starters
34	56.7	Response to CPU/master STOP	[0] Switch substitute value [1] Retain last value	—	[0]	All starters
208	58 ... 59	Brake release delay on starting	- 2.5 to 2.5 s	0.01 s	0 s	All with BO[1)]
209	60 ... 61	Brake holding time on stopping	0 to 25 s	0.01 s	0 s	All with BO[1)]
—	73	Reserved (for input level)	—	—	—	—
151	93.0 ... 1	Output 1 - Level	[0]: Not inverted [1]: Inverted [2 to 3]: Reserved	—	[0]	All starters
152	93.2 ... 3	Output 2 - Level	[0]: Not inverted [1]: Inverted [2 to 3]: Reserved	—	[0]	All starters
155	94.0 ... 3	Output 1 signal	[0]: Continuous [1]: Flashing [6 to 15]: Reserved	—	[0]	All starters
156	94.4 ... 7	Output 2 signal	[0]: Continuous [1]: Flashing [6 to 15]: Reserved	—	[0]	All starters

Object No.	Byte.Bit	Parameters / content	Range of values	Increment	Default setting	Relevant for
163	96	Output 1 action	[00]: No action [01]: Control source PIO DO 1.0 [02]: Control source PIO DO 1.1 [03]: Control source PIO DO 0.2 [06]: Control source input 1 [07]: Control source input 2 [08]: Control source input 3 [09]: Control source input 4 [10]: Run-up [11]: Operation/shunting [12]: Coasting down [13]: On time motor (RUN) [14]: Control command motor (ON) [17]: Brake output [18]: Device ON [30]: Group prewarning [31]: Group warning [32]: Group fault [33]: Bus error [34]: Device error [35]: Maintenance required [36]: Maintenance requested [38]: Ready for motor ON	—	[01]	All starters All starters All starters All starters All starters All starters All starters All starters sDSS../sRSS.. sDSS../sRSS.. sDSS../sRSS.. All starters All starters With BO only All starters All starters All starters All starters All starters All starters All starters All starters All starters
164	97	Output 2 action	[00]: No action [01]: Control source PIO DO 1.0 [02]: Control source PIO DO 1.1 [03]: …[38]: See byte 96	—	[02]	All starters All starters All starters
230	137.0 ... 3	Connector monitoring	[0]: Deactivated [1]: Line side	—	[0]	All starters
231	137.4 ... 7	Response when connector removed	[0]: Group fault [1]: Group fault only after ON command [2]: Group warning	—	[0]	All starters

