SEW EURODRIVE

Operating Instructions

Decentralized Drive and Application Controller
MOVIPRO® ADC

Contents

Contents

1 General Information

1.1 Use of this documentation

The documentation is an integral part of the product and contains important information on operation and service. The documentation is written for all employees who assemble, install, startup, and service this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of the signal words

The following table shows the grading and meaning of the signal words for safety notes, notes on potential risks of damage to property, and other notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent danger	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the drive system or its environment
INFORMATION	Useful information or tip: Simplifies the handling of the drive system.	

1.2.2 Structure of the section-related safety notes

Section safety notes do not apply to a specific action, but to several actions pertaining to one subject. The used symbols indicate either a general or a specific hazard.

This is the formal structure of a section safety note:

⚠ SIGNAL WORD

Type and source of danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.2.3 Structure of the embedded safety notes

Embedded safety notes are directly integrated in the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Nature and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the danger.

1.3 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Read the documentation before you start working with the unit!

1.4 Exclusion of liability

You must comply with the information contained in this documentation to ensure safe operation of MOVIPRO® and to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

1.5 Copyright

2 Safety Notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and adhered to. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation or if you require further information, please contact SEW-EURODRIVE.

2.1 Preliminary information

The following safety notes are primarily concerned with the use of MOVIPRO® units. If you use other SEW components, also refer to the safety notes for the respective components in the corresponding documentation.

Please also observe the supplementary safety notes in the individual chapters of this documentation.

2.2 General information

⚠ WARNING

Depending on its enclosure, MOVIPRO® may have live, uninsulated as well as moving or rotating parts and hot surfaces during operation.

Severe or fatal injuries.

- All work related to transportation, storage, setup/mounting, connection, startup, maintenance and repair may only be carried out by qualified personnel, in strict observance of:
  - The relevant detailed documentation.
  - Warning and safety signs on the MOVIPRO®.
  - All other relevant project planning documents, operating instructions and wiring diagrams.
  - The specific regulations and requirements for the system.
  - The national/regional regulations governing safety and the prevention of accidents.
- Never install damaged products.
- Submit a complaint to the shipping company immediately in the event of damage.

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property.

Refer to the documentation for more information.

2.3 Target group

Any mechanical work may only be performed by adequately qualified personnel. Qualified staff in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- They are familiar with this documentation.

Any electronic work may only be performed by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- They are familiar with this documentation.

In addition to that, they must be familiar with the relevant safety regulations and laws, especially with the requirements of the performance levels according to DIN EN ISO 13849-1 and all other standards, directives and laws specified in this documentation. The above mentioned persons must have the authorization expressly issued by the company to operate, program, configure, label and ground units, systems and circuits in accordance with the standards of safety technology.

All work in further areas of transportation, storage, operation and waste disposal must only be carried out by persons who are trained appropriately.

2.4 Designated use

MOVIPRO® is a component intended for installation in electrical systems or machines. MOVIPRO® is designed for mobile and stationary use in industrial and commercial systems for the operation of AC asynchronous motors with squirrel-cage rotors or permanent-field AC synchronous motors. The motors must be suitable for operation with inverters. Do not connect any other loads to MOVIPRO®. MOVIPRO® can take on control and communication tasks.

In case of installation in electrical systems or machines, startup of the MOVIPRO® units (i.e. start of designated operation) is prohibited until it is determined that the machine meets the requirements stipulated in the EC Directive 2006/42/EC (machine guideline). Observe EN 60204-1. Startup (i.e. the start of designated use) is only permitted under observance of the EMC (2004/108/EC) directive.

MOVIPRO® meets the requirements stipulated in the low voltage directive 2006/95/EC. The standards given in the declaration of conformity apply to the MOVIPRO® units.

Technical data and information on the connection conditions are provided on the nameplate and in the documentation. Always comply with the data and conditions.

2.5 Functional safety technology

MOVIPRO® may not perform safety functions without higher-level safety systems unless these functions are described and expressly permitted in the relevant documentation.

2.6 Transport

Inspect the shipment for any damage that may have occurred in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be necessary to preclude startup.

Observe the following instructions when transporting MOVIPRO®:

- Cover the connections with the supplied protective caps before transportation.
- Only place the unit on the cooling fins or on the side without connectors during transportation.
- Make sure that the unit is not subject to mechanical impact during transport.

Use suitable, sufficiently rated handling equipment if necessary. Prior to startup, remove the securing devices used for transportation.

Observe the information on climatic conditions as stated in chapter "Technical Data".

2.7 Installation/assembly

Ensure that the units are installed and cooled according to the regulations in the related documentation.

Protect the MOVIPRO® unit from excessive strain. Ensure that components are not deformed and/or insulation spaces are maintained, particularly during transportation. Electric components must not be mechanically damaged or destroyed.

The following applications are prohibited unless the unit is explicitly designed for such use:

- Use in potentially explosive atmospheres.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in applications that are subject to mechanical vibration and shock loads in excess of the requirements in EN61800-5-1.

Observe the notes in the "Mechanical Installation" section.

2.8 Electrical connection

Observe applicable national accident prevention regulations when working on a live MOVIPRO®.

Perform electrical installation according to the pertinent regulations (e.g. cable cross-sections, fusing, protective conductor connection). The documentation contains additional notes.

Preventive measures and protection devices must comply with applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

Necessary protective measures for MOVIPRO® are:

Type of power transmission	Protective measure
Direct power supply	• Protective grounding

2.9 Safe disconnection

MOVIPRO® meets all of the requirements for the safe disconnection of power and electronic connections in accordance with EN 61800-5-1. To ensure safe disconnection, all connected circuits must also satisfy the requirements for safe disconnection.

2.10 Startup/operation

Do not deactivate monitoring and protection devices even for a test run.

When in doubt, switch off the MOVIPRO® whenever changes occur in relation to normal mode (e.g. increased temperatures, noise, oscillation). Determine the cause of the fault and consult SEW-EURODRIVE, if necessary.

Where required, systems with integrated MOVIPRO® units must be equipped with additional monitoring and protection devices in accordance with the respective applicable safety regulations, e.g. the law governing technical equipment, accident prevention regulations, etc.

Additional protective measures may be necessary for applications with increased potential risk. You have to check the effectiveness of protection devices each time you change the configuration.

Connections which are not being used must be covered with the supplied protection caps during operation.

Do not touch live components or power connections immediately after disconnecting the MOVIPRO® from the voltage supply because some capacitors may still be charged. Adhere to a minimum switch-off time of 10 minutes. Observe the corresponding labels on the MOVIPRO® unit.

When the unit is switched on, dangerous voltages are present at all power connections as well as at any connected cables and motor terminals. This also applies even when the unit is inhibited and the motor is at standstill.

The fact that the status LED and other display elements are no longer illuminated does not indicate that the unit has been disconnected from the supply system and no longer carries any voltage.

Mechanical blocking or internal safety functions of the unit can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the driven machine, disconnect the unit from the supply system before correcting the error.

Important – Danger of burns: During operation, the surface temperature of MOVIPRO® and of the external options (e.g. the braking resistor) can exceed 70 °C.

2.11 Inspection/maintenance

⚠ WARNING

Exposed, live parts inside the unit.

Severe or fatal injuries.

- Never open the unit.
- Only SEW-EURODRIVE is authorized to carry out repairs.

3 Unit Structure

3.1 Type designation

The type designation of the MOVIPRO® drive and application controller provides the following unit data:

P H C 2 . A - A ... M 1 - .. 1 A - 00 / ...

Option:
S11 = PROFIsafe option S11

Design

Version:
A = Version 1

Unit type:
1 = ADC

Bus connection:
P1 = PROFIBUS DPV1
D1 = DeviceNet
E2 = PROFINET
E3 = EtherNet/IP, Modbus/TCP

Number of power connectors:
1 = 1 axis output

Power connector:
M = Axis output

Power:
022 = 2.2 kW
040 = 4.0 kW
075 = 7.5 kW
110 = 11.0 kW
150 = 15.0 kW

Supply:
A = AC

Version

Housing height:
1 = Size 0, 1
2 = Size 2

Housing type:
C = Modular

Control type:
H = Drive control

Product range:
P = MOVIPRO®

3.2 Short designations

The following short designations are used:

Type designation	Short designation	Size	Power rating
MOVIPRO® PHC21A-A022M1-..1A-00/... drive and application controller	MOVIPRO®	Size 0	2.2 kW
MOVIPRO® PHC21A-A040M1-..1A-00/... drive and application controller		Size 1	4.0 kW
MOVIPRO® PHC21A-A075M1-..1A-00/... drive and application controller			7.5 kW
MOVIPRO® PHC22A-A110M1-..1A-00/... drive and application controller		Size 2	11.0 kW
MOVIPRO® PHC22A-A150M1-..1A-00/... drive and application controller			15.0 kW

3.3 Scope of delivery

The scope of delivery includes the following components:

- MOVIPRO® PHC2.A-A...M1-..1A-00/... drive and application controller
- 2 × grounding kit
- Jumper plug (**not** for units with PROFIsafe option S11)
- For MOVIPRO® size 2, 15.0 kW:
  - Mounted fan subassembly

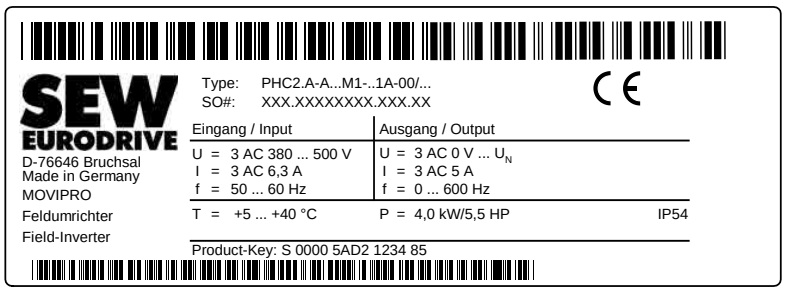
3.4 Nameplates

Each MOVIPRO® unit has 2 nameplates that provide important information:

- Main nameplate
- Function unit nameplate

3.4.1 Main nameplate

The main nameplate provides important information about the unit type. The following figure shows an example of a main nameplate:



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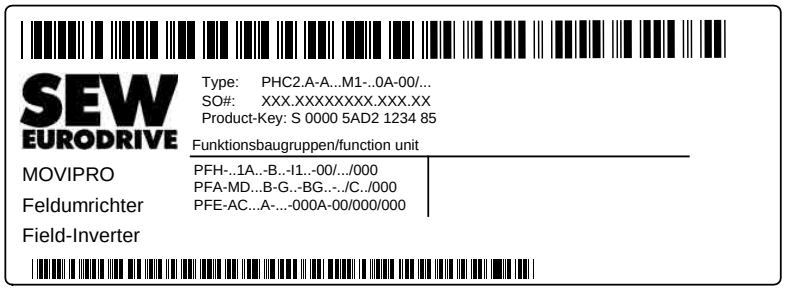
Type	Type designation	f	Frequency
SO#	Production number	T	Ambient temperature
Product key	Product key	P	Output power
U	Voltage	IP	Degree of protection
I	Current	U_N	Nominal voltage

3.4.2 Function unit nameplate

This nameplate describes the internal function units of MOVIPRO®. The following figure shows an exemplary nameplate for the function units:



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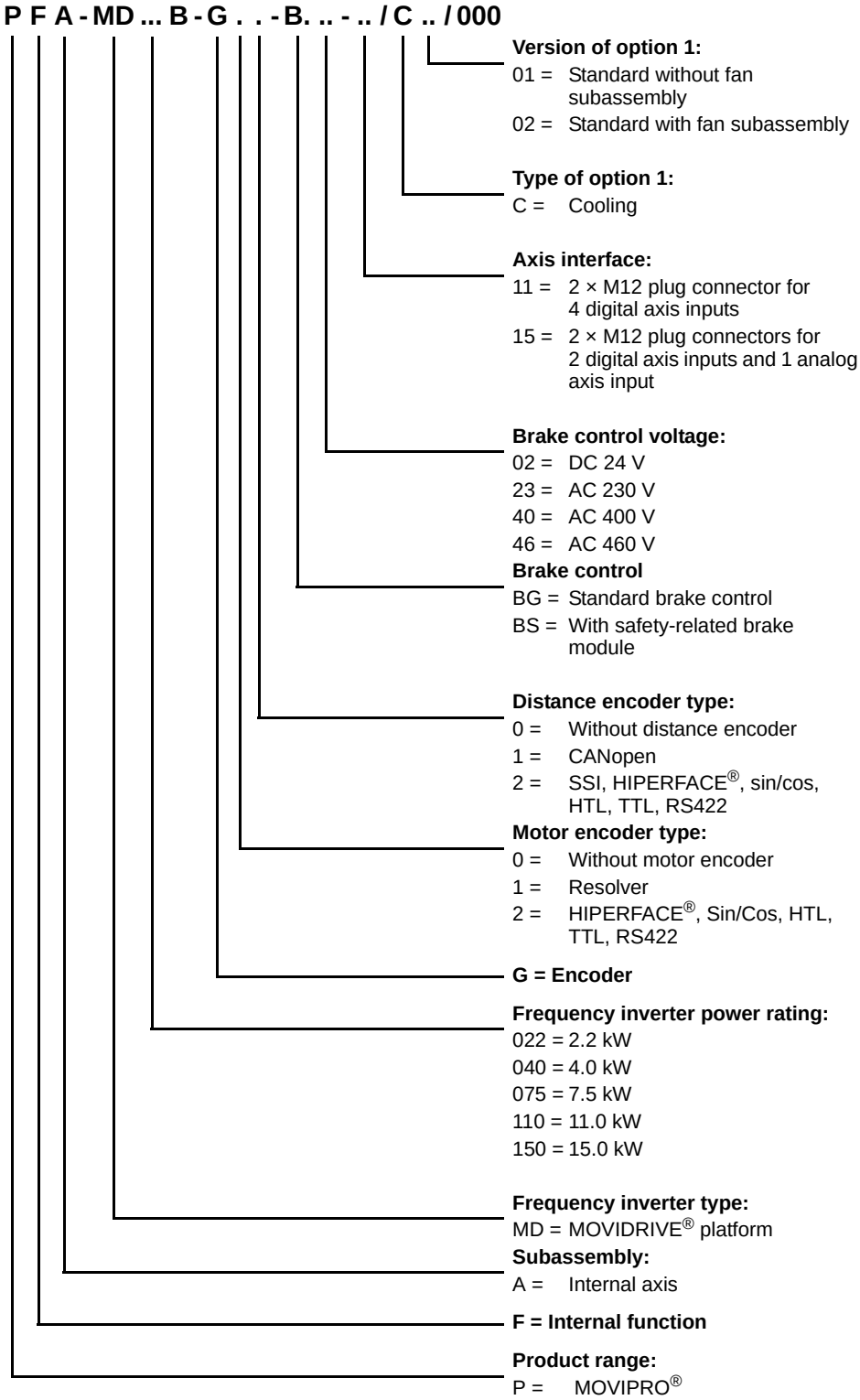
PFH-..1A..-B..-I1..-00/.../000	Communication and control unit
PFA-MD...B-G..-BG..-../C../000	Power section
PFE-AC...A-...-000A-00/000/000	Energy supply

3.5 Function units

3.5.1 Power section



3.5.2 Communication and control unit

P F H - .. 1 A . . - B .. - I 1 0 . - 00 / ... / 000

Option 1:
000 = Without option 1
S11 = PROFIsafe option S11

Design

Communication packages
0 = Without
1 = With SBUS^{plus}, CAN and RS485 interface
2 = With SBUS^{plus}, CAN and RS485 interface (with DC 24 V)
3 = With SBUS^{plus}, CAN (with DC 24 V) and RS485 interface (with DC 24 V)
4 = With SBUS^{plus}, CAN (with DC 24 V) and RS485 interface

1 = 12 digital inputs and 4 digital inputs/outputs

I = Local interface

Bus connection type:
11 = DIP module PROFIBUS, 2 × M12
12 = DIP module DeviceNet, 2 × M12
53 = 2 × M12, D-coded, Ethernet, copper
63 = 2 × push-pull RJ45, Ethernet, copper
64 = 2 × push-pull SCRJ

B = Fieldbus connection

Memory card
0 = OM._T0
1 = OM._T1
2 = OM._T2

Memory card type
C = Parameterizable
H = Programmable

A = Version 1

Unit type:
1 = ADC

Communication type:
P1 = PROFIBUS DPV1
D1 = DeviceNet
E2 = PROFINET IO
E3 = EtherNet/IP / Modbus/TCP

Subassembly:
H = Control / communication

F = Internal function

Product range:
P = MOVIPRO®

3.5.3 Energy supply

P F E - AC ... A - ... - 000 A - 00 / ... / 000

Type of option 2:
000 = Without option 2

Type of option 1:
000 = Without option 1
R15 = Regenerative power supply for MOVIPRO® with a power rating of at least 11.0 kW

Supply system connection:
001 = Connection for plug connectors, size 0,1
002 = Connection for plug connectors, size 2
101 = Connection for power interface, sizes 0 and 1
102 = Connection for power interface, size 2

A = Version A

Power rating of supply system rectifier

AC = Power supply

Subassembly:
E = Energy

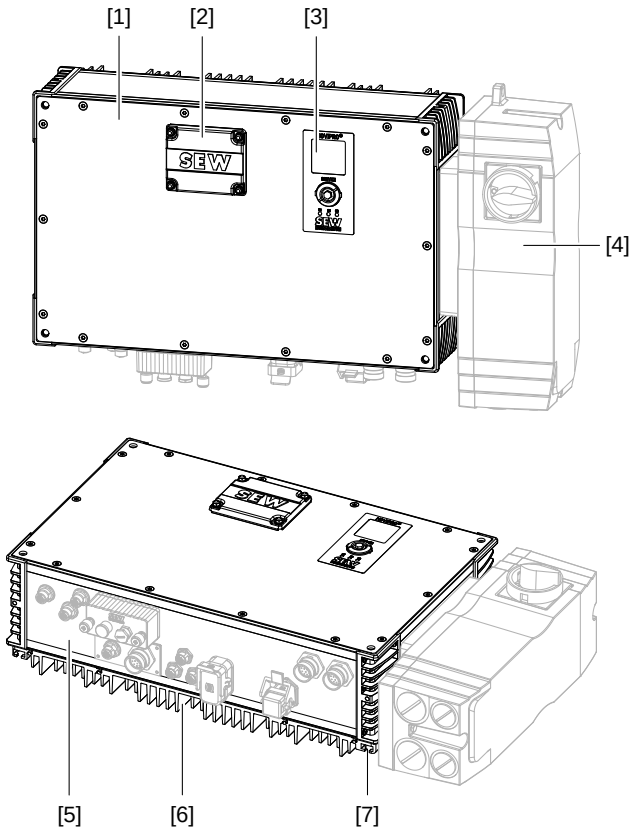
F = Internal function

Product range:
P = MOVIPRO®

3.6 Basic unit

3.6.1 Size 0

The following figure shows the unit structure of size 0:



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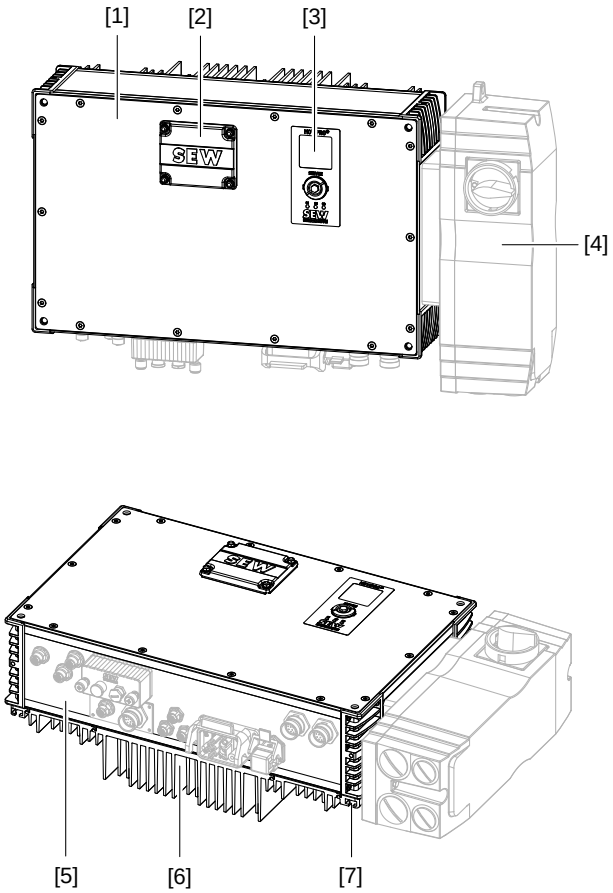
[1]	Unit cover	[5]	Connecting block (connections depend on the unit variant)
[2]	Service cover plate	[6]	Cooling fins
[3]	Service unit	[7]	T-slot profile
[4]	Power interface (optional)		

3.6.2 Size 1

The following figure shows the unit structure of size 1:



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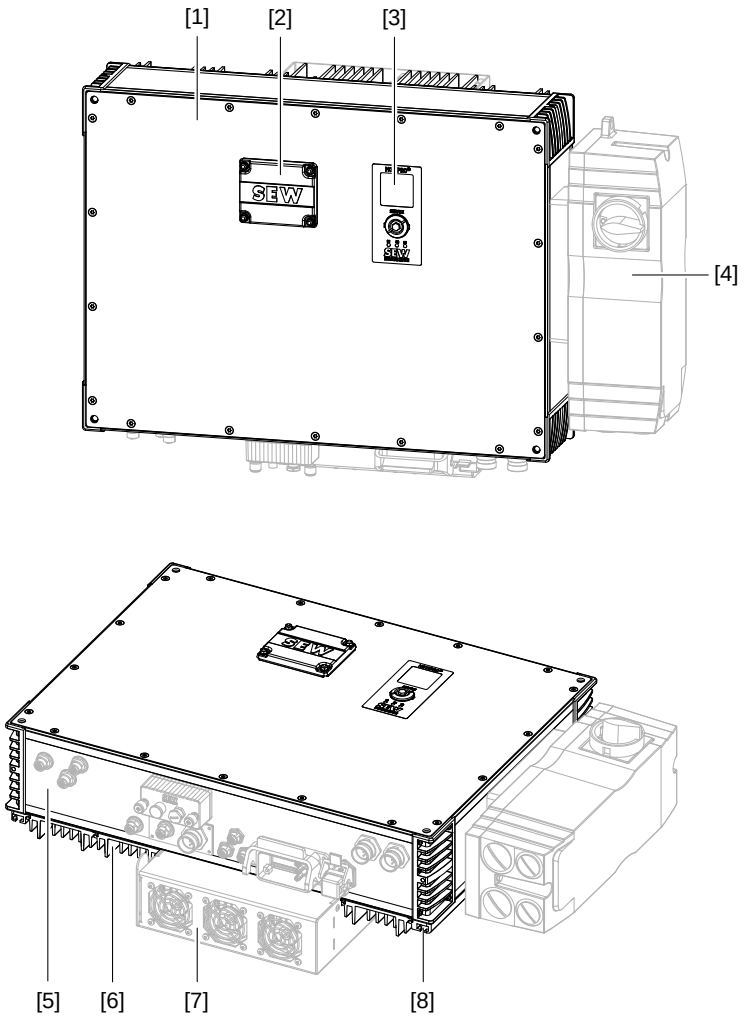
[1] Unit cover
[2] Service cover plate
[3] Service unit
[4] Power interface (optional)
[5] Connecting block (connections depend on the unit variant)
[6] Cooling fins
[7] T-slot profile

3.6.3 Size 2

The following figure shows the unit structure of size 2:



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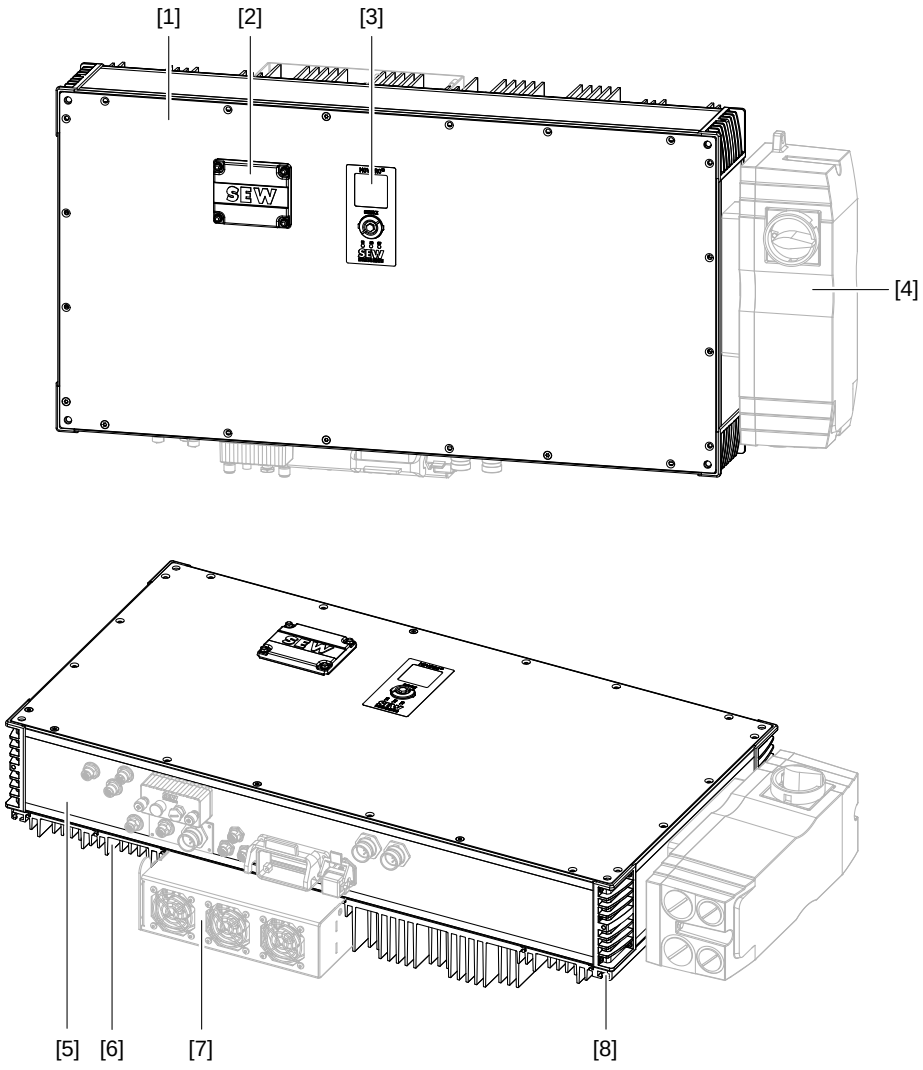
[1]	Unit cover	[5]	Connecting block (connections depend on the unit variant)
[2]	Service cover plate	[6]	Cooling fins
[3]	Service unit	[7]	Fan subassembly (optional for 11.0 kW, mandatory for 15.0 kW)
[4]	Power interface (optional)	[8]	T-slot profile

Size 2 with R15 regenerative power supply

The following figure shows the structure of MOVIPRO® with R15 regenerative power supply:



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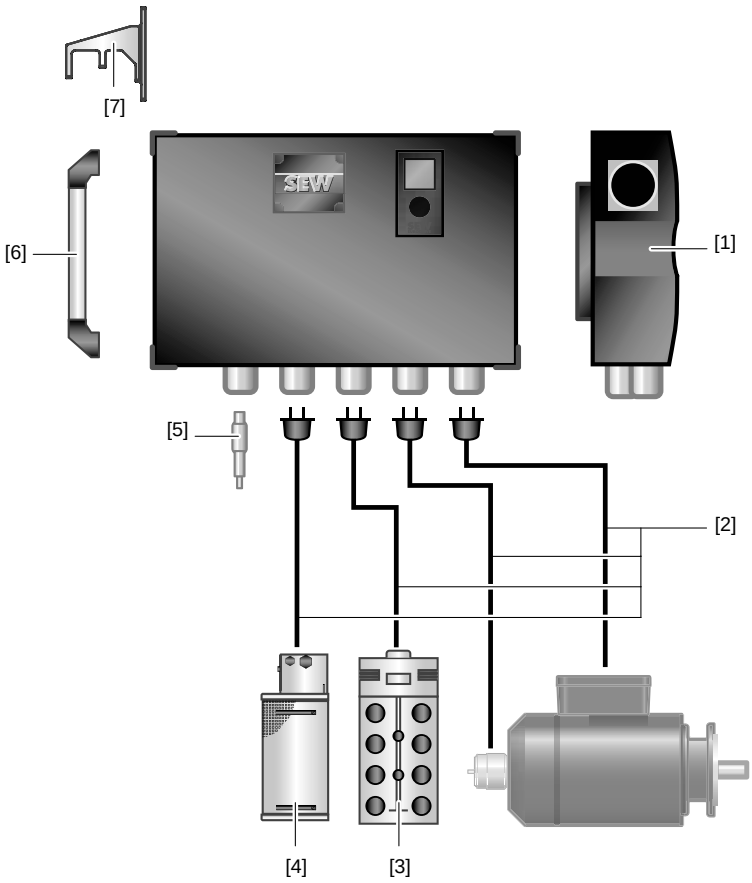
[1]	Unit cover	[5]	Connecting block (connections depend on the unit variant)
[2]	Service cover plate	[6]	Cooling fins
[3]	Service unit	[7]	Fan subassembly
[4]	Power interface (optional)	[8]	T-slot profile

3.7 Accessories

INFORMATION

The scope of delivery does not include accessories such as installation or mounting equipment or connection cables.



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[1] Power interface
[2] Connection cable
[3] Sensor/actuator box
[4] Braking resistor
[5] Jumper plug
[6] Handles
[7] Mounting bracket

The following accessories are available for MOVIPRO®.

Accessories		Part number
[1] MOVIPRO® power interfaces For further information, refer to chapter "Electrical connections" (page 61) and to the "MOVIPRO® Accessories – Addendum to the Operating Instructions".		
PZM2XA-A075-D02-00		1 825 014 9
PZM2XA-A150-D03-00		1 825 015 7
PZM2XA-A022-M13-00		1 825 023 8
PZM2XA-A040-M14-00		1 825 016 5
PZM2XA-A075-M16-00		1 825 017 3
[2] connection cable For more information, refer to chapter "Electrical connections" (page 60).		
Connection cables, e.g. for motor, encoder, braking resistor		See chapter "Electrical connections (page 60)".
[3] Sensor/actuator box For further information, refer to chapter "Electrical connections" (page 109) and to the "MOVIPRO® Accessories – Addendum to the Operating Instructions".		
Sensor/actuator box 1.0 m		1 330 926 9
Sensor/actuator box 2.0 m		1 330 927 7
Sensor/actuator box 3.0 m		1 330 928 5
Sensor/actuator box 5.0 m		1 330 929 3
Sensor/actuator box 10.0 m		1 330 930 7
[4] Braking resistors Further information on request.		
BW100-004-00 (including installed connection cable)	Size 0	1 796 218 8
BW050-008-01	Size 1	1 796 224 2
BW033-012-01	Size 1	1 796 219 6
BW017-024-02	Size 2	1 796 221 8
Mounting accessories for brake resistors size 1 and 2 For further information, refer to the "MOVIPRO® Accessories – Addendum to the Operating Instructions".		
Mounting bracket kit, BW		1 822 968 9
[5] Jumper plug For further information, refer to the "MOVIPRO® Accessories – Addendum to the Operating Instructions".		
Jumper plug		1 174 709 9
Mounting accessories for MOVIPRO® For further information, refer to section "Mechanical Installation (page 38)" and to the "MOVIPRO® Accessories – Addendum to the Operating Instructions"		
[6] Optional handle 270 (size 0, 1)		1 822 278 1
Optional handle 390 (size 2)		1 822 280 3
[7] Large bracket mounting kit		1 270 830 5
Fan subassembly For further information, refer to the "MOVIPRO® – Accessories" addendum to the operating instructions.		
Fan subassembly		1 270 970 0

For further information, refer to the following documentation:

Documentation
"MOVIPRO® Accessories" addendum to the operating instructions

The following table shows the supported encoders:

Encoder		Company
Motor encoder		
Incremental encoders		
EG7S	Mount-on encoder, Sin/Cos	SEW-EURODRIVE
EG7R	Mount-on encoder, RS422	
EG7C	Mount-on encoder, TTL to HTL	
EH1C	Mount-on encoder, HTL	
EH1S	Mount-on encoder, Sin/Cos	
EH1R	Mount-on encoder, TTL (RS422)	
EI7S	Built-in encoder, Sin/Cos	
EI7C / EI71 / EI72 / EI76	Built-in encoder, HTL	
ES7S	Mount-on encoder, Sin/Cos	
ES7R	Mount-on encoder, TTL (RS422)	
ES7C	Mount-on encoder, TTL to HTL	
ES1S / ES2S	Mount-on encoder, Sin/Cos	
ES1R / ES2R	Mount-on encoder, TTL (RS422)	
ES1C / ES2C	Mount-on encoder, HTL	
EV1S	Mount-on encoder, Sin/Cos	
EV1R:	Mount-on encoder, TTL (RS422)	
EV1C	Mount-on encoder, HTL	
Absolute encoder for asynchronous motors		
AS3H / AS4H	Mount-on encoder, (HIPERFACE®, multi-turn), Sin/Cos	SEW-EURODRIVE
AS7W	Mount-on encoder (multi-turn), Sin/Cos	
AG7W	Mount-on encoder (multi-turn), Sin/Cos	
AS7Y	Mount-on encoder, M-SSI (multi-turn), Sin/Cos	
AG7Y	Mount-on encoder, M-SSI (multi-turn), Sin/Cos	
AV1H	Mount-on encoder, (HIPERFACE®, multi-turn), Sin/Cos	
AV6H	Mount-on encoder, (HIPERFACE®, multi-turn), Sin/Cos	
Absolute encoder for synchronous motors		
AK0H	Built-in encoder, (HIPERFACE®, multi-turn), Sin/Cos	SEW-EURODRIVE
AK1H	Built-in encoder, (HIPERFACE®, multi-turn), Sin/Cos	
AS1H	Built-in encoder, (HIPERFACE®, multi-turn), Sin/Cos	
EK0H	Built-in encoder, (HIPERFACE®, single-turn), Sin/Cos	
EK1H	Built-in encoder, (HIPERFACE®, single-turn), Sin/Cos	
ES1H	Built-in encoder, (HIPERFACE®, single-turn), Sin/Cos	

Encoder		Company
Resolver		
RH1M	Built-in encoder, resolver	SEW-EURODRIVE
RH1L		
MOVIPRO® also supports incremental encoders with resolver, TTL, HTL, RS422 and Sin/Cos signals.		
Distance encoder		
SSI		
AH7Y	Rotary encoder	SEW-EURODRIVE
AG7Y		
AS7Y		
AV1Y		
AV2Y		
DME3000-x11	Laser distance measuring instrument	Sick/Stegmann
DME4000-x11 0.1 mm		
DME4000-x11 1 mm		
DME5000-x11 0.1 mm		
DME5000-x11 1 mm		
AG100 MSSI	Rotary encoder	
AG626		
ARS60		
ATM60		
ATM90		
POMUX KH53	Linear distance sensor	
BPS37	Barcode measuring system	Leuze-electronic
OMS1 0.1 mm	Laser distance measuring instrument	
OMS1 1 mm		
OMS2 0.1 mm		
AMS200		
BTL5-S112-M1500-P-S32	Linear distance sensor	Balluff
BTL5-S112B-M1500-P-S32		
TR CE58M	Rotary encoder	TR-Electronic
TR CE65M		
TR LA41K	Linear distance sensor	
TR LE100 0.1 mm	Laser distance measuring instrument	
TR LE100 1 mm		
TR LE200 0.1 mm		
WCS2A-LS311	Barcode distance sensor	Pepperl & Fuchs
WCS3A-LS311		
WCS3B-LS311		
EDM	Laser distance measuring instrument	
VDM100-150 0.1 mm		
VDM100-150 1 mm		
GM 401	Rotary encoder	IVO

Encoder		Company
Kueb 9081xxxx2003	Rotary encoder	Fritz Kübler
Kueb 9081xxxx2004		
LIMAX2	Linear distance sensor	Elgo
RP 0.005 mm	Linear distance sensor	MTS Sensors
RH 0.005 mm		
RF 0.005 mm		
RD4 0.005 mm		
MSA1000	Linear distance sensor	SIKO
SSI combo		
AVM58X-1212	Rotary encoder	Pepperl & Fuchs
HMG161 S24 H2048	Rotary encoder	Hübner
AMG73 S24 S2048		
AMG83 S24 S2048		
ROQ424	Rotary encoder	Heidenhain
HIPERFACE®		
DME4000-x17	Laser distance measuring instrument	Sick/Stegmann
DME5000-x17		
SKM36	Rotary encoder	
SKS36		
SRM50		
SRM60		
SRM64		
SRS50		
SRS64		
LinCoder L230	Linear distance sensor	
CANopen		
DME4000-x19 0.1 mm	Laser distance measuring instrument	Sick
DME4000-x19 1 mm		
TR CE58M	Rotary encoder	TR-Electronic
TR LE200	Laser distance measuring instrument	
WCS3B-LS410	Barcode distance sensor	Pepperl & Fuchs
EnDat		
ECN113	Rotary encoder	Heidenhain
ECN1313		
EQN1125		
EQN1325		
EQN425		
MOVIPRO® also supports incremental encoders with TTL, HTL, RS422 and Sin/Cos signals.		

