

SIEMENS

SIMATIC

EM 300 Motor Starters

Manual

Important Information,
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Safety guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



Danger

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



Warning

indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.



Caution

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

Caution

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

Attention

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct usage

Note the following:



Warning

This device and its components may only be used for the applications described in the catalogue or the technical descriptions, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Brands

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Disclaimer of liability

We have checked this manual to ensure that its contents are correct and applicable in relation to the hardware and software it describes. Despite all our endeavors, however, discrepancies cannot be wholly excluded and so we cannot guarantee complete correctness and applicability. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Technical Assistance: Telephone: +49 (0) 911-895-5900 (8⁰⁰ - 17⁰⁰ CET)
Fax: +49 (0) 911-895-5907
E-mail: technical-assistance@siemens.com
Internet: www.siemens.com/industrial-controls/technical-assistance

SIEMENS AG
Technical Assistance
Würzburger Str. 121
D-90766 Fürth

SIEMENS AG
Industry Sector
Postfach 4848
90026 Nürnberg
GERMANY

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Important Information

Purpose of the Manual

This manual complements the *ET 200X Distributed I/O Device* manual. It describes all the functions of the EM 300 motor starters. The manual does not deal with functions that have general applicability to the ET 200X. You will find descriptions of these in the *ET 200X Distributed I/O Device* manual.

The information in this manual and in the *ET 200X Distributed I/O Device* manual allows you to run the ET 200X with a EM 300 motor starter as a DP-Slave on the PROFIBUS.

Target group

The manual describes the hardware of the EM 300 motor starters and is aimed at configuration engineers, commissioning engineers and maintenance personnel, who use the ET 200X with PLC functionality.

It consists of chapters containing instructions and reference chapters.

Delivery package

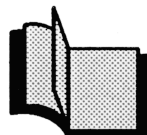
This delivery package (order number 6ES7 198-8FA01-8BA0) consists of 4 manuals with the following contents:

BM 147/CPU Basic Module



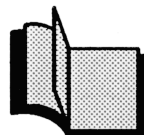
- Addressing
- ET 200X with BM 147/CPU with PROFIBUS DP
- Commissioning and diagnostics
- Technical specifications
- Order numbers
- List of *STEP 7* operations

ET 200X Distributed I/O Device



- Installing and wiring
- Commissioning and diagnostics
- Technical specifications of digital and analog modules
- Order numbers for digital and analog modules

EM 300 Motor Starters



- Wiring
- Commissioning and diagnostics
- Technical specifications
- Order numbers
- SIGUARD Safety Integrated

EM 148-FC Frequency Converter



- Wiring
- Commissioning and diagnostics
- Functions and technical specifications
- Order numbers

Applicability

This manual is valid for the EM 300 motor starters. It contains a description of the components that were valid at the time the manual was published. We reserve the right to enclose a Product Information bulletin containing up-to-date information about new components and new versions of components.

Standards, Certificates and Approvals

The ET 200X distributed I/O device is based on EN 50170, Volume 2, PROFIBUS. The ET 200X complies with the requirements and criteria of IEC 61131, Part 2 as well as the requirements of the CE marking. CSA, UL and FM certifications have been obtained for the ET 200X. You will find detailed information on these standards, certificates and approvals in the *ET 200X Distributed I/O Device* manual.

Position in the Information Landscape

In addition to the ET 200X manuals, you will also need the manual for the DP master used and the documentation for the configuration and programming software used (see the list in Appendix A of the *ET 200X Distributed I/O Device* manual).

Note

You will find a detailed list of the contents of the ET 200X manuals in Section 1.3 of this manual.

We recommend that you begin by reading this section so as to find out which parts of which manuals are most relevant to you in helping you to do what you want to do.

Aids to Finding Information

You can quickly access specific information in the manual by using the following aids:

- At the beginning of the manual you will find a comprehensive table of contents.
- The sections of the chapters in the manual contain subheadings that allow you to gain a quick overview of the content of the section.
- At the end of the manual you will find a detailed index that enables you to find the information you require quickly and easily.

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Product Overview

1

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1.1 What are the Motor Starters EM 300 DS and EM 300 RS?

Motor starters EM 300 DS/RS

Motor starters EM 300 DS and EM 300 RS are electromechanical motor starters, that can be used on the ET 200X distributed I/O device as expansion module. Up to six motor starters EM 300 can be added to the basic module.

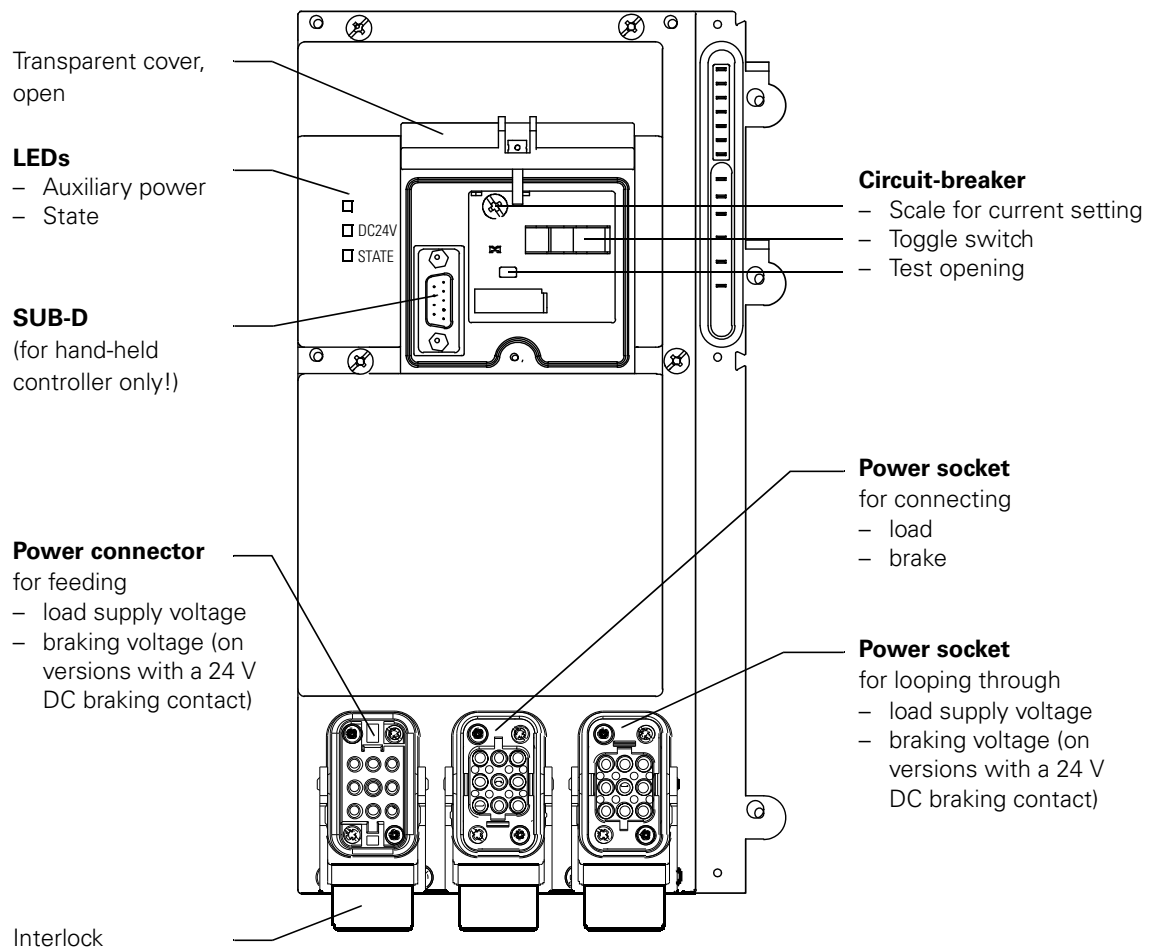
Characteristics

The motor starters EM 300 DS/RS:

- Are suitable for switching and protecting any three-phase loads up to 5.5 kW with 400 V AC.
- Are available as either direct starters (EM 300 EDS) or reversing starters (EM 300 ERS) with adjustment ranges from 0.14 to 0.2 A and 9 to 12 A respectively.
- Can be equipped with a 24 V DC, max. 3 A, or 500 V DC, max. 0,2 A, braking contact as an option.

View

The diagram below shows the components of a motor starter EM 300 DS/RS.



1.2 What are the Motor Starters EM 300 EDS and EM 300 ERS?

Motor starters EM 300 EDS/ERS

Motor starters EM 300 EDS and EM 300 ERS are electronic motor starters, which can be used on the ET 200X distributed I/O device as expansion module. Up to six motor starters EM 300 can be added to the basic module.

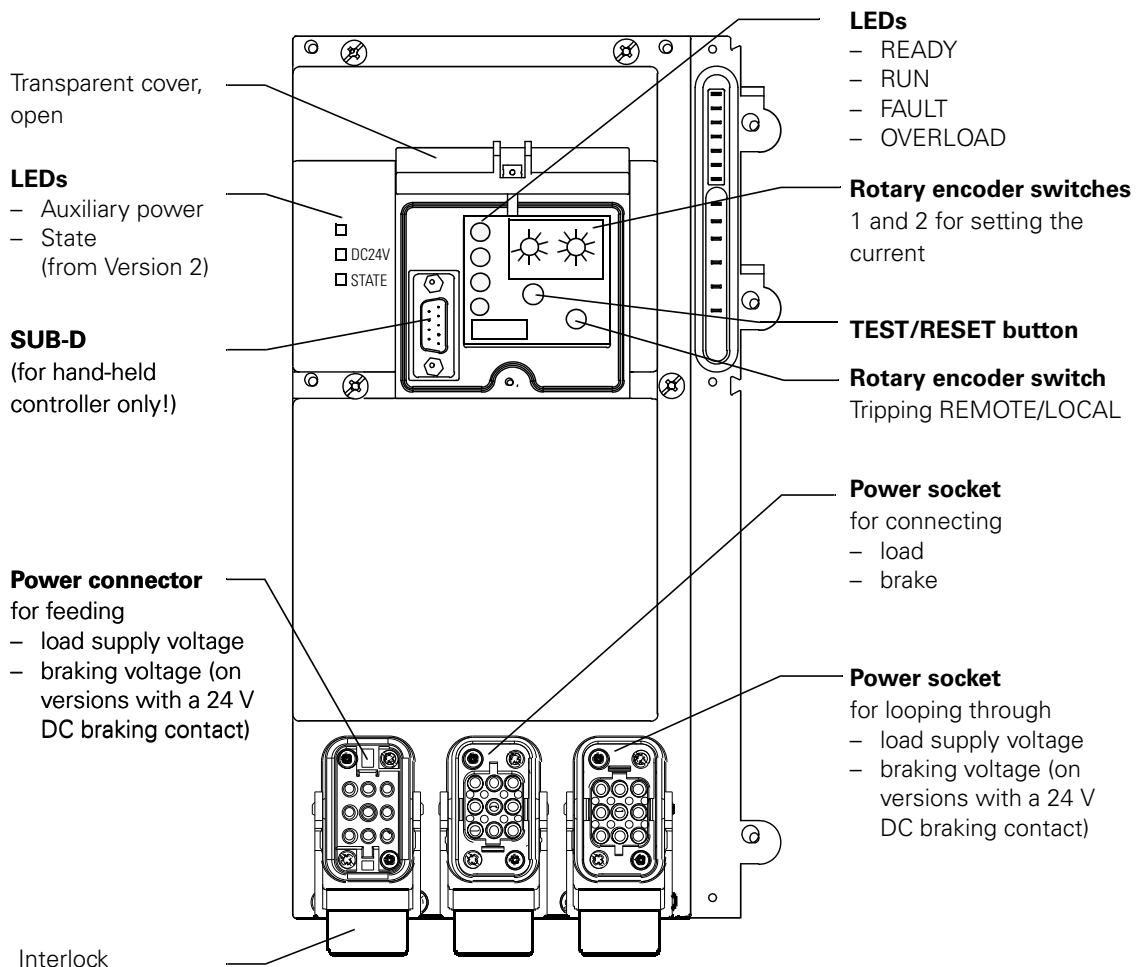
Characteristics

The motor starters EM 300 EDS/ERS:

- Are suitable for switching and protecting any three-phase loads up to 2.2 kW with 400 V AC.
- Are available as either direct starters (EM 300 EDS) or reversing starters (EM 300 ERS) with adjustment ranges from 0.6 to 2.18 A and 2.0 to 5.95 A respectively.
- Can be equipped with a 24 V DC, max. 3 A, or 400 V AC, max. 0.5 A, or 500 V DC, max. 0.2 A braking contact as an option.

View

The diagram below shows the components of a motor starter EM 300 EDS/ERS.