[1] BO: Brake output

Device functions

MLFB	Device functions_2				Device functions_1			
	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
3RK1395-6.S41-0AD0	0x0F	0x00	0x00	0x00	0xDB	0xB0	0x48	0x4C
3RK1395-6.S41-0AD3	0x0F	0x00	0x00	0x00	0xDB	0xB8	0x48	0x4C
3RK1395-6.S41-0AD5	0x0F	0x00	0x00	0x00	0xDB	0xB8	0x48	0x4C
3RK1395-6.S41-2AD0	0x0F	0x00	0x00	0x00	0xDB	0xB0	0xC8	0x4C
3RK1395-6.S41-2AD3	0x0F	0x00	0x00	0x00	0xDB	0xB8	0xC8	0x4C
3RK1395-6.S41-2AD5	0x0F	0x00	0x00	0x00	0xDB	0xB8	0xC8	0x4C
3RK1395-6.S41-1AD0	0x0F	0x00	0x00	0x00	0xDB	0xB1	0x48	0x4C
3RK1395-6.S41-1AD3	0x0F	0x00	0x00	0x00	0xDB	0xB9	0x48	0x4C
3RK1395-6.S41-1AD5	0x0F	0x00	0x00	0x00	0xDB	0xB9	0x48	0x4C
3RK1395-6.S41-3AD0	0x0F	0x00	0x00	0x00	0xDB	0xB1	0xC8	0x4C
3RK1395-6.S41-3AD3	0x0F	0x00	0x00	0x00	0xDB	0xB9	0xC8	0x4C
3RK1395-6.S41-3AD5	0x0F	0x00	0x00	0x00	0xDB	0xB9	0xC8	0x4C
3RK1395-6KS71-0AD0	0x0F	0x00	0x00	0x00	0xDB	0xD2	0x48	0x6C
3RK1395-6KS71-0AD3	0x0F	0x00	0x00	0x00	0xDB	0xDA	0x48	0x6C
3RK1395-6KS71-0AD5	0x0F	0x00	0x00	0x00	0xDB	0xDA	0x48	0x6C
3RK1395-6KS71-2AD0	0x0F	0x00	0x00	0x00	0xDB	0xD2	0xC8	0x6C
3RK1395-6KS71-2AD3	0x0F	0x00	0x00	0x00	0xDB	0xDA	0xC8	0x6C
3RK1395-6KS71-2AD5	0x0F	0x00	0x00	0x00	0xDB	0xDA	0xC8	0x6C
3RK1395-6KS71-1AD0	0x0F	0x00	0x00	0x00	0xDB	0xD3	0x48	0x6C
3RK1395-6KS71-1AD3	0x0F	0x00	0x00	0x00	0xDB	0xDB	0x48	0x6C
3RK1395-6KS71-1AD5	0x0F	0x00	0x00	0x00	0xDB	0xDB	0x48	0x6C
3RK1395-6KS71-3AD0	0x0F	0x00	0x00	0x00	0xDB	0xD3	0xC8	0x6C
3RK1395-6KS71-3AD3	0x0F	0x00	0x00	0x00	0xDB	0xDB	0xC8	0x6C
3RK1395-6KS71-3AD5	0x0F	0x00	0x00	0x00	0xDB	0xDB	0xC8	0x6C
3RK1395-6LS71-0AD0	0x0F	0x00	0x00	0x00	0xDB	0xD2	0x48	0x7C
3RK1395-6LS71-0AD3	0x0F	0x00	0x00	0x00	0xDB	0xDA	0x48	0x7C
3RK1395-6LS71-0AD5	0x0F	0x00	0x00	0x00	0xDB	0xDA	0x48	0x7C
3RK1395-6LS71-2AD0	0x0F	0x00	0x00	0x00	0xDB	0xD2	0xC8	0x7C
3RK1395-6LS71-2AD3	0x0F	0x00	0x00	0x00	0xDB	0xDA	0xC8	0x7C
3RK1395-6LS71-2AD5	0x0F	0x00	0x00	0x00	0xDB	0xDA	0xC8	0x7C
3RK1395-6LS71-1AD0	0x0F	0x00	0x00	0x00	0xDB	0xD3	0x48	0x7C
3RK1395-6LS71-1AD3	0x0F	0x00	0x00	0x00	0xDB	0xDB	0x48	0x7C
3RK1395-6LS71-1AD5	0x0F	0x00	0x00	0x00	0xDB	0xDB	0x48	0x7C
3RK1395-6LS71-3AD0	0x0F	0x00	0x00	0x00	0xDB	0xD3	0xC8	0x7C
3RK1395-6LS71-3AD3	0x0F	0x00	0x00	0x00	0xDB	0xDB	0xC8	0x7C
3RK1395-6LS71-3AD5	0x0F	0x00	0x00	0x00	0xDB	0xDB	0xC8	0x7C

A.1.17 DS134 Read/write maintenance

Byte	Parameter	Range of values	Increment	Factory setting	Relevant for
Preamble					
01	Coordination	0x21 Write via acyclic bus channel (PLC)			
2	Reserved	0x00			
3	Reserved	0x00			
4 ... 7	Reserved	0x00			
User data					
8 ... 11	Maintenance timer - warning limit_1	0 … 4 294 967 295 s	1 s	946 080 000 (30 years)	All starters
12 ... 13	Maintenance timer - warning limit_2	0 … 4 294 967 295 s	1 s	946 080 000 (30 years)	All starters

A.1.18 DS165 Read/write comments

Components of a plant are provided with a unique identifier by the user when configuring the plant. This identifier gives information about the installation location and the field of application. The individual components are then provided locally with an appropriate label.

