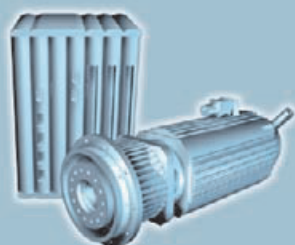




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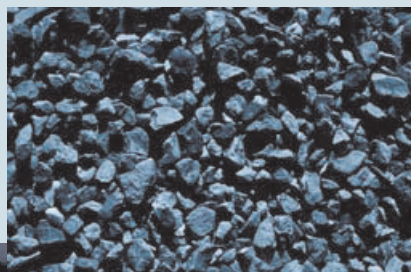
MOVIDRIVE[®] MDX60B / 61B

EA360000

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System Manual





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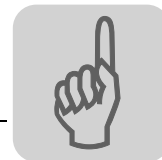
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1 Important Notes

1

Safety and warning notes

Always follow the safety and warning notes 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**. **Read the operating instructions** before you start operating the unit!

The **operating instructions** contain **important information about servicing**. Therefore, keep the operating instructions **close to the unit**.

Designated use



The MOVIDRIVE® MDX60/61B drive inverters operate AC asynchronous motors with squirrel-cage rotors or permanent-field AC synchronous motors. These motors must be suitable for operation with frequency inverters. Do not connect any other loads to the drive inverters.

MOVIDRIVE® MDX60/61B drive inverters are intended for stationary installation in control cabinets. All instructions referring to the technical data and the permissible conditions where the unit is operated must be followed.

Do not start up the unit (take it 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 98/37/EEC (with reference to EN 60204).

**Operating environment**

The following applications are prohibited unless measures are expressly taken to make them possible:

- Use in potentially explosive areas.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications that are subject to mechanical vibration and shock loads in excess of the requirements in EN 50178.

Safety functions

MOVIDRIVE® MDX60/61B drive inverters may not perform safety functions without higher-level safety systems.

Use higher-level safety systems to guarantee the protection of machinery and people.



For safety applications, refer to the following publications:

- **Safe disconnection for MOVIDRIVE® MDX60B / 61B – Conditions**
- **Safe disconnection for MOVIDRIVE® MDX60B / 61B – Applications**

Disposal

Please follow the current instructions. Dispose of the following materials in accordance with the regulations in force:

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



2 System Description

2.1 System overview

Power components

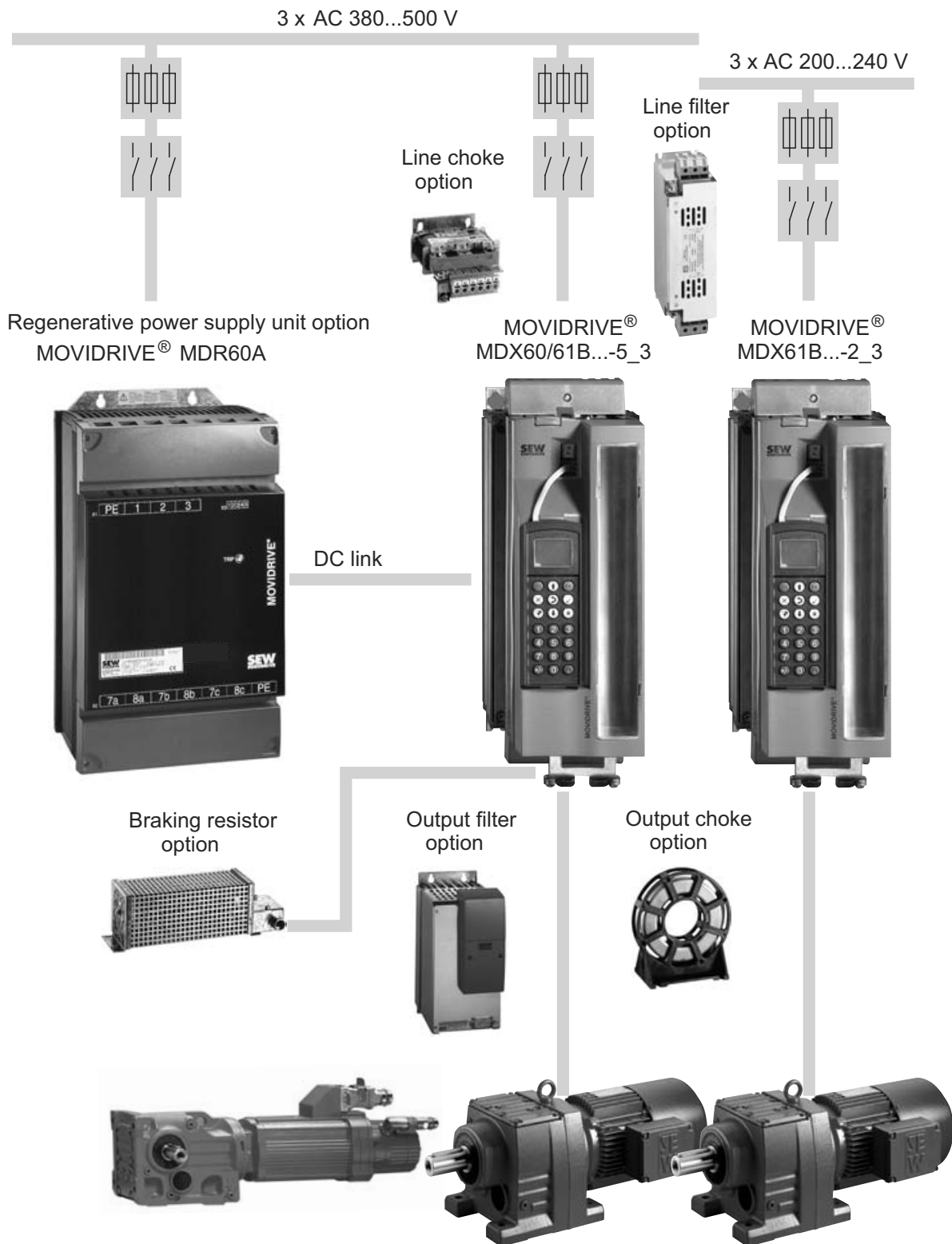


Figure 1: System overview of MOVIDRIVE® MDX60/61B power components

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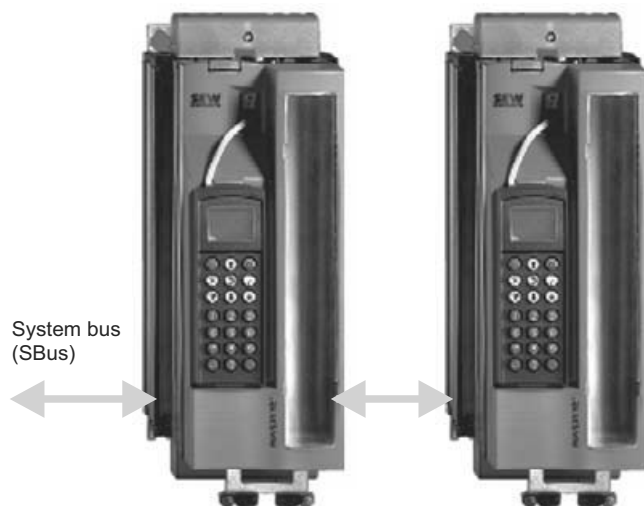
System Description

System overview

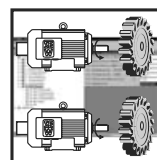
Encoder and communication options

MOVIDRIVE® MDX60/61B
Standard version with mit IPOS^{plus}® as standard

MOVIDRIVE® MDX60/61B application version for
using the "Electronic cam," "Internal Synchronous
operation" or the application modules.



System bus
(SBus)



Keypad option

MOVITOOLS® operating software



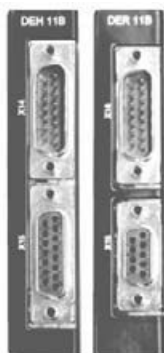
UWS..A



USB11B



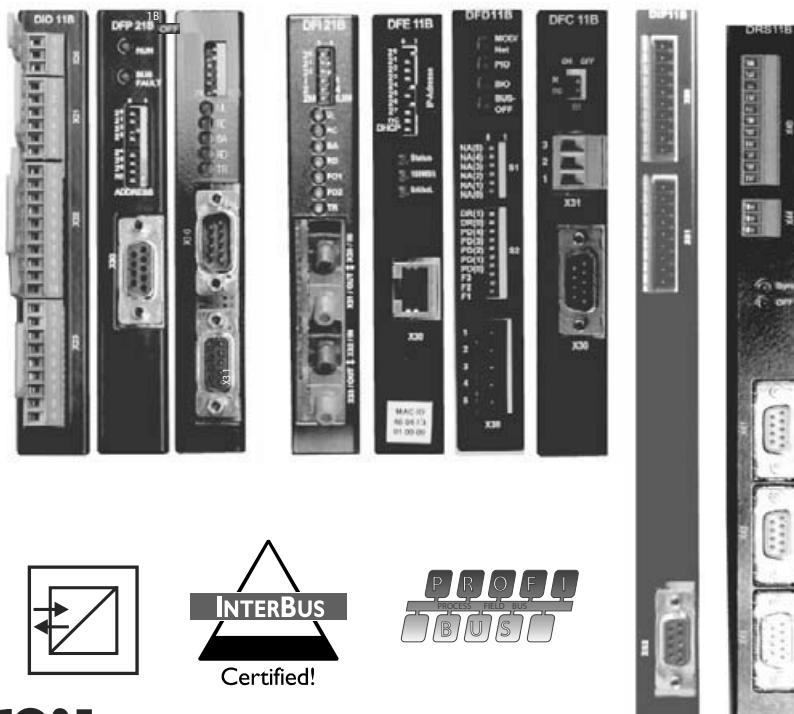
Encoder connection options



HIPOFACE® (sin/cos, TTL)
Resolver



Input/output cards and fieldbus interface options



CANopen



Device Net



ETHERNET

Figure 2: System overview of MOVIDRIVE® MDX60/61B encoder and communication options

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**General
description**

MOVIDRIVE® MDX60B/61B is the new generation of drive inverters from SEW-EURODRIVE. The new series B MOVIDRIVE® drive inverters feature a modular design, provide enhanced functions in the lower power range, more basic functions and greater overload capacity.

AC drives with the latest digital inverter technology can now be used without restrictions in the 0.55 to 160 kW power range. The levels of dynamic performance and control quality that can now be achieved with MOVIDRIVE® for asynchronous AC motors were previously only possible using servo drives or DC motors. The integrated control functions and the possibility of upgrading the system with technology and communication options results in drive systems that are designed for particularly high levels of efficiency in terms of their broad range of applications, project planning, startup and operation.

Low-emission

The MOVIDRIVE® MDX60B/61B drive inverters are produced according to particularly low-emission regulations, but with the usual high level of quality. One particular feature is the consistent use of lead-free soldering materials in the production of electronics products. These lead-free processes are in line with the RoHS EU Directive and the planned law on electronic equipment.

Range of units

The **MOVIDRIVE®** range of units includes three series:

- **MOVIDRIVE® MDX60B:** Drive inverter for asynchronous AC motors without encoder feedback. The units are not option-capable.
- **MOVIDRIVE® MDX61B:** Drive inverter for asynchronous AC motors with or without encoder feedback, or for asynchronous and synchronous servo-motors. The units are option-capable.
- **MOVIDRIVE® MDR60A:** Regenerative power supply unit; MOVIDRIVE® drive inverters (400/500 V units) operating in regenerative mode feed energy back into the supply system.

Unit versions

MOVIDRIVE® MDX60B/61B drive inverters are each available in two versions, namely the standard version and the application version.

Standard version

The units are equipped with the integrated IPOS^{plus}® positioning and sequence control system as standard. MOVIDRIVE® MDX61B can be expanded with the available options.

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

Application version

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

The application version is indicated by the "0T" digits at the end of the unit designation.



Modular unit concept

The option-capable MOVIDRIVE® MDX61B units have the following option slots:

- Size 0 (0005 ... 0014) → 2 option slots
 - 1 option slot for encoder connection
 - 1 option slot for a communication option
- Sizes 1 ... 6 (0015 ... 1320) → 3 option slots
 - 1 option slot for encoder connection
 - 1 option slot for a communication option
 - 1 option slot for an expansion option



- **Option cards can only be installed and removed later by customers for MDX61B sizes 1 to 6. The firmware of the option cards and the basic unit must be compatible.**
- **For MDX61B size 0 units, option cards can only be installed and removed later by SEW-EURODRIVE.** Please take this aspect into account when you place your order/perform project planning.

Size 0 (0005 ... 0014)

Sizes 1 ... 6 (0015 ... 1320)

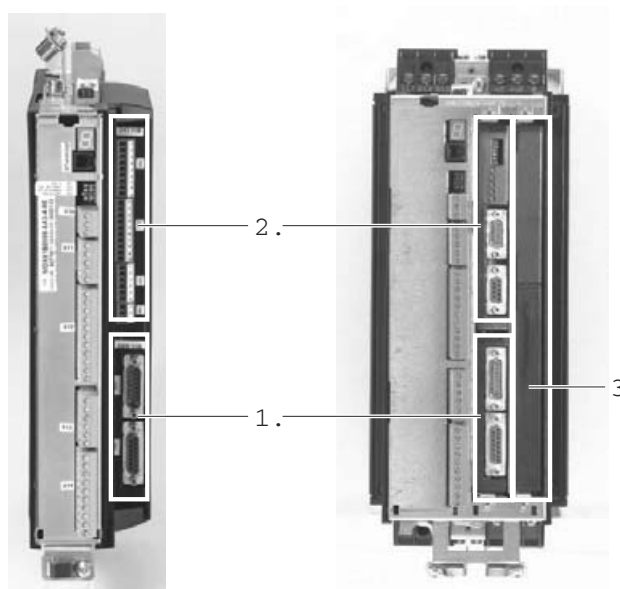


Figure 3: Options slots for MOVIDRIVE® MDX61B

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1. Option slot 1 for encoder option
2. Option slot 2 for communication option
3. Option slot 3 for expansion option

The modular unit concept allows you to choose the right option according to your application. For example, when you have an asynchronous AC motor with encoder feedback (HIPERFACE®, sin/cos or TTL), you would need the HIPERFACE® encoder card type option DEH11B.



Application	Required option	Option slot
Encoder option		
Asynchronous AC motor with encoder feedback (HIPERFACE [®] , sin/cos, TTL)	HIPERFACE [®] encoder card DEH11B	1
Asynchronous or synchronous servo-motor with HIPERFACE [®] encoder		
Synch. servomotor with resolver	Resolver card type DER11B	
Communication option		
Additional analog and binary inputs/outputs are required	Input/output card type DIO11B	2 2 (3 only if slot 2 is occupied)
Integration into a PROFIBUS system	PROFIBUS interface type DFP21B	2
Integration into an INTERBUS system	INTERBUS interface type DFI11B / DFI21B	
Integration into an Ethernet system	Ethernet interface type DFE11B	
Integration into a DeviceNet system	DeviceNet interface type DFD11B	
Integration into a CANopen system	CANopen interface type DFC11B	
Expansion option		
SSI encoder interface	DIP11B absolute encoder card	3
Phase-synchronous operation	Synch. operation board DRS11B	

Control mode

The VFC (Voltage Flux Control) and CFC (Current Flux Control) control modes are features of MOVIDRIVE[®] MDX60B/61B 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 asynchronous AC 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 asynchronous and synchronous 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 allows several MOVIDRIVE[®] drive inverters to be networked together. As a result, data can be exchanged rapidly between the units. The MOVILINK[®] unit profile is used for communication via the SBus. MOVILINK[®] is the uniform SEW-EURODRIVE standard for serial communication. The SBus can be switched to CANopen.

MOVILINK[®]

MOVILINK[®] always uses the same message format independent of the selected interface (SBus, RS232, RS485, fieldbus interfaces). As a result, the control software is independent of the selected interface.

IPOS^{plus}[®]

A significant feature of MOVIDRIVE[®] drive inverters is that the IPOS^{plus}[®] positioning and sequence control system is integrated as standard. IPOS^{plus}[®] enables you to control sequences of motion directly in the inverter close to the machine. This way, load is taken off the master controller and modular concepts can be implemented more easily.



The units at a glance

MOVIDRIVE® MDX60/61B für 3 × AC 380 ... 500 V supply voltage (400/500 V units):

Recommended motor power (VFC)		Cont. output current	MOVIDRIVE® type		Size
		(CFC)	MDX60B not option-capable	MDX61B option-capable	(Techn. data)
0.55 kW	0.75 kW	AC 2.0 A	0005-5A3-4-..	0005-5A3-4-..	0 (→ page 29)
0.75 kW	1.1 kW	AC 2.4 A	0008-5A3-4-..	0008-5A3-4-..	
1.1 kW	1.5 kW	AC 3.1 A	0011-5A3-4-..	0011-5A3-4-..	
1.5 kW	2.2 kW	AC 4.0 A	0014-5A3-4-..	0014-5A3-4-..	
1.5 kW	2.2 kW	AC 4.0 A	–	0015-5A3-4-..	1 (→ page 31)
2.2 kW	3.0 kW	AC 5.5 A	–	0022-5A3-4-..	
3.0 kW	4.0 kW	AC 7.0 A	–	0030-5A3-4-..	
4.0 kW	5.5 kW	AC 9.5 A	–	0040-5A3-4-..	
5.5 kW	7.5 kW	AC 12.5 A	–	0055-5A3-4-..	2S, 2 (→ page 33)
7.5 kW	11 kW	AC 16 A	–	0075-5A3-4-..	
11 kW	15 kW	AC 24 A	–	0110-5A3-4-..	
15 kW	22 kW	AC 32 A	–	0150-503-4-..	3 (→ page 35)
22 kW	30 kW	AC 46 A	–	0220-503-4-..	
30 kW	37 kW	AC 60 A	–	0300-503-4-..	
37 kW	45 kW	AC 73 A	–	0370-503-4-..	4 (→ page 37)
45 kW	55 kW	AC 89 A	–	0450-503-4-..	
55 kW	75 kW	AC 105 A	–	0550-503-4-..	5 (→ page 39)
75 kW	90 kW	AC 130 A	–	0750-503-4-..	
90 kW	110 kW	AC 170 A	–	0900-503-4-..	6 (→ page 41)
110 kW	132 kW	AC 200 A	–	1100-503-4-..	
132 kW	160 kW	AC 250 A	–	1320-503-4-..	

MOVIDRIVE® MDX60/61B für 3 × AC 200 ... 240 V supply voltage (230 V units):

Recommended motor power (VFC)		Cont. output current	MOVIDRIVE® type	Size
		(CFC)	MDX61B option-capable	(Technical data)
1.5 kW	2.2 kW	AC 7.3 A	0015-2A3-4-..	1 (→ page 43)
2.2 kW	3.7 kW	AC 8.6 A	0022-2A3-4-..	
3.7 kW	5.0 kW	AC 14.5 A	0037-2A3-4-..	
5.5 kW	7.5 kW	AC 22 A	0055-2A3-4-..	2 (→ page 45)
7.5 kW	11 kW	AC 29 A	0075-2A3-4-..	
11 kW	15 kW	AC 42 A	0110-203-4-..	3 (→ page 47)
15 kW	22 kW	AC 54 A	0150-203-4-..	
22 kW	30 kW	AC 80 A	0220-203-4-..	4 (→ page 49)
30 kW	37 kW	AC 95 A	0300-203-4-..	

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

MOVIDRIVE® MDR60A regenerative power supply units		Size (technical data)	MOVIDRIVE® MDX60B/61B...-5_3
0370-503-00	I _{mains} =AC 66 A, I _{DCL} = DC 70A	3 (→ page 68)	0005 ... 0370
0750-503-00	I _{mains} =AC 117 A, I _{DCL} = DC 141A	4 (→ page 69)	0005 ... 0750
1320-503-00	I _{mains} =AC 260 A, I _{DCL} = DC 340A	6 (→ page 70)	0005 ... 1320



Block circuit diagram

The following block circuit diagram shows the basic structure and theory of operation of MOVIDRIVE® MDX60B/61B drive inverters.

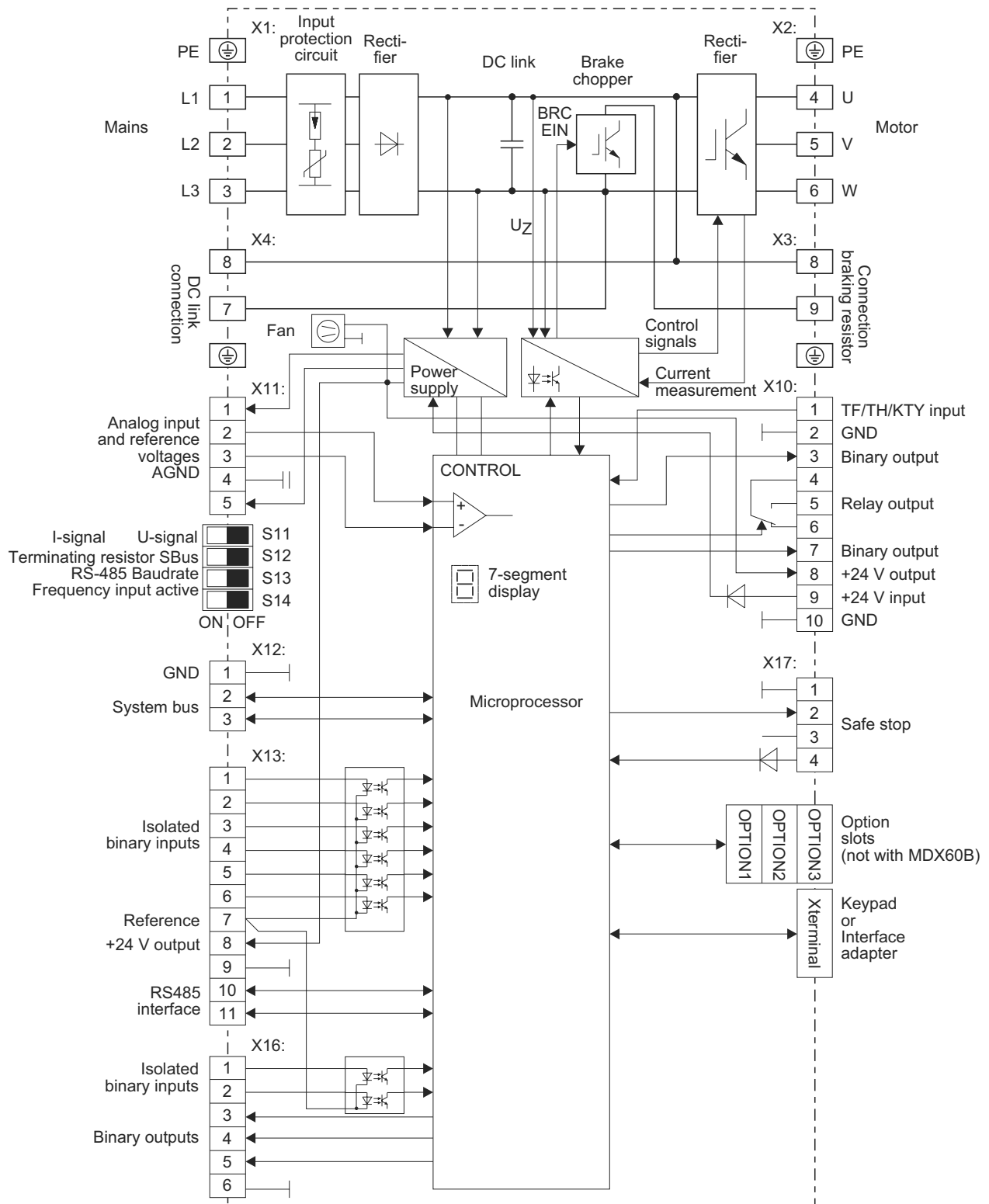


Figure 4: Block circuit diagram for MOVIDRIVE® MDX60B/61B

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2.2 Functions / features

Unit properties

- Wide voltage range
 - 400 / 500 V units for the voltage range $3 \times \text{AC } 380 \dots 500 \text{ V}$
 - 230 V units for the voltage range $3 \times \text{AC } 200 \dots 240 \text{ V}$
- High overload capacity
 - Size 0: $200 \% I_N$ for at least 60 s
 - Sizes 1 ... 6: $150 \% I_N$ for at least 60 s
 - All sizes: $125 \% I_N$ for sustained operation without overload (pumps, fans)
- With 4 kHz switching frequency, I_N is permitted for an ambient temperature $\vartheta = 50$
- 4Q capability due to integrated brake chopper installed as standard
- Compact unit mounting position for minimum control cabinet space requirement and optimum utilization of control cabinet volume
- Integrated input filter fitted as standard in sizes 0, 1 and 2, adherence to class A limit on the input side without any additional measures
- Eight potential-free binary inputs and six binary outputs, one of which is a relay output; programmable inputs/outputs
- One TF / TH / KTY input for motor protection using a PTC thermistor or thermocontact
- 7-segment display for operating and fault states
- Separate DC 24 V voltage input for powering the inverter electronics (parameter setting, diagnostics and data storage even when the supply system is switched off)
- Separable electronics terminals
- Power terminals of size 0 and 1 units can be disconnected

Control functionality

- VFC or CFC control processes for field-oriented operation (asynchronous servo)
- 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 speed accuracy, even without encoder feedback
- Flying restart circuit for synchronizing the inverter to an already rotating motor
- Hoist capability with all motor systems that can be connected
- Motor pull-out protection through 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 with the option cards DEH11B (encoder) and DER11B (resolver); user-friendly controller setting tool in the user interface
- Protective functions for complete protection of the inverter and motor (short-circuit, overload, overvoltage/undervoltage, low-impedance ground fault, overtemperature in the inverter, motor stall prevention, overtemperature in the motor)
- Speed monitoring and monitoring of the motor and regenerative limit power



- Programmable signal range monitoring (speed, current, maximum current)
- Memory for displaying x/t diagrams 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-time counter for hours of operation (unit connected to supply system or 24 V DC) and enable hours (output stage energized)
- Modular option technology for application-specific unit configuration
- Uniform operation, identical parameter setting and the same unit connection technology for the entire MOVIDRIVE® unit series

Setpoint technology

- Ramp switchover (total of 4 ramps)
- Motor potentiometer, can be combined with anal. setpoint and internal fixed setpoints
- External setpoint selections: DC (0 ... +10 V, -10 V ... +10 V, 0 ... 20 mA, 4 ... 20 mA)
- S pattern for jerk-free speed changes
- Programmable input characteristic for flexible setpoint processing
- 6 bipolar fixed setpoints which can be mixed with external setpoints and motor potentiometer function
- Primary frequency input
- Adjustable jerk limitation

Communication / operation

- System bus for networking max. 64 MOVIDRIVE® units to one another
- RS485 interface for communication between one PLC / IPC and up to 31 inverters
- Straightforward startup and parameter setting using keypad or PC
- Pluggable memory module for quick unit replacement during service

System expansion

- Extensive range of expansion options, for example:
 - Removable plain text keypad with parameter memory
 - RS232 ↔ RS485 interface adapter
 - Fieldbus interface, either PROFIBUS, INTERBUS, Ethernet, DeviceNet, CAN/CANopen
 - Input/output card
 - Braking resistors, line filters, line chokes, output chokes, output filters
- MOVITOOLS® operating software with SCOPE process data visualization
- Application version with access to technology functions and application modules for specific applications
- MOVIDRIVE® MDR60A regenerative power supply unit
 - Regenerative energy is fed back into the supply system
 - This reduces the thermal load in the control 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
- Fulfills all the requirements for CE certification of machines and plants equipped with MOVIDRIVE® units on the basis of the EC Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC. Complies with the EMC product standard EN 61800-3.
- Complies with the safety requirement "Safe stop" according to EN 954-1, category 3



2.3 New functions and improved features

MOVIDRIVE® MDX60B/61B units have the following new functions and improved features compared to MOVIDRIVE® MD_60A:

- IPOS^{plus}® program memory increased by factor 4
- IPOS^{plus}® processing speed increased by factor 10
- Additional task 3 for IPOS^{plus}®
- Twice as many IPOS^{plus}® variables
- Significantly increased speed for program download from PC to inverter
- Two additional binary inputs and three additional binary outputs in the basic unit
- Pluggable memory module for quick unit replacement during service
- Secure protection against restart to EN954-1, category 3, stop category 0 or 1
- 200 % overload rating for at least 60 s with size 0 units (0005 0014) if the following peripheral conditions are met:
 - 4 kHz or 8 kHz PWM frequency
 - Output frequency greater than 2 Hz
 - At the start of the overload phase, the unit is in a thermal steady state condition with maximum 100 % I_N
- Units in application version: expanded electronic cam functionality, 6 curves storage capacity
- Units in application version: internal synchronous operation also possible in VFC operation and with synchronous encoder
- Jerk-limited acceleration prevents mechanical vibrations
- Synchronized CAN operation for external setpoints, for example for the motion controller
- Expansion of the speed range to ± 6000 rpm
- Primary frequency possible as speed setpoint
- Simple positioning to initiator on motor fan possible
- With option DER11B: improved resolver evaluation, improved control response



2.4 Additional functions of the application version

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

2

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.

Electronic cam



You can use the MOVIDRIVE® range of units with "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 supports 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.

Note the following points:

- The "electronic cam" can only be implemented with MOVIDRIVE® MDX61B units in application version (...-0T).
- Encoder feedback is mandatory. This is why the "electronic cam" can only be realized in "CFC," "SERVO" and "VFC-n control" operating modes with master/slave connection via X14-X14 or with an SBus connection.
- The "electronic cam" is only available in parameter set 1.
- The "synchronous operation board type DRS11B" option cannot be used together with "internal synchronous operation."

Motor and encoder

Use the following motor types:

- For operation with MOVIDRIVE® MDX61B...-4-0T:
 - CT/CV asynchronous servomotor, high-resolution sin/cos encoder installed as standard or HIPERFACE® encoder
 - AC motor DT/DV/D with encoder option (incremental encoder), preferably high-resolution sin/cos encoder or HIPERFACE® encoder
 - DS/CM/CMD synchronous servomotors, resolver (installed as standard) or HIPERFACE® encoder

High-resolution speed measurement is required for optimum operation of the electronic cam. The encoders installed as standard in CT/CV and DS/CM/CMD motors fulfill these requirements. SEW-EURODRIVE recommends using high-resolution sin/cos encoders (incremental encoders) if DT/DV/D motors are used.



System Description

Additional functions of the application version

Example

The figure below shows a typical application for the "electronic cam." Filled yogurt tubs are transported for further processing. The "electronic cam" function allows for smooth movement, which is an important requirement for this application.

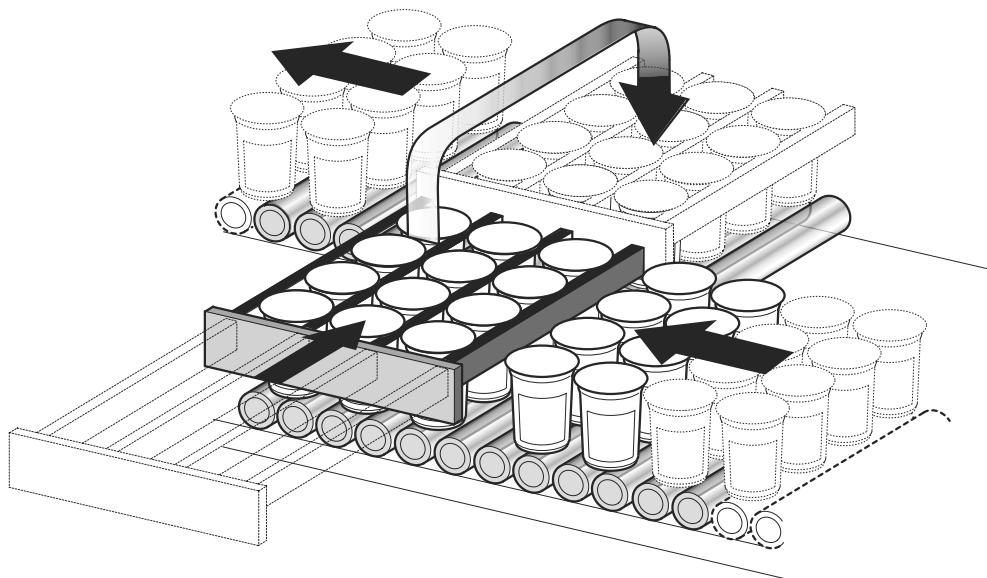
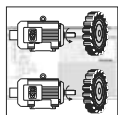


Figure 5: Application example for the "electronic cam."

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Internal synchronous operation



You can use the MOVIDRIVE® range of units with "internal synchronous operation" whenever a group of motors has 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.

Please note the following points:

- "Internal synchronous operation" can only be implemented with MOVIDRIVE® MDX61B units in application version (...-0T).
- Encoder feedback is mandatory. This is why "internal synchronous operation" can only be realized in "CFC," "SERVO" and "VFC-n control" operating modes with master/slave connection via X14-X14 or with an SBus connection.
- "Internal synchronous operation" is only available in parameter set 1.
- The "synchronous operation board DRS11B" option cannot be used together with "internal synchronous operation."

Motor and encoder

Use the following motor types:

- For operation with MOVIDRIVE® MDX61B...-4-0T:
 - CT/CV asynchronous servomotor, high-resolution sin/cos encoder installed as standard or HIPERFACE® encoder
 - AC motor DT/DV/D with encoder option (incremental encoder), preferably high-resolution sin/cos encoder or HIPERFACE® encoder
 - DS/CM/CMD synchronous servomotors, resolver (installed as standard) or HIPERFACE® encoder



High-resolution speed measurement is required for optimum operation of internal synchronous operation. The encoders installed as standard in CT/CV and DS/CM/CMD motors fulfill these requirements. SEW-EURODRIVE recommends using high-resolution sin/cos encoders (incremental encoders) if DT/DV/D motors are used.

Example

The figure below shows 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.

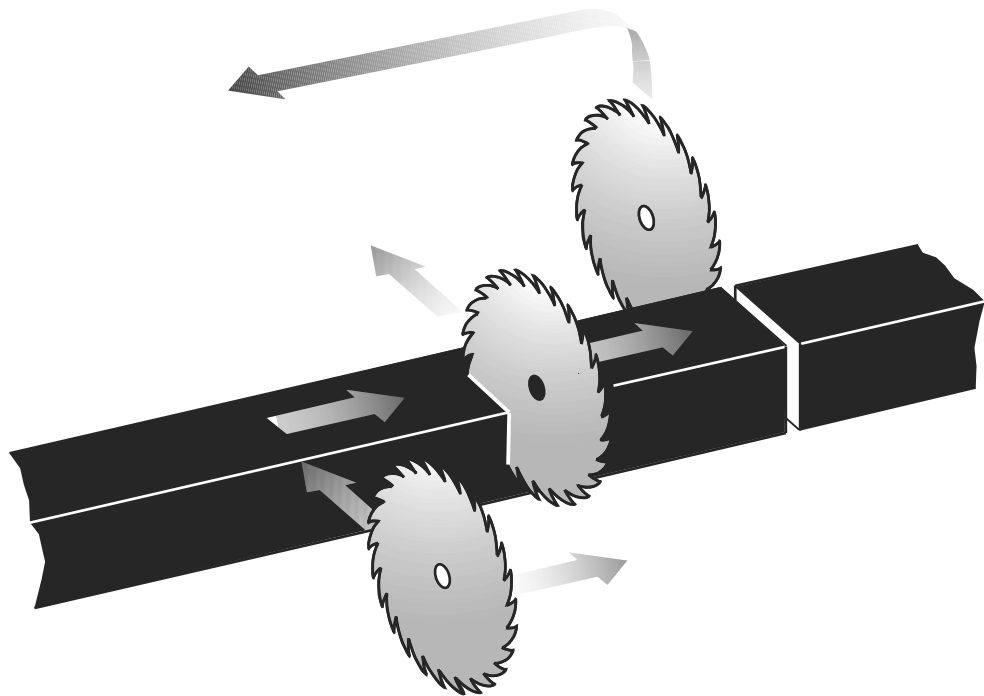


Figure 6: Typical application for the "internal synchronous operation" function

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2.5 Application modules for MOVIDRIVE® MDX61B

The drive application

The drive application often involves more than just 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 solved without this resulting in lengthy project planning and startup.

The solution with MOVIDRIVE®

SEW-EURODRIVE offers various standardized control programs specifically for "positioning," "winding" and "controlling" applications. These programs are called application modules. The application modules are part of the MOVITOOLS® operating software and can be used with units in application version.

A user-friendly user interface guides you through the process of setting the parameters. All you have to do is enter the parameters you need for your application. The application module uses this information to create the control program and loads it into the inverter. MOVIDRIVE® takes over complete control of the motion processes, the load is taken off the machine control and decentralized concepts are easier to implement.

The benefits at a glance

- Wide range of functions
- User-friendly user interface
- You only have to enter the parameters needed for the application
- Guided parameter setting process instead of complicated programming
- No programming experience necessary
- No lengthy training, therefore quick project planning and startup
- All movement functions are controlled directly in MOVIDRIVE®
- Decentralized concepts can be implemented more easily

Scope of delivery and documentation

The application modules are part of the MOVITOOLS® operating software and can be used with MOVIDRIVE® MDX61B units in application version (...-0T). The individual application manuals can also be downloaded in PDF format from the SEW homepage.

Available application modules

The application modules currently available are listed below. These application modules are explained in the following pages.

Positioning

Linear movement; the inverter manages the movement records:

- Table positioning via terminal or fieldbus

Linear movement; the PLC manages the movement records:

- Positioning via bus
- Extended positioning via bus
- Absolute positioning (Rapid / creep speed positioning)

Rotational movement:

- Module positioning via terminal: The inverter manages the movement records
- Module positioning via fieldbus: The PLC manages the movement records

Winding

- Center winder

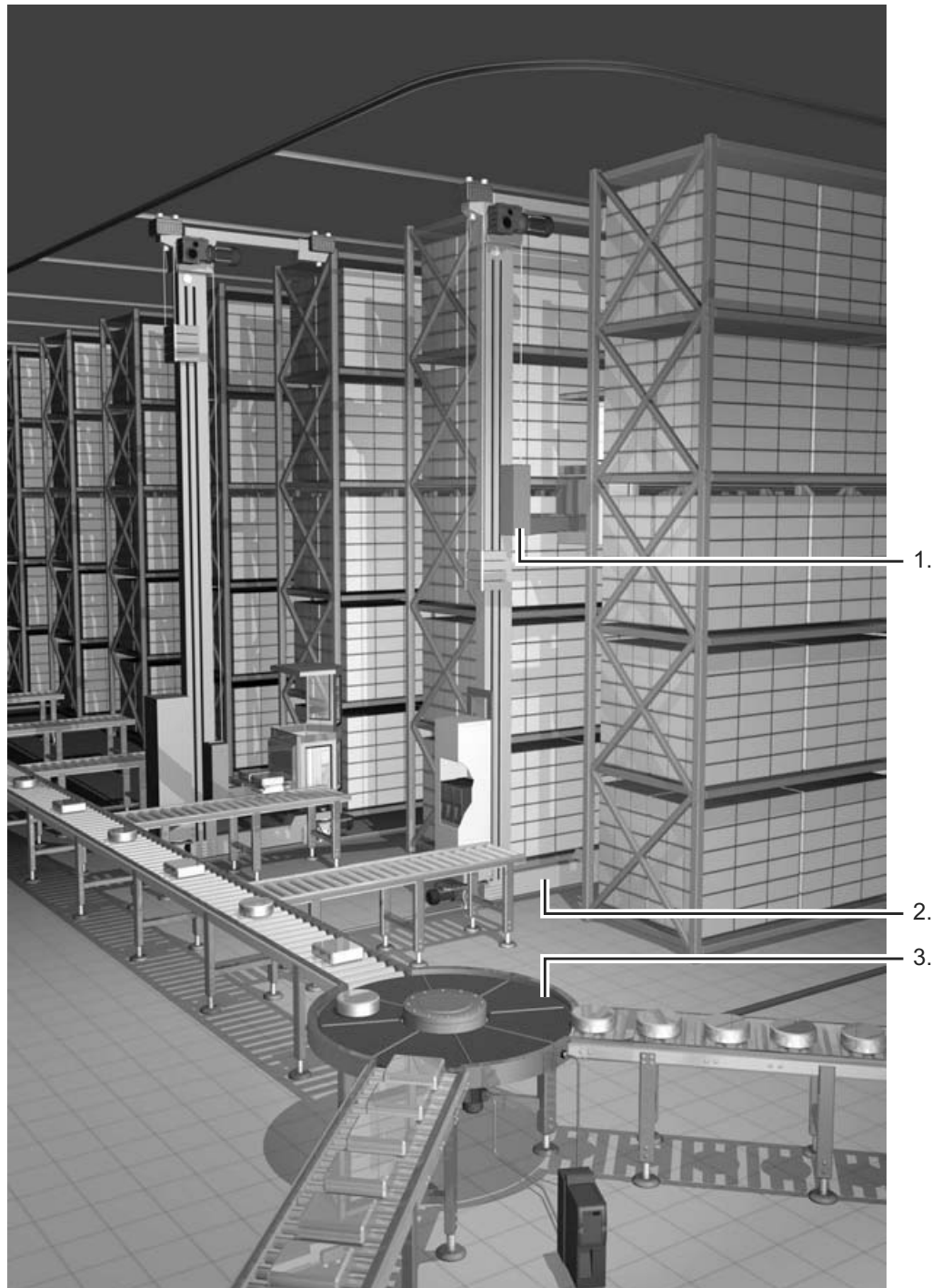
Controlling

- Flying saw
- DriveSync via fieldbus
- Sensor-based positioning



Application

The following illustration shows an example of how the various SEW application modules are used in a block warehouse.



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Figure 7: Application in a block warehouse

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



Positioning

The application modules for the "Positioning" application are suited to all applications where target positions are specified and movement then takes place to those positions. The sequence of motion can be linear or rotational.

Such sequences of motions 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-EURODRIVE distinguishes between whether the movement records are administered in the inverter or in the master PLC.

Movement records in the inverter

- **Table positioning via terminals**
- **Table positioning via fieldbus**

These application modules are suited to applications in which movement only has to take place to a limited number of different target positions and in which the highest possible degree of independence from the machine control is required.

Up to 32 movement records can be managed in the inverter in these application modules. A movement record comprises target position, speed and ramp. The target position to which movement is to take place is selected using binary code, by means of the binary inputs of the inverter or via the virtual terminals (fieldbus, system bus). The application modules come with the following range of features:

- Up to 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.
- Either encoders or absolute encoders can be evaluated as encoders.
- Guided startup procedure and diagnosis.

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**

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

In these application modules, the movement records are managed in the PLC. The target position 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 via 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.
- Either encoders or absolute encoders can be evaluated as encoders.
- Straightforward connection to the master PLC.



- Guided startup procedure and diagnosis.

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.

- **Absolute positioning (Rapid / creep speed positioning)**

This application module is suitable for applications in which there is a high tendency to vibrate, for example storage and retrieval units for high-bay warehouses or heavy trolleys.

In this application module, the movement records are also managed in the PLC and specified via the fieldbus or system bus. No motor encoder is required. The absolute encoder mounted on the travel path is used for positioning. The application module comes with the following range of features:

- Any number of target positions can be defined and selected via fieldbus / system bus.
- Software limit switches can be defined and evaluated.
- Only absolute encoders are used for position measurement.
- No motor encoder is required.
- Straightforward connection to the machine control.
- Guided startup procedure and diagnostics.

There are two operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Automatic mode: Automatic sequence controlled by the master PLC.

**Rotational positioning**

- **Modulo positioning**

A large number of movements have to be controlled in automated conveyor and logistics applications to transport the material. Linear movements in the form of trolleys and hoists, and rotary movements with rotary tables, play an important part in this.

Rotary movements often occur in pulses (rotary indexing tables) in which the material is moved on by a certain number of degrees every cycle. However, there are also many rotational applications in which the material should be moved to its destination by the shortest possible route (distance-optimized positioning) or in which it is only permitted to move to the target position in a defined direction of rotation (positioning with fixed direction of rotation).

The position axis is represented on a numbered circle from 0° to 360° to meet these requirements. As a result, the actual position always moves within this range.

The "modulo positioning" application module accomplishes these tasks using various operating modes which are selected via binary inputs (16 table positions) or virtual terminals (control via fieldbus, variable positions).

The following operating modes are available for controlling the machine:

- Jog mode
- Teach mode (terminal control only)
- Referencing mode
- Automatic mode with position optimization
- Automatic mode with direction of rotation inhibit (clockwise - counterclockwise)
- Pulsed automatic mode

The "modulo positioning" module offers the following advantages:

- User-friendly user interface
- Only the parameters needed for modulo positioning have to be entered (number of teeth of the gear unit, speed)
- User-friendly application programs guide you through the process of setting parameters, so there is no need for complicated programming
- Monitor mode for optimum diagnosis
- You do not need any programming experience
- Rapid familiarization with the system



Winding

- **Center winder**

The "Central winder" application module is suitable for applications in which endless material, such as paper, plastic, fabrics, sheet metal or wire, must be wound, unwound or rewound continuously.

Control takes place either via the binary inputs of the inverter or the virtual terminals (fieldbus, system bus).

The "Central winder" application module comes with the following range of features:

- Constant tensile force or web speed independent of the diameter
- Automatic calculation of the speed-dependent friction factors via a teach-in run
- Winding characteristics to prevent the winding material from becoming loose
- Binary selection of 4 different winding cores
- Diameter can be determined using a diameter calculator (master encoder required) or an analog input (distance sensor required)
- Free-running function (jog)
- CW / CCW winding, winding / unwinding
- Simple connection to the machine control (PLC).
- Guided startup procedure and diagnostics

There are four operating modes for controlling the machine:

- Jog mode: The machine can be moved to the right or the left manually
- Teach-in: The speed-dependent friction factors are determined automatically
- Automatic mode with constant tensile force
- Automatic mode with constant web speed



Controlling

• Flying saw

The "Flying saw" application module is suited to applications in which endless material has to be cut, sawn or pressed, for example in diagonal saws or flying punches.

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

- Control either via fieldbus or terminals.
- Cut edge protection or sorting using the "pulling a gap" function.
- Immediate cut function by manual interrupt.
- Material length counter.
- Straightforward connection to the machine control.
- Guided startup procedure and diagnostics

There are four 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

• DriveSync via fieldbus

The "DriveSync" application module makes it possible to implement conveyor systems and machinery with drives that have to move at a synchronous angle to one another occasionally or permanently.

The program can be used for the master drive and the slave drive. The master works in the "Jog" and "Positioning" operating modes, while the slave drives are operated in "synchronous operation" mode.

If the "Synchronous operation" mode is deselected for the slave drives, they can be operated with free-running in "Jog" and "Positioning" operating modes.

The "DriveSync" application module comes with the following range of features:

- Guided startup and extensive diagnostic functions
- High degree of similarity with "Extended positioning via bus"
- One program module for the master and slave drive
- The selected IPOS^{plus}® encoder source is also effective in synchronous operation
- The master value for the "synchronous operation" mode can be adjusted
- A mechanical vertical shaft can be replaced by transferring the virtual master value via an S-bus connection
- Endless rotation is supported by the modulo function



Four operating modes are available for controlling the application:

- Jog mode
- Reference travel
- Positioning mode
- Synchronous operation
 - The electrical connection of the master/slave can be made using the X14 encoder connection or an SBus connection.
 - If the SBus connection is used, the content of the send object can be adjusted.
 - Time or position-related sequence of motion for synchronization processes.
 - The startup cycle process can also be started with interrupt control.

- **Sensor-based positioning**

This application module is used to position the drive using an external sensor signal plus an adjustable remaining distance. This application module is especially suitable for applications in the following industrial sectors:

- Materials handling technology
 - Trolleys
 - Hoists
 - Rail vehicles
- Logistics
 - Storage and retrieval systems
 - Transverse carriages



2.6 MOVITOOLS® operating software

Description

MOVITOOLS® is a program package comprising SHELL, SCOPE and the IPOS^{plus}® Compiler. You can use MOVITOOLS® to address either of the four unit series MOVIDRIVE® MDX60B/61B, MOVIDRIVE® MD_60A, MOVIDRIVE® *compact* and MOVITRAC® 07.

- SHELL can be used to start up the drive and set its parameters quickly and easily.
- SCOPE provides extensive oscilloscope functions for drive diagnostics.
- 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.
- The device status shows you the status of the connected unit.

Various application modules, such as table positioning, are already stored in MOVITOOLS® as IPOS^{plus}® programs and can be activated using the application version units.

MOVITOOLS® is supplied on a CD-ROM and can also be downloaded from the SEW homepage (<http://www.sew-eurodrive.de>). MOVITOOLS® can be operated 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)
- Windows® XP

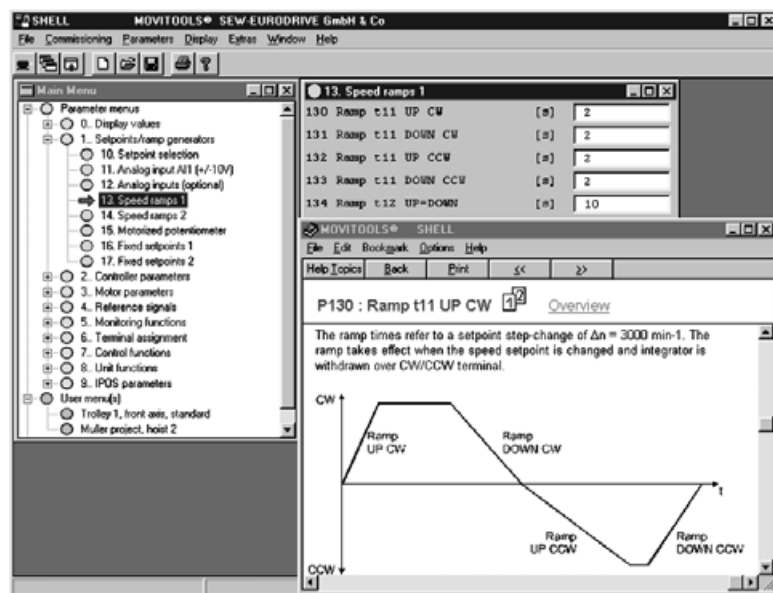
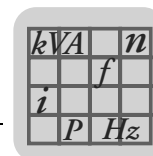


Figure 8: MOVITOOLS® window

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3 Technical Data and Dimensions

3.1 CE-marking, UL approval and unit designation

CE marking

- Low Voltage Directive
MOVIDRIVE® MDX60B/61B drive inverters comply with the regulations of the Low Voltage Directive 73/23/EEC.
- Electromagnetic compatibility (EMC)
MOVIDRIVE® drive inverters and regenerative power supply units are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives." Provided the installation instructions are complied with, they satisfy the appropriate requirements for CE marking of the entire machine/system in which they are installed, on the basis of the EMC Directive 89/336/EEC.
- Compliance with limit class A or B has been tested on a specified test setup. SEW-EURODRIVE can provide detailed information on request.



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

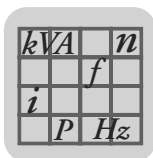


UL and cUL approval has been granted for the entire MOVIDRIVE® range of units. cUL is equivalent to CSA approval.

C-Tick

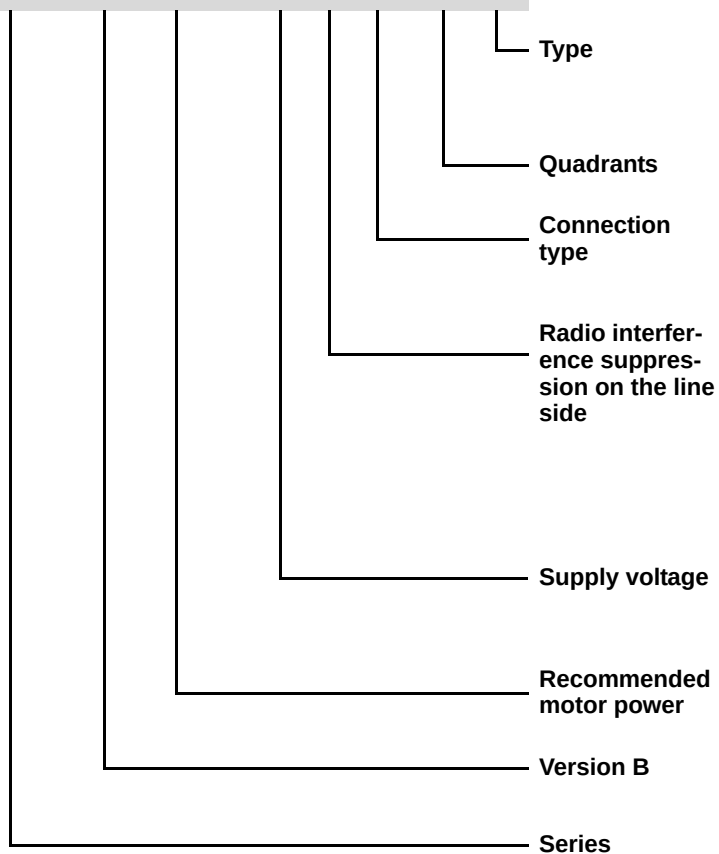


C-Tick approval has been granted for the entire MOVIDRIVE® range of units. C-Tick certifies conformity with the requirements of the ACA (Australian Communications Authority).



Sample unit designation

MDX61 B 0055 - 5 A 3 - 4 00



00 = Standard

0T = Application

4 = 4Q (with brake chopper)

3 = 3 - phase

B = Radio interference suppression B

A = Radio interference suppression A

0 = No radio interference suppression

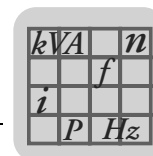
5 = AC 380 ... 500 V

2 = AC 200 ... 240 V

0055= 5.5 kW

60 = no options can be installed

61 = options can be installed

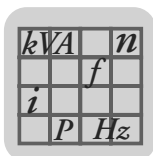


3.2 General technical data

The following table lists the technical data applicable to all MOVIDRIVE® MDX60/61B drive inverters, regardless of their type, version, size and power rating.

MOVIDRIVE® MDX60B/61B		All sizes
Interference immunity		Meets EN 61800-3
Interference emission with EMC compliant installation		According to class B limit to EN 55011 and EN 55014 Meets EN 61800-3 Sizes 0, 1, and 2 according to class A limit to EN 55011 and EN 55014 without additional measures
Ambient temperature ϑ_U		0 °C...+50 °C when $I_D = 100\% I_N$ and $f_{PWM} = 4$ kHz 0 °C...+40 °C when $I_D = 125\% I_N$ and $f_{PWM} = 4$ kHz 0 °C...+40 °C when $I_D = 100\% I_N$ and $f_{PWM} = 8$ kHz
Derating ambient temperature		Derating: • 2.5 % I_N per K for 40 °C - 50 °C • 3 % I_N per K for 50 °C - 60 °C
Climate class		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-controller fan, response threshold 45 °C)
Enclosure EN 60529 (NEMA1)	Sizes 0 to 3 Sizes 4 to 6	IP20 IP00 (power connections) IP10 (power connections) with • fitted plexiglass cover supplied as standard and • shrink tubing (not included in scope of delivery)
Operating mode		DB (EN 60149-1-1 and 1-3)
Overvoltage category		III according to IEC 60664-1 (VDE 0110-1)
Pollution class		2 according to IEC 60664-1 (VDE 0110-1)
Altitude	h	Up to $h \leq 1000$ m without restrictions. The following restrictions apply at heights ≥ 1000 m: • From 1000 m to max. 4000 m: – I_N reduction by 1% per 100 m (330 ft) • From 2000 m to max. 4000 m: – AC 230 V units: V_N reduction by 3 V AC per 100 m – AC 500 V units: V_N reduction by AC 6 V per 100 m Over 2000 m only overvoltage class 2, external measures are required for overvoltage class 3. Overvoltage classes to DIN VDE 0110-1.

1) For long-term storage, connect to power supply every 2 years for at least 5 minutes, otherwise the unit's service life may be reduced.



MOVIDRIVE®
MDX60B/61B
series, size 0



Figure 9: MOVIDRIVE® MDX60/61B series, size 0

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MOVIDRIVE®
MDX61B series,
sizes 1 to 6



Figure 10: MOVIDRIVE® MDX61B series, sizes 1 to 6

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3.3 MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

Size 0 (400/500 V) MDX60B0005 ... 0014, no options can be installed

MDX61B0005 ... 0014, options can be installed



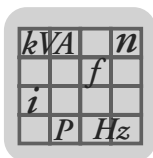
Figure 11: Size 0

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MOVIDRIVE® MDX60/61B		0005-5A3-4-0_	0008-5A3-4-0_	0011-5A3-4-0_	0014-5A3-4-0_
Size		0S		0M	
INPUT					
Supply voltage	V _{mains}	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %			
Mains frequency	f _{mains}	50 Hz – 60 Hz ± 5 %			
Rated supply current ¹⁾ I _{mains} (at V _{mains} = 3 × AC 400 V)	100 % 125 %	AC 1.8 A AC 2.3 A	AC 2.2 A AC 2.7 A	AC 2.8 A AC 3.5 A	AC 3.6 A AC 4.5 A
OUTPUT					
Apparent output power ²⁾ (at V _{mains} = 3 × AC 380...500 V)	P _{rated}	1.4 kVA	1.6 kVA	2.1 kVA	2.8 kVA
Rated output current ¹⁾ (at V _{mains} = 3 × AC 400 V)	I _N	AC 2 A	AC 2.4 A	AC 3.1 A	AC 4 A
Current limitation	I _{max}	Motor and regenerative 200 % I _N , duration depending on capacity utilization			
Internal current limitation		I _{max} = 0...200 % adjustable			
Minimum permitted braking resistor value (4Q operation)	R _{BRmin}	68 Ω			
Output voltage	V _{out}	Max. V _{mains}			
PWM frequency	f _{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz			
Speed range / resolution	n _A / Δn _A	–6000 ... 0 ... +6000 min ^{–1} / 0.2 min ^{–1} across the entire range			
GENERAL					
Power loss at S _N ²⁾	P _{Vmax}	42 W	48 W	58 W	74 W
Cooling air consumption		3 m ³ /h		9 m ³ /h	

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

2) In VFC operating modes: The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting).

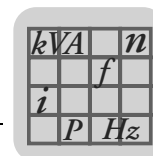


Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0005-5A3-4-00	0008-5A3-4-00	0011-5A3-4-00	0014-5A3-4-00
Part number	827 722 2	827 723 0	827 724 9	827 725 7
MDX61B Application version	0005-5A3-4-0T	0008-5A3-4-0T	0011-5A3-4-0T	0014-5A3-4-0T
Part number	827 726 5	827 727 3	827 728 1	827 729 X
 Constant load Recomm. motor power P_{mot}	0.55 kW	0.75 kW	1.1 kW	1.5 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	0.75 kW	1.1 kW	1.5 kW	2.2 kW
Continuous output current = 125 % I_N I_D (at $V_{mains} = 3 \times AC\ 400\ V$ and $f_{PWM} = 4\ kHz$)	AC 2.5 A	AC 3 A	AC 3.8 A	AC 5 A
Mass	2.0 kg		2.5 kg	
Dimensions $W \times H \times D$	45 × 317 × 260 mm		67.5 × 317 × 260 mm	

MDX61B standard version (VFC/CFC/SERVO)	0005-5A3-4-00	0008-5A3-4-00	0011-5A3-4-00	0014-5A3-4-00
Part number	827 730 3	827 731 1	827 732 X	827 733 8
MDX61B application version (VFC/CFC/SERVO)	0005-5A3-4-0T	0008-5A3-4-0T	0011-5A3-4-0T	0014-5A3-4-0T
Part number	827 734 6	827 735 4	827 736 2	827 737 0
VFC operating mode	Recommended motor power → MDX60B			
CFC operating mode				
Continuous output current = 100 % I _N I _D	AC 2 A	AC 2.4 A	AC 3.1 A	AC 4 A
Mass	2.3 kg		2.8 kg	
Dimensions W × H × D	72.5 × 317 × 260 mm		95 × 317 × 260 mm	
Recommended motor power	→ Sec. Project Planning, CFC motor selection			



Size 1 (400/500 V) MDX61B0015 ... 0040, options can be installed in all units



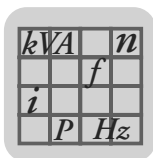
Figure 12: Size 1

53071AXX

MOVIDRIVE® MDX61B		0015-5A3-4-0_	0022-5A3-4-0_	0030-5A3-4-0_	0040-5A3-4-0_
INPUT					
Supply voltage	V _{mains}	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %			
Mains frequency	f _{mains}	50 Hz – 60 Hz ± 5 %			
Rated supply current ¹⁾ I _{mains} (at V _{mains} = 3 × AC 400 V)	100 % 125 %	AC 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
OUTPUT					
Apparent output power ²⁾ (at V _{mains} = 3 × AC 380...500 V)	P _{rated}	2.8 kVA	3.8 kVA	4.9 kVA	6.6 kVA
Rated output current ¹⁾ (at V _{mains} = 3 × AC 400 V)	I _N	AC 4 A	AC 5.5 A	AC 7 A	AC 9.5 A
Current limitation	I _{max}	Motor and regenerative 150 % I _N , duration depending on capacity utilization			
Internal current limitation		I _{max} = 0...150 % adjustable			
Minimum permitted braking resistor value (4Q operation)	R _{BRmin}	68 Ω			
Output voltage	V _{out}	Max. V _{mains}			
PWM frequency	f _{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz			
Speed range / resolution	n _A / Δn _A	–6000 ... 0 ... +6000 min ^{–1} / 0.2 min ^{–1} across the entire range			
GENERAL					
Power loss at S _N ²⁾	P _{Vmax}	85 W	105 W	130 W	180 W
Cooling air consumption		40 m ³ /h			
Mass		3.5 kg			
Dimensions	W × H × D	105 × 314 × 234 mm			

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

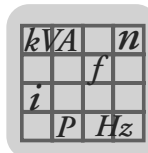
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
Part number	827 957 8	827 958 6	827 959 4	827 960 8
MDX61B Application version	0015-5A3-4-0T	0022-5A3-4-0T	0030-5A3-4-0T	0040-5A3-4-0T
Part number	827 975 6	827 976 4	827 977 2	827 978 0
 Constant load Recomm. motor power P_{mot}	1.5 kW	2.2 kW	3.0 kW	4.0 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	2.2 kW	3.0 kW	4.0 kW	5.5 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 5 A	AC 6.9 A	AC 8.8 A	AC 11.9 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 4 A → Sec. Project Planning, CFC/SERVO motor selection	AC 5.5 A	AC 7 A	AC 9.5 A



Size 2S, 2
(400/500 V)

MDX61B0055 ... 0110, options can be installed to all units



3

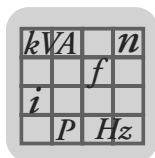
Figure 13: Size 2

53072AXX

MOVIDRIVE® MDX61B		0055-5A3-4-0_	0075-5A3-4-0_	0110-5A3-4-0_
Size		2S		2
INPUT				
Supply voltage	V_{mains}	$3 \times \text{AC } 380 \text{ V} -10 \% \dots 3 \times \text{AC } 500 \text{ V} +10 \%$		
Mains frequency	f_{mains}	50 Hz – 60 Hz $\pm 5 \%$		
Rated supply current ¹⁾ I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	100 % 125 %	AC 11.3 A AC 14.1 A	AC 14.4 A AC 18.0 A	AC 21.6 A AC 27.0 A
OUTPUT				
Apparent output power ²⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 380\dots 500 \text{ V}$)	P_{rated}	8.7 kVA	11.2 kVA	16.8 kVA
Rated output current ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{N}	AC 12.5 A	AC 16 A	AC 24 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization		
Internal current limitation		$I_{\text{max}} = 0\dots 150 \%$ adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	47 Ω		22 Ω
Output voltage	V_{out}	Max. V_{mains}		
PWM frequency	f_{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz		
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range		
GENERAL				
Power loss at $S_{\text{N}}^{2)}$	P_{Vmax}	220 W	290 W	400 W
Cooling air consumption		80 m ³ /h		
Mass		6.6 kg		
Dimensions	$W \times H \times D$	105 $\times$ 335 $\times$ 294 mm		135 $\times$ 315 $\times$ 285 mm

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

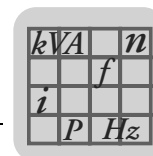
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
Part number	827 961 6	827 962 4	827 963 2
MDX61B Application version	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
Part number	827 979 9	827 980 2	827 981 0
 Constant load Recomm. motor power P_{mot}	5.5 kW	7.5 kW	11 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	7.5 kW	11 kW	15 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 15.6 A	AC 20 A	AC 30 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 12.5 A → Sec. Project Planning, CFC/SERVO motor selection	AC 16 A	AC 24 A



Size 3 (400/500 V) MDX61B0150 ... 0300, options can be installed to all units



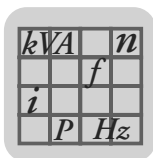
3

Figure 14: Size 3

53073AXX

MOVIDRIVE® MDX61B		0150-503-4-0_	0220-503-4-0_	0300-503-4-0_
INPUT				
Supply voltage	V_{mains}	$3 \times \text{AC } 380 \text{ V } -10 \% \dots 3 \times \text{AC } 500 \text{ V } +10 \%$		
Mains frequency	f_{mains}	50 Hz – 60 Hz $\pm 5 \%$		
Rated supply current ¹⁾ I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	100 % 125 %	AC 28.8 A AC 36 A	AC 41.4 A AC 51.7 A	AC 54 A AC 67.5 A
OUTPUT				
Apparent output power ²⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 380\dots 500 \text{ V}$)	P_{rated}	22.2 kVA	31.9 kVA	41.6 kVA
Rated output current ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{N}	AC 32 A	AC 46 A	AC 60 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization		
Internal current limitation		$I_{\text{max}} = 0\dots 150 \%$ adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	15 Ω		12 Ω
Output voltage	V_{out}	Max. V_{mains}		
PWM frequency	f_{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz		
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range		
GENERAL				
Power loss at $S_{\text{N}}^{2)}$	P_{Vmax}	550 W	750 W	950 W
Cooling air consumption		180 m ³ /h		
Mass		15.0 kg		
Dimensions	$W \times H \times D$	200 × 465 × 308 mm		

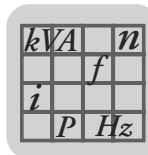
- 1) The system and output currents must be reduced by 20 % from the nominal values for $V_{\text{mains}} = 3 \times \text{AC } 500 \text{ V}$.
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0150-503-4-00	0220-503-4-00	0300-503-4-00
Part number	827 964 0	827 965 9	827 966 7
MDX61B Application version	0150-503-4-0T	0220-503-4-0T	0300-503-4-0T
Part number	827 982 9	827 983 7	827 984 5
 Constant load Recomm. motor power P_{mot}	15 kW	22 kW	30 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	22 kW	30 kW	37 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 40 A	AC 57.5 A	AC 75 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power → Sec. Project Planning, CFC/SERVO motor selection	AC 32 A	AC 46 A	AC 60 A



Size 4 (400/500 V) MDX61B0370 ... 0450, options can be installed to all units



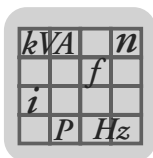
Figure 15: Size 4

53074AXX

MOVIDRIVE® MDX61B		0370-503-4-0__	0450-503-4-0__
INPUT			
Supply voltage	V _{mains}	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %	
Mains frequency	f _{mains}	50 Hz – 60 Hz ± 5 %	
Rated supply current ¹⁾ I _{mains} (at V _{mains} = 3 × AC 400 V)	100 % 125 %	AC 65.7 A AC 81.9 A	AC 80.1 A AC 100.1 A
OUTPUT			
Apparent output power ²⁾ (at V _{mains} = 3 × AC 380...500 V)	P _{rated}	51.1 kVA	62.3 kVA
Rated output current ¹⁾ (at V _{mains} = 3 × AC 400 V)	I _N	AC 73 A	AC 89 A
Current limitation	I _{max}	Motor and regenerative 150 % I _N , duration depending on capacity utilization	
Internal current limitation		I _{max} = 0...150 % adjustable	
Minimum permitted braking resistor value (4Q operation)	R _{BRmin}	6 Ω	
Output voltage	V _{out}	Max. V _{mains}	
PWM frequency	f _{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz	
Speed range / resolution	n _A / Δn _A	–6000 ... 0 ... +6000 min ^{–1} / 0.2 min ^{–1} across the entire range	
GENERAL			
Power loss at S _N ²⁾	P _{Vmax}	1200 W	1450 W
Cooling air consumption		180 m ³ /h	
Mass		27 kg	
Dimensions	W × H × D	280 × 522 × 307 mm	

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

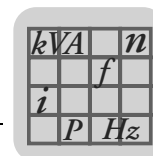
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0370-503-4-00	0450-503-4-00
Part number	827 967 5	827 968 3
MDX61B Application version	0370-503-4-0T	0450-503-4-0T
Part number	827 985 3	827 986 1
 Constant load Recomm. motor power P_{mot}	37 kW	45 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	45 kW	55 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 91 A	AC 111 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 73 A → Sec. Project Planning, CFC/SERVO motor selection	AC 89 A



Size 5 (400/500 V) MDX61B0550 ... 0750, options can be installed to all units



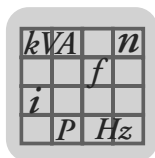
Figure 16: Size 5

53075AXX

MOVIDRIVE® MDX61B		0550-503-4-0_	0750-503-4-0_
INPUT			
Supply voltage	V _{mains}	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %	
Mains frequency	f _{mains}	50 Hz – 60 Hz ± 5 %	
Rated supply current ¹⁾ I _{mains} (at V _{mains} = 3 × AC 400 V)	100 % 125 %	AC 94.5 A AC 118.1 A	AC 117 A AC 146.3 A
OUTPUT			
Apparent output power ²⁾ (at V _{mains} = 3 × AC 380...500 V)	P _{rated}	73.5 kVA	91.0 kVA
Rated output current ¹⁾ (at V _{mains} = 3 × AC 400 V)	I _N	AC 105 A	AC 130 A
Current limitation	I _{max}	Motor and regenerative 150 % I _N , duration depending on capacity utilization	
Internal current limitation		I _{max} = 0...150 % adjustable	
Minimum permitted braking resistor value (4Q operation)	R _{BRmin}	6 Ω	4 Ω
Output voltage	V _{out}	Max. V _{mains}	
PWM frequency	f _{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz	
Speed range / resolution	n _A / Δn _A	–6000 ... 0 ... +6000 min ^{–1} / 0.2 min ^{–1} across the entire range	
GENERAL			
Power loss at S _N ²⁾	P _{Vmax}	1700 W	2000 W
Cooling air consumption		360 m ³ /h	
Mass		35 kg	
Dimensions	W × H × D	280 × 610 × 330 mm	

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

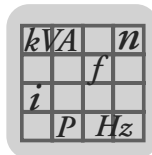
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0550-503-4-00	0750-503-4-00
Part number	827 969 1	827 970 5
MDX61B Application version	0550-503-4-0T	0750-503-4-0T
Part number	827 988 8	827 989 6
 Constant load Recomm. motor power P_{mot}	55 kW	75 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	75 kW	90 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 131 A	AC 162 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 105 A → Sec. Project Planning, CFC/SERVO motor selection	AC 130 A



Size 6 (400/500 V) MDX61B0900 ... 1320, options can be installed to all units



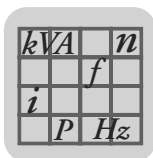
Figure 17: Size 6

53076AXX

MOVIDRIVE® MDX61B		0900-503-4-0_	1100-503-4-0_	1320-503-4-0_
INPUT				
Supply voltage	V_{mains}	$3 \times \text{AC } 380 \text{ V } -10 \% \dots 3 \times \text{AC } 500 \text{ V } +10 \%$		
Mains frequency	f_{mains}	50 Hz – 60 Hz $\pm 5 \%$		
Rated supply current ¹⁾ I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	100 % 125 %	AC 153 A AC 191 A	AC 180 A AC 225 A	AC 225 A AC 281 A
OUTPUT				
Apparent output power ²⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 380\dots 500 \text{ V}$)	P_{rated}	118 kVA	139 kVA	174 kVA
Rated output current ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{N}	AC 170 A	AC 200 A	AC 250 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization		
Internal current limitation		$I_{\text{max}} = 0\dots 150 \%$ adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	2.7 Ω		
Output voltage	V_{out}	Max. V_{mains}		
PWM frequency	f_{PWM}	Adjustable: 4 or 8 kHz		
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range		
GENERAL				
Power loss at $S_{\text{N}}^{2)}$	P_{Vmax}	2300 W	2500 W	2700 W
Cooling air consumption		600 m ³ /h		
Mass		60 kg		
Dimensions	$W \times H \times D$	280 × 1000 × 382mm		

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

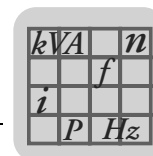
2) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)

MDX61B Standard version	0900-503-4-00	1100-503-4-00	1320-503-4-00
Part number	827 971 3	827 972 1	827 974 8
MDX61B Application version	0900-503-4-0T	1100-503-4-0T	1320-503-4-0T
Part number	827 991 8	827 992 6	827 993 4
 Constant load Recomm. motor power P_{mot}	90 kW	110 kW	132 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	110 kW	132 kW	160 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	AC 212 A	AC 250 A	AC 312 A
CFC operating mode Continuous output current = 100 % I_N I_D Recommended motor power	AC 170 A → Sec. Project Planning, CFC motor selection	AC 200 A	AC 250 A



3.4 MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

Size 1 (230 V)

MDX61B0015 ... 0037, options can be installed to all units



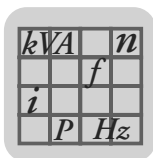
3

Figure 18: Size 1

53071AXX

MOVIDRIVE® MDX61B		0015-2A3-4-0_	0022-2A3-4-0_	0037-2A3-4-0_
INPUT				
Supply voltage	V_{mains}	$3 \times \text{AC } 200 \text{ V} -10 \% \dots 3 \times \text{AC } 240 \text{ V} +10 \%$		
Mains frequency	f_{mains}	50 Hz – 60 Hz $\pm 5 \%$		
Rated supply current I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	100 % 125 %	AC 6.7 A AC 8.4 A	AC 7.8 A AC 9.8 A	AC 12.9 A AC 16.1 A
OUTPUT				
Apparent output power ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 230..0.240 \text{ V}$)	P_{rated}	2.7 kVA	3.4 kVA	5.8 kVA
Output rated current (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	I_{N}	AC 7.3 A	AC 8.6 A	AC 14.5 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization		
Internal current limitation		$I_{\text{max}} = 0...150 \%$ adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	27 Ω		
Output voltage	V_{out}	Max. V_{mains}		
PWM frequency	f_{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz		
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range		
GENERAL				
Power loss at $S_{\text{N}}^{1)}$	P_{Vmax}	110 W	126 W	210 W
Cooling air consumption		40 m ³ /h		
Mass		2.8 kg		
Dimensions	$W \times H \times D$	105 × 314 × 234 mm		

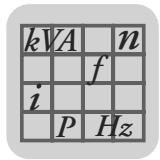
1) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

MDX61B Standard version	0015-2A3-4-00	0022-2A3-4-00	0037-2A3-4-00
Part number	827 994 2	827 995 0	827 996 9
MDX61B Application version	0015-2A3-4-0T	0022-2A3-4-0T	0037-2A3-4-0T
Part number	828 003 7	828 004 5	828 005 3
 Constant load Recomm. motor power P_{mot}	1.5 kW	2.2 kW	3.7 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	2.2 kW	3.7 kW	5.0 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	AC 9.1 A	AC 10.8 A	AC 18.1 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 7.3 A → Sec. Project Planning, CFC/SERVO motor selection	AC 8.6 A	AC 14.5 A



Size 2 (230 V)

MDX61B0055 ... 0075, options can be installed to all units



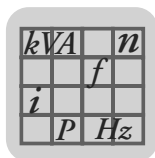
3

Figure 19: Size 2

53072AXX

MOVIDRIVE® MDX61B		0055-2A3-4-0_	0075-2A3-4-0_
INPUT			
Supply voltage	V_{mains}	$3 \times \text{AC } 200 \text{ V } -10 \% \dots 3 \times \text{AC } 240 \text{ V } +10 \%$	
Mains frequency	f_{mains}	$50 \text{ Hz} - 60 \text{ Hz} \pm 5 \%$	
Rated supply current I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	100 % 125 %	AC 19.5 A AC 24.4 A	AC 27.4 A AC 34.3 A
OUTPUT			
Apparent output power ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 230 \dots 0.240 \text{ V}$)	P_{rated}	8.8 kVA	11.6 kVA
Output rated current (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	I_{N}	AC 22 A	AC 29 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization	
Internal current limitation		$I_{\text{max}} = 0 \dots 150 \% \text{ adjustable}$	
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	12 Ω	
Output voltage	V_{out}	Max. V_{mains}	
PWM frequency	f_{PWM}	Adjustable: 4 / 8 / 12 / 16 kHz	
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range	
GENERAL			
Power loss at $S_{\text{N}}^{1)}$	P_{Vmax}	300 W	380 W
Cooling air consumption		80 m^3/h	
Mass		5.9 kg	
Dimensions	$W \times H \times D$	135 $\times$ 315 $\times$ 285 mm	

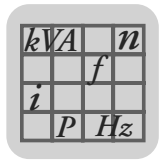
1) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

MDX61B Standard version	0055-2A3-4-00	0075-2A3-4-00
Part number	827 997 7	827 998 5
MDX61B Application version	0055-2A3-4-0T	0075-2A3-4-0T
Part number	828 006 1	828 008 8
 Constant load Recomm. motor power P_{mot}	5.5 kW	7.5 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	7.5 kW	11 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	AC 27.5 A	AC 36.3 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 22 A → Sec. Project Planning, CFC/SERVO motor selection	AC 29 A



Size 3 (230 V)

MDX61B0110 ... 0150, options can be installed to all units



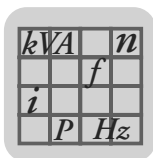
3

Figure 20: Size 3

53073AXX

MOVIDRIVE® MDX61B		0110-203-4-0__	0150-203-4-0__
INPUT			
Supply voltage	V _{mains}	3 × AC 200 V –10 % ... 3 × AC 240 V +10 %	
Mains frequency	f _{mains}	50 Hz – 60 Hz ± 5 %	
Rated supply current I _{mains} (at V _{mains} = 3 × AC 230 V)	100 % 125 %	AC 40 A AC 50 A	AC 49 A AC 61 A
OUTPUT			
Apparent output power ¹⁾ (at V _{mains} = 3 × AC 230..0.240 V)	P _{rated}	17.1 kVA	21.5 kVA
Output rated current (at V _{mains} = 3 × AC 230 V)	I _N	AC 42 A	AC 54 A
Current limitation	I _{max}	Motor and regenerative 150 % I _N , duration depending on capacity utilization	
Internal current limitation		I _{max} = 0...150 % adjustable	
Minimum permitted braking resistor value (4Q operation)	R _{BRmin}	7.5 Ω	5.6 Ω
Output voltage	V _{out}	Max. V _{mains}	
PWM frequency	f _{PWM}	Adjustable: 4/ 8 / 12 / 16 kHz	
Speed range / resolution	n _A / Δn _A	–6000 ... 0 ... +6000 min ^{–1} / 0.2 min ^{–1} across the entire range	
GENERAL			
Power loss at S _N ¹⁾	P _{Vmax}	580 W	720 W
Cooling air consumption		180 m ³ /h	
Mass		14.3 kg	
Dimensions	W × H × D	200 × 465 × 308 mm	

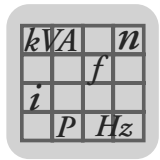
1) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

MDX61B Standard version	0110-203-4-00	0150-203-4-00
Part number	827 999 3	828 000 2
MDX61B Application version	0110-203-4-0T	0150-203-4-0T
Part number	828 009 6	828 011 8
 Constant load Recomm. motor power P_{mot}	11 kW	15 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	15 kW	22 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	AC 52.5 A	AC 67.5 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 42 A → Sec. Project Planning, CFC/SERVO motor selection	AC 54 A



Size 4 (230 V)

MDX61B0220 ... 0300, options can be installed to all units



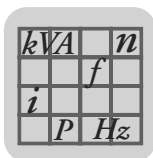
3

Figure 21: Size 4

53074AXX

MOVIDRIVE® MDX61B		0220-203-4-0_	0300-203-4-0_
INPUT			
Supply voltage	V_{mains}	$3 \times \text{AC } 200 \text{ V } -10 \% \dots 3 \times \text{AC } 240 \text{ V } +10 \%$	
Mains frequency	f_{mains}	50 Hz – 60 Hz $\pm 5 \%$	
Rated supply current I_{mains} (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	100 % 125 %	AC 72 A AC 90 A	AC 86 A AC 107 A
OUTPUT			
Apparent output power ¹⁾ (at $V_{\text{mains}} = 3 \times \text{AC } 230 \dots 0.240 \text{ V}$)	P_{rated}	31.8 kVA	37.8 kVA
Output rated current (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	I_{N}	AC 80 A	AC 95 A
Current limitation	I_{max}	Motor and regenerative 150 % I_{N} , duration depending on capacity utilization	
Internal current limitation		$I_{\text{max}} = 0 \dots 150 \% \text{ adjustable}$	
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	3.0 Ω	
Output voltage	V_{out}	Max. V_{mains}	
PWM frequency	f_{PWM}	Adjustable: 4 / 8 / 12 / 16 kHz	
Speed range / resolution	$n_{\text{A}} / \Delta n_{\text{A}}$	$-6000 \dots 0 \dots +6000 \text{ min}^{-1} / 0.2 \text{ min}^{-1}$ across the entire range	
GENERAL			
Power loss at $S_{\text{N}}^{1)}$	P_{Vmax}	1100 W	1300 W
Cooling air consumption		180 m ³ /h	
Mass		26.3 kg	
Dimensions	$W \times H \times D$	280 × 522 × 307 mm	

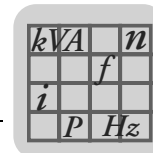
1) The performance data apply to $f_{\text{PWM}} = 4 \text{ kHz}$ (factory setting in VFC operating modes).



Technical Data and Dimensions

MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

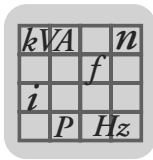
MDX61B Standard version	0220-203-4-00	0300-203-4-00
Part number	828 001 0	828 002 9
MDX61B Application version	0220-203-4-0T	0300-203-4-0T
Part number	828 012 6	828 013 4
 Constant load Recomm. motor power P_{mot}	22 kW	30 kW
 Variable torque load or constant load without overload Recomm. motor power P_{mot}	30 kW	37 kW
VFC operating mode ($f_{\text{PWM}} = 4 \text{ kHz}$) Continuous output current = 125 % I_N I_D (at $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$)	AC 100 A	AC 118 A
CFC/SERVO operating mode ($f_{\text{PWM}} = 8 \text{ kHz}$) Continuous output current = 100 % I_N I_D Recommended motor power	AC 80 A → Sec. Project Planning, CFC/SERVO motor selection	AC 95 A



3.5 MOVIDRIVE® MDX60/61B electronics data

MOVIDRIVE® MDX60/61B		General electronics data	
Voltage supply for setpoint input	X11:1 X11:5	REF1: DC+10 V +5 % / -0 %, $I_{\max}$ = DC 3 mA REF2: DC-10 V +0 % / -5 %, $I_{\max}$ = DC 3 mA	Reference voltages for setpoint potentiometer
Setpoint input n1 (Differential input) Operating mode AI11/AI12 Resolution Internal resistance	X11:2/X11:3	AI11/AI12: Voltage or current input, can be set with S11 and P11_, sampling interval 1 ms Voltage input: n1 = DC 0...+10 V or DC -10 V...0...+10 V 12 bit R_i = 40 k Ω (external voltage supply) R_i = 20 k Ω (supply from REF1/REF2)	Current input: n1 = DC 0...20 mA or DC 4...20 mA 11 bit R_i = 250 Ω
Internal setpoints		Parameter set 1: n11/n12/n13 = -6000...0...+6000 min ⁻¹ Parameter set 2: n21/n22/n23 = -6000...0...+6000 min ⁻¹	
Time ranges of speed ramps at Δn = 3000 min ⁻¹		1. Ramp t11/t21 Up: 0..0.2000 s Down: 0..2000 s 2. Ramp t12/t22 Up = down: 0..0.2000 s Stop ramp t13/t23 Down: 0..0.20 s Emergency ramp t14/t24 Down: 0..0.20 s Motor potentiometer t3 Up: 0.2...50 s Down: 0.2...50 s	
Auxiliary voltage output ¹⁾ X13:8/X10:8		VO24: V_{OUT} = DC 24 V, maximum current carrying capacity $I_{\max}$ = DC 400 mA	
External voltage supply ¹⁾ X10:9		VI24: V_{IN} = DC 24 V -15 % / +20 % (range: DC 19.2...30 V) to EN 61131-2	
Binary inputs X13:1...X13:6 and X16:1/X16:2 Internal resistance		Isolated (optocoupler), PLC compatible (EN 61131), sampling interval 1 ms DI00...DI05 and DI06/DI07 R_i $\approx$ 3 k Ω , I_E $\approx$ DC 10 mA	
Signal level		DC +13 V...+30 V = "1" = contact closed DC -3 V...+5 V = "0" = contact open	To EN 61131
Function X13:1 X13:2...X13:6, X16:1/X16:2		DI00: fixed assignment with "/Controller inhibit" DI01...DI05, DI06/DI07: Selection option → Parameter menu P60_	
Binary outputs ¹⁾ X10:3/X10:7 and X16:3...X16:5		PLC compatible (EN 61131-2), response time 1 ms DB00/DO02 and DO03...DO05	
Signal level		"0" = DC 0 V "1" = DC +24 V Important: Do not apply external voltage!	
Function X10:3 X10:7, X16:3...X16:5		DB00: With fixed assignment "/Brake", $I_{\max}$ = DC 150 mA, short-circuit proof, protected against external voltage DO02, DO03...DO05: Selection option → Parameter menu P62_, $I_{\max}$ = DC 50 mA, short-circuit proof, protected against external voltage	
Relay output Function	X10:4...X10:6 X10:4 X10:5 X10:6	DO01: Load capacity of the relay contacts $V_{\max}$ = DC 30 V, $I_{\max}$ = DC 800 mA DO01-C: Shared relay contact DO01-NO: NO contact DO01-NC: NC contact	Selection option → Parameter menu P62_
System bus (SBus)	X12:1 X12:2 X12:3	DGND: Reference potential 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
RS485 interface	X13:10 X13:11	ST11: RS485+ ST12: RS485-	EIA standard, 9.6 kBaud, max. 32 stations Max. cable length 200 m Dynamic terminating resistor with fixed installation
TF/TH/KTY input	X10:1	TF1: Response threshold at $R_{TF} \geq 2.9$ k Ω $\pm$ 10 %	
Reference terminals X11:4 X12:1/X13:9/X16:6/X10:2/X10:10 X13:7		AGND: Reference potential for analog signals and terminals X11:1 and X11:5 (REF1/REF2) DGND: Reference potential for binary signals, system bus, RS485 interface and TF/TH DCOM: Reference potential for binary inputs X13:1...X13:6 and X16:1/X16:2 (DI00...DI05 and DI06/DI07)	
Permitted line cross section		One core per terminal: 0.20...2.5 mm ² (AWG 24...12) Two cores per terminal: 0.25...1 mm ² (AWG 22...17)	

1) The unit provides a current of $I_{\max}$ = DC 400 mA for the DC+24 V outputs (VO24, binary outputs). If this value is insufficient, a DC 24 V voltage supply must be connected to X10:9 (VI24).



Technical Data and Dimensions

MOVIDRIVE® MDX60/61B electronics data

MOVIDRIVE® MDX60/61B		General electronics data
Safety contact	X17:1 X17:2 X17:3 X17:4	DGND: Reference potential for X17:3 VO24: : $V_{OUT} = DC\ 24\ V$, only to supply X17:4 SOV24: Reference potential for DC+24 V input "Safe stop" (safety contact) SVI24: DC+24 V input "Safe stop" (safety contact)
Permitted line cross section		One core per terminal: $0.08...1.5\ mm^2$ (AWG28...16) Two cores per terminal: $0.25 ... 1.0\ mm^2$ (AWG23...17)
Power consumption X17:4		BG0: 3 W BG1: 5 W BG2, 2S: 6 W BG3: 7.5 W BG4: 8 W BG5: 10 W BG6: 6 W
Time for restart		$t_A = 200\ ms$
Signal level		DC +13 V...+30 V = "1" = contact closed DC -3 V...+5 V = "0" = contact open

3.6 MOVIDRIVE® MDX60B dimension drawings

Size 0S

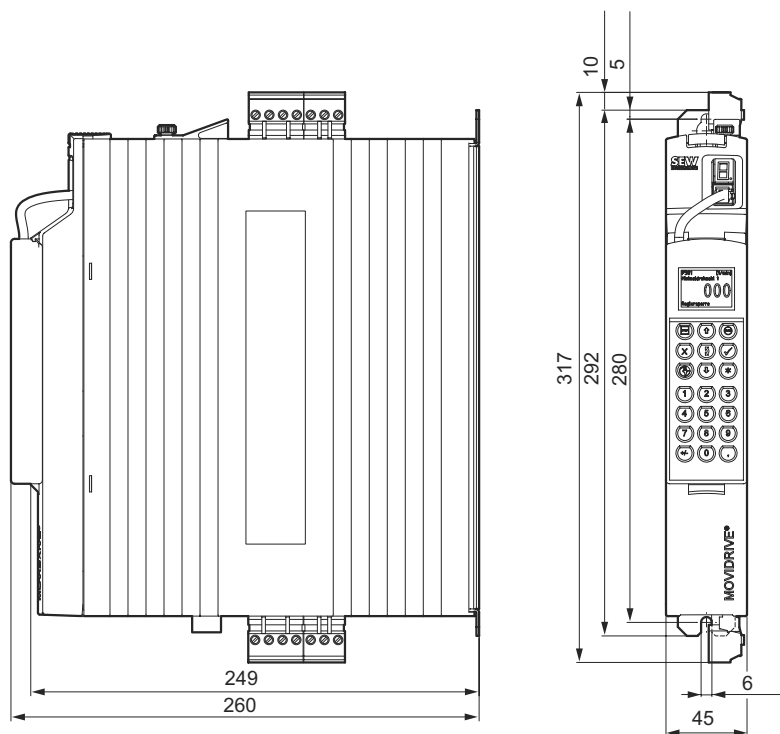


Figure 22: Dimension drawing for MDX60B size 0S, dimensions in mm

53019BXX

Size 0S with
mounted braking
resistor

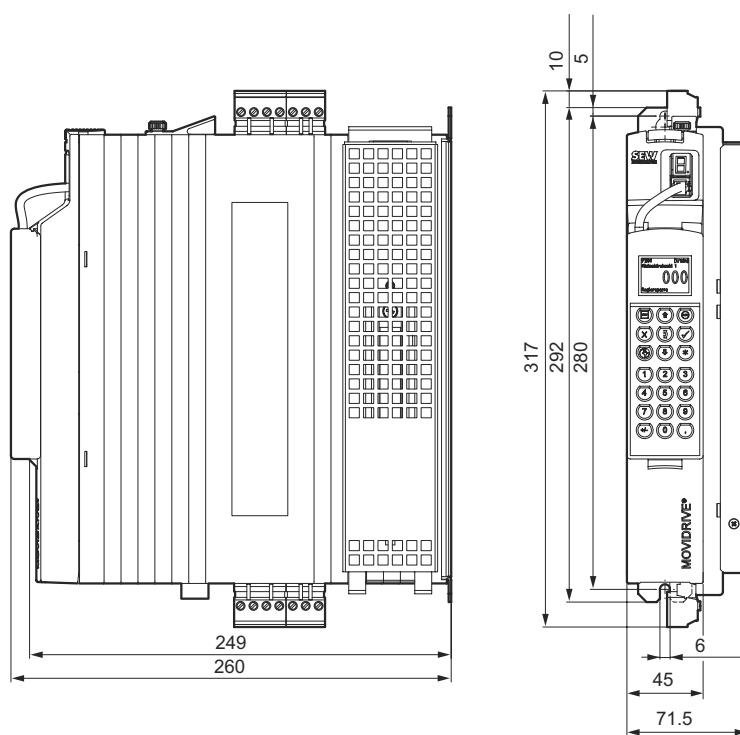
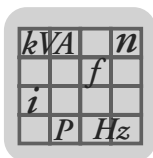


Figure 23: Dimension drawing for MDX60B size 0S with braking resistor, dimensions in mm

53020BXX



Technical Data and Dimensions

MOVIDRIVE® MDX60B dimension drawings

Size 0M

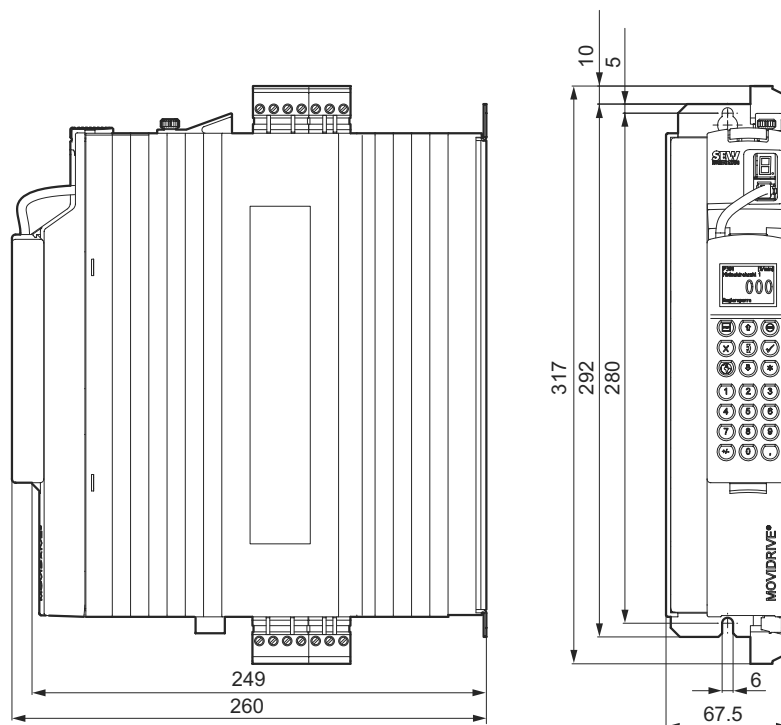


Figure 24: Dimension drawing for MDX60B size 0M, dimensions in mm

53022BXX

Size 0M with braking resistor

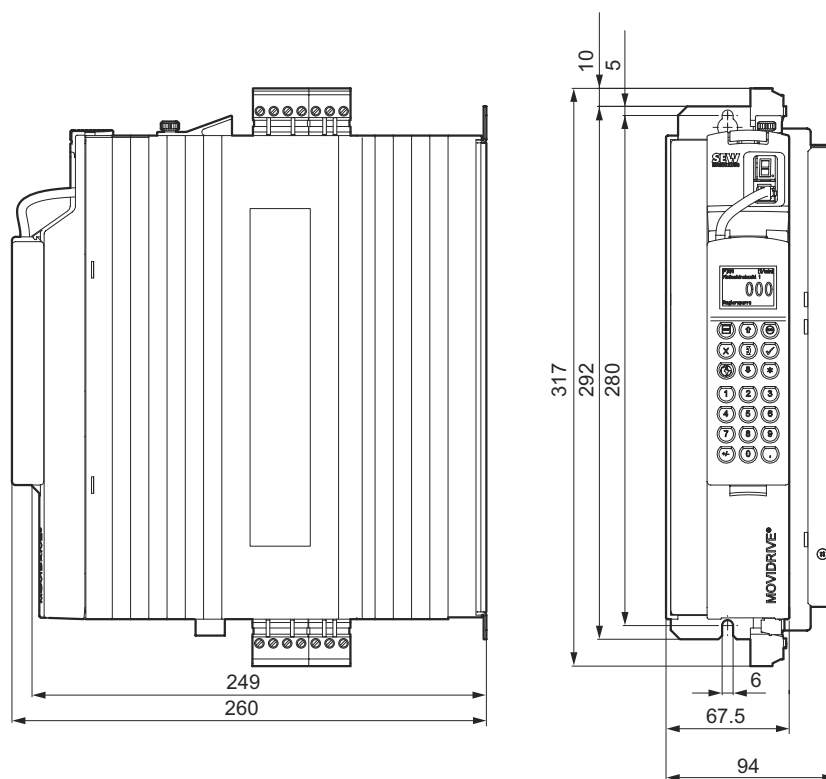


Figure 25: Dimension drawing for MDX60B size 0M with braking resistor, dimensions in mm

53023BXX

3.7 MOVIDRIVE® MDX61B dimension drawings



For MOVIDRIVE® MDX61B size 0, installing a braking resistor does not affect the dimensions. Therefore, all dimension drawings are shown without braking resistors.

3

Size 0S

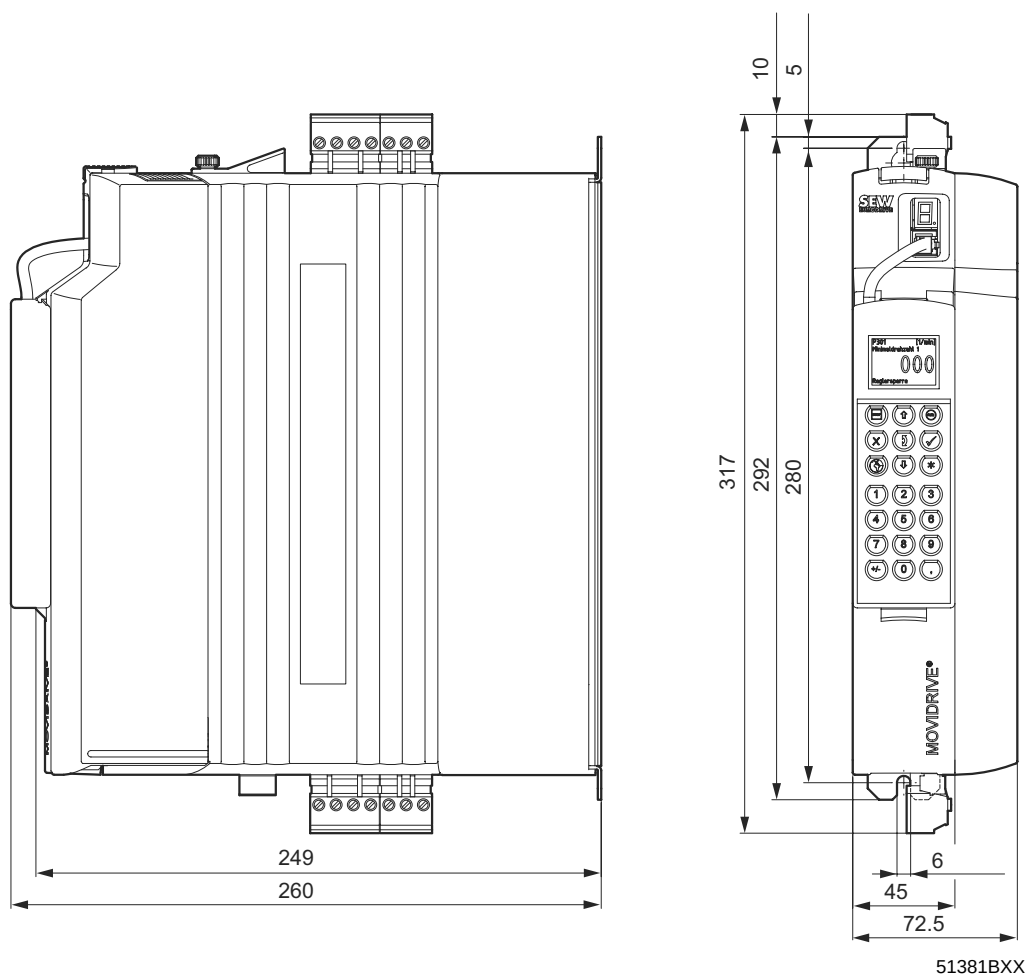
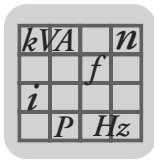
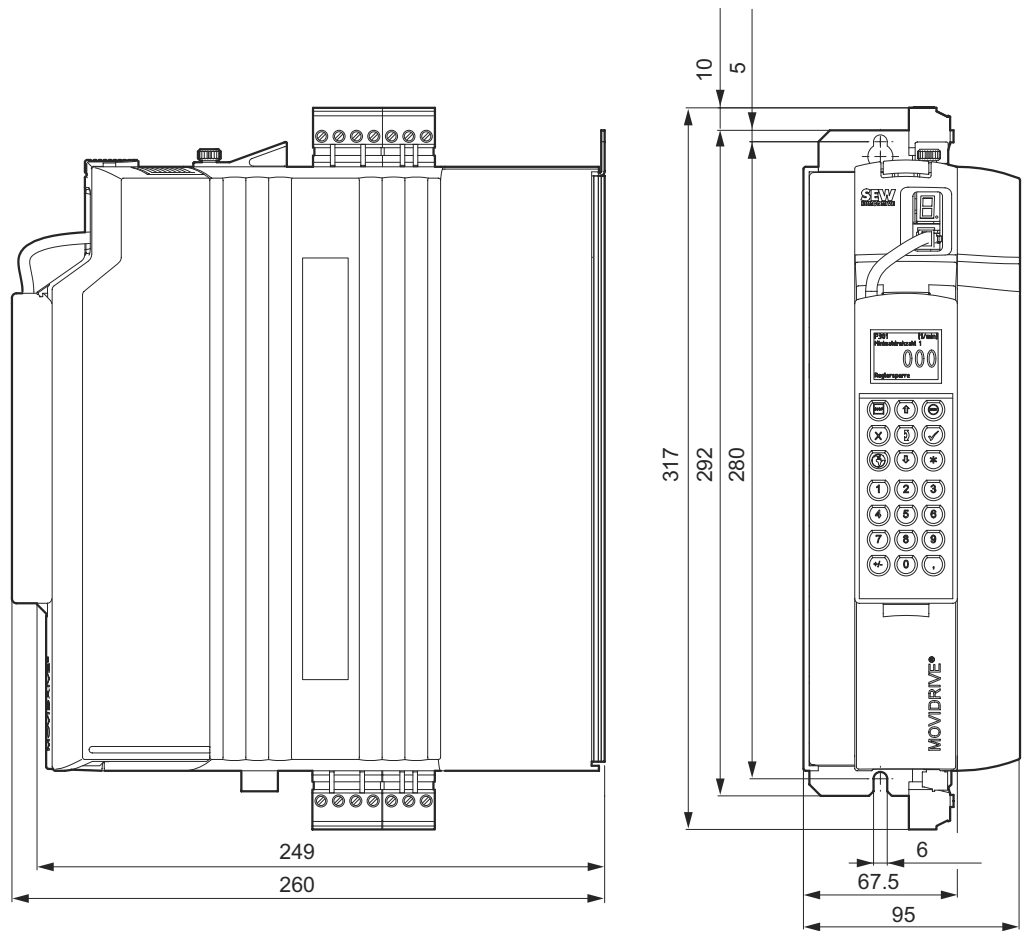


Figure 26: Dimension drawing for MDX61B size 0S, dimensions in mm



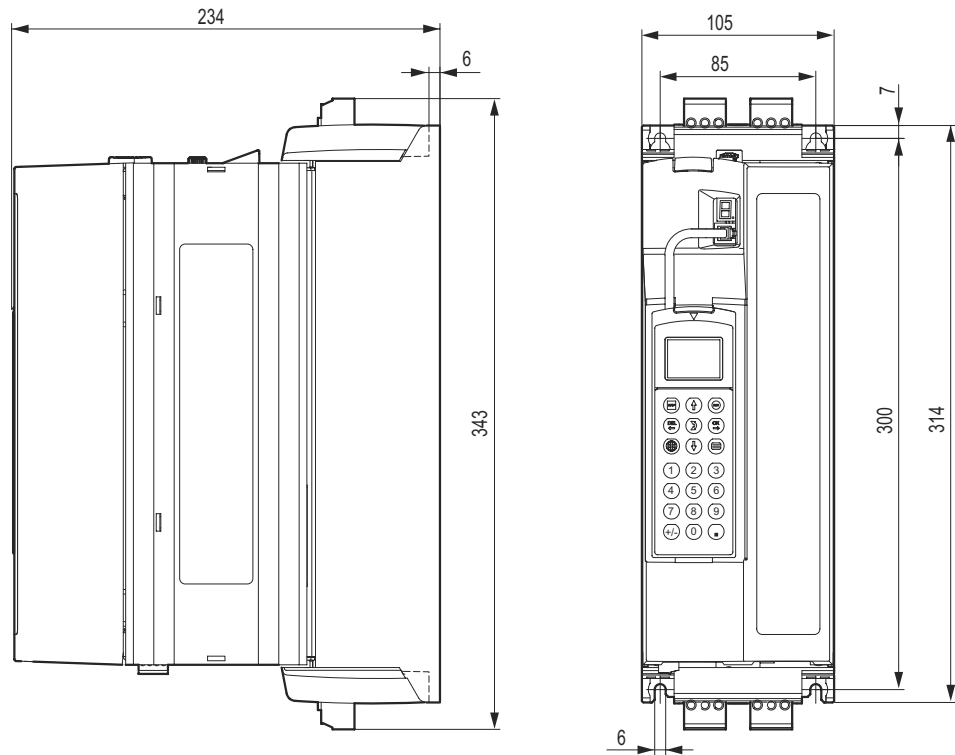
Size 0M



51378BXX

Figure 27: Dimension drawing for MDX61B size 0M, dimensions in mm

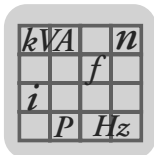
Size 1



3

Figure 28: Dimension drawing for MDX61B size 1, dimensions in mm

52274BXX



Size 2S

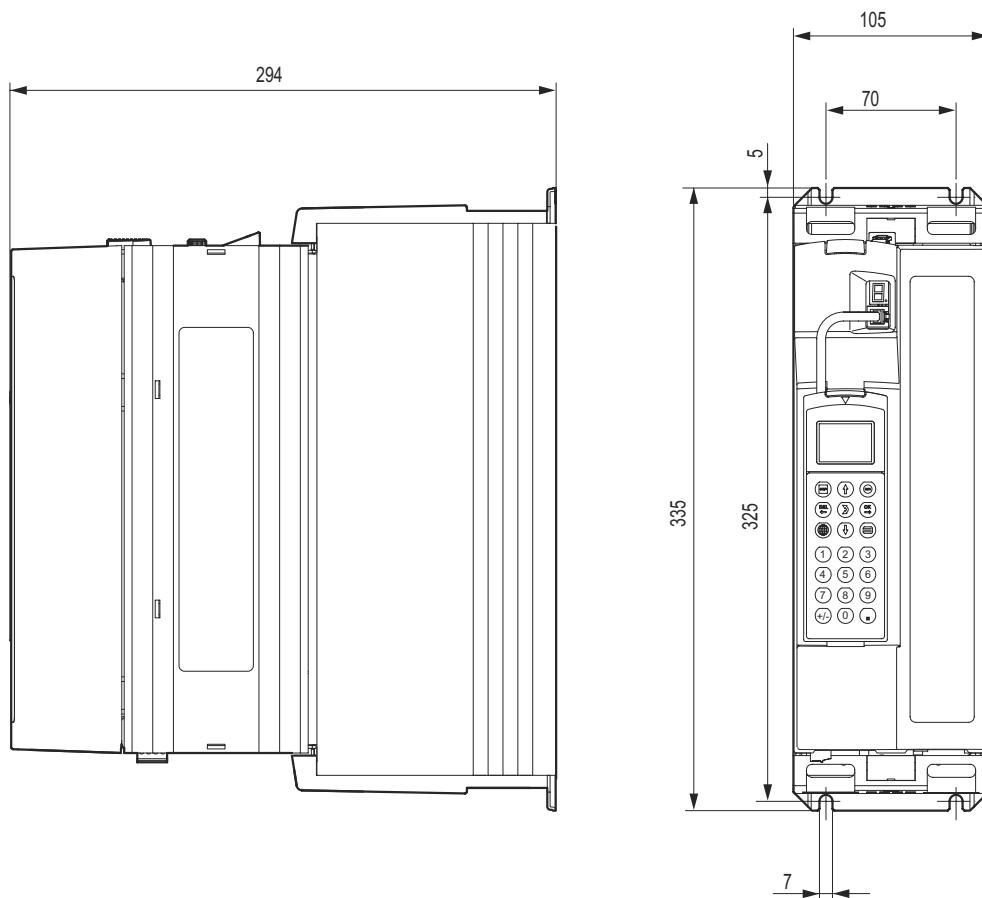
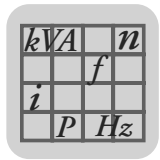
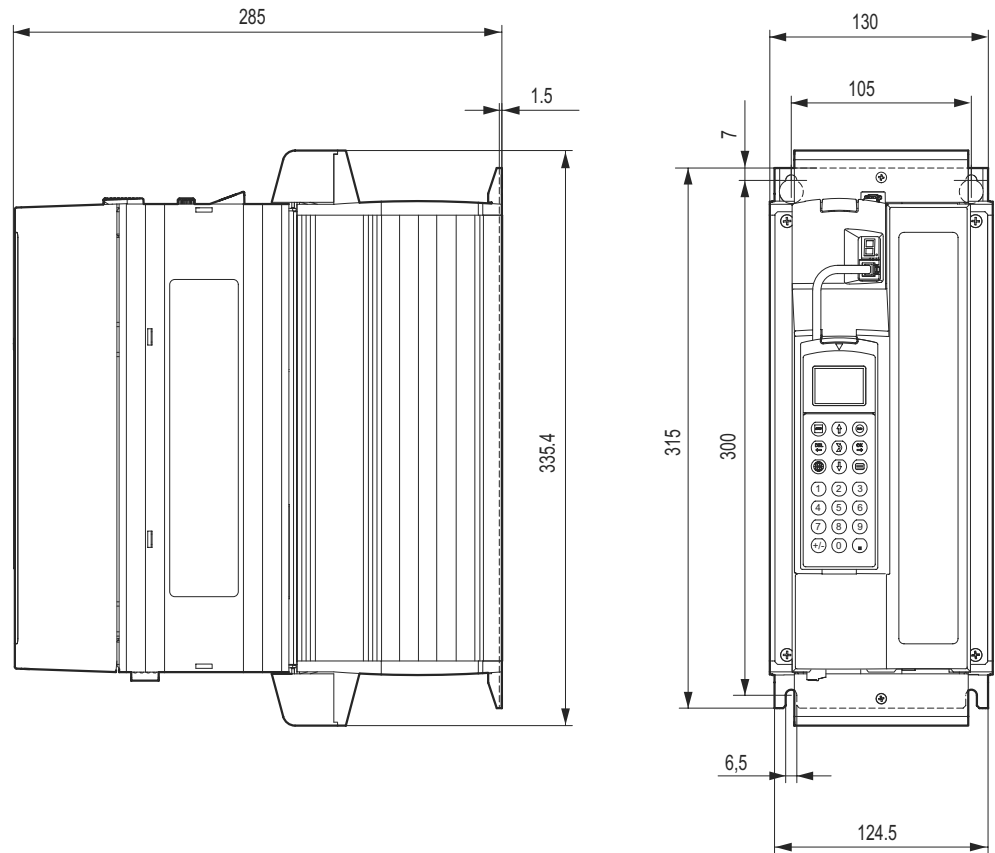


Figure 29: Dimension drawing for MDX61B size 2S, dimensions in mm

52273BXX

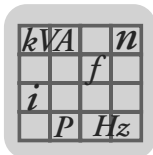


Size 2



52276BXX

Figure 30: Dimension drawing for MDX61B size 2, dimensions in mm



Size 3

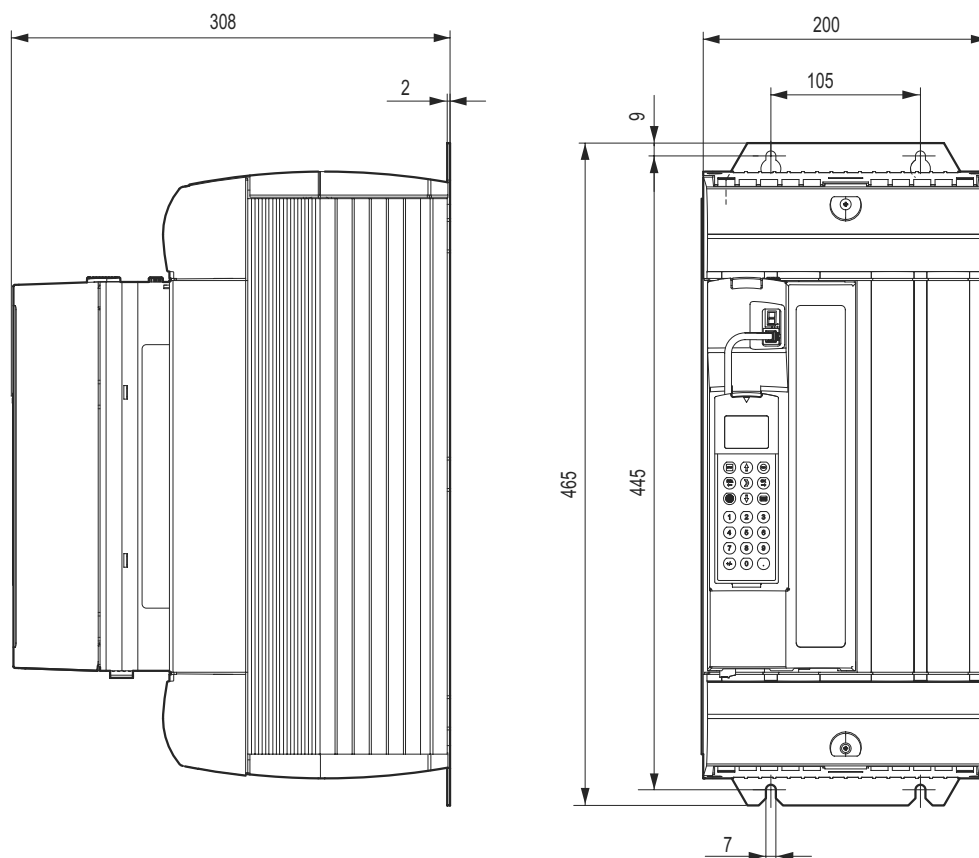
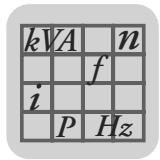


Figure 31: Dimension drawing for MDX61B size 3, dimensions in mm

52315BXX



Size 4

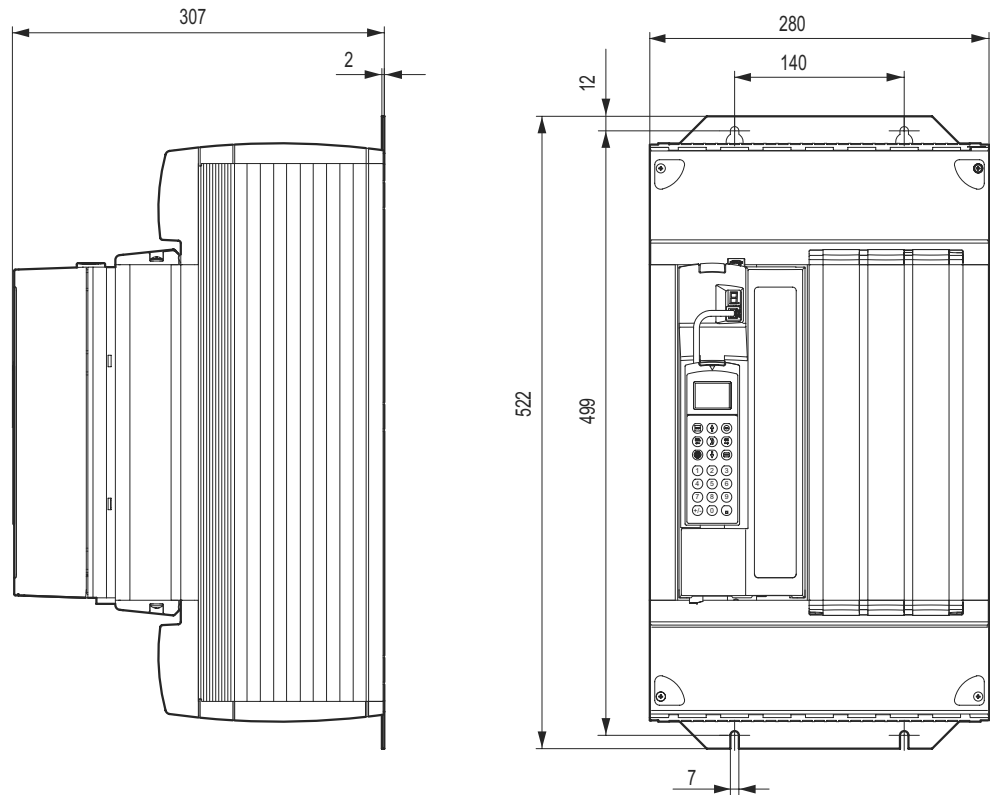
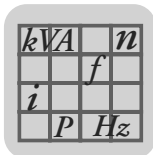


Figure 32: Dimension drawing for MDX61B size 4, dimensions in mm

52277BXX



Size 5

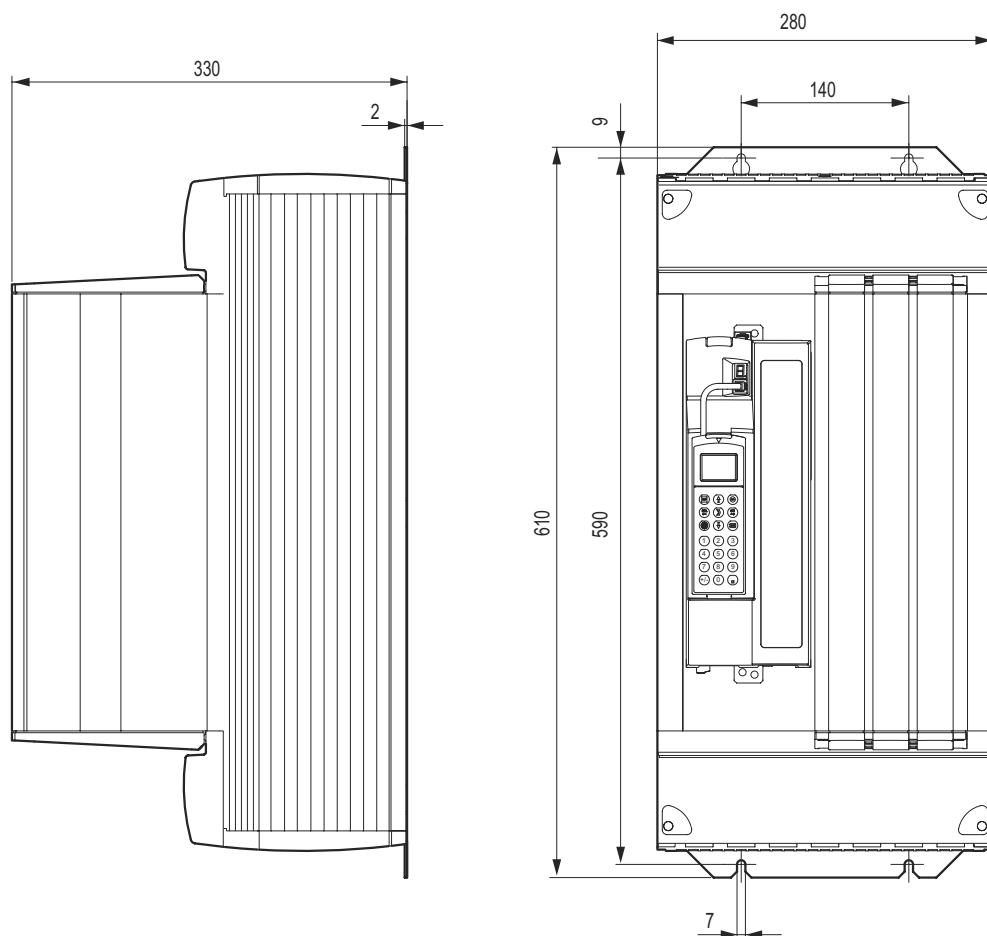


Figure 33: Dimension drawing for MDX61B size 5, dimensions in mm

52278BXX

Size 6

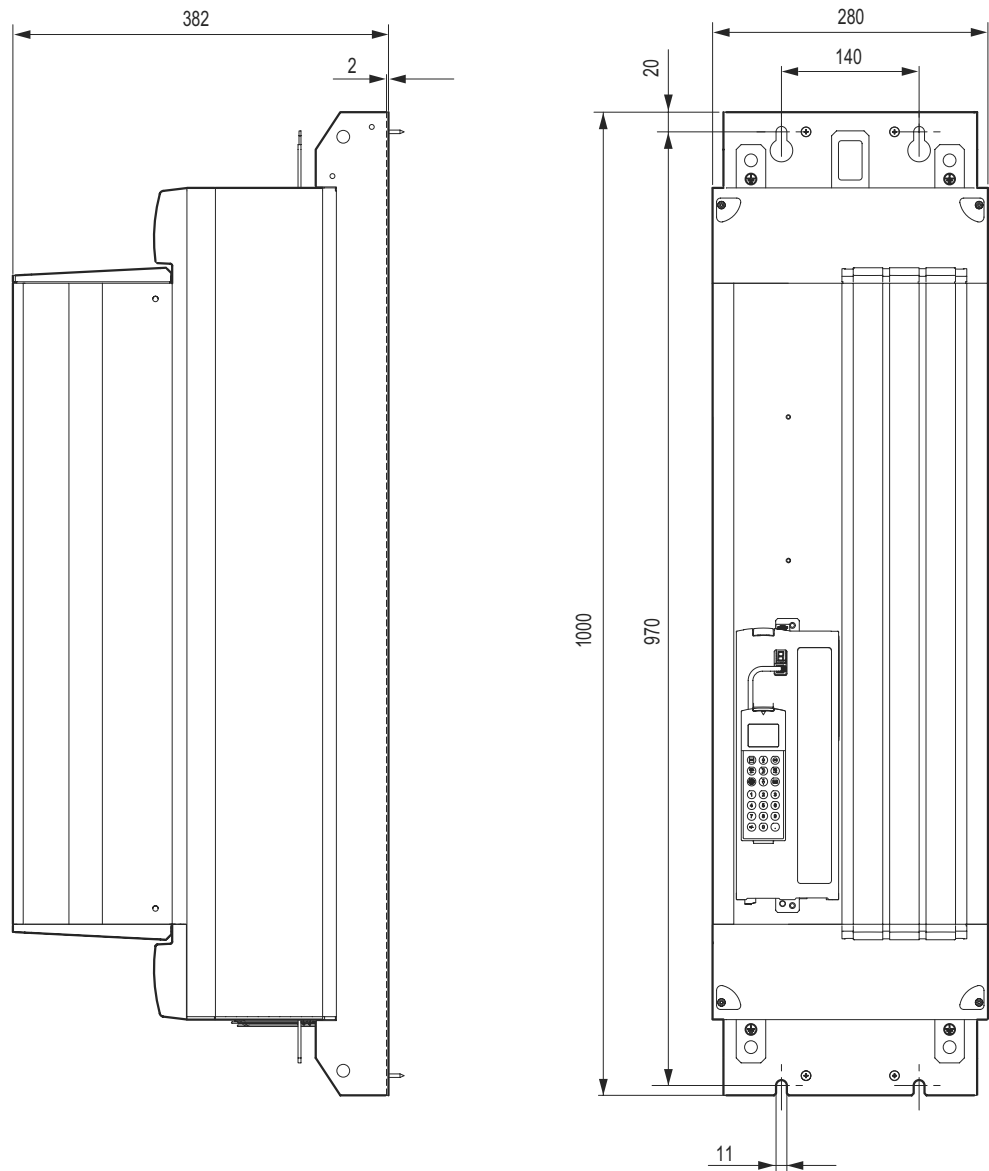
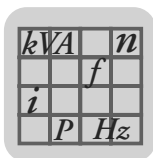


Figure 34: Dimension drawing for MDX61B size 6, dimensions in mm

52283BXX



3.8 MOVIDRIVE® MDR60A regenerative power supply units

In MOVIDRIVE® drive inverters operating in regenerative mode (4Q operation), the MOVIDRIVE® MDR60A regenerative power supply unit can be used as an alternative to braking resistors. The prerequisite is a powerful supply system. For more detailed information, refer to the "MOVIDRIVE® MDR60A Regenerative Power Supply Unit" system manual. This manual can be ordered from SEW-EURODRIVE.