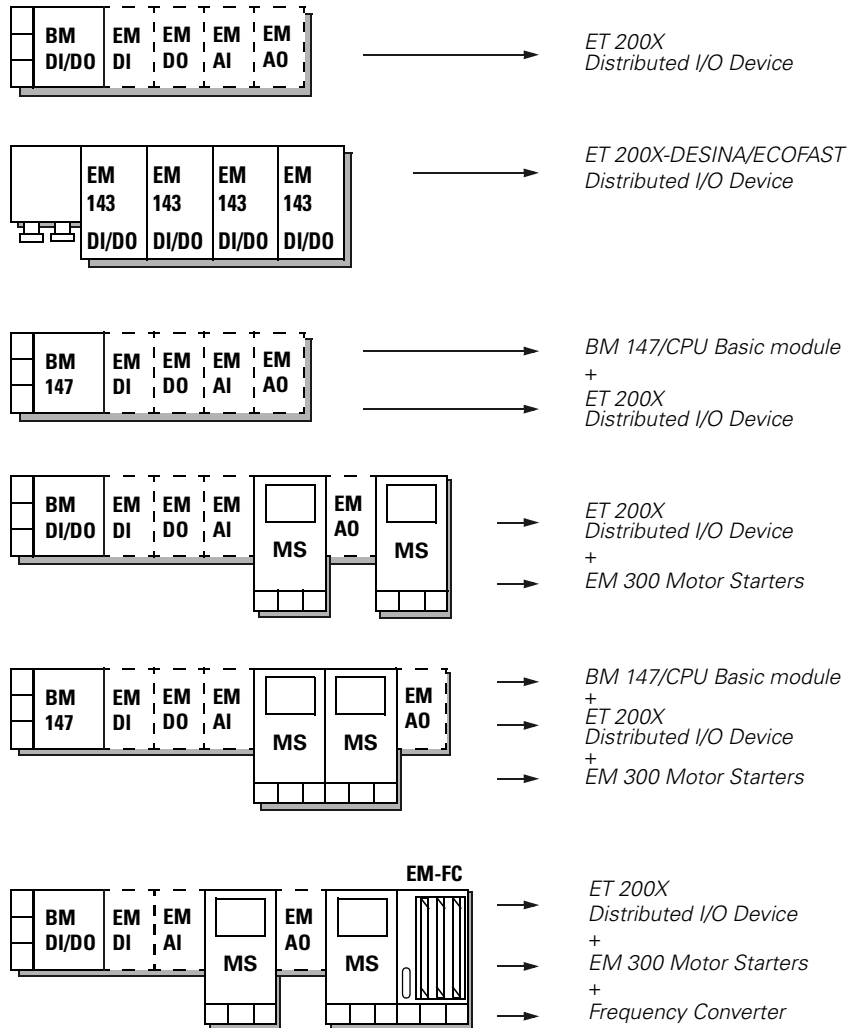
1.3 Guide to the ET 200X Manuals

You are Using the following Components ...

The components of the ET 200X are described in various manuals in the ET 200X package. The figure below shows possible ET 200X configurations and the manuals required for them.

The ET 200X consists of the following components:

You need the information contained in the following manuals:



Where Do You Find What Information?

The table below will help you get your bearings and find the information you need quickly. It tells you which manual you need to refer to and which chapter deals with the topic you are interested in.

Subject	Manual				Chapter/ Appendix
	ET 200X Distributed I/O Device	BM 147/ CPU Basic Module	EM 300 Motor Starters	EM 148-FC Frequency Converter	
ET 200X configuration options	x				2
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Electrical configuration and wiring of the ET 200X	x				4
Electrical configuration and wiring of the ET 200X-DESINA/ECOFAST	x				4
Wiring of motor starters			x		2
Wiring of frequency converters				x	2
The ET 200X with the BM 147/CPU with PROFIBUS DP		x			3
Commissioning and diagnostics of the ET 200X	x				5
Commissioning and diagnostics of the ET 200X-DESINA/ECOFAST	x				5
Commissioning and diagnostics of the ET 200X with BM 147/CPU		x			4
Commissioning and diagnostics of the ET 200X with motor starters			x		3
Commissioning and diagnostics of the ET 200X with frequency converters				x	3
General technical specifications of the ET 200X (standards, certificates and approvals, EMC, environmental conditions etc.)	x				6
Technical specifications of the basic and expansion modules with DI, DO, AI and AO	x				7
Technical specifications of the BM 147/CPU		x			5
Technical specifications of the motor starters			x		5

Subject	Manual				Chapter/ Appendix
	ET 200X Distributed I/O Device	BM 147/ CPU Basic Module	EM 300 Motor Starters	EM 148-FC Frequency Converter	
Functions and technical specifications of frequency converters				x	4
BM 147/CPU cycle and response times		x			6
Order numbers of the components	x				A
Order numbers of the motor starters			x		A
Order numbers of frequency converters				x	A
Dimensioned drawings of the basic modules and digital and analog expansion modules	x				C
Dimensioned drawings of the motor starters			x		B
Dimensioned drawings of frequency converters				x	B
Configuration and parameter assignment frames	x				C
Configuration and parameter assignment frames for the BM 147/CPU		x			A
Configuration frame for motor starters			x		C
List of <i>STEP 7</i> operations		x			B
Execution times of SFCs		x			C
Glossary	x	x			Glossary

Wiring

2

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2.1 Rules for Wiring



Warning

Dangerous high voltage! Take care to avoid electric shock and injuries from burns. Always deenergize the system and the device before carrying out any work.

Selecting the motor connecting cables

The core cross section of the motor connecting cables must match the given environmental conditions. The cross section is governed by:

- the nominal current set on the unit,
- the method of cable laying,
- the ambient temperature,
- the insulation material of the motor connecting cable (PVC, rubber).

For PVC motor connecting cables laid in cable ducts, the following maximum current carrying capacities apply according to environment temperature:

$T_{env} =$	30 °C	40 °C	45 °C	50 °C	55 °C
4 x 1.5 mm ²	14 A	12.2 A	11.1 A	9.9 A	8.5 A
4 x 2.5 mm ²	19 A	16.5 A	15.0 A	13.5 A	11.6 A
4 x 4.0 mm ²	26 A	22.6 A	20.5 A	18.5 A	15.9 A

Wiring power connectors

The rules and procedure for wiring the power connectors apply both to the electromechanical (EM 300 DS/RS) and the electronic motor starter (EM 300 EDS/ERS). Observe the following rules when wiring the power plug:

Rules for flexible conductors	Data	
Current carrying capacity of the connection depending on the connected core cross-section and the environment temperature	at T_{env}	
	55 °C	40 °C
	1.5 mm ²	12 A 15 A
	2.5 mm ²	20 A 25 A
	4.0 mm ²	30 A 35 A
Permissible outside diameter of cable Sealing insert	green	7.0 ... 10.5 mm
	red	9.0 ... 13.0 mm
	white	11.5 ... 15.5 mm
Bared length of cores	8 mm	
Bared length of cable sheath	20 mm	

Motor starter EM 300 with braking contact

The 400 V power supply for the motor and the 24 V DC power supply for the brake are fed to the load through a common cable and connector. There is a danger of voltage overspill if the cable is flattened. Do not therefore connect loads with degree of protection "extra-low voltage" to the braking circuit.

In order to avoid voltage overspill in case of fault the supply voltage for the brake must be drawn from a power supply unit with safe electrical isolation (PELV).

Motor starter EM 300 without braking contact

The braking supply voltage of motor starters without a 24 V braking contact is internally not looped through. The 24 V DC braking voltage must then be drawn from the power supply unit again.

Unused connections

Seal unused connections with caps, only then is degree of protection IP 65 guaranteed (order number 3 RK1 902-0**CK**00 (1 piece) or 3 RK1 902-0**CJ**00 (10 pieces)).

2.2 Motor Starters EM 300 without a Braking Contact

2.2.1 Making up Connecting Cables

Accessories

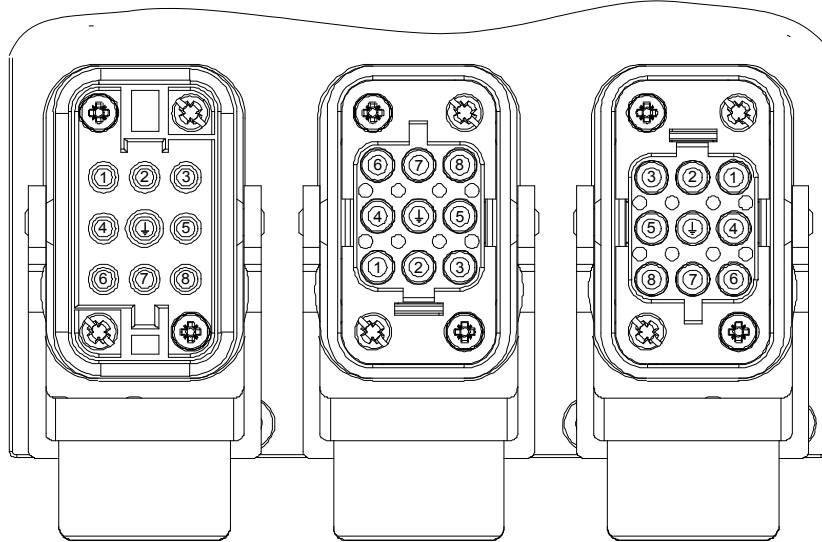
If you want to make up your own connecting cable for motor starters EM 300 without braking contact, you will need one crimping tool for contact pins/jacks (alternatively, they can be soldered) and the following components.

You need ...					
For connecting load supply voltage	X1	For connecting load	X2	For looping through load supply voltage	X3
One flexible 4-core copper cable 2.5 mm ² / 4.0 mm ² (3 conductors + PE)		One flexible 4-core copper cable 1.5 mm ² / 2.5 mm ² (3 conductors + PE)		One flexible 4-core copper cable 2.5 mm ² / 4.0 mm ² (3 conductors + PE)	
One set of connectors		One set of connectors		One set of connectors	
<ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CA00 • 4.0 mm²: 3RK1902-0CB00 		<ul style="list-style-type: none"> • 1.5 mm²: 3RK1902-0CE00 • 2.5 mm²: 3RK1902-0CC00 		<ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CC00 • 4.0 mm²: 3RK1902-0CD00 	
—		resp.		resp.	
		one motor connecting cable with plug, 4 x 1.5 mm ²		one power connecting cable with plug and socket	
		<ul style="list-style-type: none"> • 3 m: 3 RK1 902-0CM00 • 5 m: 3 RK1 902-0CP00 • 10 m: 3 RK1 902-0CQ00 		<ul style="list-style-type: none"> • 6 x 2.5 mm², 0.12 m: 3 RK1 902-0CH00 • 4 x 4.0 mm², 0.15 m: 3 RK1 902-0CG00 	

2.2.2 Wiring the Power Connectors

Pinout

The diagram and the table below indicate the pinout of the power connector and the two power sockets on the motor starter without a braking contact.



Pin-out	Plug X1	Socket X2	Socket X3
	Connecting load supply voltage	Connecting load	Looping through load supply voltage
1	—	Phase 1	—
2	Phase 2	—	Phase 2
3	—	Phase 3	—
4	—	—	—
5	—	—	—
6	Phase 1	—	Phase 3
7	—	Phase 2	—
8	Phase 3	—	Phase 1
⊕	PE	PE	PE

Coding

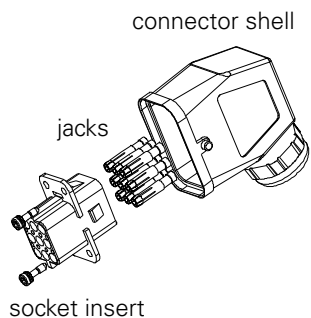
To avoid confusion of compact starter power sockets X2 and X3, the mounting position of X2 is rotated by 180° relative to the mounting position of X3.