The motor starter supports electronic device identification. Data set 165 is used for this purpose.

Byte	Data type	Meaning
0	ASCII char	First character
1	ASCII char	Second character
...	...	...
127	ASCII char	128. character
128	ASCII char	129. character
...	...	...
199	ASCII char	200. character

A.1.19 I&M data

The following I&M (identification & maintenance function) data is supported by all M200D PROFIBUS/PROFINET motor starters:

Number	Name	Remark
I&M 0	Device identification	As stored in the device initialization
I&M 1	Equipment designation	Entered by the user during configuration via the Device Properties screen form in HW Config
I&M 2	Installation	
I&M 3	Description	

Note

With PROFINET, the I&M data can be accessed via data sets 0xAFF0 - 0xAFF3 (PNO).

A.1.19.1 DS231 Read device identification

PROFIBUS: I&M 0

The following data is saved in data set DS 231:

Byte	Length	Content	Meaning
I&M header			
0 ... 9	0x00	Reserved = 0	—
I&M0 data block 0			
10 ... 11	0x002A	MANUFACTURER_ID	42 = Manufacturer ID SIEMENS
12 ... 31	(20 bytes)	ORDER_ID	Order No. (MLFB)
32 ... 47	(16 bytes)	SERIAL_NUMBER	Serial number
48 ... 49	(2 bytes)	HARDWARE REVISION	Hardware revision or product version
50 ... 53	(4 bytes)	SOFTWARE_REVISION	Firmware version
54 ... 55	(2 bytes)	REV_COUNTER	Provides information about the parameterized changes on the module. The "REV_ COUNTER" is incremented after each change.
56 ... 57	(2 bytes)	PROFILE_ID	Gives information about the PROFIBUS profile supported by the device and the line of products belonging to the device.
58 ... 59	(2 bytes)	PROFILE_SPECIFIC_TYPE	Used to supplement the object "PROFILE_ID" and contains further information on the profile.
60 ... 61	(2 bytes)	IM_VERSION	Provides information about the version of the identification data (01 01hex = Version 1.1).
62 ... 63	(2 bytes)	IM_SUPPORTED	Provides information about the available identification data (Index 2 to 4).

A.1.19.2 DS232 Read/write designation

PROFIBUS: I&M 1

The following data is saved in data set DS 232:

Byte	Length	Content	Meaning
I&M header			
0 ... 9	(10 bytes)	Reserved	—
I&M data block 1			
10 ... 41	(32 bytes)	TAG FUNCTION	Plant identifier Fill unused positions with blanks (0x20)
42 ... 63	(22 bytes)	TAG LOCATION	Location designation Fill unused positions with blanks (0x20)

A.1.19.3 DS233 Read/write installation

PROFIBUS: I&M 2

The following data is saved in data set DS 233:

Byte	Length	Content	Meaning
I&M header			
0 ... 9	(10 bytes)	Reserved	—
I&M data block 2			
10 ... 25	(16 bytes)	INSTALLATION_DATE	Installation date
26 ... 63	(38 bytes)	Reserved	—

A.1.19.4 DS234 Read/write description

PROFIBUS: I&M 3

The following data is saved in data set DS 234:

Byte	Length	Content	Meaning
I&M header			
0 ... 9	(10 bytes)	Reserved	—
I&M data block 3			
10 ... 63	(54 bytes)	DESCRIPTOR	Customer-specific additional information and explanations Fill unused positions with blanks (0x20)

