MOVIDRIVE® *compact*

Edition

04/2002

System Manual

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SEW-EURODRIVE

     

1
2
3
4
5
6
7
8
9
10
11
12
13
14

1 Important Notes

Safety and warning instructions

Always follow the safety and warning instructions contained in this publication!

Electrical hazard
Possible consequences: Severe or fatal injuries.

Hazard
Possible consequences: Severe or fatal injuries.

Hazardous situation
Possible consequences: Slight or minor injuries.

Harmful situation
Possible consequences: Damage to the unit and the environment.

Tips and useful information.

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that you adhere to the information in the **operating instructions**. Consequently, **read the operating instructions** before you start working with the unit!

The **operating instructions** contain **important information about servicing**; as a result, they should be kept **in the vicinity of the unit**.

Designated use

MOVIDRIVE® *compact* drive inverters are intended for use in industrial and commercial systems for the operation of AC asynchronous motors or permanent-field AC synchronous motors. These motors must be suitable for operation with frequency inverters. No other loads may be connected to the units.

MOVIDRIVE® *compact* drive inverters are units intended for stationary installation in switch cabinets. Observe all instructions referring to the technical data and the permitted conditions where the unit is operated.

Do not start up the unit (take into operation in the designated fashion) until you have established that the machine complies with the EMC Directive 89/336/EEC and that the conformity of the end product has been determined in accordance with the Machinery Directive 89/392/EEC (with reference to EN 60204).

Application environment

The following uses are forbidden unless measures are expressly taken to make them possible:

- Use in explosion-proof areas
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications which are subject to mechanical vibration and shock loads in excess of the requirement in EN 50178

Safety functions

MOVIDRIVE® *compact* drive inverters are not allowed to perform any safety functions unless the inverters are monitored by other safety systems.

Use superordinate safety systems to guarantee the protection of machinery and people.

Waste disposal

Please follow the current instructions: Dispose in accordance with the material structure and the regulations in force, for instance as:

- Electronics scrap (printed-circuit boards)
- Plastic (housing)
- Sheet metal
- Copper

etc.

2 System Description

2.1 Overview of the system

Power components

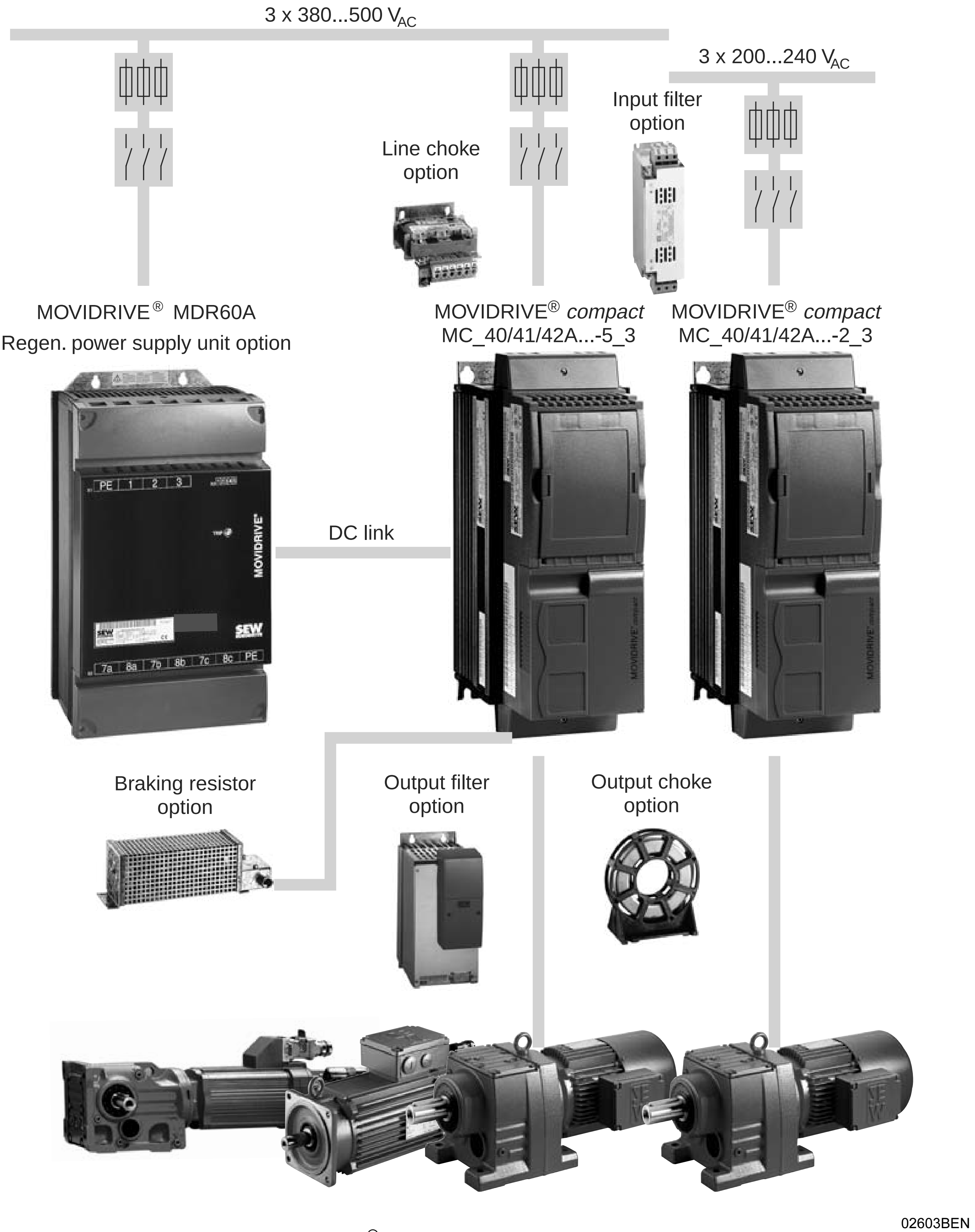

Figure 1: Overview of the system, MOVIDRIVE® compact MC_4_A power components

Communications components

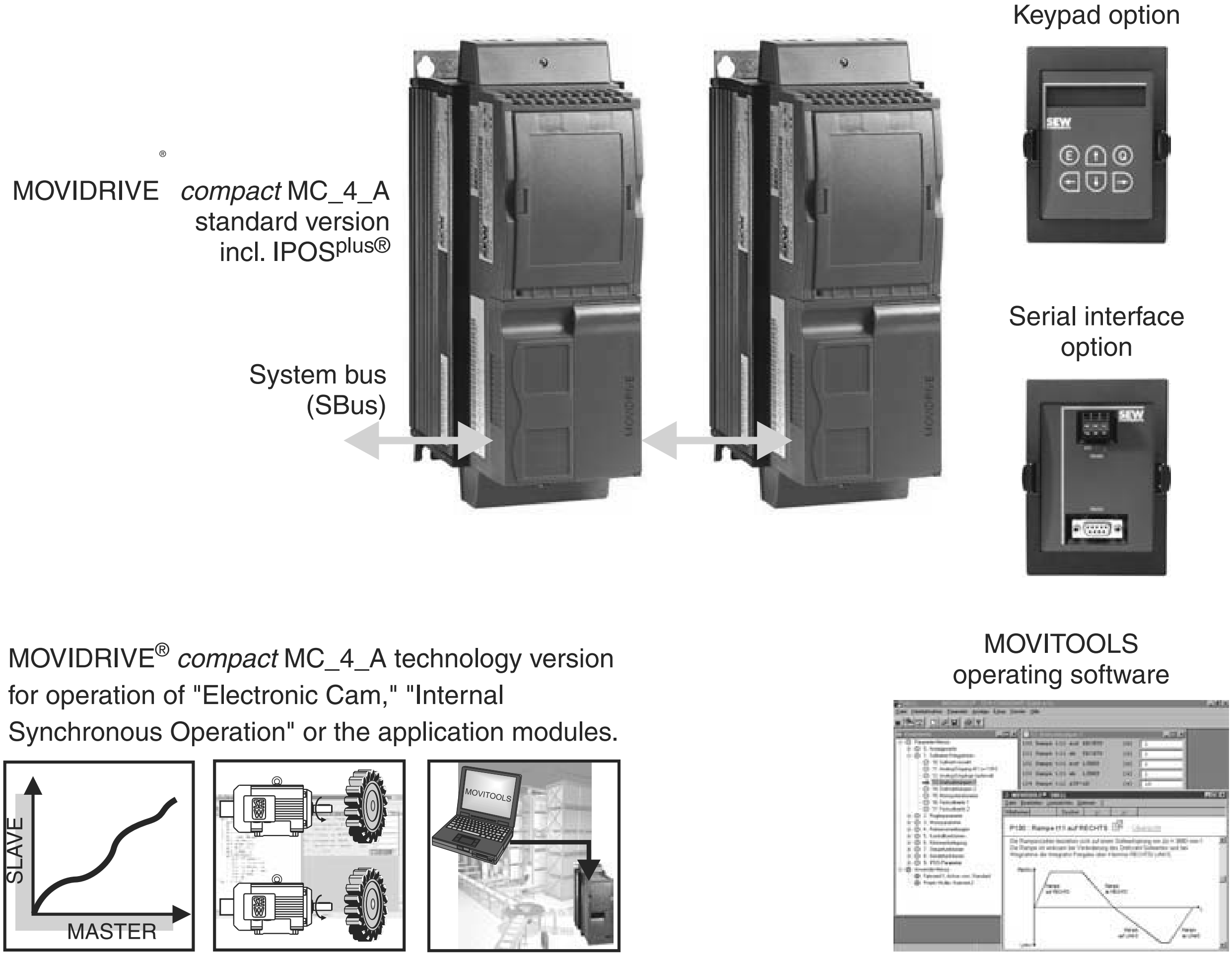

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Figure 2: Overview of the system, MOVIDRIVE® compact MC_4_A communications components

General description

MOVIDRIVE® *compact* is the term for compact and high-performance drive inverters from SEW. MOVIDRIVE® *compact* units are precisely tailored to your requirements. You can use them for AC drives in the power range from 1.5 to 90 kW (2.0 to 120 HP). They satisfy the most exacting requirements for dynamic properties and control quality thanks to the most modern inverter technology combined with tried-and-tested SEW control processes.

Range of units

The **MOVIDRIVE® *compact*** range of units includes four series:

- MOVIDRIVE® *compact* MCF: Drive inverter for asynchronous AC motors without encoder feedback, VFC control mode
- MOVIDRIVE® *compact* MCV: Drive inverter for asynchronous AC motors with encoder feedback, either VFC or CFC control mode.
- MOVIDRIVE® *compact* MCS: Drive inverter for synchronous servo motors with resolver, CFC control mode.
- MOVIDRIVE® *compact* MCH: Drive inverter for asynchronous AC motors, asynchronous servo motors or synchronous servo motors. Encoder feedback with Hiperface encoder, sin/cos encoder or TTL sensor.

Unit variants

The MCF, MCV and MCS series are available in two variants:

- **MCF/MCV/MCS40A:** Control via binary inputs and setpoint selection via analog setpoint input.
- **MCF/MCV/MCS41A:** Control either via PROFIBUS interface or binary inputs. Setpoint selection via PROFIBUS-DP interface.

The MCH series is available in three variants:

- **MCH40A:** Control via binary inputs and setpoint selection via analog setpoint input.
- **MCH41A:** Control either via PROFIBUS interface or binary inputs. Setpoint selection via PROFIBUS-DP interface.
- **MCH42A:** Control either via INTERBUS FO interface or binary inputs. Setpoint selection via INTERBUS FO interface.

Unit versions

MOVIDRIVE® *compact* drive inverters are each available in two versions, namely the standard version and the technology version.

Standard version

As standard, the units are equipped with the IPOS^plus® integrated positioning and sequence control system. They can also be expanded with the available options.

The standard version is indicated by the '00' digits at the end of the unit designation.

Technology version

In addition to the features of the standard version, these units include the technology functions of 'electronic cam' and 'internal synchronous operation'. Furthermore, you can use all the application modules available in the MOVITOOLS software package with the units in technology version.

The technology version is indicated by the '0T' characters at the end of the unit designation.

Overview of the series and versions

The following table presents an overview of the series and versions:

	Without encoder input	With encoder input for sin/cos and incremental encoders	With resolver input	With encoder input for Hiperface, sin/cos and incremental encoders
Without fieldbus	MCF40A	MCV40A	MCS40A	MCH40A
With PROFIBUS-DP	MCF41A	MCV41A	MCS41A	MCH41A
With INTERBUS FO	-	-	-	MCH42A

Control mode

VFC (Voltage Flux Control) and CFC (Current Flux Control) control modes are features of MOVIDRIVE® *compact* drive inverters. Continuous calculation of the complete motor model forms the basis for both control modes.

VFC (Voltage Flux Control) control mode	CFC (Current Flux Control) control mode
Voltage-controlled control mode for AC asynchronous motors with and without encoder feedback. • With encoder feedback –At least 150% torque, even with the motor stopped –Servo-like characteristics • Without encoder feedback –At least 150 % torque up to 0.5 Hz	Current-controlled control mode for AC asynchronous motors and permanent-field AC servomotors. Encoder feedback is always required. • At least 160 % torque, even with the motor stopped • Maximum precision and concentric running characteristics right down to standstill • Servo characteristics and torque control even for asynchronous AC motors • Reacts to load changes within a few milliseconds

System bus (SBus)

The system bus (SBus) is available as standard. It permits several MOVIDRIVE® drive inverters to be networked together. As a result, data can be exchanged rapidly between the units. MOVILINK® is the uniform SEW unit profile used for communication via the SBus.

MOVILINK®

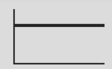
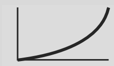
MOVILINK® means the same message structure is always used, regardless of the interface selected (SBus, RS-232, RS-485, fieldbus interfaces). As a result, the control software is independent of the selected interface.

IPOSplus®

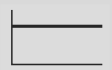
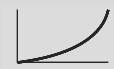
A significant feature of MOVIDRIVE® drive inverters is that the IPOSplus® positioning and sequence control system is integrated as standard. IPOSplus® enables you to control sequences of motion directly in the inverter, right on the plant floor. This concept takes the load off the master controller and allows modular concepts to be implemented more easily.

The units at a glance

MOVIDRIVE® compact for 3 × 380 500 V_{AC} supply voltage (400/500 V units):

Recommended motor power (VFC) (at V_{in} = 3 × 400 V_{AC})		**Continuous output current**	**MOVIDRIVE® *compact* type**				**Size**
		**(CFC)**	**MCF4_A Asynchronous without encoder**	**MCV4_A Asynchronous with encoder**	**MCS4_A Synchronous with resolver**	**MCH42A Asynchronous/ synchronous with encoder**	**(Techn. data)**
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	4.0 A_{AC}	0015-5A3-4-..	0015-5A3-4-..	0015-5A3-4-..	0015-5A3-4-..	1 (→ page 22)
2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	5.5 A_{AC}	0022-5A3-4-..	0022-5A3-4-..	0022-5A3-4-..	0022-5A3-4-..	
3.0 kW (4.0 HP)	4.0 kW (5.0 HP)	7.0 A_{AC}	0030-5A3-4-..	0030-5A3-4-..	0030-5A3-4-..	0030-5A3-4-..	
4.0 kW (5.0 HP)	5.5 kW (7.5 HP)	9.5 A_{AC}	0040-5A3-4-..	0040-5A3-4-..	0040-5A3-4-..	0040-5A3-4-..	
5.5 kW (7.5 HP)	7.5 kW (10 HP)	12.5 A_{AC}	0055-5A3-4-..	0055-5A3-4-..	0055-5A3-4-..	0055-5A3-4-..	2 (→ page 24)
7.5 kW (10 HP)	11 kW (15 HP)	16 A_{AC}	0075-5A3-4-..	0075-5A3-4-..	0075-5A3-4-..	0075-5A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	24 A_{AC}	0110-5A3-4-..	0110-5A3-4-..	0110-5A3-4-..	0110-5A3-4-..	
15 kW (20 HP)	22 kW (30 HP)	32 A_{AC}	0150-503-4-..	0150-503-4-..	0150-503-4-..	0150-503-4-..	3 (→ page 26)
22 kW (30 HP)	30 kW (40 HP)	46 A_{AC}	0220-503-4-..	0220-503-4-..	0220-503-4-..	0220-503-4-..	
30 kW (40 HP)	37 kW (50 HP)	60 A_{AC}	0300-503-4-..	0300-503-4-..	0300-503-4-..	0300-503-4-..	
37 kW (50 HP)	45 kW (60 HP)	73 A_{AC}	0370-503-4-..	0370-503-4-..	0370-503-4-..	0370-503-4-..	4 (→ page 28)
45 kW (60 HP)	55 kW (75 HP)	89 A_{AC}	0450-503-4-..	0450-503-4-..	0450-503-4-..	0450-503-4-..	
55 kW (75 HP)	75 kW (100 HP)	105 A_{AC}	0550-503-4-..	0550-503-4-..	0550-503-4-..	0550-503-4-..	5 (→ page 30)
75 kW (100 HP)	90 kW (120 HP)	130 A_{AC}	0750-503-4-..	0750-503-4-..	0750-503-4-..	0750-503-4-..	

MOVIDRIVE® compact for 3 × 200 240 V_{AC} supply voltage (230 V units):

Recommended motor power (VFC) (at V_{in} = 3 × 230 V_{AC})		**Continuous output current**	**MOVIDRIVE® *compact* type**				**Size**
		**(CFC)**	**MCF4_A Asynchronous without encoder**	**MCV4_A Asynchronous with encoder**	**MCS4_A Synchronous with resolver**	**MCH42A Asynchronous/ synchronous with encoder**	**(Technical data)**
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	7.3 A_{AC}	0015-2A3-4-..	0015-2A3-4-..	0015-2A3-4-..	0015-2A3-4-..	1 (→ page 32)
2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	8.6 A_{AC}	0022-2A3-4-..	0022-2A3-4-..	0022-2A3-4-..	0022-2A3-4-..	
3.7 kW (5.0 HP)	5.0 kW (6.8 HP)	14.5 A_{AC}	0037-2A3-4-..	0037-2A3-4-..	0037-2A3-4-..	0037-2A3-4-..	
5.5 kW (7.5 HP)	7.5 kW (10 HP)	22 A_{AC}	0055-2A3-4-..	0055-2A3-4-..	0055-2A3-4-..	0055-2A3-4-..	2 (→ page 34)
7.5 kW (10 HP)	11 kW (15 HP)	29 A_{AC}	0075-2A3-4-..	0075-2A3-4-..	0075-2A3-4-..	0075-2A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	42 A_{AC}	0110-203-4-..	0110-203-4-..	0110-203-4-..	0110-203-4-..	3 (→ page 36)
15 kW (20 HP)	22 kW (30 HP)	54 A_{AC}	0150-203-4-..	0150-203-4-..	0150-203-4-..	0150-203-4-..	
22 kW (30 HP)	30 kW (40 HP)	80 A_{AC}	0220-203-4-..	0220-203-4-..	0220-203-4-..	0220-203-4-..	4 (→ page 38)
30 kW (40 HP)	37 kW (50 HP)	95 A_{AC}	0300-203-4-..	0300-203-4-..	0300-203-4-..	0300-203-4-..	

MOVIDRIVE® MDR60A regenerative power supply units for 400/500 V units:

Regenerative power supply units[1)]		**MOVIDRIVE® MDR60A**	**Size**
1.5 ... 37 kW (20 ... 50 HP)	I_{in} = 66 A_{AC}, I_{DCL} = 70 A_{DC}	0370-503-00	3
15 ... 75 kW (20 ... 100 HP)	I_{in} = 117 A_{AC}, I_{DCL} = 141 A_{DC}	0750-503-00	4

1) Technical data → 'MDR60A Regenerative Power Supply Unit' manual

Block wiring diagram

The following block wiring diagram shows the configuration principles and theory of operation of MOVIDRIVE® *compact* drive inverters taking the example of the MOVIDRIVE® *compact* MCV41A.

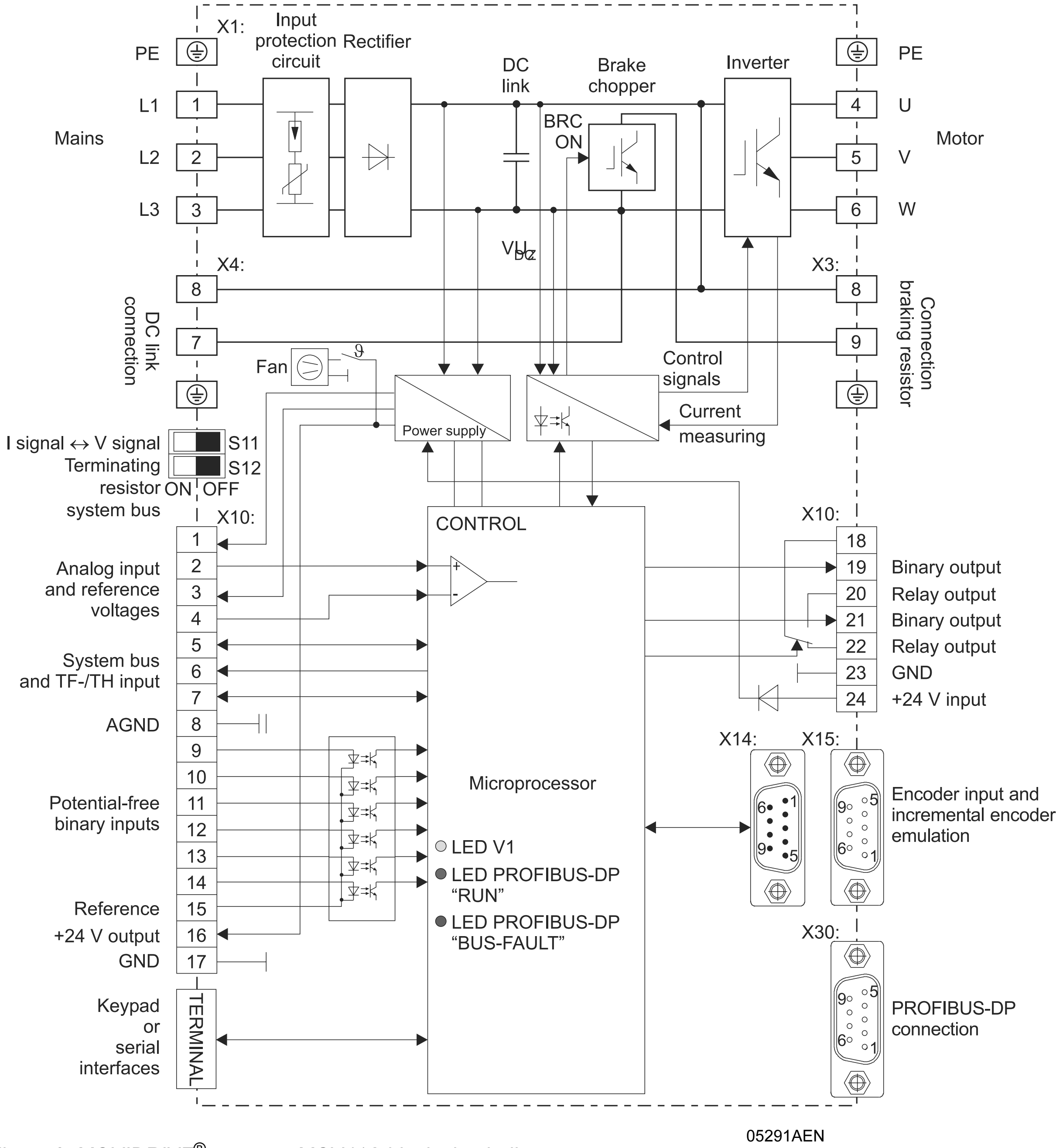


Figure 3: MOVIDRIVE® compact MCV41A block circuit diagram

2.2 Functions / features

Unit properties

- Wide voltage range

  –400/500 V units for the voltage range 3 × 380 ... 500 V_{AC}
  –230 V units for the voltage range 3 × 200 ... 240 V_{AC}
- High overload capacity

  –150 % I_N short-term operation
  –125 % I_N sustained for operation without overload (pumps, fans)
- In VFC mode and at I_N = 100 % permitted ambient temperature up to ϑ = 50° C
- 4Q capability thanks to integrated brake chopper fitted as standard
- Compact unit mounting position for minimum switch cabinet space requirement and optimum utilization of switch cabinet volume
- Integrated input filter fitted as standard in sizes 1 and 2, adherence to class A limit on the input side without any additional measures
- Six isolated binary inputs and three binary outputs, one of which is a relay output, programmable inputs/outputs
- One TF/TH input for the motor protection involving a PTC thermistor or thermocontact
- 3-color LED to display operating and fault states.
- Separate 24 V_{DC} voltage input for powering the inverter electronics (parameter setting, diagnostics and data storage even with the supply system switched off)
- Removable connection unit and, in addition with MOVIDRIVE® *compact* MCH4_A, separable electronics terminals
- Power terminals of size 1 units can be disconnected

Control functions

- VFC or CFC control processes for field-oriented operation (asynchronous servo)
- With MCH4_A: Either asynchronous or synchronous AC motors can be operated.
- IPOS^plus® positioning and sequence control system integrated as standard
- Two complete parameter sets
- Automatic motor calibration
- Automatic brake control by the inverter
- DC braking to decelerate the motor even in 1Q mode
- Slip compensation for high static accuracy of speed, even without encoder feedback
- Flying restart circuit for flying restart of the inverter
- Hoist capability with all motor systems which can be connected
- Motor pull-out protection by sliding current limitation in the field weakening range
- Speed window masking to avoid mechanical resonance ranges
- Heating current to prevent condensation forming in the motor
- Factory settings can be reactivated
- Parameter lock to protect against parameter changes
- Speed controller and encoder input in types MCV (optionally sin/cos encoder, TTL sensor or HTL sensor), MCS (resolver) and MCH (optionally Hiperface encoder, sin/cos encoder or TTL sensor), user-friendly controller setting tool in the user interface

- Protective feature for complete protection of the inverter and motor (short-circuit, overload, overvoltage/undervoltage, ground fault, excess temperature in the inverter, motor pull-out protection, excess temperature in the motor)
- Temperature-controlled power unit fan, i.e. no disruptive fan noise in most cases.
- Speed monitoring and monitoring of the motor and regenerative limit power
- Programmable signal range monitoring (speed, current, maximum current)
- Memory for storing x/t diagrams which can be displayed using the SCOPE process data visualization software (four channels, real-time capable)
- Fault memory (five memory locations) with all relevant operating data at the moment of the fault
- Elapsed-hour counter for ON-hours (unit connected to supply system or 24 V_{DC}) and enable hours (output stage energized)
- Uniform operation, identical parameter setting and the same unit connection technology for the entire MOVIDRIVE® unit series

Setpoint technology

- Ramp switch mode (total of four ramps)
- Motor potentiometer, can be combined with analog setpoint and internal fixed setpoints
- External setpoint selections: 0 ... +10 V, ±10 V, 0 ... 20 mA, 4 ... 20 mA or fieldbus
- S-pattern for jerk-free speed changes
- Programmable input characteristics for flexible setpoint processing
- Six bipolar fixed setpoints which can be mixed with external setpoints and motor potentiometer function

Communication / operation

- System bus for networking up to 64 MOVIDRIVE® units to one another
- PROFIBUS-DP interface (max. 12 Mbaud) in MC_41A and INTERBUS FO interface in MCH42A
- Straightforward startup and parameter setting using keypad or PC

System expansion

- Extensive range of expansion options, for example:

  –Removable plain text keypad with parameter memory
  –RS-232 and RS-485 serial interfaces
  –Braking resistors, input filters, line chokes, output chokes, output filters
- MOVITOOLS software package with SCOPE process data visualization
- Technology version with access to technology functions and application modules for user-friendly application solutions
- MOVIDRIVE® MDR60A regenerative power supply unit

  –Regenerative energy is fed back into the supply system
  –This reduces the thermal load in the switch cabinet and helps to cut costs

Standards / certificates

- UL, cUL and C-Tick approved
- Safe separation of power and electronic connections according to EN 50178
- Compliance with all the requirements for CE certification of machines and plant equipped with MOVIDRIVE® on the basis of the EC Low-voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC. Compliance with EMC product standard EN 61800-3

2.3 Additional functions of the application version

SEW offers additional functions for special applications. You can use these additional functions with MOVIDRIVE® units in technology version (...-0T).

The following additional functions are available:

- Electronic cam
- Internal synchronous operation

Please refer to the 'Electronic Cam' and 'Internal Synchronous Operation' manuals for detailed information about the additional functions. These manuals form part of the 'Technology Version' documentation package available from SEW.

Electronic cam

You can use the MOVIDRIVE® range of units with the 'electronic cam' whenever you need to harmonize complex sequences of motion in cyclical machines. This solution gives you much greater flexibility in comparison to the mechanical cam. As a result, it meets the needs of modern production and processing lines.

A user-friendly cam editor helps you during startup. You can also import existing cam data. You can also set application-specific parameters for the engagement and disengagement phases using the cam editor.

Example

The figure below displays a typical application for the 'electronic cam'. Freshly filled yogurt jars are transported for further processing. The 'electronic cam' makes it possible for movement to take place smoothly, which is an important requirement for this application.

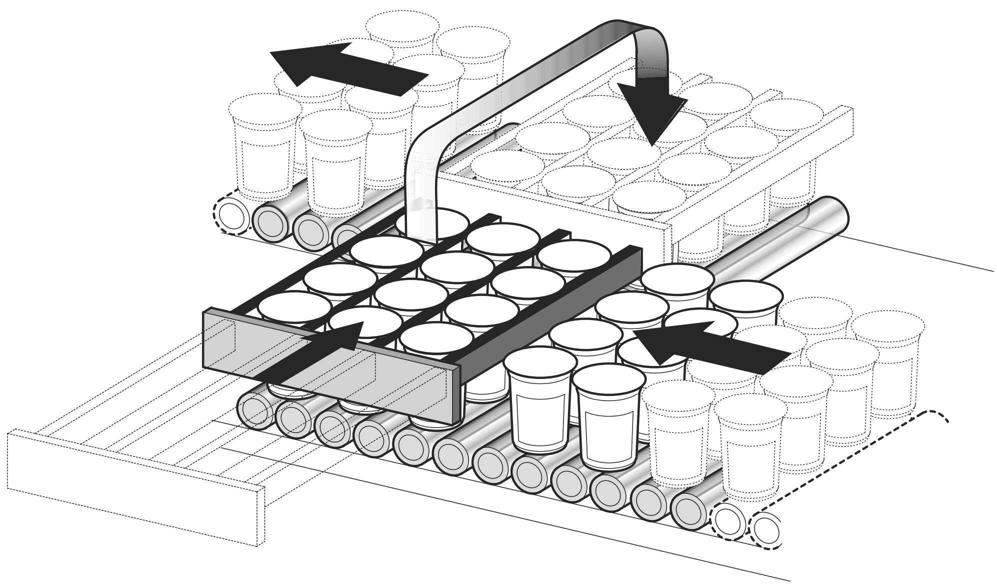


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Figure 4: Typical application for the 'electronic cam'

Internal synchronous operation

You can always use the MOVIDRIVE® range of units with 'internal synchronous operation' whenever a group of motors have to be operated at a synchronous angle in relation to one another or with an adjustable proportional ratio (electronic gear). A user-friendly monitor helps you during startup.

Example

The figure below displays a typical application for the 'internal synchronous operation'. Extruded material has to be cut to length. The saw receives a start signal and synchronizes itself with the extruded material. The saw moves synchronously to the extruded material as it cuts. The saw returns to its starting position at the end of the sawing operation.

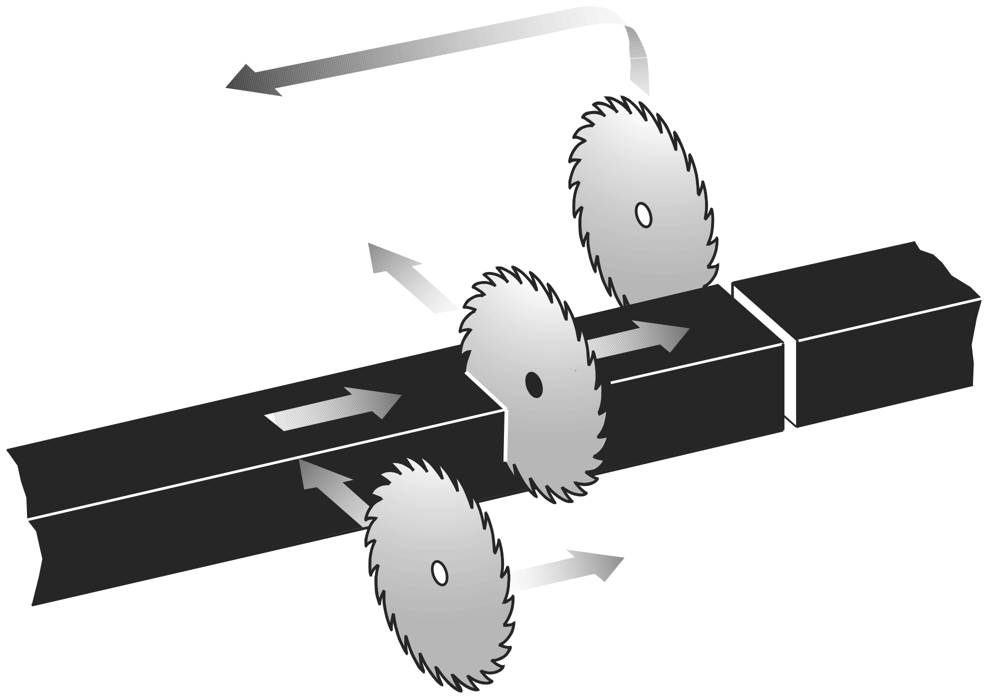

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Figure 5: Typical application for the 'internal synchronous operation'

2.4 Application modules

The application

Usually, the application involves more than adjusting the speed of a motor. Often, the inverter is also required to control sequences of motion and undertake typical PLC tasks. More and more complex drive applications have to be carried out without this resulting in lengthy project planning and startup routines.

The solution with MOVIDRIVE®

SEW offers various standardized control programs specifically for 'positioning', 'winding' and 'controlling' applications. These programs are called application modules. The application modules form part of the MOVITOOLS software package and can be used with units in technology version.

A user-friendly user interface leads you through the process of setting the parameters. All you have to do is enter the parameters you need for your application. The application modules turns this information into the control program and loads it into the inverter. MOVIDRIVE® then undertakes all the movement control functions. This takes the load off the master controller and allows decentralized concepts to be implemented more easily.

The benefits at a glance

- Wide range of functions
- User-friendly user interface
- You only have to enter the parameters needed for the application
- User-friendly application programs guide you through the process of setting parameters, so there is no need for complicated programming
- No programming experience necessary
- No lengthy learning curve, therefore quick project planning and startup
- Control of all movement functions is performed directly in MOVIDRIVE®
- Decentralized concepts can be implemented more easily

Available application modules

The application modules currently available for MOVIDRIVE® *compact* are listed below. These application modules are explained in the 'Technical Data and Dimensions' chapter.

Positioning

Linear movement, the movement records are administered in the inverter:

- Table positioning with bus control

Linear movement, the movement records are administered in the PLC:

- Positioning via bus
- Extended positioning via bus

Rotational movement:

- Rotary axis

Winding

- Constant tension center winder
- Winder with jockey roll control

Controlling

- Flying saw

Application The following figure shows an example for how the various SEW applications modules are used in a block warehouse.

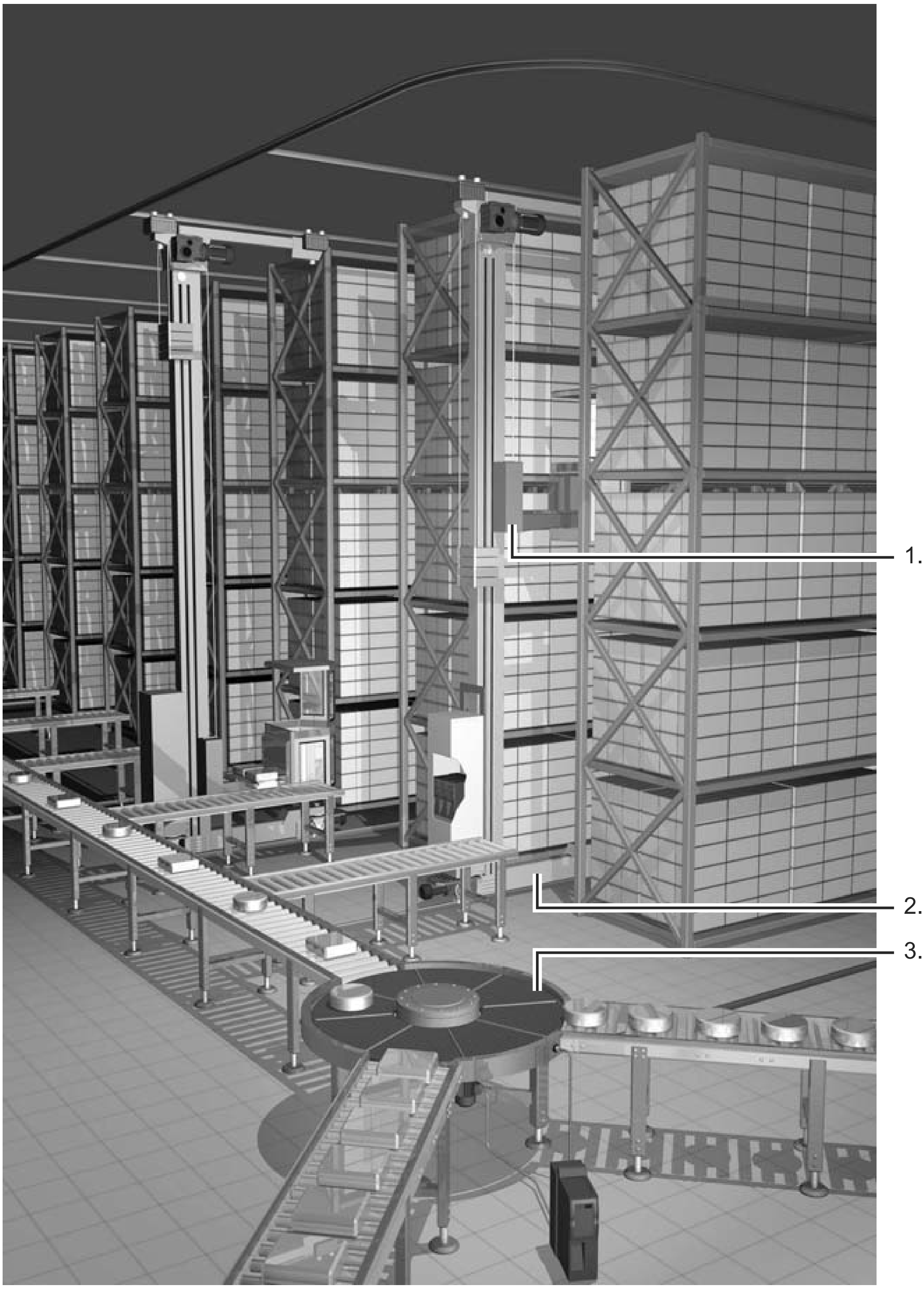

Figure 6: Application in a block warehouse

1. Hoist: Table positioning
2. Travel axis: Absolute value or bus positioning
3. Rotary distributor: Rotary axis

3 Technical Data and Dimensions

3.1 CE-marking, UL approval and unit designation

CE-marking

- Low Voltage Directive

  MOVIDRIVE® *compact* drive inverters comply with the regulations of the Low Voltage Directive 73/23/EEC.

- Electromagnetic compatibility (EMC)

  MOVIDRIVE® *compact* drive inverters are designed as components for installation in machinery and plant. They comply with the EMC product standard EN 61800-3 'Variable-speed electrical drives'. Provided the installation instructions are complied with, they satisfy the appropriate requirements for CE-marking of the entire machine/system in which they are fitted, on the basis of the EMC Directive 89/336/EEC.

  MOVIDRIVE® *compact* drive inverters of size 1 and 2 are fitted with an input filter as standard. These units comply with limit value class A to EN 55011 and EN 55014 on the line side without further measures.

The CE-mark on the nameplate indicates conformity with the Low-voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC. We can issue a declaration of conformity to this effect on request.

UL approval

UL and cUL approval has been granted for the entire MOVIDRIVE® range of units. cUL is equivalent to CSA approval.

C-Tick

C-Tick approval has been granted for the entire MOVIDRIVE® *compact* range of units. C-Tick certifies conformity with the requirements of the ACA (Australian Communications Authority).

Unit designation

The following example illustrates the unit designation of MOVIDRIVE® *compact*:

MOVIDRIVE® *compact* MCV 41 A 0055-5A3-4-00

- Version: 00 = Standard / 0T = Technology
- Quadrants: 4 = 4Q (with brake chopper)
- Type of supply: 3 = 3-phase
- Input filter: A = installed / 0 = not installed
- Rated supply voltage: 5 = 380...500 V_{AC} / 2 = 200...240 V_{AC}
- Recommended motor power: 0055 = 5.5 kW
- Version A
- Type series and generation
- Type:
  - MCF = flux control mode without encoder for asynchronous motors
    VFC operating modes (VFC = Voltage Flux Control) only
  - MCV = flux control mode without and with encoder for asynchronous motors
    VFC and CFC operating modes (CFC = Current Flux Control)
  - MCS = flux control mode with resolver for synchronous motors
    SERVO operating modes
  - MCH = flux control mode with encoder (Hiperface, sin/cos or TTL) for asynchronous or synchronous motors

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3.2 General technical data

The following table lists the technical data applicable to all MOVIDRIVE® *compact* drive inverters, irrespective of their type, version, size and performance.

MOVIDRIVE® *compact*	**All sizes**
Interference immunity	To EN 61800-3
Interference emission with EMC-compliant installation	According to class B limit to EN 55011 and EN 55014 To EN 61800-3 Sizes 1 and 2 on line side according to class A limit to EN 55011 and EN 55014 without further measures
Ambient temperature ϑ_{amb} **Derating ambient temperature** **Climate class**	0 °C...+50 °C at I_D = 100 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 125 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 100 % I_N and f_{PWM} = 8 kHz P_N reduction: 3.0 % I_N per K to max. 60 °C EN 60721-3-3, class 3K3
Storage temperature[1] ϑ_L	-25 °C...+70 °C (EN 60721-3-3, class 3K3) DBG keypad: -20 °C...+60 °C
Type of cooling (DIN 51751)	Forced cooling Temperature-controlled fan, response threshold at ϑ = 45 °C
Enclosure EN 60529 (NEMA1) **Sizes 1 to 3** **Size 4 and 5**	IP20 IP00 (power connections); IP10 with Plexiglas cover mounted (supplied as standard)
Operating mode	DB (EN 60149-1-1 and 1-3)
Installation altitude	h ≤ 1000 m (3300 ft) I_N reduction: 1 % per 100 m (330 ft) from 1000 m (3300 ft) to max. 2000 m (6600 ft)

1) Connect to supply voltage for min. 5 minutes every 2 years if stored for long periods, otherwise the unit service life may be reduced.

MOVIDRIVE® compact unit series

02531AXX

Figure 7: MOVIDRIVE® compact unit series

3.3 MOVIDRIVE® compact MC_4_A...-5_3 (400/500 V units)

Size 1

02570AXX

Figure 8: Size 1

MOVIDRIVE® *compact*		0015-5A3-4-0_	0022-5A3-4-0_	0030-5A3-4-0_	0040-5A3-4-0_
INPUT					
Supply voltage	V_{mains}	3×380 V_{AC} -10 %...3×500 V_{AC} +10 %			
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %			
Rated system current[1] I_{mains} (at $V_{mains} = 3 \times 400$ V_{AC})	**100 %** **125 %**	3.6 A_{AC} 4.5 A_{AC}	5.0 A_{AC} 6.2 A_{AC}	6.3 A_{AC} 7.9 A_{AC}	8.6 A_{AC} 10.7 A_{AC}
OUTPUT					
Rated output power[2] (at $V_{mains} = 3 \times 400...500$ V_{AC})	P_N	2.8 kVA	3.8 kVA	4.9 kVA	6.6 kVA
Rated output current[1] (at $V_{mains} = 3 \times 400$ V_{AC})	I_N	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization			
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)			
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	68 Ω			
Output voltage	V_{out}	max. V_{in}			
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)			
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range			
GENERAL					
Power loss at $P_N P_{Vmax}$		85 W	105 W	130 W	180 W
Cooling air consumption		40 m^3/h (24 ft^3/min)			
Weight		2.8 kg (6.16 lb)			
Dimensions	**W × H × D**	MCF/MCV/MCS: 105 × 315 × 155 mm (4.13 × 12.40 × 6.10 in) MCH: 105 × 315 × 161 mm (4.13 × 12.40 × 6.34 in)			

1) The system and output currents must be reduced by 20 % from the nominal values for $V_{mains} = 3 \times 500$ V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
MCF40A part numbers (without fieldbus)	826 738 3	826 739 1	826 740 5	826 741 3
MCF41A part numbers (with PROFIBUS-DP)	826 835 5	826 836 3	826 837 1	826 838 X
MCF4_A technology type (VFC)	**0015-5A3-4-0T**	**0022-5A3-4-0T**	**0030-5A3-4-0T**	**0040-5A3-4-0T**
MCF40A part numbers (without fieldbus)	827 426 6	827 427 4	827 428 2	827 429 0
MCF41A part numbers (with PROFIBUS-DP)	827 449 5	827 450 9	827 451 7	827 452 5
Constant load Recommended motor power P_{mot}	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.0 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.0 HP)	5.5 kW (7.5 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 400 V_{AC} and f_{PWM} = 4 kHz)	5.0 A_{AC}	6.9 A_{AC}	8.8 A_{AC}	11.9 A_{AC}

MCV4_A standard type (VFC/CFC)	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
MCV40A part numbers (without fieldbus)	826 908 4	826 909 2	826 910 6	826 911 4
MCV41A part numbers (with PROFIBUS-DP)	826 928 9	826 929 7	826 930 0	826 931 9
MCV4_A technology type (VFC/CFC)	**0015-5A3-4-0T**	**0022-5A3-4-0T**	**0030-5A3-4-0T**	**0040-5A3-4-0T**
MCV40A part numbers (without fieldbus)	827 472 X	827 473 8	827 474 6	827 475 4
MCV41A part numbers (with PROFIBUS-DP)	827 495 9	827 496 7	827 497 5	827 498 3
VFC operating mode	Recommended motor power → MCF4_A			
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection			

MCS4_A standard type (SERVO)	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
MCS40A part numbers (without fieldbus)	827 060 0	827 061 9	827 062 7	827 063 5
MCS41A part numbers (with PROFIBUS-DP)	827 077 5	827 078 3	827 079 1	827 080 5
MCS4_A technology type (SERVO)	**0015-5A3-4-0T**	**0022-5A3-4-0T**	**0030-5A3-4-0T**	**0040-5A3-4-0T**
MCS40A part numbers (without fieldbus)	827 518 1	827 519 X	827 520 3	827 521 1
MCS41A part numbers (with PROFIBUS-DP)	827 541 6	827 542 4	827 543 2	827 544 0
SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, SERVO motor selection			

MCH4_A standard type (VFC/CFC/SERVO)	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
MCH40A part numbers (without fieldbus)	827 603 X	827 604 8	827 605 6	827 606 4
MCH41A part numbers (with PROFIBUS-DP)	827 649 8	827 650 1	827 651 X	827 652 8
MCH42A part numbers (with INTERBUS FO)	827 565 3	827 566 1	827 567 X	827 568 8
MCH4_A technology type (VFC/CFC/SERVO)	**0015-5A3-4-0T**	**0022-5A3-4-0T**	**0030-5A3-4-0T**	**0040-5A3-4-0T**
MCH40A part numbers (without fieldbus)	827 626 9	827 627 7	827 628 5	827 629 3
MCH41A part numbers (with PROFIBUS-DP)	827 672 2	827 673 0	827 674 9	827 675 7
MCH42A part numbers (with INTERBUS FO)	827 158 5	827 159 3	827 160 7	827 161 5
VFC operating mode	Recommended motor power → MCF4_A			
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection			

Size 2

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Figure 9: Size 2

MOVIDRIVE® *compact*		**0055-5A3-4-0_**	**0075-5A3-4-0_**	**0110-5A3-4-0_**
INPUT				
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %		
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %		
Rated system current[1] **(at V_{mains} = 3 × 400 V_{AC})**	I_{mains} **100 %** **125 %**	11.3 A_{AC} 14.1 A_{AC}	14.4 A_{AC} 18.0 A_{AC}	21.6 A_{AC} 27.0 A_{AC}
OUTPUT				
Rated output power[2] **(at V_{mains} = 3 × 400...500 V_{AC})**	P_N	8.7 kVA	11.2 kVA	16.8 kVA
Rated output current[1] **(at V_{mains} = 3 × 400 V_{AC})**	I_N	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	47 Ω		22 Ω
Output voltage	V_{out}	max. V_{in}		
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at $P_N P_{Vmax}$		220 W	290 W	400 W
Cooling air consumption		80 m^3/h (48 ft^3/min)		
Weight		5.9 kg (12.98 lb)		
Dimensions	**W × H × D**	MCF/MCV/MCS: 130 × 335 × 207 mm (5.12 × 13.19 × 8.15 in) MCH: 130 × 335 × 213 mm (5.12 × 13.19 × 8.39 in)		

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

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
MCF40A part numbers (without fieldbus)	826 742 1	826 743 X	826 744 8
MCF41A part numbers (with PROFIBUS-DP)	826 839 8	826 840 1	826 841 X
MCF4_A technology type (VFC)	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
MCF40A part numbers (without fieldbus)	827 430 4	827 431 2	827 432 0
MCF41A part numbers (with PROFIBUS-DP)	827 453 3	827 454 1	827 455 X
Constant load Recommended motor power P_{mot}	5.5 kW (7.5 HP)	7.5 kW (10 HP)	11 kW (15 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	7.5 kW (10 HP)	11 kW (15 HP)	15 kW (20 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 400 V_{AC} and f_{PWM} = 4 kHz)	15.6 A_{AC}	20.0 A_{AC}	30.0 A_{AC}

MCV4_A standard type (VFC/CFC)	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
MCV40A part numbers (without fieldbus)	826 912 2	826 913 0	826 914 9
MCV41A part numbers (with PROFIBUS-DP)	826 932 7	826 933 5	826 934 3
MCV4_A technology type (VFC/CFC)	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
MCV40A part numbers (without fieldbus)	827 476 2	827 477 0	827 478 9
MCV41A part numbers (with PROFIBUS-DP)	827 499 1	827 500 9	827 501 7
VFC operating mode	Recommended motor power → MCF4_A		
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection		

MCS4_A standard type (SERVO)	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
MCS40A part numbers (without fieldbus)	827 064 3	827 065 1	827 066 X
MCS41A part numbers (with PROFIBUS-DP)	827 081 3	827 082 1	827 083 X
MCS4_A technology type (SERVO)	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
MCS40A part numbers (without fieldbus)	827 522 X	827 523 8	827 524 6
MCS41A part numbers (with PROFIBUS-DP)	827 545 9	827 546 7	827 547 5
SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Recommended motor power	→ Sec. Project Planning, SERVO motor selection		

MCH4_A standard type (VFC/CFC/SERVO)	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
MCH40A part numbers (without fieldbus)	827 607 2	827 608 0	827 609 9
MCH41A part numbers (with PROFIBUS-DP)	827 653 6	827 654 4	827 655 2
MCH42A part numbers (with INTERBUS FO)	827 569 6	827 570 X	827 571 8
MCH4_A technology type (VFC/CFC/SERVO)	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
Part numbers (without fieldbus)	827 630 7	827 631 5	827 632 3
Part numbers (with PROFIBUS-DP)	827 676 5	827 677 3	827 678 1
Part numbers (with INTERBUS FO)	827 162 3	827 163 1	827 164 X
VFC operating mode	Recommended motor power → MCF4_A		
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 3

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Figure 10: Size 3

MOVIDRIVE® *compact*		**0150-503-4-0_**	**0220-503-4-0_**	**0300-503-4-0_**
INPUT				
Supply voltage	$\mathbf{V_{mains}}$	3×380 V_{AC} -10 %...3×500 V_{AC} +10 %		
Supply frequency	$\mathbf{f_{mains}}$	50 Hz...60 Hz ±5 %		
Rated system current[1] **(at $\mathbf{V_{mains} = 3 \times 400\ V_{AC}}$)**	$\mathbf{I_{mains}}$ **100 %** **125 %**	28.8 A_{AC} 36.0 A_{AC}	41.4 A_{AC} 51.7 A_{AC}	54.0 A_{AC} 67.5 A_{AC}
OUTPUT				
Rated output power[2] **(at $\mathbf{V_{mains} = 3 \times 400...500\ V_{AC}}$)**	$\mathbf{P_N}$	22.2 kVA	31.9 kVA	41.6 kVA
Rated output current[1] **(at $\mathbf{V_{mains} = 3 \times 400\ V_{AC}}$)**	$\mathbf{I_N}$	32 A_{AC}	46 A_{AC}	60 A_{AC}
Current limitation	$\mathbf{I_{max}}$	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	$\mathbf{R_{BWmin}}$	15 Ω		12 Ω
Output voltage	$\mathbf{V_{out}}$	max. V_{in}		
PWM frequency	$\mathbf{f_{PWM}}$	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	$\mathbf{n_A / \Delta n_A}$	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at $\mathbf{P_N P_{Vmax}}$		550 W	750 W	950 W
Cooling air consumption		180 m^3/h (108 ft^3/min)		
Weight		14.3 kg (31.46 lb)		
Dimensions	$\mathbf{W \times H \times D}$	MCF/MCV/MCS: $200 \times 465 \times 227$ mm ($7.87 \times 18.31 \times 8.94$ in) MCH: $200 \times 465 \times 233$ mm ($7.87 \times 18.31 \times 9.17$ in)		

1) The system and output currents must be reduced by 20 % from the nominal values for $V_{in} = 3 \times 500$ V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0150-503-4-00	0220-503-4-00	0300-503-4-00
MCF40A part numbers (without fieldbus)	826 745 6	826 746 4	826 747 2
MCF41A part numbers (with PROFIBUS-DP)	826 842 8	826 843 6	826 844 4
MCF4_A technology type (VFC)	**0150-503-4-0T**	**0220-503-4-0T**	**0300-503-4-0T**
MCF40A part numbers (without fieldbus)	827 433 9	827 434 7	827 435 5
MCF41A part numbers (with PROFIBUS-DP)	827 456 8	827 457 6	827 458 4
Constant load Recommended motor power P_{mot}	15 kW (20 HP)	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	22 kW (30 HP)	30 kW (40 HP)	37 kW (50 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 400 V_{AC} and f_{PWM} = 4 kHz)	40.0 A_{AC}	57.5 A_{AC}	75.0 A_{AC}

MCV4_A standard type (VFC/CFC)	0150-503-4-00	0220-503-4-00	0300-503-4-00
MCV40A part numbers (without fieldbus)	826 915 7	826 916 5	826 917 3
MCV41A part numbers (with PROFIBUS-DP)	826 935 1	826 936 X	826 937 8
MCV4_A technology type (VFC/CFC)	**0150-503-4-0T**	**0220-503-4-0T**	**0300-503-4-0T**
MCV40A part numbers (without fieldbus)	827 479 7	827 480 0	827 481 9
MCV41A part numbers (with PROFIBUS-DP)	827 502 5	827 503 3	827 504 1
VFC operating mode	Recommended motor power → MCF4_A		
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	32 A_{AC}	46 A_{AC}	60 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection		

MCS4_A standard type (SERVO)	0150-503-4-00	0220-503-4-00	0300-503-4-00
MCS40A part numbers (without fieldbus)	827 067 8	827 068 6	827 069 4
MCS41A part numbers (with PROFIBUS-DP)	827 084 8	827 085 6	827 086 4
MCS4_A technology type (SERVO)	**0150-503-4-0T**	**0220-503-4-0T**	**0300-503-4-0T**
MCS40A part numbers (without fieldbus)	827 525 4	827 526 2	827 527 0
MCS41A part numbers (with PROFIBUS-DP)	827 548 3	827 549 1	827 550 5
SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	32 A_{AC}	46 A_{AC}	60 A_{AC}
Recommended motor power	→ Sec. Project Planning, SERVO motor selection		

MCH4_A standard type (VFC/CFC/SERVO)	0150-503-4-00	0220-503-4-00	0300-503-4-00
MCH40A part numbers (without fieldbus)	827 610 2	827 611 0	827 612 9
MCH41A part numbers (with PROFIBUS-DP)	827 656 0	827 657 9	827 658 7
MCH42A part numbers (with INTERBUS FO)	827 572 6	827 573 4	827 574 2
MCH4_A technology type (VFC/CFC/SERVO)	**0150-503-4-0T**	**0220-503-4-0T**	**0300-503-4-0T**
MCH40A part numbers (without fieldbus)	827 633 1	827 634 X	827 635 8
MCH41A part numbers (with PROFIBUS-DP)	827 679 X	827 680 3	827 681 1
MCH42A part numbers (with INTERBUS FO)	827 165 8	827 166 6	827 167 4
VFC operating mode	Recommended motor power → MCF4_A		
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	32 A_{AC}	46 A_{AC}	60 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 4

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Figure 11: Size 4

MOVIDRIVE® *compact*		0370-503-4-0_	0450-503-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current[1] **(at V_{mains} = 3 × 400 V_{AC})**	I_{mains} **100 %** **125 %**	65.7 A_{AC} 81.9 A_{AC}	80.1 A_{AC} 100.1 A_{AC}
OUTPUT			
Rated output power[2] **(at V_{mains} = 3 × 400...500 V_{AC})**	P_N	51.1 kVA	62.3 kVA
Rated output current[1] **(at V_{mains} = 3 × 400 V_{AC})**	I_N	73 A_{AC}	89 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	6 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at $P_N P_{Vmax}$		1200 W	1450 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		26.3 kg (57.86 lb)	
Dimensions	**W × H × D**	MCF/MCV/MCS: 280 × 522 × 227 mm (11.02 × 20.55 × 8.94 in) MCH: 280 × 522 × 233 mm (11.02 × 20.55 × 9.17 in)	

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

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0370-503-4-00	0450-503-4-00
MCF40A part numbers (without fieldbus)	826 748 0	826 749 9
MCF41A part numbers (with PROFIBUS-DP)	826 845 2	826 846 0
MCF4_A technology type (VFC)	**0370-503-4-0T**	**0450-503-4-0T**
MCF40A part numbers (without fieldbus)	827 436 3	827 437 1
MCF41A part numbers (with PROFIBUS-DP)	827 459 2	827 460 6
Constant load Recommended motor power P_{mot}	37 kW (50 HP)	45 kW (60 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	45 kW (60 HP)	55 kW (75 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 400 V_{AC} and f_{PWM} = 4 kHz)	91 A_{AC}	111 A_{AC}

MCV4_A standard type (VFC/CFC)	0370-503-4-00	0450-503-4-00
MCV40A part numbers (without fieldbus)	826 918 1	826 919 X
MCV41A part numbers (with PROFIBUS-DP)	826 938 6	826 939 4
MCV4_A technology type (VFC/CFC)	**0370-503-4-0T**	**0450-503-4-0T**
MCV40A part numbers (without fieldbus)	827 482 7	827 483 5
MCV41A part numbers (with PROFIBUS-DP)	827 505 X	827 506 8
VFC operating mode	Recommended motor power → MCF4_A	
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	73 A_{AC}	89 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection	

MCS4_A standard type (SERVO)	0370-503-4-00	0450-503-4-00
MCS40A part numbers (without fieldbus)	827 070 8	
MCS41A part numbers (with PROFIBUS-DP)	827 087 2	
MCS4_A technology type (SERVO)	**0370-503-4-0T**	**0450-503-4-0T**
MCS40A part numbers (without fieldbus)	827 528 9	827 529 7
MCS41A part numbers (with PROFIBUS-DP)	827 551 3	827 552 1
SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	73 A_{AC}	89 A_{AC}
Recommended motor power	→ Sec. Project Planning, SERVO motor selection	

MCH4_A standard type (VFC/CFC/SERVO)	0370-503-4-00	0450-503-4-00
MCH40A part numbers (without fieldbus)	827 613 7	827 614 5
MCH41A part numbers (with PROFIBUS-DP)	827 659 5	827 660 9
MCH42A part numbers (with INTERBUS FO)	827 575 0	827 576 9
MCH4_A technology type (VFC/CFC/SERVO)	**0370-503-4-0T**	**0450-503-4-0T**
MCH40A part numbers (without fieldbus)	827 636 6	827 637 4
MCH41A part numbers (with PROFIBUS-DP)	827 682 X	827 683 8
MCH42A part numbers (with INTERBUS FO)	827 168 2	827 169 0
VFC operating mode	Recommended motor power → MCF4_A	
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	73 A_{AC}	89 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 5

02574AXX

Figure 12: Size 5

MOVIDRIVE® *compact*		0550-503-4-0_	0750-503-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current[1] (at V_{mains} = 3 × 400 V_{AC})	I_{mains} 100 % 125 %	94.5 A_{AC} 118.1 A_{AC}	117.0 A_{AC} 146.3 A_{AC}
OUTPUT			
Rated output power[2] (at V_{mains} = 3 × 400...500 V_{AC})	P_N	73.5 kVA	91.0 kVA
Rated output current[1] (at V_{mains} = 3 × 400 V_{AC})	I_N	105 A_{AC}	130 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	6 Ω	4 Ω
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at $P_N P_{Vmax}$		1700 W	2000 W
Cooling air consumption		360 m^3/h (216 ft^3/min)	
Weight		34.3 kg (75.46 lb)	
Dimensions	**W × H × D**	280 × 610 × 330 mm (11.02 × 24.02 × 12.99 in)	

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

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0550-503-4-00	0750-503-4-00
MCF40A part numbers (without fieldbus)	826 750 2	826 751 0
MCF41A part numbers (with PROFIBUS-DP)	826 847 9	826 848 7
MCF4_A technology type (VFC)	**0550-503-4-0T**	**0750-503-4-0T**
MCF40A part numbers (without fieldbus)	827 438 X	827 439 8
MCF41A part numbers (with PROFIBUS-DP)	827 461 4	827 462 2
Constant load Recommended motor power P_{mot}	55 kW (75 HP)	75 kW (100 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	75 kW (100 HP)	90 kW (120 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 400 V_{AC} and f_{PWM} = 4 kHz)	131 A_{AC}	162 A_{AC}

MCV4_A standard type (VFC/CFC)	0550-503-4-00	0750-503-4-00
MCV40A part numbers (without fieldbus)	826 920 3	826 921 1
MCV41A part numbers (with PROFIBUS-DP)	826 940 8	826 941 6
MCV4_A technology type (VFC/CFC)	**0550-503-4-0T**	**0750-503-4-0T**
MCV40A part numbers (without fieldbus)	827 484 3	827 485 1
MCV41A part numbers (with PROFIBUS-DP)	827 507 6	827 508 4
VFC operating mode	Recommended motor power → MCF4_A	
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	105 A_{AC}	130 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection	

MCS4_A standard type (SERVO)	0550-503-4-00	0750-503-4-00
MCS40A part numbers (without fieldbus)		
MCS41A part numbers (with PROFIBUS-DP)		
MCS4_A technology type (SERVO)	**0550-503-4-0T**	**0750-503-4-0T**
MCS40A part numbers (without fieldbus)	827 530 0	827 531 9
MCS41A part numbers (with PROFIBUS-DP)	827 553 X	827 554 8
SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	105 A_{AC}	130 A_{AC}
Recommended motor power	→ Sec. Project Planning, SERVO motor selection	

MCH4_A standard type (VFC/CFC/SERVO)	0550-503-4-00	0750-503-4-00
MCH40A part numbers (without fieldbus)	827 615 3	827 616 1
MCH41A part numbers (with PROFIBUS-DP)	827 661 7	827 662 5
MCH42A part numbers (with INTERBUS FO)	827 577 7	827 578 5
MCH4_A technology type (VFC/CFC/SERVO)	**0550-503-4-0T**	**0750-503-4-0T**
MCH40A part numbers (without fieldbus)	827 638 2	827 639 0
MCH41A part numbers (with PROFIBUS-DP)	827 684 6	827 685 4
MCH42A part numbers (with INTERBUS FO)	827 170 4	827 171 2
VFC operating mode	Recommended motor power → MCF4_A	
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	105 A_{AC}	130 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

3.4 MOVIDRIVE® compact MC_4_A...-2_3 (230 V units)

Size 1

02570AXX

Figure 13: Size 1

MOVIDRIVE® *compact*		0015-2A3-4-0_	0022-2A3-4-0_	0037-2A3-4-0_
INPUT				
Supply voltage	V_{mains}	$3 \times 200\ V_{AC}$ -10 %...$3 \times 240\ V_{AC}$ +10 %		
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %		
Rated system current I_{mains} **(at** $V_{mains} = 3 \times 230\ V_{AC}$**)**	**100 %** **125 %**	$6.7\ A_{AC}$ $8.4\ A_{AC}$	$7.8\ A_{AC}$ $9.8\ A_{AC}$	$12.9\ A_{AC}$ $16.1\ A_{AC}$
OUTPUT				
Rated output power[1] **(at** $V_{mains} = 3 \times 230...240\ V_{AC}$**)**	P_N	2.7 kVA	3.4 kVA	5.8 kVA
Rated output current (at $V_{mains} = 3 \times 230\ V_{AC}$**)**	I_N	$7.3\ A_{AC}$	$8.6\ A_{AC}$	$14.5\ A_{AC}$
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	27 Ω		
Output voltage	V_{out}	max. V_{in}		
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at P_N	P_{Vmax}	110 W	126 W	210 W
Cooling air consumption		40 m^3/h (24 ft^3/min)		
Weight		2.8 kg (6.16 lb)		
Dimensions	**W × H × D**	MCF/MCV: 105 × 315 × 155 mm (4.13 × 12.40 × 6.10 in) MCH: 105 × 315 × 161 mm (4.13 × 12.40 × 6.34 in)		

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0015-2A3-4-00	0022-2A3-4-00	0037-2A3-4-00
MCF40A part numbers (without fieldbus)	826 752 9	826 753 7	826 754 5
MCF41A part numbers (with PROFIBUS-DP)	826 853 3	826 854 1	826 855 X
MCF4_A technology type (VFC)	**0015-2A3-4-0T**	**0022-2A3-4-0T**	**0037-2A3-4-0T**
MCF40A part numbers (without fieldbus)	827 440 1	827 441 X	827 442 8
MCF41A part numbers (with PROFIBUS-DP)	827 463 0	827 464 9	827 465 7
Constant load Recommended motor power P_{mot}	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	5.0 kW (6.8 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 230 V_{AC} and f_{PWM} = 4 kHz)	9.1 A_{AC}	10.8 A_{AC}	18.1 A_{AC}

MCV4_A standard type (VFC/CFC)	0015-2A3-4-00	0022-2A3-4-00	0037-2A3-4-00
MCV40A part numbers (without fieldbus)	826 922 X	826 923 8	826 924 6
MCV41A part numbers (with PROFIBUS-DP)	826 942 4	826 943 2	826 944 0
MCV4_A technology type (VFC/CFC)	**0015-2A3-4-0T**	**0022-2A3-4-0T**	**0037-2A3-4-0T**
MCV40A part numbers (without fieldbus)	827 486 X	827 487 8	827 488 6
MCV41A part numbers (with PROFIBUS-DP)	827 509 2	827 510 6	827 511 4
VFC operating mode	Recommended motor power → MDF60A		
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	7.3 A_{AC}	8.6 A_{AC}	14.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection		

MCH4_A standard type (VFC/CFC)	0015-2A3-4-00	0022-2A3-4-00	0037-2A3-4-00
MCH40A part numbers (without fieldbus)	827 617 X	827 618 8	827 619 6
MCH41A part numbers (with PROFIBUS-DP)	827 663 3	827 664 1	827 665 X
MCH42A part numbers (with INTERBUS FO)	827 588 2	827 589 0	827 590 4
MCH4_A technology type (VFC/CFC)	**0015-2A3-4-0T**	**0022-2A3-4-0T**	**0037-2A3-4-0T**
MCH40A part numbers (without fieldbus)	827 640 4	827 641 2	827 642 0
MCH41A part numbers (with PROFIBUS-DP)	827 686 2	827 687 0	827 688 9
MCH42A part numbers (with INTERBUS FO)	827 579 3	827 580 7	827 581 5
VFC operating mode	Recommended motor power → MCF4_A		
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	7.3 A_{AC}	8.6 A_{AC}	14.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 2

02571AXX

Figure 14: Size 2

MOVIDRIVE® *compact*		0055-2A3-4-0_	0075-2A3-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 200 V_{AC} -10 %...3 × 240 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} **(at** V_{mains} **= 3 × 230** V_{AC}**)**	**100 %** **125 %**	19.5 A_{AC} 24.4 A_{AC}	27.4 A_{AC} 34.3 A_{AC}
OUTPUT			
Output rated power[1] **(at** V_{mains} **= 3 × 230...240** V_{AC}**)**	P_N	8.8 kVA	11.6 kVA
Output rated current (at V_{mains} **= 3 × 230** V_{AC}**)**	I_N	22 A_{AC}	29 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	12 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	300 W	380 W
Cooling air consumption		80 m^3/h (48 ft^3/min)	
Weight		5.9 kg (12.98 lb)	
Dimensions	**W × H × D**	MCF/MCV: 130 × 335 × 207 mm (5.12 × 13.19 × 8.15 in) MCH: 130 × 335 × 213 mm (5.12 × 13.19 × 8.39 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	**0055-2A3-4-00**	**0075-2A3-4-00**
MCF40A part numbers (without fieldbus)	826 755 3	826 756 1
MCF41A part numbers (with PROFIBUS-DP)	826 856 8	826 857 6
MCF4_A technology type (VFC)	**0055-2A3-4-0T**	**0075-2A3-4-0T**
MCF40A part numbers (without fieldbus)	827 443 6	827 444 4
MCF41A part numbers (with PROFIBUS-DP)	827 466 5	827 467 3
Constant load Recommended motor power P_{mot}	5.5 kW (7.5 HP)	7.5 kW (10 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	7.5 kW (10 HP)	11 kW (15 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 230 V_{AC} and f_{PWM} = 4 kHz)	27.5 A_{AC}	36.3 A_{AC}

MCV4_A standard type (VFC/CFC)	**0055-2A3-4-00**	**0075-2A3-4-00**
MCV40A part numbers (without fieldbus)	826 925 4	826 926 2
MCV41A part numbers (with PROFIBUS-DP)	826 945 9	826 946 7
MCV4_A technology type (VFC/CFC)	**0055-2A3-4-0T**	**0075-2A3-4-0T**
MCV40A part numbers (without fieldbus)	827 489 4	827 490 8
MCV41A part numbers (with PROFIBUS-DP)	827 512 2	827 513 0
VFC operating mode	Recommended motor power → MCF4_A	
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	22 A_{AC}	29 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection	

MCH4_A standard type (VFC/CFC)	**0055-2A3-4-00**	**0075-2A3-4-00**
MCH40A part numbers (without fieldbus)	827 620 X	827 621 8
MCH41A part numbers (with PROFIBUS-DP)	827 666 8	827 667 6
MCH42A part numbers (with INTERBUS FO)	827 591 2	827 592 0
MCH4_A technology type (VFC/CFC)	**0055-2A3-4-0T**	**0075-2A3-4-0T**
MCH40A part numbers (without fieldbus)	827 643 9	827 644 7
MCH41A part numbers (with PROFIBUS-DP)	827 689 7	827 690 0
MCH42A part numbers (with INTERBUS FO)	827 582 3	827 583 1
VFC operating mode	Recommended motor power → MCF4_A	
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	22 A_{AC}	29 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 3

02572AXX

Figure 15: Size 3

MOVIDRIVE® *compact*		0110-203-4-0_	0150-203-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 200 V_{AC} -10 %...3 × 240 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} **(at** V_{mains} **= 3 × 230** V_{AC}**)**	**100 %** **125 %**	40.0 A_{AC} 50.0 A_{AC}	49.0 A_{AC} 61.0 A_{AC}
OUTPUT			
Output rated power[1)] **(at** V_{mains} **= 3 × 230...240** V_{AC}**)**	P_N	17.1 kVA	21.5 kVA
Output rated current (at V_{mains} **= 3 × 230** V_{AC}**)**	I_N	42 A_{AC}	54 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	7.5 Ω	5.6 Ω
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	580 W	720 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		14.3 kg (31.46 lb)	
Dimensions	**W × H × D**	MCF/MCV/MCS: 200 × 465 × 227 mm (7.87 × 18.31 × 8.94 in) MCH: 200 × 465 × 233 mm (7.87 × 18.31 × 9.17 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	0110-203-4-00	0150-203-4-00
MCF40A part numbers (without fieldbus)	826 757 X	827 263 8
MCF41A part numbers (with PROFIBUS-DP)	826 858 4	827 266 2
MCF4_A technology type (VFC)	**0110-203-4-0T**	**0150-203-4-0T**
MCF40A part numbers (without fieldbus)	827 445 2	827 446 0
MCF41A part numbers (with PROFIBUS-DP)	827 468 1	827 469 X
Constant load Recommended motor power P_{mot}	11 kW (15 HP)	15 kW (20 HP)
Variable torque load or constant load without overload Recommended motor power P_{mot}	15 kW (20 HP)	22 kW (30 HP)
Continuous output current = 125 % I_N I_D (at V_{mains} = 3 × 230 V_{AC} and f_{PWM} = 4 kHz)	52.5 A_{AC}	67.5 A_{AC}

MCV4_A standard type (VFC/CFC)	0110-203-4-00	0150-203-4-00
MCV40A part numbers (without fieldbus)	826 927 0	827 269 7
MCV41A part numbers (with PROFIBUS-DP)	826 947 5	827 272 7
MCV4_A technology type (VFC/CFC)	**0110-203-4-0T**	**0150-203-4-0T**
MCV40A part numbers (without fieldbus)	827 491 6	827 492 4
MCV41A part numbers (with PROFIBUS-DP)	827 514 9	827 515 7
VFC operating mode	Recommended motor power → MCF4_A	
CFC operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	42 A_{AC}	54 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection	

MCH4_A standard type (VFC/CFC)	0110-203-4-00	0150-203-4-00
MCH40A part numbers (without fieldbus)	827 622 6	827 623 4
MCH41A part numbers (with PROFIBUS-DP)	827 668 4	827 669 2
MCH42A part numbers (with INTERBUS FO)	827 593 9	827 594 7
MCH4_A technology type (VFC/CFC)	**0110-203-4-0T**	**0150-203-4-0T**
MCH40A part numbers (without fieldbus)	827 645 5	827 646 3
MCH41A part numbers (with PROFIBUS-DP)	827 691 9	827 692 7
MCH42A part numbers (with INTERBUS FO)	827 584 X	827 585 8
VFC operating mode	Recommended motor power → MCF4_A	
CFC/SERVO operating mode (f_{PWM} = 8 kHz) Continuous output current = 100 % I_N I_D	42 A_{AC}	54 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 4

02573AXX

Figure 16: Size 4

MOVIDRIVE® *compact*		0220-203-4-0_	0300-203-4-0_
INPUT			
Supply voltage	V_{mains}	$3 \times 200\ V_{AC}$ -10 %...$3 \times 240\ V_{AC}$ +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} (at $V_{mains} = 3 \times 230\ V_{AC}$)	**100 % 125 %**	72 A_{AC} 90 A_{AC}	86 A_{AC} 107 A_{AC}
OUTPUT			
Output rated power[1)](at $V_{mains} = 3 \times 230...240\ V_{AC}$)	P_N	31.8 kVA	37.8 kVA
Output rated current (at $V_{mains} = 3 \times 230\ V_{AC}$)	I_N	80 A_{AC}	95 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	3.0 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	$n_A / \Delta n_A$	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	1100 W	1300 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		26.3 kg (57.86 lb)	
Dimensions	**W × H × D**	MCF/MCV/MCS: 280 × 522 × 227 mm (11.02 × 20.55 × 8.94 in) MCH: 280 × 522 × 233 mm (11.02 × 20.55 × 9.17 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCF4_A standard type (VFC)	**0220-203-4-00**	**0300-203-4-00**
MCF40A part numbers (without fieldbus)	827 264 6	827 265 4
MCF41A part numbers (with PROFIBUS-DP)	827 267 0	827 268 9
MCF4_A technology type (VFC)	**0220-203-4-0T**	**0300-203-4-0T**
MCF40A part numbers (without fieldbus)	827 447 9	827 448 7
MCF41A part numbers (with PROFIBUS-DP)	827 470 3	827 471 1
Constant load **Recommended motor power P_{mot}**	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	30 kW (40 HP)	37 kW (50 HP)
Continuous output current = 125 % I_N I_D **(at V_{mains} = 3 × 230 V_{AC} and f_{PWM} = 4 kHz)**	100 A_{AC}	118 A_{AC}

MCV4_A standard type (VFC/CFC)	**0220-203-4-00**	**0300-203-4-00**
MCV40A part numbers (without fieldbus)	827 270 0	827 271 9
MCV41A part numbers (with PROFIBUS-DP)	827 273 5	827 274 3
MCV4_A technology type (VFC/CFC)	**0220-203-4-0T**	**0300-203-4-0T**
MCV40A part numbers (without fieldbus)	827 493 2	827 494 0
MCV41A part numbers (with PROFIBUS-DP)	827 516 5	827 517 3
VFC operating mode	Recommended motor power → MCF4_A	
CFC operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	80 A_{AC}	95 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC motor selection	

MCH4_A standard type (VFC/CFC)	**0220-203-4-00**	**0300-203-4-00**
MCH40A part numbers (without fieldbus)	827 624 2	827 625 0
MCH41A part numbers (with PROFIBUS-DP)	827 670 6	827 671 4
MCH42A part numbers (with INTERBUS FO)	827 595 5	827 596 3
MCH4_A technology type (VFC/CFC)	**0220-203-4-0T**	**0300-203-4-0T**
MCH40A part numbers (without fieldbus)	827 647 1	827 648 X
MCH41A part numbers (with PROFIBUS-DP)	827 693 5	827 694 3
MCH42A part numbers (with INTERBUS FO)	827 586 6	827 587 4
VFC operating mode	Recommended motor power → MCF4_A	
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	80 A_{AC}	95 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

3.5 Additional functions in the application type

Electronic cam

Refer to the 'Electronic cam' manual for detailed information. This manual forms part of the 'application version' documentation package which you can order from SEW.

Please note the following points:

- The 'electronic cam' can only be implemented on MOVIDRIVE® units in application version (...-0T).
- It is essential for the 'electronic cam' to have the current-controlled control mode and, therefore, encoder feedback. As a result, the 'electronic cam' can only be implemented with type MCV in CFC operating modes, with type MCS in SERVO operating modes and with type MCH in CFC or SERVO operating modes. The 'electronic cam' cannot be implemented with type MCV/MCH in VFC and VFC-n-CONTROL operating modes or with type MCF.
- The 'electronic cam' is available in parameter set 1 only.

Motor and encoder

Use the following motor types:

- For operation with MOVIDRIVE® *compact* MCV4_A...-5_3-4-0T:

  –Asynchronous servomotor CT/CV with high-resolution sin/cos encoder.
  –AC motor DT/DV/D with incremental encoder option, preferably high-resolution sin/cos encoder.
- For operation with MOVIDRIVE® *compact* MCS4_A...-5_3-4-0T:

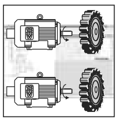
  –Synchronous servomotor CM with AS1H (Hiperface encoder).

  –Synchronous servomotor DS/DY with resolver.
- For operation with MOVIDRIVE® *compact* MCH4_A...-5_3-4-0T:

  –Asynchronous servomotor CT/CV with AV1H option (Hiperface encoder).
  –AC motor DT/DV/D with AV1H option (Hiperface encoder).
  –Synchronous servomotor CM with AS1H/ES1H (Hiperface encoder).

High-resolution speed detection is required for optimum operation of the cam disk. The encoders installed as standard on CT/CV, CM and DS/DY motors fulfill these requirements. SEW recommends using high-resolution sin/cos encoders ES1S, ES2S or EV1S as incremental encoders if DT/DV/D motors are used.

Internal synchronous operation



Refer to the 'Internal Synchronous Operation' manual for detailed information. This manual forms part of the 'Additional Functions and Application Modules' documentation package which you can order from SEW.

Please note the following points:

- 'Internal synchronous operation' can only be implemented on MOVIDRIVE® units in application version (...-0T).
- It is essential for 'internal synchronous operation' to have the current-controlled control mode and, therefore, encoder feedback. As a result, 'internal synchronous operation' can only be implemented with type MCV in CFC operating modes, with type MCS in SERVO operating modes and with type MCH in CFC or SERVO operating modes. 'Internal synchronous operation' cannot be implemented with type MCV/MCH in VFC and VFC-n-CONTROL operating modes or with type MCF.
- 'Internal synchronous operation' is available in parameter set 1 only.

Motor and encoder

Use the following motor types:

- For operation with MOVIDRIVE® *compact* MCV4_A...-5_3-4-0T:

  –Asynchronous servomotor CT/CV with high-resolution sin/cos encoder.
  –AC motor DT/DV/D with incremental encoder option, preferably high-resolution sin/cos encoder.
- For operation with MOVIDRIVE® *compact* MCS4_A...-5_3-4-0T:

  –Synchronous servomotor CM with AS1H (Hiperface encoder).

  –Synchronous servomotor DS/DY with resolver.
- For operation with MOVIDRIVE® *compact* MCH4_A...-5_3-4-0T:

  –Asynchronous servomotor CT/CV with AV1H option (Hiperface encoder).
  –AC motor DT/DV/D with AV1H option (Hiperface encoder).
  –Synchronous servomotor CM with AS1H/ES1H (Hiperface encoder).

High-resolution speed detection is required for optimum operation of internal synchronous operation. The encoders installed as standard on CT/CV, CM and DS/DY motors fulfill these requirements. SEW recommends using high-resolution sin/cos encoders ES1S, ES2S or EV1S as incremental encoders if DT/DV/D motors are used.

3.6 MOVIDRIVE® compact MCF/MCV/MCS electronics data

MOVIDRIVE® *compact*	**Setpoint processing and speed ramps**	
MCF/MCV/MCS40A and MCV/MCS41A	**Version with analog setpoint input**	
Voltage supply X10:1 for setpoint input X10:3	REF1: +10 V_{DC} +5 % / -0 %, I_{max} = 3 mA REF2: -10 V_{DC} +0 % / -5 %, I_{max} = 3 mA	Reference voltages for setpoint potentiometer
Setpoint input n1 X10:2/X10:4	AI11/AI12: Voltage or current input, can be set with S11 and P11_, sampling interval 1 ms	
(Differential input) Operating mode AI11/AI12 Resolution Internal resistance	Voltage input: n1 = 0...+10 V or -10 V...0...+10 V 12 bits R_i = 40 kΩ (external voltage supply) R_i = 20 kΩ (supply from REF1/REF2)	Current input: n1 = 0...20 mA or 4...20 mA 11 bits R_i = 250 Ω
MCF/MCV/MCS41A (X10:2 and X10:4 ineffective with MCF41A)	**Version with PROFIBUS-DP interface. There is no analog setpoint input n1 (AI11/AI12) in MCF41A, setpoint specification only via PROFIBUS-DP interface.**	
Protocol option Baud rate Connection system Bus termination Station address Name of the GSD file DP identity number	PROFIBUS-DP acc. to IEC 61158 Automatic detection of baud rate from 9.6 kbaud to 12 Mbaud 9-pin sub D connector, pin assignment to IEC 61158 Can be activated for cable type A to IEC 61158 0...125, can be set using DIP switch SEW_6002.GSD 6002_{hex} (24578_{dec})	
Applies to all versions		
Setpoint input n2 X10:6 TF/TH input	Analog input 0...10 V or optionally (→ P120) TF/TH input with response threshold at R_{TF} ≥ 2.9 kΩ ±10 %	
Internal setpoints	Parameter set 1: n11/n12/n13 = -5000...0...+5000 rpm Parameter set 2: n21/n22/n23 = -5000...0...+5000 rpm	
Time ranges of speed ramps at Δn = 3000 rpm	1st ramp t11/t21 Up: 0.0...2000 s Down: 0.0...2000 s 2nd ramp t12/t22 Up = down: 0.0...2000 s Stop ramp t13/t23 Down: 0...20 s Emergency ramp t14/t24 Down: 0...20 s Motorized potentiometert3 Up: 0.2...50 s Down: 0.2...50 s	

MOVIDRIVE® *compact*		Other electronics data	
Auxiliary voltage output[1]	X10:16	VO24: V_{OUT} = 24 V_{DC}, maximum current carrying capacity I_{max} = 200 mA	
Ext. voltage supply[1]	X10:24	VI24: V_{IN} = 24 V_{DC} -15 % / +20 % (range: 19.2...30 V_{DC}) to EN 61131-2	
Binary inputs Internal resistance	X10:9...X10:14	DIØØ...DIØ5: Isolated (optocoupler), PLC-compatible (EN 61131), sampling interval 5 ms $R_i \approx 3.0\ k\Omega$, $I_E \approx 10$ mA	
Signal level		+13 V...+30 V = '1' = Contact closed -3 V...+5 V = '0' = Contact open	To EN 61131
Function	X10:9 X10:10...X10:14	DIØØ: With fixed assignment '/Controller inhibit' DIØ1...DIØ5: Selection option → Parameter menu P60_	
Binary outputs[1]	X10:21/X10:19	DBØØ/DOØ2: PLC compatible (EN 61131-2), response time 5 ms	
Signal level		'0' = 0 V '1' = +24 V **Important:** Do not apply external voltage!	
Function	X10:21 X10:19	DBØØ: With fixed assignment '/Brake', I_{max} = 150 mA, short-circuit proof DOØ2: Selection option → Parameter menu P62_, I_{max} = 50 mA, short-circuit proof	
Only in MCF/MCV/MCS40A Analog output	X10:19	AOØ1: → Menu P64_, resolution 8-bit, I_{max} = 20 mA (short-circuit proof)	
Relay output	X10:18/20/22	DOØ1: Load capacity of the relay contacts V_{max} = 30 V_{DC}, I_{max} = 800 mA	
Function	X10:18 X10:20 X10:22	DOØ1-C: Shared relay contact DOØ2-NO: NO contact DOØ2-NC: NC contact	Selection option → Parameter menu P62_
System bus (SBus)	X10:5 X10:7	SC11: SBus high SC12: SBus low	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations, terminating resistor (120 Ω) can be activated using DIP switches
Motor encoder input[1] not with type MCF4_A	X15:	Encoder with type MCV4_A Permitted encoder types: • sin/cos encoder 1 V_{SS} • 5 V TTL sensors • 24 V HTL sensors Encoder power supply: +24 V, I_{max} = 180 mA	Resolver with type MCS4_A 2-pole, 7 $V_{AC\_r.m.s.}$, 7 kHz
Output encoder simulation or input external encoder[1] not with type MCF4_A	X14:	Output encoder simulation: Signal level to RS-422 (5 V TTL) Number of pulses as on X15: (MCV4_A) or fixed 1024 pulses/revolution (MCS4_A)	Input external encoder (max. 200 kHz): Only encoder with signal level to RS-422 (5 V TTL) should be connected! Encoder power supply: +24 V, I_{max} = 180 mA
Reference terminals	X10:8 X10:17/X10:23 X10:15	AGND: Reference potential for analog signals n1 and n2 and terminals X10:1 and X10:3 DGND: Reference potential for binary signals, system bus (SBus), encoder and resolver. DCOM: Reference potential for binary inputs X10:9...X10:14 (DIØØ...DIØ5).	
Permitted line cross section		one core per terminal: 0.20...2.5 mm^2 (AWG 24...12) two cores per terminal: 0.20...1 mm^2 (AWG 24...17)	

1) **MCF/MCV/MCS40A (without fieldbus):** The unit provides a current of I_{max} = 400 mA for the +24 V outputs (VO24, DBØØ, DBØ2, encoder supply). If this value is insufficient, a 24 V_{DC} power supply unit must be connected to X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.

MCF/MCV/MCS41A (with PROFIBUS-DP): SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
The maximum total current which may be applied to the 24 V_{DC} outputs X10:16 (VO24), X10:21 (DBØØ) and X10:19 (DOØ2) is I_{max} = 400 mA.

Front view of MCF40A, MCF41A control unit

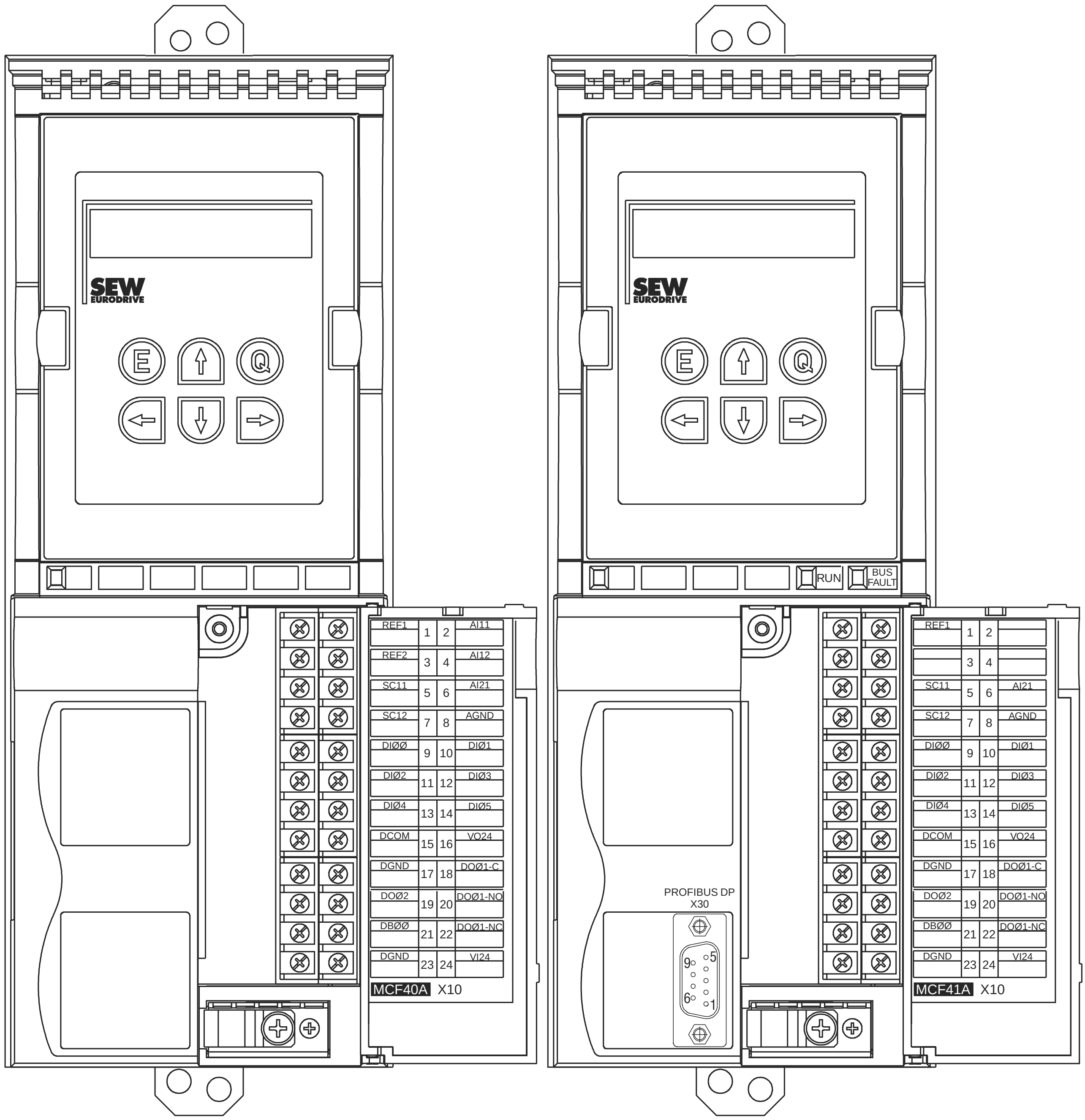


Figure 17: Front view of MCF40A, MCF41A control unit

Front view of MCV/MCS40A, MCV/MCS41A control unit

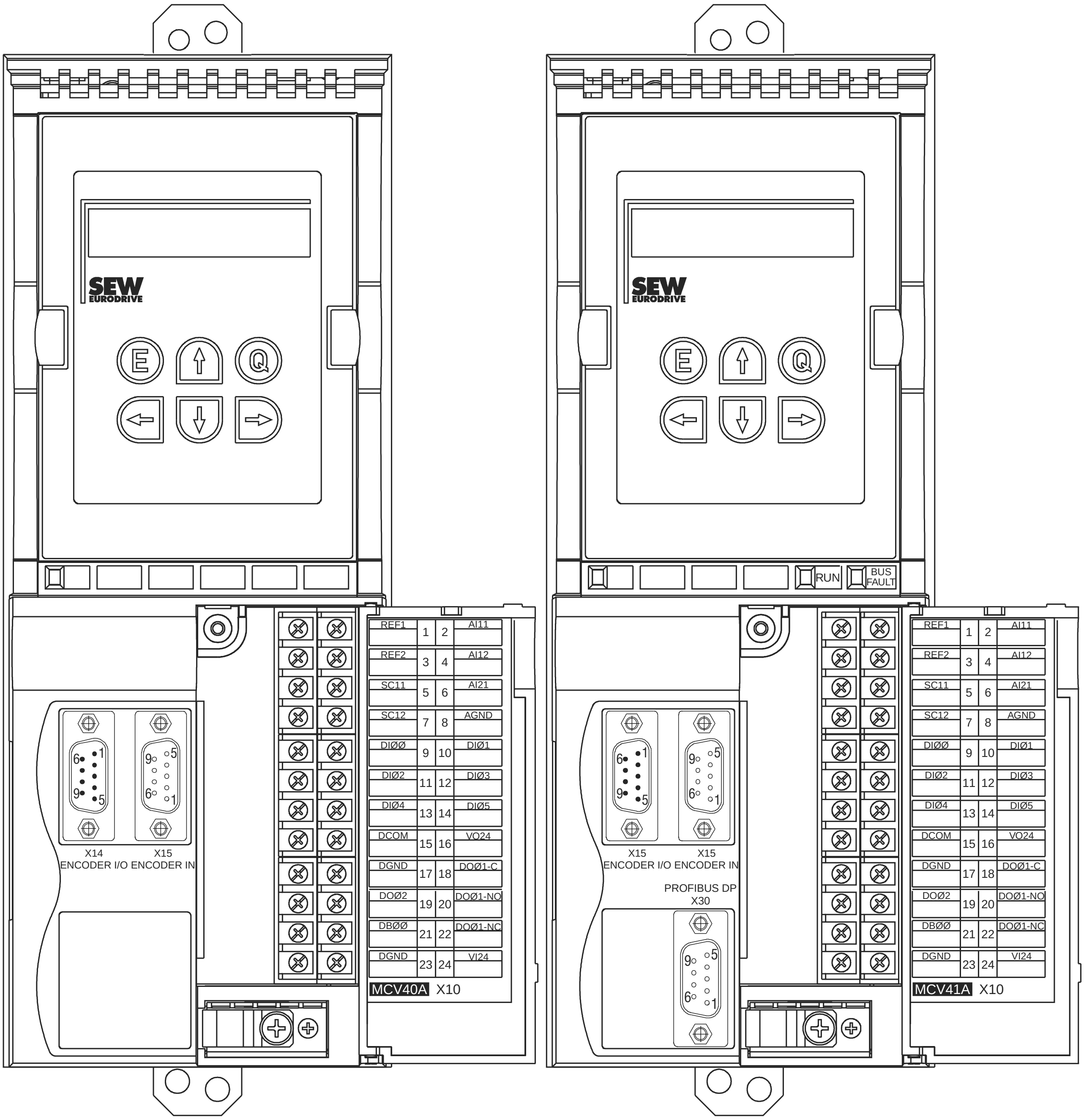


Figure 18: Front view of MCV/MCS40A, MCV/MCS41A control unit

3.7 MOVIDRIVE® compact MCH electronics data

MOVIDRIVE® *compact*	**Setpoint processing and speed ramps**	
MCH40A	**Version without fieldbus interface.**	
MCH41A	**Version with PROFIBUS-DP interface.**	
Protocol option Baud rate Connection system Bus termination Station address Name of the GSD file DP identity number	PROFIBUS-DP acc. to IEC 61158 Automatic detection of baud rate from 9.6 kbaud to 12 Mbaud 9-pin sub D connector, pin assignment to IEC 61158 not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on 0...125, can be set using DIP switch SEW_6003.GSD 6003_{hex} (24579_{dec})	
MCH42A	**Version with INTERBUS fiber optic (FO) interface.**	
Protocol option Baud rate Connection system	INTERBUS to prEN 50254 (DIN 19258) with optically controlled FO interface 500 kbaud and 2 Mbaud, changeover via DIP switch 4 F-SMA plugs (2 × remote bus input and 2 × remote bus output)	
Applies to all versions		
Voltage supply X10:1 for setpoint input X10:6	REF1: +10 V_{DC} +5 % / -0 %, I_{max} = 3 mA REF2: -10 V_{DC} +0 % / -5 %, I_{max} = 3 mA	Reference voltages for setpoint potentiometer
Setpoint input n1 X10:2/X10:3	AI11/AI12: Voltage or current input, can be set with S11 and P11_, sampling interval 1 ms	
(Differential input) Operating mode AI11/AI12 Resolution Internal resistance	Voltage input: n1 = 0...+10 V or -10 V...0...+10 V 12 bits R_i = 40 kΩ (external voltage supply) R_i = 20 kΩ (supply from REF1/REF2)	Current input: n1 = 0...20 mA or 4...20 mA 11 bits R_i = 250 Ω
Setpoint input n2 X10:4 TF/TH input	Analog input 0...10 V or optionally (→ P120) TF/TH input with response threshold at $R_{TF} \geq 2.9$ kΩ ±10 %	
Internal setpoints	Parameter set 1: n11/n12/n13 = -5000...0...+5000 rpm Parameter set 2: n21/n22/n23 = -5000...0...+5000 rpm	
Time ranges of speed ramps at Δn = 3000 rpm	1st ramp t11/t21 Up: 0.0...2000 s Down: 0.0...2000 s 2nd ramp t12/t22 Up = down: 0.0...2000 s Stop ramp t13/t23 Down: 0...20 s Emergency ramp t14/t24 Down: 0...20 s Motorized potentiometert3 Up: 0.2...50 s Down: 0.2...50 s	

The PROFIBUS-DP interface of the MOVIDRIVE® MCH41A unit corresponds to the state-of-the-art in PROFIBUS technology. The new, ground-breaking PROFIBUS-ASIC technology has been used for these units.

The concept of the MCH41A PROFIBUS-DP interface is the same as the MOVIDRIVE® MD_60A option 'PROFIBUS fieldbus interface type DFP21A'. As a result, both PROFIBUS interfaces can be used with the same PROFIBUS project planning.

MOVIDRIVE® *compact*	Other electronics data	
Auxiliary voltage output[1] X11:8	VO24: V_{OUT} = 24 V_{DC}, maximum current carrying capacity I_{max} = 200 mA	
Ext. voltage supply[1] X12:6	VI24: V_{IN} = 24 V_{DC} -15 % / +20 % (range: 19.2...30 V_{DC}) to EN 61131-2	
Binary inputs X11:1...X11:6 Internal resistance	DIØØ...DIØ5: Isolated (optocoupler), PLC-compatible (EN 61131), sampling interval 5 ms $R_i \approx$ 3.0 kΩ, $I_E \approx$ 10 mA	
Signal level	+13 V...+30 V = '1' = Contact closed -3 V...+5 V = '0' = Contact open	To EN 61131
Function X11:1 X11:2...X11:6	DIØØ: With fixed assignment '/Controller inhibit' DIØ1...DIØ5: Selection option → Parameter menu P60_	
Binary outputs[1] X12:1/X12:5	DBØØ/DOØ2: PLC compatible (EN 61131-2), response time 5 ms	
Signal level	'0' = 0 V '1' = +24 V **Important:** Do not apply external voltage!	
Function X12:1 X12:5	DBØØ: With fixed assignment '/Brake', I_{max} = 150 mA, short-circuit proof DOØ2: Selection option → Parameter menu P62_, I_{max} = 50 mA, short-circuit proof	
Analog output X12:5	AOØ1: → Menu P64_, resolution 8-bit, I_{max} = 20 mA (short-circuit proof)	
Relay output X12:2/3/4	DOØ1: Load capacity of the relay contacts V_{max} = 30 V_{DC}, I_{max} = 800 mA	
Function X12:2 X12:3 X12:4	DOØ1-C: Shared relay contact DOØ2-NO: NO contact DOØ2-NC: NC contact	Selection option → Parameter menu P62_
System bus (SBus) X10:7/10 X10:8/11	SC11/21: SBus high SC12/22: SBus low	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations, terminating resistor (120 Ω) can be activated using DIP switches
Motor encoder input[1] X15:	Permitted encoder types: • Hiperface encoders • sin/cos encoder 1 V_{SS} • TTL sensor Encoder power supply: +12 V, I_{max} = 180 mA	
Output encoder simulation or input external encoder[1] X14:	Output encoder simulation: Signal level to RS-422 (5 V TTL) The number of pulses is as follows: • 1024 pulses/revolution (Hiperface encoder on X15) • as on X15: Motor encoder input (sin/cos encoder or TTL sensor on X15)	Input external encoder (max. 200 kHz): Permitted encoder types: • Hiperface encoders • sin/cos encoder 1 V_{SS} • TTL sensor Encoder power supply: +12 V, I_{max} = 180 mA
Reference terminals X10:5 X10:9/X11:9/X12:7 X11:7	AGND: Reference potential for analog signals n1 and n2 and terminals X10:1 and X10:6 DGND: Reference potential for binary signals, system bus (SBus), encoder and resolver. DCOM: Reference potential for binary inputs X10:9...X10:14 (DIØØ...DIØ5).	
Permitted line cross section	only one core per terminal: 0.20...1.5 mm^2 (AWG 24...16) Use right-angled crimping pliers with 1.5 mm^2 (AWG16)	

1) **MCH40A (without fieldbus):** The unit provides a current of I_{max} = 400 mA for the +24 V outputs (VO24, DBØØ, DBØ2, encoder supply). If this value is insufficient, a 24 V_{DC} power supply unit must be connected to X10:24 (VI24). This external 24V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.

MCH41A (with PROFIBUS-DP) or MCH42A (with INTERBUS FO): SEW recommends always supplying these units with 24V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
The maximum total current which may be applied to the 24 V_{DC} outputs X10:16 (VO24), X10:21 (DBØØ) and X10:19 (DOØ2) is I_{max} = 400 mA.

Front view of MCH42A control unit

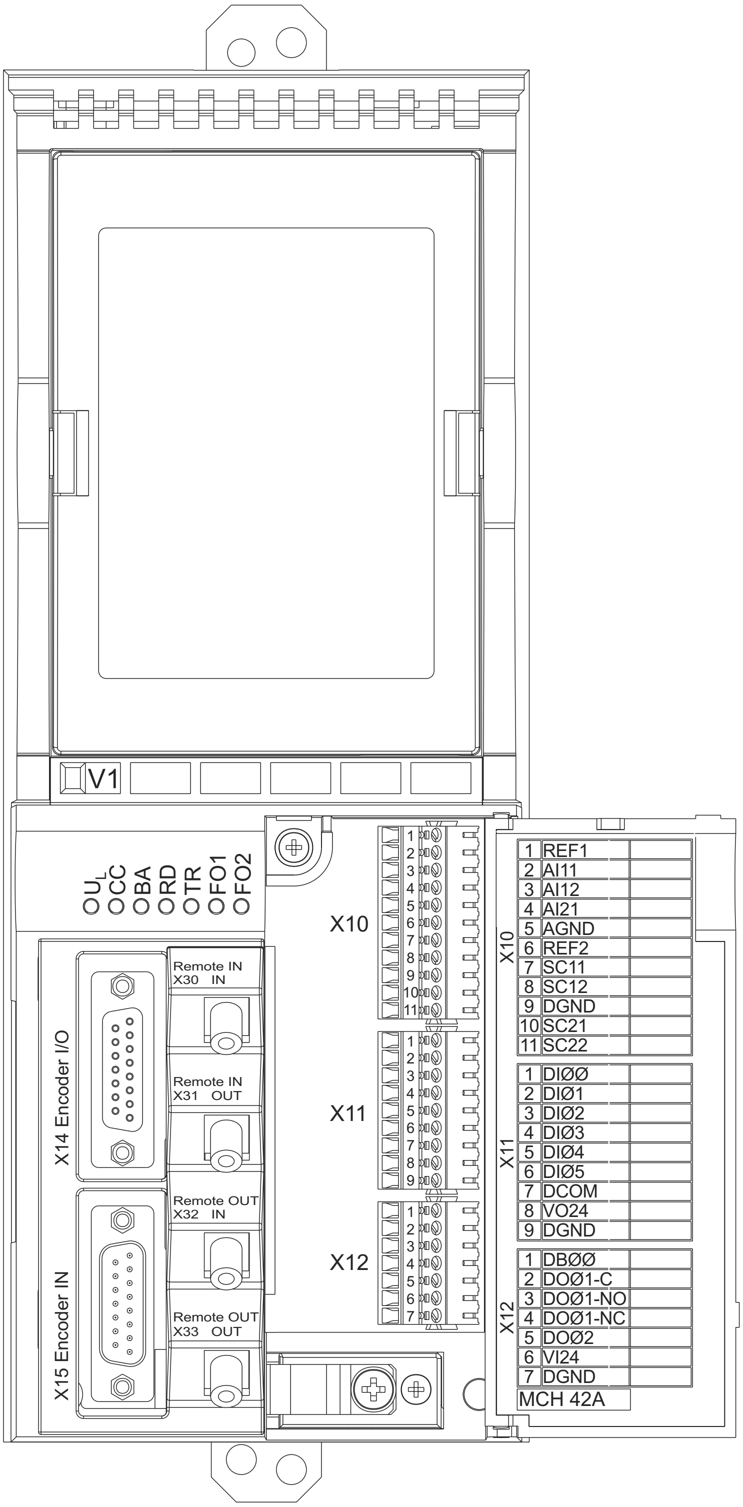


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Figure 19: Front view of MCH42A control unit

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3.8 MOVIDRIVE® compact dimensions

Dimensions, size 1 (0015...0040-5A3 and 0015...0037-2A3)

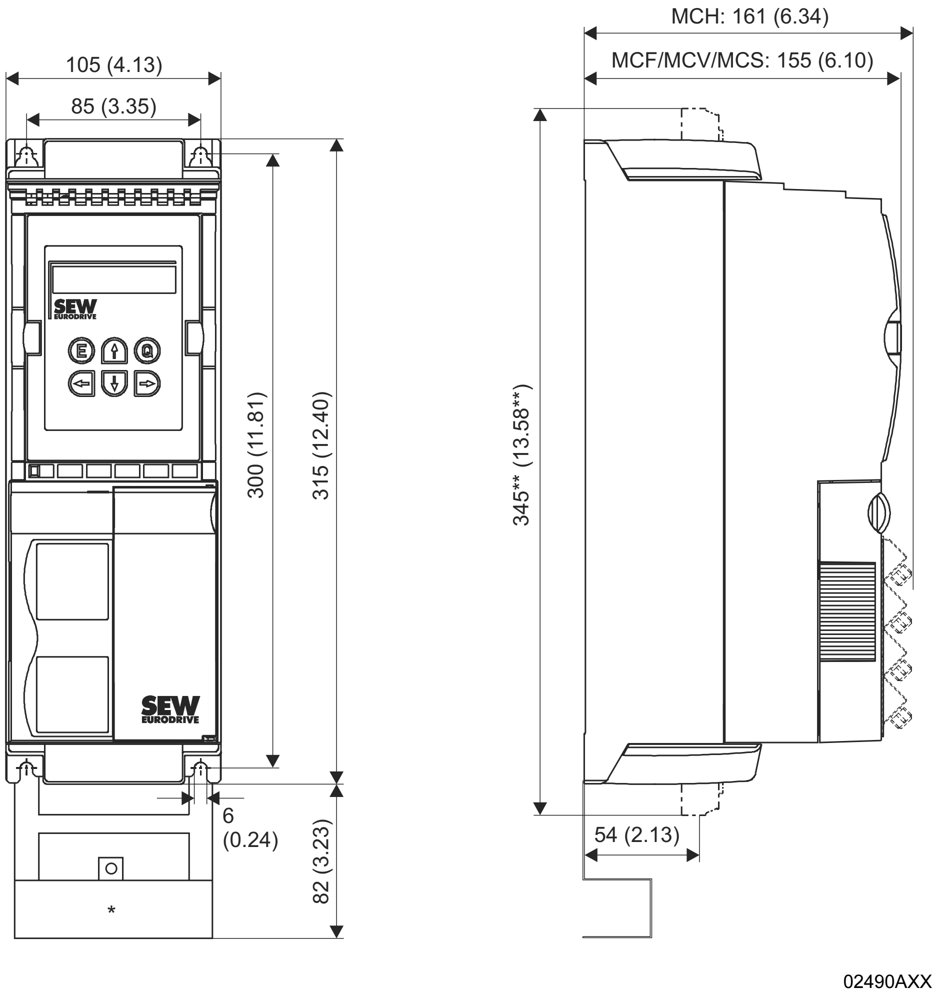


Figure 20: Dimensions, size 1, in mm (in)

* Power shield clamp

** Unit dimension with power terminals attached

Provide at least 100 mm (4 in) clearance above and below the unit to ensure adequate cooling! No lateral clearance required; the units can be lined up side-by-side.

Dimensions, size 2 (0055...0110-5A3 and 0055 / 0075-2A3)

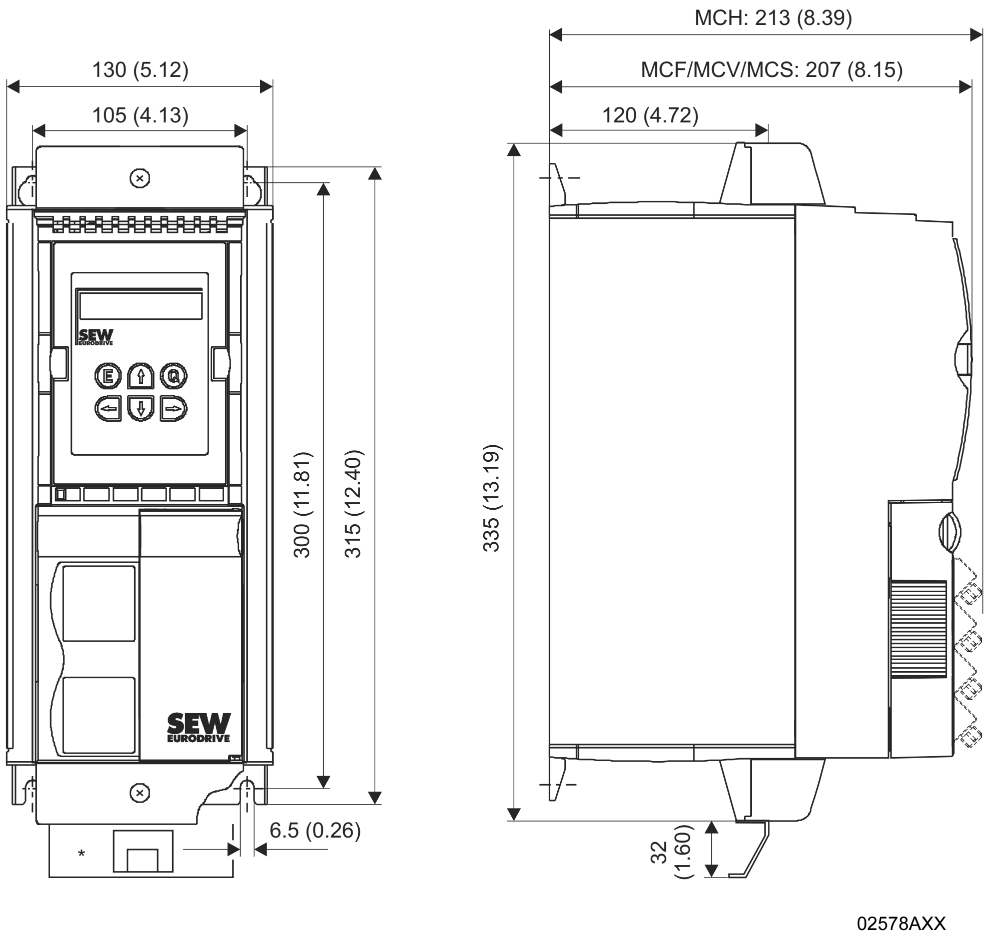


Figure 21: Dimensions, size 2, in mm (in)

* Power shield clamp

Provide at least 100 mm (4 in) clearance above and below the unit to ensure adequate cooling! No lateral clearance required; the units can be lined up side-by-side.

Dimensions, size 3 (0150...0300-503 and 0110 / 0150-203)

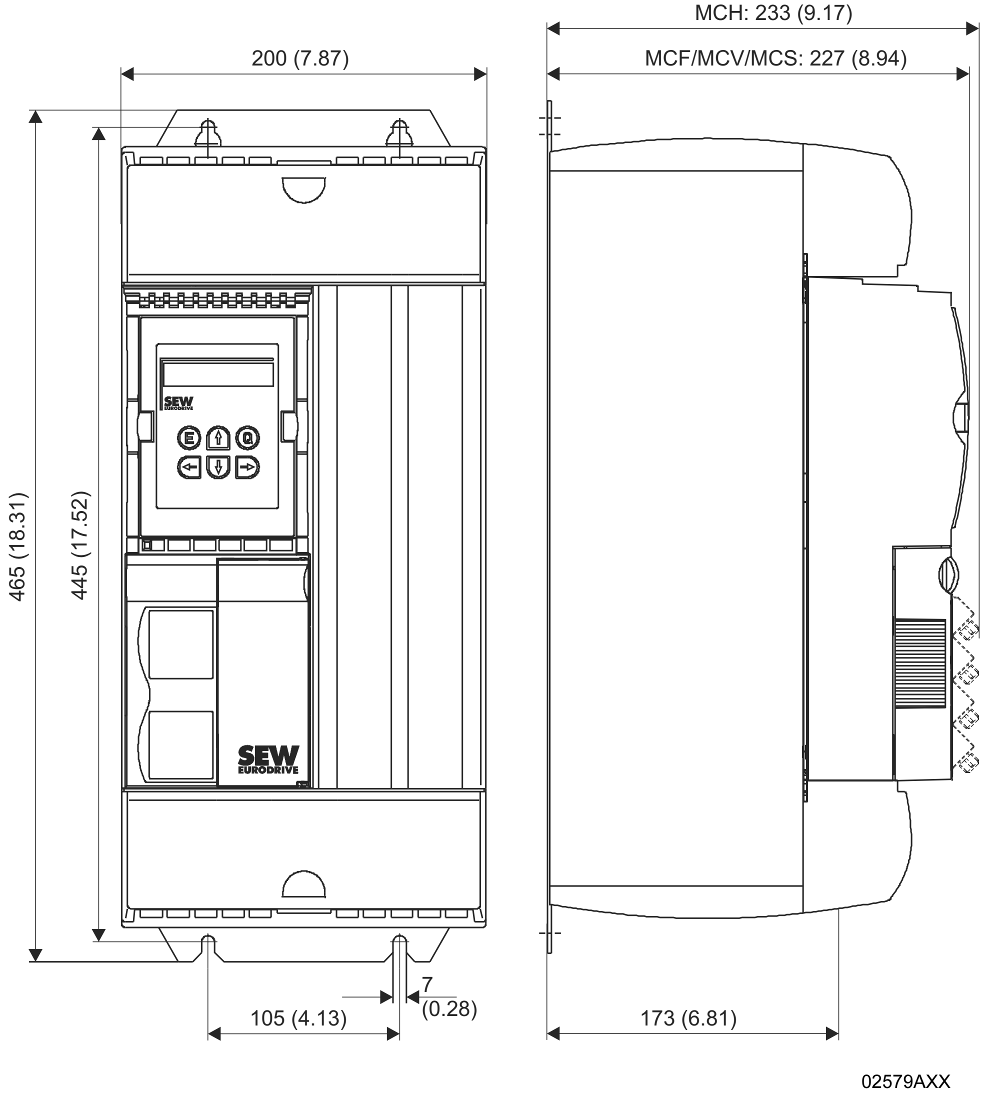


Figure 22: Dimensions, size 3, in mm (in)

Provide at least 100 mm (4 in) clearance above and below the unit to ensure adequate cooling! No lateral clearance required; the units can be lined up side-by-side.

Dimensions, size 4 (0370 / 0450-503 and 0220 / 0300-203)

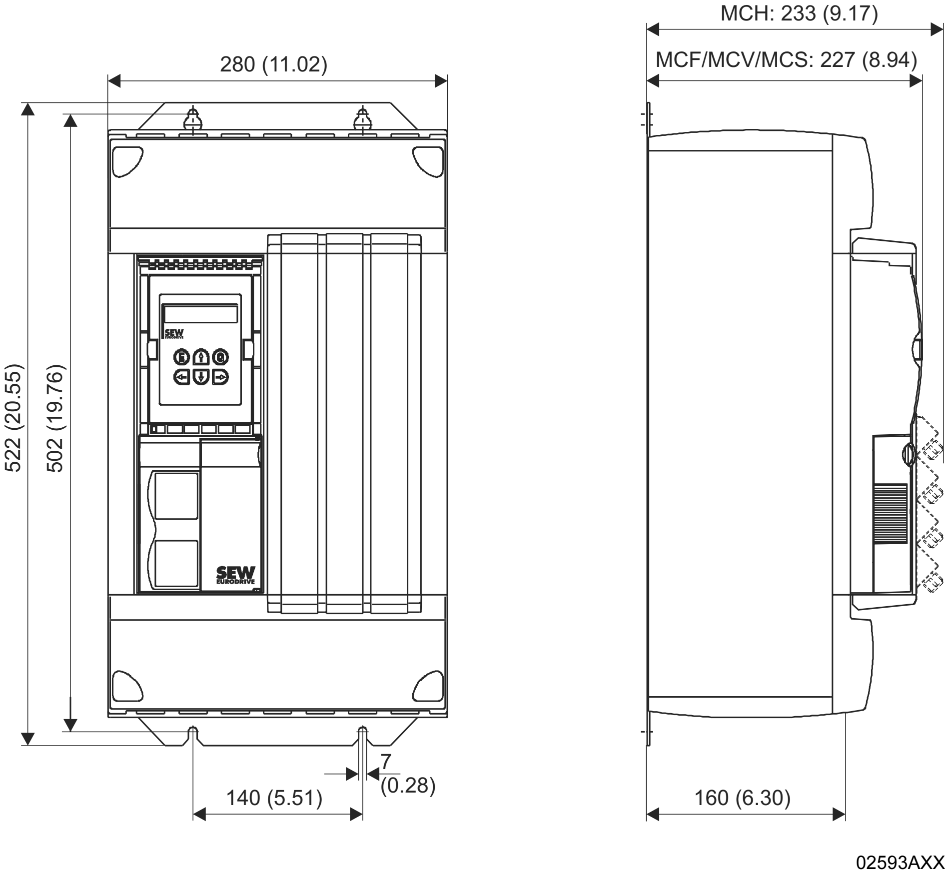


Figure 23: Dimensions, size 4, in mm (in)

Provide at least 100 mm (4 in) clearance above and below the unit. No clearance is required at the sides; the units can be lined up side-by-side.

Do not install any components which are sensitive to high temperatures within 300 mm (11.81 in) of the top of the unit (e.g. contactors or fuses).

Dimensions, size 5 (0550 / 0750-503)

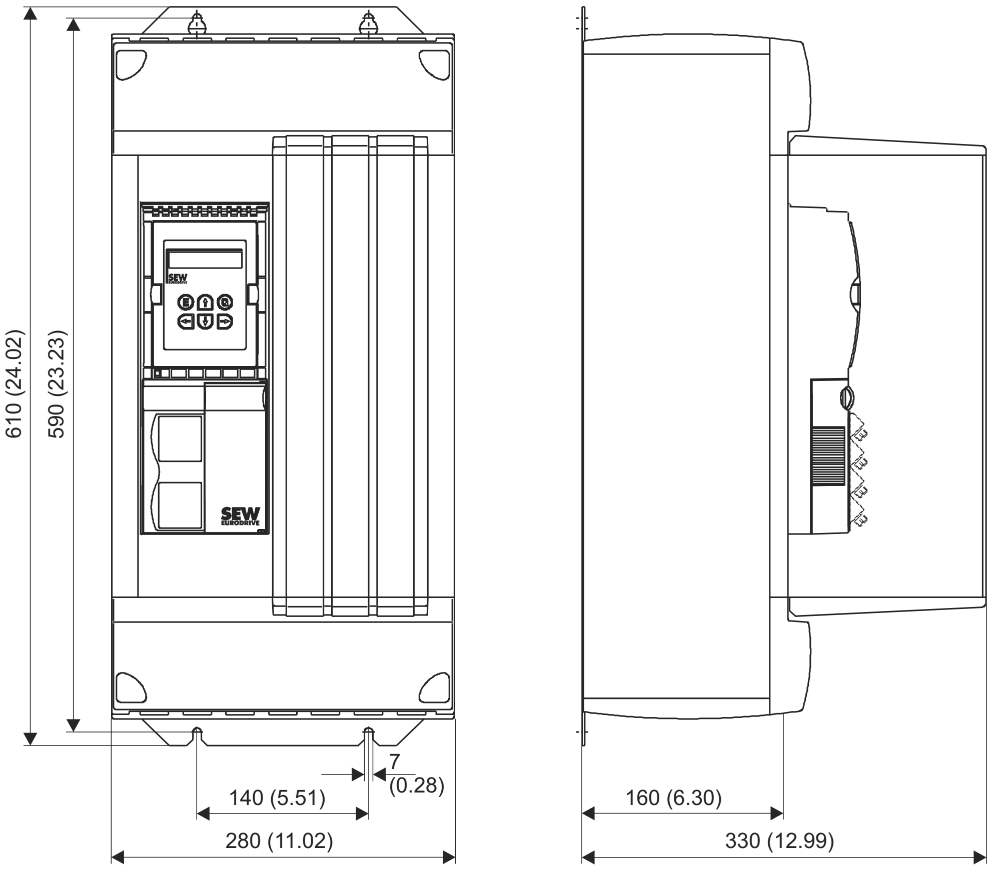


Figure 24: Dimensions, size 5, in mm (in)

Provide at least 100 mm (4 in) clearance above and below the unit. No clearance is required at the sides; the units can be lined up side-by-side.

Do not install any components which are sensitive to high temperatures within 300 mm (11.81 in) of the top of the unit (e.g. contactors or fuses).

3.9 IPOS$^{plus®}$

Description

The IPOS$^{plus®}$ positioning and sequence control system is integrated into every MOVIDRIVE® inverter as standard. With IPOS$^{plus®}$, control functions and positioning tasks can be performed either simultaneously or independently of one another.

The IPOS$^{plus®}$ sequence control system makes it possible to run a user program, regardless of any encoder feedback or the selected control mode (VFC, CFC, SERVO). In conjunction with encoder feedback (MCV, MCS, MCH), the IPOS$^{plus®}$ positioning control provides a high-performance point-to-point positioning capability. The IPOS$^{plus®}$ program is written using the MOVITOOLS software. Startup of the inverter, accessing parameters and editing variables are possible either with the software or the DBG11B keypad. (Note: The DBG11B can only be used for startup in VFC mode.)

Properties

- Program execution independent of encoder feedback and operating mode.
- The user program is continued even if the unit develops a malfunction (troubleshooting is possible in the user program).
- Two user programs can be run in parallel and independently of one another (task 1, interrupt-capable, and task 2).
- The user programs programmed in assembler can contain up to 800 program lines.
- User-friendly and comprehensive control options for the inverter.
- Extensive options for communication via system bus (SBus), RS-485, RS-232 and fieldbus (direct communication with MOVIMOT® is possible).
- Processing of digital and analog input/output signals.

With MCV/MCS/ MCH only

- Positioning with selectable travel speed and positioning ramp.
- Feedforward for position, speed and torque control loops with minimized lag error.
- Two touch probe inputs.
- LINEAR, SINUSOIDAL and SQUARED ramp functions.
- Status and monitoring functions: Lag error monitoring, position signal, software and hardware limit switches.
- Eight possible reference travel types.
- Possibility of changing the target position, travel speed, positioning ramp and torque while movement is in progress.
- 'Endless positioning' is possible.
- Override function.

Technical data

Max. program length of task 1 and task 2	**approx. 800 program lines in total (assembler programming)**
Command processing time per program line	Task 1: 1.0 ms; Task 2: 0.5 ms
Variables	512, of which 128 (0...127) can be stored to non-volatile memory; range of values: $-2^{31}...+(2^{31}-1)$
Touch probe inputs	2 inputs, processing time < 100 µs
Sampling interval of digital and analog inputs	1...5 ms
Digital inputs/outputs	6 inputs / 3 outputs
Analog inputs/outputs	1 input (0...10 V, ±10 V, 0...20 mA, 4...20 mA) 1 input (0...10 V) 1 output (0...20 mA, 4...20 mA)

3.10 DBG11B keypad option

Description

The keypad is used for startup and for service. The basic version of MOVIDRIVE® does not have a keypad but can be upgraded.

Keypad	Language	Part number
DBG11B-08	DE/EN/FR/ES/PT (German/English/French/Spanish/Portuguese)	824 154 6
DBG11B-09	EN/IT/SV/DA/FI (English/Italian/Swedish/Danish/Finnish)	824 155 4
DBG11B-11	ES/DE/EN/FR/PT (Spanish/German/English/French/Portuguese)	824 156 2
DBG11B-12	SV/EN/IT/DA/FI (Swedish/English/Italian/Danish/Finnish)	824 157 0
DBG11B-13	EN/ES/DE/FR/PT (English/Spanish/German/French/Portuguese)	824 158 9
DBG11B-14	FR/IT/ES/PT/EN (French/Italian/Spanish/Portuguese/English)	824 248 8

Equipment

- Illuminated plain text display, five languages can be set.
- Membrane keypad with 6 keys.
- Selection between the quick menu, detailed parameter menu and startup menu in VFC mode (CFC and SERVO startup is not possible with the DBG11B).
- Can be plugged onto the inverter (TERMINAL option slot).
- Connection possible via FKG11A extension cable (part number 822 101 4).
- Enclosure IP40 (EN 60529)

Note

The DBG11B keypad option and the USS21A serial interface option are connected to the same inverter slot (TERMINAL) and cannot therefore be used at the same time.

Functions

- Displays of process values and status displays.
- Status displays of the binary inputs/outputs.
- Fault memory inquiry and fault reset.
- Displaying and setting the operating parameters and service parameters.
- Saving data and transferring parameter sets to other MOVIDRIVE® units.
- User-friendly startup menu for VFC mode.
- Storing a curve for the electronic cam.

Dimensions

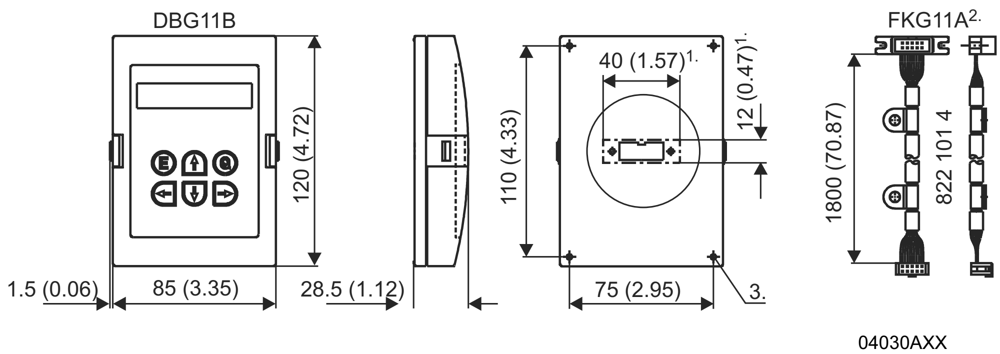


Figure 25: Dimensions, DBG11B and FKG11A, in mm (in)

1. Cut-out for the plug in the mounting plate
2. DBG11B-MOVIDRIVE® communications cable
3. Holes for tapping screws 3.5 × 9.5 mm (0.14 × 0.37 in)

3.11 Serial interface option type USS21A (RS-232 and RS-485)

Part number 822 914 7

Description MOVIDRIVE® can be equipped with isolated RS-232 and RS-485 interfaces. The RS-232 interface is configured as a 9-pin sub D female connector (EIA standard) and the RS-485 interface as a terminal connection. The interfaces are accommodated in a housing for plugging onto the inverter (TERMINAL option slot). The option can be plugged on during operation. The transmission rate of both interfaces is 9600 baud.