Power connectors

The power connectors of a motor starter without a braking contact consist of the following components:

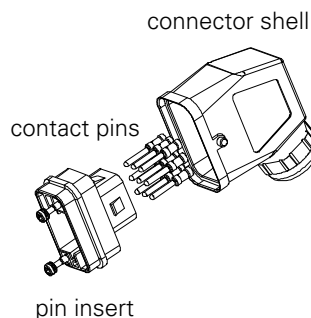
Power socket

- for connecting load supply voltage



Power connector

- for connecting the load
- for looping through the load supply voltage



Installing and wiring power connectors

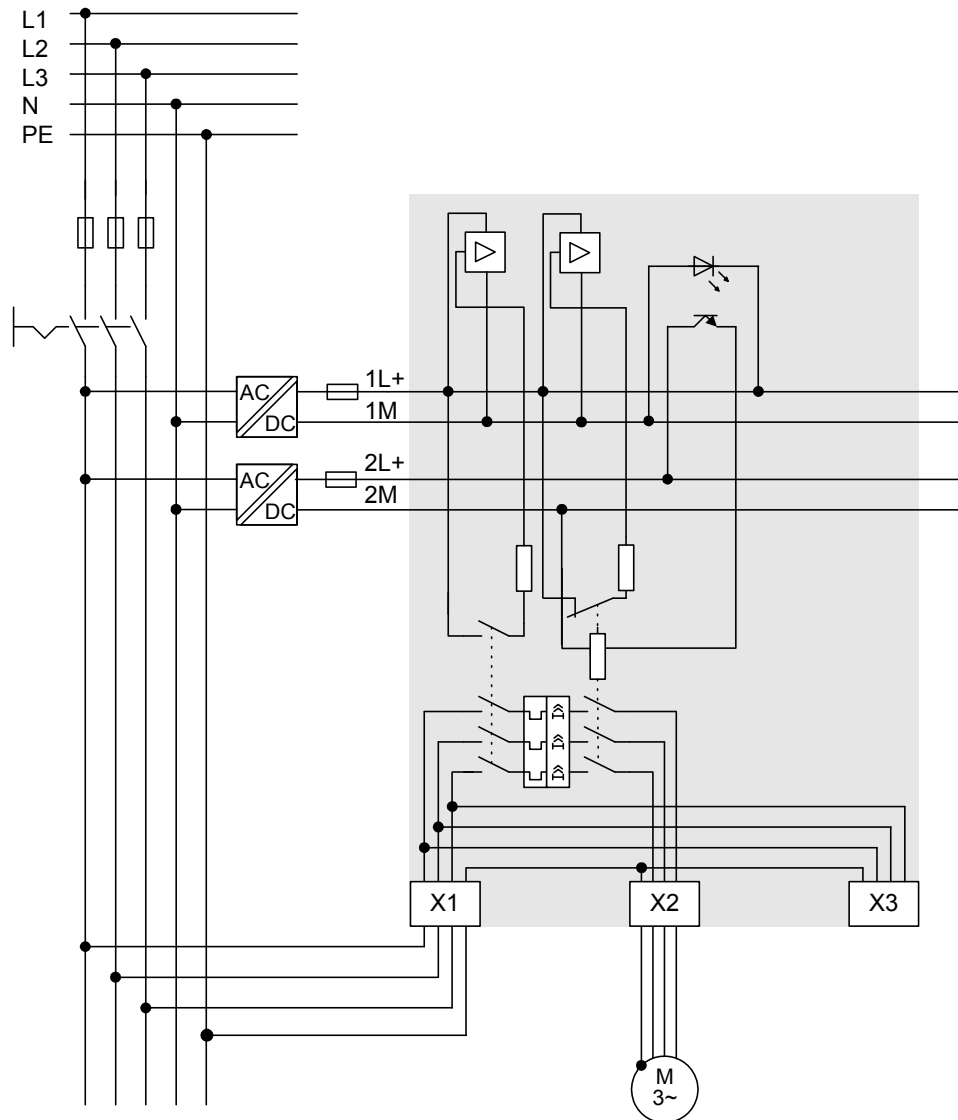
Install the power connectors of a motor starter without a braking contact as follows. Please note the wiring rules described in Chapter 2.1.

Step	Procedure		
	Socket for X1	Connector for X2	Connector for X3
1	Feed the cable through the gland, the appropriately-sized sealing ring supplied and the connector shell.		
2	Fasten the jacks to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for PE 	Fasten the contact pins to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for PE 	
3	Press the jacks into the socket insert until they snap into place.	Press the contact pins into the pin insert until they snap into place.	
4	Withdraw the cable sufficiently to be able to screw the socket or pin insert tightly inside the connector shell with the enclosed screws.		
5	Screw the gland tight.		

2.2.3 Electrical Design

Configuration

The following diagram shows the electrical design of a motor starter EM 300 DS/RS without a braking contact.



2.3 Motor Starters EM 300 with a 24 V DC Braking Contact

2.3.1 Making up Connecting Cables

Accessories

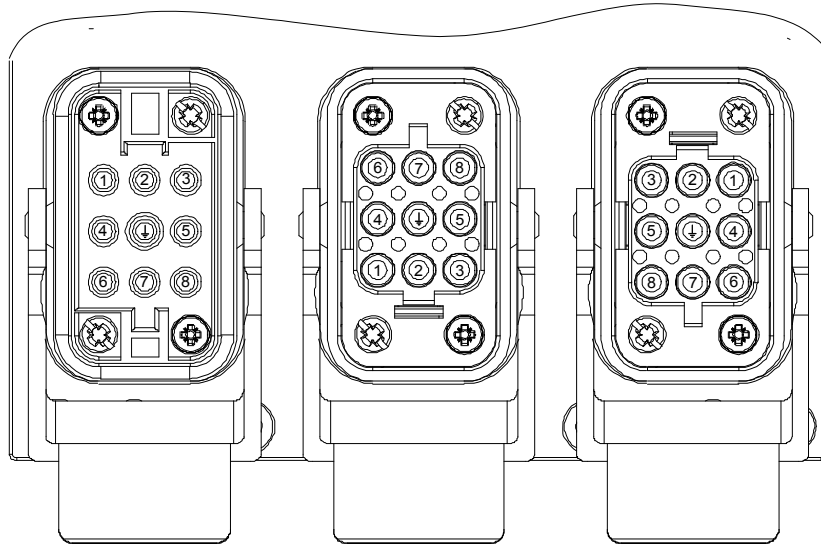
If you want to make up your own connecting cable for motor starters EM 300 with a 24 V DC braking contact, you will need one crimping tool for contact pins/jacks (alternatively, they can be soldered) and the following components.

You need ...		
For connecting load supply voltage X1	For connecting load with a brake 24 V DC X2	For looping through load supply voltage and brake voltage X3
One flexible 6-core copper cable 2.5 mm ² / (4.0 mm ²) (3 conductors + PE + 24 V + M)	One flexible 6-core copper cable 1.5 mm ² / 2.5 mm ² (3 conductors + PE + 24 V + M)	One flexible 6-core copper cable 2.5 mm ² / (4.0 mm ²) (3 conductors + PE + 24 V + M)
One set of connectors <ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CA00 • 4.0 mm²: 3RK1902-0CB00 	One set of connectors <ul style="list-style-type: none"> • 1.5 mm²: 3RK1902-0CE00 • 2.5 mm²: 3RK1902-0CC00 	One set of connectors <ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CC00 • 4.0 mm²: 3RK1902-0CD00
—	resp. one motor connecting cable with plug, 6 x 1.5 mm ² <ul style="list-style-type: none"> • 3 m: 3 RK1 902-0CN00 • 5 m: 3 RK1 902-0CR00 • 10 m: 3 RK1 902-0CS00 	resp. one power connecting cable with plug and socket, 6 x 2.5 mm ² <ul style="list-style-type: none"> • 0.12 m: 3 RK1 902-0CH00

2.3.2 Wiring the Power Connectors

Pinout

The diagram and the table below indicate the pinout of the power connector and the two power sockets on a motor starter with a 24 V DC braking contact.



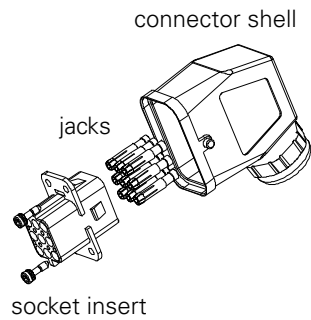
Pin-out	Plug X1	Socket X2	Socket X3
		Connecting load supply voltage	Connecting load with brake
1	—	Phase 1	—
2	Phase 2	—	Phase 2
3	—	Phase 3	—
4	GND	GND	+ 24 V DC
5	+ 24 V DC	+	GND
6	Phase 1	—	Phase 3
7	—	Phase 2	—
8	Phase 3	—	Phase 1
⊕	PE	PE	PE

Power connectors

The power connectors of a motor starter EM 300 with a 24 V DC braking contact consist of the following components:

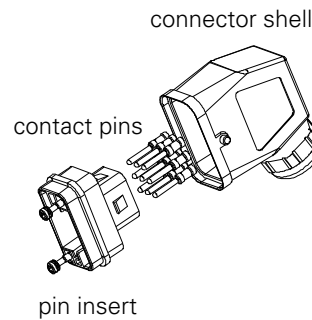
Power socket

- for connecting load supply voltage



Power connector

- for connecting the load with a brake
- for looping through the load supply voltage and the braking voltage



Installing and wiring power connectors

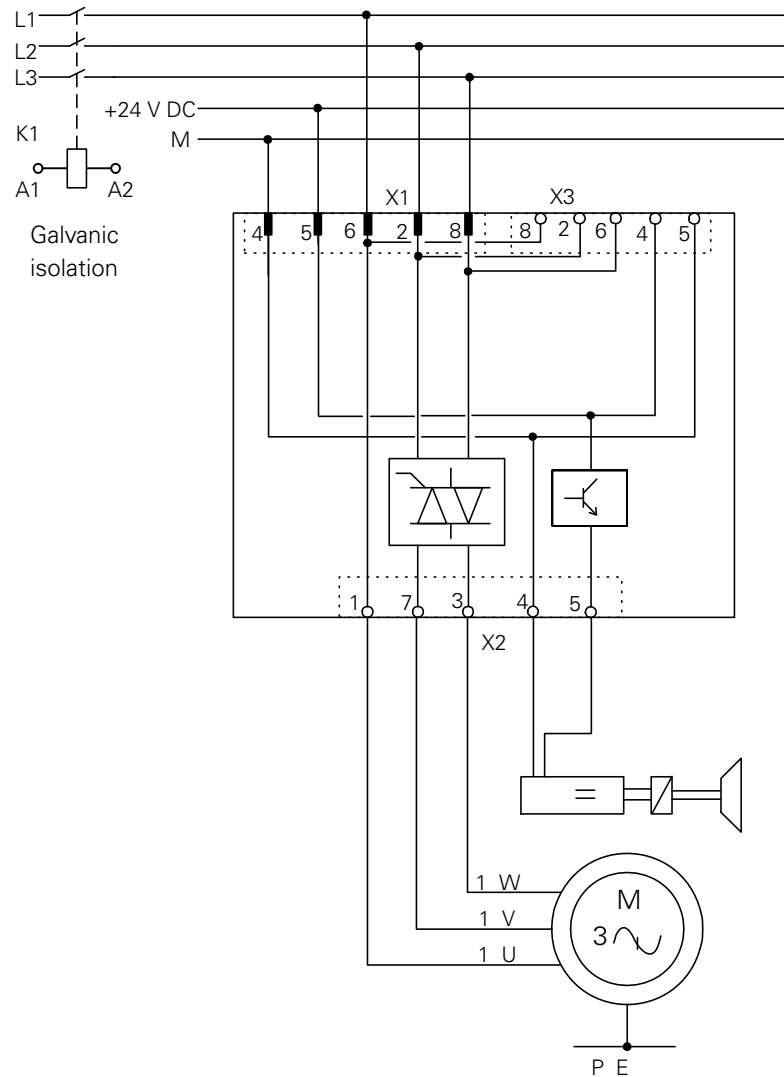
Install the power connectors of a motor starter with a 24 V DC braking contact as follows. Please note the wiring rules described in Chapter 2.1

Step	Procedure		
	Socket for X2	Connector for X2	Connector for X3
1	Feed the cable through the gland, the appropriately-sized sealing ring supplied and the connector shell.		
2	Fasten the jacks to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for the brake • for PE 	Fasten the contact pins to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for the brake • for PE 	
3	Press the jacks into the socket insert until they snap into place.	Press the contact pins into the pin insert until they snap into place.	
4	Withdraw the cable sufficiently to be able to screw the socket or pin insert tightly inside the connector shell with the enclosed screws.		
5	Screw the gland tight.		

2.3.3 Electrical Design

Suggested circuit

The following diagram suggests one way of controlling the motor with a 24 V DC brake via an electronic compact starter EM 300 EDS/ERS.



Motor with 24 V DC brake

Galvanic isolation



An external isolating contactor must be fitted to ensure galvanic isolation from the power supply system!

2.4 Motor Starters EM 300 with a 400 V AC resp. 500 V DC Braking Contact

2.4.1 Making up Connecting Cables

Accessories

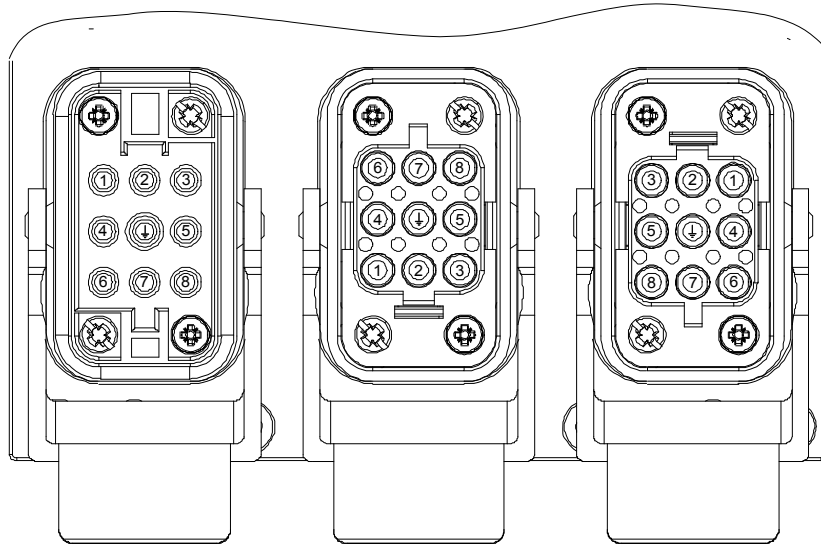
If you want to make up your own connecting cable for motor starters EM 300 with a 400 V AC resp. 500 V DC braking contact, you will need one crimping tool for contact pins/jacks (alternatively, they can be soldered) and the following components.

