SEW EURODRIVE

System Manual

MOVIAXIS® Multi-Axis Servo Inverter

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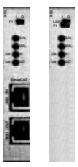
 **MXA axis module** **Description: (page 18)** **Technical data: (page 124)**	**Option cards for axis modules**  **XGS11A, XGH11A multi-encoder card** **Description: (page 144)**  **PROFIBUS fieldbus XFP11A** **Description: (page 138)**  **EtherCAT® fieldbus XFE24A** **Description: (page 139)** **EtherCAT®-compatible system bus XSE24A**  **K-Net XFA11A** **Description: (page 140)**  **XIO11A, XIA11A input/output module** **Description: (page 141)**

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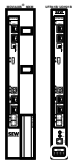
	**MXM gateway master module** **Description: (page 22)** **Technical data: (page 129)**		**PROFIBUS/DeviceNet gateway UFE41B** **PROFINET/Ethernet gateway UFR41B** **Description: (page 65)**
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1.2 Additional system and automation components

System and automation component	
Operator terminals	
 **DOP** The operator panels meet the requirements for human-machine communication for process monitoring and control in various production methods.	
Single-axis servo inverter	
 **MOVIDRIVE® MDX** The universally applicable inverter for asynchronous motors and servomotors.	
Servomotors	
 **CMP40 – 100** **CMPZ71 – 100** Compact, highly dynamic servomotor, form-closed mounting to all SEW gear units. The CMPZ has an increased intrinsic inertia for high external loads. **Description: (page 216)** **Technical data: (page 217)**	 **CMDV55 – 162** The new compact servomotor series from SEW-EURODRIVE. **Description: (page 226)** **Technical data: (page 227)**
 **DRL71 – 225** Asynchronous servomotors are the link between the classical asynchronous AC motors for supply system and inverter operation and the highly dynamic synchronous servomotors. **Description: (page 234)** **Technical data: (page 236)**	
Servo gear units	
 **PS.F** The low backlash PS.F planetary servo gear units are designed for the torque range from 25 – 3000 Nm. Variants: PSF, PSKF. PSBF. **Technical data: (page 245)**	 **PS.C** The low backlash PS.C planetary servo gear units are designed for the torque range from 30 – 305 Nm. Variants: PSC, PSKC, PSCZ, PSKCZ. **Technical data: (page 245)**
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1.3 Benefits and key features of MOVIAXIS®

MOVIAXIS® is the name of the new, modular servo inverter series from SEW-EURODRIVE.

1.3.1 Highly dynamic drive solution

Technology and motion control functions that meet the highest standards, combined with maximum dynamics, integrated energy saving technology, and global availability – All this is provided by SEW-EURODRIVE's modular system of highly dynamic servo drives. MOVIAXIS® is the perfect multi-axis servo inverter for drive and automation solutions that save time, costs and effort.

The powerful and reliable MOVIAXIS® handles a variety of drive solutions and offers a wide range of communication and automation options for almost any application.

1.3.2 Flexible and adaptable

Its big advantage is its high degree of flexibility:

Depending on the desired machine and system concept, the MOVIAXIS® multi-axis servo inverter can be combined flexibly and adapted to meet the specific requirements of the automation structures.

1.3.3 Integrated in the SEW modular system

MOVIAXIS® has a central position in the portfolio of servo drive systems. It is perfectly integrated in the existing modular concept of SEW-EURODRIVE, allowing for a multitude of drive and automation solutions.

1.3.4 Structure of an axis system

The MOVIAXIS® product series consists of the following modules:

- Supply modules
- Sinusoidal supply and regenerative modules
- Axis modules
- Buffer and storage modules
- DC 24 V switched-mode power supply modules for internal consumption
- DC link discharge modules
- Control and communication modules

1.3.5 Good software support

The entire system is supported by the "all-in-one" software MOVITOOLS® MotionStudio. This software can be used for startup, parameterization, programming, and diagnostics. The execution of these functions is quick, easy, and graphically supported.

1.3.6 Application area

MOVIAXIS® multi-axis servo inverters have been designed for compact machine and plant automation systems at the highest stage. Productivity and intelligence are combined in an ideal way, allowing for a wide range of application.

1.3.7 Characteristic criteria of MOVIAXIS®

This is ensured by the following criteria:

- Optimum adaptation to the application and maximum flexibility of the entire drive/automation system in terms of:
  - Product scalability (hardware and software)
  - Communication and networking options
  - Drive functionality and automation options
  - Engineering, startup, configuration and diagnostics using MOVITOOLS® MotionStudio
- A variety of application options for variable machines and systems:
  - Power range from 10 kW nominal supply power, up to a peak power of 187 kW,
  - A maximum peak current of 250 A
  - Energy-optimized, sinusoidal regeneration
  - Safety technology can be integrated
  - Robust housing and simple installation
  - Support of all common encoder systems
- Guaranteed solutions with a scalable ratio between costs/solution/resources:
  - With motion control functions that range from simple, graphically selectable technology functions to powerful 32-bit control systems
  - With widely applicable motor/gear unit range
  - With tiered motion control that ranges from simple positioning to support of customer-specific kinematics.

1.3.8 MXP supply modules

The supply module provides energy to up to 8 axis modules as standard. It controls the regenerated energy via a braking resistor or via DC link storage to separate capacitor or buffer modules.

You can connect a maximum of 10 axis modules. In this case, please contact SEW-EURODRIVE.

Battery-powered supply modules are available for special applications. Contact SEW-EURODRIVE in such cases.

Customer benefits of the supply modules:

- Covers a wide range of power ratings with 4 finely graded performance classes: 10/ 25/50/75 kW
- Wide range of supply system voltages for universal application: AC 3 × 380 – 500 V, 50 – 60 Hz
- High drive dynamics with smaller line connection components due to the high overload capacity of 250% of the nominal power for maximum 1 s
- Minimized THD/harmonics values and reactive power consumption due to optimized charging currents and high effective current percentage
- Time-saving and error-proof due to automatic address assignment for all axes connected to the CAN1/EtherCAT® system bus
- Informative and easy due to 7-segment display for user-friendly visualization of operating and error states at the supply module
- 4-quadrant capability due to the standard brake chopper integrated in the supply module.

Unit data

Supply voltage	3 x 380 V -10 % up to 3 x 500 V +10 %
Line frequency	50 - 60 Hz ± 5 %
Nominal DC link voltage	DC 560 V
Overload capacity for max. 1 s	250 %

Available types	**Nominal power kW**	**Nominal DC link current A**	**Maximum DC link current A**	**Nominal line current A**	**Size**	**Technical data**
MXP80A-010-503-00	10	18	45	15	1	(page 116)
MXP80A-025-503-00	25	45	112.5	36	2	
MXP80A-050-503-00	50	90	225	72	3	
MXP80A-075-503-00	75	135	337.5	110	3	

Scope of delivery

- Touch guards
- DC link connections
- Electronics shield clamp
- Power shield clamp
- 24 V supply cable
- Connection cable for CAN-based system bus/EtherCAT®-compatible system bus
- CAN terminating resistor

Optional accessories

- Braking resistors
- Chokes
- Filters
- System bus connection cable for CAN-based system bus
- Connection cable for EtherCAT® master module
- System bus connection cable for EtherCAT®-compatible system bus
- System bus connection cable CAN
- Adapter cable – master module to CAN-based application bus CAN2
- Connection cable for CAN-based application bus CAN2
- CAN2 terminating resistor
- Two-row configuration kit

1.3.9 MXP81 compact supply module 10 kW

The compact supply module provides energy to up to 8 axis modules as standard. It controls the regenerated energy via an integrated braking resistor or via an external braking resistor and DC link storage to an integrated energy buffer.

You can connect a maximum of 10 axis modules. In this case, please contact SEW-EURODRIVE.

Customer benefits of the supply modules:

- Compact size due to the integration of the braking resistor, brake chopper, and energy buffer in the housing.
- Saves energy by storing up to 250 Ws and dynamically re-using this energy.
- Optimized and flexible installation due to the integration of all elements that are important for operation. This means additional wiring of braking resistors is no longer necessary. If the internal braking resistor is used to capacity, you can connect a larger, external braking resistor as an option
- Wide range of supply system voltages for universal application: AC 3 × 380 – 500 V, 50 – 60 Hz
- High drive dynamics with smaller line connection components due to the high overload capacity of 250% of the nominal power for maximum 1 s
- Minimized THD/harmonics values and reactive power consumption due to optimized charging currents and high effective current percentage
- Time-saving and error-proof due to automatic address assignment for all axes connected to the CAN1/EtherCAT® system bus
- Informative and easy due to 7-segment display for user-friendly visualization of operating and error states at the supply module
- 4-quadrant capability due to the standard brake chopper integrated in the supply module.

Unit data

Supply voltage	3 x 380 V -10 % up to 3 x 500 V +10 %
Line frequency	50 - 60 Hz ± 5 %
Nominal DC link voltage	DC 560 V
Overload capacity for max. 1 s	250 %

Available types	**Nominal power kW**	**Nominal DC link current A**	**Maximum DC link current A**	**Nominal line current A**	**Size**	**Technical data**
MXP81A-010-503-00	10	18	45	15	1	(page 117)

Scope of delivery

- Touch guards
- DC link connections
- Electronics shield clamp
- Power shield clamp
- 24 V supply cable
- Connection cable for CAN-based system bus/EtherCAT®-compatible system bus
- CAN terminating resistor

Optional accessories

- Braking resistors
- Chokes
- Filters
- System bus connection cable for CAN-based system bus
- Connection cable for EtherCAT® master module
- System bus connection cable for EtherCAT®-compatible system bus
- System bus connection cable CAN
- Adapter cable – master module to CAN-based application bus CAN2
- Connection cable CAN2
- CAN2 terminating resistor
- Two-row configuration kit

1.3.10 MXR supply and regenerative modules

Supply and regenerative modules provide energy to up to 8 axis modules as standard. The regenerative energy is controlled through sinusoidal feedback to the supply system. A brake chopper is integrated as standard, e.g. for emergency braking operations.

You can connect a maximum of 10 axis modules. In this case, please contact SEW-EURODRIVE.

Customer benefits of supply and regenerative modules:

- Optimum logistics, because one unit covers two performance classes (50 kW or 75 kW)
- Wide range of supply system voltages for universal application: AC 3 × 380 – 500 V, 50 – 60 Hz
- High drive dynamics with smaller line connection components due to the high overload capacity of 200 % of the nominal power for maximum 1 s
- Only effective power consumption in nominal operation, i.e. cosφ = 1
- Minimal THD values and reactive power consumption due to sinusoidal current consumption and regeneration
- Time-saving and error-proof due to automatic address assignment for all axes connected to the CAN1/EtherCAT® system bus
- Informative and easy due to 7-segment display for user-friendly visualization of operating and error states at the supply module
- Information about the current energy flow and regenerative energy via service parameter
- Better utilization of the motor power due to increased DC link level of DC 750 V
- Necessary transformer power is minimized by optional EcoLine filter
- Intelligent and communicative due to option cards for EtherCAT®, PROFIBUS and SBus^{plus} for seamless system integration
- Safe in case of a power failure due to standard integrated brake chopper for connecting an emergency braking resistor.

Unit data

Supply voltage	3 x 380 V - 3 x 480 V ±10 %
Line frequency	50 - 60 Hz ±5 %
Nominal DC link voltage	DC 750 V controlled
Overload capacity for max. 1 s	200 %[1)]

Available types	**Nominal power kW**	**Nominal DC link current A**	**Maximum DC link current A**	**Nominal line current A**	**Technical data**
MXR80A-075-503-00	50 kW at 8 kHz PWM 75 kW at 4 kHz PWM	135	135 × 2.5	73 A at 8 kHz PWM 110 A at 4 kHz PWM	(page 121)

1) For a connection voltage of DC 380 - 400 V

Scope of delivery

- DC link connections
- Electronics shield clamp
- Power shield clamp
- 24 V supply cable
- Connection cable for CAN-based system bus/EtherCAT®-compatible system bus
- Measurement cable connector

Necessary accessories

- NFR line filter
- NDR line choke

Optional accessories

- Braking resistors
- Eco-Line filter[1)]
- System bus connection cable for CAN-based system bus
- EtherCAT® - master module connection cable
- System bus connection cable for EtherCAT®-compatible system bus
- System bus connection cable CAN
- Adapter cable master module to CAN2
- Connection cable for CAN-based application bus CAN2
- CAN2 terminating resistor
- Two-row configuration kit

For the part numbers of the cables, see chapter "Installation and connection accessories" (page 77).

1) Mandatory for 75 kW operation

1.3.11 MXA axis modules

The axis modules either communicate directly with a control over the integrated system buses or are controlled centrally via a master module.

The modules can be equipped with up to two safety relays for implementing safe stop in compliance with category 3 or 4 / performance level "d" or "e" and SIL3, see also chapter "Functional safety/ Safety functions" (page 98).

Customer benefits and key features of the axis modules:

- Finely-graded axis sizes:
  - At PWM 4 kHz: 2 / 4 / 8 / 12 / 16 / 32 / 43 / 64 / 85 / 133 A
  - At PWM 8 kHz: 2 / 4 / 8 / 12 / 16 / 24 / 32 / 48 / 64 / 100 A
  - At PWM 16 kHz: 1.5 / 3 / 5 / 8 / 11 / 13 / 18 / - / - / - A
- High overload capacity of 250 % of the nominal current for a maximum of 1 s
- Up to three motors with their own parameter sets can be operated per axis module. Users can switch between parameter sets.
- Very comprehensive technology and motion control functions are available free of charge, such as electronic cam, virtual encoder, touch probe, event control, positioning, referencing
- Can be controlled with user-defined units
- Central data backup and automatic reload in case of service via the master module
- CAN-based system bus SBus, CAN-based application bus CAN2, or EtherCAT®-compatible system bus SBus^{plus}
- Firmware upload and download via fieldbus, system bus, or parameterization interface
- 7-segment display for user-friendly visualization of operating and error states at the axis module
- Non-linear torque and speed characteristic curves are taken into account
- Brake test function for checking the braking capability of the motor regularly
- Digital inputs and outputs at the axis module
  - 9 isolated binary inputs; one is set to the controller inhibit function, 8 can be programmed by the user, 4 touch probe inputs,
  - 4 freely programmable binary outputs.
- Power shield clamps that can be separated up to size 3
- Electronics shield clamps can be separated
- 3 option card slots to expand the functionality
- Separate DC 24 V voltage supply for powering the inverter electronics and motor brakes. Configuration, diagnostics and data storage even when the supply system is switched off.

Standard functionality of the axis modules

Fieldbus/network communication	
PROFIBUS	×
DeviceNet	×
PROFINET	×
EtherNet/IP	×
CAN2	•
EtherCAT® /SBus^{plus}	×
CAN1 / SBus	•
User-defined units	•
TCP/IP, UDP/IP	•
Motion control/technology functions	
40 electronic cams	•
Online curve calculation	•
Virtual encoder	•
Event/sequence control	•
Electronic gear unit	•
Touch probe	•
Cam controller	•
Sensor-based positioning	•
Jog mode	•
Reference travel	•
Modulo function	•
Encoder/motor data	
Synchronous, asynchronous, linear motor operation	•
Non-linear torque characteristics	•
Hiperface®, resolver, TTL, Endat 2.1	•
Calibrating the encoder and commutation	•
Non-SEW motors	×
Brake test function	•
Multi-motor operation, max. 3 motors	•

Motion control	
MOVI-PLC® *advanced*	×
IEC 61131 motion libraries	×
Basic unit functions	
User-level password management	•
Graphical function connection	•
Double CAN system bus	•
EtherCAT®-compatible system bus	×
9 digital inputs	•
4 digital outputs	•
Diagnostics/service/monitoring	
Offline scope	•
8-channel scope	•
Thermal motor management	•
Thermal inverter management	•
Electronic nameplate	•
Overload prevention	•
Central data storage/SD card	•
Auto reload data record for replacement	•
Temperature-compensated torque control for asynchronous motors	•
Direct control of 24 V brakes	•
Auto address setting	•
Safety technology	
STO PL d / category 3	×
STO PL e / category 4, SIL3	×
• as standard	
× optional	

Encoders for the axis module

See chapter "Additional system components" (page 242).

Unit data

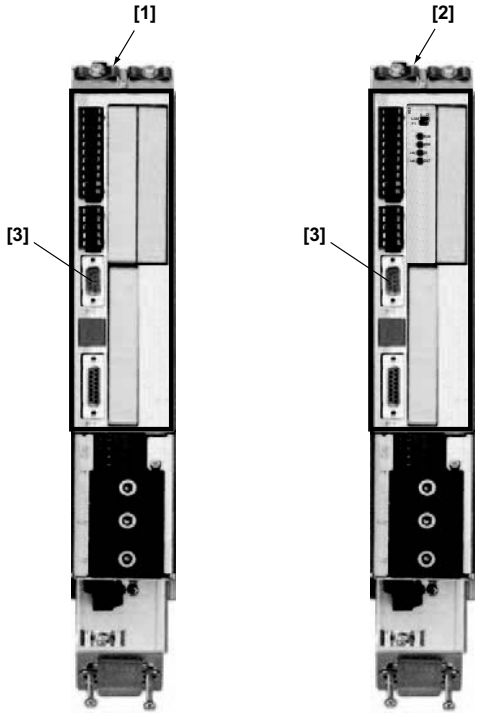
Nominal DC link voltage[1)]	DC 560 V DC 750 V[2)]
Output voltage	0 - max. V_{mains}
Overload capacity for max. 1 s	250 %

Available types	Nominal output current at 8 kHz PWM A	Nominal output current at 4 kHz PWM A	Maximum output current A	Size	Technical data
MXA80A-503-00 MXA81A-503-00	2	2	5	1	(page 124)
	4	4	10	1	
	8	8	20	1	
MXA80A-503-00 MXA81A-503-00 MXA82A-503-00	12	12	30	2	
	16	16	40	2	
	24	32	60	3	
	32	43	80	3	
	48	64	120	4	
	64	85	160	5	
	100	133	250	6	

1) with U_{mains} = 400 V

2) For operation with a MXR supply and regenerative module

Bus interface/system bus variants



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[1] CAN-based system bus, SBus
[2] EtherCAT®-compatible system bus SBus^{plus}
[3] CAN-based application bus CAN2 (standard)

Scope of delivery

- DC link connections

- Electronics shield clamp
- Power shield clamp
- 24 V supply cable
- Connection cable for CAN-based system bus/EtherCAT®-compatible system bus

Optional accessories

- Motor protection connection terminal block

1.3.12 MXM master modules

The master module extends the MOVIAXIS® multi-axis servo system by various control, communication and data management functions.

The master module is available as variant with MOVI-PLC® *advanced* (32 bit motion controller) and fieldbus gateway.

The fieldbus gateways provide sophisticated and transparent communication access to the entire axis system. They replace all fieldbus interfaces in the individual axis modules. This means that the axis module type does not have to be adjusted using fieldbus interfaces, which saves time and optimizes the logistics and storage processes. The axis module is equipped with a USB port for parameter setting as well as a TCP/IP network connection and an SD memory card for central data storage of all axis system data. When an axis is replaced, the entire data record, including the parameter settings, is loaded to the new axis. This feature makes it very easy to restart a system after the replacement has been made.

The fieldbus gateways communicate with the axis system either via the CAN1/CAN2 or the EtherCAT® system bus connection.

All integrated controllers are available with comprehensive libraries. The ready-made function modules can be programmed in IEC 61131. This means that the user can access the drive functions of the servo inverter directly from his or her usual PLC programming environment. Consequently, all MOVI-PLC® controllers speak the "language" of the servo inverter and control it much better than non-SEW controllers using the process data interface. Depending on the control class, additional USB and TCI/IP interfaces, local I/O, and central data storage for all data and programs of the axis system can be integrated.

Variants

Due to flexible combination options for hardware, functionality, technology and control engineering, the MOVIAXIS® multi-axis servo inverters can be used in various automation topologies.

These structures differ primarily in where and with which PLC and motion control functions they are processed.

The use of different master modules according to the automation structure (control/fieldbus gateway) is typical.

Unit data

Nominal input voltage	DC 24 V ± 25 % (EN 61131)	
	Unit design	**Technical data**
Available types **MXM80A-000-000-00/DHP11B** **MXM80A-000-000-00 / DH.41B**	MOVI-PLC® *advanced*[1] DHE41B, DHF41B, DHR41B	(page 129)
	PROFIBUS / DeviceNet gateway UFE41B	
	PROFINET / EtherNet/IP / Modbus/TCP UFR41B	

1) For technical data and connections of the control module DH.41B, see the "MOVI-PLC® *advanced* /DHE41B/DHF41B/DHR41B Controller" manual.

Scope of delivery

- Electronics shield clamp
- 24 V supply cable
- CAN - master module connection cable
- Cable lugs

Optional accessories

- System bus connection cable for CAN-based system bus
- Connection cable for EtherCAT® master module
- System bus connection cable for EtherCAT®-compatible system bus
- System bus connection cable CAN
- Adapter cable master module to CAN2
- Connection cable for CAN-based application bus CAN2
- CAN2 terminating resistor

For the part numbers of the cables, see chapter "Installation and connection accessories" (page 77).

1.3.13 MXS 24 V switched-mode power supply option

The switched-mode power supply is fed from the DC link voltage and provides the 24 V voltage for supplying the electronics in the axis system and the motor brakes.

The DC 24 V supply can bridge a voltage dip in the DC link for a short time (about 10 ms).

The switched-mode power supply is protected against overload during operation in the defined DC link voltage range. The output voltage is led out in parallel on 3 different output terminals with a joint ground reference. Each output is separately monitored for a maximum output current value of 10 A, which means the power supply is current limited and short-circuit proof.

If the DC link voltage is not available, operation of the switched-mode power supply can be continued via the external 24V supply, e.g. for setting the parameters of the axis system. This means all monitoring functions and the operating display continue to operate.

The same monitoring levels as for the output voltages, which are generated from the DC link, also apply to the 24 V supply.

The current overload at the output terminals is indicated by a three-color diode.

The switched-mode power supply unit can be combined with all MOVIAXIS® modules, except for the MXR supply and regenerative module. If you plan to combine MXS and MXR, please contact SEW-EURODRIVE.

Unit data

Nominal DC link voltage[1)]	DC 560 V		
Nominal input backup voltage	DC 24 V ± 25 % (EN 61131)		
Nominal output voltage	DC 3 x 24 V (shared ground) tolerance for supply via DC link: DC 24 V +10 % / -0 % Tolerance for supply via external 24 V: Depends on the input voltage and the requirements of the connected units.		
Available types	**Nominal output current** **A**	**Nominal output power** **W**	**Technical data**
MXS80A-060-503-00	3 × 10 A[2)]	600	(page 133)

1) With V_{line} = 400 V

2) Not possible at the same time because total power is limited to 600 W

Scope of delivery

- DC link connections
- 24 V supply cable

1.3.14 MXC capacitor modules

Capacitor modules are intelligent energy buffers.

In the capacitor module, the energy supplied to the DC link when applying the brake of a motor is activated through a charging circuit and quickly "stored". During an acceleration process, this energy is then supplied back to the main DC link and utilized again. Only braking energy that exceeds the capacity of the capacitor modules is dissipated via an optional braking resistor.

The capacitor module is a simple and easily integrated additional component for saving or re-using energy.

When designing the application accordingly, you can save a remarkable amount of energy. Depending on the application, only the power losses are taken from the supply system. In addition, you can omit the braking resistor, which means no dissipated heat.

Unit data

MXC80A-050-503-00		**Technical data**
Nominal DC link voltage U_{NZK}	DC 560 V[1)]	(page 131)
Storable energy[1)]	1000 Ws	
Peak power capacity	50 kW	

1) With V_{line} = 400 V

Scope of delivery

- DC link connections
- 24 V supply cable

1.3.15 MXB buffer modules

Buffer modules are pure energy storage devices.

Buffer modules are charged with energy from the DC link irrespective of whether the motors are decelerated or accelerated.

This means buffer modules make available a “guaranteed amount of energy” in the DC link. This amount of energy can be used to move drives to a safe position (return movement), for example in the event of a power failure in the system.

Unit data

MXB80A-050-503-00		**Technical data**
Nominal DC link voltage U_{NZK}	DC 560 V[1)]	(page 132)
Storable energy[1)]	1000 Ws	

1) With V_{line} = 400 V

Scope of delivery

- DC link connections
- 24 V supply cable

1.3.16 MXZ DC link discharge modules

The DC link discharge module shorts the voltage link of the axis system by means of an electronic switch via a special braking resistor. This may only take place if the supply of the DC link has been disconnected, i.e. the MXP supply module or the MXR supply and regenerative module is no longer connected to the supply system.

Once the discharge process is complete and the discharge current is approaching zero, the electronic switch will open automatically.

A synchronous servomotor connected to the DC link via an axis module generates a speed-dependent braking torque. This means an uncontrolled drive can be decelerated electronically even without servo inverter function.

At the same time, the kinetic energy is converted into heat energy via the special braking resistor.

The maximum amount of energy that can be dissipated via the braking resistor will have to be configured because the DC link discharge module and the braking resistor will have to be of appropriate size.

	INFORMATION
	If a motor is driven mechanically, as is the case in a hoist, standstill cannot be accomplished. The DC link discharge module is intended for discharge of kinetically stored energy only. Do not use the DC link discharge module for potential energy (hoist, spring, accumulator).

Unit data

Nominal DC link voltage	DC 560 V[1)]				
Available types	**Convertible energy E J**	**Discharge resistor[2)] Ω**	**Duration of quick discharge s**	**Size**	**Technical data**
MXZ80A-050-503-00	5000	1	≤ 1	1	(page 135)

1) With V_{line} = 400 V

2) For the DC link discharge module to function correctly, you must choose a suitable discharging resistor during project planning.

Scope of delivery

- DC link connections
- Power shield clamp
- 24 V supply cable

1.4 Areas of application and automation options with MOVIAXIS®

The MOVIAXIS® multi-axis servo inverter was developed with the specific requirement to create additional value for the user, however different the applications may be.

1.4.1 High degree of flexibility and great user benefits

MOVIAXIS® offers a high degree of flexibility and great user benefits. These are:

- **Perfect adaptation and maximum flexibility of the entire drive and automation system.**
  - Hardware and software can be scaled
  - Communication and networking options
  - Drive functionality and automation options
  - Engineering, startup, configuration and diagnostics using MOVITOOLS® MotionStudio.
- **A variety of application options for variable machines and systems.**
  - Nominal supply power of 10 kW, peak power up to 187 kW
  - Sinusoidal energy recovery technology
  - Peak current of 250 A
  - Integrated safety technology, up to performance level "e"
  - Robust housing and simple installation
  - Support of all common encoder systems.
- **Best effort/solution/resources ratio.**
  - Motion control functions that range from simple, graphically selectable technology functions to powerful 32-bit control systems
  - Widely applicable motor/gear unit range
  - Tiered motion control that ranges from simple positioning to support of customer-specific kinematics.

With these features, MOVIAXIS® is perfect for a wide range of applications in machine and plant engineering. In addition, MOVIAXIS® can be combined with the known automation structures and hybrids thereof:

1.4.2 Centralized control structure

- Structure 1

  Classic machine and system PLC with fieldbus or network connection of the inverters. Here, a higher-level controller (PLC) coordinates the entire machine/plant and controls all processes. In general, only the positioning and travel commands or very time-critical tasks are handed down to the connected drive systems.

1.4.3 Modularization

- Structure 2

  Higher-level machine and system PLC with lower-level module and segment controllers or control devices.

  Here, the higher-level PLC monitors and controls only the overall process, while lower-level module controllers, with a defined interface to the higher-level PLC, control the individual modules and segments of a machine independently. Often, the focus is on motion control and encapsulating an application for re-use without much additional effort.

1.4.4 Master module

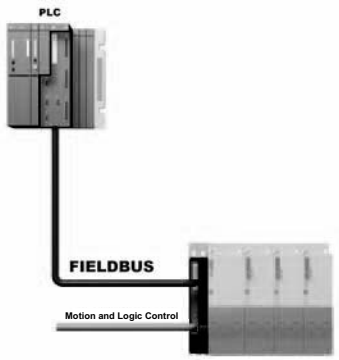
This high degree of adaptability is ensured by the different master module variants. The master module functions as the head of MOVIAXIS®, see the system component description for the master module (page 22).

Das master module is available in two different variants:

1. Fieldbus or network gateway for universal connection to all common fieldbus and network systems.
2. Motion Control MOVI-PLC® *advanced*, as freely programmable motion controller on the basis of IEC 61131 or as purely parameterizable controller with pre-defined application modules.

These two variants are described below:

1.4.5 1. MOVIAXIS® with fieldbus or network gateway in combination with a classic machine or system PLC – centralized structure



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Application requirements

This variant of the MOVIAXIS® master module is suitable for the following machines and systems:

- High demands on individual, axis-related motion control functions, no complex axis interplay and respective processing,
- Only limited flexibility and performance required from the motion controller,
- Machines that replace systems operated with frequency inverter and PLC,
- Machines for which a increase in production requires the use of at least some motion control and servo technology functions.
- Machines in which the use of a motion controller makes no sense technically and economically.

Target applications

Application examples:

- Storage and retrieval systems
- Simple packaging machines
- Handling equipment
- Discharge and unloading systems
- Simple sheet metal forming machines.

Machines and systems with the above requirements can easily be implemented with a combination of MOVIAXIS® and a classical PLC via a master module with fieldbus or network gateway.

Customer benefits

The following features in particular offer sustainable customer benefits:

- Motion control functions integrated in the axis,
- Centralized communication,
- Automatic data storage.

Motion control integrated in the axis controller: functional, simple, and realized in the PLC program with very little effort.

PLC remains unchanged

One of the essential advantages of MOVIAXIS® with a centralized machine controller is the fact that the PLC can remain almost unchanged. No program structures and already implemented functions must be transferred to the new system. The PLC programmer does not have to become acquainted with the complex motion control functions of MOVIAXIS®.

Wizard support

The servo and motion control functions are all controlled via process data interfaces and functions that can be graphically linked. Standard functions, such as single-axis positioning, can easily be implemented using wizards and startup editors. Pre-configured driver modules, e.g. for the S7 PLC, simplify the control integration process further.

Customer benefits

Customer benefits of the axis-integrated motion control application:

- Simple and minimal-effort solution, established automation structures can usually be maintained,
- Cost-optimized solution: Servo inverter and motion control in one solution package,
- Minimal training period: Software-assisted implementation of all motion control tasks,
- Safe and fast solutions: Complete, tested, and approved solutions and implementation options.

Centralized communication, powerful and flexible

The UFx fieldbus/network gateway systems optimize a number of bottlenecks of modern machine/plant automation.

This provides for an ideal cost/benefit ratio.

High-speed gateway

If you use high-speed gateways throughout, you can keep the axes fieldbus-independent. The fieldbus/network functionality is set on site/at the customer's via DIP switch.

Fieldbuses

This allows you to select flexibly between PROFIBUS / DeviceNet and PROFINET, EtherNet/IP, Modbus/TCP.

System buses

The following scalable bus systems are available for connecting the axes: CAN-based system bus SBus, CAN-based application bus CAN2, and, as maximum expansion stage,EtherCAT®-compatible system bus.

TCP/IP, USB

In addition, TCP/IP communication is on board for a connection with a host system. This allows, for example, a maintenance computer to access the system directly to read system data and make settings. The USB interface is available for fast access.

Customer benefits

Advantages of this centralized communication:

- Axis modules independent of the fieldbus: Optimized and minimized storage, which means reduced service complexity,
- Integrated TCP/IP: Office communication, remote maintenance and standard PC connection always available,
- Three communication performance classes: Costs and communication performance can be scaled perfectly,
- High-speed gateways that can be switched: Flexible connection option to all common PLC manufacturers, such as Siemens, Schneider, Allen Bradley.

Automatic data storage, centralized and always available

Modern drive systems offer a variety of setting and optimization options for perfect adaptation to the application and maximum productivity. These settings are guarantors of the machine performance. They refer to the machine and not to a drive controller, which is why they must remain with the machine.

Saving the settings

SEW-EURODRIVE ensures that these important axis module settings are saved by means of a central data memory in the gateway.

The data of all parameterizable axis modules is stored in the "data safe". If needed, it can be used for re-parameterization or recovery.

When replacing a unit, the "auto reload" function can write the data from the "data safe" directly to the new unit, no action of the user required.

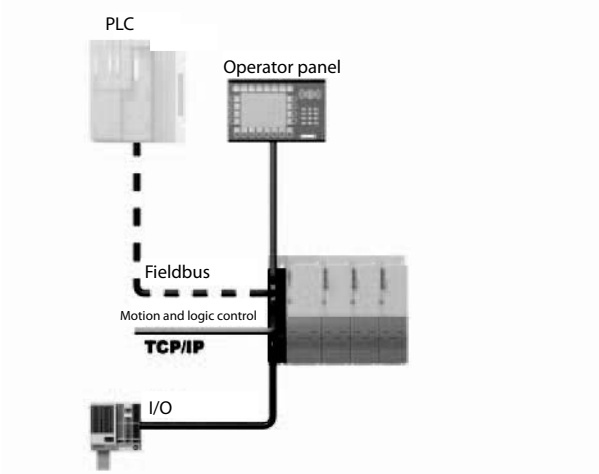
The data is also saved on an exchangeable SD card in the gateway.

Customer benefits

Advantages of this data storage:

- Data stored centrally in the gateway: All relevant settings are always safely stored in a central location, independent of the axis,
- Data on the SD card: The settings of the project and of the machine are saved when replacing an axis or a gateway,
- Auto reload: Minimal standstill times in the event of a failure, even without specially trained service staff.

1.4.6 2. MOVIAXIS® with integrated MOVI-PLC® – motion control in the master module as a lower-level modular controller in combination with a higher-level overall controller



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Application requirements

This variant of the master module is suited for the following structures.

Automation structures with modular machine and system components that require an integrated MOVI-PLC® controller are usually characterized as follows:

- Machine modules are automated independently of each other and started up in advance,
- Tasks of the motion controller, the PLC, and the continuous path controller are to be solved on a shared platform. It must be possible to encapsulate and re-use modular solutions,
- Performance-critical motion control tasks must be independent of the PLC programming and the PLC system,
- Machines are distributed worldwide and work with different control systems, such as Siemens, Schneider, Allen Bradley, as requested by the end customer. The effort for program modifications in the end customer PLC must be minimal. The machine is started up with a pre-defined program library.

Target applications

Application examples:

- Robot cells,
- Cutting, sorting, labeling, filling, and sealing units, e.g. in bottling and packaging machines,
- Deep drawing and blister machines,
- Very powerful and flexible storage and retrieval systems,
- Systems with processing stations.

One platform for all – MOVI-PLC® high-end motion control, PLC, kinematic and continuous path control

The higher-level machine controller can be designed in such a way that it only performs additional "coordination and management tasks" for the overall process.

MOVI-PLC® will continue to offer different technology and performance levels, which allows for perfect scaling and adaptation to the application.

The communication and data storage options of MOVI-PLC® and of the high-speed gateway are exactly the same.

Motion control

The decisive motion control functions of the individual stations or machine modules are implemented completely in the MOVI-PLC® controller that is matched perfectly to MOVIAXIS®.

In this way, the higher-level controller can be adapted with minimum effort to regional end customer requirements concerning the manufacturer of the higher-level machine or system PLC.

IEC 61131 standard

It is not necessary to develop the decisive motion control programs anew in the respective, manufacturer-specific programming languages. MOVI-PLC® supports the worldwide, standardized programming environment IEC 61131, including PLCopen functions.

Configurable control units CCU

Sophisticated applications can be realized using the configurable control units (CCU), which merely require the parameterization of pre-defined functions, e.g. for storage and retrieval systems.

Kinematics/robotics

One of the scalable expansion stages of MOVI-PLC® offers, for example, a complete, integrated continuous-path control system that supports and transforms various kine-

matics. Simulation tools for implementing complete robotics and handling systems are also integrated.

PLC and motion control

In addition to modular and sub-system control, MOVI-PLC® is powerful enough to offer complete machine control with visualization, PLC and motion control tasks, and data storage.

In these cases, the overall machine controller can be omitted, which leads to a lean and cost-optimized solution.

Customer benefits

Advantages of using MOVI-PLC® and MOVIAXIS®:

- Comprehensive periphery: MOVI-PLC® I/O and the DOPs provide for optimum operation of almost any application and integration of peripheral units,
- Quick adaptation to controllers from different manufacturers: All critical motion control and machine functions can be programmed independently in MOVI-PLC®,
- Short startup times: The modular design allows for pre-tested modules and sub-systems. MOVI-PLC® can also be used to completely automate machines without a classical PLC,
- Motion control, PLC, kinematic or continuous-path control: One platform with minimal complexity and universal programming,
- Ready-to-use and tested IEC-61131 libraries: Easy and fast programming of all drives from SEW-EURODRIVE. Use of configurable control units (CCU): Application modules for multi-axis applications that offer fast implementation without programming and protection against manipulation by the operator,
- Scalable motion control functionality: Costs and functions can be adapted perfectly to the application due to various technology levels; scalable hardware platforms: Differentiated use of "advanced" controllers allow for further, cost-optimizing price and performance adaptations,
- Transparent and universal data storage and communication: Identical behavior throughout the entire MOVIAXIS® system, irrespective of whether a high-speed gateway or a MOVI-PLC® controller is used.

1.4.7 Summary

Be it master modules in connection with high-speed gateways or MOVI-PLC® motion controllers – MOVIAXIS® can almost always be adapted perfectly to the application in terms of technology, functionality, communication, and unit control.

Costs and effort are saved due to

- Simpler operation, programming, validated ready-to-use solutions and product combinations,
- Consistency and reduced complexity,
- Optimized logistics, fewer modules, and one supplier.

1.5 Option cards providing more functions and flexibility for axis modules and supply and regenerative modules

MOVIAXIS® offers a number of different option cards to expand the functionality of the individual axis modules or sinusoidal supply and regenerative modules and/or to make them more flexible.

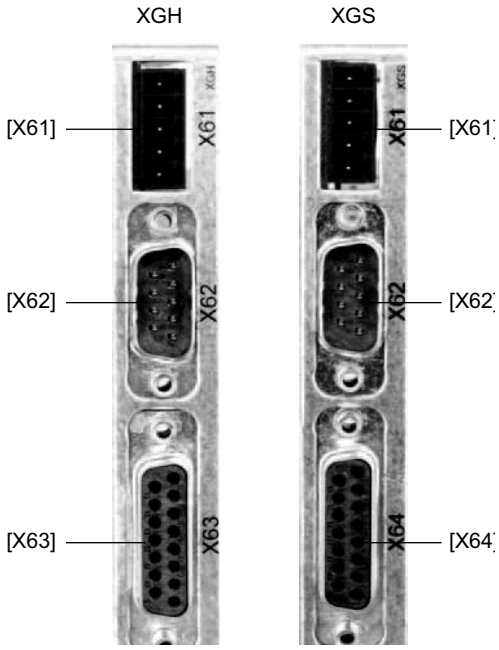
The following option cards are available:

Option card	Designation	Description	Installation in MXA	Installation in MXR
Encoder and distance encoder cards	XGH11A	Multi-encoder card for • Motor and distance encoders TTL, encoder, Hiperface®, EnDAT 2.1, SinCos • Encoder simulation • ±10V AE • DC 24 V supply	x	
	XGS11A	Like XGH, but with SSI as additional encoder system	x	
Input/output cards	XIA11A	I/O card with • 4 DI, 4 DO • 2 AI, 2 AO resolution 12 bit • 24 V supply	x	
	XIO11A	I/O card with • 8 DI, 8 DO • 24 V supply	x	
System bus and fieldbus interfaces	XFP11A	PROFIBUS IO fieldbus interface, up to 12 Mbaud	x	x
	XFE11A	Fieldbus interface for connection to EtherCAT® networks	x	x
	XSE11A	System bus option card for expansion to EtherCAT®-compatible system bus	x	x

1.5.1 XGH11A, XGS11A multi-encoder card option

The multi-encoder card expands the MOVIAXIS® system for evaluation of additional encoders.

Two different multi-encoder cards are available. Their selection is based on the encoder type that is to be evaluated, see encoder list on the next page. An analog, differential input (±10 V) is available in addition.



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Overview of functions

The following functions and encoder types can be evaluated with the multi-encoder card:

Functions	XGH version	XGS version
SSI functionality	--	x
Hiperface® functionality	x	x
EnDat 2.1 functionality		
Incremental encoder sin/cos functionality		
Encoder simulation		
Temperature evaluation		
Analog, differential input ±10 V		
Optional voltage supply 24 V		
Resolver	--	--

- HTL encoders can be operated using an HTL → TTL interface adapter. The part number of the interface adapter is 0188 1809.
- Single-ended HTL encoders can be operated using an HTL → TTL interface adapter. The part number of the interface adapter is 0188 1876.
- **Resolvers cannot be evaluated with the multi-encoder card.**

Connection technology of the multi-encoder card

Suitable encoders The encoders listed in the following tables are evaluated by the multi-encoder card.

SEW encoder designation	Encoder system	Manufacturer designation/manufacturer	Voltage supply
AL1H	Hiperface linear encoder	L230 / SICK-Stegmann	12 V
EK0H	Hiperface single-turn	SKS36 / SICK-Stegmann	
AS0H	Absolute encoder Hiperface multi-turn	SRS36 / SICK-Stegmann	
ES1H	Hiperface single-turn	SRS50 / SICK-Stegmann	
ES3H/ES4H	Hiperface single-turn absolute encoder	SRS64 / SICK-Stegmann	
AK0H	Hiperface multi-turn	SKM36 / SICK-Stegmann	
AS1H	Hiperface multi-turn	SRM50 / SICK-Stegmann	
AS3H / AS4H	Absolute encoder Hiperface multi-turn	SRM64 / SICK-Stegmann	
AV1H	Hiperface absolute encoder	SRM50C3 / SICK-Stegmann	
EV1C	HTL	ROD436 1024 / Heidenhain	
EV1S	Sine	ROD486 1024 / Heidenhain	
EV2R	Encoder	OG71-DN 1024R / Hübner	
AV1Y	SSI absolute encoder	ROQ424SSI / Heidenhain	
ES1S	Encoder	OG72S-DN1024R / Hübner	
ES2S		OG72S-DN1024R / Hübner	
EV2S		OG71S-DN1024R / Hübner	
EH1S		HOG74-DN1024R / Hübner	
ES1R		OG72-DN1024R / Hübner	
ES2R		OG72-DN1024R / Hübner	
EH1R		HOG74-DN1024R / Hübner	
ES1T		OG72-DN1024TTL / Hübner	
ES2T		OG72-DN1024TTL / Hübner	
EH1T		HOG74-DN1024TTL / Hübner	
EV1T	TTL	ROD426 1024 / Heidenhain	5 V[1)]
EV2T	Encoder	OG71-DN 1024TTL / Hübner	
ES1T		OG72-DN1024TTL / Hübner	
ES2T		OG72-DN1024TTL / Hübner	
EH1T		HOG74-DN1024TTL / Hübner	
EV1R:	TTL	ROD466 1024 / Heidenhain	

1) Can only be used with option DWI11A

Encoder system	Manufacturer designation/manufacturer	Voltage supply
Laser encoder	DME5000 / SICK-Stegmann	24 V
Laser encoder	DME4000 / SICK-Stegmann	
SSI	BTL5-S112-M1500-P-S32 / Balluf	24 V
	AMS200/200 / Leuze	
	OMS1 / Leuze	
	WCS2 LS 311 / Pepperl & Fuchs	
	DME 3000 111 / Sick	
	DME 5000 -111 / Sick	
	AG626 / Stegmann	
	LE100 / T&R	
	EDM / Visolux	
	OMS2 / Leuze	
	WCS2A / Pepperl & Fuchs	
Hiperface single-turn absolute encoder	SRS60 / SICK-Stegmann	12 V
Absolute encoder Hiperface multi-turn	SRM60 / SICK-Stegmann	
Single-turn absolute encoder	ECN1313 / Heidenhain	
Multi-turn absolute encoder	EQN1325 / Heidenhain	
SSI	GM401 / IVO	12 V
	AG100 MSSI / Stegmann	
	CE58 / T&R	

Restrictions for the evaluation of inputs for axis modules equipped with I/O and multi-encoder cards

	INFORMATION
	If the axis module is equipped with two I/O and one multi-encoder card or with one I/O and two multi-encoder cards (see following table), the following restrictions apply for the evaluation of inputs and outputs: **Evaluation is only possible for the inputs and outputs (if applicable) of two cards.**

Variant	Plugged card	Plugged card	Plugged card
1	I/O card	I/O card	Multi-encoder card
2	I/O card	Multi-encoder card	Multi-encoder card

Supply of the multi-encoder card

The table below shows the maximally permitted currents for supplying the XGH and XGS multi-encoder cards via the MOVIAXIS® basic unit.

Number of multi-encoder cards	Maximum permitted current I_{max}
1 pc	500 mA
2 pc	800 mA[1)]

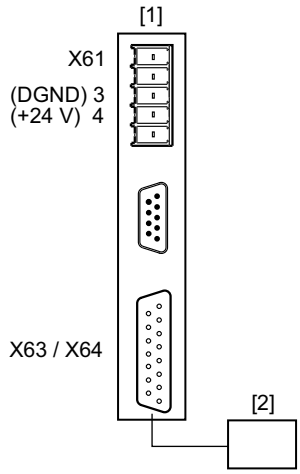
1) MOVIAXIS® cannot provide more than 800 mA in total for the supply of the multi-encoder cards

Wiring diagrams for encoders with external voltage supply

The following wiring diagrams show the connection of one and of two multi-encoder cards with 12 V and 24 V voltage supply.

12 V without supply

Example: Wiring diagram of a multi-encoder card with 12 V supplied to the encoder via the basic unit:



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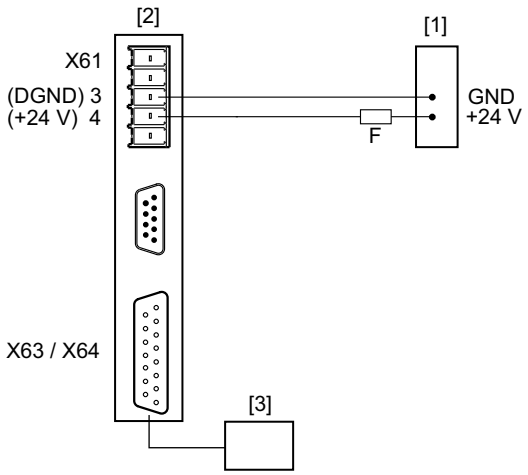
[1] Multi-encoder card [2] Encoder

24 V with external supply

Example: Wiring diagram of a multi-encoder card with 24 V voltage supply and I ≤ 500 mA:



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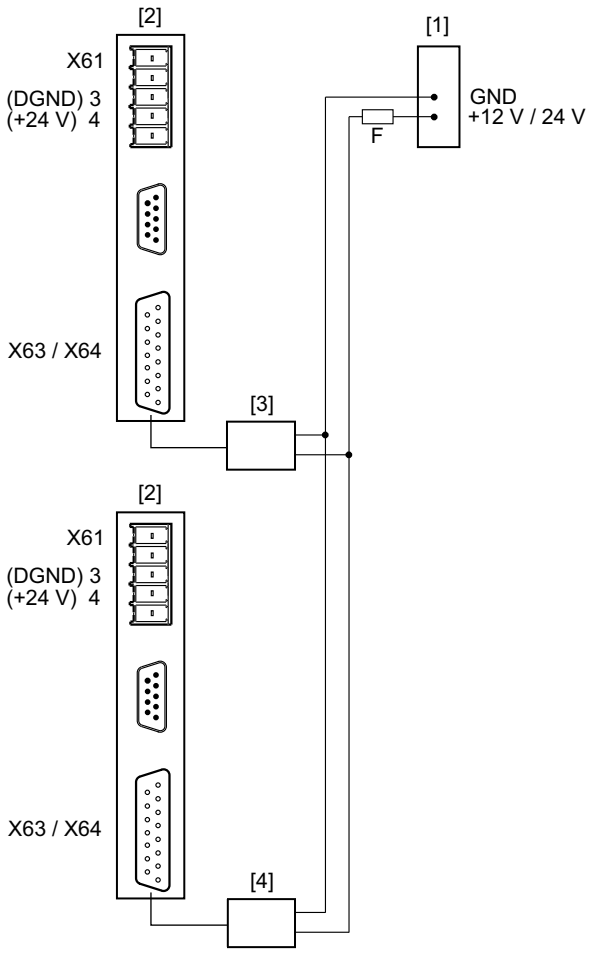
[1] Voltage source
[2] Multi-encoder card
[3] Encoder

12 V / 24 V, total current > 500 mA

Example: Wiring diagram of a multi-encoder card with 12 V/24 V voltage supply and a total current of > 500 mA:



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[1] Voltage source
[2] Multi-encoder card
[3] Encoder 1
[4] Encoder 2

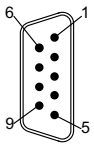
	INFORMATION
	When using two multi-encoder cards, a maximum current of 800 mA can be supplied to the encoder via the basic unit. For a total current of > 800 mA, an external voltage supply must be implemented.

Connection and terminal description of the card

Connector assignment X61

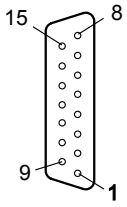
	Terminal	Assignment	Brief description	Type of connector
	**X61**			
	1	AI 0+	Analog, differential input	Mini Combicon 3.5, 5-pole. Cable cross section max: 0.5 mm^2
	2	AI 0-		
	3	DGND	Reference for PIN 4	
	4	24 V	Optional encoder voltage supply	
	5	n.c.		

Connector assignment X62 encoder emulator signals

	Terminal	Assignment	Brief description	Type of connector
	**X62**			
	1	Signal track A (cos+)	Encoder emulator signals	Sub-D 9-pole (male)
	2	Signal track B (sin+)		
	3	Signal track C		
	4	n.c.[1)]		
	5	DGND		
	6	Signal track A_N (cos-)		
	7	Signal track B_N (sin-)		
	8	Signal track C_N		
	9	n.c.		

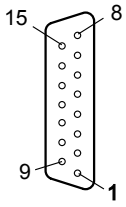
1) Do not connect a cable

PIN assignment X63 XGH X64 XGS with TTL encoder, sin/cos encoder

	Terminal	Function for TTL encoder, sin/cos encoder	Type of connector
	**X63 (XGH)**		
	1	Signal track A (cos+)	Sub-D 15-pole (female)
	2	Signal track B (sin+)	
	3	Signal track C	
	4	n.c.[1)]	
	5	n.c.	
	6	TF/TH/KTY-	
	7	n.c.	
	8	DGND	
	9	Signal track A_N (cos-)	
	10	Signal track B_N (sin-)	
	11	Signal track C_N	
	12	n.c.	
	13	n.c.	
	14	TF/TH/KTY+	
	15	Us	

1) Do not connect a cable

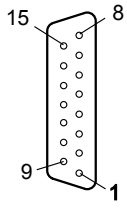
Connector assignment X63 XGH X64 XGS with Hiperface® encoder



	Terminal	Function for Hiperface® encoder	Type of connector
	X63 (XGH)		
	1	Signal track A (cos+)	Sub-D 15-pole (female)
	2	Signal track B (sin+)	
	3	n.c.[1]	
	4	DATA+	
	5	n.c.	
	6	TF/TH/KTY-	
	7	n.c.	
	8	DGND	
	9	Signal track A_N (cos-)	
	10	Signal track B_N (sin-)	
	11	n.c.	
	12	DATA-	
	13	n.c.	
	14	TF/TH/KTY+	
	15	Us	

1) Do not connect a cable

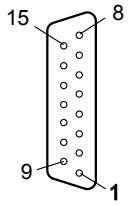
Connector assignment X63 XGH X64 XGS with EnDat 2.1



	Terminal	Function for EnDat 2.1	Type of connector
	X63 (XGH)		
	1	Signal track A	Sub-D 15-pole (female)
	2	Signal track B	
	3	Pulse +	
	4	DATA+	
	5	n.c.[1]	
	6	TF/TH/KTY-	
	7	n.c.	
	8	DGND	
	9	Signal track A_N	
	10	Signal track B_N	
	11	Cycle-	
	12	DATA-	
	13	n.c.	
	14	TF/TH/KTY+	
	15	Us	

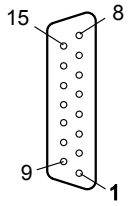
1) Do not connect a cable

Connector assignment X64 XGS with SSI

	Terminal	Function for SSI	Type of connector
	X64 (XGS)		
	1	n.c.[1]	Sub-D 15-pole (female)
	2	n.c.	
	3	Pulse +	
	4	DATA+	
	5	n.c.	
	6	TF/TH/KTY-	
	7	n.c.	
	8	DGND	
	9	n.c.	
	10	n.c.	
	11	Cycle-	
	12	DATA-	
	13	n.c.	
	14	TF/TH/KTY+	
	15	Us	

1) Do not connect a cable

Connector assignment X64 XGS with SSI (AV1Y)

	Terminal	Function for SSI (AV1Y)	Type of connector
	X64 (XGS)		
	1	Signal track A (cos+)	Sub-D 15-pole (female)
	2	Signal track B (sin+)	
	3	Pulse +	
	4	DATA+	
	5	n.c.[1]	
	6	TF/TH/KTY-	
	7	n.c.	
	8	DGND	
	9	Signal track A_N (cos-)	
	10	Signal track B_N (sin-)	
	11	Cycle-	
	12	DATA-	
	13	n.c.	
	14	TF/TH/KTY+	
	15	Us	

1) Do not connect a cable

Connection of TTL encoder to XGH, XGS

TTL encoder

The following encoders can be connected at X63, X64 (external encoder input):

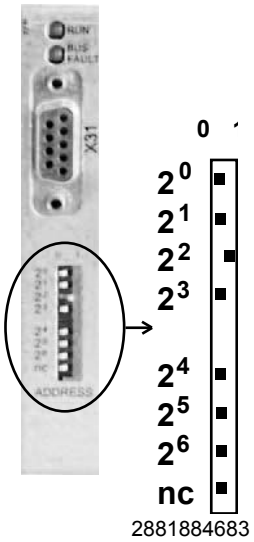
- DC 5 V TTL encoder with DC 5 V voltage supply type ES1T, ES2T, EV1T, EV2T or EH1T via DWI11A option or encoder with signal level to RS422

DC 5 V voltage supply

The TTL encoders with a DC 5 V voltage supply (ES1T, ES2T, EV1T, EV2T or EH1T) must be connected via the "DC 5 V encoder power supply type DWI11A" option (part number 822 759 4).

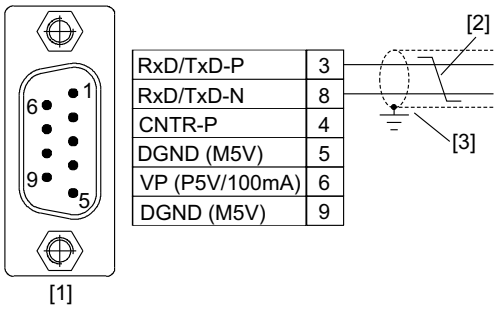
1.5.2 Fieldbus interface option PROFIBUS XFP11A

Terminal assignment

Front view of XFP11A	Description	DIP switch Terminal	Function
	**RUN: PROFIBUS operation LED (green)** **BUS FAULT: PROFIBUS error LED (red)**		Indicates that the bus electronics are operating correctly. Indicates PROFIBUS-DP error.
			Assignment
	X31: PROFIBUS connection	**X31:1** **X31:2** **X31:3** **X31:4** **X31:5** **X31:6** **X31:7** **X31:8** **X31:9**	N.C. N.C. RxD / TxD-P CNTR-P DGND (M5V) VP (P5V/100 mA) N.C. RxD/TxD-N DGND (M5V)
	ADDRESS: DIP switch for setting the PROFIBUS station address	**2^0** **2^1** **2^2** **2^3** **2^4** **2^5** **2^6** **nc**	Significance: 1 Significance: 2 Significance: 4 Significance: 8 Significance: 16 Significance: 32 Significance: 64 Reserved

Connector assignment

Connection to the PROFIBUS network using a 9-pin sub D plug according to IEC 61158. The T-bus connection must be made using a plug with the corresponding configuration.



2882128779

[1] 9-pin sub D plug
[2] Signal line, twisted
[3] Conductive connection over a large area between connector housing and shield

MOVIAXIS® – PROFIBUS connection

As a rule, the XFP11A option is connected to the PROFIBUS system using a shielded twisted-pair cable. Observe the maximum supported transmission rate when selecting the bus connector.

The twisted-pair cable is connected to the PROFIBUS connector at pin 3 (RxD/TxD-P) and pin 8 (RxD/TxD-N). Communication takes place via these two contacts. The RS-485 signals RxD/TxD-P and RxD/TxD-N must be connected to the same contacts in all PROFIBUS stations.

The PROFIBUS interface sends a TTL control signal for a repeater or fiber optic adapter (reference = pin 9) via pin 4 (CNTR-P).

	INFORMATION
	If long bus cables are used, the bus stations must have a "hard" common reference potential.

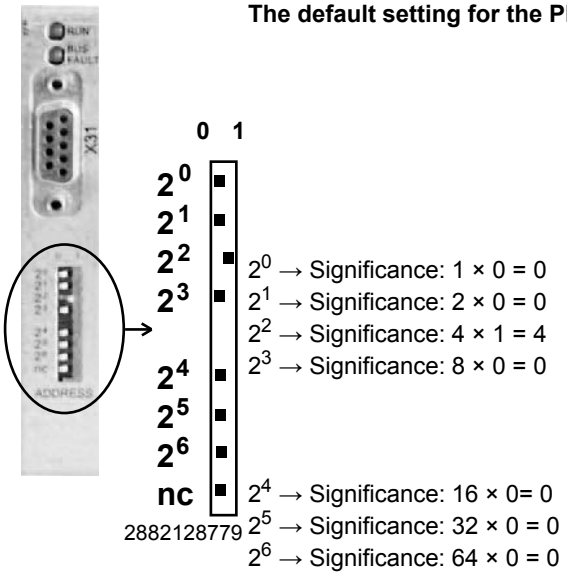
Baud rates greater than 1.5 Mbaud

The XFP11A option with baud rates > 1.5 Mbaud can only be operated with special 12-Mbaud PROFIBUS connectors.

Setting the station address

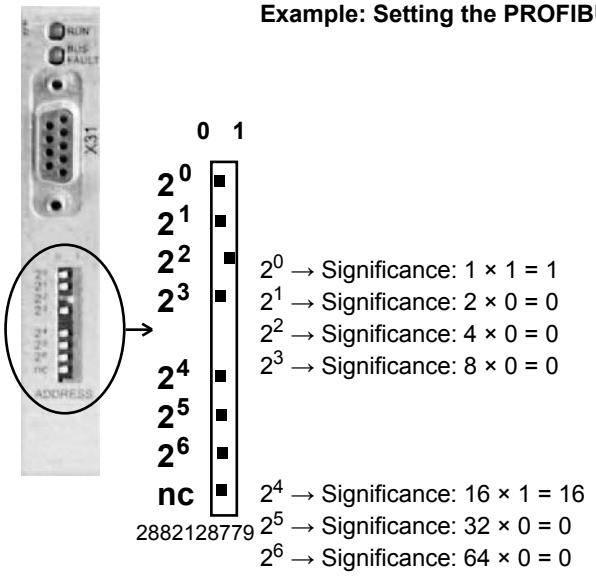
The PROFIBUS station address is set using DIP switches 2^0 – 2^6 on the option card. MOVIAXIS® supports the address range 0 – 125.

The default setting for the PROFIBUS station address is 4:



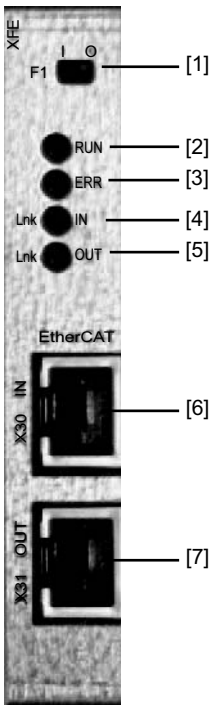
Any change made to the PROFIBUS station address during ongoing operation does not take effect immediately. The change takes effect when the servo inverter is switched on again (power supply +24 V OFF/ON).

Example: Setting the PROFIBUS station address 17



1.5.3 Fieldbus interface option EtherCAT® XFE24A

The XFE24A fieldbus interface is a slave module for connection to EtherCAT® networks. Only one XFE24A fieldbus interface can be installed per axis module. The XFE24A fieldbus interface allows MOVIAXIS® to communicate with all EtherCAT® master systems. All standards of the ETG (EtherCAT® Technology Group), such as wiring, are supported. This means the cables must be wired at the front by the customer.