Startup, operation and service are possible from the PC via the serial interface. The SEW MOVITOOLS software is used for this. It is also possible to transfer parameter settings to several MOVIDRIVE® drive inverters via PC.

Note DBG11B and USS21A are connected to the same inverter slot (TERMINAL) and cannot be used at the same time.

RS-232 interface To connect a PC to the MOVIDRIVE® USS21A option, use a commercial shielded serial interface cable with a 1:1 connection assignment.

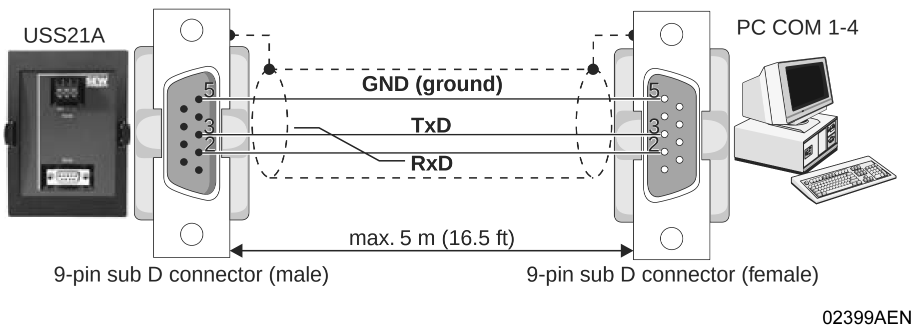


Figure 26: USS21A-PC connection cable (1:1 connection assignment)

RS-485 interface You can network up to 16 MOVIDRIVE® units for communications purposes (max. total cable length 200 m (660 ft)) via the RS-485 interface of the USS21A. Dynamic terminating resistors are permanently installed, so do not connect any external terminating resistors.

Unit addresses 0...99 are permitted with multipoint connections. In this case, the 'point to point connection' must not be selected in MOVITOOLS. The communications address in MOVITOOLS and the RS-485 address of the MOVIDRIVE® unit (P810) must be the same.

Dimensions

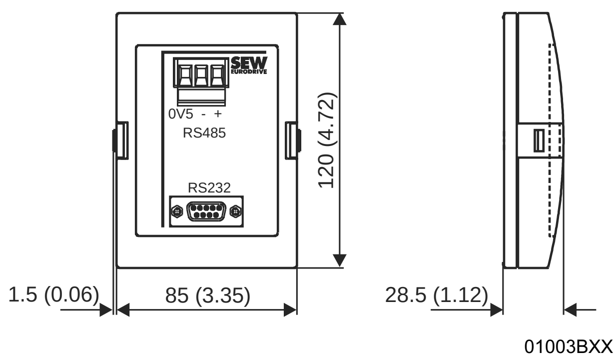


Figure 27: Dimensions, USS21A, in mm (in)

3.12 5 V encoder power supply option type DWI11A

Part number 822 759 4

Description If you are using an incremental encoder with a 5 V_{DC} encoder power supply, install the 5 V encoder power supply option type DWI11A between the inverter and the incremental encoder. This option provides a regulated 5 V_{DC} power supply for the encoder. This involves converting the 24 V_{DC} power supply for the encoder inputs to 5 V_{DC} by means of a voltage controller. The supply voltage at the encoder is measured using a sensor line and the voltage drop along the encoder cable is compensated.

Do not connect incremental encoders with 5 V_{DC} encoder power supply directly to the encoder inputs X14: and X15:. Such a connection would result in irreparable damage to the encoders.

STOP

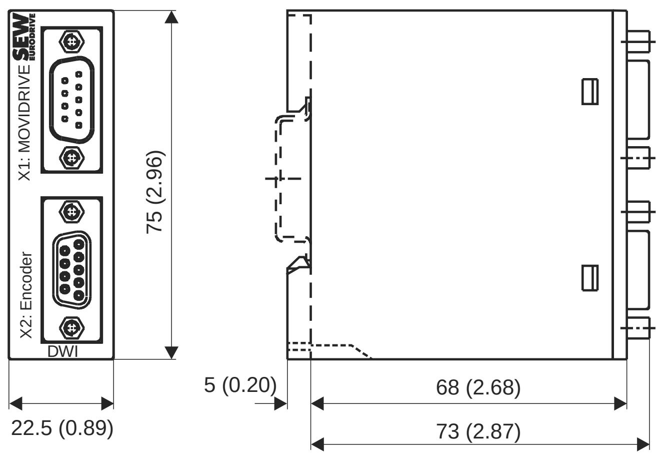
Note that in the event of a short circuit on the sensor line, the connected encoder may be subjected to a voltage in excess of its permitted voltage.

Technical data

Option	5 V encoder power supply type DWI11A
Part number	822 759 4
Voltage input	+24 V to EN 61131-2, 18...30 V_{DC}, I_{max} = 120 mA
Encoder power supply	+5 V (up to $V_{max} \approx$ +10 V), I_{max} = 300 mA
Max. line length which can be connected	100 m (330 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 MOVIDRIVE®.

Recommendation Use prefabricated cables from SEW for connection of the encoder.

Dimensions



01315BXX

Figure 28: Dimensions, DWI11A, in mm (in)

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

3.13 MOVITOOLS software

Part number 0918 5054

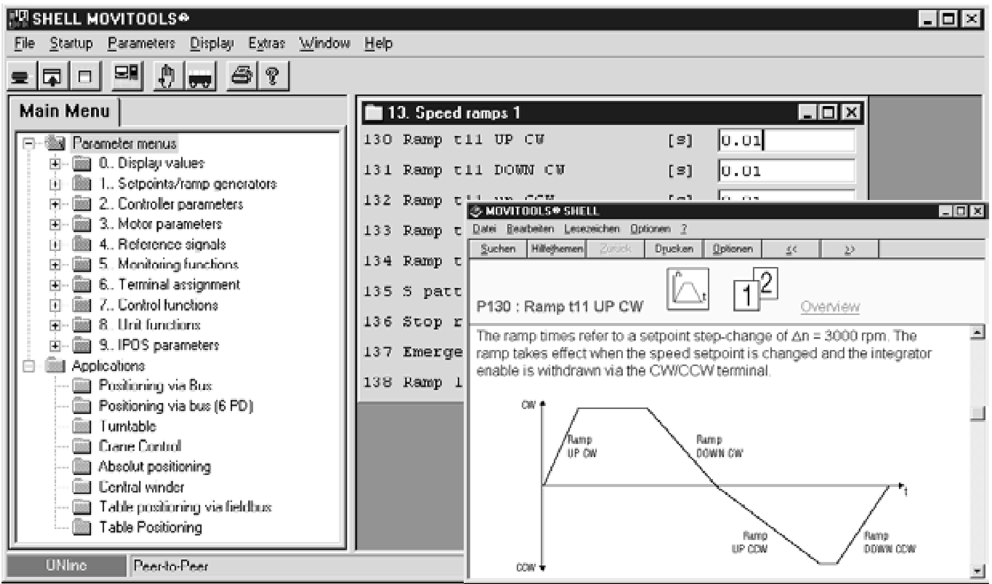
Description MOVITOOLS is a program package comprising SHELL, SCOPE, IPOS$^{plus®}$ Compiler and LOGODrive. You can use MOVITOOLS to address either of the three ranges of units MOVIDRIVE® MD_60A, MOVIDRIVE® *compact* and MOVITRAC® 07.

- SHELL can be used for starting up the drive and setting its parameters in a convenient fashion.
- SCOPE provides extensive oscilloscope functions for diagnostics of the drive.
- IPOS$^{plus®}$ Compiler provides a convenient way of writing programs for applications in a high-level language.
- The assembler enables you to write programs directly on the machine.
- LOGODrive allows you to write applications with graphics support.
- Device status displays the status of the connected unit.

Various application modules, e.g. table positioning, are stored in MOVITOOLS in advance as IPOS$^{plus®}$ programs and can be activated using units in application version.

MOVITOOLS is supplied on a CD-ROM and can also be downloaded from the SEW homepage (http://www.sew-eurodrive.com). MOVITOOLS can be used with the following operating systems:

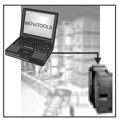
- Windows® 95
- Windows® 98
- Windows NT® 4.0
- Windows® 2000 (from version 2.60)
- Windows® Me (from version 2.60)



02719AEN

Figure 29: MOVITOOLS window

3.14 Application modules for MOVIDRIVE® compact



In the past, it was necessary to write complicated control programs for the machine control in order to implement applications such as bus positioning. All movements were controlled by the machine control.

IPOS plus®

SEW MOVIDRIVE® *compact* drive inverters with integrated IPOS plus® positioning and sequence control systems are capable of controlling all movements themselves. The control program runs in the inverter. The major advantages are:

- Decentralized concepts can be implemented more easily.
- Movements are controlled closer to the machine, i.e. response times are shorter.
- The machine control does not have to perform as many functions.

Users do not have to go to the trouble of writing the IPOS plus® control program themselves. SEW offers application modules for MOVIDRIVE® *compact* units in application version. The application modules form part of the MOVITOOLS software package.

Advantages

The application modules offer the following benefits:

- Wide range of functions
- User-friendly user interface
- You only have to enter the parameters needed for the application
- User-friendly application programs guide you through the process of setting parameters, i.e. there is no need for complicated programming
- No programming experience necessary
- Steep learning curve

Scope of supply and documentation

The application modules form part of the MOVITOOLS software package and can be used with units in application version (MOVIDRIVE® *compact*...-0T). All manuals relating to the application modules are contained in the 'Additional Functions and Application Modules' documentation package. You can order this documentation package from SEW.

The individual manuals (files in PDF format) can also be downloaded from the SEW homepage (http://www.sew-eurodrive.com).

Positioning

The application modules for the 'Positioning' application are suited to all applications which involve target positions being specified and then movement taking place to those positions. The sequence of motion can be linear or rotational.

These include trolleys, hoists, gantries, rotary tables, swiveling devices and storage and retrieval units for high-bay warehouses.

Linear positioning

In the case of linear positioning application modules, SEW distinguishes between whether the movement records are managed in the inverter or in the master PLC.

Movement records in the inverter

- **Table positioning with bus control**

You can manage up to 32 movement records in the inverter with this application module. A movement record is made up of the destination, speed and ramp. The destination to which movement is to take place is selected using binary code, by means of virtual terminals (fieldbus, system bus). The application module comes with the following range of features:

- 32 table positions can be defined and selected.
- The travel speed can be selected as required for each positioning movement.
- The ramp can be set separately for each positioning movement.
- Software limit switches can be defined and evaluated.
- Menu system for startup and diagnostics
  –Freely definable user travel units
  –Calculation of position resolution during positioning via the motor encoder
  –Graphical position display

This application module is suited to applications in which movement has to take place to a limited number of different destinations only and that require the highest possible degree of independence from the machine control.

There are four operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The machine zero is determined automatically with incremental position measurement.
- Teach-in: The stored position can be corrected without a programming unit.
- Automatic mode: Automatic sequence controlled by the master PLC.

Movement records in the PLC

- **Positioning via bus**
- **Extended positioning via bus**

In these application modules, the movement records are managed in the PLC. The destination and travel speed are specified via the fieldbus or system bus. The application modules come with the following range of features:

- Any number of target positions can be defined and selected by means of a fieldbus/system bus.
- The travel speed can be selected as required via the fieldbus/system bus for each positioning movement.
- Software limit switches can be defined and evaluated.
- Straightforward connection to the machine control.

- Menu system for startup and diagnostics
  –Freely definable user travel units
  –Calculation of position resolution during positioning via the motor encoder
  –Jog mode with variable speed
  –Fieldbus monitor

These application modules are suited for applications in which movement has to take place to a large number of different target positions.

There are three operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The machine zero is determined automatically with incremental position measurement.
- Automatic mode: Automatic sequence controlled by the master PLC.

Rotational positioning

- **Rotary axis**

You can manage up to 16 movement records in the inverter with this application module. A movement record is made up of the destination, speed and ramp. The destination to which movement is to take place is selected using binary code, by means of the binary inputs of the inverter or via virtual terminals (fieldbus, system bus). The position measurement can only take place with incremental encoders. The application module comes with the following range of features:

- 16 table positions can be defined and selected.
- The travel speed can be selected as required for each positioning movement.
- The ramp can be set separately for each positioning movement.
- Flying referencing when using a non-whole number ratio.
- Positioning with position optimization or positioning with a predefined direction of rotation.
- Pulse mode with 16 step widths.
- External encoder for position detection possible.
- Menu system for startup and diagnostics
  –Calculation of position resolution during positioning via the motor encoder
  –Graphical position display

This application module is suited for applications in which rotational movements or similar endless movements are required. These include rotary tables, circular indexing tables, swiveling devices or cyclic belts.

The following operating modes are available for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The machine zero is determined automatically.
- Teach-in: The stored position can be corrected without a programming unit.
- Positioning with position optimization
- Positioning with a fixed direction of rotation
- Cyclical operation

Winding

- **Constant tension central winder** (short: central winder)

In this application, the web tension is set for winding or unwinding using the setpoints, the mechanical friction values, the winding diameter and the winding characteristics. Control takes place either via the binary inputs of the inverter or the virtual terminals (fieldbus, system bus). The application module comes with the following range of features:

- Calculation of the reel diameter and the tensile force.
- Material tear monitoring.
- Material length counter.
- Straightforward connection to the machine control.
- Menu system for startup and diagnostics

  –Adjustable winding curve
  –Display of web speed and current diameter

This application module is suited for applications in which an endless material, e.g. paper, film, foam, textiles or sheet metal is wound for further processing.

There are four operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Teach-in: The speed-dependent friction values are determined automatically.
- Automatic mode with constant torque.
- Automatic mode with constant web tension.

Controlling

- **Flying saw**

In this application module, the sequence of motion is controlled according to specifications. The application module comes with the following range of features:

- Cut edge protection or singling using the 'Draw gap' function.
- Immediate cut function by manual interrupt.
- Material length counter.
- Straightforward connection to the machine control.
- Menu system for startup and diagnostics

  –Display of the current cut length and the material speed
  –Display of the saw drive speed

This application module is suited for applications in which endless material has to be cut, sawn or pressed, e.g. diagonal saws or flying punches.

There are two operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The reference point of the machine is determined.
- Positioning mode
- Automatic mode

3.15 Braking resistor option type BW...

General information

The braking resistors in the BW... series are adapted to the technical characteristics of MOVIDRIVE® drive inverters.

Flat-type braking resistor

- Shockproof (IP54)
- Internal thermal overload protection (fuse which cannot be replaced)
- Touch guard and mounting rail mounting available from SEW as accessories.

3

Wire and grid resistors

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

SEW recommends protecting the wire and grid resistors against overload using a bimetallic relay. Set the trip current to the value I_F in the table. Do not use any electronic or electromagnetic fuses since even the brief excess currents which are still permitted may cause them to trip.

The surfaces of the resistors get very hot if loaded with P_N. Bear this aspect in mind when selecting the installation location. As a rule, braking resistors are mounted on the switch cabinet roof.

The performance data listed in the tables below show the load capacity of the braking resistors according to their cyclic duration factor (cyclic duration factor = cdf of the braking resistor in % in relation to a cycle duration ≤ 120 s).

Parallel connection

Two braking resistors must be connected in parallel in the case of some inverter/resistor combinations. In this case, the trip current must be set on the bimetallic relay to twice the value of I_F entered in the table.

Assignment to 400/500 V units (...-5_3)

Braking resistor type		**BW100-005**	**BW100-006**	**BW168**	**BW268**	**BW147**	**BW247**	**BW347**
Part number		826 269 1	821 701 7	820 604 X	820 715 1	820 713 5	820 714 3	820 798 4
Load capacity at	**100 % cdf** **50 % cdf**[1] **25 % cdf** **12 % cdf** **6 % cdf**	0.45 kW 0.60 kW 0.83 kW 1.11 kW 2.00 kW	0.6 kW 1.1 kW 1.9 kW 3.5 kW 5.7 kW	0.8 kW 1.4 kW 2.6 kW 4.7 kW 7.6 kW	1.2 kW 2.2 kW 3.8 kW 6.7 kW 10 kW[2]	1.2 kW 2.2 kW 3.8 kW 7.2 kW 11 kW	2.0 kW 3.8 kW 6.4 kW 12 kW 14.4 kW[2]	4.0 kW 7.6 kW 12.8 kW 14.4 kW[2] 14.4 kW[2]
		Note the **regenerative power limit** of the inverter! (= 150 % of the recommended motor power → Technical Data)						
Resistance value	R_{BW}	100 Ω ±10 %		68 Ω ±10 %		47 Ω ±10 %		
Trip current (of F16)	I_F	0.8 A_{RMS}	1.8 A_{RMS}	2.5 A_{RMS}	3.4 A_{RMS}	3.5 A_{RMS}	4.9 A_{RMS}	7.8 A_{RMS}
Type		Flat type	Wire resistor on ceramic core					
Connections		Cable	Ceramic terminals 2.5 mm^2 (AWG12)					
Enclosure		IP54	IP20 (when mounted)					
Ambient temperature	ϑ_{amb}	-20...+45 °C						
Type of cooling		KS = Self-cooling						
for MOVIDRIVE®		0015/0022	0015...0040			0055/0075		

1) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration T_D ≤ 120 s.

2) Physical power limit due to the DC link voltage and the resistance value.

Braking resistor type		BW039-012	BW039-026	BW039-050	BW018-015	BW018-035	BW018-075
Part number		821 689 4	821 690 8	821 691 6	821 684 3	821 685 1	821 686 X
Load capacity at	100 % cdf 50 % cdf[1] 25 % cdf 12 % cdf 6 % cdf	1.2 kW 2.1 kW 3.8 kW 7.0 kW 11.4 kW	2.6 kW 4.6 kW 8.3 kW 15.3 kW 17.3 kW[2]	5.0 kW 8.5 kW 15.0 kW 17.3 kW[2] 17.3 kW[2]	1.5 kW 2.5 kW 4.5 kW 6.7 kW 11.4 kW	3.5 kW 5.9 kW 10.5 kW 15.7 kW 26.6 kW	7.5 kW 12.7 kW 22.5 kW 33.7 kW 37.5 kW[2]
		Note the **regenerative power limit** of the inverter! (= 150 % of the recommended motor power → Technical Data)					
Resistance value	R_{BW}	39 Ω ±10 %			18 Ω ±10 %		
Trip current (of F16)	I_F	4.2 A_{RMS}	7.8 A_{RMS}	11 A_{RMS}	4.0 A_{RMS}	8.1 A_{RMS}	14 A_{RMS}
Type		Wire resistor		Grid resistor			
Connections		Ceramic terminals 2.5 mm^2 (AWG12)					
Enclosure		IP20 (when mounted)					
Ambient temperature	ϑ_{amb}	-20...+45 °C					
Type of cooling		KS = Self-cooling					
for MOVIDRIVE®		0110			0150/0220 and 2 × parallel with 0370/0450		

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

2) Physical power limit due to the DC link voltage and the resistance value.

Braking resistor type		BW915	BW012-025	BW012-050	BW012-100	BW106	BW206
Part number		821 260 0	821 680 0	821 681 9	821 682 7	821 050 0	821 051 9
Load capacity at	100 % cdf 50 % cdf[1] 25 % cdf 12 % cdf 6 % cdf	16 kW 27 kW 45 kW[2] 45 kW[2] 45 kW[2]	2.5 kW 4.2 kW 7.5 kW 11.2 kW 19.0 kW	5.0 kW 8.5 kW 15.0 kW 22.5 kW 38.0 kW	10 kW 17 kW 30 kW 45 kW 56 kW[2]	13 kW 24 kW 40 kW 66 kW 102 kW	18 kW 32 kW 54 kW 88 kW 112 kW[2]
		Note the **regenerative power limit** of the inverter! (= 150 % of the recommended motor power → Technical Data)					
Resistance value	R_{BW}	15 Ω ±10 %	12 Ω ±10 %			6 Ω ±10 %	
Trip current (of F16)	I_F	28 A_{RMS}	6.1 A_{RMS}	12 A_{RMS}	22 A_{RMS}	38 A_{RMS}	42 A_{RMS}
Type		Grid resistor					
Connections		M8 stud	Ceramic terminals 2.5 mm^2 (AWG12)			M8 stud	
Enclosure		IP20 (when mounted)					
Ambient temperature	ϑ_{amb}	-20...+45 °C					
Type of cooling		KS = Self-cooling					
for MOVIDRIVE®		0220	0300			0370...0750	

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

2) Physical power limit due to the DC link voltage and the resistance value.

Assignment to 230 V units (-2_3)

Braking resistor type		BW039-003	BW039-006	BW039-012	BW039-026	BW027-006	BW027-012	BW018-015	BW018-035
Part number		821 687 8	821 688 6	821 689 4	821 690 8	822 422 6	822 423 4	821 684 3	821 685 1
Load capacity at	**100 % cdf**	0.3 kW	0.6 kW	1.2 kW	2.6 kW	0.6 kW	1.2 kW	1.5 kW	3.5 kW
	50 % cdf[1]	0.5 kW	1.1 kW	2.1 kW	4.6 kW	1.2 kW	2.3 kW	2.5 kW	5.9 kW
	25 % cdf	1.0 kW	1.9 kW	3.8 kW	5.9 kW[2]	2.0 kW	5.0 kW	4.5 kW	10.5 kW
	12 % cdf	1.7 kW	3.5 kW	5.9 kW[2]	5.9 kW[2]	3.5 kW	7.5 kW	6.7 kW	15.7 kW
	6 % cdf	2.8 kW	5.7 kW	5.9 kW[2]	5.9 kW[2]	6.0 kW	8.5 kW[2]	11.4 kW	25.6 kW[3]
		Note the **regenerative power limit** of the inverter! (= 150 % of the recommended motor power → Technical Data)							
Resistance value	R_{BW}	39 Ω ±10 %				27 Ω ±10 %		18 Ω ±10 %	
Trip current (of F16)	I_F	2.0 A_{RMS}	3.2 A_{RMS}	4.2 A_{RMS}	7.8 A_{RMS}	2.5 A_{RMS}	4.4 A_{RMS}	4.0 A_{RMS}	8.1 A_{RMS}
Type		Wire resistor						Grid resistor	
Connections		Ceramic terminals 2.5 mm² (AWG12)							
Enclosure		IP20 (when mounted)							
Ambient temperature	ϑ_{amb}	-20...+45 °C							
Type of cooling		KS = Self-cooling							
for MOVIDRIVE®		0015/0022				0015...0037		2 × parallel with 0110	

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

2) Physical power limit due to the DC link voltage and the resistance value.

3) Physical power limit due to the DC link voltage and the resistance value.

Braking resistor type		BW018-075	BW915	BW012-025	BW012-050	BW012-100	BW106	BW206
Part number		821 686 X	821 260 0	821 680 0	821 681 9	821 682 7	821 050 0	821 051 9
Load capacity at	**100 % cdf**	7.5 kW	16.0 kW	2.5 kW	5.0 kW	10 kW	13 kW	18 kW
	50 % cdf[1]	12.7 kW	27.0 kW	4.2 kW	8.5 kW	17 kW	24 kW	32 kW
	25 % cdf	22.5 kW	30.7 kW[2]	7.5 kW	15.0 kW	19.2 kW[2]	38.4 kW[2]	38.4 kW[2]
	12 % cdf	25.6 kW[2]	30.7 kW[2]	11.2 kW	19.2 kW[2]	19.2 kW[2]	38.4 kW[2]	38.4 kW[2]
	6 % cdf	25.6 kW[2]	30.7 kW[2]	19.0 kW	19.2 kW[2]	19.2 kW[2]	38.4 kW[2]	38.4 kW[2]
		Note the **regenerative power limit** of the inverter! (= 150 % of the recommended motor power → Technical Data)						
Resistance value	R_{BW}	18 Ω ±10 %	15 Ω ±10 %	12 Ω ±10 %			6 Ω ±10 %	
Trip current (of F16)	I_F	14 A_{RMS}	28 A_{RMS}	10 A_{RMS}	19 A_{RMS}	27 A_{RMS}	38 A_{RMS}	42 A_{RMS}
Type		Grid resistor						
Connections		2.5 mm² (AWG12)	M8 stud	Ceramic terminals 2.5 mm² (AWG12)			M8 stud	
Enclosure		IP20 (when mounted)						
Ambient temperature	ϑ_{amb}	-20...+45 °C						
Type of cooling		KS = Self-cooling						
for MOVIDRIVE®		2 × parallel with 0110		0055/0075			0150 and 2 × parallel with 0220/0300	

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

Touch guard

Touch guard is available for braking resistors in flat-pack design.

Touch guard	BS005
Part number	813 152 X
For braking resistor	BW100-005

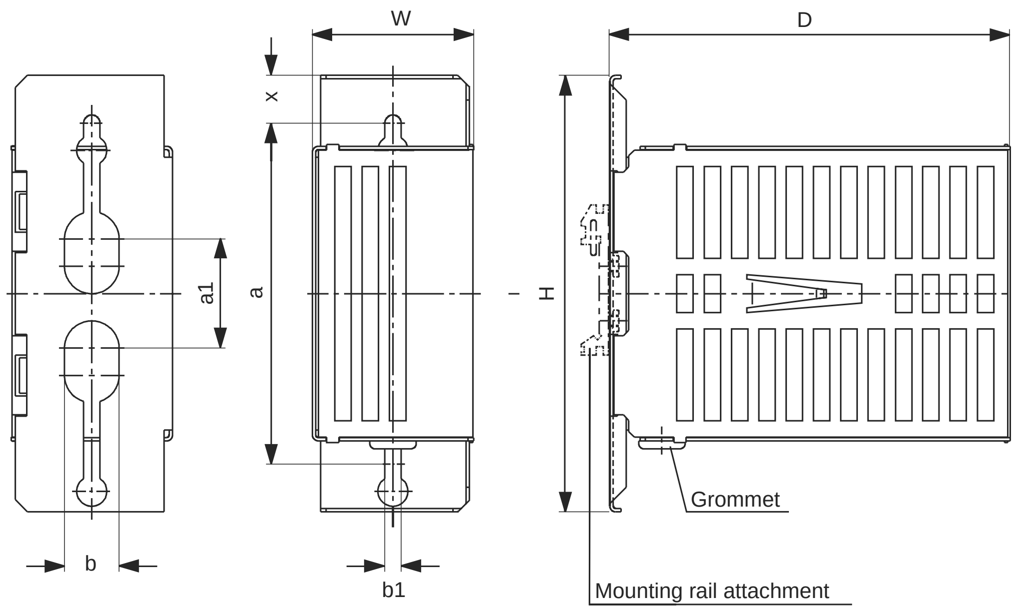


Figure 30: Dimensions, touch guard

All dimensions in mm (in):

Touch guard	Main dimensions			Fixing dimensions					Weight
	W	H	D	a	a1	b	b1	x	kg (lb)
BS005	60 (2.36)	160 (6.30)	252 (9.92)	125 (4.92)	40 (1.57)	20 (0.79)	6 (0.24)	17.5 (0.69)	0.5 (1.1)

Mounting rail installation

A mounting rail attachment is available from SEW as an accessory, part number 822 194 4, for mounting the touch guard on a mounting rail.

DKB11A heat sink for brake resistors in flat-pack design

Part number 814 345 5

Description The DKB11A heat sink for brake resistors in flat-pack design provides a space-saving means of mounting braking resistors in flatpack design (BW100-005) below MOVIDRIVE® size 1 (400/500 V units: 0015...0040; 230 V units: 0015...0037). The resistor is inserted into the heat sink and attached using the supplied screws (M4 × 20).

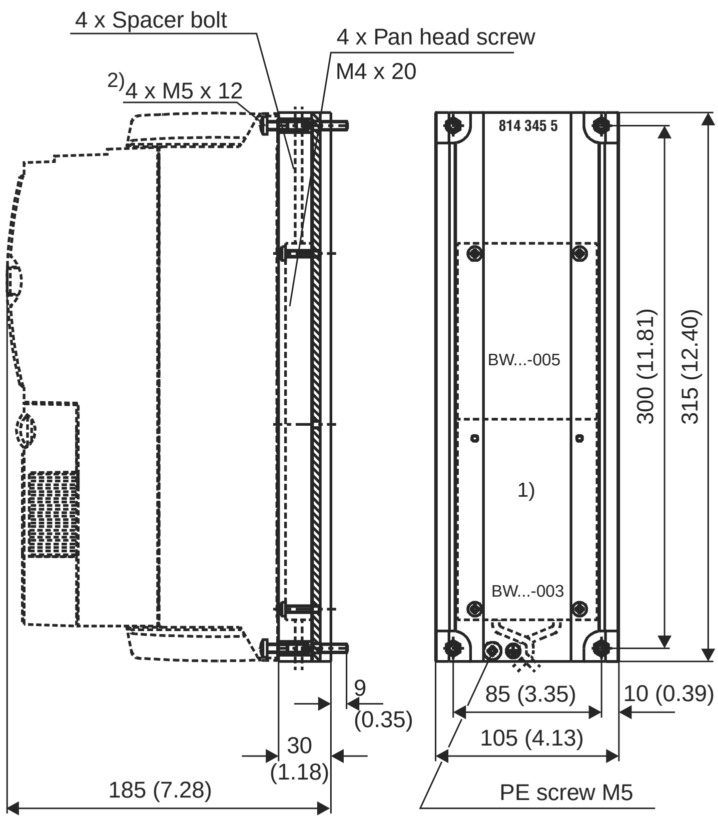


Figure 31: Dimensions, DKB11A heat sink for brake resistors in flatpack design in mm (in)

1) Mounting surface for the braking resistor
2) Retaining screws, not included in scope of delivery

Dimensions, BW...

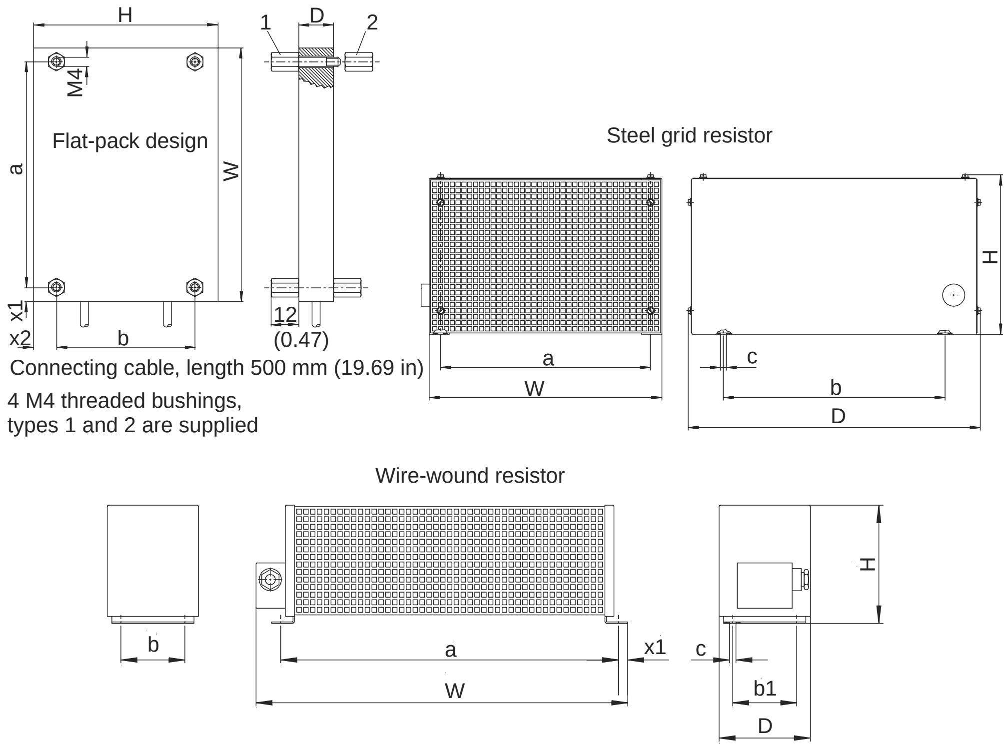


Figure 32: Dimensions, BW... braking resistors

Mounting position as required

All dimensions in mm (in):

<table>
<tr><th>BW...</th><th colspan="3">Main dimensions</th><th colspan="4">Fixing dimensions</th><th>Hole dimension</th><th>Weight</th></tr>
<tr><th>Type</th><th>W</th><th>H</th><th>D</th><th>a</th><th>b/b1</th><th>x1</th><th>x2</th><th>c</th><th>kg (lb)</th></tr>
<tr><td>BW100-005</td><td>216 (8.50)</td><td>80 (3.15)</td><td>15 (0.59)</td><td>204 (8.03)</td><td>60 (2.36)</td><td>6 (0.24)</td><td>10 (0.39)</td><td>4 threaded bushes</td><td>0.6 (1.3)</td></tr>
<tr><td>BW100-006</td><td>486 (19.13)</td><td rowspan="5">120 (4.72)</td><td>92 (3.62)</td><td>426 (16.77)</td><td>64 (2.52)</td><td rowspan="10">10 (0.39)</td><td rowspan="22">-</td><td rowspan="10">5.8 (0.23)</td><td>2.2 (4.9)</td></tr>
<tr><td>BW168</td><td>365 (14.37)</td><td rowspan="4">185 (7.28)</td><td>326 (12.83)</td><td rowspan="4">150 (5.91)</td><td>3.6 (8.0)</td></tr>
<tr><td>BW268</td><td rowspan="2">465 (18.31)</td><td rowspan="2">426 (16.77)</td><td>4.3 (9.5)</td></tr>
<tr><td>BW147</td><td>4.3 (9.5)</td></tr>
<tr><td>BW247</td><td>665 (26.18)</td><td>626 (24.65)</td><td>6.1 (13.5)</td></tr>
<tr><td>BW347</td><td>670 (26.38)</td><td>145 (5.71)</td><td>340 (13.39)</td><td>630 (24.80)</td><td>300 (11.81)</td><td>13.2 (29.1)</td></tr>
<tr><td>BW039-003</td><td>286 (11.26)</td><td rowspan="4">120 (4.72)</td><td rowspan="2">92 (3.62)</td><td>226 (8.90)</td><td rowspan="2">64 (2.52)</td><td>1.5 (3.3)</td></tr>
<tr><td>BW039-006</td><td rowspan="2">486 (19.13)</td><td rowspan="2">426 (16.77)</td><td>2.2 (4.9)</td></tr>
<tr><td>BW039-012</td><td>185 (7.28)</td><td>150 (5.91)</td><td>4.3 (9.5)</td></tr>
<tr><td>BW039-026</td><td>586 (23.07)</td><td>275 (10.83)</td><td>530 (20.87)</td><td>240 (9.45)</td><td>7.5 (16.6)</td></tr>
<tr><td>BW039-050</td><td>395 (15.55)</td><td>260 (10.24)</td><td>490 (19.29)</td><td>370 (14.57)</td><td>380 (14.96)</td><td>-</td><td>10.5 (0.41)</td><td>12 (26.5)</td></tr>
<tr><td>BW027-006</td><td rowspan="2">486 (19.13)</td><td rowspan="3">120 (4.72)</td><td>92 (3.62)</td><td rowspan="2">426 (16.77)</td><td>64 (2.52)</td><td rowspan="3">10 (0.39)</td><td rowspan="3">5.8 (0.23)</td><td>2.2 (4.9)</td></tr>
<tr><td>BW027-012</td><td>185 (7.28)</td><td>150 (5.91)</td><td>4.3 (9.5)</td></tr>
<tr><td>BW018-015</td><td>600 (23.62)</td><td>92 (3.62)</td><td>540 (21.26)</td><td>64 (2.52)</td><td>4.0 (8.8)</td></tr>
<tr><td>BW018-035</td><td>295 (11.61)</td><td rowspan="8">260 (10.24)</td><td rowspan="8">490 (19.29)</td><td>270 (10.63)</td><td rowspan="8">380 (14.96)</td><td rowspan="8">-</td><td rowspan="8">10.5 (0.41)</td><td>9.0 (19.8)</td></tr>
<tr><td>BW018-075</td><td>595 (23.43)</td><td>570 (22.44)</td><td>21 (46.3)</td></tr>
<tr><td>BW915</td><td>795 (31.30)</td><td>770 (30.31)</td><td>26 (57.3)</td></tr>
<tr><td>BW012-025</td><td>295 (11.61)</td><td>270 (10.63)</td><td>9.0 (19.8)</td></tr>
<tr><td>BW012-050</td><td>395 (15.55)</td><td>370 (14.57)</td><td>12 (26.5)</td></tr>
<tr><td>BW012-100</td><td>595 (23.43)</td><td>570 (22.44)</td><td>21 (46.3)</td></tr>
<tr><td>BW106</td><td>795 (31.30)</td><td>770 (30.31)</td><td>32 (70.5)</td></tr>
<tr><td>BW206</td><td>995 (39.17)</td><td>970 (38.18)</td><td>43 (94.8)</td></tr>
</table>

3.16 Line chokes option type ND...

- To increase the overvoltage protection
- To limit the charging current when several inverters are connected together in parallel on the input end with a shared supply system contactor (rated current of line choke = total of inverter rated currents)

Line choke type		ND020-013	ND045-013	ND085-013	ND1503	ND200-0033
Part number		826 012 5	826 013 3	826 014 1	825 548 2	826 579 8
Rated voltage	V_N	$3 \times 380\ V_{AC}$ -10 %...$3 \times 500\ V_{AC}$ +10 %, 50/60 Hz				
Rated current[1)]	I_N	20 A_{AC}	45 A_{AC}	85 A_{AC}	150 A_{AC}	200 A_{AC}
Power loss at I_N	P_V	10 W	15 W	25 W	65 W	100 W
Inductance	L_N	0.1 mH				0.03 mH
Ambient temperature	ϑ_{amb}	-25...+45 °C				
Enclosure		IP 00 (EN 60529)				
Connections		Modular terminal blocks 4 mm² (AWG 10)	Modular terminal blocks 10 mm² (AWG 8)	Modular terminal blocks 35 mm² (AWG 2)	M10 stud / PE: M8 stud	
Assignment to 400/500 V units (...-5_3)						
In rated operation (100 %)		0015...0075	0110...0220	0300...0450 and MDR60A0370	0550/0750	MDR60A0750
With increased power (VFC, 125 %)		0015...0075	0110/0150	0220...0370	0450...0750	
Assignment to 230 V units (...-2_3)						
In rated operation (100 %)		0015...0055	0075/0110	0150/0220	0300	-
With increased power (VFC, 125 %)		0015...0037	0055/0075	0110/0150	0220/0300	-

1) If more than one MOVIDRIVE® is connected to a line choke, the **total value of the rated currents** of the connected units **must not exceed the rated current of the line choke**!

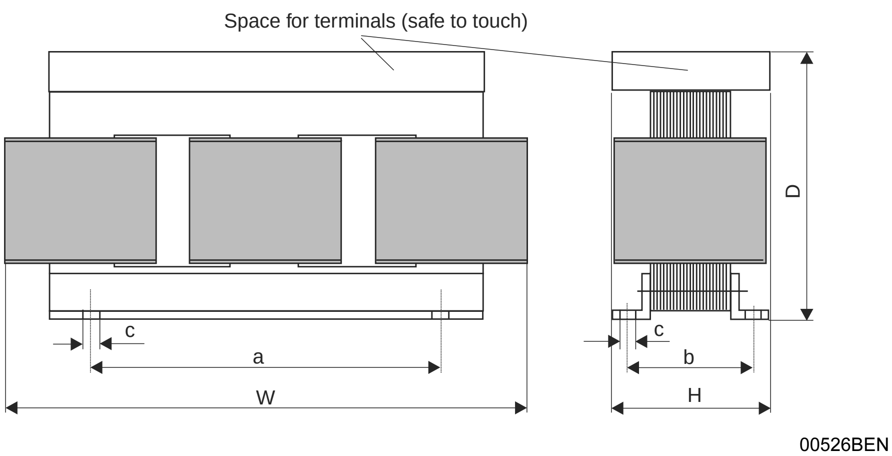


Figure 33: Dimensions, ND... line chokes

Mounting position as required

All dimensions in mm (in):

Line choke type	Main dimensions			Fixing dimensions		Hole dim.	Weight
	W	H	D	a	b	c	kg (lb)
ND020-013	85 (3.35)	60 (2.36)	120 (4.72)	50 (1.97)	31 (1.22)	5-10 (0.20-0.39)	0.5 (1.1)
ND045-013	125 (4.92)	95 (3.74)	170 (6.69)	84 (3.31)	55-75 (2.17-2.95)	6 (0.24)	2.5 (5.5)
ND085-013	185 (7.28)	115 (4.53)	235 (9.25)	136 (5.35)	56 (2.20)	7 (0.28)	8 (17.6)
ND1503	255 (10.04)	140 (5.51)	230 (9.06)	170 (6.69)	77 (3.03)	8 (0.31)	17 (37.5)
ND200-0033	250 (9.84)	160 (6.30)	230 (9.06)	180 (7.09)	98 (3.86)	8 (0.31)	15 (33.1)

3.17 NF...-... line filter option

- To suppress interference emissions on the line side of inverters

Input filter type	NF009-503	NF014-503	NF018-503	NF035-503	NF048-503	NF063-503	NF085-503	NF115-503	NF150-503
Part number	827 412 6	827 116 X	827 413 4	827 128 3	827 117 8	827 414 2	827 415 0	827 416 9	827 417 7
Rated voltage V_N	$3 \times 380\ V_{AC}$ -10 %...$3 \times 500\ V_{AC}$ +10 %, 50/60 Hz								
Rated current I_N	9 A_{AC}	14 A_{AC}	18 A_{AC}	35 A_{AC}	48 A_{AC}	63 A_{AC}	85 A_{AC}	115 A_{AC}	150 A_{AC}
Power loss at $I_N P_V$	6 W	9 W	12 W	15 W	22 W	30 W	35 W	60 W	90 W
Earth-leakage current at V_N	< 25 mA	< 25 mA	< 25 mA	< 25 mA	< 40 mA	< 30 mA	< 30 mA	< 30 mA	< 30 mA
Ambient temperature ϑ_{amb}	-25...+40 °C								
Enclosure	IP 20 (EN 60529)								
Connections L1-L3/L1'-L3'	4 mm² (AWG 10)			10 mm² (AWG 8)		16 mm² (AWG 6)	35 mm² (AWG 2)	50 mm² (AWG1/0)	95 mm² (AWG4/0)
PE	M5 stud			M5 stud	M6 stud	M6 stud	M8 stud	M10 stud	M10 stud
Assignment to 400/500 V units (...-5_3)									
In rated operation (100 %)	0015...0040	0055/0075	-	0110/0150	0220	0300	0370/0450	0550	0750
With increased power (VFC, 125 %)	0015...0030	0040/0055	0075	0110	0150	0220	0300/0370	0450	0550/0750
Assignment to 230 V units (...-2_3)									
In rated operation (100 %)	0015/0022	0037	-	0055/0075	0110	0150	0220	0300	-
With increased power (VFC, 125 %)	0015	0022	0037	0055/0075	-	0110/0150	-	0220/0300	-

The effectiveness of input filters is restricted in IT systems.

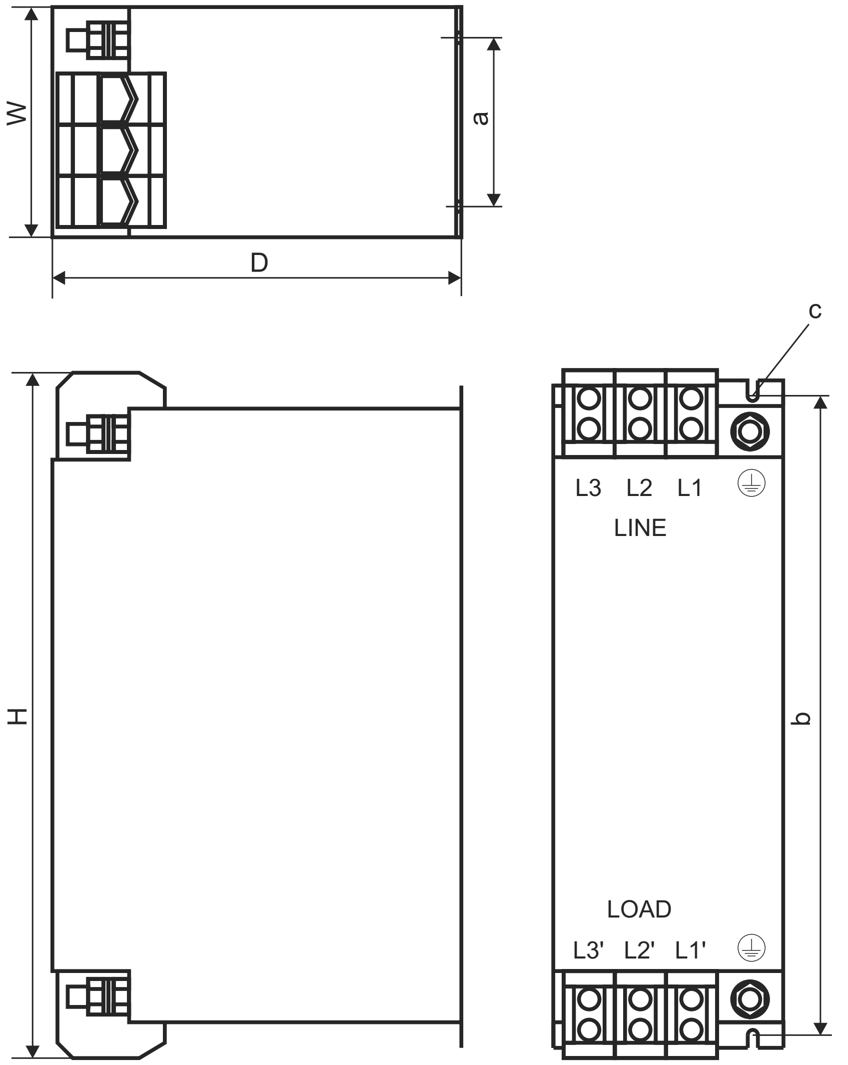


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Figure 34: Dimensions, NF input filters

Mounting position as required

All dimensions in mm (in):

<table>
<tr><th rowspan="2">Input filter type</th><th colspan="3">Main dimensions</th><th colspan="2">Fixing dimensions</th><th>Hole dimension</th><th rowspan="2">PE connec-tion</th><th>Weight</th></tr>
<tr><th>W</th><th>H</th><th>D</th><th>a</th><th>b</th><th>c</th><th>kg (lb)</th></tr>
<tr><td>NF009-503</td><td rowspan="2">55 (2.16)</td><td>195 (7.67)</td><td rowspan="3">80 (3.15)</td><td rowspan="3">20 (0.79)</td><td>180 (7.09)</td><td rowspan="5">5.5 (0.22)</td><td rowspan="4">M5</td><td>0.8 (1.8)</td></tr>
<tr><td>NF014-503</td><td>225 (8.85)</td><td>210 (8.27)</td><td>0.9 (2.0)</td></tr>
<tr><td>NF018-503</td><td>50 (1.96)</td><td>255 (10.04)</td><td>240 (9.45)</td><td>1.1 (2.4)</td></tr>
<tr><td>NF035-503</td><td rowspan="2">60 (2.36)</td><td>275 (10.83)</td><td rowspan="3">100 (3.93)</td><td rowspan="2">30 (1.18)</td><td>255 (10.04)</td><td>1.7 (3.7)</td></tr>
<tr><td>NF048-503</td><td>315 (12.40)</td><td>295 (11.61)</td><td rowspan="2">M6</td><td>2.1 (4.6)</td></tr>
<tr><td>NF063-503</td><td rowspan="2">90 (3.54)</td><td>260 (10.24)</td><td rowspan="2">60 (2.36)</td><td>235 (9.25)</td><td rowspan="4">6.5 (0.26)</td><td>2.4 (5.3)</td></tr>
<tr><td>NF085-503</td><td>320 (12.60)</td><td>140 (5.51)</td><td rowspan="3">255 (10.04)</td><td>M8</td><td>3.5 (7.7)</td></tr>
<tr><td>NF115-503</td><td rowspan="2">100 (3.93)</td><td rowspan="2">330 (13.00)</td><td rowspan="2">155 (6.10)</td><td rowspan="2">65 (2.56)</td><td rowspan="2">M10</td><td>4.8 (10.6)</td></tr>
<tr><td>NF150-503</td><td>5.6 (12.3)</td></tr>
</table>

3.18 Output choke option type HD...

- To suppress radiated interference from the unshielded motor cable. We recommend routing the motor cable through the output choke with five loops. Less than five loops are possible if the cable has a large diameter. To make up for this, two or three output chokes should be connected in series. Two output chokes should be connected in series if there are four loops, and three output chokes in series if there are three loops.

Output chokes are allocated on the basis of the cable cross sections of the motor feeders. Consequently, there is no separate allocation table for the 230 V units.

Output choke type	HD001	HD002	HD003
Part number	813 325 5	813 557 6	813 558 4
Dimensions W × H × D	121 × 64 × 131 mm (4.76 × 2.52 × 5.16 in)	66 × 49 × 73 mm (2.60 × 1.93 × 2.87 in)	170 × 64 × 185 mm (6.69 × 2.52 × 7.28 in)
Inside diameter d	50 mm (1.97 in)	23 mm (0.91 in)	88 mm (4.46 in)
Max. power loss P_{Vmax}	15 W	8 W	30 W
Weight	0.5 kg (1.1 lb)	0.2 kg (0.44 lb)	1.1 kg (2.42 lb)
For cable cross sections	1.5...16 mm^2 (AWG 16...6)	≤ 1.5 mm^2 (AWG 16)	≥ 16 mm^2 (AWG 6)

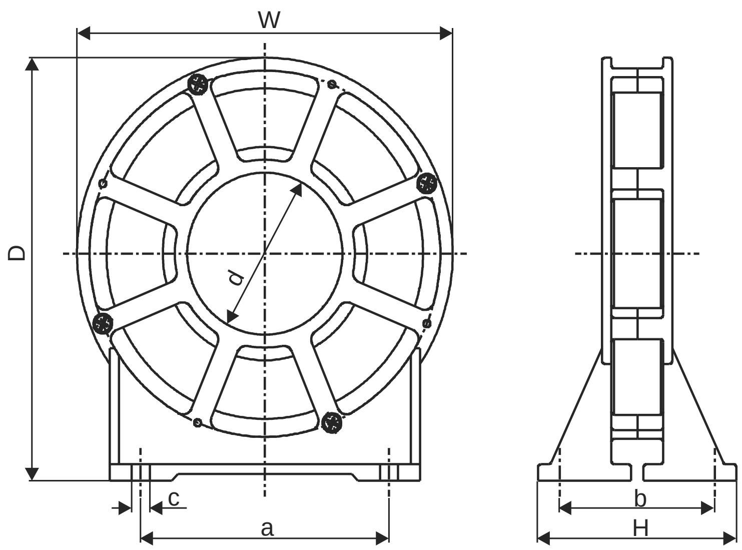

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Figure 35: Dimensions, HD... output chokes

Mounting position as required

All dimensions in mm (in):

Output choke type	Main dimensions			Fixing dimensions		Inside ∅	Hole dimension
	W	H	D	a	b	d	c
HD001	121 (4.76)	64 (2.52)	131 (5.16)	80 (3.15)	50 (1.97)	50 (1.97)	5.8 (0.23)
HD002	66 (2.60)	49 (1.93)	73 (2.87)	44 (1.73)	38 (1.50)	23 (0.91)	
HD003	170 (6.69)	64 (2.52)	185 (7.28)	120 (4.72)	50 (1.97)	88 (3.46)	7.0 (0.28)

3.19 Output filter option type HF...

Sine filter for smoothing the output voltage of inverters. They are used:

- In group drives (several motor feeders in parallel); the discharge currents in the motor cables are suppressed.
- To protect the motor winding insulation of non-SEW motors which are not suitable for use with PWM inverters and could be damaged by voltage spikes in long motor feeders (> 100 m).

STOP

- Output filters are only allowed to be used with 400/500 V units type MCF, MCV and MCH in VFC operating modes. Do not use with 230 V units, do not use with type MDV in CFC operating modes, do not use with type MCH in CFC or SERVO operating modes and do not use with type MDS.
- Output filters are not allowed to be used in hoists.

Output filter type		HF015-503	HF022-503	HF030-503	HF040-503	HF055-503
Part number		826 030 3	826 031 1	826 032 X	826 311 6	826 312 4
Rated voltage	V_N	$3 \times 380\ V_{AC}$ -10 %...$3 \times 500\ V_{AC}$ +10 %, 50/60 Hz[1)]				
Voltage drop at I_N	ΔV	< 6.5 % (7.5 %) at 400 V / < 4 % (5 %) at 500 V and f_{Amax} = 50 Hz (60 Hz)				
Rated throughput current[2)] (at $V_{mains} = 3 \times 400\ V_{AC}$)	$I_{N\ 400\ V}$	4 A_{AC}	6 A_{AC}	8 A_{AC}	10 A_{AC}	12 A_{AC}
Rated throughput current[2)] (at $V_{mains} = 3 \times 500\ V_{AC}$)	$I_{N\ 500\ V}$	3 A_{AC}	5 A_{AC}	6 A_{AC}	8 A_{AC}	10 A_{AC}
Earth-leakage current at V_N	ΔI	0 mA				
Power loss at I_N	P_V	35 W	55 W	65 W	90 W	115 W
Emitted interference via unshielded motor lead		According to class B limit to EN 55011 and EN 55014 Complies with EN 50081, parts 1 and 2				
Ambient temperature	ϑ_{amb}	0...+45 °C (reduction: 3.0 % I_N per K to max. 60 °C)				
Enclosure (EN 60529)		IP 20				
Connections		M4 connection studs: 0.5...6 mm^2 (AWG 20...10)				10 mm^2 (AWG 8)
Weight		4.4 kg (9.68 lb)			10.8 kg (23.76 lb)	
For MOVIDRIVE® MD_60A...-5_3 In rated operation (100 %)		0015	0022	0030	0040	0055
With increased power (125 %)		-	0015	0022	0030	0040

Output filter type		HF075-503	HF450-503	HF023-403	HF033-403	HF047-403
Part number		826 313 2	826 948 3	825 784 1	825 785 X	825 786 8
Rated voltage	V_N	$3 \times 380\ V_{AC}$ -10 %...$3 \times 500\ V_{AC}$ +10 %, 50/60 Hz[1)]				
Voltage drop at I_N	ΔV	< 6.5 % (7.5 %) at 400 V / < 4 % (5 %) at 500 V and f_{Amax} = 50 Hz (60 Hz)				
Rated throughput current[2)] (at $V_{mains} = 3 \times 400\ V_{AC}$)	$I_{N\ 400\ V}$	16 A_{AC}	90 A_{AC}	23 A_{AC}	33 A_{AC}	47 A_{AC}
Rated throughput current[2)] (at $V_{mains} = 3 \times 500\ V_{AC}$)	$I_{N\ 500\ V}$	13 A_{AC}	72 A_{AC}	19 A_{AC}	26 A_{AC}	38 A_{AC}
Earth-leakage current at V_N	ΔI	0 mA				
Power loss at I_N	P_V	135 W	400 W	90 W	120 W	200 W
Emitted interference via unshielded motor lead		According to class B limit to EN 55011 and EN 55014 Complies with EN 50081, parts 1 and 2				
Ambient temperature	ϑ_{amb}	0...+45 °C (reduction: 3.0 % I_N per K to max. 60 °C)				
Enclosure (EN 60529)		IP 20	IP 10	IP 20		
Connections		10 mm^2 (AWG 8)	35 mm^2 (AWG 2)	25 mm^2 (AWG 4)		
Weight		10.8 kg (23.76 lb)	32 kg (70.58 lb)	15.9 kg (35.0 lb)	16.5 kg (36.3 lb)	23 kg (50.6 lb)
For MOVIDRIVE® MD_60A...-5_3 In rated operation (100 %)		0075	0370/0450/ 0550[3)]/0750[3)]	0110	0150/0300[3)]	0220
With increased power (125 %)		0055	0300/0370/0450/ 0550/0750	0075	0110/0220[3)]	0150

1) A reduction of 6 % I_N per 10 Hz applies above f_{AN} = 60 Hz for the rated throughput current I_N.

2) Only applies to operation without U_Z connection. For operation with U_Z connection, observe the project planning instructions in the MOVIDRIVE® *compact* System Manual, Sec. 'Project Planning/Connecting the optional power components'.

3) Connect **two HF... output filters together in parallel for operation with these MOVIDRIVE®** units.

Dimensions, output filter HF...-503, in mm (in)

HF015/022/030-503 HF040/055/075-503

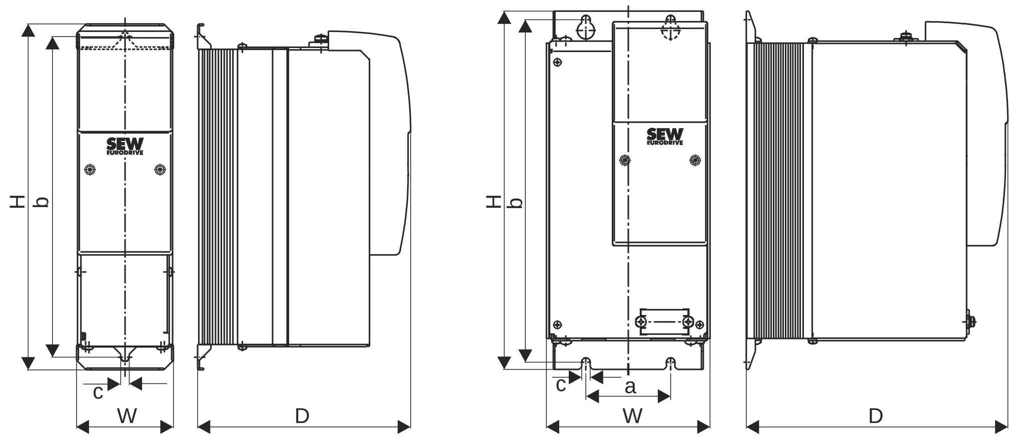

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Figure 36: Dimensions, output filter HF015...075-503

Only the mounting position shown in the dimensions diagram is permitted

Output filter type	Main dimensions			Fixing dimensions		Hole dimen-sion	Ventilation clearance1)	
	W	H	D	a	b	c	Top	Bottom
HF015/022/030-503	80 (3.15)	286 (11.26)	176 (6.93)	-	265 (10.43)	7 (0.28)	100 (3.94)	100 (3.94)
HF040/055/075-503	135 (5.31)	296 (11.65)	216 (8.50)	70 (2.76)	283 (11.14)			

1) No clearance is required at the sides; the units can be lined up side-by-side.

HF450-503

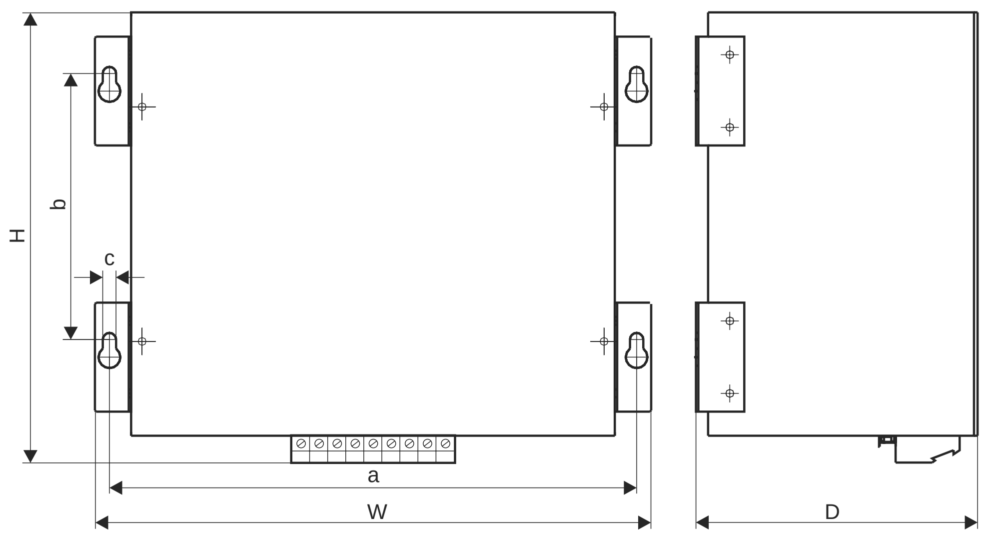

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Figure 37: Dimensions, output filter HF450-503

Only the mounting position shown in the dimensions diagram is permitted

Output filter type	Main dimensions			Fixing dimensions		Hole dimen-sion	Ventilation clearance	
	W	H	D	a	b	c	Top	Bottom
HF450-503	465 (18.31)	385 (15.16)	240 (9.45)	436 (17.17)	220 (8.66)	8.5 (0.33)	100 (3.94)	100 (3.94)

Dimensions, output filter HF...-403, in mm (in)

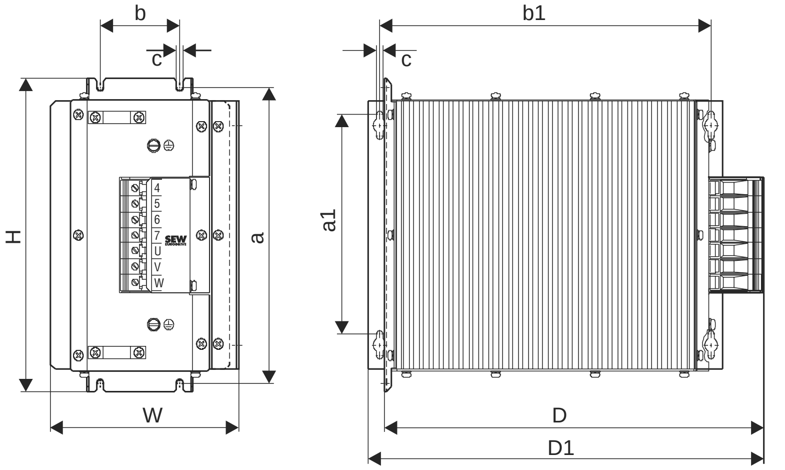

Figure 38: Dimensions, output filter HF...-403

Type	Main dimensions			Fixing dimensions: Standard installation		Fixing dimensions: Crossways mounting position		Hole dimension	Ventilation clearance		
	W	H	D/D1	a	b	a1	a2	c	At side	Top	Bottom
HF023-403	145 (5.71)	284 (11.18)	365/390 (14.37/15.35)	268 (10.55)	60 (2.36)	210 (8.27)	334 (13.15)	6.5 (0.26)	30 each (1.18 ea)	150 (5.91)	150 (5.91)
HF033-403											
HF047-403	190 (7.48)	300 (11.82)	385/400 (15.16/15.57)	284 (11.18)	80 (3.15)						

3.20 Pre-fabricated cables

Overview

SEW offers cable sets and prefabricated cables for straightforward and error-free connection of various system components to MOVIDRIVE®. Specifically, these are:

1. Cable sets for DC link connection MDR → MCF/MCV/MCS/MCH
2. Motor cables and extension cables for connecting CM motors to MCS and MCH
3. Motor cables for connecting DS/DY motors to MCS
4. Hiperface cables, resolver cables and extension cables (plug and terminal box versions) for CM/DS/DY motors
5. VR forced cooling fan cables and extension cables
6. Brake cables
7. Encoder cables for connecting the motor encoder to encoder input X15 of the MCV basic unit or to 'X2: Encoder' of the 5 V encoder power supply type DWI11A
8. Encoder connection 'X1: MOVIDRIVE' of the DWI11A and X15 MCV basic unit
9. Encoder cables for connecting an external encoder or a control (encoder simulation output) to X14 of the MCV/MCS basic unit
10. Encoder connection (MCV/MCS: master X14 → slave X14)

It is necessary to differentiate between whether the cables are intended for fixed routing or for use in cat tracks. The cables are pre-fabricated in 1 m steps for the required length.

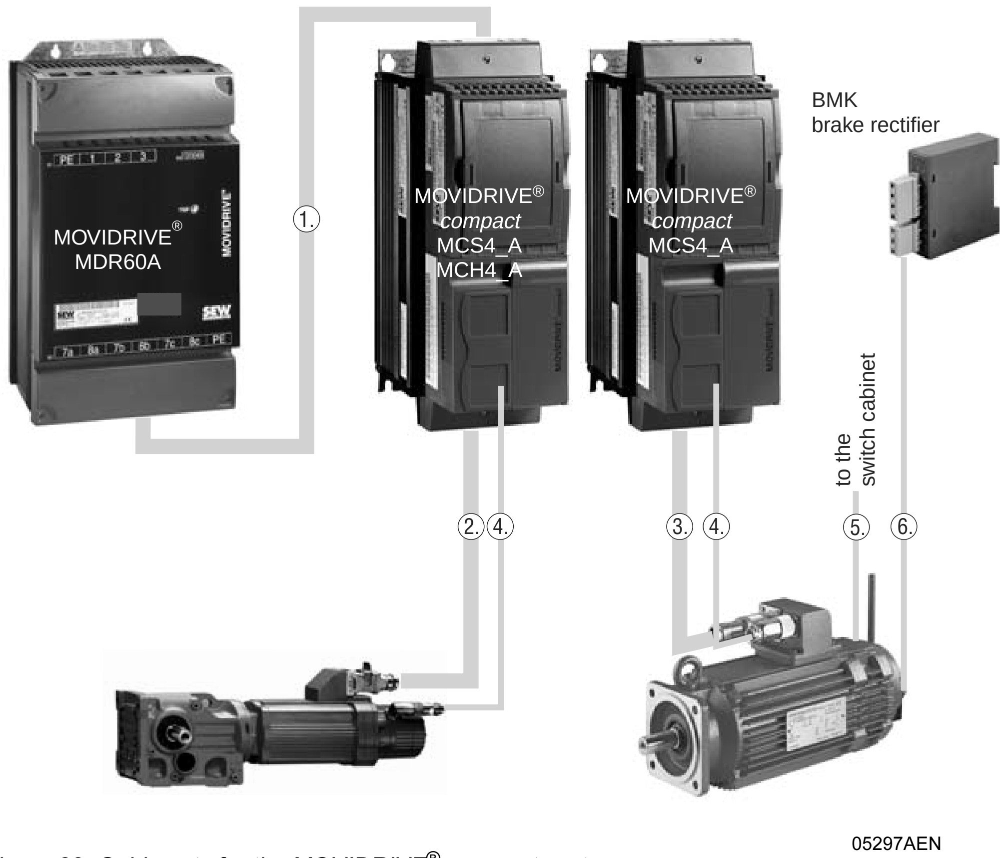

Figure 39: Cable sets for the MOVIDRIVE® compact system

3

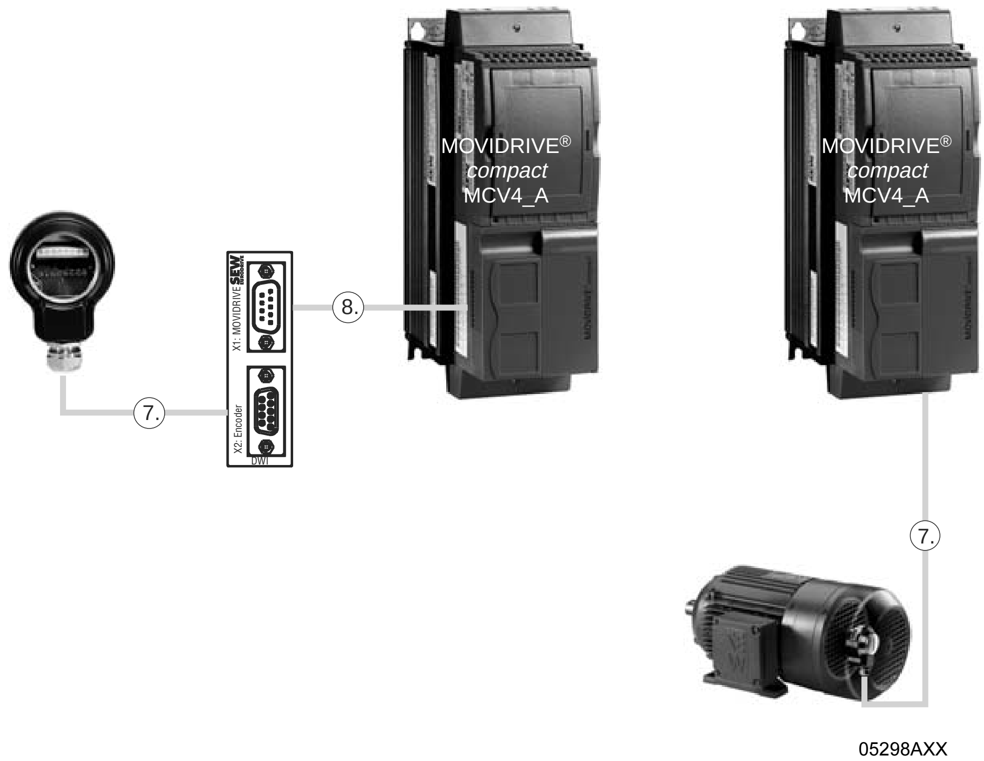

Figure 40: Motor encoder connection

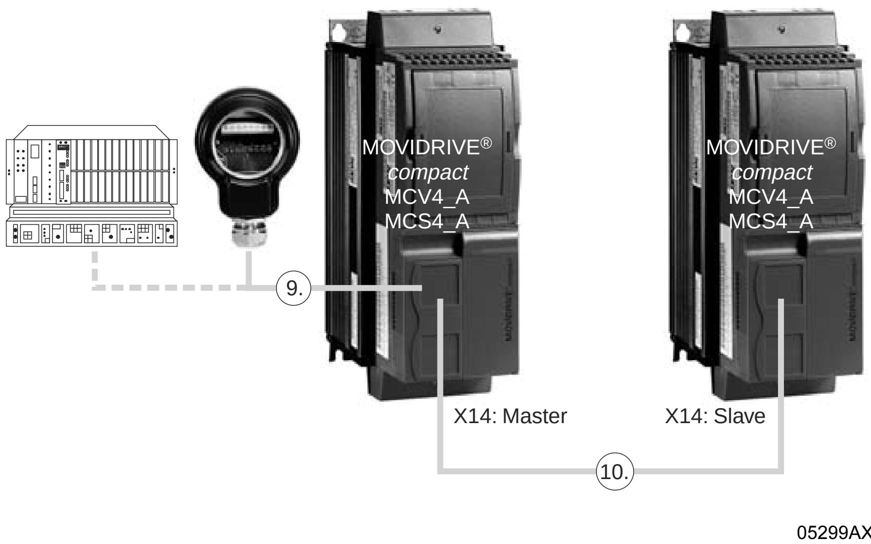

Figure 41: Connection of external encoder and master/slave connection

1. Cable sets for DC link connection MDR → MCF/MCV/MCS/MCH

Description

SEW strongly recommends that the cable sets named below are used, because they possess the relevant dielectric strength and are also color-coded. This is necessary because cross-polarity and ground faults could cause irreparable damage to the connected equipment.

The length of the cables restricts the DC link circuit connection to the permitted five meters (16.4 ft), whilst they can also be cut to length by the customer for connecting several units. The lugs for connecting to the regenerative power supply unit and an inverter are supplied with the cable set. Use commercial lugs for connecting additional inverters. The inverters must then be connected to the regenerative power supply unit in a star configuration. Use a busbar subdistributor if the DC link terminals of the regenerative power supply unit are not sufficient.

Type of routing

Only fixed routing is possible.

Cable set type	DCP12A	DCP13A	DCP15A
Part number	814 567 9	814 250 5	814 251 3
For connecting MOVIDRIVE®	0015...0110	0150...0300	0370...0750

2. Motor cables for connecting CM motors to MCS or MCH and extension cables

Motor cables

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

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm² (AWG 16)	199 179 5	Fixed routing	CM..SM51
4×1.5 mm² (AWG 16) + 3×1.0 mm² (AWG 17)	199 189 2		CM..BR SB51
4×2.5 mm² (AWG 12)	199 181 7		CM..SM52
4×2.5 mm² (AWG 12) + 3×1.0 mm² (AWG 17)	199 191 4		CM..BR SB52
4×4 mm² (AWG 10)	199 183 3		CM..SM54
4×4 mm² (AWG 10) + 3×1.0 mm² (AWG 17)	199 193 0		CM..BR SB54
4×6 mm² (AWG 10)	199 185 X		CM..SM56
4×6 mm² (AWG 10) + 3×1.5 mm² (AWG 16)	199 195 7		CM..BR SB56
4×10 mm² (AWG 8)	199 187 6		CM..SM59
4×10 mm² (AWG 8) + 3×1.5 mm² (AWG 16)	199 197 3		CM..BR SB59

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm² (AWG 16)	199 180 9	Cat track routing	CM..SM51
4×1.5 mm² (AWG 16) + 3×1.0 mm² (AWG 17)	199 190 6		CM..BR SB51
4×2.5 mm² (AWG 12)	199 182 5		CM..SM52
4×2.5 mm² (AWG 12) + 3×1.0 mm² (AWG 17)	199 192 2		CM..BR SB52
4×4 mm² (AWG 10)	199 184 1		CM..SM54
4×4 mm² (AWG 10) + 3×1.0 mm² (AWG 17)	199 194 9		CM..BR SB54
4×6 mm² (AWG 10)	199 186 8		CM..SM56
4×6 mm² (AWG 10) + 3×1.5 mm² (AWG 16)	199 196 5		CM..BR SB56
4×10 mm² (AWG 8)	199 188 4		CM..SM59
4×10 mm² (AWG 8) + 3×1.5 mm² (AWG 16)	199 198 1		CM..BR SB59

Extension cables The cables are equipped with a plug and coupling for extending the CM motor cable.

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm^2 (AWG 16)	199 549 9	Fixed routing	CM..SM51
4×1.5 mm^2 (AWG 16) + 3×1.0 mm^2 (AWG 17)	199 199 X		CM..BR SB51
4×2.5 mm^2 (AWG 12)	199 551 0		CM..SM52
4×2.5 mm^2 (AWG 12) + 3×1.0 mm^2 (AWG 17)	199 201 5		CM..BR SB52
4×4 mm^2 (AWG 10)	199 553 7		CM..SM54
4×4 mm^2 (AWG 10) + 3×1.0 mm^2 (AWG 17)	199 203 1		CM..BR SB54
4×6 mm^2 (AWG 10)	199 555 3		CM..SM56
4×6 mm^2 (AWG 10) + 3×1.5 mm^2 (AWG 16)	199 205 8		CM..BR SB56
4×10 mm^2 (AWG 8)	199 557 X		CM..SM59
4×10 mm^2 (AWG 8) + 3×1.5 mm^2 (AWG 16)	199 207 4		CM..BR SB59

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm^2 (AWG 16)	199 550 2	Cat track routing	CM..SM51
4×1.5 mm^2 (AWG 16) + 3×1.0 mm^2 (AWG 17)	199 200 7		CM..BR SB51
4×2.5 mm^2 (AWG 12)	199 552 9		CM..SM52
4×2.5 mm^2 (AWG 12) + 3×1.0 mm^2 (AWG 17)	199 202 3		CM..BR SB52
4×4 mm^2 (AWG 10)	199 554 5		CM..SM54
4×4 mm^2 (AWG 10) + 3×1.0 mm^2 (AWG 17)	199 204 X		CM..BR SB54
4×6 mm^2 (AWG 10)	199 556 1		CM..SM56
4×6 mm^2 (AWG 10) + 3×1.5 mm^2 (AWG 16)	199 206 6		CM..BR SB56
4×10 mm^2 (AWG 8)	199 558 8		CM..SM59
4×10 mm^2 (AWG 8) + 3×1.5 mm^2 (AWG 16)	199 208 2		CM..BR SB59

3. Motor cables for connecting DS/DY motors to MCS

Description The cables are equipped with a plug for the motor connection and conductor end sleeves for the inverter connection.

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm^2 (AWG 16)	198 669 4	Fixed routing	DS56 / SM11
4×1.5 mm^2 (AWG 16) + 2×0.75 mm^2 (AWG 18)	198 670 8		DS56..B / SM11
4×1.5 mm^2 (AWG 16)	198 683 X		DY71 / SM21
4×2.5 mm^2 (AWG 12)	198 684 8		DS71 / SM22
4×2.5 mm^2 (AWG 12)	198 685 6		DY90/112 / SM32
4×4 mm^2 (AWG 10)	198 686 4		DY90/112 / SM34
4×6 mm^2 (AWG 10)	198 687 2		DY90/112 / SM36
4×6 mm^2 (AWG 10)	198 688 0		DY112 / SM46
4×10 mm^2 (AWG 8)	198 689 9		DY112 / SM41

Number of cores and line cross section	Part number	Type of routing	For motor
4×1.5 mm² (AWG 16)	198 741 0	Cat track routing	DS56 / SM11
4×1.5 mm² (AWG 16) + 2×0.75 mm² (AWG 18)	198 742 9		DS56..B / SM11
4×1.5 mm² (AWG 16)	198 734 8		DY71 / SM21
4×2.5 mm² (AWG 12)	198 735 6		DS71 / SM22
4×2.5 mm² (AWG 12)	198 736 4		DY90/112 / SM32
4×4 mm² (AWG 10)	198 737 2		DY90/112 / SM34
4×6 mm² (AWG 10)	198 738 0		DY90/112 / SM36
4×6 mm² (AWG 10)	198 739 9		DY112 / SM46
4×10 mm² (AWG 8)	198 740 2		DY112 / SM41

4. Hiperface cables, resolver cables and extension cables

Hiperface cables for CM motors with plug connection:

Part number	**199 488 3**	**199 320 8**
Routing	Fixed routing	Cat track routing
For Hiperface encoder AS1H/ES1H in motor	CM71...112	
Line cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) D+: Black (BK) D-: Violet (VT) TF/TH/KTY+: Brown (BN) TF/TH/KTY-: White (WH) GND: Grey/pink + pink (GY-PK + PK) U_S: Red/blue + gray (RD-BU + GY)	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
Connection to encoder / motor **MOVIDRIVE® *compact* MCH4_A**	With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) With 15-pin sub D plug	

Extension cables for Hiperface cables (CM motors with plug connection):

Part number	**199 539 1**	**199 540 5**
Routing	Fixed routing	Cat track routing
For Hiperface encoder AS1H/ES1H in motor	CM71...112	
Line cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) D+: Black (BK) D-: Violet (VT) TF/TH/KTY+: Brown (BN) TF/TH/KTY-: White (WH) GND: Grey/pink + pink (GY-PK + PK) U_S: Red/blue + gray (RD-BU + GY)	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
Connection to encoder / motor **Hiperface cable**	With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) With 12-pin round connector plug (Intercontec, type AKUA20)	

Hiperface cables for CM motors with terminal box:

Part number	199 591 X	199 592 8
Routing	Fixed routing	Cat track routing
For Hiperface encoder AS1H/ES1H in motor	CM71...112	
Line cross section	$6 \times 2 \times 0.25$ mm^2 (AWG 23)	
Conductor colors	cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) D+: Black (BK) D-: Violet (VT) TF/TH/KTY+: Brown (BN) TF/TH/KTY-: White (WH) GND: Grey/pink + pink (GY-PK + PK) U_S: Red/blue + gray (RD-BU + GY)	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
Connection to encoder / motor MOVIDRIVE® *compact* MCH4_A	With conductor end sleeves With 15-pin sub D plug	

Resolver cables for DS56 and CM motors with plug connection:

Part number	199 487 5	199 319 4
Routing	Fixed routing	Cat track routing
For RH1M resolver in motor	DS56, CM71...112	
Line cross section	$5 \times 2 \times 0.25$ mm^2 (AWG 23)	
Conductor colors	Ref.+: Pink (PK) Ref.-: Gray (GY) cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) TF/TH/KTY+: Brown + pink (BN + PK) TF/TH/KTY-: White + black (WH + BK)	
Manufacturer and type	Lapp, PVC/C/PP	Nexans
Connection to resolver/motor MOVIDRIVE® *compact* MCS4_A	With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) With 9-pin sub D plug	

Extension cables for resolver cables (DS56 and CM motors with plug connection):

Part number	199 542 1	199 541 3
Routing	Fixed routing	Cat track routing
For RH1M resolver in motor	DS56, CM71...112	
Line cross section	$5 \times 2 \times 0.25$ mm^2 (AWG 23)	
Conductor colors	Ref.+: Pink (PK) Ref.-: Gray (GY) cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) TF/TH/KTY+: Brown + pink (BN + PK) TF/TH/KTY-: White + black (WH + BK)	
Manufacturer and type	Lapp, PVC/C/PP	Nexans
Connection to resolver/motor Resolver cables	With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) With 12-pin round connector plug (Intercontec, type AKUA20)	

Resolver cables for DY71...112 motors with plug connection:

Part number	198 827 1	198 812 3
Routing	Fixed routing	Cat track routing
For RH1M resolver in motor	DY71...112	
Line cross section	$4 \times 2 \times 0.25$ mm^2 (AWG 23)	
Conductor colors	Ref.+: Pink (PK) Ref.-: Gray (GY) cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) TF/TH: Brown (BN) TF/TH: White (WH)	
Manufacturer and type	Lapp, Unitronic Li2YCY (TP) Helukabel, Paar-Tronic-CY	Lapp, Unitronic FD CP (TP) Helukabel, Super-Paar-Tronic-C-PUR
Connection to resolver/motor MOVIDRIVE® *compact* MCS4_A	With 12-pin round connector plug (Framatome Souriou, type GN-DMS2-12S) With 9-pin sub D plug	

Resolver cables for DS56 and DY71...112 motors with terminal box:

Part number	199 589 8	199 590 1
Routing	Fixed routing	Cat track routing
For RH1M resolver in motor	DS56, DY71...112	
Line cross section	$5 \times 2 \times 0.25$ mm^2 (AWG 23)	
Conductor colors	Ref.+: Pink (PK) Ref.-: Gray (GY) cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) TF/TH/KTY+: Brown + pink (BN + PK) TF/TH/KTY-: White + black (WH + BK)	
Manufacturer and type	Lapp, PVC/C/PP	Nexans
Connection to resolver/motor MOVIDRIVE® *compact* MCS4_A	With conductor end sleeves With 9-pin sub D plug	

5. VR forced cooling fan cables and extension cables

VR forced cooling fan cables:

Part number	199 559 6	199 560 X
Routing	Fixed routing	Cat track routing
Line cross section	3×1 mm^2 (AWG 17)	
Connection VR forced cooling fan Switch cabinet	With plug STAK 200 With conductor end sleeves	

Extension cables for VR forced cooling fan cables:

Part number	199 561 8	199 562 6
Routing	Fixed routing	Cat track routing
Line cross section	3×1 mm^2 (AWG 17)	
Connection VR forced cooling fan VR forced cooling fan cables	With plug STAK 200 with plug connection	

6. Brake cables

Part number		**198 633 3**	**198 745 3**
Routing		Fixed routing	Cat track routing
Line cross section		4 × 1.5 mm² (AWG 16)	
Connection to	**DY motor** **Brake rectifier**	With plug With conductor end sleeves	

7. Motor encoder cables, connection to MCV4_A, X15

Cables for TTL sensors and sin/cos motor encoders (TTL sensors and sin/cos encoders)

Part number		**198 829 8**	**198 828 X**
Routing		Fixed routing	Cat track routing
For encoder		ES1T, ES2T and EV1T via option DWI11A and cable 814 344 7 ES1S, ES2S, EV1S, ES1R, ES2R and EV1R directly to X15 (MCV)	
Line cross section		4 × 2 × 0.25 mm² (AWG 23) + 1 × 0.25 mm² (AWG 23)	
Conductor colors		A: Yellow (YE) $\overline{A}$: Green (GN) B: Red (RD) $\overline{B}$: Blue (BU) C: Pink (PK) $\overline{C}$: Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor line: Violet (VT)	
Manufacturer and type		Lapp, Unitronic Li2YCY (TP) Helukabel, Paar-Tronic-CY	Lapp, Unitronic FD CP (TP) Helukabel, Super-Paar-Tronic-C-PUR
Connection	**To encoder/motor**	With conductor end sleeves On ES1T, ES2T and EV1T, connect the violet conductor (VT) on the encoder to UB On ES1S, ES2S, EV1S, ES1R, ES2R and EV1R, cut off the violet conductor (VT) at the encoder end	
	To MCV4_A, X15 or DWI11A	With 9-pin sub D plug	

Cables for HTL motor encoders (HTL encoders)

Part number		**198 932 4**	**198 931 6**
Routing		Fixed routing	Cat track routing
For encoder		ES1C, ES2C and EV1C	
Line cross section		5 × 0.25 mm² (AWG 23) + 1 × 0.25 mm² (AWG 23)	
Conductor colors		A: Yellow (YE) B: Green (GN) C: Gray (GY) UB: White (WH) ⊥: Brown (BN)	
Manufacturer and type		Lapp, Unitronic LiYCY Helukabel, Tronic-CY	Lapp, Unitronic FD CP Helukabel, Super-Tronic-C-PURö
Connection	**To encoder/motor** **To MCV4_A, X15**	With conductor end sleeves With 9-pin sub D plug	

8. Encoder connection

This cable is intended for the following connections:

- MOVIDRIVE® *compact* MCV 'Encoder In' (X15) → 5 V encoder power supply option type DWI11A

Part number		**814 344 7**
Routing		Fixed routing
For encoder with 5 V encoder power supply		ES1T, ES2T and EV1T via option DWI11A
Line cross section		$4 \times 2 \times 0.25$ mm² (AWG 23) + 1×0.25 mm² (AWG 23)
Conductor colors		A: Yellow (YE) $\overline{A}$: Green (GN) B: Red (RD) $\overline{B}$: Blue (BU) C: Pink (PK) $\overline{C}$: Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor line: Violet (VT)
Manufacturer and type		Lapp, Unitronic Li2YCY (TP) Helukabel, Paar-Tronic-CY
Connection to	**To DWI11A** **X15**	With 9-pin sub D socket With 9-pin sub D plug

9. Cable for external encoder (TTL encoder) or encoder simulation, connection on X14

This cable is provided for connecting an external encoder or evaluation of encoder simulation on MCV/MCS4_A.

Part number		**815 354 X**	**-**
Routing		Fixed routing	-
For encoder		ES1R, ES2R and EV1R or evaluation of encoder simulation	
Line cross section		$4 \times 2 \times 0.25$ mm² (AWG 23) + 1×0.25 mm² (AWG 23)	
Conductor colors		A: Yellow (YE) $\overline{A}$: Green (GN) B: Red (RD) $\overline{B}$: Blue (BU) C: Pink (PK) $\overline{C}$: Gray (GY) UB: White (WH) ⊥: Brown (BN) Switch mode: Violet (VT)	
Manufacturer and type		Lapp, Unitronic Li2YCY (TP) Helukabel, Paar-Tronic-CY	-
Connection	**To encoder/to the Evaluation unit** **To MCV/MCS4_A, X14**	With conductor end sleeves External encoder: cut off the violet conductor (VT) at the encoder end Evaluation unit: jumper the violet conductor (VT) with the brown conductor (BN) With 9-pin sub D socket	

10. Encoder connection MCV/MCS4_A X14: Master → MCV/MCS4_A X14: Slave

This cable is provided for the master/slave connection of two MCV/MCS4_A units.

Part number	**815 355 8**
Routing	Fixed routing
For master/slave connection	X14: Master → X14: Slave
Line cross section	4 × 2 × 0.25 mm² (AWG 23) + 1 × 0.25 mm² (AWG 23)
Conductor colors	A: Yellow (YE) $\overline{A}$: Green (GN) B: Red (RD) $\overline{B}$: Blue (BU) C: Pink (PK) $\overline{C}$: Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor line: Violet (VT)
Manufacturer and type	Lapp, Unitronic Li2YCY (TP) Helukabel, Paar-Tronic-CY
Connection to **X14: Master**[1)] **X14: Slave**[1)]	With 9-pin sub D socket With 9-pin sub D socket

1) **Important:** Connect the socket marked 'Master' to X14: Master and the socket marked 'Slave' to X14: Slave!

4 Parameters

Generally speaking, the parameters menu is only required for startup and when servicing is undertaken. Consequently, the basic unit of MOVIDRIVE® is configured without a keypad; it can be supplemented with the appropriate communications facility as an option.

There are various ways of setting MOVIDRIVE® parameters:

- With the optional keypad type DBG11B.
- With the MOVITOOLS PC program (includes SHELL, SCOPE and IPOS programming). PC connection via the USS21A serial interface.
- Using the serial interfaces, programming by the customer.
- Using the fieldbus interfaces, programming by the customer.
- Using IPOSplus®, programming by the customer.

The latest version of the MOVITOOLS PC program can be downloaded from the SEW homepage (www.sew-eurodrive.com).

4.1 Menu structure

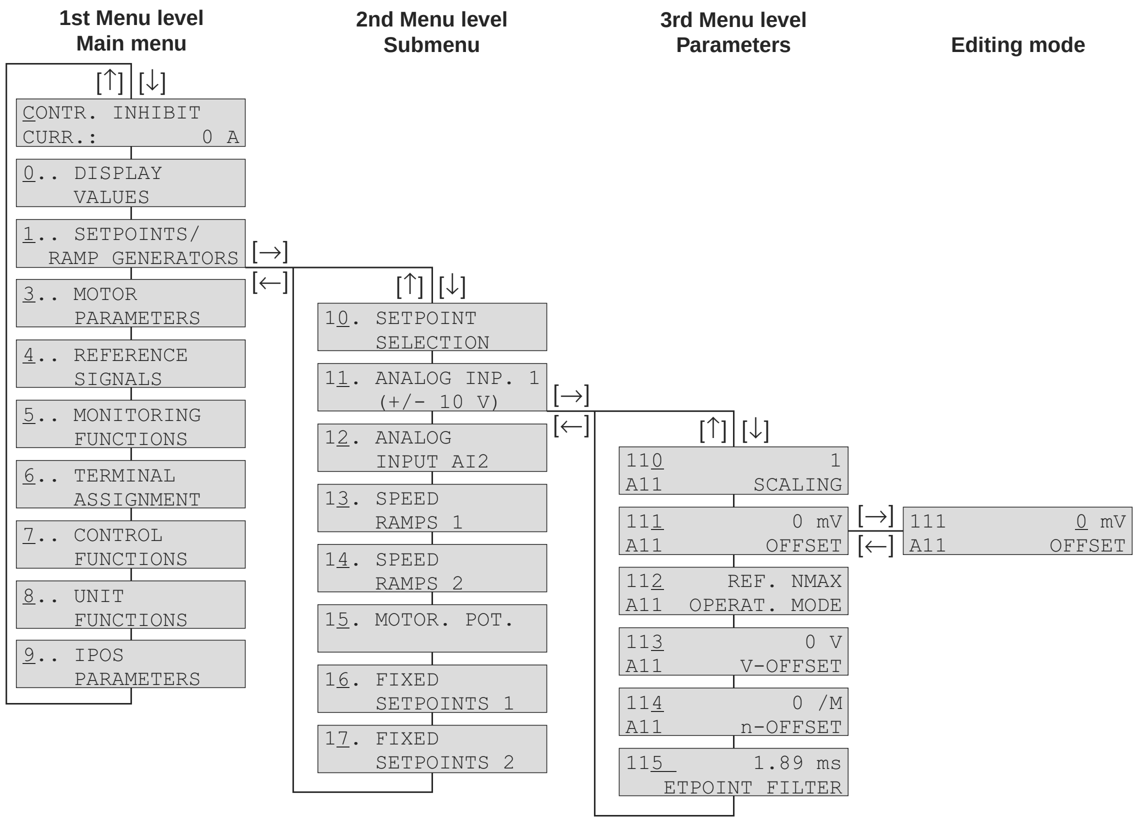

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Figure 42: Menu structure

4.2 Overview of parameters

The following table lists all parameters with their setting range and the factory settings (in bold):

0__	**DISPLAY VALUES → page 91**	
00_	**Process values**	
000	Speed	
001	User display	
002	Frequency	
003	Actual position	
004	Output current	
005	Active current	
006	Motor utilization 1	
007	Motor utilization 2	
008	DC link voltage	
009	Output current	
01_	**Status displays**	
010	Inverter status	
011	Operational status	
012	Fault status	
013	Active parameter set	
014	Heat sink temperature	
015	Mains ON operation time	
016	Operating time (enabled)	
017	Electrical energy	
02_	**Analog setpoints**	
020/021	Analog input AI1/AI2	
022	External current limit	
03_	**Binary inputs basic unit**	
030...035	Binary input DIØØ...DIØ5	
036	Status binary inputs	
04_	**Binary inputs option**	
040...047	Binary inputs DI1Ø...DI17	
048	Status binary inputs	
05_	**Binary outputs basic unit**	
050	Binary output DBØØ	
051/052	Binary output DOØ1/DOØ2	
053	Status binary outputs	
06_	**Binary outputs option**	
060...067	Binary outputs DO1Ø...DO17	
068	Status binary outputs	
07_	**Unit data**	
070	Unit type	
071	Output rated current	
072	Option 1	
073	Option 2	
074	Firmware option 1	
075	Firmware option 2	
076	Firmware basic unit	
077	Technology function	

08_	**Fault memory**	
080...084	Fault t-0...t-4	
09_	**Bus diagnosis**	
090	PD configuration	
091	Fieldbus type	
092	Fieldbus baud rate	
093	Fieldbus address	
094...096	PO1...PO3 setpoint	
097...099	PI1...PI3 actual value	
1__	**SETPOINTS / RAMP GENERATORS → page 94**	
10_	**Setpoint selection**	
100	Setpoint source	**UNIPOL/FIX.SETPT**
101	Control signal source	**TERMINALS**
11_	**Analog input AI1**	
110	AI1 scaling	-10...-0.1 / 0.1...**1**...10
111	AI1 offset	-500...**0**...500 mV
112	AI1 operation mode	**Ref. N-MAX**
113	AI1 voltage offset	-10...**0**...10 V
114	AI1 speed offset	-5000...**0**...5000 rpm
115	Filter setpoint	0...**5**...100 ms, 0 = OFF
12_	**Analog inputs (optional)**	
120	AI2 operation mode	**NO FUNCTION**
13_/14_	**Speed ramps 1 / 2**	
130/140	Ramp t11/t21 UP CW	0...**2**...2000 s
131/141	Ramp t11/t21 DOWN CW	0...**2**...2000 s
132/142	Ramp t11/t21 up CCW	0...**2**...2000 s
133/143	Ramp t11/t21 down CCW	0...**2**...2000 s
134/144	Ramp t12/t22 UP=DOWN	0...**2**...2000 s
135/145	S pattern t12/t22	**0**...3
136/146	Stop ramp t13/t23	0...**2**...20 s
137/147	Emergency ramp t14/t24	0...**2**...20 s
138	Ramp limit	NO = 0 / **YES = 1**
15_	**Motorized potentiometer**	
150	Ramp t3 UP	0.2...**20**...50 s
151	Ramp t3 DOWN	0.2...**20**...50 s
152	Save last setpoint	ON / **OFF**
16_/17_	**Fixed setpoints 1 / 2**	
160/170	Internal setpoint n11/n21	-5000...**150**...5000 rpm
161/171	Internal setpoint n12/n22	-5000...**750**...5000 rpm
162/172	Internal setpoint n13/n23	-5000...**1500**...5000 rpm

2__	**CONTROLLER PARAMETERS → page 107**	
20_	**Speed control**	
200	P gain speed controller	0.1...**2**...32
201	Time constant n-control.	0...**10**...300 ms
202	Gain accel. feedforward	**0**...32
203	Filter accel. feedforward	**0**...100 ms
204	Filter speed actual value	**0**...32 ms
205	Load feedforward CFC	**0**...150 %
206	Sample time n-control.	**1 ms = 0** / 0.5 ms = 1
207	Load feedforward VFC	**0**...150 %
21_	**Hold controller**	
210	P-gain hold controller	0.1...**2**...32
22_	**Internal synchronous operation**	
228	Feedforward filter (DRS)	**0**...100 ms
3__	**Motor parameters → page 110**	
30_/31_	**Limits 1 / 2**	
300/310	Start/stop speed 1/2	0...**60**...150 rpm
301/311	Minimum speed 1/2	0...**60**...5500 rpm
302/312	Maximum speed 1/2	0...**1500**...5500 rpm
303/313	Current limit 1/2	0...**150** %I_N
304	Torque limit	**0**...150 %
32_/33_	**Motor compensat. 1/2 (asynchr.)**	
320/330	Automatic adjustment 1/2	**ON** / OFF
321/331	Boost 1/2	**0**...100 %
322/332	I×R compensation 1/2	**0**...100 %
323/333	Premagnetizing time 1/2	0...**0.1**...2 s
324/334	Slip compensation 1/2	**0**...500 rpm
34_ 1 2	**Motor protection**	
340/342	Motor protection 1/2	ON / **OFF**
341/343	Cooling type 1/2	**FAN** / FORCED
35_ 1 2	**Motor sense of rotation**	
350/351	Change direction of rotation 1/2	ON / **OFF**
36_	**Startup (only available in DBG11B)**	
360	Startup	YES / **NO**
4__	**REFERENCE SIGNALS → page 114**	
40_	**Speed reference signal**	
400	Speed reference value	0...**1500**...5000 rpm
401	Hysteresis	0...**100**...500 rpm
402	Delay time	0...**1**...9 s
403	Signal = '1' if:	$\mathbf{n < n_{ref}}$ / $n > n_{ref}$
41_	**Speed window signal**	
410	Window center	0...**1500**...5000 rpm
411	Range width	**0**...5000 rpm
412	Delay time	0...**1**...9 s
413	Signal = '1' if:	**INSIDE** / OUTSIDE

42_	**Speed setp./act. val. comp.**	
420	Hysteresis	0...**100**...300 rpm
421	Delay time	0...**1**...9 s
422	Signal = '1' if:	$n \neq n_{setpt}$ / $n = n_{setpt}$
43_	**Current reference signal**	
430	Current reference value	0...**100**...150 % I_N
431	Hysteresis	0...**5**...30 % I_N
432	Delay time	0...**1**...9 s
433	Signal = '1' if:	$\mathbf{I < I_{ref}}$ / $I > I_{ref}$
44_	**Imax signal**	
440	Hysteresis	0...**5**...50 % I_N
441	Delay time	0...**1**...9 s
442	Signal = '1' if:	$I = I_{max}$ / $\mathbf{I < I_{max}}$
5__	**MONITORING FUNCTIONS → page 117**	
50_ 1 2	**Speed monitoring**	
500/502	Speed monitoring 1/2	**OFF**/MOT/GEN/MOT& GEN
501/503	Delay time 1/2	0...**1**...10 s
52_	**Mains OFF monitoring**	
520	Mains OFF response time	**0**...5 s
521	Mains OFF response	**CONTROL.INHIBIT**/EMERGENCY STOP
6__	**TERMINAL ASSIGNMENT → page 118**	
60_	**Binary inputs basic unit**	
600	Binary input DIØ1	**CW/STOP**
601	Binary input DIØ2	**CCW/STOP**
602	Binary input DIØ3	**ENABLE/RAP.STOP**
603	Binary input DIØ4	**n11/n21**
604	Binary input DIØ5	**n12/n22**
62_	**Binary outputs basic unit**	
620	Binary output DOØ1	**READY**
621	Binary output DOØ2	**NO FUNCTION**
64_	**Analog output**	
640	Analog output AO1	**ACTUAL SPEED**
641	Scaling AO1	-10...0...**1**...10
642	Operating mode AO1	OFF/±**10 V**/0(4)..20 mA
7__	**Control functions → page 122**	
70_ 1 2	**Operating modes**	
700/701	Operating mode 1/2	**VFC 1 / 2**
71_ 1 2	**Current at standstill**	
710/711	Standstill current 1/2	**0**...50 % I_{mot}
72_ 1 2	**Setpoint stop function**	
720/723	Setpoint stop function 1/2	ON / **OFF**
721/724	Stop setpoint 1/2	0...**30**...500 rpm
722/725	Start offset 1/2	0...**30**...500 rpm
73_ 1 2	**Brake function**	
730/733	Brake function 1/2	**ON** / OFF
731/734	Brake release time 1/2	**0**...2 s
732/735	Brake application time 1/2	0...**0.2**...2 s

74_	**Speed skip**	
740/742	Skip window center 1/2	0...**1500**...5000 rpm
741/743	Skip width 1/2	0...300 rpm
75_	**Master-Slave function**	
750	Slave setpoint	**MASTER-SLAVE OFF**
751	Scaling slave setpoint	-10...0...**1**...10
8__	**UNIT FUNCTIONS → page 139**	
80_	**Setup**	
800	Quick menu	**ON** / OFF
801	Language	**DE** / EN / FR
802	Factory setting	YES / **NO**
803	Parameter lock	ON / **OFF**
804	Reset statistic data	**NO** / FAULT / KWH / OPERATING HOURS
806	Copy DBG → MDX	YES / **NO**
807	Copy MDX → DBG	YES / **NO**
81_	**Serial communication**	
810	RS485 address	**0**...99
811	RS-485 group address	**100**...199
812	RS485 timeout delay	**0**...650 s
813	SBus address	**0**...63
814	SBus group address	**0**...63
815	SBus timeout delay	**0**...650 s
816	SBus baud rate	125/250/**500**/1000 kB
817	SBus synchronization ID	**0**...1023
818	CAN synchronization ID	0...**1**...2047
819	Fieldbus timeout delay	0...**0.5**...650 s
82_	**Brake operation**	
820/821	4-quadrant operation 1/2	**ON** / OFF
83_	**Fault response**	
830	Response EXT. FAULT	**EMERG.STOP/FAULT**
831	Response FIELDBUS TIME-OUT	**RAPID STOP/FAULT**
832	Response MOTOR OVER-LOAD	**EMERG.STOP/FAULT**
833	Response RS485 TIMEOUT	**RAPID STOP/WARNG**
834	Response DRS LAG ERROR	**EMERG.STOP/FAULT**
835	Response TF sensor SIG-NAL	**NO RESPONSE**
836	Response SBus TIMEOUT	**EMERG.STOP/FAULT**
84_	**Reset response**	
840	Manual reset	YES / **NO**
841	Auto reset	ON / **OFF**
842	Restart time	1...**3**...30 s
85_	**Scaling speed actual value**	
850	Scaling factor numerator	**1**...65535
851	Scaling factor denominator	**1**...65535
852	User dimension	**1 rpm**

86_	**Modulation**	
860/861	PWM frequency 1/2	**4** / 8 / 16 kHz
862/863	PWM fix 1/2	ON / **OFF**
864	PWM frequency CFC	4 / **8** / 16 kHz
87_	**Process data description**	
870	Setpoint description PO1	**CTRL. WORD 1**
871	Setpoint description PO2	**SPEED**
872	Setpoint description PO3	**NO FUNCTION**
873	Actual value description PI1	**STATUS WORD1**
874	Actual value description PI1	**SPEED**
875	Actual value description PI1	**OUTPUT CURRENT**
876	PO data enable	**ON** / OFF
877	DeviceNet PD configuration	**PARAM+1PD**
88_	**Manual operation**	
880	Manual operation	ON / **OFF**
9__	**IPOS PARAMETERS → page 148**	
90_	**IPOS Reference travel**	
900	Reference offset	$-(2^{31}-1)$...**0**...$2^{31}-1$ inc
901	Reference speed 1	0...**200**...5000 rpm
902	Reference speed 2	0...**50**...5000 rpm
903	Reference travel type	**0**...7
904	Reference travel to zero pulse	**Yes** / No
91_	**IPOS Travel parameter**	
910	Gain X controller	0.1...**0.5**...32
911	Positioning ramp 1	0...**1**...20 s
912	Positioning ramp 2	0...**1**...20 s
913	Travel speed CW	0...**1500**...5000 rpm
914	Travel speed CCW	0...**1500**...5000 rpm
915	Speed feedforward	-199.99...0...**100** ...199.999 %
916	Ramp type	**LINEAR**/SINE/SQUARED
92_	**IPOS Monitoring**	
920	SW limit switch CW	$-(2^{31}-1)$...**0**...$2^{31}-1$ inc
921	SW limit switch CCW	$-(2^{31}-1)$...**0**...$2^{31}-1$ inc
922	Position window	0...**50**...32767 inc
923	Lag error window	0...**5000**...$2^{31}-1$ inc
93_	**IPOS Special functions**	
930	Override	ON / **OFF**
931	CTRL word Task 1	START / **STOP**
932	CTRL word Task 2	START / **STOP**

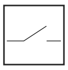
94_	**IPOS Encoder**	
940	IPOS variables edit	ON / **OFF**
941	Source actual position	**MOTOR ENC. (X15)**/ EXTERN.ENC (X14)/ ABSOL.ENC. (DIP)
942	Encoder factor numerator	**1**...32767
943	Encoder factor denominator	**1**...32767
944	Encoder scaling ext. encoder	×**1**/×2/×4/×8/×16/×32/×64
945	Encoder type (X14)	**TTL** / SIN/COS / HIPERFACE
95_	**DIP**	
950	Encoder type	**NO ENCODER**
951	Counting direction	**NORMAL** / INVERTED
952	Cycle frequency	**1**...200 %
953	Position offset	$-(2^{31}-1)$...**0**...$2^{31}-1$ inc
954	Zero offset	$-(2^{31}-1)$...**0**...$2^{31}-1$ inc
955	Encoder scaling	×**1**/×2/×4/×8/×16/×32/×64
96_	**IPOS Modulo Function**	
960	Modulo function	**OFF**/SHORT/CW/CCW
961	Modulo numerator	**0**...2^{31}
962	Modulo denominator	**0**...2^{31}
963	Modulo encoder resolution	0...**4096**...20000

4.3 Explanation of the parameters

The parameters are explained below. The parameters are divided into 10 groups. The names of the parameters correspond to their representation in the MOVITOOLS\SHELL PC program. The factory setting is underlined in each case.

Symbols The following symbols are used to assist understanding:

1 2 — Parameters which can be switched over, i.e. they are available in parameter sets 1 and 2.



Parameters which can only be changed with INHIBITED inverter status (= output stage at high resistance).

AUTO — Parameter is automatically changed by the startup function.

PARAMETER GROUP 0__, DISPLAY VALUES

This group of parameters contains information about process values and status conditions of the basic unit and the installed options. Furthermore, the fault memory and the fieldbus parameters can be called up.

00_ **Process values**

000 Speed [rpm]

Resolution with DBG11B: ±1 rpm; with MOVITOOLS\SHELL: ± 0.2 rpm

The speed is established by taking the rated speed and the set slip compensation in VFC mode without an encoder connection. The speed is established from the encoder or resolver signals and displayed when there is an encoder connection.

001 User display [text]

Speed value weighted by the scaling factors (→ P850/P851) in the user dimension (→ P852).

002 Frequency [Hz]

Output frequency of the inverter.

003 Actual position [inc] (4096 increments/motor revolution)

Position of the drive as a value in increments observing the signs in the range 0...$\pm 2^{31}$-1 inc (with encoder connection). The value is zero without an encoder connection.

004 Output current [%In]

Apparent current in the range 0...200 % of the rated unit current.

005 Active current [%In]

Active current in the range 0...200 %IN. The displayed value is positive when the torque is in the positive sense of rotation; the displayed value is negative when the torque is in the negative sense of rotation.

006 Motor utilisation 1 [%] (applies to parameter set 1)

007 Motor utilisation 2 [%] (applies to parameter set 2)

Parameters P006 and P007 show the thermal utilisation of the connected motor in the range 0...200 % (→ P340/P341).

008 DC link voltage [V]

009 Output current [A]

Apparent current, displayed in A_{AC}.

01_	**Status displays**
010	Inverter status Status of the unit output stage (INHIBITED, ENABLED).
011	Operational status The following operational states are possible: 24 V OPERATION, CONTROLLER INHIBIT, NO ENABLE, CURRENT AT STANDSTILL, ENABLE (VFC), ENABLE (N-CONTROL), TORQUE OPERATION, HOLD CONTROL, FACTORY SETTING, LIMIT SWITCH, TECHNOLOG.OPTION, FAULT, REFERENCE MODE, FLYING START.
012	Fault status Fault number and fault in plain text. The operation LED V1 lights up red to indicate a fault.
013	Active parameter set Parameter set 1 or 2.
014	Heat sink temperature [°C] Heat sink temperature of the inverter in the range -40...0...125 °C.
015	Mains ON operation time [h] Total number of hours for which the inverter has been connected to the mains or a 24 V_{DC} external supply. Storage cycle every 15 min.
016	Operating time (enabled) [h] Total number of hours for which the inverter has been at ENABLE operating status. Storage cycle every 15 min.
017	Electrical energy [kWh] Cumulated electrical watt-hours used by the motor. Storage cycle every 15 min.
02_	Analog setpoints (020...022)
020/021	Analog input AI1 [V] / Analog input AI2 [V] Voltage (0...10 V) at analog input AI1 (020) and at the optional analog input AI2 (021). If P112 'AI1 operation mode' is set to 'N-MAX, 0(4)...20mA' and S11 = ON, P020 displays 0(1)...5 V = 0(4)...20 mA.
022	External current limit [%] If analog input AI2 is set to the '0..10V I-limit' operation mode (→ P120, 0...10 V = 0...100 %), 022 displays which external current limit is in effect.
03_	**Binary inputs basic unit (030...035)**
04_	**Binary inputs option (040...047)**
05_	**Binary outputs basic unit (050...052)**
06_	**Binary outputs option (060...067)** Status ('0' or '1') of the binary inputs/outputs and programmed function (menu selection → P6__). Note that binary input DIØØ (030) is fixed at /CONTROLLER INHIBIT and binary output DBØØ (050) is fixed at /BRAKE in the programming. They cannot be reprogrammed.

07	**Unit data (070...076)**
	Unit type, rated unit current, firmware part number, type (standard or application version).

08_	**Fault memory (Fault t-0...t-4)**
	There are 5 fault memories (t-0...t-4). The faults are stored in a chronological sequence with the most recent fault event being held in fault memory t-0. If there are more than 5 faults, the fault event of longest standing, stored in t-4, is deleted (fault response → P83_).
080...084	Faults which have occurred t-0...t-4.
	At the time of the fault, the following information is stored and can be displayed using P080...P084 in the event of a fault:
	Status ('0' or '1') of the binary inputs/outputs, operational status of the inverter, inverter status, heat sink temperature [°C], speed [rpm], output current [%In], active current [%], unit utilization [%], DC link voltage [V], mains on operation time [h], operating time (enabled) [h], parameter set [1/2] and motor utilization 1 and 2 [%].

09_	**Bus diagnostics**
090	Set process data word configuration.
091	Installed fieldbus type
	CAN, PROFIBUS FMS/DP, PROFIBUS DP, INTERBUS, INTERBUS with FO, DeviceNet, CAN, CANopen, NO FIELDBUS
092	Active baud rate.
093	Address of the inverter on the fieldbus.
094...096	Process data setpoints from the fieldbus master.
097...099	Process data actual values to the fieldbus master.
	→ P87_ 'Process data description' for the meaning of the process data.

PARAMETER GROUP 1, SETPOINTS / RAMP GENERATORS

10_ **Setpoint selection**

100 Setpoint source

This parameter is used for setting the source from which the inverter obtains its setpoint.

BIPOL./FIX.SETPT

The setpoint comes from the analog inputs (AI1/AI2) or the fixed setpoints (P16_), if these are selected via a binary input (→ P60_/P61_). The setpoints are processed as signed setpoints. A positive setpoint causes CW rotation; a negative setpoint produces CCW rotation.

UNIPOL/FIX.SETPT

The setpoint is provided by the analog inputs or the fixed setpoints. Negative analog setpoints result in a setpoint of zero. The fixed setpoints are processed in accordance with their value. The direction of rotation is specified using binary inputs (→ P 60_).

RS-485

The setpoint comes from the RS-485 interface.

FIELDBUS

The setpoint comes from the fieldbus interface.

MOTOR POT (→ P15_)

The setpoint is defined by the internal motor potentiometer. To enable this, one binary input must be programmed to MOTOR.POT. UP and another binary input to MOTOR.POT. DOWN, and the binary inputs must be activated accordingly. The direction of rotation is specified by the clockwise/stop and counterclockwise/stop binary inputs.

MOTOR.POT.+ANALOG1 (→ P15_)

The setpoint is defined by the total of the motorised potentiometer and the setpoint selection at analog input AI1. The analog setpoint is processed as a signed setpoint. n_{min} takes effect if the total is negative. The direction of rotation is specified using binary inputs. Also, the settings of AI1 operation mode apply (→ P112).

FIXED SETPOINT+ANALOG1 (→ P16_)

The setpoint is defined by the total of the selected fixed setpoint and the setpoint selection at analog input AI1. The fixed setpoint is processed without its sign (= according to its value) and the analog setpoint is processed as a signed setpoint. n_{min} is in effect if the total is negative or if no fixed setpoint is selected. The direction of rotation is specified using binary inputs.

FIXED SETPOINTx ANALOG1 (→ P16_)

The value at analog input AI1 serves as the evaluation factor (0...10 V = 0...100 %) for the selected fixed setpoint. The fixed setpoint is processed without its sign (= according to its value). n_{min} is in effect if the voltage at analog input AI1 is negative or if no fixed setpoint is selected. The direction of rotation is specified using binary inputs.

MASTER SBus (→ P75_)

The setpoint comes from the master in master/slave mode via the system bus.

MASTER RS-485 (→ P75_)

The setpoint comes from the master in master/slave mode via the RS-485 interface.

SBus (→ IPOS$^{plus®}$ manual)

The setpoint selection is made via the system bus.

101 Control signal source

This parameter sets the source from which the inverter obtains its control commands (CONTROLLER INHIBIT, ENABLE, CW, CCW, etc.). Control via IPOS$^{plus®}$ is taken into account regardless of P101.

<u>TERMINALS</u>

Control is via the binary inputs.

RS-485

Control is via the RS-485 interface and the binary inputs.

FIELDBUS

Control is via the fieldbus and the binary inputs.

SBus

Control is via the system bus and the binary inputs.

P100 and P101 can also be used for selecting a communications port as the setpoint or control signal source. However, the interfaces are not automatically deactivated with these parameters because the drive inverter must remain ready to receive via all interfaces all the time.

If the drive inverter is in 't = Timeout active' status, please check the timeout times of parameters P812, P815 and P819 and, if necessary, switch off timeout monitoring by entering 0 s or 650 s.

*11_* **Analog input AI1**

110 AI1 scaling

Setting range: -10...0...1...10

The slope of the setpoint characteristic is defined. When AI1 scaling = 1 and the input voltage V_E is ±10 V, the setpoint is defined as ±3000 rpm or $\pm n_{max}$ depending on the set operating mode of analog input AI1 (→ P112).

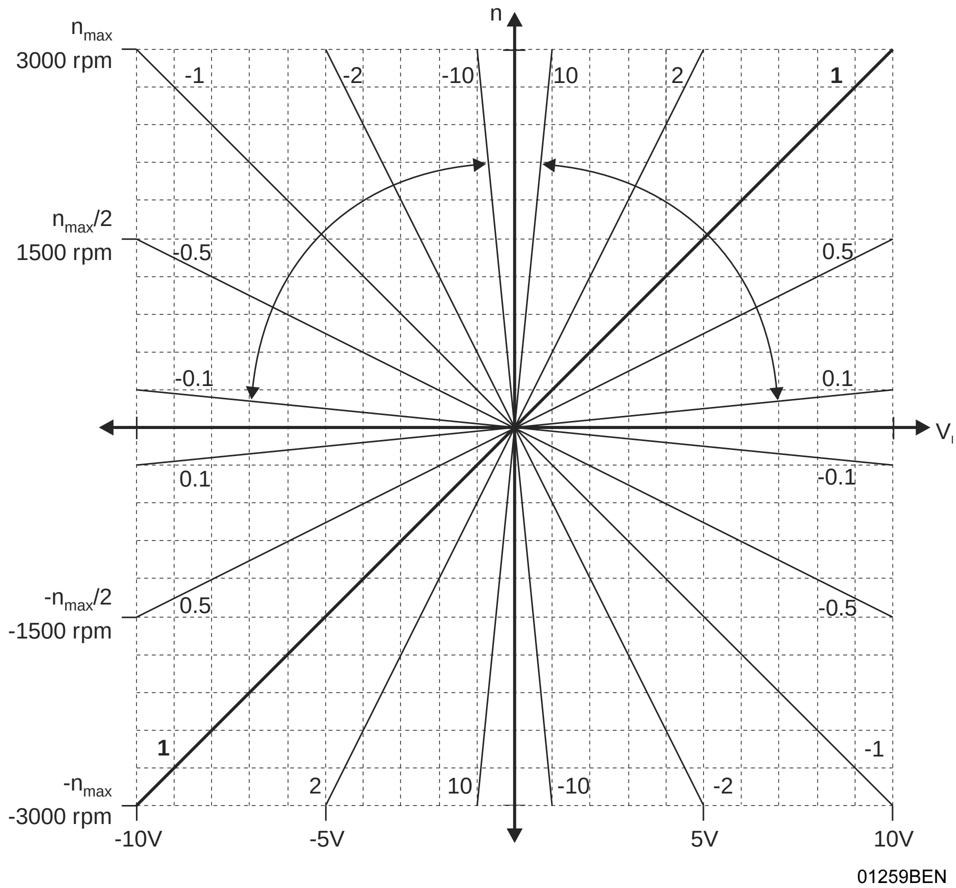


Figure 43: Slope of the setpoint characteristic

Only the 1st quadrant can be used with a unipolar setpoint source (→ P100); negative setpoint selections then produce the setpoint zero. P110 does not have any effect if current input is set in the AI1 operation mode (→ P112).

111 AI1 offset compensation [mV]

Setting range: -500...0...500 mV

When the setpoint selection is made by an external controller, it is possible to compensate for a fault voltage present at analog input AI1 when the setpoint selection is zero. The setting of this parameter causes the co-ordinate zero point in Figure 43 to be calibrated. This setting is in effect in all AI1 operating modes.

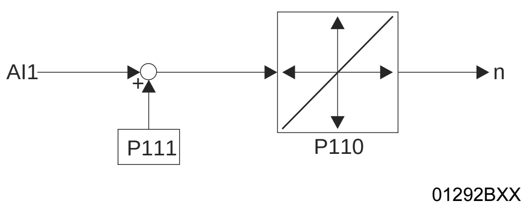


Figure 44: Effect of the AI1 offset

112 AI1 operation mode

The selection for the AI1 operating mode differentiates between various characteristic curves and voltage/current input.

Ref. N-MAX

Voltage input with reference n_{max} (→ P302/P312). The characteristic can be adapted with AI1 scaling (→ P110). AI1 voltage offset (→ P113) and AI1 speed offset (→ P114) do not have any effect.

Ref. 3000 rpm

Voltage input with reference 3000 rpm. The characteristic can be adapted with AI1 scaling. AI1 voltage offset and AI1 speed offset do not have any effect.

U-Off., N-MAX

Voltage input with reference n_{max}. The characteristic can be adapted with AI1 voltage offset. AI1 scaling and AI1 speed offset do not have any effect.

N-Off., N-MAX

Voltage input with reference n_{max}. The characteristic can be adapted with AI1 speed offset. AI1 scaling and AI1 voltage offset do not have any effect.

Expert charact.

There is a free choice of reference between setpoint voltage and speed. The characteristic can be adapted with AI1 scaling (reference 3000 rpm), AI1 voltage offset and AI1 speed offset (→ Figure 49). The following structural diagram shows how the speed setpoint is created from the expert characteristic.

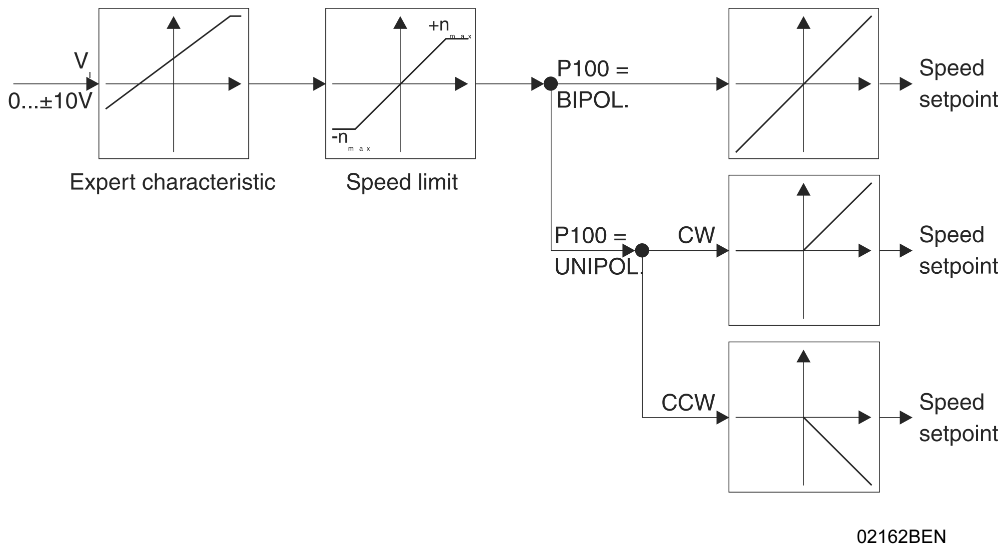


Figure 45: 'Expert characteristic' structural diagram

N-MAX, 0-20mA

Current input 0...20 mA = 0...n_{max}, no setting possibilities (P110 ineffective). Set the internal load (250 Ω) 'S11 = ON'.

N-MAX, 4-20mA

Current input 4...20 mA = 0...n_{max}, no setting possibilities (P110 ineffective). Set the internal load (250 Ω) 'S11 = ON'.

113 AI1 voltage offset [V]

Setting range: -10...0...10 V

The zero passage of the setpoint characteristic can be moved along the U_E axis.

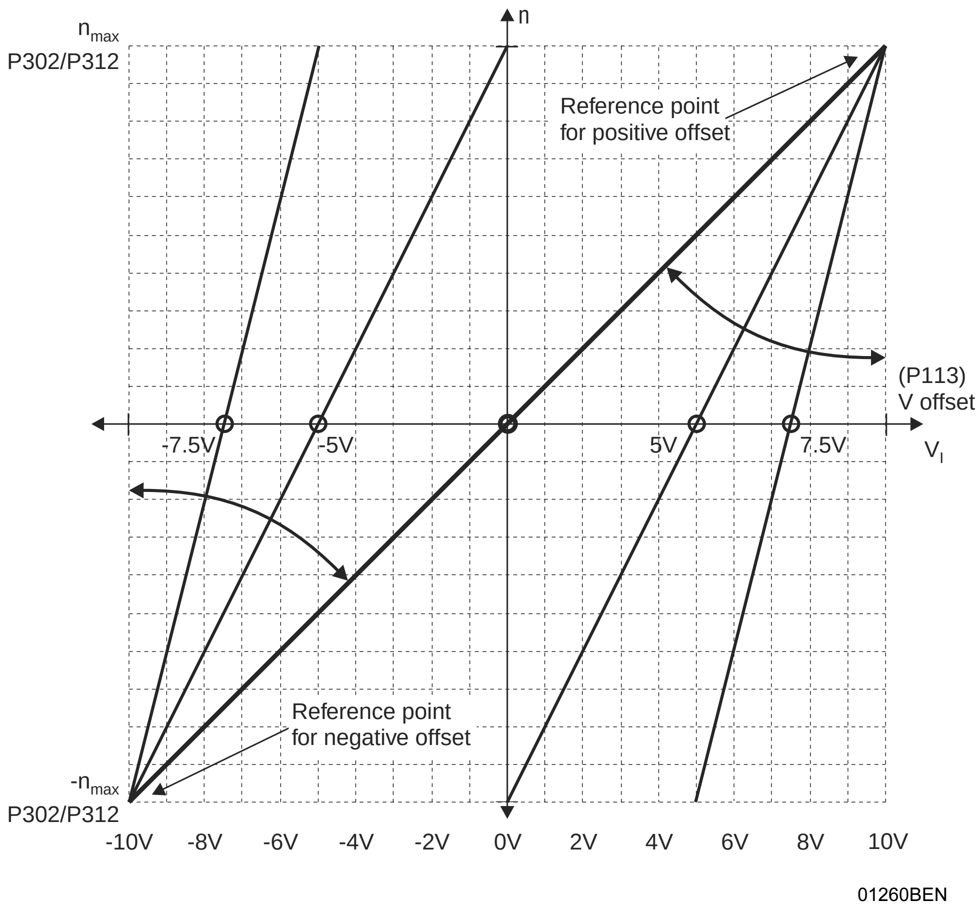


Figure 46: AI1 voltage offset

114 AI1 speed offset [rpm]

Setting range: -5000...0...5000 rpm

The zero passage of the setpoint characteristic can be moved along the n axis.

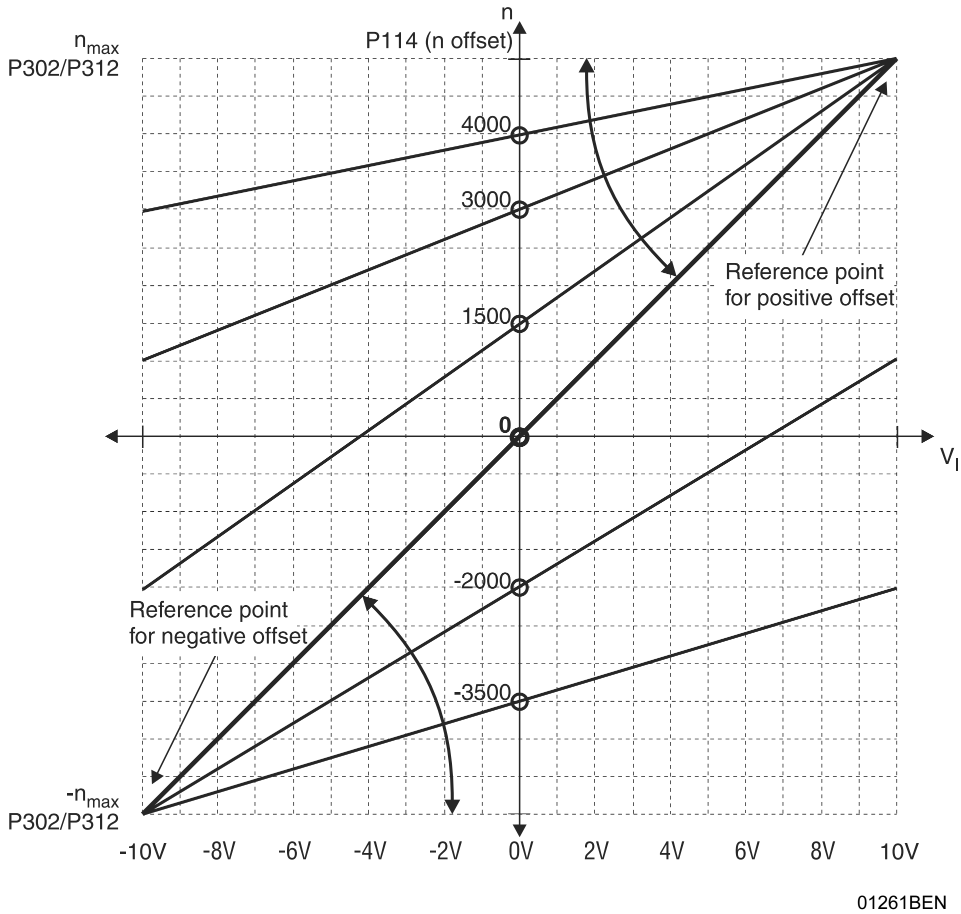


Figure 47: AI1 speed offset

115 Filter setpoint [ms]

Setting range: T = 0...5...100 ms (0 = filter setpoint off)

The speed ramp is filtered. This can be used for dampening stepped setpoint selections, e.g. from external controllers, or interference pulses at the analog input. Also effective in torque control.