3.8 Unit components

3.8.1 PFA-MD...B-G..-B...-../C../000 power section

MOVIDRIVE®-based inverter

The inverter in its basic design is used to control asynchronous motors. Option cards enable the inverter to control different motor types.

The following power ratings are available:

Power rating	Function unit
2.2 kW	PFA-MD022B-G..-B...-../C../000
4.0 kW	PFA-MD040B-G..-B...-../C../000
7.5 kW	PFA-MD075B-G..-B...-../C../000
11.0 kW	PFA-MD110B-G..-B...-../C../000
15.0 kW	PFA-MD150B-G..-B...-../C../000

Encoder evaluation option

The encoder evaluation option enables control of either asynchronous AC motors, asynchronous servomotors or synchronous servomotors.

You can use the following encoder combinations:

Encoder		Function unit
Motor	Distance	
Without	Without	PFA-MD...B-G00-B...-../C../000
Resolver	Without	PFA-MD...B-G10-B...-../C../000
HIPERFACE®, Sin/Cos, HTL, TTL, RS422	Without	PFA-MD...B-G20-B...-../C../000
	CANopen	PFA-MD...B-G21-B...-../C../000
	SSI, HIPERFACE®	PFA-MD...B-G22-B...-../C../000

For an overview of the supported encoder types, refer to the chapter "Unit Structure" > "Accessories (page 23)".

Brake control

The brake control system is responsible for the power supply and control of the SEW disk brakes. Only approved SEW disk brakes with the following brake voltages must be connected to the the MOVIPRO® unit.

Unit power MOVIPRO®	Supported brake voltage			
	DC 24 V	AC 230 V	AC 400 V	AC 460 V
2.2 kW	•	•	•	•
4.0 kW	•	•	•	•
7.5 kW		•	•	•
11.0 kW		•	•	•
15.0 kW		•	•	•

Safety-related brake module

The safety-related brake module offers the safety function SBC (Safe Brake Control). SBC is possible for the following brake voltages:

	Brake voltages			
	DC 24 V	AC 230 V	AC 400 V	AC 460 V
SBC		•	•	•

INFORMATION

For detailed information, refer to the "MOVIPRO® ADC – Functional Safety" manual.

Motor types

MOVIPRO® supports the following SEW motor types:

- DR motors
- CMP motors

3.8.2 PFH-..1A..-B..-I10.-00/.../000 communication and control unit

ADC

The engineering of the communication and control unit comprises the following activities:

- Configuration
- Parameterization
- Programming with SEW application solutions

These activities are carried out using the MOVITOOLS® MotionStudio engineering software. The software has a number of useful features for startup and diagnostics of all SEW units. MOVIPRO® is connected to the engineering computer via the service interface.

Fieldbus connection

Depending on the unit variant, the MOVIPRO® unit offers one of the following fieldbus connection options:

Fieldbus	Function unit
PROFIBUS	PFH-P11A..-B11-I10.-00/.../000
EtherNet/IP, Modbus/TCP	PFH-E31A..-B53-I10.-00/.../000
	PFH-E31A..-B63-I10.-00/.../000
PROFINET	PFH-E21A..-B53-I10.-00/.../000
	PFH-E21A..-B63-I10.-00/.../000
DeviceNet	PFH-D11A..-B12-I10.-00/.../000

The fieldbus is connected via plug connectors as described in chapter "Electrical Installation" > "Electrical connections" (page 60).

Communication packages

The additional communication packages allow you to integrate external components in your overall application.

MOVIPRO® includes the following communication packages depending on the unit variant:

Communication packages	Interfaces		
Package 0	Without additional interfaces		
Package 1	SBUS^{plus} interface	CAN interface (electrically isolated)	RS485 interface (electrically isolated)
Package 2	SBUS^{plus} interface	CAN interface (electrically isolated)	RS485 interface (with DC 24 V)
Package 3	SBUS^{plus} interface	CAN interface (with DC 24 V)	RS485 interface (with DC 24 V)
Package 4	SBUS^{plus} interface	CAN interface (with DC 24 V)	RS485 interface (electrically isolated)

Variants of the CAN interface

Depending on the unit variant, the MOVIPRO® unit offers one of the following CAN interface variants:

Variants of the CAN interface	
Variant 1	• Electrically isolated • Without DC 24 V • For communication connection of SEW components (Slave, e.g. MOVIGEAR®)
Variant 2	• Electrically coupled • With DC 24 V • For connecting sensors (e.g. RFID readers, barcode scanners)

Variants of the RS485 interface

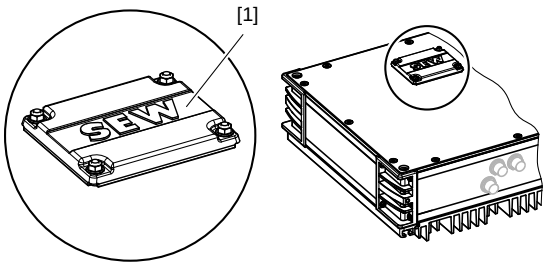
Depending on the unit variant, the MOVIPRO® unit offers one of the following RS485 interface variants:

Variants of the RS485 interface	
Variant 1	• Electrically isolated • Without DC 24 V • For communication connection of SEW components (Slave, e.g. MOVIMOT®)
Variant 2	• Electrically coupled • With DC 24 V • For connecting sensors (e.g. RFID readers, barcode scanners)

SD memory card

The slot for the SD memory card is located under the memory card cover on the top of the MOVIPRO® unit. The cover ensures the degree of protection of the MOVIPRO® unit and allows for easy access in the event of a required replacement or any other maintenance procedures. In order to remove the memory card cover, loosen the nuts and remove the cover by lifting it upwards.

The following figure shows the memory card cover:



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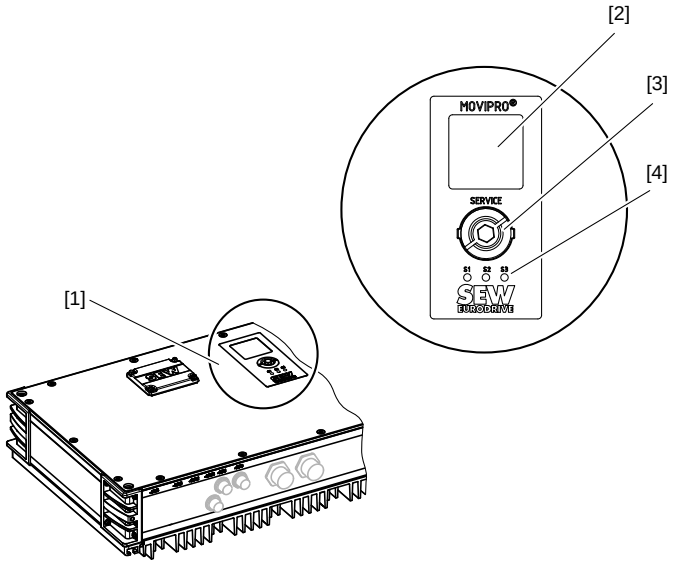
[1] Memory card cover

Service unit

The service unit is used for startup, diagnostics, and maintenance of the MOVIPRO® unit. It is equipped with a status display and a service interface

The following figure shows the service unit:



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[1] Service unit
[2] Status indication
[3] Ethernet service interface (Ethernet RJ45)
[4] Status LED

INFORMATION

SEW-EURODRIVE recommends using an Ethernet cable with extended locking device.

Status display and LED

The status display and the LED show status or error messages and allow for a quick evaluation of the current status of MOVIPRO®.

For further information, refer to chapters "Operation" > "Status and error messages" and "Operation" > "Status LED" and the following documentation:

Documentation
"MOVIPRO® ADC with PROFINET Interface" manual

Ethernet service interface

For configuration and maintenance purposes, the unit is equipped with an Ethernet service interface that connects MOVIPRO® to an engineering PC.

Ethernet service interface	
Standard IP address	**Subnet mask**
192.168.10.4	255.255.255.0

3.8.3 PFE-AC...A-...-000A-../000/000 power supply


10 minutes

⚠ WARNING

Electric shock due to charged capacitors

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

The MOVIPRO® unit is connected to a three-phase alternating-current supply system.

The line filter on the supply system end complies with limit class C2 to EN 61800-3 without further measures.

4 Integrated Safety Technology

4.1 Standards

The safety technology of this MOVIPRO® unit described below has been developed and tested in accordance with the following safety requirements:

- DIN EN 1037: 2008
- EN ISO 13849-1: 2008
- EN ISO 13849-2: 2008

4.2 Safety functions

The following drive-related safety functions can be used:

- STO – Safe Torque Off according to EN 61800-5-2: 2008
- SS1(c) – Safe Stop 1, function variant c according to EN 61800-5-2: 2008
- SBC – safe brake control according to EN 61800-5-2: 2008

4.3 Safety concepts

The following safety concepts can be realized with this MOVIPRO® unit:

- Axis module with safe torque off
- Safety-oriented brake module
- PROFIsafe option S11

4.4 Additional information

For additional information, refer to the following documentation

Documentation
"MOVIPRO® ADC Functional Safety" manual

⚠ WARNING

Failure of the safety components due to improper startup.

Severe or fatal injuries.

- Only use MOVIPRO® in combination with functional safety when you have the "MOVIPRO® ADC – Functional Safety" manual at hand and you all requirements for operation are fulfilled.

5 Project Planning for Units with R15 Regenerative Power Supply

5.1 Supply system requirements

Units with regenerative power supply require a stable supply system with sufficient capacity. The following tables describe the requirements regarding the supply system (required transformer power) based on the cable length from the transformer to the unit.

- We presume a short-circuit voltage (u_K) of the transformer of 6 %.
- If you operate several MOVIPRO® units with R15 regenerative power supply on one transformer, you must consider the total power of all the regenerative power supply units enabled at the same time to dimension the transformer accordingly.

  Example:

  – 5 MOVIPRO® units with R15 regenerative power supply and 50 m supply cable

  – No more than three R15 regenerative power supply units are enabled at the same time.

  – 3 × 45 kVA = 135 kVA required transformer power
- Choose the cable cross sections according to the unit power and not according to the mean expected power. Note that smaller cable cross sections and long supply cables can cause increased voltage for other supply system participants.

5.2 Installation

For regenerative power supply units, a star-shaped wiring from the supply to the units is optimal.

INFORMATION

Line topology is also possible. In this case, no more than 3 units should be connected in series.

The transformer power is based on the supply cable length of the furthest unit, multiplied by the number of enabled units.

Required transformer power (kVA)			
Cable length in m	**400 V / 50 Hz**	**480 V / 60 Hz**	**500 V / 50 Hz**
50	45	45	45
100	45	45	45
150	45	45	45
200	45	45	45
250	50	45	45
300	50	45	45
500	55	50	45

5.3 System configuration

The following table shows the restrictions for different system configurations:

System configuration	Restrictions
TT / TN networks	None
IT systems	Prohibited

6 Mechanical Installation

6.1 General information

Observe the following notes on mechanical installation:

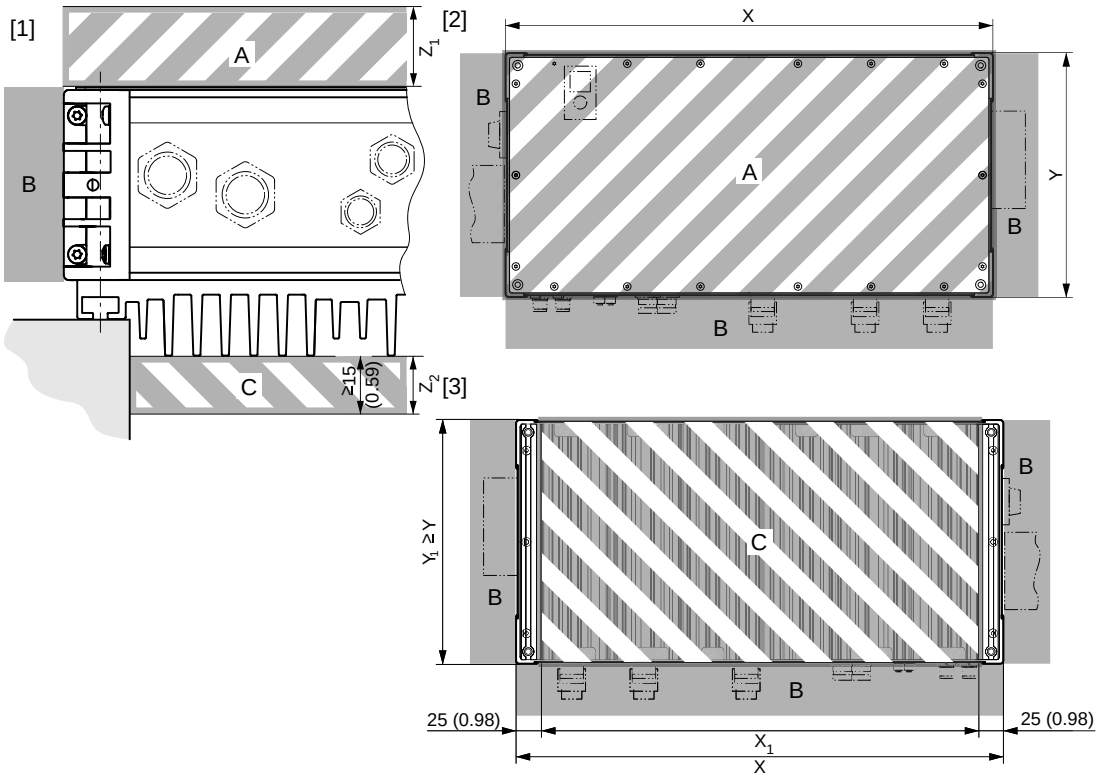
- Observe the general safety notes.
- Strictly observe all instructions as to the technical data and the permissible conditions regarding the place of installation.
- Do only use provided attachment options when mounting the unit.

6.2 Minimum clearance

INFORMATION

- Observe the required minimum clearance for:
  - the connection of the cables and plug connectors (EN 61800-5-1)
  - the handling of the display, diagnostics and operating elements
  - heat convection below the cooling fins
- Refer to the dimension drawing for information on the required space.

The following figure shows the minimum distances and clearances at all sides of the unit:



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[1] View from bottom
[2] View from front
[3] View from back

A Clearance for cover
B Clearance on the side (optional)
C Clearance below the cooling fins

X, Y Housing dimensions
X_1, Y_1 Cut-out dimensions
Z_1 Clearance height, housing cover
Z_2 Clearance height, cooling fins

The following table lists the minimum distances and clearances:

Clearance	Function	Size
A: Housing cover • Width X • Depth Y • Height Z_1	Space for display elements, diagnostics elements and actuator elements, e.g. service unit	• Z_1 = min. 150 mm (5.91 in)
B: On the side (optional)[1]	Room for connection cables, plug connectors, mounted elements and actuator elements, e.g. maintenance switch	(see dimension drawing)
C: Below the cooling fins • Width X_1 • Depth Y_1 • Height Z_2	Space for optimum heat convection[2]	• X_1 = housing dimension X - 50 mm (2.0 in) • Y_1 ≥ housing dimension Y • Z_2 ≥ 15 mm (0.59 in)

1) Clearance above or on the side of the MOVIPRO® unit is only needed if elements for display, diagnostics and operation or connections for signal and power cables are located there.

2) The cooling fins must not be located in a closed hollow space.

6.3 Cooling

Ensure that the cooling fins can dissipate waste heat into the environment by free convection!

Observe the following notes to ensure an optimized heat convection:

- Use SEW mounting systems or suitable spacers, e.g.:
  - Spacers
  - Profiles
  - Square pipes
  - Mounting plates
  - T-beams
  - Rails
- Ensure that the cooling fins are not located in a closed hollow space.
- When using a mounting plate, ensure that there is an appropriate clearance between the mounting plate and the cooling fins of the unit for heat convection.
- It is essential that a minimum distance of 15 mm (0.59 in) between the highest cooling fin and the next surface is maintained.
- Avoid sources of heat, e.g. motors or braking resistors, in the immediate vicinity of the MOVIPRO® unit.

6.4 Mounting position

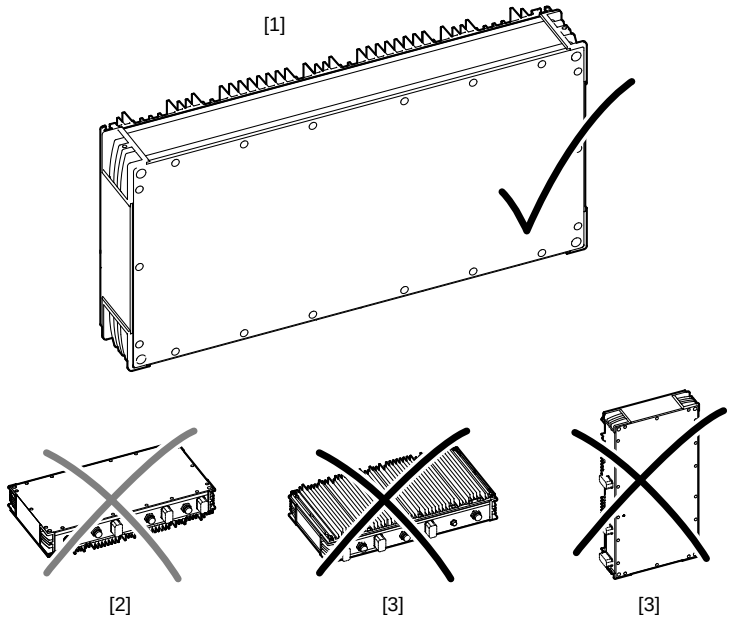
NOTICE

Danger of collision.

Damage to plant and unit components

- Always position the unit so that it will not collide with other components, design elements or persons along the travel distance.

The following figure shows permitted and not permitted mounting positions:



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[1] Permitted vertical mounting position
[2] Conditionally permitted horizontal mounting positions
[3] Mounting positions that are not permitted

INFORMATION

When using the horizontal mounting position [2], power is reduced by 50 % because of reduced convection.

Always install the unit so that display and actuator elements such as displays and diagnostics interfaces are visible and accessible after installation.

6.5 Assembly

⚠ WARNING

Risk of crushing if the load falls.

Severe or fatal injuries.

- Do not stand under the load.
- Secure the danger zone.

⚠ CAUTION

Risk of injury due to protruding parts.

Risk of cutting or crushing.

- Cover sharp and protruding parts.
- The installation must only be carried out by qualified personnel.

Adhere to the following rules for installation:

- When selecting and dimensioning the mounting and safety elements, observe the applicable standards, the technical data of the unit, as well as local circumstances.
- Only use mounting and locking elements that fit into the existing bores, threads and countersinks.
- Observe the respective minimum distances and clearances, see section "Minimum clearance".
- When assembling on mounting plates, ensure that the section for heat convection is adequately dimensioned, see "Minimum clearance" section.
- Calculate the bore dimensions according to the respective type of fixture (see the following sections).

Use one of the following mechanical mounting options:

- Mounting with mounting brackets
- Mounting via through bores

6.5.1 Mounting with mounting brackets

Note the following points during assembly:

- Strictly observe the safety notes contained in this documentation.
- Observe the required minimum distances and clearances.

Use the following parts for assembly:

- The SEW-EURODRIVE "Large bracket mounting set" accessory, part number 1 270 830 5. It contains:
  - 4 mounting brackets
  - 8 studs M5 × 8 type in accordance with DIN EN ISO 4027
- Suitable mounting and retaining elements to attach the MOVIPRO® unit to the fixture:
  - e.g. M6 or M8 screws of an appropriate length with washers

Mounting brackets

Proceed as follows to attach the mounting brackets to the MOVIPRO® unit:

1. Insert the mounting brackets into the T-slots of the MOVIPRO® unit so that the upper edge of the bracket is flush with the upper end of the slot.
2. In order to prevent the mounting brackets from slipping out of position in the T-slots, you can fasten them with M8 × 30 screws in the through bores of the MOVIPRO®.
3. Fasten the mounting bracket with the enclosed studs.

Preparing the fixture

Square pipes or bars can be used as a fixture for the MOVIPRO®.

INFORMATION

Use only square pipes with an edge length ≤ 35 mm for mounting the MOVIPRO® unit to avoid mechanical interference.

Proceed as follows to prepare the fixture:

1. Refer to the following table for dimensions of the threaded holes in the holding fixture:

Bore dimension	Value
X_2	Housing dimension X – 30 mm (1.2 in) (see dimension drawing)

2. Cut the threads at the appropriate points.
3. For the clearance dimensions of the fixture, refer to the following table:

Distance	Value
A	Housing dimension Y – 145 mm (5.71 in) (see dimension drawing)

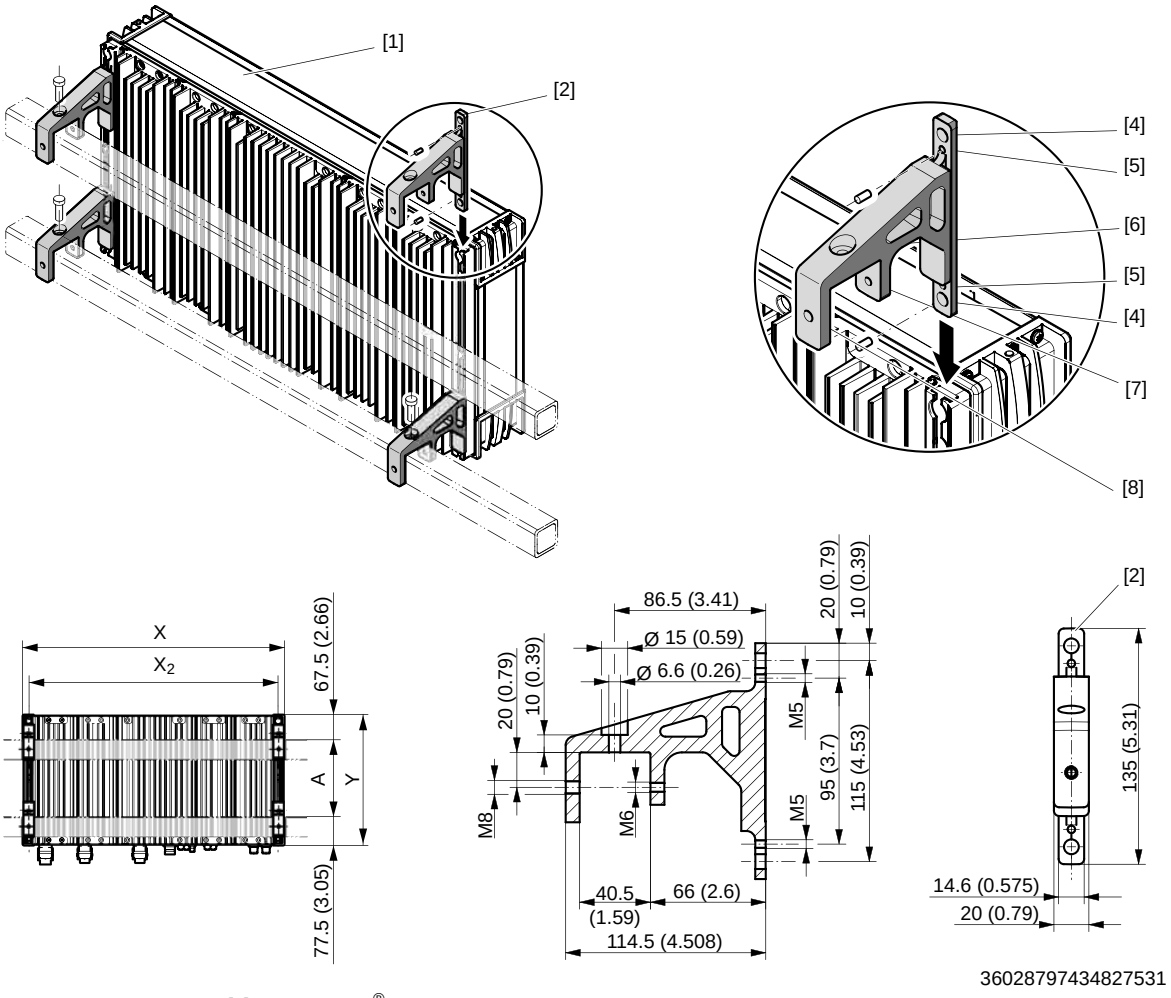
4. Mount the holding fixture within the calculated clearance.

Fastening the MOVIPRO®

Proceed as follows to fasten the unit to the fixture:

1. Use the mounting brackets to hang the MOVIPRO® on the fixture.

2. Screw the mounting brackets to the fixture. The following figure illustrates suitable mounting and locking elements. It shows the main mounting elements and dimensions in mm (in):



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[1] MOVIPRO®
[2] Large mounting brackets
[3] Holding fixture, e.g. square pipe or bar

Bore for:

[4] M8 × 30 screw
[5] M5 × 8 stud
[6] M8 screw of an appropriate length with washer
[7] M6 screws with suitable length with washer through bore [7] and [8]

X, Y Housing dimensions
X_2 Bore dimension
A Distance

Maximum permitted tightening torque: 3.2 Nm (28 in-lb)

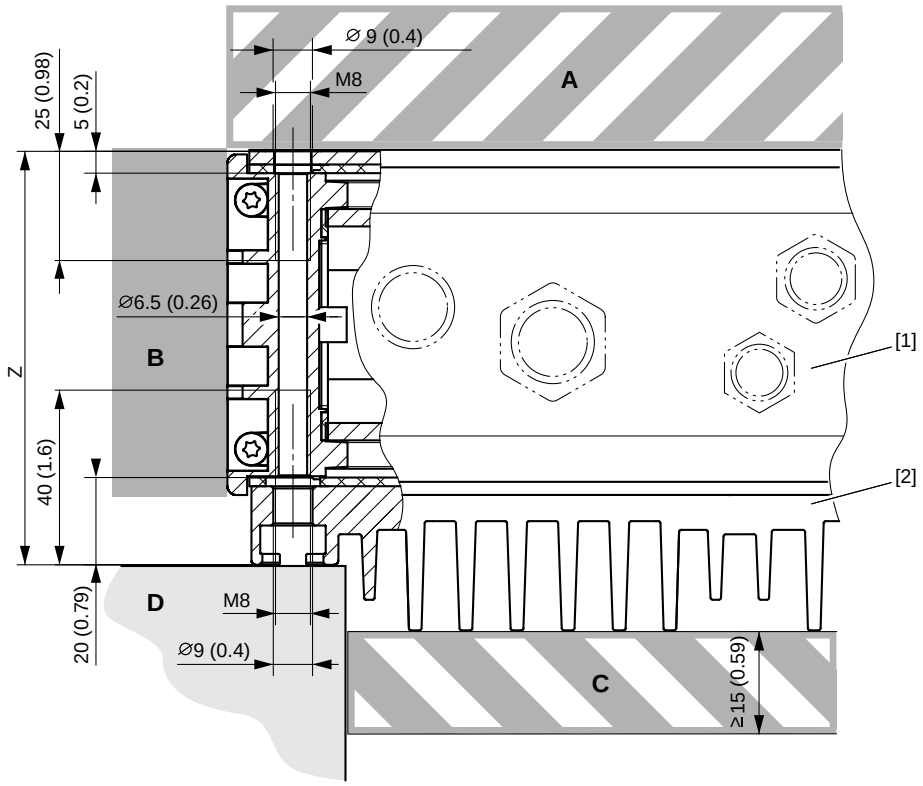
6.5.2 Mounting via through bores

INFORMATION

This mounting variant is not possible when using the handles on MOVIPRO®.

For mechanical installation, the MOVIPRO® units are equipped with 4 through bores in the corner profiles with a diameter of 6.5 mm (0.26 in) and M8 threads on both sides, as well as with T-slots.

The following figure shows the design of the through bore and the minimum clearance in mm (in):



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[1] MOVIPRO®
[2] Cooling fins

A Clearance above (optional)
B Clearance on the side (optional)
C Clearance below the cooling fins
D Mounting surface, e.g. mounting plate
Z Height of through bore + T-slot (see dimension drawing)

Mounting from the front

Note the following points during assembly:

- Strictly observe the safety notes contained in this documentation.
- Observe the required minimum distances and clearances.

Use the following parts for assembly:

- To maintain the required minimum distances and clearances use one of the following mounting elements:
  - Suitable spacers
  - Mounting plate (with appropriate cut-out for long cooling fins)
- Suitable mounting and safety elements:
  - e.g. M6 screws of an appropriate length with washers
- Suitable locking devices:
  - e.g. lock washers

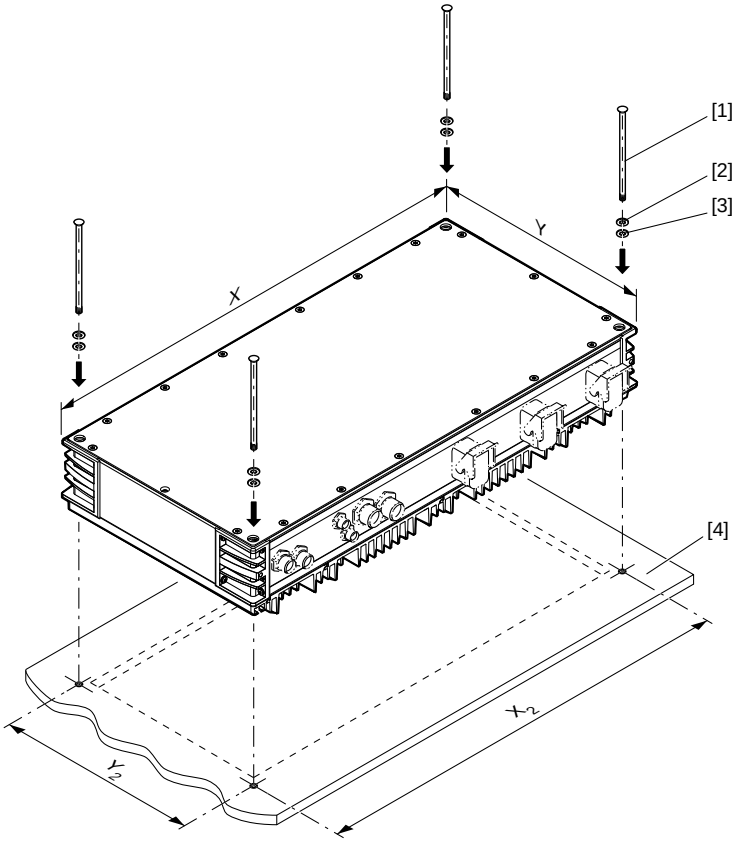
Proceed as follows to mount the braking resistors:

1. For the bore dimensions, refer to the following table:

Bore dimension	Value
X_2	Housing dimension X – 30 mm (1.2 in) (see dimension drawing)
Y_2	Housing dimension Y – 30 mm (1.2 in) (see dimension drawing)

2. Drill the holes in the appropriate places.
3. Mount the mounting and retaining elements through the fixture in the housing corners from the front.