A.2 Order numbers

A.2.1 Motor starter module

Type Contacts	Current range	Brake	Manual operation	Order number
Direct starter electromechanical DSte	0.15 to 2.0 A	-	-	3RK1395-6KS41-0AD0
		400 / 230 V AC	-	3RK1395-6KS41-0AD3
		180 V DC	-	3RK1395-6KS41-0AD5
		-	With HMI	3RK1395-6KS41-2AD0
		400 / 230 V AC	With HMI	3RK1395-6KS41-2AD3
		180 V DC	With HMI	3RK1395-6KS41-2AD5
	1.5 to 12.0 A	-	-	3RK1395-6LS41-0AD0
		400 / 230 V AC	-	3RK1395-6LS41-0AD3
		180 V DC	-	3RK1395-6LS41-0AD5
		-	With HMI	3RK1395-6LS41-2AD0
		400 / 230 V AC	With HMI	3RK1395-6LS41-2AD3
		180 V DC	With HMI	3RK1395-6LS41-2AD5
Reversing starter electromechanical RSte	0.15 to 2.0 A	-	-	3RK1395-6KS41-1AD0
		400 / 230 V AC	-	3RK1395-6KS41-1AD3
		180 V DC	-	3RK1395-6KS41-1AD5
		-	With HMI	3RK1395-6KS41-3AD0
		400 / 230 V AC	With HMI	3RK1395-6KS41-3AD3
		180 V DC	With HMI	3RK1395-6KS41-3AD5
	1.5 to 12.0 A	-	-	3RK1395-6LS41-1AD0
		400 / 230 V AC	-	3RK1395-6LS41-1AD3
		180 V DC	-	3RK1395-6LS41-1AD5
		-	With HMI	3RK1395-6LS41-3AD0
		400 / 230 V AC	With HMI	3RK1395-6LS41-3AD3
		180 V DC	With HMI	3RK1395-6LS41-3AD5
Direct soft starter electronic sDSSte	0.15 to 2.0 A	-	-	3RK1395-6KS71-0AD0
		400 / 230 V AC	-	3RK1395-6KS71-0AD3
		180 V DC	-	3RK1395-6KS71-0AD5
		-	With HMI	3RK1395-6KS71-2AD0
		400 / 230 V AC	With HMI	3RK1395-6KS71-2AD3
		180 V DC	With HMI	3RK1395-6KS71-2AD5
	1.5 to 12.0 A	-	-	3RK1395-6LS71-0AD0
		400 / 230 V AC	-	3RK1395-6LS71-0AD3
		180 V DC	-	3RK1395-6LS71-0AD5
		-	With HMI	3RK1395-6LS71-2AD0
		400 / 230 V AC	With HMI	3RK1395-6LS71-2AD3
		180 V DC	With HMI	3RK1395-6LS71-2AD5

Type Contacts	Current range	Brake	Manual operation	Order number
Reversing soft starter electronic sRSSte	0.15 to 2.0 A	-	-	3RK1395-6KS71-1AD0
		400 / 230 V AC	-	3RK1395-6KS71-1AD3
		180 V DC	-	3RK1395-6KS71-1AD5
		-	With HMI	3RK1395-6KS71-3AD0
		400 / 230 V AC	With HMI	3RK1395-6KS71-3AD3
		180 V DC	With HMI	3RK1395-6KS71-3AD5
	1.5 to 12.0 A	-	-	3RK1395-6LS71-1AD0
		400 / 230 V AC	-	3RK1395-6LS71-1AD3
		180 V DC	-	3RK1395-6LS71-1AD5
		-	With HMI	3RK1395-6LS71-3AD0
		400 / 230 V AC	With HMI	3RK1395-6LS71-3AD3
		180 V DC	With HMI	3RK1395-6LS71-3AD5

A.2.2 Communication modules

No.	Connection	Order number
1	PROFIBUS - M12	3RK1305-0AS01-0AA0
2	PROFINET - M12	3RK1335-0AS01-0AA0