You need ...		
For connecting load supply voltage X1	For connecting load with brake 400 V AC resp. 500 V DC X2	For looping through load supply voltage X3
One flexible 4-core copper cable 2.5 mm ² / 4.0 mm ² (3 conductors + PE)	One flexible 6-core copper cable 1.5 mm ² / 2.5 mm ² (3 conductors + PE + 2 conductors)	One flexible 4-core copper cable 2.5 mm ² / 4.0 mm ² (3 conductors + PE)
One set of connectors <ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CA00 • 4.0 mm²: 3RK1902-0CB00 	One set of connectors <ul style="list-style-type: none"> • 1.5 mm²: 3RK1902-0CE00 • 2.5 mm²: 3RK1902-0CC00 	One set of connectors <ul style="list-style-type: none"> • 2.5 mm²: 3RK1902-0CC00 • 4.0 mm²: 3RK1902-0CD00
—	resp. one motor connecting cable with plug, 4 x 1.5 mm ² <ul style="list-style-type: none"> • 3 m: 3 RK1 902-0CN00 • 5 m: 3 RK1 902-0CR00 • 10 m: 3 RK1 902-0CS00 	resp. one power connecting cable with plug and socket <ul style="list-style-type: none"> • 6 x 2.5 mm², 0.12 m: 3 RK1 902-0CH00 • 4 x 4.0 mm², 0.15 m: 3 RK1 902-0CG00

2.4.2 Wiring the Power Connectors

Pinout

The diagram and the table below indicate the pinout of the power connector and the two power sockets on a motor starter EM 300 with a braking contact 400 V AC resp. 500 V DC.



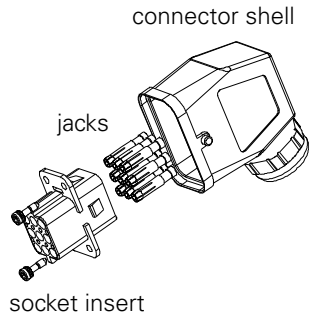
Pin-out	Plug X1	Socket X2	Socket X3
	Connecting load supply voltage	Connecting load with brake	Looping through load supply voltage
1	—	Phase 1	—
2	Phase 2	—	Phase 2
3	—	Phase 3	—
4	—	L1 / +OUT	—
5	—	L3 / +IN	—
6	Phase 1	—	Phase 3
7	—	Phase 2	—
8	Phase 3	—	Phase 1
⊕	PE	PE	PE

Installing and wiring power connectors

The power connectors of a motor starter EM 300 with a braking contact 400 V AC resp. 500 V DC consist of the following components:

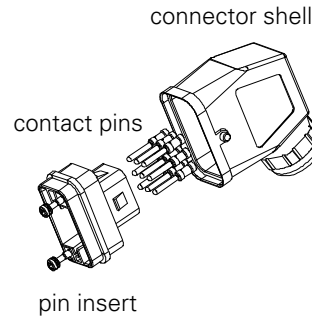
Power socket

- for connecting load supply voltage



Power connector

- for connecting the load with a brake
- for looping through the load supply voltage



Installing and wiring power connectors

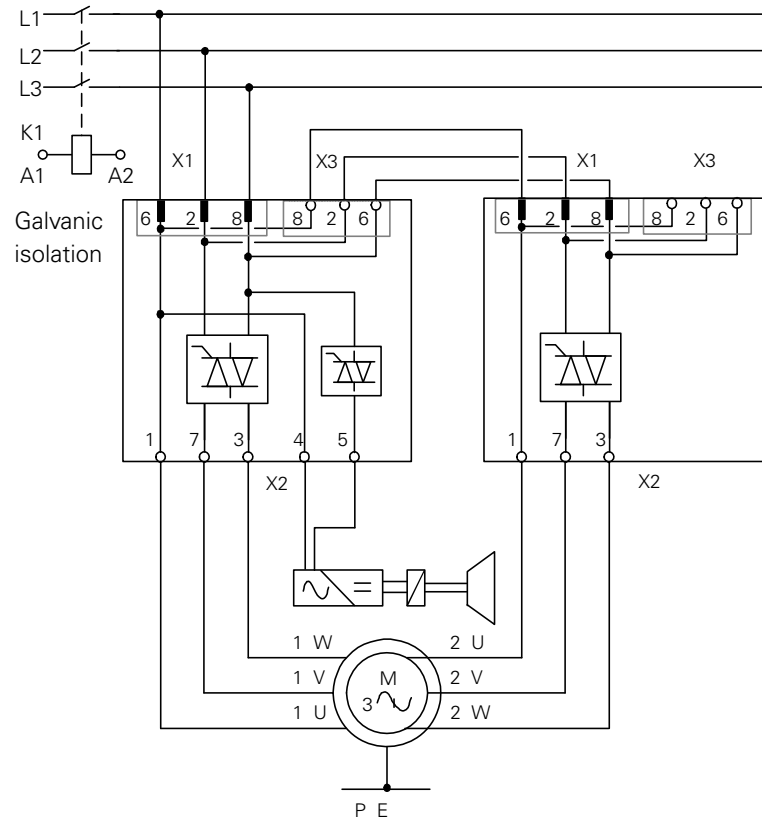
Install the power connectors of a motor starter with a braking contact 400 V AC resp. 500 V DC as follows. Please note the wiring rules described in Chapter 2.1.

Step	Procedure		
	Socket for X1	Connector for X2	Connector for X3
1	Feed the cable through the gland, the appropriately-sized sealing ring supplied and the connector shell.		
2	Fasten the jacks to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for PE 	Fasten the contact pins to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for the brake • for PE 	Fasten the contact pins to the cores <ul style="list-style-type: none"> • for phases 1 to 3 • for PE
3	Press the jacks into the socket insert until they snap into place.	Press the contact pins into the pin insert until they snap into place.	
4	Withdraw the cable sufficiently to be able to screw the socket or pin insert tightly inside the connector shell with the enclosed screws.		
5	Screw the gland tight.		

2.4.3 Electrical Design

Suggested circuit 400 V AC brake

The following diagram shows you a way of controlling a pole-changing motor for two directions with a 400 V AC brake by two electronic motor starters EM 300 EDS/ERS.



Motor with separate windings
and brake 400 V AC

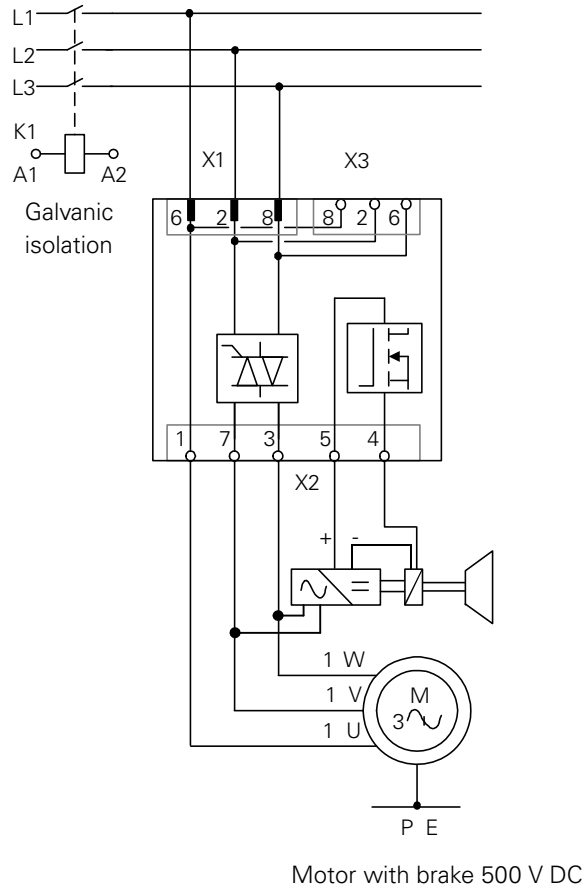
Galvanic isolation



An external isolating contactor must be fitted to ensure galvanic isolation from the power supply system!

Suggested circuit 500 V DC brake

The following diagram shows you a way of controlling a motor with a 500 V DC brake by one electronic motor starter motor starter EM 300.



Galvanic isolation



An external isolating contactor must be fitted to ensure galvanic isolation from the power supply system!

Commissioning

3

Section	Subject	Page
3.1	Motor Starters EM 300 DS and EM 300 RS	3-2
3.1.1	Commissioning	3-2
3.1.2	Operation	3-3
3.1.3	Diagnostics	3-4
3.2	Motor Starters EM 300 EDS and EM 300 ERS	3-6
3.2.1	Commissioning	3-6
3.2.2	Operation	3-8
3.2.3	Diagnostics	3-10

3.1 Motor Starters EM 300 DS and EM 300 RS

3.1.1 Commissioning

Set current I_e

Before you commission the motor starter, you must set the current I_e for tripping the overload release.

Step	Procedure
1	Open the transparent cover in the top section of the motor starter.
2	Set the current I_e on the circuit-breaker scale with a screw-driver (see figure on page 1-2).

External short-circuit protection

If the short-circuit current at the point at which the motor starter is installed is greater than the rated ultimate short-circuit breaking capacity of the circuit-breaker (see table), you must provide external short-circuit protection (fuse or circuit-breaker; see Catalog).

U_e	$I_{cu \text{ max}}$
400 V AC	50 kA
440 V AC	10 kA
500 V AC	3 kA

Overload release test

You can test the overload release function.

Step	Procedure
1	Open the transparent cover in the top section of the motor starter.
2	Reset the toggle switch from 0 to 1.
3	Insert a screwdriver in the test opening (see figure on page 1-2) and press it over to the left. The overload release function is working if the toggle switch is switched back from 1 to 0.

Reversing starter EM 300 RS

When switching over from right to left or back again, a stop interval of more than 200 milliseconds must be observed. This interval has to be set via the user program.

3.1.2 Operation

If overload release trips

After an overload release trip during operation you must reset the circuit-breaker.

Step	Procedure
1	Open the transparent cover in the top section of the motor starter.
2	Reset toggle switch from 0 to 1.
3	Check whether any switching contacts have been damaged as a result of a short-circuit.

Disconnecting a load from the power system

You can disconnect a load from the electrical power system by resetting the toggle switch on the circuit-breaker from 1 to 0.

Safeguard against accidental opening/unauthorized switching on

You can seal the transparent cover of the motor starter in order to safeguard it against accidental opening, for example in order to prevent the overload release current from being altered inadvertently.

You can prevent the motor starter from being switched on by unauthorized persons, by fitting the actuating element of the circuit-breaker with a safety lock.

3.1.3 Diagnostics

Diagnosis via the LEDs

During operation, the LEDs on the motor starter EM 300 DS and EM 300 RS indicate the following statuses:

LED	Indication	Status
DC 24 V	Steady green light	Auxiliary power applied
	Off	Auxiliary power missing
STATE	Steady green light	Control signal applied (bus / hand-held controller)

Diagnosis via the user program

You can evaluate the input and output signals in your application. Please note that

- "DI2" is not driven by the direct starter EM 300 DS, i. e. "DI2" is always 0.
- "DO2" is only driven on versions with a braking contact.

Input signals

DI0	Manual/automatic mode	DI1	Feedback from contactor*
0	Manual	0	Clockwise rotation on
1	Automatic	1	Clockwise rotation off
DI2	Feedback from contactor*	DI3	Circuit-breaker
0	Anticlockwise rotation on	0	Off
1	Anticlockwise rotation off	1	On

* The feedback signal for the protective circuit-breaker position is by means of positive-action NC contacts. That is why the signal level is inverted here.

Output signals

DI0	Signal to contactor	DI1	Signal to contactor
0	Clockwise rotation off	0	Anticlockwise rotation off
1	Clockwise rotation on	1	Anticlockwise rotation on
DI2	Braking contact	—	
0	Open braking contact		
1	Close braking contact		



Caution !

The braking contact is driven via the bus independently of the main current circuit. This allows non-synchronous switching of the motor and brake.