2882456971

[1] LAM switch
- Switch position 0: All axis modules except the last one
- Switch position 1: Last axis module in the system

Switch F1
- Switch position 0: Delivery state
- Switch position 1: Reserved for added functions

[2] LED RUN; color: Green/orange
[3] LED ERR; color: Red
[4] LED link IN; color: Green
[5] LED link OUT; color: Green
[6] Bus input
[7] Bus output

For more information about the EtherCAT® fieldbus card, refer to the "MOVIAXIS® MX Multi-Axis Servo Inverter XFE24A EtherCAT® Fieldbus Interface" manual.

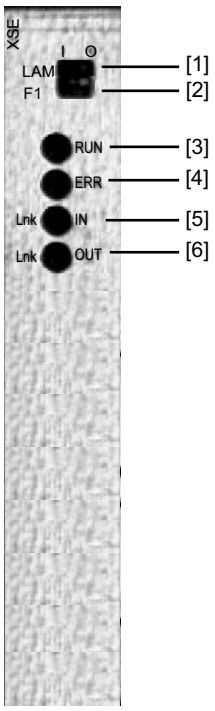
Technical data

XFE24A option (MOVIAXIS®)	
Standards	IEC 61158, IEC 61784-2
Baud rate	100 Mbaud full duplex
Connection technology	2 × RJ45 (8x8 modular jack)
Bus termination	Not integrated because bus termination is automatically activated.
OSI layer	Ethernet II
Station address	Setting via EtherCAT® master
Vendor ID	0 x 59 (CANopenVendor ID)
EtherCAT® services	• CoE (CANopen over EtherCAT®) • VoE (Simple MOVILINK® Protocol over EtherCAT®)
Firmware status of MOVIAXIS®	Firmware status 21 or higher
Tools for startup	• PC program MOVITOOLS® MotionStudio from version 5.40

1.5.4 XSE24A EtherCAT®-compatible system bus option

The EtherCAT®-compatible system bus XSE24A is an optional, axis-internal expansion module. This module implements the functionality of an EtherCAT®-compatible high-speed system bus for MOVIAXIS®. The XSE24A option module is no fieldbus interface. It cannot be used for communication with non-SEW EtherCAT® masters.

Analog to the wiring of the CAN system bus, the system is connected using the RJ45 plug connection on the top of the unit included in the standard scope of delivery. The CAN system bus is not available when XSE24A is used.



2882542731

[1] LAM switch
- Switch position 0: All axis modules except the last one
- Switch position 1: Last axis module in the system

[2] Switch F1
- Switch position 0: Delivery state
- Switch position 1: Reserved for added functions

[3] LED RUN; color: Green/orange

[4] LED ERR; color: Red

[5] LED link IN; color: Green

[6] LED link OUT; color: Green

1.5.5 Optional input/output card type XIO11A

	INFORMATION
	For information about the ground designations used in the following wiring diagrams, refer to section "Terminal assignment" on the next page.

Supply

- The logic of the module is supplied by MOVIAXIS®.
- Binary inputs and outputs are supplied via the DCOM and 24 V terminals on the front. The supply voltage must be fused with 4 A, see also chapter "UL-compliant installation".
- The binary inputs and outputs are electrically isolated from the logic supply.

Module behavior

Short circuit

In the event of a short circuit of a binary output, the driver will change to pulse mode and in this way protects itself. The status of the binary output does not change.

Once the short-circuit is eliminated, the status of the binary output is that which is output by MOVIAXIS® at that moment.

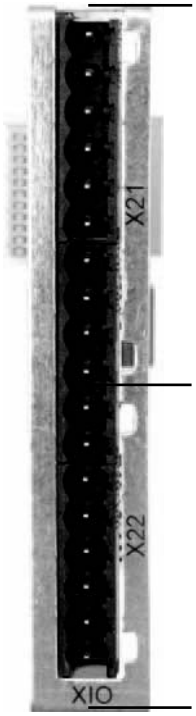
Switching inductive loads

- The module does not contain an internal free-wheeling diode for receiving inductive energies when inductive loads are switched off.
- The inductive load per output is 100 mJ at a frequency of 1 Hz.
- The inductive energy is converted into heat energy in the switching transistor. A voltage of 47 V is present. In this way, the energy can be reduced faster than by using a free-wheeling diode.
- The load capacity of the outputs through inductive loads can be increased by adding an external free-wheeling diode. However, switching off will take considerably longer.

Switching binary outputs in parallel

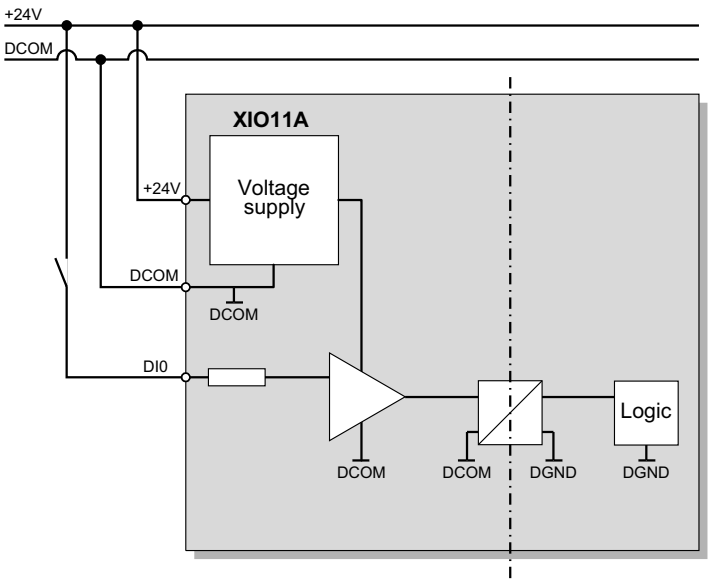
Connecting two binary outputs in parallel doubles the nominal current.

Terminal assignment

	Designation	Terminal	Plug	Plug size
 2882694795	DCOM	1	X21	COMBICON 5.08 One core per terminal: 0.20 - 1.5 mm^2 Two cores per terminal: 0.25 - 1.5 mm^2
	+24 V	2		
	DO 0	3		
	DO 1	4		
	DO 2	5		
	DO 3	6		
	DO 4	7		
	DO 5	8		
	DO 6	9		
	DO 7	10		
	DI 0	1	X22	
	DI 1	2		
	DI 2	3		
	DI 3	4		
	DI 4	5		
	DI 5	6		
	DI 6	7		
	DI 7	8		

Connection diagram

Wiring the binary inputs



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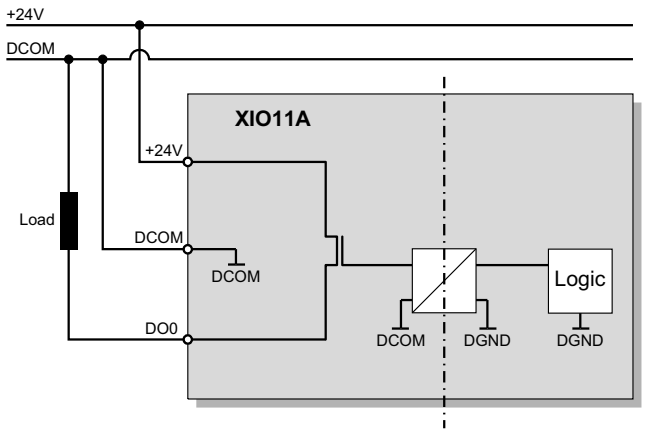
Switching the binary outputs



2882701195

	INFORMATION
	It the 24 V supply for the outputs is disconnected, the inputs will not function any longer.

1.5.6 Optional input/output card type XIA11A

	INFORMATION
	For information about the ground designations used in the following wiring diagrams, refer to section "Terminal assignment" on the next page.

Supply

- The logic of the module is supplied by MOVIAXIS®.
- Analog inputs and outputs are also supplied by MOVIAXIS®.
- Binary inputs and outputs are supplied via the DCOM and 24 V terminals on the front. The supply voltage must be fused with 4 A, see chapter "UL-compliant installation".
- The binary inputs and outputs are electrically isolated from the logic supply.

Module behavior

Short circuit

In the event of a short circuit of a binary output, the driver will change to pulse mode and in this way protects itself. The status of the binary output does not change.

Once the short-circuit is eliminated, the status of the binary output is that which is output by MOVIAXIS® at that moment.

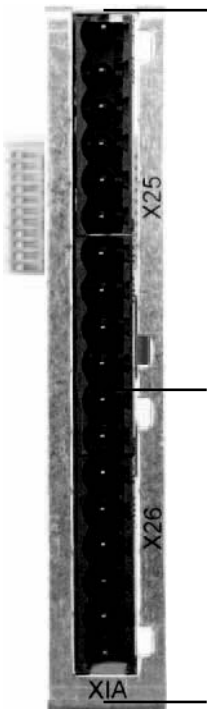
Switching inductive loads

- The module does not contain an internal free-wheeling diode for receiving inductive energies when inductive loads are switched off.
- The inductive load per output is 100 mJ at a frequency of 1 Hz.
- The inductive energy is converted into heat energy in the switching transistor. A voltage of 47 V is present. In this way, the energy can be reduced faster than by using a free-wheeling diode.
- The load capacity of the outputs through inductive loads can be increased by adding an external free-wheeling diode. However, switching off will take considerably longer.

Switching binary outputs in parallel

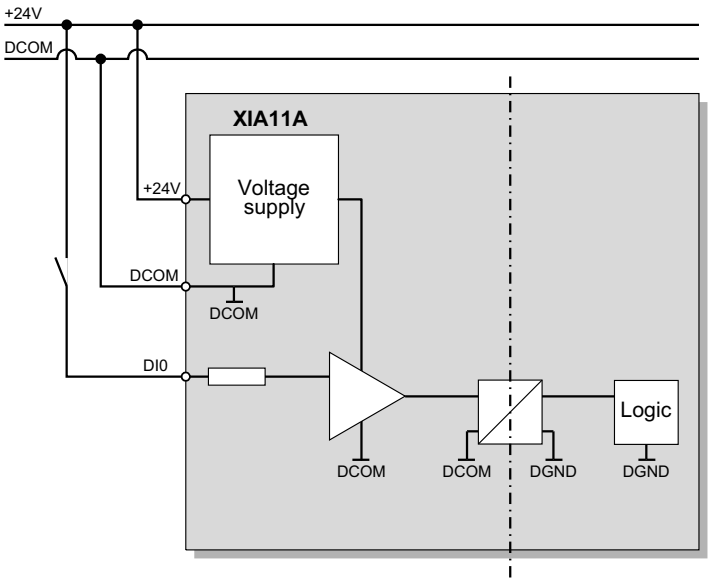
Connecting two binary outputs in parallel doubles the nominal current.

Terminal assignment

	Designation	Terminal		
 2883219723	DCOM	1	X25	COMBICON 5.08 One core per terminal: 0.20 - 1.5 mm^2 Two cores per terminal: 0.25 - 1.5 mm^2
	24 V	2		
	DO 0	3		
	DO 1	4		
	DO 2	5		
	DO 3	6		
	DI 0	7		
	DI 1	8		
	DI 2	9		
	DI 3	10		
	AI 0+	1	X26	
	AI 0-	2		
	AI 1+	3		
	AI 1-	4		
	AO 0	5		
	AO 1	6		
	DGND	7		
	DGND	8		

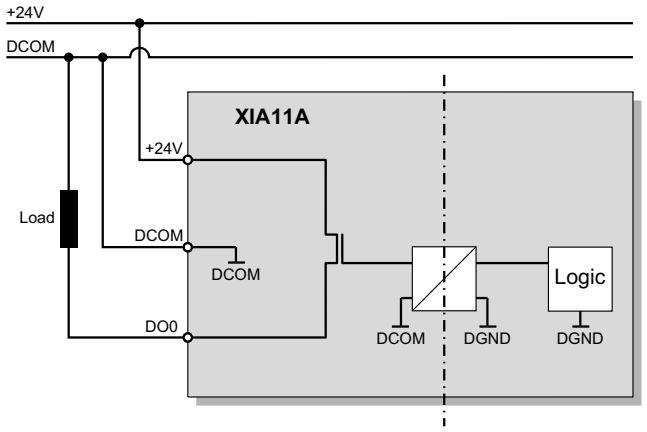
Connection diagram

Wiring the binary inputs



2883419659

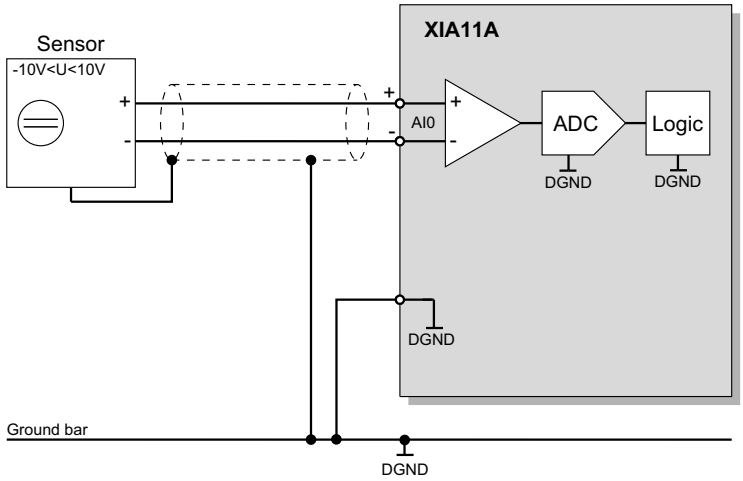
Switching the binary outputs



2883422603

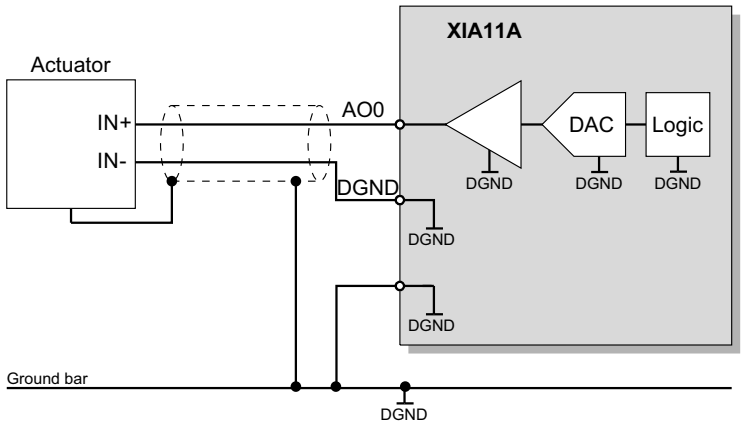
	INFORMATION
	The analog/binary hybrid module XIA11A has no internal free-wheeling diodes.

Wiring the analog inputs



2883425547

Switching the analog outputs

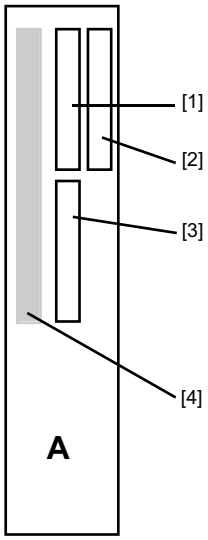


2883428491

	INFORMATION
	The analog/binary hybrid module XIA11A has no internal free-wheeling diodes.

1.5.7 Installation and function combinations of the option cards

MOVIAXIS® axis module can have up to three option cards installed. Depending on the option cards that you want to install, the following combinations must be considered.



2936300811

[1 - 3] Slots 1 - 3, assignment see following table
[4] Control board – component of the basic unit

A general distinction is made between whether MOVIAXIS® is used with the CAN-based system bus (SBus) or the EtherCAT®-compatible SBus^{plus}.

CAN unit variants

When using the CAN-based SBus, all three slots can be used according the following table.

The following tables show the possible combinations and the fixed assignment of cards to the slots.

Fieldbus combinations

The fieldbus options can be plugged in the following combinations:

Combination	Slot 1	Slot 2	Slot 3
1	Fieldbus option[1)]		
2	XIO11A	Fieldbus option	
3			XIA11A
4			XGH
5			XGS
6			XIO11A
7	XIA11A		
8			XGH
9			XGS
10			XIA11A
11	Fieldbus option		XGH
12	XGS	Fieldbus option	
13	XGH		
14	Fieldbus option		XGS
15	XGS	Fieldbus option	

1) **XFE24A**: EtherCAT®; **XFP11A**: PROFIBUS; **XFA11A**: K-Net

XIO combinations

The options can be combined as follows:

Combination	Slot 1	Slot 2	Slot 3
1	XIO11A		
2		XIA11A	
3			XGH
4			XGS
5		XIA11A	XGH
6			XGS
7		XGS	XGH
8		XGH	
9		XGS	XGS
10		XIO11A	
11			XGH
12			XGS

XIA combinations

The options can be combined as follows:

Combination	Slot 1	Slot 2	Slot 3
1	XIA11A		
2			XGH
3			XGS
4		XGS	XGH
5		XGH	
6		XGS	XGS
7		XIA11A	
8			XGH
9			XGS

Combinations with XGH, XGS only

The options can be combined as follows:

Combination	Slot 1	Slot 2	Slot 3
1			XGH
2	XGS		
3	XGH		

Combinations with XGS only

The options can be combined as follows:

Combination	Slot 1	Slot 2	Slot 3
1			XGS
2	XGS		

EtherCAT®-capable units

When using SBus^{plus} (EtherCAT®-compatible high-speed system bus), the XSE option must be installed in slot 1.

The following table shows the possible combinations and the fixed assignment of cards to the slots.

Combinations with EtherCAT®-compatible system bus

The options can be combined as follows:

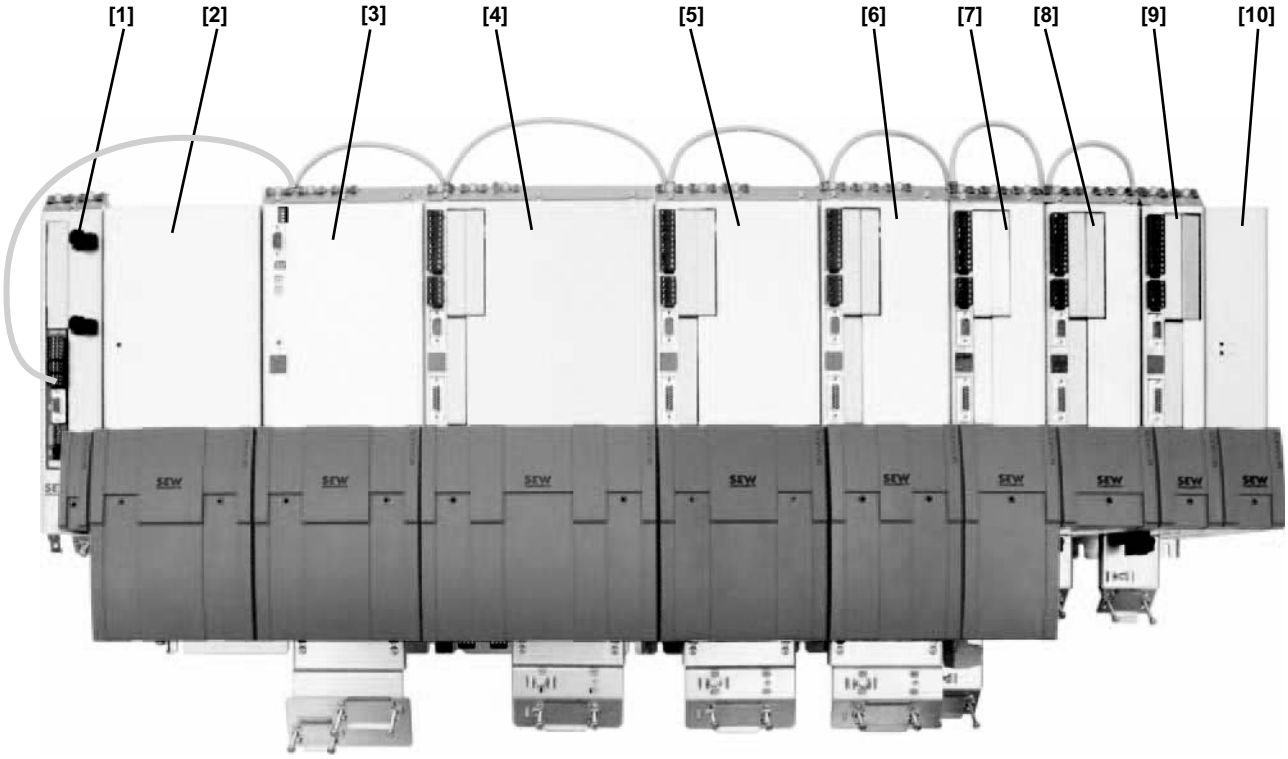
Combination	Slot 1	Slot 2	Slot 3
1	XSE24A		
2		XIO11A	
3			XIA11A
4			XGH
5			XGS
6			XIO11A
7		XIA11A	
8			XGH
9			XGS
10			XIA11A
11			XGH
12		XGS	
13		XGH	
14			XGS
15		XGS	

1.6 Installation variants, combination and communication options

MOVIAXIS® offers a high degree of flexibility for installation and combinations of the individual system components. The mechanical installation options and the resulting communication options are described below.

1.6.1 Arrangement of individual system elements in the axis system (single-row configuration)

All MOVIAXIS® system components must be arranged in a particular way. The following figure shows the correct installation of the available MOVIAXIS® modules (without DC link discharge module).



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[1] Master module
[2] Capacitor or buffer module
[3] Supply module or supply and regenerative module
[4] Axis module size 6
[5] Axis module size 5
[6] Axis module size 4
[7] Axis module size 3
[8] Axis module size 2
[9] Axis module size 1
[10] 24 V switched-mode power supply module

If one of the modules is needed for the application solution, the other modules must be moved to close the gap in the axis system.

Axes with a height of 300 mm and 400 mm can be combined according to the performance and supply project planning.

Separate operation Separate operation of individual modules is not permissible under any circumstances.

Hole intervals

The bore holes of the axis modules are spaced out evenly at intervals of n × 30 mm. This means that the back walls of the control cabinet can easily be prepared with a pattern of n × 30 mm. You can mount the different axes in any place, as all axes have the same mounting hole pattern.

Number of modules in the axis system

In general, you can add up to 8 axis modules to a supply module. After consultation with SEW-EURODRIVE, it is possible to add more.

Two-row configuration

With a special DC link connection, you can install the axis system in two rows, which is advantageous for narrow control cabinets (e.g. in narrow SRS aisles). Contact SEW-EURODRIVE in such cases.

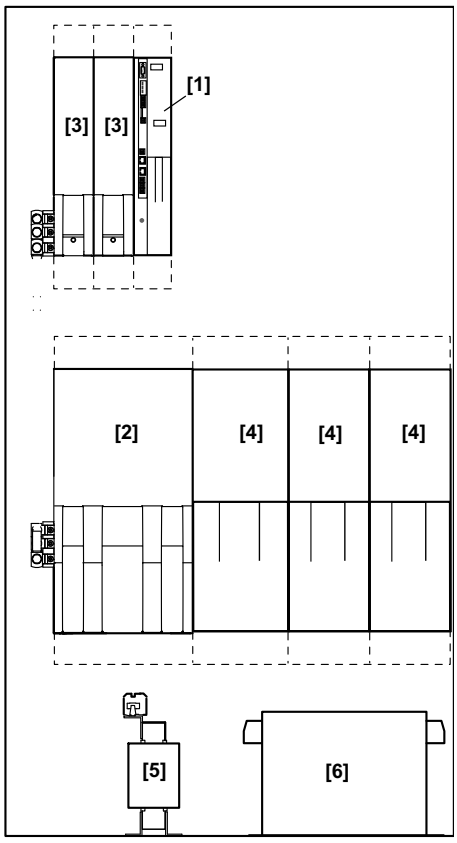
1.6.2 Two-row configuration of the axis system[1)]

A two-row configuration of the axis system is particularly suited for "two-level" installation in a narrow control cabinet. This configuration can only be realized with a special DC link connection.

An example for two-row configuration is the installation in the narrow aisles of a high-bay warehouse.

If your application requires two-row configuration of your axis system, please contact SEW-EURODRIVE.

The following figure shows an example of a two-row configuration of MOVIAXIS® modules.



2936855691

1) Available as of 4th quarter 2010

The following MOVIAXIS® modules can be combined:

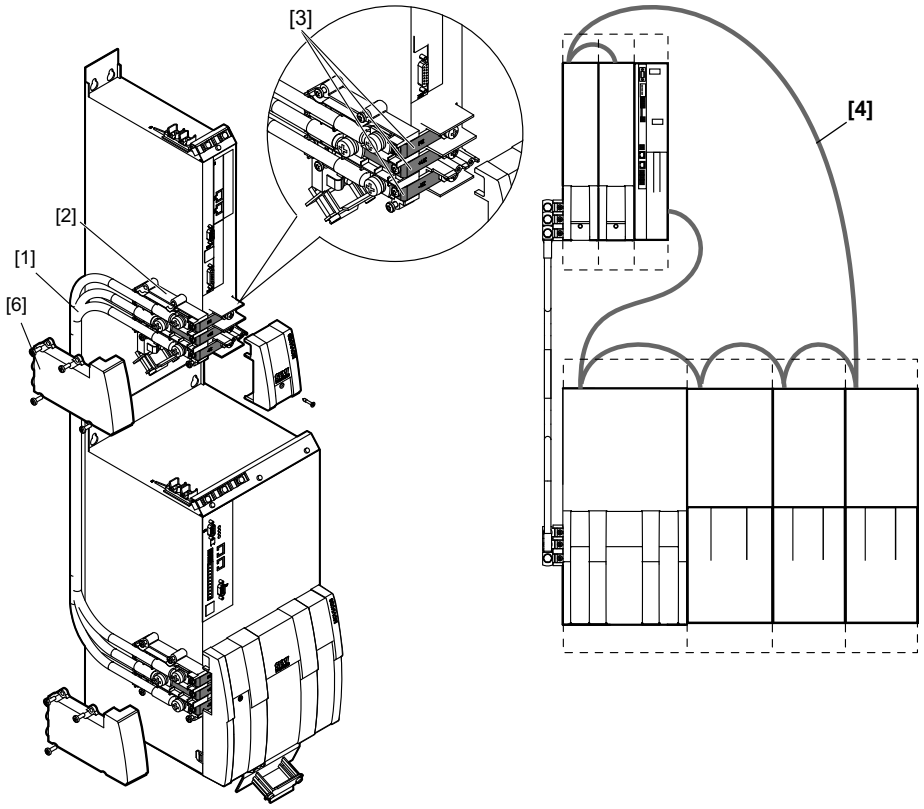
- [1] One MXM master module,
- [2] One MXR supply and regenerative unit,
- [3] A maximum of 4 MXA axis modules of size 1 or size 2,
- [4] MXA axis modules of size 1 – 6,
- [5] One line choke for MXR,
- [6] One line filter for MXR.

The number and size of the modules are determined in project planning.

Accessories are listed in chapter "Installation and connection accessories" (page 74).

Scope of delivery

For the described two-row configuration, an assembly kit is supplied.



The assembly kit contains:

- [1] Three prefabricated cables for the DC link connection,
- [2] Two insulators,
- [3] Six conductor bars,
- [4] One signal bus connection,
- [5] Screws, small parts,
- [6] Two protection caps.

1.6.3 Combination and communication options with and without master module

MOVIAXIS® can be integrated in automation and control structures in two different ways.

1. With optional fieldbus interfaces or the CAN-based application bus CAN2,
2. Master modules with CAN-based system bus SBus or EtherCAT®-compatible system bus SBus^{plus} for connection to the axis modules.
   - One axis system with MOVIAXIS®
   - Several MOVIAXIS® axis systems with each other

Without master module – MOVIAXIS® connection via fieldbus interfaces or via CAN-based application bus CAN2

Communication paths

This type of communication offers communication paths via PROFIBUS cards, EtherCAT® fieldbus cards, or axis-integrated CAN2 with DS301 profile.

Fieldbus connection

The individual fieldbuses are connected directly to the axis modules using the specified plugs of the respective fieldbus. For PROFIBUS, for example, there are axis drivers / S7 function blocks available for easy integration.

MOVILINK®

This type of connection is very lean and enables the use of all axis-integrated motion control and technology functions. MOVILINK®, the SEW fieldbus profile, can be used for all fieldbus types.

MOVILINK® always uses the same message format independent of the selected interface (CAN2-Bus, RS232, RS485, fieldbus interfaces). Hence the control software does not depend on the selected interface.

Variants without master module

The following table shows the individual connection variants with the main criteria for application adaptation. Communication cables are listed in chapter "System bus and connection cables – optional accessories" (page 77).

	Without option card	With axis-integrated option card	Fields of application	Data backup	Fieldbus communication	Axis communication
Without master module	CAN-based application bus CAN2		Simple control of MOVIAXIS®, fieldbus operation, use of integrated technology functions	Via higher-level controller or separate DHE in UOH housing	DS301 profile according to CIA, drive control via MOVILINK® protocol	Via CAN2
		XFP PROFIBUS card			According to PROFIBUS specification, axis driver for S7 available	Via SBus (CAN1) for all axes or CAN2
		XFE Ethernet card			According to EtherCAT® specification, drive control via MOVILINK® protocol	Via SBus (CAN1) for all axes or CAN2

	Without option card	With axis-integrated option card	Parameterization access	Control	Standard cabling	Optional/additional system bus cable
Without master module	CAN-based application bus CAN2		Centrally via D-sub 9 SBus (CAN1) access at supply module for all axes	Via external CAN controller	- Connection cable CAN2 for 3 axes, for 4 axes, terminating resistor CAN2	-
		XFP PROFIBUS card	Centrally via D-sub 9 SBus (CAN1) access at supply module for all axes or directly at each axis via CAN2	Via external PROFIBUS controller	All SBus (CAN 1) cables of the axes are included in the scope of delivery	Connection cable CAN2 for 3 axes, 4 axes, terminating resistor CAN2
		XFE Ethernet card	Centrally via D-sub 9 SBus (CAN1) access at supply module for all axes or directly at each axis via CAN2	Via external EtherCAT® controller		Connection cable CAN2 for 3 axes, 4 axes, terminating resistor CAN2

With master module – MOVIAXIS® connection – fieldbus network gateway or MOVI-PLC® motion control

The most powerful and cost-effective way to integrate MOVIAXIS® in control and automation structures is using the master module and the gateways. The master module itself offers different variants and communication options. The master module can also be connected to higher-level controllers as "slave element" via common networks and fieldbuses.

Three types of system internal communication are described below.

EtherCAT®, CAN1, CAN2

The system bus communication with the axes is scalable. You can either use the CAN-based system bus SBus with an expansion option via CAN2 or the optional EtherCAT®-compatible SBus^{plus}.

SBus, SBus^{plus}

Due to the lean and highly efficient protocol structure of the system bus, the CAN-based system bus SBus is sufficient in most cases. The EtherCAT®-compatible system bus SBus^{plus} is recommended for all applications that place extremely high demands on the data volume, speed, and cable length.

Variants with master module

The master module variants offer communication and integration options with different price and function levels.

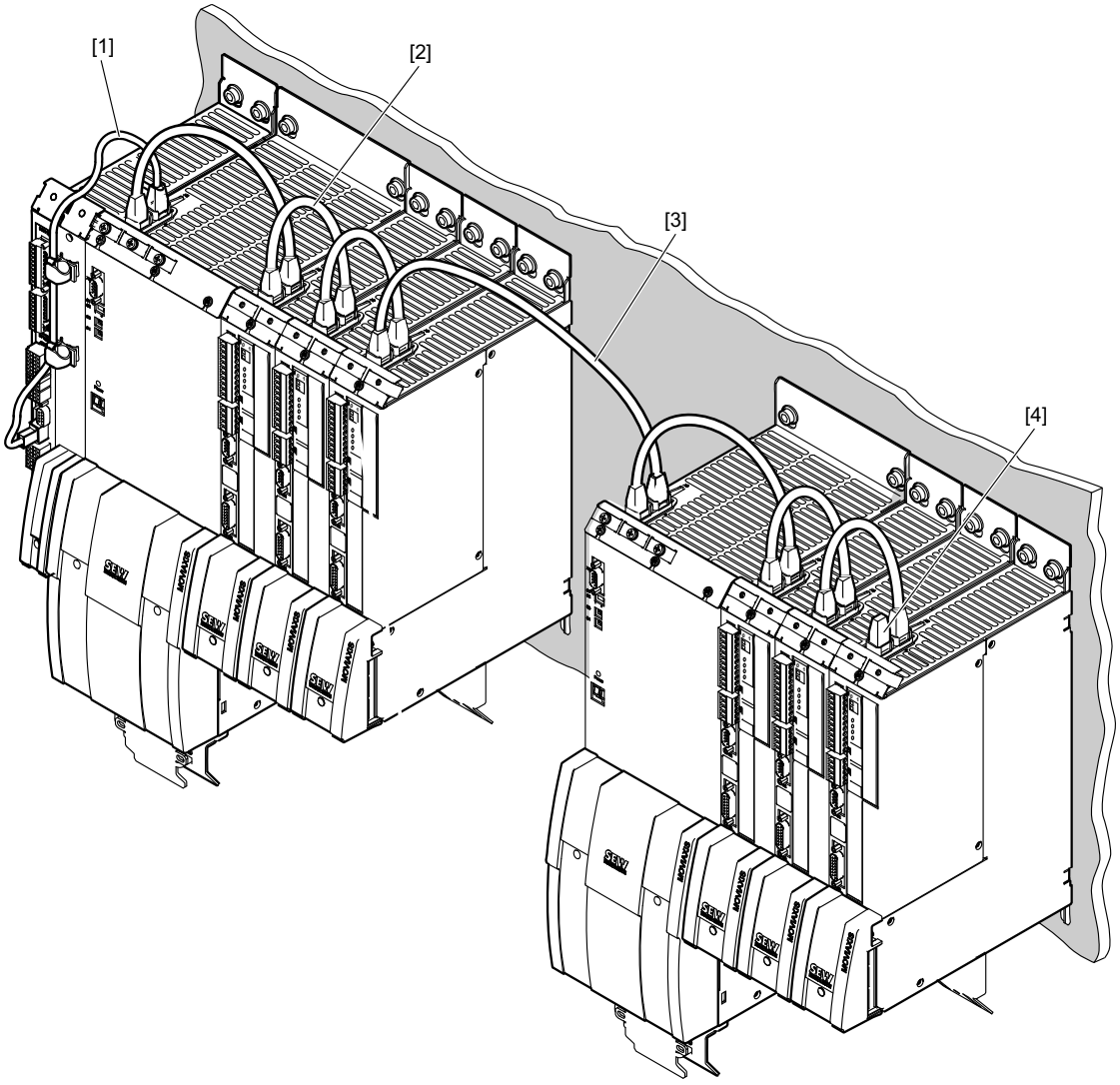
	Gateway	MOVI-PLC®	Fields of application	Data backup	Fieldbus/network communication	Axis module – master module communication
With master module	UFF		Central fieldbus access for all connected axis modules, switchable for PROFIBUS and DeviceNet	Centrally to SD card in the master module with auto reload	With max. 64 PD in 500 ms via gateway (for control connection)	1. SBus (CAN1), probably CAN2 in addition 2. SBus^{plus} (EtherCAT®-compatible, with optional system bus card XSE)
	UFR		Central network access for all connected axis modules, switchable for PROFINET, EtherNet/IP and Modbus/TCP			
		DHF	Control of all connected axes and module functions (robotics, motion control, kinematics, PLC) via DeviceNet/PROFIBUS		With max. 64 PD in 500 ms via MOVI-PLC® controller (for central control connection)	
		DHR	Control of all connected axes and module functions (robotics, motion control, kinematics, PLC) via EtherNet/IP, Modbus/TCP, PROFINET		With max. 64 PD in 500 ms via MOVI-PLC® controller (for central control connection)	
		DHE	Control of all connected axes and module functions (robotics, motion control, kinematics, PLC) via TCP/IP, UDP/IP			

	Gateway	MOVI-PLC®	Parameterization access	Control	Standard cabling	Optional/additional system bus cables
With master module	UFF		USB or TCP/IP to master module or CAN2 for each axis	Control via DeviceNet or PROFIBUS controller	- All SBus (CAN1) cables of the axes are included in the scope of delivery - Standard EtherCAT® cables are automatically included when order includes XSE - A CAN1 cable from the master module to the supply module is always included with the master module	- Adapter cable CAN2, master module** (for 3-way / 4-way adapter), Connection cable 3-way CAN2 for 3 axes, 4-way CAN2, 4 axes. CAN2 terminating resistor
	UFR			Control via EtherNet/IP or Modbus/TCP or PROFINET controller		
		DHF		Control of MOVIAXIS® via MOVI-PLC®, MOVI-PLC® as independent module controller		
		DHR				
		DHE		Control of MOVIAXIS® via MOVI-PLC®, MOVI-PLC® as independent module controller		

Three types of system internal communication are described below.

1. CAN-based system bus SBus

The following figure shows two connected axis systems.



[1]	CAN - master module connection cable	[3]	System bus connection cable
[2]	Cable for CAN-based system bus SBus	[4]	Terminating resistor

Fast data exchange between the axes

The individual axis modules are linked with the standard CAN-based system bus (CAN1). This system bus enables fast data exchange between the individual axes. The unit profile MOVILINK® 3.0 (or higher) from SEW-EURODRIVE is used for communication via the system bus. Option cards are available for real-time data transfer.

The CAN-based system bus is not optional and must always be used because of the data exchange via the signaling bus. CAN1 is primarily intended for exchanging engineering data, such as scope data, loading data sets, downloading firmware, etc.

CAN1 is included in the scope of delivery

All system connections for CAN1 communication are included in the scope of delivery of the basic unit.

In general, the following communication links can be established:

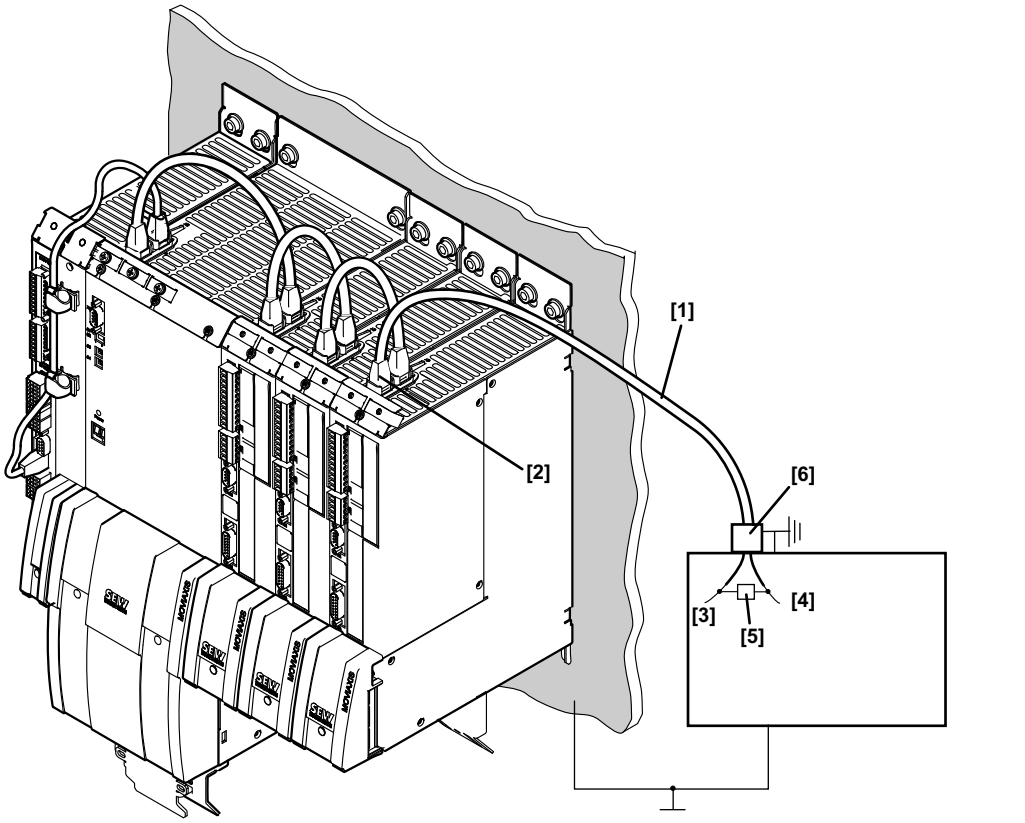
- MOVIAXIS® with CAN-based system bus SBus
- MOVIAXIS® with master module gateway
- MOVIAXIS® with master module controller

Cabling

No.	Designation	Connection	Length mm	Grommet color	Part number
[1]	CAN - master module connection cable	MXM to MXP	750	Black	0819 6923
[2]	Cable for CAN-based system bus SBus[1)]	MXP to MXA MXA to MXA	200	Green/red	0818 4720
			230		0819 1549
			260		0818 4739
			290		0819 1557
			350		0818 4747
[3]	System bus connection cable	MXA to MXP	750	Green/red	0819 7261
			3000		0819 8993
[4]	Terminating resistor SBus	-	-	-	0818 9633

1) Included in the standard scope of delivery. Is listed here for service purposes.

System bus connection cable to other SEW units



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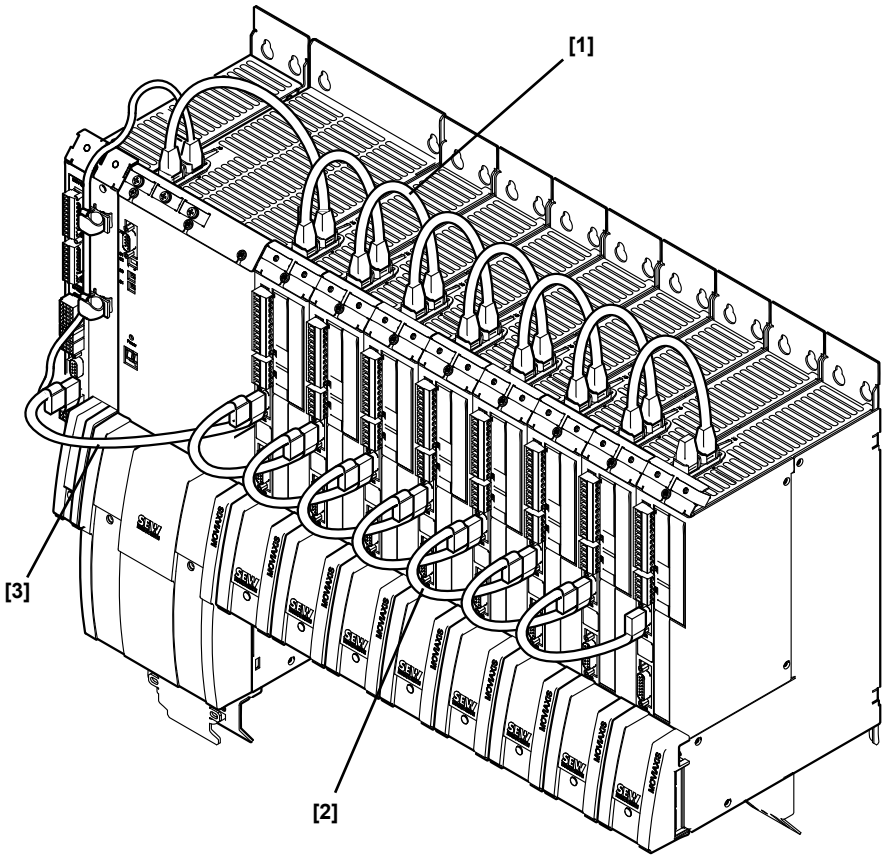
[1]	System bus connection cable	[4]	CAN H orange-white
[2]	Output plug black	[5]	Terminating resistor
[3]	CAN L orange	[6]	Contact shield connection

Cabling

No.	Designation	Connection	Length mm	Grommet color	Part number
[1]	Connection cable	Axis system to SEW units	750	Black	0819 7288
			3000		0819 7563

2. CAN-based application bus CAN2



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[1] CAN1 bus
[2] CAN2 bus
[3] Adapter cable master module to CAN2

CAN2 for additional tasks

The CAN2 bus, which is available as standard on the front of the axis module, can be used to implement various additional functions. One possibility is to take load off the CAN1 bus when it is heavily loaded by using the CAN2 system bus simultaneously, e.g. in connection with the master module variants with fieldbus gateway. This is also possible when using MOVI-PLC® controllers.

Additionally, it is possible to implement targeted cross-communication between individual axis modules for special drive tasks such as master/slave operation, electronic cam, and so on.

In addition, the individual axes can also be configured via CAN2 and addressed directly via a CAN USB adapter.

The system connections for the CAN2 system bus are available as accessories.

In general, the following communication links can be established:

- MOVIAXIS® with CAN-based application bus CAN2
- MOVIAXIS® with master module gateway
- MOVIAXIS® with master module controller

Cabling

No.	Designation	Connection	Length mm	Grommet color	Part number
[2]	Connection cable for CAN-based application bus CAN2 – 3 modules	MXA to MXA	3 × 210		1810 1585
	Connection cable for CAN-based application bus CAN2 – 4 modules		4 × 210		1810 1593
[3]	Adapter cable master module to CAN2	MXM to MXA	500		1810 1607
	CAN2 terminating resistor	-	-	-	1810 1615

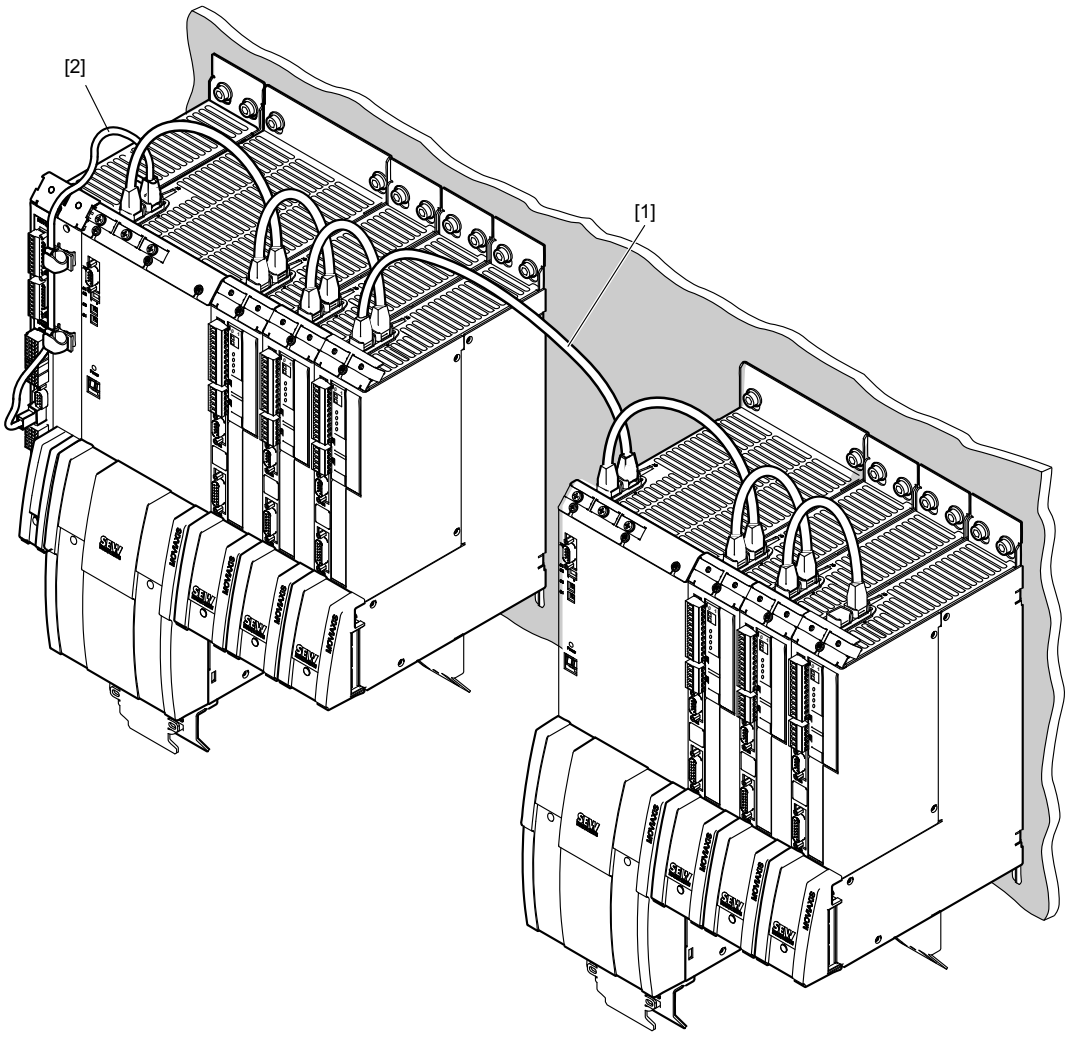
3. EtherCAT®-compatible system bus SBUS^{plus}

The EtherCAT®-compatible system bus SBUS^{plus} (XSE24A) is an optional, axis-internal expansion module. This module implements the functionality of an EtherCAT®-compatible high-speed system bus for MOVIAXIS®. The XSE24A option module is no fieldbus interface. It cannot be used for communication with non-SEW EtherCAT® masters.

Analog to the wiring of the CAN system bus, the system is connected using the RJ45 plug connection on the top of the unit included in the standard scope of delivery.

The CAN system bus is not available when XSE24A is used.

The following figure shows two connected axis systems.



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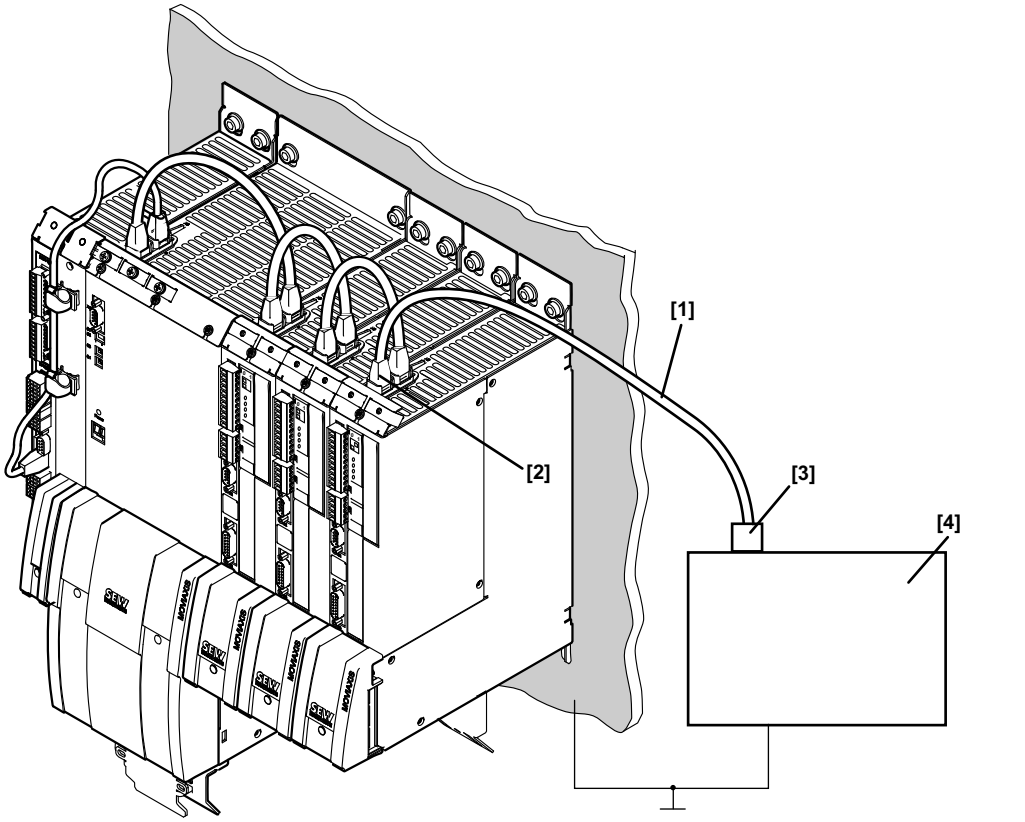
[1] System bus connection cable [2] CAN - master module connection cable

Cabling

No.	Designation	Connection	Length mm	Grommet color	Part number
[1]	Connection cable	MXA to MXP	750	Yellow/green	1810 0287
			3000		0819 4971
[2]	Connection cable for EtherCAT® master module	MXM to MXP	750	Yellow/black	1810 0279

System bus connection cable to other SEW units



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[1] System bus connection cable
[2] Output plug yellow
[3] Input plug green, RJ45
[4] SEW stations with SEW EtherCAT® interface

Cabling

No.	Designation	Connection	Length mm	Grommet color	Part number
[1]	Connection cable	MXA (yellow) to SEW units (green)	750	Yellow/green	1810 0287
			3000		0819 4971

1.6.4 Combinations of MOVIAXIS® axis systems with MOVIAXIS®, MOVIDRIVE®, MOVITRAC®

In addition to the combination options and flexibility within the axis system, MOVIAXIS® with the master module as the central element allows for further connection and installation options:

1. Communication can be connected on the basis of the CAN-based system bus SBus and optionally of the CAN-based application bus CAN2
   - Several MOVIAXIS® axis systems (page 66)
   - MOVIAXIS® axis systems with MOVIDRIVE® and MOVITRAC® 07 (page 68)
2. Communication is connected on the basis of the EtherCAT®-compatible system bus SBus^{plus}
   - Several MOVIAXIS® axis systems (page 71)
   - MOVIAXIS® axis systems with MOVIDRIVE® and MOVITRAC® 07 (page 72)

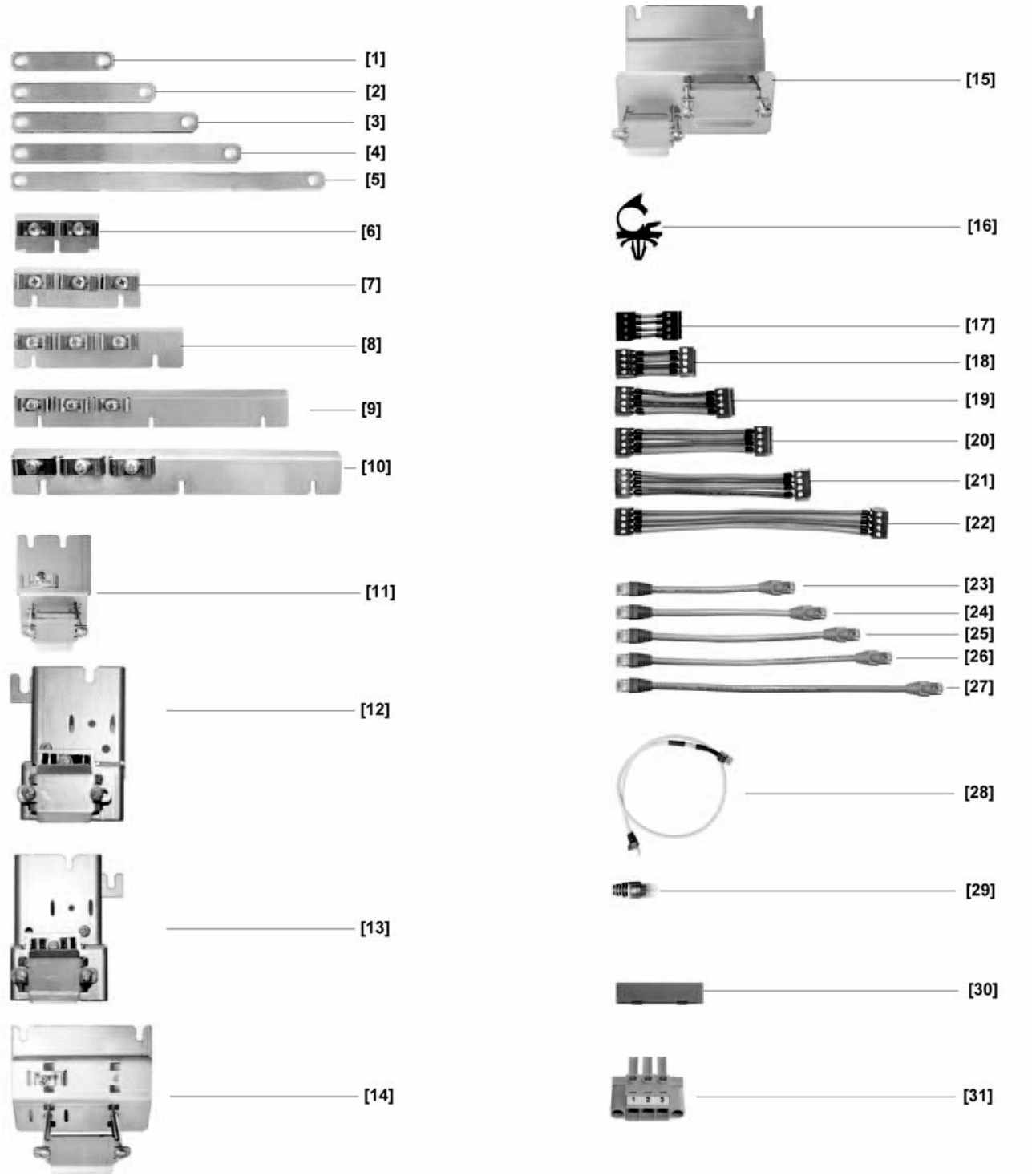
All installation variants can integrate existing SEW control cabinet inverters, such as MOVIDRIVE® and MOVITRAC® with the respective system buses (SBus, SBUS^{plus}) and their communication, data storage, and control.

The required, additional system bus and connection cables are assigned to the individual installation variants.

1.7 Installation and connection accessories

1.7.1 System cables – standard accessories

Standard accessories are included with the basic unit at delivery.



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The corresponding mating connectors for all connectors are installed at the factory. An **exception** are the D-sub connectors; they are supplied without mating connector.