A.2.3 Spare parts/accessories

Power supply

Identifier	Order no.
Power outlet connector, connector set for connecting to a T distributor, consisting of coupling housing, straight outlet (with clip), pin insert for HAN Q4/2, incl. cable gland	
5 contact pins 2.5 mm^2	3RK1911-2BS60
5 contact pins 4 mm^2	3RK1911-2BS20
5 contact pins 6 mm^2	3RK1911-2BS40
Power connector, connector set for connection to M200D motor starters, consisting of socket shell, angled outlet, socket insert for HAN Q4/2, incl. cable gland	
5 socket contacts 2.5 mm^2, 2 socket contacts 0.5 mm^2	3RK1911-2BE50
5 socket contacts 4 mm^2, 2 socket contacts 0.5 mm^2	3RK1911-2BE10
5 socket contacts 6 mm^2, 2 socket contacts 0.5 mm^2	3RK1911-2BE30
Power supply cable, one end prefabricated, with "N" and jumper pin 11 and 12 for connector monitoring, with HAN Q4/2, angled; one end open; 5 x 4 mm^2	
Length 1.5 m	3RK1911-0DC13
Length 5.0 m	3RK1911-0DC33

Motor cable

Identifier	Order no.
Motor connector for connection to M200D motor starters, consisting of socket shell, angled outlet, pin insert for HAN Q8/0, incl. cable gland	
8 contact pins 1.5 mm²	3RK1902-0CE00
6 contact pins 2.5 mm²	3RK1902-0CC00
Motor connector for connection to motor, consisting of socket shell, straight outlet, socket insert for HAN 10e, incl. neutral bridge, incl. cable gland	
7 socket contacts 1.5 mm²	3RK1911-2BM21
7 socket contacts 2.5 mm²	3RK1911-2BM22
Motor cable, one end prefabricated, one end open, HAN Q8/0, angled, length 5 m	
for motor without brake for M200D, 4 x 1.5 mm²	3RK1911-0EB31
for motor without brake for M200D with thermistor, 6 x 1.5 mm²	3RK1911-0EF31
for motor with brake 400 V AC/180 V DC, 6 x 1.5 mm²	3RK1911-0ED31
for motor with brake 400 V AC/180 V DC and thermistor, 8 x 1.5 mm²	3RK1911-0EG31
for motor with brake 230 V AC, 6 x 1.5 mm²	3RK1911-0EH31
for motor with brake 230 V AC and thermistor, 8 x 1.5 mm²	3RK1911-0EE31

Operating voltage / communication

Identifier	Order no.
PROFIBUS connector, M12 screws, angled, 5-pin, B coded:	
5 pins	3RK1902-1BA00
5 socket contacts	3RK1902-1DA00
PROFIBUS cable, one end prefabricated, M12 socket for screws, angled, 5-pin, B coded:	
3.0 m	3RK1902-1GB30
5.0 m	3RK1902-1GB50
10.0 m	3RK1902-1GC10
PROFIBUS cable, both ends prefabricated, M12 socket/pin for screws, angled, 5-pin, B coded:	
3.0 m	3RK1902-1NB30
5.0 m	3RK1902-1NB50
10.0 m	3RK1902-1NC10
PROFINET connector, M12 screws, angled, 4-pin, D coded:	
4 pins	3RK1902-2DA00
PROFINET cable, one end prefabricated, M12 pin for screws, angled, 4-pin, D coded:	
3.0 m	3RK1902-2HB30
5.0 m	3RK1902-2HB50
10.0 m	3RK1902-2HC10
PROFINET cable, both ends prefabricated, M12 pin/pin for screws, angled, 4-pin, D coded:	
3.0 m	3RK1902-2NB30
5.0 m	3RK1902-2NB50
10.0 m	3RK1902-2NC10
Power supply connector, 7/8" for screws, angled, 5-pin, 1.5 mm²	
5 pins	3RK1902-3BA00
5 socket contacts	3RK1902-3DA00