Make sure that no dangerous system states can occur (e. g. unwanted coasting or blocking of the motor) by means of the user program. This also applies to local disconnections (e. g. triggered by an overload). You can use input signal DI3 to check the device state.

Electronic overload protection

You can set the overload protection mode with the tripping REMOTE/LOCAL rotary encoder switch on the motor starter EM 300 EDS/ERS (see figure on page 1-3).

In the user program you can define the response to the signal "FAULT /release signal" (DI2) when the rotary encoder switch is in position tripping REMOTE.

Rotary encoderswitch position	Overload protection	Response
Tripping REMOTE	Control via the bus	Depending on the settings in the user program: <ul style="list-style-type: none"> • Operation continued inspite of release signal or • Remote shutdown (= overload release)
Tripping LOCAL	Local control	<ul style="list-style-type: none"> • Direct shutdown (= overload release)



Caution !

Direct shutdown of the device if a release signal is received is disabled if the rotary encoder switch is in the tripping REMOTE position.

In the user program, define a suitable response (usually shutdown of the load circuit) for a signal received at input DI2.

Overload release test

You can perform an overload release test either in the initial state or in operating mode. An internal program checks the overload and current flow acquisition.

Step	Procedure	Description	READY LED	OVERLOAD LED	FAULT LED
1	Open the transparent cover in the top section of the compact starter.		On	—	—
2	Press the TEST/RESET button for at least 2 s.	Test runs for approx. 10 s. Bus control is disabled.	On	Flashes fast	—
		a) Test successful	On	Flashes slowly	—
3a	Press the TEST/RESET button again.	Bus control enabled again.	On	Off	—
		b) Fault during test	Off	Flashes slowly	On
3b	Remedy the cause of the fault.				
4	Press the TEST/RESET button again for at least 2 s.	Test is restarted.	On	Flashes fast	—
		a) Test successful: See step 3 for how to continue procedure 3.	On	Flashes slowly	—

Safeguard against accidental opening

You can apply a lead seal or place a lock on the transparent cover of the motor starter EM 300 EDS/ERS to prevent unauthorized setting of the rotary encoder switch, for example.

3.2.2 Operation

Remote reset

Remote reset causes the following:

- If the rotary encoder switch is in position tripping LOCAL: Resets overload release as soon as the motor model has fallen below the release threshold.
- If the rotary encoder switch is in position tripping LOCAL or tripping REMOTE: Resets a FAULT signal if the cause of the fault has been remedied.

Local reset

If you press the TEST/RESET button during a local reset, various responses are triggered depending on how long the button is depressed (see the following table).

Reset after signal "FAULT/release signal" (DI2)

After a release signal (device continues operation) resp. overload release (device is shut down) the OVERLOAD LED lights up. After a FAULT signal (device is shut down) the FAULT LED lights up. You can reset the OVERLOAD resp. the FAULT display and the DI2 signal with a local or remote reset in which case the LEDs goes out.

Rotary encoder switch setting	Reset	Procedure
Tripping REMOTE	Local reset	<ul style="list-style-type: none"> • Press the RESET/RESET button for less than 2 s: <ul style="list-style-type: none"> – A pending FAULT signal is reset if the cause of the fault has been remedied. • Press the TEST/RESET button for more than 2 s: <ul style="list-style-type: none"> – Fast discharge of the motor model, i. e. the motor model is reset without a delay, – Device self-test is triggered. Press the TEST/RESET button again as soon as the READY LED lights up again.
	Auto reset	The release signal is reset automatically as soon as the motor model is below the release threshold again.
Tripping LOCAL	Local reset	<ul style="list-style-type: none"> • Press the RESET/RESET button for less than 2 s: <ul style="list-style-type: none"> – The release signal is reset as soon as the motor model is below the release threshold again, – A pending FAULT signal is reset if the cause of the fault has been remedied. • Press the TEST/RESET button for more than 2 s: <ul style="list-style-type: none"> – Fast discharge of the motor model, i. e. the motor model is reset without a delay, – Device self-test is triggered. Press the TEST/RESET button again as soon as the READY LED lights up again.
	Remote Reset	In the user program set output DO3 to "1" and then to "0" again.

Communication failure

If communication fails, the circuit outputs are reset after approx. 100 ms. Restart is automatic.

Note

If the 24 V DC supply voltage for electronic motor starters is interrupted for longer than 5 seconds, a waiting period of $t > 50$ s for normal operation must be observed before switching back on.

3.2.3 Diagnostics

Diagnosis via LEDs

During operation, the LEDs on the motor starter EM 300 EDS/ERS indicate the following statuses:

LED	Function	Indication	Status
DC 24 V	Auxiliary power	Steady green light	Auxiliary power applied
		Off	Auxiliary power missing
STATE (from Version 2)	Control by bus/ hand-held controller	Steady green light	Control signal applied
READY	Initial state	Steady green light	Device ready for operation
RUN	Operating state	Steady yellow light	Main circuit on if current flow > 20 % I _N
FAULT	Fault	Steady red light	Main circuit off , e.g. after <ul style="list-style-type: none"> • failure of two phases • motor connector pulled out • supply voltage dip (< 18 V) • simultaneous activation of clockwise and anticlockwise rotation
OVER-LOAD	Overcurrent signal	Flashing red	Main circuit on
	Overload release test	Flashing red Flashes quickly Flashes slowly	Main circuit off Test running Test completed
	Overload release	Steady red light	Main circuit off <ul style="list-style-type: none"> • Rotary encoder switch in position tripping LOCAL: Direct shutdown • Rotary encoder switch in position tripping REMOTE: Remote shutdown if the relevant settings have been made in the user program
	Overload signal	Steady red light	Main circuit on <ul style="list-style-type: none"> • Rotary encoder switch in position tripping REMOTE: Operation is continued if the relevant settings have been made in the user program.

Diagnosis via the user program

You can evaluate the input and output signals in your application.
Please note that "DO2" is only triggered on versions with a braking contact.

Input signals

DI0	Manual/automatic mode	DI1	Current flow signal
0	Manual	0	No current flow
1	Automatic	1	Current flow
DI2	FAULT/release signal	DI3	Overcurrent signal
0	Not released	0	No overcurrent
1	Rotary encoder switch in position tripping LOCAL: <ul style="list-style-type: none"> • Direct shutdown (= overload release) • FAULT shutdown Rotary encoder switch in position tripping REMOTE: if the relevant settings have been made in the user program <ul style="list-style-type: none"> • Remote shutdown (= overload release) • Continued operation (= release signal) • FAULT shutdown 	1	Overcurrent

Output signals

DO0	Activation of main circuit	DO1	Activation of main circuit
0	Clockwise rotation off	0	Anticlockwise rotation off
1	Clockwise rotation on	1	Anticlockwise rotation on
DO2	Braking contact	DO3	Remote reset
0	Open braking contact	0	Remote reset off
1	Close braking contact	1	Remote reset on

Hand-held Controller

4

Section	Subject	Page
4.1	Functions and View	4-2
4.2	Operation	4-3
4.3	LEDs	4-4
4.4	Buttons	4-5

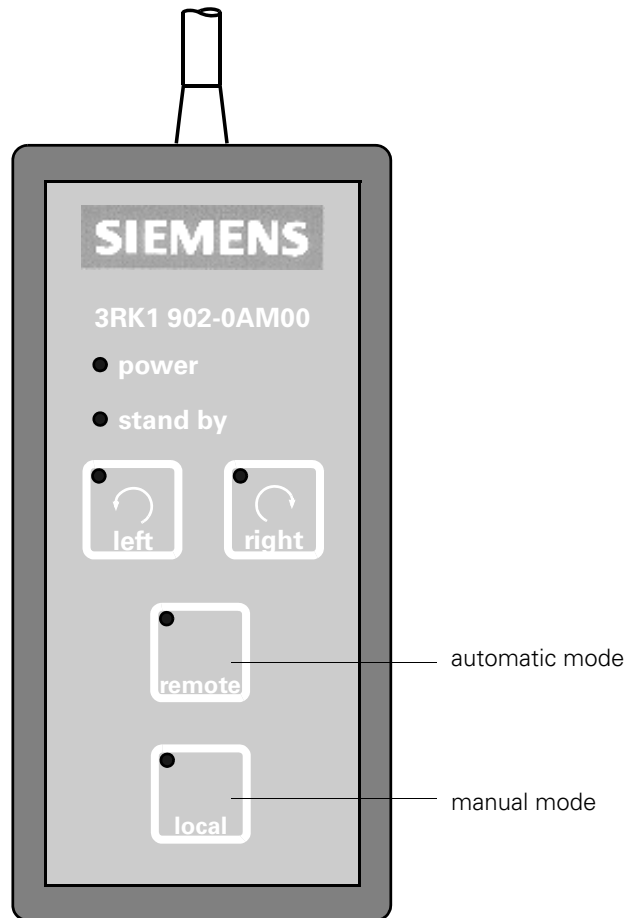
4.1 Functions and View

Functions

You can use the hand-held controller to operate the motor starter independently in the field when a load voltage is applied to ET 200X:

- Before commissioning the PROFIBUS-DP and the PLC in order to test the motor,
- In order to operate the system in manual mode if the PLC or the bus system fails,
- When operating a PLC or bus for autonomous local operator control,
- During normal operation in order to test the outputs (diagnosis/monitoring).

View



Function modes

You can operate the hand-held controller in "jogging mode" and "continuous mode". In manual mode, the functions of the left and right buttons differ depending on this setting.

4.2 Operation

Connection

Connect the hand-held controller as follows:

Step	Procedure
1	Open the transparent cover of the compact starter.
2	Connect the cable of the hand-held controller to the Sub-D socket.

Switchover to continuous mode

The hand-held controller is available in "jogging mode". However, it can also be set to "continuous mode". To do this, proceed as follows:

Step	Procedure
1	Switch to "remote" mode on the connected hand-held controller.
2	Keep both the left and right button pressed for approximately 5 s.
3	Release the buttons as soon as the LED remote starts to flash.

"Continuous mode" is maintained as long as the hand-held controller on the on the motor starter is connected to 24 V DC. "Jogging mode" is reestablished as soon as you remove the hand-held controller.

Removing the hand-held controller

If you remove the hand-held controller from the motor starter,

- actuation via the PROFIBUS-DP remains blocked if "local" mode is set on the hand-held controller,
- a motor in operation is switched off again if "local" mode is set on the hand-held controller,
- "Jogging mode" is set on the hand-held controller again.

Motor starter with braking contact

On motor starters with a braking contact, the brake is automatically controlled with the right or left button.

4.3 LEDs

Monitoring

You can monitor the functions of the motor starter via the LEDs on the hand-held controller:

LED	Lights up when ...	Goes out when ...
Power	Auxiliary power is supplied	No auxiliary power is supplied
Standby	Auxiliary power is supplied	Remote or local is pressed on the hand-held controller
Right	The direct starter is switched on	The direct starter is switched off
	The reversing starter activates the clockwise direction	<ul style="list-style-type: none"> • The reversing starter activates the anticlockwise direction • The reversing starter is switched off
Left	The reversing starter activates the anticlockwise direction	<ul style="list-style-type: none"> • The reversing starter activates the anticlockwise direction • The reversing starter is switched off
Remote	Automatic mode is switched on	The hand-held controller is switched to manual mode
Local	Manual mode is switched on	The hand-held controller is switched to automatic mode

4.4 Buttons

Remote button

You can set the motor starter to **automatic mode** with the remote button. In this mode you can monitor the status of the bus control.

The LED indicates

- on a direct starter whether the bus is controlled,
- on a reversing starter, the direction currently activated: Clockwise (LED right) or anticlockwise (LED left).

Local button

With the local button you can set the motor starter to **manual mode**.

Activation via PROFIBUS-DP is blocked in this mode!

If you switch from "remote" to "local", an active motor is switched off.

If you disconnect the hand-held controller,

- "local" mode is maintained, i. e. activation via PROFIBUS-DP remains blocked.
- a motor in operation is switched off.

Right-/left button

The table below shows the functions of the right and left button in "local" mode in relation to the function mode of the hand-held controller:

Function mode of HHU	"Local" mode
Jogging mode	The motor starter remains switched on while you keep the right or left button (on the reversing starter) pressed.
Continuous mode	<p>You can effect the following actions:</p> <ul style="list-style-type: none"> • With a direct starter <ul style="list-style-type: none"> – Switch on the motor starter by pressing the "Right" button once, – Switch off the motor starter by pressing the "Right" button again or by pressing the "Left" button. • With a reversing starter <ul style="list-style-type: none"> – Activate the "left" or "right" direction of rotation by pressing the appropriate button, – Switch off the motor starter by pressing the same button again, – Reverse the direction of rotation directly.

