SEW EURODRIVE

MOVIDRIVE® MDX60B / 61B

Edition 06/2008
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System Manual

Color code system for catalogs and system manuals

Our catalogs and system manuals are identified by a color code system at the back to make it easier to work with these publications. The short designation of the publication is indicated as well. In this way you can immediately recognize the publication even if it is standing on a shelf together with other publications. The following overview shows an exemplary assignment of colors to product groups and products.

Mechanics

DR-GM 2008
DR gearmotors

GSE1 2008
Synchronous servo gearmotors

GSE2 2008
Asynchronous servo gearmotors

GK 2008
Gear units

Electromechanics

MOT1 2008
DR series AC motors

MOT2 2008
DT/DV/CT/CV series AC motors

Explosion-proof drives

EXG 2008
Explosion-proof gearmotors

EXS 2008
Explosion-proof servo gearmotors

EXM 2008
Explosion-proof motors

Control cabinet inverters, control technology and HMI

MDX 2008
MOVIDRIVE®

MC 2008
MOVITRAC®

MX 2008
MOVIAXIS®

PLC 2008
MOVI-PLC®

HMI 2008
DOP11B

Decentralized technology

MM 2008
MOVIMOT®
DR gearmotors

DI 2008
Decentralized installation

MG 2008
MOVIGEAR®

Industrial gear units

IGX1 2008
X series horizontal industrial gear units

IGX2 2008
X series vertical industrial gear units

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1 System Description

1.1 System Overview MOVIDRIVE® MDX60B/61B

Power components

Encoder and communication options

MDX60/61B standard version with IPOS plus® as standard

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

DBG60B keypad option

MOVITOOLS® operating software

Encoder options

DEH 11B DEH 21B DER 11B DIP 11B DIO 11B DRS 11B

Interface adapter option:

UWS 21B UWS 11A USB 11A

63225AEN

Fieldbus options

DFC 11B

DFD 11B

DFI 11B

DFI 21B

DFP 21B

DFE 11B

DFE 12B

DFE 13B

DFE 24B

DFE 32B

DFE 33B

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Control options

MOVI-PLC®

DHP 11B OST 11B DHE 41B DHF 41B

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Safety options

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General description

MOVIDRIVE® MDX60/61B is the new generation of drive inverters from SEW. The new MOVIDRIVE® B series 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 functionality and the option to extend the drive using technology and communication options creates drive systems that are designed to be particularly cost-effective with regard to the application range, project planning, startup and operation.

Low-emission

The MOVIDRIVE® MDX60B/61B 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 law on electronic equipment.

Range of units

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

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

Unit versions

MOVIDRIVE® MDX60/61B inverters are available in two versions: standard version and application version.

Standard design

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.

Design with coated printed circuit boards

The units are designed for use in harsh environments. The coating of the printed circuit boards increases their resistivity against environmental conditions.

The version with coated circuit board is indicated by the "00/L" 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

	NOTES
	• **Installing or removing option cards later is only possible with 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)

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Figure 1: Option slots for MOVIDRIVE® MDX61B

[1] Encoder slot for encoder option

[2] Fieldbus slot for communication option

[3] Expansion slot for communication option (only sizes 1 - 6)

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.

Use	Required option	Option slot
Encoder option		
Asynchronous AC motor with encoder feedback (HIPERFACE®, sin/cos, TTL)	HIPERFACE® encoder card DEH11B	1
Asynchronous or synchronous servomotor with HIPERFACE® encoder		
SSI encoder interface	Absolute encoder card DEH21B	
Synchronous servomotor with resolver	Resolver card type DER11B	
Communication options (fieldbus, control)		
User-programmable MOVI-PLC® controller	MOVI-PLC® *basic* DHP11B controller	2 (3 only if slot 2 is occupied)
Additional RS485 interface (only in combination with option DHP11B)	DHP11B + OST11B	• DHP11B in 2, OST11B in 1 • If 1 is occupied: DHP11B + OST11B in 3
User-programmable MOVI-PLC® controller	MOVI-PLC® *advanced* controller DHE41B	2 (3 only if slot 2 is occupied)
	MOVI-PLC® *advanced* controller DHF41B	3
Additional analog and binary inputs/outputs are required	Input/output card type DIO11B	2 (3 only if slot 2 is occupied)
Integration into a PROFIBUS system	PROFIBUS interface type DFP21B	2
Integration into a PROFIBUS system with PROFIsafe	Fieldbus interface type DFS11B	
Integration into an INTERBUS system	INTERBUS interface type DFI11B / DFI21B	
Integration into an Ethernet system	Ethernet interface type DFE11B, DFE12B, DFE13B, DFE32B; DFE33B	
Integration into an Ethernet system with PROFIsafe	Fieldbus interface type DFS21B	
Integration into an EtherCAT system	EtherCAT interface type DFE24B	
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	Synchronous operation board DRS11B	
Safety module	DCS21B option (only in conjunction with DFS12B/22B option) / DCS31B	

Control mode

The VFC (Voltage Flux Control) and CFC (Current Flux Control)/SERVO control modes are features of MOVIDRIVE® MDX60B/61B inverters. The continuous calculation of the complete motor model forms the basis for both control modes.

VFC (Voltage Flux Control) control mode	CFC (Current Flux Control)/SERVO 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 – Characteristics similar to servo operation • 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 milli-seconds

System bus (SBus)

The system bus (SBus) is available as standard. It permits several MOVIDRIVE® inverters to be networked together. This system bus enables fast data exchange 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® 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, right on the plant floor. That way, load is taken off the master controller and modular concepts can be implemented more easily.

The units at a glance

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

Recommended motor power (VFC)		Contin. output current (CFC)	MOVIDRIVE® type		Size (techn. data)
			MDX60B not option-capable	MDX61B option-capable	
0.55 kW (0.74 HP)	0.75 kW (1.0 HP)	AC 2.0 A	0005-5A3-4-..	0005-5A3-4-..	0 (→ Page 36)
0.75 kW (1.0 HP)	1.1 kW (1.5 HP)	AC 2.4 A	0008-5A3-4-..	0008-5A3-4-..	
1.1 kW (1.5 HP)	1.5 kW (2.0 HP)	AC 3.1 A	0011-5A3-4-..	0011-5A3-4-..	
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 4.0 A	0014-5A3-4-..	0014-5A3-4-..	
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 4.0 A	–	0015-5A3-4-..	1 (→ Page 38)
2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	AC 5.5 A	–	0022-5A3-4-..	
3.0 kW (4.0 HP)	4.0 kW (5.4 HP)	AC 7.0 A	–	0030-5A3-4-..	
4.0 kW (5.4 HP)	5.5 kW (7.4 HP)	AC 9.5 A	–	0040-5A3-4-..	
5.5 kW (7.4 HP)	7.5 kW (10 HP)	AC 12.5 A	–	0055-5A3-4-..	2S, 2 (→ Page 39)
7.5 kW (10 HP)	11 kW (15 HP)	AC 16 A	–	0075-5A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	AC 24 A	–	0110-5A3-4-..	
15 kW (20 HP)	22 kW (30 HP)	AC 32 A	–	0150-503-4-..	3 (→ Page 40)
22 kW (30 HP)	30 kW (40 HP)	AC 46 A	–	0220-503-4-..	
30 kW (40 HP)	37 kW (50 HP)	AC 60 A	–	0300-503-4-..	
37 kW (50 HP)	45 kW (60 HP)	AC 73 A	–	0370-503-4-..	4 (→ Page 41)
45 kW (60 HP)	55 kW (74 HP)	AC 89 A	–	0450-503-4-..	
55 kW (74 HP)	75 kW (100 HP)	AC 105 A	–	0550-503-4-..	5 (→ Page 42)
75 kW (100 HP)	90 kW (120 HP)	AC 130 A	–	0750-503-4-..	
90 kW (120 HP)	110 kW 148 HP)	AC 170 A	–	0900-503-4-..	6 (→ Page 43)
110 kW (148 HP)	132 kW (177 HP)	AC 200 A	–	1100-503-4-..	
132 kW (177 HP)	160 kW (215 HP)	AC 250 A	–	1320-503-4-..	

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

Recommended motor power (VFC)		Contin. output current (CFC)	MOVIDRIVE® type	Size (technical data)
			MDX61B option-capable	
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 7.3 A	0015-2A3-4-..	1 (→ Page 44)
2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	AC 8.6 A	0022-2A3-4-..	
3.7 kW (5.0 HP)	5.0 kW (7.0 HP)	AC 14.5 A	0037-2A3-4-..	
5.5 kW (7.4 HP)	7.5 kW (10 HP)	AC 22 A	0055-2A3-4-..	2 (→ Page 45)
7.5 kW (10 HP)	11 kW (15 HP)	AC 29 A	0075-2A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	AC 42 A	0110-203-4-..	3 (→ Page 46)
15 kW (20 HP)	22 kW (30 HP)	AC 54 A	0150-203-4-..	
22 kW (30 HP)	30 kW (40 HP)	AC 80 A	0220-203-4-..	4 (→ Page 47)
30 kW (40 HP)	37 kW (50 HP)	AC 95 A	0300-203-4-..	

MOVIDRIVE® MDR60A regenerative power supply units for AC 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, $I_{DC\ link}$ = DC 70 A	3, 4, 6 (→ page 63)	0005 ... 0370
0750-503-00	I_{mains} = AC 117 A, $I_{DC\ link}$ = DC 141 A		0005 ... 0750
1320-503-00	I_{mains} = AC 260 A, $I_{DC\ link}$ = DC 340 A		0005 ... 1320

Block circuit diagram

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

1.2 Functions / features

Unit properties

- Wide voltage range
  - 400/500 V units for the voltage range 3 × AC 380 ... 500 V
  - 230 V units for the voltage range 3 × AC 200 ... 240 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 sustained for operation without overload (pumps, fans)
- With 4 kHz switching frequency, I_N is permitted for an ambient temperature ϑ = 50 °C
- 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, 2S and 2, adherence to class C2 limit on the input side without any additional measures
- 8 isolated binary inputs and 6 binary outputs, one of which is a relay output; programmable inputs/outputs
- 1 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 electronic terminals
- Separable power terminals for size 0 and 1 units
- Safe stop according to EN 954-1

Control function

- VFC or CFC control modes for field-oriented operation (asynchronous servo)
- IPOS$^{plus®}$, positioning and sequence control system integrated as standard
- 2 complete parameter sets
- Automatic motor calibration
- Automatic brake control by the inverter
- DC braking to decelerate the motor even in 1Q mode
- Energy-saving function for optimizing the magnetization current automatically
- Slip compensation for high stationary speed accuracy, even without encoder feedback
- Flying restart function for synchronizing the inverter to an already rotating SEW motor
- Hoist capability with all motor systems which can be connected
- Motor stall protection through sliding current limitation in the field weakening range
- Function to hide speed window to avoid mechanical resonances
- Heating current for avoiding condensation in the motor
- Parameter lock for protection against changes to parameters
- Speed controller and encoder input for incremental, Hiperface® or SSI encoders and resolver. User-friendly controller setting tool in the operator interface.
- Protective functions for complete protection of the inverter and motor (short-circuit, overload, overvoltage/undervoltage, ground fault, excess temperature in the inverter, motor stall prevention, excess temperature 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 SCOPE process data visualization four channels (8 channels, real-time capable)
- Fault memory (five memory locations) with all relevant operating data at the moment of the fault
- Elapsed-hour counter for hours of operation (unit connected to power supply or DC 24 V) 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 analog setpoint and internal fixed setpoints
- External setpoint selections: DC (0 ... +10 V, –10 V ... +10 V, 0 ... 20 mA, 4 to 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
- Simple startup and parameter setting using the keypad or PC
- Pluggable memory module for quick unit replacement during service

System expansion

- Extensive expansion options, for example:
  - Removable plain text keypad with parameter memory
  - USB11A, 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, which removes the thermal load from the control cabinet and saves costs.

Standards / certificates

- UL, cUL, C-Tick approval. The MOVIDRIVE® MDR60A1320-503-00 unit does not have UL or cUL or C-Tick approval. The GOST-R certificate (Russia) is approved for the MOVIDRIVE® range of units.
- Safe disconnection of power and electronic connections according to EN 61800-5-1.
- Compliance with all the requirements for CE certification of machines and plant equipped with MOVIDRIVE® on the basis of the EC Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC. Compliance with EMC product standard EN 61800-3
- Complies with the safety requirement "Safe stop" according to EN 954-1, category 3
- Approved for use in applications for performance level d according to EN ISO 13849-1

1.3 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).

The following additional functions are available:

- Electronic cam
- Internal synchronous operation

	NOTE
	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 also have the option of importing 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® 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 the "electronic cam" function.

Motors and encoders

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.
  - DT/DV/D series AC motors with incremental encoder option, preferably high-resolution sin/cos encoder or HIPERFACE® encoder.
  - Synchronous servomotors DS/CM/CMD/CMP, 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 on CT/CV and DS/CM/CMD/CMP motors fulfill these requirements. SEW-EURODRIVE recommends using high-resolution sin/cos encoders as incremental encoders if DR/DT/DV/D motors are used.

Example

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

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Figure 2: Application example for the "electronic cam."

Internal synchronous operation

You can always use the MOVIDRIVE® range of units with "internal synchronous operation" whenever a group of motors has to be operated at a synchronous angle in relation to one another or with an adjustable proportional ratio (electronic gear). A user-friendly editor guides you through the startup procedure.

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."

Motors and encoders

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.
- DT/DV/D series AC motors with incremental encoder option, preferably high-resolution sin/cos encoder or HIPERFACE® encoder.
- Synchronous servomotors DS/CM/CMD/CMP, resolver (installed as standard) or HIPERFACE® encoder

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

Example

The figure below shows a typical application for the "internal synchronous operation." Extruder material must be cut to length. The saw receives a start signal and synchronizes with the material. During the sawing process, the saw moves synchronously with the material. At the end of the sawing process the saw moves back to its starting position.

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Figure 3: Typical application for the "internal synchronous operation" function

1.4 Application modules for MOVIDRIVE® MDX61B

The application

The drive application often involves more than just adjusting the speed of a motor. The inverter often has to control motion sequences and take on 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 incorporated into the MOVITOOLS® operating software and can be used with units in the technology version.

A user-friendly operator 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 these parameters to generate 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 know-how required
- No lengthy training, therefore quick project planning and startup
- Control of all movement functions is performed 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 be downloaded as PDFs from the SEW homepage.

Available application modules

The application modules currently available are listed below. These application modules are explained on 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:

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

Rotary motion:

- Module positioning via terminals: 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

Use

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

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Figure 4: Use in a high-bay warehouse

1. Hoist: Table positioning
2. Travel axis: Absolute value 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. Movement can either be linear or rotatory.

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 application modules for linear positioning, SEW-EURODRIVE distinguishes between whether the movement records are administered in the inverter or in the higher-level 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). These 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 for each positioning movement.
- The ramp can be set separately for each positioning movement.
- Software limit switches can be defined and evaluated.
- Either increment or absolute encoders can be evaluated.
- Guided startup and diagnostics.

There are 4 operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The machine zero is determined automatically for incremental position measurement.
- Teach-In: The saved position can be corrected without a programming device.
- Automatic mode: Higher-level PLC controls the process automatically.

Movement records in the PLC

- **Bus positioning**
- **Extended positioning via bus**

These application modules are suited to applications with a large number of different target positions.

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

- Any number of target positions can be defined and selected by means of a fieldbus/system bus.
- The travel speed can be selected as required via the fieldbus / system bus for each positioning movement.
- Software limit switches can be defined and evaluated.
- Either increment or absolute encoders can be evaluated.

- Straightforward connection to the machine control.
- Guided startup and diagnostics.

There are 3 operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Reference travel: The machine zero is determined automatically for incremental position measurement.
- Automatic mode: Higher-level PLC controls the process automatically.

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

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. This application module comes with the following range of features:

- Any number of target positions can be defined and selected by means of a field-bus/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 and diagnostics.

There are 2 operating modes for controlling the machine:

- Jog mode: The machine can be moved manually.
- Automatic mode: Higher-level PLC controls the process automatically.

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 or hoists, and rotary movements via rotary tables play an important role in these applications.

Rotary movements are often synchronized (circular transfer tables); the material is fed at a specific degree value. 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. The actual position is always in 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)
- Synchronous automatic mode

The "modulo positioning" module offers the following advantages:

- User-friendly user interface
- Only the parameters required for Modulo positioning (number of teeth in the gear unit, speed) have to be entered
- Guided parameter setting instead of complicated programming
- Monitor mode for optimum diagnosis
- Users 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 using 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 master controller (PLC).
- Guided startup and diagnostics.

There are 4 operating modes for controlling the machine:

- Jog mode: The machine can be moved to the right or the left manually.
- Teach-in run: The speed-dependent friction factors are determined automatically.
- Automatic mode with constant tension.
- Automatic mode with constant velocity.

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.

This application module is used to control the sequence of motion according to specific values. This application module comes with the following range of features:

- Choice of fieldbus or terminal control.
- Cut edge protection or sorting using the "pulling a gap" function.
- Immediate cut function by manual interrupt.
- Counter for material length.
- Straightforward connection to the machine control.
- Guided startup and diagnostics.

There are 4 operating modes for controlling the machine:

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

- **DriveSync via fieldbus**

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

- Guided startup as well as 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 SBus 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
  - Trolleys
  - Hoists
  - Rail vehicles
- Logistics
  - Storage and retrieval units
  - Transverse carriages

1.5 MOVITOOLS® operating software

Description

MOVITOOLS® is a program package comprising SHELL, SCOPE and the IPOS$^{plus®}$ Compiler. MOVITOOLS® can be used for the MOVIDRIVE® MDX60B/61B and MOVIDRIVE® *compact* range of units.

- SHELL can be used for starting up the drive and setting its parameters in a convenient way.
- 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.
- 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
- Windows® Me
- Windows® XP

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Figure 5: MOVITOOLS® window

2 Technical Data and Dimension Sheets

2.1 CE-marking, UL approval and C-Tick

CE marking

- Low voltage directive

  MOVIDRIVE® MDX60B/61B inverters comply with the regulations of the Low Voltage Directive 2006/95/EC.
- Electromagnetic compatibility (EMC)

  The designated use of MOVIDRIVE® inverters and regenerative power supply units is as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives." Provided the installation instructions are complied with, they satisfy the relevant requirements for the CE marking for the entire machine/system in which they are installed, on the basis of the EMC Directive 89/336/EEC. For detailed information on EMC compliant installation, refer to the publication "Electromagnetic Compatibility in Drive Engineering" from SEW-EURODRIVE.
- Compliance with limit classes C1 or C2 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 2006/95/EC. We can provide a declaration of conformity on request.

UL / cUL / GOST-R

UL, cUL approval (USA) and the GOST-R certificate (Russia) have been approved for the entire MOVIDRIVE® unit series. 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 ACMA (Australian Communications and Media Authority) standards.

2.2 General technical data

The following table lists the technical data applicable to all MOVIDRIVE® MDX60B/61B inverters, regardless of their type, version, size and performance.

MOVIDRIVE® MDX60B/61B	All sizes
Interference resistance	Complies with EN 61800-3
Interference emission with EMC compliant installation	Sizes 0 to 6 meet EN 61800-3 Sizes 0 to 5: According to limit value class C1 to EN 61800-3 with a corresponding line filter Sizes 0, 1, and 2 in accordance with limit value class C2 to EN 61800-3 without additional measures Size 6 in accordance with limit value class C2 to EN 61800-3 with corresponding line filter
Ambient temperature ϑ_U	0 °C...+50 °C at I_D = 100 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 125 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 100 % I_N and f_{PWM} = 8 kHz
I_N reduction Ambient temperature	2.5 % I_N per K between 40 °C - 50 °C 3 % I_N per K at 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
Cooling type (DIN 41751)	Forced cooling (temperature-controlled 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)
Duty cylce	Continuous operation with 50% overload capacity (size 0: 100 %)
Overvoltage category	III according to IEC 60664-1 (VDE 0110-1)
Pollution class	2 according to IEC 60664-1 (VDE 0110-1)
Installation altitude h	Up to h = 1000 m (3281 ft) without restrictions. At h ≥ 1000 m (3281 ft), the following restrictions apply: • from 1000 m (3281 ft) to max. 4000 m (13120 ft): – I_N reduction by 1% per 100 m (328 ft) • from 2,000 m (6562 ft) to max. 4000 m (13120 ft): – AC 230 V units: U_N reduction by AC 3 V per 100 m (328 ft) – AC 500 V units: U_N reduction by AC 6 V per 100 m (328 ft) Over 2000 m (6562 ft) only overvoltage class 2, external measures are required for overvoltage class 3. Overvoltage classes according to DIN VDE 0110-1.

1) In case of long-term storage, the unit must be connected to the mains voltage for at least 5 minutes, otherwise the unit's service life may be reduced.

MOVIDRIVE® MDX60B/61B series, size 0

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Figure 6: MOVIDRIVE® MDX60/61B series, size 0

MOVIDRIVE® MDX61B series, sizes 1 to 6

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Figure 7: MOVIDRIVE® MDX61B series, sizes 1 to 6

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

Size 0

MOVIDRIVE® MDX60/61B		0005-5A3-4-0_	0008-5A3-4-0_	0011-5A3-4-0_	0014-5A3-4-0_
Size		0S		0M	
INPUT					
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V -500 V			
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %			
Rated supply current[1] (at V_{supply} = 3 × AC 400 V)	I_{supply} 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_{supply} = 3 × AC 380...500 V)	S_N	1.4 kVA	1.6 kVA	2.1 kVA	2.8 kVA
Rated output current[1] (at V_{supply} = 3 × AC 400 V)	I_N	AC 2 A	AC 2.4 A	AC 3.1 A	AC 4 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 400 V and f_{PWM} = 4 kHz)	I_D	AC 2.5 A	AC 3 A	AC 3.8 A	AC 5 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 400 V and f_{PWM} = 8 kHz)	I_D	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..0.200 % adjustable			
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	68 Ω			
Output voltage	U_A	Max. V_{supply}			
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz			
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range			
GENERAL INFORMATION					
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	
Cross section of unit terminals X1, X2, X3, X4		Disconnectable terminal strip 4 mm^2 conductor end sleeve DIN 46228			
Tightening torque		0.6 Nm			

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B standard version Design with coated printed circuit boards	0005-5A3-4-00 0005-5A3-4-00/L	0008-5A3-4-00 0008-5A3-4-00/L	0011-5A3-4-00 0011-5A3-4-00/L	0014-5A3-4-00 0014-5A3-4-00/L
Part number	827 722 2 828 947 6	827 723 0 828 948 4	827 724 9 828 949 2	827 725 7 828 950 6
MDX61B Application version **Design with coated printed circuit boards**	**0005-5A3-4-0T** **0005-5A3-4-0T/L**	**0008-5A3-4-0T** **0008-5A3-4-0T/L**	**0011-5A3-4-0T** **0011-5A3-4-0T/L**	**0014-5A3-4-0T** **0014-5A3-4-0T/L**
Part number	827 726 5 828 951 4	827 727 3 828 952 2	827 728 1 828 953 0	827 729 X 828 954 9
Constant load **Recommended motor power** P_{Mot}	0.55 kW (0.74 HP)	0.75 kW (1.0 HP)	1.1 kW (1.5 HP)	1.5 kW (2.0 HP)
Variable torque load or constant load without overload **Recommended motor power** P_{Mot}	0.75 kW (1.0 HP)	1.1 kW (1.5 HP)	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)
Weight	2.0 kg (4.4 lb)		2.5 kg (5.5 lb)	
Dimensions **W × H × D**	45 mm × 317 mm × 260 mm (1.8 in x 12.5 in x 10.2 in)		67,5 mm × 317 mm × 260 mm (2.66 in x 12.5 in x 10.2 in)	

MDX61B standard version (VFC/CFC/SERVO) Design with coated printed circuit boards	0005-5A3-4-00 0005-5A3-4-00/L	0008-5A3-4-00 0008-5A3-4-00/L	0011-5A3-4-00 0011-5A3-4-00/L	0014-5A3-4-00 0014-5A3-4-00/L
Part number	827 730 3 828 955 7	827 731 1 828 956 5	827 732 X 828 957 3	827 733 8 828 958 1
MDX61B Application version (VFC/CFC/SERVO) **Design with coated printed circuit boards**	**0005-5A3-4-0T** **0005-5A3-4-0T/L**	**0008-5A3-4-0T** **0008-5A3-4-0T/L**	**0011-5A3-4-0T** **0011-5A3-4-0T/L**	**0014-5A3-4-0T** **0014-5A3-4-0T/L**
Part number	827 734 6 828 960 3	827 735 4 828 961 1	827 736 2 828 963 8	827 737 0 828 964 6
Weight	2.3 kg (5.1 lb)		2.8 kg (6.2 lb)	
Dimensions **W × H × D**	72.5 mm × 317 mm × 260 mm (2.85 in ×12.5 in ×10.2 in)		95 mm × 317 mm × 260 mm (3.7 in ×12.5 in ×10.2 in)	
Recommended motor power	→ section "Motor selection"			

Size 1 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0015-5A3-4-0_	0022-5A3-4-0_	0030-5A3-4-0_	0040-5A3-4-0_
INPUT					
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V			
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %			
Rated supply current[1] (at V_{supply} = 3 × AC 400 V)	I_{supply} 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_{supply} = 3 × AC 380...500 V)	S_N	2.8 kVA	3.8 kVA	4.9 kVA	6.6 kVA
Rated output current[1] (at V_{supply} = 3 × AC 400 V)	I_N	AC 4 A	AC 5.5 A	AC 7 A	AC 9.5 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 400 V and f_{PWM} = 4 kHz)	I_D	AC 5 A	AC 6.9 A	AC 8.8 A	AC 11.9 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 400 V and f_{PWM} = 8 kHz)	I_D	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	U_A	Max. V_{supply}			
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz			
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range			
GENERAL INFORMATION					
Power loss at S_N[2]	P_{Vmax}	85 W	105 W	130 W	180 W
Cooling air consumption		40 m^3/h			
Weight		3.5 kg (7.7 lb)			
Dimensions	W × H × D	105 mm × 314 mm × 234 mm (4.13 in ×12.4 in × 9.21 in)			
Cross section of unit terminals X1, X2, X3, X4		Disconnectable terminal strip 4 mm^2 conductor end sleeve DIN 46228			
Tightening torque		0.6 Nm			

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**	**0015-5A3-4-00** **0015-5A3-4-00/L**	**0022-5A3-4-00** **0022-5A3-4-00/L**	**0030-5A3-4-00** **0030-5A3-4-00/L**	**0040-5A3-4-00** **0040-5A3-4-00/L**
Part number	827 957 8 1840 013 2	827 958 6 1840 014 0	827 959 4 1840 015 9	827 960 8 1840 016 7
MDX61B Application version **Design with coated printed circuit boards**	**0015-5A3-4-0T** **0015-5A3-4-0T/L**	**0022-5A3-4-0T** **0022-5A3-4-0T/L**	**0030-5A3-4-0T** **0030-5A3-4-0T/L**	**0040-5A3-4-0T** **0040-5A3-4-0T/L**
Part number	827 975 6 1840 031 0	827 976 4 1840 032 9	827 977 2 1840 033 7	827 978 0 1840 034 5
Constant load **Recommended motor power** P_{Mot}	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.4 HP)
Variable torque load or constant load without overload **Recommended motor power** P_{Mot}	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.4 HP)	5.5 kW (7.4 HP)
Recommended motor power	→ section "Motor selection"			

Sizes 2S, 2 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0055-5A3-4-0_	0075-5A3-4-0_	0110-5A3-4-0_
Size		2S		2
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %		
Rated supply current[1] **(at V_{supply} = 3 × AC 400 V)**	I_{supply} 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_{supply} = 3 × AC 380...500 V)**	S_N	8.7 kVA	11.2 kVA	16.8 kVA
Rated output current[1] **(at V_{supply} = 3 × AC 400 V)**	I_N	AC 12.5 A	AC 16 A	AC 24 A
Continuous output current (= 125 % I_N)I_D **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)**		AC 15.6 A	AC 20 A	AC 30 A
Continuous output current (= 100 % I_N)I_D **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 8 kHz)**		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_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	47 Ω		22 Ω
Output voltage	U_A	Max. V_{supply}		
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range		
GENERAL INFORMATION				
Power loss at S_N[2]	P_{Vmax}	220 W	290 W	400 W
Cooling air consumption		80 m^3/h		
Weight		6.6 kg (15 lb)		
Dimensions	W × H × D	105 mm × 335 mm × 294 mm (4.13 in ×13.2 in ×11.6 in)		135 mm × 315 mm × 285 mm (5.31 in ×12.4 in ×11.2 in)
Cross section of unit terminals X1, X2, X3, X4		Terminal blocks 4 mm^2 conductor end sleeves DIN 46228		M4 screw and washer assembly with terminal clip 4 mm^2 conductor end sleeve DIN 46228 6 mm^2 crimp cable lug DIN 46234
Tightening torque		1.5 Nm		

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**		**0055-5A3-4-00** **0055-5A3-4-00/L**	**0075-5A3-4-00** **0075-5A3-4-00/L**	**0110-5A3-4-00** **0110-5A3-4-00/L**
Part number		827 961 6 1840 017 5	827 962 4 1840 018 3	827 963 2 1840 019 1
MDX61B Application version **Design with coated printed circuit boards**		**0055-5A3-4-0T**	**0075-5A3-4-0T**	**0110-5A3-4-0T**
Part number		827 979 9 1840 035 3	827 980 2 1840 036 1	827 981 0 1840 038 8
Constant load **Recommended motor power**	P_{Mot}	5.5 kW (7.4 HP)	7.5 kW (10 HP)	11 kW (15 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	7.5 kW (10 HP)	11 kW (15 HP)	15 kW (20 HP)
Recommended motor power		→ section "Motor selection"		

Size 3 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0150-503-4-0_	0220-503-4-0_	0300-503-4-0_
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %		
Rated supply current[1] (at V_{supply} = 3 × AC 400 V)	I_{supply} 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_{supply} = 3 × AC 380...500 V)	S_N	22.2 kVA	31.9 kVA	41.6 kVA
Rated output current[1] (at V_{supply} = 3 × AC 400 V)	I_N	AC 32 A	AC 46 A	AC 60 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)	I_D	AC 40 A	AC 57.5 A	AC 75 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 8 kHz)	I_D	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_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	15 Ω	12 Ω	
Output voltage	U_A	Max. V_{supply}		
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range		
GENERAL INFORMATION				
Power loss at S_N[2]	P_{Vmax}	550 W	750 W	950 W
Cooling air consumption		180 m^3/h		
Weight		15.0 kg (33 lb)		
Dimensions	W × H × D	200 mm × 465 mm × 308 mm (7.87 in ×18.3 in ×12.1 in)		
Cross section of unit terminals X1, X2, X3, X4		M6 screw with washer max. 25 mm^2 Crimp cable lug DIN 46234		
Tightening torque		3.5 Nm		

1) **The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.**
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**		**0150-503-4-00** **0150-503-4-00/L**	**0220-503-4-00** **0220-503-4-00/L**	**0300-503-4-00** **0300-503-4-00/L**
Part number		827 964 0 1840 020 5	827 965 9 1840 021 3	827 966 7 1840 022 1
MDX61B Application version **Design with coated printed circuit boards**		**0150-503-4-0T** **0150-503-4-0T/L**	**0220-503-4-0T** **0220-503-4-0T/L**	**0300-503-4-0T** **0300-503-4-0T/L**
Part number		827 982 9 1840 039 6	827 983 7 1840 041 8	827 984 5 1840 042 6
Constant load **Recommended motor power**	P_{Mot}	15 kW (20 HP)	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	22 kW (30 HP)	30 kW (40 HP)	37 kW (50 HP)
Recommended motor power		→ section "Motor selection"		

Size 4 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0370-503-4-0_	0450-503-4-0_
INPUT			
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V	
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %	
Rated supply current[1] **(at V_{supply} = 3 × AC 400 V)**	I_{supply} 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_{supply} = 3 × AC 380...500 V)**	S_N	51.1 kVA	62.3 kVA
Rated output current[1] **(at V_{supply} = 3 × AC 400 V)**	I_N	AC 73 A	AC 89 A
Continuous output current (= 125 % I_N) **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)**	I_D	AC 91 A	AC 111 A
Continuous output current (= 100 % I_N) **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 8 kHz)**	I_D	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	U_A	Max. V_{supply}	
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz	
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range	
GENERAL INFORMATION			
Power loss at S_N[2]	P_{Vmax}	1200 W	1450 W
Cooling air consumption		180 m^3/h	
Weight		27 kg (60 lb)	
Dimensions	W × H × D	280 mm × 522 mm × 307 mm (11.0 in ×20.6 in ×12.1 in)	
Cross section of unit terminals X1, X2, X3, X4		M10 bolt with nut Max. 70 mm^2 Press cable lug DIN 46235	
Tightening torque		14 Nm	

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**		**0370-503-4-00** **0370-503-4-00/L**	**0450-503-4-00** **0450-503-4-00/L**
Part number		827 967 5 1840 024 8	827 968 3 1840 025 6
MDX61B Application version **Design with coated printed circuit boards**		**0370-503-4-0T** **0370-503-4-0T/L**	**0450-503-4-0T** **0450-503-4-0T/L**
Part number		827 985 3 1840 043 4	827 986 1 1840 044 2
Constant load **Recommended motor power**	P_{Mot}	37 kW (50 HP)	45 kW (60 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	45 kW (60 HP)	55 kW (74 HP)
Recommended motor power		→ section "Motor selection"	

Size 5 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0550-503-4-0_	0750-503-4-0_
INPUT			
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V	
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %	
Rated supply current[1] **(at V_{supply} = 3 × AC 400 V)**	I_{supply} 100% 125 %	AC 94.5 A AC 118.1 A	AC 117 A AC 146.3 A
OUTPUT			
Apparent output power[2] **(at V_{supply} = 3 × AC 380...500 V)**	S_N	73.5 kVA	91.0 kVA
Rated output current[1] **(at V_{supply} = 3 × AC 400 V)**	I_N	AC 105 A	AC 130 A
Continuous output current (= 125 % I_N) **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)**	I_D	AC 131 A	AC 162 A
Continuous output current (= 100 % I_N) **(at V_{supply} = 3 × AC 400 V with f_{PWM} = 8 kHz)**	I_D	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	U_A	Max. V_{supply}	
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz	
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range	
GENERAL INFORMATION			
Power loss at S_N[2]	P_{Vmax}	1700 W	2000 W
Cooling air consumption		360 m^3/h	
Weight		35 kg (77 lb)	
Dimensions	W × H × D	280 mm × 610 mm × 330 mm (11.0 in ×24.0 in × 13.0 in)	
Cross section of unit terminals X1, X2, X3, X4		M10 bolt with nut Max. 70 mm^2 Press cable lug DIN 46235	
Tightening torque		14 Nm	

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**		**0550-503-4-00** **0550-503-4-00/L**	**0750-503-4-00** **0750-503-4-00/L**
Part number		827 969 1 1840 026 4	827 970 5 1840 027 2
MDX61B Application version **Design with coated printed circuit boards**		**0550-503-4-0T** **0550-503-4-0T/L**	**0750-503-4-0T** **0750-503-4-0T/L**
Part number		827 988 8 1840 045 0	827 989 6 1840 046 9
Constant load **Recommended motor power**	P_{Mot}	55 kW (74 HP)	75 kW (100 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	75 kW (100 HP)	90 kW (120 HP)
Recommended motor power		→ section "Motor selection"	

Size 6 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0900-503-4-0_	1100-503-4-0_	1320-503-4-0_
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %		
Rated supply current[1] (at V_{supply} = 3 × AC 400 V)	I_{supply} 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_{supply} = 3 × AC 380...500 V)	S_N	118 kVA	139 kVA	174 kVA
Rated output current[1] (at V_{supply} = 3 × AC 400 V)	I_N	AC 170 A	AC 200 A	AC 250 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)	I_D	AC 212 A	AC 250 A	AC 312 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)	I_D	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_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	2.7 Ω		
Output voltage	U_A	Max. V_{supply}		
PWM frequency	f_{PWM}	Can be set: 4 or 8 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range		
GENERAL INFORMATION				
Power loss at S_N[2]	P_{Vmax}	2300 W	2500 W	2700 W
Cooling air consumption		600 m^3/h		
Weight		60 kg (130 lb)		
Dimensions	W × H × D	280 mm × 1000 mm × 382 mm (11.0 in ×39.37 in × 15.0 in		
Cross section of unit terminals X1, X2, X3, X4		M12 bolt with nut Max. 185 mm^2 Press cable lug DIN 46235		
Tightening torque		20 Nm		

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version **Design with coated printed circuit boards**		**0900-503-4-00** **0900-503-4-00/L**	**1100-503-4-00** **1100-503-4-00/L**	**1320-503-4-00** **1320-503-4-00/L**
Part number		827 971 3 1840 028 0	827 972 1 1840 029 9	827 974 8 1840 030 2
MDX61B Application version **Design with coated printed circuit boards**		**0900-503-4-0T** **0900-503-4-0T/L**	**1100-503-4-0T** **1100-503-4-0T/L**	**1320-503-4-0T** **1320-503-4-0T/L**
Part number		827 991 8 1840 047 7	827 992 6 1840 048 5	827 993 4 1840 049 3
Constant load **Recommended motor power**	P_{Mot}	90 kW (120 HP)	110 kW (148 HP)	132 kW (177 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	110 kW (148 HP)	132 kW (177 HP)	160 kW (215 HP)
Recommended motor power		→ section "Motor selection"		

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

Size 1 (AC 230 V units)

MOVIDRIVE® MDX61B		0015-2A3-4-0_	0022-2A3-4-0_	0037-2A3-4-0_
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 200 V - 240 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %		
Rated supply current (at V_{supply} = 3 × AC 230 V)	I_{supply} **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_{supply} = 3 × AC 230..0.240 V)	S_N	2.7 kVA	3.4 kVA	5.8 kVA
Rated output current (at V_{supply} = 3 × AC 230 V)	I_N	AC 7.3 A	AC 8.6 A	AC 14.5 A
Continuous output current (= 125 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)		AC 9.1 A	AC 10.8 A	AC 18.1 A
Continuous output current (= 100 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 8 kHz)		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_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	27 Ω		
Output voltage	U_A	Max. V_{supply}		
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range		
GENERAL INFORMATION				
Power loss at S_N[1]	P_{Vmax}	110 W	126 W	210 W
Cooling air consumption		40 m^3/h		
Weight		2.8 kg (6.2 lb)		
Dimensions	**W × H × D**	105 mm × 314 mm × 234 mm (4.13 in × 12.4 in × 9.21 in)		
Cross section of unit terminals X1, X2, X3, X4		Separable terminal block 4 mm^2 conductor end sleeve DIN 46228		
Tightening torque		0.6 Nm		

1) The performance data applies to f_{PWM} = 4 kHz.

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 **Recommended motor power**	P_{Mot}	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	5.0 kW (6.7 HP)
Recommended motor power		→ section "Motor selection"		

Size 2 (AC 230 V units)

MOVIDRIVE® MDX61B		0055-2A3-4-0_	0075-2A3-4-0_
INPUT			
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 200 V - 240 V	
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %	
Rated supply current (at V_{supply} = 3 × AC 230 V)	I_{supply} **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_{supply} = 3 × AC 230..0.240 V)	S_N	8.8 kVA	11.6 kVA
Rated output current (at V_{supply} = 3 × AC 230 V)	I_N	AC 22 A	AC 29 A
Continuous output current (= 125 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)		AC 27.5 A	AC 36.3 A
Continuous output current (= 100 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 8 kHz)		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_{max} = 0...150 % adjustable	
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	12 Ω	
Output voltage	U_A	Max. V_{supply}	
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz	
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range	
GENERAL INFORMATION			
Power loss at S_N[1]	P_{Vmax}	300 W	380 W
Cooling air consumption		80 m^3/h	
Weight		5.9 kg (13 lb)	
Dimensions	**W × H × D**	135 mm × 315 mm × 285 mm (5.31 in ×12.4 in ×11.2 in)	
Cross section of unit terminals X1, X2, X3, X4		M4 screw and washer assembly with terminal clip 4 mm^2 conductor end sleeve DIN 46228 6 mm^2 crimp cable lug DIN 46234	
Tightening torque		0.6 Nm	

1) The performance data applies to f_{PWM} = 4 kHz.

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 **Recommended motor power**	P_{Mot}	5.5 kW (7.4 HP)	7.5 kW (10 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	7.5 kW (10 HP)	11 kW (15 HP)
Recommended motor power		→ section "Motor selection"	

Size 3 (AC 230 V units)

MOVIDRIVE® MDX61B		0110-203-4-0_	0150-203-4-0_
INPUT			
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 200 V - 240 V	
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %	
Rated supply current (at V_{supply} = 3 × AC 230 V)	I_{supply} **100 %** **125 %**	AC 40 A AC 50 A	AC 49 A AC 61 A
OUTPUT			
Apparent output power[1] (at V_{supply} = 3 × AC 230..0.240 V)	S_N	17.1 kVA	21.5 kVA
Rated output current (at V_{supply} = 3 × AC 230 V)	I_N	AC 42 A	AC 54 A
Continuous output current (= 125 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)		AC 52.5 A	AC 67.5 A
Continuous output current (= 100 % I_N)I_D (at V_{supply} = 3 × AC 230 V with f_{PWM} = 8 kHz)		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	U_A	Max. V_{supply}	
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz	
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range	
GENERAL INFORMATION			
Power loss at S_N[1]	P_{Vmax}	580 W	720 W
Cooling air consumption		180 m^3/h	
Weight		14.3 kg (31.5 lb)	
Dimensions	**W × H × D**	200 mm × 465 mm × 308 mm (7.87 in ×18.3 in ×12.1 in)	
Cross section of unit terminals X1, X2, X3, X4		M6 screw and washer assembly with washer max. 25 mm^2 Crimp cable lug DIN 46234	
Tightening torque		3.5 Nm	

1) The performance data applies to f_{PWM} = 4 kHz.

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 **Recommended motor power**	P_{Mot}	11 kW (15 HP)	15 kW (20 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	15 kW (20 HP)	22 kW (30 HP)
Recommended motor power		→ section "Motor selection"	

Size 4 (AC 230 V units)

MOVIDRIVE® MDX61B		0220-203-4-0_	0300-203-4-0_
INPUT			
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 200 V - 240 V	
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %	
Rated supply current (at V_{supply} = 3 × AC 230 V)	I_{supply} 100 % 125 %	AC 72 A AC 90 A	AC 86 A AC 107 A
OUTPUT			
Apparent output power[1] (at U_{supply} = 3 × AC 230...240 V)	S_N	31.8 kVA	37.8 kVA
Rated output current (at V_{supply} = 3 × AC 230 V)	I_N	AC 80 A	AC 95 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)	I_D	AC 100 A	AC 118 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)	I_D	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_{max} = 0...150 % adjustable	
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	3 Ω	
Output voltage	U_A	Max. V_{supply}	
PWM frequency	f_{PWM}	Can be set: 4/8/12/16 kHz	
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 rpm / 0.2 rpm across the entire range	
GENERAL INFORMATION			
Power loss at S_N[1]	P_{Vmax}	1100 W	1300 W
Cooling air consumption		180 m^3/h	
Weight		26.3 kg (57 lb)	
Dimensions	W × H × D	280 mm × 522 mm × 307mm (11.0 in ×20.6 in ×12.1 in)	
Cross section of unit terminals X1, X2, X3, X4		M10 bolt with nut max. 70 mm^2 Press cable lug DIN 46235	
Tightening torque		3.5 Nm	

1) The performance data applies to f_{PWM} = 4 kHz.

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 **Recommended motor power**	P_{Mot}	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload **Recommended motor power**	P_{Mot}	30 kW (40 HP)	37 kW (50 HP)
Recommended motor power		→ section "Motor selection"	

2.5 MOVIDRIVE® MDX60/61B electronics data

MOVIDRIVE® MDX60/61B	General electronics data	
Voltage supply X11:1 for setpoint input 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 X11:2/X11:3	AI11/AI12: Voltage or current input, can be set with S11 and P11_, sampling interval 1 ms	
(differential input) Operating mode AI11/AI12 Resolution Internal resistance	Voltage input: n1 = DC 0...+10 V or DC –10 V...0...+10 V 12 bit R_i = 40 kΩ (external voltage supply) R_i = 20 kΩ (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 rpm Parameter set 2: n21/n22/n23 = –6000...0...+6000 rpm	
Time ranges of the speed ramps at Δn = 3000 rpm	1. Ramp t11/t21 Up: 0...2000 s Down: 0..2000 s 2. Ramp t12/t22 Up = down: 0...2000 s Stop ramp t13/t23 Down: 0...20 s Emergency ramp t14/t24 Down: 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: U_{IN} = DC 24 V –15 % / +20 % according 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 DIØØ...DIØ5 and DIØ6/DIØ7 $R_i \approx$ 3 kΩ, $I_E \approx$ DC 10 mA	
Signal level	DC +13 V...+30 V= "1" = Contact closed DC–3 V...+5 V = "0" = Contact open	according to EN 61131
Function X13:1 X13:2...X13:6, X16:1/X16:2	DIØØ: fixed assigned with "/Controller inhibit" DIØ1...DIØ5, DIØ6/DIØ7: Selection option → Parameter menu P60_	
Binary outputs[1)] X10:3/X10:7 and X16:3...X16:5	PLC-compatible (EN 61131-2), response time 1ms DBØØ/DOØ2 and DOØ3...DOØ5	
Signal level	"0" = DC 0 V "1" = DC +24 V **Caution:** Do not apply external voltage!	
Function X10:3 X10:7, X16:3...X16:5	DBØØ: With fixed assignment "/Brake", I_{max} = DC 150 mA, short-circuit proof, protected against external voltage to DC 30 V DOØ2, DOØ3...DOØ5: Selection option → Parameter menu P62_, I_{max} = DC 50 mA, short-circuit proof, protected against external voltage to DC 30 V	
Relay output X10:4...X10:6	DOØ1: Load capacity of the relay contacts U_{max} = DC 30 V, I_{max} = DC 800 mA	
Function X10:4 X10:5 X10:6	DOØ1-C: Shared relay contact DOØ1-NO: Normally open contact DOØ1-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 according to CAN specification 2.0, parts A and B, transmission technology according 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 kΩ ± 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 (DIØØ...DIØ5 and DIØ6/DIØ7)	
Permitted cable 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).

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 of the same unit; **it cannot be used** to supply other units. SOV24: Reference potential for DC+24 V input "Safe stop" (safety contact) SVI24: DC+24 V input "Safe stop" (safety contact)
Permitted cable cross section		One core per terminal: 0.08...1.5 mm^2 (AWG 28...16) Two cores per terminal: 0.25 ... 1.0 mm^2 (AWG 23...17)
Power consumption X17:4		Size 0: 3 W Size 1: 5 W Size 2, 2S: 6 W Size 3: 7.5 W Size 4: 8 W Size 5: 10 W Size 6: 6 W
Input capacitance X17:4		Size 0: 27 µF Sizes 1...6: 270 µF
Time for restart Time to inhibit output stage		t_A = 200 ms t_S = 200 ms
Signal level		DC +19.2 V...+30 V= "1" = Contact closed DC–30 V...+5 V = "0" = Contact open

2.6 MOVIDRIVE® MDX60B dimension sheets

Size 0S

53019CXX

Figure 8: Dimensions for MDX60B size 0S, dimensions in mm (in)

Size 0S with braking resistor installed

53020CXX

Figure 9: Dimensions for MDX60B size 0S with braking resistor, dimensions in mm (in)

Size 0M

53022CXX

Figure 10: Dimensions for MDX60B size 0M, dimensions in mm (in)

Size 0M with braking resistor

53023CXX

Figure 11: Dimensions for MDX60B size 0M with braking resistor, dimensions in mm (in)

2.7 MOVIDRIVE® MDX61B dimension sheets

	NOTE
	For MOVIDRIVE® MDX61B size 0, installing a braking resistor does not affect the dimensions. Therefore, MOVIDRIVE® MDX61B size 0 dimensions are displayed without an installed braking resistor.

Size 0S

Figure 12: Dimensions for MDX61B size 0S, dimensions in mm (in)

Size 0M

Figure 13: Dimensions for MDX61B size 0M, dimensions in mm (in)

Size 1

52274CXX

Figure 14: Dimensions for MDX61B size 1, dimensions in mm (in)

Size 2S

Figure 15: Dimensions for MDX61B size 2S, dimensions in mm (in)

Size 2

Figure 16: Dimensions for MDX61B size 2, dimensions in mm (in)

Size 3

Figure 17: Dimensions for MDX61B size 3, dimensions in mm (in)

Size 4

Figure 18: Dimensions for MDX61B size 4, dimensions in mm (in)

Size 5

Figure 19: Dimensions for MDX61B size 5, dimensions in mm (in)

Size 6

58389CXX

Figure 20: Dimensions for MDX61B size 6, dimensions in mm (in)

2.8 MOVIDRIVE® MDR60A regenerative power supply units

In MOVIDRIVE® 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® inverter with electrical power from the supply system in motor operation and returns regenerative power to the supply system in regenerative operation.

UL approval

UL and cUL approval has been granted for the entire MOVIDRIVE® MDR60A0370-503-00 and MDR60A0750-503-00 range of units. cUL is equivalent to CSA approval. The MOVIDRIVE® MDR60A1320-503-00 unit does not have UL or cUL approval.

Protection and monitoring functions

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

54512AXX

Figure 21: MOVIDRIVE® MDR60A regenerative power supply units

Features of a regenerative power supply unit compared to an inverter with braking resistors

- Energy balance: Regenerative power is fed back into the supply system instead of being converted into waste heat.
- Less installation work for several inverters (network and braking resistor connections). However, a braking resistor is required to bring 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.

General technical data

MOVIDRIVE® MDR60A	**0370-503-00 (size 3)** **0750-503-00 (size 4)**	**1320-503-00 (size 6)**
Interference resistance	Complies with EN 61800-3	Meets EN 61000-6-1 and EN 61000-6-2
Interference emission with EMC-compliant installation	Conforms to EN 61800-3 • With NF085-503 line filter (size 3) • With NF150-503 line filter (size 4)	Meets EN 61000-6-4 with line filter NF300-503
Ambient temperature ϑ_U **I_N reduction ambient temperature**	0 °C...+40 °C I_N reduction: 3 % I_N per K to max. 60 °C	0 °C...+40 °C I_N reduction: 3 % I_N per K to max. 55 °C
Climate class	EN 60721-3-3, class 3K3	
Storage temperature[1] ϑ_L	–25 °C...+70 °C (EN 60721-3-3, class 3K3)	–25 °C...+55 °C (EN 60721-3-3, class 3K3)
Cooling type (DIN 41751)	Forced cooling (temperature-controlled fan, response threshold 50 °C)	Forced cooling (temperature-controlled fan, response threshold 45 °C)
Degree of protection EN 60529 (NEMA1) **Size 3** **Size 4**	IP20 IP00 (power connections) IP10 (power connections) • With fitted plexiglass cover supplied as standard • With fitted shrink tubing (not included in scope of delivery)	IP20
Duty cylce	Continous duty with 50 % overload	
Overvoltage category	III according to IEC 60664-1 (VDE 0110-1)	
Pollution class	2 according to IEC 60664-1 (VDE 0110-1)	
Installation altitude	Up to h = 1000 m (3281 ft) without restrictions. At h ≥ 1000 m (3281 ft), the following restrictions apply: • from 1000 m (3281 ft) to max. 4000 m (13120 ft): – I_N reduction by 1% per 100 m (328 ft) • From 2000 m (6562 ft) to max. 4000 m (13120 ft): – U_N reduction by AC 6 V per 100 m (328 ft) Over 2000 m (6562 ft) only overvoltage class 2, external measures are required for overvoltage class 3. Overvoltage classes according to DIN VDE 0110-1.	h ≤ 1000 m (3281 ft): No limitation from 1000 m (3281 ft) to max. 4000 m (13120 ft): I_N reduction: 0.5 % per 100 m (328 ft)

1) In case of long-term storage, the unit must be connected to the mains voltage for at least 5 minutes, otherwise the unit's service life may be reduced.

Technical data for MOVIDRIVE® MDR60A regenerative power supply

MOVIDRIVE® MDR60A	0370-503-00 (size 3)	0750-503-00 (size 4)	1320-503-00 (size 6)
Part number	826 658 1	826 556 9	827 952 7
INPUT			
Rated mains voltage (according to EN 50160) V_{supply}	3 × AC 380 V - 500 V		
Supply frequency f_{supply}	50 Hz - 60 Hz ±5 %		40 Hz - 60 Hz ±10 %
Rated connected load P_N	37 kW	75 kW	132 kW
Rated supply current (at V_{supply} = 3 × AC 400 V) I_{supply}	AC 66 A	AC 117 A	AC 260 A
DC LINK			
Apparent output power (at U_{supply} = 3 × AC 380..0.500 V) S_A	50 kVA	90 kVA	173 kVA
DC link voltage $U_{DC\ link}$	DC 560 V - 780 V		
Rated DC link current $I_{DC\ link}$	DC 70 A	DC 141 A	DC 340 A
Max. DC link current I_{DClink_max}	DC 105 A	DC 212 A	DC 410 A
GENERAL INFORMATION			
Power loss at P_N P_{Vmax}	950 W	1700 W	2650 W
Cooling air consumption	180 m^3/h	360 m^3/h	700 m^3/h
Connection for power terminals X1, X2 (L1, L2, L3 for size 6) **Permitted tightening torque** **Permitted cable cross section**	M6 screw with washer 3.5 Nm (31 in-lb) 25 mm^2 (AWG4)	M10 terminal studs 14 Nm (120 in-lb) 70 mm^2 (AWG2/0)	M10 terminal studs 3.5 Nm 25 mm^2 (AWG4)
Connection for DC link connection ±UG **Permitted cable cross section** **Permitted tightening torque**	-	-	150 mm^2 (power supply connection) / 30 Nm (270 in-lb)[1)] 185 mm^2 (power supply connection) / 32 Nm (280 in-lb)[1)]
Connection for electronics terminalsX3 (X2 for size 6)	Permitted cable cross section: • One conductor per terminal: 0.20...2.5 mm^2 (AWG24...13) • Two conductors per terminal:0.25...1 mm^2 (AWG23...17)		Permitted cable cross section: • 0.8...4 mm^2 (AWG18...12)
Weight	16 kg (35 lb)	24 kg (53 lb)	90 kg (200 lb)
Dimensions W × H × D	200 mm × 465 mm × 221 mm (7.87 in x 18.3 in x 8.7 in)	280 mm × 522 mm × 205 mm (11 in x 20.6 in x 8.07 in)	380 mm × 937 mm × 395 mm (15 in x 36.9 in x 15.6 in)
Line choke (always required)	ND085-013 L_N = 0.1 mH Part number 826 014 1	ND200-0033 L_N = 0.03 mH Part number 826 579 8	Already installed
Line filter (optional)	NF085-503, part number 827 415 0	NF150-503, part number 827 417 7	NF300-503, part number 827 419 3
For MOVIDRIVE® MDX60B/61B...-5_3	0005 ... 0370	0005 ... 0750	0005 ... 1320

1) Important: Do not apply tightening torque directly at terminals L1, L2, L3 and ±UG; use a second wrench.

Dimension drawings for MDR60A

Provide at least 100 mm clearance above and below the unit. There is no need for clearance at the sides. You can line up the units directly next to one another. With sizes 4 and 6, do not install any components that are sensitive to high temperatures within 300 mm (11.8 in) of the top of the unit, for example contactors or fuses.

54260CXX

Figure 22: Dimension drawing, MDR60A size 3, dimensions in mm (in)

54261CXX

Figure 23: Dimension drawing, MDR60A size 4, dimensions in mm (in)

54282CXX

Figure 24: Dimension drawing, MDR60A size 6, dimensions in mm (in)

DC link connection

SEW-EURODRIVE 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 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

NOTE

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.

2.9 IPOS$^{plus®}$

Description

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

The IPOS$^{plus®}$ sequence control system makes it possible to run a user program, disregarding any 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 (startup 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

With encoder feedback only

- 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, JERK LIMITED, SINE and SQUARE
- 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

Max. program length of task 1, task 2 and task 3	**Total of ca. 3200 program lines**
Command processing time per program line	Task 1, 2: 1 ... 11 commands/ms can be configured Task 3: At least 1 command/ms (typical is 40 commands/ms)
Variables	1024, of which 128 (0 ... 127) can be stored to non-volatile memory; range of values: -2^{31}...$+(2^{31}-1)$
Touch probe inputs	2 inputs, processing time < 100 µs
Sampling interval of digital and analog inputs	1 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)

2.10 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 variants	Part number
56555AXX	**DBG60B-01**	DE/EN/FR/IT/ES/PT/NL (German / English / French / Italian / Spanish / Portuguese / Dutch)	1820 403 1
	DBG60B-02	DE / EN / FR / FI / SV / DA / TR (German / English / French / Finnish / Swedish / Danish / Turkish)	1820 405 8
	DBG60B-03	DE/EN/FR/RU/PL/CS (German / English / French / Russian / Polish / Czech)	1820 406 6
	DBG60B-04	DE / EN / FR / ZH (German / English / French / Chinese)	1820 850 9
	Door installation set[1)]	**Description (= scope of delivery)**	**Part number**
	DBM60B	• Housing for DBG60B (IP65) • DKG60B extension cable, length 5 m	824 853 2
	Extension cables	**Description (= scope of delivery)**	**Part number**
	DKG60B	• Length 5 m • 4-core, shielded cable	817 583 7

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

Functions

- Display process values and status
- Status displays of the binary inputs / outputs
- Error memory and error 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 of MOVIDRIVE® B and MOVITRAC® B
- Manual operation of MOVIMOT® (→ Decentralized technology documentation)

Features

- Illuminated text display, range of 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 into MOVIDRIVE®
- Can be connected via extension cable DKG60B (5 m [16.4 ft])
- Degree of protection IP40 (EN 60529)

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

Dimension drawing for DBG60B

Dimensions in mm (in)

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.

62899AXX

Figure 25: Dimension drawing for DBG60B housing, dimensions in mm (in)

2.11 DMP11B mounting 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 mounting panel. New retaining holes do not have to be drilled.

2.12 DLB11B touch guard option

Part number 823 111 7 (12 pieces included in the scope of delivery)

Description

63233AXX

Degree of protection IP20 can be achieved with touch guard DLB11B for MOVIDRIVE® MDX61B sizes 4 and 5 (AC 500 V units: MDX61B0370/0450/0550/0750; AC 230 V units: MDX61B0220/0300).

2.13 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 synchronous encoder. The input for the external encoder can also be used as an output for incremental encoder simulation.

Electronics data

Option DEH11B			
 11870AXX	Output for incremental encoder simulation or external encoder input X14:	Output for incremental encoder simulation: • Signal level to RS422 • The number of pulses is the same as on X15 motor encoder input	External encoder input (max. 200 kHz): Permitted encoder types: • HIPERFACE® encoder • sin/cos encoder AC 1 V_{SS} • TTL encoder with negated tracks • Encoder with signal level to RS422 Encoder power supply: • DC+12 V (tolerance range DC 10.5 - 13 V) • I_{max} = DC 650 mA[1)]
	Motor encoder inputX15:	Permitted encoder types: • HIPERFACE® encoder • sin/cos encoder AC 1 V_{SS} • TTL encoder with negated tracks • Encoder with signal level to RS422 • Permitted resolution: 128/256/512/1024/2048 increments Encoder power supply: • DC+12 V (tolerance range DC 10.5 - 13 V) • I_{max} = DC 650 mA[1)]	

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

2.14 Absolute encoder card option type DEH21B/DIP11B

Part numbers

- DEH21B: 1820 818 5
- DIP11B: 824 969 5

Description

The DEH21B and DIP11B options extend the MOVIDRIVE® B 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 with the DIP1B option.
- 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 for DEH21B

DEH21B option		
 11935AXX	Motor encoder connection X15:	Permitted encoder types: • HIPERFACE® encoder • sin/cos encoder AC 1 V_{SS} • TTL encoder with negated tracks • Encoder with signal level to RS422 • Permitted resolution: 128/256/512/1024/2048 increments Encoder power supply: , • DC+12 V (tolerance range DC 10.5 ... 13 V) • I_{max} = DC 650 mA
	Encoder connection X62:	SSI encoder input
	Power supply connection X60:1	24VIN: DC 24 V power supply for encoder connected to X62
	Reference terminal X60:2	Reference potential 24VIN

Electronics data for DIP11B

DIP11B option		
 11884AXX	Connection binary inputs X60:1 ... 8	DI10 ... DI17 isolated via optocoupler, PLC compatible (EN 61131), scanning time 1 ms
	Internal resistance Signal level (EN 61131) Function X60:1 ... 8	$R_i \approx$ 3 kΩ , $I_E \approx$ DC 10 mA DC+13 V ... +30 V = "1" / DC–3 V ... +5 V = "0" DI10 ... DI17: Selection option → Parameter menu P61_
	Connection binary outputs X61:1 ... 8	DO10 ... DO17, PLC-compatible (EN 61131), short-circuit proof and protected against external voltage to DC 30 V Response time 1 ms
	Signal level (EN 61131) Function X61:1 ... 8	DC +24 V = "1" DC 0 V = "0" **Important**: Do not apply external voltage! DO10 ... DO17: Selection option → Parameter menu P63_
	Encoder connection X62:	SSI encoder input
	Reference terminals X60:9 X60:10	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
	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)
	Voltage input X61:9	24VIN: Supply voltage DC+24 V for binary outputs DO10 ... DO17 and encoder (mandatory)

2.15 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 synchronous encoder. The input for the external encoder can also be used as an output for incremental encoder simulation.

Electronics data

DER11B option			
 11871AXX	Output for incremental encoder simulation or external encoder input X14:	Output for incremental encoder simulation: Signal level to RS422 The number of pulses is 1024 pulses/revolution	External encoder input (max. 200 kHz): Permitted encoder types: • HIPERFACE® encoder • sin/cos encoder AC 1 V_{SS} • TTL encoder with negated tracks • Encoder with signal level to RS422 Encoder power supply: • DC+12 V (tolerance range DC 10.5 - 13 V) • I_{max} = DC 650 mA
	Motor encoder input X15:	Resolver 2-pole, U_{ref} = AC 3.5 V_{eff}, 4 kHz U_{in} / U_{ref} = 0.5	
	Maximum cable length:	100 m (328 ft)	

2.16 Connector adapter for unit replacement MD_60A - MDX60B/61B

The following 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

  If the TF/TH option is connected to X10 when using MOVIDRIVE® MD_A, then X10 can be directly replugged. The jumper between X10:1 and X10:2 must be removed if a TF/TH option is connected to encoder input X15. 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 socket, you will either have to convert the encoder cable or use the encoder adapter. The encoder adapter DAE15B for connecting sin/cos and TTL encoders can be inserted directly between the existing encoder cable with a 9-pin connector and the 15-pin socket on DEH11B. This step makes for fail-safe and fast connection of existing drives. HTL encoders have to be connected to MOVIDRIVE® B with the DWE11B/12B option (→ section "DWE11B/12B interface adapter option).

DAE15B

54585AXX

Length of DAE15B: 200 mm ± 20 mm (7.87 in ± 0.79 in)

Cable cross section: 6 x 2 x 0.25 mm^2 (AWG 23)

Terminal of the 15-pin sub D connector (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
8	Brown (BN)	5
9	Green (GN)	6
10	Blue (BU)	7
11	Gray (GY)	8
15	White (WH)	9

- 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 socket. Since the DEH11B and DER11B options for MOVIDRIVE® MDX61B come equipped with a 15-pin plug, you will either have to rework the encoder cable or use the DAE14B encoder adapter. The DAE14B encoder adapter can be plugged directly between the existing encoder cable with 9-pin socket and the 15-pin connector on the DEH11B//DER11B option. This step makes for fail-safe and fast connection of existing drives.

DAE14B

54586AXX

Length of DAE14B: 200 mm ± 20 mm (7.87 in ± 0.79 in)

Cable cross section: 6 x 2 x 0.25 mm^2 (AWG 23)

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

2.17 Interface adapter option type DWE11B/12B

Part number and description

- DWE11B, part number 188 187 6

  The interface adapter DWE11B (HTL→TTL) in the form of an adapter cable is used **to connect single-ended HTL encoders to the DEH11B/DEH21B option**. Only the A, B and C tracks are connected. The interface adapter is suitable for all HTL encoders that were operated on MOVIDRIVE® A, MDV and MCV and can be connected without any rewiring effort.

58748AXX

[A] 5 x 2 x 0.25 mm^2 (AWG 23) / length 1000 mm (39.37 in) /
Max. line length inverter - encoder: 100 m (328 ft)

[B] DC 24 V connection for HTL encoder; 1 x 0.5 mm^2 (AWG 20) / length 250 mm (9.84 in)

Signal	Terminal of 9-pin sub D socket [C] (encoder end)
A	1
B	2
C	3
UB	9
GND	5

- DWE12B, part number 188 180 9

  The interface adapter DWE12B (HTL→TTL) in the form of an adapter cable is used **to connect single-ended HTL encoders to the DEH11B/DEH21B option**. In addition to the A, B and C track, you will also have to connect the negated tracks ($\overline{A}$, $\overline{B}$, $\overline{C}$). SEW-EURODRIVE recommends using this interface adapter for any new system.

58748XX

[A] 4 x 2 x 0.25 mm^2 (AWG 23 / length 1000 mm (39.37 in)

Max. line length inverter - encoder: 200 m (656 ft)

[B] DC 24 V connection for HTL encoder; 1 x 0.5 mm^2 (AWG 20) / length 250 mm (9.84 in)

Signal	Terminal of 9-pin sub D socket [C] (encoder end)
A	1
$\overline{A}$	6
B	2
$\overline{B}$	7
C	3
$\overline{C}$	8
UB	9
GND	5

2.18 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} = DC 50 mA).

RS232 interface

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

RS485 interface

Max. 32 MOVIDRIVE® units can be networked for communication (max. line length 200 m) via the RS485 interface of the UWS11A. Do not connect external terminating resistors because dynamic terminating resistors are already installed!