Identifier	Order no.
Power supply connecting cable, one end prefabricated, 7/8" socket for screws, angled, 5-pin, 1.5 mm²: 3.0 m 5.0 m 10.0 m	 3RK1902-3GB30 3RK1902-3GB50 3RK1902-3GC10
Power supply connecting cable, both ends prefabricated, 7/8" socket/pin for screws, angled, 5-pin, 1.5 mm²: 3.0 m 5.0 m 10.0 m	 3RK1902-3NB30 3RK1902-3NB50 3RK1902-3NC10
M12 screw caps for sealing unassigned input/output sockets (one set contains ten screw caps)	3RK1901-1KA00
7/8" screw caps for sealing unassigned input/output sockets (one set contains ten screw caps)	6ES7194-3JA00-0AA0

Motor controller with IO communication

Identifier	Order no.
Control cable, one end prefabricated/one end open, M12 angled cable connectors, degree of protection IP67, 5 x 0.34 mm² (metal screw cap) Cable length 5 m Cable length 10 m	 3RK1902-4HB50-5AA0 3RK1902-4HC01-5AA0
M12 coupler plug, straight, screw-type connection max. 0.75 mm², 5-pin, A-coded, max. 4 A	3RK1902-4BA00-5AA0
M12 coupler plug, angled, screw-type connection max. 0.75 mm², 5-pin, A-coded, max. 4 A	3RK1902-4DA00-5AA0

Further accessories

Identifier	Order no.
M200D protection guards	3RK1911-3BA00
RS 232 interface cable	3RK1922-2BP00
USB interface cable	6SL3555-0PA00-2AA0
Hand-held device for motor starters for local control Serial interface cable must be ordered separately	3RK1922-3BA00
Diagnostics and commissioning tool **Motor Starter ES 2007**	3ZS1310-6CC10-0YA5
Identification label 9 x 20, petrol (19 frames, 380 labels)	3RT1900-1SB50
Dismantling tool for Han Q4/2	3RK1902-0AB00
Dismantling tool for Han Q8/0	3RK1902-0AJ00

Correction sheet

B

Correction sheet

Have you noticed any errors while reading this manual? If so, please use this form to tell us about them. We welcome comments and suggestions for improvement.

Fax response

	From (please complete):
To	Name
SIEMENS AG	
I IA CE MK&ST 3	Company/Department
92220 Amberg / Germany	Address

Fax: +49 (0)9621-80-3337

Manual title:

Table 8- 6 Errors, comments, and suggestions for improvements

Glossary

24 V-NS DC

Electronics supply voltage

24 V-S DC

Switching element supply voltage

AS-Interface (AS-i)

The AS-Interface (or actuator/sensor interface; abbreviated to AS–i) is a connection system for the lowest process level in automation systems.

BO

Brake output

Combined Transaction Type 2 (CTT2)

Communication protocol on AS-Interface in accordance with Specification V3.0 for the transfer of large volumes of data (analog values, strings, etc.).

Degree of protection

The degree of protection of a device indicates the extent of protection. The extent of protection includes the safety of persons against coming in contact with live or rotating parts, and the protection of electric resources against the penetration of water, foreign bodies and dust.

The M200D has an IP65 degree of protection when all the unused connections are sealed.

DSte

Abbreviation for "direct starter, electromechanical"

ESD

Components sensitive to electrostatic charge
Electronic components (e.g. field effect transistors, integrated circuits) that may be destroyed by high voltages (for instance by electrically charged non-grounded persons)

Ground fault

Fault whereby an external conductor comes into contact with ground or the grounded neutral point.