Technical Specifications

5

Section	Subject	Page
5.1	General Technical Specifications of Motor Starters	5-2
5.2	Voltages and Currents	5-3
5.3	Braking Current Circuit	5-4
5.4	Specifications of Motor Starters EM 300 DS/RS	5-5
5.5	Specifications of Motor Starters EM 300 EDS/ERS	5-6
5.6	Shipping and Storage Conditions	5-7
5.7	Mechanical and Climatic Environment Conditions	5-8

5.1 General Technical Specifications of Motor Starters

Dimensions	
W x H x D (mm)	120 x 265 x 134
Weight	
• Direct starter EM 300 DS	1.5 kg
• Reversing starter EM 300 RS	1.9 kg
• Direct starter EM 300 EDS	1.5 kg
• Reversing starter EM 300 ERS	1.6 kg
Assignment type	
• Type 1 up to $I_{rated} \leq 12$ A	IEC 60947-4-1, DIN VDE 0660, Part 102
• Type 2 up to $I_{rated} \leq 1.6$ A	(does not apply to motor starters EM 300 EDS/ERS)
Pollution severity 3	IEC 60664 (IEC 61131)
Safety class I	IEC 60536 (VDE 0106, Part 1)
Degree of protection IP 65	IEC 60529
<ul style="list-style-type: none"> • Protection against the ingress of dust and complete protection against electric shock • Protection against water jets from nozzles which are aimed at the casing from all directions. (There must be no harmful effects from the water.) 	

Note

The degree of protection IP 65 is only warranted when the compact starter is completely closed. Therefore: Seal off any terminal connections which are not required with screw caps.

Insulation strength

Circuits with a rated voltage U_e to other circuits or to ground	Test voltage in accordance with IEC 61131, Part 2
$0 \text{ V} < U_e \leq 50 \text{ V}$	500 V DC
$300 \text{ V} < U_e \leq 600 \text{ V}$	2.6 kV DC to ground

5.2 Voltages and Currents

Voltages

Rated supply voltage for electronics and sensors (1L+)	24 V DC
Reverse polarity protection	yes
Short-circuit protection	yes
Rated load voltage (2L+) for contactor coil resp. electronics and hand-held controller	24 V DC
Reverse polarity protection	no
Short-circuit protection	yes
Braking voltage	
• EM 300 DS/RS	24 V DC resp. 500 V DC
• EM 300 EDS/ERS	24 V DC, 400 V AC, 500 V DC
Reverse polarity protection	yes
Short-circuit protection	yes
Safe isolation between main circuit and auxiliary circuit to DIN VDE 0106, Part 101/Part 101 A1	400 V

Currents

Aggregate current of motor starters	
• at 55 °C	
– with 2.5 mm ² connection	20 A
– with 4.0 mm ² connection	30 A
• at 40 °C	
– with 2.5 mm ² connection	25 A
– with 4.0 mm ² connection	35 A
Power input	
• from supply voltage 1L+	typ. 70 mA
• from load voltage 2L+ (without hand-held controller)	typ. 170 mA
Minimum tripping current if a phase fails (= 100% current unbalance)	0.85 x I _e

Main circuit

Rated operating voltage U _e	
• to IEC 60947-1, EN 60947-1	500 V AC; tolerance range to 575 V AC
• to CSA and UL	up to 600 V AC
Rated insulation voltage U _i	690 V AC
Rated impulse strength U _{imp}	
• EM 300 DS/RS	6 kV
• EM 300 EDS/ERS	2.5 kV
Rated frequency	50/60 Hz

Caution

Large EMC faults can occur as a result of three-phase motors being operated when connected in star formation (particularly when < 1 kW).

Faults above the IEC limit values can lead to impairment of function or failure of the electronics.

We recommend using motors featuring EMC protective circuits in the case of high EMC faults. (Exception: Electronic starters must not be operated with an EMC protective circuit). The best filter effect is achieved using 3-phase RC interference suppression modules. Varistor interference suppression modules should not be used, as these do not filter out rapid transients to a sufficient extent.

5.3 Braking Current Circuit

Version with a 24 V DC braking contact

Utilization category to VDE 0660, Part 102 and IEC 60947-4.1	DC-13
Max. permissible output of the brake coil	70 W
Rated operational current I_e	3 A

Version with a 400 V AC braking contact

Utilization category to VDE 0660, Part 102 and IEC 60947-4.1	AC-15
Max. permissible output of the brake coil	200 VA
Rated operational current I_e	0.5 A

Version with a 500 V DC braking contact

Utilization category to VDE 0660, Part 102 and IEC 60947-4.1	AC-13
Max. permissible output of the brake coil	100 W
Rated operational current I_e	0.2 A

5.4 Specifications of Motor Starters EM 300 DS/RS

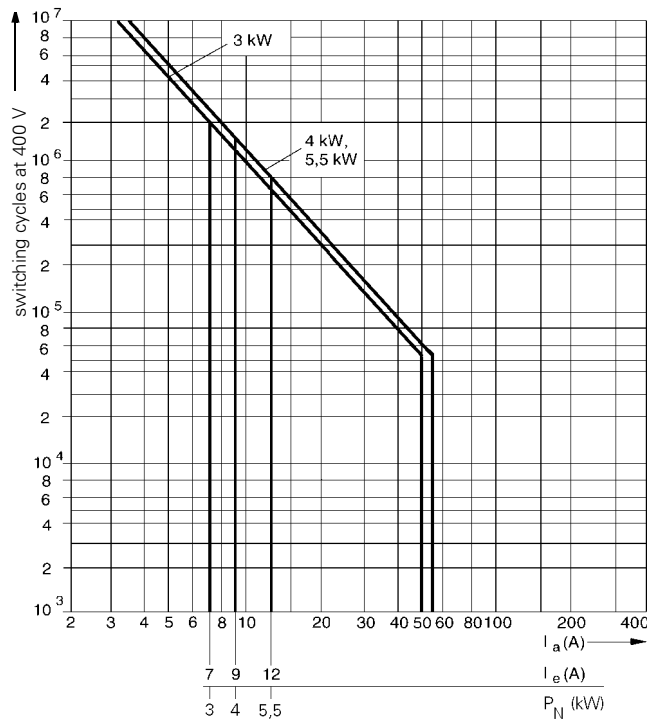
Circuit-breaker

Tripping class	Class 10
Max. rated current	12 A
Adjustment ranges	
• Thermal overload release	0.14-0.2 A to 9-12 A
• Undelayed overcurrent release	$12 \times I_{rated}$ (fixed)
Rated ultimate short-circuit braking capacity up to $I_{rated} = 12$ A	50 kA
Mechanical life	$\geq 100,000$ switching cycles

Contactors

Utilization category to VDE 0660, Part 102 and IEC 60947-4.1	AC-2, AC-3
Max. permissible output of three-phase motors (with 400 V AC)	5.5 kW
Rated operating current I_e	12 A
Max. permissible switching rate at motor starting time $t_a = 0.1$ s and 50% relative ON period	80/h
Mechanical life	≥ 10 Mill. switching cycles
Operating delay of auxiliary contact (including input delay of module)	
• From 0 to 1	29 to 59 ms
• From 1 to 0	26 to 34 ms

Switching cycles



I_a = Breaking current
 I_e = Rated operating current
 P_N = Permissible output of three phase motors at 400 V

5.5 Specifications of Motor Starters EM 300 EDS/ERS

Electronic overload protection

Tripping class	Class 10
Max. rated current	2.18 A or 5.95 A
Setting ranges	0.6 to 2.18 A 2.0 to 5.95 A

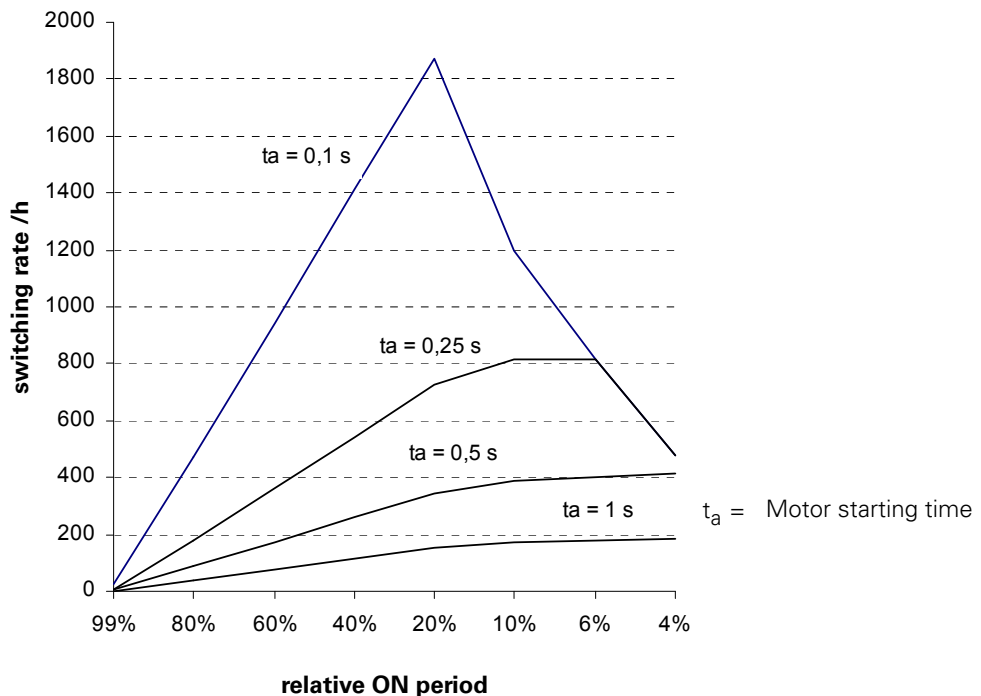
Short-circuit protection (fuses)

Rated ultimate short-circuit breaking capacity	100 kA
--	--------

Electronic switchgear unit (2-phase)

Utilization category to IEC 60947-4.2	AC-53b
Rated operating current I_e	2.18 A or 5.95 A
Modes of operation	S1, S2, S3, S4
Shortest ON period	300 ms
Shortest pause between 2 switching operations	1 s

Maximum switching rate



5.6 Shipping and Storage Conditions

Shipping and storage conditions

The motor starters surpasses the requirements of IEC 61131, Part 2, with regard to shipping and storage conditions. The following details apply to modules that are shipped and stored in their original packing.

Type of condition	Admissible range
Free fall	0.4 m
Temperature	from -40 °C to +70 °C
Temperature variation	20 K/h
Air pressure	from 1,080 to 660 hPa (corresponds to an altitude of -1,000 to 3,500 m)
Relative humidity	from 5 to 95%, without condensation

5.7 Mechanical and Climatic Environment Conditions

Mechanical environment conditions

Oscillation test to IEC 60068, Part 2-6 (Sine)

- Oscillation type: frequency sweeps with a rate of change of 1 octave per minute
 - $10 \text{ Hz} \leq f \leq 58 \text{ Hz}$ constant amplitude: 0.15 mm
 - $58 \text{ Hz} \leq f \leq 150 \text{ Hz}$ constant acceleration: 2 g
- Oscillation time: 10 frequency sweeps per axis in all of the three perpendicular axes

Shock test to IEC 60068, Part 2-27

- Type of shock: Half sine
 - Force of shock: 15 g peak value, 11 ms duration
 - Direction of shock: 3 shocks per +/- direction in all of the three perpendicular axes
-

Climatical environment conditions

Temperature	From 0 to 55 °C	All installation positions
Temperature variation	10 K/h	
Permissible rated current	100% at $0 \text{ °C} \leq T_{\text{env}} < 40 \text{ °C}$ 87% at $40 \text{ °C} \leq T_{\text{env}} \leq 55 \text{ °C}$	
Relative humidity	From 5 to 100%	
Air pressure	From 1080 to 795 hPa	Corresponds to an altitude of -1,000 to 2,000 m
Contaminant concentration	SO ₂ : < 0.5 ppm rel. humidity < 60%, no moisture condensation	Test: 10 ppm; 4 days
	H ₂ S: < 0.1 ppm rel. humidity < 60%, no moisture condensation	1 ppm; 4 days