Permitted cable cross section: One core per terminal 0.20...2.5 mm^2 (AWG 24...12)
Two cores per terminal 0.20...1 mm^2 (AWG 24...17)

Dimension drawing

Dimensions, UWS11A, in mm (in)

59322BXX

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

Technical data

UWS11A	
Part number	822 689 X
Ambient temperature	0 ... 40 °C
Storage temperature	–25 °C ... +70 °C (according to EN 60721-3-3, class 3K3)
Degree of protection	IP20
Current consumption	max. DC 50 mA
Weight	150 g (0.35 lb)
Dimensions	83 mm x 75 mm x 22.5 mm (3.3 in x 3.0 in x 0.866 in)

2.19 Interface adapter option type UWS21B

Part number 1820 456 2

Description The UWS21B option converts RS232 signals, for example from the PC, into RS485 signals. These RS485 signals can then be routed to the XT slot of MOVIDRIVE® B.

RS232 interface The connection of UWS21B with PC is made using a standard serial interface cable (shielded).

RS485 interface UWS21B and MOVIDRIVE® B are connected using a serial interface cable with RJ10 connectors.

Scope of delivery The scope of delivery for the UWS21B option includes:

- UWS21B unit
- Serial interface cable with 9-pin sub D socket and 9-pin sub D connector to connect the UWS21B option to the PC.
- Serial interface cable with two RJ10 connectors to connect UWS21B and MOVIDRIVE® B.
- CD-ROM with MOVITOOLS®

Dimension drawing Dimensions in mm (in)

Technical data

UWS21B	
Part number	1 820 456 2
Ambient temperature	0 ... 40 °C
Storage temperature	–25 °C ... +70 °C (according to EN 60721-3-3, class 3K3)
Degree of protection	IP20
Weight	300 g (0.7 lb)
Dimensions	96 mm x 43 mm x 25 mm (3.8 in x 1.7 in x 0.98 in)

2.20 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 XT slot of MOVIDRIVE® B. 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® B and USB11A are connected using a serial interface cable with RJ10 connectors.

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 connectors to connect USB11A and MOVIDRIVE® B
- CD-ROM with drivers and MOVITOOLS®

Dimension drawing

Dimensions in mm (in)

55732CXX

Technical data

USB11A	
Part number	824 831 1
Ambient temperature	0 ... 40 °C
Storage temperature	–25 °C ... +70 °C (according to EN 60721-3-3, class 3K3)
Degree of protection	IP20
Weight	300 g (80.7 lb)
Dimensions	92.5 mm x 43 mm x 25 mm (3.64 in x 1.7 in x 0.98 in)

2.21 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 cause irreparable damage to the encoder.

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

Recommendation Use prefabricated cables from SEW for the encoder connection.

Dimension drawing Dimensions in mm (in)

01315DXX

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

Technical data

DC 5 V encoder power supply option type DWI11A	
Part number	822 759 4
Voltage input	DC 10...30 V, I_{max} = DC 120 mA
Encoder power supply	DC +5 V (up to $U_{max} \approx$ +10 V), I_{max} = DC 300 mA
Max. line length that can be connected	100 m (9,997.44 cm) total Use a shielded twisted-pair cable (A and $\overline{A}$, B and $\overline{B}$, C and $\overline{C}$) for connecting the encoder to the DWI11A and the DWI11A to MOVIDRIVE®.

2.22 Input/output card type DIO11B option

Part number 824 308 5

Description The number of inputs/outputs of the basic MOVIDRIVE® B 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 the basic unit (→ parameter group P6__, Terminal assignment).

Electronics data

DIO11B option			
 11872AXX	Setpoint input n2	X20:1/X20:2	AI21/AI22: Voltage input Differential input or input with AGND reference potential
	AI21/AI22 operating mode Resolution Internal resistance		n2 = DC 0...+10 V or DC -10 V...0...+10 V 12 bit, sampling time 1 ms R_i > 40 kΩ
	Analog outputs	X21:1/X21:4 X21:2/X21:5	AOV1/AOV2: Voltage outputs DC-10 V...0...+10 V, I_{max} = DC 10 mA, short-circuit proof and protected against external voltage to DC 30 V, selection option → parameter menu P64_ AOC1/AOC2: Current outputs DC 0(4)...20 mA, max. output voltage DC 15 V, short-cirucit proof and protected against external voltages up to DC 30 V, selection option → parameter menu P64_
	Response time Resolution		5 ms 12 bit
	Binary inputs X22:1...X22:8 Internal resistance		Isolated (optocoupler), PLC compatible (EN 61131) DI1Ø...DI17 $R_i \approx$ 3 kΩ, $I_E \approx$ DC 10 mA Sampling interval 1 ms
	Signal level		DC+13 V...+30 V= "1" = Contact closed DC-3 V...+5 V = "0" = Contact open Fulfills EN 61131
	Function	X22:1...X22:8	DI10...DI17: Selection option → Parameter menu P61_
	Binary outputs	X23:1...X23:8	DO1Ø...DO17: PLC-compatible (EN 61131-2), response time 1ms
	Signal level		"0" = DC 0 V "1" = DC+24 V
	Function	X23:1...X23:8	DO10...DO17: Selection option → Parameter menu P63_, I_{max} = DC 50 mA, short-circuit proof and protected against external voltage to DC 30 V
	Reference terminals X20:3/X21:3/X21:6	X22:9 X22:10	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
	Voltage input	X23:9	24VIN: Supply voltage DC +24 V for binary outputs DO1Ø...DO17
	Permitted line cross section		One core per terminal: 0.08...1.5 mm² (AWG 28...16) Two cores per terminal: 0.25...1 mm² (AWG 22...17)

Functions

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

2.23 PROFIBUS fieldbus interface option type DFP21B

Part number 824 240 2

Description MOVIDRIVE® B can be equipped with a 12 Mbaud fieldbus interface for the PROFIBUS-DP serial bus system. The device master data (GSD) and type files for MOVIDRIVE® are available from the SEW homepage (http://www.sew-eurodrive.de) under "Software" to help with project planning and 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 rapid cyclic data exchange; e.g. setpoints or binary commands, between central automation units (PROFIBUS master) and decentralized peripheral units (e.g. drive inverters). The DFP21B option supports PROFIBUS-DP and DP-V1. Consequently, MOVIDRIVE® B can be controlled via PLC and PROFIBUS-DP / DP-V1.

Electronics data

DFP21B option		
 11873AXX	Protocol option	PROFIBUS-DP and DPV1 to IEC 61158
	Baud rate	Automatic detection of baud rate from 9.6 kbaud to 12 Mbaud
	Connection technology	9-pin sub D socket, pin assignment to IEC 61158
	Bus terminator	Not integrated, implement using suitable PROFIBUS connector with terminating resistors that can be activated
	Station address	1 ... 125, adjustable via DIP switches
	GSD file name	DP: SEW_6003.GSD DP-V1: SEWA6003.GSD
	DP ID number	6003_{hex} (24579_{dec})
	Max. number of process data	10 process data

2.24 INTERBUS fieldbus interface option type DFI11B

Part number 824 309 3

Description MOVIDRIVE® B can be equipped with a fieldbus interface for the non-proprietary and standardized INTERBUS sensor/actuator bus system.

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® B inverter can be controlled and configured in a user-friendly way.

Electronics data

DFI11B option		
 11874AXX	Supported baud rates Connection technology DP identity numbers Max. number of process data	500 kBaud and 2 MBaud, can be selected via DIP switch Remote bus input: 9-pin D-sub connector Remote bus output: 9-pin D-sub socket RS485 transmission technology, 6-core shielded and twisted-pair cable $E3_{hex} = 227_{dec}$ (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) 6 process data

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

Part number 824 311 5

Description MOVIDRIVE® B 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).

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® B inverter can be controlled and configured in a user-friendly way.

Electronics data

DFI21B option		
 11875AXX	Supported baud rates Connection technology DP identity numbers Max. number of process data	500 kBaud and 2 MBaud, can be selected via DIP switch F-SMA connector $E3_{hex} = 227_{dec}$ (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) 6 process data

2.26 DFE11B fieldbus interface option Modbus/TCP

Part number 1820 036 2

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE11B option to connect to higher-level automation, project planning and visualization systems via Ethernet (MODUBUS/TCP protocol) 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 makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

Electronics data

Option DFE11B		
 11876AXX	Application protocols	• **MODBUS/TCP** (Transmission Control Protocol) to control and set parameters for the 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)
	Ethernet services	• ARP • ICMP (Ping)
	Automatic baud rate detection	10 MBaud / 100 MBaud
	Max. number of process data	10 process data
	Connection technology	RJ45 plug connector
	Addressing	4 byte IP address
	Tools for startup	• MOVITOOLS® MotionStudio software • DBG60B keypad

Functions

- MODBUS/TCP protocol
- RJ45 plug connector, 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)

2.27 PROFINET IO RT type DFE12B fieldbus interface option

Part number 1820 563 1

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE12B option to connect to higher-level automation, project planning and visualization systems via Ethernet (PROFINET/IO protocol) thanks to its powerful, universal fieldbus interface. You can use option DFE12B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

Electronics data

Option DFE12B		
 11877AXX	Application protocols	• **PROFINET IO** to control and configure the drive inverter. • **HTTP** (Hypertext Transfer Protocol) for diagnostics using a Web browser. • **SMLP** (Simple Movilink Protocol), protocol used by MOVITOOLS®.
	Port numbers used	• 34962 - 34964 (PROFINET IO) • 300 (SMLP) • 80 (HTTP)
	Ethernet services	• ICMP (ping) • ARP
	Transmission rate	100 MBit full duplex
	Transmission process	100BASETX
	Max. number of process data	10 process data
	Connection technology	RJ45 plug connector
	Auto-negation	Yes
	GSD file	GSDML-V1.0-SEW-DFE12B-xxxxxxxx.xml (xxxxxxxx is a placeholder for year/month/day)
	SEW manufacturer ID	$010A_{hex}$
	Device ID	0001_{hex}
	Alarms	Diagnostic alarm in the event of a unit fault (can be activated)
	Diagnostics	Yes
	Configuration via PROFINET	In preparation
	Max. number of connections	3
	Tools for startup	• MOVITOOLS® MotionStudio software • DBG60B keypad

Functions

- PROFINET IO protocol
- RJ45 plug connector, star-type cabling
- Up to 10 process data and PROFINET diagnostic parameter data items can be transferred at the same time
- The PROFINET IO controller assigns the IP address
- 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
  - DFE11B configuration (after login)

2.28 PROFINET IO RT type DFE32B fieldbus interface option

Part number 1821 345 6

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE32B option to connect to higher-level automation, project planning and visualization systems via Ethernet (PROFINET/IO protocol) thanks to its powerful, universal fieldbus interface. You can use option DFE32B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

Electronics data

DFE32B option		
 11878AXX	Application protocol	• **PROFINET IO** (Ethernet frames with frame identification 8892_{hex}) to control and set parameters for the inverter. • **HTTP** (Hypertext Transfer Protocol) for diagnostics using a Web browser. • **SMLP** (Simple Movilink Protocol), protocol used by MOVITOOLS®.
	Port numbers used	• 300 (SMLP) • 80 (HTTP)
	Ethernet services	• ARP • ICMP (Ping)
	ISO / OSI layer 2	Ethernet II
	Baud rate	100 Mbaud in full duplex process
	Connection technology	Two RJ45 plug connectors with integrated switch and auto-crossing
	Addressing	4 byte IP address or MAC-ID (00:0F:69:xx:xx:xx)
	Manufacturer ID (vendor ID)	$010A_{hex}$
	Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher. • DBG60B keypad
	Firmware status of MOVIDRIVE® MDX61B	Firmware version 824 854 0.17 or higher (→ display with P076)

Functions

- PROFINET IO protocol
- Two RJ45 plug connectors for star or line type cabling
- Up to 10 process data and PROFINET diagnostic parameter data items can be transferred at the same time
- The PROFINET IO controller assigns the IP address
- 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
  - DFE32B configuration (after login)

2.29 DFE13B EtherNet/IP fieldbus interface option

Part number 1820 565 8

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE13B option to connect to higher-level automation, project planning and visualization systems via Ethernet (EtherNet/IP protocol) thanks to its powerful, universal fieldbus interface. You can use option DFE13B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

Electronics data

Option DFE13B		
 11879AXX	Application protocols	• **EtherNet/IP** (Industrial 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	• 44818 (Ethernet/IP TCP) • 2222 (EtherNet/IP UDP) • 300 (SMLP) • 80 (HTTP) • 67 / 68 (DHCP)
	Ethernet services	• ARP • ICMP (Ping)
	Automatic baud rate detection	10 MBaud / 100 MBaud
	Max. number of process data	10 process data
	Connection technology	RJ45 plug connector
	Addressing	4 byte IP address
	Manufacturer ID	$013B_{hex}$
	Tools for startup	• MOVITOOLS® MotionStudio software • DBG60B keypad

Functions

- EtherNet/IP protocol
- RJ45 plug connector, star-type cabling
- Up to 10 process data and parameter data items can be transferred at the same time
- Two ways to allocate the IP address:
  1. Make the setting using the DBG60B keypad and MOVITOOLS®
  2. 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
  – DFE13B configuration (after login)

2.30 DFE33B EtherNet/IP fieldbus interface option

Part number 1821 346 4

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE33B option to connect to higher-level automation, project planning and visualization systems via Ethernet (EtherNet/IP protocol) thanks to its powerful, universal fieldbus interface. You can use option DFE33B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

Electronics data

DFE33B option		
 11880AXX	Application protocol	• **EtherNet/IP** (Industrial 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	• 44818 (EtherNet/IP TCP) • 2222 (EtherNet/IP UDP) • 300 (SMLP) • 80 (HTTP) • 67 / 68 (DHCP)
	Ethernet services	• ARP • ICMP (Ping)
	ISO / OSI layer 2	Ethernet II
	Automatic baud rate detection	10 MBaud / 100 MBaud
	Connection technology	Two RJ45 plug connectors with integrated switch and auto-crossing
	Addressing	4 byte IP address or MAC-ID (00-0F-69-xx-xx-xx)
	Manufacturer ID (vendor ID)	$013B_{hex}$
	Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher. • DBG60B keypad
	Firmware status of MOVIDRIVE® MDX61B	Firmware version 824 854 0.17 or higher (→ display with P076)

Functions

- EtherNet/IP protocol
- Two RJ45 plug connectors for star or line type cabling
- Up to 10 process data and parameter data items can be transferred at the same time
- Two ways to allocate the IP address:
  1. Make the setting using the DBG60B keypad and MOVITOOLS®
  2. 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
  – DFE33B configuration (after login)

2.31 EtherCAT fieldbus interface option type DFE24B

Part number 1821 126 7

Description The MOVIDRIVE® MDX61B inverter enables you to use the DFE24B option to connect to higher-level automation, project planning and visualization systems via EtherCAT thanks to its powerful, universal fieldbus interface. You can use option DFE24B to communicate directly with the inverters via EtherCAT and operate the MOVITOOLS® software to change parameters and IPOS^plus®^ programs.

Electronics data

DFE24B option		
 11881AXX	Standards	IEC 61158, IEC 61784-2
	Baud rate	100 Mbaud full duplex
	Connection technology	Two RJ45 plug connectors
	Bus terminator	Not integrated as bus termination is activated automatically.
	OSI layer	Ethernet II
	Station address	Setting via EtherCAT master (→ Display with P093)
	XML file name	SEW_DFE24B.xml
	Vendor ID	0x59 (CANopenVendor ID)
	EtherCAT services	• CoE (CANopen over EtherCAT) • VoE (Simple MOVILINK protocol over EtherCAT)
	MOVIDRIVE® B firmware status	824 854 0.18 or higher (→ isplay with P076)
	Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher. • DBG60B keypad

Functions

- EtherCAT
- Two RJ45 plug connectors for line type cabling
- Simultaneous communication of up to 10 process data and parameter data as well as access (Rx, Tx) to 8 IPOS^plus®^ variables
- Automatic addressing via EtherCAT master
- Engineering access using MOVITOOLS® MotionStudio via EtherCAT

2.32 DeviceNet fieldbus interface option type DFD11B

Part number 824 972 5

Description

The MOVIDRIVE® MDX61B 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 integrated the DFD11B in the machine control. You can download this file from the SEW homepage in the Software section.

Electronics data

DFD11B option		
 11882AXX	Communication protocol	Master/slave connection set according to DeviceNet specification version 2.0
	Number of process data words	Can be set using DIP switch: • 1 ... 10 process data words • 1 ... 4 process data words with bit-strobe I/O
	Baud rate	125, 250 or 500 kbaud, can be set using DIP switch
	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 according 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® MotionStudio software • DBG60B keypad

2.33 CANopen fieldbus interface option type DFC11B

Part number 824 317 4

Description

The MOVIDRIVE® MDX61B inverter in conjunction with the DFC11B option allows connection to higher-level automation, project planning and visualization systems via the open and standardized CANopen fieldbus system thanks to the option's high-performance universal fieldbus interface. You can also access parameters and process data using the MOVILINK® protocol designed especially for units from SEW-EURODRIVE.

The DFC11B fieldbus interface type can be plugged into the fieldbus slot on all MOVIDRIVE® MDX61B units. in this way, a second system bus (CAN) on MOVIDRIVE® is made available. The DFC11B 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 DFC11B in the higher-level CANopen control. You can download this file from the SEW homepage in the Software section.

Electronics data

DFC11B option		
 11883AXX	Communication profile	• SEW-MOVILINK® • CANopen • CAN Layer 2
	Number of process data words	1 ... 10 process data words
	Baud rate	Setting using parameter P894: 125 kBaud / 250 kBaud / 500 kBaud / 1 MBaud
	Connection technology	9-pole Sub-D plug connector X30 (plug assigned to CIA standard) or terminal X31
	Permitted line cross section X31 (CAN-Bus connection)	One core per terminal: 0.20 ... 2.5 mm^2 (AWG24 ... 12) Two cores per terminal: 0.25 ...1 mm^2 (AWG22 ... 17)
	Terminating resistor	120 Ω (set using DIP switch S1-R)
	Addressing	Setting via parameter P891 (SBus MOVILINK) or P896 (CANopen)
	Tools for startup	• MOVITOOLS® MotioStudio software • DBG60B keypad

Functions

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

	NOTE
	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.

2.34 Synchronous operation board option type DRS11B

Part number 824 672 6

Description The DRS11B option enables a group of motors to run in angular synchronous operation 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 slave motors. The motors must be equipped with encoders. The DRS11B option is plugged into the expansion slot.

Option DRS11B		
 11885AXX	Binary inputs X40:1...X40:6	EINGØ...EING5: isolated (opto-coupler) PLC compatible (EN 61131) $R_i \approx 3\ k\Omega$, $I_E \approx$ DC 10 mA Sampling interval 5 ms
	Internal resistance	
	Signal level	DC+13 V...+30 V= "1" = Contact closed DC–3 V...+5 V = "0" = Contact open
	Function	Fixed assignment with: • EINGØ = Free-running • INP1 = Offset 1 • INP2 = Offset 2 • INP3 = Offset 3 • INP4 = IPOS$^{plus®}$ variable H477.0 • INP5 = IPOS$^{plus®}$ variable H477.1
	Binary outputs X40:9/X40:10	OUTPØ/OUTP1: PLC compatible (EN 61131-2) Response time 5 ms
	Signal level	"0" = DC 0 V "1" = DC+24 V **Caution:** Do not apply external voltage!
	Function	Fixed assignment with: • OUTPØ = IPOS$^{plus®}$ variable H476.0 • OUTP1 = IPOS$^{plus®}$ variable H476.1 I_{max} = DC 50 mA, short-circuit proof, protected against external voltage to DC 30 V
	Reference terminals X40:11 X40:7 Voltage output X40:8	DGND: Reference potential for binary signals DCOM: Reference potential for binary inputs X40:1...X40:6 (INPØ...INP5) VO24: Voltage output DC +24 V, max. DC 100 mA
	Synchronous encoder input X41: Encoder power supply	Max. 200 kHz, signal level according to RS422 or sin/cos DC +24 V, I_{max} = 650 mA[1)] 9-pin D-sub socket
	Master encoder input X42: Encoder power supply	Max. 200 kHz, signal level according to RS422 or sin/cos DC+24 V, I_{max} = DC 650 mA[1)] 9-pin D-sub socket
	Encoder simulation output X43:	Signal level to RS422 9-pin D-sub 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)

1) Total current load (X41 **and** X42) of the DC 24 V encoder supply ≤ DC 650 mA

2.35 PROFIBUS DP-V1 with PROFIsafe fieldbus interface option type DFS11B

Part number 1820 962 9

Description MOVIDRIVE® B can be equipped with a 12 Mbaud fieldbus interface DFS11B for the PROFIBUS-DP-V1 serial bus system with PROFIsafe. In addition to cyclical and acyclical data exchange, safety-oriented communication takes place that allows to switch a safe F-DO output. The device master data (GSD) and type files for MOVIDRIVE® are available from the SEW homepage (http://www.sew-eurodrive.de) under "Software" to help with project planning and facilitate startup.

For more detailed information, refer to the "Fieldbus Interface DFS11B PROFIBUS DP-V1 with PROFIsafe" manual. You can order this manual from SEW-EURODRIVE.

Electronics data

DFS11B option		
11892AXX	PROFIBUS protocol options	PROFIBUS DP and DP-V1 according to IEC 61158
	Automatic baud rate detection	9.6 kBaud ... 12 MBaud
	Connection technology	• 9-pin D-sub socket • Pin assignment acc. to IEC 61158
	Bus terminator	Not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on.
	Station address	1 ... 125, adjustable via DIP switches
	GSD file name	SEW_600C.GSD
	DP ID number	600C = 24588_{hex}
	Diagnostics data	• Max. 8 bytes • Standard diagnostics: 6 bytes
	Tools for startup	• MOVITOOLS® MotionStudio software • DBG60B keypad
	F address	1 ... 1022 DIP switch for setting the failsafe address
	Ambient temperature	0 to 55 °C

Safety part

Safety characteristics	
Highest possible safety category	• SIL 3 according to EN 61508 • Category 4 according to EN 954-1 • Performance level e according to EN ISO 13849-1
System structure	2 channels with diagnostics (1002D)
Type of operating mode	"High demand" rate according to EN 61508
Probability of dangerous failure per hour (PFH value)	<1.00E-09 (1 FIT)
Proof test interval (EN61508)	10 years, after which the component must be replaced with a new one
Repair time	100 hours
Safe status	Value "0" for all safety-oriented F-DO process values (output disabled)
Safe output	
P-M switch (from load voltage supply)	DC 24 V output according to EN 61131-2, protected against short circuits and overloads
Rated current	1A
Leakage current (at "0" signal)	Typically –2 mA (with 2 V / 1 kΩ load resistance) (Note: Current flows from F-DO_M to F-DO_P)
Internal voltage drop (P and M output)	max. 3 V
Short circuit protection	Electronic, response value: 2.8 A ... 9 A
Overload protection	Response value: 1.4 A ... 1.6 A
Load resistance range	24 kΩ ... 1 kΩ
Voltage limitation when switching off inductive loads	Typically –70 V
Response time (command via PROFIsafe → output switches)	≤ 25 ms
Maximum line length	30 m

2.36 PROFIBUS DP-V1 with PROFIsafe fieldbus interface option type DFS12B

Part number 1820 963 7 (in preparation)

Description MOVIDRIVE® B can be equipped with a 12 Mbaud fieldbus interface DFS12B for the PROFIBUS-DP-V1 serial bus system with PROFIsafe. In addition to cyclical and acyclical data exchange, safety-oriented communication takes place in conjunction with the DCS21B option. The device master data (GSD) and type files for MOVIDRIVE® are available from the SEW homepage (http://www.sew-eurodrive.de) under "Software" to help with project planning and facilitate startup.

For more detailed information, refer to the "Fieldbus Interface DFS12B PROFIBUS DP-V1 with PROFIsafe" manual. You can order this manual from SEW-EURODRIVE.

Electronics data

DFS12B option		
 11893AXX	PROFIBUS protocol options	PROFIBUS DP and DP-V1 according to IEC 61158
	Automatic baud rate detection	9.6 kBaud ... 12 MBaud
	Connection technology	• 9-pin D-sub socket • Pin assignment acc. to IEC 61158
	Bus terminator	Not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on.
	Station address	1 ... 125, adjustable via DIP switches
	GSD file name	SEW_600C.GSD
	DP ID number	600C = 24588_{hex}
	Diagnostics data	• Max. 8 bytes • Standard diagnostics: 6 bytes
	Tools for startup	• MOVITOOLS® MotionStudio software • DBG60B keypad
	F address	The failsafe address is set using the DCS21B option
	Ambient temperature	0 to 55 °C

2.37 PROFINET IO with PROFIsafe fieldbus interface option, type DFS21B

Part number 1821 183 6

Description

The MOVIDRIVE® MDX61B inverter enables you to use the DFS21B option to connect to higher-level automation, project planning and visualization systems via Ethernet (PROFINET/IO RT protocol) thanks to its powerful, universal fieldbus interface. In addition to cyclical and acyclical data exchange, safety-oriented communication takes place that allows to switch a safe F-DO output. You can use option DFS21B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

For more detailed information, refer to the "Fieldbus Interface DFS21B PROFINET IO with PROFIsafe" manual. You can order this manual from SEW-EURODRIVE.

Electronics data

DFS21B option		
 11894AXX	Application protocol	• **PROFINET IO** (Ethernet frames with frame identification 8892_{hex}) to control and set parameters for the inverter. • **HTTP** (Hypertext Transfer Protocol) for diagnostics using a Web browser. • **SMLP** (Simple Movilink Protocol), protocol used by MOVITOOLS®.
	Port numbers used	• 300 (SMLP) • 80 (HTTP)
	Ethernet services	• ARP • ICMP (Ping)
	ISO / OSI layer 2	Ethernet II
	Baud rate	100 Mbaud in full duplex process
	Connection technology	Two RJ45 plug connectors with integrated switch and auto-crossing
	Addressing	4 byte IP address or MAC-ID (00:0F:69:xx:xx:xx)
	Manufacturer ID (vendor ID)	$010A_{hex}$
	Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher. • DBG60B keypad
	F address	1 ... 1022 DIP switch for setting the failsafe address
	Firmware status of MOVIDRIVE® MDX61B	Firmware version 824 854 0.17 or higher (→ display with P076)
	Ambient temperature	0 to 55 °C

Safety part

Safety characteristics	
Highest possible safety category	• SIL 3 according to EN 61508 • Category 4 according to EN 954-1 • Performance level e according to EN ISO 13849-1
System structure	2 channels with diagnostics (1oo2D)
Type of operating mode	"High demand" rate according to EN 61508
Probability of dangerous failure per hour (PFH value)	<1.00E-09 (1 FIT)
Proof test interval (EN61508)	10 years, after which the component must be replaced with a new one
Repair time	100 hours
Safe status	Value "0" for all safety-oriented F-DO process values (output disabled)
Safe output	
P-M switch (from load voltage supply)	DC 24 V output according to EN 61131-2, protected against short circuits and overloads
Rated current	1A
Leakage current (at "0" signal)	Typically –2 mA (with 2 V / 1 kΩ load resistance) (Note: Current flows from F-DO_M to F-DO_P)
Internal voltage drop (P and M output)	max. 3 V
Short circuit protection	Electronic, response value: 2.8 A ... 9 A
Overload protection	Response value: 1.4 A ... 1.6 A
Load resistance range	24 kΩ ... 1 kΩ
Voltage limitation when switching off inductive loads	Typically –70 V
Response time (command via PROFIsafe® → output switches)	≤ 25 ms
Maximum line length	30 m

2.38 PROFINET IO with PROFIsafe fieldbus interface option, type DFS22B

Part number 1821 184 4

Description

The MOVIDRIVE® MDX61B inverter enables you to use the DFS22B option to connect to higher-level automation, project planning and visualization systems via Ethernet (PROFINET/IO RT protocol) thanks to its powerful, universal fieldbus interface. In addition to cyclical and acyclical data exchange, safety-oriented communication takes place in conjunction with the DCS21B option. You can use option DFS22B to communicate directly with the inverters via Ethernet and operate the MOVITOOLS® software to change parameters and IPOS$^{plus®}$ programs. An integrated Web server makes it possible for the user to access diagnostic values quickly and easily using a standard browser (e.g. Internet Explorer).

For more detailed information, refer to the "Fieldbus Interface DFS22B PROFINET IO with PROFIsafe" manual. You can order this manual from SEW-EURODRIVE.

Electronics data

DFS22B option		
 11895AXX	Application protocol	• **PROFINET IO** (Ethernet frames with frame identification 8892_{hex}) to control and set parameters for the inverter. • **HTTP** (Hypertext Transfer Protocol) for diagnostics using a Web browser. • **SMLP** (Simple Movilink Protocol), protocol used by MOVITOOLS®.
	Port numbers used	• 300 (SMLP) • 80 (HTTP)
	Ethernet services	• ARP • ICMP (Ping)
	ISO / OSI layer 2	Ethernet II
	Baud rate	100 Mbaud in full duplex process
	Connection technology	Two RJ45 plug connectors with integrated switch and auto-crossing
	Addressing	4 byte IP address or MAC-ID (00:0F:69:xx:xx:xx)
	Manufacturer ID (vendor ID)	$010A_{hex}$
	Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher. • DBG60B keypad
	F address	The failsafe address is set using the DCS21B option
	Firmware status of MOVIDRIVE® MDX61B	Firmware version 824 854 0.17 or higher (→ display with P076)
	Ambient temperature	0 ... 55 °C

2.39 MOVISAFE® DCS21B/31B safety module option

Part numbers

- DCS21B complete with prefabricated cable DAE34B (CAN bus connection between DCS21B X86 and DFS21B X31): 1821 895 4
- DCS21B without prefabricated cable: 1820 392 2
- DCS31B: 1820 958 0

Description

The DCS21B and DCS31B options of the MOVISAFE® series are designed as expansion options for functional safety. They are capable of performing various drive monitoring functions, such as standstill, speed, direction of rotation or position monitoring. Additionally, sensor signals can be processed via safe inputs and outputs and MOVIDRIVE® B can be switched off according to stop categories 0, 1, or 2.

To being able to communicate with a higher-level safety controller in a safety-oriented manner, the DCS21B option must be used together with the DFS12B fieldbus interface (PROFIBUS DP-V1) or DFS22B (PROFINET IO). The DCS21B/31B option is plugged into the expansion slot.

For detailed information, refer to the "Safety Monitor DCS21B/31B" manual, which you can order from SEW-EURODRIVE.

Electronics data

DCS21B/31B option		
 11890AXX	 11891AXX	LED alarm/error LED watchdog LED system B LED system A X80: Power supply connection X81: Connection binary inputs X82: Connection of binary outputs DO0, DO1 X83: Connection of binary output DO2 X84: Connection of incremental, sin/cos or absolute encoder (encoder 1) X85: Connection of incremental, sin/cos or absolute encoder (encoder 2) X86: CAN bus connection (only for DCS21B) X87: Connection of service interface

2.40 MOVI-PLC® basic DHP11B.. controller option

Part numbers

The MOVI-PLC® *basic* controller DHP11B.. is available in 3 versions, which differ in the modules available from a range of libraries.

Part number	MOVI-PLC® *basic* DHP11B.. unit version	Description
1820 472 4	DHP11B-T0	MOVI-PLC® *basic* controller
1820 822 3	DHP11B-T1	Application version I (in addition to version T0, enables additional functions including electronic cam and synchronous operation)
1820 823 1	DHP11B-T2	Application version II (in addition to version T1, enables additional functions including handling)

Description

MOVI-PLC® is a series of controllers available from SEW-EURODRIVE. MOVI-PLC® can be programmed by users according to IEC 61131-3 and PLCopen.

The MOVI-PLC® *basic* controller DHP11B.. is equipped with a PROFIBUS DP-V1 slave interface, two SBus interfaces (CAN), RS485 and eight digital inputs/outputs, five of which are interrupt-capable. MOVI-PLC® *basic* DHP11B.. can control 12 units at the same time (MOVIDRIVE® B/compact, MOVITRAC® 07/B, MOVIAXIS®, MOVIMOT®).

Electronics data

MOVI-PLC® *basic* DHP11B.. option		
 11886AXX	Status displays	LEDs for the voltage supply to the I/Os, firmware, program, PROFIBUS, System buses
	Fieldbus	• PROFIBUS DP and DP-V1 to IEC 61158 • Automatic detection of baud rate from 9.6 kbaud to 12 Mbaud • Bus termination with suitable connector to implement • GSD file SEW_6007.GSD • DP ident. number 6007_{hex} (24579_{dec}) • Maximum 32 process data
	System bus	• 2 system buses (CAN) for control of 12 inverters and CANopen I/O modules • CAN layer 2 (SCOM cyclic, acyclic) or via the SEW MOVILINK® protocol • Baud rate: 125 kBaud ... 1 MBaud • External bus terminator • Address range: 0 ... 127
	Engineering	Via RS485, PROFIBUS and the system buses
	Panel operation	Via RS485 and CAN 2 (in preparation)
	Connection technology	• PROFIBUS: 9-pin Sub-D connector to IEC61158 • System buses and I/Os: plug-in terminals • RS485: RJ10
	Binary inputs / outputs	• 8 I/Os to IEC 61131-2; can be configured as inputs or outputs. Five are interrupt-capable
	Memory	• Program: 512 kByte • Data: 128 kByte • Retain: 24 kByte
	Tools for startup	MOVITOOLS® MotionStudio with integrated PLC editor (Programming languages IL, ST, LD, FBD, CFC, SFC; libraries to optimize control of the inverters)

2.41 OST11B option

Part number 1820 544 5

Description

Option OST11B provides an additional RS485 interface (COM2) for MOVI-PLC® *basic* DHP11B.. in terminal design or as an engineering interface. Only use option OST11B in conjunction with MOVI-PLC® *basic* DHP11B...

When the MOVI-PLC® *basic* DHP11B.. option is plugged into the fieldbus slot, option OST11B is plugged into the encoder slot. When the MOVI-PLC® *basic* DHP11B.. option is plugged into the expansion slot, option OST11B is installed in the expansion slot above the option MOVI-PLC® *basic* DHP11B...

Electronics data

OST11B option		
 11887AXX	RS485 interface COM2 X35:1 ... X35:4 X36:1 ... X36:3	• For connection of an Engineering PC, a DOP11A/B operator terminal or a gear-motor with integrated frequency inverter MOVIMOT® • I/O standard, 57.6 kBaud, max. total cable length 200 m, integrated dynamic terminating resistor permanently installed
	Potential level	COM2 is isolated from the MOVI-PLC® *basic* DHP11B.. controller

2.42 MOVI-PLC® advanced controller option DH.41B

Part numbers

The MOVI-PLC® *advanced* DH.41B is available in 2 variants, which differ in the integrated fieldbus interfaces:

Part number	Unit design of MOVI-PLC® *advanced* DH.41B	Fieldbus interfaces
1821 160 7	DHE41B	Ethernet TCP/IP, UDP
1821 161 5	DHF41B	Ethernet TCP/IP, UDP, PROFIBUS DP-V1

The MOVI-PLC® *advanced* controller DH.41B is available as

- **control card** MOVI-PLC® *advanced* DH.41B as an option for MOVIDRIVE® B and MOVITRAC® B inverters and for MOVIAXIS® servo inverters
- **compact controller** MOVI-PLC® *advanced* DHE41B/UOH11B or DHF41B/UOH21B prepared for installation on a DIN rail. As a compact controller, it is designed for controlling inverters.

Description

MOVI-PLC® is a series of controllers available from SEW-EURODRIVE. MOVI-PLC® can be programmed by users according to IEC 61131-3 and PLCopen.

The MOVI-PLC® *advanced* controller DH.41B is equipped with numerous communication interfaces.

The two system bus interfaces CAN 1 and CAN 2 are used primarily for connecting and controlling several inverters and integrating decentralized I/O modules. SEW-EURODRIVE recommends connecting a maximum of 256 inputs and 256 outputs to the MOVI-PLC® *advanced* DH.41B controller.

This machine module can be operated via the integrated fieldbus interface with a higher-level controller.

Engineering is carried out using the powerful Ethernet 1 interface or USB interface (in preparation).

An operator terminal (e.g. DOP11A/B) or a MOVIMOT® gearmotor with integrated frequency inverter are connected to the RS485 interfaces.

Electronics data for DHE41B

MOVI-PLC® *advanced* DHE41B option		
 11888AXX	Electrical supply	The following applies for all units (MDX, MX, compact controller): • You will have to supply the binary inputs and outputs with DC 24 V (X31:1/2) separately. Integrated in MOVIDRIVE® MDX61B: • Power consumption: P_{max} = 6.8 W • The MOVI-PLC® *advanced* DHE41B controller is supplied by MOVIDRIVE® MDX61B via backplane connector. • In the case of disconnection from the power supply, continued function is guaranteed by DC 24 backup (external DC 24 V supply to X10:9/10 of MOVIDRIVE® MDX61B required). Installed in the MOVIAXIS® master module (MXM): • Power consumption: P_{max} = 8.5 W • U = DC 24 V (–15 % / +20 %) • I_{max} = 600 mA • The MOVI-PLC® *advanced* DHE41B.. controller can be supplied by the MOVIAXIS® switched mode power supply module (MXS) or from an external voltage supply. For this purpose, connect X5 between the individual devices. • If the MOVI-PLC® *advanced* DHE41B controller is supplied with DC 24 V by the MOVIAXIS® switched-mode power supply module, the function of the MOVI-PLC® *advanced* DHE41B.. controller is maintained after disconnection from the line voltage (external DC 24 V supply at X16 of the MOVIAXIS® switched-mode power supply module required).
	Potential levels	The MOVI-PLC® *advanced* DHE41B controller has the following potential levels: • Potential control / CAN 1 / COM1 • Potential COM2 • Potential binary inputs and outputs • Potential system bus CAN 2
	Memory	• Program memory: 8 MByte (for application program, incl. IEC libraries) • Data memory: 4 MByte (for IEC application) • Retain data: 32 kByte • System variables (retain): 8 kByte
	Binary inputs X31:3...X31:10 Internal resistance Signal level	Isolated (optocoupler), PLC-compatible (IEC 61131-2), cycle time 1 ms, available unfiltered and filtered (filter constant ca. 2 ms) Can be configured as binary input or output X31:6...X31:10 are interrupt capable (response time <100 ms) $R_i \approx 3$ kΩ, $I_E \approx 10$ mA DC (+13 V...+30 V) = "1" = Contact closed (according to IEC 61131) DC (–3 V...+5 V) = "0" = Contact open (according to IEC 61131)
	Binary outputs X31:3...X31:10 Signal level	PLC compatible, (IEC 61131-2) response time 1 ms Can be configured as binary input or output Maximum permitted output current I_{A_max} = DC 150 mA per binary output All 8 binary outputs can be subject to the maximum approved output current I_{A_max} load at the same time. "0" = 0 V "1" = DC+24 V

MOVI-PLC® *advanced* DHE41B option		
	System bus CAN 2 X32:1 ... X32:3 System bus CAN 1 X33:1 ... X33:3	• System bus CAN 1 and CAN 2 to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations, • The CAN 2 system bus is electrically isolated • Max. 64 stations per CAN system bus, • Max. 64 SCOM transmit objects / 32 receive objects per CAN system bus • Address range 0...127 • Baud rate: 125 kBaud...1 MBaud • If X32 or X33 is the bus terminator, you must connect a terminating resistor (120 Ω) externally. • You can remove connectors X32 or X33 without interrupting the system bus. • The system bus can be run in layer 2 (SCOM cyclic, acyclic) or in accordance with the SEW-MOVILINK® protocol.
	Ethernet 1 X36	System bus, reserved
	Ethernet 2 X37	• TCP/IP • Connection options: Engineering PC, other controller, Intranet
	USB	USB 1.0 for connecting an engineering PC (in preparation)
	RS485 Interface COM1/2 X34:1 ... X34:4	• For connection of an engineering PC, a DOP11A/B operator terminal or a MOVIMOT® gearmotor with integrated frequency inverter • I/O standard, 57.6 / 9.6 kBaud, max. cable length 200 m • Dynamic terminating resistor with fixed installation
	SD memory card	• PC readable • Includes: – Firmware – IEC program – Data • At least 128 MB memory • Designs, part numbers, and functions: – OMH41B-T0: 1821 204 2 Functions: Handling of speed control, positioning, e.g. with the MPLCMotion_MDX library – OMH41B-T1: 1821 205 0 Functions: Additional: cam disk, electronic gear, cam controller, for example – OMH41B-T2: 1821 206 9 Functions: Additional: material handling, for example
	Engineering	Engineering takes place via one of the following interfaces: • Ethernet 2 (X37) • In preparation: USB (X35) The engineering of all SEW components connected to the MOVI-PLC® *advanced* DHE41B controller can be carried out using the MOVI-PLC® *advanced* DHE41B controller. Engineering of the MOVI-PLC® *advanced* DHE41B controller cannot be performed via the inverters. • MOVITOOLS® MotionStudio PC software with PLC-Editor

Electronics data for DHF41B

	NOTE
	For connections identical with DHE41B, refer to the "Electronics data for DHE41B" section.

MOVI-PLC® *advanced* DHF41B option		
11889AXX	Potential levels	The MOVI-PLC® *advanced* DHF41B controller has the following potential levels: • Potential control / CAN 1 / COM1 • Potential COM2 • Potential binary inputs and outputs • Potential system bus CAN 2 • Potential PROFIBUS
	PROFIBUS connection X30P:1 ... X30P:9	Via 9-pin sub D connector, pin assignment according to IEC 61158
	Bus terminator	Not integrated. Activate bus termination with suitable PROFIBUS connector with switchable terminating resistors
	Automatic baud rate recognition	9.6 kBaud ... 12 MBaud
	Protocol options	PROFIBUS DP and DP-V1 to IEC 61158
	GSD file	SEW_6007.GSD
	DP ID number	Not yet assigned
	DeviceNet connection X30D:1 ... X30D:5	• 2-wire bus and 2-wire supply voltage DC 24 V with 5-pole Phoenix terminal • Pin assignment according to DeviceNet specification
	Communication protocol	Master/slave connection set according to DeviceNet specification version 2.0
	Number of process data words	• Programmable via IEC function (0 ... 64 process data words) • A parameter channel can be used as option in addition to the process data words.
	Baud rate	125, 250 or 500 kBaud, can be set using DIP switches 2^6 and 2^7
	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
	MAC ID	0 ... 63, can be set using DIP switch2^0 ... 2^5 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

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

General information

- Braking resistors BW... / BW...-T and BW...-P match the technical features of the MOVIDRIVE® inverters.
- Take account of a power reduction of 4 % per 10 K from an ambient temperature of 40 °C. Do not exceed a maximum ambient temperature of 80 °C.

PTC resistor BW090-P52B

- Direct installation on MOVIDRIVE® MDX60B/61B size 0 (0005 ... 0014) (→ chapter "Dimension drawings MOVIDRIVE® MDX60B")
- 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 (F04).

Flat-type braking resistors

- Protection against contact (IP54)
- Internal thermal overload protection (non-replaceable fuse)
- 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-term load capacity of the wire and grid resistors is higher than in the flat-type braking resistors (→ MOVIDRIVE® MDX60B/61B system manual, chapter. "Selecting the braking resistor")
- A temperature switch is integrated in the BW...-T braking resistor
- A thermal overcurrent relay is integrated in the BW...-P braking resistor

SEW-EURODRIVE recommends also protecting the wire and grid resistors against overload using a bimetallic relay with trip characteristics of trip class 10 or 10A (in accordance with EN 60947-4-1). Set the trip current to the value I_F (→ following tables). Do not use electronic or electromagnetic fuses because these can be triggered even in case of short-term excess currents that are still within the tolerance range.

For braking resistors of the BW..-T / BW...-P series, you can connect the integrated temperature sensor / overcurrent relay using a 2-core, shielded cable as an alternative to a bimetallic relay. The cable entry for the BW...-T and BW...-P braking resistors can be run from the front or the back (→ dimension drawing for BW... / BW...-T / BW...-P braking resistors). Use filler plugs for tapped holes that are not connected.

The resistor surfaces will heat up under a load of P_N. Make sure that you select an installation site that will accommodate these high temperatures. As a rule, braking resistors are therefore 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® B inverters. SEW-EURODRIVE will provide a certificate on request. The BW...-T and BW...-P braking resistors have cRUus approval independent of the MOVIDRIVE® inverters.

Parallel connection

Two braking resistors with the same value 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. For the BW...-T BW...-P braking resistors, the temperature switch/overcurrent relay must be connected in 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			1820 419 8			1820 133 4	1820 417 1
Continuous braking power (= 100% cdf)	0.10 kW	0.45 kW	0.6 kW	0.23 kW	0.45 kW	0.8 kW	1.2 kW
Load capacity at 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	3.6 kW	0.58 kW	1.11 kW	4.8 kW	7.2 kW
6 % cdf	0.7 kW	2.00 kW	5.7 kW	1.00 kW	2.00 kW	7.6 kW	11 kW
	Observe **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}	2.4 A_{RMS}	0.6 A_{RMS}	1 A_{RMS}	3.4 A_{RMS}	4.2 A_{RMS}
Design	PTC	Flat-design	Wire resistor on ceramic core	Flat-design		Wire resistor on ceramic core	
Connections / Tightening torque	Cable	Cable	Ceramic terminals 2.5 mm^2 (AWG13) 0.5 Nm	Cable		Ceramic terminals 2.5 mm^2 (AWG13) 0.5 Nm	
Degree of protection	IP20	IP54	IP20 (when installed)	IP54		IP20 (when installed)	
Ambient temperature ϑ_U	–20 ... +40 °C						
Type of cooling	KS = Self-cooling						
For MOVIDRIVE® (recommended)	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	1820 134 2	1820 084 2	1820 135 0	1820 136 9	1820 415 5	1820 137 7
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)]	1.2 kW	2.0 kW	4.0 kW	1.2 kW	2.6 kW	5.0 kW
25 % cdf	2.2 kW	3.6 kW	7.2 kW	2.1 kW	4.7 kW	8.5 kW
12 % cdf	3.8 kW	6.4 kW	12.8 kW	3.8 kW	8.3 kW	15.0 kW
6 % cdf	7.2 kW	12 kW	20 kW[2)]	7.2 kW	15.6 kW	24.0 kW[2)]
	11 kW	19 kW	20 kW[2)]	11.4 kW	24.0 kW[2)]	24.0 kW[2)]
	Observe **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	5 A_{RMS}	6.5 A_{RMS}	9.2 A_{RMS}	5.5 A_{RMS}	8.1 A_{RMS}	11.3 A_{RMS}
Design	Wire resistor on ceramic core					Grid resistor
Connections / tightening torque	Ceramic terminals 2.5 mm² (AWG13) / 0.5 Nm BW347-T: Ceramic terminals 10 mm² (AWG18) / 1.6 Nm					M8 stud / 6 Nm
Degree of protection	IP20 (when installed)					
Ambient temperature ϑ_U	–20 ... +40 °C					
Type of cooling	KS = Self-cooling					
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.

Braking resistor type BW...	BW018-015			
Part number	821 684 3			
Braking resistor type BW...-T/-P	**BW018-015-P**	**BW018-035-T**	**BW018-075-T**	**BW915-T**
Part number	1820 416 3	1820 138 5	1820 139 3	1820 413 9
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)]	1.5 kW	3.5 kW	7.5 kW	16 kW
25 % cdf	2.5 kW	5.9 kW	12.7 kW	27.2 kW
12 % cdf	4.5 kW	10.5 kW	22.5 kW	48 kW
6 % cdf	6.7 kW	15.7 kW	33.7 kW	62.7 kW[2)]
	11.4 kW	26.6 kW	52.2 kW[2)]	62.7 kW[2)]
	Observe **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	9.1 A_{RMS}	13.9 A_{RMS}	20.4 A_{RMS}	32.6 A_{RMS}
Design	Wire resistor on ceramic core	Grid resistor		
Connections / tightening torque	BW018-015: Ceramic terminals 2.5 mm² (AWG13) / 0.5 Nm BW018-015-P: Terminal 2.5 mm² (AWG13) / 1 Nm	Bolt M8 / 6 Nm		
Degree of protection	IP20 (when installed)			
Ambient temperature ϑ_U	–20 ... +40 °C			
Type of cooling	KS = Self-cooling			
For MOVIDRIVE® (recommended)	0150/0220 and 2 × parallel with 0370/0450[3)]			0220

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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...-	BW012-025				
Part number	821 680 0				
Braking resistor type BW...-T/-P	**BW012-025-P**	**BW012-050T**	**BW012-100-T**	**BW106-T**	**BW206-T**
Part number	1820 414 7	1820 140 7	1820 141 5	1820 083 4	1820 412 0
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)] 25 % cdf 12 % cdf 6 % cdf	2.5 kW 4.2 kW 7.5 kW 11.2 kW 19.0 kW	5.0 kW 8.5 kW 15.0 kW 22.5 kW 38.0 kW	10 kW 17 kW 30 kW 45 kW 76 kW	13.5 kW 23 kW 40 kW 61 kW 102 kW	18 kW 30.6 kW 54 kW 81 kW 136.8 kW
	Observe **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	14.4 A_{RMS}	20.4 A_{RMS}	28.8 A_{RMS}	47.4 A_{RMS}	54.7 A_{RMS}
Design	Grid resistor				
Connections / tightening torque	Ceramic terminals 2.5 mm^2 (AWG13) / 0.5 Nm BW012-025-P: Terminals 4 mm^2 (AWG12) / 1 Nm			Bolt M8 / 6 Nm	
Degree of protection	IP20 (when installed)				
Ambient temperature ϑ_U	–20 ... +40 °C				
Type of cooling	KS = Self-cooling				
For MOVIDRIVE® (recommended)	0300			0370...0750 and 2 × parallel with 0900/1100/1320[2)]	

1) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ 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		822 422 6	822 423 4		
Braking resistor type BW...-T			BW039-012-T	BW039-026-T			BW018-015-P	BW018-035-T
Part number			1820 136 9	1820 415 5			1820 416 3	1820 138 5
Continuous braking power (= 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
Load capacity at 50 % cdf[1]	0.5 kW	1.1 kW	2.1 kW	4.6 kW	1.1 kW	2.1 kW	2.5 kW	5.9 kW
25 % cdf	1.0 kW	1.9 kW	3.8 kW	6.0 kW[2]	1.9 kW	3.8 kW	4.5 kW	10.5 kW
12 % cdf	1.8 kW	3.6 kW	6.0 kW[2]	6.0 kW[2]	3.6 kW	7.2 kW	6.7 kW	13.0 kW[2]
6 % cdf	2.8 kW	5.7 kW	6.0 kW[2]	6.0 kW[2]	5.7 kW	8.7 kW[2]	11.4 kW	13.0 kW[2]
	Observe **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	2.7 A_{RMS}	3.9 A_{RMS}	5.5 A_{RMS}	8.1 A_{RMS}	4.7 A_{RMS}	6.6 A_{RMS}	9.1 A_{RMS}	13.9 A_{RMS}
Design	Wire resistor						Grid resistor	
Connections / tightening torque	Ceramic terminals 2.5 mm² (AWG12) / 0.5 Nm							M8 stud / 6 Nm
Degree of protection	IP20 (when installed)							
Ambient temperature ϑ_U	–20 ... +40 °C							
Type of cooling	KS = Self-cooling							
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...-T/-P	BW018-075-T	BW915-T	BW012-025-P	BW012-050-T	BW012-100-T	BW106-T	BW206-T
Part number	1820 139 3	1820 413 9	1820 414 7	1820 140 7	1820141 5	1820 083 4	1820 412 0
Continuous braking power (= 100% cdf)	7.5 kW	15.6 kW[2]	2.5 kW	5.0 kW	10 kW	13.5 kW	18 kW
Load capacity at 50 % cdf[1]	12.7 kW	15.6 kW[2]	4.2 kW	8.5 kW	17 kW	23 kW	30.6 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]
	Observe **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	20.4 A_{RMS}	32.6 A_{RMS}	14.4 A_{RMS}	20.4 A_{RMS}	28.8 A_{RMS}	47.4 A_{RMS}	54.7 A_{RMS}
Design	Grid resistor						
Connections / tightening torque	M8 stud / 6 Nm						
Degree of protection	IP20 (when installed)						
Ambient temperature ϑ_U	–20 ... +40 °C						
Type of cooling	KS = Self-cooling						
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

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

BW...-T / BW...-P	
Connection cross section for signal contact	1 x 2.5 mm²
Switching capability of the thermostat's signal contact	• DC 2 A / DC 24 V (DC11) • AC 2 A / AC 230V (AC11)
Switch contact (NC)	according to EN 61800-5-1

MDimension drawing braking resistors BW... / BW...-T / BW...-P

BW... :
- 1 = Flat design
  The connecting lead is 500 mm (19.7 in) long.
  The scope of delivery includes four M4 stud bolts each of type 1 and 2.
- 2 = Grid resistor
- 3 = Wire resistor
- 4 = Wire resistor with temperature switch (-T/-P)
  Cable entry (X) is possible from both sides.

Type BW...	Mounting position	Main dimensions mm (in)			Fastening parts mm (in)			Cable gland	Weight kg (lb)
BW..-T/ BW...-P		A/A'	B	C	a	b/c	d		
BW106-T	2	795 (31.3)	270 (10.6)	490 (19.3)	770(30.3)	380 (15)	10.5 (0.41)	-	32 (71)
BW206-T	2	995 (39.2)	270 (10.6)	490 (19.3)	970 (38.2)	380 (15)	10.5 (0.41)	-	40 (88)
BW012-025	2	295 (11.6)	260 (10.2)	490 (19.3)	270 (10.6)	380 (15)	10.5 (0.41)	M12 + M25	8.0 (18)
BW012-025-P	2	295/355 (11.6)/(14)	260 (10.2)	490 (19.3)	270 (10.6)	380 (15)	10.5 (0.41)	M12 + M25	8.0 (18)
BW012-050-T	2	395 (15.6)	260 (10.2)	490 (19.3)	370 (14.6)	380 (15)	10.5 (0.41)	-	12 (26)
BW012-100-T	2	595 (23.4)	270 (10.6)	490 (19.3)	570 (22.4)	380 (15)	10.5 (0.41)	-	21 (46)
BW915-T	2	795 (31.3)	270 (10.6)	490 (19.3)	770 (30.3)	380 (15)	10.5 (0.41)	-	30 (66)
BW018-015	3	620 (24.4)	120 (4.72)	92 (3.6)	544 (21.4)	64 (2.5)	6.5 (0.26)	PG11	4.0 (8.8)
BW018-015-P	4	649 (25.6)	120 (4.72)	185 (7.28)	530 (20.9)	150 (5.91)	6.5 (0.26)	M12 + M25	5.8 (13)
BW018-035-T	2	295 (11.6)	270 (10.6)	490 (19.3)	270 (10.6)	380 (15)	10.5 (0.41)	-	9.0 (20)
BW018-075-T	2	595 (23.4)	270 (10.6)	490 (19.3)	570 (22.4)	380 (15)	10.5 (0.41)	-	18.5 (40.8)
BW027-006	3	486 (19.1)	120 (4.72)	92 (3.6)	430 (16.9)	64 (2.5)	6.5 (0.26)	PG11	2.2 (4.9)
BW027-012	3	486 (19.1)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	PG11	4.3 (9.5)
BW039-003	3	286 (11.3)	120 (4.72)	92 (3.6)	230 (9.06)	64 (2.5)	6.5 (0.26)	PG11	1.5 (3.3)
BW039-006	3	486 (19.1)	120 (4.72)	92 (3.6)	430 (16.9)	64 (2.5)	6.5 (0.26)	PG11	2.2 (4.9)
BW039-012	3	486 (19.1)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	PG11	4.3 (9.5)
BW039-012-T	4	549 (21.6)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	M12 + M25	4.9 (11)
BW039-026-T	4	649 (25.6)	120 (4.72)	275 (10.8)	530 (20.9)	240 (9.45)	6.5 (0.26)	M12 + M25	7.5 (17)
BW039-050-T	2	395 (15.6)	260 (10.2)	490 (19.3)	370 (14.6)	380 (15)	10.5 (0.41)	-	12 (26)
BW147	3	465 (18.3)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	PG13.5	4.3 (9.5)
BW147-T	4	549 (21.6)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	M12 + M25	4.9 (11)
BW247	3	665 (26.2)	120 (4.72)	185 (7.28)	626 (24.6)	150 (5.91)	6.5 (0.26)	PG13.5	6.1 (13)
BW247-T	4	749 (29.5)	120 (4.72)	185 (7.28)	626 (24.6)	150 (5.91)	6.5 (0.26)	M12 + M25	9.2 (20)
BW347	3	670 (26.4)	145 (5.71)	340 (13.4)	630 (24.8)	300 (11.8)	6.5 (0.26)	PG13.5	13.2 (29.1)
BW347-T	4	749 (29.5)	210 (8.27)	185 (7.28)	630 (24.8)	150 (5.91)	6.5 (0.26)	M12 + M25	12.4 (27.3)
BW168	3	365 (14.4)	120 4.72)	185 (7.28)	326 (12.8)	150 (5.91)	6.5 (0.26)	PG13.5	3.5 (7.7)
BW168-T	4	449 (17.7)	120 (4.72)	185 (7.28)	326 (12.8)	150 (5.91)	6.5 (0.26)	M12 + M25	3.6 (7.9)
BW268	3	465 (18.3)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	PG13.5	4.3 (9.5)
BW268-T	4	549 (21.6)	120 (4.72)	185 (7.28)	426 (16.8)	150 (5.91)	6.5 (0.26)	M12 + M25	4.9 (11)
BW072-003	1	110 (4.33)	80 (3.1)	15 (0.59)	98 (3.9)	60 (2.4)	–	-	0.3 (0.7)
BW072-005	1	216 (8.5)	80 (3.1)	15 (0.59)	204 (8.03)	60 (2.4)	–	-	0.6 (1)
BW100-005	1	216 (8.5)	80 (3.1)	15 (0.59)	204 (8.03)	60 (2.4)	–	-	0.6 (1)
BW100-006	4	486 (19.1)	120 (4.72)	92 (3.6)	430 (16.9)	64 (2.5)	6.5 (0.26)	PG11	2.2 (4.9)
BW100-006-T	4	549 (21.6)	120 (4.72)	92 (3.6)	430 (16.9)	80 (3.1)	6.5 (0.26)	M12 + M25	3.0 (6.6)

Touch guard BS... A BS.. touch guard is available for braking resistors in flat design.

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

Dimensions drawing for BS...

05247AXX

Figure 26: Dimension drawing, BS touch guard with grommet [1] and support rail mounting [2]

Type	Main dimensions mm (in)			Mounting dimensions mm (in)					Weight kg (lb)
	A	B	C	b	d	e	a	x	
BS-003	60 (2.4)	160 (6.3)	146 (5.75)	125 (4.92)	40 (1.6)	20 (0.79)	6 (0.2)	17.5 (0.69)	0.35 (0.77)
BS-005	60 (2.4)	160 (6.3)	252 (9.92)	125 (4.92)	4 (1.6)	20 (0.79)	6 (0.2)	17.5 (0.69)	0.5 (1)

Mounting rail installation A mounting rail attachment HS001 is available from SEW-EURODRIVE, part number 822 194 4, for mounting the touch guard on a mounting rail.

DKB11A heat sink for braking resistors in flat design

Part number 814 345 5

Description The DKB11A heat sink for braking resistors in flat design provides a space-saving means for mounting the braking resistors (BW072-005, BW100-005) beneath MOVIDRIVE® size 1 units (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

Figure 27: Dimensions, DKB11A heat sink for brake resistors in flatpack design, all in mm (in)

[1] Mounting surface for the braking resistor

[2] Retaining screws are not included in the delivery scope

2.44 Line choke 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 currents).
- ND.. line filters have cRUus approval independent of the MOVIDRIVE® inverters.

Line choke type	ND020-013	ND030-023[1]	ND045-013	ND085-013	ND150-013	ND200-0033	ND300-0053
Part number	826 012 5	827 151 8	826 013 3	826 014 1	825 548 2	826 579 8	827 721 4
Rated power supply voltage V_{supply} (according to EN 50160)	3 × AC 380 V - 500 V, 50/60 Hz						
Rated current[2] I_N	AC 20 A	AC 30 A	AC 45 A	AC 85 A	AC 150 A	AC 200 A	AC 300 A
Power loss at bei I_N P_V	10 W	30 W	15 W	25 W	65 W	100 W	280 W
Inductance L_N	0.1 mH	0.2 mH	0.1 mH	0.1 mH	0.1 mH	0.03 mH	0.05 mH
Ambient temperature ϑ_U	–25 ... +45 °C						
Degree of protection	IP 00 (EN 60529)						
Connections	Terminal strips 4 mm² (AWG12)	Terminal strips 2.5 mm²... 10 mm² (AWG13 ... AWG8)	Terminal strips 10 mm² (AWG8)	Terminal strips 35 mm² (AWG2)	M10 stud PE: M8 stud		M12 stud PE: 2 × M10
Tightening torque	0.6 ... 0.8 Nm	max. 2.5 Nm		3.2 ... 3.7 Nm	M10 stud: 10 Nm PE: 6 Nm		M12 stud: 15.5 Nm PE: 10 Nm
Assignment to AC 400/500 V units (MDX60/61B...-5_3)							
Rated operation (100 %)	0005...0075	0110...0220		0300...0450 and MDR60A0370	0550/0750	MDR60A 0750	0900...1320
Increased power (125 %)	0005...0075	0110/0150		0220...0370	0450...0750		
Assignment to 230 V units (MDX61B...-2_3)							
Rated operation (100 %)	0015...0055	-	0075/0110	0150/0220	0300	-	-
Increased power (125 %)	0015...0037	-	0055/0075	0110/0150	0220/0300	-	-

1) Use ND030-023 for DC link connection without regenerative power supply unit in connection type A or B (see system manual MOVIDRIVE® MDR60A regenerative power supply).

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

Dimension drawings for ND...

Figure 28: Dimension drawing for line chokes ND020.. / ND030.. / ND045.. / ND085..

[1] Space for installation terminals Input: 1U1, 1V1, 1W1

Any mounting position Output: 1U2, 1V2, 1W2

Figure 29: Dimension drawing for line chokes ND150.. / ND200.. / ND300..

Line choke type	Main dimensions mm (in)			Mounting dimensions mm (in)		Hole dimension mm (in)	Weight
	A	B	C	a	b	c	kg (lb)
ND020-013	85 (3.3)	60 (2.4)	120 (4.72)	50 (2)	31 - 42 (1.2 - 1.7)	5 - 10 (0.2 - 0.39)	0.5 (1)
ND030-023 **ND045-013**	125 (4.92)	95 (3.7)	170 (6.69)	84 (3.3)	55-75 (2.2 - 3)	6 (0.24)	2.5 (5.5)
ND085-013	185 (7.28)	115 (4.53)	235 (9.25)	136 (5.35)	56 - 88 (2.2 - 3.5)	7 (0.28)	8 (18)
ND150-013	255 (10)	140 (5.51)	230 (9.06)	170 (6.69)	77 (3)	8 (0.31)	17 (37)
ND200-0033	250 (9.84)	160 (6.3)	230 (9.06)	180 (7.09)	98 (3.9)	8 (0.31)	15 (33)
ND300-0053	300 (11.8)	190 (7.48)	295 (11.6)	255 (10)	145 (5.71)	11 (0.43)	35 (77)

2.45 Line filter type NF...-... option

- To suppress interference emission on the line side of inverters.
- Do not switch between the NF... line filter and MOVIDRIVE®.
- NF.. line filters have cRUus approval independent of the MOVIDRIVE® inverters.

Line filter type	NF009-503	NF014-503	NF018-503	NF035-503	NF048-503
Part number	827 412 6	827 116 X	827 413 4	827 128 3	827 117 8
Rated mains voltage V_N (according to EN 50160)	3 × AC 380 V - 500 V, 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 bei 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				
Degree of protection	IP20 (EN 60529)				
Connections L1-L3/L1'-L3' Tightening torque L1-L3/L1'-L3' Connection PE Tightening torque PE	4 mm² (AWG 10) 0.8 Nm M5 stud 3.4 Nm			10 mm² (AWG 8) 1.8 Nm M5 stud 3.4 Nm	10 mm² (AWG 8) 1.8 Nm M6 stud 5.5 Nm
Assignment to AC 400/500 V units (MDX60/61B...-5_3)					
Rated operation (100 %)	0005...0040	0055/0075	-	0110/0150	0220
Increased power (125 %)	0005...0030	0040/0055	0075	0110	0150
Assignment to 230 V units (MDX61B...-2_3)					
Rated operation (100 %)	0015/0022	0037	-	0055/0075	0110
Increased power (125 %)	0015	0022	0037	0055/0075	-

Line filter type	NF063-503	NF085-503	NF115-503	NF150-503	NF210-503	NF300-503
Part number	827 414 2	827 415 0	827 416 9	827 417 7	827 418 5	827 419 3
Rated mains voltage V_N (according to EN 50160)	3 × AC 380 V - 500 V, 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					
Degree of protection	IP20 (EN 60529)					
Connections L1-L3/L1'-L3' Tightening torque L1-L3/L1'-L3' Connection PE Tightening torque PE	16 mm² (AWG 6) 3 Nm M6 5.5 Nm	35 mm² (AWG 2) 3.7 Nm M8 12.8 Nm	50 mm² (AWG1/0) 3.7 Nm M10 23.8 Nm	50 mm² (AWG1/0) 3.7 Nm M10 23.8 Nm	95 mm² (AWG4/0) 20 Nm M10 23.8 Nm	150 mm² (AWG300-2) 30 Nm M12 36 Nm
Assignment to AC 400/500 V units (MDX60/61B...-5_3)						
Rated operation (100 %)	0300	0370/0450	0550	0750	0900/1100	1320
Increased power (125 %)	0220	0300/0370	0450	0550/0750	0900	1100/1320
Assignment to 230 V units (MDX61B...-2_3)						
Rated operation (100 %)	0150	0220	0300	-	-	-
Increased power (125 %)	0110/0150	-	0220/0300	-	-	-

Dimension drawing for NF...