Assignment table for standard accessories – Mechanical accessories

Accessory pack		1821 0864	1820 2683		1820 2632	1821 7583	1821 7400	1820 3310	1820 3310	1821 8598	1820 2616			1820 2632			1821 7435	1820 2977	1821 3987	1820 3000		
No.	Dimensions[1]	MXM	MXZ	MXS	MXP in kW					MXR	MXA in A										MXC	MXB
					10	10E[2]	25	50	75		2	4	8	12	16	24	32	48	64	100		
DC link connection																						
[1]	76 mm			3x							3x	3x	3x									
[2]	106 mm				3x									3x	3x	3x	3x					
[3]	136 mm		2x			3x												3x				
[4]	160 mm						3x	3x	3x										3x		3x	3x
[5]	226 mm									3x										3x		
Electronics shield clamp																						
[6]	60 mm	1x								1x	1x	1x	1x									
[7]	90 mm				1x									1x	1x	1x	1x					
[8]	120 mm					1x												1x				
[9]	150 mm						1x	1x	1x	1x									1x			
[10]	210 mm																			1x		
Power shield clamp																						
[11]	60 mm				1x	1x					1x	1x	1x	1x	1x	1x						
[12]	60 mm[3]						1x															
[13]	60 mm[4]																1x					
[14]	105 mm		1x															1x	1x	1x		
[15]	105 mm							1x	1x	1x												
Cable lugs																						
[16]		3x																				

1) Length of the cables: Length of the bulk cable without connector

2) MXP81A supply module with integrated braking resistor

3) Clamp with short support, 60 mm wide

4) Clamp with long support, 60 mm wide

Assignment table for standard accessories – Electric accessories

Accessory pack				18 20 52 24	18 21 10 03	1821 7591	18 21 10 03	1820 3329		18 21 86 01	1820 2624			1820 2640				18 20 29 85	18 20 98 23	182 0 301 9	1821 3006	
No.	Dimen-sions[1]	MXM	MXZ	MXS	MXP in kW					MXR	MXA in A										MXC	MXB
					10	10E[2]	25	50	75		2	4	8	12	16	24	32	48	64	100		
24 V supply cable																						
[17]	40 mm	1x																				
[18]	50 mm			1x							1x	1x	1x									
[19]	80 mm				1x		1x							1x	1x	1x	1x					
[20]	110 mm		1x			1x												1x				
[21]	140 mm							1x	1x										1x		1x	1x
[22]	200 mm									1x										1x		
Connection cable for CAN-based system bus SBus/EtherCAT®-compatible system bus SBus^{plus}																						
[23]	200 mm										1x	1x	1x									
[24]	230 mm				1x		1x							1x	1x	1x	1x					
[25]	260 mm					1x												1x				
[26]	290 mm							1x	1x										1x			
[27]	350 mm									1x										1x		
CAN - master module connection cable																						
[28]	750 mm	1x																				
CAN terminating resistor																						
[29]					1x	1x	1x	1x	1x													
Touch guard																						
[30]					2x	2x	2x	2x	2x													
Measurement cable connector																						
[31]										1x												

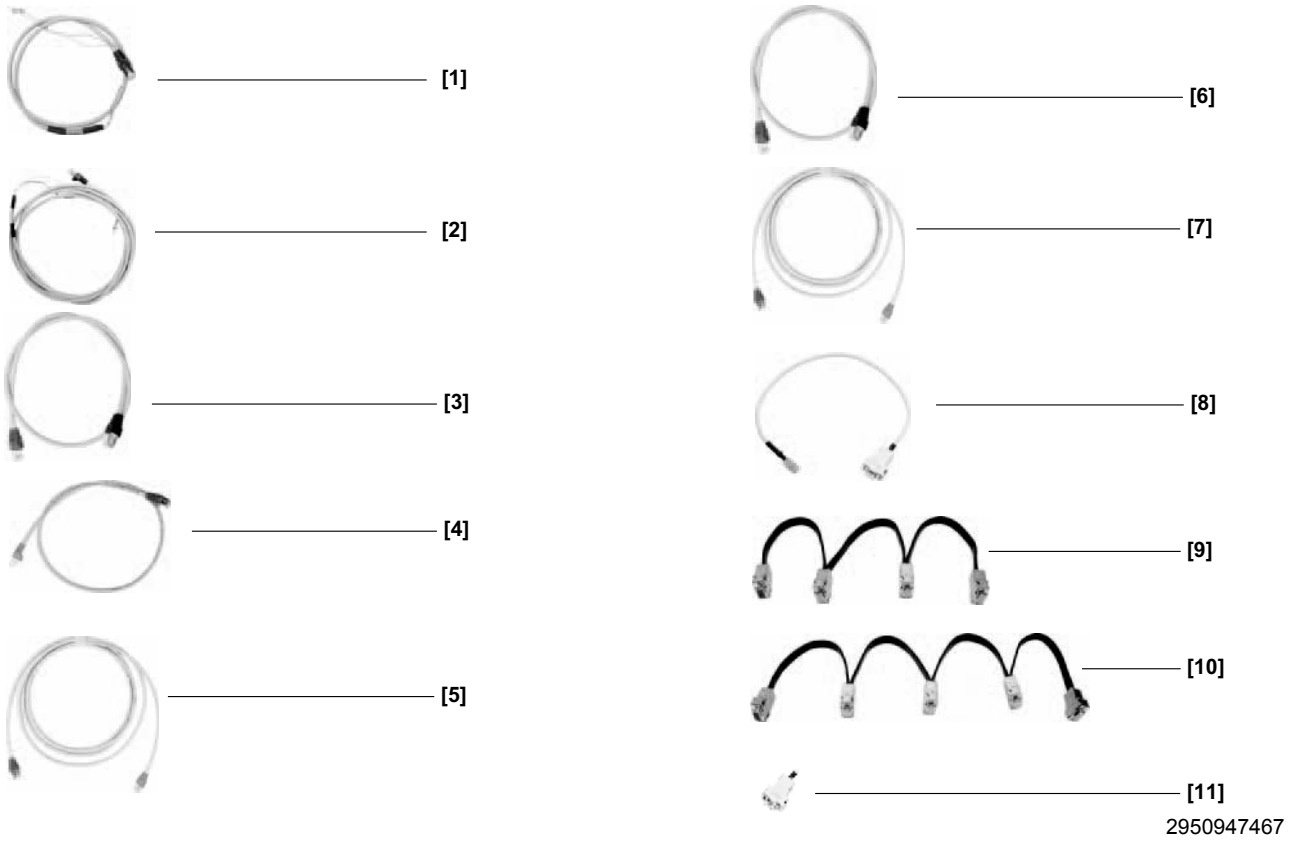
1) Length of the cables: Length of the bulk cable without connector

2) MXP81A supply module with integrated braking resistor

1.7.2 Accessories for two-row configuration of the axis system

Module	Part number
Two-row configuration	1822 2811

1.7.3 System bus and connection cables – optional accessories



Assignment table for optional accessories

No.	Dimensions / designation / connector type	Part number
System bus connection cable for CAN-based system bus SBus (axis system with other SEW units)		
[1]	750 mm RJ45 / open end	0819 7288
[2]	3000 mm RJ45 / open end	0819 7563
Connection cable for EtherCAT® master module		
[3]	750 mm 2 × RJ45	1810 0279
System bus connection cable for EtherCAT®-compatible system bus SBus^{plus} (axis system to other SEW units)		
[4]	750 mm 2 × RJ45 (special assignment)	1810 0287
[5]	3000 mm 2 × RJ45 (special assignment)	0819 4971
System bus connection cable CAN (axis system to axis system)		
[6]	750 mm 2 × RJ45 (special assignment)	0819 7261
[7]	3000 mm 2 × RJ45 (special assignment)	0819 8993
Adapter cable master module to CAN2		
[8]	500 mm Weidmüller to Sub-D9 w	1810 1607
Connection cable for CAN-based application bus CAN2		
[9]	3 modules Sub-D9 m/w	1810 1585
[10]	4 modules Sub-D9 m/w	1810 1593
CAN2 terminating resistor		
[11]	Sub-D9	1810 1615

1.8 Technology and unit functions

1.8.1 Control modes, machine control, and auto-tuning

CFC control mode (current-mode flux control)

Characteristics

MOVIAXIS® uses a high-performance, current-controlled control mode for synchronous and asynchronous servomotors. This control mode was optimized and further developed particularly for highly dynamic servo applications. Encoder feedback is necessary to ensure this performance.

This control mode offers the following features:

Advantages

- Torque up to the permitted maximum motor torque, even at standstill.
- Maximum precision and concentric running characteristics right down to standstill.
- Maximum servo characteristics and torque control even for standard asynchronous AC motors.
- Highest dynamic properties of the speed and position control loops due to short sampling intervals up to 250 µs and maximum, effective bandwidth.

Machine control

32-bit CPU

This results in higher positioning dynamics for the user with very low lag error. The control values for the torque, speed and position control loops are exactly calculated by the internal profile generators with the accuracy of a 32-bit floating point system.

This is a decisive factor for precise travel to the target position with maximum dynamic properties. Reactions to load variations within milliseconds provide optimal control of the drive along the setpoint curves.

The "floating point" function can calculate curve transitions between cams during the run time to ensure optimal transitions.

Torque and speed precontrol

Precontrol values for speed and torque setpoints are integrated for very fast responses to control deviations that do not run through the entire control loop.

Non-linear torque characteristic curve and standardization to nominal motor data

Consideration of non-linear torque characteristics of highly utilized servomotors is another important feature.

Advantage: Maximum stiffness of the motor over the entire torque range.

All torque settings and actual torque values refer to the nominal motor torque, and thus directly to the application. When using a larger inverter, the right motor values would still be selected.

Motor inductance compensation

In modern, tooth-wound servomotors with high utilization (e.g. CMP series), the inductance is changed via the impressed motor current. In case of high overload, this can lead to suboptimal motor control unless this behavior is compensated by the inverter.

MOVIAXIS® compensates this change in real-time, ensuring extreme control performance and dynamics even in the limit range of motor operation. The advantages are a higher degree of motor utilization, more power, and safe operation in limit ranges with maximum stiffness.

Temperature compensation during operation of asynchronous motors

Temperature compensation is possible to increase the torque accuracy when operating asynchronous motors. A KTY sensor evaluates the motor temperature and refines the parameters that map the copper heating.

Advantage: Very exact torque control for asynchronous motors can be implemented very easily.

Application and system limits

For optimum protection of the application or the processed goods and the machine/system, you can set limit values for speed, acceleration, and jerk separately in MOVIAXIS®.

This allows you to constantly adapt the application limits to different processed goods while the system limits reflect the maximum permissible load limits of the mechanical components.

Switched integrators

The freely parameterizable, precontrolable, and switched integrators provide optimal control results especially in case of changing loads, or load take-over in hoists, for example. As a result, the drive can be started up with optimal stiffness right after it is switched on.

Active control value management

Active control value management further optimizes the positioning times. When the drive reaches the control value limit, it uses the acceleration that is just possible to reach the target position without overshoots. In normal control loops, deviations would occur due to the I-component in the controller, which would have to be compensated with a transient motion. This needs more time than positioning at the control limits.

Advantage: MOVIAXIS® uses this function whenever loads greater than the projected values can occur, which would overload the control ranges of the servo inverter. Even in such cases, positioning times are optimized and long transient processes are prevented.

Torque control with speed range limiting

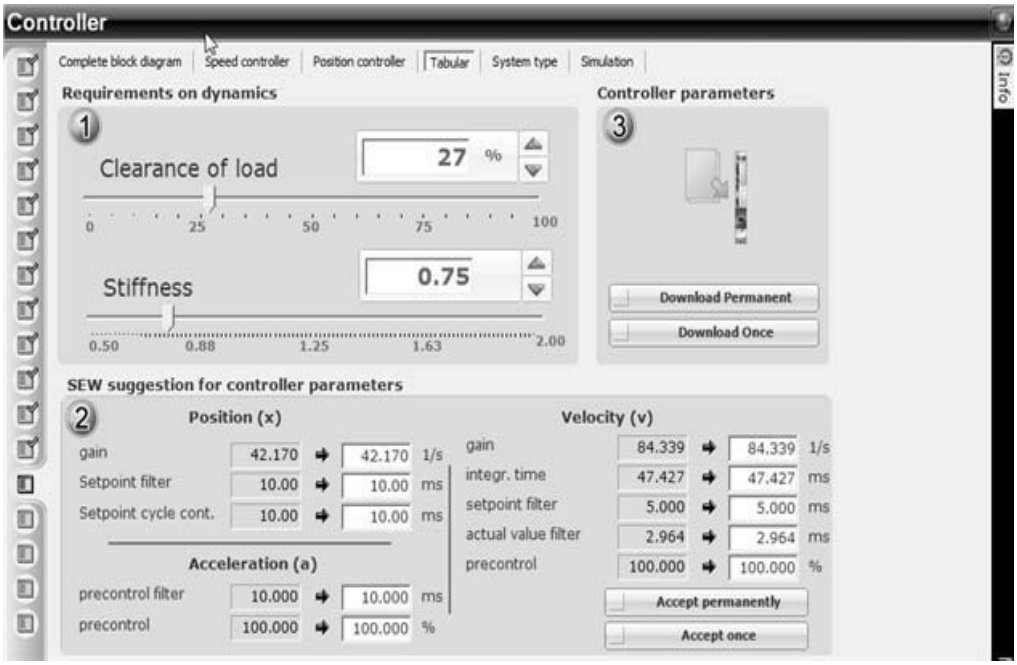
Even with torque control, this function ensures that certain speed limits are not exceeded. The drive can be kept in a target speed range without overspeeding.

4-quadrant operation

The torque limits for all 4 quadrants can be set or specified independently of each other, depending on the selected FCB. This means possible accelerations can be realized separately for each movement cycle, e.g. for critical storage and retrieval operations or special removal operations.

Automated startup and controller optimization

Auto-tuning / easy-tuning



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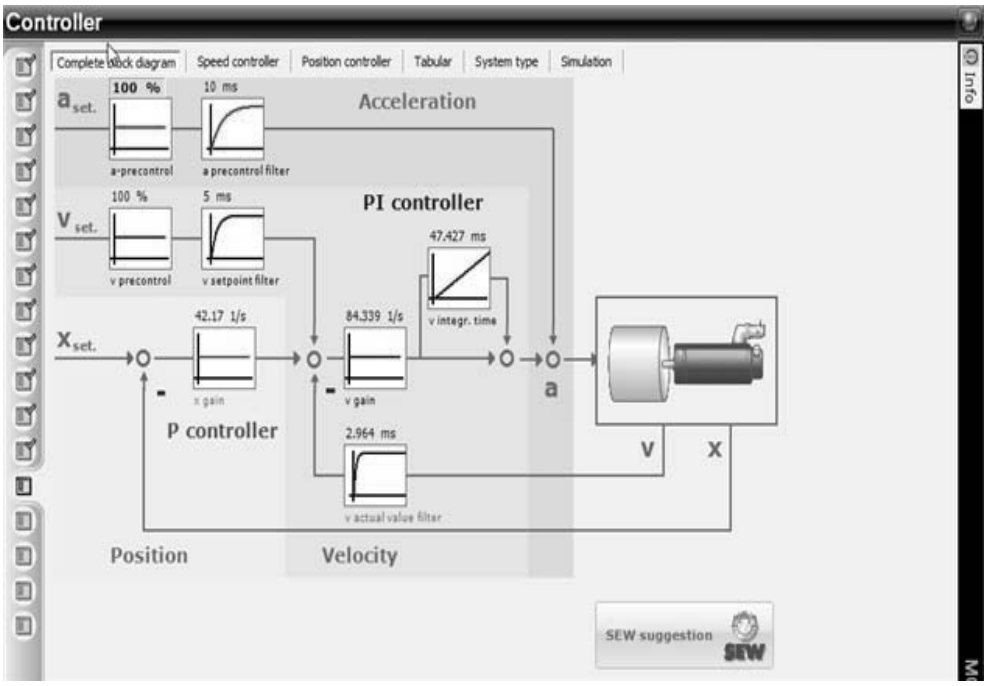
Two easily adjustable sliders are used to set an optimum controller setting for each axis. Using two advanced algorithms, the two controllers influence various parameters of the control loops.

To put it simply: The first slider, "Clearance of load", influences all relevant parameters for the load clearance, e.g. how "stiffly" the load is coupled mechanically to the drive motor.

The second controller, "Stiffness", influences the stiffness of the controller, e.g how strongly the system reacts to control deviations.

In this way, the desired behavior can be set easily and without in-depth control technology knowledge.

Expert tuning



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Based on the schematic representation, the control loops can also be set manually for very sophisticated drive tasks.

Graphical setting aids and interactive menus that are selected directly in the illustration plus setting diagrams that visualize the made settings allow experts to access and modify all relevant controller data.

1.8.2 Motion control and technology functions

General target positioning monitoring

MOVIAXIS® checks a target position before movement starts to determine whether it is in the permitted (software limit switch) travel range. If the position is not within the range, an error is issued (the error response corresponds to the response of the software limit switch set in the parameters). The positioning process is not started.

Dual drive

The "dual drive" function is a special form of synchronous operation. Its objective is to distribute the load under special basic conditions, e.g. position synchronicity, crash safety.

Seen from the outside, the drives operated in a system are given a speed setpoint. Within the axis system, the drives are all synchronous in terms of position.

The following features are offered:

- Parallel speed setpoint specification by the controller to all connected axes
- Ensuring position synchronicity of 2, 3, or 4 drives (motors), which are run in this operating mode together.
- Ensuring synchronicity even in case of
  - Overload of one or more axes when the torque control limit is reached or when the lag error builds up for the specified torque setpoint,

    or
  - Failure of an axis due to an error.

This feature was developed for special cases of application without rigid coupling of the axis mechanics. No rigid coupling can lead to tension and damage to the mechanical components if this function is not used.

For this reason, special position balancing controllers are integrated in all MOVIAXIS® axis modules, which constantly calculate and balance the position deviation between them and all other axes when the "dual drive" function is activated.

The maximum control limit of the weakest drive or of the drive with the heaviest load is used as a limit value for the drive group.

This offers the following user benefits:

- Operation of several motors on a non-rigidly coupled mechanical system, absolutely position-synchronous and gentle on the mechanics.
  - Under certain conditions, critical mechanical systems can be designed smaller and lighter, as they no longer have to be dimensioned for crash cases.
- High degree of crash protection of machines and tools.
  - Failure of a drive and the synchronous consequences for all other drives are detected almost in real time. This ensures almost no strain in the drive train, which means no unintended machine load or damage.
- Maximum acceleration and dynamics of coupled systems, as the intelligent control limit management ensures maximum utilization without risking an overload of the individual axes.
  - The drive performance of a machine can be precisely scaled by using several smaller drives, compared to using corresponding larger motors.

Jerk-limited profile generator

MOVIAXIS® has a jerk-limited profile generator. This jerk-limitation feature is required in particular with highly-dynamic positioning processes to position the axes with the relevant dynamic properties and to protect the mechanical machine components.

In contrast to MOVIDRIVE®, the jerk can be entered as a direct value with the unit "rpm/s^2" (revolutions per minute/s^2).

This value is then converted internally into the corresponding filter time and used to limit the increase in acceleration. The following formula applies:

Filter time = MAX (acceleration, deceleration) / jerk value.

The length of the acceleration is extended to include this filter time and therefore also the speed increase and positioning time. This superficial disadvantage is more than compensated for in most applications thanks to the protection of the mechanical components and the reduced vibrations.

The following values can be changed during a positioning process without having to adjust the jerk value:

- New target / overwrite position / sensor-based positioning,
- New maximum/minimum speed.

The acceleration and deceleration values can also be changed, but because the jerk time remains constant in this case, the actual jerk will change. This function should only be used when compatibility with the mechanical components has been checked.

If the value "0" is entered as the jerk, jerk limitation is deactivated and linear ramps are used for movement.

In position signal

The "in position" signal can only be activated as a subfunction of the FCB "Positioning" in positioning mode (FCB 09 "Positioning is activated").

Hysteresis for position window

The "In position" monitor uses two windows to activate and deactivate the "In position" signal.

If the actual position is in the inner window when the monitoring function is active, this signal is activated. The signal is only revoked when the drive leaves the outer window. If the drive with the same target position enters the inner position window again, the signal is activated again.

Thanks to this hysteresis, a small window can be used to activate the "In position" signal even for when the drive overshoots the actual position.

4 kHz operation for all axes 400 mm high

In the scope of the further development of MOVIAXIS®, axis modules with a height of 400 mm have been qualified for operation with a PWM of 4 kHz.

If MOVIAXIS® is operated in this way, all axes can be run with 33% higher continuous current up to a rotational frequency of 0.1 Hz. Below a rotational frequency of 0.1 Hz, the continuous output current must be reduced linearly to 100% of the nominal unit current.

Example: Axis module MXA80A-100-503-00

Nominal unit current = 100 A at 8 kHz.

Continuous unit current = 133 A at 4 kHz.

Reduction for rotational frequency < 0.1 Hz to 100% nominal unit current = 100 A.

Software and hardware limit switches

A certain travel range of a drive can be monitored using hardware limit switches.

If hardware limit switches are not installed, or if, for example, an early warning alarm is to be activated when a specific position is exceeded, the software limit switches integrated in MOVIAXIS® can be activated.

Each limit switch (left or right software limit switch) can be activated/deactivated independently of one another. Furthermore, the source of the software limit switches (encoder 1 - encoder 3) can also be set. If the drive hits one of the two software or hardware limit switches, it reacts using one of the responses set by the user.

Software and hardware limit switches basically react in the same way. In order to enable the monitoring function, the appropriate encoder must be referenced.

Reference travel

In the same way as MOVIDRIVE® B, MOVIAXIS® offers a number of options for reference travel. The reference travel type "Reference to fixed stop" is new.

The aim of reference travel is to reference / match the drive and its position data with the machine design. Referencing is used to identify the real zero point of the drive. This value is then used to define distances necessary for positioning processes, for example.

MOVIAXIS® offers the following reference travel types:

- Left zero pulse
- Left end reference cam
- Right end reference cam
- Limit switch right.
- Limit switch left.
- No reference travel I
- Reference cam flush with right limit switch.
- Reference cam flush with left limit switch.
- No reference travel II.
- High-precision referencing to right fixed stop.
- High-precision referencing to left fixed stop.

The reference travel types differ according to the first search direction or the switching contact (reference cam, limit switch or fixed stop) used for referencing. Reference travel can apply to all three encoders.

Using the reference point determined by reference travel, the machine zero point can be changed using the reference offset according to the following equation.

Machine zero = reference position - reference offset

Basic control modes

MOVIAXIS® usually operates with the CFC control mode for asynchronous and synchronous motors with encoder feedback. MOVIAXIS® can be operated in the basic control modes torque, speed and position control. This means that the customer can activate closed-loop control circuits where they are most suitable for the application. MOVIAXIS® can be implemented in a wide range of applications and, in many cases, can take on all the tasks of a motion controller.

Torque control

MOVIAXIS® can be run as a torque-controlled axis.

The user can specify limit values for speed, acceleration and jerk as the basic conditions for torque control. The actual torque setpoint for the drive controller is generated in the controller cycle by a ramp generator integrated in MOVIAXIS® using the specified limit values.

The maximum speed can be limited during torque control. The speed limit can be changed dynamically using process data.

Interpolated torque control

For applications with a higher-level (motion control) controller, this controller usually calculates a track profile (x, y, z) for several drive axes. The axis is then assigned one setpoint (position, speed, torque) that it has to follow. MOVIAXIS® only limits the setpoints using the unit's internal system limits. The application limits for speed, acceleration and jerk must be taken from the track curve and are then controlled by the controller.

The cycle in which the controller sends the setpoints to the axes does not usually correspond with the setpoint processing cycle of MOVIAXIS® (500 µs). If MOVIAXIS® were to "see" the same controller setpoint for several cycles, a step-shaped actual torque value would result. To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle. MOVIAXIS® can be set to different cycle times of higher-level controllers.

Speed control

MOVIAXIS® can be run as a speed-controlled axis.

The user can specify limit values for acceleration, deceleration and jerk as the basic conditions for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle by a ramp generator integrated in MOVIAXIS® using the specified limit values.

You can configure several data sets (instances, and therefore "speed controllers" with different settings) for the "Speed control" function. You can switch between the instances using process data or parameter access.

In this way, for example, a process, in which speed controllers with different settings are used, is simple to implement using the instance switchover function.

Interpolated speed control

For applications with a higher-level (motion control) controller, this controller usually calculates a track profile (x, y, z) for several drive axes. The axis is then assigned one setpoint (position, speed, torque) that it has to follow.

MOVIAXIS® only limits the setpoints using the unit's internal system limits. The application limits for speed, acceleration and jerk must be taken from the track curve and are then controlled by the controller.

However, torque limitation at the drive is desirable, e.g. to protect the machine and for applications that use the speed control to move to a stop and that have to generate clamping pressure.

The controller can specify the torque limit using process data or parameters. A lag error can occur when the track curve requires a higher torque rating.

The user can configure the torque limitation:

1. One limit value for all the quadrants of the N-M diagram.
2. One value each for the regenerative and motor range.
3. A limit value is set for each quadrant.

The cycle in which the controller sends the setpoints to the axes does not usually correspond with the setpoint processing cycle of MOVIAXIS® (500 µs). If MOVIAXIS® were to "see" the same controller setpoint for several cycles, a step-shaped actual speed value would result.

To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle. MOVIAXIS® can be set to different cycles of higher-level controllers.

Position control (normal or modulo mode)

MOVIAXIS® has a number of positioning mode. These modes are described briefly in the following section. FCB "Positioning" can be instanced to a maximum of 64 times.

Absolute positioning

The position setpoint in user-defined units is interpreted as an absolute target and is converted and executed in system units.

The travel range in system units is ± (2^{31} - 2). If this travel range is exceeded after the conversion, the FCB issues an error.

Relative positioning

The position setpoint in user units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

If the target calculated in system units is outside the travel range of ± (2^{31} - 2), the FCB issues an error.

Modulo in positive direction with absolute position setpoint

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued. The drive always turns in a positive direction to reach the specified position.

Modulo in positive direction with relative position setpoint

The position setpoint in user units is interpreted as the offset to the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The position setpoint must be **positive**, otherwise an error is issued.

The drive always turns in a positive direction to reach the new position.

Modulo in negative direction with absolute position setpoint

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued. The drive always turns in a negative direction to reach the new position.

Modulo in negative direction with relative position setpoint

The position setpoint in user units is interpreted as the offset to the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The position setpoint must be **negative**, otherwise an error is issued.

The drive always turns in a negative direction to reach the new position.

Modulo with shortest possible route and absolute position setpoint

The position setpoint in user-defined units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo underflow"

Upper limit = "Modulo overflow"

If the position setpoint is outside this range, an error is issued.

The direction of the drive is determined using the last setpoint position (= current actual position after activation without an "In position" message) and the current setpoint position. This value is used to determine the shortest possible route and, therefore, the direction of rotation for positioning.

Modulo with relative position setpoint

The position setpoint in user units is interpreted as the offset to the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

The sign of the position setpoint determines the direction of rotation of the drive.

Interpolated position control

For applications with a higher-level (motion control) controller, this controller usually calculates a track profile (x, y, z) for several drive axes. The axis is then assigned one setpoint (position, speed, torque) that it has to follow.

MOVIAXIS® only limits the setpoints using the unit's internal system limits. The application limits for speed, acceleration and jerk must be taken from the track curve and are then controlled by the controller.

The cycle in which the controller sends the setpoints to the axes does not usually correspond with the setpoint processing cycle of MOVIAXIS® (500 µs). If MOVIAXIS® were to "see" the same controller setpoint for several cycles, a step-shaped actual position value would result.

To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle. MOVIAXIS® can be set to different cycles of higher-level controllers.

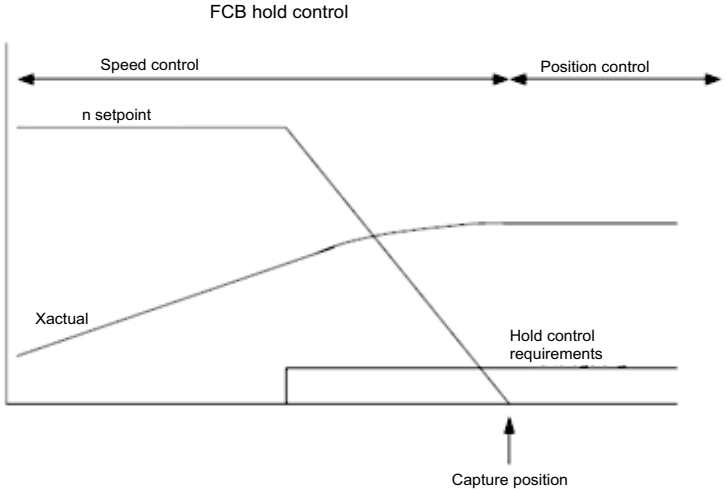
Jog mode

MOVIAXIS® has a position-controlled jog mode function; this means it is possible to move an axis in positive or negative direction, for example, for alignment purposes in **position control** mode using two adjustable speeds for each direction. The advantage of this function is that it can be used with hoist applications for which the position is not permitted to change when a change in load occurs when the drive is at a standstill.

Hold control

The hold control function integrated in MOVIAXIS® enables the axis to be held subject to position control once it has come to a standstill. The actual position reached at speed "0" (capture position) is used as the "setpoint position" for hold control.

The hold control function can be activated from "any" motion state.



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User-defined units for all process data

In contrast to MOVIDRIVE® B, MOVIAXIS® offers customers the option of using the controller to send process output data for position, speed, acceleration, and torque to MOVIAXIS® in user-defined units.

In the axis, this process data is converted into internal units (basis: increments) in the setpoint cycle of a minimum of 500 µs. The same process applies to the process input data returned from MOVIAXIS® to the controller. The data for position, speed, or acceleration are converted into the customer's user units.

The big advantage for customers and PLC programmers is that they do not have to convert the complex physical conditions in the machine into SEW-specific units in their programs.

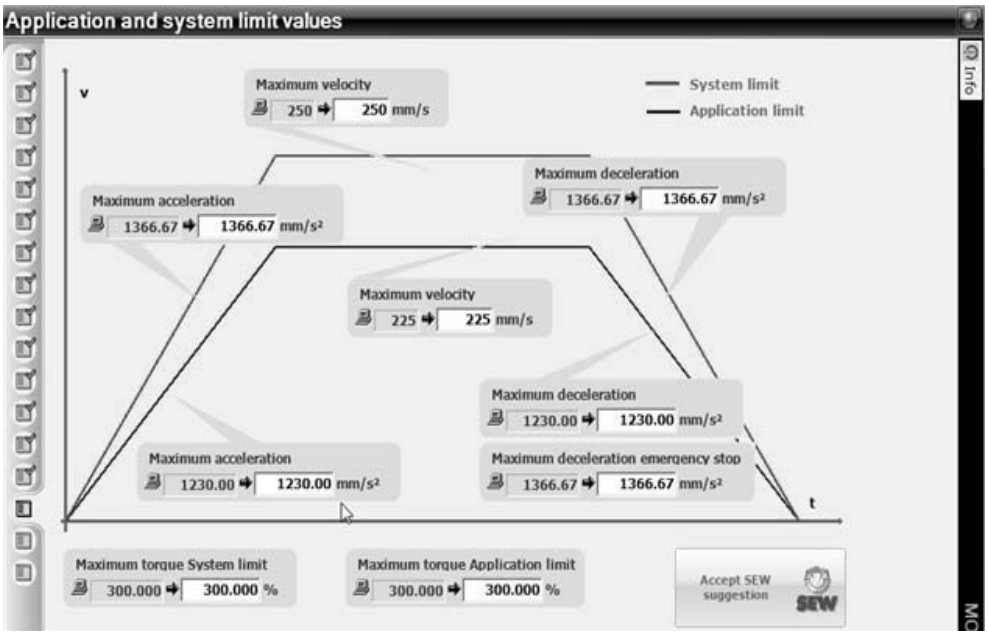
Customers can simply select the units most suitable for their applications and send them as specifications to MOVIAXIS®.

For example, customers can specify the following:

- For the position: Compartments, packages, bottles
- For the speed: Bottles/minutes, bags/second
- For the acceleration: Bags/second^2, compartments/min×s

Application and system limit values

The entry of application and system limits in user-defined units allows the user to set limits for acceleration and velocities separately. They are set once according to the maximum load of the mechanics of machinery (machine limit value) and according to the product (application limit value). This protects the product and the machine and/or system in the best way possible. These limits can be set using the graphical user interface of MOVITOOLS® MotionStudio.



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For more information on this topic, refer to the operating instructions, chapter "Description of the startup software".

For detailed information about the technology functions, refer to the manual "MOVIAXIS® Technology Functions".

Electronic cam

A high-performance electronic cam functionality is integrated in MOVIAXIS®. Basic data:

- A max. of 10240 curve points can be distributed between a max. of 40 curves.
- User-defined sequence of curves (this means curve points can be located closer to one another if required).
- Parameterizable curve transition events, e.g. C-track, input terminals, timer-controlled, control word, which can also be used as startup signals.
- Transition functions between curves calculated during the runtime (e.g. 5th degree polynomial).
- Modulo cam (infinite gear ratios).
- Different curve types can be selected (e.g. speed curves and torque curves are also possible).

Synchronous operation/electronic gear unit

The functionality of an electronic gear unit is available as an independent, easy-to-use function outside the cam.

It offers the following features:

- The slave length can be defined by the user.
- Startup curves with a 5th degree polynomial are possible.
- There are significantly more options for intervention and overlapping.

Virtual encoder

The virtual encoder integrated in MOVIAXIS® offers the following operating types and basic functions:

- Endless operating mode.
- Positioning operating mode.
- Modulo operating mode.
- Jerk limitation.

Touch probe

MOVIAXIS® offers a touch probe function that has significantly more recording options for events and data than the standard touch probe functionality.

The following basic functions are included:

- Edge changes (pos./neg.) and the duration of a signal can be used for evaluation/ event recognition.
- The specified events can be stored in a ring buffer with 4 different channels and max. 4 storage positions per channel. In this way, signals can occur in quick succession and be stored in an intermediate buffer for further processing.
- The dependencies of the event recognition (edge, duration) can be combined with one another, e.g. the event is only recognized when a specific edge change and signal duration are present.
- All positions are saved for each event.

1.8.3 Basic functions, installation, and wiring

Brake control system

Possible up to size CMP63. After that the brake must be controlled via a brake rectifier due to the higher brake current.

The brake rectifiers for controlling three-wire brakes are activated via the switching output, e.g. in CM/DS/DY/CT/CV motors.

Note that the operation of non-SEW brakes must be included in project planning and must be cleared with SEW-EURODRIVE.

Direct brake control

MOVIAXIS® can control the DC 24 V holding brake of the CMP servomotors directly, i.e. without a brake rectifier, using an integrated solid-state switch.

Brake control with brake rectifier

Recommended brake rectifiers:

- BST → supplied with DC 560 V voltage.
- BMK
- BME
- BMV

Binary inputs and outputs

MOVIAXIS® has 9 binary inputs and 4 binary outputs. One of the binary outputs is assigned as the output stage enable, and all outputs can be used as touch probes.

Electronic motor nameplate

The electronic nameplate of SEW motors with relevant motor and gear unit data is supported (if implemented).

Encoder evaluations in the basic unit

The following encoders can be evaluated using the encoder evaluation function integrated in the MOVIAXIS® basic unit:

- Hiperface® encoder
- Sin/cos encoder
- TTL encoder
- Resolver (2 – 12 pole pairs)

Standards and approvals

- The following approvals have been granted for the MOVIAXIS® modules: See chapter "Technical data" (page 109).
- Safe disconnection of power and electronic connections according to EN 61800-5-2.
- Compliance with all the requirements for CE certification of machines and plant equipped with MOVIAXIS® on the basis of the EC Low Voltage Directive 2006/96/EC and the EMC Directive 2004/108/EC. Complies with the EMC product standard EN 61800-3.
- Meets the following safety categories: See chapter "Functional safety / "Safety technology" (page 98).

1.8.4 Communication profiles

Depending on the used system buses "CAN-based" or "EtherCAT®-compatible", the following communication profiles are possible:

Profile	CAN-based system bus, SBus	EtherCAT®-compatible system bus SBus^{plus}	CAN-based application bus CAN2
MOVILINK®	x	x	x
EtherCAT® axis profile		x	
CANopen			x

MOVILINK®

MOVILINK® always uses the same message format independent of the selected interface (CAN-based system bus, RS232, RS485, fieldbus interfaces). Hence the control software does not depend on the selected interface.

1.8.5 Energy saving functions and grid compatibility

Saving energy

In addition to energy consumption, which is already optimized in synchronous servomotors due to their operating principle, the handling of the braking energy is key.

During the development of MOVIAXIS®, this topic was paid special attention. Options for re-using the braking energy were developed in order to significantly improve the overall energy balance of a drive solution and to save costs.

MOVIAXIS® offers different modules with different purposes, which are defined by the application. Decisive criteria are the repetition rate of a movement (cycle, dynamics) and the size of the load (inertia). According to this, there are different application areas with a recommendation for the individual energy-saving modules, see table below.

	Very dynamic applications with fast cycle times	Dynamic applications	Reduced dynamics
Lower axis output	Saving energy MXP81[1)]	Saving energy MXC / MXP81	Regenerating energy MXR[2)]
Large servo axes, medium loads	Saving energy MXC[3)]	Saving energy MXC	Regenerating energy MXC / MXR
(Continuously operated) power axes, heavy loads	Saving energy MXC	Regenerating energy MXR	Regenerating energy MXR

1) 10 kW compact supply module
2) Supply and regenerative module
3) Optional capacitor module

The following comparison gives an overview of the MOVIAXIS® energy saving modules with their main application data and customer benefits:

Product	Product purpose	Power rating	Energy storage	Braking resistor	Application	Customer benefits
MXP81A-010	Supply module	10 kW nominal 25 kW peak	200 Ws	220 W nominal 25 kW peak	• Very dynamic servo application • Compact automation	• Less installation effort • All-in-one unit • Energy efficient • Low heat build-up
MXC	Active energy storage module	-	1000 Ws	-	• Intermediate energy storage • Applications with medium power	• Modular unit that can be adapted • Energy efficient • Low heat build-up
MXR80A-075	Supply and regenerative module	75 kW nominal 150 kW peak	Energy feedback into the grid	optional	• Energy recycling • Applications with medium and high power • High mass moment of inertia • Start/stop applications	• Energy regeneration • Low heat build-up • Minimized harmonics

Grid compatibility and harmonics reduction

The quality of the supply system is becoming more and more important due to an increasing number of electronic consumers. This is critical in the automation plants themselves with their many electronic units on the one hand, and on the other hand for the energy providers and the grids they supply.

Interference, harmonics, and reactive power must be compensated or filtered additionally in critical cases, which can lead to complex requirements (space, maintenance, investments).

MOVIAXIS® offers an ideal solution for this with its sinusoidal supply and regenerative module MXR.

- Minimized harmonics (THDi < 10%)
- Sinusoidal current consumption
- No heating of cables, chokes, etc. (smaller dimensioning of line components)
- Greatly reduced influence on sensitive systems connected to the supply system
- Cosφ = 1, pure active power consumption, sinusoidal current consumption

Depending on the unit operating mode, an optional EcoLine filter can be used for additional, maximum reduction of harmonics in very sensitive applications.

The positive side effect, in addition to optimal grid compatibility, is the reduction of the necessary transformer power, which also lowers costs.

1.8.6 Diagnostics and scope function

Diagnostics

Energy meter

The MXR supply and regenerative module of the MOVIAXIS® series can analyze the energy flow between the axis system and the supply system, and uses an energy feedback meter to determine the amount of energy that has been saved.

8-channel online scope

All unit parameters of MOVIAXIS® can be displayed in the scope of the engineering software MOVITOOLS® MotionStudio. This allows for a 360° view of every relevant system and process variable to detect and remedy errors as quickly as possible.

Per axis, 8 channels are available with max. 2048 values per channel at a resolution of 500 µs. When using fewer channels, the number of values per channel can be increased.

Advantage: Even system-internal variables are accessible for detailed unit diagnostics; they can be displayed comprehensively with a high resolution.

Multi-axis scope

Furthermore, several axes can be displayed online in a time-synchronized representation in the diagnostic software of MOVI-PLC® (trace function of multi motion).

Advantage: A synchronized representation of the time-related interaction between several axes allows for optimal diagnostics.

8-channel offline scope

It is also possible to parameterize an offline scope function that processes preset scope characteristics and saves the results in the axis.

Advantage: User only has to load a pre-programmed scope file on site. Independent monitoring and recording is possible irrespective of connected PCs and qualified personnel on site.

The diagnostic functionality is completed by a multi-stage error memory with buffer in which the most recent errors are saved and made accessible via a log system. Error patterns can be made visible and used in this way.

1.8.7 Monitoring, protection, and test functions

Process safety and plannable productivity can only be ensured if the drive is running reliably and "thinking ahead". The consequences of an unintended system standstill can be dramatic. To prevent this, MOVIAXIS® offers a number of monitoring and check functions.

Thermal online monitoring of all SEW motors

All SEW motors have a thermal motor model stored in the inverter that is predicated on a KTY-based initial value. Thermal motor protection is no longer ensured by a switch or sensor, but via the motor load that is calculated online in the inverter in parallel. This safely prevents a burn-out or medium-term overheating of smaller motors, for example, which would not be detected by a slow sensor.

Advantage: Maximum utilization of SEW motors with optimal protection.

KTY-based motor models can be realized for non-SEW motors (depending on the non-SEW motor, calibration subject to charge might be required).

In summary, MOVIAXIS® offers the following four methods for thermal motor protection:

- TF/TH connection
- KTY that trips after reaching an adjustable limit temperature
- KTY with I^2t trip (based on motor data that has to be provided for non-SEW motors)
- KTY with online calculated motor model (SEW motor only)

Preventive overload detection of the inverter system

MOVIAXIS® detects an imminent overload of the inverter using an internal, online calculated simulation of the load situation and offers the user a chance to react before the unit shuts down. Such overload situations can be caused, for example, by a blockage or mechanical stiffness.

One of the following responses to such faults can be selected:

1. Drive continues to execute the cycle until a thermal trip occurs, or
2. Automatic reduction of the output current.

Advantage: The drive does not simply shut down, but critical processes can be completed despite the overload (if possible in terms of thermal utilization), or the process can be continued at a slower speed in favor of production safety.

In this, not only the output stage, but all critical system areas are constantly monitored, simulated, and evaluated.

- Heat sink
- Chip temperature
- Temperature rise of the chip
- Overcurrent
- Electromechanical components (cables, terminals, etc.)

The monitoring functions are completed by phase failure and short circuit detection, DC link and brake current monitoring, and encoder connection monitoring.

Brake test

This function is used to check the braking capability of a brake connected to MOVIAXIS®. A test torque is applied electrically via the motor when the brake is applied.

Even when the brake has passed the brake test, it does not take on any safety functions as far as machine safety is concerned in combination with MOVIAXIS®.

The brake is only tested in accordance with the set brake test torque. The actual "brake breakaway torque" is not measured.

MOVIAXIS® supports four test modes:

1. A higher-level controller provides the setpoints and monitoring function for the test.
2. MOVIAXIS® performs a check in both directions compared to the set limit torques.
3. MOVIAXIS® performs a check in positive direction compared to the set limit torques.
4. MOVIAXIS® performs a check in negative direction compared to the set limit torques.

The test torque, test time and the direction of rotation of the test can be set. If a test is not passed, the breakaway torque is documented.

The brake is considered to be "ok" when the motor shaft does not move more than 10°. This is a fixed value.

IMPORTANT: The function does not check whether a brake is actually installed. If the brake test is activated when a brake is not installed, the drive will move depending on the brake test mode.

Brake monitoring

If the MOVIAXIS® axis modules control the brakes of the SEW motors directly, the brake voltage and current are monitored. MOVIAXIS® signals an error if the brakes cannot be operated correctly due to insufficient current or voltage.

Axis-integrated commutation detection/encoder alignment

Commutation detection of permanent-field synchronous motors

MOVIAXIS® can detect the commutation of a permanent-field synchronous motor and set the respective offsets and commutation angles for further operation automatically. This is recommended for

- Motors with pure incremental encoders without absolute information per revolution,
- Disassembly of the encoder in the field or encoder fault (brake or encoder replacement).

There are two possible methods: Both variants can be activated independently of each other as separate function blocks (FCB):

Commutation detection with rotor movement

MOVIAXIS® impresses a rotating field for a short time, detects the direction of rotation with a small rotor movement, and based on this data determines the rotor position and the commutation angle.

This method is recommended for motors in which the rotor can move freely for at least one mechanical revolution. The load must be disengaged before activating commutation. Prior to activating this function, you must make sure that the necessary movement cannot cause any damage or danger.

Commutation detection without rotor movement

MOVIAXIS® determines the position of the rotor of the motor on the basis of the available motor parameters, without movement. In this case, special values must be available for the motor. For many SEW motors, these values have already been determined. They are stored in the SEW motor data base.

This function is recommended for directly coupled loads that cannot be disengaged via an adapter, or not without difficulty.

If you want to make use of this function, please contact SEW-EURODRIVE.

Controlled stop in case of power failure

In case of a power failure, the standard application of a working brake can cause excessive strain in critical applications or sensitive mechanical systems.

To prevent this, MOVIAXIS® can detect a power failure and switch to braking mode depending on the application (hoist and/or travel drive). In such cases, MOVIAXIS® is powered

- either by the braking energy that accumulates in the DC link and via the DC 24 V switched-mode power supply unit, or
- by an external DC 24 V backup voltage that is independent of the supply system.

MOVIAXIS® stops all drives along an adjustable ramp almost to a standstill and then applies the motor brake. A hoist is slowed down by the gravitational acceleration, and at standstill, when the hoist is at the highest point, the brake is applied.

This allows for a lighter and leaner design or mechanical systems, and critical goods or tools are not damaged.

This function requires additional components and project planning. Please contact SEW-EURODRIVE.

Encoder monitoring

With resolvers, sin/cos, and TTL encoders, MOVIAXIS® monitors the failure of track signals caused by faults or cable problems (amplitude monitoring).

If MOVIAXIS® detects an error, the output stage inhibit and brake are activated.

Password administration for graded access protection

MOVIAXIS® offers a range of access levels for access to the unit parameters. These levels include write and read authorization or, for example, read only authorization. The different levels can be protected by passwords.

The passwords can be changed, for example, to allow end customers access to specific parameters only.

At present, the following access levels are available:

1. Observer: The parameters can only be read and observed.
2. Planning engineer: A "planning engineer" is a specialist who has complete access to all unit functions (delivery state).
3. OEM: The authorization level OEM-SERVICE can be used, for example, to reset internal counters or program serial numbers.

1.9 Functional safety / safety functions

1.9.1 Functions integrated in the unit

Safety technology can be integrated in the basic unit of the MOVIAXIS® multi-axis servo inverter. Depending on the unit variant, PL "d" or "e" are met.

The MOVIAXIS® axis modules are available in the following functional variants:

Safety concept

- MOVIAXIS® is characterized by the connection options via a 24 V control voltage (X7, X8) to a higher-level safety control system, a safety relay. Internal relays and an electronic logic disconnect all active elements that generate the pulse trains to the power output stage (IGBT) when the DC 24 V control voltage is disconnected.
- **Concept for category 3 according to EN 954-1 and performance level d according to EN ISO 13849-1:** One internal relay (tested according to EN 50205 with positively-driven contact set) and an electronic logic ensure that the supply voltages required for operating the servo inverter and consequently for generating a rotating field of pulse patterns (which allow the generation of a torque) are safely interrupted, preventing automatic restart.
- **Concept for protection type III according to EN 201, category 4 according to EN 954-1, performance level e according to EN ISO 13849-1 and SIL3 according to IEC 61800-5-2:** Two internal relays (tested according to EN 50205 with positively-driven contact set) ensure that the supply voltages required for operating the servo inverter and consequently for generating a rotating field of pulse patterns (which allow the generation of a torque) are safely interrupted, preventing automatic restart.
- The circuit state has to be transmitted by the respective relay via an NC contact to a higher-level control system for evaluation.
- Instead of separating the drive galvanically from the power supply using contactors or switches, the disconnection procedure described here prevents the power semiconductors in the servo inverter from being activated, thus ensuring safe disconnection. This process disconnects the torque for the respective motor. The individual motor cannot develop any torque in this state even though the line voltage is still present.

Safety functions

The following, drive-related safety functions can be realized with the axis-integrated safety functions:

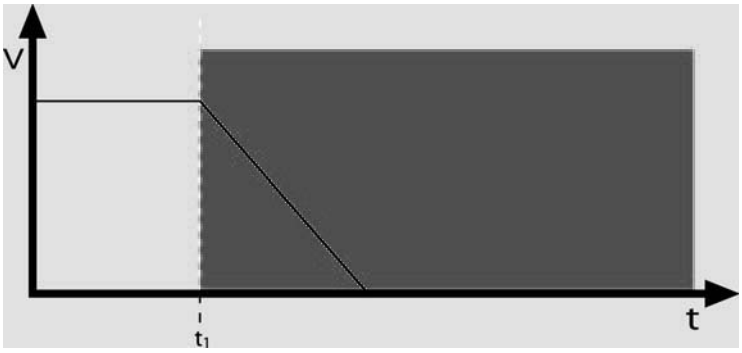
- **Safe Torque Off (STO)**

  Safe Torque Off according to IEC 61800-5-2 via disconnection of the safety-related 24 V supply

  If the STO function is activated, the frequency inverter no longer supplies power to the motor for generating torque. This safety function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

  The safety-related 24 V power supply must be switched off by a suitable external safety controller or a suitable external safety relay.

  The following figures applies to the safe torque off STO:



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V	Velocity
t	Time
t_1	Point of time when STO is triggered
	Normal operation
	Disconnection range

- **Safe Stop 1 (SS1(c))**

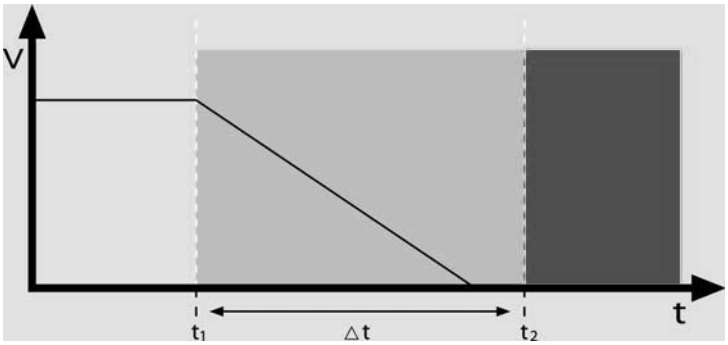
  Safe Stop 1, function variant c according to IEC 61800-5-2 via suitable external control (e.g. safety relay with delayed disconnection)

  The following procedure must be observed for this safety function:

  – Decelerate the drive using an appropriate brake ramp specified via setpoints

  – Disconnect the safety-related 24 V power supply (= triggering the STO function) after a specified safety-related time delay.

  The following figure illustrates the disconnection according to SSI:



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V	Velocity
t	Time
t_1	Point of time when the motor deceleration is triggered
t_2	Point of time when STO is triggered
Δt	Application-specific delay
	Normal operation
	Range of the safety function
	Disconnection range

This safety function corresponds to the controlled stop of a drive according to EN 60204-1, stop category 1.

Restrictions

- **Note:** When using the SS1(c) function as described above, the brake ramp of the drive is not monitored with respect to safety. In case of a fault, the drive might not be decelerated after the delay time, or it might be accelerated in the worst case. In this case, the STO function (see above) is only activated after the set time delay has passed. You have to take the resulting danger into account when you perform the risk analysis for the plant/machine, and you have to provide for suitable precautionary measures if required.
- **Note:** A system/machine-specific risk analysis must be carried out through the system/machine manufacturer and taken into account for the use of the drive system with MOVIAXIS®.
- **Important: The safety concept is only suitable for performing mechanical work on system/machine components.**
- **Danger of fatal injury:** If the 24 V supply voltage is disconnected, the mains supply voltage is still present at the frequency inverter DC link.
- **Important: If work is carried out on the electrical section of the drive system, the power supply must be disconnected using an external maintenance switch.**

Units with one safety relay

The following axis modules meet category 3 to EN 954-1 or performance level d to EN ISO13849-1 if the safety guidelines (conditions) are observed:

Unit designation	Nominal current in A	Size
MXA81A-002-503-00 **MXA81A-004-503-00** **MXA81A-008-503-00**	2 4 8	1
MXA81A-012-503-00 **MXA81A-016-503-00**	12 16	2
MXA81A-024-503-00 **MXA81A-032-503-00**	24 32	3
MXA81A-048-503-00	48	4
MXA81A-064-503-00	64	5
MXA81A-100-503-00	100	6

Units with two safety relays

Observing the safety regulations (conditions), the following axis modules comply with protection type III according to EN 201, category 4 according to EN 954-1, performance level e according to EN ISO 13849-1 or SIL3 according to IEC 61800-5-2:

Unit designation	Nominal current in A	Size
MXA82A-012-503-00 **MXA82A-016-503-00**	12 16	2
MXA82A-024-503-00 **MXA82A-032-503-00**	24 32	3
MXA82A-048-503-00	48	4
MXA82A-064-503-00	64	5
MXA82A-100-503-00	100	6

1.9.2 Optional expansion functions

For applications that require higher safety functions, e.g. "Safely Reduced Speed", the expansion functions described below can be used.

MOVISAFE® safety monitor, UCS series

The UCS safety monitors are a modular system with finely graded prices and functions. The safety monitors are installed close to the inverter. They always work together with an MXA81 or MXA82 axis module.

Depending on the selected monitor module (UCS10B,11B,12B,14B[1)]), you can monitor single axes, double axes, up to the complete axis system. In addition to the safe drive functions, you can also read in and program safe peripheral units, e.g. I/O, buttons, light grids. This can be used to safely design and program complete machine or system modules in parallel with the MOVI-PLC® motion control solutions.

A parameter and communication channel between MOVI-PLC® and the master module allows for the connection of both units to only one PROFIBUS/PROFINET port with PROFIsafe® protocol. MOVI-PLC® and the MOVISAFE® monitor communicate via an integrated diagnostic channel, which ensures integrated and well-linked applications.

1) In preparation

Safety functions

The following drive safety functions of IEC 61800-5-2 are covered by the UCS safety monitors:

Safety function	Abbreviation
Safe Torque Off	STO
Safe Stop 1	SS1
Safe Stop 2	SS2
Safe Operational Stop	SOS
Safe Direction	SDI
Safely Limited Speed	SLS
Safely Limited Acceleration	SLA
Safe Speed Monitor	SSM
Safely Limited Increment	SLI
Safely Limited Position	SLP
Safe Brake Control	SBC
Safe Cam	SCA

Customer benefits

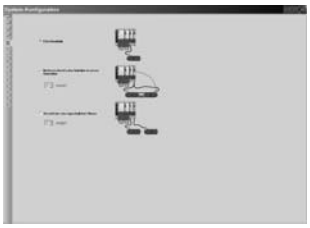
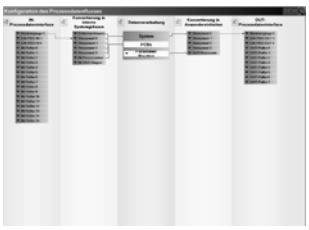
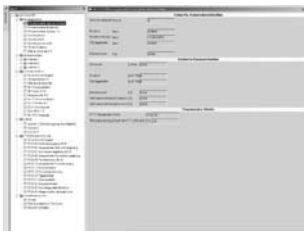
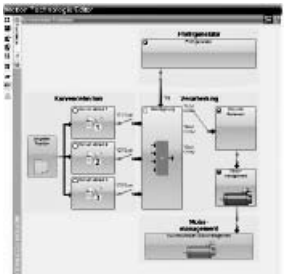
The combination of MOVIAXIS® and MOVISAFE® safety monitors of the UCS series offers the following advantages:

- All necessary drive safety functions in one system
- Up to performance level "e" for speed-based functions
- Up to performance level "d" for position-based functions
- System can be expanded optionally by adding expansion modules
- Hiperface® and SSI encoder processing
- Can be used for single and multi-axis systems
- Minimal logistic effort, because the combination of an in-stock axis module and an optional UCS safety monitor can solve a multitude of drive tasks.

1.10 MOVITOOLS® MotionStudio engineering software

MOVITOOLS® MotionStudio is the new engineering software from SEW-EURODRIVE for use with MOVIAXIS®.

The new MOVITOOLS® MotionStudio is a consistent modular software system for all drive electronics products from SEW-EURODRIVE. The advantage for the system manufacturer and operator is that only one software package is required for comprehensive engineering.

Designation	Screenshot	Description
Startup		Configuration and startup: To adapt the inverter to the connected motor and to optimize the current, speed and position controllers.
PDO Editor		A process data object editor for graphic configuration of the MOVIAXIS® multi-axis servo inverter.
Parameter tree		A standardized editor to set parameters for various device types.
Application Builder		Editor for creating user-specific visualizations and application-specific diagnostics. Visualization is connected via file download with the inverter program IPOS and the parameter settings.
Scope		Diagnostics using an oscilloscope program for all SEW-EURODRIVE inverters.
Technology editor for single-axis positioning		Simple configuration of the MOVIAXIS® multi-axis servo inverter for positioning applications.
Motion technology editor		Editor for easy adaptation of the technology functions to user-specific requirements.

1.10.1 Overview of features

- Application programs to IEC 61131-3 can be used for all products based on the PLC Editor
- Different communication media and fieldbus systems can be used.
- Handling of projects with several different units (multi-unit perspective).
- Uniform multi-product editors for programming and parameter setting.
- Coordinated IEC libraries concept:
  - Basic library,
  - Motion library,
  - Application library.
- SEW application modules for a large number of applications for parameter setting.
- Editor for creating customer-specific visualizations and application-specific diagnostics.
- Continuity and downward compatibility.

1.10.2 Tools and functionality

PLC Editor

Programming the MOVI-PLC® controller series using application programs that are written once and can be used independent of the unit.

SEW communication server

Communication via a server enables

- Free selection of communication paths,
- Local and central storage of project data,
- Diagnostics and engineering,
- Use of modern remote maintenance technologies.

FCB concept and PDO Editor

Technology editor

The technology editor is a kind of "startup software interface" to startup standard application functions such as single-axis positioning, electronic cam, etc. A special feature of this editor is that the user is guided through all the settings and only has to make the settings required for the specific functionality. Comment and help functions are included.

As a result, the user is offered a complete standard application functionality without a lot of configuration.

If users want to make more detailed settings, they can do so at any time by running through the technology editor using the PDO editor.

PDO Editor Process Data Object Editor

The PDO Editor is the central, graphical software tool for editing and configuring FCBs and the entire unit functionality.

The tool can be used to determine where and which data packages should be retrieved from buses or I/O, how they should be interpreted (control/process data), how they are used in the unit functions, and how this data is then output again (via bus or I/O).

This ensures maximum flexibility when using the MOVIAXIS® functions without any programming. The graphical structure makes it easy for users to familiarize themselves with the tool using the intuitive interface.

FCB Function Control Block

The term "FCB concept" describes the modular firmware design of MOVIAXIS®. This feature ensures that a wide range of functions can be selected or deselected quickly and easily using control words, no programming required.

All primary functions, i.e. functions that move or control the motors, are designed as individual FCBs that only have to be selected, for example, to perform positioning tasks.

The user can switch between FCBs at any time depending on the requested function.

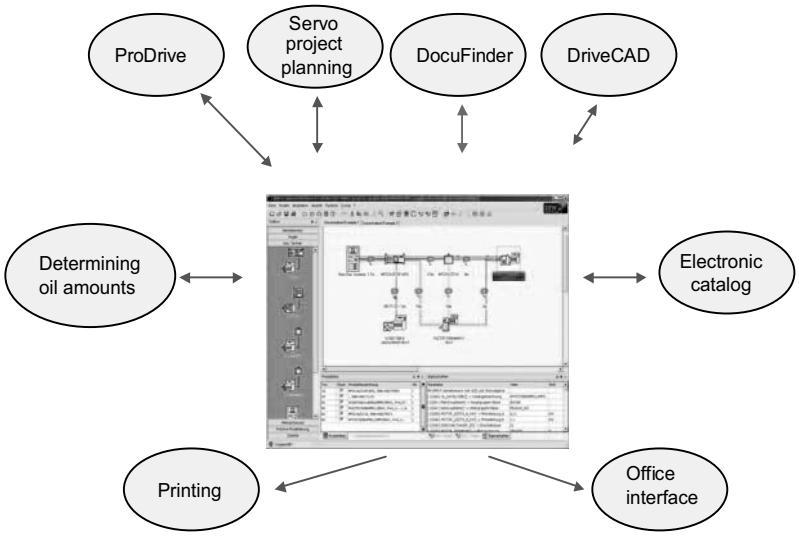
1.11 "SEW WORKBENCH" project planning software

"SEW Workbench" provides the user with a central interface to compile complex drive systems from individual SEW components. It allows the user to create complex drive systems for "switch cabinet technology" or "decentralized technology" from SEW components such as drives, servo inverters, cables, field distributors, etc. using the drag and drop function.

Key features of "SEW Workbench":

- Application selection
- Calculation of gear unit and motor
- Price-optimized project planning
- Comparison of different solutions
- Recommendation of "best drive" solution
- Inverter calculation
- Multi-axis optimization
- Configuration of cables and accessories
- Configuration error check
- Parts list generation
- Electronic catalog with all products

The user has the option to access existing functions and programs such as EKAT, SAP Configurator and ProDrive as well as to use new functions.



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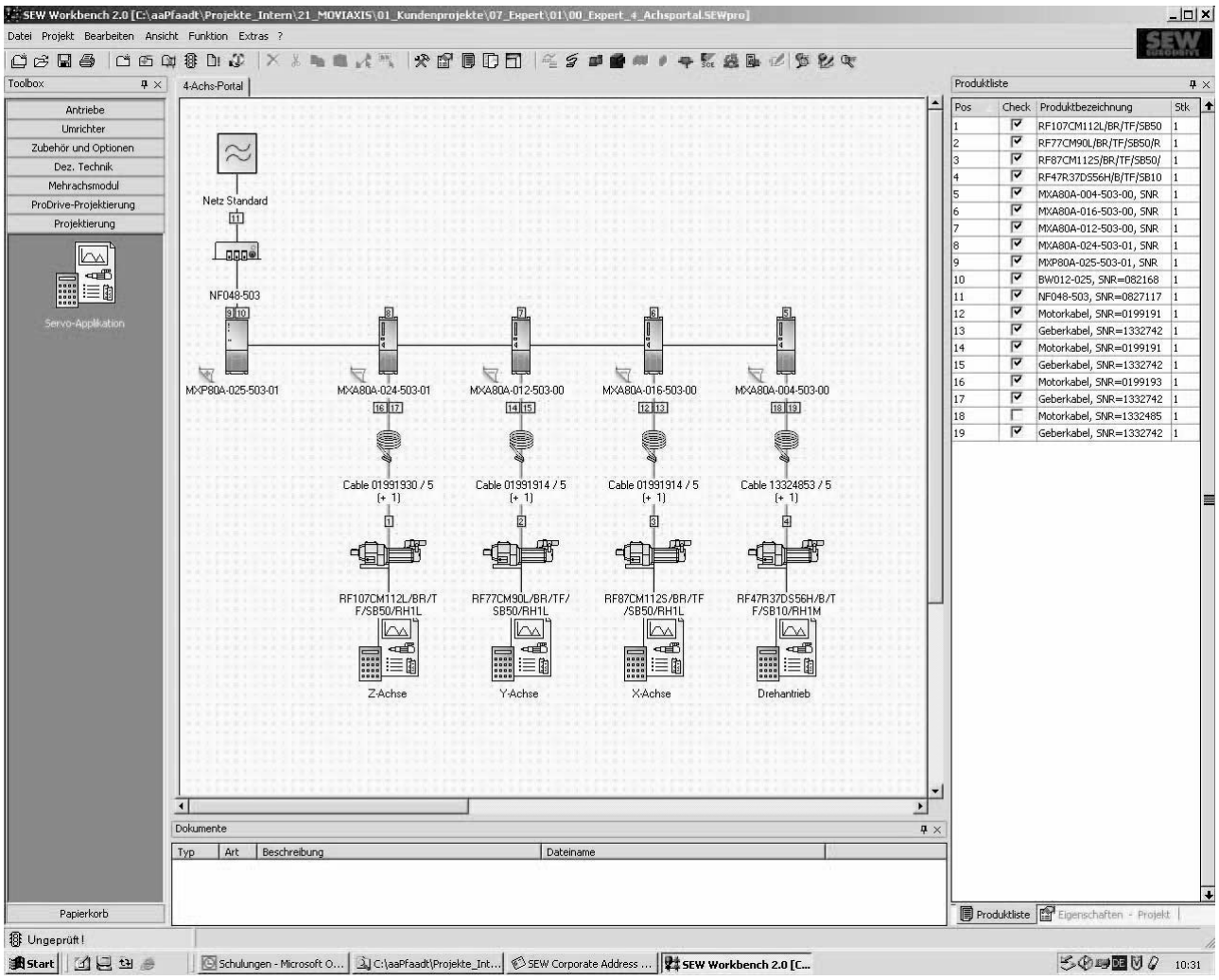
"SEW Workbench" allows you to perform an initial compatibility check of different components, i.e. to determine whether a servo inverter, cable and drive can be configured and designed for this combination.