MOVIDRIVE® MDR60A supplies the DC link circuit of the connected MOVIDRIVE® drive inverter with electrical power from the supply system in motor operation and returns regenerative power to the supply system in regenerative operation.

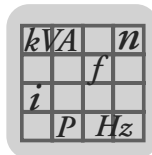
MOVIDRIVE® MDR60A does not require an auxiliary power supply or control signals. A DC 24 V signal output and a ready signal indicator show that MOVIDRIVE® MDR60A is ready for operation.

Properties of the regenerative power supply unit in comparison to the inverter with braking resistor

- Energy balance: Regenerative power is fed back into the supply system instead of being converted into waste heat.
- Reduced complexity of installation when there are several inverters (mains and braking resistor connections). However, a braking resistor is required for bringing the drive to a controlled stop even when there is a disruption in the supply system.
- Reduction in use of control cabinet capacity and ventilator power if the braking resistor used to have to be installed in the control cabinet.

Protection and monitoring functions

- Monitoring and protection against thermal overload.
- Detection of power failure under load within one supply system half-wave.
- Overvoltage protection.



General technical data

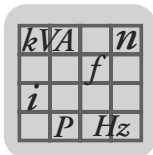
MOVIDRIVE® MDR60A	0370-503-00 (size 3) 0750-503-00 (size 4)	1320-503-00 (size 6)
Interference immunity	Complies with EN 50082, parts 1 and 2	EN 61000-4-4 severity 4 EN 61000-4-2 severity 3 EN 50082-2 criterion A
Interference emission with EMC-compliant installation	Complies with EN 50081, parts 1 and 2 with NF180-503	Complies with EN 50081 part 2 with NF300-503
Ambient temperature ϑ_U Derating ambient temperature Climate class	0 °C...+40 °C P_N reduction: 3 % I_N per K up to max. 60 °C EN 60721-3-3, class 3K3	0 °C...+40 °C P_N reduction: 3 % I_N per K up to max. 55 °C EN 50178 part 6.1, class 3K3
Storage temperature ¹⁾ ϑ_L	–25 °C...+70 °C (EN 60721-3-3, class 3K3)	–25 °C...+55 °C (to VDE0160, EN 50178 part 6.1, class 3K3)
Type of cooling (DIN 51751)	Forced cooling	
Enclosure EN 60529 (NEMA1) Size 3 Size 4	IP20 IP00 (power connections) IP10 (power connections) with • fitted plexiglass cover supplied as standard and • shrink tubing (not included in scope of delivery)	IP20
Operating mode	continuous duty (EN 60149-1-1 and 1-3)	
Installation altitude	$h \leq 1000$ m): No limitation From 1000 m to max. 4000 m: I_N reduction: 1 % per 100 m From 2000 m to max. 4000 m: U_N reduction: AC 6 V per 100 m	$h \leq 1000$ m: No limitation From 1000 m to max. 4000 m: I_N reduction: 0.5 % per 100 m

1) For long-term storage, connect to power supply every 2 years for at least 5 minutes, otherwise the unit's service life may be reduced.



54512AXX

Figure 35: MOVIDRIVE® MDR60A regenerative power supply units



Technical Data and Dimensions

MOVIDRIVE® MDR60A regenerative power supply units

MDR60A size 3

MOVIDRIVE® MDR60A		0370-503-00 (size 3)
Part number		826 658 1
INPUT		
Supply voltage	V_{mains}	$3 \times \text{AC } 380 \text{ V} -10 \% \dots 3 \times \text{AC } 500 \text{ V} +10 \%$
Mains frequency	f_{mains}	$50 \text{ Hz} - 60 \text{ Hz} \pm 5 \%$
Rated connected load	P_N	37 kW
Rated supply current (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{mains}	AC 66 A
DC LINK		
Apparent output power (at $V_{\text{mains}} = 3 \times \text{AC } 380 \dots 500 \text{ V}$)	S_A	50 kVA
DC link voltage	V_{DClink}	DC 560 V ... 780 V
Rated DC link current	I_{DCL}	DC 70 A
Max. DC link current $I_{\text{DCLink\_max}}$		DC 105 A
GENERAL		
Power loss at P_N	$P_{V\text{max}}$	950 W
Cooling air consumption		180 m ³ /h
Mass		16 kg
Dimensions	$W \times H \times D$	$200 \times 465 \times 221 \text{ mm}$
Line choke (always necessary)		ND085-013, $L_N = 0.1 \text{ mH}$, part number 826 014 1
Input filter (optional)		NF080-503, part number 826 077 X
For MOVIDRIVE® MDX60B/61B...-5_3		0005 ... 0370

Dimension drawing

Provide at least 100 mm clearance above and below the unit. No clearance is required at the sides; the units can be lined up in rows.

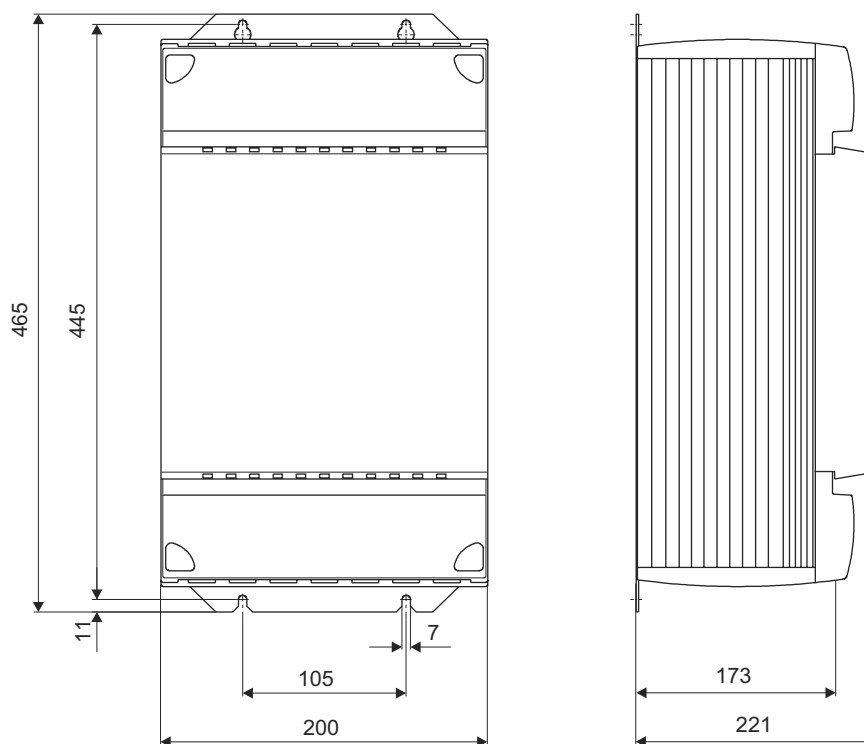
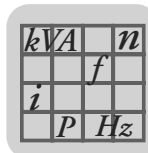


Figure 36: Dimension drawing for MDR60A size 3, dimensions in mm

54260BXX



MDR60A size 4

MOVIDRIVE® MDR60A		0750-503-00 (size 4)
Part number		826 556 9
INPUT		
Supply voltage	V_{mains}	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %
Mains frequency	f_{mains}	50 Hz – 60 Hz ± 5 %
Rated connected load	P_N	75 kW
Rated supply current (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{mains}	AC 117 A
DC LINK		
Apparent output power (at $V_{\text{mains}} = 3 \times \text{AC } 380...500 \text{ V}$)	S_A	90 kVA
DC link voltage	V_{DCL}	DC 560 V ... 780 V
Rated DC link current	I_{DCL}	DC 141 A
Max. DC link current	$I_{\text{DCLink\_max}}$	DC 212 A
GENERAL		
Power loss at P_N	P_{Vmax}	1700 W
Cooling air consumption		360 m³/h
Mass		24 kg
Dimensions	$W \times H \times D$	280 × 522 × 205 mm
Line choke (always necessary)		ND200-0033, $L_N = 0.03 \text{ mH}$, part number 826 579 8
Input filter (optional)		NF180-503, part number 826 455 4
For MOVIDRIVE® MDX60B/61B...-5_3		0005 ... 0750

Dimension drawing

Provide at least 100 mm clearance above and below the unit. No clearance is required at the sides; the units can be lined up in rows. Do not install any components that are sensitive to high temperatures within 300 mm of the top of the unit, for example contactors or fuses.

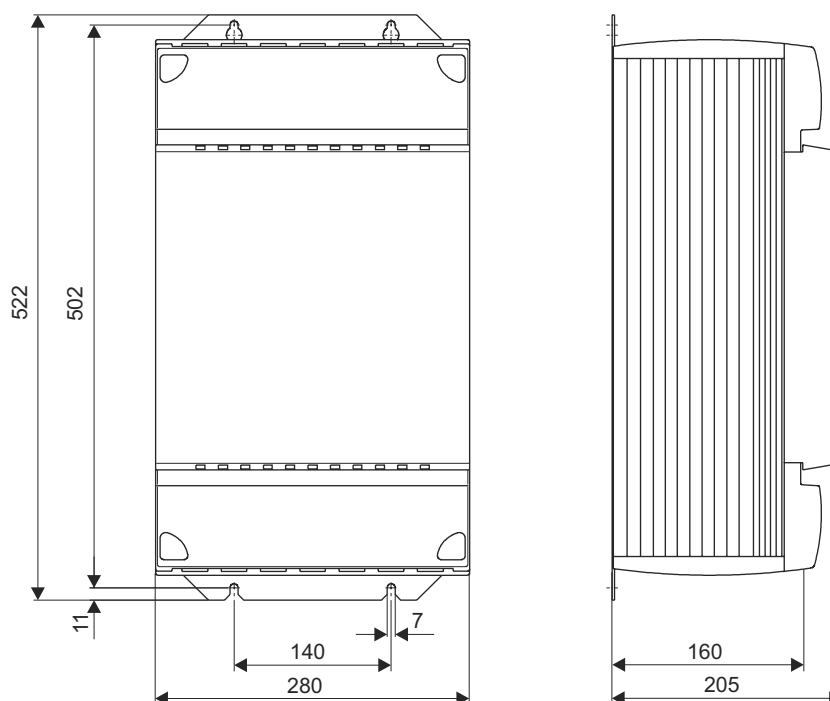
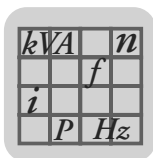


Figure 37: Dimension drawing for MDR60A size 4, dimensions in mm

54261BXX



Technical Data and Dimensions

MOVIDRIVE® MDR60A regenerative power supply units

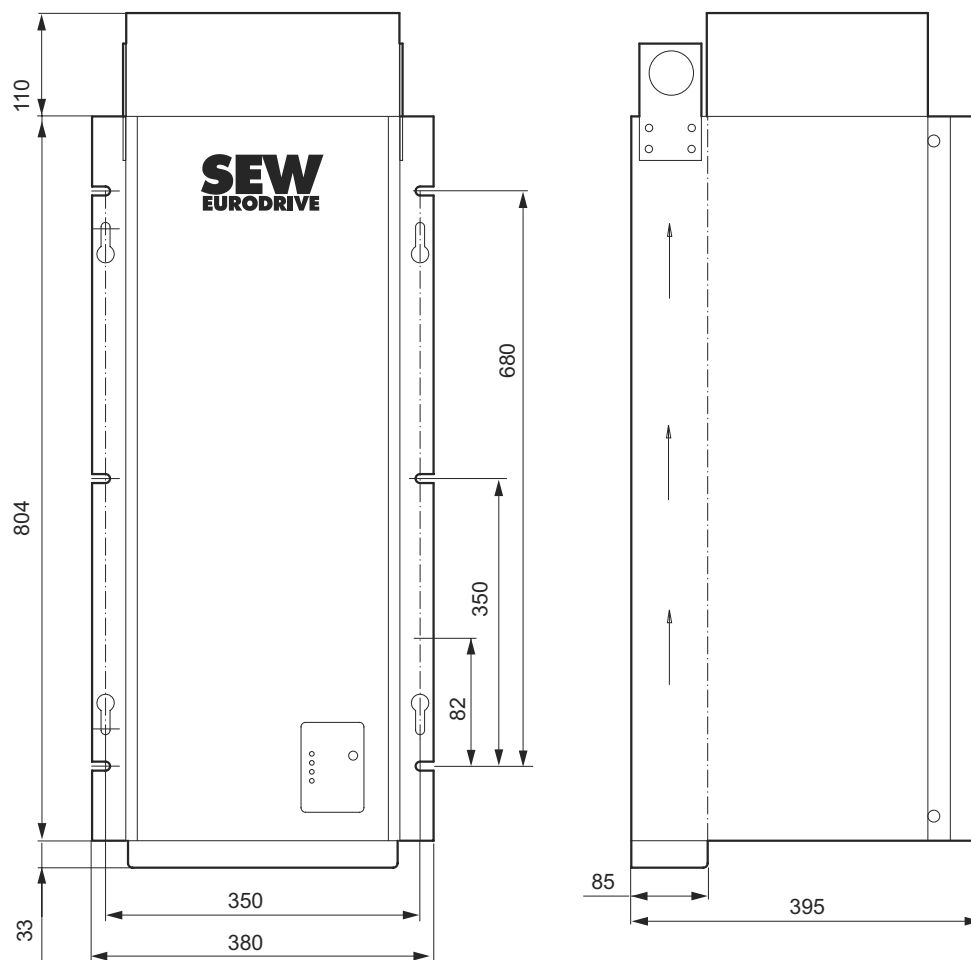
MDR60A size 6

MOVIDRIVE® MDR60A		1320-503-00 (size 6)
Part number		827 952 7
INPUT		
Supply voltage	V_{mains}	$3 \times \text{AC } 380 \text{ V} -10 \% \dots 3 \times \text{AC } 500 \text{ V} +10 \%$
Mains frequency	f_{mains}	40 Hz – 60 Hz $\pm 10 \%$
Rated connected load	P_N	132 kW
Rated supply current (at $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$)	I_{mains}	AC 260 A
DC LINK		
Apparent output power (at $V_{\text{mains}} = 3 \times \text{AC } 380 \dots 500 \text{ V}$)	S_A	173 kVA
DC link voltage V_{DCL}		DC 560 V ... 780 V
Rated DC link current I_{DCL}		DC 340 A
Max. DC link current	$I_{\text{DCLink\_max}}$	DC 410 A
GENERAL		
Power loss at P_N	P_{Vmax}	2650 W
Cooling air consumption		700 m ³ /h
Mass		90 kg
Dimensions	$W \times H \times D$	380 × 937 × 395 mm
Line choke		Already installed
Input filter (optional)		NF300-503, part number 827 419 3
for MOVIDRIVE® MDX61B...-5_3		0005 ... 1320

Dimension drawing

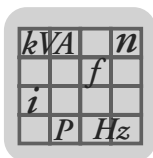
Provide at least 100 mm clearance above and below the unit. No clearance is required at the sides; the units can be lined up in rows.

Do not install any components that are sensitive to high temperatures within 300 mm of the top of the unit, for example contactors or fuses.



54282BXX

Figure 38: Dimension drawing for MDR60A size 6, dimensions in mm



Technical Data and Dimensions

MOVIDRIVE® MDR60A regenerative power supply units

DC link connection

SEW-EURODRIVE strongly recommends using the following cable sets for the DC link connection. These cable sets offer the appropriate dielectric strength and are also color-coded. Color coding 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 connection to the permitted length of 5 m. They can also be cut to length by the customer for connecting several units. The lugs for connection to the regenerative power supply unit and an inverter are supplied with the cable set. Use commercially available lugs for connecting additional inverters. The inverters must then be connected to the regenerative power supply unit in a star configuration.

Cable set type	DCP12A	DCP13A	DCP15A	DCP16A
Part number	814 567 9	814 250 5	814 251 3	817 593 4
For connecting MOVIDRIVE®	0005 ... 0110	0150 ... 0370	0450 ... 0750	0900 ... 1320



Refer to the "MOVIDRIVE® MDR60A Regenerative Power Supply Unit" system manual for information on the DC link connection. This manual can be ordered from SEW-EURODRIVE.

DCD12A damping module

Part number of damping module type DCD12A: 826 903 3

If more than six MOVIDRIVE® drive inverters are connected via the DC link, each unit of size 0 (0005-5A3 ... 0014-5A3), of size 1 (0015-5A3 ... 0040-5A3) as well as sizes 2 and 2S (0055-5A3 ... 0110-5A3) in the group must be connected to a DCD12A damping module at terminal X4:8 (+U_Z).

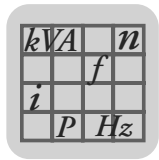


Figure 39: DCD12A damping module

04810AXX



Do not connect the DCD12A damping module to MOVIDRIVE® drive inverters sizes 3 to 6 (0150-503 ... 1320-503).



Technical data

DCD12A damping module	
Part number	826 903 3
Rated through current	DC 30 A
Electrical connection	Terminal screw 6 mm ² (AWG10)
Dimensions W x H x D	100 x 105 x 44 mm
Mass	0.5 kg

Dimension drawing

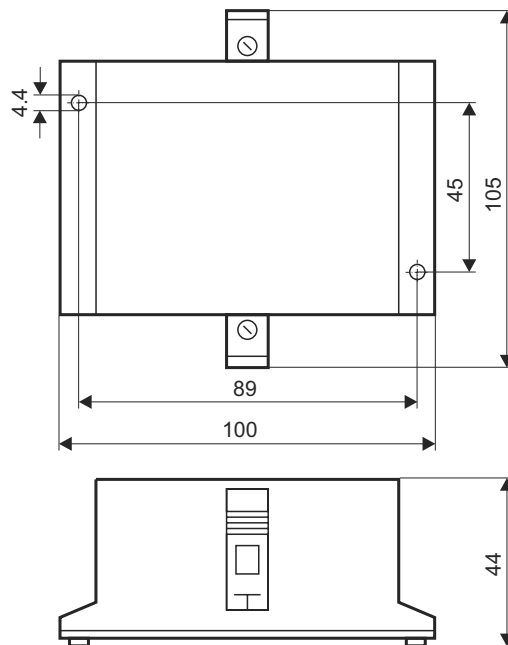
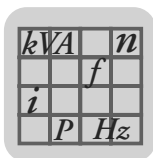


Figure 40: Dimension drawing for DCD12A, dimensions in mm

54320BXX



3.9 IPOS^{plus}®

Description

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

The IPOS^{plus}® sequence control system makes it possible to run a user program, regardless of the encoder feedback or the selected control mode (VFC, CFC, SERVO). In conjunction with encoder feedback, the IPOS^{plus}® positioning control provides high-performance point-to-point positioning. The IPOS^{plus}® program is written using the MOVITOOLS® software. Starting up the inverter, accessing parameters and editing variables are all possible either with the operating software or the DBG60B keypad (start-up in VFC mode only).

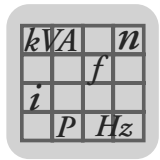
Features

- Program execution independent of encoder feedback and operating mode
- The user program is continued even if a unit malfunction occurs (troubleshooting is possible in the user program)
- Three user programs can be run in parallel and independently of one another (task 1, task 2 and task 3, each of them interrupt-capable)
- The user programs programmed in assembler can contain up to 3200 program lines
- User-friendly and comprehensive control options for the inverter
- Access to all available options
- Extensive options for communication via system bus (SBus), RS485, RS232 and fieldbus (direct communication with MOVIMOT® is possible)
- Processing of digital and analog input/output signals
- Positioning with selectable travel speed, positioning ramp and jerk limitation
- Feedforward for position, speed and torque control loops with minimized lag error
- Two touch probe inputs
- Ramp types: LINEAR, LINEAR jerk limited, SINUSOIDAL and SQUARED
- Status and monitoring functions: Lag error monitoring, position signal, software and hardware limit switches
- Nine types of reference travel
- Possibility of changing the target position, travel speed, positioning ramp and torque while movement is in progress
- Possibility of "Endless positioning"
- Override function
- Cam control
- Synchronous operation and electronic cam

Only with encoder feedback

Technical data for assembler programming

Max. program length of task 1, task 2 and task 3	approx. 3200 program lines in total
Command processing time per program line	1 ... 11 commands/ms can be configured
Variables	1024, of which 128 (0 ... 127) can be stored to non-volatile memory; range of values: $-2^{31} \dots + (2^{31} - 1)$
Touch probe inputs	2 inputs, processing time < 100 µs
Sampling interval of digital and analog inputs	1 ms
Digital inputs/outputs	8 inputs / 5 outputs
Analog inputs/outputs	1 input (DC 0 ... 10 V, DC ±10 V, DC 0 ... 20 mA, DC 4 ... 20 mA) 1 input (DC 0...10 V) 1 output (DC 0...20 mA, DC 4...20 mA)



3.10 DBG60B keypad option

Description

The basic version of MOVIDRIVE® does not have a DBG60B keypad and can be upgraded to include the keypad as an option.

Keypad	Language	Part number
 56555AXX	DBG60B-01	DE/EN/FR/IT/ES/PT/NL (German/English/French/Italian/Spanish/ Portuguese/Dutch)
	DBG60B-02	DE/EN/FR/FI/SV/DA/TR (German/English/French/Finnish/ Swedish/Danish/Turkish)
	DBG60B-03	DE/EN/FR/RU/PL/CS (German/English/France/Russian/Polish/ Czech)
	Door installation set¹⁾	Description (= scope of delivery)
	DBM60B	- Housing for DBG60B (IP65) - DKG60B extension cable, length 5 m
	Extension cable	Description (= scope of delivery)
	DKG60B	- Length 5 m 4-core, shielded cable (AWG26)
		Part number
		1 820 403 1
		1 820 405 8
		1 820 406 6
		824 853 2
		817 583 7

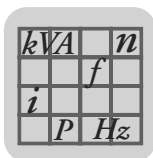
1) The DBG60B keypad is not included in the scope of delivery and must be ordered separately.

Functions

- Process values and status display
- Status display of binary inputs and outputs
- Fault memory and fault reset queries
- Option to display and set the operating parameters and service parameters
- Data backup and transfer of parameter sets to other MOVIDRIVE® units
- User-friendly startup menu for VFC mode
- Manual control for MOVIDRIVE®

Features

- Illuminated text display, choice of 7 languages
- Keypad with 21 keys
- Selection between user menu, detailed parameter menu and startup menu in VFC mode (CFC and SERVO startup is not possible with the DBG60B)
- Can be plugged onto the inverter
- Can be connected via extension cable DKG60B (5 m)
- Enclosure IP40 (EN 60529)



The DBG60B keypad option and the interface adapter option are plugged into the same inverter slot (Xterminal) and therefore cannot be used at the same time.

Dimension drawing for DBG60B

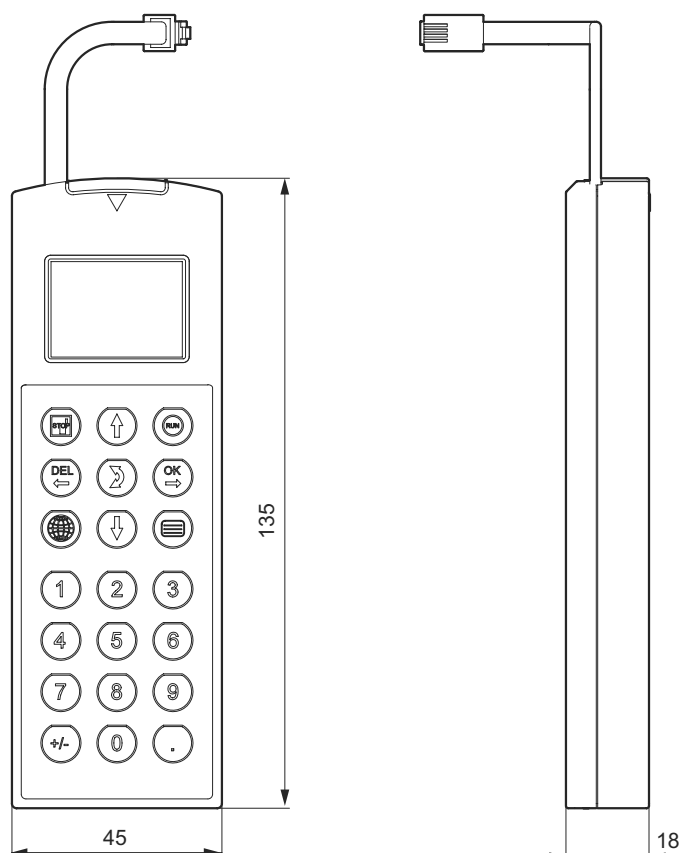
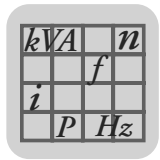


Figure 41: Dimension drawing for DBG60B, dimensions in mm

53147BXX



**Dimension
drawing for
DBG60B housing**

The DBM60B option can be used to mount the keypad close to the inverter (e.g. in the control cabinet door). The DBM60B option consists of housing in enclosure IP65 and a 5 m DKG60B extension cable.

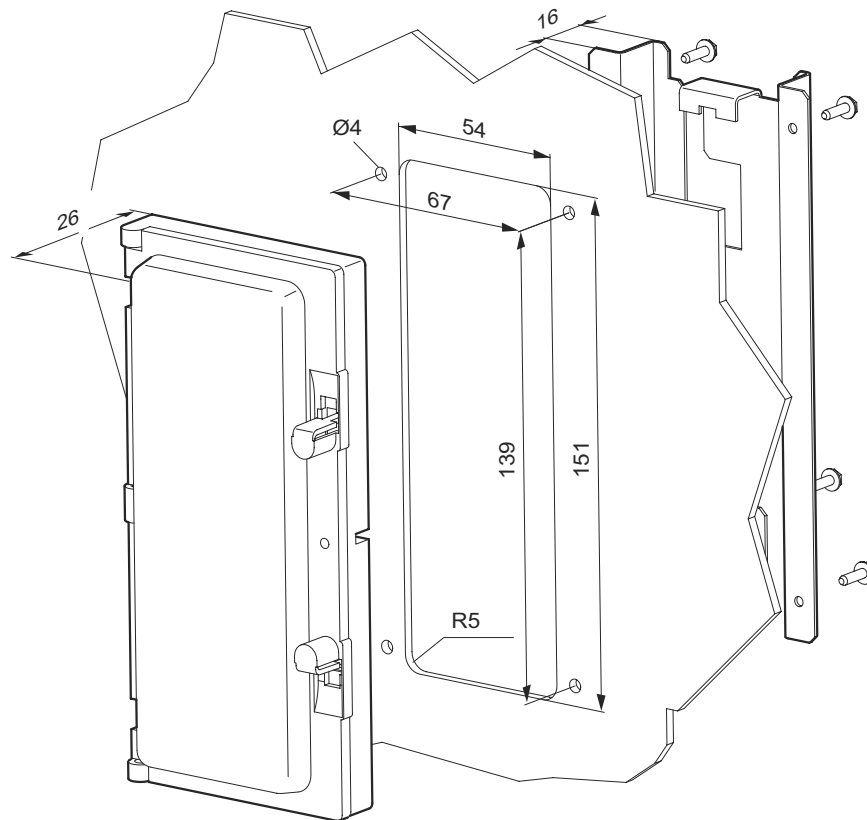
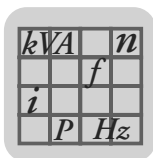


Figure 42: Dimension drawing for DBG60B housing, dimensions in mm

55735BXX

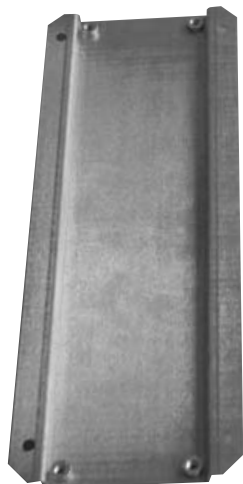


3.11 DMP11B fitting panel option

Part number 818 398 8

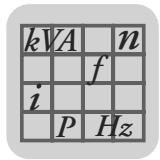
Description

DMP11B



54588AXX

If a MOVIDRIVE® MD_60A size 2 unit is to be replaced by MOVIDRIVE® MDX61B size 2S, the MDX61B size 2S can be fitted on the existing mounting plate with the DMP11B fitting panel. New retaining holes do not have to be drilled.



3.12 HIPERFACE® encoder card option type DEH11B

Part number 824 310 7

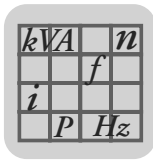
Description

The option-capable MOVIDRIVE® MDX61B units can be equipped with the HIPERFACE® encoder card type DEH11B. The encoder card offers one input for the motor encoder and one input for an external encoder, also referred to as a synchronous encoder. The input for the external encoder can also be used as an output for encoder simulation.

Electronics data

DEH11B option			
	Encoder X14: simulation output or External encoder input	Encoder simulation output: Signal level to RS422 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)	External encoder input (max. 200 kHz): Permitted encoder types: - HIPERFACE® encoder - sin/cos-Geber AC 1 V_{SS} - TTL sensor Encoder power supply: DC+12 V, I _{max} = DC 650 mA ¹⁾
	Motor enc. input X15:	Permitted encoder types: - HIPERFACE® encoder - sin/cos-Geber AC 1 V_{SS} - TTL sensor - Permitted resolution: 128/256/512/1024/2048 [increments/revolution] Encoder power supply: DC+12 V, I _{max} = DC 650 mA ¹⁾	

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



3.13 Resolver card option type DER11B

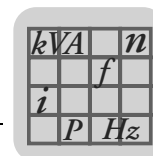
Part number 824 307 7

Description

Option-capable MOVIDRIVE® MDX61B units can be equipped with resolver card type DER11B. The resolver card offers one input for the resolver as motor encoder and one input for an external encoder, also referred to as a synchronous encoder. The input for the external encoder can also be used as an output for encoder simulation.

Electronics data

DER11B option			
	Encoder simulation output or input external encoder	X14:	Encoder simulation output: Signal level to RS422 The number of pulses is 1024 pulses/revolution
	Motor encoder input	X15:	Resolver 2-pole, $U_{ref} = AC\ 3.5\ V_{eff}$, 4 kHz $U_{in} / U_{ref} = 0.5$
		External encoder input (max. 200 kHz): Permitted encoder types: • HIPERFACE® encoder • sin/cos-Geber AC 1 V_{SS} • TTL sensor Encoder power supply: DC+12 V, $I_{max} = DC\ 650\ mA$	



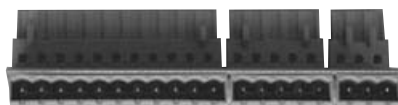
3.14 Connector adapter for replacing MD_60A with MDX60B/61B

Three adapters are available for rapid replacement of a MOVIDRIVE® A unit with a MOVIDRIVE® B unit during system operation.

- DAT11B: Terminal adapter, part number 824 671 8

X10 can be rearranged directly when using MOVIDRIVE® MDF, MDV or MDS. Three connectors have to be rewired. You can avoid such rewiring work by using the DAT11B terminal adapter. Using this adapter will prevent incorrect connection and save time. The terminal adapter is required for terminals X11 (analog input), X12 (SBus) and X13 (binary inputs).

DAT11B



54589AXX

- DAE15B: Encoder adapter X15, part number 817 629 9

If a motor with encoder on X15 is in operation on an MDV or MCV, the encoder is connected via a 9-pin plug connector to MOVIDRIVE® A. Since the DEH11B option for MOVIDRIVE® MDX61B comes equipped with a 15-pin plug, you will either have to convert the encoder cable or use the encoder adapter. The encoder adapter can be plugged directly between the existing encoder cable with 9-pin connector and the 15-pin connector on the DEH11B. This step makes for fail-safe and fast connection of existing drives.

DAE15B

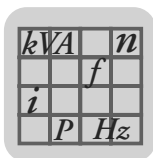


54585AXX

Length of DAE15B: 200 mm ± 20 mm

Line cross section: 6 x 2 x 0.25 mm² (AWG23)

Terminal of the 15-pin sub D plug (MOVIDRIVE® MDX61B, option DEH11B, X15)	Core color in prefabricated cable	Terminal of 9-pin sub D socket (encoder end)
1	Yellow (YE)	1
2	Red (RD)	2
3	Pink (PK)	3
4	Violet (VT)	4
5	Brown (BN)	8
6	Green (GN)	9
7	Blue (BU)	10
8	Gray (GY)	11
9	White (WH)	15



Technical Data and Dimensions

Connector adapter for replacing MD_60A with MDX60B/61B

- DAE14B: Encoder adapter X14, part number 817 630 2

If a synchronous encoder at X14 is operated on a MOVIDRIVE® MDV, MDS, MCV or MCS unit, connection takes place via a 9-pin connector. Since the DEH11B and DER11B options for MOVIDRIVE® MDX61B comes equipped with a 15-pin plug, you will either have to rework the encoder cable or use the encoder adapter. The encoder adapter can be plugged directly between the existing encoder cable with 9-pin plug and the 15-pin plug on the DEH11B/DER11B. This step makes for fail-safe and fast connection of existing drives.

DAE14B

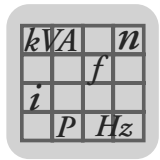


54586AXX

Length of DAE14B: 200 mm ± 20 mm

Line cross section: 6 x 2 x 0.25 mm² (AWG23)

Terminal of the 15-pin sub D plug (MOVIDRIVE® MDX61B, option DEH11B/DER11B, X14)	Core color in prefabricated cable	Terminal of 9-pin sub D socket (encoder end)
1	Yellow (YE)	1
2	Red (RD)	2
3	Pink (PK)	3
4	Violet (VT)	4
5	Brown (BN)	8
6	Green (GN)	9
7	Blue (BU)	10
8	Gray (GY)	11
9	White (WH)	15



3.15 Interface adapter option type UWS11A

Part number 822 689 X

Description

The UWS11A option converts RS232 signals, for example from the PC, into RS485 signals. These RS485 signals can then be routed to the RS485 interface of the MOVIDRIVE® unit (ST11/ST12).

The UWS11A option requires a DC 24 V voltage supply ($I_{\max} = 100 \text{ mA}$).

RS232 interface

The connection between the UWS11A and the PC is made using a commercially available serial interface cable (shielded!).

RS485 interface

Max. 32 MOVIDRIVE® units can be networked for communication (max. cable length 200 m) via the RS485 interface of the UWS11A. Dynamic terminating resistors are permanently installed, so do not connect any external terminating resistors.

Permitted line cross section: One core per terminal $0.20 \dots 2.5 \text{ mm}^2$ (AWG 24...12)
Two cores per terminal $0.20 \dots 1 \text{ mm}^2$ (AWG 24...17)

Dimensions

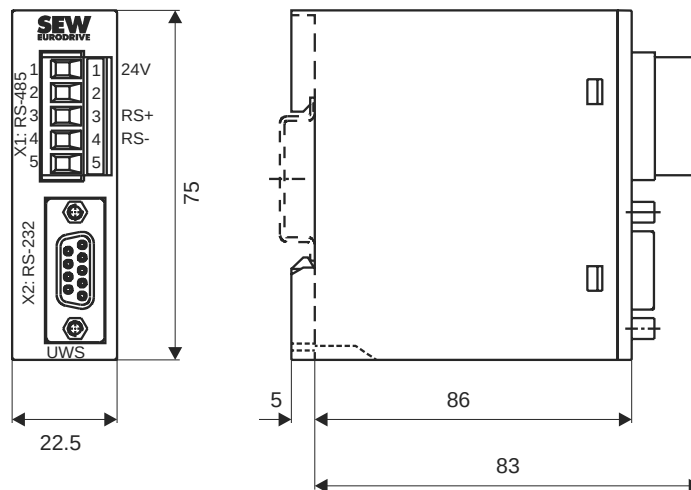
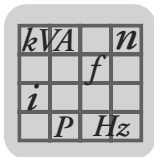


Figure 43: UWS11A dimension drawing, dimensions in mm

01219CXX

The UWS11A option is mounted on a support rail (EN 50022-35 × 7.5) in the control cabinet.



3.16 Interface adapter option type UWS21A

Part number 823 077 3

Description The UWS21A option converts RS232 signals, for example from the PC, into RS485 signals. These RS485 signals can then be routed to the Xterminal interface of the MOVIDRIVE® unit.

RS232 interface The connection between UWS21A and PC is made using a commercially available serial interface cable (shielded!).

RS485 interface UWS21A and MOVIDRIVE® are connected using a serial interface cable with RJ10 plugs.

Scope of delivery The scope of delivery for the UWS21A option includes:

- UWS21A interface adapter
- Serial interface cable with 9-pin sub D socket and 9-pin sub D plug to connect the UWS21A option to the PC.
- Serial interface cable with two RJ10 plugs to connect UWS21A and MOVIDRIVE®.

Dimension drawing

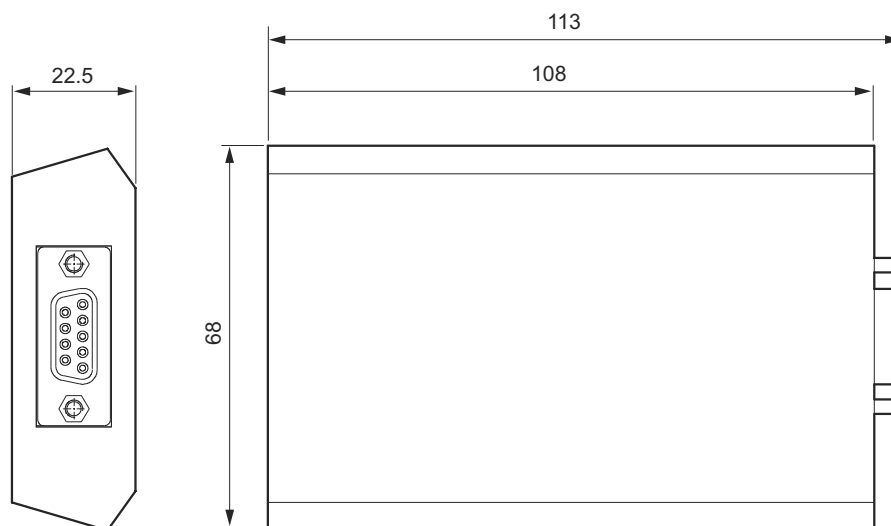
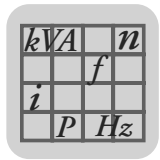


Figure 44: UWS21A dimension drawing, dimensions in mm

53153BXX



3.17 Interface adapter option type USB11A

Part number 824 831 1

Description Option USB11A enables a PC or laptop with a USB interface to be connected to the Xterminal interface of the MOVIDRIVE® unit. The USB11A interface adapter supports USB1.1 and USB2.0.

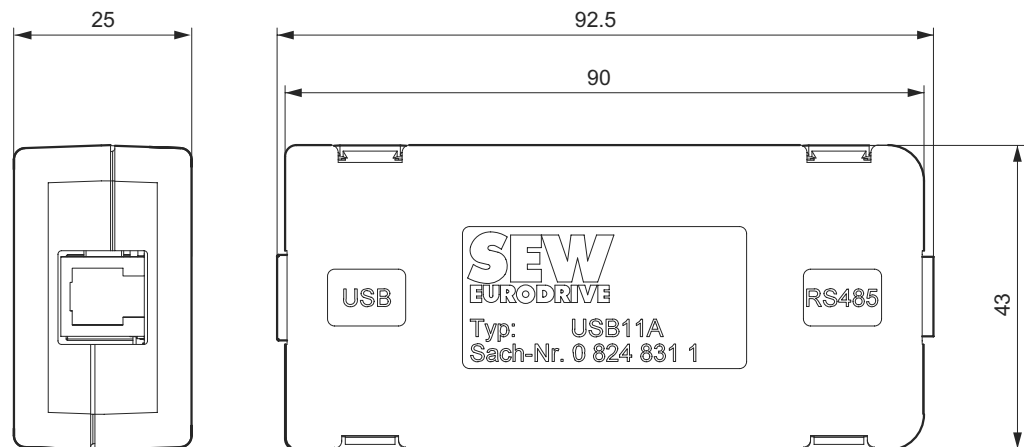
USB11A - PC USB11A is connected to the PC using a commercially available, shielded USB connection cable type USB A-B.

MOVIDRIVE® - USB11A MOVIDRIVE® and USB11A are connected using a serial interface cable with RJ10 plugs.

Scope of delivery The scope of delivery for the USB11A option includes:

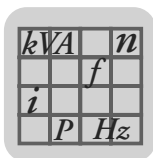
- USB11A interface adapter
- USB connection cable to connect USB11A - PC
- Serial interface cable with two RJ10 plugs to connect USB11A and MOVIDRIVE®
- CD-ROM with drivers and MOVITOOLS®

Dimension drawing



55732BXX

Figure 45: USB11A dimension drawing, dimensions in mm



3.18 DC 5 V encoder power supply option type DWI11A

Part number 822 759 4

Description

If you are using an incremental encoder with a DC 5 V encoder power supply, install the DC 5 V encoder power supply option type DWI11A between the inverter and the incremental encoder. This option provides a regulated DC 5 V power supply for the encoder. For this purpose, the DC 12 V power supply for the encoder inputs is converted to DC 5 V by means of a voltage controller. A sensor line is used to measure the supply voltage at the encoder and compensate the voltage drop along the encoder cable.

Incremental encoders with DC 5 V encoder power supply are not allowed to be connected directly to the encoder inputs X14: and X15:. This would result in irreparable damage to the encoders.



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	DC 5 V encoder power supply type DWI11A
Part number	822 759 4
Voltage input	DC+24 V to EN 61131-2, DC 10 ... 30 V, $I_{\max} = \text{DC } 120 \text{ mA}$
Encoder power supply	DC +5 V (up to $V_{\max} \approx +10 \text{ V}$), $I_{\max} = \text{DC } 300 \text{ mA}$
Max. line length that can be connected	100 m total Use a shielded twisted-pair cable (A and $\bar{A}$, B and $\bar{B}$, C and $\bar{C}$) for connecting the encoder to the DWI11A and the DWI11A to MOVIDRIVE®.

Recommendation Use prefabricated cables from SEW for connecting the encoder.

Dimension drawing

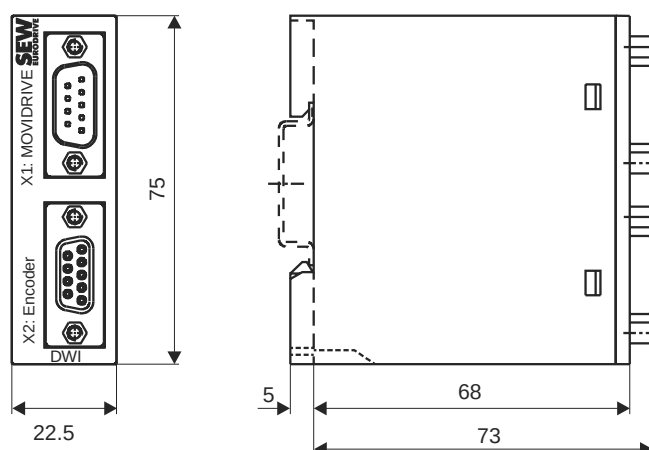
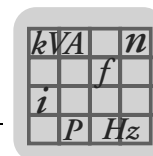


Figure 46: DWI11A dimension drawing, dimensions in mm

01315CXX

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



3.19 Input/output board type DIO11B

Part number 824 308 5

Description

The number of inputs/outputs of the basic MOVIDRIVE® unit can be expanded with the DIO11B option. The DIO11B option is plugged into the fieldbus slot. If the fieldbus slot is not available, you can plug the DIO11B option into the expansion slot. The programmable signal types of the additional binary inputs/outputs are the same as for the basic unit (→ parameter group P6___, terminal assignment).

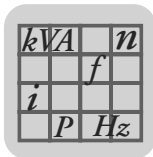
Electronics data

DIO11B option		
 53159AXX	Setpoint input n2	X20:1/X20:2
	Mode AI21/AI22	
	Resolution	
	Internal resistance	
	Analog outputs	X21:1/X21:4 X21:2/X21:5
	Response time	
	Resolution	
	Binary inputs	X22:1...X22:8
	Internal resistance	
	Signal level	
	Function	X22:1...X22:8
	Binary outputs	X23:1...X23:8
	Signal level	
	Function	X23:1...X23:8
	Reference terminals	X20:3/X21:3/X21:6
		X22:9 X22:10
	Voltage input	X23:9
	Permitted line cross section	

AI21/AI22: Voltage input, sampling interval 1 ms Differential input or input with AGND reference potential n2 = DC 0...+10 V or DC -10 V...0...+10 V 12 bit R _i = 40 kΩ	
AOV1/AOV2: Voltage outputs DC -10 V...0...+10 V, I _{max} = DC 10 mA, short-circuit proof and protected against external voltage, selection option → parameter menu P64_ AOC1/AOC2: Current outputs DC 0(4)...20 mA, short-circuit proof and protected against external voltage, selection option → parameter menu P64_	
5 ms 12 bit	
Isolated (optocoupler), PLC compatible (EN 61131), sampling interval 1 ms DI1Ø...DI17 R _i ≈ 3 kΩ, I _E ≈ DC 10 mA	
DC+13 V...+30 V = "1" = contact closed DC-3 V...+5 V = "0" = contact open	Fulfills EN 61131
DI10...DI17: Selection option → Parameter menu P61_	
DO1Ø...DO17: PLC compatible (EN 61131-2), response time 1 ms	
"0" = DC 0 V "1" = DC+24 V	
DO10...DO17: Selection option → Parameter menu P63_ I _{max} = DC 50 mA, short-circuit proof and protected against external voltage	
AGND: Reference potential for analog signals (AI21/AI22/AO_1/AO_2) DCOM: Reference potential for binary inputs X22:1...X22:8 (DI1Ø...DI17) DGND: Reference potential for binary signals, reference potential for DC 24 V power supply	
24VIN: Supply voltage DC +24 V for binary outputs DO1Ø...DO17	
One conductor per terminal: 0.08...1.5 mm ² (AWG 28...16) Two conductors per terminal: 0.25...1 mm ² (AWG 22...17)	

Functions

- Eight binary inputs
- Eight binary outputs
- 1 analog differential input (DC 0...10 V, DC -10 V...+10 V, DC 0...20 mA with corresponding load)
- 2 analog inputs (DC -10 V ... +10 V, DC 0...20 mA, DC 4...20 mA)



3.20 PROFIBUS fieldbus interface option type DFP21B

Part number 824 240 2

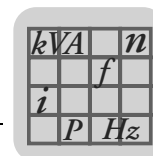
Description

MOVIDRIVE® can be equipped with a 12 Mbaud fieldbus interface for the PROFIBUS-DP serial bus system. For detailed information, refer to the PROFIBUS documentation package, which can be ordered from SEW-EURODRIVE. The documentation package contains the GSD files (device database files (DDBF)) and type files for MOVIDRIVE® to help with project planning and to facilitate startup.

PROFIBUS-DP (Decentralized Periphery) is primarily used at the sensor/actuator level where fast response times are required. The principal task of PROFIBUS-DP is to exchange data, e.g. setpoints or binary commands, in rapid cycles between central automation equipment (PROFIBUS master) and decentralized peripheral units (e.g. drive inverters). The DFP21B option supports PROFIBUS-DP and DP-V1. Consequently, MOVIDRIVE® can be controlled via PLC and PROFIBUS-DP / DP-V1.

Electronics data

DFP21B option	
	Protocol option
	Baud rate
	Connection technology
	Bus termination
	Station address
	Name of the GSD file
	DP ident number
	Max. number of process data
	PROFIBUS DP and DP-V1 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 connector with terminating resistors that can be activated
	0 ... 125, can be set using DIP switch
	SEWA6003.GSD
	6003 _{hex} (24579 _{dec})
	10 process data



3.21 INTERBUS fieldbus interface option type DFI11B

Part number 824 309 3

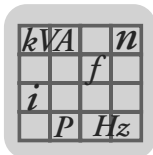
Description

MOVIDRIVE® can be equipped with a fieldbus interface for the non-proprietary and standardized INTERBUS sensor/actuator bus system. For detailed information, refer to the INTERBUS documentation package, which can be ordered from SEW-EURODRIVE.

INTERBUS is defined in EN 50254 / DIN 19258 and, as far as its function is concerned, it consists of a process data channel and a parameter data channel. Intelligent actuators such as the MOVIDRIVE® drive inverter can be controlled and parameterized in a user-friendly way.

Electronics data

DFI11B option	
	Supported baud rates 500 kbaud and 2 Mbaud, can be selected via DIP switch
	Connection technology Remote bus input: 9-pin sub D connector Remote bus output: 9-pin Sub-D socket RS485 transmission technology, 6-core shielded and twisted-pair cable
	DP identity numbers E3_{hex} = 227_{dec} (1 PCP word) E0_{hex} = 224_{dec} (2 PCP words) E1_{hex} = 225_{dec} (4 PCP words) 38_{hex} = 56_{dec} (microprocessor not ready) 03_{hex} = 3_{dec} (no PCP word)
	Max. number of process data 6 process data



3.22 INTERBUS-LWL fieldbus interface option type DFI21B (FO)

Part number 824 311 5

Description

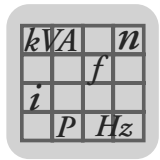
MOVIDRIVE® can be equipped with a fieldbus interface for the non-proprietary and standardized INTERBUS sensor/actuator bus system / INTERBUS with fiber optic cables (INTERBUS-LWL). For detailed information, refer to the INTERBUS documentation package, which can be ordered from SEW-EURODRIVE.

INTERBUS is defined in EN 50254 / DIN 19258 and, as far as its function is concerned, it consists of a process data channel and a parameter data channel. Intelligent actuators such as the MOVIDRIVE® drive inverter can be controlled and parameterized in a user-friendly way.

Electronics data

DFI21B option	
	Supported baud rates
	500 kbaud and 2 Mbaud, can be selected via DIP switch
	Connection technology
	F-SMA connector
	DP identity numbers
	E3 _{hex} = 227 _{dec} (1 PCP word) E0 _{hex} = 224 _{dec} (2 PCP words) E1 _{hex} = 225 _{dec} (4 PCP words) 38 _{hex} = 56 _{dec} (microprocessor not ready) 03 _{hex} = 3 _{dec} (no PCP word)
	Max. number of process data
	6 process data

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3.23 Ethernet fieldbus interface type DFE11B

Part number 1820 036 2

Description

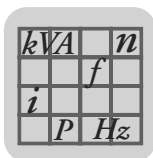
The MOVIDRIVE® MDX61B drive inverter enables you to use the DFE11B option to connect to higher-level automation, project planning and visualization systems via Ethernet thanks to its powerful, universal fieldbus interface. You can use option DFE11B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS^{plus}® programs. An integrated Web server provides quick and easy access to diagnostics values using a standard browser such as Internet Explorer.

Electronics data

Option DFE11B	
	Power consumption
	P = 3 W
	Application protocol
	• MODBUS/TCP (Transmission Control Protocol) to control and set parameters for the drive inverter. • HTTP (Hypertext Transfer Protocol) for diagnostics using a Web browser. • SMLP (Simple Movilink Protocol), protocol used by MOVITOOLS®. • DHCP (Dynamic Host Configuration Protocol) to assign address parameter automatically.
	Port numbers used
	• 502 (MODBUS) • 300 (SMLP) • 80 (HTTP) • 67 / 68 (DHCP)
	ISO / OSI layer 2
	Ethernet II
	Automatic baud rate detection
	10 MBaud / 100 MBaud
	Connection technology
	RJ45 modular jack 8-8
	Addressing
	4 byte IP address
	Tools for startup
	• MOVITOOLS® software • DBG60B keypad

Functions

- MODBUS / TCP protocol
- RJ45 plug connection, star-type cabling
- Up to 10 process data and parameter data items can be transferred at the same time
- Three ways to allocate the IP address:
 1. Set the node address manually (byte 0 or IP address)
 2. Make the setting using the DBG60B keypad and MOVITOOLS®
 3. Use the DHCP server
- Engineering access using MOVITOOLS® via Ethernet-TCP/IP
- Inverter diagnostics using a standard browser (e.g. Internet Explorer) via the integrated Web server:
 - Transfer display values
 - Configure DFE11B (after login)



3.24 DeviceNet fieldbus interface option type DFD11B

Part number 824 972 5

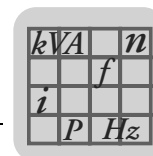
Description

The MOVIDRIVE® MDX61B drive inverter in conjunction with the DFD11B option allows connection to higher-level automation, project planning and visualization systems via the open and standardized DeviceNet fieldbus system thanks to the option's high-performance universal fieldbus interface.

The DeviceNet fieldbus interface type DFD11B can be plugged into the fieldbus slot on all MOVIDRIVE MDX61B units. The DFD11B option enables communication with the machine control for a maximum of 10 process data. You need an EDS file to be able to integrate the DFD11B in the machine control. You can download this file from the SEW homepage in the Software section.

Electronics data

DFD11B option	
 55729AXX	Power consumption
	P = 3 W
	Communication protocol
	Master/slave connection set acc. to DeviceNet specification version 2.0
	Number of process data words
	Adjustable via DIP switches: • 1 ... 10 process data words • 1 ... 4 process data words with Bit-Strobe I/O
	Baud rate
	125, 250 or 500 kBaud, to be set via DIP switches
	Bus cable length
	For thick cable according to DeviceNet specification 2.0 Appendix B • 500 m at 125 kbaud • 250 m at 250 kbaud • 100 m at 500 kbaud
	Transmission level
	ISO 11 98 - 24 V
	Connection technology
	• 2-wire bus and 2-wire supply voltage DC 24 V with 5-pole Phoenix terminal • Pin assignment acc. to DeviceNet specification
	MAC-ID
	0 ... 63, can be set using DIP switch Max. 64 stations
	Supported services
	• Polled I/O: 1 ... 10 words • Bit-Strobe I/O: 1 ... 4 words • Explicit messages: – Get_Attribute_Single – Set_Attribute_Single – Reset – Allocate_MS_Connection_Set – Release_MS_Connection_Set
	Tools for startup
	• MOVITOOLS® software • DBG60B keypad



3.25 CANopen fieldbus interface option type DFC11B

Part number 824 317 4

Description A second system bus (CAN) from MOVIDRIVE® can be used via the DFC11B option. The DFC11B option is plugged into the fieldbus slot.

3

Electronics data

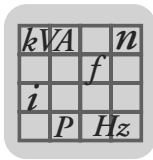
DFC11B option	
 55728AXX	Power consumption
	Application profile
	Number of process data words
	Baud rate
	Connection technology
	Permitted line cross section X31 (CAN-Bus connection)
	Terminating resistor
	Addressing
	Tools for startup

Functions

- CANopen Layer 2 and application profile MOVILINK® or CANopen
- Electrical isolation via optocoupler



If electrical isolation is not required, the CAN-Bus can be connected directly to the basic unit at X12:SC11/SC12 without the DFC11B option. This does not effect the functionality.



3.26 OptionAbsolute encoder card type DIP11B

Part number 824 969 5

Description

Option DIP11B extends the MOVIDRIVE® system to include an SSI interface for absolute encoders. This option allows the following possibilities for IPOS^{plus}® positioning:

- No reference travel required when the system is started or after a power failure
- Positioning can take place either with the absolute encoder or the incremental encoder/resolver installed on the motor
- No position switch needed on the travel distance, even without motor encoder feedback
- Free processing of the absolute position in the IPOS^{plus}® program
- In addition to the basic unit, 8 digital inputs and 8 digital outputs are available
- The absolute encoder can be mounted either on the motor or along the track (e.g. high-bay warehouse)
- Simple encoder adjustment with user-guided startup
- Endless positioning in combination with activated modulo function

Electronics data

DIP11B option		
	Connection binary inputs	X60:1 ... 8
	Internal resistance	
	Signal level (EN 61131)	
	Function	X60:1 ... 8
	Connection binary outputs	X61:1 ... 8
	Signal level (EN 61131)	
	Function	X61:1 ... 8
	Encoder connection	X62:
	Reference terminals	X60:9 X60:10
	Permitted line cross section	
	Voltage input	X61:9

DI10 ... DI17 isolated via optocoupler, scanning time 1 ms, PLC compatible (EN 61131)

$R_i \approx 3 \text{ k}\Omega$, $I_E \approx \text{DC } 10 \text{ mA}$
 DC +13 V ... +30 V = "1" / DC -3 V ... +5 V = "0"
 DI10 ... DI17: Selection option → Parameter menu P61_

DO10 ... DO17, PLC-compatible (EN 61131), response time 1 ms, short-circuit proof and protected against external voltage

DC +24 V = "1" DC 0 V = "0" **Important:** Do not apply external voltage!
 DO10 ... DO17: Selection option → Parameter menu P63_

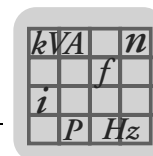
SSI encoder input

DCOM: Reference potential for binary inputs (DI10 ... DI17)
 DGND: Reference potential for binary signals and 24VIN
 • Without jumper X60:9 -X60:10 (DCOM-DGND) isolated binary inputs
 • With jumper X60:9-X60:10 (DCOM-DGND) non-isolated binary inputs

One core per terminal: 0.08 ... 1.5 mm² (AWG28 ... 16)
 Two cores per terminal: 0.25 ... 1 mm² (AWG22 ... 17)

24VIN: Supply voltage DC +24 V for binary outputs DO10 ... DO17 and encoder (mandatory)

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3.27 Synchronous operation board option type DRS11B

Part number 824 672 6

Description The DRS11B option enables a group of motors to be operated at a synchronous angle to one another or in an adjustable proportional relationship. For detailed information, refer to the "Synchronous Operation Board Type DRS11B" manual, which can be ordered from SEW-EURODRIVE.

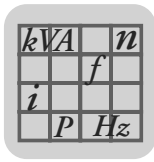
The basis for synchronous operation is the continuous comparison of the rotor angle positions of the master and the slave motors. The motors must be fitted with encoders. The DRS11B option is plugged into the expansion slot.

Electronics data

Option DRS11B		
	Part number	824 672 6
	Binary inputs X40:1...X40:6	INØ IN5: Isolated (optocoupler) PLC-compatible (EN 61131), sampling interval 5 ms
	Internal resistance	$R_i \approx 3 \text{ k}\Omega$, $I_E \approx \text{DC } 10 \text{ mA}$
	Signal level	DC+13 V...+30 V = "1" = contact closed DC-3 V...+5 V = "0" = contact open
	Function	With fixed assignment with: - INØ = Freewheel - IN1 = Offset 1 - IN2 = Offset 2 - IN3 = Offset 3 - IN4 = IPOS^{plus}® variable H477.0 - IN5 = IPOS^{plus}® variable H477.1
	Binary outputs X40:9/X40:10	OUTØ/OUT1: PLC compatible (EN 61131-2) Response time 5 ms
	Signal level	"0" = DC 0 V "1" = DC+24 V Important: Do not apply external voltage!
	Function	With fixed assignment with: - OUTØ = IPOS^{plus}® variable H476.0 - OUT1 = IPOS^{plus}® variable H476.1 $I_{\text{max}} = \text{DC } 50 \text{ mA}$, short-circuit proof, protected against external voltage
	Reference terminals X40:11 X40:7	DGND: Reference potential for binary signals DCOM: Reference potential of binary inputs X40:1 X40:6 (INØ IN5)
	Voltage output X40:8	VO24: Voltage output DC +24 V, max. DC 100 mA
	Synchronous encoder input Encoder power supply X41:	Max. 200 kHz, signal level according to RS422 or sin/cos DC +24 V, $I_{\text{max}} = 650 \text{ mA}^{1)}$ 9-pin Sub-D socket
	Master encoder input Encoder power supply X42:	Max. 200 kHz, signal level according to RS422 or sin/cos DC+24 V, $I_{\text{max}} = \text{DC } 650 \text{ mA}^{1)}$ 9-pin Sub-D socket
	Encoder output X43:	Signal level to RS422 9-pin sub D connector
	Voltage input X44:1 X44:2 X44:3	GND DC +24 V supply voltage for binary outputs X40:9/X40:10 and encoder GND
	Permitted line cross section	One core per terminal: 0.08 ... 1.5 mm ² (AWG28 ... 16) Two cores per terminal: 0.25 ... 1 mm ² (AWG22 .. 17)

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1) Total current load (X41 and X42) of the DC 24 V encoder supply $\leq \text{DC } 650 \text{ mA}$



3.28 Braking resistor option type BW... / BW...-T

General information

The BW... / BW...-T braking resistor series are adapted to the technical characteristics of MOVIDRIVE® drive inverters.

PTC resistor BW090-P52B

- Direct installation on MOVIDRIVE® MDX60B/61B size 0 (0005 ... 0014)
- The MOVIDRIVE® units can be lined up even with mounted braking resistor BW090-P52B.
- The resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals a brake chopper fault (fault code 04).

Flat-type braking resistors

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

Wire and grid resistors

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

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

For braking resistors in the BW...-T series, you can connect the integrated thermostat using a 2-core, shielded cable as an alternative to a bimetallic relay.

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, therefore, braking resistors are mounted on the control 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).

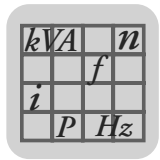
UL and cUL approval

Type BW... braking resistors are UL and cUL approved in conjunction with MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.

Parallel connection

Two braking resistors must be connected in parallel for 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.

The thermostats must be connected in series for braking resistors in the BW...-T series.



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

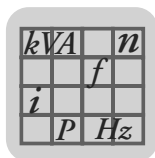
Braking resistor type BW...		BW090-P52B	BW100-005	BW100-006	BW072-003	BW072-005	BW168	BW268
Part number		824 563 0	826 269 1	821 701 7	826 058 3	826 060 5	820,604 X	820 715 1
Braking resistor type BW...-T				BW100-006-T			BW168-T	BW268-T
Part number				1 820 419 8			1 820 133 4	1 820 417 1
Load capacity at	100 % cdf	0.10 kW	0.45 kW	0.6 kW	0.23 kW	0.45 kW	0.8 kW	1.2 kW
	50 % cdf ¹⁾	0.15 kW	0.60 kW	1.1 kW	0.31 kW	0.60 kW	1.4 kW	2.2 kW
	25 % cdf	0.2 kW	0.83 kW	1.9 kW	0.42 kW	0.83 kW	2.6 kW	3.8 kW
	12 % cdf	0.4 kW	1.11 kW	3.5 kW	0.58 kW	1.11 kW	4.7 kW	6.7 kW
	6 % cdf	0.7kW	2.00 kW	5.7 kW	1.00 kW	2.00 kW	7.6 kW	11 kW
		Note the regenerative power limit of the inverter! (= 150 % of the recommended motor power → Technical Data)						
Resistance value	R _{BW}	90 Ω ±35 %	100 Ω ±10 %		72 Ω ±10 %		68 Ω ±10 %	
Trip current (of F16)	I _F	-	0.8 A _{RMS}	1.8 A _{RMS}	0.6 A _{RMS}	1.0 A _{RMS}	2.5 A _{RMS}	3.4 A _{RMS}
Type		PTC	Flat type	Wire resistor on ceramic core	Flat type		Wire resistor on ceramic core	
Connection		Cable	Cable	Ceramic terminals 2.5 mm ² (AWG12)	Cable		Ceramic terminals 2.5 mm ² (AWG12)	
Enclosure		IP20	IP54	IP20 (when mounted)	IP54		IP20 (when mounted)	
Ambient temperature	ϑ _U	-20 ... +40 °C						
Type of cooling		KS = Self-cooling						
For MOVIDRIVE®		0005 ... 0014	0005 ... 0022	0015 ... 0040	0005 ... 0014		0005 ... 0040	0015 ... 0040

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

Braking resistor type BW...		BW147	BW247	BW347	BW039-012		
Part number		820 713 5	820 714 3	820 798 4	821 689 4		
Braking resistor type BW...-T		BW147-T	BW247-T	BW347-T	BW039-012-T	BW039-026-T	BW039-050-T
Part number		1 820 134 2	1 820 084 2	1 820 135 0	1 820 136 9	1 820 415 5	1 820 137 7
Load capacity at	100 % cdf	1.2 kW	2.0 kW	4.0 kW	1.2 kW	2.6 kW	5.0 kW
	50 % cdf ¹⁾	2.2 kW	3.8 kW	7.6 kW	2.1 kW	4.6 kW	8.5 kW
	25 % cdf	3.8 kW	6.4 kW	12.8 kW	3.8 kW	8.3 kW	15.0 kW
	12 % cdf	7.2 kW	12 kW	19.2 kW ²⁾	7.0 kW	15.3 kW	24.0 kW ²⁾
	6 % cdf	11 kW	20 kW ²⁾	20 kW ²⁾	11.4 kW	24.0 kW ²⁾	24.0 kW ²⁾
Note the regenerative power limit of the inverter! (= 150 % of the recommended motor power → Technical Data)							
Resistance value	R _{BW}	47 Ω ±10 %			39 Ω ±10 %		
Trip current (of F16)	I _F	3.5 A _{RMS}	4.9 A _{RMS}	7.8 A _{RMS}	4.2 A _{RMS}	7.8 A _{RMS}	11 A _{RMS}
Type	Wire resistor on ceramic core						Grid resistor
Connection	Ceramic terminals 2.5 mm ² (AWG12)						
Enclosure	IP20 (when mounted)						
Ambient temperature	ϑ _U	-20 ... +40 °C					
Type of cooling	KS = Self-cooling						
For MOVIDRIVE®	0055/0075				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.



Technical Data and Dimensions

Braking resistor option type BW... / BW...-T

Braking resistor type BW...		BW018-015			
Part number		821 684 3			
Braking resistor type BW...-T		BW018-015-T	BW018-035-T	BW018-075-T	BW915-T
Part number		1 820 416 3	1 820 138 5	1 820 139 3	1 820 413 9
Load capacity at	100 % cdf	1.5 kW	3.5 kW	7.5 kW	16 kW
	50 % cdf ¹⁾	2.5 kW	5.9 kW	12.7 kW	27 kW
	25 % cdf	4.5 kW	10.5 kW	22.5 kW	48 kW
	12 % cdf	6.7 kW	15.7 kW	33.7 kW	62.7 kW ²⁾
	6 % cdf	11.4 kW	26.6 kW	52.2 kW ²⁾	62.7 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 %
Trip current (of F16)	I _F	4.0 A _{RMS}	8.1 A _{RMS}	14 A _{RMS}	28 A _{RMS}
Type		Steel-grid resistor			
Connection		Ceramic terminals 2.5 mm ² (AWG12)			M8 stud
Enclosure		IP20 (when mounted)			
Ambient temperature	ϑ _U	-20 ... +40 °C			
Type of cooling		KS = Self-cooling			
for MOVIDRIVE®		0150/0220 and 2 × parallel for 0370/0450 ³⁾			0220

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

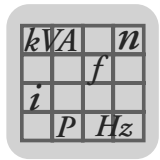
2) Physical power limit due to the DC link voltage and the resistance value.

3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...-T		BW012-025-T	BW012-050T	BW012-100-T	BW106-T	BW206-T
Part number		1 820 414 7	1 820 140 7	1 820 141 5	1 820 083 4	1 820 412 0
Load capacity at	100 % cdf	2.5 kW	5.0 kW	10 kW	13 kW	18 kW
	50 % cdf ¹⁾	4.2 kW	8.5 kW	17 kW	24 kW	32 kW
	25 % cdf	7.5 kW	15.0 kW	30 kW	40 kW	54 kW
	12 % cdf	11.2 kW	22.5 kW	45 kW	66 kW	88 kW
	6 % cdf	19.0 kW	38.0 kW	76 kW	102 kW	136 kW
Note the regenerative power limit of the inverter! (= 150 % of the recommended motor power → Technical Data)						
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}
Type		Steel-grid resistor				
Connection		Ceramic terminals 2.5 mm ² (AWG12)			M8 stud	
Enclosure		IP20 (when mounted)				
Ambient temperature		ϑ _U -20 ... +40 °C				
Type of cooling		KS = Self-cooling				
for MOVIDRIVE®		0300			0370...0750 and 2 × parallel for 0900/1100/1320 ²⁾	

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

2) When connected in parallel, the load capacity and trip current are doubled.



Assignment to AC 230 V units (...-2_3)

Braking resistor type BW...		BW039-003		BW039-006		BW039-012				BW027-006		BW027-012							
Part number		821 687 8		821 688 6		821 689 4		821 690 8		822 422 6		822 423 4							
Braking resistor type BW...T						BW039-012-T		BW039-026-T						BW018-015-T		BW018-035-T			
Part number						1 820 136 9		1 820 415 5						1 820 416 3		1 820 138 5			
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		6.0 kW ²⁾		2.0 kW		5.0 kW		4.5 kW		10.5 kW			
	12 % cdf	1.7 kW		3.5 kW		6.0 kW ²⁾		6.0 kW ²⁾		3.5 kW		7.5 kW		6.7 kW		13.0 kW ²⁾			
	6 % cdf	2.8 kW		5.7 kW		6.0 kW ²⁾		6.0 kW ²⁾		6.0 kW		8.7 kW ²⁾		11.4 kW		13.0 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 %						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												Steel-grid resistor					
Connection		Ceramic terminals 2.5 mm ² (AWG12)																	
Enclosure		IP20 (when mounted)																	
Ambient temperature		ϑ _U		−20 ... +40 °C															
Type of cooling		KS = Self-cooling																	
For MOVIDRIVE®		0015/0022						0015...0037				2 × parallel with 0110 ³⁾							

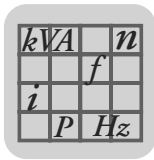
- 1) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ s.
- 2) Physical power limit due to the DC link voltage and the resistance value.
- 3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...T		BW018-075-T	BW915-T	BW012-025-T	BW012-050-T	BW012-100-T	BW106-T	BW206-T
Part number		1 820 139 3	1 820 413 9	1 820 414 7	1 820 140 7	1 820141 5	1 820 083 4	1 820 4120
Load capacity at	100 % cdf	7.5 kW	15.6 kW ²⁾	2.5 kW	5.0 kW	10 kW	13 kW	18 kW
	50 % cdf ¹⁾	12.7 kW	15.6 kW ²⁾	4.2 kW	8.5 kW	17 kW	24 kW	32 kW
	25 % cdf	13.0 kW ²⁾	15.6 kW ²⁾	7.5 kW	15.0 kW	19.6 kW ²⁾	39.2 kW ²⁾	39.2 kW ²⁾
	12 % cdf	13.0 kW ²⁾	15.6 kW ²⁾	11.2 kW	19.6 kW ²⁾	19.6 kW ²⁾	39.2 kW ²⁾	39.2 kW ²⁾
	6 % cdf	13.0 kW ²⁾	15.6 kW ²⁾	19.0 kW	19.6 kW ²⁾	19.6 kW ²⁾	39.2 kW ²⁾	39.2 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		Steel-grid resistor						
Connection		2.5 mm ² (AWG12)	M8 stud	Ceramic terminals 2.5 mm ² (AWG12)			M8 stud	
Enclosure		IP20 (when mounted)						
Ambient temperature		ϑ _U -20 ... +40 °C						
Type of cooling		KS = Self-cooling						
For MOVIDRIVE®		2 × parallel with 0110 ³⁾		0055/0075			0150 and 2 × parallel with 0220/0300 ³⁾	

- 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) When connected in parallel, the load capacity and trip current are doubled.

Technical data of the braking resistor BW...-T

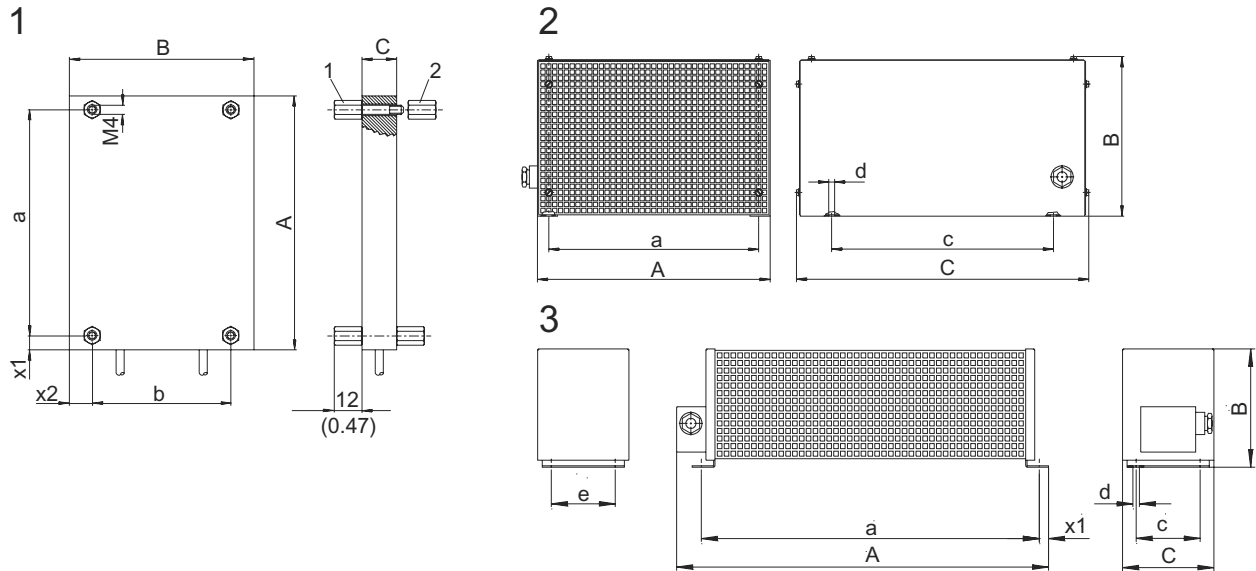
BW...-T	
Connection cross section for signal contact	1 x 1.5 mm ²
Switching capability of the thermostat's signal contact	• DC 2 A / DC 24 V (DC11) • AC 2 A / AC 230V (AC11)
Switching contact	To EN 50178



Technical Data and Dimensions

Braking resistor option type BW... / BW...-T

Dimension drawing for BW... / BW...-T braking resistors



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Figure 47: Dimension drawing for BW braking resistors in **1** flat-type / **2** grid resistor / **3** wire resistor

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

Type	Mounting position	Main dimensions [mm]			Fastening parts [mm]					Mass [kg]
		A	B	C	a	b/c/e	x1	x2	d	
BW.. / BW...-T										
BW072-003	1	110	80	15	98	60	6	10	–	0.3
BW072-005		216	80	15	204	60	6	10	–	0.6
BW100-005										
BW027-006	3	486	120	92	430	64	10	–	6.5	2.2
BW027-012		486	120	185	426	150	10	–	6.5	4.3
BW012-025-T	2	295	260	490	270	380	–	–	10.5	8.0
BW012-050-T		395	260	490	370	380	–	–	10.5	12
BW012-100-T		595	270	490	570	380	–	–	10.5	21
BW018-015/-T		600	120	92	544	64	10	–	6.5	4.0
BW018-035-T		295	270	490	270	380	–	–	10.5	9.0
BW018-075-T		595	270	490	570	380	–	–	10.5	21
BW100-006/-T	3	486	120	92	430	64	10	–	6.5	2.2
BW168		365	120	185	326	150	10	–	6.5	3.5
BW168-T		406	120	185	326	150	10	–	6.5	3.6
BW268		465	120	185	426	150	10	–	6.5	4.3
BW268-T		486	120	185	426	150	10	–	6.5	4.3
BW147		465	120	185	426	150	10	–	6.5	4.3
BW147-T		486	120	185	426	150	10	–	6.5	4.3
BW247		665	120	185	626	150	10	–	6.5	6.1
BW247-T		686	120	185	626	150	10	–	6.5	6.1
BW347		670	145	340	630	300	10	–	6.5	13.2
BW347-T		750	210	185	630	150	10	–	6.5	12.4
BW039-003		286	120	92	230	64	10	–	6.5	1.5
BW039-006		486	120	92	430	64	10	–	6.5	2.2
BW039-012/-T		486	120	185	426	150	10	–	6.5	4.3
BW039-026-T		586	120	275	530	240	10	–	6.5	7.5
BW039-050-T	2	395	260	490	370	380	–	–	10.5	12
BW915-T		795	270	490	770	380	–	–	10.5	32
BW106-T		795	270	490	770	380	–	–	10.5	32
BW206-T		995	270	490	970	380	–	–	10.5	40

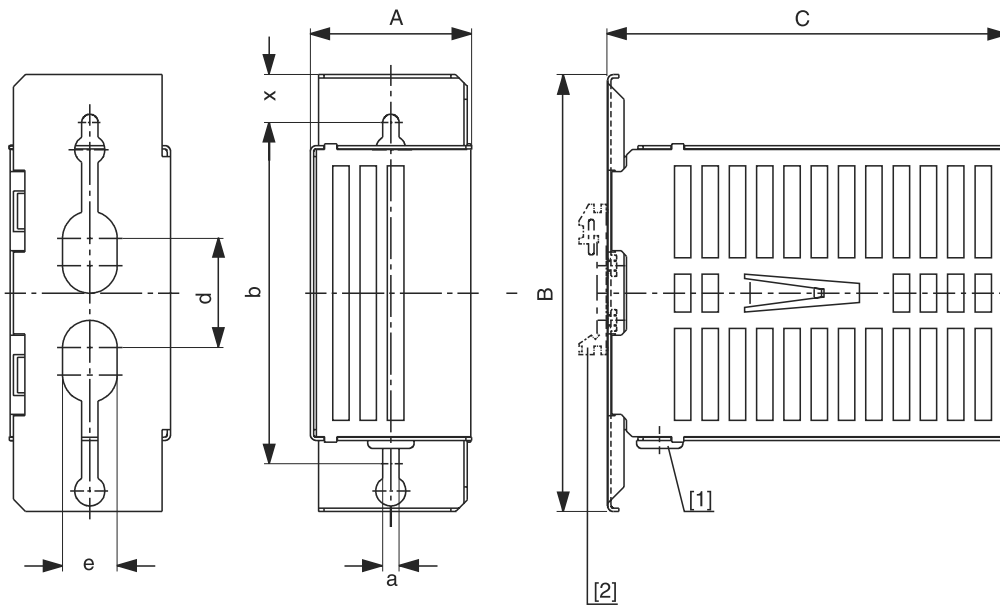
Touch guard

A touch guard is available for flat-type braking resistors.

Touch guard	BS003	BS005
Part number	813 151 1	813 152 X
For braking resistor	BW027-003 BW072-003	BW027-005 BW072-005 BW100-005

3

Dimension drawing for BS touch guard



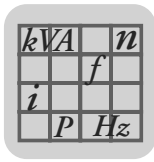
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Figure 48: Dimension drawing for BS touch guard with grommet [1] and mounting rail attachment [2]

Type	Main dimensions [mm]			Mounting dimensions [mm]					Mass [kg]
	A	B	C	b	d	e	a	x	
BS-003	60	160	146	125	40	20	6	17.5	0.35
BS-003	60	160	252	125	40	20	6	17.5	0.5

Mounting rail installation

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



Technical Data and Dimensions

Braking resistor option type BW... / BW...-T

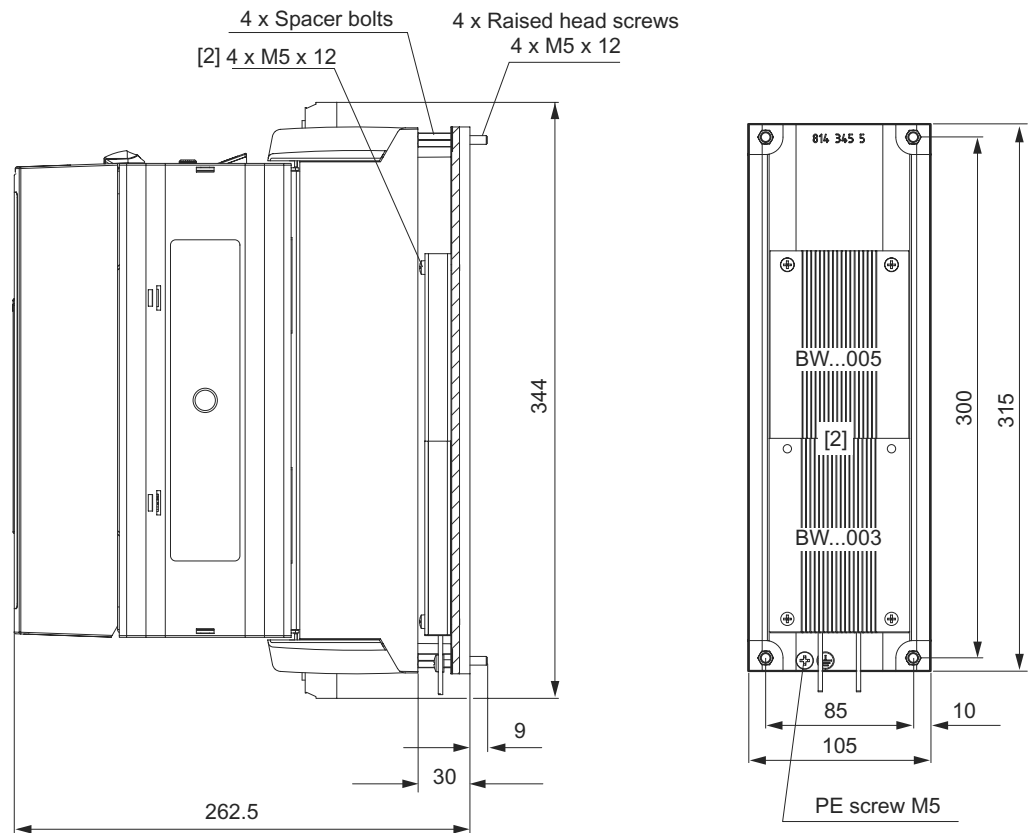
DKB11A heat sink for braking resistors in flatpack design

Part number 814 345 5

Description

The DKB11A heat sink provides a space-saving means of mounting braking resistors in flatpack design (BW072-005, BW100-005) under 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).

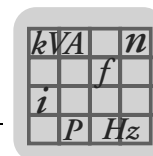
Dimension drawing



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Figure 49: Dimension drawing for DKB11A heat sink, all dimensions in mm

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



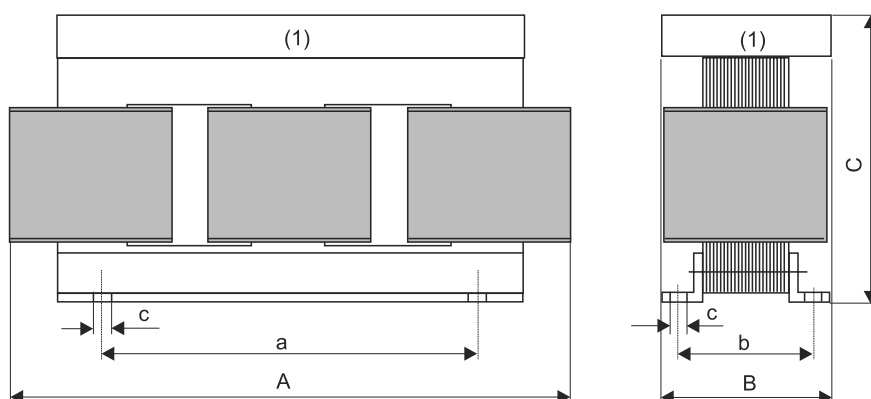
3.29 Line chokes option type ND...

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

Line choke type	ND020-013 ¹⁾	ND045-013 ¹⁾	ND085-013 ¹⁾	ND150-013 ¹⁾	ND200-0033 ¹⁾	ND300-0053
Part number	826 012 5	826 013 3	826 014 1	825 548 2	826 579 8	827 721 4
Rated voltage V_N	3 × AC 380 V -10 % ... 3 × AC 500 V +10 %, 50/60 Hz					
Rated current ²⁾ I_N	AC 20 A	AC 45 A	AC 85 A	AC 150 A	AC 200 A	AC 300 A
Power loss at I_N P_V	10 W	15 W	25 W	65 W	100 W	280 W
Inductance L_N	0.1 mH				0.03 mH	0.05 mH
Ambient temperature ϑ_U	-25 ... +45 °C					
Enclosure	IP 00 (EN 60529)					
Connection	Terminal strips 4 mm ² (AWG10)	Terminal strips 10 mm ² (AWG8)	Terminal strips 35 mm ² (AWG2)	M10 stud PI: M8 stud		M12 stud PI: 2 × M10
Assignment to AC 400/500 V units (MDX60/61B...-5_3)						
Rated operation (100 %)	0005...0075	0110...0220	0300 0450 and MDR60A0370	0550/0750	MDR60A0750	0900...1320
Increased power (VFC, 125 %)	0005...0075	0110/0150	0220...0370	0450...0750		
Assignment to AC 230 V units (MDX61B...-2_3)						
Rated operation (100 %)	0015...0055	0075/0110	0150/0220	0300	-	-
Increased power (VFC, 125 %)	0015...0037	0055/0075	0110/0150	0220/0300	-	-

1) UL/cUL approval in conjunction with MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.

2) If more than one MOVIDRIVE® unit 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!**



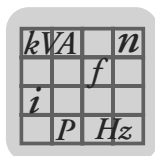
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Figure 50: Dimension drawing for ND... line choke

(1) Space for terminal strips (touch-safe)
Mounting position as required

All dimensions in mm:

Line choke type	Main dimensions			Mounting dimensions		Hole dimension	Mass kg
	A	B	C	a	b	c	
ND020-013	85	60	120	50	31	5-10	0.5
ND045-013	125	95	170	84	55-75	6	2.5
ND085-013	185	115	235	136	56	7	8
ND150-013	255	140	230	170	77	8	17
ND200-0033	250	160	230	180	98	8	15
ND300-0053	300	190	295	255	145	11	35



3.30 Line filter option type NF...-...

- To suppress interference emissions on the line side of inverters.

Line filter type	NF009-503 ¹⁾	NF014-503 ¹⁾	NF018-503 ¹⁾	NF035-503 ¹⁾	NF048-503 ¹⁾
Part number	827 412 6	827,116 X	827 413 4	827 128 3	827 117 8
Rated voltage V_N	3 × AC 380 V –10 % ... AC 500 V +10 %, 50/60 Hz				
Rated current I_N	AC 9 A	AC 14 A	AC 18 A	AC 35 A	AC 48 A
Power loss at I_N P_V	6 W	9 W	12 W	15 W	22 W
Earth-leakage current at V_N	< 25 mA	< 25 mA	< 25 mA	< 25 mA	< 40 mA
Ambient temperature ϑ_U	–25 ... +40 °C				
Enclosure	IP 20 (EN 60529)				
Connection L1-L3/L1'-L3' PE	4 mm ² (AWG 10) M5 stud			10 mm ² (AWG 8) M5/M6 stud	
Assignment to AC 400/500 V units (MDX60/61B...-5_3)					
Rated operation (100 %)	0005...0040	0055/0075	-	0110/0150	0220
Increased power (VFC, 125 %)	0005...0030	0040/0055	0075	0110	0150
Assignment to AC 230 V units (MDX61B...-2_3)					
Rated operation (100 %)	0015/0022	0037	-	0055/0075	0110
Increased power (VFC, 125 %)	0015	0022	0037	0055/0075	-

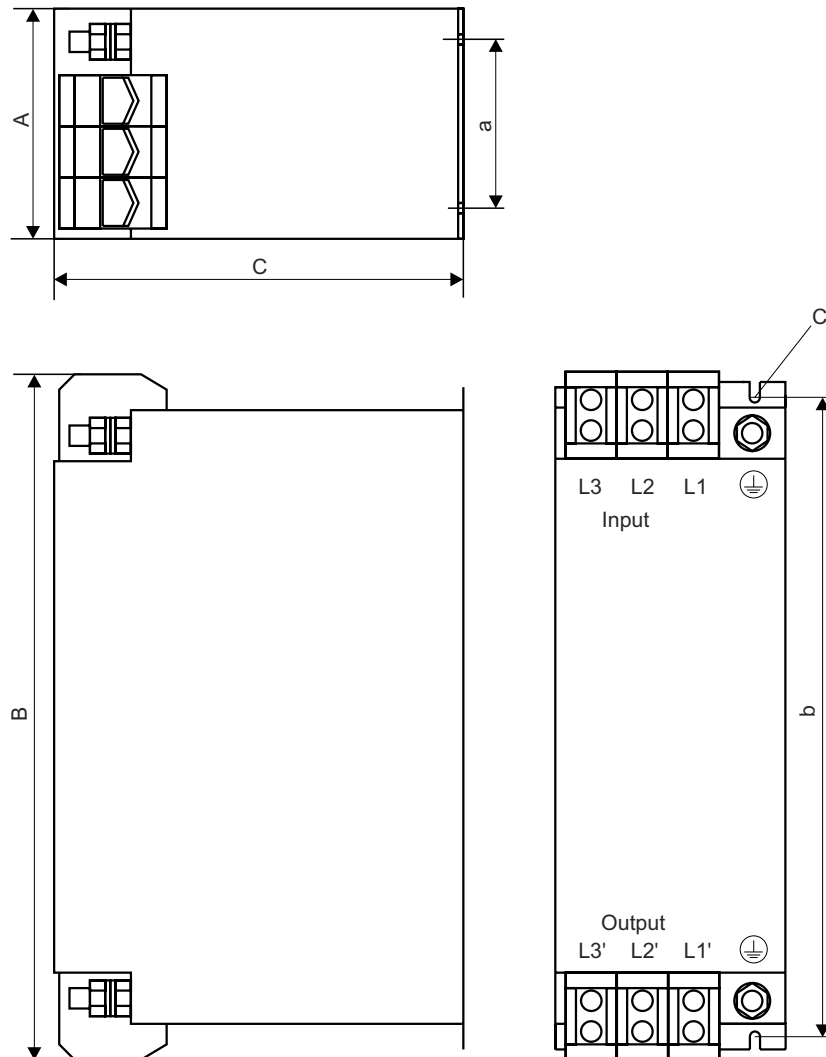
1) NF... line filters have cRUus approval independent of the MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.

Line filter type	NF063-503 ¹⁾	NF085-503 ¹⁾	NF115-503 ¹⁾	NF150-503 ¹⁾	NF210-503 ¹⁾	NF300-503 ¹⁾
Part number	827 414 2	827 415 0	827 416 9	827 417 7	827 418 5	827 419 3
Rated voltage V_N	3 × AC 380 V –10 % ... AC 500 V +10 %, 50/60 Hz					
Rated current I_N	AC 63 A	AC 85 A	AC 115 A	AC 150 A	AC 210 A	AC 300 A
Power loss at $I_N P_V$	30 W	35 W	60 W	90 W	150 W	180 W
Earth-leakage current at V_N	< 30 mA	< 30 mA	< 30 mA	< 30 mA	< 40 mA	< 45 mA
Ambient temperature ϑ_U	–25 ... +40 °C					
Enclosure	IP 20 (EN 60529)					
Connection L1-L3/L1'-L3' PE	16 mm ² (AWG 6) M6	35 mm ² (AWG 2) M8	50 mm ² (AWG1/0) M10	95 mm ² (AWG4/0) M10	95 mm ² (AWG4/0) M10	150 mm ² (AWG300-2) M12
Assignment to AC 400/500 V units (MDX60/61B...-5_3)						
Rated operation (100 %)	0300	0370/0450	0550	0750	0900/1100	1320
Increased power (VFC, 125 %)	0220	0300/0370	0450	0550/0750	0900	1100/1320
Assignment to AC 230 V units (MDX61B...-2_3)						
Rated operation (100 %)	0150	0220	0300	-	-	-
Increased power (VFC, 125 %)	0110/0150	-	0220/0300	-	-	-

1) NF... line filters have cRUus approval independent of the MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.



The effectiveness of line filters is restricted in IT systems.



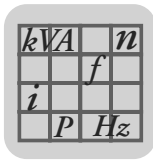
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Figure 51: Dimension drawing for NF line filter

Mounting position as required

All dimensions in mm:

Line filter type	Main dimensions			Mounting dimensions		Hole dimension c	PE connection	Mass kg
	A	B	C	a	b			
NF009-503	55	195	80	20	180	5.5	M5	0.8
NF014-503		225			210			0.9
NF018-503	50	255			240			1.1
NF035-503	60	275	100	30	255			M6
NF048-503		315			295		2.1	
NF063-503	90	260		60	235	6.5	M8	2.4
NF085-503		320	140					255
NF115-503	100	330	155	65	M10		4.8	
NF150-503								
NF210-503	140	450	190	102			365	
NF300-503	170	540	230	125	435		M12	12.2

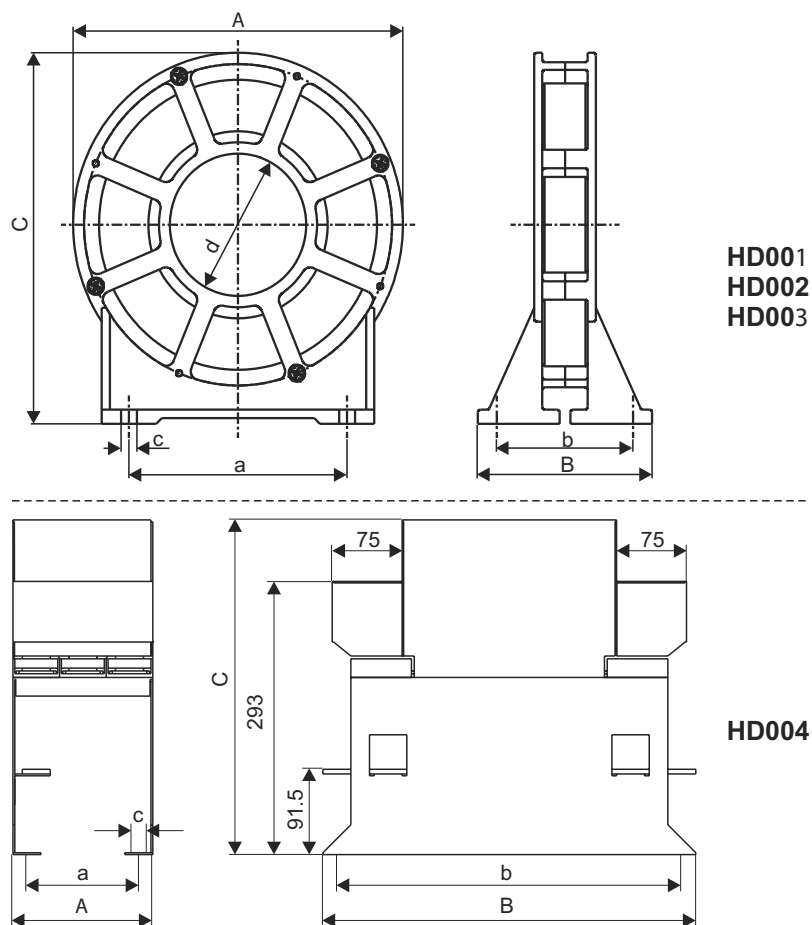


3.31 Output choke option type HD...

- To suppress radiated interference from the unshielded motor cable. For HD001 to HD003 we recommend routing the motor cable through the output choke with 5 loops. Less than 5 loops are possible if the cable has a large diameter. To make up for this, 2 or 3 output chokes should be connected in series. Two output chokes should be connected in series if there are 4 loops, and three output chokes in series if there are 3 loops. The number of loops is fixed for HD004.
- Output chokes HD001 to HD003 are allocated using the cable cross sections of the motor feeders. Consequently, there is no separate assignment table for the AC 230 V units.
- The HD004 output choke is assigned to size 6 units (0900...1320).

Output choke type	HD001 ¹⁾	HD002 ¹⁾	HD003 ¹⁾	HD004 ¹⁾
Part number	813 325 5	813 557 6	813 558 4	816 885 7
Max. power loss P_{Vmax}	15 W	8 W	30 W	100 W
For cable cross sections/connections	1.5...16 mm ² (AWG 16...6)	≤1.5 mm ² (AWG 16)	≥ 16 mm ² (AWG 6)	M12 terminal studs

1) The HD... output choke is not a UL/cUL-relevant component.

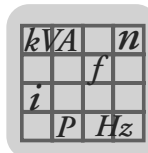


05660BXX

Figure 52: Dimensions for HD001...HD003 and HD004 output chokes (any mounting position)

All dimensions in mm:

Output choke	Main dimensions			Mounting dimensions		Inside $\varnothing$	Hole dimen. c	Dimensions kg
	A	B	C	a	b			
HD001	121	64	131	80	50	50	5.8	0.5
HD002	66	49	73	44	38	23		0.2
HD003	170	64	185	120	50	88	7.0	1.1
HD004	150	400	360	120	370	-	9.0	12.5



3.32 Output filter option type HF...

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

- In group drives (several motor leads 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 inverters
- To protect against overvoltage spikes in long motor cables (> 100 m)



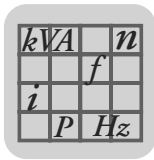
- Operate output filters in V/f and VFC operating modes only. Do not use output filters in CFC / SERVO operating modes.
- Do not use output filters in hoist applications.
- During project planning of the drive, take into account the voltage drop in the output filter and consequently the reduced motor torque available. This applies particularly to AC 230 V units with output filters.

Output filter type	HF008-503 ¹⁾	HF015-503 ¹⁾	HF022-503 ¹⁾	HF030-503 ¹⁾	HF040-503 ¹⁾	HF055-503 ¹⁾
Part number	826,029 X	826 030 3	826 031 1	826,032 X	826 311 6	826 312 4
Rated voltage V_N	3 × AC 380 V –10 % ... 3 × AC 500 V +10 %, 50/60 Hz ²⁾					
Voltage drop at I_N ΔU	< 6.5 % (7.5 %) at AC 400 V / < 4 % (5 %) at AC 500 V and f_{Amax} = 50 Hz (60 Hz)					
Rated through current ³⁾ $I_{N\ 400\ V}$ (at V_{mains} = 3 × AC 400 V)	AC 2.5 A	AC 4 A	AC 6 A	AC 8 A	AC 10 A	AC 12 A
Rated through current ³⁾ $I_{N\ 500\ V}$ (at V_{mains} = 3 × AC 500 V)	AC 2 A	AC 3 A	AC 5 A	AC 6 A	AC 8 A	AC 10 A
Earth-leakage current at $V_N\Delta I$	0 mA					
Power loss at $I_N\ P_V$	25 W	35 W	55 W	65 W	90 W	115 W
Interference emission via unshielded motor cable	According to class B limit to EN 55011 and EN 55014 complies with EN 50081, parts 1 and 2					
Ambient temperature ϑ_U	0 ... +45 °C (reduction: 3 % I_N per K to max. 60 °C)					
Enclosure (EN 60529)	IP 20					
Connection	M4 terminal studs: 0.5 ... 6 mm ² (AWG 20 ... 10)					10 mm ² (AWG 8)
Mass	3.1 kg	4.4 kg			10.8 kg	
Assignment to AC 400/500 V units (MDX60/61B...-5_3)						
Rated operation (100 %) ³⁾	0005 ... 0011	0014 / 0015	0022	0030	0040	0055
Increased power (125 %) ³⁾	0005	0008 / 0011	0014 / 0015	0022	0030	0040
Assignment to AC 230 V units (MDX61B...-2_3)						
Voltage drop at I_N ΔU	-	< 18.5 % (19 %) at AC 230 V with f_{Amax} = 50 Hz (60 Hz)				
Rated through current ³⁾ $I_{N\ 230\ V}$ (at V_{mains} = 3 × AC 230 V)	AC 4.3 A	AC 6.5 A	AC 10.8 A	AC 13 A	AC 17.3 A	AC 22 A
Rated operation (100 %) ³⁾	-	-	0015/0022	-	0037	0055
Increased power (125 %) ³⁾	-	0005	0015/0022	-	-	0037

1) UL/cUL approval in conjunction with MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.

2) A reduction of 6 % I_N per 10 Hz applies above $f_N = 60$ Hz for the rated through current I_N .

3) Only applies for operation without VDC link connection. For operating the inverter with VDC link connection, observe the project planning notes in the system manual of the respective inverter.



Technical Data and Dimensions

Output filter option type HF...

Output filter type	HF075-503 ¹⁾	HF023-403 ¹⁾	HF033-403 ¹⁾	HF047-403 ¹⁾	HF450-503
Part number	826 313 2	825 784 1	825,785 X	825 786 8	826 948 3
Rated voltage V_N	$3 \times \text{AC } 380 \text{ V} -10 \% \dots 3 \times \text{AC } 500 \text{ V} +10 \%, 50/60 \text{ Hz}^{2)}$				
Voltage drop at I_N ΔV	$< 6.5 \% (7.5 \%)$ at AC 400 V / $< 4 \% (5 \%)$ at AC 500 V and $f_{Amax} = 50 \text{ Hz} (60 \text{ Hz})$				
Rated through current ³⁾ $I_{N 400 \text{ V}}$ (at $V_{mains} = 3 \times \text{AC } 400 \text{ V}$)	AC 16 A	AC 23 A	AC 33 A	AC 47 A	AC 90 A
Rated through current ³⁾ $I_{N 500 \text{ V}}$ (at $V_{mains} = 3 \times \text{AC } 500 \text{ V}$)	AC 13 A	AC 19 A	AC 26 A	AC 38 A	AC 72 A
Earth-leakage current at V_N ΔI	0 mA				
Power loss at I_N P_V	135 W	90 W	120 W	200 W	400 W
Interference emission via unshielded motor cable	According to class B limit to EN 55011 and EN 55014 complies with EN 50081, parts 1 and 2				
Ambient temperature ϑ_U	0 ... +45 °C (reduction: 3 % I_N per K to max. 60 °C)				
Enclosure (EN 60529)	IP 20	IP 20			IP 10
Connection	10 mm ² (AWG 8)	25 mm ² (AWG 4)			35 mm ² (AWG 2)
Mass	10.8 kg	15.9 kg	16.5 kg	23 kg	32 kg
Assignment to AC 400/500 V units (MDX60/61B...-5_3)					
Rated operation (100 %) ³⁾	0075	0110	0150/0300 ⁴⁾	0220	0370/0450/ 0550 ⁴⁾ /0750 ⁴⁾ / 0900 ⁴⁾
Increased power (125 %) ³⁾	0055	0075	0110/0220 ⁴⁾	0150	0300/0370/0450/ 0550 ⁴⁾ /0750 ⁴⁾
Assignment to AC 230 V units (MDX61B...-2_3)					
Voltage drop at I_N ΔV	$< 18.5 \% (19 \%)$ at AC 230 V with $f_{Amax} = 50 \text{ Hz} (60 \text{ Hz})$				
Rated through current ³⁾ $I_{N 230 \text{ V}}$ (at $V_{mains} = 3 \times \text{AC } 230 \text{ V}$)	AC 29 A	AC 42 A	AC 56.5 A	AC 82.6 A	AC 156 A
Rated operation (100 %) ³⁾	0075	0110	0150/0300 ⁴⁾	0220	0300
Increased power (125 %) ³⁾	0055	0075	0110/0220 ⁴⁾	0150	0220/0300

1) UL/cUL approval in conjunction with MOVIDRIVE® drive inverters. SEW-EURODRIVE will provide a certificate on request.

2) A reduction of 6 % I_N per 10 Hz applies above $f_N = 60 \text{ Hz}$ for the rated through current I_N .

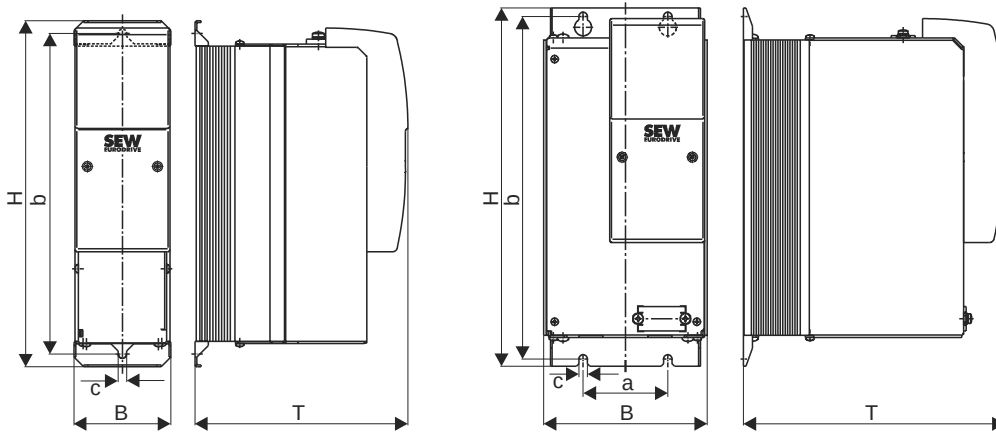
3) Only applies for operation without $V_{DC \text{ link}}$ connection. For operation with V_Z connection, observe the project planning instructions in the MOVIDRIVE® MDX6/61B system manual, section "Project Planning/Connecting the optional power components."

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

Dimension drawings for HF...-503 output filters, dimensions in mm

HF015/022/030-503

HF040/055/075-503



00527BDE

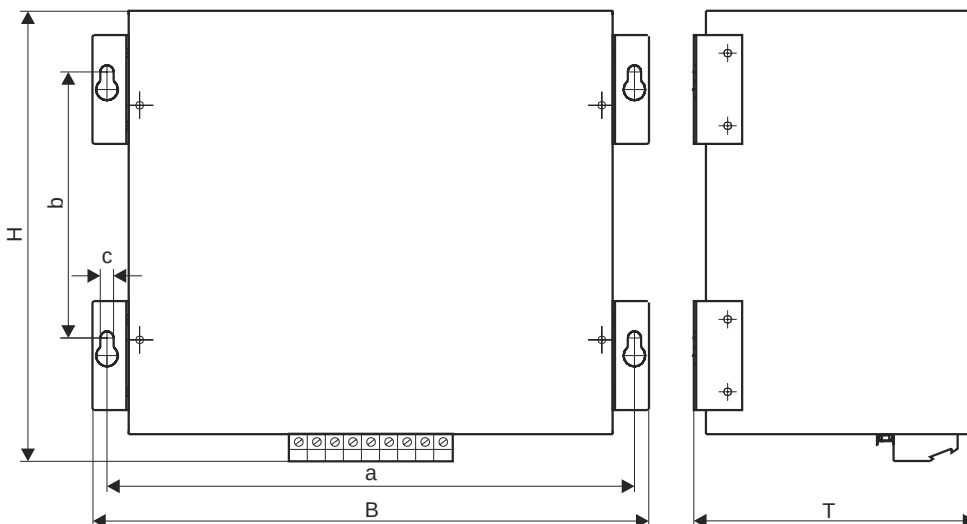
Figure 53: Dimension drawings for output filters HF015...075-503

Only the mounting position shown in the dimension drawing is permitted.

Output filter type	Main dimensions			Mounting dimensions		Hole dimension c	Ventilation clearance ¹⁾	
	B	H	T	a	b		Top	Bottom
HF015/022/030-503	80	286	176	-	265	7	100	100
HF040/055/075-503	135	296	216	70	283			

1) No clearance is required at the sides; the units can be lined up in rows.

HF450-503

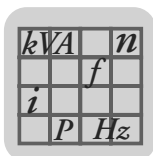


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Figure 54: Dimension drawing for output filter HF450-503

Only the mounting position shown in the dimension diagram is permitted

Output filter type	Main dimensions			Mounting dimensions		Hole dim. c	Ventilation clearance	
	B	H	T	a	b		Top	Bottom
HF450-503	465	385	240	436	220	8.5	100	100



Dimension drawing for HF...-403 output filter, dimensions in mm

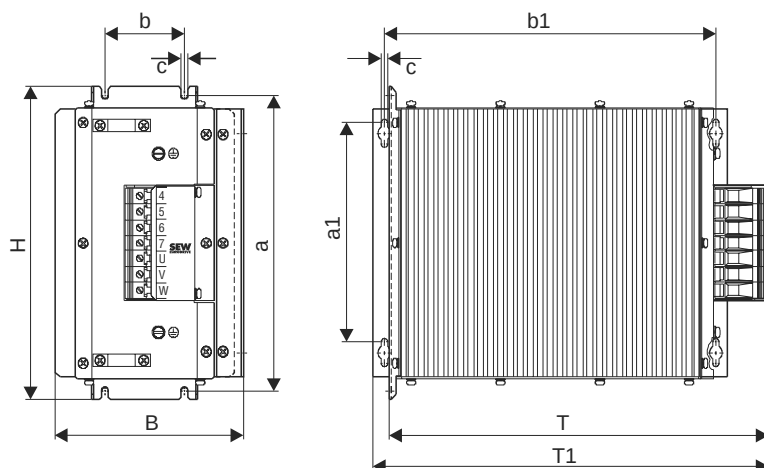
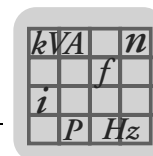


Figure 55: Dimension drawing for HF...-403 output filter

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Type	Main dimensions			Mounting dimensions				Hole dimension	Ventilation clearance		
	B	H	T/T1	Standard installation		Horizontal mounting position			At side	Top	Bottom
HF023-403	145	284	365/390	268	60	210	334	6.5	30 each	150	150
HF033-403											
HF047-403	190	300	385/400	284	80						



3.33 Prefabricated cables

Overview

SEW-EURODRIVE offers cable sets and prefabricated cables for straightforward and fault-free connection of various system components to MOVIDRIVE®. The cables are prefabricated in 1 m steps to the required length. It is necessary to differentiate between whether the cables are intended for fixed routing or for cable carrier applications.

1. Cable sets for DC link connection MDR → MDX
2. Motor cables and extension cables for connecting CM motors
3. Motor cables and extension cables for connecting DS / CMD motors
4. VR forced cooling fan cables and extension cables
5. Connection to DEH11B / DER11B: Encoder cable and extensions cable (Hiperface®, incremental encoder), resolver cable and extension cable in plug and terminal box design for motors.

1. Cable sets for DC link connection MDR → MDX

Description

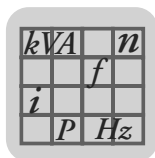
SEW-EURODRIVE strongly recommends that you use the cable sets listed below as they have the relevant dielectric strength and are also color-coded. Color coding is necessary because cross-polarity and ground faults could cause irreparable damage to the connected equipment.

The length of the cables restricts the DC link connection to the permitted length of 5 m. They can also be cut to length by the customer for connecting several units. The lugs for connection to the regenerative power supply unit and an inverter are supplied with the cable set. Use commercially available lugs for connecting additional inverters. The inverters must then be connected to the regenerative power supply unit in star configuration. Use a busbar subdistributor if the DC link terminals of the regenerative power supply unit are not sufficient.

Installation type

Only fixed routing is possible.

Cable set type	DCP12A	DCP13A	DCP15A	DCP16A
Part number	814 567 9	814 250 5	814 251 3	817 593 4
For connecting MOVIDRIVE®	0015...0110	0150...0370	0450...0750	0900...1320



2. Prefabricated cables and extension cables for connecting CM motors to MDX

Motor cable

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

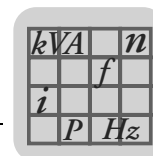
Number of cores and line cross section	Part number	Installation type	For motor
4×1.5 mm ² (AWG 16)	199 179 5	Fixed routing	CM..SM51
4×1.5 mm ² (AWG 16) + 3×1.0 mm ² (AWG 17)	199 189 2		CM..BR SB51
4×2.5 mm ² (AWG 12)	199 181 7		CM..SM52
4×2.5 mm ² (AWG 12) + 3×1.0 mm ² (AWG 17)	199 191 4		CM..BR SB52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

Number of cores and line cross section	Part number	Installation type	For motor
4×1.5 mm ² (AWG 16)	199 180 9	Cable carrier installation	CM..SM51
4×1.5 mm ² (AWG 16) + 3×1.0 mm ² (AWG 17)	199 190 6		CM..BR SB51
4×2.5 mm ² (AWG 12)	199 182 5		CM..SM52
4×2.5 mm ² (AWG 12) + 3×1.0 mm ² (AWG 17)	199 192 2		CM..BR SB52
4×4 mm ² (AWG 10)	199 184 1		CM..SM54
4×4 mm ² (AWG 10) + 3×1.0 mm ² (AWG 17)	199 194 9		CM..BR SB54
4×6 mm ² (AWG 10)	199 186 8		CM..SM56
4×6 mm ² (AWG 10) + 3×1.5 mm ² (AWG 16)	199 196 5		CM..BR SB56
4×10 mm ² (AWG 8)	199 188 4		CM..SM59
4×10 mm ² (AWG 8) + 3×1.5 mm ² (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	Installation type	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	Installation type	For motor
4×1.5 mm ² (AWG 16)	199 550 2	Cable carrier installation	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. Prefabricated cables for connecting DS / CMD motors to MDX

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	Installation type	For motor
4×1.5 mm ² (AWG 16)	199 093 4	Fixed routing	DS56 /CMD.. / SM11
4×1.5 mm ² (AWG 16) + 2×0.75 mm ² (AWG 18)	199 094 2		DS56..B / SM11

Number of cores and line cross section	Part number	Installation type	For motor
4×1.5 mm ² (AWG 16)	199 095 0	Cable carrier installation	DS56 /CMD.. / SM11
4×1.5 mm ² (AWG 16) + 2×0.75 mm ² (AWG 18)	199 096 9		DS56..B / SM11

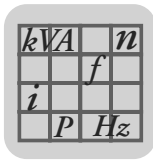
4. Prefabricated cables and extension cables for connecting VR forced cooling fans

VR forced cooling fan cables:

Part number	198 634 1	199,560 X
Installation	Fixed routing	Cable carrier installation

Extension cables for VR forced cooling fan cables:

Part number	199 561 8	199 562 6
Installation	Fixed routing	Cable carrier installation

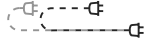
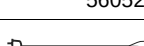
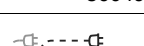
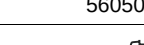
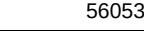
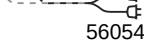
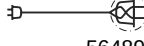
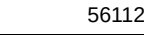


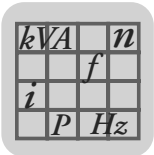
5. Prefabricated cables for connecting options DEH11B / DER11B

The following overviews show the possible connections for the DEH11B and DER11B options.

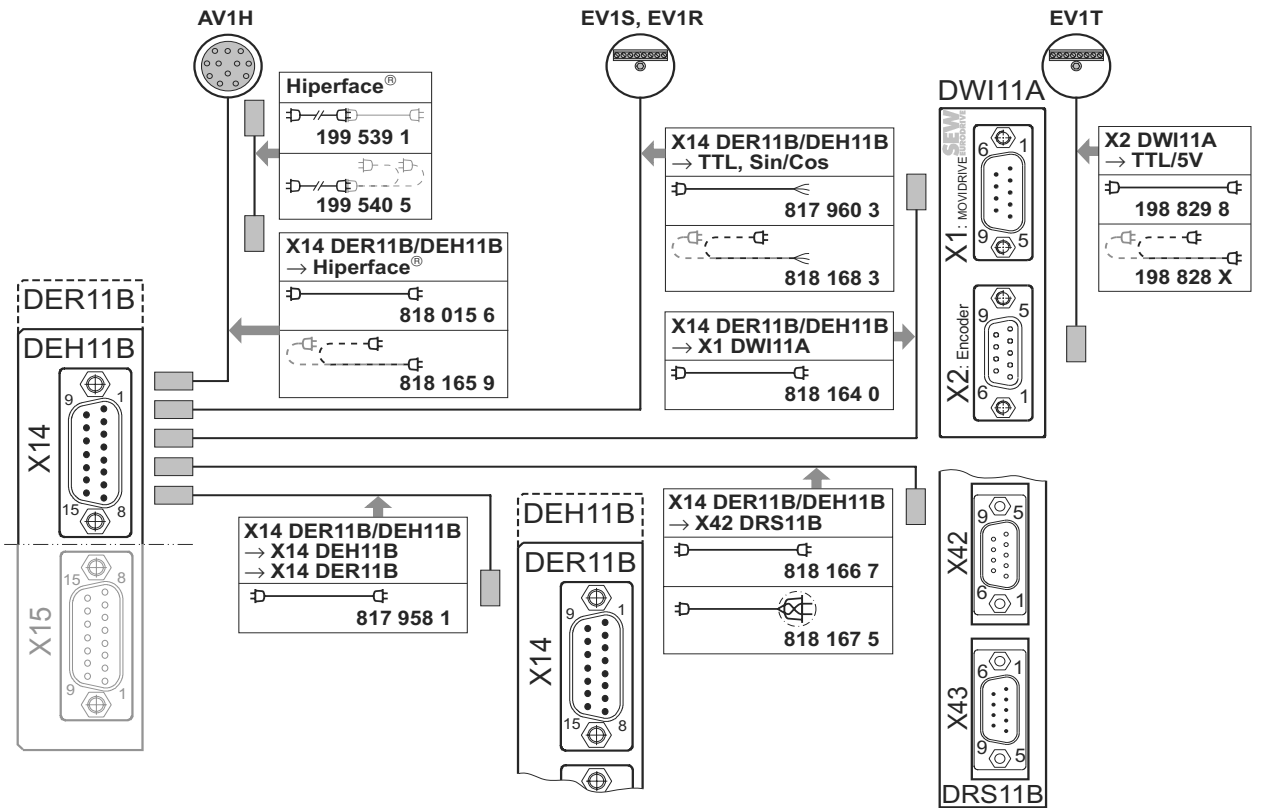
Meaning of the symbols

The connection cables are assigned a part number and a symbol. The symbols have the following meaning:

Symbol	Description
 56047AXX	Connection cable connector → connector for fixed installation
 56051AXX	Extension connection cable connector → connector for fixed installation
 56048AXX	Connection cable connector → connector for cable carrier installation
 56052AXX	Extension connection cable connector → connector for cable carrier installation
 56049AXX	Connection cable connector → terminal box for fixed installation
 56050AXX	Connection cable connector → terminal box for cable carrier installation
 56053AXX	Connection cable connector → Y connector for fixed installation
 56054AXX	Connection cable connector → Y connector for cable carrier installation
 56489AXX	Connection cable connector → connector with crossed A/B track for reversing the direction of rotation (for fixed installation)
 56112AXX	Encoder connection via plug connector
 56113AXX	Encoder connection via encoder terminal strip
 56114AXX	Connection via plug connector on the motor side
 56115AXX	Connection via terminal box on the motor side



Connection
options at X14,
DEH11B /
DER11B



56479AXX



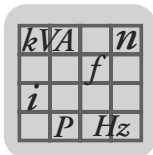
For the individual wiring diagrams, refer to the section "Installation" in the MOVIDRIVE® MDX60B/61B operating instructions.