Figure 30: Dimension drawing for NF line filter

Any mounting position

Line filter type	Main dimensions mm (in)			Mounting dimensions mm (in)		Hole dimension mm (in)	PE connection	Weight
	A	B	C	a	b	c		kg (lb)
NF009-503	55 (2.2)	195 (7.68)	80 (3.1)	20 (0.78)	180 (7.09)	5.5 (0.22)	M5	0.8 (2)
NF014-503		225 (8.86)			210 (8.27)			0.9 (2)
NF018-503	50 (1.97)	255 (10)			240 (9.45)			1.1 (2.4)
NF035-503	60 (2.36)	275 (10.8)	100 (3.94)	30 (1.18)	255 (10)			1.7 (3.7)
NF048-503		315 (12.4)			295 (11.6)		M6	2.1 (4.6)
NF063-503	90 (3.54)	260 (10.2)		60 (2.36)	235 (9.25)	6.5 (0.26)		2.4 (5.3)
NF085-503		320 (12.6)	140 (5.51)		255 (10)		M8	3.5 (7.7)
NF115-503	100 (3.94)	330 (13)	155 (6.1)	65 (2.56)			M10	4.8 (11)
NF150-503								5.6 (12.3)
NF210-503	140 (5.51)	450 (17.7)	190 (7.48)	102 (4.02)	365 (14.4)			8.9 (20)
NF300-503	170 (6.69)	540 (21.3)	230 (9.06)	125 (4.92)	435 (17.1)		M12	12.2 (26.9)

2.46 HD... output choke option

- For suppression of interference from the unshielded motor cable. For HD001 to HD003 we recommend routing the motor cable through the output choke with 5 loops. Only 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. Connect in series two output chokes in case of 4 windings and three output chokes in case of 3 windings.
- 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 output choke[1)]	HD004[2)]
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/ tightening torque	1.5...16 mm^2 (AWG 16...6)	≤ 1.5 mm^2 (AWG 16)	≥ 16 mm^2 (AWG 6)	M12 terminal stud 20 Nm
Degree of protection	-	-	-	IP10

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

2) UL/cUL approval is not available for the HD0044 output choke

Dimension drawing for HD

HD001
HD002
HD003

58419AXX

HD004

58424AXX

Output choke type	Main dimensions mm (in)			Mounting dimensions mm (in)		Inside ∅ mm (in)	Hole dimension mm (in)	Weight
	A	B	C	a	b	d	c	kg (lb)
HD001	121 (4.76)	64 (2.5)	131 (5.16)	80 (3.1)	50 (2.0)	50 (2.0)	5.8 (0.23)	0.5 (1)
HD002	66 (2.6)	49 (1.9)	73 (2.9)	44 (1.7)	38 (1.5)	23 (0.91)		0.2 (0.4)
HD003	170 (6.69)	64 (2.5)	185 (7.28)	120 (4.72)	50 (2.0)	88 (3.5)	7.0 (0.28)	1.1 (2.4)
HD004	150 (5.91)	400 (15.7)	360 (14.2)	120 (4.72)	370 (14.6)	-	9.0 (0.35)	12.5 (27.6)

2.47 Output filter option type HF...

HF... output filters are sine filters used to smooth output voltage from inverters. HF... output filters (with the exception of HF450-503) are approved to UL/cUL in combination with MOVIDRIVE® inverters. HF... output filters are used in the following cases:

- 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
- for protection against overvoltage spikes in long motor cables (> 100 m)

Please read the following notes carefully:

NOTES

- Operate output filters in V/f and VFC operating modes only. Do not use output filters 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.

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 230 V - 500 V, 50/60 Hz[2)]					
Earth-leakage current at U_N ΔI	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 limit value class C1 to EN 61800-3					
Ambient temperature ϑ_U	0 ... +45 °C (reduction: 3 % I_N per K to max. 60 °C)					
Degree of protection (EN 60529)	IP20					
Connections / tightening torque	M4 terminal stud 1.6 Nm ± 20 %					
Weight	3.1 kg (6.8 lb)	4.4 kg (9.7 lb)			10.8 kg (23.8 lb)	
Assignment to AC 400/500 V units (MDX60/61B...-5_3)						
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 throughput current[3)] $I_{N\ 400\ V}$ (at V_{supply} = 3 × AC 400 V)	AC 2.5 A	AC 4 A	AC 6 A	AC 8 A	AC 10 A	AC 12 A
Rated throughput current[3)] $I_{N\ 500\ V}$ (at V_{supply} = 3 × AC 500 V)	AC 2 A	AC 3 A	AC 5 A	AC 6 A	AC 8 A	AC 10 A
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 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 throughput current[3)] $I_{N\ 230\ V}$ (at V_{supply} = 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)]	-	-	0015/0022	-	-	0037

1) Approved to UL/cUL in combination with MOVIDRIVE® inverters. SEW-EURODRIVE will provide a certificate on request.

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

3) Only applies to operation without $V_{DC\ link}$ connection. For operating the inverter with $V_{DC\ link}$ connection, observe the project planning notes in the system manual of the respective inverter.

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 × AC 230 V - 500 V, 50/60 Hz[2)]				
Earth-leakage current at U_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 limit value class C1 to EN 61800-3				
Ambient temperature ϑ_U	0 ... +45 °C (reduction: 3 % I_N per K to max. 60 °C)				
Degree of protection (EN 60529)	IP 20	IP20			IP 10
Connections / tightening torque	M4 terminal stud 1.6 Nm ± 20 %	35 mm² (AWG 2) 3.2 Nm			
Weight	10.8 kg (23.8 lb)	15.9 kg (35.1 lb)	16.5 kg (36.4 lb)	23 kg (51 lb)	32 kg (71 lb)
Assignment to AC 400/500 V units (MDX60/61B...-5_3)					
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 throughput current[3)] $I_{N\ 400\ V}$ (at V_{supply} = 3 × AC 400 V)	AC 16 A	AC 23 A	AC 33 A	AC 47 A	AC 90 A
Rated throughput current[3)] $I_{N\ 500\ V}$ (at V_{supply} = 3 × AC 500 V)	AC 13 A	AC 19 A	AC 26 A	AC 38 A	AC 72 A
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[4)] /0550[4)]/0750[4)]
Assignment to 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 throughput current[3)] $I_{N\ 230\ V}$ (at V_{supply} = 3 × AC 230 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) Approved to UL/cUL in combination with MOVIDRIVE® inverters. SEW-EURODRIVE will provide a certificate on request.

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

3) Only applies for operation without $V_{DC\ link}$ connection. For operation with V_Z connection, observe the project planning instructions in the MOVIDRIVE® MDX60/61B system manual, section "Project Planning/Connecting the optional power components."

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

Dimension drawings for HF...-503 output filters

HF008 / 015 / 022 / 030-503 HF040/055/075-503

Figure 31: Dimension drawings for output filters HF008...075-503

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

Output filter type	Main dimensions mm (in)			Mounting dimensions mm (in)		Hole dimension mm (in)	Ventilation clearances[1] mm (in)	
	A	B	C	a	b	c	Top	Bottom
HF008/015/022/030-503	80 (3.1)	286 (11.3)	176 (6.93)	-	265 (10.4)	7 (0.3)	100 (3.94)	100 (3.94)
HF040/055/075-503	135 (5.31)	296 (11.7)	216 (8.5)	70 (2.8)	283 (11.1)			

1) There is no need for clearance at the sides. You can line up the units next to one another.

HF450-503

Figure 32: Dimension drawing for output filter HF450-503

Only the mounting position shown in the dimension drawing is permitted

Output filter type	Main dimensions mm (in)			Mounting dimensions mm (in)		Hole dimension mm (in)	Ventilation clearances mm (in)	
	A	B	C	a	b	c	Top	Bottom
HF450-503	465 (18.3)	385 (15.2)	240 (9.45)	436 (17.2)	220 (8.66)	8.5 (0.33)	100 (3.94)	100 (3.94)

Dimension drawing for HF...-403 output filter

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Figure 33: Dimension drawing for HF...-403 output filter

Type	Main dimensions mm (in)			Mounting dimensions mm (in)				Hole dimen-sion mm (in)	Ventilation clearances mm (in)		
				Standard mounting position		Horizontal mounting position					
	A	B	C/C1	a	b	a1	a2	c	At the side	Top	Bot-tom
HF023-403	145 (5.71)	284 (11.2)	365/390 (14.4/15.4)	268 (10.6)	60 (2.4)	210 (8.27)	334 (13.1)	6.5 (0.26)	je 30 (1.2)	150 (5.91)	150 (5.91)
HF033-403											
HF047-403	190 (7.48)	300 (11.8)	385/400 (15.2/15.7)	284 (11.2)	80 (3.1)						

2.48 Prefabricated cables

Overview

SEW offers cable sets and prefabricated cables for straightforward and error-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 and CMP motors.
4. VR forced cooling fan cable and extension cable
5. Connection to DEH11B/DEH21B/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 using the cable sets listed in the table below. 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 cable lugs to connect other inverters. In this case, connect inverters in star configuration to the regenerative power supply unit. 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 cables The cables are equipped with a connector for motor connection and conductor end sleeves for inverter connection.

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	199 179 5	Fixed installation	CM..SM51
4×1.5 mm² + 3×1.0 mm²	199 189 2		CM..BR SB51
4×2.5 mm²	199 181 7		CM..SM52
4×2.5 mm² + 3×1.0 mm²	199 191 4		CM..BR SB52
4×4 mm²	199 183 3		CM..SM54
4×4 mm² + 3×1.0 mm²	199 193 0		CM..BR SB54
4×6 mm²	199 185 X		CM..SM56
4×6 mm² + 3×1.5 mm²	199 195 7		CM..BR SB56
4×10 mm²	199 187 6		CM..SM59
4×10 mm² + 3×1.5 mm²	199 197 3		CM..BR SB59

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	1 333 114 0	Cable carrier installation	CM..SM51
4×1.5 mm² + 3×1.0 mm²	1 333 116 7		CM..BR SB51
4×2.5 mm²	1 333 115 9		CM..SM52
4×2.5 mm² + 3×1.0 mm²	1 333 117 5		CM..BR SB52
4×4 mm²	199 184 1		CM..SM54
4×4 mm² + 3×1.0 mm²	199 194 9		CM..BR SB54
4×6 mm²	199 186 8		CM..SM56
4×6 mm² + 3×1.5 mm²	199 196 5		CM..BR SB56
4×10 mm²	199 188 4		CM..SM59
4×10 mm² + 3×1.5 mm²	199 198 1		CM..BR SB59

Extension cables The cables are equipped with a connector and adapter for extending the CM motor cable.

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	199 549 9	Fixed installation	CM..SM51
4×1.5 mm² + 3×1.0 mm²	199 199 X		CM..BR SB51
4×2.5 mm²	199 551 0		CM..SM52
4×2.5 mm² + 3×1.0 mm²	199 201 5		CM..BR SB52
4×4 mm²	199 553 7		CM..SM54
4×4 mm² + 3×1.0 mm²	199 203 1		CM..BR SB54
4×6 mm²	199 555 3		CM..SM56
4×6 mm² + 3×1.5 mm²	199 205 8		CM..BR SB56
4×10 mm²	199 557 X		CM..SM59
4×10 mm² + 3×1.5 mm²	199 207 4		CM..BR SB59

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	1 333 118 3	Cable carrier installation	CM..SM51
4×1.5 mm² + 3×1.0 mm²	1 333 120 5		CM..BR SB51
4×2.5 mm²	1 333 119 1		CM..SM52
4×2.5 mm² + 3×1.0 mm²	1 333 121 3		CM..BR SB52
4×4 mm²	199 554 5		CM..SM54
4×4 mm² + 3×1.0 mm²	199 204 X		CM..BR SB54
4×6 mm²	199 556 1		CM..SM56
4×6 mm² + 3×1.5 mm²	199 206 6		CM..BR SB56
4×10 mm²	199 558 8		CM..SM59
4×10 mm² + 3×1.5 mm²	199 208 2		CM..BR SB59

3. Prefabricated cables and extension cables for connecting DS/CMD/CMP motors

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

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	590 454 4	Fixed installation	DS56 / CMD.. / CMP.. SM11
4×1.5 mm² + 2×1 mm²	1 332 485 3		DS56..B / CMD..BP / CMP..BP SB11
4×2.5 mm²	590 455 2		DS56 / CMD.. / CMP.. SM12
4×2.5 mm² + 2×1 mm²	1 333 213 9		DS56..B / CMD..BP / CMP..BP SB12
4×4 mm²	590 456 0		DS56 / CMD.. / CMP.. SM14
4×4 mm² + 2×1 mm²	1 333 214 7		DS56..B / CMD..BP / CMP..BP SB14

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	590 624 5	Cable carrier installation	DS56 / CMD.. / CMP.. SM11
4×1.5 mm² + 2×1 mm²	1 333 122 1		DS56..B / CMD..BP / CMP..BP SB11
4×2.5 mm²	590 625 3		DS56 / CMD.. / CMP.. SM12
4×2.5 mm² + 2×1 mm²	1 333 215 5		DS56..B / CMD..BP / CMP..BP SB12
4×4 mm²	590 480 3		DS56 / CMD.. / CMP.. SM14
4×4 mm² + 2×1 mm²	1 333 216 3		DS56..B / CMD..BP / CMP..BP SB14

Extension cables The cables are equipped with a connector and adapter for extending the motor cable.

Number of cores and line cross section	Part number	Installation type	for motor
4×1.5 mm²	1 333 245 7	Cable carrier installation	DS56 / CMD.. / CMP.. SM11
4×1.5 mm² + 2×1 mm²	1 333 248 1		DS56..B / CMD..BP / CMP..BP SB11
4×2.5 mm²	1 333 246 5		DS56 / CMD.. / CMP.. SM12
4×2.5 mm² + 2×1 mm²	1 333 250 3		DS56..B / CMD..BP / CMP..BP SB12
4×4 mm²	1 333 247 3		DS56 / CMD.. / CMP.. SM14
4×4 mm² + 2×1 mm²	1 333 251 1		DS56..B / CMD..BP / CMP..BP SB14

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

VR forced cooling fan cable:

Number of cores and line cross section	Part number	Installation type
3×1 mm²	198 634 1	Fixed installation
3×1 mm²	199 560 X	Cable carrier installation

Extension cable for the VR forced cooling fan cable:

Number of cores and line cross section	Part number	Installation type
3×1 mm²	199 561 8	Fixed installation
3×1 mm²	199 562 6	Cable carrier installation

5. Prefabricated cables for connecting options DEH11B / DEH21B / DER11B

The following overviews show the possible connections for the DEH11B/DEH21B 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	Meaning
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 X15 X15 DEH11B/DEH21B

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

- Cable to connect HIPERFACE® encoders AF1H, AK0H, AS1H, AS3H, AS4H, EF1H, EK0H, ES1H, ES3H, ES4H, EV1H, AV1H with plug connector connection on the motor side to DS, CM, CMD, CMP, DT, DV, DT(E), DV(E), CT, CV, DZ or DX motors.

56135AXX

Type	Installation	Part number
DEH11B/21B X15 → DS/CM/CMD/CMP/DT/DV/DT(E)/DV(E)/CT/CV/DZ/DX motors with AF1H, AK0H, AS1H, AS3H, AS4H, EF1H, EK0H, ES1H, ES3H, ES4H, EV1H, AV1H	56047AXX	1332 453 5
	56048AXX	1332 455 1

- Extension cable to connect HIPERFACE® encoders AF1H, AK0H, AS1H, AS3H, AS4H, EF1H, EK0H, ES1H, ES3H, ES4H, EV1H, AV1H with plug connector connection on the motor side to DS, CM, CMD, CMP, DT, DV, DT(E), DV(E), CT, CV, DZ or DX motors.

56136AXX

Type	Installation	Part number
DEH11B/21B X15 → DS/CM/CMD/CMP/DT/DV/DT(E)/DV(E)/CT/CV/DZ/DX motors with AF1H, AK0H, AS1H, AS3H, AS4H, EF1H, EK0H, ES1H, ES3H, ES4H, EV1H, AV1H	56051AXX	199 539 1
	56052AXX	199 540 5

- Cable to connect HIPERFACE® encoders AS1H, ES1H, AF1H, EF1H with terminal box connection on the motor side to CM motors.

56137AXX

Type	Installation	Part number
DEH11B/21B X15 → CM motors with AS1H, ES1H, AF1H, EF1H	56049AXX	1332 457 8
	56050AXX	1332 454 3

- Cable to connect HIPERFACE® encoders AS1H, ES1H, AF1H, EF1H with terminal box connection on the motor side to DS motors.

56132AXX

Type	Installation	Part number
DEH11B/21B X15 → DS motors with AS1H, ES1H, AF1H, EF1H	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 and DX motors.

56132AXX

Type	Installation	Part number
DEH11B/21B 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 (option DWE12B, interface adapter HTL → TTL) to connect push-pull HTL encoders at X15 of option (→ chapter "Interface adapter DWE11B/12B").

59109AXX

Type	Installation	Part number
DEH11B/21B X15 → Option DWE12B (connection for push-pull HTL encoders)	56047AXX	188 180 9

- Cable to connect push-pull HTL encoders ES1C, ES2C, EV1C, EV2C, EH1C with terminal box connection on the motor side to DT(E), DV(E), eDT, eDV, DR, DZ and DX motors.

56132AXX

Type	Installation	Part number
Push-pull HTL encoders ES1C, ES2C, EV1C, EV2C, EH1C → DT(E)/DV(E)/eDT/eDV/DR/DZ/DX motors	56049AXX	198 829 8
	56050AXX	198 828 X

- Cable to connect DC 5 V TTL sensors ES1T, ES2T, EV1T, EV2T, 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, EV2T, 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/21B X15 → DWI11A X1	56047AXX	817 957 3

- Y cable to connect the AV1Y absolute encoder with plug connector on the motor side to DT(E), DV(E), CT, CV, DR, DZ and DX motors. The following encoder tracks are evaluated with the Y cable:
  - SSI track of the AV1Y absolute encoder and at DIP11B/DEH21B X62
  - sin/cos track of the AV1Y absolute encoder at DEH11B X15

59321AXX

Type	Installation	Part number
DEH11B X15 → AV1Y and DIP11B/DEH21B 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	593 968 2

Connection options at X14, DEH11B / DER11B

	NOTE 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, AF1H, EF1H via plug connector.

56130AXX

Type	Installation	Part number
DEH11B / DER11B X14 → AV1H, AS1H, ES1H, AF1H, EF1H	56047AXX	818 015 6
	56048AXX	818 165 9

- Cable to connect external HIPERFACE® encoders AV1H, AS1H, ES1H, AF1H, EF1H via plug connector.

56131AXX

Type	Installation	Part number
DEH11B / DER11B X14 → AV1H, AS1H, ES1H, AF1H, EF1H	56051AXX	199 539 1
	56052AXX	199 540 5

- Cable to connect external Hiperface® encoders via encoder terminal strip.

56132AXX

Type	Installation	Part number
DEH11B / DER11B X14 → Hiperface® encoders	56049AXX	1810 695 1
	56050AXX	1810 697 8

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

56132AXX

Type	Installation	Part number
DEH11B / DER11B X14 → sin/cos encoders	56049AXX	819 869 1
	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 DER11B

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

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

56138AXX

Type	Installation	Part number
DER11B X15 → DS/CM/CMD/CMP 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, CMD or CMP motors.

56139AXX

Type	Installation	Part number
DER11B X15 → DS/CM/CMD/CMP 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

3 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 homepage www.sew-eurodrive.com.

3.1 Menu structure DBG60B

Figure 34: Structure of the DBG60B menu

3.2 Overview of parameters

The following table lists all parameters together with their factory settings (underlined): Numerical values are displayed with the complete setting range.

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	Current parameter set	
014	Heat sink temperature	
015	Hours of operation	
016	Enable hours	
017	Work	
018 / 019	KTY utilization 1 / 2	
02x	**Analog setpoints**	
020 / 021	Analog input AI1 / AI2	
022	External current limit	
03x	**Binary inputs basic unit**	
030 ... 037	Binary input DIØØ ... DIØ7	
039	Binary inputs DIØØ ... DIØ7	
04x	**Binary inputs option**	
040 ... 047	Binary input DI1Ø ... DI17	
048	Binary inputs DI1Ø ... DI17	
05x	**Binary outputs basic unit**	
050	Binary output DBØØ	
051 ... 055	Binary output DOØ1 ... DOØ5	
059	Binary outputs DB00, DOØ1 ... DOØ5	
06x	**Binary outputs option**	
060 ... 067	Binary output DO1Ø ... DO17	
068	Binary outputs DO1Ø ... DO17	
07x	**Unit data**	
070	Unit type	
071	Rated output current	
072	Option / firmware encoder slot	
073	Option / firmware fieldbus slot	

074	Option / firmware expansion slot	
076	Firmware basic unit	
078	Technology function	
079	Unit type	
08x	**Error 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	PO1 ... PO3 Setpoint	
097 ... 099	PI1 ... PI3 Actual value	
1xx	**Setpoints / integrators**	
10x	**Setpoint selection**	
100	Setpoint source	UNIPOL./FIX.SETPT.
101	Control signal source	TERMINALS
102	Frequency scaling	0.1 ... 10 ... 65 kHz
105	Error response to wire breakage AI1	No response
11x	**Analog input AI1**	
110	AI1 scaling	–10 ... 0 ... 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 rpm
115	Filter setpoint	0 ... 5 ... 100 ms, 0 = OFF
12x	**Analog inputs option**	
120	AI2 operating mode (optional)	NO FUNCTION
13x / 14x	**Speed ramps 1 / 2**	
130 / 140	Ramp t11 / t21up CW	0 ... 2 ... 2000 s
131 / 141	Ramp t11 / t21 down CW	0 ... 2 ... 2000 s
132 / 142	Ramp t11 / t21up CCW	0 ... 2 ... 2000 s
133 / 143	Ramp t11 / t21 down CCW	0 ... 2 ... 2000 s
134 / 144	Ramp t12 / t22 UP = DOWN	0 ... 10 ... 2000 s
135 / 145	S pattern t12 / t22	0 ... 3
136 / 146	Stop ramp t13 / t23	0 ... 2 ... 20 s
137 / 147	Emergency stop ramp t14 / t24	0 ... 2 ... 20 s
138	Ramp limit VFC	YES
139 / 149	Ramp monitoring 1 / 2	NO
15x	**Motor potentiometer**	
150	Ramp t3 up	0.2 ... 20 ... 50 s
151	Ramp t3 down	0.2 ... 20 ... 50 s
152	Save last setpoint	OFF

16x / 17x	**Fixed setpoints 1 / 2**	
160 / 170	Internal setpoint n11 / n21	–6000 ... 150 ... 6000 rpm (% I_N)
161 / 171	Internal setpoint n12 / n22	–6000 ... 750 ... 6000 rpm (% I_N)
162 / 172	Internal setpoint n13 / n23	–6000 ... 1500 ... 6000 rpm (% I_N)
2xx	**Controller parameters**	
20x	**Speed control**	
200	P gain n-controller	0.01 ... 2 ... 32
201	Time constant n-controller	0 ... 10 ... 3000 ms
202	Amplified acceleration precontrol	0 ... 65
203	Filter acceleration precontrol	0 ... 100 ms
204	Filter speed actual value	0 ... 32 ms
205	Load precontrol CFC	–150 ...0 ... 150 %
206	Sampling time n-controller	1 ms / 0.5 ms
207	Load precontrol VFC	–150 ... 0 ... 150 %
21x	**Hold controller**	
210	P gain hold controller	0.1 ... 0.5 ... 32
22x	**Synchronous operation control (only with the DRS11B option)**	
220	P-gain DRS	1 ... 10 ... 200
221	Master gear unit factor	1 ... 3 999 999 999
222	Slave gear unit factor	1 ... 3 999 999 999
223	Mode selection	Mode 1 Mode 8
224	Slave counter	–99 999 999 ... 10 ... 99 999 999
225	Offset 1	–32 767 ... 10 ... 32 767
226	Offset 2	–32 767 ... 10 ... 32 767
227	Offset 3	–32 767 ... 10 ... 32 767
228	Filter precontrol DRS	0 ... 100 ms
23x	**Synchronous operation with synchronous encoder (only with the DRS11B option)**	
230	Synchronous encoder	OFF
231	Factor slave encoder	1 ... 1000
232	Factor slave synchronous encoder	1 ... 1000
233	Synchronous encoder resolution	128 / 256 / 512 / 1024 / 2048
234	Master encoder resolution	128 / 256 / 512 / 1024 / 2048
24x	**Synchronous operation with catch up**	
240	Synchronous speed	–6000 ... 1500 ... 6000 rpm
241	Synchronous ramp	0 ... 2 ... 50 s
26x	**Process controller parameters**	
260	Duty cylce	Controller off
261	Cycle time	1 / 5 / 10 ms
262	Interruption	No response:
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
27x	**Process controller input values**	
270	Setpoint source	Parameters
271	setpoint	–32767 ... 0 ... 32767
272	IPOS setpoint address	0 ... 1023
273	Time constant	0 ... 0.01 ... 2000 s

274	Scaling setpoint	–32.767 ... 1 ... 32.767
275	Actual value source	Analog 1
276	IPOS actual value address	0 ... 1023
277	Actual scaling factor	–32.767 ... 1 ... 32.767
278	Actual offset value	–32767 ... 0 ... 32767
279	Actual time constant	0 ... 500 ms
28x	**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
283	PID controller maximum output	–32767 ... 10000 ... 32767
284	Minimum output process controller	–32767 ... 0 ... 32767
285	Maximum output process controller	–32767 ... 7500... 32767
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 ... 15... 6100 rpm
302 / 312	Maximum speed 1 / 2	0 ... 1500 ... 6100 rpm
303 / 313	Current limit 1 / 2	0 ... 150 % I_N (BG0: 0 ... 200 % I_N)
304	Torque limit	0 ... 150 % (BG0: 0 ... 200 %)
32x / 33x	**Motor compensation 1 / 2 (asynchronous)**	
320 / 330	Automatic adjustment 1 / 2	ON
321 / 331	Boost 1 / 2	0 ... 100 %
322 / 332	IxR adjustment 1 / 2	0 ... 100 %
323 / 333	Pre-magnetization time 1 / 2	0 ... 2 s
324 / 334	Slip compensation 1 / 2	0 ... 500 rpm
34x	**Motor protection**	
340 / 342	Motor protection 1 / 2	OFF
341 / 343	Type of cooling 1/2	FAN COOLED
344	Interval for motor protection	0.1...4..0.20 s
345 / 346	I_N UL monitoring 1 / 2	0.1 ... 500 A
35x	**Direction of rotation of the motor**	
350 / 351	Direction of rotation reversal 1 / 2	OFF
36x	**Startup (only available in DBG60B)**	
360	Startup	NO
4xx	**Reference messages**	
40x	**Speed reference signal**	
400	Speed reference value	0 ... 1500 ... 6000 rpm
401	Hysteresis	0 ... 100 ... 500 rpm
402	Delay time	0 ... 1 ... 9 s
403	Signal = "1" if:	n < nref / n > n_{ref}
41x	**Speed window signal**	
410	Window center	0 ... 1500 ... 6000 rpm
411	Range width	0 ... 6000 rpm
412	Delay time	0 ... 1 ... 9 s
413	Signal = "1" if:	INSIDE

42x	**Speed setpoint/actual value comparison**	
420	Hysteresis	0 ... 100 ... 300 rpm
421	Delay time	0 ... 1 ... 9 s
422	Signal = "1" if:	$n \neq n_{setpt}$ / $n = n_{setpt}$
43x	**Current reference signal**	
430	Current reference value	0 ... 100 ... 200 % I_N
431	Hysteresis	0 ... 5 ... 30 % I_N
432	Delay time	0 ... 1 ... 9 s
433	Signal = "1" if:	I < Iref / $I > I_{ref}$
44x	**Imax signal**	
440	Hysteresis	0 ... 5 ... 50 % I_N
441	Delay time	0 ... 1 ... 9 s
442	Signal = "1" if:	$I = I_{max}$ / $I < I_{max}$
5xx	**Monitoring functions**	
50x	**Speed monitoring**	
500 / 502	Speed monitoring 1 / 2	MOT.&REGEN.
501 / 503	Delay time 1 / 2	0 ... 1 ... 10 s
504	Encoder monitoring motor	NO
505	Synchronous encoder monitoring	NO
51x	**Synchronous operation monitoring**	
510	Positional tolerance slave	10 ... 25 ... 32 768 increments
511	Prewarning lag error	50 ... 99,999,999 increments
512	Lag error limit	100 ... 4000 ... 99 999 999
513	Delay lag error signal	0 ... 1 ... 99 s
514	Counter LED display	10 ... 100 ... 32 768 increments
515	Delay position signal	5 ... 10 ... 2000 ms
516	X41 Encoder monitoring	NO
517	X41 Pulse count monitoring	NO
518	X42 Encoder monitoring	NO
519	X42 Pulse count monitoring	NO
52x	**Mains-off check**	
520	Mains OFF response time	0 ... 5 s
521	Mains OFF response	CONTROLLER INHIBIT
522	Phase failure monitoring	ON
53x	**Motor temperature protection**	
530	Sensor type 1	No sensor / TF-TH / KTY
531	Sensor type 2	No sensor / TF-TH / KTY
54x	**Gear unit/motor monitoring**	
540	Response to drive vibration / warning	Display error
541	Response to drive vibration / fault	Rapid stop / warning
542	Response to oil aging / warning	Display error
543	Response to oil aging / fault	Display error
544	Response oil aging / overtempera-ture	Display error
545	Response oil aging / ready signal	Display error
549	Response brake wear	Display error
55x	**DCS safety monitor**	
550	status DCS safety monitor	Display value

551	Binary inputs DCS 1 ... 8	Display value
552	Binary outputs DCS DO0_P ... DO2_M	Display value
553	Serial number DCS	Display value
554	CRC DCS	Display value
555	DCS error response	Immediate stop/fault
556	DCS alarm response	Rapid stop / warning
557	DCS source actual position	Motor encoder (X15)
56x	**Current limitation Ex-e motor**	
560	Current limit Ex-e motor	Off
561	Frequency A	0 ... 5 ... 60
562	Current limit A	0 ... 50 ... 150 %
563	Frequency B	0 ... 10 ... 104 Hz
564	Current limit B	0 ... 80 ... 200 %
565	Frequency C	0 ... 25 ... 104 Hz
566	Current limit C	0 ... 100 .... 200 %
6xx	**Terminal assignment**	
60x	**Binary inputs basic unit**	
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
61x	**Binary inputs option**	
610 ... 617	Binary inputs DI1Ø ... DI17	NO FUNCTION
62x	**Binary outputs basic unit**	
620	Binary output DOØ1	READY FOR OPERATION
621	Binary output DOØ2	/FAULT
622	Binary output DOØ3	IPOS OUTPUT
623	Binary output DOØ4	IPOS OUTPUT
624	Binary output DOØ5	IPOS OUTPUT
63x	**Binary outputs option**	
630 ... 637	Binary outputs DO1Ø ... DO17	NO FUNCTION
64x	**Optional analog outputs**	
640	Analog output AO1	ACTUAL SPEED
641	Scaling AO1	–10 ... 0 ... 1 ... 10
642	Operating mode AO1	OFF / –10 V...+10 V / 0(4) ... 20 mA
643	Analog output AO2	OUTPUT CURRENT
644	Scaling AO2	–10 ... 0 ... 1 ... 10
645	Operating mode AO2	OFF / –10 V...+10 V / 0(4) ... 20 mA
7xx	**Control functions**	
70x	**Operating modes**	
700 / 701	Operating mode 1 / 2	VFC 1 / 2
71x	**Standstill current**	
710 / 711	Standstill current 1 / 2	0 ... 50 % I_{Mot}
72x	**Setpoint stop function**	

720 / 723	Setpoint stop function 1 / 2	OFF
721 / 724	Stop setpoint 1 / 2	0 ... 30 ... 500 rpm
722 / 725	Start offset 1 / 2	0 ... 30 ... 500 rpm
73x	**Brake function**	
730 / 733	Brake function 1 / 2	ON
731 / 734	Brake release time 1 / 2	0 ... 2 s
732 / 735	Brake application time 1 / 2	0 ... 2 s
74x	**Speed skip function**	
740 / 742	Skip window center 1 / 2	0 ... 1500 ... 6000 rpm
741 / 743	Skip width 1 / 2	0 ... 300 rpm
75x	**Master/slave function**	
750	Slave setpoint	MASTER-SLAVE OFF
751	Scaling slave setpoint	–10 ... 0 ... 1 ... 10
76x	**Manual operation**	
760	Lockout run/stop keys	NO
77x	**Energy-saving function**	
770	Energy-saving function	OFF
78x	**Ethernet configuration**	
780	IP address	000.000.000.000 ... 192.168.10.x ... 223.255.255.255
781	Subnetwork mask	000.000.000.000 ... 255.255.255.000 ... 255.255.255.255
782	Standard gateway	000.000.000.000 ... 223.255.255.255
783	Baud rate [MBaud]	
784	MAC address	
785	EtherNet / IP startup configuration	DHCP
8xx	**Unit functions**	
80x	**Setup**	
800	User menu	ON (only in DBG60B)
801	Language	Dependent on DBG60B version
802	Factory setting	NO
803	Parameter lock	OFF
804	Reset statistical data	NO
806	Copy DBG → MDX	NO (only in DBG60B)
807	Copy MDX → DBG	NO (only in DBG60B)
81x	**Serial communication**	
810	RS485 address	0 ... 99
811	RS485 group address	100 ... 199
812	RS485 timeout delay	0 ... 650 s
819	Fieldbus timeout delay	0 ... 0.5 ... 650 s
82x	**Brake operation**	
820 / 821	4-quadrant operation 1 / 2	ON
83x	**Error responses**	
830	Response EXT. ERROR	EMERG. ST/FAULT
831	Response FIELDBUS TIMEOUT	RAPID STOP/FAULT
832	Response MOTOR OVERLOAD	EMERG. ST/FAULT
833	Response RS485 TIMEOUT	RAPID STOP/WARN.
834	LAG ERROR response	EMERG. ST/FAULT
835	Response TF SIGNAL	NO RESPONSE
836 / 837	Response SBus TIMEOUT 1 / 2	EMERG. ST/FAULT

838	Response SW LIMIT SWITCH	EMERG. ST/FAULT
84x	**Reset behavior**	
840	Manual reset	NO
841	Auto reset	OFF
842	Restart time	1 ... 3 ... 30 s
85x	**Scaling actual speed value**	
850	Scaling factor numerator	1 ... 65 535
851	Scaling factor denominator	1 ... 65 535
852	User travel unit	rpm
86x	**Modulation**	
860 / 861	PWM frequency 1 / 2 VFC	4 / 8 / 12 / 16 kHz
862 / 863	PWM fix 1 / 2	OFF
864	PWM CFC	4 / 8 / 16 kHz
87x	**Process data description**	
870	Setpoint description PO1	CONTROL WORD 1
871	Setpoint description PO2	SPEED
872	Setpoint description PO3	NO FUNCTION
873	Actual value description PI1	STATUS WORD 1
874	Actual value description PI2	SPEED
875	Actual value description PI3	OUTPUT CURRENT
876	PO data enable	ON
88x / 89x	**Serial communication SBus 1 / 2**	
880 / 890	Protocol SBus 1 / 2	SBus MOVILINK
881 / 891	SBus address 1 / 2	0 ... 63
882 / 892	SBus group address 1 / 2	0 ... 63
883 / 893	SBus timeout delay 1 / 2	0 ... 650 s
884 / 894	Baud rate SBus 1 / 2	125 / 250 / 500 / 1000 kbaud
885 / 895	Synchronization ID SBus 1 / 2	0 ... 2047
886 / 896	CANopen address 1 / 2	1 ... 127
887	Synchronization ext. control	OFF
888	Synchronization time	1 ... 5 ... 10 ms
889 / 899	Parameter channel 2	NO
9xx	**IPOS parameters**	
90x	**IPOS Reference travel**	
900	Reference offset	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
901	Reference speed 1	0 ... 200 ... 6000 rpm
902	Reference speed 2	0 ... 50 ... 6000 rpm
903	Reference travel type	0 ... 8
904	Reference travel to zero pulse	YES
905	Hiperface® offset X15	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
906	Cam distance	Display value
91x	**IPOS travel parameters**	
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 rpm
914	Positioning speed CCW	0 ... 1500 ... 6000 rpm
915	Speed feedforward	–199.99 ... 0 ... 100 ... 199.99 %

916	Ramp type	LINEAR
917	Ramp mode	MODE 1
92x	**IPOS Monitoring**	
920	SW limit switch RIGHT	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
921	SW limit switch LEFT	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
922	Position window	0 ... 50 ... 32,767 increments
923	Lag error window	0 ... 5000 ... $2^{31}-1$ increments
93x	**IPOS Special functions**	
930	Override	OFF
931	IPOS CTRL WORD Task 1	STOP (only with DBG60B)
932	IPOS CTRL WORD Task 2	STOP (only with DBG60B)
933	Jerk time	0.005 ... 2 s
938	Speed task 1	0 ... 9 additional commands/ms
939	Speed task 2	0 ... 9 additional commands/ms
94x	**IPOS encoder**	
940	IPOS variables edit	OFF
941	Source actual position	Motor encoder (X15)
942	Encoder factor numerator	1 ... 32 767
943	Encoder factor denominator	1 ... 32 767
944	Encoder scaling ext. Encoders	x1 / x2 / x4 / x8 / x16 / x32 / x64
945	Synchronous encoder type (X14)	TTL
946	Synchronous encoder counting direction (X14)	NORMAL
947	Hiperface ® Offset X14	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
948	Automatic encoder replacement detection	On
95x	**Absolute encoder (SSI)**	
950	Encoder type	NO ENCODER
951	Counting direction	NORMAL
952	Clock rate	1 ... 200 %
953	Position offset	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
954	Zero point offset	$-(2^{31}-1)$ ... 0 ... $2^{31}-1$ increments
955	Encoder scaling	x1 / x2 / x4 / x8 / x16 / x32 / x64
96x	**IPOS Modulo function**	
960	Modulo function	OFF
961	Modulo numerator	0 ... 1 ... $2^{31}-1$
962	Modulo denominator	0 ... 1 ... $2^{31}-1$
963	Modulo encoder resolution	0 ... 4096 ... 65535
97x	**IPOS synchronization**	
970	DPRAM synchronization	ON
971	Synchronization phase	–2 ... 0 ... 2 ms

3.3 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 indicated by underline.

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
- Error memory
- Fieldbus parameters

P00x process values

P000 Speed	Resolution with DBG60B: +/– 1 rpm; with SHELL: +/– 0.2 rpm In VFC or U/f mode without connected encoder, the speed results from the setpoint speed and the set slip compensation. The speed is established from the encoder or resolver signals and displayed when there is an encoder connection.
P001 User display	The user display is defined by the following parameters: • P850 Scaling factor numerator • P851 Scaling factor denominator • P852 User-defined unit
P002 Frequency	Output frequency of the inverter.
P003 Actual position	Position of the drive with correct sign in increments ranging from 0 ... +/– 2^{31} –1 increments (with encoder connection). Without encoder connection, the value is zero.
P004 Output current	Apparent current in the range 0 ... 200 % of the rated unit current (BG0: 250 %).
P005 Active current	Active current in the range 0... 200 % I_N (BG0: 250 %). The display value is positive when torque is in positive sense of rotation; negative when torque is in negative sense of rotation.
P006 / P007 Motor utilization 1 / 2	The thermal utilization 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 synchronous motor with KTY and the asynchronous motor is turned off when 110 % is reached.
P008 DC link voltage	The displayed value is the voltage measured in the DC link circuit.
P009 Output current	Apparent current, displayed in AC A.

P01x Status displays

P010 Inverter status	Status of the unit output stage (INHIBITED, ENABLED).

P011 Operating state

The following operating states are possible (7 segment display):

- 0: 24 V OPERATION (inverter not ready for operation)
- 1: CONTROLLER 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 SWITCH
- A: TECHNOLOGY OPTION
- c : REFERENCE OPERATION
- d : FLYING START IS RUNNING
- E: CALIBRATE ENCODER
- F: ERROR
- H: MANUAL MODE
- t: WAITING ON DATA
- U: SAFE STOP

P012 Error status

Error number and error in plain text. The error number also appears on the inverter's 7-segment display.

P013 Current parameter set

Parameter set 1 or 2.

P014 Heat sink temperature

Heat sink temperature of the inverter in the range –40 ... 0 ... 125 °C.

P015 Operating time

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.

P016 Enable time

Total number of hours for which the inverter was in ENABLE operating status; storage cycle every 15 min.

P017 Work

Total of the active energy the motor has consumed; storage cycle every 15 min.

P018 / P019 KTY utilization 1 / 2

Display 0 %: Motor is not in operation at max. ambient temperature.

Display 110 %: Cut-off point of motor.

P02x Analog setpoints

P020/P021 Analog input AI1/AI2

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.

P022 External current limitation

If P120 AI2 operating mode (optional) = 0 ... 10 V I-limit, then P022 will display the external current limitation that is active.

P03x Binary inputs basic unit

P030 ... P037 binary input DI00 ... DI07	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.
P039 binary inputs DI00 ... DI07	Displays the standard binary inputs DI00 to DI07 in this sequence.

P04x Binary inputs option

P040 ... P047 Binary input DI10 ... DI17	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.
P048 binary inputs DI10 ... DI17	Displays the optional binary inputs DO10 ... DO17 in this sequence.

P05x Binary outputs basic unit

P050 ... P055 Binary output DB00, DO01 ... DO05	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.
P059 binary outputs DB00, DO01 ... DO05	Displays the binary outputs DB00 and DO01 ... DO05 in this sequence.

P06x Binary outputs option

P060 ... P067 Binary output DO10 ... DO17	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.
P068 binary outputs DO10 ... DO17	Displays the optional binary outputs DO10 ... DO17 in this sequence.
P07x Unit data	Unit type, rated unit current, type of options and firmware part numbers (basic unit and options), type (standard or application).
P070 Unit type	Displays the complete designation of the unit, e.g. MDX60B0014-5A3.
P071 Rated output current	Displays the r.m.s. value of the rated output current.
P072 Option / firmware encoder slot	Displays the encoder card currently installed in the encoder slot and the program version.
P073 Option / firmware fieldbus slot	Displays the fieldbus card currently installed in the fieldbus slot and the program version.
P074 Option / firmware expansion slot	Displays the option card currently installed in the expansion slot and the program version, if this option has a program memory.
P076 firmware basic unit	Displays the program version of the firmware used in the basic unit.
P078 Technology function	Displays the currently set technology function. The function is set via MOVITOOLS® in "Startup – Select technology function". • STANDARD: Setting for operating the 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 for sending data in an event-controlled manner depending on touch probe events.
- Cross cutter: Special solution for synchronizing a slave that follows the master using a certain travel profile.

P079 Unit design

Displays the device type.

- STANDARD: Application modules and technology functions are not available.
- TECHNOLOGY: Application modules and technology functions are available.

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 sequence 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 the binary inputs/outputs
- Operating status of the inverter
- Inverter status
- Heat sink temperature
- Speed
- Output current
- Active current
- Unit utilization
- DC link voltage
- Hours of operation
- Enable hours
- Parameter set
- Motor utilization 1 and 2

P09x Bus diagnostics

P090 PD configuration

Set process data configuration.

P091 Fieldbus type

Installed fieldbus type:

- PROFIBUS DP
- INTERBUS
- INTERBUS with LWL
- Ethernet
- DeviceNet
- NO FIELDBUS

P092 Baud rate fieldbus

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.

Fixed setpoints have priority over other setpoints.

If the drive inverter is in "t = Wait for data" status, please 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 to set the setpoint source for the inverter.

- BIPOL./FIX.SETPT: The setpoint is derived from the analog inputs (AI1/AI2) or from P16x Fixed setpoints 1, if these were selected via P60x Binary inputs basic unit / P61x Binary inputs option. The setpoints are processed according to their value. Positive setpoint results in CW rotation, negative setpoint in 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 set 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 generated 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 counterclockwise/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. If the sum is negative, n_{min} applies. The direction of rotation is specified using binary inputs. Also, the settings of P112 AI1 Operation mode apply. 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 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.
- 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 sign (= according to its value). If the voltage at analog input AI1 is negative or if no fixed setpoint is selected, n_{min} applies. The direction of rotation is specified using binary inputs. See P16x Fixed setpoints 1.
- MASTER SBus1: In master/slave mode, the setpoint is provided by the master via system bus 1. 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 1: The setpoint is specified using system bus 1. See IPOS$^{plus®}$ manual.
- FREQUENCY INPUT: Setting P100 Setpoint source to the function "Frequency input" causes the set speed to be set via binary input DI04 in form of a frequency. For this purpose, the binary input DI04 (P603) must be set to "No function" and DIP switch S14 must be set to "ON" position. 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 binary input to serve as a reference input variable encoder. The pulses from this encoder are then counted via binary 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. Use P102 Frequency scaling to determine at which input frequency the system setpoint (torque or speed) 100 % is reached. The reference of the system setpoint is set via P112 AI1 Operation mode. The direction of rotation is set via the binary inputs CW/STOP and CCW/STOP.
  - The number of pulses recorded at binary input DI04 are mapped in IPOS variable H508. The maximum input frequency is 65 kHz.

	NOTE
	IPOS variable H508 is also used when *P916 Ramp type* is set to "Position interpolation 16 bit". IPOS variable H508 only provides meaningful values when • DIP switch S14 = "ON", or • P916 Ramp type = "Position interpolation 16 bit"

- SBus 2: The setpoint is specified using system bus 2. (See IPOS$^{plus®}$ manual.)
- IPOS setpoint: The value of the IPOS variable H524 (IPOS system setpoint) is used as the setpoint. The setpoint is interpreted depending on P700 Operation mode 1.
  - If an operating mode of speed control (CFC, servo, VFC, VFC n-control, VFC & group, VFC & hoist, VFC & flying start, VFC & DC Braking) is set via P700 Operating mode 1, then the setpoint will be interpreted as speed. The following formula applies: H524 = Set speed rpm x 5.
  - If an operation mode of torque control (CFC & M-ctrl., Servo & M-ctrl.) is set via P700 Operation mode 1, the setpoint will be interpreted as torque value. The following formula applies: H524 = Set current in % I_N x 100.
  - In the operating modes CFC & IPOS, CFC & Sync, Servo & IPOS, Servo & Sync, VFC & n-control & IPOS, VFC & n-control & Sync, the setting of P100 to the IPOS setpoint function will have no effect.

P101 Control signal source

This parameter is used to set the source of the control signals for the inverter (CONTROLLER INHIBIT, ENABLE, CW, CCW, ...). Control via IPOS$^{plus®}$ is taken into account disregarding of P101.

- TERMINALS: Control is performed via the binary inputs.
- RS485: Control is performed via tha RS485 interface and the binary inputs.
- FIELDBUS: Control is performed via the fieldbus and the binary inputs.
- SBus: Control is performed via the system bus and the binary inputs.

P102 Frequency scaling

Setting range: 0,1 ... 10 ... 65 kHz

Only effective, if P100 is set to "Frequency input". Is set to determine at which input frequency the system setpoint (torque or speed) 100% is reached.

P105 Error response to wire breakage AI1

Setting range: No response / Immediate stop/Fault / Rapid stop/Fault / Rapid stop/Warning

Only effective if *P112 AI1 Operating mode* is set to "N-MAX, 4-20 mA". If analog input AI1 is used as current input 4...20 mA, the set response will be triggered in the event of a wire breakage (measured current < 2 mA). If a response is set, error message F113 will be issued.

P11x Analog input AI1

P110 AI1 Scaling Setting range: –10 ... 0 ... 1 ... 10

The slope of the setpoint characteristic is defined. Depending on P112 AI1 operation mode with AI1 scaling = 1 and an input voltage V_I of +/–10 V, the setpoint +/–3000 rpm or +/–n_{max} is set.

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Figure 35: Incline of the setpoint characteristic curve

With P100 Setpoint source = UNIPOL./FIXED SETP., only the first quadrant can be used; negative setpoint selections will result in a setpoint of zero. If a current input is set in P112 AI1 Operation mode, P110 AI1 Scaling is ineffective.

P111 AI1 Offset

Setting range: –500 ... 0 ... 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 35. This setting takes effect in all AI1 operating modes.

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Figure 36: Effect of the AI1 offset

P112 AI1 Operating mode

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

- Ref. N-MAX: Voltage input with reference n_{max} (P302 maximum speed 1 / P312 maximum speed 2). The characteristic can be adapted with P110 AI1 scaling. P113 AI1 voltage offset and P114 AI1 speed offset are ineffective.
- Ref. 3000 rpm: Voltage input with reference 3000 rpm. The characteristic can be adapted with P110 AI1 scaling. P113 AI1 voltage offset and P114 AI1 speed offset are ineffective.
- V-Off., N-MAX Voltage input with reference n_{max}. The characteristic can be adapted with P113 AI1 voltage offset. P110 AI1 scaling and P114 AI1 speed offset are ineffective.
- N-Off., N-MAX Voltage input with reference n_{max}. The characteristic can be adapted with P114 AI1 speed offset. P110 AI1 Scaling and P113 AI1 Voltage offset are ineffective.
- N-MAX, 0-20mA: Current input 0 ... 20 mA = 0 ... n_{max}, no setting options (P110 AI1 scaling ineffective). 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 ineffective). Set the internal burden (250 Ω) "S11 = ON". This setting means that analog input AI1 is monitored for wire breakage (see P105).

- Expert characteristic: Free choice of reference between setpoint voltage and speed. The characteristic can be adapted with P110 AI1 scaling (reference 3000 rpm), P113 AI1 voltage offset and P114 AI1 speed offset (-> Figure 41). The following structural diagram shows how a speed setpoint is created from an expert characteristics.

Figure 37: Structural diagram "Expert characteristic"

P113 AI1 voltage offset

Setting range: –10 ... 0 ... 10 V

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

Figure 38: AI1 voltage offset

P114 AI1 speed offset

Setting range: –6000 ... 0 ... 6000 rpm

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

Figure 39: AI1 speed offset

P115 Filter setpoint

Setting range: T = 0 ... 5 ... 100 ms (0 = setpoint filter 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 with torque control.

Figure 40: Effect of setpoint filter

Sample expert characteristics (P112 AI1 operating mode = Expert charactristic curve):

Free choice of reference between setpoint voltage and speed for the expert characteristics. Set parameter P100 Setpoint source = BIPOL./FIX.SETPT to make full use of the possibilities of the expert characteristic.

One point in the characteristic (in Figure 41 indicated with a circle) will be determined with P113 AI1 voltage offset and P114 AI1 speed offset; the slope will then be set 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 41 P302 Maximum speed 1 is set to 4000 rpm. Setting the maximum speed does not alter the slope.

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

Figure 41: Samples of expert characteristics with P100 Setpoint source = BIPOL./FIX.SETPT.

For characteristics 2 and 4 in Figure 41 the following slope triangulation functions will be calculated to determine the setting values forP110 AI1 scaling.

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

Characteristic 4: Δy_4 = –3000 rpm, Δx_4 = 8 V = 2400 rpm, $\Delta y_4/\Delta x_4$ = –3000/2400 = –1.25

The expert characteristics displayed in Figure 41 are created as follows:

Char-acter-istics 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 characteristic can also be used with P100 Setpoint source = UNIPOL/FIX.SETPT. The direction of rotation is 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 ... n_{max} will be executed; for set direction of rotation "CCW" only speeds in the range 0 ... $–n_{max}$ will be executed. Figure 42 shows the expert characteristics from Figure 41 with the setting P100 Setpoint source = UNIPOL./FIXED SETP.

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Figure 42: Examples of expert characteristics with P100 Setpoint source = UNIPOL/FIX.SETPT.

The expert characteristics displayed in Figure 42 are created as follows:

Char.	P113 AI1 Voltage offset V	P114 AI1 Speed offset rpm	P110 AI1 scaling (slope)
1	0	0	1
2	4	500	1.39
3	0	1500	1
4	0	3000	–1.25

Expert characteristics 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 setpoint, switch S11 (changeover I-signal/U-signal) must be set to ON and the current signal routed to X11:2 AI11. Through the internal load (250 Ω), setpoints 0 (4) ... 20 mA will be converted into voltage signals 0 (1) ... 5 V.

Figure 43: Sample expert characteristics with current setpoints

If you want to achieve speeds of 1000 ... 4000 rpm with 0 (4) ... 20 mA, you will have to set the expert characteristics as follows:

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 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%. +/–10 V = +/–n_{max} (reference n_{max}).
- 0 ... 10 V I-limit: The input serves as external current limitation. 0 ... 10 V = 0 ... 100 % of the internally set current limitation:
  – in operating modes V/f and VFC: P303 Current limit 1 / P313 Current limit 2
  – In CFC and SERVO operating modes: P304 Torque limit
- ACTUAL VALUE PID CONTROLLER: Feedback of actual value for process controller (→ P275).

P13x / P14x Speed ramps 1 / 2

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

1 2

P130 Ramp t11 up CW / P140 Ramp t21 up CW

P131 Ramp t11 down CW / P141 Ramp t21 down CW

P132 Ramp t11 up CCW / P142 Ramp t21 up CCW

P133 Ramp t11 down CCW / P143 Ramp t21 down CCW

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

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

Figure 44: Separately adjustable speed ramps

P134 / P144 Ramp t12 / t22 UP=DOWN

1 2

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

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

Ramps t12 / t22 are activated by a binary input (→ P610 ... , which is set to the function "Ramp switchover".

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.

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Figure 45: Effect of the S pattern

A started S pattern is interrupted by the stop ramp t13/t23 and a changeover to ramp t11/t21. Revoking the setpoint or a stop via the input terminals causes the started S curve to be completed. This means the drive can still accelerate in spite of the withdrawal of the setpoint.

P136 / P146 Stop ramp t13 / t23

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. After expiry of the set time, the output stage will be inhibited and the brake applied even if zero speed has not yet been reached.

P138 Ramp limitation VFC

Setting range: YES / NO

The ramp limit restricts the smallest possible ramp time to 100 ms in the VFC and V/F operating modes (P700 Operating mode 1) (reference: Δn = 3000 rpm). Values smaller than 100 ms will be ignored. In this case, the ramp time of 100 ms will apply. The ramp limitation limits the maximum output current to the value set in P303/P313. Active stall protection is implemented for the connected motor using the current limiting controller when ramp limitation is activated.

	NOTE
	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 limitation 1 / P313 Current limitation 2 will be ineffective. If a maximum output current of 185 % of the rated output current is exceeded (applies to BG1...6; 225 % apply to BG0) for more than 60 ms, the inverter will switch off indicating fault F01 Overcurrent and "Immediate switch-off" fault 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 a fault signal and increase brake wear.

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.

P15x Motor potentiometer

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

P150 / P151 Ramp t3 up / down

Setting range: 0,2 ... 20 ... 50 s

The ramp is active when the setpoint source P100 Setpoint source is set to MOTOR POT. or MOT.POT. +ANALOG1 and an input terminal programmed to MOTOR POT UP or MOTOR POT DOWN P6xx Terminal assignment) has a '1' signal.

P152 Save last setpoint

Setting range: ON / OFF

- 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: The inverter starts with P301 Minimum speed 1 / P311 Minimum speed 2) following a mains off/on or after withdrawal of the enable.

Figure 46: Motor potentiometer function

P16x / P17x Fixed setpoints 1 / 2

Setting range: –6000 .... +6000 rpm

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+ANALOG1
- 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/stop	Parameter set 1/2
Stop with t13/t23	X	X	"0"	X
Fixed setpoint not active	"0"	"0"	"1"	"0"
n11 effective	"1"	"0"	"1"	"0"
n12 effective	"0"	"1"	"1"	"0"
n13 effective	"1"	"1"	"1"	"0"
n21 effective	"1"	"0"	"1"	"1"
n22 effective	"0"	"1"	"1"	"1"
n23 effective	"1"	"1"	"1"	"1"

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

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.

Figure 47: Basic structure of the speed control loop

P200 P gain speed controller

AUTO

Setting range: 0,01 ... 2 ... 32

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

P201 Time constant n-control

AUTO

Setting range: 0 ... 10 ... 3000 ms (0 = no I-component)

Intgration 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.

P202 Acceleration feedforward gain

AUTO

Setting range: 0 ... 65

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

P203 Acceleration feedforward filter

AUTO

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 programmed.

P204 Actual speed value filter

AUTO

Setting range: 0 ... 32 ms

Filter time constant of the actual speed value filter.

P205 Load precontrol CFC

Load precontrol 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 for dynamic drives with low moment of inertia.

P207 Load precontrol VFC

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

Setting range: –150 ... OFF ... 150 %

This parameter determines the initial value of slip control upon 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 x s_N is in effect.

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

P21x Hold control

Hold control only in 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 up" 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 DBG60B keypad. The 7-segment display shows status '7' when hold control is active.

P210 P gain hold controller

AUTO

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

Synchronous operation control only in parameter set 1 and with the DRS11B option.

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 synchronous 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. The encoder must be installed on the moving machine component with a positive connection.

P223 Mode selection

Setting range: Mode 1 / Mode 2 / Mode 3 / Mode 4 / Mode 5 / Mode 6 / Mode 7 / Mode 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.

- 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

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

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 increments (only effective in mode 6 or mode 7)

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

P228 Filter precontrol DRS

Setting range: 0 ... 100 ms

Setpoint filter for precontrol 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 BG 0).

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

Position measurement has to be performed via an external encoder (=synchronous encoder) in all applications in which power transmission between the motor shaft and the machine is non-positive, which means that slip is to be expected.

P230 Synchronous encoder

Setting range: OFF / EQUAL-RANKING / CHAIN

- OFF: 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.

P231 / P232 Factor slave encoder / Factor slave sync. encoder

Setting range: 1 .. 1000

In most cases there is a mechanical gear ratio between both encoders. This gear ratio must be set using the parameters.

P233 Synchronous encoder resolution

Setting range: 128 / 256 / 512 / 1024 / 2048

Setting the resolution of the connected synchronous encoder.

P234 Master encoder resolution

Setting range: 128 / 256 / 512 / 1024 / 2048

Setting the resolution of the connected master encoder.

P24x Synchr. oper. with catch up

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. In order for this catch up procedure to be performed in a controlled way, it is possible to set parameters for both the synchronization speed and the synchronization ramp.

P240 Synchronization speed

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

This parameter indicates the duration of the synchronization procedure.

P241 Synchronization ramp

Setting range: 0 ... 2 ... 50 s

Value of the acceleration ramp for synchronizing the slave with the master. A value of 0 means maximum possible acceleration.

P26x Process controller parameters

P260 Operation mode

Setting range: Controller off / 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.

P261 Cycle time

Setting range: 1 / 5 / 10 ms

This parameter sets the cycle time of the PID controller.

P262 Interruption

Setting range: No response / 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.

P263 Factor K_P

Setting range: 0 ...1 ... 32,767

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.

P264 Integrative time T_N

Setting range: 0 ... 65535 ms

This parameter is used to set the integrative time (time constant) of the integrating part of the PID controller:

- 1 ms ≤ T_N ≤ 65535 ms
- T_N = 0 → no I-component

P265 Derivative time T_V

Setting range: 0 ... 30 ms

This parameter is used to set the derivative time (time constant) of the differential part of the PID controller:

- 1 ms ≤ T_V ≤ 30 ms
- T_V = 0 → no D-component

P266 Precontrol

Setting range: –32767 ... 0 ... 32767

The precontrol value is added to the result of the PID controller. P266 and the IPOS variable H545 are identical.

P27x Process controller input values

P270 Setpoint source

Setting range: Parameters / IPOS variable / Analog 1 / Analog 2

This parameter is used to set the source from which the setpoint should be read.

P271 Setpoint

Setting range: –32767 ... 0 ... 32767

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.

P272 IPOS setpoint address

Setting range: 0 ... 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.

P273 Time constant

Setting range: 0 ... 0.01 ... 2000 s

This parameter is used to set the ramp for the setpoint ramp generator (reference 15000 units).

- Time constant $T_{setpoint}$ = 0 → ramp is deactivated.

P274 Scaling setpoint

Setting range: –32,767 ... 1 ... 32,767

Factor for scaling the setpoint. P274 and the IPOS variable H548 are identical.

P275 Actual value source

Setting range: Analog 1 / Analog 2 / IPOS Variable

This parameter is used to set the source from which the actual value should be read.

P276 IPOS actual value address

Setting range: 0 ... 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.

P277 Scaling actual value

Setting range: –32,767... 1... 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 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. To use the output value of the process controller as setpoint for MOVIDRIVE® B, *P100 Setpoint source* must be set to "IPOS setpoint".

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

Minimum output value of the P, I and D components. P282 and the IPOS variable H555 are identical. For PI and PID controllers, you have to enter a negative value for enabling downward integration.

P283 PID controller maximum output

Setting range: –32767 ... 10000 ... 32767

Maximum output value of the P, I and D components. P283 and the IPOS variable H556 are identical.

P284 Process controller minimum output

Setting range: –32767 ... 0 ... 32767

Minimum output value of the process controller (PID controller + precontrol P266). P284 and the IPOS variable H557 are identical.

P285 Process controller maximum output

Setting range: –32767 ... 7500 ... 32767

Maximum output value of the process controller (PID controller + precontrol P266). P285 and the IPOS variable H558 are identical.

P3xx Motor parameters

This parameter group is used to adjust 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

1 2 AUTO

Setting range: 0 ... 150 rpm

During startup in the VFC & Hoist operating mode, the rated slip of the connected motor is set. In all other operating modes, 0.5 x the rated slip of the connected motor is set at startup.

Only effective in the VFC and U/f operating modes. The parameter is not relevant in CFC and SERVO operating modes. 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.

P301 / P311 Minimum speed 1 / 2

1 2 AUTO

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

Speed value, the lower limit of which must not be exceeded even when zero is selected as the setpoint. The minimum speed also applies when $n_{min} < n_{start/stop}$ has been set.

Caution:

- If the hoist function is active, the slowest speed is 15 rpm 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

1 2 AUTO

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

The value set here cannot be exceeded by a setpoint selection. If $n_{min} > n_{max}$ is set, then n_{max} applies. The maximum speed depends on the set operating mode (see chapter "Operating modes").

P303 / P313 Current limit 1 / 2

1 2 AUTO

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

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

The internal current limitation is based on the apparent current. It is superordinate 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. In the field weakening range, the current limit is reduced automatically above the frequency of 1.15 x f_{trans} (only applies to V/f and VFC operating modes without speed control). This provides protection against the motor deviating from the optimal operating point.

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

Current limit = (1.15 x f_{trans} / f_{act}) x settign value of P303 / P313

f_{act} is the current rotating field frequency.

P304 Torque limit

1 2 AUTO

Setting range: 0 ... 150 % (size 0: 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).

	NOTE
	In the CFC and SERVO operating modes, the current limit P303 must always be set = P304 torque limit to ensure that speed monitoring is triggered reliably.

P32x / P33x Motor compensation 1 / 2 (asynchronous)

P320 / P330 Automatic adjustment 1/2

1 2

Setting range: ON / OFF

Only effective in the VFC and U/f operating modes. The function is only useful for single motor operation. The inverter automatically sets P322 IxR compensation / P332 IxR compensation 2 with each enable operation and saves the values. The inverter determines a basic setting that is adequate for a great number of drive applications. The connected motor is calibrated during the last 20 ms of the pre-magnetization time. 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 & FLYING RESTART
- P323 Premagnetization time 1 / P333 Premagnetization time 2 was shortened by more than 30 ms from the suggested value.
- Operating mode VFC-n-CONTROL is selected and P730 Brake function 1 / P733 Brake function 2 is set to OFF.

In such cases, the set IxR value is used for calculating the winding resistance.

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

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 is usually not required. In exceptional cases, manual setting may be necessary to increase the breakaway torque. In this case set to **max. 10 %**.

Figure 48: Working principle of boost (drawing not to scale)

P322 / P332 IxR compensation 1/2

Setting range: 0 ... 100 %

The I×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 which establish the torque. An automatic setting takes place with P320 Automatic adjustment 1 / P330 Automatic adjustment 2 = ON. If set to 100 %, the output voltage of the inverter is increased by 50 V when the rated current of the motor flows. Manual alterations to individual controller parameters are reserved for optimization by specialists.

P323 / P333 Pre-magnetization time 1 / 2

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 deactivated

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. If values are entered manually, you will have to enter the rated slip of the connected motor. A setting range of +/– 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. Motor utilization is determined using the inverter output current, cooling type, motor speed and 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.

	NOTE
	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 OVERLOAD	Error response of the inverter when reaching P006 Motor utilization 1 / P007 Motor utilization 2 of 110 %. Factory setting: Emergency stop/Fault.

Set the following parameters:

Parameters	Setting / meaning
P341 Type of cooling	Self-ventilation or forced cooling
Binary output can be programmed to: /Motor utilization 1 /Motor utilization 2	Prewarning if 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.

Caution: 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 parameter sets. 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. Equally, the motor protection function must not be used with group drives because it is not possible to protect each individual motor reliably.

ON SERVO:

- Motor without KTY temperature sensor: MOVIDRIVE® B 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.

  Requirements: 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 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 OVERLOAD	In setting P340 = ON SERVO without function

  Set the following parameters:

Parameters	Meaning
P344 Motor protection interval	Corresponds to the machine cycle of the application. Range: 0.1 s... 20 s

NOTE

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

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

- SEW motor **with** KTY temperature sensor: Motor utilization is calculated using a motor model stored in MOVIDRIVE® (P006 Motor utilization1, P018 KTY utilization 1). Once the motor dependent switch-off limit is reached, the inverter will be switched off using the response set in P832 Response motor utilization. In this case, the settings in P341 and P344 are not relevant.

P341 / P343 Cooling type 1 / 2

1 2

Setting range: FAN COOLED / FORCED COOLING

You need to know the cooling type of the motor to calculate the thermal load on the motor as exactly as possible, as described in P340 Motor protection 1 / P342 Motor protection 2.