The following figure shows the main mounting elements and dimensions:



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[1] Mounting elements, e.g. M6 screws
[2] Locking elements, e.g. lock washers
[3] Mounting elements, e.g. washers
[4] Mounting surface, e.g. mounting plate

X, Y Housing dimensions
X_2, Y_2 Bore dimensions

Maximum permitted tightening torque: 3.2 Nm (28 in-lb)

Mounting from behind

Note the following points during assembly:

- Strictly observe the safety notes contained in this documentation.
- Observe the required minimum distances and clearances.

Use the following parts for assembly:

- To maintain the required minimum distances and clearances use one of the following mounting elements:
  - Suitable spacers
  - Mounting plate (with appropriate cut-out for long cooling fins)
- Suitable mounting and safety elements:
  - e.g. M8 screws of an appropriate length with washers
- Suitable locking devices:
  - e.g. lock washers

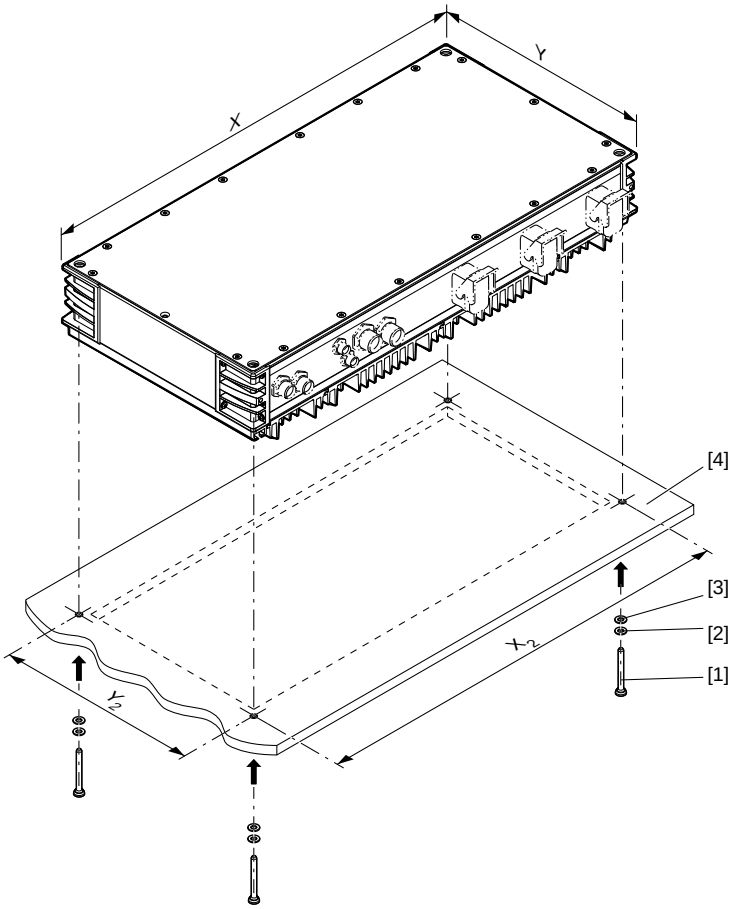
Proceed as follows to mount the braking resistors:

1. For the bore dimensions, refer to the following table:

Bore dimension	Value
X_2	Housing dimension X – 30 mm (1.2 in) (see dimension drawing)
Y_2	Housing dimension Y – 30 mm (1.2 in) (see dimension drawing)

2. Drill the holes in the appropriate places.
3. Mount the mounting and retaining elements through the fixture in the housing corners from the back.

The following figure shows the main mounting elements and dimensions:



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[1] Mounting elements, e.g. M8 screws
[2] Locking elements, e.g. lock washers
[3] Mounting elements, e.g. washers
[4] Mounting surface, e.g. mounting plate

X, Y Housing dimensions
X_2, Y_2 Bore dimensions

Maximum permitted tightening torque: 3.2 Nm (28 in-lb)

7 Electrical Installation

7.1 General information

Observe the following notes on electrical installation:

- Observe the general safety notes.
- Strictly observe all instructions as to the technical data and the permissible conditions regarding the place of installation.

7.2 Low-voltage supply systems

MOVIPRO® is designed for operation on TN and TT systems with a directly grounded star point. Operation on IT systems with a non-grounded star point is permitted.

SEW-EURODRIVE recommends using earth-leakage monitors with pulse-code measurement. Use of such devices prevents the earth-leakage monitor mis-tripping due to the earth capacitance of MOVIPRO®.

No EMC limits are specified for interference emission in IT systems.

7.3 Electromagnetic compatibility (EMC)

INFORMATION

MOVIPRO® units can cause EMC interference within the permitted limit range according to DIN EN 61800-3.

This MOVIPRO® unit is a drive system of the category C2 (see DIN EN 61800-3).

For detailed information on EMC-compliant installation, refer to the publication "Drive Engineering – Practical Implementation: EMC in Drive Engineering".

7.4 Cable installation

Comply with the following points when installing the cables:

- Use suitable cables to connect the power supply and the communication.
- Route power cables and signal cables in separate cable ducts.
- Maintain the greatest possible distance between power cables and signal cables.
- Avoid using long cables running parallel to one another.

7.5 Information regarding UL

Observe the following sections for UL-compliant installation.

7.5.1 Power terminals of the power interface

Use 75 °C copper wire only.

7.5.2 Short circuit current rating

MOVIPRO® is suitable for use on a circuit capable of delivering not more than 200,000 rms symmetrical amperes. The maximum voltage is limited to AC 500 V.

7.5.3 Branch circuit protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

Use one of the following methods to protect branch circuits:

- Fuse according to UL 248

  (Non-semiconductor branch-circuit type fuse)
- Power switch to UL 489

  (Inverse-time circuit breaker)
- Type E motor protection switch to UL 508

  (Self-protected combination motor controller Type E)

The maximum permitted pre-fuse depends on the following data:

- Current carrying capacity of the connection cable
- Maximum permitted pre-fusing for the power interfaces

Power interfaces	Pre-fuse
PZM2xA-A075-D02-00	Max. 35 A[1)]
PZM2xA-A150-D03-00	Max. 50 A[1)]
PZM2xA-A022-M13-00	Max. 60 A
PZM2xA-A040-M14-00	Max. 60 A
PZM2xA-A075-M16-00	Max. 60 A

1) Also observe the permitted maximum pre-fusing for the connected MOVIPRO®. Always adhere to the smallest value.

7.5.4 Motor overload protection

The units are equipped with motor overload protection with a trip current adjusted to 150% of the rated motor current.

7.5.5 Ambient temperature

The units are suitable for an ambient temperature of 40 °C, max. 60 °C with derated output current. To determine the output current rating at temperatures higher than 40 °C, the output current should be derated by 3% per °C between 40 °C and 60 °C.

7.5.6 Requirements for line topologies with MOVIPRO® units

SEW-EURODRIVE recommends to always use power interfaces with **cable and unit protection** (PZM2xA-A...-**M1.**-00) when implementing line installations.

For the fusing of a line installation with MOVIPRO® units with power interfaces **with** cable and unit protection (PZM2xA-A...-**M1.**-00), you have to observe **the total nominal supply current** of the connected MOVIPRO® units. The following table lists examples of nominal supply current values of MOVIPRO® ADC:

MOVIPRO® power rating	Nominal line current 100% (for V_{line} = 3 AC 400 V)[1)]
2.2 kW	AC 5 A
4.0 kW	AC 8.6 A
7.5 kW	AC 14.4 A
11.0 kW	AC 21.6 A
15.0 kW	AC 28.8 A

1) The supply currents must be reduced by 20% compared with the nominal values for V_{line} = 3 × AC 500 V. Use linear interpolation to determine intermediate values.

7.5.7 Requirements for star topologies with MOVIPRO® units

For the fusing of MOVIPRO® units with power interfaces **without** cable and unit protection (PZM2xA-A...-**D0.**-00), you have to observe **the nominal supply current values** of the connected MOVIPRO® units. The following table lists examples of nominal supply current values of MOVIPRO® ADC:

MOVIPRO® power	Nominal line current 100% (for V_{line} = 3 AC 400 V)[1)]
2.2 kW	AC 5 A
4.0 kW	AC 8.6 A
7.5 kW	AC 14.4 A
11.0 kW	AC 21.6 A
15.0 kW	AC 28.8 A

1) The supply currents must be reduced by 20% compared with the nominal values for V_{line} = 3 × AC 500 V. Use linear interpolation to determine intermediate values.

7.6 Shielding

Note the following points regarding the shielding:

- Use shielded power and electronics cables.
- Connect the shield and make sure it is grounded over a wide area at both ends. When using cables with multiple shielding, you also have to ground the inner shields on both ends over a wide area.
- For external bus connections, refer to the bus-specific installation instructions.

7.7 Unit output

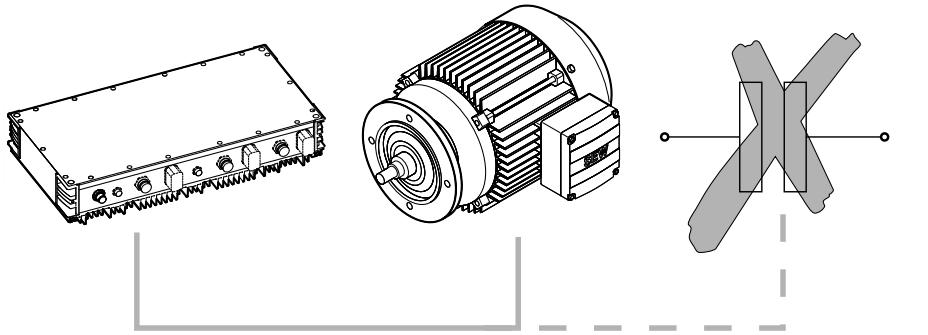
NOTICE

No capacitive loads must be connected to the output of the MOVIPRO® unit.

The unit can be destroyed by connecting capacitive loads.

- Only connect ohmic/inductive loads.
- Never connect capacitive loads.

The unit output of the MOVIPRO® unit may not be subjected to capacitive loads. A capacitive load occurs, for example, when very long cables are used to connect the motor.



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The motor supply cable must not exceed a length of 30 m (98 ft).

7.8 Installation altitudes higher than 1000 m asl

MOVIPRO® units with supply voltages of 380 to 500 V can be used at altitudes above 1000 m asl up to 4000 m asl under the following conditions.

- The nominal continuous power is reduced due to the reduced cooling above 1000 m (see chapter "Technical Data").
- Above 2000 m asl, the air and creeping distances are only sufficient for overvoltage class 2. If the installation calls for overvoltage class 3, you will have to install additional external overvoltage protection to limit overvoltage peaks to 2.5 kV phase-to-phase and phase-to-ground.
- If safe electrical disconnection is required, it must be implemented outside the device at altitudes of more than 2000 m (6,561 ft) above sea level (safe electrical disconnection in accordance with EN 61800-5-1 and EN 60204-1).

7.9 Protective measures against electrical hazards

⚠ WARNING

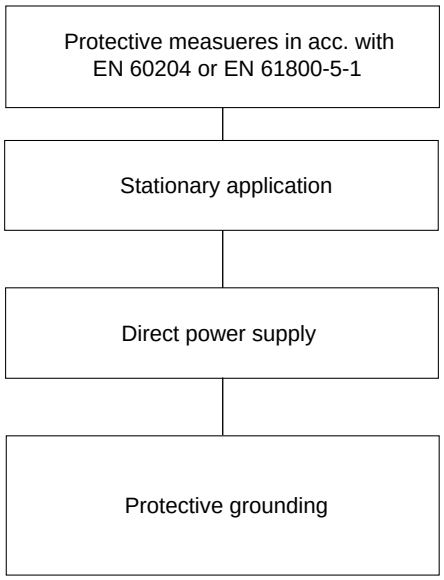
Electric shock due to missing or defective protection covers.

Severe or fatal injuries.

- Install the protective covers according to the regulations.
- The installation must only be carried out by qualified personnel.
- Never start the unit if the protective covers are not installed.

7.9.1 Overview

The following figure is an overview of the protective measures against electrical hazards:



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7.9.2 PE connection

⚠ WARNING

Electric shock due to incorrect connection of PE or equipotential bonding.

Severe or fatal injuries.

- Observe the installation notes for stationary use.

It is mandatory to ground the units.

Adhere to the following rules for grounding the unit:

- Ground the unit using the shortest possible route.
- Use short, low-impedance, HF-compliant cables.

Leakage currents ≥ AC 3.5 mA/DC 10 mA may occur during normal operation. Observe the following to comply with EN 61800-5-1:

- **Supply system lead < 10 mm^2:**

  Route a **second PE conductor with the same cable cross section as the supply system lead** in parallel to the PE via separate terminals. Alternatively, use a **copper PE conductor with a cross section of 10 mm^2**.

- **Supply system lead 10 mm^2:**

  Route a **copper PE conductor with the cross section of the supply system lead**.

7.9.3 Connection points for grounding or equipotential bonding

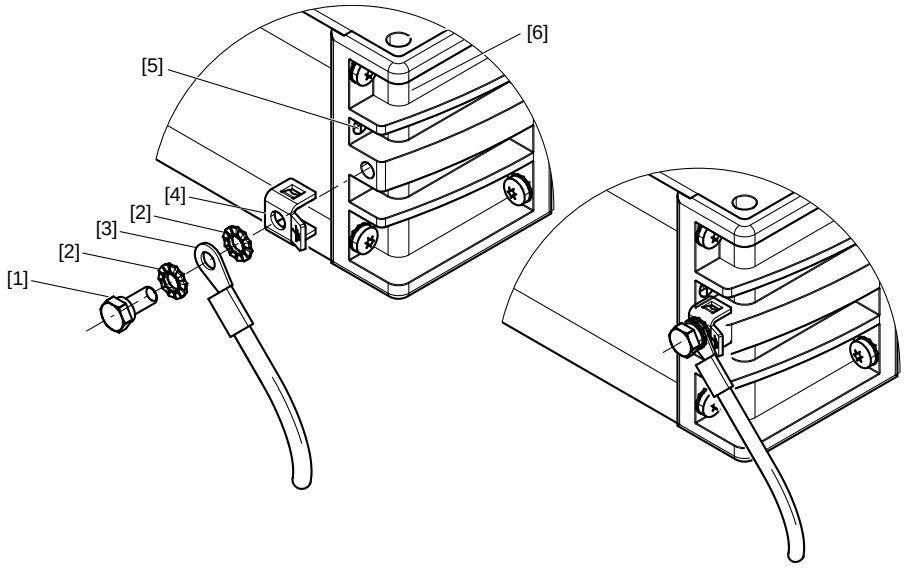
The connection points for grounding or equipotential bonding are marked on the housing corners of the units with the symbol ⏚.

The bores in the housing corners are prepared for M5 self-tapping screws, e.g. M5 x 12 to DIN ISO 3506 or equivalent.

Adhere to the following rules when you install the grounding of the equipotential bonding:

1. Secure the grounding or equipotential bonding cable using connection elements as shown in the figure below.
2. Use the grounding kit included in the scope of delivery.
3. Assemble the parts as shown in the diagram.

The following figure shows the positions of the connection points and the sequence in which to install the individual parts:



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[1]	Screw, self-tapping	[4]	Terminal clip
[2]	Tooth lock washer	[5]	Ground symbol ⏚
[3]	Crimp cable lug for M5	[6]	Housing corner

Maximum permitted tightening torque: 5 Nm (40 in-lb)

7.9.4 Fuses and residual current devices

⚠ WARNING

Wrong type of residual current device installed.

Severe or fatal injuries.

MOVIPRO® can cause direct current in the PE conductor. When a residual current device (RCD) is used for protection against direct or indirect contact, only a type B RCD is permitted on the power supply end of the MOVIPRO® unit.

SEW-EURODRIVE recommends that you do not use RCDs. However, if an RCD is stipulated for direct or indirect protection against contact, observe the note above in accordance with EN 61800-5-1:

Install the fuses at the beginning of the supply system lead behind the supply bus junction.

Line fuse types

Line protection types in operation classes gL, gG:

- Rated fusing voltage ≥ rated line voltage
- Depending on the inverter utilization, the rated fusing current must be dimensioned for 100 % of the inverter current.

Power circuit breaker with characteristics B, C:

- Power circuit breaker rated voltage ≥ rated line voltage
- The rated voltage of the line protection circuit breaker must be 10 % above the inverter current.

7.10 Connection blocks

The design of the MOVIPRO® connection block depends on the unit variant.

The illustration on the front of MOVIPRO® shows the connection designations for your MOVIPRO® unit.

⚠ WARNING

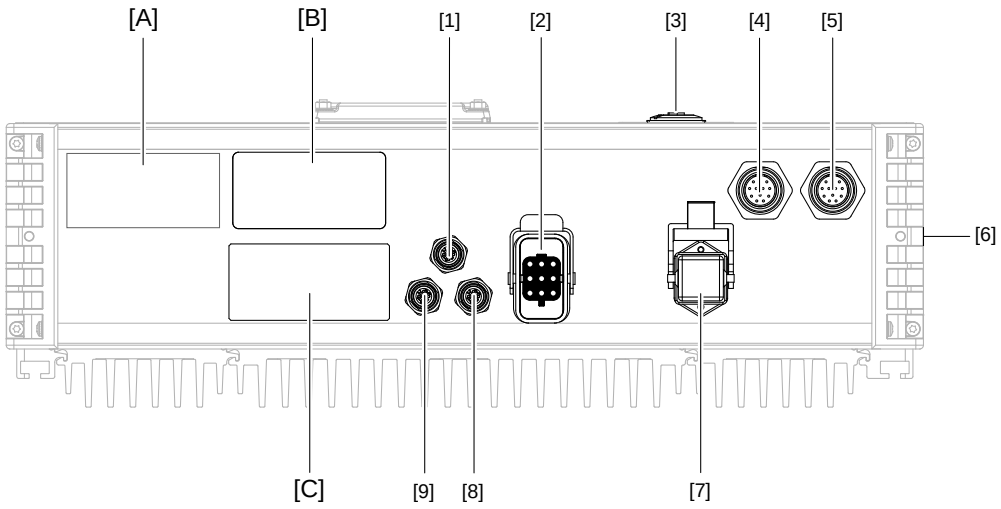
Electric shock when disconnecting or connecting voltage-carrying plug connectors.

Severe or fatal injuries.

- Switch off the 24 V DC supply voltage and the mains voltage.
- Make sure that the inverter is de-energized.
- Never plug or unplug the plug connectors while they are energized.

7.10.1 Size 0

Depending on the unit variant, the MOVIPRO® connection block looks as follows:



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[A] Connection area A
→ "Connectors of connection area A" (page 57)

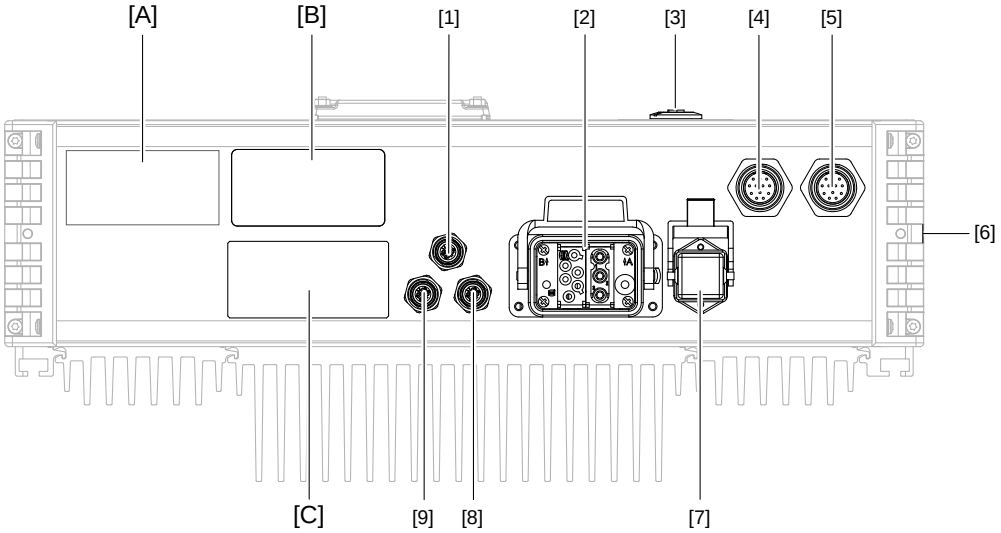
[B] Connection area B
→ "Connectors of connection area B" (page 58)

[C] Connection area C: Encoder option
→ "Connectors of connection area C: encoder option" (page 59)

[1]	X5502	STO-IN
[2]	X2011	Motor with brake control
[3]	X4223	Ethernet service interface
[4]	X5001_1	Digital inputs/outputs – communication and control unit
[5]	X5001_2	Digital inputs – communication and control unit
[6]	X1213	AC 400 V input / 24 V supply (power interface)
	or	
	X1214	AC 400 V input / 24 V supply (power interface)
[7]	X2301	External braking resistor
[8]	X5102_1	Digital inputs – power section
[9]	X5102_2	Digital inputs – power section
	or	
	X5201	Analog input – power section

7.10.2 Size 1

Depending on the unit variant, the MOVIPRO® connection block looks as follows:



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[A] Connection area A
→ "Connectors of connection area A" (page 57)

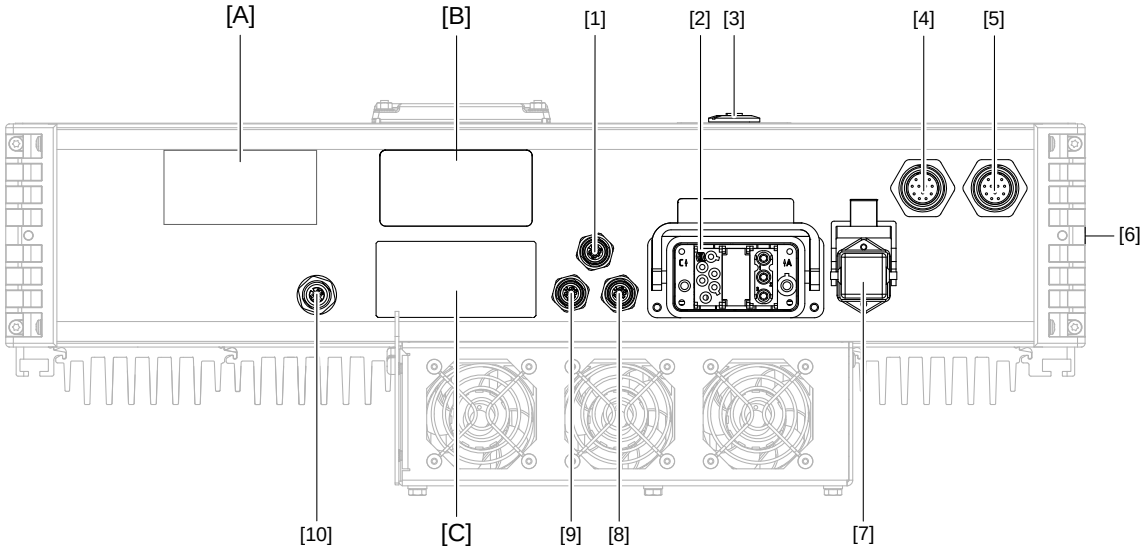
[B] Connection area B
→ "Connectors of connection area B" (page 58)

[C] Connection area C: Encoder option
→ "Connectors of connection area C: encoder option" (page 59)

[1]	X5502	STO-IN
[2]	X2012	Motor with brake control
[3]	X4223	Ethernet service interface
[4]	X5001_1	Digital inputs/outputs – communication and control unit
[5]	X5001_2	Digital inputs – communication and control unit
[6]	X1213	AC 400 V input / 24 V supply (power interface)
	or	
	X1214	AC 400 V input / 24 V supply (power interface)
[7]	X2301	External braking resistor
[8]	X5102_1	Digital inputs – power section
[9]	X5102_2	Digital inputs – power section
	or	
	X5201	Analog input – power section

7.10.3 Size 2

Depending on the unit variant, the MOVIPRO® connection block looks as follows:



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[A] Connection area A
→ "Connectors of connection area A" (page 57)

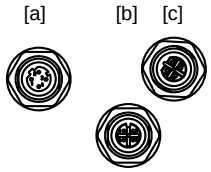
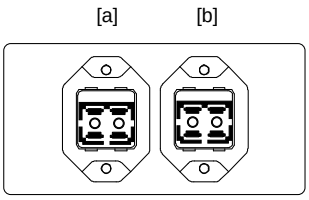
[B] Connection area B
→ "Connectors of connection area B" (page 58)

[C] Connection area C: Encoder option
→ "Connectors of connection area C: encoder option" (page 59)

[1]	X5502	STO-IN
[2]	X2016	Motor with brake control
[3]	X4223	Ethernet service interface
[4]	X5001_1	Digital inputs/outputs – communication and control unit
[5]	X5001_2	Digital inputs – communication and control unit
[6]	X1213	AC 400 V input / 24 V supply (power interface)
	or	
	X1214	AC 400 V input / 24 V supply (power interface)
[7]	X2303	External braking resistor
[8]	X5102_1	Digital inputs – power section
[9]	X5102_2	Digital inputs – power section
	or	
	X5201	Analog input – power section
[10]	X5111	Fan subassembly

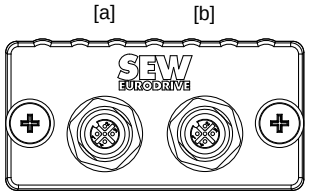
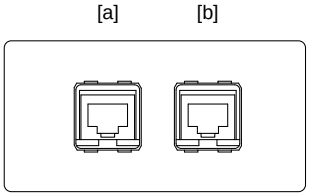
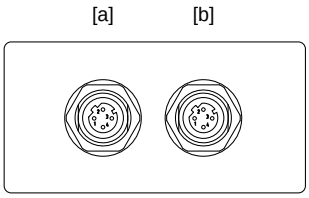
7.10.4 Connectors of connection area A

The following table shows the connection options for connection area A:

MOVIPRO® connections	Type Code Function unit	Connections		
	**Communication package 1**			
	PFH-..1A..-B..-I1.1	[a]	X4251	SBus^{PLUS} interface
		[b]	X4112	CAN interface (without DC 24 V)
		[c]	X4012	RS485 interface (without DC 24 V)
	Communication package 2			
	PFH-..1A..-B..-I1.2	[a]	X4251	SBus^{PLUS} interface
		[b]	X4112	CAN interface (without DC 24 V)
		[c]	X4011	RS485 interface (with DC 24 V)
	Communication package 3			
	PFH-..1A..-B..-I1.3	[a]	X4251	SBus^{PLUS} interface
		[b]	X4111	CAN interface (with DC 24 V)
		[c]	X4011	RS485 interface (with DC 24 V)
	Communication package 4			
	PFH-..1A..-B..-I1.4	[a]	X4251	SBus^{PLUS} interface
		[b]	X4111	CAN interface (with DC 24 V)
		[c]	X4012	RS485 interface (without DC 24 V)
Only for units with the following properties: • Without communication package and • with fieldbus connection push-pull SCRJ (X4234_11 and X4234_12)				
	PFH-E21A..-B64-I1..	[a]	X4234_11	Ethernet fieldbus, Push-pull SCRJ
	PFH-E31A..-B64-I1..	[b]	X4234_12	

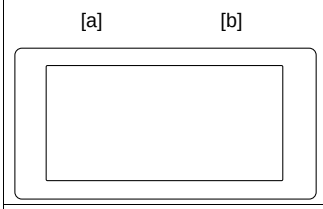
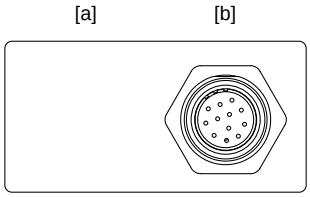
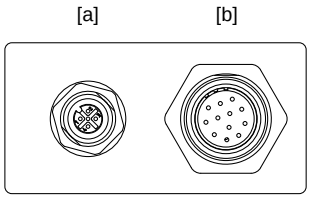
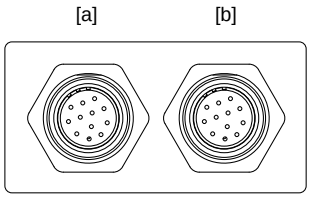
7.10.5 Connectors of connection area B

The following table shows the connection options for connection area B:

MOVIPRO® connections	Type Code Function unit	Connections		
	PFH-P11A..-B11-I1..	[a]	X4201	PROFIBUS input, M12
		[b]	X4202	PROFIBUS output, M12
	PFH-D11A..-B12-I1..	[a]	X4241	DeviceNet input, M12
		[b]	X4242	DeviceNet output, M12
	PFH-E21A..-B63-I1..	[a]	X4232_11	Ethernet fieldbus, Push-pull RJ45
	PFH-E31A..-B63-I1..	[b]	X4232_12	
	PFH-E21A..-B63-I1..	[a]	X4233_11	Ethernet fieldbus, M12
	PFH-E31A..-B63-I1..	[b]	X4233_12	

7.10.6 Connectors of connection area C: Encoder option

The following table shows the connection options for encoders:

MOVIPRO® connections	Type Code Function unit	Connections		
	PFA-MD...B-G00-B...-../C../000	Without encoder		
	PFA-MD...B-G10-B...-../C../000	[b]	X3001	Resolver motor encoder
	PFA-MD...B-G20-B...-../C../000	[b]	X3011	HIPERFACE®, Sin/Cos, TTL, HTL, RS422 motor encoders
	PFA-MD...B-G21-B...-../C../000	[a]	X3211	CANopen synchronous encoder
		[b]	X3011	HIPERFACE®, Sin/Cos, TTL, HTL, RS422 motor encoders
	PFA-MD...B-G22-B...-../C../000	[a]	X3222	Multi synchronous encoder (HIPERFACE®, SSI, Sin/Cos, HTL)
		[b]	X3011	HIPERFACE®, Sin/Cos, TTL, HTL, RS422 motor encoders

7.11 Electrical connections

7.11.1 Representation of plug connectors

The wiring diagrams of the plug connectors display the contact end of the connection.

7.11.2 Connection cable

Connection cables are not included in the scope of delivery.

Prefabricated cables for connection between SEW components can be ordered from SEW-EURODRIVE at any time. They are described in the following sections. Specify the part number and length of the required cable in your order.

The number and design of the required connection cables depend on the design of the units and the components to be connected. This is why not all cables that are listed are actually required.

The following figures show the different cable designs:

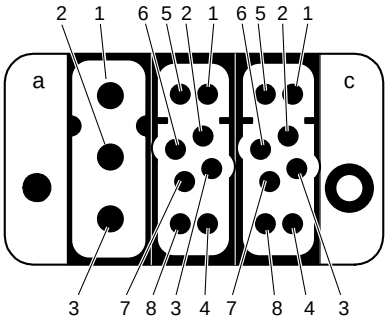
Cable	Length	Installation type
	Fixed length	Suitable for cable carrier installation 
	Variable length	Not suitable for cable carrier installation 

INFORMATION

For more information about cable types, see chapter "Technical Data".