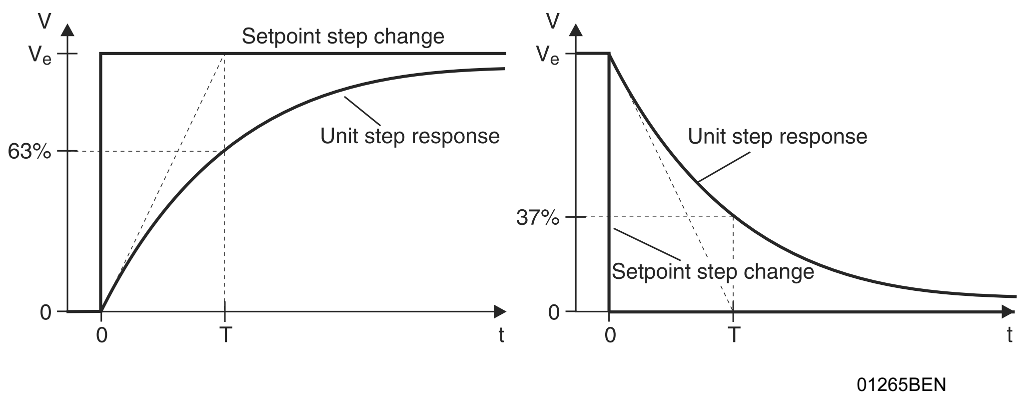


Figure 48: Effect of the setpoint filter

Sample expert characteristics (P112 = Expert charact.):

There is a free choice of reference between setpoint voltage and speed in the expert characteristic. Set parameter P100 'Setpoint source' to 'BIPOL./FIX.SETPT' in order to exploit the possibilities of the expert characteristic to the full.

One point on the characteristic (marked by **o** in Figure 49) is specified by AI1 voltage offset and AI1 speed offset, then the slope is specified with AI1 scaling. Reference 3000 rpm always applies to scaling with the expert characteristic.

The speed range is restricted by P302/P312 'Maximum speed 1/2'. P302 is set to 4000 rpm. Setting the maximum speed does not alter the slope.

The voltage value of the x-axis must be converted to a speed value for calculating the slope triangulation function $\Delta y/\Delta x$ = slope = setting value for P110 'Scaling'. The following applies: 10 V = 3000 rpm.

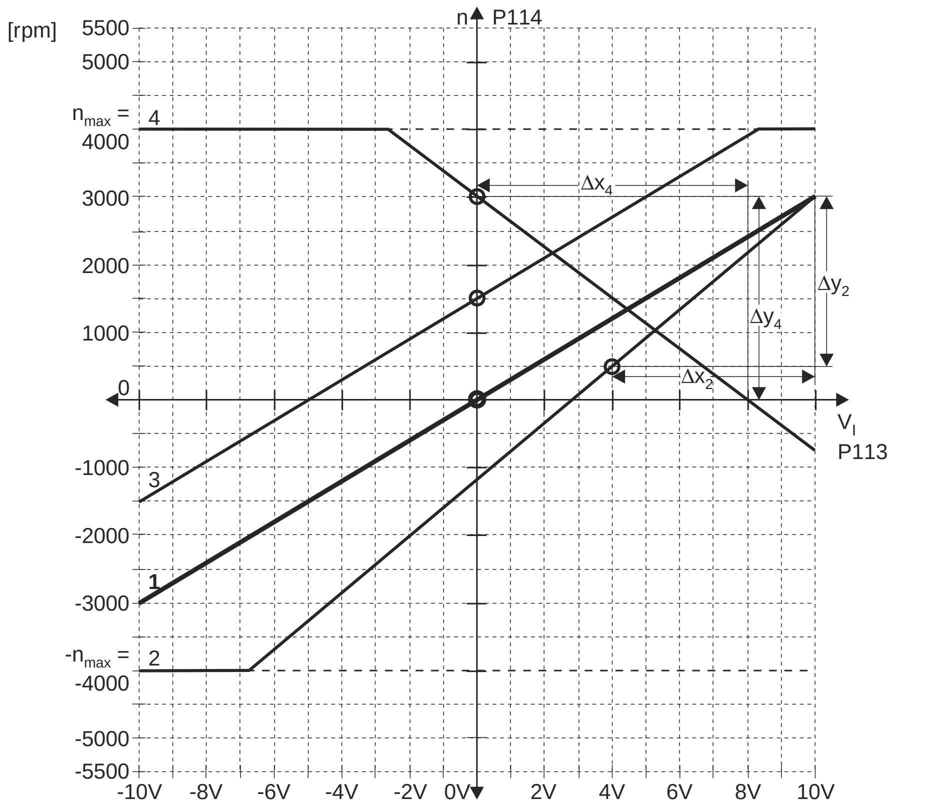


Figure 49: Samples of expert characteristics with P100 'Setpoint source' = 'BIPOL./ FIX.SETPT'

The following slope triangulation functions are calculated for characteristic curves 2 and 4 in Figure 49 below. This determines the settings for P110 'Scaling'.

Char. curve 2: Δy_2 = 2500 rpm, Δx_2 = 6 V = 1800 rpm, $\Delta y_2/\Delta x_2$ = 2500/1800 = 1.39

Char. curve 4: Δy_4 = -3000 rpm, Δx_4 = 8 V = 2400 rpm, $\Delta y_4/\Delta x_4$ = -3000/2400 = -1.25

The expert characteristics displayed in Figure 49 are created as follows:

Char.	P113 AI1 voltage offset [V]	P114 AI1 speed offset [rpm]	P110 AI1 scaling (slope)
1	0	0	1
2	4	500	1.39
3	0	1500	1
4	0	3000	-1.25

The expert characteristic can also be used with P100 'Setpoint source = UNIPOL/ FIX.SETPT'. The direction of rotation is then specified using binary inputs. The expert characteristic is mirrored on the x-axis. The section below the x-axis causes the speed setpoint to be 0. If the direction of rotation 'CW' is specified, then movement is only possible at speeds in the range 0...n_{max}, while the range 0...-n_{max} applies if the direction of rotation 'CCW' is specified. Figure 50 shows the expert characteristics from Figure 49 with the setting P100 'Setpoint source = UNIPOL/FIX.SETPT'.

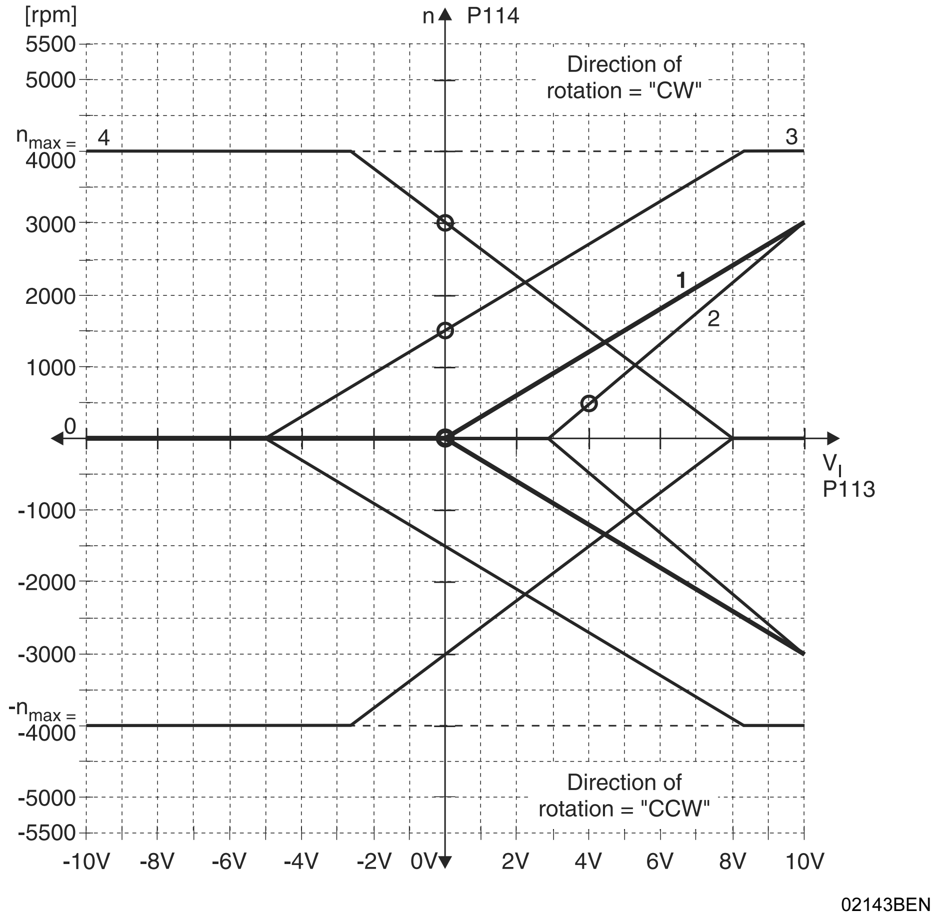


Figure 50: Samples of expert characteristics with P100 'Setpoint source' = 'UNIPOL/ FIX.SETPT'

The expert characteristics displayed in Figure 49 are created as follows:

Char.	P113 AI1 voltage offset [V]	P114 AI1 speed offset [rpm]	P110 AI1 scaling (slope)
1	0	0	1
2	4	500	1.39
3	0	1500	1
4	0	3000	-1.25

Expert characteristic with current setpoints:

Voltage signals are required at the AI11/AI12 analog input for the expert characteristic function. Switch S11 (changeover I signal ↔ V signal) must be set to ON and the current signal routed to AI11 if an impressed current of 0(4)...20 mA is available as the setpoint. The internal load (250 Ω) converts the 0(4)...20 mA setpoints into 0(1)...5 V voltage signals.

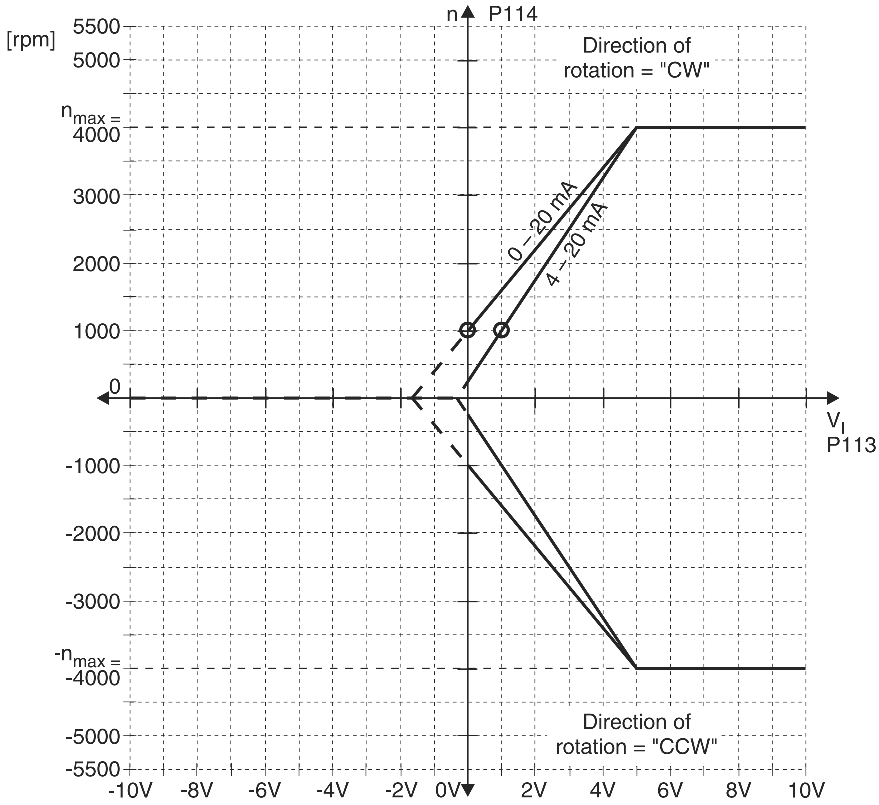


Figure 51: Samples of expert characteristics with current setpoints

You have to set the expert characteristic as follows if you want to achieve speeds of 1000...4000 rpm, for example, with 0(4)...20 mA:

for 0...20 mA:	P110 = 2	P113 = 0 V	P114 = 1000 rpm	P302 (n_{max}) = 4000 rpm
for 4...20 mA:	P110 = 2.5	P113 = 1 V	P114 = 1000 rpm	P302 (n_{max}) = 4000 rpm

Set P100 'Setpoint source' to 'UNIPOL/FIX.SETPT'. The direction of rotation is then specified using binary inputs.

12_ **Analog inputs AI2**

120 AI2 operation mode (optional)

Analog input AI2 is available with the optional terminal expansion board (DIO11A) only.

NO FUNCTION

The setpoint at AI2 is not used; the external current limitation is set to 100 %.

0...10 V+Setpt1

The setpoint at AI2 is added to setpoint 1 (=AI1) observing the signs; the external current limitation is set to 100 %. ±10 V = $\pm n_{max}$ (reference n_{max}).

0...10 V I-limit

The input is used as an external current limitation. 0...10 V = 0...100 % of the internal set current limit (→ P303/P313).

TF sensor

Analog input AI2 can also be used as a TF/TH input.

4

13_/14_ 1 2 **Speed ramps 1 (parameter set 1) / Speed ramps 2 (parameter set 2)**

130/140 Ramp t11 UP CW [s] / Ramp t21 UP CW [s]

131/141 Ramp t11 DOWN CW [s] / Ramp t21 DOWN CW [s]

132/142 Ramp t11 up CCW [s] / Ramp t21 up CCW [s]

133/143 Ramp t11 down CCW [s] / Ramp t21 down CCW [s]

Setting range: 0...2...2000 s

The ramp times refer to a setpoint step change of Δn = 3000 rpm. The ramp takes effect when the speed setpoint is changed and the enable is withdrawn via the CW/CCW terminal.

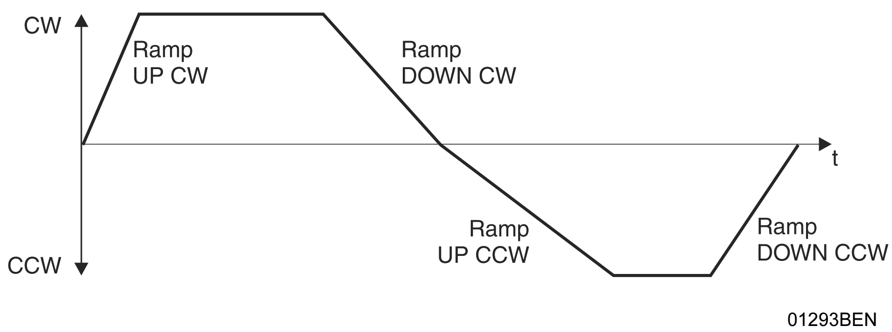


Figure 52: Separately adjustable speed ramps

134/144 Ramp t12 UP=DOWN [s] / Ramp t22 UP=DOWN [s] (2nd ramp of parameter set 1/2)

Setting range: 0...10...2000 s

The following applies to this ramp: UP = DOWN and CW = CCW.

135/145 S pattern t12 / S pattern t22

Setting range: 0 / 1 / 2 / 3 (0 = off, 1 = weak, 2 = medium, 3 = strong)

The 2nd ramp of parameter set 1 and 2 can be rounded with 3 pattern grades in order to achieve a smoother acceleration of the drive.

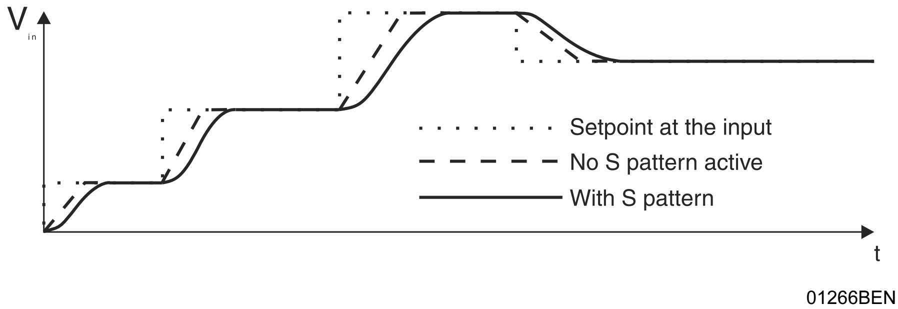


Figure 53: Effect of the S pattern

STOP

A started S pattern is interrupted by the stop ramp t13/t23 and a changeover to ramp t11/t12. Withdrawing the setpoint or a stop via the input terminals causes the started S curve to be completed. This means the drive can still accelerate in spite of the withdrawal of the setpoint.

136/146 Stop ramp t13 [s] / Stop ramp t23 [s]

Setting range: 0...2...20 s

The stop ramp is activated by withdrawing the ENABLE terminal or by a fault (→ P83_).

137/147 AUTO Emergency ramp t14 [s] / Emergency ramp t24 [s]

Setting range: 0...2...20 s

The emergency ramp is activated by a fault (→ P83_). The system monitors whether the drive reaches zero speed in the set time. The output stage is inhibited and the brake is applied after the set time has elapsed; this is the case even if zero speed has not yet been reached.

138 Ramp limit

Setting range: NO = 0 / YES = 1

The ramp limit restricts the smallest possible ramp time to 100 ms in VFC operation modes (→ P700, reference: Δn = 3000 rpm). Settings less than 100 ms are ignored and the ramp time 100 ms applies. The ramp limit limits the maximum output current to 185 % of the rated output current. An active pull-out protection for the connected motor is implemented using the current limiting controller when ramp limitation is activated.

STOP

There is no active pull-out protection for the connected motor when ramp limitation is deactivated and ramp times of less than 100 ms are used. Parameters P303/313 'Current limit 1/2' are not effective then. If a maximum output current of 185 % of the rated output current is exceeded for more than 60 ms, the inverter switches off with fault message F01 'Overcurrent' and the 'Immediate switch-off' fault response.

15_ **Motor potentiometer (parameter set 1 and 2)**

The ramp times refer to a setpoint change of Δn = 3000 rpm.

150/151 Ramp t3 UP / Ramp t3 DOWN

Setting range: 0.2...20...50 s

The ramp is active when the setpoint source (→ P100) is set to MOTOR POT or MOT.POT. +AI1 and an input terminal programmed to MOTOR POT UP or MOTOR POT DOWN (→ P6__) has a '1' signal.

152 Save last setpoint

ON

If MOTOR POT UP and MOTOR POT DOWN = '0', the last applicable motorized potentiometer setpoint is stored in the permanent memory 2 s afterwards. The last motorized potentiometer setpoint is reactivated following mains power off/power on.

OFF

The inverter starts with n_{min} (→ P301/P311) following a mains power off/power on or after withdrawal of the enable.

The motorized potentiometer function is used for **continuous speed control**. Consequently, set **P152 to OFF** otherwise the EEPROM fault message may appear after about 100,000 storage procedures.

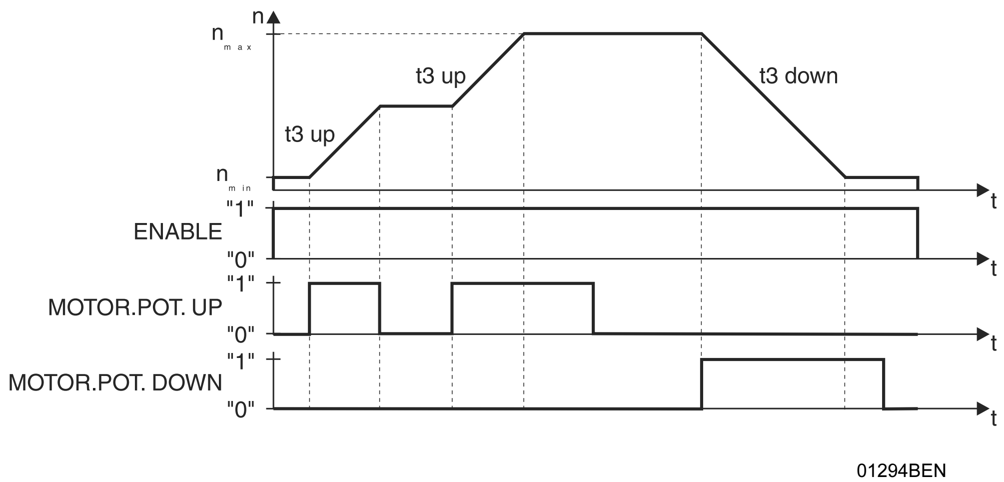


Figure 54: Motorized potentiometer function

16_/17_ 1 2 **Fixed setpoints 1 (parameter set 1) / Fixed setpoints 2 (parameter set 2)**

160/170 Internal setpoint n11 (parameter set 1) / n21 (parameter set 2)

161/171 Internal setpoint n12 (parameter set 1) / n22 (parameter set 2)

162/172 Internal setpoint n13 (parameter set 1) / n23 (parameter set 2)

Setting range: 0...5000 rpm

Factory setting: n11/n21 = 150 rpm, n12/n22 = 750 rpm, n13/n23 = 1500 rpm

3 internal setpoints (= fixed setpoints) can be set separately for each of parameter sets 1 and 2. The internal setpoints are active when the setpoint source (→ P100) is set to BIPOL./FIX.SETPT, UNIPOL/FIX.SETPT, FIX SETP+AI1 or FIX SETP*AI1 and an input terminal programmed to n11/n21 or n12/n22 (→ P6__) has a '1' signal.

Response	Terminal			
	n11/n21	n12/n22	Enable/rapid stop	Parameter set 1/2
Rapid stop	X	X	'0'	X
Fixed setpoint not active	'0'	'0'	'1'	'0'
n11 in effect	'1'	'0'	'1'	'0'
n12 in effect	'0'	'1'	'1'	'0'
n13 in effect	'1'	'1'	'1'	'0'
n21 in effect	'1'	'0'	'1'	'1'
n22 in effect	'0'	'1'	'1'	'1'
n23 in effect	'1'	'1'	'1'	'1'

The fixed setpoints of the currently inactive parameter set come into effect when this terminal is actuated (= '1') if an input terminal is programmed to FIX SETPT SW.OV. This changeover is possible whether the unit is inhibited or enabled.

PARAMETER GROUP 2__, CONTROLLER PARAMETERS

20_ **Speed control (parameter set 1 only)**

The speed controller of the MOVIDRIVE® is a PI-controller and is active when the following operating modes are set:

- All operating modes with VFC-n-CONTROL
- CFC operating modes: The speed controller is only active in 'CFC & M-CONTROL' when speed limiting is active (→ P70_)
- Servo operating modes: The speed controller is only active in 'SERVO & M-CTRL' when speed limiting is active (→ P70_).

The setting of all parameters relevant for speed control is supported by the startup functions of the MOVITOOLS\SHELL or the DBG11B keypad (VFC only). Direct alterations to individual controller parameters are reserved for optimisation by specialists.

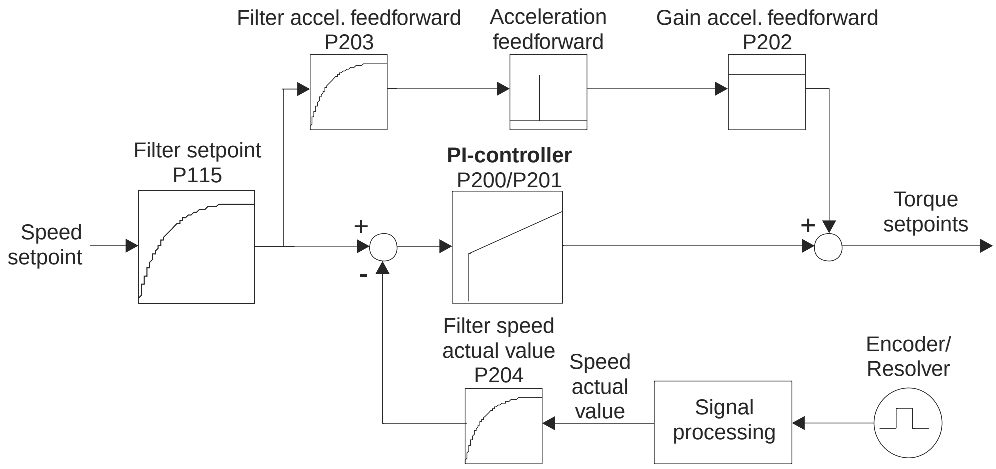


Figure 55: Structural principles of the speed control loop

200 AUTO P gain speed controller

Setting range: 0.1...2...32

Gain factor of the P-component of the speed controller.

201 AUTO Time constant n-control.

Setting range: 0...10...300 ms (0 = no I-component)

Integration time constant of the speed controller. The I-component reacts inversely proportionate to the time constant, i.e. a large numerical value results in a small I component, although 0 = no I-component.

202 AUTO Gain accel. feedforward

Setting range: 0...32

Gain factor of the acceleration feedforward. It influences the control response of the speed controller.

203 AUTO Filter accel. feedforward

Setting range: 0...100 ms

Filter time constant of the acceleration feedforward. It influences the control response of the speed controller. The differentiator is fixed in the programming.

204 AUTO Filter speed actual value

Setting range: 0...32 ms

Filter time constant of the speed actual value filter.

205 Load feedforward CFC (effective in CFC and SERVO operating modes only)

Setting range: -150...0...150 %

This parameter determines the initial value and the direction of the torque setpoint on enable. The parameter must be set if an increased initial torque is required after the enable. For example, setting the value to greater than 0 % makes it possible to prevent the unwanted sagging of hoists when the brake is released.

Recommended setting: Value of the active current (P005 [% In]) when n = 0 rpm is specified.

206 Sample time n-control (effective in CFC and SERVO operating modes only)

Setting range: 1 ms = 0 / 0.5 ms = 1

The setting 0.5 s improves speed control in dynamic drives with a low inherent moment of inertia.

207 Load feedforward VFC (effective in VFC-n-CTRL operating modes only)

Setting range: -150...0...150 %

This parameter determines the initial value and the direction of slip control on enable. A setting greater than 0 % causes slip control to be pre-stressed, which means the motor develops more torque when enabled. For example, this makes it possible to prevent the unwanted sagging of hoists when the brake is released.

Setting values greater than 150 % switches off the function (no pre-stressing).

Recommended setting:

$I_{rms} \times I_N / I_{Mot\_N} \times \cos phi$

I_{rms}= Value of the active current (P005 [% In]) when n = 0 rpm is specified.

I_N = Rated output current (P071 [A])

I_{Mot_N} = Rated motor current (motor nameplate [A])

cos phi = Power factor (motor nameplate)

In VFC & HOIST and VFC-n-CTRL.&HOIST modes and with load feedforward switched off (value > 150 % set), pre-stressing of $0.5 \times s_N$ is in effect. Pre-stressing then takes place in the direction of the applied setpoint.

21_ **Hold controller (parameter set 1 only)**

The hold control function is used for drift-free standstill control of the drive and can only be activated in operating modes with speed control (encoder feedback). Hold control is active when an input terminal programmed to /HOLD CONTROL (→ P6__) has a '0' signal. The unit then performs a stop using the t11 DOWN or t21 DOWN ramp. The position applicable at the moment when the speed of the drive reaches zero is held. The gain factor setting is supported in the **startup function** of the speed controller in MOVITOOLS\SHELL or in the DBG11B keypad.

210 AUTO P gain hold controller

Setting range: 0.1...0.5...32

The parameter corresponds to the proportional gain of a position controller and is effective in conjunction with the activated 'Hold control' function only.

22_ **Internal synchronous operation (effective with the 'Internal Synchronous Operation' technology function only)**

(Detailed description → 'Additional Functions and Application Modules' documentation package)

228 Feedforward filter (DRS)

Setting range: 0...100 ms

Setpoint filter for feedforward of synchronous operation control.

PARAMETER GROUP 3, MOTOR PARAMETERS

This group of parameters is used for adapting the inverter to the motor. The parameters can be set separately for parameter set 1 and 2. This means two different motors can be operated alternately on the same inverter without any new setting having to be made.

30_/31_ 1 2 **Limits 1 (parameter set 1) / Limits 2 (parameter set 2)**

300/310 AUTO Start/stop speed 1/2

Setting range: 0...60...150 rpm

Only in effect in VFC mode, without function in CFC and SERVO mode. This entry defines the smallest speed request which the inverter sends to the motor when enabled. The transition to the speed determined in the setpoint selection is made using the active acceleration ramp.

When a stop command is performed, this setting also defines the slowest speed at which the motor energization is switched off or at which post-magnetization takes effect and the brake is applied, if appropriate.

301/311 AUTO Minimum speed 1/2 (n_{min})

Setting range: 0...60...5500 rpm

The speed value below which it is not possible to go, even when zero is selected as the setpoint. The minimum speed also applies when $n_{min} < n_{start/stop}$ has been set.

Important: The slowest speed is 15 rpm when the hoist function is active, even if n_{min} has been set to a lower value.

302/312 AUTO Maximum speed 1/2 (n_{max})

Setting range: 0...1500...5500 rpm

The value set here cannot be exceeded by a setpoint selection. n_{max} applies if n_{min} is set > n_{max}.

303/313 AUTO Current limit 1/2

Setting range: 0...150 %I_N

The internal current limitation refers to the apparent current. It is superordinate to the external current limitation (→ P120). Consequently, the entry determines the 100 % value within which the external current limitation can take effect. The current limit is automatically reduced in the field weakening range above the frequency of 1.15 × f_{trans}. This provides protection against the motor pulling out.

The current limit in effect in the field weakening range can be calculated using the following formula:

Current limit [%] = (1.15 × f_{trans} / f_{act}) × Setting value of P303/P313 [%]

f_{act} is the current rotating field frequency.

304 AUTO Torque limit (only effective in CFC and SERVO operating modes)

Setting range: 0...150 %

The parameter limits the maximum torque of the motor. The entry acts on the setpoint of the motor torque (k_T × $I_{N\_inverter}$). Refer to the 'Project Planning' chapter for detailed information about calculating the setpoint torque (Motor selection for asynchronous servomotors (CFC) and Motor selection for synchronous servomotors (SERVO)).

The current limit comes into effect before the torque limit is reached if the current limit (P303) is set to a lower value than the torque limit.

32_/33_ 1 2

320/330

Motor compensat. 1 (asynchr.) / Motor compensat. 2 (asynchr.)

Automatic adjustment 1/2

This is only in effect in VFC modes. The function only makes sense with single motor operation. The inverter sets P322/P332 'I×R 1/2' automatically at each enable and stores the value. The inverter thereby determines a basic setting which is suitable for many different drive tasks. The connected motor is calibrated during the last 20 ms of the pre-magnetization phase. The motor is **not** calibrated if

- P320/P330 = OFF,
- Operating mode (P700/P701) VFC & GROUP or VFC &FLY.START selected,
- Pre-magnetization time (P323/P333) ≤ 100 ms set,
- Operating mode VFC-n-CONTROL selected and brake function P730 = OFF set.

4

In such cases, the set I×t value is used for calculating the winding resistance.

<u>ON</u>

Automatic adjustment

OFF

No automatic calibration

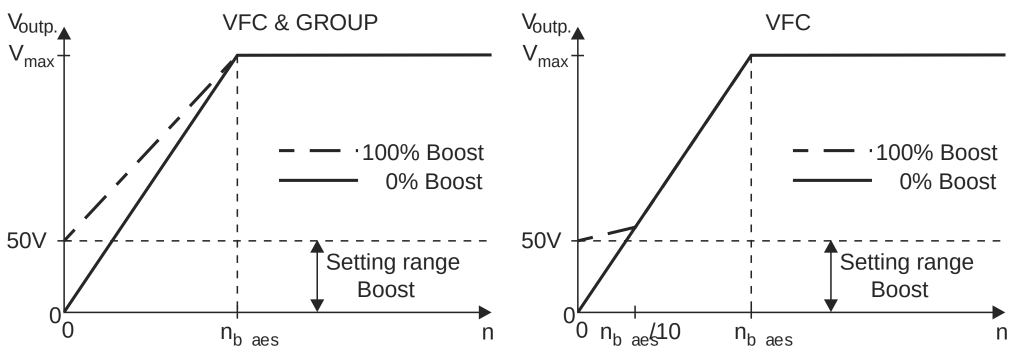
321/331

Boost 1/2

Setting range: <u>0</u>...100 %

With VFC & GROUP: Manual setting for increasing the starting torque by increasing the output voltage in the range below the transition speed.

With VFC: Manual setting normally not required. In exceptional cases, manual setting may be necessary to increase the breakaway torque. In this case set to **max. 10 %**.



01295BEN

Figure 56: Working principle of boost (drawing not to scale)

322/332 AUTO

I×R compensation 1/2

Setting range: <u>0</u>...100 %

In VFC operating mode, this parameter acts on the parameters of the calculated motor model which establish the torque. Automatic setting takes place when P320/P330 = ON. Manual alterations to this parameter are reserved for optimization by specialists.

323/333 AUTO — Premagnetizing time 1/2

Setting range: 0...<u>0.1</u>...2 s Pre-magnetization serves to establish a high motor torque and it starts when the inverter is enabled.

324/334 — Slip compensation 1/2

Setting range: <u>0</u>...500 rpm

Slip compensation increases the speed accuracy of the motor. The rated slip of the connected motor should be entered if the entry is made manually. A setting range of 20 % of the rated slip is permitted if a value other than the rated slip is entered in order to compensate for fluctuations between various motors.

34_ 1 2 — Motor protection

340/342 — Motor protection 1/2

Recommendation: Only use in VFC modes. Ensure motor protection through the project planning in CFC and SERVO operating modes.

When this function is activated, MOVIDRIVE® takes over the thermal protection of the connected motor by electronic means. In most cases, the motor protection function is comparable to standard thermal protection (motor protection switch) and, furthermore, it takes account of speed-dependent cooling by the integral fan. The motor utilization is determined on the basis of the inverter output current, the type of cooling, the motor speed and the time. The thermal motor model is based on the motor data entered during commissioning (MOVITOOLS\SHELL, DBG11B) and on maintaining the operating conditions specified for the motor. If the motor also has to be protected against failure of the ventilation, blockage of air ducts, etc., it is also necessary to employ protection in the form of a positive temperature coefficient thermistor TF or bimetallic switch TH.

The following signaling and indication functions are available in conjunction with motor protection:

P006/P007 Motor utilization 1/2	Display of the motor utilization for parameter set 1/2
P832 Response MOTOR OVERLOAD	Fault response of the inverter when 110 % of motor utilization 1/2 (P006/007) is reached. Factory setting: <u>EMERG.STOP/FAULT</u>
Binary output programmable to: /Motor utilization 1 /Motor utilization 2	Prewarning if motor utilization 1/2 (P006/007) exceeds a value of 100 %. In this case, the programmed output is set to '0' = 0 V.

STOP

Isolating the inverter (mains and 24 V external) always resets the motor utilization to zero, i.e. any motor heating existing when the motor is switched back on is not taken into account. The motor protection function processes the utilization of the connected motors separately for both sets of parameters. The motor protection function must not be used if only one motor is permanently connected to the inverter and the 'parameter set changeover' function is only used for control purposes. Equally, the motor protection function must not be used with group drives since it is not possible to protect each individual motor reliably.

ON

Motor protection function is active.

<u>OFF</u>

Motor protection function is not active.

341/342 — Cooling type 1/2

Setting range: <u>FAN COOLED</u> / FORCED COOLING

It is necessary to know the motor cooling type in order to calculate the thermal load of the motor as exactly as possible, as described in P340/P342.

*35_*

Motor sense of rotation

SEW-EURODRIVE defines the sense of rotation looking onto the drive side of the motor. A clockwise turn (positive) is defined as to the right and a counterclockwise turn as to the left. This definition is implemented in the configuration of the motor connection in accordance with the SEW designation.

350/351 Change direction of rotation 1/2

Change direction of rotation	Positive setpoint (positive travel direction)	Negative setpoint (negative travel direction)
OFF	Motor turns CW	Motor turns CCW
ON	Motor turns CCW	Motor turns CW

ON

The above definition is reversed. The assignment of limit switches is maintained in all cases. When the sense of rotation is CW, the drive is stopped properly if movement results in contact with the right limit switch. It is necessary to check carefully that the limit switches are connected correctly and also that the reference point and the travel positions are defined correctly during the use of and just after the changeover of this parameter.

Altering the 'Change direction of rotation' parameter after the system has been moved to its reference point causes the system to lose its reference point for the absolute position. This may result in undesirable travel movements of the axis.

OFF

The SEW definition applies.

*35_*

Startup (available in DBG11B only)

360 Startup

YES

Begins the startup function with the DBG11B keypad.

With P360, MOVIDRIVE® can only be started up in VFC operating modes. Startup in CFC and SERVO operating modes requires MOVITOOLS/SHELL.

NO

The startup function is not begun.

PARAMETER GROUP 4__, REFERENCE SIGNALS

The following reference values are used for recording and signaling certain operational states. All signals in parameter group 4__ can be output via binary outputs (→ P62_/ P63_).

Important: The signals are only valid if the inverter has signaled 'ready' after switch-on and there is no fault display.

40_ **Speed reference signal**

Signal if the speed is less than or greater than the set reference speed.

400 Speed reference value

Setting range: 0...1500...5000 rpm

401 Hysteresis

Setting range: 0...100...500 rpm

402 Delay time

Setting range: 0...1...9 s

403 Signal = '1' if:

n<nref / n>nref

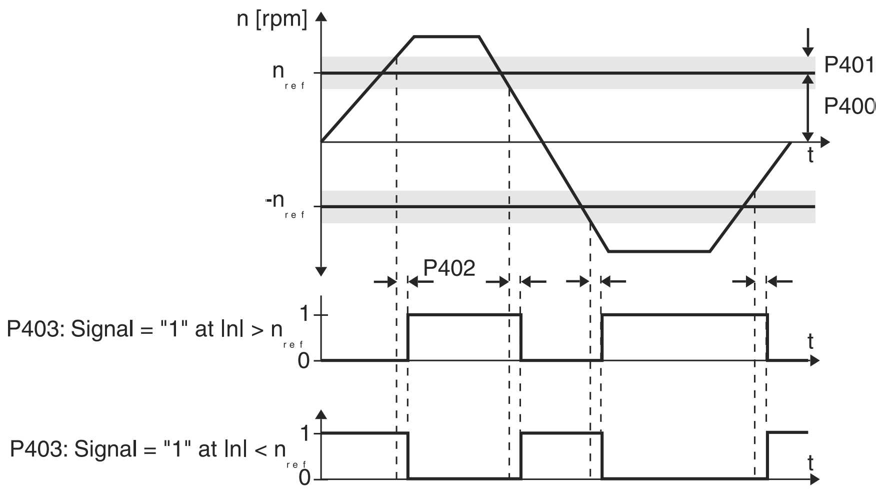


Figure 57: Speed reference signal

41_ **Speed window signal**

Signal if the speed is within or outside the set window range.

410 Window center

Setting range: 0...1500...5000 rpm

411 Range width

Setting range: 0...5000 rpm

412 Delay time

Setting range: 0...1...9 s

413 Signal = '1' if:

INSIDE / OUTSIDE

42_ **Speed setp./act. val. comp.**

Signal if the speed is equal to or not equal to the setpoint speed.

420 Hysteresis

Setting range: 0...100...300 rpm

421 Delay time

Setting range: 0...1...9 s

422 Signal = '1' if:

n = n setpt / n <> n setpt

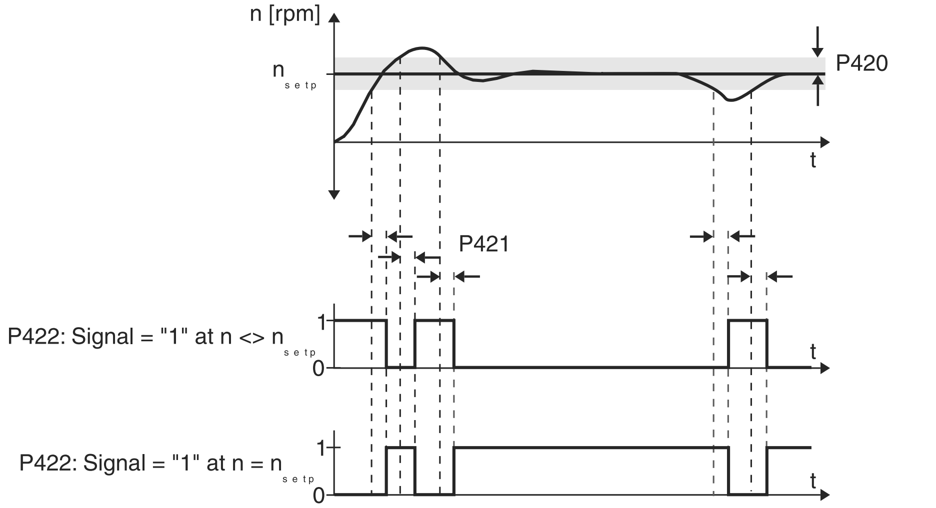


Figure 58: Speed setp./act. val. comp.

43_ **Current reference signal**

Signal if the output current is greater than or less than the reference value.

430 Current reference value

Setting range: 0...100...150 $\%I_N$

431 Hysteresis

Setting range: 0...5...30 $\%I_N$

432 Delay time

Setting range: 0...1...9 s

433 Signal = '1' if:

I < Iref / I > Iref

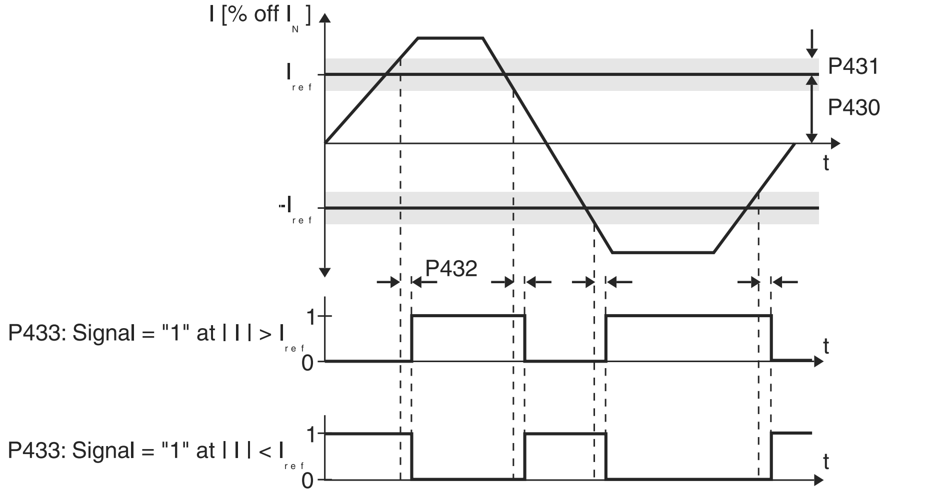


Figure 59: Current reference signal

44_	**Imax signal**
	Signal if the inverter has reached the current limitation
440	Hysteresis
	Setting range: 0...15...50 $\%I_N$
441	Delay time
	Setting range: 0...1...900 s
442	Signal = '1' if:
	I<Imax / I=Imax

PARAMETER GROUP 5__, MONITORING FUNCTIONS

The following monitoring functions have been implemented in order to monitor what happens to drive-specific parameters in the specific application and to be able to react in case of impermissible deviations. Some of the monitoring functions are available separately in both parameter sets. It is possible to set the reaction to the triggering of monitoring functions using the parameters in group P83_ (Fault response).

50_ **Speed monitoring**

500/502 1 2 Speed monitoring 1/2

Setting range: OFF / MOTOR MODE / REGENERAT. MODE / <u>MOT.& REGEN.MODE</u>

The speed required by the setpoint can only be achieved if there is sufficient torque available to meet the load request. If the set current limit (P303 and external current limitation) is reached, MOVIDRIVE® assumes that the torque has reached the maximum limit and the desired speed cannot be attained. Speed monitoring is triggered if this situation persists for the duration specified in P501/P503.

501/503 1 2 Delay time 1/2

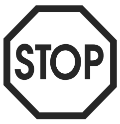
Setting range: 0...<u>1</u>...10 s

The set current limit may be reached briefly during acceleration and deceleration procedures or when load peaks occur. An unintentionally sensitive response by the speed monitoring function can be prevented by setting the delay time accordingly. The current limit must be attained uninterruptedly for the duration of the delay time before the monitoring function responds.

504 encoder monitoring (from firmware version 822 660 0.18 for sin/cos encoders and from firmware version 823 854 5.10 for TTL sensors and sin/cos encoders)

Setting range: ON / <u>OFF</u>

TTL sensors and sin/cos encoders are monitored for function and voltage supply. The encoder monitoring is triggered in the event of a malfunction or if there is no voltage supply. Fault F14 'Encoder' is generated. The drive is stopped with a rapid stop.



Encoder monitoring is not a safety function!

52_ **Mains OFF monitoring**

The setting of P520/P521 is significant when a binary input is programmed to 'MAINS ON' and MOVIDRIVE® regenerative mode is used (→MOVIDRIVE® regenerative power unit MDR manual).

520 Mains OFF response time

Setting range: <u>0</u>...5 s

521 Mains OFF response

<u>CONTROL.INHIBIT</u> / EMERGENCY STOP

PARAMETER GROUP 6__, TERMINAL ASSIGNMENT

60_ **Binary inputs basic unit**

Binary input DIØØ with fixed assignment '/CONTROLLER INHIBIT'

600...604 Binary inputs DIØ1...DIØ5

The binary inputs can be programmed to the following functions:

Function	Effect of '0' signal	Effect of '1' signal	Effective in Inverter status: Inhibit	Effective in Inverter status: enabled	Factory setting	See also
NO FUNCTION	-	-	-	-		
ENABLE/RAP.STOP	Rapid stop on t13/t23	Enable		•	DIØ3	P13_/ P14_
CW/STOP	Stop on t11/t21 or t12/t22	Enable CW running		•	DIØ1	
CCW/STOP	Stop on t11/t21 or t12/t22	Enable CCW running		•	DIØ2	
n11/n21 n13/n33	External setpoints only	n11/n21 n13/n23		•	DIØ4	P16_/ P17_
n12/n22	External setpoints only	n12/n22		•	DIØ5	
FIX SETPT SW.OV	Fixed setpoints of active parameter set selected	Fixed setpoints of inactive parameter set selected	•	•		
PAR. SWITCHOVER	Parameter set 1	Parameter set 2	•			
RAMP SWITCHOVER	1st ramp (t11/t21) active	2nd ramp (t12/t22) active	•	•		P13_/ P14_
MOTOR POT UP	-	Increase setpoint		•		P15_
MOTOR POT DOWN	-	Reduce setpoint		•		
/EXT. FAULT	External fault	-		•		
FAULT RESET	Reset on positive edge ('0' → '1')		•	•		
/HOLD CONTROL	Hold control active	-		•		P210
/LIM. SWITCH CW	CW limit switch reached	Not reached		•		
/LIM. SWITCH CCW	CCW limit switch reached	Not reached		•		
IPOS INPUT	Function depends on IPOS program					IPOS-plus® manual
REFERENCE CAM	Not actuated	Actuated		•		
REF TRAVEL START	-	Start of reference travel for IPOS		•		
SLAVE FREE RUNN.	Master/slave mode	Slave free running	•	•		
SETPOINT HOLD	Do not take over	Take over setpoint		•		
MAINS ON	→ P521	Ext. signal MAINS ON	•	•		P52_
DRS SET ZERO PT.	'1' → '0': Sets new zero point	Delete angular misalignment	•	•		Synchronous running manual
DRS SLAVE START	no enable	Enable		•		
DRS TEACH-IN	-	Take on position	•	•		
DRS MASTER STOPPED	Master turning	Master at standstill	•	•		

62_ **Binary outputs basic unit**

Binary output DBØØ with fixed assignment '/BRAKE'

620/621 Binary outputs DOØ1-NO/DOØ1-NC/DOØ2

The binary outputs can have the following functions assigned to them:

Function	Binary output has '0' signal	Binary output has '1' signal	factory setting	See also
NO FUNCTION	Always '0' signal	-	DOØ2	
/FAULT	Collective fault signal	-		
READY	Not ready	Ready	DOØ1	
OUTP. STAGE ON	Unit inhibited	Unit enabled and motor is energized		
ROT. FIELD ON	No rotating field	Rotating field		
BRAKE RELEASED[1]	Brake is applied	Brake is released		
BRAKE APPLIED[1]	Brake is released	Brake is applied		
MOTOR STANDSTILL	Motor turning	Motor at standstill		
PARAMETER SET	Parameter set 1 active	Parameter set 2 active		
SPEED REFERENCE P403 = $n < n_{ref}$ **(**$n > n_{ref}$**)**	$n > n_{ref}$ ($n < n_{ref}$)	n < nref (n > nref)		P40_
SPEED WINDOW P413 = INSIDE (OUTSIDE)	Speed is outside (inside) speed window	Speed is inside (outside) speed window		P41_
SP/ACT.VAL.COMP. P422 = $n = n_{setpt}$ **(**$n <> n_{setpt}$**)**	$n <> n_{setpt}$ ($n = n_{setpt}$)	n = n setpt (n <> n setpt)		P42_
CURR. REFERENCE P433 = $I < I_{ref}$ **(**$I > I_{ref}$**)**	$I > I_{ref}$ ($I < I_{ref}$)	I < Iref (I > Iref)		P43_
Imax-SIGNAL P442 = $I = I_{max}$ **(**$I < I_{max}$**)**	$I < I_{max}$ ($I = I_{max}$)	I = Imax (I < Imax)		P44_
/MOTOR UTILIZ.1	100 % prewarning of motor protection in parameter set 1	-		P34_
/MOTOR UTILIZ.2	100 % prewarning of motor protection in parameter set 2	-		
/DRS PREWARN.	Value for prewarning lag error (P511) exceeded	-		Synchronous running manual
/DRS LAG ERROR	Lag error limit (P512) exceeded	-		
DRS SLAVE IN POS	Position not reached	Position reached		
IPOS IN POSITION	Position not reached	Position reached		IPOS$^{plus®}$ manual
IPOS REFERENCE	No reference travel	Reference travel completed		
IPOS OUTPUT	Depends on IPOS program			
/IPOS FAULT	Fault signal IPOS program	-		

1) Use binary output DBØØ for activating the brake. This binary output has the fixed assignment of the '/BRAKE' function. The 'BRAKE RELEASED' and 'BRAKE APPLIED' signals are intended to be passed on to a master controller.

STOP

The binary signals are only valid if the inverter has signaled 'READY' after switch-on and there is no fault display. Binary signals have '0' status while MOVIDRIVE® is being initialized.

Several terminals can be programmed with the same function.

64_ **Analog output**

640 Analog output AO1

The signal range is 0...20 mA or 4...20 mA depending on the set operating mode (→ P642).

The analog output can have the following functions assigned to it:

Function	Scaling (with P641 = 1) Reference value	Output value	Explanation	factory setting
NO FUNCTION	0 mA		-	
RAMP INPUT	± 3000 rpm	20 mA	Setpoint speed at input of internal ramp generator	
SPEED SETPOINT	±3000 rpm	20 mA	Valid setpoint speed (output ramp generator or correcting variable of master controller)	
ACTUAL SPEED	±3000 rpm	20 mA	Actual speed	AO1
ACTUAL FREQUENCY	±100 Hz	20 mA	Rotating field frequency	
OUTPUT CURRENT	150 % I_N	20 mA	Apparent current	
ACTIVE CURRENT	±150 % I_N	20 mA	Active current, pos. with torque in pos. direction of rotation, neg. with torque in neg. direction of rotation.	
RELATED TORQUE	±150 % I_N	20 mA	Active current which forms the torque; the value '0' is always output in VFC operating modes.	
UNIT UTILIZATION	150 %	20 mA	Momentary unit utilization	
IPOS OUTPUT	±10,000 digit	20 mA	Internal IPOS values (→ IPOS$^{plus®}$ manual)	
IPOS OUTPUT 2	±10,000 digit	20 mA	Internal IPOS values (→ IPOS$^{plus®}$ manual)	

641 Scaling AO1

Setting range: -10...0...1...10

The slope of the characteristic for the analog output is defined.

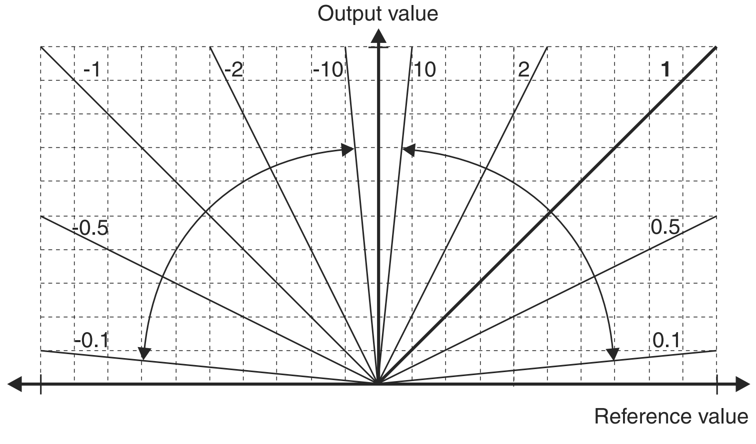


Figure 60: Slope of the characteristic for the analog output

642 Operating mode AO1

OFF

The value zero is always output.

0...20 mA

Output of the value of the reference value as current value 0...20 mA on AOC1, the voltage output AOV1 is not valid. The scaling AO1 (P641) is evaluated on the basis of the value.

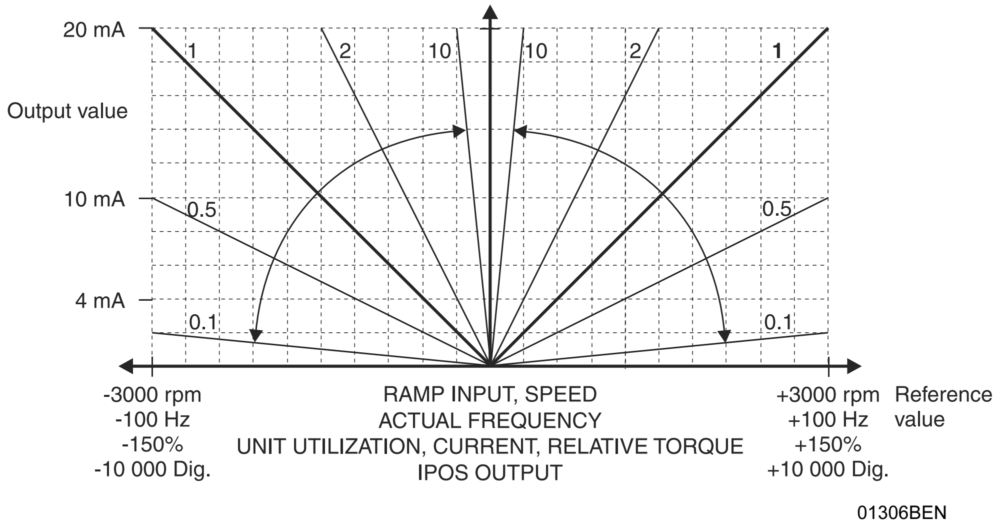


Figure 61: Characteristic of 0...20 mA operating mode

4...20 mA

Output of the value of the reference value as current values 4...20 mA on AOC1, the voltage output AOV1 is not valid. The slope of the characteristics is flatter than in 0...20 mA operating mode. The characteristic has an offset of 4 mA and the value of the scaling AO1 (P641) refers to the value range of 16 mA.

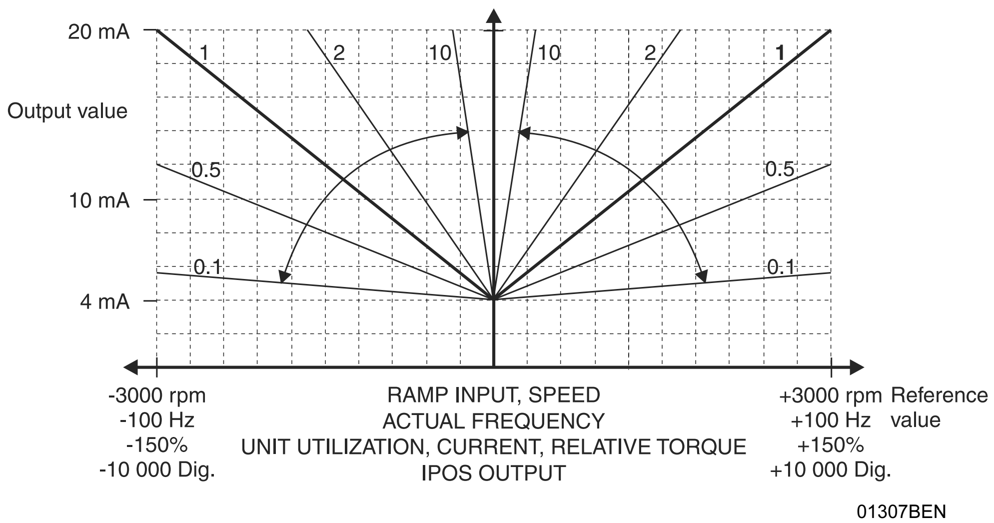


Figure 62: Characteristic of 4...20 mA operating mode

PARAMETER GROUP 7__, CONTROL FUNCTIONS

All settings with regard to the fundamental control properties of the inverter are defined within parameter group 7__. These are all functions which the inverter performs automatically upon activation and which influence its behavior in certain operating modes.

70_ **Operating modes**

700/701 1 2 Operating mode 1/2

This parameter sets the basic operating mode of the inverter for parameter set 1 and 2. In particular, this comprises defining the motor system, the encoder feedback and corresponding control functions. When MOVIDRIVE® inverters are delivered, their parameters are set to the specific motor which matches the power of the motor.

All operating modes can be set for parameter set 1. Only operating modes without encoder feedback can be set for parameter set 2 (→ following table).

Parameter set 1/2 700/701 Operating mode 1/2	Unit type and option	Motor
VFC 1 / 2 VFC 1/2 & GROUP VFC 1/2 & HOIST VFC 1/2 & DC BRAK. VFC 1/2 &FLY.START	MCF, MCV or MCH	DT/DV/D without incremental encoder
VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL&HOIST VFC-n-CTRL& IPOS	MCV or MCH	DT/DV/D with incremental encoder
CFC CFC & M-CONTROL CFC & IPOS	MCV or MCH	DT/DV/D with incremental encoder or CT/CV (incremental encoder installed as standard)
SERVO SERVO & M-CTRL. SERVO&IPOS	MCS or MCH	CM (as standard with Hiperface encoder) or DFY (as standard with resolver)

700/701 1 2 VFC 1 / 2

Default setting for asynchronous motors without encoder feedback. Suited to general applications such as conveyor belts, trolleys and hoists with a counterweight. A flux-oriented motor model is used. This is optimally adapted to the motor after the commissioning function in MOVITOOLS or in the DBG11B keypad has been carried out. It is necessary to input the motor type (SEW motor) or the nameplate data (motor from another manufacturer) as part of the startup function. The following parameters are preset (parameter set 1/2):

Settings after the startup function	
P303/P313 Current limit 1/2	I_{max} (inverter) = 150 % I_{N_mot}
P302/P312 Maximum speed 1/2	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301/P311 Minimum speed 1/2	15 rpm
P130...P133/P140...P143 Ramp t11/t21	2 s
P136/P146 Stop ramp t13 / t23	2 s
P137/P147 Emergency ramp t14 / t24	2 s
P500/P502 Speed monitoring 1/2	MOT.& REGEN.MODE
P501/P503 Delay time 1/2	1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730/P733 Brake function 1/2	ON
P731/P734 Brake release time 1/2	With SEW motors: Setting in accordance with motor data. **With non-SEW motors: Set the correct value by hand!**
P732/735 Brake application time 1/2	
P300/P310 Start/stop speed 1/2	15 rpm

Settings after the startup function	
P820/P821 4-quadrant operation 1/2	ON
P324/P334 Slip compensation 1/2	Setting in accordance with specified motor data
P321/P331 Boost 1/2	0
P322/P332 IxR compensation 1/2	Setting in accordance with specified motor data
P320/P330 Automatic adjustment 1/2	ON
P323/P333 Premagnetizing time 1/2	Setting in accordance with specified motor data

- SEW recommends using the P320/P330 'Automatic adjustment' parameter activated in the factory setting. This means the P322/P332 'IxR compensation 1/2' parameter is set automatically during the pre-magnetization time through the calibration of the motor.
- SEW recommends not changing the P321/P331 'Boost 1/2' parameter from its factory setting (=0).

4

700/701 1 2

VFC 1/2 & GROUP

Set this if a group of asynchronous motors is to be operated on one inverter. All motors in the group must have the same rated voltage and rated frequency. The brake is controlled in accordance with P730/P733. Set the data for the largest motor in the group during commissioning (→ VFC 1). Once startup is finished, adapt the current limit P303/P313 to the total current of all connected motors. We recommend a basic setting of P321/P331 'Boost 1/2' to the same value as P322/P332 'IxR compensation 1/2'.

Settings after the startup function	
P303/P313 Current limit 1/2	I_{max} (inverter) = 150 % I_{N_mot}
P302/P312 Maximum speed 1/2	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301/P311 Minimum speed 1/2	15 rpm
P130...P133/P140...P143 Ramp t11/t21	2 s
P136/P146 Stop ramp t13 / t23	2 s
P137/P147 Emergency ramp t14 / t24	2 s
P500/P502 Speed monitoring 1/2	MOT.& REGEN.MODE
P501/P503 Delay time 1/2	1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730/P733 Brake function 1/2	ON
P731/P734 Brake release time 1/2	With SEW motors: Setting in accordance with motor data. **With non-SEW motors: Set the correct value by hand!**
P732/P735 Brake application time 1/2	
P300/P310 Start/stop speed 1/2	Setting in accordance with specified motor data
P820/P821 4-quadrant operation 1/2	ON

- Do not use this operating mode for hoist applications!
- The pre-magnetization current is adapted to the largest motor in the group during startup. Whenever motors are taken out of the group by being switched off, it may be necessary to reduce the current limitation to a current appropriate to the remaining combination of motors.
- Slip compensation is not in effect. This means load-dependent speeds are established on the motors.

700/701 1 2

700

VFC 1 / 2 & HOIST

VFC-n-CTRL&HOIST (only parameter set 1)

The hoist function automatically provides all functions required for operating a non-balanced hoist. In particular, monitoring functions are activated for safety reasons. These may prevent the drive from starting. They are in particular:

- Monitoring the output current during the pre-magnetization phase.
- Avoiding sag when the brake is released by load feedforward (→ P207).
- Monitoring that the pre-magnetization time is set to an adequate value

Constellations which can be recognized as incorrect	Fault triggered
2 or 3-phase motor phase interruption	F82 = Output open
Pre-magnetization time too short, or incorrect motor/ inverter combination.	F81 = Fault start condition
Failure of a motor phase through active speed monitoring (factory setting) P500/501, P502/503	F08 = Fault n-monitoring

- A single-phase motor phase failure cannot always be reliably detected.
- SEW strongly recommends activating speed monitoring (factory setting).
- Correct performance of the hoist function requires the motor brake to be controlled via the inverter.

700/701 1 2

VFC 1 / 2 & DC BRAK.

The DC braking function permits the asynchronous motor to be braked using a current injection. In this case, the motor can be braked on the inverter without a braking resistor.

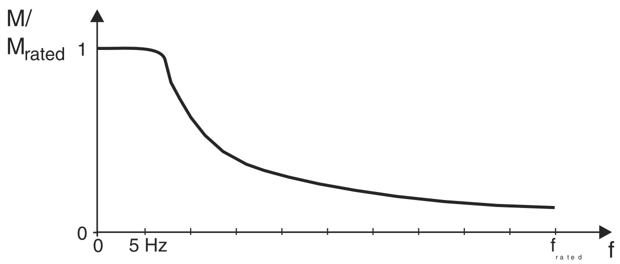


Figure 63: DC braking: Braking torque profile

A constant current with a rotating field frequency of 5 Hz is impressed during the braking process. The braking torque equals 0 at a standstill. A greater braking torque acts at a slower speed; the braking torque drops as the speed increases. The braking time, and thus the duration of the braking current, depends on the load on the motor. If the rotating field frequency of the motor reaches 5 Hz, DC braking is cancelled and the motor is stopped with the rapid stop ramp. The current injection occurs at rated motor current in accordance with the startup function. In all cases, the inverter limits the current to max. 125 % I_N. See the brake function regarding activation of the brake.

STOP

It is not possible to enable a directed stop or to observe a certain ramp using DC braking. The main application of this parameter is to drastically reduce coasting of motors.

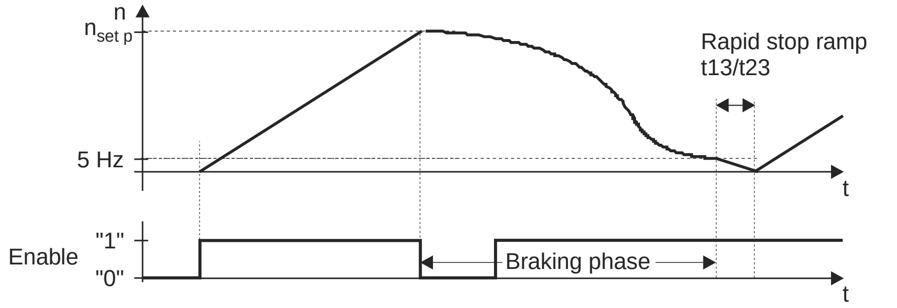


Figure 64: DC braking: Braking profile

- The **braking procedure is interrupted** if the 'Enable' binary input receives a '1' signal again during the braking phase. DC braking is completed and the drive is only accelerated afterwards.
- The drive stops with ramp t11/t21 or t12/t22 if a binary input is programmed to the 'CW/STOP' ('CCW/STOP') function in 'VFC 1/2 & DC BRAK.' operating mode and 'CW/STOP' ('CCW/STOP') receives a '0' signal. The stop is continued and **no DC braking initiated** if the 'Enable' binary input is switched from '1' to '0' during the ramp time.

  To **start DC braking**, it is **first necessary for 'Enable' to be switched from '1' to '0'**, and this must happen at least 10 ms prior to 'CW/STOP' ('CCW/STOP') is switched from '1' to '0'.

700/701 1 2

VFC 1/2 &FLY.START (from firmware version .15)

The flying restart circuit makes it possible to lock the inverter onto a rotating motor. This applies in particular to drives which are not braked actively, which run on for a long time or which are turned by a flowing medium, e.g. pumps and fans. The maximum flying start time is approx. 200 ms.

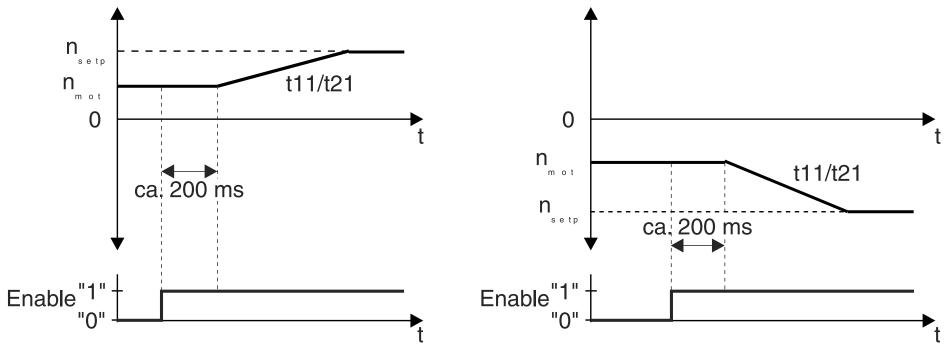


Figure 65: VFC & flying start function

The flying restart circuit does not function if there is an output filter connected to the inverter.

Never use the flying restart circuit with hoist applications!

700 VFC-n-CONTROL (parameter set 1 only)

This operating mode builds on VFC mode to make it possible to have speed controlled operation with an incremental encoder mounted on the motor shaft. The following encoders can be used as incremental encoders:

1. RS-422 / TTL incremental encoder
2. HTL incremental encoder (only with MCV, not with MCH)
3. High resolution incremental encoder with sinusoidal tracks 1 V_{SS}
4. Hiperface encoder (only with MCH, not with MCV)

SEW recommends the use of encoders with 1024 increments/revolution by default. The following properties derive from the speed feedback:

- Increase in the static control accuracy and greater control dynamics.
- Hold control: Programming a binary input to '/Hold control' (P60_/P61_) enables the motor to be brought to a standstill with position control even when under load. Set the hold controller (gain) using P210.

The startup function of MOVITOOLS/SHELL not only supports motor startup (VFC) but also the additional controller setting of the speed controller. The following parameters are set which are relevant to n-control:

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOT.& REGEN.MODE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	With SEW motors: Setting in accordance with motor data. **With non-SEW motors: Set the correct value by hand!**
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Gain accel. feedforward	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter accel. feedforward	
P210 P gain hold controller	Position controller gain for the hold control Hold control
P910 Gain X controller	Position controller gain for IPOS$^{plus®}$ (positioning mode)
P130...P133/P140...P143 Ramp t11/t21	Setting in accordance with specified data
P136/P146 Stop ramp t13 / t23	
P137/P147 Emergency ramp t14 / t24	

The setting of the 4-quadrant operation (P820) is ignored; 4-quadrant operation is always active.

700 VFC-n-CTRL&GROUP (parameter set 1 only)

Set this if a group of asynchronous motors is to be operated on one inverter. All motors in the group must have the same rated voltage, rated frequency and rated power. One motor in the group is operated with speed control and must be equipped with an incremental encoder connected to X15. The following encoders can be used as incremental encoders:

1. RS-422 / TTL incremental encoder
2. HTL incremental encoder (only with MCV, not with MCH)
3. High resolution incremental encoder with sinusoidal tracks 1 V_{SS}
4. Hiperface encoder (only with MCH, not with MCV)

SEW recommends the use of encoders with 1024 increments/revolution by default. The other motors in the group follow the speed controlled motor in a slip-dependent function.

The startup function of MOVITOOLS not only supports motor startup (VFC) but also the additional controller setting of the speed controller. The following parameters are set which are relevant to n-control:

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{N_mot}
P302 Maximum speed 1	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOT.& REGEN.MODE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	With SEW motors: Setting in accordance with motor data. **With non-SEW motors: Set the correct value by hand!**
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Gain accel. feedforward	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter accel. feedforward	
P210 P gain hold controller	Position controller gain for the hold control Hold control
P910 Gain X controller	Position controller gain for IPOS$^{plus®}$ (positioning mode)
P130...P133/P140...P143 Ramp t11/t21	Setting in accordance with specified data
P136/P146 Stop ramp t13 / t23	
P137/P147 Emergency ramp t14 / t24	

The setting of the 4-quadrant operation (P820) is ignored; 4-quadrant operation is always active.

700 VFC-n-CTRL& IPOS (only parameter set 1)

Must be set if IPOS$^{plus®}$ positioning commands are to be processed. Refer to the 'IPOS$^{plus®}$ Positioning and Sequence Control System' manual for detailed descriptions of IPOS$^{plus®}$. This manual can be obtained from SEW.

700 CFC (parameter set 1 only)

CFC operating mode makes it possible to operate an asynchronous motor with real servo properties, i.e. high control dynamics, very good smooth running properties and controlled operation even when at a standstill. This is achieved because the CFC procedure enables direct control over the magnetic flux in the motor and, therefore, over the torque. Operation in conjunction with speed feedback via incremental encoder is obligatory. The following encoders can be used as incremental encoders:

1. RS-422 / TTL incremental encoder
2. HTL incremental encoder (only with MCV, not with MCH)
3. High resolution incremental encoder with sinusoidal tracks 1 V_{SS}
4. Hiperface encoder (only with MCH, not with MCV)

SEW recommends using type 3 encoders with a resolution of 1024. These encoders achieve the best possible control characteristics.

The following parameters do not have any effect: slip compensation (P324), boost (P321) and IxR compensation (P322).

The MOVITOOLS startup function requires the motor type to be entered (SEW motor). No startup can be performed with the DBG11B keypad in CFC mode. The following parameters are set by default (parameter set 1):

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOT.& REGEN.MODE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

CFC always requires the speed controller to be started up as well.

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Gain accel. feedforward	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter accel. feedforward	
P210 P gain hold controller	Position controller gain for the hold control Hold control
P910 Gain X controller	Position controller gain for IPOS$^{plus®}$ (positioning mode)
P130...P133/P140...P143 Ramp t11/t21	Setting in accordance with specified data
P136/P146 Stop ramp t13 / t23	
P137/P147 Emergency ramp t14 / t24	

The setting of the 4-quadrant operation (P820) is ignored; 4-quadrant operation is always active.

700 CFC & M-CONTROL (only parameter set 1) → Sec. 4.5

This operating mode allows the torque of the asynchronous motor to be controlled directly. The setpoint is standardized on the following torque:

3000 rpm = 150 % output current × torque constant.

The torque values should be entered directly as fixed setpoints in the unit [%In] (P 16_, P 17_). The set processing (P11_) also applies to the torque control if the setpoint selection is made by way of an analog input.

The torque constant (motor-specific parameter) is defined by: $k_T = M_N / I_{q\_n}$

- If P500 'Speed monitoring 1' is active, the drive is monitored according to the P500 parameter description (→ page 117).
- If P500 'Speed monitoring 1' = OFF is set, the drive reacts as follows if its speed is faster or slower than n_{max} (P302) and $-n_{max}$:
  - Motor mode: The available motor torque is reduced to zero with a linear function above n_{max} and below $-n_{max}$. As a result, there is no active speed control.
  - Regenerative mode: No response; the master drive must prevent the drive losing position.
- M-control is also in effect in the range $-n_{min}...n...n_{min}$.
- The current is always limited to the set current limit (P303).

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depending on number of poles and rated motor frequency e.g. 2-pole / 50 Hz → 3000 rpm e.g. 4-pole / 60 Hz → 1800 rpm
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOT.& REGEN.MODE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data.
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the commissioning function of the torque controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Gain accel. feedforward	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter accel. feedforward	
P210 P gain hold controller	Position controller gain for the hold control Hold control
P910 Gain X controller	Position controller gain for IPOS$^{plus®}$ (positioning mode)
P130...P133/P140...P143 Ramp t11/t21	Setting in accordance with specified data
P136/P146 Stop ramp t13 / t23	
P137/P147 Emergency ramp t14 / t24	

The setting of the 4-quadrant operation (P820) is ignored; 4-quadrant operation is always active.

700 CFC & IPOS (parameter set 1 only)

Must be set if IPOS$^{plus®}$ positioning commands are to be processed. Refer to the 'IPOS$^{plus®}$ Positioning and Sequence Control System' manual for detailed descriptions of IPOS$^{plus®}$. This manual can be obtained from SEW.

700 SERVO (parameter set 1 only)

SERVO operating mode makes it possible to operate a synchronous motor (servomotor) with a permanent field.

MCS4_A: The motor must be equipped with a resolver.

MCH4_A: The motor must be equipped with a Hiperface encoder.

The MOVITOOLS startup function requires the motor type to be entered (SEW motor). No startup can be performed with the DBG11B keypad in SERVO mode. The following parameters are set by default (parameter set 1):

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 3 × motor current at standstill
Torque limit	The value of the motor torque can be limited. The maximum value (= 3 × motor standstill torque) is determined by the motor type. Do not alter P303 'Current limit'!
P302 Maximum speed 1	Rated motor speed (2000 rpm, 3000 rpm, 4500 rpm)
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOT.& REGEN.MODE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL/FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data
P732 Brake application time 1	

SERVO always requires the speed controller to be started up as well.

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Gain accel. feedforward	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter accel. feedforward	
P210 P gain hold controller	Position controller gain for the hold control Hold control
P910 Gain X controller	Position controller gain for IPOS$^{plus®}$ (positioning mode)
P130...P133/P140...P143 Ramp t11/t21	Setting in accordance with specified data
P136/P146 Stop ramp t13 / t23	
P137/P147 Emergency ramp t14 / t24	

The setting of the 4-quadrant operation (P820) is ignored; 4-quadrant operation is always active.

700 SERVO & M-CTRL. (only parameter set 1) → Sec. 4.6

This operating mode allows the torque of the servomotor to be controlled directly. The setpoint is standardized on the following torque:

3000 rpm = 150 % output current × torque constant

The torque values should be entered directly as fixed setpoints in the unit [%In] (P16_, P17_). The set processing (P11_) also applies to the torque control if the setpoint selection is made by way of an analog input.

The torque constant (motor-specific parameter) is defined by: $k_e = M_0 / I_0$

- If P500 'Speed monitoring 1' is active, the drive is monitored according to the P500 parameter description (→ page 117).
- If P500 'Speed monitoring 1' = OFF is set, the drive reacts as follows if its speed is faster or slower than n_{max} (P302) and $-n_{max}$:
  – Motor mode: The available motor torque is reduced to zero with a linear function above n_{max} and below $-n_{max}$. As a result, there is no active speed control.
  – Regenerative mode: No response; the master drive must prevent the drive losing position.
- M-control is also in effect in the range $-n_{min}...n...n_{min}$.
- The current is always limited to the set current limit (P303).

700 SERVO & IPOS (only parameter set 1)

Must be set if IPOS$^{plus®}$ positioning commands are to be processed. Refer to the 'IPOS$^{plus®}$ Positioning and Sequence Control System' manual for detailed descriptions of IPOS$^{plus®}$. This manual can be obtained from SEW.

71_ Standstill current (parameter set 1/2)

710/711 2 1 Current at standstill

Setting range: <u>0</u>...50% I_{mot}

The standstill current is used for injecting an adjustable current into the motor when the motor is at a standstill and the brake is applied. The standstill current can be switched off by /CONTROLLER INHIBIT = 0. This allows the following functions to be carried out:

- At low ambient temperatures of the motor, it is possible to prevent the danger of condensation formation and freezing (in particular of the disc brake). Setting the current level avoids overheating of the motor. **Recommendation:** The motor housing should be hand-hot.
- It is possible to perform a rapid motor start when standstill current is activated because the motor is kept in an excited state. This means the motor can be started without having to wait for the premagnetizing time. **Recommendation:** Set to 45...50 % for hoists.

The standstill current function is deactivated by P710/P711 = 0. The setting is made in % of the rated motor current. The standstill current is monitored for current limit 1/2 (P303/P313) in every case.

In CFC mode, the amount of magnetization current injected is always at least that required on the basis of the motor model. The higher value applies if P710 is set higher. This function does not have any effect in SERVO (MDS) operating mode.

72_ 1 2

Setpoint stop function (parameter set 1/2)

The setpoint stop function makes possible an enable function generated automatically by the inverter depending on the main setpoint. There is an enable with all required functions such as pre-magnetization, brake control system, etc. In all cases, there must be an additional enable via terminals.

720/723 Setpoint stop function 1/2

Setting range: ON / OFF

721/724 Stop setpoint 1/2

Setting range: 0...30...50 rpm

722/725 Start offset 1/2

Setting range: 0...30...50 rpm

There is no enable if stop setpoint + start offset (start setpoint) > n_{max}.

Movement with n_{min} is never possible if the stop setpoint is > n_{min}.

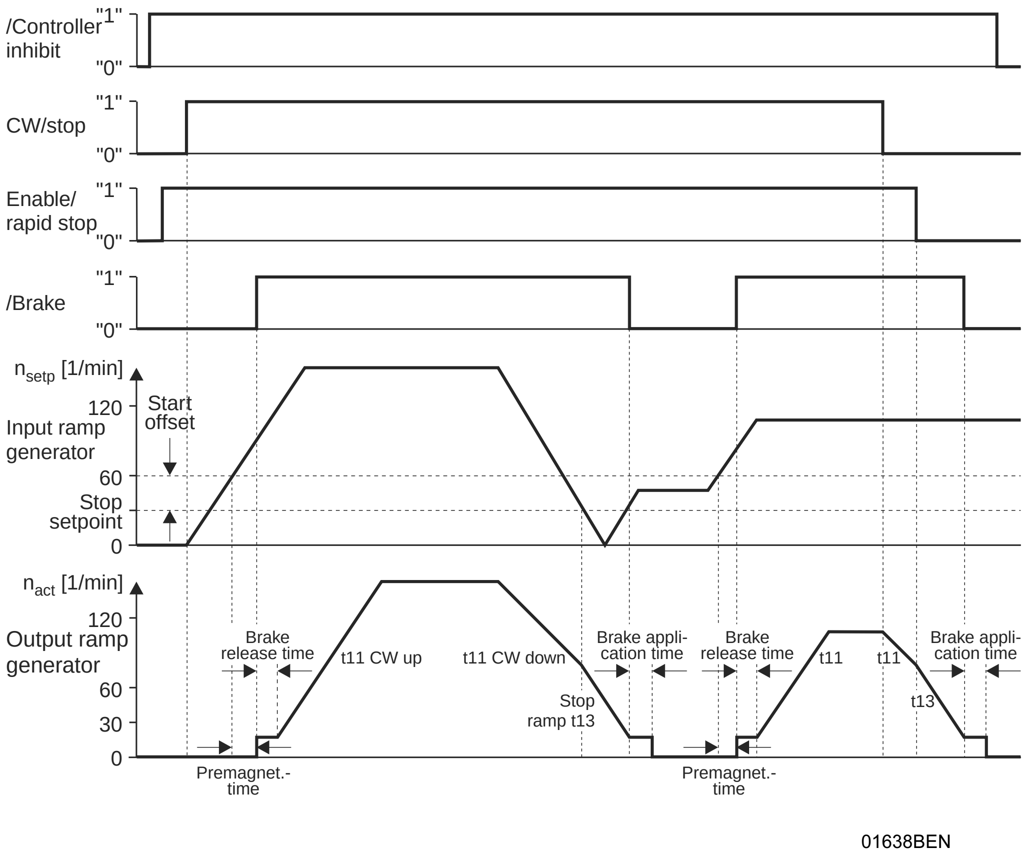


Figure 66: Setpoint stop function

73_ 1 2

Brake function (parameter set 1/2)

MOVIDRIVE® inverters are capable of controlling a brake fitted on the motor. The brake function acts on the binary output DBØØ which has the fixed assignment of the '/BRAKE' function (24 V = brake released). In drives with encoder feedback (speed control), this makes it possible to select between electrical holding of the load and mechanical application of the brake in halt condition.

→ Sec. 7.11.1 regarding wiring of the brake control system.

Operating mode P700 (The same applies to parameter set 2 /P701, however in this case VFC operating modes are possible without encoder feedback)	Brake function P730 (P733) ON/OFF
1) **VFC, VFC & GROUP, VFC & DC BRAK., VFC & FLYING START**	P730 = ON Brake control in accordance with Figure 67. Effective parameters: P300/P310 Start/stop speed 1/2 P323/P333 Premagnetizing time 1/2 P731/P734 Brake release time 1/2 P732/P735 Brake application time 1/2 P730 = OFF In this case too, post-magnetization takes place with the set brake application time in order to improve positioning of the drive.
2) **VFC & HOIST**	See 1) The brake function is automatically always active when the hoist function is activated, even if P730 = OFF.
3) **VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL&HOIST**	P730 = ON See 1) P730 = OFF The speed setpoint of 0 rpm is specified in the inverter when the start/stop speed is reached. See 'HOLD CONTROL' if real hold control (position control) is required.
4) **CFC**	See 3): Pre-magnetization is carried out.
5) **Servo**	See 3)
6) **CFC & M-CONTROL**	The brake is controlled in accordance with P730.
7) **SERVO & M-CTRL.**	The brake is controlled in accordance with P730.
8) **VFC/CFC/ SERVO & IPOS**	See IPOSplus® manual

STOP

The brake is **always** applied when /CONTROLLER INHIBIT = 0.

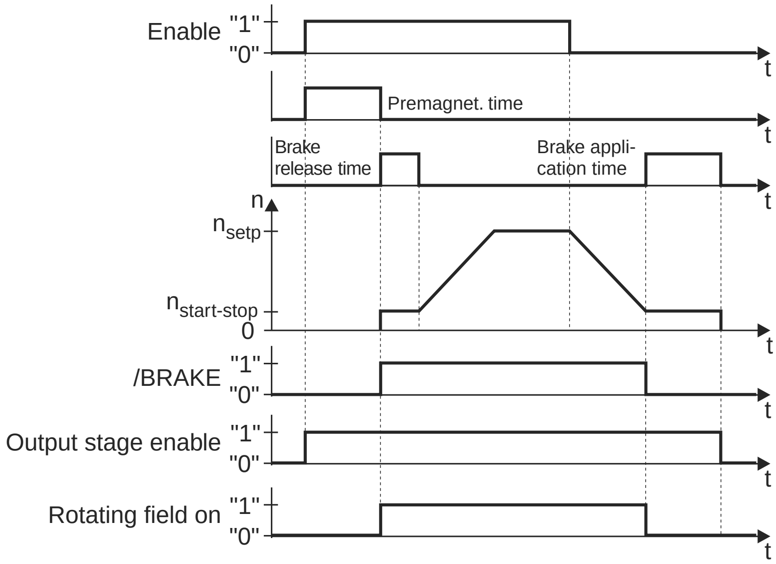


Figure 67: Inverter response when the brake function is activated

74_ **Speed skip (parameter set 1/2)**

The 'Speed skip' function makes it possible to prevent the motor speed from remaining within a certain speed window. This suppresses vibration and noise, in particular in machines with pronounced mechanical resonances.

740/742 Skip window center 1/2

Setting range: 0...1500...5000 rpm

741/743 Skip width 1/2

Setting range: 0...300 rpm

The skip window center and skip width are values and automatically have an effect on positive and negative setpoints when activated. The function is deactivated by setting skip width = 0.

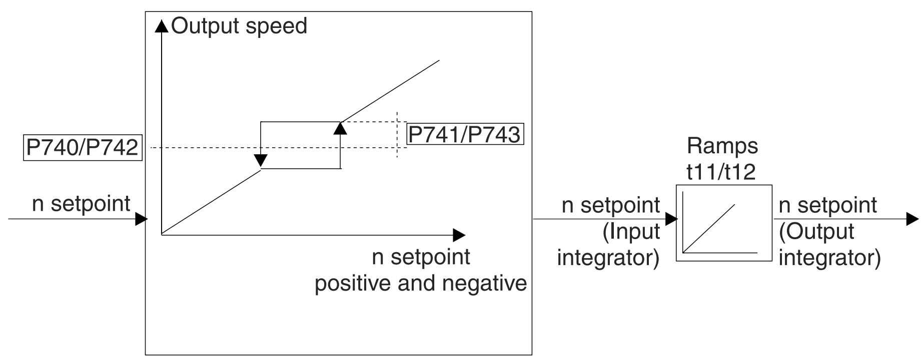


Figure 68: Speed skip

75_ **Master-Slave function**

Master-slave function offers the opportunity to implement functions such as synchronous speed running, load share and torque control (slave). The RS-485 interface (USS21A) or the system bus interface (SBus) can be used as the communications link. Both interfaces can also send setpoints. Note that a slave can only be served from one interface. Sending setpoints from both interfaces makes sense when some slaves are connected to the RS-485 interface and other slaves to the SBus. P100 'Setpoint source' must then be set to MASTER-SBus or MASTER-RS-485. By programming a binary input to 'SLAVE FREE RUNN.' (P60_/P61_), it is possible to separate the slave from the master setpoint of the master and switch it to a local control mode.

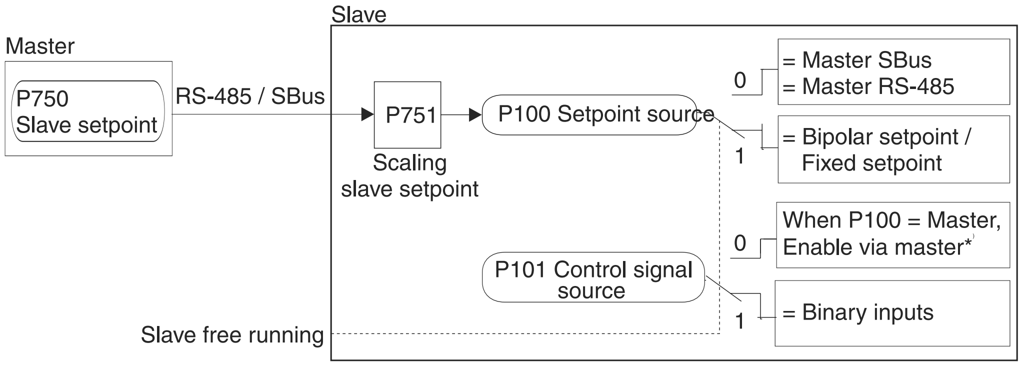


Figure 69: Master-Slave function

*) DIØØ '/Controller inhibit' and the programmed binary inputs Enable, CW and CCW must also get a '1' signal.

STOP

RS-485 group addresses (P811) and SBus group addresses (P814) must be set to the same value in the master and the slave. Set a group address (P811) greater than 100 for master/slave operation via the RS-485 interface. Activate the bus terminating resistors on the master and slave (S12 = ON) for master/slave operation via the system bus.

Connection check

System bus (SBus):

Parameter P815 'SBus timeout delay' is in effect when there is a communications link via the SBus. If P815 is set to '0', there is no monitoring of data transmission via the SBus.

RS-485 interface:

A connection check is always in effect if the communications link is via the RS-485 interface (USS21A), parameter P812 'RS-485 timeout delay' does not have any function. The slave inverters must receive a valid RS-485 telegram within the fixed time interval of t = 500 ms. If the time is exceeded, the slave drives are stopped with the emergency stop ramp and fault message F43 'RS-485 timeout' is signaled.

STOP

Important: The fault is automatically reset and the drives are enabled when the slave inverters once again receive a valid telegram.

Overview of functions, master/slave mode

Function	Master		Slave	
	Slave setpoint P750	Operating mode P700	Setpoint source P100	Operating mode P700
Synchronous speed operation: Master controlled Slave controlled	SPEED (RS485) SPEED (SBus) SPEED (485+SBus)	VFC, VFC & GROUP, VFC & HOIST	MASTER SBus MASTER RS-485	VFC, VFC & GROUP, VFC & HOIST
Synchronous speed operation: Master speed controlled Slave controlled	SPEED (RS485) SPEED (SBus) SPEED (485+SBus)	VFC-n-CONTROL VFC-n-CTRL. & ... CFC CFC/SERVO & IPOS	MASTER SBus MASTER RS-485	VFC, VFC & GROUP, VFC & HOIST
Synchronous speed operation: Master speed controlled Slave speed controlled Drives without rigid mechanical connection!	SPEED (RS485) SPEED (SBus) SPEED (485+SBus)	VFC-n-CONTROL VFC-n-CTRL. & ... CFC CFC/SERVO & IPOS	MASTER SBus MASTER RS-485	VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL&HOIST CFC SERVO
Synchronous speed operation: Master controlled Slave speed controlled Drives without rigid mechanical connection!	SPEED (RS485) SPEED (SBus) SPEED (485+SBus)	VFC, VFC & GROUP VFC & HOIST	MASTER SBus MASTER RS-485	VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL&HOIST CFC SERVO
Load share: Master controlled Slave controlled	LOAD SHAR(RS-485) LOAD SHARE (SBus) LOAD S(485+SBus)	VFC, VFC & GROUP VFC & HOIST	MASTER SBus MASTER RS-485	VFC, VFC & GROUP VFC & HOIST
Load share: Master speed controlled Slave controlled	LOAD SHAR(RS-485) LOAD SHARE (SBus) LOAD S(485+SBus)	VFC-n-CONTROL VFC-n-CTRL. & ... CFC CFC/SERVO & IPOS	MASTER SBus MASTER RS-485	VFC, VFC & GROUP VFC & HOIST VFC & FLYING START
Load share: Master speed controlled Slave speed controlled	Not possible in control system			
Load share: Master controlled Slave speed controlled	Not possible in control system			
Torque control of slave: Master speed controlled Slave torque controlled	TORQUE (RS-485) TORQUE (SBus) TORQUE(485+SBus)	CFC/SERVO CFC/SERVO & IPOS	MASTER SBus MASTER RS-485	CFC/SERVO & M-CONTROL

750 Slave setpoint

The setpoint which is sent to the slave is set on the master. The 'MASTER-SLAVE OFF' setting must be retained on the slave.

<u>MASTER-SLAVE OFF</u>

SPEED (RS-485)

SPEED (SBus)

SPEED (485+SBus)

TORQUE (RS-485)

TORQUE (SBus)

TORQUE(485+SBus)

LOAD SHAR(RS-485)

LOAD SHARE (SBus)

LOAD S(485+SBus)

751 Scaling slave setpoint

Setting range: -10...0...1...10

The setpoint sent from the master is multiplied by this factor which is set in the slave.

Speed synchronization (SPEED (RS-485) / SPEED (SBus) / SPEED (485+SBus)):

The speed of the inverter which is parameterized as the slave follows the speed of the master inverter. Set the speed ratio using parameter P751 'Scaling slave setpoint' on the slave inverter. The slip compensation (P324/P334) of the slave should be left at the startup setting.

Example:

Parameters	Setting on master	Setting on slave
P100 Setpoint source	E.g. UNIPOL/FIX.SETPT	MASTER SBus
P101 Control signal source	E.g. TERMINALS	Not effective
P700 Operating mode	VFC-n-CONTROL	VFC 1
P750 Slave setpoint	SPEED (SBus)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not effective	1 (then 1:1)
P811 RS-485 group address	Not effective	
P814 SBus group address	Set the same value (0...63)	
P816 SBus baud rate	Set the same value (125, 250, 500 or 1000 kbaud)	

Load share (LOAD SHAR(RS-485) / LOAD SHARE. (SBus) / LOAD S(485+SBus)):

This function allows two inverters to operate at the same load. It is assumed in this case that the shafts of the motors corresponding to the master and the slave are rigidly connected together. You are recommended to use the same motors with the same gear ratios, otherwise different delays may result during starting/stopping due to the pre-magnetizing time and the brake release/application time. Set the speed ratio (recommendation: 1) using parameter P751 'Scaling slave setpoint'.

STOP

The slip compensation (P324 / P334) of the slave must be set to 0.

Example:

Parameters	Setting on master	Setting on slave
P100 Setpoint source	E.g. BIPOL./FIX.SETPT	MASTER-RS-485
P101 Control signal source	E.g. TERMINALS	Not effective
P324 Slip compensation 1	Do not alter	0
P700 Operating mode	VFC 1	VFC 1
P750 Slave setpoint	LOAD SHAR(RS-485)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not effective	1 (then 1:1)
P811 RS-485 group address	Set the same value (101...199)	
P814 SBus group address	Not effective	
P816 SBus baud rate	Not effective	

Torque control of the slave (TORQUE (RS-485) / TORQUE (SBus) / TORQUE (485+SBus)):

The slave inverter receives the torque setpoint of the master directly (the correcting variable of the speed controller). This also enables a high quality load share to be achieved, for example. This setting should be preferred over 'Load share' if the drive configuration permits it. Set the torque ratio using parameter P751 'Scaling slave setpoint'.

Example:

Parameters	Setting on master	Setting on slave
P100 Setpoint source	E.g. UNIPOL/FIX.SETPT	MASTER-RS-485
P101 Control signal source	E.g. TERMINALS	Not effective
P700 Operating mode	CFC	CFC
P750 Slave setpoint	TORQUE (RS-485)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not effective	1 (then 1:1)
P811 RS-485 group address	Set the same value (101...199)	
P814 SBus group address	Not effective	
P816 SBus baud rate	Not effective	

PARAMETER GROUP 8__, UNIT FUNCTIONS

80_ **Setup**

800 Quick menu (with DBG11B only)

Setting range: ON / OFF

P800 enables the DBG11B keypad to be changed over between the factory-set quick menu and the detailed parameter menu. The fact that the quick menu is activated is indicated by a slash following the parameter number. The parameters contained in the quick menu are identified by a '/' in the parameter list. The previously selected menu is active after MOVIDRIVE® has been switched off and on again.

801 Language (with DBG11B only)

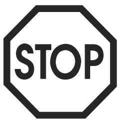
Setting range DBG11B-08: DE / EN / FR / ES / PT

P801 enables the DBG11B keypad to be changed over between various languages. The language setting is not altered by the factory setting.

802 Factory setting

Setting range: YES / NO

P802 can be used to reactivate the factory settings for almost all parameters; these are stored in the EPROM. Startup data, statistical data and language are not reset. The statistical data must be reset separately using P804. The factory settings are restored if the parameter is set to 'YES'. The operation LED V1 flashes yellow during this period. After the factory settings have been set, the operation LED V1 shows the previous operating status of the inverter again and P802 automatically reverts to 'NO'.



Almost all parameter values are overwritten when the factory setting is activated. However, the unit is not returned to its original delivery condition. Store the set parameter values (MOVITOOLS) before you activate the factory setting. The startup parameters are not altered by activating the factory setting, which means the startup procedure for the drive does not have to be repeated. We recommend checking the following parameters after activating the factory setting and setting them again if necessary:

- P100 Setpoint source
- P101 Control signal source
- P13_/P14_ Speed ramps
- P16_/P17_ Fixed setpoints
- P5__ Monitoring functions
- P6__ Terminal assignment

803 Parameter lock

Setting range: ON / OFF

Setting parameter 803 to 'ON' makes it possible to prevent any change to the parameters (except for parameter 841 'Manual reset' and the parameter lock itself). This makes sense, for example, after the MOVIDRIVE® setting has been optimized. Parameter 803 must be restored to 'OFF' in order to permit changes to parameters again.

Important: The parameter lock also acts on the RS-485, fieldbus and SBus interfaces and on IPOS$^{plus®}$.

804 Reset statistic data (with MOVITOOLS/Shell only)

Setting range: NO / FAULT MEMORY / KWH-METER / OPERATING HOURS

P804 permits the statistical data stored in the EEPROM, namely the fault memory, kilowatt-hour meter and operating hours counter, to be reset. These data are not affected when the factory setting function is activated.

806 Copy DBG → MDX (with DBG11B only)

Setting range: YES / NO

The parameter data in the DBG11B are transmitted to MOVIDRIVE®.

807 Copy MDX → DBG (with DBG11B only)

Setting range: YES / NO

The parameter data set in MOVIDRIVE® are transmitted to the DBG11B keypad.

81_ **Serial communication**

810 RS485 address

Setting range: 0...99

P810 sets the address by means of which communication can take place with MOVIDRIVE® via the RS-485 serial interface (USS21A). Max. 32 participants can be networked together.

On delivery, the MOVIDRIVE® address is always 00. You are recommended not to use the 00 address in order to avoid collisions during data transfer when several inverters are involved in serial communication.

811 RS-485 group address

Setting range: 100...199

P811 makes it possible to group together several MOVIDRIVE® units for communication via the serial interface. All MOVIDRIVE® units with the same RS-485 group address can thus be addressed using a multicast telegram via this address. The data received via the group address are not acknowledged by MOVIDRIVE®. For example, the RS-485 group address makes it possible to send setpoint selections to a group of MOVIDRIVE® inverters simultaneously. Group address 100 means that the inverter is not assigned to any group.

812 RS485 timeout delay

Setting range: 0...650 s

P812 sets the monitoring time for data transmission via the serial interface. MOVIDRIVE® performs the fault response set in P833 if there is no cyclical process data exchange via the serial interface for the period set in parameter 812. No monitoring of serial data transmission takes place when P812 is set to the value 0. Monitoring is activated with the first cyclical data exchange.

813 SBus address

Setting range: 0...63

P813 sets the system bus address of MOVIDRIVE®. The MOVIDRIVE® unit can communicate with other MOVIDRIVE® units using the system bus (SBus) by means of the address set here.

814 SBus group address

Setting range: 0...63

P814 sets the system bus group address (for multicast telegrams) of MOVIDRIVE®.

815 SBus timeout delay

Setting range: 0...650 s

P815 sets the monitoring time for data transmission via the system bus. MOVIDRIVE® performs the fault response set in P836 if there is no data traffic via the system bus for the period set in P815. No monitoring of data transmission via the system bus takes place when P815 is set to the value 0.

816 SBus baud rate

Setting range: 125 / 250 / 500 / 1000 kbaud

P816 sets the transmission speed of the system bus.

817 SBus synchronization ID

Setting range: 0...2047

A synchronization between the drives can take place for transmitting process data and parameter data via the system bus. To do this, the master control has to send a synchronization message to the connected inverters at specific intervals. Thus, the inverters synchronize themselves with the master controller. P817 is used for setting the identifier (address) of the synchronization signal in the inverter for the internal system bus. Make sure there is no overlap between the identifiers for the process data or parameter data telegrams.

818 CAN synchronization ID

Setting range: 0...1...2047

A synchronization between the drives can take place for transmitting process data and parameter data via the optional CAN bus. To do this, the master control has to send a synchronization message to the connected inverters at specific intervals. Thus, the inverters synchronize themselves with the master controller. P818 is used for setting the identifier (address) of the synchronisation signal in the inverter for the optional CAN bus. Make sure there is no overlap between the identifiers for the process data or parameter data telegrams.

819 Fieldbus timeout delay

Setting range: 0...0.5...650 s

P819 sets the monitoring time for data transmission via the existing fieldbus (MC_41A → PROFIBUS-DP or MCH42A → INTERBUS FO). MOVIDRIVE® performs the fault response set in P831 if there is no data traffic via the fieldbus for the period set in P819. No monitoring of data transmission via the fieldbus takes place when P819 is set to the value 0 or 650. The timeout time is automatically specified by the DP master with PROFIBUS-DP. Changing this parameter does not have any effect and it is overwritten whenever the PROFIBUS-DP is started up again.

82_ **Brake operation**

820/821 4-quadrant operation 1/2

Setting range: ON / OFF

This is only taken into account in VFC operating mode without encoder feedback; 4-quadrant operation is assumed in all other operating modes. P820 enables 4-quadrant operation to be switched on and off for parameter set 1/2. 4-quadrant operation is possible if a braking resistor or a regenerative power supply unit is connected to MOVIDRIVE® (CCW/CW; motor/regenerative). P820/P821 must be set to 'NO' if there is neither a braking resistor nor a regenerative power supply unit connected to MOVIDRIVE®, which means regenerative operation is not possible. In this operating mode, MOVIDRIVE® attempts to extend the deceleration ramp so the generated power is not too great and the DC link voltage remains below the switch-off threshold.

Despite the fact that the deceleration ramps are automatically extended by MOVIDRIVE®, it is possible that the generated power during braking may be too great, leading to MOVIDRIVE® switching itself off and issuing fault message F07 (DC link overvoltage). In such a case, the deceleration ramps must be extended manually.

83_ **Fault response**

830 Response EXT. FAULT

The fault is only triggered in the ENABLED inverter status. P830 programs the fault response which is triggered by an input terminal programmed to '/EXT. FAULT'. The following responses can be programmed:

Response	Description
NO RESPONSE	No fault is displayed and no fault response is undertaken. The fault which is signaled is completely ignored.
DISPLAY FAULT	The fault is displayed (operation LED V1 and MOVITOOLS), although the unit does not implement any other fault response. The fault can be reset (terminal, RS-485, fieldbus, auto-reset).
IMM. STOP/ FAULT	The inverter performs an immediate switch-off and a fault is signaled. The output stage is inhibited and the brake is applied. The ready signal is revoked and the fault output is set, if programmed. A restart is only possible after a fault reset has been performed during which the inverter is reinitialized.
EMERG.STOP/ FAULT	The drive is braked with the set emergency stop ramp. Once the stop speed is reached, the output stage is inhibited and the brake is applied. The fault is signaled immediately. The ready signal is revoked and the fault output is set, if programmed. A restart is only possible after a fault reset has been performed during which the inverter is reinitialized.
RAPID STOP/ FAULT	The drive is braked with the set rapid stop ramp. Once the stop speed is reached, the output stage is inhibited and the brake is applied. The fault is signaled immediately. The ready signal is revoked and the fault output is set, if programmed. A restart is only possible after a fault reset has been performed during which the inverter is reinitialized.
IMM. STOP/ WARNG	The inverter performs an immediate switch-off and a fault is signaled. The output stage is inhibited and the brake is applied. A fault message is issued via the terminal, if programmed. The ready signal is not revoked. The drive restarts without a unit re-initialization if the fault is rectified by an internal procedure or by a fault reset.
EMERG.STOP/ WARNG	The drive is braked with the set emergency stop ramp. Once the stop speed is reached, the output stage is inhibited and the brake is applied. The fault is signaled immediately. A fault message is issued via the terminal, if programmed. The ready signal is not revoked. The drive restarts without a unit re-initialization if the fault is rectified by an internal procedure or by a fault reset.
RAPID STOP/ WARNG	The drive is braked with the set rapid stop ramp. Once the stop speed is reached, the output stage is inhibited and the brake is applied. The fault is signaled immediately. A fault message is issued via the terminal, if programmed. The ready signal is not revoked. The drive restarts without a unit re-initialization if the fault is rectified by an internal procedure or by a fault reset.

831 Response FIELDBUS TIMEOUT

See P830 for the responses which can be programmed. Factory setting: RAPID STOP/WARNG

The fault is only triggered in the ENABLED inverter status. P831 programs the fault response which is triggered by the fieldbus timeout monitoring. The reaction time for the monitoring can be set using P819 (see P819 and the 'Fieldbus Unit Profile' manual for a more detailed description of the 'Fieldbus timeout').

832 Response MOTOR OVERLOAD

See P830 for the responses which can be programmed. Factory setting: EMERG.STOP/FAULT

P832 programs the fault response which is triggered by the motor protection function (see P340 for a more detailed description of 'Motor overload').

833 Response RS-485 TIMEOUT

See P830 for the responses which can be programmed. Factory setting: RAPID STOP/WARNG

The fault is only triggered in the ENABLED inverter status. P833 programs the fault response which is triggered by the RS-485 timeout monitoring. The reaction time for the monitoring can be set using P812 (see P812 for a more detailed description of the 'RS-485 timeout').

834 Response DRS LAG ERROR (IPOSplus®)

See P830 for the responses which can be programmed. Factory setting: EMERG.STOP/FAULT

P834 programs the fault response which is triggered by the lag error monitoring of the positioning mode with IPOSplus®. It is possible to make various settings for this in parameter group 51_.

835 Response TF sensor SIGNAL

See P830 for the responses which can be programmed. Factory setting: NO RESPONSE

P835 programs the fault response which is triggered by the temperature sensor monitoring of the TF which may be incorporated in the motor winding.

836 Response SBus TIMEOUT

See P830 for the responses which can be programmed. Factory setting: EMERG.STOP/FAULT

P836 programs the fault response which is triggered by the system bus timeout monitoring. The reaction time for the monitoring can be set using P815 (see P815 for a more detailed description of the 'SBus timeout').

*84_* Reset response

840 Manual reset

YES

The fault in MOVIDRIVE® is reset. In case of a fault, it is possible to press the [E] key on the DBG11B to access P840 directly.

Also, P840 is listed in the 'Main menu' under 'Parameters' in MOVITOOLS as well. P840 automatically reverts to NO following a reset. Activating the manual reset does not have any effect if there is no fault present.

NO

No reset.

841 Auto reset

ON

The auto-reset function is activated. In the event of a fault, this function automatically resets the unit after an adjustable restart time (P842). Up to five auto-resets are possible in one auto-reset phase. Should five faults occur which are reset by an auto-reset, no more auto-resets are possible until:

–a manual reset is performed using the input terminal,
–a manual reset is performed using the serial interface (MOVITOOLS/Shell, DBG11B, master controller),
–there is a transition to 24 V backup mode or the inverter is completely switched off.

Following this, five auto-resets are possible once again.

Do not use auto-reset with drives where an automatic restart could represent a danger to people or units.

OFF

No auto-reset.

842 Restart time

Setting range: 1...3...30 s

P842 sets the waiting time which has to elapse after a fault occurs before an auto-reset is performed.

85_ **Scaling actual speed value**

Scaling actual speed value defines a user-specific display parameter (→ P001 User display). For example, the user display is to be shown in 1/s. A scaling factor of 1/60 is required for this. The scaling factor numerator must therefore be set to 1 and the scaling factor denominator to 60. The scaling unit 1/s is entered in P852.

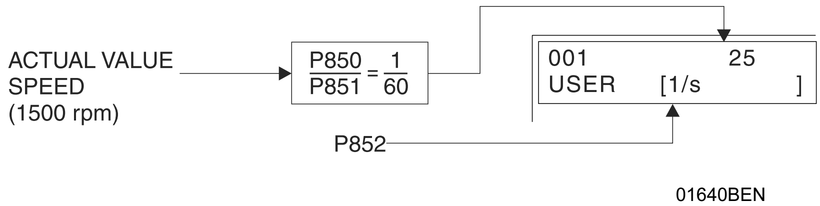


Figure 70: Scaling actual speed value (example)

850 Scaling factor numerator

Setting range: 1...65535 (can only be set using MOVITOOLS/Shell)

851 Scaling factor denominator

Setting range: 1...65535 (can only be set using MOVITOOLS/Shell)

852 User dimension (can only be set using MOVITOOLS/Shell)

Factory setting: 1 rpm

Up to eight ASCII characters; is displayed in P001 'User display'.

86_	**Modulation**
860/861	PWM frequency 1/2 (parameter set 1/2)

Setting range: 4 / 8 / 16 kHz

P860/P861 can be used in VFC modes to set the switching frequency at the inverter output for parameter set 1/2. The inverter automatically switches back to lower switching frequencies when the unit utilization reaches a specific level if the clock frequency for parameter set 1/2 is not fixed to the set value using P862/P863. This reduces switching losses in the output stage and, consequently, unit utilization.

862/863 PWM fix 1/2 (parameter set 1/2)

ON

P862/P863 = ON for parameter set 1/2 enables the PWM frequency set in P860/P861 to be fixed when an automatic reduction in the PWM frequency is not permitted (e.g. when output filters with DC link are used).

OFF

MOVIDRIVE® automatically reduces the set output frequency (down to minimum 4 kHz) when there is a high level of thermal load on the output stage, in order to avoid a switch-off with the 'Unit utilization' fault.

864 PWM frequency CFC (effective in CFC and SERVO operating modes)

Setting range: 4 / 8 / 16 kHz

The switching frequency at the inverter output can be set using P864 in CFC and SERVO operating modes (only possible in parameter set 1). 'PWM fix 1 = ON' is always in effect in the settings 8 kHz (= factory setting) and 16 kHz. Note that the inverter must be of an adequate size in order to supply the increased power demand at higher switching frequencies.

87_ **Process data description**

870 Setpoint description PO1; Factory setting: CTRL. WORD 1

871 Setpoint description PO2; Factory setting: SPEED

872 Setpoint description PO3; Factory setting: NO FUNCTION

P870/P871/P872 define the content of the process output data words PO1/PO2/PO3. This is necessary so MOVIDRIVE® can allocate the appropriate setpoints. The following process output assignments are available:

Assignment	Description
NO FUNCTION	The content of the process output data word is ignored.
SPEED	Speed setpoint selection in rpm.
CURRENT	Current setpoint selection (for torque control)
POSITION LO	Position setpoint low word
POSITION HI	Position setpoint high word
MAX. SPEED	Maximum system speed (P302/P312)
MAX. CURRENT	Current limitation in % of I_N of the inverter (P303/P313)
SLIP	Slip compensation (P324/P334)
RAMP	Ramp time for setpoint selection
CTRL. WORD 1	Control signals for start/stop, etc.
CTRL. WORD 2	Control signals for start/stop, etc.
SPEED [%]	Selection of a speed setpoint in % of n_{max}
IPOS PO data	Specification of a 16-bit-coded value for IPOS$^{plus®}$

→ 'Fieldbus Unit Profile' manual for additional explanations

873 Actual value description PI1; Factory setting: STATUS WORD1

874 Actual value description PI2; Factory setting: SPEED

875 Actual value description PI3; Factory setting: NO FUNCTION

P873/P874/P875 define the content of the process input data words PI1/PI2/PI3. This is necessary so MOVIDRIVE® can allocate the appropriate actual values. The following process input assignments are available:

Assignment	Description	
NO FUNCTION	The content of the process input data word is 0000_{hex}	
SPEED	Current actual speed value of the drive in rpm.	
OUTPUT CURRENT	Momentary output current of the system in % of I_N	
ACTIVE CURRENT	Momentary active current of the system in % of I_N: Positive sign = Positive torque Negative sign = Negative torque	
POSITION LO*	Current actual position low word	The actual position is read from: P941 'Source actual position'
POSITION HI*	Current actual position high word	
STATUS WORD1	Status information of the inverter	
STATUS WORD2	Status information of the inverter	
SPEED [%]	Current actual speed value in % of n_{max}.	
IPOS PI-DATA	Checkback of a 16-bit-coded value for IPOS$^{plus®}$	

* Both assignments must always be set.

→ 'Fieldbus Unit Profile' manual for additional explanations

876 PO data enable

ON

The process output data sent most recently by the fieldbus controller come into effect.

OFF

The process output data which were most recently valid remain in effect.

877 DeviceNet PD configuration

Setting range: 1...24 PD / Param + 1...24 PD

This parameter sets the process data configuration for the DFD11A DeviceNet interface.

88_ **Manual mode (only available in DBG11B keypad)**

The inverter can be controlled using the DBG11B keypad using the manual operation function. The inverter must be in 'No enable' status in order for manual operation to be started. 'No enable' status means DIØØ /Controller inhibit = '1' and binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop = '0' which are programmed in the factory settings.

Binary input DIØØ /Controller inhibit is also effective in manual operation. The other binary inputs are ineffective during manual operation. Binary input DIØØ '/Controller inhibit' must get a '1' signal to enable the drive to be started in manual operation. The drive can also be stopped in manual operation by DIØØ = '0'. The direction of rotation is not determined by the 'CW/stop' or 'CCW/stop' binary inputs. Instead, you select the direction of rotation using the keypad (→ Figure 71).

Manual operation remains active even after the supply system power has been switched off/on. The inverter is then inhibited, however. A change of direction command using the → or ← key produces an enable and a start in the selected sense of rotation at n_{min}. The speed is increased and decreased using the ↑ and ↓ keys. The modification speed is 150 rpm per second.

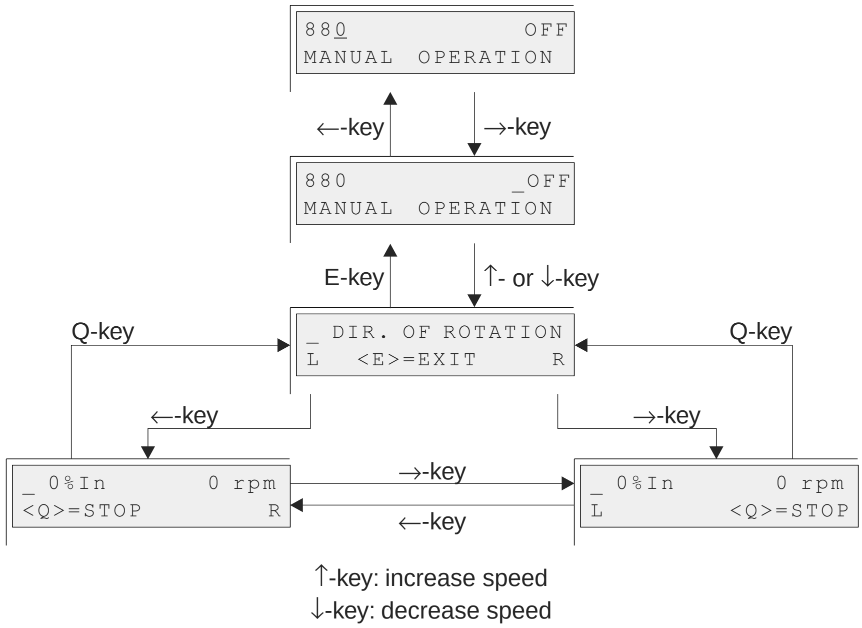


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Figure 71: Manual mode with DBG11B

The signals at the binary inputs take effect as soon as manual operation is finished. Binary input DIØØ '/Controller inhibit' does not have to be switched from '1' to '0' and back to '1'. The drive can start according to the signals at the binary inputs and the setpoint sources.

Note that the binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop which are programmed in the factory settings receive a '0' signal when you end manual operation.

Connection check

In manual mode, a connection check is always active between the DBG11B and the inverter or between the USS21A and the inverter. Parameter P812 'RS-485 timeout delay' does not have any function. The inverter must receive a valid RS-485 telegram within the fixed time interval of t = 500 ms. If the time is exceeded, the drive is stopped with the emergency stop ramp and fault message F43 'RS-485 timeout' is signaled.

Important: The fault is automatically reset and the drive is enabled when the inverter once again receives a valid telegram.

880

Manual operation

ON

Manual mode is activated.

OFF

No manual mode.

PARAMETER GROUP 9__, IPOS PARAMETERS

The IPOS parameters are described in detail in the IPOS$^{plus®}$ manual.

Be aware that modifying these parameters without knowledge of the IPOS program which may be active can give rise to unexpected movements and place undesirable loads on the mechanical driveline. Knowledge of the IPOS$^{plus®}$ manual is an essential prerequisite for setting these parameters.

*90_* **IPOS Reference travel**

The purpose of reference travel is to establish a **machine zero** to which all absolute positioning commands refer. It is possible to select from various strategies, referred to as reference travel strategies, for this purpose (→ **P903 Reference travel type**). These define appropriate travel modes, for example to search for a reference cam. Starting from the **reference point** located using reference travel, **P900 Reference offset** permits the machine zero point to be moved in accordance with the following equation:

Machine zero = Reference position + Reference offset

The speeds of the travel movements required on the basis of the **reference travel type** are set using **P901 Reference speed 1** and **P902 Reference speed 2**.

In addition, **P904** can be used for specifying whether the **zero pulse** should be used for **reference travel**.

*91_* **IPOS Travel parameter**

910 P910 Gain X controller

Setting range: 0.1...0.5...32

Setting value for the P controller of the position control loop in IPOS$^{plus®}$. The value from P210 (P gain hold controller) is adopted here in the default setting.

911/912 Positioning ramp 1/2

Setting range: 0.01...1...20 s

Setting value for the ramp which is used during the positioning operation. The same ramp (positioning ramp 1) is always used for acceleration and deceleration when the ramp type setting (P916) is SINE and SQUARED. Deceleration takes place in accordance with positioning ramp 2 when a LINEAR ramp type is set.

913/914 Travel speed CW / CCW

Setting range: 0...3000...5000 rpm

Specifies the speed with which positioning should occur. The setting must be matched to the maximum motor speed.

P302/P312 limit P913/P914, so consequently always set P302/P312 greater than P913/P914 (by approx. 10 %). Otherwise, there may be a lag error!

915 Speed feedforward

Setting range: -199.99...0...<u>100</u>...199.99 %

With a value of 100 %, the drive operates with a linear speed profile optimized in respect of time. If a value less than 100 % is specified, a larger gap between position setpoint and actual position occurs (lag distance) during a positioning operation. This results in a 'soft' run-in to the target position for the acceleration procedure.

This function is inoperative with 'sine' and 'squared' acceleration types!

916 Ramp type

This parameter specifies the type of positioning ramp. This has an effect on the speed or acceleration characteristic during positioning.

Ramp type	Positioning performance
LINEAR	Optimum time, however block-shaped acceleration characteristic
SQUARED	Smoother acceleration characteristic than LINEAR
SINE	Very smooth acceleration characteristic; higher torque requirement than with SQUARED
BUSRAMP	Setpoint interpolation for SBus.
CAM-CONTROL	Only available in the technology version.
I-SYNCHR.OPERAT.	

92_ IPOS Monitoring

920/921 SW limit switch CW/CCW

Setting range: $-(2^{31}-1)...\underline{0}...2^{31}-1$ inc

The software limit switches permit the user to restrict the range in which travel commands are accepted. This is done via the software. The limits of the movement range are specified using these two parameters (software limit switches). If P941 'Source actual position' is set to MOTOR ENC. (X15) or EXTERN.ENC (X14), then these do not take effect until after performance of a reference travel. If the software limit switches are in effect, the system checks whether the target position (H492) of the current movement command is beyond the software limit switches. The movement command is not performed if the target position is beyond. If a drive is already in motion, it is decelerated using the emergency stop ramp. Fault message F78 (IPOS SW limit switch) is generated. The fault response is an emergency stop followed by an inhibit. The drive no longer has a reference point after the fault is reset!

Reset options:

•1-signal at the 'reset' input
•Mains power OFF / ON (not in 24 V backup mode)
•Manual reset via MOVITOOLS/Shell
•Reset using IPOS$^{plus®}$ control word (H484)

STOP

Following a fault reset (F78), the monitoring function for the software limit switches is not reactivated until the drive has been moved to its reference point again!

Deactivation: Set both parameter values to 0 during uni-directional operation. This deactivates the software limit switch function.

922 Position window

Setting range: 0...5...32767 inc

The parameter defines a distance range (position window) around the target position of a travel or STOP command. The 'Axis in position' = YES condition applies if a drive is inside the position window around the current target position (H492). The 'Axis in position' information is used as a final condition for waiting positioning commands. It can be used further as an output terminal function.

923 Lag error window

Setting range: 0...5000...2^{31}-1 inc

The lag error window defines a permitted difference in values between the setpoint and actual positions. A lag error message or lag error response is triggered if the limit is exceeded. You can set the responses with P834 'Response DRS LAG ERROR'.

Deactivation: Setting value = 0 deactivates lag error monitoring

*93_* IPOS Special functions

930 Override

Setting range: ON / OFF

The override function makes it possible to change the travel speed for positioning operations which is programmed in the IPOS$^{plus®}$ program. The speed can be altered within the range from 0 to 150 % of the specifically programmed speed. The analog input (X11:2/3) is used for this purpose. As such, 0 to 150 % corresponds to 0...10 V on the analog input. However, the maximum value for the speed is always restricted by P302, 'Maximum speed'.

931 CTRL word Task 1 (only in the DBG11B keypad, not in MOVITOOLS)

Setting range: START / STOP

Task 1 of the IPOS$^{plus®}$ program is started or stopped.

932 CTRL word Task 2 (only in the DBG11B keypad, not in MOVITOOLS)

Display parameter, cannot be set using DBG11B.

Indicating range: START / STOP

START = Task 2 of the IPOS$^{plus®}$ program is currently being processed.

STOP = Task 2 of the IPOS$^{plus®}$ program is stopped.

*94_* IPOS Encoder

940 IPOS Variables edit (only in the DBG11B keypad, not in MOVITOOLS)

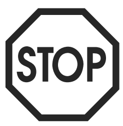
Setting range: ON / OFF

The IPOS variable can be altered if P940 is set to 'ON'.

941 Source actual position

Setting range: MOTOR ENC. (X15) / EXTERN.ENC (X14) / ABSOL.ENC. (DIP)

Defines the encoder to which IPOS$^{plus®}$ positions.



Only the settings P941 = MOTOR ENC. (X15) and P941 = EXTERN.ENC (X14) are permitted with MOVIDRIVE® *compact*.

942/943	Encoder factor numerator/denominator Setting range: 1...32767 In the event of positioning to an external encoder (X14), then these two parameters for used for adapting the resolution to the motor encoder (X15).
944	Encoder scaling ext. encoder Setting range: ×1 / ×2 / ×4 / ×8 / ×16 / ×32 / ×64 The significance of the travel resolution of the external encoder (incremental encoder on basic unit: X14) is adapted using this parameter.
945	Encoder type (X14) Setting range: TTL / SIN/COS / HIPERFACE
946	Counting direction X14 (effective with MCH4_A only) Setting range: NORMAL / INVERTED Determines the counting direction of the Hiperface encoder connected to X14. The setting must be done so that the counting direction of motor encoder (X15) matches the one of the external encoder (X14).

4

*96_* IPOS Modulo function

The IPOS modulo function is used for endless positioning, for example with circular indexing tables or chain conveyors. Refer to the IPOS manual for detailed information.

960 Modulo function

OFF

The modulo function is switched off.

SHORT

The 'short travel' modulo function is active. The drive moves from its actual position to the target position by the shortest possible route. Both directions of rotation are possible.

CW

The 'clockwise' modulo function is active. The drives moves from its actual position to the target position with the 'CW' direction of rotation, even if this means moving a longer distance. The 'CCW' direction of rotation is not possible.

CCW

The 'counterclockwise' modulo function is active. The drives moves from its actual position to the target position with the 'CCW' direction of rotation, even if this means moving a longer distance. The 'CW' direction of rotation is not possible.

961 Modulo numerator

Setting range: 0...2^{31}

Numerator value for simulating the ratio (gear unit + additional gear).

962 Modulo denominator

Setting range: 0...2^{31}

Denominator value for simulating the ratio (gear unit + additional gear).

963 Modulo encoder resolution

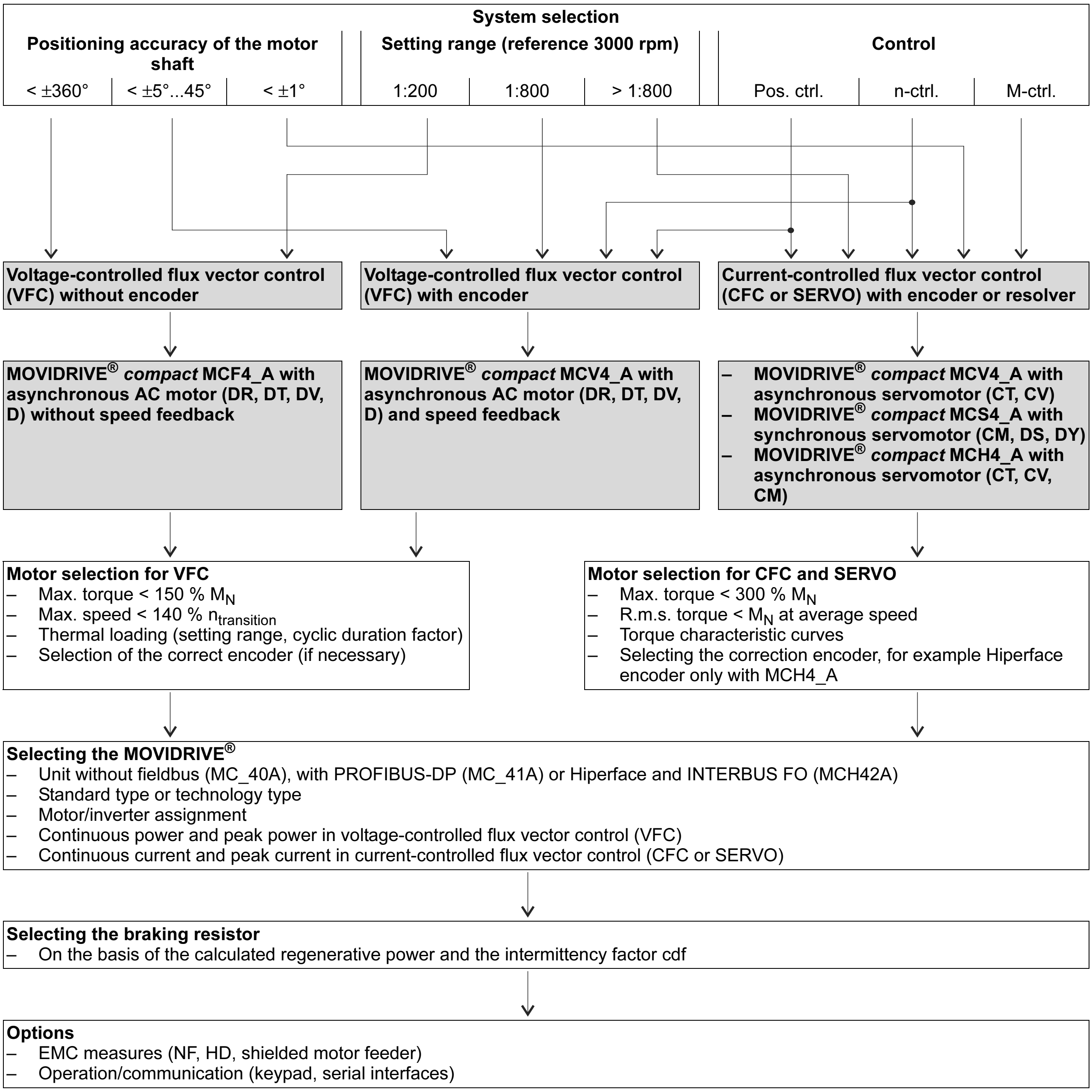
Setting range: 0...4096...20000

Resolution of the selected IPOS encoder system in increments.

5 Project Planning

5.1 Schematic procedure

Drive properties The required drive properties are the chief factors determining the selection of the inverter. The following figure is intended to provide assistance.



Key

Pos. ctrl.	= Positioning control
n-ctrl.	= Speed control
M-ctrl.	= Torque control
VFC	= Voltage-controlled flux vector control (voltage flux control)
CFC	= Current-controlled flux vector control (current flux control) for asynchronous servomotors
SERVO	= Current-controlled flux vector control for synchronous servomotors
M_N	= Rated torque of the motor
n_{trans}	= Rated speed (transition speed) of the motor

5.2 Control characteristics

Characteristic parameters

MOVIDRIVE® drive inverters achieve excellent control characteristics thanks to their optimally adapted control algorithms. The following characteristic parameters apply to operation with four-pole SEW motors and synchronous SEW servomotors.