P344 Interval for motor protection

1 2

Setting range: 0,1 ... 4 ... 20 s

P344 is not relevant for asynchronous motors. This parameter corresponds to the cycle time of the travel and is used for the function P006 Motor utilization 1 / P007 Motor utilization 2. The setting range is 100 ms ... 20000 ms.

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

P345 / 346 I_N / UL monitoring 1 / 2

1 2 AUTO

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 with F84.

At 500 % rated motor current, the inverter switches off after 20 seconds with F84.

P35x Motor direction of rotation

SEW-EURODRIVE specifies the direction of rotation as seen 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.

P350 / P351 Change direction of rotation 1/2

1 2 AUTO

Setting range: ON / OFF

Direction of rotation reversal	Positive setpoint (positive direction of travel)	Negative setpoint (negative direction of travel)
OFF	Motor turns clockwise	Motor turns counterclockwise
ON	Motor turns counterclockwise	Motor turns clockwise

- ON: Above definition is reversed. The assignment of limit switches is maintained. When the motor turns in CLOCKWISE direction, the drive will be properly stopped once it hits the right limit switch. It is important to carefully check that the limit switch is connected properly and the reference point and travel positions are defined correctly when using this parameter.

	NOTE
	Altering the 'Direction of rotation reversal' 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 **Startup** (only available in the DBG60B keypad).

P360 Startup Setting range: YES / NO

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

	NOTE
	With P360, MOVIDRIVE® B can only be started up in VFC operating modes. Startup in the CFC and SERVO operating modes must be performed using MOVITOOLS/SHELL.

- NO: The startup function is not begun.

P4xx Reference signals

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

Caution: The messages are only valid if the inverter has signaled 'ready' after switch-on and there is no error display.

P40x Speed reference signal Signal if the speed is less than or greater than the set reference speed.

Figure 49: Speed reference signal

P400 Speed reference value Setting range: 0 ... 1500 ... 6000 rpm

P401 Hysteresis Setting range: 0 ... 100 ... 500 rpm

P402 Delay time Setting range: 0 ... 1 ... 9 s

P403 Signal = "1" when: n < nref / n > n_{ref}

P41x Speed window signal

Signals whether the speed is within or outside the set window range.

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Figure 50: 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" if: — Setting range: INTERNAL / EXTERNAL

P42x Speed set-point/actual value comparison

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

01625BEN

Figure 51: Speed setpoint/actual value comparison

P420 Hysteresis — Setting range: 1 ... 100 ... 300 rpm

P421 Delay time — Setting range: 0 ... 1 ... 9 s

P422 Signal = '1' if: — Setting range: $n = n_{setpt}$ / $n <> n_{setpt}$

P43x Current reference signal

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

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Figure 52: Current reference signal

P430 Current reference value

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

P431 Hysteresis

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

P432 Delay time

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

P433 Signal = "1" if:

I < Iref / I > I_{ref}

P44x Imax message

Signal if the inverter has reached the current limit.

P440 Hysteresis

Setting range: 5 ... 50 % I_N

P441 Delay time

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

P442 Signal = '1' if:

I < Imax / 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 control functions can be set with P83x Error responses.

P50x Speed monitoring

P500 / P502 Speed monitoring 1 / 2

1 2

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

The speed required by the setpoint can only be achieved if there is sufficient torque available to meet the load requirements. If P303 Current limit 1 / P313 Current limit 2 and external current limitation are reached, MOVIDRIVE® assumes that the torque has reached the maximum limit and the desired speed cannot be attained. Speed monitoring is triggered if this situation persists for the duration specified in P501 Delay time 1 / P503 Delay time 2.

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 can be reached briefly during acceleration, deceleration, or load peaks. You can prevent the speed monitoring from responding too sensitively by setting the delay time accordingly. The current limit must be reached permanently for the duration of the delay time before monitoring responds.

P504 Encoder monitoring motor

Setting range: YES / NO

- NO: A wire breakage 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: A wire breakage between frequency inverter and motor encoder will be directly detected when using sin/cos encoders and TTL encoders. The fault message F14 Encoder fault will be issued in case of a fault. This fault will also be generated in inhibited state.

	NOTE
	Encoder monitoring is not a safety function! If you use a HIPERFACE® encoder, encoder monitoring (also for the track) is always active independent of the setting in P504.

P505 Encoder monitoring distance

Setting range: YES / NO

- NO: A wire breakage between frequency inverter and synchronous 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: A wire breakage between frequency inverter and synchronous encoder will be directly detected when using sin/cos encoders and TTL encoders. The fault message F14 Encoder fault will be issued in case of a fault. This fault will also be generated in inhibited state.

P51x Synchrous 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 Positioning 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 misalignment 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

Fault message F42 'Lag error' is issued if the angular misalignment 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 signal

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

The LED V1 (green) lights up if the angular offset exceeds the set value. 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 in-position signal

Setting range: 5 ... 10 ... 2000 ms

The DRS SLAVE IN POS binary output message is not issued unless the master and slave are located within the P510 Positioning tol. slave for the time set here.

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 fault 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.
- YES: 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 fault 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.
- YES: Pulse counter monitoring is active.

P52x Power OFF monitoring

The setting of P520 Mains OFF response time / P521 Mains OFF response is important when programming a binary input to “MAINS ON” and using MOVIDRIVE® line regeneration (see MOVIDRIVE® line regeneration MDR system manual).

P520 Power off response time

Setting range: 0 ... 5 s

P521 Power off response

Setting range: CONTROL.INHIBIT / EMERGENCY STOP

If the binary input is programmed to "Power on", the response set here will be triggered when the binary receives a "0" signal. The 7-segment display of MOVIDRIVE® B indicates "0" (unit status 24 V operation).

P522 Phase fault monitoring

Setting range: OFF / ON

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 Δt = 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 *F06 Phase failure* is displayed. The error response is as follows: Immediate switch-off with inhibit. The error can only be remedied by executing a unit reset.

P53x Thermal protection motor

P530 Sensor type 1

Setting range: No sensor / TF-TH / KTY (KTY only for SEW synchronous motors)

Selection of the sensor used for motor protection in parameter set 1.

- TF/TH: Set the response with P835 Response TF SIGNAL.
- KTY: Set P340 Motor protection 1 to "ON SERVO". The motor model is now activated. Set the response using P832 Response motor overload.

P531 Sensor type 2

Setting range: No sensor / TF-TH / KTY (KTY not implemented)

Selection of the sensor used for motor protection in parameter set 2.

	NOTE
	If you select the setting "KTY" (for SEW synchronous motors only), you have to repeat startup, else fault F84 will be triggered.

P54x Gear unit / motor monitoring

These parameters are used to set the response to be triggered in the event of a motor or gear unit problem. The binary inputs have to be set accordingly for this purpose. The fault responses will also be triggered in the CONTROLLER INHIBIT inverter status.

Response	Description
NO RESPONSE	Neither a fault is displayed nor a fault response occurs. The fault which is signaled is completely ignored.
DISPLAY ERROR	The fault is displayed (in 7-segment display and SHELL), the fault output is set (if programmed). The unit has no other fault responses. The fault can be reset (terminal, RS485, fieldbus, auto-reset).
IMMEDIATE 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 the error has been reset during which the inverter is reinitialized.
EMER-GENCY STOP/ FAULT	The drive is braked with the set emergency ramp t14/t24. 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 the error has been reset during which the inverter is reinitialized.
RAPID STOP/FAULT	The drive is braked with the set stop ramp t13/t23. 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 the error has been reset 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.
EMER-GENCY STOP/ WARNG	The drive is braked with the set emergency ramp t14/t24. Once the stop speed is reached, the output stage is inhibited and the brake 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.	The drive is braked with the set stop ramp t13/t23. Once the stop speed is reached, the output stage is inhibited and the brake 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.

P540 Response drive vibration / warning

Factory setting: Display error

Once the drive vibration sensor signals a warning, the inverter will respond with the set response.

P541 Response drive vibration / fault

Factory setting: Rapid stop warning

Once the drive vibration sensor signals a fault, the inverter will respond with the set response.

P542 Response oil aging / warning

Factory setting: Display error

Once the oil aging sensor signals a warning, the inverter will respond with the set response.

P543 Response oil aging / fault

Factory setting: Display error

Once the oil aging sensor signals a fault, the inverter will respond with the set response.

P544 Oil aging / overtemperature

Factory setting: Display error

Once the oil aging sensor signals overtemperature, the inverter will respond with the set response.

P545 Oil aging / ready signal

Factory setting: Display error

Once the oil aging sensor signals ready, the inverter will respond with the set response.

P549 Response brake wear

Factory setting: Display error

Once the brake wear sensor signals a fault, the inverter will respond with the set response.

P55x Safety monitor DCS

The parameter group *P55x DCS safety monitor* includes display and setting values that are specific to the DCS21B/31B option. For more information, refer to the "MOVIDRIVE® MDX 61B Safety module option DCS21B/31B" manual.

P550 DCS safety monitor status

Display value that cannot be changed.

Parameter P550 shows the current status of option DCS21B/31B.

- RUN: Normal operation.
- STOP: Operation of option DCS21B/31B was stopped via programming interface.
- ALARM: Option DCS21B/31B has issued an alarm.
- ERROR: Option DCS21B/31B has signaled an error.

  You have the following options to read the corresponding error or alarm message from the error memory of option DCS21B/31B:

  – Via the service interface X87
  – With the DBG60B keypad
  – With the MOVISAFE® CONFIG/ASSIST parameter setting software, if P555/P556 is set to "NO RESPONSE".

P551 Binary inputs DCS DI1 ... DI8

Display value that cannot be changed.

Parameter P551 shows the current status of the binary inputs of option DCS21B/31B in the order DI1 ... DI8.

P552 Binary outputs DCS DO0_P ... DO2_M

Display value that cannot be changed.

Parameter P552 shows the current status of the binary outputs of option DCS21B/31B in the following order:

- DO0_P
- DO0_M
- DO1_P
- DO1_M
- DO2_P
- DO2_M

P553 DCS series number

Display value that cannot be changed.

Parameter P553 shows the serial number of option DCS21B/31B. The displayed serial number must be identical with the series number on the nameplate of option DCS21B/31B, which is attached to MOVIDRIVE® MDX61B. You have to enter the serial number in the validation report.

P554 CRC DCS

Display value that cannot be changed.

Parameter CRC DCS shows the CRC (cyclic redundancy check) of the program stored on the DCS21B/31B option. You have to enter the CRC in the validation report.

P555 Error response DCS / P556 Alarm response DCS

Setting range P555: No response / Display error / Immediate stop / Fault / Emergency stop/Fault / Rapid stop/Fault / Immediate stop/Warning / Emergency stop/Warning / Rapid stop/Warning

Setting range P556: No response / Display error / Rapid stop / Fault / Emergency stop/Fault / Rapid stop/Fault / Immediate stop/Warning / Emergency stop/Warning / Rapid stop/Warning

If option DCS21B/31B signals an error (P555) or an alarm (P556), the inverter performs the set response (No response / Display error). As the safety-oriented switching off is performed by the DCS21B/31B option or a higher-level safety controller, SEW-EURODRIVE recommends to set P555 and P556 to "Display error".

P557 Actual position source DCS

Setting range: Motor encoder (X15) / Ext. Encoder (X14) / absolute encoder

If the option "Inverter encoder" is set as encoder 1 in the MOVISAFE® CONFIG/ASSIST parameter setting software, the setting in P557 determines which encoder signal is evaluated by the DCS21B/31B option.

P56x Current limitation Ex-e motor

The parameter group *P56x Current Limitation Ex-e Motor* contains display and setting values that are specific to the "Current Limitation in the Ex-e Motor on Inverter" function. The factory setting is indicated by underline. The factory settings apply for the delivery status.

Frequency lower than frequency A are only allowed with restrictions. Frequencies greater than the rated motor frequency are not allowed. Refer to the "Explosion-Proof AC Motors" operating instructions for more information. The following rules always apply:

- frequency A < frequency B < frequency C < rated motor frequency
- current limitation A < current limitation B < current limitation C

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P560 Current limitation Ex-e motor

AUTO

Setting range: On / Off

ON: Current limitation for Ex-e motors active.

On startup, the current limitation for Ex-e motors is automatically activated for motors selected and approved for the operation in potentially explosive areas.

P561 Frequency A

AUTO

Setting range: 0 ... 5 ... 60 Hz

Value for minimum operating frequency f_A. The operation time with frequency A is 60 seconds, regardless of the current value. After this time, the inverter switches with "F110 Ex-e protection" error message.

P562 Current limit A

AUTO

Setting range: 0 ... 50 ... 150 %

Current limitation that is permitted with operating frequency f_A. There is a linear gradient between current limitation A and current limitation B.

P563 Frequency B

AUTO

Setting range: 0 ... 10 ... 104 Hz

Value for operating frequency f_B.

P564 Current limit B

AUTO

Setting range: 0 ... 80 ... 200 %

Current limitation that is permitted with operating frequency f_B. There is a linear gradient between current limitation B and current limitation C.

P565 Frequency C

AUTO

Setting range: 0 ... 25 ... 104 Hz

Value for operating frequency f_C.

P566 Current limit C

AUTO

Setting range: 0 ... 100 ... 200 %

Current limitation that is permitted between operating frequency f_C and rated motor frequency. The rated motor frequency is 50 Hz for star connection and 87 Hz for delta connection. After startup with an Ex-e motor, the current limit C is approximately equal to the rated motor frequency I_N.

P6xx Terminal assignment

P60x Binary inputs basic unit

Binary input DIØØ with fixed assignment "/CONTROL. INHIBIT."

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

The binary inputs of the basic unit can be set to the same functions as the binary outputs option (P61x).

P61x Binary inputs option

P610 ... P617 Binary input DI1Ø ... DI17

The binary inputs can be programmed to the following functions:

Function	Effect at		Effect in Inverter status		Factory set to	See also
	"0" signal	"1" signal	Inhibited	Enabled		
NO FUNCTION	–	–	–	–	DIØ6 DIØ7	
ENABLE/STOP	Stop on t13/t23	Enable	No	Yes	DIØ3	P13x / P14x
CW/STOP	Stop on t11/t21 or t12/t22	Enable CW	No	Yes	DIØ1	
CCW/STOP	Stop on t11/t21 or t12/t22	Enable CCW	No	Yes	DIØ2	
n11/n21 n13/n23	External setpoints only	n11/n21 n13/n23	No	Yes	DIØ4	P16x / P17x
n12/n22	External setpoints only	n12/n22	No	Yes	DIØ5	
FIXED SETP. SELECT	Fixed setpoints of the active parameter set selected	Fixed setpoints of the active parameter set selected	Yes	Yes		
PARAM. SELECT[1)]	Parameter set 1	Parameter set 2	Yes	No		
RAMP SELECT	1st ramp (t11/t21) active	2nd ramp (t12/t22) active	Yes	Yes		P13x / P14x
MOTOR POT UP	–	Increase setpoint	No	Yes		P15x
MOTOR POT DOWN	–	Decrease 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
/LS CW	Right limit switch reached	Not reached	No	Yes		
/LS CCW	Left limit switch reached	Not reached	No	Yes		
IPOS INPUT	Function depends on IPOS function					IPOS-plus® manual
REFERENCE CAM	not actuated	Actuated	No	Yes		
START REF.TRAVEL	–	Start referencing for IPOS	No	Yes		
SLAVE FREE RUNNING	Master/slave mode	Slave free running	Yes	Yes		
ACCEPT SETPOINT	Do not take over	Accept setpoint	No	Yes		
POWER ON	see P521	Ext. POWER ON signal	Yes	Yes		P52x
SET DRS ZERO POINT	"1" to "0": sets new zero point	Delete angular misalignment	Yes	Yes		Synchronous operation manual
START DRS SLAVE	No enable	Enable	No	Yes		
DRS TEACH IN	–	Adopt angular offset in P224	Yes	Yes		
DRS MASTER STOP	Master drive turns	Master drive at a standstill	Yes	Yes		
Vibration/warning	Vibration sensor signals warning	Vibration sensor does not signal warning	Yes	Yes		

Function	Effect at		Effect in Inverter status		Factory set to	See also
	"0" signal	"1" signal	Inhibited	Enabled		
Vibration/fault	Vibration sensor reports fault	Vibration sensor does not report fault	Yes	Yes		
Oil aging/warning	Oil aging sensor signals warning	Oil aging sensor does not signal warning	Yes	Yes		
Oil aging/fault	Oil aging sensor signals fault	Oil aging sensor does not signal fault	Yes	Yes		
Oil aging / overtemperature	Oil aging sensor signals overtemperature	Oil aging sensor does not signals overtemperature	Yes	Yes		
Oil aging/ready	Oil aging sensor is not ready for operation	Oil aging sensor is ready for operation	Yes	Yes		
Brake wear	Brake is worn	Brake is ok	Yes	Yes		

1) Important for operating modes with encoder feedback: The parameter set must not be changed more often than every two seconds.

P62x Binary outputs basic unit

Use binary output DBØØ for controlling 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.

NOTE

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 assigned the same function.

P620 ... P624 Binary output DOØ1 ... DOØ5

The binary outputs of the basic unit can be set to the same functions as the binary outputs option (P63x).

P63x Binary outputs option

P630 ... P637
Binary output
DO1Ø ... DO17

The following functions can be assigned to the binary outputs:

Function	Binary output has "0" signal	Binary output has "1" signal	Factory set to	See also
NO FUNCTION	Always "0" signal	–		
/FAULT	Collective fault signal	–	DOØ2	
READY FOR OPERATION	Not ready	Ready	DOØ1	
OUTPUT STAGE ON	Unit inhibited	Unit enabled and motor energized		
ROTATING FIELD ON	No rotating field	Rotating field		
BRAKE RELEASED[1)]	Brake applied	Brake released		
BRAKE APPLIED[1)]	Brake released	Brake applied		
MOTOR STANDSTILL	Motor turning	Motor stopped		
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 = INSIDE (OUTSIDE)**	Speed is outside (within) speed window	Speed is within (outside) speed window		P41x
SP/ACT.VAL.COMP. **P422 = n = n_{set} (n <> n_{set})**	n <> n_{set} (n = n_{set})	n = n_{set} (n <> n_{set})		P42x
CURRENT REFERENCE **P433 = I < I_{ref} (I > I_{ref})**	I > I_{ref} (I < I_{ref})	I < Iref (I > I_{ref})		P43x
Imax 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 PREWARN.	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		
IPOS IN POSITION	Position not reached	Position reached		IPOS[plus®] manual
IPOS REFERENCE	No referencing	Referencing finished		
IPOS OUTPUT	Depends on IPOS program		DOØ3 DOØ4 DOØ5	
/IPOS ERROR	Error message IPOS program	–		
Ex-e current limit	Not active	Active	-	P56x
LSM commutation	Not commutated	Commutated	-	-
S pattern	S pattern is not calculated	S pattern is calculated	-	P135/145
Safe stop	Not active	Active	-	-

1) Use binary output DBØØ to control 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.

	NOTE
	The binary signals are only valid if the inverter has signaled "READY" after switch-on. Binary signals have "0" status while MOVIDRIVE® is being initialized. Several terminals can be assigned 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 following functions can be assigned to the analog outputs:

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 the input of the internal ramp generator	
SET SPEED	+/–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 FRE-QUENCY	+/–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 nega-tive sense of rotation.	
RELATIVE 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	Current 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)	

P641 / P644 Scaling AO1 / AO2

Setting range: –10 ... 0 ... 1 ... 10

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

Figure 53: Incline 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 value.
- 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 operating mode. The characteristic has an offset of 4mA and the value of P641 Scaling AO1 / P644 Scaling AO2 refers to the value range of 16 mA. The value for unit utilization, current and relative torque is 200% for each in BG0.

Figure 54: Characteristic of operating mode 0... 20 mA

Figure 55: Characteristic of operating mode 4... 20 mA

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.

	NOTE
	When using incremental encoders (resolver, TTL, RS422, sin/cos, Hiperface® single-turn), changing the parameter set invalidates the positions 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

1 2 AUTO

This parameter is used to set the basic operating mode of the inverter for parameter sets 1 and 2. This includes in particular the definition of the motor system, 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 group 1). Without new startup, the operating mode may only be changed within a group.

Group	Parameter set 1/2 P700 Operating mode 1 P701 Operating mode 2	Unit and option	Motor
1	**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 characteristic curve** **V/f & DC BRAKING**	MDX, no option required	DT/DV without incremental encoder
2	**VFC-n-control** **VFC-n-control & group** **VFC-n-control & hoist**	MDX + DEH11B	DT/DV with incremental encoder or HIPERFACE® encoder
	VFC-n-control & sync	MDX + DRS11B + DEH11B	
	VFC-n-control & IPOS	MDX + DEH11B	
3	**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	
4	**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 find detailed information on the individual operating modes in the "Operating modes" chapter.

P702 Motor category

AUTO

Setting range: Rotatory / Linear

This parameter is set automatically during startup. It shows the connected motor type.

Parameter set 2 is not available when operating a linear motor.

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:

- At low ambient temperatures of the motor, it is possible to prevent the danger of condensation formation and freezing (in particular of the disc brake). Overheating the motor must be avoided when setting the current. **Recommendation:** 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:** For hoists, set to 45 ... 50 %.

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

- In CFC mode, the amount of magnetization current injected is always at least that required on the basis of the motor model. This higher value will be valid if P710 Standstill current 1 / P711 Standstill current 2 were set to a higher value.
- This function does not have any effect in SERVO operating mode. No current was injected.
- The rated magnetizing current will always be set for operating modes VFC & hoist, and VFC n-control & hoist if P710 is active.
- Else, a rapid start will only take place if 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.

Figure 56: Setpoint stop function

P720 / P723 Setpoint stop function 1/2

1 2

Setting range: ON / OFF

P721 / P724 Stop setpoint 1 / 2

1 2

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

In the VFC&Hoist operating mode, the minimum stop setpoint is internally limited to 16 rpm.

P722 / P725 Start offset 1/2

1 2

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

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

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

P73x Brake function

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

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

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Figure 57: Inverter behavior with activated brake function

P730 / P733 Brake function 1/2

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

1 2 AUTO

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

1 2 AUTO

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 the skip width to 0.

Figure 58: Speed skip function

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

1 2

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

P741 / P743 Skip width 1/2

1 2

Setting range: 0 ... 300 rpm

P75x Master-Slave function

The master-slave function allows for implementing automatical functions such as speed synchronization, shared load and torque control (slave). The RS485 interface (ST11 ST12) or the system bus interface (SC11 / SC12) can be used as the communication link. P100 Setpoint source = Master SBus or P100 Setpoint source = Master RS485 must be set on the slave. The process output data PO1 ... PO3 (P870, P871, P872) are automatically set by the firmware. It is possible via programmable terminal function "Slave free-wheel" P60x Binary inputs basic unit / P61x Binary inputs option to separate the slave from the reference input variable of the master and have it run in local control mode.

NOTE

For the slave, the process data P87x are automatically assigned as follows:

- PO1 = Control word 1
- PO2 = Speed or current in M-control
- PO3 = IPOS PO data
- PI1 = Status word 1
- PI2 = Speed
- PI3: IPOS PI data

PI3 and PO3 are not used and are available in IPOS$^{plus®}$ as required.

If a fieldbus card is plugged in the slave, only the parameter channel is available for the output data. The master can read the automatically assigned process input data via fieldbus.

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Figure 59: Master/slave function

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

NOTE

P811 RS485 Group address or *P882 SBus Group address* must be set to the same value in master and slave. For master/slave operation via RS485 interface, set P811 RS485 Group address to a value 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): P815 SBus timeout delay is in effect when there is a communication link via the SBus. If P883 SBus timeout delay = 0, there is no monitoring of data transmission via the SBus.
- RS485 interface: A connection check is always in effect if the communication link takes place via the RS485 interface; P812 RS485 timeout delay does not have any function. The slave inverters 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 should be set to ≥ 10 ms (recommendation: 100 ms).

NOTE

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 XTERMINAL and the UWS21B option, every telegram from the PC will reset the error.

Overview of functions of master/slave operation

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 (RS485+SBus1) SPEED (RS485) SPEED (SBus1)	VFC VFC & GROUP VFC & HOIST V/f CHARACTERIS-TICS V/f & DC BRAKING	MASTER SBus1 MASTER RS485:	VFC VFC & GROUP VFC & HOIST V/f CHARACTERIS-TICS V/f & DC BRAKING
Synchronous speed running: • **Master speed controlled** • **Slave controlled**	SPEED (485+SBus1) SPEED (RS485) SPEED (SBus1)	VFC n-CONTROL VFC n-REG & ... CFC CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus1 MASTER RS485:	VFC VFC & GROUP VFC & HOIST
Synchronous speed running: • **Master speed controlled** • **Slave controlled** • **Drives without rigid mechanical connection!**	SPEED (485+SBus1) SPEED (RS485) SPEED (SBus1)	VFC n-CONTROL VFC n-REG & ... CFC/SERVO CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus1 MASTER RS485:	VFC n-CONTROL VFC n-CTRL & GROUP VFC n-CTRL & HOIST CFC SERVO
Synchronous speed running: • **Master controlled** • **Slave controlled** • **Drives without rigid mechanical connection!**	SPEED (485+SBus1) SPEED (RS485) SPEED (SBus1)	VFC VFC & GROUP VFC & HOIST	MASTER SBus1 MASTER RS485:	VFC n-CONTROL VFC n-CTRL & GROUP VFC n-CTRL & HOIST CFC SERVO
Load distribution: • **Master controlled** • **Slave controlled**	LOAD SHAR. (RS485+SBus1) LOAD SHAR. (RS485) LOAD SHAR. (SBus1)	VFC VFC & GROUP VFC & HOIST	MASTER SBus1 MASTER RS485:	VFC VFC & GROUP VFC & HOIST
Load distribution: • **Master speed controlled** • **Slave controlled**	LOAD SHAR. (RS485+SBus1) LOAD SHAR. (RS485) LOAD SHAR. (SBus1)	VFC n-CONTROL VFC n-REG & ... CFC/SERVO CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus1 MASTER RS485:	VFC VFC & GROUP VFC & HOIST VFC & FLYING START
Load distribution: • **Master speed controlled** • **Slave controlled**	Not possible			
Load distribution: • **Master controlled** • **Slave controlled**	Not possible			
Torque control of the slave: • **Master speed controlled** • **Slave torque controlled**	TORQUE (RS485+SBus1) TORQUE (RS485) TORQUE (SBus1)	CFC/SERVO CFC/SERVO & IPOS CFC/SERVO & SYNC	MASTER SBus1 MASTER RS485:	CFC/SERVO & M-CTRL.

Synchronous speed running

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

The actual speed of the master is transferred to the slave. The speed ratio is set for the slave inverter with P751 Scaling slave setpoint. Leave P324 Slip compensation 1 / P334 Slip compensation 2 of the slave at the value of the startup setting. Example:

Parameters	Setting on the master	Setting on the 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)
P810 RS485 Address	Set different values	
P811 RS485 group address	Not in effect	
P881 Address SBus 1	Set different values	
P882 / P892 SBus Group address	Set the same value (0 ... 63)	
P884 / P894 SBus baud rate	Set the same value (125, 250, 500 or 1000 kBaud)	

Load distribution

Load sharing (LOAD SHAR (RS485) / LOAD SHARE (SBus) / LOAD SHARE (485+SBus)):

This function lets two inverters control the same load. The rotating field frequency of the master is transferred to the slave. 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. P751 Scaling slave setpoint must be set to the value "1".

NOTE

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 rpm

Example:

Parameters	Setting on the master	Setting on the 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)	
P881 Address SBus 1	Set different values	
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 distribution to be achieved, for example. This setting should be preferred over load sharing if the drive configuration permits it. Set the torque ratio using P751 Scaling slave setpoint. Example:

Parameters	Setting on the master	Setting on the 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)	
P881 Address SBus 1	Set different values	
P882 / P892 SBus Group address	Not in effect	
P884 / P894 SBus baud rate	Not in effect	

P750 Slave setpoint

The setpoint to be transferred to the master is set on the master. The "MASTER-SLAVE OFF" setting must be retained on the slave.

- MASTER-SLAVE OFF
- SPEED (RS485)
- SPEED (SBus1)
- SPEED (485+SBus1)
- TORQUE (RS485)
- TORQUE (SBus1)
- TORQUE (485+SBus1)
- LOAD SHAR. (RS485)
- LOAD SHAR. (SBus1)
- LOAD SHAR. (485+SBus1)

P751 Scaling slave setpoint

Setting range: –10 ... 1 ... 10

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

P76x Manual operation

P760 Lockout run/stop keys

Setting range: YES / NO

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 therefore without function.

P77x Energy-saving function

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.

P770 Energy-saving function

Setting range: ON / OFF

The energy-saving function can be activated for the following operatin modes: VFC / VFC & GROUP / VFC & FLYING START/ V/f CHARACTERISTIC. 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

P78x Ethernet configuration

The parameter group P78x includes display and setting values that are specific for the DFE11B option card.

P780 IP address

Setting range: 000.000.000.000 ... 192.168.10.x ... 223.255.255.255

Use P780 to set the IP address for linking MOVIDRIVE® B 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.

P781 Subnetwork mask

Setting range: 000.000.000.000 ... 255.255.255.0 ... 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.

P782 Standard gateway

Setting range: 000.000.000.000 ... 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.

P783 Baud rate

Display value, cannot be altered. Shows the current baud rate of the Ethernet connection. During the initialization phase of the DFE11B, the value 0 is displayed for approximately 35 seconds.

P784 MAC address

Display value, cannot be altered. Displays the MAC address, i.e. the unique layer-2 Ethernet address of the interface.

P785 Ethernet / IP Startup Configuration:

Setting range: DHCP / Saved IP parameters

Only available with DFE13B EtherNet/IP option.

- DHCP: The DFE13B option is assigned its IP parameters (P780 ... P782) P782) by a DHCP server when the supply voltage is switched on.
- Saved IP parameters: The DFE13B option is started with the saved IP parameters when the supply voltage is switched on.

P8xx Unit functions

P80x Setup

P800 User menu

User menu only for DBG60B keypad.

Setting range: ON / OFF

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® B unit has been switched off and on again.

P801 Language

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.

P802 Factory setting

Setting range: NO / DEFAULT STANDARD / DELIVERY CONDITION

You can use P802 to reset the factory settings stored in the EPROM for almost all parameters. The following data are not reset when default standard is selected:

- IPOS program
- P20x Speed control
- P210 P gain hold control
- P26x Process controller parameters
- P27x Process controller input values
- P28x Process controller limits
- P30x Limits 1 / P31x Limits 2
- P32x Motor compensation 1 / P33x Motor compensation 2
- P344 Interval for motor protection
- P345 / P346 I_N-U_L monitoring 1 / 2
- P53x Thermal protection motor
- P557 DCS source actual position
- P70x Operating modes
- P73x Brake function
- P78x Ethernet configuration
- P810 RS485 address
- P811 RS485 group address
- P88x Serial communication SBus 1 (except for P883, P884, P885)
- P89x Serial communication SBus 2 (except for P893, P894, P895)
- P905 Hiperface offset X15
- P910 Gain X controller
- P938 / P939 Speed task 1 / 2

- P94x IPOS encoder (except for P944)
- P95x DIP (except for P955)
- Error memory
- Statistical data
- PROFINET device name

The "Delivery state" setting also resets the data listed above.

"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."

	NOTE
	The "Default standard" setting overwrites almost all parameter values; the setting "delivery status" overwrites all parameter values. Save the set parameter values with SHELL or the DBG60B keypad before you start resetting the parameters. After reset, it is necessary to adapt the altered parameter values and terminal assignments to meet the requirements.

P803 Parameter lock

Setting range: ON / OFF

Setting P803 to "ON" makes it possible to prevent any change to the parameters (except for P840 Manual reset and the parameter lock itself). This makes sense, for example, after the MOVIDRIVE® B setting has been optimized. P803 must be set to "OFF" to enable changes to parameters again.

Important: Startup is not possible when P803 is set to ON. The parameter lock also acts on the RS485, fieldbus and SBus interfaces, and on IPOS$^{plus®}$.

The parameter lock does not have any effect on the following parameters:

- P780 IP address
- P781 Subnetwork mask
- P782 Standard gateway
- P785 Ethernet/IP Startup Configuration
- P803 Parameter lock
- P819 Fieldbus timeout delay
- P840 Manual reset
- P876 PO data enable
- P931 IPOS control word task 1

P804 Reset statistics data

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

P804 permits reset of the statistics data stored in the EEPROM, namely the error memory, kilowatt-hour meter and operating hours counter. These data are not affected when selecting "Default standard" for P802 Factory setting.

P806 Copy DBG -> MDX

Setting range: YES / NO

The parameter data in the DBG60B are transferred to MOVIDRIVE®.

P807 Copy MDX -> DBG

Setting range: YES / NO

The parameter data set in MOVIDRIVE® are transferred to the DBG60B keypad.

P81x Serial communication

P810 RS485 Address

Setting range: 0 ... 99

P810 is used to set the address by means of which communication can take place with MOVIDRIVE® via the serial interfaces. A maximum of 32 stations can be networked together.

	NOTE
	MOVIDRIVE® B 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 allows for grouping several MOVIDRIVE® B units in one group for communication via the serial interface. In this way, all MOVIDRIVE® B units with the same RS485 group address can be addressed via this address using a multicast telegram. The data received via group address are not acknowledged by MOVIDRIVE® B. For example, the RS485 group address allows for sending setpoint selections to a group of MOVIDRIVE® B inverters simultaneously. Group address 100 means that the inverter is not assigned to a group.

P812 RS485 timeout interval

Setting range: 0 ... 650 s

P811 sets the monitoring time for data transmission via the serial interface. MOVIDRIVE® performs the error response set in P833 Response RS485 TIMEOUT if there is no cyclical process data exchange via the serial interface for the period set in parameter 812. No monitoring of serial data transmission takes place when P812 is set to 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). MOVIDRIVE® B performs the error response set in P831 Response FIELDBUS TIMEOUT if there is no data traffic via the fieldbus for the period set in P819. 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 and DeviceNet. 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® B (CCW / CW; motor / regenerative). P820/P821 must be set to "OFF" if there is neither a braking resistor nor a regenerative power supply unit connected to MOVIDRIVE® B, which means regenerative operation is not possible. In these operating modes, MOVIDRIVE® B 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® B, it is possible that the generated power during braking may be too great, leading to MOVIDRIVE® B switching itself off and issuing error message F07 (V_{DClink} overvoltage). In this case you have to extend the deceleration ramps manually.

P83x Error responses

The following responses can be programmed:

Response	Description
NO RESPONSE	Neither a fault is displayed nor a fault response is triggered. The error which is signaled is completely ignored.
DISPLAY ERROR	The fault is displayed (in 7-segment display and SHELL), the fault output is set (if programmed). The unit has no other fault responses. The fault can be reset (terminal, RS485, fieldbus, auto-reset).
IMMEDIATE 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 the error has been reset during which the inverter is reinitialized.
EMER-GENCY STOP/ FAULT	The drive is braked with the set emergency ramp t14/t24. 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 a fault reset has been performed during which the inverter is reinitialized.
RAPID STOP/FAULT	The drive is braked with the set stop ramp t13/t23. 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 a fault 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.
EMER-GENCY STOP/ WARNG	The drive is braked with the set emergency ramp t14/t24. Once the stop speed is reached, the output stage is inhibited and the brake 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.	The drive is braked with the set stop ramp t13/t23. Once the stop speed is reached, the output stage is inhibited and the brake 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. ST/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 Response FIELDBUS TIMEOUT

Factory setting: RAPID STOP/WARN.

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 process can be set with P819 Fieldbus timemout delay (see "Fieldbus unit profile" manual for a more detailed description).

P832 Response MOTOR OVERLOAD

Factory setting: EMERG. ST/FAULT

P832 programs the fault response that is triggered in the event of motor overload. Make one of the following settings to monitor motor overload:

- P340 Motor protection set to ON ASYNCHRONOUS
- P340 Motor protection 1 set to ON SERVO and P530 Sensor type 1 to KTY

P833 Response RS485 TIMEOUT

Factory setting: RAPID STOP/WARN.

P833 programs the fault response that is triggered by the RS485 timeout monitoring. The response time of the monitoring process can be set with P812 RS485 timeout interval.

P834 LAG ERROR response

Response lag error with DRS11B and IPOS$^{plus®}$ only.

Factory setting: EMERG. ST/FAULT

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.

P835 Response TF MESSAGE

Factory setting: NO RESPONSE

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

P836 / P837 Response SBus TIMEOUT 1 / 2

Factory setting: EMERG. ST/FAULT

P836 / P837 programs the fault response that is triggered by the system bus timeout monitoring. The response time of the monitoring process can be set with P883 Timeout delay SBus 1 / P893 Timeout delay SBus 2.

Caution: If the option DCS21B/31B is plugged, P837 is automatically set to "Emergency stop/Warning" after each restart.

P838 Response SW LIMIT SWITCH

Factory setting: EMERG. ST/FAULT

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 using parameters P920 / P921.

P84x Reset response

P840 Manual reset

Setting range: YES / NO

- YES: The error in the MOVIDRIVE® B unit is reset. In case of a fault, it is possible to press the [← / Del] key on the DBG60B to access P840 directly. P840 is also available in the "Parameters" main menu in SHELL. P840 automatically reverts to NO after the reset. Activating the manual reset does not have any effect if there is no error present.
- NO: No reset.

P841 Auto reset

Setting range: ON / OFF

- ON: The auto reset function is activated. In case of an error, this function automatically resets the unit after P842 Restart time. A maximum of five auto resets are possible during an 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 24V support operation or the inverter is completely turned off

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

HAZARD!

Risk of crushing if the motor starts up automatically after an auto reset.

Severe or fatal injuries.

- Do not use auto reset with drives where an automatic restart represents a danger to people or units.
- Perform a manual reset.

- OFF: No auto reset.

P842 Restart time

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

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

P85x Scaling actual speed value

Scaling of the actual speed value with SHELL only.

Scaling actual speed value defines a user-specific display parameter P001 User display. For example, the user display is to be shown in 1/s. Such a setting requires a scaling factor of 1/60. This means the numerator scaling factor has to be set to 1 and the denominator scaling factor to 60. The scaling unit 1/2 is entered in P852 User unit.

01640BEN

Figure 60: Scaling actual speed value (example)

P850 Scaling factor numerator

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

P851 Scaling factor denominator

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

P852 User-defined unit

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

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

P86x Modulation

P860 / P861 PWM frequency 1 / 2 VFC

1 2

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. The inverter automatically switches back to lower switching frequencies when the unit utilization reaches a specific level if the clock frequency for parameter set 1/2 is not fixed to the set value using P862 PWM fix 1 / P863 PWM fix 2. The modulation frequency reduces switching losses in the output stage and, consequently, unit utilization.

P862 / P863 PWM fix 1 / 2

1 2

Setting range: ON / OFF

- ON: Use P862/P863 = ON for parameter sets 1 / 2 to fix the PWM frequency set with P860 PWM frequency 1 / P861 PWM frequency 2 when an automatic reduction in the PWM frequency is undesirable (e.g. when output filters are used).
- OFF: MOVIDRIVE® automatically reduces the set output frequency (down to minimum 4 kHz) when there is a high level of thermal load on the output stage to avoid a switch-off with the "Unit utilization" error.

P864 PWM frequency 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.

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 MOVIDRIVE® B can allocate the appropriate setpoints.

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

The following PO 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
CONTROL WORD 1	Control signals for start/stop, etc.
CONTROL 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 the "Fieldbus unit profile with parameter list" manual for detailed explanations.

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® B 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 PI assignments are available:

Assignment	Description	
NO FUNCTION	The content of the process input data word is 0000_{hex}.	
SPEED	Current actual speed value of the drive in rpm.	
OUTPUT CURRENT	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 LO[1)]	Current actual position low word	The actual position is read from: P941Source actual position
POSITION HI[1)]	Current actual position high word	
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 the "Fieldbus unit profile with parameter list" manual for detailed explanations.

P876 PO data enable

Setting range: ON / OFF

- ON: The process output data that was last sent from the fieldbus control become effective.
- OFF: The last valid process output data remain in effect.

NOTE

If the process data assignment is changed, P876 will automatically set to "OFF".

P88x / P89x Serial communication SBus 1 / 2

P880 / P890 Protocol SBus 1 / 2

Setting range: SBus MOVILINK / CANopen / Protocol DCS

P881 / P891 Address SBus 1 / 2

Setting range: 0 ... 63

Use P882 / P892 to set system bus address of MOVIDRIVE® B unit. The MOVIDRIVE® B unit can communicate with other MOVIDRIVE® B 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® B unit.

P883 / P893 SBus timeout delay 1 / 2

Setting range: 0 ... 650 s

P883 / P893 sets the monitoring time for data transmission via the system bus. If there is no data traffic via the system bus during the time period set in P883 / P893, the MOVIDRIVE® unit will execute the error response set in P836 SBus timeout response 1 / P837 SBus timeout response 2. No monitoring of data transmission via the system bus takes place when P883 / P893 are set to the value 0.

P884 / P894 SBus baud rate 1 / 2

Setting range: 125 / 250 / 500 / 1000 kbaud

P884 / P894 set the transmission speed of the system bus. The total of the baud rates in P884 / P894 must not exceed 1125 kBaud.

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 CANBus. For this purpose, the master controller must send a synchronization telegram to the connected inverter at certain intervals. In this way, the inverters synchronize themselves to 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.

	NOTE
	The inverters may either be synchronized by SBus1 or SBus2 or by DPRAM (P970). The inverters must **not be synchronized from several interfaces at the same time**.

P886 / P896 CAN-open address 1 / 2

Setting range: 1 ... 127

P886 / P896 is used to set the serial communication with the SBus.

P887 Synchronization ext. control

Setting range: ON / OFF

If a MOVIDRIVE® B receives cyclical setpoints from a master control via SBus 1 or SBus 2 (e.g. position setpoint or master axis position) it is necessary that the MOVIDRIVE® B 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.

The synchronization of MOVIDRIVE® and control takes place via P885 Synchronization ID SBus 1 / P895 Synchronization ID SBus 2; the setting of the time dial takes place via P887.

You will have to set P916 Ramp form to BUS RAMP for cyclical presetting of the position setpoint.

ON: the internal time dial for position control will have to be set to exactly 1 ms.

OFF: the internal time dial for position control is set to the standard SEW time base (ca. 1 ms).

If several MOVIDRIVE® B units are synchronized via SBus without control, P887 has 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: 1 ... 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.

P889 / P899 Parameter channel 2

Setting range: YES / NO

P9xx IPOS parameters

The IPOS[plus®] parameters are described in detail in the IPOS[plus®] manual.

	HAZARD! Risk of crushing if the motor starts up unintentionally. Severe or fatal injuries. • Ensure that the motor cannot start unintentionally. • 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. Knowledge of the IPOS[plus®] manual is an essential prerequisite for setting these parameters.

P90x IPOS reference travel

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

Machine zero = reference position + reference offset

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

P900 Reference offset

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

Reference offset (zero offset) is used to determine the machine zero (origin). The following applies:

Machine zero = reference position + 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

The reference offset is activated again after reference travel has been completed successfully.

	NOTE In case of a reference travel of a drive system with absolute encoder (HIPERFACE® or DIP), P905 Hiperface offset X15 / P947 Hiperface offset X14 or DIP offset P953 Position offset will be recalculated and overwritten by the reference travel depending on the actual position source.

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 directions during reference travel are determined by the respective reference travel type. The speed is 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 directions during reference travel are determined by the respective reference travel type. The speed is effective upon leaving the reference cam until reaching the first zero pulse.

P903 Reference travel type

Setting range: 0 ... 8

The reference travel type specifies the reference travel strategy that is used to establish the machine zero of a machine.

This setting also defines the search direction for the reference cam in the individual referencing phases.

Use parameter P904 Referencing to zero pulse to determine if the reference travel takes place to the edge change of the reference cam or the 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.

There are also types available that can function without a reference cam.

- **Type 0: CCW zero pulse**
  - First search direction is CCW.
  - Reference position = Left zero pulse from current position
  - Machine zero = reference position + reference offset
- **Type 1: CW 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: CW 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: CW 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 CW 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 CCW 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: $-(2^{31} - 1)$ ... 0 ... $2^{31} - 1$

This parameter is used to specify the zero point of the motor encoder display.

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 = Encoder value – P905
- P947 Hiperface offset X14 has an effect on the actual position of the external encoder H510.

  H510 = Encoder value – P947

The actual position is determined directly after the values have been entered. A Hiperface® multi-turn encoder must be referenced once, a Hiperface® single-turn encoder must always be referenced.

Note:

When reference travel of a drive system takes place with a Hipferface® encoder, the Hiperface offsets (P905 or P947) are recalculated and overwritten due to the reference travel 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 IPOSplus®. The value from P210 P gain hold controller is adopted here in the default setting.

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 for acceleration and deceleration when the ramp type setting is P916 Ramp function SINE and SQUARED. With LINEAR ramp function, deceleration will be 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 decleration 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 used for positioning. The setting must be adjusted to the maximum motor speed.

	NOTE
	P302 Maximum speed 1 / P312 Maximum speed 2 limits P913 / P914; set P302 Maximum speed 1 / P312 Maximum speed 2 to a value (ca. 10 %) greater than P913 / P914 to prevent lag errors!

P915 Velocity precontrol

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.

	NOTE
	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 the positioning ramp. This influences the speed or acceleration characteristics during positioning.

NOTE

The following ramp types are not supported if P702 Motor category is set to "Linear":
- SPEED INTERPOLATION
- POSITION INTERPOLATION 12 BIT
- POSITION INTERPOLATION 16 BIT

Ramp type	Positioning characteristics
LINEAR	Time-optimal but block-shaped acceleration profile.
SQUARED	Softer acceleration and higher torque demand than LINEAR.
SINE	Very soft acceleration profile, required torque higher than with SQUARED acceleration profile.
BUS RAMP	Setting for operation of drive inverter with master controller. This controller generates a cyclical position setpoint that is written directly to the position controller. The ramp generator is deactivated. The position specifications sent cyclically by the external controller are interpolated linearly. For configuration, one process output data word must be set to "position HIGH" and another one to "position LOW".
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, the torque is reduced again over time in linear form to zero. This means that system vibrations can be virtually avoided. A setting range can be selected from 0.005 ms to 2 ms (P933). 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 SYNCHRONOUS OPERATION	Activating the technology function "Electronic synchronous operation."
CROSS CUTTER	Activating the technology function "Cross cutter."
SPEED INTERPOLATION	The speed values sent cyclically by the external controller are interpolated linearly. • Speed specification via process data: – Set P888 *Synchronization time SBus* to 5 ms or 10 ms – Set the *P100 Setpoint source* to "SBus" or "Fieldbus" – You have to set a process output data word to "Speed" • Speed specification via SBus/SCOM object: – Set *P888 Synchronization time SBus* to 1 ... 10 ms. – Set the *P100 Setpoint source* to "BIPOL. FIXED SETPT". – Do not set a process output data word to "Speed". – Create a SCOM receive object (using the SCOM receive command → IPOS$^{plus®}$ manual) with the target variable *SetpPosBus* (H499).

Ramp type	Positioning characteristics
POSITION INTERPOLATION 12 BIT	The position specifications sent cyclically by the external controller are interpolated. Position resolution: 1 revolution corresponds to 4096 increments (12 bit). • Position specification using process data: – Set P888 *Synchronization time SBus* to 5 ms or 10 ms – Set the *P100 Setpoint source* to "SBus" or "Fieldbus" – Set one process output data word to "position HIGH" and another one to "position LOW". • Position specification via SBus/SCOM object: – Set *P888 Synchronization time SBus* to 1 ... 10 ms. – Set the *P100 Setpoint source* to "BIPOL./FIXED SETPT". – Do not set a process output data word to "position HIGH" or "position LOW". – Create a SCOM receive object (using the SCOM receive command → IPOS$^{plus®}$ manual) with the target variable *SetpPosBus* (H499).
POSITION INTERPOLATION 16 BIT	The position specifications sent cyclically by the external controller are interpolated. Position resolution: 1 revolution corresponds to 65536 increments (16 bit). • Position specification using process data: – Set P888 *Synchronization time SBus* to 5 ms or 10 ms – Set the *P100 Setpoint source* to "SBus" or "Fieldbus" – Set one process output data word to "position HIGH" and another one to "position LOW". **Important:** Position resolution via PI data assignment is 4096 incrrements per revolution (= 12 bit). The motor position expanded to 16 bit is available on IPOS$^{plus®}$ variable H508. The IPOS$^{plus®}$ variable *ActPos_Mot* (H511) has a position resolution of 4096 increments per revolution (= 12 bit) • Position specification via SBus/SCOM object: – Set *P888 Synchronization time SBus* to 1 ... 10 ms. – Set the *P100 Setpoint source* to "BIPOL./FIXED SETPT". – Do not set a process output data word to "position HIGH" or "position LOW". – Create a SCOM receive object (using the SCOM receive command → IPOS$^{plus®}$ manual) with the target variable *SetPosBus* (H499). **Important:** Position resolution via PI data assignment is 4096 increments per revolution (= 12 bit). The position resolution of 4096 increments per revolution (= 12 bit) expanded to 16 bit is available on IPOS$^{plus®}$ variable H508. The IPOS$^{plus®}$ variable *ActPos_Mot* (H511) has a position resolution of 4096 increments per revolution (= 12 bit)

NOTE

Note the following for the "POSITION INTERPOLATION 16 BIT" ramp type:

- IPOS variable H508 is also used when S14 is set to ON.

  IPOS variable H508 only provides meaningful values when

  – DIP switch S14 = "ON", **or**
  – P916 Ramp type = "Position interpolation 16 bit"

P917 Ramp mode

Setting range: MODE 1 / MODE 2

This parameter determines the use of P912 Positioning ramp 2 with ramp type set to LINEAR.

- P917 = MODE 1: Deceleration for travel to target position (spot braking) takes place with P912 Positioning ramp 2. P911 positioning ramp 1 is used for all other positioning operations. If position interpolation 12 or 16 bit was activated, it will operate in mode 1 without dead-time compensation.
- P917 = MODE 2: Positioning ramp 2 P912 is used for decelerating the speed during travel. P911 positioning ramp 1 is used for acceleration. If position interpolation 12 or 16 bit was activated, mode 2 will activate dead-time compensation.

P92x IPOS monitoring

P920 / P921 SW limit switch CW / CCW

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

The software limit switches let the user limit the range in which travel commands are accepted. This is implemented via 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, then these are 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. If the target position is beyond the range limited by the limit switches, the travel command will not be executed. The drive responds according to the error response set in P838. If *P838 Fault response SW limit switch* is set to "... / Warning" or "... / Fault", then fault message F78 (IPOS SW limit switch) is generated. The software limit switches are only monitored in the "...& IPOS" (P700) operating modes.

If *P838 Fault response SW limit switch* is set to ".../Fault", then a drive with incremental encoder is no longer referenced after a fault reset whereas a drive with absolute encoder is still referenced.

If the drive is not referenced, the software limit switches are inactive until the drive has been referenced again.

If *P838 Fault response SW limit switch* is set to ".../Warning", the drive remains referenced following a reset. The target might be overshot due to the mass moment of inertia of the machine or incorrectly set controller parameters. The software limit switches do not respond in this case.

Deactivation: Set both parameter values to 0 for endless travel so that the software limit switch function is deactivated.

P922 Position window

Setting range: 0 ... 50 ... 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 between the setpoint and actual position value. If the permitted value is exceeded, a lag error message or lag error response will be triggered. You can set the responses with P834 Response lag error.

Deactivation: Set 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 limited by P302 Maximum speed 1 / P312 Maximum speed 2.

P931 IPOS CTRL word Task 1

Setting range: STOP / START / HALT

IPOS CTRL WORD Task 1 in the DBG60B keypad only, not in SHELL.

STOP: Task 1 of the IPOS$^{plus®}$ program is stopped.

START: Task 1 of the IPOS$^{plus®}$ program is started.

STOP: Tasks 1, 2 and 3 of the IPOS$^{plus®}$ program are stopped.

P932 IPOS CTRL word Task 2

Display range: START / STOP

IPOS CTRL WORD Task 2 in the DBG60B keypad only, not in SHELL.

Display parameter, cannot be set using DBG60B.

START= Task 2 of the IPOS$^{plus®}$ program is currently being processed.

STOP= Task 2 of the IPOS$^{plus®}$ program is stopped.

P933 Jerk time

Setting range: 0.005 ... 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 0.005 ... 2 s that has to be set for the function jerk limit 2 s). Please note that P911 Positioning ramp 1 / P912Positioning ramp 2 are of a greater or equal value.

P933 ≤ 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.

P938 Speed task 1

Setting range: 0 ... 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 additional 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

P939 Speed task 2

Setting range: 0 ... 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. 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

P94x IPOS$^{plus®}$ encoder

P940 IPOS variables edit

Setting range: ON / OFF

IPOS$^{plus®}$ variables edit with DBG60B keypad only, not in SHELL.

IPOS$^{plus®}$ varibles can be changed if P940 is set to 'ON'.

P941 Source actual position

Setting range: Motor encoder (X15) / Ext. encoder (X14) / Absolute encoder (X62)

Defines the encoder to which IPOS$^{plus®}$ positions.

P942 / P943 Encoder factor numerator / denominator

Setting range: 1 ... 32767

First set the parameter P944 Encoder scaling ext. encoder or P955 encoder scaling (when using DIP11B or DEH21B option). Next, set P942/P943.

In the event of positioning to an external encoder (X14) or an absolute encoder (X62), 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 absolute position (H510 with external encoder) 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 new– H509 old= H509 difference
  - H511 new – H511 old= 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

Before setting P944, make sure that P942 and P943 are set to "1".

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).
- Calculate the difference between the values you wrote down and the current values:
  - H510 new – H510 old = H510 difference
  - H511 new – H511 old = H511 difference
- Calculate the quotient from H511 difference divided by H510 difference. Set the parameter P944 Encoder scaling ext. encoder to the value that is closest to the calculated quotient.

Important: 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 encoder. The setting of all listed parameters has to be adjusted every time the encoder scaling is changed.

The number of pulses detected at X14 is multiplied by P944 and then mapped to H510. The external encoder must always provide fewer pulses than the motor encoder. Please contact SEW-EURODRIVE if this is not possible.

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, with negated tracks, encoder with signal level according to RS422
- 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: $-(2^{31} - 1)$ ... 0 ... $2^{31} - 1$

This parameter is used to specify the zero point of the motor encoder display.

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 = Encoder value – P905
- P947 Hiperface offset X14 has an effect on the actual position of the external encoder H510.

  H510 = 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 a Hipferface® encoder, the Hiperface offsets (P905 or P947) are recalculated and overwritten due to the reference travel depending on the set actual position source.

The following applies:

- P905 = Encoder value – P900
- P947 = Encoder value – P900

P948 Automatic encoder replacement detection

Setting range: ON / OFF

This parameter is only effective with Hiperface® encoders.

- ON: A replaced Hiperface® encoder is detected. Reference travel is required before the "IPOS reference" bit is set.

  Note the following when operating a linear motor with AL1H motor encoder:

  If the linear motor was commutated in the dialog "Encoder adjustment" during initial startup, the "LSM commutated" bit will be cleared in the IPOS status word after encoder replacement. A new commutation travel must be triggered to enable the inverter. Doing so will reset the "LSM commutated" bit. Commutation travel is triggered automatically if the "/CONTROLLER INHIBIT" terminal is set to "1" and no terminal set to "Enable" receives a "1 signal". If a terminal set to "Enable" receives a "1 signal", or if no terminal is set to "Enable", error message F81 will be issued.

  For linear motors with AL1H motor encoder, SEW-EURODRIVE recommends to set parameter P948 to "OFF". After having replaced the encoder, test the drive system with reduced velocity and force in jog mode.
- OFF: The Hiperface® encoder is always referenced. The "IPOS referenced" bit is set.

  Note the following when operating a linear motor with AL1H motor encoder:

  If the linear motor was commutated in the dialog "Encoder adjustment" during initial startup, the "LSM commutated" bit will be maintained in the IPOS status word. The drive system can be enabled immediately.

	NOTE
	If P948 is switched off and on again, the "IPOS referenced" bit is set to "0" once you have restarted MOVIDRIVE® B. Reference travel is necessary to rest the "IPOS referenced" bit to "1".

P95x Absolute encoder (SSI)

The DIP parameters are described in detail in the "MOVIDRIVE® MDX61B Absolute Encoder Card DIP11B/DEH21B" manual. The DIP11B option cannot be used with MOVIDRIVE® MDX61B size 0.

P950 Encoder type

The absolute encoder connected to the DEH21B/DIP11B option (X62) is selected. At present, encoders can be selected from the following list:

- VISOLUX EDM
- T&R CE65, CE58, CE100 MSSI
- T&R LE100, LE200
- T&R LA66K
- AV1Y/ROQ424
- STEGMANN AG100 MSSI
- SICK DME -3000-111
- STAHL WCS2-LS311
- Stegmann AG626
- IVO GM401, GXMMW A202PA2
- STAHL WCS3
- LEUZE OMS1, OMS2
- T&R ZE 65M
- LEUZE BPS37
- SICK DME 5000-111
- POMUX KH53
- KÜBLER 9081
- LEUZE AMS200
- MTS TEMPOSONICS RP
- P+F AVM58X-1212
- Hübner HMG161 S24 H2048
- Balluf BTL5-S112B-M1500
- T&R LA41K
- Elgo LIMAX2

P951 Counting direction

Setting range: NORMAL / INVERTED

Defines the counting direction of the absolute encoder. The setting must be made so the counting direction of the motor encoder (X15) and the absolute encoder (X62) match.

P952 Clock rate

Setting range: 1 ... 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.

P953 Position offset

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

The position offset P953 only needs to be set on incremental encoders; it should be set to 0 for other encoders.

Note: The position value will be recalculated and overwritten automatically after successful completion of the reference travel.

P954 Zero offset

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

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 off the value of variable H509 ACT.POS.ABS and enter the following value in parameter P954 Zero offset: P954 = Variable H509 – required value.

The required value is the display value you wish to have for the current position.

P955 Encoder scaling

Setting range: x1 / x2 / x4 / x8 / x16 / x32 / x64

Before setting P955, make sure that P942 and P943 are set to "1".

The significance of the travel resolution of the motor encoder and absolute encoder is adapted. The parameter is set so the travel information ratio between the motor encoder and the absolute encoder is as close to "1" as possible. Set the parameter initially to "x1." To do this, note the values in variables H509 and H511.

- Move the drive by about 1000 increments (H511).
- Calculate the difference between the values you wrote down and the current values:
  - H509 new– H509 old= H509 difference
  - H511 new – H511 old= H511 difference
- Calculate the quotient from H511 difference divided by H509 difference. Set parameter P955 Encoder scaling to the value that is closest to the calculated quotient.

Important: Encoder scaling directly influences parameters P900 Reference offset, P942 Encoder factor numerator, 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 encoder. The setting of all listed parameters has to be adjusted every time the encoder scaling is changed.

P96x IPOS$^{plus®}$ modulo function

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.

P960 Modulo function

Setting range: OFF / SHORT / CW / CCW

- OFF: The modulo function is deactivated.
- SHORT: The "short travel" modulo function is active. The drive moves from the actual position to the target position taking the shortest possible route. Both directions of rotation are possible.
- CW: The "CW" modulo function is active. The drives 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 drives 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.

P961 Modulo numerator

Setting range: 0 ... 1 ... $2^{31}-1$

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

P962 Modulo denominator

Setting range: 0 ... 1 ... 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

P963 Modulo encoder resolution

Setting range: 0 ... 4096 ... 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 4,096 increments (prequisite is an encoder resolution of 512 to 2,048).

P97x IPOS synchronization

P970 DPRAM synchronization

Setting range: ON / OFF

MOVIDRIVE® B allows for synchronized operation with option cards (e.g. DHP11B, DFE24B).

ON: Synchronized operation with option card is activated.

Important: The inverters may either be synchronized by SBus1, SBus2 or by DPRAM. The inverters must **not be synchronized from several interfaces at the same time**. SEW-EURODRIVE recommends to set P885/895 to an identifier that is not used in the entire CAN network. You need parameters P888 and P916 to implement synchronization with interpolating setpoint processing.

OFF: Synchronized operation with the option card is not activated.

P971 Synchronization phase

Setting range: –2 ... 0 ... 2 ms

Time interval between clock signal and data transfer

3.4 Duty types

	NOTES
	• In operating modes with encoder feedback, toggling between parameter sets must not be performed faster than every 2 seconds. The reason is to ensure that the encoders can be initialized. • The maximum output frequency in the VFC operating modes without encoder feedback is 150 Hz. • The maximum output frequency in the V/f operating mode and all operating modes with encoder feedback is 600 Hz. • If the maximum output frequency is exceeded, error 08 "Speed monitoring" is displayed.

VFC 1 / 2 and V/f characteristic curves

Default setting for asynchronous motors without encoder feedback. Suitable for general applications, such as conveyor belts, trolleys, and hoists with 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} (inverter) = 150 % I_{N_mot}
P302 Maximum speed 1 / P312 Maximum speed 2	Depends 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 Deceleration time 1 / P503 Deceleration time 2	1 s
P100 Setpoint source	UNIPOL./FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1 / P733 Brake function 2	ON
P731 Brake release time 1 / P734 Brake release time 2	For SEW motors: Setting in accordance with motor data. **For non-SEW motors: Set the correct value manually!**
P732 Brake reaction time 1 / P735 Brake reaction 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 motor data
P321 Boost 1 / P331 Boost 2	0
P322 IxR compensation 1 / P332 IxR compensation 2	Setting in accordance with specified motor data
P320 Automatic compensation 1 / P330 Automatic compensation 2	ON
P323 Pre-magnetization time 1 / P333 Pre-magnetization time 2	Setting in accordance with specified motor data

	NOTE
	• SEW-EURODRIVE recommends using P320 Automatic compensation 1 / P330 Automatic compensation 2 activated in the factory setting. This means P322 IxR compensation 1 / P332 IxR compensation 2 are set automatically during the pre-magnetization time by calibration of the motor. • SEW-EURODRIVE recommends not to change parameters P321 Boost 1 / P331 Boost 2 from its 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 of the group must have the same rated voltage and rated frequency. The brake is controlled with P730 Brake function 1 / P733 Brake function 2. Set the data for the largest motor in the group during startup. Once startup is finished, adapt P393 Current limit 1 / P313 Current limit 2 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} (inverter) = 150 % ΣI_{N_Mot}
P302 Maximum speed 1 / P312 Maximum speed 2	Depends 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 Deceleration time 1 / P503 Deceleration time 2	1 s
P100 Setpoint source	UNIPOL./FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1 / P733 Brake function 2	ON
P731 Brake release time 1 / P734 Brake release time 2	For SEW motors: Setting in accordance with motor data. **For non-SEW motors: Set the correct value manually!**
P732 Brake reaction time 1 / P735 Brake reaction time 2	
P300 Start/stop speed 1 / P310 Start/stop speed 2	Setting in accordance with specified motor data
P820 4-quadrant operation 1 / P821 4-quadrant operation 2	ON

	NOTE
	• Do not use this operating mode for hoist applications! • The premagnetization current is adapted to the largest motor in the group during startup. If motors are removed from the group by switching them off, it may be necessary to reduce the current limit to a current that matches the actual combination of motors. • Slip compensation is not effective. Motor speeds are therefore dependent on the load.

VFC 1 / 2 & Hoist / VFC n-control & Hoist

VFC n-control & hoist in parameter set 1 only. Disabling 4Q operation (P820) will be ignored.

In the VFC&Hoist operating mode, the start/stop speed (P300/P310) is set to the slip speed of the motor; in the VFC n-control & hoist operating mode it is set to 15 rpm.

The minimum speed (P301/P311) is internally limited to 15 rpm in the VFC&Hoist operating mode.

The hoist function automatically provides all functions necessary for operating an unbalanced hoist. In particular, monitoring functions are activated for safety reasons. These may prevent the drive from starting: These are:

- Monitoring the output current during the pre-magnetization phase.
- Avoiding sag when the brake is released through load precontrol.

Constellations which can be recognized as incorrect	Triggered fault
2 or 3-phase motor phase failure	F82 = Output open
Premagnetization time too short or incorrect motor/inverter combination.	F81 = Error start condition
Failure of a motor phase by active speed monitoring (factory setting) P500 Speed monitoring 1 / 502 Speed monitoring 2, P501 Deceleration time 1 / P503 Deceleration time 2	F08 = Fault n-monitoring

NOTE

- A single-phase motor phase failure cannot always be detected reliably.
- 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 BRAKING and V/f & DC BRAKING

The DC braking function allows the asynchronous motor to be braked using a direct current injection. The motor can be braked without braking resistor on the inverter.

02167BDE

Figure 61: DC braking: Braking torque profile

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

STOP	**STOP!** No guided stop. The system can be damaged. With DC braking, guided stops are not possible and certain ramp values cannot be observed. The main purpose of DC braking is to drastically reduce the time the motors need for coasting to a halt.

Figure 62: DC braking: braking profile

i	**NOTES** • 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 t11/t21 or t12/t22 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 start function lets you synchronize the inverter to an already running motor. This function is used in particular with drives that are not braked actively, run on for a long time or are turned by a flowing medium, e.g. pumps and fans. The maximum flying start time is approx. 200 ms.

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Figure 63: VFC & flying start function

If the inverter does not detect a trap 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).

HAZARD!

Risk of crushing if the motor starts up unintentionally in hoist applications.

Severe or fatal injuries.

- **Do not use the flying start function in hoist applications!**
- Ensure that the motor cannot start unintentionally.

NOTE

- The flying restart function does not function if there is an output filter connected to the inverter.
- Due to exact motor data, the proper function of the flying start function has only been tested with SEW motors. SEW-EURODRIVE does not guarantee a proper function of the flying start function for non-SEW motors.

VFC n-control

VFC n-control in parameter set 1 only.