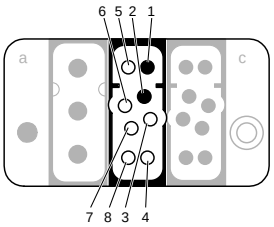
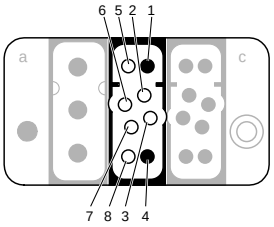
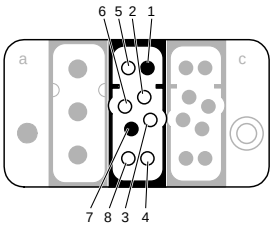
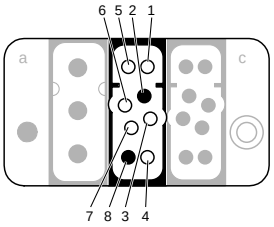
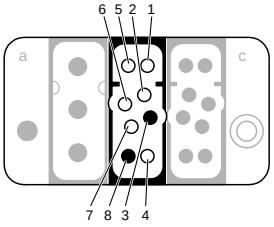
7.11.3 X1213: AC 400 V input / DC 24 V supply for a power interface (up to 15 kW – coded)

The following table provides information about this connection:

Function		
• AC 400 V unit supply input • DC 24 V output and input		• With signal contact for external maintenance switch • For connecting a power interface (PZM)
Connection type		
Han-Modular® 10 B, male		
Wiring diagram		
 2442494347		
Assignment		
No.	**Name**	**Function**
[a] Han® C module, male		
1	L1	Supply system phase 1
2	L2	Supply system phase 2
3	L3	Supply system phase 3
[b] Han® EE module, male		
Coding of the unit power, see section coding (page 62)		
[c] Han® EE module, male		
1	+24V_C	DC 24 V input – backup voltage
2	SC	Signal contact for maintenance switch (external)
3	VO24	DC 24 V output
4	n.c.	Not connected
5	0V24_C	0V24 reference potential – backup voltage
6	n.c.	Not connected
7	GND	Reference potential
8	n.c.	Not connected
Hinged frame		
PE	PE	PE connection

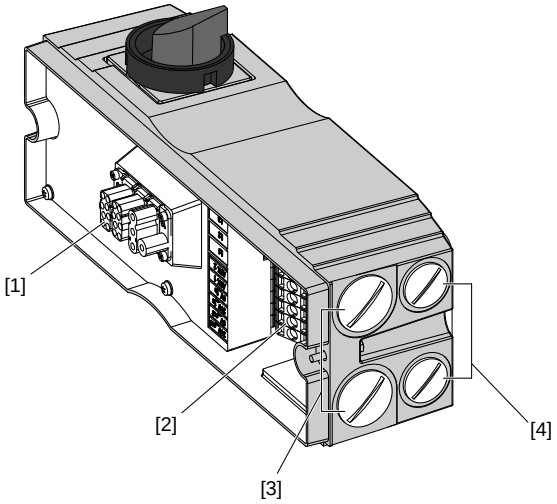
Coding

The following table shows the assignment of the different coding to the respective unit power ratings and the corresponding power interfaces:

Unit power	Coding of connection X1213	Power interface
2.2 kW		PZM2xA-A075-D02-00 PZM2xA-A150-D03-00 PZM2xA-A022-M13-00
4.0 kW		PZM2xA-A075-D02-00 PZM2xA-A150-D03-00 PZM2xA-A040-M14-00
7.5 kW		PZM2xA-A075-D02-00 PZM2xA-A150-D03-00 PZM2xA-A075-M16-00
11.0 kW		PZM2xA-A150-D03-00
15.0 kW		PZM2xA-A150-D03-00

Power interface connections

The following table shows the connections of the power interface:



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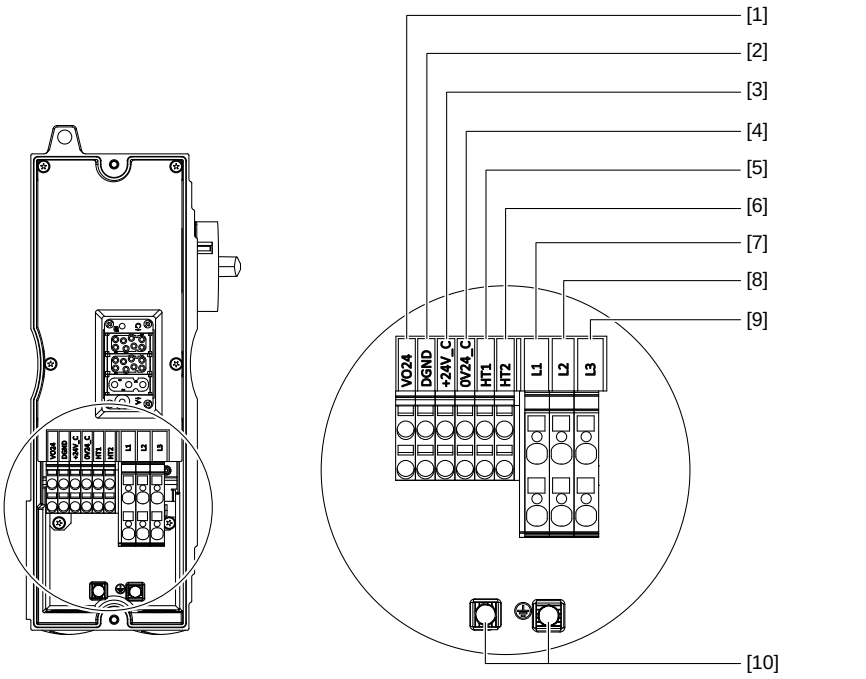
[1] Connection to the MOVIPRO® unit (Han® 10 B, female)
[2] Terminal strip, power input
[3] Covers of the screw fitting hole (M32 × 1.5)[1)]
[4] Covers of the screw fitting hole (M25 × 1.5)[1)]

1) The respective screw fittings are not included in the scope of delivery.

Terminal strip of power interface

The following table shows the connections of the power interface:



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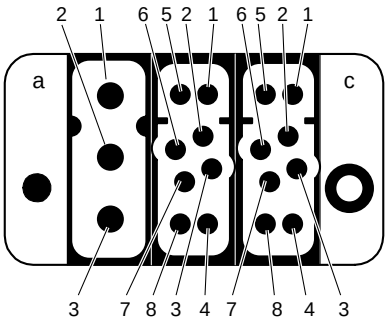
Terminal strip X1 (power input terminal strip)			Terminal cross section
No.	**Name**	**Function**	
1	VO24	DC 24 V output	6 mm²
2	GND	Reference potential / DC 24 V output	
3	+24 V_C	DC 24 V input	
4	0V24_C	0V24 reference potential – input	
5	HT1	Auxiliary terminal for additional voltage levels (without internal function)	
6	HT2	Auxiliary terminal for additional voltage levels (without internal function)	
7	L1	Phase L1	10 mm²
8	L2	Phase L2	
9	L3	Phase L3	
10	PE	Equipotential bonding/protective earth conductor	

7.11.4 X1214: AC 400 V input and DC 24 V supply for a supply cable (up to 15.0 kW – coded)

The following table informs about this connection:

Function		
• AC 400 V input to supply units up to 15.0 kW • DC 24 V output and input		• With signal contact for external maintenance switch • For connecting a supply cable
Connection type		
Han-Modular® 10 B, male, 1 single lever		
Wiring diagram		
 2442494347		
Assignment		
No.	**Name**	**Function**
[a] Han® C module, male		
1	L1	Supply system phase 1
2	L2	Supply system phase 2
3	L3	Supply system phase 3
[b] Han® EE module, male		
Coding of the unit power, see section "Coding".		
[c] Han® EE module, male		
1	+24V_C	DC 24 V input – backup voltage
2	SC	Signal contact for maintenance switch (external)
3	VO24	DC 24 V output
4	n.c.	Not connected
5	0V24_C	0V24 reference potential – backup voltage
6	n.c.	Not connected
7	GND	Reference potential
8	n.c.	Not connected
Hinged frame		
PE	PE	PE connection

INFORMATION

The internal components can be supplied with DC 24 V either from the MOVIPRO® or via an external DC 24 V backup voltage.

To use the **internal** DC 24 V supply, you must jumper the following contacts:

- [c].1 and [c].3
- [c].5 and [c].7

To use an **external** DC 24 V backup voltage, connect it to the following contacts:

- [c].1
- [c].5

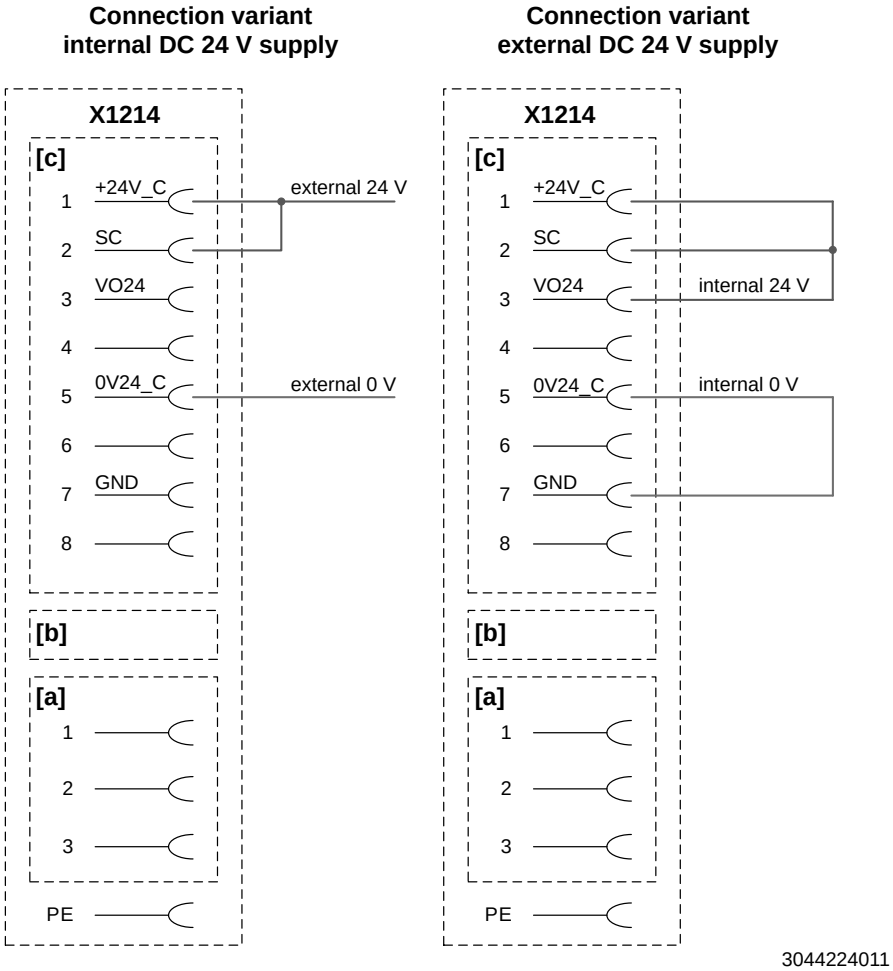
In this case, you **must not use contacts [c].3 and [c].7**!

Signal contact for external maintenance switch

MOVIPRO® has a signal contact for an external maintenance switch.

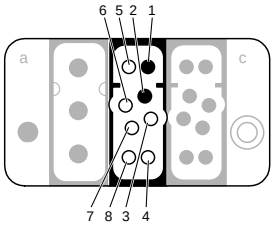
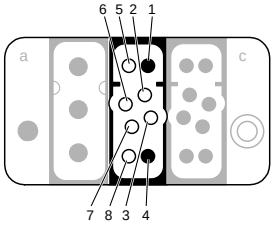
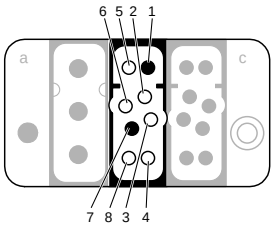
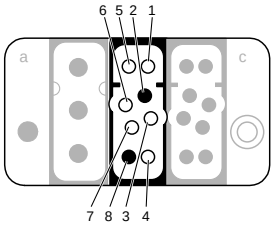
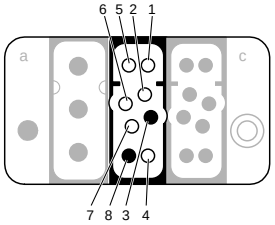
INFORMATION

If you do not use an external maintenance switch, you must jumper the DC 24 V to the signal contact (SC).



Coding

The following table shows the assignment of the individual coding to the respective unit power rating:

Unit power	Coding of connection X1214
2.2 kW	
4.0 kW	
7.5 kW	
11.0 kW	
15.0 kW	

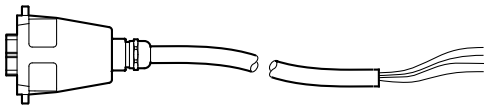
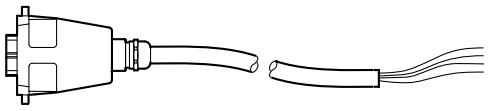
Connection cables

INFORMATION

The following cable already contains the jumpers for using an external maintenance switch with internal DC 24 V supply.

For more information, refer to chapter "Signal contact for external maintenance switch".

The following table shows the available cable for this connection:

Connection cable		
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**
Up to 7.5 kW (IEC / UL)	**Part number 1 813 143 3** Cable design: 4G2.5  Han® 10 B — Open (conductor end sleeves)	Variable length 
11.0 – 15.0 kW (IEC / UL)	**Part number 1 813 146 8** Cable design: 4G6.0  Han® 10 B — Open (conductor end sleeves)	Variable length 

Connection of cables with open ends

The following table shows the conductor assignment of the cable with the following part number:

- 1 813 143 3
- 1 813 146 8

Signal name	Color coding
L1	Black / 1
L2	Black / 2
L3	Black / 3
GND	Green/yellow

7.11.5 X2011: Motor with brake control (MOVIPRO® size 0)

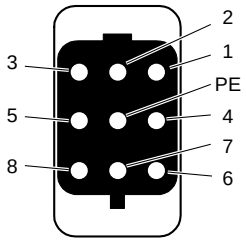
NOTICE

Damage or malfunction due to motors with built-in brake rectifiers.

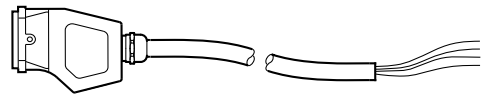
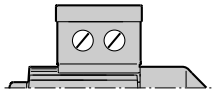
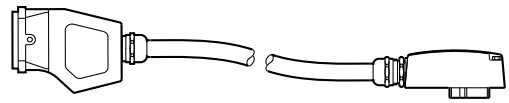
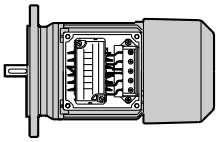
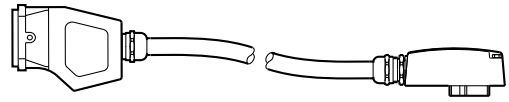
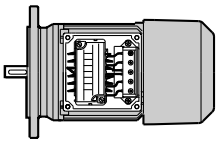
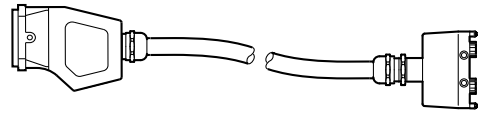
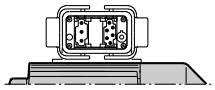
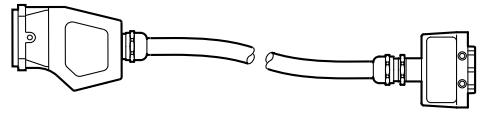
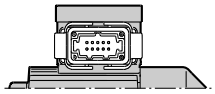
Damage to the drive system or its environment.

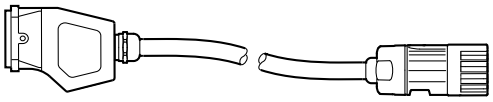
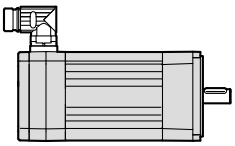
- You **must not** use motors with built-in brake rectifiers in conjunction with MOVIPRO®.

The following table informs about this connection:

Function		
Power connection for motor with brake up to 4.0 kW		
Connection type		
Han® Q 8/0, female		
Wiring diagram		
 9007201696170251		
Assignment		
No.	**Name**	**Function**
1	U	Motor phase U output
2	14	SEW brake terminal 14 (white)
3	W	Motor phase W output
4	15	SEW brake terminal 15 (blue)
5	TF/TH/KTY+	Motor temperature sensor (+)
6	13	SEW brake terminal 13 (red)
7	V	Motor phase V output
8	TF/TH/KTY-	Motor temperature sensor (-)
PE	PE	PE connection

Connection cables The following table provides an overview of the cables available for this connection:

Connection cable and component				
MOVIPRO®	**Hybrid cables**	**Length/ Installation type**	**Cable type**	**Drive**
up to 2.2 kW (IEC / UL)	**Part number 1 812 579 4**  Han® Q 8/0 — Open (M4 terminal box connection)	Variable length 	D/1.5	**DRS71 – 100** **DRE80 – 100** **DRP90 – 100** 
	Part number 1 812 770 3 ⅄  Han® Q 8/0 — IS ⅄	Variable length 		**DRS71 – 90** ⅄ **DRE80 – 100M** ⅄ **DRP90 – 100** ⅄ 
	Part number 1 812 768 1 △  Han® Q 8/0 — IS △	Variable length 		**DRS71 – 80M** △ **DRE80 – 90M** △ **DRP90** △ 
	Part number 1 812 771 1  Han® Q 8/0 — ABB8	Variable length 		**DRS71 – 90** **DRE80 – 100M** **DRP90 – 100** 
	Part number 1 812 773 8  Han® Q 8/0 — ASB8	Variable length 		**DRS71 – 90** **DRE80 – 100M** **DRP90 – 100** 

Connection cable and component				
MOVIPRO®	**Hybrid cables**	**Length/ Installation type**	**Cable type**	**Drive**
up to 2.2 kW (IEC / UL)	**Part number 1 812 585 9**  Han® Q 8/0 SB11	Variable length 	E/1.5	**CMP63 – 80** 

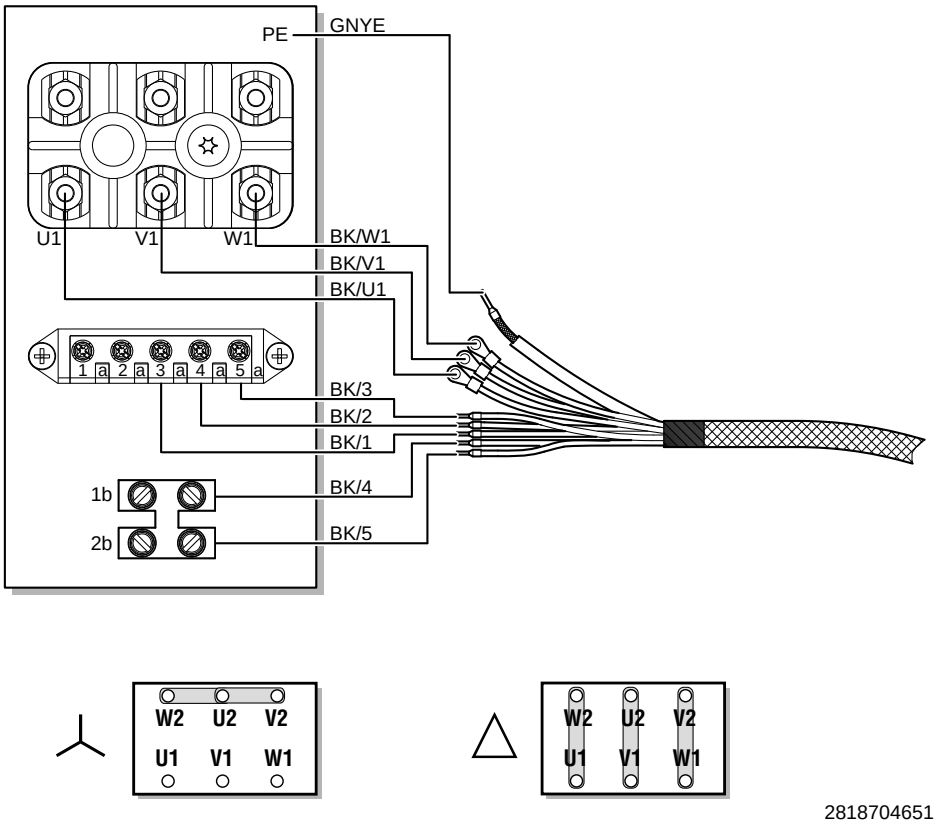
Connection of cables with open ends

The following tables shows the conductor assignment in hybrid cables with the following part number and the corresponding motor terminals of the DR motor:

1 812 579 4

Motor terminal DR motor	Wire color/hybrid cable designation
U1	Black/U1
V1	Black/V1
W1	Black/W1
4a	Black / 1
3a	Black / 2
5a	Black / 3
1b	Black / 4
2b	Black / 5
PE connection	Green/yellow + shield end (inner shield)

The following figure shows the connection of the hybrid cable to the terminal box of the DR motor. However, also observe the wiring diagram of the respective motor.



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7.11.6 X2012: Motor with brake control (MOVIPRO® size 1)

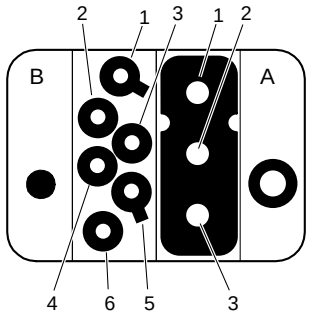
NOTICE

Damage or malfunction due to motors with built-in brake rectifiers.

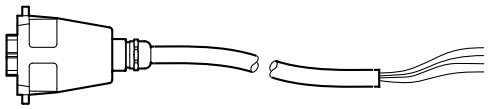
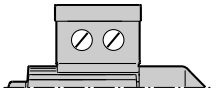
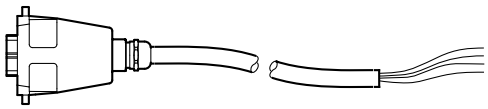
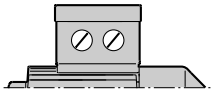
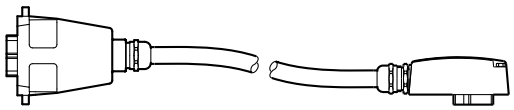
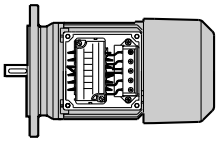
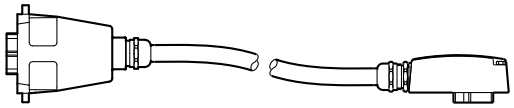
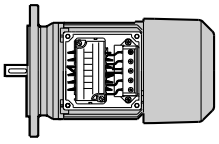
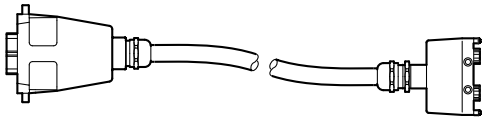
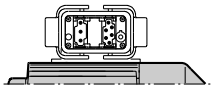
Damage to the drive system or its environment.

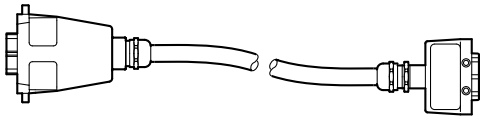
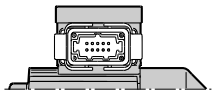
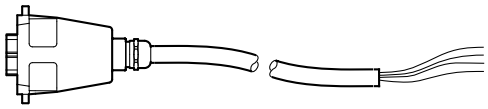
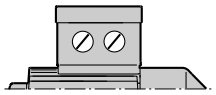
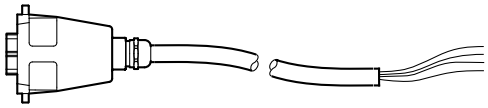
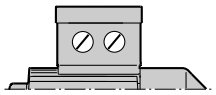
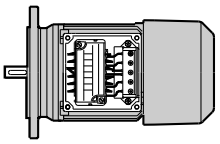
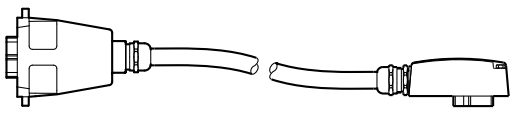
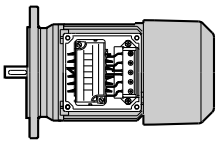
- You **must not** use motors with built-in brake rectifiers in conjunction with MOVIPRO®.

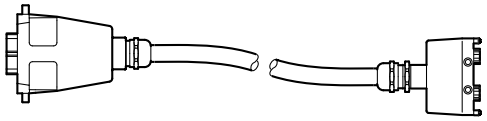
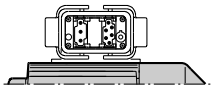
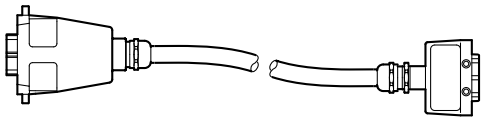
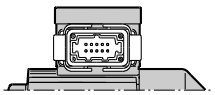
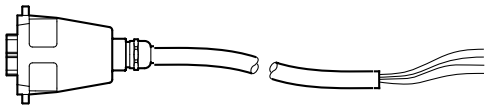
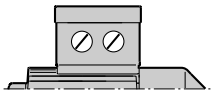
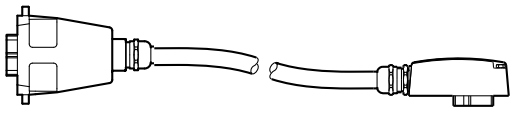
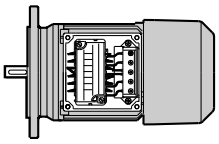
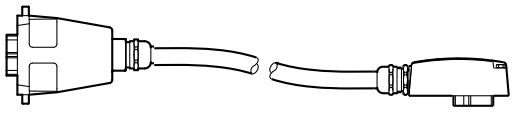
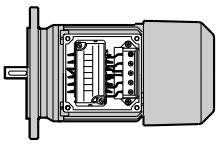
The following table informs about this connection:

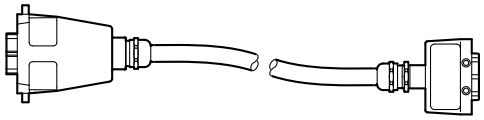
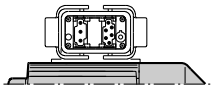
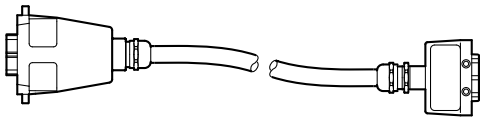
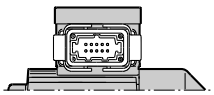
Function		
Power connection for motor with brake up to 7.5 kW		
Connection type		
Han-Modular® 6 B, female, 1 single lever		
Wiring diagram		
 2441439499		
Assignment		
No.	**Name**	**Function**
[A] Han® C Module, female		
1	U	Motor phase U output
2	V	Motor phase V output
3	W	Motor phase W output
[B] Han® E Protected Module, female		
1	TF/TH/KTY+	Motor temperature sensor (+)
2	15	SEW brake terminal 15 (blue)
3	13	SEW brake terminal 13 (red)
4	14	SEW brake terminal 14 (white)
5	n.c.	Not connected
6	TF/TH/KTY-	Motor temperature sensor (-)
Hinged frame		
PE	PE	PE connection

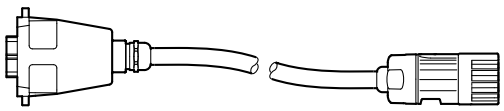
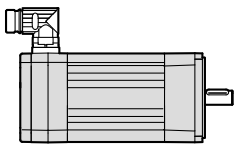
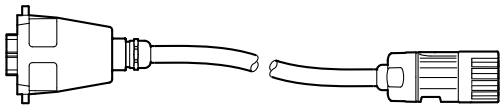
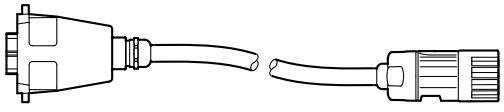
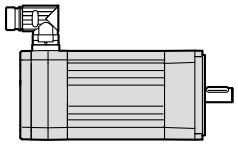
Connection cables The following table provides an overview of the cables available for this connection:

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
4.0 kW (IEC / UL)	**Part number 1 811 813 5**  Han® 6 B — Open (M4 terminal box connection)	Variable length 	**D/1.5**	**DRS71 – 100** **DRE80 – 100** **DRP90 – 100** 
	Part number 1 811 814 3  Han® 6 B — Open (M5 terminal box connection)	Variable length 		**DRS112** **DRE112 – 132** **DRP112 – 132** 
	Part number 1 811 817 8 人  Han® 6 B — IS 人	Variable length 		**DRS71 – 112** 人 **DRE80 – 132S** 人 **DRP90 – 132M** 人 
	Part number 1 811 815 1 △  Han® 6 B — IS △	Variable length 		**DRS71 – 90** △ **DRE80 – 100M** △ **DRP90 – 100** △ 
	Part number 1 811 818 6  Han® 6 B — ABB8	Variable length 		**DRS71 – 112** **DRE80 – 132** **DRP90 – 132** 

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
4.0 kW (IEC / UL)	**Part number 1 811 819 4**  Han® 6 B — ASB8	Variable length 	**D/1.5**	**DRS71 – 112** **DRE80 – 132** **DRP90 – 132** 
4.0 kW (IEC / UL) until 7.5 kW (IEC)	**Part number 1 810 833 4**  Han® 6 B — Open (M4 terminal box connection)	Variable length 	**D/2.5**	**DRS71 – 100** **DRE80 – 100** **DRP90 – 100** 
	Part number 1 810 834 2  Han® 6 B — Open (M5 terminal box connection)	Variable length 		**DRS112 – 132M** **DRE112 – 132** **DRP112 – 132** 
	Part number 1 810 832 6 人  Han® 6 B — IS 人	Variable length 		**DRS71 – 132M** 人 **DRE80 – 132** 人 **DRP90 – 132** 人 
	Part number 1 810 831 8 △  Han® 6 B — IS △	Variable length 		**DRS71 – 112** △ **DRE80 – 132S** △ **DRP90 – 132M** △ 

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
4.0 kW (IEC / UL) until 7.5 kW (IEC)	**Part number 1 810 824 5**  Han® 6 B — ABB8	Variable length 	**D/2.5**	**DRS71 – 132M** **DRE80 – 160S** **DRP90 – 160M** 
	Part number 1 810 820 2  Han® 6 B — ASB8	Variable length 		**DRS71 – 132M** **DRE80 – 160S** **DRP90 – 160M** 
4.0 kW (IEC / UL) until 7.5 kW (IEC / UL)	**Part number 1 812 060 1**  Han® 6 B — Open (M5 terminal box connection)	Variable length 	**D/4.0**	**DRS112 – 132M** **DRE112 – 132** **DRP112 – 132** 
	Part number 1 812 128 4 人  Han® 6 B — IS 人	Variable length 		**DRS71 – 132M** 人 **DRE80 – 132** 人 **DRP90 – 132** 人 
	Part number 1 812 127 6 △  Han® 6 B — IS △	Variable length 		**DRS71 – 112** △ **DRE80 – 132S** △ **DRP90 – 132M** △ 

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
4.0 kW (IEC / UL) until 7.5 kW (IEC / UL)	**Part number 1 812 062 8**  Han® 6 B ABB8	Variable length 	**D/4.0**	**DRS71 – 132M** **DRE80 – 160S** **DRP90 – 160M** 
	Part number 1 812 063 6  Han® 6 B ASB8	Variable length 		**DRS71 – 132M** **DRE80 – 160S** **DRP90 – 160M** 

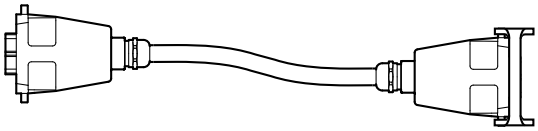
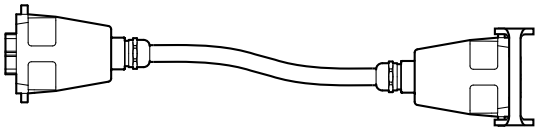
Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
4.0 kW (IEC / UL) until 7.5 kW (IEC / UL)	**Part number 1 812 202 7**  Han® 6 B SB11	Variable length 	**E/1.5**	**CMP63 – 80** 
	Part number 1 811 052 5  Han® 6 B SB12	Variable length 	**E/2.5**	
	Part number 1 812 203 5  Han® 6 B SB14	Variable length 	**E/4.0**	**CMP63 – 100** 

Phase reversal cable

INFORMATION

If you are using an encoder, note that you also need an encoder signal reversal cable in addition to the phase reversal cable. For more information about encoder signal reversal cables, refer to the description of the encoder connection.

The following table shows the available phase reversal cables:

Connection cable				
MOVIPRO®	**Phase reversal cable**	**Length/installation type**	**Cable type**	**Wiring diagram**
4.0 kW (IEC / UL) until 7.5 kW (IEC)	**Part number 1 811 373 7**  Han® 6 B Han® 6 B	Fixed length	**D/2.5**	U1 – V1 V1 – U1 W1 – W1 13 – 13 14 – 14 15 – 15 TF+ – TF+ TF– – TF–
4.0 kW (IEC / UL) until 7.5 kW (IEC / UL)	**Part number 1 812 200 0**  Han® 6 B Han® 6 B	Fixed length	**D/6.0**	

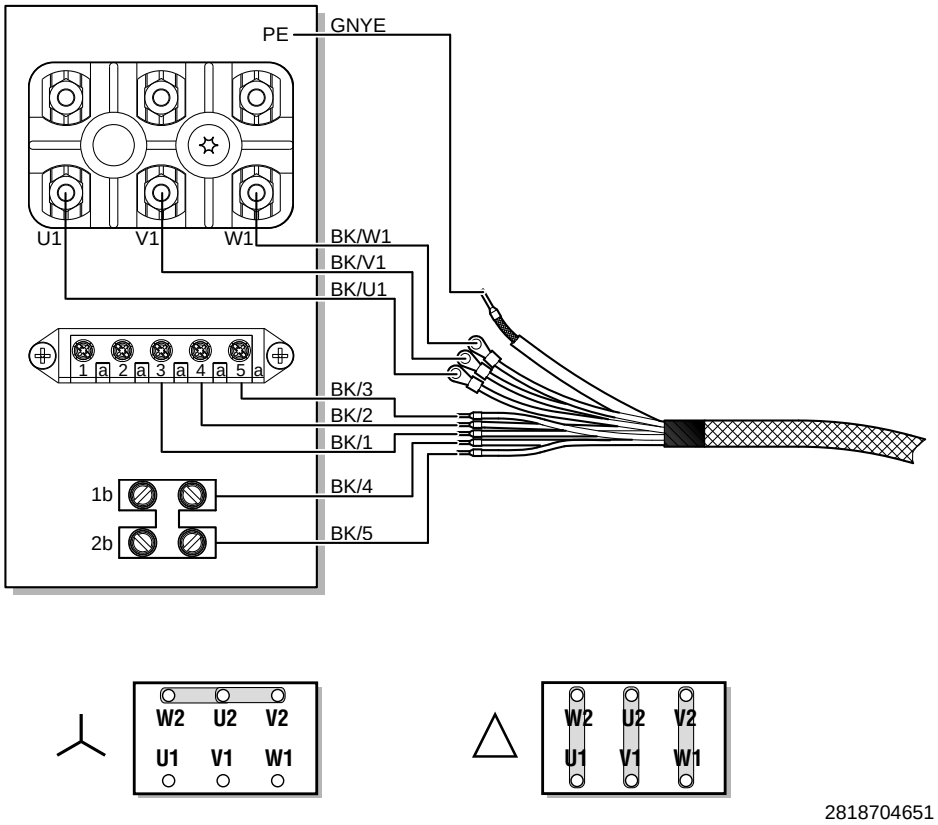
Connection of cables with open ends

The following tables shows the conductor assignment in cables with the following part numbers and the corresponding motor terminals of the DR motor:

- 1 811 813 5
- 1 811 814 3
- 1 810 833 4
- 1 810 834 2
- 1 812 060 1

DR motor terminal	Wire color/hybrid cable designation
U1	Black/U1
V1	Black/V1
W1	Black/W1
4a	Black / 1
3a	Black / 2
5a	Black / 3
1b	Black / 4
2b	Black / 5
PE connection	Green/yellow + shield end (inner shield)

The following figure shows the connection of the cable to the terminal box of the DR motor. However, also observe the wiring diagram of the respective motor.