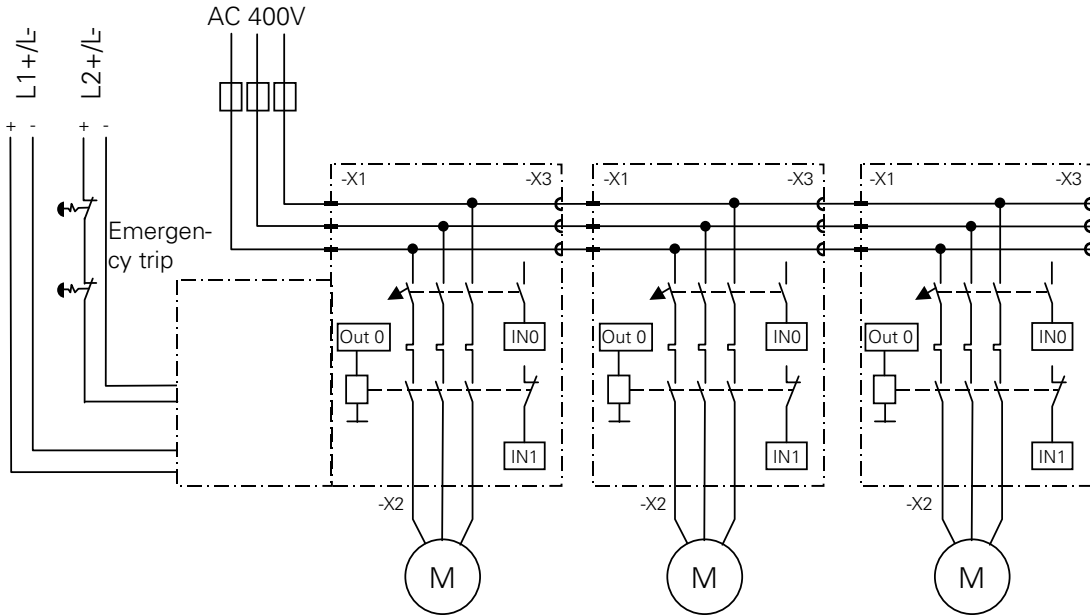
SIGUARD Safety Integrated

6

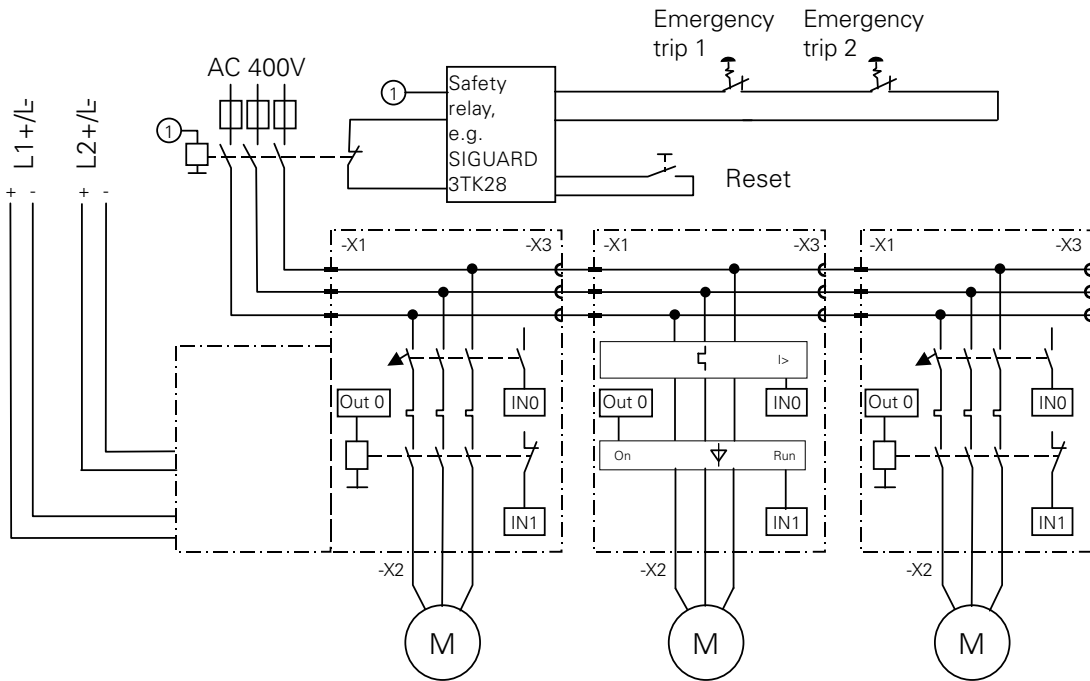
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6.1 Suggested Circuits

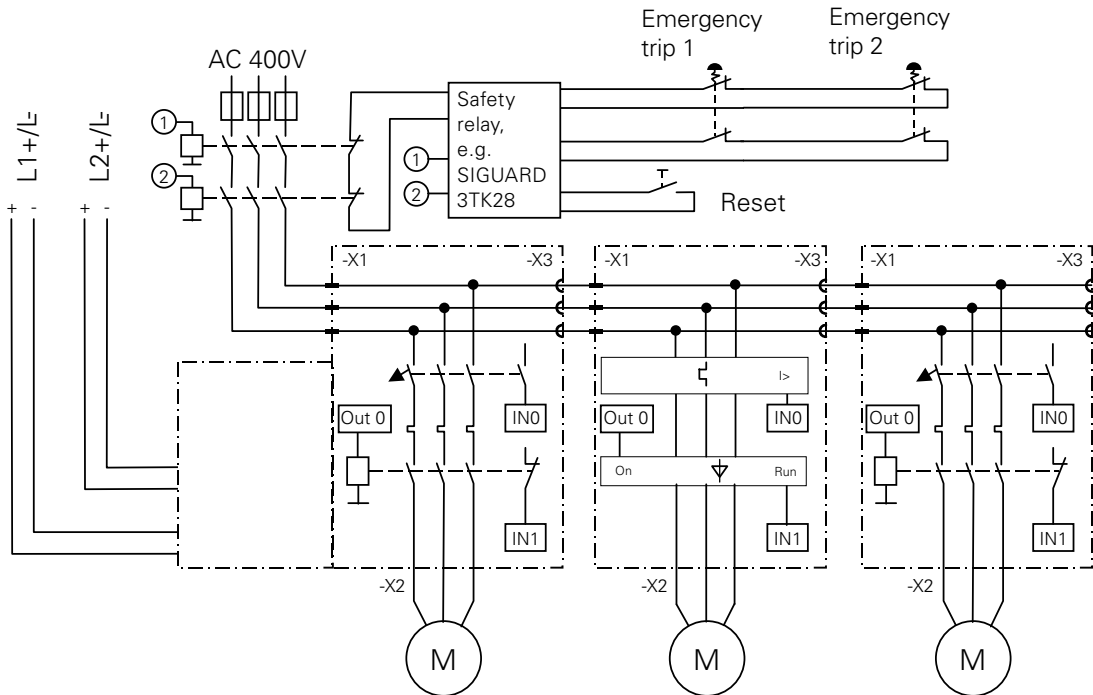
6.1.1 Safety category 1 (EN 954-1)



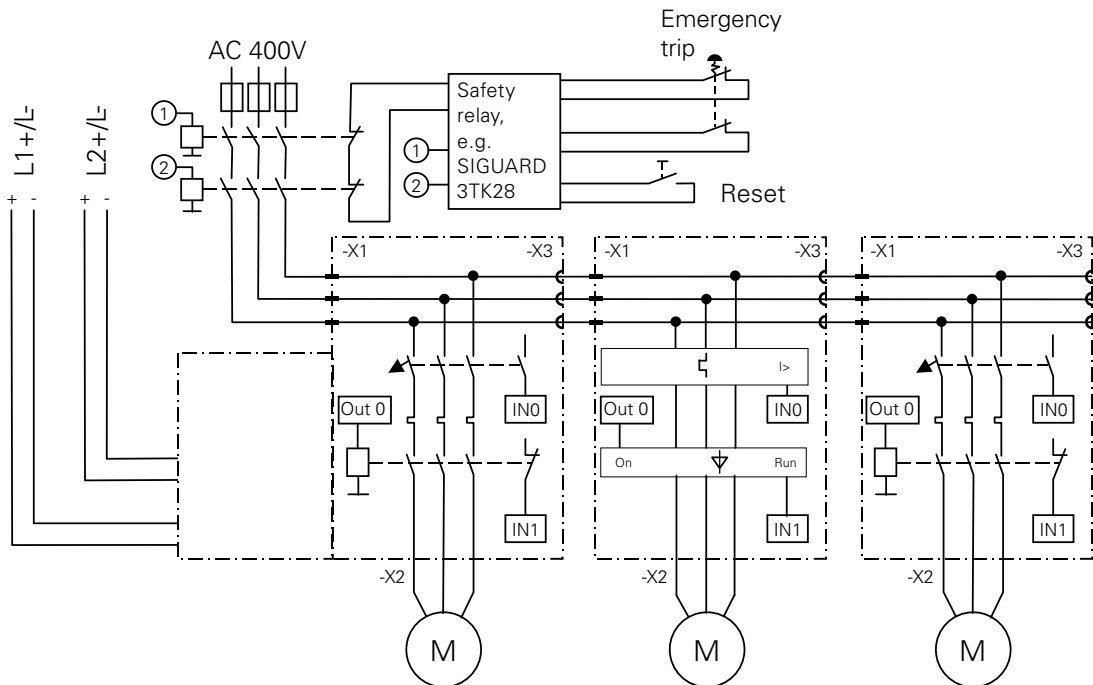
6.1.2 Safety category 2 (EN 954-1)



6.1.3 Safety category 3 (EN 954-1)



6.1.4 Safety category 4 (EN 954-1)



Order Numbers



Direct Starters EM 300 EDS

Adjustment range *	Order number	Order number extension			
		Basic version	Versions with braking contact		
A			24 V DC	400 V AC	500 V DC
0.6 - 2.18	3RK1 300- 0AS 10-	0AA0	0AA1	0AA3	0AA4
2.0 - 5.95	3RK1 300- 0BS 10-	0AA0	0AA1	0AA3	0AA4

Reversing Starters EM 300 ERS

Adjustment range *	Order number	Order number extension			
		Basic version	Versions with braking contact		
A			24 V DC	400 V AC	500 V DC
0.6 - 2.18	3RK1 300- 0AS 10-	1AA0	1AA1	1AA3	1AA4
2.0 - 5.95	3RK1 300- 0BS 10-	1AA0	1AA1	1AA3	1AA4

* For assignment to performance of 400 V AC squirrel-cage motors see Appendix D

Direct Starters EM 300 DS

Adjustment range *	Order number	Order number extension		
		Basic version	Version with braking contact 24 V DC	Version with braking contact 500 V DC
A				
0.14 - 0.20	3RK1 300- 0BS 01-	0AA0	0AA1	0AA4
0.18 - 0.25	3RK1 300- 0CS 01-	0AA0	0AA1	0AA4
0.22 - 0.32	3RK1 300- 0DS 01-	0AA0	0AA1	0AA4
0.28 - 0.40	3RK1 300- 0ES 01-	0AA0	0AA1	0AA4
0.35 - 0.50	3RK1 300- 0FS 01-	0AA0	0AA1	0AA4
0.45 - 0.63	3RK1 300- 0GS 01-	0AA0	0AA1	0AA4
0.55 - 0.80	3RK1 300- 0HS 01-	0AA0	0AA1	0AA4
0.70 - 1.00	3RK1 300- 0JS 01-	0AA0	0AA1	0AA4
0.90 - 1.25	3RK1 300- 0KS 01-	0AA0	0AA1	0AA4
1.10 - 1.60	3RK1 300- 1AS 01-	0AA0	0AA1	0AA4
1.40 - 2.00	3RK1 300- 1BS 01-	0AA0	0AA1	0AA4
1.80 - 2.50	3RK1 300- 1CS 01-	0AA0	0AA1	0AA4
2.20 - 3.20	3RK1 300- 1DS 01-	0AA0	0AA1	0AA4
2.80 - 4.00	3RK1 300- 1ES 01-	0AA0	0AA1	0AA4
3.50 - 5,00	3RK1 300- 1FS 01-	0AA0	0AA1	0AA4
4.50 - 6.30	3RK1 300- 1GS 01-	0AA0	0AA1	0AA4
5.50 - 8.00	3RK1 300- 1HS 01-	0AA0	0AA1	0AA4
7.00 - 10.0	3RK1 300- 1JS 01-	0AA0	0AA1	0AA4
9.00 - 12.0	3RK1 300- 1KS 01-	0AA0	0AA1	0AA4

* For assignment to performance of 400 V AC squirrel-cage motors see Appendix D

Reversing Starters EM 300 RS

Adjustment range *	Order number	Order number extension		
		Basic version	Version with braking contact 24 V DC	Version with braking contact 500 V DC
A				
0.14 - 0.20	3RK1 300- 0BS 01-	1AA 0	1AA 1	1AA 4
0.18 - 0.25	3RK1 300- 0CS 01-	1AA 0	1AA 1	1AA 4
0.22 - 0.32	3RK1 300- 0DS 01-	1AA 0	1AA 1	1AA 4
0.28 - 0.40	3RK1 300- 0ES 01-	1AA 0	1AA 1	1AA 4
0.35 - 0.50	3RK1 300- 0FS 01-	1AA 0	1AA 1	1AA 4
0.45 - 0.63	3RK1 300- 0GS 01-	1AA 0	1AA 1	1AA 4
0.55 - 0.80	3RK1 300- 0HS 01-	1AA 0	1AA 1	1AA 4
0.70 - 1.00	3RK1 300- 0JS 01-	1AA 0	1AA 1	1AA 4
0.90 - 1.25	3RK1 300- 0KS 01-	1AA 0	1AA 1	1AA 4
1.10 - 1.60	3RK1 300- 1AS 01-	1AA 0	1AA 1	1AA 4
1.40 - 2.00	3RK1 300- 1BS 01-	1AA 0	1AA 1	1AA 4
1.80 - 2.50	3RK1 300- 1CS 01-	1AA 0	1AA 1	1AA 4
2.20 - 3.20	3RK1 300- 1DS 01-	1AA 0	1AA 1	1AA 4
2.80 - 4.00	3RK1 300- 1ES 01-	1AA 0	1AA 1	1AA 4
3.50 - 5,00	3RK1 300- 1FS 01-	1AA 0	1AA 1	1AA 4
4.50 - 6.30	3RK1 300- 1GS 01-	1AA 0	1AA 1	1AA 4
5.50 - 8.00	3RK1 300- 1HS 01-	1AA 0	1AA 1	1AA 4
7.00 - 10.0	3RK1 300- 1JS 01-	1AA 0	1AA 1	1AA 4
9.00 - 12.0	3RK1 300- 1KS 01-	1AA 0	1AA 1	1AA 4