- Cable to connect external HIPERFACE® encoders AV1H, AS1H, ES1H via plug connector.



56130AXX

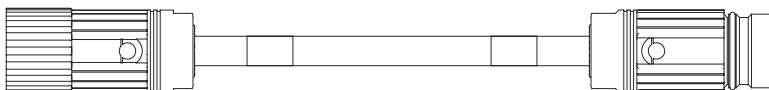
Type	Installation	Part number
DEH11B / DER11B X14 → AV1H, AS1H, ES1H	 56047AXX	818 015 6
	 56048AXX	818 165 9



Technical Data and Dimensions

Prefabricated cables

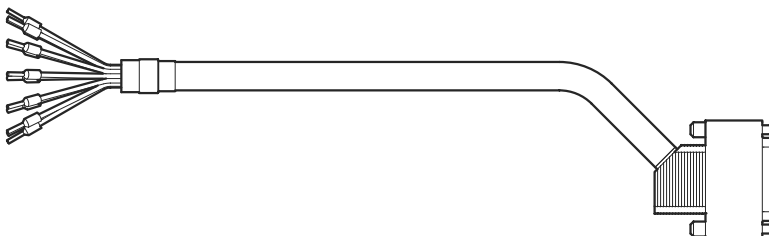
- Extension cable to connect external HIPERFACE® encoders AV1H, AS1H, ES1H via plug connector.



56131AXX

Type	Installation	Part number
DEH11B / DER11B X14 → AV1H, AS1H, ES1H	 56051AXX	199 539 1
	 56052AXX	199 540 5

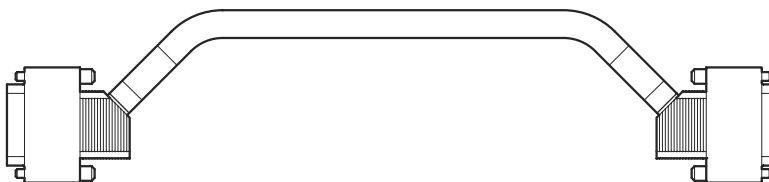
- Cable to connect external sin/cos encoders via encoder terminal strip.



56132AXX

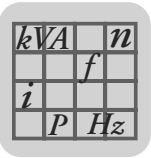
Type	Installation	Part number
DEH11B / DER11B X14 → sin/cos encoders	 56049AXX	817 960 3
	 56050AXX	818 168 3

- Cable to connect the DC 5 V encoder power supply type DWI11A via plug connector.

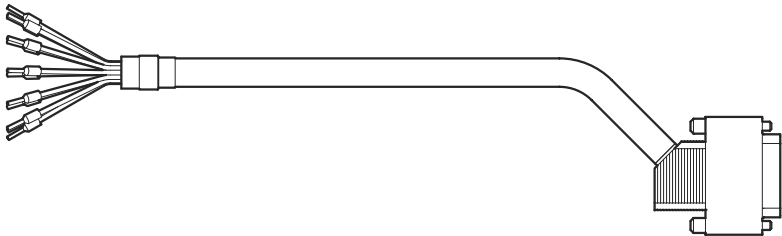


56109AXX

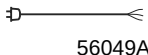
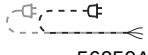
Type	Installation	Part number
DEH11B / DER11B X14 → DWI11A X1	 56047AXX	818 164 0



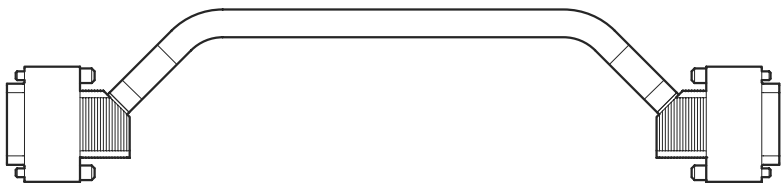
- Cable to connect an external DC 5 V TTL sensor to the DC 5 V encoder power supply type DWI11A via encoder terminal strip.



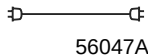
56132AXX

Type	Installation	Part number
DC 5 V TTL sensor → DWI11A X2	 56049AXX	198 829 8
	 56050AXX	198 828 X

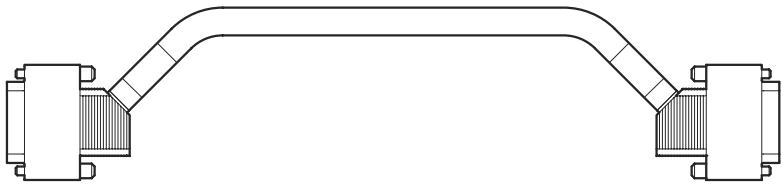
- Cable to connect a master/slave connection.



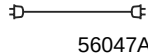
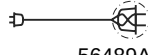
56109AXX

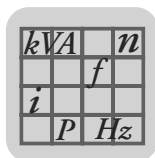
Type	Installation	Part number
DEH11B/DER11B X14 → DER11B/DEH11B X14	 56047AXX	817 958 1

- Cable to connect the encoder simulation (DEH11B/DER11B:X14) of the master to terminal X42 of option DRS11B.

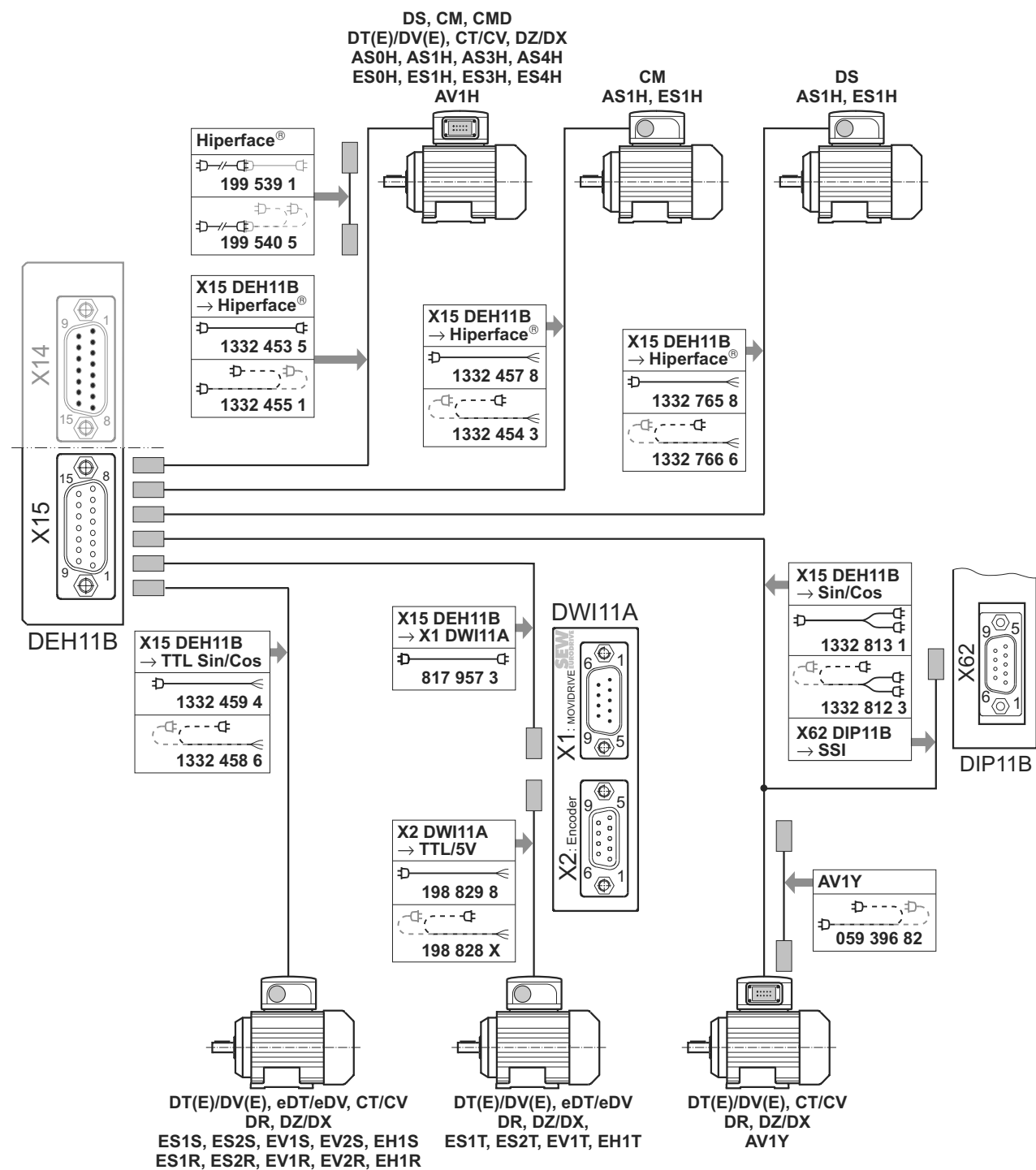


56109AXX

Type	Installation	Part number
DEH11B/DER11B X14 → DRS11B X42 (master and slave turn in the same direction)	 56047AXX	0818 166 7
DEH11B/DER11B X14 → DRS11B X42 (master and slave turn in opposite directions)	 56489AXX	0818 167 5



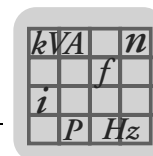
Connection options at X15 DEH11B



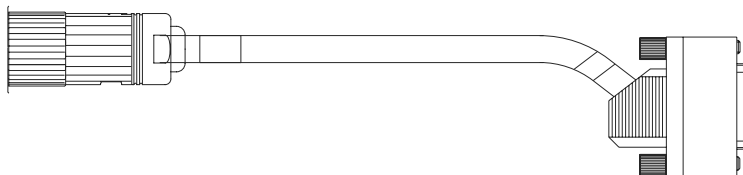
56481AXX



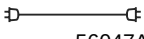
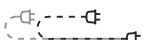
For individual wiring diagrams, refer to the section "Installation" in the MOVIDRIVE® MDX60B/61B operating instructions.



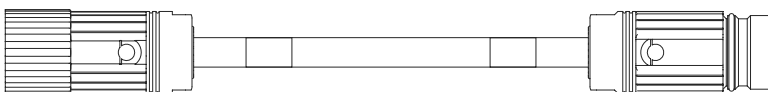
- Cable to connect HIPERFACE® encoders AS0H, AS1H, AS3H, AS4H, ES0H, ES1H, ES3H, ES4H, AV1H with plug connector connection on the motor side to DS, CM, CMD, DT, DV, DT(E), DV(E), CT, CV, DZ or DX motors.



56135AXX

Type	Installation	Part number
DEH11B X15 → DS/CM/CMD/DT/DV/DT(E)/DV(E)/CT/CV/DZ/DX motors with AS0H, AS1H, AS3H, AS4H, ES0H, ES1H, ES3H, ES4H, AV1H	 56047AXX	1332 453 5
	 56048AXX	1332 455 1

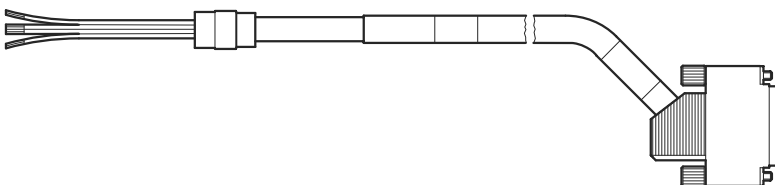
- Extension cable to connect HIPERFACE® encoders AS0H, AS1H, AS3H, AS4H, ES0H, ES1H, ES3H, ES4H, AV1H with plug connector connection on the motor side to DS, CM, CMD, DT, DV, DT(E), DV(E), CT, CV, DZ or DX motors.



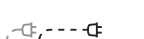
56136AXX

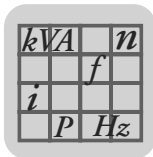
Type	Installation	Part number
DEH11B X15 → DS/CM/CMD/DT/DV/DT(E)/DV(E)/CT/CV/DZ/DX motors with AS0H, AS1H, AS3H, AS4H, ES0H, ES1H, ES3H, ES4H, AV1H	 56051AXX	199 539 1
	 56052AXX	199 540 5

- Cable to connect HIPERFACE® encoders AS1H, ES1H with terminal box connection on the motor side to CM motors.



56137AXX

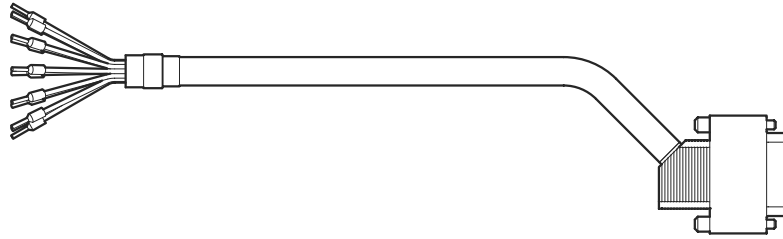
Type	Installation	Part number
DEH11B X15 → CM motors with AS1H, ES1H	 56049AXX	1332 457 8
	 56050AXX	1332 454 3



Technical Data and Dimensions

Prefabricated cables

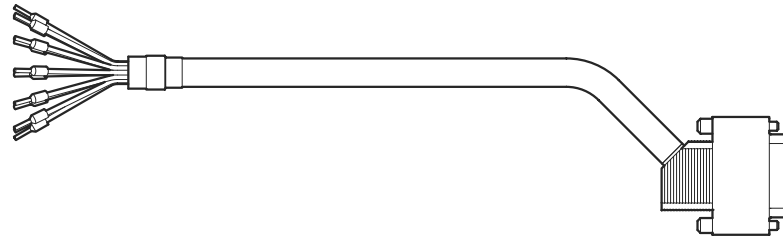
- Cable to connect HIPERFACE® encoders AS1H, ES1H with terminal box connection on the motor side to DS motors.



56132AXX

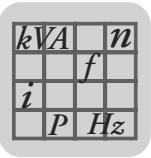
Type	Installation	Part number
DEH11B X15 → DS motors with AS1H, ES1H	 56049AXX	1332 765 8
	 56050AXX	1332 766 6

- Cable to connect sin/cos encoders ES1S, ES2S, EV1S, EV2S, EH1S, ES1R, ES2R, EV1R, EV2R, EH1R with terminal box connection on the motor side to CT, CV, DT(E), DV(E), eDT, eDV, DR, DZ und DX motors.

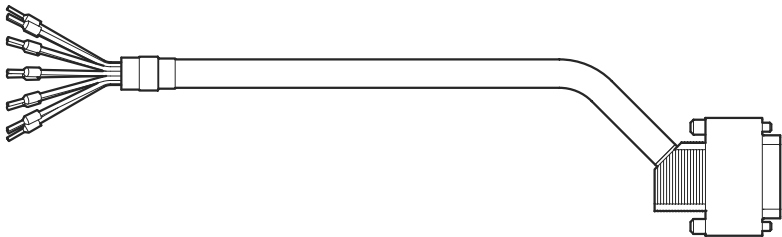


56132AXX

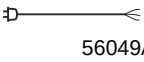
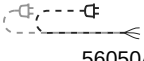
Type	Installation	Part number
DEH11B X15 → DT(E)/DV(E)/eDT/eDV/CT/CV/DR/DZ/DX motors with sin/cos encoders ES1S, ES2S, EV1S, EV2S, EH1S, ES1R, ES2R, EV1R, EV2R, EH1R	 56049AXX	1332 459 4
	 56050AXX	1332 458 6



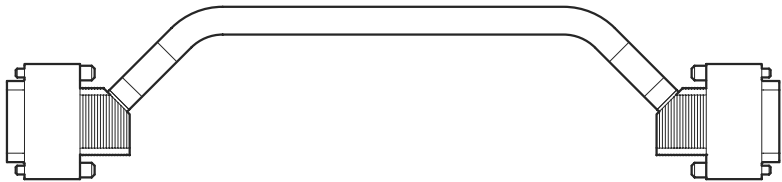
- Cable to connect DC 5 V TTL sensors ES1T, ES2T, EV1T, EH1T with terminal box connection on the motor side (DT(E), DV(E), eDT, eDV, DR, DZ or DX motors) to DC 5 V encoder power supply type DWI11A.



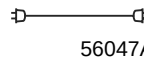
56132AXX

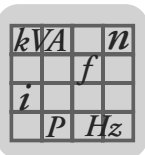
Type	Installation	Part number
DC 5 V TTL sensors ES1T, ES2T, EV1T, EH1T → DWI11A X2	 56049AXX	198 829 8
	 56050AXX	198,828 X

- Cable to connect the DC 5 V encoder power supply type DWI11A via plug connector



56109AXX

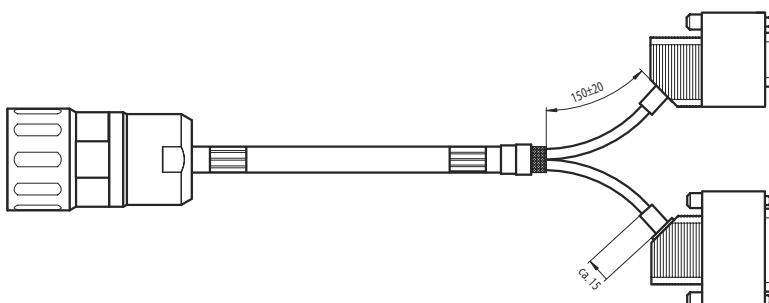
Type	Installation	Part number
DEH11B X15 → DWI11A X1	 56047AXX	817 957 3



Technical Data and Dimensions

Prefabricated cables

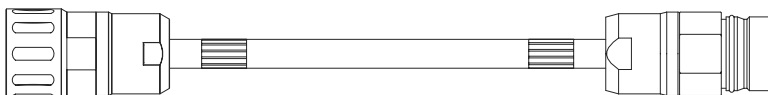
- Y cable to connect the AV1Y absolute encoder with plug connector on the motor side to DT(E), DV(E), CT, CV, DR, DZ und DX motors. The following encoder tracks are evaluated with the Y cable:
 - SSI track of the AV1Y absolute encoder and at DIP11B X62
 - sin/cos track of the AV1Y absolute encoder at DEH11B X15



56133AXX

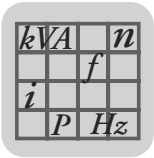
Type	Installation	Part number
DER11B X15 → AV1Y and DIP11B X62	 56053AXX	1332 813 1
	 56054AXX	1332 812 3

- Extension cable to connect the AV1Y absolute encoder with plug connector on the motor side to DT(E), DV(E), CT, CV, DR, DZ und DX motors.

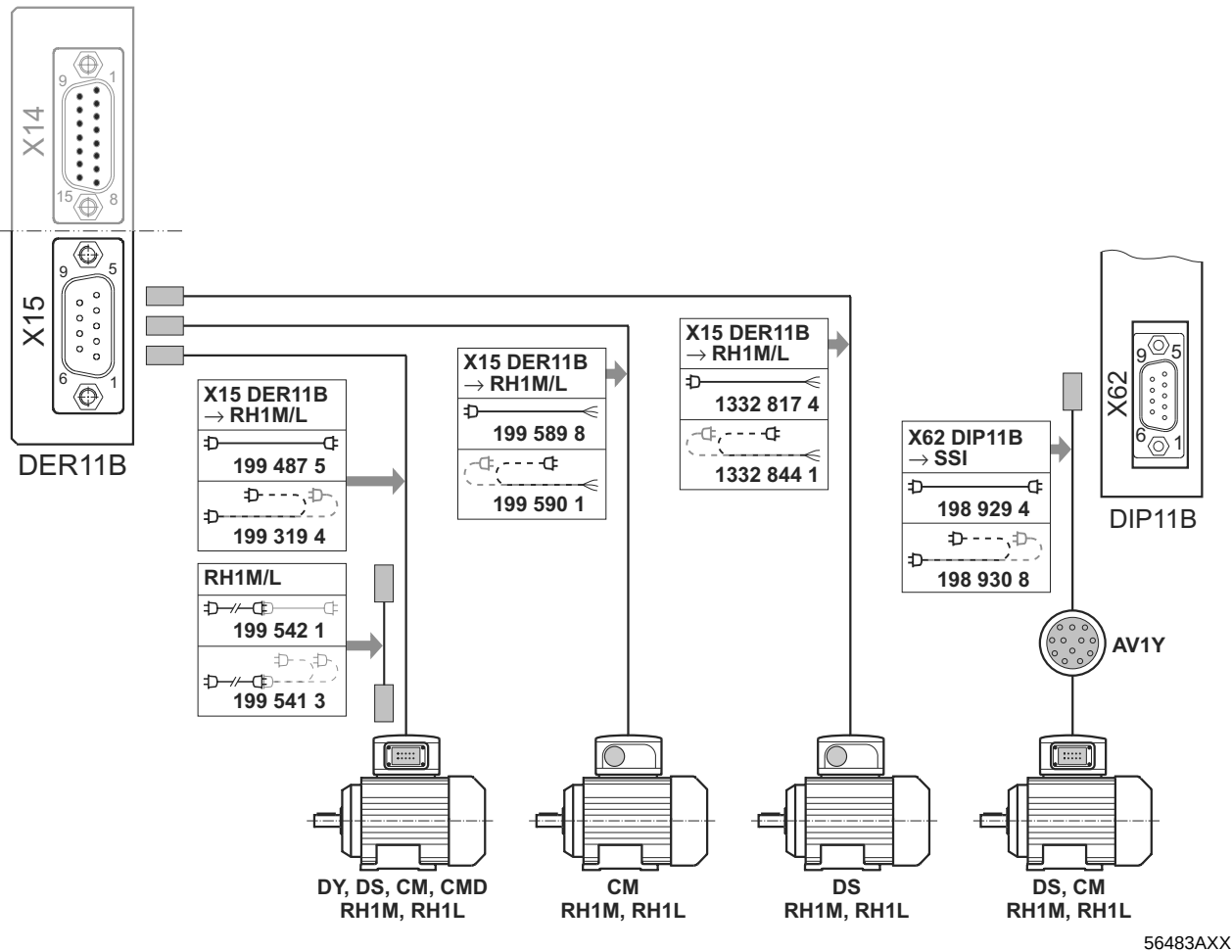


56131AXX

Type	Installation	Part number
DT(E)/DV(E)/CT/CV/DR/DZ/DX motors → AV1Y	 56052AXX	0593 539 1



Connection
options at X15
DER11B



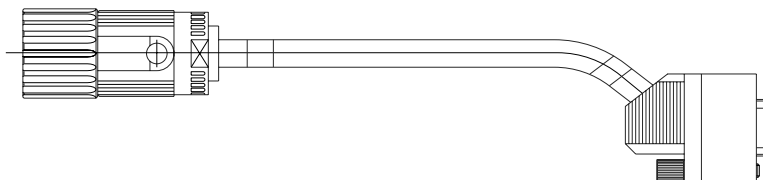
For individual wiring diagrams, refer to the section "Installation" in the MOVIDRIVE® MDX60B/61B operating instructions.



Technical Data and Dimensions

Prefabricated cables

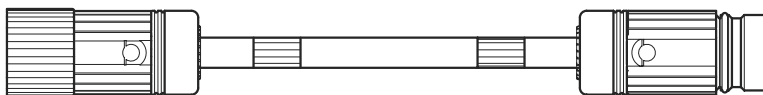
- Cable to connect resolvers RH1M / RH1L with plug connector connection on the motor side to DS, CM or CMD motors.



56138AXX

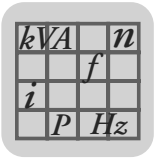
Type	Installation	Part number
DER11B X15 → DS/CM/CMD motors with RH1M/RH1L	 56047AXX	199 487 5
	 56048AXX	199 319 4

- Extension cable to connect resolvers RH1M / RH1L with plug connector connection on the motor side to DS, CM or CMD motors.

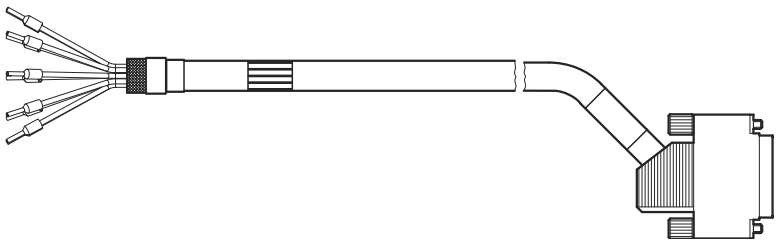


56139AXX

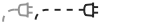
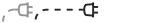
Type	Installation	Part number
DER11B X15 → DS/CM/CMD motors with RH1M/RH1L	 56051AXX	199 542 1
	 56052AXX	199 541 3



- Cable to connect resolvers RH1M / RH1L with terminal box connection on the motor side to CM and DS motors.



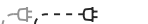
56142AXX

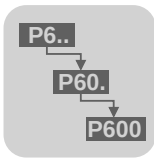
Type	Installation	Part number
DER11B X15 → CM motors with RH1M/RH1L	 56049AXX	199 589 8
	 56050AXX	199 590 1
DER11B X15 → DS motors with RH1M/RH1L	 56049AXX	1332 817 4
	 56050AXX	1332 844 1

- CM and DS motors with integrated resolver: Additional cable to connect the AV1Y absolute encoder with plug connector connection on the motor side to DIP11B X62.



56143AXX

Type	Installation	Part number
DS/CM motors with AV1Y→ DIP11B X62	 56047AXX	198 929 4
	 56048AXX	198 930 8



Parameters

Menu structure DBG60B

4 Parameters

Generally speaking, the parameter menu is only required for startup and in case of service. That is the reason why MOVIDRIVE® is designed as a basic unit without keypad. You can equip the MOVIDRIVE® with a PC connection or a keypad.

You can set the MOVIDRIVE® parameters in various ways:

- With the optional keypad type DBG60B.
- With the MOVITOOLS® PC program (includes SHELL, SCOPE and IPOS^{plus}® programming).
- Using the serial interfaces.
- Using the fieldbus interfaces.
- Using IPOS^{plus}®.

You can download the latest version of the MOVITOOLS® program from the SEW-EURODRIVE homepage www.sew-eurodrive.com.

4.1 Menu structure DBG60B

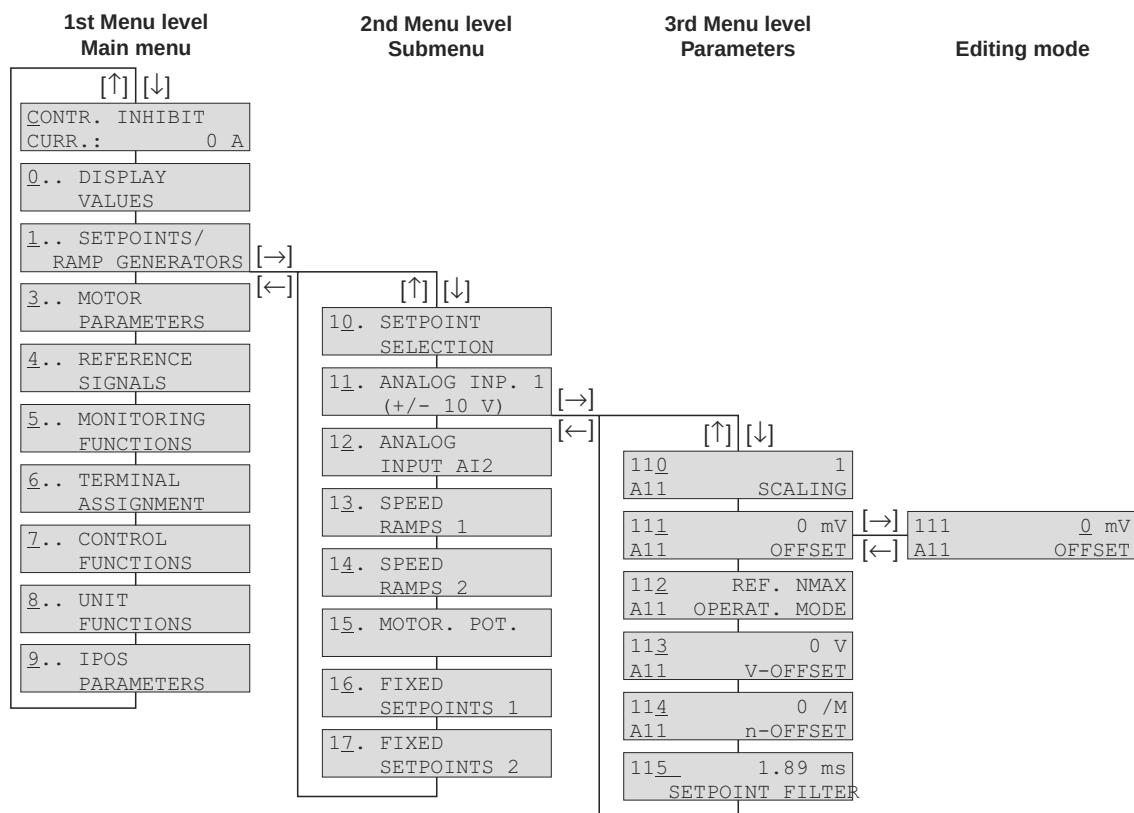
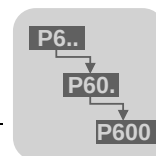


Figure 56: Structure of the DBG60B menu

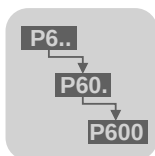
02407AEN



4.2 Overview of parameters

The following table lists all parameters together with their setting range and the factory settings (underlined>):

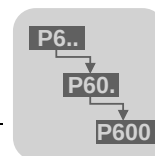
0xx	Display values	
00x	Process values	
000	Speed	
001	User display	
002	Frequency	
003	Actual position	
004	Output current	
005	Active current	
006 / 007	Motor utilization 1 / 2	
008	DC link voltage	
009	Output current	
01x	Status displays	
010	inverter status	
011	Operating status	
012	Error status	
013	Active parameter set	
014	Heat sink temperature	
015	Mains ON operating time	
016	Operating time (enabled)	
017	Electrical energy	
018 / 019	KTY capacity utilization 1 / 2	
02x	Analog setpoints	
020 / 021	Analog input AI1/AI2	
022	External current limitation	
03x	Binary inputs basic unit	
030 ... 037	Binary input DI00 ... DI07	
039	Binary inputs DI00 ... DI07	
04x	Binary inputs option	
040 ... 047	Binary input DI10 ... DI17	
048	Binary inputs DI10 ... DI17	
05x	Binary outputs basic unit	
050	Binary output DB00	
051 ... 055	Binary output DO01 ... DO05	
059	Binary outputs DB00, DO01 ... DO05	
06x	Binary outputs option	
060 ... 067	Binary output DO10 ... DO17	
068	Binary outputs DO10 ... DO17	
07x	Unit data	
070	Device type	
071	Rated output current	
072	Option / firmware encoder slot	
073	Option / firmware fieldbus slot	



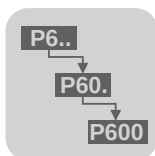
Parameters

Overview of parameters

074	Option / firmware expansion slot	
076	Firmware basic unit	
078	Technology function	
079	Unit type	
08x	Fault memory	
080 ... 084	Error t-0 ... t-4	
09x	Bus diagnostics	
090	PD configuration	
091	Fieldbus type	
092	Fieldbus baud rate	
093	Fieldbus address	
094 ... 096	PA1 ... PO3 setpoint	
097 ... 099	PE1 ... PI3 actual value	
1xx	Setpoints / ramp generators	
10x	Setpoint selection	
100	Setpoint source	<u>UNIPOL/FIX.SETPT</u>
101	Control signal source	<u>TERMINALS</u>
102	Frequency scaling	0.1 ... <u>10</u> ... 65 kHz
11x	Analog input AI1	
110	AI1 scaling	-10 ... 0 ... <u>1</u> ... 10
111	AI1 offset	-500 ... <u>0</u> ... 500 mV
112	AI1 operating mode	<u>Ref. N-MAX</u>
113	AI1 voltage offset	-10 ... <u>0</u> ... 10 V
114	AI1 speed offset	-6000 ... <u>0</u> ... 6000 rpm
115	Filter setpoint	0 ... <u>5</u> ... 100 ms, 0 = OFF
12x	Analog inputs option	
120	AI2 operating mode (optional)	<u>NO FUNCTION</u>
13x / 14x	Speed ramps 1 / 2	
130 / 140	Ramp t11/t21 UP CW	0 ... <u>2</u> ... 2000 s
131 / 141	Ramp t11/t21 DOWN CW	0 ... <u>2</u> ... 2000 s
132 / 142	Ramp t11/t21 up CCW	0 ... <u>2</u> ... 2000 s
133 / 143	Ramp t11/t21 down CCW	0 ... <u>2</u> ... 2000 s
134 / 144	Ramp t12/t22 UP = DOWN	0 ... <u>10</u> ... 2000 s
135 / 145	S pattern t12/t22	<u>0</u> ... 3
136 / 146	Stop ramp t13/t23	0 ... <u>2</u> ... 20 s
137 / 147	Emergency ramp t14/t24	0 ... <u>2</u> ... 20 s
138	Ramp limit VFC	<u>YES</u> / NO
139 / 149	Ramp monitoring 1 / 2	YES / <u>NO</u>
15x	Motor potentiometer	
150	Ramp t3 up	0.2 ... <u>20</u> ... 50 s
151	Ramp t3 DOWN	0.2 ... <u>20</u> ... 50 s
152	Save last setpoint	ON / <u>OFF</u>



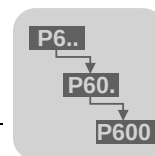
16x / 17x	Fixed setpoints 1 / 2	
160 / 170	Internal setpoint n11/n21	–6000 ... <u>150</u> ... 6000 rpm (% I _N)
161 / 171	Internal setpoint n12/n22	–6000 ... <u>750</u> ... 6000 rpm (% I _N)
162 / 172	Internal setpoint n13/n23	–6000 ... <u>1500</u> ... 6000 rpm (% I _N)
2xx	Controller parameters	
20x	Speed control	
200	P gain speed controller	0.01 ... <u>2</u> ... 32
201	Time constant n-control.	0 ... <u>10</u> ... 3000 ms
202	Amplified acceleration feedforward	<u>0</u> ... 65
203	Filter acceleration feedforward	<u>0</u> ... 100 ms
204	Filter speed actual value	<u>0</u> ... 32 ms
205	Load feedforward CFC	–150 ... <u>0</u> ... 150 %
206	Sample time n-control.	<u>1</u> ms / 0.5 ms
207	Load feedforward VFC	–150 ... <u>0</u> ... 150 %
21x	Hold controller	
210	P gain hold controller	0.1 ... <u>0.5</u> ... 32
22x	Synchronous operation control (not in effect for BG0)	
220	P-gain DRS	1 ... <u>10</u> ... 200
221	Master gear ratio factor	<u>1</u> ... 3 999 999 999
222	Slave gear ratio factor	<u>1</u> ... 3 999 999 999
223	Mode selection	<u>Mode 1</u> Mode 8
224	Slave counter	–99 999 999 ... <u>10</u> ... 99 999 999
225	Offset 1	–32 767 ... <u>10</u> ... 32 767
226	Offset 2	–32 767 ... <u>10</u> ... 32 767
227	Offset 3	–32 767 ... <u>10</u> ... 32 767
228	Feedforward filter DRS	<u>0</u> ... 100 ms
23x	Synchronous operation with synchronous encoder	
230	Synchronous encoder	<u>OFF</u> / EQUAL-RANKING / CHAIN
231	Factor slave encoder	<u>1</u> ... 1000
232	Factor slave sync. encoder	<u>1</u> ... 1000
233	Synchronous encoder resolution	128 / 256 / 512 / <u>1024</u> / 2048
234	Master encoder resolution	128 / 256 / 512 / <u>1024</u> / 2048
24x	Synchr. oper. w. catch up	
240	Synchronous speed	–6000 ... <u>1500</u> ... 6000 rpm
241	Synchronous ramp	0 ... <u>2</u> ... 50 s
26x	Process controller parameters	
260	Operating mode	<u>Controller off</u> / Control / Step response
261	Cycle time	1 / <u>5</u> / 10 ms
262	Interruption	<u>No response</u> / Move closer to setpoint
263	Factor K _P	0 ... <u>1</u> ... 32,767
264	Integrative time T _n	<u>0</u> ... 10 ... 65535 ms
265	Derivative time T _V	<u>0</u> ... 1 ... 30 ms
266	Feedforward	–32767 ... <u>0</u> ... 32767 [0.2/min]
27x	Process controller input values	
270	Setpoint source	<u>Parameter</u> / IPOS variable / Analog 1 / Analog 2 / Fieldbus
271	Setpoint	–32767 ... <u>0</u> ... 32767 [0.2/min]
272	IPOS setpoint address	<u>0</u> ... 1023



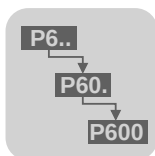
Parameters

Overview of parameters

273	Time constant	$\underline{Q}$... 0.01 ... 2000 s
274	Scaling setpoint	–32.767 ... <u>1</u> ... 32.767
275	Actual value source	<u>Analog 1</u> / Analog 2 / IPOS variable / Fieldbus
276	IPOS actual value address	$\underline{Q}$... 1023
277	Actual scaling factor	–32.767 ... <u>1</u> ... 32.767
278	Actual offset value	–32767 ... $\underline{Q}$... 32767
279	Actual time constant	$\underline{Q}$... 500 ms
28x	Process controller limits	
280	Minimum offset + actual value	–32767 ... $\underline{Q}$... 32767
281	Maximum offset + actual value	–32767 ... <u>10000</u> ... 32767
282	Minimum output PID controller	–32767 ... <u>–1000</u> ... 32767 [0.2/min]
283	PID controller maximum output	–32767 ... <u>10000</u> ... 32767 [0.2 / min]
284	Minimum output process controller	–32767 ... $\underline{Q}$... 32767 [0.2/min]
285	Maximum output process controller	–32767 ... <u>7500</u> ... 32767 [0.2/min]
3xx	Motor parameters	
30x / 31x	Limits 1 / 2	
300 / 310	Start/stop speed 1 / 2	0 ... 150 rpm
301 / 311	Minimum speed 1/2	0 ... <u>15</u> ... 6100 rpm
302 / 312	Maximum speed 1/2	0 ... <u>1500</u> ... 6100 rpm
303 / 313	Current limit 1/2	0 ... 150 % I_N (BG0: 0 ... 200 % I_N)
304	Torque limit	$\underline{Q}$... 150 % (BG0: 0 ... 200 %)
32x / 33x	Motor compensation 1 / 2 (asynchronous)	
320 / 330	Automatic adjustment 1/2	<u>ON</u> / OFF
321 / 331	Boost 1/2	$\underline{Q}$... 100 %
322 / 332	I×R compensation 1/2	0 ... 100 %
323 / 333	Premagnetizing time 1/2	0 ... 2 s
324 / 334	Slip compensation 1/2	0 ... 500 rpm
34x	Motor protection	
340 / 342	Motor protection 1/2	<u>OFF</u> / ON ASYNCHRONOUS / ON SERVO
341 / 343	Cooling type 1/2	<u>FAN COOLED</u> / FORCED COOLING
344	Interval for motor protection	0.1... <u>4</u> ..0.20 s
345 / 346	I_N - U_L monitoring 1 / 2	0.1 ... 500 A
35x	Direction of rotation of the motor	
350 / 351	Change direction of rotation 1/2	ON / <u>OFF</u>
36x	Startup (only available in DBG60B)	
360	Startup	YES / <u>NO</u>
4xx	Reference signals	
40x	Speed reference message	
400	Speed reference value	0 ... <u>1500</u> ... 6000 rpm
401	Hysteresis	0 ... <u>100</u> ... 500 rpm
402	Delay time	0 ... <u>1</u> ... 9 s
403	Signal = "1" if:	$\underline{n} \leq n_{ref}$ / $n > n_{ref}$
41x	Speed window signal	
410	Window center	0 ... <u>1500</u> ... 6000 rpm
411	Range width	$\underline{Q}$... 6000 rpm
412	Delay time	0 ... <u>1</u> ... 9 s
413	Signal = "1" if:	<u>INSIDE</u> / OUTSIDE



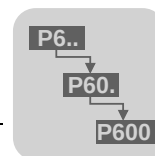
42x	Speed setp./act. val. comp.	
420	Hysteresis	0 ... <u>100</u> ... 300 rpm
421	Delay time	0 ... <u>1</u> ... 9 s
422	Signal = "1" if:	$n \neq n_{\text{setpt}} / \underline{n = n_{\text{setpt}}}$
43x	Current reference signal	
430	Current reference value	0 ... <u>100</u> ... 200 % I_N
431	Hysteresis	0 ... <u>5</u> ... 30 % I_N
432	Delay time	0 ... <u>1</u> ... 9 s
433	Signal = "1" if:	$I < I_{\text{ref}} / I > I_{\text{ref}}$
44x	I_{max} signal	
440	Hysteresis	0 ... <u>5</u> ... 50 % I_N
441	Delay time	0 ... <u>1</u> ... 9 s
442	Signal = "1" if:	$I = I_{\text{max}} / \underline{I < I_{\text{max}}}$
5xx	Monitoring functions	
50x	Speed monitoring	
500 / 502	Speed monitoring 1/2	OFF / MOTOR / REGENERATIVE / <u>MOT.&REGEN.MODE</u>
501 / 503	Delay time 1/2	0 ... <u>1</u> ... 10 s
504	Encoder monitoring motor	YES / <u>NO</u>
505	Synchronous encoder monitoring	YES / <u>NO</u>
51x	Synchr. operation monitoring	
510	Positioning tol. slave	10 ... <u>25</u> ... 32,768 inc
511	Prewarning setpoint deviation	<u>50</u> ... 99,999,999 inc.
512	Setpoint deviation limit	100 ... <u>4000</u> ... 99 999 999
513	Delay setpoint deviation message	0 ... <u>1</u> ... 99 s
514	Counter LED display	10 ... <u>100</u> ... 32,768 inc.
515	Delay position message	5 ... <u>10</u> ... 2000 ms
516	X41 Encoder monitoring	<u>NO</u> / YES
517	X41 Pulse count monitoring	<u>NO</u> / YES
518	X42 Encoder monitoring	<u>NO</u> / YES
519	X42 Pulse count monitoring	<u>NO</u> / YES
52x	Mains OFF monitoring	
520	Mains OFF response time	<u>0</u> ... 5 s
521	Mains OFF response	<u>CONTROL.INHIBIT</u> / EMERGENCY STOP
522	Phase failure monitoring	OFF / <u>ON</u>
53x	Thermal protection motor	
530	Sensor type 1	<u>No sensor</u> / TF-TH / KTY
531	Sensor type 2	<u>No sensor</u> / TF-TH / KTY
6xx	Terminal assignment	
60x	Binary inputs basic unit	
600	Binary input DIØ1	<u>CW/STOP</u>
601	Binary input DIØ2	<u>CCW/STOP</u>
602	Binary input DIØ3	<u>ENABLE /STOP</u>
603	Binary input DIØ4	<u>n11/n21</u>
604	Binary input DIØ5	<u>n12/n22</u>
605	Binary input DIØ6	<u>NO FUNCTION</u>
606	Binary input DIØ7	<u>NO FUNCTION</u>



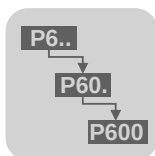
Parameters

Overview of parameters

61x	Binary inputs option	
610 ... 617	Binary inputs DI1Ø ... DI17	<u>NO FUNCTION</u>
62x	Binary outputs basic unit	
620	Binary output DOØ1	<u>READY</u>
621	Binary output DOØ2	<u>/FAULT</u>
622	Binary output DOØ3	<u>IPOS OUTPUT</u>
623	Binary output DOØ4	<u>IPOS OUTPUT</u>
624	Binary output DOØ5	<u>IPOS OUTPUT</u>
63x	Binary outputs option	
630 ... 637	Binary outputs DO1Ø ... DO17	<u>NO FUNCTION</u>
64x	Analog outputs optional	
640	Analog output AO1	<u>ACTUAL SPEED</u>
641	Scaling AO1	-10 ... 0 ... <u>1</u> ... 10
642	Operating mode AO1	OFF / <u>-10 V...+10 V</u> / 0(4) ... 20 mA
643	Analog output AO2	<u>OUTP.CURRENT</u>
644	Scaling AO2	-10 ... 0 ... <u>1</u> ... 10
645	Operating mode AO2	OFF / <u>-10 V...+10 V</u> / 0(4) ... 20 mA
7xx	Control functions	
70x	Operating modes	
700 / 701	Operating mode 1/2	<u>VFC 1 / 2</u>
71x	Current at standstill	
710 / 711	Standstill current 1/2	<u>0</u> ... 50 % I _{Mot}
72x	Setpoint stop function	
720 / 723	Setpoint stop function 1/2	ON / <u>OFF</u>
721 / 724	Stop setpoint 1 / 2	0 ... <u>30</u> ... 500 rpm
722 / 725	Start offset 1/2	0 ... <u>30</u> ... 500 rpm
73x	Brake function	
730 / 733	Brake function 1/2	<u>ON</u> / OFF
731 / 734	Brake release time 1/2	0 ... 2 s
732 / 735	Brake application time 1/2	0 ... 2 s
74x	Speed skip	
740 / 742	Skip window center 1/2	0 ... <u>1500</u> ... 6000 rpm
741 / 743	Skip width 1/2	<u>0</u> ... 300 rpm
75x	Master-Slave function	
750	Slave setpoint	<u>MASTER-SLAVE OFF</u>
751	Scaling slave setpoint	-10 ... 0 ... <u>1</u> ... 10
76x	Manual operation	
760	Locking RUN/STOP keys	YES / <u>NO</u>
77x	Energy-saving function	
770	Energy-saving function	ON / <u>OFF</u>
78x	Ethernet configuration	
780	IP address	000.000.000.000 ... <u>192.168.10.x</u> ... 223.255.255.255
781	Subnetwork mask	000.000.000.000 ... <u>255.255.255.000</u> ... 255.255.255.255
782	Standard gateway	<u>000.000.000.000</u> ... 223.255.255.255
782	Baud rate [MBaud]	
784	MAC address	



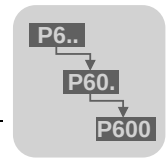
8xx	Unit Functions	
80x	Setup	
800	User menu	<u>ON</u> / OFF (only in DBG60B)
801	Language	Dependent on DBG60B version
802	Factory setting	<u>NO</u> / DEFAULT STANDARD / DELIVERY STATUS
803	Parameter lock	ON / <u>OFF</u>
804	Reset statistic data	<u>NO</u> / ERROR MEMORY / kWh METER / OPERATING HOURS
806	Copy DBG → MDX	YES / <u>NO</u> (in DBG60B only)
807	Copy MDX → DBG	YES / <u>NO</u> (in DBG60B only)
81x	Serial communication	
810	RS-485 address	<u>0</u> ... 99
811	RS485 group address	<u>100</u> ... 199
812	RS485 timeout delay	<u>0</u> ... 650 s
819	Fieldbus timeout delay	0 ... <u>0.5</u> ... 650 s
82x	Brake operation	
820 / 821	4-quadrant operation 1/2	<u>ON</u> / OFF
83x	Fault responses	
830	Response EXT. ERROR	<u>EMERG. STOP/FAULT</u>
831	Response FIELDBUS TIMEOUT	<u>RAPID STOP/FAULT</u>
832	Response MOTOR OVERLOAD	<u>EMERG. STOP/FAULT</u>
833	Response RS485 TIMEOUT	<u>RAPID STOP/WARNG</u>
834	Response LAG ERROR	<u>EMERG. STOP/FAULT</u>
835	Response TF sensor SIGNAL	<u>NO RESPONSE</u>
836 / 837	Response SBus TIMEOUT 1 / 2	<u>EMERG. STOP/FAULT</u>
838	Response SW LIMIT SWITCH	<u>EMERG. STOP/FAULT</u>
84x	Reset response	
840	Manual reset	YES / <u>NO</u>
841	Auto reset	ON / <u>OFF</u>
842	Restart time	1 ... <u>3</u> ... 30 s
85x	Scaling speed actual value	
850	Scaling factor numerator	<u>1</u> ... 65 535
851	Scaling factor denominator	<u>1</u> ... 65 535
852	User unit	<u>rpm</u>
86x	Modulation	
860 / 861	PWM frequency 1 / 2 VFC	<u>4</u> / 8 / 12 / 16 kHz
862 / 863	PWM fix 1/2	ON / <u>OFF</u>
864	PWM CFC	4 / <u>8</u> / 16 kHz
87x	Process data description	
870	Setpoint description PO1	<u>CTRL. WORD 1</u>
871	Setpoint description PO2	<u>SPEED</u>
872	Setpoint description PO3	<u>NO FUNCTION</u>
873	Actual value description PI1	<u>STATUS WORD 1</u>
874	Actual value description PI2	<u>SPEED</u>
875	Actual value description PI3	<u>OUTP.CURRENT</u>
876	PO data enable	<u>ON</u> / OFF
88x / 89x	Serial communication SBus 1 / 2	
880 / 890	Protocol SBus 1 / 2	<u>SBus MOVILINK</u> / CANopen
881 / 891	SBus address 1 / 2	<u>0</u> ... 63



Parameters

Overview of parameters

882 / 892	SBus group address 1 / 2	<u>0</u> ... 63
883 / 893	SBus timeout delay 1 / 2	<u>0</u> ... 650 s
884 / 894	Baud rate SBus 1 / 2	125 / 250 / <u>500</u> / 1000 kBaud
885 / 895	Synchronization ID SBus 1 / 2	<u>0</u> ... 2047
886 / 896	CANopen address 1 / 2	1 ... <u>127</u>
887	Synchronization ext. Control	ON / <u>OFF</u>
888	Synchronization time	<u>5 ms</u> / 10 ms
9xx	IPOS parameters	
90x	IPOS Reference travel	
900	Reference offset	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
901	Reference speed 1	0 ... <u>200</u> ... 6000 rpm
902	Reference speed 2	0 ... <u>50</u> ... 6000 rpm
903	Reference travel type	<u>0</u> ... 8
904	Reference travel to zero pulse	<u>YES</u> / NO
905	Hiperface® Offset X15	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
91x	IPOS travel parameters	
910	Gain X controller	0.1 ... <u>0.5</u> ... 32
911	Positioning ramp 1	0.01 ... <u>1</u> ... 20 s
912	Positioning ramp 2	0.01 ... <u>1</u> ... 20 s
913	Positioning speed CW	0 ... <u>1500</u> ... 6000 rpm
914	Positioning speed CCW	0 ... <u>1500</u> ... 6000 rpm
915	Speed feedforward	-199.99 ... 0 ... <u>100</u> ... 199.99 %
916	Ramp type	<u>LINEAR</u> / SINE / SQUARE / BUS RAMP / JERK-LIMITED / ELECTRONIC CAM / SYNCHRONOUS OPERATION / CROSS CUTTER
917	Ramp mode	<u>MODE 1</u> / MODE 2
92x	IPOS Monitoring	
920	SW limit switch CW	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
921	SW limit switch CCW	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
922	Position window	0 ... <u>50</u> ... 32 767 inc.
923	Setpoint deviation window	0 ... <u>5000</u> ... $2^{31}-1$ inc.
93x	IPOS Special functions	
930	Override	ON / <u>OFF</u>
931	IPOS CTRL word Task 1	START / <u>STOP</u> (with DBG60B only)
932	IPOS CTRL word Task 2	START // <u>STOP</u> (with DBG60B only)
933	Jerk time	<u>0.005</u> ... 2 s
938	Speed task 1	<u>0</u> ... 9 additional commands/ms
939	Speed task 2	<u>0</u> ... 9 additional commands/ms
94x	IPOS Encoder	
940	IPOS variables edit	ON / <u>OFF</u>
941	Source actual position	<u>Motor encoder (X15)</u> / Ext. encoder (X14) / Absolute encoder (DIP)
942	Encoder factor numerator	<u>1</u> ... 32 767
943	Encoder factor denominator	<u>1</u> ... 32 767
944	Encoder scaling ext. Encoder	<u>x1</u> / x2 / x4 / x8 / x16 / x32 / x64
945	Encoder type (X14)	<u>TTL</u> / SIN/COS / HIPERFACE
946	Synchronous encoder counting direction (X14)	<u>NORMAL</u> / INVERTED
947	Hiperface® Offset X14	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.



95x	DIP	
950	Encoder type	<u>NO ENCODER</u>
951	Counting direction	<u>NORMAL</u> INVERTED
952	Cycle frequency	<u>1</u> ... 200 %
953	Position offset	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
954	Zero offset	$-(2^{31}-1) \dots \underline{0} \dots 2^{31}-1$ inc.
955	Encoder scaling	<u>x1</u> / x2 / x4 / x8 / x16 / x32 / x64
96x	IPOS Modulo function	
960	Modulo function	<u>OFF</u> / SHORT / CW / CCW
961	Modulo numerator	0 ... <u>1</u> ... $2^{31}-1$
962	Modulo denominator	0 ... <u>1</u> ... $2^{31}-1$
963	Modulo encoder resolution	0 ... <u>4096</u> ... 65535

4.3 Explanation of the parameters

The parameters are explained below. The parameters are divided into 10 groups. The parameter names correspond to their representation in the SHELL[®] PC program. The factory setting is underlined in each case.

Symbols

The following symbols explain the parameters:



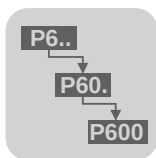
These parameters are switch-selectable and available in parameter sets 1 and 2.



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



The startup function automatically changes this parameter.

***P0xx display values***

This parameter group contains the following information:

- Process values and states of the basic unit
- Process values and states of the installed options
- Fault memory
- Fieldbus parameters

P00x Process values***P000 Speed***

Unit: [rpm]

Resolution with DBG60B: ± 1 rpm; with SHELL: ± 0.2 rpm

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

P001 User display

Unit: [Text]

The user display is defined by the following parameters:

- P850 Scaling factor numerator
- P851 Scaling factor denominator
- P852 User-defined unit

P002 Frequency

Unit: [Hz]

Output frequency of the inverter.

P003 Actual position

Unit: [Inc] (4,096 increments/motor revolution)

Position of the drive with correct sign in increments ranging from 0 ... $\pm 2^{31} - 1$ Inc (with encoder connection). The value is zero without an encoder connection.

P004 Output current

Unit: [% I_N]

Apparent current in the range 0 ... 200 % of the rated unit current (BG0: 250 %).

P005 Active current

Unit: [% I_N]

Active current in the range 0... 200 % I_N (BG0: 250 %). 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.

P006 / P007 Motor utilization 1 / 2

Unit: [%]

The thermal loading of the connected motor is displayed in the range 0 ... 200 %.

The displayed value is the current motor utilization for the motor in parameter sets 1 / 2 that is determined via the motor temperature emulation in the inverter. The asynchronous motor is turned off when 110 % is reached.

P008 DC link voltage

Unit: [V]

The displayed value is the voltage measured in the DC link circuit.

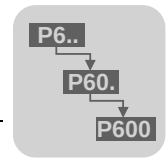
P009 Output current

Unit: [A]

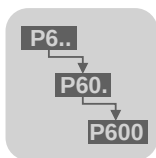
Apparent current, displayed in AC A.

P01x Status displays***P010 Inverter status***

Status of the unit output stage (INHIBITED, ENABLED).



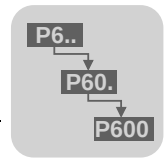
<i>P011 Operating state</i>	The following operating states are possible (7 segment display): • 0: 24 V OPERATION (inverter not ready for operation) • 1: CONTR. INHIBIT • 2: NO ENABLE • 3: CURRENT AT STANDSTILL • 4: ENABLE (VFC) • 5: ENABLE (N-CONTROL) • 6: TORQUE CONTROL • 7: HOLD CONTROL • 8: FACTORY SETTING • 9: LIMIT SWITCHES • A: TECHNOLOGY OPTION • c: REFERENCE OPERATION • d: FLYING START IS RUNNING • EN: CALIBRATE ENCODER • F: ERROR • H: MANUAL MODE • t: TIMEOUT • U: SAFE STOP
<i>P012 Error status</i>	Error number and error in plain text. The error number also appears on the inverter's 7-segment display.
<i>P013 Current parameter set</i>	Parameter set 1 or 2.
<i>P014 Heat sink temperature</i>	Unit: [°C] Heat sink temperature of the inverter in the range –40 ... 0 ... 125 °C.
<i>P015 Operating time</i>	Unit: [h] Total number of hours for which the inverter has been connected to the mains or an external DC 24 V supply. Storage cycle every 15 min.
<i>P016 Enable time</i>	Unit: [h] Total number of hours for which the inverter has been at ENABLE operating status. Storage cycle every 15 min.
<i>P017 Work</i>	Unit: [kWh] Cumulated electrical watt-hours used by the motor. Storage cycle every 15 min.
<i>P018 / P019 Motor temperature 1 / 2</i>	Unit: [%] Display 0 %: Motor is not in operation at max. ambient temperature. Display 110 %: Cut-off point of motor.
<i>P02x Analog setpoints</i>	
<i>P020/P021 Analog input AI1/AI2</i>	Unit: [V] Voltage (–10 V... +10 V) at analog input AI1 (020) and at the optional analog input AI2 (021). If P112 AI1 Operating mode = N-MAX, 0(4) ... 20 mA and S11 = ON, then the display will show P020 0(1) ... 5 V = 0(4) ... 20 mA.



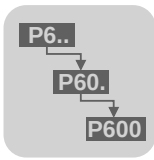
Parameters

Explanation of the parameters

<i>P022 External current limitation</i>	Unit: [%] If P120 AI2 operating mode (optional) = 0 ... 10 V I-limit, then P022 will display the external current limitation that is active.
<i>P03x Binary inputs basic unit</i>	
<i>P030 ... P037 Binary input DI00 ... DI07</i>	The display will show the current status of input terminal DI00 ... DI07 and the current function assignment. Please note that binary input DI00 is always assigned with controller inhibit. Menu selection see P60x Binary inputs basic unit.
<i>P039 Binary inputs DI00 ... DI07</i>	Displays the standard binary inputs DI00 to DI07 in this sequence.
<i>P04x Binary inputs option</i>	
<i>P040 ... P047 Binary input DI10 ... DI17</i>	Displays the current status of the binary input on an option card (e.g. DIO) with the current function assignment. If the option is not present, the display will read "--". Menu selection see P61x Binary inputs option.
<i>P048 Binary inputs DI10 ... DI17</i>	Displays the optional binary inputs DO10 ... DO17 in this sequence.
<i>P05x Binary outputs basic unit</i>	
<i>P050 ... P055 Binary output DB00, DO01 ... DO05</i>	Displays the current status of the binary output on the basic unit with the the current function assignment. Output DB00 is always programmed to the brake function. Menu selection see P62x Binary outputs basic unit.
<i>P059 Binary outputs DB00, DO01 ... DO05</i>	Displays the binary outputs DB00 and DO01 ... DO05 in this sequence.
<i>P06x Binary outputs option</i>	
<i>P060 ... P067 Binary output DO10 ... DO17</i>	Displays the current status of the binary output on an option card (e.g. DIO) with the current function assignment. If the option is not present, the display will read "--". Menu selection see P63x Binary outputs option.
<i>P068 Binary outputs DO10 ... DO17</i>	Displays the optional binary outputs DO10 ... DO17 in this sequence.
<i>P07x Unit data</i>	Unit type, rated unit current, type of options and firmware part numbers (basic unit and options), type (standard or application).
<i>P070 Unit type</i>	Displays the complete designation of the unit, e.g. MDX60B0014-5A3.
<i>P071 Rated output current</i>	Displays the r.m.s. value of the rated output current.
<i>P072 Option / firmware encoder slot</i>	Displays the encoder card currently installed in the encoder slot and the program version.
<i>P073 Option / firmware fieldbus slot</i>	Displays the fieldbus card currently installed in the fieldbus slot and the program version.



<i>P074 Option / firmware expansion slot</i>	Displays the option card currently installed in the expansion slot and the program version, if this option has a program memory.
<i>P076 Firmware basic unit</i>	Displays the program version of the firmware used in the basic unit.
<i>P078 Technology function</i>	Displays the currently set technology function. The function is set via MOVITOOLS® in "Startup – Select technology function". • STANDARD: Setting for operation of drive inverter with the functions described in the system manual (positioning, speed control, etc.). • ELECTRONIC CAM: Setting for technology function "Electronic cam" to coordinate the operation of several drives. Prerequisites are: – Motor with encoder feedback – Inverter in unit design "Application version" • ISYNCH: Setting for technology function "Electronic synchronous operation" to synchronize the operation of several drives with accurate positioning. Prerequisites are: – Motor with encoder feedback – Inverter in unit design "Application version" • AUTO / ASR: Special solution for optimum load distribution of the drive power for running gear with multiple-axle drive. • SBUS / TP: Special solution.
<i>P079 Unit design</i>	Displays the unit design. • STANDARD: Application modules and technology functions are not available. • TECHNOLOGY: Application modules and technology functions are available.



Parameters

Explanation of the parameters

P08x Error memory

*P080 ... P084 Error
t-0 ... t4*

There are 5 error memories (t-0 ... t-4). The errors are stored in a chronological order with the most recent error event being held in error memory t-0. If there are more than 5 errors, the error event of longest standing, stored in t-4, is deleted.

Programmable error responses: see table P83x.

The following information is stored at the time of the error and can be displayed in the event of an error:

- Status ("0" or "1") of binary inputs/outputs
- Operating status of the inverter
- inverter status
- Heat sink temperature [°C]
- Speed [rpm]
- Output current [% I_N]
- Active current [%]
- Unit utilization[%]
- DC link voltage [V]
- Operating hours [h]
- Enable hours [h]
- Parameter set [1/2]
- Motor utilization 1 and 2 [%]

P09x Bus diagnostics

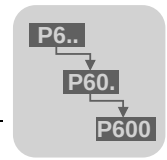
*P090 PD
configuration* Set process data word configuration.

P091 Fieldbus type Installed fieldbus type:

- CAN
- PROFIBUS FMS/DP
- PROFIBUS DP
- INTERBUS
- INTERBUS with LWL
- Ethernet
- DeviceNet
- CANopen
- NO FIELDBUS

*P092 Fieldbus
baud rate* Active baud rate.

*P093 Fieldbus
address* Address of the inverter on the fieldbus.



P094 ... P096 PO1
... PO3 setpoint

Displays the value currently transferred on the process data word in hexadecimal form.

PO setpoint	Description
P094 PO1 setpoint	P870 Setpoint description PO1
P095 PO2 setpoint	P871 Setpoint description PO2
P096 PO3 setpoint	P872 Setpoint description PO3

P097 ... P099 PI1
... PI3 actual value

Displays the value currently transferred on the process data word in hexadecimal form.

PI setpoint	Description
P097 PI1 actual value	P873 Actual value description PI1
P098 PI2 actual value	P874 Actual value description PI2
P099 PI3 actual value	P875 Actual value description PI3

P1xx Setpoints / Ramp generators

P10x Setpoint preselection



P100 and P101 can also be used for selecting a communication 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 at any time.

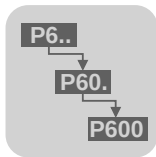
If the drive inverter is in "t = Timeout active" status, check the timeout intervals of parameters P812, P815 and P819 and, if necessary, switch off timeout monitoring by entering 0 s or 650 s.

P100 Setpoint
source



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

- **BIPOL./FIX.SETPT:** The setpoint is provided by the analog inputs (AI1/AI2) or P16x Fixed setpoints 1, if these are selected via P60x Binary inputs basic unit / P61x Binary inputs option. 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 via P60x Binary inputs basic unit / P61x Binary inputs option.
- **RS485:** The setpoint comes from the RS485 interface.
- **FIELDBUS:** The setpoint comes from the fieldbus interface.
- **MOTOR POT.:** The setpoint is defined by the internal motor potentiometer. For this purpose, 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 counter-clockwise/stop binary inputs. see P15x Motor potentiometer.
- **MOTORPOT+ANALOG1:** The setpoint is defined by the total of the motorized 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. The settings of P112 AI1 Operating mode. see P15x Motor potentiometer.
- **FIX SETP+ANALOG1:** 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. See P16x Fixed setpoints 1.



Parameters

Explanation of the parameters

- **FIXEDSETxANALOG1:** The value at the analog input AI1 serves as an 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. see P16x Fixed setpoints 1.
- **MASTER SBus:** The setpoint comes from the master in master/slave mode via the system bus. see P75x Master-Slave function.
- **MASTER-RS485:** The setpoint comes from the master in master/slave mode via the RS485 interface. see P75x Master-Slave function.
- **SBus:** The setpoint is selected via the system bus. See the IPOS^{plus®} manual.
- **FREQUENCY INPUT:** Setting the parameter P100 Setpoint source to the function "Frequency input" causes the set speed to be set via digital input DI04 in the form of a frequency. To be able to do so, the binary input DI04 (P603) must be set to "No function." The binary input works with PLC-compatible input signals that are specified as follows:
 - 0 ... 7 V -> 0 level
 - 7 ... 24 V -> 1 level
 - This means an HTL encoder can be connected to the input to serve as a reference input variable encoder. The pulses from this encoder are then counted via input DI04 and a setpoint is calculated for the unit. The pulse duty factor (pulse width of the high and low signal) should be about 1 : 1. The factor determines the rising edge and the falling edge of the input signal. The P102 Frequency scaling is used to determine at which input frequency the system setpoint 100 % is reached. The reference of the system setpoint is set via parameter P112 AI1 Operating mode. The direction of rotation is set via the binary inputs CW/STOP and CCW/STOP.
- **IPOS Setpoint:** The value of the IPOS variable H524 (IPOS system setpoint) is used as the setpoint. The setpoint is interpreted depending on P700 Operating mode 1 .
 - If P700 Operating mode 1 is used to set an operating mode of the speed control (CFC, Servo, VFC, VFC+n-ctrl., VFC+Group, VFC+Hoist, VFC+Flying restart, VFC+DC-Brake), the setpoint will be interpreted as the speed value. The following formula applies: $H524 = \text{Set speed [rpm]} \times 5$.
 - If P700 Operating mode 1 is used to set an operation mode of torque control (CFC+M-ctrl., Servo+M-ctrl.), the setpoint will be interpreted as the torque value. The following formula applies: $H524 = \text{Set current [\% I}_N\text{]} \times 100$.
 - Setting P100 to the IPOS setpoint function is ineffective for operation modes CFC+IPOS, CFC+Sync, Servo+IPOS, Servo+Sync, VFC+n-ctrl.+IPOS, VFC+n-ctrl.+Sync.

P101 Control signal source



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

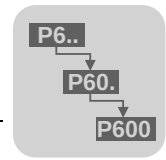
- **TERMINALS:** Control is via the binary inputs.
- **RS485:** Control is via the RS485 interface and the binary inputs.
- **FIELD BUS:** Control is via the fieldbus and the binary inputs.
- **SBus:** Control is via the system bus and the binary inputs.

P102 Frequency scaling



Setting range: 0.1 ... 10 ... 65 kHz

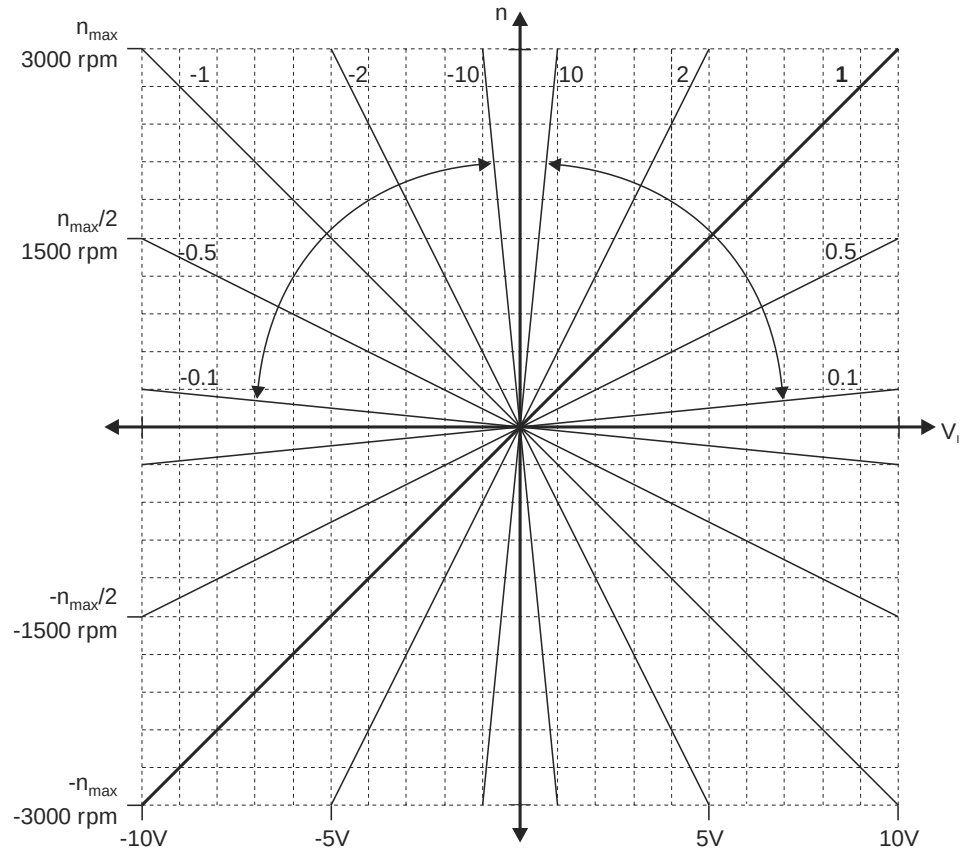
P11x Analog input AI1



P110 AI1 Scaling

Setting range: $-10 \dots 0 \dots \underline{1} \dots 10$

The slope of the setpoint characteristic is defined. Depending on P112 AI1 Operating mode with AI1 scaling = 1 and an input voltage V_i of ± 10 V, the setpoint ± 3000 rpm or $\pm n_{\max}$ is selected.



01259BEN

Figure 57: Slope of the setpoint characteristic

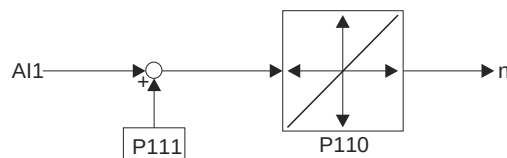
With P100 Setpoint source = UNIPOL./FIXED SETPT. only the 1st quadrant can be used, negative setpoint selections then produce the setpoint zero. If a current input is set in P112 AI1 Operating mode, P110 AI1 scaling will have no effect.

P111 AI1 Offset

Unit: [mV]

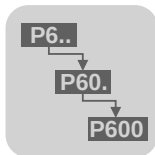
Setting range: $-500 \dots \underline{0} \dots 500$ mV

When the setpoint is selected by an external controller, it is possible to compensate for a voltage offset present at analog input AI1 when the setpoint selection is zero. The setting of this parameter causes calibration of the coordinate basic origin of Figure 57. This setting is in effect in all AI1 operating modes.



01292BXX

Figure 58: Effect of the AI1 offset



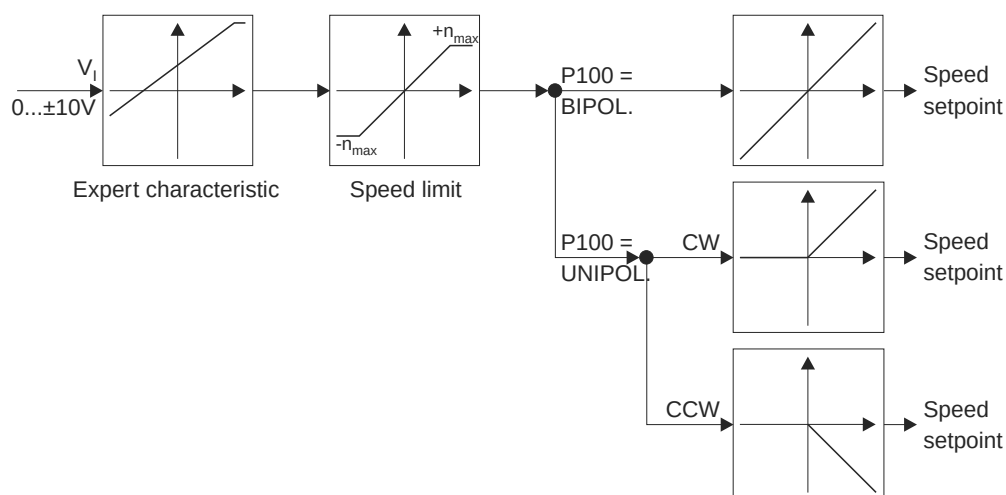
Parameters

Explanation of the parameters

P112 AI1 Operating 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 Maximum speed 1 / P312 Maximum speed 2). With P110 AI1 scaling you can adapt the characteristics. P113 AI1 voltage offset and P114 AI1 speed offset will have no effect.
- Reference 3000 rpm: Voltage input with reference 3000 rpm. With P110 AI1 scaling you can adapt the characteristics. P113 AI1 voltage offset and P114 AI1 speed offset will have no effect.
- V-Off., N-MAX Voltage input with reference $n_{\max}$. With P113 AI1 voltage offset you can adapt the characteristics. P110 AI1 scaling and P114 AI1 speed offset will have no effect.
- N-Off., N-MAX Voltage input with reference $n_{\max}$. With P114 AI1 speed offset you can adapt the characteristics. P110 AI1 scaling and P114 AI1 speed offset will have no effect.
- N-MAX, 0-20mA: Current input 0 ... 20 mA = 0 ... $n_{\max}$, no setting options (P110 AI1 scaling has no effect). Set the internal burden (250 Ω) "S11 = ON."
- N-MAX, 4-20mA: Current input 4 ... 20 mA = 0 ... $n_{\max}$, no setting options (P110 AI1 scaling has no effect). Set the internal burden (250 Ω) "S11 = ON."
- Expert characteristic: There is a free choice of reference between setpoint voltage and speed. With P110 AI1 scaling (Reference 3000 rpm), P113 AI1 voltage offset and P114 AI1 speed offset you can adapt the characteristics (-> Figure 63). The following structural diagram shows how the speed setpoint is created from the expert characteristic.



02162BEN

Figure 59: Structural diagram "Expert characteristic"

P113 AI1 Voltage
offset

Unit: [V]

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

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

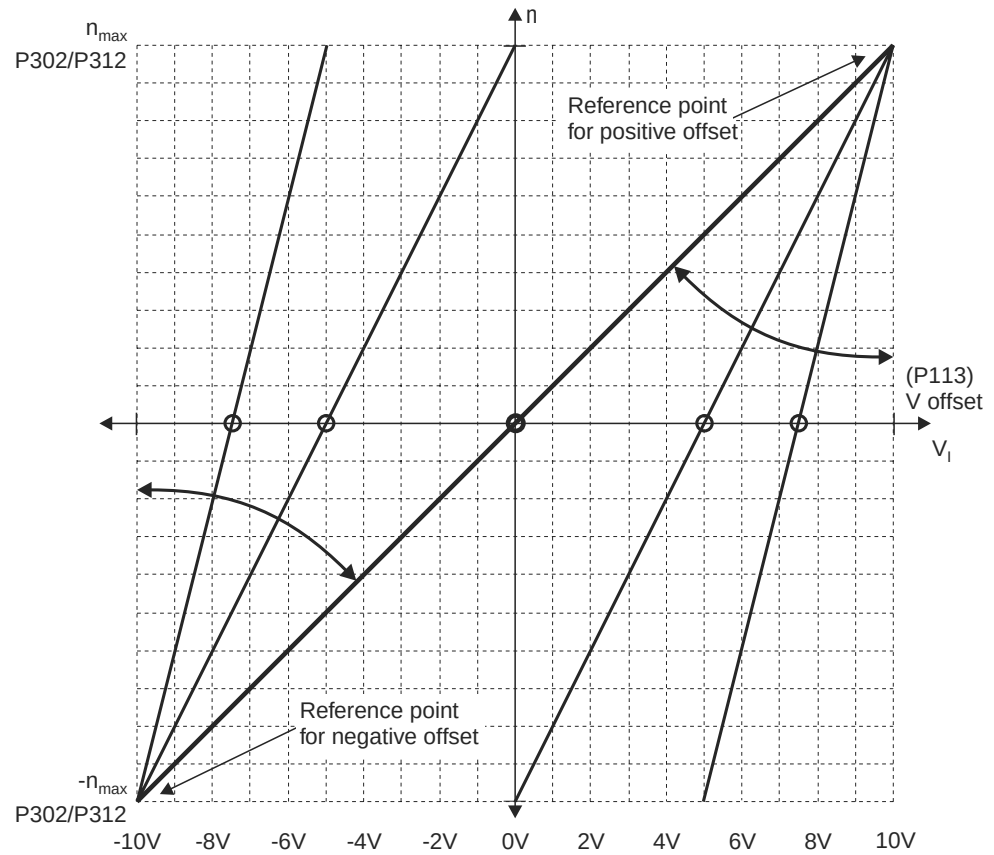
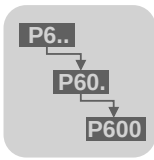


Figure 60: AI1 voltage offset

01260BEN



Parameters

Explanation of the parameters

P114 AI1 speed offset

Unit: [rpm]

Setting range: -6000 ... 0 ... 6000 rpm

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

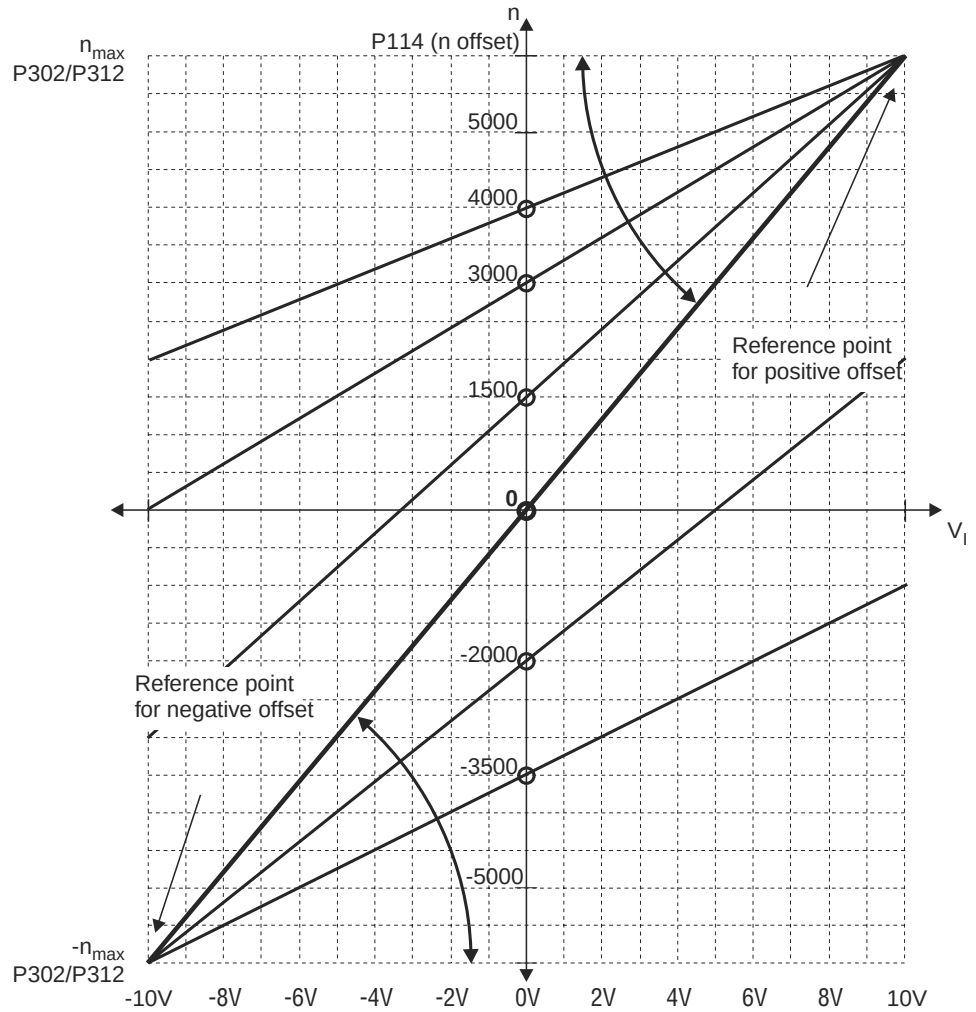


Figure 61: AI1 speed offset

01261CEN

P115 Filter setpoint Unit: [ms]

Setting range: $T = 0 \dots \underline{5} \dots 100$ ms (0 = Filter setpoint off)

The speed ramp is filtered. The filter 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.

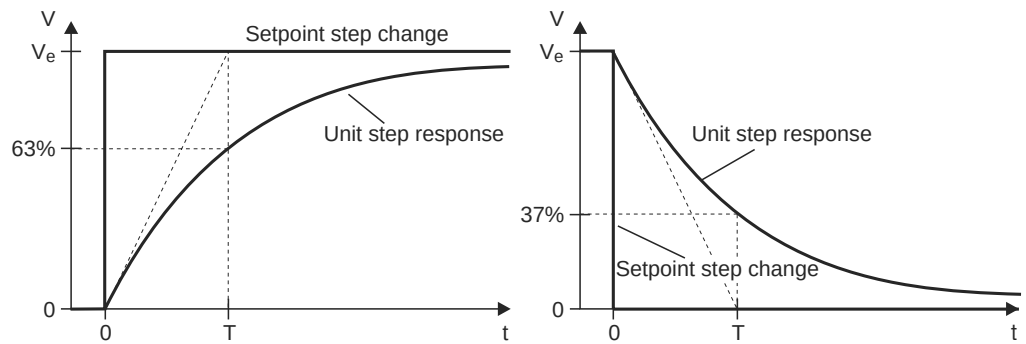


Figure 62: Effect of setpoint filter

01265BEN

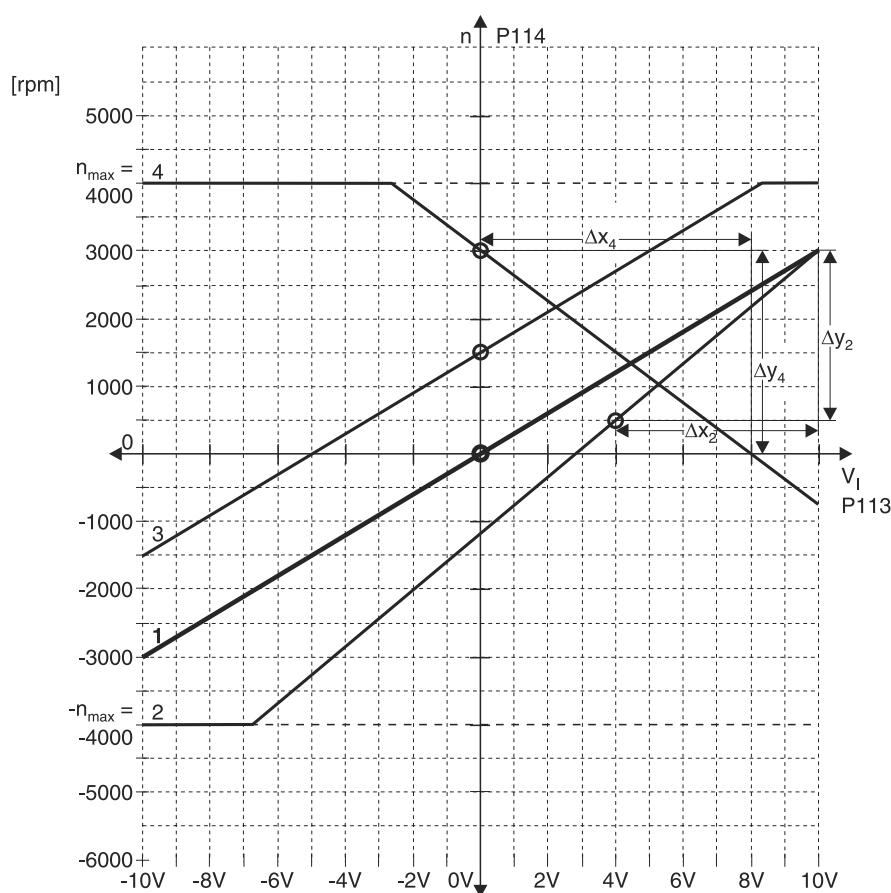
Sample expert characteristics (P112 AI1 Operating mode = expert charact.):

There is a free choice of reference between setpoint voltage and speed in the expert characteristic. For access to all options of the expert characteristics, set the parameter P100 Setpoint source = BIPOL./FIX.SETPT.

One point in the characteristic (in Figure 63 indicated by a circle) is selected with P113 AI1 voltage offset and P114 AI1 speed offset and the pitch is then selected with P110 AI1 scaling. Reference 3000 rpm always applies to scaling with the expert characteristic.

The speed range is limited by P302 Maximum speed 1 / P312 Maximum speed 2. In Figure 63 the P302 Maximum speed 1 = 4000 rpm is set. Setting the maximum speed does not alter the slope.

When calculating the slope triangulation function $\Delta y / \Delta x = \text{slope} = \text{setting value of P110 AI1 scaling}$ the voltage value of the x-axis must be converted to a speed value. The following applies: 10 V = 3000 rpm.



01264DEN

Figure 63: Samples of expert characteristics with P100 Setpoint source = BIPOL./FIX.SETPT.

For characteristics 2 and 4 in Figure 63, the slope triangulation functions are calculated and the setting values for P110 AI1 scaling determined.

Charac. curve 2: $\Delta y_2 = 2500 \text{ rpm}$, $\Delta x_2 = 6 \text{ V} = 1800 \text{ rpm}$, $\Delta y_2 / \Delta x_2 = 2500 / 1800 = 1.39$

Charac. curve 2: $\Delta y_4 = -3000 \text{ rpm}$, $\Delta x_4 = 8 \text{ V} = 2400 \text{ rpm}$, $\Delta y_4 / \Delta x_4 = -3000 / 2400 = -1.25$

The expert characteristics displayed in Figure 63 are created as follows:

Curve	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 characteristics 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 results in a speed setpoint = 0. In case of set direction of rotation "CW", only speeds in the range $0 \dots n_{\max}$ will be executed; for set direction of rotation "CCW" only speeds in the range $0 \dots -n_{\max}$ will be executed. Figure 64 shows the expert characteristics from Figure 63 at the setting P100 Setpoint source = UNIPOL./FIX.SETPT.

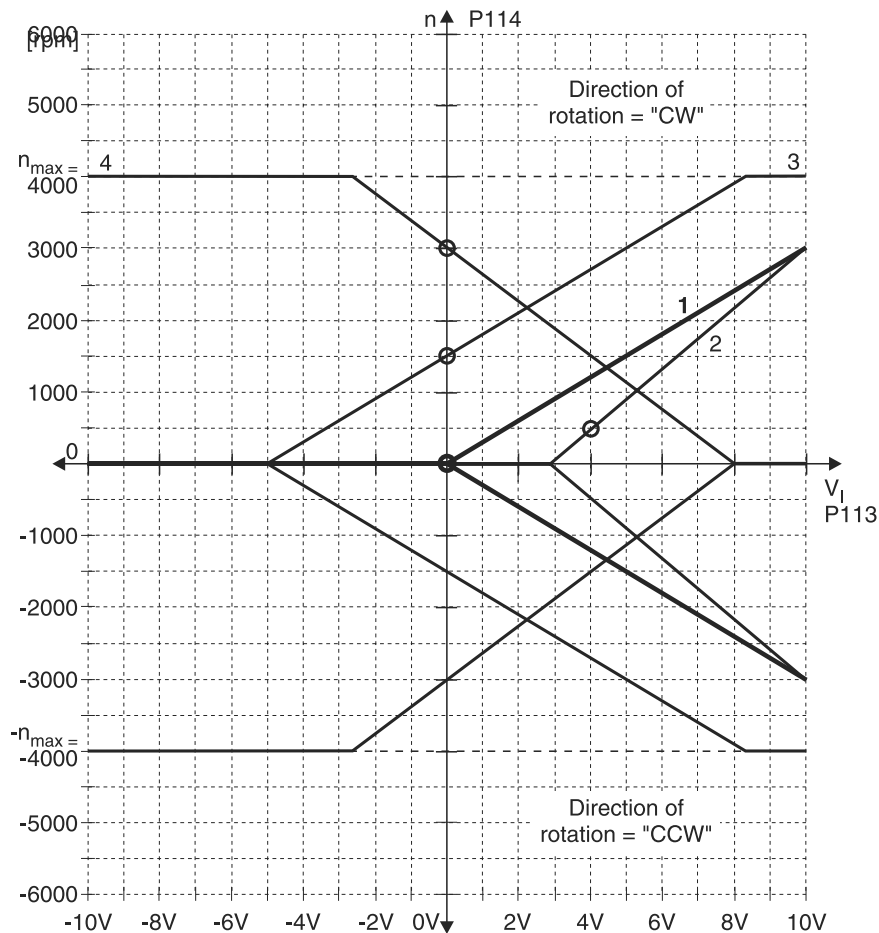
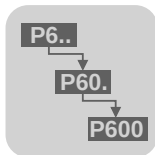


Figure 64: Samples of expert characteristics with P100 Setpoint source = UNIPOL./FIX.SETPT.

The expert characteristics displayed in Figure 64 are created as follows:

Curve	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

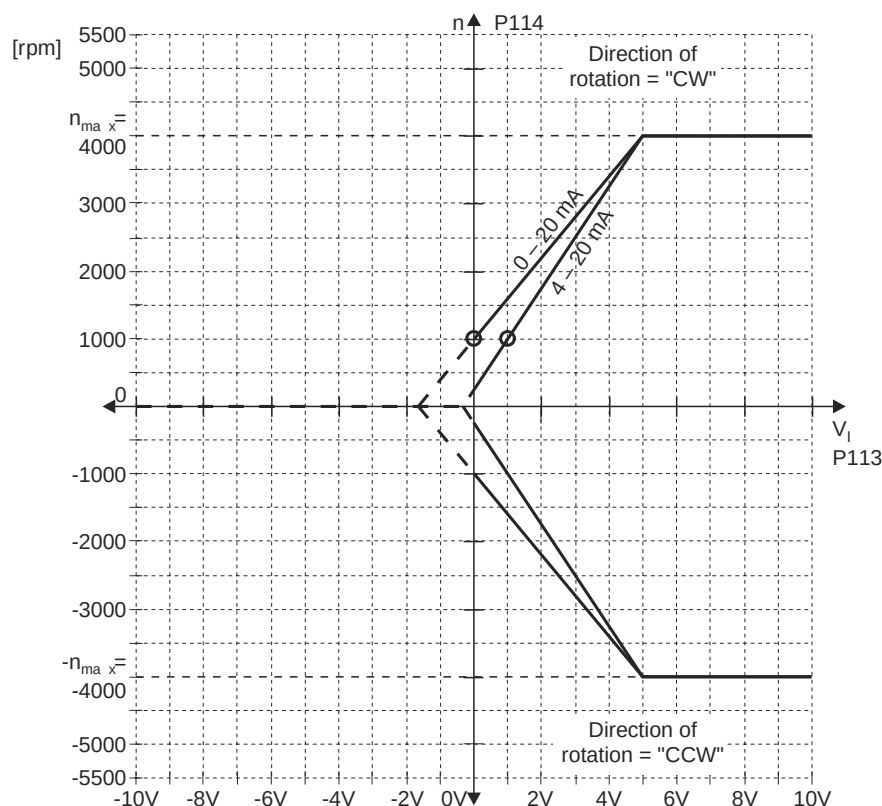


Parameters

Explanation of the parameters

Expert characteristic with current setpoints:

Voltage signals are required at the AI11/AI12 analog input for the expert characteristic function. If a load-independent current 0 (4)...20 mA is available as the setpoint, switch S11 (changeover I-signal/V-signal) must be set to ON and the current signal routed to X11:2 AI11. The setpoints 0 (4) ...20 mA will be converted into voltage signals 0 (1) ... 5 V through the internal burden (250 Ω) .



02165BEN

Figure 65: Samples of expert characteristics with current setpoints

You have to set the expert characteristics 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 = UNIPOL/FIX.SETPT. The direction of rotation is then specified using binary inputs.

P12x Analog inputs option

P120 AI2 operating mode (optional)

Analog input AI2 is only available with the optional input/output card (DIO11B).

- **NO FUNCTION:** The setpoint at AI2 is not used; the external current limitation is set to 100 %.
- **0 ... 10 V + Setpt.1:** The setpoint at AI2 is added to setpoint 1 (=AI1) observing the signs; the external current limitation is set to 100%. $\pm 10 \text{ V} = \pm n_{\max}$ (reference $n_{\max}$).
- **0 ... 10 V I-limit:** The input is used as an external current limitation. $0 \dots 10 \text{ V} = 0 \dots 100 \%$ of the internally set current limitation (P303 Current limit 1 / P313 Current limit 2).
- **ACTUAL VALUE CONTROLLER:** Feedback of actual value for process controller ($\rightarrow$ P275).
- **KTY evaluation:** The KTY sensor can be connected to analog input AI2 for direct measurement of the motor temperature. The measured values for parameter sets 1 and 2 are displayed via P018 Motor temperature 1 and P019 Motor temperature 2 is displayed on the LED at the same time.
- **TF sensor:** The temperature sensor TF that is integrated in the motor winding can be connected to analog input AI2 for thermal protection of the drive. To activate the monitoring function you will also have to set P530 Sensor type 1 / P531 Sensor type 2 to the function TF/TH sensor.

P13x / P14x Speed ramps 1 / 2

P130 ... P133 / P140 ... P143 Ramp t11/t21 up/down CW/CCW

1 2

P130 Ramp t11 up CW [s] / P140 Ramp t21 up CW [s]

P131 Ramp t11 up CW [s] / P141 Ramp t21 up CW [s]

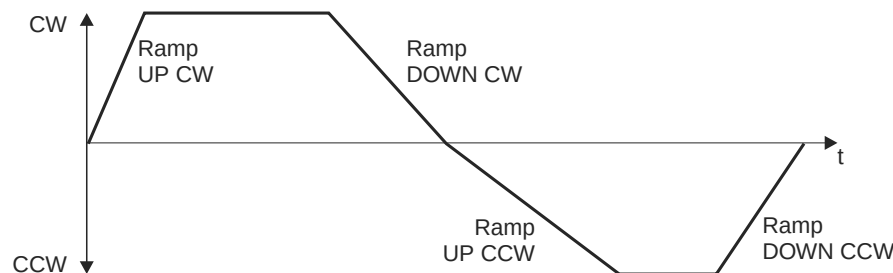
P132 Ramp t11 up CCW [s] / P142 Ramp t21 up CCW [s]

P133 Ramp t11 up CCW [s] / P143 Ramp t21 up CCW [s]

Unit: [s]

Setting range: $0 \dots \underline{2} \dots 2000 \text{ s}$

The ramp times refer to a setpoint step change of $\Delta n = 3000 \text{ rpm}$. The ramp takes effect when the speed setpoint is changed and the enable is withdrawn via the CW/CCW terminal.



01293BEN

Figure 66: Separately adjustable speed ramps

P134 / P144 Ramp t12 / t22 UP=DOWN

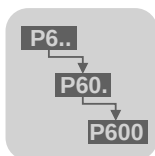
1 2

Unit: [s]

Setting range: $0 \dots \underline{10} \dots 2000 \text{ s}$

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

Ramps t12 / t22 are activated via a binary input ($\rightarrow$ P610 ... P617), which is set to the function "Ramp switchover."



Parameters

Explanation of the parameters

P135 / P145 S
pattern t12 / t22



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

The 2nd ramp (t12/ t22) of parameter sets 1 and 2 can be rounded with 3 pattern grades to achieve a smoother acceleration of the drive.

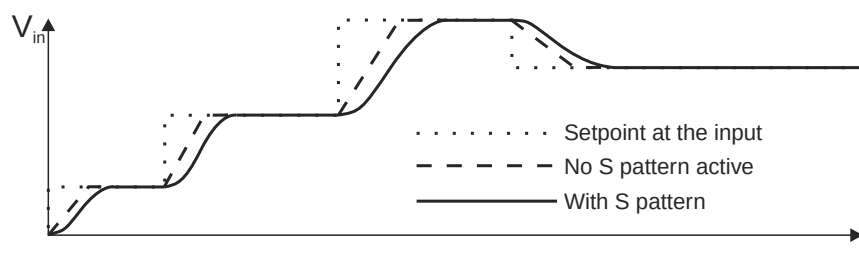


Figure 67: Effect of the S pattern

01266BEN



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 despite the withdrawal of the setpoint.

P136 / P146 Stop
ramp t13 / t23

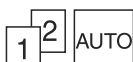


Unit: [s]

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

The stop ramp is activated by withdrawing the ENABLE terminal or by an error (P83x Error responses).

P137 / P147
Emergency ramp
t14 / t24



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

The emergency ramp is activated by an error (P83x Error responses). The system monitors whether the drive reaches zero speed within 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.

P138 Ramp
limitation VFC



Setting range: YES / NO

The ramp limitation limits the smallest ramp time in VFC operating modes (P700 Operating mode 1) to 100 ms (reference: $\Delta n = 3000$ rpm). Settings less than 100 ms are ignored and the ramp time 100 ms applies. The ramp limitation limits the maximum output current to 185 % (for size 1 ... 6, 225 % for size 0) of the rated output current. Active stall protection is implemented for the connected motor using the current limiting controller when ramp limitation is activated.



There is no active stall protection for the connected motor when ramp limitation is deactivated and ramp times of less than 100 ms are used. Parameters P303 Current limit 1 / P313 Current limit 2 will not be effective in this case. If a maximum output current of 185 % of the rated output current is exceeded for more than 60 ms, the inverter switches off with error message F01 Overcurrent and the "Immediate switch-off" error response.

P139 / P149 Ramp
monitoring 1 / 2



Setting range: YES / NO

If you set the deceleration ramps to a value that is a lot shorter than can be physically accomplished in this system, the turning drive will be stopped after expiration of the monitoring time. Such a setting will cause an error message and increase brake wear.

P15x Motor
potentiometer

P150 / P151 Ramp
t3 up / down

1 2

P152 Save last
setpoint

1 2

This step also entails an increased setting of the respective ramp, if the ramp timeout definitely appears in form of a preset ramp that cannot be traveled.

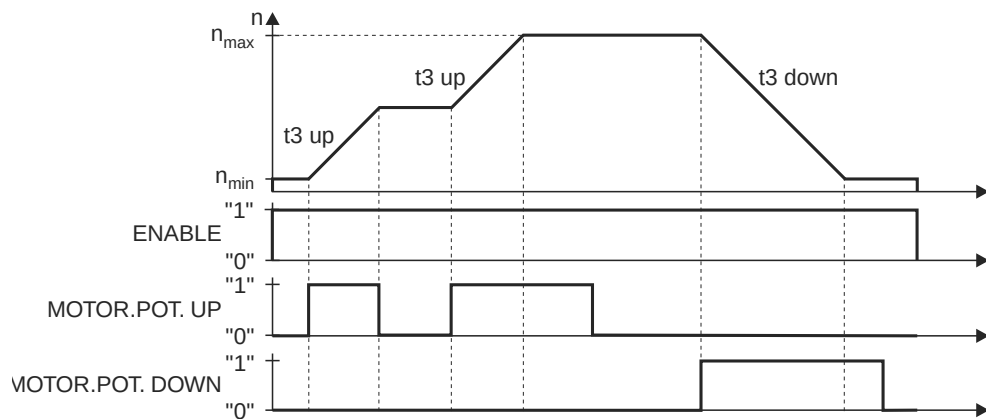
This parameter is an additional monitoring function for speed monitoring. This parameter only applies to the downwards ramp. This means the parameter can be used to monitor the downwards ramp, stop ramp or emergency stop ramp if speed monitoring is not desired.

The ramp times refer to a setpoint step change of $\Delta n = 3000$ rpm.

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

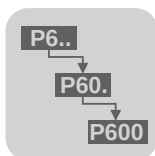
The ramp is active if P100 Setpoint source is set to MOTOR POTENTIOMETER or MOTORPOT+ANALOG1 and an input terminal programmed to MOTORPOTI UP or MOTORPOTI DOWNP6xx Terminal assignment has a "1" signal.

- **ON:** If MOTOR POT UP and MOTOR POT DOWN = "0," the last applicable motor potentiometer setpoint is stored in the non-volatile memory 2 s afterwards. The last motorized potentiometer setpoint is reactivated following mains power off/power on.
- **OFF:** Following a mains power off/power on or after withdrawal of the enable, the inverter starts with P301 Minimum speed 1 / P311 Minimum speed 2).



01294BEN

Figure 68: Motor potentiometer function



Parameters

Explanation of the parameters

P16x / P17x Fixed setpoints 1 / 2



3 internal setpoints (= fixed setpoints) can be set separately for parameter sets 1 and 2. The internal setpoints are active if P100 Setpoint source is set to one of the following functions and an input terminal programmed to n11/n21 or n12/n22 (P6xx Terminal assignment) has a "1" signal:

- BIPOL./FIX.SETPT
- UNIPOL/FIX.SETPT.
- FIXED SETP+AI1
- FIXEDSETxANALOG1

Setting range: 0 ... 6000 rpm

Fixed setpoint	Factory setting
P160 / P170 Internal setpoint n11/n21	n11 / n21 = 150 rpm
P161 / P171 Internal setpoint n12 / n22	n12 / n22 = 750 rpm
P162 / P172 Internal setpoint n13/n23	n13 / n23 = 1500 rpm

Programming the input terminals:

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"

If an input terminal is programmed to FIX SETPT SW.OV, the fixed setpoints of the currently inactive parameter set come into effect when this terminal is activated (= "1"). This changeover is possible when the unit is inhibited and enabled.

P2xx Controller parameters

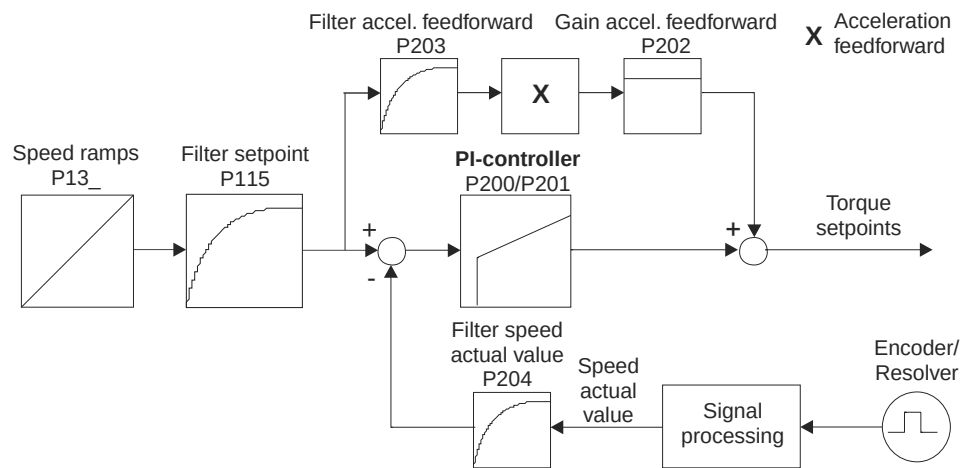
P20x Speed control

Speed control only parameter set 1.

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 (P70x Operating modes).
- Servo operating modes: The speed controller is only active in "SERVO & M-CONTROL" when speed limiting is active (P70x Operating modes).

The setting of all parameters relevant for speed control is supported by the SHELL startup functions or the DBG60B keypad (VFC only). Direct alterations to individual controller parameters are reserved for optimization by specialists.



01312BEN

Figure 69: Structural principles of the speed control loop

P200 P gain speed controller

Setting range: 0.01 ... 2 ... 32

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

AUTO

P201 Time constant n-control.

Setting range: 0 ... 10 3000 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.

AUTO

P202 Acceleration feedforward gain

Setting range: 0 ... 65

Gain factor of the acceleration feedforward. This parameter improves the control response of the speed controller.

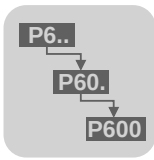
AUTO

P203 Acceleration feedforward filter

Setting range: 0 ... 100 ms

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

AUTO



Parameters

Explanation of the parameters

*P204 Filter speed
actual value*



Setting range: 0 ... 32 ms

Filter time constant of the speed actual value filter.

*P205 Load
feedforward CFC*

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

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

This parameter determines the initial value of the torque setpoint upon 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. This function should only be used in hoists without counterweight.

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

*P206 Sampling
time n-control*

Sampling time n-control only effective in CFC and SERVO operating modes.

Setting range: 1 ms / 0.5 ms

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

*P207 Load
feedforward VFC*

Load feedforward VFC only effective in VFC-n-CTRL operating modes.

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

This parameter determines the initial value 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. This function should only be used in hoists without counterweight.

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

In VFC & HOIST mode and with a value greater than 150 % set, pre-stressing of $0.5 \times s_N$ is in effect.

Recommended setting: Value of the active current (P005 [% I_N]) at minimum speed.

P21x Hold control

Hold control only parameter set 1.

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 (P6xx Terminal assignment) has a "0" signal. The unit then performs a stop using the t11 DOWN or t21 DOWN ramp. The position achieved when the drive speed 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. The 7-segment display shows status "7" when hold control is active.

*P210 P gain hold
controller*



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

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

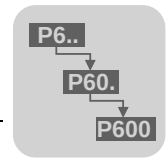
*P22x Synchronous
operation control*

Synch. operation control only in parameter set 1 and with the DRS11B option (not BG0). For a detailed description, refer to the "MDX61B - Synchronous Operation Board DRS11B" manual.

P220 P gain DRS

Setting range: 1 ... 10 ... 200

Gain of the synchr. operation controller in the slave drive. This determines the control response of the slave drive depending on the angle differentials in relation to the master drive.



P221 / P222
Master gear ratio
factor / Slave gear
ratio factor

Setting range: 1 ... 3 999 999 999

These settings are only required with the slave inverter. These parameters set the position measurement ratio between the master and slave drives. The ratio is entered as the quotient of master to slave drive to include non-integer ratios.

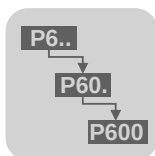
Note that position measurement of the master and slave drive can only occur using the motor encoders if there is **positive power transmission (without slip)**. Position measurement has to be via an **additional encoder (external encoder)** in all applications in which power transmission between motor shaft and machine is **by friction** and thus slip is to be expected. This encoder must be mounted on the moved machine component using a positive connection.

P223 Mode
selection

Setting range: 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8

Mode selection determines how the slave drive reacts to a free running signal.

- Mode 1: Free-running unlimited, new reference point
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - An angular offset generated in free-running mode is not processed when synchronization is started again.
- Mode 2: Free-running unlimited, offset is processed
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - An angular offset generated during free-running mode is reduced to zero when synchronization is started again.
- Mode 3: Free-running unlimited, offset generated is processed + P224
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - During resynchronization, in addition to the offset, the old synchronous position of the signed position offset in P224 is also reduced to zero.
- Mode 4: Free-running limited by *P224 Slave counter*, generated offset is processed
 - Free-running is activated via a "1" signal (>100 ms) at X40:1.
 - The input terminals and setpoints of the slave drive are effective during free-running.
 - Free-running ends when the angle differential entered in P224 has been reached. The angular offset is then reduced to zero.
- Mode 5: Free-running limited by *P224 Slave counter*, new reference point
 - Free-running is activated via a "1" signal (>100 ms) at X40:1.
 - The input terminals and setpoints of the slave drive are effective during free-running.
 - Free-running ends when the angle differential entered in P224 has been reached.
 - If another HIGH signal is applied at X40:1 before free-running has ended, the value at which free-running is to end increases to the value entered in P224.
 - The slave drive synchronizes with the new angle differential.



Parameters

Explanation of the parameters

- Mode 6: Temporary angular offset, new reference point
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - An angular offset generated in free-running mode is not processed when synchronization is started again.
 - A "1" signal at 40:2, X40:3 or X40:4 on DRS11B activates an angular offset. Each angular offset is stored in parameters P225, P226 and P227.
 - If a "0" signal is applied again at one of the input terminals X40:2, X40:3 or X40:4, the angular offset is eliminated again.
- Mode 7: Permanent angular offset (phase trimming), new reference point
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - An angular offset generated in free-running mode is not processed when synchronization is started again.
 - A "1" signal at 40:2, X40:3 or X40:4 on DRS11B activates an angular offset. Each angular offset is stored in parameters P225, P226 and P227.
 - If a "0" signal is applied again at one of the input terminals X40:2, X40:3 or X40:4, the angular offset is maintained.
 - If the input signal lasts longer than 3 seconds, the value is corrected at four steps per second.
- Mode 8: Free-running unlimited, new reference point + P224
 - Free-running is active when a "1" signal is set at X40:1.
 - The input terminals and setpoints of the slave drive are effective in free-running mode.
 - If a "0" signal is applied at input terminal X40:1, the slave drive synchronizes with the current position of the master drive plus the position offset stored in P224.

P224 Slave counter

Unit: [Inc]

Setting range: –99 999 999 ... 10 ... 99 999 999

The angular offset in relation to the master drive, which can be activated in mode 3, 4, 5 and 8, is referred to as the slave counter. In contrast to the offset, this offset angle can be set using the "Teach In" function. Depending on the mode, it functions as a limit value for free running or specifies a permanent angular offset for the slave drive in relation to the master drive (= new reference point).

*P225 / P226 /
P227 Offset 1 / 2 /
3*

Setting range: –32 767 ... 10 ... 32 767 inc (only effective in mode 6 or mode 7!)

Three separately adjustable angle differentials to which the slave drive sets itself for the duration of the "1" signal on X40:2 / X40:3 / X40:4.

P228 Feedforward filter DRS

Setting range: 0 ... 100 ms

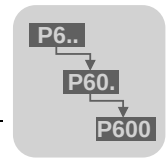
Setpoint filter for feedforward of synchronous operation control DRS11B. The master speed (determined on the DRS) must be filtered for optimum acceleration feedforward of the slave drive. Filtering requires the filter time constant. Value 0 indicates an unfiltered master speed.

P23x Synchronous operation with synchronous encoder

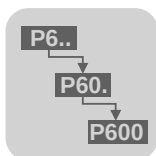
Synchronous operation with synchronous encoder only in parameter set 1 and with the DRS11B option (not in BG0).

For a detailed description, refer to the "MDX61B - Synchronous Operation Board DRS11B" manual.

Position measurement has to be via an external encoder (=synchronous encoder) in all applications in which power transmission between the motor shaft and the machine is by friction and thus slip is to be expected.



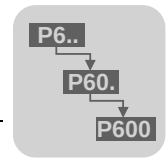
<i>P230 Synchronous encoder</i>	<u>OFF</u>: Synchronous operation control with the signals on X15: "Motor encoder". P231 and P232 have no effect. - EQUAL-RANKING: Forwarding of X42 signals: "Master encoder" at X43: "Incremental encoder output". Evaluation of P231 and P232. - CHAIN: Forwarding of X41 signals: "Input synchronous encoder" at X43: "Incremental encoder output". Evaluation of P231 and P232.
<i>P231 / P232 Factor slave encoder / Factor slave sync. encoder</i>	Setting range: <u>1</u> .. 1000 In most cases, there is a mechanical ratio between both encoders. This ratio must be set with the parameters.
<i>P233 Synchronous encoder resolution</i>	Setting range: 128 / 256 / 512 / <u>1024</u> / 2048 Setting for the resolution of the connected synchronous encoder.
<i>P234 Master encoder resolution</i>	Setting range: 128 / 256 / 512 / <u>1024</u> / 2048 Setting for the resolution of the connected master encoder.
<i>P24x Synchr. oper. w. catch up</i>	Synchr operation with catch up only in parameter set 1 and with the DRS11B option. For a detailed description, refer to the "MDX61B - Synchronous Operation Board DRS11B" manual. When the slave drive is switched to synchronous operation, the current angle offset in relation to the master is reduced to zero, depending on the operation mode selected. For this catch up procedure to be performed in a controlled manner, it is possible to set parameters for both the synchronization speed and the synchronization ramp.
<i>P240 Synchronization speed</i>	Unit: [rpm] Setting range: 0 ... <u>1500</u> ... 6000 rpm This parameter specifies the speed of the synchronization procedure.
<i>P241 Synchronization ramp</i>	Unit: [s] Setting range: 0 ... <u>2</u> ... 50 s Value for the accelerating ramp for synchronizing the slave with the master. Zero setting means maximum possible acceleration.
<i>P26x Process controller parameters</i>	
<i>P260 Operation mode</i>	Setting range: <u>Controller off</u> / Control / Step response - Controller off: The PID controller is deactivated. - Control: The PID controller is active and determine the required motor speed using the control deviation and its parameters. - Step response: A step can be specified via the setpoint (P271). The filtered and scaled actual value can be included for purposes of evaluation. - P260 and the IPOS variable H543 are identical
<i>P261 Cycle time</i>	Setting range: 1 / <u>5</u> / 10 ms This parameter sets the cycle time of the PID controller.
<i>P262 Interruption</i>	Setting range: <u>No response</u> / Move closer to setpoint This parameter specifies how the PID controller responds to an interruption (controller inhibit). - No response: The PID controller is not affected and continues to operate as usual. - Move closer to setpoint: After an interruption, the setpoint is set to the actual value. The ID controller then moves closer to the set value again via the setpoint ramp.



Parameters

Explanation of the parameters

<i>P263 Factor K_P</i>	Setting range: 0 ... <u>1</u> ... 32767 Proportional factor of the proportional share of the PID controller with 3 decimal places. The proportionality factor takes the sign (+/-) of the parameter "Direction of rotation" into account. P263 and the IPOS variable H541 are identical.
<i>P264 Integrative time T_N</i>	Setting range: <u>0</u> ... 65535 ms This parameter is used to set the integrative time (time constant) of the integrating part of the PID controller: • $1 \text{ ms} \leq T_N \leq 65535 \text{ ms}$ • $T_N = 0 \rightarrow$ no I-component
<i>P265 Derivative time T_V</i>	Setting range: <u>0</u> ... 30 ms This parameter is used to set the derivative time (time constant) of the differential part of the PID controller: • $1 \text{ ms} \leq T_V \leq 30 \text{ ms}$ • $T_V = 0 \rightarrow$ no D-component
<i>P266 Feedforward</i>	Setting range: -32767 ... <u>0</u> ... 32767 The feedforward value is added to the result of the PID controller. P266 and the IPOS variable H545 are identical.
<i>P27x Process controller input values</i>	
<i>P270 Setpoint source</i>	Setting range: <u>Parameter</u> / IPOS variable / Analog 1 / Analog 2 / Fieldbus This parameter is used to set the source from which the setpoint should be read.
<i>P271 Setpoint</i>	Setting range: -32767 ... <u>0</u> ... 32767 Unit: [0.2/ min] If P270 is set to "Parameter," the value of the parameter P271 is used as the setpoint. P271 and the IPOS variable H546 are identical.
<i>P272 IPOS setpoint address</i>	Setting range: <u>0</u> ... 1023 If P270 is set to "IPOS variable," the address of the variable to be used is stored in P271. P272 and the IPOS variable H547 are identical.
<i>P273 Time constant</i>	Setting range: <u>0</u> ... 0.01 ... 2000 s This parameter is used to set the time constant for the setpoint ramp generator via a ramp that can be set via parameters. • Time constant $T_{\text{setpoint}} = 0 \rightarrow$ ramp is deactivated
<i>P274 Scaling setpoint</i>	Setting range: -32,767 ... <u>1</u> ... 32,767 Factor for scaling the setpoint. P274 and the IPOS variable H548 are identical.
<i>P275 Actual value source</i>	Setting range: <u>Analog 1</u> / Analog 2 / IPOS variable / Fieldbus This parameter is used to set the source from which the actual value should be read.
<i>P276 IPOS actual value address</i>	Setting range: <u>0</u> ... 1023 If P275 is set to "IPOS variable," the address of the variable to be used is stored in P276. P276 and the IPOS variable H549 are identical.
<i>P277 Scaling actual value</i>	Setting range: -32767... <u>1</u>... 32,767 Scaling factor of the filtered actual value. P277 and the IPOS variable H550 are identical.



P278 Offset actual value	Setting range: –32767 ... 0 ... 32767 This parameter is used to set an integer, permanent offset of the actual value. P278 and the IPOS variable H552 are identical.
P279 Time constant actual value	Setting range: 0 ... 1 ... 500 ms This parameter is used to set the time constant of the actual value 1 filter. When the parameter is set to "0," the filter is deactivated.

P28x Process controller limits

The output value of the process controller is stored in the IPOS variable H524.

P280 Minimum offset + actual value	Setting range: –32767 ... 0 ... 32767 Minimum value for the offset. P280 and the IPOS variable H553 are identical.
P281 Maximum offset + actual value	Setting range: –32767 ... 10000 ... 32767 Maximum value for offset. P281 and the IPOS variable H554 are identical.
P282 PID controller minimum output	Setting range: –32767 ... –1000 ... 32767 Unit: [0.2/ min] Minimum output value of the PID controller. P282 and the IPOS variable H555 are identical.
P283 PID controller maximum output	Setting range: –32767 ... 10000 ... 32767 Unit: [0.2/ min] Maximum output value of the PID controller. P283 and the IPOS variable H556 are identical.
P284 Process controller minimum output	Setting range: –32767 ... 0 ... 32767 Unit: [0.2/ min] Minimum output value of the process controller. P284 and the IPOS variable H557 are identical.
P285 Process controller maximum output	Setting range: –32767 ... 7500 ... 32767 Unit: [0.2/ min] Maximum output value of the process controller. P285 and the IPOS variable H558 are identical.

P3xx 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 requiring a new setting.

P30x / P31x Limits 1 / 2

P300 / P310 Start/stop speed 1/2

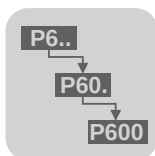


Setting range: 0 ... 150 rpm

At startup, $0.5 \times$ the rated slip of the connected motor is set.

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.

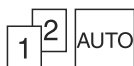


Parameters

Explanation of the parameters

P301 / P311

Minimum speed 1 / 2



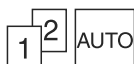
Setting range: 0 ... 15 ... 6100 rpm

The speed value which lower limit must not be exceeded even when zero is selected as the setpoint. The minimum speed also applies when $n_{\min} < n_{\text{start/stop}}$ 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.
- To enable the drive to move clear of the limit switches even at low speeds, $n_{\min}$ is not active for the hardware limit switch with which the drive has come into contact.

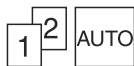
P302 / P312 Maximum speed 1 / 2



Setting range: 0 ... 1500 ... 6100 rpm

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

P303 / P313 Current limit 1 / 2



Setting range: 0 ... 150 % I_N (BG0: 200 % I_N)

The factory setting for the current limitation is set to 150 % I_N of the matching motor.

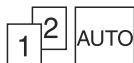
The internal current limitation refers to the apparent current. It is assigned to the external current limitation (P120 AI2 Operating mode = 0 ... 10 V I-limit). Consequently, the entry determines the 100 % value within which the external current limitation can take effect. The current limit is automatically reduced in the field weakening range above the frequency of $1.15 \times f_{\text{trans}}$. This provides protection against the motor deviating from the optimal operating point.

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

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

f_{act} is the current rotating field frequency.

P304 Torque limit



Setting range: 0 ... 150 % (BG0: 200 %)

The parameter limits the maximum torque of the motor. The entry acts on the setpoint of the motor torque ($k_T \times I_{N\_inverter}$). The value is multiplied by the external current limit and can be altered with analog input 2. This function is only effective in CFC and SERVO operating modes. Refer to the "Project Planning" chapter for detailed information about calculating the setpoint torque (Motor selection for asynchronous servomotors CFC and synchronous servomotors SERVO).



If the P303 Current limit 1 / P313 Current limit 2 is set to a value smaller than the torque, the current limit will be in effect prior to reaching the torque limit.

P32x / P33x Motor compensation 1 / 2 (asynchronous)

P320 / P330 Automatic adjustment 1/2



Setting range: ON / OFF

Only effective in the VFC and U/f operating modes. The function only makes sense with single motor operation. The inverter sets P322 IxR compensation 1 / P332 IxR compensation 2 automatically with each enable and saves 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 Automatic adjustment 1 / P330 Automatic adjustment 2 = OFF
- P700 Operating mode 1 / P701 Operating mode 2 = VFC & GROUP or VFC & FLY-ING START

- P323 Premagnetizing time 1 / P333 Premagnetizing time 2 set to $\leq$ ca. 100 ms (depending on motor),
- VFC n-CONTROL mode selected and P730 Brake function 1 / P733 Brake function 2 = OFF.

In such cases, the set $I \times R$ value is used for calculating the winding resistance.

- ON: Automatic calibration.
- OFF: No automatic calibration.