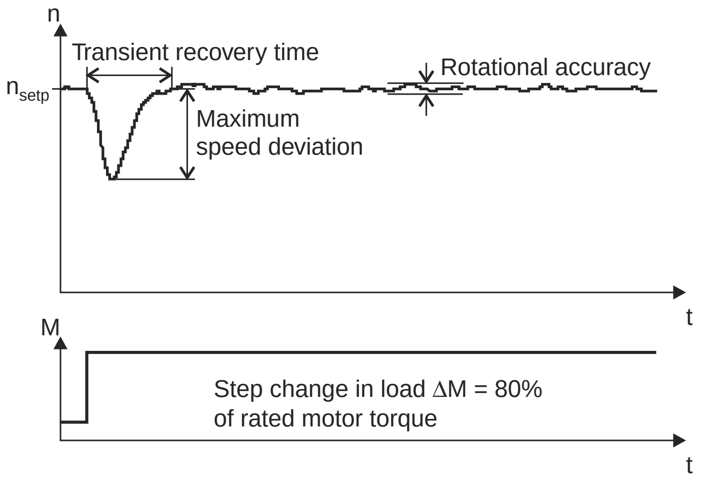


Figure 72: Characteristic parameters for the control characteristics

The following values apply to MOVIDRIVE® inverters in combination with motors of the same power:

MOVIDRIVE® *compact* type	**Continuous speed range n_{max} = 3000 rpm**	**Static control accuracy[1)] with reference to n_{max} = 3000 rpm**
MCF, VFC without encoder	1:200	0.30%
MCV/MCH, VFC with encoder (1024 inc.)	1:800	0.01%
MCV/MCH, CFC with encoder (1024 inc.)	1:3000	0.01%
MCV/MCH, CFC with sin/cos encoder	1:5000	0.01%
MDS, SERVO with resolver	> 1:3000	0.01%
MCH, CFC/SERVO with Hiperface encoder	1:5000	0.01%

1) = Deviation from speed actual value - speed mean value to setpoint speed

The defined control characteristics are maintained in the specified speed range.

Control response

By way of example, the following table shows the differences in control characteristics between the MCF and MCV MOVIDRIVE® *compact* types.

Settings

- Set speed n_{set} = 1000 rpm
- Step change in load ΔM = 80 % of rated motor torque
- Torsion-free load with mass inertia ratio J_L/J_M = 1.8

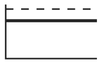
MOVIDRIVE® *compact* type	**Transient recovery time in relation to the value of MCF**	**Max. speed deviation at ΔM = 80 %, with reference to n = 3000 rpm**	**True-running accuracy at M = const. in relation to n = 3000 rpm**
MCF, VFC Without encoder	100%	1.8%	≤ 0.20%
MCV, VFC with encoder (1024 increments)	90%	1.5%	≤ 0.17%
MCV, CFC with encoder (1024 increments)	35%	1.0%	≤ 0.07%
MCV, CFC with sin/cos encoder	25%	0.7%	≤ 0.03%

5.3 Description of applications

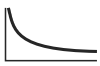
Inverter selection The large number of different drive applications can be divided up into five categories. The five categories are listed below and the suitable SEW inverter recommended. This assignment is based on the required setting range and the resulting control process.

1. Drives with a base load and a speed-dependent load, e.g. conveyor belt drives.
   •Low requirements with regard to the setting range (motor without encoder)
   –MOVIDRIVE® *compact* MCF4_A (VFC)
   •High requirements with regard to the setting range (motor with encoder)
   –MOVIDRIVE® *compact* MCV4_A (VFC-n-CONTROL)

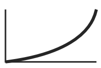
2. Dynamic load, e.g. trolleys; brief high torque demand for acceleration followed by low load.
   •Low requirements with regard to the setting range (motor without encoder)
   –MOVIDRIVE® *compact* MCF4_A (VFC)
   •High requirements with regard to the setting range (motor with encoder)
   –MOVIDRIVE® *compact* MCV4_A (VFC-n-CONTROL)
   •High dynamic requirements (asynchronous or synchronous servomotor)
   –MOVIDRIVE® *compact* MCV/MCH4_A (CFC)
   –MOVIDRIVE® *compact* MCS/MCH4_A (SERVO)



3. Static load, e.g. hoists; chiefly steady high static load with overload peaks.
   •Low requirements with regard to the setting range (motor without encoder)
   –MOVIDRIVE® *compact* MCF4_A (VFC)
   •High requirements with regard to the setting range (motor with encoder)
   –MOVIDRIVE® *compact* MCV4_A (VFC-n-CONTROL)
   –MOVIDRIVE® *compact* MCV/MCH4_A (CFC)
   –MOVIDRIVE® *compact* MCS/MCH4_A (SERVO)

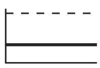


4. Load falling in inverse proportion to speed, e.g. winch or coil drives.
- Torque control (asynchronous or synchronous servomotor)
  –MOVIDRIVE® *compact* MCV/MCH4_A (CFC&M-CONTROL)
  –MOVIDRIVE® *compact* MCS/MCH4_A (SERVO&M-CTRL.)



5. Variable torque load, e.g. fans and pumps.
- Low load at low speed and no load peaks, 125 % utilization (I_D = 125 % I_N) (motor without encoder)
  –MOVIDRIVE® *compact* MCF4_A (VFC)

Project planning for trolleys



The motor load in the dynamic sections determines the peak motor power according to which the dimensions are to be set. The thermal load determines the required continuous power of the motor. The thermal load is determined on the basis of the movement cycle, with the load from acceleration and deceleration as well as the standstill times. The speed characteristic is a significant factor in determining the self-cooling of the motor. See also 'Motor selection examples' on page 159.

Project planning for hoists

In practice, the question of setting the size of hoists is addressed with regard to special thermal and safety-critical criteria.

Thermal considerations

In contrast to trolleys, hoists require approx. 70...90 % of the rated motor torque assuming constant speed upwards or downwards and the standard configuration.

Starting torque

The highest operating torque is required in the event of acceleration with maximum load in the UPWARDS hoisting direction.

VFC&HOIST

The 4-pole geared motor should always be designed for a maximum speed of 2100 rpm (70 Hz) with a transition speed of 1500 rpm (50 Hz) and 2500 rpm (83 Hz) at a transition speed of 1800 rpm (60 Hz). This means the gear unit input speed is increased by a factor of 1.4. Consequently, it is also necessary to choose a gear ratio which is higher by a factor of 1.4. This measure means that no torque is lost on the output shaft in the field weakening range (50...70 Hz or 60...83 Hz), since the higher gear ratio compensates for the inversely proportionate fall in torque in relation to speed (frequency). Furthermore, the startup torque is 1.4 times greater in the range from 0...1500 rpm (0...50 Hz) or 0...1800 rpm (0...60 Hz). Other advantages are that the speed range is greater and the self-cooling of the motor more powerful.

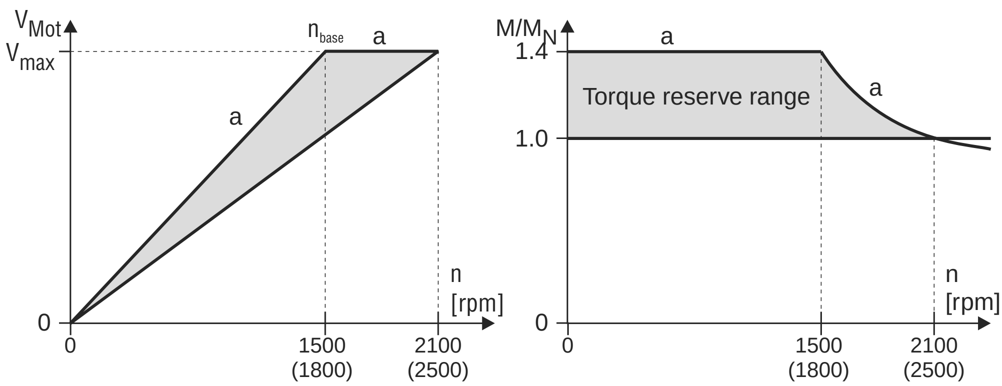


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Figure 73: a = Recommended voltage/speed characteristics and resultant torque characteristic

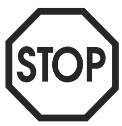
The motor power for hoists is selected according to the load type.

- S1 (100 % c.d.f.): Motor power 1 level higher than the selected inverter power, e.g. for lengthy upwards travel or continuous elevators.
- S3 (40 % c.d.f.): Motor power according to the selected inverter power.

The hoist function on the inverter should be activated irrespective of the above guidelines. See also 'Motor selection examples' on page 159.

Encoder monitoring

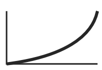
MOVIDRIVE® *compact* has encoder monitoring for TTL sensors, sin/cos and Hiperface encoders (only MCH). There is no encoder monitoring for HTL sensors.



SEW recommends using TTL sensors or sin/cos encoders for speed controlled hoist drives and activating encoder monitoring.

Avoid using an HTL sensor if possible.

Variable torque load (pumps, fans)



In these applications, there is no chance of the motor suffering a thermal overload at low speeds. The maximum load occurs at the maximum speed; there are no overload peaks. As a result, the dimensions of MOVIDRIVE® and the motor can be selected so the continuous motor current is less than or equal to the continuous output current (VFC operating mode, 125 % of the nominal output current at f_{PWM} = 4 kHz) of the MOVIDRIVE®. This means MOVIDRIVE® can operate a motor whose power is one level greater. See also 'Motor selection examples' on page 159.

5.4 Motor selection for asynchronous AC motors (VFC)

Basic recommendations

- Only use motors with a thermal classification of F at least.
- Use TF thermistor sensors or TH winding thermostats. TH should be preferred in the case of multi-motor drives on one inverter. The series connection of TH contacts (NC contacts) is not subject to any restriction if joint monitoring is provided.
- For multi-motor drives, we recommend that the motors should not differ from one another by more than 3 type levels.
- 4-pole motors should be preferred. This particularly applies to geared motors which are operated with a high oil filling level as a result of their vertical mounting position.
- Generally speaking, the motor can be operated at its listed power without forced cooling if the operating conditions differ from S1-mode, e.g. positioning drive with 1:20 speed range in S3-mode.
- Avoid selecting a motor which is too large, especially in case of a delta connection. Otherwise, the inverter may trigger a short circuit detection function due to the small winding resistance of the motor (1/3 that of a star connection).
- A MOVIDRIVE® *compact* MCV4_A (with encoder connection) is required for speed control. The motor must then be equipped with an incremental encoder, preferably with 1024 increments/revolution.

Voltage/frequency characteristic

The asynchronous motor follows a load-dependent voltage/frequency characteristic in VFC operating mode. It is possible to achieve full motor torque down to minimum speeds because the motor model is continuously calculated. This characteristic curve is set by entering the rated motor voltage and the rated frequency of the motor in the startup function. The setting determines the speed-dependent torque and power characteristics of the asynchronous motor.

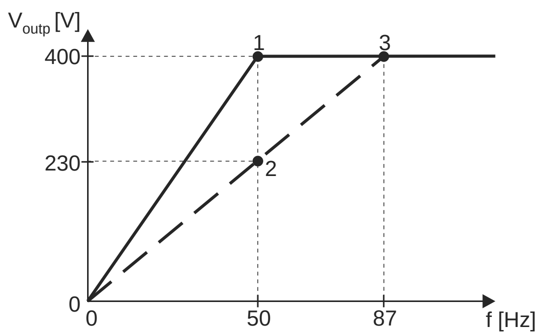


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Figure 74: Voltage/frequency characteristics of the asynchronous motor

Sample asynchronous motor 230/400 V, 50 Hz

1 Star connection; 400 V, 50 Hz
2 Delta connection: 230 V, 50 Hz
3 Delta connection: 400 V, 87 Hz

The inverter output voltage V_A is limited by the supply voltage which is connected. The 'nominal system voltage' input value in the startup function limits the effective value of the maximum output voltage. This restriction is used whenever the connected motor has a lower design voltage than the power supply of the inverter. The maximum permitted motor voltage should be entered. Furthermore, make sure that the 'nominal system voltage' input value is less than or equal to the supply voltage of the inverter.

Speed/torque characteristics

The field weakening range starts when the set maximum output voltage of the inverter is reached. As the speed increases, the motor generates:

- constant torque with increasing power in the basic speed range,
- constant power with an inversely proportionate decrease in torque in the field weakening range.

When determining the maximum speed in the field weakening range, note that the rated torque M_N (in relation to the rated speed, e.g. n_N = 1500 rpm) falls in inverse proportion and the breakdown torque M_K is reduced in an inverse quadratic relationship. The M_K/M_N ratio is a motor-specific parameter. The MOVIDRIVE® pull-out protection limits the speed when the maximum possible torque is reached.

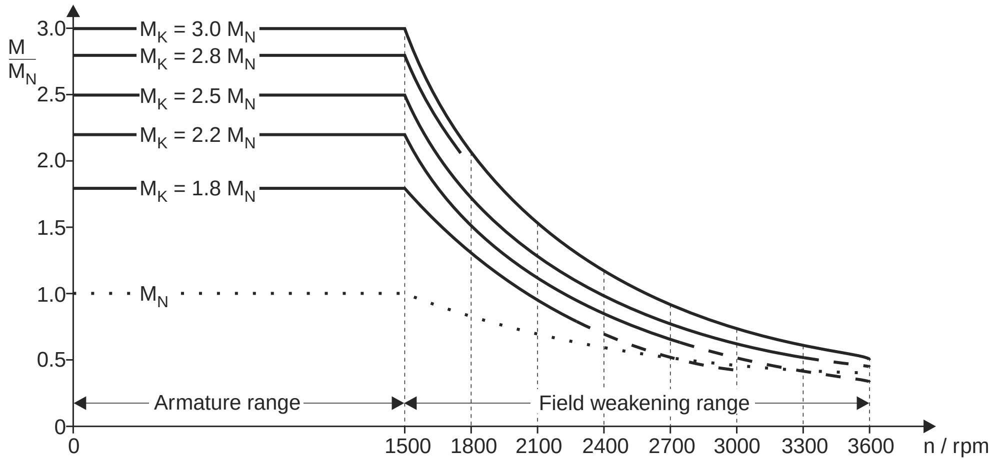

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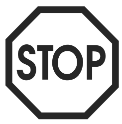
Figure 75: Quadratically falling breakdown torque

With geared motors, the maximum motor speed is dependent on the size and mounting position of the gear unit. The speed should not exceed 3000 rpm due to the resulting noise and oil churning losses.

Dynamic applications ($P_{inverter}$ greater than P_{motor})

- The startup function sets the current limit of the inverter (P303/P313) to 150 % of the rated motor current. The value of the current limit refers to the rated inverter current. As a result, 150 % of the rated motor current is less than 150 % of the rated inverter current (value of P303/P313). This parameter must be set to a higher value manually for dynamic applications.
- The startup function sets the slip compensation parameter (P324/P334) to the nominal slip of the motor. In the case of VFC-n-CONTROL, the internal slip limiting function allows the slip to reach max. 150 % of this setting. Consequently, the motor develops at most 150 % of the nominal motor torque. The slip compensation parameter (P324) must be increased accordingly for greater torques.



Set parameter P324 'Slip compensation' to **max. 130 % of the nominal slip of the motor** for **stable operation**.

Combinations with $P_{inverter}$ greater than 4 × P_{motor}

The large difference between the rated inverter current and the rated motor current means that these combinations cannot be started up without taking special measures:

- Project planning for connecting the motor in a delta connection. This means the motor current is increased by a factor $\sqrt{3}$ and the unfavorable ratio is reduced.
- The motor must be started up in VFC & GROUP operating mode if this measure does not suffice. In this operating mode, the inverter operates without slip compensation and simulates a constant-voltage constant-frequency system (system with a constant U/f ratio).

Motor selection in delta/star topology (230/400 V_{AC} / 50 Hz)

Motors for 380 V_{AC} / 60 Hz can also be allocated on the basis of this selection table.

P_{max} [kW (HP)] for operation on MOVIDRIVE® *compact* MCF/MCV/MCH 4_A...-5_3 (400/500 V units)											
Connection			⅄ / 400 V_{AC} 1)						Δ / 230 V_{AC} 2)		
Cooling			Self-cooling			Forced			Self-cooling		Forced
f_{min}...f_{max} [Hz]			10 - 50 6 - 60 5 - 70 / 5.5 - 80			≤ 2.5 - 50 / ≤ 3 - 60 3)			9 - 87		≤ 2.5 - 87 3)
n_{min}...n_{max} [rpm]			300 - 1500 180 - 1800 150 - 2100 / 165 - 2400			≤ 75 - 1500 / ≤ 90 - 1800			270 - 2610		≤ 75 - 2610
Setting range			1:5 1:10 1:15			≥ 1:20			1:10		≥ 1:20
Motor type	**Rated power P_n [kW (HP)]**		**P = $P_{reduced}$** [kW (HP)]		**With MCF/ MCV/MCH 5) 4_A...-5_3**	**P = P_n** [kW (HP)]		**With MCF/ MCV/MCH 5) 4_A...-5_3**	**P = $P_{increased}$ 4)** [kW (HP)]		**With MCF/ MCV/MCH 5) 4_A...-5_3**
DT71D4	**0.37**	**(0.5)**	0.25	(0.33)	**0015**	0.37	(0.5)	**0015**	0.55	(0.75)	**0015**
DT80K4	**0.55**	**(0.75)**	0.37	(0.5)		0.55	(0.75)		0.75	(1.0)	
DT80N4	**0.75**	**(1.0)**	0.55	(0.75)		0.75	(1.0)		1.1	(1.5)	
DT90S4	**1.1**	**(1.5)**	0.75	(1.0)		1.1	(1.5)		1.5	(2.0)	
DT90L4	**1.5**	**(2.0)**	1.1	(1.5)		1.5	(2.0)		2.2	(3.0)	**0022**
DV100M4	**2.2**	**(3.0)**	1.5	(2.0)		2.2	(3.0)	**0022**	3.0	(4.0)	**0030**
DV100L4	**3.0**	**(4.0)**	2.2	(3.0)	**0022**	3.0	(4.0)	**0030**	4.0	(5.4)	**0040**
DV112M4	**4.0**	**(5.4)**	3.0	(4.0)	**0030**	4.0	(5.4)	**0040**	5.5	(7.5)	**0055**
DV132S4	**5.5**	**(7.5)**	4.0	(5.4)	**0040**	5.5	(7.5)	**0055**	7.5	(10)	**0075**
DV132M4	**7.5**	**(10)**	5.5	(7.5)	**0055**	7.5	(10)	**0075**	9.2	(12.5)	**0110**
DV132ML4	**9.2**	**(12.5)**	7.5	(10)	**0075**	9.2	(12.5)	**0110**	11	(15)	
DV160M4	**11**	**(15)**	9.2	(12.5)	**0110**	11	(15)		15	(20)	**0150**
DV160L4	**15**	**(20)**	11	(15)		15	(20)	**0150**	18.5	(25)	**0220**
DV180M4	**18.5**	**(25)**	15	(20)	**0150**	18.5	(25)	**0220**	22	(30)	**0300**
DV180L4	**22**	**(30)**	18.5	(25)	**0220**	22	(30)		30	(40)	**0370**
DV200L4	**30**	**(40)**	22	(30)		30	(40)	**0300**	37	(50)	
DV225S4	**37**	**(50)**	30	(40)	**0300**	37	(50)	**0370**	45	(60)	**0450**
DV225M4	**45**	**(60)**	37	(50)	**0370**	45	(60)	**0450**	55	(75)	**0550**
DV250M4	**55**	**(75)**	45	(60)	**0450**	55	(75)	**0550**	75	(100)	**0750**
DV280S4	**75**	**(100)**	55	(75)	**0550**	75	(100)	**0750**	-		
D280M4	**90**	**(120)**	75	(100)	**0750**	-					

1) Also applies to motors with rated voltage 460 V or 500 V and to 400 V / 690 V motors with Δ connection.

2) Also applies to motors with rated voltage 266 V or 290 V.

3) The following applies to MCF, MCV and MCH without speed control: f_{min} = 0.5 Hz

4) $P_{increased}$ means that the motor is operated at the power of the next larger motor (1 frame size), rather than with the $\sqrt{3}$-fold power.

5) The devices listed here permit intermittent loads of up to 1.5 times the nominal load in the specific application. With variable torque load and constant load without overload, each inverter can also be operated with an increased continuous output power (→ Sec. Technical Data). The continuous output current of 125 % of the rated unit current is only available at f_{PWM} = 4 kHz in the VFC operating modes.

Examples for motor selection delta/star topology 230/400 V

Trolley drive

Constant load with overload (acceleration) and low load when in motion:

- P_{travel} = 1.3 kW
- P_{max} = 13 kW
- n_{min} = 270 rpm, setting range 1:10
- n_{max} = 2610 rpm

In inverter mode with adapted power ($P = P_n$), the motor output can be 150 % of its listed power during the acceleration phase. Consequently:

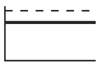
$P_{Mot} = P_{max}$: 1.5 = 13 kW : 1.5 = 8.67 kW

A DV132M4 with delta connection (P_n = 9.2 kW) is selected.

The selection table (→ page 158) allocates a MOVIDRIVE® *compact* MCF60A0110 ($P = P_n$).

5

Hoist drive



High constant load with intermittent overload (acceleration):

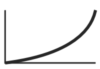
- P_{max} = 26 kW
- $P_{sustained}$ = 20 kW
- Speed range 1:15, low speed only for positioning
- Brake applied when stationary
- Load type S3 (40 % c.d.f.)

The inverter output can be 150 % of its rated current during acceleration. Consequently, a MOVIDRIVE® *compact* MCF60A0220 is selected.

In view of the load type (S3, 40 % c.d.f.), the selection table allocates motor type DV180L4 (P_n = 22 kW) in a star connection.

→ Sec. Project planning for hoists on page page 155 for more information.

Fan/ pump



Variable torque load with the following power values:

- P_{max} = 4.8 kW
- n_{max} = 1400 rpm, continuous duty with n_{max}

The motor can be operated at its listed power ($P = P_n$) even without forced cooling due to the quadratically falling torque. This means the DV132S4 motor type with star connection (P_n = 5.5 kW) is adequate.

The selection table allocates a MOVIDRIVE® *compact* MCF60A0055 ($P = P_n$). However, the inverter can be operated with an increased output power because this case involves a variable torque load without overload. Consequently, a MOVIDRIVE® *compact* MCF60A0040 is sufficient.

Motor selection in double-star/star topology (230/460 V_{AC} / 60 Hz)

P_{max} [kW (HP)] for operation on MOVIDRIVE® *compact* MCF/MCV/MCH 4_A...-5_3 (400/500 V units)											
Connection			⅄ / 460 V_{AC}						⅄⅄ / 230 V_{AC}		
Cooling			Self-cooling			Self-cooling		Forced	Self-cooling		Forced
f_{min}...f_{max} [Hz]			6 - 90			10 - 60		0 - 60[1)]	10 - 120		0 - 120[1)]
n_{min}...n_{max} [rpm]			180 - 2700			200 - 1800		0 - 1800	200 - 3600		0 - 3600
Setting range			1:15			1:6		≥ 1:15	1:12		≥ 1:20
			P = $P_{reduced}$			**P = P_n**			**P = $P_{increased}$[2)]**		
Motor type	**Rated power P_n [kW (HP)]**		**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-5_3**	**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-5_3**	**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-5_3**
DT71D4	**0.37**	**(0.5)**	0.25	(0.33)	**0015**	0.37	(0.5)	**0015**	0.75	(1.0)	**0015**
DT80K4	**0.55**	**(0.75)**	0.37	(0.5)		0.55	(0.75)		1.1	(1.5)	
DT80N4	**0.75**	**(1.0)**	0.55	(0.75)		0.75	(1.0)		1.5	(2.0)	
DT90S4	**1.1**	**(1.5)**	0.75	(1.0)		1.1	(1.5)		2.2	(3.0)	**0022**
DT90L4	**1.5**	**(2.0)**	1.1	(1.5)		1.5	(2.0)		3.0	(4.0)	**0030**
DV100M4	**2.2**	**(3.0)**	1.5	(2.0)		2.2	(3.0)	**0022**	4.0	(5.4)	**0040**
DV100L4	**3.7**	**(5.0)**	2.2	(3.0)	**0022**	3.0	(4.0)	**0030**	5.5	(7.5)	**0055**
DV112M4	**4.0**	**(5.4)**	3.0	(4.0)	**0030**	4.0	(5.4)	**0040**	7.5	(10)	**0075**
DV132S4	**5.5**	**(7.5)**	4.0	(5.4)	**0040**	5.5	(7.5)	**0055**	9.2	(12.5)	**0110**
DV132M4	**7.5**	**(10)**	5.5	(7.5)	**0055**	7.5	(10)	**0075**	11	(15)	
DV132ML4	**9.2**	**(12.5)**	7.5	(10)	**0075**	9.2	(12.5)	**0110**	15	(20)	**0150**
DV160M4	**11**	**(15)**	9.2	(12.5)	**0110**	11	(15)		18.5	(25)	**0220**
DV160L4	**15**	**(20)**	11	(15)		15	(20)	**0150**	22	(30)	
DV180M4	**18.5**	**(25)**	15	(20)	**0150**	18.5	(25)	**0220**	30	(40)	**0300**
DV180L4	**22**	**(30)**	18.5	(25)	**0220**	22	(30)		37	(50)	**0370**
DV200L4	**30**	**(40)**	22	(30)		30	(40)	**0300**	45	(60)	**0450**
DV225S4	**37**	**(50)**	30	(40)	**0300**	37	(50)	**0370**	55	(75)	**0550**
DV225M4	**45**	**(60)**	37	(50)	**0370**	45	(60)	**0450**	75	(100)	**0750**
DV250M4	**55**	**(75)**	45	(60)	**0450**	55	(75)	**0550**	-		
DV280S4	**75**	**(100)**	55	(75)	**0550**	75	(100)	**0750**			
D280M4	**90**	**(120)**	75	(100)	**0750**	-					

1) The following applies to MCF, MCV and MCH without speed control: f_{min} = 0.5 Hz

2) $P_{increased}$ means that the motor is operated at the power of the next larger motor (1 frame size), rather than with the $\sqrt{3}$-fold power.

3) The devices listed here permit intermittent loads of up to 1.5 times the nominal load in the specific application. With variable torque load and constant load without overload, each inverter can also be operated with an increased continuous output power (→ Sec. Technical Data). The continuous output current of 125 % of the rated unit current is only available at f_{PWM} = 4 kHz in the VFC operating modes.

Motor selection with the delta topology (230 V_{AC} / 50 Hz)

P_{max} [kW (HP)] for operation on MOVIDRIVE® *compact* MCF/MCV/MCH 4_A...-2_3 (230 V units)								
Connection			Δ / 230 V_{AC}					
Cooling			Self-cooling			Forced		
$f_{min}...f_{max}$ [Hz]			10 - 50 6 - 60 5 - 70 / 5.5 - 80			≤ 2.5 - 50 / ≤ 3 - 60[1)]		
$n_{min}...n_{max}$ [rpm]			300 - 1500 180 - 1800 150 - 2100 / 165 - 2400			≤ 75 - 1500 / ≤ 90 - 1800		
Setting range			1:5 1:10 1:15			≥ 1:20		
			P = $P_{reduced}$			**P = P_n**		
Motor type[2)]	**Rated power P_n [kW (HP)]**		**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-2_3**	**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-2_3**
DT71D4	**0.37**	**(0.5)**	0.25	(0.33)	**0015**	0.37	(0.5)	**0015**
DT80K4	**0.55**	**(0.75)**	0.37	(0.5)		0.55	(0.75)	
DT80N4	**0.75**	**(1.0)**	0.55	(0.75)		0.75	(1.0)	
DT90S4	**1.1**	**(1.5)**	0.75	(1.0)		1.1	(1.5)	
DT90L4	**1.5**	**(2.0)**	1.1	(1.5)		1.5	(2.0)	
DV100M4	**2.2**	**(3.0)**	1.5	(2.0)		2.2	(3.0)	**0022**
DV100L4	**3.0**	**(4.0)**	2.2	(3.0)	**0022**	3.0	(4.0)	**0030**
DV112M4	**4.0**	**(5.4)**	3.0	(4.0)	**0030**	4.0	(5.4)	**0040**
DV132S4	**5.5**	**(7.5)**	4.0	(5.4)	**0040**	5.5	(7.5)	**0055**
DV132M4	**7.5**	**(10)**	5.5	(7.5)	**0055**	7.5	(10)	**0075**
DV132ML4	**9.2**	**(12.5)**	7.5	(10)	**0075**	9.2	(12.5)	**0110**
DV160M4	**11**	**(15)**	9.2	(12.5)	**0110**	11	(15)	
DV160L4	**15**	**(20)**	11	(15)		15	(20)	**0150**
DV180M4	**18.5**	**(25)**	15	(20)	**0150**	18.5	(25)	**0220**
DV180L4	**22**	**(30)**	18.5	(25)	**0220**	22	(30)	**0300**
DV200L4	**30**	**(40)**	22	(30)		30	(40)	
DV225S4	**37**	**(50)**	30	(40)	**0300**	-		

1) The following applies to MCF, MCV and MCH without speed control: f_{min} = 0.5 Hz

2) In load type S3 (40 % c.d.f.), the motor must not be operated at its listed power (P = P_n) even without forced-cooling. Example: P_{stat} = 2 kW, P_{dyn} = 2.5 kW → selected motor DV100M4 (P_n = 2.2 kW).

3) The devices listed here permit intermittent loads of up to 1.5 times the nominal load in the specific application. With variable torque load and constant load without overload, each inverter can also be operated with an increased continuous output power (→ Sec. Technical Data). The continuous output current of 125 % of the rated unit current is only available at f_{PWM} = 4 kHz in the VFC operating modes.

Motor selection with the double-star topology (230 V_{AC} / 60 Hz)

P_{max} [kW (HP)] for operation on MOVIDRIVE® *compact* MCF/MCV/MCH 4_A...-2_3 (230 V units)								
Connection			⅄⅄ / 230 V_{AC}					
Cooling			Self-cooling			Self-cooling		Forced
f_{min}...f_{max} [Hz]			6 - 90			10 - 60		0 - 60[1)]
n_{min}...n_{max} [rpm]			180 - 2700			200 - 1800		0 - 1800
Setting range			1:15			1:6		≥ 1:15
			P = $P_{reduced}$			**P = P_n**		
Motor type	**Rated power P_n [kW (HP)]**		**[kW (HP)]**		**With MCF/ MCV/MCH[2)] 4_A...-2_3**	**[kW (HP)]**		**With MCF/ MCV/MCH[3)] 4_A...-2_3**
DT71D4	**0.37**	**(0.5)**	0.25	(0.33)	**0015**	0.37	(0.5)	**0015**
DT80K4	**0.55**	**(0.75)**	0.37	(0.5)		0.55	(0.75)	
DT80N4	**0.75**	**(1.0)**	0.55	(0.75)		0.75	(1.0)	
DT90S4	**1.1**	**(1.5)**	0.75	(1.0)		1.1	(1.5)	
DT90L4	**1.5**	**(2.0)**	1.1	(1.5)		1.5	(2.0)	
DV100M4	**2.2**	**(3.0)**	1.5	(2.0)		2.2	(3.0)	**0022**
DV100L4	**3.7**	**(5.0)**	2.2	(3.0)	**0022**	3.0	(4.0)	**0030**
DV112M4	**4.0**	**(5.4)**	3.0	(4.0)	**0030**	4.0	(5.4)	**0040**
DV132S4	**5.5**	**(7.5)**	4.0	(5.4)	**0040**	5.5	(7.5)	**0055**
DV132M4	**7.5**	**(10)**	5.5	(7.5)	**0055**	7.5	(10)	**0075**
DV132ML4	**9.2**	**(12.5)**	7.5	(10)	**0075**	9.2	(12.5)	**0110**
DV160M4	**11**	**(15)**	9.2	(12.5)	**0110**	11	(15)	
DV160L4	**15**	**(20)**	11	(15)		15	(20)	**0150**
DV180M4	**18.5**	**(25)**	15	(20)	**0150**	18.5	(25)	**0300**
DV180L4	**22**	**(30)**	18.5	(25)	**0220**	22	(30)	**0370**
DV200L4	**30**	**(40)**	22	(30)		30	(40)	
DV225S4	**37**	**(50)**	30	(40)	**0300**	-		

1) The following applies to MCF, MCV and MCH without speed control: f_{min} = 0.5 Hz

2) The devices listed here permit intermittent loads of up to 1.5 times the nominal load in the specific application. With variable torque load and constant load without overload, each inverter can also be operated with an increased continuous output power (→ Sec. Technical Data). The continuous output current of 125 % of the rated unit current is only available at f_{PWM} = 4 kHz in the VFC operating modes.

5.5 Motor selection for asynchronous servomotors (CFC)

STOP

The torque limit (M limit) is set automatically by the startup function of the MOVITOOLS software package. Do not alter this automatically set value!

We recommend always using the latest version of MOVITOOLS (2.70 or later) for startup. The latest MOVITOOLS version can be downloaded from our homepage (www.sew-eurodrive.de).

Motor characteristics

The drive in CFC operating modes is characterized by its ability to control torque directly and rapidly. This means it achieves a high level of dynamic overload capacity (up to 3 × M_N) and a very high speed and control range (up to 1:5000). Smooth running at speed and positioning accuracy fulfill the exacting requirements of servo systems. This behavior is achieved by the field-oriented control function. The current components for magnetization (I_d) and torque generation (I_q) are controlled separately. A feature of the CFC operating modes is that there must always be an encoder on the motor.

The inverter needs exact data about the connected motor in order to calculate the motor model. These data are made available by the MOVITOOLS software with the startup function. CFC operating modes are only possible with 4-pole SEW-motors (CT/CV or DT/DV/D), not with the other SEW motors or non-SEW motors. The necessary motor data for the CFC operating modes are stored in MOVIDRIVE® for the 4-pole SEW motors.

Typical speed-torque characteristic

M_N is determined by the motor. M_{max} and $n_{transition}$ depend on the motor/inverter combination. You can refer to the motor selection tables for CFC mode for the values of $n_{transition}$, M_N and M_{max}.

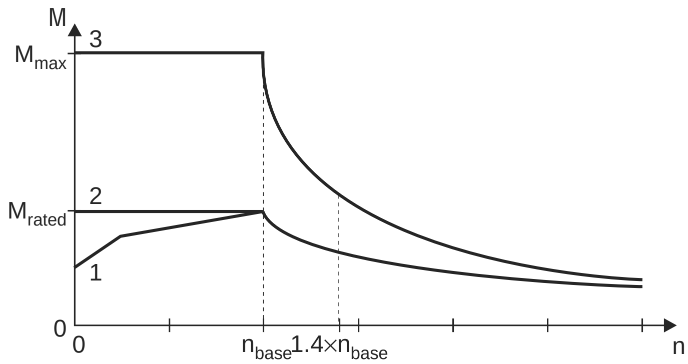


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Figure 76: Speed/torque characteristic curve in CFC operating mode

1 With integrated cooling
2 With forced cooling
3 Maximum torque

Magnetization current

Dynamic drives which are supposed to accelerate without a time lag are also energized when at a standstill without load. This means the magnetization current I_d is flowing. The inverter must be able to supply this current constantly in applications in which the output stage is permanently enabled, e.g. in CFC & M-CONTROL mode. In particular in the case of large motors with a slip frequency ≤ 2 Hz, you must refer to the diagrams in Sec. 'Load capacity of the units at low output frequencies' (→ page 192) to check whether the inverter can supply the current. Also check whether the thermal characteristics of the motor are suitable for this mode of operation (forced cooling fan). Refer to the motor tables (CT/CV → page 167, DT/DV/D → page 172) for the magnetization current I_d.

Basic recommendations

CFC operating modes are only possible with SEW-motors (CT/CV or DT/DV/D series), not with non-SEW motors. The necessary motor data for the CFC operating modes are stored in MOVIDRIVE® for the SEW motors.

Speed is the correcting variable in the CFC modes with speed control. Torque is the correcting variable in the CFC modes with torque control (CFC & M-CONTROL).

CFC mode with speed control

There is no reason to differentiate between quadratic, dynamic and static load types when configuring a system for CFC mode. Project planning for an asynchronous motor in CFC mode is undertaken in accordance with the following requirements:

1. Effective torque demand at the average speed of the application.

   $M_{r.m.s.} < M_{n\_mot}$

   The point must lie below the characteristic curve for the continuous torque (Figure 76, curve 2). No forced cooling is required if this operating point lies below the characteristic curve for forced cooling (Figure 76, curve 1).

2. Maximum torque required across the speed characteristic.

   $M_{max} < M_{dyn\_mot}$

   This operating point must lie below the characteristic curve for the maximum torque of the motor-MOVIDRIVE® combination (Figure 76, curve 3).

3. Maximum speed

   The maximum speed of the motor should not be configured higher than 1.4 times the transition speed. The maximum torque available will then still be approx. 100 % of the rated continuous torque of the motor; the input speed for the gear unit connected to the motor output will still be less than 3000 rpm with delta connection.

   $n_{max} < 1.4 \times n_{transition} < 3000$ rpm

Motor cooling

Self-cooling of asynchronous motors is based on the integrated fan, and consequently depends on the speed. The integrated fan does not provide any cooling at low speeds and when the motor is stopped. Forced cooling may be required in case of a high static load or a high effective torque.

CFC mode with torque control (CFC & M-CONTROL)

This operating mode permits direct torque control of the asynchronous motor in the basic speed range ($n \leq n_{transition}$). The setpoint sources of the speed controlled CFC mode can also be used for torque control. All speed setpoint sources are interpreted as current setpoint sources. The settings for evaluating the analog input (→ P11_, parameter description) also remain in effect. The fixed setpoints (P16_, P17_) can be entered either in the unit [rpm] or [$\%I_{N\_inverter}$] (→ MOVITOOLS).

The following relationship applies between the units:

3000 rpm = 150 % rated inverter current

The torque on the output shaft can then be calculated for the basic speed range ($n \leq n_{transition}$) using the following formulae:

Specification of a setpoint for the motor torque in $\%I_{n\_inverter}$:

$$M = k_T \times I_{n\_inverter} \times Setpoint$$

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Specification of a setpoint for the motor torque in rpm:

$$M = k_T \times 1.5 \times I_{n\_inverter} \times \frac{Setpoint}{3000\ rpm}$$

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$I_{n\_inverter}$	= Rated output current of the inverter
k_T	= Torque constant = M_n / I_{q_n}
	M_n and I_{q_n} are motor-specific parameters. Refer to the motor tables (DT/DV/D → page 172, CT/CV → page 167) for the values of the torque constants k_T and the motor-specific parameters M_n and I_{q_n}.

In addition to the current I_q for creating the torque, the inverter also needs to supply the magnetization current I_d. The inverter output current I_{tot} which actually flows can be calculated using the following formulae:

Specification of a setpoint for the motor torque in $\%I_{n\_inverter}$:

$$I_{tot} = \sqrt{\left(Setpoint \times I_{n\_inverter}\right)^2 + I_{d\_N}^2}$$

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Specification of a setpoint for the motor torque in rpm:

$$I_{tot} = \sqrt{\left(Setpoint \times 1.5 \times I_{n\_inverter} \times \frac{1}{3000\ rpm}\right)^2 + I_{d\_N}^2}$$

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I_{q_n}	= Nominal value for the current which generates the torque, according to the motor table
I_{d_n}	= Nominal value for the magnetization current, according to the motor table

CT/CV asynchronous servomotors

SEW offers series CT/CV asynchronous servomotors especially for operation with MOVIDRIVE® *compact* in the CFC operating modes. These motors have the following characteristics:

High power yield

The optimum winding of CT/CV motors permits a high power yield.

Organization into speed categories

CT/CV motors are supplied in four speed categories. This ensures optimum utilization of torque and speed.

With sin/cos encoder as standard

As standard, CT/CV motors are equipped with a high-resolution sin/cos encoder (ES1S, ES2S, EV1S).

As standard, with TF or TH motor protection

The winding temperature of the three motor phases is monitored using thermistor sensors (TF). The thermistor sensor can be connected to the TF/TH input of MOVIDRIVE® *compact*. Thermal monitoring is then undertaken by MOVIDRIVE® *compact*; no additional monitoring unit is required.

Bimetallic switches (TH) can also be used instead of thermistor sensors. The bimetallic switches are also connected to the TF/TH input.

Thermal classification F as standard

As standard, CT/CV motors are built using thermal classification F materials. The maximum permitted temperature rise is therefore 105 K.

Reinforced pinion spigot

CT/CV motors can generate up to three times their rated motor torque during dynamic operation. For this reason, these motors are fitted with reinforced pinion spigots for direct mounting to gear units. These spigots enable these motors to transmit the high torque levels reliably.

Either DT/DV/D motors or CT/CV motors can be used in CFC mode. SEW recommends using CT/CV motors in order to achieve optimum benefit from the advantages of CFC mode.

<table>
<tr><th></th><th>Advantage</th><th>Disadvantage</th></tr>
<tr><td rowspan="4">CFC mode with DT/DV/D motor
Motor selection → page 175</td><td rowspan="4">Standard version of motor</td><td>Slower transition speed than the CT/CV motor.</td></tr>
<tr><td>The power yield of the motor is less than the rated motor power.</td></tr>
<tr><td>In terms of the power yield, the mass inertia is greater than the CT/CV motors.</td></tr>
<tr><td>In some inverter/motor combinations, the maximum torque is limited by the mechanical strength.</td></tr>
<tr><td rowspan="4">CFC mode with CT/CV motor
Motor selection → page 168</td><td>Faster transition speed than DT/DV/D motor.</td><td rowspan="2">Not an IEC standard motor</td></tr>
<tr><td>Usually with a power yield one level higher.</td></tr>
<tr><td>Lower mass inertia in relation to the power yield.</td><td rowspan="2">Higher current consumption due to the higher power yield, therefore a larger inverter must be assigned.</td></tr>
<tr><td>Motor is designed for dynamic operation.</td></tr>
</table>

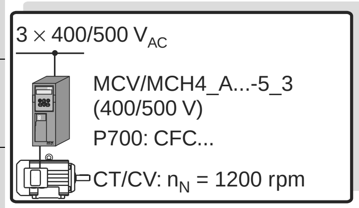
Motor table CT/CV

n_N [rpm]	Motor	M_N [Nm]	I_N [A]	I_{q_n} [A]	I_{d_n} [A]	k_T [A]	U_N [V]	J_{mot} [10^{-4} kgm^2]	J_{Bmot} [10^{-4} kgm^2]
1200	CT80N4	5	2.0	1.52	1.30	2.50	350	8.7	9.6
	CT90L4	10	3.5	2.95	1.89	2.86	345	34	39.5
	CV100M4	15	4.7	4.13	2.25	3.19	345	53	59
	CV100L4	26	8.9	8.30	3.21	2.92	310	65	71
	CV132S4	37	11.1	9.99	4.83	3.33	340	146	158
	CV132M4	50	15.5	14.2	6.18	3.23	340	280	324
	CV132ML4	61	17.6	16.0	7.43	3.47	345	330	374
	CV160M4	73	22.5	20.3	9.73	3.24	335	400	440
	CV160L4	95	29	25.3	14.2	3.28	330	925	1030
	CV180M4	110	34	27.7	19.7	3.24	330	1120	1226
	CV180L4	125	35	28.4	20.5	3.57	345	1290	1396
	CV200L4	200	58	52.9	23.7	3.45	330	2340	2475
1700	CT80N4	5	2.8	2.15	1.79	2.33	350	8.7	9.6
	CT90L4	10	4.8	4.03	2.61	2.48	345	34	39.5
	CV100M4	15	6.5	5.71	3.10	2.63	345	53	59
	CV100L4	26	13.6	12.9	4.41	2.02	315	65	71
	CV132S4	37	15.2	13.7	6.67	2.70	340	146	158
	CV132M4	48	20.8	18.9	8.70	2.54	335	280	324
	CV132ML4	58	24.4	21.7	11.2	2.67	320	330	374
	CV160M4	71	29.8	26.6	13.4	2.67	340	400	440
	CV160L4	89	37.5	32.0	19.5	2.78	330	925	1030
	CV180M4	105	44.5	35.2	27.2	2.98	335	1120	1226
	CV180L4	115	48.5	37.5	30.7	3.07	325	1290	1396
	CV200L4	190	77	69.4	33.4	2.74	330	2340	2475
2100	CT71D4	2.5	2.0	1.60	1.20	1.56	340	4.6	5.5
	CT80N4	5	3.5	2.67	2.26	1.87	340	8.7	9.6
	CT90L4	10	6.1	5.14	3.29	1.95	335	34	39.5
	CV100M4	15	8.1	7.09	3.91	2.12	335	53	59
	CV100L4	25	14.8	13.7	5.56	1.82	305	65	71
	CV132S4	37	19.2	17.3	8.41	2.14	335	146	158
	CV132M4	48	26	23.7	10.7	2.03	335	280	324
	CV132ML4	58	29	26.0	12.9	2.23	340	330	374
	CV160M4	70	37	33.9	16.9	2.13	330	400	440
	CV160L4	88	46	38.9	24.6	2.26	330	925	1030
	CV180M4	100	53	40.5	34.2	2.47	330	1120	1226
	CV180L4	115	56	43.4	35.4	2.65	345	1290	1396
	CV200L4	175	88	77.8	41.2	2.25	325	2340	2475
3000	CT71D4	2.4	2.6	2.01	1.65	1.19	345	4.6	5.5
	CT80N4	4.5	4.3	2.97	3.11	1.52	350	8.7	9.6
	CT90L4	9.5	7.9	6.47	4.54	1.47	345	34	39.5
	CV100M4	15	11.3	9.93	5.39	1.51	345	53	59
	CV100L4	21	17.0	15.2	7.65	1.38	310	65	71
	CV132S4	35	25.0	22.1	11.6	1.58	340	146	158
	CV132M4	45	34	30.5	15.1	1.48	335	280	324
	CV132ML4	52	38	32.7	19.3	1.59	320	330	374
	CV160M4	64	47	40.8	23.3	1.57	345	400	440
	CV160L4	85	62	51.9	33.9	1.64	335	925	1030
	CV180M4	93	68	49.0	47.2	1.90	340	1120	1226
	CV180L4	110	81	61.2	53.1	1.80	325	1290	1396
	CV200L4	145	102	84.0	57.8	1.73	330	2340	2475

CT/CV motor selection

CT/CV motors in the four speed categories are designed for operation with 400/500 V units. Please contact SEW concerning operation with 230 V units.

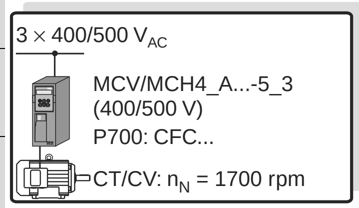
1. Rated speed n_N = 1200 rpm:



Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CT80N4	M_{max} [Nm]	15.6													
	([lb.in])	(138)													
	$n_{transition}$ [rpm]	540													
CT90L4	M_{max} [Nm]	18.2	25.7	30.5											
	([lb.in])	(160)	(227)	(270)											
	$n_{transition}$ [rpm]	928	781	685											
CV100M4	M_{max} [Nm]		29.0	37.0	45.0										
	([lb.in])		(256)	(327)	(398)										
	$n_{transition}$ [rpm]		883	781	680										
CV100L4	M_{max} [Nm]			32.6	45.3	60.0	75.0								
	([lb.in])			(288)	(400)	(530)	(663)								
	$n_{transition}$ [rpm]			1062	947	813	675								
CV132S4	M_{max} [Nm]					64.0	84.0	110							
	([lb.in])					(565)	(743)	(972)							
	$n_{transition}$ [rpm]					992	915	1175							
CV132M4	M_{max} [Nm]						82.0	125	150						
	([lb.in])						(725)	(1105)	(1326)						
	$n_{transition}$ [rpm]						1011	877	770						
CV132ML4	M_{max} [Nm]							126	169	183					
	([lb.in])							(1114)	(1495)	(1617)					
	$n_{transition}$ [rpm]							922	819	725					
CV160M4	M_{max} [Nm]							125	169	219					
	([lb.in])							(1105)	(1495)	(1936)					
	$n_{transition}$ [rpm]							986	909	840					
CV160L4	M_{max} [Nm]								163	240	294				
	([lb.in])								(1440)	(2121)	(2600)				
	$n_{transition}$ [rpm]								1043	954	1240				
CV180M4	M_{max} [Nm]									241	320	360			
	([lb.in])									(2130)	(2828)	(3183)			
	$n_{transition}$ [rpm]									1050	986	1005			
CV180L4	M_{max} [Nm]									231	308	360			
	([lb.in])									(2042)	(2723)	(3183)			
	$n_{transition}$ [rpm]									1018	973	980			
CV200L4	M_{max} [Nm]										326	402	494	567	
	([lb.in])										(2882)	(3554)	(4367)	(5013)	
	$n_{transition}$ [rpm]										1011	986	947	940	

2. *Rated speed n_N = 1700 rpm:*

Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CT80N4	M_{max} [Nm]	12.6	15.6												
	([lb.in])	(111)	(138)												
	$n_{transition}$[rpm]	1150	980												
CT90L4	M_{max} [Nm]		18.0	23.5	30.5										
	([lb.in])		(159)	(208)	(270)										
	$n_{transition}$[rpm]		1400	1280	1150										
CV100M4	M_{max} [Nm]			25.7	36.0	45.0									
	([lb.in])			(227)	(318)	(398)									
	$n_{transition}$[rpm]			1402	1274	1150									
CV100L4	M_{max} [Nm]				32.9	44.2	57.0	75.0							
	([lb.in])				(290)	(390)	(504)	(663)							
	$n_{transition}$[rpm]				1510	1402	1274	1090							
CV132S4	M_{max} [Nm]						59.0	91.0	110						
	([lb.in])						(522)	(805)	(972)						
	$n_{transition}$[rpm]						1470	1330	1280						
CV132M4	M_{max} [Nm]							89.0	121	150					
	([lb.in])							(787)	(1070)	(1326)					
	$n_{transition}$[rpm]							1440	1330	1250					
CV132ML4	M_{max} [Nm]							83.0	114	166	183				
	([lb.in])							(734)	(1008)	(1468)	(1618)				
	$n_{transition}$[rpm]							1562	1485	1331	1325				
CV160M4	M_{max} [Nm]								120	176	219				
	([lb.in])								(1060)	(1555)	(1936)				
	$n_{transition}$[rpm]								1420	1310	1250				
CV160L4	M_{max} [Nm]									170	226	277	294		
	([lb.in])									(1503)	(2000)	(2450)	(2600)		
	$n_{transition}$[rpm]									1470	1400	1330	1380		
CV180M4	M_{max} [Nm]									168	226	280	345	360	
	([lb.in])									(1485)	(2000)	(2475)	(3050)	(3183)	
	$n_{transition}$[rpm]									1550	1510	1460	1400	1490	
CV180L4	M_{max} [Nm]										217	269	332	360	
	([lb.in])										(1918)	(2378)	(2935)	(3183)	
	$n_{transition}$[rpm]										1450	1420	1370	1420	
CV200L4	M_{max} [Nm]												353	420	524
	([lb.in])												(3120)	(3713)	(4632)
	$n_{transition}$[rpm]												1421	1395	1344



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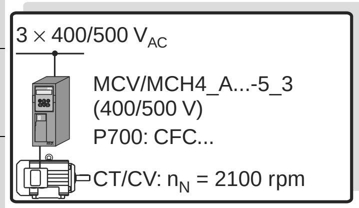
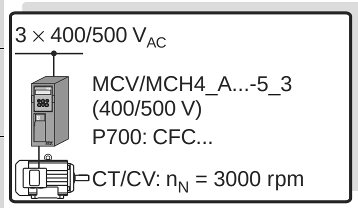
3. Rated speed n_N = 2100 rpm:

Motor			MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
			0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CT71D4	M_{max}	[Nm]	7.7													
		([lb.in])	(68)													
	$n_{transition}$	[rpm]	1280													
CT80N4	M_{max}	[Nm]	9.7	13.8	15.6											
		([lb.in])	(86)	(122)	(138)											
	$n_{transition}$	[rpm]	1754	1510	1400											
CT90L4	M_{max}	[Nm]			18.3	25.5	30.5									
		([lb.in])			(162)	(225)	(270)									
	$n_{transition}$	[rpm]			1843	1677	1625									
CV100M4	M_{max}	[Nm]				28.0	38.1	45.0								
		([lb.in])				(248)	(337)	(398)								
	$n_{transition}$	[rpm]				1760	1626	1550								
CV100L4	M_{max}	[Nm]					33.7	44.0	67.0	75.0						
		([lb.in])					(298)	(390)	(592)	(663)						
	$n_{transition}$	[rpm]					2003	1894	1645	1550						
CV132S4	M_{max}	[Nm]							72.0	97.0	110					
		([lb.in])							(637)	(858)	(972)					
	$n_{transition}$	[rpm]							1850	1722	1730					
CV132M4	M_{max}	[Nm]								95.0	138	150				
		([lb.in])								(840)	(1220)	(1326)				
	$n_{transition}$	[rpm]								1850	1670	1670				
CV132ML4	M_{max}	[Nm]									139	183				
		([lb.in])									(1230)	(1618)				
	$n_{transition}$	[rpm]									1715	1574				
CV160M4	M_{max}	[Nm]									138	183	219			
		([lb.in])									(1220)	(1618)	(1936)			
	$n_{transition}$	[rpm]									1792	1690	1625			
CV160L4	M_{max}	[Nm]										177	218	268	294	
		([lb.in])										(1565)	(1927)	(2370)	(2600)	
	$n_{transition}$	[rpm]										1882	1824	1740	1760	
CV180M4	M_{max}	[Nm]											218	270	322	360
		([lb.in])											(1927)	(2387)	(2847)	(3183)
	$n_{transition}$	[rpm]											1939	1894	1836	1930
CV180L4	M_{max}	[Nm]												260	310	360
		([lb.in])												(2300)	(2740)	(3183)
	$n_{transition}$	[rpm]												1824	1786	1840
CV200L4	M_{max}	[Nm]													329	412
		([lb.in])													(2910)	(3642)
	$n_{transition}$	[rpm]													1830	1792



4. Rated speed n_N = 3000 rpm:

Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CT71D4	M_{max} [Nm] ([lb.in])	6.6 (58)	7.7 (68)												
	$n_{transition}$ [rpm]	2280	2080												
CT80N4	M_{max} [Nm] ([lb.in])		9.7 (86)	12.7 (112)	15.5 (137)										
	$n_{transition}$ [rpm]		2560	2350	2200										
CT90L4	M_{max} [Nm] ([lb.in])			12.7 (112)	18.0 (160)	24.0 (212)	30.5 (270)								
	$n_{transition}$ [rpm]			2790	2650	2490	2360								
CV100M4	M_{max} [Nm] ([lb.in])					26.5 (235)	34.6 (305)	45.0 (398)							
	$n_{transition}$ [rpm]					2620	2490	2425							
CV100L4	M_{max} [Nm] ([lb.in])						31.8 (281)	49.0 (433)	66.0 (583)	75.0 (663)					
	$n_{transition}$ [rpm]						2800	2600	2380	2290					
CV132S4	M_{max} [Nm] ([lb.in])							51.0 (450)	69.0 (610)	101 (893)	110 (972)				
	$n_{transition}$ [rpm]							2740	2650	2455	2580				
CV132M4	M_{max} [Nm] ([lb.in])								67.0 (592)	99.0 (875)	131 (1158)	150 (1326)			
	$n_{transition}$ [rpm]								2750	2600	2450	2400			
CV132ML4	M_{max} [Nm] ([lb.in])									94.0 (830)	124 (1096)	152 (1343)	183 (1618)		
	$n_{transition}$ [rpm]									2765	2656	2547	2400		
CV160M4	M_{max} [Nm] ([lb.in])									98.0 (866)	131 (1158)	161 (1423)	198 (1750)	219 (1936)	
	$n_{transition}$ [rpm]									2630	2550	2470	2370	2380	
CV160L4	M_{max} [Nm] ([lb.in])										124 (1096)	155 (1370)	192 (1697)	228 (2015)	286 (2528)
	$n_{transition}$ [rpm]										2720	2680	2620	2545	2440
CV180M4	M_{max} [Nm] ([lb.in])											150 (1326)	191 (1690)	228 (2015)	289 (2555)
	$n_{transition}$ [rpm]											2790	2745	2700	2635
CV180L4	M_{max} [Nm] ([lb.in])												182 (1610)	220 (1945)	276 (2440)
	$n_{transition}$ [rpm]												2620	2580	2540
CV200L4	M_{max} [Nm] ([lb.in])														293 (2590)
	$n_{transition}$ [rpm]														2573



DT/DV/D motor tables

Characteristic values for delta/star 230/400 V / 50 Hz

Motor	M_N [Nm (lb.in)]	Mass moment of inertia J_M [10^{-4} kgm^2 (10^{-3} lb.ft^2)] Without brake	With brake	Star ⅄ (400 V) I_n [A]	I_{q_n} 1) [A]	I_{d_n} 1) [A]	k_T 1) [Nm/A]	Delta Δ (230 V) I_n [A]	I_{q_n} 1) [A]	I_{d_n} 1) [A]	k_T 1) [Nm/A]
DT71D4	2.6 (23)	4.6 (10.4)	5.5 (12.5)	-	-	-	-	2.15	1.82	1.14	1.43
DT80K4	3.9 (34)	6.6 (15.6)	7.5 (17.7)	-	-	-	-	3.03	2.53	1.67	1.54
DT80N4	5.2 (46)	8.7 (20.7)	9.6 (22.8)	2.15	1.72	1.29	3.02	3.72	2.99	2.21	1.74
DT90S4	7.5 (66)	25 (59.4)	31 (72.2)	2.80	2.39	1.46	3.13	4.85	4.17	2.48	1.80
DT90L4	10.2 (90)	34 (78.9)	40 (93.6)	3.7	3.18	1.89	3.21	6.41	5.51	3.28	1.85
DV100M4	15.0 (133)	42 (101)	48 (114)	4.95	4.37	2.32	3.43	8.57	7.57	4.02	1.98
DV100L4	20.5 (181)	53 (126)	59 (139)	6.7	5.89	3.19	3.48	11.6	10.2	5.52	2.01
DV112M4	26.9 (238)	98 (233)	110 (262)	8.7	7.85	3.75	3.43	15.2	13.6	6.79	1.98
DV132S4	36.7 (324)	146 (416)	158 (445)	11.4	10.3	4.89	3.56	19.8	17.9	8.46	2.05
DV132M4	50.1 (443)	280 (655)	330 (769)	15.5	14.2	6.21	3.53	27.0	24.6	11.1	2.04
DV132ML4	61.0 (539)	330 (769)	380 (887)	18.7	17.1	7.57	3.57	32.5	29.6	13.4	2.06
DV160M4	72.9 (644)	398 (945)	448 (1049)	22.5	20.3	9.70	3.59	39.0	35.1	17.0	2.08
DV160L4	98.1 (867)	925 (2197)	1060 (2449)	31.0	27.6	14.1	3.55	54.0	47.8	25.1	2.05
DV180M4	121 (1070)	1120 (2660)	1255/1520 2) (2912/3164 2))	38.5	33.1	19.7	3.66	67.0	57.3	34.7	2.11
DV180L4	143 (1264)	1290 (3064)	1425/1520 2) (3316/3567 2))	46.0	40.7	21.4	3.51	80.0	70.4	38.0	2.03
DV200L4	195 (1724)	2340 (5558)	2475/2570 2) (5809/6061 2))	57.0	51.8	23.8	3.76	99.0	89.8	41.7	2.17
DV225S4	240 (2122)	3010 (7149)	3145/3240 2) (7400/7652 2))	70.0	64.5	27.2	3.72	122	112	48.4	2.14
DV225M4	292 (2581)	3570 (8479)	3705/3800 2) (8730/8982 2))	86.0	77.6	37.1	3.76	149	134	65.2	2.18
DV250M4	356 (3147)	6300 (14950)	6600/6730 2) (15550/ 15908 2))	102	91.7	44.7	3.88	-	-	-	-
DV280S4	483 (4270)	8925 (21180)	9225/9355 2) (21737/ 22112 2))	142	124	68.9	3.90	-	-	-	-
D280M4	580 (5127)	14500 (34409)	3)	155	147	49.2	3.95	-	-	-	-

1) Applies in the basic speed range up to $n_{transition}$.

2) Double disk brake

3) On request

Characteristic values for double-star/star 230/460 V / 60 Hz

(according to MG1, NEMA design B up to DT80K4, NEMA design C up to DT80N4)

Motor	Mass moment of inertia J_M		Star ⅄ (460 V)					Double-star ⅄⅄ (230 V)				
	Without brake	With brake	M_N at 1000 rpm	I_n	I_{q_n} 1)	I_{d_n} 1)	k_T 1)	M_N at 2400 rpm	I_n	I_{q_n} 1)	I_{d_n} 1)	k_T 1)
	[10^{-4} kgm^2 (10^{-3} lb.ft^2)]		[Nm (lb.in)]	[A]	[A]	[A]	[Nm/A (lb.in/A)]	[Nm (lb.in)]	[A]	[A]	[A]	[Nm/A (lb.in/A)]
DT71D4	4.6 (10.4)	5.5 (12.5)	2.60 (23.0)	1.15	0.95	0.65	2.74 (24.2)	2.60 (23.0)	2.30	1.90	1.30	1.37 (12.1)
DT80K4	6.6 (15.6)	7.5 (17.7)	3.90 (34.5)	1.67	1.35	0.98	2.89 (27.3)	3.90 (34.5)	3.34	2.70	1.96	1.44 (12.8)
DT80N4	8.7 (20.7)	9.6 (22.8)	5.20 (46.0)	2.11	1.72	1.22	3.03 (26.8)	5.20 (46.0)	4.21	3.44	2.44	1.51 (13.4)
DT90S4	25 (59.4)	31 (72.2)	7.50 (66.3)	2.94	2.33	1.80	3.21 (28.4)	7.50 (66.3)	5.89	4.66	3.60	1.61 (14.2)
DT90L4	34 (78.9)	40 (93.6)	10.2 (90.2)	3.57	3.06	1.84	3.35 (29.6)	10.2 (90.2)	7.13	6.11	3.68	1.67 (14.8)
DT100LS4	42 (101)	48 (114)	15.0 (133)	5.00	4.47	2.25	3.34 (29.5)	15.0 (133)	10.1	9.00	4.50	1.66 (14.7)
DT100L4	53 (126)	59 (139)	20.5 (181)	7.92	7.32	3.02	3.45 (30.5)	20.5 (181)	15.8	14.6	6.05	1.72 (15.2)
DV112M4	98 (233)	110 (262)	26.9 (238)	8.20	7.47	3.37	3.60 (31.8)	26.9 (238)	16.4	14.9	6.74	1.80 (15.9)
DV132S4	146 (416)	158 (445)	36.7 (324)	11.0	10.3	3.77	3.55 (31.4)	36.7 (324)	22.0	20.7	7.54	1.78 (15.7)
DV132M4	280 (655)	330 (769)	50.0 (442)	15.9	14.3	6.87	3.46 (30.5)	50.1 (443)	31.8	28.7	13.7	1.77 (15.3)
DV132ML4	330 (769)	380 (887)	61.0 (539)	18.6	16.9	7.69	3.61 (31.7)	61.0 (539)	37.2	33.9	15.4	1.80 (15.8)
DV160M4	398 (945)	448 (1049)	71.0 (628)	22.7	20.4	9.93	3.47 (30.7)	71.0 (628)	45.4	40.8	19.9	1.74 (15.4)
DV160L4	925 (2197)	1060 (2449)	96.0 (849)	30.7	27.4	13.7	3.51 (31.0)	96.0 (849)	61.3	54.8	27.5	1.75 (15.5)
DV180M4	1120 (2660)	1255/1520 2) (2912/3164 2))	120 (1060)	36.5	33.6	14.3	3.57 (31.6)	120 (1060)	72.9	67.1	28.6	1.79 (15.8)
DV180L4	1290 (3064)	1425/1520 2) (3316/3567 2))	130 (1150)	42.7	37.6	20.2	3.46 (30.6)	130 (1150)	85.4	75.1	40.5	1.73 (15.3)
DV200L4	2340 (5558)	2475/2570 2) (5809/6061 2))	190 (1680)	54.6	52.1	16.2	3.65 (32.3)	190 (1680)	109	104	32.5	1.82 (16.2)
DV225S4	3010 (7149)	3145/3240 2) (7400/7652 2))	235 (2078)	67.9	64.5	21.0	3.64 (32.3)	235 (2078)	136	129	42.0	1.83 (16.2)
DV225M4	3570 (8479)	3705/3800 2) (8730/8982 2))	280 (2475)	78.8	74.1	27.0	3.78 (33.5)	260 (2300)	148	138	54.0	1.89 (16.8)
D250M4	7300 (17323)	3)	356 (3147)	102	95.6	36.4	3.73 (33.0)	-	-	-	-	-
D280S4	12000 (28476)	3)	483 (4270)	135	128	45.2	3.77 (33.3)	-	-	-	-	-
D280M4	14500 (34409)	3)	580 (5128)	162	153	51.7	3.79 (33.5)	-	-	-	-	-

1) Applies in the basic speed range up to $n_{transition}$.

2) Double disk brake

3) On request

Characteristic values for JEC motors

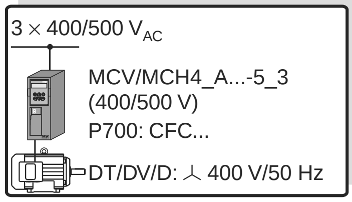
Motor	M_N	Mass moment of inertia J_M		400 V / 60 Hz 440 V / 60 Hz 400 V / 50 Hz				200 V / 60 Hz 220 V / 60 Hz 200 V / 50 Hz			
		Without brake	With brake	I_n	I_{q_n}[1]	I_{d_n}[1]	k_T[1]	I_n	I_{q_n}[1]	I_{d_n}[1]	k_T[1]
	[Nm (lb.in)]	[10^{-4} kgm^2 (10^{-3} lb.ft^2)]		[A]	[A]	[A]	[Nm/A (lb.in/A)]	[A]	[A]	[A]	[Nm/A (lb.in/A)]
DT80K4	2.71 (24)	6.55 (15.5)	7.45 (17.7)	1.35 (⅄)	0.96	0.95	2.82 (24.9)	2.70 (⅄⅄)	1.92	1.90	1.41 (12.5)
DT80N4	4.97 (44)	8.7 (20.6)	9.6 (22.8)	2.20 (⅄)	1.72	1.37	2.88 (25.5)	4.40 (⅄⅄)	3.45	2.73	1.44 (12.7)
DT90L4	10.0 (88)	34 (80.7)	39.4 (93.5)	3.85 (⅄)	3.29	2.00	3.04 (26.9)	7.70 (⅄⅄)	6.58	3.99	1.52 (13.4)
DV100M4	14.9 (131)	53 (126)	58.4 (139)	4.70 (⅄)	4.13	2.25	3.60 (31.8)	9.40 (⅄⅄)	8.25	4.50	1.80 (15.9)
DV112M4	24.4 (215)	98 (233)	110.2 (262)	8.50 (⅄)	7.55	3.93	3.24 (28.6)	17.0 (⅄⅄)	15.1	7.85	1.62 (14.3)
DV132S4	36.7 (324)	146 (346)	158.0 (375)	12.0 (Δ)	10.9	5.10	3.38 (29.9)	24.0 (ΔΔ)	21.7	10.2	1.69 (14.9)
DV132M4	48.8 (431)	280 (664)	323.7 (768)	16.0 (Δ)	14.6	6.50	3.34 (29.5)	32.0 (ΔΔ)	29.2	13.0	1.67 (14.8)
DV160M4	70.4 (622)	398 (944)	441.7 (1048)	23.0 (Δ)	20.6	10.3	3.42 (30.2)	46.0 (ΔΔ)	41.2	20.5	1.71 (15.1)
DV160L4	96.6 (854)	925 (2195)	1031 (2447)	32.3 (Δ)	28.6	14.9	3.38 (29.9)	64.5 (ΔΔ)	57.2	29.8	1.69 (14.9)
DV180M4	120 (1060)	1120 (2658)	1226/1332[2] (2909/3160[2])	40.5 (Δ)	34.8	20.7	3.46 (30.6)	81.0 (ΔΔ)	69.6	41.4	1.73 (15.3)
DV180L4	140 (1237)	1290 (3060)	1396/1502[2] (3313/3564[2])	47.8 (Δ)	42.0	22.7	3.34 (29.5)	95.5 (ΔΔ)	84.1	45.3	1.67 (14.8)
DV200L4	194 (1714)	2340 (5553)	2446/2552[2] (5804/6056[2])	60.0 (Δ)	54.5	24.9	3.56 (31.5)	120 (ΔΔ)	109	49.9	1.78 (15.7)
DV225S4	234 (2068)	3010 (7143)	3116/3222[2] (7394/7645[2])	72.0 (Δ)	66.0	28.7	3.54 (31.3)	144 (ΔΔ)	132	57.3	1.77 (15.6)
DV225M4	284 (2510)	3570 (8472)	3676/3782[2] (8723/8975[2])	88.5 (Δ)	79.5	38.9	3.58 (31.6)	177 (ΔΔ)	159	77.9	1.79 (15.8)

1) Applies in the basic speed range up to $n_{transition}$.

2) Double disk brake

DT/DV/D motor selection with the delta/star topology (230/400 V_{AC} / 50 Hz)

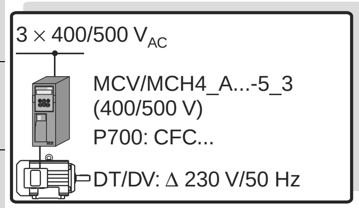
1. Star connection ⅄ 400 V / 50 Hz or 400/690 V / 50 Hz motors in Δ connection:



Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
⅄ 400 V / 50 Hz		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
DT80N4	M_{max} [Nm] ([lb.in])	9.3 (82)													
	$n_{transition}$ [rpm]	908													
DT90S4	M_{max} [Nm] ([lb.in])	13.5 (120)	13.5 (120)												
	$n_{transition}$ [rpm]	1011	1011												
DT90L4	M_{max} [Nm] ([lb.in])	18.2 (161)	18.3 (162)	18.3 (162)											
	$n_{transition}$ [rpm]	928	1049	1056											
DV100M4	M_{max} [Nm] ([lb.in])		26.8 (236)	26.8 (236)	26.8 (236)										
	$n_{transition}$ [rpm]		940	1043	1056										
DV100L4	M_{max} [Nm] ([lb.in])			36.8 (325)	36.8 (325)	36.8 (325)									
	$n_{transition}$ [rpm]			889	1004	1011									
DV112M4	M_{max} [Nm] ([lb.in])				47.1 (416)	48.4 (427)	48.4 (427)								
	$n_{transition}$ [rpm]				915	1030	1062								
DV132S4	M_{max} [Nm] ([lb.in])					64.4 (569)	66.1 (584)	66.1 (584)							
	$n_{transition}$ [rpm]					992	1132	1196							
DV132M4	M_{max} [Nm] ([lb.in])						81.7 (722)	90.2 (797)	90.2 (797)						
	$n_{transition}$ [rpm]						1011	1145	1152						
DV132ML4	M_{max} [Nm] ([lb.in])							110 (972)	110 (972)						
	$n_{transition}$ [rpm]							1043	1132						
DV160M4	M_{max} [Nm] ([lb.in])							124 (1096)	131 (1157)	131 (1157)					
	$n_{transition}$ [rpm]							986	1132	1196					
DV160L4	M_{max} [Nm] ([lb.in])								163 (1440)	177 (1565)	177 (1565)				
	$n_{transition}$ [rpm]								1043	1248	1312				
DV180M4	M_{max} [Nm] ([lb.in])									217 (1917)	217 (1917)	217 (1917)			
	$n_{transition}$ [rpm]									1164	1395	1465			
DV180L4	M_{max} [Nm] ([lb.in])									230 (2033)	258 (2280)	258 (2280)	258 (2280)		
	$n_{transition}$ [rpm]									1017	1152	1299	1369		
DV200L4	M_{max} [Nm] ([lb.in])										325 (2873)	351 (3100)	351 (3100)	351 (3100)	
	$n_{transition}$ [rpm]										1011	1126	1299	1420	
DV225S4	M_{max} [Nm] ([lb.in])											395 (3490)	433 (3826)	433 (3826)	433 (3826)
	$n_{transition}$ [rpm]											947	1030	1164	1312
DV225M4	M_{max} [Nm] ([lb.in])												482 (4260)	526 (4648)	526 (4648)
	$n_{transition}$ [rpm]												1030	1100	1299
DV250M4	M_{max} [Nm] ([lb.in])													587 (5188)	641 (5665)
	$n_{transition}$ [rpm]													1017	1133
DV280S4	M_{max} [Nm] ([lb.in])														711 (6283)
	$n_{transition}$ [rpm]														1075
D280M4	M_{max} [Nm] ([lb.in])														745 (6583)
	$n_{transition}$ [rpm]														1107

Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

2. *Delta connection Δ 230 V / 50 Hz:*

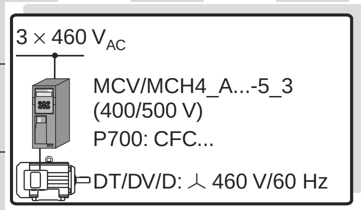


Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
Δ 230 V / 50 Hz		**0015**	**0022**	**0030**	**0040**	**0055**	**0075**	**0110**	**0150**	**0220**	**0300**	**0370**	**0450**	**0550**	**0750**
DT71D4	M_{max} [Nm]	4.6													
	([lb.in])	(40.5)													
	$n_{transition}$ [rpm]	1958													
DT80K4	M_{max} [Nm]	6.9	6.9												
	([lb.in])	(61)	(61)												
	$n_{transition}$ [rpm]	1849	1868												
DT80N4	M_{max} [Nm]	9.3	9.3	9.3											
	([lb.in])	(82)	(82)	(82)											
	$n_{transition}$ [rpm]	1817	2054	2054											
DT90S4	M_{max} [Nm]		13.5	13.5	13.5										
	([lb.in])		(120)	(120)	(120)										
	$n_{transition}$ [rpm]		1971	2246	2304										
DT90L4	M_{max} [Nm]			18.3	18.3	18.3									
	([lb.in])			(162)	(162)	(162)									
	$n_{transition}$ [rpm]			1843	2240	2329									
DV100M4	M_{max} [Nm]				26.8	26.8	26.8								
	([lb.in])				(236)	(236)	(236)								
	$n_{transition}$ [rpm]				1862	2214	2297								
DV100L4	M_{max} [Nm]					36.8	36.8	36.8							
	([lb.in])					(325)	(325)	(325)							
	$n_{transition}$ [rpm]					1779	2080	2188							
DV112M4	M_{max} [Nm]						45.5	48.4	48.4						
	([lb.in])						(402)	(427)	(427)						
	$n_{transition}$ [rpm]						1779	2163	2195						
DV132S4	M_{max} [Nm]							66.1	66.1	66.1					
	([lb.in])							(584)	(584)	(584)					
	$n_{transition}$ [rpm]							1996	2374	2444					
DV132M4	M_{max} [Nm]								90.2	90.2					
	([lb.in])								(797)	(797)					
	$n_{transition}$ [rpm]								1939	2310					
DV132ML4	M_{max} [Nm]									110	110				
	([lb.in])									(972)	(972)				
	$n_{transition}$ [rpm]									2105	2246				
DV160M4	M_{max} [Nm]									131	131	131			
	([lb.in])									(1157)	(1157)	(1157)			
	$n_{transition}$ [rpm]									1894	2246	2348			
DV160L4	M_{max}[Nm]										177	177	177	177	
	([lb.in])										(1565)	(1565)	(1565)	(2496)	
	$n_{transition}$ [rpm]										1881	2208	2451	2496	
DV180M4	M_{max} [Nm]											217	217	217	217
	([lb.in])											(1917)	(1917)	(1917)	(1917)
	$n_{transition}$ [rpm]											1952	2336	2611	2809
DV180L4	M_{max} [Nm]												258	258	258
	([lb.in])												(2280)	(2280)	(2280)
	$n_{transition}$ [rpm]												1836	2131	2457
DV200L4	M_{max} [Nm]													329	351
	([lb.in])													(2908)	(3100)
	$n_{transition}$ [rpm]													1830	2092
DV225S4	M_{max} [Nm]														405
	([lb.in])														(3580)
	$n_{transition}$ [rpm]														1708

Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

DT/DV/D motor selection with the double-star/star topology (230/460 V_{AC} / 60 Hz)

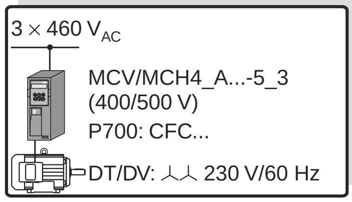
1. Star connection ⅄ 460 V / 60 Hz:



Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
⅄ 460 V / 60 Hz		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
DT80N4	M_{max} [Nm] ([lb.in])	9.3 (82)													
	$n_{transition}$ [rpm]	1145													
DT90S4	M_{max} [Nm] ([lb.in])	13.5 (120)													
	$n_{transition}$ [rpm]	1312													
DT90L4	M_{max} [Nm] ([lb.in])	18.3 (162)	18.3 (162)												
	$n_{transition}$ [rpm]	1152	1318												
DT100LS4	M_{max} [Nm] ([lb.in])		26.5 (234)	27.0 (238)											
	$n_{transition}$ [rpm]		1100	1222											
DT100L4	M_{max} [Nm] ([lb.in])			28.2 (250)	36.8 (325)	36.8 (325)									
	$n_{transition}$ [rpm]			1171	1075	1120									
DV112M4	M_{max} [Nm] ([lb.in])			35.8 (316)	48.4 (427)	48.4 (427)									
	$n_{transition}$ [rpm]			1196	1139	1312									
DV132S4	M_{max} [Nm] ([lb.in])				48.7 (430)	65.1 (575)	66.1 (584)								
	$n_{transition}$ [rpm]				1068	992	1100								
DV132M4	M_{max} [Nm] ([lb.in])						80.0 (705)	90.2 (797)							
	$n_{transition}$ [rpm]						1088	1222							
DV132ML4	M_{max} [Nm] ([lb.in])							110 (972)	110 (972)						
	$n_{transition}$ [rpm]							1196	1299						
DV160M4	M_{max} [Nm] ([lb.in])							120.3 (1062)	131 (1157)	131 (1157)					
	$n_{transition}$ [rpm]							1132	1260	1318					
DV160L4	M_{max} [Nm] ([lb.in])								161 (1422)	177 (1565)					
	$n_{transition}$ [rpm]								1158	1370					
DV180M4	M_{max} [Nm] ([lb.in])								164 (1448)	217 (1917)	217 (1917)				
	$n_{transition}$ [rpm]								1140	1177	1350				
DV180L4	M_{max} [Nm] ([lb.in])									228 (2015)	258 (2280)	258 (2280)			
	$n_{transition}$ [rpm]									1081	1196	1324			
DV200L4	M_{max} [Nm] ([lb.in])										323 (2845)	351 (3100)	351 (3100)		
	$n_{transition}$ [rpm]										1024	1107	1248		
DV225S4	M_{max} [Nm] ([lb.in])										318 (2815)	391 (3456)	433 (3826)	433 (3826)	
	$n_{transition}$ [rpm]										1100	1075	1145	1286	
DV225M4	M_{max} [Nm] ([lb.in])											401 (3542)	494 (4364)	526 (4648)	526 (4648)
	$n_{transition}$ [rpm]											1081	1056	1139	1324
D250M4	M_{max} [Nm] ([lb.in])													570 (5040)	640 (5656)
	$n_{transition}$ [rpm]													1300	1395
D280S4	M_{max} [Nm] ([lb.in])														717 (6335)
	$n_{transition}$ [rpm]														1345
D280M4	M_{max} [Nm] ([lb.in])														712 (6290)
	$n_{transition}$ [rpm]														1337

Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

2. *Double-star connection ⅄⅄ 230 V / 60 Hz:*



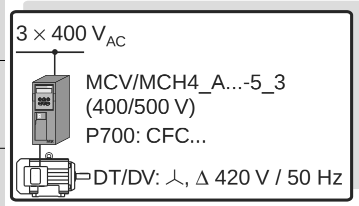
Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
⅄⅄ 230 V / 60 Hz		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
DT71D4	M_{max} [Nm]	4.6													
	([lb.in])	(40.5)													
	$n_{transition}$ [rpm]	2988													
DT80K4	M_{max} [Nm]	7.0	7.0												
	([lb.in])	(62)	(62)												
	$n_{transition}$ [rpm]	2688	2822												
DT80N4	M_{max} [Nm]	8.3	9.3	9.3											
	([lb.in])	(73)	(82)	(82)											
	$n_{transition}$ [rpm]	2585	2873	2969											
DT90S4	M_{max} [Nm]		11.9	13.5	13.5										
	([lb.in])		(105)	(120)	(120)										
	$n_{transition}$ [rpm]		2636	2931	3462										
DT90L4	M_{max} [Nm]			16.4	18.3	18.3									
	([lb.in])			(145)	(162)	(162)									
	$n_{transition}$ [rpm]			2604	3014	3353									
DT100LS4	M_{max} [Nm]				22.5	27.0	27.0								
	([lb.in])				(200)	(238)	(238)								
	$n_{transition}$ [rpm]				2592	2732	3104								
DT100L4	M_{max} [Nm]						32.5	36.8							
	([lb.in])						(287)	(325)							
	$n_{transition}$ [rpm]						2592	2912							
DV112M4	M_{max} [Nm]						41.4	48.4							
	([lb.in])						(365)	(427)							
	$n_{transition}$ [rpm]						2534	2988							
DV132S4	M_{max} [Nm]							62.4	66.1						
	([lb.in])							(550)	(585)						
	$n_{transition}$ [rpm]							2233	2572						
DV132M4	M_{max} [Nm]								80.0	90.2					
	([lb.in])								(705)	(797)					
	$n_{transition}$ [rpm]								2348	2707					
DV132ML4	M_{max} [Nm]									110	110				
	([lb.in])									(972)	(972)				
	$n_{transition}$ [rpm]									2566	2944				
DV160M4	M_{max} [Nm]									115	131	131			
	([lb.in])									(1015)	(1157)	(1157)			
	$n_{transition}$ [rpm]									2451	2688	2963			
DV160L4	M_{max} [Nm]										150	177	177		
	([lb.in])										(1325)	(1565)	(1565)		
	$n_{transition}$ [rpm]										2457	2512	2918		
DV180M4	M_{max}[Nm]											189	217	217	217
	([lb.in])											(1670)	(1917)	(1917)	(1917)
	$n_{transition}$ [rpm]											2355	2457	2771	3040
DV180L4	M_{max} [Nm]												220	258	258
	([lb.in])												(1943)	(2280)	(2280)
	$n_{transition}$ [rpm]												2284	2291	2720
DV200L4	M_{max} [Nm]													281	350
	([lb.in])													(2482)	(3092)
	$n_{transition}$ [rpm]													2208	2163
DV225S4	M_{max} [Nm]														346
	([lb.in])														(3056)
	$n_{transition}$ [rpm]														2291
DV225M4	M_{max} [Nm]														354
	([lb.in])														(3127)
	$n_{transition}$ [rpm]														2278

Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

DT/DV/D motor selection with the double-star/star or double-delta/delta topology (200/400 V_{AC} / 50 Hz)

1. Star connection ⅄ or delta connection Δ 400 V / 50 Hz:

Motor ⅄, Δ 400 V / 50 Hz[1]		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700) 0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
DT80K4	M_{max} [Nm]	6.9													
	([lb.in])	(61)													
	$n_{transition}$ [rpm]	748													
DT80N4	M_{max} [Nm]	9.3													
	([lb.in])	(82)													
	$n_{transition}$ [rpm]	985													
DT90L4	M_{max} [Nm]	17.2	18.3	18.3											
	([lb.in])	(152)	(162)	(162)											
	$n_{transition}$ [rpm]	1011	1120	1145											
DV100M4	M_{max} [Nm]		26.8	26.8	26.8										
	([lb.in])		(236)	(236)	(236)										
	$n_{transition}$ [rpm]		940	1043	1056										
DV112M4	M_{max} [Nm]				44.5	48.4	48.4								
	([lb.in])				(393)	(427)	(427)								
	$n_{transition}$ [rpm]				992	1088	1145								
DV132S4	M_{max} [Nm]					61.0	66.1	66.1							
	([lb.in])					(540)	(584)	(584)							
	$n_{transition}$ [rpm]					1068	1177	1280							
DV132M4	M_{max} [Nm]						77.3	90.2	90.2						
	([lb.in])						(683)	(797)	(797)						
	$n_{transition}$ [rpm]						1088	1210	1228						
DV160M4	M_{max} [Nm]							118	131	131					
	([lb.in])							(1042)	(1157)	(1157)					
	$n_{transition}$ [rpm]							1056	1177	1273					
DV160L4	M_{max} [Nm]								154	177	177				
	([lb.in])								(1363)	(1565)	(1565)				
	$n_{transition}$ [rpm]								1113	1292	1401				
DV180M4	M_{max}[Nm]									217	217	217			
	([lb.in])									(1917)	(1917)	(1917)			
	$n_{transition}$ [rpm]									1177	1440	1561			
DV180L4	M_{max} [Nm]									218	258	258	258		
	([lb.in])									(1930)	(2280)	(2280)	(2280)		
	$n_{transition}$ [rpm]									1088	1177	1344	1452		
DV200L4	M_{max} [Nm]										308	351	351	351	
	([lb.in])										(2730)	(3100)	(3100)	(3100)	
	$n_{transition}$ [rpm]										1075	1139	1331	1472	
DV225S4	M_{max} [Nm]											374	433	433	433
	([lb.in])											(3307)	(3826)	(3826)	(3826)
	$n_{transition}$ [rpm]											1004	1043	1190	1363
DV225M4	M_{max} [Nm]												456	526	526
	([lb.in])												(4037)	(4648)	(4648)
	$n_{transition}$ [rpm]												1094	1113	1324

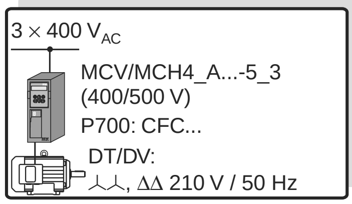


Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

1) The values also apply to 400 V / 60 Hz and 440 V / 60 Hz.

2. Double-star connection ⅄⅄ or double-delta ΔΔ 200 V / 50 Hz:

Motor		MOVIDRIVE® *compact* MCV/MCH4_A...-5_3 (400/500 V units) in CFC operating modes (P700)													
⅄⅄, ΔΔ 200 V / 50 Hz[1]		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
DT80K4	M_{max} [Nm]	6.9	6.9												
	([lb.in])	(61)	(61)												
	$n_{transition}$ [rpm]	2035	2112												
DT80N4	M_{max} [Nm]		9.3	9.3	9.3										
	([lb.in])		(82)	(82)	(82)										
	$n_{transition}$ [rpm]		2483	2624	2624										
DT90L4	M_{max} [Nm]				18.3	18.3	18.3								
	([lb.in])				(162)	(162)	(162)								
	$n_{transition}$ [rpm]				2521	2924	2963								
DV100M4	M_{max} [Nm]				24.4	26.8	26.8								
	([lb.in])				(215)	(236)	(236)								
	$n_{transition}$ [rpm]				2124	2419	2732								
DV112M4	M_{max} [Nm]							48.4	48.4						
	([lb.in])							(427)	(427)						
	$n_{transition}$ [rpm]							2457	2796						
DV132S4	M_{max} [Nm]							58.3	66.1	66.1					
	([lb.in])							(515)	(585)	(585)					
	$n_{transition}$ [rpm]							2355	2656	3052					
DV132M4	M_{max} [Nm]								77.3	90.2	90.2				
	([lb.in])								(683)	(797)	(797)				
	$n_{transition}$ [rpm]								2361	2688	2886				
DV160M4	M_{max} [Nm]									112	131	131	131		
	([lb.in])									(995)	(1157)	(1157)	(1157)		
	$n_{transition}$ [rpm]									2265	2470	2784	2918		
DV160L4	M_{max} [Nm]											177	177	177	177
	([lb.in])											(1565)	(1565)	(1565)	(1565)
	$n_{transition}$ [rpm]											2316	2726	2995	3084
DV180M4	M_{max} [Nm]												217	217	217
	([lb.in])												(1917)	(1917)	(1917)
	$n_{transition}$ [rpm]												2406	2803	3251
DV180L4	M_{max} [Nm]													252	258
	([lb.in])													(2233)	(2280)
	$n_{transition}$ [rpm]													2240	2662
DV200L4	M_{max} [Nm]														336
	([lb.in])														(2975)
	$n_{transition}$ [rpm]														2233
DV225S4	M_{max} [Nm]														330
	([lb.in])														(2917)
	$n_{transition}$ [rpm]														2112

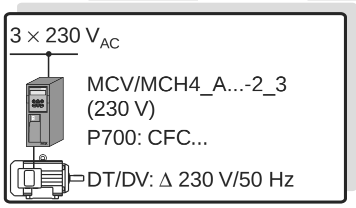


Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

1) The values also apply to 200 V / 60 Hz and 220 V / 60 Hz.

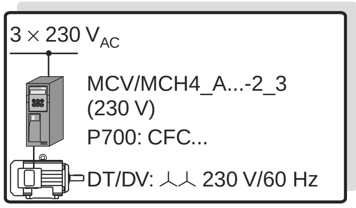
DT/DV motor selection with the delta connection type (230 V_{AC} / 50 Hz)

Motor			MOVIDRIVE® *compact* MCV/MCH4_A...-2_3 (230 V units) in CFC operating modes (P700)								
Δ 230 V / 50 Hz			0015	0022	0037	0055	0075	0110	0150	0220	0300
DT80K4	M_{max}	[Nm] ([lb.in])	6.9 (61)								
	$n_{transition}$	[rpm]	812								
DT80N4	M_{max}	[Nm] ([lb.in])	9.3 (82)								
	$n_{transition}$	[rpm]	908								
DT90S4	M_{max}	[Nm] ([lb.in])	13.5 (120)	13.5 (120)							
	$n_{transition}$	[rpm]	1011	1011							
DT90L4	M_{max}	[Nm] ([lb.in])	18.3 (162)	18.3 (162)	18.3 (162)						
	$n_{transition}$	[rpm]	953	1024	1056						
DV100M4	M_{max}	[Nm] ([lb.in])		25.5 (225)	26.8 (236)						
	$n_{transition}$	[rpm]		921	1056						
DV100L4	M_{max}	[Nm] ([lb.in])			36.8 (325)	36.8 (325)					
	$n_{transition}$	[rpm]			972	1011					
DV112M4	M_{max}	[Nm] ([lb.in])				48.4 (427)	48.4 (427)				
	$n_{transition}$	[rpm]				1036	1062				
DV132S4	M_{max}	[Nm] ([lb.in])				65.3 (577)	66.1 (584)	66.1 (584)			
	$n_{transition}$	[rpm]				992	1152	1196			
DV132M4	M_{max}	[Nm] ([lb.in])					85.4 (755)	90.2 (797)	90.2 (797)		
	$n_{transition}$	[rpm]					998	1152	1152		
DV132ML4	M_{max}	[Nm] ([lb.in])						110 (972)	110 (972)	110 (972)	
	$n_{transition}$	[rpm]						1050	1132	1132	
DV160M4	M_{max}	[Nm] ([lb.in])						126 (1110)	131 (1157)	131 (1157)	
	$n_{transition}$	[rpm]						980	1120	1196	
DV160L4	M_{max}	[Nm] ([lb.in])							158 (1395)	177 (1565)	177 (1565)
	$n_{transition}$	[rpm]							1050	1248	1312
DV180M4	M_{max}	[Nm] ([lb.in])								217 (1917)	217 (1917)
	$n_{transition}$	[rpm]								1165	1325
DV180L4	M_{max}	[Nm] ([lb.in])								231 (2042)	258 (2280)
	$n_{transition}$	[rpm]								1017	1068
DV200L4	M_{max}	[Nm] ([lb.in])									295 (2605)
	$n_{transition}$	[rpm]									1025



Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

DT/DV motor selection with the double-star topology (230 V_{AC} / 60 Hz)



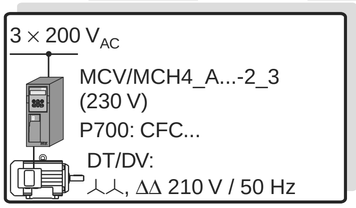
Motor			MOVIDRIVE® *compact* MCV/MCH4_A...-2_3 (230 V units) in CFC operating modes (P700)								
⅄⅄ 230 V / 60 Hz			0015	0022	0037	0055	0075	0110	0150	0220	0300
DT80K4	M_{max}	[Nm] ([lb.in])	7.0 (62)								
	$n_{transition}$	[rpm]	1100								
DT80N4	M_{max}	[Nm] ([lb.in])	9.3 (82)								
	$n_{transition}$	[rpm]	1145								
DT90S4	M_{max}	[Nm] ([lb.in])	13.5 (120)	13.5 (120)							
	$n_{transition}$	[rpm]	1267	1337							
DT90L4	M_{max}	[Nm] ([lb.in])	17.2 (152)	18.3 (162)	18.3 (162)						
	$n_{transition}$	[rpm]	1145	1210	1325						
DT100LS4	M_{max}	[Nm] ([lb.in])		20.1 (178)	27.0 (238)						
	$n_{transition}$	[rpm]		1190	1228						
DT100L4	M_{max}	[Nm] ([lb.in])			29.2 (258)	36.8 (325)	36.8 (325)				
	$n_{transition}$	[rpm]			1158	1113	1120				
DV112M4	M_{max}	[Nm] ([lb.in])			37.2 (328)	48.4 (427)	48.4 (427)				
	$n_{transition}$	[rpm]			1190	1248	1337				
DV132S4	M_{max}	[Nm] ([lb.in])				57.0 (504)	66.1 (585)	66.1 (585)			
	$n_{transition}$	[rpm]				1030	1062	1120			
DV132M4	M_{max}	[Nm] ([lb.in])					71.7 (633)	90.2 (797)	90.2 (797)		
	$n_{transition}$	[rpm]					1113	1165	1222		
DV132ML4	M_{max}	[Nm] ([lb.in])						109 (970)	110 (972)		
	$n_{transition}$	[rpm]						1100	1260		
DV160M4	M_{max}	[Nm] ([lb.in])						104 (920)	131 (1157)	131 (1157)	
	$n_{transition}$	[rpm]						1165	1145	1318	
DV160L4	M_{max}	[Nm] ([lb.in])							133 (1178)	177 (1565)	177 (1565)
	$n_{transition}$	[rpm]							1190	1267	1395
DV180M4	M_{max}	[Nm] ([lb.in])								208 (1840)	217 (1917)
	$n_{transition}$	[rpm]								1100	1203
DV180L4	M_{max}	[Nm] ([lb.in])									236 (2087)
	$n_{transition}$	[rpm]									1075
DV200L4	M_{max}	[Nm] ([lb.in])								210 (1860)	253 (2235)
	$n_{transition}$	[rpm]								1080	1062

Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

DT/DV motor selection with the double-star or double-delta topology (200 V_{AC} / 50 Hz)

Motor			MOVIDRIVE® *compact* MCV/MCH4_A...-2_3 (230 V units) in CFC operating modes (P700)								
⅄⅄, ΔΔ 200 V / 50 Hz[1]			0015	0022	0037	0055	0075	0110	0150	0220	0300
DT80K4	M_{max}	[Nm] ([lb.in])	6.9 (61)								
	$n_{transition}$	[rpm]	748								
DT80N4	M_{max}	[Nm] ([lb.in])	9.3 (82)								
	$n_{transition}$	[rpm]	985								
DT90L4	M_{max}	[Nm] ([lb.in])	15.5 (137)	18.3 (162)	18.3 (162)						
	$n_{transition}$	[rpm]	1049	998	1145						
DV100M4	M_{max}	[Nm] ([lb.in])			26.8 (236)	26.8 (236)					
	$n_{transition}$	[rpm]			1050	1056					
DV112M4	M_{max}	[Nm] ([lb.in])				48.4 (427)	48.4 (427)	48.4 (427)			
	$n_{transition}$	[rpm]				1017	1132	1145			
DV132S4	M_{max}	[Nm] ([lb.in])					66.1 (585)	66.1 (585)			
	$n_{transition}$	[rpm]					1107	1280			
DV132M4	M_{max}	[Nm] ([lb.in])						90.2 (797)	90.2 (797)	90.2 (797)	
	$n_{transition}$	[rpm]						1139	1228	1228	
DV160M4	M_{max}	[Nm] ([lb.in])							131 (1157)	131 (1157)	
	$n_{transition}$	[rpm]							1050	1273	
DV160L4	M_{max}	[Nm] ([lb.in])								177 (1565)	177 (1565)
	$n_{transition}$	[rpm]								1177	1312
DV180M4	M_{max}	[Nm] ([lb.in])								195 (1723)	217 (1917)
	$n_{transition}$	[rpm]								1145	1216
DV180L4	M_{max}	[Nm] ([lb.in])									226 (2000)
	$n_{transition}$	[rpm]									1080

1) The values also apply to 200 V / 60 Hz and 220 V / 60 Hz.



Please note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

5.6 Motor selection for synchronous servomotors (SERVO)

The torque limit (M limit) is set automatically by the startup function of the MOVITOOLS software package. Do not alter this automatically set value!

We recommend always using the latest version of MOVITOOLS (2.70 or later) for startup. The latest MOVITOOLS version can be downloaded from our homepage (www.sew-eurodrive.de).

Motor characteristics

The requirements made of a servo drive include speed dynamics, stable speed and positioning accuracy. CM/DFS/DFY motors with MOVIDRIVE® meet these requirements.

Technically speaking, these are synchronous motors with permanent magnets on the rotor and an integrated resolver. The required characteristics, namely a constant torque over a wide speed range (up to 4500 rpm), a high speed and control range (up to 1:3000) and a high overload capacity ($3 \times M_0$), are achieved using control by MOVIDRIVE®. The servomotor has a lower mass moment of inertia than the asynchronous motor. This means it is optimally suited to applications requiring dynamic speeds.

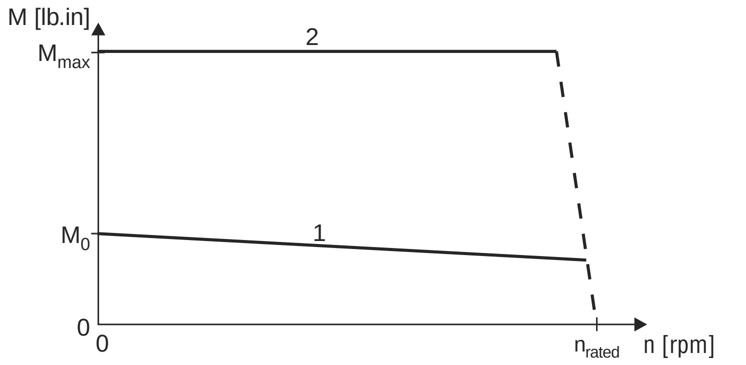


Figure 77: Speed/torque characteristic curve of the DFY servomotor

1 Continuous torque
2 Maximum torque

M_0 is determined by the motor. M_{max} is $3 \times M_0$ of the motor. The attainable M_{max} may also be less, depending on the inverter.

Refer to the motor table (CM → page 186, DFS/DFY → page 189) for the values for M_0.

Refer to the motor table (CM → page 187, DFS/DFY → page 190) for the values for M_0.

Basic recommendations

SERVO operating modes are only possible with SEW motors (CM/DFS/DFY), not with non-SEW motors. The necessary motor data for the SERVO operating modes are stored in MOVIDRIVE® for the SEW motors.

Speed is the correcting variable in the SERVO modes with speed control. Torque is the correcting variable in the SERVO modes with torque control (SERVO & M-CONTROL).

SERVO mode with speed control

There is no reason to differentiate between quadratic, dynamic and static load types when configuring a system for SERVO mode. Project planning for a synchronous motor is undertaken in accordance with the following requirements:

1. Effective torque demand at the average speed of the application.

   $M_{r.m.s.} < M_{n\_mot}$

   The point must lie below the characteristic curve for the continuous torque (Figure 77, curve 1). The continuous torque of the DFY series can be increased by 60 % by forced cooling if this operating point lies above the characteristic curve for self-cooling.

2. Maximum torque required across the speed characteristic.

   $M_{max} < M_{dyn\_mot}$

   This operating point must lie below the characteristic curve for the maximum torque of the motor-MOVIDRIVE® combination (Figure 77, curve 2).

3. Maximum speed

   The maximum speed must not be configured higher than the rated speed of the motor. Planetary gear units should be used for speeds greater than 3000 rpm as a result of the high input speed.

   $n_{max} \leq n_N$

SERVO mode with torque control (SERVO & M-CTRL.)

This operating mode allows the torque of the servomotor to be controlled directly. The setpoint sources of the speed controlled SERVO mode can also be used for torque control. All speed setpoint sources are interpreted as current setpoint sources. The settings for evaluating the analog input (→ P11_, parameter description) also remain in effect. The fixed setpoints (P16_, P17_) can be entered either in the unit [rpm] or [%$I_{N\_inverter}$] (→ MOVITOOLS).

The following relationship applies between the units:

3000 rpm = 150 % rated inverter current

You can calculate the torque at the output shaft of the servomotor using the following formula:

$$M = \frac{M_0}{I_0} \times \frac{150\% \times I_{n\_inverter} \times n_{set}}{3000\ rpm}$$

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M_0	Continuous static torque according to the motor table DFS/DFY (→ page 189)
I_0	Continuous static torque according to the motor table DFS/DFY (→ page 189)

Motor table CM

Additional project planning notes and information about the type CM synchronous servomotors can be found in the 'Geared Servo Motors' catalog. This can be ordered from SEW.

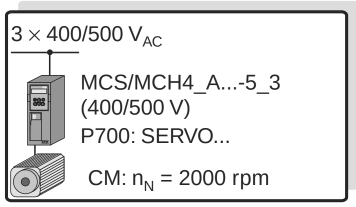
Characteristic values at V_{max} = 400 V_{AC}

n_N [rpm]	Motor	Without forced cooling fan M_0 [Nm (lb.in)]	Without forced cooling fan I_0 [A]	With forced cooling fan VR M_{0_VR} [Nm (lb.in)]	With forced cooling fan VR I_{0_VR} [A]	I_{max} [A]	Mass moment of inertia J_M Without brake [10^{-4} kgm^2 (10^{-3} lb.ft^2)]	Mass moment of inertia J_M With brake [10^{-4} kgm^2 (10^{-3} lb.ft^2)]
2000	**CM71S**	5.0 (44)	2.2	7.3 (64)	3.2	8.8	4.85 (11.4)	6.89 (16.2)
	CM71M	6.5 (57)	2.9	9.4 (83)	4.2	11.6	6.27 (14.7)	8.31 (19.5)
	CM71L	9.5 (84)	4.2	13.8 (122)	6.1	16.8	9.1 (21.4)	11.1 (26.1)
	CM90S	11.0 (97)	4.9	16.0 (141)	7.1	20.0	14.3 (33.6)	19.8 (46.5)
	CM90M	14.5 (128)	6.9	21.0 (185)	10.0	28.0	18.6 (43.7)	24.1 (56.7)
	CM90L	21.0 (185)	9.9	30.5 (270)	14.4	40.0	27.1 (63.7)	32.6 (76.7)
	CM112S	23.5 (207)	10.0	34.0 (300)	14.5	40.0	67.4 (159)	87.5 (206)
	CM112M	31.0 (274)	13.5	45.0 (397)	19.6	54.0	87.4 (206)	108 (254)
	CM112L	45.0 (397)	19.1	65.0 (574)	29.0	80.0	128 (301)	148 (348)
3000	**CM71S**	5.0 (44)	3.3	7.3 (64)	4.8	13.2	4.85 (11.4)	6.89 (16.2)
	CM71M	6.5 (57)	4.3	9.4 (83)	6.2	17.2	6.27 (14.7)	8.31 (19.5)
	CM71L	9.5 (84)	6.2	13.8 (122)	9.0	25.0	9.1 (21.4)	11.1 (26.1)
	CM90S	11.0 (97)	7.3	16.0 (141)	10.6	30.0	14.3 (33.6)	19.8 (46.5)
	CM90M	14.5 (128)	10.1	21.0 (185)	14.6	40.0	18.6 (43.7)	24.1 (56.7)
	CM90L	21.0 (185)	14.4	30.5 (270)	21.0	58.0	27.1 (63.7)	32.6 (76.7)
	CM112S	23.5 (207)	15.0	34.0 (300)	22.0	60.0	67.4 (159)	87.5 (206)
	CM112M	31.0 (274)	20.5	45.0 (397)	30.0	82.0	87.4 (206)	108 (254)
	CM112L	45.0 (397)	30.0	65.0 (574)	44.0	120	128 (301)	148 (348)
4500	**CM71S**	5.0 (44)	4.9	7.3 (64)	7.2	20.0	4.85 (11.4)	6.89 (16.2)
	CM71M	6.5 (57)	6.6	9.4 (83)	9.6	27.0	6.27 (14.7)	8.31 (19.5)
	CM71L	9.5 (84)	9.6	13.8 (122)	14.0	39.0	9.1 (21.4)	11.1 (26.1)
	CM90S	11.0 (97)	11.1	16.0 (141)	16.2	45.0	14.3 (33.6)	19.8 (46.5)
	CM90M	14.5 (128)	14.7	21.0 (185)	21.5	59.0	18.6 (43.7)	24.1 (56.7)
	CM90L	21.0 (185)	21.6	30.5 (270)	31.5	86.0	27.1 (63.7)	32.6 (76.7)
	CM112S	23.5 (207)	22.5	34.0 (300)	32.5	90.0	67.4 (159)	87.5 (206)
	CM112M	31.0 (274)	30.0	45.0 (397)	44.0	120	87.4 (206)	108 (254)
	CM112L	45.0 (397)	46.0	65.0 (574)	67.0	184	128 (301)	148 (348)

CM motor selection

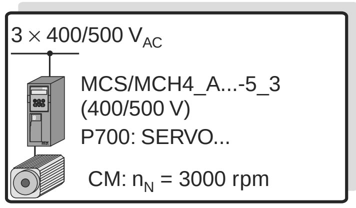
1. Rated speed n_N = 2000 rpm:

Motor			MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)													
			0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CM71S	M_{max}	[Nm] ([lb.in])	13.0 (115)	16.0 (141)	16.5 (145)											
CM71M	M_{max}	[Nm] ([lb.in])	13.0 (115)	16.9 (149)	19.8 (175)	21.5 (190)										
CM71L	M_{max}	[Nm] ([lb.in])		18.5 (163)	22.8 (201)	28.5 (252)	31.4 (278)									
CM90S	M_{max}	[Nm] ([lb.in])		18.5 (163)	23.3 (206)	30.8 (272)	38.0 (336)	39.6 (350)								
CM90M	M_{max}	[Nm] ([lb.in])			22.5 (199)	30.5 (269)	39.2 (346)	47.9 (423)	52.2 (461)							
CM90L	M_{max}	[Nm] ([lb.in])				31.9 (282)	41.4 (366)	52.5 (464)	72.5 (640)	75.6 (668)						
CM112S	M_{max}	[Nm] ([lb.in])				35.3 (312)	45.8 (405)	57.3 (506)	77.6 (686)	81.1 (717)						
CM112M	M_{max}	[Nm] ([lb.in])					45.9 (405)	58.3 (515)	84.3 (745)	102.3 (904)	107.0 (945)					
CM112L	M_{max}	[Nm] ([lb.in])							87.4 (772)	112.8 (997)	150.4 (1329)	161.2 (1425)				



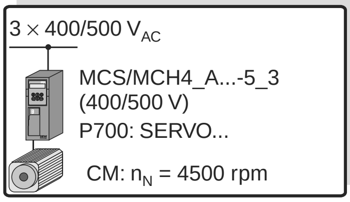
2. Rated speed n_N = 3000 rpm:

Motor			MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)													
			0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	0550	0750
CM71S	M_{max}	[Nm] ([lb.in])	9.0 (80)	11.9 (105)	14.3 (126)	16.5 (145)	16.5 (145)									
CM71M	M_{max}	[Nm] ([lb.in])		12.2 (107)	14.8 (130)	18.9 (167)	21.5 (190)	21.5 (190)								
CM71L	M_{max}	[Nm] ([lb.in])			15.8 (140)	20.6 (182)	26.1 (230)	30.5 (270)	31.4 (278)							
CM90S	M_{max}	[Nm] ([lb.in])				21.2 (187)	27.0 (238)	33.6 (297)	39.6 (350)							
CM90M	M_{max}	[Nm] ([lb.in])					27.4 (242)	34.4 (304)	48.1 (425)	52.2 (461)						
CM90L	M_{max}	[Nm] ([lb.in])						36.5 (322)	53.1 (469)	67.6 (597)	75.0 (663)					
CM112S	M_{max}	[Nm] ([lb.in])						39.0 (344)	56.6 (500)	71.7 (633)	80.6 (712)					
CM112M	M_{max}	[Nm] ([lb.in])							55.8 (493)	72.9 (644)	98.0 (866)	106.3 (940)				
CM112L	M_{max}	[Nm] ([lb.in])								77.6 (686)	109.0 (963)	137.2 (1213)	157.5 (1392)	162.6 (1437)		



3. *Rated speed n_N = 4500 rpm:*

Motor		MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)													
		0015	**0022**	**0030**	**0040**	**0055**	**0075**	**0110**	**0150**	**0220**	**0300**	**0370**	**0450**	**0550**	**0750**
CM71S	M_{max} [Nm] ([lb.in])		8.0 (70)	10.0 (88)	13.0 (115)	15.7 (138)	16.5 (145)								
CM71M	M_{max} [Nm] ([lb.in])			9.9 (87)	13.3 (117)	16.7 (147)	19.8 (175)	21.5 (190)							
CM71L	M_{max} [Nm] ([lb.in])					18.1 (160)	22.1 (195)	29.8 (263)	31.4 (277)						
CM90S	M_{max} [Nm] ([lb.in])					18.4 (162)	23.1 (204)	33.6 (297)	39.6 (350)	39.6 (350)					
CM90M	M_{max} [Nm] ([lb.in])						24.1 (213)	34.9 (308)	45.2 (400)	52.2 (461)					
CM90L	M_{max} [Nm] ([lb.in])							36.5 (322)	47.9 (423)	65.5 (580)	75.6 (668)	75.6 (668)			
CM112S	M_{max} [Nm] ([lb.in])							39.2 (346)	51.2 (452)	70.0 (618)	81.1 (716)	81.1 (716)			
CM112M	M_{max} [Nm] ([lb.in])								52.7 (465)	73.5 (650)	90.5 (800)	104.2 (921)	107.0 (945)		
CM112L	M_{max} [Nm] ([lb.in])									73.8 (652)	94.0 (830)	112.8 (997)	133.0 (1175)	150.4 (1330)	162.2 (1434)



Motor table DFS/DFY

Additional project planning notes and information about the type DFS/DFY synchronous servomotors can be found in the 'Geared Servo Motors' catalog. This document can be ordered from SEW.

Characteristic values at V_{max} = 400 V_{AC}

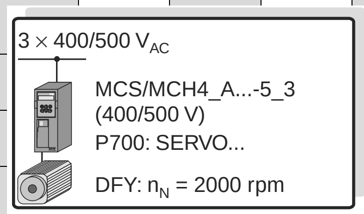
n_N	Motor	Without forced cooling fan		With forced cooling fan VY		I_{max}	Mass moment of inertia J_M	
		M_0	I_0	M_{0_VY}	I_{0_VY}		Without brake	With brake
[rpm]		[Nm (lb.in)]	[A]	[Nm (lb.in)]	[A]	[A]	[10^{-4} kgm^2 (10^{-3} lb.ft^2)]	
2000	DFY71S	2.5 (22)	1.25	4.0 (35)	2.0	3.75	3.42 (8.12)	5.46 (13.0)
	DFY71M	3.7 (33)	1.8	5.9 (52)	2.9	5.4	4.85 (11.5)	6.89 (16.3)
	DFY71ML	5.0 (44)	2.5	8.0 (71)	4.0	7.5	6.27 (14.9)	8.31 (19.7)
	DFY71L	7.5 (66)	3.7	12 (106)	5.9	11.1	9.1 (21.6)	11.1 (26.3)
	DFY90S	9.0 (80)	4.0	14.4 (127)	6.4	12	14.3 (34.0)	19.8 (47.0)
	DFY90M	12 (106)	5.3	19.2 (170)	8.5	15.9	18.6 (44.1)	24.1 (57.2)
	DFY90L	18 (159)	8.0	28.9 (255)	12.9	24	27.1 (64.3)	32.6 (77.4)
	DFY112S	12 (106)	5.5	19.2 (170)	8.8	16.5	47.2 (112)	67.4 (160)
	DFY112M	17.5 (155)	8.0	28 (248)	12.8	24	67.4 (160)	87.5 (208)
	DFY112ML	24 (212)	11	38.5 (340)	17.6	33	87.4 (207)	108 (256)
	DFY112L	35 (309)	16	56 (495)	25.5	48	128 (304)	148 (351)
3000	DFS56M	1.0 (8.8)	1.55	-	-	4.65	0.47 (1.12)	0.85 (2.02)
	DFS56L	2.0 (18)	2.22	-	-	6.66	0.82 (1.95)	1.2 (2.85)
	DFY71S	2.5 (22)	1.85	4.0 (35)	3.0	5.55	3.42 (8.12)	5.46 (13.0)
	DFY71M	3.7 (33)	2.7	5.9 (52)	4.3	8.1	4.85 (11.5)	6.89 (16.3)
	DFY71ML	5.0 (44)	3.8	8.0 (71)	6.1	11.4	6.27 (14.9)	8.31 (19.7)
	DFY71L	7.5 (66)	5.5	12 (106)	8.8	16.5	9.1 (21.6)	11.1 (26.3)
	DFY90S	9.0 (80)	5.9	14.4 (127)	9.4	17.7	14.3 (34.0)	19.8 (47.0)
	DFY90M	12 (106)	7.9	19.2 (170)	12.6	23.7	18.6 (44.1)	24.1 (57.2)
	DFY90L	18 (159)	12	29 (256)	19.7	36	27.1 (64.3)	32.6 (77.4)
	DFY112S	12 (106)	8.0	19.2 (170)	12.8	24	47.2 (112)	67.4 (160)
	DFY112M	17.5 (155)	12	28 (248)	19.2	36	67.4 (160)	87.5 (208)
	DFY112ML	24 (212)	16.5	38.5 (340)	26.5	49.5	87.4 (207)	108 (256)
	DFY112L	35 (309)	24	56 (495)	38	72	128 (304)	148 (351)
4500	DFS56M	1.0 (8.8)	1.55	-	-	4.65	0.47 (1.12)	0.85 (2.02)
	DFS56L	2.0 (18)	2.22	-	-	6.66	0.82 (1.95)	1.2 (2.85)
	DFY71S	2.5 (22)	2.8	4.0 (35)	4.5	8.4	3.42 (8.12)	5.46 (13.0)
	DFY71M	3.7 (33)	4.1	5.9 (52)	6.6	12.3	4.85 (11.5)	6.89 (16.3)
	DFY71ML	5.0 (44)	5.8	8.0 (71)	9.3	17.4	6.27 (14.9)	8.31 (19.7)
	DFY71L	7.5 (66)	8.2	12 (106)	13.1	24.6	9.1 (21.6)	11.1 (26.3)
	DFY90S	9.0 (80)	9.0	14.4 (127)	14.4	27	14.3 (34.0)	19.8 (47.0)
	DFY90M	12 (106)	11.6	19.2 (170)	18.6	34.8	18.6 (44.1)	24.1 (57.2)
	DFY90L	18 (159)	18	29 (256)	29	54	27.1 (64.3)	32.6 (77.4)
	DFY112S	12 (106)	11.7	19.2 (170)	18.7	35.1	47.2 (112)	67.4 (160)
	DFY112M	17.5 (155)	18	28 (248)	28.8	54	67.4 (160)	87.5 (208)
	DFY112ML	24 (212)	24.5	38.5 (340)	39.2	73.5	87.4 (207)	108 (256)
	DFY112L	35 (309)	36.5	56 (495)	58.4	109	128 (304)	148 (351)

5

DFS/DFY motor selection

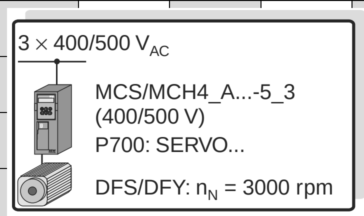
1. Rated speed n_N = 2000 rpm:

Motor			MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)										
			0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370
DFY71S	M_{max}	[Nm] ([lb.in])	7.5 (66.3)										
DFY71M	M_{max}	[Nm] ([lb.in])	11.1 (98.1)										
DFY71ML	M_{max}	[Nm] ([lb.in])	12.0 (106)	15.0 (133)									
DFY71L	M_{max}	[Nm] ([lb.in])	12.2 (108)	16.7 (148)	21.3 (188)	22.5 (199)							
DFY90S	M_{max}	[Nm] ([lb.in])	13.5 (119)	18.6 (164)	23.6 (209)	27.0 (238)							
DFY90M	M_{max}	[Nm] ([lb.in])		18.7 (165)	23.7 (210)	32.2 (285)	36.0 (318)						
DFY90L	M_{max}	[Nm] ([lb.in])				32.1 (284)	42.2 (373)	54.0 (477)					
DFY112S	M_{max}	[Nm] ([lb.in])		18.0 (159)	22.9 (202)	31.1 (275)	36.0 (318)						
DFY112M	M_{max}	[Nm] ([lb.in])				31.2 (276)	41.0 (362)	52.5 (464)					
DFY112ML	M_{max}	[Nm] ([lb.in])					40.9 (362)	52.3 (462)	72.0 (636)				
DFY112L	M_{max}	[Nm] ([lb.in])						52.5 (464)	78.8 (697)	105 (928)			



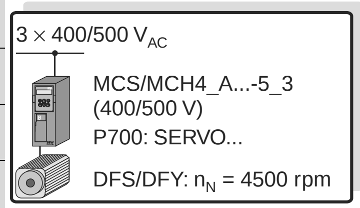
2. Rated speed n_N = 3000 rpm:

Motor			MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)										
			0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370
DFS56M	M_{max}	[Nm] ([lb.in])	3.0 (26.5)										
DFS56L	M_{max}	[Nm] ([lb.in])	5.0 (44.2)	6.0 (53.2)									
DFY71S	M_{max}	[Nm] ([lb.in])	7.5 (66.4)										
DFY71M	M_{max}	[Nm] ([lb.in])	8.2 (72.7)	11.1 (97.9)									
DFY71ML	M_{max}	[Nm] ([lb.in])	7.9 (69.8)	10.9 (96.0)	13.8 (122)	15.0 (133)							
DFY71L	M_{max}	[Nm] ([lb.in])		11.2 (99.4)	14.3 (127)	19.4 (172)	22.5 (199)						
DFY90S	M_{max}	[Nm] ([lb.in])			16.0 (142)	21.7 (192)	27.0 (238)						
DFY90M	M_{max}	[Nm] ([lb.in])				21.6 (191)	28.5 (252)	36.0 (318)					
DFY90L	M_{max}	[Nm] ([lb.in])					28.1 (249)	36.0 (318)	54.0 (477)				
DFY112S	M_{max}	[Nm] ([lb.in])				21.4 (189)	28.1 (249)	36.0 (318)					
DFY112M	M_{max}	[Nm] ([lb.in])					27.3 (242)	35.0 (309)	52.5 (464)				
DFY112ML	M_{max}	[Nm] ([lb.in])							52.4 (463)	69.8 (617)	72.3 (639)		
DFY112L	M_{max}	[Nm] ([lb.in])							52.4 (463)	70.0 (619)	100 (890)	105 (928)	



3. *Rated speed n_N = 4500 rpm:*

Motor		MOVIDRIVE® *compact* MCS/MCH4_A...-5_3 (400/500 V units) in SERVO operating modes (P700)										
		0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370
DFS56M	M_{max} [Nm] ([lb.in])	3.0 (26.5)										
DFS56L	M_{max} [Nm] ([lb.in])	5.0 (44.2)	6.0 (53.2)									
DFY71S	M_{max} [Nm] ([lb.in])	5.4 (47.4)	7.4 (65.1)	7.5 (66.3)								
DFY71M	M_{max} [Nm] ([lb.in])		7.4 (65.8)	9.5 (83.8)	11.1 (97.8)							
DFY71ML	M_{max} [Nm] ([lb.in])			9.1 (80.0)	12.3 (109)	15.0 (132)						
DFY71L	M_{max} [Nm] ([lb.in])				13.0 (115)	17.1 (152)	22.0 (194)	22.5 (199)				
DFY90S	M_{max} [Nm] ([lb.in])				14.3 (126)	18.8 (166)	24.0 (212)	27.0 (238)				
DFY90M	M_{max} [Nm] ([lb.in])					19.4 (171)	24.8 (219)	36.0 (318)				
DFY90L	M_{max} [Nm] ([lb.in])							36.0 (318)	48.0 (424)	53.8 (576)		
DFY112S	M_{max} [Nm] ([lb.in])					19.2 (170)	24.6 (218)	36.0 (318)				
DFY112M	M_{max} [Nm] ([lb.in])							35.0 (309)	46.7 (413)	52.3 (463)		
DFY112ML	M_{max} [Nm] ([lb.in])								47.0 (416)	67.6 (598)	71.7 (634)	
DFY112L	M_{max} [Nm] ([lb.in])									66.2 (585)	86.3 (763)	105 (928)



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5.7 *Load capacity of the units at low output frequencies*

The thermal model in MOVIDRIVE® implements dynamic limiting of the maximum output current. Consequently, the thermal model only permits less than 100 % output current at output frequencies less than 2 Hz if the capacity utilization is high.

This can occur in the case of:

- electrically stopping hoists,
- torque control at low speeds or when stopped.

In the case of dynamic applications (CFC and SERVO operating modes) with a brief overload duration (< 1 s), please refer to the information in Sec. 5.9 (page 204).

Guaranteed sustained output currents I_D depending on the output frequency f_A:

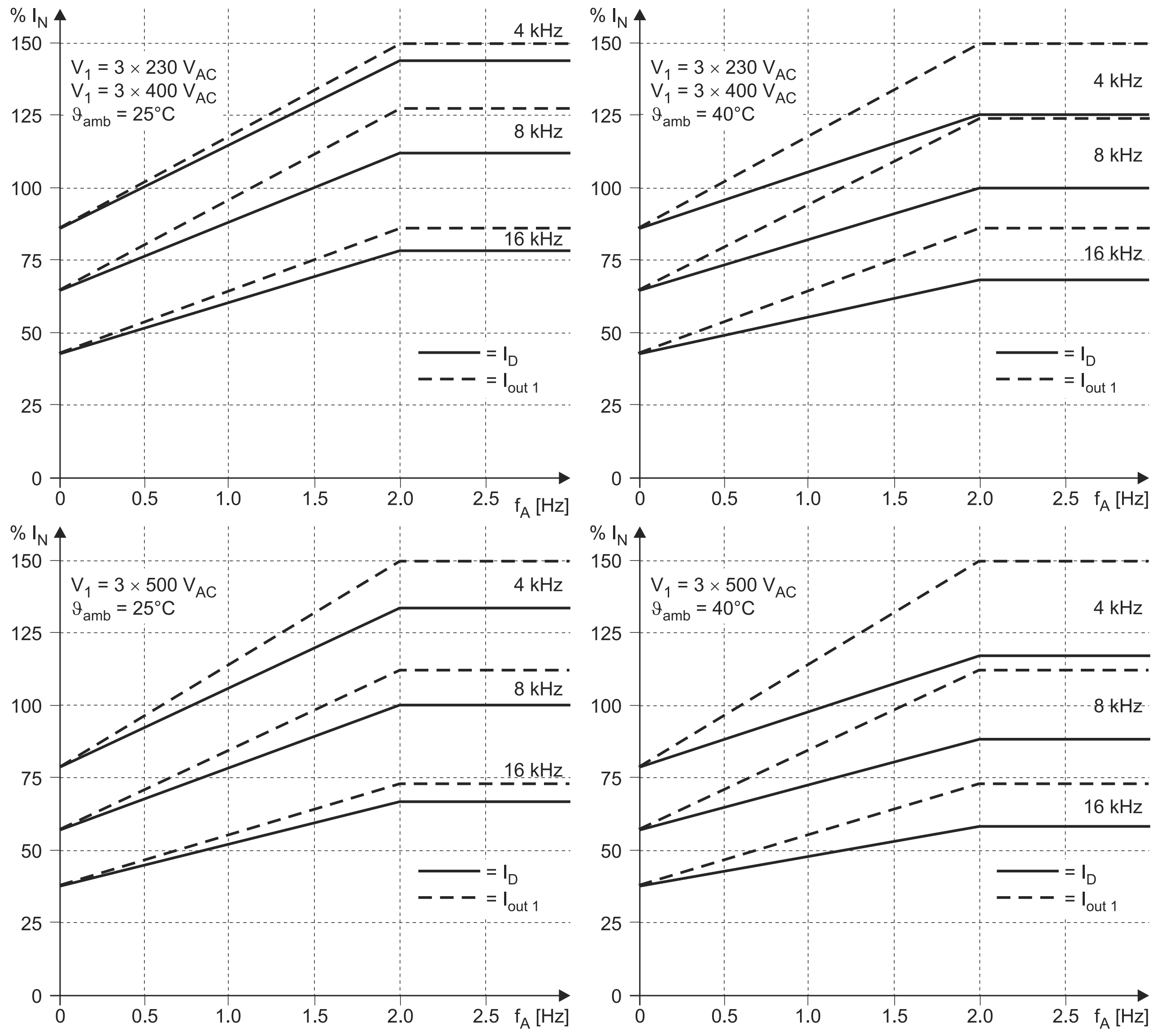

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Figure 78: Sustained output currents I_D

ϑ_{amb}	= Ambient temperature	I_D	= Sustained inverter output current
V_1	= Supply voltage	$I_{out\ 1}$	= Time-limited overload current of the inverter
f_A	= Inverter output frequency	I_N	= Rated inverter output current according to technical data

5.8 Overload capacity of the inverter

Sustained output current and heat sink time constant

MOVIDRIVE® drive inverters permanently calculate the load on the inverter output stage (unit utilization). Consequently, they enable the maximum possible power to be output in each operating status.

The sustained output current I_D is the reference parameter for ascertaining the overload capacity. The permitted continuous output current depends on the ambient temperature, the supply voltage, the output frequency and the PWM frequency. The current $I_{out\,1}$ during the overload phase and the current $I_{out\,2}$ during the low-load phase are specified as a function of the sustained output current I_D. The time unit used for ascertaining the overload capacity is the heat sink time constant T of the inverter. This time constant is different for each size.

Heat sink time constant T for inverter size				
1	2	3	4	5
T = 3.5 min = 210 s	T = 5 min = 300 s	T = 4 min = 240 s	T = 9 min = 540 s	T = 5 min = 300 s

Unit utilization

If 'P860/P861 PWM frequency 1/2' > 4 kHz is set in the VFC modes and 'P862/P863 PWM fix 1/2' is set to off, the inverter automatically reduces the PWM frequency in the event of a unit overload. The PWM frequency stays at the same setting in CFC and SERVO modes. The inverter does not reduce the PWM frequency in case of a unit overload. The inverter reacts to a higher than permitted load by outputting the 'F44 Unit utilization' fault message and an immediate switch-off.

Temperature-controlled fan

The fans of the power section heat sink are temperature-controlled. The fan is not switched on until above a heat sink temperature of ϑ = 45 °C.

Load cycle

The required load cycle is the basis for ascertaining the overload capacity of the inverter. The following conditions must be met so that a load cycle can be repeated periodically:

- The temperature must be just below the critical heat sink temperature at the end of the overload time t_1.
- During the subsequent low-load time t_2, the heat sink temperature must fall far enough so that a renewed overload for duration t_1 is possible.

Figure 79 shows an example of a load cycle of this type. The temperature profiles of the heat sink for the overload time t_1 and the low-load time t_2 are shown under the load cycle. If you arrange the temperature profiles as shown in Figure 79, you can check whether the overload limit is being exceeded.