Based on VFC operating mode, the VFC n-control operating mode allows for speed controlled operation with an encoder installed on the motor shaft. The following encoders can be used:

- Hiperface® encoder
- TTL sensors with negated tracks, encoders with signal level to RS422
- High-resolution incremental encoder with sine shaped tracks 1 V_{SS}
- HTL encoder with DWE12B option

SEW-EURODRIVE recommends the use of encoders with 1024 increments/revolution as standard. Speed control results in the following characteristics:

- Increased static control accuracy and higher dynamic response.
- Hold control: Programming a binary input to '/Hold control' (P60x Binary inputs basic unit / P61x Binary inputs option) enables the motor to be brought to a standstill with position control even when under load. Set hold control with P210 P-gain hold control.
- 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 relevant for n-control are set:

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depends 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 Deceleration time 1 / P503 Deceleration time 2	0.1 s
P100 Setpoint source	UNIPOL./FIX.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	For SEW motors: Setting in accordance with motor data. **For non-SEW motors: Set the correct value manually!**
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-controller	
P202 Gain acceleration precontrol	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter acceleration precontrol	
P210 P gain hold control	Position controller gain for the hold control function
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 stop ramp t14	

Setting of P820 4-quadrant operation 1 is ignored; 4-Q 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 of the group must have the same rated voltage, rated frequency and rated power. One motor of the group must be operated with speed control and be equipped with an incremental encoder that is connected to X15. The other motors of the group follow the speed controlled motor depending on the slip. The following encoders can be used as incremental encoder:

- Hiperface® encoder
- TTL sensors with negated tracks, encoders with signal level to RS422
- High-resolution incremental encoder with sine shaped tracks 1 V_{SS}
- HTL encoder with DWE12B option

SEW-EURODRIVE recommends the use of encoders with 1024 increments/revolution as standard.

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

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % ΣI_{N_Mot}
P302 Maximum speed 1	Depends 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.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	For SEW motors: Setting in accordance with motor data. **For non-SEW motors: Set the correct value manually!**
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-controller	
P202 Gain acceleration precontrol	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter acceleration precontrol	
P210 P gain hold control	Position controller gain for the hold control function
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 stop ramp t14	

Setting of P820 4-quadrant operation 1 is ignored; 4-Q 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.

The CFC operating mode allows for operating an asynchronous motor with real servo properties, which means high dynamic response, excellent concentric running characteristics and controlled operation even at standstill. It is achieved because the CFC procedure enables direct control over the magnetic flux in the motor and, therefore, over the torque. Speed feedback via encoder is mandatory for this operating mode. The following encoders can be used:

- Hiperface® encoder
- TTL sensors with negated tracks, encoders with signal level to RS422
- High-resolution incremental encoder with sine shaped tracks 1 V_{SS}
- HTL encoder with DWE12B option

SEW-EURODRIVE recommends high-resolution incremental encoders with a PPR count of 1024. Optimum control characteristics are achieved with these encoders.

P324 Slip compensation 1, P321 Boost 1 and P322 IxR compensation are ineffective.

The SHELL startup function requires the motor type to be entered (SEW motor). No startup can be performed with the DBG60B keypad in CFC mode. The following parameters are preset (parameter set 1):

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depends 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.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

CFC always requires to startup the speed controller.

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-controller	
P202 Gain acceleration precontrol	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter acceleration precontrol	
P210 P gain hold control	Position controller gain for the hold control function
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 stop ramp t14	

Setting of P820 4-quadrant operation 1 is ignored; 4-Q operation is always active.

CFC & M-control

CFC & M-control in parameter set 1 only.

This operating mode enables the asynchronous motor to be controlled directly with torque control. The setpoint is standardized on the torque as follows:

3000 rpm = 150 % output current × torque constant.

In P16x Fixed setpoints 1, the torques have to be entered directly in [% I_N]. The set processing P11x Analog input AI1 also applies to the torque control if the setpoint selection is made by way of an analog input.

The torque constant (motor-specific value) is defined with: $k_T = M_N / I_{q_n}$

NOTES

- If P500 Speed monitoring 1 is active, the drive is monitored according to the P500 parameter description.
- If P500 Speed monitoring 1 = OFF, the drive reacts as follows if its speed exceeds or drops below P302 Maximum speed 1:
  - Motor operation: 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 operation: No response; the master drive must prevent the drive losing position.
- M-control is also in effect in the range $-n_{min}$ ... n ... n_{min}.
- The current is always limited to P303 Current limit 1.
- At a stop ramp, the drive inverter switches in speed control and the drive is braked using the associated stop ramp.

Settings after the startup function	
P303 Current limit 1	I_{max} (inverter) = 150 % I_{motor}
P302 Maximum speed 1	Depends 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.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data.
P732 Brake application time 1	
P323 Premagnetizing time 1	Setting in accordance with specified motor data

Settings after the startup function of the torque controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-controller	
P202 Gain acceleration precontrol	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter acceleration precontrol	
P210 P gain hold control	Position controller gain for the hold control function
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 stop ramp t14	

Setting of P820 4-quadrant operation 1 is ignored; 4-Q 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.

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.

The SERVO operating mode allows for operating a permanent-field synchronous motor (servomotor). 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 preset (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. Do not alter P303 Current limit 1!
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.SETPT
P101 Control signal source	TERMINALS
P730 Brake function 1	ON
P731 Brake release time 1	Setting in accordance with specified motor data
P732 Brake application time 1	

SERVO always requires to startup the speed controller.

Settings after the startup function of the speed controller	
P200 P gain speed controller	Setting in accordance with specified data
P201 Time constant n-controller	
P202 Gain acceleration precontrol	
P204 Filter speed actual value	
P115 Filter setpoint	
P203 Filter acceleration precontrol	
P210 P gain hold control	Position controller gain for the hold control function
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 stop ramp t14	

Setting of P820 4-quadrant operation 1 is ignored; 4-Q operation is always active.

SERVO & M-control

SERVO & M-control in parameter set 1 only.

This operating mode enables the servomotor to be controlled directly with torque control. The setpoint is standardized on the following torque:

3000 rpm = 150 % output current × torque constant

In P16x Fixed setpoints 1, the torques have to be entered directly in [% I_N]. The set processing (P11x Analog input AI1) also applies to the torque control if the setpoint selection is made by way of an analog input.

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

NOTES

- If P500 Speed monitoring 1 is active, the drive is monitored according to the P500 parameter description.
- If P500 Speed monitoring 1 = OFF, the drive reacts as follows if its speed exceeds or drops below P302 Maximum speed 1:
  - Motor operation: 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 operation: No response; the master drive must prevent the drive losing position.
- M-control is also in effect in the range $-n_{min}$ ... n ... n_{min}.
- The current is always limited to P303 Current limit 1.
- At a stop ramp, the drive inverter switches in speed control and the drive is decelerated using the associated stop ramp.

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.

4 Project Planning

4.1 Schematic procedure

Drive properties The required drive properties are the main factors determining the selection of the inverter. The following figure is to provide assistance for this.

Key

Pos. control	= Positioning control
n control	= Speed control
M control	= Torque control
VFC	= Voltage flux control
CFC	= 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

4.2 Control characteristics

Characteristic features

MOVIDRIVE® 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.

Figure 64: Features of control characteristics

The following values apply to MOVIDRIVE® inverters in combination with motors of the same power:

MOVIDRIVE® type	Contin. speed range n_{max} = 3000 rpm	Stationary ctrl. accuracy[1] based on n_{max} = 3000 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®	1:5000	0.01%

1) = Deviation from 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.

Settings

- Set speed n_{set} = 1000 rpm
- Step change in load ΔM = 80 % of rated motor torque
- Torsion-free load with mass inertia ratio J_L/J_M = 1.8

MOVIDRIVE® MDX60/61B	Transient recovery time in relation to value of VFC without encoder	Max. speed deviation at ΔM = 80 %, with reference to n = 3000 rpm	True-running accuracy at M = const. in relation to n = 3000 rpm
VFC without encoder	100 %	1.8 %	≤ 0.20 %
VFC with TTL sensor (1024 inc.)	90 %	1.5 %	≤ 0.17 %
CFC with TTL sensor (1024 inc.)	35 %	1.0 %	≤ 0.07 %
CFC with sin/cos encoder	25 %	0.7 %	≤ 0.03 %

4.3 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. The assignment is based on the required setting range and the resulting control process.

1. Drives with a base load and a speed dependent load, such as conveyor drives.
   - Low requirements on the setting range (motor without encoder)
     – MOVIDRIVE® MDX60/61B without option in VFC operating mode
   - High requirements on the setting range
     – MOVIDRIVE® MDX61B with 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 on the setting range (motor without encoder)
     – MOVIDRIVE® MDX60/61B without option in VFC operating mode
   - High requirements on the setting range
     – MOVIDRIVE® MDX61B with in the VFC n-CONTROL operating mode
   - High dynamic requirements (asynchronous or synchronous servomotor)
     – Asynchronous or synchronous servomotor with encoder feedback: MOVIDRIVE® MDX61B in CFC or SERVO operating mode

3. Stationary load, e.g. hoists; mainly steady high stationary load with overload peaks.
   - Low requirements on the setting range (motor without encoder)
     – MOVIDRIVE® MDX60/61B in VFC operating mode
   - High requirements on the setting range (motor with encoder)
     – Motor with encoder: MOVIDRIVE® MDX61B in VFC-n-CONTROL, CFC or 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 encoder: MOVIDRIVE® MDX61B in CFC&M-CONTROL or 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).
  – Asynchronous servomotor without encoder: MOVIDRIVE® MDX60/61B in VFC or V/f operating mode.

Project planning for trolleys

The motor load in the dynamic sections determines the peak motor power to be dimensioned. The thermal load determines the required continuous motor power. 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 profile is the significant factor in determining the self-cooling of the motor. See also "Motor selection examples" on page 260.

Project planning for hoists

In practice, hoists are dimensioned by taking account of special thermal and safety-relevant criteria.

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 designed for a maximum speed of 2100 rpm (70 Hz) with a transition speed of 1500 rpm (50 Hz) and 2500 rpm (83 Hz) at a transition speed of 1800 rpm (60 Hz). This means the input speed of the gear unit is approx. 1.4 times higher. This is why you have to select a 1.4 times higher gear unit reduction ratio. 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.

Figure 65: 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 in accordance with the selected inverter power.

The hoisting function must be activated on the inverter regardless of the above guidelines. See also "Motor selection examples" on page 260.

Encoder monitoring

MOVIDRIVE® has encoder monitoring for RS422, TTL, sin/cos, and HIPERFACE® encoders.

	NOTE
	For speed controlled hoist drives, SEW-EURODRIVE recommends using RS422, TTL, sin/cos, 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 (pumps, fans)

Thermal overload of the motor at low speeds can be ruled out in these applications. 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 kHz) of the MOVIDRIVE®. This means MOVIDRIVE® can operate a motor with the power of the next higher motor type. See also "Motor selection examples" on page 260.

4.4 Basic recommendations for motor selection

- Only use motors with at least thermal class F.
- Use TF thermistors or TH winding thermostats. TH should be preferred in the case of group drives on one inverter. The series connection of the TH contacts (normally closed) is not subject to limitation when both monitoring functions are used.
- For group drives, we recommend that the motors should not differ from one another by more than 3 motor types.
- Use 4-pole motors if possible. 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.
- Do not select a motor that is too big, particularly for delta connection. Otherwise, the inverter may trigger a short circuit fault.
- A MOVIDRIVE® MDX61B with HIPERFACE® encoder card type DEH11B option or with DER11B resolver card option is required for speed control. In this case, the motor must be equipped with an encoder (HIPERFACE®, sin/cos or TTL) or resolver.

4.5 Motor selection for asynchronous AC motors (VFC)

Voltage/ frequency characteristics

The operating mode VFC runs the asynchronous motor on a load-dependent voltage/frequency curve. The continuous calculation of the motor model enables the full motor torque to be utilized right down to the lowest speeds. This characteristic curve is set by entering the rated motor voltage and the rated motor frequency 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 66: 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

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. Enter the maximum permitted motor voltage. 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.

Figure 67: 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.

Typical speed/torque characteristic curve

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}.

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Figure 68: Speed/torque characteristic curve in CFC operating mode

[1] With integrated cooling

[2] With forced cooling

[3] Maximum torque

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 is based on 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 manually set 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. For higher torque ratings, the slip compensation parameter (P324) must be increased accordingly.

	NOTE
	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 increases the motor current by a factor of $\sqrt{3}$ and lowers the unfavorable ratio.
- 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 with delta/star connection type (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} in kW (HP) for operation on MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)							
Connection		⅄ / 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 (HP)**	**$P = P_{reduced}$**		**$P = P_n$**		**$P = P_{increased}$[5)]**	
		kW (HP)	**MDX[6)] 60/61B...-5_3**	**kW (HP)**	**MDX[6)] 60/61B...-5_3**	**kW (HP)**	**MDX[6)] 60/61B...-5_3**
DR63S4	**0.12 (0.16)**					0.18	**0005**
DR63M4	**0.18 (0.24)**			0.18	**0005**	0.25	
DR63L4	**0.25 (0.34)**	0.18 (0.24)	**0005**	0.25 (0.34)		0.37 (0.5)	
DT71D4	**0.37 (0.5)**	0.25 (0.34)	**0005/0015**	0.37 (0.5)	**0005/0015**	0.55 (0.74)	**0005/0015**
DT80K4	**0.55 (0.74)**	0.37 (0.5)		0.55 (0.74)		0.75 (1.0)	**0008/0015**
DT80N4	**0.75 (1.0)**	0.55 (0.74)		0.75 (1.0)	**0008/0015**	1.1 (1.5)	**0011/0015**
DT90S4	**1.1 (1.5)**	0.75 (1.0)	**0008/0015**	1.1 (1.5)	**0011/0015**	1.5 (2.0)	**0014/0015**
DT90L4	**1.5 (2.0)**	1.1 (1.5)	**0011/0015**	1.5 (2.0)	**0014/0015**	2.2 (3.0)	**0022**
DV100M4	**2.2 (3.0)**	1.5 (2.0)	**0014/0015**	2.2 (3.0)	**0022**	3.0 (4.0)	**0030**
DV100L4	**3.0 (4.0)**	2.2 (3.0)	**0022**	3.0 (4.0)	**0030**	4.0 (5.4)	**0040**
DV112M4	**4.0 (5.4)**	3.0 (4.0)	**0030**	4.0 (5.4)	**0040**	5.5 (7.4)	**0055**
DV132S4	**5.5 (7.4)**	4.0 (5.4)	**0040**	5.5 (7.4)	**0055**	7.5 (10)	**0075**
DV132M4	**7.5 (10)**	5.5 (7.4)	**0055**	7.5 (10)	**0075**	9.2 (12)	**0110**
DV132ML4	**9.2 (12)**	7.5 (10)	**0075**	9.2 (12)	**0110**	11 (15)	
DV160M4	**11 (15)**	9.2 (12)	**0110**	11 (15)		15 (20)	**0150**
DV160L4	**15 (20)**	11 (15)		15 (20)	**0150**	18.5 (24.8)	**0220**
DV180M4	**18.5 (24.8)**	15 (20)	**0150**	18.5 24.8)	**0220**	22 (30)	**0300**
DV180L4	**22 (30)**	18.5 (24.8)	**0220**	22 (30)		30 (40)	**0370**
DV200L4	**30 (40)**	22 (30)		30 (40)	**0300**	37 (50)	
DV225S4	**37 (50)**	30 (40)	**0300**	37 (50)	**0370**	45 (60)	**0450**
DV225M4	**45 (60)**	37 (50)	**0370**	45 (60)	**0450**	55 (74)	**0550**
DV250M4	**55 (74)**	45 (60)	**0450**	55 (74)	**0550**	75 (100)	**0750**
DV280S4	**75 (100)**	55 74)	**0550**	75 (100)	**0750**	90 (120)	**0900**
D280M4	**90 (120)**	75 (100)	**0750**	90 (120)	**0900**	110 (148)	**1100**
D315S4	**110 (148)**	90 (120)	**0900**	110 (148)	**1100**	132 (177)	**1320**
D315M4	**132 (177)**	110 (148)	**1100**	132 (177)	**1320**		
D315M4a	**160 (215)**	132 (177)	**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 duty type S3 (40 % c.d.f.), the motor must not be operated at its listed power ($P = P_n$) even without forced-cooling. Example: P_{stat} = 2 kW, P_{dyn} = 2.5 kW, see 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 (see chapter Technical Data). The continuous output current of 125 % of the rated unit current is only available 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 during travel:

- P_{travel} = 1.3 kW
- P_{max} = 13 kW
- n_{min} = 270 rpm, setting range 1:10
- n_{max} = 2610 rpm

In inverter mode with adapted power ($P = P_n$), the motor can output 150 % of its listed power during the acceleration phase. This means:

$P_{Mot} = P_{max} : 1.5 = 13\ kW : 1.5 = 8.67\ kW$

A DV132M4 motor with delta connection (P_n = 9.2 kW) is selected.

According to the selection table (→ page 259) allocates a MOVIDRIVE® MDX61B0110 ($P = P_n$).

Hoist drive

High constant load with short-term overload (acceleration):

- P_{max} = 26 kW
- $P_{const.}$ = 20 kW
- Setting range 1:15, low speed only for positioning
- Brake applied when the drive is at a standstill
- Load type S3 (40 % c.d.f.)

The inverter can deliver 150 % of its rated current during acceleration. Consequently, a MOVIDRIVE® MDX61B0220 is selected.

In view of the duty type (S3, 40 % cdf), the selection table allocates motor type DV180L4 (P_n = 22 kW) in a star connection.

For more information, refer to the Project planning for hoists section

Fan/pump

Variable torque load with the following power values:

- P_{max} = 4.8 kW
- n_{max} = 1400 rpm, continuous duty with n_{max}

The motor can be operated at its listed power ($P = P_n$) even without forced cooling due to the quadratically falling torque. Therefore, the motor type DV132S4 in star connection (P_n = 5.5 kW) is sufficient.

The selection table allocates a MOVIDRIVE® MDX61B0055 ($P = P_n$). However, as there is a variable torque load without overload, the inverter can be operated with increased output power. Consequently, a MOVIDRIVE® MDX61B0040 is sufficient.

Motor selection in double-star/star circuit type (AC 230/460 V / 60 Hz)

P_{max} in kW (HP) for operation on MOVIDRIVE® MDX60/61B...-5_3 (AC 400/500 V units)							
Connection		⅄ / AC 460 V				⅄⅄ / 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 (HP)**	**$P = P_{reduced}$**		**$P = P_n$**		**$P = P_{increased}$[2)]**	
		kW (HP)	**With MDX60/61B...-5_3[3)]**	**kW (HP)**	**With MDX60/61B...-5_3[3)]**	**kW (HP)**	**With MDX60/61B...-5_3[3)]**
DR63S4	**0.12 (0.16)**					0.18 (0.24)	**0005**
DR63M4	**0.18 (0.24)**			0.18 (0.24)	**0005**	0.25 (0.34)	
DR63L4	**0.25 (0.34)**	0.18 (0.24)	**0005**	0.25 (0.34)		0.37 (0.5)	
DT71D4	**0.37 (0.5)**	0.25 (0.34)	**0005/0015**	0.37 (0.5)	**0005/0015**	0.75 (1.0)	**0008/0015**
DT80K4	**0.55 (0.74)**	0.37 (0.5)		0.55 (0.74)		1.1 (1.5)	**0011/0015**
DT80N4	**0.75 (1.0)**	0.55 (0.74)		0.75 (1.0)	**0008/0015**	1.5 (2.0)	**0014/0015**
DT90S4	**1.1 (1.5)**	0.75 (1.0)	**0008/0015**	1.1 (1.5)	**0011/0015**	2.2 (3.0)	**0022**
DT90L4	**1.5 (2.0)**	1.1 (1.5)	**0011/0015**	1.5 (2.0)	**0014/0015**	3.0 (4.0)	**0030**
DV100M4	**2.2 (3.0)**	1.5 (2.0)	**0014/0015**	2.2 (3.0)	**0022**	4.0 5.4)	**0040**
DV100L4	**3.7 (5.0)**	2.2 (3.0)	**0022**	3.0 (4.0)	**0030**	5.5 (7.4)	**0055**
DV112M4	**4.0 (5.4)**	3.0 (4.0)	**0030**	4.0 (5.4)	**0040**	7.5 (10)	**0075**
DV132S4	**5.5 (7.4)**	4.0 (5.4)	**0040**	5.5 (7.4)	**0055**	9.2 (12)	**0110**
DV132M4	**7.5 (10)**	5.5 (7.4)	**0055**	7.5 (10)	**0075**	11 (15)	
DV132ML4	**9.2 (12)**	7.5 (10)	**0075**	9.2 (12)	**0110**	15 (20)	**0150**
DV160M4	**11 (15)**	9.2 (12)	**0110**	11 (15)		18.5 (24.8)	**0220**
DV160L4	**15 (20)**	11 (15)		15 (20)	**0150**	22 (30)	
DV180M4	**18.5 (24.8)**	15 (20)	**0150**	18.5 (24.8)	**0220**	30 (40)	**0300**
DV180L4	**22 (30)**	18.5 (24.8)	**0220**	22 (30)		37 (50)	**0370**
DV200L4[4)]	**30 (40)**	22 (30)		30 (40)	**0300**	45 (60)	**0450**
DV225S4[4)]	**37 (50)**	30 (40)	**0300**	37 (50)	**0370**	55 (74)	**0550**
DV225M4[4)]	**45 (60)**	37 (50)	**0370**	45 (60)	**0450**	75 (100)	**0750**
DV250M4[5)]	**55 (74)**	45 (60)	**0450**	55 (74)	**0550**	90 (120)	**0900**
DV280S4[5)]	**75 (100)**	55 (74)	**0550**	75 (100)	**0750**	110 (148)	**1100**
D280M4[5)]	**90 (120)**	75 (100)	**0750**	90 (120)	**0900**	132 (177)	**1320**
D315S4	**110 (148)**	90 (120)	**0900**	110 (148)	**1100**		
D315M4	**132 (177)**	110 (148)	**1100**	132 (177)	**1320**		
D315M4a	**160 (215)**	132 (177)	**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 (see chapter Technical Data). The continuous output current of 125 % of the rated unit current is only available 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 (HP)**	**$P = P_{reduced}$**		**$P = P_n$**	
		kW (HP)	**Mit MDX61B...-2_3[3]**	**kW (HP)**	**Mit MDX61B...-2_3[3]**
DT71D4	**0.37 (0.5)**	0.25 (0.34)	**0015**	0.37 (0.5)	**0015**
DT80K4	**0.55 (0.74)**	0.37 (0.5)		0.55 (0.74)	
DT80N4	**0.75 (1.0)**	0.55 (0.74)		0.75 (1.0)	
DT90S4	**1.1 (1.5)**	0.75 (1.0)		1.1 (1.5)	
DT90L4	**1.5 (2.0)**	1.1 (1.5)		1.5 (2.0)	
DV100M4	**2.2 (3.0)**	1.5 (2.0)		2.2 (3.0)	**0022**
DV100L4	**3.0 (4.0)**	2.2 (3.0)	**0022**	3.0 (4.0)	**0030**
DV112M4	**4.0 (5.4)**	3.0 (4.0)	**0030**	4.0 (5.4)	**0040**
DV132S4	**5.5 (7.4)**	4.0 (5.4)	**0040**	5.5 (7.4)	**0055**
DV132M4	**7.5 (10)**	5.5 (7.4)	**0055**	7.5 (10)	**0075**
DV132ML4	**9.2 (12)**	7.5 (10)	**0075**	9.2 (12)	**0110**
DV160M4	**11 (15)**	9.2 (12)	**0110**	11 (15)	
DV160L4	**15 (20)**	11 (15)		15 (20)	**0150**
DV180M4	**18.5 (24.8)**	15 (20)	**0150**	18.5 (24.8)	**0220**
DV180L4	**22 (30)**	18.5 (24.8)	**0220**	22 (30)	**0300**
DV200L4	**30 (40)**	22 (30)		30 (40)	
DV225S4	**37 (50)**	30 (40)	**0300**	-	

1) Without speed control: f_{min} = 0.5 Hz

2) In duty type S3 (40 % c.d.f.), the motor must not be operated at its listed power ($P = P_n$) even without forced-cooling. Example: P_{stat} = 2 kW, P_{dyn} = 2.5 kW, see 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 (see chapter Technical Data). The continuous output current of 125 % of the rated unit current is only available 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		⅄⅄ / 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 (HP)**	**P = $P_{reduced}$**		**P = P_n**	
		kW (HP)	**Mit MDX61B...-2_3[2)]**	**kW (HP)**	**Mit MDX61B...-2_3[2)]**
DT71D4	**0.37 (0.5)**	0.25 (0.34)	**0015**	0.37 (0.5)	**0015**
DT80K4	**0.55 (0.74)**	0.37 (0.5)		0.55 (0.74)	
DT80N4	**0.75 (1.0)**	0.55 (0.74)		0.75 (1.0)	
DT90S4	**1.1 (1.5)**	0.75 (1.0)		1.1 (1.5)	
DT90L4	**1.5 (2.0)**	1.1 (1.5)		1.5 (2.0)	
DV100M4	**2.2 (3.0)**	1.5 (2.0)		2.2 (3.0)	**0022**
DV100L4	**3.7 (5.0)**	2.2 (3.0)	**0022**	3.0 (4.0)	**0030**
DV112M4	**4.0 (5.4)**	3.0 (4.0)	**0030**	4.0 (5.4)	**0040**
DV132S4	**5.5 (7.4)**	4.0 (5.4)	**0040**	5.5 (7.4)	**0055**
DV132M4	**7.5 (10)**	5.5 (7.4)	**0055**	7.5 (10)	**0075**
DV132ML4	**9.2 (12)**	7.5 (10)	**0075**	9.2 (12)	**0110**
DV160M4	**11 (15)**	9.2 (12)	**0110**	11 (15)	
DV160L4	**15 (20)**	11 (15)		15 (20)	**0150**
DV180M4	**18.5 (24.8)**	15 (20)	**0150**	18.5 (24.8)	**0300**
DV180L4	**22 (30)**	18.5 (24.8)	**0220**	22 (30)	**0370**
DV200L4	**30 (40)**	22 (30)		30 (40)	
DV225S4	**37 (50)**	30 (40)	**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 (see chapter Technical Data). The continuous output current of 125 % of the rated unit current is only available at f_{PWM} = 4 kHz.

4.6 Motor selection for asynchronous servomotors (CFC)

	NOTE
	The torque limit (M limit) is set automatically by the startup function of the MOVITOOLS® operating software. Do not increase this automatically set value! SEW-EURODRIVE recommends always using the latest version of MOVITOOLS® for startup. The latest MOVITOOLS® version can be downloaded from our homepage (www.sew-eurodrive.com).

Motor characteristics

Drives in CFC modes are characterized by their ability to control torque directly and quickly. This means it achieves a high level of dynamic overload capacity (up to $3 \times M_N$) and a very high speed and control range (up to 1:5000). Stable speed and positioning accuracy meet the high requirements of servo technology. This behavior is implemented using field-oriented control. The current components for magnetization (I_d) and torque generation (I_q) are controlled separately. One prerequisite for the CFC operating modes is that the motor must always be equipped with an encoder.

The inverter needs to know exact data about the motor connected to calculate the motor model. This data is 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.

Magnetization current

Dynamic drives that have to accelerate without delay are also energized at standstill without load. The magnetizing current I_d flows at standstill. 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 268, DT/DV/D → page 273).

CFC mode with speed control

There is no need to differentiate between the load types quadratic, dynamic and static when performing project planning for the CFC operating mode. Project planning for an asynchronous motor in CFC mode is carried out in accordance with the following requirements:

1. Effective torque requirement at average application speed.

   $M_{r.m.s.} < M_{N_mot}$

   The operating point must lie below the characteristic curve for the continuous torque (Figure 68, curve 2). If this operating point lies below the characteristic curve for forced cooling (Figure 68, curve 1), then no forced cooling is required.

2. Maximum torque needed across the speed curve.

   $M_{max} < M_{dyn_mot}$

   This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIDRIVE® combination (Figure 68, curve 3).

3. Maximum speed

   Do not configure the maximum speed of the motor 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 rpm with delta connection.

   $n_{max} < 1.4 \times n_{trans} < 3000$ rpm

Cooling the motor

Self-cooling of asynchronous motors is based on the integrated fan, which means self-cooling depends on the speed. The integrated fan does not provide cooling for the motor at low speeds and standstill. Forced cooling may be necessary 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 (except for bus setpoints) are interpreted as current setpoint sources. Assign "Current" to a process data word for fieldbus control. The settings for evaluating the analog input (→ P11_, parameter description) also remain in effect. The fixed setpoints (P16_, P17_) can be entered either in the unit (rpm) or (%$I_{N_inverter}$) (→ MOVITOOLS®).

The following relationship exists between the units:

3000 rpm = 150 % rated inverter current

The torque on the output shaft can then be calculated for the basic speed range ($n \leq n_{trans}$) 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:

$$M = k_T \times 1.5 \times I_{n_inverter} \times \frac{Setpoint}{3000\ rpm}$$

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$I_{n_inverter}$ = Rated output current of the inverter

k_T = Torque constant = M_n / I_{q_n}

M_n and I_{q_n} are motor-specific parameters. For the values of the torque constants k_T and the motor-specific parameters M_n and I_{q_n}, refer to the motor tables (DT/DV/D → page 273, CT/CV → page 267).

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 %$I_{N_inverter}$:

$$I_{tot} = \sqrt{\left(Setpoint \times I_{n_inverter}\right)^2 + I_{d_N}^2}$$

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Specification of a setpoint for the motor torque in rpm:

$$I_{tot} = \sqrt{\left(Setpoint \times 1.5 \times I_{n_inverter} \times \frac{1}{3000\ rpm}\right)^2 + I_{d_N}^2}$$

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I_{q_n} = Nominal value for the current, which generates the torque, according to the motor table

I_{d_n} = Nominal value for the magnetization current, according to the motor table

CT/CV asynchronous servomotors

SEW offers CT/CV asynchronous servomotors especially for operating 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.

Classification into speed classes

CT/CV motors are available in four speed classes. The division into speed classes ensures optimum utilization of torque and speed.

With sin/cos encoder as standard

As standard, CT/CV motors are equipped with a high-resolution sin/cos encoder (ES1S, ES2S, EV1S).

With TF or TH motor protection as standard

The winding temperature of the three motor phases is monitored using temperature sensors (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 have thermal classification F as standard.

Reinforced pinion spigot

CT/CV motors can generate up to three times their rated motor torque during dynamic operation. For this reason, these motors are 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 advantages of CFC mode.

	Advantage	Disadvantage
CFC mode with DT/DV/D motor selection → page 275	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.
		The maximum torque is limited for some of the inverter/motor combinations due to mechanical rigidity.
CFC mode with CT/CV motor Motor selection → page 269	Higher transition speed than DT/DV/D motor.	No IEC standard motor
	Usually with a power yield one motor type higher.	
	Based on the power yield of a lower mass moment of inertia.	Higher current demand due to higher power yield; therefore a larger inverter has to be assigned.
	Motor is designed for dynamic operation.	

Motor table CT/CV

n_N rpm	Motor	M_N Nm (lb in)	I_N A	I_{q_n} A	I_{d_n} A	k_T Nm/A (lb in(A)	U_N V	J_{Mot} 10^{-4} kgm²	J_{BMot} 10^{-4} kgm²
1200	CT71D4	3 (27)	1.4	1.21	0.69	2.48 (21.9)	360	4.6	5.5
	CT80N4	5 (44)	2.1	1.65	1.30	3.0 (27)	350	8.7	9.6
	CT90L4	10 (88.5)	3.65	3.13	1.89	3.2 (28)	345	34	39.5
	CV100M4	15 (133)	4.7	4.15	2.25	3.61 (32)	345	53	59
	CV100L4	26 (230)	8.5	7.9	3.21	3.29 (29.1)	320	65	71
	CV132S4	37 (327)	11.5	10.4	4.83	3.56 (31.5)	340	146	158
	CV132M4	50 (440)	15.5	14.2	6.18	3.52 (31.2)	340	280	324
	CV132ML4	61 (540)	18.2	16.7	7.43	3.66 (32.4)	345	330	374
	CV160M4	73 (650)	22.5	20.3	9.73	3.60 (31.9)	335	400	440
	CV160L4	95 (840)	30	26.7	14.2	3.56 (31.5)	330	925	1030
	CV180M4	110 (974)	36	30.2	19.7	3.65 (32.3)	330	1120	1226
	CV180L4	125 (1110)	39.5	33.8	20.5	3.7 (33)	345	1290	1396
	CV200L4	200 (1770)	58	53.2	23.7	3.76 (33.3)	330	2340	2475
1700	CT71D4	3 (30)	1.9	1.67	0.95	1.80 (15.9)	355	4.6	5.5
	CT80N4	5 (40)	2.9	2.28	1.79	2.19 (19.4)	350	8.7	9.6
	CT90L4	10 (89)	5	4.32	2.61	2.32 (20.5)	345	34	39.5
	CV100M4	15 (130)	6.5	5.73	3.10	2.62 (23.2)	345	53	59
	CV100L4	26 (230)	11.7	10.9	4.41	2.39 (21.2)	320	65	71
	CV132S4	37 (330)	15.8	14.4	6.67	2.58 (22.8)	340	146	158
	CV132M4	48 (420)	21	19.2	8.7	2.50 (22.1)	335	280	324
	CV132ML4	58 (510)	26.5	23.8	11.2	2.44 (21.6)	320	330	374
	CV160M4	71 (630)	30.5	27.2	13.4	2.60 (23)	340	400	440
	CV160L4	89 (790)	39.5	34.5	19.5	2.58 (22.8)	335	925	1030
	CV180M4	105 (929)	48	39.7	27.2	2.64 (23.4)	335	1120	1226
	CV180L4	115 (1020)	56	46.6	30.7	2.47 (21.9)	325	1290	1396
	CV200L4	190 (1680)	79	71.2	33.4	2.67 (23.6)	325	2340	2475
2100	CT71D4	3 (27)	2.4	2.1	1.20	1.43 (12.7)	345	4.6	5.5
	CT80N4	5 (44)	3.65	2.87	2.26	1.74 (15.4)	340	8.7	9.6
	CT90L4	10 (88.5)	6.4	5.44	3.29	1.84 (16.3)	335	34	39.5
	CV100M4	15 (130)	8.2	7.23	3.91	2.07 (18.3)	335	53	59
	CV100L4	25 (221)	14.3	13.2	5.56	1.9 (17)	310	65	71
	CV132S4	37 (330)	19.9	18.1	8.41	2.05 (18.1)	335	146	158
	CV132M4	48 (425)	26	23.7	10.75	2.03 (18)	330	280	324
	CV132ML4	58 (510)	30.5	27.5	12.9	2.1 (19)	340	330	374
	CV160M4	70 (620)	38	33.9	16.9	2.07 (18.3)	330	400	440
	CV160L4	88 (780)	49.5	43	24.6	2.05 (18.1)	330	925	1030
	CV180M4	100 (885)	59	47.7	34.2	2.1 (19)	325	1120	1226
	CV180L4	115 (1020)	64	53.7	35.4	2.14 (18.9)	345	1290	1396
	CV200L4	175 (1550)	91	80.1	41.2	2.16 (19.1)	325	2340	2475
3000	CT71D4	3 (27)	3.35	2.9	1.65	1.04 (9.2)	350	4.6	5.5
	CT80N4	4.5 (40)	4.75	3.6	3.11	1.26 (11.2)	345	8.7	9.6
	CT90L4	9.5 (84)	8.4	7.12	4.54	1.33 (11.8)	345	34	39.5
	CV100M4	15 (133)	11.3	9.95	5.39	1.51 (13.4)	345	53	59
	CV100L4	21 (190)	17	15.2	7.65	1.38 (12.2)	310	65	71
	CV132S4	35 (310)	26.5	23.6	11.6	1.49 (13.2)	340	146	158
	CV132M4	45 (400)	34.5	31.2	15.1	1.44 (12.7)	335	280	324
	CV132ML4	52 (460)	41.5	36.9	19.3	1.41 (12.5)	320	330	374
	CV160M4	64 (570)	48.5	42.6	23.3	1.50 (13.3)	340	400	440
	CV160L4	85 (752)	67	57.2	33.9	1.49 (13.2)	340	925	1030
	CV180M4	93 (820)	77	61.1	47.2	1.52 (13.5)	335	1120	1226
	CV180L4	110 (974)	94	77	53.1	1.43 (12.7)	325	1290	1396
	CV200L4	145 (1280)	110	94.1	57.8	1.54 (13.6)	330	2340	2475

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 (lb in)	7.7 (68)	7.7 (68)						
	n_{trans}	rpm	429	429						
CT80N4	M_{max}	Nm (lb in)		14.0 (124)	16.0 (142)	16.0 (142)	16.0 (142)			
	n_{trans}	rpm		627	550	550	550			
CT90L4	M_{max}	Nm (lb in)				25.0 (221)	18.0 (159)	26.0 (230)	31.0 (274)	
	n_{trans}	rpm				794	928	781	678	
CV100M4	M_{max}	Nm (lb in)						29.0 (257)	37.0 (327)	45.0 (398)
	n_{trans}	rpm						883	781	678
CV100L4	M_{max}	Nm (lb in)							33.0 (292)	46.0 (407)
	n_{trans}	rpm							1050	934

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 (lb in)	61.0 (540)	75.0 (664)							
	n_{trans}	rpm	800	666							
CV132S4	M_{max}	Nm (lb in)	64.0 (566)	84.0 (743)	110 (974)						
	n_{trans}	rpm	992	915	826						
CV132M4	M_{max}	Nm (lb in)		82.0 (726)	125 (1110)	150 (1330)					
	n_{trans}	rpm		1010	877	806					
CV132ML4	M_{max}	Nm (lb in)			129 (1140)	174 (1540)	183 (1620)				
	n_{trans}	rpm			890	781	774				
CV160M4	M_{max}	Nm (lb in)			125 (1110)	169 (1500)	220 (1950)				
	n_{trans}	rpm			986	909	838				
CV160L4	M_{max}	Nm (lb in)				163 (1440)	240 (2120)	295 (2610)			
	n_{trans} rpm	rpm-				1045	954	922			
CV180M4	M_{max}	Nm (lb in)					240 (2120)	320 (2830)	360 (3190)		
	n_{trans}	rpm					1050	986	1005		
CV180L4	M_{max}	Nm (lb in)					245 (2170)	325 (2880)	360 (3190)	360 (3190)	
	n_{trans}	rpm					960	909	947	1035	
CV200L4	M_{max}	Nm (lb in)						325 (2880)	400 (3540)	495 (4380)	565 (5000)
	n_{trans}	rpm						1010	986	947	941

2. Rated speed n_N = 1700 rpm:

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 (lb in)	7.0 (62)	7.7 (68)	7.7 (68)								
	n_{trans}	rpm	986	890	890								
CT80N4	M_{max}	Nm (lb in)			13.0 (115)	16.0 (142)	13.0 (115)	16.0 (142)					
	n_{trans}	rpm			1125	992	1150	992					
CT90L4	M_{max}	Nm (lb in)						18.0 (159)	24.0 (212)	31.0 (274)			
	n_{trans}	rpm						1400	1285	1150			
CV100M4	M_{max}	Nm (lb in)							26.0 (230)	36.0 (319)	45.0 (398)		
	n_{trans}	rpm							1365	1230	1145		
CV100L4	M_{max}	Nm (lb in)								32.0 (283)	44.0 (389)	57.0 (504)	75.0 (664)
	n_{trans}	rpm								1535	1425	1300	1115
CV132S4	M_{max}	Nm (lb in)										60.0 (531)	91.0 (805)
	n_{trans}	rpm										1470	1330
CV132M4	M_{max}	Nm (lb in)											87.4 (774)
	n_{trans}	rpm											1484
CV132ML4	M_{max}	Nm (lb in)											83.0 (735)
	n_{trans}	rpm											1560

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 (lb in)	110 (974)							
	n_{trans}	rpm	1295							
CV132M4	M_{max}	Nm (lb in)	118 (1040)	150 (1330)						
	n_{trans}	rpm	1370	1295						
CV132ML4	M_{max}	Nm (lb in)	114 (1010)	166 (1470)	183 (1620)					
	n_{trans}	rpm	1485	1330	1345					
CV160M4	M_{max}	Nm (lb in)	120 (1060)	176 (1560)	220 (1950)					
	n_{trans}	rpm	1420	1310	1255					
CV160L4	M_{max}	Nm (lb in)		171 (1510)	225 (1990)	280 (2480)	295 (2610)			
	n_{trans}	rpm		1470	1400	1330	1395			
CV180M4	M_{max}	Nm (lb in)		168 (1490)	225 (1990)	280 (2480)	345 (3050)	360 (3190)		
	n_{trans}	rpm		1555	1510	1460	1400	1505		
CV180L4	M_{max}	Nm (lb in)			210 (1860)	260 (2300)	320 (2830)	360 (3190)	360 (3190)	
	n_{trans}	rpm			1510	1480	1435	1470	1665	
CV200L4	M_{max}	Nm (lb in)					345 (3050)	410 (3630)	515 (4560)	565 (5000)
	n_{trans}	rpm					1460	1425	1380	1445

3. Rated speed n_N = 2100 rpm:

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)									
			0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
CT71D4	M_{max}	Nm (lb in)	6.6 (58)	7.7 (68)	7.7 (68)	7.7 (68)						
	n_{trans}	rpm	1470	1320	1320	1320						
CT80N4	M_{max}	Nm (lb in)			13 (115)	9.7 (86)	14 (124)	16 (142)				
	n_{trans}	rpm			1535	1755	1510	1420				
CT90L4	M_{max}	Nm (lb in)						18 (159)	26 (230)	31 (274)		
	n_{trans}	rpm						1845	1675	1620		
CV100M4	M_{max}	Nm (lb in)							28 (248)	38 (336)	45 (398)	
	n_{trans}	rpm							1760	1625	1580	
CV100L4	M_{max}	Nm (lb in)								34 (301)	44 (389)	68 (602)
	n_{trans}	rpm								1980	1870	1615
CV132S4	M_{max}	Nm (lb in)										72 (637)
	n_{Eck}	rpm										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 (lb in)	75.0 (664)									
	n_{trans}	rpm	1555									
CV132S4	M_{max}	Nm (lb in)	97 (859)	110 (974)								
	n_{trans}	rpm	1720	1785								
CV132M4	M_{max}	Nm (lb in)	95 (841)	138 (1220)	150 (1330)							
	n_{trans}	rpm	1850	1670	1695							
CV132ML4	M_{max}	Nm (lb in)	97 (859)	143 (1270)	183 (1620)							
	n_{trans}	rpm	1790	1660	1550							
CV160M4	M_{max}	Nm (lb in)		138 (1220)	183 (1620)	220 (1950)						
	n_{trans}	rpm		1790	1690	1625						
CV160L4	M_{max}	Nm (lb in)			177 (1570)	220 (1950)	270 (2390)	295 (2610)				
	n_{trans}	rpm			1880	1825	1740	1780				
CV180M4	M_{max}	Nm (lb in)				220 (1950)	270 (2390)	320 (2830)	360 (3190)			
	n_{trans}	rpm				1940	1895	1835	1935			
CV180L4	M_{max}	Nm (lb in)					275 (2430)	330 (2920)	360 (3190)	360 (3190)		
	n_{trans}	rpm					1710	1670	1805	1985		
CV200L4	M_{max}	Nm (lb in)						330 (2920)	410 (3630)	500 (4430)	565 (5000)	
	n_{trans}	rpm						1830	1790	1745	1870	

4. Rated speed n_N = 3000 rpm:

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)								
			0011	0014	0015	0022	0030	0040	0055	0075	0110
CT71D4	M_{max}	Nm (lb in)	6 (53)	7.7 (68)	6 (53)	7.7 (68)					
	n_{trans}	rpm	2380	2095	2380	2095					
CT80N4	M_{max}	Nm (lb in)				9.7 (86)	13 (120)	16 (140)			
	n_{trans}	rpm				2565	2360	2200			
CT90L4	M_{max}	Nm (lb in)						18 (160)	24 (210)	31 (270)	
	n_{trans}	rpm						2660	2495	2370	
CV100M4	M_{max}	Nm (lb in)							27 (240)	35 (310)	45 (400)
	n_{trans}	rpm							2555	2430	2460
CV100L4	M_{max}	Nm (lb in)								31 (270)	49 (430)
	n_{trans}	rpm								2850	2645
CV132S4	M_{max}	Nm (lb in)									51 (450)
	n_{trans}	rpm									2745

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 (lb in)	65 (580)	75 (660)								
	n_{trans}	rpm	2425	2370								
CV132S4	M_{max}	Nm (lb in)	69 (610)	101 (894)	110 (974)							
	n_{trans}	rpm	2650	2460	2610							
CV132M4	M_{max}	Nm (lb in)	66 (580)	97 (860)	101 (894)	110 (974)						
	n_{trans}	rpm	2810	2670	2515	2450						
CV132ML4	M_{max}	Nm (lb in)		94 (830)	124 (1100)	152 (1350)	183 (1620)					
	n_{trans}	rpm		2765	2655	2545	2445					
CV160M4	M_{max}	Nm (lb in)		98 (870)	131 (1160)	161 (1420)	197 (1740)	220 (1950)				
	n_{trans}	rpm		2630	2555	2470	2370	2385				
CV160L4	M_{max}	Nm (lb in)				155 (1370)	192 (1700)	230 (2040)	285 (2520)	295 (2610)		
	n_{trans}	rpm				2680	2620	2555	2440	2630		
CV180M4	M_{max}	Nm (lb in)					190 (1680)	230 (2040)	290 (2570)	350 (3100)	360 (3190)	
	n_{trans}	rpm					2750	2705	2635	2560	2920	
CV180L4	M_{max}	Nm (lb in)						210 (1860)	270 (2390)	325 (2880)	360 (3190)	360 (3190)
	n_{trans}	rpm						2680	2630	2575	2855	3170
CV200L4	M_{max}	Nm (lb in)							285 (2520)	350 (3100)	455 (4030)	565 (5000)
	n_{trans}	rpm							2625	2590	2535	2475

DT/DV/D motor tables

Characteristic values for delta/star AC 230/400 V / 50 Hz

Motor	M_N	Mass moment of inertia J_M		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)
	Nm (lb in)	10^{-4} kgm²		A	A	A	Nm/A (lb in/A)	A	A	A	Nm/A (lb in/A)
DT71D4	2.6 (23)	4.6	5.5	1.15	0.95	0.65	2.69 (23.8)	1.99	1.64	1.13	1.56 (14)
DT80K4	3.9 (34.5)	6.6	7.5	1.75	1.44	1	2.68 (23.7)	3.03	2.49	1.73	1.55 (13.7)
DT80N4	5.2 (46)	8.7	9.6	2.1	1.67	1.27	3.11 (27.5)	3.64	2.89	2.2	1.79 (15.8)
DT90S4	7.5 (66)	25	31	2.80	2.39	1.46	3.13 (27.7)	4.85	4.14	2.53	1.81 (16)
DT90L4	10.2 (90.3)	34	40	3.55	2.93	2	3.48 (30.8)	6.15	5.07	3.46	2.01 (17.8)
DV100M4	15.0 (133)	53	59	4.7	4.12	2.24	3.61 (32)	8.14	7.14	3.88	2.09 (18.5)
DV100L4	20.5 (181)	65	71	6.3	5.6	2.98	3.66 (32.4)	10.9	9.70	5	2.11 (18.7)
DV112M4	26.9 (238)	98	110	8.7	7.85	3.75	3.43 (30.4)	15.1	13.6	6.5	1.98 (17.5)
DV132S4	36.7 (325)	146	158	11	9.9	4.7	3.69 (32.7)	19.1	17.2	8.14	2.13 (18.9)
DV132M4	50.1 (443)	280	330	15.5	14.2	6.15	3.53 (31.2)	26.9	24.6	10.7	2.04 (18.1)
DV132ML4	61.0 (540)	330	380	18.1	16.5	7.46	3.7 (33)	31.4	28.6	12.9	2.13 (18.9)
DV160M4	72.9 (645)	398	448	22.5	20.3	9.70	3.59 (31.8)	39.0	35.2	16.8	2.07 (18.3)
DV160L4	98.1 (868)	925	1060	29.5	26.1	13.7	3.75 (33.2)	51.1	45.28	23.7	2.17 (19.2)
DV180M4	121 (1070)	1120	1255/1350 2)	37	21.7	19.1	3.82 (33.8)	64.1	54.9	33.1	2.2 (19)
DV180L4	143 (1266)	1290	1425/1520 1)	42.5	37.4	20.3	3.83 (33.9)	73.6	64.7	35.1	2.21 (19.6)
DV200L4	195 (1726)	2340	2475/2570 2)	55	49.9	23.1	3.91 (34.6)	95.3	86.5	39.9	2.25 19.9)
DV225S4	240 (2120)	3010	3145/3240 2)	67	61.6	26.4	3.9 (34.5)	116	107	45.7	2.25 (19.9)
DV225M4	292 (2584)	3570	3705/3800 2)	83	74.8	36.1	3.9 (34.5)	143.8	130	62.4	2.26 (20)
DV250M4	356 (3151)	6300	6600/6730 2)	102	91.7	44.7	3.88 (34.3)	177	159	77.4	2.24 (19.8)
DV280S4	484 (4284)	8925	9225/9355 2)	138	120.4	67.5	4.02 (35.6)	239	209	117	2.32 (20.5)
DV280M4	581 (5142)	8925	9225/9355 2)	170	149	81.9	3.9 (34.5)	295	258	142	2.25 (19.9)
D315S4	707 (6257)	20000	3)	192	180	67.0	3.93 (34.8)	-	-	-	-
D315M4	849 (7514)	24000		235	209	106	4.06 (35.9)	-	-	-	-
D315M4a	1028 (9098)	31000		295	259	140	3.97 (35.1)	-	-	-	-

1) Applies in the basic speed range up to n_{trans}.
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 to DT80K4, NEMA Design C from DT80N4)

Motor	M_N	Mass moment of inertia J_M		Star ⅄ (AC 460 V)				Double-star ⅄⅄ (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)
	Nm (lb in)	10^{-4} kgm²		A	A	A	Nm/A (lb in/A)	A	A	A	Nm/A (lb in/A)
DT71D4	2.1 (19)	4.6	5.5	1	0.76	0.65	2.74 (24.3)	2	1.52	1.30	1.37 (12.1)
DT80K4	3.1 (27)	6.6	7.5	1.45	1.06	0.98	2.92 (25.8)	2.9	2.12	1.96	1.46 (12.9)
DT80N4	4.2 (37)	8.7	9.6	1.85	1.39	1.21	3.03 (26.8)	3.7	2.78	2.42	1.51 (13.4)
DT90S4	6.1 (54)	25	31	2.6	1.87	1.79	3.25 (28.8)	5.2	3.74	3.58	1.62 (14.3)
DT90L4	8.3 (73)	34	40	3.1	2.49	1.84	3.34 (29.6)	6.2	4.98	3.68	1.67 (14.8)
DT100M4	12.1 (107)	53	59	4.1	3.59	1.97	3.37 (29.8)	8.2	7.18	3.94	1.69 (15)
DT100L4	21 (186)	65	71	6.6	5.98	2.78	3.51 (31.1)	13.2	12	5.56	1.76 (15.6)
DV112M4	22.1 (196)	98	110	7	6.13	3.37	3.61 (32)	14	12.3	6.74	1.80 (15.9)
DV132S4	30.5 (270)	146	158	9.4	8.61	3.76	3.54 (31.3)	18.8	17.2	7.52	1.77 (15.7)
DV132M4	41.2 (365)	280	330	13.7	11.9	6.87	3.48 (30.8)	27.4	23.7	13.7	1.74 (15.4)
DV132ML4	50.5 (447)	330	380	16.4	14.4	7.83	3.50 (31)	32.8	28.8	15.76	1.75 (15.5)
DV160M4	60.4 (535)	398	448	20	17.4	9.92	3.48 (30.8)	40	34.7	19.8	1.74 (15.4)
DV160L4	81.4 (720)	925	1060	27	23.2	13.7	3.50 (31)	54	46.5	27.5	1.75 (15.5)
DV180M4	100 (885)	1120	1255/1350 2)	31.5	28.1	14.3	3.56 (31.5)	63	56.1	28.6	1.78 (15.8)
DV180L4	119 (1053)	1290	1425/1520 2)	40	34.5	20.2	3.45 (30.5)	80	69	40.4	1.72 (15.2)
DV200L4	163 (1443)	2340	2475/2570 2)	47.5	44.6	16.3	3.65 (32.3)	95	89.3	32.5	1.83 (16.2)
DV225S4	201 (1779)	3010	3145/3240 2)	59	55.1	21	3.65 (32.3)	118	110.	42	1.82 (16.1)
DV225M4	244 (2160)	3570	3705/3800 2)	70	64.6	27	3.78 (33.5)	140	129	54	1.89 (16.7)
DV250M4	296 (2620)	6300	6600/6730 2)	87	78.5	37.6	3.77 (33.4)	174	157	75.2	1.89 (16.7)
DV280S4	402 (3558)	8925	9225/9355 2)	118	107	50.8	3.77 (33.4)	236	213	102	1.89 (16.7)
D280M4	580 (5133)	14500	3)	162	153	51.7	3.79 (33.5)	324	306	103	1.89 (16.7)
D315S4	707 (6257)	20000	3)	201	188	69.8	3.76 (33.3)	-	-	-	-
D315M4	849 (7514)	24000	3)	246	219	111	3.87 (34.3)	-	-	-	-
D315M4a	1028 (9098)	31000	3)	308	271	147	3.79 (33.5)	-	-	-	-

1) Applies in the basic speed range up to n_{trans}.

2) Double disc brake

3) On request

DT/DV/D motor selection in delta/star connection type (AC 230/400 V / 50 Hz)

1. Motors AC 230/400 V / 50 Hz in ⅄ connection or motors AC 400/690 V / 50 Hz in △ 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)										
⅄ AC 400 V / 50 Hz		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DT71D4	M_{max} Nm (lb in)	4.6 (41)										
	n_{trans} rpm	883										
DT80K4	M_{max} Nm (lb in)	6.9 (61)	6.9 (61)									
	n_{trans} rpm	813	813									
DT80N4	M_{max} Nm (lb in)	9.3 (82)	9.3 (82)	9.3 (82)	9.3 (82)	9.3 (82)						
	n_{trans} rpm	915	922	922	922	922						
DT90S4	M_{max} Nm (lb in)		13.5 (119)	13.5 (119)	13.5 (119)	13.5 (119)						
	n_{trans} rpm		960	1011	1011	1011						
DT90L4	M_{max} Nm (lb in)				18.3 (162)	18.3 (162)	18.3 (162)					
	n_{trans} rpm				1082	973	1088					
DV100M4	M_{max} Nm (lb in)						26.8 (237)	26.8 (237)	26.8 (237)			
	n_{trans} rpm						941	1043	1056			
DV100L4	M_{max} Nm (lb in)							36.8 (326)	36.8 (326)	36.8 (326)		
	n_{trans} rpm							890	1005	1011		
DV112M4	M_{max} Nm (lb in)								47.1 (417)	48.4 (428)	48.4 (428)	
	n_{trans} rpm								915	1030	1062	
DV132S4	M_{max} Nm (lb in)									66.1 (585)	66.1 (585)	66.1 (585)
	n_{trans} rpm									1011	1171	1222
DV132M4	M_{max} Nm (lb in)		**Note:** The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 400 V.								81.7 (723)	90.2 (798)
	n_{trans} rpm										1011	1145
DV132ML4	M_{max} Nm (lb in)											110 (974)
	n_{trans} rpm											1082
DV160M4	M_{max} Nm (lb in)											125 (1110)
	n_{trans} rpm											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 (lb in)	90.2 (798)									
	n_{trans} rpm	1152									
DV132ML4	M_{max} Nm (lb in)	110 (974)									
	n_{trans} rpm	1165									
DV160M4	M_{max} Nm (lb in)	131 (1160)	131 (1160)								
	n_{trans} rpm	1133	1197								
DV160L4	M_{max} Nm (lb in)	172 (1520)	177 (1520)	177 (1520)							
	n_{trans} rpm	1050	1306	1350							
DV180M4	M_{max} Nm (lb in)		217 (1920)	217 (1920)	217 (1920)						
	n_{trans} rpm		1222	1453	1517						
DV180L4	M_{max} Nm (lb in)		231.2 (2046)	258 (2280)	258 (2280)	258 (2280)					
	n_{trans} rpm		1018	1152	1299	1370					
DV200L4	M_{max} Nm (lb in)			339.5 (3005)	351 (3110)	351 (3110)	351 (3110)				
	n_{trans} rpm			1018	1171	1350	1466				
DV225S4	M_{max} Nm (lb in)				414.7 (3670)	433 (3830)	433 (3830)	433 (3830)			
	n_{trans} rpm				954	1082	1222	1363			
DV225M4	M_{max} Nm (lb in)					502.6 (4448)	526 (4660)	526 (4660)			
	n_{trans} rpm					1037	1146	1344			
DV250M4	M_{max} Nm (lb in)						586.5 (5191)	641 (5670)	641 (5670)		
	n_{trans} rpm						1018	1133	1357		
DV280S4	M_{max} Nm (lb in)							735.4 (6509)	871 (7710)	871 (7710)	
	n_{trans} rpm							1082	1184	1344	
DV280M4	M_{max} Nm (lb in)								941 (8330)	1000 (8851)	1000 (8851)
	n_{trans} rpm								1139	1254	1478
D315S4	M_{max} Nm (lb in)									1150 (10180)	1273 (11270)
	n_{Eck} rpm									1088	1203
D315M4	M_{max} Nm (lb in)										1453 (12860)
	n_{trans} rpm										1024
D315M4a	M_{max} Nm (lb in)										1374 (12160)
	n_{trans} rpm										1107

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 400 V.

2. Motors AC 230/400 V / 50 Hz in delta connection:

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 / 50 Hz		**0008**	**0011**	**0014**	**0015**	**0022**	**0030**	**0040**	**0055**	**0075**	**0110**
DT71D4	M_{max} Nm (lb in)	4.6 (41)	4.6 (41)	4.6 (41)	4.6 (41)						
	n_{trans} rpm	2054	2054	2054	2054						
DT80K4	M_{max} Nm (lb in)		6.9 (61)	6.9 (61)	6.9 (61)	6.9 (61)					
	n_{trans} rpm		1869	1869	1850	1869					
DT80N4	M_{max} Nm (lb in)			9.3 (82)	9.3 (82)	9.3 (82)					
	n_{trans} rpm			2080	1869	2080					
DT90S4	M_{max} Nm (lb in)					13.5 (119)	13.5 (119)	13.5 (119)			
	n_{trans} rpm					1971	2246	2304			
DT90L4	M_{max} Nm (lb in)						18.3 (162)	18.3 (162)	18.3 (162)		
	n_{trans} rpm						1946	2342	2387		
DV100M4	M_{max} Nm (lb in)							26.8 (237)	26.8 (237)	26.8 (237)	
	n_{trans} rpm							1862	2214	2298	
DV100L4	M_{max} Nm (lb in)								36.8 (326)	36.8 (326)	36.8 (326)
	n_{trans} rpm								1779	2080	2188
DV112M4	M_{max} Nm (lb in)									45.5 (403)	48.4 (403)
	n_{trans} rpm									1779	2163
DV132S4	M_{max} Nm (lb in)										66.1 (585)
	n_{trans} rpm										2086

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 400 V.

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 (lb in)	48.4 (428)									
	n_{trans} rpm	2195									
DV132S4	M_{max} Nm (lb in)	66.1 (585)	66.1 (585)								
	n_{trans} rpm	2458	2496								
DV132M4	M_{max} Nm (lb in)	90.2 (798)	90.2 (798)								
	n_{trans} rpm	1939	2310								
DV132ML4	M_{max} Nm (lb in)		110 (974)	110 (974)							
	n_{trans} rpm		2176	2291							
DV160M4	M_{max} Nm (lb in)		131 (1160)	131 (1160)	131 (1160)						
	n_{trans} rpm		1894	2246	2348						
DV160L4	M_{max} Nm (lb in)			177 (1570)	177 (1570)	177 (1570)					
	n_{trans} rpm			2010	2336	2560					
DV180M4	M_{max} Nm (lb in)				217 (1920)	217 (1920)	217 (1920)				
	n_{trans} rpm				2061	2445	2720				
DV180L4	M_{max} Nm (lb in)					258 (2280)	258 (2280)	258 (2280)			
	n_{trans} rpm					1837	2131	2458			
DV200L4	M_{max} Nm (lb in)						341.8 (3025)	351 (3110)	351 (3110)		
	n_{trans} rpm						1843	2182	2643		
DV225S4	M_{max} Nm (lb in)							425 (3760)	433 (3830)	433 (3830)	
	n_{trans} rpm							1715	2138	2394	
DV225M4	M_{max} Nm (lb in)								526 (4660)	526 (4660)	526 (4660)
	n_{trans} rpm								1952	2253	2630
DV250M4	M_{max} Nm (lb in)								542 (4800)	641 (5670)	641 (5670)
	n_{trans} rpm								1843	1837	2227
DV280S4	M_{max} Nm (lb in)									638.2 (5649)	823.2 (7286)
	n_{trans} rpm									1946	1920

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 400 V.

DT/DV/D motor selection in double-star/star connection type (AC 230/460 V / 60 Hz)

1. Motors AC 230460 V / 60 Hz in star connection:

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)										
⅄ AC 460 V / 60 Hz		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DT80K4	M_{max} Nm (lb in)	7.0 (62)										
	n_{trans} rpm	1101										
DT80N4	M_{max} Nm (lb in)	9.3 (82)	9.3 (82)	9.3 (82)	9.3 (82)	9.3 (82)						
	n_{Eck} rpm	1133	1146	1146	1146	1146						
DT90S4	M_{max} Nm (lb in)			13.5 (119)	13.5 (119)	13.5 (119)						
	n_{trans} rpm			1325	1350	1312						
DT90L4	M_{max} Nm (lb in)				18.3 (162)	18.3 (162)	18.3 (162)					
	n_{trans} rpm				1312	1152	1318					
DV100M4	M_{max} Nm (lb in)						26.8 (237)	26.8 (237)				
	n_{trans} rpm						1363	1510				
DV100L4	M_{max} Nm (lb in)							35.6 (315)	36.8 (326)	36.8 (326)		
	n_{trans} rpm							1069	1197	1210		
DV112M4	M_{max} Nm (lb in)							35.8 (317)	48.4 (428)	48.4 (428)		
	n_{trans} rpm							1197	1139	1312		
DV132S4	M_{max} Nm (lb in)								48.7 431)	65 (580)	66 584)	
	n_{trans} rpm								1069	992	1101	
DV132M4	M_{max} Nm (lb in)		**Note:** The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 460 V.							60.8 (538)	80 (708)	90 (797)
	n_{trans} rpm									1152	1088	1222
DV132ML4	M_{max} Nm (lb in)											110 (974)
	n_{trans} rpm											1171
DV160M4	M_{max} Nm (lb in)											120 (1062)
	n_{trans} rpm											1133

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 (lb in)	110 (974)									
	n_{trans} rpm	1267									
DV160M4	M_{max} Nm (lb in)	131 (1159)	131 (1159)								
	n_{trans} rpm	1261	1319								
DV160L4	M_{max} Nm (lb in)	161 (1420)	177 (1570)								
	n_{trans} rpm	1158	1370								
DV180M4	M_{max} Nm (lb in)	164 (1450)	217 (1921)	217 (1921)							
	n_{trans} rpm	1139	1177	1350							
DV180L4	M_{max} Nm (lb in)		228 (2018)	258 (2283)	258 (2283)						
	n_{trans} rpm		1082	1197	1325						
DV200L4	M_{max} Nm (lb in)			323 (2859)	351 (3107)	351 (3107)					
	n_{trans} rpm			1024	1107	1248					
DV225S4	M_{max} Nm (lb in)			318 (2815)	391 (3460)	433 (3830)	433 (3830)				
	n_{trans} rpm			1101	1075	1146	1286				
DV225M4	M_{max} Nm (lb in)				401 (3550)	494 (4370)	526 (4660)	526 (4660)			
	n_{trans} rpm				1082	1056	1139	1325			
DV250M4	M_{max} Nm (lb in)						576 (5100)	641 (5670)			
	n_{trans} rpm						1261	1370			
DV280S4	M_{max} Nm (lb in)							711 (6290)	871 (7710)	871 (7710)	
	n_{trans} rpm							1421	1478	1664	
D280M4	M_{max} Nm (lb in)							712 (6300)	946 (8370)	1045 (9249)	
	n_{trans} rpm							1338	1318	1382	
D315S4	M_{max} Nm (lb in)									1099 (9727)	1273 (11270)
	n_{trans} rpm									1325	1408
D315M4	M_{max} Nm (lb in)										1387 (12280)
	n_{trans} rpm										1242
D315M4a	M_{max} Nm (lb in)										1308 (11580)
	n_{trans} rpm										1344

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 460 V.

2. Motors AC 230/460 V / 60 Hz in double star connection:

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 (lb in)	4.6 (41)	4.6 (41)	4.6 (41)	4.6 (41)						
	n_{trans} rpm	2771	2989	2989	2989						
DT80K4	M_{max} Nm (lb in)		7 (62)	7 (62)	7 (62)	7 (62)					
	n_{trans} rpm		2733	2822	2688	2822					
DT80N4	M_{max} Nm (lb in)			9.3 (82)	8.3 (73)	9.3 (82)	9.3 (82)				
	n_{trans} rpm			2835	2586	2874	2970				
DT90S4	M_{max} Nm (lb in)					11.9 (105)	13.5 (119)	13.5 (119)			
	n_{trans} rpm					2637	2931	3462			
DT90L4	M_{max} Nm (lb in)						16.4 (145)	18.3 (162)	18.3 (162)		
	n_{trans} rpm						2605	3014	3354		
DV100M4	M_{max} Nm (lb in)							23.1 (204)	26 (230)	26.8 (237)	
	n_{trans} rpm							3142	3360	3680	
DV100L4	M_{max} Nm (lb in)								31.5 (279)	36.8 (326)	36.8 (326)
	n_{trans} rpm								2470	2605	3014
DV112M4	M_{max} Nm (lb in)									41.4 (366)	48.4 (428)
	n_{trans} rpm									2534	2989
DV132S4	M_{max} Nm (lb in)										62.4 (552)
	n_{trans} rpm										2234

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 460 V.