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1.11.1 SEW Workbench functions

Different catalog functions and project planning functions are available for selecting individual components. Each component is represented in the work area by a graphical object. The result of the total of the objects together is the drive system. A complete check is performed for all products after the user has created the complete drive system.

The "SEW Workbench" generates a drive system including a product list tested and approved according to SEW rules.

The drive systems (product lists) created in the "SEW Workbench" can be saved as a project file and called up again. This allows data exchange and further processing by another "Workbench user".

2 Technical Data

2.1 CE marking and UL approval

The MOVIAXIS® MX multi-axis servo inverters comply with the following directives and guidelines:

2.1.1 CE marking

- Low Voltage Directive 2006/95/EC.
- Electromagnetic Compatibility 2004/108/EC.

  MOVIAXIS® servo inverters and supply modules are designed as components for installation in machines and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives". 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 the EMC Directive 2004/108/EC.
- Compliance with limit class "C2" according to EN 61800-3 has been tested on a specified test setup. SEW-EURODRIVE can provide detailed information on request.

CE

The CE mark on the nameplate indicates conformity with the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC. We can provide a declaration of conformity on request.

2.1.2 Approvals

The following approvals have been granted for the MOVIAXIS® modules:

MOVIAXIS® module	UL / cUL	c-Tick
MXP supply module 10 kW	x	x
MXP81 supply module 10 kW	x	x
MXP supply module 25 kW	x	x
MXP supply module 50 kW	x	x
MXP supply module 75 kW	x	x
MXR supply and regenerative module	x	x
MXA axis module	x	x
MXM master module	x	x
MXS 24 V switched-mode power supply module	x	x
MXB buffer module	x	x
MXC capacitor module	x	x
MXZ DC link discharge module	x	x
Two-row configuration of the axis system[1)]	x	x

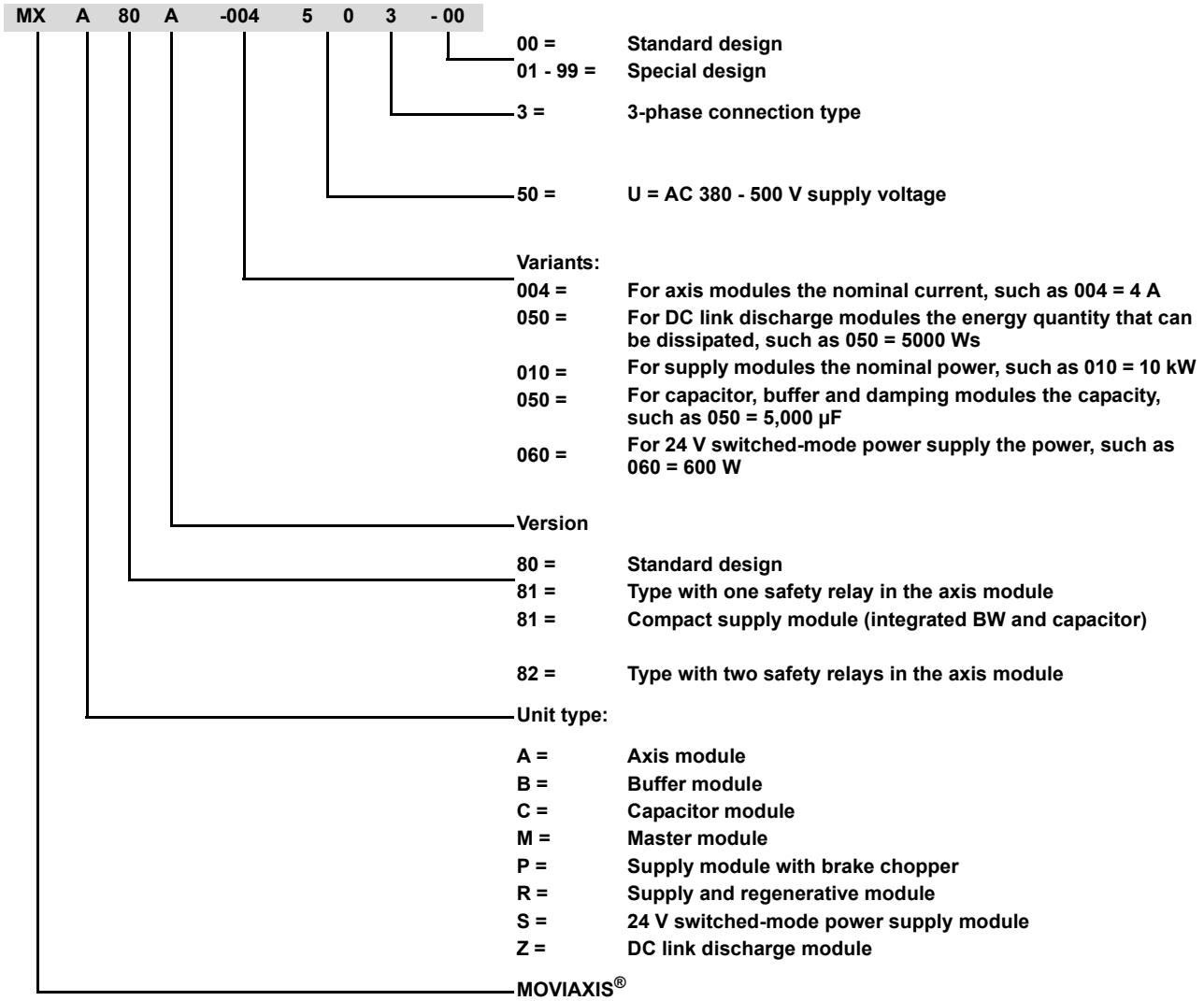
1) In preparation

cUL is equivalent to CSA approval.

C-Tick certifies conformity with ACA (Australian Communications Authority) standards.

2.2 Unit designation

2.2.1 Example: Type designation for MOVIAXIS® basic units



Unit designation for the axis module:

MXA80A-004-503-00 = Axis module with 4 A nominal current

Unit designation for the buffer module component

MXB80A-050-503-00 = Buffer module with a capacity of 5000 µF

Unit designation for the capacitor module component

MXC80A-050-503-00 = Capacitor module with a capacity of 5000 µF

Type designation for master module with fieldbus gateway component:

MXM80A-000-000-00/UFF41B	=	Master module with PROFIBUS/DeviceNet
MXM80A-000-000-00/UFR41B	=	Master module with EtherNet/IP / PROFINET Modbus/TCP

Type designation for master module with controller component:

MXM80A-000-000-00/DHF41B/OMH41B	=	Master module with PROFIBUS/DeviceNet
MXM80A-000-000-00/DHR41B/OMH41B	=	Master module with EtherNet/IP / PROFINET Modbus/TCP Variants: T0 – T25

Unit designation for the supply module:

MXP81A-010-503-00	=	10 kW compact supply module with integrated C and BW
MXP80A-010-503-00	=	10 kW supply module
MXR80A-050-503-00	=	50 kW supply and regenerative module

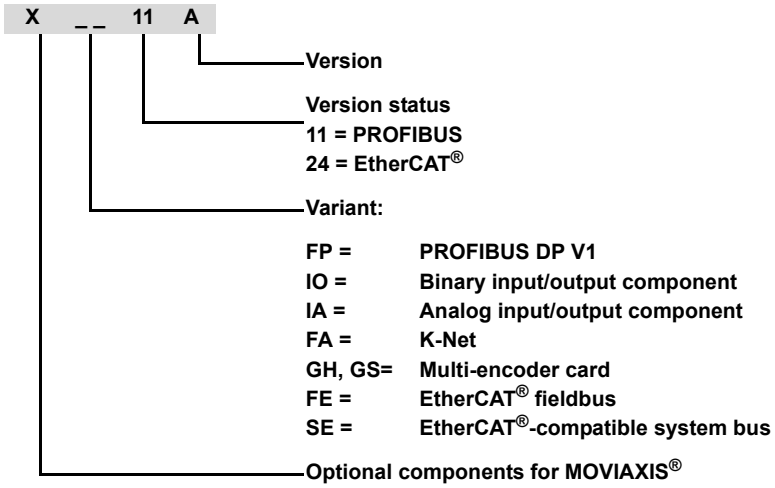
Unit designation for the 24 V switched-mode power supply module component

MXS80A-060-503-00	=	24 V switched-mode power supply module

Unit designation DC link discharge module component:

MXZ80A-050-503-00	=	DC link discharge module with an energy quantity of 5000 Ws that can be dissipated

2.2.2 MOVIAXIS® MX communication module option



2.3 General technical data

The following tables lists the technical data for all MOVIAXIS® MX multi-axis servo inverters independent of

- Type,
- Design,
- Size,
- Power

MOVIAXIS® MX	
Interference immunity	Complies with EN 61800-3
Interference emission with EMC-compliant installation	Category "C2" according to 61800-3
Ambient temperature ϑ_U	0 °C to +45 °C
Climate class	EN 60721-3-3, class 3K3
Storage temperature ϑ_L	-25 °C to +70 °C
Storage life	Up to 2 years without special measures
Cooling type (DIN 41751)	Forced cooling and convection cooling, depending on size
Degree of protection EN 60529 (NEMA1)[1)] **Axis module size 1 - 3** **Axis module size 4 - 6** **Power supply module size 1, 2** **MXP81 supply module** **Supply module size 3** **MXR supply and regenerative module** **Master module** **Switched-mode power supply module** **Capacitor module** **Buffer module** **Two-row configuration of the axis system**	 IP20 IP10 IP20 IP20 IP10 IP10 IP20 IP10 IP10 IP10 IP10
Operating mode	DB (EN 60034-1)
Pollution class	2 according to IEC 60664-1 (VDE 0110-1)
Overvoltage category	III according to IEC 60664-1 (VDE 0110-1)
Installation altitude h	Up to h ≤ 1000 m without restrictions. The following restrictions apply to heights > 1000 m: – From 1000 m to max. 2000 m: I_N reduction by 1% per 100 m

1) - The covers on the left and right end of the unit system must be equipped with touch guard covers. - All cable lugs must be insulated.

2.3.1 Use of standard binary inputs

	INFORMATION
	It is not permitted to control the standard binary inputs with safety-related (pulsed) voltages (except X7 and X8 at MXA).

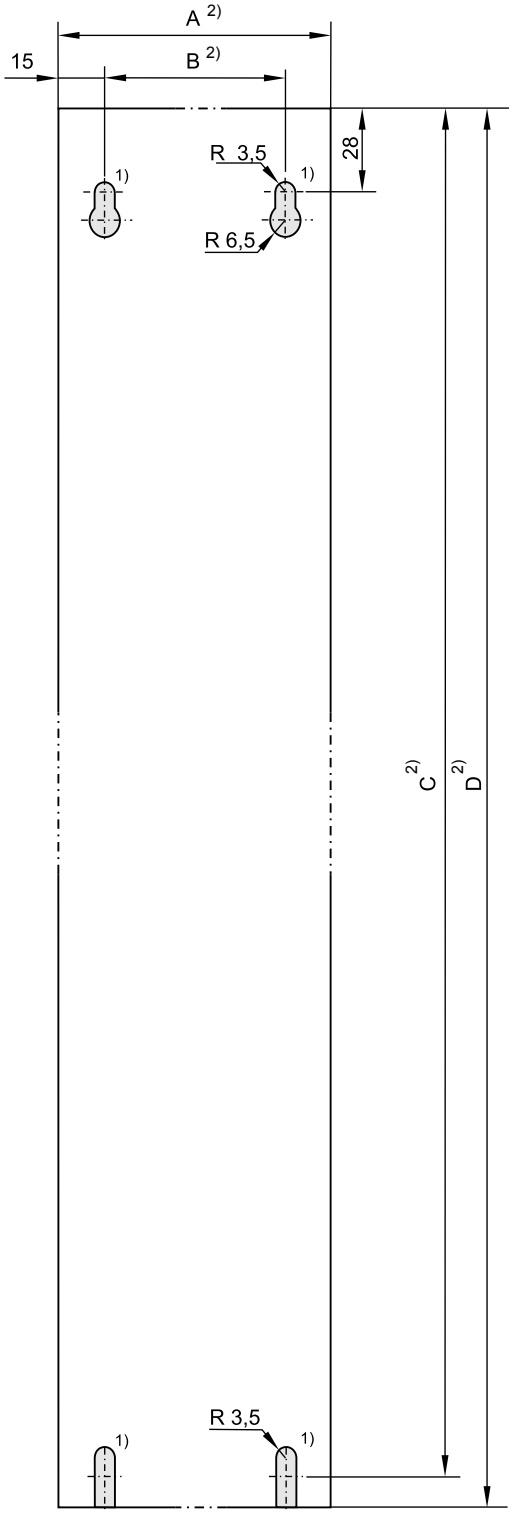
2.3.2 24 V supply

For projecting the 24 V supply, see system manual, chapter "Project planning".

2.4 Rear view of housing and bore patterns

MOVIAXIS® MX	Rear view dimensions of MOVIAXIS® MX housing			
	A mm	B mm	C mm	D mm
MXA axis module size 1 (2 A, 4 A, 8 A)	60	30	353	362.5
MXA axis module size 2 (12 A, 16 A)	90	60	353	362.5
MXA axis module size 3 (24 A, 32 A)	90	60	453	462.5
MXA axis module size 4 (48 A)	120	90	453	462.5
MXA axis module size 5 (64 A)	150	120	453	462.5
MXA axis module size 6 (100 A)	210	180	453	462.5
MXP supply module size 1	90	60	353	362.5
MXP81 supply module	120	90	353	362.5
MXP supply module size 2	90	60	453	462.5
MXP supply module size 3	150	120	453	462.5
MXR supply and regenerative module	210	180	453	462.5
MXM master module	60	30	353	362.5
MXC capacitor module	150	120	453	462.5
MCB buffer module	150	120	453	462.5
MXS 24 V switched-mode power supply module	60	30	353	362.5
MXZ DC link discharge module	(page 115)			

2.4.1 Rear view of MOVIAXIS® MX axis and supply module housing



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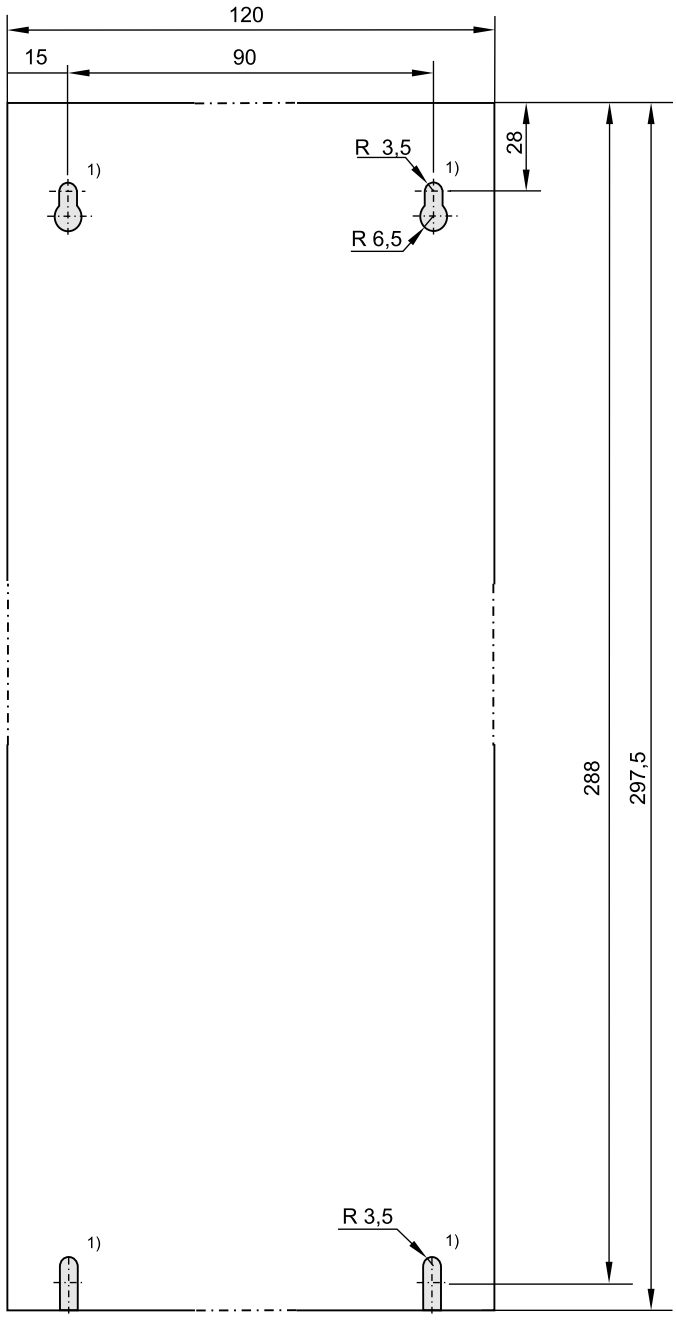
1) Position of tapped hole

2) See table with dimensions (page 113)

2.4.2 Rear view of MOVIAXIS® MX DC link discharge module housing



1) Position of tapped hole

2.5 Technical data of the modules

2.5.1 Technical data of MXP supply modules

MOVIAXIS® supply module MXP80A-...-503-00	1)	2)	Size			
			1	2	3	
Type			010	025	050	075
INPUT						
Supply voltage AC V_{supply}	U	V	3 × 380 V - 3 × 500 V ±10			
Nominal line current AC I_{line}	I	A	15	36	72	110
Nominal power P_N	P	kW	10	25	50	75
Line frequency f_{line}	f	Hz	50 - 60 ±5%			
Cross section and contacts on connections		mm^2	COMBICON PC4 pluggable, max. 4	COMBICON PC16 pluggable, max. 10	Screw bolt M8 max. 70	
Cross section and contacts on shield clamp		mm^2	max. 4 × 4	max. 4 × 10	max. 4 × 50 shielded	
OUTPUT (DC LINK)						
Nominal DC link voltage[3] U_{NZK}	U	V	DC 560			
Nominal DC link current[4] DC I_{NZK}	I	A	18	45	90	135
Max. DC link current DC $I_{ZK\ max}$	I_{max}	A	45	112.5	225	337.5
Overload capacity for max. 1 s			250 %			
Brake chopper power		kW	Peak power: 250 % × P_N ; continuous power: 0.5 × P_N			
Mean regenerative power capacity		kW	0.5 x P_N			
Cross section[5] and contacts		mm	CU bars 3 × 14 mm, M6 screw fitting			
BRAKING RESISTOR						
Minimum permitted braking resistor value R (4-Q operation)		Ω	26	10	5.3	3.5
Cross section and contacts on connections		mm^2	COMBICON PC4 pluggable, max. 4	COMBICON PC16 pluggable, max. 10	M6 screw bolts max. 35	
Cross section and contacts on shield clamp		mm^2	max. 4 × 4	max. 4 × 10	max. 4 × 16	
GENERAL INFORMATION						
Power loss at nominal capacity		W	30	80	160	280
No. of times power may be switched on/off		rpm	< 1/min			
Minimum switch-off time for power off		s	> 10			
Mass		kg	4.2	5.7	10.3	10.8
Dimensions: W		mm	90	90	150	
Dimensions: H		mm	300	400		
Dimensions: D		mm	254			

1) Nameplate information
2) Unit
3) The system and output currents must be reduced by 20 % from the nominal values for V_{line} = 3 × AC 500 V.
4) Decisive value for planning the assignment of supply and axis modules
5) Material thickness [mm] × width [mm]

Power section of MXP81 compact supply module

The technical data of the MXP81 supply module with integrated braking resistor correspond to those of the supply module size 1. Deviating data is listed below:

MOVIAXIS® supply module MXP81A-...-503-00	1)	2)	Size 1
ADDITIONAL CAPACITY OF DC LINK			
Nominal DC link voltage	U	V	DC 560
Storable energy	W	Ws	250
Peak power capacity	P	kW	20
Nominal capacity	C	µF	1000
INTERNAL BRAKING RESISTOR			
Effective braking power	P_{eff}	W	220
Maximum braking power	P_{max}	kW	26
BRAKING RESISTOR (external)			
Minimum permitted braking resistor value R (4-Q operation)		Ω	26
Cross section and contacts on connections		mm^2	COMBICON PC4 pluggable, max. 4
Cross section and contacts on shield clamp		mm^2	max. 4 × 4
GENERAL INFORMATION			
Power loss at nominal capacity		W	30
Mass		kg	4.2
Dimensions: W		mm	120
Dimensions: H		mm	300
Dimensions: D		mm	254

1) Nameplate information

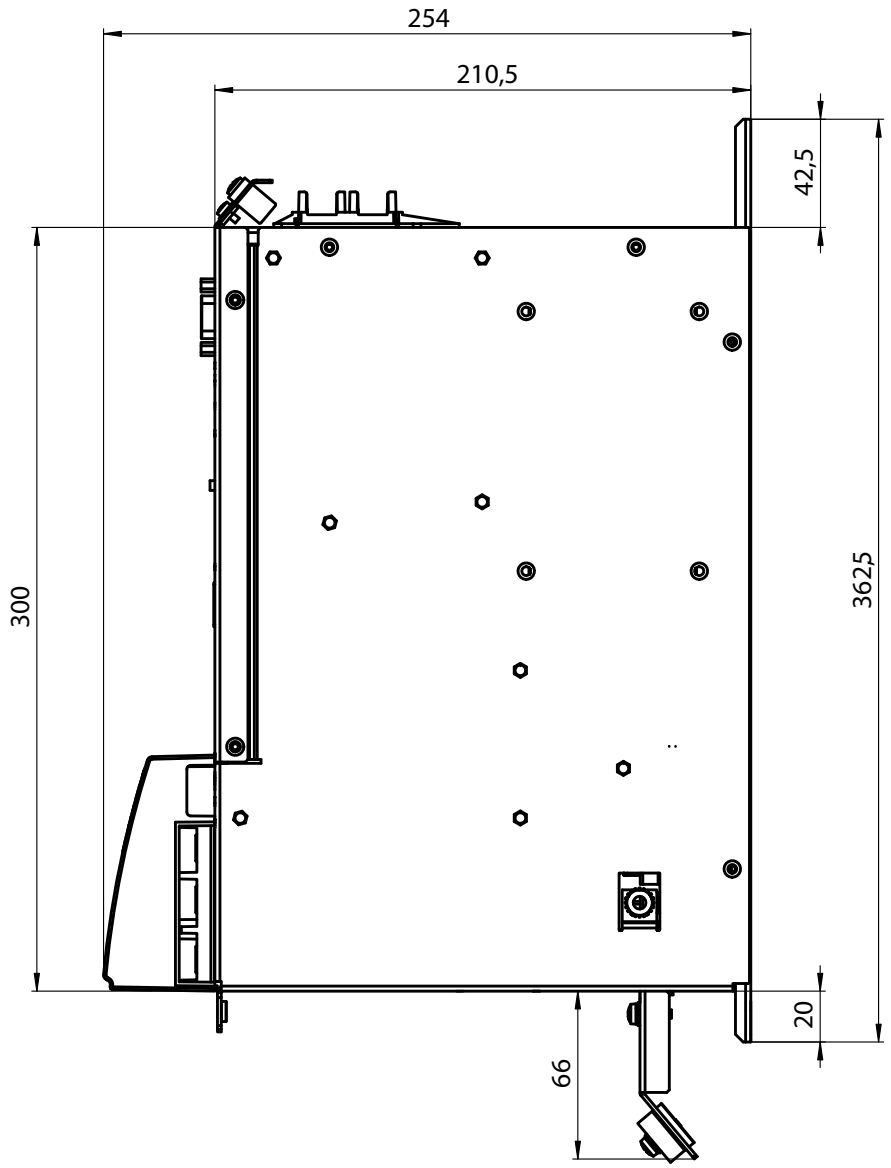
2) Unit

Control section of supply module

MOVIAXIS® MX supply module	General electronics data	
CAN interface[1)]	**CAN**: 9-pin D-sub connector	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations, Terminating resistor (120 Ω) has to be implemented externally, Baud rate can be set from 125 kbaud – 1Mbaud, Expanded MOVILINK® protocol,
DC 24 V voltage supply	DC 24 V ± 25 % (EN 61131)	
Cross section and contacts	COMBICON 5.08 One core per terminal: 0.20 - 1.5 mm² Two cores per terminal: 0.25 - 1.5 mm²	
Decoupling of EtherCAT®-compatible system bus from 9-pin D-sub connector	DIP switch, 4-pole	
Shield clamps	Shield clamps for control lines available	
Maximum cable cross section that can be connected to the shield clamp	10 mm (with insulating sheath)	

1) Only for CAN-based system bus

Dimension sheet
size 1, MXP81



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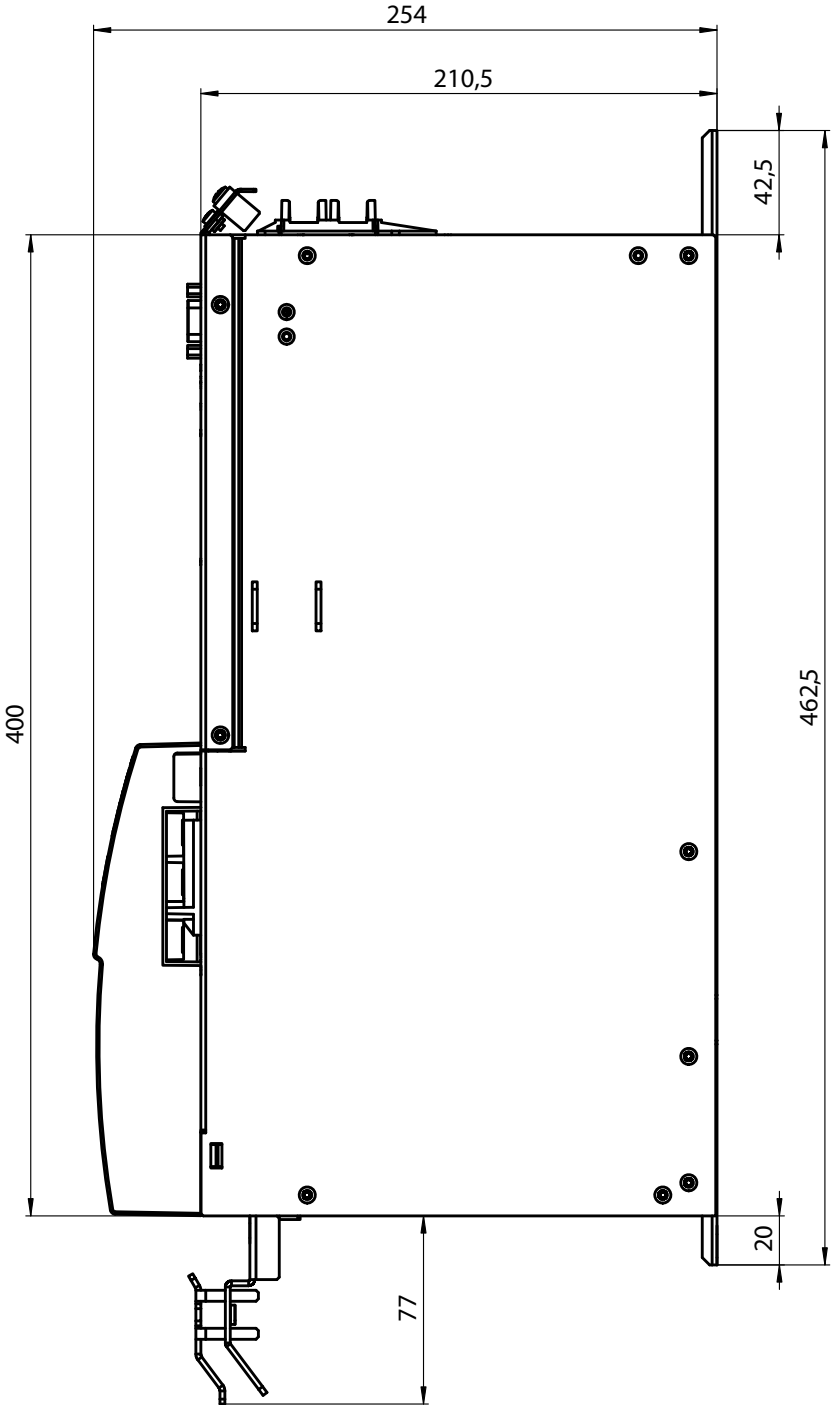
Dimension sheet size 2, size 3



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2.5.2 Technical data of MXR supply and regenerative modules

		Name-plate infor-mation	Unit	MXR supply and regenerative module
INPUT				
Supply voltage AC V_{supply}		U	V	3 × 400 V – 3 × 480 V ±10 %
Nominal line voltage		U	V	400
Nominal line current[1)]	75 kW[2)]	I	A	110 (@ 4 kHz PWM)
	50 kW	I	A	73 (@ 8 kHz PWM)
Nominal power (motor/regenerative)	75 kW[2)]	P	kW	75 (@ 4 kHz PWM)
	50 kW	P	kW	50 (@ 8 kHz PWM)
Line frequency f_{line}		f	Hz	50 – 60 ±5%
Permitted voltage systems		-	-	TT and TN
Cross section and contacts on connections		-	mm^2	Screw bolt M8 max. 70
Cross section and contacts on shield clamp		-	mm^2	max. 4 × 50 shielded
LINE VOLTAGE MEASUREMENT				
Measurement			-	All 3 phases are picked off between line filter and choke
Cross section and contacts			mm^2	Combicon 7.62 3-pole / one core max. 2.5;
OUTPUT (DC LINK)				
DC link U_{ZK}[1)]		U_{ZK}	V	• U_{line} up to 400 V: U_{ZK} = 750 V controlled • 400 V < U_{line} < 480 V: U_{ZK} increases linearly from 750 V to 800 V
Nominal DC link current[1)] DC I_{ZK}		I_{ZK}	A	100 at 4 kHz 67 at 8 kHz
Max. nominal DC link current[1)] DC $I_{ZK\ max}$		I_{max}	A	250 at 4 kHz 168 at 8 kHz
Overload capacity for max. 1s		-	-	200 %
BRAKING RESISTOR / EMERGENCY BRAKING RESISTOR				
Brake chopper power		-	kW	Peak power: 250 % × P_N Continuous power: 0.5 × 75 kW
Minimum permitted braking resistor value R (4-Q operation)		-	Ω	3.5
Cross section[3)] and contacts on shield clamp		-	mm^2	M6 screw bolts max. 35
Cross section[4)] and contacts on shield clamp		-	mm^2	max. 4 x 16

1) Applies when nominal supply system voltage is 400 V

2) EcoLine filter is mandatory

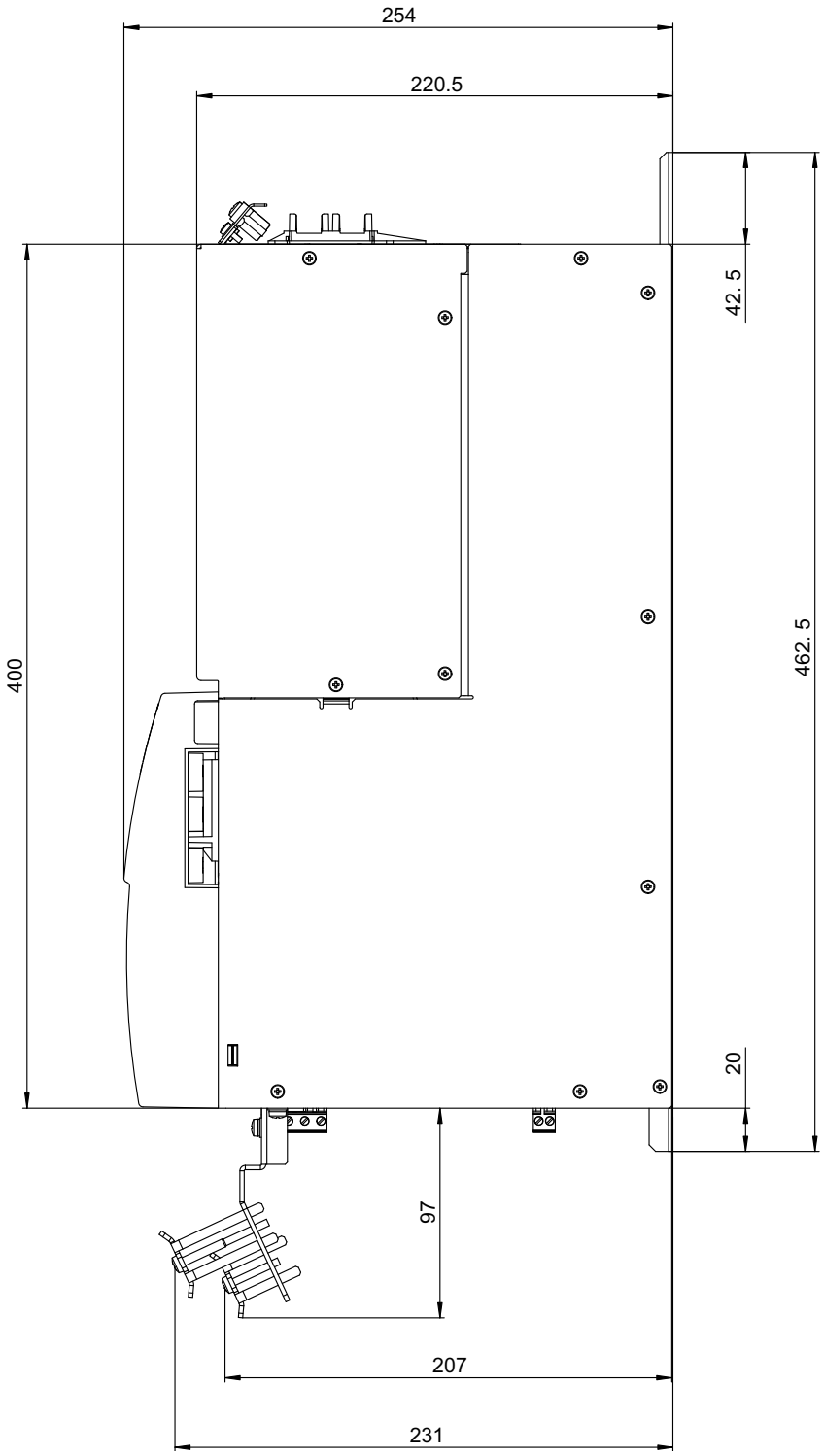
3) Material thickness [mm] × width [mm]

4) Material thickness [mm] × width [mm]

Control section of MXR supply and regenerative module

MOVIAXIS® MX Regenerative power module	**General electronics data**		
INPUT			
DC 24 V voltage supply	DC 24 V ± 25 % (EN 61131)		
Cross section and contacts	COMBICON 5.08 One core per terminal: max. 1.5 mm² (with conductor end sleeve)		
INPUTS/OUTPUTS			
4 binary inputs **Internal resistance**	Isolated (optocoupler), PLC compatible (EN 61131), sampling interval 1 ms R_i ≈ 3.0 kΩ, I_I ≈ 10 mA		
Signal level	+13 V – +30 V = "1" = contact closed -3 V – +5 V = "0" = contact open		according to EN 61131
Function	DIØ1 - DIØ4: Fixed assignment		
2 binary outputs	PLC compatible (EN 61131-2), response time 1 ms, short-circuit proof, I_{max} = 50 mA		
Signal level	"0"=0 V, "1"=+24 V, **Important: Do not apply external voltage.**		
Function	DOØØ and DOØ1: Fixed assignment DOØ2: User-programmable DOØ3: Not connected		
Cross section and contacts	COMBICON 5.08 One core per terminal: 0.20 – 2.5 mm² Two cores per terminal: 0.25 – 1 mm²		
Shield clamps	Shield clamps for control lines available		
Maximum cable cross section that can be connected to the shield clamp	10 mm (with insulating sheath)		
Enable contact for line contactor (Line contactor control)	Relay		
	Relay contact (NO contact) AC 230 V (max. 300 VA pickup power of line contactor)		
	Pickup current:	At AC 230 V	2 A
		At DC 24 V	0.5 A
	Permitted continuous current:	At AC 230 V	0.5 A
		At DC 24 V	
	Number of switching cycles	200000	
Cross section and contacts	COMBICON 5.08 One core per terminal: max. 1.5 mm² (with conductor end sleeve)		

Dimension sheet of MXR.. supply and regenerative module



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2.5.3 Technical data of MXA axis modules

MOVIAXIS® axis module MXA80A-...-503-00	1)	2)	Size									
			1			2		3		4	5	6
Type			002	004	008	012	016	024	032[3)]	048	064	100
INPUT (DC link)												
Nominal DC link voltage U_{NZK}	U	V	DC 560									
Nominal DC link current I_{NZK}[4)]	I	A	2	4	8	12	16	24	32	48	64	100
Cross section [5)] and contacts		mm	CU bars 3 × 14, M6 screw fitting									
OUTPUT												
Output voltage U	U	V	0 – max. U_{line}									
Continuous output current AC I_N PWM = 4 kHz[6)]	I	A	2	4	8	12	16	32	42[7)]	64	85	133
Continuous output current AC I_N PWM = 8 kHz[6)]	I	A	2	4	8	12	16	24	32	48	64	100
Continuous output current AC I_N PWM = 16 kHz[6)]	I	A	1.5	3	5	8	11	13	18	-	-	-
Max. unit output current I_{max}[8)]	I_{max}	A	5	10	20	30	40	60	80	120	160	250
Overload capacity for max. 1 s			250 %									
Apparent output power S_{NAus}[9)]	S	kVA	1.4	2.8	5.5	8.5	11	17	22	33	44	69
PWM frequency f_{PWM}		kHz	Setting options: 4/8/16; Setting on delivery: f_{PWM} = 8 kHz									
Maximum output frequency f_{max}	f	Hz	600									
Cross section and contacts on motor connections		mm^2	COMBICON PC4 pluggable, max. 4					COMBICON PC16 pluggable, max. 10		Screw bolts M6 max. 35		Screw bolts M8 max. 70
Cross section and contacts on motor shield clamp		mm^2	max. 4 × 4					max. 4 × 10		max. 4 × 35		max. 4 × 50
Brake connection	U_{BR} / I_{BR}	V / A	1 binary output brake control	Suitable for direct operation of brake, short-circuit proof. External 24 V required. Tolerance depends on the used brake type, see project planning manual. **See example for maximum load below the footnotes.**								
			Signal level: "0" = 0 V "1" = +24 V **Important:** Do not apply external voltage!									
			Function: "/Brake" fixedly assigned									
Brake connection contacts			COMBICON 5.08									
		mm^2	One core per terminal: 0.20 – 1.5 mm^2 Two cores per terminal: 0.25 – 1.5 mm^2									
Shield clamps			Shield clamps for brake lines available									
Maximum cable cross section that can be connected to the shield clamp			10 mm (with insulating sheath)									

Table continued on next page. Footnotes on next page.

MOVIAXIS® axis module MXA80A-...-503-00		1)	2)	Size									
				1			2		3		4	5	6
GENERAL INFORMATION													
Power loss at nominal capacity			W	30	60	100	150	210	280	380	450	670	1100
Mass			kg	4.2	4.2	4.2	5.2	5.2	9.2	9.2	9.2	15.6	15.6
Dimensions:	**W**		mm	60			90		90		120	150	210
	H		mm	300			300		400		400	400	400
	D		mm	254									

1) Nameplate information
2) Unit
3) When used under UL conditions, the unit cannot be operated at 4 kHz due to the limited cable cross section
4) with simplification: $I_{NZK} = I_N$ (typical motor application)
5) Material thickness [mm] × width [mm]
6) The system and output currents must be reduced by 20 % from the nominal values for V_{line} = 3 × AC 500 V.
7) For a 32 A axis used in line with UL and with a PWM of 4 kHz, the maximum continuous output current is 35 A.
8) Indicated values apply to motor operation. Motor and regenerative have the same peak performance.
9) Applies to a line voltage of 400 V and 50 Hz/PWM = 8 kHz.

Notes on brake control

	**INFORMATION**
	Note on tolerance requirement for the brake voltage! The brake voltage has to be configured. See MOVIAXIS® system manual.

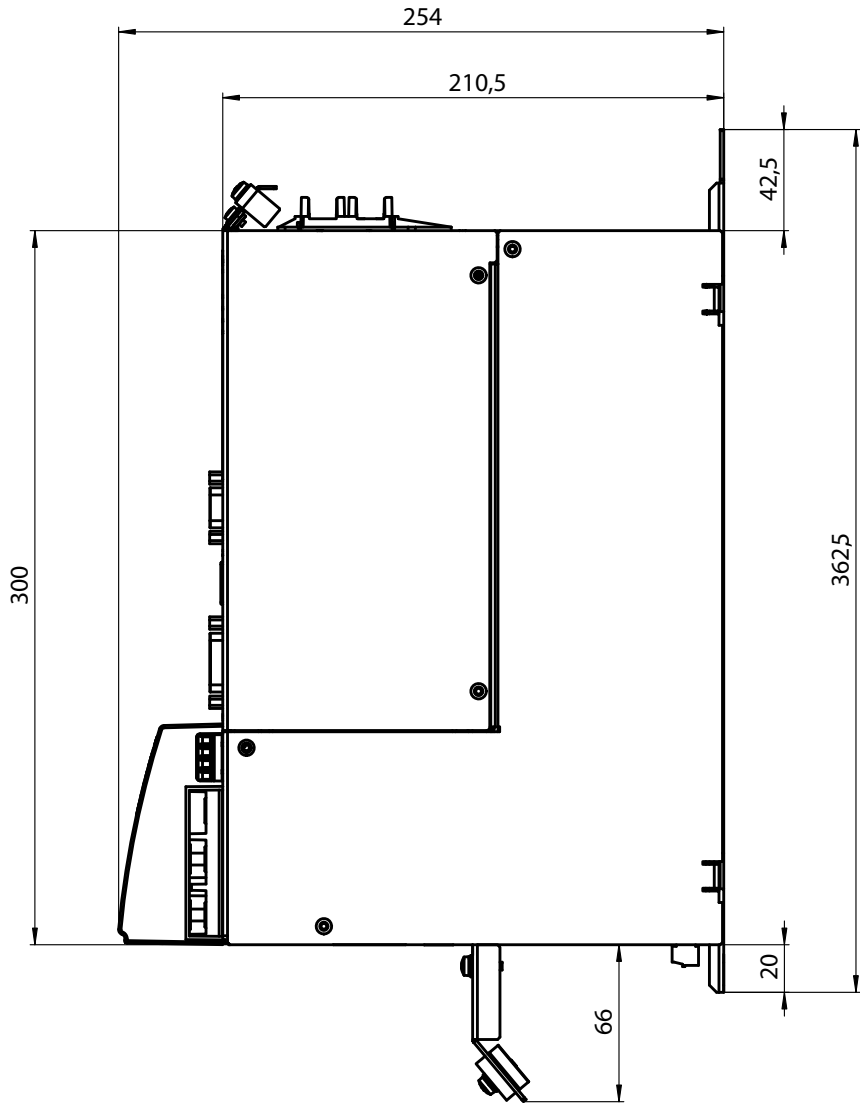
Permitted load of brake control and brake

One complete switching sequence (opening and closing) must not be repeated more often than a maximum of every two seconds. The brake must remain switched off for at least 100 ms before it can be switched on again.

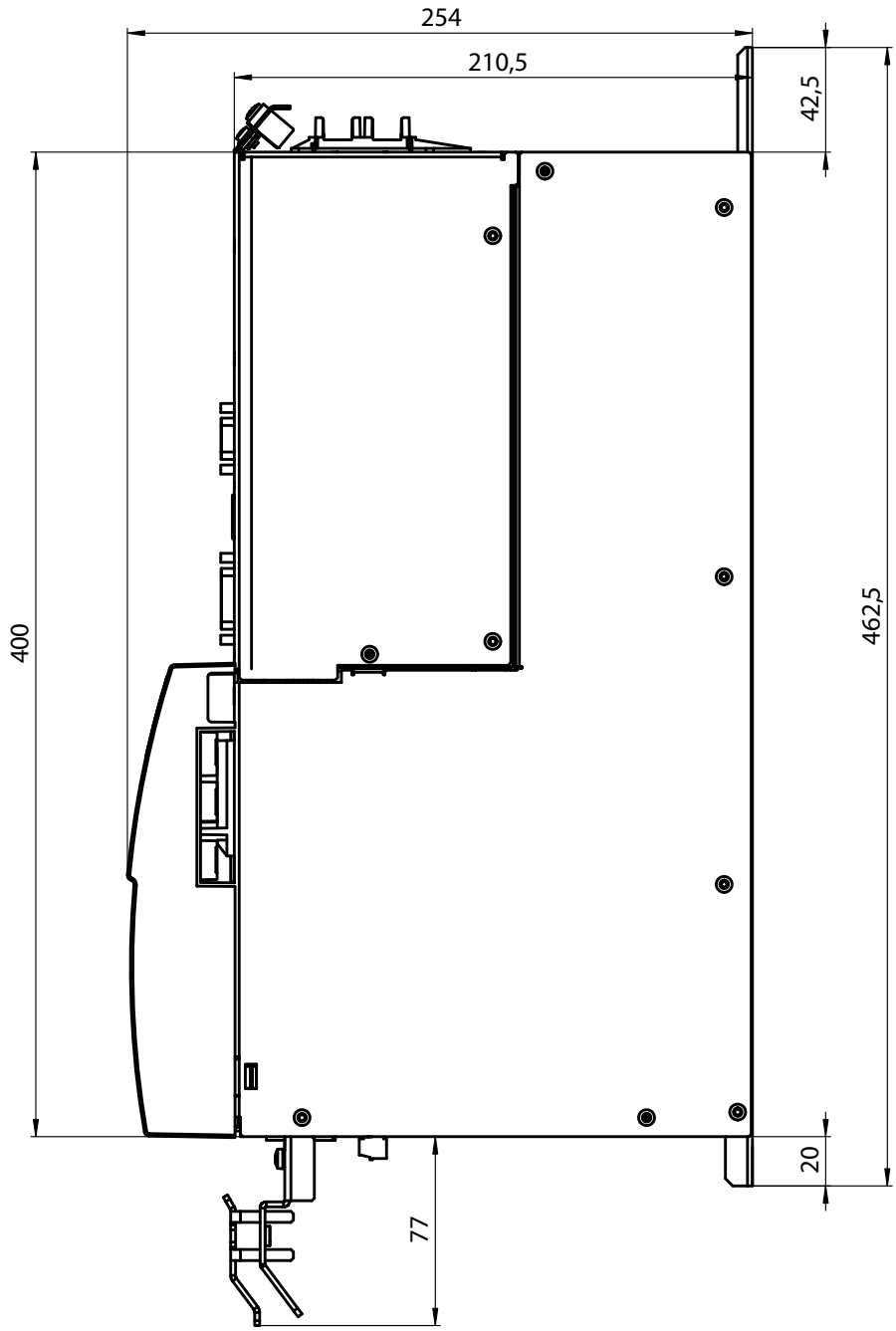
Control section of axis module

MOVIAXIS® MX axis module	General electronics data	
DC 24 V voltage supply	DC 24 V ± 25 % (EN 61131)	
Cross section and contacts	COMBICON 5.08 One core per terminal: 0.20 - 1.5 mm² Two cores per terminal: 0.25 - 1.5 mm²	
X10:1 and X10:10 binary inputs **Internal resistance**	Isolated (optocoupler), PLC compatible (EN 61131), sampling interval 1 ms $R_i \approx 3.0\ k\Omega$, $I_I \approx 10$ mA	
Signal level	+13 V - +30 V = "1" = contact closed -3 V - +5 V = "0" = contact open	according to EN 61131
Function	DIØØ: "Output stage enable" fixedly assigned DIØ1 - DIØ8: Selection option, see parameter menu DIØ1 and DIØ2 suitable for touch probe function (latency period < 100 µs)	
4 binary outputs	PLC compatible (EN 61131-2), response time 1 ms, short-circuit proof, I_{max} = 50 mA	
Signal level	"0"=0 V, "1"=+24 V, **Important: Do not apply external voltage.**	
Function	DOØØ - DOØ3: Selection option, see parameter menu	
Cross section and contacts	COMBICON 5.08 One core per terminal: 0.20 - 1.5 mm² Two cores per terminal: 0.25 - 1.5 mm²	
Shield clamps	Shield clamps for control lines available	
Maximum cable cross section that can be connected to the shield clamp	10 mm (with insulating sheath)	
X7 and X8: Connection contacts for safety functions	Safety relay integrated in unit as option Suitable for operation as device of stop category 0 or 1 according to EN 60204-1 with prevention of restart for safety applications in: • Category 3 according to EN 954-1 • Protection type III according to EN 201	
Cross section and contacts	Mini COMBICON 3.5 One core per terminal: 0.08 - 1.5 mm² Two cores per terminal: 0.08 - 0.75 mm²	
CAN2 interface **(Front end CAN)**	CAN: 9-pin D-sub connector	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations,

Dimension sheet size 1, size 2



Dimension sheet size 3, size 4, size 5, size 6



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2.5.4 Technical data of MXM master module component

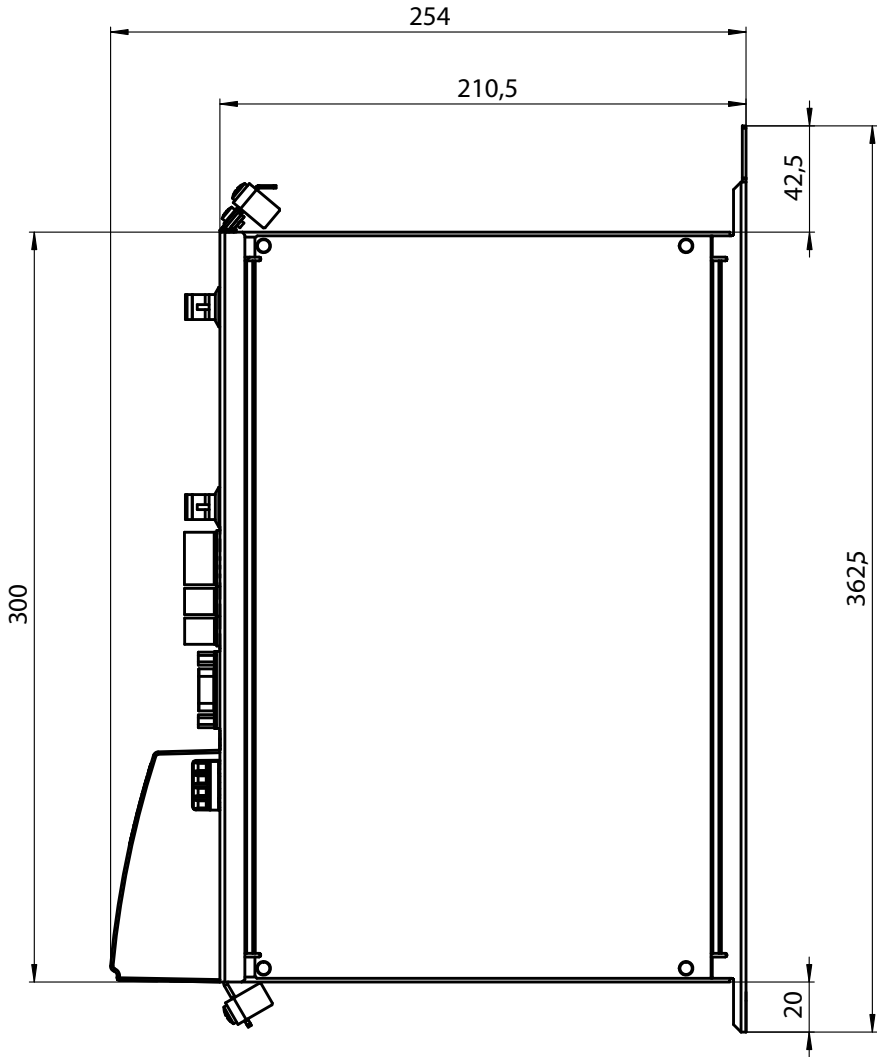
MOVIAXIS® MX master module MXM80A-...-000-00 Type	1)	2)	Size 1 000
Supply voltage V	U	V	DC 24 V ± 25 % according to EN 61131
Cross section and contacts (X5a)	COMBICON 5.08 One core per terminal: 0.20 – 1.5 mm² Two cores per terminal: 0.25 – 1.5 mm²		
Cross section and contacts (X5b)	COMBICON 5.08 One core per terminal: 0.20 – 1.5 mm² Two cores per terminal: 0.25 – 1.5 mm² Maximum outer diameter of the cable: 3.5 mm. Recommended connector: MSTB 2.5/4-ST-5.08 BK (Phoenix) (COMBICON 5.08 with front-end cable output)		
GENERAL INFORMATION			
Mass		kg	2.3
Dimensions: W		mm	60
Dimensions: H		mm	300
Dimensions: D		mm	254
Shield clamps	Shield clamps for control lines available		
Maximum cable cross section that can be connected to the shield clamp	10 mm (with insulating sheath)		

1) Nameplate information

2) Unit

	INFORMATION
	For additional technical data, refer to the manuals "MOVI-PLC® *advanced* DH..41B Controller", "UFR41B Fieldbus Gateway for EtherNet/IP, Modbus/TCP and PROFINET IO", and "UFF41B Fieldbus Gateway for DeviceNet and PROFIBUS DP".

Dimension sheet



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2.5.5 Technical data of MXC capacitor module component

MOVIAXIS® capacitor module MXC80A-050-503-00		1)	2)	
Type				050
INPUT				
Nominal DC link voltage U_{NZK}		U	V	DC 560
Storable energy[3]		W	Ws	1000
Peak power capacity			kW	50
Cross section and contacts			mm	CU bars 3 × 14, M6 screw fitting
GENERAL INFORMATION				
Capacity		C	mF	4920
Time from switching the unit on until it is ready for operation			s	10
Mass			kg	12.6
Dimensions:	**W**		mm	150
	H		mm	400
	D		mm	254

1) Nameplate information

2) Unit

3) At V_{line} = 3 × AC 400 V

Control section of capacitor module

MOVIAXIS® MXC capacitor module	General electronics data
DC 24 V voltage supply	DC 24 V ± 25 % (EN 61131)
Cross section and contacts	COMBICON 5.08 One core per terminal: 0.20 – 1.5 mm^2 Two cores per terminal: 0.25 – 1.5 mm^2

2.5.6 Technical data of MXB buffer module component

MOVIAXIS® buffer module MXB80A-050-503-00	1)	2)	
Type			050
INPUT			
Nominal DC link voltage[3] **U_{NZK}**	U	V	DC 560
Cross section and contacts		mm	CU bars 3 × 14, M6 screw fitting
GENERAL INFORMATION			
Capacity	C	mF	4920
Time from switching the unit on until it is ready for operation		s	10
Mass		kg	11
Dimensions: W		mm	150
Dimensions: H		mm	400
Dimensions: D		mm	254

1) Nameplate information

2) Unit

3) At V_{line} = 3 × AC 400 V

2.5.7 Technical data of MXS 24 V switched-mode power supply module component

MOVIAXIS® 24 V switched-mode power supply module MXS80A-...-503-00 Type	1)	2)	060
INPUT via DC link			
Nominal DC link voltage U_{NZK}	U	V	DC 560
Cross section[3] and contacts			CU bars 3 × 14, M6 screw fitting
INPUT via external 24 V			
Nominal input voltage U_N	U	V	DC 24 -0 % / +10 % - with direct brake control DC 24 ±25 % (EN 61131) - with brake control via brake switchgear
Cross section and contacts		mm^2	PC6 One core per terminal: 0.5 – 6 Two cores per terminal: 0.5 – 4
OUTPUT			
Nominal output voltage V	U	V	DC 3 x 24 (shared ground) Tolerance for supply via DC link: DC 24 0 % / +10 % tolerance for supply via external 24 V: According to input voltage
Nominal output current I	I	A	3 x 10 [4]
Nominal output power P	P	W	600
Cross section and contacts		mm^2	COMBICON 5.08 One core per terminal: 0.20 – 1.5 mm^2 Two cores per terminal: 0.25 – 1.5 mm^2
GENERAL INFORMATION			
Bridging resistance for U_Z drop[5]	t	s	Nominal power for 10 ms
Efficiency			approx. 80 %
Mass		kg	4.3
Dimensions: W		mm	60
Dimensions: H		mm	300
Dimensions: D		mm	254

1) Nameplate information

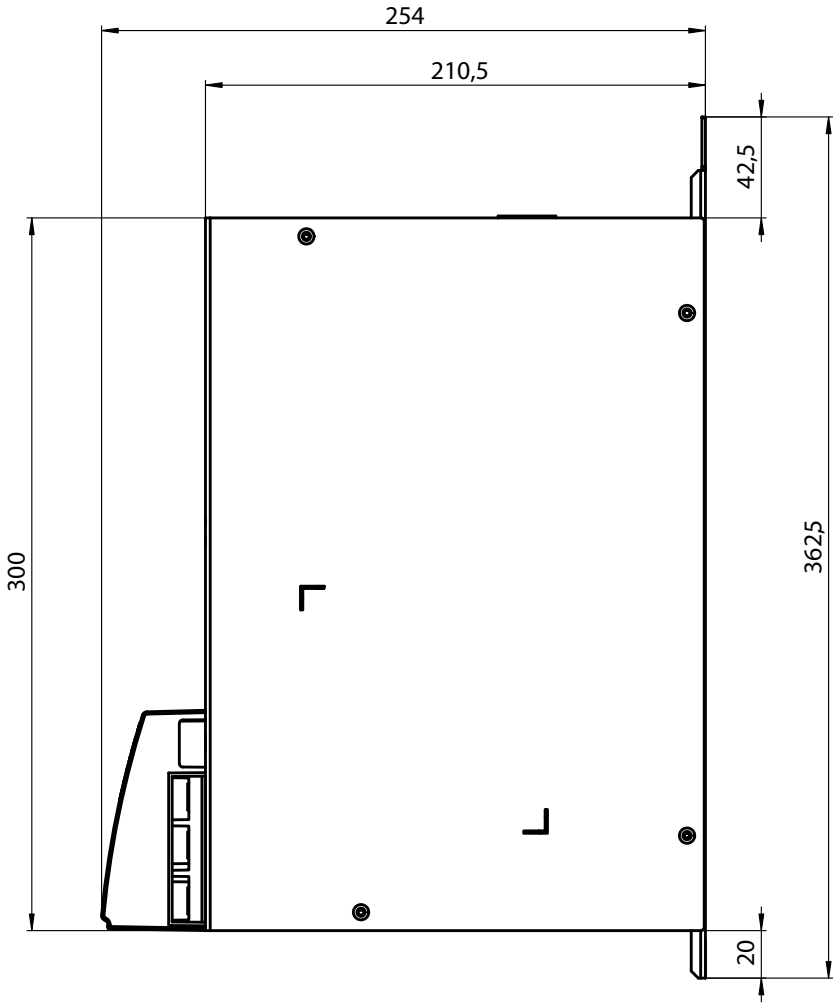
2) Unit

3) Material thickness [mm] × width [mm]

4) Not possible at the same time because total power is limited to 600 W

5) Applies to the following measuring point: 10 ms are guaranteed for an edge steepness of the falling DC link voltage of (dU_{ZK} / dt) > (200 V / 1 ms). Applies for a line voltage U_{ZK} of 3 × AC 380 V.