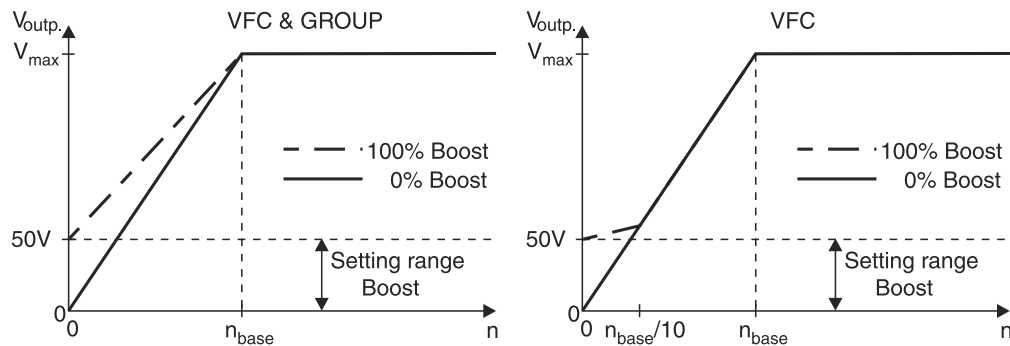
P321 / P331 Boost
1 / 2

1 2

Setting range: 0 ... 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 %**.



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Figure 70: Working principle of boost (drawing not to scale)

P322 / P332 $I \times R$
compensation 1/2

1 2 AUTO

Setting range: 0 ... 100 %

The $I \times R$ value of the matching motor is set as the factory setting.

In VFC operating mode, this parameter acts on the parameters of the calculated motor model that establish the torque. With P320 Automatic adjustment 1 / P330 Automatic adjustment 2 = ON an automatic setting takes place. Manual alterations to this parameter are reserved for optimization by specialists.

P323 / P333 Pre-
magnetization time
1 / 2

1 2 AUTO

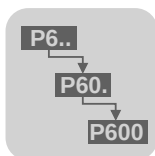
Setting range: 0 ... 2 s

The pre-magnetization value of the matching motor is set as the factory setting.

Pre-magnetization serves to establish a high motor torque and starts when the inverter is enabled.

Pre-magnetization is in effect in VFC with encoder feedback operating mode with:

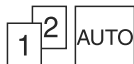
- P730 Brake function 1 / P733 Brake function 2 Active
- P710 Standstill current 1 / P711 Standstill current 2 Switched off



Parameters

Explanation of the parameters

P324 / P334 Slip compensation 1 / 2



Setting range: 0 ... 500 rpm

The value of the matching motor is set as the factory setting.

Only effective in VFC, VFC-n control and U/f operating modes. 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 $\pm 20\%$ of the rated slip is permitted if a value other than the rated slip is entered to compensate for fluctuations between various motors.

P34x Motor protection

P340 / P342 Motor protection 1 / 2



Setting range: OFF / ON ASYNCHRONOUS / ON SERVO

Depending on the motor connected (synchronous or asynchronous motor) this function can have the following effects.

OFF: Function not active

ON ASYNCHRONOUS:

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 integrated 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 startup (MOVITOOLS® / DBG60B) and when the operating conditions specified for the motor are observed.



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 TF positive temperature coefficient thermistor or TH bimetallic switch.

The following signal and display functions are available in conjunction with motor protection:

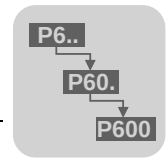
Parameters	Signal and display function
P006 Motor utilization 1 / P007 Motor utilization 2	Display of the motor utilization for parameter set 1 / 2.
P832 Response MOTOR OVER-LOAD	Error response of inverter when reaching P006 Motor utilization 1 / P007 Motor utilization 2 of 110 %. Factory setting: EMERG.STOP/FAULT

Set the following parameters:

Parameters	Setting / Description
P341 Type of cooling	Self-ventilation or forced cooling
Binary output programmable to: /Motor utilization 1 /Motor utilization 2	Prewarning in case Motor utilization 1 (P006) / Motor utilization 2 (P007) exceeds a value of 100 %. In this case, the programmed output is set to "0" = 0 V.

Important: Switching off 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 may **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. Likewise, the motor protection function must not be used with group drives because it is not possible to protect each individual motor reliably.



ON SERVO:

MOVIDRIVE® calculates and displays the motor utilization based on the current. The goal is to determine if the drive is going to fail based on an overload with the error "TF sensor" (F31) after only a few cycles or during startup. This setting is available for parameter set 1 only.

Prerequisites: Motor utilization is always determined based on the rated motor current. Enter the duration of the machine cycle to receive an exact statement concerning the utilization for the motor powering the machine cycle.

The following signal and display functions are available in conjunction with motor protection:

Parameters	Signal and display function
P006 Motor utilization 1	Display of the motor utilization for parameter set 1. Valid after ca. 10 to 20 cycles or after ca. .2 s and can be evaluated using IPOS ^{plus} ® or from a PLC.
P007 Motor utilization 2	In setting P340 = ON SERVO without function
P832 Response MOTOR OVER-LOAD	In setting P340 = ON SERVO without function

Set the following parameter:

Parameters	Description
P344 Motor protection interval	Corresponds to the machine cycle of the application. Range: 100 ms... 20000 ms



Activating the function does not trigger monitoring or protection of the connected motor. Protection must be guaranteed via TF/TH/KTY.

Setting a binary output to "Motor utilization_1" or "Motor utilization_2" also has no effect when P340 is set to ON SERVO.

P341 / P343 Type of cooling 1 / 2



Setting range: FAN COOLED / FORCED COOLING

For calculation of the thermal motor load as described in P340 Motor protection 1 / P342 Motor protection 2 you will need to know the type of cooling for the motor.

P344 Interval for motor protection

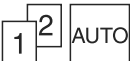


Setting range: 0.1 ... 4 ... 20 s

P344 is not relevant for asynchronous motors. For synchronous motors, this parameter corresponds to the cycle time of the movement and is used for the function P006 Motor utilization 1 / P007 Motor utilization 2. The setting range is 100 ms ... 20 000 ms.

You should always set the time for roundtrip travel (back and forth).

P345 / 346 I_N / U_L monitoring 1 / 2



Setting range: 0.1 ... 500 A

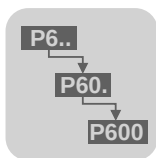
The function cannot be deactivated. The factory setting is dependent on the rated power of the MOVIDRIVE® B unit and is set to the rated current of the SEW motor with the same power (when option DER11B is installed: factory setting = 0).

At 150 % rated motor current, the inverter switches off after 5 minutes.

At 500 % rated motor current, the inverter switches off after 20 seconds.

P35x Motor direction of rotation

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



Parameters

Explanation of the parameters

P350 / P351
Change direction
of rotation 1/2



Setting range: ON / OFF

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. The result may be undesirable travel movements of the axis.

- OFF: The SEW definition applies.

P36x Startup

P360 Startup

Startup (only available in DBG60B).

Setting range: YES / NO

- **YES:** Begins the startup function with the DBG60B 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.

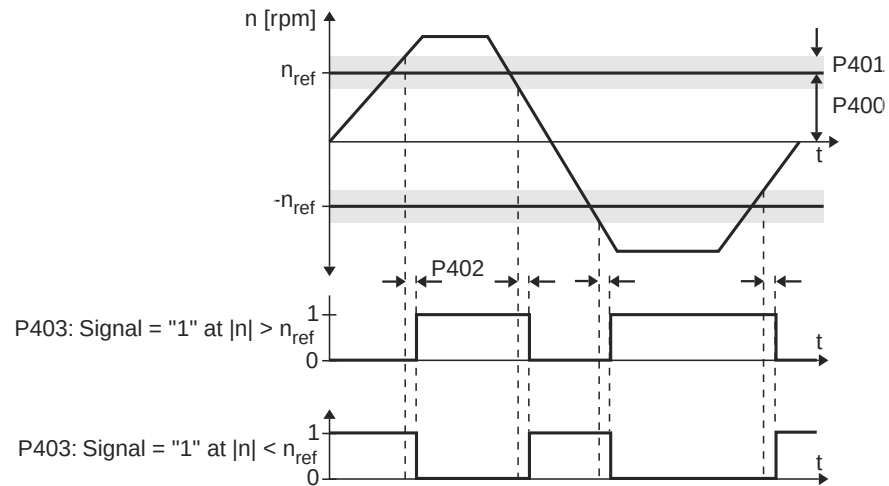
P4xx Reference messages

The following reference values are used for recording and signaling certain operating states. All messages from parameter group P4xx can be issued via binary outputs (P62x Binary outputs basic unit / P63x Binary outputs option).

Important: The messages are only valid if the inverter has signaled “Ready” after switch-on and there is no error display.

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

P40x Speed
reference
message



01619BEN

Figure 71: Speed reference message

Setting range: 0 ... 1500 ... 6000 rpm

P400 Speed
reference value

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

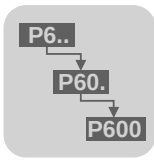
P401 Hysteresis

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

P402 Delay time

P403 Signal = “1”
when:

$n \leq n_{ref} / n > n_{ref}$

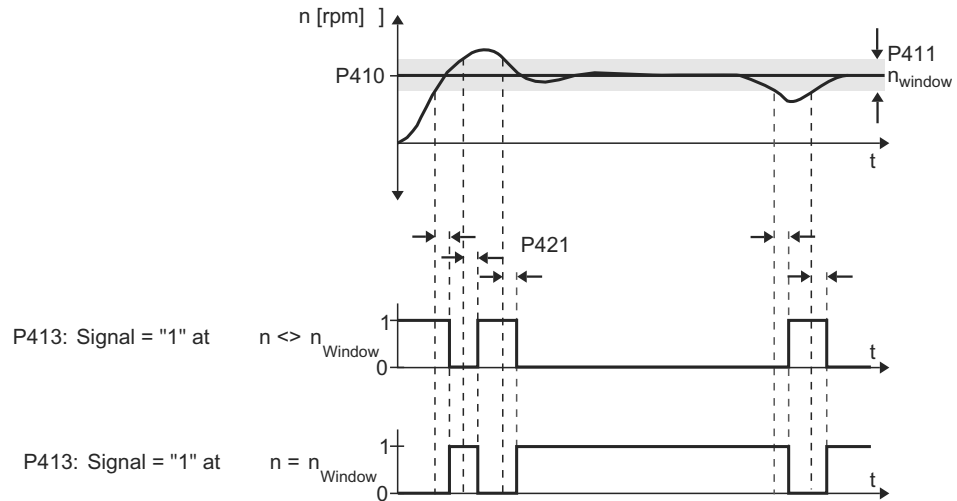


Parameters

Explanation of the parameters

P41x Speed window message

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



55733AEN

Figure 72: Speed window signal

P410 Window center

Setting range: 0 ... 1500 ... 6000 rpm

P411 Range width

Setting range: 0 ... 6000 rpm

P412 Delay time

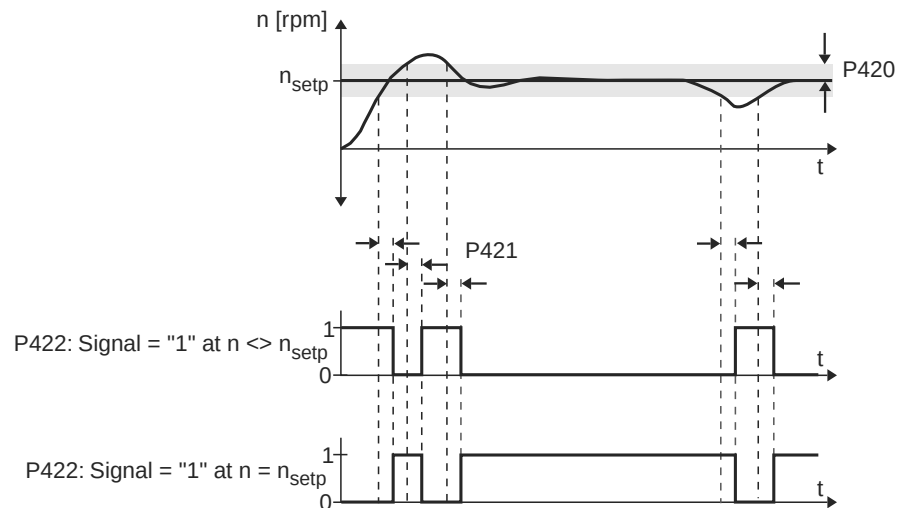
Setting range: 0 ... 1 ... 9 s

P413 Signal = "1" when:

INSIDE / OUTSIDE

P42x Speed set-point/actual value comparison

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



01625BEN

Figure 73: Speed setp./act. val. comp.

P420 Hysteresis

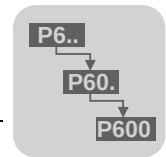
Setting range: 0 ... 100 ... 300 rpm

P421 Delay time

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

P422 Signal = "1" when:

n = n_setpt / n <> n_setpt



**P43x Current
reference
message**

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

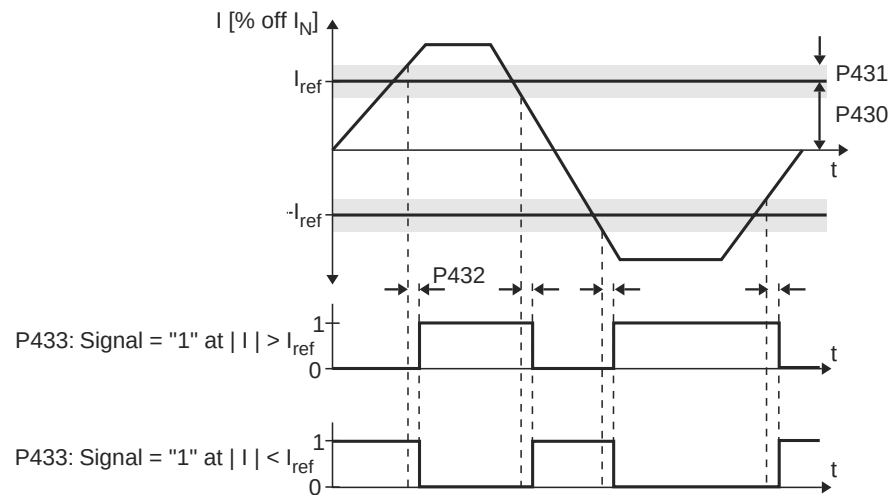


Figure 74: Current reference signal

01623BEN

**P430 Current
reference value**

Setting range: 0 ... 100 ... 150 % I_N (BG0: 200 % I_N)

P431 Hysteresis

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

P432 Delay time

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

**P433 Signal = "1"
when:**

$I < I_{ref} / I > I_{ref}$

P44x I_{max} signal

Signal if the inverter has reached the current limitation.

P440 Hysteresis

Setting range: 0 ... 5 ... 50 % I_N

P441 Delay time

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

**P442 Signal = "1"
when:**

$I < I_{max} / I = I_{max}$

P5xx Monitoring functions

The following monitoring functions have been implemented 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. The response to the triggering of the monitoring functions can be set with P83x Error responses .

P50x Speed monitoring

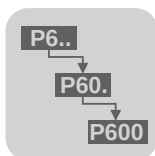
P500 / P502

Setting range: OFF / MOTOR / REGENERATIVE / MOT&REGEN.MODE

**Speed monitoring
1 / 2**

1 2

The speed required by the setpoint can only be achieved if there is sufficient torque available to meet the load request. If P303 Current limit 1 / P313 Current limit 2 and the external current limit has been reached, then 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 Delay time 1 / P503 Delay time 2 .



Parameters

Explanation of the parameters

Activate the speed monitoring for hoists and set the delay time to a rather small value. Speed monitoring is not that important for safety since an incorrect movement of the hoist does not necessarily mean operation in the current limitation.

P501 / P503 Delay time 1 / 2



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

P504 Encoder monitoring motor

Setting range: YES / NO

- NO: An open circuit between frequency inverter and motor encoder is not directly detected. In case of a defective connection, fault F08 Speed monitoring will be issued in enabled state unless it was deactivated.
- YES: An open circuit between frequency inverter and motor encoder will be directly detected when using sin/cos encoders and TTL encoders. The error message F14 Encoder error will be issued in case of an error. This error will also be generated in inhibited state.



Encoder monitoring is not a safety function!

P505 Encoder monitoring distance

Setting range: YES / NO

- NO: An open circuit between frequency inverter and synchronous encoder is not directly detected. In case of a defective connection, error F08 Speed monitoring will be issued in enabled state unless it was deactivated.
- YES: An open circuit between frequency inverter and synchronous encoder will be directly detected when using sin/cos encoders and TTL encoders. The error message F14 Encoder error will be issued in case of an error. This error will also be generated in inhibited state.

P51x Synchronous operation monitoring

Synchr. operation monitoring only parameter set 1 and when the DRS11B option is used.

For a detailed description, refer to the "MDX61B - Synchronous Operation Board DRS11B" manual.

P510 Positional tolerance slave

Setting range: 10 ... 25... 32,768 inc

Various conditions must be met to allow for precise positioning of the slave drive. The brake of the slave drive is applied if all of the following conditions are met:

- Brake function of the slave drive is activated
- Master drive at a standstill
- Master drive is de-energized (= inverter status INHIBITED)
- Slave drive is at a standstill and is located within the positioning window

P511 Prewarning lag error

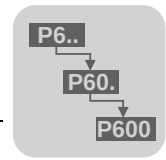
Setting range: 50... 99,999,999 inc

A prewarning is issued if the angular offset exceeds the value set here. The prewarning is issued regardless of the operating mode of the slave drive.

P512 Lag error limit

Setting range: 100 ... 4000... 99,999,999 inc

Error message F42 "Lag error" is issued if the angular offset exceeds the value set here. This is regardless of whether the slave drive is operating in free-running or synchronous operation mode.



- P513 Delay time lag error message** Setting range: 0 ... 1 ... 99 s
For an adjustable hold time, the messages "Prewarn. lag error" and "Lag error limit" as error messages or as signal at a binary output can be suppressed during transition from free-running to synchronous operation.
- P514 Counter LED display** Setting range: 10 ... 100... 32,768 inc
LED V1 (green) lights up if the angle offset exceeds the value set here. This permits an immediate visual display of the maximum differential between the master and slave drives during operation. This is helpful during startup.
- P515 Delay time position message** Setting range: 5 ... 10 ... 2000 ms
The DRS SLAVE IN POS binary output message is not issued unless the master and slave drives are located within the time set in P510 Positioning tolerance slave .
- P516 X41 Encoder monitoring** Setting range: NO / YES
- NO: Wire breakage between the frequency inverter and a TTL encoder connected at X41 is not recognized directly. In case of a defective connection, error F42 "Lag error" will be issued in enabled state unless it has been deactivated.
 - YES: Wire breakage between the frequency inverter and a TTL encoder connected at X41 is recognized directly. The error message F48 "Hardware DRS" will be issued in case of an error. This error will also be generated in inhibited state.



Encoder monitoring is not a safety function!

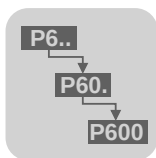
- P517 X41 Pulse count monitoring** Setting range: NO / YES
The number of pulses of the encoder connected at X41 is checked using the resolution set in P233 through evaluation of the C track. If increments are lost, the error message F48 "Hardware DRS" is generated.
- NO: Pulse counter monitoring is not active.
 - ON: Pulse counter monitoring is active.

- P518 X42 Encoder monitoring** Setting range: NO / YES
- NO: Wire breakage between the frequency inverter and a TTL encoder connected at X42 is not recognized directly. In case of a defective connection, error F42 "Lag error" will be issued in enabled state unless it has been deactivated.
 - YES: Wire breakage between the frequency inverter and a TTL encoder connected at X42 is recognized directly. The error message F48 "Hardware DRS" will be issued in case of an error. This error will also be generated in inhibited state.



Encoder monitoring is not a safety function!

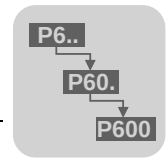
- P519 X42 Pulse count monitoring** Setting range: NO / YES
The number of pulses of the encoder connected at X42 is checked using the resolution set in P234 through evaluation of the C track. If increments are lost, the error message F48 "Hardware DRS" is generated.
- NO: Pulse counter monitoring is not active.
 - ON: Pulse counter monitoring is active.



Parameters

Explanation of the parameters

<i>P52x Power OFF monitoring</i>	Setting the parameter P520 Power OFF response time / P521 Power OFF response The setting of P520/P521 is significant when a binary input is programmed to "POWER ON" and MOVIDRIVE® regenerative mode is used (see MOVIDRIVE® regenerative power unit MDR manual).
<i>P520 Power OFF response time</i>	Setting range: 0 ... 5 s
<i>P521 Power OFF response</i>	<u>CONTROL.INHIBIT</u> / EMERGENCY STOP
<i>P522 Phase failure monitoring</i>	OFF / <u>ON</u> The power supply phases of the MOVIDRIVE® unit are monitored for phase failure. If a phase failure is detected in two phases, then the DC link will be de-energized, which corresponds to a power supply (mains) disconnection. Since the power supply phases cannot be monitored directly, monitoring has to be done indirectly via ripple of the DC link, which increases drastically in case of a phase failure. The DC link voltage is monitored at a time interval $\Delta t = 1$ ms for dropping below a minimum voltage level that depends on the rated supply voltage of the unit. The result is the following nominal guide value for detection of a phase failure: • 50 Hz power supply: ca. $t_{\max} = 3.0$ s • 60 Hz power supply: ca. $t_{\max} = 2.5$ s Once a phase failure has been detected, the output stage is inhibited and the brake is applied. The error message <i>F06 Phase failure</i> is displayed. The error response is as follows: Immediate switch-off with inhibit. The error can only be remedied by executing a unit reset.
<i>P53x Thermal protection motor</i>	
<i>P530 Sensor type 1</i>	Setting values: <u>No sensor</u> / TF-TH / KTY (KTY only for synchronous motors) Selection of the sensor used for motor protection.
<i>P531 Sensor type 2</i>	Setting values: <u>No sensor</u> / TF-TH / KTY (KTY only for synchronous motors) Selection of the sensor used for motor protection.



P6xx Terminal assignment

P60x Binary inputs basic unit Binary input DIØØ with fixed assignment "/CONTROL. INHIBIT."

P600 ... P606
Binary inputs DIØ1
... DIØ7

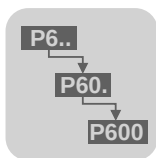


P61x Binary inputs option

P610 ... P617 The binary inputs can be programmed to the following functions:
Binary input DI1Ø
... DI17



Function	Effect at		Effective in inverter status		Factory setting	See also
	"0" signal	"1" signal	Inhibited	Enabled		
NO FUNCTION	–	–	–	–	DIØ6 DIØ7	
ENABLE / STOP	Rapid stop on t13/t23	Enable	No	Yes	DIØ3	P13x / P14x
CCW/STOP	Stop on t11/t21 or t12/t22	Enable CW running	No	Yes	DIØ1	
CCW/STOP	Stop on t11/t21 or t12/t22	Enable CCW running	No	Yes	DIØ2	
n11/n21	External setpoints only	n11/n21	No	Yes	DIØ4	P16x / P17x
n12/n22	External setpoints only	n12/n22	No	Yes	DIØ5	
FIXED SETP. SELECT	Fixed setpoints of active parameter set selected	Fixed setpoints of inactive parameter set selected	Yes	Yes		
PARAM. SELECT	Parameter set 1	Parameter set 2	Yes	No		
RAMP SELECT	1. Ramp (t11/t21) active	2. Ramp (t12/t22) active	Yes	Yes		P13x / P14x
MOTOR POT UP	–	Increase setpoint	No	Yes		P15x
MOTOR POT DOWN	–	Reduce setpoint	No	Yes		
/EXT. ERROR	External fault	–	No	Yes		
FAULT RESET	Reset on positive edge ("0" to "1")		Yes	Yes		
/HOLD CONTROL	Hold control active	–	No	Yes		P210
/LIM. SWITCH CW	CW limit switch reached	Not reached	No	Yes		
/LIM. SWITCH CCW	CCW limit switch reached	Not reached	No	Yes		
IPOS INPUT	Function depends on IPOS program					
REFERENCE CAM	Not actuated	Actuated	No	Yes		IPOS ^{plus} manual
REF.TRAVEL START	–	Start of reference travel for IPOS	No	Yes		
SLAVE FREE RUNN.	Master/slave operation	Slave free running	Yes	Yes		
SETPOINT HOLD	Do not take over	Take over setpoint	No	Yes		
MAINS ON	SeeP521	Ext. signal MAINS ON	Yes	Yes		P52x
SET DRS ZERO PT.	"1" to "0": Sets new zero point	Delete angular offset	Yes	Yes		Synchrono- ous Operation manual
DRS SLAVE START	No enable	Enable	No	Yes		
DRS TEACH-IN	–	Adopt angular offset in P224	Yes	Yes		
DRS MAST.STOPPED	Master drive turns	Master drive at a standstill	Yes	Yes		



Parameters

Explanation of the parameters

P62x Binary outputs basic unit

Use binary output DB00 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.

Important: The binary signals are only valid if the inverter has signaled "Ready" after switch-on and there is no error display. Binary signals have "0" status while MOVIDRIVE® is being initialized. Several terminals can be programmed with the same function.

P620 ... P624 Binary output DO01 ... DO05



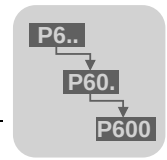
P63x Binary outputs option

P630 ... P637 Binary output DO10 ... DO17



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

Function	Binary output has		Factory setting	See also
	"0" signal	"1" signal		
NO FUNCTION	Always "0" signal	–		
/FAULT	Collective fault signal	–	DO02	
READY	Not ready	Ready	DO01	
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 is turning	Motor at standstill		
PARAMETER SET	Parameter set 1 active	Parameter set 2 active		
SPEED REFERENCE P403 = $n < n_{ref}$ ($n > n_{ref}$)	$n > n_{ref}$ ($n < n_{ref}$)	$n < n_{ref}$ ($n > n_{ref}$)		P40x
SPEED WINDOW P413 = WITHIN (OUTSIDE)	Speed is outside (within) speed window	Speed is within (outside) speed window		P41x
SP/ACT.VAL.COMP. P422 = $n = n_{setpt}$ ($n < n_{setpt}$)	$n < n_{setpt}$ ($n = n_{setpt}$)	$n = n_{setpt}$ ($n < n_{setpt}$)		P42x
CURR. REFERENCE P433 = $I < I_{ref}$ ($I > I_{ref}$)	$I > I_{ref}$ ($I < I_{ref}$)	$I < I_{ref}$ ($I > I_{ref}$)		P43x
I _{max} -SIGNAL P442 = $I = I_{max}$ ($I < I_{max}$)	$I < I_{max}$ ($I = I_{max}$)	$I = I_{max}$ ($I < I_{max}$)		P44x
/MOTOR UTILIZATION 1	100 % prewarning of motor protection in parameter set 1	–		P34x
/MOTOR UTILIZATION 2	100 % prewarning of motor protection in parameter set 2	–		
/DRS PREWARNING	Value for prewarning lag error (P511) exceeded	–		Synchronous Operation manual
/DRS LAG ERROR	Lag error limit (P512) exceeded	–		
DRS SLAVE IN POS	Position not reached	Position reached		



Function	Binary output has		Factory setting	See also
	"0" signal	"1" signal		
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		DOØ3 DOØ4 DOØ5	
/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.



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

Several terminals can be programmed with the same function.

P64x Analog outputs optional

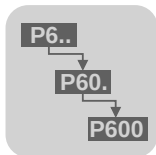
P640 / P643 Analog output AO1 / AO2

Depending on P642 Operating mode AO1 / P645 Operating mode AO2 the signal range is –10 ... 0 ... 10 V (AOV1 / AOV2) or 0 (4) ... 20 mA (AOC1 / AOC2).

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



Function	Scaling (at P641/P644 = 1)		Explanation	Factory setting
	Reference value	Output value		
NO FUNCTION	Always 0 V or 0 mA		–	
RAMP INPUT	+/- 3000 rpm	+/-10 V or 20 mA	Setpoint speed at input of internal ramp generator	
SPEED SETPOINT	+/- 3000 rpm	+/-10 V or 20 mA	Valid setpoint speed (output ramp generator or correcting variable of master controller)	
ACTUAL SPEED	+/- 3000 rpm	+/-10 V or 20 mA	Actual speed	AO1
ACTUAL FREQUENCY	+/- 100 Hz	+/-10 V or 20 mA	Rotating field frequency	
OUTP.CURRENT	150 % I _N (BG0: 200 % I _N)	10 V or 20 mA	Apparent current	AO2
ACTIVE CURRENT	+/-150 % I _N (BG0: +/-200 % I _N)	+/-10 V or 20 mA	Active current, positive when torque is in positive sense of rotation; negative when torque is in negative sense of rotation.	
RELATED TORQUE	+/-150 % I _N (BG0: +/-200 % I _N)	+/-10 V or 20 mA	Active current that forms the torque; the value "0" is always output in VFC operating modes.	
UNIT UTILIZATION	150 % (BG0: 200 %)	10 V or 20 mA	Momentary unit utilization	
IPOS OUTPUT	+/-10 000 digits	+/-10 V or 20 mA	Internal IPOS values (see IPOS ^{plus} ® manual)	
IPOS OUTPUT 2	+/-10 000 digits	+/-10 V or 20 mA	Internal IPOS values (see IPOS ^{plus} ® manual)	



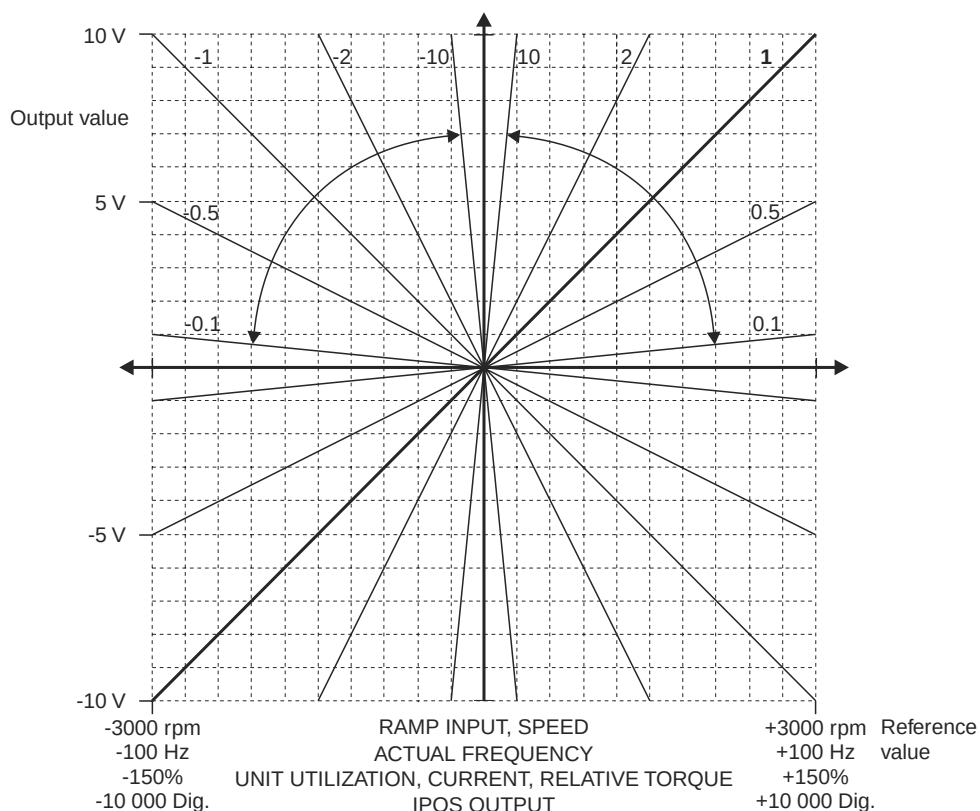
Parameters

Explanation of the parameters

P641 / P644
Scaling AO1 / AO2

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

The slope of the characteristic for the analog outputs is defined. The value for unit utilization, current and relative torque is 200 % for each in BG0.



01305BEN

Figure 75: Slope of the characteristic curve for the analog outputs

P642 / P645
Operating mode
AO1 / AO2

Here you can set the operating mode of the analog output. The following operating modes are available:

- OFF: The value zero is always output.
- -10 ... 0 ... 10 V: Output of the reference value with the correct signs as voltage values on AOV1/AOV2; the current outputs AOC1/AOC2 are not valid.
- 0 ... 20 mA: Output of the value of the reference values as current values 0 ... 20 mA on AOC1 / AOC2; voltage outputs AOV1 / AOV2 are invalid. P641 Scaling AO1 / P644 Scaling AO2 will be evaluated as absolute number.
- 4 ... 20 mA: Output of the value of the reference values as current values 4 ... 20 mA on AOC1 / AOC2; voltage outputs AOV1 / AOV2 are invalid. The slope of the characteristics is flatter than in 0 ... 20 mA. The characteristics has an offset of 4 mA and the absolute of P641 Scaling AO1 / P644 Scaling AO2 refers to the value range of 16 mA. For BG0, the value for unit utilization, current and relative torque is 200 % for each.

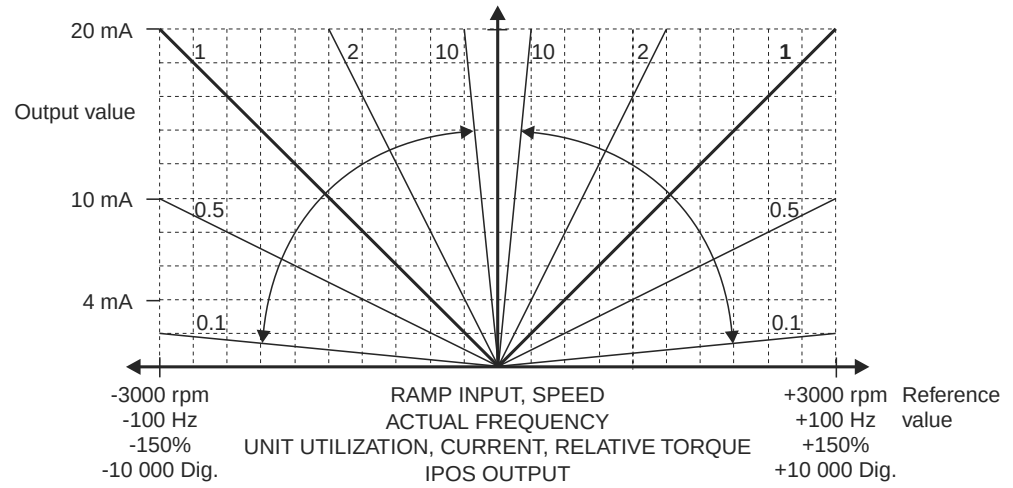


Figure 76: Characteristic curve of 0... 20 mA

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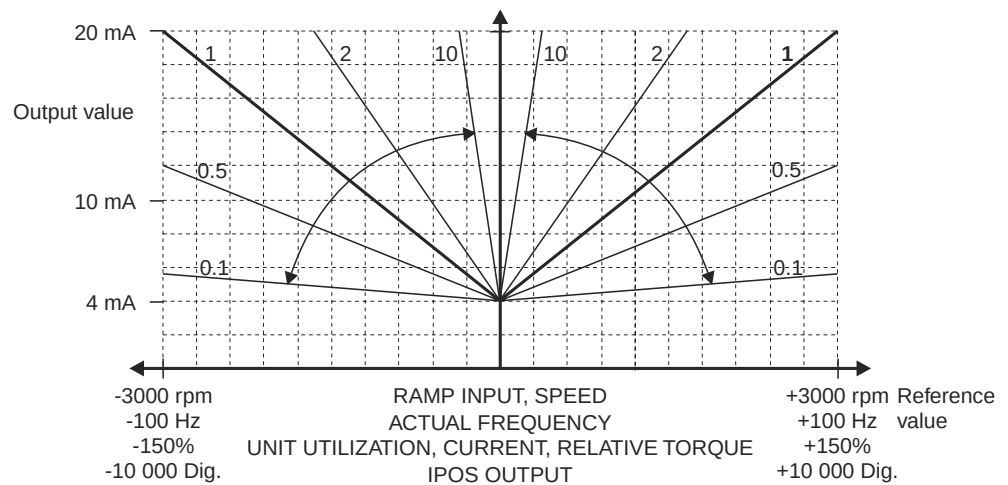
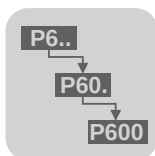


Figure 77: Characteristic curve of 4... 20 mA

01307BEN



Parameters

Explanation of the parameters

P7xx Control functions

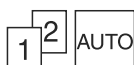
All settings with regard to the fundamental control properties of the inverter are defined within parameter group 7xx. These are all functions which the inverter performs automatically upon activation and which influence its behavior in certain operating modes.



When using incremental encoders (resolver, TTL, sin/cos, Hiperface® single-turn), changing the parameter set invalidates the position H510 and H511. If a valid position is to be maintained after the parameter set has been changed, an absolute encoder (SSI, Hiperface® multi-turn) must be used.

P70x Operating modes

P700/P701 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 (see following table).

Parameter set 1/2 P700 Operating mode 1 P701 Operating mode 2	Unit type and option	Motor
VFC 1 / 2 (factory setting) VFC 1/2 & Group VFC 1 / 2 & Hoist VFC 1 / 2 & DC BRAK. VFC 1 / 2 & Flying start V/f characteristics U/f & DC BRAKING	MDX, no option required	DT/DV without incremental encoder
VFC-n-control VFC-n-control & Group VFC-n-control & Hoist	MDX + DEH11B	DT/DV with incremental encoder or HIPERFACE® encoder
VFC n-control & Synch	MDX + DRS11B + DEH11B	
VFC n-control & IPOS	MDX + DEH11B	
CFC CFC & M-control CFC&IPOS	MDX + DEH11B	DT/DV/D with incremental encoder or HIPERFACE® encoder or CT/CV (incremental encoder installed as standard)
CFC & Sync	MDX + DRS11B + DEH11B	
SERVO SERVO & M-control SERVO&IPOS	MDX with option DER11B or DEH11B	DS/CM/CMD with HIPERFACE® encoder or resolver
SERVO & Sync	MDX + DRS11B + DEH11B/DER11B	

You will find detailed information on the individual operating modes in the Operating modes chapter.

P71 x Standstill current

P710 / P711

Standstill current 1 / 2



Setting range: 0 ... 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:

- When the ambient temperature of the motor is low, it is possible to prevent the risk of condensation 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 pre-magnetizing time. **Recommendation:** Set to 45 ... 50 % for hoists.

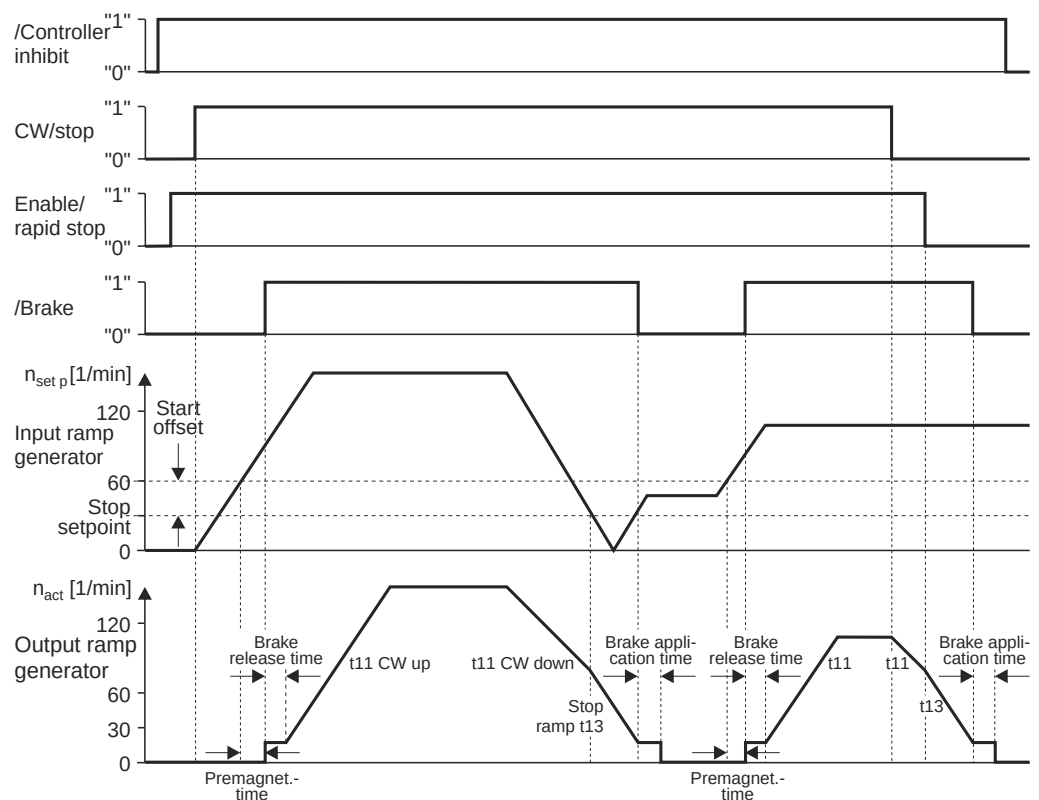
The standstill current function is deactivated by P710/P711 = 0. The setting is made in % of the rated motor current. The standstill current is definitely monitored by P303 Current limit 1 / P313 Current limit 2.

In CFC mode, the amount of magnetization current injected is always at least that required on the basis of the motor model. If P710 Standstill current 1 / P711 Standstill current 2 is set to a higher value, this higher value applies. This function does not have any effect in SERVO operating mode. The rated magnetizing current will always be set for operating modes VFC & hoist, VFC n-control & hoist and CFC if P710 is active. A rapid start will only take place in case the set standstill current is greater than or equal to the rated magnetizing current.

During the standstill current phase, the motor resistance is calibrated in the intervals of the set premagnetization time if the standstill current was constant and greater than the rated magnetizing current of the motor during the measurement interval. If a new enable takes place before expiration of the measurement interval, there will be no calculation of a new resistance value. The existing resistance value will still be used.

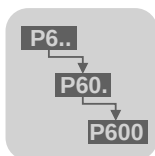
P72x Setpoint stop function

The setpoint stop function makes possible an enable function generated automatically by the inverter depending on the main setpoint. It results in an enable process with all necessary functions, such as premagnetization, brake control, etc. It always requires an additional enable via terminals.



01638BEN

Figure 78: Setpoint stop function



Parameters

Explanation of the parameters

P720 / P723 Set-point stop function 1/2

Setting range: ON / OFF



P721 / P724 Stop setpoint 1 / 2

Setting range: 0 ... 30 ... 500 rpm



P722 / P725 Start offset 1/2

Setting range: 0 ... 30 ... 500 rpm

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

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



P73x Brake function

MOVIDRIVE® inverters are capable of controlling a brake installed on the motor. The brake function acts on the binary output DB00 which has the fixed assignment of the "/BRAKE" function (24 V = brake released). In drives with encoder feedback (speed control), it is possible to select between electrical holding of the load and mechanical application of the brake in halt condition.



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

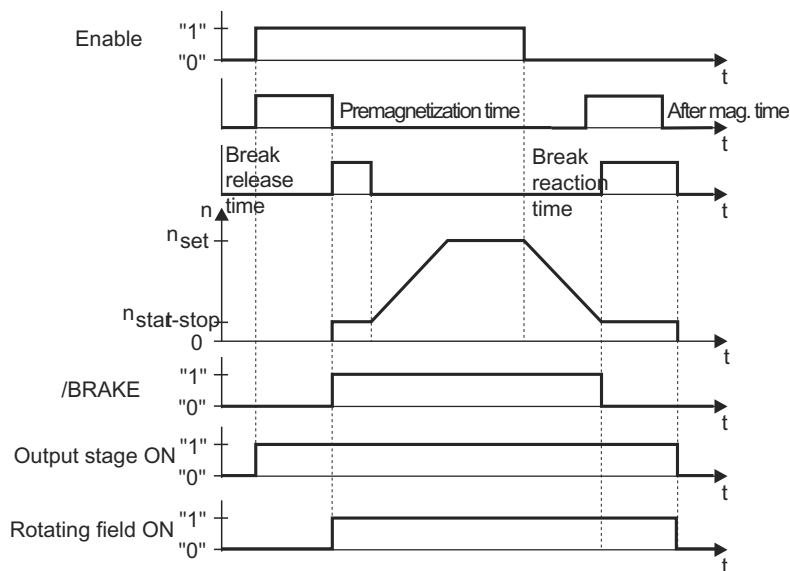


Figure 79: Inverter response when the brake function is activated

55734AEN

P730 / P733 Brake function 1/2

Setting range: ON / OFF

This function determines whether the brake is to be activated when the enable is withdrawn (enable = "0"). The brake is always active in controlled hoist operation.



P731/P734 Brake
release time 1/2



Setting range: 0 ... 2 s

The brake release time of the matching motor is set as the factory setting.

This parameter determines how long the motor will remain at a standstill after expiration of the premagnetizing time and how much time the brake has to release.

P732/P735 Brake
application time
1/2



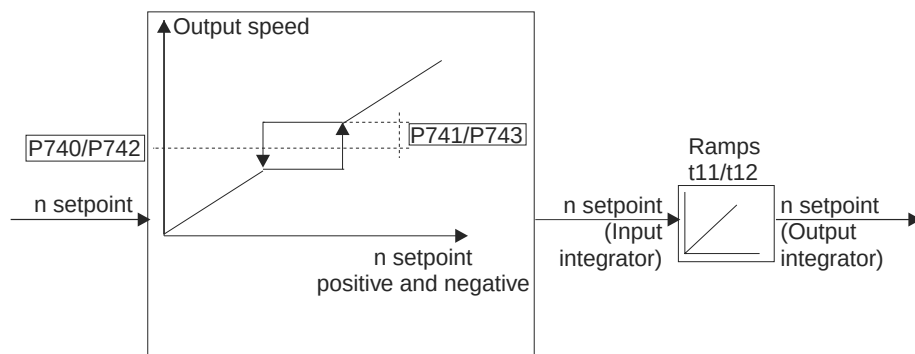
Setting range: 0 ... 2 s

The brake application time of the matching motor is set as the factory setting.

Serves to set the time required for application of the mechanical brake. This parameter prevents a sagging of the drive (particularly in hoists).

P74x Speed skip

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.



01310BEN

Figure 80: Speed skip

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 resonance.

P740 / P742 Skip
window center 1/2

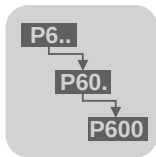


Setting range: 0 ... 1500 ... 6000 rpm

P741 / P743 Skip
width 1/2



Setting range: 0 ... 300 rpm

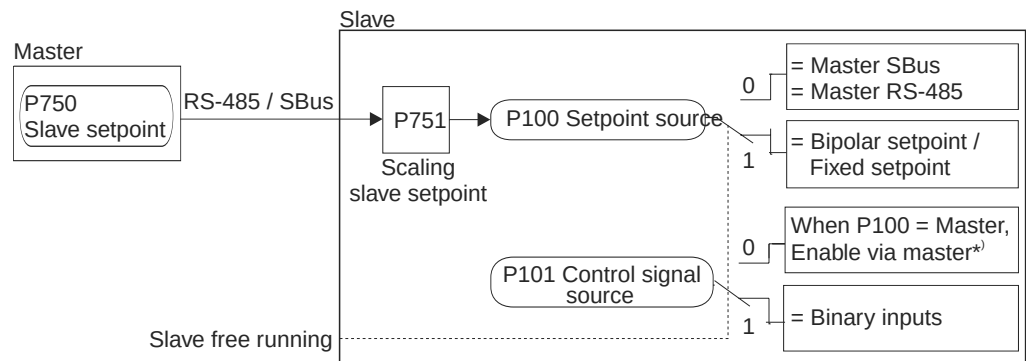


Parameters

Explanation of the parameters

P75x Master-Slave function

Master-slave function offers the opportunity to implement functions such as synchronous speed running, load share and torque control (slave). The RS485 interface (ST11 / ST12) or the system bus interface (SC11 / SC12) can be used as the communication link. To do so, make the following settings for the slave: P100 Setpoint source = Master-SBus or P100 Setpoint source = Master-RS485. The programmed terminal function "Slave free running" P60x Binary inputs basic unit / P61x Binary inputs option gives operators the option to separate the slave from the reference input variable of the master and switch to a local control mode.



01311BEN

Figure 81: Master-Slave function

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



P811 RS485 group address or P882 SBus group address must be set to the same value for master and slave. For Master/slave operation via the RS485 interface set P811 RS485 group address greater than 100. For operation via system bus (e.g. master/slave operation), the bus terminating resistors at the start and end of the system bus must be activated (S12 = ON).

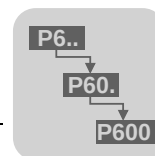
Connection check

- System bus (SBus): In case of a communication link via SBus, P883 SBus timeout delay is effective. If P883 SBus timeout delay is set to "0," there is no monitoring of data transmission via the SBus.
- RS485 interface: A connection check is always in place with a communication link via the RS485 interface; P812 RS485 timeout delay has no function. The slave inverter must receive a valid RS485 telegram within the fixed time interval of $t = 500$ ms. If the time is exceeded, the slave drives are stopped at the emergency stop ramp and error message F43 "RS485 timeout" is signaled.
- In case of communication via SBus 2, parameter P893 Timeout delay SBus 2 $\geq$ should be set to 10 ms (recommendation: 100 ms).



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

The connection check is effective at both RS485 interfaces. If you have connected a PC using TERMINAL and the UWS21A option, every telegram from the PC will reset the error.



Overview of functions, master/slave mode

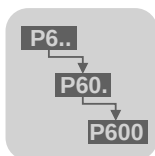
Function	Master		Slave	
	P750 Slave setpoint	P700 Operating mode 1	P100 Setpoint source	P700 Operating mode 1
Synchronous speed running: • Master controlled • Slave controlled	SPEED (485+SBus)	VFC VFC & GROUP VFC & HOIST V/f CHARACTERISTICS U/f & DC BRAKING	MASTER SBus MASTER-RS485	VFC VFC & GROUP VFC & HOIST V/f CHARACTERISTICS U/f & DC BRAKING
Synchronous speed running: • Master speed controlled • Slave controlled	SPEED (485+SBus)	VFC-n-CONTROL VFC-n-CTRL & CFC CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus MASTER-RS485	VFC VFC & GROUP VFC & HOIST
Synchronous speed running: • Master speed controlled • Slave speed controlled • Drives without rigid mechanical connection!	SPEED (485+SBus)	VFC-n-CONTROL VFC-n-CTRL & CFC CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus MASTER-RS485	VFC-n-CONTROL VFC-n-CTRL & GROUP VFC-n-CTRL&HOIST CFC SERVO
Synchronous speed running: • Master controlled • Slave speed controlled • Drives without rigid mechanical connection!	SPEED (485+SBus)	VFC VFC & GROUP VFC & HOIST	MASTER SBus MASTER-RS485	VFC-n-CONTROL VFC-n-CTRL & GROUP VFC-n-CTRL&HOIST CFC SERVO
Load distribution: • Master controlled • Slave controlled	LOAD SHAR. (485+SBus)	VFC VFC & GROUP VFC & HOIST	MASTER SBus MASTER-RS485	VFC VFC & GROUP VFC & HOIST
Load distribution: • Master speed controlled • Slave controlled	LOAD SHAR. (485+SBus)	VFC-n-CONTROL VFC-n-CTRL & CFC CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus MASTER-RS485	VFC VFC & GROUP VFC & HOIST VFC & FLYING START
Load distribution: • Master speed controlled • Slave speed controlled	Not possible in control system			
Load distribution: • Master controlled • Slave speed controlled	Not possible in control system			
Torque control of slave: • Master speed controlled • Slave torque controlled	TORQUE (485+SBus)	CFC/SERVO CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus MASTER-RS-485	CFC/SERVO & M-CONTROL

Synchronous speed running

Speed synchronization (SPEED (RS485) / SPEED (SBus) / SPEED (485+SBus)):

The speed of the inverter that is set up as the slave follows the speed of the master inverter. Set the speed ratio with P751 Scaling slave setpoint at the slave inverter. P324 Slip compensation 1 / P334 Slip compensation 2 of the slave is to remain at the value set in the startup setting. Example:

Parameters	Setting on master	Setting on slave
P100 Setpoint source	e.g. UNIPOL./FIXED SETP	MASTER SBus
P101 Control signal source	e.g. TERMINALS	Not in effect
P700 Operating mode 1	VFC-n-CONTROL	VFC 1
P750 Slave setpoint	SPEED (Sbus)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not in effect	1 (then 1 : 1)
P811 RS485 group address	Not in effect	
P881 Address SBus 1/2	Set different values	
P882 / P892 SBus groupaddress	Set the same value (0 ... 63)	
P884 / P894 SBus baud rate	Set the same value (125, 250, 500 or 1000 kBaud)	



Parameters

Explanation of the parameters

Load sharing



Load sharing (LOAD SHAR (RS485) / 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 load share ratio (recommendation: 1) with P751 Scaling slave setpoint.

P324 Slip compensation 1 / P334 Slip compensation 2 of the slave must be set to 0.

Better behavior can be accomplished by setting the slave as follows:

- P138 Ramp limitation VFC: OFF
- P115 Filter setpoint: 0 s
- Ramps P130 / P131 / P132 / P133: 0 s
- P301 Minimum speed 1 / P311 Minimum speed 2: 0 ... 15 rpm

Example:

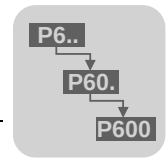
Parameters	Setting on master	Setting on slave
P100 Setpoint source	e.g. BIPOL./FIXED SETP	MASTER RS485
P101 Control signal source	e.g. TERMINALS	Not in effect
P324 Slip compensation 1	Do not change	0
P700 Operating mode 1	VFC 1	VFC 1
P750 Slave setpoint	LOAD SHAR. (RS485)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not in effect	1 (then 1 : 1)
P810 RS485 Address	Set different values	
P811 RS485 group address	Set the same value (101 ... 199)	
P882 / P892 SBus group address	Not in effect	
P884 / P894 SBus baud rate	Not in effect	

Torque control

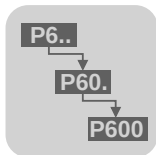
Torque control of the slave (TORQUE (RS485) / TORQUE (SBus) / TORQUE (485+SBus)):

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

Parameters	Setting on master	Setting on slave
P100 Setpoint source	e.g. UNIPOL./FIXED SETP	MASTER RS485
P101 Control signal source	e.g. TERMINALS	Not in effect
P700 Operating mode 1	CFC	CFC & M-CONTROL
P750 Slave setpoint	TORQUE (RS485)	MASTER-SLAVE OFF
P751 Scaling slave setpoint	Not in effect	1 (then 1 : 1)
P810 RS485 Address	Set different values	
P811 RS485 group address	Set the same value (101 ... 199)	
P882 / P892 SBus group address	Not in effect	
P884 / P894 SBus baud rate	Not in effect	



<i>P750 Slave set-point</i>	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 (RS485) • SPEED (Sbus) • SPEED (485+SBus) • TORQUE (RS485) • TORQUE (SBus) • TORQUE (485+SBus) • LOAD SHAR. (RS485) • LOAD SHAR. (SBus) • LOAD SHAR. (485+SBus)
<i>P751 Scaling slave setpoint</i>	Setting range: -10 ... <u>0</u> ... 1 ... 10 The setpoint sent from the master is multiplied by this factor which is set in the slave.
<i>P76x Manual operation</i>	
<i>P760 Locking Run/Stop keys</i>	YES / <u>NO</u> NO: Run/stop keys of the DBG60B keypad are active and can be used for starting and stopping the motor. YES: Run/stop keys of the DBG60B keypad are locked and without function.
<i>P77x Energy-saving function</i>	Energy can be saved in the operation of pumps, fans, conveyor belts etc. In this procedure, the magnetization of the asynchronous motor is controlled depending on the load by adapting the voltage-frequency ratio; the motor is undermagnetized.
<i>P770 Energy-saving function</i>	ON / <u>OFF</u> ON: The energy-saving function can be activated for the following operation modes: FC / VFC & GROUP / VFC & FLYING START / V/f CHARACTERISTICS. During no-load operation, the power consumption of the inverter can be reduced by up to 70 %. Please observe the following limitations: • The energy-saving function only offers advantages in the part-load range • No large changes in load should occur during operation
<i>P78x Ethernet configuration</i>	The parameter group P78x includes display and setting values that are specific for the DFE11B option card.
<i>P780 IP address</i>	Setting range: 000.000.000.000 ... <u>192.168.10.x</u> ... 223.255.255.255 Use P780 to set the IP address for linking MOVIDRIVE® via Ethernet. The IP address consists of four bytes in decimal form separated by dots. The first three bytes of the IP address are specified in the menu. The last byte is set via the DIP switches of the option. If the DIP switch is set to 0, the last byte of the IP address can be set via P780 as well. If the value is set via the DIP switch of the DHCP (Dynamic Host Configuration Protocol) option, the value specified by the DHCP server will be displayed.



Parameters

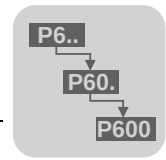
Explanation of the parameters

<i>P781 Subnetwork screen</i>	Setting range: 000.000.000.000 ... <u>255.255.255.0</u> ... 255.255.255.255 Factory setting at delivery is a class C network. The subnetwork mask divides the network into subnetworks. The set bits determine which part of the IP address represents the address of the subnetwork. If the DHCP option is activated via the DIP switch, the value specified by the DHCP server will be displayed.
<i>P782 Standard gateway</i>	Setting range: <u>000.000.000.000</u> ... 255.255.255.255 The standard gateway is addressed if the desired communication partner is not within the actual network. The standard gateway will have to be part of the actual network. If the DHCP option is activated via the DIP switch, the value specified by the DHCP server will be displayed.
<i>P783 Baud rate</i>	Display value, cannot be altered. Shows the current baud rate of the Ethernet connection.
<i>P784 MAC address</i>	Display value, cannot be altered. Indicates the MAC address, i.e. the layer 2 Ethernet address of the interface, that is clearly assigned worldwide.

P8xx Unit functions

P80x Setup

<i>P800 User menu</i>	User menu only for DBG60B keypad. Setting range: ON / <u>OFF</u> P800 enables the DBG60B keypad to be switch between the individual user menu and the detailed parameter menu. A slash following the parameter number indicates that the user menu is activated. The parameters contained in the standard user menu are identified by a “\” in the parameter list. The previously selected menu is active after the MOVIDRIVE® unit has been switched off and on again.
<i>P801 Language</i>	Language selection only for DBG60B keypad. You can set different languages with P801 in the DBG60B keypad. The language setting is not changed by the factory setting of MOVIDRIVE® MDX60B/61B units.
<i>P802 Factory setting</i>	Setting range: <u>NO</u> / DEFAULT STANDARD / DELIVERY STATUS You can use P802 to reset the factory settings stored in the EPROM for almost all parameters. The factory setting function does not affect the following: • P30x Limits 1 / P31x Limits 2 • P32x Motor compensation 1 / P33x Motor compensation 2 • P700 Operating mode 1 / P701 Operating mode 2 • P88x Serial communication SBus 1 / P89x Serial communication SBus 2 • P840 Manual reset • Fault memory • Statistical data The "Delivery state" setting also resets the parameters listed above. An "8" appears on the 7-segment display during the reset. The previous operating status of the inverter appears on the display after the factory settings have been restored. P802 automatically reverts to "NO."



P803 Parameter lock

Activation of the factory settings overwrites almost all parameter values; resetting to the delivery status overwrites all parameter values. Save the set parameter values with SHELL or the DBG60B keypad before you start resetting the parameters. After resetting, it is necessary to adapt the altered parameter values and terminal assignments to meet the requirements.

Setting range: ON / OFF

By setting P803 to "ON", you can prevent any modification of parameters (except P840 Manual reset and the parameter lock itself). This makes sense, for example, after the MOVIDRIVE[®] setting has been optimized. P803 must be set to "OFF" to enable changes to parameters again.

Important: The parameter lock also acts on the RS485, fieldbus and SBus interfaces and on IPOS^{plus}[®].

P804 Reset statistics data

Reset statistic data.

Setting range: NO / ERROR MEMORY / kWh METER / OPERATING HOURS

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

P806 Copy DBG -> MDX

Copy DBG -> MDX (only with DBG60B)

Setting range: YES / NO

The parameter data in the DBG60B are transmitted to MOVIDRIVE[®].

P807 Copy MDX -> DBG

Copy MDX -> DBG (only with DBG60B)

Setting range: YES / NO

The parameter data set in MOVIDRIVE[®] are transmitted to the DBG60B keypad.

P81x Serial communication

P810 RS485 Address

Setting range: 0 ... 99

P810 sets the address by means of which communication can take place with MOVIDRIVE[®] via the serial interfaces. Max. 32 participants can be networked together.

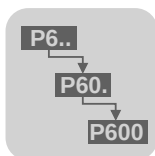


MOVIDRIVE[®] units are always set to the address 0 on delivery. To avoid problems during data exchange in serial communication with several inverters, we recommend that you do not use address 0.

P811 RS485 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 RS485 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 RS485 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.



Parameters

Explanation of the parameters

P812 RS485 time-out delay

Setting range: 0 ... 650 s

P812 sets the monitoring time for data transmission via the serial interface. MOVIDRIVE® performs the error response set in P833 if there is no cyclical process data exchange via the serial interface for the period set in parameter 812. P833 Response RS485 TIMEOUT . 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.

P819 Fieldbus timeout delay

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

P819 sets the monitoring time for data transmission via the implemented fieldbus (DFx). If no data traffic takes place via the fieldbus during the time period set in P819, MOVIDRIVE® will execute the error response set in P831 FIELDBUS TIMEOUT response. When P819 is set to the value 0 or 650, data transmission via the fieldbus is not monitored. The timeout time is specified automatically by the DP master with PROFIBUS-DP. Changing this parameter does not have any effect and is overwritten whenever the PROFIBUS-DP is started up again.

P82x Braking operation

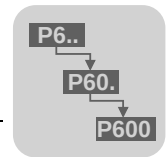
P820 / P821 4-quadrant operation 1/2



Setting range: ON / OFF

This setting is only taken into account in operating modes without encoder feedback (VFC, V/f); 4-quadrant operation is assumed in all other operating modes. P820 / P821 enables 4-quadrant operation to be switched on and off for parameter sets 1 / 2. Four-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 these operating modes, 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 error message F07 (DC link overvoltage). In such a case, the deceleration ramps must be extended manually.



P83x Error responses

The following responses can be programmed:

Response	Description
NO RESPONSE	No error is displayed and no error response is undertaken. The error which is signaled is completely ignored.
DISPLAY ERROR	The error is displayed (in 7-segment display and SHELL), the fault output is set (if programmed). The unit has no other fault responses. The error can be reset (terminal, RS485, fieldbus, auto-reset).
IMM. STOP/FAULT	The inverter performs an immediate switch-off and an error is signaled. The output stage is inhibited and the brake is applied. The ready signal is revoked and the error output is set, if programmed. A restart is only possible after an error 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 error is signaled immediately. The ready signal is revoked and the error output is set, if programmed. A restart is only possible after an error 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 error is signaled immediately. The ready signal is revoked and the error output is set, if programmed. A restart is only possible after an error reset has been performed during which the inverter is reinitialized.
IMM. STOP/WARN.	The inverter performs an immediate switch-off and an error is signaled. The output stage is inhibited and the brake is applied. The error is signaled via the terminal, if programmed. The ready signal is not revoked. The drive restarts without unit re-initialization if the error is rectified by an internal procedure or by an error reset.
EMERG. STOP/ WARN G	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 error is signaled immediately. The error is signaled via the terminal, if programmed. The ready signal is not revoked. The drive restarts without unit re-initialization if the error is rectified by an internal procedure or by an error reset.
RAPID STOP/WARN G	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 error is signaled immediately. The error is signaled via the terminal, if programmed. The ready signal is not revoked. The drive restarts without unit re-initialization if the error is rectified by an internal procedure or by an error reset.

P830 Response EXT. ERROR

Factory setting: EMERG. STOP/FAULT

The error is only triggered in the ENABLED inverter status. P830 programs the error response that is triggered by an input terminal programmed to "/EXT. ERROR."

P831 FIELD BUS TIMEOUT response

Factory setting: RAPID STOP/WARN G

The error is only triggered in the ENABLED inverter status. P831 programs the error response which is triggered by the fieldbus timeout monitoring. The response time of the monitoring function can be set with P819 Fieldbus timeout delay (see "Fieldbus Unit Profile" for more details).

P832 Response MOTOR OVERLOAD

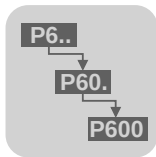
Factory setting: EMERG. STOP/FAULT

Use P832 to program the error response triggered via P340 Motor protection 1.

P833 Response RS485 TIMEOUT

Factory setting: RAPID STOP/WARN G

The error is only triggered in the ENABLED inverter status. P833 programs the error response that is triggered by the RS485 timeout monitoring. The response time of the monitoring function can be set with P812 RS485 timeout delay .



Parameters

Explanation of the parameters

<i>P834 LAG ERROR response</i>	Response lag error with DRS11B and IPOS^{plus}® only. Factory setting: <u>EMERG. STOP/FAULT</u> P834 is used to program the error response that is triggered by lag error monitoring of the synchronous operation option DRS11B and of the positioning mode with IPOS^{plus}®. Different settings are available in P51x Synchronous operation monitoring .
<i>P835 Response TF MESSAGE</i>	Factory setting: <u>NO RESPONSE</u> P835 programs the error response which is triggered by the temperature sensor monitoring of the TF which may be incorporated in the motor winding.
<i>P836 / P837 Response SBus TIMEOUT 1 / 2</i>	Factory setting: <u>EMERG. STOP/FAULT</u> P836 / P837 programs the error response that is triggered by the system bus timeout monitoring. The response time of the monitoring function can be set with P883 SBus timeout delay 1 / P893 SBus timeout delay 2 .
<i>P838 Response SW LIMIT SWITCH</i>	Factory setting: <u>EMERG. STOP/FAULT</u> P838 programs the error response executed by the inverter if a target position for a referenced drive is outside the software limit switch. The software limit switches are set via parameters P920 / P921 .
<i>P84x Reset response</i>	
<i>P840 Manual reset</i>	Setting range: YES / <u>NO</u> • YES: The error in MOVIDRIVE® unit is reset. In case of an error, it is possible to press the [X] key on the DBG60B to access P840 directly. P840 is also available in the "Parameters" main menu in SHELL. P840 automatically reverts to NO following a reset. Activating the manual reset does not have any effect if there is no error present. • <u>NO</u>: No reset.
<i>P841 Auto reset</i>	• ON: The auto-reset function is activated. In case of an error, this function performs an automatic unit reset following P842 Restart time . Up to five auto-resets are possible in one auto-reset phase. If five errors occur that 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 (SHELL, DBGT60B, master controller), – There is a transition to 24 V support operation or the inverter is completely turned off Following this, five auto-resets are possible once again.
	Danger through automatic start-up Possible consequences: Severe or fatal injuries. Do not use auto-reset with drives where an automatic restart could represent a danger to people or units. • <u>OFF</u>: No auto-reset.
	<i>P842 Restart time</i> Setting range: 1 ... <u>3</u> ... 30 s P842 sets the waiting time which has to elapse after a fault occurs before an auto-reset is performed.

**P85x Scaling
actual speed value**

Scaling of the actual speed value with SHELL only.

Scaling actual speed value sets a user-specific display parameter P001 User display. For example, the user display is to be shown in 1/s. Such a setting requires a scaling factor of 1/60. The scaling factor numerator must therefore be set to 1 and the scaling factor denominator to 60. In P852 User-defined unit the scaling unit 1/s is entered.

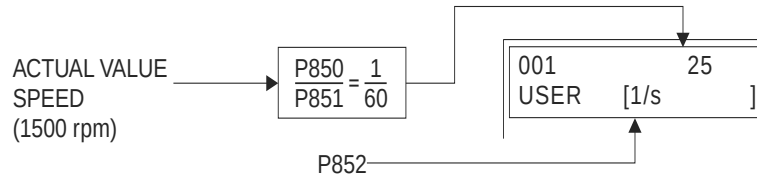


Figure 82: Scaling speed actual value (example)

01640BEN

**P850 Scaling
factor numerator**

Setting range: 1 ... 65535 (can only be set with SHELL)

**P851 Scaling
factor denominator**

Setting range: 1 ... 65535 (can only be set with SHELL)

P852 User unit

Factory setting: rpm (can only be set with SHELL)

Up to eight ASCII characters will be displayed in P001 User display .

P86x Modulation

**P860 / P861 PWM
frequency 1 / 2
VFC**



Setting range: 4 / 8 / 12 / 16 kHz (for size 6: 4 / 8 kHz)

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

**P862 / P863 PWM
fix 1 / 2**

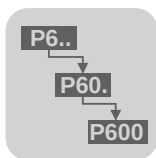


- **ON:** If an automatic reduction of the PWM frequency (e. g. by installing output filters) is not wanted, use P862 / P863 = ON for parameter set 1 / 2 to fix the frequency set with P860 PWM frequency 1 / P861 PWM frequency 2 .
- **OFF:** MOVIDRIVE® automatically reduces the set output frequency (down to minimum 4 kHz) when there is a high level of thermal load on the output stage to avoid a switch-off with the "Unit utilization" error.

P864 PWM CFC

Setting range: 4 / 8 / 16 kHz (for size 6: 4 / 8 kHz)

P864 can be used in CFC and SERVO operating modes to set the switching frequency at the inverter output for parameter set 1. The cycle frequency is set to a fixed value and is not automatically reduced with high unit utilization.



Parameters

Explanation of the parameters

P87x Process data description

P870 / P871 /
P872 Setpoint
description PO1 /
PO2 / PO3

P870/P871/P872 define the content of the process output data words PO1/PO2/PO3. This is necessary so that MOVIDRIVE® can allocate the appropriate actual values.

Setpoint description	Factory setting
P870 Setpoint description PO1	CTRL. WORD 1
P871 Setpoint description PO2	SPEED
P872 Setpoint description PO3	NO FUNCTION

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 [% I _N]	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 [% I _N]	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} ®

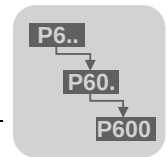
See "Fieldbus unit profile with parameter list" manual for detailed explanations.

Detailed description of process data.

P873 / P874 /
P875 Actual value
description PI1 /
PI2 / PI3

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.

Actual value description	Factory setting
P873 Actual value description PI1	STATUS WORD 1
P874 Actual value description PI2	SPEED
P875 actual value description PI3	NO FUNCTION



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.
OUTP.CURRENT	Instantaneous output current of the system in % of I _N .
ACTIVE CURRENT	Current active current of the system in % of I _N : - Positive sign = Positive torque - Negative sign = Negative torque
POSITION LO¹⁾	Current actual position low word
POSITION HI¹⁾	Current actual position high word
The actual position is read from: P941 Source actual position.	
STATUS WORD 1	Status information of the inverter
STATUS WORD 2	Status information of the inverter
SPEED [%]	Current actual speed value in % of n _{max} .
IPOS PI-DATA	Feedback of a 16-bit coded value for IPOS ^{plus®} .
STATUS WORD 3	Status information of the inverter

1) Both assignments must always be set.

See "Fieldbus unit profile with parameter list" manual for detailed explanations.

P876 PO data enable

Setting range: ON / OFF

- 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.

P88x / P89x Serial communication SBus 1 / 2

P880 / P890 Protocol SBus 1 / 2

Setting range: SBus MOVILINK / CANopen

P881 / P891 SBus address 1 / 2

Setting range: 0 ... 63

Use P882 / P892 to set system bus address of MOVIDRIVE[®] unit. The MOVIDRIVE[®] unit can communicate with other MOVIDRIVE[®] units using the system bus (SC11 / SC12) by means of the address set here.

P882 / P892 SBus group address 1 / 2

Setting range: 0 ... 63

P883 / P893 set the system bus group address for multicast telegrams of the MOVIDRIVE[®] unit.

P883 / P893 SBus timeout delay 1 / 2

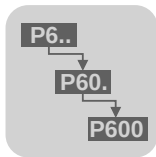
Setting range: 0 ... 650 s

P883 / P893 set the monitoring time for data transmission via the system bus. If no data traffic takes place via the fieldbus during the time period set in P883/P893, MOVIDRIVE[®] will execute the error response set in P836 Response SBus TIMEOUT 1 / P837 Response SBus TIMEOUT 2. No monitoring of data transmission via the system bus takes place when P883 / P893 are set to the value 0.

P884 / P894 Baud rate SBus 1 / 2

Setting range: 125 / 250 / 500 / 1000 kBaud

P884 / P894 set the transmission speed of the system bus. The total of the baudrates in P884 / P894 must not exceed 1125 kBaud.



Parameters

Explanation of the parameters

*P885 / P895 Synchronization ID
SBus 1 / 2*

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. P885 / P895 is used for setting the identifier (address) of the synchronization message 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.

*P886 / P896
CANopen address
1 / 2*

1 ... 127

Use P886 / P896 to set the serial communication with the SBus.

P887 Synchronization ext. control

Setting range: ON / OFF

If a MOVIDRIVE[®] receives cyclical setpoints from a master control via SBus 1 or SBus 2 (e.g. position setpoint or leading axis position) it is necessary that the MOVIDRIVE[®] processor works synchronously with the control processor so that the internal time dial for the position controller is an integer divisor of the synchronization time (the cycle time for the new setpoints from the control).

This setting prevents information from being processed twice and ensures that setpoint jumps do not occur due to beat effects or long-term drift.

Synchronization of MOVIDRIVE[®] and control takes place via P885 Synchronization ID SBus 1 / P895 Synchronization ID SBus 2 the setting of the time dial via P887.

For cyclical setting of the position setpoint, you will also have to set P916 Ramp type to BUS RAMP.

P887 = ON: the internal time dial for position control will have to be set to exactly 1 ms.

P887 = OFF: the internal time dial for position control is set to the standard SEW time base (ca. 1 ms). This setting corresponds to the time dial in MOVIDRIVE[®] A.

If several MOVIDRIVE[®] units are synchronized via SBus without control, P887 will have to be set to OFF in all inverters.

Note: For technical reasons, the setting P887 = ON is available for field-oriented operating modes with CFC or SERVO only. VFC operating modes always work with the standard SEW time base.

*P888
Synchronization
time*

Setting range: 5 / 10 ms

Cycle time for new setpoints of a master control.

See also: P885 Synchronization ID SBus 1 / P895 Synchronization ID SBus 2 / P887 Synchronization ext. Control.

P9xx IPOS parameters

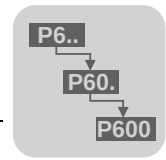
The IPOS^{plus}[®] parameters are described in detail in the IPOS^{plus}[®] manual.



Danger through unexpected travel movements

Possible consequences: Severe or fatal injuries.

Note that modifying these parameters without knowledge of the IPOS^{plus}[®] program, which may be active, can cause unexpected movements and place unwanted loads on the mechanical driveline. It is essential that you are familiar with the IPOS^{plus} manual to make the setting for these parameters.



*P90x IPOS
reference travel*

The purpose of reference travel is to establish a **machine zero** to which all absolute positioning commands refer. You can select different reference travel strategies in P903 Reference travel type. These strategies define appropriate travel modes, for example to search for a reference cam. Based on the **reference point** established through the reference travel, you can use P900 Reference offset to shift the machine zero according to the equation

$$\text{Machine zero} = \text{reference position} + \text{reference offset}$$

.

The speeds for the necessary travel movements according to **reference travel type** will be set with P901 Reference speed 1 / P902 Reference speed 2 .

*P900 Reference
offset*

Setting range: $-(2^{31}-1) \dots 0 \dots 2^{31}-1$

Reference offset (zero offset) is used to determine the machine zero (origin). The following applies:

$$\text{Machine zero} = \text{reference position} + \text{reference offset}$$

The reference offset always refers to the encoder set via P941 Source actual position .

This encoder can be a motor encoder, an external encoder or a DIP encoder. The corresponding actual positions are indicated by IPOS^{plus}® variables.

- H509 Actual position DIP encoder
- H510 Actual position external encoder
- H511 Actual position motor encoder

Reference offset becomes active after reference travel has been completed successfully.



When reference travel of a drive system takes place with absolute encoder (HIPERFACE® or DIP), depending on the set actual position source, the reference travel will recalculate and overwrite P905 Hiperface offset X14 / P947Hiperface offset X15 or DIP offset P953 Position offset .

*P901 Reference
speed 1*

Setting range: 0 ... 200 ... 6000 rpm

Reference speed 1 determines the travel speed for the first part of the reference travel. Speed change always takes place via stop ramp t13. The search direction during reference travel is determined by the respective reference travel type. The speed will be in effect until the reference cam has been reached.

*P902 Reference
speed 2*

Setting range: 0 ... 50 ... 6000 rpm

Reference speed 2 determines the travel speed for the second part of the reference travel. Speed change always takes place via stop ramp t13. The search direction during reference travel is determined by the respective reference travel type. The speed is effective upon leaving the reference cam until reaching the first zero pulse.

*P903Reference
travel type*

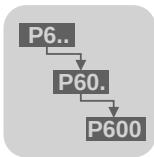
Setting range: 0 ... 8

The reference travel type specifies the reference travel strategy with which the machine zero of a machine should be established.

This setting also defines the search direction for the reference cam in the individual referencing phases.

Use parameter P904 Reference travel to zero pulse to determine if reference travel takes place to edge change of reference cam or next zero pulse of the encoder.

Prerequisite for execution of reference travel is a drive that is **ready** and **enabled** with the exception of reference travel type 8.



Parameters

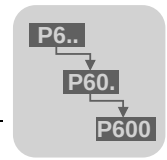
Explanation of the parameters

There are also types available that can function without a reference cam.

- **Type 0: Left zero pulse**
 - First search direction is CCW.
 - Reference position = Left zero pulse from current position
 - Machine zero = reference position + reference offset
- **Type 1: Left end of the reference cam**
 - First search direction is CCW.
 - Reference position = First zero pulse or falling edge to the left of the reference cam
 - Machine zero = reference position + reference offset
- **Type 2: Right end of the reference cam**
 - First search direction is CW.
 - Reference position = First zero pulse or falling edge to the right of the reference cam
 - Machine zero = reference position + reference offset
- **Type 3: Right-hand limit switch**
 - First search direction is CW.
 - Reference position = First zero pulse or falling edge to the left of the right limit switch.
 - Machine zero = reference position + reference offset
 - Reference travel should take place to zero pulse.
- **Type 4: CCW limit switch**
 - First search direction is CCW.
 - Reference position = First zero pulse or falling edge to the right of the left limit switch.
 - Machine zero = reference position + reference offset
 - Reference travel should take place to zero pulse.
- **Type 5: No reference travel**
 - Reference position = current position
 - Machine zero = reference offset
- **Type 6: Reference cam flush with right limit switch**
 - First search direction is CW.
 - Reference position = First zero pulse or falling edge to the left of the reference cam
 - Machine zero = reference position + reference offset
 - NOTE: Reference cam and limit switches must be flush!
- **Type 7: Reference cam flush with left limit switch**
 - First search direction is CCW.
 - Reference position = First zero pulse or falling edge to the right of the reference cam
 - Machine zero = reference position + reference offset
 - NOTE: Reference cam and limit switches must be flush!
- **Type 8: Resetting of encoder position for drive not ready for operation**

Reference travel can take place when the drive is not enabled.

 - Reference position = current position
 - Machine zero = reference offset



P904 Reference travel to zero pulse

Setting range: YES / NO

- Yes: Reference travel takes place to the zero pulse of the selected IPOS^{plus}® encoder.
- No: Reference travel takes place to the falling edge of the reference cam.

P905 Hiperface offset X15

Setting range: $-(2^{31} - 1) \dots 0 \dots 2^{31} - 1$

The zero point of the encoder display is specified with this parameter.

Use this parameter to define the machine zero without reference travel. It adds or subtracts the offset from the encoder value.

- P905 Hiperface offset X15 has an effect on the actual position of the motor encoder H511.

$$H511 = \text{Encoder value} - P905$$

- P947 Hiperface offset X14 has an effect on the actual position of the external encoder H510.

$$H510 = \text{Encoder value} - P947$$

The actual position is determined directly after the values have been entered. A HIPERFACE[®] multi-turn encoder must be reference once, a HIPERFACE[®] single-turn encoder must always be referenced.

Note:

When reference travel of a drive system takes place with a HIPERFACE[®] encoder, the reference travel will recalculate and overwrite the Hiperface offset (P905 or P947) depending on the set actual position source .

The following applies:

- P905 = Encoder value – P900
- P947 = Encoder value – P900

P91x IPOS^{plus}® travel parameters

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}®. In basic setting, the value of P210 P gain hold controller will be adopted.

P911/912 Positioning ramp 1/2

Setting range: 0,01 ... 1 ... 20 s

Value set for the ramp used during the positioning operation. The same ramp (positioning ramp 1) is always used in P916 Ramp type SINE and SQUARE for acceleration and deceleration. With a LINEAR ramp type, deceleration is set depending on P917 Ramp mode.

- P917 Ramp mode = Mode 1: Deceleration for travel to target position (spot braking) only takes place with positioning ramp 2 (P912). Positioning ramp 1 (P911) is used for all other positioning operations.
- P917 Ramp mode = Mode 2: Positioning ramp 2 (P912) is used for deceleration of the travel speed during travel. Positioning ramp 1 (P911) is used for acceleration.

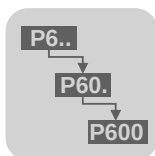
P913 / P914 Travel speed CW / CCW

Setting range: 0 ... 1500 ... 6000 rpm

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



P302 Maximum speed 1 / P312 Maximum speed 2 limits P913/ P914, always set P302 Maximum speed 1 / P312 Maximum speed 2 about 10 % greater than P913 / P914 to prevent a lag fault!



Parameters

Explanation of the parameters

P915 Speed feed-forward

Setting range: –199,99 ... 0 ... 100 ... 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.



Parameter P915 is only in effect with the LINEAR and JERK LIMITED ramp types. The function has no effect for the ramp types "SINE" and "SQUARED"!

P916 Ramp type



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

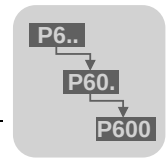
Ramp type	Positioning performance
LINEAR	Optimum time, however block-shaped acceleration characteristic
SQUARED	Softer acceleration and higher torque demand than LINEAR.
SINE	Very smooth acceleration characteristic; higher torque requirement than with SQUARED
BUSRAMP	Setting for operation of drive inverter with master motion controllers. This motion controller generates a cyclical position setpoint that is written directly to the position controller. The ramp generator is deactivated.
JERK LIMITED	Jerk limitation is based on the principle of the linear ramp. For jerk limitation, the torque and, therefore, the acceleration is trapezoidal to limit the jolting action. Over time, jerk limitation builds up the torque in linear form during acceleration until the maximum value is reached. In the same way, over time the torque is reduced again in linear form to zero. This means that system vibrations can be virtually avoided. A setting range of 5 ms to 2000 ms (P933) can be selected. The positioning time in comparison to the linear ramp is extended by the set jerk time. The acceleration and torque do not increase in comparison with the linear ramp.
ELECTRONIC CAM	Activating the technology function "Electronic cam."
I-SYNCHR.OPERAT.	Activating the technology function "Electronic synchronous operation."
CROSS CUTTER	Activating the technology function "Cross cutter."

P917 Ramp mode

Setting range: MODE 1 / MODE 2

Use this parameter to set Positioning ramp 2 P912 with set LINEAR ramp function.

- P917 = MODE 1: Deceleration for travel to target position (target braking) with Positioning ramp 2 P912 only. For all other positioning processes, use Positioning ramp 1 P911 used.
- P917 = MODE 2: When changing the travel speed during travel, always use Positioning ramp 2 P912 for deceleration. P911 positioning ramp 1 is used for acceleration.



P92x IPOS monitoring

P920 / P921 SW limit switch CW / CCW

Setting range: $-(2^{31}-1) \dots 0 \dots 2^{31}-1$

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 encoder or external encoder, then these do not take effect until after performance of a reference travel. If P941 Source actual position is set to absolute encoder DIP, it will be effective immediately without reference travel. If the software limit switches are in effect, the system checks whether the target position H492 of the current travel command is beyond the software limit switches. The movement command is not performed if the target position is beyond. The drive responds according to the error response set in P838. If P838 is set to "... / Warning" or "... / Fault", then error message F78 (IPOS SW limit switch) is generated. After the error reset, a drive with incremental encoder no longer has a reference point; for a drive with an absolute encoder the position is maintained (during referencing)!

Reset options:

- 1-signal at the "reset input"
- Power supply OFF / ON (not in 24 V backup mode)
- Manual reset via SHELL
- Reset using IPOS^{plus}® control word (H484)



Following an error 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 with continuous process so that software limit switch function is deactivated.

P922 Position window

Setting range: 0 ... 5... 32 767 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.

P923 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 response with P834 Lag error response .

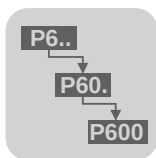
Deactivation: Setting value = 0 deactivates lag error monitoring

P93x IPOS^{plus}® special functions

P930 Override

Setting range: ON / OFF

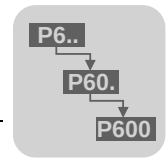
The override function makes it possible to change the travel speed for positioning operations which is programmed in the IPOS^{plus}® program. The speed can be altered within the range from 0 to 150 % of the specifically programmed speed. It requires an analog input, with 0 to 150 % corresponding to 0 ... 10 V at the analog input. The maximum speed value is definitely limited by P302 Maximum speed 1 / P312 Maximum speed 2.



Parameters

Explanation of the parameters

<i>P931 IPOS CTRL word Task 1</i>	IPOS CTRL word Task 1 in the DBG60B keypad only, not in SHELL. Setting range: <u>START</u> / <u>STOP</u> Task 1 of the IPOS^{plus}® program is started or stopped.
<i>P932 IPOS CTRL word Task 2</i>	IPOS CTRL word Task 2 in the DBG60B keypad only, not in SHELL. Display parameter, cannot be set using DBG60B. Indicating range: <u>START</u> / <u>STOP</u> START = Task 2 of the IPOS^{plus}® program is currently being processed. STOP = Task 2 of the IPOS^{plus}® program is stopped.
<i>P933 Jerk time</i>	Setting range: <u>0.005</u> ... 2 s The jerk time indicates the duration of the torque formation. The positioning time in comparison to the linear ramp is extended by the set jerk time. The jerk time <u>0.005</u> ... 2 s that has to be set for the function jerk limit. Note that P911 Positioning ramp 1 / P912 Positioning ramp 2 have a greater or equal value. $P933 \leq P911 \ \& \ P912$ If $P933 > P911 \ \& \ P912$, torque formation still has a trapezoidal shape with the set jerk time not being the time for the torque formation.
<i>P938 Speed task 1</i>	Setting range: <u>0</u> ... 9 additional assembler commands/ms The standard setting for task 1 is 1 assembler command/ms. The speed can be increased by up to 9 assembler commands/ms with P938. P938 and P939 share the resources for the speed increase; that is, task 1 and task 2 together can be assigned a total of 9 additional assembler commands/ms. Example: Task 1 + 2 additional assembler commands/ms = 3 assembler commands/ms Task 2 + 7 additional assembler commands/ms = 9 assembler commands/ms
<i>P939 Speed task 2</i>	Setting range: <u>0</u> ... 9 additional assembler commands/ms The standard setting for task 2 is 2 assembler commands/ms. The speed can be increased by up to 9 additional assembler commands/ms with P939. P939 and P938 share the resources for the speed increase; that is, task 1 and task 2 together can be assigned a total of 9 additional assembler commands/ms. Example: Task 1 + 2 additional assembler commands/ms = 3 assembler commands/ms Task 2 + 7 additional assembler commands/ms = 9 assembler commands/ms



P94x IPOS^{plus}® encoder

P940 IPOS variables edit

IPOS^{plus}® variables edit with DBG60B keypad only, not in SHELL.

Setting range: ON / OFF

The IPOS^{plus}® variables can be altered when P940 = "ON."

P941 Source actual position

Setting range: Motor encoder (X15) / Ext. encoder (X14) / Absolute encoder (DIP)

Defines the encoder to which IPOS^{plus}® positions.

Set P942 / P943 encoder factor numerator / denominator

Setting range: 1 ... 32767

In the event of positioning to an external encoder (X14) or an absolute encoder (DIP), then these two parameters are used for adapting the resolution to the motor encoder (X15).

Proceed as follows:

- Write down the values of variables H509 DIP position and H511 Current motor position.
- Move the drive by about 30 000 increments (H511).
- Calculate the difference between the values you wrote down and the new values of the variables:
 - H509 old – H509 new = H509 difference
 - H511 old – H511 new = H511 difference
- The values must not differ by more than 32 767 ($2^{15} - 1$). If the values are greater, divide both differentials by the same number to obtain correspondingly smaller values. Alternatively, repeat the procedure with a shorter travel distance.
- Enter the result H511 difference in P942 Encoder factor nominator and H509 in P943 Encoder factor denominator.

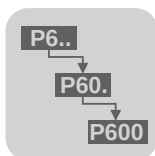
P944 Encoder scaling ext. encoder

Setting range: x1 / x2 / x4 / x8 / x16 / x32 / x64

The significance of the travel resolution of the motor encoder and external encoder is adapted. The parameter is set so the travel information ratio between the motor encoder and the external encoder is as close to "1" as possible. Set the parameter initially to "x1." To do this, note the values in variables H510 and H511.

Move the drive by about 1000 increments (H511). Determine the difference between the noted value and the current value and calculate the quotient. Set the parameter P944 Encoder scaling ext. encoder to the value that is closest to the calculated quotient.

Important: The encoder scaling directly influences parameters P900 Reference offset, P942 Encoder factor numerator and P943 Encoder factor denominator and the parameter group P92x IPOS monitoring. All positions of the IPOS^{plus}® program have to be adjusted when using the external encoder. The setting of all listed parameters has to be adjusted every time the encoder scaling is changed!



Parameters

Explanation of the parameters

P945 Synchronous encoder type (X14)

Setting range: TTL / SIN/COS / HIPERFACE

Enter the used encoder type here. Possible encoder types are:

- TTL: Encoder with digital, rectangular output signal (TTL level 0 V, 5 V)
- SIN/COS: Encoder with analog, sine-shaped output signal (1 V_{SS})
- HIPERFACE®: Encoder with designation AV1H, AS1H, ES1H, EV1H

SEW encoder type	Startup parameters encoder type / encoder PPR count
ES1S / ES2S / EV1S / EH1S	SINE ENCODER / 1024
AV1Y	SINE ENCODER / 512
ES1R / ES2R / EV1R / EH1R	INCREM. ENCODER TTL / 1024
ES1T ¹⁾ / ES2T ¹⁾ / EV1T ¹⁾ / EH1T ¹⁾	INCREM. ENCODER TTL / 1024
AV1H / AS1H / ES1H / EV1H	HIPERFACE®

1) via DWI11A only

P946 Synchronous encoder counting direction (X14)

Setting range: NORMAL / INVERTED

Defines the counting direction of the synchronous encoder. The setting must be made so the counting direction of the motor encoder (X15) and the synchronous encoder (X14) match.

P947 Hiperface offset X14

Setting range: $-(2^{31} - 1) \dots 0 \dots 2^{31} - 1$

The zero point of the encoder display is specified with this parameter.

Use this parameter to define the machine zero without reference travel. It adds or subtracts the offset from the encoder value.

- P905 Hiperface offset X15 has an effect on the actual position of the motor encoder H511.

$$H511 = \text{Encoder value} - P905$$

- P947 Hiperface offset X14 has an effect on the actual position of the external encoder H510.

$$H510 = \text{Encoder value} - P947$$

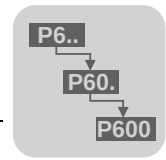
The actual position is determined directly after the values have been entered. It does not require prior reference travel.

Note:

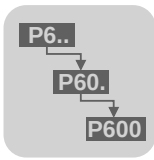
When reference travel of a drive system takes place with Hiperface® encoder, depending on the set actual position source, the reference travel will recalculate and overwrite the Hiperface offsets (P905 or P947).

The following applies:

- $P905 = \text{Encoder value} - P900$
- $P947 = \text{Encoder value} - P900$



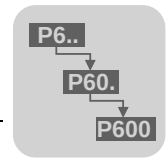
<i>P95x DIP</i>	The DIP parameters are described in detail in the "MOVIDRIVE® MDX61B Absolute Encoder Card DIP11B" manual. DIP11B cannot be used with size 0.
<i>P950 Encoder type</i>	The absolute encoder connected to X62 on the DIP11B is selected. At present, encoders can be selected from the following list: • <u>NO ENCODER</u> • AV1Y / ROQ424 • IVO GM401 • LEUZE BPS37 • LEUZE OMS1 • SICK ATM60 / ATM90 • SICK DME-3000-111 • SICK DME5000-111 • STAHLWCS2-LS311 • STAHL WCS3 • STEGMANN AG100 MSSI • STEGMANN AG626 / SICK ATM60 • T&R CE65, CE 58, CE100 MSSI • T&R LA66K • T&R LE100 • T&R ZE 65M • VISOLUX EDM
<i>P951 Counting direction</i>	Setting range: <u>NORMAL</u> / INVERTED Defines the counting direction of the absolute encoder. The setting must be made so the counting directions of the motor encoder (X15) and the absolute encoder (X62) match.
<i>P952 Cycle frequency</i>	Setting range: <u>1</u> ... 200 % Defines the cycle frequency at which absolute encoder information is transmitted from the encoder to the inverter. A cycle frequency of 100 % corresponds to the nominal frequency of the encoder in relation to a 100 m cable length.
<i>P953 Position offset</i>	Setting range: $-(2^{31}-1) \dots 0 \dots 2^{31}-1$ This parameter adapts the encoder registration range to the working range of the machine. The position offset P953 only needs to be set on incremental encoders; it should be set to 0 for other encoders. This parameter is used for shifting the change of position of the absolute encoder to a position outside the working range. Move the drive to approximately to the center of the working range. Note: The position value will be recalculated and overwritten automatically after successful completion of the reference travel.



Parameters

Explanation of the parameters

<i>P954 Zero offset</i>	Setting range: $-(2^{31}-1) \dots 0 \dots 2^{31}-1$ Zero offset is used for assigning the value you want to a specific position. The range of values can adopt positive or negative position values. The maximum valid parameter must not be exceeded. The limit is determined by the range of values of the numerator (2^{31}) and the range of values of the absolute encoder. Move the drive to a known position. Read out the value of variable H509 ACT.POS.ABS and enter the following value in parameter P954 Zero offset: $P954 = \text{Variable H509} - \text{required value}$. The required value is the display value you wish to have for the current position.
<i>P955 Encoder scaling</i>	Setting range: $\underline{x1} / x2 / x4 / x8 / x16 / x32 / x64$ The significance of the travel resolution of the motor encoder and absolute encoder is adapted with this parameter.
<i>P96x IPOS^{plus}® modulo function</i>	The IPOS^{plus}® modulo function is used for endless positioning, for example with circular indexing tables or chain conveyors. Refer to the IPOS^{plus}® manual for detailed information.
<i>P960 Modulo function</i>	Setting range: <u>OFF</u> / SHORT / CW / CCW <u>OFF</u>: The modulo function is deactivated. - 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 "CW" modulo function is active. The drive moves from its actual position to the target position with a "CW" direction of rotation, even if this means moving a longer distance. The "CCW" direction of rotation is not possible. - CCW: The "CCW" modulo function is active. The drive moves from its actual position to the target position with a "CCW" direction of rotation, even if this means moving a longer distance. The "CW" direction of rotation is not possible.
<i>P961 Modulo numerator</i>	Setting range: $0 \dots \underline{1} \dots 2^{31}-1$ Simulation of the gear unit by entering the number of teeth of the gear unit and the additional gear. Modulo numerator = Numerator gear unit i x numerator additional gear i
<i>P962 Modulo denominator</i>	Setting range: $0 \dots \underline{1} \dots 2^{31}-1$ Simulation of the gear unit by entering the number of teeth of the gear unit and the additional gear. Modulo denominator = Denominator gear unit i x denominator additional gear i
<i>P963 Modulo encoder resolution</i>	Setting range: $0 \dots \underline{4096} \dots 65535$ Resolution of the selected IPOS^{plus}® encoder system in increments. The IPOS^{plus}® encoder resolution for positioning to the motor encoder will be set to 4096 increments (prerequisite is an encoder resolution of 512 to 2048).



4.4 Operating modes

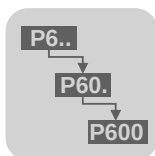
VFC 1 / 2 and V/f characteristics

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 (not for V/f characteristic operating mode). This model is optimally adapted to the motor after the startup function in SHELL or in the DBG60B keypad has been carried out. It is necessary to enter 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 Current limit 1 / P313 Current limit 2	$I_{\max}(\text{inverter}) = 150 \% I_{N\_mot}$
P302 Maximum speed 1 / P312 Maximum speed 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 Minimum speed 1 / P311 Minimum speed 2	15 rpm
P130 ... P133 Ramp t11 / P140 ... P143 Ramp t21	2 s
P136 Stop ramp t13 / P146 Stop ramp t23	2 s
P137 Emergency ramp t14 / P147 Emergency ramp t24	2 s
P500 Speed monitoring 1 / P502 Speed monitoring 2	MOTOR & REGENERATIVE
P501 Delay time 1 / P503 Delay time 2	1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
P101 Control signal source	TERMINALS
P730 Brake function 1 / P733 Brake function 2	ON
P731 Brake release time 1 / P734 Brake release time 2	With SEW motors: Setting in accordance with motor data. With non-SEW motors: Set the correct value manually!
P732 Brake application time 1 / P735 Brake applic. time 2	
P300 Start/stop speed 1 / P310 Start/stop speed 2	15 rpm
P820 4-quadrant operation 1 / P821 4-quadrant operation 2	ON
P324 Slip compensation 1 / P334 Slip compensation 2	Setting in accordance with specified data
P321 Boost 1 / P331 Boost 2	0
P322 IxR compensation 1 / P332 IxR compensation 2	Setting in accordance with specified data
P320 Automatic adjustment 1 / P330 Auto. adjustment 2	ON
P323 Premagnetizing time 1 / P333 Premagnetizing time 2	Setting in accordance with specified data



- SEW-EURODRIVE recommends using the P320 Automatic adjustment 1 / P330 Automatic adjustment 2 activated in the factory setting. The result is an automatic setting during the pre-magnetization phase by calibrating the motor of P322 IxR compensation 1 / P332 IxR compensation 2 .
- SEW-EURODRIVE recommends keeping the parameters P321 Boost 1 / P331 Boost 2 at the factory setting (= 0).



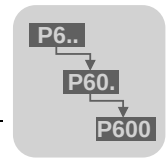
VFC 1/2 & Group

Set this mode 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 via P730 Brake function1 / P733 Brake function 2 . Set the data for the largest motor in the group during startup. Following startup, P303 Current limit 1 / P313 Current limit 2 have to be set to the total current of all connected motors. We recommend a basic setting of P321 Boost 1 / P331 Boost 2 to the same value as P322 IxR compensation 1 / P332 IxR compensation 2 .

Settings after the startup function	
P303 Current limit 1 / P313 Current limit 2	$I_{\max}(\text{inverter}) = 150 \% \Sigma I_{N\_mot}$
P302 Maximum speed 1 / P312 Maximum speed 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 Minimum speed 1 / P311 Minimum speed 2	15 rpm
P130 ... P133 Ramp t11 / P140 ... P143 Ramp t21	2 s
P136 Stop ramp t13 / P146 Stop ramp t23	2 s
P137 Emergency ramp t14 / P147 Emergency ramp t24	2 s
P500 Speed monitoring 1 / P502 Speed monitoring 2	MOTOR & REGENERATIVE
P501 Delay time 1 / P503 Delay time 2	1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
P101 Control signal source	TERMINALS
P730 Brake function 1 / P733 Brake function 2	ON
P731 Brake release time 1 / P734 Brake release time 2	With SEW motors: Setting in accordance with motor data.
P732 Brake application time 1 / P735 Brake applic. time 2	With non-SEW motors: Set the correct value manually!
P300 Start/stop speed 1 / P310 Start/stop speed 2	Setting in accordance with specified data
P820 4-quadrant operation 1 / P821 4-quadrant operation 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.



VFC 1 / 2 & Hoist / VFC n-control & Hoist

VFC-n-control & Hoist in parameter set 1 only.

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.

Constellations which can be recognized as incorrect	Fault triggered
2 or 3-phase motor phase interruption	F82 = Output open
Premagnetization time too short or incorrect motor/inverter combination.	F81 = Fault start condition
Failure of a motor phase by active speed monitoring (factory setting) P500 Speed monitoring 1 / P502 Speed monitoring 2, P501 Delay time 1 / P503 Delay time 2	F08 = Error n-monitoring



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

VFC 1 / 2 & DC BRAKE and V/f & DC BRAKING

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.

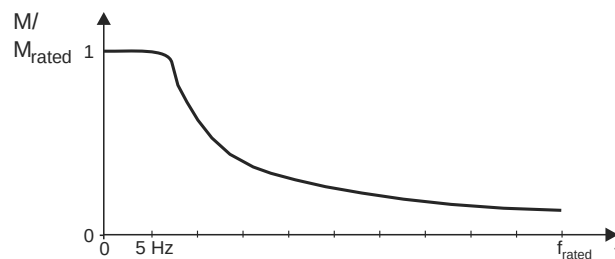


Figure 83: DC braking: Braking torque profile

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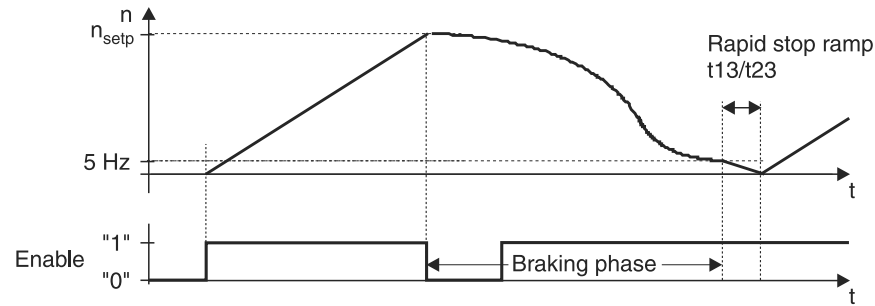
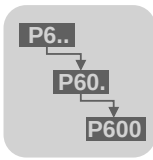
A constant current with a rotating field frequency of 5 Hz is impressed during the braking process. The braking torque = 0 at standstill. A greater braking torque acts at a slower speed; the braking torque drops as the speed increases. The braking time, and thus the duration of the braking current, depends 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.

Caution: No guided stop.

Possible consequences: Damages to system.

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





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Figure 84: DC braking: Braking profile

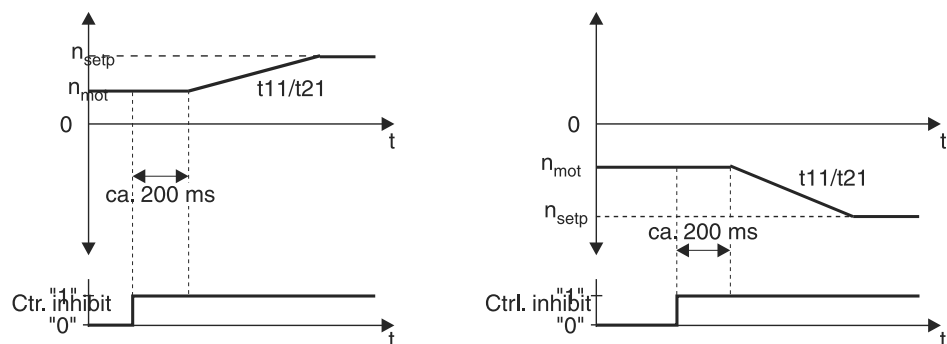


- The **braking procedure is not interrupted** if the "Enable" binary input receives a "1" signal again during the braking phase. DC braking is completed and the drive is only accelerated afterwards.
- The drive stops with ramp t_{11}/t_{21} or t_{12}/t_{22} if a binary input is programmed to the function "CW/Stop (CCW/Stop)" 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."

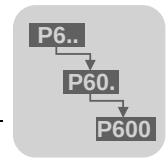
VFC 1 / 2 & Flying start

The flying restart circuit makes it possible to lock the inverter onto a rotating motor. In particular used with drives that 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. In this process, the inverter energises the motor starting from $n_{\max}$ and searches the speed range for the motor speed, without however applying any significant torque to it. The direction of rotation at the start of the search is determined by the sign of the active setpoint n_{setp} (n_1 , fixed setpoints, ...). The search speed depends on the motor type and is set by the startup process. Possible range: 400 rpm 1500 rpm



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Figure 85: VFC & flying start function



If the inverter does not detect a flying start point, it assumes a motor at rest and starts the integrator at $n = 0$. This process is characterized by braking of the motor to $n = 0$ and subsequent acceleration to n_{setpt} . This behavior may arise in particular with very low resistance motors in the speed range below $n=300$ rpm (4-pole motor).



Danger with hoists

Possible consequences: Severe or fatal injuries.

Never use the flying restart function with hoist applications!



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

VFC n-control

VFC n-control in 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:

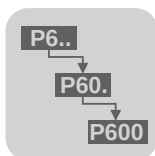
- RS422 / TTL incremental encoder
- High resolution incremental encoder with sinusoidal tracks 1 V_{SS}

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

- Increase in the static control accuracy and greater control dynamics.
- Hold control: By programming a binary input to “/Hold control” (P60x Binary inputs basic unit / P61x Binary inputs option) a position-controlled standstill of the motor can be accomplished under load. Set the hold controller with P210 P gain hold controller.
- Synchronous operation is possible with DRS11B.

The startup function of 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	$I_{\text{max}} (\text{inverter}) = 150 \% I_{\text{motor}}$
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	MOTOR & REGENERATIVE
P501 Delay time 1 / P503 Delay time 2	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
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 manually!
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data



Parameters

Operating modes

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 Acceleration feedforward gain	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Acceleration feedforward filter	Position controller gain for the hold control function
P210 P gain hold controller	
P910 Gain X controller	Position controller gain for IPOS ^{plus} ® (positioning mode)
P130 ... P133 Ramp t11	Setting in accordance with specified data
P136 Stop ramp t13	
P137 Emergency ramp t14	

Setting the parameter P820 4-quadrant operation 1 will be ignored; 4-quadrant operation is always active.

VFC n-control & group

VFC n-control & group in parameter set 1 only.

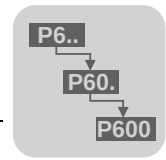
Set this mode if a group of asynchronous motors is to be operated on one inverter. All motors in the group must have the same rated voltage, rated frequency and rated power. One motor in the group is operated with speed control and must be equipped with an incremental encoder connected to X15. The following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

- RS422 / TTL incremental encoder
- High resolution incremental encoder with sinusoidal tracks 1 V_{SS}

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

The startup function of 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	$I_{\max}(\text{inverter}) = 150 \% \Sigma I_{N\_mot}$
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	MOTOR & REGENERATIVE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	With SEW motors: Setting in accordance with motor data.
P732 Brake application time 1	With non-SEW motors: Set the correct value manually!
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 Acceleration feedforward gain	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Acceleration feedforward filter	Position controller gain for the hold control function
P210 P gain hold controller	
P910 Gain X controller	Position controller gain for IPOS ^{plus} ® (positioning mode)
P130 ... P133 Ramp t11	Setting in accordance with specified data
P136 Stop ramp t13	
P137 Emergency ramp t14	

Setting the parameter P820 4-quadrant operation 1 will be ignored; 4-quadrant operation is always active.

VFC n-control & Synch

VFC n-control & Sync in parameter set 1 only.

Set on the slave drives if a group of asynchronous motors should be operated at a synchronous angle in relation to one another or with an adjustable proportional ratio. Refer to the "MDX61B - Synchronous Operation Board DRS11B" manual for a detailed description of synchronous operation. This manual is available from SEW-EURODRIVE.

VFC n-control & IPOS

VFC n-control & IPOS in 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-EURODRIVE.

CFC

CFC in parameter set 1 only.

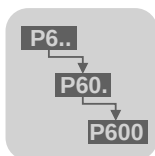
CFC operating mode makes it possible to operate an asynchronous motor with real servo properties, i.e. high control dynamics, very good smooth running properties and controlled operation even when at a standstill. It is achieved because the CFC procedure enables direct control over the magnetic flux 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:

- RS422 / TTL incremental encoder
- High resolution incremental encoder with sinusoidal tracks 1 V_{SS}

SEW-EURODRIVE recommends high-resolution incremental encoders with a PPR count of 1024. These encoders achieve the best possible control characteristics.



P324 Slip compensation 1, P321 Boost 1 and P322 IxR compensation are ineffective.



Parameters

Operating modes

The SHELL startup function requires the motor type to be entered (SEW motor). No start-up can be performed with the DBG60B keypad in CFC mode. The following parameters are set by default (parameter set 1):

Settings after the startup function	
P303 Current limit 1	$I_{\max} (\text{inverter}) = 150 \% I_{\text{motor}}$
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	MOTOR & REGENERATIVE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
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 Acceleration feedforward gain	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Acceleration feedforward filter	Position controller gain for the hold control function
P210 P gain hold controller	
P910 Gain X controller	Position controller gain for IPOS ^{plus} ® (positioning mode)
P130 ... P133 Ramp t11	Setting in accordance with specified data
P136 Stop ramp t13	
P137 Emergency ramp t14	

Setting the parameter P820 4-quadrant operation 1 will be ignored; 4-quadrant operation is always active.

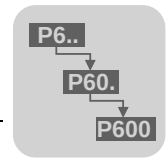
CFC & M-control

CFC & M-control in parameter set 1 only.

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.

In P16x Fixed setpoints 1 you can enter the torque values directly in [% I_N]. If setpoints are entered via analog input, the set processing P11x Analog input AI1 applies to torque control as well.



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 parameter description P500.
- If P500 Speed monitoring 1 set to OFF, the drive reacts as follows when exceeding or falling below P302 Maximum speed 1 :
 - 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 $-n_{min} \dots n \dots n_{min}$.
- The current is always limited to P303 Current limit 1.

Settings after the startup function	
P303 Current limit 1	$I_{max} \text{ (inverter)} = 150 \% I_{motor}$
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	MOTOR & REGENERATIVE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
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

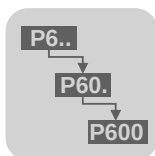
Settings after the startup function of the torque controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-control.	
P202 Acceleration feedforward gain	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Acceleration feedforward filter	Position controller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

Setting the parameter P820 4-quadrant operation 1 will be ignored; 4-quadrant operation is always active.

CFC & IPOS

CFC & IPOS in 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-EURODRIVE.



Parameters

Operating modes

CFC & Sync

CFC & Sync in parameter set 1 only.

Set on the slave drives if a group of asynchronous motors should be operated at a synchronous angle in relation to one another or with an adjustable proportional ratio. Refer to the "MDX61B - Synchronous Operation Board DRS11B" manual for a detailed description of synchronous operation. This manual is available from SEW-EURODRIVE.

SERVO

SERVO in parameter set 1 only.

SERVO operating mode makes it possible to operate a synchronous motor (servomotor) with a permanent field. The motor must be equipped with a resolver or a HIPERFACE® encoder.

The SHELL startup function requires the motor type to be entered (SEW motor). Startup cannot be performed with the DBG60B 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) = Max. motor current at standstill
Torque limit	The value of the motor torque can be limited. The maximum value is determined by the motor type. P303 Current limit 1 Do not change!
P302 Maximum speed 1	Rated motor speed (2000 rpm, 3000 rpm, 4500 rpm)
P301 Minimum speed 1	0 rpm
P500 Speed monitoring 1	MOTOR & REGENERATIVE
P501 Delay time 1	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPOINT
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 Acceleration feedforward gain	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Acceleration feedforward filter	Position controller gain for the hold control function
P210 P gain hold controller	
P910 Gain X controller	Position controller gain for IPOS ^{plus} ® (positioning mode)
P130 ... P133 Ramp t11	Setting in accordance with specified data
P136 Stop ramp t13	
P137 Emergency ramp t14	

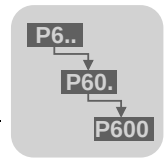
Setting the parameter P820 4-quadrant operation 1 will be ignored; 4-quadrant operation is always active.

SERVO & M-control

SERVO & M-control in parameter set 1 only.

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.



Enter the torque values directly in [% I_N] as fixed setpoints (P16x Fixed setpoints 1). If setpoints are entered via analog input, the set processing (P11x Analog input AI1) applies to torque control as well.

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 parameter description P500.
- If P500 Speed monitoring 1 set to OFF, the drive reacts as follows when exceeding or falling below P302 Maximum speed 1 :
 - 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 $-n_{min} \dots n \dots n_{min}$.
- The current is always limited to P303 Current limit 1.

SERVO & IPOS

SERVO & IPOS in 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-EURODRIVE.

SERVO & Sync

SERVO & Sync in parameter set 1 only.

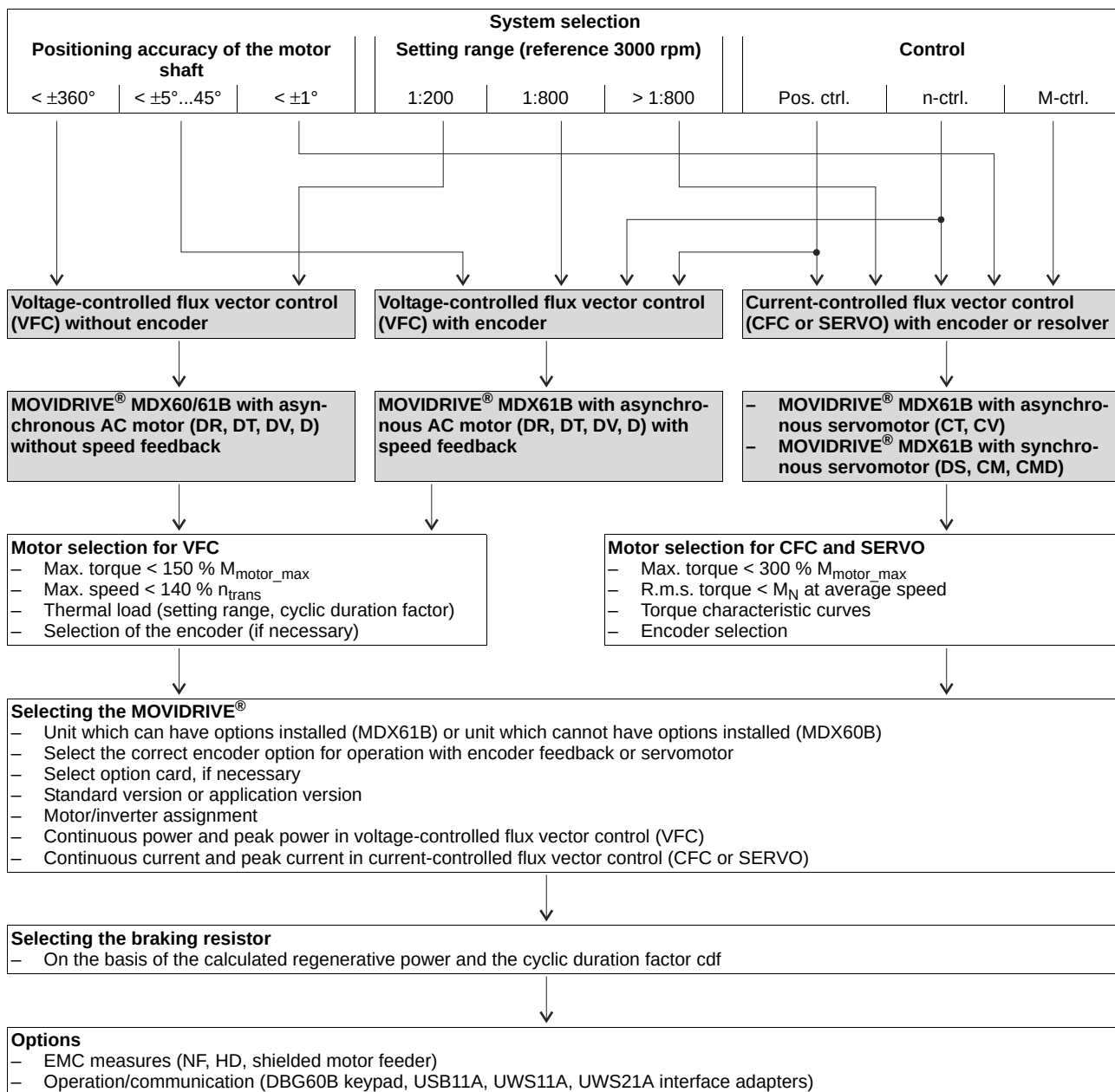
Set on the slave drives if a group of servomotors should be operated at a synchronous angle in relation to one another or with an adjustable proportional ratio. Refer to the "MDX61B - Synchronous Operation Board DRS11B" manual for a detailed description of synchronous operation. This manual is available from SEW-EURODRIVE.



5 Project Planning

5.1 Schematic procedure

Drive properties The required drive properties are the main factors determining the selection of the inverter. The following figure is intended to provide assistance.



Key

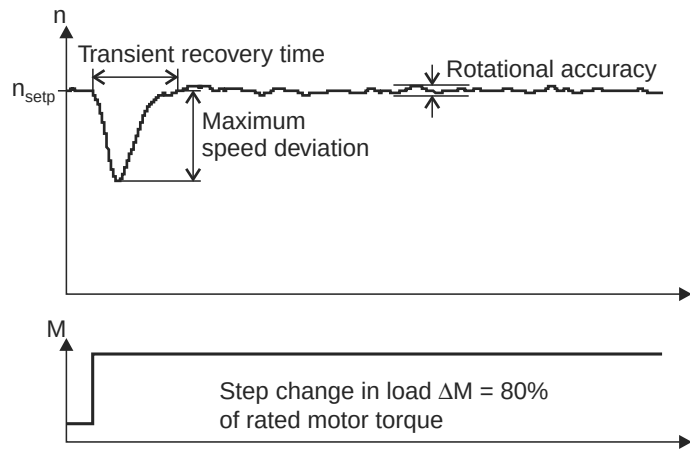
Pos. ctrl.	= Positioning control
n-ctrl.	= Speed control
M-ctrl.	= Torque control
VFC	= Voltage-controlled flux vector control (voltage flux control)
CFC	= Current-controlled flux vector control (current flux control) for asynchronous servomotors
SERVO	= Current-controlled flux vector control for synchronous servomotors
M_N	= Rated torque of the motor
n_{trans}	= Rated speed (transition speed) of the motor



5.2 Control characteristics

Characteristic features

MOVIDRIVE® drive inverters achieve excellent control characteristics thanks to their optimally adapted control algorithms. The following characteristic features apply to operation with four-pole motors and synchronous servomotors from SEW-EURODRIVE.



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Figure 86: Features for the control characteristics

The following values apply to MOVIDRIVE® inverters in combination with motors of the same power:

MOVIDRIVE® type	Continuous speed range $n_{\max} = 3000 \text{ rpm}$	Static control accuracy ¹⁾ based on $n_{\max} = 3000 \text{ rpm}$
MDX60/61B, VFC without encoder	1:200	0.30%
MDX61B, VFC with TTL sensor (1024 inc.)	1:800	0.01%
MDX61B, CFC with TTL sensor (1024 inc.)	1:3000	0.01%
MDX61B, CFC with sin/cos encoder	1:5000	0.01%
MDX61B, SERVO with resolver	> 1:3000	0.01%
MDX61B, CFC/SERVO with HIPERFACE® encoder	1:5000	0.01%

1) = Deviation from actual speed value - speed mean value to setpoint speed

The defined control characteristics are maintained in the specified speed range.

Control response

The following table shows the differences in control characteristics between VFC without encoder, VFC with encoder, and CFC (always with encoder) operating modes.