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7.11.7 X2016: Motor with brake control (MOVIPRO® size 2)

NOTICE

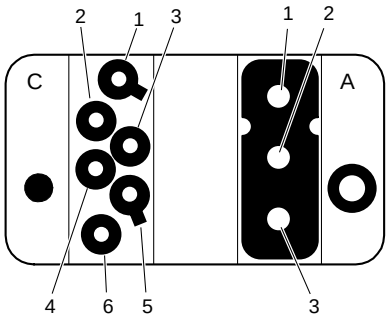
Damage or malfunction due to motors with built-in brake rectifiers.

Damage to the drive system or its environment.

- You **must not** use motors with built-in brake rectifiers in conjunction with MOVIPRO®.

The following table informs about this connection:

Function		
Power connection for motor with brake up to 15 kW		
Connection type		
Han-Modular® 10 B, female, 1 single lever		
Wiring diagram		



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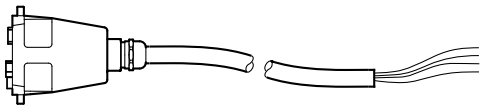
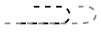
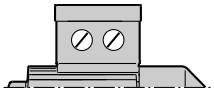
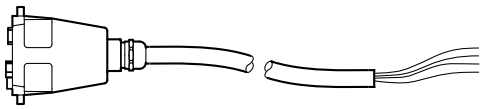
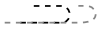
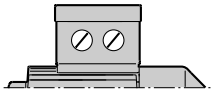
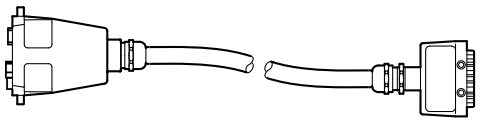
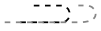
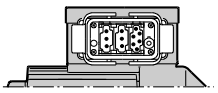
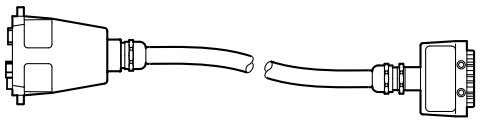
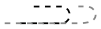
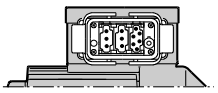
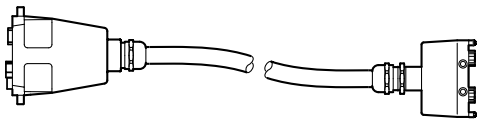
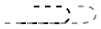
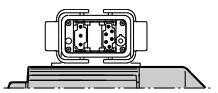
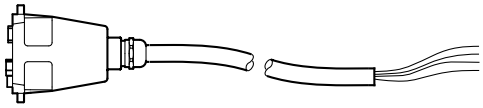
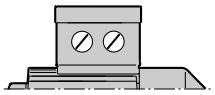
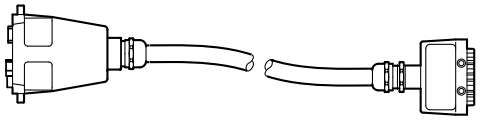
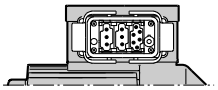
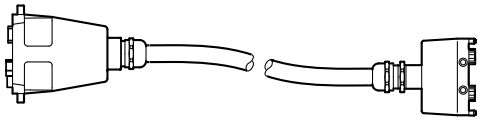
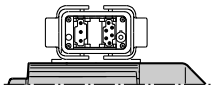
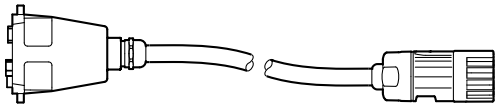
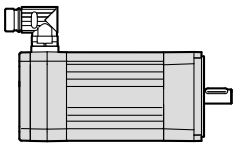
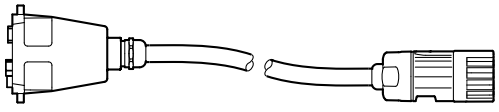
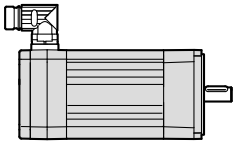
Assignment		
No.	**Name**	**Function**
[A] Han® C Module, female		
1	U	Motor phase U output
2	V	Motor phase V output
3	W	Motor phase W output
[C] Han® E Protected Module, female		
1	TF/TH/KTY+	Motor temperature sensor (+)
2	15	SEW brake terminal 15 (blue)
3	13	SEW brake terminal 13 (red)
4	14	SEW brake terminal 14 (white)
5	n.c.	Not connected
6	TF/TH/KTY-	Motor temperature sensor (-)
Hinged frame		
PE	PE	PE connection

Connection cables The following tables list the cables available for this connection:

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
11.0 kW (IEC / UL) until 15.0 kW (IEC)	**Part number 1 811 045 2**  Han® 10 B — Open (M5 terminal box connection)	Variable length 	**D/6.0**	**DRS112 – 132** **DRE112 – 132** **DRP112 – 132** 
	Part number 1 811 047 9  Han® 10 B — Open (M6 terminal box connection)	Variable length 		**DRS160 – 180S** **DRE160 – 180M** **DRP160 – 180L** 
	Part number 1 812 356 2 人  Han® 10 B — ADB2 人	Variable length 		**DRS112 – 180S** 人 **DRE112 – 180M** 人 **DRP112 – 180L** 人 
	Part number 1 812 357 0 △  Han® 10 B — ADB2 △	Variable length 		**DRS112 – 160S** △ **DRE112 – 160M** △ **DRP112 – 180S** △ 
	Part number 1 811 043 6  Han® 10 B — ABB8	Variable length 		**DRS112 – 180S** **DRE112 – 180M** **DRP112 – 180L** 

Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Cable type**	**Drive**
11.0 kW (IEC / UL) until 15.0 kW (IEC / UL)	**Part number 1 812 198 5**  Han® 10 B — Open (M6 terminal box connection)	Variable length 	**D/10.0**	**DRS160 – 180S** **DRE160 – 180M** **DRP160 – 180L** 
	Part number 1 812 358 9 人  Han® 10 B — ADB2 人	Variable length 		**DRS112 – 180S** 人 **DRE112 – 180M** 人 **DRP112 – 180L** 人 
	Part number 1 811 820 8  Han® 10 B — ABB8	Variable length 		**DRS112 – 180S** **DRE112 – 180M** **DRP112 – 180L** 

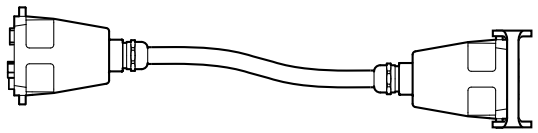
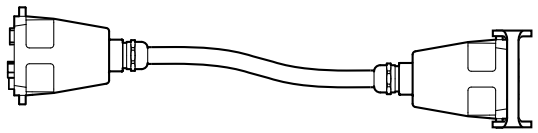
Connection cable and component				
MOVIPRO®	**Hybrid cable**	**Length/ installation type**	**Cable type**	**Drive**
11.0 kW (IEC / UL) until 15.0 kW (IEC / UL)	**Part number 1 812 205 1**  Han® 10 B — SB14	Variable length 	E/4.0	**CMP63 – 100** 
	Part number 1 811 053 3  Han® 10 B — SBB6	Variable length 	E/6.0	**CMP80 – 100** 

Phase reversal cable

INFORMATION

If you are using an encoder, note that you also need an encoder signal reversal cable in addition to the phase reversal cable. For more information about encoder signal reversal cables, refer to the description of the encoder connection.

The following table shows the available phase reversal cables:

Connection cable				
MOVIPRO®	**Phase reversal cable**	**Length/installation type**	**Cable type**	**Wiring diagram**
11.0 kW (IEC / UL) until 15.0 kW (IEC / UL)	**Part number 1 811 963 8**  Han® 10 B Han® 10 B	Fixed length	**D/6.0**	U1 – V1 V1 – U1 W1 – W1 13 – 13 14 – 14 15 – 15 TF+ – TF+ TF– – TF–
	Part number 1 811 374 5  Han® 10 B Han® 10 B	Fixed length	**D/10.0**	

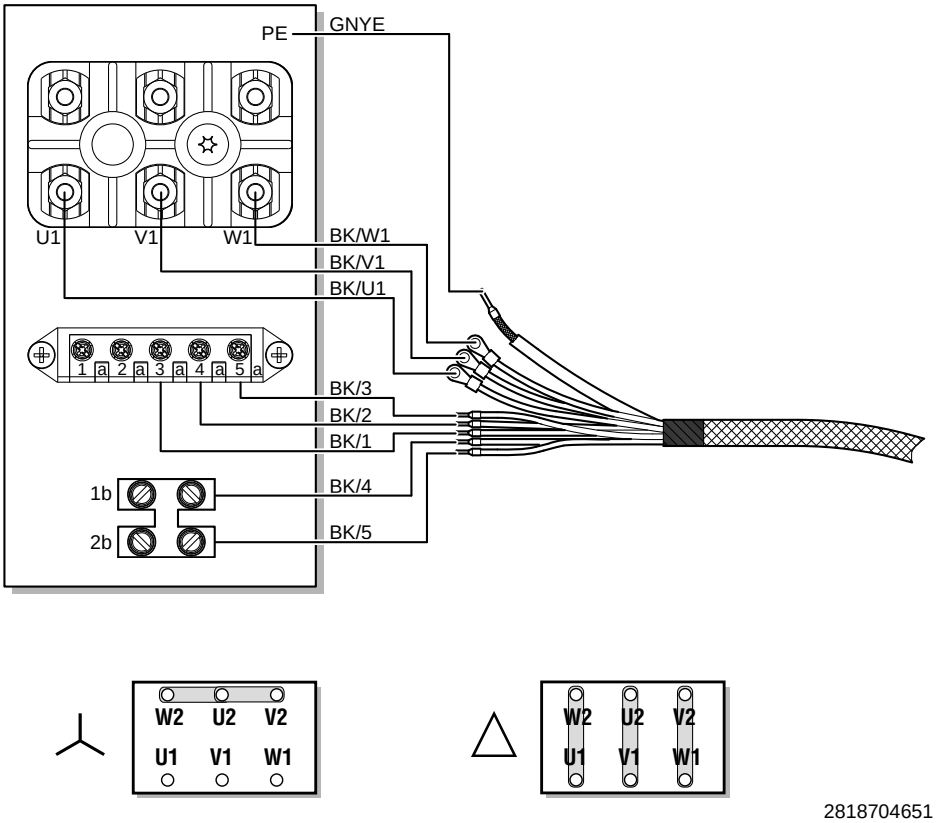
Connection of cables with open ends

The following tables shows the conductor assignment in cables with the following part numbers and the corresponding motor terminals of the DR motor:

- 1 811 045 2
- 1 811 047 9
- 1 812 198 5

DR motor terminal	Wire color/hybrid cable designation
U1	Black/U1
V1	Black/V1
W1	Black/W1
4a	Black / 1
3a	Black / 2
5a	Black / 3
1b	Black / 4
2b	Black / 5
PE connection	Green/yellow + shield end (inner shield)

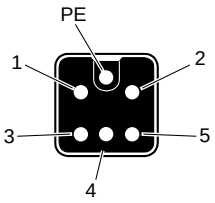
The following figure shows the connection of the cable to the terminal box of the DR motor. However, also observe the wiring diagram of the respective motor.



2818704651

7.11.8 X2301: Braking resistor (MOVIPRO® size 0 and 1)

The following table informs about this connection:

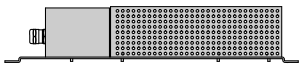
Function		
Power connection for external braking resistor		
Connection type		
Han® Q 5/0, female		
Wiring diagram		
 2442587659		
Assignment		
No.	**Name**	**Function**
1	n.c.	Not connected
2	n.c.	Not connected
3	+R	Braking resistor (+)
4	n.c.	Not connected
5	-R	Braking resistor (-)
PE	PE	PE connection

Connection cables

INFORMATION

For the **braking resistor BW100-004-00**, you do **not** have to order an additional cable! The braking resistor is delivered with mounted connection cable (with attached Han® Q 5/0).

The following table provides an overview of the cables available for this connection:

Connection cable and component			
MOVIPRO®	**Cable**	**Length/ Installation type**	**Component**
4.0 to 7.5 kW	**Part number: 1 172 291 6** Cable design: (3G2.5) Cable cross section: 2,5 mm²  Han® Q 5/0 — Open (conductor end sleeves)	Variable length 	**External braking resistor**  Terminal cross-section: 6 mm²

Connection of cables with open ends

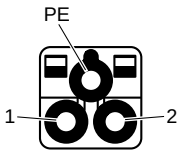
The following table shows the conductor assignment of the cable with the following part number:

1 172 291 6

Signal name	Color coding
+R	Black / 1
-R	Black / 2
PE connection	Green/yellow

7.11.9 X2303: Braking resistor (MOVIPRO® size 2)

The following table provides information about this connection:

Function		
Power connection for external braking resistor		
Connection type		
Han® Q 2/0, female, I-coded		
Wiring diagram		
 2442589963		
Assignment		
No.	**Name**	**Function**
1	+R	Braking resistor (+)
2	-R	Braking resistor (-)
PE	PE	PE connection

Connection cables The following table provides an overview of the cables available for this connection:

Connection cable and component			
MOVIPRO®	**Hybrid cable**	**Length/ Installation type**	**Component**
11.0 to 15.0 kW	**Part number 1 812 196 9** Cable design: (3G2.5) Cable cross section: 2.5 mm²  Han® Q 2/0 — Open (conductor end sleeves)	Variable length 	**External braking resistors**  Terminal cross section: 6 mm²
	Part number 1 812 197 7 Cable design: (3G6.0) Cable cross section: 6 mm²  Han® Q 2/0 — Open (conductor end sleeves)	Variable length 	

Connection of cables with open ends

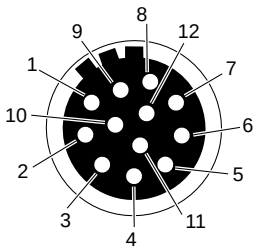
The following table shows the conductor assignment of the cables with the following part numbers:

- 1 812 196 9
- 1 812 197 7

Signal name	Color coding
+R	Black / 1
-R	Black / 2
PE connection	Green/yellow

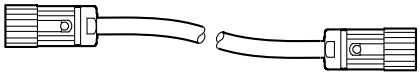
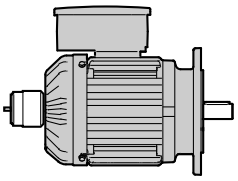
7.11.10 X3001: Motor encoder (resolver)

The following table informs about this connection:

Function		
Connection for resolver		
Connection type		
M23, P insert 12-pole, female, +20°-coded		
Wiring diagram		
 2459939339		
Assignment		
No.	**Name**	**Function**
1	Ref+	Reference voltage (+)
2	Ref-	Reference voltage (-)
3	Cos+	Cosine track (+)
4	Cos-	Cosine track (-)
5	Sin+	Sine track (+)
6	Sin-	Sine track (-)
7	res.	Reserved
8	res.	Reserved
9	TF/TH/KTY+	Motor temperature sensor (+)
10	TF/TH/KTY-	Motor temperature sensor (-)
11	res.	Reserved
12	res.	Reserved

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cable and component **Encoder cables**	**Length/ Installation type**	**Component**
Part number 1 172 492 7 Cable design: (4X2X0.25)  M23, 12-pole, 20°-coded — M23, 12-pole, 0°-coded	Variable length 	**Resolver RH1M, RH1L** 
Part number 1 172 643 1 Cable design: (4X2X0.25)  M23, 12-pole, 20°-coded — Open (conductor end sleeves)	Variable length 	

Connection of cables with open ends

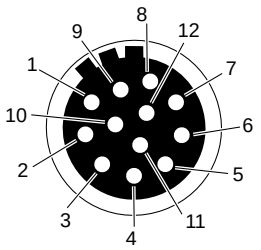
The following table shows the conductor assignment of the cable with the following part number:

1 172 643 1

Signal name	**Color coding**
Ref+	Pink
Ref-	Gray
Cos+	Red
Cos-	Blue
Sin+	Yellow
Sin-	Green
TF/TH/KTY+	White
TF/TH/KTY-	Brown

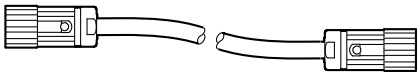
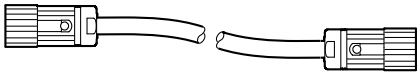
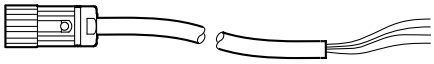
7.11.11 X3011: Motor encoder (HIPERFACE®, sin/cos, TTL, HTL, RS422)

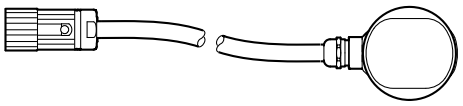
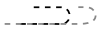
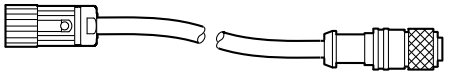
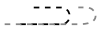
The following table provides information about this connection:

Function		
Connection for HIPERFACE®, sin/cos, TTL, HTL and RS422 encoders		
Connection type		
M23, P insert 12-pole, female, +20°-coded		
Wiring diagram		
 2459939339		
Assignment		
No.	**Name**	**Function**
1	C	Signal track C (K0)
2	/C	Negated signal track C (/K0)
3	A	Signal track A (K1)
4	/A	Negated signal track A (/K1)
5	B	Signal track B (K2)
6	/B	Negated signal track B (/K2)
7	Data-	Data line (-)
8	Data+	Data line (+)
9	TF/TH/KTY+	Motor temperature sensor (+)
10	TF/TH/KTY-	Motor temperature sensor (-)
11	GND	Reference potential
12	+12V	DC 12 V output[1)]

1) Total current load of DC 12 V encoder supply ≤ DC 650 mA.

Connection cable The following table provides an overview of the cables available for this connection:

Connection cable and component **Encoder cable**	**Length/ Installation type**	**Component**
Part number 1 812 145 4 (with temperature sensor) Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — M23, 12-pole, 0°-coded	Variable length	• **AK0H** • **AK1H** • **AS1H** • **EK0H** • **EK1H** • **ES1H**
Part number 1 812 192 6 (without temperature sensor) Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — M23, 12-pole, 0°-coded	Variable length	• **AS3H** • **AS4H** • **AV1H** • **AV6H**
Part number 1 812 143 8 (without temperature sensor) Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — Open (conductor end sleeves)	Variable length	• **A.7W** • **AG7Y** • **AS7Y** • **E.7C** • **E.7R** • **E.7S** • **EH1.** • **EI7.** • **EV1.** • **ES1.** • **ES2.**
Part number 1 812 144 6 (with temperature sensor) Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — Open (conductor end sleeves)	Variable length	• **AK1H** • **EK1H** • **ES1H** • **AS1H**

Connection cable and component Encoder cable	Length/ Installation type	Component
Part number 1 811 099 1 (without temperature sensor) Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — Encoder cover	Variable length 	• **A.7W** • **E.7C** • **E.7R** • **E.7S**
Part number 1 812 195 0 (without temperature sensor) Cable design: (4X2X0.25)  M23, 12-pole, 20°-coded — M12, 8-pole	Variable length 	**EI7.**

Connection of cables with open ends

The following table shows the conductor assignment of the cable with the following part number:

1 812 143 8

Signal name	Color coding
C	Brown
/C	White
A	Red
/A	Blue
B	Yellow
/B	Green
Data-	Violet
Data+	Black
GND	Gray pink + pink
+12V	Red blue + gray

The following table shows the conductor assignment of the cable with the following part number:

1 812 144 6

Signal name	Color coding
C	Pink
/C	Gray
A	Red
/A	Blue
B	Yellow
/B	Green
Data-	Violet

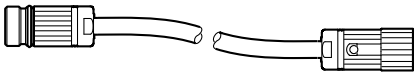
Signal name	Color coding
Data+	Black
TF/TH/KTY+	Brown
TF/TH/KTY-	White
GND	Gray pink
+12V	Red blue

Encoder signal reversal cable

INFORMATION

An additional encoder signal reversal cable is only necessary if you are using a phase reversal cable.

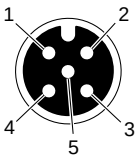
The following encoder signal reversal cable is available for this connection:

Connection cable Encoder signal reversal cable	Length/ Installation type	Component
Part number 1 811 480 6[1)] Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — M23, 12-pole, 20°-coded	Variable length 	**AK0H, AK1H, EK1H**

1) Not suitable for HIPERFACE® encoders.

7.11.12 X3211: Distance encoder (CANopen)

The following table provides information about this connection:

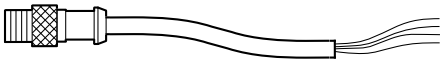
Function		
Connection for CANopen encoder		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	CAN_SHLD	Shield/equipotential bonding
2	+24V	DC 24 V output[1)]
3	GND	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

1) Total current load of DC 24 V encoder supply ≤ 400 mA.

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cable and component		
Cable	**Length/ Installation type**	**Component**
Length 5 m: Part no. 1 328 633 1 **Length 10 m: Part no. 1 328 635 8** **Length 15 m: Part no. 1 328 636 6** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 M12, female	Fixed length	**Sick DME4000, TR CE58M, TR LE200, WCS3(B)-LS410**

Connection cable and component Cable	Length/ Installation type	Component
Length 5 m: Part no. 1 328 140 2 **Length 10 m: Part no. 1 328 141 0** **Length 15 m: Part no. 1 328 142 9** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 — Open (conductor end sleeves)	Fixed length 	**Sick DME4000, TR CE58M, TR LE200, WCS3(B)-LS410**

Connection of cables with open ends

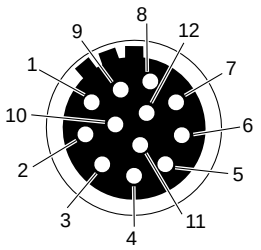
The following table shows the conductor assignment of the cables with the following part numbers:

- 1 328 140 2
- 1 328 141 0
- 1 328 142 9

Signal name	Color coding
CAN_SHLD	Gray
+24V	Red
GND	Black
CAN_H	White
CAN_L	Blue

7.11.13 X3222: Multi distance encoder (HIPERFACE®, SSI, sin/cos, TTL, HTL, RS422)

The following table provides information about this connection:

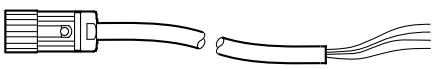
Function		
Connection for HIPERFACE®, SSI, sin/cos, TTL, HTL and RS422 encoders		
Connection type		
M23, P insert 12-pole, female, +20°-coded		
Wiring diagram		
 2459939339		
Assignment		
No.	**Name**	**Function**
1	CLK (C)	Clock line (Signal track C (K0))
2	/CLK (/C)	Negated clock line (Negated signal track C (/K0))
3	A	Signal track A (K1)
4	/A	Negated signal track A (/K1)
5	B	Signal track B (K2)
6	/B	Negated signal track B (/K2)
7	Data-	Data line (-)
8	Data+	Data line (+)
9	GND	Reference potential
10	+24V	DC 24 V output[1)]
11	GND	Reference potential
12	+12V	DC 12 V output[2)]

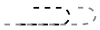
1) Total current load of DC 24 V encoder supply ≤ 400 mA.

2) Total current load of DC 12 V encoder supply ≤ 650 mA.

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cable and component		
Encoder cable	**Length/ Installation type**	**Component**
Part number 1 812 193 4 Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — Open (Conductor end sleeves)	Variable length 	**HIPERFACE® / SSI encoder (12 V)**

Connection cable and component Encoder cable	Length/ Installation type	Component
Part number 1 812 194 2 Cable design: (6X2X0.25)  M23, 12-pole, 20°-coded — Open (Conductor end sleeves)	Variable length 	**HIPERFACE® / SSI encoder (24 V)**

Connection of cables with open ends

The following table shows the conductor assignment of the cable with the following part number:

1 812 193 4

Signal name	Color coding
CLK (C)	Brown
/CLK (/C)	White
A	Red
/A	Blue
B	Yellow
/B	Green
Data-	Violet
Data+	Black
GND	Gray pink + pink
+12V	Red blue + gray

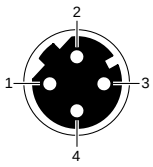
The following table shows the conductor assignment of the cable with the following part number:

1 812 194 2

Signal name	Color coding
CLK (C)	Brown
/CLK (/C)	White
A	Red
/A	Blue
B	Yellow
/B	Green
Data-	Violet
Data+	Black
GND	Gray pink + pink
+24V	Red blue + gray

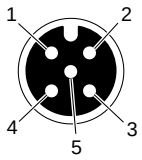
7.11.14 X4251: SBus^{PLUS} system bus

The following table informs about this connection:

Function		
EtherCAT®-based SEW system bus SBus^{PLUS}		
Connection type		
M12, 4-pole, female, D-coded		
Wiring diagram		
 2464600971		
Assignment		
No.	**Name**	**Function**
1	TX+	Transmit line (+)
2	RX+	Receive line (+)
3	TX-	Transmit line (-)
4	RX-	Receive line (-)

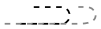
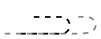
7.11.15 X4111: CAN interface (with DC 24 V)

The following table informs about this connection:

Function		
CAN bus for external components		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	CAN_SHLD	Shield/equipotential bonding
2	+24V	DC 24 V output
3	GND	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cables	Length/installation type
Length 5 m: Part no. 1 328 633 1 **Length 10 m: Part no. 1 328 635 8** **Length 15 m: Part no. 1 328 636 6** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 M12,	Fixed length 
Length 5 m: Part no. 1 328 140 2 **Length 10 m: Part no. 1 328 141 0** **Length 15 m: Part no. 1 328 142 9** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 Open (conductor end sleeves)	Fixed length 

Connection of cables with open ends

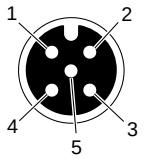
The following table shows the conductor assignment of the cables with the following part numbers:

- 1 328 140 2
- 1 328 141 0
- 1 328 142 9

Signal name	Color coding
CAN_SHLD	Gray
+24V	Red
GND	Black
CAN_H	White
CAN_L	Blue

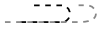
7.11.16 X4112: CAN interface (without DC 24 V)

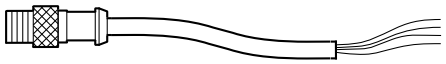
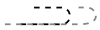
The following table provides information about this connection:

Function		
CAN bus for external components (electrically isolated)		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	CAN_SHLD	Shield/equipotential bonding
2	res.	Reserved
3	CAN_GND	CAN reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cables	Length/installation type
Length 5 m: Part no. 1 328 633 1 **Length 10 m: Part no. 1 328 635 8** **Length 15 m: Part no. 1 328 636 6** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 M12,	Fixed length 

Connection cables	Length/installation type
Length 5 m: Part no. 1 328 140 2 **Length 10 m: Part no. 1 328 141 0** **Length 15 m: Part no. 1 328 142 9** Cable design: ((1X2X0.2)+(1X2X0.32)+1X0.32)  M12 Open (conductor end sleeves)	Fixed length 

Connection of cables with open ends

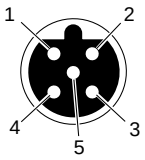
The following table shows the conductor assignment of the cables with the following part numbers:

- 1 328 140 2
- 1 328 141 0
- 1 328 142 9

Signal name	Color coding
CAN_SHLD	Gray
+24V	Red
GND	Black
CAN_H	White
CAN_L	Blue

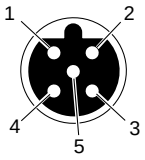
7.11.17 X4011: RS485 interface (with DC 24 V)

The following table informs about this connection:

Function		
RS485 interface for external components		
Connection type		
M12, 5-pole, female, B-coded		
Wiring diagram		
 2354431115		
Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	RS-	RS485 data line (-)
3	GND	Reference potential
4	RS+	RS485 data line (+)
5	res.	Reserved

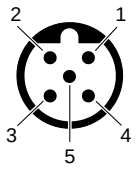
7.11.18 X4012: RS485 interface (without DC 24 V)

The following table provides information about this connection:

Function		
RS485 interface for external components (electrically isolated)		
Connection type		
M12, 5-pole, female, B-coded		
Wiring diagram		
 2354431115		
Assignment		
No.	**Name**	**Function**
1	res.	Reserved
2	RS-	RS485 data line (-)
3	RS_GND	RS485 reference potential
4	RS+	RS485 data line (+)
5	res.	Reserved

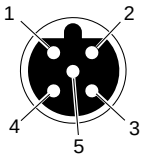
7.11.19 X4201: PROFIBUS input

The following table provides information about this connection:

Function		
PROFIBUS input		
Connection type		
M12, 5-pole, male, B-coded		
Wiring diagram		
 2461813259		
Assignment		
No.	**Name**	**Function**
1	res.	Reserved
2	A	PROFIBUS data line A (green)
3	res.	Reserved
4	B	PROFIBUS data line B (red)
5	res.	Reserved

7.11.20 X4202: PROFIBUS output

The following table provides information about this connection:

Function		
PROFIBUS output		
Connection type		
M12, 5-pole, female, B-coded		
Wiring diagram		
 2354431115		
Assignment		
No.	**Name**	**Function**
1	+5V	DC 5 V output
2	A	PROFIBUS data line A (green)
3	0V5	0V5 reference potential
4	B	PROFIBUS data line B (red)
5	res.	Reserved

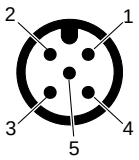
Bus termination

INFORMATION

If the unit is the last station in the bus, you must provide for a bus termination by connecting an according resistor to plug connector X4202.

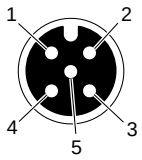
7.11.21 X4241: DeviceNet input

The following table provides information about this connection:

Function		
DeviceNet input		
Connection type		
M12, 5-pole, male, A-coded		
Wiring diagram		
 2264818187		
Assignment		
No.	**Name**	**Function**
1	Drain	Shield/equipotential bonding
2	V+	DC 24 V input
3	V-	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

7.11.22 X4242: DeviceNet output

The following table provides information about this connection:

Function		
DeviceNet output		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	Drain	Shield/equipotential bonding
2	V+	DC 24 V output
3	V-	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

Bus termination

INFORMATION

If the unit is the last station in the bus, you must provide for a bus termination by connecting an according resistor to plug connector X4242.

7.11.23 X4232_11 and X4232_12: Ethernet fieldbus

The following table provides information about this connection:

Function		
Ethernet fieldbus interface, 4-pole		
Connection type		
Push-pull RJ45		
Wiring diagram		
 2354433675		
Assignment		
No.	**Name**	**Function**
1	TX+	Transmit line (+)
2	TX-	Transmit line (-)
3	RX+	Receive line (+)
4	res.	Reserved
5	res.	Reserved
6	RX-	Receive line (-)
7	res.	Reserved
8	res.	Reserved

NOTICE

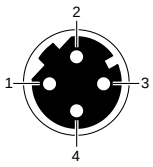
RJ45 patch cable without push-pull connector housing not snapped into place.

Damage to the push-pull RJ45 connection.

- Only use push-pull RJ45 mating connectors in accordance with IEC PAS 61076-3-117.