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 (lb in)	66 (584)									
	n_{trans} rpm	2573									
DV132M4	M_{max} Nm (lb in)	80 (708)	90.2 (798)								
	n_{trans} rpm	2349	2707								
DV132ML4	M_{max} Nm (lb in)		110 (974)	110 (974)							
	n_{trans} rpm		2496	2880							
DV160M4	M_{max} Nm (lb in)		115 (1018)	131 (1159)	131 (1159)						
	n_{trans} rpm		2451	2688	2963						
DV160L4	M_{max} Nm (lb in)			150 (1328)	177 (1567)	177 (1567)					
	n_{trans} rpm			2458	2515	2918					
DV180M4	M_{max} Nm (lb in)				189 (1673)	217 (1921)	217 (1921)				
	n_{trans} rpm				2355	2458	2771				
DV180L4	M_{max} Nm (lb in)					220 (1947)	258 (2283)	258 (2283)			
	n_{trans} rpm					2285	2291	2720			
DV200L4	M_{max} Nm (lb in)						281 (2487)	350 (3098)	351 (3107)		
	n_{trans} rpm						2208	2163	2662		
DV225S4	M_{max} Nm (lb in)							346 (3062)	433 (3832)	433 (3832)	
	n_{trans} rpm							2291	2362	2694	
DV225M4	M_{max} Nm (lb in)							354 (3133)	471 (4169)	526 (4655)	526 (4655)
	n_{trans} rpm							2278	2240	2336	2803
DV250M4	M_{max} Nm (lb in)								459 (4062)	547 (4841)	641 (5673)
	n_{trans} rpm								2656	2630	2771
DV280S4	M_{max} Nm (lb in)									533 (4717)	681 (6027)
	n_{trans} rpm									2963	2925

Note: The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 460 V.

DT/DV motor selection with delta connection type (AC 230 V / 50 Hz)

Motors AC 230/400 V / 50 Hz in delta connection:

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 (lb in)	6.9 (61)								
	n_{trans}	rpm	813								
DT80N4	M_{max}	Nm (lb in)	9.3 (82)								
	n_{trans}	rpm	922								
DT90S4	M_{max}	Nm (lb in)	13.5 (119)	13.5 (119)							
	n_{trans}	rpm	1011	1011							
DT90L4	M_{max}	Nm (lb in)	18.3 (162)	18.3 (162)	18.3 (162)						
	n_{trans}	rpm	998	1068	1088						
DV100M4	M_{max}	Nm (lb in)		25.5 (226)	26.8 (237)						
	n_{trans}	rpm		922	1056						
DV100L4	M_{max}	Nm (lb in)			36.8 (326)	36.8 (326)					
	n_{trans}	rpm			973	1011					
DV112M4	M_{max}	Nm (lb in)				48.4 (428)	48.4 (428)				
	n_{trans}	rpm				1037	1062				
DV132S4	M_{max}	Nm (lb in)				66.1 (585)	66.1 (585)	66.1 (585)			
	n_{trans}	rpm				1024	1190	1222			
DV132M4	M_{max}	Nm (lb in)					85.4 (756)	90.2 (798)	90.2 (798)		
	n_{trans}	rpm					998	1152	1152		
DV132ML4	M_{max}	Nm (lb in)						110 (974)	110 (974)	110 (974)	
	n_{trans}	rpm						1082	1165	1165	
DV160M4	M_{max}	Nm (lb in)						126 (1115)	131 (1159)	131 (1159)	
	n_{trans}	rpm						979	1120	1197	
DV160L4	M_{max}	Nm (lb in)							167 (1478)	177 (1567)	177 (1567)
	n_{trans}	rpm							1056	1306	1350
DV180M4	M_{max}	Nm (lb in)		**Note:** The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 230 V.						217 (1921)	217 (1921)
	n_{trans}	rpm								1222	1382
DV180L4	M_{max}	Nm (lb in)								231 (2045)	258 (2283)
	n_{trans}	rpm								1017	1069
DV200L4	M_{max}	Nm (lb in)									307 (2717)
	n_{trans}	rpm									1030

DT/DV motor selection with double-star connection type (AC 230 V / 60 Hz)

Motors AC 230/460 V / 60 Hz in double star connection:

Motor			MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) in CFC operating modes (P700)								
⅄⅄ AC 230 V / 60 Hz			0015	0022	0037	0055	0075	0110	0150	0220	0300
DT80N4	M_{max}	Nm (lb in)	9.3 (82)								
	n_{trans}	rpm	1146								
DT90S4	M_{max}	Nm (lb in)	13.5 (119)	13.5 (119)							
	n_{trans}	rpm	1267	1338							
DT90L4	M_{max}	Nm (lb in)	17.2 (152)	18.3 (162)	18.3 (162)						
	n_{trans}	rpm	1146	1210	1325						
DV100M4	M_{max}	Nm (lb in)		20.7 (183)	26.8 (237)						
	n_{trans}	rpm		1459	1517						
DV100L4	M_{max}	Nm (lb in)			36.8 (326)	36.8 (326)					
	n_{trans}	rpm			1056	1210					
DV112M4	M_{max}	Nm (lb in)			37.2 (329)	48.4 (428)	48.4 (428)				
	n_{trans}	rpm			1190	1248	1338				
DV132S4	M_{max}	Nm (lb in)				57 (504)	66.1 (585)	66.1 (585)			
	n_{trans}	rpm				1030	1062	1120			
DV132M4	M_{max}	Nm (lb in)					71.7 (635)	90.2 (798)	90.2 (798)		
	n_{trans}	rpm					1114	1165	1222		
DV132ML4	M_{max}	Nm (lb in)						106 (938)	110 (974)		
	n_{trans}	rpm						1101	1235		
DV160M4	M_{max}	Nm (lb in)						104 (921)	131 (1159)	131 (1159)	
	n_{trans}	rpm						1165	1146	1318	
DV160L4	M_{max}	Nm (lb in)							133 (1177)	177 (1567)	177 (1567)
	n_{trans}	rpm							1190	1267	1395
DV180M4	M_{max}	Nm (lb in)		**Note:** The maximum torque M_{max} is limited to 180 % of the rated motor torque M_N. The data is based on a supply voltage of AC 230 V.						208 (1841)	217 (1921)
	n_{trans}	rpm								1101	1203
DV180L4	M_{max}	Nm (lb in)								195 (1726)	236 (2089)
	n_{trans}	rpm								1107	1075
DV200L4	M_{max}	Nm (lb in)								210 (1859)	253 (2239)
	n_{trans}	rpm								1082	1062
DV225S4	M_{max}	Nm (lb in)									247 (2186)
	n_{trans}	rpm									1133

4.7 Motor selection for synchronous servomotors (SERVO)

	NOTE
	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-eurodrive.com).

Motor characteristics

The requirements on a servo drive include speed dynamics, stable speed and positioning accuracy. DS/CM/CMD/CMP motors with MOVIDRIVE® meet these requirements.

Technically speaking, these are synchronous motors with permanent magnets on the rotor and a mounted resolver. The required characteristics, namely a constant torque over a wide speed range (up to 6000 rpm), a high speed and control range and a high overload capacity, are achieved using control with MOVIDRIVE®. The mass moment of inertia of the servomotor is lower than that of the asynchronous motor. This means it is optimally suited to applications requiring dynamic speeds.

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Figure 69: Speed/torque characteristic curve of 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 selection tables (DS/CM/CMD/CMP) the values for M_0.

Refer to the motor selection tables (DS/CM/CMD/CMP) 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 operating 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 need to differentiate between the load types quadratic, dynamic and static when performing project planning for the SERVO operating mode. Project planning for a synchronous motor is carried out in accordance with the following requirements:

1. Effective torque requirement at average application speed.

   $M_{eff} < M_0$

   The operating point must lie below the characteristic curve for the continuous torque (Figure 69, 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 needed across the speed curve.

   $M_{max} < M_{dyn_mot}$

   This operating point must lie below the characteristic curve for the maximum torque of the motor/MOVIDRIVE® combination (Figure 69, curve 2).

3. Maximum speed

   The maximum speed must not be configured higher than the rated speed of the motor. Planetary gear units should be used for speeds greater than 3000 rpm as a result of the high input speed.

   $n_{max} \leq n_N$

SERVO mode with torque control (SERVO & M-CTRL.)

This operating mode enables the servomotor to be controlled directly with torque control. The setpoint sources of the speed controlled SERVO mode can also be used for torque control. All speed setpoint sources (except for bus setpoints) are interpreted as current setpoint sources. Assign "Current" to a process data word for fieldbus control. The settings for evaluating the analog input (→ P11_, parameter description) also remain in effect. The fixed setpoints (P16_, P17_) can be entered either in the unit (rpm) or (%$I_{N_inverter}$) (→ MOVITOOLS®).

The following relationship exists between the units:

3000 rpm = 150 % rated inverter current

The torque at the output shaft of the servomotor can be calculated using the following formula:

$$M = \frac{M_0}{I_0} \times \frac{150\ \% \times I_{n_inverter} \times n_{setp}}{3000\ 1/min}$$

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M_0 Continuous static torque according to the motor tables DS/CM/CMD/CMP

I_0 Continuous static torque according to the motor tables DS/CM/CMD/CMP

Motor table DS/CM

Characteristic values at V_{max} = AC 230 V / AC 400 V

n_N rpm	Motor	Without forced cooling fan M_0 Nm (lb in)	I_0 1) A	I_0 2) A	With forced cooling fan VR M_{0_VR} Nm (lb in)	I_{0_VR} 1) A	I_{0_VR} 2) A	I_{max} 1) A	I_{max} 2) A	Mass moment of inertia J_M Without brake 10^{-4} kgm²	With brake 10^{-4} kgm²
2000	**CM71S**	5.0 (44)	2.2	3.95	7.3 (65)	3.2	5.7	8.8	15.8	4.85	6.89
	CM71M	6.5 (58)	3.0	5.3	9.4 (83)	4.2	7.7	12.0	21.0	6.27	8.31
	CM71L	9.5 (84)	4.2	7.4	13.8 (122)	6.1	10.7	16.8	29.5	9.1	11.1
	CM90S	11.0 (97.4)	4.9	8.7	16.0 (142)	7.1	12.6	19.6	35.0	14.3	19.8
	CM90M	14.5 (128)	6.9	12.1	21.0 (186)	10.0	17.5	28.0	48.5	18.6	24.1
	CM90L	21.0 (186)	9.9	17.1	30.5 (270)	14.4	25.0	40.0	68.0	27.1	32.6
	CM112S	23.5 (208)	10.0	18.0	34.0 (301)	14.5	26.0	40.0	72	67.4	87.5
	CM112M	31.0 (274)	13.5	24.5	45.0 (398)	19.6	35.5	54.0	98	87.4	108
	CM112L	45.0 (398)	20.0	35.5	65.0 (575)	29.0	51.0	80.0	142	128	148
	CM112H	68.0 (602)	30.5	52.0	95.0 (841)	42.5	73.0	122	208	189	209
3000	**DS56M**	1.0 (8.9)	1.65	1.65	-	-	-	6.6	6.6	0.47	0.85
	DS56L	2.0 (18)	2.4	2.4	-	-	-	9.6	9.6	0.82	1.2
	DS56H	4.0 (36)	2.8	4.7	-	-	-	11.2	19	1.53	1.88
	CM71S	5.0 (44)	3.3	5.9	7.3 (65)	4.8	8.6	13.2	23.5	4.85	6.89
	CM71M	6.5 (58)	4.3	7.6	9.4 (83)	6.2	11.0	17.2	30.5	6.27	8.31
	CM71L	9.5 (84)	6.2	11.1	13.8 (122)	9.0	16.1	25.0	44.5	9.1	11.1
	CM90S	11.0 (97.4)	7.3	12.7	16.0 (142)	10.6	18.4	30.0	51	14.3	19.8
	CM90M	14.5 (128)	10.1	17.4	21.0 (186)	14.6	25.0	40.0	70	18.6	24.1
	CM90L	21.0 (186)	14.4	25.5	30.5 (270)	21.0	37.0	58.0	102	27.1	32.6
	CM112S	23.5 (208)	15.0	27.0	34.0 (301)	22.0	39.0	60.0	108	67.4	87.5
	CM112M	31.0 (274)	20.5	35.0	45.0 (398)	30.0	51.0	82.0	140	87.4	108
	CM112L	45.0 (398)	30.0	48.0	65.0 (575)	44.0	70.0	120	192	128	148
	CM112H	68.0 (602)	43.0	73.0	95.0 (841)	60.0	102	172	292	189	209
4500	**DS56M**	1.0 (8.9)	1.65	1.65	-	-	-	6.6	6.6	0.47	0.85
	DS56L	2.0 (18)	2.4	-	-	-	-	9.6	-	0.82	1.2
	DS56H	4.0 (36)	4.0	-	-	-	-	16.0	-	1.53	1.88
	CM71S	5.0 (44)	4.9	8.5	7.3 (65)	7.2	12.3	20.0	34	4.85	6.89
	CM71M	6.5 (58)	6.6	11.3	9.4 (83)	9.6	16.4	26.0	45	6.27	8.31
	CM71L	9.5 (84)	9.6	17.1	13.8 (122)	14.0	25.0	38.0	68	9.1	11.1
	CM90S	11.0 (97.4)	11.1	18.9	16.0 (142)	16.2	27.5	44.0	76	14.3	19.8
	CM90M	14.5 (128)	14.7	26.0	21.0 (186)	21.5	37.5	59.0	104	18.6	24.1
	CM90L	21.0 (186)	21.6	39.0	30.5 (270)	31.5	57	86.0	156	27.1	32.6
	CM112S	23.5 (208)	22.5	38.5	34.0 (301)	32.5	56	90.0	154	67.4	87.5
	CM112M	31.0 (274)	30.0	54.0	45.0 (398)	44.0	78	120	216	87.4	108
	CM112L	45.0 (398)	46.0	78.0	65.0 (575)	67.0	113	184	312	128	148
	CM112H	68.0 (602)	66.0	-	95.0 (841)	92.0	-	264	-	189	209
6000	**DS56M**	1.0 (8.9)	1.65	-	-	-	-	6.6	-	0.47	0.85
	DS56L	2.0 (18)	2.75	-	-	-	-	11.0	-	0.82	1.2
	DS56H	4.0 (36)	5.3	-	-	-	-	21.0	-	1.53	1.88
	CM71S	5.0 (44)	6.5	11.6	7.3 (65)	7.2	16.8	26.0	46.5	4.85	6.89
	CM71M	6.5 (58)	8.6	14.1	9.4 (83)	9.6	20.5	34.0	56	6.27	8.31
	CM71L	9.5 (84)	12.5	21.5	13.8 (122)	14.0	31.0	50.0	86	9.1	11.1
	CM90S	11.0 (97.4)	14.5	23.5	16.0 (142)	16.2	34.0	58.0	94	14.3	19.8
	CM90M	14.5 (128)	19.8	37.0	21.0 (186)	21.5	54	79.0	148	18.6	24.1
	CM90L	21.0 (186)	29.5	51.0	30.5 (270)	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

	NOTE
	Additional project planning instructions and information on the DS/CM synchronous servomotors can be found in the "Servo Gearmotors" catalog, which can be ordered from SEW-EURODRIVE.

DS/CM motor selection (AC 400 V system voltage)

1. Rated speed n_N = 2000 rpm:

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)															
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450
CM71S	M_{max}	Nm (lb in)	8.9 (79)	10.5 (93)	13.1 (116)	15.6 (138)	12.7 (112)	15.9 (141)	16.5 (146)									
CM71M	M_{max}	Nm (lb in)	8.6 (76)	10.3 (91)	13.1 (116)	16.2 (143)	12.7 (112)	16.7 (148)	19.8 (175)	21.5 (190)								
CM71L	M_{max}	Nm (lb in)		10.8 (96)	13.9 (123)	17.7 (157)	13.5 (119)	18.2 (161)	22.5 (199)	28.4 (251)	31.4 (278)							
CM90S	M_{max}	Nm (lb in)			13.9 (123)	17.8 (158)	13.4 (119)	18.4 (163)	23.2 (205)	30.6 (271)	38.2 (338)	39.4 (349)						
CM90M	M_{max}	Nm (lb in)				16.8 (149)	12.6 (112)	17.3 (153)	21.9 (194)	29.5 (261)	38.0 (336)	46.9 (415)	52.5 (465)					
CM90L	M_{max}	Nm (lb in)						17.5 (155)	22.2 (196)	30.1 (266)	39.3 (348)	49.6 (439)	70.3 (622)	75.8 (671)				
CM112S	M_{max}	Nm (lb in)						19.3 (171)	24.6 (218)	33.4 (296)	43.6 (386)	54.8 (485)	76.2 (674)	81.9 (725)				
CM112M	M_{max}	Nm (lb in)							23.9 (212)	32.6 (289)	42.9 (380)	54.7 (484)	79.3 (702)	99.6 (882)	108.0 (956)			
CM112L	M_{max}	Nm (lb in)									42.0 (372)	53.9 (477)	80.3 (711)	104.9 (928	141.5 (1252)	156.8 (1388)		
CM112H	M_{max}	Nm (lb in)										53.2 (471)	80.1 (709)	106.5 (943)	150.3 (1330)	189.2 (1675)	220.1 (1948)	237.0 (2100)

2. Rated speed n_N = 3000 rpm:

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)								
			0005	0008	0011	0014	0015	0022	0030	0040	0055
DS56M	M_{max}	Nm (lb in)	2.4 (21)	2.8 (25)	3.6 (32)	3.8 (34)	3.5 (31)	3.8 (34)			
DS56L	M_{max}	Nm (lb in)	3.3 (29)	4.0 (35)	5.1 (45)	6.4 (57)	4.9 (43)	6.6 (58)	7.6 (67)		
DS56H	M_{max}	Nm (lb in)	5.7 (50)	6.8 (60)	8.8 (78)	11.2 (99)	8.5 (75)	11.5 (102)	14.3 (127)	15.0 (133)	
CM71S	M_{max}	Nm (lb in)	6.0 (53)	7.2 (64)	9.2 (81)	11.6 (103)	8.9 (79)	11.9 (105)	14.3 (127)	16.5 (146)	
CM71M	M_{max}	Nm (lb in)		7.2 (64)	9.3 (82)	11.9 (105)	9.0 (80)	12.2 (108)	15.1 (134	19.1 (169)	21.5 (190)
CM71L	M_{max}	Nm (lb in)			9.5 (84)	12.2 (108)	9.2 (81)	12.6 (112)	15.9 (141)	21.0 (186)	26.2 (232)
CM90S	M_{max}	Nm (lb in)				12.0 (106)	9.0 (80)	12.4 (110)	15.7 (139)	21.2 (188)	27.4 (243)
CM90M	M_{max}	Nm (lb in)						11.8 (104)	15.0 (133)	20.4 (181)	26.6 (235)
CM90L	M_{max}	Nm (lb in)								20.7 (183)	27.3 (242)
CM112S	M_{max}	Nm (lb in)								22.2 (196)	29.3 (259)
CM112M	M_{max}	Nm (lb in)									28.2 (250

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)								
			0075	0110	0150	0220	0300	0370	0450	0550	0750
CM71L	M_{max}	Nm (lb in)	30.8 (273)	31.5 (279)							
CM90S	M_{max}	Nm (lb in)	34.0 (301)	39.2 (347)							
CM90M	M_{max}	Nm (lb in)	33.7 (298)	47.8 (423)	51.6 (457)						
CM90L	M_{max}	Nm (lb in)	34.7 (307)	51.1 (452)	65.6 (581)	75.6 (669)					
CM112S	M_{max}	Nm (lb in)	37.4 (331)	54.8 (485)	69.8 (618)	81.9 (725)					
CM112M	M_{max}	Nm (lb in)	36.2 (320)	54.0 (478)	70.7 (626)	95.7 (847)	108.0 (956)				
CM112L	M_{max}	Nm (lb in)	35.8 (317)	53.9 (477)	71.6 (634)	101.0 (894)	126.9 (1123)	147.4 (1305)	156.8 (1388)		
CM112H	M_{max}	Nm (lb in)		56.6 (501)	75.7 (670)	108.6 (961)	139.9 (1238)	167.0 (1478)	197.1 (1744)	223.2 (1975)	237.0 (2098)

3. Rated speed n_N = 4500 rpm:

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)							
			0005	0008	0011	0014	0015	0022	0030	0040
DS56M	M_{max}	Nm (lb in)	2.4 (21)	2.8 (25)	3.6 (32)	3.8 (34)	3.5 (31)	3.8 (34)		
DS56L	M_{max}	Nm (lb in)	3.3 (29)	4.0 (35)	5.1 (45)	6.4 (57)	4.9 (43)	6.6 (58)	7.6 (67)	
DS56H	M_{max}	Nm (lb in)	4.0 (35)	4.8 (42)	6.2 (55)	7.9 (70	6.0 (53)	8.2 (73)	10.3 (91)	13.7 (121)
CM71S	M_{max}	Nm (lb in)			6.3 (56)	8.1 (72)	6.1 (54)	8.3 (73)	10.4 (92)	13.4 (119)
CM71M	M_{max}	Nm (lb in)				7.9 (70)	5.9 (52)	8.1 (72)	10.2 (90)	13.6 (120)
CM71L	M_{max}	Nm (lb in)						8.2 (73)	10.4 (92)	14.0 (124)
CM90S	M_{max}	Nm (lb in)							10.4 (92)	14.1 (125)
CM90M	M_{max}	Nm (lb in)								14.0 (124)

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)											
			0055	0075	0110	0150	0220	0300	0370	0450	0550	0750	0900	1100
DS56H	M_{max}	Nm (lb in)	15.2 (135)											
CM71S	M_{max}	Nm (lb in)	16.1 (142)	16.5 (146)										
CM71M	M_{max}	Nm (lb in)	17.1 (151)	20.3 (180)	21.3 (189)									
CM71L	M_{max}	Nm (lb in)	18.1 (160)	22.5 (199)	30.3 (268)	31.2 (276)								
CM90S	M_{max}	Nm (lb in)	18.4 (163)	23.4 (207)	33.6 (297)	39.2 (347)								
CM90M	M_{max}	Nm (lb in)	18.4 (163)	23.5 (208)	34.6 (306)	44.5 (394)	52.1 (461)							
CM90L	M_{max}	Nm (lb in)	18.2 (161)	23.3 (206)	34.7 (307)	45.8 (405)	63.4 (561)	75.0 (664)						
CM112S	M_{max}	Nm (lb in)	19.5 (173)	25.0 (221)	37.4 (331)	49.2 (435)	67.5 (597)	81.9 (725)						
CM112M	M_{max}	Nm (lb in)		24.6 (218)	37.1 (328)	49.4 (437)	69.6 (616)	87.4 (774)	101.5 (898)	108.0 (956)				
CM112L	M_{max}	Nm (lb in)			35 (310)	46.8 (414)	67.2 (595)	86.9 (769)	104.1 (921)	123.5 (1093)	140.7 (1245)	156.8 (1388)		
CM112H	M_{max}	Nm (lb in)					70.9 (628)	92.5 (819)	112.1 (992)	135.5 (1199)	157.7 (1396)	189.4 (1676)	231.6 (2050)	237.0 (2098)

4. Rated speed n_N = 6000 rpm:

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in the SERVO operating modes (P700)															
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110	0150	0220	0300	0370	0450
DS56M	M_{max}	Nm (lb in)	2.4 (21)	2.8 (25	3.6 (32)	3.8 (34)	3.5 (31)	3.8 (34)										
DS56L	M_{max}	Nm (lb in)	2.9 (26)	3.5 (31)	4.5 (40)	5.7 (50)	4.3 (38)	5.8 (51)	7.3 (65)	7.6 (67)								
DS56H	M_{max}	Nm (lb in)			4.7 (42)	6.0 (53)	4.5 (40)	6.2 (55)	7.9 (70)	10.5 (93)	13.6 (120)	15.1 (134)						
CM71S	M_{max}	Nm (lb in)				6.1 (54)	4.6 (41)	6.3 (56)	8.0 (71)	10.6 (94)	13.3 (118)	15.8 (140)	16.5 (146)					
CM71M	M_{max}	Nm (lb in)						6.2 (55)	7.9 (70)	10.6 (94)	13.7 (121)	16.8 (149)	21.3 (189)					
CM71L	M_{max}	Nm (lb in)							8.0 (71)	10.8 (96)	14.1 (125)	17.9 (158)	25.2 (223)	30.7 (272)	31.4 (278)			
CM90S	M_{max}	Nm (lb in)								10.8 (96)	14.2 (126)	18.1 (160)	26.6 (235)	34.2 (303)	39.4 (349)			
CM90M	M_{max}	Nm (lb in)									13.7 (121)	17.5 (155)	26.1 (231)	34.3 (304)	46.9 (415)	51.9 (459)		
CM90L	M_{max}	Nm (lb in)										17.1 (151)	25.6 (227)	33.9 (300)	48.0 (425)	60.9 (539)	71.3 (631)	75.2 (666)

DS/CM motor selection (AC 230 V system voltage)

1. Rated speed n_N = 2000 rpm:

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 (lb in)	12.9 (114)	14.6 (129)	16.5 (146)						
CM71M	M_{max} Nm (lb in)	13.1 (116)	15.1 (134)	21.4 (189)						
CM71L	M_{max} Nm (lb in)	14.0 (124)	16.3 (144)	25.6 (227)	31.3 (277)					
CM90S	M_{max} Nm (lb in)	13.8 (122)	16.2 (143)	26.8 (237)	38.0 (336)	39.6 (350)				
CM90M	M_{max} Nm (lb in)	13.1 (116)	15.4 (136)	25.8 (228)	38.2 (338)	48.1 (426)	52.0 (460)			
CM90L	M_{max} Nm (lb in)		15.8 (140)	26.6 (235)	40.0 (354)	51.9 (459)	70.9 (628)	74.9 (663)		
CM112S	M_{max} Nm (lb in)			28.3 (250)	42.7 (378)	55.1 (488)	74.7 (661)	81.9 (725)		
CM112M	M_{max} Nm (lb in)			27.4 (243)	41.6 (368)	54.6 (483)	76.8 (680)	94.4 (836)	108.0 (956)	
CM112L	M_{max} Nm (lb in)				41.7 (369)	55.0 (487)	79.2 (701)	100.2 (887)	139.3 (1233)	156.8 (1388)
CM112H	M_{max} Nm (lb in)					56.6 (501)	82.2 (728)	105.5 (934)	153 (1350)	177.9 (1575)

2. Rated speed n_N = 3000 rpm:

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 (lb in)	3.8 (34)								
DS56L	M_{max} Nm (lb in)	7.6 (67)								
DS56H	M_{max} Nm (lb in)	9.2 (81)	10.7 (95)	15.3 (135)						
CM71S	M_{max} Nm (lb in)	9.1 (81)	10.6 (94)	15.8 (140)	16.5 (146)					
CM71M	M_{max} Nm (lb in)	9.3 (82)	10.9 (97)	17.2 (152)	21.5 (190)					
CM71L	M_{max} Nm (lb in)	9.4 (83)	11.0 (97)	18.2 (161)	25.8 (228)	31.0 (274)	31.4 (278)			
CM90S	M_{max} Nm (lb in)	9.5 (84)	11.2 (99)	18.7 (166)	27.7 (245)	35.1 (311)	39.5 (350)			
CM90M	M_{max} Nm (lb in)			18.1 (160)	27.2 (241)	35.3 (312)	48.4 (428)	52.2 (462)		
CM90L	M_{max} Nm (lb in)			17.9 (158)	27.1 (240)	35.5 (314)	50.5 (447)	63.1 (558)	75.2 (666)	
CM112S	M_{max} Nm (lb in)			18.8 (166)	28.7 (254)	37.7 (334)	53.4 (473)	66.3 (587)	81.9 (725)	
CM112M	M_{max} Nm (lb in)				29.1 (258)	38.4 (340)	55.3 (489)	69.9 (619)	97.0 (859)	108.0 (956)
CM112L	M_{max} Nm (lb in)					40.6 (359)	58.9 (521)	75.4 (667)	108.8 (963)	125.9 (1114)
CM112H	M_{max} Nm (lb in)						58.4 (517)	75.3 (666)	111.1 (983)	131.1 (1160)

3. Rated speed n_N = 4500 rpm:

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 (lb in)	3.8 (34)								
CM71S	M_{max} Nm (lb in)	6.4 (57)	7.5 (66)	12.1 (107)	16.3 (144)	16.5 (146)				
CM71M	M_{max} Nm (lb in)	6.3 (56)	7.4 (65)	12.2 (108)	17.4 (154)	21.0 (186)	21.4 (189)			
CM71L	M_{max} Nm (lb in)		7.2 (64)	12.1 (107)	17.9 (158)	22.8 (202)	29.9 (265)	31.3 (277)		
CM90S	M_{max} Nm (lb in)			12.6 (112)	19.0 (168)	24.8 (219)	34.4 (304)	39.6 (350)		
CM90M	M_{max} Nm (lb in)			12.1 (107)	18.3 (162)	24.1 (213)	34.3 (304)	42.8 (379)	52.0 (460)	
CM90L	M_{max} Nm (lb in)				17.7 (157)	23.4 (207)	33.7 (298)	42.9 (380)	61.4 (543)	70.5 (624)
CM112S	M_{max} Nm (lb in)				20.0 (177)	26.5 (235)	38.2 (338)	48.6 (430)	68.3 (605)	77.7 (688)
CM112M	M_{max} Nm (lb in)					24.8 (219)	36.1 (320)	46.3 (410)	67.4 (597)	78.5 (695)

4. Rated speed n_N = 6000 rpm:

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 (lb in)	4.7 (42)	5.6 (50)	9.2 (81)	13.2 (117)	15.9 (141)	16.6 (147)			
CM71M	M_{max} Nm (lb in)	5.0 (44)	5.9 (52)	9.9 (88)	14.6 (129)	18.2 (161)	21.4 (189)			
CM71L	M_{max} Nm (lb in)			9.6 (85)	14.5 (128)	18.7 (166)	25.6 (227)	30.3 (268)	31.4 (278)	
CM90S	M_{max} Nm (lb in)			10.2 (90)	15.4 (136)	20.1 (178)	28.5 (252)	35.3 (312)	39.4 (349)	
CM90M	M_{max} Nm (lb in)				12.9 (114)	17.0 (150)	24.5 (217)	31.2 (276)	44.3 (392)	50.6 (448)
CM90L	M_{max} Nm (lb in)					17.9 (158)	25.9 (229)	33.1 (293)	48.3 (427)	56.5 (500)

Motor table CMD

Characteristic values at V_{max} = AC 400 V

n_N rpm	Motor	M_0 Nm (lb in)	I_0 A	I_{max} A	Mass moment of inertia J_M 10^{-4} kgm^2
1200	CMD93S	2.4 (21)	1.55	8.1	1.23
	CMD93M	4.2 (37)	2.5	16.2	2.31
	CMD93L	6.0 (50)	3.5	22.9	3.38
	CMD138S	6.7 (59	3.9	13.2	6.4
	CMD138M	12.1 (107)	5.5	25.5	11.4
	CMD138L	16.5 (146)	8	40.2	16.5
2000	CMD138S	6.7 (59)	7.4	25.0	6.5
	CMD138M	12.1 (107)	11.4	53.0	11.4
	CMD138L	16.5 (146)	15.1	76.0	16.5
3000	CMD70S	0.7 (6)	1.04	5.8	0.261
	CMD70M	1.1 (9.7)	1.36	7.9	0.45
	CMD70L	1.9 (17)	1.96	17.7	0.83
	CMD93S	2.4 (21)	2.32	12.2	1.23
	CMD93M	4.2 (37)	3.6	23.2	2.31
	CMD93L	6.0 (53)	6	39.7	3.38
4500	CMD55S	0.25 (2.2)	0.7	4.1	0.087
	CMD55M	0.45 (4)	0.95	6.1	0.15
	CMD55L	0.9 (8)	1.5	12.2	0.267

CMD motor selection (AC 400 V system voltage)

1. Rated speed n_N = 1200 rpm:

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
CMD93S	M_{max} Nm (lb in)	5.8 (51)	6.7 (59)	8.1 (72)	10 (89)	7.9 (70)	10 (89)						
CMD93M	M_{max} Nm (lb in)		8.2 (73)	10.5 (93)	13.3 (118)	10.2 (90)	13.6 (120)	16.6 (147)	20.6 (182)	22 (190)			
CMD93L	M_{max} Nm (lb in)			10.5 (93)	13.5 (119)	10.1 (89)	14.0 (124)	17.6 (156)	23.1 (204)	28.6 (253)	33 (290)		
CMD138S	M_{max} Nm (lb in)				12.5 (111)	9.8 (87)	12.8 (113)	15.2 (135)	17 (150)				
CMD138M	M_{max} Nm (lb in)							21.9 (194)	27.9 (247)	33.3 (295)	37.8 (335)	39 (350)	
CMD138L	M_{max} Nm (lb in)									36.8 (326)	45.0 (398)	59 (520)	62 (550)

2. Rated speed n_N = 2000 rpm:

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400 V units) in SERVO operating modes (P700)						
		0040	0055	0075	0110	0150	0220	0300
CMD138S	M_{max} Nm (lb in)	11.9 (105)	14.7 (130)	17 (150)				
CMD138M	M_{max} Nm (lb in)			23.7 (210)	31.8 (281)	37.2 (329)	38.8 (343)	
CMD138L	M_{max} Nm (lb in)				37.4 (331)	47.1 (417)	59.6 (528)	62 (550)

3. Rated speed n_N = 3000 rpm:

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 (lb in)	2.2 (19)	2.5 (22)	3 (27)									
CMD70M	M_{max}	Nm (lb in)	3.2 (28)	3.7 (33)	4.5 (40)	5.2 (46)	4.4 (39)	5 (44)						
CMD70L	M_{max}	Nm (lb in)	3.8 (34)	4.5 (40)	5.8 (51)	7.4 (65)	5.7 (50)	7.6 (67)	9.1 (81)	10.6 (94)	11 (97)			
CMD93S	M_{max}	Nm (lb in)		4.8 (42)	6.0 (53)	7.3 (65)	5.8 (51)	7.5 (66)	8.8 (78)	10 (86)				
CMD93M	M_{max}	Nm (lb in)				9.5 (84)	7.2 (64)	9.8 (87)	12.3 (109)	15.9 (141)	19.5 (173)	22 (190)		
CMD93L	M_{max}	Nm (lb in)								13.9 (123)	18.1 (160)	22.5 (199)	30.7 (272)	33 (290)

4 Rated speed n_N = 4500 rpm:

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 (lb in)	1.2 (11)							
CMD55M	M_{max}	Nm (lb in)	1.8 (16)	2 (18)	2.3 (20)					
CMD55L	M_{max}	Nm (lb in)	2.5 (22)	2.9 (26)	3.7 (33)	4.5 (40)	3.6 (32)	4.6 (41)	5.4 (48)	6 (53)

Motor table CMP

Characteristic values at V_{max} = AC 400 V

n_N rpm	Motor	Without forced cooling fan M_0 Nm (lb in)	Without forced cooling fan I_0 A	With forced cooling fan M_{0_VR} Nm (lb in)	With forced cooling fan I_{0_VR} A	I_{max} A	Mass moment of inertia J_M Without brake 10^{-4} kgm²	Mass moment of inertia J_M With brake 10^{-4} kgm²
3000	CMP40S	0.5 (4)	1.2	-	-	6.1	0.104	0.132
	CMP40M	0.8 (7)	0.95	-	-	6.0	0.148	0.176
	CMP50S	1.3 (12)	0.96	1.7 (15)	1.25	5.1	0.415	0.481
	CMP50M	2.4 (21)	1.68	3.5 (31)	2.45	9.6	0.667	0.733
	CMP50L	3.3 (29)	2.2	4.8 (42)	3.2	13.6	0.919	0.985
	CMP63S	2.9 (26)	2.15	4 (35)	3	12.9	1.148	1.489
	CMP63M	5.3 (47)	3.6	7.5 (66)	5.1	21.6	1.919	2.260
	CMP63L	7.1 (63)	4.95	10.3 (91.2)	7.2	29.7	2.689	3.030
4500	CMP40S	0.5 (4)	1.2	-	-	6.1	0.104	0.132
	CMP40M	0.8 (7)	0.95	-	-	6	0.148	0.176
	CMP50S	1.3 (12)	1.32	1.7 (15)	1.7	7	0.415	0.481
	CMP50M	2.4 (21)	2.3	3.5 (31)	3.35	13.1	0.667	0.733
	CMP50L	3.3 (29)	3.15	4.8 (42)	4.6	19.5	0.919	0.985
	CMP63S	2.9 (26)	3.05	4 (35)	4.2	18.3	1.148	1.489
	CMP63M	5.3 (47)	5.4	7.5 (66)	7.6	32.4	1.919	2.260
	CMP63L	7.1 (63)	6.9	10.3 (91.2)	10	41.4	2.689	3.030
6000	CMP40S	0.5 (4)	1.2	-	-	6.1	0.104	0.132
	CMP40M	0.8 (7)	1.1	-	-	6.9	0.148	0.176
	CMP50S	1.3 (12)	1.7	1.7 (15)	2.2	9	0.415	0.481
	CMP50M	2.4 (21)	3	3.5 (31)	4.4	17.1	0.667	0.733
	CMP50L	3.3 (29)	4.2	4.8 (42)	6.1	26	0.919	0.985
	CMP63S	2.9 (26)	3.9	4 (35)	5.4	23.4	1.148	1.489
	CMP63M	5.3 (47)	6.9	7.5 (66)	9.8	41.4	1.919	2.260
	CMP63L	7.1 (63)	9.3	10.3 (91.2)	13.5	55.8	2.689	3.030

CMP motor selection (AC 400 V system voltage)

1. Rated speed n_N = 3000 rpm:

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
CMP40S	M_{max} Nm (lb in)	1.5 (13)	1.7 (15)	1.9 (17)		1.9 (17)	1.9 (17)					
CMP40M	M_{max} Nm (lb in)	3.0 (27)	3.3 (29)	3.8 (34)		3.8 (3.4)						
CMP50S	M_{max} Nm (lb in)	4.5 (40)	5.0 (44)	5.2 (46)		5.2 (46)						
CMP50M	M_{max} Nm (lb in)	5.4 (48)	6.3 (56)	7.7 (68)	9.3 (82)	7.6 (67)	9.4 (83)	10.3 (91)				
CMP50L	M_{max} Nm (lb in)	5.9 (52)	6.9 (61)	8.7 (77)	10.7 (95)	8.4 (74)	11.0 (97)	13.1 (116)	15.4 (136)			
CMP63S	M_{max} Nm (lb in)	5.2 (46)	6.0 (53)	7.3 (65)	8.7 (77)	7.1 (63)	8.8 (78)	10.1 (89)	11.1 (98)			
CMP63M	M_{max} Nm (lb in)	6.0 (53)	7.1 (63)	8.9 (79)	11.1 (98)	8.7 (77)	11.3 (100)	13.7 (121)	17.0 (150)	20.0 (177)	21.4 (189)	
CMP63L	M_{max} Nm (lb in)			9.0 (80)	11.3 (100)	8.7 (77)	11.6 (103)	14.4 (127)	18.6 (165)	23.0 (204)	27.0 (239)	30.4 (269)

2. Rated speed n_N = 4500 rpm:

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
CMP40S	M_{max} Nm (lb in)	1.5 (13)	1.7 (15)	1.9 (17)		1.9 (17)	1.9 (17)						
CMP40M	M_{max} Nm (lb in)	3.0 (27)	3.3 (29)	3.8 (34)		3.8 (34)							
CMP50S	M_{max} Nm (lb in)	3.5 (31)	4.1 (36)	4.8 (42)	5.2 (46)	4.7 (42)	5.2 (46)						
CMP50M	M_{max} Nm (lb in)	4.1 (36)	4.8 (42)	6.0 (53)	7.4 (65)	5.9 (52)	7.6 (67)	9.0 (80)	10.3 (91)				
CMP50L	M_{max} Nm (lb in)	4.2 (37)	5.0 (44)	6.3 (56)	7.9 (70)	6.1 (54)	8.2 (73)	10.0 (89)	12.7 (112)	15.1 (134)	15.4 (136)		
CMP63S	M_{max} Nm (lb in)	3.8 (34)	4.5 (40)	5.6 (50)	6.8 (60)	5.4 (48)	7.0 (62)	8.2 (73)	9.9 (88)	11.1 (98)			
CMP63M	M_{max} Nm (lb in)			6.2 (55)	7.8 (69)	6.0 (53)	8.0 (71)	9.9 (88)	12.7 (112)	15.6 (138)	18.3 (162)	21.4 (189)	
CMP63L	M_{max} Nm (lb in)				8.3 (73)	6.4 (57)	8.6 (76)	10.7 (95)	14.1 (125)	17.8 (158)	21.6 (191)	28.2 (250)	30.4 (269)

3. Rated speed n_N = 6000 rpm:

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	0220
CMP40S	M_{max} Nm (lb in)	1.5 (13	1.7 (15)	1.9 (17)		1.9 (17)	1.9 (17)							
CMP40M	M_{max} Nm (lb in)	2.6 (23)	3.0 (27)	3.6 (32)	3.8 (34)	3.5 (31)	3.8 (34)							
CMP50S	M_{max} Nm (lb in)	2.9 (26)	3.3 (29)	4.1 (36)	4.8 (42)	4.0 (35)	4.9 (43)	5.2 (46)						
CMP50M	M_{max} Nm (lb in)		3.8 (34)	4.8 (42)	6.0 (53)	4.6 (41)	6.1 (54)	7.4 (65)	9.2 (81)	10.3 (91)				
CMP50L	M_{max} Nm (lb in)		3.8 (34)	4.8 (42)	6.1 (54)	4.7 (42)	6.3 (56)	7.8 (69)	10.2 (90)	12.5 (111)	14.7 (130)	15.4 (136)		
CMP63S	M_{max} Nm (lb in)		3.6 (32)	4.5 (40)	5.6 (50)	4.4 (39)	5.8 (51)	6.9 (61)	8.6 (76)	10.0 (89)	11.1 (98)			
CMP63M	M_{max} Nm (lb in)				6.3 (56)	4.8 (42)	6.5 (58)	8.0 (71)	10.4 (92)	13.0 (115)	15.6 (138)	20.0 (177)	21.4 (189)	
CMP63L	M_{max} Nm (lb in)						6.5 (58)	8.1 (72)	10.8 (96)	13.8 (122)	17.0 (150)	23.3 (206)	28.1 (249)	30.4 (269)

4.8 SL2 synchronous linear motors

NOTE

For detailed information on SL2 synchronous linear motors, refer to the operating instructions and the catalog "SL2 Synchronous Linear Motors". The documents are available for download from the homepage of SEW-EURODRIVE.

4.9 Overload capacity of the inverter

MOVIDRIVE® inverters permanently calculate the load on the inverter output stage (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 (→ section "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. Determining the overload capacity in the characterized time range (→ following figure):
   - Minutes: Overload diagrams (A) → page 302
   - Seconds: Seconds: Tables and formulas (B) → page 315
   - Fraction of a second: Overload diagrams (C) → page 317

A B C

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Heat sink time contant 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 fulfilled for periodic repetition of a load cycle:

- The temperature must be just below the critical heat sink temperature at the end of the overload time t_1.
- During the following low-load time t_2, the heat sink temperature drops to such a degree that another overload is possible for the duration t_1.

Figure 70 shows an example of such a load cycle. 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 70 , 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 70: Sample load cycle

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 $_{amb}$ and the output frequency f_A.

It is particularly important to take output frequencies f_A < 2 Hz into account for:

- Electrically-stopping hoists.
- Torque control at low speeds or at a standstill

	NOTE
	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.

MDX60B / 61B size 0: Guaranteed continuous output currents I_D depending on the output frequency f_A

Figure 71: Continuous output currents I_D for MOVIDRIVE® MDX60B / 61B size 0

ϑ_{amb} = Ambient temperature
V_1 = Mains voltage
f_A = Inverter output frequency
I_D = Inverter continuous output current
$I_{out\ 1}$ = Time-limited overload current of the inverter
I_N = Rated output current of inverter according to technical data

MDX61B sizes 1 - 6: Guaranteed continuous output currents I_D depending on the output frequency f_A

Figure 72: Continuous output currents I_D for MOVIDRIVE® MDX61B, sizes 1 - 6 (f_A = 16 kHz only for sizes 1 - 5)*

ϑ_{amb}	= Ambient temperature	I_D	= Inverter continuous output current
V_1	= Mains voltage	$I_{out\ 1}$	= Time-limited overload current of the inverter
f_A	= Inverter output frequency	I_N	= Rated output current of inverter according to technical data

Unit utilization

If 'P860/P861 PWM frequency 1/2' > 4 kHz is set in the VFC and F/f modes and 'P862/P863 PWM fix 1/2' is set to off, the inverter automatically reduces the PWM frequency in the event of a unit overload. 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. The inverter responds to a higher than permitted load with the 'F44 Unit utilization' fault message and immediate switch-off.

Temperature-controlled fan

The fans of the power section heat sink are subject to temperature-control. The fan is not switched on until above a heat sink temperature of ϑ = 45 °C.

Overload capacity in the minute range

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 $t_1 \geq 0.25 \times T$:

Figure 73: Sample overload diagram

The time axis is separated. The left part shows the overload time t_1 and the right part the low-load time t_2. The temperature profile of the maximum permitted overload current $I_{out\ 1}$ is shown above t_1 for the corresponding peripheral conditions. The temperature profiles of the various low-load currents $I_{out\ 2}$ are shown in a series of curves above t_2.

Using the sample data above and the load cycle from Figure 70 the overload capacity ($\rightarrow$ figure 73) is determined as follows:

- At overload time $t_1 = 0.75 \times T$ vertically upwards until the intersection with $I_{out\ 1}$.
- Horizontally to the right until the intersection with $I_{out\ 2} = 0.4 \times I_D$.
- 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 (√); all times t_2 to the left are not (!).

In the load cycle from Figure 70 $t_2 = 1.5 \times T$, 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 72 .

MDX60B/61B, BG0 overload capacity at 400 V / 25 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 74: Overload capacity at f_{PWM} = 4 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

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Figure 75: Overload capacity at f_{PWM} = 8 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 76: Overload capacity at f_{PWM} = 16 kHz (400 V / 25 °C)

MDX61B, BG 1-6 overload capacity at 400 V / 25 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 77: Overload capacity at f_{PWM} = 4 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

63458AXX

Figure 78: Overload capacity at f_{PWM} = 8 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 79: Overload capacity at f_{PWM} = 16 kHz (400 V / 25 °C)

MDX60B/61B, BG0 overload capacity at 400 V / 40 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 80: Overload capacity at f_{PWM} = 4 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

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Figure 81: Overload capacity at f_{PWM} = 8 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

Figure 82: Overload capacity at f_{PWM} = 16 kHz (400 V / 40 °C)

MDX61B,BG1-6 overload capacity at 400 V / 40 °C

Cycle frequency f_{PWM} = 4 kHz:

Figure 83: Overload capacity at f_{PWM} = 4 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

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Figure 84: Overload capacity at f_{PWM} = 8 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 85: Overload capacity at f_{PWM} = 16 kHz (400 V / 40 °C)

MDX60B/61B, BG0 overload capacity at 500 V / 25 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 86: Overload capacity at f_{PWM} = 4 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

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Figure 87: Overload capacity at f_{PWM} = 8 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 88: Overload capacity at f_{PWM} = 16 kHz (500 V / 25 °C)

MDX61B, BG 1-6 overload capacity at 500 V / 25 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 89: Overload capacity at f_{PWM} = 4 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 8 kHz:

63474AXX

Figure 90: Overload capacity at f_{PWM} = 8 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 91: Overload capacity at f_{PWM} = 16 kHz (500 V / 25 °C)

MDX60B/61B, BG0 overload capacity at 500 V / 40 °C

Cycle frequency f_{PWM} = 4 kHz:

Figure 92: Overload capacity at f_{PWM} = 4 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

Figure 93: Overload capacity at f_{PWM} = 8 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 94: Overload capacity at f_{PWM} = 16 kHz (500 V / 40 °C)

MDX61B, BG 1-6 overload capacity at 500 V / 40 °C

Cycle frequency f_{PWM} = 4 kHz:

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Figure 95: Overload capacity at f_{PWM} = 4 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 8 kHz:

63480AXX

Figure 96: Overload capacity at f_{PWM} = 8 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

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Figure 97: Overload capacity at f_{PWM} = 16 kHz (500 V / 40 °C)

Overload capacity in the second range

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:

$$t_2 > k \times t_1 \qquad k = \text{Overload factor}$$

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 ϑ = 40 °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 (→ Figure 72)
- Overload time t_1 = 30 s = 0.1 × T
- Low-load current $I_{out\,2}$ = 6 A = 0.4 × I_D → k = 0.778

Clock rate 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 × I_D	0.4 × I_D	0.6 × 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

Clock rate 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 × I_D	0.4 × I_D	0.6 × I_D	0.8 × 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

Clock rate 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 × I_D	0.4 × I_D	0.6 × I_D	0.8 × 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

MDX60B/61B, BG0 overload capacity at 400 V / 40 °C

Clock rate f_{PWM}	Contin. 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	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

Clock rate f_{PWM}	Contin. 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
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

Clock rate f_{PWM}	Contin. 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	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

Clock rate f_{PWM}	Contin. 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	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

Clock rate f_{PWM}	Contin. 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	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

Clock rate f_{PWM}	Contin. 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	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 (size 0: 200 % at PWM frequency 8kHz and 12k Hz; 133 % at PWM frequency 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 sizes 1 - 6 using the diagarms (→ following figure)
- For MDX60B/61B size 0 according to section "Overload capacity in the second range" (→ page)

The mean inverter output current $I_{out\ RMS}$ during the load cycle must not exceed a value.

Figure 98: Sample overload diagram for short overload time

The time axis is separated. The left part shows the overload time t_1 and the right part the low-load time t_2. The temperature profiles of the various low-load currents $I_{out\ 1}$ are shown in a series of curves above t1. The temperature profiles of the various low-load currents $I_{out\ 2}$ are shown in a series of curves above t2.

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 $I_{out\ 2} = 0.4 \times I_D$.

- 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 (√); 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:

$$I_{out\ 1} \times \frac{t_1}{t_1 + t_2} + I_{out\ 2} \times \frac{t_2}{t_1 + t_2} \leq I_{out\ RMS}$$

$$140\%\ I_D \times \frac{0.3\ s}{1.3\ s} + 40\%\ I_D \times \frac{1.0\ s}{1.3\ s} \leq 65\%\ I_D$$

$$32.31\%\ I_D + 30.77\%\ I_D = 63.08\%\ I_D \leq 65\%\ I_D$$

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The permitted mean inverter output current is $I_{out\ RMS} \leq 65\ \%\ I_D$. In the specified load cycle, $I_{out\ RMS} = 63.08\ \%\ I_D$. 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 $I_{out\ RMS} \leq 79\ \%\ I_D$.

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Figure 99: Brief overload capacity at f_{PWM} = 8 kHz (400 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 81\ \%\ I_D$.

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Figure 100: Brief overload capacity at f_{PWM} = 16 kHz (400 V / 25 °C)

MDX61B, BG 1-6 overload capacity at 400 V / 40 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 65\ \%\ I_D$.

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Figure 101: Brief overload capacity at f_{PWM} = 8 kHz (400 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 69\ \%\ I_D$.

Figure 102: Brief overload capacity at f_{PWM} = 16 kHz (400 V / 40 °C)

MDX61B, BG 1-6 overload capacity at 500 V / 25 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 80\ \%\ I_D$.

Figure 103: Brief overload capacity at f_{PWM} = 8 kHz (500 V / 25 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 82\ \%\ I_D$.

Figure 104: Brief overload capacity at f_{PWM} = 16 kHz (500 V / 25 °C)

MDX61B, BG 1-6 overload capacity at 500 V / 40 °C

Cycle frequency f_{PWM} = 8 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 67\ \%\ I_D$.

Figure 105: Brief overload capacity at f_{PWM} = 8 kHz (500 V / 40 °C)

Cycle frequency f_{PWM} = 16 kHz:

The permitted mean inverter output current is $I_{out\ RMS} \leq 69\ \%\ I_D$.

Figure 106: Brief overload capacity at f_{PWM} = 16 kHz (500 V / 40 °C)

4.10 Selecting the braking resistor

HAZARD!

The supply cables to the braking resistor carry a **high DC voltage (ca. DC 900 V)**.

Severe or fatal injuries from electric shock.

- The braking resistor cables must be suitable for this high DC voltage.
- Install the braking resistor cables according to the regulations.

WARNING!

The surfaces of the braking resistors get very hot when the braking resistors are loaded with P_{rated}.

Risk of burns and fire.

- Choose a suitable installation location. Braking resistors are usually mounted on top of the control cabinet.
- Do not touch the braking resistors.

NOTES

- The data applies to BW..., BW...-T and BW...-P braking resistors.
- For BW..., BW...-T and BW...-P braking resistors, plan for a load derating of 4% per 10 K from an ambient temperature of 40 °C (113 °F) Do not exceed a maximum ambient temperature of 80 °C.
- The overload factor of the BW..-T and BW...-P braking resistors is limited by using an integrated temperature relay:
  - BW...-T up to overload factor 12
  - BW...-P up to overload factor 40
- The **maximum permitted line length** between **MOVIDRIVE®** and the braking resistor is **100 m**.

Parallel connection

Two braking resistors with the same value 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. For the BW...-T BW...-P braking resistors, the temperature switch/overcurrent relay must be connected in series.

Peak braking power

Due to the DC link voltage and the resistance value, the peak braking power can be less than the load capacity of the braking resistor. The peak braking power is determined as follows:

$$P_{max} = \frac{U_{DC}^2}{R}$$

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U_{DC} is the maximum permitted DC link voltage. Its value is

- with MOVIDRIVE® MDX60/61B...-5_3 (400/500 V units) V_{DC} = DC 970 V and
- for MOVIDRIVE® MDX61B...-2_3 (AC 230 V units) V_{DC} = DC 485 V.

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

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			1820 419 8			1820 133 4	1820 417 1
Continuous braking power (= 100% cdf)	0.10 kW	0.45 kW	0.6 kW	0.23 kW	0.45 kW	0.8 kW	1.2 kW
Load capacity at 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	3.6 kW	0.58 kW	1.11 kW	4.8 kW	7.2 kW
6 % cdf	0.7 kW	2.00 kW	5.7 kW	1.00 kW	2.00 kW	7.6 kW	11 kW
	Observe **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}	2.4 A_{RMS}	0.6 A_{RMS}	1 A_{RMS}	3.4 A_{RMS}	4.2 A_{RMS}
Design	PTC	Flat-design	Wire resistor on ceramic core	Flat-design		Wire resistor on ceramic core	
Connections / Tightening torque	Cable	Cable	Ceramic terminals 2.5 mm^2 (AWG13) 0.5 Nm	Cable		Ceramic terminals 2.5 mm^2 (AWG13) 0.5 Nm	
Degree of protection	IP20	IP54	IP20 (when installed)	IP54		IP20 (when installed)	
Ambient temperature ϑ_U	–20 ... +40 °C						
Type of cooling	KS = Self-cooling						
For MOVIDRIVE® (recommended)	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	1820 134 2	1820 084 2	1820 135 0	1820 136 9	1820 415 5	1820 137 7
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)] 25 % cdf 12 % cdf 6 % cdf	1.2 kW 2.2 kW 3.8 kW 7.2 kW 11 kW	2.0 kW 3.6 kW 6.4 kW 12 kW 19 kW	4.0 kW 7.2 kW 12.8 kW 20 kW[2)] 20 kW[2)]	1.2 kW 2.1 kW 3.8 kW 7.2 kW 11.4 kW	2.6 kW 4.7 kW 8.3 kW 15.6 kW 24.0 kW[2)]	5.0 kW 8.5 kW 15.0 kW 24.0 kW[2)] 24.0 kW[2)]
	Observe **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	5 A_{RMS}	6.5 A_{RMS}	9.2 A_{RMS}	5.5 A_{RMS}	8.1 A_{RMS}	11.3 A_{RMS}
Design	Wire resistor on ceramic core					Grid resistor
Connections / Tightening torque	Ceramic terminals 2.5 mm^2 (AWG13) / 0.5 Nm BW347-T: Ceramic terminals 10 mm^2 (AWG18) / 1.6 Nm					M8 stud / 6 Nm
Degree of protection	IP20 (when installed)					
Ambient temperature ϑ_U	–20 ... +40 °C					
Type of cooling	KS = Self-cooling					
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.

Braking resistor type BW...	BW018-015			
Part number	821 684 3			
Braking resistor type BW...-T/-P	**BW018-015-P**	**BW018-035-T**	**BW018-075-T**	**BW915-T**
Part number	1820 416 3	1820 138 5	1820 139 3	1820 413 9
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)] 25 % cdf 12 % cdf 6 % cdf	1.5 kW 2.5 kW 4.5 kW 6.7 kW 11.4 kW	3.5 kW 5.9 kW 10.5 kW 15.7 kW 26.6 kW	7.5 kW 12.7 kW 22.5 kW 33.7 kW 52.2 kW[2)]	16 kW 27.2 kW 48 kW 62.7 kW[2)] 62.7 kW[2)]
	Observe **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	9.1 A_{RMS}	13.9 A_{RMS}	20.4 A_{RMS}	32.6 A_{RMS}
Design	Wire resistor on ceramic core	Grid resistor		
Connections / Tightening torque	BW018-015: Ceramic terminals 2.5 mm^2 (AWG13) / 0.5 Nm BW018-015-P: Terminal 2.5 mm^2 (AWG13) / 1 Nm	Bolt M8 / 6 Nm		
Degree of protection	IP20 (when installed)			
Ambient temperature ϑ_U	–20 ... +40 °C			
Type of cooling	KS = Self-cooling			
For MOVIDRIVE® (recommended)	0150/0220 and 2 × parallel with 0370/0450[3)]			0220

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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...-	BW012-025				
Part number	821 680 0				
Braking resistor type BW...-T/-P	**BW012-025-P**	**BW012-050T**	**BW012-100-T**	**BW106-T**	**BW206-T**
Part number	1820 414 7	1820 140 7	1820 141 5	1820 083 4	1820 412 0
Continuous braking power (= 100% cdf) Load capacity at 50 % cdf[1)] 25 % cdf 12 % cdf 6 % cdf	2.5 kW 4.2 kW 7.5 kW 11.2 kW 19.0 kW	5.0 kW 8.5 kW 15.0 kW 22.5 kW 38.0 kW	10 kW 17 kW 30 kW 45 kW 76 kW	13.5 kW 23 kW 40 kW 61 kW 102 kW	18 kW 30.6 kW 54 kW 81 kW 136.8 kW
	Observe **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	14.4 A_{RMS}	20.4 A_{RMS}	28.8 A_{RMS}	47.4 A_{RMS}	54.7 A_{RMS}
Design	Grid resistor				
Connections / Tightening torque	Ceramic terminals 2.5 mm^2 (AWG13) / 0.5 Nm BW012-025-P: Terminals 4 mm^2 (AWG12) / 1 Nm			Bolt M8 / 6 Nm	
Degree of protection	IP20 (when installed)				
Ambient temperature ϑ_U	–20 ... +40 °C				
Type of cooling	KS = Self-cooling				
For MOVIDRIVE® (recommended)	0300			0370...0750 and 2 × parallel with 0900/1100/1320[2)]	

1) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration $T_D \leq 120$ 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		822 422 6	822 423 4		
Braking resistor type BW...-T			BW039-012-T	BW039-026-T			BW018-015-P	BW018-035-T
Part number			1820 136 9	1820 415 5			1820 416 3	1820 138 5
Continuous braking power (= 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
Load capacity at 50 % cdf[1]	0.5 kW	1.1 kW	2.1 kW	4.6 kW	1.1 kW	2.1 kW	2.5 kW	5.9 kW
25 % cdf	1.0 kW	1.9 kW	3.8 kW	6.0 kW[2]	1.9 kW	3.8 kW	4.5 kW	10.5 kW
12 % cdf	1.8 kW	3.6 kW	6.0 kW[2]	6.0 kW[2]	3.6 kW	7.2 kW	6.7 kW	13.0 kW[2]
6 % cdf	2.8 kW	5.7 kW	6.0 kW[2]	6.0 kW[2]	5.7 kW	8.7 kW[2]	11.4 kW	13.0 kW[2]
	Observe **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	2.7 A_{RMS}	3.9 A_{RMS}	5.5 A_{RMS}	8.1 A_{RMS}	4.7 A_{RMS}	6.6 A_{RMS}	9.1 A_{RMS}	13.9 A_{RMS}
Design	Wire resistor						Grid resistor	
Connections / Tightening torque	Ceramic terminals 2.5 mm^2 (AWG12) / 0.5 Nm							M8 stud / 6 Nm
Degree of protection	IP20 (when installed)							
Ambient temperature ϑ_U	–20 ... +40 °C							
Type of cooling	KS = Self-cooling							
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

Braking resistor type BW...-T/-P	BW018-075-T	BW915-T	BW012-025-P	BW012-050-T	BW012-100-T	BW106-T	BW206-T
Part number	1820 139 3	1820 413 9	1820 414 7	1820 140 7	1820141 5	1820 083 4	1820 412 0
Continuous braking power (= 100% cdf)	7.5 kW	15.6 kW[2]	2.5 kW	5.0 kW	10 kW	13.5 kW	18 kW
Load capacity at 50 % cdf[1]	12.7 kW	15.6 kW[2]	4.2 kW	8.5 kW	17 kW	23 kW	30.6 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]
	Observe **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	20.4 A_{RMS}	32.6 A_{RMS}	14.4 A_{RMS}	20.4 A_{RMS}	28.8 A_{RMS}	47.4 A_{RMS}	54.7 A_{RMS}
Design	Grid resistor						
Connections / Tightening torque	M8 stud / 6 Nm						
Degree of protection	IP20 (when installed)						
Ambient temperature ϑ_U	–20 ... +40 °C						
Type of cooling	KS = Self-cooling						
For MOVIDRIVE® (recommended)	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 DC link voltage and resistance value.
3) When connected in parallel, the load capacity and trip current are doubled.

Overload factor for braking resistors

In braking operations within the cycle duration T_D (standard: $T_D \leq 120$ s), the resulting cdf braking power can be determined using the overload factor (→ following diagrams). Observe the conditional peak braking power due to the DC link voltage when determining the load capacity.

The cdf braking power is calculated using the following formula:

CDF braking power = continuous braking power × overload factor

Overload factor for flat-type braking resistors

Figure 107: Overload factor depending on the cyclic duration factor for flat-type braking resistors

Cyclic duration factor (cdf)	1 %	3 %	6 %	15 %	25 %	40 %	60 %	80 %	100 %
Overload factor (OF)	8.7	8.6	4	2.6	1.83	1.5	1.2	1.12	1

Overload factor for wire resistors on ceramic core

58875AXX

Figure 108: Overload factor depending on the cyclic duration factor for wire resistors

Cyclic duration factor (cdf)	1 %	3 %	6 %	15 %	25 %	40 %	60 %	80 %	100 %
Overload factor (OF)	30	15	9.5	5	3.2	2.2	1.5	1.12	1

Overload factor for grid resistors

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Figure 109: Overload factor depending on the cyclic duration factor for grid resistors

Cyclic duration factor (cdf)	1 %	3 %	6 %	15 %	25 %	40 %	60 %	80 %	100 %
Overload factor (OF)	20	12	7.6	4	3	2.2	1.5	1.12	1

Calculation example

Given:

- Peak braking power 13 kW
- Average braking power during the braking time 6.5 kW
- Cyclic duration factor cdf 6 %

Required:

- BW.. braking resistor

Procedure

1. **Determine the overload capacity.**

   First, determine the overload factor for a cyclic duration factor cdf of 6% from the respective diagrams.

2. **Calculate the continuous braking power.**

   Calculate the continuous braking power (= 100% cdf braking power) using the following formula:

   Mean braking power / overload factor

   Results:

   100 % cdf braking power for wire resistors: 685 W.

   100 % cdf braking power for grid resistors: 856 W.

3. **Determine the maximum braking resistor value depending on MOVIDRIVE® B .**

   The **maximum braking resistance value is 72** Ω for a peak braking power of 13 kW when using a **MDX60B/61B...-5_3 (AC 400/500 V unit)** (→ Peak braking power table).

   The **maximum braking resistance value is 18** Ω for a peak braking power of 13 kW when using a **MDX60B/61B...-2_3 (AC 230/500 V unit)** (→ Peak braking power table).

4. **Select the matching braking resistor:**

   Select the matching braking resistor from the assignment tables (AC 400/500 V units or AC 230V units) on the basis of the following aspects:

   – Max. permitted braking resistance value
   – MOVIDRIVE® B unit used

   Result when using, for example, MDX61B0110-5_3: BW039-012 (or braking resistor with higher power)

   Result when using, for example, MDX61B0110-2_3: BW018-015-T (or braking resistor with higher power)

4.11 Connecting AC brakemotors

For detailed information about the SEW brake system, refer to the "Gearmotors" catalog, which you can order from SEW-EURODRIVE.

SEW brake systems are disc brakes with a DC coil that release electrically and brake using spring force. A brake rectifier provides the brake with DC voltage.

	NOTE
	The brake rectifier must have a separate supply system cable for inverter operation; it must not be powered using the motor voltage!

Disconnecting the brake rectifier

The brake rectifier can be switched off, causing the brake to be applied, in two ways:

1. Cut-off in the AC circuit
2. Cut-off in the DC and AC circuit (faster cut-off)

Always switch off the brake on the DC and AC sides 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 DOØ2 '/Brake' is configured as an output for operating a relay with free-wheeling diode and a control voltage of DC +24 V / max. 150 mA / 3.6 W. A power contactor can be controlled directly with a DC 24 V coil voltage or the BMK brake rectifier. This power contactor is used to switch 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 in the case of SEW-EURODRIVE motors with a higher number of poles and non-SEW motors.