Data

- Setpoint speed $n_{\text{set}} = 1000 \text{ rpm}$
- Step change in load $\Delta M = 80 \%$ of rated motor torque
- Torsion-free load with mass inertia ratio $J_L/J_M = 1.8$

MOVIDRIVE® MDX60/61B	Transient recovery time in relation to the VFC value w/o encoder	Max. speed deviation at $\Delta M = 80 \%$, based on $n = 3000 \text{ rpm}$	True-running accuracy at $M = \text{const.}$ based on $n = 3000 \text{ rpm}$
VFC without encoder	100 %	1.8 %	$\leq 0.20 \%$
VFC with TTL sensor (1024 inc.)	90 %	1.5 %	$\leq 0.17 \%$
CFC with TTL sensor (1024 inc.)	35 %	1.0 %	$\leq 0.07 \%$
CFC with sin/cos encoder	25 %	0.7 %	$\leq 0.03 \%$



5.3 Description of Applications

Selecting the inverter

The large number of different drive applications can be divided into five categories. The five categories are listed below together with the recommended SEW inverter. 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® MDX60/61B without option in VFC operating mode
- High requirements with regard to the setting range (motor with TTL, sin/cos or HIPERFACE® encoder)
 - MOVIDRIVE® MDX61B with DEH11B option in the VFC-n-CONTROL operating mode



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® MDX60/61B without option in VFC operating mode
- High requirements with regard to the setting range (motor with TTL, sin/cos or HIPERFACE® encoder)
 - MOVIDRIVE® MDX61B with DEH11B option in the VFC-n-CONTROL operating mode
- High dynamic requirements (asynchronous or synchronous servomotor)
 - Asynchronous or synchronous servomotor with HIPERFACE® encoder: MOVIDRIVE® MDX61B with DEH11B option in CFC or SERVO operating mode
 - Synchronous servomotor with resolver: MOVIDRIVE® MDX61B with DER11B option in SERVO operating mode



3. Static load, e.g. hoists; mainly steady high static load with overload peaks.

- Low requirements with regard to the setting range (motor without encoder)
 - MOVIDRIVE® MDX60/61B without option in VFC operating mode
- High requirements with regard to the setting range (motor with encoder)
 - Motor with TTL, sin/cos or HIPERFACE® encoder: MOVIDRIVE® MDX61B with DEH11B option in VFC-n-CONTROL, CFC or SERVO operating modes
 - Synchronous servomotor with resolver: MOVIDRIVE® MDX61B with DER11B option in SERVO operating mode



4. Load falling in inverse proportion to speed, e.g. winding or coil drives.

- Torque control (asynchronous or synchronous servomotor)
 - Asynchronous or synchronous servomotor with HIPERFACE® encoder: MOVIDRIVE® MDX61B with DEH11B option in CFC&M-CONTROL or SERVO&M-CTRL operating mode.
 - Synchronous servomotor with resolver: MOVIDRIVE® MDX61B with DER11B option in SERVO&M-CTRL. operating mode.

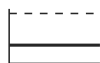


5. Variable torque load, e.g. fans and pumps.

- Low load at low speeds and no load peaks, 125 % utilization ($I_D = 125 \% I_N$) (motor without encoder)
 - MOVIDRIVE® MDX60/61B without option in VFC operating mode.



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 travel 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 229.

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.

5

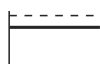
Thermal considerations

In contrast to trolleys, hoists require approx. 70 to 90 % of the rated motor torque assuming constant speed upwards or downwards and the standard configuration.

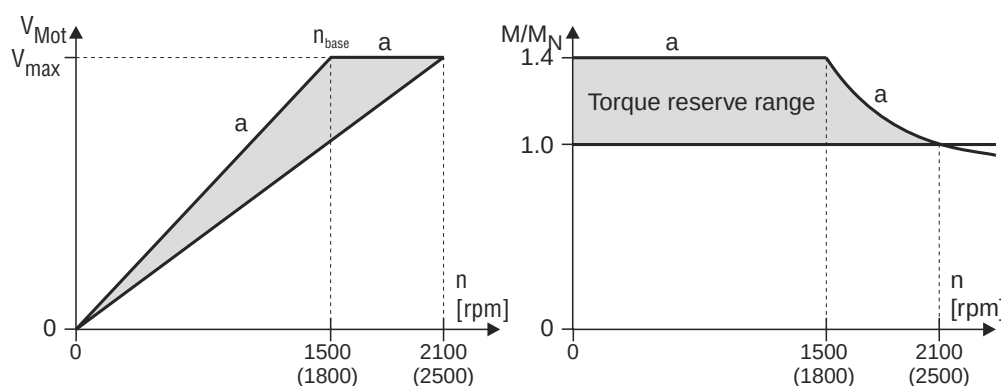
Starting torque

The highest operating torque is required for acceleration with maximum load in the UPWARDS hoisting direction.

VFC&HOIST



The 4-pole gearmotor should always be selected for a maximum speed of 2100 rpm (70 Hz) with a transition speed of 1500 rpm (50 Hz) and 2500 rpm (83 Hz) with 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), because 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). Further advantages are that the speed range is greater and the self-cooling of the motor more powerful.



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Figure 87: a = Recommended voltage/speed characteristic curve and resultant torque profile

The motor power for hoists is selected according to the load type.

- S1 (100 % cdf.): Motor power of next higher motor type than the selected inverter power, e.g. for lengthy upwards travel or continuous elevators.
- S3 (40 % cdf.): Motor power according to the selected inverter power.

The hoist function on the inverter should be activated regardless of the above guidelines. See also "Motor selection examples" on page 229.



Project Planning

Description of Applications

Encoder monitoring



MOVIDRIVE[®] has encoder monitoring for TTL sensors, sin/cos and HIPERFACE[®] encoders.

For speed-controlled hoist drives, SEW-EURODRIVE recommends using TTL sensors, sin/cos encoders or HIPERFACE[®] encoders and activating encoder monitoring.

Control

The control for the hoist must be designed so that the direction of rotation of the drive can only be changed when it is at a standstill.

Variable torque load (pump, fan)



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 rated output current at $f_{PWM} = 4 \text{ kHz}$) of the MOVIDRIVE[®]. This means the MOVIDRIVE[®] unit can operate a motor with the power of the next higher motor type. See also "Motor selection examples" on page 229.



5.4 Motor selection for asynchronous AC motors (VFC)

Basic recommendations

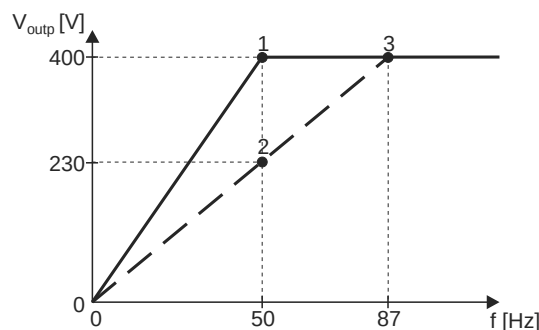
Observe the following recommendations for selecting the motor:

- 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 group drives on one inverter. The series connection of TH contacts (NC contacts) is not subject to any restriction if joint monitoring is provided.
- For group drives, we recommend that the motors should not differ from one another by more than 3 motor types.
- 4-pole motors should be preferred. This recommendation particularly applies to gear-motors that are operated with a high oil filling level due to 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 operation, e.g. positioning drive with 1:20 speed range in S3 operation.
- 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® MDX61B with HIPERFACE® encoder card type DEH11B option is required for speed control. The motor must then be equipped with an encoder (HIPERFACE®, sin/cos or TTL).

Voltage/frequency characteristics

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.

The following figure shows an example of the voltage/frequency characteristic curves of an asynchronous AC motor 230/400 V, 50 Hz.



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Figure 88: Voltage/frequency characteristics of the asynchronous motor

- 1 Star connection; 400 V, 50 Hz
- 2 Delta connection: 230 V, 50 Hz
- 3 Delta connection: 400 V, 87 Hz



Project Planning

Motor selection for asynchronous AC motors (VFC)

The inverter output voltage V_{out} is limited by the connected supply voltage. The "rated supply 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 rated voltage than the power supply of the inverter. The maximum permitted motor voltage should be entered. Furthermore, make sure that the "rated supply voltage" input value is less than or equal to the supply voltage of the inverter.

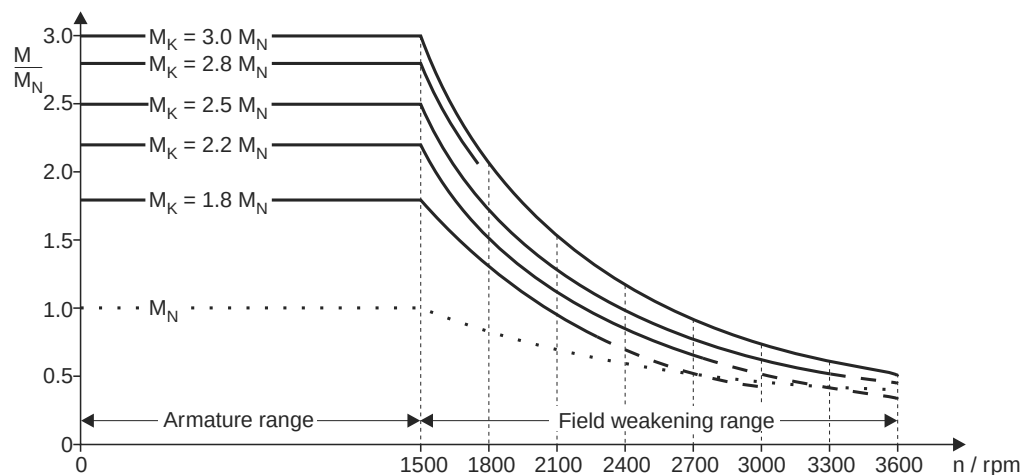
Speed/torque characteristics

The field weakening range starts when the set maximum output voltage of the inverter is reached. Consequently, the speed range of the motor is divided into two ranges:

- Basic speed range → constant torque with increasing power
- Field weakening range → constant power with an inversely proportionate decrease in torque.

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® stall protection limits the speed when the maximum possible torque is reached.

The following figure shows an example of different motor characteristic curves in the basic speed range and in the field weakening range.



01729BEN

Figure 89: Quadratically falling breakdown torque

With gearmotors, the maximum motor speed depends 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})

Observe the following notes for dynamic applications in which the inverter power is significantly greater than the motor power:

- 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). For dynamic applications, this parameter must be set manually to a higher value.
- The startup function sets the slip compensation parameter (P324/P334) to the rated 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 rated motor torque. The slip compensation parameter (P324) must be increased accordingly for greater torques.



Set parameter P324 "Slip compensation" to **max. 130 % of the rated slip of the motor for stable operation.**

Combinations with
 $P_{inverter}$ greater than $4 \times P_{motor}$

For inverter/motor combinations in which the inverter power is greater than four times the motor power, special measures must be taken during project planning and startup. The reason for this is the large difference between the rated inverter current and the rated motor current.

Therefore, note the following measures:

- Perform 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.
- If this measure does not suffice, start up the motor in VFC & GROUP or V/f operating mode. In these operating modes, the inverter simulates a supply system with constant voltage and frequency with a constant V/f ratio.


Motor selection in delta/star connection (AC 230/400 V / 50 Hz)

Motors for AC 380 V / 60 Hz can also be allocated on the basis of this selection table.

P _{max} [kW (HP)] for operation on MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)						
Connection	W / AC 400 V ¹⁾				Δ / AC 230 V ²⁾	
Cooling	Own		Forced		Own	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 ⁴⁾	Rated power P _n [kW]	P = P _{reduced} [kW] MDX ⁶⁾ 60/61B...-5_3		P = P _n [kW] MDX ⁶⁾ 60/61B...-5_3	P = P _{increased} ⁵⁾ [kW] MDX ⁶⁾ 60/61B...-5_3	
DR63S4	0.12				0.18	
DR63M4	0.18			0.18	0.25	0005
DR63L4	0.25	0.18	0005	0.25	0.37	
DT71D4	0.37	0.25		0.37	0.55	0005/0015
DT80K4	0.55	0.37	0005/0015	0.55	0.75	0008/0015
DT80N4	0.75	0.55		0.75	1.1	0011/0015
DT90S4	1.1	0.75	0008/0015	1.1	1.5	0014/0015
DT90L4	1.5	1.1	0011/0015	1.5	2.2	0022
DV100M4	2.2	1.5	0014/0015	2.2	3.0	0030
DV100L4	3.0	2.2	0022	3.0	4.0	0040
DV112M4	4.0	3.0	0030	4.0	5.5	0055
DV132S4	5.5	4.0	0040	5.5	7.5	0075
DV132M4	7.5	5.5	0055	7.5	9.2	
DV132ML4	9.2	7.5	0075	9.2	11	0110
DV160M4	11	9.2		11	15	0150
DV160L4	15	11	0110	15	18.5	0220
DV180M4	18.5	15	0150	18.5	22	0300
DV180L4	22	18.5		22	30	
DV200L4	30	22	0220	30	37	0370
DV225S4	37	30	0300	37	45	0450
DV225M4	45	37	0370	45	55	0550
DV250M4	55	45	0450	55	75	0750
DV280S4	75	55	0550	75	90	0900
D280M4	90	75	0750	90	110	1100
D315S4	110	90	0900	110	132	1320
D315M4	132	110	1100	132		
D315M4a	160	132	1320			

1) Also applies to motors with AC 460 V or AC 500 V rated voltage and for AC 400/690 V motors in Δ connection.

2) Also applies to motors with AC 266 V or AC 290 V rated voltage.

3) Without speed control: f_{min} = 0.5 Hz

4) In load type S3 (40 % c.d.f.), the motor may 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).

5) P_{increased} means that the motor is operated at the power of the next larger motor (one frame size), rather than with the $\sqrt{3}$ -fold power.

6) In each application, the units listed here permit intermittent loads of up to two times the rated load with size 0 (0005 ... 0014) and up to 1.5 times the rated load with sizes 1 ... 6 (0015 ... 1320). 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 in the VFC operating modes at f_{PWM} = 4 kHz.



Examples for motor selection delta/star AC 230/400 V

Trolley drive



Constant load with overload (acceleration) and low load when in motion:

- $P_{\text{travel}} = 1.3 \text{ kW}$
- $P_{\text{max}} = 13 \text{ kW}$
- $n_{\text{min}} = 270 \text{ rpm}$, setting range 1:10
- $n_{\text{max}} = 2610 \text{ rpm}$

In inverter mode with adapted power ($P = P_n$), the motor can output 150 % of its listed power during the acceleration phase. Consequently:

$$P_{\text{Mot}} = P_{\text{max}} : 1.5 = 13 \text{ kW} : 1.5 = 8.67 \text{ kW}$$

A DV132M4 motor with delta connection ($P_n = 9.2 \text{ kW}$) is selected.

According to the selection table (→ page 228) a MOVIDRIVE® MDX61B0110 ($P = P_n$) should be selected.

Hoist drive



High constant load with intermittent overload (acceleration):

- $P_{\text{max}} = 26 \text{ kW}$
- $P_{\text{sustained}} = 20 \text{ kW}$
- Speed range 1:15, low speed only for positioning
- Brake applied when stationary
- Load type S3 (40 % c.d.f.)

The inverter can yield 150 % of its rated current during acceleration. Consequently, a MOVIDRIVE® MDX61B0220 is selected.

In view of the load type (S3, 40 % c.d.f.), the selection table allocates motor type DV180L4 ($P_n = 22 \text{ kW}$) in a star connection.

For more information, see → Sec. Project planning for hoists

Fan/pump



Variable torque load with the following power values:

- $P_{\text{max}} = 4.8 \text{ kW}$
- $n_{\text{max}} = 1400 \text{ rpm}$, 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 ($P_n = 5.5 \text{ kW}$) is adequate.

According to the selection table, a MOVIDRIVE® MDX61B0055 ($P = P_n$) should be selected. However, the inverter can be operated with an increased output power because this case involves a variable torque load without overload. Consequently, a MOVIDRIVE® MDX61B0040 is sufficient.


Motor selection in double-star/star connection (AC 230/460 V / 60 Hz)

P _{max} [kW (HP)] for operation on MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)						
Connection	W / AC 460 V			WW / AC 230 V		
Cooling	Own	Own	Forced	Own	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	300 - 1800	0 - 1800	300 - 3600	0 - 3600	
Setting range	1:15	1:6	≥ 1:15	1:12	≥ 1:20	
Motor type	Rated power P _n [kW]	P = P _{reduced} [kW] With MDX ³⁾ 60/61B...-5_3		P = P _n [kW] With MDX ³⁾ 60/61B...-5_3		P = P _{increased} ²⁾ [kW] With MDX ³⁾ 60/61B...-5_3
DR63S4	0.12					0.18
DR63M4	0.18			0.18	0005	0.25
DR63L4	0.25	0.18	0005	0.25		0.37
DT71D4	0.37	0.25	0005/0015	0.37	0005/0015	0.75
DT80K4	0.55	0.37		0.55		1.1
DT80N4	0.75	0.55		0.75	0008/0015	1.5
DT90S4	1.1	0.75	0008/0015	1.1	0011/0015	2.2
DT90L4	1.5	1.1	0011/0015	1.5	0014/0015	3.0
DV100M4	2.2	1.5	0014/0015	2.2	0022	4.0
DV100L4	3.7	2.2	0022	3.0	0030	5.5
DV112M4	4.0	3.0	0030	4.0	0040	7.5
DV132S4	5.5	4.0	0040	5.5	0055	9.2
DV132M4	7.5	5.5	0055	7.5	0075	11
DV132ML4	9.2	7.5	0075	9.2	0110	15
DV160M4	11	9.2	0110	11		18.5
DV160L4	15	11		15	0150	22
DV180M4	18.5	15	0150	18.5	0220	30
DV180L4	22	18.5	0220	22		37
DV200L4 ⁴⁾	30	22		30	0300	45
DV225S4 ⁴⁾	37	30	0300	37	0370	55
DV225M4 ⁴⁾	45	37	0370	45	0450	75
DV250M4 ⁵⁾	55	45	0450	55	0550	90
DV280S4 ⁵⁾	75	55	0550	75	0750	110
D280M4 ⁵⁾	90	75	0750	90	0900	132
D315S4	110	90	0900	110	1100	
D315M4	132	110	1100	132	1320	
D315M4a	160	132	1320			

1) 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 (one frame size), rather than with the $\sqrt{3}$ -fold power.

3) In each application, the units listed here permit intermittent loads of up to two times the rated load with size 0 (0005 ... 0014) and up to 1.5 times the rated load with sizes 1 ... 6 (0015 ... 1320). 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 in the VFC operating modes at f_{PWM} = 4 kHz.

4) Maximum permitted motor speed n_{max} = 3000 rpm

5) Maximum permitted motor speed n_{max} = 2600 rpm



Motor selection in delta connection type (AC 230 V / 50 Hz)

P _{max} [kW (HP)] for operation on MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)					
Connection		Δ / AC 230 V			
Cooling		Own		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	
Motor type ²⁾	Rated power P _n [kW]	P = P _{reduced}		P = P _n	
		[kW]	With MDX ³⁾ 61B...-2_3	[kW]	With MDX ³⁾ 61B...-2_3
DT71D4	0.37	0.25	0015	0.37	0015
DT80K4	0.55	0.37		0.55	
DT80N4	0.75	0.55		0.75	
DT90S4	1.1	0.75		1.1	
DT90L4	1.5	1.1		1.5	
DV100M4	2.2	1.5	0022	2.2	0022
DV100L4	3.0	2.2		3.0	0030
DV112M4	4.0	3.0	0030	4.0	0040
DV132S4	5.5	4.0	0040	5.5	0055
DV132M4	7.5	5.5	0055	7.5	0075
DV132ML4	9.2	7.5	0075	9.2	0110
DV160M4	11	9.2	0110	11	
DV160L4	15	11		15	0150
DV180M4	18.5	15	0150	18.5	0220
DV180L4	22	18.5	0220	22	0300
DV200L4	30	22		30	
DV225S4	37	30	0300	-	-

1) Without speed control: f_{min} = 0.5 Hz

2) In load type S3 (40 % c.d.f.), the motor may 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 units listed here permit intermittent loads of up to 1.5 times the rated 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 in the VFC operating modes at f_{PWM} = 4 kHz.


Motor selection in double-star connection type (AC 230 V / 60 Hz)

P _{max} [kW (HP)] for operation on MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)				
Connection	WW / AC 230 V			
Cooling	Own		Own	Forced
f _{min} - f _{max} [Hz]	6 - 90		10 - 60	0 - 60 ¹⁾
n _{min} - n _{max} [rpm]	180 - 2700		300 - 1800	0 - 1800
Setting range	1:15		1:6	≥ 1:15
Motor type	Rated power P _n [kW]	P = P _{reduced}		P = P _n
		[kW]	With MDX ²⁾ 61B...-2_3	[kW] With MDX ²⁾ 61B...-2_3
DT71D4	0.37	0.25	0015	0.37
DT80K4	0.55	0.37		0.55
DT80N4	0.75	0.55		0.75
DT90S4	1.1	0.75		1.1
DT90L4	1.5	1.1		1.5
DV100M4	2.2	1.5		2.2
DV100L4	3.7	2.2	0022	3.0
DV112M4	4.0	3.0	0030	4.0
DV132S4	5.5	4.0	0040	5.5
DV132M4	7.5	5.5	0055	7.5
DV132ML4	9.2	7.5	0075	9.2
DV160M4	11	9.2	0110	11
DV160L4	15	11		15
DV180M4	18.5	15	0150	18.5
DV180L4	22	18.5	0220	22
DV200L4	30	22		30
DV225S4	37	30	0300	-

1) Without speed control: f_{min} = 0.5 Hz

2) The units listed here permit intermittent loads of up to 1.5 times the rated 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 in the VFC operating modes at f_{PWM} = 4 kHz.



5.5 Motor selection for asynchronous servomotors (CFC)



The torque limit (M_{limit}) is set automatically by the startup function of the MOVITOOLS® operating software. Do not increase this automatically set value!

We recommend always using the latest version of MOVITOOLS® for startup. The latest MOVITOOLS® version can be downloaded from our homepage (www.sew-euro-drive.com).

Motor characteristics

The drive in CFC operating modes is characterized by its ability to control torque directly and rapidly. This means it achieves a highly dynamic overload capacity (up to $3 \times M_N$) 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 to know exact data about the motor connected to calculate the motor model. These data are made available by the MOVITOOLS® operating 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 characteristics

M_N is determined by the motor. M_{max} and n_{trans} depend on the motor/inverter combination. You can refer to the motor selection tables for CFC mode for the values of n_{trans} , M_N and M_{max} .

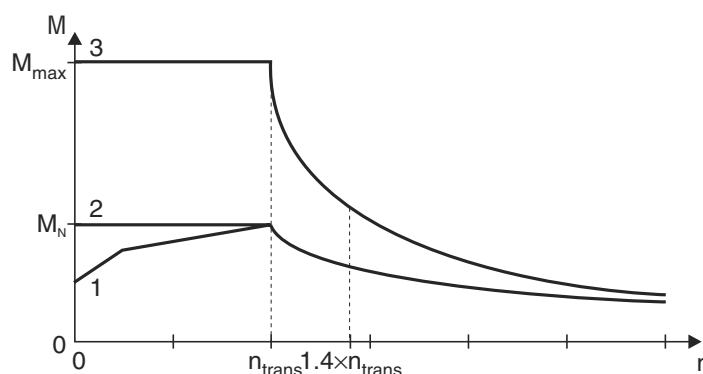


Figure 90: Speed/torque characteristic curve in CFC operating mode

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- 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, for example in CFC & M-CONTROL mode. In particular in the case of large motors with a slip frequency ≤ 2 Hz, you have to refer to the diagrams in Sec. "Load capacity of the units at low output frequencies" to check whether the inverter can supply the current. Also check whether the thermal characteristics of the motor are suitable (forced cooling fan) for this. For the magnetization current I_d , refer to the motor tables (CT/CV → page 237, DT/DV/D → page 242).

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 carried out in accordance with the following requirements:

1. Effective torque demand at the average speed of the application.

$$M_{\text{eff}} < M_{N\_Mot}$$

The point must lie below the characteristic curve for the continuous torque (Figure 90, curve 2). If this operating point lies below the characteristic curve for forced cooling (Figure 90, curve 1), then no forced cooling is required.

2. Maximum torque required across the speed characteristic.

$$M_{\text{max}} < M_{\text{dyn\_Mot}}$$

This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIDRIVE® combination (Figure 90, 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. 110 % of the continuous rated torque of the motor; also, the input speed for the gear unit connected to the motor output will still be less than 3000 1/min with delta connection.

$$n_{\text{max}} < 1.4 \times n_{\text{trans}} < 3000 \text{ rpm}$$

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 ($n \leq n_{trans}$). 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 ($\rightarrow$ P11_, parameter description) also remain in effect. The fixed setpoints (P16_, P17_) can be entered in the units [rpm] or [%I_{N_inverter}] as required ($\rightarrow$ MOVITOOLS®).

The following relationship applies between the units:

3000 rpm = 150 % rated inverter current

The torque on the output shaft of the motor can then be calculated for the basic speed range ($n \leq n_{trans}$) 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:

$$M = k_T \times 1.5 \times I_{n\_inverter} \times \frac{Setpoint}{3000 \text{ rpm}}$$

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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 values. For the values of the torque constants k_T and the motor-specific values M_n and I_{q_n}, refer to the motor tables (DT/DV/D $\rightarrow$ page 242, CT/CV $\rightarrow$ page 236).

In addition to the current I_q for creating the torque, the inverter also needs to supply the magnetization current I_d. The actual inverter output current I_{tot} can be calculated using the following formulae:

Specification of a setpoint for the motor torque in %I_{N_inverter}:

$$I_{tot} = \sqrt{(Setpoint \times I_{n\_inverter})^2 + I_{d\_N}^2}$$

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Specification of a setpoint for the motor torque in rpm:

$$I_{tot} = \sqrt{\left(Setpoint \times 1.5 \times I_{n\_inverter} \times \frac{1}{3000 \text{ rpm}} \right)^2 + I_{d\_N}^2}$$

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I_{q_n} = Nominal value of the torque-generating current according to the motor table

I_{d_n} = Nominal value of the magnetization current according to the motor table



Project Planning

Motor selection for asynchronous servomotors (CFC)

CT/CV asynchronous servomotors

SEW-EURODRIVE offers CT/CV asynchronous servomotors especially for operation with MOVIDRIVE® 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.

Division into speed classes

CT/CV motors are available in four speed classes. This ensures optimum utilization of torque and speed.

Sin/cos encoder as standard

CT/CV motors are equipped as standard with a high-resolution sin/cos encoder (ES1S, ES2S, EV1S).

TF or TH motor protection as standard

The winding temperature of the three motor phases is monitored using thermistors (TF). The thermistor can be connected to the TF/TH input of MOVIDRIVE®. The temperature is then monitored by MOVIDRIVE®; no additional monitoring unit is required.

Bimetallic switches (TH) can also be used instead of thermistors. The bimetallic switches are also connected to the TF/TH input.

Thermal classification F as standard

CT/CV motors are designed with thermal classification F materials.

Reinforced pinion spigot

CT/CV motors can generate up to three times their rated motor torque in dynamic operation. For this reason, these motors are equipped with reinforced pinion spigots for direct mounting to gear units to enable them to transmit the high torque levels reliably.



Either DT/DV/D motors or CT/CV motors can be used in CFC mode. SEW-EURODRIVE recommends using CT/CV motors to achieve optimum benefit from the CFC mode.

	Advantage	Disadvantage
CFC mode with DT/DV/D motor Motor selection → page 244	Standard motor version	Slower transition speed than the CT/CV motor.
		The power yield of the motor is less than the rated motor power.
		In terms of the power yield, the mass inertia is greater than that of the CT/CV motors.
		In some inverter/motor combinations, the maximum torque is limited by the mechanical strength.
CFC mode with CT/CV motor Motor selection → page 238	Higher transition speed than DT/DV/D motor.	Not an IEC standard motor
	Usually with a power yield one motor type higher.	
	Lower mass inertia in relation to the power yield.	Higher current consumption due to the higher power yield, therefore a larger inverter must be assigned.
	Motor is designed for dynamic operation.	



Motor table CT/CV

n_N [1/ min]	Motor	M_N [Nm]	I_N [A]	$I_{q,n}$ [A]	$I_{d,n}$ [A]	k_T [Nm/A]	V_N [V]	J_{Mot} [10 ⁻⁴ kgm ²]	J_{Bmot}
1200	CT71D4	2.5	1.24	1.03	0.69	2.42	340	4.6	5.5
	CT80N4	5	2.0	1.52	1.30	3.29	350	8.7	9.6
	CT90L4	10	3.5	2.95	1.89	3.39	345	34	39.5
	CV100M4	15	4.7	4.13	2.25	3.63	345	53	59
	CV100L4	26	8.9	8.30	3.21	3.13	310	65	71
	CV132S4	37	11.1	9.99	4.83	3.70	340	146	158
	CV132M4	50	15.5	14.2	6.18	3.52	340	280	324
	CV132ML4	61	17.6	16.0	7.43	3.81	345	330	374
	CV160M4	73	22.5	20.3	9.73	3.60	335	400	440
	CV160L4	95	29	25.3	14.2	3.75	330	925	1030
	CV180M4	110	34	27.7	19.7	3.97	330	1120	1226
	CV180L4	125	35	28.4	20.5	4.40	345	1290	1396
	CV200L4	200	58	52.9	23.7	3.78	330	2340	2475
1700	CT71D4	2.5	1.7	1.42	0.95	1.76	340	4.6	5.5
	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



Project Planning

Motor selection for asynchronous servomotors (CFC)

CT/CV motor selection

1. Rated speed $n_N = 1200$ rpm:

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0040-503 (sizes 0 and 1):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)							
			0005	0008	0011	0014	0015	0022	0030	0040
CT71D4	M _{max}	[Nm]	7.7	7.7						
	n _{trans}	[1/min]	428	428						
CT80N4	M _{max}	[Nm]		14.0	15.6	15.6	15.6			
	n _{trans}	[1/min]		627	550	550	550			
CT90L4	M _{max}	[Nm]				24.8	18.2	25.7	30.5	
	n _{trans}	[1/min]				794	928	781	685	
CV100M4	M _{max}	[Nm]						29.0	37.0	45.0
	n _{trans}	[1/min]						883	781	680
CV100L4	M _{max}	[Nm]							32.6	45.3
	n _{trans}	[1/min]							1062	947

Assignment of MOVIDRIVE® MDX61B0055-503 ... MDX61B0550-503 (sizes 2 ... 5):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)								
			0055	0075	0110	0150	0220	0300	0370	0450	0550
CV100L4	M _{max}	[Nm]	60.0	75.0							
	n _{trans}	[1/min]	813	675							
CV132S4	M _{max}	[Nm]	64.0	84.0	110						
	n _{trans}	[1/min]	992	915	825						
CV132M4	M _{max}	[Nm]		82.0	125	150					
	n _{trans}	[1/min]		1011	877	806					
CV132ML4	M _{max}	[Nm]			126	169	183				
	n _{trans}	[1/min]			922	819	725				
CV160M4	M _{max}	[Nm]			125	169	219				
	n _{trans}	[1/min]				909	840				
CV160L4	M _{max}	[Nm]				163	240	294			
	n _{trans}	[1/min]				1043	954	921			
CV180M4	M _{max}	[Nm]					241	320	360		
	n _{trans}	[1/min]					1050	986	1005		
CV180L4	M _{max}	[Nm]					244	324	360		
	n _{trans}	[1/min]					960	959	947		
CV200L4	M _{max}	[Nm]						326	402	494	567
	n _{trans}	[1/min]						1011	986	947	940



2. Rated speed $n_N = 1700$ 1/min:

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor		MOVIDRIVE® MDV60A...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
CT71D4	M _{max} [Nm]	7.1	7.7									
	n _{trans} [1/min]	986	890									
CT80N4	M _{max} [Nm]			13.0	15.6	12.6	15.6					
	n _{trans} [1/min]			1126	992	1150	992					
CT90L4	M _{max} [Nm]						18.1	23.6	30.5			
	n _{trans} [1/min]						1400	1280	1150			
CV100M4	M _{max} [Nm]							26.3	36.4	45.0		
	n _{trans} [1/min]							1363	1229	1145		
CV100L4	M _{max} [Nm]								32.4	43.6	56.5	75.0
	n _{trans} [1/min]								1536	1427	1299	1113
CV132S4	M _{max} [Nm]										59.0	91.0
	n _{trans} [1/min]										1470	1330
CV132M4	M _{max} [Nm]											87.4
	n _{trans} [1/min]											1484

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B0900-503 (sizes 3 ... 6):

Motor		MOVIDRIVE® MDV60A...-5_3 (AC 400/500 V units) in CFC operating modes (P700)							
		0150	0220	0300	0370	0450	0550	0750	0900
CV132S4	M _{max} [Nm]	110							
	n _{trans} [1/min]	1280							
CV132M4	M _{max} [Nm]	118	150						
	n _{trans} [1/min]	1369	1292						
CV132ML4	M _{max} [Nm]	114	166	183					
	n _{trans} [1/min]	1485	1331	1345					
CV160M4	M _{max} [Nm]	120	176	219					
	n _{trans} [1/min]	1420	1312	1254					
CV160L4	M _{max} [Nm]		170	226	278	294			
	n _{trans} [1/min]		1470	1400	1330	1395			
CV180M4	M _{max} [Nm]			226	280	345	360		
	n _{trans} [1/min]			1510	1460	1400	1504		
CV180L4	M _{max} [Nm]				259	321	360	360	
	n _{trans} [1/min]				1480	1434	1472	1664	
CV200L4	M _{max} [Nm]					345	411	513	567
	n _{trans} [1/min]					1460	1428	1382	1446



Project Planning

Motor selection for asynchronous servomotors (CFC)

3. Rated speed $n_N = 2100$ 1/min:

Assignment of MOVIDRIVE® MDX61B0008-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)												
Motor			0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
CT71D4	M _{max}	[Nm]	6.6	7.7	7.7	7.7						
	n _{trans}	[1/min]	1420	1318	1318	1318						
CT80N4	M _{max}	[Nm]			13.4	9.7	13.5	15.6				
	n _{trans}	[1/min]			1536	1754	1510	1420				
CT90L4	M _{max}	[Nm]						18.3	25.5	30.5		
	n _{trans}	[1/min]						1843	1676	1619		
CV100M4	M _{max}	[Nm]							28.4	38.1	45.0	
	n _{trans}	[1/min]							1760	1626	1580	
CV100L4	M _{max}	[Nm]								34.0	44.4	67.6
	n _{trans}	[1/min]								1978	1869	1613
CV132S4	M _{max}	[Nm]										71.6
	n _{trans}	[1/min]										1850

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
CV100L4	M _{max}	[Nm]	75.0									
	n _{trans}	[1/min]	1555									
CV132S4	M _{max}	[Nm]	96.7	110								
	n _{trans}	[1/min]	1722	1786								
CV132M4	M _{max}	[Nm]	94.8	138	150							
	n _{trans}	[1/min]	1850	1670	1696							
CV132ML4	M _{max}	[Nm]		143	183							
	n _{trans}	[1/min]		1658	1549							
CV160M4	M _{max}	[Nm]		138	183	219						
	n _{trans}	[1/min]		1792	1690	1625						
CV160L4	M _{max}	[Nm]			177	218	268	294				
	n _{trans}	[1/min]			1882	1824	1740	1779				
CV180M4	M _{max}	[Nm]				218	270	322	360			
	n _{trans}	[1/min]				1939	1894	1836	1932			
CV180L4	M _{max}	[Nm]					275	328	360			
	n _{trans}	[1/min]					1709	1670	1805			
CV200L4	M _{max}	[Nm]						329	412	498	567	
	n _{trans}	[1/min]						1830	1792	1747	1869	



4. Rated speed $n_N = 3000$ 1/min:

Assignment of MOVIDRIVE® MDX61B0011-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)							
			0014	0015	0022	0030	0040	0055	0075	0110
CT71D4	M _{max}	[Nm]	7.7	6.0	7.7					
	n _{trans}	[1/min]	2093	2380	2092					
CT80N4	M _{max}	[Nm]			9.7	12.7	15.6			
	n _{trans}	[1/min]			2566	2362	2200			
CT90L4	M _{max}	[Nm]					18.0	24.3	30.5	
	n _{trans}	[1/min]					2662	2496	2368	
CV100M4	M _{max}	[Nm]						27.1	35.2	45.0
	n _{trans}	[1/min]						2554	2432	2458
CV100L4	M _{max}	[Nm]							31.4	48.5
	n _{trans}	[1/min]							2848	2643
CV132S4	M _{max}	[Nm]								51.0
	n _{trans}	[1/min]								2740

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Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
CV100L4	M _{max}	[Nm]	65.4	75.0								
	n _{trans}	[1/min]	2425	2368								
CV132S4	M _{max}	[Nm]	69.2	101	110							
	n _{trans}	[1/min]	2650	2458	2611							
CV132M4	M _{max}	[Nm]	65.8	97.3	128	150						
	n _{trans}	[1/min]	2809	2669	2512	2451						
CV132ML4	M _{max}	[Nm]		93.5	124	152	183					
	n _{trans}	[1/min]		2765	2656	2547	2444					
CV160M4	M _{max}	[Nm]			131	161	198	219				
	n _{trans}	[1/min]			2550	2470	2368	2387				
CV160L4	M _{max}	[Nm]				155	192	228	285	294		
	n _{trans}	[1/min]				2682	2618	2554	2438	2630		
CV180M4	M _{max}	[Nm]					191	228	288	348	360	
	n _{trans}	[1/min]					2752	2707	2637	2560	2914	
CV180L4	M _{max}	[Nm]						212	268	325	360	360
	n _{trans}	[1/min]						2682	2630	2572	2854	3168
CV200L4	M _{max}	[Nm]							293	350	454	567
	n _{trans}	[1/min]							2573	2592	2534	2477

**DT/DV/D motor tables**

Characteristic values for delta/star AC 230/400 V / 50 Hz

Motor	M_N [Nm]	Mass moment of inertia J_M		Star $\star$ (AC 400 V)				Delta Δ (AC 230 V)			
		Without brake	With brake	I_n	$I_{q_n^{(1)}}$	$I_{d_n^{(1)}}$	$k_T^{(1)}$	I_n	$I_{q_n^{(1)}}$	$I_{d_n^{(1)}}$	$k_T^{(1)}$
		[10 ⁻⁴ kgm ²]		[A]	[A]	[A]	[Nm/A]	[A]	[A]	[A]	[Nm/A]
DT71D4	2.6	4.6	5.5	1.24	1.03	0.69	2.52	2.15	1.82	1.14	1.43
DT80K4	3.9	6.6	7.5	1.56	1.44	1.00	2.70	3.03	2.53	1.67	1.54
DT80N4	5.2	8.7	9.6	2.15	1.72	1.29	3.02	3.72	2.99	2.21	1.74
DT90S4	7.5	25	31	2.80	2.39	1.46	3.13	4.85	4.17	2.48	1.80
DT90L4	10.2	34	40	3.7	3.18	1.89	3.21	6.41	5.51	3.28	1.85
DV100M4	15.0	42	48	4.95	4.37	2.32	3.43	8.57	7.57	4.02	1.98
DV100L4	20.5	53	59	6.7	5.89	3.19	3.48	11.6	10.2	5.52	2.01
DV112M4	26.9	98	110	8.7	7.85	3.75	3.43	15.2	13.6	6.79	1.98
DV132S4	36.7	146	158	11.4	10.3	4.89	3.56	19.8	17.9	8.46	2.05
DV132M4	50.1	280	330	15.5	14.2	6.21	3.53	27.0	24.6	11.1	2.04
DV132ML4	61.0	330	380	18.7	17.1	7.57	3.57	32.5	29.6	13.4	2.06
DV160M4	72.9	398	448	22.5	20.3	9.70	3.59	39.0	35.1	17.0	2.08
DV160L4	98.1	925	1060	31.0	27.6	14.1	3.55	54.0	47.8	25.1	2.05
DV180M4	121	1120	1255/1520 ²⁾	38.5	33.1	19.7	3.66	67.0	57.3	34.7	2.11
DV180L4	143	1290	1425/1520 ¹⁾	46.0	40.7	21.4	3.51	80.0	70.4	38.0	2.03
DV200L4	195	2340	2475/2570 ²⁾	57.0	51.8	23.8	3.76	99.0	89.8	41.7	2.17
DV225S4	240	3010	3145/3240 ²⁾	70.0	64.5	27.2	3.72	122	112	48.4	2.14
DV225M4	292	3570	3705/3800 ²⁾	86.0	77.6	37.1	3.76	149	134	65.2	2.18
DV250M4	356	6300	6600/6730 ²⁾	102	91.7	44.7	3.88	172	159	77.7	2.24
DV280S4	483	8925	9225/9355 ²⁾	142	124	68.9	3.90	226	216	120	2.24
D280M4	580	14500	³⁾	155	147	49.2	3.95	270	255	86.1	2.27
D315S4	707	20000	³⁾	192	180	67.0	3.93	-	-	-	-
D315M4	849	24000	³⁾	235	209	106	4.06	-	-	-	-
D315M4a	1028	31000	³⁾	295	259	140	3.97	-	-	-	-

1) Applies in the basic speed range up to n_{Eck} .

2) Double disc brake

3) On request



Characteristic values for double-star/star AC 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 Δ (AC 460 V)					Double-star $\Delta\Delta$ (AC 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]		[Nm]	[A]	[A]	[A]	[Nm/A]	[Nm]	[A]	[A]	[A]	[Nm/A]
DT71D4	4.6	5.5	2.60	1.15	0.95	0.65	2.74	2.60	2.30	1.90	1.30	1.37
DT80K4	6.6	7.5	3.90	1.67	1.35	0.98	2.89	3.90	3.34	2.70	1.96	1.44
DT80N4	8.7	9.6	5.20	2.11	1.72	1.22	3.03	5.20	4.21	3.44	2.44	1.51
DT90S4	25	31	7.50	2.94	2.33	1.80	3.21	7.50	5.89	4.66	3.60	1.61
DT90L4	34	40	10.2	3.57	3.06	1.84	3.35	10.2	7.13	6.11	3.68	1.67
DT100LS4	42	48	15.0	5.00	4.47	2.25	3.34	15.0	10.1	9.00	4.50	1.66
DT100L4	53	59	20.5	7.92	7.32	3.02	3.45	20.5	15.8	14.6	6.05	1.72
DV112M4	98	110	26.9	8.20	7.47	3.37	3.60	26.9	16.4	14.9	6.74	1.80
DV132S4	146	158	36.7	11.0	10.3	3.77	3.55	36.7	22.0	20.7	7.54	1.78
DV132M4	280	330	50.0	15.9	14.3	6.87	3.46	50.1	31.8	28.7	13.7	1.77
DV132ML4	330	380	61.0	18.6	16.9	7.69	3.61	61.0	37.2	33.9	15.4	1.80
DV160M4	398	448	71.0	22.7	20.4	9.93	3.47	71.0	45.4	40.8	19.9	1.74
DV160L4	925	1060	96.0	30.7	27.4	13.7	3.51	96.0	61.3	54.8	27.5	1.75
DV180M4	1120	1255/1520 ²⁾	120	36.5	33.6	14.3	3.57	120	72.9	67.1	28.6	1.79
DV180L4	1290	1425/1520 ²⁾	130	42.7	37.6	20.2	3.46	130	85.4	75.1	40.5	1.73
DV200L4	2340	2475/2570 ²⁾	190	54.6	52.1	16.2	3.65	190	109	104	32.5	1.82
DV225S4	3010	3145/3240 ²⁾	235	67.9	64.5	21.0	3.64	235	136	129	42.0	1.83
DV225M4	3570	3705/3800 ²⁾	280	78.8	74.1	27.0	3.78	260	148	138	54.0	1.89
D250M4	7300	³⁾	356	102	95.6	36.4	3.73	356	204	191	72.8	1.86
D280S4	12000	³⁾	483	135	128	45.2	3.77	483	270	256	90.4	1.89
D280M4	14500	³⁾	580	162	153	51.7	3.79	580	324	306	103.4	1.89
D315S4	20000	³⁾	702	201	188	69.8	3.76	-	-	-	-	-
D315M4	24000	³⁾	849	246	219	111	3.87	-	-	-	-	-
D315M4a	31000	³⁾	1028	308	271	147	3.79	-	-	-	-	-

1) Applies in the basic speed range up to n_{Eck} .

2) Double disc brake

3) On request



Project Planning

Motor selection for asynchronous servomotors (CFC)

DT/DV/D motor selection in delta/star connection type (AC 230/400 V / 50 Hz)

1. Star connection Δ AC 400 V / 50 Hz or 400/690 V / 50 Hz motors in Δ connection

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
Δ AC 400 V / 50 Hz			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DT71D4	M _{max}	[Nm]	4.6										
	n _{trans}	[1/min]	826										
DT80K4	M _{max}	[Nm]	6.9	6.9									
	n _{trans}	[1/min]	813	813									
DT80N4	M _{max}	[Nm]		9.3	9.3	9.3	9.3						
	n _{trans}	[1/min]		909	909	909	908						
DT90S4	M _{max}	[Nm]			13.5	13.5	13.5	13.5					
	n _{trans}	[1/min]			1011	1011	1011	1011					
DT90L4	M _{max}	[Nm]				18.3	18.2	18.3	18.3				
	n _{trans}	[1/min]				1043	928	1049	1056				
DV100M4	M _{max}	[Nm]						26.8	26.8	26.8			
	n _{trans}	[1/min]						940	1043	1056			
DV100L4	M _{max}	[Nm]							36.8	36.8	36.8		
	n _{trans}	[1/min]							889	1004	1011		
DV112M4	M _{max}	[Nm]								47.1	48.4	48.4	
	n _{trans}	[1/min]								915	1030	1062	
DV132S4	M _{max}	[Nm]									64.4	66.1	66.1
	n _{trans}	[1/min]									992	1132	1196
DV132M4	M _{max}	[Nm]		Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .								81.7	90.2
	n _{trans}	[1/min]										1011	1145
DV132ML4	M _{max}	[Nm]											110
	n _{trans}	[1/min]											1043
DV160M4	M _{max}	[Nm]											124
	n _{trans}	[1/min]											986



Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
AC 400 V / 50 Hz		0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DV132M4	M _{max}	[Nm]	90.2								
	n _{trans}	[1/min]	1152								
DV132ML4	M _{max}	[Nm]	110								
	n _{trans}	[1/min]	1132								
DV160M4	M _{max}	[Nm]	131	131							
	n _{trans}	[1/min]	1132	1196							
DV160L4	M _{max}	[Nm]	163	177	177						
	n _{trans}	[1/min]	1043	1248	1312						
DV180M4	M _{max}	[Nm]		217	217	217					
	n _{trans}	[1/min]		1164	1395	1465					
DV180L4	M _{max}	[Nm]		230	258	258	258				
	n _{trans}	[1/min]		1017	1152	1299	1369				
DV200L4	M _{max}	[Nm]			325	351	351	351			
	n _{trans}	[1/min]			1011	1126	1299	1420			
DV225S4	M _{max}	[Nm]				395	433	433	433		
	n _{trans}	[1/min]				947	1030	1164	1312		
DV225M4	M _{max}	[Nm]				482	526	526			
	n _{trans}	[1/min]				1030	1100	1299			
DV250M4	M _{max}	[Nm]					587	641	641		
	n _{trans}	[1/min]					1017	1133	1133		
DV280S4	M _{max}	[Nm]						711	871	871	
	n _{trans}	[1/min]						1075	1056	1306	
D280M4	M _{max}	[Nm]						745	904	1045	1045
	n _{trans}	[1/min]						1107	1094	1184	1382
D315S4	M _{max}	[Nm]	Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .							1150	1273
	n _{trans}	[1/min]								1088	1203
D315M4	M _{max}	[Nm]									1453
	n _{trans}	[1/min]									1024
D315M4a	M _{max}	[Nm]									1374
	n _{trans}	[1/min]									1107



Project Planning

Motor selection for asynchronous servomotors (CFC)

2. Delta connection Δ AC 230 V / 50 Hz:

Assignment of MOVIDRIVE® MDX61B0008-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
Δ AC 230 V / 50 Hz			0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	
DT71D4	M _{max}	[Nm]	4.6	4.6	4.6	4.6							
	n _{trans}	[1/min]	1958	1958	1958	1958							
DT80K4	M _{max}	[Nm]		6.9	6.9	6.9	6.9						
	n _{trans}	[1/min]		1868	1868	1849	1868						
DT80N4	M _{max}	[Nm]			9.3	9.3	9.3	9.3					
	n _{trans}	[1/min]			2054	1817	2054	2054					
DT90S4	M _{max}	[Nm]					13.5	13.5	13.5				
	n _{trans}	[1/min]					1971	2246	2304				
DT90L4	M _{max}	[Nm]						18.3	18.3	18.3			
	n _{trans}	[1/min]						1843	2240	2329			
DV100M4	M _{max}	[Nm]							26.8	26.8	26.8		
	n _{trans}	[1/min]							1862	2214	2297		
DV100L4	M _{max}	[Nm]									36.8	36.8	36.8
	n _{trans}	[1/min]									1779	2080	2188
DV112M4	M _{max}	[Nm]										45.5	48.4
	n _{trans}	[1/min]										1779	2163
DV132S4	M _{max}	[Nm]										66.1	
	n _{trans}	[1/min]										1996	

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
Δ AC 230 V / 50 Hz			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DV112M4	M _{max}	[Nm]	48.4									
	n _{trans}	[1/min]	2195									
DV132S4	M _{max}	[Nm]	66.1	66.1								
	n _{trans}	[1/min]	2374	2444								
DV132M4	M _{max}	[Nm]	90.2	90.2								
	n _{trans}	[1/min]	1939	2310								
DV132ML4	M _{max}	[Nm]		110	110							
	n _{trans}	[1/min]		2105	2246							
DV160M4	M _{max}	[Nm]		131	131	131						
	n _{trans}	[1/min]		1894	2246	2348						
DV160L4	M _{max}	[Nm]			177	177	177					
	n _{trans}	[1/min]			1881	2208	2451					
DV180M4	M _{max}	[Nm]				217	217	217				
	n _{trans}	[1/min]				1952	2336	2611				
DV180L4	M _{max}	[Nm]					258	258	258			
	n _{trans}	[1/min]					1836	2131	2457			
DV200L4	M _{max}	[Nm]						329	351	351		
	n _{trans}	[1/min]						1830	2092	2413		
DV225S4	M _{max}	[Nm]							405	433	433	
	n _{trans}	[1/min]							1708	1895	2290	
DV225M4	M _{max}	[Nm]								487	526	526
	n _{trans}	[1/min]								1856	2163	2541
DV250M4	M _{max}	[Nm]								492	641	641
	n _{trans}	[1/min]								1856	1837	2227
DV280S4	M _{max}	[Nm]									616	796
	n _{trans}	[1/min]									1933	1907

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.



DT/DV/D motor selection in double-star/star connection type (AC 230/460 V / 60 Hz)

1. Star connection Δ AC 460 V / 60 Hz:

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61A0110-503 (size 0 ... 2):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
Δ AC 460 V / 60 Hz		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DT80K4	M _{max} [Nm]	7.0										
	n _{trans} [1/min]	1100										
DT80N4	M _{max} [Nm]	9.3	9.3	9.3	9.3	9.3						
	n _{trans} [1/min]	1133	1146	1146	1146	1146						
DT90S4	M _{max} [Nm]			13.5	13.5	13.5						
	n _{trans} [1/min]			992	1351	1312						
DT90L4	M _{max} [Nm]				18.3	18.3	18.3					
	n _{trans} [1/min]				1312	1152	1318					
DT100LS4	M _{max} [Nm]						26.5	27.0				
	n _{trans} [1/min]						1100	1222				
DT100L4	M _{max} [Nm]							28.2	36.8	36.8		
	n _{trans} [1/min]							1171	1075	1120		
DV112M4	M _{max} [Nm]							35.8	48.4	48.4		
	n _{trans} [1/min]							1196	1139	1312		
DV132S4	M _{max} [Nm]								48.7	65.1	66.1	
	n _{trans} [1/min]								1068	992	1100	
DV132M4	M _{max} [Nm]		Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .								80.0	90.2
	n _{trans} [1/min]										1088	1222
DV132ML4	M _{max} [Nm]											110
	n _{trans} [1/min]											1196
DV160M4	M _{max} [Nm]											120.3
	n _{trans} [1/min]											1132



Project Planning

Motor selection for asynchronous servomotors (CFC)

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
AC 460 V / 60 Hz			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DV132ML4	M _{max}	[Nm]	110									
	n _{trans}	[1/min]	1299									
DV160M4	M _{max}	[Nm]	131	131								
	n _{trans}	[1/min]	1260	1318								
DV160L4	M _{max}	[Nm]	161	177								
	n _{trans}	[1/min]	1158	1370								
DV180M4	M _{max}	[Nm]	164	217	217							
	n _{trans}	[1/min]	1140	1177	1350							
DV180L4	M _{max}	[Nm]		228	258	258						
	n _{trans}	[1/min]		1081	1196	1324						
DV200L4	M _{max}	[Nm]			323	351	351					
	n _{trans}	[1/min]			1024	1107	1248					
DV225S4	M _{max}	[Nm]			318	391	433	433				
	n _{trans}	[1/min]			1100	1075	1145	1286				
DV225M4	M _{max}	[Nm]				401	494	526	526			
	n _{trans}	[1/min]				1081	1056	1139	1324			
D250M4	M _{max}	[Nm]						570	640			
	n _{trans}	[1/min]						1300	1395			
D280S4	M _{max}	[Nm]							717	869	871	
	n _{trans}	[1/min]							1345	1318	1594	
D280M4	M _{max}	[Nm]							712	864	1045	
	n _{trans}	[1/min]							1337	1325	1382	
D315S4	M _{max}	[Nm]									1099	1273
	n _{trans}	[1/min]									1325	1408
D315M4	M _{max}	[Nm]										1387
	n _{trans}	[1/min]										1242
D315M4a	M _{max}	[Nm]										1307
	n _{trans}	[1/min]										1344

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.



2. Double-star connection WW AC 230 V / 60 Hz:

Assignment of MOVIDRIVE® MDX61B0008-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
AC 230 V / 60 Hz		0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DT71D4	M _{max} [Nm]	4.6	4.6	4.6	4.6						
	n _{trans} [1/min]	2988	2988	2988	2988						
DT80K4	M _{max} [Nm]		7.0	7.0	7.0	7.0					
	n _{trans} [1/min]		2733	2822	2688	2822					
DT80N4	M _{max} [Nm]			9.3	8.3	9.3	9.3				
	n _{trans} [1/min]			2835	2585	2873	2969				
DT90S4	M _{max} [Nm]					11.9	13.5	13.5			
	n _{trans} [1/min]					2636	2931	3462			
DT90L4	M _{max} [Nm]						16.4	18.3	18.3		
	n _{trans} [1/min]						2604	3014	3353		
DT100LS4	M _{max} [Nm]							22.5	27.0	27.0	
	n _{trans} [1/min]							2592	2732	3104	
DT100L4	M _{max} [Nm]									32.5	36.8
	n _{trans} [1/min]									2592	2912
DV112M4	M _{max} [Nm]									41.4	48.4
	n _{trans} [1/min]									2534	2988
DV132S4	M _{max} [Nm]										62.4
	n _{trans} [1/min]										2233

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
AC 230 V / 60 Hz		0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DV132S4	M _{max} [Nm]	66.1									
	n _{trans} [1/min]	2572									
DV132M4	M _{max} [Nm]	80.0	90.2								
	n _{trans} [1/min]	2348	2707								
DV132ML4	M _{max} [Nm]		110	110							
	n _{trans} [1/min]		2566	2944							
DV160M4	M _{max} [Nm]		115	131	131						
	n _{trans} [1/min]		2451	2688	2963						
DV160L4	M _{max} [Nm]			150	177	177					
	n _{trans} [1/min]			2457	2512	2918					
DV180M4	M _{max} [Nm]				189	217	217				
	n _{trans} [1/min]				2355	2457	2771				
DV180L4	M _{max} [Nm]					220	258	258			
	n _{trans} [1/min]					2284	2291	2720			
DV200L4	M _{max} [Nm]						281	350	351		
	n _{trans} [1/min]						2208	2163	2509		
DV225S4	M _{max} [Nm]							346	419	433	
	n _{trans} [1/min]							2291	2253	2694	
DV225M4	M _{max} [Nm]							354	430	526	526
	n _{trans} [1/min]							2278	2252	2336	2803

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.



Project Planning

Motor selection for asynchronous servomotors (CFC)

DT/DV/D motor selection in double-star or double-delta connection type (AC 200 V / 50 Hz)

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 ... 2):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)							
Motor	AC 200 V / 50 Hz ¹⁾	0014	0015	0022	0030	0040	0055	0075	0110
DT80K4	M _{max} [Nm]	6.9	6.9	6.9					
	n _{trans} [1/min]	2246	2035	2112					
DT80N4	M _{max} [Nm]			9.3	9.3	9.3			
	n _{trans} [1/min]			2483	2624	2624			
DT90L4	M _{max} [Nm]					18.3	18.3	18.3	
	n _{trans} [1/min]					2521	2924	2963	
DV100M4	M _{max} [Nm]					24.4	26.8	26.8	
	n _{trans} [1/min]					2124	2419	2732	
DV112M4	M _{max} [Nm]								48.4
	n _{trans} [1/min]								2457
DV132S4	M _{max} [Nm]								58.3
	n _{trans} [1/min]								2355

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

1) The values also apply to AC 200 V / 60 Hz and AC 220 V / 60 Hz.

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 ... 6):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
Motor	AC 200 V / 50 Hz ¹⁾	0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DV112M4	M _{max} [Nm]	48.4									
	n _{trans} [1/min]	2796									
DV132S4	M _{max} [Nm]	66.1	66.1								
	n _{trans} [1/min]	2656	3052								
DV132M4	M _{max} [Nm]	77.3	90.2	90.2							
	n _{trans} [1/min]	2361	2688	2886							
DV160M4	M _{max} [Nm]		112	131	131	131					
	n _{trans} [1/min]		2265	2470	2784	2918					
DV160L4	M _{max} [Nm]				177	177	177	177			
	n _{trans} [1/min]				2316	2726	2995	3084			
DV180M4	M _{max} [Nm]					217	217	217			
	n _{trans} [1/min]					2406	2803	3251			
DV180L4	M _{max} [Nm]						252	258	258		
	n _{trans} [1/min]						2240	2662	3008		
DV200L4	M _{max} [Nm]							336	351	351	
	n _{trans} [1/min]							2233	2541	3072	
DV225S4	M _{max} [Nm]							330	401	433	433
	n _{trans} [1/min]							2112	2086	2438	2867
DV225M4	M _{max} [Nm]								395	518	526
	n _{trans} [1/min]								2291	2253	2720

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N.

1) The values also apply to AC 200 V / 60 Hz and AC 220 V / 60 Hz.



DT/DV motor selection in delta connection type (AC 230 V / 50 Hz)

Motor			MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in CFC operating modes (P700)									
Δ AC 230 V / 50 Hz			0015	0022	0037	0055	0075	0110	0150	0220	0300	
DT80K4	M _{max}	[Nm]	6.9									
	n _{trans}	[1/min]	812									
DT80N4	M _{max}	[Nm]	9.3									
	n _{trans}	[1/min]	908									
DT90S4	M _{max}	[Nm]	13.5	13.5								
	n _{trans}	[1/min]	1011	1011								
DT90L4	M _{max}	[Nm]	18.3	18.3	18.3							
	n _{trans}	[1/min]	953	1024	1056							
DV100M4	M _{max}	[Nm]		25.5	26.8							
	n _{trans}	[1/min]		921	1056							
DV100L4	M _{max}	[Nm]			36.8	36.8						
	n _{trans}	[1/min]			972	1011						
DV112M4	M _{max}	[Nm]				48.4	48.4					
	n _{trans}	[1/min]				1036	1062					
DV132S4	M _{max}	[Nm]				65.3	66.1	66.1				
	n _{trans}	[1/min]				992	1152	1196				
DV132M4	M _{max}	[Nm]					85.4	90.2	90.2			
	n _{trans}	[1/min]					998	1152	1152			
DV132ML4	M _{max}	[Nm]						110	110	110		
	n _{trans}	[1/min]						1050	1132	1132		
DV160M4	M _{max}	[Nm]						126	131	131		
	n _{trans}	[1/min]						980	1120	1196		
DV160L4	M _{max}	[Nm]							158	177	177	
	n _{trans}	[1/min]							1050	1248	1312	
DV180M4	M _{max}	[Nm]		Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .							217	217
	n _{trans}	[1/min]									1165	1325
DV180L4	M _{max}	[Nm]									231	258
	n _{trans}	[1/min]									1017	1068
DV200L4	M _{max}	[Nm]									295	
	n _{trans}	[1/min]									1025	

**DT/DV motor selection with double-star connection type (AC 230 V / 60 Hz)**

Motor			MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in CFC operating modes (P700)									
WW AC 230 V / 60 Hz			0015	0022	0037	0055	0075	0110	0150	0220	0300	
DT80K4	M _{max}	[Nm]	7.0									
	n _{trans}	[1/min]	1100									
DT80N4	M _{max}	[Nm]	9.3									
	n _{trans}	[1/min]	1145									
DT90S4	M _{max}	[Nm]	13.5	13.5								
	n _{trans}	[1/min]	1267	1337								
DT90L4	M _{max}	[Nm]	17.2	18.3	18.3							
	n _{trans}	[1/min]	1145	1210	1325							
DT100LS4	M _{max}	[Nm]		20.1	27.0							
	n _{trans}	[1/min]		1190	1228							
DT100L4	M _{max}	[Nm]			29.2	36.8	36.8					
	n _{trans}	[1/min]			1158	1113	1120					
DV112M4	M _{max}	[Nm]			37.2	48.4	48.4					
	n _{trans}	[1/min]			1190	1248	1337					
DV132S4	M _{max}	[Nm]				57.0	66.1	66.1				
	n _{trans}	[1/min]				1030	1062	1120				
DV132M4	M _{max}	[Nm]					71.7	90.2	90.2			
	n _{trans}	[1/min]					1113	1165	1222			
DV132ML4	M _{max}	[Nm]						109	110			
	n _{trans}	[1/min]						1100	1260			
DV160M4	M _{max}	[Nm]						104	131	131		
	n _{trans}	[1/min]						1165	1145	1318		
DV160L4	M _{max}	[Nm]							133	177	177	
	n _{trans}	[1/min]							1190	1267	1395	
DV180M4	M _{max}	[Nm]		Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .							208	217
	n _{trans}	[1/min]									1100	1203
DV180L4	M _{max}	[Nm]										236
	n _{trans}	[1/min]										1075
DV200L4	M _{max}	[Nm]								210	253	
	n _{trans}	[1/min]								1080	1062	



DT/DV motor selection in double-star of double-delta connection type (AC 200 V / 50 Hz)

Motor			MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in CFC operating modes (P700)								
WW, ΔΔ AC 200 V / 50 Hz ¹⁾			0015	0022	0037	0055	0075	0110	0150	0220	0300
DT80K4	M _{max}	[Nm]	6.9								
	n _{trans}	[1/min]	748								
DT80N4	M _{max}	[Nm]	9.3								
	n _{trans}	[1/min]	985								
DT90L4	M _{max}	[Nm]	15.5	18.3	18.3						
	n _{trans}	[1/min]	1049	998	1145						
DV100M4	M _{max}	[Nm]			26.8	26.8					
	n _{trans}	[1/min]			1050	1056					
DV112M4	M _{max}	[Nm]				48.4	48.4	48.4			
	n _{trans}	[1/min]				1017	1132	1145			
DV132S4	M _{max}	[Nm]					66.1	66.1			
	n _{trans}	[1/min]					1107	1280			
DV132M4	M _{max}	[Nm]						90.2	90.2	90.2	
	n _{trans}	[1/min]						1139	1228	1228	
DV160M4	M _{max}	[Nm]							131	131	
	n _{trans}	[1/min]							1050	1273	
DV160L4	M _{max}	[Nm]		Note: The maximum torque M _{max} is limited to 180 % of the rated motor torque M _N .						177	177
	n _{trans}	[1/min]								1177	1312
DV180M4	M _{max}	[Nm]								195	217
	n _{trans}	[1/min]								1145	1216
DV180L4	M _{max}	[Nm]									226
	n _{trans}	[1/min]									1080

1) The values also apply to AC 200 V / 60 Hz and AC 220 V / 60 Hz.



5.6 Motor Selection for Synchronous Servomotors (SERVO)



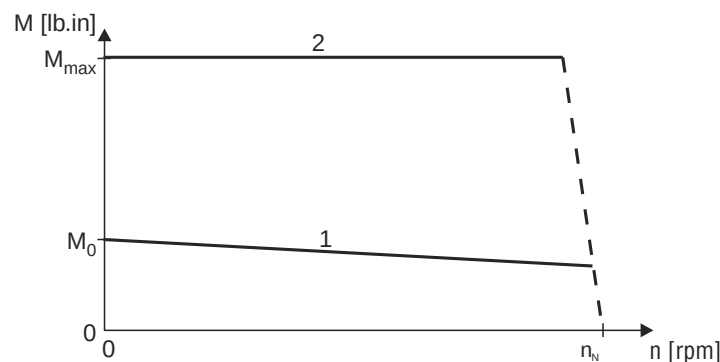
The torque limit (M limit) is set automatically by the startup function of the MOVITOOLS® operating software. Do not increase this automatically set value!

We recommend always using the latest version of MOVITOOLS® for startup. The latest MOVITOOLS® version can be downloaded from our homepage (www.sew-euro-drive.com).

Motor characteristics

The requirements on a servo drive include speed dynamics, stable speed and positioning accuracy. DS/CM/CMD 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 6000 1/min), a high speed and control range and a high overload capacity, are achieved using control by MOVIDRIVE®. The servomotor has a lower mass moment of inertia than the asynchronous motor. This means it is ideally suited to applications requiring dynamic speeds.



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Figure 91: Speed/torque characteristic curve of the DS/CM/CMD/CMP servomotors

- 1 Continuous torque
- 2 Maximum torque

M_0 and $M_{\max}$ are determined by the motor. The attainable $M_{\max}$ can also be less, depending on the inverter.

Refer to the motor tables (DS/CM/CMD) for the values for M_0 .

Refer to the motor selection tables (DS/CM/CMD) for the values for $M_{\max}$.



Basic recommendations

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 operating 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.

$$M_{\text{eff}} < M_{N\_Mot}$$

The point must lie below the characteristic curve for the continuous torque (Figure 91, curve 1). The continuous torque of the CM series can be increased by 40 % by forced cooling if this operating point lies above the characteristic curve for self-cooling.

2. Maximum torque required across the speed characteristic.

$$M_{\text{max}} < M_{\text{dyn\_Mot}}$$

This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIDRIVE® combination (Figure 91, 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 1/min as a result of the high input speed.

$$n_{\text{max}} \leq n_N$$

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 in the units [1/min] or [%I_{N_inverter}] as required (→ 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:

$$M = \frac{M_0}{I_0} \times \frac{150\% \times I_{n\_inverter} \times n_{\text{setp}}}{3000 \text{ rpm}}$$

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M_0 Continuous static torque according to the motor tables DS/CM/CMD

I_0 Continuous static current according to the motor tables DS/CM/CMD

**DS/CM motor table**Characteristic values at $V_{max} = AC 230 V / AC 400 V$

n_N [1/ min]	Motor	Without forced cooling fan		$I_0^{2)}$ [A]	With forced cooling fan VR		$I_0\_VR^{2)}$ [A]	$I_{max}^{1)}$ [A]	$I_{max}^{2)}$ [A]	Mass moment of inertia J_M	
		M_0 [Nm]	$I_0^{1)}$ [A]		M_0_VR [Nm]	$I_0\_VR^{1)}$ [A]				Without brake [10 ⁻⁴ kgm ²]	With brake
2000	CM71S	5.0	2.2	3.95	7.3	3.2	5.7	8.8	15.8	4.85	6.89
	CM71M	6.5	3.0	5.3	9.4	4.2	7.7	12.0	21.0	6.27	8.31
	CM71L	9.5	4.2	7.4	13.8	6.1	10.7	16.8	29.5	9.1	11.1
	CM90S	11.0	4.9	8.7	16.0	7.1	12.6	19.6	35.0	14.3	19.8
	CM90M	14.5	6.9	12.1	21.0	10.0	17.5	28.0	48.5	18.6	24.1
	CM90L	21.0	9.9	17.1	30.5	14.4	25.0	40.0	68.0	27.1	32.6
	CM112S	23.5	10.0	18.0	34.0	14.5	26.0	40.0	72	67.4	87.5
	CM112M	31.0	13.5	24.5	45.0	19.6	35.5	54.0	98	87.4	108
	CM112L	45.0	20.0	35.5	65.0	29.0	51.0	80.0	142	128	148
	CM112H	68.0	30.5	52.0	95.0	42.5	73.0	122	208	189	209
3000	DS56M	1.0	1.65	1.65	-	-	-	6.6	6.6	0.47	0.85
	DS56L	2.0	2.4	2.4	-	-	-	9.6	9.6	0.82	1.2
	DS56H	4.0	2.8	4.7	-	-	-	11.2	19	1.53	1.88
	CM71S	5.0	3.3	5.9	7.3	4.8	8.6	13.2	23.5	4.85	6.89
	CM71M	6.5	4.3	7.6	9.4	6.2	11.0	17.2	30.5	6.27	8.31
	CM71L	9.5	6.2	11.1	13.8	9.0	16.1	25.0	44.5	9.1	11.1
	CM90S	11.0	7.3	12.7	16.0	10.6	18.4	30.0	51	14.3	19.8
	CM90M	14.5	10.1	17.4	21.0	14.6	25.0	40.0	70	18.6	24.1
	CM90L	21.0	14.4	25.5	30.5	21.0	37.0	58.0	102	27.1	32.6
	CM112S	23.5	15.0	27.0	34.0	22.0	39.0	60.0	108	67.4	87.5
	CM112M	31.0	20.5	35.0	45.0	30.0	51.0	82.0	140	87.4	108
	CM112L	45.0	30.0	48.0	65.0	44.0	70.0	120	192	128	148
	CM112H	68.0	43.0	73.0	95.0	60.0	102	172	292	189	209
4500	DS56M	1.0	1.65	1.65	-	-	-	6.6	6.6	0.47	0.85
	DS56L	2.0	2.4	-	-	-	-	9.6	-	0.82	1.2
	DS56H	4.0	4.0	-	-	-	-	16.0	-	1.53	1.88
	CM71S	5.0	4.9	8.5	7.3	7.2	12.3	20.0	34	4.85	6.89
	CM71M	6.5	6.6	11.3	9.4	9.6	16.4	26.0	45	6.27	8.31
	CM71L	9.5	9.6	17.1	13.8	14.0	25.0	38.0	68	9.1	11.1
	CM90S	11.0	11.1	18.9	16.0	16.2	27.5	44.0	76	14.3	19.8
	CM90M	14.5	14.7	26.0	21.0	21.5	37.5	59.0	104	18.6	24.1
	CM90L	21.0	21.6	39.0	30.5	31.5	57	86.0	156	27.1	32.6
	CM112S	23.5	22.5	38.5	34.0	32.5	56	90.0	154	67.4	87.5
	CM112M	31.0	30.0	54.0	45.0	44.0	78	120	216	87.4	108
	CM112L	45.0	46.0	78.0	65.0	67.0	113	184	312	128	148
	CM112H	68.0	66.0	-	95.0	92.0	-	264	-	189	209
6000	DS56M	1.0	1.65	-	-	-	-	6.6	-	0.47	0.85
	DS56L	2.0	2.75	-	-	-	-	11.0	-	0.82	1.2
	DS56H	4.0	5.3	-	-	-	-	21.0	-	1.53	1.88
	CM71S	5.0	6.5	11.6	7.3	7.2	16.8	26.0	46.5	4.85	6.89
	CM71M	6.5	8.6	14.1	9.4	9.6	20.5	34.0	56	6.27	8.31
	CM71L	9.5	12.5	21.5	13.8	14.0	31.0	50.0	86	9.1	11.1
	CM90S	11.0	14.5	23.5	16.0	16.2	34.0	58.0	94	14.3	19.8
	CM90M	14.5	19.8	37.0	21.0	21.5	54	79.0	148	18.6	24.1
	CM90L	21.0	29.5	51.0	30.5	31.5	74	118.0	204	27.1	32.6

1) For DS/CM synchronous servomotors with AC 400 V system voltage

2) For DS/CM synchronous servomotors with AC 230 V system voltage



Additional project planning instructions and information on the DS/CM synchronous servomotors can be found in the "Geared Servomotors" catalog, which can be ordered from SEW-EURODRIVE.

DS/CM motor selection (AC 400 V system voltage)

1. Rated speed $n_N = 2000$ 1/min:

		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)																
Motor		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450	
CM71S	M _{max} [Nm]	8.9	10.5	13.1	15.6	12.7	15.9	16.5										
CM71M	M _{max} [Nm]	8.6	10.3	13.1	16.2	12.7	16.7	19.8	21.5									
CM71L	M _{max} [Nm]		10.8	13.9	17.7	13.5	18.2	22.5	28.4	31.4								
CM90S	M _{max} [Nm]			13.9	17.8	13.4	18.4	23.2	30.6	38.2	39.4							
CM90M	M _{max} [Nm]				16.8	12.6	17.3	21.9	29.5	38.0	46.9	52.5						
CM90L	M _{max} [Nm]						17.5	22.2	30.1	39.3	49.6	70.3	75.8					
CM112S	M _{max} [Nm]						19.3	24.6	33.4	43.6	54.8	76.2	81.9					
CM112M	M _{max} [Nm]							23.9	32.6	42.9	54.7	79.3	99.6	108.0				
CM112L	M _{max} [Nm]									42.0	53.9	80.3	104.9	141.5	156.8			
CM112H	M _{max} [Nm]										53.2	80.1	106.5	150.3	189.2	220.1	237.0	

2. Rated speed $n_N = 3000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)									
		0005	0008	0011	0014	0015	0022	0030	0040	0055	
DS56M	M_{max} [Nm]	2.4	2.8	3.6	3.8	3.5	3.8				
DS56L	M_{max} [Nm]	3.3	4.0	5.1	6.4	4.9	6.6	7.6			
DS56H	M_{max} [Nm]	5.7	6.8	8.8	11.2	8.5	11.5	14.3	15.0		
CM71S	M_{max} [Nm]	6.0	7.2	9.2	11.6	8.9	11.9	14.3	16.5		
CM71M	M_{max} [Nm]		7.2	9.3	11.9	9.0	12.2	15.1	19.1	21.5	
CM71L	M_{max} [Nm]			9.5	12.2	9.2	12.6	15.9	21.0	26.2	
CM90S	M_{max} [Nm]					12.0	9.0	12.4	15.7	21.2	27.4
CM90M	M_{max} [Nm]							11.8	15.0	20.4	26.6
CM90L	M_{max} [Nm]								20.7	27.3	
CM112S	M_{max} [Nm]								22.2	29.3	
CM112M	M_{max} [Nm]									28.2	

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)									
		0075	0110	0150	0220	0300	0370	0450	0550	0750	
CM71L	M_{max} [Nm]	30.8	31.5								
CM90S	M_{max} [Nm]	34.0	39.2								
CM90M	M_{max} [Nm]	33.7	47.8	51.6							
CM90L	M_{max} [Nm]	34.7	51.1	65.6	75.6						
CM112S	M_{max} [Nm]	37.4	54.8	69.8	81.9						
CM112M	M_{max} [Nm]	36.2	54.0	70.7	95.7	108.0					
CM112L	M_{max} [Nm]	35.8	53.9	71.6	101.0	126.9	147.4	156.8			
CM112H	M_{max} [Nm]		56.6	75.7	108.6	139.9	167.0	197.1	223.2	237.0	



Project Planning

Motor Selection for Synchronous Servomotors (SERVO)

3. Rated speed $n_N = 4500$ 1/min:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)							
		0005	0008	0011	0014	0015	0022	0030	0040
DS56M	M _{max} [Nm]	2.4	2.8	3.6	3.8	3.5	3.8		
DS56L	M _{max} [Nm]	3.3	4.0	5.1	6.4	4.9	6.6	7.6	
DS56H	M _{max} [Nm]	4.0	4.8	6.2	7.9	6.0	8.2	10.3	13.7
CM71S	M _{max} [Nm]			6.3	8.1	6.1	8.3	10.4	13.4
CM71M	M _{max} [Nm]				7.9	5.9	8.1	10.2	13.6
CM71L	M _{max} [Nm]						8.2	10.4	14.0
CM90S	M _{max} [Nm]							10.4	14.1
CM90M	M _{max} [Nm]								14.0

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)										0900	1100
		0055	0075	0110	0150	0220	0300	0370	0450	0550	0750		
DS56H	M _{max} [Nm]	15.2											
CM71S	M _{max} [Nm]	16.1	16.5										
CM71M	M _{max} [Nm]	17.1	20.3	21.3									
CM71L	M _{max} [Nm]	18.1	22.5	30.3	31.2								
CM90S	M _{max} [Nm]	18.4	23.4	33.6	39.2								
CM90M	M _{max} [Nm]	18.4	23.5	34.6	44.5	52.1							
CM90L	M _{max} [Nm]	18.2	23.3	34.7	45.8	63.4	75.0						
CM112S	M _{max} [Nm]	19.5	25.0	37.4	49.2	67.5	81.9						
CM112M	M _{max} [Nm]		24.6	37.1	49.4	69.6	87.4	101.5	108.0				
CM112L	M _{max} [Nm]			35	46.8	67.2	86.9	104.1	123.5	140.7	156.8		
CM112H	M _{max} [Nm]					70.9	92.5	112.1	135.5	157.7	189.4	231.6	237.0

4. Rated speed $n_N = 6000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in SERVO operating modes (P700)															
		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450
DS56M	M _{max} [Nm]	2.4	2.8	3.6	3.8	3.5	3.8										
DS56L	M _{max} [Nm]	2.9	3.5	4.5	5.7	4.3	5.8	7.3	7.6								
DS56H	M _{max} [Nm]			4.7	6.0	4.5	6.2	7.9	10.5	13.6	15.1						
CM71S	M _{max} [Nm]				6.1	4.6	6.3	8.0	10.6	13.3	15.8	16.5					
CM71M	M _{max} [Nm]						6.2	7.9	10.6	13.7	16.8	21.3					
CM71L	M _{max} [Nm]							8.0	10.8	14.1	17.9	25.2	30.7	31.4			
CM90S	M _{max} [Nm]								10.8	14.2	18.1	26.6	34.2	39.4			
CM90M	M _{max} [Nm]									13.7	17.5	26.1	34.3	46.9	51.9		
CM90L	M _{max} [Nm]										17.1	25.6	33.9	48.0	60.9	71.3	75.2



DS/CM motor selection (AC 230 V system voltage)

1. Rated speed $n_N = 2000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in SERVO operating modes (P700)								
		0015	0022	0037	0055	0075	0110	0150	0220	0300
CM71S	$M_{\max}$ [Nm]	12.9	14.6	16.5						
CM71M	$M_{\max}$ [Nm]	13.1	15.1	21.4						
CM71L	$M_{\max}$ [Nm]	14.0	16.3	25.6	31.3					
CM90S	$M_{\max}$ [Nm]	13.8	16.2	26.8	38.0	39.6				
CM90M	$M_{\max}$ [Nm]	13.1	15.4	25.8	38.2	48.1	52.0			
CM90L	$M_{\max}$ [Nm]		15.8	26.6	40.0	51.9	70.9	74.9		
CM112S	$M_{\max}$ [Nm]			28.3	42.7	55.1	74.7	81.9		
CM112M	$M_{\max}$ [Nm]			27.4	41.6	54.6	76.8	94.4	108.0	
CM112L	$M_{\max}$ [Nm]				41.7	55.0	79.2	100.2	139.3	156.8
CM112H	$M_{\max}$ [Nm]					56.6	82.2	105.5	153	177.9

2. Rated speed $n_N = 3000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in SERVO operating modes (P700)								
		0015	0022	0037	0055	0075	0110	0150	0220	0300
DS56M	$M_{\max}$ [Nm]	3.8								
DS56L	$M_{\max}$ [Nm]	7.6								
DS56H	$M_{\max}$ [Nm]	9.2	10.7	15.3						
CM71S	$M_{\max}$ [Nm]	9.1	10.6	15.8	16.5					
CM71M	$M_{\max}$ [Nm]	9.3	10.9	17.2	21.5					
CM71L	$M_{\max}$ [Nm]	9.4	11.0	18.2	25.8	31.0	31.4			
CM90S	$M_{\max}$ [Nm]	9.5	11.2	18.7	27.7	35.1	39.5			
CM90M	$M_{\max}$ [Nm]			18.1	27.2	35.3	48.4	52.2		
CM90L	$M_{\max}$ [Nm]			17.9	27.1	35.5	50.5	63.1	75.2	
CM112S	$M_{\max}$ [Nm]			18.8	28.7	37.7	53.4	66.3	81.9	
CM112M	$M_{\max}$ [Nm]				29.1	38.4	55.3	69.9	97.0	108.0
CM112L	$M_{\max}$ [Nm]					40.6	58.9	75.4	108.8	125.9
CM112H	$M_{\max}$ [Nm]						58.4	75.3	111.1	131.1

3. Rated speed $n_N = 4500$ 1/min:

Motor		MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in SERVO operating modes (P700)								
		0015	0022	0037	0055	0075	0110	0150	0220	0300
DS56M	$M_{\max}$ [Nm]	3.8								
CM71S	$M_{\max}$ [Nm]	6.4	7.5	12.1	16.3	16.5				
CM71M	$M_{\max}$ [Nm]	6.3	7.4	12.2	17.4	21.0	21.4			
CM71L	$M_{\max}$ [Nm]		7.2	12.1	17.9	22.8	29.9	31.3		
CM90S	$M_{\max}$ [Nm]			12.6	19.0	24.8	34.4	39.6		
CM90M	$M_{\max}$ [Nm]			12.1	18.3	24.1	34.3	42.8	52.0	
CM90L	$M_{\max}$ [Nm]				17.7	23.4	33.7	42.9	61.4	70.5
CM112S	$M_{\max}$ [Nm]				20.0	26.5	38.2	48.6	68.3	77.7
CM112M	$M_{\max}$ [Nm]					24.8	36.1	46.3	67.4	78.5

4. Rated speed $n_N = 6000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in SERVO operating modes (P700)								
		0015	0022	0037	0055	0075	0110	0150	0220	0300
CM71S	$M_{\max}$ [Nm]	4.7	5.6	9.2	13.2	15.9	16.6			
CM71M	$M_{\max}$ [Nm]	5.0	5.9	9.9	14.6	18.2	21.4			
CM71L	$M_{\max}$ [Nm]			9.6	14.5	18.7	25.6	30.3	31.4	
CM90S	$M_{\max}$ [Nm]			10.2	15.4	20.1	28.5	35.3	39.4	
CM90M	$M_{\max}$ [Nm]				12.9	17.0	24.5	31.2	44.3	50.6
CM90L	$M_{\max}$ [Nm]					17.9	25.9	33.1	48.3	56.5

**Motor table CMD**Characteristic values at $V_{max} = AC\ 400\ V$

n_N [1/min]	Motor	M_0 [Nm]	I_0 [A]	I_{max} [A]	Mass moment of inertia J_M [10 ⁻⁴ kgm ²]
1200	CMD93S	2.4	1.55	8.1	1.16
	CMD93M	4.2	2.5	16.2	2.25
	CMD93L	6.0	3.5	22.9	3.35
	CMD138S	6.7	3.9	13.2	6.5
	CMD138M	12.1	5.5	25.5	12.4
	CMD138L	16.5	8	40.2	18.1
2000	CMD138S	6.7	7.4	24.9	6.5
	CMD138M	12.1	11.4	53.0	12.4
	CMD138L	16.5	15.1	75.7	18.1
3000	CMD70S	0.7	1.04	5.8	0.21
	CMD70M	1.1	1.36	7.9	0.4
	CMD70L	1.9	1.96	17.7	0.76
	CMD93S	2.4	2.32	12.2	1.16
	CMD93M	4.2	3.6	23.2	2.25
	CMD93L	6.0	6	39.7	3.35
4500	CMD55S	0.25	0.7	4.1	0.076
	CMD56M	0.45	0.95	6.1	0.15
	CMD56L	0.9	1.5	12.2	0.3

CMD motor selection (AC 400 V system voltage)1. Rated speed $n_N = 1200\ 1/min$:

		MOVIDRIVE® MDX61B...-5_3 (AC 400 V units) in SERVO operating modes (P700)											
Motor		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150
CMD93S	M_{max} [Nm]	5.8	6.7	8.1	10	7.9	10						
CMD93M	M_{max} [Nm]		8.2	10.5	13.3	10.2	13.6	16.6	20.6	22			
CMD93L	M_{max} [Nm]			10.5	13.5	10.1	14.0	17.6	23.1	28.6	33		
CMD138S	M_{max} [Nm]				12.5	9.8	12.8	15.2	17				
CMD138M	M_{max} [Nm]							21.9	27.9	33.3	37.8	39	
CMD138L	M_{max} [Nm]									36.8	45.0	59	62

2. Rated speed $n_N = 2000\ 1/min$:

		MOVIDRIVE® MDX61B...-5_3 (AC 400 V units) in SERVO operating modes (P700)						
Motor		0040	0055	0075	0110	0150	0220	0300
CMD138S	M_{max} [Nm]	11.9	14.7	17				
CMD138M	M_{max} [Nm]			23.7	31.8	37.2	38.8	
CMD138L	M_{max} [Nm]				37.4	47.1	59.6	62



3. Rated speed $n_N = 3000$ 1/min:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400 V units) in SERVO operating modes (P700)											
		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150
CMD70S	M_{max} [Nm]	2.2	2.5	3									
CMD70M	M_{max} [Nm]	3.2	3.7	4.5	5.2	4.4	5						
CMD70L	M_{max} [Nm]	3.8	4.5	5.8	7.4	5.7	7.6	9.1	10.6	11			
CMD93S	M_{max} [Nm]		4.8	6.0	7.3	5.8	7.5	8.8	10				
CMD93M	M_{max} [Nm]				9.5	7.2	9.8	12.3	15.9	19.5	22		
CMD93L	M_{max} [Nm]								13.9	18.1	22.5	30.7	33

4. Rated speed $n_N = 4500$ 1/min:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400 V units) in SERVO operating modes (P700)							
		0005	0008	0011	0014	0015	0022	0030	0040
CMD55S	M_{max} [Nm]	1.2							
CMD55M	M_{max} [Nm]	1.8	2	2.3					
CMD55L	M_{max} [Nm]	2.5	2.9	3.7	4.5	3.6	4.6	5.4	6



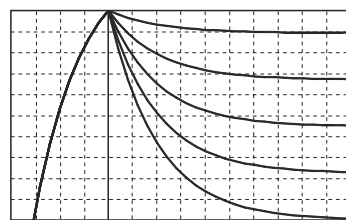
5.7 Overload capacity of the inverter

MOVIDRIVE® drive inverters calculate the load on the inverter output stage permanently (unit utilization). Consequently, they enable the maximum possible power to be produced in each operating status. The heat sink constant T of the inverter is used as the time unit. The heat sink time constant T is different for every size (→ Sec. "Heat sink time constant")

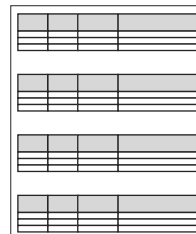
Determining the overload capacity

Three steps are required to determine the overload capacity:

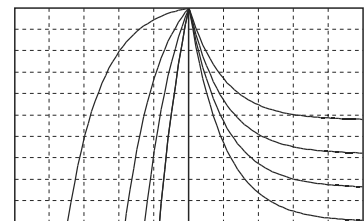
1. Determine the continuous output current I_{out} depending on the output frequency (especially < 2 Hz) and the PWM frequency.
2. Characterize the duration of the overload:
 - Minutes: $t_{overload} \geq 0.25 T$ (e.g. fans)
 - Seconds: $t_{overload} < 0.25 T$ (e.g. roller conveyor)
 - Fraction of a second: $t_{overload} \leq 1$ s (e.g. dynamic servo applications)
3. Determine the overload capacity in the characterized time range (→ following figure):
 - Minutes: Overload diagrams (A)
 - Seconds: Tables and formulas (B)
 - Fraction of a second: Overload diagrams (C)



A



B



C

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Heat sink time constant T

Heat sink time constant T for inverter size								
0S	0M	1	2	2S	3	4	5	6
9.3 min = 560 s	6 min = 360 s	3.5 min = 210 s	5 min = 300 s	4 min = 240 s	4 min = 240 s	9 min = 540 s	5 min = 300 s	4.5 min = 270 s

Load cycle

The required load cycle is the basis for determining 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 92 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 92, you can check whether the overload limit is exceeded.



Example

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 $t_2 = 1.5 \times T$

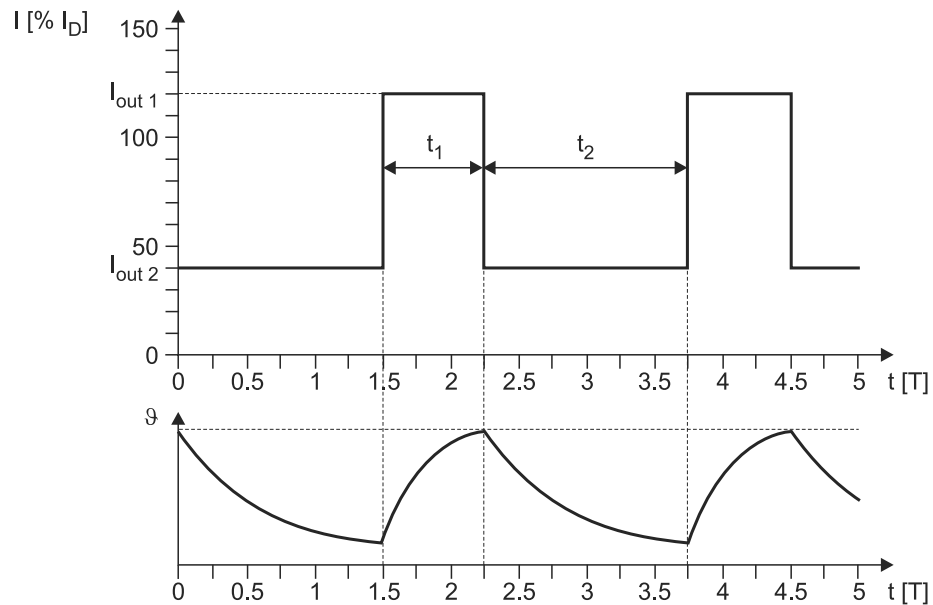


Figure 92: Sample load cycle

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**Continuous
output current**

The thermal model in MOVIDRIVE® implements dynamic limiting of the maximum output current. The maximum continuous output current I_D is dependent on the PWM cycle frequency, the ambient temperature ϑ_{amb} and the output frequency f_A .

It is particularly important to take output frequencies $f_A < 2\text{ Hz}$ into account for:

- Electrically stopping hoists
- Torque control at low speeds or at a standstill



The output frequency of the inverter when used with asynchronous motors is made up of the rotational frequency (= speed) and the slip frequency. With synchronous motors, the output frequency of the inverter is the same as the rotational frequency of the synchronous motor.



Project Planning

Overload capacity of the inverter

MDX60B / 61B size 0: Guaranteed continuous output currents I_D depending on the output frequency f_A

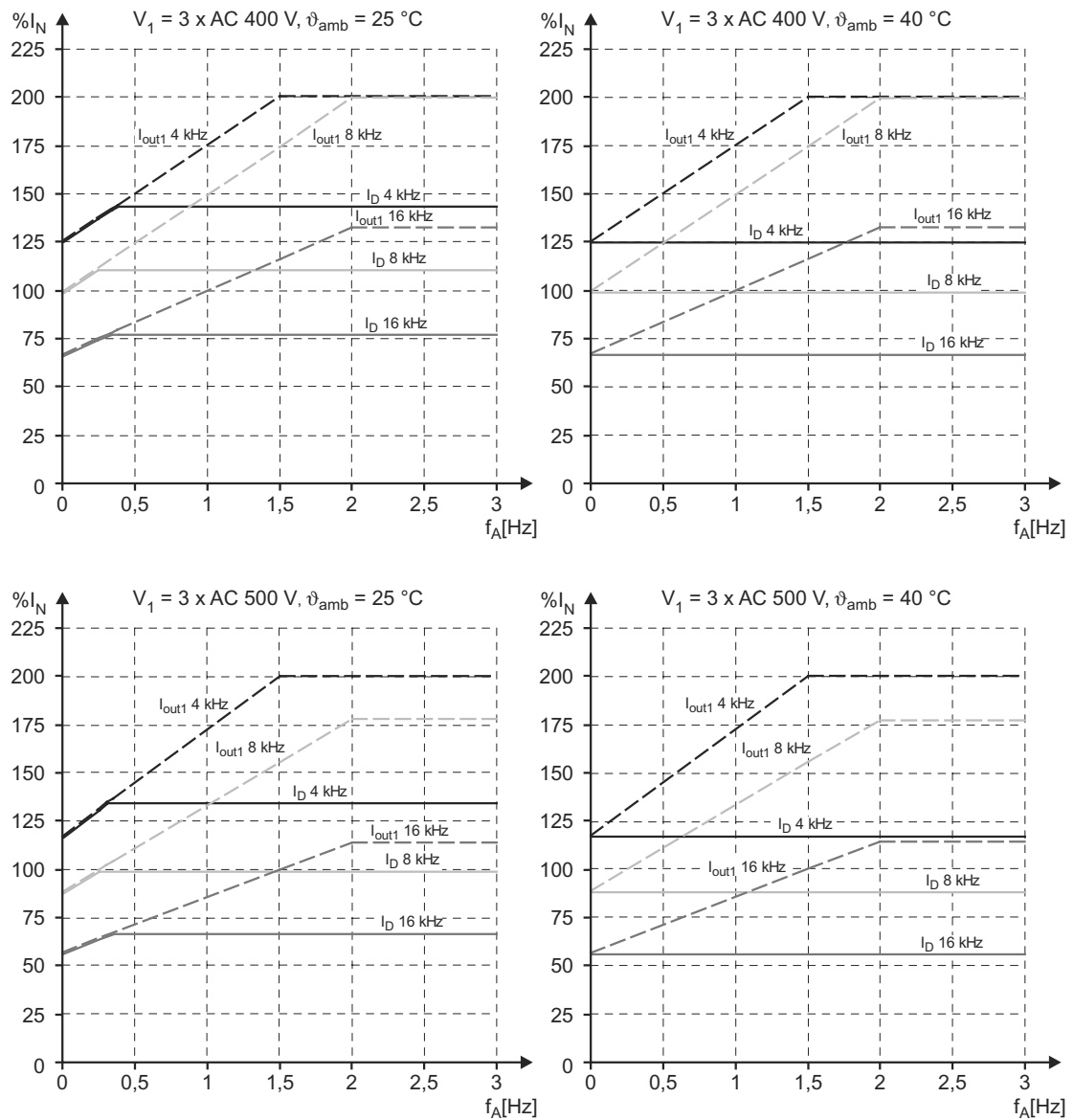


Figure 93: Continuous output currents I_D for MOVIDRIVE® MDX60B / 61B size 0

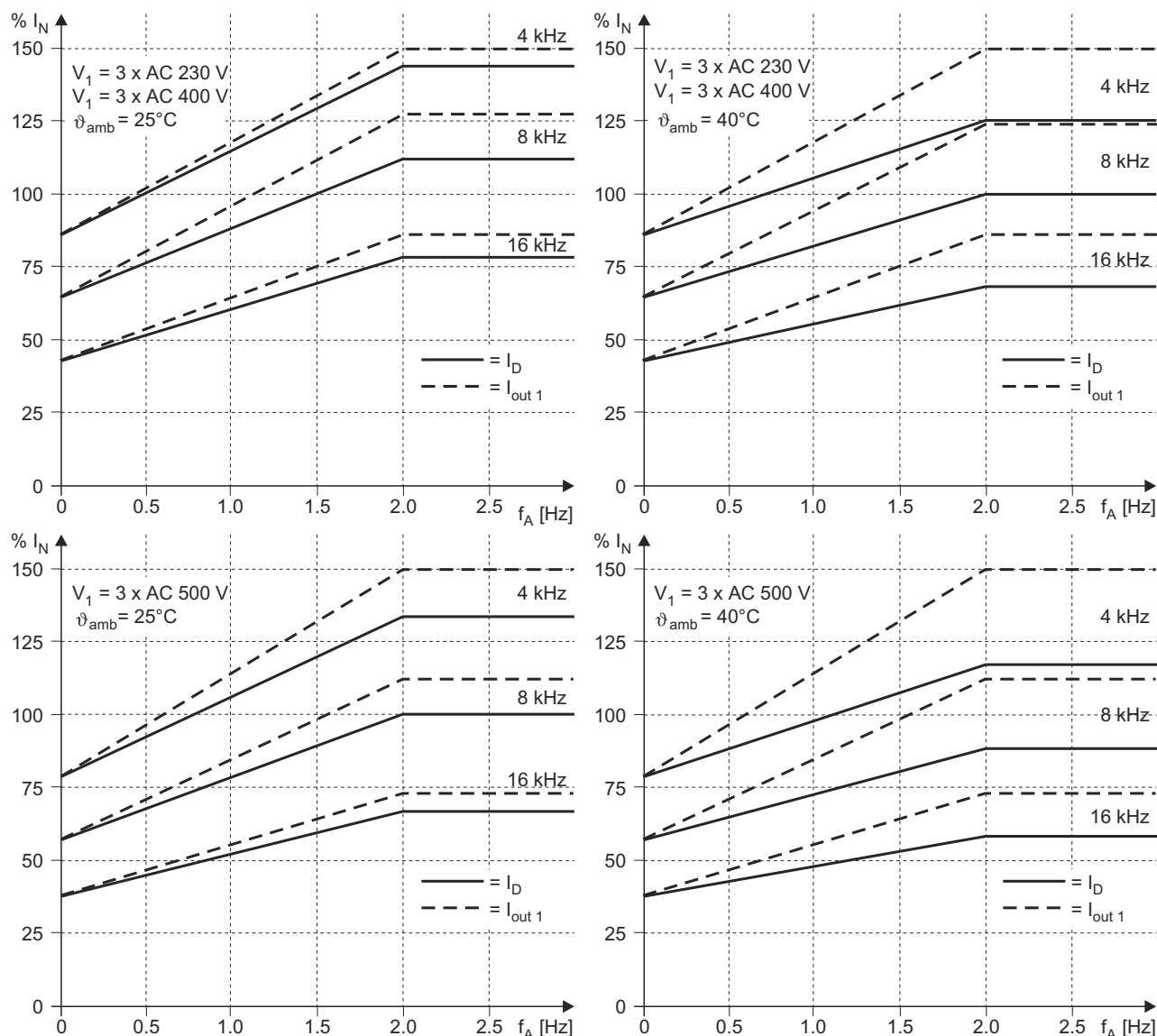
56681AXX

ϑ_{amb} = Ambient temperature
 V_1 = Supply voltage
 f_A = Inverter output frequency

I_D = Inverter continuous output current
 I_{out1} = Time-limited overload current of the inverter
 I_N = Inverter rated output current according to technical data



MDX61B sizes 1 - 6: Guaranteed continuous output currents I_D depending on the output frequency f_A



56691AXX

Figure 94: Continuous output currents I_D for MOVIDRIVE® MDX61B sizes 1 - 6

ϑ_{amb} = Ambient temperature
 V_1 = Supply voltage
 f_A = Inverter output frequency

I_D = Inverter continuous output current
 $I_{out 1}$ = Time-limited overload current of the inverter
 I_N = Inverter rated output current according to technical data

Unit utilization

If "P860/P861 PWM frequency 1/2" > 4 kHz is set in the VFC operating modes and "P862/P863 PWM fix 1/2" = OFF, the inverter automatically reduces the PWM frequency in the event of a unit overload. In the CFC and SERVO operating modes, the PWM frequency remains at the same setting and the inverter does not reduce the PWM frequency in the event of a unit overload. If the inverter is subjected to a higher than permitted load, it issues the fault message "F44 Unit utilization" and switches off immediately.

Temperature-controlled fans

The fans of the power section heat sink are subject to temperature-control. The fan is not switched on until a heat sink temperature of $\vartheta = 45^\circ\text{C}$ is exceeded.



Project Planning

Overload capacity of the inverter

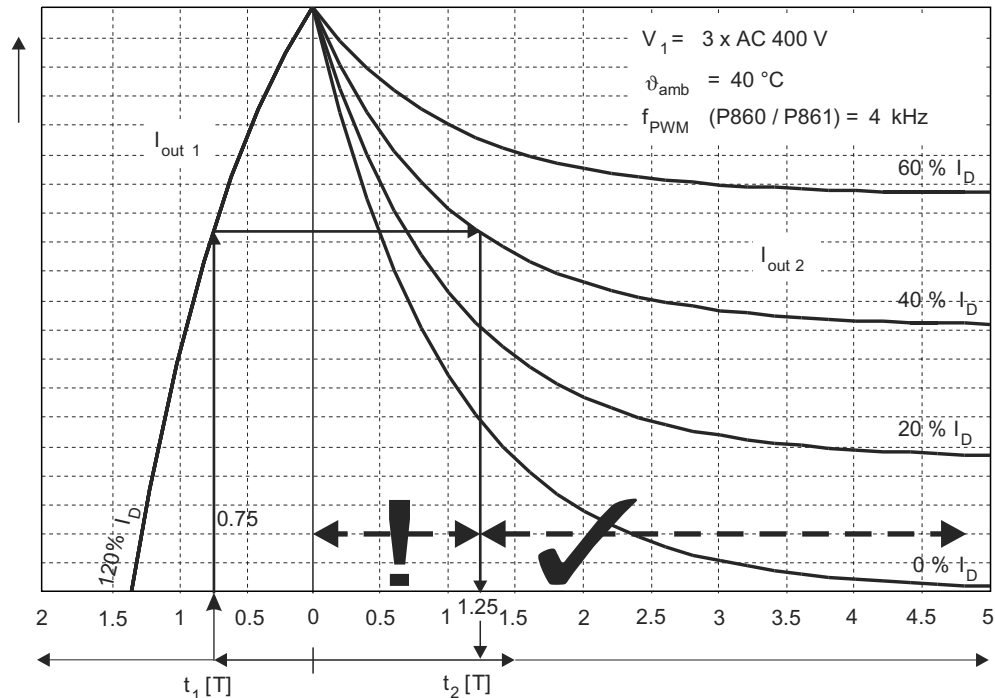
Overload capacity in minutes

This is the overload capacity that corresponds to at least a quarter of the heat sink time constant ($0.25 T$). The overload usually lasts a few minutes. The overload capacity can be determined as follows:

Overload time $t_1 \geq 0.25 \times T \rightarrow$ determine using the diagrams

Example

Overload times $t_1 \geq 0.25 \times T$:



56693AXX

Figure 95: 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_{out1} is shown above t_1 for the corresponding peripheral conditions. The temperature profiles of the various low-load currents I_{out2} are shown in a series of curves above t_2 .

Using the sample data above and the load cycle from Figure 92 the overload capacity ($\rightarrow$ Fig.95) is determined as follows:

- At overload time $t_1 = 0.75 \times T$ move vertically upwards until the point of intersection with I_{out1} .
- Move horizontally to the right until the point of intersection with $I_{out2} = 0.4 \times I_D$.
- Move vertically downwards and read the minimum low-load time $t_2 \rightarrow t_2 = 1.25 \times T$.

All times t_2 to the right of the point of intersection with I_{out2} are permissible ($\checkmark$); all times t_2 to the left are not (!).

In the load cycle from Figure 92 $t_2 = 1.5 \times T$, which means the overload capacity is given.

For overload times $t_1 < 0.25 \times T$, the reading accuracy of the diagrams is inadequate. The curves in this area are almost linear. This means you can use a linear formula for overload times $t_1 < 0.25 \times T$ instead of the diagrams.

For **overload times $t_1 \geq 0.25 \times T$** use the following diagrams to ascertain the overload capacity. Note the dependencies of I_D on I_N as shown in Figure 94.



MDX60B/61B,
BG0 overload
capacity at
400 V / 25 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

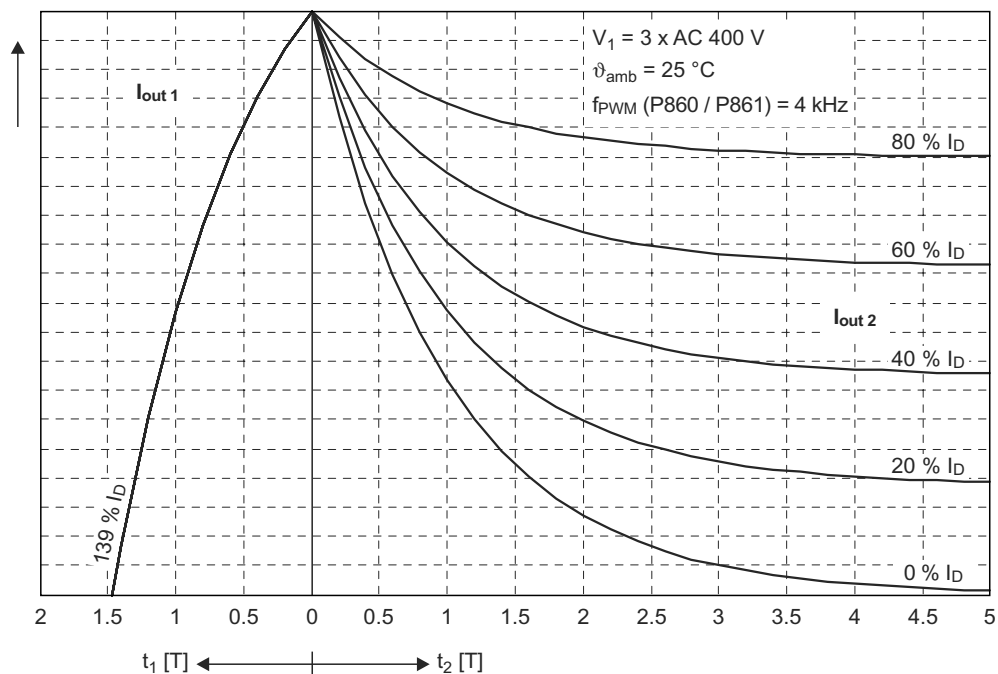


Figure 96: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (400 V / 25 °C)

56698AXX

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

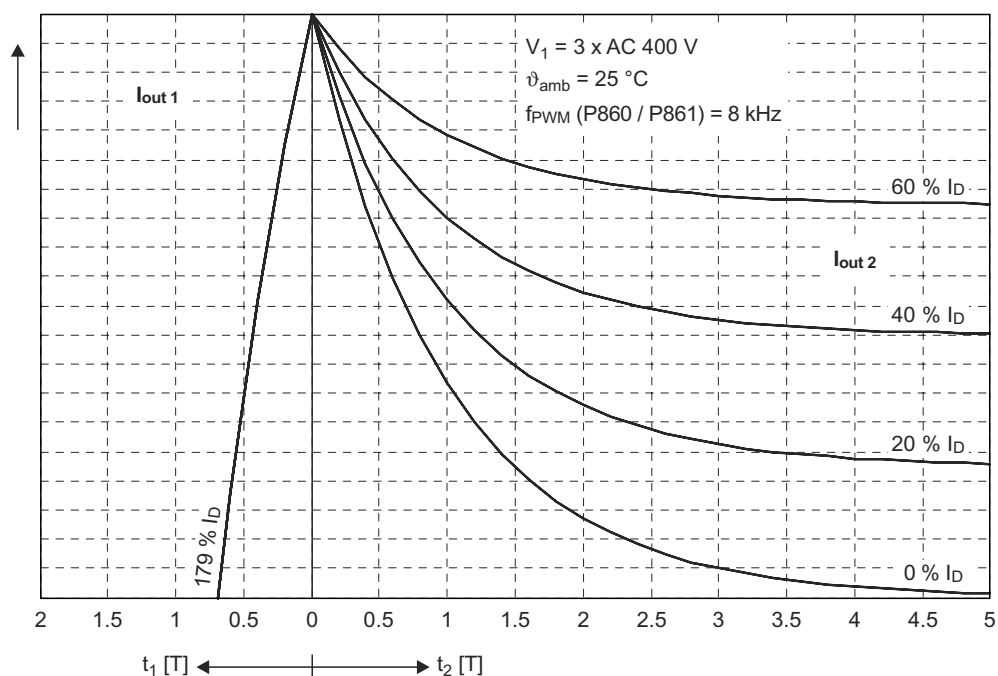


Figure 97: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (400 V / 25 °C)

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Project Planning

Overload capacity of the inverter

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

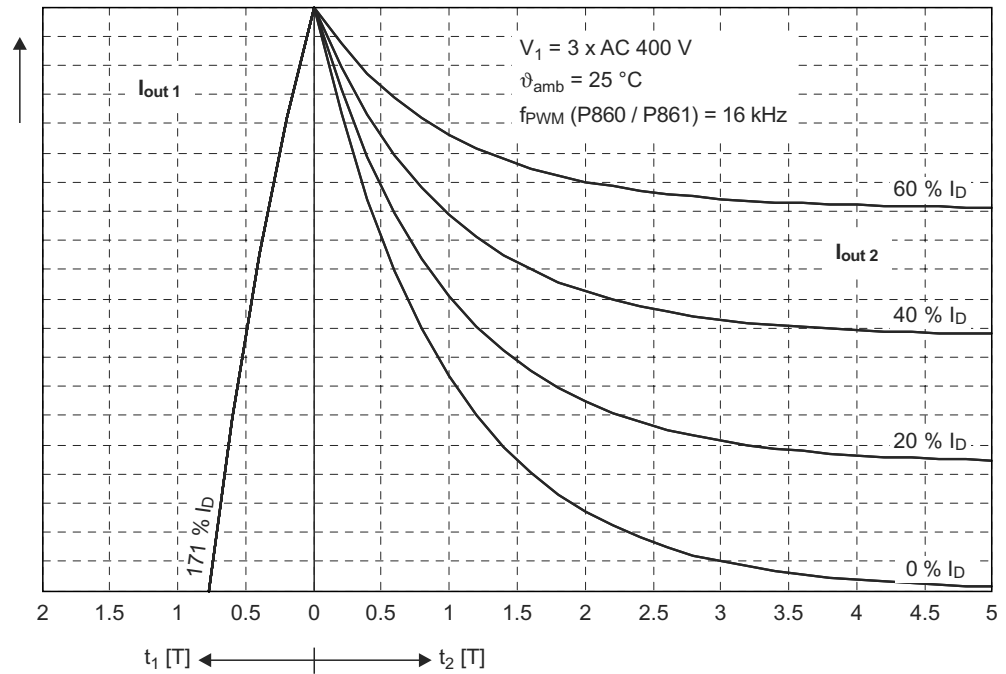


Figure 98: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 25 °C)

56700AXX

MDX61B, BG 1-6
overload capacity
at 400 V / 25 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

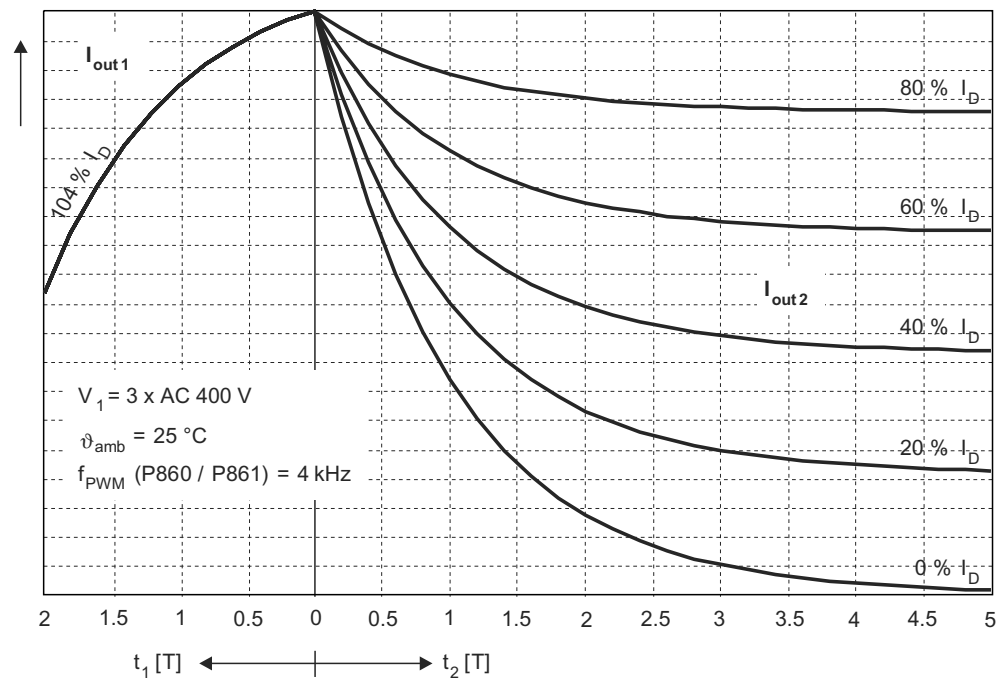


Figure 99: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (400 V / 25 °C)

56694AXX



Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

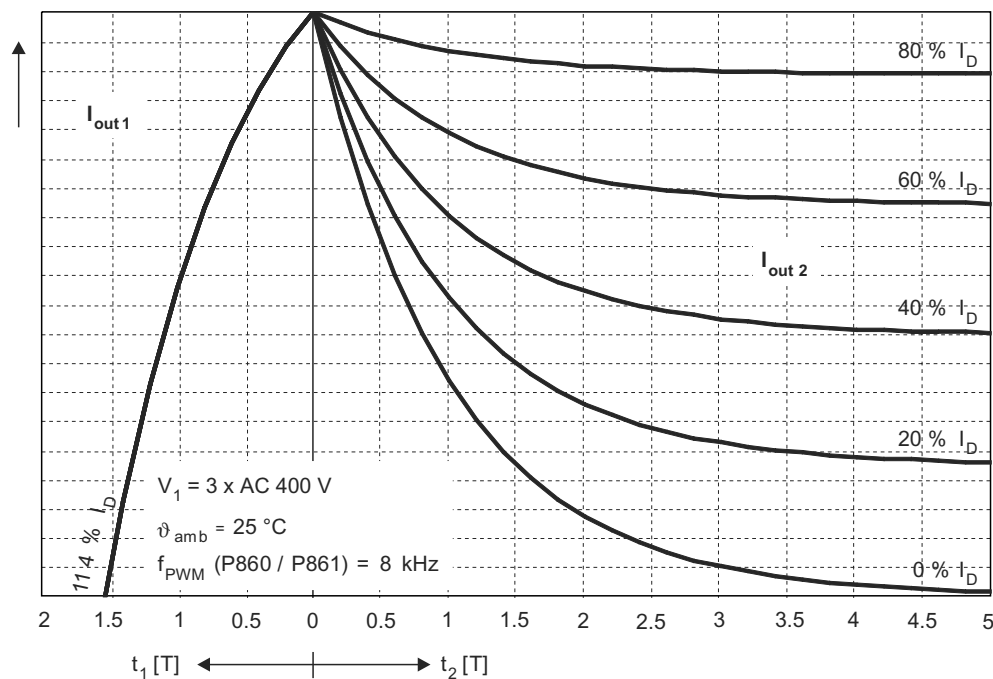


Figure 100: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (400 V / 25 °C)

56696AXX

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

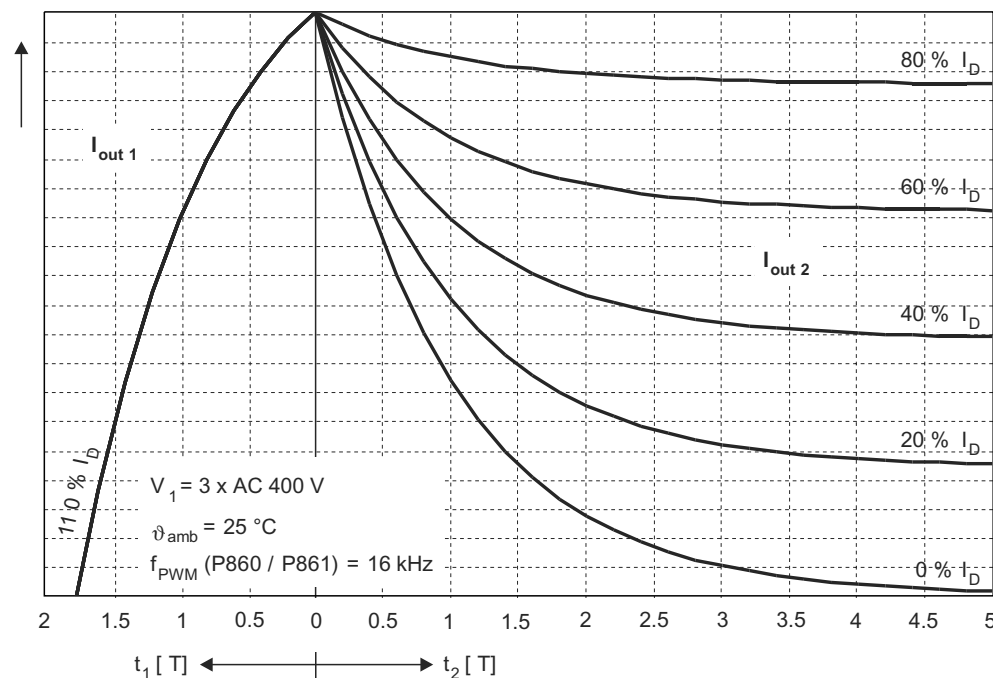


Figure 101: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 25 °C)

56697AXX



MDX60B/61B,
BG0 overload
capacity at
400 V / 40 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

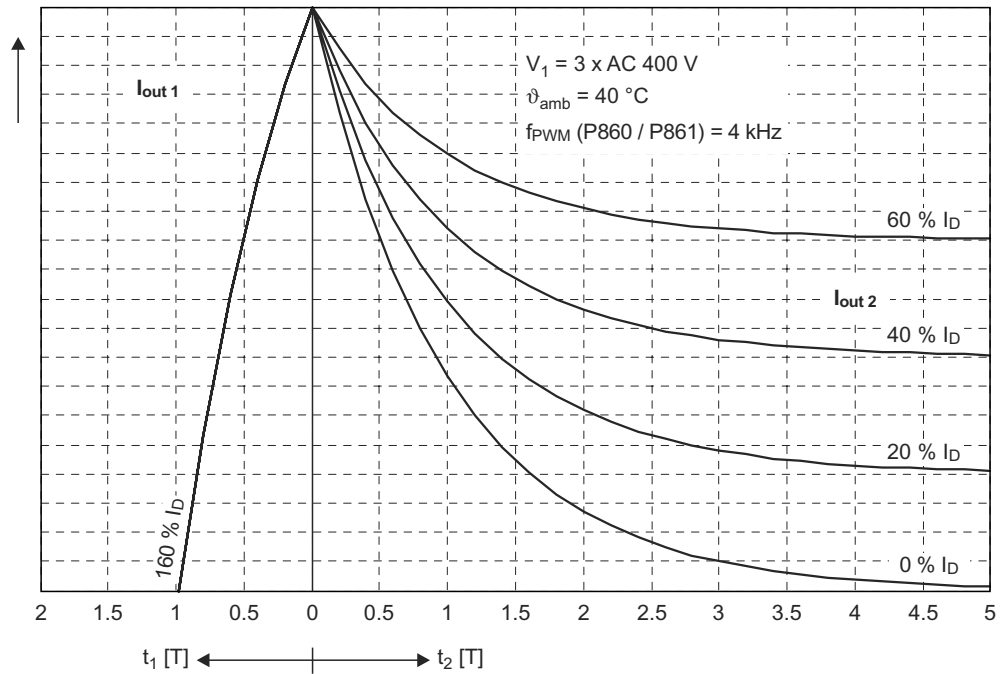


Figure 102: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (400 V / 40 °C)

56701AXX

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

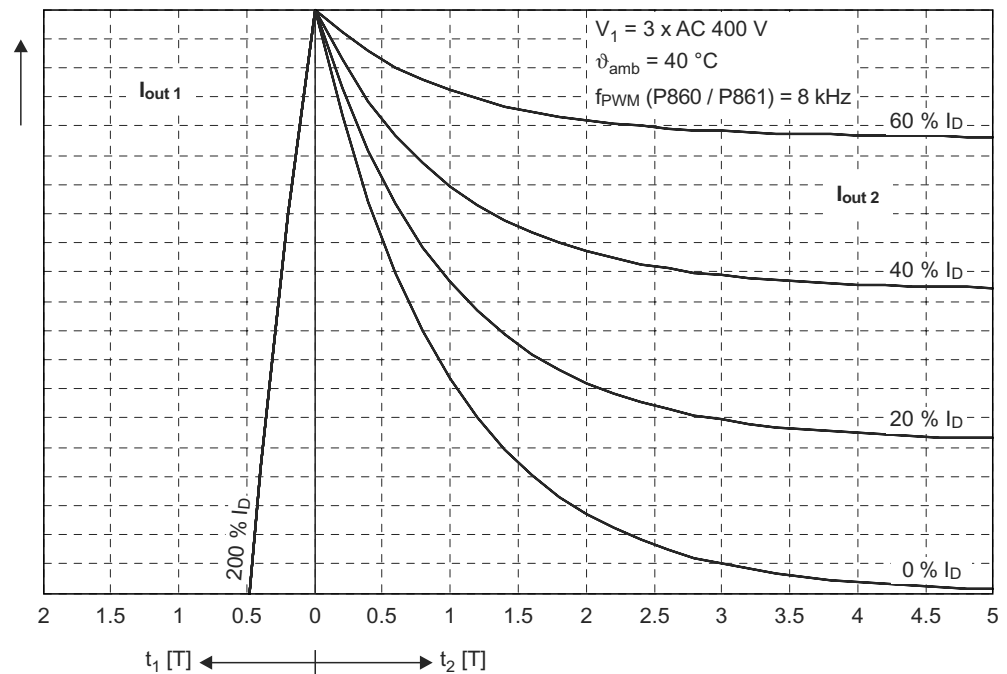
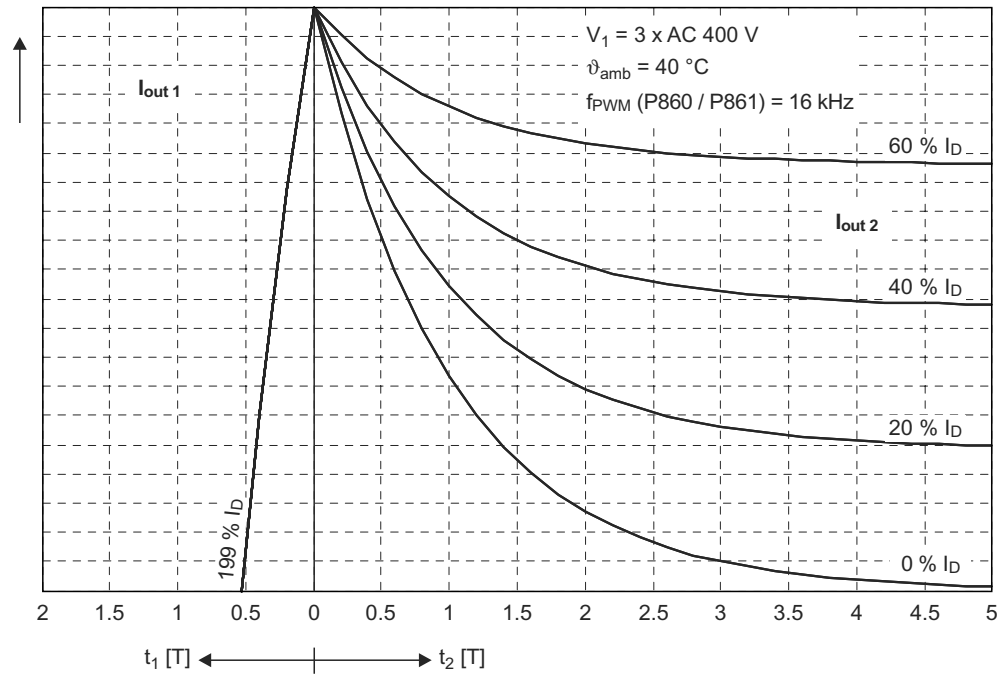