7.11.24 X4233_11 and X4233_12: Ethernet fieldbus

The following table provides information about this connection:

Function		
Ethernet fieldbus interface, 4-pole		
Connection type		
M12, 4-pole, female, D-coded		
Wiring diagram		
 2464600971		
Assignment		
No.	**Name**	**Function**
1	TX+	Sending cable (+)
2	RX+	Receiving cable (+)
3	TX-	Sending cable (-)
4	RX-	Receiving cable (-)

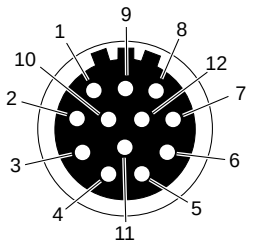
7.11.25 X4234_11 and X4234_12: Ethernet fieldbus

The following table informs about this connection:

Function		
Ethernet fieldbus interface, SCRJ / POF		
Connection type		
Push-pull SCRJ		
Wiring diagram		
 3419100299		
Assignment		
No.	**Name**	**Function**
1	Tx	Transmitting line (POF)
2	Rx	Receiving line (POF)

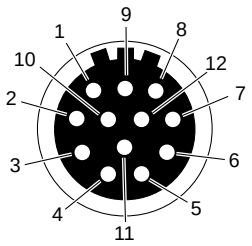
7.11.26 X5001_1: Digital inputs/outputs – communication and control unit

The following table provides information about this connection:

Function		
Digital inputs/outputs of the communication and control unit		
Connection type		
M23, P insert 12-pole, female, 0°-coded		
Wiring diagram		
 2264820107		
Assignment		
No.	**Name**	**Function**
1	DI00 / DO00	Binary input DI00 or binary output DO00
2	DI01 / DO01	Binary input DI01 or binary output DO01
3	DI02 / DO02	Binary input DI02 or binary output DO02
4	DI03 / DO03	Binary input DI03 or binary output DO03
5	DI04	Binary input DI04
6	DI05	Binary input DI05
7	DI06	Binary input DI06
8	DI07	Binary input DI07
9	0V24	0V24 reference potential
10	0V24	0V24 reference potential
11	+24V	DC 24 V output
12	FE	Equipotential bonding/functional ground

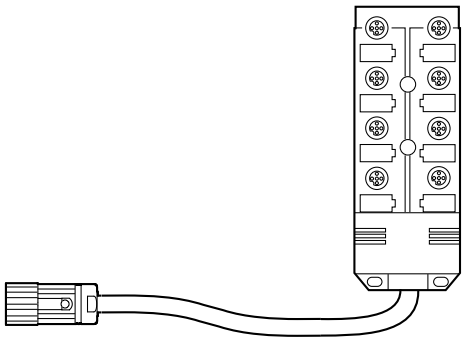
7.11.27 X5001_2: Digital inputs – communication and control unit

The following table provides information about this connection:

Function		
Digital inputs of the communication and control unit		
Connection type		
M23, P insert 12-pole, female, 0°-coded		
Wiring diagram		
 2264820107		
Assignment		
No.	**Name**	**Function**
1	DI08	Binary input DI08
2	DI09	Binary input DI09
3	DI10	Binary input DI10
4	DI11	Binary input DI11
5	DI12	Binary input DI12
6	DI13	Binary input DI13
7	DI14	Binary input DI14
8	DI15	Binary input DI15
9	0V24	0V24 reference potential
10	0V24	0V24 reference potential
11	+24V	DC 24 V output
12	FE	Equipotential bonding/functional ground

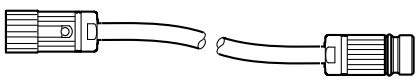
Connection cables

The following table shows the cables available for the connection X5001_1 and X5001_2:

Connection cable and component **Cable**	**Length/ Installation type**
Length 1 m: Part no. 1 330 926 9 **Length 2 m: Part no. 1 330 927 7** **Length 3 m: Part no. 1 330 928 5** **Length 5 m: Part no. 1 330 929 3** **Length 10 m: Part no. 1 330 930 7** Cable design: (3X0.75+8X0.34)  M23, 12-pole, male, 0°-coded Sensor/actuator box (8 M12 slots)	Fixed length 
Part number 1 174 145 7 Cable design: (6X2X0.25)  M23, 12-pole, male, 0°-coded Open (Conductor end sleeves)	Variable length 

Special cables

The following extension cable is available for the sensor/actuator box:

Sensor/actuator box extension cables	**Length/ Installation type**
Part number 1 812 346 5 Cable design: (6X2X0.25)  M23, 12-pole, male, 0°-coded (1:1 assignment) M23, 12-pole, female, 0°-coded	Variable length 

Connection of cables with open ends

The following table shows the conductor assignment of the cable with the following part number:

1 174 145 7

Core assignment X5001_1

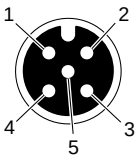
Signal name	Color coding
DI00	Pink
DI01	Gray
DI02	Red
DI03	Blue
DI04	Yellow
DI05	Green
DI06	Violet
DI07	Black
0V24	Brown
0V24	White
+24V	Gray pink
FE	Red blue

Core assignment X5001_2

Signal name	Color coding
DI08	Pink
DI09	Gray
DI10	Red
DI11	Blue
DI12	Yellow
DI13	Green
DI14	Violet
DI15	Black
0V24	Brown
0V24	White
+24V	Gray pink
FE	Red blue

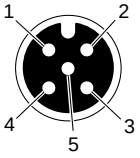
7.11.28 X5102_1: Digital inputs – power section

The following table provides information about this connection:

Function		
Digital inputs – power section		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	DI03	Binary input DI03
3	0V24	0V24 reference potential
4	DI02	Binary input DI02
5	FE	Equipotential bonding/functional ground

7.11.29 X5102_2: Digital inputs – power section

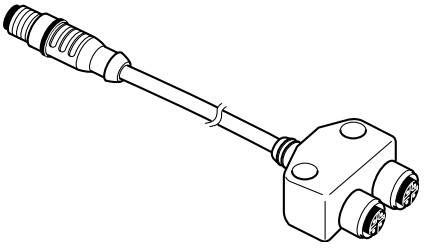
The following table provides information about this connection:

Function		
Digital inputs – power section		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	DI05	Binary input DI05
3	0V24	0V24 reference potential
4	DI04	Binary input DI04
5	FE	Equipotential bonding/functional ground

Y adapter

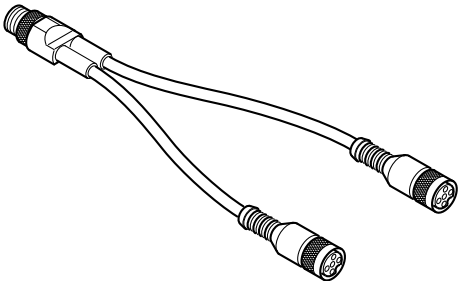
Use a Y adapter with extension for connecting 2 sensors/actuators to a M12 plug connector.

The Y adapter is available from different manufacturers:



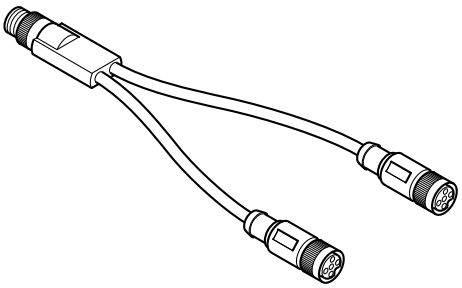
915294347

Manufacturer: Escha
Type: WAS4-0,3-2FKM3/..



1180380683

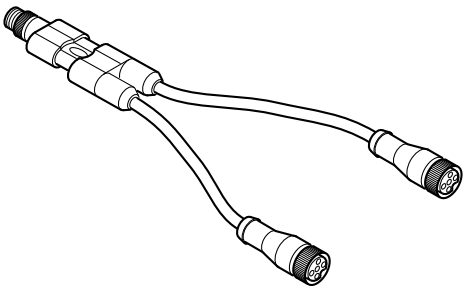
Manufacturer: Binder
Type: 79 5200 ..



1180375179

Manufacturer: Phoenix Contact
Type: SAC-3P-Y-2XFS SCO/.../...

The sheath of the cables is made of PVC. Provide suitable UV protection.

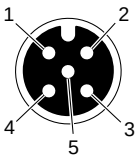


1180386571

Manufacturer: Murr
Type: 7000-40721-..

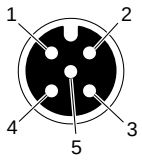
7.11.30 X5201: Analog input – power section

The following table provides information about this connection:

Function		
Analog input of the power section		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	AI1+_FU	Analog input 1 (+) – power section
3	GND	Reference potential
4	AI1-_FU	Analog input 1 (-) – power section
5	FE	Equipotential bonding/functional ground

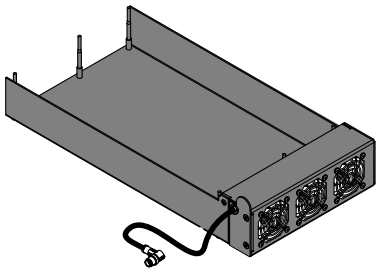
7.11.31 X5111: Fan subassembly (optional)

The following table provides information about this connection:

Function		
Temperature-controlled DC 24 V output for additional external fan		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	res.	Reserved
2	res.	Reserved
3	0V24	0V24 reference potential
4	+24V_FAN	DC 24 V output – fan (control signal)
5	res.	Reserved

Connection component

The following table shows the available component for this connection:

Connection component Fan subassembly	
Part number 1 270 970 0 Connection: M12	

7.11.32 X5502: STO-IN (safety relay)

WARNING

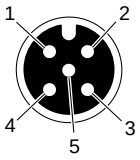
No safe disconnection of the unit if the connection is jumpered.

Severe or fatal injuries.

- Jumper this connection only if the unit will not perform any safety functions according to DIN EN ISO 13849-1.

This connection is marked by a yellow ring.

The following table provides information about this connection:

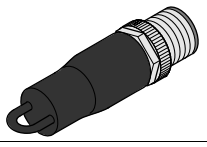
Function		
Input for safe torque off (STO)		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	STO-	0V24 reference potential for safe torque off (STO)
3	0V24	0V24 reference potential
4	STO+	DC 24 V input for safe torque off (STO)
5	res.	Reserved

INFORMATION

Use shielded cables only for this connection.

Connection component

The following table shows the available component for this connection:

Connection component
Jumper plug
Part number 1 174 709 9 Structure: bridged 1+4 / 2+3 Connection: M12 

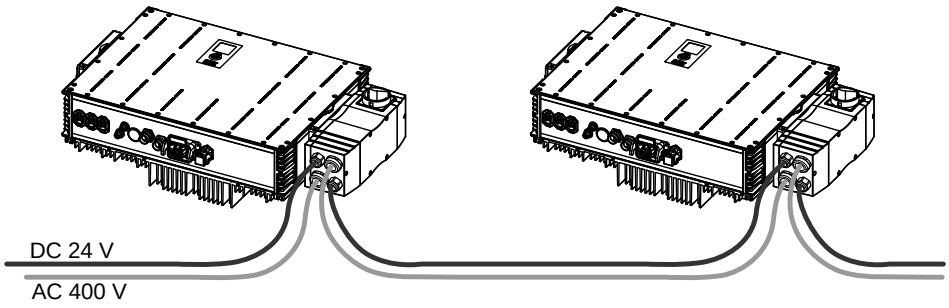
7.12 Power distribution with network supply

You can use a MOVIPRO® power interface to distribute energy from the supply system.

The MOVIPRO® power interface is equipped with the following inputs and outputs for power distribution:

- AC 400 V IN: max. 10 mm^2
- DC 24 V IN: max. 6 mm^2

The following figure shows the energy distribution for MOVIPRO® when the MOVIPRO® power interface is connected:



455787915

8 Startup

8.1 General information

INFORMATION

You must comply with the general safety instructions in section "Safety Notes / General information" during startup.

⚠ WARNING

Uncontrolled unit behavior due to ineffective emergency stop circuit.

Severe or fatal injuries.

- Comply with the installation notes.
- The installation must only be carried out by qualified personnel.

⚠ WARNING

Unit malfunction due to incorrect unit setting.

Severe or fatal injuries.

- Observe the startup instructions.
- The installation must only be carried out by qualified personnel.
- Check the parameters and data sets.
- Only use settings that are consistent with the function.

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Activate "safe stop".
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start-up automatically.

NOTICE

Danger due to arcing.

Damage to electrical components.

- Do not unplug the power connectors during operation. Do not plug in the power connectors during operation.

⚠ WARNING

Electric shock due to missing or defective protection covers.

Severe or fatal injuries.

- Install the protective covers according to the regulations.
- The installation must only be carried out by qualified personnel.
- Never start the unit if the protective covers are not installed.

⚠ WARNING

Electric shock due to open connections.

Severe or fatal injuries.

- The installation must only be carried out by qualified personnel.
- Never start the unit if the touch guard is not installed.

INFORMATION

To ensure fault-free operation, do not disconnect or connect the signal cables during operation.

8.2 Prerequisites

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Activate "safe stop".
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start-up automatically.

⚠ WARNING

Uncontrolled unit behavior due to ineffective emergency stop circuit.

Severe or fatal injuries.

- Comply with the installation notes.
- The installation must only be carried out by qualified personnel.

The following conditions apply to startup:

- The MOVIPRO® unit must be installed correctly both mechanically and electrically.
- The system and connected drives must be configured correctly.
- Appropriate safety measures are taken to prevent the drives from starting up unintentionally.
- Appropriate safety measures must be taken to prevent risk of injury or damage to machine.

The following hardware is required for startup:

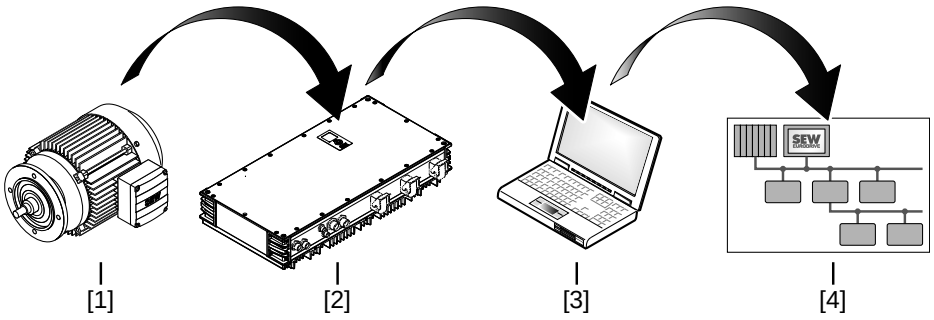
- PC or laptop with Ethernet interface
- Conventional Ethernet cable

INFORMATION

SEW-EURODRIVE recommends using an Ethernet cable with extended locking device (e.g. from Harting).

8.3 Sequence

The following table gives an overview of the MOVIPRO® startup procedure and lists other applicable documentation:



9007200459333259

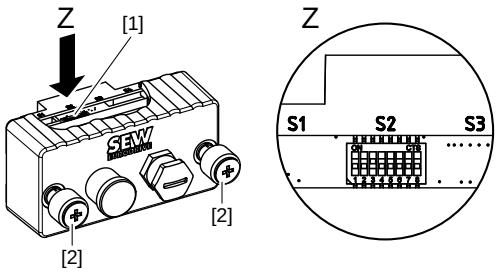
Fieldbus interface	[1] Motor startup	[2] MOVIPRO® startup	[3] Parameterization/programming	[4] Fieldbus configuration
PROFINET	Operating instructions of the motor	• These operating instructions • System manual "MOVIPRO® ADC"	• System manual "MOVIPRO® ADC" • Manual "MOVI-PLC® Programming in the PLC Editor"	Manual "MOVIPRO® ADC with PROFINET Interface"
PROFIBUS				Manual "MOVIPRO® ADC with PROFIBUS Interface" (In preparation)
EtherNet/IP Modbus/TCP				Manual "MOVIPRO® ADC with EtherNet/IP and Modbus/TCP Interface" (In preparation)
DeviceNet				Manual "MOVIPRO® ADC with DeviceNet Interface" (In preparation)

8.4 Setting the station address (PROFIBUS)

INFORMATION

Any changes to the station address during operation become effective after the power supply has been interrupted (DC 24 V reset).

Use the S2 DIP switch in the PROFIBUS® module to set the station address of the MOVIPRO. The default setting for the station address is 4. The following figure shows the DIP switch S2 ant its position on the PROFIBUS module:

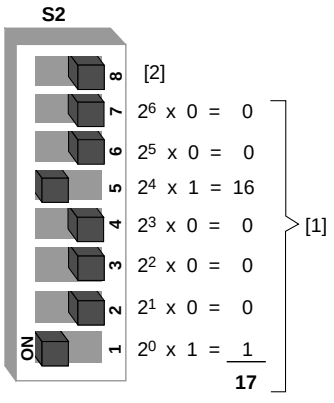


1642743307

[1] DIP switch S2
[2] Knurled screw

The DIP switch S2 is located on the top of the PROFIBUS module. You have to remove the PROFIBUS module to reach it. This does not interrupt the PROFIBUS network. Proceed as follows when removing the module:

1. Loosen the knurled screws.
2. Pull the PROFIBUS module from the MOVIPRO® unit to the front.
3. Use DIP switches 1 to 7 to set the PROFIBUS address. The following example shows the settings of the DIP switches for PROFIBUS address 17.



1946073995

[1] Example: Address 17
[2] Switch 8 = Reserved
Addresses 1 to 125: valid addresses
Addresses 0, 126, 127: are not supported

The following table uses PROFIBUS address 17 as an example to show how to determine the DIP switch settings for any bus address:

DIP switch setting	Significance
DIP 1 = ON	1
DIP 2 = OFF	2
DIP 3 = OFF	4
DIP 4 = OFF	8
DIP 5 = ON	16
DIP 6 = OFF	32
DIP 7 = OFF	64

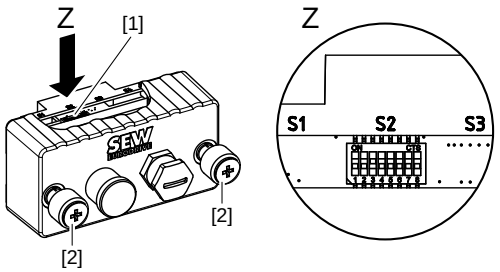
4. Connect the bus terminating resistor to the MOVIPRO® at the last bus station.
   - If MOVIPRO® is located at the end of a PROFIBUS segment, the unit can only be connected to the PROFIBUS network via the incoming PROFIBUS line.
   - To prevent malfunctions in the bus system due to reflections, etc., the PROFIBUS segment must be terminated using bus terminating resistors at the first and last stations.
5. Once plugged-in, secure the PROFIBUS module with both knurled screws.

8.5 Setting the station address (DeviceNet)

INFORMATION

Any changes to the station address during operation become effective after the power supply has been interrupted (DC 24 V reset).

Use the S2 DIP switch in the DeviceNet module to set the DeviceNet station address of the MOVIPRO®. The default setting for the station address is 4. The following figure shows the DIP switch S2 ant its position on the DeviceNet module:

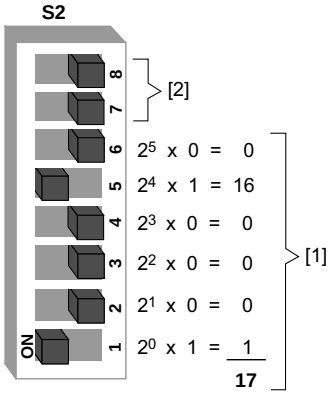


1642743307

[1] DIP switch S2
[2] Knurled screw

The DIP switch S2 is located on the top of the DeviceNet module. You have to remove the DeviceNet module to reach it. This does not interrupt the DeviceNet network. Proceed as follows when removing the module:

1. Loosen the knurled screws.
2. Pull the DeviceNet module from the MOVIPRO® unit to the front.
3. Use DIP switches 1 to 6 to set the DeviceNet address. The following example shows the settings of the DIP switches for DeviceNet address 17.



1951510539

[1] Example: Address 17
[2] Switch 7, 8 = Switches for setting the baud rate
Addresses 0 to 63: valid addresses

The following table uses DeviceNet address 17 as an example to show how to determine the DIP switch settings for any bus address:

DIP switch setting	Significance
DIP 1 = ON	1
DIP 2 = OFF	2
DIP 3 = OFF	4
DIP 4 = OFF	8
DIP 5 = ON	16
DIP 6 = OFF	32

4. Connect the bus terminating resistor to the MOVIPRO® at the last bus station.
   - If MOVIPRO® is located at the end of a DeviceNet segment, the unit can only be connected to the DeviceNet network via the incoming DeviceNet line.
   - To prevent malfunctions in the bus system due to reflections, etc, the DeviceNet segment must be terminated using bus terminating resistors at the first and last physical stations.
5. Once plugged-in, secure the DeviceNet module with both knurled screws.

8.5.1 Setting the baud rate

INFORMATION

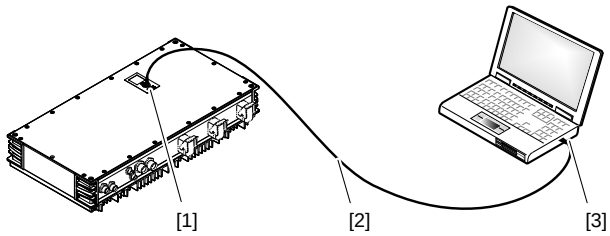
Any changes to the baud rate during operation become effective after the power supply has been interrupted (DC 24 V reset).

Use DIP switches 7 to 8 to set the baud rate:

DIP switch		Baud rate
7	8	
OFF	OFF	125 kBaud
ON	OFF	250 kBaud
OFF	ON	500 kBaud
ON	ON	Reserved

8.6 Connection to a PC/laptop

The following figure shows the connection between a PC/laptop and the engineering interface of the MOVIPRO®:



1204936459

[1] Service interface (Ethernet RJ45) of MOVIPRO®
[2] Conventional Ethernet cable
[3] Ethernet interface of the laptop

The following table shows the IP address and the subnet mask of the MOVIPRO®:

Ethernet service interface	
Standard IP address	**Subnetwork mask**
192.168.10.4	255.255.255.0

8.7 Programming

Information about programming can be found in the following documentation:

– "MOVI-PLC® Programming in the PLC Editor" system manual
– "MOVI-PLC® AxisControl Sample Project" manual
– "MPLCMotion_MDX and MPLCMotion_MX Libraries for MOVI-PLC®" manual

9 Operation

⚠ WARNING

When MOVIPRO® is switched on, dangerous voltages are present at the terminals as well as any connected cables and motor terminals. This also applies even when the MOVIPRO® unit is inhibited and the motor is at standstill.

Severe or fatal injuries from electric shock.

- Do not switch under load.
- Disconnect the MOVIPRO® unit from the power supply before you perform any work on the unit.
  Dangerous voltages may still be present for up to 10 minutes after disconnection from the power supply source.
- The unit output may only be switched when the output stage of the inverter is inhibited.

⚠ Warning

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Activate "safe stop".
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start-up automatically.

⚠ CAUTION

Hot surfaces.

Injury.

- Cover hot surfaces.
- Install protection devices as stipulated.
- Check the protection device.

⚠ WARNING

Electric shock due to charged capacitors

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

9.1 Cyclic duration factor (cdf)

The cyclic duration factor (cdf) is the ratio between the period of loading and the duration of the duty cycle. The duration of the duty cycle is the sum of times of operation and times at rest and de-energized. A typical value for the duration of the duty cycle is ten minutes.

$$cdf = \frac{\textit{Sum of times of operation (t1 + t2 + t3)}}{\textit{Cycle duration (T)}} \times 100\,\%$$

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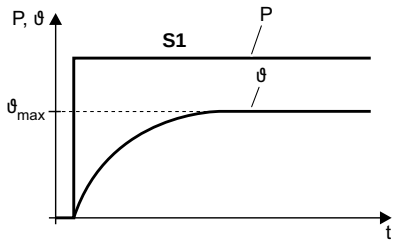
9.2 Operating modes

9.2.1 Duty type S1

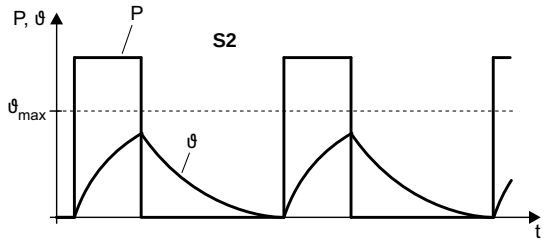
Continuous duty: Operation at a constant load; the motor reaches thermal equilibrium.



2325833867

9.2.2 Duty type S2

Short-time duty: Operation at constant load for a given time followed by a time at rest. The motor returns to ambient temperature during the rest period.



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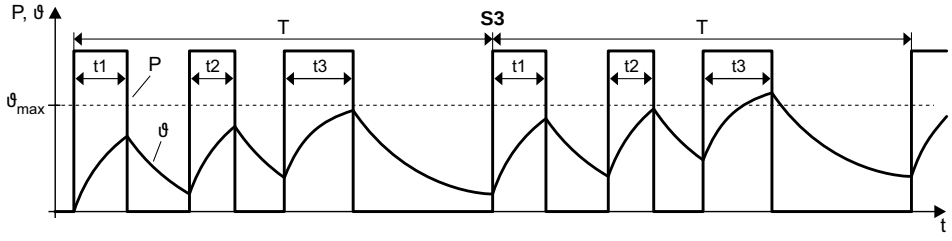
9.2.3 Duty type S3

Intermittent periodic duty: The starting current does not significantly affect the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the relative cyclic duration factor (cdf) in %.



2325831947

9.2.4 Duty types S4 – S10

Intermittent periodic duty: The switch-on sequence affecting the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the relative cyclic duration factor (cdf) in % and the number of cycles per hour.

9.3 Brake control operation

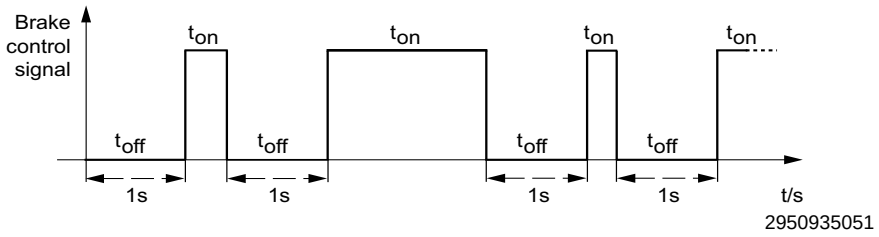
NOTICE

Damage to the brake controller if necessary off periods are not adhered to.
Damage to the drive system.

- Observe the required off periods for the brake controller.

9.3.1 Brake control under normal operating conditions, e.g. automatic operation of the plant

With a brake coil power of P ≥ 70 W, you must ensure a timeout of at least 1 second for brake control:



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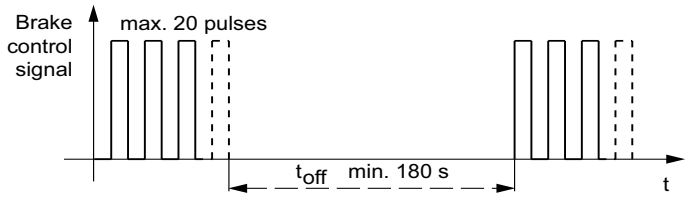
9.3.2 Brake control under special operating conditions, e.g. teach or jog mode

For teach or jog mode, for example, timeouts shorter than 1 second are possible. After 20 control pulses, a timeout of minimum 3 min is mandatory in this case.



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9.4 Status and error messages

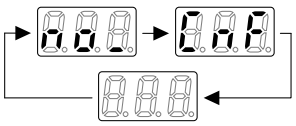
The 7-segment display informs about the status of the MOVIPRO® unit. In case of repeated malfunctions, contact the SEW Service staff.

The display of the three-digit 7-segment display shows the current status of the unit. If several statuses or errors are active at the same time, the error with the highest priority is displayed.

9.4.1 Parameterizable unit (CCU)

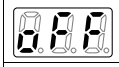
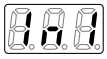
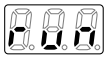
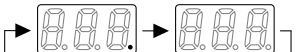
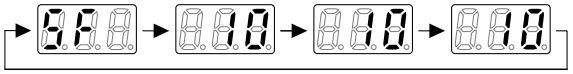
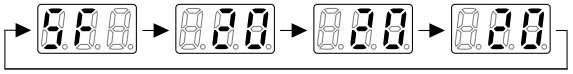
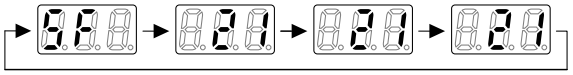
Initial startup

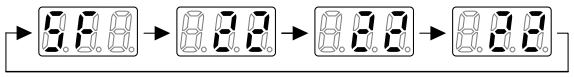
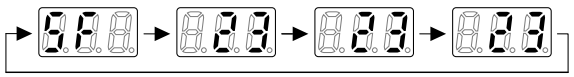
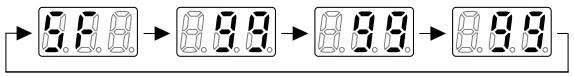
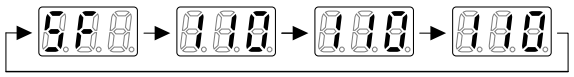
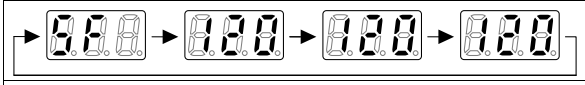
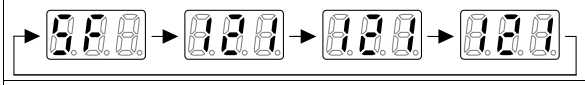
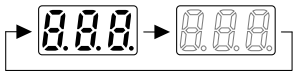
When you switch on the parameterizable MOVIPRO® ADC unit for the first time, it displays the following:

Display	Description
 **In combination with:** **S2:** Flashing green **S3:** Lights up green	No configuration has been loaded yet with Application Configurator.

Unit status

The following unit statuses are possible after successful initial configuration:

Display	Description
	Maintenance switch is switched off.
	Initialization: Trying to establish a connection to all internal components. This can take several minutes after a unit replacement.
	The connection has been established. The statuses of the components or the application are displayed after 3 s.
	Flashing dot: Application module of the "PFA-..." power section is running.
	Fieldbus error
	Communication error with the power section
	Error in external periphery
	Non-enabled application module loaded. Remedy: Set Parameter P802 "Factory settings" of the "PFA-..." power section to "Delivery status".
	Configuration with Application Configurator not completed.
	Data backup on SD memory card failed, upload aborted.
	Data backup on SD memory card failed, SD memory card is write-protected.

Display	Description
	Data recovery to MOVIPRO® failed, download aborted.
	Data recovery to MOVIPRO® failed, controller not inhibited.
	Internal system error
	Actuator voltage overload
	Overload sensor voltage group 1
	Overload sensor voltage group 2
	Internal communication error
 **In combination with:** **S2:** Flashing orange **S3:** Flashing green	Unit waiting for boot loader update.

9.4.2 Programmable unit (MOVI-PLC®)

The programmable MOVIPRO® ADC unit allows for user-defined control of the 7-segment display. Use the libraries available for MOVIPRO® for this purpose:

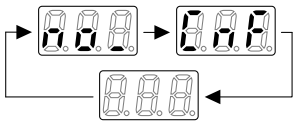
- PFH_P1D1_1_A (PROFIBUS, DeviceNet)
- PFH_E2E3_1_A (PROFINET, EtherNet/IP, Modbus/TCP)

INFORMATION

For the latest versions of the libraries, go to the "Software" area on the SEW-EURODRIVE website.

Initial startup

When you switch on the programmable MOVIPRO® ADC unit for the first time, it displays the following:

Display	Description
 **In combination with:** **S2:** Flashing green **S3:** Lights up green	No executable IEC program is loaded. Load your user program into the unit.

9.4.3 Inverter status

The inverter status is indicated by displaying the address/number of the axis and the corresponding status code in the form of A1.y.

INFORMATION

The unit status display takes priority over the inverter status display. If the maintenance switch is switched off of a fieldbus error occurs, no inverter status is displayed.

The following figure shows the display for the "Enable" status of axis 1:

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The following table shows the various status codes:

7-segment display	Unit status (high byte in status word 1)	Meaning
0	0_{dec}	DC 24 V operation (inverter not ready)
1	1_{dec}	Controller inhibit active
2	2_{dec}	No enable
3	3_{dec}	Standstill current
4	4_{dec}	Enable
5	5_{dec}	n-control (speed control)
6	6_{dec}	M-control (torque control)
7	7_{dec}	Hold control
8	8_{dec}	Factory setting
9	9_{dec}	Limit switch contacted
A	10_{dec}	Technology option
c	12_{dec}	IPOS$^{plus®}$ reference travel
d	13_{dec}	Flying start
E	14_{dec}	Calibrate encoder
F	Error code (page 142)	Error indicator (flashing)
U	17_{dec}	"Safe Stop" active
• (blinking dot)	–	Application module running

⚠ WARNING

Incorrect interpretation of display **U = "Safe stop" active**.

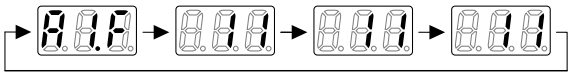
Severe or fatal injuries.

The display **U = "Safe stop" active** is not safety-related and must not be used as a safety function.

9.4.4 Inverter error

In case of an inverter error, the status display alternatively shows the address/number of the axis and 3 times the corresponding error code.

The following figure shows the display for an "Overtemperature" error of axis 1:



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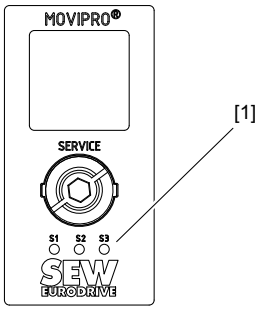
For a list of error codes, refer to section "Service" (page 142).

9.5 Status LED

The status LEDs are located on the service unit of MOVIPRO®. They show the fieldbus and unit status.



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[1] Status LEDs S1, S2, S3

9.5.1 Status LED S1 PROFINET IO

LED status	Status or cause of error	Remedy
Off	• PROFINET IO device is currently exchanging data with the PROFINET IO controller (Data Exchange).	–
Flashing green Flashing green/ red	• The flashing function in the PROFINET IO controller configuration is activated to visually localize the stations.	–
Lights up red	• Connection to the PROFINET IO controller has failed. • PROFINET IO device does not detect a link. • Bus interruption • PROFINET IO controller is not in operation.	• Check the PROFINET connection of the MOVIPRO®. • Check the PROFINET IO controller. • Check the cabling of your PROFINET network.
Flashing yellow Lights up yellow	• The STEP 7 hardware configuration contains a module that is not permitted.	• Switch the STEP 7 hardware configuration to ONLINE and analyze the component status of the slots in the PROFINET IO device.

9.5.2 Status LED S1 PROFIBUS

LED status	Status or cause of error	Remedy
Off	• Unit is currently exchanging data with the DP master (data exchange).	–
Flashing	• Unit has detected the baud rate, but is not addressed by DP master. • Unit was not configured in DP master or configured incorrectly.	• Check the PROFIBUS address setting in MOVIPRO® and in the configuration software of the DP master. • Check configuration of the DP master.
Lights up red	• Connection to the DP master has failed. • Unit does not detect PROFIBUS baud rate. • Possible bus interruption. • DP master not in operation	• Check the PROFIBUS-DP connection on the MOVIPRO® unit. • Check the project planning of the DP master. • Check the cabling of your PROFIBUS network.

9.5.3 Status LED S1 EtherNet/IP and Modbus/TCP

LED status	Meaning
Off	• MOVIPRO® has no IP parameters yet.
Flashing green/ red	• MOVIPRO® is performing an LED test.
Flashing green	• There is no controlling IO connection.
Lights up green	• There is a controlling EtherNet/IP IO connection.
Lights up red	• Conflict detected in the assigned IP addresses. Another station in the network uses the same IP address.
Flashing red	• The previously established controlling IO connection is in timeout state. The state is reset by restarting communication.