Dimension sheet



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2.5.8 Technical data of MXZ DC link discharge module component

Power section of DC link discharge module

MOVIAXIS® MX DC link discharge module MXZ80A-...-503-00 Type	1)	2)	Size 1 050
INPUT (DC link)			
Nominal DC link voltage[3] U_{NZK}	U	V	DC 560
Cross section[4] and contacts			CU bars 3 × 14, M6 screw fitting
Convertible energy E	E	J	5000
OUTPUT			
Braking resistor R	R	Ω	1
Discharge connection			Specific screw fitting by SEW
Cross section and contacts		mm^2	M6 screw bolts, max. 4 × 35
Connection to power shield clamp		mm^2	max. 4 × 16
GENERAL INFORMATION			
Ready for operation after switching on the mains power and the 24 V supply		s	≤ 10
Ready for operation after short circuit		s	Depends on application
Repeatability of quick discharge		s	60
Duration of quick discharge		s	≤ 1
Shutdown temperature		°C	70
Mass		kg	3.8
Dimensions: W		mm	120
Dimensions: H		mm	235
Dimensions: D		mm	254

1) Nameplate information

2) Unit

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

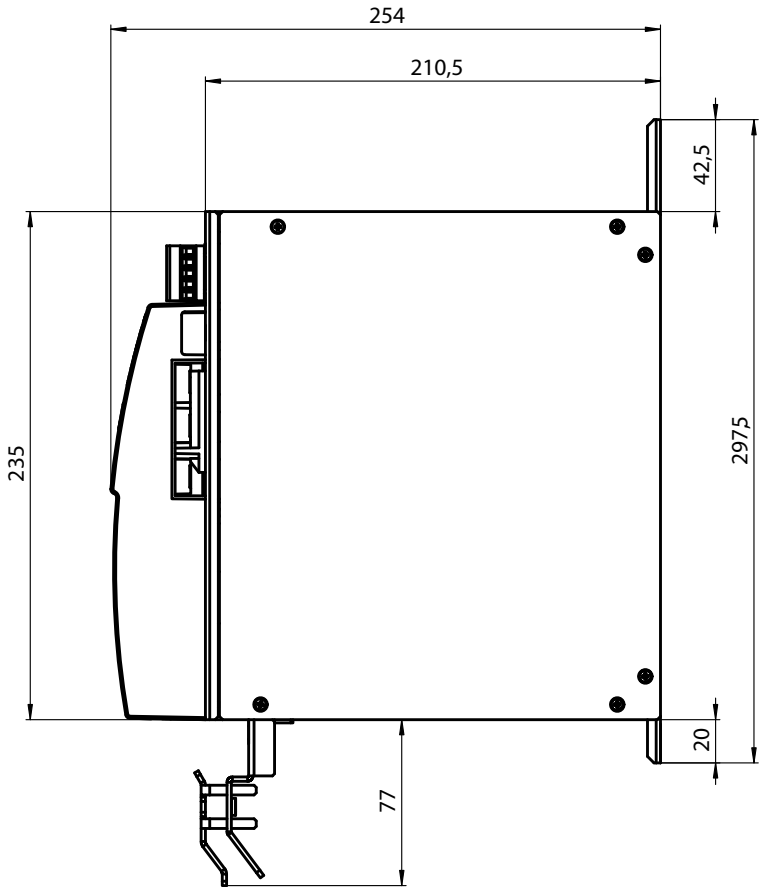
4) Material thickness [mm] × width [mm]

Control section of DC link discharge module

MOVIAXIS® MX DC link discharge module	1)	General electronics data
Inhibit		Control signal for discharge process
DC 24 V voltage supply	V	DC 24 ± 25 % (EN 61131-2)
Cross section and contacts	mm^2	COMBICON 5.08 One core per terminal: 0.20 – 1.5 mm^2 Two cores per terminal: 0.25 – 1.5 mm^2

1) Unit

Dimension sheet



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2.5.9 Technical data of two-row configuration of the axis system[1)]

The following table lists only the data that deviates from the technical data listed above due to two-row configuration.

MOVIAXIS® MX	
Enclosure EN 60529	IP10
Connection cross section of the DC link connection	35 mm^2
Screw fitting at cable lug	M8
Tightening torques	
Retaining screws of the cover	2.5 – 3 Nm
Retaining screws of conductor bars at insulator	2.5 – 3 Nm
Retaining screws of the DC link connections	3 – 4 Nm

1) Available as of 4th quarter 2010

2.6 Technical data of option cards for axis modules and regenerative modules

2.6.1 Technical data of XFP11A communication option

Description

The XFP11A communication module is a PROFIBUS slave module for direct integration into MOVIAXIS® axis modules. The XFP11A PROFIBUS card is used for directly connecting axis modules to PROFIBUS-capable control systems. Only one XFP11A PROFIBUS card can be installed per axis module.

XFP11A option	
Part number	1820 4341
Power consumption	P = 2.5 W
PROFIBUS protocol variants	PROFIBUS DP and DP-V1 to IEC 61158
Automatic baud rate detection	9.6 kBd – 12 MBd
Connection technology	• Via 9-pin D-sub connector • Pin assignment acc. to IEC 61158
Bus termination	Not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on.
Station address	0 – 125, can be set via DIP switch
Name of GSD file	• SEW_6006.GSD (PROFIBUS DP) • SEWA6003.GSD (PROFIBUS DP-V1)
DP ID number	$6006_{hex} = 24582_{dec}$
Application-specific parameterization data (Set-Prm-UserData)	• Length: 9 bytes • Hex parameter settings 00,00,00,06,81,00,00,01,**01** = DP diagnostics alarm = **OFF** • Hex parameter settings 00,00,00,06,81,00,00,01,**00** = DP diagnostics alarm = **ON**
Diagnostics data	• Standard diagnostics: 6 bytes
Tools for startup	• PC program MOVITOOLS® MotionStudio

2.6.2 Technical data of EtherCAT® fieldbus interface option

Description

The XFE24A fieldbus interface is a slave module for connection to EtherCAT® networks. Only one XFE24A fieldbus interface can be installed per axis module. The XFE24A fieldbus interface allows MOVIAXIS® to communicate with all EtherCAT® master systems. All standards of the ETG (EtherCAT® Technology Group), such as wiring, are supported. This means the cables must be wired at the front by the customer.

XFE24A option (MOVIAXIS®)	
Standards	IEC 61158, IEC 61784-2
Baud rate	100 Mbaud full duplex
Connection technology	2 × RJ45 (8x8 modular jack)
Bus termination	Not integrated because bus termination is automatically activated.
OSI layer	Ethernet II
Station address	Setting via EtherCAT® master
Vendor ID	0x59 (CANopenVendor ID)
EtherCAT® services	• CoE (CANopen over EtherCAT®) • VoE (simple MOVILINK protocol over EtherCAT®)
Firmware status of MOVIAXIS®	Firmware status 21 or higher
Tools for startup	• PC program MOVITOOLS® MotionStudio from version 5.40

2.6.3 Technical data of K-Net communication option

Description

The XFA11A (K-Net) communication module is a slave module for connection to a serial bus system for high-speed data transfer. No more than one XFA11A (K-Net) communication module may be installed per MOVIAXIS® MXA axis module.

Terminal assignment

	Terminal	Assignment	Brief description
	**X31:**		K-Net connection (RJ-45 socket)
	**X32:**		K-Net connection (RJ-45 socket)

INFORMATION

You can select either connector X31 or X32 as input or output.

Technical data

K-Net	
Power consumption	2 W
Electrical isolation	no
Bus bandwidth	Max. 50 Mbit/s
Connection technology	2xRJ-45
Max. cable length per section	50 m
Transmission medium	CAT7 cable

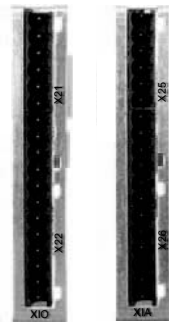
Interfaces	K-Net: Front
K-Net properties	Serial bus
	No electrical isolation
	Bus bandwidth with max. 50 Mbit/s
	Connection technology with two RJ-45 sockets
	Transmission medium CAT7 cable
Card properties	Installation in MOVIAXIS® MX servo inverter with housing widths as of 60 mm

INFORMATION

The power and current data refer to DC 24 V. The losses of the internal switched-mode power supply units have been taken into account.

2.6.4 Technical data of XIO11A, XIA11A input/output option

Description



The input/output modules XIO11A/XIA11A are digital and digital/analog hybrid option modules. They can be used to read or send both digital and analog signals from the servo inverter.

XIO11A binary hybrid module

General information	
Supply voltage	DC 24 V ± 25 %, 4 A[1] (EN 61131-1)
Supply of IOs	from the front
Addressing	via 16-digit address switch (positions 1 and 3 only)
Connection contacts	COMBICON 5.08 One core per terminal: 0.20 – 2.5 mm^2 Two cores per terminal: 0.25 – 1 mm^2
Inverter power consumption	0.6 W
Binary inputs	
Number of inputs	8
Input type	Type 1 according to EN 61131-2
Filter	500 Hz
Voltage range for "1"	15 V ≤ UH ≤ 30 V
Voltage range for "0"	-3 V ≤ UL ≤ 5 V
Processing time	1 ms
Electrical isolation	yes
Binary outputs	
Number of outputs	8
Output type	Binary outputs according to EN 61131-2
Nominal voltage	DC 24 V
Processing time	1 ms
Nominal current	0.5 A
Power loss	0.1 W with nominal current ($R_{on\ max}$: 400 mΩ)
Inductive load capacity	100 mJ at max. 1 Hz
Protection device	Short circuit and overload protection
Electrical isolation	yes

1) Maximum current of 4 A must be fused externally.

XIA11A analog/ binary hybrid module

General information	
Supply voltage	DC 24 V ± 25 %, 2 A (EN 61131-1)
Supply of IOs	from the front
Addressing	via 16-digit address switch (positions 1 and 3 only)
Connection contacts	COMBICON 5.08 One core per terminal: 0.20 – 2.5 mm^2 Two cores per terminal: 0.25 – 1 mm^2
Inverter power consumption	0.7 W
Analog inputs	
Number of inputs	2
Input range	±10 V
Input type	differential
Conversion cycle	1 ms
Resolution	12 bit
Electrical isolation	no
Encoder resistance	Min. 1 kΩ
Maximum permitted permanent overload	+30 V against GND
Input impedance	> 20 kΩ (EN 61131)
Accuracy (at 25 °C)	± 0.2 %
Measuring error temperature coefficient	100 ppm SKE[1]/ °C
Input filter limit frequency	250 Hz
Analog outputs	
Number of outputs	2
Output range	±10 V
Conversion cycle	1 ms
Resolution	12 bit
Electrical isolation	no
Output load	Min. 1 kΩ
Accuracy (at 25 °C)	± 0.1 %
Measuring error temperature coefficient	100 ppm SKE[1]/ °C
Minimum rise time (0 – 10 V)	100 µs
Binary inputs	
Number of inputs	4
Input type	Type 1 according to EN 61131-2
Filter	500 Hz
Voltage range for "1"	15 V ≤ UH ≤ 30 V
Voltage range for "0"	-3 V ≤ UL ≤ 5 V
Processing time	1 ms
Electrical isolation	yes

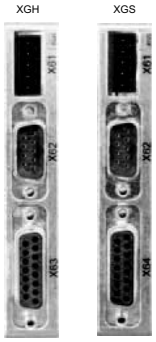
Table continued on next page.

Binary outputs	
Number of outputs	4
Output type	Binary outputs according to EN 61131-2
Nominal voltage	DC 24 V
Processing time	1 ms
Nominal current	0.5 A
Power loss	0.1 W with nominal current ($R_{on\ max}$: 400 mΩ)
Inductive load capacity	100 mJ at max. 1 Hz
Protection device	Short circuit and overload protection
Electrical isolation	yes

1) SKE = maximum scale value

2.6.5 Technical data of XGS11A, XGH11A multi-encoder card option

Description



XGS, XGH multi-encoder card	1)	
Power consumption via integrated supply SBus (without connected encoder)	W	2
Output current for supplying connected encoders	mA	500
Peak output current I_{max} for 400 ms	mA	650
When using 2 encoder cards, the total current must be limited to 800 mA.		

1) Unit

Technical data and characteristics of the differential input X61:

- Tolerance: ± 10 V.
- Resolution: 12 bits.
- Update every 250 ms.

The input can be used as

- n or M setpoint input,
- General input for measured values,
- Torque limit value.

Technical data and characteristics of X62:

- RS422.
- Maximum frequency: 200 kHz.
- Simulation output is based on the motor or option encoder, can be selected via unit parameters.
- PPR count can be freely selected in powers of two from 2^6 – 2^{12} [pulses per revolution].
- Encoder signals can be multiplied.
- The maximum possible speed depends on the emulation PPR count set:

Set PPR count	Maximum possible speed in min^{-1}
64 - 1024	No limit
2048	5221
4096	2610

2.6.6 Technical data of DWI11A

Connection of TTL encoder to XGH, XGS multi-encoder cards

TTL encoder

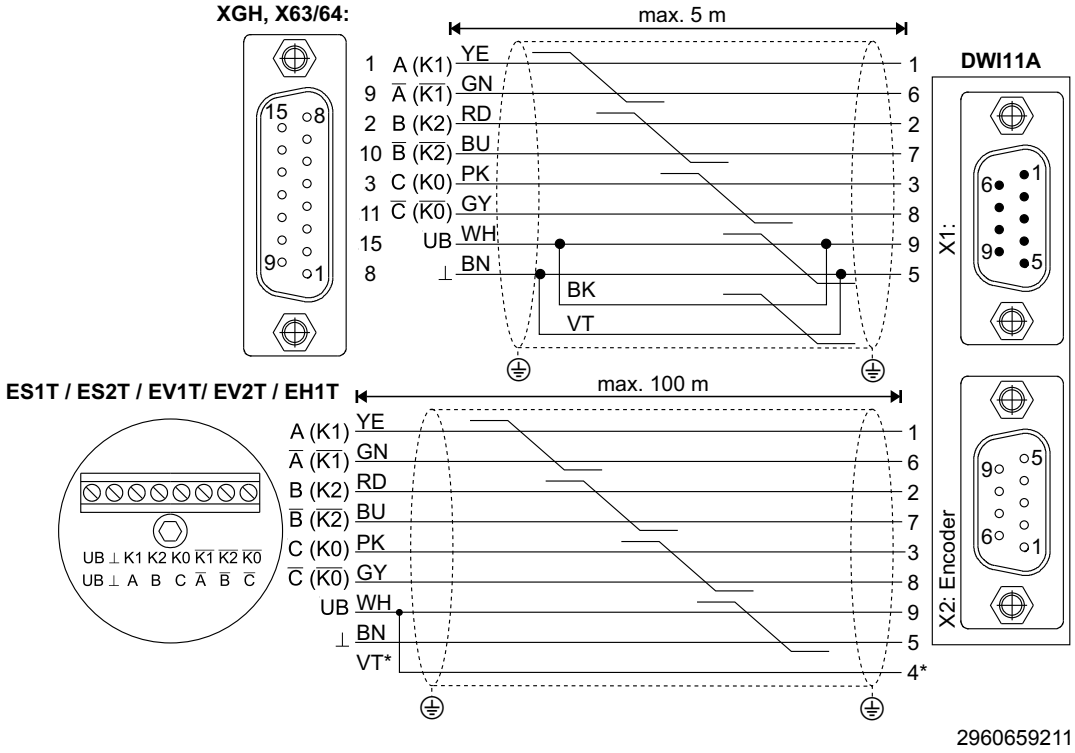
The following encoders can be connected at X63, X64 (external encoder input):

- DC 5 V TTL encoder with DC 5 V voltage supply type ES1T, ES2T, EV1T, EV2T or EH1T via DWI11A option or encoder with signal level to RS422

DC 5 V voltage supply

The TTL encoders with a DC 5 V voltage supply (ES1T, ES2T, EV1T, EV2T or EH1T) must be connected via the "DC 5 V encoder power supply type DWI11A" option (part number 822 759 4).

Connecting TTL encoders via DWI11A to XGH, XGS as a motor encoder:



* Connect the sensor cable (VT) on the encoder to UB, do not jumper on the DWI11A!

Part numbers of the prefabricated cables:

- Hiperface® option, type XGH, XGS X63 / 64: → DWI11A X1:
  - For fixed installation: 817 957 3
- Encoders ES1T, ES2T, EV1T, EV2T, EH1T → DWI11A X2: Encoder
  - For fixed installation: 198 829 8
  - For cable carriers 198 828 X

DC 5 V encoder supply type DWI11A

The part number of the DC 5 V encoder power supply option type DWI11A is: 822 7594

Description

If you are using an incremental encoder with a DC 5 V encoder power supply, install the DC 5 V encoder power supply option type DWI11A between the inverter and the incremental encoder.

This option provides a regulated DC 5 V power supply for the encoder. For this purpose, the DC 12 V power supply for the encoder inputs is converted to DC 5 V by means of a voltage controller. A sensor line is used to measure the supply voltage at the encoder and compensate the voltage drop along the encoder cable.

Incremental encoders with DC 5 V encoder power supply must not be connected directly to the encoder inputs X14 and X15. This would cause irreparable damage to the encoder.

	INFORMATION
	Note that if a short circuit occurs in the sensor cable, the connected encoder may be exposed to a voltage higher than permitted.

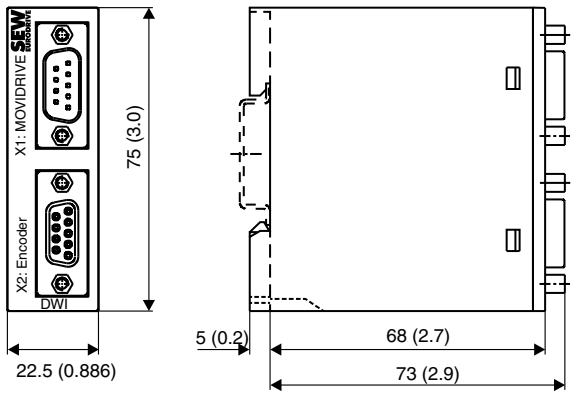
Recommendation

Use prefabricated cables from SEW-EURODRIVE for the encoder connection (page 213).

SEW-EURODRIVE offers a prefabricated cable for connecting DWI11A to MOVIAXIS®. This cable can be used for both asynchronous and synchronous motors.

Dimension drawing

All dimensions in mm (in)



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The DWI11A option is mounted on a support rail (EN 50022-35 × 7.5) in the control cabinet.

Technical data

DC 5 V encoder power supply option type DWI11A	
Part number	822 759 4
Voltage input	DC 10 – 30 V, I_{max} = DC 120 mA
Encoder power supply	DC +5 V (up to V_{max} ≈ +10 V), I_{max} = DC 300 mA
Max. line length that can be connected	100 m (328 ft) total Use a shielded twisted-pair cable (A and $\overline{A}$, B and $\overline{B}$, C and $\overline{C}$) for connecting the encoder to the DWI11A and the DWI11A to MOVIAXIS®.

2.7 System accessories

2.7.1 Technical data of optional braking resistors

General information

The BW... braking resistors are tailored to the technical characteristics of MOVIAXIS® multi-axis servo inverters.

	INFORMATION
	When using a DC link discharge module, you must install braking resistors with center tap. These braking resistors are marked in the table on the following page.

Wire and grid resistors

- Perforated sheet cover (IP20) open to mounting surface.
- The short-time load capacity of the wire and grid resistors is greater than in the flat-type braking resistors.

SEW-EURODRIVE recommends protecting the wire and grid resistors against overload using a thermal overload relay or a thermal circuit breaker. Set the trip current to the value I_F except when using the braking resistor type BW...-P, see the following tables. Do not use electronic or electromagnetic fuses because these can be triggered even in case of short-term excess currents that are still within the tolerance range.

The resistor surfaces reach high temperatures under load with P_N. Make sure that you select an installation site that will accommodate these high temperatures. As a rule, therefore, braking resistors are mounted on the control cabinet roof.

The performance data listed in the following tables indicate the load capacity of the braking resistors depending on their cyclic duration factor. The cyclic duration factor cdf of the braking resistor is indicated in % and refers to a cycle duration of ≤ 120 s.

UL and cUL approval

BW... type braking resistors are UL and cUL approved in conjunction with the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE will provide certification on request.

The following braking resistors have cRUus approval independent of the MOVIAXIS® multi-axis servo inverter:

- BW012-015-01
- BW006-025-01
- BW006-050-01
- BW004-050-01

SEW-EURODRIVE will provide certification on request.

Technical data

Braking resistor type	1)	BW027-006	BW027-012	BW247	BW247-T	BW347	BW347-T	BW039-050
Part number		822 4226	822 4234	820 7143	1820 0842	820 798 4	1820 1350	821 691 6
Power class of the supply module	kW	10, 25, 50, 75						
Load capacity at 100 % cdf[2)]	kW	0.6	1.2	2		4		5
Resistance value R_{BW}	Ω	27 ±10 %		47 ±10 %				39 ±10 %
Trip current (of F16) I_F	A_{RMS}	4.7	6.7	6.5		9.2		11.3
Design		Wire-wound tube resistor						Grid resistor
Connections	mm^2	Ceramic terminals 2.5						
Permitted electric loading of the terminals at 100% cdf	A	DC 20						
Permitted electric loading of the terminals at 40 % cdf	A	DC 25						
Amount of energy that can be absorbed	kWs	10	28	64		84		600
Degree of protection		IP20 (when installed)						
Ambient temperature ϑ_U	°C	-20 to +45						
Type of cooling		KS = self-cooling						

1) Unit

2) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ s.

Braking resistor type	1)	BW012-015	BW012-015-01[2)]	BW012-025	BW12-025-P	BW012-050	BW012-100-T	BW915-T
Part number		821 679 7	1 820 010 9	821 680 0	1820 4147	821 681 9	1820 1415	1820 4139
Power class of the supply module	kW	25, 50, 75						
Load capacity at 100 % cdf[3)]	kW	1.5	1.5	2.5		5.0	10	16
Resistance value R_{BW}	Ω	12 ±10 %						15 ±10 %
Trip current (of F16) I_F	A_{RMS}	11.2	11.2	14.4		20.4	28.8	31.6
Design		Wire-wound tube resistor	Grid resistor					
Connections	mm^2	Ceramic terminals 2.5						
Permitted electric loading of the terminals at 100% cdf	A	DC 20						
Permitted electric loading of the terminals at 40 % cdf	A	DC 25						
Amount of energy that can be absorbed	kWs	34	240	360		600	1260	1920
Degree of protection		IP20 (when installed)						
Ambient temperature ϑ_U	°C	-20 to +45						
Type of cooling		KS = self-cooling						

1) Unit

2) Braking resistors have a 1 Ω tap

3) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ s.

Braking resistor type	1)	BW006-025-01 2)	BW006-050-01	BW106-T	BW206-T	BW004-050-01
Part number		1 820 011 7	1 820 012 5	1820 0834	1820 4120	1 820 0133
Power class of the supply module	kW	50, 75				75
Load capacity at 100 % cdf 3)	kW	2.5	5.0	13	18	5.0
Resistance value R_{BW}	Ω	5.8 ±10 %		6 ±10 %		3.6 ±10 %
Trip current (of F16) I_F	A_{RMS}	20.8	29.4	46.5	54.7	37.3
Design		Grid resistor				
Connections		M8 stud				
Permitted electric loading of the terminal stud at 100% cdf	A	DC 115				
Permitted electric loading of the terminal stud at 40% cdf	A	DC 143				
Amount of energy that can be absorbed	kWs	300	600	1620	2160	600
Degree of protection		IP20 (when installed)				
Ambient temperature ϑ_U	°C	-20 to +45				
Type of cooling		KS = self-cooling				

1) Unit

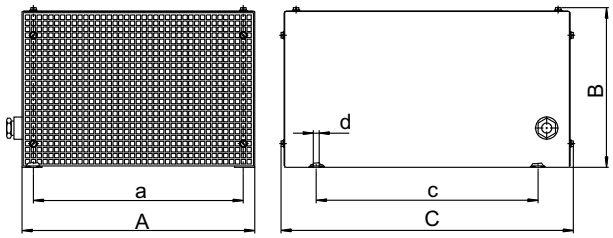
2) Braking resistors have a 1 Ω tap

3) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ s.

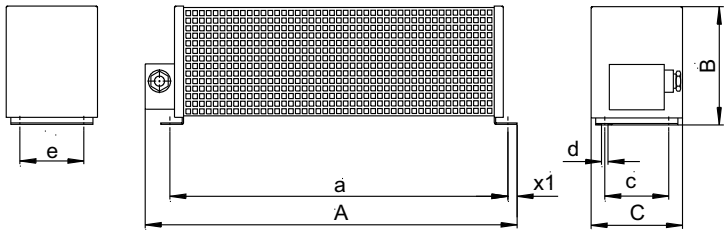
Dimension drawing of BW.. braking resistors

Dimension drawing of BW braking resistors, [2] grid resistor / [3] wire resistor

[2]



[3]



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Flat-design resistors: The connecting lead is 500 mm long. The scope of delivery includes four M4 threaded bushes each of type 1 and 2.

Type	Main dimensions mm			Fastening mm				Mass kg
BW..	A	B	C	a	c/e	x1	d	
BW027-006	486	120	92	430	64	10	6.5	2.2
BW027-012	486	120	185	426	150	10	6.5	4.3
BW247	665	120	185	626	150		6.5	6.1
BW247-T	749	120	185	626	150		6.5	9.2
BW347	670	145	340	630	300		6.5	13.2
BW347-T	749	210	185	630	150		6.5	12.4
BW039-050	395	260	490	370	380		10.5	12
BW012-015	600	120	92	544	64	10	6.5	4.0
BW012-015-01	195	260	490	170	380		10.5	7
BW012-025	295	260	490	270	380	-	10.5	8.0
BW012-025-P	295/355	260	490	270	380		10.5	8.0
BW012-050	395	260	490	370	380	-	10.5	11.0
BW012-100-T	595	270	490	570	380		10.5	21
BW915-T	795	270	490	770	380		10.5	30
BW006-025-01	295	260	490	270	380	-	10.5	9.5
BW006-050-01	395	260	490	370	380	-	10.5	13.0
BW106-T	795	270	490	770	380		10.5	32
BW206-T	995	270	490	970	380		10.5	40
BW004-050-01	395	260	490	370	380	-	10.5	13.0

2.7.2 Technical data of line filter option for supply module

The line filters listed here can be combined with the respective supply modules according to the project planning information in order to suppress interference from the grid.

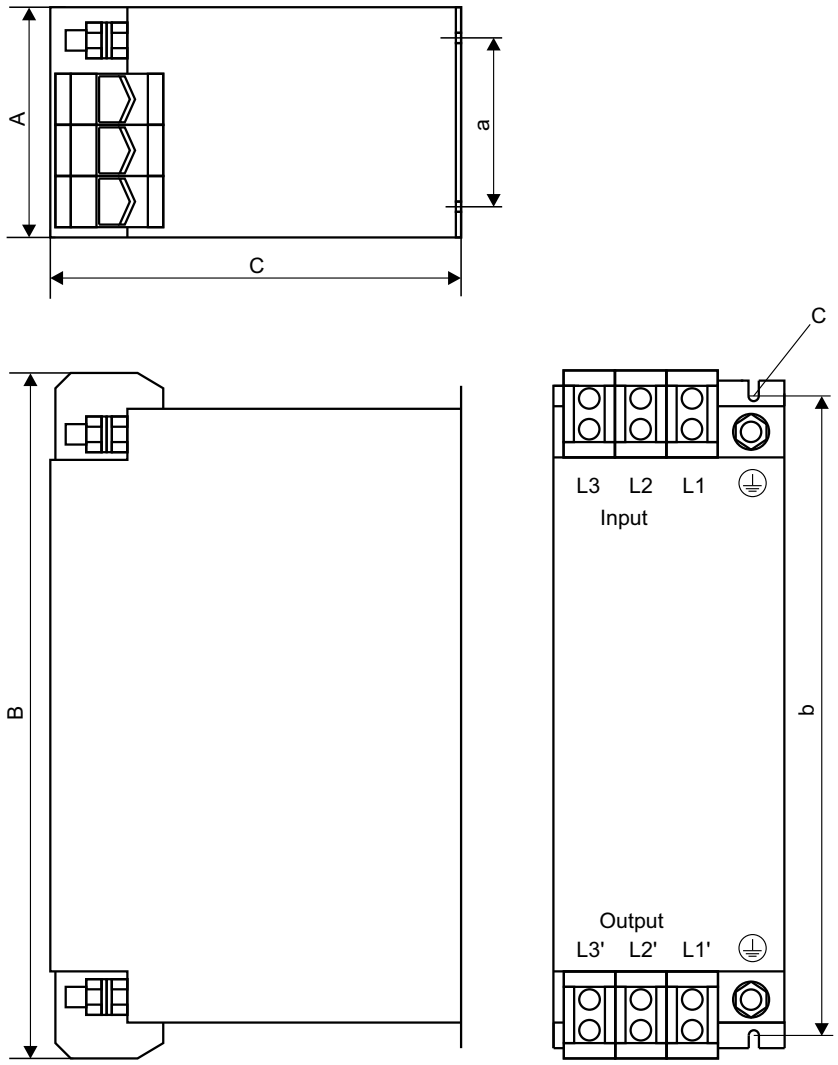
Technical data

NF.. line filters have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE will provide certification on request.

Line filter type	[1]	**NF018-503**	**NF048-503**	**NF085-503**	**NF150-503**
Part number		827 413 4	827 117 8	827 415 0	827 417 7
Supply module		Size 1	Size 2	Size 3	Size 3
Nominal voltage V_N	V_{AC}	3 × 500 +10 %, 50/60 Hz			
Nominal current I_N	A_{AC}	18	48	85	150
Power loss at I_N P_V	W	12	22	35	90
Earth-leakage current at V_N	mA	< 25	< 40	< 30	< 30
Ambient temperature ϑ_U	°C	-25 to +40			
Degree of protection		IP20 (EN 60529)			
Connections L1-L3/L1'-L3'	mm^2	4	10	35	95
PE		M5 stud	M5/M6 stud	M8	M10

1) Unit

Dimension drawing of NF.. line filter



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Any mounting position

Line filter type	Main dimensions mm			Mounting dimensions mm		Hole dimension mm	PE connection	Mass
	A	B	C	a	b	c		kg
NF018-503	50	255	80	20	240	5.5	M5	1.1
NF048-503	60	315	100	30	295		M6	2.1
NF085-503	90	320	140	60	255	6.5	M8	3.5
NF150-503	100	330	155	65			M10	5.6

2.7.3 Technical data of line choke option for supply module

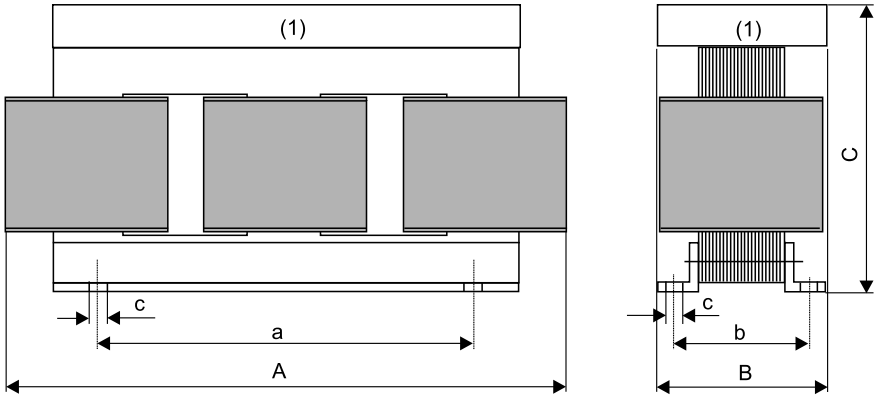
Line chokes are used to smooth the line current that the MX system consumes. This minimizes power supply disturbances, reduces load on weaker grids, and dampens current fluctuations.

Technical data

ND.. line chokes have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE will provide certification on request.

Line choke type	1)	ND020-013	ND045-013	ND085-013	ND150-013
Part number		826 012 5	826 013 3	826 014 1	825 548 2
Supply module		Size 1	Size 2	Size 3	Size 3
Nominal voltage V_N	V_{AC}	3 × 500 +10 %, 50/60 Hz			
Nominal current I_N	A_{AC}	20	45	85	150
Power loss at I_N P_V	W	10	15	25	62
Inductance L_N	mH	0.1	--	--	--
Ambient temperature ϑ_U	°C	-25 to +40			
Degree of protection		IP00 (EN 60529)			
Connections L1-L3/L1'-L3'	mm^2	4	10	35	M10 stud
PE		Terminal strips	Terminal strips	Terminal strips	PE: M8 stud

1) Unit



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(1) Space for terminal strips (touch-safe)

Any mounting position

Line choke type	Main dimensions mm			Mounting dimensions mm		Hole dimension mm	Weight
	A	B	C	a	b	c	kg
ND020-013	85	60	120	50	31	5-10	0.5
ND045-013	125	95	170	84	55-75	6	2.5
ND085-013	185	115	235	136	56	7	8
ND150-013	255	140	230	170	77	8	17

2.7.4 Technical data of the optional line components for supply and regenerative modules

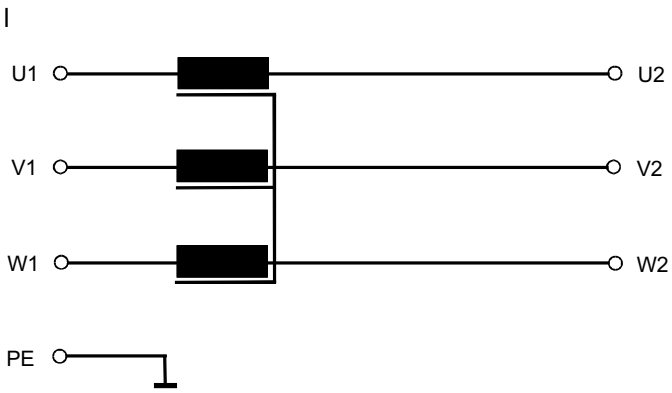
The line components NK50 and NK75 are mandatory for the operation of the supply and regenerative module. They cannot be replaced by other choke/filter combinations. The NK.. line components always comprise a matched combination of filter and choke. They can be ordered as a package under the specified part number, see following table:

NK line components	Part number	Included line choke	Included line filter
NK50	0829 9730	NDR075-083	NFR 075-503
NK75	0829 9722	NDR11-083	NFR111-503

Technical data of line choke option for supply and regenerative modules

The two line chokes NDR 110 and NDR 075 are tailored to the MXR and NFR filters. They cannot be replaced by "normal" line chokes. These line chokes are the core of the boost converter function, which is essential for sinusoidal energy feedback into the grid. Each operating mode (50 kW or 75 kW operation) requires a separate choke.

Wiring diagram



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Technical data

NDR.. line chokes have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE will provide certification on request.

	Unit	Line choke	
		NDR 075-083 (50 kW)	NDR 110-063 (75 kW)
Connection voltage AC[1)] V_{line}	V_{AC}	3 × 380 V – 3 × 480 V ±10 %	
Nominal line voltage[2)] U_N	V_{AC}	3 x 500 V, 50 Hz	3 x 500 V, 50 Hz
Nominal current I_N	A	75	110
Power loss at • **0 % I_N** • **100 % I_N**	W	 • 135 • 270	 • 220 • 440
Operating temperature at • **0 % I_N** • **100 % I_N**	°C	 • 85 • 140	 • 85 • 140
Ambient temperature	°C	0 to +45	0 to +45
Inductance	mH	3 x 0.8	3 x 0.55
Degree of protection according to EN 60529	-	IP00	IP00

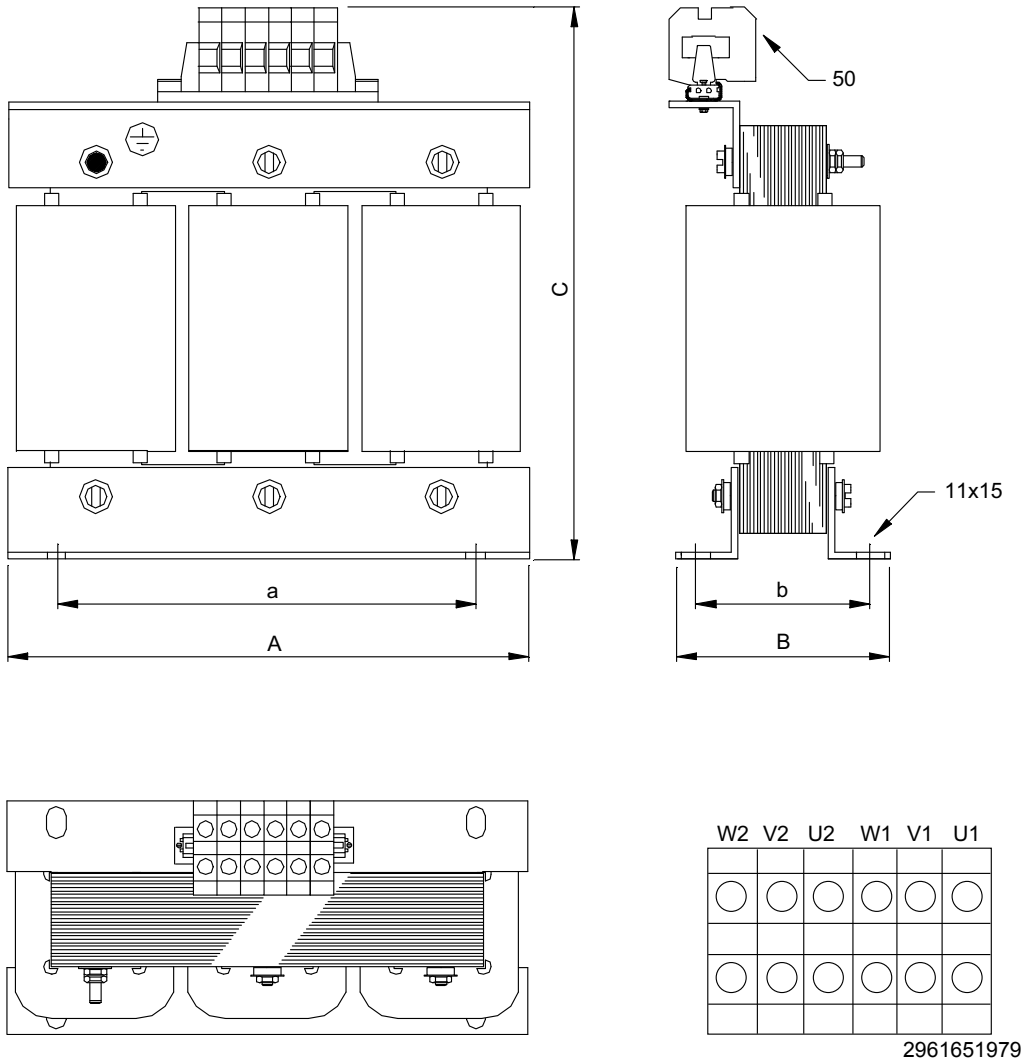
Table continued on next page. Footnotes on next page.

		Unit	Line choke	
			NDR 075-083 (50 kW)	NDR 110-063 (75 kW)
Weight		kg	40	47
Dimensions	**A**	mm	240	300
	B	mm	200	230
	C	mm	410	430
Mounting dimensions	**a**	mm	190	240
	b	mm	131	160

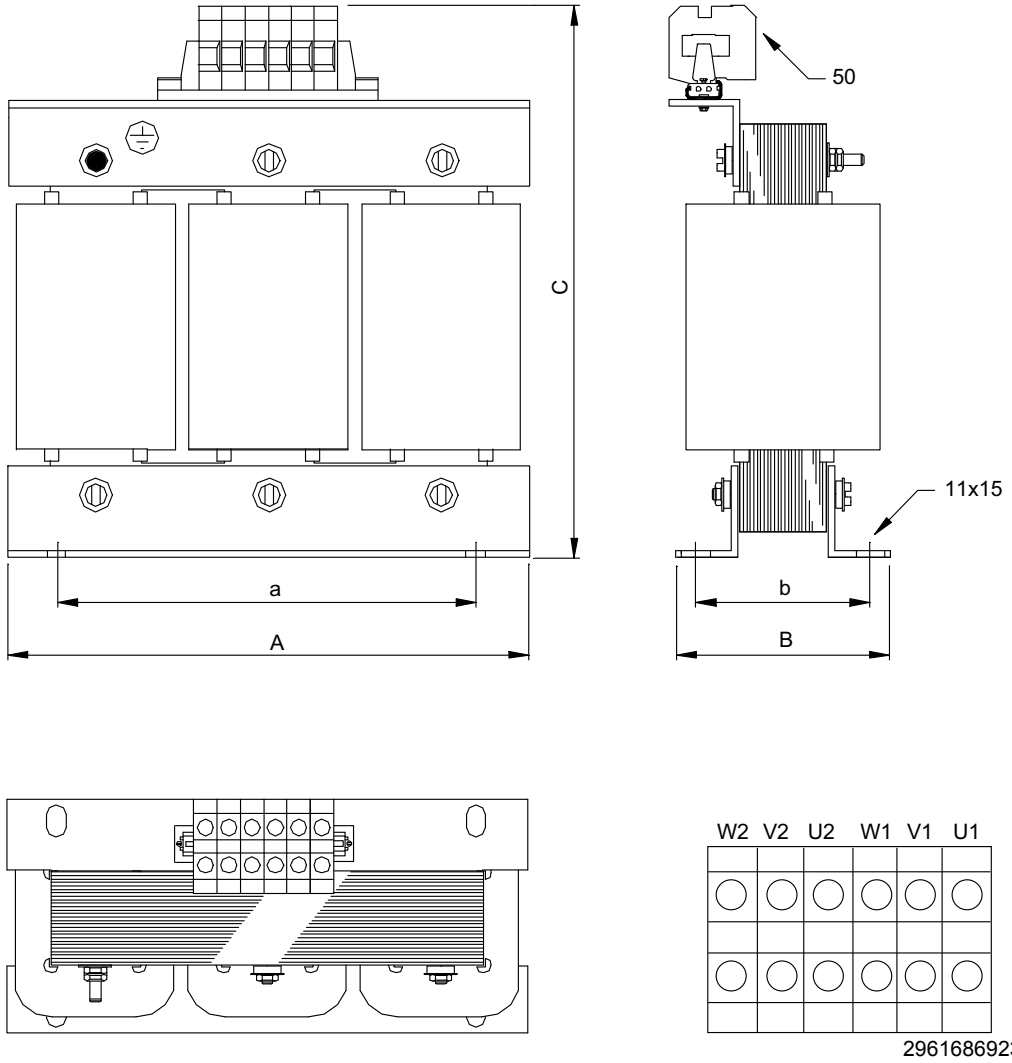
1) Max. operating voltage in conjunction with MXR

2) Max. operating voltage of the choke

Dimension drawing NDR 075-083 (50 kW)



Dimension drawing NDR 110-063 (75 kW)



Technical data of line filter option for supply and regenerative modules

Structure	• 3-conductor filter • Metal housing
Features	• Design according to UL1283, IEC 60939, CSA 22.2 No. 8
Applications	• Frequency inverter for motor drives • Frequency inverter with regenerative operation
Connections	• Touch-safe connection terminals

Technical data

NFR.. line filters have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE will provide certification on request.

		Unit	Line filter	
			NFR 075-503 (50 kW)	**NFR 111-503 (75 kW)**
Connection voltage AC[1)]	**V_{line}**	V_{AC}	3 × 380 V – 3 × 480 V ±10 %	
Nominal line voltage[2)]	**U_N**	V_{AC}	3 × 500	3 × 500
Nominal current I_N		A_{AC}	73	110
Power loss[3)]		W	60	105
Regenerative cycle frequency	**f**	kHz	8	4
Discharge current I_{Abl}		mA	< 60 mA at AC 500 V 50 Hz in nominal operation	< 20 mA at AC 500 V 50 Hz in nominal operation
Ambient temperature		°C	0 to +45	0 to +45
Degree of protection EN 60529		-	IP20	IP20
Connections L1 - L3 ; L1' - L3'		mm^2	Up to 50 (screw terminals)	Up to 50 (screw terminals)
Connections U, V, W **(Line voltage measurement)**	**PE**	mm^2	Screw terminals 0.2 – 4	Screw terminals 0.2 – 4
Weight		kg	31	39
Dimensions	**A**	mm	150	210
	B	mm	400	400
	C	mm	300	300
Connection dimensions	**a**	mm	120	180
	b	mm	422	422

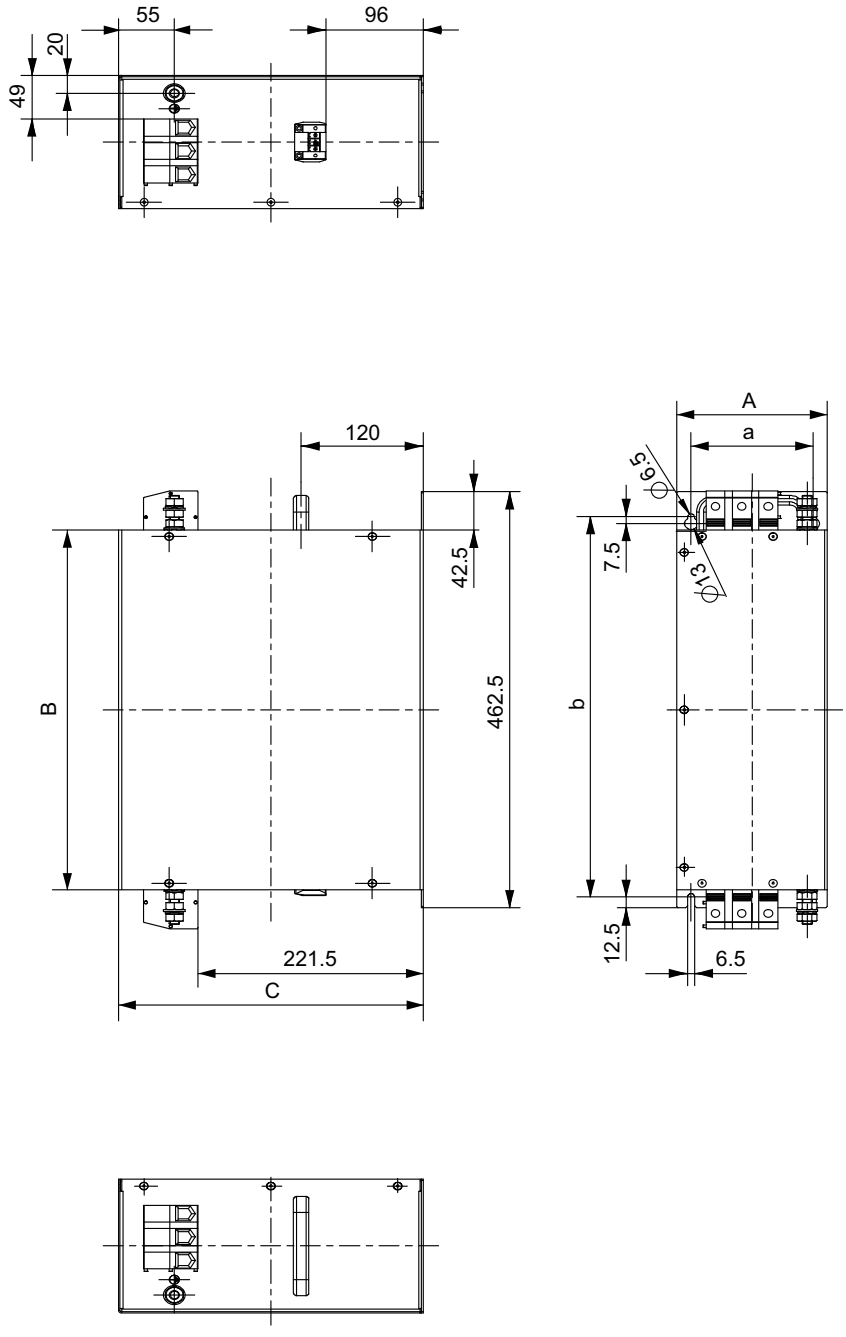
1) Max. operating voltage in conjunction with MXR

2) Max. operating voltage of the filters

3) Rule of three applied for partial loads

Dimension drawing NFR 075-503 (50 kW)

Dimension drawing of line filter for 3-phase systems.



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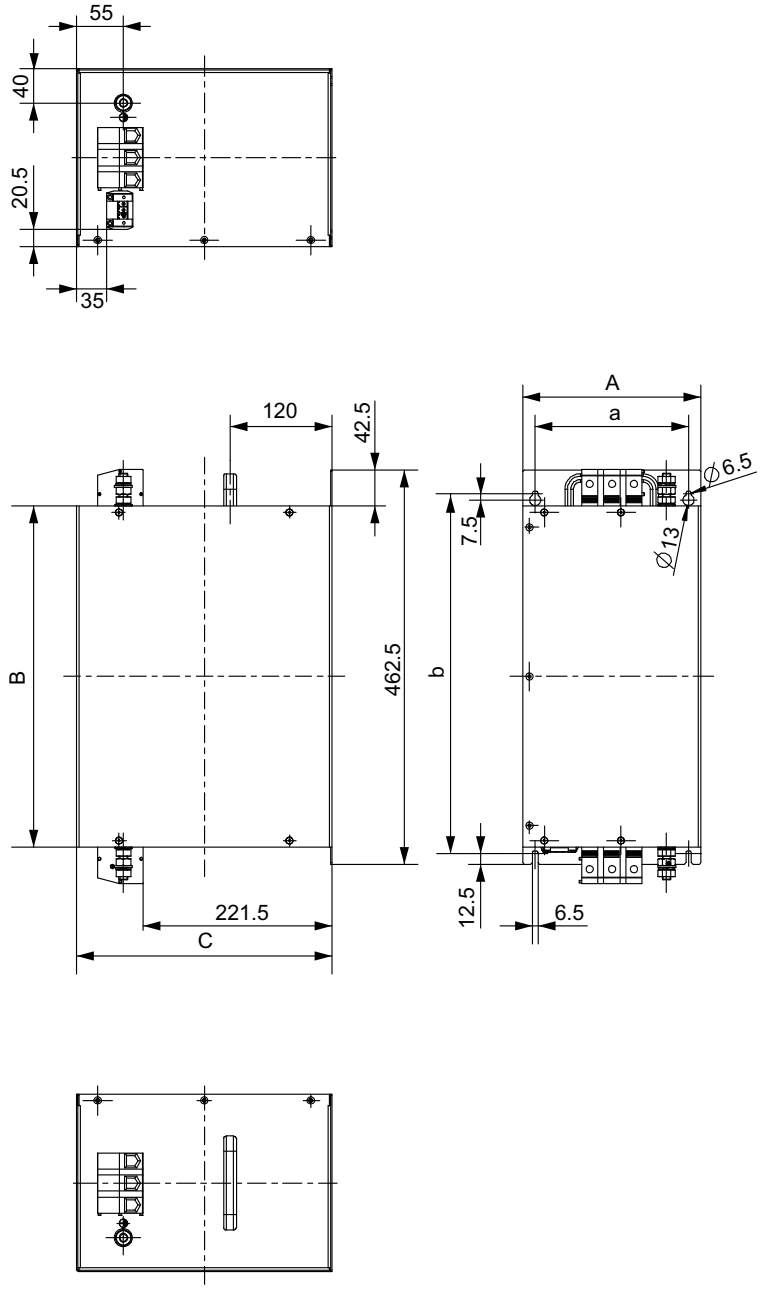
[1] Terminals for line phase measurement

Dimension drawing NFR 111-503 (75 kW)

Dimension drawing of line filter for 3-phase systems.



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[1] Terminals for line phase measurement

2.7.5 Technical data of the EcoLine filter for supply and regenerative modules

Every regenerative unit, be it block-shaped or sinusoidal, affects the grid to which it is connected. To limit these feedback effects on other consumers connected to the grid, and to keep them within a safe range under all circumstances, the transformer must be overdimensioned or the grid must be sufficiently strong. This is due to the basic mode of operation of energy feedback systems and the structure of electric power grids.

These project planning requirements are easily fulfilled by the vast majority of applications.

However, you can use an EcoLine filter if the following conditions apply to your application:

- Special requirements for no feedback effects caused by the regenerative unit in the grid,
- Overdimensioning / strong grid is not possible.

The EcoLine filter decouples the grid almost completely from possible feedback effects of the regenerative unit.

The technical advantages for the customers are:

- Almost no overdimensioning required
- Required transformer size is reduced by factor 3
- Regenerative unit can be used in combination with very weak grids
- Regenerative unit can be combined/integrated with existing system and grid conditions
- Easy retrofitting of systems with regenerative units

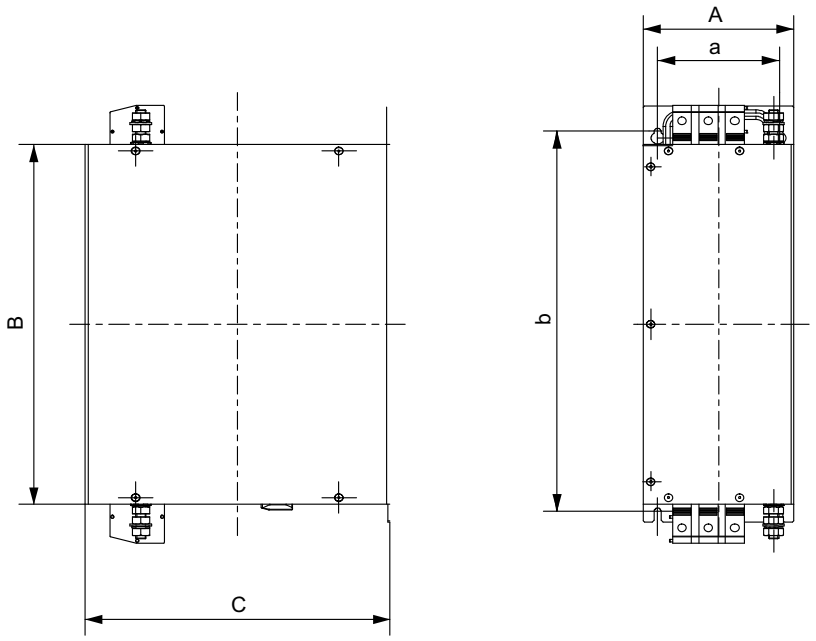
Technical data

In conjunction with MXR units, the NFH line filter is an UL-listed accessory.

	Unit	EcoLine filter	
		NFH 075-503 (50 kW)	**NFH 110-503 (75 kW)**
Connection voltage AC[1)] V_{line}	V_{AC}	3 × 380 V – 3 × 480 V ±10 %	
Nominal line voltage U_N	V_{AC}	3 × 500	3 × 500
Nominal current I_N	A_{AC}	73	110
Power loss	W	65	100
Regenerative cycle frequency f	kHz	8	4
Ambient temperature	°C	0 to +45	0 to +45
Degree of protection EN 60529 (NEMA1)	-	IP20 to EN 60529	IP20 to EN 60529
Connections L1 - L3 ; L1' - L3'	mm^2	Up to 50 (screw terminals)	Up to 50 (screw terminals)
Weight	kg	20	24

1) Max. operating voltage in conjunction with MXR

Dimension drawing of NFH EcoLine filter



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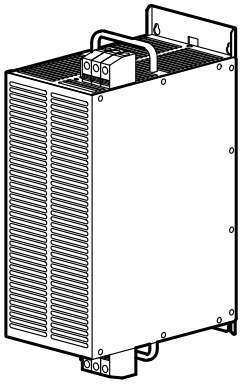
		Unit	EcoLine filter	
			NFH 075-503 (50 kW)	NFH 110-503 (75 kW)
Dimensions	**A**	mm	180	180
	B	mm	330	400
	C	mm	225	300
Mounting dimensions	**a**	mm	150	150
	b	mm	352	422

Mounting positions The preferred mounting positions are suspended and horizontal, see the following schematic diagrams:

Suspended



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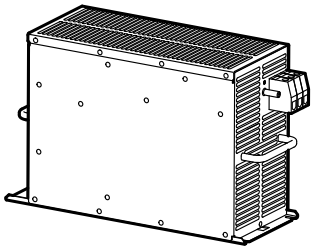
Horizontal



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	INFORMATION
	For installation, observe the required minimum clearance of 100 mm above and below the connecting terminals and the ventilation openings.

2.7.6 Cables for supply system connection, motor, motor brake, braking resistor, and fuses

Special regulations

Comply with the **regulations issued by specific countries and for specific machines** regarding fusing and the selection of cable cross sections. If required, also adhere to the notes on **UL compliant installation**.

Prescribed motor cable length

The maximum motor cable length is

- 50 m shielded,
- 100 m unshielded.

An exception from this rule is the 2 A axis module. Its maximum motor cable length is

- 25 m shielded,
- 50 m unshielded

.

Motor brake cable

The listed tolerances for direct brake supply (without brake rectifier) refer to a maximum cable length of 25 m and a minimum cross section of 1 mm^2.

Cable cross sections and fusing

SEW-EURODRIVE proposes the following line cross-sections and fusing for single-core copper cables with PVC insulation laid in cable ducts, an ambient temperature of 40 °C and nominal system currents of 100 % of the nominal unit current:

MOVIAXIS® MXP supply modules:

MOVIAXIS® MXP	**Size 1**	**MXP81**	**Size 2**	**Size 3**	
Nominal output power kW	10	10	25	50	75
Power supply					
Nominal line current AC A	15	15	36	72	110
Fuses F11/F12/F13 I_N	Design according to nominal line current				
Supply system cable L1/L2/L3	1.5 – 6 mm^2	1.5 – 6 mm^2	10 – 16 mm^2	16 – 50 mm^2	35 – 50 mm^2
PE conductor	1 × 10 mm^2	1 × 10 mm^2	1 × 16 mm^2	1 × 50 mm^2	1 × 50 mm^2
Cross section and contacts of supply system connection	COMBICON PC4 pluggable, max. 4	COMBICON PC4 pluggable, max. 4	COMBICON PC6 pluggable, max. 6	Screw bolt M8 max. 50 mm^2	
Braking resistor connection					
Brake line +R/-R	Design according to rated current of braking resistor				
Cross section and contacts on connections	COMBICON PC4 pluggable, max. 4	COMBICON PC4 pluggable, max. 4	COMBICON PC6 pluggable, max. 6	M6 screw bolts max. 16 mm^2	
Cross-section and contacts at the braking resistor	See technical data of braking resistors				

MOVIAXIS® MXA axis modules:

MOVIAXIS® MXA	Size 1			Size 2	
Continuous AC output current in A PWM = 4 kHz	2	4	8	12	16
Nominal AC output current in A PWM = 8 kHz	2	4	8	12	16
Motor cable U/V/W	1.5 – 4 mm^2				
Cross section and contacts of motor connection	COMBICON PC4 pluggable, max. 4 mm^2				

MOVIAXIS® MXA	Size 3		Size 4	Size 5	Size 6
Continuous AC output current in A PWM = 4 kHz	32	43	64	85	133
Nominal AC output current in A PWM = 8 kHz	24	32	48 24, 32 (special design)	64	100 64 (special design)
Motor cable U/V/W	4 – 6 mm^2	6 mm^2	10 – 16 mm^2	16 mm^2	25 – 50 mm^2
Cross section and contacts of motor connection	COMBICON PC6 One core per terminal: 0.5 – 16 mm^2; two conductors per terminal: 0.5 – 6 mm^2		M6 screw bolts max. 25 mm^2		max. 4 × 70 mm^2

MOVIAXIS® MXZ DC link discharge module:

MOVIAXIS® MXZ	Size 1
Braking resistor connection	
Brake line +R/-R	Design according to rated current of braking resistor
Cross section and contacts	M6 screw bolts, max. 4 × 16
Connection to power shield clamp	max. 4 × 16
Cross-section and contacts at the braking resistor	See technical data of braking resistors

Voltage drop

The cable cross section of the motor cable should be selected so the **voltage drop is as small as possible**. An excessively large voltage drop means that the full motor torque is not achieved.

The expected voltage drop can be determined with reference to the following tables (the voltage drop can be calculated in proportion to the length if the cables are shorter or longer). This information applies when using cores made of copper with PVC insulation at 40 °C ambient temperature and installation type "E" according to EN 60204-1 1998-11 table 5.