Brake parameters

	NOTE
	The brake parameters are adapted to the brake activation arrangement shown in the wiring diagram. If the values set for the brake release and application times are too short, e.g. for long response times in the brake control system, hoists, for example, may sag.

4.12 Permitted voltage systems for MOVIDRIVE® B

	NOTE
	MOVIDRIVE® B is intended to be operated on TN and TT voltage supply systems with a directly grounded star point. Operation on voltage supply systems with a non-grounded star point (for example IT power systems) is also permitted. In such cases, SEW-EURODRIVE recommends using earth-leakage monitors with pulse-code measurement. Using such devices prevents the earth-leakage monitor from mis-tripping due to the ground capacitance of the inverter. The mains voltage tolerance (short-term overvoltage or undervoltage) must not exceed 10%.

4.13 Input contactors and input fuses

Input contactor

- Only use input contactors of utilization category AC-3 (EN 60947-4-1).

	STOP!
	• Do not use the **input contactor K11** (→ MOVIDRIVE® MDX60B/61B operating instructions, section "Wiring diagram for basic unit") for jog mode but **only to switch the inverter on and off**. For jog mode, use the commands "Enable/Stop", "CW/Stop" or CCW/Stop". • Observe a minimum switch-off time of 10 s for the supply system contactor K11.

Mains fuse types

Line protection types in operation classes gL, gG:

- Rated fusing voltage ≥ Rated supply voltage
- Depending on the inverter utilization, the rated fusing current has to be designed for 100 % or 125 % of the rated inverter currents.

Line protection switch with characteristics B, C:

- Line protection rated voltage ≥ rated supply voltage
- The rated voltage of the line protection switch must be 10 % above the rated inverter current.

4.14 Supply system cables and motor cables

Special regulations

Comply with the regulations issued by **specific countries and for specific machines** regarding fusing and selecting the supply and motor cables. If required, also adhere to the notes on **UL compliant installation** (→ Section "UL compliant installation").

Line cross sections and fusing

SEW-EURODRIVE proposes the following line cross sections and fusing, assuming the use of single-core copper cables with PVC insulation laid in cable ducts, an ambient temperature of 25 °C and rated system currents of 100 % of the rated inverter current:

AC 400/500 V units metric, V_{supply} = 3 × AC 400 V:

MDX60/61B...-5A3	0005	0008	0011	0014	0015	0022	0030	0040
Size	0S		0M		1			
Fuses F11/F12/F13 I_N	16 A				16 A			
Supply system cable L1/L2/L3	1.5 mm²				1.5 mm²			
PE conductor	2 × 1.5 mm² oder 1 × 10 mm²				2 × 1.5 mm² oder 1 × 10 mm²			
Motor cable U/V/W	1.5 mm²				1.5 mm²			
Unit terminal cross section of the power section	Separable terminal strip 4 mm² conductor end sleeve DIN 46228				Separable terminal strip 4 mm² conductor end sleeve DIN 46228			
Tightening torque	0.6 Nm							

MDX61B...-503	0055	0075	0110	0150	0220	0300
Size	2S		2	3		
Fuses F11/F12/F13 I_N	16 A		25 A	35 A	50 A	63 A
Supply system cable L1/L2/L3	2.5 mm²		4 mm²	6 mm²	10 mm²	16 mm²
PE conductor	2 × 4 mm² oder 1 × 10 mm²			2 × 6 mm² oder 1 × 10 mm²	1 × 10 mm²	1 × 16 mm²
Motor cable U/V/W	2.5 mm²		4 mm²	6 mm²	10 mm²	16 mm² 1)
Unit terminal cross section of the power section	Terminal blocks 4 mm² conductor end sleeves DIN 46228		M4 screw and washer assembly with terminal clip 4 mm² conductor end sleeve DIN 46228 6 mm² crimp cable lug DIN 46234	M6 screw and washer assembly with washer max. 25 mm² Crimp cable lug DIN 46234		
Tightening torque	1.5 Nm			3.5 Nm		

1) With synchronous servo drives: Use motor with terminal box!

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
Supply system cable L1/L2/L3	25 mm²	35 mm²		50 mm²	70 mm²	95 mm²	150 mm²
PE conductor	1 × 16 mm²			25 mm²	35 mm²	50 mm²	70 mm²
Motor cable U/V/W	25 mm² 1)	35 mm²		50 mm²	70 mm²	95 mm²	150 mm²
Unit terminal cross section of the power section	M10 bolt with nut max. 70 mm² Press cable lug DIN 46235				M12 bolt with nut max. 185 mm² Press cable lug DIN 46235		
Tightening torque	14 Nm				20 Nm		

1) With synchronous servo drives: Use motor with terminal box!

AC 230 V units metric, V_{supply} = 3 × 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
Supply system cable L1/L2/L3	1.5 mm^2		4 mm^2	4 mm^2	6 mm^2
PE conductor	2 × 1.5 mm^2 1 × 10 mm^2		2 × 4 mm^2 1 × 10 mm^2	2 × 4 mm^2 1 × 10 mm^2	2 × 6 mm^2 1 × 10 mm^2
Motor cable U/V/W	1.5 mm^2		4 mm^2	4 mm^2	6 mm^2
Unit terminal cross section of the power section	Separable 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 lug DIN 46234	
Tightening torque	0.6 Nm				

MDX61B...-2_3	0110	0150	0220	0300
Size	3		4	
Fuses F11/F12/F13 I_N	50 A	63 A	80 A	100 A
Supply system cable L1/L2/L3	10 mm^2	16 mm^2	25 mm^2	35 mm^2
PE conductor	1 × 10 mm^2	1 × 16 mm^2	1 × 16 mm^2	1 × 16 mm^2
Motor cable U/V/W	10 mm^2	16 mm^2	25 mm^2	35 mm^2
Unit terminal cross section of the power section	M6 screw and washer assembly with washer max. 25 mm^2 Crimp cable lug DIN 46234		M10 bolt with nut max. 70 mm^2 Press cable lug DIN 46235	
Tightening torque	3.5 Nm		14 Nm	

Smallest bending space (EN 61800-5-1)

As stipulated in EN 61800-5-1, the distance between a power connection terminal and an obstruction toward which the wire is directed on leaving the terminal must correspond with the minimum values given in the table below.

Cable cross section in mm^2	Smallest wire bending space in mm Wires per connection terminal		
	1	**2**	**3**
10 ... 16	40	-	-
25	50	-	-
35	65	-	-
50	125	125	180
70	150	150	190
95	180	180	205
120	205	205	230
150	255	255	280
185	305	305	330

AC 400/500 V units according to USA NEC, U_{supply} = 3 × AC 460 V:

MDX61B...-5A3	0005	0008	0011	0014	0015	0022	0030	0040
Size	0S		0M		1			
Fuses F11/F12/F13 I_N	6 A	6 A		6 A	6 A	10A		15 A
Mains L1/L2/L3	AWG14				AWG14			
PE conductor	AWG14				AWG14			
Motor cable U/V/W	AWG14				AWG14			
Unit terminal cross section of the power section	Separable terminal strip AWG10 conductor end sleeve				Separable terminal strip AWG10 conductor end sleeve			
Tightening torque	0.6 Nm							

MDX61B...-503	0055	0075	0110	0150	0220	0300
Size	2S		2	3		
Fuses F11/F12/F13 I_N	20 A		30 A	40 A	60 A	80 A
Mains L1/L2/L3	AWG12		AWG10	AWG8	AWG6	AWG4
PE conductor	AWG12		AWG10	AWG10		AWG8
Motor cable U/V/W	AWG12		AWG10	AWG8	AWG6[1)]	AWG4[1)]
Unit terminal cross section of the power section	Terminal blocks 4 mm^2 conductor end sleeves DIN 46228		M4 screw and washer assembly with terminal clip AWG10 conductor end sleeve AWG10 crimp cable lug	M6 screw and washer assembly with washer max. AWG4 crimp cable lug		
Tightening torque	1.5 Nm			3.5 Nm		

1) With synchronous servo drives: Use motor with terminal box!

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 cable L1/L2/L3	AWG4	AWG3	AWG1	AWG2/0	AWG2/0	AWG3/0	AWG4/0
PE conductor	AWG8	AWG6	AWG6		AWG6	AWG6	AWG4
Motor cable U/V/W	AWG4 [1)]	AWG3	AWG1	AWG2/0	AWG2/0	AWG3/0	Kcmil 250
Unit terminal cross section of the power section	M10 bolt with nut Max. AWG2/0 crimp cable lug				M12 bolt with nut max. Kcmil 350 Crimp cable lug		
Tightening torque	14 Nm				20 Nm		

1) With synchronous servo drives: Use motor with terminal box!

AC 230 V units to USA NEC, V_{supply} = 3 × 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 L1/L2/L3	AWG14		AWG12	AWG10	
PE conductor	AWG14		AWG12	AWG10	
Motor cable U/V/W	AWG14		AWG12	AWG10	
Unit terminal cross section of the power section	Separable terminal strip AWG10 conductor end sleeve			M4 screw and washer assembly with terminal clip AWG10 conductor end sleeve AWG10 crimp cable lug	
Tightening torque	0.6 Nm				

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 L1/L2/L3	AWG6	AWG4	AWG4	AWG3
PE conductor	AWG10	AWG8	AWG8	AWG6
Motor cable U/V/W	AWG6	AWG4	AWG4	AWG3
Unit terminal cross section of the power section	M6 screw and washer assembly with washer max. AWG4 crimp cable lug		M10 bolt with nut Max. AWG2/0 crimp cable lug	
Tightening torque	3.5 Nm		14 Nm	

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 limiting values, but exclusively by the voltage drop along the motor feeder.
- 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 (exception: 200 m for HTL encoders with interface adapter DWE12B)

The following information provides approximate values:

MOVIDRIVE® MDX60/61B...-5_3:

MDX60/61B...-5_3 at V_{supply} = 3 × AC 400 V		**0005...0014**	**0015**	**0022**	**0030**	**0040**	**0055**	**0075...1320**
		Recommended maximum motor cable length in m						
		Shielded cable						
PWM frequency (P860/P861)	**4 kHz**	120	120	200	250	300	300	400
	8 kHz	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 line						
PWM frequency (P860/P861)	**4 kHz**	360	360	600	750	900	900	1200
	8 kHz	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

MOVIDRIVE® MDX61B...-2_3:

MDX61B...-2_3 at V_{supply} = 3 × AC 230 V		**0015**	**0022**	**0037**	**0055**	**0075**	**0110 ... 0300**
		Recommended maximum motor cable length in m					
		Shielded cable					
PWM frequency (P860/P861)	**4 kHz**	120	200	250	300	300	400
	8 kHz	80	120	150	250	250	300
	12 kHz	50	80	120	200	200	250
	16 kHz	40	60	100	150	150	200
		Unshielded line					
PWM frequency (P860/P861)	**4 kHz**	360	600	750	900	900	1200
	8 kHz	240	360	450	750	750	900
	12 kHz	150	240	360	600	600	750
	16 kHz	120	180	300	450	450	600

NOTE

SEW-EURODRIVE recommends not to use a ground fault circuit interrupter with long motor cables. The leakage currents caused by cable capacitance may cause mis-tripping.

Voltage drop

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

The expected voltage drop can be determined using the following tables (the voltage drop can be calculated in proportion to the length if the cables are shorter or longer).

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 ΔV in V with length = 100 m and ϑ = 70 °C																		
1.5 mm²	5.3	8	10.6	13.3	17.3	21.3	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
2.5 mm²	3.2	4.8	6.4	8.1	10.4	12.8	16	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
4 mm²	1.9	2.8	3.8	4.7	6.5	8.0	10	12.5	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
6 mm²					4.4	5.3	6.4	8.3	9.9	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
10 mm²						3.2	4.0	5.0	6.0	8.2	10.2	1)	1)	1)	1)	1)	1)	1)	1)
16 mm²								3.3	3.9	5.2	6.5	7.9	10.0	1)	1)	1)	1)	1)	1)
25 mm²									2.5	3.3	4.1	5.1	6.4	8.0	1)	1)	1)	1)	1)
35 mm²											2.9	3.6	4.6	5.7	7.2	8.6	1)	1)	1)
50 mm²														4.0	5.0	6.0	1)	1)	1)
70 mm²																	4.6	1)	1)
95 mm²																	3.4	4.2	1)
150 mm²																		2.7	3.3
185 mm²																			2.7

1) Load not permitted according to IEC60364-5-52.

Line cross section	Load with I in A =																		
	4	**6**	**8**	**10**	**13**	**16**	**20**	**25**	**30**	**40**	**50**	**63**	**80**	**100**	**125**	**150**	**200**	**250**	**300**
Copper	Voltage drop ΔV in V with length = 100 m and ϑ = 70 °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_{mains} = AC 460 V.

4.15 Group drive in VFC mode

In VFC & GROUP operating mode, a group of asynchronous motors can be operated on one inverter. In this operating mode, the inverter operates without slip compensation and with a constant V/f ratio. The motors are operated without encoder feedback.

	NOTE
	The parameter settings apply to all connected motors.

Motor currents

The total of the rated motor currents must not exceed the rated output current of the inverter.

Motor lines and fusing

Comply with the regulations issued by **specific countries and for specific machines** regarding fusing and selecting the supply and motor cables.

The permitted length of all motor cables connected in parallel is determined as follows:

$$l_{tot} \leq \frac{l_{max}}{n}$$

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l_{tot} = Total length of the motor leads connected in parallel

l_{max} = Recommended maximum motor lead length (→ page 336)

n = Number of motors connected in parallel

No additional fusing is required if the cross section of the motor line corresponds to that of the supply system lead. If the cross section of the motor cable is smaller than that of the supply system cable, you have to protect the motor cable against short-circuit for the relevant cross section. Motor protection switches are suitable for this purpose.

Motor size

The motors in a group must not be more than three motor types apart.

Output filter

An HF... output filter is required if the maximum motor cable length (l_{max}) given in the table "Permitted motor cable lengths" is exceeded. This may be the case in large groups (n) or when there are long motor cable lengths connected in parallel (l_{tot}). In this case, the maximum motor line length is not limited by the limit value given in the table but by the voltage drop on the motor line. The sum of the rated motor currents must not exceed the rated through current of the output filter.

4.16 Connecting explosion-proof AC motors

Observe the following instructions when connecting explosion-proof AC motors to MOVIDRIVE® B inverters:

- The inverter must be installed outside the potentially explosive area.
- 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 of MOVIDRIVE® B must not be used for thermal monitoring of the motor. Use a TF/TH trip switch which is approved for use in potentially explosive atmospheres for thermal monitoring.
- If the motor is equipped with speed feedback, the speed sensor must also be approved for use in potentially explosive atmospheres. The tachometer can be directly connected to MOVIDRIVE® B.

	NOTE
	For more information on the operation of explosion-proof AC motors, refer to the "Explosion-Proof AC Motors, Asynchronous Servomotors" operating instructions. You can order the operating instructions from SEW-EURODRIVE.

4.17 EMC-compliant installation according to EN 61800-3

The designated use of drive systems with MOVIDRIVE® is as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives." Provided the information relating to EMC compliant installation is observed, 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.

MOVIDRIVE® MDX60/61B 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 industrial environments. In industrial environments, it may be possible to dispense with the measures listed below depending on the situation of the supply system (mains) and the system configuration.

Class C2 limit

Three options are available for EMC-compliant installation in accordance with EN 55011, **class C2 limit**, depending on the machine configuration:

Class C2 limit	on the motor end	on the supply end	
	Sizes 0 to 6	Sizes 0 to 2	Sizes 3 to 6
1. Option	HD... output choke	No measure required	NF...-... line filter
2. Option	Shielded motor cable	No measure required	NF...-... line filter
3. Option	HF... output filter	No measure required	NF...-... line filter

Class C1 limit

Three options are available for EMC-compliant installation in accordance with EN 61800-3, **class C1 limit**, depending on the machine configuration:

Class C1 limit	on the motor end	on the supply end
	Sizes 0 to 5	Sizes 0 to 5
1. Option	HD... output choke	NF...-... line filter
2. Option	Shielded motor cable	NF...-... line filter
3. Option	HF... output filter	NF...-... line filter

IT systems

	NOTE
	No EMC limits are specified for interference emission in voltage supply systems without a grounded star point (IT systems).

Block diagram of class C1 limit

Figure 110: EMC-compliant installation according to class C1 limit

(1) = 1. Possible solution with HD... output choke

(2) = 2. Possible solution with shielded motor line

(3) = 3. Possible solution with HF... output filter (see chapter "HF output filter")

Refer to the publication entitled "Drive Engineering - Practical Implementation, Electromagnetic Compatibility" for more information. The publication can be ordered from SEW-EURODRIVE.

4.18 HF output filter type

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 start function is not possible with HF.. output filter

Installation, connection and operation

	NOTES
	• 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 inverter and output filter to the absolutely necessary length. Maximum 1 m with an unshielded cable and 10 m for a shielded cable. • An unshielded motor line 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 together 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 to 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).

$V_{DC\ link}$ connection

Operation without $V_{DC\ link}$ connection:

- Approved only for PWM frequency 4 kHz or 8 kHz.

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Figure 111: HF...-... output filter connection without $V_{DC\ link}$ connection

NOTES

Operation with $V_{DC\ link}$ connection (Connection of inverter terminal + R with HF-503 terminal V5 or HF-403 terminal 7):

- Approved only for PWM frequency 12 kHz or 16 kHz. Note that increased losses (= power reduction) occur in the inverter when operating with 12 kHz or 16 kHz.
- Optimized grounded filter effect.
- Higher filter effect in the low-frequency range (≤ 150 kHz).
- Set PMW fix = ON; the inverter must not be able to reduce the PWM frequency automatically
- Strictly observe the following for HF...-403: $V_{DC\ link}$ connection only permitted if V_{mains} ≤ AC 400 V, not with V_{mains} = AC 500 V.
- The $V_{DC\ link}$ 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}	V_{mains} = 3 × AC 230 V	V_{mains} = 3 × AC 400 V	V_{mains} = 3 × 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 112: HF...-... output filter connection with $V_{DC\ link}$ connection

The procedure for selecting the PWM frequency and checking the inverter is summarized in the following figure.

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4.19 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 mm^2 (AWG24...12)
  - Double core 0.20...1 mm^2 (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 setpoint potentiometer with R = 5 kΩ.
- If necessary, potentiometer setpoints are switched using the 10 V voltage rather than via the wiper lead.

Figure 113: Switch potentiometer setpoint

- Never connect 0 V cables (AGND, DGND, DCOM) for generating signals. The 0 V cables of several electrical units which are connected 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 mm^2 (AWG16) cross section from a central point to each individual unit by the shortest possible route.
- If coupling relays are used, they should always 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 voltage up to DC 30 V.
- The inverter starts a self-test (ca. 3 s) when the power supply or 24 V supply is connected. All signal outputs have the level '0' throughout the self-test.
- DC 24 V voltage supply VI24:

  To EN 61131-2, V_N = +24 V –15 % / +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.

4.20 External DC 24 V voltage supply

General information

The internal switched-mode power supply of MOVIDRIVE® B has a maximum power of 29 W. An external DC 24 V power supply unit must be connected if a higher power is needed due to installed options. **In this case, switch on the external DC 24 V power supply unit prior to the input contactor or simultaneously with the input contactor.**

The following tables show the power demand of the MOVIDRIVE® units without options and the power demand of the individual options. MOVIDRIVE® B without option does not require external DC 24 V supply.

The following conditions apply to the information about the power demand without option:

- The DC 24 V outputs (VO24) are not subject to load.
- Binary outputs DBØØ und DOØ2 ... DOØ5 are not subject to load.

The following conditions apply to the information about the DEH11B and DER11B options:

- The motor encoder/resolver is supplied from MOVIDRIVE® B.
- An external encoder (synchronous encoder) is not connected to X14. Observe the power ratings of the manufacturer when connecting an external encoder (approx. 4 W with SEW encoder).

Power demand

The power values of the options are basic values **without** load on the inputs and outputs.

NOTES

- The load of the outputs depends on the connected consumer.
- The binary inputs have an internal resistance of 3 kΩ. This results in a power demand of 0.2 W per terminal.

  You have to take this power into account when you supply terminals via the DC 24 V output of the MOVIDRIVE® B unit.
- The power ratings of the DIP11B and DRS11B options do not include the voltage supply of the encoder. The encoders and binary outputs of the DIP11B and DRS11B options are only supplied with voltage if DC 24 V is connected to X10:9 (VI24) of the MOVIDRIVE® B unit. You have to take the additional power into account when the MOVIDRIVE® B is to provide the voltage supply for these options. Note that MOVIDRIVE® B delivers a maximum total current of DC 400 mA for the DC 24 V outputs.

- DC 24 V power demand of MOVIDRIVE® MDX60/61B **without option**:

Size MDX60B/61B	DC 24 V power demand without option
0	17.6 W
1	
2, 2S	
3	23.6 W
4	25.6 W
5	
6	

- Additional DC 24 V power demand of MOVIDRIVE® MDX60/61B **with option** (size 0: only available with option-capable MDX61B units):

Additional DC 24 V power demand with installed option									
DEH11B DEH21B	**DER11B**	**Fieldbus options[1)]**	**DIO11B**	**DRS11B DIP11B**	**DHP11B**	**OST11B**	**DHE41B**	**DHF41B**	**DHR41B**
5 W	6 W	3 W	6 W	2.5 W	4.5 W	1.5 W	6.5 W	8 W	9.5 W

1) Fieldbus options are: DFP21B, DFI11B, DFI21B, DFE11B, DFE12B, DFE13B, DFE32B, DFE33B, DFE24B , DFD11B, DFC11B, DFS..B

- The safety monitor options DCS21B/31B always require external DC 24 V voltage supply.

Example 1

MOVIDRIVE® MDX61B0022-5A3-4-00 (size 1) with fieldbus interface option type DFI11B. MOVIDRIVE® B supplies the binary inputs DI00 (controller inhibit), DI01 (CW/Stop), DI02 (CCW/Stop), DI03 (Enable/Stop) with voltage. The motor brake is controlled via DB00. The coil of the brake relay requires DC 100 mA at DC 24 V.

- Calculating the total power demand:
  - Power demand of the basic unit: 17.6 W
  - Power demand of the DFI11B option: 3 W
  - Power demand of the binary inputs: 4 x 0.2 W = 0.8 W
  - Power demand of the brake coil on DB00; 24 V x 0.1 A = 2.4 W

  The total power demand is 23.8 W. No external DC 24 V voltage supply is required in this case.

Example 2

MOVIDRIVE® MDX61B0110-5A3-4-00 (size 2) with the options HIPERFACE® encoder card DEH11B, fieldbus interface DFP21B and input/output card DIO11B. Four inputs of the basic unit and four inputs of the DIO11B option are used. The motor brake is controlled via terminal DB00. The coil of the brake relay requires DC100 mA at DC 24 V. Additionally, six outputs of the DIO11B option are subject to a load of DC25 mA each.

- Calculating the total power demand:
  - Power demand of the basic unit: 17.6 W
  - Power demand of the DEH11B option: 5 W
  - Power demand of the DFP21B option: 3 W
  - Power demand of the DIO11B option without terminals: 6 W
  - Power demand of the inputs (basic unit + DIO11B): 8 x 0.2 W = 1.6 W
  - Power demand of the brake coil on DB00; 24 V x 0.1 A = 2.4 W
  - Power demand of the binary outputs: 6 x 24 V x 0.025 A = 3.6 W

  The total power demand is 39.2 W. An external DC 24 V voltage supply is required in this case.

4.21 Parameter set switchover

This function serves for operating two motors on one inverter using two different parameter sets.

The parameter set is switched over via binary input or fieldbus. A binary input must be programmed to the 'PARAM. SWITCHOVER' function (→ P60_/P61_) for this purpose. You can then change from parameter set 1 to 2 and vice versa in INHIBITED inverter status.

Function	Effect at	
	"0" signal	"1" signal
PARAM. SELECT	Parameter set 1 active	Parameter set 2 active

NOTES

- In operation with encoder feedback, switching between the parameter sets must not be faster than every 2 seconds. The reason is to ensure that the encoders can be initialized.
- A changeover contactor should be provided for each of the two motor leads when two motors are operated alternately on the same inverter with the parameter set switchover function in use (→ P60_/P61_ PARAM. SWITCHOVER). Switch changeover contactors only when the unit is inhibited!
- Parameter set 2 allows for VFC operating modes without speed control only. Speed control or CFC and SERVO operating modes are not possible.

4.22 Priority of the operating states and interrelation between control signals

Priority of the operating states

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Figure 114: Priority of the operating states

Interrelation between control signals

The following table shows the interrelation between control signals. "/Controller inhibit" is programmed to binary input DIØØ and cannot be changed. The other control signals are only in effect if a binary input is programmed to this function (→ parameter P60_).

/Controller inhibit (DIØØ)	Binary input is programmed to				Inverter status
	Enable/ 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 enabled
"1"	"1"	"1"	"0"	"1"	CCW enabled

1) Not relevant if "/Controller inhibit (DIØØ)" = "0"
2) Not relevant if "Enable/Stop" = "0"
3) Not relevant if "/Hold control" = "0"

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Figure 115: Interrelation between control signals

* If a binary input is programmed to this function.

4.23 Limit switches

Limit switch processing

Limit switch processing makes sure that the travel range of a drive is observed. To do this, it is possible to program the binary inputs to the functions "/LS CW" (limit switch CW) and "/LS CCW" (limit 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 activated) → 24 V signal
- Limit switch contacted (= actuated) → 0 V signal
- The limit switches must supply a '1' signal continuously in the travel range.

Limit switch contacted ("0"-signal)

- The drive is stopped at the emergency ramp t14/t24.
- When brake function is activated, the brake is applied.
- 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).

Clearing from limit switch

- The inverter must be enabled at the binary inputs.
- Hold control must be inactive.
- The inverter receives a setpoint value from the setpoint source that guides it in the right direction.
- When the setpoint stop function is activated: Setpoint > start setpoint

Behavior of the drive when moving clear

- Once a limit switch is hit, the drive can be moved clear of the limit switch in the other direction.
- When the brake function is activated, the brake is first released and then the drive is moved clear ('0' → '1' signal). .

If the drive leaves the limit switch range without having been moved clear of the switch automatically, for example when the drive is moved manually, the drive can still be moved afterwards in the standard operating mode.

Limit switch monitoring

- The inverter monitors whether the limit switches are missing, whether there is a break in a wire or whether the limit switches have been mixed up. F280
- If this is the case, the inverter triggers an emergency stop and displays fault F27, "Limit switches missing."

5 Serial Communication

5.1 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 of the master/slave structure via RS-485 using a master (single master) and a maximum of 31 slave stations (SEW inverters).
- Support of the 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.

6 General Information

6.1 Structure of the safety notes

The safety notes in these operating instructions are structured as follows:

Symbol	SIGNAL WORD!
	Nature and source of hazard. Possible consequence(s) if disregarded. • Measure(s) to avoid the hazard.

Symbol	Signal word	Meaning	Consequences if disregarded
Example: General hazard Specific hazard, e.g. electric shock	HAZARD!	Imminent hazard	Severe or fatal injuries
	WARNING!	Possible hazardous situation	Severe or fatal injuries
	CAUTION!	Possible hazardous situation	Minor injuries
STOP	STOP!	Possible damage to property	Damage to the drive system or its environment
	NOTE	Useful information or tip. Simplifies handling of the drive system.	

6.2 Rights to claim under warranty

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

Make sure that the operating instructions are available to persons responsible for the system and its operation as well as to persons who work independently on the unit. You must also ensure that the documentation is legible.

6.3 Exclusion of liability

You must comply with the information contained in these operating instructions to ensure safe operation of the MOVIDRIVE® MDX60B/61B inverters and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

7 Safety Notes

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

7.1 General information

Never install or start up damaged products. Submit a complaint to the shipping company immediately in the event of damage.

During operation, inverters can have live, bare and movable or rotating parts as well as hot surfaces, depending on their enclosure.

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

Refer to the documentation for additional information.

7.2 Target group

Only qualified personnel is authorized to install, startup or service the units or correct unit faults (observing IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 as well as national accident prevention guidelines).

Qualified electricians in the context of these basic safety notes are persons familiar with installation, assembly, startup and operation of the product who possess the required qualifications.

Any activities regarding transportation, storage, operation, and disposal must be carried out by persons who have been instructed appropriately.

7.3 Designated use

Drive inverters are components intended for installation in electrical systems or machines.

In case of installation in machines, startup of the drive inverters (meaning the start of proper use) is prohibited until it is determined that the machine meets the requirements stipulated in the EC Directive 98/37/EC (machine guideline); observe EN 60204.

Startup (i.e. the start of designated use) is only permitted under observance of the EMC directive (89/336/EEC).

The drive inverters meet the requirements stipulated in low voltage guideline 2006/95/EC. The harmonized standards of the EN 61800-5-1/DIN VDE T105 series in connection with EN 60439-1/VDE 0660 part 500 and EN 60146/VDE 0558 are applied to these drive inverters.

Technical data and information on the connection requirements are provided on the nameplate and in the documentation; these must be observed under all circumstances.

Safety functions

MOVIDRIVE® MDX60/61B inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel.

For safety applications, refer to the information in the following publications:

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

7.4 Transportation, storage

You must observe the notes on transportation, storage and proper handling. Observe the climatic conditions as stated in the section "General technical data."

7.5 Installation

The units must be installed and cooled according to the regulations and specifications in the corresponding documentation.

Protect the inverters from excessive strain. Ensure that components are not deformed and/or insulation spaces are maintained, particularly during transportation. Avoid contact with electronic components and contacts.

Inverters contain components that can be damaged by electrostatic energy and improper handling. Prevent mechanical damage or destruction of electric components (may pose health risk).

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

- Use in potentially explosive areas
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications which are subject to mechanical vibration and impact loads in excess of the requirements in EN 61800-5-1.

7.6 Electrical connection

Observe the applicable national accident prevention guidelines when working on live drive inverters (for example, BGV A3).

Electrical installation is to be carried out in compliance with pertinent regulations (e.g. cable cross sections, fusing, protective conductor connection). Additional information is contained in the documentation.

You will find notes on EMC-compliant installation, such as shielding, grounding, arrangement of filters and routing of lines, in the documentation of the drive inverters. Always observe these notes even with inverters bearing the CE marking. The manufacturer of the system or machine is responsible for maintaining the limits established by EMC legislation.

Protective measures and protection devices must comply with the regulations in force (e.g. EN 60204 or EN 61800-5-1).

Required preventive measure: grounding the unit.

7.7 Safe disconnection

The unit meets all requirements for safe disconnection of power and electronic connections in accordance with EN 61800-5-1. All connected circuits must also satisfy the requirements for safe disconnection.

7.8 Operation

Systems with integrated drive inverters must be equipped with additional monitoring and protection devices, if necessary, according to the applicable safety guidelines, such as legislation governing technical equipment, accident prevention regulations, etc. Changes to the inverter using the operating software are permitted.

Do not touch live components or power connections immediately after disconnecting the inverters from the supply voltage because there may still be some charged capacitors. Note the respective labels on the inverter.

Keep all covers and doors closed during operation.

If the operation LED and other display elements are no longer illuminated, this does not indicate that the unit has been disconnected from the power supply and no longer carries any voltage.

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

8 Unit Design

8.1 Unit designation, nameplates and scope of delivery

Example: Unit designation

MDX60 B 0011 - 5 A 3 - 4 00

Variant	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 C1 A = Radio interference suppression C2 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 size 0

The **system nameplate** for MDX60B/61B.. size 0 is attached to the side of the unit.

52246AXX

Example: Nameplate for BW090-P52B braking resistor

The braking resistor BW090-P52B is only available for MDX60B/61B size 0.

54522AXX

Example: System nameplate for sizes 1 - 6

For MDX61B.. sizes 1 - 6, the **system nameplate** is attached to the side of the unit.

56493AXX

Example: Nameplate for power section sizes 1 - 6

For MDX61B.. sizes 1-6, the **nameplate of the power section** is located at the side of the unit.

56492AXX

Example: Nameplate for control unit sizes 1 - 6

For MDX61B.. sizes 1-6, the **nameplate of the control unit** is located at the side of the unit.

56491AXX

Example: Nameplate for option card

62882AXX

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
- Only for size 6: Carrying bar and 2 split pins

Size 2S

- Accessories set, not installed. The accessories set (→ following figure) 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).

  Degree of protection IP20 is achieved as soon as one of the following conditions is fulfilled:
  - The touch guard [2] mounted to X3 / X4 (→ chapter "Touch guard")
  - An adequate cable is connected to X3 / X4
    If neither of the two conditions is fulfilled, the degree of protection is IP10.

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8.2 Size 0

MDX60/61B-5A3 (AC 400/500 V units): 0005 ... 0014

* View of the bottom of the unit

[1] Power shield clamp for mains connection and connection for DC link connection
[2] X4: Connection for DC link connection U_Z– / U_Z+ and PE connection, separable
[3] X1: Power supply connection L1, L2, L3 and PE connection, separable
[4] Only with MDX61B: Fieldbus slot
[5] Only with MDX61B: Encoder slot
[6] Shield clamp for signal cables MDX61B size 0
[7] X10: Signal terminal strip for binary outputs and TF/TH input
[8] X16: Signal terminal strip binary inputs and outputs
[9] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[10] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[11] X12: Signal terminal strip system bus (SBus)
[12] DIP switches S11 ... S14
[13] XT Slot for DBG60B keypad or UWS21B serial interface
[14] 7-segment display
[15] Memory card
[16] Threaded hole for grounding screw M4×8 or M4×10
[17] X17: Signal terminal strip for safety contacts for safe stop
[18] X2: Motor connection U, V, W and PE connection, separable
[19] X3: Braking resistor connection +R / –R and PE connection, separable
[20] Power shield clamp for motor connection and braking resistor connection

8.3 Size 1

MDX61B-5A3 (AC 400/500 V units): 0015 ... 0040
MDX61B-2A3 (AC 230 V units): 0015 ... 0037

62711AXX

[1] X1: Power supply connection 1/L1, 2/L2, 3/L3, separable
[2] X4: Connection for DC link connection $–U_Z$ $+U_Z$, separable
[3] Fieldbus slot
[4] Expansion slot
[5] Encoder slot
[6] X3: Braking resistor connection 8/+R, 9/–R and PE connection, separable
[7] Shield clamp for signal cables and PE connection
[8] X2: Motor connection 4/U, 5/V, 6/W and PE connection, separable
[9] X17: Signal terminal strip for safety contacts for safe stop
[10] X10: Signal terminal strip for binary outputs and TF/TH input
[11] X16: Signal terminal strip binary inputs and outputs
[12] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[13] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[14] X12: Signal terminal strip system bus (SBus)
[15] Threaded hole for grounding screw M4×8 or M4×10
[16] DIP switches S11 ... S14
[17] XT Slot for DBG60B keypad or UWS21B serial interface
[18] 7-segment display
[19] Memory card

8.4 Size 2S

MDX61B-5A3 (AC 400/500 V units): 0055 / 0075

62712AXX

[1] X1: Power supply connection 1/L1, 2/L2, 3/L3
[2] X4: Connection for DC link connection $-U_Z$ $+U_Z$ and PE connection
[3] Memory card
[4] Fieldbus slot
[5] Expansion slot
[6] Encoder slot
[7] X3: Braking resistor connection 8/+R, 9/–R and PE connection
[8] Shield clamp for signal cables and PE connection
[9] X2: Motor connection 4/U, 5/V, 6/W
[10] X17: Signal terminal strip for safety contacts for safe stop
[11] X10: Signal terminal strip for binary outputs and TF/TH input
[12] X16: Signal terminal strip binary inputs and outputs
[13] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[14] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[15] X12: Signal terminal strip system bus (SBus)
[16] Threaded hole for grounding screw M4×8 or M4×10
[17] DIP switches S11 ... S14
[18] XT Slot for DBG60B keypad or UWS21B serial interface
[19] 7-segment display

8.5 Size 2

MDX61B-5A3 (AC 400/500 V units): 0110
MDX61B-2A3 (AC 230 V units): 0055 / 0075

62713AXX

[1] X1: Power supply connection 1/L1, 2/L2, 3/L3
[2] X4: Connection for DC link connection $-U_Z$ $+U_Z$ and PE connection
[3] Fieldbus slot
[4] Expansion slot
[5] Encoder slot
[6] X3: Braking resistor connection 8/+R, 9/–R and PE connection
[7] Shield clamp for signal cables and PE connection
[8] X2: Motor connection 4/U, 5/V, 6/W
[9] X17: Signal terminal strip for safety contacts for safe stop
[10] X10: Signal terminal strip for binary outputs and TF/TH input
[11] X16: Signal terminal strip binary inputs and outputs
[12] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[13] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[14] X12: Signal terminal strip system bus (SBus)
[15] Threaded hole for grounding screw M4×8 or M4×10
[16] DIP switches S11 ... S14
[17] XT Slot for DBG60B keypad or UWS21B serial interface
[18] 7-segment display
[19] Memory card

8.6 Size 3

MDX61B-503 (AC 400/500 V units): 0150 ... 0300
MDX61B-203 (AC 230 V units): 0110 / 0150

62714AXX

[1] PE connections
[2] X1: Power supply connection 1/L1, 2/L2, 3/L3
[3] X4: Connection for DC link connection $-U_Z$ $+U_Z$
[4] Fieldbus slot
[5] Expansion slot
[6] Encoder slot
[7] X3: Braking resistor connection 8/+R, 9/–R
[8] X2: Motor connection 4/U, 5/V, 6/W
[9] Shield clamp for signal cables and PE connection
[10] X17: Signal terminal strip for safety contacts for safe stop
[11] X10: Signal terminal strip for binary outputs and TF/TH input
[12] X16: Signal terminal strip binary inputs and outputs
[13] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[14] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[15] X12: Signal terminal strip system bus (SBus)
[16] DIP switches S11 ... S14
[17] Threaded hole for grounding screw M4×8 or M4×10
[17] XT Slot for DBG60B keypad or UWS21B serial interface
[18] 7-segment display
[19] Memory card

8.7 Size 4

MDX61B-503 (AC 400/500 V units): 0370 / 0450
MDX61B-203 (AC 230 V units): 0220 / 0300

62715AXX

[1] PE connection
[2] X1: Power supply connection 1/L1, 2/L2, 3/L3
[3] X4: Connection for DC link connection $-U_Z$ $+U_Z$ and PE connection
[4] Fieldbus slot
[5] Expansion slot
[6] Encoder slot
[7] X3: Braking resistor connection 8/+R, 9/–R and PE connection
[8] X2: Motor connection 4/U, 5/V, 6/W
[9] PE connection
[10] Shield clamp for signal cables
[11] X17: Signal terminal strip for safety contacts for safe stop
[12] X10: Signal terminal strip for binary outputs and TF/TH input
[13] X16: Signal terminal strip binary inputs and outputs
[14] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[15] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[16] X12: Signal terminal strip system bus (SBus)
[17] DIP switches S11 ... S14
[18] Threaded hole for grounding screw M4×8 or M4×10
[19] XT Slot for DBG60B keypad or UWS21B serial interface
[20] 7-segment display
[21] Memory card

8.8 Size 5

MDX61B-503 (AC 400/500 V units): 0550 / 0750

62716AXX

[1] PE connection
[2] X1: Power supply connection 1/L1, 2/L2, 3/L3
[3] X4: Connection for DC link connection $-U_Z$ $+U_Z$ and PE connection
[4] Fieldbus slot
[5] Expansion slot
[6] Encoder slot
[7] X3: Braking resistor connection 8/+R, 9/–R and PE connection
[8] X2: Motor connection 4/U, 5/V, 6/W
[9] PE connection
[10] Shield clamp for signal cables
[11] X17: Signal terminal strip for safety contacts for safe stop
[12] X10: Signal terminal strip for binary outputs and TF/TH input
[13] X16: Signal terminal strip binary inputs and outputs
[14] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[15] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[16] X12: Signal terminal strip system bus (SBus)
[17] DIP switches S11 ... S14
[18] Threaded hole for grounding screw M4×8 or M4×10
[19] XT Slot for DBG60B keypad or UWS21B serial interface
[20] 7-segment display
[21] Memory card

8.9 Size 6

MDX61B-503 (AC 400/500 V units): 0900 ... 1320

62717AXX

[1] PE connection
[2] X1: Power supply connection 1/L1, 2/L2, 3/L3
[3] X4: Connection for DC link connection $–U_Z$ $+U_Z$
[4] Fieldbus slot
[5] Expansion slot
[6] Encoder slot
[7] X3: Braking resistor connection 8/+R, 9/–R
[8] X2: Motor connection 4/U, 5/V, 6/W and PE connection
[9] Shield clamp for signal cables
[10] X17: Signal terminal strip for safety contacts for safe stop
[11] X10: Signal terminal strip for binary outputs and TF/TH input
[12] X16: Signal terminal strip binary inputs and outputs
[13] X13: Signal terminal strip terminal strip for binary inputs and RS485 interface
[14] X11: Signal terminal strip for setpoint input AI1 and 10 V reference voltage
[15] X12: Signal terminal strip system bus (SBus)
[16] Threaded hole for grounding screw M4×8 or M4×10
[17] DIP switches S11 ... S14
[18] XT Slot for DBG60B keypad or UWS21B serial interface
[19] 7-segment display
[20] Memory card

9 Installation

9.1 Installation instructions for basic unit

Installation notes for size 6

The MOVIDRIVE® units of size 6 (0900 ... 1320) are equipped with a factory mounted lifting lug [1]. Use a crane and lifting eye [1] to install the unit.

HAZARD!

Suspended load.

Danger of fatal injury if the load falls.

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

If a crane is not available, you can push a carrying bar [2] through the rear panel [4] to facilitate installation (included in the delivery scope of size 6). Secure the carrying bar [2] against axial displacement using the split pin [3].

Figure 116: Installing MOVIDRIVE® size 6 with fixed lifting eye and carrying bar

[1] Fixed lifting eye

[2] Carrying bar (included in the delivery of size 6)

[3] 2 split pins (included in the delivery of size 6)

[4] Rear panel

Tightening torques

- Only use **original connection elements**. Note the **permitted tightening torques** of MOVIDRIVE® power terminals.
  - Sizes 0, 1 and 2S → 0.6 Nm (5 lb in)
  - Size 2 → 1.5 Nm (13 lb in)
  - Size 3 → 3.5 Nm (31 lb in)
  - Sizes 4 and 5 → 14.0 Nm (120 lb in)
  - Size 6 → 20.0 Nm (180 lb in)
- The **permitted tightening torque** of the **signal terminals** is 0.6 Nm (5 lb in).

Minimum clearance and mounting position

- Leave at least **100 mm (4 in) clearance above and below the unit for optimum cooling**. Make sure air circulation in the clearance is not impaired by cables or other installation equipment. With sizes 4, 5 and 6, do not install any components which are sensitive to high temperatures within 300 mm (12 in) of the top of the unit.
- Ensure unobstructed cooling air supply and make sure that air heated by other units cannot be drawn in or reused.
- There is no need for clearance at the sides of the unit. You may line up the units directly next to each other.
- Only install the units **vertically**. Do not install them horizontally, tilted or upside down (→ following figure, applies to all sizes).

Figure 117: Minimum clearance and mounting position of the units

Separate cable ducts

- Route **power cables** and **signal cables** in **separate cable ducts**.

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).
- SEW-EURODRIVE recommends that you do not use earth-leakage circuit breakers. However, if an earth-leakage circuit breaker is stipulated for direct or indirect protection against contact, observe the **following note in accordance with EN 61800-5-1**:

WARNING!

Incorrect earth-leakage circuit breaker installed.

Severe or fatal injuries.

MOVIDRIVE® can cause direct current in the protective earth. In cases where an earth-leakage circuit breaker is used for protection against direct or indirect contact, only install a type B earth-leakage circuit breaker on the **power supply end of the MOVIDRIVE® unit**.

Supply system and brake contactors

- Only use **contactors in utilization category AC-3** (IEC 60947-4-1) as mains and brake contactors.

NOTES

- Only use the **input contactor K11** (→ Sec. "Wiring diagram for basic unit") to **switch the inverter on and off**. Do not use it for jog mode. For jog mode, use the commands "Enable/Stop", "CW/Stop" or "CCW/Stop".
- Observe a minimum switch-off time of 10 s for the supply system contactor K11.

PE connection (→EN 61800-5-1)

Earth-leakage currents ≥ 3.5 mA may occur during normal operation. To meet the requirements of EN 61800-5-1 observe the following:

- **Supply system cable < 10 mm^2** (AWG 7):

  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 7)**.
- **Supply system cable 10 mm^2 ... 16 mm^2 (AWG 7 ... AWG 6)**:

  Route a **copper protective earth conductor with the cross section of the supply system lead**.
- **Supply system cable 16 mm^2 ... 35 mm^2 (AWG 6 ... AWG 2)**:

  Route a **copper protective earth conductor with a cable cross section of 16 mm^2**.
- **Supply system cable > 35 mm^2 (AWG 2)**:

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

IT systems

- MOVIDRIVE® B is designed for operation on TN and TT systems with a directly grounded star point. Operation on voltage supply systems with a non-grounded star point is permitted In this case, SEW-EURODRIVE recommends using **earth-leakage monitors with pulse-code measurement** for voltage supply systems with a non-grounded star point **(IT systems)**. Using such devices prevents the earth-leakage monitor from mis-tripping due to the ground capacitance of the inverter. **No EMC limits have been specified for interference emission** in **voltage supply systems without grounded star point** (IT systems).

Cable cross sections

- Supply cable: **Cable cross section according to rated input current** I_{mains} at rated load.
- Motor cable: **Cable cross section according to rated output current** I_{rated}.
- Signal cables of basic unit (terminals X10, X11, X12, X13, X16):
  - One core per terminal 0.20 ... 2.5 mm^2 (AWG 24 ... 13)
  - Two cores per terminal 0.25 ... 1 mm^2 (AWG 23 ... 17)
- Signal cables of terminal X17 and DIO11B input/output card (terminals X20, X21, X22):
  - One core per terminal 0.08 ... 1.5 mm^2 (AWG 28 ... 16)
  - Two cores per terminal 0.25 ... 1 mm^2 (AWG 23 ... 17)

Unit output

STOP	**STOP!** MOVIDRIVE® B can suffer irreparable damage if you connect capacitive loads. • **Only connect ohmic/inductive loads (motors).** • Never connect capacitive loads.

60031AXX

Figure 118: Only connect ohmic/inductive loads; do not connect capacitive loads

Installing braking resistors BW.../ BW..-T / BW...-P

- Permitted installation:
  - on horizontal surfaces
  - on vertical surfaces with brackets at the bottom and perforated sheets at top and bottom
- Not permitted:
  - on vertical surfaces with brackets at the top, right or left

AConnecting braking resistors

- Use **two closely twisted cables or a 2-core shielded power cable**. Cable cross section according to trip current I_F of F16. The rated voltage of the cable must amount to at least V_0/V = 300 V / 500 V (in accordance with DIN VDE 0298).
- 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**. SEW-EURODRIVE recommends using an overcurrent relay from trip class 10 or 10 A in accordance with EN 60947-4-1.

- For braking resistors of the **BW...-T / BW...-P** series, the **integrated temperature switch/overcurrent relay can be connected using a 2-core shielded cable** as an **alternative** to a bimetallic relay.
- **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**.

Operating braking resistors

- The connection leads to the braking resistors carry a **high pulsed DC voltage** during rated operation.

WARNING!

The surfaces of the braking resistors get very hot when the braking resistors are loaded with P_{rated}.

Risk of burns and fire.

- Choose a suitable installation location. Braking resistors are usually mounted on top of the control cabinet.
- Do not touch the braking resistors.

Binary inputs / binary outputs

- The **binary inputs** are **electrically isolated** by optocouplers.
- The **binary outputs** are **short-circuit proof** and **protected against external voltage to DC 30 V.** External voltages > DC 30 V can cause irreparable damage to binary outputs.

EMC-compliant installation

- All cables except for the supply system lead 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**.
- Apply the **shield by the shortest possible route and make sure it is grounded over a wide area at both ends**. Ground one end of the shield using an interference 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 at the other end.

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Figure 119: Correct shield connection using metal clamp (shield clamp) or cable gland

- You can also use **earthed sheet-metal ducts or metal pipes** to **shield the cables**. **Route** the **power and signal cables separately**.
- Ground the **inverter** and **all additional units to ensure high-frequency compatibility** (wide area, metal-on-metal contact between the unit housing and ground, e.g. unpainted control cabinet mounting panel).

	NOTES
	• MOVIDRIVE® B is a product with restricted availability in accordance with EN 61800-3. It may cause EMC interference. In this case, 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 C1 limit for MOVIDRIVE® MDX60B/61B units size 0 to 5.
- Do not switch between the line filter and MOVIDRIVE® MDX60B/61B.
- 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.
- SEW-EURODRIVE recommends taking one of the following **EMC measures on the motor side to maintain class C1 and C2 limits**:
  - Shielded motor cable
  - HD... output choke option
  - HF.. output filter option (in operating modes VFC and V/f)

Interference emission category

Compliance with category C2 according to EN 61800-3 has been tested on a specified test setup. SEW-EURODRIVE can provide detailed information on request.

	WARNING!
	This product can cause high-frequency interferences in residential areas which can require measures for interference suppression.

HD... output choke

- Install the **output choke close to the inverter** but outside the minimum clearance for cooling.
- For HD001 ... HD003: Route **all three phases (U, V, W) of the motor cable [1] through the output choke**. To achieve a higher filter effect, **do not route the PE conductor through the output choke**!

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Figure 120: Connecting the HD001 ... HD003 output choke

[1] Motor cable

62879AXX

Figure 121: Connecting the HD004 output choke

[1] Motor cable

9.2 Removing/installing the keypad

Removing the keypad

Proceed as follows:

60032AXX

Figure 122: Removing the keypad

1. Unplug the connection cable from the XT slot.
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!).

Installing the keypad

Proceed as follows:

60033AXX

Figure 123: Installing the keypad

1. Place the underside of the keypad 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 XT slot.

9.3 Removing/installing the front cover

Removing the front cover

Proceed as follows to remove the front cover:

Figure 124: Removing the front cover

1. If a keypad is installed, remove it first (→ page 374).
2. Press the grooved clip on top of the front cover.
3. Keep the clip pressed down to remove the front cover.

Installing the front cover

Proceed as follows to install the front cover:

Figure 125: Installing the front cover

1. Insert the underside of the front cover 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

Observe the following notes for UL-compliant installation:

- Only use copper cables with the **following rated thermal values** as connection cables:
- MOVIDRIVE® MDX60B/61B0005 ... 0300:

  Rated thermal valuee 60 °C / 75 °C
- MOVIDRIVE® MDX61B0370 ... 1320:

  Rated thermal value 75 °C
- **Permitted tightening torques** for MOVIDRIVE® power terminals:
  - Sizes 0,1 and 2S → 0.6 Nm (5 lb in)
  - Size 2 → 1.5 Nm (13 lb in)
  - Size 3 → 3.5 Nm (31 lb in)
  - Sizes 4 and 5 → 14.0 Nm (120 lb in)
  - Size 6 → 20.0 Nm (180 lb in)
- MOVIDRIVE® inverters are **suitable for operation in TN and TT voltage power systems with a directly grounded star point** 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 UL-approved fuses.

AC 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

AC 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

NOTES

- Use only tested units with a **limited output voltage** (U_{max} = DC 30 V) and **limited output current** ($I \leq 8$ A) as an **external DC 24 V voltage source**.
- **UL certification does not apply to operation in voltage supply systems with a non-grounded star point (IT systems).**

9.5 Shield clamps

Shield clamp for power section, size 0

A set of shield clamps is supplied as standard for the power section of MOVIDRIVE® MDX60B/61B size 0. The shield clamps are not yet installed.

Install the shield clamps for the power section as follows:

- Secure the contact clips to the shield plates.
- Secure the shield clamps to the top and the bottom of the unit.

62718AXX

Figure 126: Securing the shield clamp of the power section (size 0)

[1] Contact clips
[2] Retaining screws for contact clip
[3] Shield plate
[4] Retaining screw for shield clamp

Shield clamp for power section, size 1

A shield clamp is supplied as standard for the power section with MOVIDRIVE® MDX61B size 1. Install this shield clamp on the power section together with the unit's retaining screws.

60019AXX

Figure 127: Securing the shield clamp on the power section (size 1)

[1] Power section shield clamp [2] PE connection (⏚)

Shield clamp for power section, sizes 2S and 2

A shield clamp for the power section is supplied as standard with two retaining screws with MOVIDRIVE® MDX61B sizes 2S and 2. Install these shield clamp using the two retaining screws.

60020AXX

Figure 128: Securing the shield clamp on the power section (figure shows size 2)

[1] Power section shield clamp [2] PE connection (⏚)

The shield clamps for the power section provide you with a very convenient way of installing the shield for the motor and brake cables. Apply the shield and PE conductor as shown in the figures.

Shield clamp for power section, sizes 3 to 6

No shield clamps for the power section 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.

Shield clamp for signal cables

Install the shield clamp for the signal cable as follows:

- If installed, remove the keypad and the front cover.
- Size 0: Attach the shield clamp on the bottom of the control unit.
- Sizes 1 to 6: Attach the shield clamp on the bottom of the control unit.

Size 0

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Sizes 1 to 6

62719AXX

[1] Contact clip(s)
[2] Retaining screw(s) for contact clips
[3] Shield plate
[4] Retaining screw for shield clamp

9.6 Touch guard for power terminals

	HAZARD!
	Uncovered power connections. Severe or fatal injuries from electric shock. • Install the touch guard according to the regulations. • Never start the unit if the touch guard is not installed.

Size 2S

IP20 is achieved for MOVIDRIVE® MDX61B size 2S if one of the following conditions is fulfilled:

- Touch guard is installed on X3 / X4.
- An adequate cable is connected to X3 / X4

If neither of the two conditions is fulfilled, the degree of protection is IP10.

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Figure 129: Touch guard for MOVIDRIVE® MDX61B size 2S

Sizes 4 and 5

IP20 is achieved for MOVIDRIVE® MDX61B sizes 4 and 5 (AC 500 V units: MDX61B0370/0450/0550/0750; AC 230 V units: MDX61B0220/0300), as soon as one of the following conditions is fulfilled:

- Cables with shrink tubing and a cable cross section of ≥ 35 mm^2 (AWG2) are connected to X1, X2, X3, X4. The additional DLB11B touch guard need not be installed.
- Cables with shrink tubing and a cable cross section of < 35 mm^2 (AWG2) are connected to X1, X2, X3, X4. The DLB11B touch guard must be installed properly (see section 'Installing the DLB11B touch guard').
- The DLB11B must be connected to power terminals that are not connected. The DLB11B does not have to be connected to the PE terminals.

If neither of the conditions is fulfilled, the degree of protection is IP10. The **DLB11B touch guard (12 pieces included in the scope of delivery)** is available via the **part number 0823 111 7**.

Installing the DLB11B touch guard

Proceed as follows when installing the DLB11B touch guard:

- Figure I: Power terminal with connected power cable with a cable cross section of < 35 mm^2 (AWG2):

  Remove the plastic saddle [1] and push the DLB11B touch guard [3] on the respective stud [2] of the power terminal. Make sure that the cable output is straight. Install the cover for the power terminals.
- Figure II: Power terminal without connected power cable:

  Push the DLB11B touch guard [1] on the respective stud [2]. Install the cover for the power terminals.

[1] Plastic saddle	[1] Touch guard
[2] Terminal stud	[2] Terminal stud
[3] Correctly mounted touch guard	[3] Correctly mounted touch guard

For additional information on the X1, X2, X3 and X4 power terminals, refer to the "Technical Data" chapter.

Sizes 4 -6

For MOVIDRIVE® size 4 (AC 500 V units: MDX61B0370/0450; AC 230 V units: MDX61B0220/0300), size 5 (MDX61B0550/0750) and size 6 (MDX61B0900/1100/1320), two (2) touch guards with eight (8) retaining screws are supplied as standard. Install the touch guard on both covers of the power terminals.

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Figure 130: Touch guard for MOVIDRIVE® MDX61B sizes 4, 5 and 6

The touch guard comprises the following parts:

[1] Cover

[2] Connection plate

[3] Screen (only for size 5)

IP10 is only achieved for the MOVIDRIVE® MDX61B units sizes 4, 5 and 6 when the following conditions are fulfilled:

- Touch guard is fully installed
- Shrink tubing is installed on the power cables of all power terminals (X1, X2, X3, X4) (see following picture)

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	NOTE
	If the above conditions are not met, MOVIDRIVE® units sizes 4, 5 and 6 have degree of protection IP00.

9.7 Wiring diagrams for basic unit

Power section and brake

* With sizes 1, 2 and 2S, 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).

** **You must adhere to the connection sequence of the brake connector.** Incorrect connection will cause irreparable damage to the brake. **Read the operating instructions for the motors** when connecting the brake using the terminal box.

	NOTES
	• Connect the brake rectifier using a separate supply system lead. • **Supply via the motor voltage is not permitted!**

Always switch off the brake on the DC and AC sides with:

– all hoist applications,
– Drives that require a rapid brake response time
– CFC and SERVO operating modes

Brake rectifier in control cabinet

Install the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the control cabinet. Joint installation is only permitted with shielded power cables.

Braking resistor BW... / BW...-...-T /BW...-...-P

When the signal contact F16 trips, K11 must be opened and DIØØ"/Controller inhibit" must receive a "0" signal. The resistor circuit must not be interrupted!

When the internal temperature switch trips, K11 must be opened and DIØØ"/Controller inhibit" must receive a "0" signal. The resistor circuit must not be interrupted!

When the external bimetal relay (F16) trips, K11 must be opened and DIØØ "/Controller inhibit" must receive a "0" signal . The resistor circuit must not be interrupted!

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Braking resistor type	Overload protection		
	Design specified	Internal temperature switch (..T)	External bimetallic relay (F16)
BW...	-	-	Required
BW...-...-T	-	One of the two options (internal temperature switch / external bimetallic relay) is required.	
BW...-003 / BW...-005	Adequate	-	Permitted
BW090-P52B	Adequate	-	-

Signal terminals

7-segment display Operating status	
0	Inverter not ready
1	Controller inhibit active
2	No enable
3	Standstill current
4	VFC operation
5	n-control
6	M-control
7	Hold control
8	Factory setting
9	Limit switch contacted
A	Technology option
c	IPOS reference travel
d	Flying start
E	Calibrate encoder
F	Fault display
H	Manual operation
t	Waiting for data
U	Safe stop active
•	IPOS program Runnning (flashing dot)

* 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®.

DGND (X10, X12, X13, X16, X17) is electrically isolated as standard. The electrical isolation can be disabled by means of a M4 x 8 or M4 x 10 grounding screw (tightening torque 1.4 ... 1.6 Nm). The grounding screw (threaded hole → section "Unit design") is not included in the scope of delivery.

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 XT. 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**	**DIØØ** **DIØ1** **DIØ2** **DIØ3** **DIØ4** **DIØ5**	Binary input 1, with fixed assignment"/Controller inhibit" Binary input 2, factory setting "CW/stop" Binary input 3, factory setting "CCW/STOP" Binary input 4, factory setting "Enable/rapid stop" Binary input 5, factory setting "n11/n21" Binary input 6, factory setting "n12/n22"	• The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 2 to 6 (DIØ1 ... DIØ5) → Parameter menu P60_
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 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+ (baud rate has a fixed setting of 9.6 kBaud) 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 connect external voltage to binary outputs X16:3 (DOØ3) and X16:5 (DOØ5)!** Reference potential for binary signals	• The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 7 to 8 (DIØ6/DIØ7) → Parameter menu P60_ • Selection options for binary inputs 3 to 5 (DOØ3...DOØ5) → Parameter menu P62_
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 set to "No response" (→ P835) Reference potential for binary signals / KTY– Binary output DBØØ has fixed assignment "/Brake", load capacity max DC 150 mA (short-circuit proof, protected against external voltage to DC 30 V) Shared contact binary output 1, factory setting "Ready" Normally open contact binary output 1, max. load of relay contacts DC 30 V and DC 0.8 A NC contact binary output 1 Binary output DBØ2, factory set to "/Fault", max. load capacity DC 50 mA (short-circuit proof, protected against external voltage to DC 30 V). Selection options for binary outputs 1 and 2 (DOØ1 and 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 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 system 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 on the same unit** Reference potential for DC+24 V input "Safe stop" (safety contact) DC+24 V input "Safe stop" (safety contact)	
XT		Only service interface. Option slot: DBG60B / UWS21B / USB11A	

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 = 3.4 A_{RMS}	820 604 X	1820 133 4				
BW100-006 BW100-006-T	I_F = 2.4 A_{RMS}	821 701 7	1820 419 8				
Line chokes		**Part number**					
ND020-013	ΣI_{supply} = AC 20 A	826 012 5					
Line filter		**Part number**					
NF009-503	U_{max} = AC 550 V	827 412 6					
Output chokes	**Inside diameter**	**Part number**					
HD001	d = 50 mm (2 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)			
Output filter (only in VFC operating mode)		**Part number**					
HF008-503		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 (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 number BW...**	**Part number BW...-...-T**							
BW100-005	I_F = 0.8 A_{RMS}	826 269 1								
BW100-006/ BW100-006-T	I_F = 2.4 A_{RMS}	821 701 7	1820 419 8							
BW168/BW168-T	I_F = 3.4 A_{RMS}	820 604 X	1820 133 4							
BW268/BW268-T	I_F = 4.2 A_{RMS}	820 715 1	1820 417 1							
BW147/BW147-T	I_F = 5 A_{RMS}	820 713 5	1820 134 2							
BW247/BW247-T	I_F = 6.5 A_{RMS}	820 714 3	1820 084 2							
BW347/BW347-T	I_F = 9.2 A_{RMS}	820 798 4	1820 135 0							
BW039-012/ BW039-012-T	I_F = 5.5 A_{RMS}	821 689 4	1820 136 9							
BW039-026-T	I_F = 8.1 A_{RMS}		1820 415 5							
BW039-050-T	I_F = 11.3 A_{RMS}		1820 137 7							
Line chokes		**Part number**								
ND020-013	ΣI_{supply} = AC 20 A	826 012 5								
ND045-013	ΣI_{supply} = AC 45 A	826 013 3								
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								
Output chokes	**Inside diameter**	**Part number**								
HD001	d = 50 mm (2 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 (3.5 in)	813 558 4		for cable cross sections > 16 mm^2 (AWG 6)						
Output filter (only in VFC operating mode)		**Part number**								
HF015-503		826 030 3		A						
HF022-503		826 031 1		B	A					
HF030-503		826 032 X			B	A				
HF040-503		826 311 6				B	A			
HF055-503		826 312 4					B	A		
HF075-503		826 313 2						B	A	
HF023-403		825 784 1							B	A
HF033-403		825 785 X								B

A In rated operation (100 %)

B With variable torque load (125 %)

AC 400/500 V units, sizes 3 and 4

MOVIDRIVE® MDX61B...-503					0150	0220	0300	0370	0450
Size					3			4	
Braking resistors BW... / BW...-...-T BW...-...-P	Trip current	Part number BW...	Part number BW...-...-T	Part number BW...-...-P					
BW018-015/ BW018-015-P	I_F = 9.1 A_{RMS}	821 684 3		1 820 416 3				C	C
BW018-035-T	I_F = 13.9 A_{RMS}		1820 138 5					C	C
BW018-075-T	I_F = 20.4 A_{RMS}		1820 139 3					C	C
BW915-T	I_F = 32.6 A_{RMS}		1820 413 9						
BW012-025/ BW012-025-P	I_F = 14.4A_{RMS}	821 680 0		1 820 414 7					
BW012-050-T	I_F = 20.4 A_{RMS}		1820 140 7						
BW012-100-T	I_F = 28.8 A_{RMS}		1820 141 5						
BW106-T	I_F = 47.4 A_{RMS}		1820 083 4						
BW206-T	I_F = 54.7 A_{RMS}		1820 412 0						
Line chokes		Part number							
ND045-013	ΣI_{supply} = AC 45 A	826 013 3				A			
ND085-013	ΣI_{supply} = AC 85 A	826 014 1				B			A
ND150-013	ΣI_{supply} = AC 150 A	825 548 2							B
ND300-0053	ΣI_{supply} = AC 300 A	827 721 4							

A In rated operation (100 %)

B With variable torque load (125 %)

C Connect two braking resistors in parallel and set twice the trip current on F16 ($2 \times I_F$)

AC 400/500 V units, sizes 5 and 6

MOVIDRIVE® MDX61B...-503					0550	0750	0900	1100	1320
Size					5		6		
Braking resistors BW... / BW...-...-T BW...-...-P	Trip current	Part number BW...	Part number BW...-...-T	Part number BW...-...-P					
BW018-015/ BW018-015-P	I_F = 9.1 A_{RMS}	821 684 3		1 820 416 3					
BW018-035-T	I_F = 13.9 A_{RMS}		1820 138 5						
BW018-075-T	I_F = 20.4 A_{RMS}		1820 139 3						
BW915-T	I_F = 32.6 A_{RMS}		1820 413 9						
BW012-025/ BW012-025-P	I_F = 14.4 A_{RMS}	821 680 0		1 820 414 7					
BW012-050-T	I_F = 20.4 A_{RMS}		1820 140 7						
BW012-100-T	I_F = 28.8 A_{RMS}		1820 141 5						
BW106-T	I_F = 47.7 A_{RMS}		1820 083 4				C	C	C
BW206-T	I_F = 54.7 A_{RMS}		1820 412 0				C	C	C
Line chokes		Part number							
ND045-013	ΣI_{mains} = AC 45 A	826 013 3							
ND085-013	ΣI_{mains} = AC 85 A	826 014 1							
ND150-013	ΣI_{mains} = AC 150 A	825 548 2							
ND300-0053	ΣI_{mains} = AC 300 A	827 721 4							

A In rated operation (100 %)

B With variable torque load (125 %)

C Connect two braking resistors in parallel and set twice the trip current on F16 ($2 \times I_F$)

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		
Line filter		**Part number**										
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**	**813 325 5**	for cable cross sections 1.5...16 mm^2 (AWG 16...6)									
HD003	**d = 88 mm**	**813 558 4**	for cable cross sections > 16 mm^2 (AWG 6)									
HD004	**Connection with M12 bolt**	**816 885 7**										
Output filter (only in VFC operating 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 (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

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 BW...-.../ BW...-...-T BW...-...-P	**Trip current**	**Part number BW...**	**Part number BW...-...-T**									
BW039-003	I_F = 2.7 A_{RMS}	821 687 8										
BW039-006	I_F = 3.9 A_{RMS}	821 688 6										
BW039-012 BW039-012-T	I_F = 5.5 A_{RMS}	821 689 4	1 820 136 9									
BW039-026-T	I_F = 8.1 A_{RMS}		1 820 415 5									
BW027-006	I_F = 4.7 A_{RMS}	822 422 6										
BW027-012	I_F = 6.6 A_{RMS}	822 423 4										
BW018-015-T	I_F = 9.1 A_{RMS}		1 820 416 3						C	C	C	C
BW018-035-T	I_F = 13.9 A_{RMS}		1 820 138 5						C	C	C	C
BW018-075-T	I_F = 20.4 A_{RMS}		1 820 139 3						C	C	C	C
BW915-T	I_F = 32.6 A_{RMS}		1 820 413 9						C	C	C	C
BW012-025-P	I_F = 14.4 A_{RMS}		1 820 414 7									
BW012-050-T	I_F = 20.4 A_{RMS}		1 820 140 7									
BW012-100-T	I_F = 28.8 A_{RMS}		1 820 141 5									
BW106-T	I_F = 47.4 A_{RMS}		1 820 083 4								C	C
BW206-T	I_F = 54.7 A_{RMS}		1 820 412 0								C	C
Line chokes		**Part number**										
ND020-013	ΣI_{supply} = AC 20 A	826 012 5					A					
ND045-013	ΣI_{supply} = AC 45 A	826 013 3					B		A			
ND085-013	ΣI_{supply} = AC 85 A	826 014 1							B		A	
ND150-013	ΣI_{supply} = 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	**Inside diameter**	**Part number**										
HD001	d = 50 mm (2 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 (3.5 in)	813 558 4		for cable cross sections > 16 mm^2 (AWG 6)								

A **In rated operation (100 %)**

B **With variable torque load (125 %)**

C **Connect two braking resistors in parallel and set twice the trip current on F16 (2 × I_F)**

9.9 System bus connection (SBus 1)

	NOTE
	Only if P884 "SBus baud rate" = 1000 kbaud: MOVIDRIVE® *compact* MCH4_A units are not allowed to be combined with other MOVIDRIVE® units in the same system bus combination. The units may be combined at baud rates ≠ 1000 kbaud.