9.5.4 Status LED S1 DeviceNet

LED status	Status	Meaning
Off	• Not switched on / off-line	• Unit is offline. • Unit is performing DUP MAC check. • Unit is switched off.
Flashing green	• Online and in operational mode	• The unit is online and no connection has been established. • DUP-MAC check performed successfully. • A connection has not yet been established with a master. • Missing, incorrect or incomplete configuration.
Lights up green	• Online, operational mode and connected	• Online • Connection has been established with a master. • Connection is active (established state).
Flashing red	• Minor error or connection timeout	• A correctable fault has occurred. • A unit error is active. • Polled I/O and/or bit-strobe I/O connections are in timeout state.
Lights up red	• Critical error or critical link failure	• A correctable fault has occurred. • BusOff status • DUP-MAC check has detected an error.

9.5.5 Status LED S2 PLC status

LED status	Status or cause of error	Remedy
Flashing green	• The firmware of the communication and control unit is running correctly.	–
Flashing green/ orange	• Data backup is created/restored.	–
Lights up orange	• Boot process is active.	–
Flashing orange	• Firmware is being updated or • Bootloader update required.	–
Flashing red	• No SD card plugged in. • File system of the SD card corrupt. • Boot process has failed.	• Switch the unit off and back on again. If the error occurs repeatedly, contact the SEW Service staff.

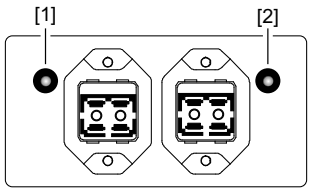
9.5.6 Status LED S3 IEC program status

LED status	Status or cause of error	Remedy
Lights up green	• IEC program is running.	–
Flashing green	• Program has stopped. • Bootloader update required.	• Start the IEC program.
Off	• No program is loaded.	• Load an IEC program into the communication and control unit.

9.5.7 Status LED FO1 and FO2 Ethernet connection push-pull SCRJ

The two LEDs "FO1" and "FO2" indicate the signal quality of the respective optical transmission line.

The following figure shows the positions of the two LEDs:



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[1] FO1
[2] FO2

LED status	Status or cause of error	Remedy
Off	The signal level is 2 dB or more. The signal quality is good.	–
Yellow light	The optical signal level has fallen below 2 dB. This can have the following reasons: • Aging effect of the polymer fiber • The plug connector is not properly connected. • The externally connected cable is faulty or damaged.	• Check whether the plug connector is properly connected. • Check the attenuation of the externally connected cable.

10 Service

10.1 Inspection/maintenance

The MOVIPRO® does not require any maintenance. SEW-EURODRIVE does not stipulate any regular inspection work. However, it is recommended that you check the following parts regularly:

- Connection cables:

  Damaged or fatigue cables must be replaced immediately.

- Cooling fins:

  Remove any residue. Otherwise, sufficient cooling is not ensured.

- Fan subassembly, if applicable:

  The individual axial fans of the fan subassembly must be checked for operability.

INFORMATION

Repairs may only be carried out by SEW-EURODRIVE

10.2 Unit replacement

10.2.1 Notes on replacing units

The MOVIPRO® unit allows for a quick unit replacement. The MOVIPRO® unit is equipped with a replaceable memory card on which all unit data can be stored.

If a unit has to be replaced, the plant can be started up again quickly by simply re-plugging the memory card.

After the startup procedure, you have to download the unit data to the memory card.

INFORMATION

Prerequisites for successful unit replacement

- The units that you want to swap must be identical. If the units have different configurations, a successful unit replacement cannot be guaranteed.
- You must save the data of the old unit on the SD memory card **before** you replace the unit. SEW-EURODRIVE recommends to always backup the data right after starting up a unit.

Observe the following notes when replacing a unit:

- Only insert the memory card when the MOVIPRO® unit is switched off.
- After the replacement, the parameters last saved on the SD card are used.
- If an **absolute encoder** is used as motor encoder or distance encoder, you have to perform a reference travel during initial startup or after a unit or encoder replacement.
- If you are using an encoder with **HIPERFACE® interface**, a unit or encoder replacement is detected automatically and the "IPOS reference" is reset.
- If you are using an encoder with **SSI interface**, you have to adapt the encoder position to the mechanical plant conditions by carrying out another reference travel.

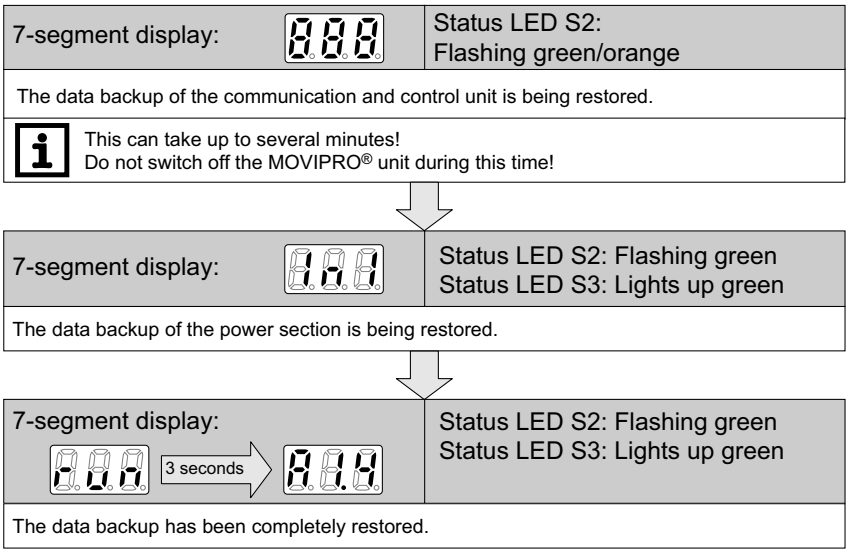
Important for programmable units:

- The 7-segment display depends on the programming.
  Requirement: The module for the data backup function (data management) must be integrated in the program.

10.2.2 Unit replacement (parameterizable unit "PFH-..1AC.-B..-I10.-00/.../000")

Proceed as follows to replace the MOVIPRO®:

1. Perform a data backup now if you are not certain whether the current unit parameterization is stored on the SD card.
2. Disconnect the MOVIPRO® unit from the power supply and remove it from the system.
3. Remove the memory card of the unit via the service cover plate on the MOVIPRO® housing cover.
4. Insert the memory card into a new MOVIPRO® unit via the service cover plate.
5. Install the new MOVIPRO® unit in the system and connect it to the power supply.
6. Switch on the new MOVIPRO® unit.



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7. Now the parameters stored on the card are available. If you want the new MOVIPRO® unit to have a different parameter set, change the parameter set now, and save the changes on the memory card after startup.
8. For applications with motor encoder or synchronous encoder, you have to perform a reference travel.

10.2.3 Unit replacement (programmable unit "PFH-..1AT.-B..-I10.-00/.../000")

Proceed as follows to replace the MOVIPRO®:

1. Perform a data backup now if you are not certain whether the current unit parameterization is stored on the SD card.
2. Disconnect the MOVIPRO® unit from the power supply and remove it from the system.
3. Remove the memory card of the unit via the service cover plate on the MOVIPRO® housing cover.
4. Insert the memory card into a new MOVIPRO® unit via the service cover plate.
5. Install the new MOVIPRO® unit in the system and connect it to the power supply.
6. Switch on the new MOVIPRO® unit.

7-segment display: 	Status LED S2: Flashing green/orange
The data backup of MOVIPRO® is being restored.	
This can take up to several minutes! Do not switch off the MOVIPRO® unit during this time!	

7-segment display: The display depends on the IEC program.	Status LED S2: Flashing green Status LED S3: Lights up green
The data backup has been completely restored.	

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7. Now the parameters stored on the card are available. If you want the new MOVIPRO® unit to have a different parameter set, change the parameter set now, and save the changes on the memory card after startup.
8. For applications with motor encoder or synchronous encoder, you have to perform a reference travel.

10.3 Encoder exchange

10.3.1 Replacing incremental encoders

Incremental encoders for positioning always require a reference travel after startup. This is why there are no special measures required in the event of a unit or encoder (motor) replacement.

10.3.2 Replacing absolute encoders.

MOVIPRO® stores the position of absolute encoders with 32 bit. This allows for representing a larger absolute area than with an encoder with typical 12 bits in the single-turn range and 12 bits in the multi-turn range. However, this also means that you must reference the encoder in case of a unit or encoder (motor) replacement.

10.3.3 Replacing linear encoder systems

If you replace an absolute linear encoder system without encoder overflow in such a way that the encoder system provides the same values as before the replacement, a reference travel is not required.

10.3.4 Replacing HIPERFACE® encoders

With HIPERFACE® encoders, you can use parameter P948 to specify whether or not a reference travel is required after an encoder replacement.

10.4 Fault information of the frequency inverter

For information on the functionality of the inverter, refer to the following documentation:

Documentation
"MOVIPRO® ADC with PROFINET Interface" manual

10.4.1 Error memory

The error memory (P080) stores the last five error messages (errors t-0 to t-4) of the inverter. The oldest error message is deleted whenever more than 5 error messages have occurred.

The following information is stored when a malfunction occurs:

- Error occurred
- Status of binary inputs/outputs
- Operating status of the inverter
- Inverter status
- Heat sink temperature
- Speed
- Output current
- Active current
- Unit utilization
- DC link voltage
- Hours of operation
- Enable hours
- Parameter set
- Motor utilization

10.4.2 Switch-off responses

There are the following switch-off responses of the inverter depending on the error: In all cases, the inverter of the MOVIPRO® unit remains inhibited in error status.

Immediate switch-off
The unit can no longer brake the drive. In the event of an error, the output stage goes to high-resistance and the brake is applied immediately.

Rapid stop
The drive is decelerated with the stop ramp. The brake is applied when the stop speed is reached. The output stage goes to high resistance after the brake application time has elapsed.

Emergency stop
The drive is decelerated with the emergency stop ramp. The brake is applied when the stop speed is reached. The output stage goes to high resistance after the brake application time has elapsed.

Safe stop
A safe stop is triggered by a safety relay. The frequency inverter no longer supplies power to the motor for generating torque. At the same time, the brake is de-energized.

10.4.3 Reset

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Set the controller inhibit.
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start-up automatically.

An error message can be acknowledged by:

- Switching the voltage supply off and then on

  Always maintain a minimum switch-off time of 1 minute.
- Reset using the parameters of the frequency inverter
- Reset via the process data interface.

Auto reset performs up to 5 unit resets with an adjustable restart time.

10.5 MOVIPRO® ADC error list

The factory set error response is listed in the "Response (P)" column. "(P)" means that the response can be set with parameter *P83_error response*.

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
00	No error					
01	Overcurrent	Immediate disconnection	0	Output stage	• Short circuit at output • Motor too large • Faulty output stage • Ramp limit is deactivated and set ramp time is too short • Braking resistance value too low • Short circuit in the braking resistor circuit	• Rectify the short circuit • Connect a smaller motor • Consult SEW Service if the output stage is defective. • Extend the ramp time • Check technical data of braking resistor • Check the supply cable of the braking resistor
			1	V_{CE} monitoring or undervoltage monitoring of the unit driver		
			5	Inverter remains in hardware current limit		
03	Ground fault	Immediate disconnection	0			
04	Brake chopper	Immediate disconnection	0	DC link voltage too high in 4Q operation	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Brake resistance too high • Brake chopper defective	• Extend deceleration ramps • Check supply cable to braking resistor • Check technical data of braking resistor • Replace MOVIPRO® if the brake chopper is defective
			1			
06	Line phase failure	Immediate disconnection	0	DC link voltage periodically too low	Phase failure	Check the line cable
07	DC link overvoltage	Immediate disconnection	0	DC link voltage too high in 2Q operation	DC link voltage too high	• Extend deceleration ramps • Check supply cable to the braking resistor • Check technical data of braking resistor
			1			

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
08	Speed monitoring	Immediate disconnection (P)	0	Inverter in current limit or in slip limit	• Speed/current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase failure in the power system or motor. • Encoder not connected correctly or incorrect direction of rotation • n_{max} is exceeded during torque control. • In operating mode VFC: Output frequency > 150 Hz • In operating mode V/f: Output frequency > 600 Hz	• Reduce load • Increase delay time setting (*P501 or P503*). • Check encoder connection, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limitation • Extend ramps if necessary • Check motor cable and motor • Check line phases
			3	"Actual speed" system limit exceeded. Speed difference between ramp setpoint and actual value for 2 × ramp time higher than expected slip		
			4	Maximum rotating field speed exceeded Maximum rotating field frequency (with VFC max 150 Hz and V/f max 600 Hz) exceeded		
09	Startup	Immediate disconnection	0	Startup missing	The inverter has not been started up for the selected operating mode or the encoder data has not been loaded yet.	Perform the startup for the respective operating mode or start up the encoder.
			1	Wrong operating mode selected		
			2	Wrong encoder type or defective encoder card		
10	IPOS-ILLOP	Emergency stop	0	Invalid IPOS$^{plus®}$ command	• Incorrect command detected during execution of the IPOS$^{plus®}$ program • Incorrect conditions during command execution	• Check the content of the program memory and, if necessary, correct. • Load the correct program into the program memory • Reload the application module
11	Overtemperature	Emergency stop (P)	0	Heat sink temperature too high or defective temperature sensor	Thermal overload of inverter	Reduce load and/or ensure adequate cooling
			3	Overtemperature switched-mode power supply		

Error			Suberror		Possible cause	Measure
Code	Designation	Response (P)	Code	Designation		
14	Encoder	Immediate disconnection	0	Encoder not connected, defective encoder, defective encoder cable	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
			25	Motor encoder error – Speed range exceeded Encoder exceeds 6542 rpm		
			26	Motor encoder error – Card is defective. Error in the quadrant evaluation.		
			27	Encoder error – encoder connection or encoder is defective		
			28	Encoder error – Communication error RS485 channel.		
			29	External encoder error – Communication error RS485 channel		
			30	Unknown encoder type on the external encoder/motor encoder		
			31	Plausibility error of HIPERFACE® on the external encoder/motor encoder Increments have been lost.		
			32	HIPERFACE® motor encoder error HIPERFACE® encoder on motor encoder reports an error		
			33	HIPERFACE® external encoder error HIPERFACE® encoder on external encoder reports an error		
			34	Revolver motor encoder error Encoder connection or encoder is defective.		
17	System malfunction	Immediate disconnection	0	"Stack overflow" error	Inverter electronics disrupted, possibly due to effect of EMC	• Check grounding and shielding and improve, if necessary • Consult SEW service if the error occurs again
18			0	"Stack underflow" error		
19			0	"External NMI" error		
20			0	"Undefined opcode" error		
21			0	"Protection fault" error		
22			0	"Illegal word operand access" error		
23			0	"Illegal instruction access" error		
24			0	"Illegal external bus access" error		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
25	EEPROM	Rapid stop	0	Read or write error on EEPROM power section	Error while accessing EEPROM	• Restore factory settings, perform reset and reset parameters. • Consult SEW service if the error reoccurs
			11	NV memory read error Internal NVRAM		
			13	NV memory chip card System module defective		
			14	NV memory chip card Memory card defective		
			16	NV memory initialization error		
26	External terminal	Emergency stop (P)	0	External terminal	Read external error signal via programmable input	Eliminate respective cause; reprogram terminal if necessary
27	No limit switches	Emergency stop	0	Both limit switches missing or open circuit	• Open circuit/both limit switches missing • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches • Swap limit switch connections • Reprogram terminals
			2	Limit switch reversed		
			3	Both limit switches are active simultaneously		
29	Limit switch contacted	Emergency stop	0	Hardware limit switch approached	A limit switch has been reached in IPOS$^{plus®}$ mode (only with application module).	• Check travel range • Correct operator program
30	Emergency stop Timeout	Immediate disconnection	0	Emergency stop ramp time exceeded	• Drive overloaded • Emergency stop ramp too short	• Check configuration • Extend emergency stop ramp
31	TF/TH sensor tripped	No response (P)	0	Thermal motor protection error	• Motor too hot, TF/TH has triggered • TF/TH of the motor not connected or connected incorrectly • MOVIDRIVE® connection and TF/TH connection on motor interrupted	• Let motor cool off and reset error • Check connections/link between MOVIDRIVE® and TF/TH. • Set P835 to "No response"
32	IPOS index overflow	Emergency stop	0	IPOS$^{plus®}$ program is faulty	Programming principles violated leading to system-internal stack overflow	Reload the application module
34	Ramp Timeout	Immediate disconnection	0	Rapid stop ramp timeout	Downward ramps timeout, e.g. due to overload.	• Extend the downwards ramps • Eliminate overload
35	Operating mode	Immediate disconnection	0	Operating mode not available	Operating mode not defined or defined incorrectly	Use P700/P701 to set correct operating mode
			1	Wrong assignment operating mode - hardware		
37	System watchdog	Immediate disconnection	0	"System watchdog overflow" error	Error while executing system software	Consult SEW Service
38	System software	Immediate disconnection	0	"System software" error	System malfunction	Consult SEW Service
39	Reference travel	Immediate disconnection (P)	0	"Reference travel" error	• The reference cam is missing or does not switch • Limit switches are connected incorrectly • Reference travel type was changed during reference travel	• Check reference cam • Check limit switch connection • Check reference travel type setting and required parameters.

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
40	Boot synchronization	Immediate disconnection	0	Timeout during boot synchronization	Error during boot synchronization between inverter and option.	Consult SEW service if the error reoccurs
41	Watchdog option	Immediate disconnection	0	Error – Watchdog timer from/to option.	Error in communication between system software and option software	Consult SEW Service
42	Lag error	Immediate disconnection (P)	0	Positioning lag error	• Encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrect speed controller parameters • Value of lag error tolerance too small	• Check encoder connection • Extend ramps • Set P component to higher value • Reset speed controller parameters • Increase lag error tolerance • Check wiring of encoder, motor and line phase. • Check whether mechanical system components can move freely or if they are blocked
44	Unit utilization	Immediate disconnection	0	Unit utilization error	Unit utilization (IxT value) > 125%	• Decrease power output • Extend ramps • If suggested actions are not possible, use a larger inverter • Reduce load
			8	U_L monitoring error		
45	Initialization	Immediate disconnection	0	General error during initialization	No parameters set for EEPROM in power section, or parameters set incorrectly	Restore factory settings (*P802*). Consult SEW service if the error cannot be reset.
			3	Data bus error during RAM check		
			6	CPU clock error		
			7	Error in the current evaluation		
			10	Error when setting flash protection		
			11	Data bus error during RAM check		
47	System bus 1 timeout	Rapid stop (P)	0	Timeout system bus CAN1	Error during communication via system bus 1.	Check system bus connection
57	TTL encoder	Immediate stop	1	TTL encoder: Broken wire		
			512	TTL encoder: Error in amplitude control		
			541	TTL encoder: Incorrectly set numerator/ denominator values		Set the correct system numerator/denominator values.
			16385	TTL synchronous encoder: Broken wire		
			16896	TTL synchronous encoder: Error in amplitude control		
			16898	TTL synchronous encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
58	Sin/cos encoder	Immediate stop	1	Sin/cos encoder: Broken wire		
			512	Sin/cos encoder: Error in amplitude control		
			514	Sin/cos encoder: Track signal error		
			515	Sin/cos encoder: Incorrectly set numerator/ denominator values		Set the correct system numerator/denominator values.
			16385	Sin/cos synchronous encoder: Broken wire		
			16896	Sin/cos synchronous encoder: Error in amplitude control		
			16898	Sin/cos synchronous encoder: Track signal error		
			16899	Sin/cos synchronous encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.
59	Encoder communication	Rapid stop	1	HIPERFACE® encoder: Track signal error		
			2	HIPERFACE® encoder: Calibration error	Incorrect calibration of encoder	• Restore factory settings (P802) • Repeat encoder startup
			16	HIPERFACE® encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			64			
			128			
			192			
			256			
			320			
			384			
			448			
			512			
			576			
			1024	EnDat encoder: Communication error	MOVIPRO® and EnDat encoder connection interrupted	Check wiring
			1088			
			1152			
			1216			
			1280			
			1388			
			16385	HIPERFACE® synchronous encoder: Track signal error		
			16386	HIPERFACE® synchronous encoder:	Incorrect calibration of encoder	• Restore factory settings (P802) • Repeat encoder startup

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
59	Encoder communication	Rapid stop	16400	HIPERFACE® synchronous encoder: Communication error	MOVIPRO® and HIPERFACE® synchronous encoder connection interrupted	Check wiring
			16448			
			16512			
			16576			
			16640			
			16704			
			16768			
			16832			
			17408	EnDat synchronous encoder: Communication error	MOVIPRO® and EnDat synchronous encoder connection interrupted	Check wiring
			17472			
			17536			
			17600			
			17664			
			17772			
77	IPOS control word	No response (P)	0	Invalid control word IPOS$^{plus®}$	**Only in IPOS$^{plus®}$ mode:** • An attempt was made to set an invalid automatic mode (via external controller). • "P916 = Bus ramp" is set.	• Check serial connection to external controller • Check write values of external controller • Set correct value for P916
78	IPOS SW limit switch	No response (P)	0	Software limit switch reached	**Only in IPOS$^{plus®}$ mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check the user program • Check position of software limit switches
80	RAM test	Immediate disconnection	0	"RAM test" error	Internal unit error, RAM defective.	Consult SEW Service
81	Start condition	Immediate disconnection	0	Start condition error with "VFC & hoist"	**Only in "VFC & hoist" mode:** The motor could not be supplied with the correct amount of current during the pre-magnetizing time: • Rated motor power too small in relation to rated inverter power • Motor cable cross section too small	• Check startup data and perform new startup, if necessary. • Check connection between inverter and motor • Check cross section of motor cable and increase if necessary
82	Open output	Immediate disconnection	0	Output open with "VFC & hoist"	**Only in "VFC & hoist" mode:** • 2 or all output phases interrupted • Rated motor power too small in relation to rated inverter power	• Check connection between inverter and motor • Check startup data and perform new startup, if necessary.
84	Motor protection	Emergency stop (P)	0	"Motor temperature emulation" error	• Motor utilization too high. • I_N-U_L monitoring 1 triggered • P530 set later to "KTY"	• Reduce load • Extend ramps • Observe longer pause times • Check P345/P346 • Select a larger motor
			2	Short circuit or open circuit in the temperature sensor		
			3	No thermal motor model available		
			4	U_L monitoring error		
			11	Temperature sensor short circuit		

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
88	Flying start	Immediate disconnection	0	"Flying start" error	**Only in "VFC n control" mode:** Actual speed > 6000 rpm when inverter enabled	Enable not unless current speed ≤ 6000 rpm
94	EEPROM checksum	Immediate disconnection	0	Power section parameters	Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send unit in for repair.
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
97	Copy error	Immediate disconnection	0	Parameter set upload is/was faulty	• Error during data transmission • Memory can neither be written nor read	• Repeat copying process • Restore default setting (P802) and repeat copying process
			1	Parameter set download to unit cancelled		
			2	Not possible to adopt parameters		
98	CRC error	Immediate disconnection	0	"CRC via internal flash" error	Internal unit error Flash memory defective	Send unit in for repair
99	IPOS ramp calculation	Immediate disconnection	0	"Ramp calculation" error	**Only in IPOS$^{plus®}$ mode:** Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter.	Rewrite the IPOS$^{plus®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.
100	Vibration warning	Display error (P)	0	Vibrations diagnostics warning	Vibration sensor warning (see "DUV10A" operating instructions)	• Determine cause of vibrations • Continue operation until F101 occurs
101	Vibration error	Rapid stop (P)	0	Vibration diagnostics error	Vibration sensor signals error	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display error (P)	0	Oil aging warning	Error message from the oil aging sensor	Schedule oil change
103	Oil aging error	Display error (P)	0	Oil aging error	Error message from the oil aging sensor	SEW-EURODRIVE recommends that you change the gear unit oil immediately.
104	Oil aging overtemperature	Display error (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
105	Oil aging ready signal	Display error (P)	0	Oil aging ready signal	Oil aging sensor is not ready for operation	• Check voltage supply of oil aging sensor • Check and, if necessary, replace the oil aging sensor
106	Brake wear	Display error (P)	0	Brake wear error	Brake lining worn	Replace brake lining (see "Motors" operating instructions)
110	"Ex-e protection" error	Emergency stop	0	Duration of operation below 5 Hz exceeded	Duration of operation below 5 Hz exceeded	• Check configuration • Shorten duration of operation below 5 Hz
116	"Timeout" error	Rapid stop/ warning	0	Internal communication timeout		• Check startup • Check wiring

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	1	Plausibility check		Check the cables of the sine tracks or replace the encoder
			2	HIPERFACE® encoder: Unknown encoder type		
			3	HIPERFACE® encoder: Corrupt encoder nameplate data		
			32	HIPERFACE® encoder: Internal encoder error		Replace the encoder
			33	HIPERFACE® encoder: Analog voltages not within tolerance		
			34	HIPERFACE® encoder: Internal encoder error		Replace the encoder
			35			
			36			
			37			
			38			
			39			
			40			
			41	HIPERFACE® encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			42			
			43			
			44			
			45			
			46	HIPERFACE® encoder: Internal encoder error		Replace the encoder
			47			
			48			
			49			
			50			
			60	HIPERFACE® encoder: Analog voltages not within tolerance		
			61	HIPERFACE® encoder: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder
			62	HIPERFACE® encoder: Critical encoder temperature		Replace the encoder
			63	HIPERFACE® encoder: Position error	Speed too high, position cannot be created	set slower speed
			64	HIPERFACE® encoder: Internal encoder error		Replace the encoder
			65			
			66			
			67			
			256	SSI encoder: Voltage dip	12 V voltage supply broken in	Check SSI encoder voltage supply
			257	SSI encoder: Clocking or data line interrupted		Check connection to SSI encoder
			258	SSI encoder: Change of position		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	259	SSI encoder: Insufficient clock frequency		Set a higher cycle frequency
			260	SSI encoder: Encoder signals programmable error		Check encoder parameterization
			261	SSI encoder: No high level present		• Replace the encoder • Consult SEW Service
			513	EnDat encoder: Plausibility check		
			514	EnDat encoder: Internal encoder error		Replace the encoder
			515			
			516			
			544			
			576	EnDat encoder: Internal encoder warning		Check encoder parameterization
			768	CANopen encoder: PDO timeout	No PDO data from CANopen encoder	• Check interface • Check the configuration
			769	CANopen encoder: Encoder signals programmable error		Check encoder parameterization
			770	CANopen encoder: Change of position		
			771	CANopen encoder: Emergency signal		Check encoder
			772	CANopen encoder: Internal encoder error		Replace the encoder
			773			
			774			
			16385	HIPERFACE® synchronous encoder: Plausibility check		
			16386	HIPERFACE® synchronous encoder: Unknown encoder type		
			16387	HIPERFACE® synchronous encoder: Corrupt encoder nameplate data		
			16417	HIPERFACE® synchronous encoder: Analog voltages not within tolerance		
			16418	HIPERFACE® synchronous encoder: Internal encoder error		Replace the encoder
			16419			
			16420			
			16421			
			16422			
			16423			
			16424			
			16425	HIPERFACE® synchronous encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			16426			
			16427			
			16428			
			16429			

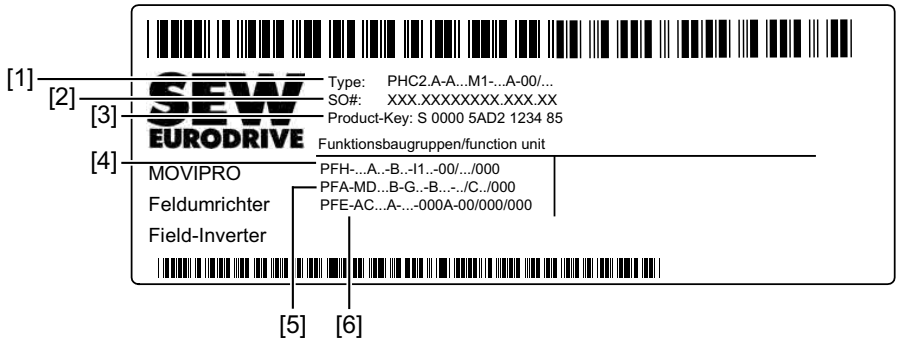
Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	16430	HIPERFACE® sync. enc.: Internal encoder error		Replace the encoder
			16431			
			16432			
			16433			
			16434			
			16444	HIPERFACE® sync. enc.: Analog voltages not within tolerance		
			16445	HIPERFACE® sync. enc.: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder
			16446	HIPERFACE® sync. enc.: Critical encoder temperature		Replace the encoder
			16447	HIPERFACE® sync. enc.: Position error	Speed too high, position cannot be created	set slower speed
			16448	HIPERFACE® sync. enc.: Internal encoder error		Replace the encoder
			16449			
			16450			
			16451			
			16640	SSI synchronous encoder: Voltage dip	12 V voltage supply broken in	Check SSI encoder voltage supply
			16641	SSI synchronous encoder: Clocking or data line interrupted		Check connection to SSI encoder
			16642	SSI synchronous encoder: Change of position		
			16643	SSI synchronous encoder: Insufficient clock frequency		Set a higher cycle frequency
			16644	SSI synchronous encoder: Encoder signals programmable error		Check encoder parameterization
			16645	SSI synchronous encoder: No high level present		• Replace the encoder • Consult SEW Service
			16897	EnDat synchronous encoder: Plausibility check		
			16898	EnDat synchronous encoder: Internal encoder error		Replace the encoder
			16899			
			16900			
			16928			
			16960	EnDat synchronous encoder: Internal encoder warning		Check encoder parameterization
			17152	CANopen synchronous encoder: PDO timeout	No PDO data from CANopen synchronous encoder	Check interface or configuration
			17153	CANopen synchronous encoder: Encoder signals programmable error		Check encoder parameterization
			17154	CANopen synchronous encoder: Change of position		
			17155	CANopen synchronous encoder: Emergency signal		Check encoder
			17156	CANopen synchronous encoder: Internal encoder error		Replace the encoder
			17157			
			17158			

10.6 SEW Electronics Service

If a fault cannot be solved, please contact the SEW-EURODRIVE Service (see the section "Address List").

Please have the following information at hand when you consult the SEW Service:

- Unit designation [1]
- Serial number [2]
- Product key [3]
- Function units [4], [5], [6]
- Brief description of the application
- Nature of the fault
- Accompanying circumstances (e.g. initial startup)
- Your own assumptions
- Any unusual events preceding the problem, etc.



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[1] Type designation
[2] Serial number
[3] Product key
[4] Communication and control unit
[5] Power section
[6] Energy supply

10.7 Shutdown

To shut down the MOVIPRO® unit, disconnect the unit using appropriate measures.


10 minutes

⚠ WARNING

Electric shock due to charged capacitors

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

10.8 Storage

Observe the following instructions when shutting down or storing MOVIPRO®:

- If you shut down and store the unit for a longer period, you must cover the connections with the protective caps supplied.
- Only store the unit on the cooling fins or on the side without connectors.
- Make sure that the unit is not subject to mechanical impact during storage.
- Connect the unit to the power supply for at least 5 minutes every 2 years.

Observe the notes on storage temperature in the "Technical Data" chapter.

10.9 Disposal

Observe the applicable national regulations.

Dispose of materials separately in accordance with the regulations in force, for example:

- Electronics scrap (circuit boards)
- Plastics
- Sheet metal
- Copper
- Aluminum

11 Technical Data

11.1 Standards and certification

11.1.1 Applicable standards and directives

MOVIPRO® was developed and tested in accordance with the following standards:

- EN 13849-1:2007
- EN 61800-3:2007
- EN 61800-5-1:2007
- EN 61800-5-2:2007

11.1.2 CE marking

The CE mark on the nameplate shows that the product meets the requirements of the following directives:

- 2006/42/EC: (Machinery Directive)
- 2006/95/EC: (Low Voltage Directive)

The following harmonized standards were applied for development and testing:

Harmonized standard	For compliance with
EN 61800-5-1:2007	Low Voltage Directive
EN ISO 13849-1:2008	Machinery Directive

MOVIPRO® is a component intended for installation in machines or systems. Provided the installation instructions are complied with, they satisfy the relevant requirements for the CE marking for the entire machine/system in which they are installed, on the basis of 2004/108/EC.