* For assignment to performance of 400 V AC squirrel-cage motors see Appendix D

Accessories for Motor Starters EM 300

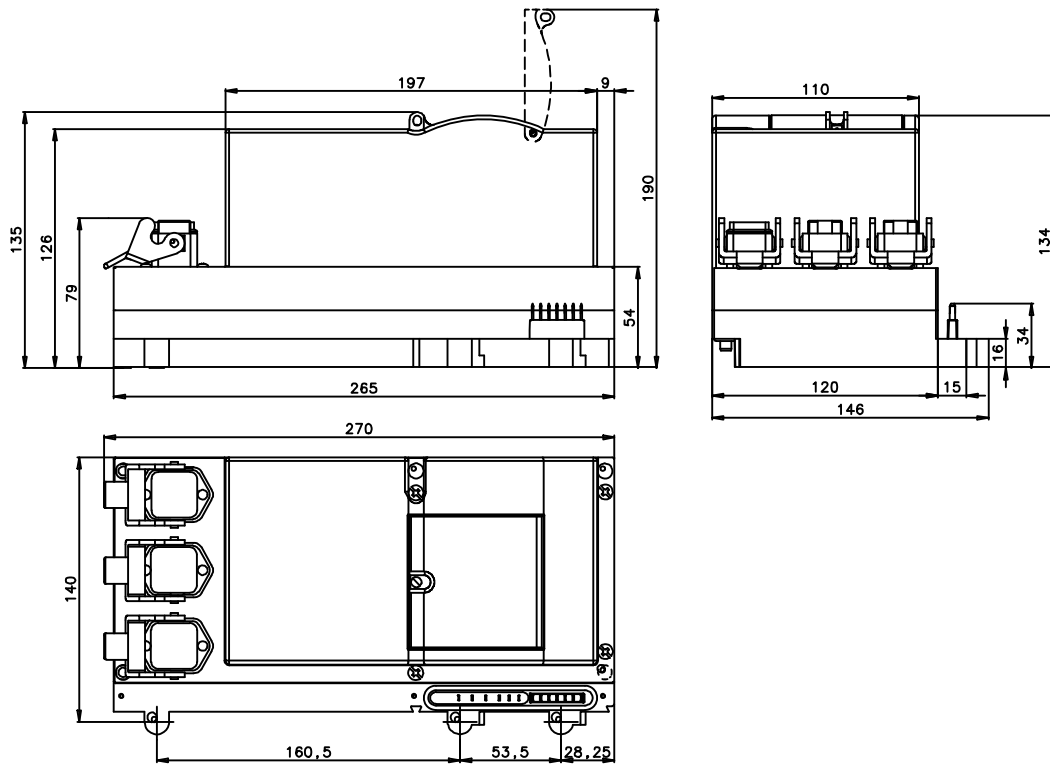
Description	No. of items per pack	Order number
Crimping tool	1	3RK1902-0AH00
- for contact pins and jacks 1.5 to 2.5 mm ²	1	3RK1902-0CT00
- for contact pins and jacks 2.5 to 4.0 mm ²		
Dismantling tool for contact pins and jacks (for 9-pole inserts)	1	3RK1902-0AJ00
Screw cap for power sockets	1	3RK1902-0CK00
	10	3RK1902-0CJ00
Hand-held controller with 0.5 m connecting cable	1	3RK1902-0AM00
Power connecting cable 6 x 2.5 mm ² , 0.12 m long	1	3RK1902-0CH00
Power connecting cable 4 x 4.0 mm ² , 0.15 m long	1	3RK1902-0CG00
Set of connectors for power supply 2.5 mm ² : 1 connector shell with PG 16, 1 socket insert and 6 jacks 2.5 mm ²	1	3RK1902-0CA00
Set of connectors for power supply 4.0 mm ² : 1 connector shell with PG 16, 1 socket insert and 6 jacks 4.0 mm ²	1	3RK1902-0CB00
Set of connectors for looping through power 2.5 mm ² : 1 connector shell with PG 16, 1 pin insert and 6 contact pins 2.5 mm ²	1	3RK1902-0CC00
Set of connectors for looping through power 4.0 mm ² : 1 connector shell with PG 16, 1 pin insert and 6 contact pins 4.0 mm ²	1	3RK1902-0CD00
Set of connectors for connecting motor 1.5 mm ² : 1 connector shell with PG 16, 1 pin insert and 8 contact pins 1.5 mm ²	1	3RK1902-0CE00
Motor connecting cable 4 x 1.5 mm ² , 3 m long, with plug	1	3RK1902-0CM00
Motor connecting cable 4 x 1.5 mm ² , 5 m long, with plug	1	3RK1902-0CP00
Motor connecting cable 4 x 1.5 mm ² , 10 m long, with plug	1	3RK1902-0CQ00
Motor connecting cable 6 x 1.5 mm ² , 3 m long, with plug	1	3RK1902-0CN00
Motor connecting cable 6 x 1.5 mm ² , 5 m long, with plug	1	3RK1902-0CR00
Motor connecting cable 6 x 1.5 mm ² , 10 m long, with plug	1	3RK1902-0CS00

Dimension Drawings

B

Motor starters EM 300

The diagram below is a dimension drawing of the motor starters EM 300.



Configuration Frame

C

DP Identifiers (Special Identifier Format)

The identifiers serve to distinguish between the modules that are used on the PROFIBUS-DP. The following table contains all special DP identifiers for the motor starters, that are used as expansion modules on the ET 200X distributed I/O device.

Motor starter	Order number	Identifiers (hexadecimal)				
		Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
EM 300 DS	3RK1 300- . .S01-0AA .	C2	00	00	CF	C9
EM 300 RS	3RK1 300- . .S01-1AA .	C2	00	00	DF	C9
EM 300 EDS	3RK1 300- . .S10-0AA .	C2	00	00	EF	C9
EM 300 ERS	3RK1 300- . .S10-1AA .	C2	00	00	FF	C9

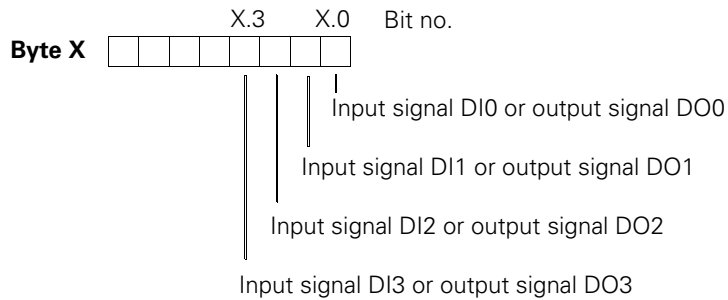
DP Identifiers (Normal Identifier Format)

The identifiers serve to distinguish between the modules that are used on the PROFIBUS-DP. The following table contains all normal DP identifiers for the motor starters, that are used as expansion modules on the ET 200X distributed I/O device.

Motor starter	Order number	Identifiers (hexadecimal)
		Byte 0
EM 300 DS	3RK1 300- . .S00-0AA .	30
EM 300 RS	3RK1 300- . .S00-1AA .	30
EM 300 EDS	3RK1 300- . .S10-0AA .	30
EM 300 ERS	3RK1 300- . .S10-1AA .	30

Byte assignment

The diagram below shows the byte for the input and output signals. Bits X.4 to X.7 have no meaning.



Evaluation

The following is an extract from an application for interrogating signals. The address of the motor starter is 4 in the example.

STL	Description
.	Custom application
.	
UN E 4.3	Has circuit-breaker tripped (E4)?
SPB Error	If so, branch to error handling
U E 4.0	Interrogate operating mode (E1)
SPBN	Branch if manual
.	Program section for driving clockwise
.	rotation output
S A 4.0	Activate clockwise rotation output (A1)
U A 4.0	Generate positive edge for timer 0
L S5T#60ms	Load delay time until contactor "safely on"
U T0	If timer 0 expires
SPB On	
Label: .	Continue here if time not elapsed
.	Remainder of Program
Ende: BE	
On: UN E 4.1	Interrogate feedback from contactor (E2)
SPBN Error	Branch if error
SPA Label	
Manual: .	Program section for manual mode
.	
SPA End	
Error: .	Program section for error handling
.	
SPA End	

Selection Help

D

Application examples

The table below contains various applications together with the type and number of motor starters EM 300 that you need for each application. You can actuate both pole-changing motors and motors with separate windings.

Application		Direct starter EM 300 DS, EM 300 EDS	Reversing starter EM 300 RS, EM 300 ERS	Direct starter with braking contact	Reversing starter with braking contact
With- out brake	One dir. of rotation One speed	1 starter			
	Two dir. of rotation One speed		1 st.		
	One dir. of rotation Two speeds	2 st. ¹⁾			
	Two dir. of rotation Two speeds		2 st. ¹⁾		
With brake	One dir. of rotation One speed			1 st.	
	Two dir. of rotation One speed				1 st.
	One dir. of rotation Two speeds	1 st. ²⁾		1 st. ²⁾	
				2 st. ³⁾	
	Two dir. of rotation Two speeds		1 st. ²⁾		1 st. ²⁾
					2 st. ³⁾

Notes

- 1) The two speeds must be mutually interlocked in the user program with the feedback contactor of the other starter.
- 2) see 1), but in addition the output brake of one starter must remain set during switchover and activation of the other starter.
- 3) This version is suitable if you want to loop the 24 V DC braking voltage through to the next drive. The 24 V DC braking voltage cannot be looped through via a motor starter without braking contact.

Motor list

The following tables contain the operating values of squirrel-cage motors of basic design. Source: Siemens Three-Phase AC Low-Voltage Motors Catalog 1996“.

Speed 3000 rpm two-pole	Rated power kW	Rated speed min⁻¹	Efficiency %	Power factor cos φ	Rated current A
50 Hz 400 V	0.18	2680	60	0.83	0.52
	0.25	2725	64	0.82	0.69
	0.37	2750	67	0.80	1.00
	0.55	2790	71	0.81	1.38
	0.75	2850	74	0.83	1.76
	1.1	2835	76	0.84	2.45
	1.5	2860	78	0.82	3.40
	2.2	2850	80	0.85	4.65
	3	2895	83	0.86	6.10
	4	2895	85	0.87	7.80
	5.5	2910	84	0.84	11.30

Speed 1500 rpm four-pole	0.18	1315	59	0.76	0.58
	0.25	1325	61	0.73	0.81
	0.35	1375	66	0.77	1.05
	0.55	1395	71	0.79	1.42
	0.75	1395	74	0.79	1.86
	1.1	1410	74	0.81	2.65
	1.5	1410	74	0.81	3.60
	2.2	1420	78	0.78	5.20
	3	1430	80	0.80	6.80
	4	1435	83	0.79	9.00
	5.5	1450	86	0.81	11.40

Speed 1000 rpm six-pole	Rated power kW	Rated speed min⁻¹	Efficiency %	Power factor cos φ	Rated current A
50 Hz 400 V	0.18	830	53	0.71	0.69
	0.25	825	59	0.74	0.83
	0.35	910	62	0.72	1.19
	0.55	900	65	0.73	1.67
	0.75	895	67	0.77	2.10
	1.1	900	71	0.75	3.00
	1.5	930	72	0.75	4.00
	2.2	945	76	0.72	5.80
	3	945	70	0.75	7.30
	4	940	79	0.75	9.70

Speed 750 rpm eight-pole 50 Hz 400 V	0.12	655	51	0.59	0.58
	0.18	675	51	0.66	0.78
	0.25	670	52	0.62	1.12
	0.35	655	61	0.76	1.16
	0.55	650	65	0.76	1.62
	0.75	665	65	0.77	2.15
	1.1	675	72	0.76	2.90
	1.5	710	72	0.71	4.25
	2.2	695	76	0.71	5.90
	3	700	79	0.69	7.90
	4	715	77	0.72	10.40

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