GSD

Device master data

GSDML

The GSDML language is defined by the GSDML scheme. A GSDML scheme contains validity rules that allow you to check the syntax of a GSD file, for example. Manufacturers of IO devices can obtain GSDML schemes (in the form of scheme files) from PROFIBUS International.

HMI

Operator control and monitoring
With HMI components, process data can be visualized and systems can be operated.

Integrated manual local control

Integrated manual local control is an orer variant for the M200D and involves a key-operated switch and keypad.

IP

Degrees of protection to DIN EN 60529 (IEC 529/VDE 047 T1)
(**I**nternational **P**rotection Classes)

LPS

List of configured slaves

MLFB

Machine-readable product designation

Motor Starter ES

The Motor Starter ES software is used for commissioning, parameterization, diagnostics, documentation, and preventive maintenance of the High Feature motor starters in the ranges:

- SIMATIC ET 200S (High Feature)
- ET 200pro
- ECOFAST (High Feature) and
- M200D (AS-i Standard, PROFIBUS, PROFINET)

N conductor (neutral conductor)

EN 60947-1: A conductor connected to the center point or neutral point of the system and designed to transfer electrical energy. EN 60050-141: Conductor in a multi-phase cable that is connected to the neutral point N) of a multi-phase combination.

PE (protective conductor)

- EN 60947-1: Conductor required for certain measures to protect against electric shock to establish an electrical connection between the following components:
  - Components of the electrical equipment
  - External, conductive components
  - Main grounding terminal
  - Ground electrode
  - Grounded point in the current source or artificial neutral point
- EN 60050-195: Conductor for safety purposes (e.g. to protect against electric shock).

PII/PIO

Process input image/process output image

Process image

Image of the signal states of the digital inputs and outputs in the memory of a controller.

PROFIBUS

PROFIBUS stands for "process fieldbus". PROFIBUS is a manufacturer-independent standard to network the field devices (e.g. PLCs, actuators, final controlling elements and sensors). PROFIBUS is compatible with protocols such as DP (decentralized peripherals), FMS (fieldbus message specification) and PA (process automation).

PROFIenergy

The PROFINET profile supports energy management systems in process plants by reading out measured values or by, for example, briefly shutting down the entire plant during breaks via standardized PROFIenergy commands.

PROFINET

This is an open component-based industrial communication system based on Ethernet for distributed automation systems. Communications technology required by the PROFIBUS User Organization.

Reversing starter

Starting control function for the direction of rotation (CW / CCW).

RSte

Abbreviation for "reversing starter, electromechanical"

sDSSte

Abbreviation for "direct soft starter, electronic"

sDSte

Direct starter (electronic)

Soft starter

Function for starting/stopping motors smoothly.

sRSSte

Abbreviation for "reversing soft starter, electronic"

sRSte

Reversing starter (electronic)

Step 7

The basic STEP 7 software is the standard tool for the SIMATIC S7, SIMATIC C7 and SIMATIC WinAC automation systems.

Trip class (shutdown class)

The trip class defines the start time at a particular current before the trip occurs. Different classes exist (e.g. CLASS 10, 20, 30, etc.), whereby CLASS 30 is the longest permissible start time.

Index

L

M

O

P

Q

R

S

T

U

W

Service & Support

SIRIUS M200D
www.siemens.com/sirius-m200d

Download catalogs and information material:
www.siemens.com/sirius/infomaterial

Newsletter - always up to date:
www.siemens.com/sirius/newsletter

E-Business in the Industry Mall:
www.siemens.com/sirius/mall

Online-Support:
www.siemens.com/sirius/support

Contact for all technical information:
Technical Assistance
Tel.: +49 (911) 895-5900
e-mail: technical-assistance@siemens.com
www.siemens.com/sirius/technical-assistance

Siemens AG
Industry Sector
Postfach 23 55
90713 FUERTH
GERMANY

Subject to change without prior notice
3RK1702-1BB11-1AA1

Industrial
Controls
SIRIUS

www.siemens.com/automation