Figure 103: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (400 V / 40 °C)

56702AXX



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

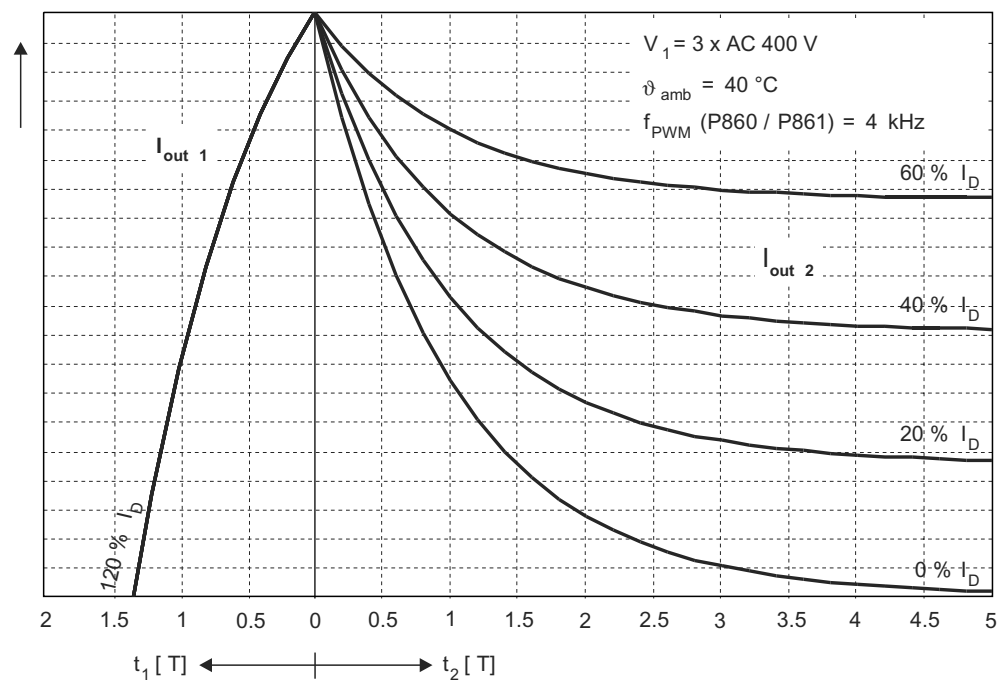


56703AXX

Figure 104: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 40 °C)

MDX61B, BG 1-6
overload capacity
at 400 V / 40 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:



56712AXX

Figure 105: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (400 V / 40 °C)



Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

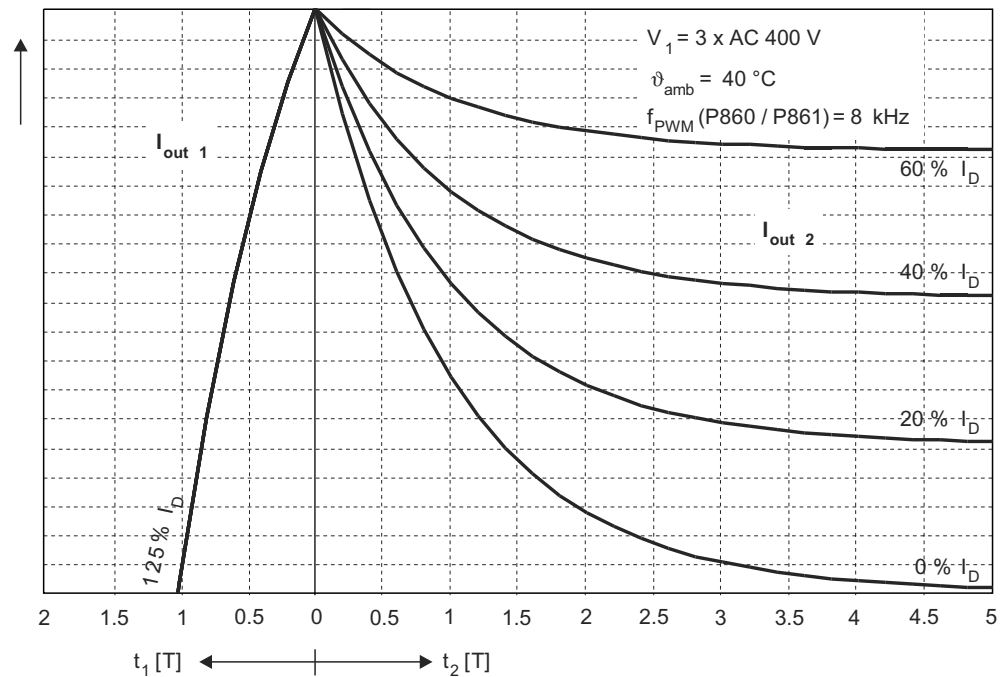


Figure 106: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (400 V / 40 °C)

56713AXX

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

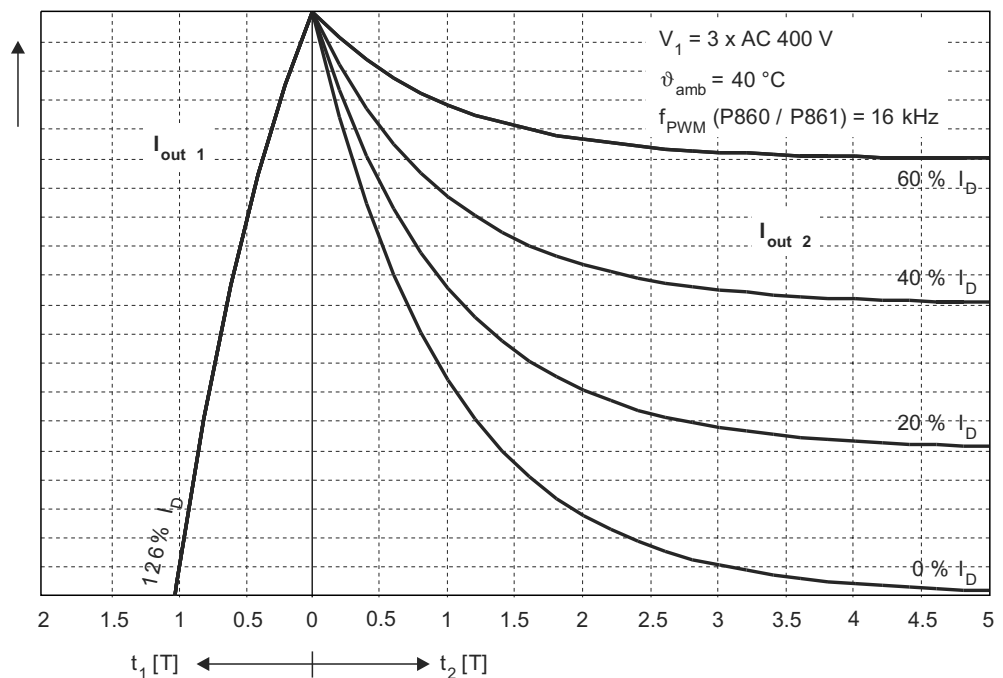


Figure 107: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 40 °C)

56714AXX



MDX60B/61B,
BG0 overload
capacity at
500 V / 25 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

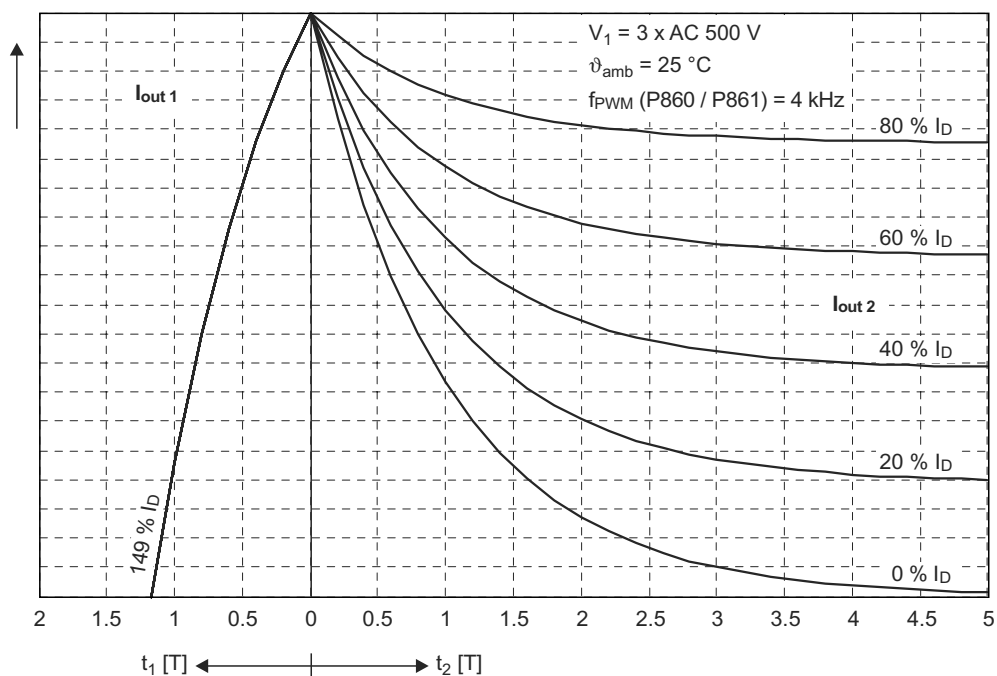


Figure 108: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (500 V / 25 °C)

56704AXX

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

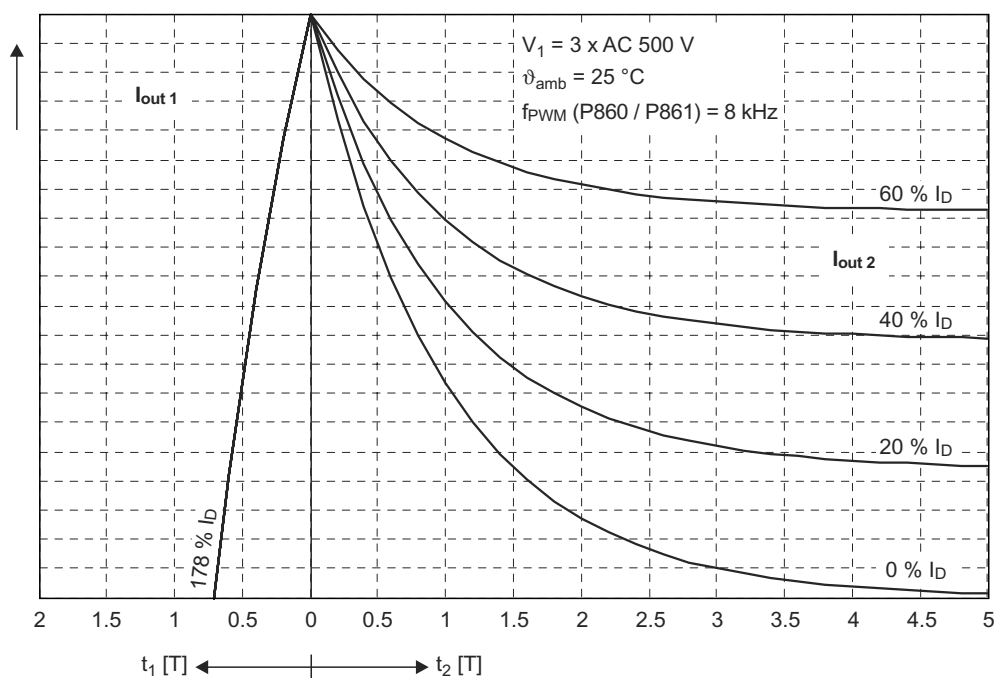


Figure 109: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 25 °C)

56706AXX



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

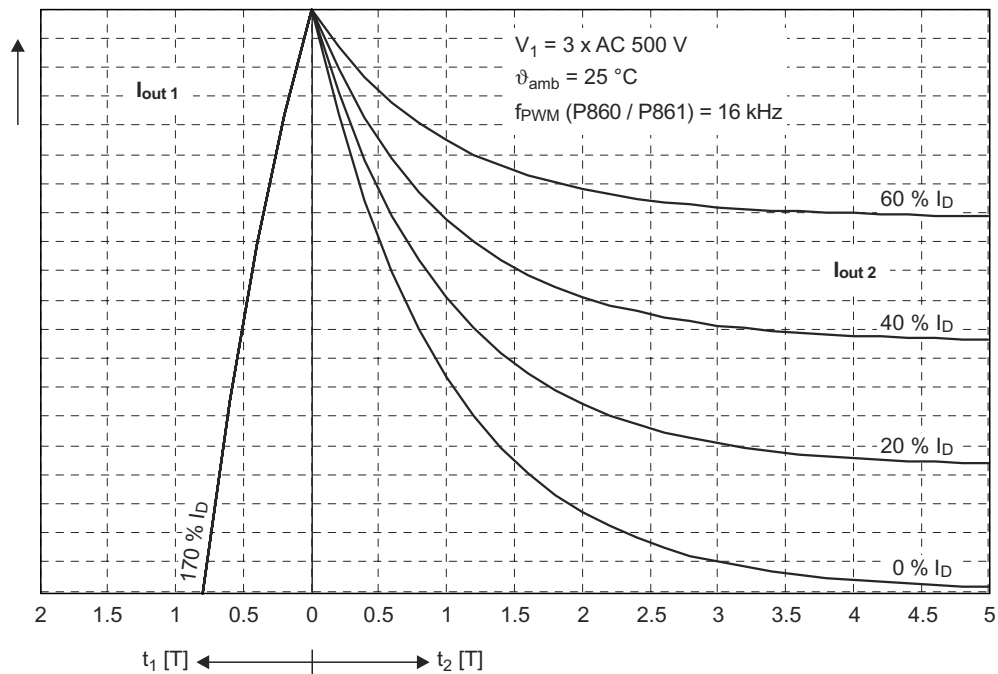


Figure 110: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 25 °C)

56707AXX

MDX61B, BG 1-6
overload capacity
at 500 V / 25 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

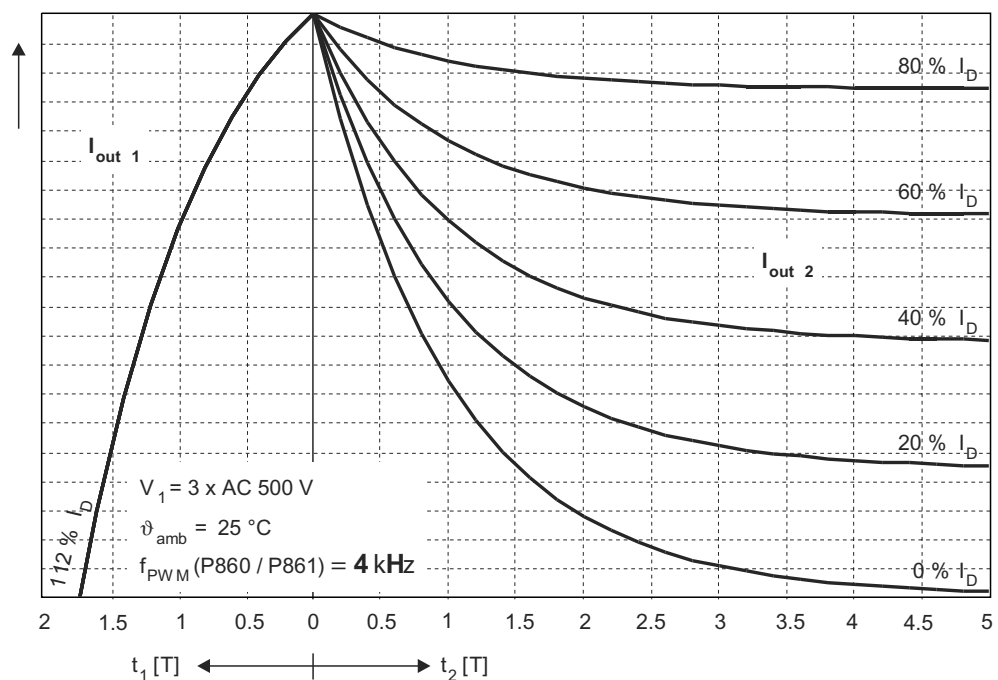


Figure 111: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (500 V / 25 °C)

56715AXX



Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

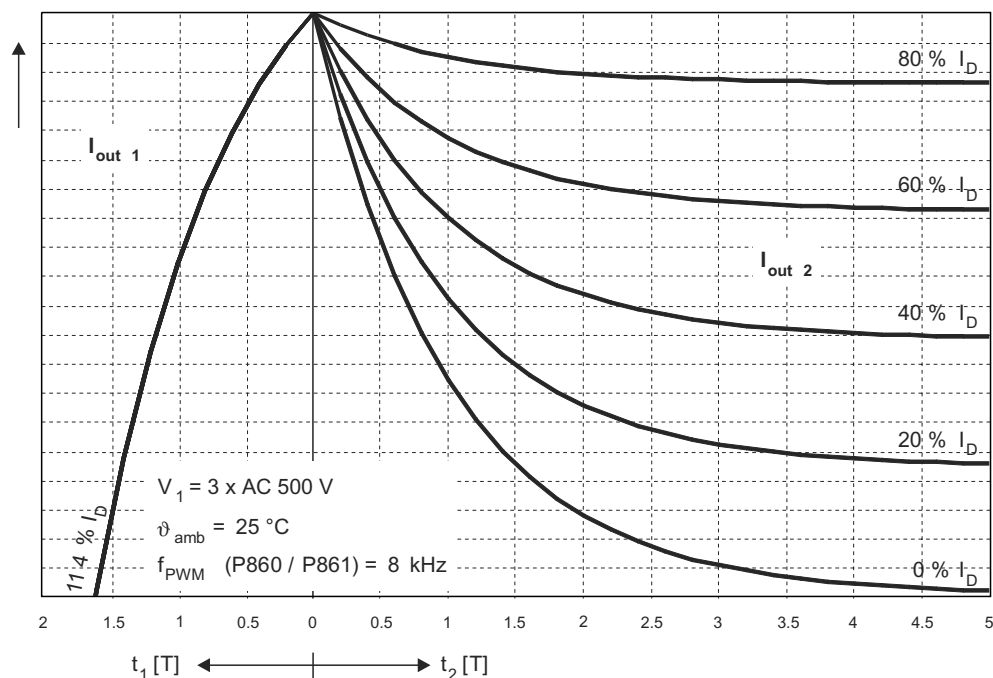


Figure 112: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 25 °C)

56716AXX

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

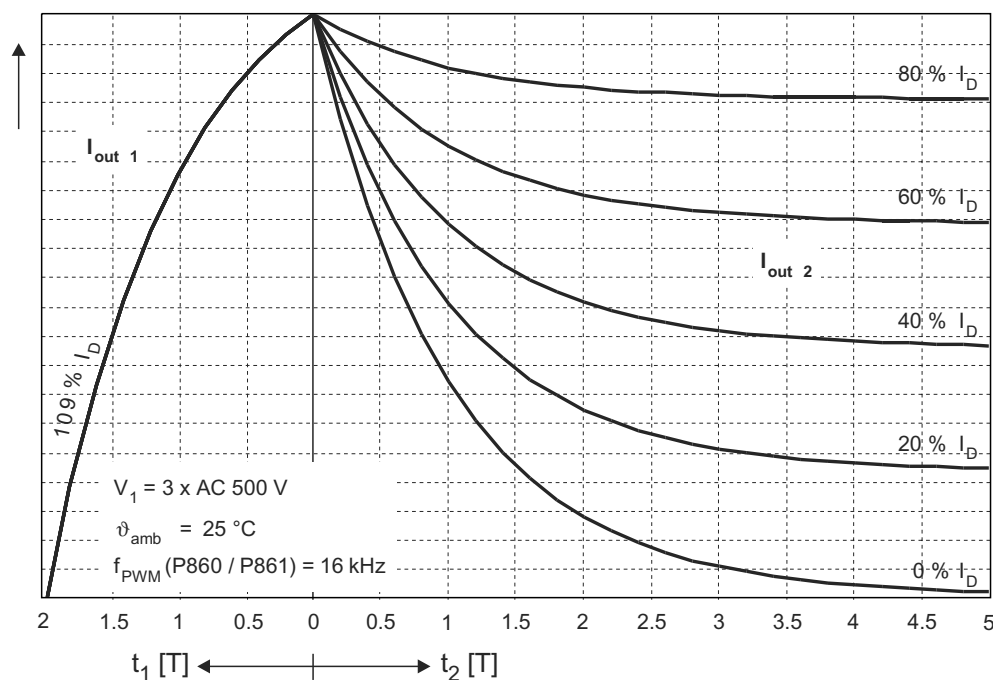


Figure 113: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 25 °C)

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Project Planning

Overload capacity of the inverter

MDX60B/61B,
BG0 overload
capacity at
500 V / 40 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

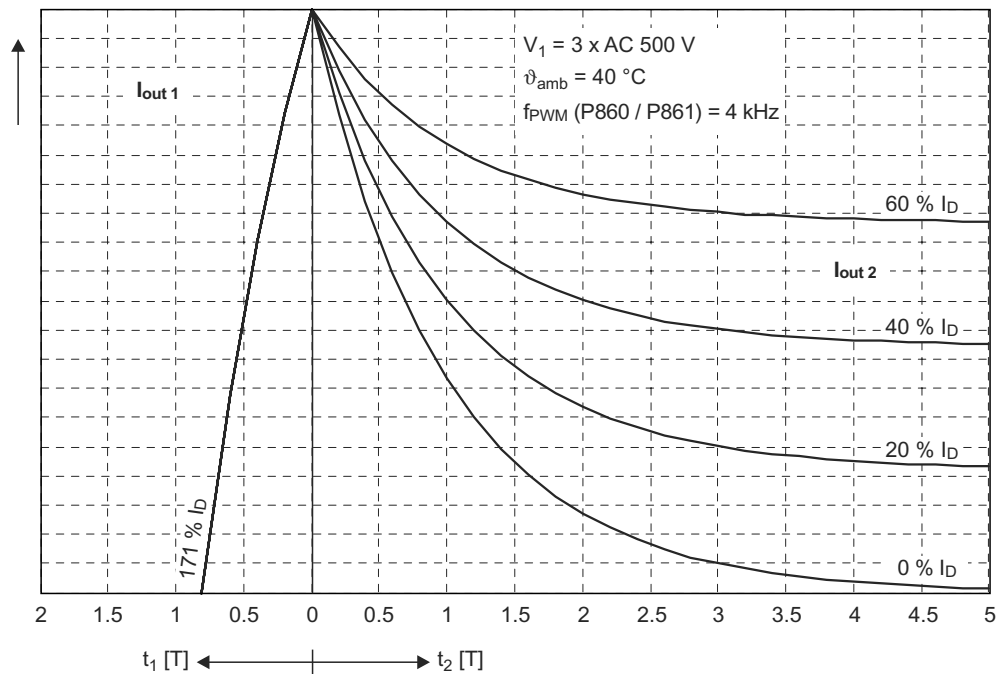


Figure 114: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (500 V / 40 °C)

56708AXX

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

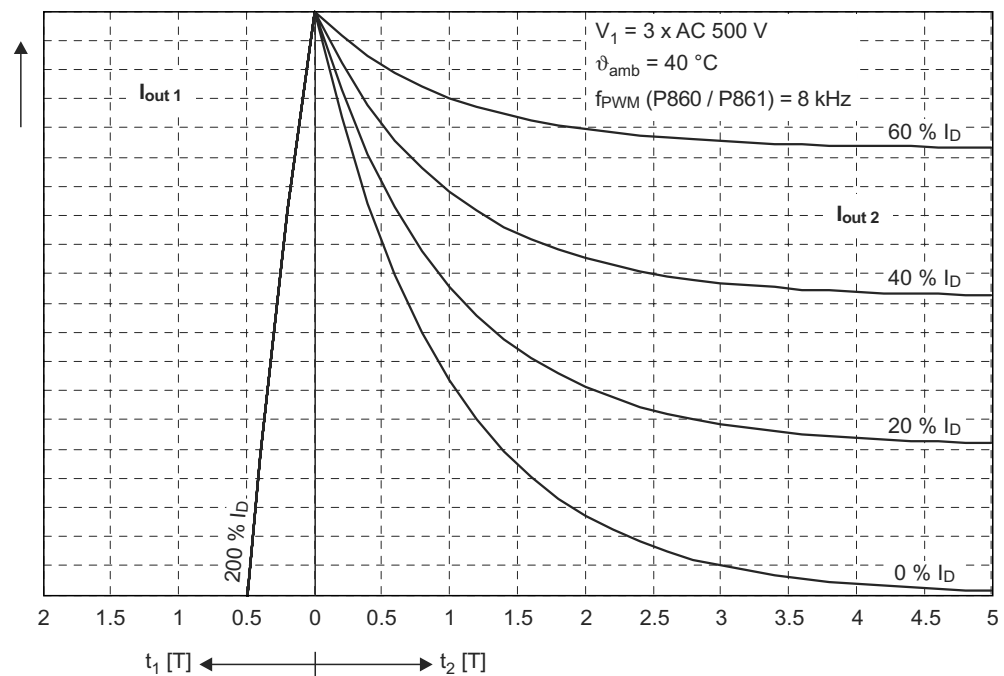


Figure 115: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 40 °C)

56709AXX



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

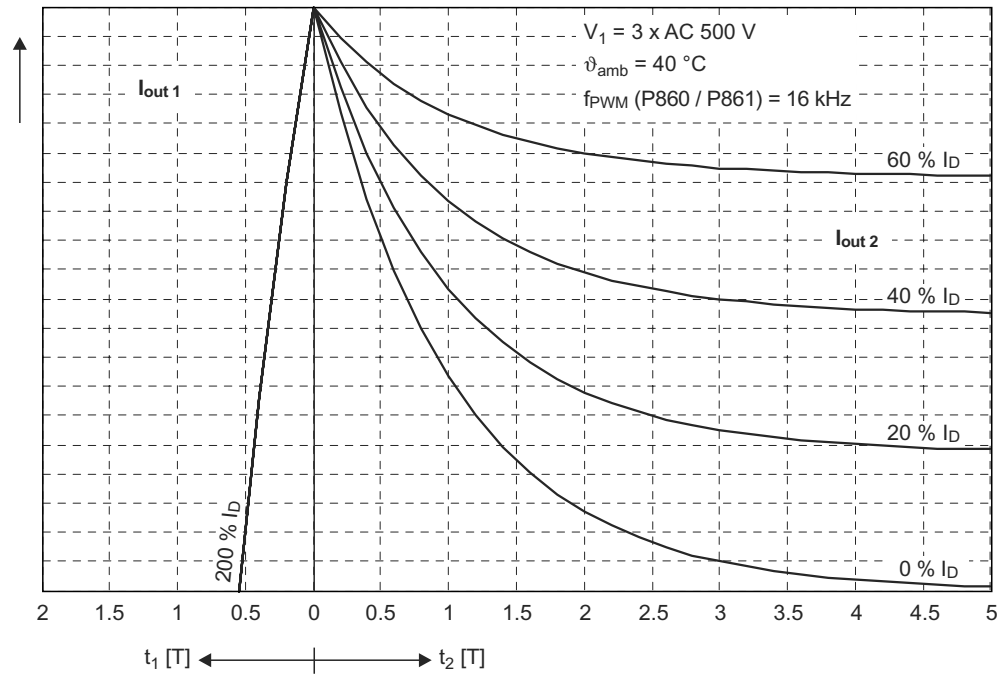


Figure 116: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 40 °C)

56710AXX

MDX61B, BG 1-6
overload capacity
at 500 V / 40 °C

Cycle frequency $f_{PWM} = 4 \text{ kHz}$:

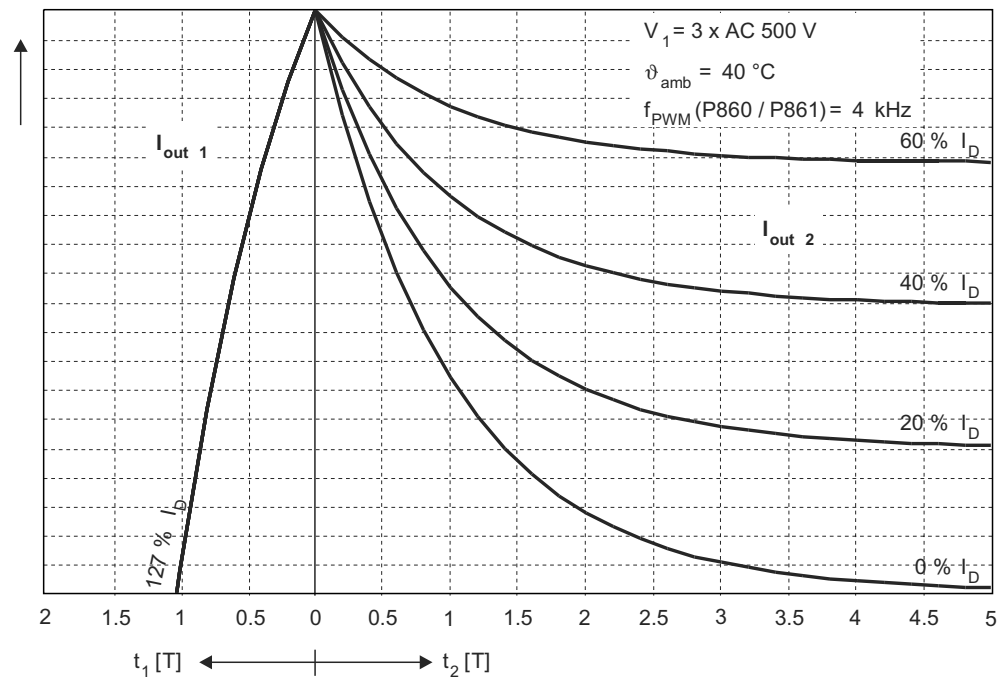


Figure 117: Overload capacity at $f_{PWM} = 4 \text{ kHz}$ (500 V / 40 °C)

56718AXX



Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

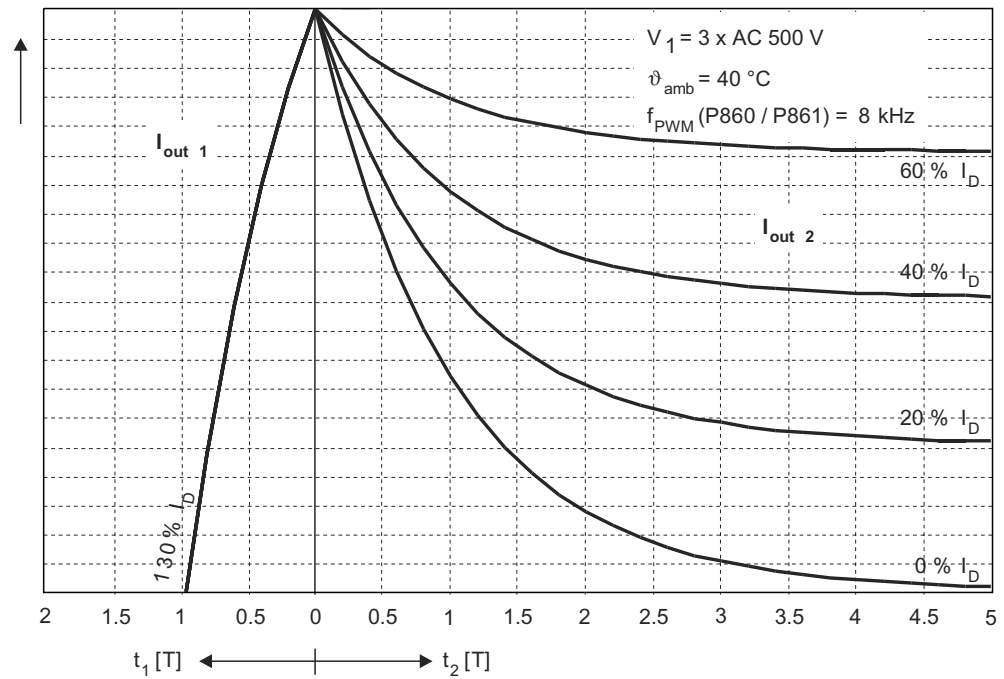


Figure 118: Overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 40 °C)

56719AXX

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

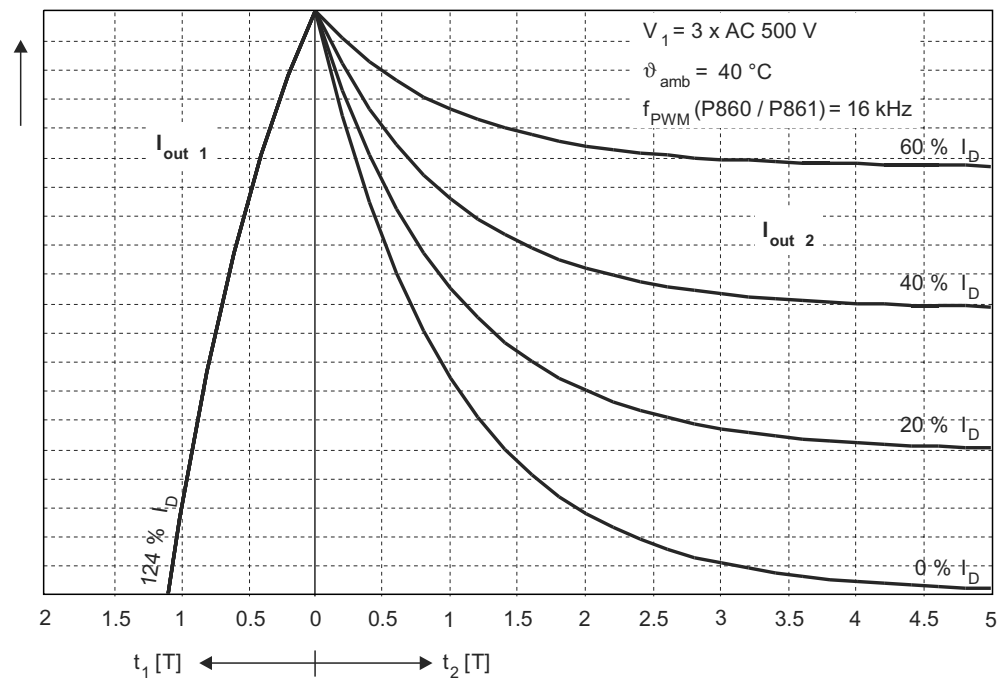


Figure 119: Overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 40 °C)

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Overload capacity in seconds

This is the overload capacity that corresponds at the most to a quarter of the heat sink time constant ($0.25 T$). The overload usually lasts a few seconds. In this time range, the curve is almost linear and the overload capacity can be determined as follows:

Overload time $t_1 < 0.25 \times T \rightarrow$ determine using a formula

Formula

At overload times $t_1 < 0.25 \times T$, you can calculate the overload capacity using the following formula:

$$t_2 > k \times t_1$$

k = overload factor

5

The values for overload factors k are given in the following tables, depending on the supply voltage V_1 , ambient temperature ϑ and cycle frequency f_{PWM} .

Example

Example with MOVIDRIVE® MDX61B0055 (size 2):

- Operation with supply voltage $V_1 = 3 \times AC\ 400\ V$, ambient temperature $\vartheta = 40\ ^\circ C$ and cycle frequency $f_{PWM} = 4\ kHz$.
- Rated unit current $I_N = AC\ 12.5\ A$ and continuous output current $I_D = 125\ \% \times I_N = AC\ 15.6\ (\rightarrow Figure\ 94)$
- 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}	Continuous output current I_D ($f_A > 2\ Hz$)	Overload current $I_{out\ 1}$ (at $f_A > 2\ Hz$)	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	$125\ \% I_N$	$120\ \% I_D (= 150\ \% I_N)$	0.411	0.538	0.778	1.407

- The low-load time must be $t_2 > k \times t_1 > 0.778 \times 30\ s > 23.34\ s$.

For **overload times $t_1 < 0.25 \times T$** use the formula $t_2 > k \times t_1$ to ascertain the overload capacity. The following tables show the overload factor k for various low-load currents. For your additional information, we have included the value depending on I_N (at $f_A > 2\ Hz$) in addition to the overload current.

MDX60B/61B,
BG0 overload capacity at 400 V / 25 °C

Cycle frequency f_{PWM}	Continuous output current I_D ($f_A > 2\ Hz$)	Overload current $I_{out\ 1}$ (at $f_A > 2\ Hz$)	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	$144\ \% I_N$	$139\ \% I_D (= 200\ \% I_N)$	0.368	0.456	0.588	0.838	1.456
8 kHz	$112\ \% I_N$	$179\ \% I_D (= 200\ \% I_N)$	1.182	1.545	2.091	3.545	14.364
16 kHz	$78\ \% I_N$	$171\ \% I_D (= 133\ \% I_N)$	1.000	1.313	1.813	2.938	9.250

MDX61B, BG 1-6
overload capacity at 400 V / 25 °C

Cycle frequency f_{PWM}	Continuous output current I_D ($f_A > 2\ Hz$)	Overload current $I_{out\ 1}$ (at $f_A > 2\ Hz$)	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	$144\ \% I_N$	$104\ \% I_D (= 150\ \% I_N)$	0.085	0.107	0.145	0.226	0.508
8 kHz	$112\ \% I_N$	$114\ \% I_D (= 128\ \% I_N)$	0.314	0.408	0.582	1.016	4.160
16 kHz	$78\ \% I_N$	$110\ \% I_D (= 86\ \% I_N)$	0.235	0.303	0.427	0.720	2.324



Project Planning

Overload capacity of the inverter

MDX60B/61B,
BG0 overload
capacity at
400 V / 40 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	125 % I_N	160 % I_D (= 200 % I_N)	0.727	0.909	1.212	1.818
8 kHz	100 % I_N	200 % I_D (= 200 % I_N)	1.931	2.690	4.069	9.448
16 kHz	67 % I_N	199 % I_D (= 133 % I_N)	0.737	0.912	1.211	1.825

MDX61B, BG 1-6
overload capacity
at 400 V / 40 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	125 % I_N	120 % I_D (= 150 % I_N)	0.411	0.538	0.778	1.407
8 kHz	100 % I_N	125 % I_D (= 125 % I_N)	0.678	0.928	1.473	3.639
16 kHz	68 % I_N	126 % I_D (= 86 % I_N)	0.676	0.922	1.448	3.438

MDX60B/61B,
BG0 overload
capacity at
500 V / 25 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$				
			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	149 % I_D (= 200 % I_N)	0.558	0.674	0.907	1.326	2.674
8 kHz	100 % I_N	178 % I_D (= 178 % I_N)	1.154	1.538	2.077	3.462	11.615
16 kHz	67 % I_N	170 % I_D (= 114 % I_N)	1.000	1.278	1.778	2.778	7.944

MDX61B, BG 1-6
overload capacity
at 500 V / 25 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$				
			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 (= 150 % I_N)	0.245	0.316	0.443	0.741	2.287
8 kHz	100 % I_N	114 % I_D (= 114 % I_N)	0.286	0.369	0.522	0.888	3.040
16 kHz	67 % I_N	109 % I_D (= 73 % I_N)	0.182	0.232	0.321	0.521	1.385

MDX60B/61B,
BG0 overload
capacity at
500 V / 40 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	117 % I_N	171 % I_D (= 200 % I_N)	1.000	1.268	1.805	3.049
8 kHz	89 % I_N	200 % I_D (= 178 % I_N)	1.882	2.529	3.824	8.412
16 kHz	57 % I_N	200 % I_D (= 114 % I_N)	1.667	2.208	3.167	5.792

MDX61B, BG 1-6
overload capacity
at 500 V / 40 °C

Cycle freq. f_{PWM}	Continuous output curr. I_D ($f_A > 2 \text{ Hz}$)	Overload current $I_{\text{out } 1}$ (at $f_A > 2 \text{ Hz}$)	Overload factor k at low-load current $I_{\text{out } 2} =$			
			0	$0.2 \times I_D$	$0.4 \times I_D$	$0.6 \times I_D$
4 kHz	117 % I_N	128 % I_D (= 150 % I_N)	0.662	0.897	1.395	3.176
8 kHz	89 % I_N	126 % I_D (= 112 % I_N)	0.745	1.022	1.627	4.103
16 kHz	59 % I_N	123 % I_D (= 73 % I_N)	0.595	0.803	1.234	2.695



Overload capacity for an overload time < 1 s

In dynamic applications (CFC and SERVO operating modes) with a short overload time t_1 , the inverter can output overload currents up to 150 % I_N even at PWM frequencies of 8 kHz and 16 kHz.

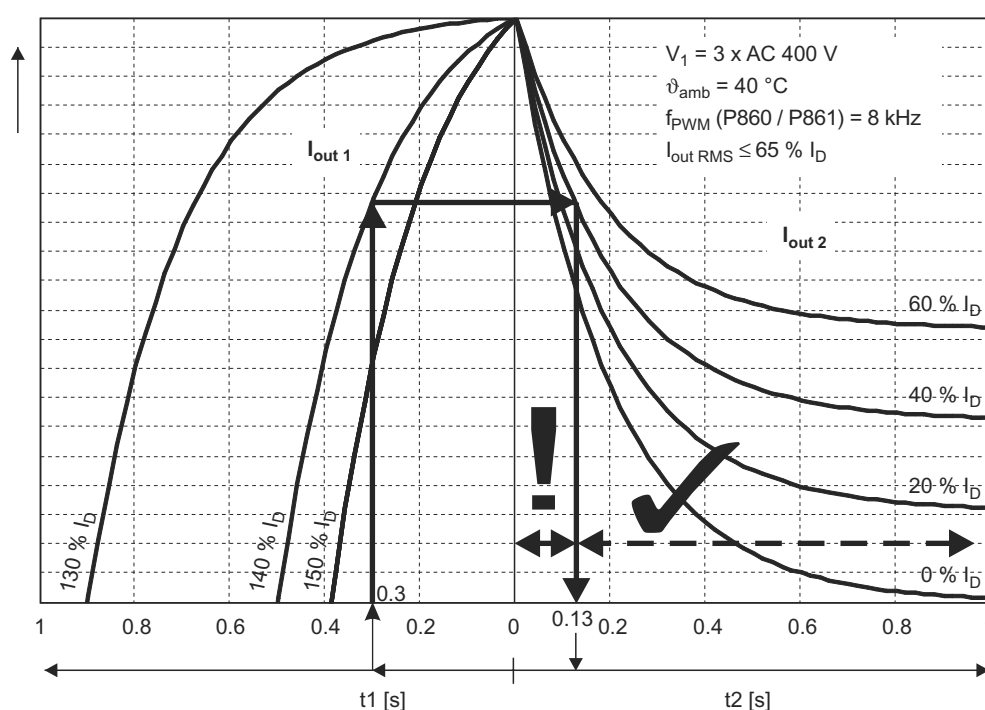
The overload time t_1 **must be less than 1 s** for this high overload capacity to be achieved.

Determining the overload capacity

The overload capacity for the short overload time ($t_1 < 1$ s) is determined as follows:

- Für MDX61B size 1 - 6 using the diagrams (→ following figure)
- For MDX60B/61B size 0 according to the section "Overload capacity in seconds" (→ S.)

The mean inverter output current $I_{out\ RMS}$ during the load cycle must not exceed a certain value.



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Figure 120: Sample overload diagram for short overload time

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 an overload time of $t_1 = 0.3$ s move vertically upwards until the point of intersection with $I_{out\ 1} = 140\ \% I_D$.
- Move horizontally to the right until the point of intersection with $I_{out\ 2} = 0.4 \times I_D$.



Project Planning

Overload capacity of the inverter

- Move vertically downwards and then read the minimum low-load time $t_2 \rightarrow t_2 = 0.13$ s. All times t_2 to the right of the point of intersection with I_{out2} are permissible ($\checkmark$); all times t_2 to the left are not (!).

The overload capacity is given according to the diagram. In addition to the diagram, you now have to check that the permitted mean inverter output current $I_{out\ RMS}$ is not exceeded:

$$I_{out\ 1} \times \frac{t_1}{t_1 + t_2} + I_{out\ 2} \times \frac{t_2}{t_1 + t_2} \leq I_{out\ RMS}$$

$$140\% I_D \times \frac{0.3\ s}{1.3\ s} + 40\% I_D \times \frac{1.0\ s}{1.3\ s} \leq 65\% I_D$$

$$32.31\% I_D + 30.77\% I_D = 63.08\% I_D \leq 65\% I_D$$

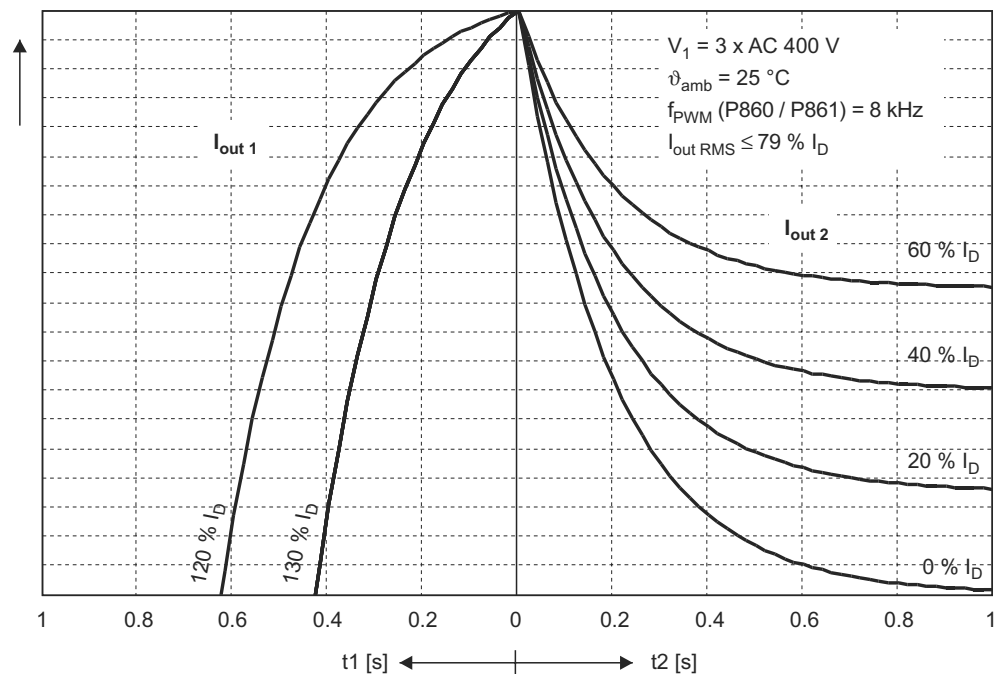
05574AXX

The permitted mean inverter output current is $I_{out\ RMS} \leq 65\% I_D$. In the specified load cycle, $I_{out\ RMS} = 63.08\% I_D$. Therefore, the load cycle is permitted.

MDX61B, BG 1-6
overload capacity
at 400 V / 25 °C

Cycle frequency $f_{PWM} = 8$ kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 79\% I_D$.



56749AXX

Figure 121: Short-term overload capacity at $f_{PWM} = 8$ kHz (400 V / 25 °C)



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 81 \% I_D$.

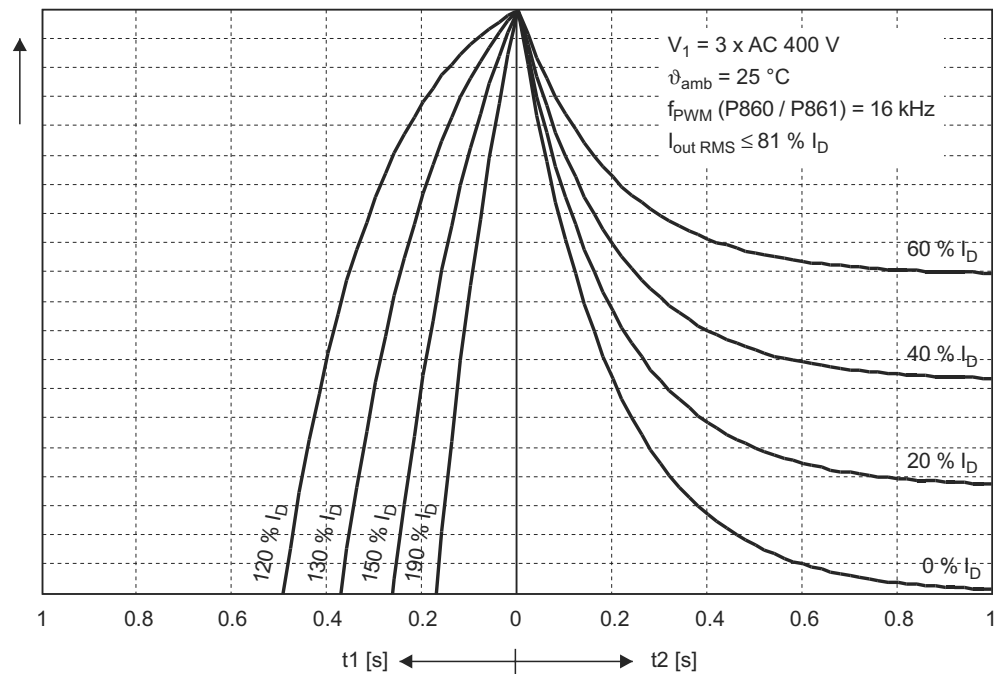


Figure 122: Short-term overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 25 °C)

56750AXX

MDX61B, BG 1-6
overload capacity
at 400 V / 40 °C

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 65 \% I_D$.

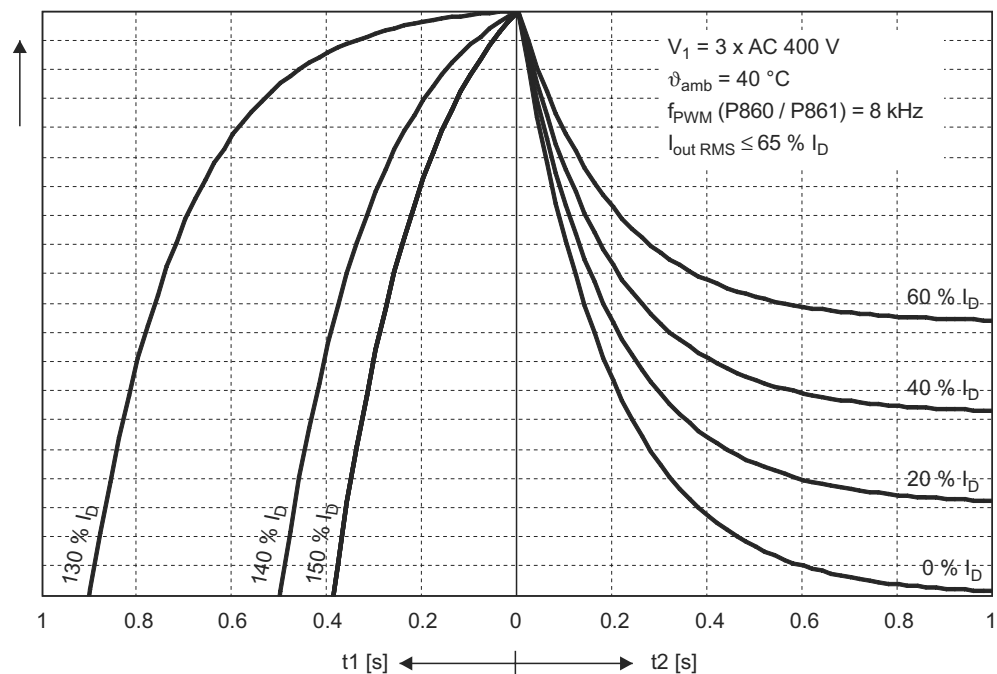


Figure 123: Short-term overload capacity at $f_{PWM} = 8 \text{ kHz}$ (400 V / 40 °C)

56751AXX



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 69 \% I_D$.

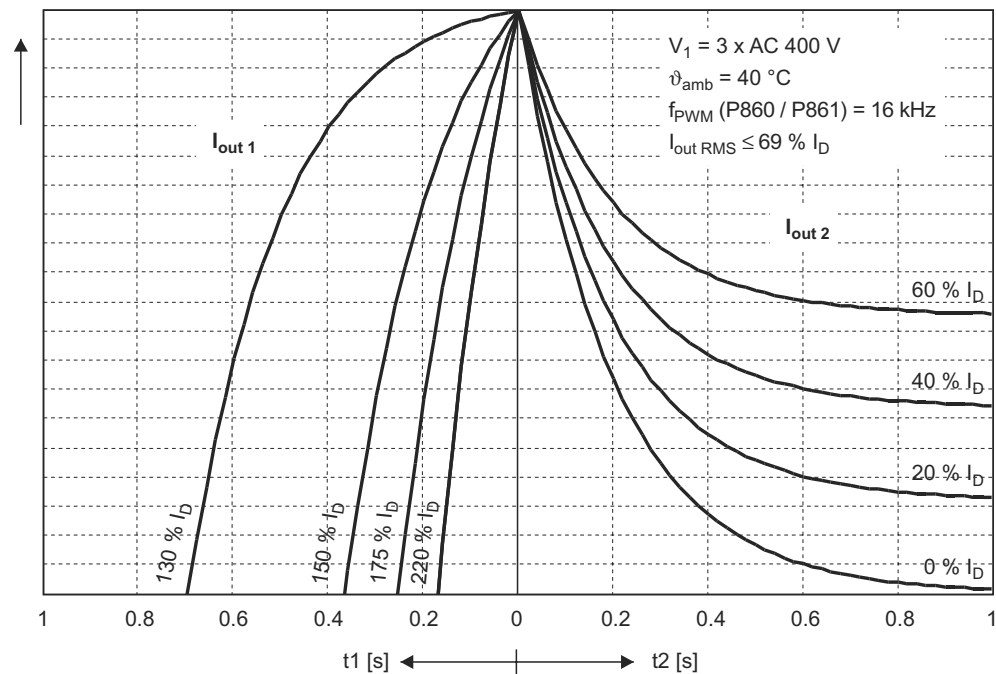


Figure 124: Short-term overload capacity at $f_{PWM} = 16 \text{ kHz}$ (400 V / 40 °C)

56721ABXX

MDX61B, BG 1-6
overload capacity
at 500 V / 25 °C

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 80 \% I_D$.

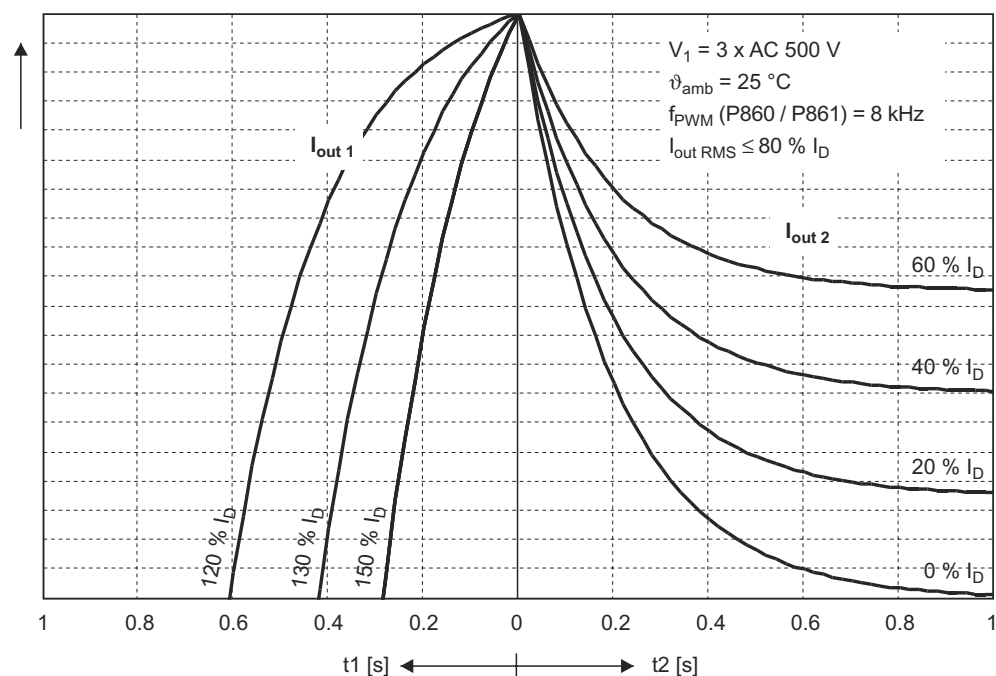


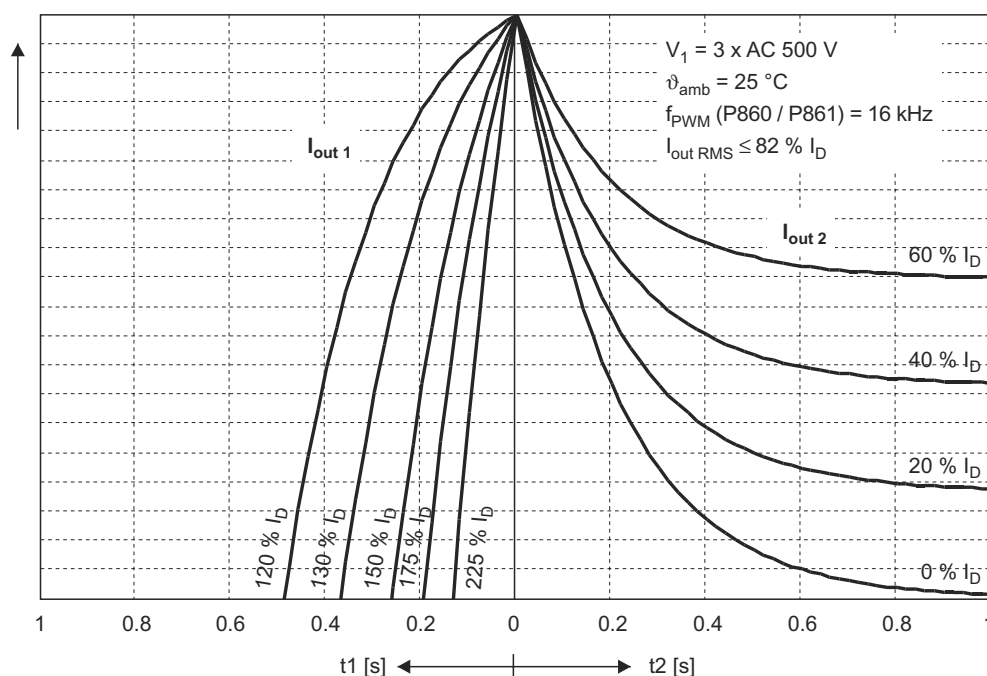
Figure 125: Short-term overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 25 °C)

56725AXX



Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 82 \% I_D$.



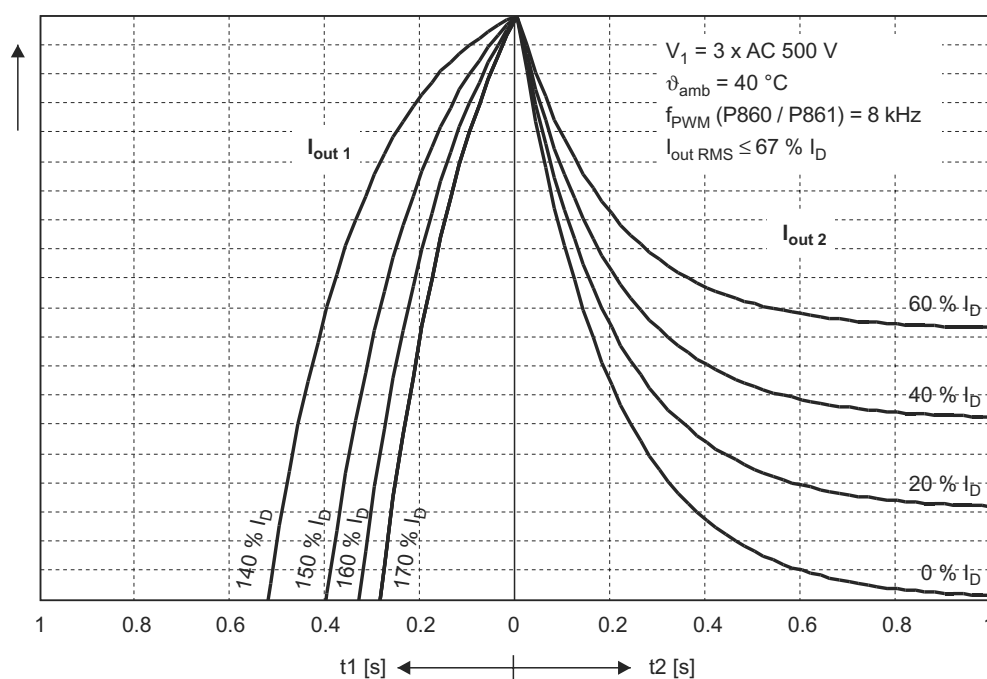
56726AXX

Figure 126: Short-term overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 25 °C)

MDX61B, BG 1-6
overload capacity
at 500 V / 40 °C

Cycle frequency $f_{PWM} = 8 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 67 \% I_D$.



56727AXX

Figure 127: Short-term overload capacity at $f_{PWM} = 8 \text{ kHz}$ (500 V / 40 °C)



Project Planning

Overload capacity of the inverter

Cycle frequency $f_{PWM} = 16 \text{ kHz}$:

The permitted mean inverter output current is $I_{out \text{ RMS}} \leq 69 \% I_D$.

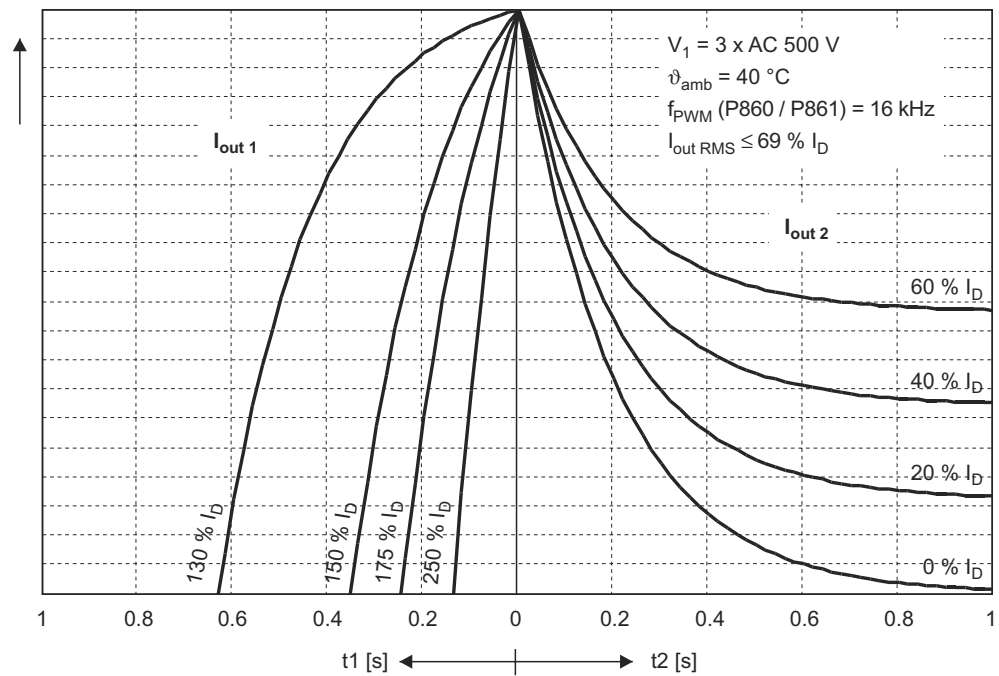


Figure 128: Short-term overload capacity at $f_{PWM} = 16 \text{ kHz}$ (500 V / 40 °C)

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5.8 Selecting the braking resistor

High voltage



The connection leads to the braking resistor carry a **high DC voltage (ca. DC 900 V)**. The braking resistor lines must be suitable for this high DC voltage.



- The data in this section apply to the BW.. and BW...-T braking resistors.
- The **maximum permitted line length** between **MOVIDRIVE®** and the braking resistor is **100 m**.

5

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 maximum permitted DC link voltage. Its value is

- V_{DC} = DC 970 V for MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)
- V_{DC} = DC 485 V for MOVIDRIVE® MDX61B...-2_3 (AC 230 V units).

The following table lists the peak braking power levels that are possible for the different resistance values.

Resistance value	Peak braking power	
	MDX60/61B...-5_3 (AC 400/500 V units)	MDX61B...-2_3 (AC 230 V units)
100 Ω	9.4 kW	2.3 kW
72 Ω	13.0 kW	3.2 kW
68 Ω	13.8 kW	3.2 kW
47 Ω	20.0 kW	5.0 kW
39 Ω	24.0 kW	6.0 kW
27 Ω	34.8 kW	8.7 kW
18 Ω	52.2 kW	13.0 kW
15 Ω	62.7 kW	15.6 kW
12 Ω	78.4 kW	19.6 kW
9 Ω (2 × BW018 parallel)	104 kW	26.1 kW
7.5 Ω (2 × BW915 parallel)	125 kW	31.3 kW
6 Ω	156 kW	39.2 kW
3 Ω (2 × BW106/206 parallel)	313 kW	78.4 kW



Project Planning

Selecting the braking resistor

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 determine the resulting continuous resistance rating (100 % cdf power) with reference to the power diagrams. The right-hand y axis shows the 100 % cdf power.

Power diagrams for MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units):

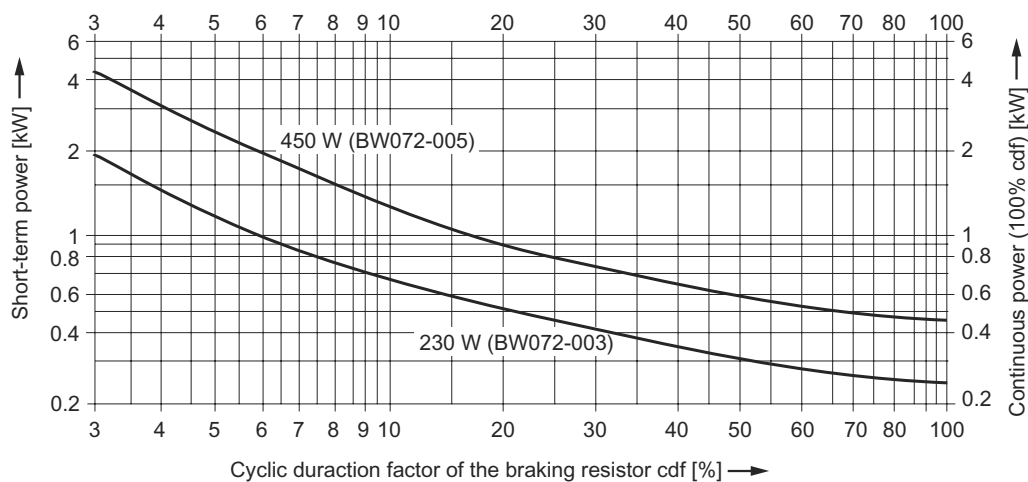


Figure 129: Power diagram for flat-type braking resistor AC 400/500 V units

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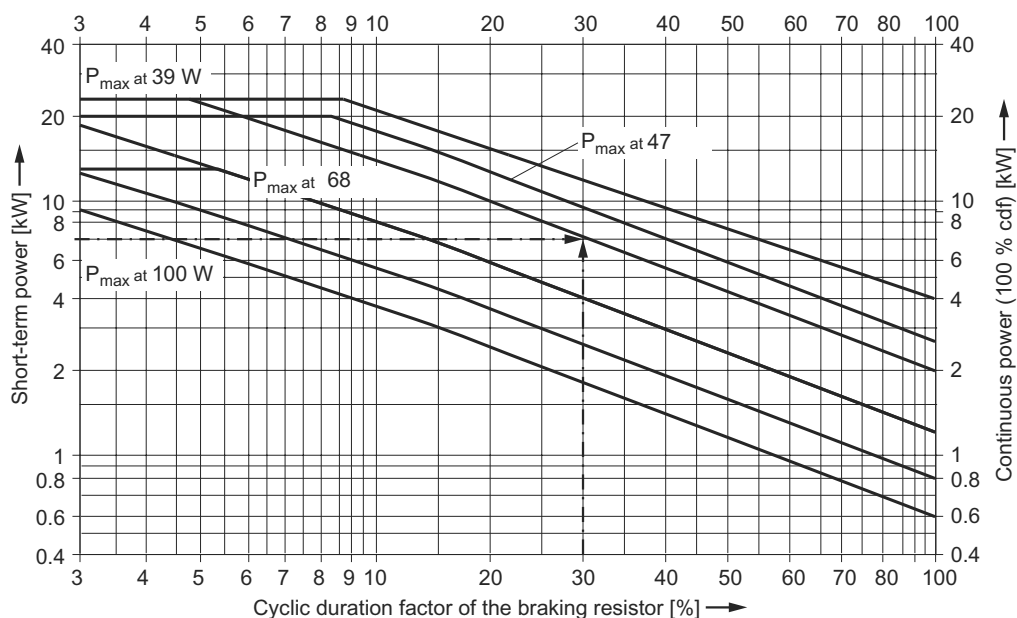


Figure 130: Power diagram for wire resistors AC 400/500 V units

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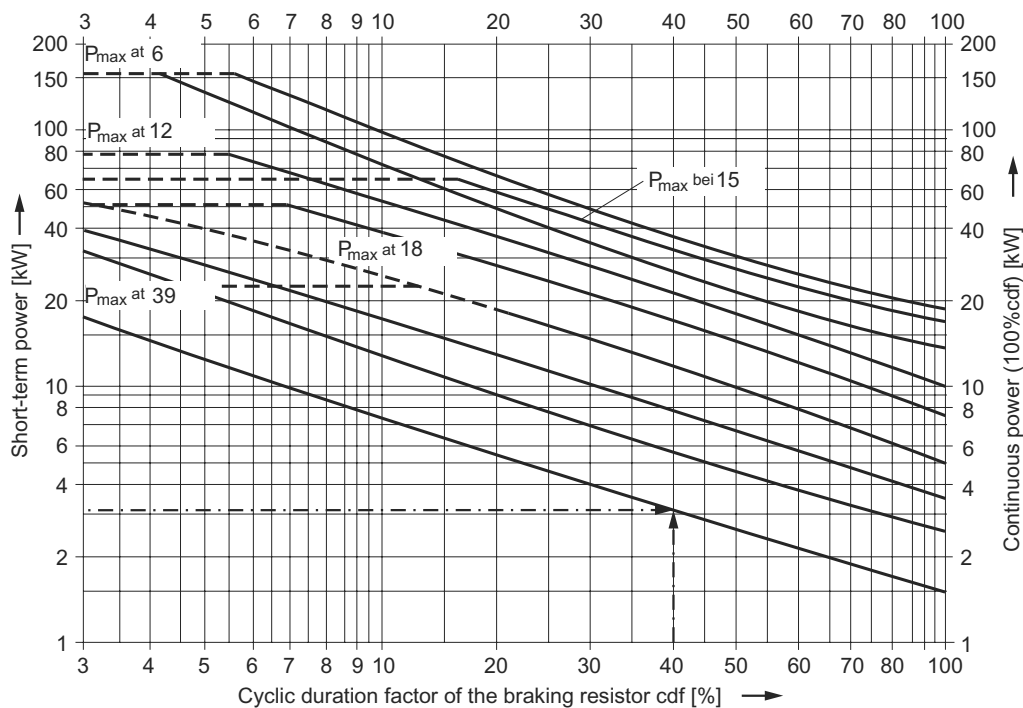
Example

When a short-term braking power of 7 kW is needed with a cyclic duration factor of 30 %, a braking resistor with a continuous power of 2 kW is required, for example BW247.



Braking resistor type	BW100-005	BW100-006	BW072-003	BW072-005	BW168	BW268
Load capacity 100 % cdf	0.45 kW	0.6 kW	0.23 kW	0.45 kW	0.8 kW	1.2 kW
Resistance value R_{BW}	100 $\Omega \pm 10\%$		72 $\Omega \pm 10\%$		68 $\Omega \pm 10\%$	
Trip current of F16 I_F	0.8 A _{RMS}	1.8 A _{RMS}	0.6 A _{RMS}	1.0 A _{RMS}	2.5 A _{RMS}	3.4 A _{RMS}
Enclosure	IP54	IP20	IP54		IP20 (when mounted)	
For MDX60/61B...-5_3	0015/0022	0015 ... 0040	0005 ... 0014		0015 ... 0040	

Braking resistor type	BW147	BW247	BW347	BW039-012	BW039-026	BW039-050
Load capacity 100 % cdf	1.2 kW	2.0 kW	4.0 kW	1.2 kW	2.6 kW	5.0 kW
Resistance value R_{BW}	47 $\Omega \pm 10\%$			39 $\Omega \pm 10\%$		
Trip current of F16 I_F	3.5 A _{RMS}	4.9 A _{RMS}	7.8 A _{RMS}	4.2 A _{RMS}	7.8 A _{RMS}	11 A _{RMS}
Enclosure	IP20 (when mounted)					
For MDX61B...-5_3	0055/0075			0110		



55663AEN

Figure 131: Power diagram for grid resistors AC 400/500 V units

Example

When a short-term braking power of 3 kW is needed with a cyclic duration factor of 40 %, a braking resistor with a continuous power of 1.5 kW is required, for example BW018-015.

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 $\Omega \pm 10\%$			15 $\Omega \pm 10\%$
Trip current of F16 I_F	4 A _{RMS} ¹⁾	8.1 A _{RMS} ¹⁾	14 A _{RMS} ¹⁾	28 A _{RMS}
Enclosure	IP20 (when mounted)			
For MDX61B...-5_3	0150/0220 and 2 × parallel for 0370/0450			0220

1) Set twice the value when connected in parallel!



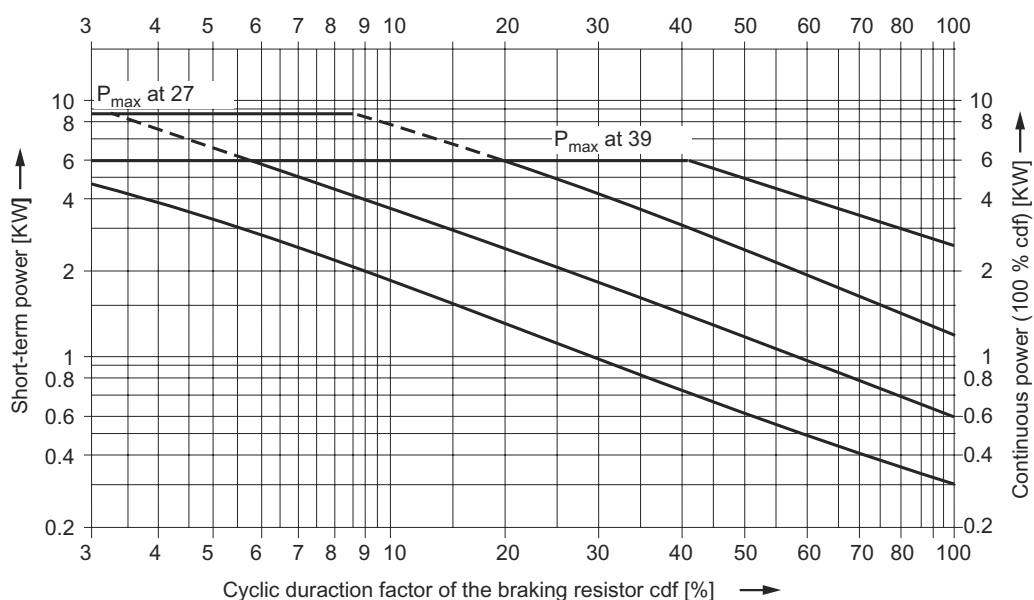
Project Planning

Selecting the braking resistor

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 $\Omega \pm 10\%$				6 $\Omega \pm 10\%$
Trip current of F16 I_F	6.1 A _{RMS}	12 A _{RMS}	22 A _{RMS}	38 A _{RMS} ¹⁾	42 A _{RMS} ¹⁾
Enclosure	IP20 (when mounted)				
For MDX61B...-5_3	0300			0370 ... 0750 and 2 × parallel with 0900 ... 1320	

1) Set twice the value when connected in parallel!

Power diagrams for MOVIDRIVE® MDX61B...-2_3 (AC 230 V units):



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Figure 132: Power diagram for wire resistors AC 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 $\Omega \pm 10\%$				27 $\Omega \pm 10\%$	
Trip current of F16 I_F	2 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 MDX61B...-2_3	0015/0022				0015 ... 0037	

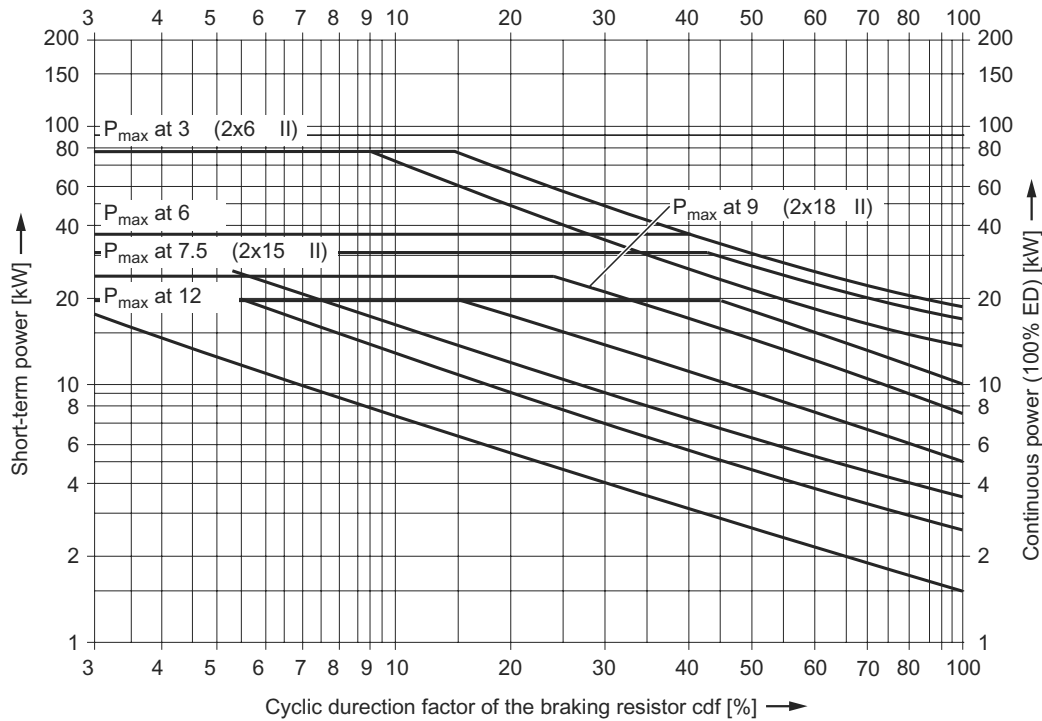


Figure 133: Power diagram for grid resistors AC 230 V units

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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}	$18 \Omega \pm 10 \%$		$18 \Omega \pm 10 \%$	$15 \Omega \pm 10 \%$
Trip current of F16 I_F	$4 A_{RMS}^{1)}$	$8.1 A_{RMS}^{1)}$	$14 A_{RMS}^{1)}$	$28 A_{RMS}^{1)}$
Enclosure	IP20 (when mounted)			
For MDX61B...-2_3	2 × parallel with 0110			

1) Set twice the value when connected in parallel!

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}	$12 \Omega \pm 10 \%$			$6 \Omega \pm 10 \%$	
Trip current of F16 I_F	$10 A_{RMS}$	$19 A_{RMS}$	$27 A_{RMS}$	$38 A_{RMS}^{1)}$	$42 A_{RMS}^{1)}$
Enclosure	IP20 (when mounted)				
For MDX61B...-2_3	0055/0075			0150 and 2 × parallel with 0220/0300	

1) Set twice the value when connected in parallel!



5.9 Connecting AC Brake Motors

For detailed information about the SEW brake system, refer to the "Gearmotors" catalog, which you can order from SEW-EURODRIVE.

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, which causes 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 in:

- All hoist applications
- The CFC and SERVO operating modes

Activating the brake



Always activate the brake via binary output DBØØ "/Brake", do not use the PLC!

The binary output DBØØ "/Brake" is configured as an output for operating a relay with a control voltage of DC+24 V / max. 150 mA / 3.6 W. This means a power contactor can be controlled directly with a DC 24 V coil voltage. This power contactor is used for switching the brake.

The startup function in the DBG60B keypad and in the MOVITOOLS® operating software sets the brake parameters for the 2 and 4-pole motors from SEW-EURODRIVE. The brake parameters (P73_) must be set manually for SEW-EURODRIVE motors with a higher number of poles and non-SEW motors.

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.



5.10 Permitted voltage systems for MOVIDRIVE®



MOVIDRIVE® is intended for operation 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-EURODRIVE recommends using earth-leakage monitors employing pulse-code measurement. Use of such devices prevents the earth-leakage monitor mis-tripping due to the earth capacitance of the inverter.

5.11 Input contactors and input fuses

Input contactor

- Only use input contactors in utilization category AC-3 (IEC 158-1).
- Do not use the K11 input contactor for jog mode, but only for switching the inverter on and off. Use the commands "Enable/Rapid stop", "CW/Stop" or "CCW/Stop" for jog mode.



Observe a minimum switch-off time of 10 s for the input contactor K11.

Fuse types for input fuses

Line protection types in utilization categories gL, gG:

- Rated fusing voltage $\geq$ Rated supply voltage
- Depending on the inverter utilization, rated fusing currents have to be designed for 100% or 125 % of the rated inverter currents.

Line protection switch with characteristics B, C:

- Line protection rated voltage $\geq$ rated supply voltage
- Rated line protection currents must be 10 % above the rated inverter current.



5.12 Supply system 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

If single-core copper cables with PVC insulation routed in cable ducts are used, SEW-EURODRIVE proposes the following line cross sections and fusing for an ambient temperature of 25 °C and rated system currents of 100 % of the rated inverter current:

AC 400/500 V units metric, $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$:

MDX60/61B...-5A3	0005	0008	0011	0014	0015	0022	0030	0040
Size	0				1			
Fuses F11/F12/F13 I_N	16 A				16 A			
Mains conductor L1/L2/L3	1.5 mm ²				1.5 mm ²			
PE conductor	2 × 1.5 mm ² or 1 × 10 mm ²				2 × 1.5 mm ² or 1 × 10 mm ²			
Motor line U/V/W	1.5 mm ²				1.5 mm ²			
Unit terminal cross section of the power section	Disconnectable terminal strip 4 mm ² conductor end sleeve DIN 46228				Disconnectable terminal strip 4 mm ² conductor end sleeve DIN 46228			

MDX61B...-503	0055	0075	0110	0150	0220	0300
Size	2			3		
Fuses F11/F12/F13 I_N	16 A		25 A	35 A	50 A	63 A
Mains conductor L1/L2/L3	1.5 mm ²		4 mm ²	6 mm ²	10 mm ²	16 mm ²
PE conductor	2 × 1.5 mm ² or 1 × 10 mm ²		2 × 4 mm ² or 1 × 10 mm ²	2 × 6 mm ² or 1 × 10 mm ²	1 × 10 mm ²	1 × 16 mm ²
Motor line U/V/W	1.5 mm ²	2.5 mm ²	4 mm ²	6 mm ²	10 mm ²	16 mm ² 1)
Unit terminal cross section of the power section	M4 screw and washer assembly with terminal clip 4 mm ² conductor end sleeve DIN 46228 6 mm ² crimp cable connector DIN 46234			M6 screw and washer assembly with washer max. 25 mm ² Crimp cable connector DIN 46234		

1) With synchronous servo drives: Use a motor feeder with a 10 mm² cross section due to the connector on the CM motor!

MDX61B...-503	0370	0450	0550	0750	0900	1100	1320
Size	4		5		6		
Fuses F11/F12/F13 I_N	80 A	100 A		125 A	160 A	200 A	250 A
Mains conductor L1/L2/L3	25 mm ²	35 mm ²		50 mm ²	70 mm ²	95 mm ²	150 mm ²
PE conductor	1 × 16 mm ²				35 mm ²	50 mm ²	70 mm ²
Motor line U/V/W	25 mm ² 1)	35 mm ²		50 mm ²	70 mm ²	95 mm ²	150 mm ²
Unit terminal cross section of the power section	Bolt M10 with nut max. 70 mm ² Crimp cable connector DIN 46235				Bolt M12 with nut max. 185 mm ² Crimp cable connector DIN 46235		

1) With synchronous servo drives: Use a motor feeder with a 10 mm² cross section due to the connector on the CM motor!



AC 230 V units metric, $V_{\text{mains}} = 3 \times \text{AC 230 V}$:

MDX61B...-2_3	0015	0022	0037	0055	0075
Size	1			2	
Fuses F11/F12/F13 I_N	16 A		25 A	25 A	35 A
Mains conductor 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 line 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			M4 screw and washer assembly with terminal clip 4 mm ² conductor end sleeve DIN 46228 6 mm ² crimp cable connector DIN 46234	

MDX61B...-2_3	0110	0150	0220	0300
Size	3		4	
Fuses F11/F12/F13 I_N	50 A	63 A	80 A	100 A
Mains conductor 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 line U/V/W	10 mm ²	16 mm ²	25 mm ²	35 mm ²
Unit terminal cross section of the power section	M6 screw and washer assembly with washer max. 25 mm ² Crimp cable connector DIN 46234		Bolt M10 with nut max. 70 mm ² Crimp cable connector DIN 46235	



Project Planning

Supply system cables and motor cables

AC 400/500 V units to USA NEC, $V_{\text{mains}} = 3 \times \text{AC } 460 \text{ V}$:

MDX61B...-5A3	0005	0008	0011	0014	0015	0022	0030	0040
Size	0				1			
Fuses F11/F12/F13 I_N	6 A	6 A	6 A	6 A	6 A	10A	15 A	
Mains conductor L1/L2/L3	AWG14				AWG14			
PE conductor	AWG14				AWG14			
Motor line U/V/W	AWG14				AWG14			
Unit terminal cross section of the power section	Disconnectable terminal strip AWG10 conductor end sleeve				Disconnectable terminal strip AWG10 conductor end sleeve			

MDX61B...-503	0055	0075	0110	0150	0220	0300
Size	2			3		
Fuses F11/F12/F13 I_N	20 A	30 A	40 A	60 A	80 A	
Mains conductor L1/L2/L3	AWG12	AWG10	AWG8	AWG6	AWG4	
PE conductor	AWG12	AWG10	AWG10		AWG8	
Motor line U/V/W	AWG12	AWG10	AWG8	AWG6 ¹⁾	AWG4 ¹⁾	
Unit terminal cross section of the power section	M4 screw and washer assembly with terminal clip AWG10 conductor end sleeve AWG10 crimp cable connector			M6 screw and washer assembly with washer max. AWG4 crimp cable connector		

1) With synchronous servo drives: Use a motor feeder with a 10 mm² cross section due to the connector on the CM motor!

MDX61B...-503	0370	0450	0550	0750	0900	1100	1320
Size	4		5		6		
Fuses F11/F12/F13 I_N	90 A	110 A	150 A	175 A	175 A	200 A	230 A
Mains conductor L1/L2/L3	AWG4	AWG3	AWG1	AWG2/0	AWG2/0	AWG3/0	AWG4/0
PE conductor	AWG8	AWG6	AWG6		AWG6	AWG6	AWG4
Motor line U/V/W	AWG4 ¹⁾	AWG3	AWG1	AWG2/0	AWG2/0	AWG3/0	Kcmil 250
Unit terminal cross section of the power section	Bolt M10 with nut max. AWG2/0 crimp cable connector				Bolt M12 with nut max. Kcmil 350 Crimp cable connector		

1) With synchronous servo drives: Use a motor feeder with a 10 mm² cross section due to the connector on the CM motor!

AC 230 V units to USA NEC, $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$:

MDX61B...-2_3	0015	0022	0037	0055	0075
Size	1			2	
Fuses F11/F12/F13 I_N	16 A	25 A	25 A	35 A	
Mains conductor L1/L2/L3	AWG14	AWG12	AWG10		
PE conductor	AWG14	AWG12	AWG10		
Motor line U/V/W	AWG14	AWG12	AWG10		
Unit terminal cross section of the power section	Disconnectable terminal strip AWG10 conductor end sleeve			M4 screw and washer assembly with terminal clip AWG10 conductor end sleeve AWG10 crimp cable connector	

MDX61B...-2_3	0110	0150	0220	0300
Size	3		4	
Fuses F11/F12/F13 I_N	50 A	60 A	80 A	90 A
Mains conductor L1/L2/L3	AWG6	AWG4	AWG4	AWG3
PE conductor	AWG10	AWG8	AWG8	AWG6
Motor line U/V/W	AWG6	AWG4	AWG4	AWG3
Unit terminal cross section of the power section	M6 screw and washer assembly with washer max. AWG4 crimp cable connector		Bolt M10 with nut max. AWG2/0 crimp cable connector	

AWG = American Wire Gauge



Permitted motor line lengths

The **maximum motor line length** depends on:

- Cable type
- Voltage drop in the cable
- Set PWM frequency P860/P861.
- An HF... output filter can only be connected for VFC operating mode. If an HF... output filter is connected, the cable length is not restricted by these limit values, but exclusively by the voltage drop along the motor lead.
- For encoder connection (VFC-n, CFC, SERVO): Maximum cable length for the encoder connection is 100 m at a capacitance per unit length ≤ 120 nF/km.

The following information provides approximate values:

MOVIDRIVE® MDX60/61B...-5_3:

MDX60/61B...-5_3 At $V_{\text{mains}} = 3 \times \text{AC } 400 \text{ V}$	0005...0014	0015	0022	0030	0040	0055	0075...1320
Recommended maximum motor line length [m]							
Shielded cable							
PWM frequency 4 kHz ¹⁾	120	120	200	250	300	300	400
(P860/P861) 8 kHz ²⁾	80	80	120	150	250	250	300
12 kHz	50	50	80	120	200	200	250
16 kHz	40	40	60	100	150	150	200
Unshielded cable							
PWM frequency 4 kHz ¹⁾	360	360	600	750	900	900	1200
(P860/P861) 8 kHz ²⁾	240	240	360	450	750	750	900
12 kHz	150	150	240	360	600	600	750
16 kHz	120	120	180	300	450	450	600

1) Standard setting in VFC operating mode.

2) Standard setting in CFC and SERVO operating modes.

MOVIDRIVE® MDX61B...-2_3:

MDX61B...-2_3 At $V_{\text{mains}} = 3 \times \text{AC } 230 \text{ V}$	0015	0022	0037	0055	0075	0110 ... 0300
Recommended maximum motor line length [m]						
Shielded cable						
PWM frequency 4 kHz ¹⁾	120	200	250	300	300	400
(P860/P861) 8 kHz ²⁾	80	120	150	250	250	300
12 kHz	50	80	120	200	200	250
16 kHz	40	60	100	150	150	200
Unshielded cable						
PWM frequency 4 kHz ¹⁾	360	600	750	900	900	1200
(P860/P861) 8 kHz ²⁾	240	360	450	750	750	900
12 kHz	150	240	360	600	600	750
16 kHz	120	180	300	450	450	600

1) Standard setting in VFC operating mode.

2) Standard setting in CFC and SERVO operating modes.



Project Planning

Supply system cables and motor cables

Voltage drop

The line cross section of the motor lead 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	200	250	300
Copper	Voltage drop ΔU [V] with length = 100 m and $\vartheta = 70^\circ\text{C}$																		
1.5 mm ²	5.3	8	10.6	13.3	17.3	21.3	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
2.5 mm ²	3.2	4.8	6.4	8.1	10.4	12.8	16	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
4 mm ²	1.9	2.8	3.8	4.7	6.5	8.0	10	12.5	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
6 mm ²					4.4	5.3	6.4	8.3	9.9	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
10 mm ²						3.2	4.0	5.0	6.0	8.2	10.2	1)	1)	1)	1)	1)	1)	1)	1)
16 mm ²								3.3	3.9	5.2	6.5	7.9	10.0	1)	1)	1)	1)	1)	1)
25 mm ²									2.5	3.3	4.1	5.1	6.4	8.0	1)	1)	1)	1)	1)
35 mm ²											2.9	3.6	4.6	5.7	7.2	8.6	1)	1)	1)
50 mm ²														4.0	5.0	6.0	1)	1)	1)
70 mm ²																	4.6	1)	1)
95 mm ²																	3.4	4.2	1)
150 mm ²																		2.7	3.3
185 mm ²																			2.7

1) Load to EN 50178 not permitted

Line Cross section	Load with I [A] =																		
	4	6	8	10	13	16	20	25	30	40	50	63	80	100	125	150	200	250	300
Copper	Voltage drop ΔU [V] with length = 100 m and $\vartheta = 70^\circ\text{C}$																		
AWG16	7.0	10.5	1)	1)	1)	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)	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)	1)	1)	1)
AWG10					5.6	6.9	8.7	10.8	13.0	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
AWG8						4.5	5.6	7.0	8.4	11.2	1)	1)	1)	1)	1)	1)	1)	1)	1)
AWG6								4.3	5.1	6.9	8.6	10.8	13.7	1)	1)	1)	1)	1)	1)
AWG4									3.2	4.3	5.4	6.8	8.7	10.8	13.5	1)	1)	1)	1)
AWG3									2.6	3.4	4.3	5.1	6.9	8.6	10.7	12.8	13.7	1)	1)
AWG2											3.4	4.2	5.4	6.8	8.5	10.2	10.9	13.6	1)
AWG1												3.4	4.3	5.4	6.8	8.1	8.6	10.8	13.5
AWG1/0												2.6	3.4	4.3	5.4	6.4	6.7	8.6	10.7
AWG2/0													2.7	3.4	4.3	5.1	5.4	6.8	8.5
AWG3/0														2.6	3.3	4.0	4.1	5.2	6.5
AWG4/0															3.1	3.8	4.0	5.0	6.2
Kcmil 250																3.0	3.2	4.0	5.0

1) More than 3 % voltage drop in relation to $V_{\text{mains}} = \text{AC } 460 \text{ V}$.



5.13 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 V/f ratio. The motors are operated without encoder feedback.



The parameter settings apply to all connected motors.

5

Motor currents

The total of the rated motor currents must not exceed the rated output current of the inverter.

Motor line

The permitted length of all motor lines connected in parallel is determined as follows:

$$l_{ges} \leq \frac{l_{max}}{n}$$

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l_{tot} = Total length of the motor lines connected in parallel

l_{max} = Recommended maximum motor line length (→ page 297)

n = Number of motors connected in parallel

Motor size

The motors in a group must not be more than three motor types 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.

**5.14 Connecting Explosion-Proof AC Motors**

Observe 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® unit must not be used for thermal monitoring of the motor. Use a TF/TH trip switch for thermal monitoring that is approved for use in potentially explosive atmospheres.
- 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®.



5.15 Components for EMC Compliant Installation

MOVIDRIVE® drive inverters and regenerative power supply units are designed for use 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 observed, the devices 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® MDX60/61B drive inverters of size 0, 1 and 2 are equipped with a line filter as standard. These units comply with limit 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 61000-6-2 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 class A

Three options are available for EMC-compliant installation in accordance with EN 55011, **class A limit**, depending on the machine configuration:

Limit class A	On the motor	On the power system	
	Sizes 0 to 6	Sizes 0 to 2	Sizes 3 to 6
1st option	HD... output choke	No action needed	NF...-... line filter
2nd option	Shielded motor cable	No action needed	Line filter NF...-...
3rd option	HF... output filter	No action needed	NF...-... line filter

Limit class B

Three options are available for EMC-compliant installation in accordance with EN 55011, **class B limit**, depending on the machine configuration:

Limit class B	On the motor	On the power system
	Sizes 0 to 5	Sizes 0 to 5
1st option	HD... output choke	NF...-... line filter
2nd option	Shielded motor cable	NF...-... line filter
3rd option	HF... output filter	NF...-... line filter

IT systems



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 class B**

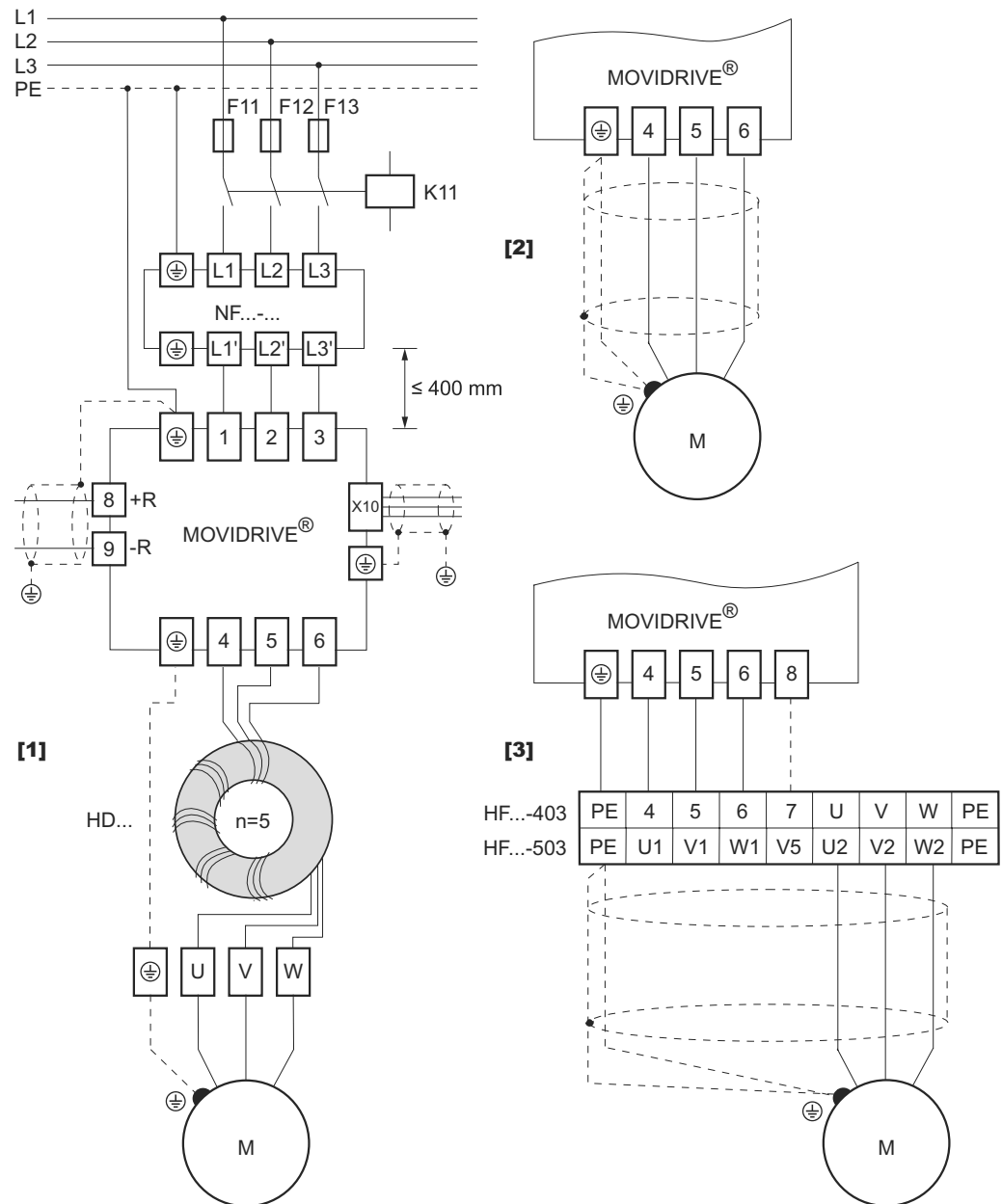


Figure 134: EMC-compliant installation in accordance with limit class B

(1) = 1st possible solution with HD... output choke
(2) = 2nd possible solution with shielded motor lead
(3) = 3rd possible solution with HF... output filter

Refer to the publication "Drive Engineering - Practical Implementation, Electromagnetic Compatibility" for more information. The publication can be ordered from SEW-EURODRIVE.



5.16 Output filter type HF...

Important notes

Observe the following instructions when using output filters:

- Operate output filters in V/f and VFC operating modes only. Output filters may not be used in CFC and SERVO operating modes.
- Do not use output filters in hoist applications.
- During project planning of the drive, take into account the voltage drop in the output filter and consequently the reduced motor torque available. This applies particularly to AC 230 V units with output filters.
- Flying restart circuit is not possible with an output filter!

5

Installation, connection and operation



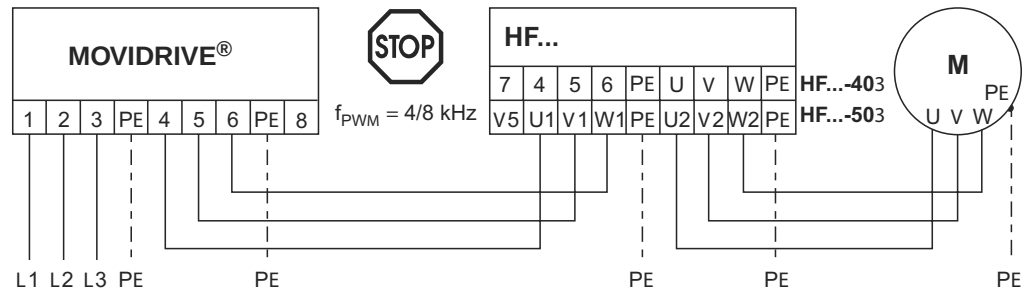
- Install output filters next to the corresponding inverter. Leave a ventilation space of at least 100 mm below and above the output filter. No clearance is required on the sides.
- Limit the connection cable between the inverter and output filter to the absolute minimum length required. Maximum 1 m with an unshielded cable and 10 m for a shielded cable.
- An unshielded motor lead is sufficient when using an output filter. Note the following instructions when you use an **output filter** together with a **shielded motor cable**:
 - The maximum permitted length of the motor cable for operation without V_{DC} link connection is 20 m.
 - Operation with V_{DC} link connection is required if the motor cable is longer than 20 m.
 - Observe the notes "Operation with V_{DC} link connection" on the next page.
- The rated through current of the output filter must be higher than or equal to the output current of the inverter. Note whether the projected output current of the inverter is 100 % I_N (= rated output current) or 125 % I_N (= continuous output current).
- Several motors can be connected to one output filter when operating a motor group from one inverter. The sum of the rated motor currents must not exceed the rated through current of the output filter.
- It is possible to connect two output filters of the same type to one inverter output to increase the rated through current. All like connections must be connected in parallel on the output filters.
- Considerable noise (magnetostriction) may occur in the output filter especially if operating with $f_{PWM} = 4$ kHz. In environments susceptible to noise, SEW-EURODRIVE recommends operation with $f_{PWM} = 12$ kHz (or 16 kHz) and V_{DC} link connection. Observe the notes regarding V_{DC} link connection.
- When the inverter is operated with $f_{PWM} = 4$ or 8 kHz, the output filter connection V5 (with HF...-503) or 7 (with HF...-403) must **not** be connected (no V_{DC} link connection).



V_{DClink} connection

Operation without V_{DClink} connection:

- Only approved for PWM frequency 4 kHz or 8 kHz.



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Figure 135: HF... output filter connection without V_{DClink} connection



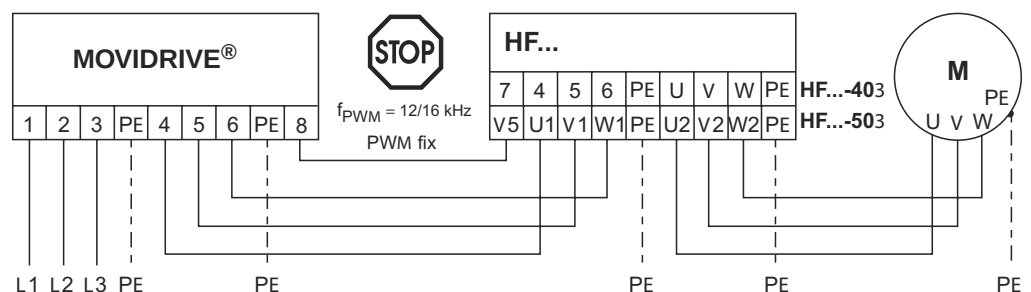
Operation with V_{DClink} connection

(Connection of inverter terminal 8 to HF...-503 terminal V5 or HF...-403 terminal 7):

- Optimized grounded filter effect.
- Improved filter effect in the low-frequency range (≤ 150 kHz).
- Only approved for PWM frequency 12 kHz or 16 kHz. Take into account that increased losses (= power reduction) occur in the inverter when operating the inverter with 12 or 16 kHz.
- Set PMW fix = ON; the inverter must not be able to reduce the PWM frequency automatically
- Strictly observe the following for HF...-403: V_{DClink} connection only permitted if $V_{mains} \leq AC 400$ V, not with $V_{mains} = AC 500$ V.
- The V_{DClink} connection increases the inverter load. The DC link connection increases the required inverter output current in relation to the rated output current of the inverter as shown in the following table.

f_{PWM}	$U_{mains} = 3 \times AC 230$ V	$U_{mains} = 3 \times AC 400$ V	$U_{mains} = 3 \times AC 500$ V
12 kHz	4 %	12 %	15 %
16 kHz	3 %	8 %	12 %

The increased power requirement causes an additional load on the inverter. Take this aspect into account during project planning of the drive. Failure to comply with this aspect may cause the inverter to shut down due to overload.

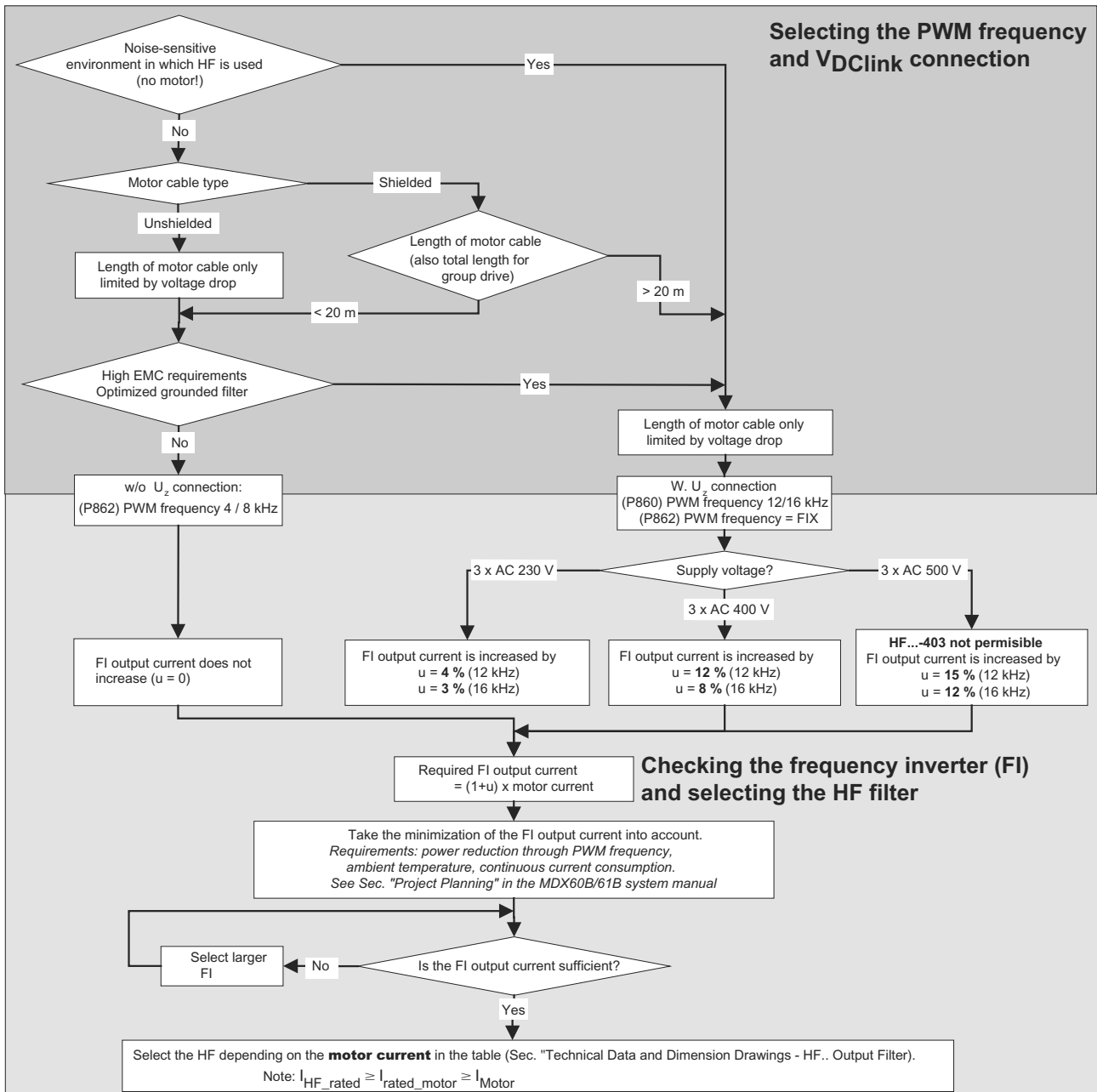


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Figure 136: HF... output filter connection with V_{DClink} connection



The procedure for selecting the PWM frequency and checking the inverter is summarized in the following figure.



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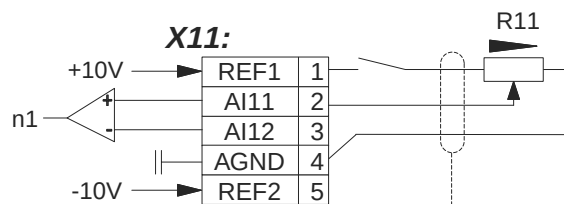
5.17 Electronics cables and signal generation

- The electronics terminals of the basic unit are suitable for the following cross sections:

- Single core 0.20...2.5 mm² (AWG24...12)
- Double core 0.20...1 mm² (AWG24...17)

Route electronics cables separately from power cables, contactor control cables or braking resistor cables. If you use shielded electronics cables, earth the shield at both ends.

- Use a setpoint potentiometer with $R = 5 \text{ k}\Omega$.
- If necessary, potentiometer setpoints are switched using the 10 V voltage rather than via the wiper lead.



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Figure 137: 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.
 - Lay the 0 V cables with 1.5 mm² (AWG16) cross section from a central point to each individual unit by the shortest possible route.
- If coupling relays are used, they should always have encapsulated, dust-protected electronics contacts 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 and protected against external voltages up to 24 V in accordance with EN 61131-2.

- 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" during the self-test.
- DC 24 V voltage supply VI24:

In accordance with EN 61131-2, $V_N = +24 \text{ V} -10 \% / +20 \%$. 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.



5.18 External DC 24 V voltage supply

General information

The internal DC 24 V power supply of MOVIDRIVE® has a maximum power of 29 W. An external DC 24 V power supply unit must be connected if a higher power level is needed due to options installed on the DC 24 V level.

The following table shows the power demand of the MOVIDRIVE® units without options and the power demand of the individual options. MOVIDRIVE® units without options do not need an external DC 24 V power supply.

The following conditions apply to the information about the power demand without options:

- The DC 24 V outputs (VO24) are not subject to load.
- Binary outputs DBØØ und DOØ2 ... DOØ5 are loaded with a total of 100 mA.

The following conditions apply to the information about the DEH11B and DER11B options:

- The motor encoder/resolver is supplied from MOVIDRIVE®.
- No external encoder (synchronous encoder) is connected. An external encoder increases the power demand by about 5 W.

The power values of the options are maximum values at full load on the inputs/outputs.

Power demand

DC 24 V power demand of MOVIDRIVE® MDX60/61B:

Size	Without option	Additional DC 24 V power demand with option ¹⁾					
		DEH11B	DER11B	Fieldbus options ²⁾	DIO11B	DIP11B	DRS11B
0	20 W	5 W	6 W	3 W	17 W	25 W	22 W
1	20 W						
2	20 W						
3	26 W						
4	28 W						
5	28 W						
6	28 W						

1) For size 0: Only available with option-capable MDX61B units

2) Fieldbus options are: DFP21B, DFI11B, DFI21B, DFE11B, DFD11B, DFC11B

Example

MOVIDRIVE® MDX61B0022-503-4-00 (size 1) with the fieldbus interface option type DFI11B:

$$20 \text{ W} + 3 \text{ W} = 23 \text{ W}$$

The power demand is less than 29 W, which means no external DC 24 V power supply unit is needed.

MOVIDRIVE® MDX61B0110-503-4-00 (size 2) with the options HIPERFACE® encoder card type DEH11B, fieldbus interface type DFP21B and input/output card type DIO11A:

$$20 \text{ W} + 5 \text{ W} + 3 \text{ W} + 17 \text{ W} = 45 \text{ W}$$

Power demand greater than 29 W, which means that a DC 24 V power supply unit with a minimum power of 50 W must be connected to VI24.



5.19 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 at	
	"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 lines 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.



5.20 Priority of operating states and interrelations between control signals

Priority of operating states

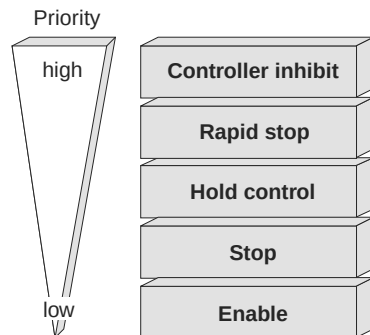


Figure 138: Priority of operating states

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Interrelation between control signals

The following table shows the interrelation between control signals. "/Controller inhibit" is programmed to binary input DI00 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 (DI00)	Binary input is programmed to				Inverter status
	Enable/Rapid stop	/Hold control	CW/Stop	CCW/Stop	
"0"	1)	1)	1)	1)	Inhibited
"1"	"0"	2)	2)	2)	
"1"	"1"	"0"	3)	3)	
"1"	"1"	"1"	"1"	"0"	CW running enabled
"1"	"1"	"1"	"0"	"1"	CCW running enabled

- 1) Not relevant if "/Controller inhibit (DI00)" = "0"
- 2) Not relevant if "Enable/Rapid stop" = "0"
- 3) Not relevant if "/Hold control" = "0"

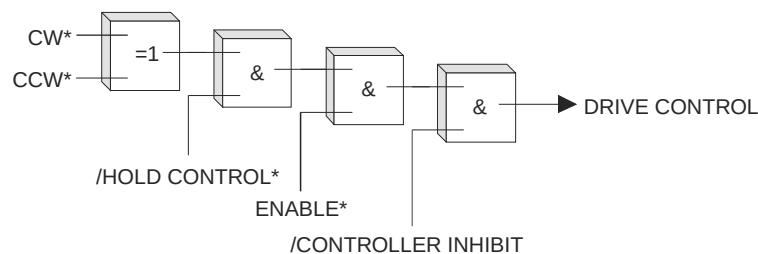


Figure 139: Interrelation between control signals

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* If a binary input is programmed to this function.



5.21 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 t_{14}/t_{24} .
- The brake is then applied if the brake function is activated.
- In IPOS^{plus}® operating modes, contacting a limit switch generates a fault message. A reset is then required in order to move clear of the limit switch (→ IPOS^{plus}® 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 function

- 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

6.1 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 parameterization concept which can be used disregarding 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 parameterization 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 telegram structure with fixed telegram 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 communication interfaces (PROFIBUS, INTERBUS, CAN etc.).
- Access to all drive parameters and functions, therefore can be used for startup, service, diagnosis, visualization and automation tasks
- Startup and diagnostic tools on the basis of MOVILINK® for PC (e.g. MOVITOOLS®/SHELL and MOVITOOLS®/SCOPE).

Refer to the "Serial Communication and System Bus (SBus)" manual for a detailed description of the MOVILINK® protocol. This manual can be ordered from SEW-EURODRIVE.



7 Safety Notes

7.1 Installation and startup



- **Never install damaged products or take them into operation.** 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).
Required preventive measures: Grounding the unit
Required 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**.
- Take **suitable measures** (e.g. disconnecting the electronics terminal block) to ensure that the connected **motor does not start up automatically** when the inverter is **switched on**.

7.2 Operation and servicing



- **Disconnect the unit from the supply system** before **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 on all subassemblies except for the control electronics. The unit must be closed during operation.
- **When the unit switch is in the ON position**, **dangerous voltages** are present at the **output terminals** as well as any **connected cables and motor terminals**. 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 permissible** 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" (P841)** to be activated.
- The inverter output may only be **switched when the output stage is inhibited**.





8 Unit Design

8.1 Type designation, nameplates and scope of supply

Example: Unit designation

MDX60 B 0011 - 5 A 3 - 4 00									
				Type		00 = Standard 0T = Application XX = Special unit			
				Quadrants		4 = 4Q (with brake chopper)			
				Connection type		3 = 3-phase			
				Radio interference suppression on the line side		B = Radio interference suppression B A = Radio interference suppression A 0 = No radio interference suppression			
				Supply voltage		5 = AC 380 ... 500 V 2 = AC 200 ... 230 V			
				Recommended motor power		0011 = 1.1 kW			
				Version B					
				Series		60 = no options can be installed 61 = options can be installed			

Example: System nameplate
MDX60B/61B..
size 0

The system nameplate for MDX60B/61B.. size 0 is attached to the side of the unit.



52246AXX

Figure 140: Example: System nameplate for MDX60B/61B.. Size 0



Unit Design

Type designation, nameplates and scope of supply

Example: Nameplate of braking resistor for MDX60B/61B..

The braking resistor BW090-P52B is only available for MDX60B/61B size 0.

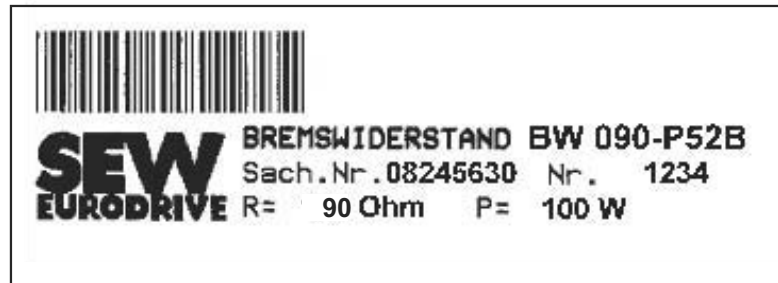


Figure 141: Nameplate of braking resistor for MDX60B/61B.. size 0

54522AXX

Example: System nameplate for MDX61B.. sizes 1 - 6

For MDX61B.. sizes 1 - 6, the **system nameplate** is attached to the side of the unit.



Figure 142: Example: System nameplate for MDX61B.. sizes 1 - 6

56493AXX

Example: Nameplate of power section for MDX61B.. sizes 1 - 6

For MDX61B.. sizes 1-6, the **nameplate of the power section** is located at the side of the unit.

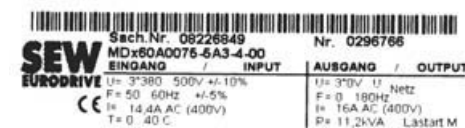


Figure 143: Nameplate of power section for MDX61B.. sizes 1-6

56492AXX

Example: Nameplate of control unit for MDX61B.. sizes 1 - 6

For MDX61B.. sizes 1-6, the **nameplate of the control unit** is located at the side of the unit.