Cable cross section	Load with I in A =															
	4	6	8	10	13	16	20	25	30	40	50	63	80	100	125	150
Copper	Voltage drop ΔU [V] with length = 100 m (330 ft) and ϑ = 70 °C															
1.5 mm²	5.3	8	10.6	13.3	17.3	21.3	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
2.5 mm²	3.2	4.8	6.4	8.1	10.4	12.8	16	1)	1)	1)	1)	1)	1)	1)	1)	1)
4 mm²	1.9	2.8	3.8	4.7	6.5	8.0	10	12.5	1)	1)	1)	1)	1)	1)	1)	1)
6 mm²					4.4	5.3	6.4	8.3	9.9	1)	1)	1)	1)	1)	1)	1)
10 mm²						3.2	4.0	5.0	6.0	8.2	10.2	1)	1)	1)	1)	1)
16 mm²								3.3	3.9	5.2	6.5	7.9	10.0	1)	1)	1)
25 mm²									2.5	3.3	4.1	5.1	6.4	8.0	1)	1)
35 mm²											2.9	3.6	4.6	5.7	7.2	8.6
50 mm²														4.0	5.0	6.0

1) Not recommended dimensioning range, excessive voltage drop

Line cross section	Load with I in A =															
	4	6	8	10	13	16	20	25	30	40	50	63	80	100	125	150
Copper	Voltage drop ΔU [V] with length = 100 m (330 ft) and ϑ = 70 °C															
AWG16	7.0	10.5	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
AWG14	4.2	6.3	8.4	10.5	13.6	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
AWG12	2.6	3.9	5.2	6.4	8.4	10.3	12.9	1)	1)	1)	1)	1)	1)	1)	1)	1)
AWG10					5.6	6.9	8.7	10.8	13.0	1)	1)	1)	1)	1)	1)	1)
AWG8						4.5	5.6	7.0	8.4	11.2	1)	1)	1)	1)	1)	1)
AWG6								4.3	5.1	6.9	8.6	10.8	13.7	1)	1)	1)
AWG4									3.2	4.3	5.4	6.8	8.7	10.8	13.5	1)
AWG3									2.6	3.4	4.3	5.1	6.9	8.6	10.7	12.8
AWG2											3.4	4.2	5.4	6.8	8.5	10.2
AWG1												3.4	4.3	5.4	6.8	8.1
AWG1/0												2.6	3.4	4.3	5.4	6.8
AWG2/0													2.7	3.4	4.3	5.1

1) More than 3% voltage drop in relation to U_{line} = AC 460 V (not recommended)

3 Power Cables for Synchronous Servomotors

3.1 Structure of the motor cable and brakemotor cables

SEW-EURODRIVE offers pre-fabricated cables with plugs for straightforward and reliable motor connection. Cable and contact are connected using the crimp technique. The following cables are available in 1 m steps:

- Motor power
- Motor power + brake
- Resolver/motor protection,
- Absolute encoder motor protection,
- Forced cooling fan.

	INFORMATION
	For cable specifications, such as approval and temperature range, please refer to chapter "Cable specification" (page 182).

The size of the plug connector depends on the current level and the maximum cable length in relation to the speed.

Hybrid cables are divided into

- Power cables (motor cable, brakemotor cable, extension cable),
- Feedback cables (resolver cable, encoder cable, extension cable).

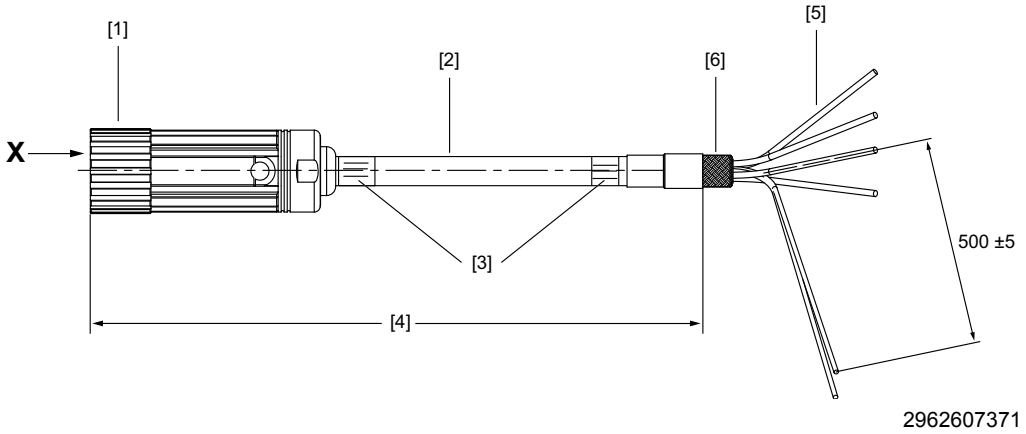
3.1.1 Plug thread

	INFORMATION
	The D-sub connectors are equipped with a common UNC thread.

3.1.2 Note on the wiring diagrams

All plugs are shown with view onto the pins!

3.1.3 Motor cables/brakemotor cables for CMP servomotors



[1] Connector: Intercontec BSTA 078
[2] SEW-EURODRIVE logo printed on cable
[3] Nameplate
[4] Cable length ≤ 10 m: Tolerance +200 mm.
Cable length > 10 m: Tolerance +2%.
Permitted line length according to the technical documents.
[5] Pre-fabricated cable end for inverter.
Required loose parts are supplied with the cable.
[6] Shielding pulled back approx. 20 mm +5 mm.

Motor side

The power cables on the motor side consist of an 8-pin plug connector and socket contacts.

The shield is connected in the connector housing according to EMC requirements. All plug connectors seal the plug on the cable end with a lamellar seal and ensure cable relief according to EN 61884.

Prefabrication on inverter end

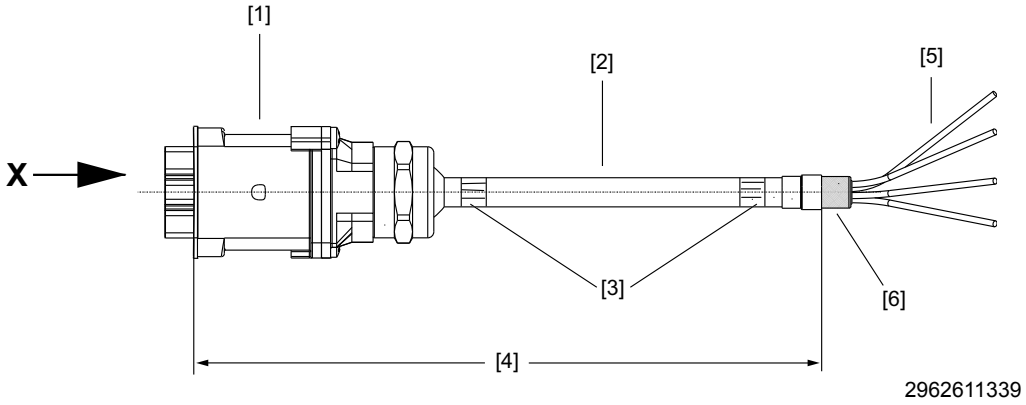
The individual cable cores of the motor and brakemotor cables are exposed and the shield is prepared for connection in the control cabinet. The cable for the inverter end still has to be prefabricated. The loose parts required are supplied with the cable in a separate bag.

Loose parts

The following loose parts are supplied in accordance with the core cross sections for connection to the power terminals on the inverter:

Bag no.	Contents
1	4 x conductor end sleeves 1.5 mm^2 , insulated 4 x M6 U-shaped cable lugs 1.5 mm^2
2	4 x conductor end sleeves 2.5 mm^2 , insulated 4 x M6 U-shaped cable lugs 2.5 mm^2
3	4 x conductor end sleeves 4 mm^2 , insulated 4 x M6 U-shaped cable lugs 4 mm^2

3.1.4 Motor cables/brakemotor cables for CFM servomotors



[1] Connector: Amphenol
[2] SEW-EURODRIVE logo printed on cable
[3] Nameplate
[4] Cable length ≤ 10 m: Tolerance +200 mm.
Cable length > 10 m: Tolerance +2%.
Permitted line length according to the technical documents.
[5] Pre-fabricated cable end for inverter.
Required loose parts are supplied with the cable.
[6] Shielding pulled back approx. 20 mm +5 mm.

Motor side

The power cables on the motor end have a 6-pin EMC Amphenol plug connector and socket contacts.

The shield is connected in the connector housing according to EMC requirements. All plug connectors seal the plug on the cable end with a lamellar seal and ensure cable relief according to EN 61884.

Inverter side

The individual cable cores of the power and brake power cables are exposed and the shield is prepared for connection in the control cabinet. The cable for the inverter end has yet to be assembled. The loose parts required are supplied with the cable in a separate bag.

Loose parts

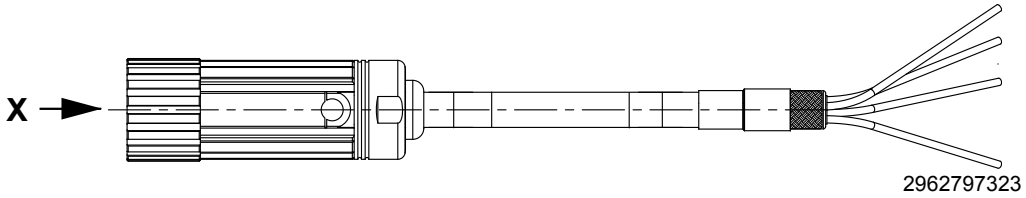
The following loose parts are supplied in accordance with the core cross sections for connection to the power terminals on the inverter:

Bag no.	Contents
1	4 x conductor end sleeves 1.5 mm^2 , insulated 4 x M6 U-shaped cable lugs 1.5 mm^2
2	4 x conductor end sleeves 2.5 mm^2 , insulated 4 x M6 U-shaped cable lugs 2.5 mm^2
3	4 x conductor end sleeves 4 mm^2 , insulated 4 x M6 U-shaped cable lugs 4 mm^2 4 x M10 U-shaped cable lugs 4 mm^2
4	4 x M6 U-shaped cable lugs 6 mm^2 4 x M10 U-shaped cable lugs 6 mm^2
5	4 x M6 U-shaped cable lugs 10 mm^2 4 x M10 ring-type cable lugs 10 mm^2

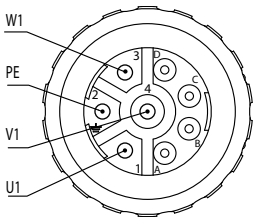
3.2 Power cable for CMP, CMDV, and CMS50/63 motors

3.2.1 Motor cable

Motor cable illustration



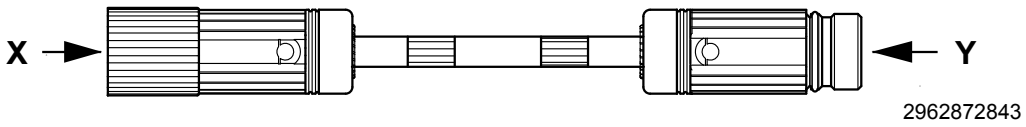
Pin assignment of the motor cable

Plug connector	Pin	Cable core color	Assigned	Extra
BSTA 078  **View X**	1	(BK) Black	U	Bag of loose parts
	2	(GN/YE) Green/Yellow	PE	
	3	(BK) Black	W	
	4	(BK) Black	V	

Motor cable types

Plug connector type	Number of cores and cable cross section	Part number	Installation	Cable type
SM 11	4 × 1.5 mm^2	0590 4544	Fixed installation	
SM 11	4 × 1.5 mm^2	0590 6245	Cable carrier installation	Low capacitance
SM12	4 × 2.5 mm^2	0590 4552	Fixed installation	
SM12	4 × 2.5 mm^2	0590 6253	Cable carrier installation	Low capacitance
SM14	4 × 4 mm^2	0590 4560	Fixed installation	
SM14	4 × 4 mm^2	0590 4803	Cable carrier installation	

Illustration of motor extension cable



Types of motor extension cables

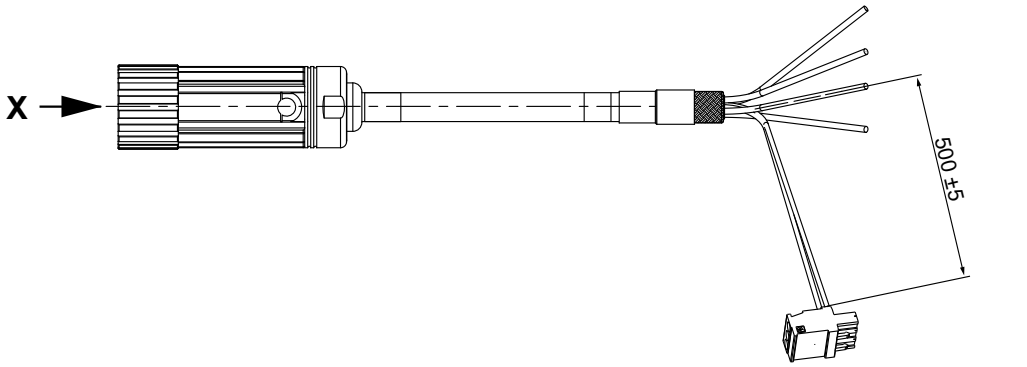
Plug connector type	Number of cores and cable cross section	Part number	Installation	Cable type
SM11	4 × 1.5 mm^2	1333 2547	Cable carrier installation	Low capacitance
SM12	4 × 2.5 mm^2	1333 2465	Cable carrier installation	Low capacitance
SM14	4 × 4 mm^2	1333 2473	Cable carrier installation	Low capacitance

Pin assignment of motor extension cable

Plug connector	Pin	Cable core color	Assigned	Pin	Plug connector
BSTA 078	1	(BK/WH)	U	1	**BKUA 199**
	4	Black with white lettering U, V, W	V	4	
	3		W	3	
	2	(GR/YE) Green/Yellow	PE	2	
View X					**View Y**

3.2.2 Brakemotor cable

Illustration of brakemotor cable



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Types of brakemotor cables

Plug connector type	Number of cores and cable cross section	Part number	Installation	Cable type
SB 11	4 × 1.5 mm^2 + 2 × 1 mm^2	1332 4853	Fixed installation	
SB 11	4 × 1.5 mm^2 + 2 × 1 mm^2	1333 1221	Cable carrier installation	Low capacitance
SB12	4 × 2.5 mm^2 + 2 × 1 mm^2	1333 2139	Fixed installation	
SB12	4 × 2.5 mm^2 + 2 × 1 mm^2	1333 2155	Cable carrier installation	Low capacitance
SB14	4 × 4 mm^2 + 2 × 1 mm^2	1333 2147	Fixed installation	
SB14	4 × 4 mm^2 + 2 × 1 mm^2	1333 2163	Cable carrier installation	

Pin assignment of brake motor cable

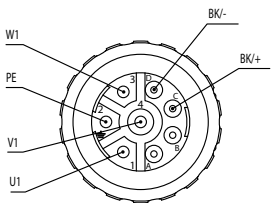
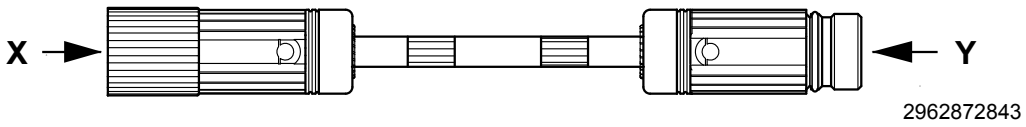
Plug connector	Pin	Cable core color	Assigned	Extra
BSTA 078  **View X**	1	(BK/WH) Black with white lettering U, V, W	U	Bag of loose parts
	4		V	
	3		W	
	2	(GN/YE) Green/Yellow	PE	
	A	-	n. c.	
	B	-	n. c.	
	C	(BK/WH) Black with white lettering 1, 2, 3	2	
	D		1	

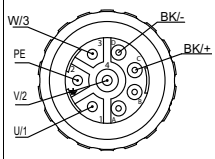
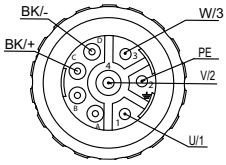
Illustration of brakemotor extension cable



Types of brake motor extension cables

Plug connector type	Number of cores and cable cross section	Part number	Installation	Cable type
SB11	4 × 1.5 mm^2 + 2 × 1 mm^2	1333 2481	Cable carrier installation	Low capacitance
SM12	4 × 2.5 mm^2 + 2 × 1 mm^2	1333 2503	Cable carrier installation	Low capacitance
SM14	4 × 4 mm^2 + 2 × 1 mm^2	1333 2511	Cable carrier installation	Low capacitance

Pin assignment of brake motor extension cable

Plug connector	Pin	Cable core color	Assigned	Pin	Plug connector
BSTA 078  **View X**	1	(BK/WH) Black with white lettering U, V, W	U	1	**BKUA 199**  **View Y**
	4		V	4	
	3		W	3	
	2	(GN/YE) Green/Yellow	PE	2	
	A	-	n. c.	A	
	B	-	n. c.	B	
	C	(BK/WH) Black with white lettering 1, 2, 3	2	C	
	D		1	D	

3.2.3 Cable specification of (brake)motor cables

Fixed installation

Motor cable

Installation		**Fixed**				
Cable cross sections		**4 x 1.5 mm² (AWG 16)**	**4 x 2.5 mm² (AWG 14)**	**4 x 4 mm² (AWG 12)**	**4 x 6 mm² (AWG 10)**	**4 x 10 mm² (AWG 8)**
Manufacturer		**HELUKABEL**				
Manufacturer designation		LI9YCY				
Operating voltage U_0 / U AC	V	600 / 1000				
Temperature range	°C	Fixed installation -40 to +80 (-40 to +176)				
Max. temperature	°C	+80				
Min. bending radius	mm	45	55	65	73	85
Diameter D	mm	9.0 ± 0.2	11 ± 0.2	13 ± 0.2	14.3 ± 0.3	17.0 ± 0.6
Core identification		BK with lettering WH + GN/YE				
Sheath color		Orange, similar to RAL 2003				
Approval(s)		DESINA/VDE/UL				
Capacitance core/shielding	nF/km	110	110	118	125	125
Capacitance core / core	nF/km	70	70	75	80	80
Halogen-free		no				
silicon-free		yes				
CFC-free		yes				
Inner insulation (core)		PP				
Outer insulation (sheath)		PVC				
Flame-retardant/self-extinguishing		no				
Conductor material		Cu				
Shielding		Tinned Cu				
Weight (cable)	kg/km	134	202	262	332	601

Brakemotor cable

Installation		**Fixed**				
Cable cross sections		**4 x 1.5 mm² (AWG 16) + 3 x 1 mm² (AWG 18)**	**4 x 2.5 mm² (AWG 14) + 3 x 1 mm² (AWG 18)**	**4 x 4 mm² (AWG 12) + 3 x 1 mm² (AWG 18)**	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	**4 x 10 mm² (AWG 8) + 3 x 1.5 mm² (AWG 16)**
Manufacturer		**HELUKABEL**				
Manufacturer designation		LI9YCY				
Operating voltage U_0 / U AC	V	600 / 1000				
Temperature range	°C	Fixed installation: -40 to +80				
Max. temperature	°C	+80				
Min. bending radius	mm	60	68	75	85	100
Diameter D	mm	11.8 ± 0.4	13.4 ± 0.4	15.0 ± 0.5	17.0 ± 0.6	20.0 ± 1.0
Core identification		BK with lettering WH + GN/YE				
Sheath color		Orange similar to RAL 2003				
Approval(s)		DESINA/VDE/UL				
Capacitance core/shielding	nF/km	105	105	110	115	120
Capacitance core / core	nF/km	60	60	70	75	78

Installation		Fixed				
Cable cross sections		**4 x 1.5 mm² (AWG 16) + 3 x 1 mm² (AWG 18)**	**4 x 2.5 mm² (AWG 14) + 3 x 1 mm² (AWG 18)**	**4 x 4 mm² (AWG 12) + 3 x 1 mm² (AWG 18)**	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	**4 x 10 mm² (AWG 8) + 3 x 1.5 mm² (AWG 16)**
Manufacturer		**HELUKABEL**				
Halogen-free		no				
silicon-free		yes				
CFC-free		yes				
Inner insulation (core)		PP				
Outer insulation (sheath)		PVC				
Flame-retardant/self-extinguishing		yes				
Conductor material		Cu				
Shielding		Tinned Cu				
Weight (cable)	kg/km	229	292	393	542	938

Cable carrier installation

Motor cable

Installation		Cable carrier				
Cable cross sections		**4 x 1.5 mm² (AWG 16)**	**4 x 2.5 mm² (AWG 14)**	**4 x 4 mm² (AWG 12)**	**4 x 6 mm² (AWG 10)**	**4 x 10 mm² (AWG 8)**
Manufacturer		**Nexans**				
Manufacturer designation		PSL(LC)C11Y-J 4 x ... mm²		PSL11YC11Y-J 4 x ... mm²		
Operating voltage U_0 / U AC	V	600 / 1000				
Temperature range	°C	-20 to +60				
Max. temperature	°C	+90 (on conductor)				
Min. bending radius	mm	134	140	135	155	180
Diameter D	mm	12.8 + 0.6 / -0.7	15.7 ± 0.3	13.2 ± 0.4	15.4 ± 0.4	17.8 ± 0.5
Maximum acceleration	m/s²	20				
Max. velocity	m/min	200 at max. travel distance of 5 m				
Core identification		BK with lettering WH + GN/YE				
Sheath color		Orange similar to RAL 2003				
Approval(s)		DESINA/VDE/UL/cRUus				
Capacitance core/shielding	nF/km	95	95	170	170	170
Capacitance core / core	nF/km	65	65	95	95	95
Halogen-free		yes				
silicon-free		yes				
CFC-free		yes				
Inner insulation (core)		Polyolefin		TPM		
Outer insulation (sheath)		TPU (PUR)				
Flame-retardant/self-extinguishing		yes				
Conductor material		E-Cu blank				
Shielding		Braided tinned Cu shield (optically covered > 85 %)				
Weight (cable)	kg/km	249	373	311	426	644
Min. bending cycles		Min. 5 million				

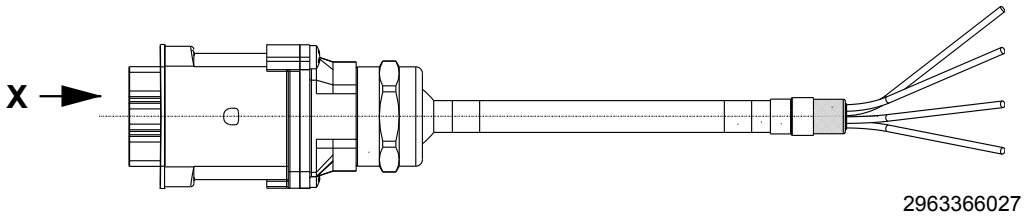
Brakemotor cable

Installation		**Cable carrier**				
Cable cross sections		**4 x 1.5 mm² (AWG 16) + 3 x 1 mm² (AWG 18)**	**4 x 2.5 mm² (AWG 14) + 3 x 1 mm² (AWG 18)**	**4 x 4 mm² (AWG 12) + 3 x 1 mm² (AWG 18)**	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	**4 x 10 mm² (AWG 8) + 3 x 1.5 mm² (AWG 16)**
Manufacturer		**Nexans**				
Manufacturer designation		PSL(LC)C11Y-J 4x... +3A.../C		PSL11YC11Y-J 4x... +3A.../C		
Operating voltage U_0 / U AC	V	600 / 1000				
Temperature range	°C	-20 to +60				
Max. temperature	°C	+90 (conductor)				
Min. bending radius	mm	159	170	155	175	200
Diameter D	mm	15.0 ± 0.9	16.5 ± 0.7	15.3 ± 0.5	17.4 ± 0.5	20.5 ± 0.5
Maximum acceleration	m/s^2	20				
Max. velocity	m/min	200 at max. travel distance of 5 m				
Core identification		BK with lettering WH + GN/YE				
Sheath color		Orange similar to RAL 2003				
Approval(s)		DESINA/VDE/UL/cRUus				
Capacitance core/shielding	nF/km	105	105	170	170	170
Capacitance core / core	nF/km	65	65	95	95	95
Halogen-free		yes				
silicon-free		yes				
CFC-free		yes				
Inner insulation (cable)		TPM				
Outer insulation (sheath)		Polyolefin		TPU (PUR)		
Flame-retardant/self-extinguishing		yes				
Conductor material		E-Cu blank				
Shielding		Braided tinned Cu shield (optically covered > 85 %)				
Weight (cable)	kg/km	335	433	396	522	730
Min. bending cycles		Min. 5 million				

3.3 Power cables for CFM and CMS71 motors

3.3.1 Motor cable

Motor cable illustration



Motor cable types

The cables are equipped with a connector for motor connection and conductor end sleeves for inverter connection.

Plug connector type	Number of cores and cable cross section	Installation	Part number
SM 51 / SM 61	4 × 1.5 mm^2 (AWG 16)	Fixed installation	199 179 5
SM 52 / SM 62	4 × 2.5 mm^2 (AWG 12)		199 181 7
SM 54 / SM 64	4 × 4 mm^2 (AWG 10)		199 183 3
SM 56 / SM 66	4 × 6 mm^2 (AWG 10)		199 185 X
SM 59 / SM 69	4 × 10 mm^2 (AWG 8)		199 187 6
SM 51 / SM 61	4 × 1.5 mm^2 (AWG 16)	Cable carrier installation	199 180 9
SM 52 / SM 62	4 × 2.5 mm^2 (AWG 12)		199 182 5
SM 54 / SM 64	4 × 4 mm^2 (AWG 10)		199 184 1
SM 56 / SM 66	4 × 6 mm^2 (AWG 10)		199 186 8
SM 59 / SM 69	4 × 10 mm^2 (AWG 8)		199 188 4

Pin assignment of the motor cable

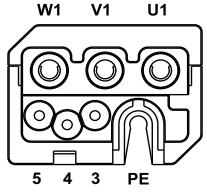
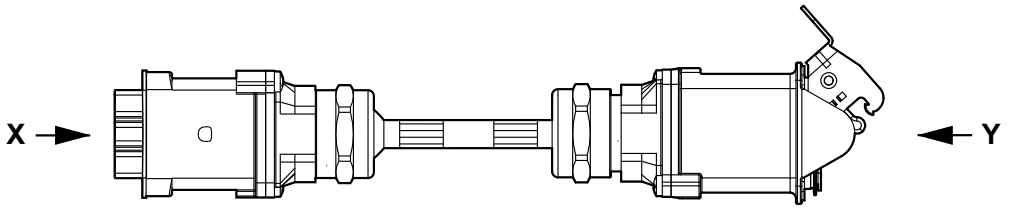
Plug connector	Pin	Core identification	Assigned	Contact type	Extra
C148U connector with socket contacts	U1	Black with white lettering U, V, W	U	Cut-off, length ca. 250 mm	Bag of loose parts
	V1		V		
	W1		W		
 **View X**	PE	Green/yellow	(protective earth)	With Phoenix plug connector GMVSTBW 2.5/3 ST	

Illustration of motor extension cable



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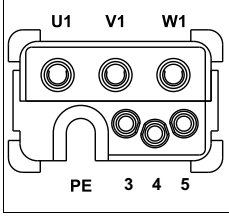
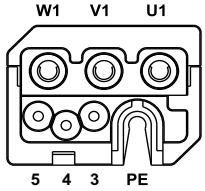
Types of motor extension cables

The cables are equipped with a plug and adapter for extending the CFM motor cable.

Plug connector type	Number of cores and cable cross section	Installation	Part number
SM 51 / SM 61	4 × 1.5 mm^2 (AWG 16)	Fixed installation	199 549 9
SM 52 / SM 62	4 × 2.5 mm^2 (AWG 12)		199 551 0
SM 54 / SM 64	4 × 4 mm^2 (AWG 10)		199 553 7
SM 56 / SM 66	4 × 6 mm^2 (AWG 10)		199 555 3
SM 59 / SM 69	4 × 10 mm^2 (AWG 8)		199 557 X
SM 51 / SM 61	4 × 1.5 mm^2 (AWG 16)	Cable carrier installation	199 550 2
SM 52 / SM 62	4 × 2.5 mm^2 (AWG 12)		199 552 9
SM 54 / SM 64	4 × 4 mm^2 (AWG 10)		199 554 5
SM 56 / SM 66	4 × 6 mm^2 (AWG 10)		199 556 1
SM 59 / SM 69	4 × 10 mm^2 (AWG 8)		199 558 8

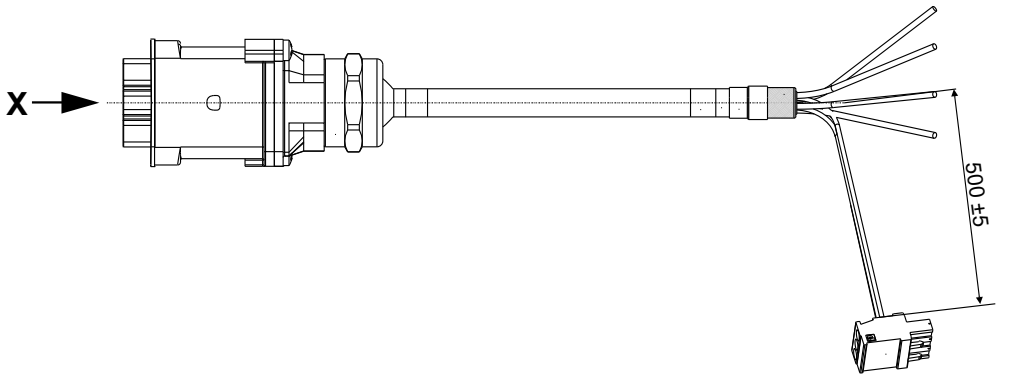
Pin assignment of motor extension cable

Plug connector	Pin	Core identification	Pin	Plug connector
C148U adapter with pin contacts	U1	Black with white lettering U, V, W	U1	**C148U connector with socket contacts**
	V1		V1	
	W1		W1	
	PE	Green/yellow	PE	
	3	Black with white lettering 1, 2, 3	3	
	4		4	
	5		5	

The motor extension cable is a 1:1 connection of all pins.

3.3.2 Brakemotor cable

Illustration of brakemotor cable



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Types of brakemotor cables

Plug connector type, complete	Number of cores and cable cross section	Installation	Part number
SB 51 / SB 61	4 × 1.5 mm^2 (AWG 16) + 3 × 1.0 mm^2 (AWG 17)	Fixed installation	199 189 2
SB 52 / SB 62	4 × 2.5 mm^2 (AWG 12) + 3 × 1.0 mm^2 (AWG 17)		199 191 4
SB 54 / SB 64	4 × 4 mm^2 (AWG 10) + 3 × 1.0 mm^2 (AWG 17)		199 193 0
SB 56 / SB 66	4 × 6 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 195 7
SB 59 / SB 69	4 × 10 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 197 3

Plug connector type, complete	Number of cores and cable cross section	Installation	Part number
SB 51 / SB 61	4 × 1.5 mm^2 (AWG 16) + 3 × 1.0 mm^2 (AWG 17)	Cable carrier installation	199 190 6
SB 52 / SB 62	4 × 2.5 mm^2 (AWG 12) + 3 × 1.0 mm^2 (AWG 17)		199 192 2
SB 54 / SB 64	4 × 4 mm^2 (AWG 10) + 3 × 1.0 mm^2 (AWG 17)		199 194 9
SB 56 / SB 66	4 × 6 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 16)		199 196 5
SB 59 / SB 69	4 × 10 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 198 1

CFM brakemotor cable – pin assignment

The brakemotor cable is prefabricated for the following brake resistors:

- BME
- BMP
- BMH
- BMK
- BMV

For the BSG control unit, the customers have to assemble the cable themselves.

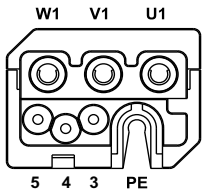
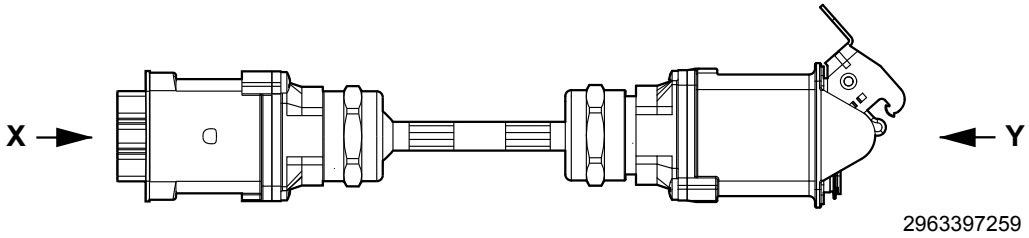
Plug connector	Pin	Core identification	Assigned	Contact type	Extra
C148U connector with socket contacts	U1	Black with white lettering U, V, W	U	Cut-off, length ca. 250 mm	Bag of loose parts
	V1		V		
	W1		W		
 **View X**	PE	Green/yellow	(protective earth)		
	3	Black with white lettering 1, 2, 3	1	with Phoenix plug connector GMVSTBW 2,5/3ST	
	4		2		
	5		3		

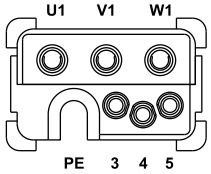
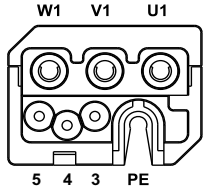
Illustration of brakemotor extension cable



Types of brake motor extension cables

Plug connector type, complete	Number of cores and cable cross section	Installation	Part number
SK 51 / SK 61	4 × 1.5 mm^2 (AWG 16) + 3 × 1.0 mm^2 (AWG 17)	Fixed installation	199 199 X
SK 52 / SK 62	4 × 2.5 mm^2 (AWG 12) + 3 × 1.0 mm^2 (AWG 17)		199 201 5
SK 54 / SK 64	4 × 4 mm^2 (AWG 10) + 3 × 1.0 mm^2 (AWG 17)		199 203 1
SK 56 / SK 66	4 × 6 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 205 8
SK 59 / SK 69	4 × 10 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 207 4
SK 51 / SK 61	4 × 1.5 mm^2 (AWG 16) + 3 × 1.0 mm^2 (AWG 17)	Cable carrier installation	199 200 7
SK 52 / SK 62	4 × 2.5 mm^2 (AWG 12) + 3 × 1.0 mm^2 (AWG 17)		199 202 3
SK 54 / SK 64	4 × 4 mm^2 (AWG 10) + 3 × 1.0 mm^2 (AWG 17)		199 204 X
SK 56 / SK 66	4 × 6 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 16)		199 206 6
SK 59 / SK 69	4 × 10 mm^2 (AWG 10) + 3 × 1.5 mm^2 (AWG 17)		199 208 2

Pin assignment of brake motor extension cable

Plug connector	Pin	Core identification	Pin	Plug connector
C148U adapter with pin contacts	U1	Black with white lettering U, V, W	U1	**C148U connector with socket contacts**
	V1		V1	
	W1		W1	
	PE	Green/yellow	PE	
	3	Black with white lettering 1, 2, 3	3	
	4		4	
	5		5	

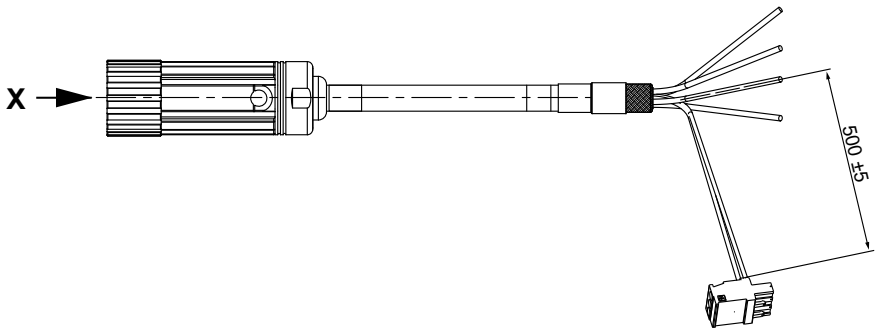
The brakemotor extension cable is a 1:1 connection of all pins.

3.4 Cable specification of (brake)motor cables

See chapter "Cable specification" (page 182).

3.5 Power cables for SL2 linear motors

3.5.1 Power cables SL2-050 and AVX0 design



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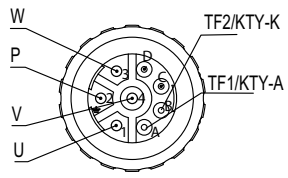
The customer assembles the cable with a Phoenix plug connector. The connector can be cut off because it is not required for the TF connection.

Plug connector	Pin	Core identification	Assigned	Contact type	Extra
BSTA 078  **View X**	1	Black with white lettering U, V, W	U		Bag of loose parts
	4		V		
	3		W		
	2	Green/yellow	PE		
	A	Black 1	TF1/KTY-A	Cut off Phoenix connector	
	B	Black 2	TF2/KTY-K		
	C	Black 3	n.c.	Ground in control cabinet	
	D	–	n.c.		

Plug connector type	No. of cores and cable cross-section	Part no.	Installation type	LC[1)]
SB71 / SB81	**4 x 1.5 mm² (AWG 16)** **3 x 1 mm² (AWG 17)**	0590 631 8	Cable carrier installation	X
SB72 / SB82	**4 x 2.5 mm² (AWG 14)** **3 x 1 mm² (AWG 12)**	0590 632 6	Cable carrier installation	X
SB74 / SB84	**4 x 4 mm² (AWG 12)** **3 x 1 mm² (AWG 17)**	0590 484 6	Cable carrier installation	

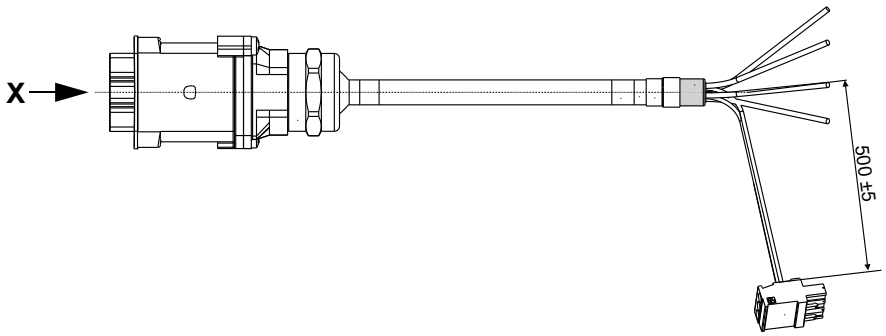
1) Cable with low capacitance characteristics (LC = low capacity).

Alternative plugs at customer end

Plug connectors for power supply with socket contacts (complete).

Type	Number of cores and cable cross-section	Part no.
SB71 / SB81	**4 x 1.5 mm² (AWG 16)** **3 x 1 mm² (AWG 17)**	0198 919 7
SB72 / SB82	**4 x 2.5 mm² (AWG 14)** **3 x 1 mm² (AWG 12)**	0198 919 7
SB74 / SB84	**4 x 4 mm² (AWG 12)** **3 x 1 mm² (AWG 17)**	0199 163 9

3.5.2 Power cable for SL-100 and SL2-150



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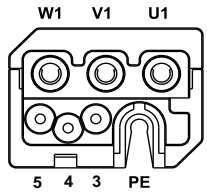
The cable is fitted with a Phoenix plug connector at the control cabinet end. The connector can be cut off because it is not required for the TF connection.

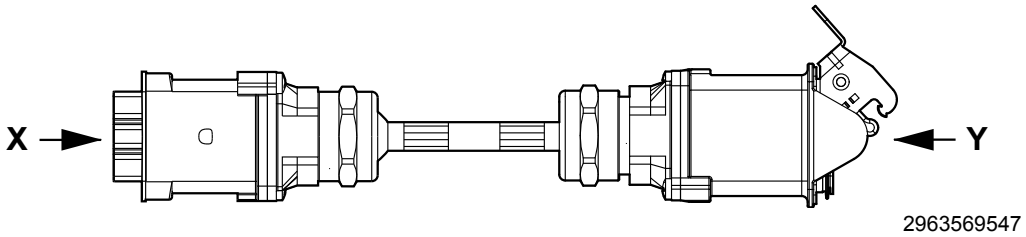
Plug connector	Pin	Core identification	Assigned	Contact type	Extra
C148U connector with socket contacts	U1	Black with white lettering U, V, W	U	Cut-off, length ca. 250 mm	Bag of loose parts
	V1		V		
	W1		W		
 **View X**	PE	Green/yellow	(protective earth)		
	3	Black 1	n.c.	Ground in control cabinet	
	4	Black 2	TF1/KTY-A	Cut off Phoenix connector	
	5	Black 3	TF2/KTY-K		

Power cable type

Plug connector type, complete	Number of cores and cable cross-section	Part number	Installation type	LC[1)]
SB51/SB61	**4 x 1.5 mm² (AWG 16) + 3 x 1.0 mm² (AWG 17)**	1333 116 7	Cable carrier installation	X
SB52/SB62	**4 x 2.5 mm² (AWG 12) + 3 x 1.0 mm² (AWG 17)**	1333 117 5		X
SB54/SB64	**4 x 4 mm² (AWG 10) + 3 x 1.0 mm² (AWG 17)**	199 194 9		
SB56/SB66	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	199 196 5		
SB59/SB69	**4 x 10 mm² (AWG 10) + 3 x 1.5 mm² (AWG 17)**	199 198 1		

1) Cable with low capacitance characteristics (LC = low capacity).

Extension cable for SL2-100 and SL2-150



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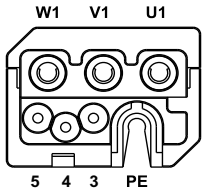
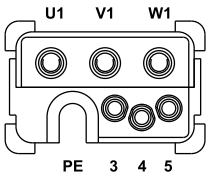
The extension cable connects all contacts 1:1.

Pin assignment for extension cables

Plug connector	Pin	Core identification	Pin	Plug connector
C148U adapter with pin contacts  **View Y**	U1	Black with white lettering U, V, W	U1	**C148U connector with socket contacts**  **View X**
	V1		V1	
	W1		W1	
	PE	Green/yellow	PE	
	n.c.	Black 1	n.c.	
	4 TF1/KTY-A	Black 2	4 TF1/KTY-A	
	5 TF1/KTY-K	Black 3	5 TF1/KTY-K	

Power extension cable types

Plug connector type, complete	Number of cores and cable cross-section	Part number	Installation type	LC[1)]
SK51 / SK61	**4 x 1.5 mm² (AWG 16) + 3 x 1.0 mm² (AWG 17)**	1333 120 5	Cable carrier installation	X
SK52 / SK62	**4 x 2.5 mm² (AWG 12) + 3 x 1.0 mm² (AWG 17)**	1333 121 3		X
SK54 / SK64	**4 x 4 mm² (AWG 10) + 3 x 1.0 mm² (AWG 17)**	0199 204 X		
SK56 / SK66	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	0199 206 6		
SK59 / SK69	**4 x 10 mm² (AWG 10) + 3 x 1.5 mm² (AWG 17)**	0199 208 2		

1) Cable with low capacitance characteristics (LC = low capacity).

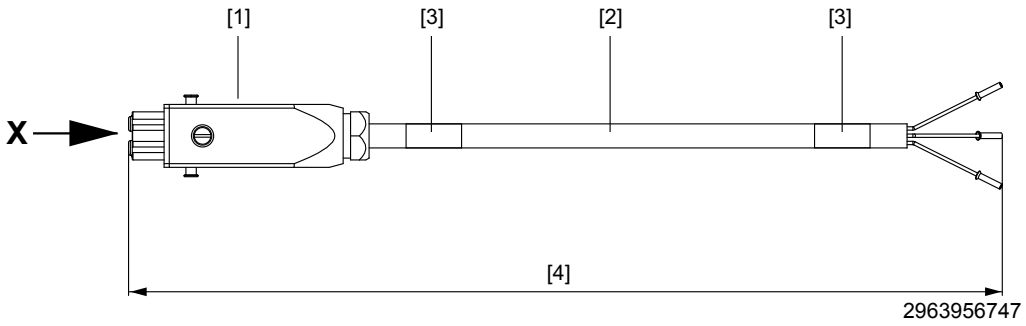
Alternative plug connector at customer end

Plug connectors for power supply with socket contacts (complete).

Type	Cross sections	Part no.
SB51/SB61	**4 x 1.5 mm² (AWG 16) + 3 x 1.0 mm² (AWG 17)**	199 142 6
SB52/SB62	**4 x 2.5 mm² (AWG 12) + 3 x 1.0 mm² (AWG 17)**	199 143 4
SB54/SB64	**4 x 4 mm² (AWG 10) + 3 x 1.0 mm² (AWG 17)**	199 144 2
SB56/SB66	**4 x 6 mm² (AWG 10) + 3 x 1.5 mm² (AWG 16)**	199 145 0
SB59/SB69	**4 x 10 mm² (AWG 10) + 3 x 1.5 mm² (AWG 17)**	199 146 9

3.6 Forced cooling fan cable for CMP and CFM motors

3.6.1 Cable for motors with VR forced cooling fan

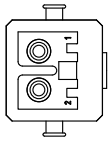


[1] Connector: STAK 200
[2] Printed on connector: SEW-EURODRIVE
[3] Nameplate
[4] Cable length ≤ 5 m: Tolerance +200 mm
Cable length > 5 m: Tolerance +2%
Permitted line length according to the technical documents.

3.6.2 Cable types for motors with VR forced cooling fan

Type	Cross section	Installation	Part number
CFM / CMP	3 × 1 mm^2 (AWG 18)	Fixed installation	0198 6341
CFM / CMP		Cable carrier installation	0199 560X

3.6.3 Pin assignment of cables for motors with VR forced cooling fan

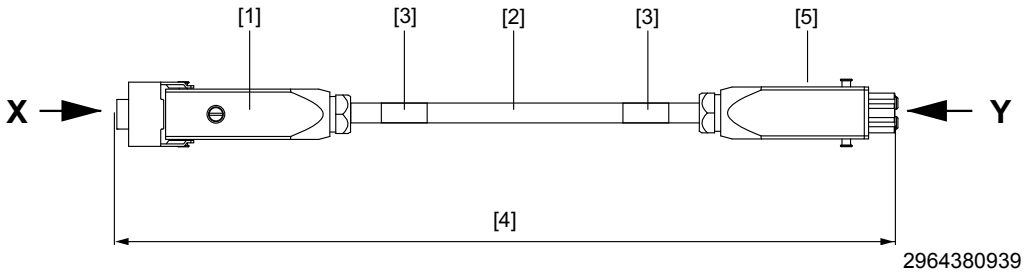
Plug connector STAK 200	Pin	Core identification	Assigned	Pin	Connection type
Connector with two socket contacts  View X	1	Digit 1	24 V +	Cut-off, length ca. 250 mm	Conductor end sleeves
	2	Digit 2	0 V		

3.6.4 Alternative connector for cable for the VR forced cooling fan

Signal plug connector with socket contacts (complete)

Type	Cross sections that can be connected	Installation	Part number
VR	3 x 1 mm^2 (AWG 18)	Fixed installation / cable carrier installation	0198 4985

3.6.5 Extension cable for motors with VR forced cooling fan

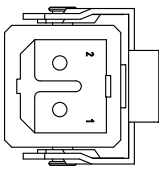
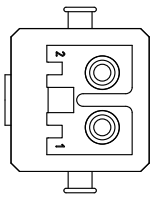


[1] Connector: STAS 200
[2] Printed on connector: SEW-EURODRIVE
[3] Nameplate
[4] Cable length ≤ 5 m: Tolerance +200 mm
Cable length > 5 m: Tolerance +2%
Permitted line length according to the technical documents.
[5] Socket: STAK 200

3.6.6 Extension cable types for motors with VR forced cooling fan

Type	Cross section	Installation	Part number
CFM / CMP	3 × 1 mm^2 (AWG 18)	Fixed installation	0199 5618
CFM / CMP		Cable carrier installation	0199 5626

3.6.7 Pin assignment of extension cables for motors with VR forced cooling fan

Plug connector STAS 200	Pin	Core identification	Assigned	Pin	Connection type STAK 200
Connector with two pin contacts	1	Digit 1	24 V +	1	**Connector with two socket contacts**
	2	Digit 2	0 V	2	
 **View X**					 **View Y**

The extension cable has the same pin assignment as all other contacts.

3.6.8 Alternative connector for cable for the VR forced cooling fan

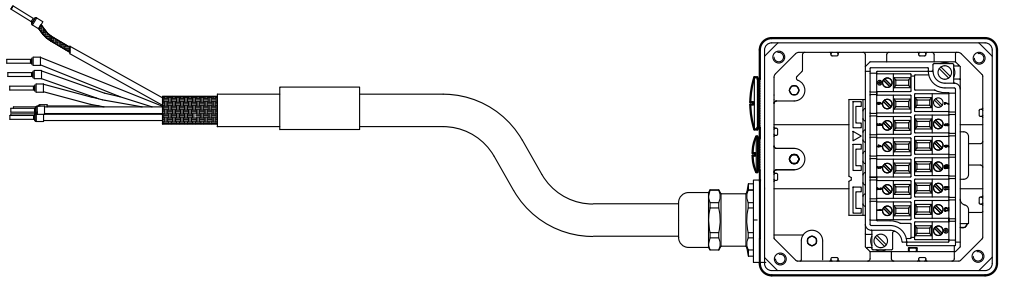
Signal plug connector with pins (complete)

Type	Cross sections that can be connected	Part no.
VR	3 x 1 mm^2	0198 5693

4 Power Cables for Asynchronous Motors

4.1 Description of power cables for DR motors

4.1.1 Brakemotor cable with IS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Motor side

On the motor end, all 12 contacts of the integrated plug connector are used for connecting motor, brake, and motor protection.

The cables are available with variable terminal link in star or delta connection.

The brakemotor can then be supplied in ISU design.

Control cabinet/ field distributor

For wiring in the control cabinet and field distributors, the cores are fitted with ring-type cable lugs or conductor end sleeves.

More connector combinations

More connection options are described in the "AC Motors" catalog.

4.2 Cables for DR and DRL motors

4.2.1 Power cable

Motor and brakemotor cables with IS

Brakemotor types

Motor type	Brake type	Plug
DR.71	BE05, BE1	/ISU
DR.80	BE05, BE1, BE2	
DR.90	BE1, BE2, BE5	
DR.100	BE2, BE5	
DR.112	BE5, BE11	
DR.132	BE5, BE11	

Cable drawing, wiring

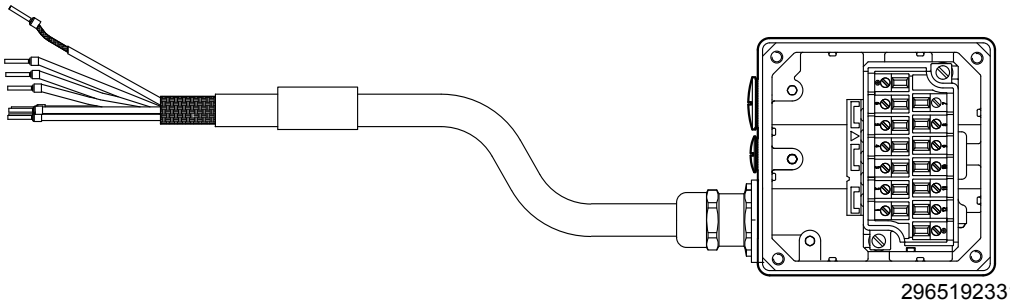

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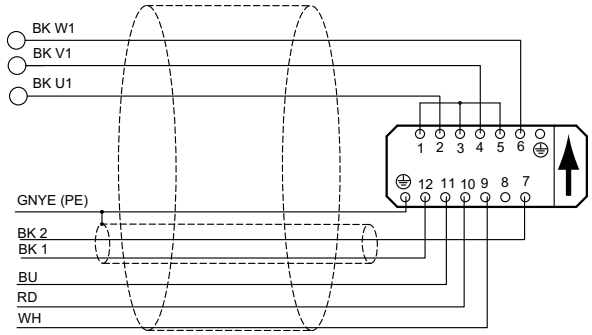
Fig. 1: IS brakemotor cable with motor protection, conductor end sleeves and ring-type cable lugs



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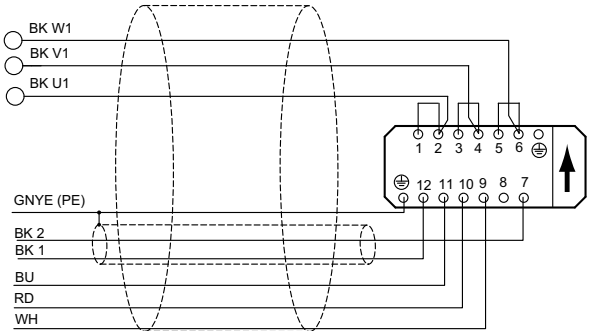
Star connection



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Delta connection

Part numbers

Variable terminal link	Star connection	Delta connection
Fixed installation	0817 8127	0817 8178

4.2.2 Cable specifications of the power cables

Installation		**Fixed**	
Cable cross sections **Manufacturer**		**Supply cores:** **7 x 1.5 mm²** **(AWG 16)**	**Control core pair** **2 x 0.75 mm²** **(AWG 14)**
Operating voltage U_0 / U AC	V	750	350
Conductor resistance at 20 °C	Ω/km	13	26
Insulation resistance at 20 °C	MΩ/km	20	
Temperature range for operation	°C	-30 to +90	
Temperature range for transportation, storage	°C	-40 to +90	
Min. bending radius	mm	5 × diameter	
Diameter D	mm	13.2 – 15.9	
Sheath color		Black	
Halogen-free		yes	
silicon-free		yes	
CFC-free			
Insulation		TPE-U (polyurethane)	
Flame-retardant		Yes	
Oil-resistant		Yes	
Fuel-resistant		Yes	
Resistance to acids, alkalis, cleaning agents		Yes	
Dust-resistant		Yes	
Conductor material		Bare E-Cu strand, extra-fine individual wires ≤ 0.1 mm	
Shielding		Tinned E-Cu wire	

5 Encoder Cables

5.1 Structure of encoder cables for synchronous motors

SEW-EURODRIVE offers pre-fabricated cables with plugs for straightforward and reliable motor connection. Cable and contact are connected using the crimp technique. The following cables are available in 1 m steps:

- Motor power
- Motor power + brake
- Resolver/motor protection,
- Absolute encoder motor protection,
- Forced cooling fan.

	INFORMATION
	For cable specifications, such as bending radius, approval and temperature range, please refer to chapter "Cable specification" (page 182).

The size of the plug connector depends on the current level and the maximum cable length according to the speed.

Hybrid cables are divided into

- Power cables (motor cable, brakemotor cable, extension cable),
- Feedback cables (resolver cable, encoder cable, extension cable).

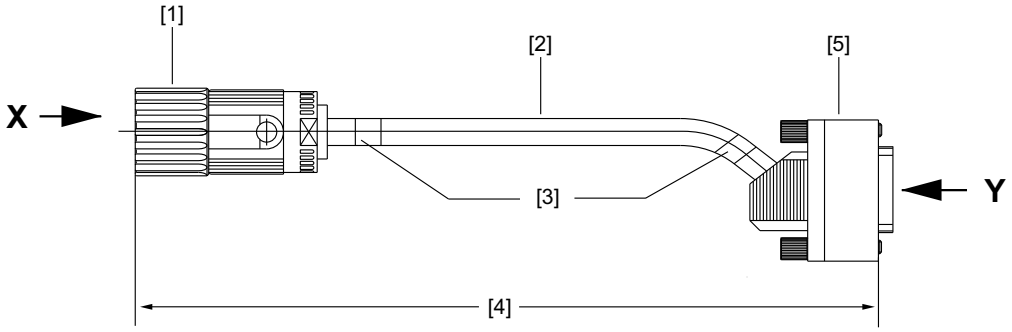
5.1.1 Plug thread

	INFORMATION
	The D-sub connectors are equipped with a common UNC thread.

5.1.2 Note on the wiring diagrams

All plugs are shown with view onto the pins!

5.1.3 Structure of the feedback cable



2965595147

[1] Connector: Intercontec ASTA
[2] Printed on connector: SEW-EURODRIVE
[3] Nameplate
[4] Cable length ≤ 10 m: Tolerance +200 mm
Cable length > 10 m: Tolerance +2%
Permitted line length according to the technical documents.
[5] D-sub plug

Motor side

A 12-pin EMC signal plug connector from Intercontec with socket contacts is used on the motor end for RH.M / AS1H / ES1H. The shield is connected in the connector housing according to EMC requirements. All plug connectors seal the plug on the cable end with a lamellar seal.

Prefabrication on inverter end

A commercial D-sub EMC connector with pin contacts is used on the inverter end. A 9-pin or 15-pin connector to suit the inverter is used.

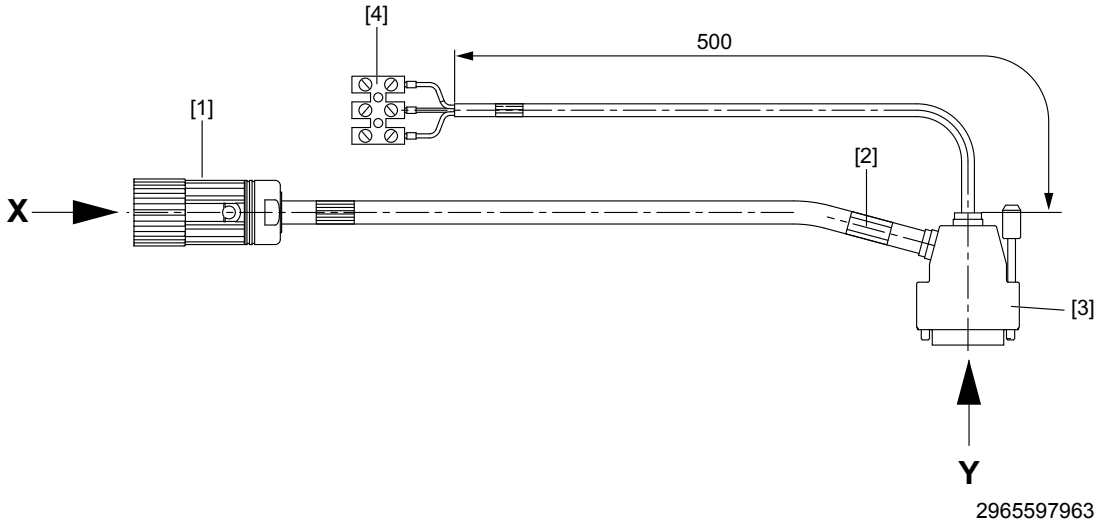
Hybrid cables

The outer cable sheath on the motor and inverter end bears a nameplate with part number and logo of the prefabricated cable manufacturer. The ordered length and permitted tolerance are interrelated as follows:

- Cable length ≤ 10 m: Tolerance 200 mm.
- Cable length > 10 m: +2% tolerance

	INFORMATION
	Refer to the system manual of the servo inverter for information on how to determine the maximum cable length. Make sure that an EMC-compliant environment is maintained during project planning.

5.1.4 Structure of AL1H encoder cables for SL2 motors



[1] Connector: Intercontec ASTA
[2] Nameplate
[3] D-sub plug
[4] Screw terminal

Prefabrication on inverter end

With MOVIAXIS®, the temperature sensor of the linear motor can also be connected via screw terminals and evaluated via the encoder input.

5.2 Encoder and extension cables for synchronous motors

5.2.1 Resolver

Illustration of RH.M resolver cable

Types of RH.M resolver cables

Installation	Part number
Fixed installation	1332 7429
Cable carrier installation	1332 7437

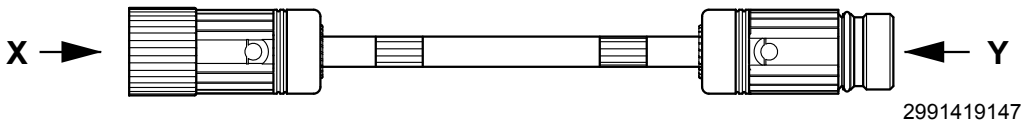
Pin assignment of resolver cable RH.M

Motor connection side					Connection MOVIAXIS® MX	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA 021FR	1	R1 (reference +)	(PK) Pink	R1 (reference +)	5	
	2	R2 (reference -)	(GY) Gray	R2 (reference -)	13	
198 921 9	3	S1 (cosine +)	(RD) Red	S1 (cosine +)	2	**D-sub**
	4	S3 (cosine -)	(BU) Blue	S3 (cosine -)	10	
12-pole with socket contacts	5	S2 (sine +)	(YE) Yellow	S2 (sine +)	1	15-pole
	6	S4 (sine -)	(GN) Green	S4 (sine -)	9	
	7	n. c.	-	n. c.	3	
	8	n. c.	-	n. c.	4	
	9	TF/KTY +	(BN) Brown/(VT) Violet[1)]	TF/KTY +	14	
	10	TF/KTY -	(WH) White/(BK) Black[1)]	TF/KTY -	6	
	11	n. c.	-	n. c.	7	
	12	n. c.	-	n. c.	8	
		-	-	n. c.	11	**View Y**
		-	-	n. c.	12	
View X		-	-	n. c.	15	

1) Double assignment to increase cross section

All connectors are shown with view onto the pins.