11.1.3 UL / cUL

UL and cUL approvals (USA and Canada) have been granted for this MOVIPRO® unit type. cUL is equivalent to the CSA approval.

c UL us LISTED

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11.2 Design with 400 V/50 Hz operating point

MOVIPRO®						
Size		**Size 0**	**Size 1**		**Size 2**	
Performance class		**2.2 kW**	**4.0 kW**	**7.5 kW**	**11.0 kW**	**15.0 kW**
Input						
Supply system connection		3-phase AC connection				
Supply voltage Permitted range	V_{line}	3 AC 380 V – 3 AC 500 V (V_{supply} = AC 380 V -10% – AC 500 V +10%)				
Line frequency	f_{line}	50 – 60 Hz ± 5%				
Nominal line current 100% (at V_{line} = 3 AC 400 V)[1)]	I_{line}	AC 5.0 A	AC 8.6 A	AC 14.4 A	AC 21.6 A	AC 28.8 A
Output						
Apparent output power (at V_{line} = 3 AC 380 – 500 V)	S_N	3.8 kVA	6.6 kVA	11.2 kVA	16.8 kVA	22.2 kVA
Motor power S1	P_{Mot}	2.2 kW (3.0 HP)	4.0 kW (5.4 HP)	7.5 kW (10 HP)	11.0 kW (15 HP)	15.0 kW (20 HP)
Nominal output current	I_N	AC 5.5 A	AC 9.5 A	AC 16 A	AC 24 A	AC 32 A
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on capacity utilization				
Internal current limitation	I_{max}	0 – 150% adjustable				
External braking resistor	R_{min}	68 Ω	33 Ω		15 Ω	
Output voltage	V_O	0 – V_{line}				
PWM frequency	f_{PWM}	Adjustable: 4/8/12/16 kHz (factory setting: 4 kHz)				
Speed range / resolution	n_R / Δn_R	-6000 - +6000 rpm / 0.2 rpm over the entire range				
Power loss at P_N	P_{Vmax}	60 W	100 W	200 W	400 W	550 W
Motor cable length		Max. 30 m (98 ft)				
Motor protection		TF, TH or KTY				
Duty type		S1 (EN 60034-1)				
Permitted length of the braking resistor cable		Max.15 m (49 ft)				
General						
Degree of protection		IP54				
Interference immunity		Meets EN 61800-3				
Interference emission		Limit value class C2 to EN 61800-3				
Ambient temperature	ϑ_A	+5 – +40 °C (+41 – +104 °F), Non-condensing, no moisture condensation; Unit is intrinsically safe with respect to temperature.				
		(P_N reduction: 3% per K up to a maximum of 60°C or 50 °C in units with push-pull SCRJ)				
Climate class		EN 60721-3-3, class 3K3				
Storage temperature	ϑ_L	-25 – +70 °C (-13 – 158 °F) EN 60721-3-3, class 3K3				
Permissible oscillation and impact load		Complies with EN 50178				
Overvoltage category		III according to IEC 60664-1 (VDE 0110-1)				
Pollution class		2 according to IEC 60664-1 (VDE 0110-1) within the housing				
Installation altitude		• Up to h < 1000 m (3281 ft) without restrictions • The following restrictions apply at h ≥ 1000 m (3284 ft): – from 1000 m (3281 ft) to max. 4000 m (13120 ft): I_N reduction by 1% per 100 m (328 ft) – from 2000 m (6562 ft) to max. 4000 m (13120 ft): U_N reduction by AC 6 V per 100 m (328 ft) • Above 2000 m (6562 ft) for overvoltage class 2 only. • External measures are required for overvoltage class 3. • Overvoltage classes according to DIN VDE 0110-1.				

MOVIPRO®					
Size	**Size 0**	**Size 1**		**Size 2**	
Performance class	**2.2 kW**	**4.0 kW**	**7.5 kW**	**11.0 kW**	**15.0 kW**
Mass	15.9 kg (35.1 lb)	18.5 kg (40.8 lb)		29.5 kg (65 lb) With fan: 31 kg (68 lb)	
Dimensions W x H x D	480 mm x 190 mm x 300 mm (18.9 in x 5.91 in x 11.8 in)			570 mm x 190 mm x 420 mm (22.4 in x 7.48 in x 16.5 in)	

1) The line and output currents must be reduced by 20% from the nominal values for V_{line} = 3 AC 500 V.

11.2.1 R15 regenerative power supply

The following table shows the technical data of the R15 regenerative power supply:

R15 regenerative power supply		
Nominal line current 100% (at V_{line} = 3 AC 400 V)	I_{line}	AC 28.8 A
Apparent output power (at V_{line} = 3 AC 380 – 500 V)	S_N	25 kVA
Motor power S1	P_{Mot}	15.0 kW (20 HP)
Power loss at P_N	P_{Vmax}	550 W

11.3 Brake control

11.3.1 AC 230 V, AC 400 V and AC 460 V

Brake control		**AC 230 V**	**AC 400 V**	**AC 460 V**
Brake voltage	V_B	DC 96 V	DC 167 V	DC 190 V
AC brake coil voltage		AC 230 V	AC 400 V	AC 460 V
Nominal output current	I_N	DC 1.2 A	DC 0.7 A	DC 0.6 A
Acceleration current	I_B	4 – 8.5 times the holding current depending on the brake type		
Max. output power	P_O	$P_O \leq 120$ W		
Brake output		The data refers to the SEW standard brake coils (two-coil system)		

11.3.2 DC 24 V

Brake control		**DC 24 V**
Brake voltage	V_B	DC 24 V
Nominal output current	I_N	DC 1.4 A
Acceleration current	I_B	–
Max. output power	P_O	33 W
Brake type		The data refer to SEW brakes BP01 – BP5 (single-coil system, no acceleration)

11.4 Digital inputs

Digital inputs	
Number of inputs	12 – 16
Input type	PLC-compatible according to EN 61131-2 (digital inputs type 3) Signal level +15 – +30 V "1" = contact closed Signal level −3 – +5 V "0" = contact open
Potential reference	0V24_C
The overall current consumption of the I/O periphery (including the encoder) should not exceed DC 2.5 A.	

11.5 Digital outputs

Digital outputs	
Number of outputs	0 – 4
Output type Rated current	PLC-compatible according to to EN 61131-2, interference-voltage proof and short-circuit proof (up to 30 V) 500 mA
Potential reference	0V24_C
The overall current consumption of the I/O periphery (including the encoder) should not exceed DC 2.5 A.	

11.6 General electronics

General electronics data	
Power supply to control electronics 24V_C(ontinous)	V_{IN} = DC 24 V -15% / +20% according to EN 61131-2 I_E ≤ 700 mA, typically 500 mA (for MOVIPRO® electronics; with external DC 24 V supply without connected 400 V)
Sensor/actuator supply 24V_C(ontinous)	V_{IN} = DC 24 V -15% / +20% according to EN 61131-2 I_E ≤ 2000 mA for sensor/actuator supply (depending on the number and type of the connected sensors/actuators) 4 outputs with 500 mA each
Electrical isolation	Separate potentials for: • Floating fieldbus connection • 24V_C for MOVIPRO® electronics and sensor/actuator supply
Analog input A11	Operating mode: DC 0 – +10 V or DC -10 V – +10 V Resolution: 12 bit Sampling time: 1 ms Internal resistance: 40 kΩ

11.7 Safety technology

	2.2 kW – 7.5 kW		11.0 kW – 15.0 kW	
Safety function	Power consumption	Input capacitance	Power consumption	Input capacitance
STO	2.5 W	27 µF	7.5 W	270 µF
STO + SBC	3.7 W	32 µF	8.7 W	275 µF
X5502				
Rated output current	DC 500 mA			
Maximum output current	DC 2 A			
The DC 24 V input voltage must comply with DIN EN 61131-2. The DC 24 V output voltage complies with DIN EN 61131-2.				

11.8 Communication and control unit

11.8.1 DeviceNet interface

DeviceNet interface	
Protocol variant	Master/slave connection set according to DeviceNet specification version 2.0
Supported baud rates	• 125 kBd • 250 kBd • 500 kBd
Maximum line length	See DeviceNet specification version 2.0
125 kBd	500 m
250 kBd	250 m
500 kBd	100 m
Bus termination	120 Ω (switch on externally)
Process data configuration	"MOVIPRO® SDC with DeviceNet Interface" manual
Address setting	Address (MAC-ID) 0 – 63 can be set via DIP switches 2^0 to 2^5 in the DIP module
DP ID number	$600E_{hex}$ (24590_{dec})
Supported services	• Polled I/O: 1 – 10 words • Bit-strobe I/O: 1 – 4 words • Explicit messages: – Get_Attribute_Single – Set_Attribute_Single – Reset – Allocate_MS_Connection_Set – Release_MS_Connection_Set
EDS file name	SEW_MOVIPRO.EDS
Name of icon file	SEW_MOVIPRO.ICO

11.8.2 EtherNet/IP interface

EtherNet/IP interface	
Supported baud rates	10 / 100 Mbit/s (full duplex, with automatic detection)
Connection technology	M12 (D-coded)
Integrated switch	Supports auto-crossing, auto-negotiation
Maximum line length (from switch to switch)	100 m according to IEEE 802.3
Addressing	• 4-byte IP address or MAC ID (00-0F-69-xx-xx-xx) • configurable via DHCP server or MOVITOOLS® MotionStudio as of version 5.6 • Default address: 192.168.10.4
Manufacturer ID	$013B_{hex}$
EDS file name	SEW_MOVIPRO.EDS
Name of icon file	SEW_MOVIPRO.ICO

11.8.3 Modbus/TCP interface

Modbus/TCP interface	
Supported baud rates	10 / 100 Mbit/s (full duplex, with automatic detection)
Connection technology	M12 (D-coded) / RJ45 (push-pull)
Integrated switch	Supports auto-crossing, auto-negotiation
Maximum line length (from switch to switch)	100 m according to IEEE 802.3
Addressing	• 4-byte IP address or MAC ID (00-0F-69-xx-xx-xx) • configurable via DHCP server or MOVITOOLS® MotionStudio as of version 5.6 • Default address: 192.168.10.4
Supported services	• FC3 • FC16 • FC23 • FC43

11.8.4 PROFIBUS interface

PROFIBUS interface	
Protocol options	PROFIBUS DP and DP-V1 to IEC 61158
Supported baud rates	9.6 kBaud - 1.5 MBaud / 3-12 MBaud (with automatic detection)
Bus termination	Not integrated. Activate bus termination with suitable PROFIBUS connector with switchable terminating resistors.
Maximum line length	
9.6 kBd	1200 m
19.2 kBd	1200 m
93.75 kBd	1200 m
187.5 kBd	1000 m
500 kBd	400 m
1.5 MBaud	200 m
12 MBaud	100 m
	To extend the length, several segments can be coupled via repeater. For information regarding the maximum expansion/cascading depth, refer to the documentation of the DP Master or the repeater modules.
Address setting	Address 1 – 125 can be set via DIP switches 2^0 to 2^7 in the PROFIBUS module
DP ID number	$600E_{hex}$ (24590_{dec})
GSD file name	SEW_600E.GSD
Bitmap file name	• SEW600EN.bmp • SEW600ES.bmp

11.8.5 PROFINET interface

PROFINET interface	
PROFINET protocol option	PROFINET IO RT
Supported baud rate	100 Mbit/s (full duplex)
SEW ID number	$010A_{hex}$
Devices ID number	4
Connection technology	M12 (D-coded) / RJ45 (push-pull)
Integrated switch	Supports auto-crossing, auto-negotiation
Permitted cable types	Category 5 and higher, class D according to IEC 11801
Maximum cable length (from switch to switch)	100 m according to IEEE 802.3
GSD file name	GSDML-V2.1-SEW-MOVIPRO-YYYYMMDD.xml
Bitmap file name	SEWMOVIPRO1.bmp

11.8.6 CAN interface

CAN interface	
General information	• Complies with CAN specification 2.9, parts A and B, transmission technology according to ISO 11898 • Maximum of 64 stations • Max. 64 SCOM objects / 256 receive objects
Address range	0 – 63
Baud rate	125 kBd – 1 MBd
Protocol	• In layer 2 (SCOM cyclical/acyclical) or • According to SEW MOVILINK® protocol
Bus termination	The interface is equipped with a terminating resistor (120 Ω) inside the unit.
DC 24 V output (variant with DC 24 V)	• DC 24 V ± 10% • Max. 500 mA
The overall current consumption of the I/O periphery (including the encoder) should not exceed DC 2.5 A.	

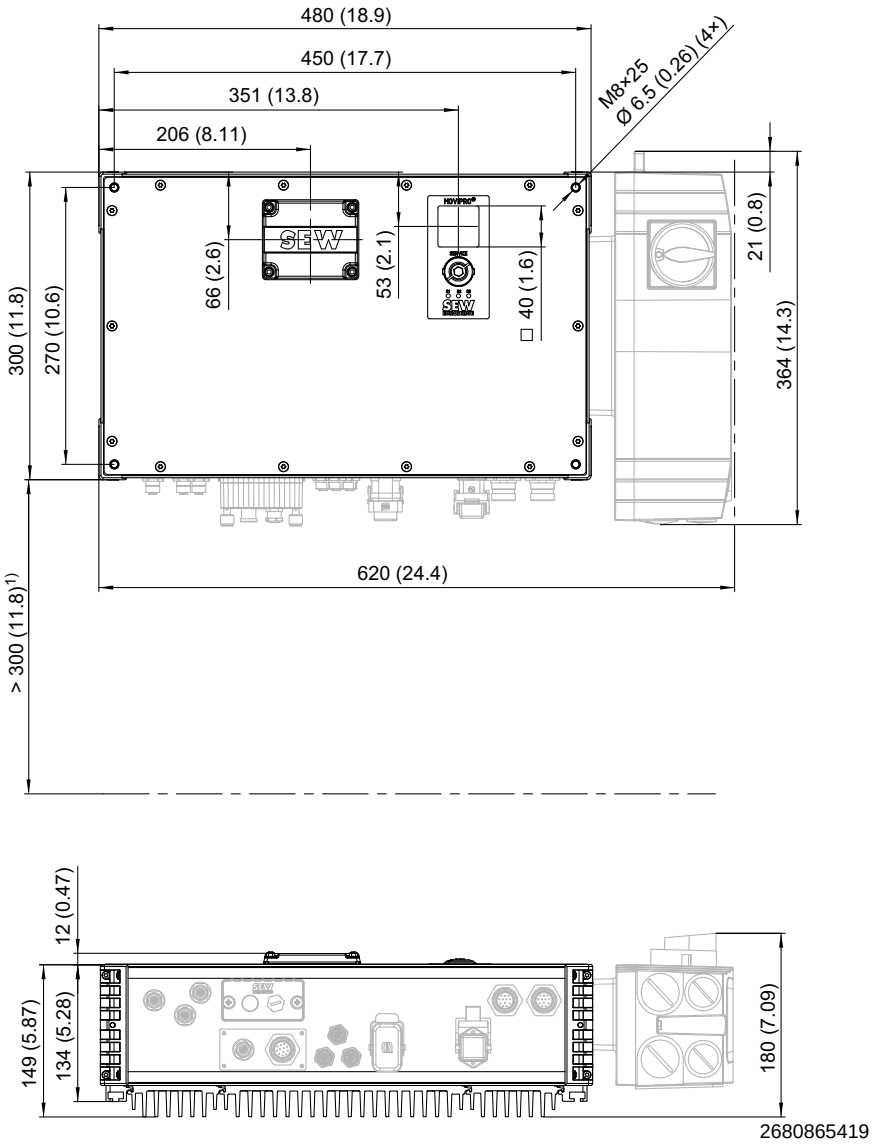
11.8.7 RS485 interface

RS485 interface	
General information	I/O standard
Baud rate	57.6 / 9.6 kBaud
Conclusion	The interface is equipped with a dynamic terminating resistor inside the unit.
DC 24 V output (variant with DC 24 V)	• DC 24 V ± 10% • Max. 500 mA
The overall current consumption of the I/O periphery (including the encoder) should not exceed DC 2.5 A.	

11.9 Dimension drawings

11.9.1 Size 0

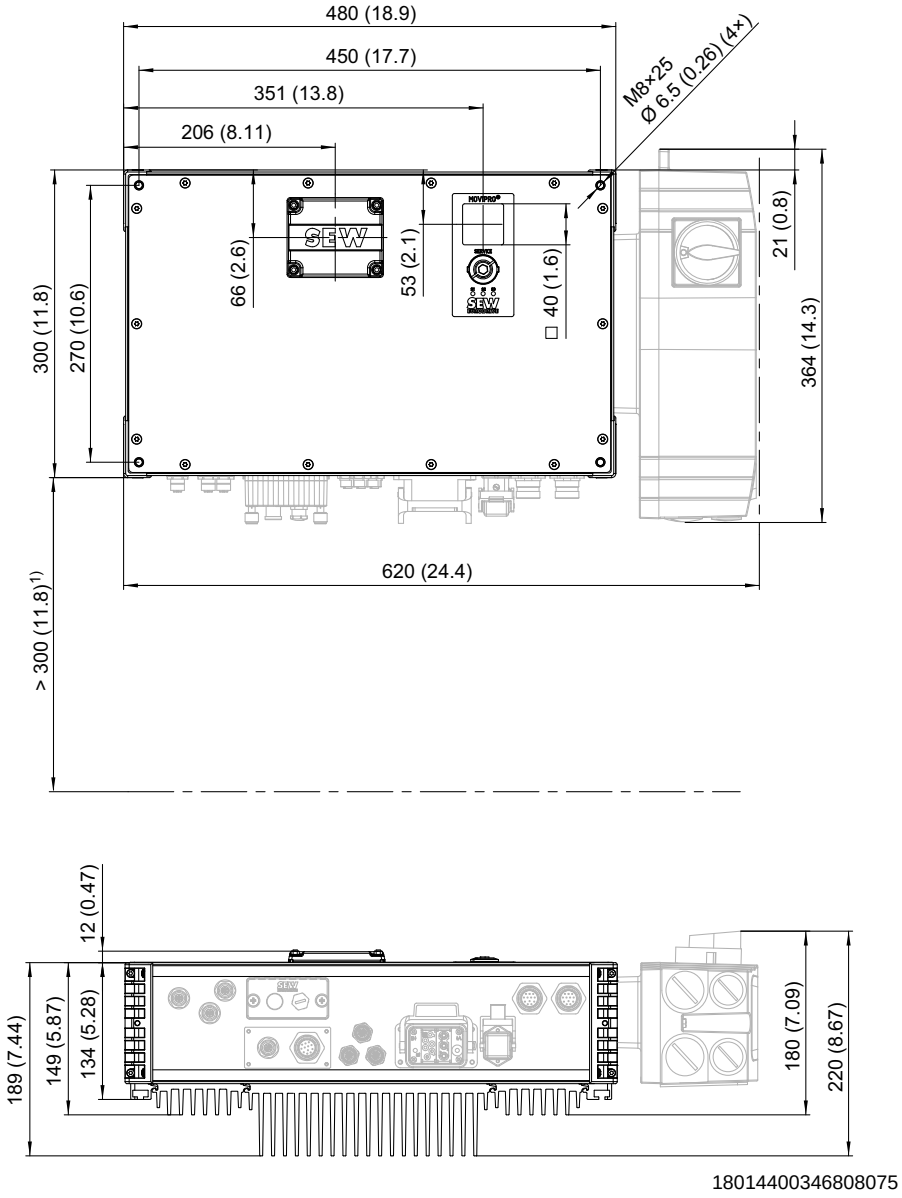
The dimension drawing shows the mechanical dimensions of the MOVIPRO® unit in mm (in):



1) Recommended clearance for connection cables (can vary depending on the cables used)

11.9.2 Size 1

The dimension drawing shows the mechanical dimensions of the MOVIPRO® unit in mm (in):



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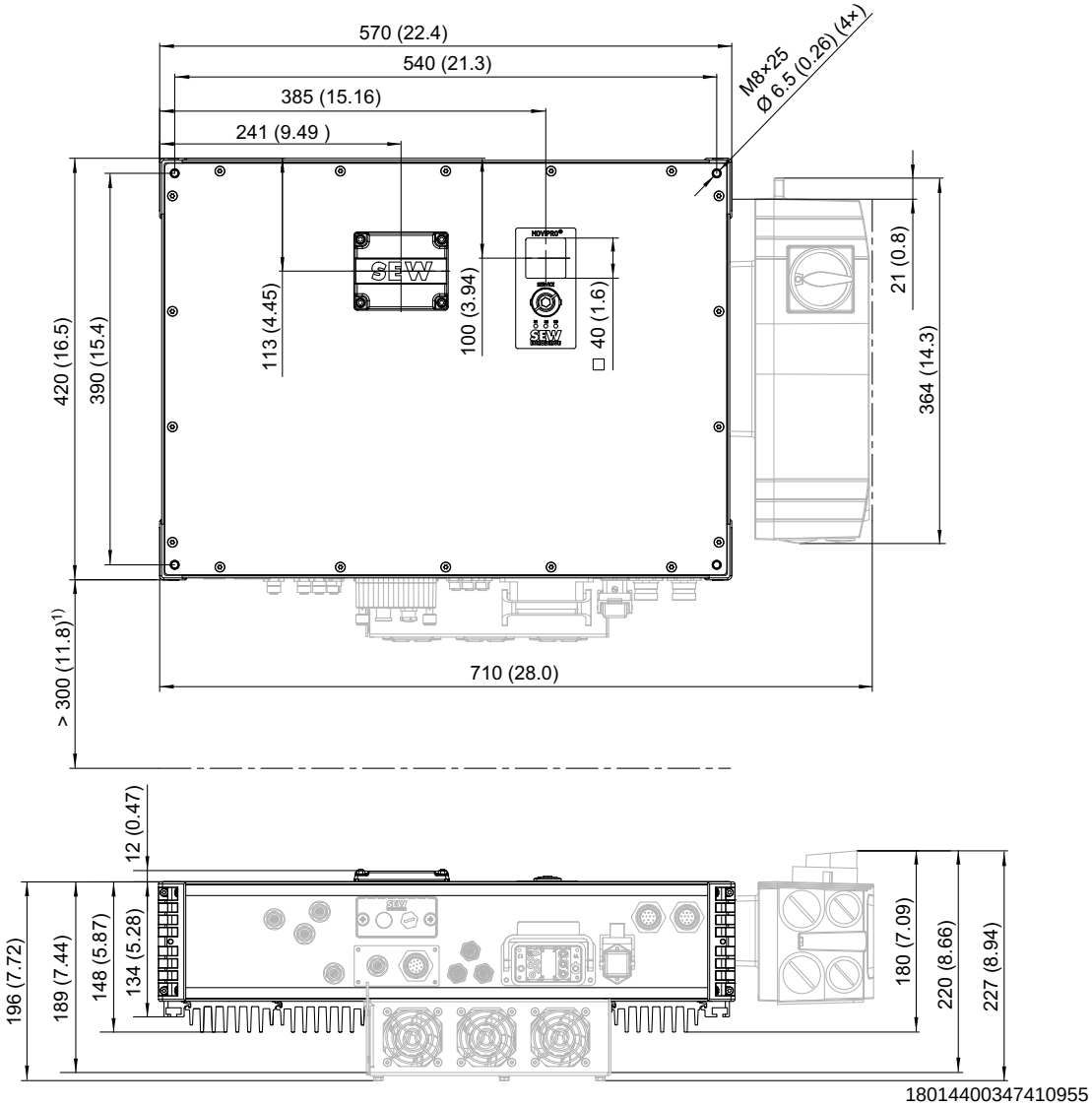
1) Recommended clearance for connection cables (can vary depending on the cables used)

11.9.3 Size 2

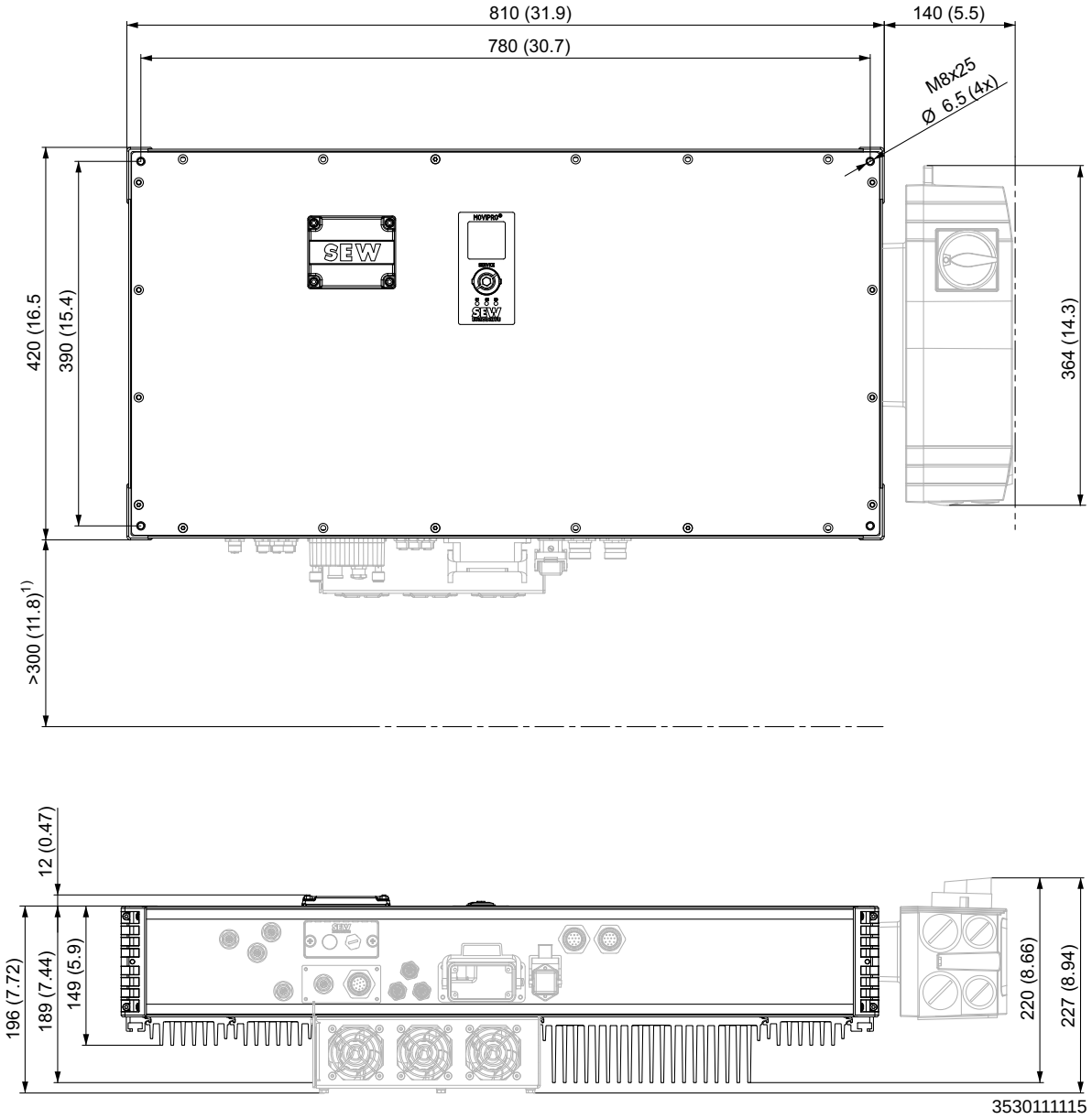
The dimension drawing shows the mechanical dimensions of the MOVIPRO® unit in mm (in):



1) Recommended clearance for connection cables (can vary depending on the cables used)

Size 2 with regenerative power supply

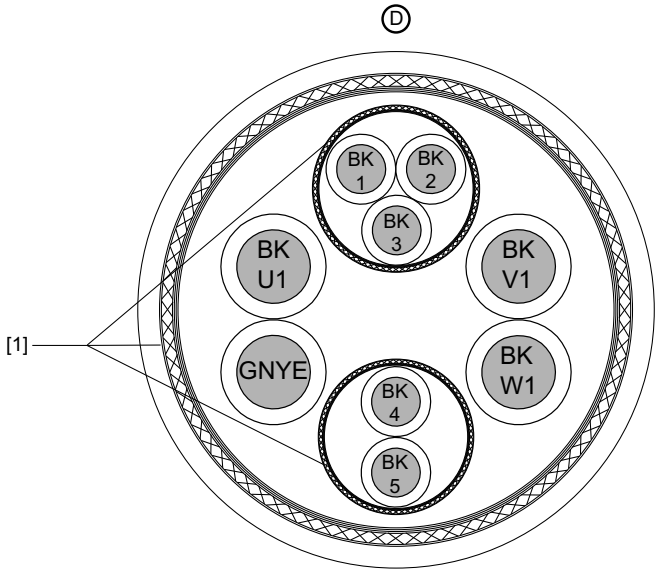
The dimension drawing shows the mechanical dimensions of the MOVIPRO® unit in mm (in):



1) Recommended clearance for connection cables (can vary depending on the cables used)

11.10 Hybrid cable type "D"

11.10.1 Mechanical design



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[1] Shield

Cable type	D/1.5	D/2.5	D/4.0	D/6.0	D/10.0
Supply cores:	4 x 1.5 mm^2	4 x 2.5 mm^2	4 x 4.0 mm^2	4 x 6.0 mm^2	4 x 10.0 mm^2
Control core pair	2 x 0.75 mm^2	2 x 0.75 mm^2	2 x 0.75 mm^2	2 x 0.75 mm^2	2 x 0.75 mm^2
Brake control	3 x 1.0 mm^2	3 x 1.0 mm^2	3 x 1.5 mm^2	3 x 1.5 mm^2	3 x 1.5 mm^2
Conductor insulation	PP (polypropylene)				
Conductor	Bare E-Cu strand, extra fine wires with individual wire 0.15 mm				
Shielding	Made of tinned E-Cu wire				
Overall diameter	13.9 mm	17.2 mm	19.0 mm	21.5 mm	25.3 mm
Color of outer cable sheath	Orange				
Cable sheath insulation	TPE-U (polyurethane)				

11.10.2 Electrical properties

The cables are approved according to European and American standards.

Cable type	D/1.5	D/2.5	D/4.0	D/6.0	D/10.0
Operating voltage for all cores	Max. 600 V				

11.10.3 Mechanical properties

- Suitable for cable carrier installation
  - Bending cycles > 5 million
  - Traveling velocity ≤ 3 m/s
- Bending radius in the cable carrier: 10 x diameter
  for fixed routing: 5 x diameter

11.10.4 Thermal properties

- Processing and operation: Fixed installation:
  –40 °C – +90 °C (load capacity according to DIN VDE 0298-4)
  –30 °C – +80 °C according to UL758
  Cable carrier installation:
  –5 °C – +90 °C (load capacity according to DIN VDE 0298-4)
  –5 °C – +80 °C according to UL758
- Transport and storage: –40 °C – +90 °C (load capacity according to DIN VDE 0298-4)
  –30 °C – +80 °C according to UL758
- Flame-retardant according to VDE 0472 part 804 (method B IEC 60 332-1)

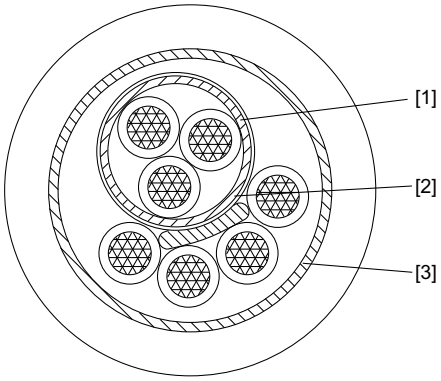
11.10.5 Chemical properties

Cable type	D/1.5	D/2.5	D/4.0	D/6.0	D/10.0
Oil-resistant	In accordance with VDE 0250 Part 407				

- General resistance to acids, alkalis, cleaning agents
- General resistance against dusts (e.g. bauxite, magnesite)
- Insulation and sheath material halogen-free
- Within the specified temperature range, free from substances interfering with wetting agents (silicone-free)

11.11 Hybrid cable type "E"

11.11.1 Mechanical design



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[1] Shielded "three-conductor" cable
[2] EMC shielding, "three-conductor" cable
[3] Plaiting for complete EMC shielding

Cable type	E/1.5	E/2.5	E/4.0	E/6.0
Supply cores:	4 x 1.5 mm^2	4 x 2.5 mm^2	4 x 4.0 mm^2	4 x 6.0 mm^2
Brake control	3 x 1.0 mm^2	3 x 1.0 mm^2	3 x 1.0 mm^2	3 x 1.5 mm^2
Conductor insulation	TPM			
Conductor	Blank CU litz wire			
Shielding	Made of tinned Cu wire			
Overall diameter	15.0 mm	16.3 mm	15.3 mm	17.4 mm
Color of outer cable sheath	Orange			
Cable sheath insulation	PUR (polyurethane)			

11.11.2 Electrical properties

The cables are approved according to European and American standards.

Cable type	E/1.5	E/2.5	E/4.0	E/6.0
Operating voltage for all cores	Max. 600 V			

11.11.3 Mechanical properties

- Suitable for cable carrier installation
  - Bending cycles > 5 million
  - Traveling velocity ≤ 3 m/s
- Bending radius in the cable carrier: 10 x diameter
  for fixed routing: 5 x diameter

11.11.4 Thermal properties

- Processing and operation: Fixed installation:
  –50 °C – +80 °C
  Cable carrier installation:
  –20 °C – +60 °C
- Flame-retardant according to VDE 0472 part 804 (method B IEC 60 332-1)

11.11.5 Chemical properties

Cable type	E/1.5	E/2.5	E/4.0	E/6.0
Oil-resistant	In accordance with VDE 0250 Part 407			

- General resistance to acids, alkalis, cleaning agents
- General resistance against dusts (e.g. bauxite, magnesite)
- Insulation and sheath material halogen-free
- Within the specified temperature range, free from substances interfering with wetting agents (silicone-free)

11.12 Additional documentation

For additional information, refer to the following documentation:

Documentation
"MOVIPRO® Accessories" addendum to the operating instructions
"MOVIPRO® ADC – Functional Safety" manual
"MOVIPRO® ADC with PROFINET Interface" manual
"MOVITOOLS® MotionStudio" manual
"MOVIPRO® ADC" system manual

12 Declaration of Conformity

EC Declaration of Conformity

SEW EURODRIVE

900840010

SEW-EURODRIVE GmbH & Co KG
Ernst-Blickle-Straße 42, D-76646 Bruchsal

declares under sole responsibility that the following products

drive systems of the series	**MOVIPRO® ADC** **PHC2.A-A...M1-..1A-00/...**	
are in conformity with		
Machinery Directive	**2006/42/EC**	**1)**
Low Voltage Directive	**2006/95/EC**	
EMC Directive	**2004/108/EC**	**4)**
Applied harmonized standards	**EN 13849-1:2008** **EN 61800-5-2: 2007** **EN 61800-5-1:2007** **EN 61800-3:2007**	**5)**

1) The products are intended for installation in machines. Startup is prohibited until it has been established that the machinery into which these products are to be incorporated complies with the provisions of the aforementioned Machinery Directive.

4) According to the EMC Directive, the listed products are not independently operable products. EMC assessment is only possible after these products have been integrated in an overall system. The assessment was verified for a typical system constellation, but not for the individual product.

5) All safety-relevant requirements of the product-specific documentation (operating instructions, manual, etc.) must be met over the entire product life cycle.

Bruchsal	14.06.10	Johann Soder	
Place	Date	Managing Director Technology	a) b)

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documents

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