Figure 144: Nameplate of control unit MDX61B.. sizes 1-6

56491AXX



Scope of delivery

- Connector housing for all signal terminals (X10 ... X17), connected
- Connector housing for the power terminals (X1 ... X4), connected
- Pluggable memory card, connected

Size 0

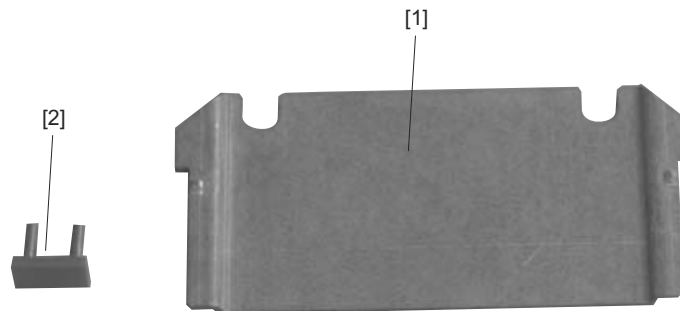
- 1 set of shield clamps for power cable and signal cable, not installed. The set of shield clamps comprises:
 - 2 shield clamps for power cable (2 contact clips each)
 - 1 shield clamp for signal cable (1 contact clip) for MDX60B
 - 1 shield clamp for signal cable (2 contact clips) for MDX61B
 - 6 contact clips
 - 6 screws for attaching the contact clips
 - 3 screws for attaching the contact clips to the unit

Sizes 1 -6

- 1 set of shield clamps for signal cable, not installed. The set of shield clamps comprises:
 - 1 shield clamp for signal cable (1 contact clip)
 - 2 contact clips
 - 2 screws for attaching the contact clips
 - 1 screw for attaching the shield clamp to the unit

Size 2S

- Accessories set, not installed. The accessories set (→ Following illustration) comprises:
 - 2 mounting feet [1] to be plugged into the heat sink
 - 2 touch guards [2] to be fastened to terminals X4: -U_Z/+U_Z and X3:-R(8)/+R(9). Once the touch guards [2] have been installed, the enclosure is IP20. Otherwise it is IP10 (→ Section "Touch guards").



54587AXX



Unit Design

Type designation, nameplates and scope of supply

Optional scope of delivery

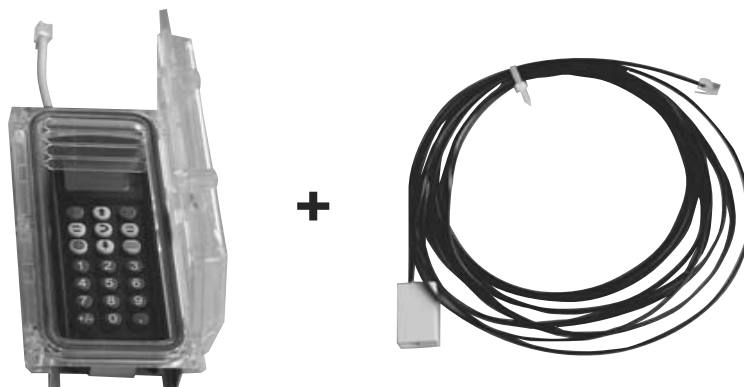
All sizes

- Option DBM60B: Cover installation for separate mounting of the DBG60B keypad (e.g. in the control cabinet).

Part number 824,853 2.

The DBM60B option consists of the housing in enclosure IP65 **and** a 5 m extension cable (→ Following illustration). The DBG60B keypad is not part of this option and must be ordered separately.

DBM60B



54412AXX

- Option DKG60B: 5 m extension cable for DBG60B keypad.

Part number 817583 7.

5 m extension cables are available for mounting the keypad separately in customer housing (→ Following illustration).

DKG60B



54414AXX



Size 2S

- DMP11B mounting plate option (→ Following illustration), not installed.
Part number 818 398 8.

If a MOVIDRIVE® MD_60A size 2 unit is to be replaced by MOVIDRIVE® MDX61B size 2S, the MDX61B size 2S can be fitted on the existing mounting plate with the DMP11B mounting panel. New retaining holes do not have to be drilled.

DMP11B



54588AXX



Unit Design

Type designation, nameplates and scope of supply

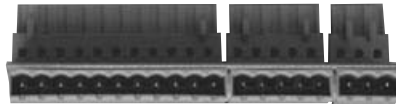
Connector adapter for replacing MOVIDRIVE® A with MOVIDRIVE® B

Three adapters have been developed to enable rapid replacement of a MOVIDRIVE® A unit with a MOVIDRIVE® B unit in running systems.

- DAT11B: Terminal adapter, part number 824 671 8

X10 can be rearranged directly when using MOVIDRIVE® MDF, MDV or MDS. Three plugs have to be rewired. You can avoid such rewiring work by using the DAT11B terminal adapter. Using this adapter will prevent incorrect connection and save time. The terminal adapter is required for terminals X11 (analog input), X12 (SBus) and X13 (binary inputs).

DAT11B



54589AXX

- DAE15B: Encoder adapter X15, part number 817 629 9

If a motor with encoder on X15 is in operation on an MDV or MCV, the encoder is connected via a 9-pin plug connector to MOVIDRIVE® A. Since the DEH11B option for MOVIDRIVE® MDX61B comes equipped with a 15-pin plug, you will either have to convert the encoder cable or use the encoder adapter. The encoder adapter can be plugged directly between the existing encoder cable with 9-pin connector and the 15-pin connector on the DEH11B. This step makes for fail-safe and fast connection of existing drives.

DAE15B



54585AXX

Length of DAE15B: 200 mm ± 20 mm

Line cross section: 6 x 2 x 0.25 mm² (AWG23)

Terminal of the 15-pin sub D plug (MOVIDRIVE® MDX61B, option DEH11B, X15)	Core color in prefabricated cable	Terminal of 9-pin sub D socket (encoder end)
1	Yellow (YE)	1
2	Red (RD)	2
3	Pink (PK)	3
4	Violet (VT)	4
5	Brown (BN)	8
6	Green (GN)	9
7	Blue (BU)	10
8	Gray (GY)	11
9	White (WH)	15



- DAE14B: Encoder adapter X14, part number 817 630 2

If a synchronous encoder or an encoder simulation at X14 is in operation on a MOVIDRIVE® MDV, MDS, MCV or MCS, connection takes place via a 9-pin plug. Since the DEH11B and DER11B options for MOVIDRIVE® MDX61B comes equipped with a 15-pin plug, you will either have to rework the encoder cable or use the encoder adapter. The encoder adapter can be plugged directly between the existing encoder cable with 9-pin plug and the 15-pin plug on the DEH11B/DER11B. This step makes for fail-safe and fast connection of existing drives.

DAE14B



54586AXX

Length of DAE14B: 200 mm ± 20 mm

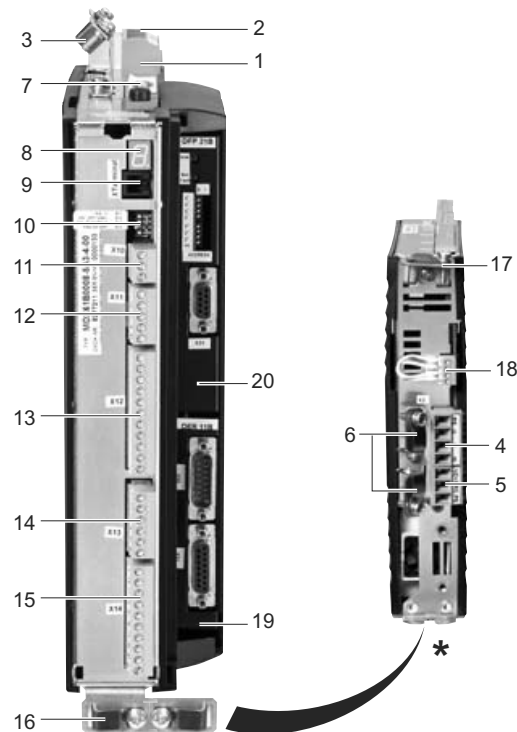
Line cross section: 6 x 2 x 0.25 mm² (AWG23)

Terminal of the 15-pin sub D plug (MOVIDRIVE® MDX61B, option DEH11B/DER11B, X14)	Core color in prefabricated cable	Terminal of 9-pin sub D socket (encoder end)
1	Yellow (YE)	1
2	Red (RD)	2
3	Pink (PK)	3
4	Violet (VT)	4
5	Brown (BN)	8
6	Green (GN)	9
7	Blue (BU)	10
8	Gray (GY)	11
9	White (WH)	15



8.2 Unit design for size 0

MDX60/61B-5A3 (AC 400/500 V units): 0005 ... 0014



52389AXX

Figure 145: MOVIDRIVE® MDX60/61B unit design, size 0

* View of unit underside

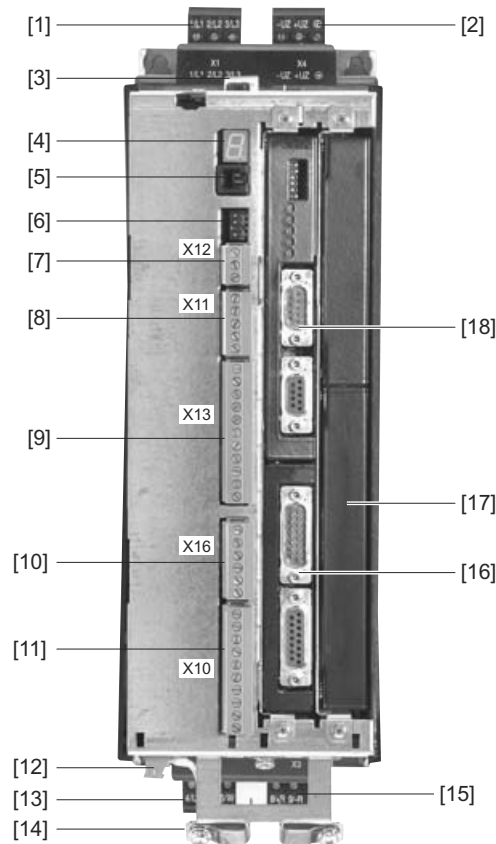
- [1] X1: Mains connection L1 (1) / L2 (2) / L3 (3) and PE connection, separable
- [2] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection, separable
- [3] Power shield clamp for mains connection and connection for DC link connection
- [4] X2: Motor connection U (4) / V (5) / W (6) and PE connection, separable
- [5] X3: Braking resistor connection R+ (8) / R- (9) and PE connection, separable
- [6] Power shield clamp for motor connection and braking resistor connection
- [7] Memory card
- [8] 7-segment display
- [9] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [10] DIP switches S11 ... S14
- [11] X12: Electronics terminal strip for system bus (SBus)
- [12] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [13] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [14] X16: Electronics terminal strip for binary inputs and outputs
- [15] X10: Electronics terminal strip for binary outputs and TF/TH input
- [16] Electronics shield clamp MDX61B size 0
- [17] Electronics shield clamp MDX60B size 0
- [18] X17: Electronics terminal strip for safety contacts for safe stop
- [19] Only with MDX61B: Encoder slot
- [20] Only with MDX61B: Fieldbus slot



8.3 Unit design for size 1

MDX61B-5A3 (AC 400/500 V units): 0015 ... 0040

MDX61B-2A3 (AC 230 V units): 0015 ... 0037



52329AXX

Figure 146: MOVIDRIVE® MDX61B unit design, size 1

- [1] X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
- [2] X4: Connection for DC link connection $-U_Z$ / $+U_Z$, separable
- [3] Memory card
- [4] 7-segment display
- [5] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [6] DIP switches S11 ... S14
- [7] X12: Electronics terminal strip for system bus (SBus)
- [8] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [9] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [10] X16: Electronics terminal strip for binary inputs and outputs
- [11] X10: Electronics terminal strip for binary outputs and TF/TH input
- [12] X17: Electronics terminal strip for safety contacts for safe stop
- [13] X2: Motor connection U (4) / V (5) / W (6) and PE connection, separable
- [14] Electronics shield clamp and PE connection
- [15] X3: Braking resistor connection R+ (8) / R- (9) and PE connection, separable
- [16] Encoder slot
- [17] Expansion slot
- [18] Fieldbus slot



8.4 Unit design for size 2S

MDX61B-5A3 (AC 400/500 V units): 0055 / 0075

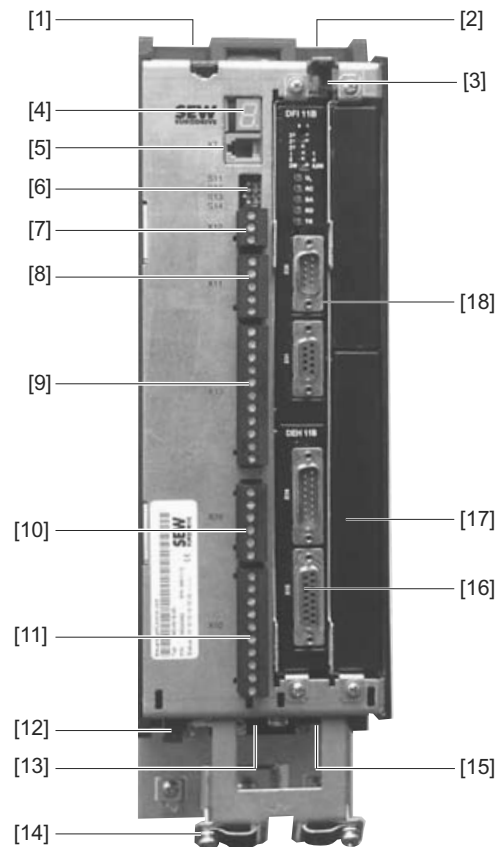


Figure 147: MOVIDRIVE® MDX61B unit design, size 2S

54525AXX

- [1] X1: Power supply connection L1 (1) / L2 (2) / L3 (3)
- [2] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection
- [3] Memory card
- [4] 7-segment display
- [5] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [6] DIP switches S11 ... S14
- [7] X12: Electronics terminal strip for system bus (SBus)
- [8] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [9] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [10] X16: Electronics terminal strip for binary inputs and outputs
- [11] X10: Electronics terminal strip for binary outputs and TF/TH input
- [12] X17: Electronics terminal strip for safety contacts for safe stop
- [13] X2: Motor connection U (4) / V (5) / W (6)
- [14] Electronics shield clamp and PE connection
- [15] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [16] Encoder slot
- [17] Expansion slot
- [18] Fieldbus slot



8.5 Unit design for size 2

MDX61B-5A3 (AC 400/500 V units): 0110

MDX61B-2A3 (AC 230 V units): 0055 / 0075

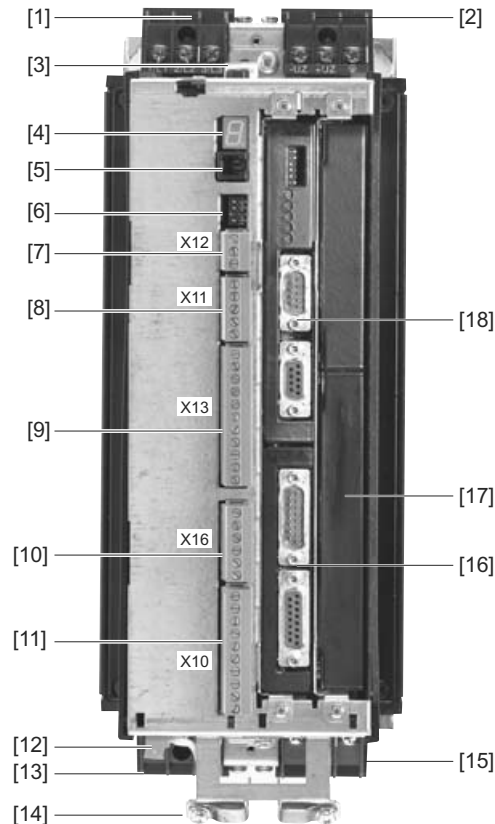


Figure 148: MOVIDRIVE® MDX61B unit design, size 2

52330AXX

- [1] X1: Power supply connection L1 (1) / L2 (2) / L3 (3)
- [2] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection
- [3] Memory card
- [4] 7-segment display
- [5] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [6] DIP switches S11 ... S14
- [7] X12: Electronics terminal strip for system bus (SBus)
- [8] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [9] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [10] X16: Electronics terminal strip for binary inputs and outputs
- [11] X10: Electronics terminal strip for binary outputs and TF/TH input
- [12] X17: Electronics terminal strip for safety contacts for safe stop
- [13] X2: Motor connection U (4) / V (5) / W (6)
- [14] Electronics shield clamp and PE connection
- [15] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [16] Encoder slot
- [17] Expansion slot
- [18] Fieldbus slot



8.6 Unit design for size 3

MDX61B-503 (AC 400/500 V units): 0150 ... 0300

MDX61B-203 (AC 230 V units): 0110 / 0150

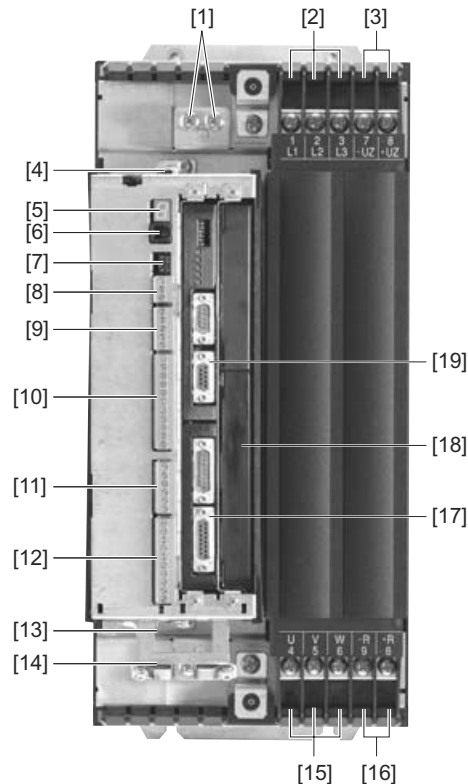


Figure 149: MOVIDRIVE® MDX61B unit design, size 3

52331AXX

- [1] PE connections
- [2] X1: Power supply connection L1 (1) / L2 (2) / L3 (3)
- [3] X4: Connection for DC link connection -U_Z / +U_Z
- [4] Memory card
- [5] 7-segment display
- [6] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [7] DIP switches S11 ... S14
- [8] X12: Electronics terminal strip for system bus (SBus)
- [9] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [10] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [11] X16: Electronics terminal strip for binary inputs and outputs
- [12] X10: Electronics terminal strip for binary outputs and TF/TH input
- [13] X17: Electronics terminal strip for safety contacts for safe stop
- [14] Electronics shield clamp and PE connection
- [15] X2: Motor connection U (4) / V (5) / W (6)
- [16] X3: Braking resistor connection R+ (8) / R- (9)
- [17] Encoder slot
- [18] Expansion slot
- [19] Fieldbus slot



8.7 Unit design for size 4

MDX61B-503 (AC 400/500 V units): 0370 / 0450

MDX61B-203 (AC 230 V units): 0220 / 0300

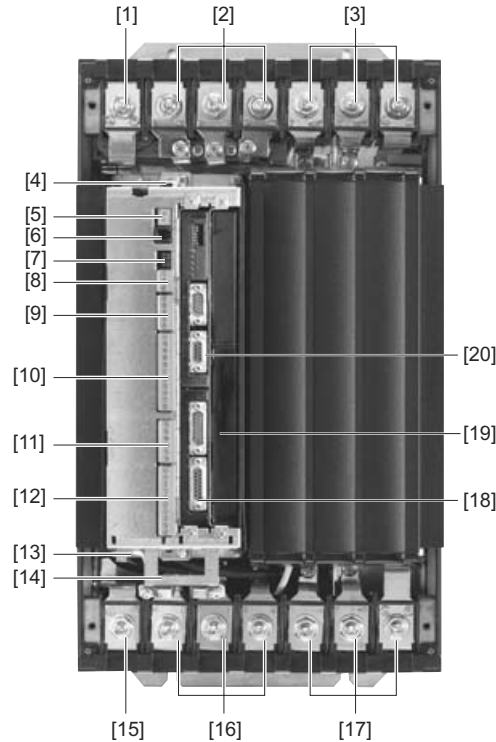


Figure 150: MOVIDRIVE® MDX61B unit design, size 4

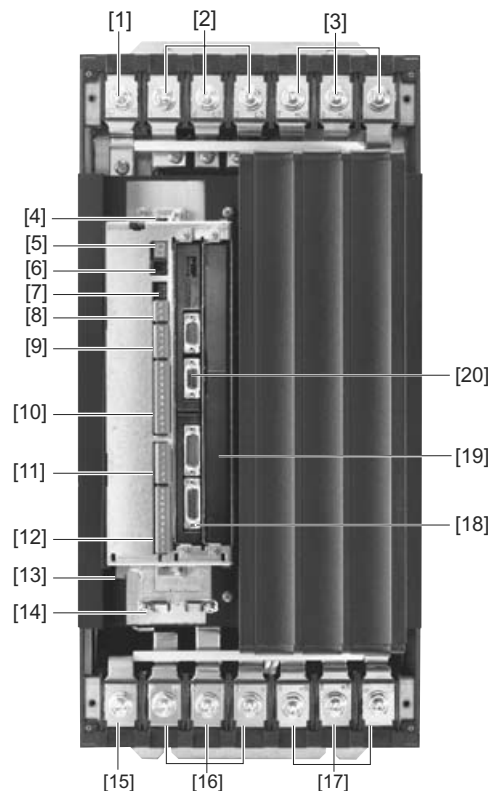
52332AXX

- [1] PE connection
- [2] X1: Power supply connection L1 (1) / L2 (2) / L3 (3)
- [3] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection
- [4] Memory card
- [5] 7-segment display
- [6] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [7] DIP switches S11 ... S14
- [8] X12: Electronics terminal strip for system bus (SBus)
- [9] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [10] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [11] X16: Electronics terminal strip for binary inputs and outputs
- [12] X10: Electronics terminal strip for binary outputs and TF/TH input
- [13] X17: Electronics terminal strip for safety contacts for safe stop
- [14] Electronics shield clamp
- [15] PE connection
- [16] X2: Motor connection U (4) / V (5) / W (6)
- [17] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [18] Encoder slot
- [19] Expansion slot
- [20] Fieldbus slot



8.8 Unit design for size 5

MDX61B-503 (AC 400/500 V units): 0550 / 0750



52333AXX

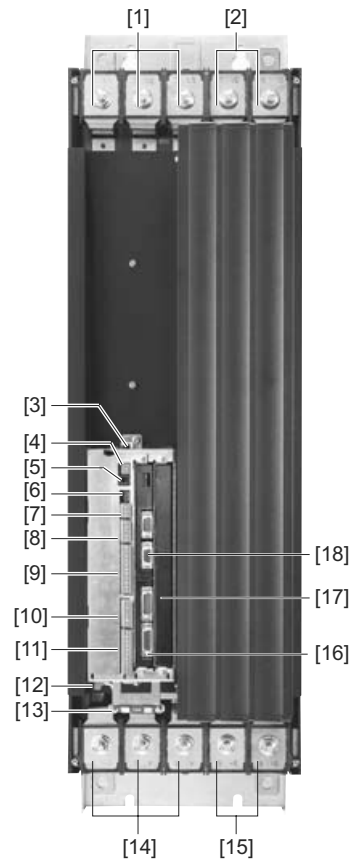
Figure 151: MOVIDRIVE® MDX61B unit design, size 5

- [1] PE connection
- [2] X1: Power supply connection L1 (1) / L2 (2) / L3 (3)
- [3] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection
- [4] Memory card
- [5] 7-segment display
- [6] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [7] DIP switches S11 ... S14
- [8] X12: Electronics terminal strip for system bus (SBus)
- [9] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [10] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [11] X16: Electronics terminal strip for binary inputs and outputs
- [12] X10: Electronics terminal strip for binary outputs and TF/TH input
- [13] X17: Electronics terminal strip for safety contacts for safe stop
- [14] Electronics shield clamp
- [15] PE connection
- [16] X2: Motor connection U (4) / V (5) / W (6)
- [17] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [18] Encoder slot
- [19] Expansion slot
- [20] Fieldbus slot



8.9 Unit design for size 6

MDX61B-503 (AC 400/500 V units): 0900 ... 1320



8

Figure 152: MOVIDRIVE® MDX61B unit design, size 6

52334AXX

- [1] X1: Mains connection L1 (1) / L2 (2) / L3 (3) and PE connection
- [2] X4: Connection for DC link connection $-U_Z$ / $+U_Z$ and PE connection
- [3] Memory card
- [4] 7-segment display
- [5] Xterminal: Slot for DBG60B keypad or UWS21A serial interface
- [6] DIP switches S11 ... S14
- [7] X12: Electronics terminal strip for system bus (SBus)
- [8] X11: Electronics terminal strip for setpoint input AI1 and 10 V reference voltage
- [9] X13: Electronics terminal strip for binary inputs and RS-485 interface
- [10] X16: Electronics terminal strip for binary inputs and outputs
- [11] X10: Electronics terminal strip for binary outputs and TF/TH input
- [12] X17: Electronics terminal strip for safety contacts for safe stop
- [13] Electronics shield clamp
- [14] X2: Motor connection U (4) / V (5) / W (6) and PE connection
- [15] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [16] Encoder slot
- [17] Expansion slot
- [18] Fieldbus slot



9 Installation

9.1 Installation instructions for basic unit

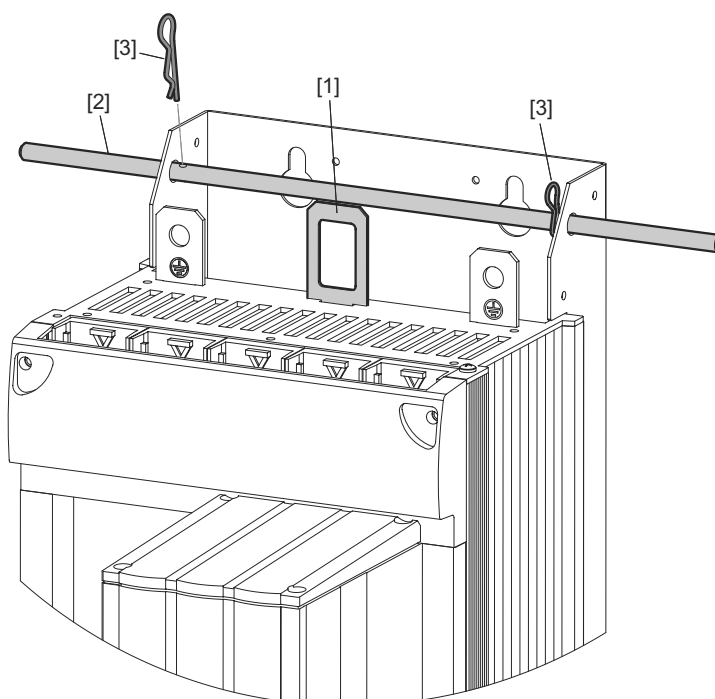


Comply with the safety notes during installation.

Installation notes for size 6

The MOVIDRIVE® units of size 6 (0900 ... 1320) are equipped with a factory mounted lifting ring [1]. If possible, use crane and lifting ring [1] to install the unit.

If a crane is not available, you can push a carrying bar [2] through the rear panel to facilitate installation (included in the delivery scope of size 6). Secure the carrying bar [2] against axial displacement by using the split pin [3].



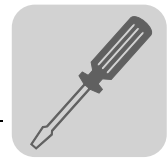
54406AXX

Figure 153: Installation of MOVIDRIVE® size 6 with factory mounted lifting ring and carrying bar

- [1] Factory mounted lifting ring
- [2] Carrying bar (included in the delivery of size 6)
- [3] Split pin (included in the delivery of size 6)

Tightening torques

- Only use **original connection elements**. Note the **permitted tightening torques** of MOVIDRIVE® power terminals.
 - size 0 and 1 → 0.6 Nm
 - Sizes 2S and 2 → 1.5 Nm
 - Size 2 → 1.5 Nm
 - Size 3 → 3.5 Nm
 - Sizes 4 and 5 → 14 Nm
 - Size 6 → 20 Nm
- The **permitted tightening torque** of the **signal terminals** is 0.6 Nm.



Minimum clearance and Mounting position

- Leave **100 mm clearance at the top and bottom** for optimum cooling. Make sure air circulation in the clearance is not impaired by cables or other installation material. With sizes 4, 5 and 6, do not install any components which are sensitive to high temperatures within 300 mm of the top of the unit.
- Ensure an unobstructed cooling air supply and that air heated by other units cannot be drawn in or reused.
- There is no need for clearance at the sides. You can line up the units directly next to one another.
- Only install the units **vertically**. Do not install them horizontally, tilted or upside down (→ following figure, applies to all sizes).

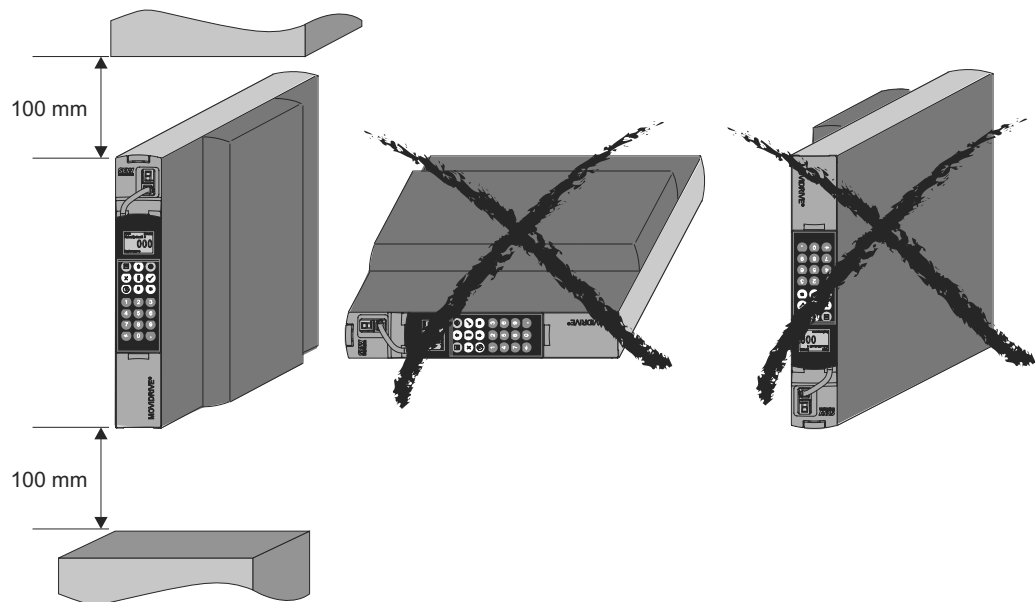


Figure 154: Minimum clearance and mounting position of the units

51463BXX

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).
- **Earth leakage circuit breaker as sole protection device:** Only use earth leakage circuit breakers type B according to EN 50178.

Supply system and brake contactors

- **Only use contactors in utilization category AC-3** (IEC 158-1) as supply system and brake contactors.
- Only use the supply system contactor K11 (→ Sec. "Wiring diagram for basic unit") to switch the inverter on and off. Do not use it for jog mode. Use the commands "Enable/Rapid stop," "CW/Stop" or "CCW/Stop" for jog mode.



Observe a minimum switch-off time of 10 s for the supply system contactor K11.



Installation

Installation instructions for basic unit

PE supply system connection (→ EN 50178)

Earth-leakage currents ≥ 3.5 mA may occur during normal operation. To meet the requirements of EN 50178 note the following:

- With a **power supply line $< 10 \text{ mm}^2$ (AWG 8)**: Route a **second PE conductor with the cross section of the power supply line** in parallel to the protective earth via separate terminals or use a **copper protective earth conductor with a cross section of 10 mm^2 (AWG 8)**.
- With a **power supply line $\geq 10 \text{ mm}^2$ (AWG 8)**: Route a **copper protective earth conductor with the cross section of the power supply line**.

IT systems

- SEW-EURODRIVE recommends using **earth-leakage monitors with pulse-code measurement** for power supply systems with a non-grounded star point (**IT systems**). Use of such devices prevents the earth-leakage monitor mis-tripping 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 cable: **Cross section according to rated output current I_{rated}** .
- Electronics cables of basic unit (terminals X10, X11, X12, X13, X16):
 - One core per terminal $0.20 \dots 2.5 \text{ mm}^2$ (AWG 24 ... 12)
 - Two cores per terminal $0.25 \dots 1 \text{ mm}^2$ (AWG 22 ... 17)
- Electronics cables of terminal X17 and DIO11B terminal expansion board (terminals X20, X21, X22):
 - One core per terminal $0.08 \dots 1.5 \text{ mm}^2$ (AWG 28 ... 16)
 - Two cores per terminal $0.25 \dots 1 \text{ mm}^2$ (AWG 22 ... 17)

Unit output

- **Only connect ohmic/inductive loads (motors).** Never connect capacitive loads!

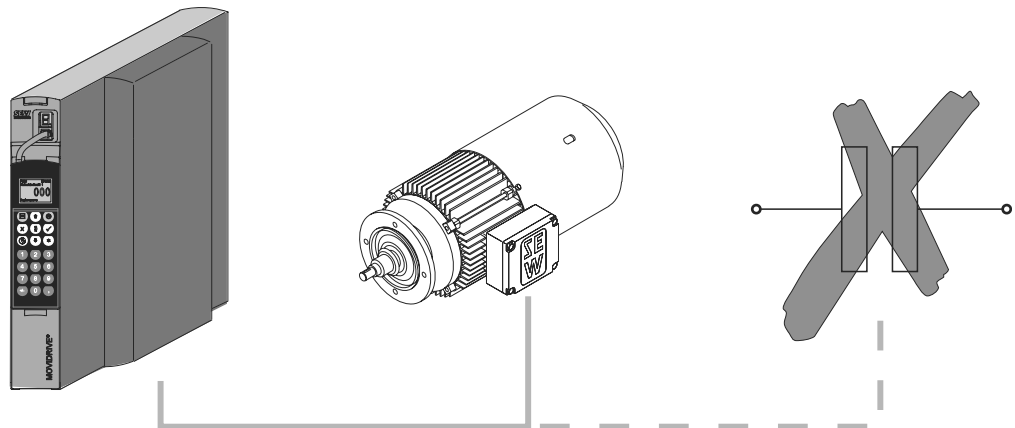


Figure 155: Only connect ohmic/inductive loads; do not connect capacitive loads

51412AXX

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 (except for BW90-P52B) using a **bimetallic relay** (→ wiring diagram for basic unit, power section and brake). Set the **trip current** according to the **technical data of the braking resistor**.
- For braking resistors of the **BW...-T** series, the **integrated temperature switch** can be connected using a **2-core shielded cable** as an **alternative** to a bimetallic relay.



**Operating
braking resistors**

- **Flat-type braking resistors** have internal thermal overload protection (fuse which cannot be replaced). Install the **flat-type braking resistors** together with the appropriate **touch guard**.

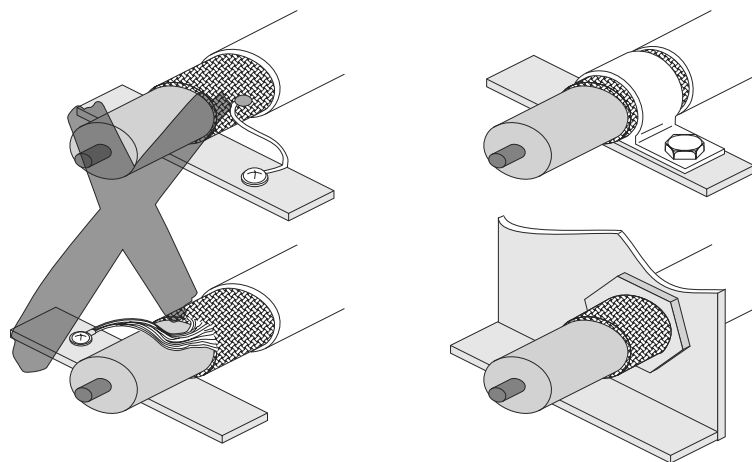
- The connection leads to the braking resistors carry a **high voltage (ca. DC 900 V)** during rated operation.
- The **surfaces** of the braking resistors get **very hot** when the braking resistors are loaded with P_{rated} . Select a **suitable installation position**. Braking resistors are usually mounted on the switch cabinet roof.

**Binary inputs /
binary outputs**

- The **binary inputs** are **electrically isolated** by optocouplers.
- The **binary outputs** are **short-circuit proof**, although they are **not protected against external voltage** (exception: relay output DOØ1). External voltage can cause irreparable damage to the binary outputs.

**EMC compliant
installation**

- All cables except for the power supply line must be **shielded**. As an alternative to the shielding, the option HD.. (output choke) can be used for the motor cable to achieve the emitted interference limit values. .
- When using shielded motor cables, e.g. prefabricated motor cables from SEW-EURODRIVE, you must keep the **unshielded conductors between the shield and connection terminal of the inverter as short as possible**.
- 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 156: Correct shield connection using metal clamp (shield clamp) or metal cable gland

- You can also use **earthed sheet-metal ducts or metal pipes** to **shield the cables**. **Route the power and control cables 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 control cabinet mounting panel).



Installation

Installation instructions for basic unit



- This is a product with restricted availability in accordance with IEC 61800-3. It may cause interference in residential environments. In such cases, the operator may need to implement appropriate measures.
- For detailed information on EMC compliant installation, refer to the publication "Electromagnetic Compatibility in Drive Engineering" from SEW-EURODRIVE.

NF.. line filter

- The NF.. line filter option can be used to maintain the class B limit for MOVIDRIVE® MDX60B/61B units size 0 to 5.
- Install the **line filter close to the inverter** but outside the minimum clearance for cooling.
- Keep the **length of the cable between the line filter and inverter to an absolute minimum**, and never more than 400 mm. Unshielded, twisted cables are sufficient. Also use unshielded cables as the supply system lead.
- **No EMC limits are specified for interference emission in voltage supply systems without earthed star point** (IT systems). The **effectiveness of input filters** in IT systems is **severely limited**.
- SEW-EURODRIVE recommends one of the following **EMC measures on the motor side to maintain class A and B limits**:
 - Shielded motor cable
 - HD... output choke option
 - HF.. output filter option (in operating modes VFC and U/f)

HD... output choke

- Install the **output choke close to the inverter** but outside the minimum clearance for cooling.
- Route **all three phases together through the output choke. Do not route the PE conductor through the output choke!**

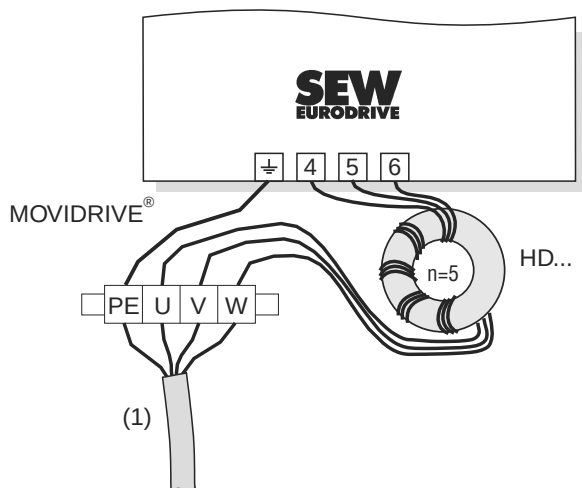


Figure 157: Connecting HD... output chokes

(1) = Motor cable

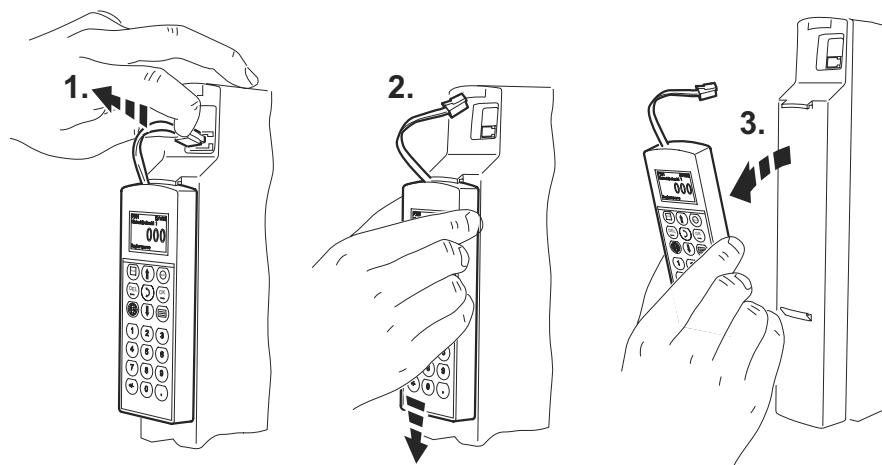
05003AXX



9.2 Removing / installing the keypad

Removing the keypad

Proceed in this order:



52205AXX

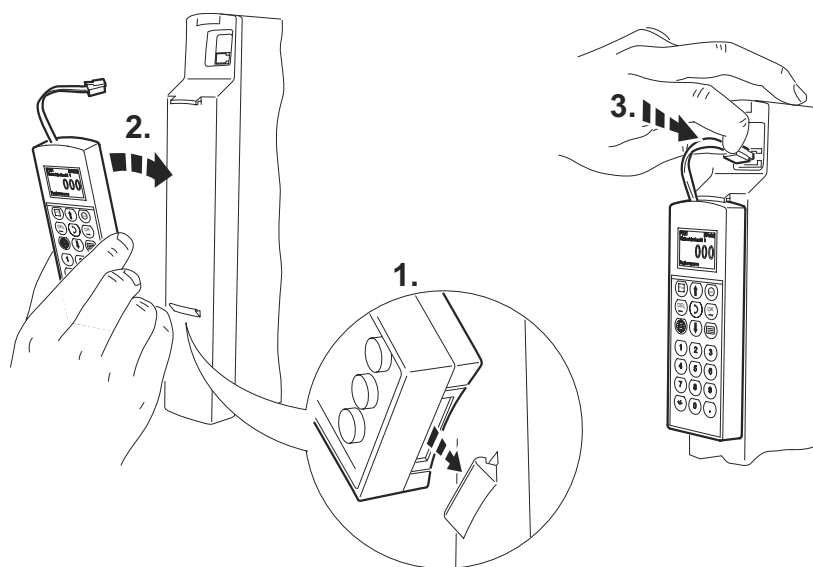
Figure 158: Removing the keypad

1. Unplug the connection cable from the Xterminal.
2. Carefully push the keypad downward until it comes off the upper fixture on the front cover.
3. Remove the keypad **forward** (not to the side!).

9

Installing the keypad

Proceed in this order:



51479AXX

Figure 159: Installing the keypad

1. Place the keypad with the bottom side onto the lower fixture of the front cover.
2. Push the keypad into the upper fixture of the front cover.
3. Plug the connecting cable into the Xterminal.



9.3 Removing / installing the front cover

Removing the front cover

Proceed as follows to remove the front cover:



- If a keypad is installed, remove it first (→ page 333).

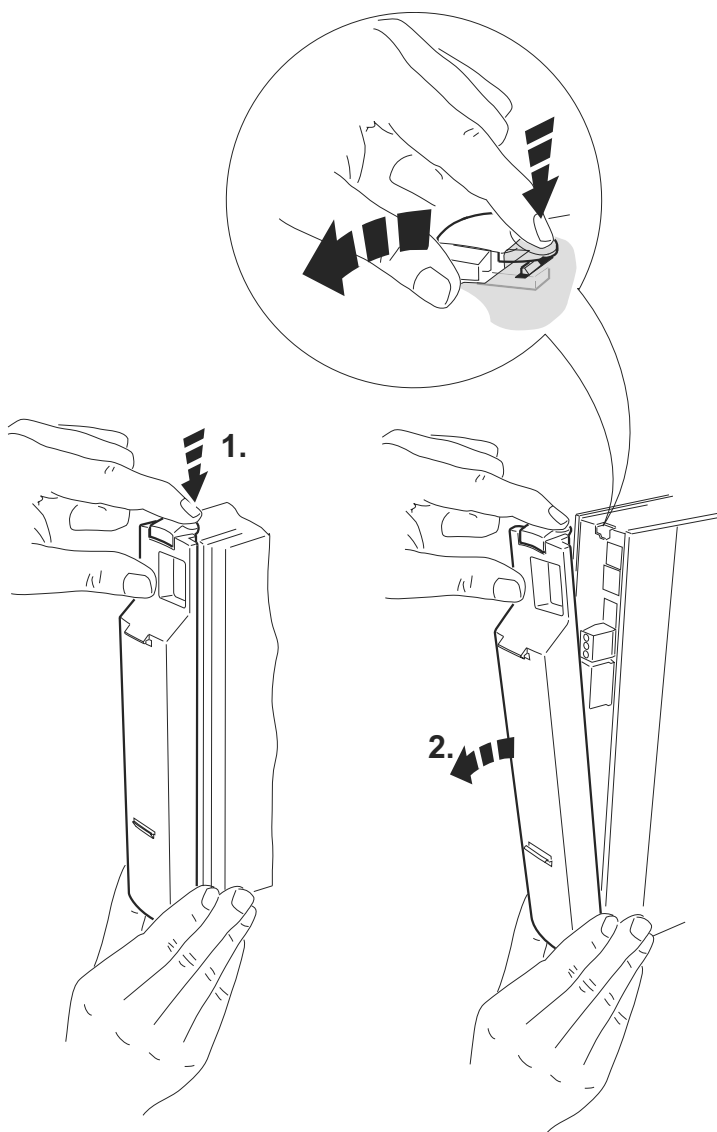


Figure 160: Removing the front cover

52948AXX

1. Press the grooved clip on top of the front cover.
2. Keep the clip pressed down to remove the front cover.



Installing the front cover

Proceed as follows to install the front cover:

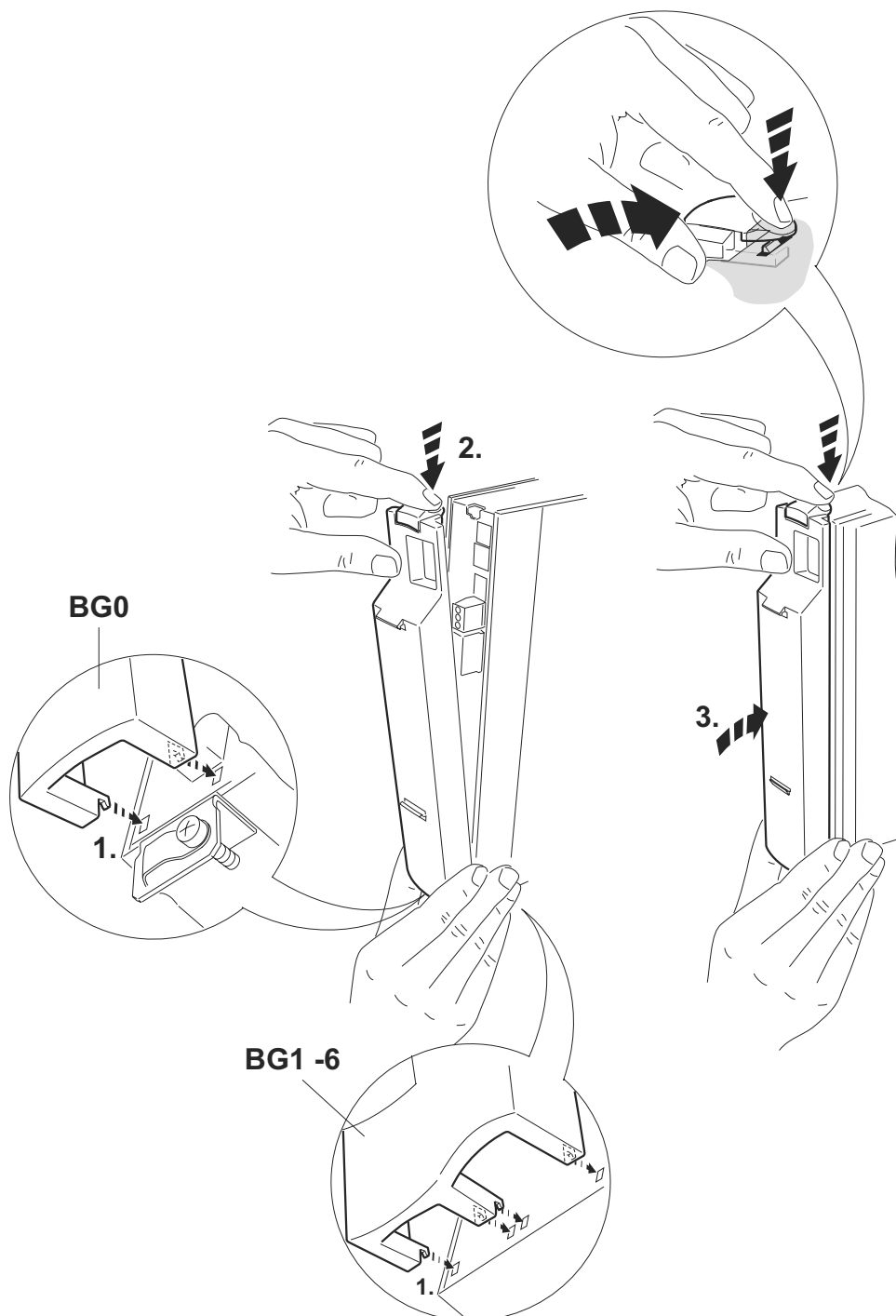


Figure 161: Installing the front cover

52989AXX

1. Insert the front cover with the bottom side into the support.
2. Keep the grooved clip on top of the front cover pressed down.
3. Push the front cover onto the unit.



9.4 UL compliant installation

Note the following points for UL compliant installation:

- Only use copper cables with the **following temperature ranges** as connection cables:
 - for MOVIDRIVE® MDX60B/61B0005 ... 0300 temperature range 60/75°C
 - for MOVIDRIVE® MDX61B0370 ... 1320 temperature range 75 °C
- **Permitted tightening torques** for MOVIDRIVE® power terminals:
 - Size 0 and 1 → 0.6 Nm
 - Sizes 2S and 2 → 1.5 Nm
 - Size 3 → 3.5 Nm
 - Sizes 4 and 5 → 14 Nm
 - Size 6 → 20 Nm
- MOVIDRIVE® drive inverters are **suitable for operation in voltage power systems with an earthed star point** (TN and TT systems), which can supply a max. supply current and a max. supply voltage in accordance with the following table. The fuses listed in the following tables are the maximum permitted fuses for each inverter. Only use melting fuses.

400/500 V units

MOVIDRIVE® MDX60B/61B...5_3	Max. supply current	Max. supply voltage	Fuses
0005/0008/0011/0014	AC 5000 A	AC 500 V	AC 15 A / 600 V
0015/0022/0030/0040	AC 10000 A	AC 500 V	AC 35 A / 600 V
0055/0075	AC 5000 A	AC 500 V	AC 60 A / 600 V
0110	AC 5000 A	AC 500 V	AC 110 A / 600 V
0150/0220	AC 5000 A	AC 500 V	AC 175 A / 600 V
0300	AC 5000 A	AC 500 V	AC 225 A / 600 V
0370/0450	AC 10000 A	AC 500 V	AC 350 A / 600 V
0550/0750	AC 10000 A	AC 500 V	AC 500 A / 600 V
0900	AC 10000 A	AC 500 V	AC 250 A / 600 V
1100	AC 10000 A	AC 500 V	AC 300 A / 600 V
1320	AC 10000 A	AC 500 V	AC 400 A / 600 V

230 V units

MOVIDRIVE® MDX61B...2_3	Max. supply current	Max. supply voltage	Fuses
0015/0022/0037	AC 5000 A	AC 240 V	AC 30 A / 250 V
0055/0075	AC 5000 A	AC 240 V	AC 110 A / 250 V
0110	AC 5000 A	AC 240 V	AC 175 A / 250 V
0150	AC 5000 A	AC 240 V	AC 225 A / 250 V
0220/0300	AC 10000 A	AC 240 V	AC 350 A / 250 V

- Use only tested units with a **limited output voltage** ($V_{\max} = \text{DC } 30 \text{ V}$) and **limited output current** ($I \leq 8 \text{ A}$) as an **external DC 24 V voltage source**.
- **UL certification does not apply to operation in voltage supply systems with a non-earthed star point (IT systems).**





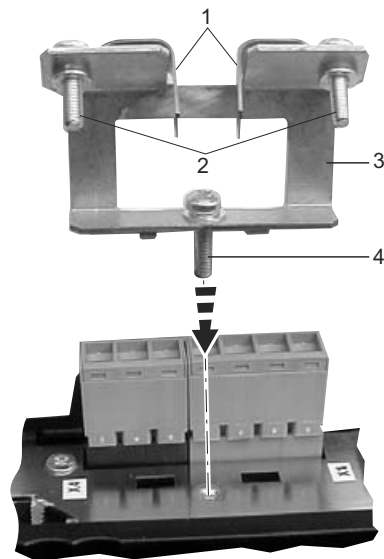
9.5 Shield clamps

Power shield clamp for size 0

A set of power shield clamps is supplied as standard with MOVIDRIVE® MDX60B/61B size 0. The power shield clamps are not yet installed.

Install the power shield clamps as follows:

- Secure the contact clips to the shield plates.
- Secure the power shield clamps to the top and the bottom of the unit.



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Figure 162: Installing the power shield clamp (size 0)

[1] Contact clips

[2] Retaining screws for contact clips

[3] Shield plate

[4] Retaining screw for power shield clamp



Installation

Shield clamps

Power shield clamp for size 1

A power shield clamp is supplied as standard with MOVIDRIVE® MDX61B size 1. Install this power shield clamp together with the retaining screws of the unit.

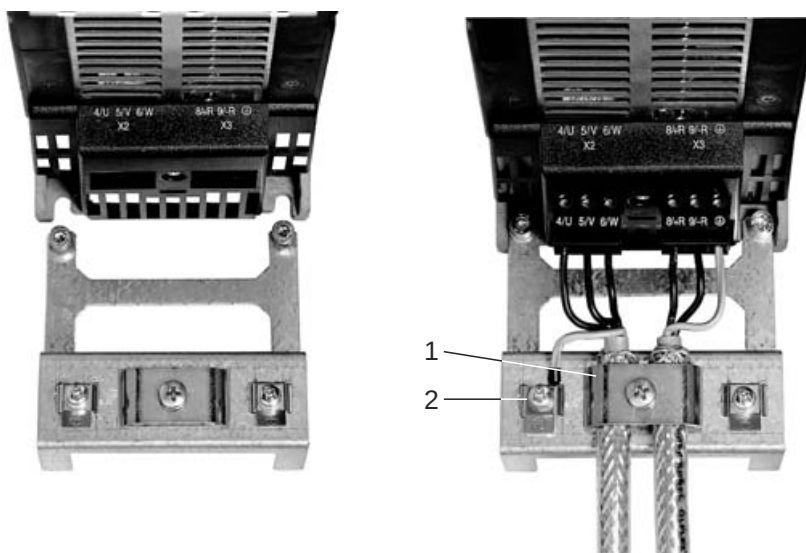


Figure 163: Installing the power shield clamp (size 1)

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[1] Power shield clamp

[2] PE connection (y)

Power shield clamp for sizes 2S and 2

A power shield clamp with 2 retaining screws is supplied as standard with MOVIDRIVE® MDX61B sizes 2S and 2. Mount this power shield clamp together with the two retaining screws to X6.

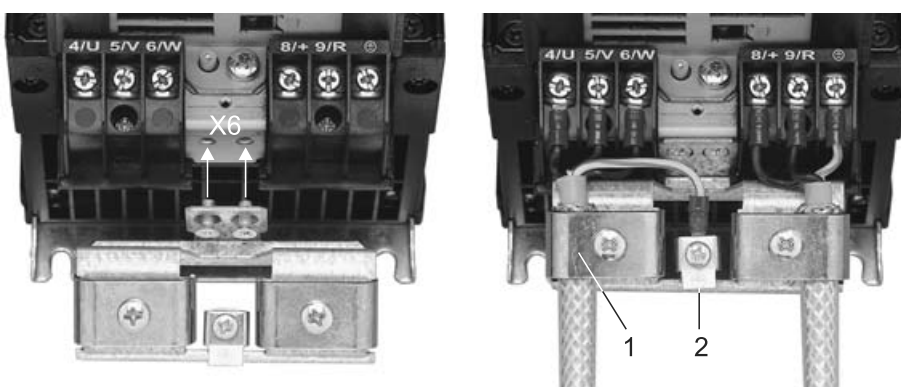


Figure 164: Installing power shield clamp (sizes 2S and 2)

01469BXX

[1] Power shield clamp

[2] PE connection (y)

Power shield clamps provide you with a very convenient way of installing the shield for the motor and brake cables. Install the shield and PE conductor as shown in the figures.

Power shield clamp for sizes 3 to 6

No power shield clamps are supplied with MOVIDRIVE® MDX61B sizes 3 to 6. Use commercially available shield clamps for installing the shielding of motor and brake cables. Apply the shield as closely as possible to the inverter.



Electronics shield clamp for size 0

Install the electronics shield clamps as follows:

- If installed, remove the keypad and the front cover.
- Secure the electronics shield clamp to the bottom of the unit directly under the electronic terminal strip X14.

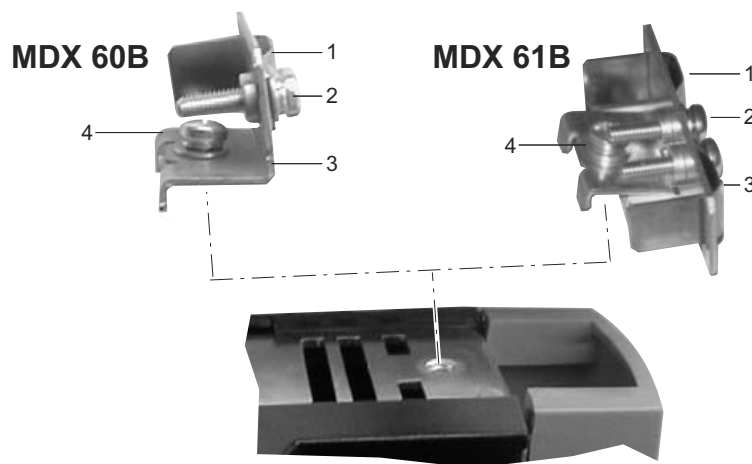


Figure 165: Installing the electronics shield clamp (size 0)

51466AXX

9

[1] Contact clip

[2] Retaining screw for contact clip

[3] Shield plate

[4] Retaining screw for electronics shield clamp

Electronics shield clamp for sizes 1 to 6

Install the electronics shield clamps as follows:

- Secure the contact clips to the shield plates.
- Secure the electronics shield clamp to the bottom of the unit.

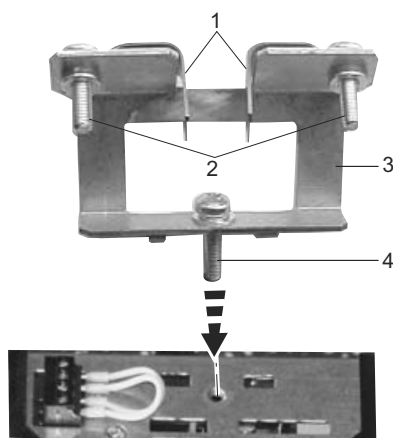


Figure 166: Installing the electronics shield clamp (sizes 1 - 6)

51465AXX

[1] Contact clips

[2] Retaining screws for contact clips

[3] Shield plate

[4] Retaining screw for electronics shield clamp



9.6 Touch guard

Sizes 4-6

With MOVIDRIVE® size 4 (AC 500 V unit: MDX61B0370/0450; AC 230 V units; MDX61B0220/0300), size 5 (MDX61B0550/0750) and size 6 (MDX61B0900/1100/1320), 2 touch guards with 6 retaining screws are supplied as standard. Install the touch guard on both covers of the power section terminals.

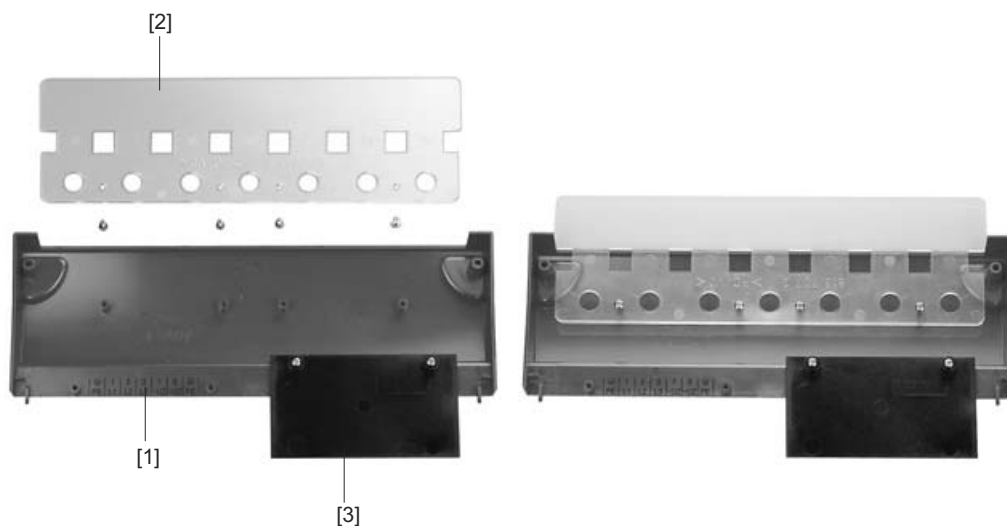


Figure 167: Touch guard for MOVIDRIVE® MDX61B sizes 4, 5 and 6

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The touch guard consist of the following parts:

- [1] Cover plate
- [2] Connection plate
- [3] Screen (only for sizes 4 and 5)

The MOVIDRIVE® MDX61B units sizes 4, 5 and 6 can only achieve enclosure IP10 when the following conditions are met:

- Touch guard is fully installed
- The shrink tubing is installed on all power terminals (X1, X2, X3, X4)



If the above conditions are not met, MOVIDRIVE® units sizes 4, 5 and 6 have enclosure IP00.



Size 2S

If the touch guard (→ following figure) is attached at the connections X4:-U_Z/+U_Z and X3:+R/-R, the MOVIDRIVE® MDX61B units size 2S have protection enclosure IP20; without touch guard they have enclosure IP10.

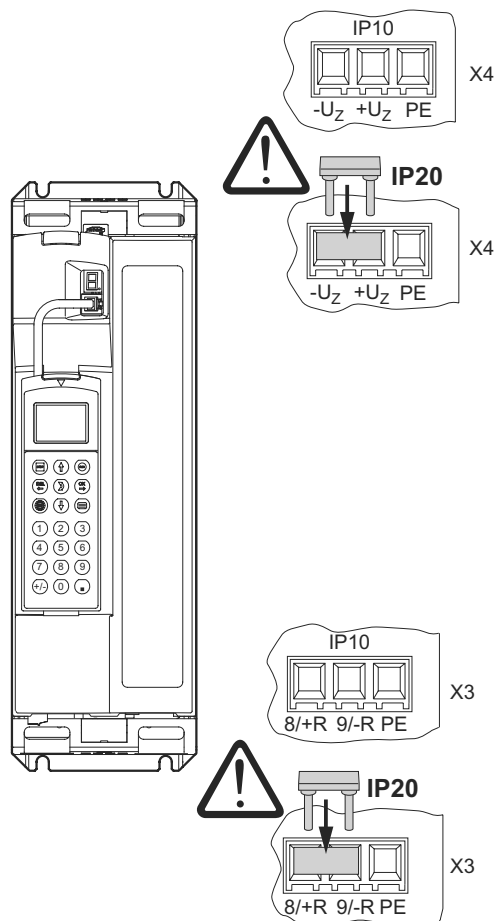


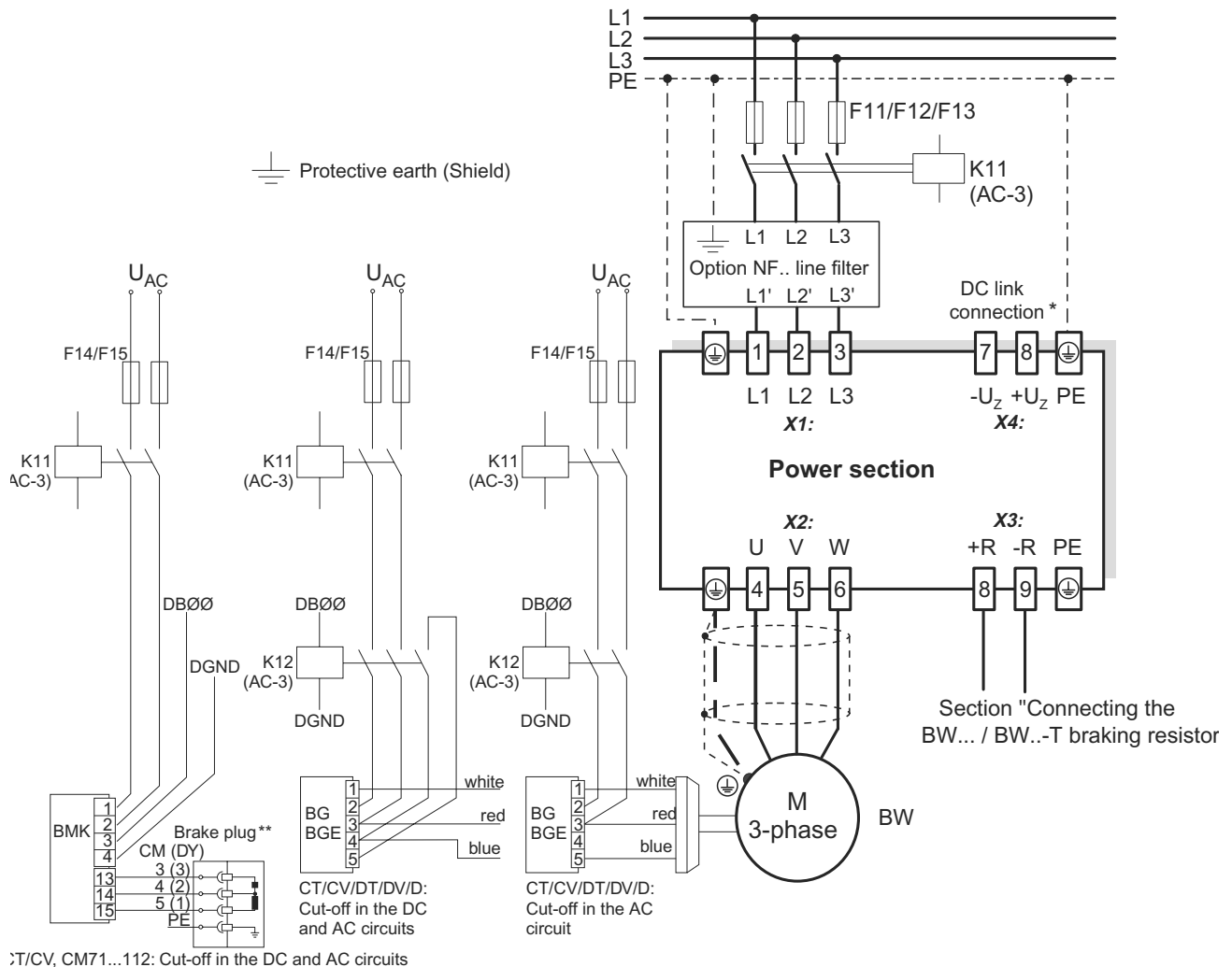
Figure 168: Touch guard for MOVIDRIVE® MDX61B size 2S

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9.7 Wiring diagram for basic unit

Wiring the power section and brake



- * With sizes 1 and 2, there is no PE connection next to the supply system connection terminals and motor connection terminals (X1, X2). In this case, use the PE terminal next to the DC link connection (X4).
- ** **Important:** It is essential to adhere to the connection sequence of the brake connector. Incorrect connection will lead to irreparable damage to the brake. When connecting the brake via the terminal box → Operating instructions for CM motors!



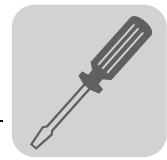
A separate supply system lead is required for connecting the brake rectifier. Powering it from the motor voltage is not permitted!

Always switch off the brake on the DC and AC sides with:

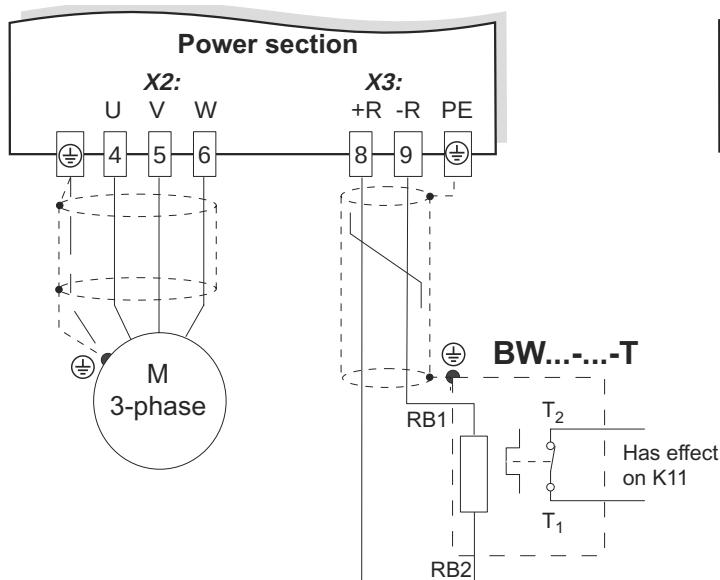
- All hoist applications
- Drives which require a rapid brake response time
- CFC and SERVO operating modes

Brake rectifier in switch cabinet

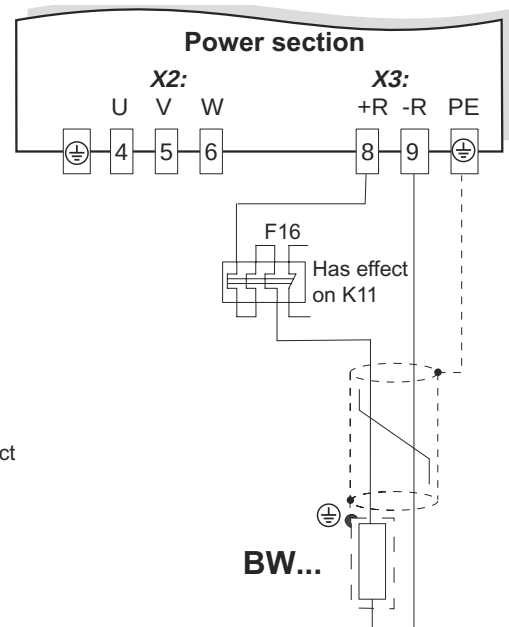
Route the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the switch cabinet. Joint installation is permitted with shielded power cables only.



Connecting the BW.../ BW...-T braking resistor



When the internal thermostat triggers, K11 must be opened and DIØØ "Controller inhibit" must have a "0" signal. The resistance circuit must not be interrupted!



When the external bimetallic relay (F16) triggers, K11 must be opened and DIØØ "controller inhibit" must have a "0" signal. The resistance circuit must not be interrupted!

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Braking resistor type	Design speci- fied	Overload protection	
		Internal thermostat (..T)	External bimetallic relay (F16)
BW...	-	-	Required
BW...-T ¹⁾	-	One of the two options (internal thermostat / external bimetallic relay) is required.	
BW...-003 / BW...-005	Adequate	-	Permitted
BW090-P52B	Adequate	-	-

- 1) Permitted mounting options: On horizontal or vertical surfaces with brackets at the bottom and perforated sheets at top and bottom. **Mounting not permitted:** On vertical surfaces with brackets at the top, right or left.



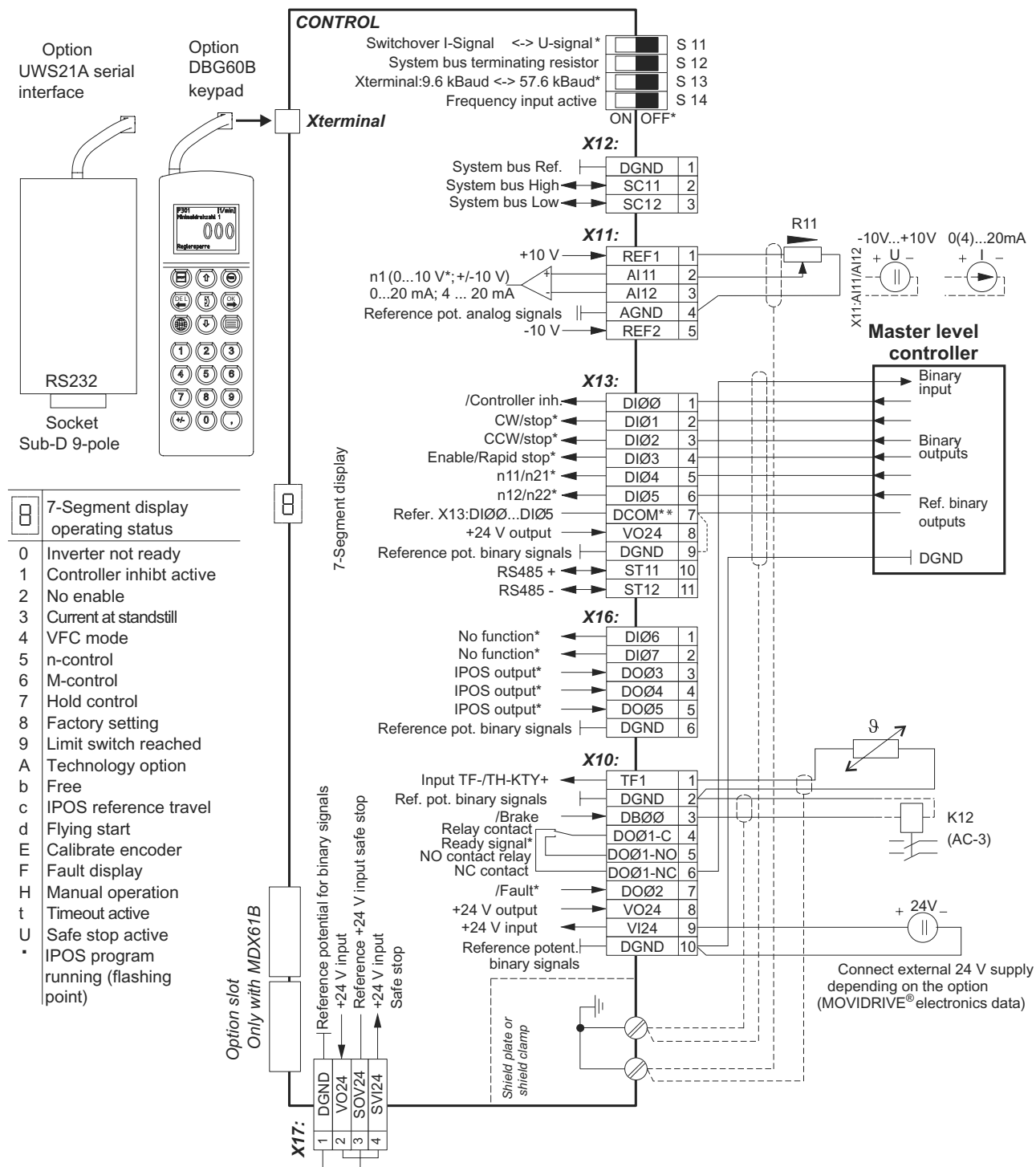
When connecting and operating the brake resistors, you must read the instructions in the section "Installation instructions for basic unit".



Installation

Wiring diagram for basic unit

Connecting the electronics terminals

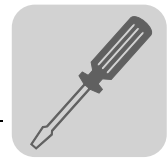


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Figure 169: Wiring diagram for electronics terminals

* Factory setting

** If the binary inputs are connected to the DC 24 V voltage supply X13:8 "VO24", install a jumper between X13:7 (DCOM) and X13:9 (DGND) on MOVIDRIVE®.



Description of terminal functions on the basic unit (power section and control unit)

Terminal		Function
X1:1/2/3 X2:4/5/6 X3:8/9 X4:	L1/L2/L3 (PE) U/V/W (PE) +R/-R (PE) +U _Z /-U _Z (PE)	Power supply connection Motor connection Braking resistor connection DC link connection
S11: S12: S13: S14:		Change I-signal DC(0(4)...20 mA) ↔ V-signal DC(-10 V...0...10 V, 0...10 V), factory setting to V signal. Switching system bus terminating resistor on/off; factory setting: OFF. Set baud rate for the RS485 interface. Either 9.6 or 57.6 kBaud, factory setting: 75.6 kBaud. Switch frequency input on or off, factory setting: switched off.
X12:1 X12:2 X12:3	DGND SC11 SC12	Reference potential system bus System bus high System bus low
X11:1 X11:2/3 X11:4 X11:5	REF1 AI11/12 AGND REF2	DC+10 V (max. DC 3 mA) for setpoint potentiometer Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_ / S11 Reference potential for analog signals (REF1, REF2, AI..., AO...) DC-10 V (max. DC 3 mA) for setpoint potentiometer
X13:1 X13:2 X13:3 X13:4 X13:5 X13:6	DI00 DI01 DI02 DI03 DI04 DI05	Binary input 1, with fixed assign "I/Controller inhibit" Binary input 2, factory setting to "CW/stop" Binary input 3, factory setting to "CCW/stop" Binary input 4, factory setting to "Enable/rapid stop" Binary input 5, factory setting to "n11/n21" Binary input 6, factory setting to "n11/n22"
		- The binary inputs are electrically isolated by optocouplers. - Selection options for binary inputs 2 to 6 (DI01 ... DI05) → Parameter menu P60_
X13:7	DCOM	Reference for binary inputs X13:1 to X13:6 (DI00 ... DI05) and X16:1/X16:2 (DI06 ... DI07) - Switching binary inputs with DC+24 V external voltage: X13:7 (DCOM) must be connected to the reference potential of the external voltage. - Without jumper X13:7-X13:9 (DCOM-DGND) → Isolated binary inputs - With jumper X13:7-X13:9 (DCOM-DGND) → Non-isolated binary inputs - The binary inputs must be switched with DC+24 V from X13:8 or X10:8 (VO24) → Jumper required X13:7-X13:9 (DCOM-DGND).
X13:8 X13:9 X13:10 X13:11	VO24 DGND ST11 ST12	Auxiliary supply output DC+24 V (max. load X13:8 and X10:8 = 400 mA) for external command switches Reference potential for binary signals RS485+ RS485-
X16:1 X16:2 X16:3 X16:4 X16:5 X16:6	DI06 DI07 DO03 DO04 DO05 DGND	Binary input 7, factory setting "no function" Binary input 8, factory setting "no function" Binary output 3, factory setting "IPOS output" Binary output 4, factory setting "IPOS output" Binary output 5, factory setting "IPOS output" Do not connect external voltage to binary outputs X16:3 (DO03) and X16:5 (DO05)! Reference potential for binary signals
		- The binary inputs are electrically isolated by optocouplers. - Selection options for binary inputs 7 and 8 (DI06/DI07) → Parameter menu P60_ - Selection option for binary inputs 3 to 5 (DO03...DO05) → Parameter menu P62_
X10:1 X10:2 X10:3 X10:4 X10:5 X10:6 X10:7	TF1 DGND DB00 DO01-C DO01-NO DO01-NC DO02	KTY+/TF-/TH connection (connect to X10:2 via TF/TH), factory setting to "No response" (→ P835) Reference potential for binary signals / KTY- Output 0, with assign. "I/Brake", max. capacity DC 150 mA (short-circuit proof and protected vs. ext. voltage) Shared contact binary output 1, factory setting "Ready" NO contact binary output 1, max. load of relay contacts DC 30 V and DC 0.8 A NC contact binary output 1 Output 2, setting "I/Fault", max. load capacity DC 50 mA (short-circuit proof, protected vs. external voltage) Selection options for binary outputs 1 and 2 (DO01 and DO02) → Parameter menu P62_ Do not apply an external voltage to binary outputs X10:3 (DB00) and X10:7 (DO02)!
X10:8 X10:9 X10:10	VO24 VI24 DGND	Auxiliary supply output DC+24 V (max. load X13:8 and X10:8 = 400 mA) for external command switches Input DC+24 V voltage supply (backup voltage depending on options, unit diagnosis when supply off) Reference potential for binary signals
X17:1 X17:2 X17:3 X17:4	DGND VO24 SOV24 SVI24	Reference potential for X17:3 Auxiliary supply voltage DC+24 V, only to supply X17:4 Reference potential for DC+24 V input "Safe stop" (safety contact) DC+24 V input "Safe stop" (safety contact)
Xterminal		Option slot: DBG60B keypad / UWS21A or USB11A interface converter
		3 slots for option cards (size 0: 2 slots for option cards)



X17: For safety applications, it is essential to observe the information in the publications "Safe disconnection for MOVIDRIVE® MDX60B/61B – Conditions" and "Safe disconnection for MOVIDRIVE® MDX60B/61B – Applications."



Installation

Assignment of braking resistors, chokes and filters

9.8 Assignment of braking resistors, chokes and filters

AC 400/500 V units, size 0

MOVIDRIVE® MDX60/61B...-5A3				0005	0008	0011	0014
Size				0			
Braking resistors BW... / BW...-T	Trip current	Part number BW...	Part number BW...-T				
BW090-P52B ¹⁾	-	824 563 0					
BW072-003	$I_F = 0.6 A_{RMS}$	826 058 3					
BW072-005	$I_F = 1.0 A_{RMS}$	826 060 5					
BW168/BW168-T	$I_F = 2.5 A_{RMS}$	820 604 X	1820 133 4				
BW100-06/BW100-006-T	$I_F = 1.8 A_{RMS}$	821 701 7	1820 419 8				
Line chokes							
ND020-013		$\Sigma I_{mains} = AC 20 A$	826 012 5				
Line filter							
NF009-503		$U_{max} = AC 550 V$	827 412 6				
Output chokes							
HD001		Inside diameter $d = 50 \text{ mm (1.97 in)}$	813 325 5		For cable cross sections 1.5 ... 16 mm ² (AWG 16 ... 6)		
HD002		$d = 23 \text{ mm (0.91 in)}$	813 557 6		For cable cross sections $\leq 1.5 \text{ mm}^2$ (AWG 16)		
Output filters (only in VFC mode)							
HF008-503		Part number 826 029 X			A		
HF015-503		826 030 3			B		A
HF022-503		826 031 1					B

1) Internal thermal overload protection, no bimetallic relay required.

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)



AC 400/500 V units, sizes 1, 2S, and 2

MOVIDRIVE® MDX61B...-5A3				0015	0022	0030	0040	0055	0075	0110
Size				1				2S		2
Braking resistors BW... / BW...-T	Trip current	Part no. BW...	Part no. BW...-T							
BW100-005	I _F = 0.8 A _{RMS}	826 269 1								
BW100-006/ BW100-006-T	I _F = 1.8 A _{RMS}	821 701 7	1820 419 8							
BW168/BW168-T	I _F = 2.5 A _{RMS}	820 604 X	1820 133 4							
BW268/BW268-T	I _F = 3.4 A _{RMS}	820 715 1	1820 417 1							
BW147/BW147-T	I _F = 3.5 A _{RMS}	820 713 5	1820 134 2							
BW247/BW247-T	I _F = 4.9 A _{RMS}	820 714 3	1820 084 2							
BW347/BW347-T	I _F = 7.8 A _{RMS}	820 798 4	1820 135 0							
BW039-012/ BW039-012-T	I _F = 4.2 A _{RMS}	821 689 4	1820 136 9							
BW039-026/ BW039-026-T	I _F = 7.8 A _{RMS}	821 690 8	1820 415 5							
BW039-050/ BW039-050-T	I _F = 11 A _{RMS}	821 691 6	1820 137 7							
Line chokes		Part no.								
ND020-013	Σ I _{mains} = AC 20 A	826 012 5								
ND045-013	Σ I _{mains} = AC 45 A	826 013 3								
Line filter		Part no.								
NF009-503	U _{max} = AC 550 V	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 no.								
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)						
Output filters (only in VFC mode)		Part no.								
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 %)



Installation

Assignment of braking resistors, chokes and filters

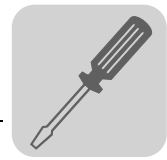
AC 400/500 V units, sizes 3 to 6

MOVIDRIVE® MDX61B...-503				0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
Size				3			4		5		6		
Braking resistors BW... / BW...-...-T	Trip current	Part no. BW...	Part no. BW...-...-T										
BW018-015/ BW018-015-T	I _F = 4.0 A _{RMS}	821 684 3	1820 416 3				C	C					
BW018-035/ BW018-035-T	I _F = 8.1 A _{RMS}	821 685 1	1820 138 5				C	C					
BW018-075/ BW018-075-T	I _F = 14 A _{RMS}	821 686 X	1820 139 3				C	C					
BW915/ BW915-T	I _F = 28 A _{RMS}	821 260 0	1820 413 9										
BW012-025/ BW012-025-T	I _F = 10 A _{RMS}	821 680 0	1820 414 7										
BW012-050/ BW012-050-T	I _F = 17 A _{RMS}	821 681 9	1820 140 7										
BW012-100/ BW012-100-T	I _F = 29 A _{RMS}	821 682 7	1820 141 5										
BW106/ BW106-T	I _F = 38 A _{RMS}	821 050 0	1820 083 4								C	C	C
BW206/ BW206-T	I _F = 42 A _{RMS}	821 051 9	1820 412 0								C	C	C
Line chokes		Part no.											
ND045-013	Σ I _{mains} = AC 45 A	826 013 3			A								
ND085-013	Σ I _{mains} = AC 85 A	826 014 1			B			A					
ND150-013	Σ I _{mains} = AC 150 A	825 548 2						B					
ND300-0053	Σ I _{mains} = AC 300 A	827 721 4											

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 ($2 \times I_F$)



MOVIDRIVE® MDX61B...-503			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
Size			3			4		5		6		
Line filter		Part no.										
NF035-503	U _{max} = AC 550 V	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				
NF210-503		827 418 5									A	
NF300-503		827 419 3										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)									
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm ² (AWG 6)									
HD004	Connection with M12 bolt	816 885 7										
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 %)
- 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



Installation

Assignment of braking resistors, chokes and filters

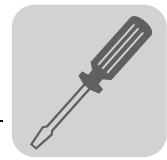
AC 230 V units, sizes 1 to 4

MOVIDRIVE® MDX61B...-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 number									
ND020-013	$\Sigma I_{mains} = AC 20 A$	826 012 5				A					
ND045-013	$\Sigma I_{mains} = AC 45 A$	826 013 3				B		A			
ND085-013	$\Sigma I_{mains} = AC 85 A$	826 014 1						B		A	
ND150-013	$\Sigma I_{mains} = AC 150 A$	825 548 2								B	
Line filter		Part number									
NF009-503	$U_{max} = AC 550 V$	827 412 6		A							
NF014-503		827 116 X		B	A						
NF018-503		827 413 4			B						
NF035-503		827 128 3									
NF048-503		827 117 8						A			
NF063-503		827 414 2						B			
NF085-503		827 415 0								A	
NF115-503		827 416 9								B	
Output chokes	Internal diameter	Part number									
HD001	$d = 50 mm$	813 325 5	For cable cross sections $1.5 \dots 16 mm^2$ (AWG 16 ... 6)								
HD002	$d = 23 mm$	813 557 6	For cable cross sections $\leq 1.5 mm^2$ (AWG 16)								
HD003	$d = 88 mm$	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 ($2 \times I_F$)



9.9 System bus connection (SBus 1)



Only if P884 "SBus baud rate" = 1000 kbaud:

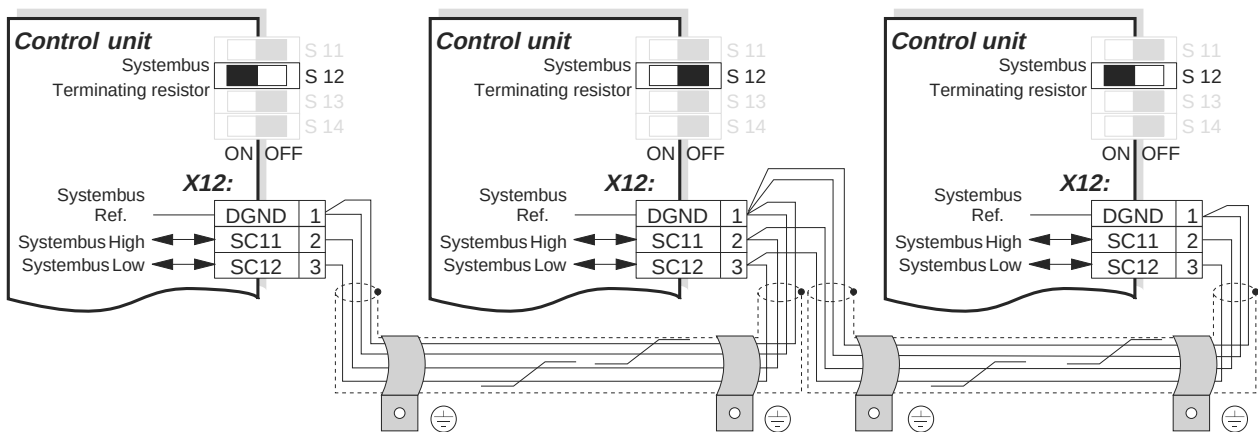
MOVIDRIVE® compact MCH4_A units must not be combined with other MOVIDRIVE® units in the same system bus combination.

The units may be combined at baud rates $\neq$ 1000 kbaud.

Max. 64 CAN bus stations can be addressed using the system bus (SBus). Use a repeater after 20 or 30 stations, depending on the length of the cables and the cable capacity. The SBus supports transmission technology compliant with ISO 11898.

The "Serial Communication" manual contains detailed information about the system bus. This manual can be ordered from SEW-EURODRIVE.

SBus wiring diagram



54534AEN

Figure 170: System bus connection

Cable specification

- Use a 4-core twisted and shielded copper cable (data transmission cable with braided copper shield). The cable must meet the following specifications:

- Core cross section 0.25 ... 0.75 mm² (AWG 23 ... AWG 18)
- Line resistance 120 Ω at 1 MHz
- Capacitance per unit length $\leq$ 40 pF/m at 1 kHz

Suitable cables include CAN bus or DeviceNet cables.

Shielding

- Connect the shield to the electronics shield clamp on the inverter or master controller and make sure it is connected over a wide area at both ends.

Cable length

- The permitted total cable length depends on the baud rate setting of the SBus (P884):
 - 125 kbaud $\rightarrow$ 320 m
 - 250 kbaud $\rightarrow$ 160 m
 - 500 kbaud $\rightarrow$ 80 m**
 - 1000 kbaud $\rightarrow$ 40 m

Terminating resistor

- Switch on the system bus terminating resistor (S12 = ON) at the start and end 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 with the SBus. Take suitable measures to avoid potential displacement, such as connecting the unit ground connectors using a separate line.



9.10 Connection of RS485 interface

The RS485 interface can be used for connecting max. 32 MOVIDRIVE® units, e.g. for master/slave operation, or 31 MOVIDRIVE® units and a master control system (PLC).

Wiring diagram RS485 interface

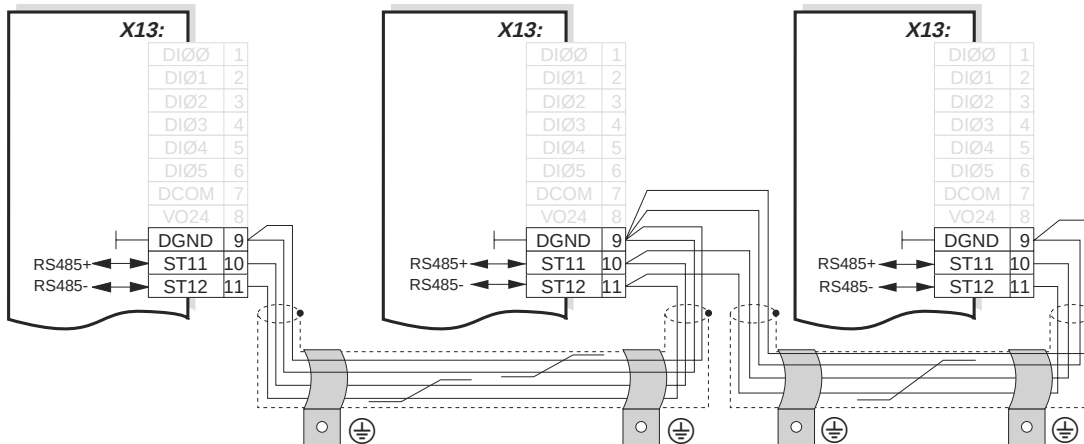


Figure 171: RS485 connection

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- Cable specification**
- Use a 4-core twisted and shielded copper cable (data transmission cable with braided copper shield). The cable must meet the following specifications:
 - Core cross section 0.25 ... 0.75 mm² (AWG 23 ... 18)
 - Cable resistance 100 ... 150 Ω at 1 MHz
 - Capacitance per unit length ≤ 40 pF/m at 1 kHz

The following cable is suitable, for example:

- BELDEN (www.belden.com), data cable type 3107A

Shielding

- Connect the shield to the electronics shield clamp on the inverter or higher-level controller and make sure it is connected over a wide area at both ends.

Cable length

- The permitted total cable length is 200 m.

Terminating resistor

- Dynamic terminating resistors are installed. Do not connect **any external terminating resistors!**



There must not be any difference of potential between the units connected with the RS485. Take suitable measures to avoid potential displacement, such as connecting the unit ground connectors using a separate line.



9.11 Connection of interface converter option UWS21A (RS232)

Part number Interface converter option UWS21A: 823 077 3

Connecting MOVIDRIVE® to UWS21A

- Use the connection cable supplied to connect the UWS21A option to the MOVIDRIVE® unit.
- Plug the connection cable into the Xterminal socket of the MOVIDRIVE® unit.
- Note that the DBG60B keypad and the UWS21A serial interface cannot be connected to the MOVIDRIVE® at the same time.

MOVIDRIVE® MDX60/61B

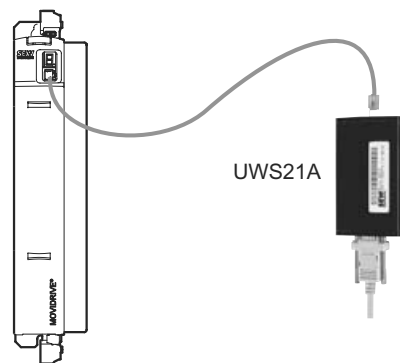


Figure 172: Connection cable between MOVIDRIVE® and UWS21A

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Connecting UWS21A to PC

- Use the connection cable supplied (shielded RS232 standard interface cable) to connect the UWS21A option to the PC.

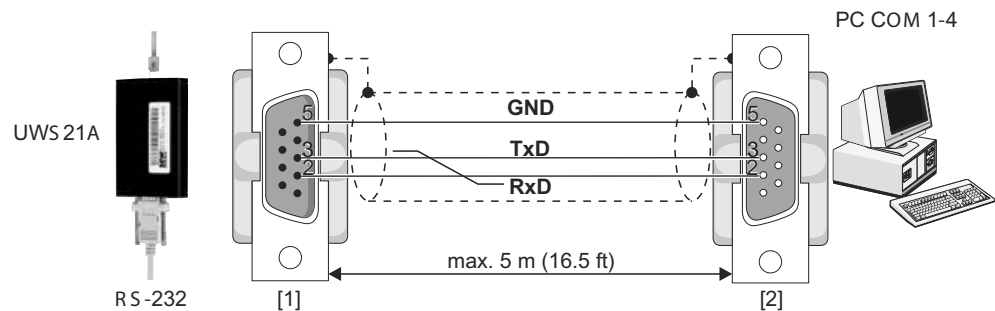


Figure 173: UWS21A-PC connection cable (1:1 connection assignment)

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- [1] 9-pin sub D connector
[2] 9-pin sub D socket



Installation

Connection of the interface converter option USB11A

9.12 Connection of the interface converter option USB11A

Part number Interface converter option USB11A: 824 831 1

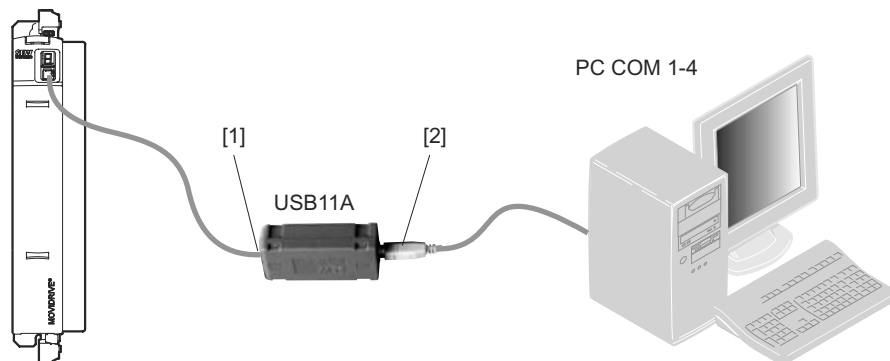


- The scope of delivery for the USB11A includes:
 - USB11A interface adapter
 - USB connection cable PC - USB11A (type USB A-B)
 - Connection cable for MOVIDRIVE® MDX60B/61B - USB11A (cable RJ10-RJ10)
 - CD-ROM with drivers and MOVITOOLS®
- The USB11A interface converter supports USB 1.1 and USB 2.0.

Connecting MOVIDRIVE®- USB11A - PC

- Use the connection cable [1] (RJ10 - RJ10) supplied to connect the USB11A option to the MOVIDRIVE® unit.
- Plug the connection cable [1] into the Xterminal slot of the MOVIDRIVE® MDX60B/61B and into the RS485 slot of the USB11A.
- Note that the DBG60B keypad and the USB11A interface converter cannot be connected to the MOVIDRIVE® at the same time.
- Use the USB connection cable [2] (type USB A-B) to connect the USB11A to the PC.

MOVIDRIVE® MDX60/61B



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Figure 174: Connection cable for MOVIDRIVE® MDX60B/61B - USB11A

Installation

- Connect the USB11A to a PC and MOVIDRIVE® MDX60B/61B using the connection cables supplied.
- Insert the enclosed CD into the CD drive of your PC and install the driver. The first free COM port on the PC will be assigned to the USB11A interface converter .

Operation with MOVITOOLS®

- After installation, the PC recognizes the USB11A interface converter after approximately 5 to 10 s.
- Start MOVITOOLS®.



If the connection between the PC and USB11A is interrupted, you will have to restart MOVITOOLS®.



9.13 Option combinations for MDX61B

Configuration of option slots

Size 0 (0005 ... 0014)

Sizes 1 ... 6 (0015 ... 1320)

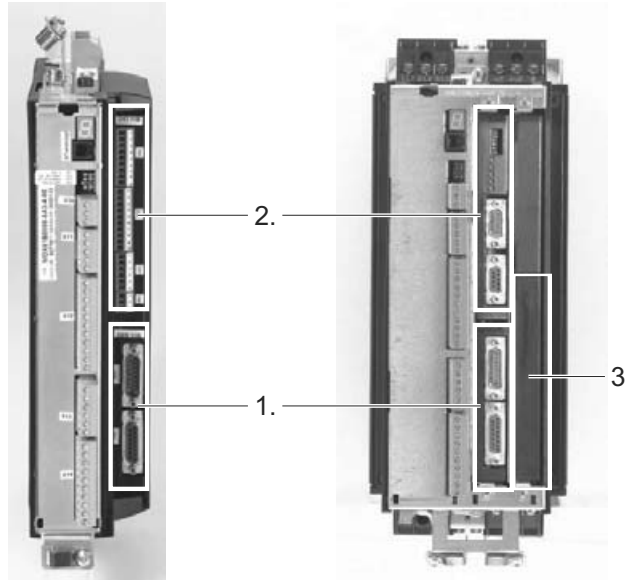


Figure 175: Options slots for MOVIDRIVE® MDX61B

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1. Encoder slot for encoder options
2. Fieldbus slot for communication options
3. Expansion slot for communication options (only for sizes 1 to 6)

Option card combinations for MDX61B

The option cards are different in size and can only be installed in the matching option slots. The following list shows the possible combinations of option cards for MOVIDRIVE® MDX61B.

Option card	Designation	MOVIDRIVE® MDX61B		
		Encoder slot Size 0 - size 6	Fieldbus slot Size 0 - size 6	Expansion slot Size 1 - size 6
DEH11B	Encoder input incr. / Hiperface®	X		
DER11B	Encoder input resolver / Hiperface®	X		
DFP21B	Fieldbus interface Profibus		X	
DFI11B	Fieldbus interface Interbus		X	
DFI21B	Fieldbus interface Interbus LWL		X	
DFD11B	Fieldbus interface DeviceNet		X	
DFC11B	Fieldbus interface CAN/CANopen		X	
DFE11B	Fieldbus interface Ethernet		X	
DIO11B	I/O expansion		X	X ¹⁾
DRS11B	Phase-synchronous operation			X
DIP11B	SSI encoder interface			X

1) When fieldbus slot is not available



9.14 Installing and removing option cards



- For MOVIDRIVE® MDX61B size 0, only SEW-EURODRIVE can install or remove option cards!
- MOVIDRIVE® MDX61B sizes 1 to 6 allow you to install or remove 3 option cards.

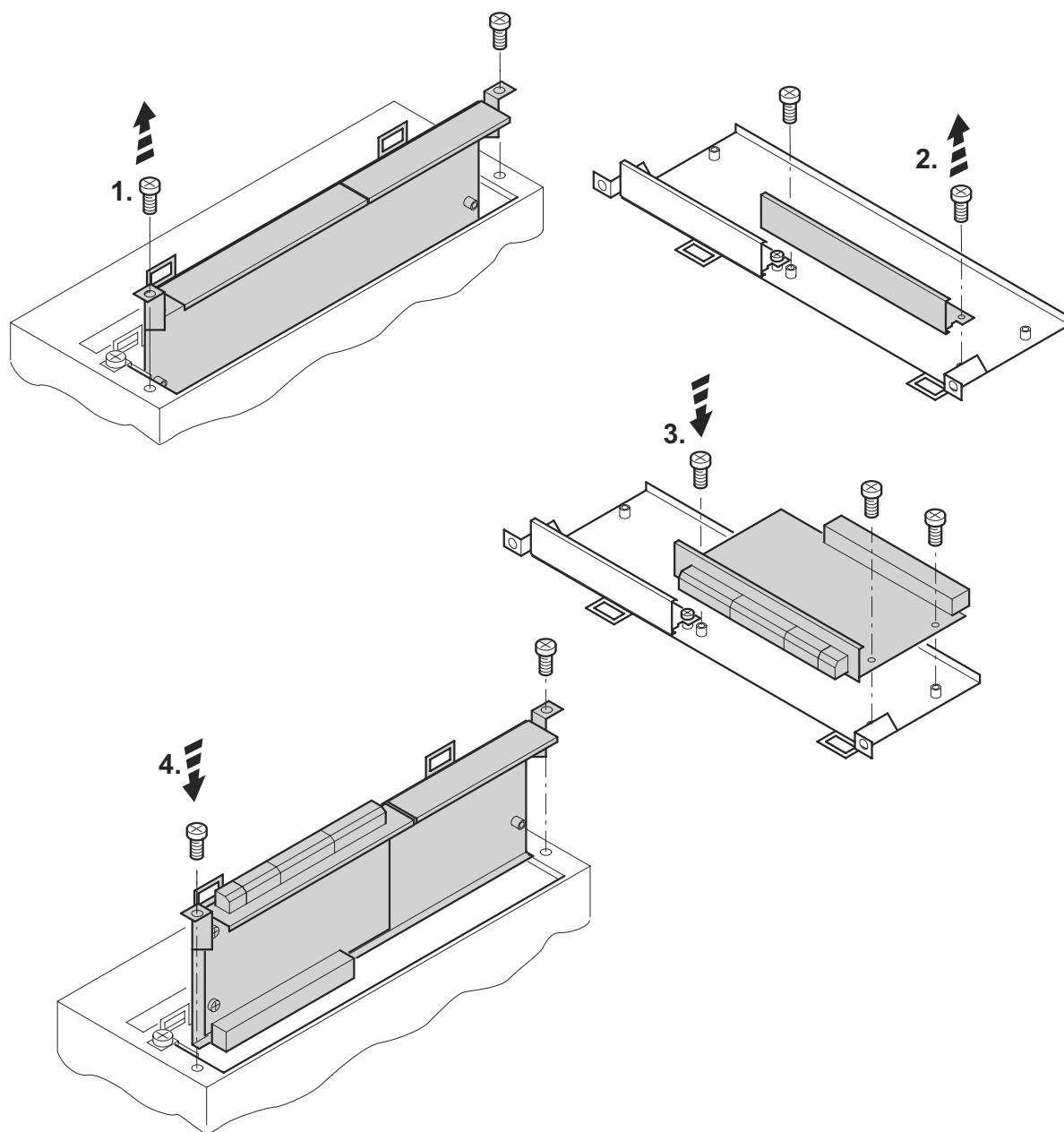
Before you begin

Observe the following notes before installing or removing an option card:

- Disconnect the inverter from power. Switch off the 24 V DC and the supply voltage.
- Take appropriate measures to protect the option card from electrostatic charge (use discharge strap, conductive shoes, etc.) before touching it.
- **Before installing the option card**, remove the keypad (→ Sec. "Removing / installing the keypad") and the front cover (→ Sec. "Removing / installing the front cover").
- **After having installed the option card**, replace the keypad (→ Sec. "Removing / installing the keypad") and the front cover (→ Sec. "Removing / installing the front cover").
- Keep the option card in its original packaging until immediately before you are ready to install it.
- Hold the option card by its edges only. Do not touch any components.



Basic procedure for installing/removing an option card



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Figure 176: Installing an option card in MOVIDRIVE® MDX61B sizes 1 to 6

1. Remove the retaining screws holding the card retaining bracket. Pull the card retaining bracket out evenly from the slot (do not twist!).
2. Remove the retaining screws of the black cover plate on the card retaining bracket. Remove the black cover plate.
3. Position the option card onto the retaining bracket so that the retaining screws fit into the corresponding bores on the card retaining bracket.
4. Insert the retaining bracket with installed option card into the slot, pressing slightly so it is seated properly. Secure the card retaining bracket with the retaining screws.
5. To remove the option card, follow the instructions in reverse order.



9.15 Connection of encoder and resolver



The following wiring diagrams do not show the view onto the cable end but

- with the plugs / sockets: View on motor plugs/sockets
- with unit sockets: View on unit socket

The core colors specified in the wiring diagrams are in accordance with the IEC 757 color code and correspond to the core colors used in the prefabricated cables from SEW-EURODRIVE.

For more details, refer to the "SEW Encoder Systems" manual, which can be obtained from SEW-EURODRIVE.

General installation information

- Max. line length from inverter - encoder/resolver: 100 m with a capacitance per unit length ≤ 120 nF/km.
- Core cross section: 0,20 ... 0,5 mm² (AWG 24 ... 20)
- If you cut a core of the encoder/resolver 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:
 - At the encoder in the cable gland or in the encoder plug
 - At the inverter in the housing of the sub D plug
- Route the encoder/resolver cable separately from the power cables.

Shielding

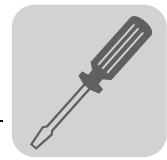
On the inverter

Connect the shield of the encoder/resolver cable over a large area.

Connect the shield on the inverter end in the housing of the sub D plug (→ following illustration).

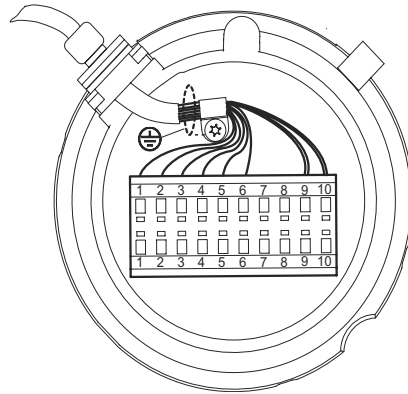


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On the encoder/resolver

Connect the shield on the encoder/resolver side at the respective earthing clamps (→ following illustration). If you are using an EMC screwed gland, connect the shield to the cable gland over a large area. For drives with a plug connector, connect the shield on the encoder plug.



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Prefabricated cables

SEW-EURODRIVE offers prefabricated cables for connecting encoders/resolvers. We recommend using these prefabricated cables.



Installation

Connecting the DEH11B (HIPERFACE®) option

9.16 Connecting the DEH11B (HIPERFACE®) option

Part number

HIPERFACE® encoder card type DEH11B option: 824 310 7



The "HIPERFACE® encoder card type DEH11B" option is only possible in conjunction with MOVIDRIVE® MDX61B, not with MDX60B.

The DEH11B option must be plugged into the encoder slot.

Front view of DEH11B	Description	Terminal	Function
	X14: Input of external encoder or output of incremental encoder simulation Connection → page 366 topage 369 Pulse count of the incremental encoder simulation: 1024 pulses/revolution with HIPERFACE® encoder on X15 - as on X15: Motor encoder input with sin/cos encoder or TTL sensor on X15	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	(COS+) signal track A (K1) (SIN+) signal track B (K2) Signal track C (K0) DATA+ Reserved Switchover Reference potential <u>D</u> GND (COS-) Signal track <u>A</u> (K1) (SIN-) Signal track <u>B</u> (K2) Signal track <u>C</u> (K0) DATA- Reserved DC+12 V (max. load X14:15 and X15:15 = DC 650 mA)
	X15: Motor encoder input	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	(COS+) signal track A (K1) (SIN+) signal track B (K2) Signal track C (K0) DATA+ Reserved Reference potential TF/TH/KTY- Reserved Reference potential <u>D</u> GND (COS-) Signal track <u>A</u> (K1) (SIN-) Signal track <u>B</u> (K2) Signal track <u>C</u> (K0) DATA- Reserved TF/TH/KTY+ connection DC+12 V (max. load X14:15 and X15:15 = DC 650 mA)

Important notes



- The connections on X14 and X15 must not be plugged or removed during operation. De-energize the inverter before plugging or removing the encoder connections. Switch off the supply voltage and the DC 24 V (X10:9).
- If X14 is used as an incremental encoder simulation output, the switchover (X14:7) must be jumpered with DGND (X14:8).
- The DC 12 V supply voltage from X14 and X15 is sufficient to operate SEW encoders with a DC 24 V supply voltage. With all other encoders, check whether they can be connected to the DC 12 V supply voltage.
- Do not connect HTL encoders.

Permitted encoders

The following encoders may be connected to the "HIPERFACE® encoder card type DEH11B" option:

- HIPERFACE® encoder type AS1H, ES1H or AV1H
- sin/cos encoder type ES1S, ES2S, EV1S or EH1S
- DC 5 V TTL sensor with DC 24 V voltage supply type ES1R, ES2R, EV1R or EH1R
- DC 5 V TTL sensor with DC 5 V voltage supply type ES1T, ES2T, EV1T or EH1T via option DWI11A



HIPERFACE® encoder connection

HIPERFACE® encoders AS1H, ES1H and AV1H are recommended for operation with DEH11B. Depending on the motor type and motor configuration, the encoder is connected via plug connector or terminal box.

DT../DV.., DS56,
CT../CV..,
CM71...112 with
plug connector

Connect the HIPERFACE® encoder as follows:

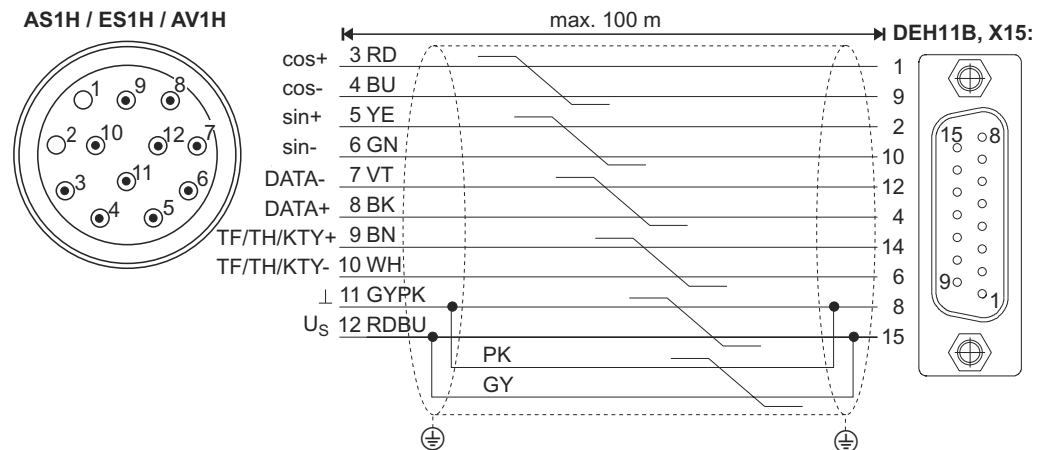


Figure 177: Connecting HIPERFACE® encoder to DEH11B as a motor encoder

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Important for DT/DV and CT/CV motors: The TF or TH is **not** connected to the encoder cable but must be connected using an additional 2-core shielded cable.

Part numbers of the prefabricated cables:

- For fixed routing: 1332 453 5
- For cable carrier routing: 1332 455 1

Part numbers of the prefabricated extension cables:

- For fixed routing: 199 539 1
- For cable carrier routing: 199 540 5



Installation

Connecting the DEH11B (HIPERFACE®) option

CM71...112 with
terminal box

Connect the HIPERFACE® encoder as follows:

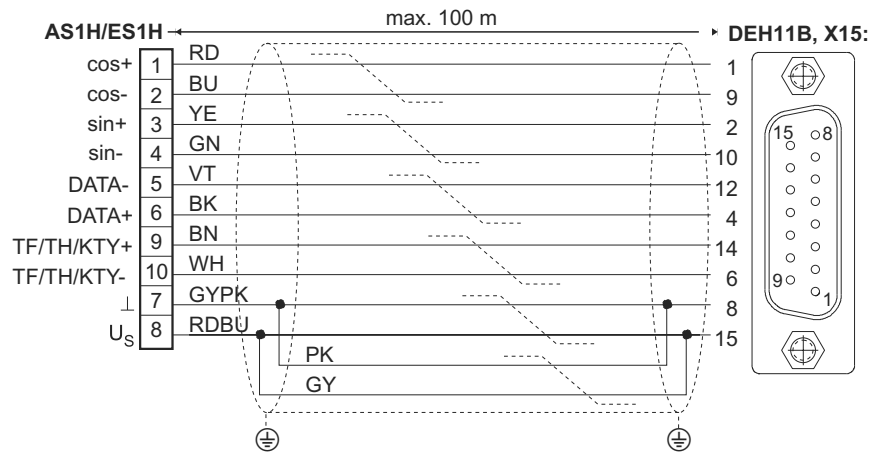


Figure 178: Connecting HIPERFACE® encoder to DEH11B as a motor encoder

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Part numbers of the prefabricated cables:

- For fixed routing: 1332 457 8
- For cable carrier routing: 1332 454 3

Connecting sin/cos encoder to DT../DV., CT../CV motors

The high resolution sin/cos encoders EH1S, ES1S, ES2S or EV1S can also be connected to DEH11B. Connect the sin/cos encoder as follows:

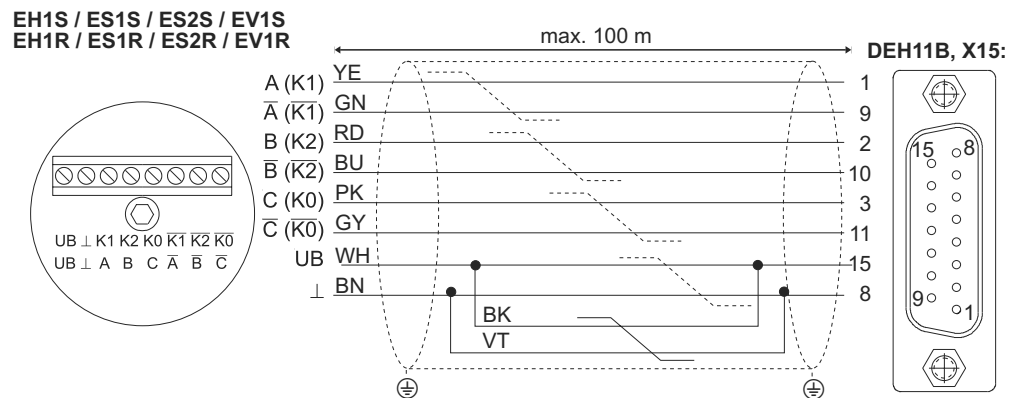
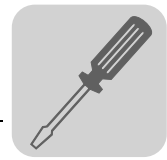


Figure 179: Connecting the sin/cos encoder to DEH11B as a motor encoder

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Part numbers of the prefabricated cables:

- For fixed routing: 1332 459 4
- For cable carrier routing: 1332 458 6



Connecting TTL sensors to DT../DV.. motors

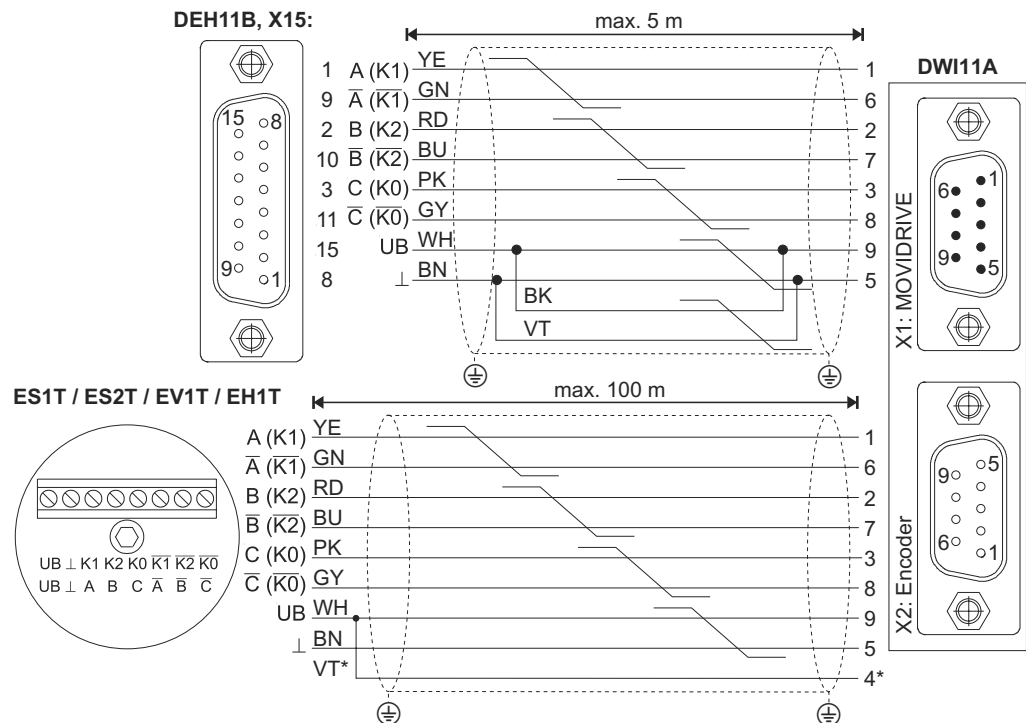
TTL sensors from SEW-EURODRIVE are available with DC 24 V and DC 5 V voltage supply.

DC 24 V voltage supply

Connect TTL sensors with DC 24 V voltage supply EH1R, ES1R, ES2R or EV1R in the same way as the high-resolution sin/cos encoders (→ Figure 179).

DC 5 V voltage supply

TTL sensors with a DC 5 V voltage supply ES1T, ES2T, EH1T or EV1T must be connected via the "DC 5 V encoder power supply type DWI11A" option (part number 822 759 4). The sensor cable must also be connected to correct the supply voltage of the encoder. Connect these encoders as follows:



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Figure 180: Connecting the TTL sensor via DWI11A to DEH11B as a motor encoder

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

Part numbers of the prefabricated cables:

- HIPERFACE® encoder card type DEH11B X15 option: → DWI11A X1: MOVIDRIVE®
 - For fixed routing: 817 957 3
- Encoders ES1T / ES2T / EV1T / EH1T → DWI11A X2: Encoder
 - For fixed routing: 198 829 8
 - For cable carrier routing: 198 828 X



Installation

Connecting the DER11B (resolver) option

9.17 Connecting the DER11B (resolver) option

Part number

Resolver card type DER11B option: 824 307 7



The "resolver card type DER11B" option is only possible in conjunction with MOVIDRIVE® MDX61B, not with MDX60B.

The DER11B option must be plugged into the encoder slot.

Front view of DER11B	Description	Terminal	Function
	X14: Input of external encoder or output of incremental encoder simulation Connection → page 366 topage 369 The pulse count of the incremental encoder simulation is always 1024 pulses per revolution	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	(cos) signal track A (K1) (sin) signal track B (K2) Signal track C (K0) DATA+ Reserved Switchover Reference potential DGND (cos-) Signal track A (K1) (sin-) Signal track B (K2) Signal track C (K0) DATA- Reserved DC+12 V (max. load DC 650 mA)
	X15: Resolver input	X15:1 X15:2 X15:3 X15:4 X15:5 X15:6 X15:7 X15:8 X15:9	sin+ (S2) cos+ (S1) Ref.+ (R1) Not assigned Reference potential TF/TH/KTY- sin- (S4) cos- (S3) Ref.- (R2) TF/TH/KTY+ connection

Important notes



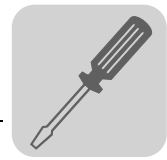
- The connections on X14 and X15 must not be plugged or removed during operation. De-energize the inverter before plugging or removing the encoder connections. Switch off the supply voltage and the DC 24 V (X10:9).
- If X14 is used as an incremental encoder simulation output, the switchover (X14:7) must be jumpered with DGND (X14:8).
- The DC 12 V supply voltage from X14 is sufficient to operate SEW encoders with a DC 24 V supply voltage. With all other encoders, check whether they can be connected to the DC 12 V supply voltage.
- Do not connect HTL encoders.