Sample load cycle:

- Overload current $I_{out\,1}$ = 120 % I_D
- Low-load current $I_{out\,2}$ = 40 % I_D
- Overload time $t_1 = 0.75 \times T$
- Low-load time $t_2 = 1.5 \times T$

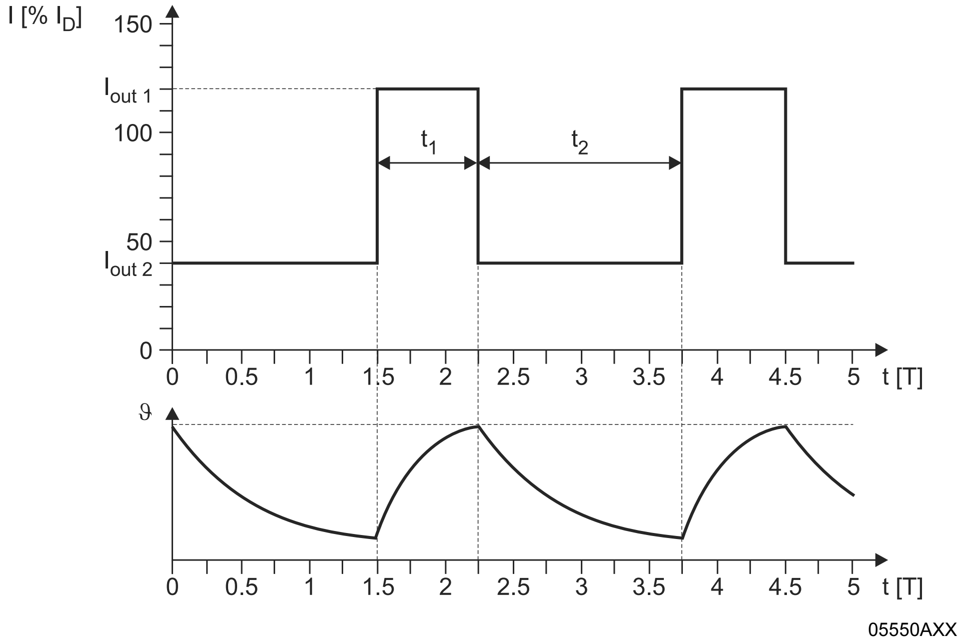

Figure 79: Sample load cycle

Determining the overload capacity

You can determine the overload capacity in two ways depending on the length of the overload time t_1:

1. Overload time $t_1 \geq 0.25 \times T$: based on diagrams.
2. Overload times $t_1 < 0.25 \times T$: using a formula.

1. Diagrams

Overload times $t_1 \geq 0.25 \times T$:

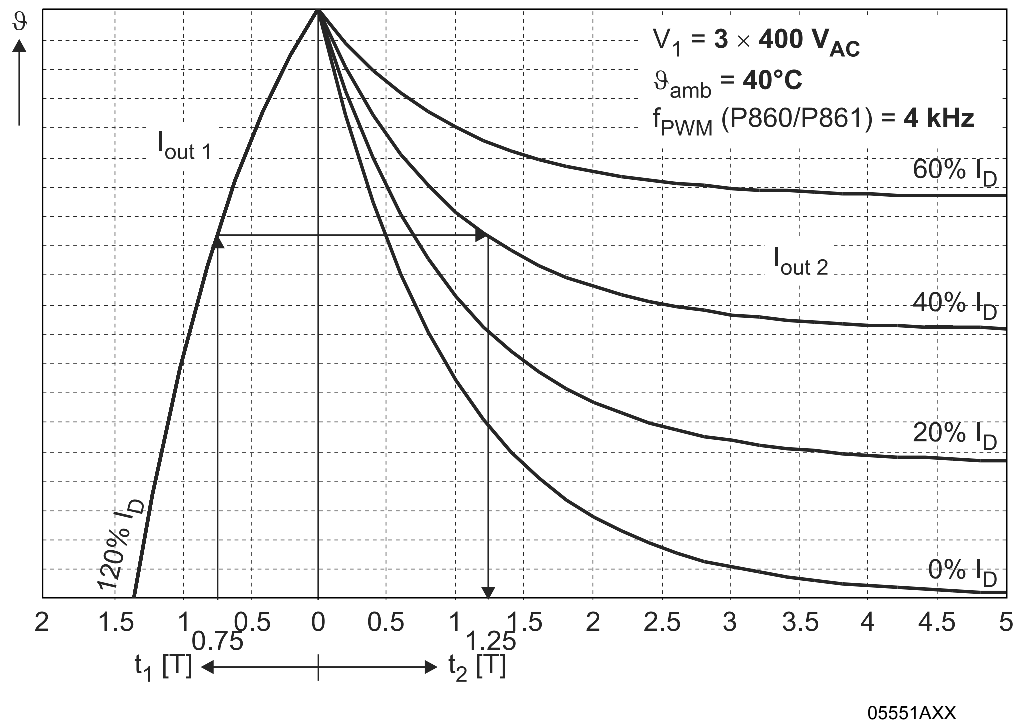

Figure 80: Sample overload diagram

The time axis is separated. The left-hand area shows the overload time t_1 and the right-hand area shows the low-load time t_2. The temperature profile of the maximum permitted overload current $I_{out\ 1}$ is shown above t_1 for the corresponding peripheral conditions. The temperature profiles of the various low-load currents $I_{out\ 2}$ are shown in a series of curves above t_2.

The overload capacity is ascertained as follows using the load cycle from Figure 79:

- At overload time $t_1 = 0.75 \times T$ vertically upwards until the intersection with $I_{out\ 1}$.
- Horizontally to the right until the intersection with $I_{out\ 2} = 0.4 \times I_D$.
- Vertically downwards and read off the minimum low-load time $t_2 \rightarrow t_2 = 1.25 \times T$.

In the load cycle from Figure 79, $t_2 = 1.5 \times T$, which means the overload capacity is given.

For overload times $t_1 < 0.25 \times T$, the reading accuracy of the diagrams is inadequate. Furthermore, the curves are almost linear in this area. This means you can use a linear formula for overload times $t_1 < 0.25 \times T$ instead of the diagrams.

Formula

At overload times $t_1 < 0.25 \times T$, it is possible to calculate the overload capacity using the following formula:

$\mathbf{t_2 > k \times t_1}$ **k = Overload factor**

The values for overload factors k are given on page 196 to page 202 as a function of the supply voltage V_1, ambient temperature ϑ and cycle frequency f_{PWM}.

Example for MOVIDRIVE® *compact* MCF40A0055 (size 2):

- Operation with supply voltage $V_1 = 3 \times 400\ V_{AC}$, ambient temperature $\vartheta = 40\ °C$ and cycle frequency $f_{PWM} = 4$ kHz.
- Rated unit current $I_N = 12.5\ A_{AC}$ and sustained output current $I_D = 125\ \% \times I_N = 15.6\ A_{AC}$ (→ Figure 78)
- Overload time $t_1 = 30\ s = 0.1 \times T$
- Low-load current $I_{out\ 2} = 6\ A = 0.4 \times I_D \rightarrow k = 0.778$

Cycle frequency f_{PWM}	Sustained output current I_D (f_A > 2 Hz)	Overload current $I_{out\ 1}$	Overload factor k at low-load current $I_{out\ 2}$ =			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	125 % I_N	120 % I_D	0.411	0.538	0.778	1.407

- The low-load time must be $t_2 > k \times t_1 > 0.778 \times 30\ s > 23.34\ s$.

Overload capacity at 400 V / 25 °C

The overload capacity of the inverter is derived from the overload time t_1 using a formula or the diagrams. The time unit used to determine the overload capacity is the heat sink time constant T of the inverter. This time constant is different for each size.

Heat sink time constant T for inverter size				
1	2	3	4	5
T = 3.5 min = 210 s	T = 5 min = 300 s	T = 4 min = 240 s	T = 9 min = 540 s	T = 5 min = 300 s

$t_1 < 0.25 \times T$

For overload times $t_1 < 0.25 \times T$, use the formula $t_2 > k \times t_1$ to determine the overload capacity (→ page 194). The following table shows the overload factor k for various low-load currents:

Cycle frequency f_{PWM}	Sustained output current I_D (f_A > 2 Hz)	Overload current $I_{out\ 1}$	Overload factor k at low-load current $I_{out\ 2}$ =				
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$	$0.8 \times I_D$
4 kHz	144 % I_N	104 % I_D	0.085	0.107	0.145	0.226	0.508
8 kHz	112 % I_N	114 % I_D	0.314	0.408	0.582	1.016	4.160
16 kHz	78 % I_N	110 % I_D	0.235	0.303	0.427	0.720	2.324

$t_1 \geq 0.25 \times T$

For overload times $t_1 \geq 0.25 \times T$, use the following diagrams to determine the overload capacity (→ page 194).

Cycle frequency f_{PWM} = 4 kHz:

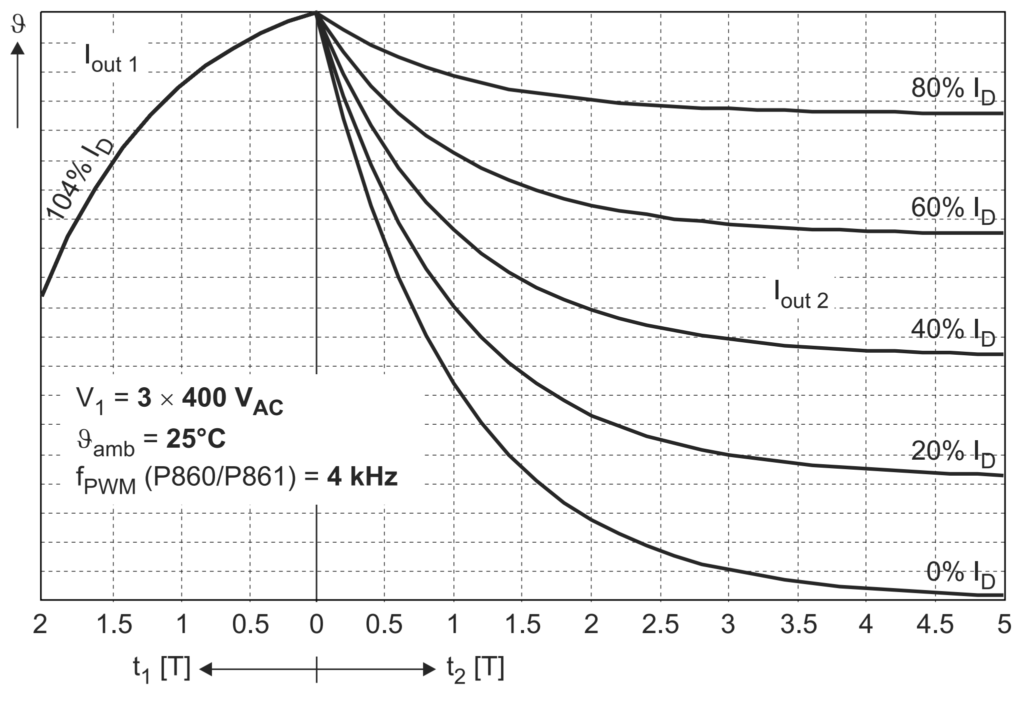

Figure 81: Overload capacity at f_{PWM} = 4 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

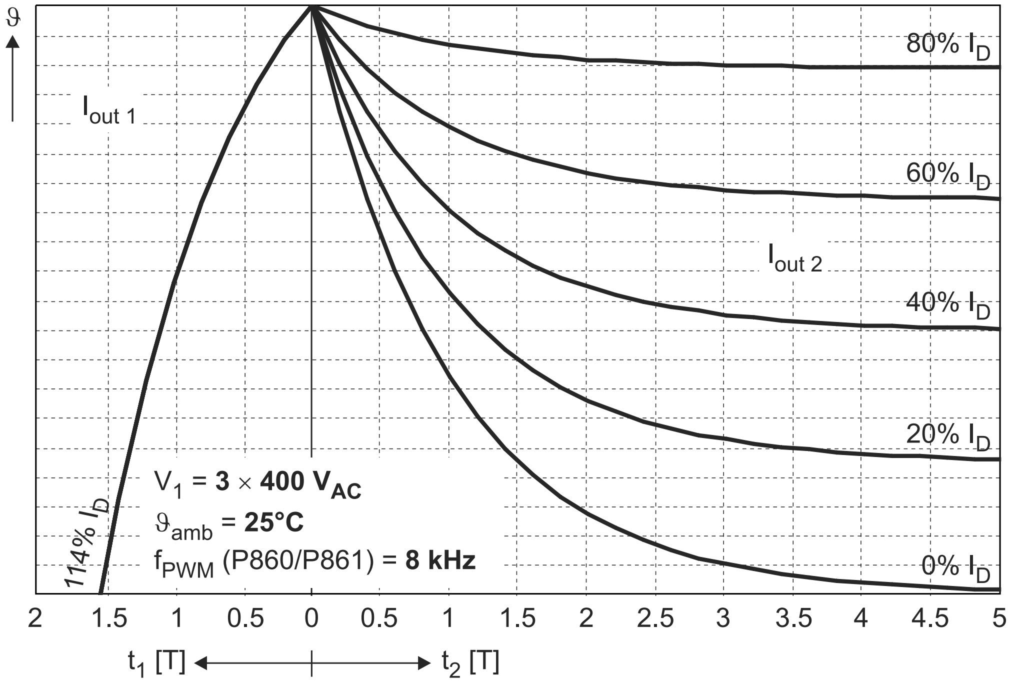

Figure 82: Overload capacity at f_{PWM} = 8 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

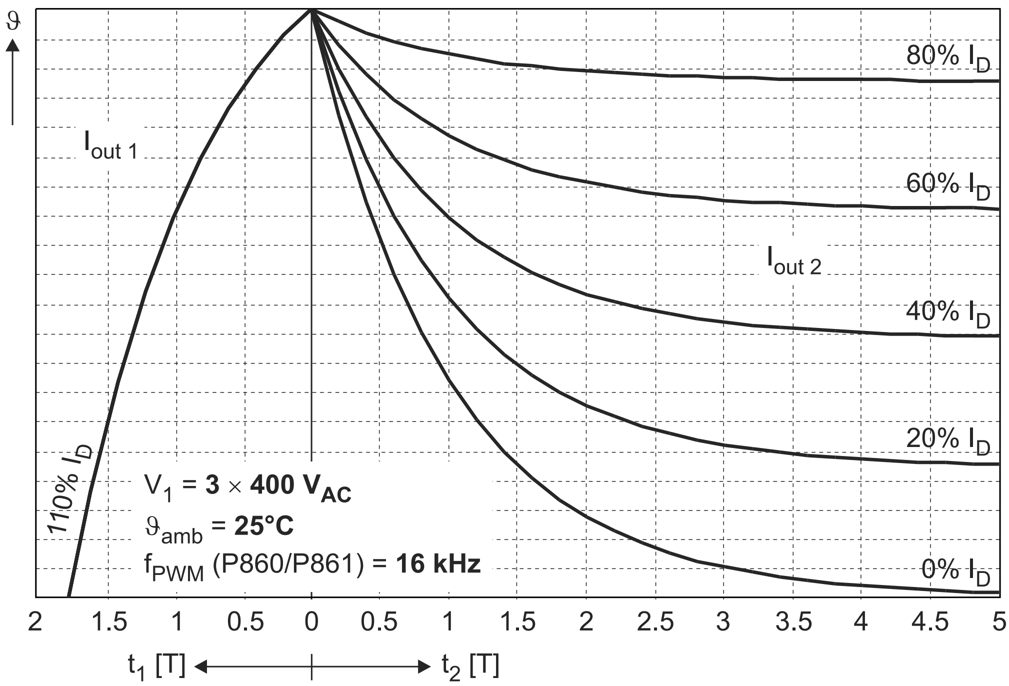

Figure 83: Overload capacity at f_{PWM} = 16 kHz (400 V / 25 °C)

Overload capacity at 400 V / 40 °C

The overload capacity of the inverter is determined from the overload time t_1 using a formula or the diagrams. The time unit used to determine the overload capacity is the heat sink time constant T of the inverter. This time constant is different for each size.

Heat sink time constant T for inverter size				
1	2	3	4	5
T = 3.5 min = 210 s	T = 5 min = 300 s	T = 4 min = 240 s	T = 9 min = 540 s	T = 5 min = 300 s

$t_1 < 0.25 \times T$

For overload times $t_1 < 0.25 \times T$, use the formula $t_2 > k \times t_1$ to determine the overload capacity (→ page 194). The following table shows the overload factor k for various low-load currents:

Cycle frequency f_{PWM}	**Sustained output current I_D (f_A > 2 Hz)**	**Overload current $I_{out\ 1}$**	**Overload factor k at low-load current $I_{out\ 2}$ =**			
			0	**$0.2 \times I_D$**	**$0.4 \times I_D$**	**$0.6 \times I_D$**
4 kHz	125 % I_N	120 % I_D	0.411	0.538	0.778	1.407
8 kHz	100 % I_N	125 % I_D	0.678	0.928	1.473	3.639
16 kHz	68 % I_N	126 % I_D	0.676	0.922	1.448	3.438

$t_1 \geq 0.25 \times T$

For overload times $t_1 \geq 0.25 \times T$, use the following diagrams to determine the overload capacity (→ page 194).

Cycle frequency f_{PWM} = 4 kHz:

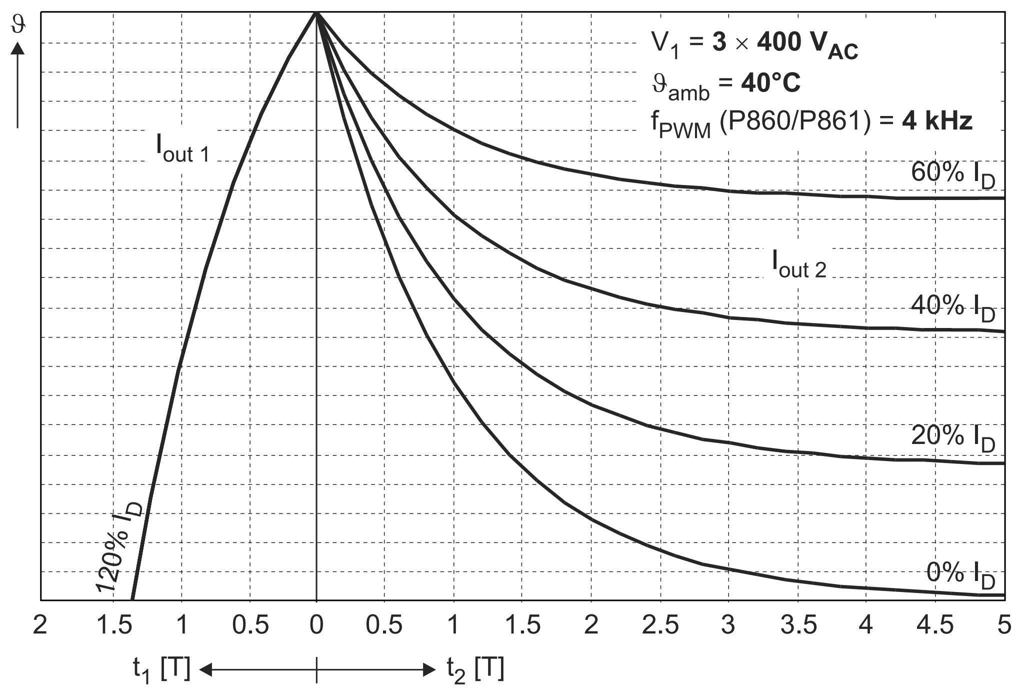

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Figure 84: Overload capacity at f_{PWM} = 4 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

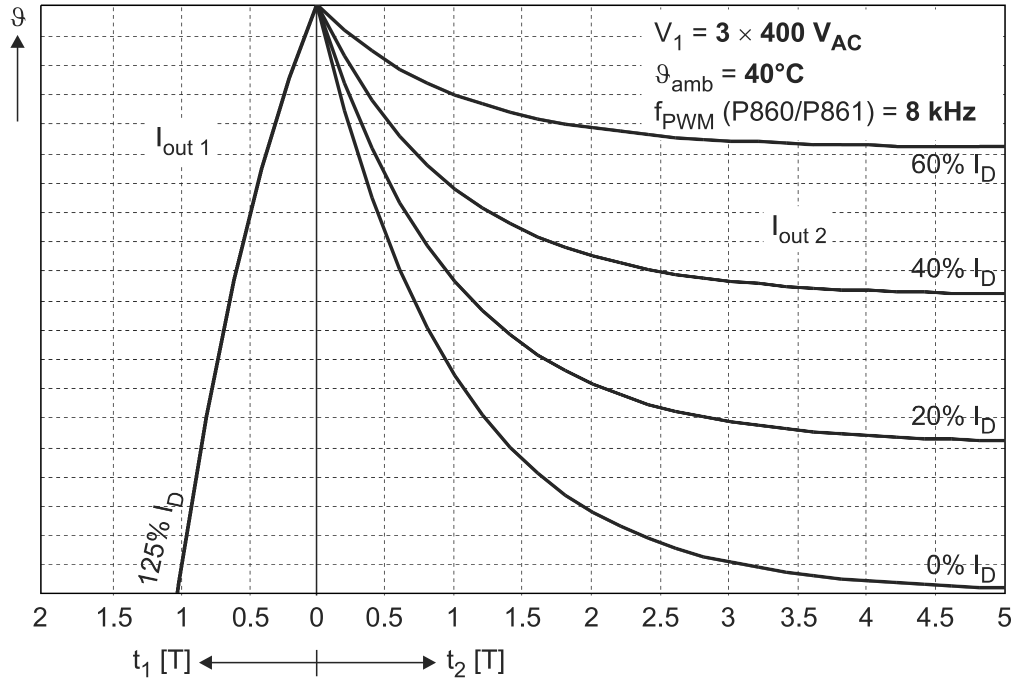

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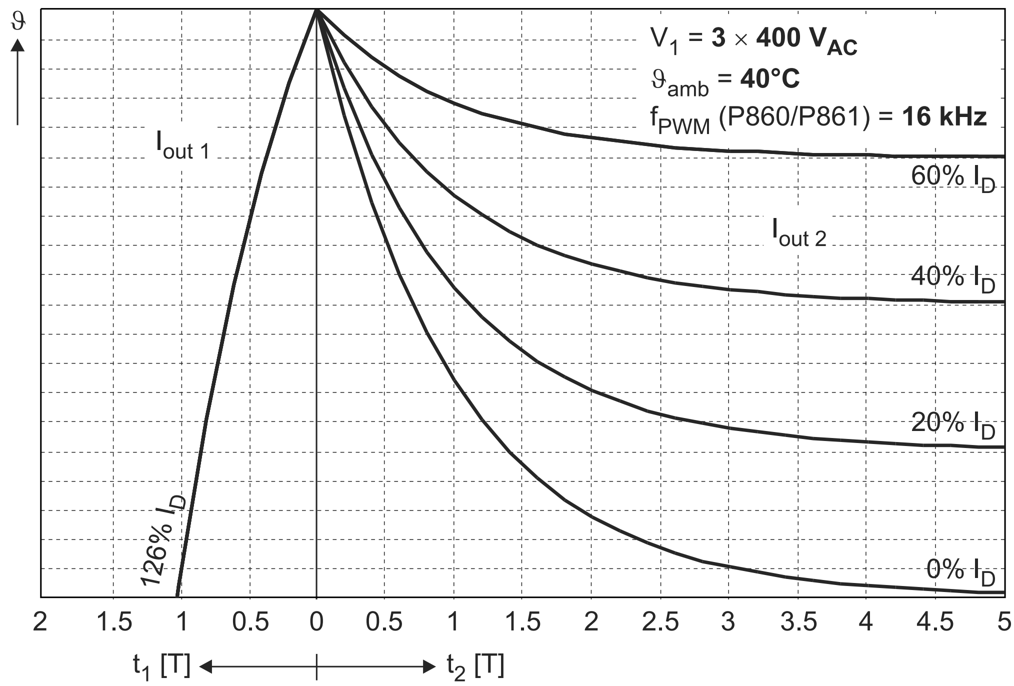
Figure 85: Overload capacity at f_{PWM} = 8 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:



05558AXX

Figure 86: Overload capacity at f_{PWM} = 16 kHz (400 V / 40 °C)

Overload capacity at 500 V / 25 °C

The overload capacity of the inverter is determined from the overload time t_1 using a formula or the diagrams. The time unit used to determine the overload capacity is the heat sink time constant T of the inverter. This time constant is different for each size.

Heat sink time constant T for inverter size				
1	2	3	4	5
T = 3.5 min = 210 s	T = 5 min = 300 s	T = 4 min = 240 s	T = 9 min = 540 s	T = 5 min = 300 s

$t_1 < 0.25 \times T$

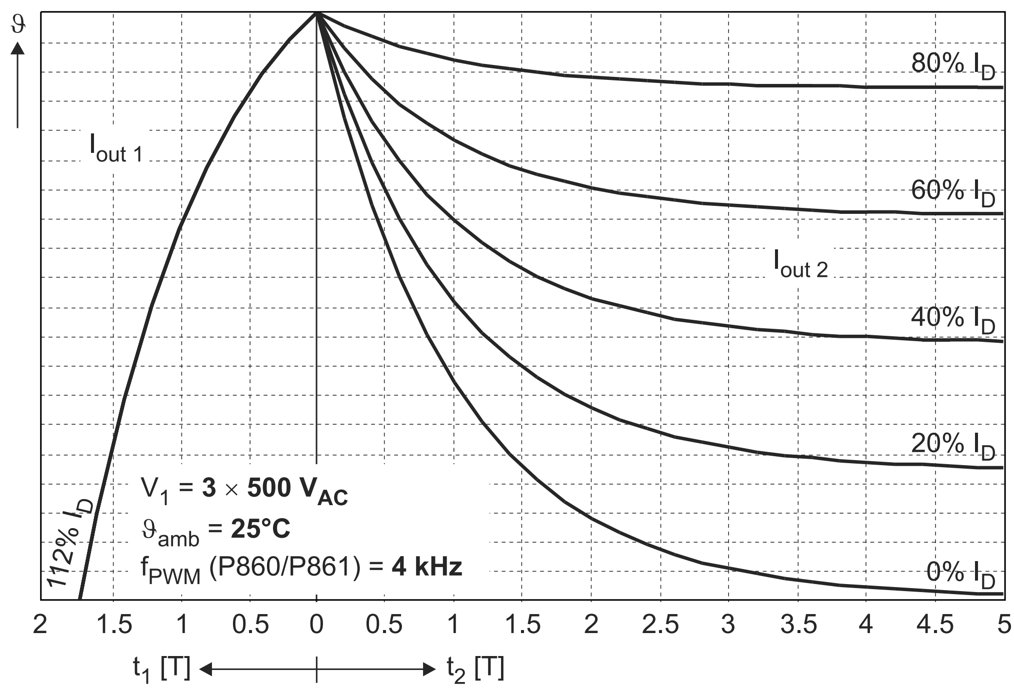
For overload times $t_1 < 0.25 \times T$, use the formula $t_2 > k \times t_1$ to determine the overload capacity (→ page 194). The following table shows the overload factor k for various low-load currents:

Cycle frequency f_{PWM}	Sustained output current I_D ($f_A > 2$ Hz)	Overload current $I_{out\ 1}$	Overload factor k at low-load current $I_{out\ 2}$ =				
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$	$0.8 \times I_D$
4 kHz	134 % I_N	112 % I_D	0.245	0.316	0.443	0.741	2.287
8 kHz	100 % I_N	114 % I_D	0.286	0.369	0.522	0.888	3.040
16 kHz	67 % I_N	109 % I_D	0.182	0.232	0.321	0.521	1.385

$t_1 \geq 0.25 \times T$

For overload times $t_1 \geq 0.25 \times T$, use the following diagrams to determine the overload capacity (→ page 194).

Cycle frequency f_{PWM} = 4 kHz:



05561AXX

Figure 87: Overload capacity at f_{PWM} = 4 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

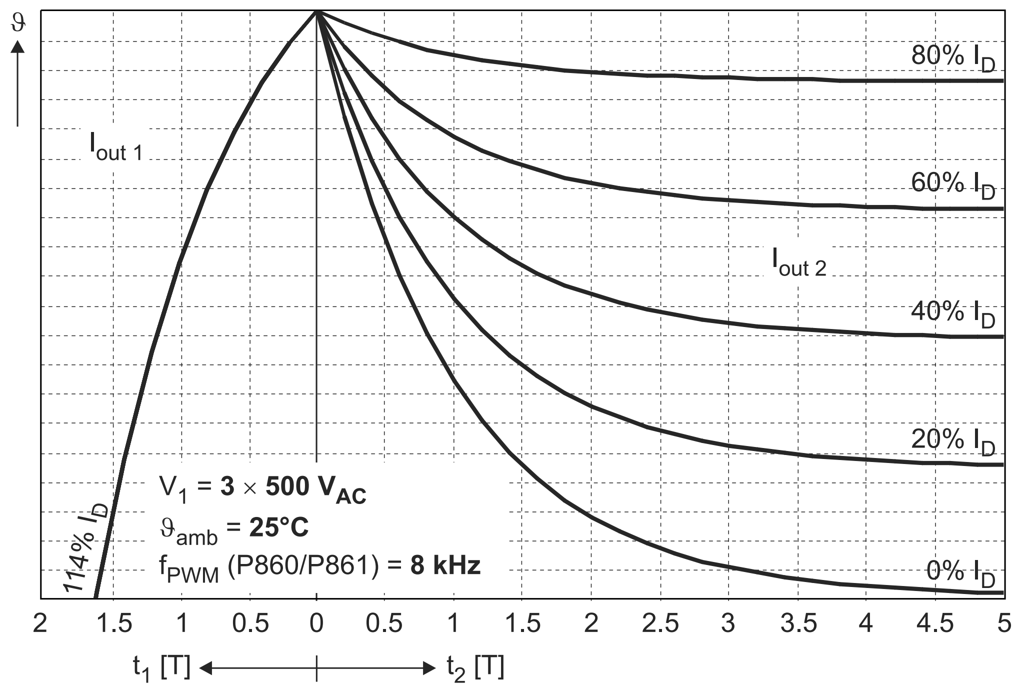


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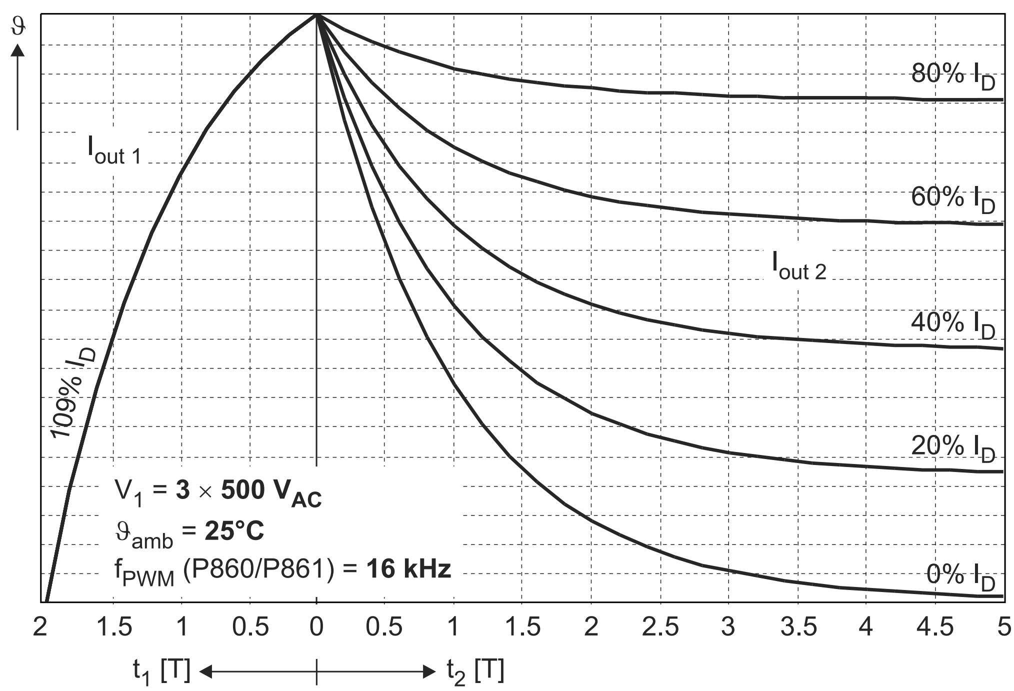
Figure 88: Overload capacity at f_{PWM} = 8 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:



05563AXX

Figure 89: Overload capacity at f_{PWM} = 16 kHz (500 V / 25 °C)

Overload capacity at 500 V / 40 °C

The overload capacity of the inverter is determined from the overload time t_1 using a formula or the diagrams. The time unit used to determine the overload capacity is the heat sink time constant T of the inverter. This time constant is different for each size.

Heat sink time constant T for inverter size				
1	2	3	4	5
T = 3.5 min = 210 s	T = 5 min = 300 s	T = 4 min = 240 s	T = 9 min = 540 s	T = 5 min = 300 s

$t_1 < 0.25 \times T$

For overload times $t_1 < 0.25 \times T$, use the formula $t_2 > k \times t_1$ to determine the overload capacity (→ page 194). The following table shows the overload factor k for various low-load currents:

Cycle frequency f_{PWM}	Sustained output current I_D (f_A > 2 Hz)	Overload current $I_{out\ 1}$	Overload factor k at low-load current $I_{out\ 2}$ =			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	144 % I_N	104 % I_D	0.662	0.897	1.395	3.176
8 kHz	112 % I_N	114 % I_D	0.745	1.022	1.627	4.103
16 kHz	78 % I_N	110 % I_D	0.595	0.803	1.234	2.695

$t_1 \geq 0.25 \times T$

For overload times $t_1 \geq 0.25 \times T$, use the following diagrams to determine the overload capacity (→ page 194).

Cycle frequency f_{PWM} = 4 kHz:

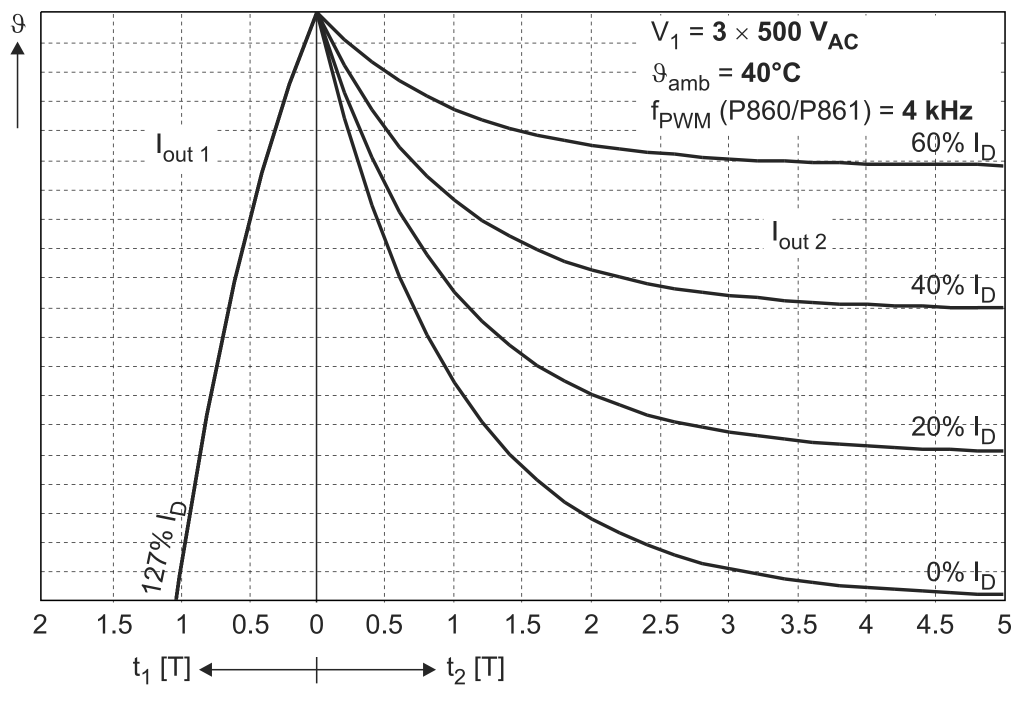


Figure 90: Overload capacity at f_{PWM} = 4 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

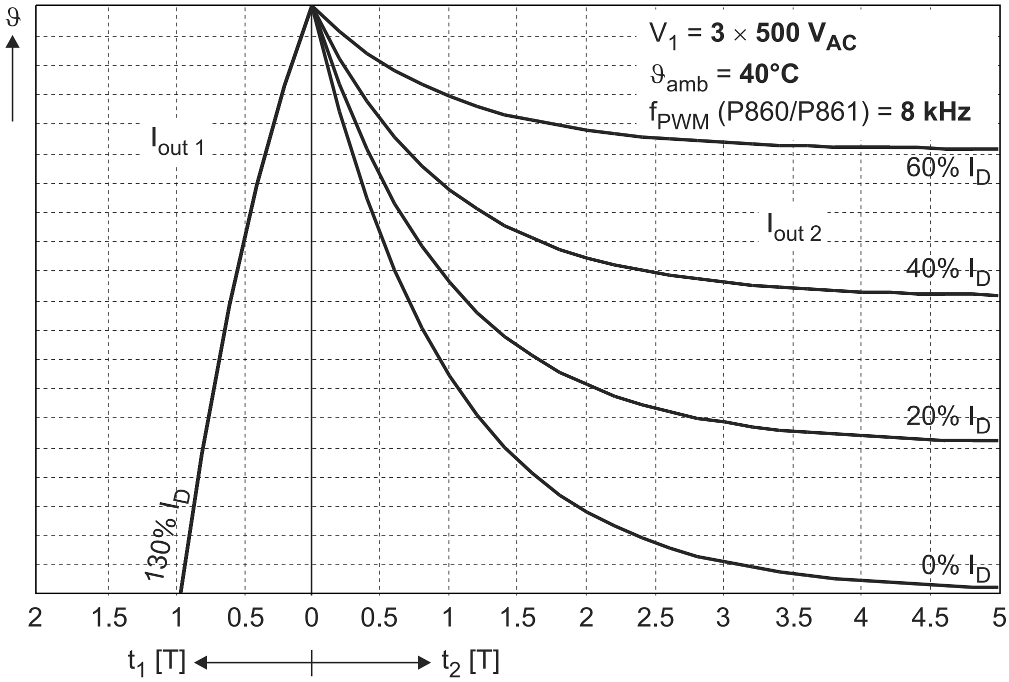


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Figure 91: Overload capacity at f_{PWM} = 8 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

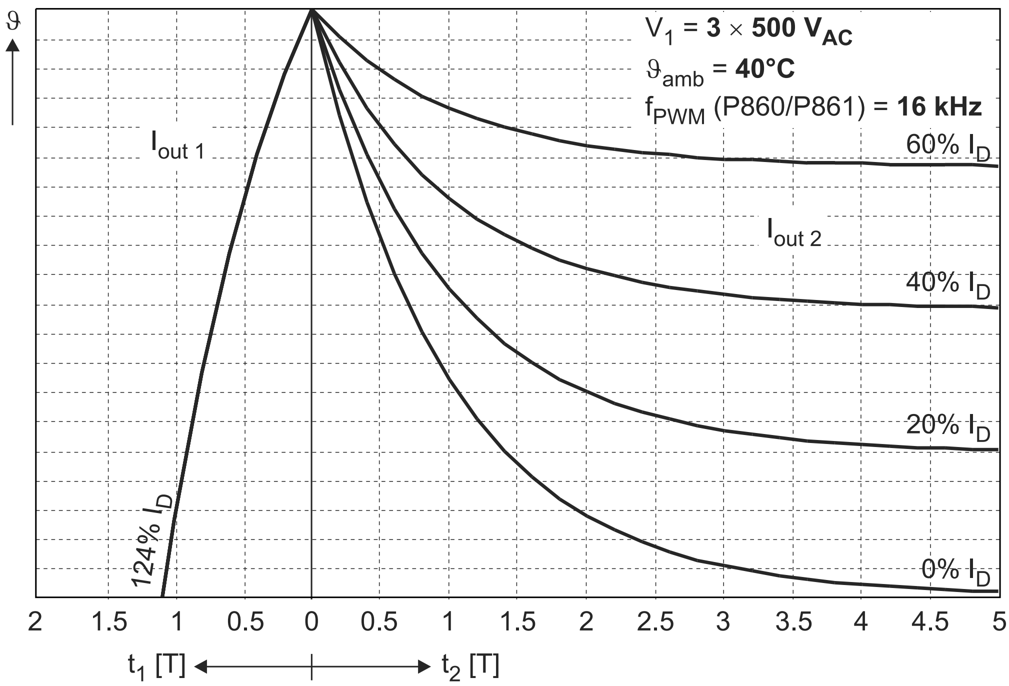

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Figure 92: Overload capacity at f_{PWM} = 16 kHz (500 V / 40 °C)

5.9 *Overload capacity of the inverter for short overload duration*

Overload duration t_1 < 1 s

In dynamic applications (CFC and SERVO modes) with a short overload duration t_1, the inverter can output overload currents up to 150 % I_N even at PWM frequencies of 8 kHz and 16 kHz.

The overload time t_1 must be less than 1 second in order for this high overload capacity to be achieved.

Ascertaining the overload capacity

The overload capacity for the short overload duration (t_1 < 1 s) must be ascertained using appropriate diagrams. The mean inverter output current $I_{out\ RMS}$ during the load cycle must not exceed a certain value.

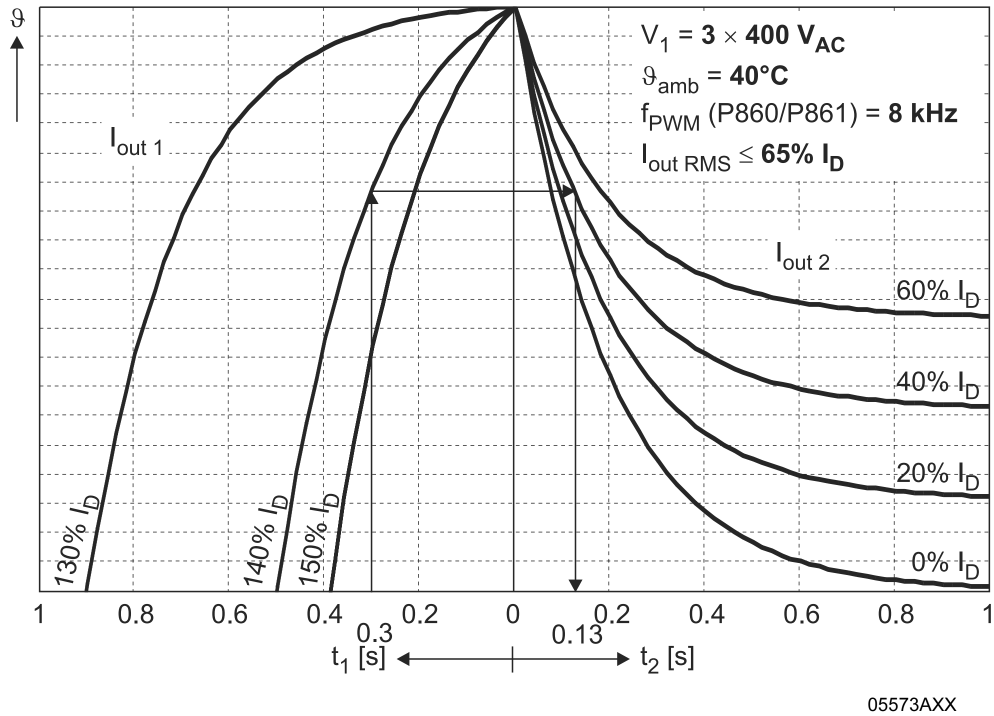

Figure 93: Sample overload diagram for short overload duration

The time axis is separated. The left-hand area shows the overload time t_1 and the right-hand area shows the low-load time t_2. The temperature profiles for various overload currents $I_{out\ 1}$ are shown in a series of curves above t_1. The temperature profiles for various low-load currents $I_{out\ 2}$ are shown in a series of curves above t_2.

Example:

- Following specifications:

  –Overload current $I_{out\ 1}$ = 140 % I_D
  –Overload time t_1 = 0.3 s
  –Low-load current $I_{out\ 2}$ = 40 % I_D
  –Low-load time t_2 = 1.0 s
- At overload time t_1 = 0.3 s vertically upwards until the intersection with $I_{out\ 1}$ = 140 % I_D.
- Horizontally to the right until the intersection with $I_{out\ 2} = 0.4 \times I_D$.
- Vertically downwards and read off the minimum low-load time $t_2 \rightarrow t_2$ = 0.13 s.

The overload capacity is given according to the diagram. In addition to the diagram, it is now necessary to check that the permitted mean inverter output current $I_{out\ RMS}$ is not exceeded:

$$I_{out\ 1} \times \frac{t_1}{t_1 + t_2} + I_{out\ 2} \times \frac{t_2}{t_1 + t_2} \leq I_{out\ RMS}$$

$$140\%\ I_D \times \frac{0.3\ s}{1.3\ s} + 40\%\ I_D \times \frac{1.0\ s}{1.3\ s} \leq 65\%\ I_D$$

$$32.31\%\ I_D + 30.77\%\ I_D = 63.08\%\ I_D \leq 65\%\ I_D$$

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The permitted mean inverter output current is $I_{out\ RMS} \leq 65$ % I_D. In the specified load cycle, $I_{out\ RMS}$ = 63.08 % I_D. This means the load cycle is just permitted.

Overload capacity at 400 V / 25 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 79\ \%\ I_D$.

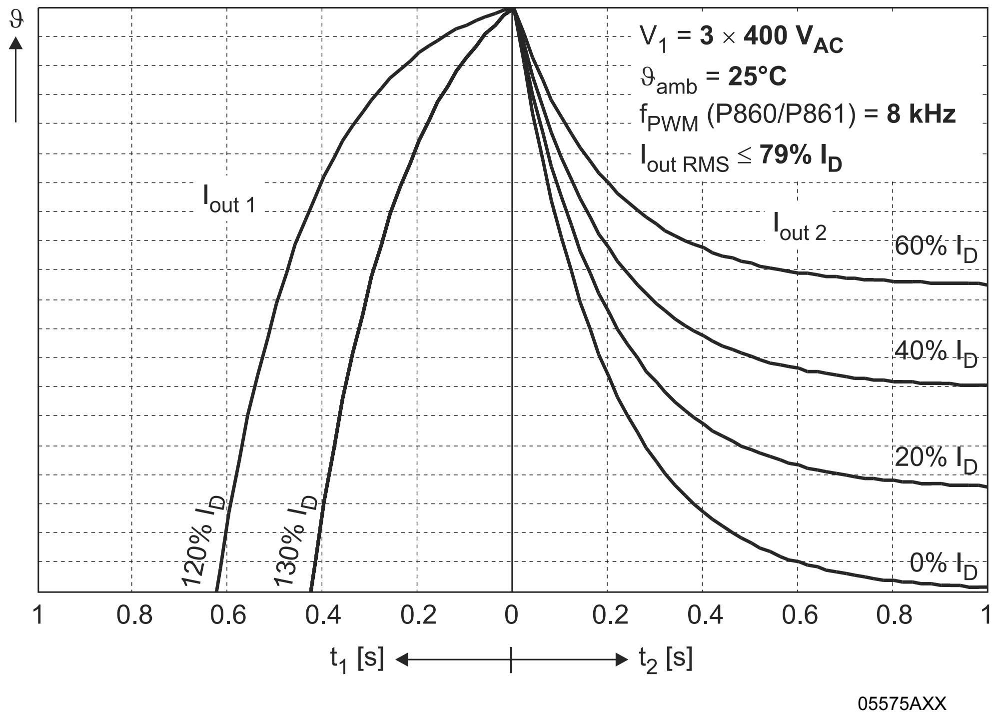

Figure 94: Brief overload capacity at f_{PWM} = 8 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 81\ \%\ I_D$.

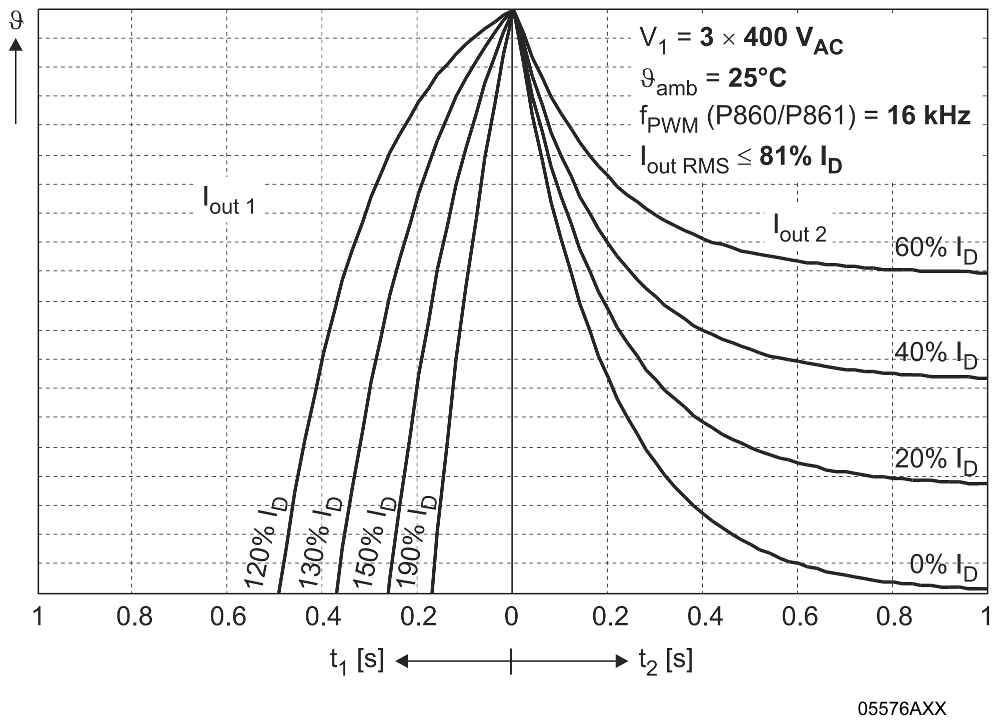

Figure 95: Brief overload capacity at f_{PWM} = 16 kHz (400 V / 25 °C)

Overload capacity at 400 V / 40 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 65\ \%\ I_D$.

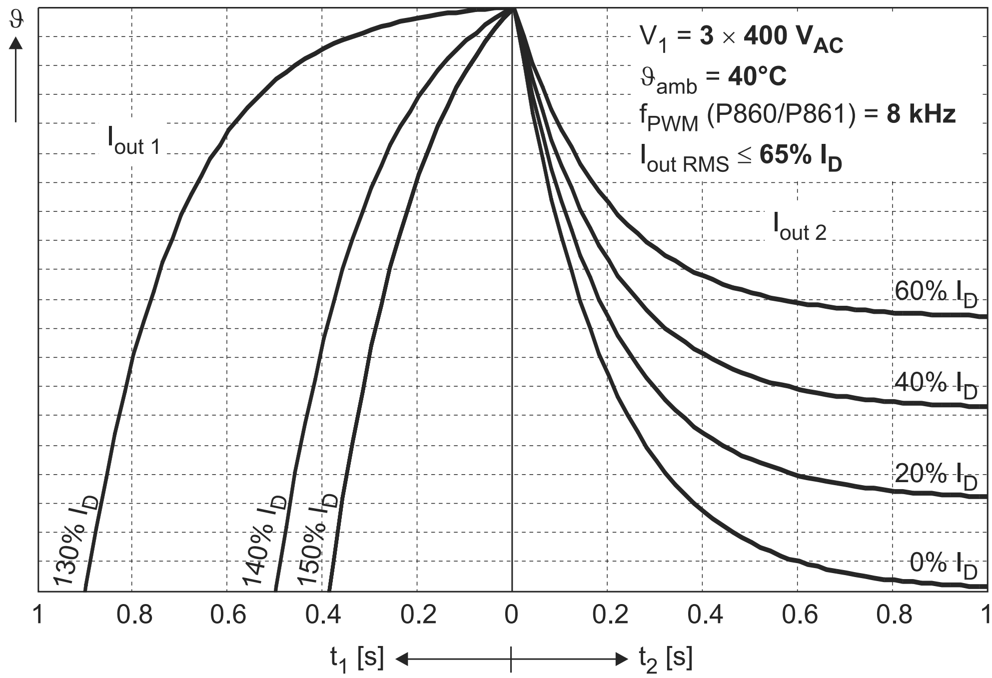

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Figure 96: Brief overload capacity at f_{PWM} = 8 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 69\ \%\ I_D$.

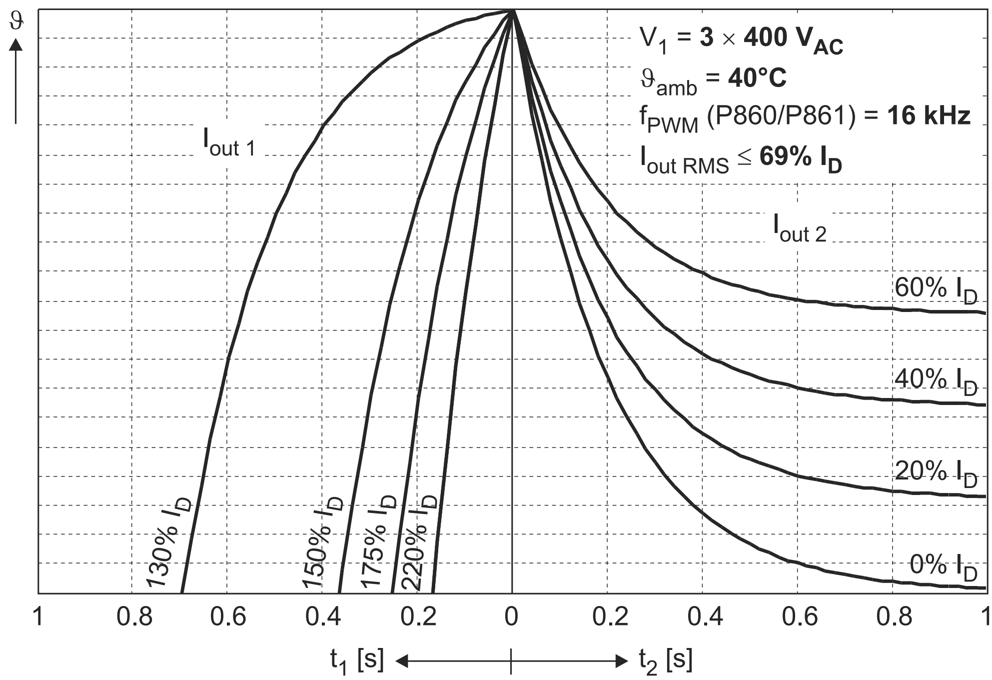

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Figure 97: Brief overload capacity at f_{PWM} = 16 kHz (400 V / 40 °C)

Overload capacity at 500 V / 25 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 80\ \%\ I_D$.

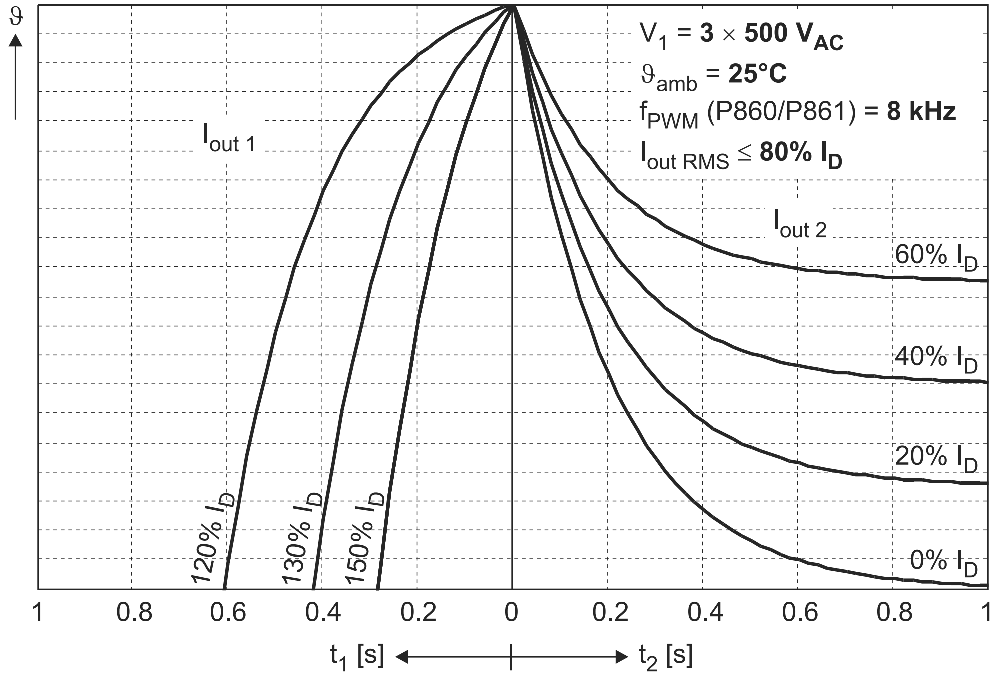

Figure 98: Brief overload capacity at f_{PWM} = 8 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 82\ \%\ I_D$.

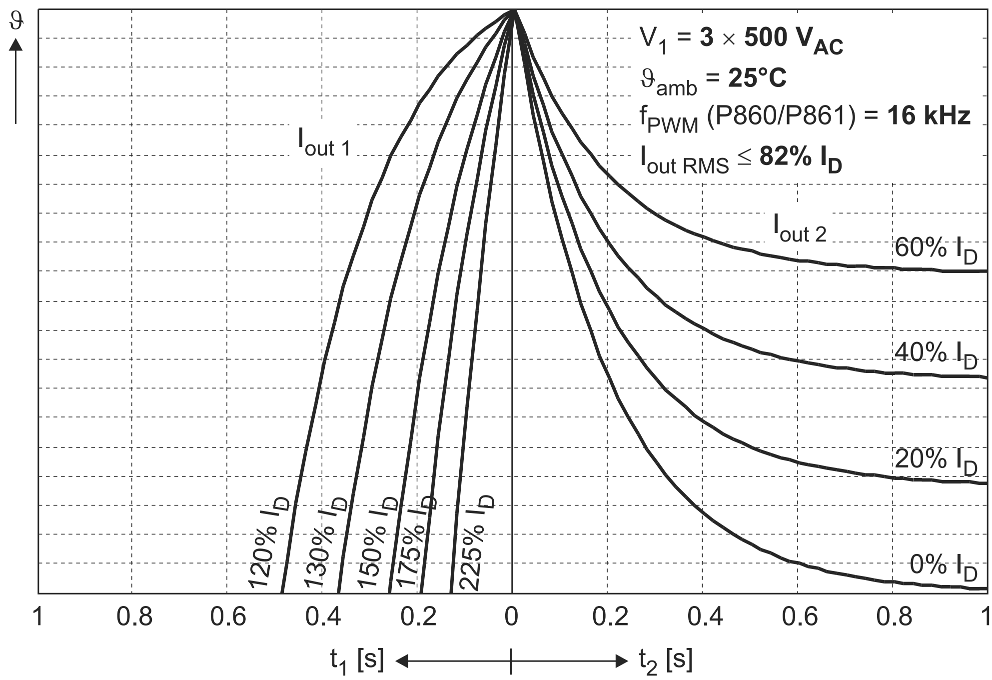

Figure 99: Brief overload capacity at f_{PWM} = 16 kHz (500 V / 25 °C)

Overload capacity at 500 V / 40 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 67\ \%\ I_D$.

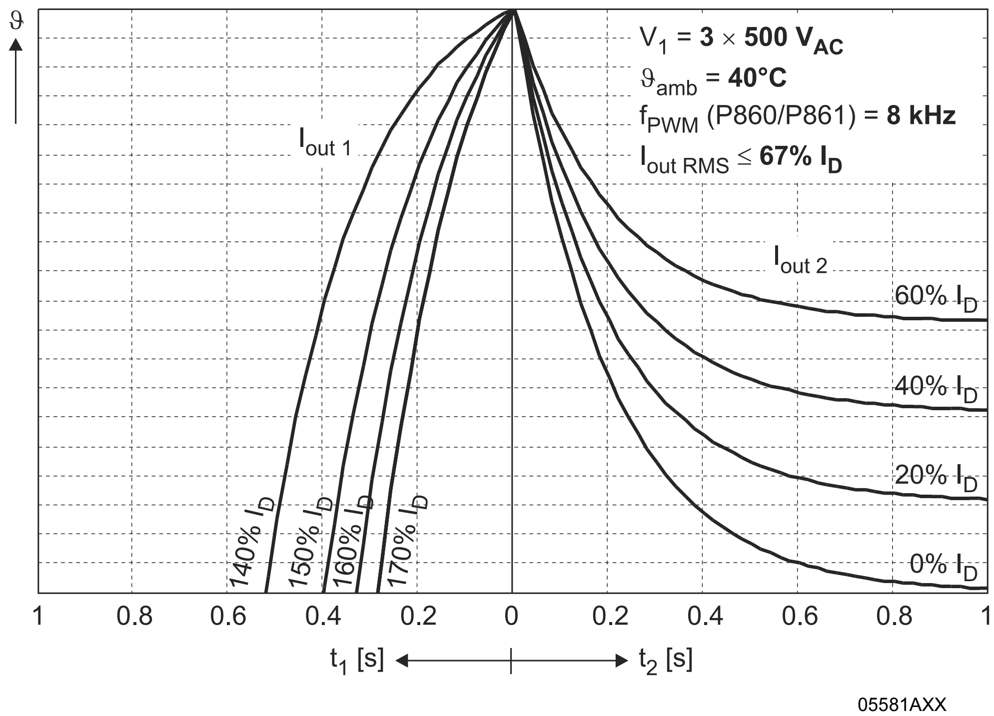

Figure 100: Brief overload capacity at f_{PWM} = 8 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 69\ \%\ I_D$.

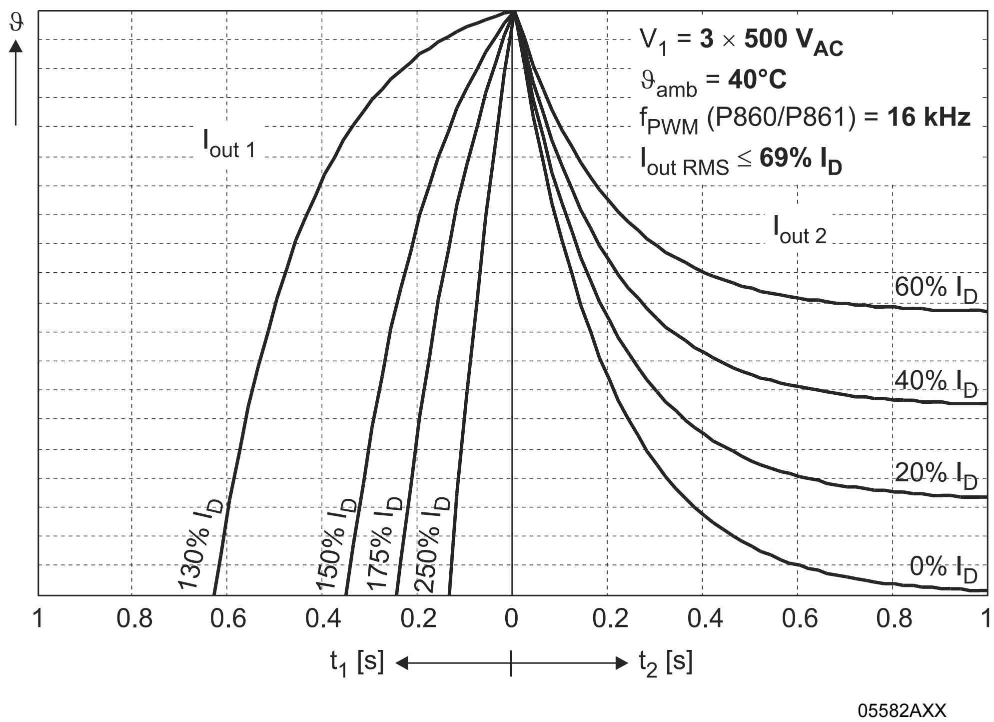

Figure 101: Brief overload capacity at f_{PWM} = 16 kHz (500 V / 40 °C)

5.10 Selecting the braking resistor

High voltage

The connection leads to the braking resistor carry a **high DC voltage (approx. 900 V)**. The braking resistor lines must be suitable for this high DC voltage.

Line length

The **maximum permitted line length** between MOVIDRIVE® and the braking resistor is **100 m (330 ft)**.

Parallel connection

Two braking resistors must be connected in parallel in the case of some inverter/resistor combinations. In this case, the **trip current** must be set on the bimetallic relay to **twice the value of I_F entered in the table**.

Peak braking power

The DC link voltage and the resistance value mean the peak braking power may be less than the load capacity of the braking resistor. This peak braking power is calculated as follows:

$$P_{max} = \frac{U_{DC}^2}{R}$$

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V_{DC} is the switch-in threshold of the brake chopper. Its value is

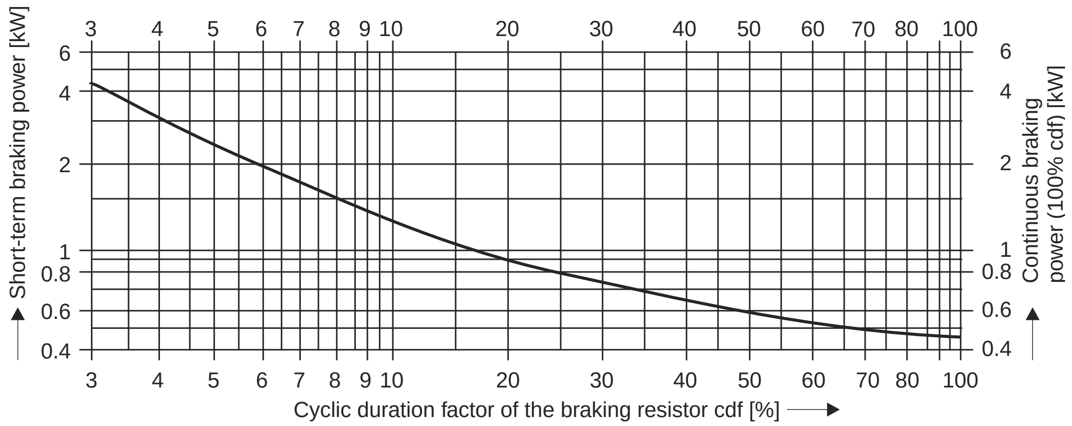
- V^{DC} = 822 V_{DC} in MOVIDRIVE® *compact* MC_4_A...-5_3 (400/500 V units) and
- V_{DC} = 480 V_{DC} in MOVIDRIVE® *compact* MC_4_A...-2_3 (230 V units).

The following table lists the peak braking power levels which are possible for the different resistance values.

Resistance value	Peak braking power	
	MC_4_A...-5_3 (400/500 V units)	MC_4_A...-2_3 (230 V units)
100 Ω	6.7 kW	-
68 Ω	10.0 kW	-
47 Ω	14.4 kW	-
39 Ω	17.3 kW	5.9 kW
27 Ω	-	8.5 kW
18 Ω	37.5 kW	-
15 Ω	45 kW	-
12 Ω	56 kW	19.2 kW
9 Ω (2 × BW018 parallel)	75 kW	25.6 kW
7.5 Ω (2 × BW915 parallel)	-	30.7 kW
6 Ω	112 kW	38.4 kW
3 Ω (2 × BW106/206 parallel)	-	76.8 kW

Power diagrams In the case of braking operations within the cycle duration T_D (standard: $T_D \leq 120$ s), the cdf braking power can be used to ascertain the resulting continuous resistor dissipation (100 % cdf power) with reference to the power diagrams. The right-hand y axis shows the 100 % cdf power.

Power diagrams for MOVIDRIVE® compact MC_4_A...-5_3 (400/500 V units):



01043BEN

Figure 102: Power diagram for flat-type braking resistor 400/500 V units (BW100-005)

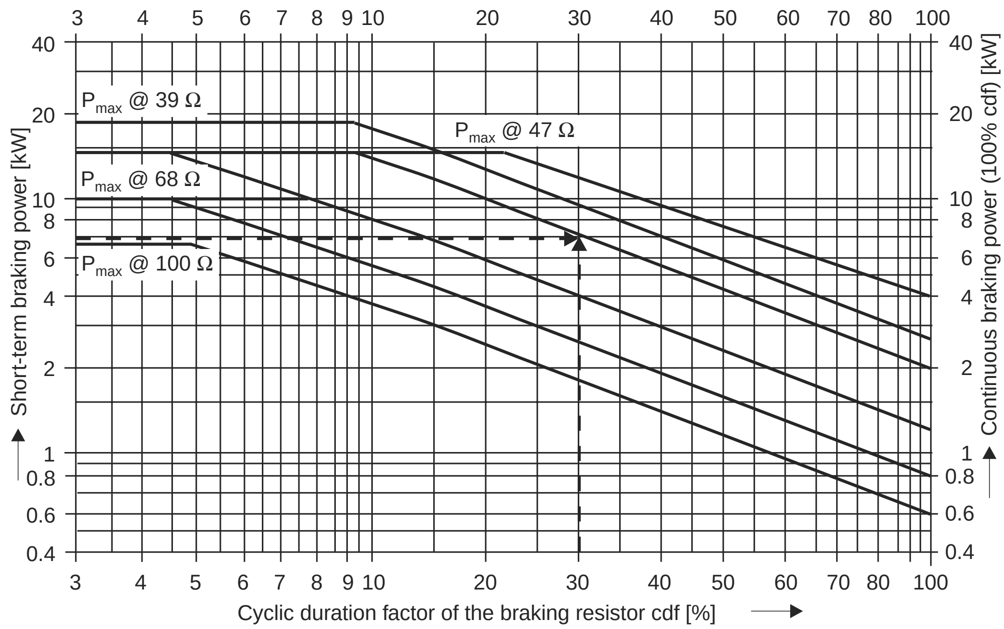


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Figure 103: Power diagram for wire resistors 400/500 V units

Example When an intermittent braking power of 7 kW is needed with a cyclic duration factor of 30 %, it requires a braking resistor with a continuous power of 2 kW, e.g. BW247.

Braking resistor type		**BW100-005**	**BW100-006**	**BW168**	**BW268**	**BW147**	**BW247**	**BW347**
Load capacity	**100 % cdf**	0.45 kW	0.6 kW	0.8 kW	1.2 kW	1.2 kW	2.0 kW	4.0 kW
Resistance value	R_{BW}	100 Ω ±10 %		68 Ω ±10 %		47 Ω ±10 %		
Trip current of F16	I_F	0.8 A_{RMS}	1.8 A_{RMS}	2.5 A_{RMS}	3.4 A_{RMS}	3.5 A_{RMS}	4.9 A_{RMS}	7.8 A_{RMS}
Enclosure		IP54	IP20 (when mounted)					
for MC_4_A...-5_3		0015/0022	0015 ... 0040			0055/0075		

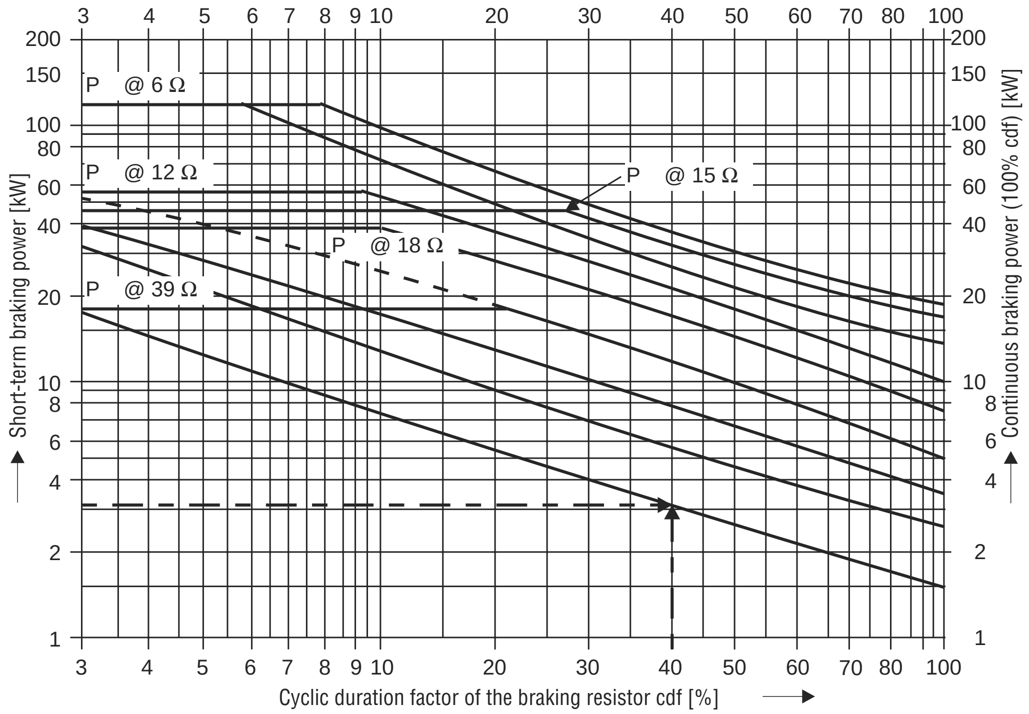

Figure 104: Power diagram for grid resistors 400/500 V units

Example When an intermittent braking power of 3 kW is needed with a cyclic duration factor of 40 %, it requires a braking resistor with a continuous power of 1.5 kW, e.g. BW018-015.

Braking resistor type		BW039-012	BW039-026	BW039-050	BW018-015	BW018-035	BW018-075
Load capacity	**100 % cdf**	1.2 kW	2.6 kW	5.0 kW	1.5 kW	3.5 kW	7.5 kW
Resistance value	R_{BW}	39 Ω ±10 %			18 Ω ±10 %		
Trip current of F16	I_F	4.2 A_{RMS}	7.8 A_{RMS}	11 A_{RMS}	4.0 A_{RMS}	8.1 A_{RMS}	14 A_{RMS}
Enclosure		IP20 (when mounted)					
for MC_4_A...-5_3		0110			0150/0220 and 2 × parallel with 0370/0450		

Braking resistor type		BW915	BW012-025	BW012-050	BW012-100	BW106	BW206
Load capacity	**100% cdf**	16 kW	2.5 kW	5.0 kW	10 kW	13 kW	18 kW
Resistance value	R_{BW}	15 Ω ±10 %	12 Ω ±10 %			6 Ω ±10 %	
Trip current of F16	I_F	28 A_{RMS}	6.1 A_{RMS}	12 A_{RMS}	22 A_{RMS}	38 A_{RMS}	42 A_{RMS}
Enclosure		IP20 (when mounted)					
for MC_4_A...-5_3		0110	0300			0370 ... 0750	

Power diagrams for MOVIDRIVE® compact MC_4_A...-2_3 (230 V units):

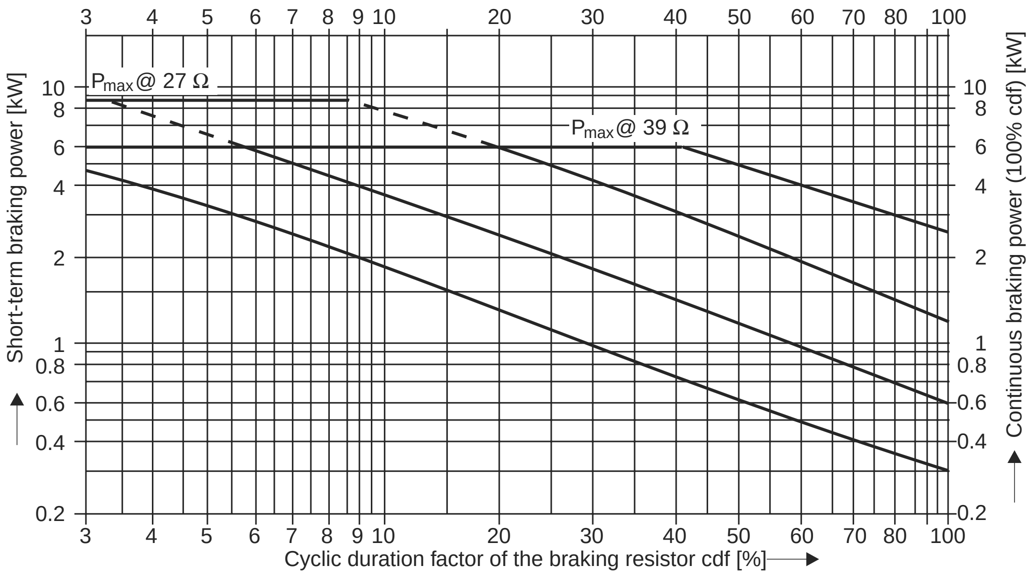

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Figure 105: Power diagram for wire resistors 230 V units

Braking resistor type		**BW039-003**	**BW039-006**	**BW039-012**	**BW039-026**	**BW027-006**	**BW027-012**
Load capacity	**100 % cdf**	0.3 kW	0.6 kW	1.2 kW	2.6 kW	0.6 kW	1.2 kW
Resistance value	R_{BW}	39 Ω ±10 %				27 Ω ±10 %	
Trip current of F16	I_F	2.0 A_{RMS}	3.2 A_{RMS}	4.2 A_{RMS}	7.8 A_{RMS}	2.5 A_{RMS}	4.4 A_{RMS}
Enclosure		IP20 (when mounted)					
for MC_4_A...-2_3		0015/0022				0015 ... 0037	

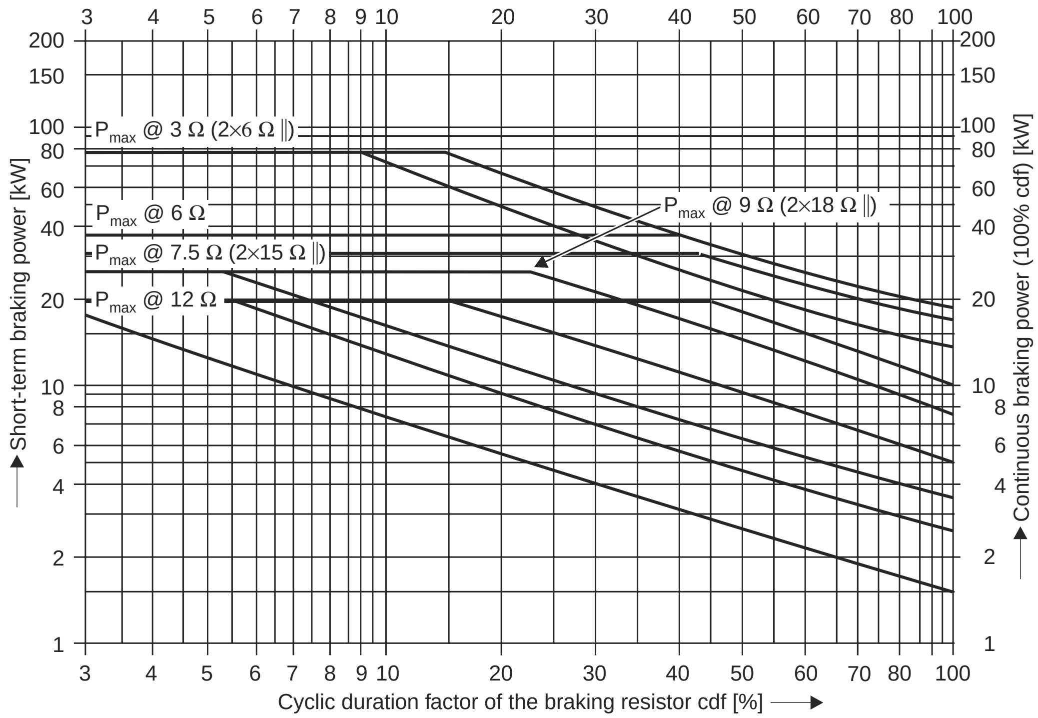

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Figure 106: Power diagram for grid resistors 230 V units

Braking resistor type		BW018-015	BW018-035	BW018-075	BW915
Load capacity	100 % cdf	1.5 kW	3.5 kW	7.5 kW	16 kW
Resistance value	R_{BW}	18 Ω ±10 %		18 Ω ±10 %	15 Ω ±10 %
Trip current of F16	I_F	4.0 A_{RMS}	8.1 A_{RMS}	14 A_{RMS}	28 A_{RMS}
Enclosure		IP20 (when mounted)			
for MC_4_A...-2_3		2 × parallel with 0110			

Braking resistor type		BW012-025	BW012-050	BW012-100	BW106	BW206
Load capacity	100 % cdf	2.5 kW	5.0 kW	10 kW	13 kW	18 kW
Resistance value	R_{BW}	12 Ω ±10 %			6 Ω ±10 %	
Trip current of F16	I_F	10 A_{RMS}	19 A_{RMS}	27 A_{RMS}	38 A_{RMS}	42 A_{RMS}
Enclosure		IP20 (when mounted)				
for MC_4_A...-2_3		0055/0075			0150 and 2 × parallel with 0220/0300	

5.11 Connecting AC brake motors

Refer to the 'Geared Motors' catalog for detailed information about the SEW brake system. This document can be ordered from SEW.

SEW brake systems are DC operated disc brakes which are released electromagnetically and applied by spring force. A brake rectifier supplies the brake with DC voltage.

The brake rectifier must have its own supply system cable for inverter operation; supply from the motor voltage is not permitted!

Switching off the brake rectifier

The brake rectifier can be switched off thereby causing the brake to be applied in two ways:

1. Cut-off in the AC circuit
2. Cut-off in the DC and AC circuit (faster cut-off)

Always switch off the brake on the DC and AC sides under the following conditions:

– all hoist applications,
– in CFC (MCV) and SERVO (MCS, MCH) operating modes.

Activating the brake

Always operate the brake via DBØØ, not via the PLC!

The binary output DBØØ '/Brake' is configured as an output for operating a relay with a control voltage of +24 V / max. 150 mA / 3.6 W. This means a power contactor can be controlled directly with a 24 V_{DC} coil voltage. The brake is switched using this power contactor.

The startup function in the DBG11B keypad and in the MOVITOOLS software sets the brake parameters for the 2 and 4-pole SEW motors. The brake parameters (P73_) must be set manually in the case of SEW motors with a higher number of poles.

Brake parameters

The brake parameters are adapted to the brake activation arrangement shown in the wiring diagram. Hoists may sag, for example, if the brake release and application time is set too short, e.g. in the event of long response times in the brake control system.

5.12 Permitted voltage systems for MOVIDRIVE®

MOVIDRIVE® is intended to be operated on voltage supply systems with a directly grounded star point (TN and TT power systems). Operation on voltage supply systems with a non-grounded star point (for example IT power systems) is permitted. In such a case, SEW recommends using earth-leakage monitors employing pulse-code measurement. This avoids mis-tripping of the earth-leakage monitor due to the earth capacitance of the inverter.

5.13 Mains contactor and mains fuses

Mains contactor

- Only use mains contactors in utilization category AC-3 (IEC 158-1).
- Do not use the K11 mains contactor for setup mode, but only for switching the inverter on and off. Use the 'Enable/RAPID STOP', 'CW/STOP' or 'CCW/STOP' commands for jog mode.

STOP

Observe a minimum switch-off time of 10 s for the mains contactor K11.

Mains fuse types

Line protection types in utilization categories gL, gG:

- Rated fuse voltage ≥ Power supply voltage
- Rated fuse currents must be configured to 100 % or 125 % of the rated inverter currents depending on the inverter capacity utilization.

Circuit breakers with characteristics B, C:

- Rated circuit breaker voltage ≥ Power supply voltage
- Rated circuit breaker currents must be 10 % above the rated inverter current.

5.14 Power cables and motor cables

Special regulations Comply with the **regulations issued by specific countries and for specific machines** regarding fusing and the selection of line cross sections. Also comply with the instructions for **UL-compliant installation** if necessary.

Line cross sections and fusing SEW proposes the following line cross sections and fusing, assuming the use of single-core copper cables with PVC insulation laid in cable ducts, an ambient temperature of 25 °C and rated system currents of 100 % of the rated inverter current:

400/500 V units metric, V_{in} = 3 × 400 V_{AC}:

MC_4_A...-5A3	0015	0022	0030	0040	0055	0075	0110
Size	1				2		
Fuses F11/F12/F13 I_N	16 A				16 A		25 A
Power cable L1/L2/L3	1.5 mm^2				1.5 mm^2		4 mm^2
PE conductor	2 × 1.5 mm^2 1 × 10 mm^2				2 × 1.5 mm^2 1 × 10 mm^2		2 × 4 mm^2 1 × 10 mm^2
Motor cable U/V/W	1.5 mm^2				1.5 mm^2	2.5 mm^2	4 mm^2
Unit terminal cross section of the power section	Disconnectable terminal strip 4 mm^2 conductor end sleeve DIN 46228				Screw and washer assembly M4 with terminal clip 4 mm^2 conductor end sleeve DIN 46228 6 mm^2 crimp cable connector DIN 46234		

MC_4_A...-503	0150	0220	0300	0370	0450	0550	0750
Size	3			4		5	
Fuses F11/F12/F13 I_N	35 A	50 A	63 A	80 A	100 A		125 A
Supply system lead L1/L2/L3	6 mm^2	10 mm^2	16 mm^2	25 mm^2	35 mm^2		50 mm^2
PE conductor	2 × 6 mm^2 1 × 10 mm^2	1 × 10 mm^2	1 × 16 mm^2	1 × 16 mm^2			
Motor cable U/V/W	6 mm^2	10 mm^2	16 mm^2 1)	25 mm^2 1)	35 mm^2		50 mm^2
Unit terminal cross section of the power section	Screw and washer assembly M6 with washer max. 25 mm^2 Crimp cable connector DIN 46234			Bolt M10 with nut max. 70 mm^2 Crimp cable connector DIN 46235			

1) Use a motor feeder with a 10 mm^2 cross section with MCS and MCH (SERVO) due to the connector on the CM/DFY motor!

230 V units metric, V_{in} = 3 × 230 V_{AC}:

MC_4_A...-2_3	0015	0022	0037	0055	0075
Size	1			2	
Fuses F11/F12/F13 I_N	16 A		25 A	25 A	35 A
Supply system lead L1/L2/L3	1.5 mm^2		4 mm^2	4 mm^2	6 mm^2
PE conductor	2 × 1.5 mm^2 1 × 10 mm^2		2 × 4 mm^2 1 × 10 mm^2	2 × 4 mm^2 1 × 10 mm^2	2 × 6 mm^2 1 × 10 mm^2
Motor cable U/V/W	1.5 mm^2		4 mm^2	4 mm^2	6 mm^2
Unit terminal cross section of the power section	Disconnectable terminal strip 4 mm^2 conductor end sleeve DIN 46228			Screw and washer assembly M4 with terminal clip 4 mm^2 conductor end sleeve DIN 46228 6 mm^2 crimp cable connector DIN 46234	

MC_4_A...-2_3	0110	0150	0220	0300
Size	3		4	
Fuses F11/F12/F13 I_N	50 A	63 A	80 A	100 A
Supply system lead L1/L2/L3	10 mm^2	16 mm^2	25 mm^2	35 mm^2
PE conductor	1 × 10 mm^2	1 × 16 mm^2	1 × 16 mm^2	1 × 16 mm^2
Motor cable U/V/W	10 mm^2	16 mm^2	25 mm^2	35 mm^2
Unit terminal cross section of the power section	Screw and washer assembly M6 with washer max. 25 mm^2 Crimp cable connector DIN 46234		Bolt M10 with nut max. 70 mm^2 Crimp cable connector DIN 46235	

400/500 V units to USA NEC, $V_{in} = 3 \times 460\ V_{AC}$:

MC_4_A...-5A3	0015	0022	0030	0040	0055	0075	0110
Size	1				2		
Fuses F11/F12/F13 I_N	6 A	10 A		15 A	20 A		30 A
Supply system lead L1/L2/L3	AWG14				AWG12		AWG10
PE conductor	AWG14				AWG12		AWG10
Motor cable U/V/W	AWG14				AWG12		AWG10
Unit terminal cross section of the power section	Disconnectable terminal strip AWG10 conductor end sleeve				Screw and washer assembly M4 with terminal clip AWG10 conductor end sleeve AWG10 crimp cable connector		

MC_4_A...-503	0150	0220	0300	0370	0450	0550	0750
Size	3			4		5	
Fuses F11/F12/F13 I_N	40 A	60 A	80 A	90 A	110 A	150 A	175 A
Supply system lead L1/L2/L3	AWG8	AWG6	AWG4	AWG4	AWG3	AWG1	AWG2/0
PE conductor	AWG10		AWG8	AWG8	AWG6	AWG6	
Motor cable U/V/W	AWG8	AWG6 1)	AWG4 1)	AWG4 1)	AWG3	AWG1	AWG2/0
Unit terminal cross section of the power section	Screw and washer assembly M6 with washer max. AWG4 crimp cable connector			Bolt M10 with nut max. AWG2/0 crimp cable connector			

1) Use a motor feeder with an AWG8 cross section with MCS and MCH (SERVO) due to the connector on the CM/DFY motor!

230 V units to USA NEC, $V_{in} = 3 \times 230\ V_{AC}$:

MC_4_A...-2_3	0015	0022	0037	0055	0075
Size	1			2	
Fuses F11/F12/F13 I_N	16 A		25 A	25 A	35 A
Supply system lead L1/L2/L3	AWG14		AWG12	AWG10	
PE conductor	AWG14		AWG12	AWG10	
Motor cable U/V/W	AWG14		AWG12	AWG10	
Unit terminal cross section of the power section	Disconnectable terminal strip AWG10 conductor end sleeve			Screw and washer assembly M4 with terminal clip AWG10 conductor end sleeve AWG10 crimp cable connector	

MC_4_A...-2_3	0110	0150	0220	0300
Size	3		4	
Fuses F11/F12/F13 I_N	50 A	60 A	80 A	90 A
Supply system lead L1/L2/L3	AWG6	AWG4	AWG4	AWG3
PE conductor	AWG10	AWG8	AWG8	AWG6
Motor cable U/V/W	AWG6	AWG4	AWG4	AWG3
Unit terminal cross section of the power section	Screw and washer assembly M6 with washer max. AWG4 crimp cable connector		Bolt M10 with nut max. AWG2/0 crimp cable connector	

AWG = American Wire Gauge

Permitted motor cable lengths

The **maximum motor cable length** is dependent on:

- cable type
- voltage drop in the cable,
- only in VFC operating mode: Set PWM frequency P860/P861.
- only in VFC operating mode: Connecting an HF... output filter.
- with an encoder connected: the maximum cable length for the encoder connection is 100 m (330 ft) with a capacitance per unit length of ≤ 120 nF/km (193 nF/mile).

The following information provides approximate values:

MOVIDRIVE® compact MC_4_A...-5_3:

MC_4_A...-5_3 at V_{in} = 3 × 400 V_{AC}	0015	0022	0030	0040	0055	0075 ... 0750
	Recommended maximum motor cable length [m (ft)]					
	Shielded cable					
VFC operating mode[1] 4 kHz PWM frequency 8 kHz (P860/P861) 12 kHz 16 kHz	120 (396) 80 (264) 50 (165) 40 (132)	200 (660) 120 (396) 80 (264) 60 (198)	250 (825) 150 (495) 120 (396) 100 (330)	300 (990) 250 (825) 200 (660) 150 (495)	300 (990) 250 (825) 200 (660) 150 (495)	400 (1320) 300 (990) 250 (825) 200 (660)
CFC and SERVO mode PWM frequency fixed at 8 kHz	100 (330)					
	Unshielded cable					
VFC operating mode[1] 4 kHz PWM frequency 8 kHz (P860/P861) 12 kHz 16 kHz	360 (1188) 240 (792) 150 (495) 120 (396)	600 (1980) 360 (1188) 240 (792) 180 (594)	750 (2475) 450 (1485) 360 (1188) 300 (990)	900 (2970) 750 (2475) 600 (1980) 450 (1485)	900 (2970) 750 (2475) 600 (1980) 450 (1485)	1200 (3960) 900 (2970) 750 (2475) 600 (1980)
CFC and SERVO mode PWM frequency fixed at 8 kHz	100 (330)					

1) An output filter is only permitted in VFC mode and with an unshielded motor feeder. If an HF... output filter is connected, the cable length is not restricted by these limiting values, but exclusively by the voltage drop along the motor feeder.

MOVIDRIVE® compact MC_4_A...-2_3:

MC_4_A...-2_3 at V_{in} = 3 × 230 V_{AC}	0015	0022	0037	0055	0075	0110 ... 0300
	Recommended maximum motor cable length [m (ft)]					
	Shielded cable					
VFC operating mode[1] 4 kHz PWM frequency 8 kHz (P860/P861) 12 kHz 16 kHz	120 (396) 80 (264) 50 (165) 40 (132)	200 (660) 120 (396) 80 (264) 60 (198)	250 (825) 150 (495) 120 (396) 100 (330)	300 (990) 250 (825) 200 (660) 150 (495)	300 (990) 250 (825) 200 (660) 150 (495)	400 (1320) 300 (990) 250 (825) 200 (660)
CFC operating mode PWM frequency fixed at 8 kHz	100 (330)					
	Unshielded cable					
VFC operating mode[1] 4 kHz PWM frequency 8 kHz (P860/P861) 12 kHz 16 kHz	360 (1188) 240 (792) 150 (495) 120 (396)	600 (1980) 360 (1188) 240 (792) 180 (594)	750 (2475) 450 (1485) 360 (1188) 300 (990)	900 (2970) 750 (2475) 600 (1980) 450 (1485)	900 (2970) 750 (2475) 600 (1980) 450 (1485)	1200 (3960) 900 (2970) 750 (2475) 600 (1980)
CFC operating mode PWM frequency fixed at 8 kHz	100 (330)					

1) No output filter is allowed to be connected to MOVIDRIVE® MD_60A...-2_3!

Voltage drop

The line cross section of the motor cable should be selected so the **voltage drop is as small as possible**. An excessively high 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).

Line cross section	Load with I [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) Loading not permitted, in accordance with VDE 0100 part 430

Line cross section	Load with I [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 V_{in} = 460 V_{AC}.

5.15 Group drive in VFC mode

In VFC & GROUP operating mode, a group of asynchronous motors can be operated on one inverter. In this operating mode, the inverter operates without slip compensation and with a constant U/f ratio. The motors are operated without encoder feedback.

The parameter settings apply to all connected motors.

Motor currents The total of the motor currents must not exceed the output rated current of the inverter.

Motor lead The permitted length of all motor leads connected in parallel is determined as follows:

$$l_{ges} \leq \frac{l_{max}}{n}$$

04999AXX

l_{tot}= Total length of the motor leads connected in parallel

l_{max}= Recommended maximum motor lead length (→ page 219)

n = Number of motors connected in parallel

Only use unshielded motor leads.

Motor size The motors in a group must not be more than three levels apart.

Output filter Usually, there is no need for an output filter with small groups of 2 to 3 motors. An output filter HF... is required if the maximum motor lead length (l_{max}) given in the table is not adequate. This may be the case in large groups (n) or when there are long motor lead lengths connected in parallel (l_{tot}). The maximum motor lead length is then no longer restricted by the limit given in the table, but instead by the voltage drop on the motor lead. The total value of the rated motor currents must not exceed the rated throughput current of the output filter.

No flying restart circuit is possible with an output filter!

5.16 Connecting explosion-proof AC motors

Comply with the following instructions when connecting explosion-proof AC motors to MOVIDRIVE® drive inverters:

- The inverter must be installed outside the potentially explosive atmosphere.
- Comply with regulations specific to the industry and country.
- Comply with the regulations and instructions issued by the motor manufacturer with regard to operation on a frequency inverter, e.g. requirement for a sine filter.
- In future, all tools and fixtures in the potentially explosive atmosphere must comply with directive 94/9/EC (ATEX 100a).
- The TF/TH input on the MOVIDRIVE® must not be used for thermal monitoring of the motor. Use a TF/TH trip switch which is approved for use in potentially explosive atmospheres for thermal monitoring.
- In the case of motors with speed feedback, the tachometer must also be approved for use in potentially explosive atmospheres. The tachometer can be directly connected to MOVIDRIVE®.

5.17 Components for EMC compliant installation

The designated use of MOVIDRIVE® drive inverters and regenerative power supply units is as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 'Variable-speed electrical drives'. Provided the information relating to EMC compliant installation is complied with, they satisfy the appropriate requirements for CE-marking of the entire machine/system in which they are fitted, on the basis of the EMC Directive 89/336/EEC.

MOVIDRIVE® *compact* MC_4_A drive inverters of size 1 and 2 are fitted with an input filter as standard. These units comply with limit value class A to EN 55011 and EN 55014 on the line side without further measures.

Interference immunity

With regard to interference immunity, MOVIDRIVE® meets **all** the requirements stipulated in EN 50082-2 and EN 61800-3.

Interference emission

Higher levels of interference are permitted in industries. In such an environment, it may be possible to dispense with the measures described below depending on the situation of the supply system and the machine configuration.

Limit value class A

Two options are available for EMC compliant installation in accordance with EN 55011, **limit value class A**, depending on the machine configuration:

Limit value class A	On the motor	On the power system	
	Sizes 1 to 5	Sizes 1 and 2	Sizes 3 to 5
1st option	HD... output choke	No action needed	NF...-... input filter
2nd option	Shielded motor feeder	No action needed	NF...-... input filter

Class B limit

Two options are available for EMC compliant installation in accordance with EN 55011, **limit value class B**, depending on the machine configuration:

Class B limit	On the motor	On the power system
	Sizes 1 to 5	Sizes 1 to 5
1st option	HD... output choke	NF...-... input filter
2nd option	Shielded motor feeder	NF...-... input filter

IT systems

STOP

No EMC limits are specified for interference emission in voltage supply systems without an earthed star point (IT systems). The effectiveness of input filters is severely limited.

Block diagram of limit value class B

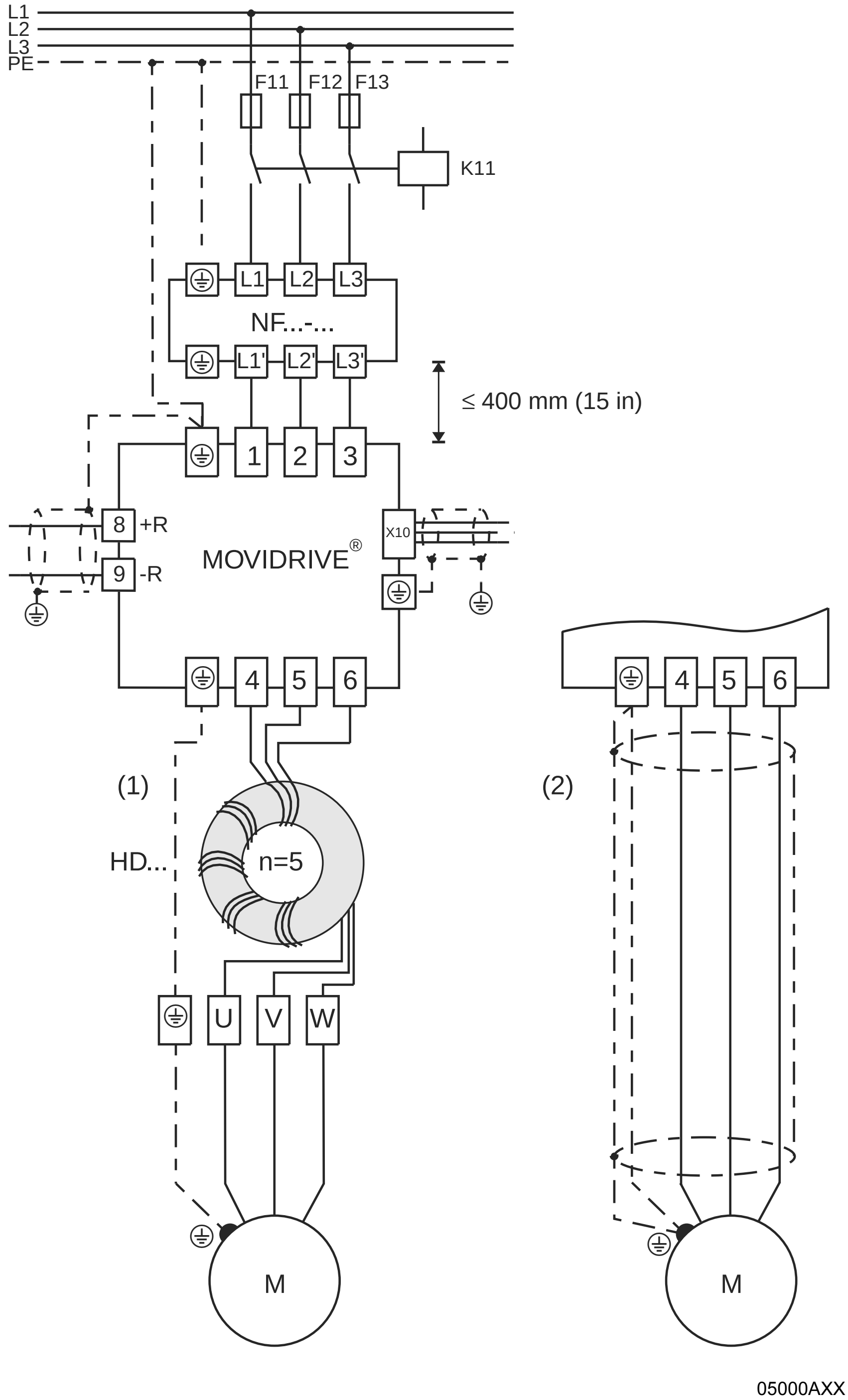


Figure 107: Installation with consideration for EMC, in accordance with limit value class B

(1) = 1st possible solution with HD... output choke

(2) = 2nd possible solution with shielded motor lead

Refer to the publication entitled 'Drive Engineering - Practical Implementation, Electromagnetic Compatibility' for more information. This document can be ordered from SEW.

5.18 Connecting the optional power components

Series ND... line choke

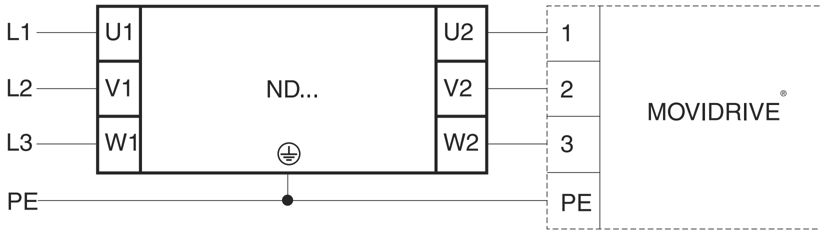


Figure 108: Connecting ND... line chokes

Series NF...-... line filters

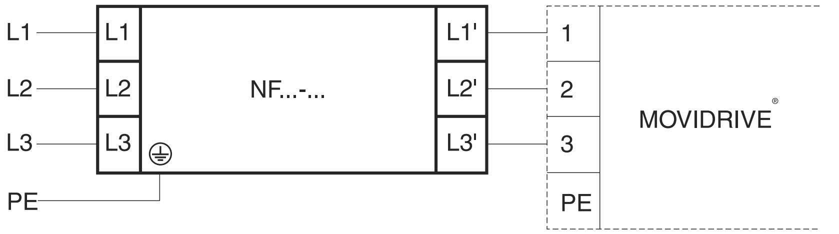


Figure 109: Connecting NF...-... line filters

Series HD... output chokes

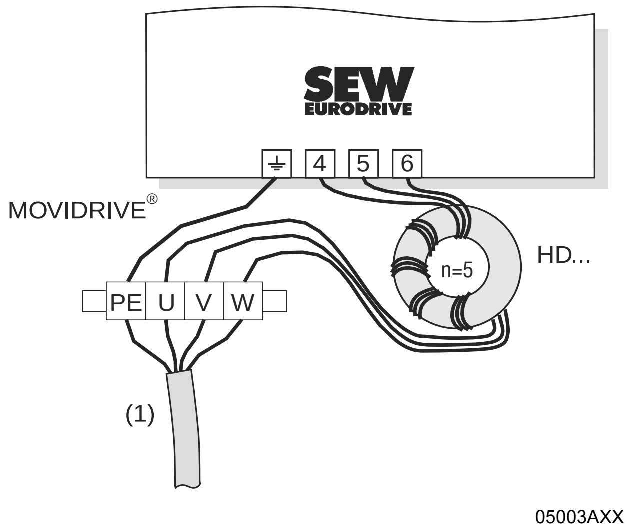
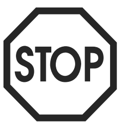


Figure 110: Connecting HD... output chokes

(1) = Motor cable



Only route the 3 phases U, V and W through the output choke! Do not route the PE conductor through the output choke!

Output choke type	HD001	HD002	HD003
For cable cross sections	1.5...16 mm^2 (AWG16...6)	≤ 1.5 mm^2 (≤ AWG16)	≥ 16 mm^2 (≥ AWG6)

Series HF... output filters

- Output filters are allowed to be used in:

Operating mode	MOVIDRIVE® *compact*			
	MCF	MCV	MCS	MCH
VFC	Yes	Yes	X	Yes
CFC	X	No	X	No
SERVO	X	X	No	No

- Install output filters next to the corresponding inverter. Leave a ventilation space of at least 100 mm (4 in) below and above the output filter. No clearance is required to either side.

- Restrict the length of the cable between the inverter and the output filter to the absolute minimum needed. Maximum 1 m (3.3 ft) with an unshielded cable and 10 m (33 ft) for a shielded cable.

- An unshielded motor lead is sufficient when using an output filter. Note the following instructions when you are using an output filter together with a shielded motor lead:
  –DC link required (→ page 227)
  –Set P860/P861 PWM frequency 1/2 = 16 kHz
  –Set P862/P863 PWM fix 1/2 = ON
  –The DC link increases the inverter load.

- Several motors can be connected jointly to one output filter when multiple motors are operated on one inverter. The total value of the rated motor currents must not exceed the rated throughput current of the output filter.

- It is acceptable for two identical output filter to be connected in parallel to one inverter output in order to double the rated throughput current. To do this, all connections with the same name should be connected to the output filters in parallel.

- Output filter connection V5 (with HF...-503) or 7 (with HF...-403) must not be connected (no DC link) when the inverter is operated with f_{PWM} = 4 or 8 kHz.

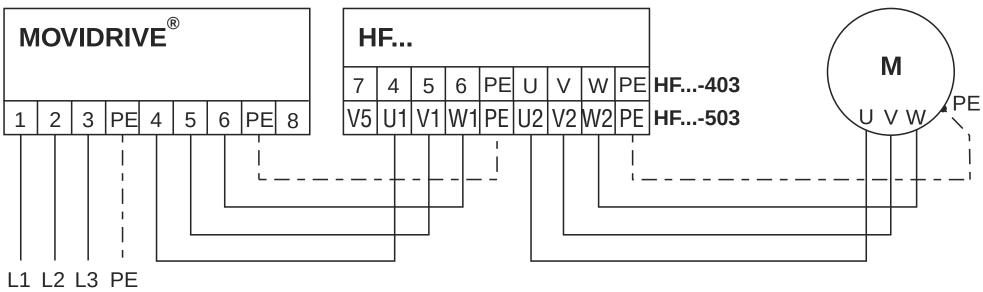


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Figure 111: HF...-... output filter connection without DC link

DC link

Operation without DC link (standard):

- Permitted for all PWM frequencies (4, 8, 16 kHz).

Operation with DC link
(Connection of inverter tl. 8 to HF...-503 tl. V5 or HF...-403 tl. 7):

- Improved filter effect in the low-frequency range (≤ 150 kHz).
- Only the PWM frequency 16 kHz is permitted. Note the power reduction of units as a function of the PWM frequency!
- Set P862/P863 'PWM fix' = ON!
- With HF...-403: Only permitted with $V_{in} \leq 400\ V_{AC}$.

The DC link connection increases the required inverter output current in relation to the rated output current of the inverter in accordance with the following table.

f_{PWM}	$V_{in} = 3 \times 400\ V_{AC}$	$V_{in} = 3 \times 500\ V_{AC}$
16 kHz	8%	12%

Failure to comply with this may result in the inverter shutting down due to an overload.

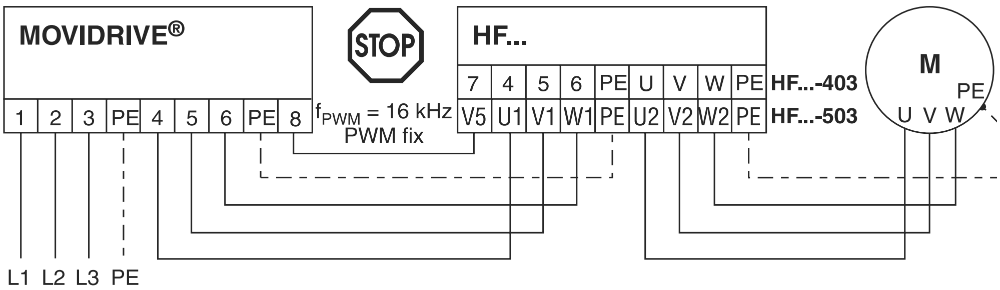

Figure 112: HF...-... output filter connection with DC link

5.19 Electronics cables and signal generation

- The electronics terminals are suitable for the following cross sections:

  MCF/MCV/MCS: Single core 0.20...2.5 mm^2 (AWG24...12)
  Double core 0.20...1 mm^2 (AWG24...17)

  MCH: Only single core 0.20...1.5 mm^2 (AWG24...16)
  Use right-angled crimping pliers with 1.5 mm^2 (AWG16)

  Route electronics cables separately from power cables and contactor control cables or braking resistor cables. If using shielded electronics cables, earth the shield at both ends.
- Use a setpoint potentiometer with R = 5 kΩ.
- If necessary, potentiometer setpoints are switched using the 10 V voltage rather than via the wiper lead.

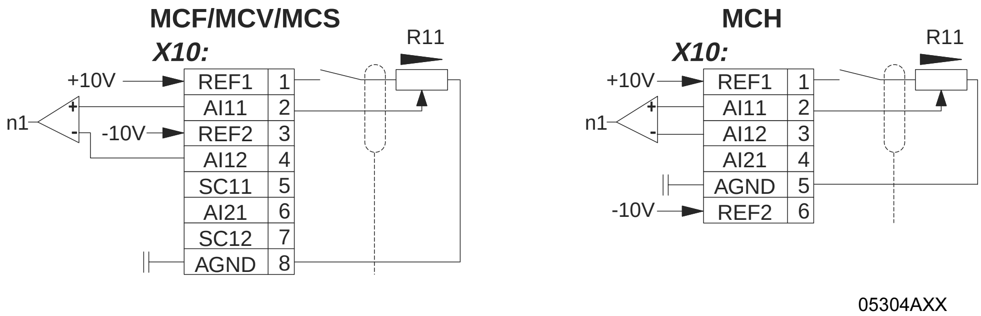

Figure 113: Switching the potentiometer setpoint

- 0 V cables (AGND, DGND, DCOM) are never connected for generating signals. The 0 V cables of several electrical units which are connected together should not be looped from unit to unit, but rather wired up in a star configuration. This means:
  - –Install the units in adjacent switch cabinet compartments rather than distributing them widely.
  - –Lay the 0 V cables with 1.5 mm^2 (AWG16) cross section from a central point to each individual unit by the shortest possible route.
- If coupling relays are used, they should always be ones with encapsulated, dust-protected electronics contacts, which are suitable for switching small voltages and currents (5...20 V, 0.1...20 mA).
- Binary inputs/outputs

  The binary inputs are electrically isolated by optocouplers. Binary input commands can also be issued directly as a 0/1 command from the PLC instead of using a coupling relay (signal level → electronics data).

  The binary outputs are short-circuit proof, although they are not interference-voltage-proof. Applying an external voltage to the binary outputs may destroy them!
- The inverter starts a self-test (approx. 3 s) when the power system or the 24 V supply is switched on. All signal outputs have the level '0' throughout the self-test.
- 24 V power supply VI24:

  To EN 61131-2, V_N = +24 V -10 %/+20 %. A total AC voltage component with a peak value of 5 % of the rated voltage (+24 V) is permitted in addition to the specified voltage tolerances.

5.20 External 24 V_{DC} voltage supply

MOVIDRIVE® *compact* units have an internal 24 V_{DC} supply with a maximum continuous power of 50 W. The units can be operated without an external 24 V_{DC} voltage supply. An external 24 V_{DC} power supply unit with minimum 50 W continuous output power must be connected to VI24 if the control electronics of the inverter should remain operational even when the power system is switched off. The permitted peak output power must be at least 100 W for 1 s. This power supply unit then takes over the complete 24 V_{DC} power supply for MOVIDRIVE® *compact*.

SEW recommends that units with a fieldbus (MC_41A and MCH42A) should always be operated with an external 24 V_{DC} voltage supply.

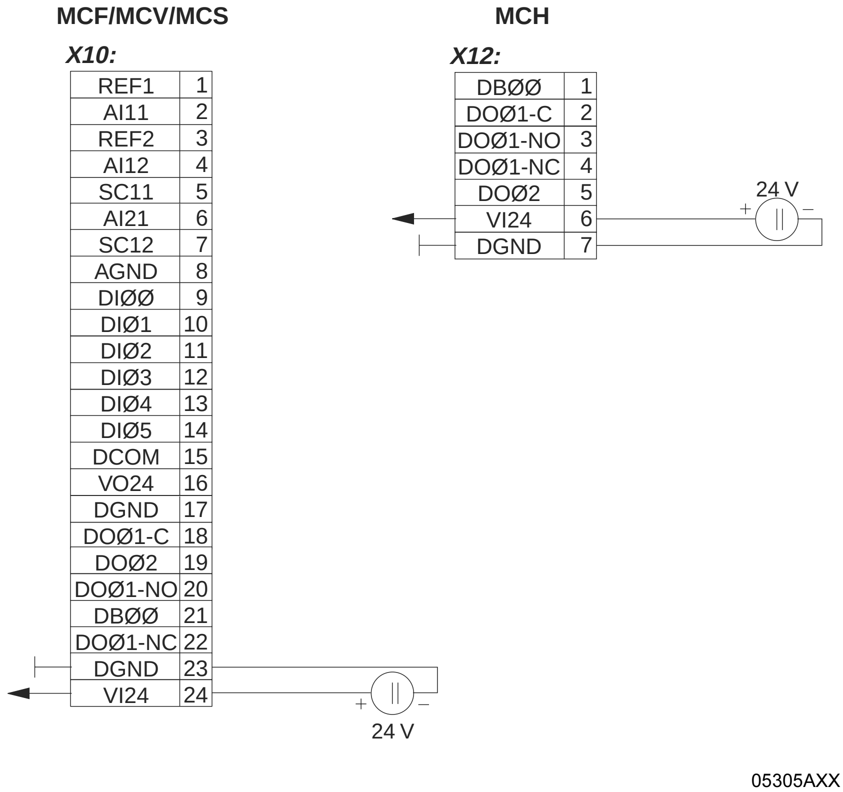

Figure 114: Connecting the external 24 V_{DC} voltage supply

5.21 Parameter set switchover

This function allows two motors to be operated with two different parameter sets on the same inverter in the VFC modes without speed control (→ P700).

The parameter set switchover occurs by means of a binary input. A binary input must be programmed to the 'PARAM. SWITCHOVER' function (→ P60_/P61_) for this purpose. It is possible to switch between parameter set 1 and 2 in the BLOCKED inverter status.

Function	Effect of	
	'0' signal	'1' signal
PARAM. SWITCHOVER	Parameter set 1 active	Parameter set 2 active

A changeover contactor should be provided for each of the two motor leads when two motors are operated alternately on the same inverter with the parameter set switchover function in use (→ P60_/P61_ PARAM. SWITCHOVER). Do not switch the switchover contacts unless the unit is inhibited!

Only VFC operating modes without speed control are possible with parameter set 2. Speed control or CFC and SERVO operating modes are not possible.

5.22 Priority of operating states and logic gating of control signals

Priority of operating states

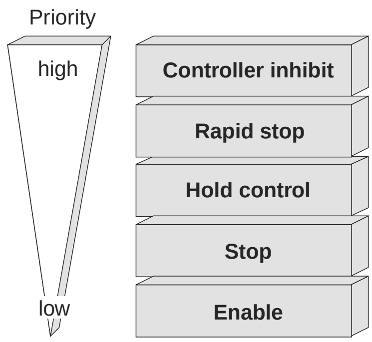

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Figure 115: Priority of operating states

Logic gating of control signals

The following table shows the logic gating of control signals. '/Controller inhibit' is programmed to binary input DIØØ and cannot be changed. The other control signals are only in effect if a binary input is programmed to this function (→ parameter P60_).

/Controller inhibit (DIØØ)	Binary input is programmed to				Inverter status
	Enable/rapid stop	/Hold control	CW/STOP	CCW/STOP	
'0'	1)	1)	1)	1)	Inhibit
'1'	'0'	2)	2)	2)	Inhibit
'1'	'1'	'0'	3)	3)	Inhibit
'1'	'1'	'1'	'1'	'0'	CW running enabled
'1'	'1'	'1'	'0'	'1'	CCW running enabled

1) Not relevant if '/Controller inhibit (DIØØ)' = '0'

2) Not relevant if 'Enable/Rapid stop' = '0'

3) Not relevant if '/Hold control' = '0'

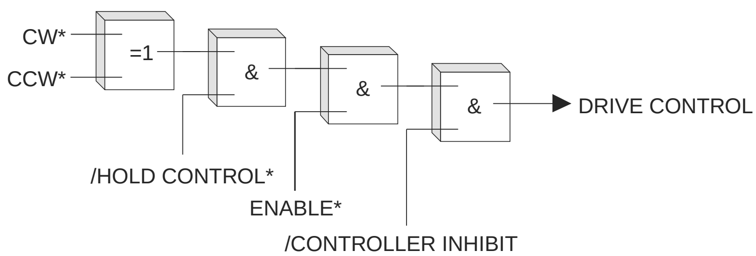

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Figure 116: Logic gating of control signals

* If a binary input is programmed to this function.

5.23 Limit switches

Limit switch processing

Limit switch processing ensures that a drive does not move outside its travel range. To do this, it is possible to program the binary inputs to the functions /LIM. SWITCH CW and /LIM. SWITCH CCW. The limit switches are connected to these binary inputs. The limit switches must be '0' active and continuously actuated in the limit switch area (= movement up to limit switch).

'0' active means:

•Limit switch not contacted (= not actuated) → 24 V signal
•Limit switch contacted (= actuated) → 0 V signal

Limit switch contacted ('0' signal)

- The drive is stopped with the emergency ramp t14/t24.
- The brake is then applied if the brake function is activated.
- In IPOS operating modes, contacting a limit switch generates a fault message. A reset is then required in order to move clear (→ IPOS manual).

Moving the drive clear

- The inverter must be enabled via the binary inputs.
- Hold control must not be active.
- The inverter receives a setpoint from the setpoint source leading in the direction for moving clear.
- If the setpoint stop function is activated: setpoint > start setpoint

Behavior of the drive when moving clear

- When the brake function is activated, the brake is first released and then the drive is moved clear ('0' → '1' signal). The limit switches must supply a '1' signal continuously in the travel range.

If movement clear of the limit switch area takes place without a move-clear phase, for example by moving the drive manually, then it is possible to continue moving in normal operating status.

Limit switch monitoring

- The inverter monitors whether the limit switches are missing, if there is an open circuit or if the limit switches have been swapped over. If this is the case, the inverter triggers an emergency stop and displays fault F27, 'Limit switches missing.'

6 Serial Communication

MOVILINK® protocol

The MOVILINK® profile enables the uniform transmission of user data between SEW inverters as well as via various communications interfaces to higher-level automation equipment. Consequently, MOVILINK® guarantees a control and parameter setting concept that can be used regardless of the fieldbus for all current bus systems, such as:

- PROFIBUS-DP
- INTERBUS with fiber optic cable
- CAN
- RS-232
- RS-485

The MOVILINK® protocol for serial interfaces in the new SEW range of inverters, MOVIDRIVE® and MOVIMOT®, enables you to set up a serial bus connection between a higher-level master and several SEW inverters. For example, masters may take the form of programmable logic controllers, PCs or even SEW inverters with PLC functions (IPOS$^{plus®}$). Generally speaking, the SEW inverters function as slaves in the bus system.

The MOVILINK® protocol allows both of the following applications to be implemented: automation tasks such as control and parameter setting of the drives by means of cyclical data exchange, startup and visualization tasks.

Features

The principal features of the MOVILINK® protocol are:

- Support for the master/slave structure via RS-485 with one master (single master) and at most 31 slave stations (SEW inverters).
- Support for point-to-point connection via RS-232.
- User-friendly implementation of the protocol in a straightforward and reliable message structure with fixed message lengths and a unique start identifier.
- Data interface to the basic unit in accordance with the MOVILINK® profile. This means the user data sent to the drive are transmitted to the inverter in the same way as via the other communications interfaces (PROFIBUS, INTERBUS, CAN etc.).
- Access to all drive parameters and functions, so they can be used for startup, service, diagnostics, visualization and automation tasks.
- Startup and diagnostic tools on the basis of MOVILINK® for PC (e.g. MOVITOOLS/SHELL and MOVITOOLS/SCOPE).

Please refer to the 'Serial Communication and System Bus (SBus)' manual for a detailed description of the MOVILINK® protocol. This manual is available from SEW-EURODRIVE.

7 Safety Notes

Installation and startup

- **Never install damaged products or take them into operation.** Please submit a complaint to the shipping company immediately in the event of damage.
- **Installation, startup and service work** may only be performed by **trained personnel** observing applicable accident prevention regulations and operating instructions! The regulations in force (e.g. EN 60204, VBG 4, DIN-VDE 0100/0113/0160) must also be complied with.
- Follow the **specific instructions** during **installation** and **startup** of the motor and the brake!
- Make sure that **preventive measures** and **protection devices** correspond to the **applicable regulations** (e.g. EN 60204 or EN 50178).

  Necessary protection measures: Grounding the unit

  Necessary protection device: Overcurrent protection devices
- **The unit meets all requirements for reliable isolation** of power and electronics connections in accordance with EN 50178. **All connected circuits** must also **satisfy the requirements for reliable isolation** so as to guarantee reliable isolation.
- Take **suitable measures** to ensure that the connected **motor does not start up automatically when the** inverter **is switched on**.

  Suitable measures are:

  –With MCF/MCV/MCS4_A: Connect terminal X10:9 '/CONTROL. INHIBIT' to DGND.
–With MCH4_A: Disconnect the electronics terminal block X11.

Operation and service

- **Disconnect the unit from the power supply system** prior to **removing the protective cover. Dangerous voltages** may still be present for up to **10 minutes after mains disconnection**.
- The unit has **IP 00** enclosure with the **protective cover removed**. **Dangerous voltages** are present at all subassemblies except for the control electronics. The unit must be closed during operation.
- **Dangerous voltages** are present at the **output terminals** and the **cables and motor terminals connected to them when the unit is switched on**. This also applies even when the unit is inhibited and the motor at a standstill.
- Just because the **operation LED and other display elements** have gone out **does not mean** that the unit has been disconnected from the supply system and is **de-energized**.
- **Safety functions inside the unit** or a **mechanical blockage** may cause the **motor to stop**. The **removal of the source of the malfunction** or a **reset** can result in an **automatic restart of the drive**. If, for safety reasons, this is **not permitted** for the driven machine, the **unit must be disconnected from the supply system** before correcting the fault. In such cases, it is also forbidden for the **'Auto reset' function (P841)** to be activated.
- Switch the inverter output only **when the output stage is inhibited**.

8 Unit Design

8.1 Unit designation, nameplates and scope of delivery

Sample unit designation

MOVIDRIVE® *compact* MCV 41 A 0055-5A3-4-00

Version	00 = Standard / 0T = Technology
Quadrants	4 = 4Q (with brake chopper)
Type of supply	3 = 3-phase
Input filter	A = installed / 0 = not installed
Rated supply voltage	5 = 380...500 V_{AC} / 2 = 200...240 V_{AC}
Recommended motor power	0055 = 5.5 kW
Version A	
Type series and generation	
Type: MCF	= flux control mode without encoder for asynchronous motors VFC operating modes (VFC = Voltage Flux Control) only
MCV	= flux control mode without and with encoder for asynchronous motors VFC and CFC operating modes (CFC = Current Flux Control)
MCS	= flux control mode with resolver for synchronous motors SERVO operating modes
MCH	= flux control mode with encoder (Hiperface, sin/cos or TTL) for asynchronous or synchronous motors

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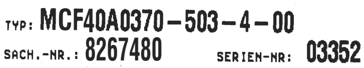
Sample name-plate

The overall nameplate is attached to the side of the unit.

01318AXX

Figure 117: Overall nameplate

Furthermore, a type label is attached to the front of the control unit (above the TERMINAL option slot).



01322AXX

Figure 118: Type label

Scope of delivery

- MCH: Connector housing for signal terminals (X10...X12), connected.
- In addition, with size 1: Plug housing for the power terminals (X1...X4), connected.
- In addition, with sizes 1 and 2: Power shield clamp.
- In addition, with sizes 4 and 5: Touch guard for the power terminals.