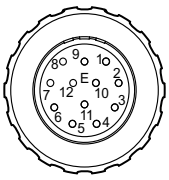
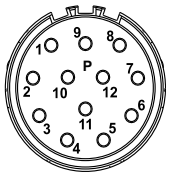
Extension cable for RH.M resolver



Types of extension cables for RH.M resolvers

Installation	Part number
Fixed installation	0199 5421
Cable carrier installation	0199 5413

Pin assignment of extension cable for RH.M resolver

Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA 021FR **198 673 2** 12-pole with socket contacts  **View X**	1	R1 (reference +)	(PK) Pink	R1 (reference +)	1	**AKUA 020MR** **199 647 9** 12-pin with pin contacts  **View Y**
	2	R1 (reference -)	(GY) Gray	R1 (reference -)	2	
	3	S1 (cosine +)	(RD) Red	S1 (cosine +)	3	
	4	S3 (cosine -)	(BU) Blue	S3 (cosine -)	4	
	5	S2 (sine +)	(YE) Yellow	S2 (sine +)	5	
	6	S4 (sine -)	(GN) Green	S4 (sine -)	6	
	7	n. c.	-	n. c.	7	
	8	n. c.	-	n. c.	8	
	9	TF/KTY +	(BN) Brown/(VT) Violet[1)]	TF/KTY +	9	
	10	TF/KTY -	(WH) White/(BK) Black[1)]	TF/KTY -	10	
	11	n. c.	-	n. c.	11	
	12	n. c.	-	n. c.	12	

1) Double assignment to increase cross section

The extension cable has the same pin assignment as all other contacts.

Alternative plug connectors

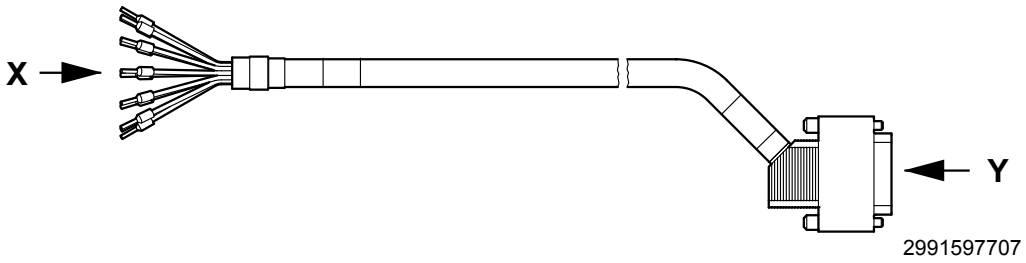
Signal plug connector with socket contacts (complete)

Type	Cross section	Installation	Part number
RH.M/RH.L	6 × 2 × 0.06 .– 1 mm^2 (AWG 29 – AWG 18)	Fixed installation / cable carrier installation	0198 6732

Signal plug connector with pins (complete)

Type	Cross section	Installation	Part number
RH.M/RH.L	6 × 2 × 0.06 – 1 mm^2 (AWG 29 .– AWG 18)	Fixed installation / cable carrier installation	0199 6479

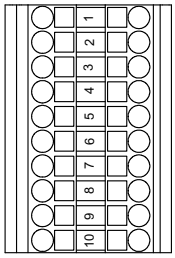
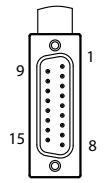
Illustration of RH.M/RH.L resolver cable – terminal box



Types of RH.M/RH.L resolver cables – terminal box

Type	Cross section	Installation	Part number
DFS	5 × 2 × 0.25 mm^2 (AWG 24)	Fixed installation	1332 7445
DFS		Cable carrier installation	1332 7453
CFM		Fixed installation	1332 7623
CFM		Cable carrier installation	1332 7631

Pin assignment of RH.M/RH.L resolver cables – terminal box

MOVIAXIS® MXA with DFS/CFM motors – RH.M/RH.L resolver cable for terminal box connection						
Motor connection side					Connection MOVIAXIS® MX	
Terminal strip	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
 View X	1	R1 (REF +)	Pink (PK)	R1 (reference +)	5	D-sub 15-pole  View Y
	2	R2 (REF -)	Gray (GY)	R2 (reference -)	13	
	3	S1 (COS +)	Red (RD)	S1 (cosine +)	2	
	4	S3 (COS -)	Blue (BU)	S3 (cosine -)	10	
	5	S2 (SIN +)	Yellow (YE)	S2 (sine +)	1	
	6	S4 (SIN -)	Green (GN)	S4 (sine -)	9	
	7	n. c	-	n. c	3	
	8	n. c	-	n. c	4	
	9	TF/TH/KTY+	Brown (BN) / violet (VT)	TF/TH/KTY+	14	
	10	TF/TH/KTY-	White (WH) / black (BK)	TF/TH/KTY-	6	
	11	-	-	n. c	7	
	12	-	-	n. c	8	
	13	-	-	n. c	11	
	14	-	-	n. c	12	
	15	-	-	n. c	15	

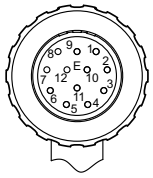
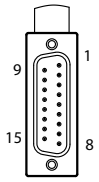
5.2.2 Absolute encoder

Illustration of Hiperface® encoder cable

Types of Hiperface® encoder cables

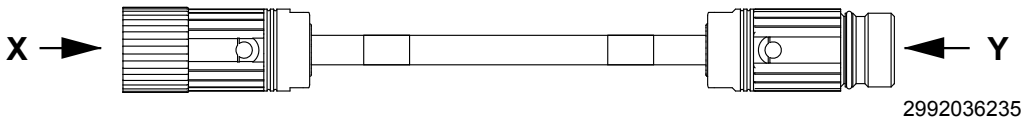
Installation	Part number
Fixed installation	1332 4535
Cable carrier installation	1332 4551

Pin assignment of Hiperface® cables for AK0H / EK0H / AS1H / ES1H encoders

Motor connection side					Connection MOVIAXIS® MX	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA 021FR 198 921 9 12-pole with socket contacts  View X	1	n. c.	n. c.	n. c.	3	D-sub 15-pole  View Y
	2	n. c.	n. c.	n. c.	5	
	3	S1 (cosine +)	(RD) Red	S1 (cosine +)	1	
	4	S3 (cosine -)	(BU) Blue	S3 (cosine -)	9	
	5	S2 (sine +)	(YE) Yellow	S2 (sine +)	2	
	6	S4 (sine -)	(GN) Green	S4 (sine -)	10	
	7	DATA-	(VT) Violet	DATA-	12	
	8	DATA+	(BK) Black	DATA+	4	
	9	TF/KTY +	(BN) Brown	TF/KTY +	14	
	10	TF/KTY -	(WH) White	TF/KTY -	6	
	11	GND	(GY/PK) Gray/Pink[1)]	GND	8	
	12	U_s	(RD/BU) Red/Blue[1)]	U_s	15	
		-	-	n. c.	7	
		-	-	n. c.	11	
		-	-	n. c.	13	

1) Double assignment to increase cross section

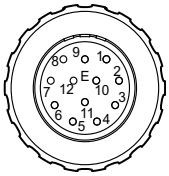
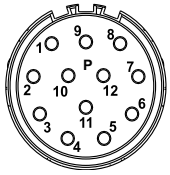
Illustration of extension cable for Hiperface® encoders AK0H / EK0H / AS1H / ES1H



Types of extension cables for Hiperface® encoders AK0H / EK0H / AS1H / ES1H

Installation	Part number
Fixed installation	0199 5391
Cable carrier installation	0199 5405

Pin assignment of extension cables for Hiperface® encoders AK0H / EK0H / AS1H / ES1H

Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA 021FR	1	n. c.	-	n. c.	1	**AKUA 020MR**
	2	n. c.	-	n. c.	2	
198 673 2	3	S1 (cosine +)	(RD) Red	S1 (cosine +)	3	**199 647 9**
12-pole with socket contacts	4	S3 (cosine -)	(BU) Blue	S3 (cosine -)	4	12-pin with pin contacts
	5	S2 (sine +)	(YE) Yellow	S2 (sine +)	5	
	6	S4 (sine -)	(GN) Green	S4 (sine -)	6	
	7	DATA-	(VT) Violet	DATA-	7	
	8	DATA+	(BK) Black	DATA+	8	
	9	TF/KTY +	(BN) Brown	TF/KTY +	9	
	10	TF/KTY -	(WH) White	TF/KTY -	10	
	11	GND	(GY/PK) Gray/Pink / (PK) Pink	GND	11	
View X	12	U_s	(RD/BU) Red/Blue / (GY) Gray	U_s	12	**View Y**

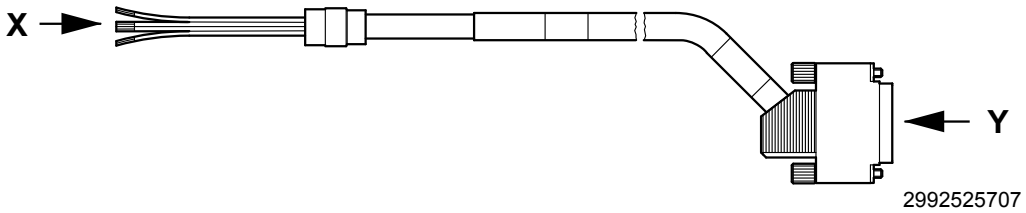
The extension cable has the same pin assignment as all other contacts.

Alternative plug connectors for AK0H / EK0H / AS1H / ES1H Hiperface® encoder cables

Signal plug connector with socket contacts (complete)

Type	Cross sections that can be connected	Part no.
AK0H	6 x 2 x 0.06 – 1 mm^2	0198 6732
EK0H		
AS1H		
ES1H		

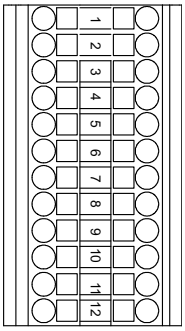
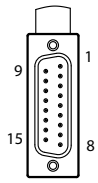
Illustration of terminal box encoder cable



Types of terminal box encoder cables

Type	Cross section	Installation	Part number
CFM	6 × 2 × 0.25 mm^2 (AWG 24)	Fixed installation	1332 4578
CFM		Cable carrier installation	1332 4543

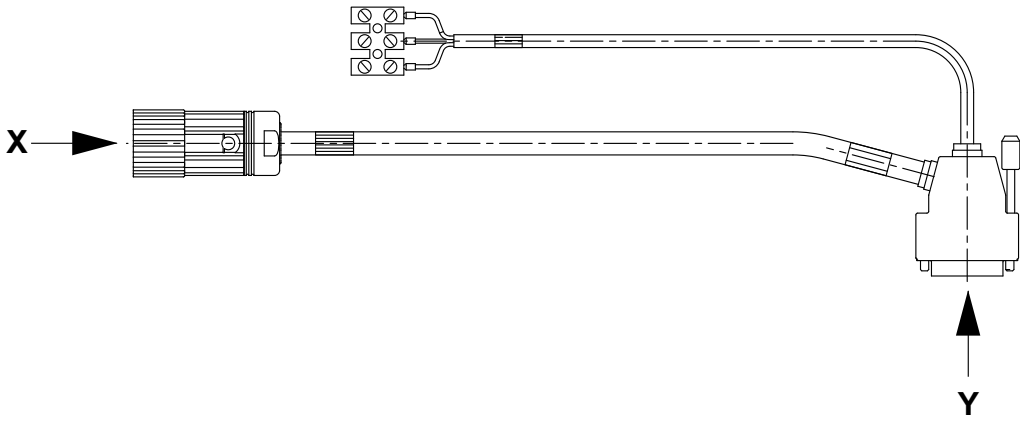
Pin assignment of terminal box encoder cable

Hiperface® cable for terminal box connection – MOVIAXIS® MX with CFM motors						
Motor connection side					MOVIAXIS® M connection	
Terminal strip	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
	6	Data +	Black (BK)	Data +	4	
	5	Data -	Violet (VT)	Data -	12	
	1	S1 (COS +)	Red (RD)	S1 (COS +)	1	
	2	S3 (COS -)	Blue (BU)	S3 (COS -)	9	
	3	S2 (SIN +)	Yellow (YE)	S2 (SIN +)	2	
	4	S4 (SIN -)	Green (GN)	S4 (SIN -)	10	
	7	GND	Gray-pink (GYPK) / pink (PK)	GND	8	
	8	Us	Red blue (RDBU)	Us	15	
	9	TF/TH/KTY+	Brown (BN)	TF/TH/KTY+	14	
	10	TF/TH/KTY-	White (WH)	TF/TH/KTY-	6	
View X						View Y

5.2.3 SL2 linear motors

Cable for AL1H encoder MOVIAXIS®

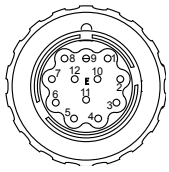
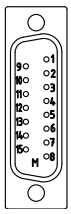
Using the following cable, also the temperature switch of the linear motor can be connected to the encoder input.



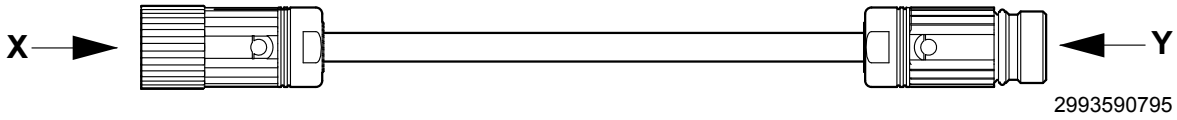
2993031307

Type	Installation	Part number
SL2	Cable carrier installation	1333 224 4

Cable pin assignment for feedback cables

Encoder end					MOVIAXIS® connection	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA021FR **198 921 9** **12-pole with socket contacts**  **View X**	1	S3 (cosine -)	Blue (BU)	S3 (cosine -)	9	**Sub-D 15-pin**  **View Y**
	2	Data (+)	Black (BK)	Data (+)	4	
	3	n. c.		n. c.	3	
	4	n. c.		n. c.	5	
	5	S2 (sine +)	Yellow (YE)	S2 (sine +)	2	
	6	S4 (sine -)	Green (GN)	S4 (sine -)	10	
	7	Data (-)	Violet (VT)	Data (-)	12	
	8	S1 (cosine +)	Red (RD)	S1 (cosine +)	1	
	9	n. c.		n. c.	6	
	10	GND	Grey/pink (GY-PK) / pink (PK)	GND	8	
	11	n. c.		n. c.	7	
	12	U_s	red/blue (RD-BU) / gray (GY)	U_s	15	
		n. c.	n. c.	n. c.	11	
		n. c.	n. c.	n. c.	13	
		n. c.				
	1	TF/TH/KTY+	BN	TF/TH/KTY+	14	
	2	TF/TH/KTY-	WH	TF/TH/KTY-	6	
	3	Shielding		PE		

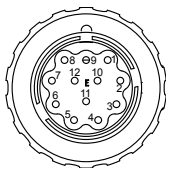
Extension cable for AL1H encoders



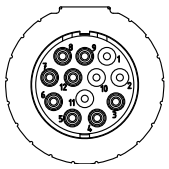
Type	Installation	Part number
SL2	Cable carrier installation	1333 387 9

Cable pin assignment for feedback cables

Encoder end					MOVIAXIS® connection	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA021FR **198 921 9** **12-pole with socket contacts**	1	S3 (cosine -)	Blue (BU)	S3 (cosine -)	1	**AKUA020 MR** **12-pole**
	2	Data (+)	Black (BK)	Data (+)	2	
	3	n. c.		n. c.	3	
	4	n. c.		n. c.	4	
	5	S2 (sine +)	Yellow (YE)	S2 (sine +)	5	
	6	S4 (sine -)	Green (GN)	S4 (sine -)	6	
	7	Data (-)	Violet (VT)	Data (-)	7	
	8	S1 (cosine +)	Red (RD)	S1 (cosine +)	8	
	9	n. c.		n. c.	9	
	10	GND	Grey/pink (GY-PK) / pink (PK)	GND	10	
	11	n. c.		n. c.	11	
	12	U_s	red/blue (RD-BU) / gray (GY)	U_s	12	
		n. c.	n. c.	n. c.		
		n. c.	n. c.	n. c.		
		n. c.				



View X



View Y

Alternative plug connector at customer end

Type	Cross sections	Part no.
ALH1	**6 x 2 x 0.25 mm²**	01986732

5.2.4 Cable specification of encoder cables

Fixed installation of feedback cables

Accessory designation		AS1H/ES1H	RH.M/RH.L
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**
Manufacturer		**HELUKABEL**	
Manufacturer designation			
Operating voltage V_0 / V AC	V	230 / 350	
Temperature range	°C	Fixed installation -40 to +80	
Max. temperature	°C	+ 80	
Min. bending radius	mm	43	36.5
Diameter D	mm	8.6 ± 0,2	7.3 ± 0,2
Core identification		DIN 47 100	
Sheath color		Green, similar to RAL 6018	
Approval(s)		DESINA / VDE / cULus	
Capacitance core/shielding	nF/km	110	
Capacitance core / core	nF/km	70	
Halogen-free		no	
Silicone-free		yes	
CFC-free		yes	
Inner insulation (core)		PP	
Outer insulation (sheath)		PVC	
Flame-retardant/self-extinguishing		no	
Conductor material		Cu blank	
Shielding		Braided tinned Cu	
Weight (cable)	kg/km	107	78

Cable carrier installation of feedback cables

Accessory designation		AS1H/ES1H	RH.M/RH.L
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**
Manufacturer		**Nexans**	
Manufacturer designation		SSL11YC11Y ... x 2 x 0.25	
Operating voltage V_0 / V AC	V	300	
Temperature range	°C	-20 to +60	
Max. temperature	°C	+90 (on conductor)	
Min. bending radius	mm	100	95
Diameter D	mm	9.8 ± 0.2	9,5 ± 0.2
Maximum acceleration	m/s^2	20	
Max. velocity	m/min	200	
Core identification		WH/BN, GN/YE, GY/PK, BU/ RD, BK/VT, GY-PK/RD-BU	WH/BN, GN/YE, GY/ PK, BU/RD, BK/VT
Sheath color		Green similar to RAL 6018	
Approval(s)		DESINA / VDE / cULus	
Capacitance core/shielding	nF/km	100	
Capacitance core / core	nF/km	55	
Halogen-free		yes	
Silicone-free		yes	
CFC-free		yes	

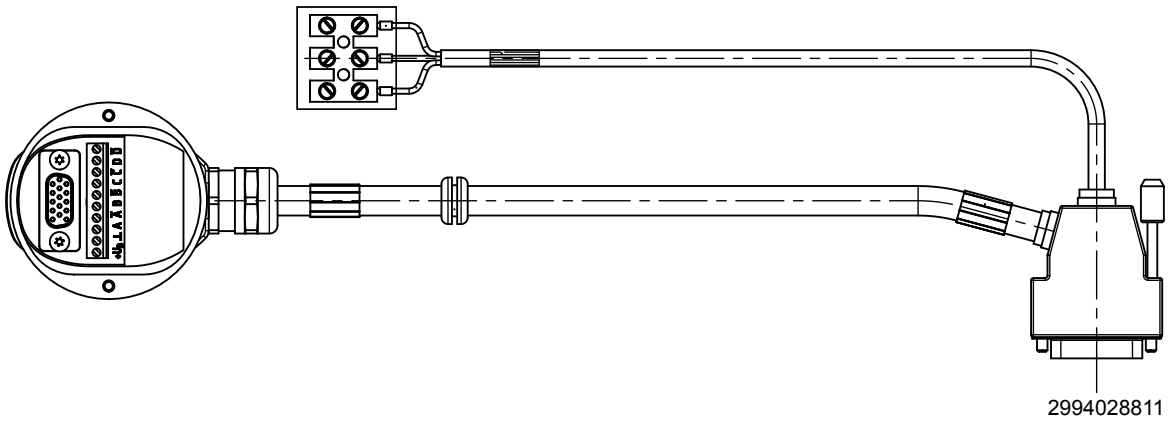
Table continued on next page

Accessory designation		AS1H/ES1H	RH.M/RH.L
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**
Manufacturer		**Nexans**	
Inner insulation (core)		PP	
Outer insulation (sheath)		TPE-U	
Flame-retardant/self-extinguishing		yes	
Conductor material		E-Cu blank	
Shielding		Braided tinned Cu	
Weight	kg/km	130	120
Min. bending cycles		Min. 5 million	

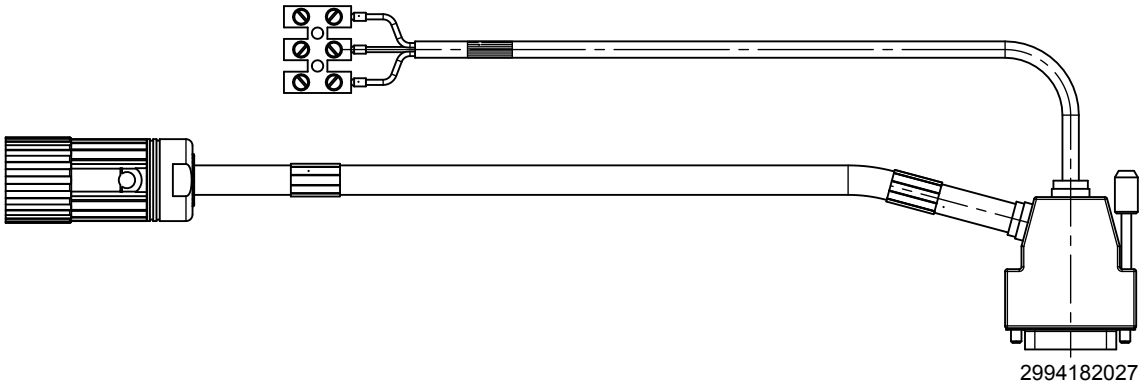
5.3 Structure of encoder cables for asynchronous motors

5.3.1 Encoder cable with D-sub

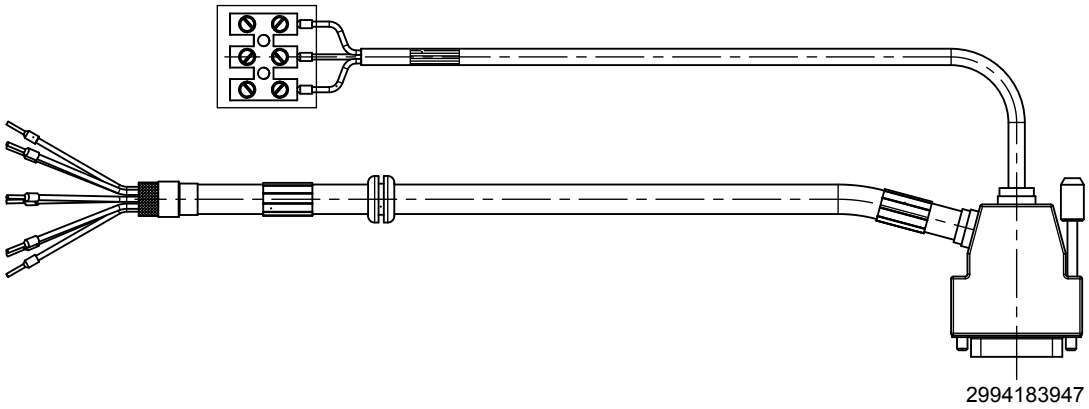
Variant with connection cover:



Variant with M23 connector.



Variant with conductor end sleeves.



Prefabrication on encoder/motor end

The prefabricated encoder cables for the add-on encoders on the DR motor are available with three different designs on the encoder/motor end.

- With connection cover: If the encoder on the motor is ordered and delivered without a connection cover, the prefabricated cable is fitted with a connection cover on the encoder end.
- With M23 connector: Prefabricated encoder cables for add-on encoders on the motor are available with a M23 coupling connector with socket contacts on the encoder/ motor end.
- Conductor end sleeves: If the encoder on the motor is ordered and delivered with a connection cover, the prefabricated cable is fitted with conductor end sleeves on the encoder end. The customer is responsible for connecting the terminal strip in the connection cover. The cable gland in the connection cover is included in the scope of delivery of the encoder.

Prefabrication on MOVIAXIS®/ inverter end

A commercial D-sub EMC connector with pin contacts is used on the inverter end of the prefabricated encoder cable for connection to MOVIAXIS® (X13).

5.4 Encoder and extension cables for asynchronous motors

The temperature protection signals must be fed to the encoder connection via the luster terminals. This is the only way to ensure thermal motor protection.

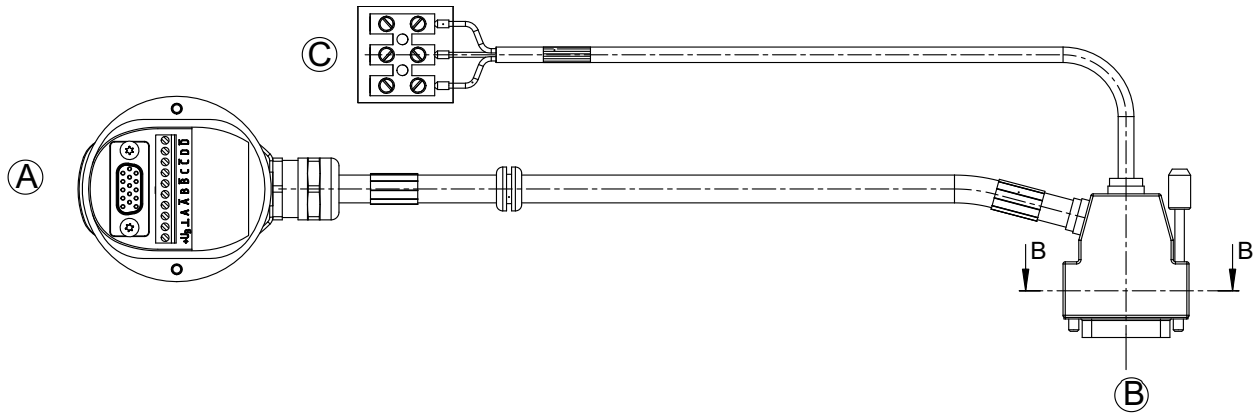
5.4.1 Encoder cables for DR. motors

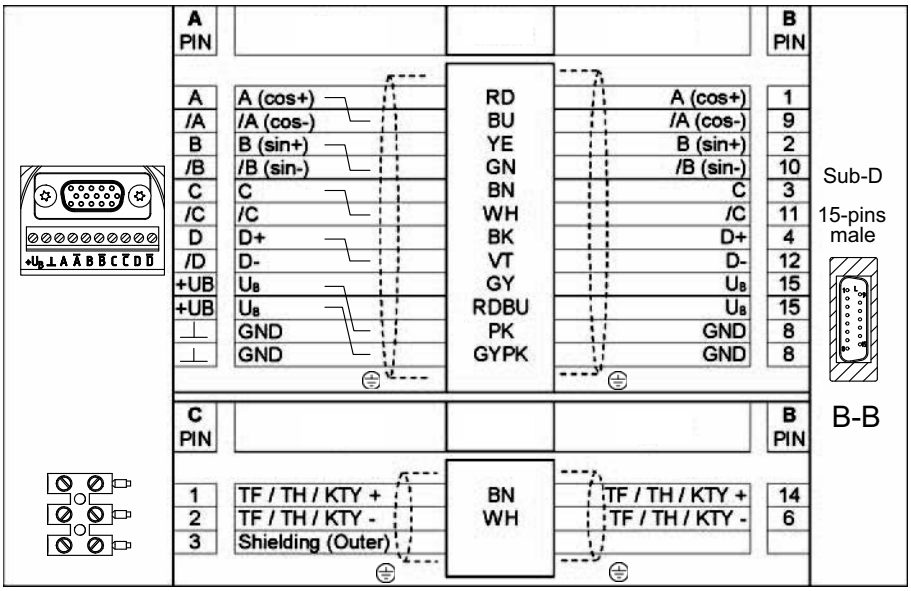
With connection cover

Prefabricated cables for encoders

Encoder types
ES7S, EG7S, ES7R, EG7R, AS7W, AG7W

Cable drawing, wiring





2996907531

Part numbers

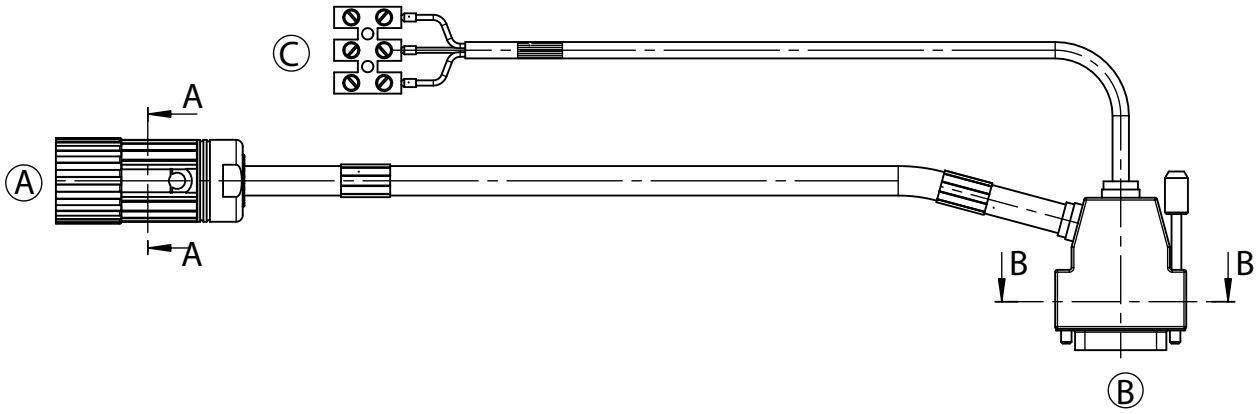
Cable type	Connection cover, D-sub 15
Fixed installation	1363 1632
Cable carrier installation	1363 1640

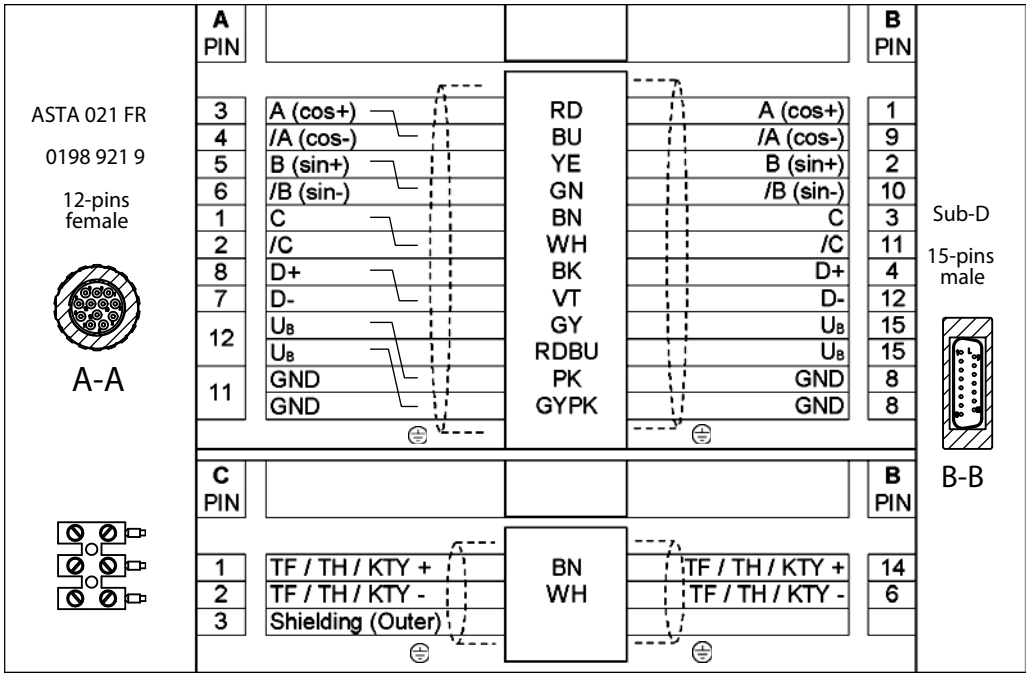
With M23 connector

Prefabricated cables for encoders

Encoder types
ES7S, EG7S, ES7R, EG7R, AS7W, AG7W

Cable drawing, wiring





2996910859

Part numbers

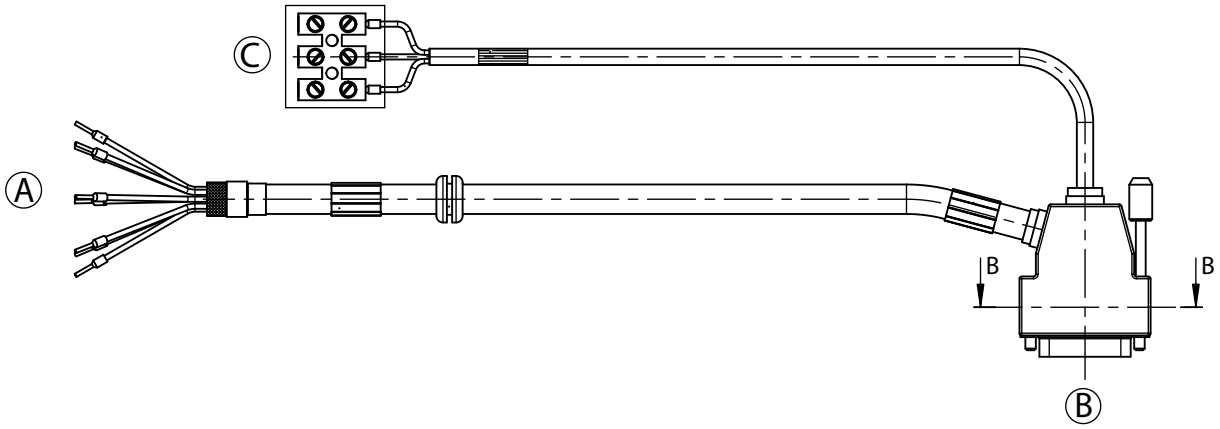
Cable type	M23, D-sub 15
Fixed installation	1363 1691
Cable carrier installation	1363 1705

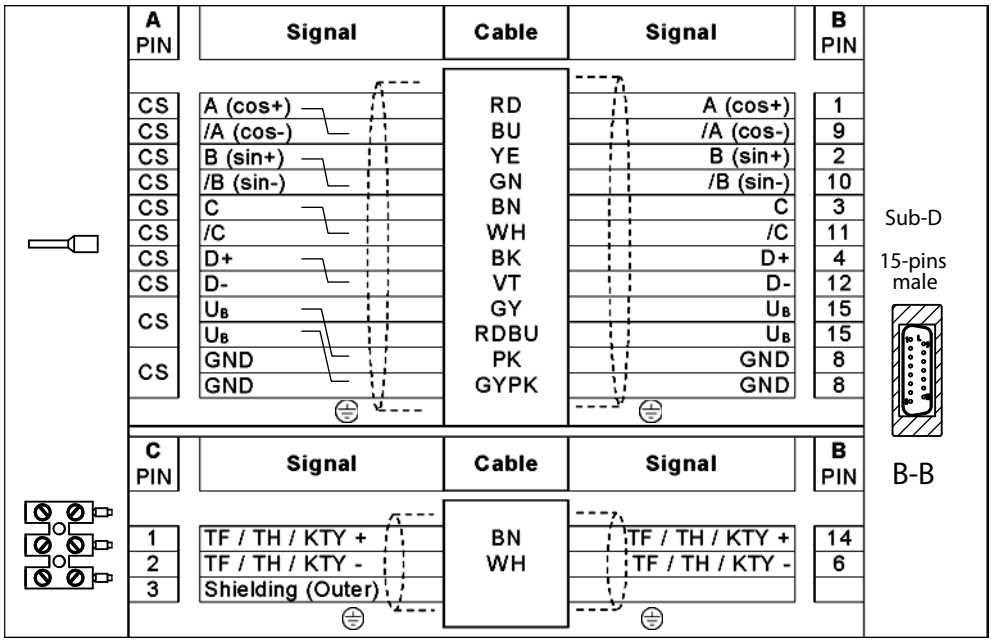
With litz connection

Prefabricated cables for encoders

Encoder types
E.7., A.7.

Cable drawing, wiring





2996914571

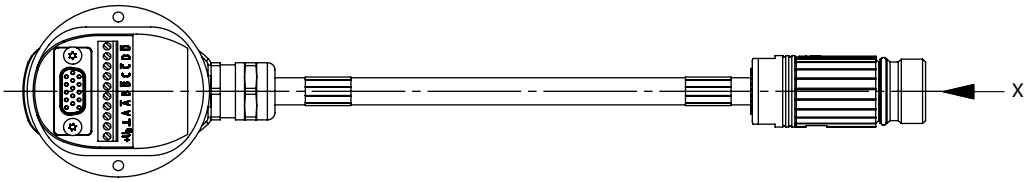
Part numbers

Cable type	Litz connection, D-sub 15
Fixed installation	1363 1659
Cable carrier installation	1363 1667

5.4.2 Encoder extension cables for DR. motors

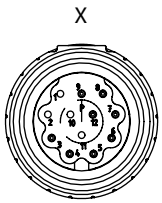
Extensions with one M23

Cable drawing, wiring



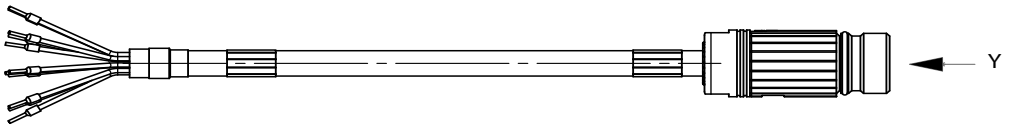
Connector assignment

A Contact	Signal	Stranding	Cable Core color	Signal MDX	B Contact
360° contact A-side			Shielding	360° contact B-side	
	A (cos+)		Red (RD)	A (cos+)	3
	$\overline{A}$ (cos-)		Blue (BU)	$\overline{A}$ (cos-)	4
	B (sin+)		Yellow (YE)	B (sin+)	5
	$\overline{B}$ (sin-)		Green (GN)	$\overline{B}$ (sin-)	6
	C +		Brown (BN)	C +	1
	C -		White (WH)	C -	2
	D +		Black (BK)	D +	8
	D -		Violet (VT)	D -	7
	UB		Red-blue-gray (RD-BU+GY)	UB	12
	GND		Gray-pink-pink (GY-PK+PK)	GND	11
			Shielding		



2997007371

Cable drawing, wiring



Connector assignment

A Contact	Signal	Stranding	Cable Core color	Signal MDX	B Contact
360° contact A-side			Shielding	360° contact B-side	
	A (cos+)		Red (RD)	A (cos+)	3
	$\overline{A}$ (cos-)		Blue (BU)	$\overline{A}$ (cos-)	4
	B (sin+)		Yellow (YE)	B (sin+)	5
	$\overline{B}$ (sin-)		Green (GN)	$\overline{B}$ (sin-)	6
	C +		Brown (BN)	C +	1
	C -		White (WH)	C -	2
	D +		Black (BK)	D +	8
	D -		Violet (VT)	D -	7
	UB		Red-blue-gray (RD-BU+GY)	UB	12
	GND		Gray-pink-pink (GY-PK+PK)	GND	11
			Shielding		

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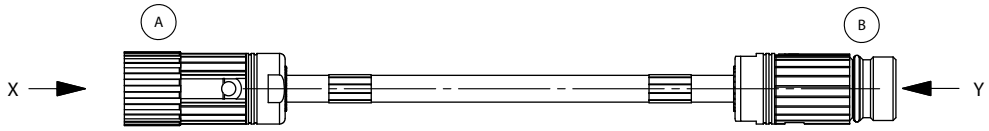
2997010571

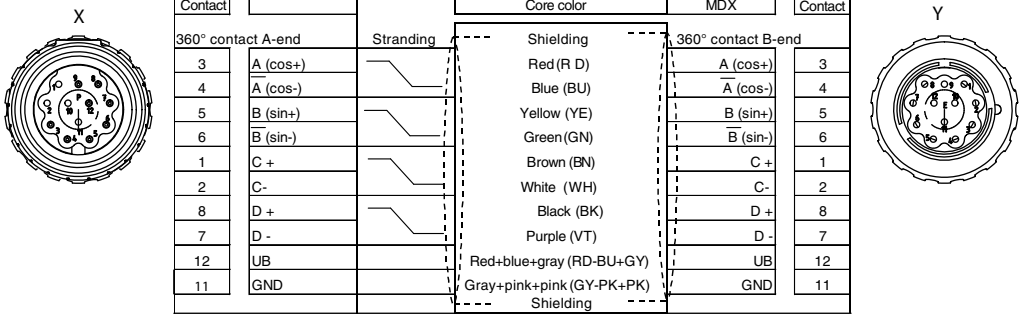
Part numbers

Cable type	Connection cover or conductor end sleeves, M23
Fixed installation	1362 3184
Cable carrier installation	1362 1963

Extensions with two M23

Cable drawing, wiring





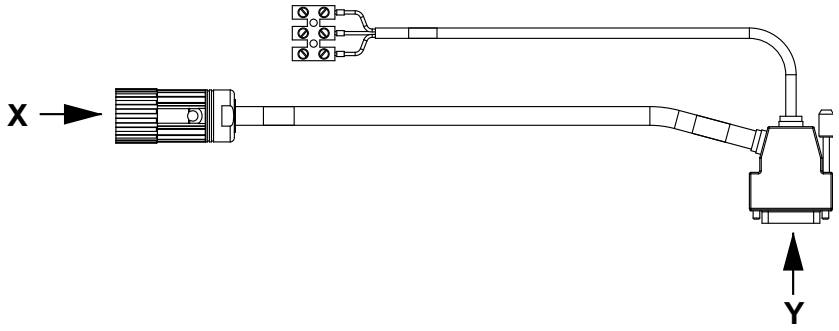
2997137931

Part numbers

Cable type	M23 – M23
Fixed installation	1362 3192
Cable carrier installation	1362 1971

5.4.3 Encoder and extension cables for CT/CV motors

Illustration of the Hiperface® encoder cable – MOVIAXIS®



2997228939

The temperature protection signals must be fed to the encoder connection via the luster terminals. This is the only way to ensure thermal motor protection.

Types of feedback cables

Type	Cross section	Part number	Installation
DT/DV, CT/CV	6 x 2 x 0.25 mm^2 + 2 x 0.25 mm^2	1333 1493	Fixed installation
		1333 1507	Cable carrier installation

Extension cable

Type	Cross section	Part number	Installation
DT/DV, CT/CV	6 x 2 x 0.25 mm^2 + 2 x 0.25 mm^2	0199 5391	Fixed installation
		0199 5405	Cable carrier installation

Pin assignment

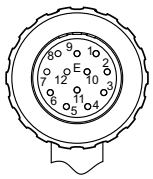
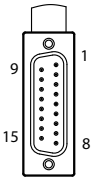
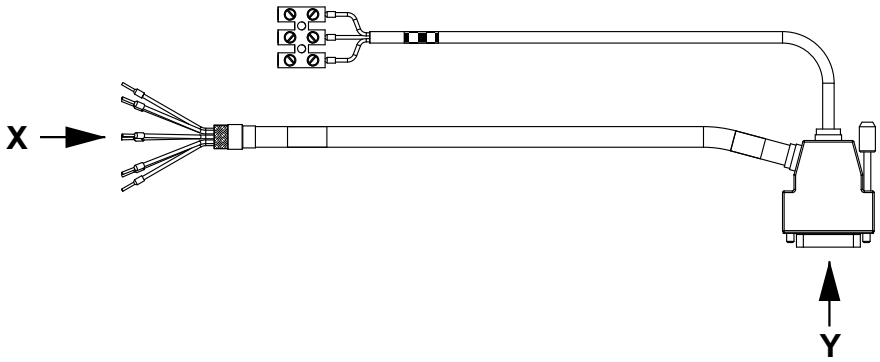
Pin assignment for Hiperface® encoder cables						
Motor connection side					Connection MOVIAXIS® MXA	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
ASTA021FR **0198 9219** 12-pole with socket contacts  **View X**	1	n. c.	n. c.	n. c.	-	**D-sub 15-pole**  **View Y**
	2	n. c.	n. c.	n. c.	-	
	3	S1 (cosine +)	Red (RD)	S1 (cosine +)	1	
	4	S3 (cosine -)	Blue (BU)	S3 (cosine -)	9	
	5	S2 (sine +)	Yellow (YE)	S2 (sine +)	2	
	6	S4 (sine -)	Green (GN)	S4 (sine -)	10	
	7	DATA-	Violet (VT)	DATA-	12	
	8	DATA+	Black (BK)	DATA+	4	
	9	n.c.		n.c.	-	
	10	n.c.		n.c.	-	
	11	GND	gray/pink (GY/PK) Pink (PK)	GND	8	
	12	U_s	Red/blue (RD/BU) / Gray (GY)	U_s	15	
	1	TF/TH/KTY+	Brown (BN)	TF/TH/KTY+	14	
	2	TF/TH/KTY-	White (WH)	TF/TH/KTY-	6	
	3	Shielding				

Illustration of the TTL encoder cable – MOVIAXIS®



2997276683

The temperature protection signals must be fed to the encoder connection via the luster terminals. This is the only way to ensure thermal motor protection.

Types of feedback cables

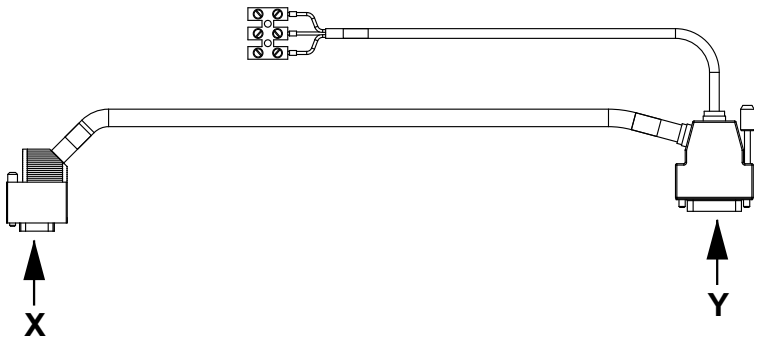
Type	Cross section	Part number	Installation
DT/DV, CT/CV	6 x 2 x 0.25 mm^2 + 2 x 0.25 mm^2	1333 1515	Fixed installation
		1333 1523	Cable carrier installation

Pin assignment

Pin assignment for TTL encoder cables						
Motor connection side					Connection MOVIAXIS® MXA	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
	-	A / K1	Yellow (YE)	A / K1	1	D-sub 15-pole
	-	B / K2	Red (RD)	B / K2	2	
	-	C / K0	Pink (PK)	C / K0	3	
	-	DGND	Violet (VT)	DGND	8	
	-	DGND	Brown (BN)	DGND	8	
	-	A / K1	Green (GN)	A / K1	9	
	-	B / K2	Blue (BU)	B / K2	10	
	-	C / K0	Gray (GY)	C / K0	11	
	-	+ 24 V	White (WH)	+ 24 V	15	
	-	+ 24 V	Black (BK)	+ 24 V	15	
	1	TF/TH/KTY+	Brown (BN)	TF/TH/KTY+	14	View Y
	2	TF/TH/KTY-	White (WH)	TF/TH/KTY-	6	
	3	Shielding				

5.4.4 DC 5 V encoder power supply type DWI11A

Illustration of the DWI11A TTL 5 V encoder cable – MOVIAXIS®



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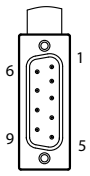
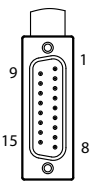
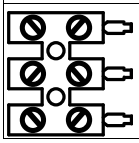
Types of feedback cables

Type	Cross section	Part number	Installation
DT/DV, CT/CV	6 x 2 x 0.25 mm² + 2 x 0.25 mm²	1333 1531	Fixed installation
		--	--

Pin assignment

Pin assignment for TTL encoder cables						
DWI connection side					Connection MOVIAXIS® MXA	
Plug connector	Pin no.	Description	Cable core color	Description	Pin no.	Plug connector
D-sub 9-pole  View X	1	A / K1	Yellow (YE)	A / K1	1	D-sub 15-pole  View Y
	2	B / K2	Red (RD)	B / K2	2	
	3	C / K0	Pink (PK)	C / K0	3	
	5	DGND	Violet (VT)	DGND	8	
	5	DGND	Brown (BN)	DGND	8	
	6	A / K1	Green (GN)	A / K1	9	
	7	B / K2	Blue (BU)	B / K2	10	
	8	C / K0	Gray (GY)	C / K0	11	
	9	+ 24 V	White (WH)	+ 9 – 12 V	15	
	9	+ 24 V	Black (BK)	+ 9 – 12 V	15	
	1	TF/TH/KTY+	Brown (BN)	TF/TH/KTY+	14	
	2	TF/TH/KTY-	White (WH)	TF/TH/KTY-	6	
	3	Shielding				

5.4.5 Cable specifications

Fixed installation of encoder cables

Accessory designation		ES7S / EG7S / ES7R / EG7R / ES7C / EG7C / AS7W / AG7W / AH7Y / AS7Y / AG7Y	EH7S / AH7Y / EI7C
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**
Manufacturer		**HELUKABEL**	
Manufacturer designation		LI9YCY	
Operating voltage V_0 / V AC	V	230 / 350	
Temperature range	°C	Fixed installation -40 to +80	
Max. temperature	°C	+ 80	
Min. bending radius	mm	43	36.5
Diameter D	mm	8.6 ± 0,2	7.3 ± 0,2
Core identification		DIN 47 100	
Sheath color		Green, similar to RAL 6018	
Approval(s)		DESINA / VDE / cULus	
Capacitance core/shielding	nF/km	110	
Capacitance core / core	nF/km	70	
Halogen-free		no	
Silicone-free		yes	
CFC-free		yes	
Inner insulation (core)		PP	
Outer insulation (sheath)		PVC	
Flame-retardant/self-extinguishing		no	
Conductor material		Cu blank	
Shielding		Braided tinned Cu	
Weight (cable)	g/km	107	78

Cable carrier installation of encoder cables

Accessory designation		ES7S / EG7S / ES7R / EG7R / ES7C / EG7C / AS7W / AG7W / AH7Y / AS7Y / AG7Y	EH7S / AH7Y	EI7C
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**	**4 x 2 x 0.25 mm²**
Manufacturer		**Nexans**		
Manufacturer designation		SSL18YC11Y 6 x 2 x 0.25/ SSL11YC11Y 5 x 2 x 0.25		
Operating voltage V_0 / V AC	V	300		
Temperature range	°C	-20 to +60		-20 to +80
Max. temperature	°C	+90 (on conductor)		+80
Min. bending radius	mm	100	95	63
Diameter D	mm	9.8 ??±?? 0.2	9.5 ??±?? 0.2	8.4 ??±?? 0.2
Maximum acceleration	m/s²	20		
Max. velocity	m/min	200		
Core identification		WH/BN, GN/YE, GY/PK, BU/RD, BK/VT, GY-PK/RD-BU	WH/BN, GN/YE, GY/PK, BU/RD, BK/VT	WH/BN, GN/YE, GY/PK
Sheath color		Green similar to RAL 6018		
Approval(s)		DESINA / VDE / cULus		
Capacitance core/shielding	nF/km	100		110
Capacitance core / core	nF/km	55		70

Table continued on next page

Accessory designation		ES7S / EG7S / ES7R / EG7R / ES7C / EG7C / AS7W / AG7W / AH7Y / AS7Y / AG7Y	EH7S / AH7Y	EI7C
Cable cross sections		**6 x 2 x 0.25 mm²**	**5 x 2 x 0.25 mm²**	**4 x 2 x 0.25 mm²**
Manufacturer		**Nexans**		
Halogen-free		yes		
Silicone-free		yes		
CFC-free		yes		
Inner insulation (core)		PP		TPE-EE
Outer insulation (sheath)		TPE-U		PUR
Flame-retardant/self-extinguishing		yes		
Conductor material		E-Cu blank		
Shielding		Braided tinned Cu		
Weight	kg/km	130	120	89
Min. bending cycles		≥ 5 million		

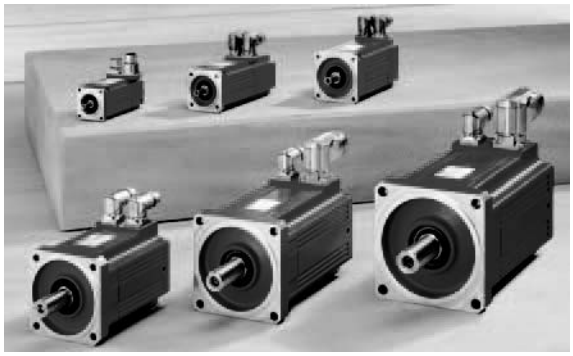
6 Suitable Motors

6.1 Synchronous servomotors

6.1.1 Product description – CMP synchronous servomotors

The CMP servomotor series combines high dynamics, high torques, and precision in a compact design.

Their innovative design with the latest in winding and magnet technology offers a motor system with optimum dynamics and the best control characteristics at the smallest space. The cast stator protects the motor against vibrations and humidity.



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Characteristics of CMP motors:

- Static torque from 0.5 to 47 Nm
- High dynamics (ratio between nominal torque and mass moment of inertia of the motor)
- High degree of protection (IP65)
- Robust encoder system (resolver)
- The optimal encoder system with sine/cosine encoder allows for a very wide setting range and absolute position detection
- High continuous torque at low speeds and at standstill, without forced cooling fan
- High overload capability
- NeFeB magnets, permanent magnets with high magnetic flux density.

The CMP servomotors can be combined with the MOVIAXIS® multi-axis servo inverter and the MOVIDRIVE® inverter.

6.1.2 Product description – CMPZ synchronous servomotors

CMPZ synchronous servomotors are equipped with an internal additional flywheel mass. These motors combine high torques and precision in a compact design and provide particularly favorable control characteristics with high external masses. Furthermore, the internal higher moment of inertial allows for a smaller gear ratio.

In addition to the above mentioned features of the CMP motors, CMPZ motors are optionally available with a powerful working brake with high working capacity and optional manual brake release.

6.1.3 Technical data – CMP synchronous servomotors

Key to the data tables

The following table lists the short symbols used in the "Technical data" table.

n_N	Rated speed
M_0	Standstill torque (thermal continuous torque at low speeds)
I_0	Standstill current
M_{pk}	Maximum limit torque of the servomotor
I_{max}	Maximum permitted motor current
M_{0VR}	Standstill torque with forced cooling fan
I_{0VR}	Standstill current with forced cooling fan
J_{mot}	Mass moment of inertia of the motor
J_{bmot}	Mass moment of inertia of the brakemotor
M_{B1}	Standard braking torque
M_{B2}	Optional braking torque
L_1	Inductance between connection phase and star point
R_1	Resistance between connection phase and star point
U_{p0} cold	Internal voltage at 1000 rpm

Technical data - CMP, CMP/BP synchronous servomotors

System voltage: 400 V

n_N	Motor	M_0	I_0	M_{pk}	I_{max}	M_{0VR}	I_{0VR}	m	J_{mot}
rpm		Nm	A	Nm	A	Nm	A	kg	10^{-4} kgm^2
3000	**CMP40S**	0.5	1.2	1.9	6.1	-	-	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	-	-	1.6	0.15
	CMP50S	1.3	0.96	5.2	5.1	1.7	1.25	2.3	0.42
	CMP50M	2.4	1.68	10.3	9.6	3.5	2.45	3.3	0.67
	CMP50L	3.3	2.2	15.4	13.6	4.8	3.2	4.1	0.92
	CMP63S	2.9	2.15	11.1	12.9	4	3	4.0	1.15
	CMP63M	5.3	3.6	21.4	21.6	7.5	5.1	5.7	1.92
	CMP63L	7.1	4.95	30.4	29.7	10.3	7.2	7.5	2.69
	CMP71S	6.4	4.9	19.2	25	8.7	6.7	7	3.04
	CMP71M	9.4	7.5	30.8	39	13.7	10.9	8.4	4.08
	CMP71L	13.1	9.4	46.9	58	21	15.1	11.4	6.18
	CMP80S	13.4	10	42.1	47	18.5	13.8	12.8	8.78
	CMP80M	18.7	13.4	62.6	69	27	19.3	16.5	11.9
	CMP80L	27.5	18.7	107	107	44	30	21.4	18.1
	CMP100S	25.5	19.6	68.3	73	36	27.5	19.8	19.34
	CMP100M	31	21.8	108	102	47	33	24.8	26.25
	CMP100L	47	32.3	178.8	167	70	48	34.6	40
4500	**CMP40S**	0.5	1.2	1.9	6.1	-	-	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	-	-	1.6	0.15
	CMP50S	1.3	1.32	5.2	7.0	1.7	1.7	2.3	0.42
	CMP50M	2.4	2.3	10.3	13.1	3.5	3.35	3.3	0.67
	CMP50L	3.3	3.15	15.4	19.5	4.8	4.6	4.1	0.92
	CMP63S	2.9	3.05	11.1	18.3	4	4.2	4.0	1.15
	CMP63M	5.3	5.4	21.4	32.4	7.5	7.6	5.7	1.92
	CMP63L	7.1	6.9	30.4	41.4	10.3	10	7.5	2.69
	CMP71S	6.4	7.3	19.2	38	8.7	9.9	7	3.04
	CMP71M	9.4	10.9	30.8	57	13.7	15.9	8.4	4.08
	CMP71L	13.1	14.1	46.9	87	21	22.5	11.4	6.18
	CMP80S	13.4	15.3	42.1	73	18.5	21	12.8	8.78
	CMP80M	18.7	20.1	62.6	103	27	29	16.5	11.9
	CMP80L	27.5	27.8	107	159	44	44.5	21.4	18.1
	CMP100S	25.5	30	68.3	111	36	42.5	19.8	19.34
	CMP100M	31	33.1	108	154	-	-	24.8	26.25
	CMP100L	47	48.4	178.8	251	-	-	34.6	40
6000	**CMP40S**	0.5	1.2	1.9	6.1	-	-	1.3	0.1
	CMP40M	0.8	1.1	3.8	6.9	-	-	1.6	0.15
	CMP50S	1.3	1.7	5.2	9.0	1.7	2.2	2.3	0.42
	CMP50M	2.4	3	10.3	17.1	3.5	4.4	3.3	0.67
	CMP50L	3.3	4.2	15.4	26	4.8	6.1	4.1	0.92
	CMP63S	2.9	3.9	11.1	23.4	4	5.4	4.0	1.15
	CMP63M	5.3	6.9	21.4	41.4	7.5	9.8	5.7	1.92
	CMP63L	7.1	9.3	30.4	55.8	10.3	13.5	7.5	2.69
	CMP71S	6.4	9.6	19.2	50	8.7	13.1	7	3.04
	CMP71M	9.4	14.7	30.8	76	13.7	21.5	8.4	4.08
	CMP71L	13.1	18.8	46.9	115	21	30	11.4	6.18
	CMP80S	13.4	20	42.1	95	18.5	27.5	12.8	8.78
	CMP80M	18.7	26.4	62.6	135	27	38	16.5	11.9
	CMP80L	27.5	37.6	107	215	-	-	21.4	18.1

n_N	Motor	L_1	R_1	U_{p0} cold	m_{bmot}	J_{bmot}	M_{B1}	M_{B2}
rpm		mH	Ω	V	kg	10^{-4} kgm^2	Nm	
3000	**CMP40S**	23	11.94	27.5	1.7	0.13	0.95	-
	CMP40M	46	19.93	56	2.0	0.18	0.95	-
	CMP50S	71	22.49	86	2.9	0.48	3.1	4.3
	CMP50M	38.5	9.96	90	3.9	0.73	4.3	3.1
	CMP50L	30.5	7.42	98	4.7	0.98	4.3	3.1
	CMP63S	36.5	6.79	90	5.0	1.49	7	9.3
	CMP63M	22	3.56	100	6.7	2.26	9.3	7
	CMP63L	14.2	2.07	100	8.5	3.03	9.3	7
	CMP71S	15.7	1.48	87.5	9	3.44	7	14
	CMP71M	9.7	0.81	85	10.4	4.5	14	7
	CMP71L	7.3	0.56	96	13.4	6.6	14	7
	CMP80S	7.2	0.54	91	16.8	10.04	16	31
	CMP80M	5	0.345	94	20.5	13.16	31	16
	CMP80L	3.35	0.21	99	24.4	19.36	31	16
	CMP100S	3.9	0.215	88	22.8	21.34	24	47
	CMP100M	3.05	0.142	95.5	27.8	28.25	47	24
	CMP100L	1.9	0.081	98	37.6	42	47	24
4500	**CMP40S**	23	11.94	27.5	1.7	0.13	0.95	-
	CMP40M	46	19.93	56	2.0	0.18	0.95	-
	CMP50S	37	11.61	62	2.9	0.48	3.1	4.3
	CMP50M	20.5	5.28	66	3.9	0.73	4.3	3.1
	CMP50L	14.6	3.57	68	4.7	0.98	4.3	3.1
	CMP63S	18.3	3.34	64	5.0	1.49	7	9.3
	CMP63M	9.8	1.48	67	6.7	2.26	9.3	7
	CMP63L	7.2	1.07	71	8.5	3.03	9.3	7
	CMP71S	7.1	0.72	59	9	3.44	7	14
	CMP71M	4.55	0.385	58	10.4	4.5	14	7
	CMP71L	3.25	0.24	64	13.4	6.6	14	7
	CMP80S	3.05	0.22	59	16.8	10.04	16	31
	CMP80M	2.25	0.148	63	20.5	13.16	31	16
	CMP80L	1.54	0.085	67	24.4	19.36	31	16
	CMP100S	1.68	0.086	58	22.8	21.34	24	47
	CMP100M	1.32	0.058	63	27.8	28.25	47	24
	CMP100L	0.84	0.038	65	37.6	42.82	47	24
6000	**CMP40S**	23	11.94	27.5	1.7	0.13	0.95	-
	CMP40M	34	14.95	48.5	2.0	0.18	0.95	-
	CMP50S	22.5	7.11	48.5	2.9	0.48	3.1	4.3
	CMP50M	12	3.21	50.5	3.9	0.73	4.3	3.1
	CMP50L	8.2	1.91	51	4.7	0.98	4.3	3.1
	CMP63S	11.2	2.1	50	5.0	1.49	7	9.3
	CMP63M	5.9	0.92	52	6.7	2.26	9.3	7
	CMP63L	4	0.62	53	8.5	3.03	9.3	7
	CMP71S	4.15	0.395	45	9	3.44	7	14
	CMP71M	2.55	0.205	43.5	10.4	4.5	14	7
	CMP71L	1.84	0.145	48	13.4	6.6	14	7
	CMP80S	1.8	0.136	46	-	-	-	-
	CMP80M	1.3	0.087	48	-	-	-	-
	CMP80L	0.84	0.051	50	-	-	-	-

Technical data - CMPZ, CMPZ/BY synchronous servomotors

System voltage: 400 V

n_N	Motor	M_0	I_0	M_{pk}	I_{max}	M_{0VR}	I_{0VR}	m	J_{mot}
rpm]		Nm	A	Nm	A	Nm	A	kg	10^{-4} kgm^2
3000	**CMPZ71S**	6.4	4.9	19.2	25	8.7	6.7	8.6	9.32
	CMPZ71M	9.4	7.5	30.8	39	13.7	10.9	10	10.37
	CMPZ71L	13.1	9.4	46.9	58	21	15.1	13	12.47
	CMPZ80S	13.4	10	42.1	47	18.5	13.8	15.8	27.18
	CMPZ80M	18.7	13.4	62.6	69	27	19.3	19.5	30.3
	CMPZ80L	27.5	18.7	107	107	44	30	24.4	36.51
	CMPZ100S	25.5	19.6	68.3	73	36	27.5	24.2	79.76
	CMPZ100M	31	21.8	108	102	47	33	29.2	86.66
	CMPZ100L	47	32.3	178.8	167	70	48	39	100.41
4500	**CMPZ71S**	6.4	7.3	19.2	38	8.7	9.9	8.6	9.32
	CMPZ71M	9.4	10.9	30.8	57	13.7	15.9	10	10.37
	CMPZ71L	13.1	14.1	46.9	87	21	22.5	13	12.47
	CMPZ80S	13.4	15.3	42.1	73	18.5	21	15.8	27.18
	CMPZ80M	18.7	20.1	62.6	103	27	29	19.5	30.3
	CMPZ80L	27.5	27.8	107	159	44	44.5	24.4	36.51
	CMPZ100S	25.5	30	68.3	111	36	42.5	24.2	79.76
	CMPZ100M	31	33.1	108	154	-	-	29.2	86.66
	CMPZ100L	47	48.4	178.8	251	-	-	39	100.41
6000	**CMPZ71S**	6.4	9.6	19.2	50	8.7	13.1	8.6	9.32
	CMPZ71M	9.4	14.7	30.8	76	13.7	21.5	10	10.37
	CMPZ71L	13.1	18.8	46.9	115	21	30	13	12.47
	CMPZ80S	13.4	20	42.1	95	18.5	27.5	15.8	27.18
	CMPZ80M	18.7	26.4	62.6	135	27	38	19.5	30.3
	CMPZ80L	27.5	37.6	107	215	-	-	24.4	36.51

n_N	Motor	L_1	R_1	U_{p0} cold	m_{bmot}	J_{bmot}	M_{B1}	M_{B2}
rpm		mH	Ω	V	kg	10^{-4} kgm^2	Nm	
3000	**CMPZ71S**	15.7	1.48	87.5	11.2	11.04	14	10
	CMPZ71M	9.7	0.81	85	12.6	12.09	20	14
	CMPZ71L	7.3	0.56	96	15.6	14.19	20	14
	CMPZ80S	7.2	0.54	91	20.8	30.95	28	20
	CMPZ80M	5	0.345	94	24.5	34.07	40	28
	CMPZ80L	3.35	0.21	99	29.4	40.28	40	28
	CMPZ100S	3.9	0.215	88	34.7	84.19	55	40
	CMPZ100M	3.05	0.142	95.5	39.7	91.1	80	55
	CMPZ100L	1.9	0.081	98	49.5	104.85	80	55
4500	**CMPZ71S**	7.1	0.72	59	11.2	11.04	14	10
	CMPZ71M	4.55	0.385	58	12.6	12.09	20	14
	CMPZ71L	3.25	0.24	64	15.6	14.19	20	14
	CMPZ80S	3.05	0.22	59	20.8	30.95	28	20
	CMPZ80M	2.25	0.148	63	24.5	34.07	40	28
	CMPZ80L	1.54	0.085	67	29.4	40.28	40	28
	CMPZ100S	1.68	0.086	58	34.7	84.19	55	40
	CMPZ100M	1.32	0.058	63	39.7	91.1	80	55
	CMPZ100L	0.84	0.038	65	49.5	104.85	80	55
6000	**CMPZ71S**	4.15	0.395	45	11.2	11.04	14	10
	CMPZ71M	2.55	0.205	43.5	12.6	12.09	20	14
	CMPZ71L	1.84	0.145	48	15.6	14.19	20	14
	CMPZ80S	1.8	0.136	46	-	-	-	-
	CMPZ80M	1.3	0.087	48	-	-	-	-
	CMPZ80L	0.84	0.051	50	-	-	-	-

6.1.4 Product description – CFM synchronous servomotors

CRM servomotors feature a wide torque range, good control characteristics with high external masses, the use of powerful working brakes, and a wide range of options.