Permitted encoders

The following encoders can be connected at X14 (external encoder inputs):

- HIPERFACE® encoder type AS1H, ES1H or AV1H
- sin/cos encoder type ES1S, ES2S, EV1S or EH1S
- DC 5 V TTL sensor with DC 24 V voltage supply type ES1R, ES2R, EV1R or EH1R
- DC 5 V TTL sensor with DC 5 V voltage supply type ES1T, ES2T, EV1T or EH1T via option DWI11A

2-pole resolvers, AC 7 V_{eff}, 7 kHz, can be connected at X15 (resolved input). The gear ratio of the resolver amplitudes must be approximately 0.5. The control dynamics decrease if the value is lower; the evaluation may be unstable if the value is higher.



Resolver

SEW-EURODRIVE offers the following pre-fabricated cables for connecting resolvers to DER11B:

For motor type		Part number	
		Fixed routing	Cable carrier installation
DS56 CM71 ... 112	With plug connector	199 487 5	199 319 4
	Extension cable	199 542 1	199 541 3
CM71 ... 112	With terminal box	199 589 8	199 590 1
DS56	With terminal box	1332 817 4	1332 844 1

Terminal / pin assignment

CM motors: The resolver connections are accommodated in a plug connector or on a 10-pin Wago terminal strip.

DS motors: The resolver connections in the terminal box are either accommodated on a 10-pin Phoenix terminal strip or in the plug connector.

CM plug connector DS56: Intercontec, type ASTA021NN00 10 000 5 000

Terminal / pin	Description	Core color in prefabricated cable
1	Ref.+	Pink (PK)
2	Ref.-	Gray (GY)
3	cos +	Red (RD)
4	cos-	Blue (BU)
5	sin+	Yellow (YE)
6	sin-	Green (GN)
9	TF / TH / KTY +	Brown (BN) / violet (VT)
10	TF/TH/KTY-	White (WH) / black (BK)

The resolver signals have the same numbering on the 10-pin Phoenix terminal strip and in the plug connectors.

Connection

Connect the resolver as follows:

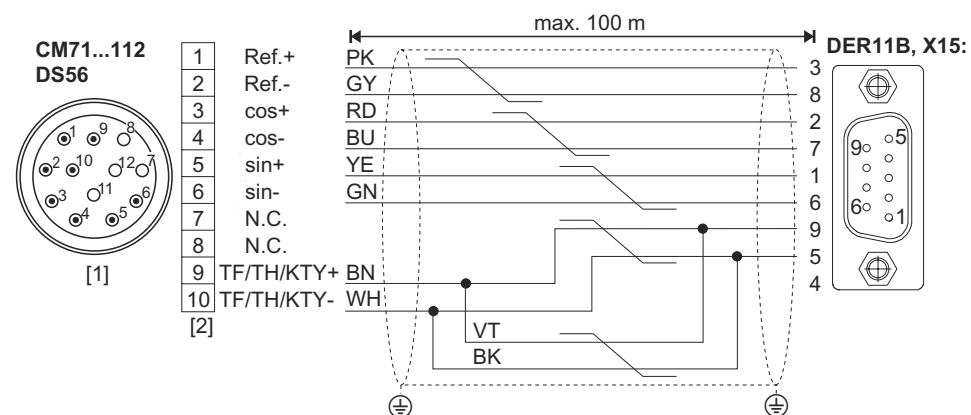


Figure 181: Connecting the resolver

54331BXX

- 1) Plug connector
- 2) Terminal strip

If using the pre-fabricated cable with conductor end sleeves, cut off the violet and black conductor (VT) of the cable in the motor terminal box.



9.18 External encoder connection

External encoders

The following external encoders can be connected to connector X14 of the DEH11B option and the DER11B option.

- HIPERFACE® encoder AV1H
- High-resolution sin/cos encoders with signal voltage 1 V_{SS}
- DC 5 V TTL sensors with signal level to RS422

Voltage supply

SEW encoders with DC 24 V voltage supply (max. DC 180 mA) are connected directly to X14. These SEW encoders are then powered by the inverter.

SEW encoders with a DC 5 V voltage supply must be connected via the "DC 5 V encoder power supply type DWI11A" option (part number 822 759 4).

Connecting HIPERFACE® encoder AV1H

Connect the HIPERFACE® encoder AV1H as follows:

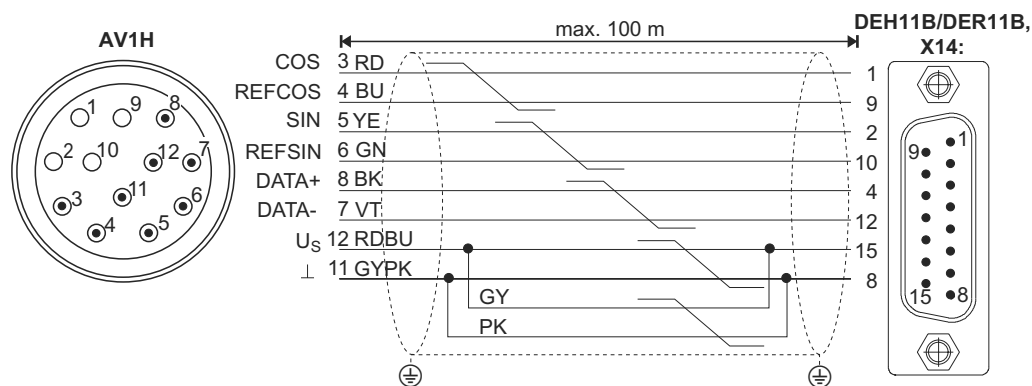


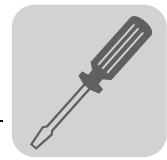
Figure 182: Connecting the HIPERFACE® encoder AV1H to DEH11B/DER11B as external encoder

Part numbers of the prefabricated cables:

- For fixed routing: 818 015 6
- For cable carrier routing: 818 165 9

Part numbers of the prefabricated extension cables:

- For fixed routing: 199 539 1
- For cable carrier routing: 199 540 5



sin/cos encoder connection

Connect the sin/cos encoder as follows:

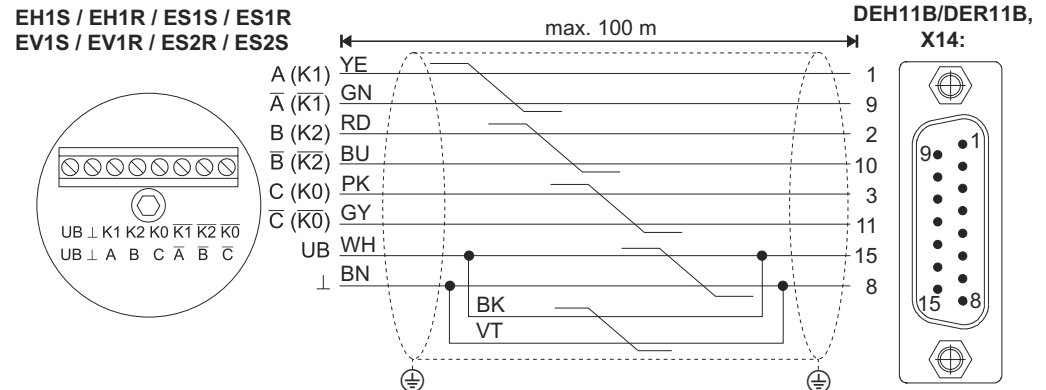


Figure 183: Connecting the sin/cos encoder to DEH11B/DER11B as an external encoder

Part numbers of the prefabricated cables:

- For fixed routing: 817 960 3
If using the prefabricated cable with conductor end sleeves, cut off the red-blue conductor (RDBU) of the cable.
- For cable carrier routing: 818 168 3

TTL sensor connection

TTL sensors from SEW-EURODRIVE are available with DC 24 V and DC 5 V voltage supply.

DC 24 V voltage supply

Connect TTL sensors with DC 24 V voltage supply EV1R in the same way as the high-resolution sin/cos encoders (→ Figure 179).

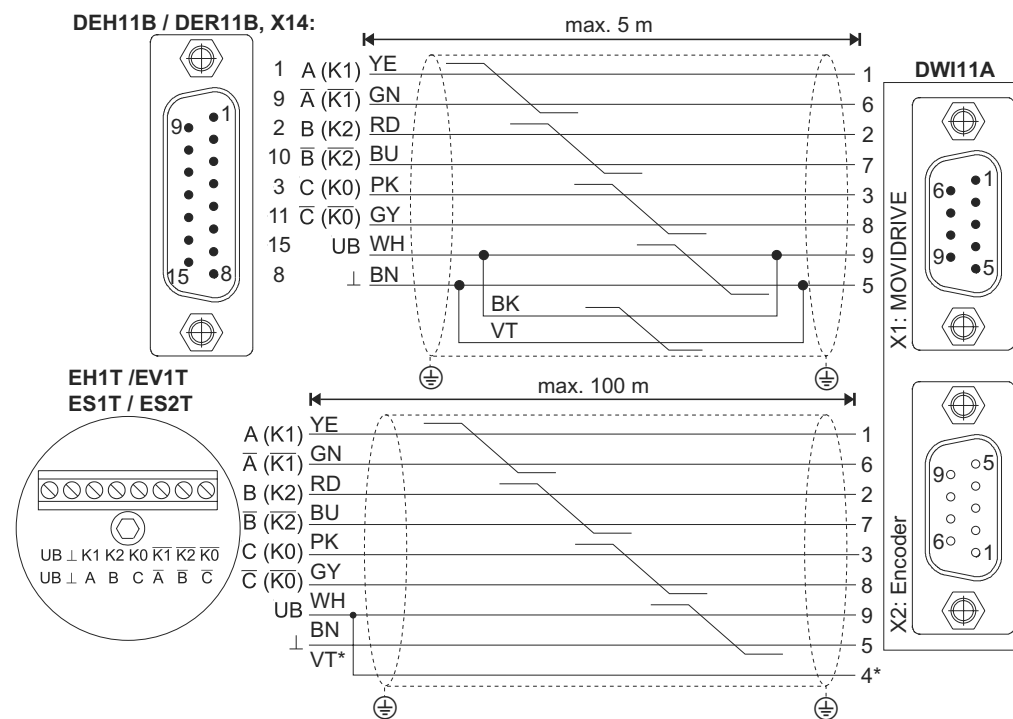


Installation

External encoder connection

DC 5 V voltage supply

DC 5 V TTL sensors with a DC 5 V voltage supply EV1T, EH1T, ES1T and ES2T must be connected via the "DC 5 V encoder power supply type DWI11A" option (part number 822 759 4). The sensor cable must also be connected to correct the supply voltage of the encoder. Connect these encoders as follows:



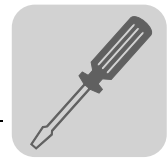
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Figure 184: Connecting the TTL sensor EV1T to MDX via DWI11A as an external encoder

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

Part numbers of the prefabricated cables:

- HIPERFACE® encoder card type DEH11B X14 option: → DWI11A X1: MOVIDRIVE®
 - For fixed routing: 818 164 0
- Encoder EV1T → DWI11A X2: Encoder
 - For fixed routing: 198 829 8
 - For cable carrier routing: 198 828 X

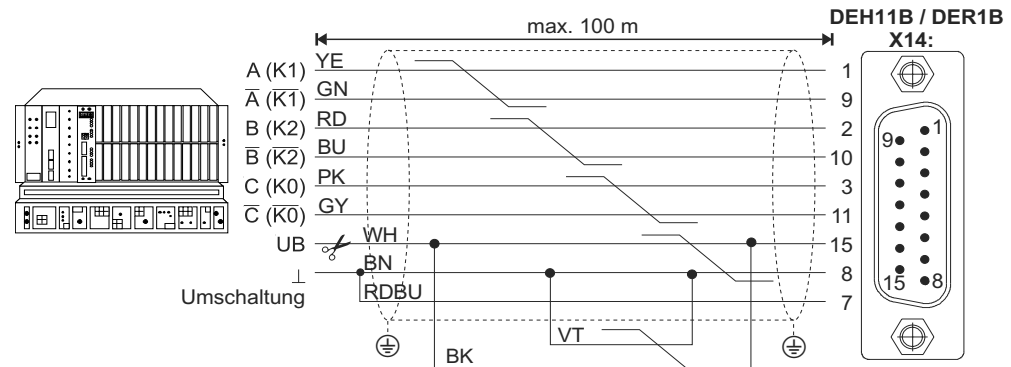


9.19 Connection of incremental encoder simulation

Incremental encoder simulation

Connector X14 of the DEH11B or DER11B option can also be used as incremental encoder simulation output. To do so, you have to jumper "switchover" (X14:7) with DGND (X14:8) and disconnect the connection between X14:15 und U_B . X14 then delivers the incremental encoder signals with a signal level according to RS422. The number of pulses is as follows:

- With DEH11B as on X15 motor encoder input
- With DER11B 1024 pulses/revolution



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Figure 185: Incremental encoder simulation connection to DEH11B or DER11B

Part number of the prefabricated cable:

- Option type DEH/DER11B X14: → incremental encoder simulation
 - For fixed routing: 817 960 3

If using the prefabricated cable with conductor end sleeves, cut off the white (WH) and black (BK) conductor of the cable.



9.20 Master/slave connection

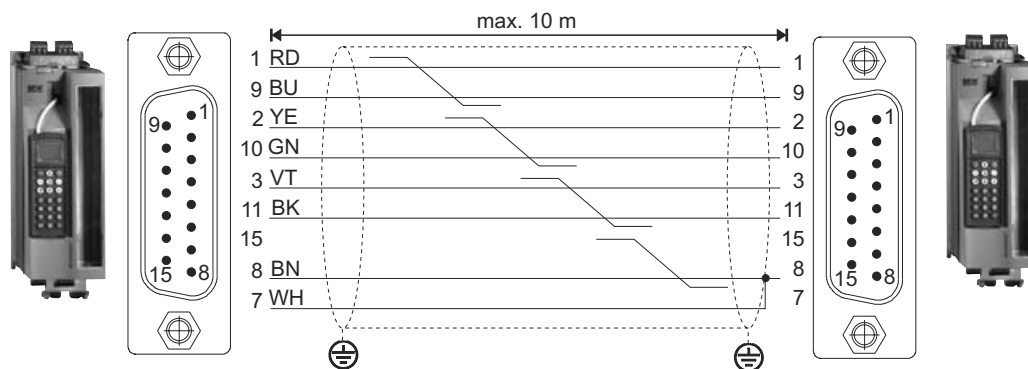
Master/slave connection

Connector X14 of the DEH11B or DER11B option can also be used for the "internal synchronous operation" application (master/slave connection of several MOVIDRIVE® units). For this purpose, you must jumper "switchover" (X14:7) with DGND (X14:8) on the master end.

X14-X14 connection (= master/slave connection) of two MOVIDRIVE® units.

MOVIDRIVE®-Master
X14:

MOVIDRIVE®-Slave
X14:



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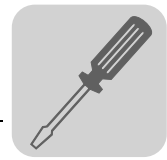
Figure 186: X14-X14 connection (master/slave connection)

Part number of the prefabricated cable:

- For fixed routing: 817 958 1



- **Up to 3 slaves** can be connected to the MOVIDRIVE® master.
- Please note: **X14:7 is not allowed to be connected** when connecting the individual MOVIDRIVE® slaves to one another. Connections **X14:7 and X14:8 are only allowed to be jumpered between the MOVIDRIVE® master and the first MOVIDRIVE® slave.**



9.21 Connection and terminal description of the DIO11B option

Part number



Terminal expansion board type DIO11B: 824 308 5

The "terminal expansion board type DIO11B" option is only possible in conjunction with MOVIDRIVE® MDX61B, not with MDX60B.

The DIO11B option must be plugged into the fieldbus slot. If the fieldbus slot is not available, you can plug the DIO11B expansion board in the expansion slot.

The **extended handle end** of the plug connectors (terminals X20, X21, X22, X23) must **only** be used for **removing the plug connectors** (not for plugging them in!).

Front view of DIO11B	Terminal	Function
Diagram labels: AI21, AI22, AGND, AOV1, AOC1, AGND, AOV2, AOC2, AGND, DI10, DI11, DI12, DI13, DI14, DI15, DI16, DI17, DCOM, DGND, DO10, DO11, DO12, DO13, DO14, DO15, DO16, DO17, 24VIN. Board part number: 06193AXX.	X20:1/2 AI21/22	Setpoint input n2, DC-10 V...0...10 V or DC 0...10 V (Differential input or input with AGND reference potential)
	X20:3 AGND	Reference potential for analog signals (REF1, REF2, AI..., AO...)
	X21:1 AOV1	Analog voltage output V1, with factory setting to "actual speed"
	X21:4 AOV2	Analog voltage output V2, with factory setting to "output current"
	X21:2 AOC1	Load capacity of the analog voltage outputs: $I_{max} = DC\ 10\ mA$
	X21:5 AOC2	Analog current output C1, with factory setting "actual speed"
		Analog current output C2, with factory setting "output current"
		P642/645 "Operating mode AO1/2" sets whether the voltage outputs V1/2 (DC-10 V...0...10 V) or the current outputs C1/2 DC(0(4)...20 mA) are in effect.
		Selection options for the analog outputs → Parameter menu P640/643
		Max. permitted cable length: 10 m
	X21:3/6 AGND	Reference potential for analog signals (REF1, REF2, AI..., AO...)
	X22:1...8 DI10...17	Binary inputs 1...8, with factory setting "no function"
		The binary inputs are electrically isolated by optocouplers.
		Selection options for the binary inputs → Parameter menu P61_
	X22:9 DCOM	Reference potential for the binary inputs DI10...17
	X22:10 DGND	Reference potential for binary signals
		– Without jumper X22:9-X22:10 (DCOM-DGND) → Isolated binary inputs
		– With jumper X22:9-X22:10 (DCOM-DGND) → Non-isolated binary inputs
	X23:1...8 DO10...17	Binary outputs 1...8, with factory setting "no function"
		Load capacity of the binary outputs: $I_{max} = DC\ 50\ mA$ (short-circuit proof, protected against external voltage)
	X23:9 24VIN	Do not apply external voltage to the binary outputs! Supply voltage DC+24 V for binary outputs DO10 ... DO17, non-isolated (reference potential DGND)



Installation

Connection and terminal description of the DIO11B option

Voltage input 24VIN

The 24VIN (X23:9) voltage input serves as DC+24 V supply voltage for the binary outputs DO1Ø ... DO17. Reference potential is DGND (X22:10). The binary outputs do not give a level if the DC+24 V supply voltage is not connected. The supply voltage DC+24 V can also be jumpered from the X10:8 connection of the basic unit if the load does not exceed DC 400 mA (current limitation in X10:8).

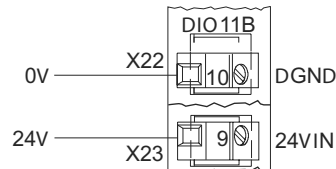


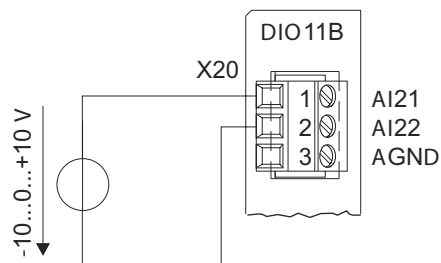
Figure 187: Voltage input 24VIN (X23:9) and reference potential DGND (X22:10)

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Voltage input n2

The analog setpoint input n2 (AI21/22) can be used as a differential input or as an input with AGND reference potential.

Differential input



Input with AGND reference potential

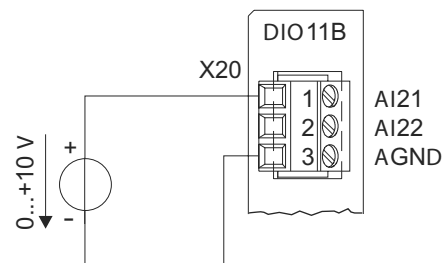


Figure 188: Setpoint input n2

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Current input n2

You must use an external load if the analog setpoint input n2 (AI21/22) should be used as a current input.

For example $R_B = 500 \Omega \rightarrow \text{DC } 0...20 \text{ mA} = \text{DC } 0...10 \text{ V}$

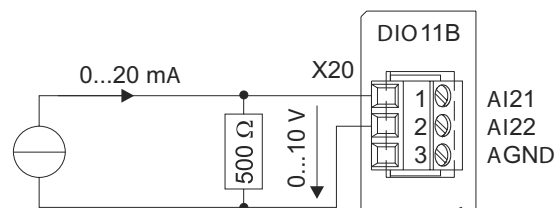
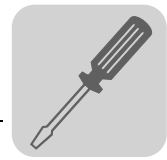


Figure 189: Current input with external load

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**Voltage outputs
AOV1 and AOV2**

Analog voltage outputs AOV1 and AOV2 must be assigned as shown in the following diagram:

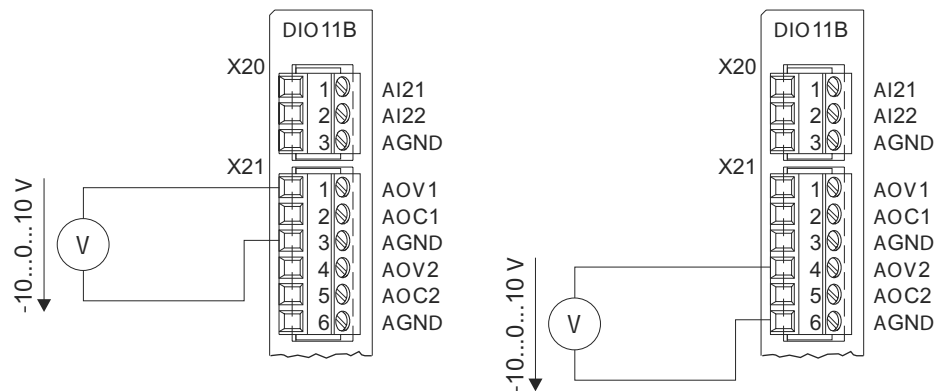


Figure 190: Voltage outputs AOV1 and AOV2

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**Current outputs
AOC1 and AOC2**

Analog current outputs AOC1 and AOC2 must be assigned as shown in the following diagram:

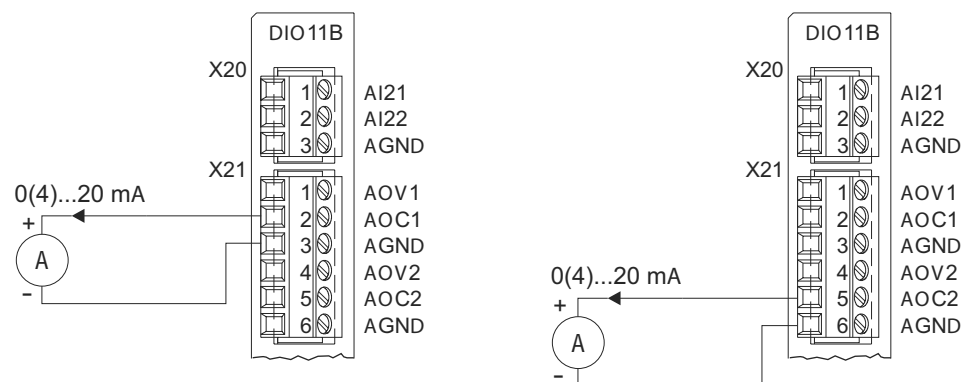


Figure 191: Current outputs AOC1 and AOC2

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Installation

Connection OptionDFC11B

9.22 Connection OptionDFC11B

Part number

CAN-Bus interface type DFC11B: 824 317 4



The "CAN-Bus interface type DFC11B" option is only possible in conjunction with MOVIDRIVE® MDX61B, not with MDX60B.

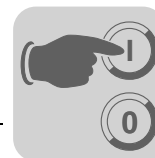
The DFC11B option must be plugged into the fieldbus slot.

The DFC11B option is powered via MOVIDRIVE® MDX61B. A separate voltage supply is not required.

Front view of DFC11B	Description	DIP switch Terminal	Function
DFC 11B ON OFF R nc S1 3 2 1 X31 6 5 4 3 2 1 X30 55405AXX	DIP switch block S1: Sets the terminating resistor	R nc	Terminating resistor for the CAN-Bus cable Reserved
	X31: CAN bus connection	X31:3 X31:2 X31:1	CAN Low (jumped with X30:2) CAN High (jumped with X30:7) DGND
	X30: CAN bus connection (Sub-D9 to CiA standard)	X30:1 X30:2 X30:3 X30:4 X30:5 X30:6 X30:7 X30:8 X30:9	Not assigned CAN Low (jumped with X31:3) DGND Not assigned Not assigned DGND CAN High (jumped with X31:2) Not assigned Not assigned

Connection MOVIDRIVE® - CAN

The DFC11B option is connected to the CAN-Bus at X30 or X31 in the same way as the SBus (→ Sec. "System bus connection (SBus 1)") in the basic unit (X12). In contrast to the SBus1, SBus2 is electrically isolated and made available via option DFC11B.



10 Startup

10.1 General startup instructions



Comply with the safety notes during startup!

Before startup

Correct project planning of the drive is the prerequisite for successful startup. Refer to the MOVIDRIVE® MDX60/61B system manual for detailed project planning notes and an explanation of the parameters.

VFC operating modes without speed control

MOVIDRIVE® MDX60/61B drive inverters are factory set to be taken into operation with the SEW motor which is adapted to the correct power level. The motor can be connected and the drive started immediately in accordance with the section "Starting the motor" (→ page 387) icon.

Inverter/motor combinations

400/500 V units

The following tables indicate which inverter/motor combinations this applies to.

MOVIDRIVE® MDX60/61B in VFC mode	SEW motor
0005-5A3-4	DT80K4
0008-5A3-4	DT80N4
0011-5A3-4	DT90S4
0014-5A3-4	DT90L4
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	DV250M4
0750-503-4	DV280S4
0900-503-4	DV280M4
1100-503-4	D315S4
1320-503-4	D315M4



Startup

General startup instructions

230 V units

MOVIDRIVE® MDX60/61B in VFC mode	SEW motor
0015-2A3-4	DT90L4
0022-2A3-4	DV100M4
0037-2A3-4	DV112M4
0055-2A3-4	DV132S4
0075-2A3-4	DV132M4
0110-203-4	DV160M4
0150-203-4	DV160L4
0220-203-4	DV180L4
0300-203-4	DV200L4



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 boundary 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® MDX60/61B drive inverters for any safety functions in conjunction with hoist applications.

Use monitoring systems or mechanical protection devices as safety features 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, for example by removing the electronics terminal block X13. Furthermore, additional safety precautions must be taken depending on the application to avoid injury to people and damage to machinery.
- For **startup with the DBG60B keypad**:
Plug the connector of the DBG60B keypad into the Xterminal slot.
- For **startup with PC and MOVITOOLS® (version 4.0 or higher)**:
Plug the UWS21A option into the Xterminal slot and use an interface cable (RS232) to connect it to the PC. Install and start MOVITOOLS® on your PC.
- Switch on the power system and, if necessary, the DC 24 V supply.
- Check the correct default parameter settings (e.g. factory setting).
- Check the terminal assignment that has been set (→ P60_ / P61_).



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® MDX60/61B system manual, section "Parameters" for the **parameter description**.



10.3 Startup using the DBG60B keypad

General information

Startup with the DBG60B keypad is **possible in VFC operating modes only**. Startup in CFC and SERVO operating modes is only possible using the MOVITOOLS® software.

Required data

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 $\cos\phi$ and rated speed.
- Rated supply voltage

The following information is also required for the 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, EV1S, EH1S	SINE ENCODER	1024
ES1R, ES2R, EV1R, EH1R ES1T ¹⁾ , ES2T ¹⁾ , EV1T ¹⁾ , EH1T ¹⁾	INCREM. TTL SENSOR	1024

1) DC 5 V TTL sensors ES1T, ES2T, EV1T and EH1T 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; applies to most applications)
 - If the drive tends to oscillate → Setting < 1
 - If the transient recovery time is too long → Setting > 1
 - Recommended setting range: 0,90 ... 1... 1.10 (factory setting = 1)
- Mass moment of inertia [10^{-4} kgm^2] of the load (gear unit + driven machine) extrapolated for the motor shaft.
- Time for the shortest required ramp.



- Activate encoder monitoring (P504 = "ON") after completing startup. The function and voltage supply of the encoder are then monitored.

Important: Encoder monitoring is not a safety function!



Selecting a language

The figure below shows the keys for selecting the language.



Figure 192: Keys for language selection

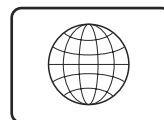
06534AXX

1. Language selection
2. Up arrow, moves up to the next menu item
3. OK, confirms the entry
4. Down arrow, moves down to the next menu item

The following text appears on the display when the keypad is switched on for the first time or after activating the start mode:

SEW
EURODRIVE

The symbol for language selection then appears on the display.



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Proceed as follows to select the language:

- Press the "Language selection" key. A list of available languages is displayed on the screen.
- Use the "up arrow / down arrow" keys to select the desired language.
- Confirm your language selection by pressing the "OK" key. The basic display is now shown in your chosen language.



Startup

Startup using the DBG60B keypad

Startup

The figure below shows the keys for required for startup.



Figure 193: Keys for startup

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1. Cancel or abort startup
2. Change the menu, display mode ↔ edit mode
3. Up arrow, moves up to the next menu item
4. OK, confirms the entry
5. Activates the context menu
6. Down arrow, moves down to the next menu item

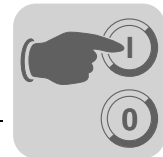
Startup procedure

1. "0" signal at terminal X13:1 (DIØØ "/CONTROL.INHIBIT"), e.g. by disconnecting the electronics terminal block X13.
2. Activate the context menu by pressing the  key.
3. Use the  key to scroll down to the "STARTUP PARAMET." menu item.

0.00rpm
0.000Amp
CONTR. INHIBIT

PARAMETER MODE
VARIABLE MODE
BASIC VIEW

MANUAL MODE
STARTUP PARAMET.
COPY TO DBG
COPY TO MDX



4. Press the key to begin the startup procedure. The first parameter appears. The flashing cursor under the parameter number indicates that the keypad is in display mode.
 - Use the key to change to edit mode. The flashing cursor disappears.
 - Use the key or the key to select "PARAMETER SET 1" or "PARAMETER SET 2".
 - Confirm the setting using the key to confirm your selection.
 - Use the key to return to the display mode. The flashing cursor appears again.
 - Use the key to select the next parameter.

STARTUP PARAMET.
PREPARE FOR STARTUP

C00*STARTUP

PARAMETER SET 1
PARAMETER SET 2

5. Set the required operating mode. Use the key to select the next parameter.

C01*OPER. MODE 1

VFC1
VFC1&GROUP

6. Select the motor type. If a 2 or 4-pole SEW motor is connected, select the correct motor from the list. If a non-SEW motor or an SEW motor with more than four poles is connected, select "NON-SEW MOTOR" from the list.
Use the key to select the next parameter.

C02*MOTOR TYPE 1
DT71D2
DT71D4
DT80K2

C02*MOTOR TYPE 1

NON-SEW MOT.
DT63K4/DR63S4

7. Enter the rated motor voltage for the selected connection type according to the value specified on the nameplate.

Example: Nameplate 230Δ/400W 50 Hz

W 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/690W 50 Hz

Only Δ connection possible → Enter "400 V".

W connection is not possible.

Use the key to select the next parameter.

C03* V
MOT. RATED VOLT 1
+400.000

8. Enter the rated frequency specified on the motor nameplate.
Example: 230Δ/400W 50 Hz
Enter "50 Hz" in W and Δ connection.

C04* Hz
MOT. RATED FREQ. 1
+50.000

Use the key to select the next parameter.

WITH SEW MOTORS

9. The motor values are stored for SEW two and four-pole motors and need not be entered.

WITH NON-SEW MOTORS

9. Enter the following motor nameplate data:
 - C10* rated motor current, note the connect. type (Λ or Δ).
 - C11* rated motor power
 - C12* power factor cos φ
 - C13* rated motor speed



Startup

Startup using the DBG60B keypad

10. Enter the rated power supply voltage (C05* for SEW motor, C14* for non-SEW motor).

C05* V
MAINS RAT. VOLT. 1
+400.000

11. If no TF/TH is connected to X10:1 and X10:2 → Set "NO RESPONSE". If a TF/TH is connected, set the required fault response.

835* RESP. TF-SIG.

NO RESPONSE
DISPLAY FAULT

12. Start the calculation for the startup data by choosing "YES". The process lasts a few seconds.

C06*CALCULATION

NO
YES

WITH SEW MOTORS

13. The calculation is performed. After calculation, the next menu item appears automatically.

C06*SAVE

NO
YES

WITH NON-SEW MOTORS

13. The calculation for non-SEW motors requires a calibration procedure:

- When prompted, apply a "1" signal to terminal X13:1 (DIØØ "/CONTROL.INHIBIT").
- Apply a "0" signal to terminal X13:1 again after the calibration is complete.
- After calculation, the next menu item appears automatically.

14. Set "SAVE" to "YES". The data (motor parameters) are copied to the non-volatile memory of MOVIDRIVE®.

DATA IS
COPIED...

15. The startup procedure is now complete. Use the  key to return to the context menu.

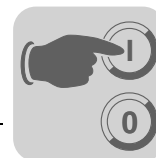
MANUAL MODE
STARTUP PARAMET.
COPY TO DBG
COPY TO MDX

16. Use the  key to scroll down to the "EXIT" menu item.

UNIT SETTTINGS
EXIT

17. Confirm the setting using the  key. The basic display appears.

0.00rpm
0.000Amp
CONTR. INHIBIT



Startup of speed controller

Startup is performed without the speed controller first(→ Section "Startup procedure, steps 1 through 17").

Important: Set the VFC-n-CONTROL mode.

C01*OPER. MODE 1
VFC1&FLYING START
VFC1-n-CONTROL
VFC-n-CTRL.GRP

1. Commence startup for the speed controller by choosing "YES".

C09*STARTUPn-CTRL.

NO
YES

2. The selected operating mode is displayed. If the setting is correct, go to the next menu item.

C00*STARTUP
PARAMETER SET 2
VFC-n-CONTROL

3. Select the correct encoder type.

C15*ENCODER TYPE
INCREM. ENCOD. TTL
SINE ENCODER
INCREM. ENCOD. HTL

4. Set the correct encoder resolution.

C16*ENC. RESOLUT.
512 Inc
1024 Inc
2048 Inc

WITH SEW MOTORS

5. Enter whether the motor has a brake.

C17*BRAKE

WITHOUT
WITH

6. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → Setting < 1
If the transient recovery time is too long → Setting > 1
Recommended setting range: 0.90 ... 1 ... 1.10

C18*
STIFFNESS
+1.000

7. Enter whether the motor has a flywheel fan (Z fan).

C19*Z FAN

WITHOUT
WITH

WITH NON-SEW MOTORS

5. Enter the moment of inertia of the motor.

D00*
J0 OF THE MOTOR
+4.600

6. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → Setting < 1
If the transient recovery time is too long → Setting > 1
Recommended setting range: 0.90 ... 1 ... 1.10

C18*
STIFFNESS
+1.000

7. Enter the moment of inertia of the brake and fan.

D00*
J BRAKE+FAN
+1.000

8. Enter the mass moment of inertia of the load (gear unit + driven machine) extrapolated for the motor shaft.

C20*
LOAD INERTIA
+0.200



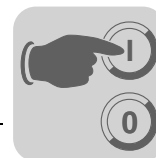
Startup

Startup using the DBG60B keypad

9. Enter the time for the shortest ramp you want.	C21* SHORTEST RAMP +0.100
10. Start the calculation for the startup data by choosing "YES". The process lasts a few seconds.	C06*CALCULATION NO YES
11. The calculation is performed. After calculation, the next menu item appears automatically.	C06*SAVE NO YES
12. Set "SAVE" to "YES". The data (motor parameters) are copied to the non-volatile memory of MOVIDRIVE®.	DATA IS COPIED...
13. The startup procedure is now complete. Use the key to return to the context menu.	MANUAL MODE STARTUP PARAMET. COPY TO DBG COPY TO MDX
14. Use the key to scroll down to the "EXIT" menu item.	UNIT SETTTINGS EXIT
15. Confirm the setting using the key. The basic display appears.	0.00rpm 0.000Amp CONTR. INHIBIT



- Once startup is complete, copy the parameter set from MOVIDRIVE® to the DBG60B keypad. You have the following options:
 - In the context menu, select the "COPY TO DBG" menu item. Confirm the setting using the key. The parameter set is copied from MOVIDRIVE® to DBG60B.
 - In the context menu, select the "PARAMETER MODE" menu item. Select parameter P807 "MDX → DBG". The parameter set is copied from MOVIDRIVE® to DBG60B.
- The parameter set can now be copied to other MOVIDRIVE® units using DBG60B. Plug the DBG60B keypad into the other inverter. You have the following options to copy the parameter set from DBG60B to another inverter:
 - In the context menu of the new inverter, choose the "COPY TO MDX" menu item and confirm your entry using the key. The parameter set is copied from DBG60B to MOVIDRIVE®.
 - In the context menu, select the "PARAMETER MODE" menu item. Select parameter P806 "DBG → MDX". The parameter set is copied from DBG60B to MOVIDRIVE®.
- Enter parameter settings that differ from the factory setting in the parameter list (→ page 390).
- In the case of non-SEW motors, set the correct brake application time (P732 / P735).
- For starting the motor, refer to the "Starting the motor" section (" page 387).
- 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.**

Setting parameters

Proceed in this order to set the parameters:

- Call up the context menu using the  key. In the context menu, select the "PARAM-ETER MODE" menu item. Confirm your entry using the  key. The flashing cursor under the parameter number indicates that the keypad is in parameter mode.
- Use the  key to change to edit mode. The flashing cursor disappears.
- Use the  key or the  key to select or set the correct parameter value.
- Confirm the setting using the  key.
- Use the  key to return to the parameter mode. The flashing cursor appears again.
- Use the  key to select the next parameter.

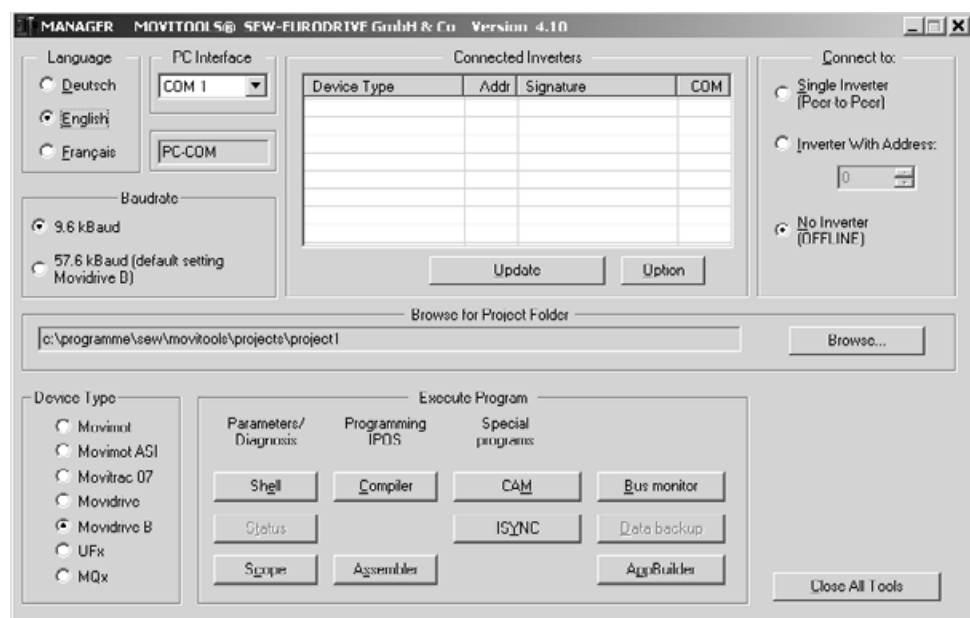


10.4 Startup with a PC and MOVITOOLS®

General information

MOVITOOLS® software version 4.20 or higher is required for startup with a PC.

- Terminal X13:1 (DIØØ "/CONTROL.INHIBIT") must receive a "0" signal!
- Start MOVITOOLS®.
- Select the language you want in the "Language" selection field.
- From the "PC-COM" drop down menu, select the PC port (e.g. COM 1) to which the inverter is connected.
- In the "Device type" field, select "Movidrive B".
- In the "Baudrate" field, select the baud rate set on the basic unit with the DIP switch S13 (standard setting → "57.6 kBaud").
- Click the <Update> button to display the connected inverter.

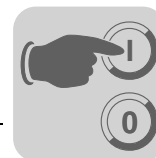


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Figure 194: MOVITOOLS® initial screen

Commencing startup

- In the "Execute Program" selection field, press the "Shell" button under <Parameters/Diagnosis>. The Shell program is started.
- In the Shell program, select the [Startup] / [Startup...] menu command. MOVITOOLS® opens the startup menu. Follow the instructions of the startup wizard. For questions on startup, refer to the MOVITOOLS® online help.



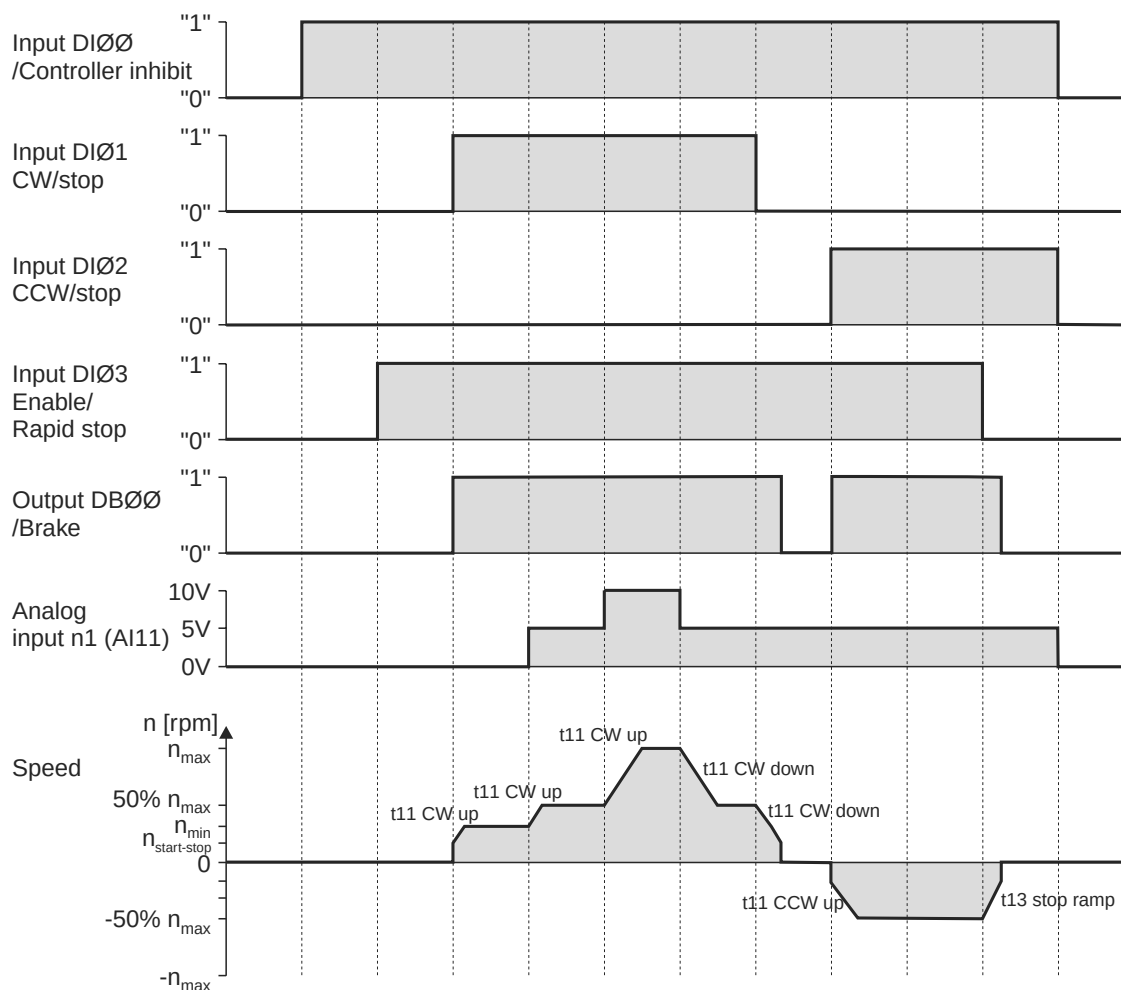
10.5 Starting the motor

Analog setpoint specification

The following table shows the signals that must be present on terminals X11:2 (AI1) and X13:1 to X13:4 (DIØØ to DIØ3) when the "UNIPOL/FIX.SETPT" setpoint is selected (P100) to operate the drive with an analog setpoint entry.

Function	X11:2 (AI1) Analog input n1	X13:1 (DIØØ) /Controller inhibit	X13:2 (DIØ1) CW/Stop	X13:3 (DIØ2) CCW/Stop	X13:4 (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"
CCW at 50 % $n_{\max}$	5 V	"1"	"0"	"1"	"1"
CCW 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 X13:1 to X13:4 and analog setpoints. Binary output X10:3 (DBØØ "/Brake") is used for switching brake contactor K12.



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Figure 195: Travel diagram with analog setpoints



The motor is not energized in the event of controller inhibit (DIØØ = "0"). A motor without a brake then coasts to a halt.



Startup

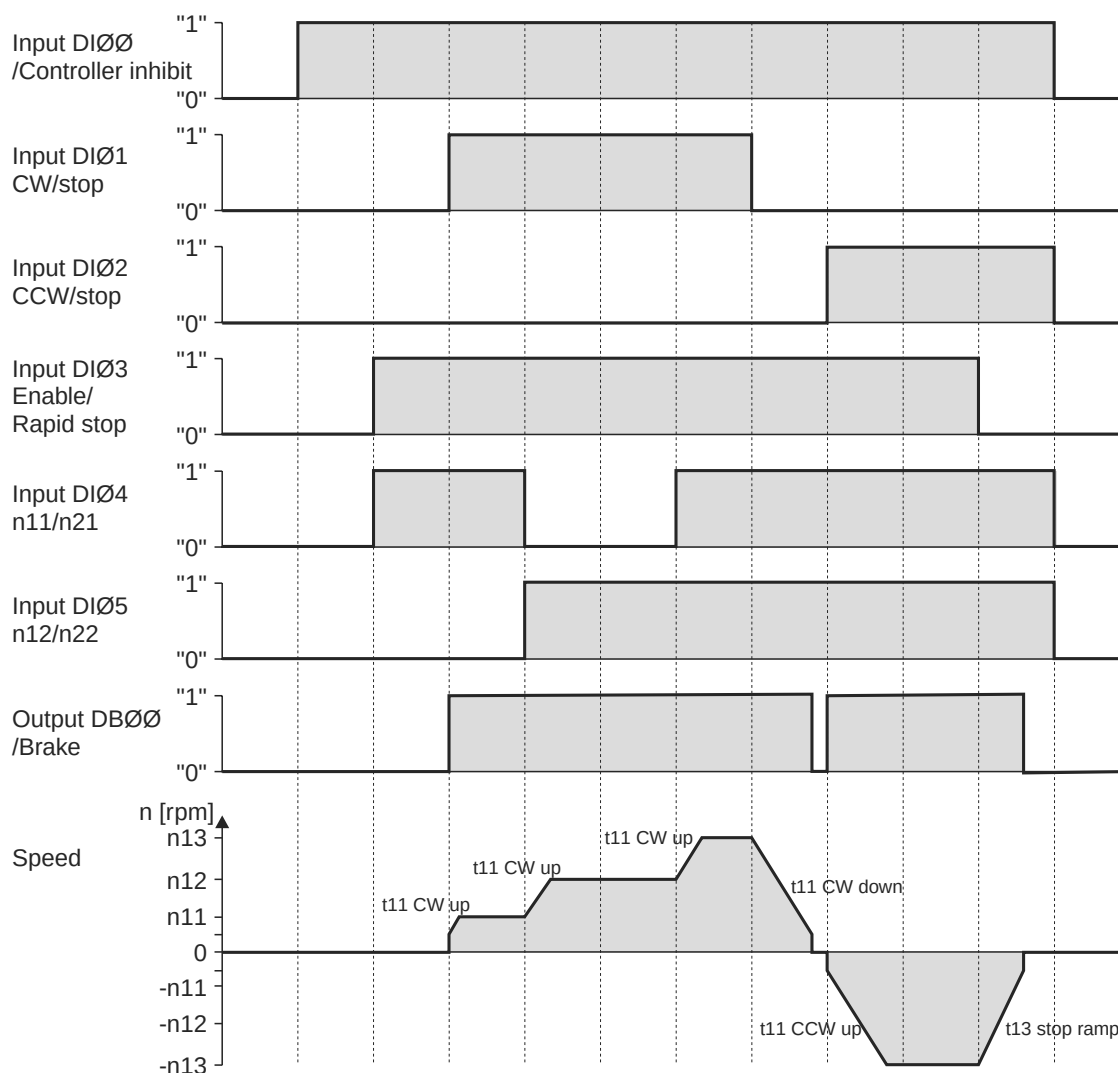
Starting the motor

Fixed setpoints

The following table shows the signals that must be present on terminals X13:1 to X13:6 (DIØØ to DIØ5) when the "UNIPOL/FIX.SETPT" setpoint (P100) is selected (P100) to operate the drive with the fixed setpoints.

Function	X13:1 (DIØØ) /Contr. inhibit	X13:2 (DIØ1) CW/Stop	X13:3 (DIØ2) CCW/Stop	X13:4 (DIØ3) Enable/Rapid stop	X13:5 (DIØ4) n11/n21	X13:6 (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"
CCW at n11	"1"	"0"	"1"	"1"	"1"	"0"

The following travel cycle shows an example of how the drive is started with the wiring of terminals X13:1 to X13:6 and internal fixed setpoints. Binary output X10:3 (DBØØ "/Brake") is used for switching brake contactor K12.

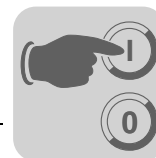


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Figure 196: Travel diagram with internal fixed setpoints



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 DBG60B keypad with the manual operation function (Context menu → Manual operation). The 7-segment display on the unit shows "H" during manual mode.

The binary inputs are then without any functions for the duration of manual operation, with the exception of X13:1 (DIØØ "/Controller inhibit"). Binary input X13:1 (DIØØ "/Controller inhibit") must receive a "1" signal to enable the drive to be started in manual operation. The drive can also be stopped in manual operation by setting X13:1 = "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 DBG60B keypad. Enter the required speed and then the direction of rotation (+ = CW / – = CCW) using the sign key (+/–).

Manual operation remains active even after the supply system power has been switched off/on. The inverter is then inhibited, however. Use the "Run" key to enable and start the inverter at $n_{\min}$ in the selected direction of rotation. The speed is increased and decreased using the ↑ and ↓ keys.



The signals at the binary inputs take effect as soon as manual operation is finished. Binary input X13:1 (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.

Startup in "VFC & Flying start" mode

The parameter *P320 Automatic adjustment* is deactivated in the "VFC & Flying start" mode. It is important that the stator resistance (*P322 IxR compensation 1*) is set correctly to ensure that the flying start function is performed properly.

Note the following when performing startup for an **SEW motor** with DBG60B or MOVITOOLS®:

- The value of the stator resistance (*P322 IxR compensation 1*) is set for an SEW motor at operating temperature (winding temperature 80 °C). For flying start with a cold motor, you have to reduce the stator resistance (*P322 IxR adjustment 1*) by 0.34 % per Kelvin.

Note the following when performing startup for a **non-SEW motor** with DBG60B or MOVITOOLS®:

Measure the stator resistance (*P322 IxR compensation 1*) at startup. Proceed as follows:

1. Start up the motor in "VFC" operation mode.
2. Enable the motor.
3. **Note** the value of *P322 IxR compensation 1* (stator resistance).
4. Select the "VFC & Flying start " operating mode.
5. Set *P320 "Automatic adjustment 1* to "Off".
6. In *P322 IxR compensation 1* (stator resistance) enter the **value you noted** in step 3.

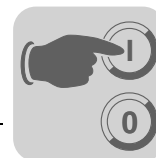


10.6 Complete parameter list

The following table lists all parameters together with their setting range and factory settings (in bold):
The parameters of the user menu are marked by a "I" (= display on the DBG60B keypad).

Par.	Name	Value range
DISPLAY VALUES		
00_	Process values	
000	Speed	-6100 ... 0 ... 6100 1/min
\001	User display	[Text]
002	Frequency	0 ... 500 Hz
003	Actual position	0 ... 2 ³¹ -1 inc
004	Output current	0 ... 250 % I _N
005	Active current	-250 ... 0 ... 250 % 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	Operating status	
012	Error status	
013	Active parameter set	1/2
014	Heat sink temperature	-20 ... 0 ... 100 °C
015	Mains ON operating time	h
016	Operating time (enabled)	h
017	Electrical energy	kWh
018	KTY capacity utilization 1	0 ... 200 %
019	KTY capacity utilization 2	0 ... 200 %
02_	Analog setpoints	
020	Analog input AI1	-10 ... 0 ... 10 V
021	Analog input AI2	-10 ... 0 ... 10 V
022	External current limitation	0 ... 100 %
03_	Binary inputs basic unit	
030	Binary input DI00	/CONTROL.INHIBIT
031	Binary input DI01	not in DBG60B
032	Binary input DI02	
033	Binary input DI03	
034	Binary input DI04	
035	Binary input DI05	
036	Binary input DI06	
037	Binary input DI07	
\039	Status binary inputs DI00...DI07	
04_	Binary inputs options	
040	Binary input DI10	not in DBG60B
041	Binary input DI11	
042	Binary input DI12	
043	Binary input DI13	
044	Binary input DI14	
045	Binary input DI15	
046	Binary input DI16	
047	Binary input DI17	
\048	Status binary inputs DI10...DI17	

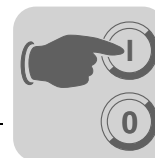
Par.	Name	Value range
05_	Binary outputs basic unit	
050	Binary output DB00	/BRAKE
051	Binary output DO01	not in DBG60B
052	Binary output DO02	
053	Binary output DO03	
054	Binary output DO04	
055	Binary output DO05	
\059	Status binary outputs DB00, DO01...DO05	
06_	Binary outputs option	
060	Binary output DO10	not in DBG60B
061	Binary output DO11	
062	Binary output DO12	
063	Binary output DO13	
064	Binary output DO14	
065	Binary output DO15	
066	Binary output DO16	
067	Binary output DO17	
\068	Status binary outputs DO10...DO17	
07_	Unit data	
070	Device type	
071	Rated output current	
072	Option 1 encoder slot	
073	Option 2 fieldbus slot	
074	Option 3 extension slot	
076	Firmware basic unit	
077	DBG firmware	only in DBG60B
078	Technology function	
079	Unit type	0 = Standard 1 = Application
08_	Fault memory	
\080	Fault t-0	
081	Fault t-1	
082	Fault t-2	
083	Fault t-3	
084	Fault t-4	
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 1/2	Setting range Factory setting	Comment
1_	SETPOINTS / RAMP GENERATORS		
10_	Setpoint selection		
\100	Setpoint source	UNIPOL/FIX.SETPT	
101	Control signal source	TERMINALS	
102	Frequency scaling	0.1 .. 10 ... 65 kHz	
11_	Analog input AI1		
110	AI1 scaling	-10 ... -0.1 / 0.1 ... 1 ...10	
111	AI1 offset	-500 ... 0 ...500 mV	
112	AI1 operating mode	Ref. N-MAX	
113	AI1 voltage offset	-10 ... 0 ... 10 V	
114	AI1 speed offset	-6000 ... 0 ... 6000 1/min	
115	Filter setpoint	0 ... 5 .0.100 ms 0 = Filter off	
12_	Analog inputs (optional)		
120	AI2 operating mode	NO FUNCTION	
13_	Speed ramps 1		
\130	Ramp t11 UP CW	0 ... 2 ... 2000 s	
\131	Ramp t11 down CW	0 ... 2 ... 2000 s	
\132	Ramp t11 UP CCW	0 ... 2 ... 2000 s	
\133	Ramp t11 DOWN CCW	0 ... 2 ... 2000 s	
\134	Ramp t12 UP=DOWN	0 ... 10 ... 2000 s	
135	S pattern t12	0 ... 3	
\136	Stop ramp t13	0 ... 2 ... 20 s	
\137	Emergency ramp t14	0 ... 2 ... 20 s	
138	Ramp limit VFC	Yes No	
139	Ramp monitoring 1	Yes No	
14_	Speed ramps 2		
140	Ramp t21 UP CW	0 ... 2 ... 2000 s	
141	Ramp t21 DOWN CW	0 ... 2 ... 2000 s	
142	Ramp t21 UP CCW	0 ... 2 ... 2000 s	
143	Ramp t21 DOWN CCW	0 ... 2 ... 2000 s	
144	Ramp t22 UP=DOWN	0 ... 10 ... 2000 s	
145	S pattern t22	0 ... 3	
146	Stop ramp t23	0 ... 2 ... 20 s	
147	Emergency ramp t24	0 ... 2 ... 20 s	
149	Ramp monitoring 2	No Yes	
15_	Motor potentiometer (parameter sets 1 and 2)		
150	Ramp t3 up	0.2 ... 20 ... 50 s	
151	Ramp t3 DOWN	0.2 ... 20 ... 50 s	
152	Last setpoint saving	OFF ON	
16_	Fixed setpoints 1		
\160	Internal setpoint n11	-6000 ... 150 ... 6000 1/min (% I _N)	
\161	Internal setpoint n12	-6000 ... 750 ... 6000 1/min (% I _N)	
\162	Internal setpoint n13	-6000 ... 1500 ... 6000 1/min (% I _N)	
17_	Fixed setpoints 2		
170	Internal setpoint n21	-6000 ... 150 ... 6000 1/min (% I _N)	
171	Internal setpoint n22	-6000 ... 750 ... 6000 1/min (% I _N)	
172	Internal setpoint n23	-6000 ... 1500 ... 6000 1/min (% I _N)	



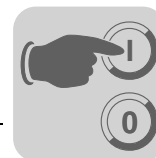
Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
2_	CONTROLLER PARAMETERS		
20_	Speed control (only parameter set 1)		
200	P-gain speed controller	0.01 ... 2 ... 32	
201	Time constant n-control.	0 ... 10 ... 300 ms	
202	Gain accel. feedforward	0 ... 65	
203	Filter acceleration feedforward	0 ... 100 ms	
204	Filter speed actual value	0 ... 32 ms	
205	Load feedforward CFC	- 150 % ... 0 ... 150 %	
206	Sample time n-control.	1 ms 0.5 ms	
207	Load feedforward VFC	- 150 % ... 0 ... 150 %	
21_	Hold controller		
210	P gain hold controller	0.1 ... 0.5 ... 32	
22_	Synchronous operation control (only parameter set 1)		
220	P-gain (DRS)	1 ... 10 ... 200	
221	Master gear ratio factor	1 ... 3 999 999 999	
222	Slave gear ratio factor	1 ... 3 999 999 999	
223	Mode selection	Mode 1 Mode 2 Mode 3 Mode 4 Mode 5 Mode 6 Mode 7 Mode 8	
224	Slave counter	-99 999 999 ... -10 / 10... 99,999,999 inc	
225	Offset 1	-32 767 ... -10 / 10... 32 767 inc	
226	Offset 2	-32 767 ... -10 / 10... 32 767 inc	
227	Offset 3	-32 767 ... -10 / 10... 32 767 inc	
228	Feedforward filter (DRS)	0 ... 100 ms	Only with MOVITOOLS®. Not visible on the DBG60B keypad.
23_	Synchronous operation with synchronous encoder		
230	Synchronous encoder	OFF EQUAL-RANKING CHAIN	
231	Factor slave encoder	1 ... 1000	
232	Factor slave sync. encoder	1 ... 1000	
233	Synchronous encoder resolution	128 / 256 / 512 / 1024 / 2048	
24_	Synchr. oper. w. catch up		
240	Synchronous speed	-6000 ... 0 ... 1500 ... 6000 1/min	
241	Synchronous ramp	0 ... 2 ... 50 s	
26_	Process controller parameters		
260	Operating mode	Controller off / Control / Step response	
261	Cycle time	1 / 5 / 10 ms	
262	Interruption	No response / Move closer to setpoint	
263	Factor K _p	0 ... 1 ... 32,767	
264	Integrative time T _n	0 ... 10 ... 65535 ms	
265	Derivative time T _v	0 ... 1 ... 30 ms	
266	Feedforward	-32767 ... 0 ... 32767 [0.2/min]	
27_	Process controller input values		
270	Setpoint source	Parameter / IPOS variable / Analog 1 / Analog 2 / Fieldbus	
271	Setpoint	-32767 ... 0 ... 32767 [0.2/min]	
272	IPOS setpoint address	0 ... 1023	
273	Time constant	0 ... 0.01 ... 2000 s	
274	Scaling setpoint	-32767 ... 1 ... 32767	



Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
275	Actual value source	Analog 1 / Analog 2 / IPOS variable / Fieldbus	
276	IPOS actual value address	0 ... 1023	
277	Actual scaling factor	–32767 ... 1 ... 32.767	
278	Actual offset value	–32767 ... 0 ... 32767	
279	Actual time constant	0 ... 500 ms	
28_	Process controller limits		
280	Minimum offset + actual value	–32767 ... 0 ... 32767	
281	Maximum offset + actual value	–32767 ... 10000 ... 32767	
282	Minimum output PID controller	–32767 ... – 1000 ... 32767 [0.2/min]	
283	PID controller maximum output	–32767 ... 10000 ... 32767 [0.2 / min]	
284	Minimum output process controller	–32767 ... 0 ... 32767 [0.2/min]	
285	Maximum output process controller	–32767 ... 7500 ... 32767 [0.2/min]	
3_	MOTOR PARAMETERS		
30_ / 31_	Limits 1 / 2		
\300 / 310	Start/stop speed 1 / 2	0 ... 150 1/min	
\301 / 311	Minimum speed 1/2	0 ... 15 ... 0.6100 1/min	
\302 / 312	Maximum speed 1 / 2	0 ... 1500 ... 6100 1/min	
\303 / 313	Current limit 1/2	0 ... 150 % (BG0: 0 ... 200 % I _N)	
304	Torque limit	0 ... 150 % (BG0: 200 %)	
32_ / 33_	Motor compensation 1 / 2 (asynchronous)		
\320 / 330	Automatic adjustment 1/2	Off On	
321 / 331	Boost 1/2	0 ... 100 %	
322 / 332	IxR compensation 1	0 ... 100 %	
323 / 333	Premagnetizing time 1 / 2	0 ... 2 s	
324 / 334	Slip compensation 1/2	0 ... 500 1/min	
34_	Motor protection		
340 / 342	Motor protection 1 / 2	Off On (asynchronous) On (synchronous)	
341 / 343	Cooling type 1/2	Fan cooled Forced cooling	
344	Interval for motor protection	0.1 ... 4 ... 20 s	
345 / 346	I _N -U _L monitoring 1 / 2	0.1 ... 500 A	
35_	Direction of rotation of the motor		
350 / 351	Change direction of rotation 1/2	Off On	
36_	Startup (only available in DBG60B)		
360	Startup	YES / NO	Only available in DBG60B, not in MOVI-TOOLS®/SHELL!
4_	REFERENCE SIGNALS		
40_	Speed reference message		
400	Speed reference value	0 ... 1500 ... 6000 1/min	
401	Hysteresis	0 ... 100 ... 500 1/min	
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 ... 6000 1/min	
411	Range width	0 ... 6000 1/min	
412	Delay time	0 ... 1 ... 9 s	
413	Signal = "1" if:	INSIDE OUTSIDE	
42_	Speed setp./act. val. comp.		
420	Hysteresis	0 ... 100 ... 300 1/min	
421	Delay time	0 ... 1 ... 9 s	



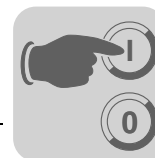
Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
422	Signal = "1" if:	$n \neq n_{setp}$ $n = n_{setp}$	
43_	Current reference signal		
430	Current reference value	0 ... 100 ... 150 %	
431	Hysteresis	0 ... 5 ... 30 % I_N	
432	Delay time	0 ... 1 ... 9 s	
433	Signal = "1" if:	$I < I_{ref}$ $I > I_{ref}$	
44_	I_{max} signal		
440	Hysteresis	0 ... 5 ... 50 % I_N	
441	Delay time	0 ... 1 ... 9 s	
442	Signal = "1" if:	$I = I_{max} / I < I_{max}$	
5_	MONITORING FUNCTIONS		
50_	Speed monitoring		
500 / 502	Speed monitoring 1/2	OFF MOTOR MODE REGENERAT. MODE MOT. & GENERATOR.	
501 / 503	Delay time 1/2	0 ... 1 ... 10 s	
504	Encoder monitoring motor	No Yes	
505	Synchronous encoder monitoring	No Yes	
51_	Synchr. operation monitoring		
510	Positioning tol. slave	10 ... 25 ... 32,768 inc	
511	Prewarning lag error	50 ... 99,999,999 inc	
512	Setpoint deviation limit	100 ... 4000 ... 99,999,999 inc	
513	Delay Lag error message	0 ... 1 ... 99 s	
514	Counter LED display	10 ... 100 ... 32,768 inc	
515	Delay in-position signal	5 ... 10 ... 2000 ms	
516	X41 Encoder monitoring	YES NO	
517	X41 Pulse count monitoring	YES NO	
518	X42 Encoder monitoring	YES NO	
519	X42 Pulse count monitoring	YES NO	
52_	Mains OFF monitoring		
520	Mains OFF response time	0 ... 5 s	
521	Mains OFF response	CONTR. INHIBIT EMERGENCY STOP	
522	Phase failure monitoring	ON Off	
53_	Thermal protection motor		
530	Sensor type 1	No sensor TF/TH/KTY+ (KTY+: only for DS/CM motors)	
531	Sensor type 2	No sensor TF/TH/KTY- (KTY-: only for DS/CM motors)	



Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment	
6__	TERMINAL ASSIGNMENT			
60__	Binary inputs basic unit			
-	Binary input DIØØ	With fixed assignment with: /CONTR. INHIBIT	The following functions can be programmed: NO FUNCTION • ENABLE/STOP • CW/STOP • CCW/STOP • n11/n21 • n12/n22 • 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 • DRS SLAVE START • DRS TEACH IN • DRS MAST. STOPPED • RESERVE- IERT • RESERVED. • RESERVED • RESERVED. • /CONTR. INHIBIT • RESERVED • MQX ENCODER IN	
600	Binary input DIØ1	CW/STOP		
601	Binary input DIØ2	CCW/STOP		
602	Binary input DIØ3	ENABLE /STOP		
603	Binary input DIØ4	n11/n21		
604	Binary input DIØ5	n12/n22		
605	Binary input DIØ6	NO FUNCTION		
606	Binary input DIØ7	NO FUNCTION		
61__	Binary inputs option			
610	Binary input DI1Ø	NO FUNCTION		
611	Binary input DI11	NO FUNCTION		
612	Binary input DI12	NO FUNCTION		
613	Binary input DI13	NO FUNCTION		
614	Binary input DI14	NO FUNCTION		
615	Binary input DI15	NO FUNCTION		
616	Binary input DI16	NO FUNCTION		
617	Binary input DI17	NO FUNCTION		
62__	Binary outputs basic unit			
-	Binary output DBØØ	With fixed assignment with: /BRAKE	The following signals can be programmed: NO FUNCTION • /FAULT • READY • OUTP. STAGE ON • ROT. FIELD ON • BRAKE RELEASED • BRAKE APPLIED • MOTOR STAND- STILL • PARAMETER SET • SPEED REFERENCE • SPEED WINDOW • SP/ACT.VAL.COMP. • CURR. REFERENCE • I _{max} SIGNAL • /MOTOR UTILIZ. 1 • /MOTOR UTILIZ. 2 • /DRS PREWARNING • /DRS LAG ERROR • DRS SLAVE IN POS • IPOS IN POSITION • IPOS REFERENCE • IPOS OUTPUT • /IPOS FAULT	
620	Binary output DOØ1	READY		
621	Binary output DOØ2	/FAULT		
622	Binary output DOØ3	IPOS OUTPUT		
623	Binary output DOØ4	IPOS OUTPUT		
624	Binary output DOØ5	IPOS OUTPUT		
63__	Binary outputs option			
630	Binary output DO1Ø	NO FUNCTION		
631	Binary output DO11	NO FUNCTION		
632	Binary output DO12	NO FUNCTION		
633	Binary output DO13	NO FUNCTION		
634	Binary output DO14	NO FUNCTION		
635	Binary output DO15	NO FUNCTION		
636	Binary output DO16	NO FUNCTION		
637	Binary output DO17	NO FUNCTION		
64__	Analog outputs optional			
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 • IPOS OUTPUT 2	
641	Scaling AO1	-10 ... 0 ... 1 ... 10		
642	Operating mode AO1	OFF / -10 ... +10 V / 0 ... 20 mA / 4 ... 20 mA		
643	Analog output AO2	OUTP.CURRENT		
644	Scaling AO2	-10 ... 0 ... 1 ... 10		
645	Operating mode AO2	OFF / -10 ... +10 V / 0 ... 20 mA / 4 ... 20 mA		



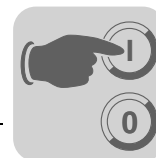
Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
7_	CONTROL FUNCTIONS		
70_	Operating modes		
700	Operating mode 1	VFC 1 VFC 1 & GROUP VFC 1 & HOIST VFC 1 & DC BRAK. VFC 1 & FLYING START VFC-n-CONTROL VFC-n-CTRL VFC-n-CTRL&HOIST VFC-n-CTRL.&SYNC VFC-n-CTRL.&IPOS RESERVED CFC CFC&M-CONTROL CFC&IPOS CFC&SYNC. RESERVED SERVO SERVO&M-CONTROL SERVO&IPOS SERVO&SYNC. RESERVED	
701	Operating mode 2	VFC 2 VFC 2 & GROUP VFC 2 & HOIST VFC 2 & DC BRAK. VFC 2 & FLYING START	
71_	Current at standstill		
710 / 711	Standstill current 1 / 2	0 ... 50 % I _{Mot}	
72_	Setpoint stop function		
720 / 723	Setpoint stop function 1 / 2	Off On	
721 / 724	Stop setpoint 1 / 2	0 ... 30 ... 500 1/min	
722 / 725	Start offset 1/2	0 ... 30 ... 500 1/min	
73_	Brake function		
730 / 733	Brake function 1/2	Off On	
731 / 734	Brake release time 1/2	0 ... 2 s	
732 / 735	Brake application time 1/2	0 ... 2 s	
74_	Speed skip		
740 / 742	Skip window center 1/2	0 ... 1500 ... 6000 1/min	
741 / 743	Skip width 1/2	0 ... 300 1/min	
75_	Master-Slave function		
750	Slave setpoint	MASTER-SLAVE OFF SPEED (RS485) SPEED (SBus) SPEED (485+SBus) TORQUE (RS485) TORQUE (SBus) TORQUE (485+SBus) LOAD SHARE (RS485) LOAD S. (SBus) LOAD (485+SBus)	
751	Scaling slave setpoint	- 10 ... 0 ... 1 ... 10	
76_	Manual operation		
760	Locking Run/Stop keys	No Yes	
77_	Energy-saving function		
770	Energy-saving function	Off On	
78_	Ethernet configuration		
780	IP address	000.000.000.000 ... 192.168.10.x ... 223.255.255.255	
781	Subnetwork mask	000.000.000.000 ... 255.255.255.0 ... 223.255.255.255	
782	Standard gateway	000.000.000.000 ... 223.255.255.255	
783	Baud rate	Display value that cannot be changed (0 ... 100 ... 1000 MBaud)	
784	MAC address	Display value that cannot be changed (00-0F-69-XX-XX-XX)	



Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
8__	UNIT FUNCTIONS		
80_	Setup		
800	User menu	ON / OFF (only in DBG60B)	
801	Language	Dependent on DBG60B version	
\802	Factory setting	No Default standard Delivery condition	
\803	Parameter lock	Off On	
804	Reset statistic data	NO FAULT MEMORY kWH METER OPERATING HOURS	
806	Copy DBG60B → MDX	YES / NO	Only in DBG60B
807	Copy MDX → DBG60B	YES / NO	Only in DBG60B
81_	Serial communication		
810	RS-485 address	0 ... 99	
811	RS485 groupsaddress	100 ... 199	
812	RS485 timeout delay	0 ... 650 s	
819	Fieldbus timeout delay	0 ... 0.5 ... 650 s	
82_	Brake operation		
\820 / 821	4-quadrant operation 1/2	Off On	
83_	Fault responses		
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/WARN. • 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 LAG ERROR	EMERG. STOP/FAULT	
\835	Response TF sensor SIGNAL	NO RESPONSE	
836 / 837	Response SBus TIMEOUT 1 / 2	EMERG. STOP/FAULT	
838	SW limit switch	EMERG.STOP/FAULT	With P831 "Response FIELDBUS-TIMEOUT", fault response "PADATA = 0/WARN." is also available.
84_	Reset response		
\840	Manual reset	No Yes	
841	Auto reset	Off On	
842	Restart time	1 ... 3 ... 30 s	
85_	Scaling speed actual value		
850	Scaling factor numerator	1 ... 65535	Can only be set using MOVITOOLS®
851	Scaling factor denominator	1 ... 65535	
852	User dimension	1/ min	
86_	Modulation		
860 / 861	PWM frequency 1/ 2 VFC	4 kHz 8 kHz 12 kHz 16 kHz	
862 / 863	PWM fix 1/2	Off On	
864	PWM frequency CFC	4 kHz 8 kHz 12 kHz 16 kHz	



Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
87_	Process data description		
870	Setpoint description PO1	CTRL. WORD 1	The following PO assignment can be set: NO FUNCTION • SPEED • CURRENT • POSITION LO • MAX. SPEED • MAX. CURRENT • SLIP • RAMP • CONTROL WORD 1 • CONTROL WORD 2 • SPEED [%] • IPOS IIO ΔATA
871	Setpoint description PO2	SPEED	
872	Setpoint description PO3	NO FUNCTION	
873	Actual value description PI1	STATUS WORD 1	The following PI assignment can be set: NO FUNCTION • SPEED • OUTPUT CURRENT • ACTIVE CURR. • POSITION LO • POSITION HI • STATUS WORD 1 • STATUS WORD 2 • SPEED [%] • IPOS PI-DATA • RESERVED • STATUS WORD 3
874	Actual value description PI2	SPEED	
875	Actual value description PI3	OUTP.CURRENT	
876	PO data enable	Off On	
88 / 89_	Serial communication SBus 1 / 2		
880 / 890	Protocol SBus 1 / 2	SBus MOVILINK CANopen	
881 / 891	SBus address 1 / 2	0...63	
882 / 892	SBus 1 / 2 groupaddress	0...63	
883 / 893	SBus timeout delay 1 / 2	0...650 s	
884 / 894	Baud rate SBus 1 / 2	125 kbaud 250 kbaud 500 kbaud 1000 kbaud	
885 / 895	Synchronization ID SBus 1 / 2	0...2047	
886 / 896	CANopen address 1 / 2	1...127	
887	Synchronization ext. Control	Off On	
888	Synchronization time SBus 1/2	5ms / 10 ms	
9_	IPOS PARAMETERS		
90_	IPOS Reference travel		
900	Reference offset	$-(2^{31}-1) \dots 0 \dots 2^{31}-1$ Inc	
901	Reference speed 1	0 ... 200 ... 6000 1/min	
902	Reference speed 2	0 ... 50 ... 6000 1/min	
903	Reference travel type	0 ... 8	
904	Reference travel to zero pulse	Yes No	
905	HIPERFACE® Offset X15	$-(2^{31}-1) \dots 0 \dots 2^{31}-1$ Inc	
910	Gain X controller	0.1 ... 0.5 ... 32	
911	Positioning ramp 1	0.01 ... 1 ... 20 s	
912	Positioning ramp 2	0.01 ... 1 ... 20 s	
913	Positioning speed CW	0 ... 1500 ... 6000 1/min	
914	Positioning speed CCW	0 ... 1500 ... 6000 1/min	
915	Speed feedforward	-199.99 ... 0 ... 100 ... 199.99 %	
916	Ramp type	LINEAR SINE SQUARED BUSRAMP JERK LIMITED ELECTRONIC CAM SYNCHRONOUS OPERATION CROSS CUTTER	
917	Ramp mode	MODE 1 MODE 2	



Par.	Name Variable par. Parameter set 1/2	Setting range Factory setting	Comment
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	IPOS CTRL word Task 1	START / STOP	Only available in DBG60B, not in MOVITOOLS®/SHELL!
932	IPOS CTRL word Task 2	START / STOP	Only available in DBG60B, not in MOVITOOLS®/SHELL!
933	Jerk time	0.005 ... 2 s	
938	IPOS speed task 1	0 ... 9 additional commands/ms	
939	IPOS speed task 2	0 ... 9 additional commands/ms	
94_	IPOS Variables/encoder		
940	IPOS variables edit	ON / OFF	This parameter is only available on the DBG60B keypad, not in MOVITOOLS®!
941	Source actual position	Motor encoder (X15) Ext. ENC (X14) Absolute encoder (DIP)	
942	Encoder 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 DBG60B keypad.
945	Encoder type (X14)	TTL SIN/COS HIPERFACE	
946	Synchronous encoder counting direction (X14)	NORMAL INVERTED	
947	HIPERFACE® Offset (X14)	– (2 ³¹ – 1)...0...2 ³¹ – 1 Inc	
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	x1/x2/x4/x8/x16/x32/x64	
96_	IPOS Modulo function		
960	Modulo function	OFF SHORT CW CCW	
961	Modulo numerator	0 ... 1 ... 2 ³¹ – 1	
962	Modulo denominator	0 ... 1 ... 2 ³¹ – 1	
963	Modulo encoder resolution	0 ... 4096 ... 20000	



11 Operation and Service

11.1 Operating mode displays

7-segment display

The 7-segment display shows the operating condition of MOVIDRIVE® and, in the event of a fault, a fault or warning code.

Display	Description
0	Inverter not ready
1	Controller inhibit active
2	No enable
3	Current at standstill
4	VFC mode
5	n-control (speed control)
6	M-control (torque control)
7	Hold control
8	Factory setting
9	Limit switch reached
A	Technology option
b	Unassigned
c	IPOS ^{plus} ® reference travel
d	Flying Start
E	Adjust encoder
F	Fault indication (flashing) → page 407
H	Manual operation
t	Timeout active → page 406
U	"Safe Stop" active
• (blinking dot)	IPOS ^{plus} ® program is running
Flashing display	STOP via DBG60B



The display U = "Safe stop" active is not safety-related and may not be used as a safety function!

DBG60B keypad

Basic displays:

0.00rpm 0.000Amp CONTR. INHIBIT	Display when X13:1 (DIØØ "/CONTROLLER INHIBIT") = "0".
0.00rpm 0.000Amp NO ENABLE	Display when X13:1 (DIØØ "/CONTROLLER INHIBIT") = "1" and inverter is disabled ("ENABLE/RAPID STOP" = "0").
950.00rpm 0.990Amp ENABLE (VFC)	Display when inverter enabled.
NOTE 6: VALUE TOO LARGE	Information message
(DEL)=Quit 9 FAULT STARTUP PARAMET.	Fault indication



11.2 Information messages

Information messages on the DBG60B (ca. 2 s in duration) or in MOVITOOLS®/SHELL (message that can be acknowledged):

No.	Text in DBG60B/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 modify a read only value.
4	PARAM. INHIBITED	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.
-		
10	ONLY VIA ST1	Manual mode must be exited via X13:ST11/ST12 (RS485).
11	TERMINAL ONLY	Manual mode must be exited via TERMINAL (DBG11A 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.



11.3 Functions of the DBG60B keypad

Key assignments for DBG60B

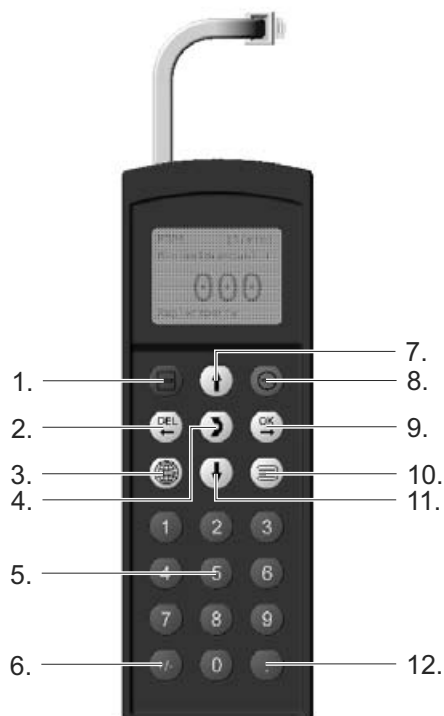


Figure 197: Key assignments for DBG60B

06552AXX

1. Stop
2. Delete previous entry
3. Language selection
4. Change menu
5. Numbers 0 to 9
6. Sign reversal
7. Up arrow, moves up to the next menu item
8. Start
9. OK, confirms the entry
10. Activates the context menu
11. Down arrow, moves down to the next menu item
12. Decimal point

Copy function of DBG60B

The DBG60B keypad can be used for copying complete parameter sets from one MOVIDRIVE® unit to other MOVIDRIVE® units. Proceed as follows:

- In the context menu, select the "COPY TO DBG" menu item. Confirm the setting using the key.
- After the copying process has finished, plug the keypad in the other inverter.
- In the context menu, select the "COPY TO MDX" menu item. Confirm the setting using the key.



Parameter mode

Proceed as follows to set the parameters in parameter mode:

1. Activate the context menu by pressing the key. The first menu item is "PARAMETER MODE".
2. Press the key to start the PARAMETER MODE. The first display parameter P000 "SPEED" appears. Use the key or the key to select the main parameter groups 0 to 9.
3. Use the key or the key to select the required main parameter group. The flashing cursor is positioned under the number of the main parameter group.
4. Activate parameter subgroup selection in the main parameter group by pressing the key. The flashing cursor moves one position to the right.
5. Use the key or the key to select the required parameter subgroup. The flashing cursor is positioned under the number of the parameter subgroup.
6. Activate parameter selection in the required parameter subgroup by pressing the key. The flashing cursor moves one position to the right.
7. Use the key or the key to select the desired parameter. The flashing cursor is positioned under the third digit of the parameter number.
8. Press the key to activate the setting mode for the selected parameter. The cursor is positioned under the parameter value.
9. Use the key or the key to select the desired parameter value.
10. Confirm the setting using the key. Exit the setting mode by pressing the key. The flashing cursor is positioned under the third digit of the parameter number again.
11. Use the key or the key to select another parameter or go back to the parameter subgroup menu using the key.
12. Use the key or the key to select another parameter subgroup or go back to the main parameter group menu using the key.
13. Use the key to return to the context menu.

PARAMETER MODE VARIABLE MODE BASIC VIEW

P 000	rpm
SPEED	+0.0
CONTR. INHIBIT	

P 1.. SETPOINTS/ RAMP GENERATORS

CONTR. INHIBIT

P 1.. SETPOINTS/ RAMP GENERATORS

CONTR. INHIBIT

\ 13. SPEED RAMPS 1

CONTR. INHIBIT

\ 13. SPEED RAMPS 1

CONTR. INHIBIT

\ 132	s
T11 UP CCW	+0.13
CONTR. INHIBIT	

\ 132	s
T11 UP CCW	+0.13_
CONTR. INHIBIT	

\ 132	s
T11 UP CCW	+0.20_
CONTR. INHIBIT	

\ 132	s
T11 UP CCW	+0.20
CONTR. INHIBIT	

\ 13. SPEED RAMPS 1

CONTR. INHIBIT

P 1.. SETPOINTS/ RAMP GENERATORS

CONTR. INHIBIT

PARAMETER MODE VARIABLE MODE BASIC VIEW



Variable mode

H... variables are displayed in the variable mode. Call up the variable mode:

- Use the  key to call up the context menu. Select the "VARIABLE MODE" menu item and use the  key. The variable mode display appears.
- Use the  to edit the variables.

User menu

The DBG60B keypad has a standard user menu containing the parameters that are used most often. The parameters in the user menu are displayed with a "I" before the parameter number (→ Sec. "Complete parameter list"). You can add or delete parameters. You can save a maximum of 50 parameter entries. The parameters are displayed in the order in which they are stored in the inverter. The parameters are not sorted automatically.

- Use the  key to call up the context menu. Select the "USER MENU" menu item and confirm your entry by pressing OK. The user menu with the most frequently used parameters appears.

Adding parameters to the user menu

Proceed in this order to add parameters to the user menu:

- Use the  key to call up the context menu. Select the "PARAMETER MODE" menu item.
- Choose the parameter you require and confirm your entry using the  key.
- Use the  key to return to the context menu. In the context menu, select the "ADD Pxxx" menu item. "xxx" is the parameter you selected previously. Confirm the setting using the  key. The selected parameter is stored in the user menu.

Deleting parameters from the user menu

Proceed in this order to delete parameters from the user menu:

- Use the  key to call up the context menu. Select the "USER MODE" menu item.
- Select the parameter that is to be deleted. Confirm the setting using the  key.
- Use the  key to return to the context menu. In the context menu, select the "DELETE Pxxx" menu item. "xxx" is the parameter you selected previously. Confirm the setting using the  key. The selected parameter is deleted from the user menu.

Wakeup parameter

The wake up parameter is the parameter that is displayed when the DBG60B is switched on. The factory setting for the wake up parameter is the basic display. You can select which parameter should be the wake up parameter. The following options can be used as the wake up parameter:

- Parameter (→ Parameter mode)
- Parameter from the user menu (→ User menu)
- H variable (→ Variable mode)
- Basic display

To store a wake up parameter, choose the menu item "XXXX INITIAL PARAM" from the context menu. "XXXX" is the selected wake up parameter. Confirm the setting using the  key.



IPOS^{plus}®

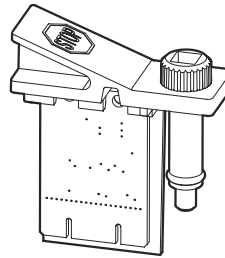
MOVITOOLS[®] version 4.0 or higher is required for programming IPOS^{plus}®. Only the IPOS^{plus}® parameters (P9__) can be displayed or changed with the DBG60B keypad.

The IPOS^{plus}® program is also stored in the DBG60B keypad when it is saved and is consequently also transferred when the parameter set is copied to another MOVIDRIVE[®] unit.

Parameter P931 can be used to start and stop the IPOS^{plus}® program from the DBG60B keypad.

11.4 Memory card

The pluggable memory card is installed in the basic unit. All current data is stored on the memory card and does not have to be copied with typing errors. If a unit has to be replaced, the system/machine can be operated again quickly without a PC and data backup simply by replugging the memory card. Any number of option cards can be installed or power sections replaced without parameters being lost.



52335AXX

Figure 198: MDX60B/61B memory card

11



- The memory card of the original unit can be installed in a new inverter. The following combinations are permitted:

Original unit: MOVIDRIVE [®] MDX60B/61B...	New inverter: MOVIDRIVE [®] MDX60B/61B...
00	00
00	0T
0T	0T

- The same options that were available in the original unit must be installed in the new inverter.
- If this is not the case, the error message "79 HW configuration" (hardware configuration) is displayed. The error can be removed by calling up the "DELIVERY CONDITION" (P802 factory setting) from the context menu. This resets the unit to its initial delivery condition. You must then restart the unit.



11.5 Malfunction information

Fault memory

The fault memory (P080) stores the last five fault messages (faults t-0 to t-4). The oldest fault message is deleted whenever more than five fault messages have occurred. The following information is stored when a malfunction occurs:

Fault that occurred • Status of binary inputs/outputs • Operating status of the inverter • Inverter status • Heat sink temperature • Speed • Output current • Active current • Unit utilization • DC link voltage • ON hours • Enable hours • Parameter set • Motor utilization.

Switch-off responses

There are three switch-off responses depending on the fault; the inverter remains blocked 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. The brake is applied once the stop speed is reached (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. The brake is applied once the stop speed is reached (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; that is, via an appropriately assigned binary input (DIØ1 to DIØ7 with the basic unit, DI1Ø to DI17 with the DIO11B option).
- Manual reset in SHELL (P840 = "YES" or [Parameter] / [Manual reset]).
- Manual reset using the DBG60B.
- 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

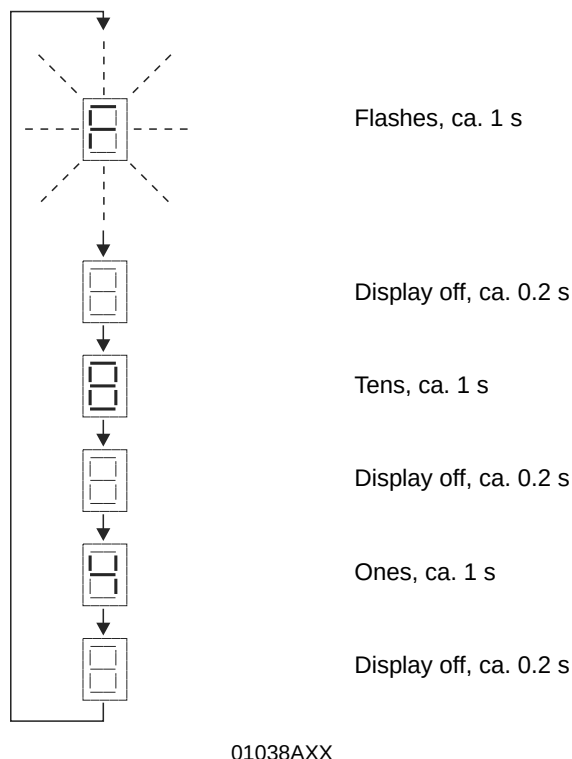
If the inverter is controlled via a communication interface (fieldbus, RS485 or SBus) and the power was switched off and back on again or a fault reset was performed, then the enable remains ineffective until the inverter once again receives valid data via the interface, which is monitored with a timeout.



11.6 Fault messages and list of faults

Fault message on 7-segment display

The fault or warning code is displayed in binary-coded format. The following display sequence is observed (e.g. fault code 84):



Following a reset or if the error or warning code resumes the value "0", the display switches to the operating display again.

List of errors

A dot in the "P" column indicates that the response is programmable (P83_ Fault response). The factory set fault response appears in the "Response" column.

Error code	Designation	Response	P	Possible cause	Action
00	No fault	-			
01	Over-current	Immediate shut-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 in the motor lead	Immediate shut-off		Ground fault - In the motor lead - In the inverter - In the motor	- Eliminate ground fault - Consult SEW Service
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	- Extend deceleration ramps - Check feeder cable to braking resistor - Check technical data of braking resistor - Install a new MOVIDRIVE® unit if the brake chopper is defective
06	Mains phase fault	Immediate shut-off		Phase failure	Check supply system lead
07	U _Z overvoltage	Immediate switch-off		DC link voltage too high	- Extend deceleration ramps - Check connection leads to the braking resistor - Check technical data of braking resistor



Operation and Service

Fault messages and list of faults

Error code	Designation	Response	P	Possible cause	Action
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 failure in the power supply 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, swap A/A and B/B pairs if necessary - Check encoder voltage supply - Check current limitation - Extend ramps if necessary - Check motor cable and motor - Check mains 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^{plus}® program. - Incorrect conditions during command execution.	- Check program memory content and correct if necessary. - Load correct program into program memory. - Check program sequence (→ IPOS^{plus}® manual)
11	Excessive temperature	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/broken encoder wire - Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
15	24 V internal	Immediate switch-off		No internal 24 V supply voltage.	Check the mains connection. Consult SEW service if the error occurs again.
17-24	System error	Immediate switch-off		Inverter electronics disrupted, possibly due to effect of EMC.	Check ground connections and shieldings and correct, if necessary. Contact SEW service if this error occurs again.
25	EEPROM	Rapid stop		Access to the EEPROM of the memory card has failed	- Call up default setting, perform reset and set parameters again. - Contact SEW service if the error occurs again. - Replace memory card.
26	External terminal	Emergency stop		Read in external fault signal via programmable input.	Eliminate specific cause of fault; reprogram terminal if appropriate.
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 communication between master and slave within the projected response monitoring.	- Check communications routine of the master - Extend fieldbus timeout time (P819)/deactivate monitoring
29	Limit switch reached	Emergency stop		A limit switch was reached in IPOS ^{plus} ® 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	None Response		- Motor too hot, TF sensor has tripped - TF sensor of motor not connected or not connected properly - Connection of MOVIDRIVE® and TF on motor interrupted - No jumper between X10:1 and X10:2.	- Let motor cool off and reset fault - Check connections/link between MOVIDRIVE® and TF. - If no TF is connected: Jumper X10:1 with X10:2. - Set P835 to "NO RESPONSE"
32	IPOS index overrun	Emergency stop		Basic programming rules violated causing stack overflow in system.	Check and correct the IPOS ^{plus} ® user program (→ IPOS ^{plus} ® manual).
33	Setpoint source	Immediate switch-off		Setpoint source not defined or defined incorrectly	Set correct setpoint source (P100).
34	Ramps Timeout	Immediate switch-off		Time of downward ramps exceeded, e.g. due to overload.	- Extend the downwards ramps - Remove overload
35	Operating mode	Immediate switch-off		- Operating mode not defined or defined incorrectly - P916 was used to set a ramp function that is needed by a MOVIDRIVE® unit in technology version. - P916 was used to set a ramp function that does not match the selected technology function.	- Use P700 or P701 to set the correct operating mode. - Use MOVIDRIVE® in technology version (..OT). - From the "Startup → Select technology function..." menu, select the technology function that matches P916



Error code	Designation	Response	P	Possible cause	Action
36	No option	Immediate switch-off		- Type of option card not allowed. - Setpoint source, control signal source or operating mode not permitted for this option card. - Incorrect encoder type set for DIP11A.	- Use correct option card. - Set correct setpoint source (P100). - Set correct control signal source (P101). - Set correct operating mode (P700 or P701). - Set the correct encoder type.
37	System watchdog	Immediate switch-off		Error during execution of system software	Contact SEW Service.
38	System software	Immediate switch-off		System error	Contact SEW Service.
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
40	Boot synchronization	Immediate switch-off		Only with DIP11B or DRS11B: Fault during boot synchronization between inverter and option.	Install a new option card if this fault reoccurs.
41	Watchdog option IPOS watchdog	Immediate switch-off		- Error in communication between system software and option software. - Watchdog in the IPOS program. - An application module without the application version has been loaded in a MOVIDRIVE® B unit - The wrong technology function has been set if an application module is used	- Contact SEW Service. - Check IPOS program - Check whether the unit has been activated for the application version (P079) - Check the selected technology function (P078)
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 fault tolerance too small	- Check rotary encoder connection - Extend ramps - Set P component to higher value - Set speed controller parameters again - Increase lag fault tolerance - Check encoder, motor and mains phase wiring - Check mechanical components can move freely, possibly blocked up
43	RS485 timeout	Rapid stop		Communication between inverter and PC interrupted	Check connection between inverter and PC. Contact SEW Service if necessary.
44	Unit utilization	Immediate switch-off		- Unit utilization (IxT value) > 125 % - I_N-U_L monitoring 1 triggered	- Reduce power output - Extend ramps - Use a larger inverter if the specified points are not possible. - Check P345 / P346 setting - Reduce load - Select a larger motor
45	Initialization	Immediate switch-off		- No parameters set for EEPROM in power section, or parameters set incorrectly. - Option card not in contact with back-plane bus.	- Restore factory settings. Consult SEW Service if the fault still cannot be reset. - Insert the option card correctly.
46	System bus 2 timeout	Rapid stop		Fault during communication via system bus 2.	Check system bus connection.
47	System bus 1 timeout	Rapid stop		Fault during communication via system bus 1.	Check system bus connection.
48	Hardware DRS	Immediate switch-off		Only with DRS11B: - Encoder signal from master/synchronous encoder faulty. - Hardware required for synchronous operation is faulty.	- Check encoder signals of master/synchronous encoder. - Check encoder wiring. - Install a new synchronous operation board.
77	IPOS ^{plus} ® control word	None Response		Only in IPOS^{plus}® operating mode: - An attempt was made to set an invalid automatic mode (via external controller). - P916 = BUSRAMP set.	- Check serial connection to external control. - Check write values of external control. - Set P916 correctly.



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Fault messages and list of faults

Error code	Designation	Response	P	Possible cause	Action
78	IPOS ^{plus} ® SW limit switches	None Response		Only in IPOS^{plus}® operating mode: Programmed target position is outside travel range delimited by software limit switches.	- Check user program - Check position of the software limit switches
79	HW configuration (hardware configuration)	Immediate switch-off		The following items do not match anymore after having replaced the memory card: - Power - Rated voltage - Variant identification - Range of units - Technology or standard version - Option cards	Ensure identical hardware or restore factory setting (parameter = factory setting).
80	n registration	Immediate switch-off		Internal unit fault, RAM defective.	Contact SEW Service.
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: - Rated motor power too small in relation to rated inverter 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.
82	Output open	Immediate switch-off		Only in "VFC hoist" operating mode: - Two or all output phases interrupted. - Rated motor power too small in relation to rated inverter power.	- Check connection between inverter and motor. - Check startup data and repeat startup procedure if necessary.
84	Motor protection	Emergency stop		Motor utilization too high.	- Reduce load. - Extend ramps. - Observe longer pause times.
86	Memory module	Immediate switch-off		- No memory card - Memory card defective	- Tighten knurled screw - Insert and secure memory card - Replace memory card
87	Technology function	Immediate switch-off		A technology function was activated in a standard version.	Disable technology function
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
92	DIP encoder problem	Fault display		Encoder signals a fault	Possible cause: Encoder is dirty → clean encoder
93	DIP encoder fault	Emergency stop		Only with DIP11B option: The encoder signals a fault, e.g. power failure: - Connection cable between encoder and DIP does not meet the requirements (twisted pair, shielded). - Cycle frequency too high for cable length. - Permitted max. speed/acceleration of encoder exceeded. - Encoder defective.	- Check absolute encoder connection. - Check connection cables. - Set correct cycle frequency. - Reduce max. traveling velocity or ramp. - Install new absolute encoder.
94	EEPROM checksum	Immediate switch-off		Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send the unit in for repair.
95	DIP plausibility error	Emergency stop		Only with DIP11B option: Unable to determine a plausible position. - Incorrect encoder type set. - IPOS^{plus}® travel parameter set incorrectly. - Numerator/denominator factor set incorrectly. - Zero adjustment performed. - Encoder defective.	- Set the correct encoder type. - Check IPOS^{plus}® travel parameters. - Check traveling velocity. - Correct numerator/denominator factor. - Reset after zero adjustment. - Install new absolute encoder.
97	Copy data	Immediate switch-off		- Memory card cannot be written or read. - Error during data transmission	- Repeat copying process - Restore default setting (P802) and repeat copying process
98	CRC error flash	Immediate switch-off		Internal unit fault Flash memory defective	Send the unit in for repair.



Error code	Designation	Response	P	Possible cause	Action
99	IPOS ramp calculation error	Immediate switch-off		Only in IPOS^{plus}® 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 ^{plus} ® program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.

11.7 SEW electronics service

Sending in for repair

Please contact the **SEW-EURODRIVE 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 when sending the unit in for repair:

- Serial number (→ nameplate)
- Unit designation
- Standard version or application version
- Digits of the service code
- Brief description of the application (application, control via terminals or serial)
- Connected motor (motor type, motor voltage, W or Δ circuit)
- Nature of the fault
- Accompanying circumstances
- Your own presumptions as to what has happened
- Any unusual events preceding the problem, etc.



12 Abbreviation Key and Index

12.1 Abbreviation key

$\cos\phi$	Power factor of motor	
F_A	Axial force acting on the output shaft	[N]
f_{in}	Supply frequency	[Hz]
h	Installation altitude	[m above sea level]
η	Efficiency	
I_d	Magnetization current	[A]
I_{in}	Input current, mains current	[A]
I_F	Trip current	[A]
$I_N = I_n$	Rated current	[A]
I_q	Torque-forming current	[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 motor torque	
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]
$P_{reduced}$	Power reduced in relation to rated power	[kW]
$P_v = P_{loss}$	Power loss	[kW]
R_{BWmin}	Minimum braking resistance for 4Q operation	[Ω]
S.., %ED	Duty type and relative cyclic duration factor cdf	
T	Cycle duration	[min]
t_1	Response time of motor brake	[10 ⁻³ s]
t_2	Reaction time of motor brake	[10 ⁻³ s]
V_{in}	Supply voltage	[V]
V_N	Rated voltage	[V]
V_{out}	Output voltage	[V]
Z	Starting frequency	[1/h], [c/h]
Z_0	No-load starting frequency	[1/h], [c/h]



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Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 sales@sew-eurodrive.co.nz
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Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 241-020 Fax +47 69 241-040 sew@sew-eurodrive.no
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Assembly Sales Service	Lima	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 sewperu@sew-eurodrive.com.pe
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Poland			
Assembly Sales Service	Lodz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Lodz	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl



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	Szczecinek	SEW-EURODRIVE Polska Sp.z.o.o. ul. Mickiewicza 2 pok. 36 PL-78-400 Szczecinek	Tel. +48 94 3728820 Fax +48 94 3728821
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	Porto	Av. D. Afonso Henriques, 1196 - 1º - sala 102 Edifício ACIA P- 4450-016 Matosinhos	Tel. +351 229 350 383 Fax +351 229 350 384 MobilTel. +351 9 332559110 esc.porto@sew-eurodrive.pt
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	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 21 552-9820 Fax +27 21 552-9830 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 31 700-3451 Fax +27 31 700-3847 dtait@sew.co.za
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	Lugo	Delegación Noroeste Apartado, 1003 E-27080 Lugo	Tel. +34 6 3940 3348 Fax +34 9 8220 2934
	Madrid	Delegación Madrid Gran Vía. 48-2° A-D E-28220 Majadahonda (Madrid)	Tel. +34 9 1634 2250 Fax +34 9 1634 0899
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	Colombo 4	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
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Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 41717-17 Fax +41 61 41717-00 http://www.imhof-sew.ch info@imhof-sew.ch
Technical Offices	Suisse romande	André Gerber Es Perreyres 1436 Chamblon	Tel. +41 2 444538-50 Fax +41 2 444548-87
	Bern	Rudolf Bühler Allerheiligenstraße 97d 2540 Grenchen	Tel. +41 3 265223-39 Fax +41 3 265223-31
	Luzern	Beat Lütolf Baumacher 11 6244 Nebikon	Tel. +41 6 275647-80 Fax +41 6 275647-86
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	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Hwa South Road, Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net
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	Khonkaen	SEW-EURODRIVE (Thailand) Ltd. 4th Floor, Kaow-U-HA MOTOR Bldg, 359/2, Mitraphab Road. Muang District Khonkaen 40000	Tel. +66 43 225745 Fax +66 43 324871 sewkk@cscoms.com
	Lampang	SEW-EURODRIVE (Thailand) Ltd. 264 Chatchai Road, sob-tuy, Muang, Lampang 52100	Tel. +66 54 310241 Fax +66 54 310242 sewthailand@sew-eurodrive.co.th

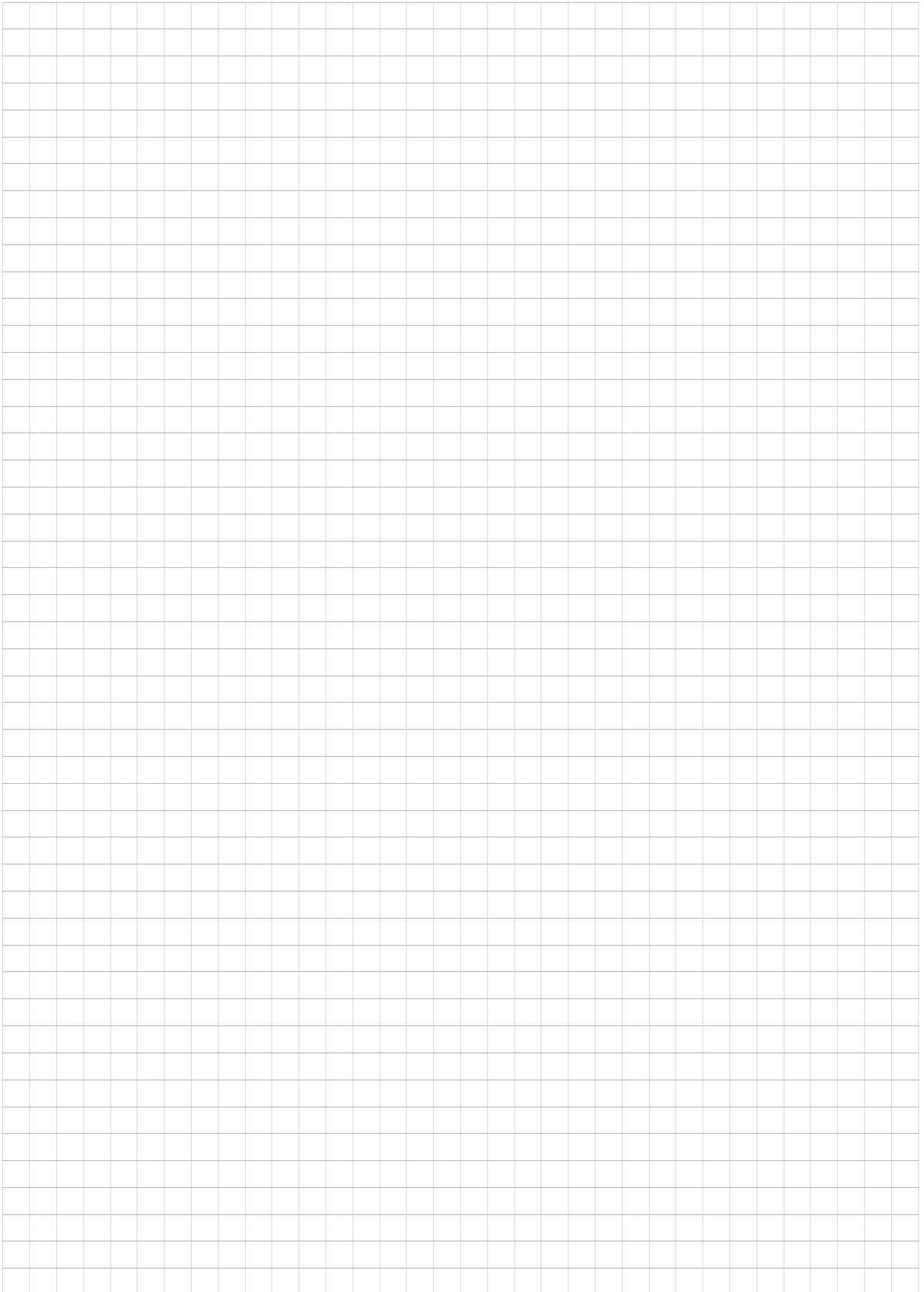


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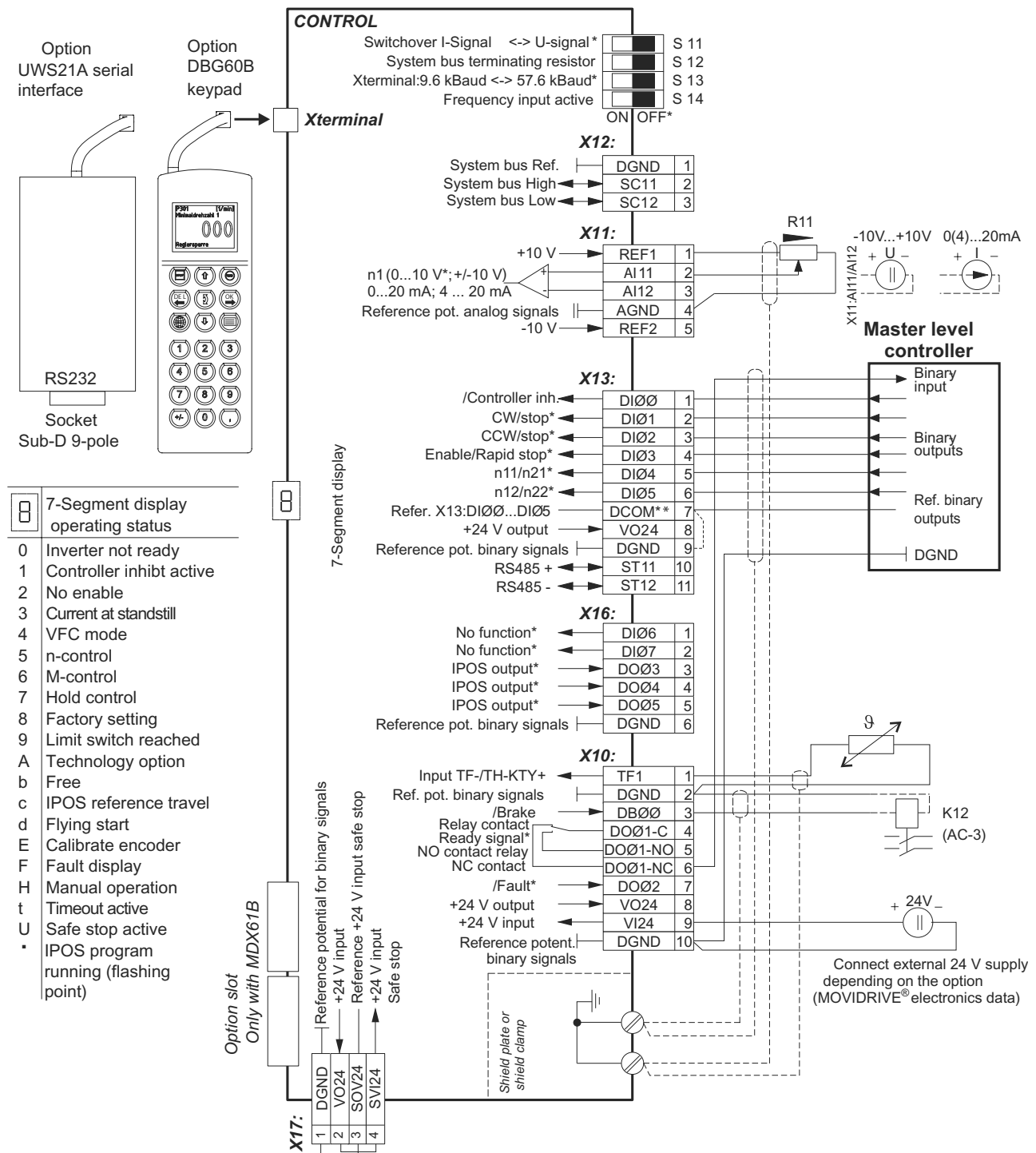
Tunisia			
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	Bursa	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Besevler Küçük Sanayi Parkoop Parçacılar Sitesi 48. Sokak No. 47 TR Nilüfer/Bursa	Tel. +90 224 443 4559 Fax +90 224 443 4558
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	Montevideo	SEW-EURODRIVE Argentina S. A. Sucursal Uruguay German Barbato 1526 CP 11200 Montevideo	Tel. +598 2 90181-89 Fax +598 2 90181-88 sewuy@sew-eurodrive.com.uy
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	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
Additional addresses for service in the USA provided on request!			



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Connection of electronics terminals



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* Factory setting

** If the binary inputs are connected to the DC 24 V voltage supply X13:8 "VO24," install a jumper between X13:7 (DCOM) and X13:9 (DGND) on MOVIDRIVE®.

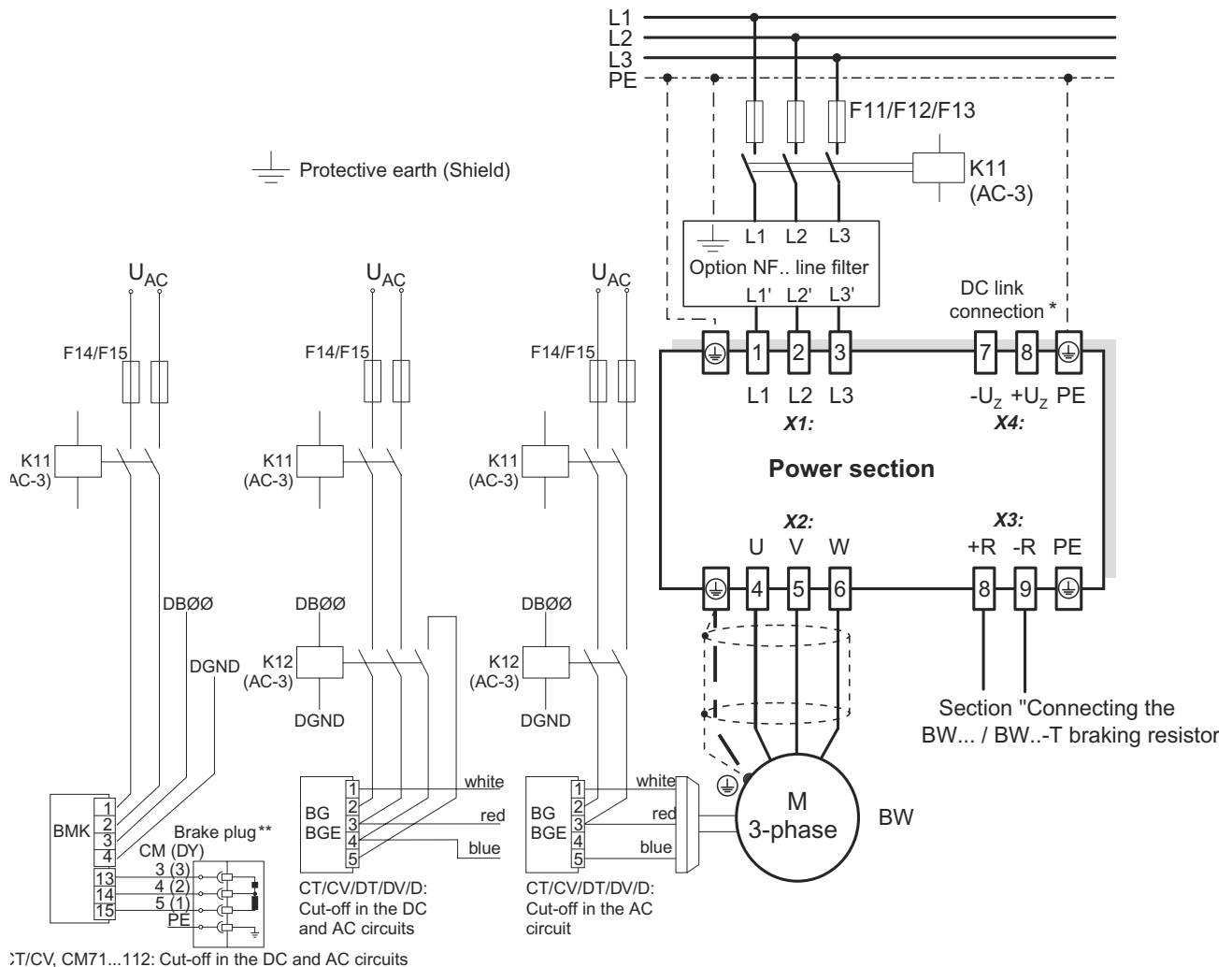
Functional description of the terminals in the basic unit (power section and control unit)

Terminal		Function
X1:1/2/3 X2:4/5/6 X3:8/9 X4:	L1/L2/L3 (PE) U/V/W (PE) +R/-R (PE) +U _Z /-U _Z (PE)	Mains connection Motor connection Braking resistor connection DC link connection
S11: S12: S13: S14:		Switching I-signal DC(0(4)...20 mA) ↔ V-signal DC(-10 V...0...10 V, 0...10 V), factory setting: V-Signal. System bus terminating resistor on/off, factory setting: off. Set baud rate for RS485 interface. Either 9.6 or 57.6 kBaud, factory setting: 57.6 kBaud. Switch frequency input on or off, factory setting: off.
X12:1 X12:2 X12:3	DGND SC11 SC12	Reference potential system bus System bus High System bus Low
X11:1 X11:2/3 X11:4 X11:5	REF1 AI11/12 AGND REF2	DC+10 V (max. DC 3 mA) for setpoint potentiometer Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_ / S11 Reference potential for analog signals (REF1, REF2, AI..., AO...) DC-10 V (max. DC 3 mA) for setpoint potentiometer
X13:1 X13:2 X13:3 X13:4 X13:5 X13:6	DIØØ DIØ1 DIØ2 DIØ3 DIØ4 DIØ5	Binary input 1, 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/n21" Binary input 6, factory setting "n12/n22"
X13:7	DCOM	Reference for binary inputs X13:1 to X13:6 (DIØØ...DIØ5) and X16:1/X16:2 (DIØ6...DIØ7) - Switching binary inputs with DC+24 V external voltage: Connection of X13:7 (DCOM) with reference potential of the external voltage required. - Without jumper X13:7-X13:9 (DCOM-DGND) → isolated binary inputs - With jumper X13:7-X13:9 (DCOM-DGND) → non-isolated binary inputs - Switch the binary inputs with DC+24 V from X13:8 or X10:8 (VO24) → jumper X13:7-X13:9 (DCOM-DGND) required.
X13:8 X13:9 X13:10 X13:11	VO24 DGND ST11 ST12	Auxiliary supply output DC+24 V (max. load X13:8 und X10:8 = DC 400 mA) for external command switch Reference potential for binary signals RS485+ RS485-
X16:1 X16:2 X16:3 X16:4 X16:5 X16:6	DIØ6 DIØ7 DOØ3 DOØ4 DOØ5 DGND	Binary input 7, factory setting "No function" Binary input 8, factory setting "No function" Binary output 3, factory setting "IPOS output" Binary output 4, factory setting "IPOS output" Binary output 5, factory setting "IPOS output" Do not apply external voltage to binary outputs X16:3 (DOØ3) to X16:5 (DOØ5)! Reference potential for binary signals
X10:1 X10:2 X10:3 X10:4 X10:5 X10:6 X10:7	TF1 DGND DBØØ DOØ1-C DOØ1-NO DOØ1-NC DOØ2	KTY+/TF-/TH connection (connect to X10:2 via TF/TH), factory setting "No response" (→ P835) Reference potential for binary signals / KTY- Bin. output 0, assignment "/Brake", load cap. max. 150 mA (short-circuit proof, protected vs. exter. voltage) Shared contact binary output 1, factory setting "Ready" NO contact binary output 1, max. load capacity of relay contacts. DC 30 V and DC 0.8 A NC contact binary output 1 Bin. output 2, fact. setting "/fault", max. load cap. DC 50 mA (short-circuit proof, protected vs. exter. voltage) Selection options for binary outputs 1 and 2 (DOØ1 und DOØ2) → Parameter menu P62_ Do not apply external voltage to binary outputs X10:3 (DBØØ) and X10:7 (DOØ2)!
X10:8 X10:9 X10:10	VO24 VI24 DGND	Auxiliary voltage output DC+24 V (max. load X13:8 and X10:8 = DC 400 mA) for external command switch Input DC+24 V voltage supply (backup voltage depends on options, unit diagnostics for supply off) Reference potential for binary signals
X17:1 X17:2 X17:3 X17:4	DGND VO24 SOV24 SVI24	Reference potential for X17:3 Auxiliary voltage output DC+24 V, only to supply X17:4 Reference potential for DC+24 V input "Safe stop" (safety contact) DC+24 V input "Safe stop" (safety contact)
Xterminal		Option slot: DBG60B keypad/ UWS21A or USB11A interface converter 3 slots for option card (size 0: 2 slots for option cards)



X17: For safety applications, comply with the information in the publications "Safe Disconnection for MOVIDRIVE® MDX60B/61B – Conditions" and "Safe Disconnection for MOVIDRIVE® MDX60B/61B – Applications"

Connection of the power section and brake



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- * With sizes 1 and 2, there is no PE connection next to the mains and motor connection terminals (X1, X2). In this case, use the PE terminal next to the DC link connection (X4).
- ** **Important:** Adhere to the connection sequence of the brake connector. Incorrect connection will lead to irreparable damage to the brake. When connecting the brake via the terminal box → Operating instructions for CM motors



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 with:

- All hoist applications
- Drives which require a rapid brake response time
- CFC and SERVO operating modes

Brake rectifier in the control 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 installation is only permitted with shielded power cables.

How we're driving the world

With people who think fast and develop the future with you.



With a worldwide service network that is always close at hand.



With drives and controls that automatically improve your productivity.



With comprehensive knowledge in virtually every branch of industry today.



With uncompromising quality that reduces the cost and complexity of daily operations.



With a global presence that offers responsive and reliable solutions. Anywhere.

With innovative technology that solves tomorrow's problems today.

With online information and software updates, via the Internet, available around the clock.

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