8.2 Unit design MCF/MCV/MCS4_A

Size 1 MCF/MCV/MCS4_A...-5A3 (400/500 V units): 0015...0040

MCF/MCV/MCS4_A...-2A3 (230 V units): 0015...0037

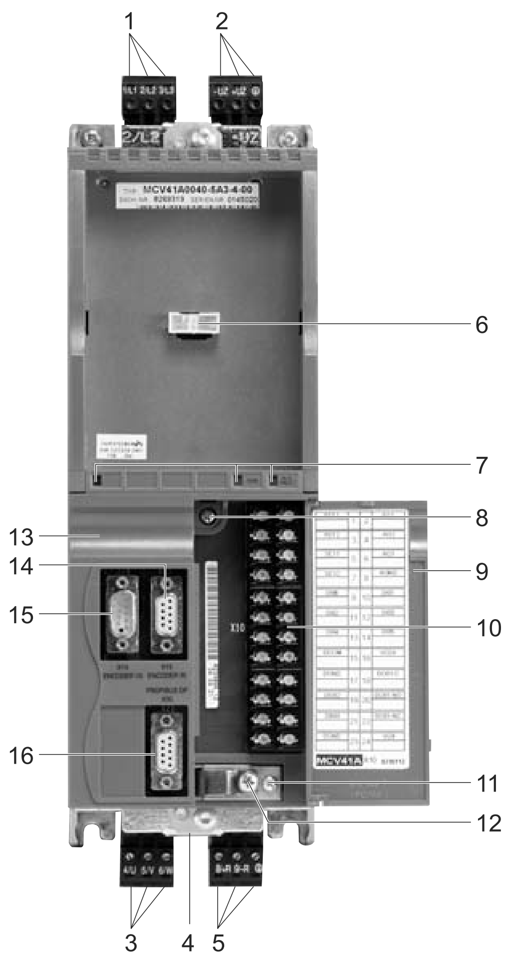


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Figure 119: Unit design, MOVIDRIVE® compact MCF/MCV/MCS4_A, size 1

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
2. X4: DC link connection -U_Z / +U_Z and PE connection, separable
3. X2: Motor connection U (4) / V (5) / W (6), separable
4. Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection, separable
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operating LED and PROFIBUS-DP diagnostic LEDs (only with MCF/MCV/MCS41A)
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip
11. Retaining screw B for terminal unit
12. Screw for electronics shield clamp
13. Terminal unit, removable
14. Only with MCV/MCS4_A X15: Motor encoder input (9-pin sub D socket)
15. Only with MCV/MCS4_A X14: Incremental encoder simulation output or external encoder input (9-pin sub D plug)
16. Only in MCF/MCV/MCS41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 2

MCF/MCV/MCS4_A...-5A3 (400/500 V units): 0055...0110

MCF/MCV/MCS4_A...-2A3 (230 V units): 0055 / 0075

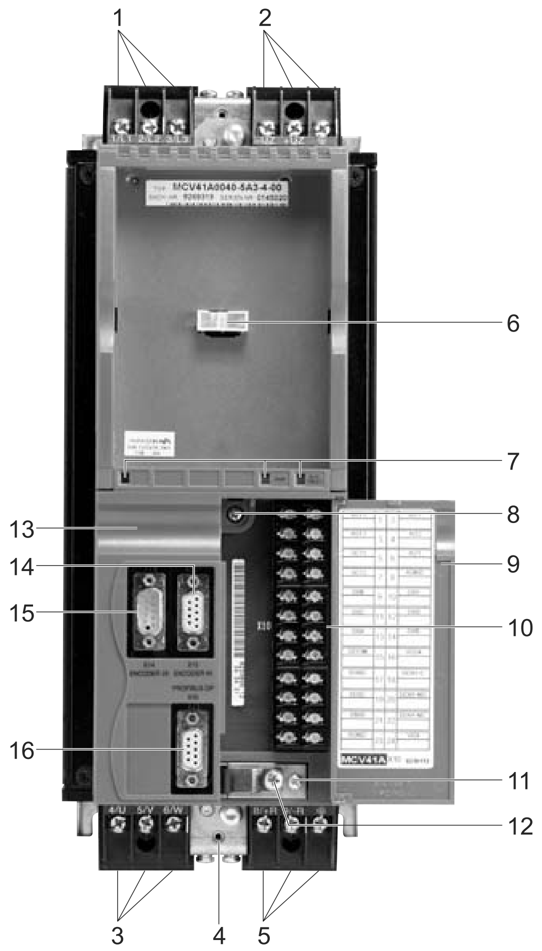

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Figure 120: Unit design, MOVIDRIVE® compact MCF/MCV/MCS4_A, size 2

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
2. X4: DC link connection -U_Z / +U_Z and PE connection
3. X2: Motor connection U (4) / V (5) / W (6)
4. X6: Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operating LED and PROFIBUS-DP diagnostic LEDs (only with MCF/MCV/MCS41A)
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip
11. Retaining screw B for terminal unit
12. Screw for electronics shield clamp
13. Terminal unit, removable
14. Only with MCV/MCS4_A X15: Motor encoder input (9-pin sub D socket)
15. Only with MCV/MCS4_A X14: Incremental encoder simulation output or external encoder input (9-pin sub D plug)
16. Only in MCF/MCV/MCS41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 3

MCF/MCV/MCS4_A...-503 (400/500 V units): 0150...0300

MCF/MCV/MCS4_A...-203 (230 V units): 0110 / 0150

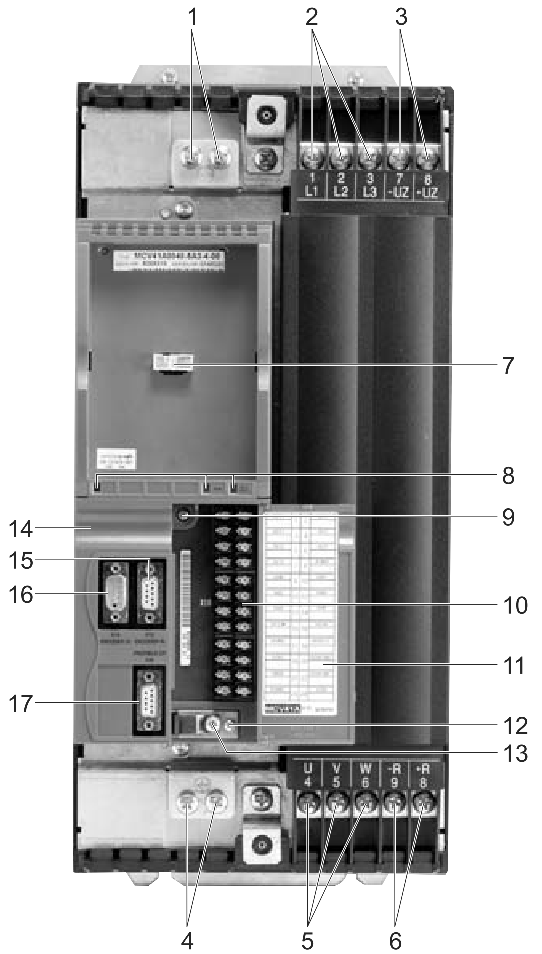

Figure 121: Unit design, MOVIDRIVE® compact MCF/MCV/MCS4_A, size 3

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operating LED and PROFIBUS-DP diagnostic LEDs (only with MCF/MCV/MCS41A)
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip
11. Flap on terminal unit with labeling tile
12. Retaining screw B for terminal unit
13. Screw for electronics shield clamp
14. Terminal unit, removable
15. Only with MCV/MCS4_A X15: Motor encoder input (9-pin sub D socket)
16. Only with MCV/MCS4_A X14: Incremental encoder simulation output or external encoder input (9-pin sub D plug)
17. Only in MCF/MCV/MCS41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 4

MCF/MCV/MCS4_A...-503 (400/500 V units): 0370 / 0450

MCF/MCV/MCS4_A...-203 (230 V units): 0220 / 0300

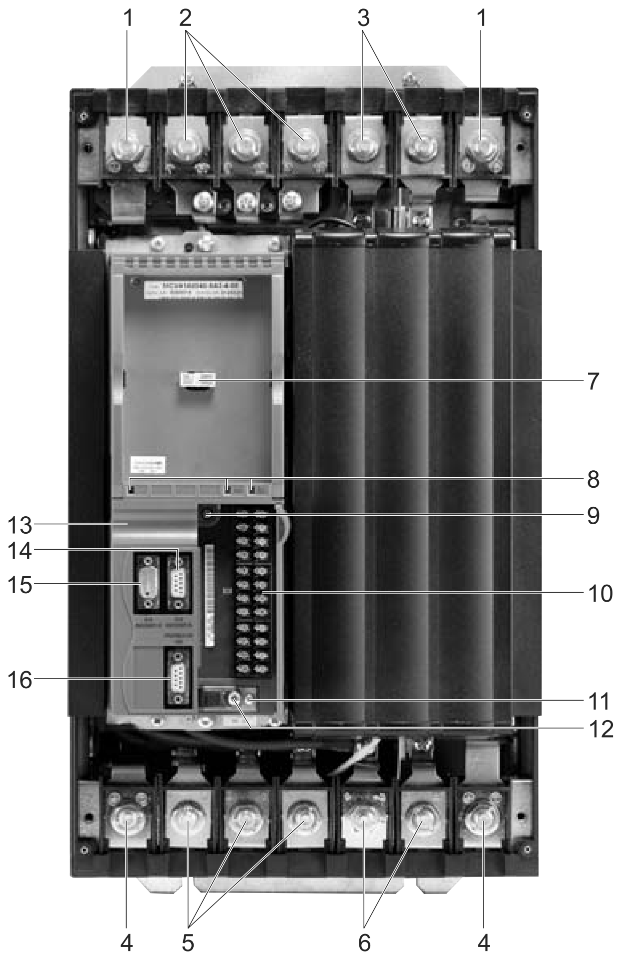

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Figure 122: Unit design, MOVIDRIVE® compact MCF/MCV/MCS4_A, size 4

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operating LED and PROFIBUS-DP diagnostic LEDs (only with MCF/MCV/MCS41A)
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip
11. Retaining screw B for terminal unit
12. Screw for electronics shield clamp
13. Terminal unit, removable
14. Only with MCV/MCS4_A X15: Motor encoder input (9-pin sub D socket)
15. Only with MCV/MCS4_A X14: Incremental encoder simulation output or external encoder input (9-pin sub D plug)
16. Only in MCF/MCV/MCS41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 5 MCF/MCV/MCS4_A...-503 (400/500 V units): 0550 / 0750

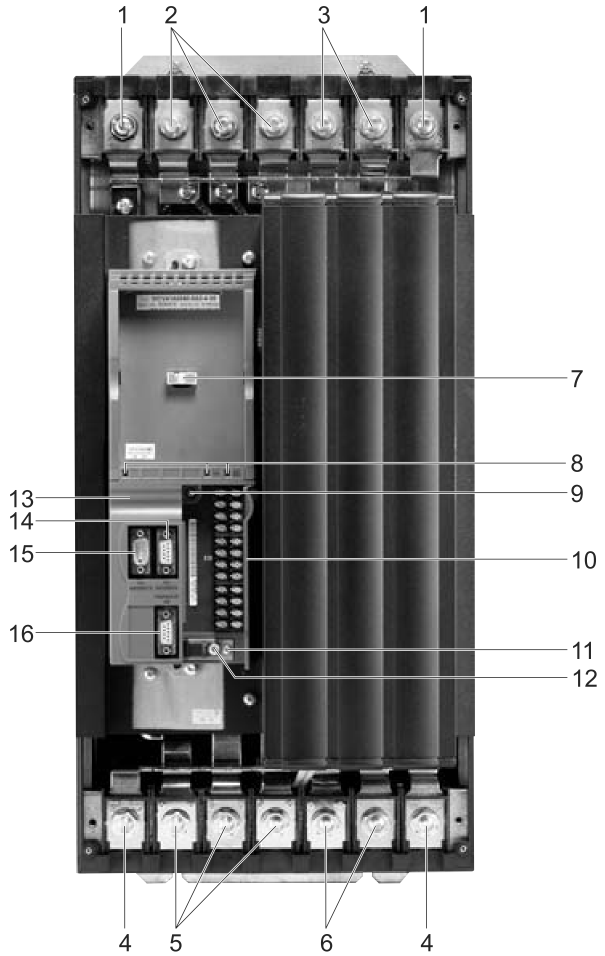

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Figure 123: Unit design, MOVIDRIVE® compact MCF/MCV/MCS4_A, size 5

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operating LED and PROFIBUS-DP diagnostic LEDs (only with MCF/MCV/MCS41A)
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip
11. Retaining screw B for terminal unit
12. Screw for electronics shield clamp
13. Terminal unit, removable
14. Only with MCV/MCS4_A X15: Motor encoder input (9-pin sub D socket)
15. Only with MCV/MCS4_A X14: Incremental encoder simulation output or external encoder input (9-pin sub D plug)
16. Only in MCF/MCV/MCS41A X30: PROFIBUS-DP connection (9-pin sub D socket)

8.3 Unit design MCH4_A

Size 1 MCH4_A...-5A3 (400/500 V units): 0015...0040

MCH4_A...-2A3 (230 V units): 0015...0037

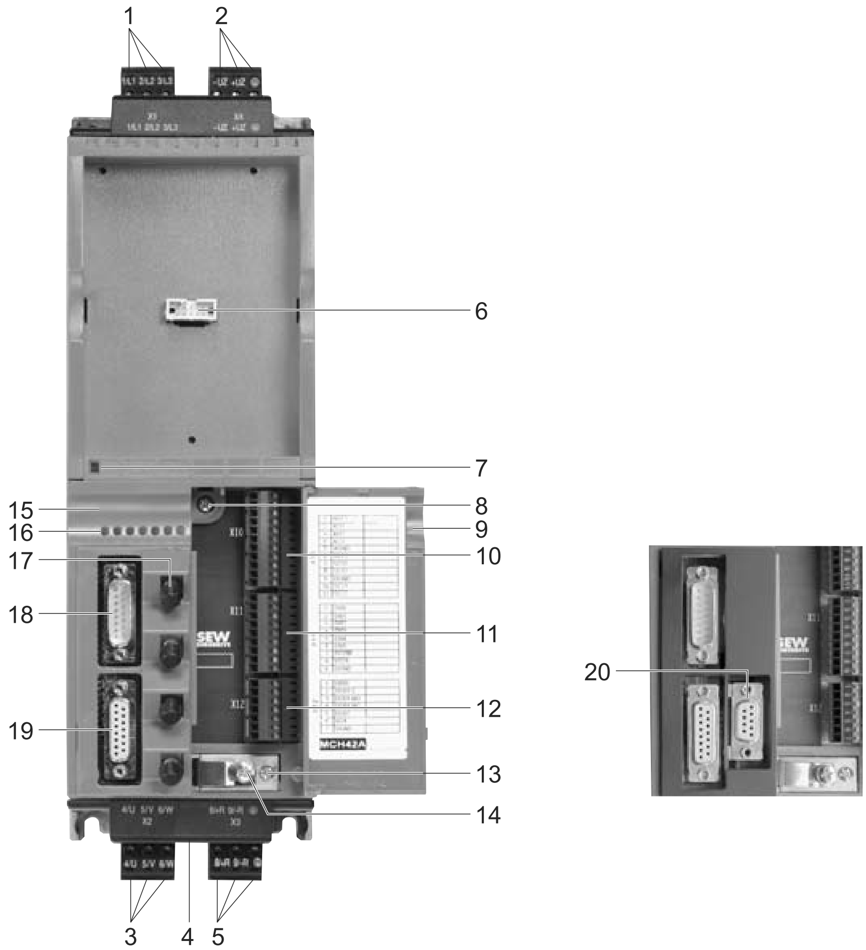

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Figure 124: Unit design, MOVIDRIVE® compact MCH4_A, size 1

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
2. X4: DC link connection $-U_Z$ / $+U_Z$ and PE connection, separable
3. X2: Motor connection U (4) / V (5) / W (6), separable
4. Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection, separable
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operation LED
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 2 MCH4_A...-5A3 (400/500 V units): 0055...0110

MCH4_A...-2A3 (230 V units): 0055 / 0075

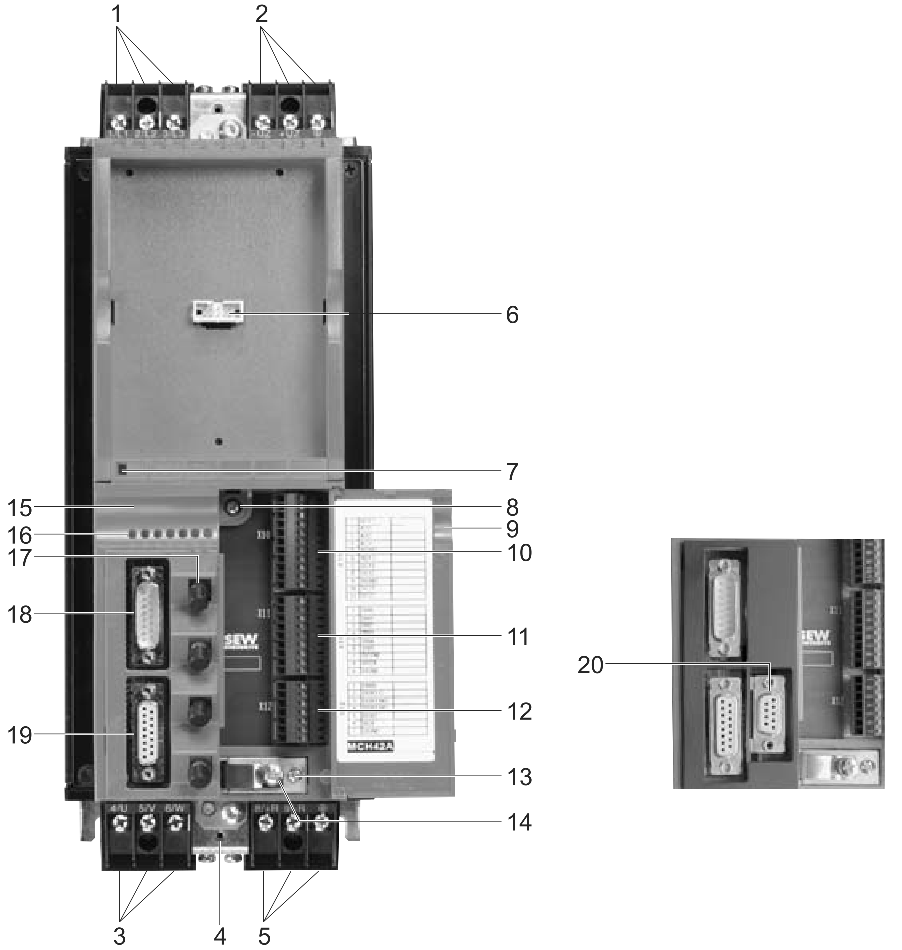
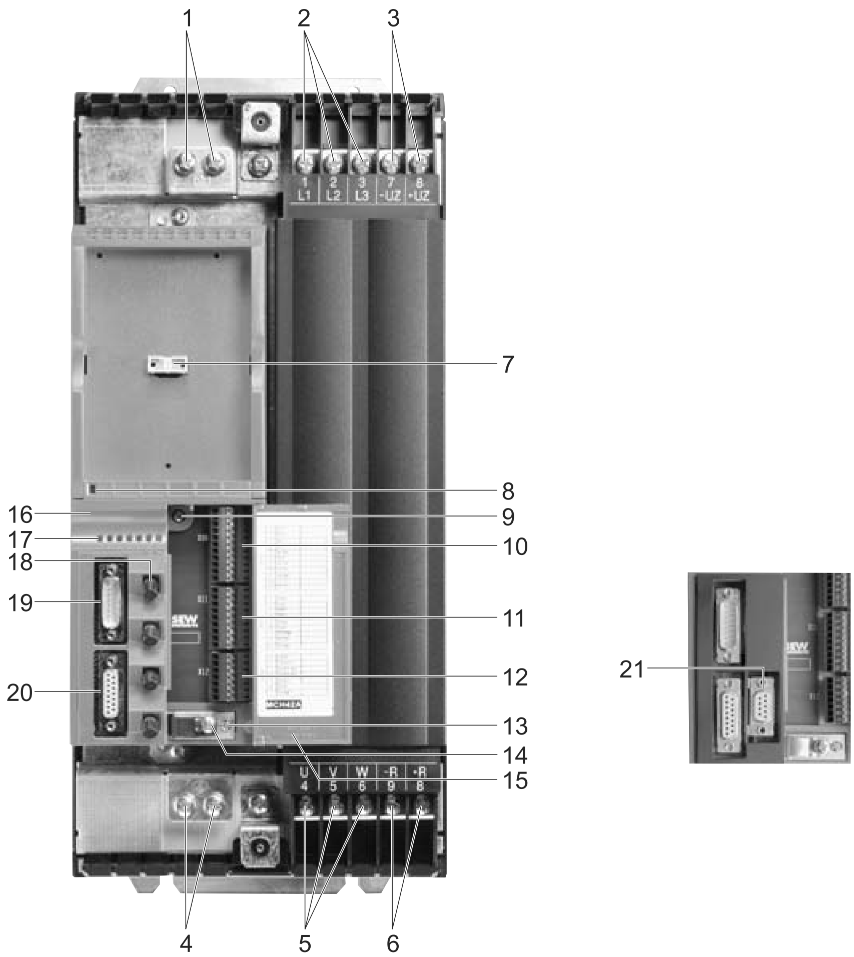


Figure 125: Unit design, MOVIDRIVE® compact MCH4_A, size 2

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
2. X4: DC link connection -U_Z / +U_Z and PE connection
3. X2: Motor connection U (4) / V (5) / W (6)
4. X6: Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operation LED
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 3 MCH4_A...-503 (400/500 V units): 0150...0300

MCH4_A...-203 (230 V units): 0110 / 0150



05195AXX

Figure 126: Unit design, MOVIDRIVE® compact MCH4_A, size 3

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection -U_Z / +U_Z
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Flap on terminal unit with labeling tile
16. Terminal unit, removable
17. Diagnostic LEDs INTERBUS-FO
18. Only with MCH42A X30...X33: INTERBUS-FO connections
19. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
20. X15: Motor encoder input (15-pin sub D socket)
21. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 4

MCH4_A...-503 (400/500 V units): 0370 / 0450

MCH4_A...-203 (230 V units): 0220 / 0300

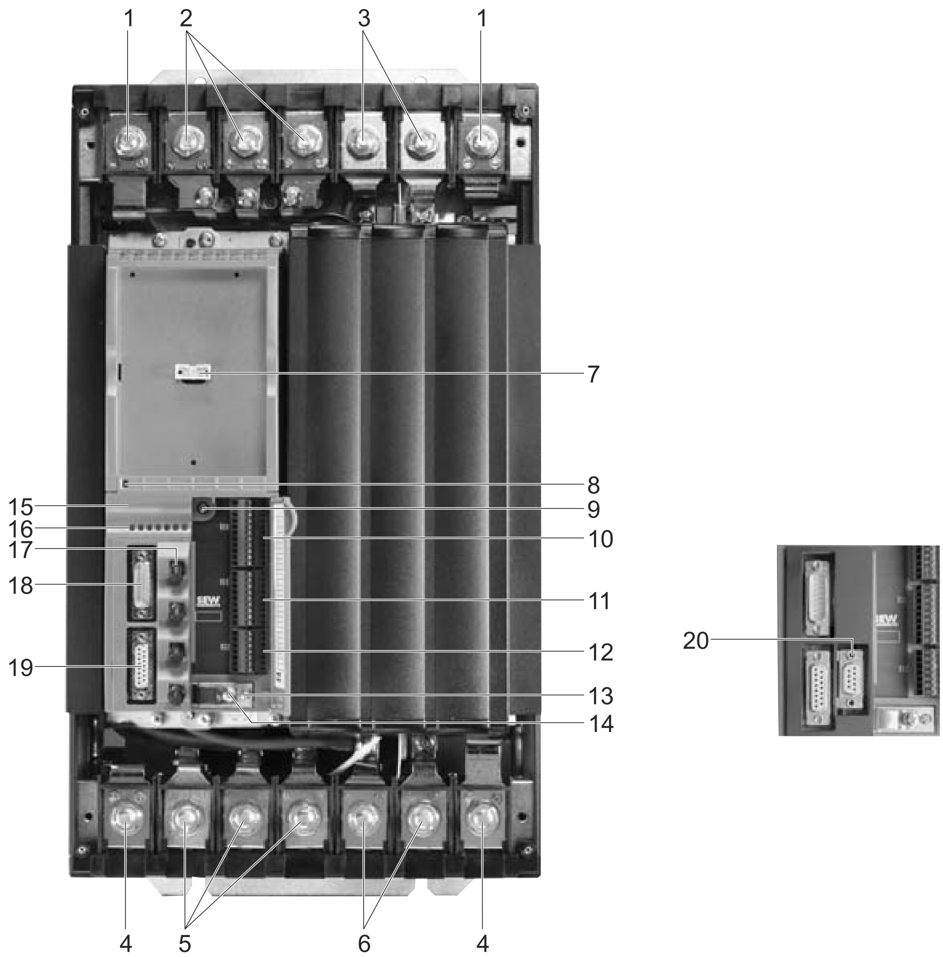
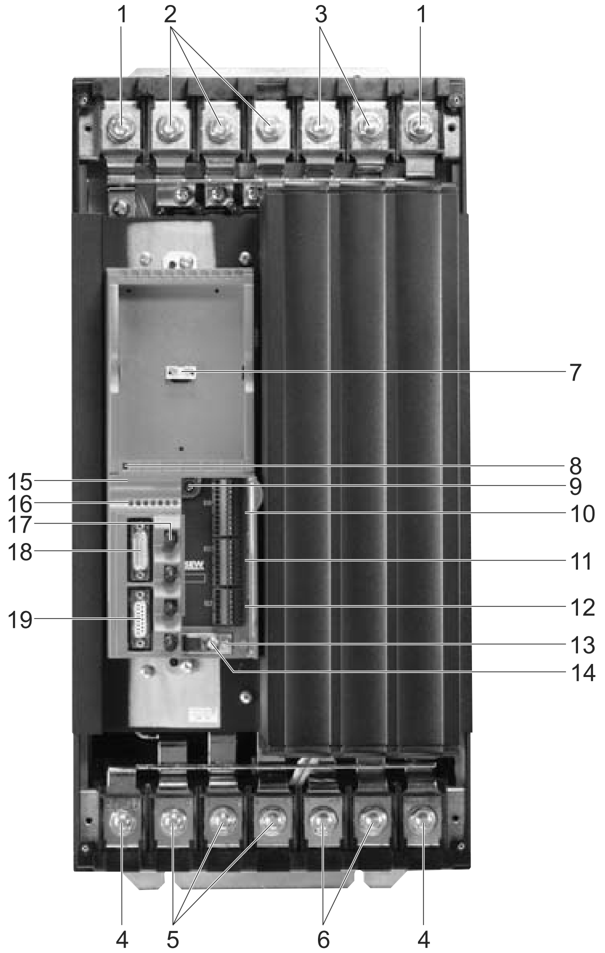
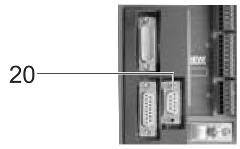


Figure 127: Unit design, MOVIDRIVE® compact MCH4_A, size 4

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 5 MCH4_A...-503 (400/500 V units): 0550 / 0750





05322AXX

Figure 128: Unit design, MOVIDRIVE® compact MCH4_A, size 5

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

9 Installation

9.1 Installation instructions for basic unit

It is essential to comply with the safety notes during installation!

Tightening torques

- Only use **genuine connection elements**. Note the **permitted tightening torques** of MOVIDRIVE® power terminals.

  –Size 1 → 0.6 Nm (5.3 lb.in)
  –Size 2 → 1.5 Nm (13.3 lb.in)
  –Size 3 → 3.5 Nm (31 lb.in)
  –Sizes 4 and 5→14 Nm (124 lb.in)

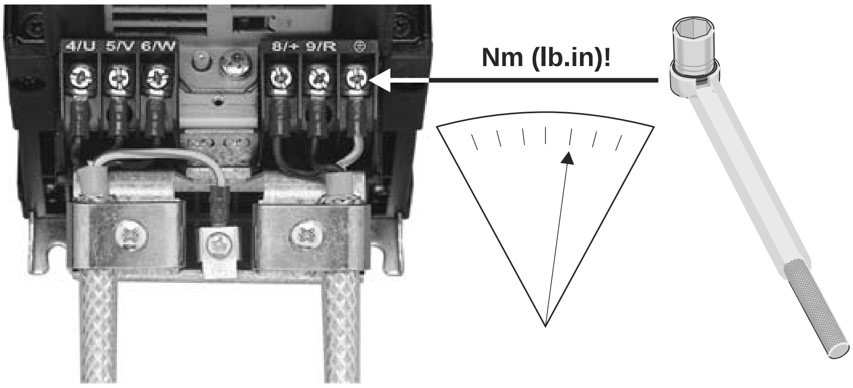


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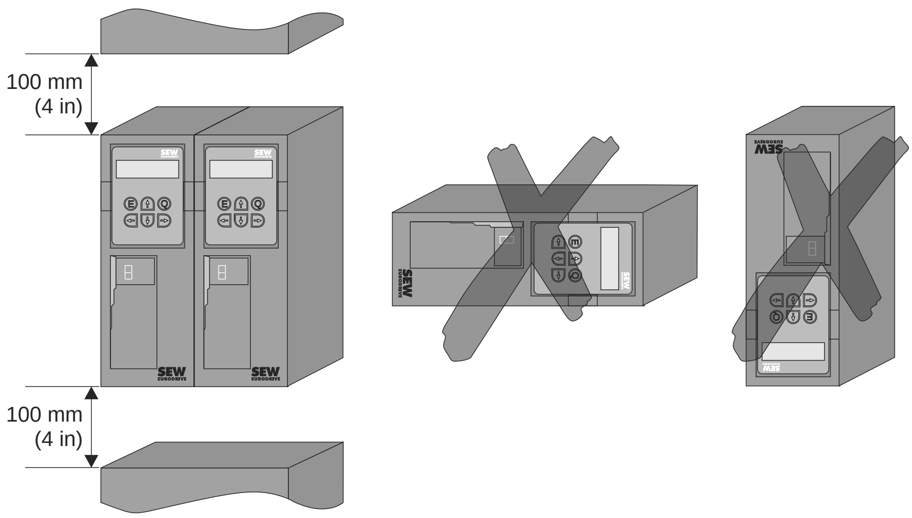
Figure 129: Note the tightening torques

Minimum clearance and mounting position

- Leave **100 mm (4 in) clearance at the top and bottom** for optimum cooling. No lateral clearance required; the units can be lined up side-by-side. With sizes 4 and 5, do not install any components which are sensitive to high temperatures within 300 mm (11.81 in) of the top of the unit. Only install the units **vertically**. Do not install the units horizontally, tilted or upside down.



02474AXX

Figure 130: Minimum clearance and installation position of the units

Separate cable ducts

- Route **power cables** and **electronics cables** in **separate cable ducts**.

Input fuses and earth-leakage circuit breakers

- Install the **input fuses at the beginning of the supply system lead** after the supply bus junction (→ Wiring diagram for basic unit, power section and brake).
- Using an **earth-leakage circuit breaker** as **the sole protection device** is **not permitted**. **Earth-leakage currents > 3.5 mA** can arise during normal operation of the inverter. Use universal current-sensitive earth-leakage circuit breakers only.

Supply system and brake contactors

- **Use only contactors in utilization category AC-3** (IEC 158-1) as supply system and brake contactors.

More than four units

- With **more than four units** on a **supply system contactor** designed to cope with the total current: **Insert a 3-phase line choke in the circuit** to limit the inrush current.

PE mains connection (→ EN 50178)

- With a **supply system lead < 10 mm^2 (AWG 8)**: Lay a **second PE conductor with the cross section of the supply system lead** in parallel to the protective earth via separate terminals or use a **copper protective earth with a cross section of 10 mm^2 (AWG 8)**.
- With a **supply system lead ≥ 10 mm^2 (AWG 8)**: Lay a **copper protective earth with the cross section of the supply system lead**.

IT systems

- SEW recommends using **earth-leakage monitors with a pulse code measuring process** in voltage supply systems with a non-earthed star point **(IT systems)**. This avoids mis-tripping of the earth-leakage monitor due to the earth capacitance of the inverter.

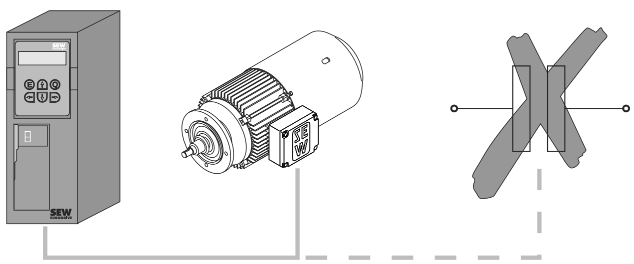
Cross sections

- Supply system lead: **Cross section according to rated input current I_{mains}** at rated load.
- Motor lead: **Cross section according to rated output current I_N**.
- Electronics cables:

MCF/MCV/MCS:	Single core 0.20...2.5 mm^2 (AWG24...12)
	Double core 0.20...1 mm^2 (AWG24...17)
MCH:	Only single core 0.20...1.5 mm^2 (AWG24...16)
	Use right-angled crimping pliers with 1.5 mm^2 (AWG16)

Unit output

- **Connect ohmic/inductive loads (motors) only.** Never connect capacitive loads!



02476AXX

Figure 131: Connect ohmic/inductive loads only; do not connect capacitive loads

Connecting braking resistors

- Use **two closely twisted cables or a 2-core shielded power cable**. Cross section according to the rated output current of the inverter.
- Protect the braking resistor with a **bimetallic relay / thermal overload relay** (→ Wiring diagram for basic unit, power section and brake). Set the **trip current** according to the **technical data of the braking resistor**.

Operating braking resistors

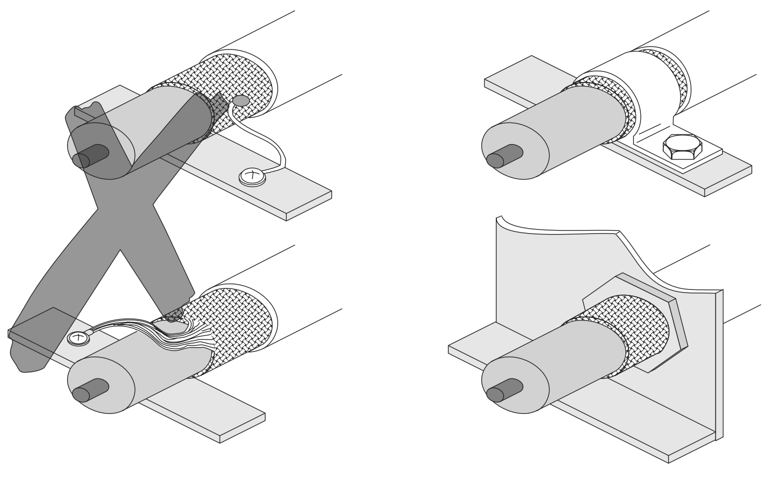
- The connection leads to the braking resistors carry a **high DC voltage (approx. 900 V)** during rated operation.
- The **surfaces** of the braking resistors get **very hot when the braking resistors are loaded with P_N**. Select a **suitable installation position**. As a rule, braking resistors are mounted on the switch cabinet roof.
- Install the **flat-type braking resistors** together with the appropriate **touch guard**.

Binary inputs / binary outputs

- The **binary inputs** are **electrically isolated** by optocouplers.
- The **binary outputs** are **short-circuit proof**, although they are **not interference-voltage-proof** (exception: relay output DOØ1). External voltage can cause irreparable damage to the binary outputs.

Shielding and earthing

- Use **shielded control cables** only.
- Connect the **shield by the shortest possible route and make sure it is earthed over a wide area at both ends**. You can ground one end of the shield via a suppression capacitor (220 nF / 50 V) to avoid ground loops. If using double-shielded cables, ground the outer shield on the inverter end and the inner shield on the other end.



00755BXX

Figure 132: Example of correct shield connection with metal clamp (shield clamp) or metal cable gland

- **Shielding** can also be achieved by laying the cables in **grounded sheet metal ducts or metal pipes**. In this case, the **power cables and control cables** should be **laid separately**.
- Provide **high frequency compatible grounding** for the **inverter** and **all additional units** (wide area metal-on-metal contact between the unit housing and ground, e.g. unpainted switch cabinet mounting panel).

Line filter

- **Sizes 1 and 2** are fitted with an **line filter as standard**. This line filter ensures that **limit value class A is maintained on the supply side**. Use an NF...-... line filter as an option to maintain the class B limit.
- The **NF...-... line filter option** is required for **sizes 3 to 5** to maintain class A and B limits.
- Install the **line filter close to the inverter**, but outside the minimum clearance required for cooling.
- Restrict the **cable between the line filter and the inverter to the absolute minimum length required**, and never more than 400 mm (15.8 in). Unshielded, twisted cables are sufficient. Also use unshielded cables as the supply system lead.
- This line filter must be installed either **directly at the entry point into the switch cabinet or in the immediate vicinity of the inverter** if **several inverters are connected to the same line filter**. The line filter must be chosen on the basis of the total current of the connected inverters.
- **No EMC limits are specified for interference emission** in **voltage supply systems without an earthed star point** (IT systems). The **effectiveness of line filters** in IT systems is **severely limited**.

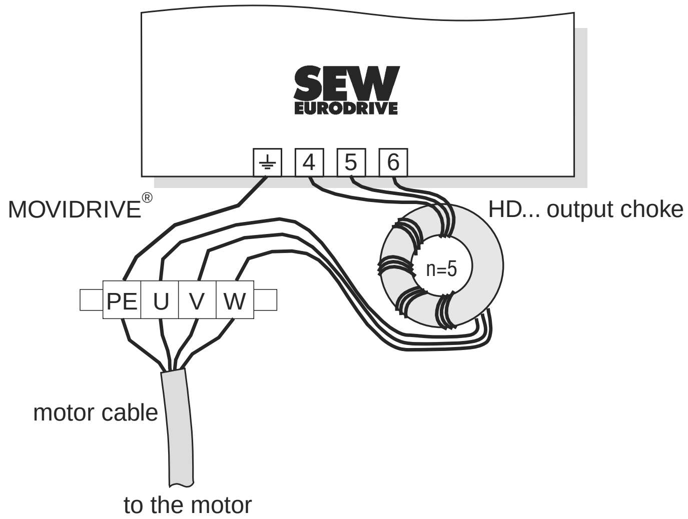
Interference emission

SEW recommends the following **EMC measures on the output side to maintain the class A and B limits**:

- Shielded motor feeder
- HD... output choke option

HD... output choke

- Install the **output choke close to the inverter**, but outside the minimum clearance required for cooling.
- Route **all three phases together through the output choke**. **Do not route the PE conductor through the output choke!**



03973AEN

Figure 133: Connecting HD... output chokes

9.2 Installation instructions for PROFIBUS-DP interface (MC_41A)

Pin 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.

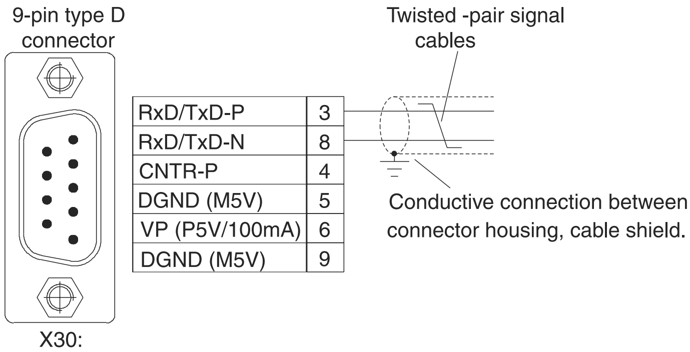


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Figure 134: Assignment of 9-pin sub D plug to IEC 61158

As a rule, the MOVIDRIVE® *compact* drive inverter is connected to the PROFIBUS system using a shielded twisted-pair cable. Note the maximum supported transmission rate when you are selecting the bus connector.

The two-core cable is connected to the PROFIBUS connector using 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. Otherwise, communication via the bus will not function.

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

Shielding and routing bus cables

The PROFIBUS interface supports RS-485 transmission technology and requires the cable type A to IEC 61158 specified as the physical medium for PROFIBUS. This cable must be a shielded, twisted-pair two-core cable.

Having the bus cable correctly shielded cuts out parasitic interference which can occur in an industrial environment. The following measures enable the best possible shielding to be achieved:

- Tighten the retaining screws of plugs, modules and equipotential bonding conductors until finger-tight.
- Only use connectors with a metal housing or a metallized housing.
- Connect the shield in the connector over a large surface area.
- Apply the bus cable shielding on both ends.
- Do not route the signal and bus cables in parallel to the power cables (motor feeders); use separate cable ducts if at all possible.
- Only use metal, grounded cable racks in industrial environments.
- Join the signal cables and the associated equipotential bonding together at closely spaced intervals by the shortest route.
- Avoid using plug connections to extend bus cables.
- Route the bus cables closely adjacent to available grounding surfaces.

In the event of fluctuations in the ground potential, a compensating current may flow along the shield which is connected at both ends and to the ground potential (PE). In this case, make adequate provision for equipotential bonding in accordance with the relevant VDE regulations.

Bus termination with MCF/MCV/ MCS41A

If the MOVIDRIVE® *compact* drive inverter is located at the start of or the end of a PROFIBUS segment, then the connection to the PROFIBUS network is not generally made using a T-bus connection with an incoming and outgoing PROFIBUS cable. Instead, the connection is a direct one with only one PROFIBUS cable. In order to prevent malfunctions in the bus system due to reflections, etc., the PROFIBUS segment must be terminated using bus terminating resistors at the first and last physical stations.

It is not necessary to use a sub D plug with integrated terminating resistors because the bus terminating resistors on the inverter can be switched on (DIP switches below the connection unit → Sec. 'Removing the connection unit' on page 269).

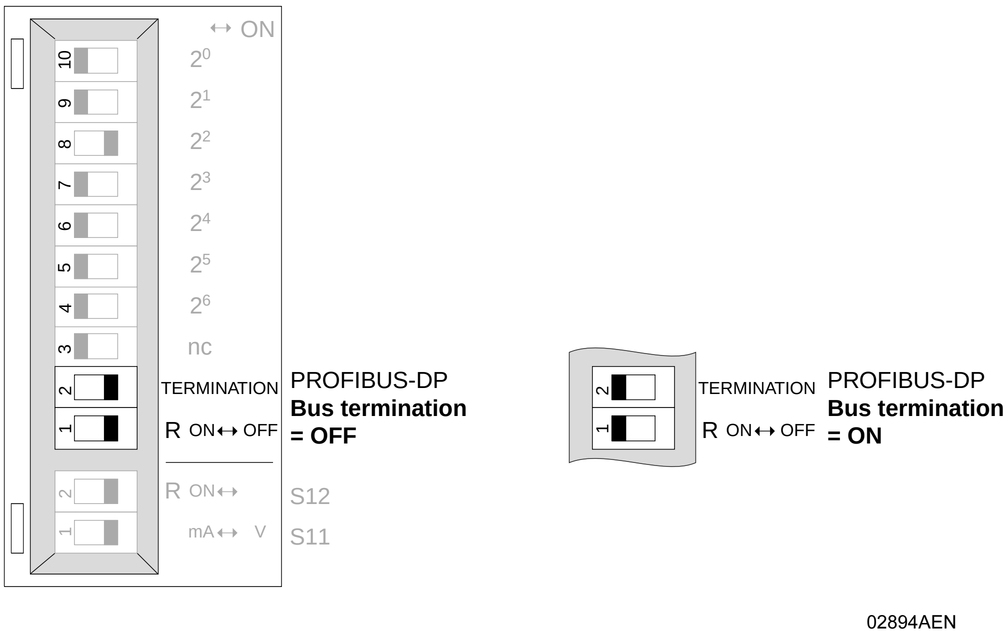

Figure 135: Activating the bus termination using DIP switches with MCF/MCV/MCS41A

Both DIP switches (TERMINATION 1 and 2) must always be switched!

Bus termination is implemented for cable type A to IEC 61158.

Do not switch on the terminating resistors on the inverter if you are using sub D plugs with integrated bus terminating resistors!

Bus termination with MCH41A

MCH41A is not provided with bus terminating resistors so that the bus system can be taken into operation more easily and in order to reduce the number of error sources.

Use a plug with an integrated bus terminating resistor if the inverter is at the start or finish of a PROFIBUS segment and only one PROFIBUS cable is leading to the inverter.

Switch on the bus terminating resistors on this PROFIBUS plug.

Setting the station address with MCF/MCV/ MCS41A

The PROFIBUS station address is set using DIP switches 4...10 (valency 2^6...2^0) below the connection unit (→ Sec. 'Removing the connection unit' on page 269). MOVIDRIVE® *compact* supports the address range 0...125.

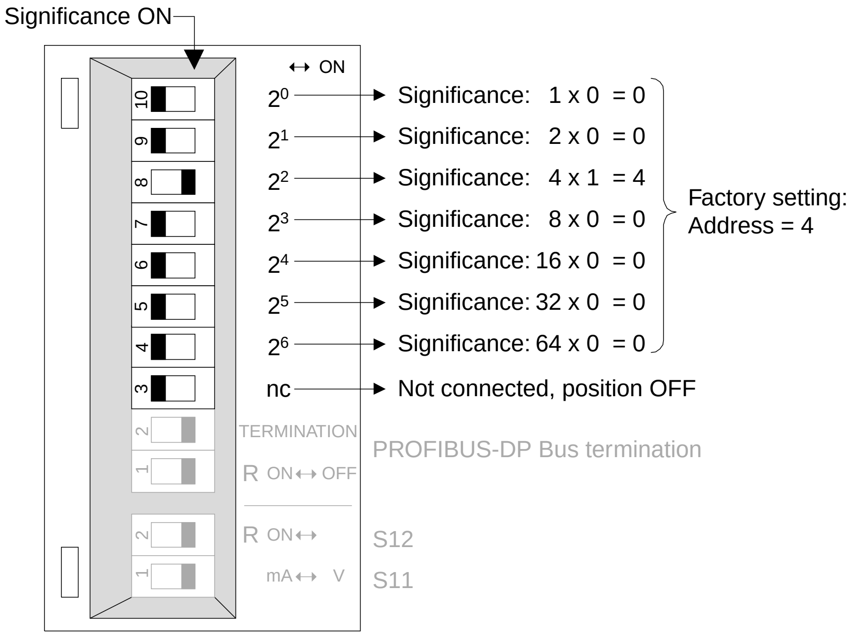

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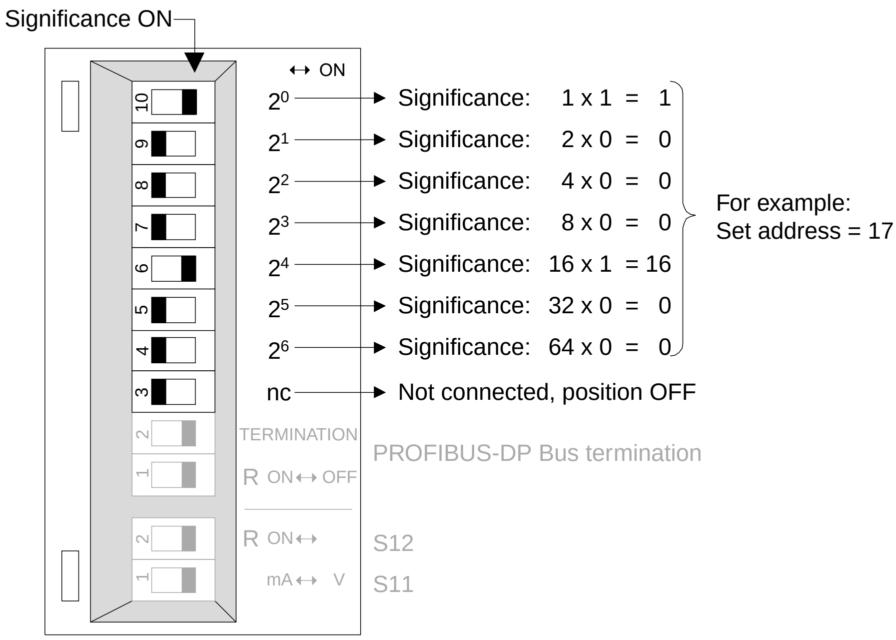
Figure 136: Setting the PROFIBUS station address with MCF/MCV/MCS41A

The PROFIBUS station address can only be set using the DIP switches when the connection unit has been removed. This means the address cannot be altered during ongoing operation. The change comes into effect when the drive inverter is switched back on (power system + 24 V OFF/ON). The drive inverter displays the current station address in fieldbus monitor parameter P092 'Fieldbus address' (display with DBG11B or MOVITOOLS/SHELL).

For example: Setting station address 17



03003AEN

Figure 137: Setting station address 17

Setting the station address with MCH41A

The PROFIBUS station address is set using DIP switches 1...8 (valency 2^0...2^6) below the connection unit (→ Sec. 'Removing the connection unit' on page 269). MOVIDRIVE® *compact* supports the address range 0...125.

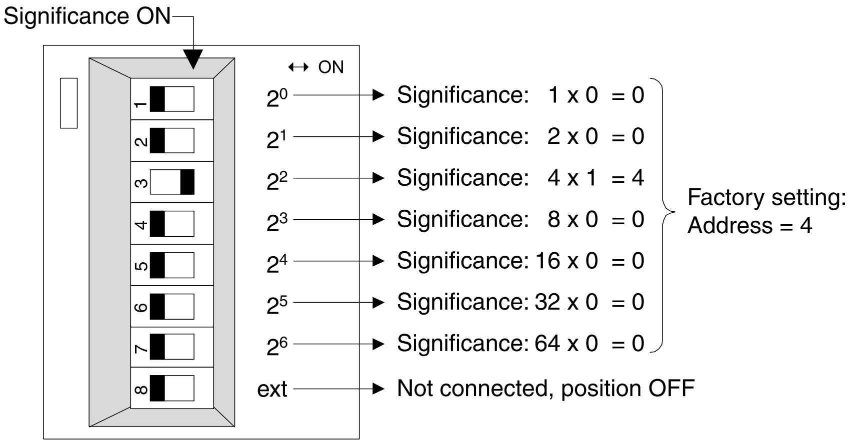


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Figure 138: Setting the PROFIBUS station address with MCH41A

The PROFIBUS station address can only be set using the DIP switches when the connection unit has been removed. This means the address cannot be altered during ongoing operation. The change comes into effect when the drive inverter is switched back on (power system + 24 V OFF/ON). The drive inverter displays the current station address in fieldbus monitor parameter P092 'Fieldbus address' (display with DBG11B or MOVITOOLS/SHELL).

For example: Setting station address 17

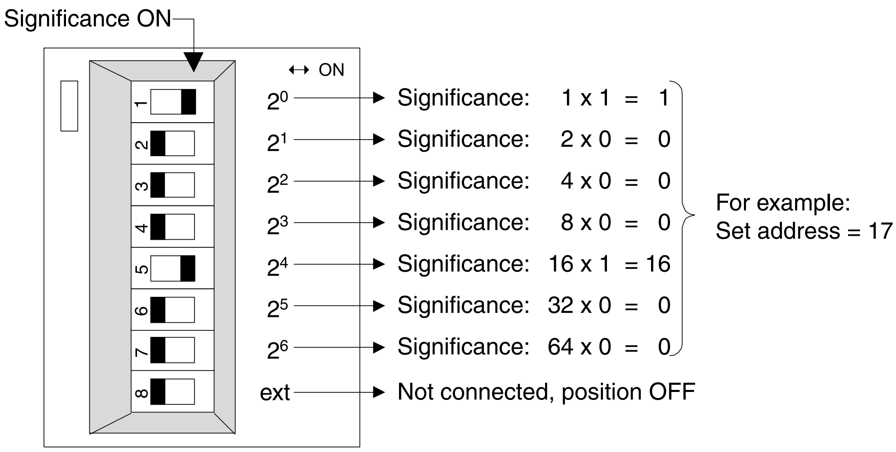

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Figure 139: Setting station address 17

9.3 Installation instructions for INTERBUS FO interface (MCH42A)

Bus connection via fiber optic cable (FO)

The bus connection uses fiber optic cables. You can use either polymer fiber cables or HCS cables.

Polymer fiber cables

This type of cable is used for distances of up to 70 meters between two INTERBUS stations. Various types are available depending on the application. This cable type offers straightforward and inexpensive installation.

HCS cables

This type of cable can be used over distances of up to 500 m, since it has much lower light attenuation values than polymer fiber cable.

The bus cable must be at least 1 meter long. Cable bridges from Phoenix Contact must be used for shorter distances.

Please refer to Phoenix Contact's fiber optic cable installation guidelines (art. name IBS SYS FOC ASSEMBLY) for further information about the correct routing of fiber optic cables.

Checklist for installing FO cables

Routing FO cables

- Do not exceed the maximum cable length
- Note the permitted bending radii
- Do not crush or kink FO cables
- Do not exceed the strain limit when routing
- When unreeling FO cables for installation, always use an unreeling fixture

Protective measures for FO cables

- Protect them from strain and impermissibly small bending radii
- Route them without loops
- Protect them against sharp edges
- Use a special cable type when routing in special areas (e.g. laying underground or in proximity to welding robots)

Pre-fabricating FO cables

- Strip the insulation off the outer sheath and the individual cores without damaging them
- Fix the individual core in the plug (strain relief)
- Polish and install the end of the plug in accordance with the guidelines

Calibrating FO cables

- Check the light intensity complies with the limit values (optical diagnosis with CMD tool or FO measuring instrument)

Connecting FO plugs

The fiber optic cable is connected to MOVIDRIVE® *compact* MCH42A using plugs called F-SMA plugs. You need a pair of plugs for the incoming and outgoing remote bus (transmitter and receiver). SEW recommends using F-SMA plugs with an anti-kinking sleeve to ensure that the optimum bending radius is maintained.

Order data

for F-SMA plugs (e.g. Phoenix Contact)

Article name	Name
F-SMA plug set for polymer fiber cables (4 pieces) with anti-kinking sleeve	PSM-SET-FSMA/4-KT

Pin assignment for INTERBUS remote bus with FO

Connection	Signal	Direction	FO core color
X30	FO remote IN (incoming remote bus)	Receive data	Orange (OG)
X31		Send data	Black (BK)
X32	FO remote OUT (continuing remote bus)	Receive data	Black (BK)
X33		Send data	Orange (OG)

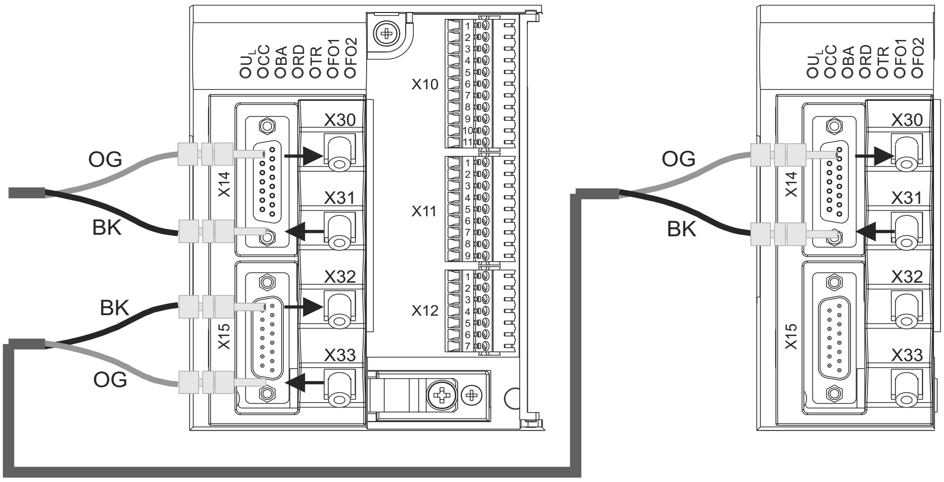

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Figure 140: FO connection assignment

Length of the fiber optic cable Use fiber optic cables with different lengths so as to avoid impermissible bending radii in the fiber optic cables. Refer to the length data in the figure below in this regard.

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Figure 141: Different lengths of fiber optic cables

Setting the DIP switches

The six DIP switches S1 to S6 on the underside of the connection unit are used for setting the process data length, the PCP length and for selecting the baud rate.

The DIP switches can only be accessed when the connection unit has been removed (→ Sec. 'Removing the connection unit' on page 269). Switch off the supply system and the 24 V_{DC} backup voltage before you remove the connection unit. This means the settings of the DIP switches cannot be changed during ongoing operation.

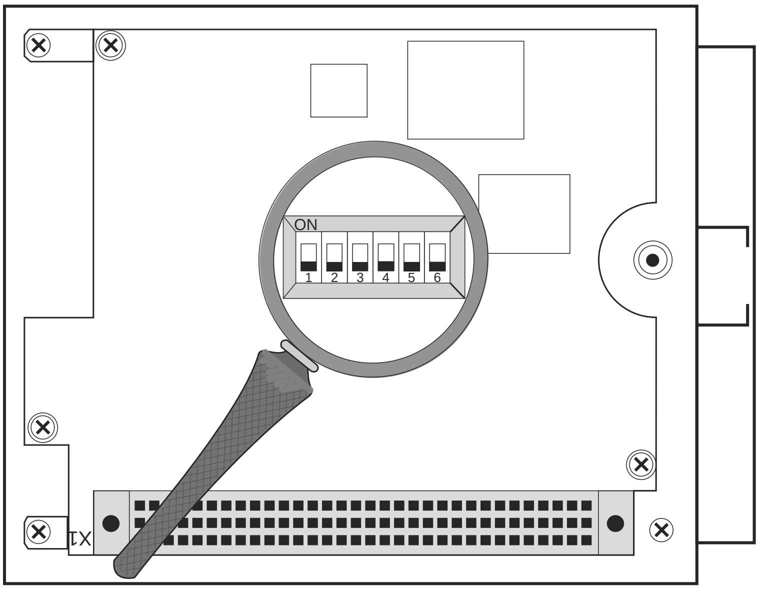

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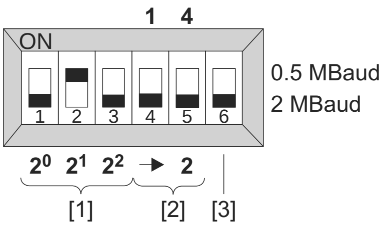
Figure 142: DIP switches S1...S6 on the underside of the connection unit



05215AXX

Figure 143: Assignment of DIP switches S1...S6

[1] Number of process data items (1...6 PD), for example 2 PD
[2] Number of PCP words (1, 2 or 4), for example 2 PCP words
[3] Baud rate (ON = 0.5 Mbaud, OFF = 2 Mbaud), for example 2 Mbaud

The drive inverter signals the 'Microprocessor not ready' ID code (38 hex) if the DIP switch settings are not correct.

Setting the process data and PCP lengths

Up to six INTERBUS data words can be exchanged between the INTERBUS interface and the inverter. These data words can be split between the process data channel and the PCP channel using DIP switches S1 to S5. Because of the restriction to six data words, there are some settings which cannot be reproduced on the INTERBUS.

The inverter signals the 'Microprocessor not ready' IC code (38hex) if the setting is incorrect. Its red TR LED indicates that the setting is incorrect. The following figure shows the peripheral conditions for setting the process data and PCP lengths. The following limits apply in principle:

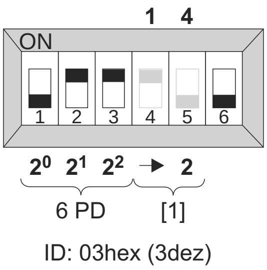


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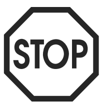
Figure 144: Settings for operating the inverter with 6 process data items

[1] The PCP settings with S4 and S5 are ineffective.



Process data length in words	PCP length	ID code
6	PCP setting ineffective; no PCP channel can be used	03hex (3dec)

Examples:

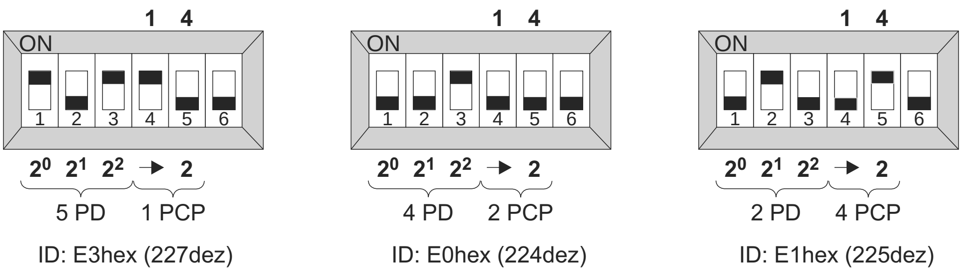


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Figure 145: Examples for setting the PCP length and the maximum process data length

PCP length	**Maximum process data length**	**ID code**
1 word	5 words	E3 hex (227dec)
2 words	4 words	E0 hex (224dec)
4 words	2 words	E1 hex (225dec)
	If the max. length is exceeded or the setting is 0 or 7 PD	38 hex (56dec) = 'Microprocessor not ready'

All settings which have not been named result in the 'Microprocessor not ready' ID code. The inverter then signals 0PD in parameter P090 'PD configuration' and indicates that the setting is incorrect by means of the red TR LED.

9.4 UL compliant installation

Please note the following points for UL compliant installation:

- Only use copper cables with the **following temperature ranges** as connection leads:

  –For MOVIDRIVE® *compact* MC_4_A0015...0300 temperature range 60/75 °C
  –For MOVIDRIVE® *compact* MC_4_A0370...0750 temperature range 75/90 °C

- The **permitted tightening torques** for MOVIDRIVE® *compact* power terminals are:

  –Size 1 → 0.6 Nm (5.3 lb.in)
  –Size 2 → 1.5 Nm (13.3 lb.in)
  –Size 3 → 3.5 Nm (31 lb.in)
  –Sizes 4 and 5→14 Nm (124 lb.in)

- MOVIDRIVE® *compact* drive inverters are **suitable for operation in voltage power systems with an earthed star point** (TN and TT systems) which can supply a max. current in accordance with the following tables and which have a max. voltage of 240 V_{AC} for MOVIDRIVE® *compact* MC_4_A...2_3 (230 V units) and 500 V_{AC} for MOVIDRIVE® *compact* MC_4_A...-5_3 (400/500 V units). The performance data of the fuses must not exceed the values in the tables.

400/500 V units

MOVIDRIVE® *compact* MC_4_A...5_3	**Max. supply current**	**Max. supply voltage**	**Fuses**
0015/0022/0030/0040	10000 A_{AC}	500 V_{AC}	30 A / 600 V
0055/0075/0110	10000 A_{AC}	500 V_{AC}	30 A / 600 V
0150/0220	5000 A_{AC}	500 V_{AC}	175 A / 600 V
0300	5000 A_{AC}	500 V_{AC}	225 A / 600 V
0370/0450	10000 A_{AC}	500 V_{AC}	350 A / 600 V
0550/0750	10000 A_{AC}	500 V_{AC}	500 A / 600 V

230 V units

MOVIDRIVE® *compact* MC_4_A...2_3	**Max. supply current**	**Max. supply voltage**	**Fuses**
0015/0022/0037	5000 A_{AC}	240 V_{AC}	30 A / 250 V
0055/0075	5000 A_{AC}	240 V_{AC}	30 A / 250 V
0110	5000 A_{AC}	240 V_{AC}	175 A / 250 V
0150	5000 A_{AC}	240 V_{AC}	225 A / 250 V
0220/0300	10000 A_{AC}	240 V_{AC}	350 A / 250 V

- Only use tested units with a **limited output voltage** ($V_{max = 30\ VDC}$) and **limited output current (I ≤ 8 A) as an external 24 V_{DC} voltage source**.

STOP

UL certification does not apply to operation in voltage supply systems with a non-earthed star point (IT systems).

9.5 Power shield clamp

For size 1 A power shield clamp is supplied as standard with MOVIDRIVE® *compact* size 1. Install this power shield clamp together with the retaining screws of the unit.

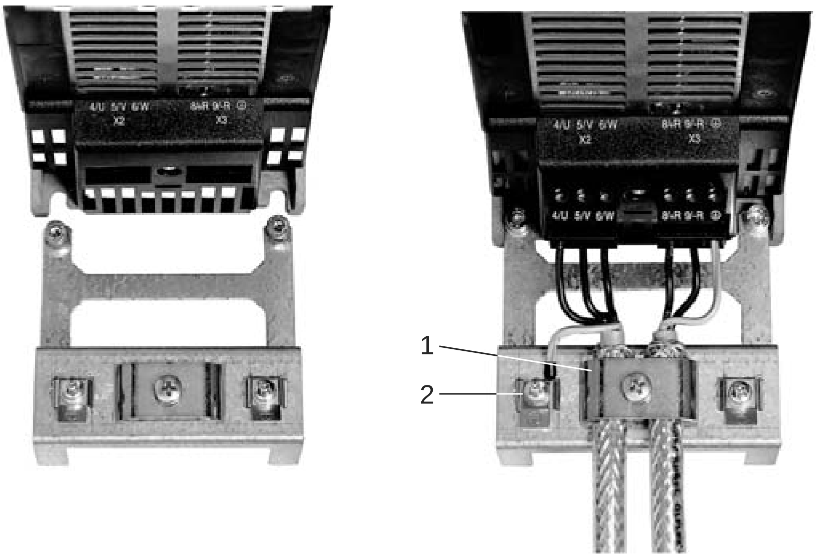

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Figure 146: Power shield clamp for MOVIDRIVE® compact size 1

1. Shield clamp
2. PE connection (⏚)

For size 2 A power shield clamp with 2 retaining screws is supplied as standard with MOVIDRIVE® *compact* size 2. Install this power shield clamp together with the two retaining screws on X6.

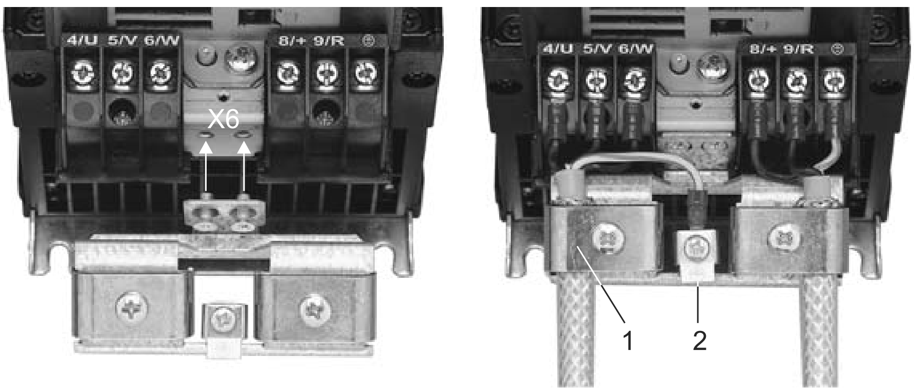

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Figure 147: Power shield clamp for MOVIDRIVE® compact size 2

1. Shield clamp
2. PE connection (⏚)

Power shield clamps provide you with a very convenient way of installing the shield for the motor and brake leads. Fit the shield and PE conductor as shown in the figures.

9.6 Touch guard

Two touch guards with eight retaining screws are supplied as standard with MOVIDRIVE® *compact* sizes 4 and 5. Install the touch guard on the two hood covers for the power section terminals.

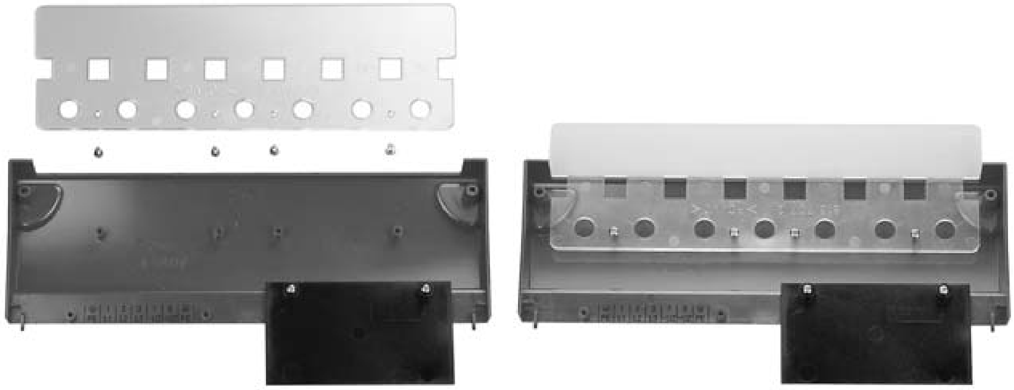

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Figure 148: Touch guard for MOVIDRIVE® compact sizes 4 and 5

With installed touch guard, MOVIDRIVE® *compact* size 4 and 5 units achieve IP10 enclosure, IP00 without touch guard.

9.7 Wiring diagram, basic unit

Connection of the power section and brake

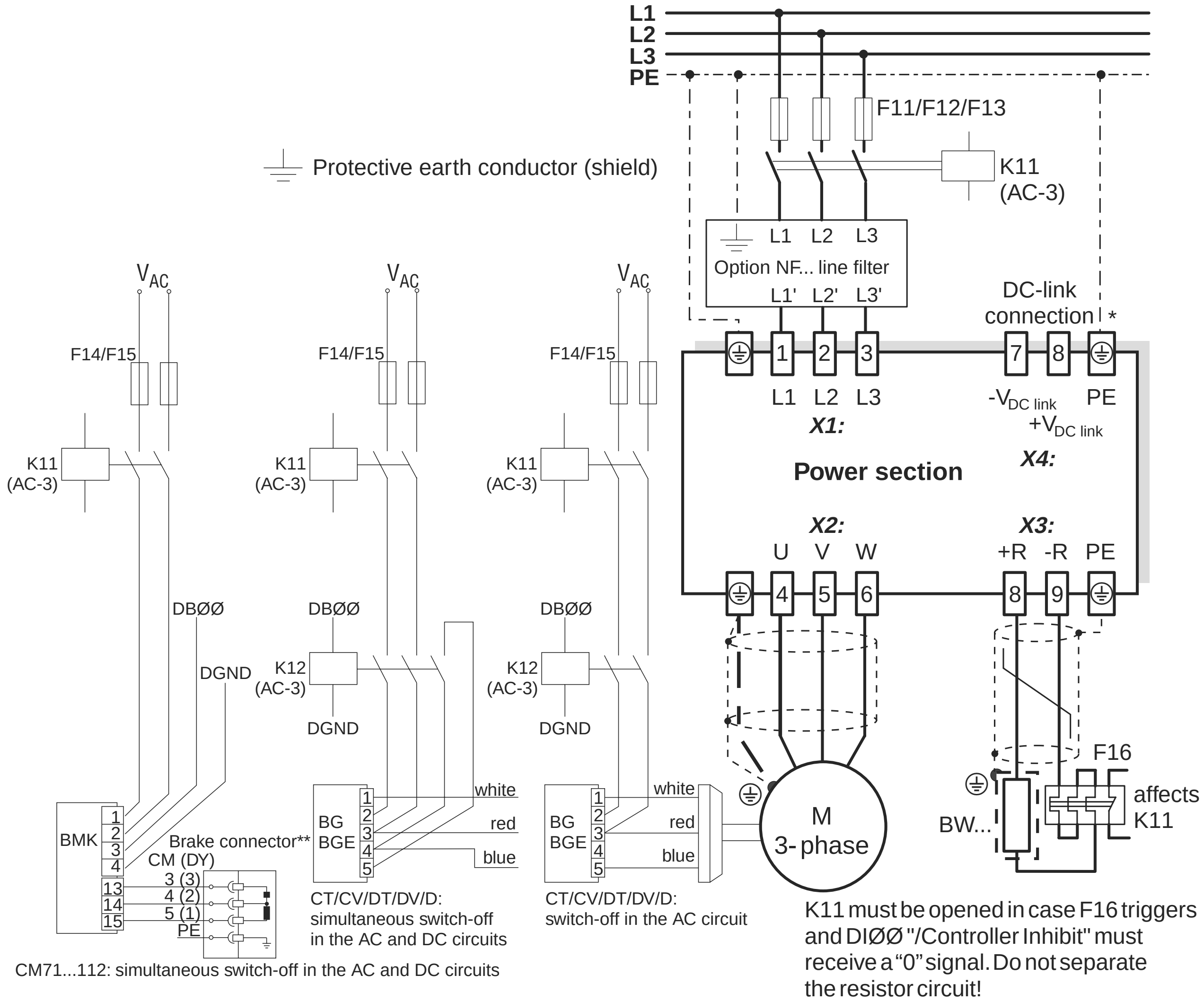

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Figure 149: Wiring diagram, power section and brake

* With sizes 1 and 2, there is no PE connection next to the mains connection terminals. In this case, use the PE terminal next to the DC link connection.

** **Important:** It is essential to adhere to the sequence of connections. Incorrect connection will lead to irreparable damage to the brake.

STOP

A separate supply system lead is required for connecting the brake rectifier. Powering it from the motor voltage is not permitted!

Always switch off the brake on the DC and AC sides under the following conditions:

– all hoist applications,
– drives which require a rapid brake reaction time and
– in CFC and SERVO operating modes.

Brake rectifier in switch cabinet

Route the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the switch cabinet. Joint routing is only permitted if the power cables are shielded.

MCF/MCV/MCS4_A: Control unit connection

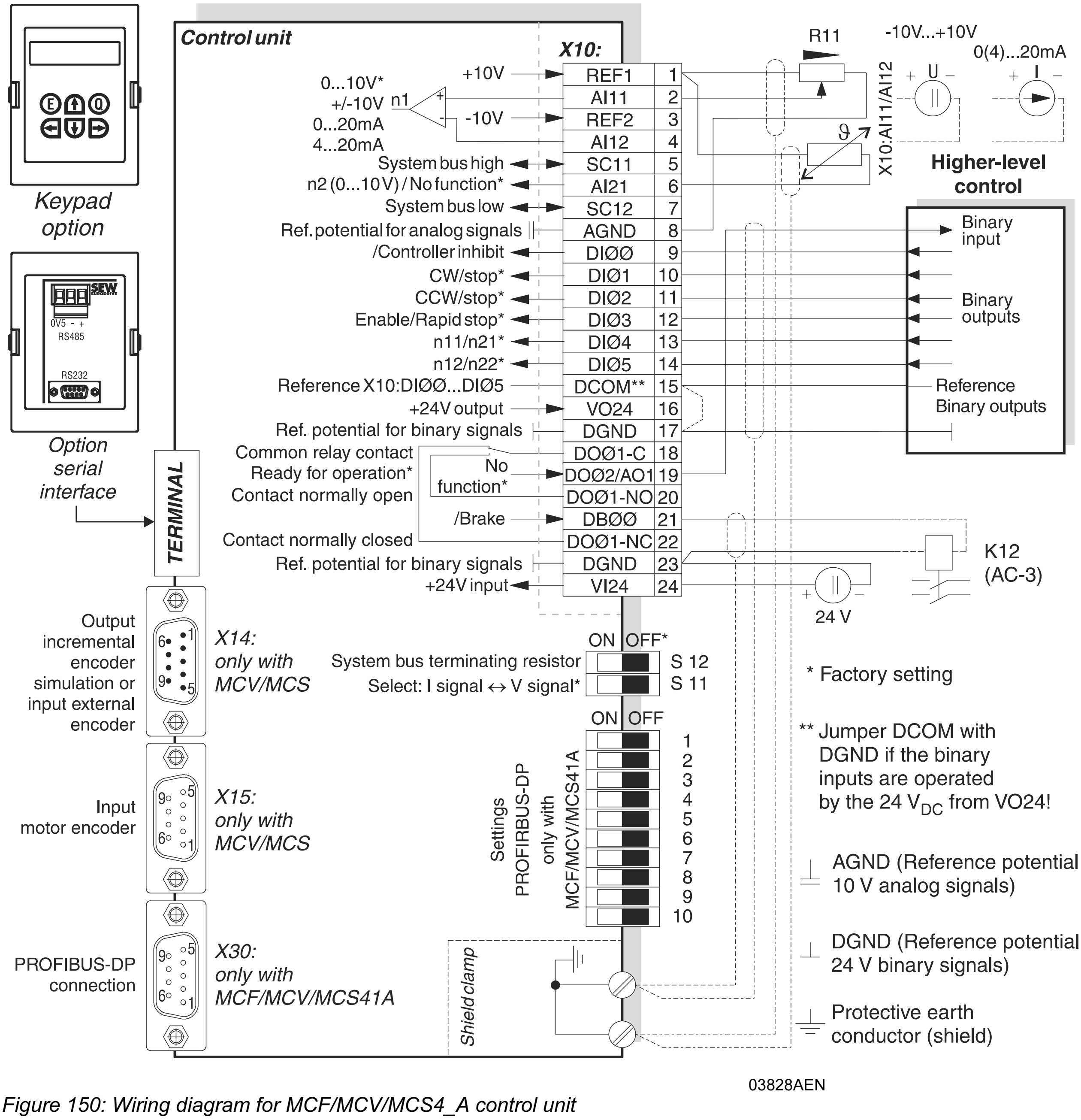

Figure 150: Wiring diagram for MCF/MCV/MCS4_A control unit

- **MCF/MCV/MCS41A (with PROFIBUS-DP):** SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
- Analog input AI21 (X10:6) can be used either as a 10 V voltage input or as a TF/TH input. It is changed over using parameter P120.
- DIP switches S11, S12 and 1...10 can only be accessed when the connection unit has been removed (→ Sec. 'Removing the connection unit' on page 269).
- The function of DIP switches 1...10 is explained in Secs. 'Bus termination' and 'Setting the station address' on page 251 and page 252.
- The TF/TH line must either be shielded or laid at a distance of at least 0.2 m (8 in) from power cables (e.g. motor or brake cables). The TF/TH line must be separately shielded if hybrid cables are used for the motor and TF/TH connection.

MCF/MCV/MCS4_A: Description of terminal functions on the basic unit

Terminal		Function
X1:1/2/3 **X2:4/5/6** **X3:8/9** **X4:**	**L1/L2/L3** **U/V/W** **+R/-R** **$+U_Z/-U_Z$**	Mains connection Motor connection Braking resistor connection DC link connection
X10:1 **X10:2/4** **X10:3** **X10:5/7** **X10:6** **X10:8**	**REF1** **AI11/12** **REF2** **SC11/SC12** **AI21** **AGND**	+10 V (max. 3 mA) for setpoint potentiometer Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_ / S11 -10 V (max. 3 mA) for setpoint potentiometer System bus (SBus) high/low Either setpoint input n2 (0...10 V) or TF/TH input, setting → P120 Reference potential for analog signals (REF1, REF2, AI..)
X10:9 **X10:10** **X10:11** **X10:12** **X10:13** **X10:14**	**DIØØ** **DIØ1** **DIØ2** **DIØ3** **DIØ4** **DIØ5**	Binary input 1, with fixed assignment '/Controller inhibit' Binary input 2, factory setting 'CW/stop' Binary input 3, factory setting 'CCW/stop' Binary input 4, factory setting 'Enable/rapid stop' Binary input 5, factory setting 'n11/n12' Binary input 6, factory setting 'n12/n22' • The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 2 to 6 (DIØ1...DIØ5) → Parameter menu P60_
X10:15	**DCOM**	Reference for binary inputs DIØØ to DIØ5 (X10:9 to X10:14) • Switching of binary inputs with +24 V external voltage: DCOM (X10:15) must be connected to the reference potential of the external voltage. –Without jumper DCOM-DGND (X10:15-X10:17) → Isolated binary inputs –With jumper DCOM-DGND (X10:15-X10:17) → Non-isolated binary inputs • Switching of binary inputs with +24 V from VO24 (X10:16) → DCOM-DGND jumper required.
X10:18 **X10:19** **X10:20** **X10:21** **X10:22** **X10:23** **X10:24**	**DOØ1-C** **DOØ2/AO1** **DOØ1-NO** **DBØØ** **DOØ1-NC** **DGND** **VI24**	Shared contact binary output 1, factory setting: 'Ready' Binary output 2, factory setting: 'No function', load capacity max. 50 mA (short-circuit proof) can also be used as analog output AO1 (not with MCF41A), switchover with P621 and P642 Normally open contact binary output 1, load capacity of the relay contacts max. 30 V_{DC} and 0.8 A Binary output 0, with fixed assignment '/Brake', load capacity max. 150 mA (short-circuit proof) NC contact binary output 1 Selection options for binary outputs 1 and 2 (DOØ1 and DOØ2) → Parameter menu P62_ **Do not apply an external voltage to binary outputs DBØØ (X10:21) and DOØ2/AO1 (X10:19)!** Reference potential for binary signals Input +24 V voltage supply (backup voltage, unit diagnosis when supply system off)
X14:1 **X14:2** **X14:3** **X14:4** **X14:5** **X14:6** **X14:7** **X14:8** **X14:9**	**Input of external encoder or output of incremental encoder simulation**	Signal track A (K1) Signal track B (K2) Signal track C (K0) Switchover Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) +24 V (max. 180 mA) The following encoders are allowed to be connected as external encoders: • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option If X14: is used as an incremental encoder simulation output, the switchover (X14:4) must be jumpered with DGND (X14:5).
 X15:1 **X15:2** **X15:3** **X15:4** **X15:5** **X15:6** **X15:7** **X15:8** **X15:9**	**Motor encoder input**	**MCV4_A:** Signal track A (K1) Signal track B (K2) Signal track C (K0) N.C. Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) +24 V (max. 180 mA) **MCS4_A:** sin+ (S2) cos+ (S1) Ref.+ (R1) N.C. REF1 (+10 V for TF/TH) sin- (S4) cos- (S3) Ref.- (R2) AI21 (TF/TH connection) The following encoders are allowed to be connected: With MCV4_A: • sin/cos encoder type ES1S, ES2S or EV1S • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option • 5 V HTL sensor with 24 V_{DC} voltage supply type ES1C, ES2C or EV1C With MCS4_A: • 2-pole resolver, 7 $V_{AC\_r.m.s.}$ / 7 kHz
X30:		MCF/MCV/MCS41A: PROFIBUS-DP connection, 9-pin sub D socket, pin assignment → page 250
1...10		DIP switches for PROFIBUS settings → page 251
S11: **S12:**		Switch mode I signal (0(4)...20 mA) ↔ V signal (-10 V...0...10 V, 0...10 V), factory setting: V signal Switch system bus terminating resistor on or off, factory setting: switched off
TERMINAL		Option slot for DBG11B keypad or serial port USS21A (RS-232 and RS-485)

STOP

Important with MCS4_A: If a TF/TH is connected to X15:5 and X15:9 then no TF/TH connection is permitted on X10:1 and X10:6! Terminal X10:6 is not allowed to be used in this case, not even as a 10 V voltage input.

Analog output AO1

With MCF40A and MCV/MCS40/41A, binary output DOØ2 (X10:19) can also be used as a 0(4)...20 mA analog output AO1. It is changed over using parameters P621 'Binary output DOØ2' and P642 'Operating mode AO1'.

Function of X10:19	P621 'Binary output DO02'	P642 'Operating mode AO1'
Binary output DOØ2	≠ Set to NO FUNCTION	Set to OFF
Analog output AO1	Set to NO FUNCTION	≠ Set to OFF
	≠ Set to NO FUNCTION	≠ Set to OFF
NO FUNCTION	Set to NO FUNCTION	Set to OFF

MCV41A: Assignment of electronics terminals and labeling tile

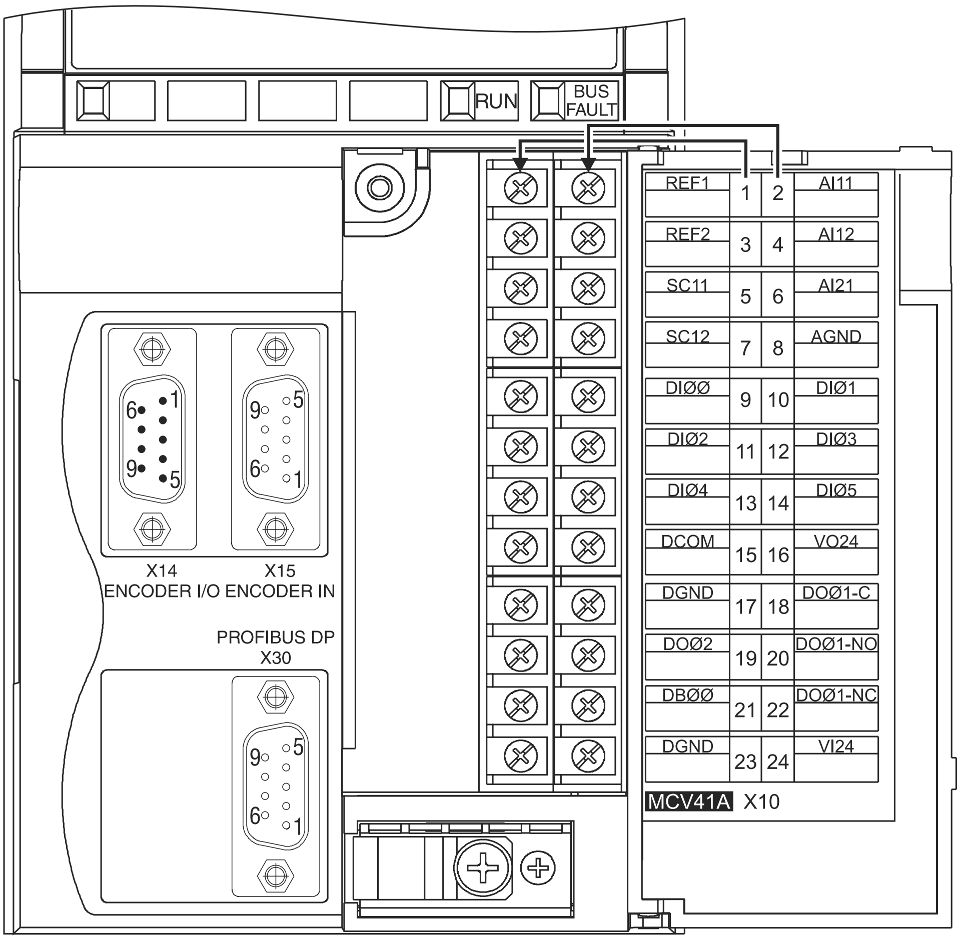

Figure 151: Electronics terminals and labeling tile, example of MCV41A

MCH4_A: Control unit connection

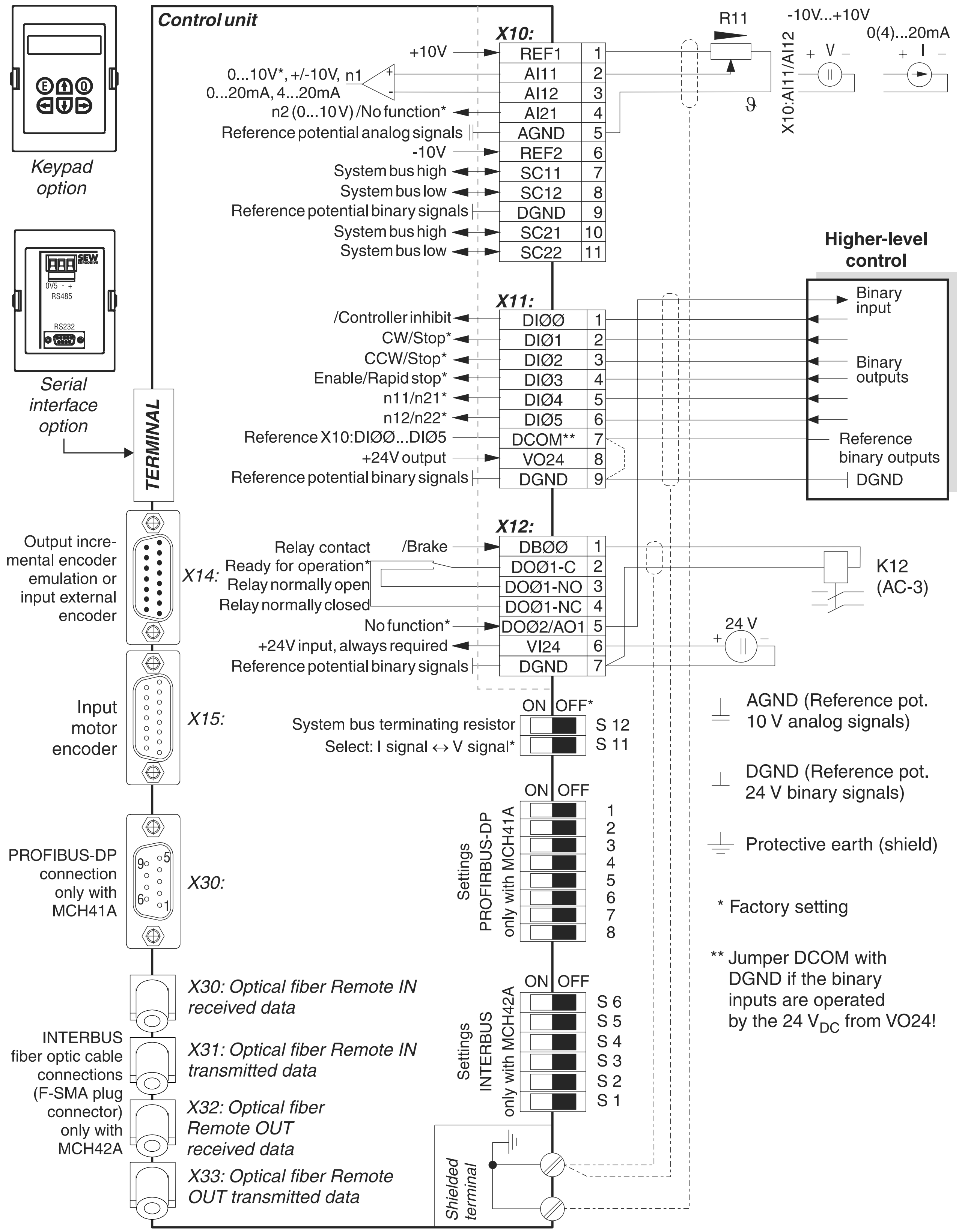

Figure 152: Wiring diagram, MCH4_A control unit

- **MCH41A (with PROFIBUS-DP) / MCH42A (with INTERBUS FO):** SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
- Analog input AI21 (X10:4) can be used either as a 10 V voltage input or as a TF/TH input. It is changed over using parameter P120.
- DIP switches S11, S12, 1...8 and S1...S6 can only be accessed when the connection unit has been removed (→ Sec. 'Removing the connection unit' on page 269).
- The function of DIP switches 1...8 is explained in Secs. 'Bus termination with MCH41A' and 'Setting the station address with MCH41A' on page 251 and page 252.
- The function of DIP switches S1...S6 is explained in Sec. 'DIP switch settings' on page 256.
- The TF/TH line must either be shielded or laid at a distance of at least 0.2 m (8 in) from power cables (e.g. motor or brake cables). The TF/TH line must be separately shielded if hybrid cables are used for the motor and TF/TH connection.

STOP

If a TF/TH is connected to X15:6 and X15:14 then no TF/TH connection is permitted on X10:1 and X10:4! However, terminal X10:4 can be used as a 10 V voltage input.

Analog output AO1

With MCH4_A, binary output DOØ2 (X12:5) can also be used as a 0(4)...20 mA analog output AO1. It is changed over using parameters P621 'Binary output DOØ2' and P642 'Operating mode AO1'.

Function of X12:5	P621 'Binary output DO02'	P642 'Operating mode AO1'
Binary output DOØ2	≠ Set to NO FUNCTION	Set to OFF
Analog output AO1	Set to NO FUNCTION	≠ Set to OFF
	≠ Set to NO FUNCTION	≠ Set to OFF
NO FUNCTION	Set to NO FUNCTION	Set to OFF

MCH4_A: Description of terminal functions on the basic unit

Terminal		Function	
X1:1/2/3 **X2:4/5/6** **X3:8/9** **X4:**	**L1/L2/L3** **U/V/W** **+R/-R** **$+U_Z/-U_Z$**	Mains connection Motor connection Braking resistor connection DC link connection	
X10:1 **X10:2/3** **X10:4** **X10:5** **X10:6**	**REF1** **AI11/12** **AI21** **AGND** **REF2**	+10 V (max. 3 mA) for setpoint potentiometer Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_ / S11 Either setpoint input n2 (0...10 V) or TF/TH input, setting → P120 Reference potential for analog signals (REF1, REF2, AI..) -10 V (max. 3 mA) for setpoint potentiometer	
X10:7/8 **X10:9** **X10:10/11**	**SC11/SC12** **DGND** **SC21/SC22**	System bus high/low, direct electrical connection to SC21/SC22 (X10:10/X10:11) Reference potential system bus System bus high/low, direct electrical connection to SC11/SC12 (X10:7/X10:8)	
X11:1 **X11:2** **X11:3** **X11:4** **X11:5** **X11:6**	**DIØØ** **DIØ1** **DIØ2** **DIØ3** **DIØ4** **DIØ5**	Binary input 1, with fixed assignment '/Controller inhibit' Binary input 2, factory setting 'CW/stop' Binary input 3, factory setting 'CCW/stop' Binary input 4, factory setting 'Enable/rapid stop' Binary input 5, factory setting 'n11/n12' Binary input 6, factory setting 'n12/n22'	• The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 2 to 6 (DIØ1...DIØ5) → Parameter menu P60_
X11:7	**DCOM**	Reference for binary inputs DIØØ to DIØ5 (X11:1 to X11:6) • Switching of binary inputs with +24 V external voltage: DCOM (X11:7) must be connected to the reference potential of the external voltage. –Without jumper DCOM-DGND (X11:7-X11:9) → Isolated binary inputs –With jumper DCOM-DGND (X11:7-X11:9) → Non-isolated binary inputs • Switching of binary inputs with +24 V from VO24 (X11:8) → DCOM-DGND jumper required.	
X11:8 **X11:9**	**VO24** **DGND**	Auxiliary supply output +24 V (max. 200 mA) for external command switches Reference potential for binary signals	
X12:1 **X12:2** **X12:3** **X12:4** **X12:5** **X12:6** **X12:7**	**DBØØ** **DOØ1-C** **DOØ1-NO** **DOØ1-NC** **DOØ2/AO1** **VI24** **DGND**	Binary output 0, with fixed assignment '/Brake', load capacity max. 150 mA (short-circuit proof) Shared contact binary output 1, factory setting: 'Ready' Normally open contact binary output 1, load capacity of the relay contacts max. 30 V_{DC} and 0.8 A NC contact binary output 1 Binary output 2, factory setting: 'No function', load capacity max. 50 mA (short-circuit proof) can also be used as analog output AO1, switchover with P621 and P642 Selection options for binary outputs 1 and 2 (DOØ1 and DOØ2) → Parameter menu P62_ **Do not apply an external voltage to binary outputs DBØØ (X12:1) and DOØ2/AO1 (X12:5)!** Input +24 V voltage supply (backup voltage, unit diagnosis when supply system off) Reference potential for binary signals	
X14:1 **X14:2** **X14:3** **X14:4** **X14:5/6** **X14:7** **X14:8** **X14:9** **X14:10** **X14:11** **X14:12** **X14:13/14** **X14:15**	**Input of external encoder or output of incremental encoder simulation**	Signal track A (K1) Signal track B (K2) Signal track C (K0) DATA+ Reserved Switchover Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) DATA- Reserved +12 V (max. 180 mA)	The following encoders are allowed to be connected as external encoders: • Hiperface encoder type AS1H, ES1H or AV1H • sin/cos encoder type ES1S, ES2S or EV1S • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option If X14: is used as an incremental encoder simulation output, the switchover (X14:7) must be jumpered with DGND (X14:8). The 12 V_{DC} supply from X14 and X15 is sufficient to operate SEW encoders with a 24 V_{DC} supply.
X15:1 **X15:2** **X15:3** **X15:4** **X15:5** **X15:6** **X15:7** **X15:8** **X15:9** **X15:10** **X15:11** **X15:12** **X15:13** **X15:14** **X15:15**	**Motor encoder input**	Signal track A (K1) Signal track B (K2) Signal track C (K0) DATA+ Reserved TF2 Reserved Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) DATA- Reserved TF2 +12 V (max. 180 mA)	The following encoders are allowed to be connected: • Hiperface encoder type AS1H or ES1H • sin/cos encoder type ES1S, ES2S or EV1S • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option The 12 V_{DC} supply from X14 and X15 is sufficient to operate SEW encoders with a 24 V_{DC} supply.
S1...S6		DIP switches for INTERBUS settings → Sec. 'Setting the DIP switches' (page 256)	
S11: **S12:**		Switch mode I signal (0(4)...20 mA) ↔ V signal (-10 V...0...10 V, 0...10 V), factory setting: V signal Switch system bus terminating resistor on or off, factory setting: switched off	
TERMINAL		Option slot for DBG11B keypad or serial port USS21A (RS-232 and RS-485)	

MCH42A: Assignment of electronics terminals and labeling tile

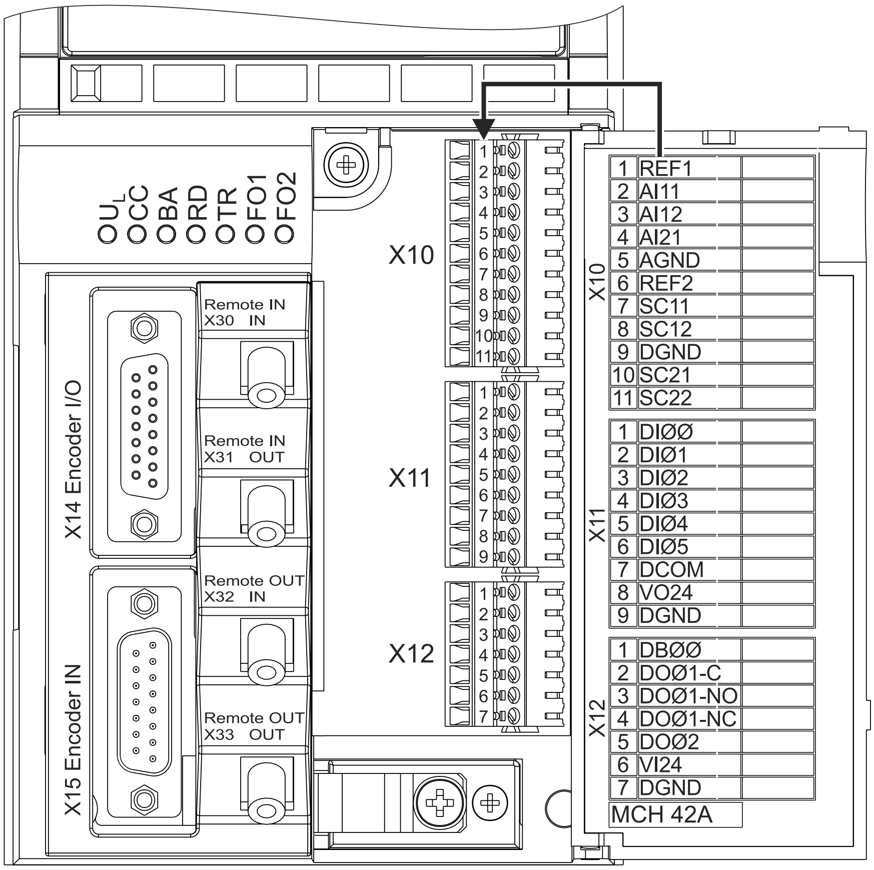

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Figure 153: Electronics terminals and labeling tile, example of MCH42A

9.8 Removing the terminal unit

STOP

First switch off the supply system and the 24 V_{DC} backup voltage, then remove the terminal unit.

You can remove the entire terminal unit completely from the control unit in order to facilitate installation of the control cables. You have to remove the terminal unit in order to set the DIP switches for PROFIBUS (1...10), INTERBUS (S1...S6), signal switchover n1 (S11) and SBus terminating resistor (S12). Proceed as follows to do this:

1. Open the flap on the terminal unit.
2. Unscrew retaining screws A and B; they are captive screws and cannot fall out.
3. Remove the terminal unit from the control unit.

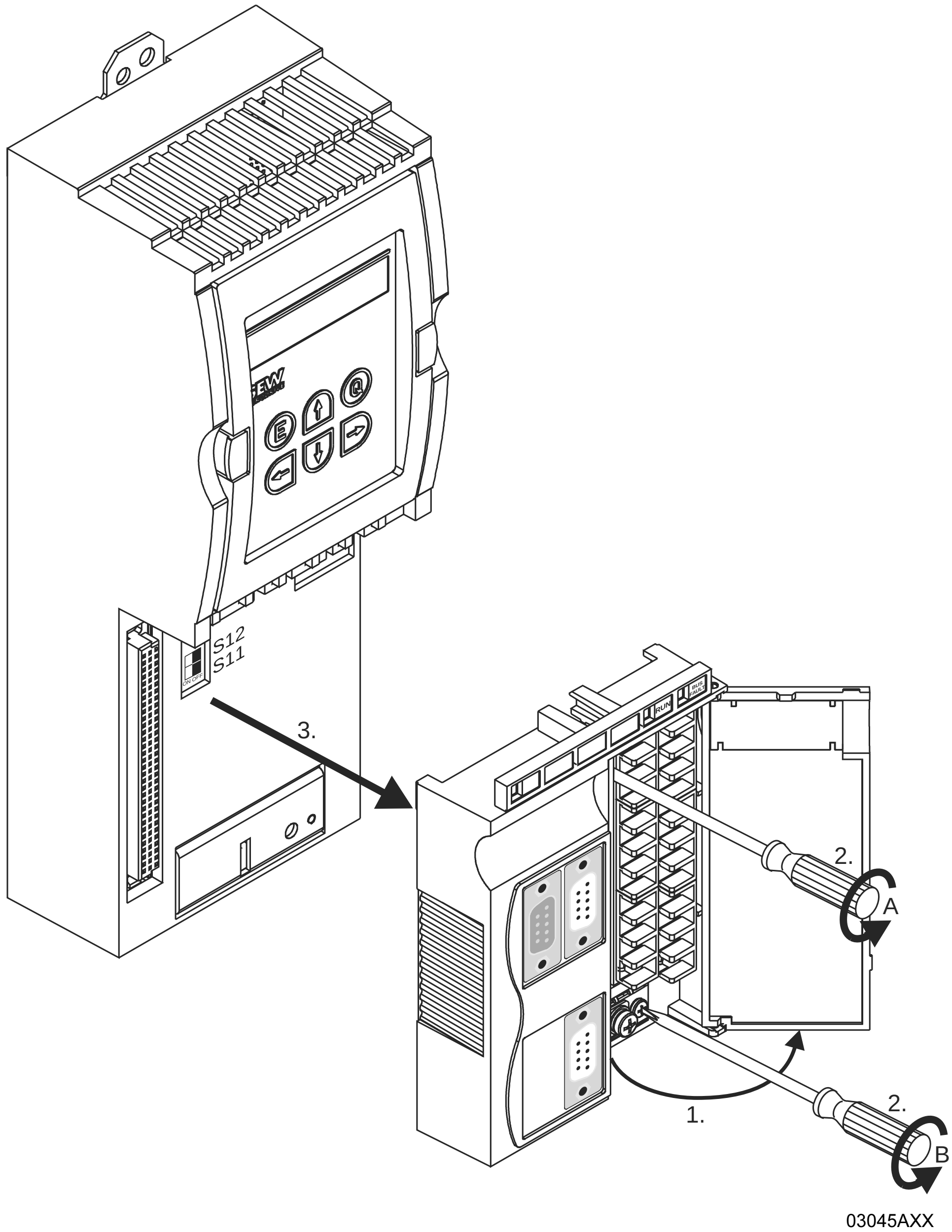


Figure 154: Removing the terminal unit, for example with MCV41A

Follow the instructions in reverse order when installing the terminal unit.

9.9 *Assignment of braking resistors, chokes and filters*

400/500 V units, sizes 1 and 2

MOVIDRIVE® *compact* MC_4_A...-5A3			0015	0022	0030	0040	0055	0075	0110
Size			1				2		
Braking resistors	**Trip current**	**Part number**							
BW100-005	$I_F = 0.8\ A_{RMS}$	826 269 1							
BW100-006	$I_F = 1.8\ A_{RMS}$	821 701 7							
BW168	$I_F = 2.5\ A_{RMS}$	820 604 X							
BW268	$I_F = 3.4\ A_{RMS}$	820 715 1							
BW147	$I_F = 3.5\ A_{RMS}$	820 713 5							
BW247	$I_F = 4.9\ A_{RMS}$	820 714 3							
BW347	$I_F = 7.8\ A_{RMS}$	820 798 4							
BW039-012	$I_F = 4.2\ A_{RMS}$	821 689 4							
BW039-026	$I_F = 7.8\ A_{RMS}$	821 690 8							
BW039-050	$I_F = 11\ A_{RMS}$	821 691 6							
Line chokes		**Part numbers**							
ND020-013	$\Sigma I_{mains} = 20\ A_{AC}$	826 012 5							
ND045-013	$\Sigma I_{mains} = 45\ A_{AC}$	826 013 3							
Line filters		**Part number**							
NF009-503	$V_{max} = 550\ V_{AC}$	827 412 6				A			
NF014-503		827 116 X				B		A	
NF018-503		827 413 4						B	
NF035-503		827 128 3							
Output chokes	**Inside diameter**	**Part number**							
HD001	d = 50 mm (1.97 in)	813 325 5	For cable cross sections 1.5...16 mm² (AWG 16...6)						
HD002	d = 23 mm (0.91 in)	813 557 6	For cable cross sections ≤ 1.5 mm² (AWG 16)						
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm² (AWG 6)						
Output filters (in VFC mode only)		**Part number**							
HF015-503		826 030 3	A						
HF022-503		826 031 1	B	A					
HF030-503		826 032 X		B	A				
HF040-503		826 311 6			B	A			
HF055-503		826 312 4				B	A		
HF075-503		826 313 2					B	A	
HF023-403		825 784 1						B	A
HF033-403		825 785 X							B

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)

400/500 V units, sizes 3 to 5

MOVIDRIVE® *compact* MC_4_A...-503			0150	0220	0300	0370	0450	0550	0750
Size				3		4		5	
Braking resistors	**Trip current**	**Part number**							
BW018-015	I_F = 4.0 A_{RMS}	821 684 3				C	C		
BW018-035	I_F = 8.1 A_{RMS}	821 685 1				C	C		
BW018-075	I_F = 14 A_{RMS}	821 686 X				C	C		
BW915	I_F = 28 A_{RMS}	821 260 0							
BW012-025	I_F = 6.1 A_{RMS}	821 680 0							
BW012-050	I_F = 12 A_{RMS}	821 681 9							
BW012-100	I_F = 22 A_{RMS}	821 682 7							
BW106	I_F = 38 A_{RMS}	821 050 0							
BW206	I_F = 42 A_{RMS}	821 051 9							
Line chokes		**Part numbers**							
ND045-013	ΣI_{mains} = 45 A_{AC}	826 013 3		A					
ND085-013	ΣI_{mains} = 85 A_{AC}	826 014 1		B			A		
ND1503	ΣI_{mains} = 150 A_{AC}	825 548 2					B		
Line filters		**Part number**							
NF035-503	V_{max} = 550 V_{AC}	827 128 3	A						
NF048-503		827 117 8	B	A					
NF063-503		827 414 2		B	A				
NF085-503		827 415 0			B		A		
NF115-503		827 416 9					B	A	
NF150-503		827 417 7						B	
Output chokes	**Inside diameter**	**Part number**							
HD001	d = 50 mm (1.97 in)	813 325 5	For cable cross sections 1.5...16 mm² (AWG 16...6)						
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm² (AWG 6)						
Output filters (only in VFC mode)		**Part number**							
HF033-403		825 785 X	A	B / D	A / D				
HF047-403		825 786 8	B	A					
HF450-503		826 948 3			B		E	D	D

A	**In rated operation (100 %)**
B	**With variable torque load in VFC mode (125 %)**
C	**Connect two braking resistors in parallel and set twice the trip current on F16 (2 × I_F)**
D	**Connect two output filters in parallel**
E	**In rated operation (100 %): One output filter** **With variable torque load (125 %): Connect two output filters in parallel**

9

230 V units, sizes 1 to 4

MOVIDRIVE® *compact* MC_4_A...-2_3			**0015**	**0022**	**0037**	**0055**	**0075**	**0110**	**0150**	**0220**	**0300**
Size				**1**		**2**		**3**		**4**	
Braking resistors	**Trip current**	**Part number**									
BW039-003	$I_F = 2.0\ A_{RMS}$	**821 687 8**									
BW039-006	$I_F = 3.2\ A_{RMS}$	**821 688 6**									
BW039-012	$I_F = 4.2\ A_{RMS}$	**821 689 4**									
BW039-026	$I_F = 7.8\ A_{RMS}$	**821 690 8**									
BW027-006	$I_F = 2.5\ A_{RMS}$	**822 422 6**									
BW027-012	$I_F = 4.4\ A_{RMS}$	**822 423 4**									
BW018-015	$I_F = 4.0\ A_{RMS}$	**821 684 3**						**C**	**C**	**C**	**C**
BW018-035	$I_F = 8.1\ A_{RMS}$	**821 685 1**						**C**	**C**	**C**	**C**
BW018-075	$I_F = 14\ A_{RMS}$	**821 686 X**						**C**	**C**	**C**	**C**
BW915	$I_F = 28\ A_{RMS}$	**821 260 0**						**C**	**C**	**C**	**C**
BW012-025	$I_F = 10\ A_{RMS}$	**821 680 0**									
BW012-050	$I_F = 19\ A_{RMS}$	**821 681 9**									
BW012-100	$I_F = 27\ A_{RMS}$	**821 682 7**									
BW106	$I_F = 38\ A_{RMS}$	**821 050 0**								**C**	**C**
BW206	$I_F = 42\ A_{RMS}$	**821 051 9**								**C**	**C**
Line chokes		**Part numbers**									
ND020-013	$\Sigma I_{mains} = 20\ A_{AC}$	**826 012 5**				**A**					
ND045-013	$\Sigma I_{mains} = 45\ A_{AC}$	**826 013 3**				**B**		**A**			
ND085-013	$\Sigma I_{mains} = 85\ A_{AC}$	**826 014 1**						**B**		**A**	
ND1503	$\Sigma I_{mains} = 150\ A_{AC}$	**825 548 2**								**B**	
Line filters		**Part number**									
NF009-503		**827 412 6**		**A**							
NF014-503		**827 116 X**		**B**	**A**						
NF018-503		**827 413 4**			**B**						
NF035-503		**827 128 3**									
NF048-503	$V_{max} = 550\ V_{AC}$	**827 117 8**						**A**			
NF063-503		**827 414 2**						**B**			
NF085-503		**827 415 0**								**A**	
NF115-503		**827 416 9**								**B**	
Output chokes	**Inside diameter**	**Part number**									
HD001	**d = 50 mm (1.97 in)**	**813 325 5**	For cable cross sections 1.5...16 mm^2 (AWG 16...6)								
HD002	**d = 23 mm (0.91 in)**	**813 557 6**	For cable cross sections ≤ 1.5 mm^2 (AWG 16)								
HD003	**d = 88 mm (4.46 in)**	**813 558 4**	For cable cross sections > 16 mm^2 (AWG 6)								

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)

C Connect two braking resistors in parallel and set twice the trip current on F16 ($2 \times I_F$)

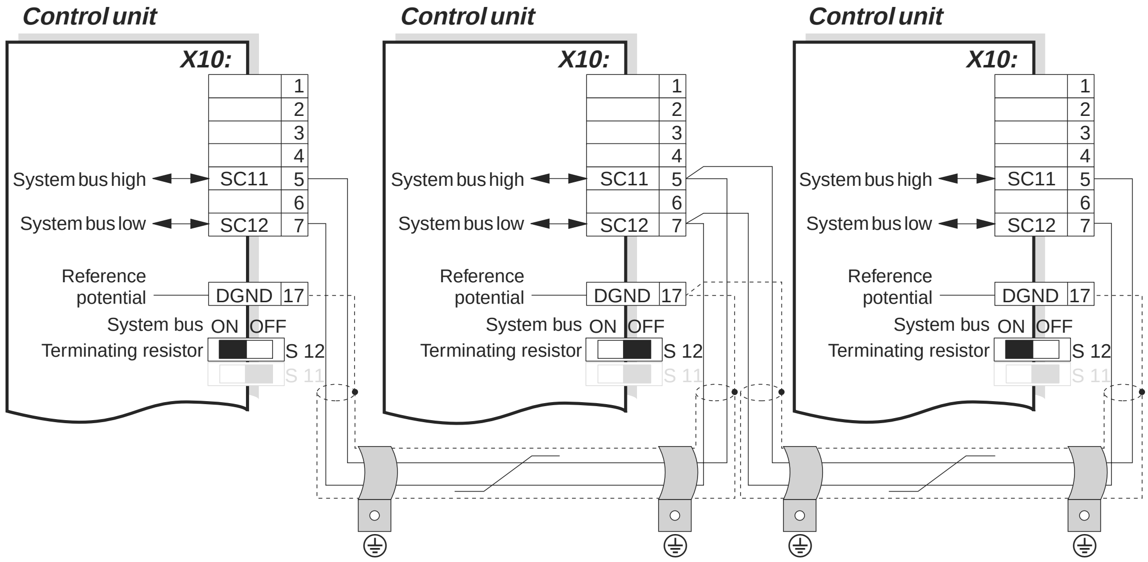
9.10 System bus (SBus) installation

Only when P816 'SBus baud rate' = 1000 kbaud:

MOVIDRIVE® *compact* MCH4_A units are not to be combined with other MOVIDRIVE® units in the same system bus combination.

The units can be combined at baud rates ≠ 1000 kbaud.

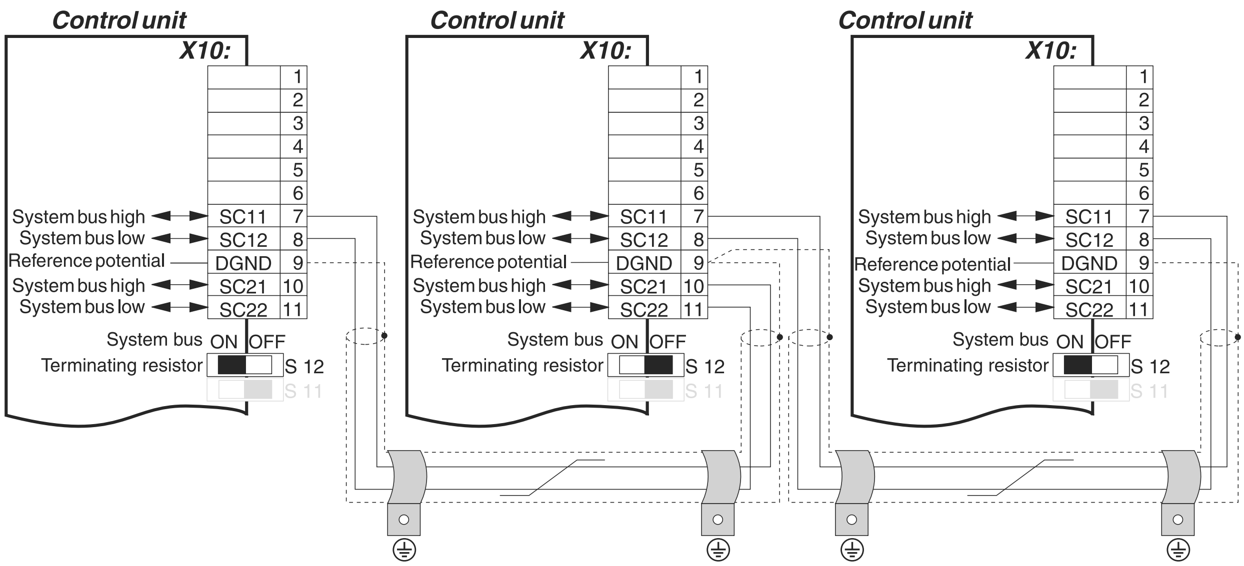
MOVIDRIVE® compact MCF/MCV/MCS4_A



02411AEN

Figure 155: System bus connection MOVIDRIVE® compact MCF/MCV/MCS4_A

MOVIDRIVE® compact MCH4_A



05210AEN

Figure 156: System bus connection MOVIDRIVE® compact MCH4_A

SBus MCH4_A: Connect the terminating equipment to SC11/SC12. SC21/SC22 are only active when S12 = OFF.

Cable specification

- Use a 2-core twisted and shielded copper cable (data transmission cable with shield comprising copper braiding). The cable must meet the following specifications:

  –Conductor cross section 0.75 mm^2 (AWG 18)
  –Cable resistance 120 Ω at 1 MHz
  –Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  Suitable cables are CAN bus or DeviceNet cables, for example.

Shield contact

- Connect the shield at either end to the electronics shield clamp of the inverter or the master control and ensure the shield is connected over a large area. Also connect the ends of the shield to DGND.

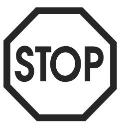
Line length

- The permitted total cable length depends on the baud rate setting of the SBus (P816):

  –125 kbaud→320 m (1056 ft)
  –250 kbaud→160 m (528 ft)
  –**500 kbaud→80 m (264 ft)**
  –1000 kbaud→40 m (132 ft)

Terminating resistor

- Switch on the system bus terminating resistor (S12 = ON) at the start and finish of the system bus connection. Switch off the terminating resistor on the other units (S12 = OFF).



- There must not be any potential displacement between the units connected using the SBus. Take suitable measures to avoid a potential displacement, e.g. by connecting the unit ground connectors using a separate lead. Do not use the shield of the SBus cable for equipotential bonding!

9.11 Connection of option USS21A (RS-232 and RS-485)

Part number USS21A: 822 914 7

RS-232 connection

- Use a shielded standard interface cable with 1:1 connection assignment for connecting to the RS-232 interface.

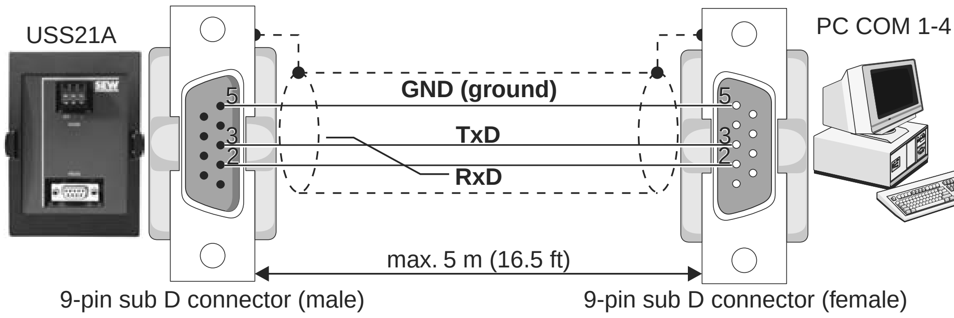


Figure 157: USS21A-PC connection cable (1:1 connection assignment)

RS-485 connection

Please observe the following connection instructions:

- Use a 2-core twisted and shielded copper cable (data transmission cable with shield comprising copper braiding). The cable must meet the following specifications:

  –Conductor cross section 0.5...0.75 mm^2 (AWG 20...18)
  –Cable resistance 100...150 Ω at 1 MHz
  –Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  The following cable is suitable, for example:

  –BELDEN (www.belden.com), data cable type 3105A
- Connect the shield at either end to the electronics shield clamp of the inverter and ensure the shield is connected over a large area. Also connect the ends of the shield to DGND.

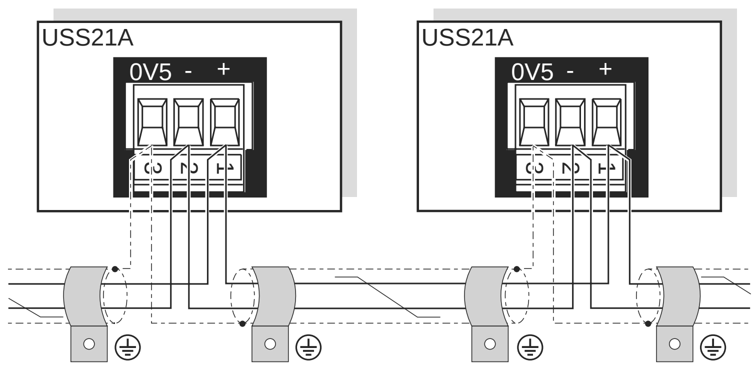


Figure 158: RS-485 interface of the USS21A

EIA standard

The RS-485 interface of the USS21A corresponds to the EIA standard:

- Max. transmission rate 9600 baud
- Max. 32 stations (each unit with USS21A counts as 2 stations)
- Max. cable length 200 m (660 ft) in total
- Dynamic terminating resistor with fixed installation

9.12 Connection of motor encoder and external encoder

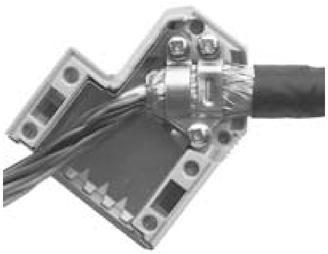
The 'SEW Encoder Systems' manual contains detailed information. This manual can be obtained from SEW.

General installation notes

- Max. line length (inverter-encoder): 100 m (330 ft) with a capacitance per unit length ≤ 120 nF/km (193 nF/mile).
- MCV/MCS4_A: Conductor cross section 0.20...0.5 mm^2 (AWG 24...20)
- MCH4_A: Core cross section
  –Hiperface encoder, sin/cos encoder and TTL sensor with 5 V_{DC} supply (via DWI11A): 0.25...0.5 mm^2 (AWG 23...20)
  –TTL sensor with 12...24 V_{DC} supply: 0.5 mm^2 (AWG 20)
- If you cut off a core of the encoder cable: Isolate the cut-off end of the core.
- Use shielded cables with twisted pairs of insulated conductors and connect the shield at both ends:
  –to the encoder in the cable screw fitting or in the encoder plug
  –to the inverter in the housing of the sub D plug and to the electronics shield clamp of the inverter
- Use encoder plugs and sub D plugs with a metal housing.
- Route the encoder cable separately from the power cables.
- Encoder with cable gland: Please note permitted diameter of the encoder cable for correct function of cable gland.

Shield contact Connect the shield of the encoder cable over a large area.

On the inverter Connect the shield on the inverter end in the housing of the sub D plug.



01939BXX

Figure 159: Connect the shield in the sub D connector

On the encoder Connect the shield on the encoder end in the cable screw fitting or in the encoder plug.

01948AXX

Figure 160: Connect the shield in the cable screw fitting of the encoder

Pre-fabricated cables

- SEW offers pre-fabricated cables for connecting encoders. We recommend using these pre-fabricated cables.
- The conductor colors specified in the connection figures are in accordance with IEC 757 and correspond to the conductor colors used in the pre-fabricated cables from SEW.

Motor encoder

The following motor encoders have been approved for connection to X15: of MOVIDRIVE® *compact* units:

- MCV4_A

  –High-resolution sin/cos encoders with signal voltage 1 V_{SS}
  –TTL sensors with signal level to RS-422
  –HTL sensors

- MCS4_A

  –2-pole resolvers, 7 $V_{AC\_r.m.s.}$ / 7 kHz

- MCH4_A

  –Hiperface encoders
  –High-resolution sin/cos encoders with signal voltage 1 V_{SS}
  –TTL sensors with signal level to RS-422

05232AXX

Figure 161: SEW encoders with plug connection or connection terminals

Voltage supply

Encoders with 12...24 V_{DC} voltage supply (max. 180 mA) are connected directly to X15:. These encoders are then powered by the inverter.

Encoders with a 5 V_{DC} voltage supply must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4).

sin/cos encoders High-resolution sin/cos encoders ES1S, ES2S or EV1S are recommended for operation with MOVIDRIVE® *compact* MCV4_A. Sin/cos encoders have also been approved for connection to MOVIDRIVE® *compact* MCH4_A. Connect the sin/cos encoder as follows:

Connection to MCV4_A

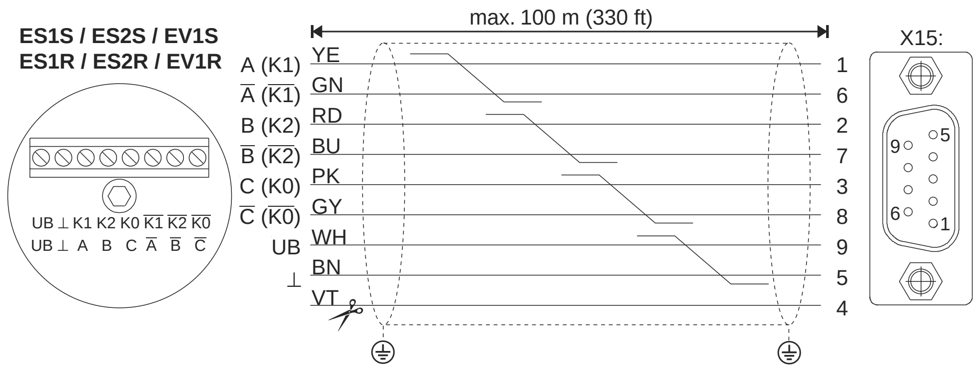


Figure 162: Connecting sin/cos encoders to MCV4_A as a motor encoder

Cut off the violet conductor (VT) of the cable at the encoder end.

Part numbers of the pre-fabricated cables:

- For fixed routing: 198 829 8
- For cat track routing: 198 828 X

Connection to MCH4_A

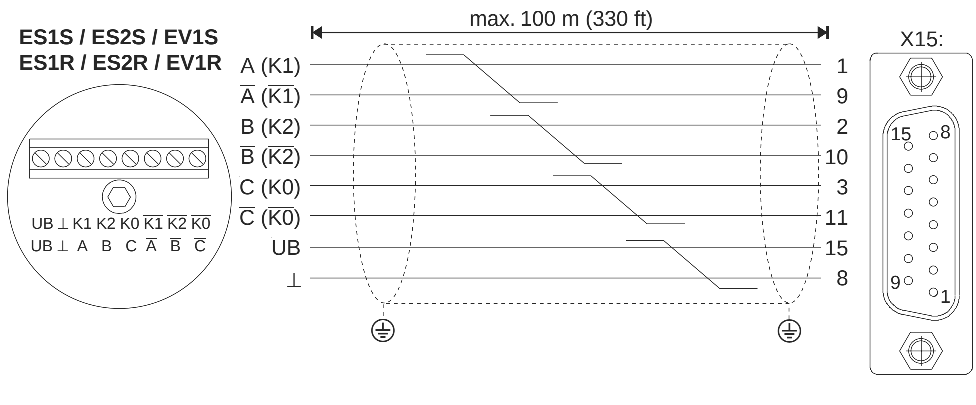


Figure 163: Connecting sin/cos encoders to MCH4_A as a motor encoder

TTL sensors

TTL sensors from SEW are available with a 12...24 V_{DC} voltage supply and a 5 V_{DC} voltage supply.

12...24 V_{DC} voltage supply

Connect TTL sensors with 12...24 V_{DC} voltage supply ES1R, ES2R or EV1S in the same way as the high-resolution sin/cos encoders.

5 V_{DC} voltage supply

TTL sensors with a 5 V_{DC} voltage supply ES1T, ES2T or EV1T must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4). The sensor cable must be connected as well in order to correct the supply voltage of the encoder. Connect these encoders as follows:

Connection to MCV4_A

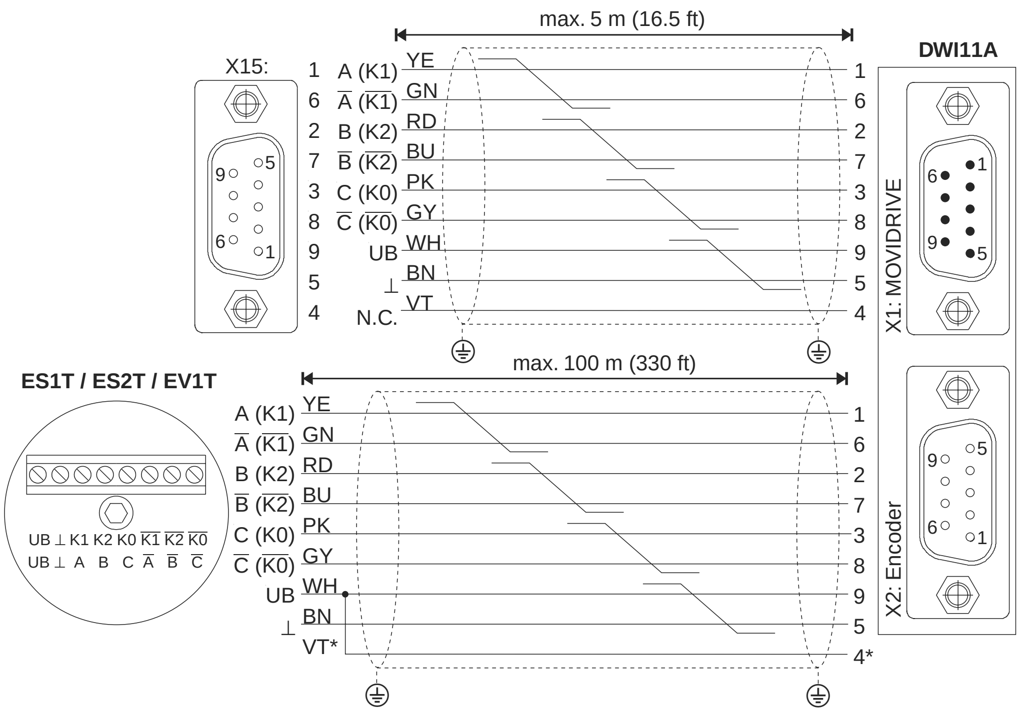


Figure 164: Connecting TTL sensors via DWI11A to MCV4_A as a motor encoder

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

Part numbers of the pre-fabricated cables:

- MOVIDRIVE® *compact* MCV4_A, X15: → DWI11A X1:MOVIDRIVE
  –Fixed routing only:814 344 7

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder
  –For fixed routing:198 829 8
  –For cat track routing:198 828 X

Connection to MCH4_A

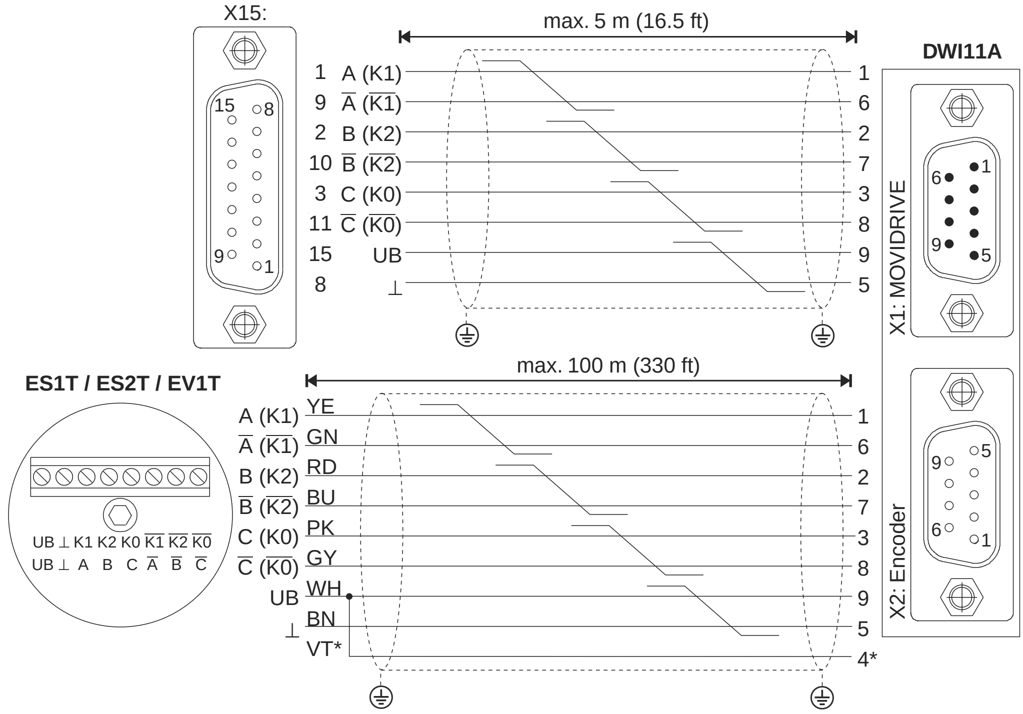


Figure 165: Connecting TTL sensors via DWI11A to MCH4_A as a motor encoder

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

Part numbers of the pre-fabricated cables:

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder
  - –For fixed routing:198 829 8
  - –For cat track routing:198 828 X

HTL sensors (on MCV4_A only)

If you are using an **HTL sensor ES1C, ES2C or EV1C**, do not connect the **negated channels** $\overline{A}$ ($\overline{K1}$), $\overline{B}$ ($\overline{K2}$) and $\overline{C}$ ($\overline{K0}$).