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Characteristics of CFM motors:

- Up to 4 x overload capacity
- Stator with pull-in winding
- Mounting of standard and servo gear units possible
- Direct mounting of gear unit possible
- Resolver or high-resolution absolute encoder possible
- Connectors or terminal box
- Optional forced cooling fan
- Optional brake with working capacity
- TF or KTY sensor for thermal motor protection
- Optional second shaft end
- Optional reinforced bearings

The CFM servomotors can be combined with the MOVIAXIS® multi-axis servo inverter and the MOVIDRIVE® inverter.

6.1.5 Technical data – CFM synchronous servomotors

Key to the data tables

The following table lists the short symbols used in the "Technical data" table.

n_N	Rated speed
M_0	Standstill torque (thermal continuous torque at low speeds).
I_0	Standstill current
M_{DYN}	Dynamic limit torque of the servomotor
I_{max}	Maximum permitted motor current
M_{0VR}	Static torque with forced cooling fan
I_{0VR}	Standstill current with forced cooling fan
J_{mot}	Mass moment of inertia of the motor
J_{bmot}	Mass moment of inertia of the brake motor
M_{B1}	Standard braking torque
M_{B2}	Optional braking torque
W_{max1}	Maximum permitted braking work per braking operation for M_{B1}.
W_{max2}	Maximum permitted braking work per braking operation for M_{B2}.
L_1	Inductance of the winding
R_1	Ohmic resistance of the winding
U_{p0}	Internal voltage at 1000 rpm
m_{mot}	Weight of the motor
m_{bmot}	Weight of the brakemotor

Technical data – CFM synchronous servomotors with 400 V system voltage

n_N	Motor	M_0	I_0	M_{DYN}	I_{max}	M_{0VR}	I_{0VR}	J_{mot}	J_{bmot}	M_{B1}	M_{B2}	W_{max1}	W_{max2}
rpm		Nm	A	Nm	A	Nm	A	10^{-4} kgm^2		Nm		kJ	
2000	**CFM71S**	5	2.2	16.5	8.8	7.3	3.2	4.99	6.72	10	5	18	22
	CFM71M	6.5	3	21.5	12	9.4	4.2	6.4	8.13	14	7	15	20
	CFM71L	9.5	4.2	31.4	16.8	13.8	6.1	9.21	10.94	14	10	15	18
	CFM90S	11	4.9	39.6	19.6	16	7.1	18.2	22	28	14	17	24
	CFM90M	14.5	6.9	52.2	28	21	10	23.4	27.2	40	20	10.5	19.5
	CFM90L	21	9.9	75.6	40	30.5	14.4	33.7	37.5	40	28	10.5	17
	CFM112S	23.5	10	82.3	40	34	14.5	68.9	84.2	55	28	32	48
	CFM112M	31	13.5	108.5	54	45	19.6	88.9	104.2	90	40	18	44
	CFM112L	45	20	157.5	80	65	29	128.8	144.1	90	55	18	32
	CFM112H	68	30.5	238	122	95	42.5	188.7	204.	90	55	18	32
3000	**CFM71S**	5	3.3	16.5	13.2	7.3	4.8	4.99	6.72	10	5	14	20
	CFM71M	6.5	4.3	21.5	17.2	9.4	6.2	6.4	8.13	14	7	11	18
	CFM71L	9.5	6.2	31.4	25	13.8	9	9.21	10.94	14	10	11	14
	CFM90S	11	7.3	39.6	29	16	10.6	18.2	22	28	14	10	20
	CFM90M	14.5	10.1	52.2	40	21	14.6	23.4	27.2	40	20	4.5	15
	CFM90L	21	14.4	75.6	58	30.5	21	33.7	37.5	40	28	4.5	10
	CFM112S	23.5	15	82.3	60	34	22	68.9	84.2	55	28	18	36
	CFM112M	31	20.5	108.5	82	45	30	88.9	104.2	90	40	7	32
	CFM112L	45	30	157.5	120	65	44	128.8	144.1	90	55	7	18
	CFM112H	68	43	238	172	95	60	188.7	204.	90	55	7	18
4500	**CFM71S**	5	4.9	16.5	19.6	7.3	7.2	4.99	6.72	10	5	10	16
	CFM71M	6.5	6.6	21.5	26	9.4	9.6	6.4	8.13	14	7	6	14
	CFM71L	9.5	9.6	31.4	38	13.8	14	9.21	10.94	14	10	6	10
	CFM90S	11	11.1	39.6	44	16	16.2	18.2	22	28	14	5	15
	CFM90M	14.5	14.7	52.2	59	21	21.5	23.4	27.2	40	20	3	9
	CFM90L	21	21.6	75.6	86	30.5	31.5	33.7	37.5	40	28	3	5
	CFM112S	23.5	22.5	82.3	90	34	32.5	68.9	84.2	55	25	11	22
	CFM112M	31	30	108.5	120	45	44	88.9	104.2	90	40	4	18
	CFM112L	45	46	157.5	184	65	67	128.8	144.1	90	55	4	11
	CFM112H	68	66	238	264	95	92	188.7	204.	90	55	4	11
6000	**CFM71S**	5	6.5	16.5	26	7.3	9.5	4.99	6.72	-	-	-	-
	CFM71M	6.5	8.6	21.5	34	9.4	12.5	6.4	8.13	-	-	-	-
	CFM71L	9.5	12.5	31.4	50	13.8	18.2	9.21	10.94	-	-	-	-
	CFM90S	11	14.5	39.6	58	16	21	18.2	22	-	-	-	-
	CFM90M	14.5	19.8	52.2	79	21	29	23.4	27.2	-	-	-	-
	CFM90L	21	29.5	75.6	118	30.5	43	33.7	37.5	-	-	-	-

n_N	Motor	L_1	R_1	U_{p0}	m_{mot}	m_{bmot}
rpm		mH	mΩ	V/1000 rpm	kg	
2000	**CFM71S**	52	7090	151	9.5	11.8
	CFM71M	36	4440	148	10.8	13.0
	CFM71L	24	2500	152	13.0	15.3
	CFM90S	18	1910	147	15.7	19.6
	CFM90M	12.1	1180	141	17.8	21.6
	CFM90L	8.4	692	146	21.9	26.5
	CFM112S	10	731	155	26.2	31.8
	CFM112M	7.5	453	153	30.5	36.0
	CFM112L	4.6	240	151	39.3	44.9
	CFM112H	2.6	115	147	54.2	59.8
3000	**CFM71S**	23	3150	101	9.5	11.8
	CFM71M	16	2000	100	10.8	13.0
	CFM71L	11	1120	102	13.0	15.3
	CFM90S	8.1	838	98	15.7	19.6
	CFM90M	5.7	533	96	17.8	21.6
	CFM90L	3.9	324	99	21.9	26.5
	CFM112S	4.6	325	103	26.2	31.8
	CFM112M	3.1	193	99	30.5	36.0
	CFM112L	2	103	101	39.3	44.9
	CFM112H	1.3	57	104	54.2	59.8
4500	**CFM71S**	10	1380	66	9.5	11.8
	CFM71M	6.9	828	64	10.8	13.0
	CFM71L	4.9	446	65	13.0	15.3
	CFM90S	3.45	358	64	15.7	19.6
	CFM90M	2.65	249	65	17.8	21.6
	CFM90L	1.73	148	66	21.9	26.5
	CFM112S	2	149	69	26.2	31.8
	CFM112M	1.5	92	68	30.5	36.0
	CFM112L	0.85	44	66	39.3	44.9
	CFM112H	0.54	24	67	54.2	59.8
6000	**CFM71S**	5.75	780	50	9.5	-
	CFM71M	3.93	493	49	10.8	-
	CFM71L	2.68	277	50	13.0	-
	CFM90S	2.03	212	49	15.7	-
	CFM90M	1.48	136	48	17.8	-
	CFM90L	0.93	77	48	21.9	-

6.1.6 Product description – CMDV synchronous servomotors[1)]

The compact CMDV servomotors come without housing and are convection cooled; they offer standstill torques from 0.3 to 32 Nm with an overload capacity of factor six. The strong bearings and the low-vibration design make these motors the ideal component for applications with small installation spaces and directly powered servo applications.

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Characteristics of CMDV motors:

- High dynamics
- Compact design
- Six-fold overload capacity
- High rotational accuracy
- Low mass
- Suitable for direct drive
- Degree of protection IP65
- Convection-cooled
- Minimal projecting edges
- 24 V holding brake
- HIPERFACE® encoder for all motors
- Hollow shaft variant CMDH possible
- UL and CSA approval

1) In preparation

6.1.7 Technical data – CMDV compact synchronous servomotors[1)]

Key to the data tables

The following table lists the short symbols used in the "Technical data" table.

n_N	Rated speed
M_0	Standstill torque (thermal continuous torque at low speeds)
I_0	Standstill current
M_{max}	Maximum limit torque of the servomotor
I_{max}	Maximum permitted motor current
R_1	Ohmic resistance of the winding
L_1	Inductance of the winding
U_{p0} cold	Internal voltage at 1000 rpm
J_{mot}	Mass moment of inertia of the motor
J_{bmot}	Mass moment of inertia of the brakemotor
M_{B1}	Standard braking torque
M_{B2}	Optional braking torque

1) In preparation

Technical data – CMDV compact synchronous servomotors

System voltage: 400 V

Motor type	n_N [1]	M_0	I_0	M_{max}	I_{max}	m	J_{mot} [2]	n_{max}	m_{bmot}	J_{bmot}	M_{B1}	M_{B2}	L_1	R_1	U_{p0}
	rpm	Nm	A	Nm	A	kg	kgcm^2	rpm	kg	kgcm^2	Nm	Nm	mH	Ω	rpm
CMDV55S	4500	0.3	0.65	1.2	4.05		0.087	8000 [3]		0.097	0.95	-	31	33.4	29
CMDV55M		0.45	0.95	2.2	6		0.149	8000 [3]		0.159	0.95	-	23	19.6	38.8
CMDV55L		0.9	1.43	5.9	11.2		0.269	8000 [3]		0.279	0.95	-	13.2	10.7	42.5
CMDV70S	1200	0.7	0.87	3	5.2		0.26	6000		0.33	3.1	4.3	44.5	27.81	52.9
CMDV70M		1.1	0.94	5.3	5.5		0.45	5000		0.52	3.1	4.3	45.5	22.01	86.5
CMDV70L		2.2	1.47	11.4	8		0.83	5000		0.90	4.3	3.1	25	11.56	100
CMDV70S	3000	0.7	1	3	6		0.26	6000		0.33	3.1	4.3	33	18.7	45.6
CMDV70M		1.1	1.36	5.3	8		0.45	5000		0.52	3.1	4.3	21.5	10.7	59.6
CMDV70L		2.2	2.05	11.4	11.2		0.83	5000		0.90	4.3	3.1	12.9	6	72.1
CMDV93K	800	1.5	1.08	4.4	4.1		0.73	4000		1.18			71	23.64	93.5
CMDV93S		2.5	1.09	10.3	5.3		1.35	4000		1.81	7	9.3	138	21.9	152
CMDV93M		4.4	1.82	21.1	11.1		2.55	4000		3	9.3	7	48.5	9.69	181
CMDV93L		6.9	2.45	38	16.2		3.74	4000		4.22	9.3	7	29.5	6.69	188
CMDV93K	1200	1.5	1.29	4.4	4.9		0.73	4000		1.18			49.5	15.75	78.1
CMDV93S		2.5	1.59	10.3	8.2		1.35	2750		1.81	7	9.3	65	10.44	104
CMDV93M		4.4	2.65	21.1	16.1		2.55	2750		3	9.3	7	23.5	4.75	126
CMDV93L		6.9	3.5	38	23.5		3.74	2750		4.22	9.3	7	14.4	3.3	131
CMDV93K	3000	1.5	1.88	4.4	7.2		0.73	4000		1.18			23.5	7.51	53.6
CMDV93S		2.5	2.4	10.3	12.3		1.35	4000		1.81	7	9.3	29	4.51	69.8
CMDV93M		4.4	3.75	21.1	23		2.55	4000		3	9.3	7	11.4	2.34	87.7
CMDV93L		6.9	6	38	40.5		3.74	4000		4.22	9.3	7	4.8	1.07	75.8
CMDV138K	600	4.3	2.15	7.6	5.8		4.13	2500		6.32			66	8.68	141
CMDV138S		8.8	3.4	19	9.8		7.09	2500		9.28	22	-	49.5	3.8	177
CMDV138M		15.7	4.85	49	19.8		12.85	2000		15.04	22	-	34	2.57	227
CMDV138L		20.2	5.4	70	24.5		18.61	2000		20.8	22	-	28	1.75	255
CMDV138K	1200	4.3	3.05	7.6	8.2		4.13	2500		6.32			33	4.39	99.6
CMDV138S		8.8	4.7	19	13.5		7.09	2500		9.28	22	-	26.5	1.96	129
CMDV138M		15.7	6.5	49	26.5		12.85	2000		15.04	22	-	19	1.38	170
CMDV138L		20.2	8.7	70	39.5		18.61	2000		20.8	22	-	10.6	0.67	158
CMDV138K	2000	4.3	3.75	7.6	10		4.13	2500		6.32			22	2.82	81.3
CMDV138S		8.8	8.9	19	25.5		7.09	3000		9.28	22	-	7.4	0.6	68.1
CMDV138M		15.7	13.5	49	55		12.85	2000		15.04	22	-	4.4	0.32	81.6
CMDV138L		20.2	16.4	70	74		18.61	2000		20.8	22	-	3	0.2	83.7
CMDV162K	400	6	1.96	11	5.1		7.5			8.93			140	10.82	220
CMDV162S		13.5	3.4	27	9.1		12.89			14.41			73	4.43	272
CMDV162M		22	5.2	57	17.3		23.64			25.07			44	2.27	332
CMDV162L		32	6.4	104	27		34.6			36.02			30	1.58	344
CMDV162K	800	6	3.55	11	9.2		7.5			8.93			43	3.3	122
CMDV162S		13.5	5.7	27	15.3		12.89			14.41			25.5	1.52	162
CMDV162M		22	9.8	57	32.5		23.64			25.07			12.3	0.67	176
CMDV162L		32	14.2	104	60		34.6			36.02			6.1	0.31	155

Motor type	n_N [1]	M_0	I_0	M_{max}	I_{max}	m	J_{mot} [2]	n_{max}	m_{bmot}	J_{bmot}	M_{B1}	M_{B2}	L_1	R_1	U_{p0}
CMDV162K	1200	6	5.6	11	14.7		7.5			8.93			16.9	1.33	76.4
CMDV162S		13.5	8.3	27	22.5		12.89			14.41			12.1	0.75	111
CMDV162M		22	16.8	57	56		23.64			25.07			4.2	0.22	103
CMDV162L		32	15.7	104	66		34.6			36.02			5	0.25	140

1) n_N = rated speed [rpm]

2) When installing the encoders AK0H / EK0H, the specified mass moment of inertia is reduced by 0.015 kgcm^2 in comparison with the resolver variant

3) For CMDV55 with brake, n_{max} = 6000 rpm

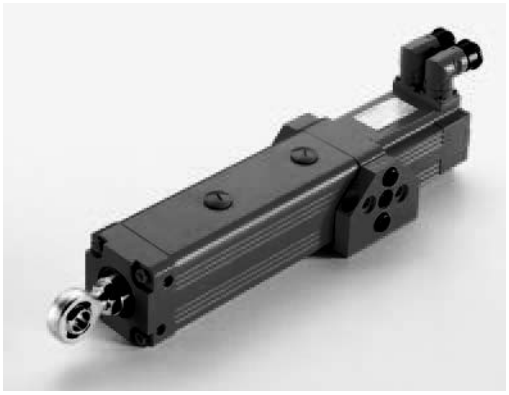
INFORMATION

M_0 is the thermal continuous torque for speeds between 5 and 200 revolutions per minute.

The permitted continuous torque at standstill is 90 % of M_0.

6.1.8 Product description – CMS electric cylinders

Applications with linear movement place high demands on the travel profile. Conventional solutions consisting of pneumatic and hydraulic cylinders will quickly reach their system limits in terms of performance.



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Combining electric cylinders with the inverters from SEW-EURODRIVE results in intelligent drive systems that offer a high degree of flexibility and positioning accuracy, new options in programming, power control and diagnostic functions. These translate into new and reliable concepts that can be integrated into a variety of production processes.

The electric cylinders of the CMS series are precise, powerful, and fast. When combined with drive electronics from SEW-EURODRIVE, they form economical, energy-efficient drive solutions that ensure a high level of process reliability in system operation and are easy to integrate into existing automation systems.

6.1.9 Technical data – CMS electric cylinder

Technical data – CMS50

Note:

Stroke length 300 mm n_{epk} = 2500 rpm (max. mechanical speed)

Stroke lengths 70 and 150 mm n_{epk} = 4500 rpm (max. mechanical speed)

	Spindle	n_N	Stroke length	M_0	I_0	M_{pk}	I_{max}	J_{mot}	J_{bmot}	J_{zusatz}	$J_{bzusatz}$	M_B	L_1	R_1	U_{p0kalt}	F	F_{pk}	m	m_{bmot}
	DxP	rpm	mm	Nm	A	Nm	A	kgcm^2				Nm	mH	[Ω]	V	kN		kg	
50S	KGT 15x5	3000	70	1.3	0.96	5.2	5.1	0.54	0.6	0.12	0.12	4.3	71	22.49	86	1.2	5.3	5.8	6.4
			150					0.56	0.62	0.14	0.14							6.5	7.1
			300					0.61	0.67	0.19	0.19							7.8	8.4
		4500	70	1.3	1.32	5.2	7.0	0.54	0.6	0.12	0.12	4.3	37	11.61	62	1.2	5.3	5.8	6.4
			150					0.56	0.62	0.14	0.14							6.5	7.1
			300					0.61	0.67	0.19	0.19							7.8	8.4
		6000	70	1.3	1.7	5.2	9.0	0.54	0.6	0.12	0.12	4.3	22.5	7.11	48.5	1.2	5.3	5.8	6.4
			150					0.56	0.62	0.14	0.14							6.5	7.1
			300					0.61	0.67	0.19	0.19							7.8	8.4

Technical data – CMS63

Note:

Stroke lengths 100, 200, 400 and 600 mm n_{epk} = 4500 rpm (max. mechanical speed)

	Spindle	n_N	Stroke length	M_0	I_0	M_{pk}	I_{max}	J_{mot}	J_{bmot}	J_{zusatz}	$J_{bzusatz}$	M_B	L_1	R_1	U_{p0kalt}	F	F_{pk}	m	m_{bmot}
	DxP	rpm	mm	Nm	A	Nm	A	kgcm²				Nm	mH	Ω	V	kN		kg	
63S	KGT 25x6	3000	**100**	2.9	2.15	11.1	12.9	1.92	2.26	0.77	0.77	9.3	36.5	6.79	90	2.4	10	9.5	10.5
			200					2.24	2.58	1.09	1.09							11	12
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
		4500	100	2.9	3.05	11.1	18.3	1.92	2.26	0.77	0.77	9.3	18.3	3.34	64	2.4	10	9.5	10.5
			200					2.24	2.58	1.09	1.09							11	12
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
		6000	100	2.9	3.9	11.1	23.4	1.92	2.26	0.77	0.77	9.3	11.2	2.1	50	2.4	10	9.5	10.5
			200					2.24	2.58	1.09	1.09							11	12
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
	PGT 20x5	3000	100	2.9	2.15	11.1	12.9	1.69	2.03	0.54	0.54	9.3	36.5	6.79	90	2.8	10	9.5	10.5
			200					1.81	2.15	0.66	0.66							11	12
		4500	100	2.9	3.05	11.1	18.3	1.69	2.03	0.54	0.54	9.3	18.3	3.34	64	2.8	10	9.5	10.5
			200					1.81	2.15	0.66	0.66							11	12
		6000	100	2.9	3.9	11.1	23.4	1.69	2.03	0.54	0.54	9.3	11.2	2.1	50	2.8	10	9.5	10.5
			200					1.81	2.15	0.66	0.66							11	12

	Spindle	n_N	Stroke length	M_0	I_0	M_{pk}	I_{max}	J_{mot}	J_{bmot}	J_{zusatz}	$J_{bzusatz}$	M_B	L_1	R_1	U_{p0kalt}	F	F_{pk}	m	m_{bmot}
	DxP	rpm	mm	Nm	A	Nm	A	kgcm²				Nm	mH	[Ω]	V	kN		kg	
63M	KGT 25x6	3000	100	5.3	3.6	11.1[1] (21.4)	7.9[2] (21.6)	2.69	3.03	0.77	0.77	9.3	22	3.56	100	4.1	10	11	12
			200					3.01	3.35	1.09	1.09							12.5	13.5
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
		4500	100	5.3	5.4	11.1[1] (21.4)	11.9[2] (32.4)	2.69	3.03	0.77	0.77	9.3	9.8	1.48	67	4.1	10	11	12
			200					3.01	3.35	1.09	1.09							12.5	13.5
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
		6000	100	5.3	6.9	11.1[1] (21.4)	15.2[2] (41.4)	2.69	3.03	0.77	0.77	9.3	5.9	0.92	52	4.1	10	11	12
			200					3.01	3.35	1.09	1.09							12.5	13.5
			400					-	-	-	-					-	-	-	-
			600					-	-	-	-							-	-
	PGT 20x5	3000	100	5.3	3.6	11.1[1] (21.4)	7.9[2] (21.6)	2.46	2.8	0.54	0.54	9.3	22	3.56	100	5.2	10	11	12
			200					2.58	2.92	0.66	0.66							12.5	13.5
		4500	100	5.3	5.4	11.1[1] (21.4)	11.9[2] (32.4)	2.46	2.8	0.54	0.54	9.3	9.8	1.48	67	5.2	10	11	12
			200					2.58	2.92	0.66	0.66							12.5	13.5
		6000	100	5.3	6.9	11.1[1] (21.4)	15.2[2] (41.4)	2.46	2.8	0.54	0.54	**9.3**	**5.9**	**0.92**	**52**	**5.2**	**10**	**11**	**12**
			200					2.58	2.92	0.66	0.66							**12.5**	**13.5**

1) Max. permitted torque

2) Max. permitted current

Technical data – CMS71

Note:

Stroke length 200 mm n_{epk} = 3000 rpm (max. mechanical speed)

Stroke length 350 mm n_{epk} = 2000 rpm (max. mechanical speed)

	Spindle	n_N	Stroke length	M_0	I_0	M_{pk}	I_{max}	J_{mot}	J_{bmot}	J_{zusatz}	$J_{bzusatz}$	M_B	L_1	R_1	U_{p0kalt}	F	F_{pk}	m	m_{bmot}
	DxP	rpm	mm	Nm	A	Nm	A	kgcm^2				Nm	mH	Ω	V	kN		kg	
71L	KGT 32x6	2000	200	9.5	4.2	22.1[1] (31.4)	9.2[2] (16.8)	32.5	37.5	23.3	26.6	19	24	2.5	151	6.7	20	19	20
			350	9.5	4.2	16.6[1] (31.4)	7.3[2] (16.8)	45.3	50.3	36.1	39.4	19	24	2.5	151	6.7	15[3]	25	26
		3000	200	9.5	6.2	22.1[1] (31.4)	13.6[2] (25)	32.5	37.5	23.3	26.6	19	11	1.12	102	6.7	20	19	20
			350	9.5	6.2	16.6[1] (31.4)	10.8[2] (25)	45.3	50.3	36.1	39.4	19	11	1.12	102	6.7	15[3]	25	26
		4500	200	9.5	9.6	22.1[1] (31.4)	21.1[2] (38)	32.5	37.5	23.3	26.6	19	4.5	0.5	65	6.7	20	19	20
			350	9.5	9.6	16.6[1] (31.4)	16.8[2] (38)	45.3	50.3	36.1	39.4	19	4.5	0.5	65	6.7	15[3]	25	26
	KGT 32x10	2000	200	9.5	4.2	31.4	16.8	32.5	37.5	23.3	26.6	19	24	2.5	151	3.6	17	19	20
		3000	200	9.5	6.2	31.4	25	32.5	37.5	23.3	26.6	19	11	1.12	102	3.6	17	19	20
		4500	200	9.5	9.6	31.4	38	32.5	37.5	23.3	26.6	19	4.5	0.5	65	3.6	17	19	20
	PGT 24x5	2000	200	9.5	4.2	24.4[1] (31.4)	10.5[2] (16.8)	32.5	37.5	23.3	26.6	19	24	2.5	151	7.2	20	19	20
		3000	200	9.5	6.2	24.4[1] (31.4)	15.5[2] (25)	32.5	37.5	23.3	26.6	19	11	1.12	102	7.2	20	19	20
		4500	200	9.5	9.6	24.4[1] (31.4)	24[2] (38)	32.5	37.5	23.3	26.6	19	4.5	0.5	65	7.2	20	19	20

1) Max. permitted torque

2) Max. permitted current

3) In case of tensile loads, a peak feed force Fpk of 20 kN is possible

6.1.10 Product description – SL2 series linear motors

SEW-EURODRIVE SL2 linear motors are designed as short stator motors. This technology achieves maximum forces in combination with small sizes and low weight.

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Motors of the SL2 series are used whenever there is a need for precision, dynamics, repeat accuracy and high traverse rates. This motor series is characterized by the optimum force-density ratio accomplished by using one of the latest winding technologies and the laminated iron core.

This motor system is perfectly suited for many applications, including highly dynamic and flexible processing machines, material handling environments as well as pick-and-place applications.

Criteria for the selection of an SL2 include the following:

- excellent positioning behavior even at high traversing rates of up to 6 m/s (also with absolute encoder)
- High stiffness of the control system in connection with MOVIDRIVE® and MOVIAXIS®
- There is no backlash or spring effects associated with mechanical transmission components
- No wear due to contactless energy transfer
- Low noise development
- Minimum downtimes when system faults occur
- High synchronous operation accuracy
- High level of enclosure, IP65
- Low-overhead system through convection cooling
- optimized handling for operator due to motor cooling unit (additional information on motor cooling unit in section 2.8).
- Advantages for the user:
    - SL2-Advance System:

      Fast and simple task handling through optimized, highly dynamic motor cooling unit for flexible mounting of components by the customer.
    - SL2-Power System:

      In addition to the SL2-Advance System, the nominal power (nominal thrust) is increased by installation of forced cooling fans without an increase in weight.
    - SL2-Advance System / SL2 -Power System

      Allow for optimum and fast integration of the drive system in the plant. The performance characteristics of the systems enable excellent machine performance

6.2 Asynchronous servomotors

6.2.1 Product description – DRL asynchronous servomotors

Asynchronous servomotors are the link between the classical asynchronous AC motors for supply system and inverter operation and the highly dynamic synchronous servomotors with permanent magnets.

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DRL motors

Asynchronous servomotors of the DRL series are a drive package made up from the many options of the modular DR motor system.

In its basic variant, the drive package always contains

- An encoder, sine signals, and electronic nameplate
- Thermal motor protection
- Dynamics package
- Various connection options
- Winding optimized with respect to speed

Depending on the application and requirements, the following elements can be added:

- Forced cooling fan
- Connection via plug connectors instead of terminals
- Temperature sensing
- And many more

Alternatives can be selected instead of the elements of the basic variant, e.g. an absolute encoder instead of the sine encoder.

Dynamics

AC motors operated on the supply system usually have an overload capacity of 160% – 180% of the nominal torque during startup.

If the motor is operated on an inverter of the same power, the inverter usually provides 150% current, and thus roughly 150% torque, for 60 seconds during startup. If a larger inverter is selected, the inverter can provide a higher current and theoretically a greater torque as well. In this case, the mechanical resistance of the motor against the overload, which might reach or exceed the permitted limit values, must be checked.

As a rule, the synchronous servomotors and the corresponding inverters are designed for a high short-time overload. 400% of the nominal torque can usually be reached and are permitted.

The mechanical design of asynchronous servomotors of the DRL series is of such a high quality that dynamic overload values can be reached which exceed the classical values of an asynchronous motor operated on a supply system or inverter and almost match the values of a synchronous servomotor.

SEW-EURODRIVE offers the DRL motors in two dynamics packages:

Package	Overload capacity to nominal torque
Dynamics 1 (D1)	190 % – 220 %
Dynamics 2 (D2)	300 % – 350 %

The nameplate of the motor specifies the respective dynamics package.

Speeds

SEW-EURODRIVE offers the DRL servomotors with 4 rated speeds:

- 1200 rpm
- 1700 rpm
- 2100 rpm
- 3000 rpm

In inverter operation, field weakening begins at the rated speed.

6.2.2 Technical data – DRL asynchronous servomotors

Key to the data tables

The following table lists the short symbols used in the "Technical data" tables.

n_N	Rated speed
M_N	Rated torque
I_N	Rated current
I_{q_n}	Torque generating nominal current
I_{d_n}	Magnetizing nominal current
k_T	Torque constant
J_{Mot}	Mass moment of inertia of the motor
M_{pk} Dyn1	Maximum limit torque (dynamics package 1)
M_{pk} Dyn2	Maximum limit torque (dynamics package 2)
m	Weight of the motor
BE..	Brake used
m_B	Weight of the brakemotor
J_{MOT_BE}	Mass moment of inertia of the brakemotor
M_B Dyn1	Braking torque (dynamics package 1)
M_B Dyn2	Braking torque (dynamics package 2)

Technical data – DRL asynchronous servomotors

System voltage: 400 V

n_N	Motor type	M_N	I_N	I_{q_n}	I_{d_n}	k_T	M_{pk} Dyn1	M_{pk} Dyn2	m	J_{Mot}
		Nm	A	A	A	Nm/A	Nm	Nm	kg	10^{-4} kgm^2
1200	DRL71S4	2.7	1.18	1.02	0.62	2.66	5	8.5	8.6	4.9
	DRL71M4	4	1.6	1.36	0.80	2.93	7	14	10	7.1
	DRL80S	6.5	2.15	1.95	0.88	3.33	10	25	11.5	14.9
	DRL80M4	9.5	2.9	2.64	1.10	3.60	14	30	15.2	21.5
	DRL90L4	15	4.8	4.14	2.21	3.63	25	46	22.5	43.5
	DRL100L4	26	8.5	8.05	2.68	3.23	40	85	30	68
	DRL132S4	42	12.6	11.9	4.07	3.52	80	150	45.5	190
	DRL132MC4	56	17.6	15.4	7.50	3.63	130	200	65	340
	DRL160M4	85	25.5	24.2	8.05	3.51	165	280	93	450
	DRL160MC4	90	28	25.1	10.9	3.58	185	320	95	590
	DRL180S	120	34.5	33.2	10.8	3.62	210	380	122	900
	DRL180M4	135	38	36.1	11.3	3.74	250	430	143	1110
	DRL180L4	165	47	44.9	14.8	3.67	320	520	154	1300
	DRL180LC4	175	52	46.8	17.1	3.74	420	600	163	1680
	DRL200L	200	58.5	56.0	17.8	3.57	475	680	260	2360
	DRL225S4	250	72	68.1	23.4	3.67	520	770	295	2930
	DRL225MC4	290	89	78.6	29.2	3.69	770	1100	330	4330
1700	DRL71S4	2.7	1.63	1.40	0.86	1.92	5	8.5	8.6	4.9
	DRL71M4	4	2.2	1.90	1.11	2.11	7	14	10	7.1
	DRL80S	6.5	2.96	2.71	1.22	2.40	10	25	11.5	14.9
	DRL80M4	9.5	4	3.65	1.52	2.60	14	30	15.2	21.5
	DRL90L4	15	6.6	5.67	3.02	2.65	25	46	22.5	43.5
	DRL100L4	26	11.4	11.00	3.66	2.36	40	85	30	68
	DRL132S4	42	17.8	16.9	5.75	2.49	80	150	45.5	190
	DRL132MC4	56	24.9	21.9	10.6	2.56	130	200	65	340
	DRL160M4	85	35	33.5	11.1	2.54	165	280	93	450
	DRL160MC4	90	36	32.3	14.0	2.78	185	320	95	590
	DRL180S	120	47.5	45.6	14.8	2.63	210	380	122	900
	DRL180M4	135	52	50.1	15.7	2.70	250	430	143	1110
	DRL180L4	165	63	61.3	20.2	2.69	320	520	154	1300
	DRL180LC4	175	72	65.7	24.1	2.66	420	600	163	1680
	DRL200S	200	80.6	78.4	25.0	2.55	475	680	260	2360
	DRL225S4	245	97	92	32.2	2.66	520	770	295	2930
	DRL225MC4	280	130	114	43.9	2.45	770	1100	330	4330
2100	DRL71S4	2.6	2	1.70	1.08	1.53	5	8.5	8.6	4.9
	DRL71M4	3.8	2.7	2.25	1.39	1.69	7	14	10	7.1
	DRL80S	6.2	3.59	3.22	1.52	1.92	10	25	11.5	14.9
	DRL80M4	9.5	5	4.60	1.91	2.07	14	30	15.2	21.5
	DRL90L4	15	8.4	7.21	3.84	2.08	25	46	22.5	43.5
	DRL100L4	25	14	13.4	4.63	1.87	40	85	30	68
	DRL132S4	41	21.4	20.3	7.07	2.02	80	150	45.5	190
	DRL132MC4	52	28.8	25.0	13.0	2.08	130	200	65	340
	DRL160M4	85	44	42.1	14.0	2.02	165	280	93	450
	DRL160MC4	88	48	42.8	18.9	2.06	185	320	95	590
	DRL180S	110	55.3	52.7	18.7	2.09	210	380	122	900
	DRL180M4	130	64	60.4	19.6	2.15	250	430	143	1110
	DRL180L4	160	78	75.8	25.8	2.11	320	520	154	1300
	DRL180LC4	170	87	79.1	29.8	2.15	420	600	163	1680
	DRL200L	195	99	94.6	30.9	2.06	475	680	260	2360
	DRL225S4	235	119	111	40.6	2.11	520	770	295	2930
	DRL225MC4	265	142	125	50.8	2.12	770	1100	330	4330

n_N	Motor type	M_N Nm	I_N A	BE..	M_B Dyn1 Nm	M_B Dyn2 Nm	m_B kg[1)]	J_{Mot_BE} 10^{-4} kgm^2
1200	**DRL71S4**	2.7	1.18	BE05	5	5	11	6,2
	DRL71M4	4	1.6	BE1	7	10	12,6	8,4
	DRL80S	6.5	2.15	BE2	10	20	15.2	19.4
	DRL80M4	9.5	2.9	BE2	14	20	18,9	26
	DRL90L4	15	4.8	BE5	20	40	28,5	49,5
	DRL100L4	26	8.5	BE5	40	55	36	74
	DRL132S4	42	12.6	BE11	80	110	60	200
	DRL132MC4	56	17.6	BE11	110	110	79	355
	DRL160M4	85	25.5	BE20	150	200	120	500
	DRL160MC4	90	28	BE20	150	200	122	640
	DRL180S	120	34.5	BE30	200	300	162	1030
	DRL180M4	135	38	BE30	200	300	183	1250
	DRL180L4	165	47	BE30	300	300	194	1440
	DRL180LC4	175	52	BE32	400	400	210	1910
	DRL200L	200	58.5	BE32	400	600	315	2590
	DRL225S4	250	72	BE32	500	500	350	3160
	DRL225MC4	290	89	BE32	600	600	385	4560
1700	**DRL71S4**	2.7	1.63	BE05	5	5	11	6,2
	DRL71M4	4	2.2	BE1	7	10	12,6	8,4
	DRL80S	6.5	2.96	BE2	10	20	15.2	19.4
	DRL80M4	9.5	4	BE2	14	20	18,9	26
	DRL90L4	15	6.6	BE5	20	40	28,5	49,5
	DRL100L4	26	11.4	BE5	40	55	36	74
	DRL132S4	42	17.8	BE11	80	110	60	200
	DRL132MC4	56	24.9	BE11	110	110	79	355
	DRL160M4	85	35	BE20	150	200	120	500
	DRL160MC4	90	36	BE20	150	200	122	640
	DRL180S	120	47.5	BE30	200	300	162	1030
	DRL180M4	135	52	BE30	200	300	183	1250
	DRL180L4	165	63	BE30	300	300	194	1440
	DRL180LC4	175	72	BE32	400	400	210	1910
	DRL200S	200	80.6	BE32	400	600	315	2590
	DRL225S4	245	97	BE32	500	500	350	3160
	DRL225MC4	280	130	BE32	600	600	385	4560
2100	**DRL71S4**	2.6	2	BE05	5	5	11	6,2
	DRL71M4	3.8	2.7	BE1	7	10	12,6	8,4
	DRL80S	6.2	3.59	BE2	10	20	15.2	19.4
	DRL80M4	9.5	5	BE2	14	20	18,9	26
	DRL90L4	15	8.4	BE5	20	40	28,5	49,5
	DRL100L4	25	14	BE5	40	55	36	74
	DRL132S4	41	21.4	BE11	80	110	60	200
	DRL132MC4	52	28.8	BE11	110	110	79	355
	DRL160M4	85	44	BE20	150	200	120	500
	DRL160MC4	88	48	BE20	150	200	122	640
	DRL180S	110	55.3	BE30	200	300	162	1030
	DRL180M4	130	64	BE30	200	300	183	1250
	DRL180L4	160	78	BE30	300	300	194	1440
	DRL180LC4	170	87	BE32	400	400	210	1910
	DRL200L	195	99	BE32	400	600	315	2590
	DRL225S4	235	119	BE32	500	500	350	3160
	DRL225MC4	265	142	BE32	600	600	385	4560

1) Applies to foot-mounted motor with brake (DRL...BE../FI..)

n_N	Motor type	M_N Nm	I_N A	I_{q_n} A	I_{d_n} A	k_T Nm/A	M_{pk} Dyn1 Nm	M_{pk} Dyn2 Nm	m kg	J_{Mot} 10^{-4} kgm^2
3000	**DRL71S4**	2.5	2.68	2.26	1.49	1.11	5	8.5	8.6	4.9
	DRL71M4	3.6	3.55	2.96	1.93	1.21	7	14	10	7.1
	DRL80S	6	4.82	4.32	2.10	1.39	10	25	11.5	14.9
	DRL80M4	8.8	6.5	5.86	2.63	1.50	14	30	15.2	21.5
	DRL90L4	14	11	9.19	5.25	1.52	25	46	22.5	43.5
	DRL100L4	21	16.6	15.4	6.35	1.36	40	85	30	68
	DRL132S4	35	25.5	24.4	10.0	1.43	80	150	45.5	190
	DRL132MC4	42	34.8	28.4	18.4	1.48	130	200	65	340
	DRL160M4	79	57	53.9	19.3	1.47	165	280	93	450
	DRL160MC4	83	59	51.8	24.3	1.60	185	320	95	590
	DRL180S	100	70.1	65.9	25.7	1.52	210	380	122	900
	DRL180M4	105	73	67.6	27.2	1.55	250	430	143	1110
	DRL180L4	130	90	83.8	35.0	1.55	320	520	154	1300
	DRL180LC4	140	105	91	41.8	1.53	420	600	163	1680
	DRL200S	165	118	112	43.3	1.47	475	680	260	2360
	DRL225S4	195	139	127	56.0	1.53	520	770	295	2930
	DRL225MC4	220	188	156	76	1.41	770	1100	330	4330

n_N	Motor type	M_N Nm	I_N A	BE..	M_B Dyn1 Nm	M_B Dyn2 Nm	m_B kg[1)]	J_{Mot_BE} 10^{-4} kgm^2
3000	**DRL71S4**	2.5	2.68	BE05	5	5	11	6,2
	DRL71M4	3.6	3.55	BE1	7	10	12,6	8,4
	DRL80S	6	4.82	BE2	10	20	15.2	19.4
	DRL80M4	8.8	6.5	BE2	14	20	18,9	26
	DRL90L4	14	11	BE5	20	40	28,5	49,5
	DRL100L4	21	16.6	BE5	40	55	36	74
	DRL132S4	35	25.5	BE11	80	110	60	200
	DRL132MC4	42	34.8	BE11	110	110	79	355
	DRL160M4	79	57	BE20	150	200	120	500
	DRL160MC4	83	59	BE20	150	200	122	640
	DRL180S	100	70.1	BE30	200	300	162	1030
	DRL180M4	105	73	BE30	200	300	183	1250
	DRL180L4	130	90	BE30	300	300	194	1440
	DRL180LC4	140	105	BE32	400	400	210	1910
	DRL200S	165	118	BE32	400	600	315	2590
	DRL225S4	195	139	BE32	500	500	350	3160
	DRL225MC4	220	188	BE32	600	600	385	4560

1) Applies to foot-mounted motor with brake (DRL...BE../FI..)

6.3 Non-SEW motors

MOVIAXIS® can basically operate any asynchronous or synchronous servomotor with feedback. Depending on the motor and the specific application, startup can be performed on site using the startup function for non-SEW motors that is integrated in MotionStudio.

For more complex applications (e.g. asynchronous motors), SEW-EURODRIVE offers to measure non-SEW motors and create a startup file for them (which is then integrated in the SEW motor data base) subject to charge.

6.3.1 Permissible encoder interfaces

MOVIAXIS® supports the following interfaces, which can be used to operate non-SEW encoder systems in general.

Note: Non-SEW encoders must not be operated without approval by or consultation with SEW-EURODRIVE. Failure to do so will void any product liability and warranty claims.

1. Hiperface® interfaces
   A According to the Hiperface® specification of the company SICK STEGMANN
2. SinCos encoder
   A Voltage 1 Vss
   B
   C
3. TTL encoders
   A Specification to RS422, 5 V TTL level
4. Resolver
   A Number of poles: 2 - 12 pole pairs
   B Transmission ratio: 0.5
   C Voltage:
   D Frequency:

6.3.2 Special motors/torque motors

Torque motors of all types (ring, built-in, separate housing) can be operated with MOVIAXIS®.

Stepper motors and reluctance motors cannot be operated.

Please contact SEW-EURODRIVE if you want to operate linear motors without iron.

Classic linear motors (with iron core/independent of the mounting position) can be operated.

7 Additional System Components

7.1 Suitable encoder systems

Manufacturer	Designation	Interface	Comment	Units
SEW	AF1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AG7W	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AK0H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AK1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AL1H	Hiperface	LINEAR	MDN, XGH, XGS,
SEW	AS0H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS1H AV1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS3H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS4H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS7H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AS7W	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AV1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AV6H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	AV7W	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	EF1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	EK0H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	EK1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES0H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES1H ES2H EV1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES2H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES3H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES4H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	ES7H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	EV1H	Hiperface	ROTATIONAL	MDN, XGH, XGS,
SEW	RH1L	Resolver	ROTATIONAL	MDN,
SEW	RH1M	Resolver	ROTATIONAL	MDN,
SEW	EG7S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1S ES1S ES2S EV1S EV2S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EH7S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	ES1S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	ES2S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	ES7S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EV1S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EV2S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	EV7S	SIN/COS	ROTATIONAL	MDN, XGH, XGS,
SEW	AH7Y	SSI	ROTATIONAL	XGS,
SEW	AG7Y	SSI combo	ROTATIONAL	XGS,
SEW	AS7Y	SSI combo	ROTATIONAL	XGS,
SEW	AV1Y	SSI combo	ROTATIONAL	XGS,
SEW	AV2Y	SSI combo	ROTATIONAL	XGS,
SEW	AV7Y	SSI combo	ROTATIONAL	XGS,
SEW	EG7C	TTL	ROTATIONAL	MDN, XGH, XGS,

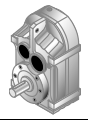
Manufacturer	Designation	Interface	Comment	Units
SEW	EG7R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EG7T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1R EH1T ESxR ESxT EVxR EVxT	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH1T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH7C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH7R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EH7T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EI71	TTL	ROTATIONAL	
SEW	EI72	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EI76	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EI7C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES1R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES1T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES2R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES2T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES7C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	ES7R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV1C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV1R:	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV1T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV2R	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV2T	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV7C	TTL	ROTATIONAL	MDN, XGH, XGS,
SEW	EV7R	TTL	ROTATIONAL	MDN, XGH, XGS,
Balluff	BTL5-S112-Mxxxx-P-xxx	SSI	LINEAR	XGS,
Balluff	BTL5-S112B-Mxxxx-P-xxx	SSI	LINEAR	XGS,
Elgo	LIMAX2	SSI	LINEAR	XGS,
Heidenhain	ECN113	EnDat2.1	ROTATIONAL	XGH, XGS,
Heidenhain	ECN1313	EnDat2.1	ROTATIONAL	XGH, XGS,
Heidenhain	EQN1125	EnDat2.1	ROTATIONAL	XGH, XGS,
Heidenhain	EQN1325	EnDat2.1	ROTATIONAL	XGH, XGS,
Heidenhain	EQN425	EnDat2.1	ROTATIONAL	XGH, XGS,
Heidenhain	ROQ424	SSI combo	ROTATIONAL	XGS,
Hübner	HMG161 S24 H2048	SSI	ROTATIONAL	XGS,
Hübner	AMG73 S24 S2048	SSI combo	ROTATIONAL	XGS,
Hübner	AMG83 S24 S2048	SSI combo	ROTATIONAL	XGS,
IVO	GM 401	SSI	ROTATIONAL	XGS,
Kuebler	Kueb 9081xxxx2003	SSI	ROTATIONAL	XGS,
Kuebler	Kueb 9081xxxx2004	SSI	ROTATIONAL	XGS,
Leuze	AMS 200/xxx-11-x	SSI	LINEAR	XGS,
Leuze	BPS 37	SSI	LINEAR	XGS,
Leuze	OMS1 0,1mm	SSI	LINEAR	XGS,
Leuze	OMS1 1mm	SSI	LINEAR	XGS,
Leuze	OMS2 0,1mm	SSI	LINEAR	XGS,
MTS Sensors	RD4 0.005 mm	SSI	LINEAR	XGS,

Manufacturer	Designation	Interface	Comment	Units
MTS Sensors	RF 0.005 mm	SSI	LINEAR	XGS,
MTS Sensors	RH 0.005 mm	SSI	LINEAR	XGS,
MTS Sensors	RP 0.005 mm	SSI	LINEAR	XGS,
Pepperl+Fuchs	WCS3B LS410	CANopen	LINEAR	
Pepperl+Fuchs	VDM100-150 0.1 mm	SSI	LINEAR	XGS,
Pepperl+Fuchs	VDM100-150 1mm	SSI	LINEAR	XGS,
Pepperl+Fuchs	WCS2(A)-LS311	SSI	LINEAR	XGS,
Pepperl+Fuchs	WCS3(A)-LS311	SSI	LINEAR	XGS,
Pepperl+Fuchs	WCS3B-LS311	SSI	LINEAR	XGS,
Pepperl+Fuchs	AVM58X-1212	SSI combo	ROTATIONAL	XGS,
Sick	DME4000-x19 0.1 mm	CANopen	LINEAR	
Sick	DME4000-x19 1mm	CANopen	LINEAR	
Sick	DME4000-x17	Hiperface	LINEAR	MDN, XGH, XGS,
Sick	DME5000-x17	Hiperface	LINEAR	MDN, XGH, XGS,
Sick	DME3000-x11	SSI	LINEAR	XGS,
Sick	DME4000-x11 0,1mm	SSI	LINEAR	XGS,
Sick	DME4000-x11 1mm	SSI	LINEAR	XGS,
Sick	DME5000-x11 0,1mm	SSI	LINEAR	XGS,
Sick	DME5000-x11 1mm	SSI	LINEAR	XGS,
Sick/Stegmann	LinCoder L 230	Hiperface	LINEAR	MDN, XGH, XGS,
Sick/Stegmann	SKM 36	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SKS 36	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRM 50	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRM 60	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRM 64	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRS 50	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRS 60	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Sick/Stegmann	SRS 64	Hiperface	ROTATIONAL	MDN, XGH, XGS,
Stegmann	AG 100 MSSI	SSI	ROTATIONAL	XGS,
Stegmann	AG 626	SSI	ROTATIONAL	XGS,
Stegmann	ARS60	SSI	ROTATIONAL	XGS,
Stegmann	ATM60	SSI	ROTATIONAL	XGS,
Stegmann	ATM90	SSI	ROTATIONAL	XGS,
Stegmann	POMUX KH53	SSI	LINEAR	XGS,
TR Electronic	CE 58M	CANopen	ROTATIONAL	
TR Electronic	LE200	CANopen	LINEAR	
TR Electronic	CE 58M	SSI	ROTATIONAL	XGS,
TR Electronic	CE 65M	SSI	ROTATIONAL	XGS,
TR Electronic	LA41K	SSI	LINEAR	XGS,
TR Electronic	LE100 0.1 mm	SSI	LINEAR	XGS,
TR Electronic	LE100 1mm	SSI	LINEAR	XGS,
TR Electronic	LE200 0.1 mm	SSI	LINEAR	XGS,
Visolux	EDM	SSI	LINEAR	XGS,

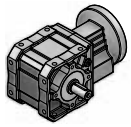
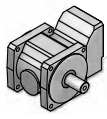
7.2 Gear units from SEW-EURODRIVE

All gear units from SEW-EURODRIVE can be mounted directly to the synchronous and asynchronous SEW servomotors.

7.2.1 Axially parallel gear units

Gear unit type		RX..	R..	F..	PS.C..	PS.F..
Technical data						
Peak torque	M_{apk} Nm	54-1150	46-4360	130-8860	37-427	26-4200
Max. continuous torque	M_{amax} Nm	36-830	31-4300	87-7840	29-347	20-3000
Max. input speed	n_{epk} rpm	Up to 4500	Up to 4500	Up to 4500	Up to 7000	Up to 8000
Peak overhung load	F_{rapk} N	3970-30000	1220-32100	4500-65000	2000-11000	1900-83000
Gear ratio range	i	1.3-8.23	3.21-216.28	3.77-276.77	3-100	3-100
Option with red. backlash	/R	x	x	x	-	x
Option with min. backlash	/M	-	-	-	-	x
Mechanical data						
Hollow shaft		-	-	x	-	-
Flange mounting		x	x	x	x	x
Foot mounting		x	x	-	-	-
Flange block		-	-	-	-	x
B5 flange		x	x	x	x	x
B14 flange		-	x	x	x	-

7.2.2 Right-angle gear units

Gear unit type		K..	S..	W.7	BS.F..	
Technical data						
Peak torque	M_{apk} Nm	187-9090	60-655	91-270	51-1910	
Max. continuous torque	M_{amax} Nm	125-8000	43-480	70-180	40-1500	
Max. input speed	n_{epk} rpm	4500	4500	4500	4500	
Peak overhung load	F_{rapk} N	5140-65000	300-12000	2950-7600	2380-36000	
Gear ratio range	i	3.98-176.05	6.8-75.06	3.2- 74.98	3-40	
Option with red. backlash	/R	x	x	-	x	
Option with min. backlash	/M	-	-	-	-	
Mechanical data						
Hollow shaft		x	x	x	x	
Flange mounting		x	x	x	x	
Foot mounting		x	x	x	x	
Flange block		-	-	-	x	
B5 flange		x	x	x	x	
B14 flange		x	x	-	-	

7.3 MOVI-PLC®, MOVI-PLC® I/O

MOVI-PLC® is a series of controllers available from SEW-EURODRIVE. MOVI-PLC® can be programmed by users according to IEC 61131-3 and PLCopen.

7.3.1 Freely programmable motion and logic controller (MOVI-PLC®)

The controller can be operated as freely programmable motion and logic controller MOVI-PLC® when using SD cards of the type OMH41B. MOVI-PLC® is a series of programmable motion and logic controllers. It allows drive solutions, logic processes and sequence controls to be automated simply and efficiently using IEC 61131-3 compliant programming languages.

- MOVI-PLC® is a **universal** solution because it is able to control the entire portfolio of SEW inverters and offers a simple upgrade to a more powerful MOVI-PLC® variant, thanks to its universal execution of the programs.
- MOVI-PLC® is **scalable** due to several different hardware platforms (advanced, etc.) and modular software concepts (libraries for numerous applications).
- MOVI-PLC® is **powerful** due to extensive technologies (such as electronic cam, synchronous operation) and the control of demanding applications (such as material handling).

MOVI-PLC® advanced performance class

- The DH.41B controller is characterized by a greater variety of interfaces and a higher performance level, which allows complex calculations and interpolated movements, for example. The DH.41B option is therefore suitable for the automation of cells and machines. The integrated Ethernet interface enables direct connection of the DH.41B controller to the control level.

7.3.2 Configurable application controller (CCU)

The controller can be used as configurable application controller (CCU) by using SD cards of the type OMC41B. Only standardized application modules created by SEW-EURODRIVE can be executed. The application modules can be started up quickly and conveniently by graphical configuration. A defined process data interface provides this functionality to a higher-level controller. A process data monitor with control mode is available to support the startup procedure.

CCU advanced performance class

The "CCU advanced" performance class is intended for application modules with single-axis and multi-axis functionality and fast response times. The following application modules are available:

- Single-axis functionality:
  - Speed specification
  - Cam positioning
  - Bus positioning with 6 process data words
  - Single-axis universal module
- Multi-axis functionality:
  - SyncCrane
  - Energy-efficient SRS

8 Appendix

8.1 Additional documentation from SEW-EURODRIVE

For further information about MOVIAXIS®, refer to the following documentation:

- "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions
- "Supply and regenerative module" manual
- "MOVIAXIS® Technology Functions" manual
- "Functional Safety" manual
- "Technology Editor for Single-Axis Positioning" manual

For additional information, refer to the following documentation:

- "Synchronous Servomotors" catalog: CMP40 – CMP100, CMPZ71 – CMPZ100, CFM71 – CFM112
- "Synchronous servo gearmotors" catalog: CMP and CFM servomotors in combination with BSF, PSF, PSC, R, F, K, S, W gear units
- "AC Motors" catalog: DRL71 – DRL225MC, DRS, DRE, DRP
- "AC Motors" manual: DRL motor-inverter assignments, dynamic and thermal limit characteristic curves of the DRL motors
- "DOP11B Operator Terminals" system manual
- "MOVI-PLC® advanced DH.41B Controller" manual
- "MOVI-PLC® I/O System" manual

For the complete range of available documentation, go to our website at www.sew-eurodrive.de.

8.2 Disposal of MOVIAXIS® units

Please dispose of MOVIAXIS® units according to their material properties and in line with applicable regulations.

8.3 Cable dimensions to AWG

AWG stands for **A**merican **W**ire **G**auge and refers to the size of the wires. This number specifies the diameter or cross section of a wire in code. This type of cable designation is usually only used in the USA. However, the designations can also be seen in catalogs or data sheets in Europe.

AWG designation	Cross section in mm^2
000000 (6/0)	185
00000 (5/0)	150
0000 (4/0)	120
000 (3/0)	90
00 (2/0)	70
0 (1/0)	50
1	50
2	35
3	25
4	25
5	16
6	16
7	10
8	10
9	6
10	6
11	4
12	4
13	2.5
14	2.5
15	2.5
16	1.5
16	1
18	1
19	0.75
20	0.5
21	0.5
22	0.34
23	0.25
24	0.2