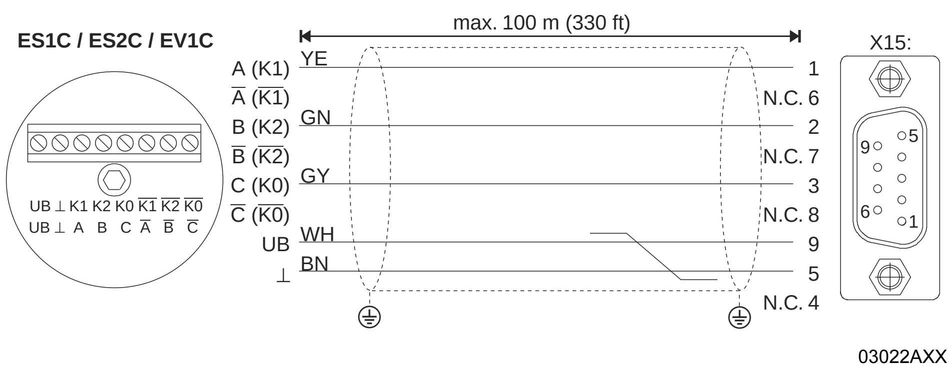


Figure 166: Connecting HTL sensors to MCV4_A as a motor encoder

Part numbers of the pre-fabricated cables:

- For fixed routing: 198 932 4
- For cat track routing: 198 931 6

Hiperface encoders (on MCH4_A only)

Hiperface encoders AS1H, ES1H and AV1H are recommended for operation with MOVIDRIVE® *compact* MCH4_A. Depending on the motor type and motor configuration, the encoder connection takes the form of a plug connection or terminal box.

CM71...112 with plug connection

Connect the Hiperface encoder as follows:

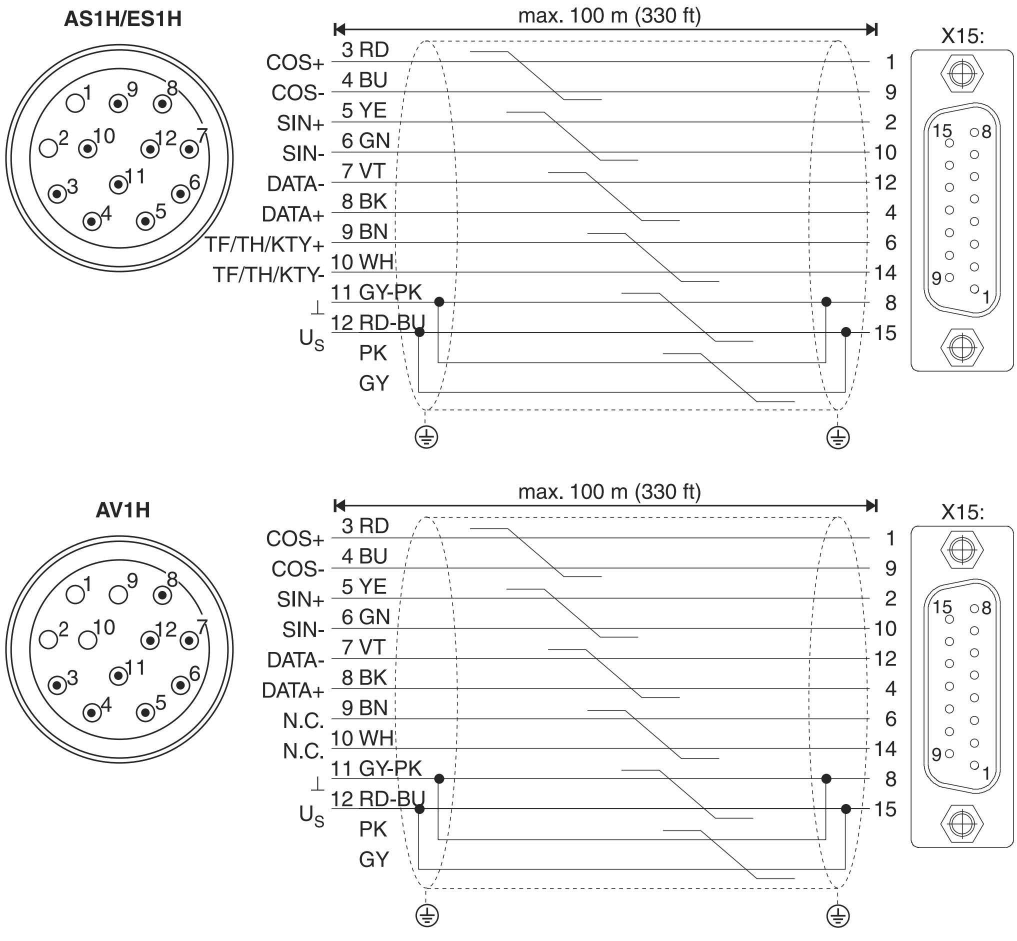


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Figure 167: Connecting Hiperface encoders to MCH4_A as a motor encoder

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 488 3
- For cat track routing: 199 320 8

Part numbers of the pre-fabricated extension cables:

- For fixed routing: 199 539 1
- For cat track routing: 199 540 5

CM71...112 with terminal box

Connect the Hiperface encoder as follows:

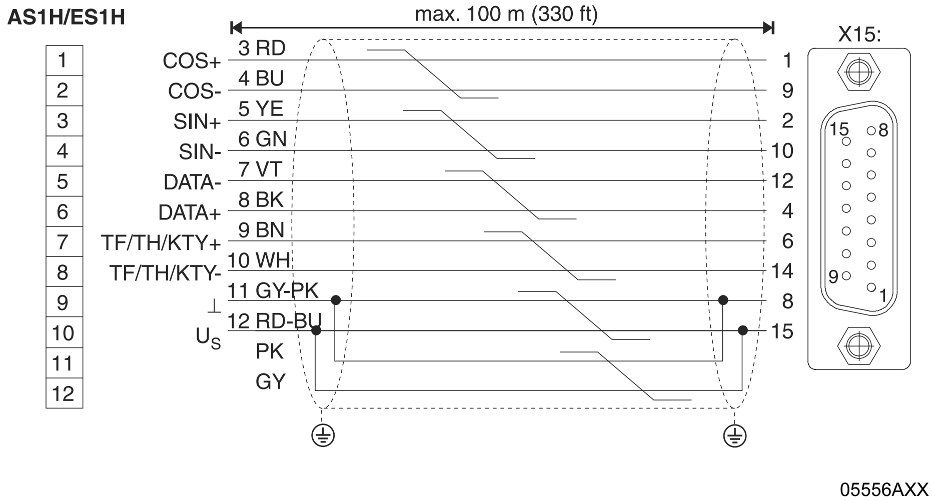


Figure 168: Connecting Hiperface encoders to MCH4_A as a motor encoder

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 591 X
- For cat track routing: 199 592 8

Resolvers (only on MCS4_A)

Depending on the motor type and motor configuration, the resolver connection takes the form of a plug connection or terminal box.

DS56, CM71...112 with plug connection

The resolver connections are housed in a plug connection.

Plug connection DS56, CM: Intercontec, type ASTA021NN00 10 000 5 000

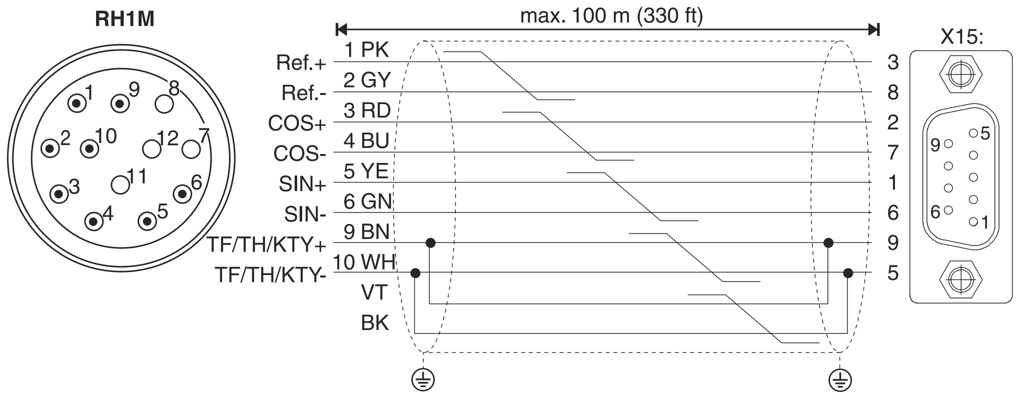


Figure 169: Resolver connection DS56 and CM motors with plug connection

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 487 5
- For cat track routing: 199 319 4

Part numbers of the pre-fabricated extension cables:

- For fixed routing: 199 542 1
- For cat track routing: 199 541 3

DS56, DY71...112 with terminal box

The resolver connections are accommodated in the terminal box on the 10-pin Phoenix terminal strip.

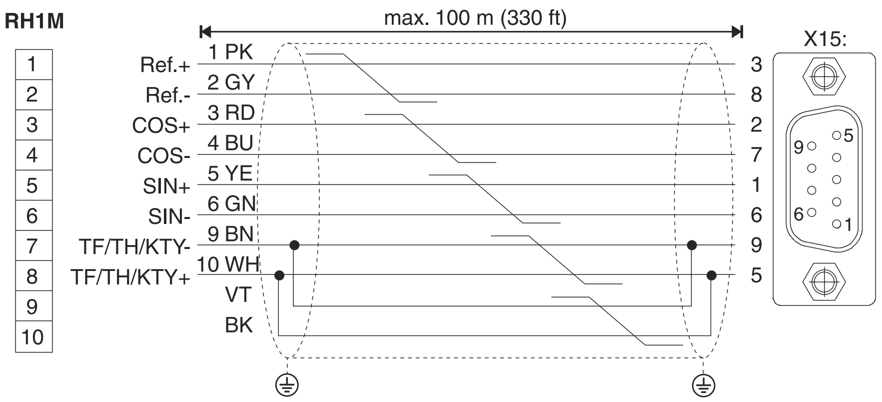


Figure 170: Resolver connection DS and DY motors with terminal box

Cut off the violet conductor (VT) of the cable at the encoder end.

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 589 8
- For cat track routing: 199 590 1

DY71...112 with plug connection

The resolver connections are housed in a plug connection.

Plug connection DY71...112: Framatome Souriou, type GN-DMS2-12S

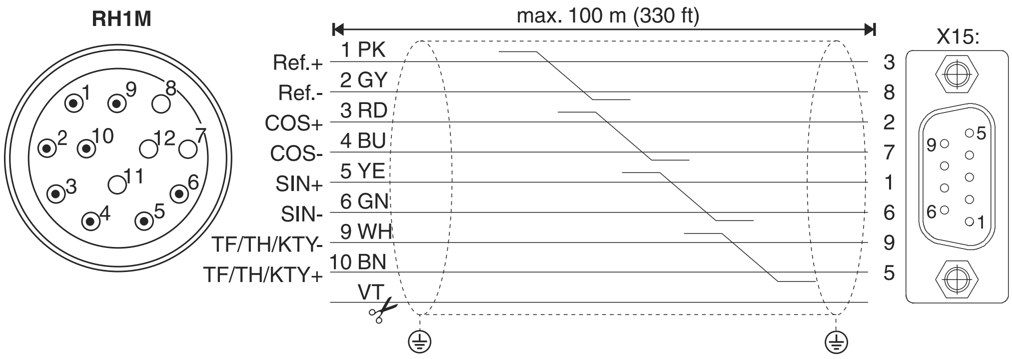


Figure 171: Resolver connection DY motors with plug connection

Cut off the violet conductor (VT) of the cable at the encoder end.

Part numbers of the pre-fabricated cables:

- For fixed routing: 198 827 1
- For cat track routing: 198 812 3

External encoders

The following motor encoders are allowed to be connected to X14: of MOVIDRIVE® *compact* units:

- MCV/MCS4_A

  –5 V TTL sensors with signal level to RS-422

- MCH4_A

  –Hiperface encoders
  –High-resolution sin/cos encoders with signal voltage 1 V_{SS}
  –5 V TTL sensors with signal level to RS-422

Voltage supply

Encoders with 12/24 V_{DC} voltage supply (max. 180 mA) are connected directly to X14:. These encoders are then powered by the inverter.

Encoders with a 5 V_{DC} voltage supply must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4).

5 V TTL sensors

5 V TTL sensors from SEW are available with a 24 V_{DC} voltage supply and a 5 V_{DC} voltage supply.

24 V_{DC} voltage supply

Connection to MCV/MCS4_A:

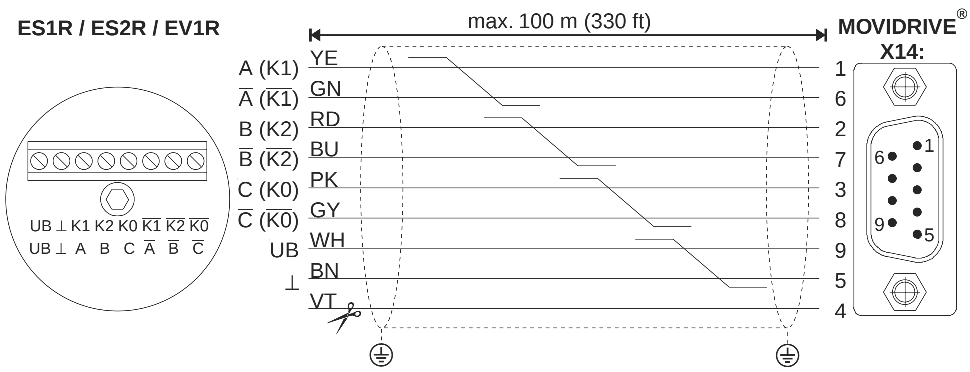


Figure 172: Connecting TTL sensors to MCV/MCS4_A as an external encoder

Cut off the violet conductor (VT) of the cable at the encoder end.

Part numbers of the pre-fabricated cables:

- Fixed routing only: 815 354 X

Connection to MCH4_A:

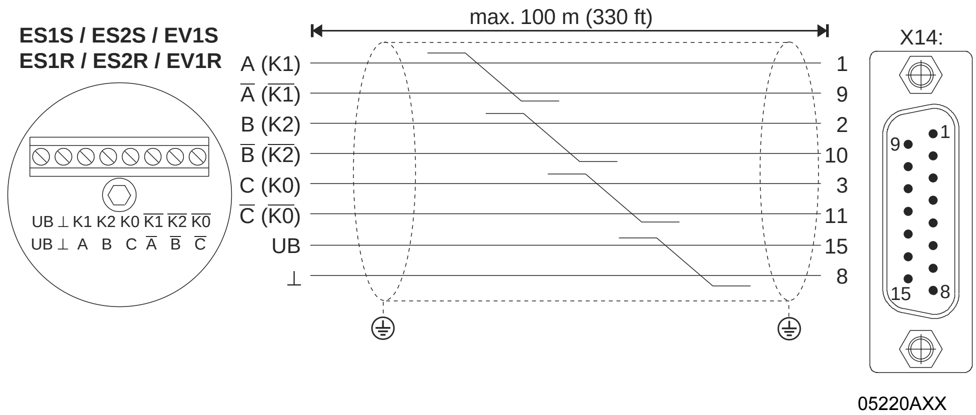


Figure 173: Connecting TTL sensors to MCH4_A as an external encoder

5 V_{DC} voltage supply

5 V TTL sensors with a 5 V_{DC} voltage supply ES1T, ES2T or EV1T must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4). The sensor cable must be connected as well in order to correct the supply voltage of the encoder.

Connection to MCV/MCS4_A:

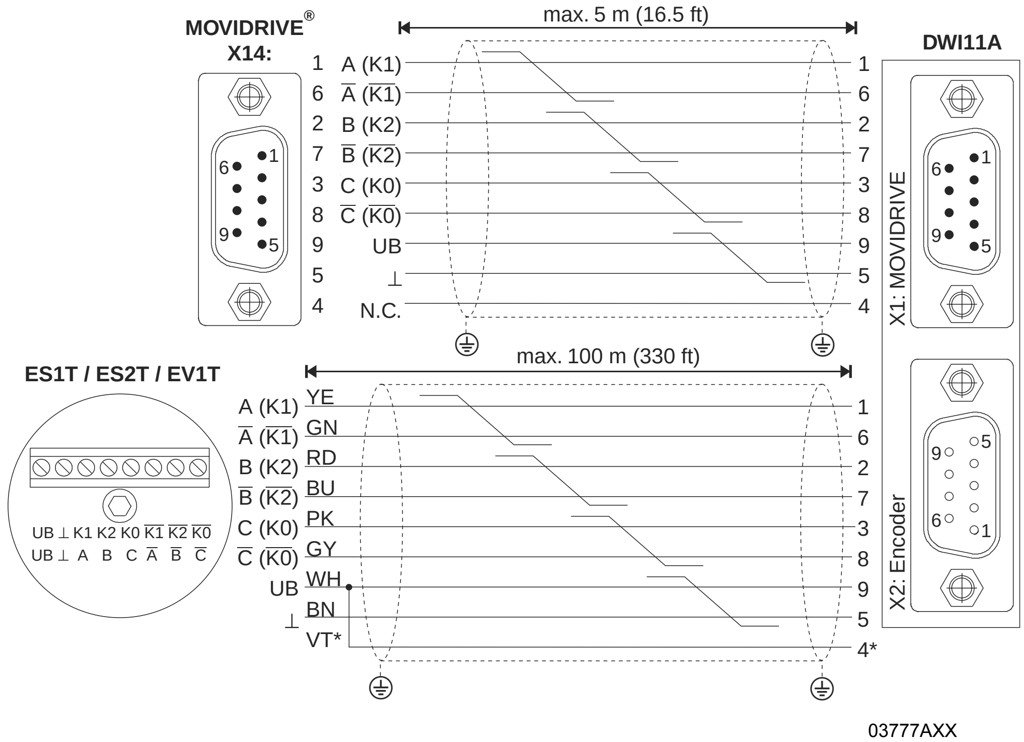


Figure 174: Connecting TTL sensors via DWI11A to MCV/MCS4_A as an external encoder

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

Part numbers of the pre-fabricated cables:

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder

  –For fixed routing:198 829 8
  –For cat track routing:198 828 X

Connection to MCH4_A:

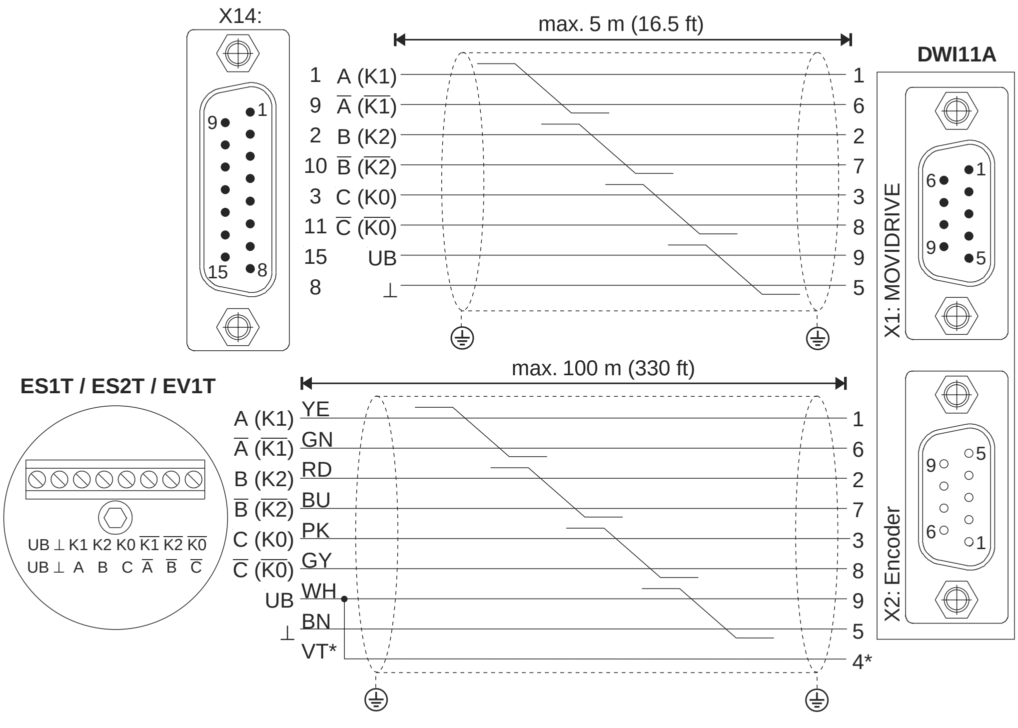


Figure 175: Connecting TTL sensors via DWI11A to MCH4_A as an external encoder

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

Part numbers of the pre-fabricated cables:

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder

  –For fixed routing:198 829 8
  –For cat track routing:198 828 X

9

Hiperface encoders (on MCH4_A only)

Hiperface encoders AS1H are recommended for operation with MOVIDRIVE® *compact* MCH4_A. Connect the Hiperface encoder as follows:

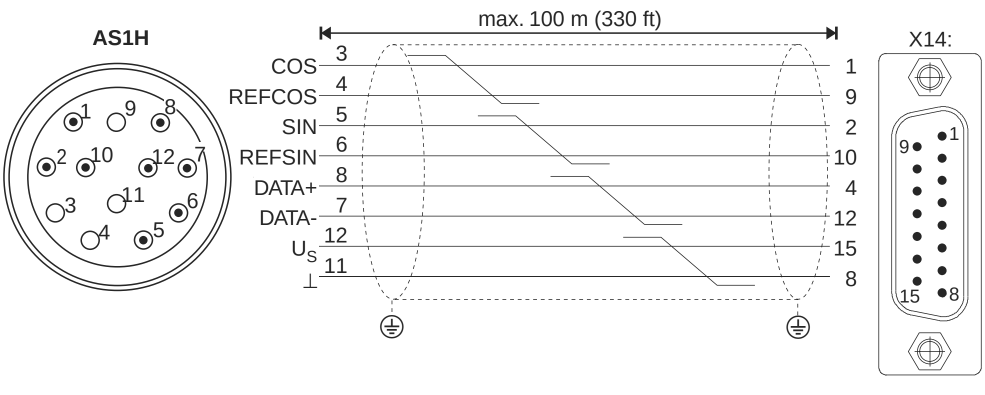


Figure 176: Connecting SEW Hiperface encoders to MCH4_A as an external encoder

sin/cos encoders (on MCH4_A only)

Connect the sin/cos encoder as follows:

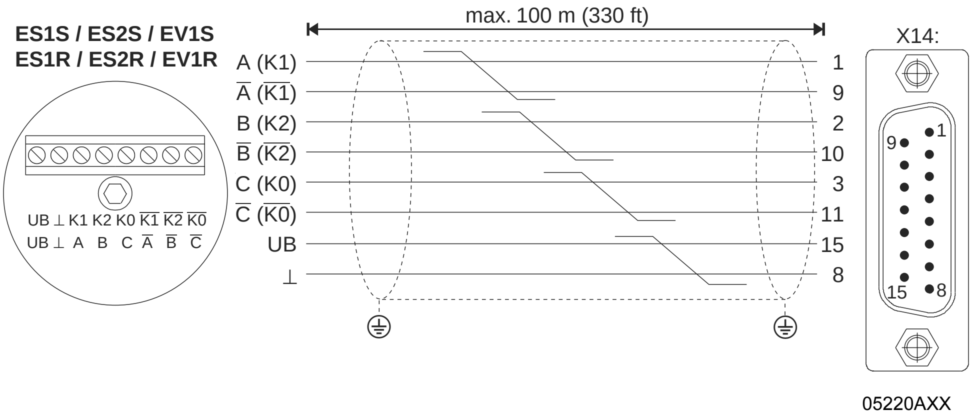


Figure 177: Connecting sin/cos encoders to MCH4_A as an external encoder

Incremental encoder simulation

You can also use X14: as an incremental encoder simulation output. To do this, you must jumper 'switchover' (X14:4 on MCV/MCS4_A, X14:7 on MCH4_A) with DGND (X14:5 on MCV/MCS4_A, X14:8 on MCH4_A). X14: then supplies incremental encoder signals with a signal level according to RS-422 (5 V TTL). The number of pulses is as follows:

- With MCV4_A as on X15: Input motor encoder
- With MCS4_A 1024 pulses/revolution
- With MCH4_A with Hiperface encoder 1024 pulses/revolution
- With MCH4_A with sin/cos encoder or TTL sensor as on X15: Input motor encoder

Connection to MCV/MCS4_A

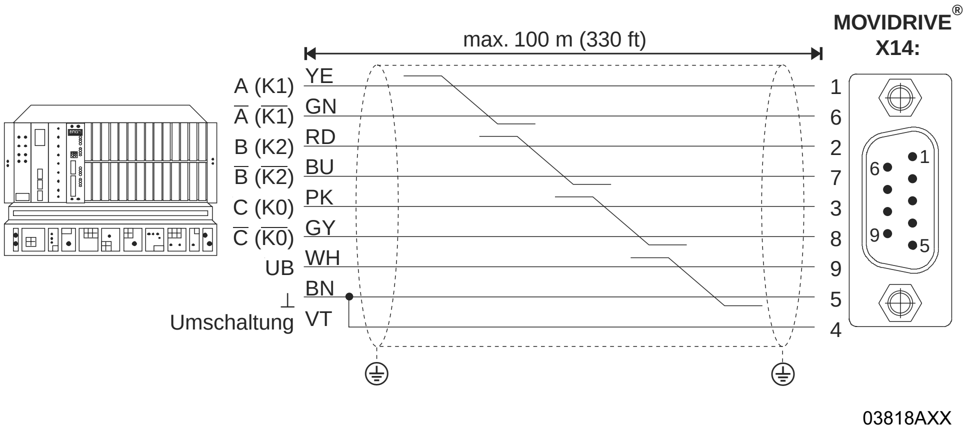


Figure 178: Incremental encoder simulation connection to MCV/MCS4_A

Part numbers of the pre-fabricated cables:

- Fixed routing only: 815 354 X

Connection to MCH4_A

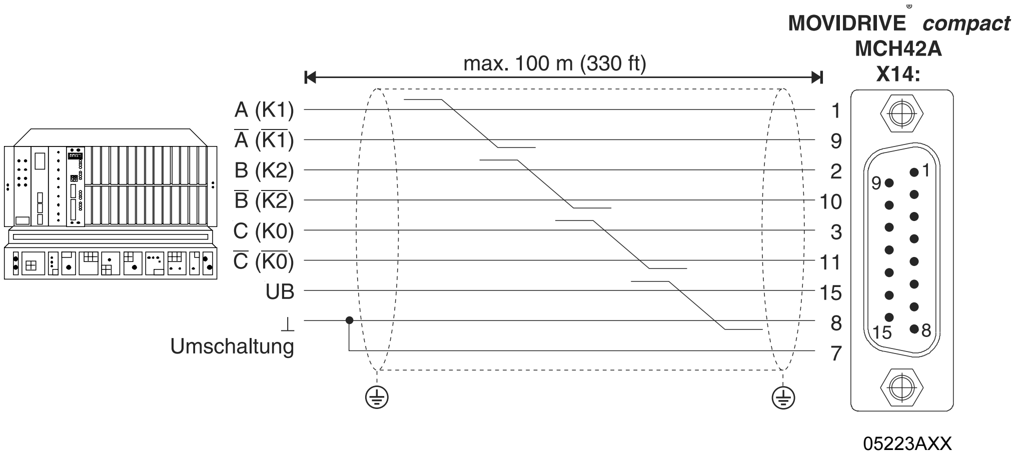


Figure 179: Incremental encoder simulation connection to MCH4_A

Master/slave connection

X14-X14 connection (= master/slave connection) of two MOVIDRIVE® *compact* units.

MCV/MCS4_A

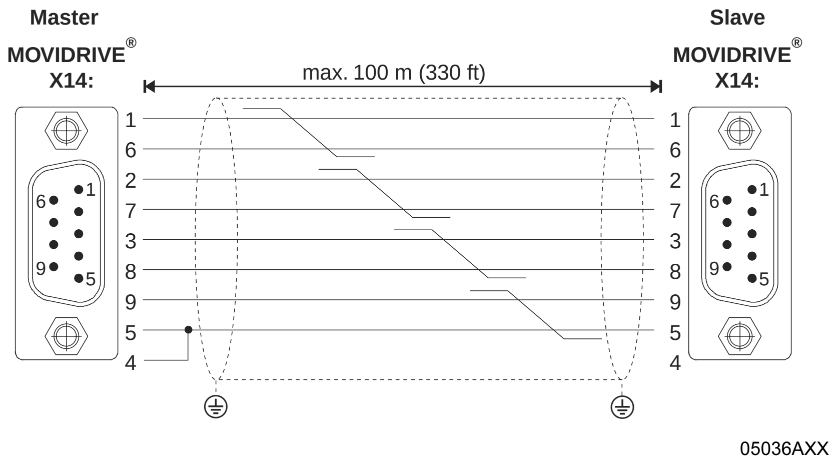


Figure 180: X14-X14 connection MCV/MCS4_A

Part numbers of the pre-fabricated cables:

- Fixed routing only: 815 355 8

The sub D sockets on the ends of the cable are marked with 'MASTER' and 'SLAVE'. Make sure that you connect the socket marked 'MASTER' to X14: of the master unit and the socket marked 'SLAVE' to X14: of the slave unit.

MCH4_A

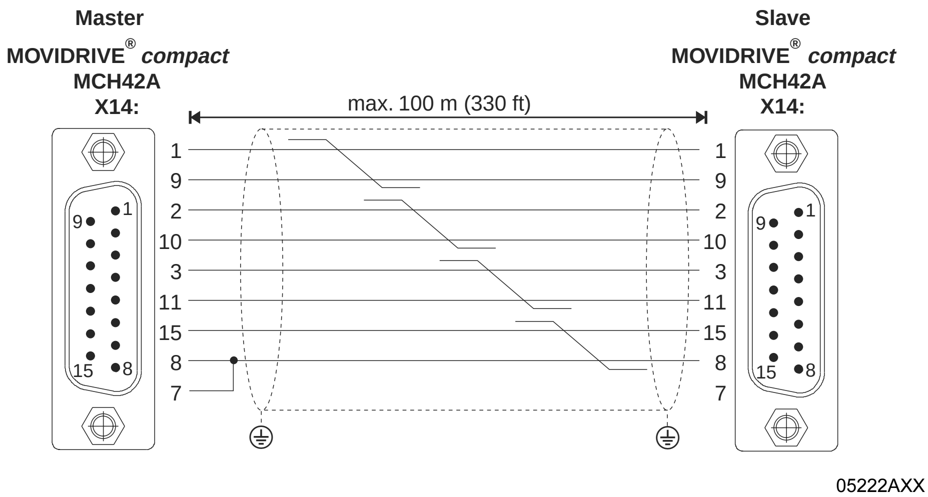


Figure 181: X14-X14 connection MCH4_A

10 Startup

10.1 General startup instructions

It is essential to comply with the safety notes during startup!

Prerequisite

Correct project planning of the drive is the prerequisite for successful startup. Refer to the MOVIDRIVE® *compact* System Manual for detailed project planning instructions and an explanation of the parameters (chapters 4 and 5).

VFC operating modes without speed control

MOVIDRIVE® *compact* drive inverters are factory set to be taken into operation with the SEW motor (MC_4_A...-5_3: 4-pole and rated voltage 3 × 400 V_{AC} / 50 Hz or MC_4_A...-2_3: 4-pole and rated voltage 3 × 230 V_{AC} / 60 Hz) which is adapted to the correct power level. The motor can be connected and the drive started immediately in accordance with Sec. 'Starting the motor' (→ page 302).

Inverter/motor combinations

400/500 V units

The following tables indicate the applicable inverter/motor combinations.

MOVIDRIVE® *compact* MCF4_A or MCV/MCH4_A in VFC mode	SEW motor
0015-5A3-4	DT90L4
0022-5A3-4	DV100M4
0030-5A3-4	DV100L4
0040-5A3-4	DV112M4
0055-5A3-4	DV132S4
0075-5A3-4	DV132M4
0110-5A3-4	DV160M4
0150-503-4	DV160L4
0220-503-4	DV180L4
0300-503-4	DV200L4
0370-503-4	DV225S4
0450-503-4	DV225M4
0550-503-4	D250M4
0750-503-4	D280S4

230 V units

MOVIDRIVE® *compact* MCF4_A or MCV/MCH4_A in VFC mode	SEW motor
0015-2A3-4	DT90L4
0022-2A3-4	DV100M4
0037-2A3-4	DV100L4
0055-2A3-4	DV132S4
0075-2A3-4	DV132M4
0110-203-4	DV160M4
0150-203-4	DV180M4
0220-203-4	DV180L4
0300-203-4	DV225S4

The startup functions described in this section are used for setting the inverter so it is optimally adapted to the motor which is actually connected and to the given operating conditions. It is essential to perform a startup as described in this section for the VFC operating modes with speed control, all CFC operating modes and SERVO operating modes.

Hoist applications

Do not use MOVIDRIVE® *compact* drive inverters for any safety functions in connection with hoist applications.

Use monitoring systems or mechanical protection devices as safety features in order to avoid possible damage to property or injury to people.

10.2 Preliminary work and resources

- Check the installation.
- Take suitable measures to prevent the motor starting up inadvertently. Furthermore, additional safety precautions must be taken depending on the application in order to avoid endangering people and machinery.

  Suitable measures are:

  –With MCF/MCV/MCS4_A: Connect terminal X10:9 '/CONTROL. INHIBIT' to DGND.
  –With MCH4_A: Disconnect the electronics terminal block X11.
- For **startup with the DBG11B keypad**:

  Connect the DBG11B keypad to the TERMINAL option slot.
- For **startup with a PC and MOVITOOLS**:

  Connect the USS21A option to the TERMINAL option slot and use an interface cable (RS-232) to connect it to the PC. MOVIDRIVE® and the PC must be de-energized when you do this, otherwise undefined states may be adopted. Then switch on both units. Install MOVITOOLS on the PC if you have not already done so. Start the program.
- Switch on the power supply and the 24 V supply, if necessary.

  If you are using the DBG11B keypad, the following message appears for about 13 s:

```
SELFTEST
MOVIDRIVE
```

- Undertake the correct preliminary parameter setting (e.g. factory setting).
- Check the set terminal assignment (→ P60_).

STOP

Startup **automatically changes a group of parameter values**. The parameter description P700 'Operating modes' explains which parameters are affected by this step. Refer to the MOVIDRIVE® *compact* System Manual, Sec. 4 'Parameters', for a **parameter description**.

10

10.3 Startup with the DBG11B keypad

General information

Startup with the DBG11B keypad is **possible with MCF and MCV/MCH in VFC operating modes only**. Startup in CFC and SERVO operating modes is possible using the MOVITOOLS software only.

Data required

The following data are required for successful startup:

- Motor type (SEW motor or non-SEW motor)
- Motor data

  –Rated voltage and rated frequency.
  –In addition, with a non-SEW motor: Rated current, rated power, power factor cosφ and rated speed.
- Power supply voltage

The following information is also required for startup of the speed controller:

- Incremental encoder type
- Encoder type and resolution of the incremental encoder:

SEW encoder type	Startup parameters	
	Encoder type	Encoder resolution
AS1H, ES1H, AV1H	HIPERFACE	1024
ES1S, ES2S, EV1	SINE ENCODER	1024
ES1R, ES2R, EV1R ES1T[1], ES2T[1], EV1T[1]	INCREM. TTL SENSOR	1024
ES1C, ES2C, EV1C	INCREM. HTL SENSOR	1024

1) 5 V TTL sensors ES1T, ES2T and EV1T must be connected via the DWI11A option (→ Sec. Installation).

- Motor data

  –SEW motor: Brake yes or no and flywheel fan (Z fan) yes or no
  –Non-SEW motor: Mass moment of inertia [10^{-4}kgm^2] of the motor, brake and fan
- Stiffness of the closed-loop control system (factory setting = 1; can be used as an initial value in most applications)

  If the drive tends to vibrate → setting < 1

  If the transient recovery time is too long → setting > 1

  Setting range for most applications: 0.70...1...1.40
- Mass moment of inertia [10^{-4}kgm^2] of the load (gear unit + driven machine) extrapolated for the motor shaft. If the mass moment of inertia of the load cannot be determined → use 1 to 20 times the value of the mass moment of inertia of the motor.
- Time for the shortest ramp required.

STOP

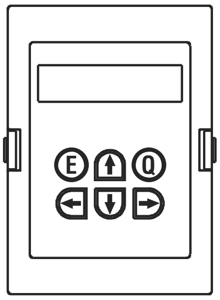
If you are using a TTL sensor (encoder type INCREM. TTL SENSOR), a sin/cos encoder (encoder type SINE ENCODER) or a Hiperface encoder (encoder type HIPERFACE):

- Activate encoder monitoring (P504 = 'ON') after completing the startup. The function and voltage supply of the encoder are then monitored.

Important: Encoder monitoring is not a safety function!

Startup functions of the DBG11B

Detailed description of the keypad → Sec. 'Operating displays':



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← and → at the same time	Commence startup.
↑ key	Next menu command or increase value in edit mode.
↓ key	Previous menu command or decrease value in edit mode.
→ key	One menu level down or activate edit mode for the menu command.
← key	One menu level up or deactivate edit mode for the menu command.
Q key	Cancel startup and return to main display.
E key	Cancel startup and return to main display.

Language selection on DBG11B keypad

- The main display of the keypad is in German.

```
REGLERSPERRE
STROM:          0  A
```

- Press the ↓ key twice to display parameter group 8...

```
8..     GERAETE-
        FUNKTIONEN
```

- Press the → key twice and the ↑ key once to display parameter 801 'Language'. Press the → key to activate edit mode. Press the ↓ or ↑ key to select the language you want and then press the ← key to exit edit mode.

```
801     GERMAN
        LANGUAGE
```

- Press the Q key to return to the main display.

10

Structure of the startup menu

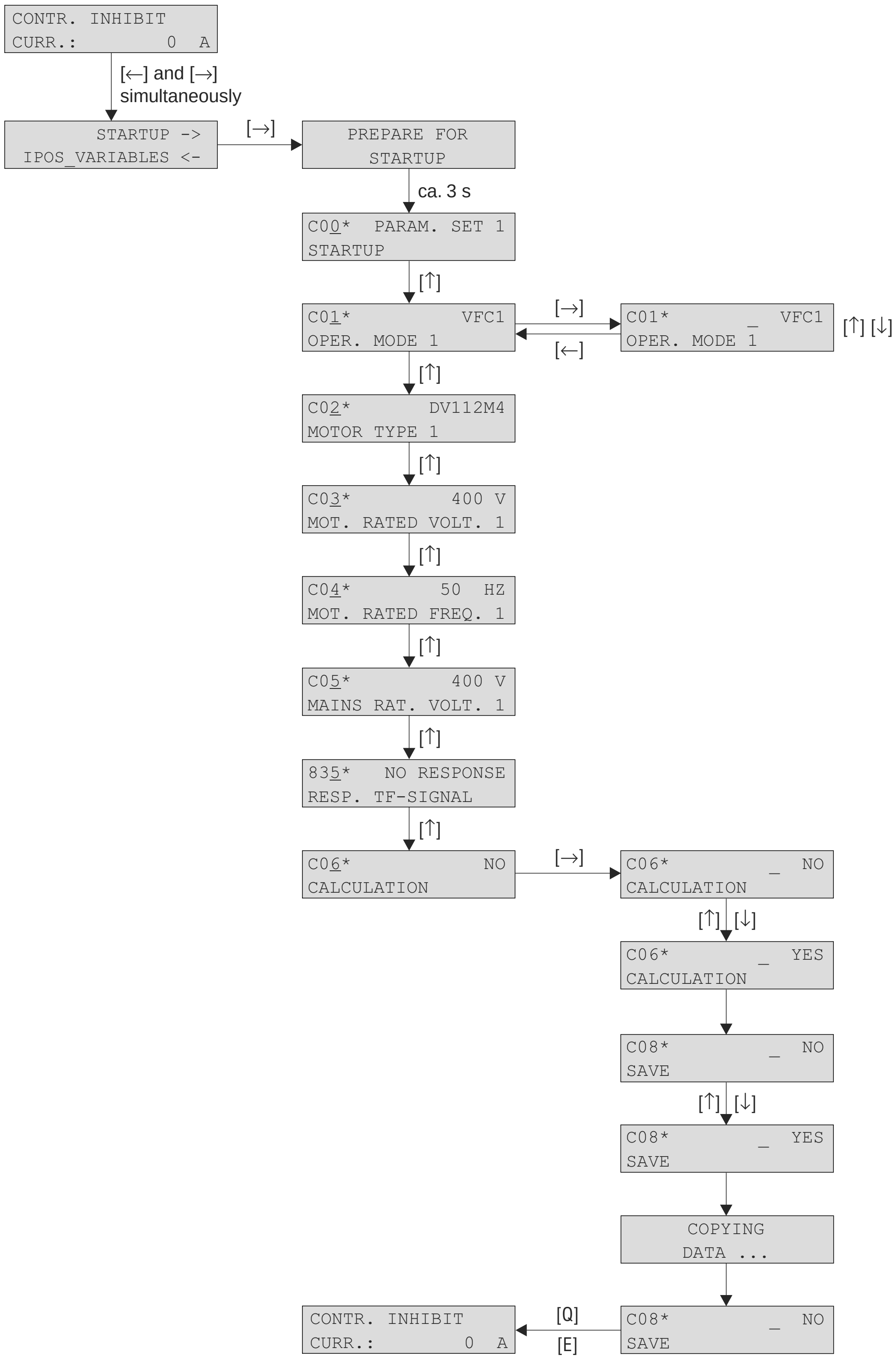

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Figure 182: Structure of the startup menu

Startup procedure

1. '0' signal at terminal DIØØ '/CONTROLLER INHIBIT'.

```
CONTROL.INHIBIT
CURRENT:       0 A
```

2. Activate the startup menu by pressing the ← and → keys on the DBG11B at the same time.

```
STARTUP →
IPOS_VARIABLES ←
```

3. Press the → key to commence the startup. The first window of the startup menu appears. The menu commands are identified by an * in the 4th position. Menu commands which only appear in the startup menu start with 'C', the other menu commands have the number in the parameter list (page 306). Press the ↑ key to jump to the next menu command when you have worked through a menu command.

```
STARTUP IS
BEING PREPARED
```

4. Select a parameter set, e.g. parameter set 1.

```
C00*  PARAM. SET 1
STARTUP
```

5. Set the operating mode, e.g. VFC1.

```
C01*           VFC1
OPER. MODE 1
```

6. Select the connected motor. If a 2 or 4-pole SEW motor is connected, select the correct motor from the list. In the case of a non-SEW motor or an SEW motor with more than four poles, choose 'NON-SEW MOTOR' in the selection list.

```
C02*        DV112M4
MOT. TYPE 1
```

```
C02*     NON-SEW
MOT.
MOT. TYPE 1
```

7. Refer to the nameplate of the motor and enter the rated motor voltage for the selected connection type.

   Example: Nameplate 230Δ/400 ⅄ 50 Hz
   ⅄ connection → Enter 400 V.
   Δ connection, transition point at 50 Hz → Enter 230 V.
   Δ connection, transition point at 87 Hz → Also enter 230 V, however after startup first set parameter P302 'MAXIMUM SPEED 1' to the value for 87 Hz and then start the drive.

   Example: Nameplate 400Δ/690 ⅄ 50 Hz
   Only Δ connection possible → Enter 400 V.
   ⅄ connection is not possible.

```
C03*        400   V
RATED MOT. VOLT. 1
```

8. Enter the rated frequency specified on the motor nameplate.
   Example: 230Δ/400 ⅄ 50 Hz
   Enter 50 Hz in a ⅄ and Δ connection.

```
C04*        50    Hz
RATED MOT. FREQ. 1
```

WITH SEW MOTORS

9. The motor values are stored for SEW 2 and 4-pole motors and do not have to be entered.

WITH NON-SEW MOTORS

9. Enter the following data from the motor nameplate:
   - Rated motor current, note the connection type (⅄ or Δ).
   - Rated power of the motor
   - Power factor cos φ
   - Rated speed of the motor

10. Enter the rated voltage of the supply system

```
C05*        400   V
RATED SYS. VOLT. 1
```

11. If no TF/TH is connected → Set 'NO RESP.'. Set the required fault response if a TF/TH is connected.

```
835*  NO RESP.
RESP. TF sensor SIG-
NAL
```

12. Commence the startup calculation by selecting 'YES'.

```
C06*        NO
CALCULATION
```

WITH SEW MOTORS

13. The calculation is performed.

WITH NON-SEW MOTORS

13. The calculation for non-SEW motors requires a calibration procedure:
    - When prompted, give a '1' signal on terminal DIØØ '/CONTROL.INHIBIT'.
    - Give a '0' signal on terminal DIØØ '/CONTROL.INHIBIT' again after the calibration is complete.
    - The motor parameters are estimated if it is not possible to calibrate (energize) the motor.

14. The 'SAVE' menu command appears automatically. The keypad is already in edit mode.

```
C08*        _NO
SAVE
```

15. Set 'SAVE' to 'YES'. The data (motor parameters) are copied into the non-volatile memory of MOVIDRIVE®.

```
  DATA ARE BEING
    COPIED...
```

16. This completes the startup. Press the E or Q key to exit the startup menu. The main display then appears.

```
CONTROL.INHIBIT
CURRENT:    0  A
```

STOP

- Copy the parameter set from MOVIDRIVE® into the DBG11B keypad after completing the startup (P807 'MDX → DBG'). In this way, it is possible to use the DBG11B to transfer the parameter set to other MOVIDRIVE® units (P 806 'DBG → MDX').
- Enter any parameter settings which differ from the factory settings in the parameter list (→ page 306).
- In the case of non-SEW motors, set the correct brake reaction time (P732 / P735).
- Refer to the information in Sec. 'Starting the motor' (→ page 302) for starting the motor.
- With Δ connection and transition point at 87 Hz → Set parameter P302/312 'Maximum speed 1/2' to the value for 87 Hz.

Startup of speed controller

Startup is performed without the speed controller first.

Important: Set VFC-n-CONTROL operating mode.

```
C01*  VFC-n-CTRL.
OPER. MODE 1
```

Structure

Structure of the startup menu for the speed controller:

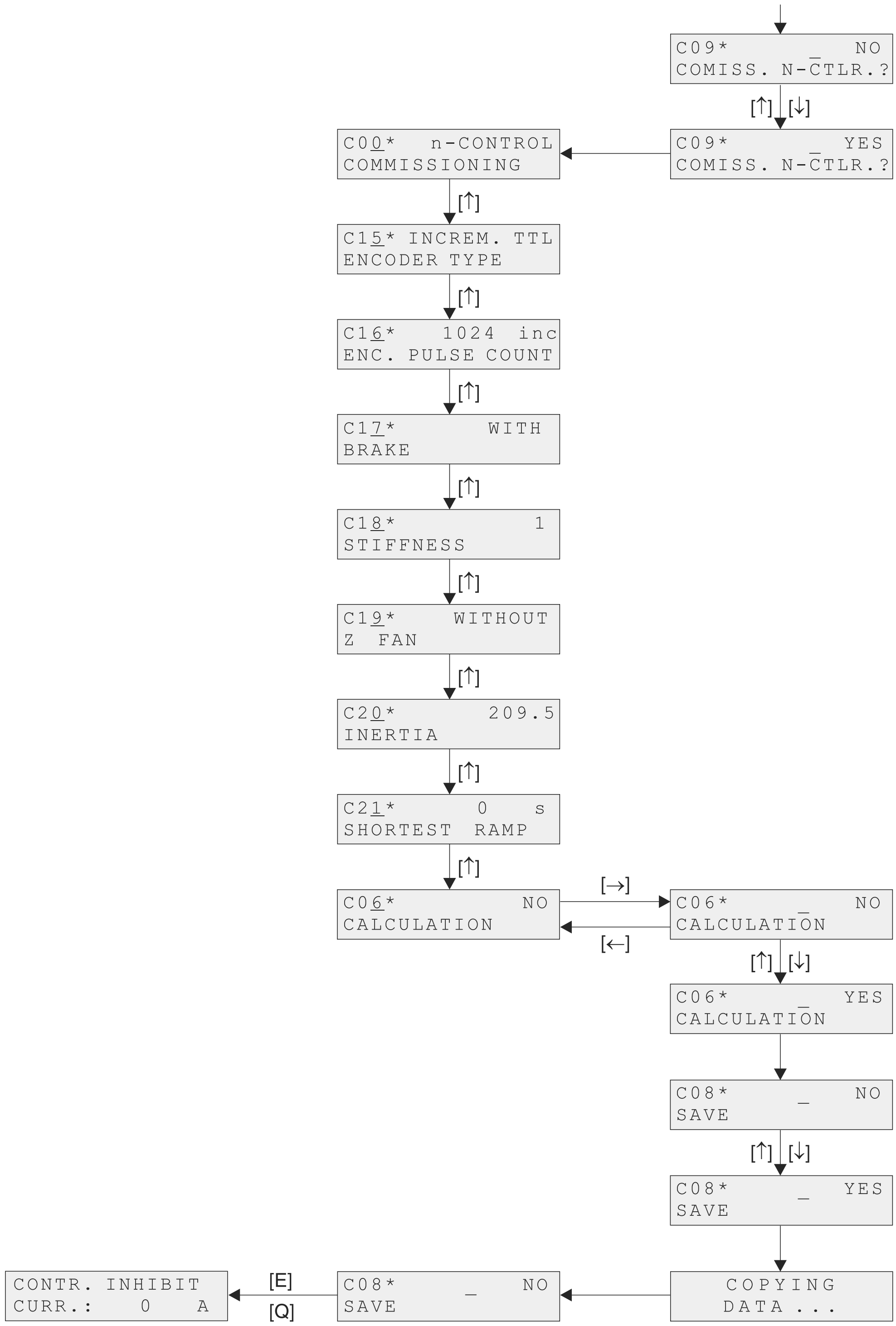

Figure 183: Structure of startup with the speed controller

Startup procedure

1. Press 'YES' to commence the speed controller startup. All mass moments of inertia must be entered in the unit [10^{-4} kgm^2].
2. Press the ↑ key to move on to the next menu item each time.
3. Enter the correct encoder type.
4. Enter the correct encoder resolution.

WITH SEW MOTORS

5. Enter whether the motor has a brake.
6. Set the stiffness of the closed-loop control system.
7. Enter whether the motor has a flywheel fan (Z fan).

WITH NON-SEW MOTORS

5. Enter the moment of inertia of the motor.
6. Set the stiffness of the closed-loop control system.
7. Set the moment of inertia of the brake and the fan.

8. Enter the mass moment of inertia of the load (gear unit + driven machine) extrapolated for the motor shaft.
9. Enter the time for the shortest ramp you want.
10. Commence the speed controller startup calculation by selecting 'YES'.
11. The 'SAVE' menu command appears automatically. Set 'SAVE' to 'YES'. The data are copied into the non-volatile memory of MOVIDRIVE®.
12. The 'SAVE' menu command appears again. Press the E or Q key to exit the startup menu. The main display then appears.

STOP

- Copy the parameter set from MOVIDRIVE® into the DBG11B keypad after completing the startup (P807 'MDX → DBG'). In this way, it is possible to use the DBG11B to transfer the parameter set to other MOVIDRIVE® units (P 806 'DBG → MDX').
- Enter any parameter settings which differ from the factory settings in the parameter list (→ page 306).
- In the case of non-SEW motors, set the correct brake reaction time (P732 / P735).
- Refer to the information in Sec. 'Starting the motor' (→ page 302) for starting the motor.
- With Δ connection and transition point at 87 Hz → Set parameter P302/312 'Maximum speed 1/2' to the value for 87 Hz.
- Activate encoder monitoring for TTL sensors, sin/cos and Hiperface encoders (P504='ON'). **Encoder monitoring is not a safety function.**

10.4 Startup with a PC and MOVITOOLS

General information

- Terminal DIØØ '/CONTROL.INHIBIT' must get a '0' signal!
- Start the MOVITOOLS program.
- Set the language.
- Select the PC port (PC COM) to which the inverter is connected.
- Select <Update> to display the connected inverter.

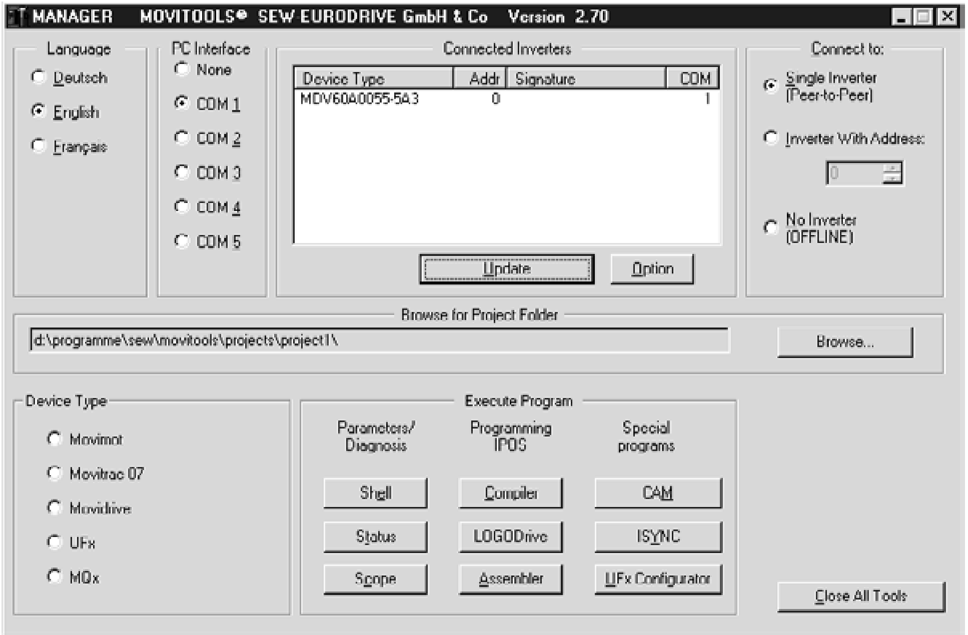

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Figure 184: MOVITOOLS startup window

Commencing startup

- Click on <Shell> in 'Execute Program'. The Shell program is started.
- Select the [Startup] / [Startup...] menu command. MOVITOOLS opens the startup menu.
- Select asynchronous or synchronous as the motor type.
- Select the parameter set. With speed-controlled drives, the speed controller can be selected separately when startup is repeated (only possible with parameter set 1).
- Set the operating mode.
- Select SEW motor or non-SEW motor. 2 and 4-pole SEW motors can be selected in VFC operating modes. Only 4-pole SEW motors can be selected in CFC and SERVO operating modes. SEW motors with different numbers of poles must be set as non-SEW motors.
- Enter the motor type data and, if speed control is being used, the speed controller data as well.
- Press <Finish> to complete the startup.
- Make any necessary parameter settings using the main menu or the user menu.
- Save the parameter set. The parameter set can be transferred to other MOVIDRIVE® units.
- Print out the set parameters using [File] / [Print Data].
- Refer to the information in Sec. 'Starting the motor' (→ page 302) for starting the motor.

10.5 Starting the motor

Analog setpoint specification

The following table shows which signals must be present on terminals AI1 and DIØØ...DIØ3 when the 'UNIPOL/FIX.SETPT' setpoint is selected (P100), in order to operate the drive with an analog setpoint entry.

Function	AI11 Analog input n1	DIØØ /Controller inhibit	DIØ1 CW/STOP	DIØ2 CCW/STOP	DIØ3 Enable/rapid stop
Controller inhibit	X	'0'	X	X	X
Rapid stop	X	'1'	X	X	'0'
Enable and stop	X	'1'	'0'	'0'	'1'
Clockwise at 50 % n_{max}	5 V	'1'	'1'	'0'	'1'
Clockwise at n_{max}	10 V	'1'	'1'	'0'	'1'
Counterclockwise at 50 % n_{max}	5 V	'1'	'0'	'1'	'1'
Counterclockwise at n_{max}	10 V	'1'	'0'	'1'	'1'

The following travel cycle shows by way of example how the motor is started with the wiring of terminals DIØØ...DIØ3 and analog setpoints. Binary output DBØØ '/Brake' is used for switching brake contactor K12.

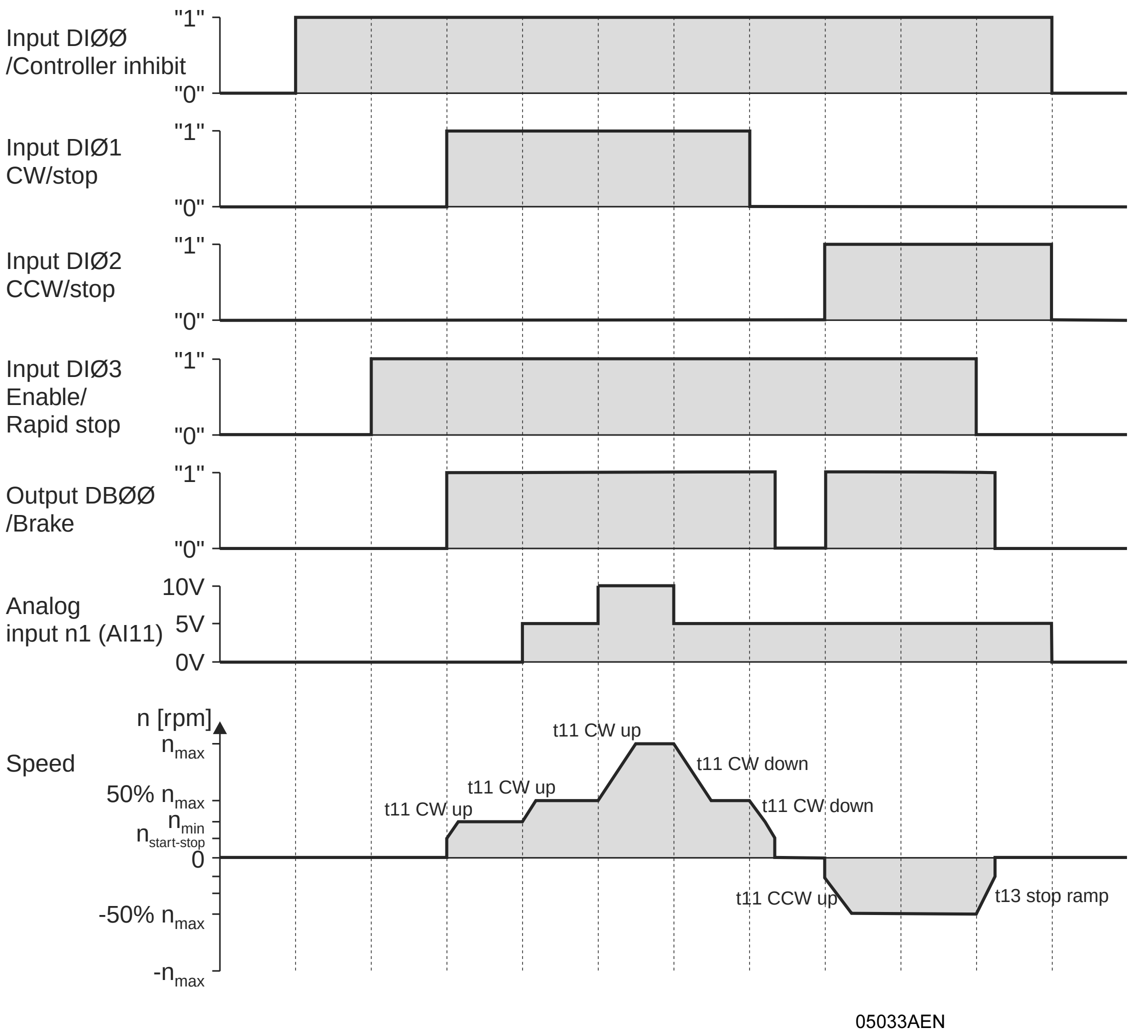

Figure 185: Travel cycle with analog setpoints

STOP

The motor is not energized in the event of controller inhibit (DIØØ = '0'). A motor without a brake then coasts to a halt.

Fixed setpoints

The following table shows which signals must be present on terminals DIØØ...DIØ5 when the 'UNIPOL/FIX.SETPT' setpoint is selected (P100) to operate the drive with the fixed setpoints.

Function	DIØØ /Controller inhibit	DIØ1 CW/STOP	DIØ2 CCW/STOP	DIØ3 Enable/rapid stop	DIØ4 n11/n21	DIØ5 n12/n22
Controller inhibit	'0'	X	X	X	X	X
Rapid stop	'1'	X	X	'0'	X	X
Enable and stop	'1'	'0'	'0'	'1'	X	X
Clockwise at n11	'1'	'1'	'0'	'1'	'1'	'0'
Clockwise at n12	'1'	'1'	'0'	'1'	'0'	'1'
Clockwise at n13	'1'	'1'	'0'	'1'	'1'	'1'
Counterclockwise at n11	'1'	'0'	'1'	'1'	'1'	'0'

The following travel cycle shows by way of example how the drive is started with the wiring of terminals DIØØ...DIØ5 and the internal fixed setpoints. Binary output X10:3 (DBØØ '/Brake') is used for switching brake contactor K12.

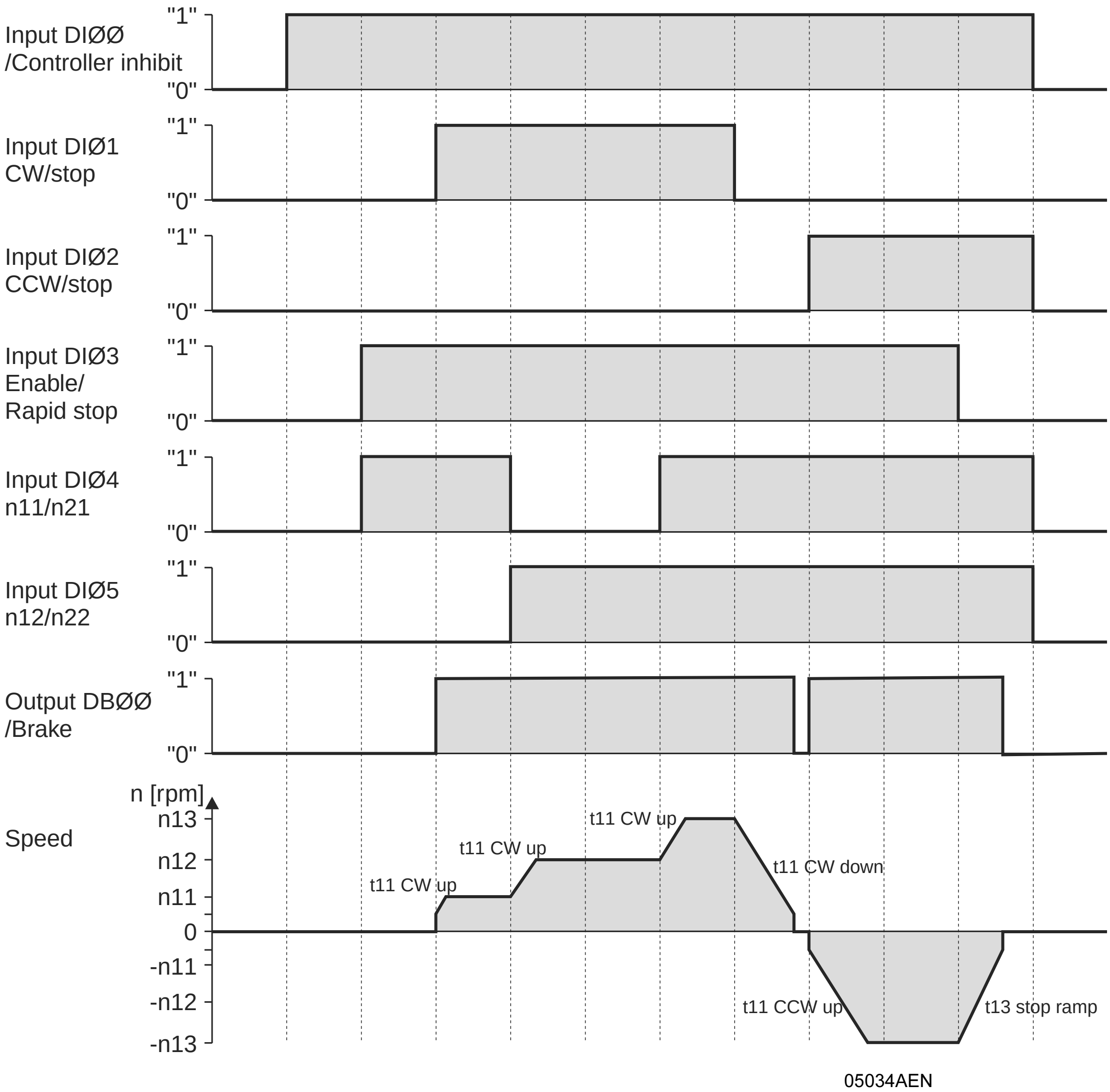

Figure 186: Travel cycle with internal fixed setpoints

STOP

The motor is not energized in the event of controller inhibit (DIØØ = '0'). A motor without a brake then coasts to a halt.

Manual operation

The inverter can be controlled using the DBG11B keypad with the manual operation function. The inverter must be in 'No enable' status to start manual operation. 'No enable' status means DIØØ /Controller inhibit = '1' and binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop = '0' which are programmed in the factory settings.

Binary input DIØØ /Controller inhibit is also effective in manual operation. The other binary inputs are ineffective during manual operation. Binary input DIØØ '/Controller inhibit' must get a '1' signal to start the drive in manual operation. The drive can also be stopped in manual operation by DIØØ = '0'. The direction of rotation is not determined by the 'CW/stop' or 'CCW/stop' binary inputs. Instead, you select the direction of rotation using the keypad (→ Figure 187).

Manual operation remains active even after the supply system power has been switched off/on. The inverter is then inhibited, however. A change of direction command using the → or ← key produces an enable and a start in the selected sense of rotation at n_{min}. The speed is increased and decreased using the ↑ and ↓ keys. The modification speed is 150 rpm per second.

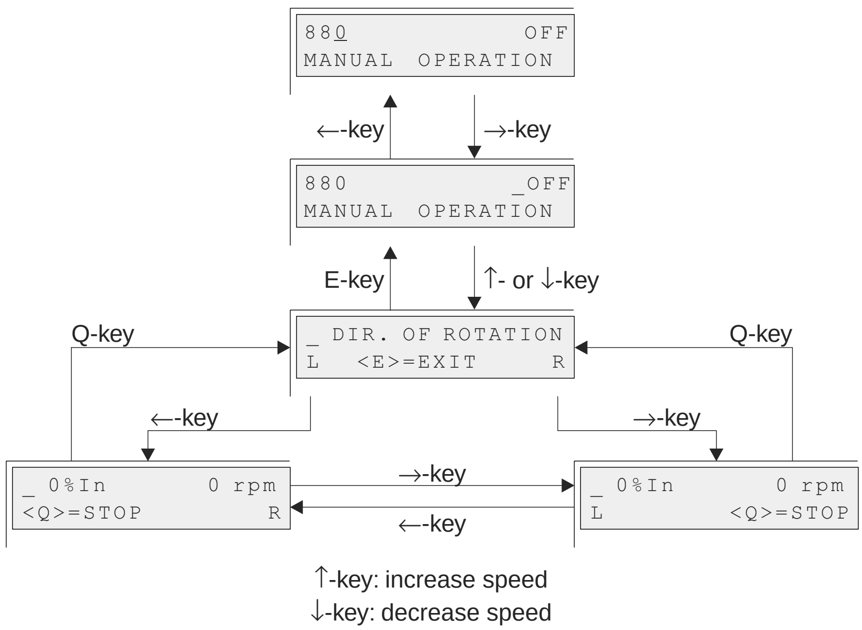

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Figure 187: Manual mode with DBG11B

The signals at the binary inputs take effect as soon as manual operation is finished. Binary input DIØØ '/Controller inhibit' does not have to be switched from '1' to '0' and back to '1'. The drive can start according to the signals at the binary inputs and the setpoint sources.

Note that the binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop which are programmed in the factory settings receive a '0' signal when you end manual operation.

10.6 Startup for positioning tasks (MCH4_A)

A Hiperface encoder connected to the MOVIDRIVE® *compact* MCH4_A provides absolute position values and is a suitable device for positioning tasks. This statement holds true for connection as motor encoder to X15 and as external encoder to X14.

A single reference travel is required to set up the absolute position.

Positioning with the Hiperface encoder as motor encoder

The motor encoder can be used for positioning tasks for slip-free applications, i.e. a positive connection between drive and driven machine. Proceed as follows:

- Set parameter P941 "Source Actual Position = Motor Encoder (X15)."
- Set parameter P900 "Reference Offset." The following formula applies: machine zero = reference point + reference offset.
- Set the reference travel parameters P901, P902, P903 and P904 according to your application.
- Execute a reference travel. The reference travel can take place in two ways:
  –Go to the manual operation menu in the MOVITOOLS operating software and start the function "Reference travel."
  –Writ an IPOS program for the reference travel and start this program.

Positioning with the Hiperface encocer as external encoder

Use an external encoder for positioning in case of slip-prone applications, i.e. non-positive connection between drive and driven machine. Proceed as follows:

- Connect the Hiperface encoder to X14.
- Set the parameter P900 "Reference offset." The following formula applies: machine zero = reference point + reference offset.
- Set the parameter P941 "Source Actual Position = Ext. Encoder (X14)."
- Set the reference travel parameters P901, P902, P903 and P904 according to your application.
- Set parameter P945 "Synchronous encoder type (X14) = Hiperface."
- Execute a reference travel.

10.7 Complete parameter list

The parameters of the short menu are identified by a '/' (= displayed on the DBG11B keypad).

Par.	Name	Value range
DISPLAY VALUES		
00_	**Process values**	
000	Speed	-5000...0...5000 rpm
001/	User display	[Text]
002	Frequency	0...400 Hz
003	Actual position	0...2^{31}-1 inc
004	Output current	0...200 % I_N
005	Active current	-200...0...200 % I_N
006/	Motor utilization 1	0...200 %
007	Motor utilization 2	0...200 %
008	DC link voltage	0...1000 V
009	Output current	A
01_	**Status displays**	
010	Inverter status	
011	Operational status	
012	Fault status	
013	Active parameter set	1/2
014	Heat sink temperature	-20...0...100 °C
015	Mains ON operation time	0...25000 h
016	Operating time (enabled)	0...25000 h
017	Electrical energy	kWh
02_	**Analog setpoints**	
020	Analog input AI1	-10...0...10 V
021	Analog input AI2	-10...0...10 V
022	External current limit	0...100 %
03_	**Binary inputs basic unit**	
030	Binary input DIØØ	/CONTROL.INHIBIT
031	Binary input DIØ1	
032	Binary input DIØ2	
033	Binary input DIØ3	
034	Binary input DIØ4	
035	Binary input DIØ5	
036/	Status binary inputs basic unit	
05_	**Binary outputs basic unit**	
050	Binary output DBØØ	/BRAKE
051	Binary output DOØ1	
052	Binary output DOØ2	
053/	Status binary outputs basic unit	

Par.	Name	Value range
07_	**Unit data**	
070	Unit type	
071	Rated output current	
076	Firmware basic unit	
077	Technology function	
08_	**Fault memory**	
080/	Fault t-0	
081	Fault t-1	
082	Fault t-2	
083	Fault t-3	
09_	**Bus diagnostics**	
090	PD configuration	
091	Fieldbus type	
092	Fieldbus baud rate	
093	Fieldbus address	
094	PO1 setpoint	
095	PO2 setpoint	
096	PO3 setpoint	
097	PI1 actual value	
098	PI2 actual value	
099	PI3 actual value	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
1__	**SETPOINTS / RAMP GENERATORS**						
10_	**Setpoint selection**						
100/	Setpoint source	**UNIPOL/FIX.SETPT**					
101	Control signal source	**TERMINALS**					
11_	**Analog input AI1**						
110	AI1 scaling	-10...-0.1 / 0.1...**1**...10					
111	AI1 offset	-500...**0**...500 mV					
112	AI1 operation mode	**Ref. N-MAX**					
113	AI1 voltage offset	-10...**0**...10 V					
114	AI1 speed offset	-5000...**0**...5000 rpm					
115	Filter setpoint	0...**5**...100 ms 0 = Filter off					
12_	**Analog input AI2**						
120	AI2 operation mode	**NO FUNCTION**					
13_	**Speed ramps 1**			**14_**	**Speed ramps 2**		
130/	Ramp t11 UP CW	0...**2**...2000 s		140	Ramp t21 UP CW	0...**2**...2000 s	
131/	Ramp t11 DOWN CW	0...**2**...2000 s		141	Ramp t21 DOWN CW	0...**2**...2000 s	
132/	Ramp t11 UP CCW	0...**2**...2000 s		142	Ramp t21 UP CCW	0...**2**...2000 s	
133/	Ramp t11 DOWN CCW	0...**2**...2000 s		143	Ramp t21 DOWN CCW	0...**2**...2000 s	
134/	Ramp t12 UP=DOWN	0...**2**...2000 s		144	Ramp t22 UP=DOWN	0...**2**...2000 s	
135	S pattern t12	**0**...3		145	S pattern t22	**0**...3	
136/	Stop ramp t13	0...**2**...20 s		146	Stop ramp t23	0...**2**...20 s	
137/	Emergency ramp t14	0...**2**...20 s		147	Emergency ramp t24	0...**2**...20 s	
15_	**Motorized potentiometer (parameter set 1 and 2)**						
150	Ramp t3 UP	0.2...**20**...50 s					
151	Ramp t3 DOWN	0.2...**20**...50 s					
152	Save last setpoint	ON / **OFF**					
16_	**Fixed setpoints 1**			**17_**	**Fixed setpoints 2**		
160/	Internal setpoint n11	-5000...0...**150**...5000 rpm		170	Internal setpoint n21	-5000...0...**150**...5000 rpm	
161/	Internal setpoint n12	-5000...0...**750**...5000 rpm		171	Internal setpoint n22	-5000...0...**750**...5000 rpm	
162/	Internal setpoint n13	-5000...0...**1500**...5000 rpm		172	Internal setpoint n23	-5000...0...**1500**...5000 rpm	
2__	**CONTROLLER PARAMETERS**						
20_	**Speed control (parameter set 1 only)**						
200	P-gain speed controller	0.1...**2**...32					
201	Time constant n-control.	0...**10**...300 ms					
202	Gain accel. feedforward	**0**...32					
203	Filter accel. feedforward	**0**...100 ms					
204	Filter speed actual value	**0**...32 ms					
205	Load feedforward	**0**...150 %					
206	Sample time n-control.	**1 ms = 0** / 0.5 ms = 1					
207	Load feedforward VFC	**0**...150 %					
21_	**Hold controller**						
210	P gain hold controller	0.1...**2**...32					
22_	**Synchr. oper. control (only parameter set 1)**						
228	Feedforward filter (DRS)	**0**...100 ms		Only with MOVITOOLS. Not visible on the DBG11B keypad.			

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
3__	**MOTOR PARAMETERS**						
30_	**Limits 1**			**31_**	**Limits 2**		
300/	Start/stop speed 1	0...**60**...150 rpm		310	Start/stop speed 2	0...**60**...150 rpm	
301/	Minimum speed 1	0...**60**...5500 rpm		311	Minimum speed 2	0...**60**...5500 rpm	
302/	Maximum speed 1	0...**1500**...5500 rpm		312	Maximum speed 2	0...**1500**...5500 rpm	
303/	Current limit 1	0...**150** %I_N		313	Current limit 2	0...**150** %I_N	
304	Torque limit	**0**...150 %					
32_	**Motor compensat. 1 (asynchr.)**			**33_**	**Motor compensat. 2 (asynchr.)**		
320/	Automatic adjustment 1	**ON** / OFF		330	Automatic adjustment 2	**ON** / OFF	
321	Boost 1	**0**...100 %		331	Boost 2	**0**...100 %	
322	IxR compensation 1	**0**...100 %		332	IxR compensation 2	**0**...100 %	
323	Premagnetizing time 1	0...**0.1**...2 s		333	Premagnetizing time 2	0...**0.1**...2 s	
324	Slip compensation 1	**0**...500 rpm		334	Slip compensation 2	**0**...500 rpm	
34_	**Motor protection**						
340	Motor protection 1	ON / **OFF**		342	Motor protection 2	ON / **OFF**	
341	Cooling type 1	**FAN COOLED** / FORCED COOLING		343	Cooling type 2	**FAN COOLED** / FORCED COOLING	
35_	**Motor sense of rotation**						
350	Change direction of rotation 1	ON / **OFF**		351	Change direction of rotation 2	ON / **OFF**	
360	Startup	YES / **NO**		Only available in DBG11B, not in MOVITOOLS/SHELL!			
4__	**REFERENCE SIGNALS**						
40_	**Speed reference signal**						
400	Speed reference value	0...**1500**...5000 rpm					
401	Hysteresis	0...**100**...500 rpm					
402	Delay time	0...**1**...9 s					
403	Signal = '1' if:	**$n < n_{ref}$** / $n > n_{ref}$					
41_	**Speed window signal**						
410	Window center	0...**1500**...5000 rpm					
411	Range width	**0**...5000 rpm					
412	Delay time	0...**1**...9 s					
413	Signal = '1' if:	**INSIDE** / OUTSIDE					
42_	**Speed setp./act. val. comp.**						
420	Hysteresis	1...**100**...300 rpm					
421	Delay time	0...**1**...9 s					
422	Signal = '1' if:	**$n <> n_{setpt}$** / $n = n_{setpt}$					
43_	**Current reference signal**						
430	Current reference value	0...**100**...150 % I_N					
431	Hysteresis	0...**5**...30 % I_N					
432	Delay time	0...**1**...9 s					
433	Signal = '1' if:	**$I < I_{ref}$** / $I > I_{ref}$					
44_	**Imax signal**						
440	Hysteresis	0...**5**...50 % I_N					
441	Delay time	0...**1**...9 s					
442	Signal = '1' if:	$I = I_{max}$ / **$I < I_{max}$**					

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
5__	**MONITORING FUNCTIONS**						
50_	**Speed monitoring**						
500	Speed monitoring 1	**OFF** / MOTOR MODE / REGENERAT. MODE / MOT.& REGEN.MODE		502	Speed monitoring 2	**OFF** / MOTOR MODE / REGENERAT. MODE / MOT.& REGEN.MODE	
501	Delay time 1	0...**1**...10 s		503	Delay time 2	0...**1**...10 s	
504	Encoder monitoring	ON / **OFF**					
52_	**Mains OFF monitoring**						
520	Mains OFF response time	**0**...5 s					
521	Mains OFF response	**CONTROL.INHIBIT** EMERGENCY STOP					
6__	**TERMINAL ASSIGNMENT**						
60_	**Binary inputs basic unit**						
-	Binary input DIØØ	With fixed assignment: **/CONTROL.INHIBIT**					
600	Binary input DIØ1	**CW/STOP**		The following functions can be programmed: NO FUNCTION • ENABLE/RAP.STOP • CW/STOP • CCW/STOP • n11(n13) • n21(n23) • n12(n13) • n22(n23) • FIX SETPT SW.OV. • PAR. SWITCHOVER • RAMP SWITCHOVER • MOTOR POT UP • MOTOR POT DOWN • /EXT. FAULT • FAULT RESET • /HOLD CONTROL • LIM. SWITCH CW • /LIM. SWITCH CCW • IPOS INPUT • REFERENCE CAM • REF.TRAVEL START • SLAVE FREE RUNN. • SETPOINT HOLD • MAINS ON • DRS SET ZERO PT. • DRS SLAVE START • DRS TEACH IN • DRS MAST.STOPPED			
601	Binary input DIØ2	**CCW/STOP**					
602	Binary input DIØ3	**ENABLE/RAP.STOP**					
603	Binary input DIØ4	**n11/n21**					
604	Binary input DIØ5	**n12/n22**					
62_	**Binary outputs basic unit**			The following signals can be programmed: NO FUNCTION • /FAULT • READY • OUTP. STAGE ON • ROT. FIELD ON • BRAKE RELEASED • BRAKE APPLIED • MOTOR STANDSTILL • PARAMETER SET • SPEED REFERENCE • SPEED WINDOW • SP/ACT.VAL.COMP. • CURR. REFERENCE • Imax-SIGNAL • /MOTOR UTILIZ.1 • /MOTOR UTILIZ.2 • DRS PREWARN. • /DRS LAG ERROR • DRS SLAVE IN POS • IPOS IN POSITION • IPOS REFERENCE • IPOS OUTPUT • /IPOS FAULT			
-	Binary output DBØØ	With fixed assignment: **/BRAKE**					
620	Binary output DOØ1	**READY**					
621	Binary output DOØ2	**NO FUNCTION**					
64_	**Analog output**						
640	Analog output AO1	**ACTUAL SPEED**		The following functions can be programmed: NO FUNCTION • RAMP INPUT • SPEED SETPOINT • ACTUAL SPEED • ACTUAL FREQUENCY • OUTPUT CURRENT • ACTIVE CURRENT • UNIT UTILIZATION • IPOS OUTPUT • RELATED TORQUE			
641	Scaling AO1	-10...0...**1**...10					
642	Operating mode AO1	OFF / **-10...+10V** / 0...20mA / 4...20mA					
7__	**CONTROL FUNCTIONS**						
70_	**Operating modes**						
700	Operating mode 1	**VFC 1** VFC 1 & GROUP VFC 1 & HOIST VFC 1 & DC BRAK. VFC 1 &FLY.START VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL.&HOIST VFC-n-CTRL& IPOS CFC CFC & M-CONTROL CFC & IPOS SERVO SERVO & M-CTRL. SERVO&IPOS		701	Operating mode 2	**VFC 2** VFC 2 & GROUP VFC 2 & HOIST VFC 2 & DC BRAK. VFC 2 &FLY.START	
71_	**Current at standstill**						
710	Standstill current 1	**0**...50 % I_{mot}		711	Standstill current 2	**0**...50 % I_{mot}	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
72_	**Setpoint stop function**						
720	Setpoint stop function 1	ON / **OFF**		723	Setpoint stop function 2	ON / **OFF**	
721	Stop setpoint 1	0...**30**...500 rpm		724	Stop setpoint 2	0...**30**...500 rpm	
722	Start offset 1	0...**30**...500 rpm		725	Start offset 2	0...**30**...500 rpm	
73_	**Brake function**						
730	Brake function 1	**ON** / OFF		733	Brake function 2	**ON** / OFF	
731	Brake release time 1	**0**...2 s		734	Brake release time 2	**0**...2 s	
732	Brake application time 1	0...**0.2**...2 s		735	Brake application time 2	0...**0.2**...2 s	
74_	**Speed skip**						
740	Skip window center 1	0...**1500**...5000 rpm		742	Skip window center 2	0...**1500**...5000 rpm	
741	Skip width 1	**0**...300 rpm		743	Skip width 2	**0**...300 rpm	
75_	**Master-Slave function**						
750	Slave setpoint	**MASTER-SLAVE OFF** SPEED (RS-485) SPEED (SBus) SPEED 485+SBus) TORQUE (RS-485) TORQUE (SBus) TORQUE(485+SBus) LOAD SHAR (RS-485) / LOAD SHARE (SBus) LOAD S(485+SBus)					
751	Scaling slave setpoint	-10...0...**1**...10					
8__	**UNIT FUNCTIONS**						
80_	**Setup**						
802/	Factory setting	YES / **NO**					
803/	Parameter lock	ON / **OFF**					
804	Reset statistic data	**NO** FAULT MEMORY KWH METER OPERATING HOURS					
800/	Quick menu	**ON** / OFF		These parameters are only available in the DBG11B keypad, not in MOVITOOLS!			
801/	Language	**DE** / EN / FR					
806	Copy DBG→MDX	YES / **NO**					
807	Copy MDX→DBG	YES / **NO**					
81_	**Serial communication**						
810	RS485 address	**0**...99					
811	RS-485 group address	**100**...199					
812	RS485 timeout delay	**0**...650 s					
813	SBus address	**0**...63					
814	SBus group address	**0**...63					
815	SBus timeout delay	0...**0.1**...650 s					
816	SBus baud rate	125/250/**500** / 1000 kbaud					
817	SBus synchronization ID	**0**...1023					
818	CAN synchronization ID	0...**1**...2047					
819	Fieldbus timeout delay	0...**0.5**...650 s					
82_	**Brake operation**						
820/	4-quadrant operation 1	**ON** / OFF		821	4-quadrant operation 2	**ON** / OFF	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
83_	**Fault response**						
830	Response EXT. FAULT	**EMERG.STOP/FAULT**		The following fault responses can be programmed: NO RESPONSE DISPLAY FAULT IMM. STOP/FAULT EMERG.STOP/ FAULT RAPID STOP/FAULT IMM.STOP/WARNG EMERG.STOP/ WARNG RAPID STOP/WARNG			
831	Response FIELDBUS TIMEOUT	**RAPID STOP/WARNG**					
832	Response MOTOR OVERLOAD	**EMERG.STOP/FAULT**					
833	Response RS485 TIMEOUT	**RAPID STOP/WARNG**					
834	Response DRS LAG ERROR	**EMERG.STOP/FAULT**					
835/	Response TF sensor SIGNAL	**NO RESPONSE**					
836	Response SBus TIMEOUT	**EMERG.STOP/FAULT**					
84_	**Reset response**						
840/	Manual reset	YES / **NO**					
841	Auto reset	ON / **OFF**					
842	Restart time	1...**3**...30 s					
85_	**Scaling speed actual value**						
850	Scaling factor numerator	**1**...65535					
851	Scaling factor denominator	**1**...65535					
852	User dimension	**1 rpm**		Can only be set using MOVITOOLS			
86_	**Modulation**						
860	PWM frequency 1	**4**/8/16 kHz		861	PWM frequency 2	**4**/8/16 kHz	
862	PWM fix 1	ON / **OFF**		863	PWM fix 2	ON / **OFF**	
864	PWM frequency CFC	4/**8**/16 kHz					
87_	**Process data description**						
870	Setpoint description PO1	**CTRL. WORD 1**					
871	Setpoint description PO2	**SPEED**					
872	Setpoint description PO3	**NO FUNCTION**					
873	Actual value description PI1	**STATUS WORD1**					
874	Actual value description PI2	**SPEED**					
875	Actual value description PI3	**OUTPUT CURRENT**					
876	PO data enable	**ON** / OFF					
877	DeviceNet PD configuration	0...**3**...5					
88_	**Manual operation**						
880	Manual operation	ON / **OFF**					

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
9__	**IPOS PARAMETERS**						
90_	**IPOS Reference travel**						
900	Reference offset	-2^{31}...**0**...2^{31}-1 inc					
901	Reference speed 1	0...**200**...5000 rpm					
902	Reference speed 2	0...**50**...5000 rpm					
903	Reference travel type	**0**...7					
904	Reference travel to zero pulse	**Yes** / No					
91_	**IPOS Travel parameter**						
910	Gain X controller	0.1...**0.5**...32					
911	Positioning ramp 1	0...**1**...20 s					
912	Positioning ramp 2	0...**1**...20 s					
913	Travel speed CW	0...**1500**...5000 rpm					
914	Travel speed CCW	0...**1500**...5000 rpm					
915	Speed feedforward	-199.99...0...**100**...199.99 %					
916	Ramp type	**LINEAR** / SINE / SQUARED / BUSRAMP					
92_	**IPOS Monitoring**						
920	SW limit switch CW	-2^{31}...**0**...2^{31}-1 inc					
921	SW limit switch CCW	-2^{31}...**0**...2^{31}-1 inc					
922	Position window	0...**50**...32767 inc					
923	Lag error window	**0**...2^{31}-1 inc					
93_	**IPOS Special functions**						
930	Override	ON / **OFF**					
931	CTRL word Task 1	START / **STOP**		Only available in DBG11B, not in MOVITOOLS/SHELL!			
932	CTRL word Task 2	START / **STOP**		Only available in DBG11B, not in MOVITOOLS/SHELL! Display parameter, cannot be edited using DBG11B.			
94_	**IPOS Variables/Encoder**						
940	IPOS variables edit	ON / **OFF**		This parameter is only available in the DBG11B keypad, not in MOVITOOLS!			
941	Source actual position	**MOTOR ENC. (X15)** EXTERN.ENC (X14) ABSOL.ENC. (DIP)					
942	Enc. factor numerator	**1**...32767					
943	Encoder factor denominator	**1**...32767					
944	Encoder scaling ext. encoder	**x1**/x2/x4/x8/x16/x32/x64		Only with MOVITOOLS. Not visible on the DBG11B keypad.			
945	Encoder type (X14)	TTL / SIN/COS / HIPERFACE					
946	Zählrichtung X14	**NORMAL**/INVERTIERT					
95_	**DIP**						
950	Encoder type	**NO ENCODER**					
951	Counting direction	**NORMAL**/INVERTED					
952	Cycle frequency	**1**...200 %					
953	Position offset	$-(2^{31}$-1)...**0**...2^{31}-1					
954	Zero offset	$-(2^{31}$-1)...**0**...2^{31}-1					
955	Encoder scaling	**x1**/x2/x4/x8/x16/x32/x64					
96_	**IPOS Modulo Function**						
960	Modulo function	**OFF**/SHORT/CW/CCW					
961	Modulo numerator	**0**...2^{31}					
962	Modulo denominator	**0**...2^{31}					
963	Modulo encoder resolution	0...**4096**...20000					

10.8 Starting up the inverter with PROFIBUS-DP (MC_41A)

Configuring the PROFIBUS-DP interface

It is necessary for the DP master to send a certain DP configuration to the drive inverter to define the type and number of input and output data used for transfer. In doing this, you have the opportunity to

- control the drive using process data
- read and write all drive parameters using the parameter channel.

The following figure shows a schematic of the data exchange between the programmable controller (DP master) and the MOVIDRIVE® drive inverter (DP slave) with the process data and parameter channel.

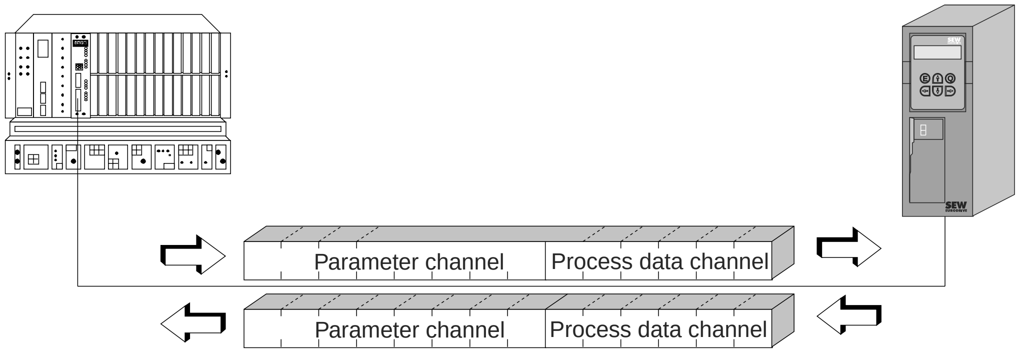


Figure 188: Communication via PROFIBUS-DP

Process data configuration

MOVIDRIVE® *compact* drive inverters make it possible to have different DP configurations for exchanging data between the DP master and the inverter. The following table provides additional information about all possible DP configurations for the MOVIDRIVE® *compact* range. The 'Process data configuration' column lists the names of the configurations. These texts also appear as a selection list in your project planning software for the DP master. The DP configurations column shows which configuration data are sent to the inverter when the PROFIBUS-DP connection is established.

Process data configuration	Meaning / information	DP configurations 0	DP configurations 1
1 PD	Control by 1 process data word	240_{dec}	-
2 PD	Control by 2 process data words	241_{dec}	-
3 PD	Control by 3 process data words	242_{dec}	-
6 PD	Control by 6 process data words	0_{dec}	245_{dec}
10 PD	Control by 10 process data words	0_{dec}	249_{dec}
Param + 1 PD	Control by 1 process data word Parameter setting using 8-byte parameter channel	243_{dec}	240_{dec}
Param + 2 PD	Control by 2 process data words Parameter setting using 8-byte parameter channel	243_{dec}	241_{dec}
Param + 3 PD	Control by 3 process data words Parameter setting using 8-byte parameter channel	243_{dec}	242_{dec}
Param + 6 PD	Control by 6 process data words Parameter setting using 8-byte parameter channel	243_{dec}	245_{dec}
Param + 10 PD	Control by 10 process data words Parameter setting using 8-byte parameter channel	243_{dec}	249_{dec}

'Universal configuration' DP configuration

Selecting the 'Universal configuration' DP configuration gives you two DP identifiers defined as 'blank spaces' (often referred to as DP modules) with the entry 0_{dec}. You can now configure these two identifiers individually, although you must comply to the following operating conditions:

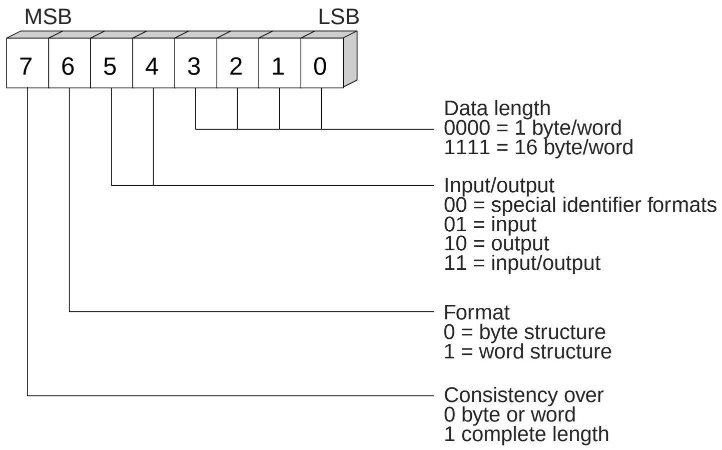
Module 0 (DP identifier 0) defines the parameter channel of the inverter:

Length	Function
0	Parameter channel switched off
8 bytes or 4 words	Parameter channel is being used

Module 1 (DP identifier 1) defines the process data channel of the inverter:

Length	Function
2 bytes or 1 word	1 process data word
4 bytes or 2 words	2 process data words
6 bytes or 3 words	3 process data words
12 bytes or 6 words	6 process data words
20 bytes or 10 words	10 process data words

The following figure shows the structure of the configuration data defined in EN 50170 (V2). These configuration data are transferred to the inverter when the DP master is starting up.



00087BEN

Figure 189: Format of the Cfg_Data identifier byte according to EN 50170 (V2)

Please note for MCF/MCV/MCS41A (does not apply to MCH41A):

'Special identifier formats' coding is not supported! Only use the 'Consistency throughout entire length' setting for data transmission!

Data consistency

Consistent data are data that have to be transmitted between the programmable controller and the drive inverter as one block at all times and are not to be transmitted separately from one another.

Data consistency is very important for transmitted position values or complete positioning tasks. The reason being that data not transmitted consistently could be from different program cycles of the programmable controller, which would lead to undefined values being transmitted to the drive inverter.

In the case of PROFIBUS-DP, data communication always takes place between the programmable controller and the inverter using the 'Data consistency throughout entire length' setting.

External diagnostics

For MOVIDRIVE® *compact*, it is possible to activate automatic generation of external diagnostic alarms via PROFIBUS-DP during the project planning in the DP master. If this function has been activated, MOVIDRIVE® *compact* sends an external diagnostic signal to the DP master every time a malfunction occurs. It is then necessary to program corresponding algorithms in the program of the DP master system to evaluate the diagnostic information. These algorithms can sometimes be quite complex.

Recommendation

It is basically not necessary to activate the external diagnostic function because MOVIDRIVE® *compact* transmits the current drive status in status word 1 during every PROFIBUS-DP cycle.

Note regarding Simatic S7 master systems

Diagnostic alarms may be triggered by the PROFIBUS-DP system in the DP master at any time even when external diagnostic signal generation is inactive. This means the corresponding operation blocks (e.g. OB84 for S7-400 or OB82 for S7-300) should always be created in the controller.

For more information, please refer to the Readme file included with the GSD file.

Identity number

Each DP master and DP slave must have its individual identity number which is assigned by the PROFIBUS user organization. This number uniquely identifies the connected unit. When the PROFIBUS-DP master starts up, it compares the identity numbers of the connected DP slaves with the identity numbers the user has entered in the project planning. User data transfer is not activated until the DP master has made sure that the connected station addresses and unit types (identity numbers) correspond to the project planning data. As a result, this process provides a high degree of protection against project planning mistakes.

The identity number is defined as an unsigned 16-bit number. The PROFIBUS user organization has defined the following identity numbers for the MOVIDRIVE® *compact* drive inverter unit series.

- MOVIDRIVE® compact MCF/MCV/MCS41A → 6002_{hex} (24578_{dec})
- MOVIDRIVE® compact MCH41A → 6003_{hex} (24579_{dec})

Control via PROFIBUS-DP

The drive inverter is controlled via the process data channel which is one, two or three I/O words in length. These process data words are reproduced in the I/O or peripheral area of the controller, for example when a programmable logic controller is used as the DP master. As a result, they can be addressed in the usual manner (see the following figure).

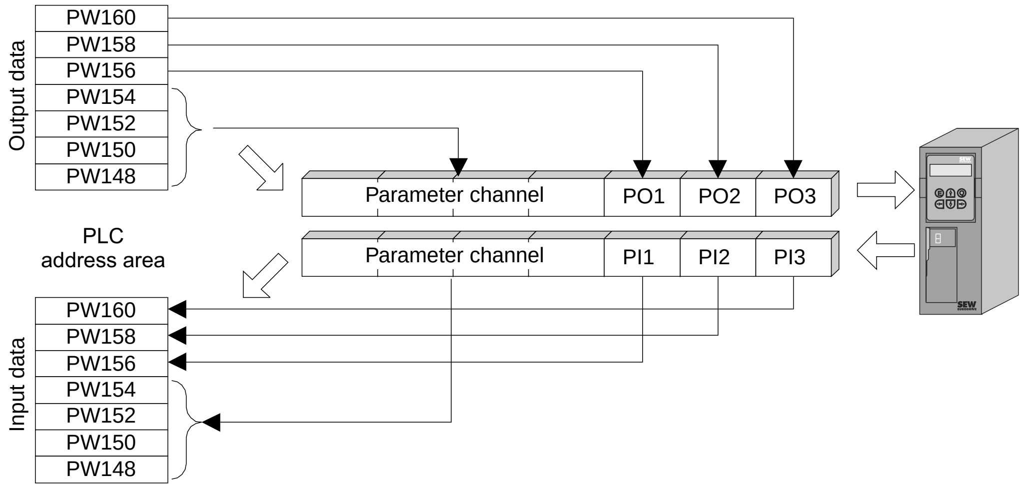


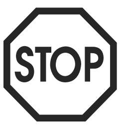
Figure 190: Assignment of the I/O area of the PLC

Control example for Simatic S5

While the process input data (actual values) are being read in, e.g. using load commands with the Simatic S5, it is possible to send the process output data (setpoints) using the transfer commands. Starting from Figure 190, the example shows the syntax for processing the process input data and process output data of the MOVIDRIVE® drive inverter. The factory setting for the process data channel is specified in the remark.

Sample STEP5 program

In this example, the project planning for MOVIDRIVE® has the process data configuration '3 PD' on input addresses PW156...161 and output addresses PW156...161. In this case, consistent access takes place in the 'last byte first' sequence.



In the Simatic S5, data consistency is principally determined by the CPU type. Please refer to the manuals for the CPU or the DP master module of the Simatic S5 for information about correct programming with data consistency.

```
//Read in actual values consistently
L...PW 160      //Load PI3 (no function)
L...PW 158      //Load PI2 (speed actual value)
L...PW 156      //Load PI1 (status word 1)

//Output setpoints consistently
L...KH 0
T PW 160        //Write 0hex to PO3 (no function)

L KF +1500
T...PW 158      //Write 1500dec to PO2 (speed setpoint = 300 rpm)

L KH 0006
T...PW 156      //Write 6hex to PO1 (control word = enable)
```

Control example for Simatic S7

The drive inverter is controlled using Simatic S7 in accordance with the selected process data configuration either directly using load and transfer commands or by means of special system functions, SFC 14 DPRD_DAT and SFC15 DPWR_DAT.

In principle with S7, data lengths of 3 bytes or more have to be transferred as 4 bytes using the SFC14 and SFC15 system functions. The following table applies:

Process data configuration	Program access
1 PD	Load/transfer commands
2 PD	Load/transfer commands
3 PD	System functions SFC14/15 (length 6 bytes)
6 PD	System functions SFC14/15 (length 12 bytes)
10 PD	System functions SFC14/15 (length 20 bytes)
Param + 1 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: Load/transfer commands
Param + 2 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: Load/transfer commands
Param + 3 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 6 bytes)
Param + 6 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 12 bytes)
Param + 10 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 20 bytes)

Sample STEP7 program

In this example, the project planning for MOVIDRIVE® *compact* has the process data configuration '3 PD' on input addresses PIW576...and output addresses POW576 . A data block DB3 is created with about 50 data words.

When SFC14 is called up, the process input data are copied into data block DB3, data words 0, 2 and 4. When SFC15 is called up after the control program has been processed, the process output data are copied from data words 20, 22 and 24 into output address POW 576 .

Note the length information in bytes in case of the RECORD parameter. This value must correspond to the configured length.

Please refer to the online help for STEP7 for further information about the system functions.

```
//Start of cyclical program processing in OB1
BEGIN
NETWORK
TITLE = Copy PI data from inverter to DB3, word 0/2/4
CALL SFC...14 (DPRD_DAT)                    //Read DP slave record
    LADDR...:= W#16#240                     //Input address 576
    RET_VAL:= MW 30                         //Result in flag word 30
    RECORD := P#DB3.DBX 0.0 BYTE 6          //Pointer

NETWORK
TITLE = PLC program with drive application
// PLC program uses the process data in DB3 for
// controlling the drive
L DB3.DBW 0                                 //Load PI1 (status word 1)
L...DB3.DBW 2                               //Load PI2 (speed actual value)
L...DB3.DBW 4                               //Load PI3 (no function)

L W#16#0006
T...DB3.DBW 20          //Write 6hex to PO1 (control word = enable)
L...1500
T DB3.DBW 22            //Write 1500dec to PO2 (speed setpoint = 300 rpm)
L W#16#0000
T...DB3.DBW 24          //Write 0hex to PO3 (no function)

//End of cyclical program processing in OB1
NETWORK
TITLE = Copy PO data from DB3, word 20/22/24 to inverter
CALL SFC...15 (DPWR_DAT)                    //Write DP slave record
    LADDR...:= W#16#240                     //Output address 576 = 240hex
    RECORD := P#DB3.DBX 20.0 BYTE 6         //Pointer to DB/DW
    RET_VAL:= MW 32                         //Result in flag word 32
```

Please refer to the Fieldbus Unit Profile manual (available from SEW) for more detailed information and sample applications for control via the process data channel, in particular concerning the coding of the control and status word.

Parameter setting via PROFIBUS-DP

With PROFIBUS-DP, the drive parameters are accessed via the MOVILINK® parameter channel. This offers extra parameter services in addition to the conventional READ and WRITE services.

Structure of the parameter channel

In order to set the parameters of peripheral units via fieldbus systems which do not provide an application layer, it is necessary to recreate the most important functions and services such as READ and WRITE for reading and writing parameters. To do this with PROFIBUS-DP, define a parameter process data object (PPO). This PPO is transmitted cyclically. In addition to the process data channel, it contains a parameter channel for the exchange of acyclical parameter values (→ Figure 191).

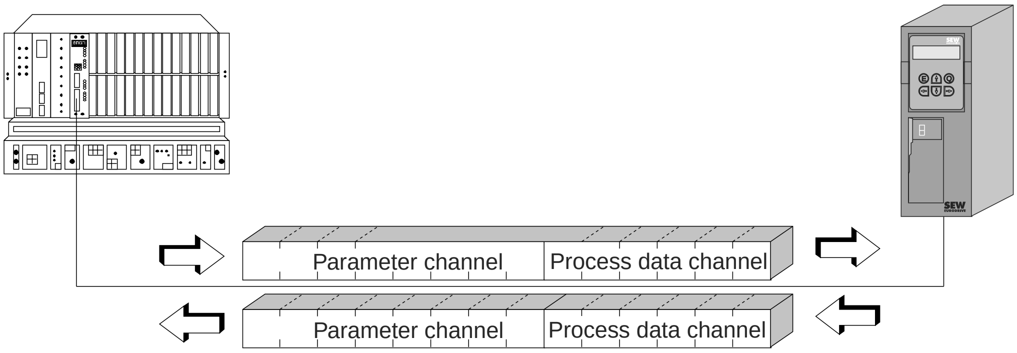


Figure 191: Parameter process data object for PROFIBUS-DP

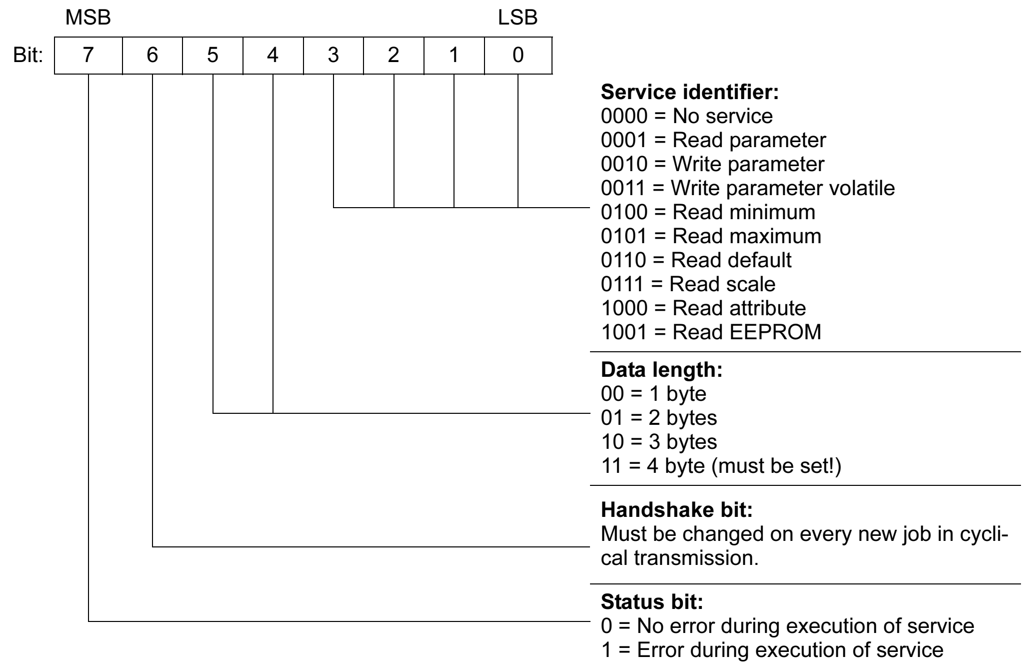
The structure of the parameter channel is shown below. In principle, it is made up of a management byte, an index word, a reserved byte and four data bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
		Parameter index			4 byte data		

Administration of the parameter channel

The entire parameter setting sequence is coordinated with 'Byte 0: Management'. This byte is used for providing important service parameters such as service identifier, data length, version and status of the service performed. Bits 0, 1, 2 and 3 contain the service identifier. These bits define which service is performed. Bit 4 and bit 5 specify the data length in bytes for the write service. This should be set to 4 bytes for all SEW drive inverters.

Byte 0: Management



Bit 6 is used as an acknowledgment between the controller and the drive inverter. It triggers the implementation of the transferred service in the drive inverter. In particular with PROFIBUS-DP, the parameter channel is transmitted cyclically with the process data. For this reason, the implementation of the service in the drive inverter must be triggered by edge control using handshake bit 6. To permit this, the value of this bit is altered for each new service to be performed (toggle). The drive inverter uses the handshake bit to signal whether the service was performed or not. The service has been performed as soon as the handshake bit received in the control corresponds to the one which was sent. Status bit 7 indicates whether it was possible to carry out the service properly or if there were errors.

Index addressing

'Byte 2: Index high' and 'Byte 3: Index low' determine the parameter which is to be read or written via the fieldbus system. The parameters of a drive inverter are addressed with a uniform index regardless of the connected fieldbus system. Byte 1 should be viewed as reserved and must always be set to 0x00.

Data range

The data are located in byte 4 to byte 7 of the parameter channel. This means up to 4 bytes of data can be transmitted per service. The data are always entered with right-justification, i.e. byte 7 contains the least significant data byte (data-LSB) whereas byte 4 is the most significant data byte (data-MSB).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
				High byte 1	Low byte 1	High byte 2	Low byte 2
				High word		Low word	
				Double word			

Incorrect performance of service

The status bit in the management byte is set to signal that a service has been performed incorrectly. The service was performed by the drive inverter if the received handshake bit is the same as the sent handshake bit. If the status bit now signals an error, the error code is entered in the data range of the parameter message. Bytes 4...7 send back the return code in a structured format (→ Sec. 'Return codes for parameter setting' on page 322).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	**Error class**	**Error code**	**Add. code high**	**Add. code low**

↓

Status bit = 1: Incorrect performance of service

Return codes for parameter setting

In the event of an incorrect parameter setting, the drive inverter sends back various return codes to the master which set the parameters. These codes provide detailed information about the cause of the error. All of these return codes are structured in accordance with EN 50170. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

These return codes apply to all communications interfaces of MOVIDRIVE®.

Error class

The error class element classifies the type of error more precisely. MOVIDRIVE® *compact* supports the following error classes as defined in EN 50170 (V2):

Class (hex)	Name	Meaning
1	vfd-state	Status error of the virtual field unit
2	application-reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error when performing service
6	access	Access error
7	ov	Error in object list
8	other	Other error (see additional code)

The error class is generated by the communications software of the fieldbus interface if there is an error in communication. This statement does not apply to error class 8, 'Other error.' Return codes sent from the drive inverter system are all in error class 8, 'Other error.' The error can be more precisely identified using the additional code element.

Error code

The error code element provides a means for more precisely identifying the cause of the error within the error class. It is generated by the communications software of the fieldbus interface in the event of an error in communication....Only error code 0 (Other error code) is defined for error class 8, 'Other error.' In this case, detailed identification is made using the additional code.

Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the drive inverter. They are sent back to the master in error class 8, 'Other error.' The following table shows all possible codings for the additional code.

Error class: 8 = 'Other error'

Add. code high (hex)	Add. code low (hex)	Meaning
00	00	No fault
00	10	Invalid parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Option card required for this function/parameter is missing
00	18	Error in system software
00	19	Parameter access via RS-485 process interface on X13 only
00	1A	Parameter access via RS-485 diagnostic interface only
00	1B	Parameter has access protection
00	1C	Controller inhibit required
00	1D	Impermissible value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with output stage enabled

Special return codes (special cases)

Faults in parameter settings which cannot be identified either automatically by the application layer of the fieldbus system or by the system software of the drive inverter are treated as special cases. This refers to the following possible faults:

- Incorrect coding of a service via parameter channel
- Incorrect length specification of a service via parameter channel
- Internal communications error

Incorrect service coding in the parameter channel

A non-defined coding was specified in the management or reserved byte during parameter setting via the parameter channel. The following table shows the return code for this special case.

	Code (dec)	Meaning
Error class:	5	Service
Error code:	5	Illegal parameter
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Check bytes 0 and 1 in the parameter channel.

Incorrect length specification in parameter channel

A data length other than 4 data bytes was specified in a write service during parameter setting via the parameter channel. The following table displays the return code.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	8	Type conflict
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Check bit 4 and bit 5 for the data length in the management byte of the parameter channel.

Internal communications error

The return code listed in the following table is sent back if a communications error has occurred within the system. The requested parameter service may not have been performed and should be repeated. If this error reoccurs, it is necessary to switch off the drive inverter completely and then back on again so it is re-initialized.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Repeat the parameter service. De-energize the drive inverter if the error reoccurs (supply voltage + ext. 24 V_{DC}) and then switch it back on. Contact SEW Service for advice if this error occurs continuously.

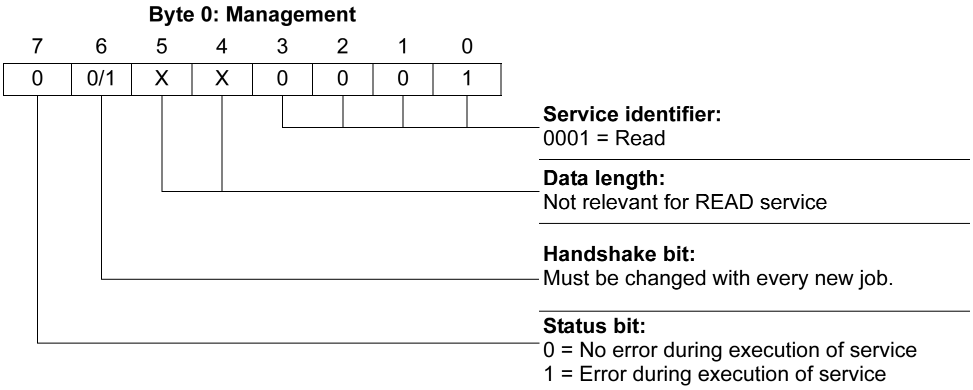
Reading a parameter with PROFIBUS-DP (Read)

In order to perform a READ service using the parameter channel, the handshake bit must not be changed until the entire parameter channel has been prepared in accordance with the service. This is because cyclical transfer takes place on the parameter channel. As a result, adhere to the following sequence in order to read a parameter:

1. Enter the index of the parameter to be read in byte 2 (Index high) and byte 3 (Index low).
2. Enter the service identifier for the read service in the management byte (byte 0).
3. Transfer the read service to the inverter by changing the handshake bit.

Since this is a read service, the sent data bytes (bytes 4...7) and the data length (in the administration byte) are ignored and consequently do not need to be set.

The inverter now processes the read service and sends the service confirmation back by changing the handshake bit.



X = Not relevant
0/1 = Bit value is changed

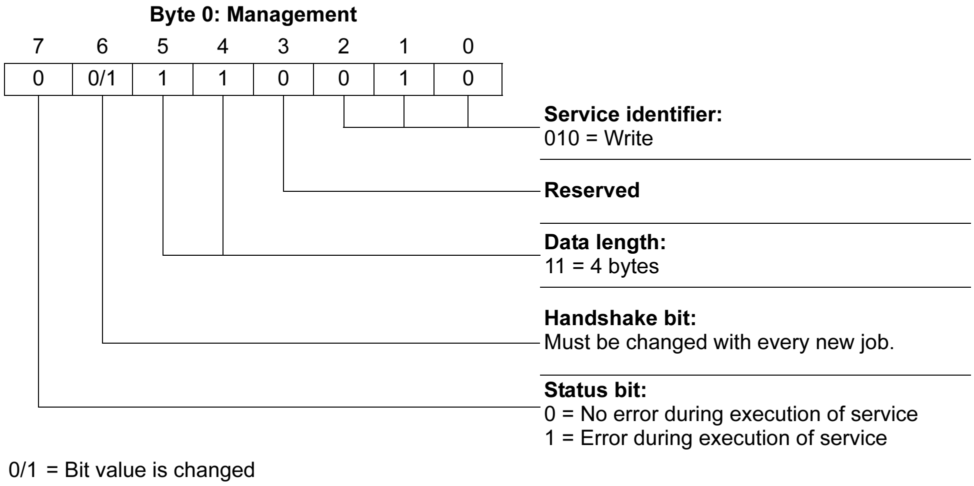
The data length is not relevant; only the service identifier for the READ service should be entered. This service is now activated in the drive inverter when the handshake bit changes. For example, it would be possible to activate the read service with the management byte coding 01_{hex} or 41_{hex}.

Writing a parameter with PROFIBUS-DP (Write)

In order to perform a WRITE service using the parameter channel, the handshake bit must not be changed until the entire parameter channel has been prepared in accordance with the service. This is because cyclical transfer takes place on the parameter channel. As a result, adhere to the following sequence in order to write a parameter:

1. Enter the index of the parameter to be written in byte 2 (Index high) and byte 3 (Index low).
2. Enter the data to be written in bytes 4...7.
3. Enter the service identifier and the data length for the write service in the administration byte (byte 0).
4. Transfer the write service to the inverter by changing the handshake bit.

The inverter now processes the write service and sends the service confirmation back by changing the handshake bit.



The data length is 4 bytes for all parameters in SEW drive inverters. This service is now transferred to the drive inverter when the handshake bit changes. As a result, a write service on SEW drive inverters always has the management byte coding 32_{hex} or 72_{hex}.

Procedure for programming with PROFIBUS-DP

Taking the example of the WRITE service, is intended to represent a process of setting parameters between the control and the drive inverter via PROFIBUS-DP (→ Figure 192). To simplify the sequence, Figure 192 only shows the management byte of the parameter channel.

The parameter channel is only received and returned by the drive inverter while the controller is preparing the parameter channel for the write service. The service is not activated until the handshake bit is changed (in this example, when it changes from 0 to 1). The drive inverter now interprets the parameter channel and processes the write service; however, it continues to respond to all messages with handshake bit = 0. Confirmation that the service has been performed occurs when the handshake bit in the response telegram of the drive inverter is changed. The controller now detects that the received handshake bit is once again the same as the one which was sent. It can now prepare another parameter setting procedure.

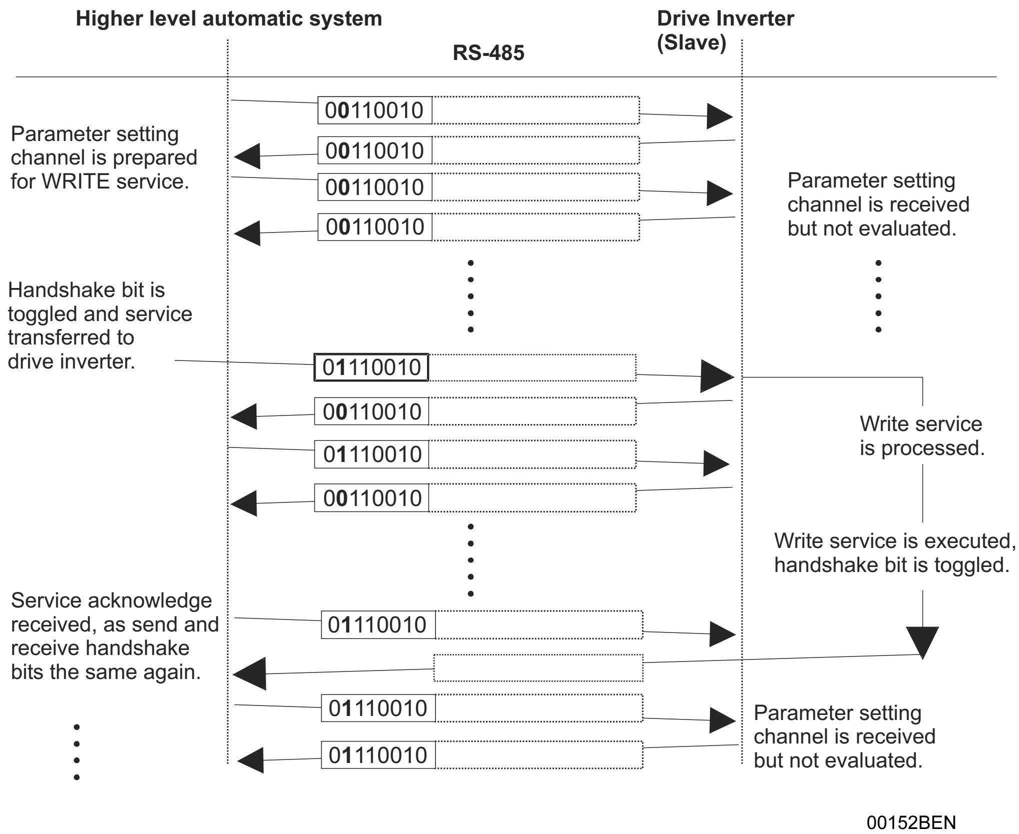


Figure 192: Parameter setting procedure

Parameter data format

When parameters are set via the fieldbus interface, the same parameter coding is used as with the serial RS-485 interfaces or the system bus.

The data formats and ranges of values for the individual parameters can be found in the 'MOVIDRIVE® Serial Communication' manual which can be ordered from SEW.

10.9 Starting up the inverter with INTERBUS (MCH42A)

The parameters of the MOVIDRIVE® *compact* MCH42A inverter can be set straight away via INTERBUS without any further settings once the INTERBUS interface has been installed. As a result, all parameters can be set by the master automation system after switch-on.

To do this, the "Control signal source" must be set to FIELDBUS in the inverter (P100 = FIELDBUS and P101 = FIELDBUS). The FIELDBUS setting means the inverter parameters are set for control and setpoint entry via INTERBUS. The inverter then responds to the process output data transmitted from the programmable master controller.

Activation of the control signal source/setpoint source FIELDBUS is signaled to the machine control using the 'Fieldbus mode active' bit in the status word. For safety reasons, the inverter must also be enabled on the terminal side for control via the fieldbus system. Accordingly, the terminals must be wired up or programmed in such a way that the inverter is enabled via the input terminals.

The simplest way of enabling the inverter on the terminal side is to connect the DIØØ (/CONTROLLER INHIBIT) input terminal to a '1' signal and to program input terminals DIØ1...DIØ3 to 'NO FUNCTION'.

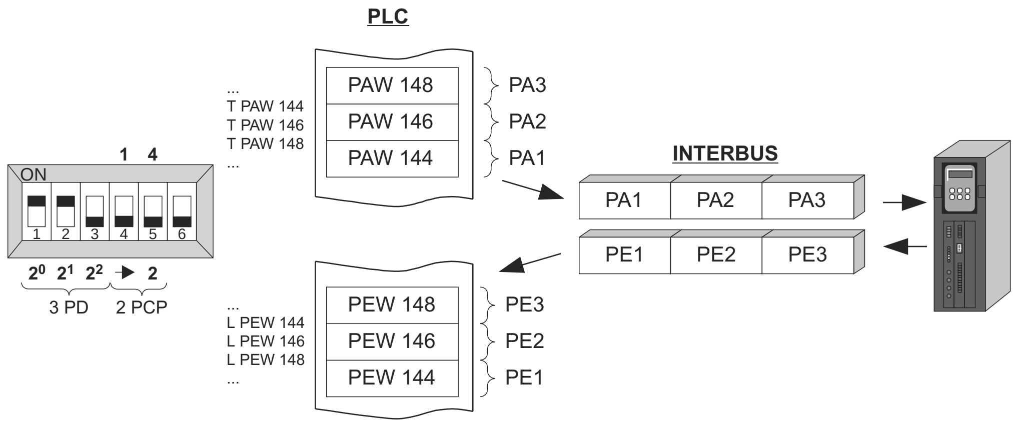
Preliminary work for startup

1. Enable the inverter on the terminal side. To do this, apply a '1' signal to X11:1 (DIØØ '/CONTROLLER INHIBIT'), for example using a jumper to X11:8 (VO24).
2. Only switch on the 24 V_{DC} voltage supply; do not switch on the supply voltage yet. You can now set the parameters of the inverter without the connected motor starting up inadvertently.
3. Set the setpoint source and control signal source to FIELDBUS (P100 = FIELDBUS and P101 = FIELDBUS).
4. Set binary inputs DIØ1...DIØ3 to 'NO FUNCTION' (P600...P602 = 'NO FUNCTION').

Configuring the INTERBUS system

There are two configuration steps for the inverter in the INTERBUS interface module using the 'CMD Tool' project planning software (CMD = Configuration Monitoring Diagnostics).

1. Create the bus structure
2. Station description and address setting for process data



03713AXX

Figure 193: Project planning example for 3PD + 2PCP

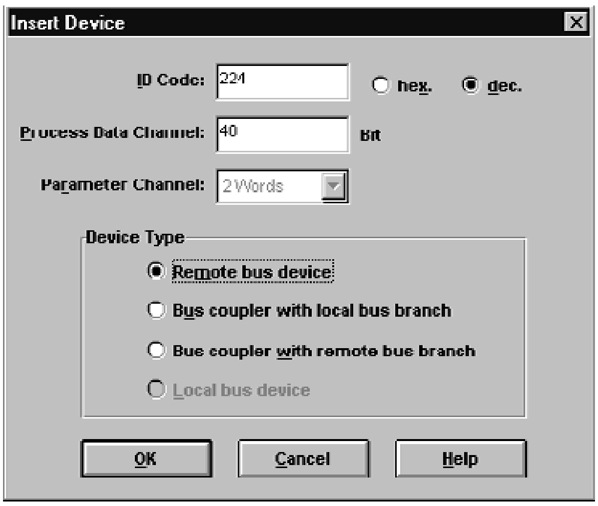
The figures below show the settings in the CMD Tool for an inverter configured with 3PD + 2PCP as shown in Figure 193, with input/output addresses 144...149 in the control.

Configuring the bus structure

The bus structure can be configured online or offline using the CMD Tool.

Offline configuration: Insert with ID code

In offline status, the inverter is configured in the CMD Tool using the 'Edit / Insert with ID code' menu command. When doing this, you must enter the values for the ID code, process data channel and station type as shown in Figure 194.



03714AXX

Figure 194: Offline configuration with CMD Tool

Note!

Not all combinations are possible, because the inverter can occupy up to six words in the INTERBUS!

The following table shows the possible settings. The ID code setting must match the DIP switches S4 and S5. The process data channel setting must match the DIP switches S1 to S3. Otherwise, INTERBUS operation is not possible.

Information for offline configuration in CMD Tool

	Program setting	Function (MOVIDRIVE display)
ID code	227 dec (E3 hex)	Parameter channel: 1 word
Process data channel:	16 bits	1 process data word (Param+1PD)
	32 bits	2 process data words (Param + 2 PD)
	48 bits	3 process data words (Param +3 PD)
	64 bits	4 process data words (Param + 4 PD)
	80 bits	5 process data words (Param + 5 PD)
ID code	224 dec (E0 hex)	Parameter channel: 2 words
Process data channel:	16 bits	1 process data word (Param + 1PD)
	32 bits	2 process data words (Param + 2 PD)
	48 bits	3 process data words (Param + 3 PD)
	64 bits	4 process data words (Param + 4 PD)
ID code	225 dec (E1 hex)	Parameter channel: 4 words
Process data channel:	16 bits	1 process data word (Param + 1 PD)
	32 bits	2 process data words (Param + 2 PD)
ID code	3 dec (03 hex)	Parameter channel: -
Process data channel:	96 bits	6 process data words (6PD)

Online configuration: Configuration frame / Read in

The INTERBUS system can also be fully installed first and then DIP switches S1 to S6 set. Following this, the entire bus structure can be read in with the CMD Tool (configuration frame). All stations are automatically detected with their data width settings.

Creating a station description

The INTERBUS stations can be identified and described uniquely using an individual station description created for the inverter in the INTERBUS system.

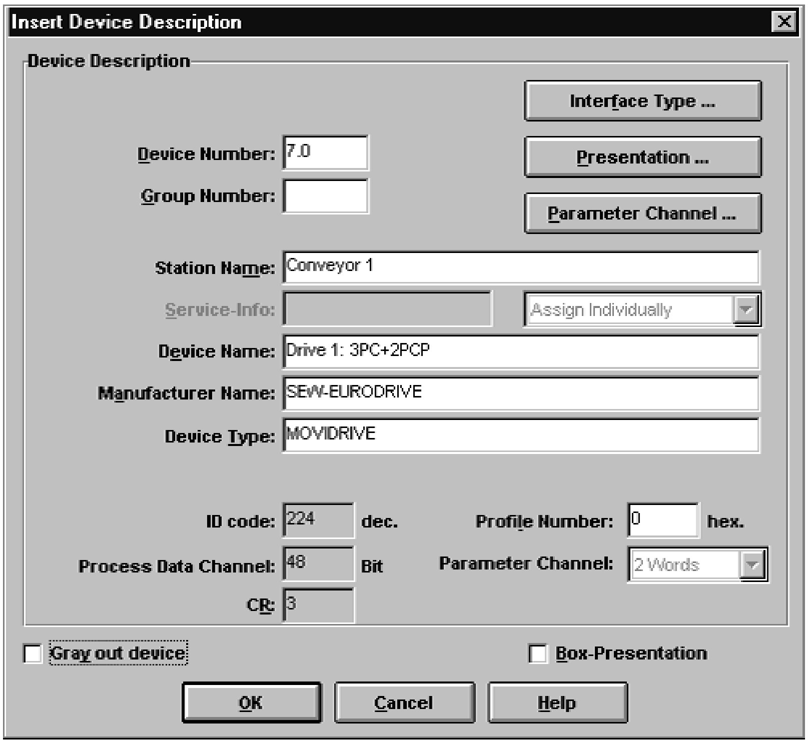
The following entries are significant:

Station description

The 'Manufacturer Name' and 'Device Type' must have the following entries:

- Manufacturer name:SEW-EURODRIVE
- Device type:MOVIDRIVE

Once these entries have been made, the drive parameters can be set using a management PC from the management level via the INTERBUS interface module (Figure 195).



03715AXX

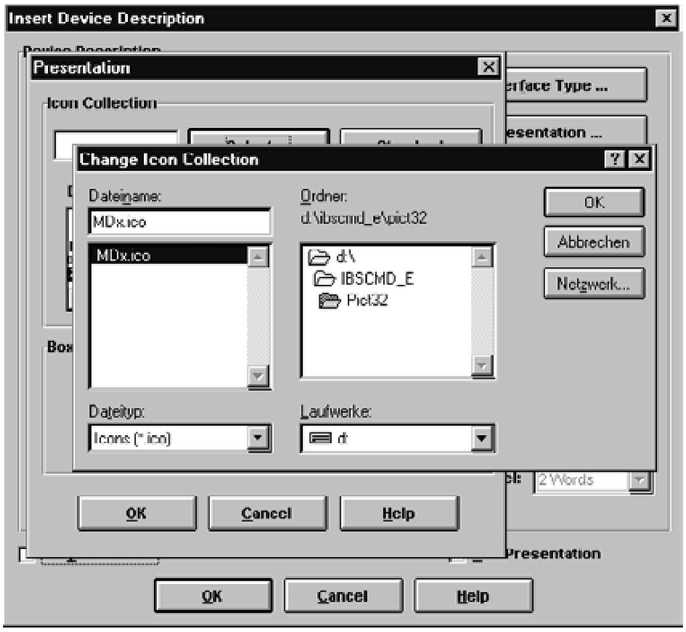
Figure 195: Station description for MOVIDRIVE® compact MCH42A

Interface type

Select 'Fiber optic remote bus' as the interface type.

Representation

You can copy your own ICO files into the '.\IBSCMD\PICT32\' directory as of CMD Tool 4.50 for easy identification of the inverter (Figure 196). The INTERBUS description files for the CMD Tool are available on the SEW website at http://www.SEW-EURO-DRIVE.com in the 'Software' section.



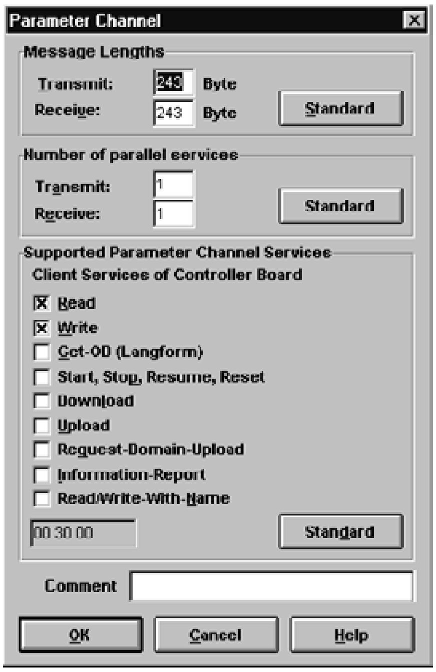
03716AXX

Figure 196: Linking the station description with the ICO file

Parameter channel

You must make the following settings for the parameter channel if you want to use the PCP channel for setting the inverter parameters in your application.

- Telegram lengths / Transmit / Receive:
  243 bytes each
- Supported parameter channel services (standard): Read / Write

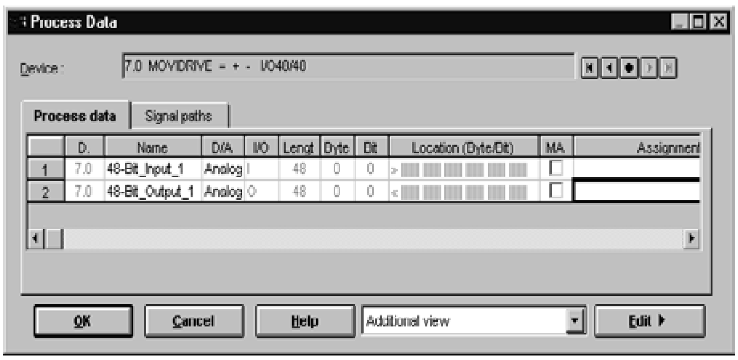


03717AXX

Figure 197: Setting the parameter channel (PCP)

Assigning process data

INTERBUS process data of the inverter are assigned to the program addresses of the control system using the 'Process Data' shortcut menu.



03718AXX

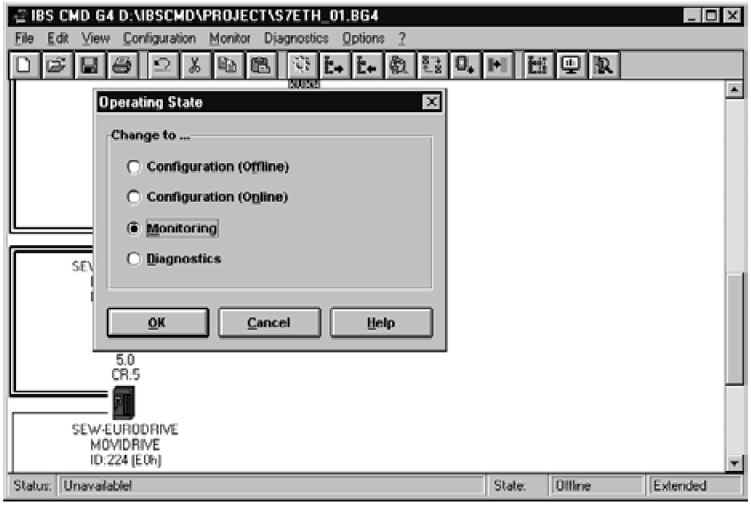
Figure 198: Assigning INTERBUS process data and PLC program addresses

Refer to the chapter for a sample program (STEP7) for controlling the inverter using the INTERBUS process data.

Testing the PCP connection

You can use the MONITOR mode of the CMD Tool for testing the PCP connection to the inverter. The following figures illustrate the PCP test procedure. Basically, this method involves establishing a PCP connection to the unit and reading the parameter list (object list) stored in the unit.

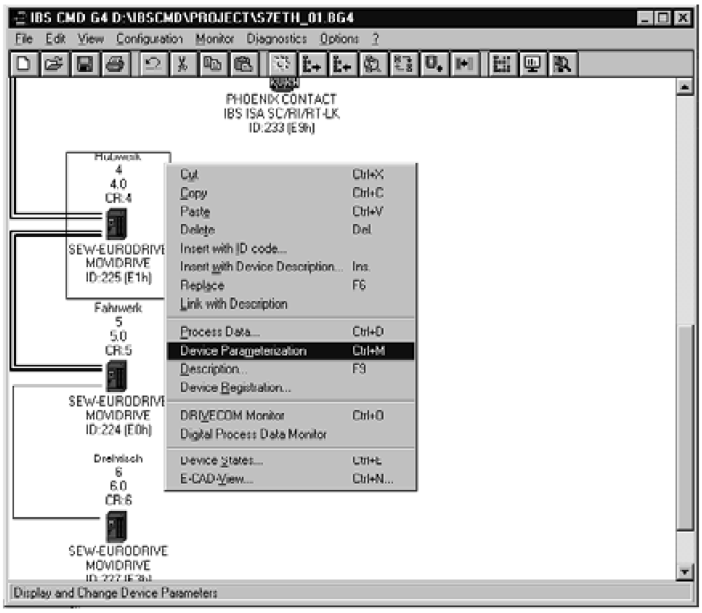
Set the CMD Tool to 'Monitoring' status.



03719AXX

Figure 199: Setting CMD Tool to 'MONITORING' status

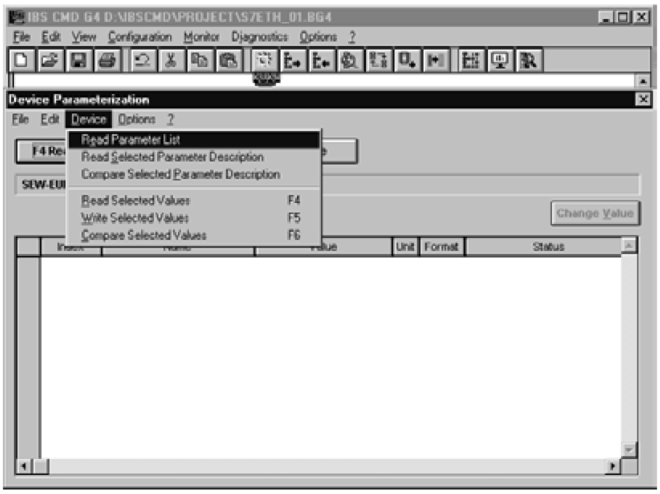
Click the inverter to which you want to establish a PCP connection. Press the right mouse button to open the shortcut menu and select the 'Device Parameterization' menu command.



03721AXX

Figure 200: Testing the PCP device parameterization

In the 'Device Parameterization' window, select the 'Device / Read Parameter List' menu command.



03722AXX

Figure 201: Window for device parameterization using the CMD Tool

The configuration of the PCP channel has been performed correctly once the device parameters have been imported. You can break off the read-in procedure.

Check the PCP configuration and the assignment of CRs if you get an error message instead of the progress bar. If necessary, reformat the parameterization memory of the interface module and then write the current project into the parameterization memory again. Now run the parameterization procedure for the interface module again and repeat this test sequence to check the PCP connection.

03723AXX

Figure 202: CMD Tool is reading in device parameters, i.e. PCP communication is OK

10

Overview of basic structure

The MOVIDRIVE® *compact* MCH42A inverter offers a standardized interface for parameterization using the 'Peripherals Communication Protocol' (PCP). This INTERBUS communications channel gives you complete access to all MOVIDRIVE® drive parameters.

The PCP channel must be configured with the corresponding ID code so you can access parameter values in the inverter. There are one, two or four words available in the INTERBUS protocol for the PCP channel. Changing the number of PCP words varies the access speed to parameter values via the PCP channel.

Additional PCP channel for startup and diagnostics

The PCP interface is implemented using PCP version 3. In addition to the familiar PCP channel between the control system (PLC) and the inverter, it is now possible to establish an additional (logical) PCP channel between the interface module and the inverter. This additional PCP channel can be used by a supervisory computer to access the inverter parameter values via the Ethernet / INTERBUS communications pathway.

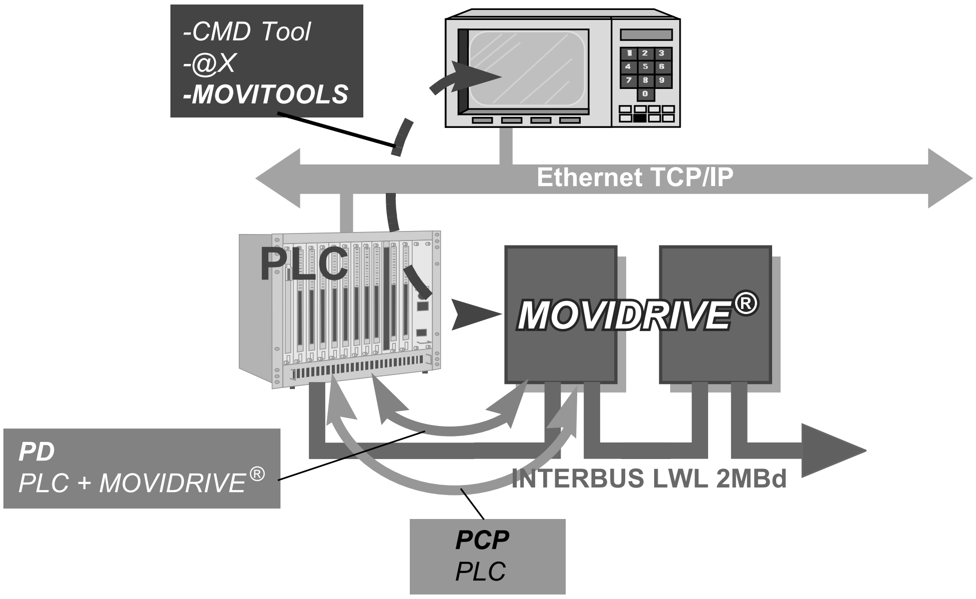


Figure 203: Communications channels with PCP version 3

Figure 203 shows a sample system topology with an Ethernet TCP/IP layer and an INTERBUS layer. In this case, an INTERBUS interface module is used with an Ethernet TCP/IP interface. This module functions as the gateway between the two communications layers.

In addition to the 'CMD Tool,' the supervisory computer also runs INTERBUS '@utomationXplorer' and 'MOVITOOLS' for programming and setting the parameters of the SEW inverter on the INTERBUS. This arrangement means existing bus infrastructures can be used for startup and maintenance. This setup facilitates startup and diagnostics of the entire automation system because the INTERBUS cable is now not only used for controlling but for startup and diagnostics of all components used on the fieldbus.

PCP services

The MOVIDRIVE® *compact* MCH42A inverter supports the PCP services shown in Figure 204. However, only the following services are of significance for setting the inverter parameters:

- Initiate
- Read
- Write
- Abort

Refer to the PCP communication user manual for your INTERBUS interface module for a detailed description of the PCP services.

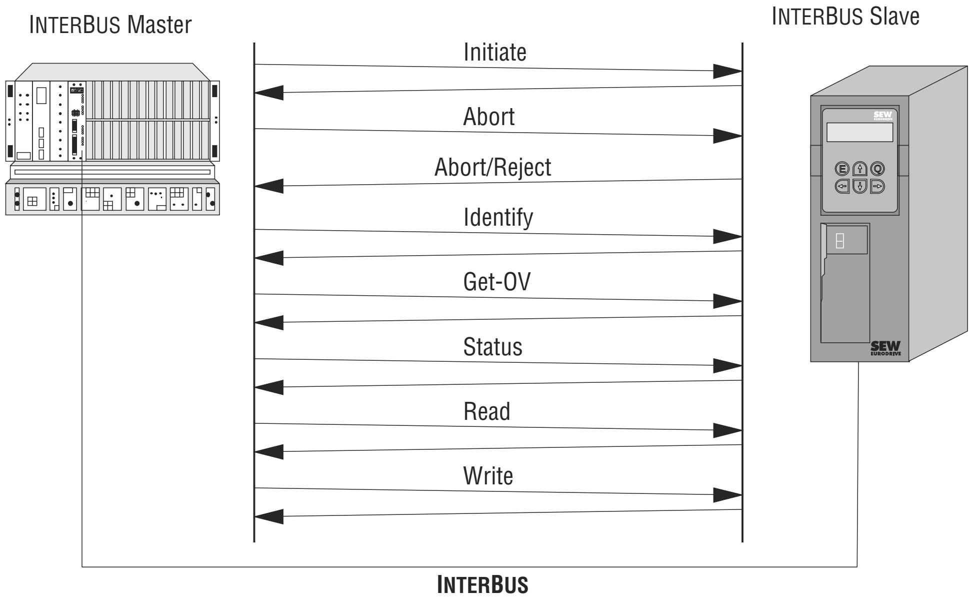


Figure 204: PCP services supported by MOVIDRIVE®

Establishing the communications link with 'Initiate'

The 'Initiate' PCP service establishes a communications link for exchanging parameters between an INTERBUS interface module and the MOVIDRIVE® inverter. Communication is always established from the INTERBUS interface module. Various arrangements relating to the communications link are checked during establishment of the connection, such as supported PCP services, user data length, etc. The inverter responds with a positive initiate response if the connection is established successfully. If the connection could not be established, then the arrangements for the communications link on the INTERBUS interface module do not match those on the MOVIDRIVE® inverter. The inverter responds with an initiate error response. In this case, compare the configured communications relationship list in the INTERBUS interface module with that in the inverter.

As a rule, an attempt to re-establish an existing communications link leads to an abort. The communications link is then dropped, which means the 'Initiate' PCP service has to be run for a third time in order to re-establish the communications connection.

Breaking off the communications link with 'Abort'

The 'Abort' PCP service breaks off an existing communications link between the INTERBUS interface module and the MOVIDRIVE® inverter. Abort is an unconfirmed PCP service and can be triggered either from the INTERBUS interface module or from MOVIDRIVE®.

Reading parameter values with 'Read'

The 'Read' PCP service gives the INTERBUS interface module read access to all communications objects (drive parameters) of the MOVIDRIVE® inverter. All drive parameters and their coding are presented in detail in the Fieldbus Unit Profile documentation and the list of MOVIDRIVE® parameters.

Writing parameter values with 'Write'

The 'Write' PCP service gives the INTERBUS interface module write access to all MOVIDRIVE® drive parameters. The inverter generates a write error response if incorrect access is made to a drive parameter (e.g. the written value is too great). Precise information is given relating to the cause of the error.

Parameters in the object list

The 'Read' and 'Write' PCP services give the INTERBUS interface module access to all parameters defined in the object list. All drive parameters which can be accessed via the bus system are described as communications objects in the static object list. All objects in the static object list are addressed using indices. The following table shows the structure of the object list for the MOVIDRIVE® *compact* MCH42A inverter.

The index range is subdivided into three logical areas. The drive parameters are addressed using indices 8300...8800dec. Refer to the MOVIDRIVE® parameter list in the SEW documentation for information about the parameter index. Indices below 8300dec are handled directly on the INTERBUS interface and are not to be viewed as drive parameters.

Parameter index (decimal)	Name of the communications object
8296	Download parameter block
8297	Last PCP index
8298	MOVILINK® parameter channel cyclical
8299	MOVILINK® parameter channel acyclical
8300...8800	Drive parameter for MOVIDRIVE® (can be accessed directly with the 'Read' and 'Write' PCP services, see the MOVIDRIVE® parameter list in the SEW documentation for information about the parameter index)
8801...9999	Drive parameters for MOVIDRIVE® (these parameters can only be accessed via the MOVILINK® parameter channel)
>10000	Table, program and variable memory (these parameters can only be accessed via the MOVILINK® parameter channel)

Object description of the drive parameters

The drive parameters of the MOVIDRIVE® inverter are described in detail in the MOVIDRIVE® parameter list in the SEW documentation. In addition to the parameter index, you will receive additional information about coding, the range of values and the meaning of the parameter data.

The object description in the object list is identical for all drive parameters. Even those parameters which can only be read are given the Read all/Write all attribute in the object list, because the inverter undertakes the corresponding check itself and sends back a return code if necessary. The following table shows the object description of all drive parameters.

Index:	8300...8800
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	4
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

'Download parameter block' object

The 'download parameter block' object lets you write up to 38 MOVIDRIVE® drive parameters at the same time with only one write service. As a result, this object gives you the opportunity to set the parameters of the inverter in the startup phase, e.g. by calling up the write service only once. As a rule, it is only necessary to change a few parameters. As a result, this parameter block with its max. 38 parameters is sufficient for almost all applications. The user data area is defined as 38 x 6 + 2 bytes = 230 bytes (octet string type). The following table shows the structure of the 'download parameter block' object.

Octet	Meaning	Note
0	reserved (0)	
1	Number of parameters	1...38 parameters
2	Index high	1. Parameters
3	Index low	
4	Data MSB	
5	Data	
6	Data	
7	Data LSB	
8	Index high	
...	...	
223	Data LSB	
224	Index high	38. Parameters
225	Index low	
226	Data MSB	
227	Data	
228	Data	
229	Data LSB	

The 'download parameter block' object is only handled locally on the INTERBUS interface and is defined as in the following table.

Index:	8296
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	230
Local address:	
Password:	
Access groups:	
Access rights:	Write all
Name[16]:	-
Extension length:	-

The WRITE service on the 'download parameter block' object starts a parameter setting mechanism on the INTERBUS interface. This step puts all parameters specified in the user data area of the object into the DPRAM and therefore sets the parameters of the inverter. The write service is terminated with a positive write response once the download parameter block has been processed successfully, i.e. all parameters transmitted by the INTERBUS interface module have been written. A negative write response is returned in case of an error. The return code contains more detailed information about the type of error as well as the number of the parameter (no. 1...38) where the error occurred (see example).

```
Example: Write error response for an error when writing the 11th param-
eter:
Error class: 8  Other
Error code:  0  Other
Additional code high: 11dec Error when writing parameter 11
Additional code low: 15hex Value too large
```

Note the following points when using the download parameter block:

- Do not perform a factory setting within the download parameter block!
- All parameters written after the parameter lock has been activated will be rejected.

'Last PCP index' object

This object is 4 bytes long and, when read access is made, returns the numerical value of the last index which can be addressed directly using the PCP services. PCP accesses to indices greater than this numerical value must be made using the 'MOVILINK® parameter channel acyclical' object.

Index:	8297
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	4
Local address:	
Password:	
Access groups:	
Access rights:	Read all
Name[16]:	-
Extension length:	-

'MOVILINK® parameter channel cyclical'

This object is 8 bytes in length and contains the cyclical MOVILINK® parameter channel. All MOVILINK® communications services can be performed by cyclically alternating reading and writing of this object. The communications service is not performed until the handshake bit in the management byte has changed. The MOVILINK® parameter channel grants access to all indices and therefore also to the IPOS variable and program memory.

The following table shows the structure of this communications object. Refer to the 'MOVIDRIVE® Fieldbus Unit Profile and Parameter List' document for information about the structure of the parameter channel.

Octet	0	1	2	3	4	5	6	7
Meaning	Manage-ment	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
Note	Manage-ment	Reserved	Parameter index		4 bytes data			

The 'MOVILINK® parameter channel cyclical' object is only handled locally on the INTERBUS interface.

Index:	8298
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	8
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

The following table shows the procedure involved in a parameter access via the cyclical MOVILINK® parameter channel. The performance of the service is not started in the inverter until the control has changed the handshake bit in the parameter channel. To do this, the control program must read the parameter channel at the start of the parameter setting process to obtain the current status of the handshake bit in the inverter. Now, the master can initiate evaluation of the parameter channel in the inverter when the handshake bit changes.

The inverter now performs the service coded in the parameter channel and enters the service confirmation back in the parameter channel. The control program receives the service confirmation the next time it makes read access to the 'MOVILINK® parameter channel cyclical'. The following tables displays the procedure of the cyclically called read/write services for the 'MOVILINK parameter channel cyclical'.

Control (master)	MOVIDRIVE® (slave)
1. 'READ MOVILINK parameter channel cyclical', to evaluate the status of the handshake bit.	
READ 8298 (parameter channel) →	
← Data = Parameter channel	
2. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object and toggling the handshake bit.	
WRITE 8298 (parameter channel) →	
← OK	
3. READ 'MOVILINK parameter channel cyclical' and evaluation of the service confirmation in the parameter channel.	
READ 8298 (parameter channel) →	
← Data = Parameter channel with result	

'MOVILINK parameter channel acyclical' object

The 'MOVILINK parameter channel acyclical' object is 8 bytes long and contains the MOVILINK parameter channel. This object can be used for acyclical parameter access, i.e. the inverter processes the service coded in the parameter channel every time a WRITE service is received on this object. The handshake bit is not evaluated! The following table shows the structure of the 'MOVILINK parameter channel acyclical'. Refer to the 'MOVIDRIVE® Fieldbus Unit Profile and Parameter List' document for information about the structure of the parameter channel.

Octet	0	1	2	3	4	5	6	7
Meaning	Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
Note	Management	Reserved	Parameter index		4 bytes data			

There are two different procedures involved in setting the inverter parameters via the acyclical MOVILINK parameter channel:

- Parameter channel performs a write type service
- Parameter channel performs a read type service

Parameter channel performs a write type service

If a write type service is performed via the acyclical parameter channel (e.g. write parameter or write parameter volatile), the inverter responds with the current service confirmation when the service has been performed. The corresponding error code is returned if the write access is not correct.

This variant offers the advantage that the write services are processed by simply sending a WRITE 'MOVILINK parameter channel' once and the service confirmation can take place by evaluating the 'write confirmation.' The following table shows how write services are performed via the acyclical MOVILINK parameter channel.

Control (master)	**MOVIDRIVE® (slave)**
1. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object.	
WRITE 8298 (parameter channel) →	
← Service confirmation (OK/error code)	

The WRITE service coded in the parameter channel is performed and the service confirmation is returned directly as the response.

Parameter channel performs a read type service

A PCP WRITE service has to be performed before a parameter can be read via the parameter channel. The PCP WRITE service defines where the inverter data should be available. A read service must take place on the acyclical parameter channel in order for these data to get to the master. As a result, a PCP WRITE and a PCP READ are always required for performing read services via the parameter channel. The following table shows how read services are performed via the acyclical MOVILINK parameter channel.

Control (master)	MOVIDRIVE® (slave)
1. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object.	
WRITE 8298 (parameter channel) →	
← OK	
2. READ 'MOVILINK parameter channel cyclical' and evaluation of the service confirmation in the parameter channel.	
READ 8298 (parameter channel) →	
← Data = Parameter channel with result	

1. Reception is confirmed immediately, the parameter channel is evaluated and the requested service performed.
2. Service confirmation is entered in the parameter channel and can be evaluated by READ access in the master.

The acyclical MOVILINK® parameter channel is only handled locally on the INTERBUS interface and is defined as in the following table.

Index:	8299
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	8
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

Return codes for parameterization

In the event of an incorrect parameter setting, the inverter sends back various return codes to the master which set the parameters. These codes provide detailed information about the cause of the error. All of these return codes are structured in accordance with EN 50170. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

These return codes apply to all MOVIDRIVE communications interfaces.

Error class

The error class element classifies the type of error more precisely. In accordance with EN 50170, the system differentiates between the error classes listed in table 1.

Class (hex)	Name	Meaning
1	vfd-state	Status error of the virtual field unit
2	application-reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error when performing service
6	access	Access error
7	ov	Error in object list
8	other	Other error (see additional code)

The error class is generated by the communications software of the fieldbus interface if there is an error in communication. This does not apply to error class 8, Other error. Return codes sent from the inverter system are all in error class 8, Other error. The error can be more precisely identified using the additional code element.

Error code

The error code element provides a means for more precisely identifying the cause of the error within the error class. It is generated by the communications software of the fieldbus card in the event of an error in communication. Only error code 0 (Other error code) is defined for error class 8, Other error. In this case, detailed identification is made using the additional code.

Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the inverter. They are sent back to the master in error class 8, Other error. Table 2 shows all possible codings for the additional code.

Add. code high (hex)	**Add. code low (hex)**	**Meaning**
00	00	No fault
00	10	Invalid parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Option card required for this function/parameter is missing
00	18	Error in system software
00	19	Parameter access only via RS-485 process interface on X13
00	1A	Parameter access only via RS-485 diagnostic interface
00	1B	Parameter has access protection
00	1C	Controller inhibit required
00	1D	Impermissible value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with output stage enabled

'Internal communications error' special case

The return code listed in the following table is sent back if a communications error has occurred between the INTERBUS interface and the inverter system. The PCP service transferred via the fieldbus may not have been performed and should be repeated. If this error reoccurs, it is necessary to switch off the inverter completely and then back on again so it is re-initialized.

	Code (dec)	**Meaning**
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault

Repeat the read or write service. If this error occurs again, switch the inverter off completely and back on again. Contact the SEW Electronics Service for advice if this error occurs continuously.

Control via process data

The inverter is controlled using the process data simply by reading/writing the program addresses where the INTERBUS process data of the inverter are replicated. The following is an example for a simple STEP7 program for the Simatic S7:

```
L...W#16#0006
T...PAW...144... //Write 6hex on PO1 (control word = enable)
L...1500
T...PAW...146... //Write 1500dec on PO2 (speed setpoint = 300 rpm)
L...W#16#0000
T...PAW...148...//Write 0hex on PA3 (no function after factory setting)
```

Please refer to the Fieldbus Unit Profile manual for more information about controlling the inverter via the process data channel, in particular regarding the coding of the control and status word.

Setting parameters via the PCP interface

This chapter describes how parameters and IPOS variables can be read and written using the standardized INTERBUS PCP ‘Read' and 'Write' services. The example applies to all 4th generation (G4) INTERBUS interface modules and is explained using PHOENIX terminology.

The coding examples shown in the following chapters are shown in the same way as in the 'Peripherals Communication Protocol (PCP)' INTERBUS user manual produced by Phoenix Contact.

Prerequisite

You should have the following user manuals:

- 'Peripherals Communication Protocol (PCP)' INTERBUS user manual, PHOENIX CONTACT, IBS SYS PCP G4 UM
- MOVIDRIVE® Fieldbus Unit Profile manual

Presentation of coding examples

The coding examples shown in the following chapters are shown in the same way as in the 'Peripherals Communication Protocol (PCP)' INTERBUS user manual produced by Phoenix Contact.

All information in a PCP service is presented word-by-word in column format. As a result, you can think of a word as a PLC word (e.g. Simatic data word). There is a coding example for the MOVIDRIVE® inverter on the right-hand side in each case.

The communication reference (CR) is used for selecting the inverter for which the parameters should be set. In the examples below, CR = 02 hex was assigned to the inverter in the CMD Tool. The index defines the drive parameter which should be accessed.

Station description of the inverter in the CMD Tool

Before you can use the PCP channel of the inverter, you have to configure the station description in the CMD Tool for the inverter.

Process of a parameterization sequence

The peripherals communication protocol (PCP) of the INTERBUS standardizes access to the parameter data of INTERBUS stations and prescribes the following procedure:

- Initialization of the PCP connection with the 'Initiate' service
- Reading or writing with the 'Read' and 'Write' services.
- The communications link can be broken off with the 'Abort' service if it is no longer required (this is not explained here because there is often no need for it, see the PCP manual).
- Initialization of the PCP connection with the 'Initiate' service

The drive parameters of the inverter are not accessed until the PCP connection has been established with 'Initate_Request,‘ e.g. once during the system startup.

Word	Meaning		Coding (hex)
1	Command_Code = Initiate_Request		00 8B
2	Parameter_Count		00 02
3	-	Comm._Reference	00 02
4	Password	Access_Groups	00 00
Bits	15...8	7...0	

You should receive the positive 'Initiate_Confirmation' message after the service has been sent (see the PCP manual in case of a negative message).

Reading a drive parameter

The 'Read' service is used for reading a drive parameter (with index ≤ 8800). All the drive parameters are 4 bytes long (1 double word).

Example

Reading from P130 Ramp t11 UP CW (index 8470dec = 2116hex)

Word	Meaning		Coding (hex)
1	Command_Code = Read_Request		00 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Index		21 16
5	Subindex	-	00 00
Bits	15...8	7...0	

You should receive the positive 'Read_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation (+)		80 81
2	Parameter_Count		00 05
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
5	-	Length	00 04
6	Data [1]	Data [2]	00 00
7	Data [3]	Data [4]	07 D0
Bits	15...8	7...0	

The parameter data are represented as follows in Motorola format (Simatic format):

Data [1] = High byte	Data [2] = Low byte	Data [3] = High byte	Data [4] = Low byte
00 hex	00 hex	07 hex	D0 hex

00 00 07 D0 hex = 2000 dec (= 2000 ms ramp)

Refer to the appendix of the 'Fieldbus Unit Profile' manual for more information about coding the drive parameters.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation		80 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 10
Bits	15...8	7...0	

The table shows the 'Value for parameter too great' return code, by way of example.

Writing a drive parameter

The 'Write' service is used for writing a drive parameter (with index ≤ 8800). All drive parameters are 4 bytes long (1 double word).

Example

Writing the ramp time 1.65 s to P130 'Ramp t11 UP CW'

Index: 8470 dec = 2116 hex

Value: 1.65 s = 1650 ms = 1650 dec = 0000 0672 hex

The parameter data are represented as follows in Motorola format (Simatic format):

Data [1] = High byte	Data [2] = Low byte	Data [3] = High byte	Data [4] = Low byte
00 hex	00 hex	06 hex	72 hex

Refer to the appendix of the 'Fieldbus Unit Profile' manual for more information about coding the drive parameters.

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 05
3	Invoke_ID	Comm._Reference	00 02
4	Index		21 16
5	Subindex	Length	00 04
6	Data [1]	Data [2]	00 00
7	Data [3]	Data [4]	06 72
Bits	15...8	7...0	

Word	Meaning		Coding (hex)
1	Message_Code = Write_Confirmation (+)		80 82
2	Parameter_Count		00 02
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
Bits	15...8	7...0	

You should receive the positive 'Write_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Write_Confirmation (-)		80 82
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 15
Bits	15...8	7...0	

The table shows the 'Value for parameter too great' return code, by way of example

Writing IPOS variables / parameters via MOVILINK®

The inverters offer special parameter access via the MOVILINK® parameter channel for universal write access to all inverter data (parameters, IPOS variables, IPOS program code, etc.). The following section illustrates the mechanism by which IPOS variables can be changed via the parameter channel.

The acyclical parameter channel can be used above 8299 dec (206B hex).

Example

Writing the value 74565 of the IPOS variable H0 = Index 11000 dec (2AF8 hex)

Value to be written = 74565 dec (0001 2345 hex)

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	32 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 01
9	Data [7]	Data [8]	23 45
Bits	15...8	7...0	

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message.

Reading IPOS variables / parameters via MOVILINK®

The inverters offer special parameter access via the MOVILINK® parameter channel for universal read access to all inverter data (parameters, IPOS variables, IPOS program code, etc.). The following section illustrates the mechanism by which IPOS variables can be read via the parameter channel. A two-stage procedure is required:

- Writing the MOVILINK parameter channel with the 'Read IPOS variable H0' job
- Reading the MOVILINK parameter channel

The MOVILINK parameter channel (acyclical) can be used above 8299 dec (206B hex).

Example

Reading the IPOS variable H0 = Index 11000 dec (2AF8 hex)

Refer to the 'Fieldbus Unit Profile' manual for a detailed description of the MOVILINK parameter channel.

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	31 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 00
9	Data [7]	Data [8]	00 00
Bits	15...8	7...0	

Once the positive 'Write_Confirmation (+)' has been received, read access takes place on the MOVILINK parameter channel; this involves reading the data into the interface module which were read during the previous read job defined by 'Write_Request'.

Word	Meaning		Coding (hex)
1	Command_Code = Read_Request		00 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	-	00 00
Bits	15...8	7...0	

You should receive the positive 'Read_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation (+)		80 81
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
5	-	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	31 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 01
9	Data [7]	Data [8]	23 45
Bits	15...8	7...0	

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation		80 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 10
Bits	15...8	7...0	

You can use the return codes for evaluating a negative message.

Writing IPOS variables / parameters using the download parameter block

MOVIDRIVE® inverters let you download the parameter block to write several IPOS variables and parameters at the same time using one PCP service.

The download parameter block is always 230 bytes long. It is possible to write up to 42 drive parameters and IPOS variables in one block.

Example

Three values of the inverter are to be written with one 'Write_Request':

Parameter/variable name	Index	Value to be written
IPOS variable H0	11000 dec (2AF8 hex)	1 dec (1 hex)
IPOS variable H1	11001 dec (2AF9 hex)	-40000 dec (FFFF63C0 hex)
P130 Ramp t11 UP CW	8470 dec (2116 hex)	1500 dec (05DC hex)

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message. The individual parameters of the download parameter block in the inverter are written one after the other. This means if there is a negative 'Write_Confirmation' in the high part of the additional code, the parameter number at which the error occurred is entered.

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count = 118 words (= 76 hex)		00 76
3	Invoke_ID	Comm._Reference	00 02
4	Index = Download parameter block		20 68
5	Subindex	Length = 230 bytes (= E6 hex)	00 E6
6	Data [1] = Reserved	Data [2] = Number of parameters	00 03
7	Data [3/4] = Index of the 1st parameter (e.g. IPOS variable H0)		2A F8
8	Data [5]	Data [6]	00 00
9	Data [7]	Data [8]	00 01
10	Data [9/10] = Index of the 1st parameter (e.g. IPOS variable H1)		2A F9
11	Data [11]	Data [12]	FF FF
12	Data [13]	Data [14]	63 C0
13	Data [15/16] = Index of the 1st parameter (P130 Ramp t11)		21 16
14	Data [17]	Data [18]	00 00
15	Data [19]	Data [20]	05 DC
...	...	...	...
Bits	15...8	7...0	

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message. The individual parameters of the download parameter block in the inverter are written one after the other. This means if there is a negative 'Write_Confirmation' in the high part of the additional code, the parameter number at which the error occurred is entered.

11 Operation and Service

11.1 MC_40A operating displays (without fieldbus)

The operational status of MOVIDRIVE® *compact* MC_40A is displayed on LED V1.

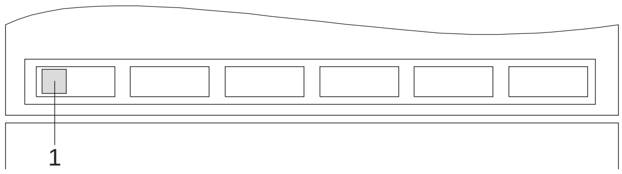


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Figure 205: MOVIDRIVE® compact MC_40A operating display

1. Operation LED V1 (three colors: green/red/yellow)

Operation LED V1 The operational states of MOVIDRIVE® *compact* MC_40A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yellow - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/yel-low	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

11.2 MC_41A (PROFIBUS-DP) operating displays

The following LEDs are on the MOVIDRIVE® *compact* MC_41A to display its operating status.

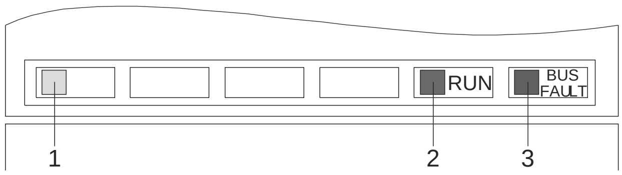

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Figure 206: MOVIDRIVE® compact MC_41A operating displays

1. Operation LED V1 (three colors: green/red/yellow)
2. PROFIBUS-DP LED 'RUN' (green)
3. PROFIBUS-DP LED 'BUS-FAULT' (red)

Operation LED V1

The operational states of MOVIDRIVE® *compact* MC_41A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/ red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/ red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yel-low - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/ yellow	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

PROFIBUS-DP LEDs

The 'RUN' LED (green) indicates that the bus electronics are operating correctly. The 'BUS FAULT' LED (red) indicates a PROFIBUS-DP fault.

RUN	BUS FAULT	Meaning
ON	**ON**	Connection to the DP master has failed, check the bus connection. Unit does not detect a baud rate, check the setting in the DP master. Bus interruption or DP master not functioning.
ON	**OFF**	Unit is currently exchanging data with the DP master (data exchange).
ON	**FLASHING**	Unit has detected the baud rate, however it is not being addressed by the DP master. Make sure the address set on the unit (P092) matches the address set in the project planning software of the DP master. Unit was not configured in DP master or configured incorrectly. Check the configuration, use the SEW_6002.GSD GSD file.
OFF	**-**	Hardware defect in the bus electronics. Switch the unit off and on again. Contact SEW Service for advice if this reoccurs.
FLASH-ING	**-**	PROFIBUS address is set higher than 125. Set address ≤ 125.

11

11.3 MCH42A operating displays (INTERBUS FO)

The following LEDs are on the MOVIDRIVE® *compact* MCH42A to display its operating status.

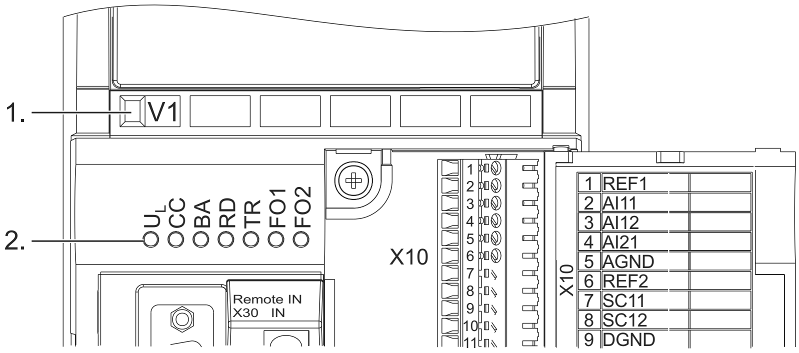

Figure 207: MOVIDRIVE® compact MCH42A operating displays

1. Operation LED V1 (three colors: green/red/yellow)
2. INTERBUS FO LEDs

Operation LED V1

The operational states of MOVIDRIVE® *compact* MCH42A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/ red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/ red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yellow - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/ yellow	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

INTERBUS FO LEDs

The INTERBUS FO LEDs display the current status of the fieldbus interface and the INTERBUS system:

U_L	Logic Voltage (green = OK)
CC	Cable Check (green = OK)
BA	Bus Active (green = OK)
RD	Remote Bus Disabled (red = OFF)
TR	Transmit (green = PCP active)
FO1	Fiber Optic 1 (yellow = not OK)
FO2	Fiber Optic 2 (yellow = not OK)

The following figure shows frequently occurring INTERBUS FO LED patterns. The meanings are described in detail in the tables below.

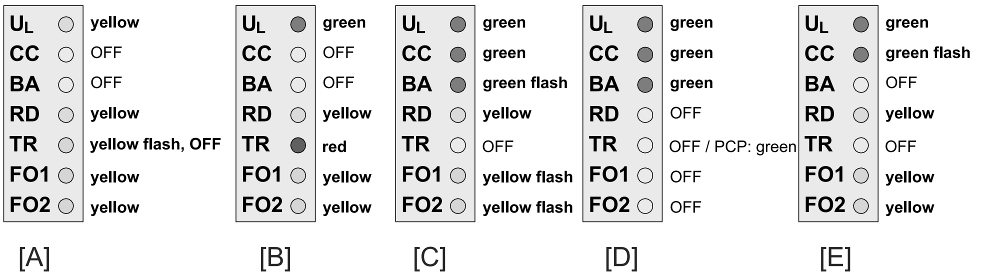

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Figure 208: Frequently occurring LED patterns

[A] Inverter power-on (INTERBUS not yet active)

[B] Incorrect DIP switch setting (INTERBUS not yet active)

[C] Initialization phase of the INTERBUS system

[D] Correct INTERBUS operation

[E] Incorrectly set baud rate

LED U_L 'U Logic' (green)

Status	Meaning	Fault rectification
On	Supply voltage applied to bus ECU	-
Off	No supply voltage for bus ECU	Check that the terminal unit is correctly seated and the 24 V_{DC} voltage supply for the inverter is present.

LED CC 'Cable Check' (green)

Status	Meaning	Fault rectification
On	Incoming remote bus connection OK	-
Off	Incoming remote bus connection not OK	Check the incoming remote bus fiber optic cable and LED FO1.

LED BA 'Bus Active' (green)

Status	Meaning	Fault rectification
On	Data transfer active on INTERBUS	-
Off	No data transfer; INTERBUS stopped	Check the incoming remote bus cable. Use the diagnostic display of the INTERBUS interface module (master) for further fault localization.

LED RD 'Remote Bus Disable' (yellow)

Status	Meaning	Fault rectification
On	Outgoing remote bus switched off	-
Off	Outgoing remote bus not switched off	-

LED FO1 'Fiber Optic 1' (yellow)

Status	Meaning	Fault rectification
On	Monitoring of the incoming fiber optic cable section. If the previous station • has an optical section diagnostic function, then the power is below the system reserve level for optical transmission • does not have an optical section diagnostic function, then the optical transmission power cannot be controlled	Check the incoming FO cable for cable quality, correct plug mounting, bending radii, etc. Use the optical diagnostic function of CMD Tool or an FO measuring instrument to localize the fault further.
Off	Incoming fiber optic section OK	-

LED FO2 'Fiber Optic 2' (yellow)

Status	Meaning	Fault rectification
On	Monitoring of the outgoing fiber optic cable section. If the next station • has an optical section diagnostic function, then the power is below the system reserve level for optical transmission • does not have an optical section diagnostic function, then the optical transmission power cannot be controlled	Check the outgoing FO cable for cable quality, correct plug mounting, bending radii, etc. Use the optical diagnostic function of CMD Tool or an FO measuring instrument to localize the fault further.
Off	Outgoing fiber optic section OK	-

LED TR 'Transmit' (green)

Status	Meaning	Fault rectification
The color of the LED TR corresponds to the INTERBUS standard.		
Off	No PCP communication	-
Green	PCP communication active or INTERBUS startup (parameter access via INTERBUS PCP channel)	-

LED TR 'Transmit' (yellow or red)

Status	Meaning	Fault rectification
When the LED TR is yellow or red, this indicates states within the system which do not occur as a rule during INTERBUS operation.		
Off or green	Normal mode (see table for TR = green)	-
Yellow Flashing	Inverter in initialization phase	-
Red Steady	Incorrect DIP switch configuration selected, no INTERBUS operation possible.	Check the settings of DIP switch S1. Correct the DIP switch settings if necessary and switch the unit on again.
Red flashing	Incorrect DIP switch configuration or INTERBUS interface defective, no INTERBUS operation possible.	Check the setting of DIP switches S1 to S6. Contact SEW Electronics Service if the setting is correct.

11.4 DBG11B keypad

Basic displays

CONTROL.INHIBIT CURRENT: 0 A	Display when X11:1 (DIØØ '/CONTROL.INHIBIT') = '0'.
NO ENABLE CURRENT: 0 A	Display when X11:1 (DIØØ '/CONTROL.INHIBIT') = '1' and inverter is not enabled ('ENABLE/RAPID STOP' = '0').
SPEED 942 rpm CURRENT: 2.51 A	Display when inverter enabled.
NOTE XX XXXXXXXXXXXXXXXXXXX	Information message
FAULT XX XXXXXXXXXXXXXXXXXXX	Fault indication

Copy function of the DBG11B

The DBG11B keypad can be used for copying parameter sets from one MOVIDRIVE® unit to other MOVIDRIVE® units. To do this, copy the parameter set onto the keypad using P807 (MD_ → DBG). Connect the keypad to another MOVIDRIVE® unit and copy the parameter set onto the MOVIDRIVE® using P806 (DBG → MD_). The keypad can be disconnected and plugged in during operation.

Not all parameters are copied with the DBG11A keypad. Use the new DBG11B keypad to ensure that all parameters are copied.

No connection between inverter and DBG11B

One of the following error messages may appear if no communication can be established with the inverter after the supply system or the 24 V_{DC} power supply is switched on and the keypad is connected.

COMMUNIC. ERROR NO SERIAL LINK	Maybe error in MOVIDRIVE® unit
ERROR WHILE COPY FLASH ERR. XX	Error in DBG11B keypad
FATAL ERROR! CODE CRC WRONG	

Try to establish the connection by disconnecting the keypad and reconnecting it. Return the unit to SEW for repair or replacement if you cannot establish the connection.

Selected via menu

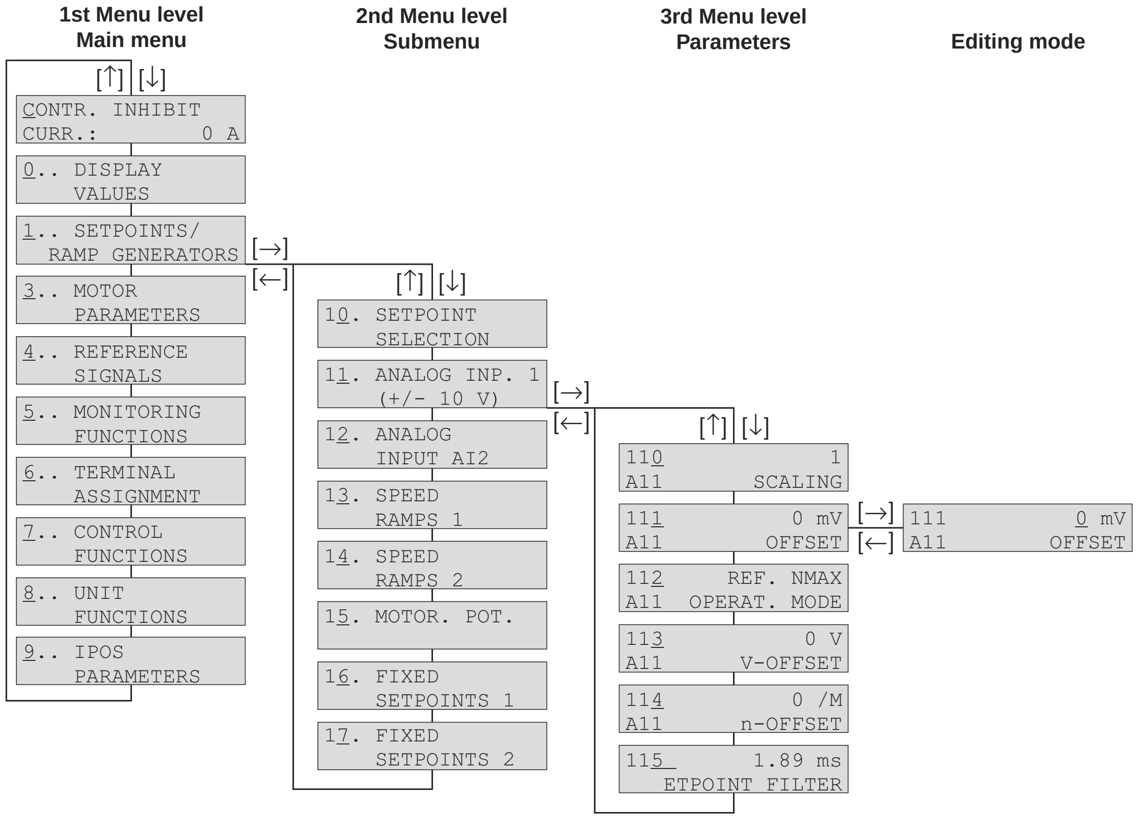

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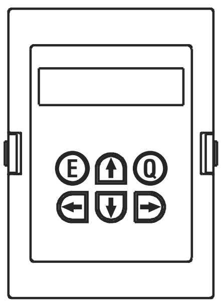
Figure 209: Menu structure



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← or → key	Change menu level, in 3rd menu level (parameter) entry to (→) or exit from (←) edit mode. The parameter can only be changed in edit mode. Startup is commenced if the ← and → keys are pressed at the same time (→ Sec. 'Startup').	
↑ or ↓ key	Select menu command, increase or decrease value in edit mode. The new value comes into effect in edit mode when the ↑ or ↓ key is released.	
Q key	Back to main display; in startup mode, cancel startup.	
E key	Startup:	Cancel startup
	Normal operation:	Signature display; the signature can only be entered or edited with MOVITOOLS/SHELL and is used for identifying the parameter set or the unit.
	Manual mode:	Exit manual mode
	Malfunction:	Call up reset parameter P840

Quick menu of the DBG11B

The DBG11B keypad has a detailed parameter menu and a clearly structured quick menu with the most frequently used parameters. It is possible to switch between both menus using P800 ('Quick menu'). This can be done in any operating status. The default setting is for the quick menu to be active. The quick menu is shown on the display by a '/' after the parameter number. The parameters in the quick menu are identified by a '/' in the parameter list.

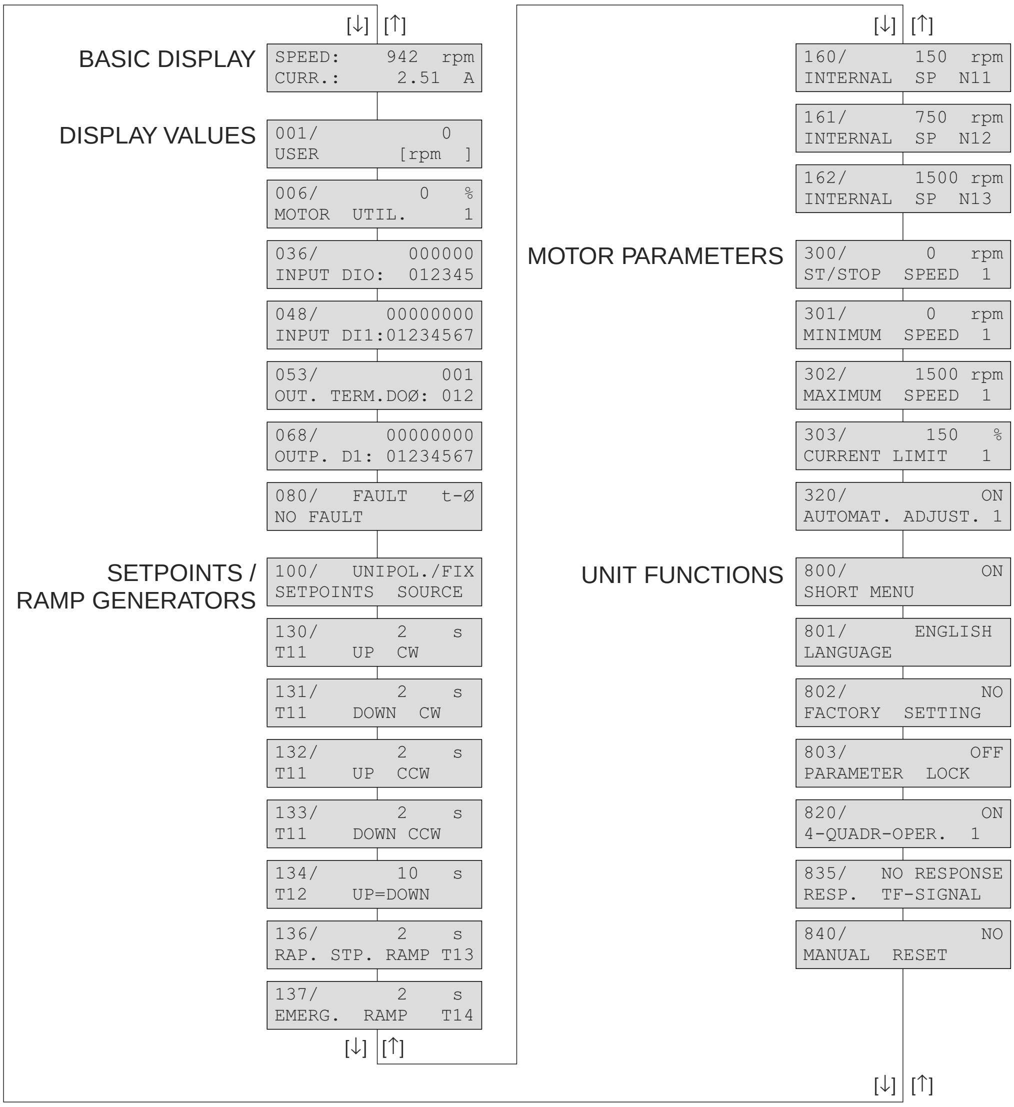

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Figure 210: DBG11B quick menu

IPOS^{plus®}

MOVITOOLS is required for programming IPOS$^{plus®}$. The DBG11B keypad only makes it possible to edit and modify IPOS$^{plus®}$ parameters (P9__).

The IPOS$^{plus®}$ program is also stored in the DBG11B keypad when it is saved. It is transferred as well when the parameter set is copied to another MOVIDRIVE® unit.

Parameter P931 can be used for starting and stopping the IPOS$^{plus®}$ program from the DBG11B keypad.

Information messages

Information messages on the DBG11B (approx. 2 s in duration) or in MOVITOOLS/SHELL (message which can be acknowledged):

No.	Text DBG11B/SHELL	Description
1	ILLEGAL INDEX	Index addressed via interface is not available.
2	NOT IMPLEMENTED	• Attempt to execute a non-implemented function. • An incorrect communication service has been selected. • Manual mode selected via impermissible interface (e.g. fieldbus).
3	READ ONLY VALUE	Attempt to edit a read only value.
4	PARAM. LOCKED	Parameter lock P803 = 'ON'. Parameter cannot be altered.
5	SETUP ACTIVE	Attempt to alter parameters during active factory setting.
6	VALUE TOO LARGE	Attempt to enter a value which is too large.
7	VALUE TOO SMALL	Attempt to enter a value which is too small.
8	REQ. PCB MISSING	The option card required for the selected function is missing.
--		
--		
11	TERMINAL ONLY	Manual mode must be completed using TERMINAL (DBG11B or USS21A).
12	NO ACCESS	Access to selected parameter refused.
13	NO CTRLER. INHIBIT	Set terminal DIØØ '/Controller inhibit' = '0' for the selected function.
14	INVALID VALUE	Attempt to enter an invalid value.
--		
16	PARAM. NOT SAVED	EEPROM buffer overrun, e.g. due to cyclical write accesses. Parameter is saved in EEPROM and is not protected against loss following POWER OFF.

11.5 Fault information

Fault memory

The fault memory (P080) stores the last five fault messages (faults t-0 t-4). The fault message of longest standing is deleted whenever more than five fault messages have occurred. The following information is stored when a malfunction takes place: Fault which occurred • Status of the binary inputs/outputs • Operational status of the inverter • Inverter status • Heat sink temperature • Speed • Output current • Active current • Unit utilization • DC link circuit voltage • ON hours • Enable hours • Parameter set • Motor utilization.

Switch-off responses

There are three switch-off responses depending on the fault; the inverter is inhibited when in fault status:

Immediate switch-off

The unit can no longer brake the drive; the output stage goes to high resistance in the event of a fault and the brake is applied immediately (DBØØ '/Brake' = '0').

Rapid stop

The drive is braked with the stop ramp t13/t23. Once the stop speed is reached (→ P300/P310), the brake is applied (DBØØ '/Brake' = '0'). The output stage goes to high-resistance after the brake reaction time has elapsed (P732 / P735).

Emergency stop

The drive is braked with the emergency ramp t14/t24. Once the stop speed is reached (→ P300/P310), the brake is applied (DBØØ '/Brake' = '0'). The output stage goes to high-resistance after the brake reaction time has elapsed (P732 / P735).

Reset

A fault message can be acknowledged by:

- Switching the supply system off and on again.

  Recommendation: Observe a minimum switch-off time of 10 s for the supply system contactor K11.
- Reset via input terminals, i.e. via an appropriately assigned binary input.
- Manual reset in SHELL (P840 = 'YES' or [Parameter] / [Manual reset]).
- Manual reset using the DBG11B (pressing the <E> key in the event of a fault gives direct access to parameter P840).

- Auto reset performs up to five unit resets with an adjustable restart time. Not to be used with drives where an automatic restart represents a risk of injury to people or damage to equipment.

Timeout active

If the inverter is controlled via a communications interface (fieldbus, RS-485 or SBus) and the power was switched off and back on again or a fault reset was performed, then the enable remains ineffective until the inverter once again receives valid data via the interface which is monitored with a timeout.

11.6 List of faults

A dot in the 'P' column means that the response is programmable (P83_ Fault response). The factory set fault response is listed in the 'Response' column.

Fault code	Name	Response	P	Possible cause	Action
00	No fault	-			
01	Over-current	Immediate switch-off		• Short circuit on output • Motor too large • Defective output stage	• Rectify the short circuit • Connect a smaller motor • Contact SEW Service for advice if the output stage is defective
03	Ground fault	Immediate switch-off		Ground fault • in the connecting harness • in the inverter • in the motor	• Eliminate ground fault • Contact SEW Service for advice
04	Brake chopper	Immediate switch-off		• Regenerative power excessive • Braking resistor circuit interrupted • Short circuit in braking resistor circuit • Excessively high braking resistance • Brake chopper defective • Possibly also ground fault	• Extend deceleration ramps • Check feeder to braking resistor • Check technical data of braking resistor • Fit a new MOVIDRIVE® if the brake chopper is defective • Check for ground fault
07	DC link overvoltage	Immediate switch-off		• DC link voltage too high • Possibly also ground fault	• Extend deceleration ramps • Check connecting harness for braking resistor • Check technical data of braking resistor • Check for ground fault
08	n-monitoring	Immediate switch-off		• Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase fault in the power system or motor. • Encoder not connected correctly or incorrect direction of rotation. • n_{max} is exceeded during torque control.	• Reduce load • Increase deceleration time setting (P501 or P503). • Check encoder connection, possibly swap over A/$\overline{A}$ and B/$\overline{B}$ in pairs • Check encoder voltage supply • Check current limitation • Extend ramps if appropriate • Check motor feeder and motor • Check supply system phases
09	Startup	Immediate switch-off		Inverter startup not yet performed for selected operating mode.	Perform startup for appropriate operating mode.
10	IPOS-ILLOP	Emergency stop		• Incorrect command detected during running of IPOS program. • Incorrect conditions during command execution. • Function not in inverter.	• Check program memory content and correct if necessary. • Load correct program into program memory. • Check program sequence (→ IPOS manual) • Use another function.
11	Overtemperature	Emergency stop		Thermal overload of inverter.	Reduce load and/or ensure adequate cooling.
13	Control signal source	Immediate switch-off		Control signal source not defined or defined incorrectly.	Set correct control signal source (P101).
14	Encoder	Immediate switch-off		• Encoder cable or shield not connected correctly • Short circuit/open circuit in encoder cable • Encoder defective	Check encoder cable and shield for correct connection, short circuit and open circuit.
15	24 V internal	Immediate switch-off		No internal 24 V supply voltage.	Check the mains connection. Contact SEW Service for advice if this reoccurs.
17-24	System fault	Immediate switch-off		Inverter electronics disrupted. Possibly due to effect of EMC.	Check ground connections and shields; improve them if necessary. Contact SEW Service for advice if this reoccurs.
25	EEPROM	Rapid stop		Fault when accessing EEPROM	Call up default setting, perform reset and set parameters again. Contact SEW Service for advice if this reoccurs.
26	External terminal	Emergency stop	•	Read in external fault signal via programmable input.	Eliminate specific cause of fault; reprogram terminal if appropriate.

Fault code	Name	Response	P	Possible cause	Action
27	Limit switches missing	Emergency stop		• Open circuit/both limit switches missing • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches. • Swap over limit switch connections. • Reprogram terminals
28	Fieldbus timeout	Rapid stop	•	No master-slave communication took place within the configured response monitoring period.	• Check master communication routine • Extend fieldbus timeout time (P819) or switch off monitoring
29	Limit switch reached	Emergency stop		Limit switch was reached in IPOS operating mode.	• Check travel range. • Correct user program.
30	Emergency stop timeout	Immediate switch-off		• Drive overloaded • Emergency stop ramp too short.	• Check project planning • Extend emergency stop ramp
31	TF sensor	No response	•	• Motor too hot, TF sensor has tripped • TF sensor of motor not connected or not connected properly • MOVIDRIVE® connection and TF connection on motor interrupted	• Let motor cool down and reset fault • Check connections/link between MOVIDRIVE® and TF. • Set P835 to 'NO RESPONSE'.
32	IPOS index overrun	Emergency stop		Basic programming rules violated causing stack overflow in system.	Check IPOS user program and correct if necessary (→ IPOS manual).
33	Setpoint source	Immediate switch-off		Setpoint source not defined or defined incorrectly	Set correct setpoint source (P100).
35	Operating mode	Immediate switch-off		Operating mode not defined or defined incorrectly	Use P700 or P701 to set correct operating mode
37	System watchdog	Immediate switch-off		Fault in system software procedure	Contact SEW Service for advice.
38	System software	Immediate switch-off		System fault	Contact SEW Service for advice.
39	Reference travel	Immediate switch-off		• Reference cam missing or does not switch • Limit switches not connected correctly • Reference travel type changed during reference travel	• Check reference cam • Check connection of limit switches • Check reference travel type setting and the parameters required for it
42	Lag error	Immediate switch-off	•	• Incremental encoder connected incorrectly • Accelerating ramps too short • P-component of positioning controller too small • Speed controller parameters set incorrectly • Value of lag error tolerance too small	• Check rotary encoder connection • Extend ramps • Set P-component to higher value • Set speed controller parameters again • Increase lag error tolerance • Check encoder, motor and mains phase wiring • Check mechanical components can move freely, possibly blocked up
43	RS-485 timeout	Rapid stop	•	Communication between inverter and PC interrupted	Check connection between inverter and PC. Contact SEW Service for advice if necessary.
44	Unit utilization	Immediate switch-off		Unit utilization (IxT value) exceeds 125 %	• Reduce power output • Extend ramps • Use a larger inverter if the specified points are not possible.
45	Initialization	Immediate switch-off		• No parameters set for EEPROM in power section or parameters set incorrectly. • Option pcb not in contact with backplane bus.	• Restore factory settings. Call SEW Service for advice if the fault still cannot be reset. • Insert the option pcb correctly.
47	System bus timeout	Rapid stop	•	Fault during communication via system bus.	Check system bus connection.
77	IPOS control word	No response		**Only in IPOS operating mode:** • Attempt was made to set an invalid automatic mode (via external control). • P916 = BUSRAMP set.	• Check serial connection to external control. • Check write values of external control. • Set P916 correctly.
78	IPOS SW limit switches	No response		**Only in IPOS operating mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check user program • Check position of software limit switches
81	Start condition	Immediate switch-off		**Only in 'VFC hoist' operating mode:** Current during premagnetization phase could not be injected into motor at a high enough level: • Motor rated power too small in relation to inverter rated power. • Motor cable cross section too small.	• Check startup data and repeat startup procedure if necessary. • Check connection between inverter and motor. • Check cross section of motor cable and increase if necessary.

Fault code	Name	Response	P	Possible cause	Action
82	Output open	Immediate switch-off		**Only in 'VFC hoist' operating mode:** • Two or all output phases interrupted. • Motor rated power too small in relation to inverter rated power.	• Check connection between inverter and motor. • Check startup data and repeat startup procedure if necessary.
84	Motor protection	Emergency stop	•	Motor utilization too high.	• Reduce load. • Extend ramps. • Observe longer pause times.
85	Copy	Immediate switch-off		Fault when copying parameters.	Check connection between inverter and PC.
87	Technology function	Immediate switch-off		Attempt made to load the parameter set for a technology version unit with the technology function activated into a standard version unit.	Activate the factory settings (P802 = YES) and perform a reset.
88	Flying start	Immediate switch-off		**Only in 'VFC n-CTRL' operating mode:** Actual speed > 5000 rpm when inverter enabled.	Enable only at actual speed ≤ 5000 rpm.
94	EEPROM checksum	Immediate switch-off		Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send the unit in for repair.
99	IPOS ramp calculation fault	Immediate switch-off		**Only in IPOS operating mode:** Attempt made to alter ramp times and traveling velocities when the inverter is enabled, with a sine or squared positioning ramp.	Rewrite the IPOS program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.

11.7 SEW electronics service

Send in for repair

Please contact the SEW electronics service if a fault cannot be rectified (→ 'Customer and spare parts service').

When contacting the SEW electronics service, please always quote the digits of your service code to enable our service personnel to assist you more effectively.

Please provide the following information if you are sending the unit in for repair:

- Serial number (→ nameplate)
- Unit designation
- Standard type or technology type
- Digits of the service code
- Brief description of the application (application, control via terminals or serial)
- Connected motor (motor type, motor voltage, ⅄ or Δ circuit)
- Nature of the fault
- Peripheral circumstances
- Your own presumption of what has happened
- Any unusual events, etc. preceding the fault

Service label

MOVIDRIVE® units have service labels attached to them; one for the power section and another for the control unit. These are located on the side next to the nameplate.

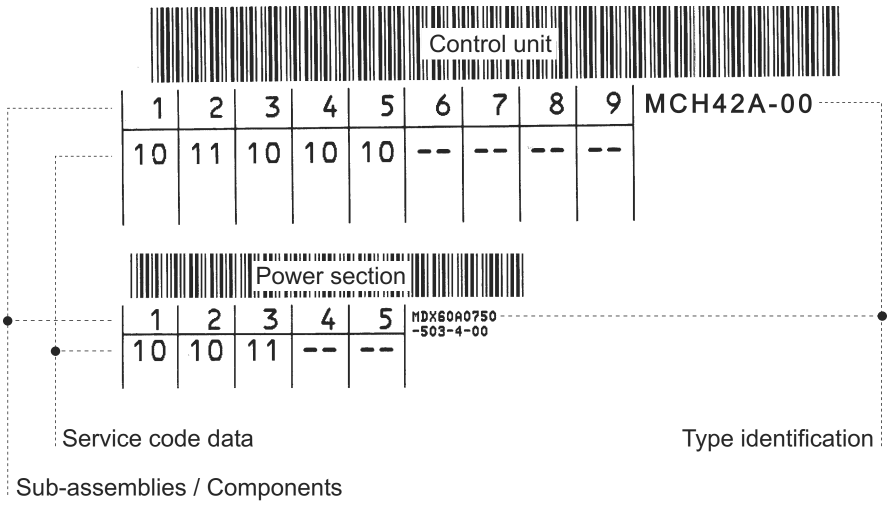

Figure 211: Service label

12 Index of Changes

This edition of the MOVIDRIVE® *compact* includes the following amendments and changes compared to the preceding edition 10/2000:

- The functionality of the MOVIDRIVE® drive inverter is represented in form of a block diagram in the seciton "System Description."
- We distinguish tow versions of the MOVIDRIVE® *compact* drive inverters. These are:
  - standard version, corresponds to the units sold so far.
  - application version, includes technology functions and application modules.
- Technology functions "Electronic Cam" and "Internal Synchronous Operation" are available with units in application version.
- Application modules for the applications "Positioning", "Winding" and "Controlling" are available with units in application version.
- The 230 V units (MOVIDRIVE® *compact* MC_4_A...-2_3) are now available with power ratings up to 30 kW (40 HP).
- New type series, i.e. MOVIDRIVE® *compact* MCH with HIPERFACE interface. You can connect asynchronous motors and synchronous motors to these MCH units in connection with HIPERFACE encoders.
- New pre-fabricated cables, e.g. for connection of CM motors and MOVIDRIVE® master-slave connection.
- New parameters:
  - P138 "Ramp limit"
  - P205 "Load precontrol"
  - P206 "Scanning time n-controller"
  - P207 "Load precontrol VFC"
  - P304 "Torque limit"
  - P96_ "IPOS Modulo function"
- The DT/DV motors from SEW are also available in JEC design. The section "Project Planning" includes a JEC motor table and motor selection tables.
- The new synchronous SEW servomotors of the CM Series can be connected to MOVIDRIVE® *compact* units. The section "Project Planning" includes a CM motor table and motor selection tables.
- The sections "Overload capacity of inverters" and "Load capacity of the units at small output frequencies" have been completely revised.

13 Abbreviation Key and Index

13.1 Abbreviation key

cosφ	Power factor of motor	
F_A	Axial force acting on the output shaft	[N]
f_{in}	Supply frequency	[Hz]
H	Installation altitude	[m ü. NN]
η	Efficiency	
I_d	Magnetizing current	[A]
I_{in}	Input current	[A]
I_F	Trip current	[A]
$I_N = I_n$	Rated current	[A]
I_q	Torque-forming current	[A]
I_{ges}	Current in total	[A]
IP..	Enclosure	
i_{tot}	Gear ratios in total	
ϑ_{Umg}	Ambient temperature	[°C]
J_{Last}	Mass moment of inertia to be driven	[10^{-4} kgm^2]
J_{Mot}	Mass moment of inertia of motor	[10^{-4} kgm^2]
J_X	Mass moment of inertia reduced to motor shaft	[10^{-4} kgm^2]
J_Z	Mass moment of inertia of heavy fan	[10^{-4} kgm^2]
k_T	Torque constant	[Nm/A]
M_a	Output torque	[Nm]
M_B	Braking torque	[Nm]
M_H/M_N	Ratio acceleration torque / rated torque motor	
M_S	Starting torque	[Nm]
n_A	Output speed	[1/min]
n_{Eck}	Base speed	[1/min]
n_E	Input speed	[1/min]
n_M	Motor speed	[1/min]
n_N	Rated speed	[1/min]
P_a	Output power	[kW]
P_e	Mathematical input power of gear unit	[kW]
P_N	Rated power	[kW]
$P_{reduziert}$	Power reduced in relation to rated power	[kW]
$P_v = P_{loss}$	Power loss	[kW]
R_{BWmin}	Minimum braking resistance value for 4Q operation	[Ω]
S.., %ED	Duty type and relative cyclic duration factor cdf	
T	Cycle duration	[min]
t1	Response time of motor brake	[10^{-3} s]
t2	Reaction time of motor brake	[10^{-3} s]
U_{in}	Supply voltage	[V]
U_N	Rated voltage	[V]
U_{out}	Output voltage	[V]
Z	Starting frequency	[1/h], [c/h]
Z_0	No-load starting frequency	[1/h], [c/h]

13

13.2 Index

13

14 Address List

Germany			
Headquarters **Production** **Sales** **Service**	**Bruchsal**	SEW-EURODRIVE GmbH & Co Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 · D-76642 Bruchsal	Tel. +49 (0) 72 51 / 75-0 Fax +49 (0) 72 51 / 75-19 70 http://www.sew-eurodrive.de sew@sew-eurodrive.de Service Electronics: Tel. +49 (0) 1 71 / 7 21 07 91 Service Gear Units and Motors: Tel. +49 (0) 1 72 / 7 60 13 77
Production	**Graben**	SEW-EURODRIVE GmbH & Co Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf P.O. Box Postfach 1220 · D-76671 Graben-Neudorf	Tel. +49 (0) 72 51 / 75-0 Fax +49 (0) 72 51 / 75-29 70 Telex 7 822 276
Assembly **Service**	**Garbsen** (near Hannover)	SEW-EURODRIVE GmbH & Co Alte Ricklinger Straße 40-42 D-30823 Garbsen P.O. Box Postfach 110453 · D-30804 Garbsen	Tel. +49 (0) 51 37 / 87 98-30 Fax +49 (0) 51 37 / 87 98-55 scm-garbsen@sew-eurodrive.de
	Kirchheim (near München)	SEW-EURODRIVE GmbH & Co Domagkstraße 5 D-85551 Kirchheim	Tel. +49 (0) 89 / 90 95 52-10 Fax +49 (0) 89 / 90 95 52-50 scm-kirchheim@sew-eurodrive.de
	Langenfeld (near Düsseldorf)	SEW-EURODRIVE GmbH & Co Siemensstraße 1 D-40764 Langenfeld	Tel. +49 (0) 21 73 / 85 07-30 Fax +49 (0) 21 73 / 85 07-55 scm-langenfeld@sew-eurodrive.de
	Meerane (near Zwickau)	SEW-EURODRIVE GmbH & Co Dänkritzer Weg 1 D-08393 Meerane	Tel. +49 (0) 37 64 / 76 06-0 Fax +49 (0) 37 64 / 76 06-30 scm-meerane@sew-eurodrive.de
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	Berlin	SEW-EURODRIVE GmbH & Co Lilienthalstraße 3a D-15732 Waltersdorf	Tel. +49 (0) 3 37 62 / 22 66 30 Fax +49 (0) 3 37 62 / 22 66 36 tb-berlin@sew-eurodrive.de
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	Erfurt	SEW-EURODRIVE GmbH & Co Blumenstraße 70 D-99092 Erfurt	Tel. +49 (0) 3 61 / 2 17 09-70 Fax +49 (0) 3 61 / 2 17 09-79 tb-erfurt@sew-eurodrive.de
	Güstrow	SEW-EURODRIVE GmbH & Co Thünenweg 19 D-18273 Güstrow P.O. Box Postfach 1216 · D-18262 Güstrow	Tel. +49 (0) 38 43 / 85 57 80 Fax +49 (0) 38 43 / 85 57 88 tb-guestrow@sew-eurodrive.de
	Hamburg	SEW-EURODRIVE GmbH & Co Wohldorfer Straße 5 D-22081 Hamburg P.O. Box Postfach 7610 07 · D-22060 Hamburg	Tel. +49 (0) 40 / 29 81 09-60 Fax +49 (0) 40 / 29 81 09-70 tb-hamburg@sew-eurodrive.de
	Hannover/Garb-sen	SEW-EURODRIVE GmbH & Co Alte Ricklinger Str.40-42 D-30823 Garbsen P.O. Box Postfach 1104 53 · D-30804 Garbsen	Tel. +49 (0) 51 37 / 87 98-10 Fax +49 (0) 51 37 / 87 98-50 tb-hannover@sew-eurodrive.de

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	Herford	SEW-EURODRIVE GmbH & Co Radewiger Straße 21 D-32052 Herford P.O. Box Postfach 4108 · D-32025 Herford	Tel. +49 (0) 52 21 / 91 41-0 Fax +49 (0) 52 21 / 91 41-20 tb-herford@sew-eurodrive.de
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	Kassel	SEW-EURODRIVE GmbH & Co Waldauer Weg 80 D-34253 Lohfelden	Tel. +49 (0) 5 61 / 9 51 44-80 Fax +49 (0) 5 61 / 9 51 44-90 tb-kassel@sew-eurodrive.de
	Koblenz	SEW-EURODRIVE GmbH & Co Bahnstraße 17a D-56743 Mendig	Tel. +49 (0) 26 52 / 97 13-30 Fax +49 (0) 26 52 / 97 13-40 tb-koblenz@sew-eurodrive.de
	Lahr	SEW-EURODRIVE GmbH & Co Europastraße 3 D-77933 Lahr / Schwarzwald	Tel. +49 (0) 78 21 / 9 09 99-60 Fax +49 (0) 78 21 / 9 09 99-79 tb-lahr@sew-eurodrive.de
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	München	SEW-EURODRIVE GmbH & Co Domagkstraße 5 D-85551 Kirchheim	Tel. +49 (0) 89 / 90 95 51-10 Fax +49 (0) 89 / 90 95 51-50 tb-muenchen@sew-eurodrive.de
	Münster	SEW-EURODRIVE GmbH & Co Von-Vincke-Straße 14 D-48143 Münster	Tel. +49 (0) 2 51 / 4 14 75-11 Fax +49 (0) 2 51 / 4 14 75-50 tb-muenster@sew-eurodrive.de
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	Ulm	SEW-EURODRIVE GmbH & Co Hauffstraße 21 D-89160 Dornstadt	Tel. +49 (0) 73 48 / 98 85-0 Fax +49 (0) 73 48 / 98 85-90 tb-ulm@sew-eurodrive.de
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	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 (0) 4 72 15 37 00 Fax + 33 (0) 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil I'Etang	Tel. +33 (0) 1 64 42 40 80 Fax +33 (0) 1 64 42 40 88
Technical Offices	**Alsace Franche-Comté**	SEW-USOCOME 51, rue de Mulhouse F-68210 Balschwiller	Tel. +33 (0) 3 89 25 91 01 Fax +33 (0) 3 89 25 91 21
	Alsace Nord	SEW-USOCOME 32, rue Jeanne d'Arc F-67250 Surbourg	Tel. +33 (0) 3 88 54 74 44 Fax +33 (0) 3 88 80 47 62
	Aquitaine	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan B.P.182 F-33607 Pessac Cedex	Tel. +33 (0) 5 57 26 39 00 Fax +33 (0) 5 57 26 39 09
	Ardennes Lorraine	SEW-USOCOME 7, rue de Prény F-54000 Nancy	Tel. +33 (0) 3 83 96 28 04 Fax +33 (0) 3 83 96 28 07
	Bourgogne	SEW-USOCOME 10, rue de la Poste F-71350 St. Loup de la Salle	Tel. +33 (0) 3 85 49 92 18 Fax +33 (0) 3 85 49 92 19
	Bretagne Ouest	SEW-USOCOME 4, rue des Châtaigniers F-44830 Brains	Tel. +33 (0) 2 51 70 54 04 Fax +33 (0) 2 51 70 54 05
	Centre Pays de Loire	SEW-USOCOME 9, rue des Erables F-37540 Saint Cyr sur Loire	Tel. +33 (0) 2 47 41 33 23 Fax +33 (0) 2 47 41 34 03
	Centre Auvergne	SEW-USOCOME 17, boulevard de la liberté F-63200 Riom	Tel. +33 (0) 4 73 64 85 60 Fax +33 (0) 4 73 64 85 61
	Champagne	SEW-USOCOME 139, rue Thiers F-10120 Saint André les Vergers	Tel. +33 (0) 3 25 79 63 24 Fax +33 (0) 3 25 79 63 25
	Lyon Nord-Est	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 (0) 4 72 15 37 03 Fax +33 (0) 4 72 15 37 15
	Lyon Ouest	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 (0) 4 72 15 37 04 Fax +33 (0) 4 72 15 37 15
	Lyon Sud-Est	SEW-USOCOME 4, Montée du Pavé F-26750 Génissieux	Tel. +33 (0) 4 75 05 65 95 Fax +33 (0) 4 75 05 65 96
	Nord	SEW-USOCOME 348, rue du Calvaire F-59213 Bermerain Cidex 102	Tel. +33 (0) 3 27 27 07 88 Fax +33 (0) 3 27 27 24 41
	Normandie	SEW-USOCOME Les Courtillages Hameau de Coupigny F-14370 Airan	Tel. +33 (0) 2 31 78 99 70 Fax +33 (0) 2 31 78 99 72

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	Paris Ouest	SEW-USOCOME 1, rue Matisse F-78960 Voisins le Bretonneux	Tel. +33 (0) 1 30 64 46 33 Fax +33 (0) 1 30 57 54 86
	Paris Picardie	SEW-USOCOME 25 bis, rue Kléber F-92300 Levallois Perret	Tel. +33 (0) 1 41 05 92 74 Fax +33 (0) 1 41 05 92 75
	Paris Sud	SEW-USOCOME 6. chemin des Bergers Lieu-dit Marchais F-91410 Roinville sous Dourdan	Tel. +33 (0) 1 60 81 10 56 Fax +33 (0) 1 60 81 10 57
	Provence	SEW-USOCOME Chemin Les Grands Vallons F-13100 St Marc Jaumegarde	Tel. +33 (0) 4 42 24 90 05 Fax +33 (0) 4 42 24 90 13
	Pyrénées	SEW-USOCOME 271, Lieu-dit Ninaut F-31190 Caujac	Tel. +33 (0) 5 61 08 15 85 Fax +33 (0) 5 61 08 16 44
	Sud-Atlantique	SEW-USOCOME 12, rue des Pinsons F-44120 Vertou	Tel. +33 (0) 2 40 80 32 23 Fax +33 (0) 2 40 80 32 13

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Argentina			
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Australia			
Assembly **Sales** **Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 (0) 3 99 33 10 00 Fax +61 (0) 3 99 33 10 03 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 (0) 2 97 25 99 00 Fax +61 (0) 2 97 25 99 05 enquires@sew-eurodirve.com.au
Technical Offices	**Adelaide**	SEW-EURODRIVE PTY. LTD. Unit 1/601 Anzac Highway Glenelg, S.A. 5045	Tel. +61 (0) 8 82 94 82 77 Fax +61 (0) 8 82 94 28 93 enquires@sew-eurodrive.com.au
	Perth	SEW-EURODRIVE PTY. LTD. 105 Robinson Avenue Belmont, W.A. 6104	Tel. +61 (0) 8 94 78 26 88 Fax +61 (0) 8 92 77 75 72 enquires@sew-eurodrive.com.au
	Brisbane	SEW-EURODRIVE PTY.LTD. 1 /34 Collinsvale St Rocklea, Queensland, 4106	Tel. +61 (0) 7 32 72 79 00 Fax +61 (0) 7 32 72 79 01 enquires@sew-eurodrive.com.au

Austria			
Assembly **Sales** **Service**	**Wien**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 A-1230 Wien	Tel. +43 (0) 16 17 55 00-0 Fax +43 (0) 16 17 55 00-30 http://sew-eurodrive.at sew@sew-eurodrive.at

Austria			
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	Graz	SEW-EURODRIVE Ges.m.b.H. Grabenstraße 231 A-8045 Graz	Tel. +43 (0) 316 68 57 56-0 Fax +43 (0) 316 68 57 55 sew@graz.sew-eurodrive.at

Bangladesh			
	Dhaka	Triangle Trade International Bldg-5, Road-2, Sec-3, Uttara Model Town Dhaka-1230 Bangladesh	Tel. +880 (0) 28 91 22 46 Fax +880 (0) 28 91 33 44

Belgium			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 (0) 10 23 13 11 Fax +32 (0) 10 2313 36 http://www.caron-vector.be info@caron-vector.be
Technical Office	**Vlaanderen**	CARON-VECTOR S.A. Industrieweg 112-114 B-9032 Gent (Wondelgem)	Tel. +32 (0) 92 27 34 52 Fax +32 (0) 92 27 41 55

Bolivia			
	La Paz	GRUPO LARCOS LTDA. Av. Jose Carrasco Not. 1398 Entre Hugo Estrada Y Av. Busch La Paz	Tel. +591 (0) 2 34 06 14 Fax +591 (0) 2 35 79 17

Brazil			
Production **Sales** **Service**	**Sao Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 50 Caixa Postal: 201-07111-970 Guarulhos - Cep.: 07251-250	Tel. +55 (0) 11 64 89 90 00 Fax +55 (0) 11 64 89 90 09 http://www.sew.com.br filial.sp@sew.com.br
	Additional addresses for service in Brazil provided on request!		

Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GMBH Bogdanovetz Str.1 BG-1606 Sofia	Tel. +359 (0) 9 29 53 25 65 Fax +359 (0) 9 29 54 93 45 bever@mbox.infotel.bg

Cameroon			
Technical Office	**Douala**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 (0) 43 22 99 Fax +237 (0) 42 77 03

Canada			
Assembly **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T3W1	Tel. +1 (0) 905 7 91-15 53 Fax +1 (0) 905 7 91-29 99 http://www.sew-eurodrive.ca l.reynolds@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1 E2	Tel. +1 (0) 604 9 46-55 35 Fax +1 (0) 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Street LaSalle, Quebec H8N 2V9	Tel. +1 (0) 514 3 67-11 24 Fax +1 (0) 514 3 67-36 77 a.peluso@sew-eurodrive.ca
	Additional addresses for service in Canada provided on request!		

Chile			
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Production **Assembly** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. +86 (0) 22 25 32 26 12 Fax +86 (0) 22 25 32 26 11 http://www.sew.com.cn
Technical Offices	**Beijing**	SEW-EURODRIVE (Tianjin) Co., LTD Room 1205/1206, Golden Corner Building, No. 129 Xuanwumen Xidajie, Xicheng District Beijing 100031	Tel. +86 (0) 10 66 41 20 26 Fax +86 (0) 10 66 41 10 17 beijing@sew.com.cn
	Chengdu	SEW-Eurodrive (Tianjin) Co. Ltd. Room 715, Sichuan International Building No. 206, Shun Cheng Avenue Chengdu 610015	Tel. +86 (0) 2 86 52 15 60 Fax +86 (0) 2 85 52 15 63 chengdu@sew.com.cn
	Fuzhou	SEW-Eurodrive (Tianjin) Co. Ltd. Unit D, 15/F, Oriental Hotel Fujian Fuzhou 350001	Tel. +86 (0) 59 17 50 75 96 Fax +86 (0) 59 17 50 72 85 fuzhou@sew.com.cn
	Guangzhou	SEW-EURODRIVE Pte.Ltd. Rm 1702, No. 138, Tiyudong Road Guangzhou, Guangdong, 510620	Tel. +86 (0) 20 38 78 00 12 Fax +86 (0) 20 38 78 00 13 guangzhou@sew.com.cn
	Jinan	SEW-Eurodrive (Tianjin) Co.Ltd. Room 2008-2009, Liang You Fu Lin Hotel No. 5, Luo Yuan Avenue Jinan 250063	Tel. +86 (0) 53 16 41 26 22 Fax +86 (0) 53 16 41 24 30 jinan@sew.com.cn
	Kunming	SEW-EURODRIVE (Tianjin) Co., Ltd Room 1401 Dong Yuan Business Building No. 464 Tuodong Road, Kunming Yunnan Province 650011	Tel. +86 (0) 87 13 11 36 77 Fax +86 (0) 87 13 15 44 54 kunming@sew.com.cn
	Nanjing	SEW-Eurodrive (Tianjing) Co.Ltd. Room 710, Jianda Plaza No. 223, North Zhongshan Road Nanjing 210009	Tel. +86 (0) 2 53 34 67 68 Fax +86 (0) 2 53 34 68 71 nanjing@sew.com.cn
	Shanghai	SEW-EURODRIVE (TIANJIN) CO., Ltd 16/F, E Block, Jinxuan Building No. 238 South Dandong Road Xuhui District Shanghai 200030	Tel. +86 (0) 21 64 69 35 34 Fax +86 (0) 21 64 69 55 32 shanghai@sew.com.cn
	Shenyang	SEW-EURODRIVE (Tianjin) Co., Ltd Shenyang OfficeRoom 0605 Koh Brother Building No. 21 Beijing Street Shenhe District Shenyang City, 110013	Tel. +86 (0) 24 22 52 15 96 Fax +86 (0) 24 22 52 15 79 shenyang@sew.com.cn
	Wuhan	SEW-Eurodrive (Tianjin) Co.Ltd. Room 911, Tai He Plaza Wusheng Road Wuhan 430033	Tel. +86 (0) 27 85 71 22 93 Fax +86 (0) 27 85 71 22 82 wuhan@sew.com.cn
	Xian	SEW-EURODRIVE (TIANJIN) CO., Ltd Rm 611, Fan Mei Building No. 1 Nan Guan Main Street Xian 710068, Shanxi Province	Tel. +86 (0) 2 97 81 13 27 Fax +86 (0) 2 97 81 13 27 xian@sew.com.cn

Colombia			
Assembly **Sales** **Service**	**Bogotá**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 (0) 5715 47 50 50 Fax +57 (0) 5715 47 50 44 sewcol@andinet.com

Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. PIT Erdödy 4 II HR 10 000 Zagreb	Tel. +385 (0) 14 61 31 58 Fax +385 (0) 14 61 31 58 kompeks@net.hr

Czech Republic			
Sales	**Praha**	SEW-EURODRIVE CZ S.R.O. Business Centrum Praha Luná 591 CZ-16000 Praha 6 - Vokovice	Tel. +420 (0) 2 20 12 12 34 + 2 20 12 12 36 Fax +420 (0) 2 20 12 12 37 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
Technical Offices	**Brno**	SEW-EURODRIVE CZ S.R.O. Zvonarka 16 CZ-61700 Brno	Tel. +420 (0) 5 43 25 61 51 + 5 43 25 61 63 Fax +420 (0) 5 43 25 68 45
	Hradec Kralove	SEW-EURODRIVE CZ S.R.O. Technicka Kancelar - vychodni Cechy Smermova CZ-53374 Horni Jeleni	Tel. +420 (0) 6 02 41 03 88 Fax +420 (0) 4 56 89 36 34

Denmark			
Assembly **Sales** **Service**	**Kopenhagen**	SEW-EURODRIVEA/S Geminivej 28-30, P.O. Box 100 DK-2670 Greve	Tel. +45 (0) 43 95 8500 Fax +45 (0) 43 95 8509 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Technical Offices	**Aarhus**	SEW-EURODRIVEA/S Birkenhaven 45 DK-8520 Lystrup	Tel. +45 (0) 86 22 8344 Fax +45 (0) 86 22 8490
	Helsingør	SEW-EURODRIVEA/S Rømøvej 2 DK-3140 Ålsgårde	Tel. +45 (0) 49 75 5700 Fax +45 (0) 49 75 5800
	Odense	SEW-EURODRIVEA/S Lindelyvei 29, Nr. Søby DK-5792 Arslev	Tel. +45 (0) 65 90 2070 Fax +45 (0) 65 90 2309

Egypt			
	Cairo	Copam Egypt for Engineering & Agencies 33 El Hegaz ST, Heliopolis, Cairo	Tel. +20 (0) 22 56 62 99 + 22 41 06 39 Fax +20 (0) 22 59 47 57 + 22 40 47 87 copam@datum.com.eg

Estonia			
Sales	**Tallin**	ALAS-KUUL AS Paldiski mnt.125 EE 0006 Tallin	Tel. +372 (0) 6 59 32 30 Fax +372 (0) 6 59 32 31

Finland			
Assembly **Sales** **Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 (0) 3 589 300 Fax +358 (0) 3 780 6211 http://www.sew-eurodrive.fi sew@sew-eurodrive.fi
Technical Offices	**Helsinki**	SEW-EURODRIVE OY Luutnantinaukio 5C LT2 FIN-00410 Helsinki	Tel. +358 (0) 3 589 300 Fax + 358 (0) 9 566 6311
	Vaasa	SEW-EURODRIVE OY Kauppapuistikko 15 A FIN-65100 Vaasa	Tel. +358 (0) 3 589 300 Fax +358 (0) 6 312 7470

Gabon			
Technical Office	**Libreville**	Electro-Services B.P. 1889 Libreville	Tel. +241 (0) 73 40 11 Fax +241 (0) 73 40 12

Great Britain			
Assembly **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 (0) 19 24 89 38 55 Fax +44 (0) 19 24 89 37 02 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Technical Offices	**London**	SEW-EURODRIVE Ltd. 764 Finchely Road, Temple Fortune GB-London N.W.11 7TH	Tel. +44 (0) 20 84 58 89 49 Fax +44 (0) 20 84 58 74 17
	Midlands	SEW-EURODRIVE Ltd. 5 Sugar Brook court, Aston Road, Bromsgrove, Worcs B60 3EX	Tel. +44 (0) 15 27 87 73 19 Fax +44 (0) 15 27 57 52 45
	Scotland	SEW-EURODRIVE Ltd. Scottish Office No 37 Enterprise House Springkerse Business Park GB-Stirling FK7 7UF Scotland	Tel. +44 (0) 17 86 47 87 30 Fax +44 (0) 17 86 45 02 23

Greece			
Sales **Service**	**Athen**	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 (0) 1 04 22 51 34 Fax +30 (0) 1 04 22 51 59 http://www.boznos.gr Boznos@otenet.gr
Technical Office	**Thessaloniki**	Christ. Boznos & Son S.A. Maiandrou 15 562 24 Evosmos, Thessaloniki	Tel. +30 (0) 3 10 70 54 00 Fax +30 (0) 3 10 70 55 15

Hong Kong			
Assembly **Sales** **Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 (0) 2-7 96 04 77 + 79 60 46 54 Fax +852 (0) 2-7 95-91 29 sew@sewhk.com

Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. H-1037 Budapest Kunigunda u. 18	Tel. +36 (0) 1 437 06 58 Fax +36 (0) 1 437 06 50 sew-eurodrive.voros@matarnet.hu

Iceland			
	Hafnarfirdi	VARMAVERK ehf Dalshrauni 5 IS - 220 Hafnarfirdi	Tel. +354 (0) 5 65 17 50 Fax +354 (0) 5 65 19 51 varmaverk@varmaverk.is

India			
Assembly **Sales** **Service**	**Baroda**	SEW-EURODRIVE India Pvt. Ltd. Plot No. 4, Gidc Por Ramangamdi · Baroda - 391 243 Gujarat	Tel. +91 (0) 265-83 10 86 Fax +91 (0) 265-83 10 87 sew.baroda@gecsl.com
Technical Offices	**Calcutta**	SEW EURODRIVE INDIA PVT. LTD. Juthika Apartment, Flat No. B1 11/1, Sunny Park Calcutta - 700 019	Tel. +91 (0) 33-4 85 39 18 Fax +91 (0) 33-4 85 38 26 sewcal@cal.vsnl.net.in
	Chennai	SEW-EURODRIVE India Private Limited 2nd Floor, Hariram Building Chennai - 600 006, Tamil Nadu	Tel. +91 (0) 44-8 21 44 71 Fax +91 (0) 44-8 21 44 73
	New Delhi	SEW-EURODRIVE India Private Limited 303 Kirti Deep, 2-Nangal Raya Business Centre New Delhi 110 046	Tel. +91 (0) 11-5 61 15 66 Fax +91 (0) 11-5 51 34 94
	Pune	SEW-EURODRIVE India Private Limited 206, Metro House 7 Mangaldas Road Pune 411001, Maharashtra	Tel. +91 (0) 20 60 10 54 Fax +91 (0) 20 63 13 65 sewpun@pn2.vsnl.net.in

Indonesia			
Technical Office	**Jakarta**	SEW-EURODRIVE Pte Ltd. Jakarta Liaison Office, Menara Graha Kencana Jl. Perjuangan No. 88, LT 3 B, Kebun Jeruk, Jakarta 11530	Tel. +62 (0) 21 535-90 66/7 Fax +62 (0) 21 536-36 86

Ireland			
Sales **Service**	**Dublin**	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 (0) 18 30 62 77 Fax +353 (0) 18 30 64 58

Israel			
	Tel-Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 (0) 3-5 59 95 11 Fax +972 (0) 3-5 59 95 12 lirazhandasa@barak-online.net

Italy			
Assembly **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 (0) 2 96 98 01 Fax +39 (0) 2 96 79 97 81 sewit@sew-eurodrive.it
Technical Offices	**Bologna**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Emilia,172 I-40064 Ozzano dell'Emilia (Bo)	Tel. +39 (0) 51 79 66 60 Fax +39 (0) 51 79 65 95
	Caserta	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Carlo III-Parco Matilde A I-81020 S. Nicola la Strada (Caserta)	Tel. +39 (0) 8 23 45 06 11 Fax +39 (0) 8 23 42 14 14
	Firenze	RIMA Via Einstein, 14 I-50013 Campi Bisenzio (Firenze)	Tel. +39 (0) 5 58 98 58 21 /-22 Fax +39 (0) 5 58 98 58 30
	Roma	Elettromec Via Castel Rosso, 10 I-00144 Roma	Tel. +39 (0) 65 92 45 30 Fax +39 (0) 65 92 45 30
	Torino	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Corso G. Ferraris,146 I-10129 Torino	Tel. +39 (0) 1 13 18 66 06 Fax +39 (0) 1 13 19 0115
	Verona	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via P. Sgulmero, 27/A I-37132 Verona	Tel. +39 (0) 45 97 77 22 Fax +39 (0) 45 97 60 79

Ivory Coast			
Technical Office	**Abidjan**	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 (0) 25 79 44 Fax +225 (0) 25 84 36

Japan			
Assembly **Sales** **Service**	**Toyoda-cho**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Toyoda-cho, Iwata gun Shizuoka prefecture, 438-0818	Tel. +81 (0) 53 83 7 3811-13 Fax +81 (0) 53 83 7 3814 sewjapan@lilac.ocn.ne.jp
Technical Offices	**Fukuoka**	SEW-EURODRIVE JAPAN CO., LTD. C-go, 5th-floor, Yakuin-Hiruzu-Bldg. 1-5-11, Yakuin, Chuo-ku Fukuoka, 810-0022	Tel. +81 (0) 92 713 69 55 Fax +81 (0) 92 713 68 60 sewkyushu@jasmine.ocn.ne.jp
	Osaka	SEW-EURODRIVE JAPAN CO., LTD. B-Space EIRAI Bldg., 3rd Floor 1-6-9 Kyoumachibori, Nishi-ku, Osaka, 550-0003	Tel. +81 (0) 6 64 44-83 30 Fax +81 (0) 6 64 44-83 38 sewosaka@crocus.ocn.ne.jp
	Tokyo	SEW-EURODRIVE JAPAN CO., LTD. Izumi-Bldg. 5 F 3-2-15 Misaki-cho Chiyoda-ku, Tokyo 101-0061	Tel. +81 (0) 3 32 39-04 69 Fax +81 (0) 3 32 39-09 43 sewtokyo@basil.ocn.ne.jp

Korea			
Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate Unit 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 (0) 3 14 92-80 51 Fax +82 (0) 3 14 92-80 56 master@sew-korea.co.kr
Technical Offices	**Busan**	SEW-EURODRIVE KOREA Co., Ltd. No. 407, Samjoo officetel. 116-7, Kamjun-2-dong, Sasang-ku Busan 617-724	Tel. +82 (0) 5 13 13 48 04 Fax +82 (0) 5 13 13 48 05 sewpu2@channeli.net
	Daegu	SEW-EURODRIVE KOREA Co., Ltd. No.1108 Sungan officete I 87-36, Duryu 2-dong, Dalseo-ku Daegu 704-712	Tel. +82 (0) 5 36 50-7111 Fax +82 (0) 5 36 50-7112 sewdaegu@netsgo.com
	DaeJeon	SEW-Eurodrive KOREA Co., Ltd. No. 2017, Hongin offictel 536-9, Bongmyung-dong, Yusung-ku Daejeon 305-710	Tel. +82 (0) 4 28 28-64 61 Fax +82 (0) 4 28 28-64 63 sewdaejeon@netsgo.com
	Kwangju	SEW-EURODRIVE KOREA Co., Ltd. 4fl., Shinhyun B/D 96-16 Unam-dong, Buk-ku Kwangju 500-170	Tel. +82 (0) 62 511-9172 Fax +82 (0) 62 511-9174 sewkwangju@netsgo.com
	Seoul	SEW-EURODRIVE KOREA Co., Ltd. No.1104 Sunkyung officetel 106-4 Kuro 6-dong, Kuro-ku Seoul 152-056	Tel. +82 (0) 28 62-80 51 Fax +82 (0) 28 62-81 99 sewseoul@netsgo.com

Lebanon			
Technical Office	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 (0) 1 49 47 86 +961 (0) 1 49 82 72 +961 (0) 3 27 45 39 Fax +961 (0) 1 49 49 71 gacar@beirut.com

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +352 (0) 10 23 13 11 Fax +352 (0) 10 2313 36 http://www.caron-vector.be info@caron-vector.be

Macedonia			
Sales	**Skopje**	SGS-Skopje / Macedonia "Teodosij Sinactaski" 66 91000 Skopje / Macedonia	Tel. +389 (0) 9 91 38 43 90 Fax +389 (0) 9 91 38 43 90 sgs@mol.com.mk

Malaysia			
Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 (0) 73 54 57 07 + 73 54 94 09 Fax +60 (0) 73 5414 04 kchtan@pd.jaring.my
Technical Offices	**Kota Kinabalu**	SEW-EURODRIVE Sdn Bhd (Kota Kinabalu Branch) Lot No. 2,1st Floor, Inanam Baru Phase III, Miles 5.1 /2, Jalan Tuaran, Inanam 89350 Kota Kinabalu Sabah, Malaysia	Tel. +60 (0) 88-42 47 92 Fax +60 (0) 88-42 48 07
	Kuala Lumpur	SEW-EURODRIVE Sdn. Bhd. No. 2, Jalan Anggerik Mokara 31/46 Kota Kemuning Seksyen 31 40460 Shah Alam Selangor Darul Ehsan	Tel. +60 (0) 35 22 96 33 Fax +60 (0) 35 22 96 22 sewpjy@po.jaring.my
	Penang	SEW-EURODRIVE Sdn. Bhd. No. 38, Jalan Bawal Kimsar Garden 13700 Prai, Penang	Tel. +60 (0) 43 99 93 49 + 43 99 98 35 Fax +60 (0) 43 99 93 48 seweurodrive@po.jaring.my

Mexico			
	Tultitlan	SEW-EURODRIVE, Sales and Distribution, S.A.de C.V. Boulevard Tultitlan Oriente #2 "G" Colonia Ex-Rancho de Santiaguito Tultitlan, Estado de Mexico, Mexico 54900	Tel. +52 (0) 55 58 88 29 76 Fax +52 (0) 55 58 88 29 77 scmexico@seweurodrive.com.mx
Morocco			
Technical Office	**Casablanca**	S. R. M. Société de Réalisations Mécaniques 5, rue Emir Abdelkader 05 Casablanca	Tel. +212 (0) 2 61 86 69 + 61 86 70 + 61 86 71 Fax +212 (0) 2 62 15 88 srm@marocnet.net.ma
Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 (0) 10 44 63 700 Fax +31 (0) 10 41 55 552 http://www.vector-aandrijftechniek.nl info@vector.nu
New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 (0) 9-2 74 56 27 Fax +64 (0) 9-2 74 01 65 sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 (0) 3-3 84 62 51 Fax +64 (0) 3-3 85 64 55 sales@sew-eurodrive.co.nz
Technical Office	**Palmerston North**	SEW-EURODRIVE NEW ZEALAND LTD. C/-Grant Shearman, RD 5, Aronui Road Palmerston North	Tel. +64 (0) 6-3 55 21 65 Fax +64 (0) 6-3 55 23 16 sales@sew-eurodrive.co.nz
Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 (0) 69 2410 20 Fax +47 (0) 69 2410 40 sew@sew-eurodrive.no
Pakistan			
Technical Office	**Karachi**	SEW-EURODRIVE Pte. Ltd. Karachi Liaison Office A/3,1 st Floor, Central Commercial Area Sultan Ahmed Shah Road Block7/8, K.C.H.S. Union Ltd., Karachi	Tel. +92 (0) 92-21-43 93 69 Fax +92 (0) 92-21-43 73 65
Paraguay			
	Asunción	EQUIS S. R. L. Avda. Madame Lynchy y Sucre Asunción	Tel. +595 (0) 21 67 21 48 Fax +595 (0) 21 67 21 50
Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos # 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 (0) 511 349-52 80 Fax +51 (0) 511 349-30 02 sewperu@terra.com.pe
Philippines			
Technical Office	**Manila**	SEW-EURODRIVE Pte Ltd Manila Liaison Office Suite 110, Ground Floor Comfoods Building Senator Gil Puyat Avenue 1200 Makati City	Tel. +63 (0) 2-8 94 27 52 54 Fax +63 (0) 2-8 94 27 44 sewmla@i-next.net

Poland			
Sales	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 3/5 PL-92-519 Lodz	Tel. +48 (0) 4 26 77 10 90 Fax +48 (0) 4 26 77 10 99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
Technical Office	**Katowice**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Nad Jeziorem 87 PL-43-100 Tychy	Tel. +48 (0) 3 22 17 50 26 + 3 22 17 50 27 Fax +48 (0) 3 22 27 79 10 + 3 22 17 74 68 + 3 22 17 50 26 + 3 22 17 50 27
	Bydgoszcz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Fordonska 246 PL-85-959 Bydgoszcz	Tel. +48 (0) 5 23 60 65 90 Fax +48 (0) 5 23 60 65 91
	Szczecinek	SEW-EURODRIVE Polska Sp.z.o.o. ul. Mickiewicza 2 pok. 36 PL-78-400 Szczecinek	Tel. +48 (0) 9 43 72 88 20 Fax +48 (0) 5 23 72 88 21

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 (0) 2 31 20 96 70 Fax +351 (0) 2 31 20 36 85 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Technical Offices	**Lisboa**	Tertir Edificio Lisboa Gabinete 119 P-2615 Alverca do Ribatejo	Tel. +351 (0) 2 19 58 01 98 Fax +351 (0) 2 19 58 02 45 esc.lisboa@sew-eurodrive.pt
	Porto	AV. D. AFONSO HENRIQUES, 1196-9° Sala 909 - Edificio Acia P- 4450 Matosinhos	Tel. +351 (0) 2 29 35 03 83 Fax +351 (0) 2 29 35 03 84 MobilTel. +351 (0) 9 33 2 55 91 10 esc.porto@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucuresti**	Sialco Trading SRL str. Madrid nr.4 71222 Bucuresti	Tel. +40 (0) 2 12 30 13 28 Fax +40 (0) 2 12 30 71 70 sialco@sialco.ro

Russia			
Sales	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 263 RUS-195220 St. Petersburg	Tel. +7 (0) 812 5 35 71 42 + 812 5 35 04 30 Fax +7 (0) 812 5 35 22 87 sew@sew-eurodrive.ru
Technical Office	**Moskau**	ZAO SEW-EURODRIVE RUS-113813 Moskau	Tel. +7 (0) 9 52 38 76 11 Fax +7 (0) 9 52 38 04 22

Senegal			
Technical Office	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 (0) 849 47 70 Fax +221 (0) 849 47 71 senemeca@sentoo.sn

Singapore			
Assembly **Sales** **Service**		SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 (0) 68 62 17 01 ... 17 05 Fax +65 (0) 68 61 28 27 Telex 38 659 sales@sew-eurodrive.com.sg

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO – 3000 Celje	Tel. +386 (0) 3 490 83 20 Fax +386 (0) 3 490 83 21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. + 27 (0) 11 248 70 00 Fax +27 (0) 11 494 23 11 ljansen@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 (0) 21 552 98 20 Fax +27 (0) 21 552 98 30 Telex 576 062 dswanepoel@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 (0) 31 700 34 51 Fax +27 (0) 31 700 38 47 dtait@sew.co.za
Technical Offices	**Nelspruit**	SEW-EURODRIVE (PTY) LTD. 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 (0) 13 752 80 07 Fax +27 (0) 13 752 80 08 robermeyer@sew.co.za
	Port Elizabeth	SEW-EURODRIVE PTY LTD. 5 b Linsay Road Neave Township 6000 Port Elizabeth	Tel. +27 (0) 41 453 03 03 Fax +27 (0) 41 453 03 05 dswanepoel@sew.co.za
	Richards Bay	SEW-EURODRIVE PTY LTD. 25 Eagle Industrial Park Alton Richards Bay P.O. Box 458 Richards Bay 3900	Tel. +27 (0) 35 797 38 05 Fax +27 (0) 35 797 38 19 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 (0) 9 44 31 84 70 Fax +34 (0) 9 44 31 84 71 sew.spain@sew-eurodrive.es
Technical Offices	**Barcelona**	Delegación Barcelona Avenida Francesc Maciá 40-44 Oficina 3.1 E-08206 Sabadell (Barcelona)	Tel. +34 (0) 9 37 16 22 00 Fax +34 (0) 9 37 23 30 07
	Lugo	Delegación Noroeste Apartado, 1003 E-27080 Lugo	Tel. +34 (0) 6 39 40 33 48 Fax +34 (0) 9 82 20 29 34
	Madrid	Delegación Madrid Gran Via. 48-2° A-D E-28220 Majadahonda (Madrid)	Tel. +34 (0) 9 16 34 22 50 Fax +34 (0) 9 16 34 08 99

Sri Lanka			
	Colombo 4	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 (0) 941-59 79 49 Fax +94 (0) 941-58 29 81

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 (0) 36 34 42 00 Fax +46 (0) 36 34 42 80 http://www.sew-eurodrive.se info@sew-eurodrive.se

Sweden			
Technical Offices	**Göteborg**	SEW-EURODRIVE AB Gustaf Werners gata 8 S-42131 Västra Frölunda	Tel. +46 (0) 3 17 09 68 80 Fax +46 (0) 3 17 09 68 93
	Malmö	SEW-EURODRIVE AB Borrgatan 5 S-21124 Malmö	Tel. +46 (0) 4 06 80 64 80 Fax +46 (0) 4 06 80 64 93
	Stockholm	SEW-EURODRIVE AB Björkholmsvägen 10 S-14125 Huddinge	Tel. +46 (0) 84 49 86 80 Fax +46 (0) 84 49 86 93
	Skellefteå	SEW-EURODRIVE AB Trädgårdsgatan 8 S-93131 Skellefteå	Tel. +46 (0) 9 10 71 53 80 Fax +46 (0) 9 10 71 53 93

Switzerland			
Assembly Sales Service	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 (0) 6 14 17 17 17 Fax +41 (0) 6 14 17 17 00 http://www.imhof-sew.ch info@imhof-sew.ch
Technical Offices	**Suisse romande**	André Gerber Es Perreyres 1436 Chamblon	Tel. +41 (0) 2 44 45 38 50 Fax +41 (0) 2 44 45 48 87
	Bern	Rudolf Bühler Allerheiligenstraße 97d 2540 Grenchen	Tel. +41 (0) 3 26 52 23 39 Fax +41 (0) 3 26 52 23 31
	Luzern	Beat Lütolf Baumacher 11 6244 Nebikon	Tel. +41 (0) 6 27 56 47 80 Fax +41 (0) 6 27 56 47 86
	Zürich	René Rothenbühler Nörgelbach 7 8493 Saland	Tel. +41 (0) 5 23 86 31 50 Fax +41 (0) 5 23 86 3213

Taiwan (R.O.C.)			
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 (0) 49-255-353 Fax +886 (0) 49-257-878
	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Hwa South Road, Taipei	Tel. +886 (0) 27 38 35 35 Fax +886 (0) 27 36 82 68 Telex 27 245 nestnet@ms6.hinet.net

Thailand			
Assembly Sales Service	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, Moo.7, Tambol Donhuaroh Muang District Chon Buri 20000	Tel. +66 (0) 38 21 40 22 Fax +66 (0) 38 21 45 31 sewthailand@sew-eurodrive.co.th
Technical Offices	**Bangkok**	SEW-EURODRIVE PTE LTD Bangkok Liaison Office TPS Building, Room No. 5/4 1023, Phattanakarn Road Klongtan, Phrakanong, Bangkok,10110	Tel. +66 (0) 2717 81 51 Fax +66 (0) 2717 81 52 sewthailand@sew-eurodrive.co.th
	Hadyai	SEW-EURODRIVE (Thailand) Ltd. Hadyai Country Home Condominium 59/101 Soi.17/1 Rachas-Utid Road. Hadyai, Songkhla 90110	Tel. +66 (0) 74-35 94 41 Fax +66 (0) 74-35 94 42 sewhdy@ksc.th.com
	Khonkaen	SEW-EURODRIVE (Thailand) Ltd. 4th Floor, Kaow-U-HA MOTOR Bldg, 359/2, Mitraphab Road. Muang District Khonkaen 40000	Tel. +66 (0) 43-22 57 45 Fax +66 (0) 43-32 48 71 sewkk@cscoms.com
	Lampang	SEW-EURODRIVE (Thailand) Ltd. 264 Chatchai Road, sub-tuy, Muang, Lampang 52100	Tel. +66 (0) 54-31 02 41 Fax +66 (0) 54-31 02 42 sewthailand@sew-eurodrive.co.th

Tunisia			
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Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri Sirketi Bagdat Cad. Koruma Cikmazi No. 3 TR-81540 Maltepe ISTANBUL	Tel. +90 (0) 216 4 41 91 63 + 216 4 41 91 64 + 216 3 83 80 14 Fax +90 (0) 216 3 05 58 67 seweurodrive@superonline.com.tr
Technical Offices	**Ankara**	SEW-EURODRIVE Hareket Sistemleri Sirketi Ehlibeyt Mah. Ceyhun Atif Kansu Cad. 12. Sok. Tepe Apt. No. 7/12 TR-06520 Balgat-Ankara	Tel. +90 (0) 312 286 80 14 Fax +90 (0) 312 286 80 15
	Izmir	SEW-EURODRIVE Hareket Sistemleri Ticaret Ltd. Sirketi 1203/11 Sok. No. 4/613 Hasan Atli Is Merkezi TR-35110 Yenisehir-Izmir	Tel. +90 (0) 232 4 69 62 64 Fax +90 (0) 232 4 33 61 05

Uruguay			
	Montevideo	SEW-EURODRIVE S. A. Sucursal Uruguay German Barbato 1526 CP 11200 Montevideo	Tel. +598 (0) 2 9018 189 Fax +598 (0) 2 9018 188 sewuy@sew-eurodrive.com.uy

USA			
Production **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 (0) 864 4 39 75 37 Fax Sales +1 (0) 864 439-78 30 Fax Manuf. +1 (0) 864 4 39-99 48 Fax Ass. +1 (0) 864 4 39-05 66 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, California 94544-7101	Tel. +1 (0) 510 4 87-35 60 Fax +1 (0) 510 4 87-63 81 cshayward@seweurodrive.com
	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 200 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 (0) 856 4 67-22 77 Fax +1 (0) 856 8 45-31 79 csbridgeport@seweurodrive.com
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 (0) 9 37 3 35-00 36 Fax +1 (0) 9 37 4 40-37 99 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 (0) 214 3 30-48 24 Fax +1 (0) 214 3 30-47 24 csdallas@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 (0) 241 8 32 98 04 Fax +58 (0) 241 8 38 62 75 sewventas@cantv.net sewfinanzas@cantv.net

MCF/MCV/MCS4_A: Control unit connection

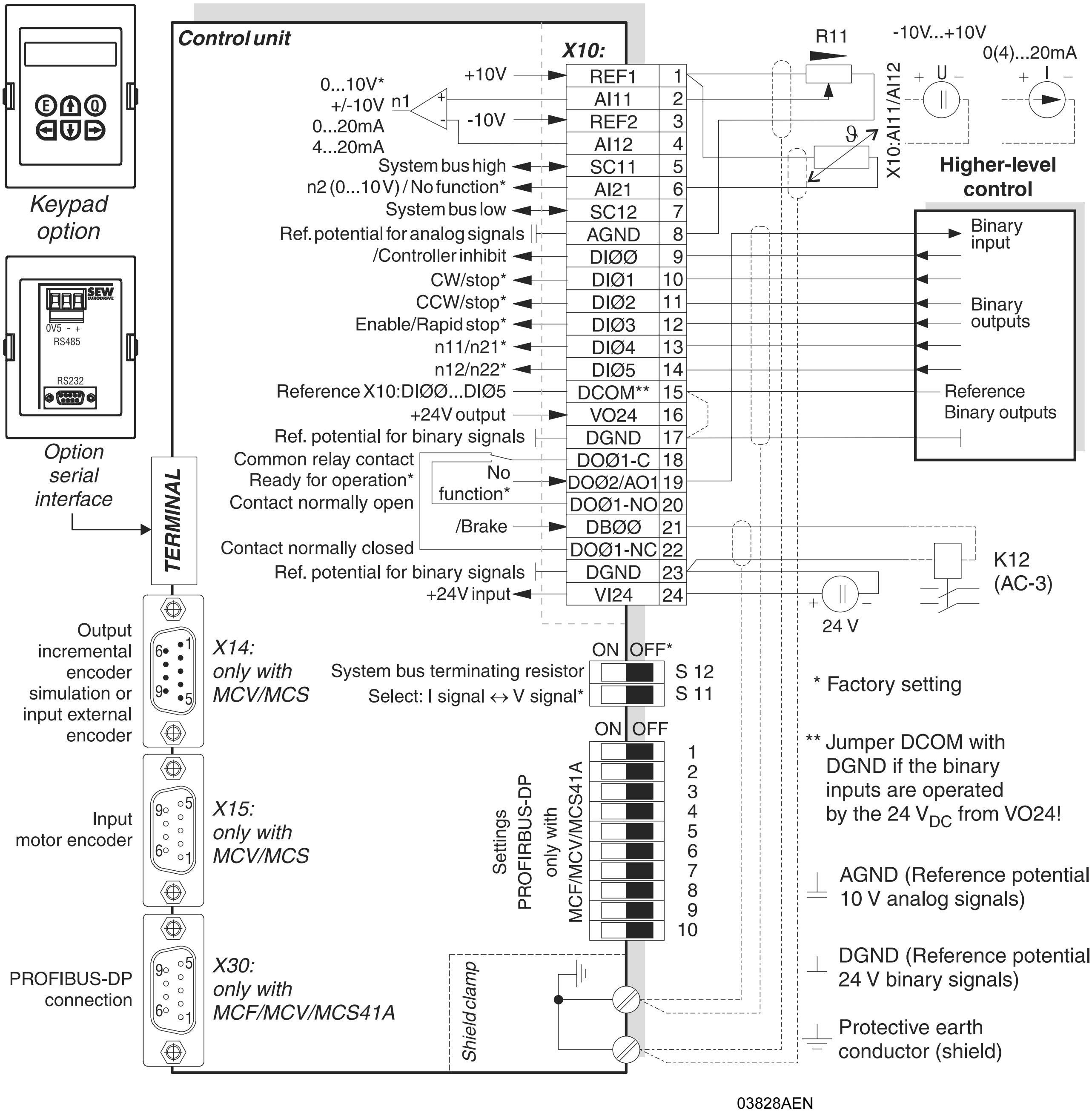


Figure 212: Wiring diagram for MCF/MCV/MCS4_A control unit

- **MCF/MCV/MCS41A (with PROFIBUS-DP):** SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
- Analog input AI21 (X10:6) can be used either as a 10 V voltage input or as a TF/TH input. You can change the setting by using parameter P120.
- DIP switches S11, S12 and 1...10 can only be accessed once the connection unit has been removed.
- The TF/TH line must either be shielded or routed at a distance of at least 0.2 m (8 in) from power cables (e.g. motor or brake cables). The TF/TH line must be shielded separately if hybrid cables are used for the motor and TF/TH connection.

MCH4_A: Control unit connection

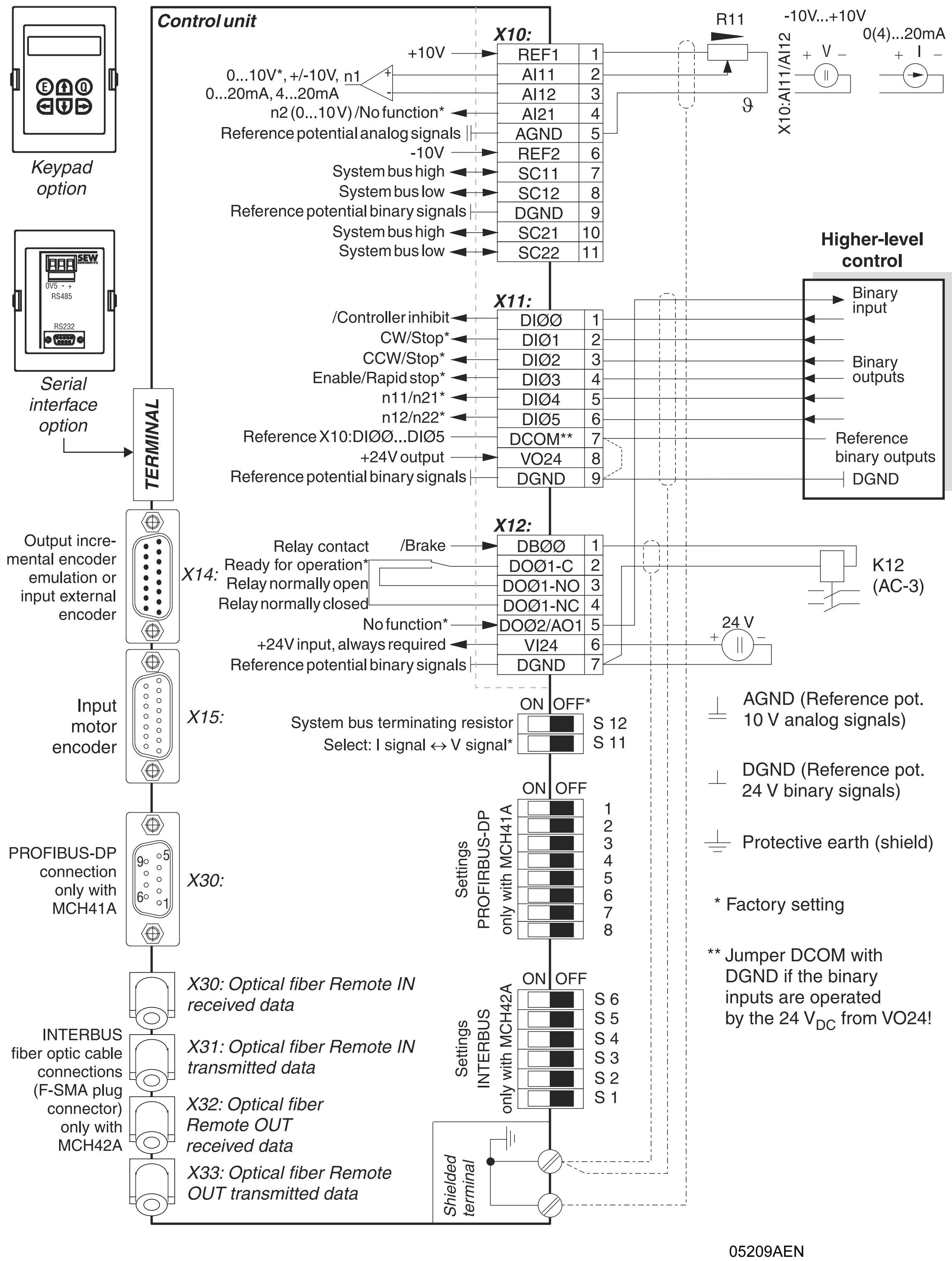
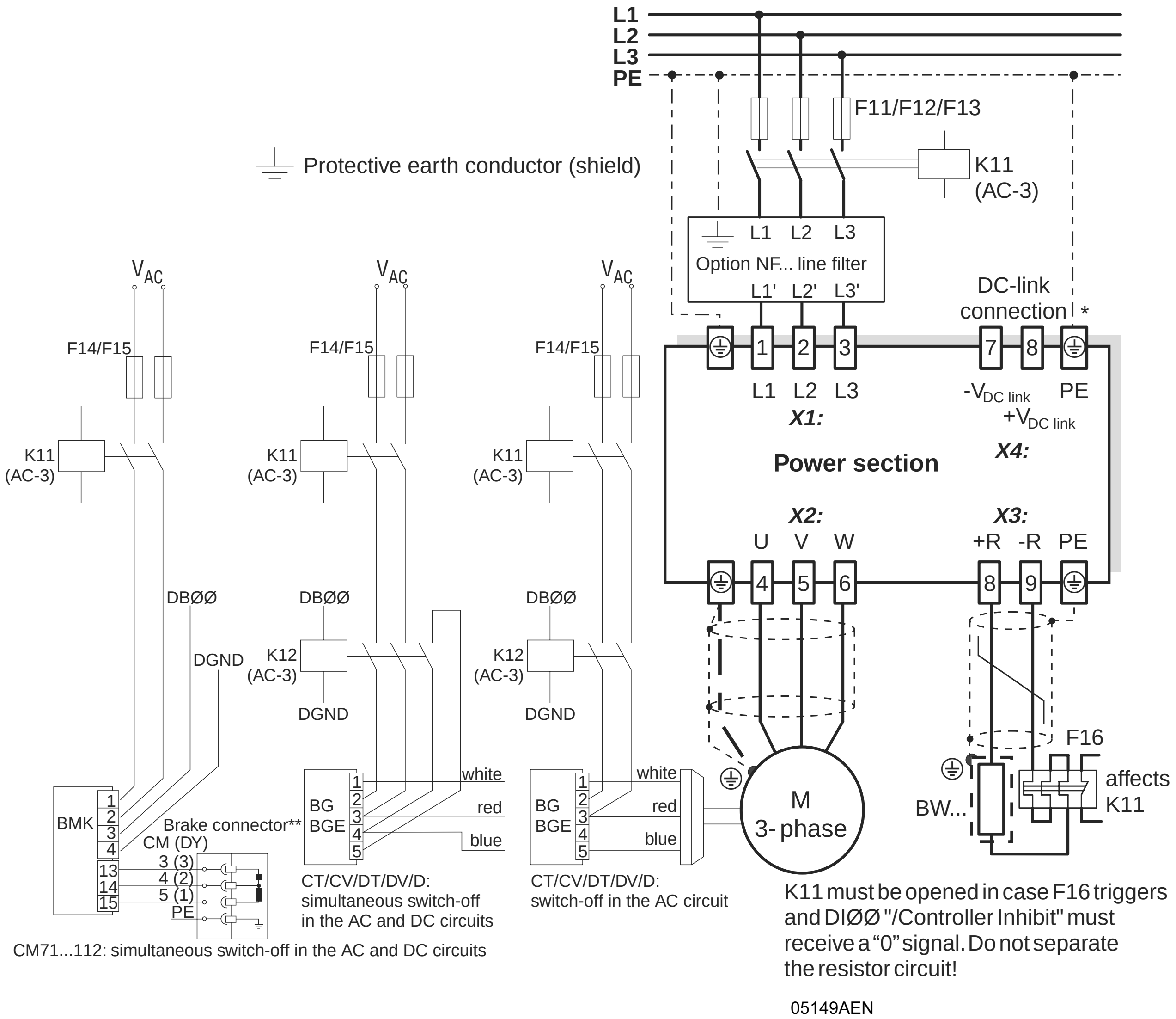


Figure 213: Wiring diagram, MCH4_A control unit

- **MCH41A (with PROFIBUS-DP) / MCH42A (with INTERBUS FO):** SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
- Analog input AI21 (X10:4) can be used either as a 10 V voltage input or as a TF/TH input. You can change the setting by using parameter P120.
- DIP switches S11, S12, 1...8 and S1...S6 can only be accessed once the connection unit has been removed.
- The TF/TH line must either be shielded or routed at a distance of at least 0.2 m (8 in) from power cables (e.g. motor or brake cables). The TF/TH line must be shielded separately if hybrid cables are used for the motor and TF/TH connection.

Connection of the power section and brake



Wiring diagram, power section and brake

* With sizes 1 and 2, there is no PE connection next to the mains connection terminals. In this case, use the PE terminal next to the DC link connection.

** **Important:** It is essential to adhere to the sequence of connections. Incorrect connection will lead to irreparable damage to the brake.

A separate supply system lead is required for connecting the brake rectifier. Powering it from the motor voltage is not permitted!

Always switch off the brake on the DC and AC sides under the following conditions:

– all hoist applications,

– drives which require a rapid brake reaction time and

– in CFC and SERVO operating modes.

Brake rectifier in switch cabinet

Route the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the switch cabinet. Joint routing is only permitted if the power cables are shielded.

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