Max. 64 CAN bus nodes can be addressed via the system bus (SBus). Use a repeater after 20 or 30 participants, 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

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:
  - Cable cross section 0.25 ... 0.75 mm^2 (AWG 23 ... AWG 19)
  - Cable resistance 120 Ω at 1 MHz
  - Capacitance per unit length = 40 pF/m at 1 kHz

  Suitable cables include CAN bus or DeviceNet cables.

Shield contact

- 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 → 320 m (1050 ft)
  - 250 kBaud → 160 m (525 ft)
  - **500 kBaud → 80 m (260 ft)**
  - 1000 kBaud → 40 m (130 ft)

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).

	STOP! There must not be any potential displacement between the units connected with the SBus. This may affect the functionality of the units. Take suitable measures to avoid potential displacement, such as connecting the unit ground connectors using a separate cable.

9.10 Connection of RS485 interface

The RS485 interface (X13:ST11, ST12) 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). The baud rate is set to 9.6 baud by default.

Wiring diagram of the RS485 interface (X13)

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:
  - Cable cross section 0.25 ... 0.75 mm^2 (AWG 23 ... AWG 19)
  - Cable resistance 100 ... 150 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m at 1 kHz

Shield contact

- 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 (656 ft).

Terminating resistor

- Dynamic terminating resistors are installed. **Do not connect any external terminating resistors.**

	STOP! There must not be any potential displacement between the units connected via the RS485. This may affect the functionality of the units. Take suitable measures to avoid potential displacement, such as connecting the unit ground connectors using a separate cable.

9.11 Connection interface adapter option type DWE11B/12B

Part number and description

- DWE11B, part number 188 187 6

  The interface adapter DWE11B (HTL→TTL) in the form of an adapter cable is used **to connect single-ended HTL encoders to theDEH11B/DEH21B option**. Only the A, B and C tracks are connected. The interface adapter is suitable for all HTL encoders that were operated on MOVIDRIVE® A, MDV and MCV and can be connected without any rewiring effort.

58748AXX

[A] 5 x 2 x 0.25 mm^2 (AWG 23) / length 1000 mm (39.37 in) / max. cable length inverter - encoder: 100 m (328 ft)

[B] DC 24 V connection for HTL encoder; 1 x 0.5 mm^2 (AWG 20) / length 250 mm (9.84 in)

Signal	Terminal of 9-pin sub D socket [C] (encoder end)
A	1
B	2
C	3
UB	9
GND	5

- DWE12B, part number 188 180 9

  The interface adapter DWE12B (HTL→TTL) in the form of an adapter cable is used **to connect single-ended HTL encoders to theDEH11B/DEH21B option. In addition to the A, B and C track, you will also have to connect the negated tracks (**$\overline{A}$, $\overline{B}$, $\overline{C}$). SEW-EURODRIVE recommends using this interface adapter for any new system.

58748XX

[A] 4 x 2 x 0.25 mm^2 (AWG 23) / length 1000 mm (39.37 in) / max. cable length inverter - encoder: 200 m (656 ft)

[B] DC 24 V connection for HTL encoder; 1 x 0.5 mm^2 (AWG 20) / length 250 mm (9.84 in)

Signal	Terminal of 9-pin sub D socket [C] (encoder end)
A	1
$\overline{A}$	6
B	2
$\overline{B}$	7
C	3
$\overline{C}$	8
UB	9
GND	5

9.12 Connection of interface adapter option UWS21B (RS232)

Part number

Interface adapter UWS21B: 1 820 456 2

Scope of delivery

The scope of delivery for the UWS21B option includes:

- UWS21B unit
- CD-ROM with MOVITOOLS®
- Serial interface cable with 9-pin sub D socket and 9-pin sub D connector to connect the UWS21B option to the PC.
- Serial interface cable with two RJ10 plugs to connect UWS21B and MOVIDRIVE®.

Connection of MOVIDRIVE® and UWS21B

- Use the connection cable supplied to connect the UWS21B option to the MOVIDRIVE® unit.
- Plug the connection cable into the XT terminal socket of the MOVIDRIVE® unit.
- Note that the DBG60B keypad and the UWS21B serial interface cannot be connected to the MOVIDRIVE® at the same time.

Figure 131: Connection cable between MOVIDRIVE® and UWS21B

Connection of UWS21B and PC

- Use the connection cable supplied (shielded RS232 standard interface cable) to connect the UWS21B option to the PC.

Figure 132: UWS21B-PC connection cable (1:1 connection assignment)

[1] 9-pin D-sub connector

[2] 9-pin D-sub socket

9.13 Connection of the interface adapter option USB11A

Part number

Interface adapter USB11A: 824 831 1

Scope of delivery

- 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 adapter supports USB 1.1 and USB 2.0.

Connecting MOVIDRIVE® USB11A and 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 XT terminal slot of the MOVIDRIVE® MDX60B/61B and into the RS485 slot of the USB11A.
- Note that the DBG60B keypad and the USB11A interface adapter cannot be connected to the MOVIDRIVE® at the same time.
- Use the supplied USB connection cable [2] (type USB A-B) to connect the USB11A to the PC.

Figure 133: 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 adapter.

Operation with MOVITOOLS®

- After installation, the PC recognizes the USB11A interface adapter after approximately 5 to 10 s.
- Start MOVITOOLS®.

	NOTE
	If the connection between the PC and USB11A is interrupted, you will have to restart MOVITOOLS®.

9.14 Option combinations for MDX61B

Configuration of option slots

Size 0 (0005 ... 0014) Sizes 1 ... 6 (0015 ... 1320)

62725AXX

[1] Encoder slot for encoder options

[2] Fieldbus slot for communication options

[3] Expansion slot for communication options (only sizes 1 to 6)

Option card combinations for MDX61B

The option cards are different sizes 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		
DEH21B	Encoder input absolute encoder	X		
DER11B	Encoder input resolver / Hiperface®	X		
DFP21B	Fieldbus interface Profibus		X	
DFI11B	Fieldbus interface Interbus		X	
DFI21B	Fieldbus interface Interbus LWL		X	
DFD11B	DeviceNet fieldbus interface		X	
DFC11B	Fieldbus interface CAN/CANopen		X	
DFE11B DFE12B DFE13B	Fieldbus interface Ethernet		X	
DFE32B	PROFINET IO fieldbus interface		X	
DFE33B	Fieldbus interface EtherNet/IP		X	
DFE24B	EtherCAT fieldbus interface		X	
DFS11B	Profibus fieldbus interface with PROFIsafe (safe stop)		X	
DFS12B	Profibus fieldbus interface with PROFIsafe		X	
DFS21B	PROFINET IO fieldbus Interface with PROFIsafe (Safe Stop)		X	
DCS21B/ 31B	Safety monitor			X
DIO11B	I/O expansion		X	X[1)]
DRS11B	Phase-synchronous operation			X
DIP11B	SSI encoder interface			X
DHP11B	User-programmable MOVI-PLC® *basic* controller		X	
DHE41B	User-programmable MOVI-PLC® *advanced* controller		X	X[1)]
DHF41B	User-programmable MOVI-PLC® *advanced* controller			X
DHR41B	User-programmable MOVI-PLC® *advanced* controller			X
DHP11B + OST11B	DHP11B + OST11B (RS485 interface, only in combination with DHP11B)	OST11B	DHP11B	DHP11B + OST11B[2)]

1) When fieldbus slot is not available

2) When encoder slot is not available

9.15 Installing and removing option cards

	NOTES
	• For MOVIDRIVE® **MDX61B size 0**, **only SEW-EURODRIVE** is authorized to install or remove option cards. • For MOVIDRIVE® MDX61B sizes 1 to 6, you can install or remove the option cards yourself.

Before you start **Observe the following notes before installing or removing an option card:**

	STOP!
	Electrostatic charge. Damage to electronic components. • Disconnect the inverter from the power. Switch off the DC 24 V and the mains 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 / replacing the keypad") and the front cover (→ Sec. "Removing / replacing the front cover").
- **After having installed the option card**, replace the keypad (→ Sec. " Removing / replacing the keypad") and the front cover (→ Sec. "Removing / replacing 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 (MDX61B, sizes 1 - 6)

60039AXX

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.

9.16 Connection of encoder and resolver

	NOTES
	• The wiring diagrams do now show the view onto the cable end. They show the connection to the motor or MOVIDRIVE®. • The conductor colors specified in the wiring diagrams are in accordance with IEC 757 and correspond to the conductor colors used in the pre-fabricated cables from SEW.

General installation notes

- The sub D connectors shown in the wiring diagrams have a 4/40 UNC thread.
- Max. line length of inverter - encoder/resolver: 100 m (328 ft) with a capacitance per unit length ≤ 120 nF/km
- Cable cross section: 0.20 ... 0.5 mm^2 (AWG 24 ... 20)
- If you cut a core of the encoder/resolver cable, insulate the cut-off end of the core.
- Use shielded cables with twisted pair conductors and make sure they are grounded on both ends over a large surface area:
  - At the encoder in the cable gland or in the encoder plug
  - At the inverter in the housing of the D-sub plug
- Route the encoder/resolver cable separately from the power cables.

Connecting the shield

Connect the shield of the encoder/resolver cable over a large area.

On the inverter

Connect the shield on the inverter end in the housing of the sub D connector (→ following figure).

01939BXX

On the encoder/resolver

Connect the shield on the encoder/resolver side at the respective grounding clamps (→ following figure). When using an EMC screw fitting, apply the shield over a wide area in the cable gland. For drives with a plug connector, connect the shield on the encoder plug.

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Prefabricated cables

SEW-EURODRIVE offers pre-fabricated cables for connecting encoders/resolvers. We recommend using these prefabricated cables.

9.17 Connection and terminal description of the DEH11B (HIPERFACE®) option

Part number DEH11B HIPERFACE® encoder card option: 824 310 7

NOTES

- 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
 59239AXX	**X14: Input for external encoder or output for incremental encoder simulation** **Connection → page 416 to page 419** **Pulse count of the incremental encoder simulation:** • **1024 pulses/revolution with HIPERFACE® encoder on X15** • **as at X51: 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 switch-over Reference potential DGND (COS–) Signal track A (K1) (SIN–) Signal track B (K2) Signal track C (K0) DATA- Reserved DC+12 V (tolerance range DC 10.5 - 13 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 DGND (COS–) Signal track A (K1) (SIN–) Signal track B (K2) Signal track C (K0) DATA- Reserved TF/TH/KTY+ connection DC+12 V (tolerance range DC 10.5 - 13 V) (max. load X14:15 **and** X15:15 = DC 650 mA)

STOP!

The connections on X14 and X15 must not be installed or removed during operation.

Electrical components in the encoder or on the encoder card could be destroyed.

De-energize the inverter before plugging or removing the encoder connections. Switch off the supply voltage and the DC 24 V (X10:9).

NOTES

- If X14 is used as an incremental encoder simulation output, the switch-over (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 (except HTL 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.

STOP	**STOP!** Do not connect HTL encoders E..C to X15 of option DEH11B. Doing so can destroy the X15 (motor encoder input) on the DEH11B option. Only connect HTL encoders E..C to option DEH11B/12B using the interface adapter DWE11B/12B (→ Sec. "Connecting the interface adapter type DWE11B/12B").

Permitted encoders

The following encoders may be connected to the "HIPERFACE® encoder card type DEH11B" option:

- HIPERFACE® encoder type AS1H, ES1H, AV1H, AF1H or EF1H
- sin/cos encoder type ES1S, ES2S, EV1S or EH1S
- DC 5 V TTL encoder with DC 24 V voltage supply type ES1R, ES2R, EV1R or EH1R
- DC 5 V TTL encoder with DC 5 V voltage supply type ES1T, ES2T, EV1T or EH1T via DWI11A option or encoder with signal level to RS422

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 to the option DEH11B as follows:

i	**NOTE** Important for DT/DV or CT/CV motors: TF or TH is **not** connected with 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

CM71...112 with terminal box

Connect the HIPERFACE® encoder to the option DEH11B as follows:

54440CXX

Figure 134: Connecting HIPERFACE® encoder to DEH11B as a motor encoder

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 to the option DEH11B as follows:

54329CXX

Figure 135: Connecting the sin/cos encoder to DEH11B as a motor encoder

Part numbers of the prefabricated cables:

- For fixed routing: 1332 459 4
- For cable carrier routing: 1332 458 6

Connecting TTL encoders to DT../DV.. motors

TTL encoders from SEW-EURODRIVE are available with DC 24 V and DC 5 V voltage supply.

DC -24 V voltage supply

Connect TTL encoders with DC 24 V voltage supply EH1R, ES1R, ES2R or EV1R in the same way as the high-resolution sin/cos encoders (→ Figure 135).

DC -5 V voltage supply

TTL encoders 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 this encoder as follows:

Figure 136: Connecting the TTL encoder 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: Encoders
  - For fixed routing: 198 829 8
  - For cable carrier routing: 198 828 X

9.18 Connection and terminal description of the DEH21B option

Part number Encoder card option DEH21B: 1820 818 5

NOTES

- For detailed information on the DEH21B option, refer to the "MOVIDRIVE® MDX61B DIP11B/DEH21B absolute encoder cards".
- The DEH21B option card can be installed in MOVIDRIVE® MDX61B sizes 0 to 6. Only SEW-EURODRIVE staff may install or remove the DEH21B option for MOVIDRIVE® MDX61B size 0.
- The DEH21B option card must be plugged into the encoder slot.
- The DC 24 V power supply of an encoder connected to X62 is ensured when X60 is supplied with DC 24 V. Observe the 'Project Planning' chapter in the MOVIDRIVE® MDX60B/61B system manual.

Front view of DEH21B	Description	Terminal	Function
	X62: Connection absolute encoder	**X62:1** **X62:2** **X62:3** **X62:4** **X62:5** **X62:6** **X62:7** **X62:8** **X62:9**	Data + Reserved Cycle + Reserved DGND Data – Reserved Cycle – DC 24 V output
	X60: Voltage supply	**X60:1** **X60:2**	24VIN DGND
	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 DGND (COS–) Signal track $\overline{A}$ ($\overline{K1}$) (SIN–) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) DATA- Reserved TF/TH/KTY+ connection DC+12 V (tolerance range DC 10.5 - 13 V) (max. load X15:15 = DC 650 mA)

STOP!

Encoders connected to X15 and X62 must not be installed or removed during operation.

Electrical components in the encoder or on the encoder card could be destroyed.

De-energize the inverter before plugging or removing the encoder connections. Switch off the supply voltage and the DC 24 V (X10:9).

	NOTE
	The DC 12 V supply voltage from X15 is sufficient to operate SEW encoders (except HTL 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.

	STOP!
	Do not connect HTL encoders E..C to X15 of the DEH21B option. Doing so can destroy the X15 (motor encoder input) of the DEH21B option. Only connect HTL encoders E..C to option DWE11B/12B using the interface adapter DWE11B/12B (→ Sec. "Connecting the interface adapter type DWE11B/12B").

9.19 Connection of DER11B (resolver) option

Part number Resolver card option type DER11B: 824 307 7

NOTES

- 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
 59240AXX	**X14: Input for external encoder or output for incremental encoder simulation** **Connection → page 416 to page 419** **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 switch-over Reference potential DGND (cos–) Signal track A (K1) (sin–) Signal track B (K2) Signal track C (K0) DATA- Reserved DC+12 V (tolerance range DC 10.5 - 13 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) N.C. Reference potential TF/TH/KTY– sin– (S4) cos– (S3) Ref.– (R2) TF/TH/KTY+ connection

STOP!

The connections on X14 and X15 must not be installed or removed during operation.

Electrical components in the encoder or on the encoder card could be destroyed.

De-energize the inverter before plugging or removing the encoder connections. Switch off the supply voltage and the DC 24 V (X10:9).

NOTES

- If X14 is used as an incremental encoder simulation output, the switch-over (X14:7) must be jumpered with DGND (X14:8).
- The DC 12 V supply voltage from X14 is sufficient to operate SEW encoders (except HTL 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.

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 encoder with DC 24 V voltage supply type ES1R, ES2R, EV1R or EH1R
- DC 5 V TTL encoder with DC 5 V voltage supply type ES1T, ES2T, EV1T or EH1T via DWI11A option or encoder with signal level to RS422

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 prefabricated cables for connecting resolvers to DER11B:

For motor type		Part number	
		Fixed installation	Cable carrier installation
DS56 **CM71 ... 112**	**With plug connector**	199 487 5	199 319 4
	Extension cables	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 the 10-pin Wago terminal strip.

DS Motors: The resolver connections in the terminal box are either located 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.+	Reference	Pink (PK)
2	Ref.-		Gray (GY)
3	cos+	Cosine signal	Red (RD)
4	cos -		Blue (BU)
5	sin +	Sine signals	Yellow (YE)
6	sin -		Green (GN)
9	TF/TH/KTY+	Motor protection	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:

[1] Plug connectors

[2] Terminal strip

9.20 Connecting an external encoder

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}
- Encoder 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).

HIPERFACE® encoder connection

Connect the HIPERFACE® encoder AV1H as follows:

Figure 137: 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

You can still connect HIPERFACE® encoders via a prefabricated cable with conductor end sleeves

54332BXX

Figure 138: Connecting the HIPERFACE® encoder to DEH11B/DER11B as external encoder

Part numbers of the prefabricated cables:

- For fixed routing: 1810 695 1
- For cable carrier routing: 1810 697 8

Sin/cos encoder connection

Connect the sin/cos encoder as follows:

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Figure 139: Connecting the sin/cos encoder to DEH11B/DER11B as an external encoder

Part numbers of the prefabricated cables:

- For fixed routing: 819 869 1
- For cable carrier routing: 818 168 3

TTL encoder connection

TTL encoders from SEW-EURODRIVE are available with DC 24 V and DC 5 V voltage supply.

DC -24 V voltage supply

Connect TTL encoders with DC 24 V voltage supply EV1R in the same way as the high-resolution sin/cos encoders (→ Figure 135).

DC -5 V voltage supply

DC-5 V encoders 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 this encoder as follows:

Figure 140: Connecting the TTL encoder EV1T to MDX via DWI11A as an external encoder

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

Part numbers of the prefabricated cables:

- HIPERFACE® encoder card type DEH11B X14: → 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

9.21 Connection of incremental encoder simulation

Incremental encoder emulation

Connector X14 of the DEH11B or DER11B option can also be used as the incremental encoder simulation output. For this purpose, you must jumper "switch-over" (X14:7) with DGND (X14:8). X14 then delivers the incremental encoder signals with a signal level according to RS422. The number of pulses is:

- With DEH11B as on X15 motor encoder input
- With DER11B 1024 pulses/revolution

Figure 141: 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: 819 768 7

9.22 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 "switch-over" (X14:7) with DGND (X14:8) on the master end.

The following figure shows an X14-X14 connection (= master/slave connection) between two MOVIDRIVE® units.

Part number of the prefabricated cable:

- For fixed routing: 817 958 1

	NOTES
	• A **maximum of 3 slaves can be connected to the MOVIDRIVE® master**. • Important: **Do not connect X14:7** when connecting the individual **MOVIDRIVE® slaves together**. Only jumper the connections **X14:7 and X14:8 on the MOVIDRIVE® master**.

9.23 Connection and terminal description of the DIO11B option

Part number Input/output card type DIO11B: 824 308 5

NOTES

- The "input/output card 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 input/output card 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
	X20:1/2 **X20:3**	**AI21/22** **AGND**	Setpoint input n2, DC-10 V...0...10 V or DC 0...10 V (Differential input or input with AGND reference potential) Reference potential for analog signals (REF1, REF2, AI.., AO..)
	X21:1 **X21:4** **X21:2** **X21:5** **X21:3/6**	**AOV1** **AOV2** **AOC1** **AOC2** **AGND**	Analog voltage output V1, with factory setting to "actual speed" Analog voltage output V2, with factory setting to "output current" Load capacity of the analog voltage outputs: I_{max} = DC 10 mA 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 / max output voltage: DC 15 V Reference potential for analog signals (REF1, REF2, AI.., AO..)
	X22:1...8 **X22:9** **X22:10**	**DI1Ø...17** **DCOM** **DGND**	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_ Reference potential for the binary inputs DI1Ø...17 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 **X23:9**	**DO1Ø...17** **24VIN**	Binary outputs 1...8, with factory setting "no function" Load capacity of binary outputs: I_{max} = DC 50 mA (short-circuit proof, protected against external voltage to DC 30 V) **Do not apply external voltage to the binary outputs.** Supply voltage DC+24 V for binary outputs D01Ø ... D017, non-isolated (reference potential DGND)

Voltage input 24 VIN

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).

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Figure 142: Voltage input 24VIN (X23:9) and reference potential DGND (X22:10)

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

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Figure 143: Setpoint input n2

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 Ω → DC 0...20 mA = DC 0...10 V

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Figure 144: Current input with external load

Voltage outputs AOV1 and AOV2

Assign the analog voltage outputs AOV1 and AOV2 in accordance with the following figure:

Figure 145: Voltage outputs AOV1 and AOV2

Current outputs AOC1 and AOC2

Assign the analog current outputs AOC1 and AOC2 in accordance with the following figure:

Figure 146: Current outputs AOC1 and AOC2

9.24 Connection and terminal description of option DFC11B

Part number CAN-Bus interface type DFC11B: 824 317 4

NOTES

- 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 switches Terminal	Function
	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 (jumpered with X30:2) CAN High (jumpered with X30:7) DGND CAN[1)]
	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**	Reserved CAN Low (jumpered with X31:3) DGND CAN[1)] Reserved Reserved DGND CAN[1)] CAN High (jumpered with X31:2) Reserved Reserved

1) DGND of the CAN-Bus-interface is independent from DGND of the basic unit

Connection MOVIDRIVE® - CAN

The DFC11B option is connected to the CAN bus at X30 or X31 in the same way as the SBus in the basic unit (→ chapter "Connecting the system bus (SBus1)") 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

	HAZARD! Uncovered power connections. Severe or fatal injuries from electric shock. • Install the touch guard according to the regulations. • Never start the unit if the touch guard is not installed.

Prerequisite

The drive must be configured correctly to ensure that startup is successful. 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 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 438) .

	NOTE The startup functions described in this section are used for setting the inverter so it can be adapted optimally to the motor that is connected and to suit the basic conditions.

Inverter/motor combinations

The following tables indicate which inverter/motor combinations this applies to.

400 / 500 V units

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

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

Hoist applications

HAZARD!

Risk of fatal injury if the hoist falls.

Severe or fatal injuries.

MOVIDRIVE® MDX60B/61B is not designed for use as a safety device in hoist applications. Use monitoring systems or mechanical protection devices to ensure safety.

10.2 Preliminary work and resources

- Check the installation.

	HAZARD! Risk of crushing if the motor starts up unintentionally. Severe or fatal injuries. • Ensure that the motor cannot start inadvertently, for example, by removing the electronics terminal block X13. • Additional safety precautions must be taken depending on the application to avoid injury to people and damage to machinery.

- Performing **startup with the DBG60B keypad**:

  Plug the connector of the DBG60B keypad into the XT slot.
- Performing **startup with a PC and MOVITOOLS®**:

  Plug an interface adapter (e.g. USB11A) into the XT slot and connect it to the PC with an interface cable (RS232). Install and start MOVITOOLS® on your PC.
- Switch on the supply voltage and, if necessary, the DC 24 V supply.
- Check that the default parameter settings are correct (e.g. factory setting).
- Check the set terminal assignment (→ P60_ / P61_).

	NOTE A group of **parameter values is changed automatically** at startup. The description of parameter 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 only **possible in VFC operating modes**. Startup of CFC and SERVO operating modes is only possible using the MOVITOOLS® operating software.

Required data

The following data is required to ensure startup is successful:

- Motor type (SEW or non-SEW motor)
- Motor data
  - Rated voltage and rated frequency
  - Additionally for non-SEW motors: Rated current, rated power, rated factor cos φ, and rated speed.
- Rated mains voltage

The following data is also needed for startup with a speed controller:

- Encoder type and encoder resolution:

SEW encoder type	Startup parameter	
	Encoder type	Encoder resolution
AK0H	HIPERFACE®	128
AS1H, ES1H, AV1H, AF1H	HIPERFACE®	1024
ES1S, ES2S, EV1S, EH1S, EF1H	SINE ENCODER	1024
ES1R, ES2R, EV1R, EH1R ES1T[1], ES2T[1], EV1T[1], EH1T[1]	INCREM. ENCODER	1024

1) DC 5 V encoders ES1T, ES2T, EV1T and EH1T must be connectetd via the DWI11A option (→ chapter Installation).

- Motor data
  - SEW motor: Brake yes or no and flywheel fan yes or no.
  - Non-SEW motor: Mass moment of inertia of motor, brake and fan
- Stiffness of the control system (factory setting = 1; suitable for most applications)

  If the drive tends to oscillate → setting < 1

  Transient recovery time is too long → Setting > 1

  Recommended setting range: 0,90 ... 1... 1.10 (factory setting = 1)
- Converted mass moment of inertia of the load (gear unit + driven machine) on the motor shaft
- Time required for the shortest ramp

NOTES

- Activate encoder monitoring (P504 = "ON") after completing the startup. The function and voltage supply of the encoder will then be monitored.
- If a Hiperface® encoder is connected, it is always monitored regardless of the setting of parameter P504. Encoder monitoring is not a safety function!

Selecting the required language

The figure below shows the keys for selecting the language.

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[1]	Key ↑	Move up to the next menu item
[2]	Key OK	Confirm entry
[3]	Key ↓	Move down to the next menu item
[4]	Key 🌐	A list of languages is displayed

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 key 🌐. A list of languages is displayed on the screen.
- Use the ↑ / ↓ keys to select the language you require.
- Confirm your selection using the OK key. The basic display is now shown in your chosen language.

Startup

The figure below shows the keys required for startup.

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[1]	Key ↑	Move up to the next menu item
[2]	Key OK	Confirm entry
[3]	Key ☰	Activate the context menu
[4]	Key ↓	Move down to the next menu item
[5]	Key ↻	Change the menu, display mode ↔ edit mode
[6]	Key DEL	Cancel or abort startup

Startup procedure

1. "0" signal at terminal X13:1 (DIØØ "/CONTROL.INHIBIT"), e.g. by disconnecting the electronics terminal block X13.

```
0.00rpm
0.000Amp
CONTROLLER INHIBIT
```

2. Activate the context menu by pressing the ☰ key.

```
PARAMETER MODE
VARIABLE MODE
BASIC VIEW
```

3. Use the ↓ key to scroll down to the "STARTUP PARAMET." menu item.

```
MANUAL MODE
STARTUP
COPY TO DBG
COPY TO MDX
```

4. Press the [OK] 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".
   - Use the [OK] 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
PREPARE FOR STARTUP
```

```
C00*STARTUP

PARAMETER SET 1
PARAMETER SET 2
```

5. Select the operating mode you require. 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 MOTOR
DT63K4/DR63S4
```

7. Enter the rated motor voltage for the selected connection type according to the value specified on the nameplate.

   Example: Nameplate 230Δ/400⅄ 50 Hz
   ⅄ connection → Enter "400 V".
   Δ connection, transition point at 50 Hz → enter '230 V'.
   Δ connection, transition point at 87 Hz → Also enter 230 V.
   However, after startup first set parameter P302 "MAXIMUM SPEED 1" to the value for 87 Hz and then start the drive.

   Example: Nameplate 400Δ/690⅄ 50 Hz
   Only Δ connection possible → enter '400 V'.
   ⅄ connection is not possible.

   Use the [↑] key to select the next parameter.

```
C03*                    V
RATED MOT. VOLT 1
              +400.000
```

8. Enter the rated frequency specified on the motor nameplate.
   Example: 230Δ/400⅄ 50 Hz
   Enter "50 Hz" in ⅄ and Δ connection.

   Use the [↑] key to select the next parameter.

```
C04*                    Hz
RATED MOT. FREQ. 1
              +50.000
```

FOR SEW MOTORS

9. The motor values are stored for SEW 2 and 4-pole motors and need not be entered.

FOR NON-SEW MOTORS

9. Enter the following motor nameplate data:
   - C10* rated motor current, note the connection type (⅄ or Δ).
   - C11* rated motor power
   - C12* power factor cos φ
   - C13* rated motor speed

10. Enter the rated power supply voltage (C05* for SEW motor, C14* for non-SEW motor).

```
C05*                    V
RAT. MAINS VOLT. 1
                +400.000
```

11. If no TF/TH is connected to X10:1/2 or X15 → Set "NO RESPONSE". If a TF/TH is connected, set the required error response. To select the sensor, you must set *P530 sensor type 1* after startup.

```
835*    RESP. TF-SIG.

NO RESPONSE
DISPLAY ERROR
```

12. Start the calculation for the startup data by choosing "YES". The process lasts a few seconds.

```
C06*CALCULATION

NO
YES
```

FOR SEW MOTORS

13. The calculation is performed. After calculation, the next menu item appears automatically.

```
C06*SAVE

NO
YES
```

FOR NON-SEW MOTORS

13. For non-SEW motors, a calibration process is required to perform the calculation:
    - 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
BEING COPIED...
```

15. The startup procedure is now complete. Use the DEL key to return to the context menu.

```
MANUAL MODE
STARTUP
COPY TO DBG
COPY TO MDX
```

16. Use the ↓ key to scroll down to the "EXIT" menu item.

```
UNIT SETTINGS
EXIT
```

17. Use the OK key. The basic display appears.

```
0.00rpm
0.000Amp
CONTROLLER INHIBIT
```

Startup of speed controller

Startup is performed without the speed controller first (→ Section "Startup procedure, steps 1 through 17").

Caution: Set the VFC-n-CONTROL mode.

```
C01*OPER. MODE 1
VFC1&FLYSTART
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
```

FOR SEW MOTORS

5. Enter whether the motor has a brake.

```
C17*BRAKE

WITHOUT
WITH
```

6. Set the stiffness of the control system.
   If the drive tends to oscillate → setting < 1
   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
```

FOR NON-SEW MOTORS

5. Enter the moment of inertia of the motor.

```
D00*        10e–4kgm²
J0 OF THE MOTOR
                +4.600
```

6. Set the stiffness of the control system.
   If the drive tends to oscillate → setting < 1
   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*        10e–4kgm²
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*          10e–4kgm²
LOAD MOMENT OF INER-
TIA
                +0.200
```

9. Enter the time for the shortest ramp you want.

```
C21*                    s
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
BEING COPIED...
```

13. The startup procedure is now complete. Use the DEL key to return to the context menu.

```
MANUAL MODE
STARTUP
COPY TO DBG
COPY TO MDX
```

14. Use the ↓ key to scroll down to the "EXIT" menu item.

```
UNIT SETTINGS
EXIT
```

15. Use the OK key. The basic display appears.

```
0.00rpm
0.000Amp
CONTROLLER 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. Use the OK 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 OK 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®.

	HAZARD! Parameter settings incorrect due to unsuitable data sets. Severe or fatal injury. Make sure that the data set you copy is suitable for the application.

- Enter parameter settings that differ from the factory setting in the parameter list (→ page 442).
- 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 438).
- 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 and sin/cos encoders (P504="ON"). **Encoder monitoring** is **not a safety function**.

Setting parameters

Proceed in the following order to set the parameters:

- Call up the context menu using the [≡] key. In the context menu, select the "PARAMETER MODE" menu item. Confirm your selection using the [OK] 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.
- You can use the [↑] key or the [↓] key to select or set the correct parameter value.
- Use the [OK] key to confirm the selection or setting.
- 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 required language 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 "Baud rate" field, select the baud rate set on the basic unit with the DIP switch S13 (standard setting → "57.6 kBaud").
- Press the <Update> button The connected inverter is displayed under "Connected devices."

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Figure 147: 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 assistant. For questions on startup, refer to the MOVITOOLS® online help.

Startup for HTL motor encoders

Observe the following safety notes when starting up an HTL motor encoder to MOVIDRIVE® MDX61B:

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Figure 148: Settings for startup of a motor with HTL motor encoder

[1] Dropdown menu "SEW encoder type"

[2] Dropdown menu "Encoder type"

[3] Dropdown menu "PPR count"

- Choose "Non-SEW encoder" from the [SEW encoder type] [1] dropdown menu.
- Choose "INCREM. ENCODER TTL" from the [encoder type [2] in the dropdown menu.
- In the dropdown menu "PPR count" [3] select the PPR count (1024 for SEW HTL encoders) printed on the HTL motor encoder.

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 X13:6 (DIØØ to DIØ5) when the "UNIPOL/FIX.SETPT" setpoint is selected (P100) to operate the drive with an analog setpoint entry.

Function	X11:2 (AI11) Analog input n1	X13:1 (DIØØ) /Controller inhibit	X13:2 (DIØ1) CW/stop	X13:3 (DIØ2) CCW/stop	X13:4 (DIØ3) Enable/stop	X13:5 (DIØ4) n11/n21	X13:6 (DIØ5) n12/n22
Controller inhibit	X	"0"	X	X	X	"0"	"0"
Stop	X	"1"	X	X	"0"	"0"	"0"
Enable and stop	X	"1"	"0"	"0"	"1"	"0"	"0"
Clockwise at 50 % n_{max}	5 V	"1"	"1"	"0"	"1"	"0"	"0"
Clockwise with n_{max}	10 V	"1"	"1"	"0"	"1"	"0"	"0"
Counterclockwise with 50 % n_{max}	5 V	"1"	"0"	"1"	"1"	"0"	"0"
CCW with n_{max}	10 V	"1"	"0"	"1"	"1"	"0"	"0"

Travel diagram

The following travel diagram is an example of how the drive is started with the wiring of terminals X13:1 ... X13:4 and analog setpoints. Binary output X10:3 (DBØØ "/Brake") is used for switching brake contactor K12.

05033BEN

	NOTE The motor is not energized in the event of controller inhibit (DIØØ = "0"). A motor without brake will coast to standstill.

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 is selected (P100) to operate the drive with the fixed setpoints.

Function	X13:1 (DIØØ) /Controller inhibit	X13:2 (DIØ1) CW/stop	X13:3 (DIØ2) CCW/stop	X13:4 (DIØ3) Enable/stop	X13:5 (DIØ4) n11/n21	X13:6 (DIØ5) n12/n22
Controller inhibit	"0"	X	X	X	X	X
Stop	"1"	X	X	"0"	X	X
Enable and stop	"1"	"0"	"0"	"1"	X	X
CW oper. with n11	"1"	"1"	"0"	"1"	"1"	"0"
CW oper. with n12	"1"	"1"	"0"	"1"	"0"	"1"
CW oper. with n13	"1"	"1"	"0"	"1"	"1"	"1"
CCW oper. with n11	"1"	"0"	"1"	"1"	"1"	"0"

Travel diagram

The following travel diagram is an example of how the drive is started with the wiring of terminals X13:1 ... X13:6 and the internal fixed setpoints. Binary output X10:3 (DBØØ "/Brake") is used for switching brake contactor K12.

05034BEN

NOTE

The motor is not energized in the event of controller inhibit (DIØØ = "0"). A motor without brake will coast to standstill.

Manual operation

The inverter can be controlled using the DBG60B keypad in manual operation (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 when the power supply is switched off and on; however, the inverter is then inhibited. 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.

	NOTE
	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.

	HAZARD!
	Risk of crushing if the motor starts up unintentionally. Severe or fatal injuries. • Ensure that the motor cannot start inadvertently, for example, by removing the signal terminal block X13. • Additional safety precautions must be taken depending on the application to avoid injury to people and damage to machinery.

Startup in "VFC & Flying start" operating 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
	Due to exact motor data, the proper function of the flying start function has only been tested with SEW motors. SEW-EURODRIVE does not guarantee a proper function of the flying start function for non-SEW motors.

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 compensation 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 in standstill**.
3. **Note** the value of *P322 IxR compensation 1* (stator resistance) for step 6.
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

General notes

- The parameters in the quick menu are marked by a "\" (= display on the DBG60B keypad).
- The factory setting for the parameter is highlighted in bold.

Par.	Name	Value range
DISPLAY VALUES		
00_	**Process values**	
000	Speed	-6100 ... 0 ... 6100 rpm
\001	User display	[Text]
002	Frequency	0 ... 600 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	Current parameter set	1/2
014	Heat sink temperature	-20 ... 0 ... 100 °C
015	Hours of operation	h
016	Enable hours	h
017	Work	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 limit	0 ... 100 %
03_	**Binary inputs basic unit**	
030	Binary input DIØØ	/CONTR. INHIBIT
031	Binary input DIØ1	Not in DBG60B
032	Binary input DIØ2	
033	Binary input DIØ3	
034	Binary input DIØ4	
035	Binary input DIØ5	
036	Binary input DIØ6	
037	Binary input DIØ7	
\039	Status binary inputs DIØØ...DIØ7	
04_	**Binary input options**	
040	Binary input DI1Ø	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 DI1Ø...DI17	

Par.	Name	Value range
05_	**Binary outputs basic unit**	
050	Binary output DBØØ	/BRAKE
051	Binary output DOØ1	Not in DBG60B
052	Binary output DOØ2	
053	Binary output DOØ3	
054	Binary output DOØ4	
055	Binary output DOØ5	
\059	Status binary outputs DBØØ, DOØ1...DOØ5	
06_	**Binary outputs option**	
060	Binary output DO1Ø	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 DO1Ø...DO17	
07_	**Unit data**	
070	Unit 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	Standard Technology
08_	**Error memory**	
\080	Error t-0	
081	Error t-1	
082	Error t-2	
083	Error t-3	
084	Error 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 Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
1__	**SETPOINTS / RAMP GENERATORS**		
10_	**Setpoint selection**		
\100	Setpoint source	**UNIPOL./FIX.SETPT.** BIPOL./FIX.SETPT UNIPOL./FIX.SETPT. RS485 Fieldbus Motor potentiometer Motor pot.+analog 1 Fix.setpt.+analog 1 Master-SBus1 Master-RS485 SBus 1 Frequency input SBus 2 IPOS setpoint	
101	Control signal source	**Terminals**	
102	Frequency scaling	0.1 .. **10** ... 65 kHz	
105	Error response to wire breakage AI1	**No response** Immediate stop/fault Rapid stop/fault Rapid stop/warning	
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** Ref. 3000 rpm V Off., N-MAX N-Off., N-MAX N-MAX, 0-20mA N-MAX, 4-20mA	
113	AI1 voltage offset	-10 ... **0** ... 10 V	
114	AI1 speed offset	-6000 ... **0** ... 6000 rpm	
115	Filter speed setpoint	0 ... **5** ...100 ms 0 = Filter off	
12_	**Analog inputs (optional)**		
120	AI2 operating mode	**No function** 0...10 V + setpt.1 0...10 V I-limit: Actual value PID controller	
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 stop 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 up 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	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
147	Emergency stop 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	Save last setpoint	**OFF** ON	
16_	**Fixed setpoints 1**		
\160	Internal setpoint n11	-6000 ... **150** ... 6000 rpm (% I_N)	
\161	Internal setpoint n12	-6000 ... **750** ... 6000 rpm (% I_N)	
\162	Internal setpoint n13	-6000 ... **1500** ... 6000 rpm (% I_N)	
17_	**Fixed setpoints 2**		
170	Internal setpoint n21	-6000 ... **150** ... 6000 rpm (% I_N)	
171	Internal setpoint n22	-6000 ... **750** ... 6000 rpm (% I_N)	
172	Internal setpoint n23	-6000 ... **1500** ... 6000 rpm (% I_N)	
2__	**CONTROLLER PARAMETERS**		
20_	**Speed control (only parameter set 1)**		
200	P-gain n-controller	0.01 ... **2** ... 32	
201	Time constant n-controller	0 ... **10** ... 300 ms	
202	Gain Accel. feedforw.	**0** ... 65	
203	Filter acceleration feedforward	**0** ... 100 ms	
204	Filter speed actual value	**0** ... 32 ms	
205	Load precontrol CFC	**– 150 %** ... 0 ... 150 %	
206	Sampling time n-controller	**1 ms** 0.5 ms	
207	Load precontrol 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_	**Synchr. oper. with synchr. encoder**		
230	Synchronous encoder	**Off** Equal-ranked Chain	
231	Factor slave encoder	**1** ... 1000	
232	Factor slave synchronous encoder	**1** ... 1000	
233	Synchronous encoder resolution	128 / 256 / 512 / **1024** / 2048	
234	Master encoder resolution	128 / 256 / 512 / **1024** / 2048	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
24_	**Synchronous operation with catch up**		
240	Synchronous speed	-6000 ... **1500** ... 6000 rpm	
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	
27_	**Process controller input values**		
270	Setpoint source	**Parameters** / IPOS variable / Analog 1 / Analog 2	
271	Setpoint	–32767 ... **0** ... 32767	
272	IPOS setpoint address	**0** ... 1023	
273	Time constant	**0** ... 0.01 ... 2000 s	
274	Scaling setpoint	–32 767 ... **1** ... 32 767	
275	Actual value source	**Analog 1** / Analog 2 / IPOS Variable	
276	IPOS actual value address	**0** ... 1023	
277	Actual scaling factor	–32.767 ... **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	
283	PID controller maximum output	–32767 .... **10000** ... 32767	
284	Minimum output process controller	–32767 ... **0** ... 32767	
285	Maximum output process controller	–32767 ... **7500** ... 32767	
3__	**MOTOR PARAMETERS**		
30_ / 31_	**Limits 1 / 2**		
\300 / 310	Start/stop speed 1 / 2	0 ... 150 rpm	
\301 / 311	Minimum speed 1 / 2	0 ... **15** 6100 rpm	
\302 / 312	Maximum speed 1 / 2	0 ... **1500** ... 6100 rpm	
\303 / 313	Current limit 1 / 2	0 ... 150 % (BG0: 0 ... 200 % I_N)	
304	Torque limit	**0** ... 150 % (BG0: 0 ... 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 rpm	
34_	**Motor protection**		
340 / 342	Motor protection 1 / 2	**Off** On (asynchronous) On (synchronous)	
341 / 343	Type of cooling 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	Direction of rotation reversal 1 / 2	**Off** On	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
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 signal**		
400	Speed reference value	0 ... **1500** ... 6000 rpm	
401	Hysteresis	0 ... **100** ... 500 rpm	
402	Delay time	0 ... **1** ... 9 s	
403	Signal = '1' if:	**n < nref** $n > n_{ref}$	
41_	**Speed window signal**		
410	Window center	0 ... **1500** ... 6000 rpm	
411	Range width	**0** ... 6000 rpm	
412	Delay time	0 ... **1** ... 9 s	
413	Signal = '1' if:	**Indoors** Outside	
42_	**Speed setpoint/actual value comparison**		
420	Hysteresis	0 ... **100** ... 300 rpm	
421	Delay time	0 ... **1** ... 9 s	
422	Signal = '1' if:	$n \neq n_{setp}$ **n = nsetp**	
43_	**Current reference signal**		
430	Current reference value	0 ...**100** ... 200 % I_N	
431	Hysteresis	0 ... **5** ... 30 % I_N	
432	Delay time	0 ... **1** ... 9 s	
433	Signal = '1' if:	**I < Iref** $I > I_{ref}$	
44_	**Imax signal**		
440	Hysteresis	0 ... **5** ... 50 % I_N	
441	Delay time	0 ... **1** ... 9 s	
442	Signal = '1' if:	$I = I_{max}$ / **$I < I_{max}$**	
5__	**MONITORING FUNCTIONS**		
50_	**Speed monitoring**		
500 / 502	Speed monitoring 1 / 2	Off Motor Regenerative **Mot. & regener.**	
501 / 503	Delay time 1 / 2	0 ... **1** ... 10 s	
504	Encoder monitoring motor	**No** Yes	
505	Synchronous encoder monitoring	**No** Yes	
51_	**Synchronous operation monitoring**		
510	Positional tolerance slave	10 ... **25** ... 32 768 inc	
511	Prewarning lag error	**50** ... 99 999 999 inc	
512	Lag error limit	100 ... **4000** ... 99 999 999 inc	
513	Delay Lag error signal	0 ... **1** ... 99 s	
514	Counter LED display	10 ... **100** ... 32 768 inc	
515	Delay 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**	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
52_	**Mains-off check**		
520	Mains OFF response time	**0** ... 5 s	
521	Mains OFF response	**Controller inhibit** Emergency stop	
522	Phase failure monitoring	**On** Off	
53_	**Motor temperature protection**		
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)	
54_	**Gear unit/motor monitoring**		
540	Response to drive vibration / warning	**Display error**	**The following error responses can be programmed:** No response • display error • imm. stop/fault • EMERG. ST/FAULT • RAPID STOP/WARNG • Rapid stop/warng. • EMERG.STOP/WARN. •RAPID STOP/WARNG
541	Response to drive vibration / fault	**Rapid stop / warning**	
542	Response to oil aging / warning	**Display error**	
543	Response to oil aging / fault	**Display error**	
544	Response oil aging / overtempera-ture	**Display error**	
545	Response oil aging / ready signal	**Display error**	
549	Response brake wear	**Display error**	
55_	**DCS safety monitor**		
550	status DCS safety monitor	Display value that cannot be changed	
551	Binary inputs DCS 1 ... 8		
552	Binary outputs DCS DO0_P ... DO2_M		
553	Serial number DCS		
554	CRC DCS		
555	DCS error response	**immediate stop** Malfunction	**The following error responses can be programmed:** No response • display error
556	DCS alarm response		
557	DCS source actual position	**Motor encoder (X15)** Ext. Encoder (X14) Absolute encoder (X62)	
56_	**Current limit Ex-e motor:**		
560	Current limit Ex-e motor:	On **Off**	
561	Frequency A	0 ... **5** ... 60 Hz	
562	Current limit A	0 ... **50** ...150 %	
563	Frequency B	0 ... **10** ... 104 Hz	
564	Current limit B	0 ... **80** ... 200 %	
565	Frequency C	0 ... **25** ... 104 Hz	
566	Current limit C	0 ... **100** ... 200 %	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
6__	**TERMINAL ASSIGNMENT**		
60_	**Binary inputs basic unit**		
-	Binary input DIØØ	Fixed assignment with: **/CONTR. INHIBIT**	
600	Binary input DIØ1	**CW/stop**	**The following functions can be programmed:** No function • enable/stop • CW/stop • CCW/stop • n11/n21 • n12/n22 • fix. setpt. sw.over • param. sw.over • ramp sw.over • Motor potentiometer uo • motor potenti-ometer down • / Ext. error • error reset • /hold control • /CW limit switch • /CCW limit switch • IPOS input • reference cam • ref. trav. start • slave free runn • setpoint hold • Mains on • set DRS zero point • DRS slave start • DRS teach in • DRS master stop • OSC./WARNING • break wear • oil aging/warng. • oil aging/error • oil aging overtemp. • oil aging/ready
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	Fixed assignment with: **/Brake**	
620	Binary output DOØ1	**Ready**	**The following signals can be programmed:** No function • /malfunction • ready • out-put stage on • rotating field on • brake rel • brake engaged • motor standstill • parameter set • speed Reference • speed window • nom./act.val.comp. • curr. reference • Imax signal • /motor utilization 1 • /motor utiliz. 2 • /DRS PREWARN. • /DRS lag error • DRS slave in pos. • IPOS in position • IPOS reference • IPOS output • /IPOS malfunction • reserved • ex-e current limit • LSM commutation • S pattern • safe stop
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_	**Optional analog outputs**		
640	Analog output AO1	**Actual speed**	**The following functions can be programmed:** No function • ramp input • setpoint speed • actual speed • actual frequency • output current • active current • unit utilization • IPOS output • relative 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	**Output current**	
644	Scaling AO2	-10 ... 0 ... **1** ... 10	
645	Operating mode AO2	OFF / **-10 ... +10 V** / 0 ... 20 mA / 4 ... 20 mA	

Par.	Name Selectable 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 BRAKE VFC 1 & FLYING START VFC-n CONTROL VFC-n-CTRL&GRP. VFC-n-CTRL&HOIST VFC-n-CTRL&SYNC VFC-n-CTRL& IPOS CFC CFC & M-CONTROL CFC&IPOS CFC&SYNC. SERVO SERVO&M-CONTROL SERVO&IPOS SERVO&SYNC.	
701	Operating mode 2	**VFC 2** VFC 2 & GROUP VFC 2 & HOIST VFC 2 & DC BRAKE VFC 2 & FLYING START	
71_	**Standstill current**		
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 rpm	
722 / 725	Start offset 1 / 2	0 ... **30** ... 500 rpm	
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 function**		
740 / 742	Skip window center 1 / 2	0 ... **1500** ... 6000 rpm	
741 / 743	Skip width 1 / 2	**0** ... 300 rpm	
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 share (SBus) Load share (485+SBus)	
751	Scaling slave setpoint	– 10 ... 0 ... **1** ... 10	
76_	**Manual operation**		
760	Lockout 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 ... **255.255.255.000** ... 223.255.255.255	
782	Standard gateway	**000.000.000.000** ... 223.255.255.255	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
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)	
785	EtherNet / IP startup configuration	**DHCP** Saved IP parameters	
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 status	
\803	Parameter lock	**Off** On	
804	Reset statistical data	**No** Error memory kWh counter Operating hours	
806	Copy DBG60B → MDX	Yes / **No**	Only in DBG60B
807	Copy MDX → DBG60B	Yes / **No**	Only in DBG60B
81_	**Serial communication**		
810	RS485 address	**0** ... 99	
811	RS485 group address	**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_	**Error responses**		
830	Response EXT. ERROR	**Emergency stop/malf.**	**The following error responses can be programmed:** No response • display error • imm. stop/fault • EMERG. ST/FAULT • RAPID STOP/WARNG • Rapid stop/warng. • EMERG.STOP/WARN. •RAPID STOP/WARNG
831	Response FIELDBUS TIMEOUT	**Rapid stop/warning**	
832	Response MOTOR OVERLOAD	**Emergency stop/malf.**	
833	Response RS485 TIMEOUT	**Rapid stop/warning**	
834	LAG ERROR response	**Emergency stop/malf.**	
\835	Response TF SIGNAL	**No response**	
836 / 837	Response SBus TIMEOUT 1 / 2	**EMERG. ST/FAULT**	
838	SW limit switch	**Emergency stop/malf.**	
84_	**Reset behavior**		
\840	Manual reset	**No** Yes	
841	Auto reset	**Off** On	
842	Restart time	1 ... **3** ... 30 s	
85_	**Scaling actual speed value**		
850	Scaling factor numerator	**1** ... 65535	Can only be set using MOVITOOLS®
851	Scaling factor denominator	**1** ... 65535	
852	User travel unit	**rpm**	
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 16 kHz	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
87_	**Process data description**		
870	Setpoint description PO1	**Control 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 PO–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 current • 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	**Output 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 group address 1 / 2	**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	1 ... **5** ... 10 ms	
889 / 899	Parameter channel 2	Yes **No**	
9__	**IPOS PARAMETERS**		
90_	**IPOS Reference travel**		
900	Reference offset	– (2^{31}– 1) ... **0** ... 2^{31}– 1 Inc	
901	Reference speed 1	0 ... **200** ... 6000 rpm	
902	Reference speed 2	0 ... **50** ... 6000 rpm	
903	Reference travel type	**0** ... 8	
904	Reference travel to zero pulse	**Yes** No	
905	HIPERFACE® Offset X15	– (2^{31}– 1) ... **0** ... 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 rpm	
914	Positioning speed CCW	0 ... **1500** ... 6000 rpm	
915	Speed feedforward	-199.99 ... 0 ... **100** ... 199.99 %	
916	Ramp type	**Linear** Sine Squared Bus ramp Jerk-limited Electronic cam Synchronous operation Cross Cutter	
917	Ramp mode	**Mode 1** Mode 2	

Par.	Name Selectable par. Parameter set 1/2	Setting range Factory setting	Comment
92_	**IPOS Monitoring**		
920	SW limit switch RIGHT	– (2^{31}– 1) ... **0** ... 2^{31}– 1 Inc	
921	SW limit switch LEFT	– (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	**Stop** / 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. Encoder (X14) Absolute encoder (X62)	
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	Synchronous 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	
948	Automatic encoder replacement detection	**On** / off	
95_	**Absolute encoder**		
950	Encoder type	**No encoder**	
951	Counting direction	**Normal** Inverted	
952	Clock rate	**1** ... 200 %	
953	Position offset	– (2^{31}– 1)...**0**...2^{31}– 1 Inc	
954	Zero point 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	
97_	**IPOS synchronization**		
970	DRAM synchronization	**No** / yes	
971	Synchronization phase	–2 ... **0** ...2 ms	

11 Operation

11.1 Operating display

7-segment display

The 7-segment display shows the operating condition of MOVIDRIVE® and, in the event of an error, an error or warning code.

7-segment display	Unit status (high byte in status word 1)	Meaning
0	**0**	24 V operation (inverter not ready)
1	**1**	Controller inhibit active
2	**2**	No enable
3	**3**	Standstill current
4	**4**	Enable
5	**5**	n-control (speed control)
6	**6**	M-control (torque control)
7	**7**	Hold control
8	**8**	Factory setting
9	**9**	Limit switch contacted
A	**10**	Technology Option
c	**12**	IPOS$^{plus®}$ reference travel
d	**13**	Flying start
E	**14**	Adjust encoder
F	**11**	Error display (flashing)
H	**-**	Manual operation
t	**16**	Inverter is waiting for data
U	**17**	"Safe Stop" active
• (blinking dot)	-	IPOS$^{plus®}$ program is running
Flashing display	-	STOP via DBG60B
ꟻ1 ...ꟻ9	-	RAM defective

WARNING!

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

Severe or fatal injuries.

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 CONTROLLER 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/STOP" = "0").
950.00rpm 0.990Amp ENABLE (VFC)	Display for enabled inverter.
NOTE 6: VALUE TOO HIGH	Information message
(DEL)=Quit ERROR 9 STARTUP	Error display

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 DBG60B/SHELL	Description
1	ILLEGAL INDEX	Index addressed via interface not available.
2	NOT IMPLEMENT.	• Attempt to execute a non-implemented function. • An incorrect communication service has been selected. • Manual operation selected via invalid interface (e.g. fieldbus).
3	READ ONLY VALUE	Attempt to edit a read-only value.
4	PARAM. INHIBITED	Parameter lock P803 = "ON", Parameter cannot be altered.
5	SETUP ACTIVE	Attempt to change parameters when factory setting is active.
6	VALUE TOO HIGH	Attempt to enter a value that is too high.
7	VALUE TOO LOW	Attempt to enter a value that is too low.
8	REQ. CARD MISSING	The option card required for the selected function is missing.
10	ONLY VIA ST1	Manual mode must be completed using X13:ST11/ST12 (RS 485).
11	ONLY TERMINAL	Manual mode must be exited via TERMINAL (DBG60B or UWS21B).
12	NO ACCESS	Access to selected parameter denied.
13	CTRL. INHIBIT MISS-ING	Set terminal DIØØ "/Controller inhibit" = "0" for the selected function.
14	INVALID VALUE	Attempt to enter an invalid value.
16	PARAM. NOT SAVED	Overflow of EEPROM buffer, e.g., due to cyclic write access. Parameter is saved in EEPROM and is not protected against loss following POWER OFF.
17	INVERTER ENABLED	• Parameter to be changed can only be set in the state "CONTROLLER INHIBIT." • Attempt to change to manual mode during live operation.

11.3 Functions of the DBG60B keypad

Key assignments for DBG60B

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[1]	Key STOP	Stop
[2]	Key ↑	Up arrow, moves up to the next menu item
[3]	Key RUN	Start
[4]	Key OK	OK, confirms the entry
[5]	Key ☰	Activate the context menu
[6]	Key ↓	Down arrow, moves down to the next menu item
[7]	Key ·	Decimal point
[8]	Key +/-	Sign reversal
[9]	Keys 0 ... 9	Digits 0... 9
[10]	Key ↻	Change menu
[11]	Key 🌐	Select language
[12]	Key DEL	Delete previous entry

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. Use the OK 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. Use the OK 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".

```
PARAMETER MODE
VARIABLE MODE
BASIC VIEW
```

2. Press the [OK] 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.

```
P 000                rpm
SPEED
                     +0.0
CONTROLLER INHIBIT
```

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.

```
P 1.. SETPOINTS/
RAMP GENERATORS

CONTROLLER INHIBIT
```

4. Activate parameter subgroup selection in the main parameter group by pressing the [OK] key. The flashing cursor moves one position to the right.

```
P 1.. SETPOINTS/
RAMP GENERATORS

CONTROLLER INHIBIT
```

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.

```
\ 13. SPEED
RAMPS 1

CONTROLLER INHIBIT
```

6. Activate parameter selection in the required parameter subgroup by pressing the [OK] key. The flashing cursor moves one position to the right.

```
\ 13. SPEED
RAMPS 1

CONTROLLER INHIBIT
```

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.

```
\ 132                s
T11 UP CCW
                     +0.13
CONTROLLER INHIBIT
```

8. Press the [OK] key to activate the setting mode for the selected parameter. The cursor is positioned under the parameter value.

```
\ 132                s
T11 UP CCW
                     +0.13_
CONTROLLER INHIBIT
```

9. Use the [↑] key or the [↓] key to select the desired parameter value.

```
\ 132                s
T11 UP CCW
                     +0.20_
CONTROLLER INHIBIT
```

10. Use the [OK] key. Exit the setting mode by pressing the [↶] key. The flashing cursor is positioned under the third digit of the parameter number again.

```
\ 132                s
T11 UP CCW
                     +0.20
CONTROLLER INHIBIT
```

11. Use the [↑] key or the [↓] to select another parameter or go back to the parameter subgroup menu using the [DEL] key.

```
\ 13. SPEED
RAMPS 1

CONTROLLER INHIBIT
```

12. Use the [↑] key or the [↓] to select another parameter subgroup or go back to the main parameter group menu using the [DEL] key.

```
P 1.. SETPOINTS/
RAMP GENERATORS

CONTROLLER INHIBIT
```

13. Use the [≡] key to return to the context menu.

```
PARAMETER MODE
VARIABLE MODE
BASIC VIEW
```

Variable mode

H... variables are displayed in the variable mode. To call up the variable mode, proceed as follows:

- Use the ☰ key to call up the context menu. Select the "VARIABLE MODE" menu item and use the OK key. The variable mode display appears.
- You can 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 "\" 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 OK 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. Use the OK 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. Use the OK 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. Use the OK key. The selected parameter is deleted from the user menu.

Wake-up parameters

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

Proceed as follows to save a wake-up parameter:

- First select the required parameter in parameter mode.
- In the context menu, select the "XXXX WAKE-UP PARAM." menu item. "XXXX" is the selected wake-up parameter. Use the OK key.

IPOS$^{plus®}$

MOVITOOLS® is required for programming IPOS$^{plus®}$. You can only use the DBG60B keypad to edit or change IPOS$^{plus®}$ variables (H__).

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 for starting and stopping the IPOS$^{plus®}$ program from the DBG60B keypad.

11.4 Memory card

The pluggable memory card is installed in the basic unit. The basic data is stored on the memory card and is always up-to-date. 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. You can install as many option cards as required.

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Figure 149: MDX60B/61B memory card

Notes for replacing the memory card

- Only plug in the memory card when the MOVIDRIVE® B unit is switched off.
- You can install the memory card from the original unit in a new inverter. The following combinations are permitted:

Original unit MOVIDRIVE® MDX60B/61B...	New inverter MOVIDRIVE® MDX60B/61B...
00	00 or 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. You can remedy the error by calling up the "DELIVERY CONDITION" menu item from the context menu (P802 factory setting). This resets the unit to its initial delivery condition. You must then restart the unit.

- The counter status of the DRS11B option and the data of the DH..1B and DCS..B options are not stored on the memory card. When you replace the memory card, you have to install the DRS11B, DH..1B and DCS..B option cards from the original unit in the new inverter.

  If the original unit was a MOVIDRIVE® B size 0 unit with the option DHP11, you have to use a new DHP11B option card with the configuration data set (file name.sew-copy) that you saved previously.
- If an absolute encoder is used as a motor or synchronous encoder, you must reference the encoder after you have replaced the unit.

12 Service

12.1 Fault information

Error memory

The error memory (P080) stores the last five error messages (errors t-0 to t-4). The error message of longest standing is deleted whenever more than five error messages have occurred. The following information is stored when the error occurs:

Fault which occurred • Status of the binary inputs/outputs • Operational status of the inverter • Inverter status • Heat sink temperature • Speed • Output current • Active current • Unit utilization • DC link circuit voltage • ON hours • Enable hours • Parameter set • Motor utilization.

Switch-off responses

There are three switch-off responses depending on the malfunction; 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

An error 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.

HAZARD!

Risk of crushing if the motor starts up automatically after an auto reset.

Severe or fatal injuries.

- Do not use auto reset with drives where an automatic restart represents a danger to people or units.
- Perform a manual reset.

Inverter is waiting for data

If the inverter is controlled via a communication interface (fieldbus, RS485 or SBus) and the power was switched off and back on again or an error reset was performed, then the enable remains ineffective until the inverter receives valid data again via the interface, which is monitored with a timeout.

12.2 Error messages and list of errors

Error message on 7-segment display

The error code is shown in a 7-segment display. The following display sequence is used (e.g. error code 100):

Following a reset or if the error code resumes the value '0', the display switches to the operating display.

Display suberror code

The suberror code is displayed in MOVITOOLS® (as of version 4.50) or in the DBG60B keypad.

Error list

The factory set error response appears in the "Response (P)" column. (P) indicates that the response is programmable (via *P83_error response* or with IPOS$^{plus®}$). In the event of error 108, (P) indicates that the response can be programmed via *P555 DCS error response* In the event of error 109, (P) indicates that the response can be programmed via *P556 DCS alarm response*

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
00	No fault					
01	Overcurrent	Immediate switch-off	0	Output stage	• Short circuit at output • Motor too large • Defective output stage • Ramp limit is deactivated and set ramp time is too short	• Rectify the short circuit • Connect a smaller motor • Contact SEW Service for advice if the output stage is defective. • Activate P138 and/or increase ramp time
			1	V_{CE} monitoring or under-voltage monitoring of the unit driver		
			5	Inverter remains in hard-ware current limit		
03	Ground fault	Immediate switch-off	0	Ground fault	Ground fault • In the motor lead • in the inverter • in the motor	• Eliminate ground fault • Consult SEW Service
04	Brake chopper	Immediate switch-off	0	DC link voltage too high in 4Q operation	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Brake resistor has too high resistance • Brake chopper is defective	• Extend deceleration ramps • Check feeder cable to braking resistor • Check technical data of braking resistor • Replace MOVIDRIVE® if the brake chopper is defective
			1			
06	Supply sys-tem phase failure	Immediate switch-off	0	DC link voltage periodi-cally too low	Phase failure	Check the supply system cable
07	DC link over-voltage	Immediate switch-off	0	DC link voltage too high in 2Q operation	DC link voltage too high	• Extend deceleration ramps • Check supply cable to the braking resistor • Check technical data of braking resistor
			1			
08	Speed monitoring	Immediate switch-off (P)	0	Inverter in current limit or in slip limit	• 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 direc-tion of rotation. • n_{max} is exceeded during torque control. • In operating mode VFC: Output frequency ≥ 150 Hz • In operating mode V/f: Out-put frequency ≥ 600 Hz	• Reduce load • Increase deceleration time (P501 or P503). • Check encoder connec-tion, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limitation • Extend ramps if necessary • Check motor cable and motor • Check line phases
			3	System limit "Actual speed" exceeded. Speed difference between ramp setpoint and actual value for 2×ramp time higher than expected slip.		
			4	Maximum rotating field speed exceeded. Maximum rotating field fre-quency (with VFC max 150 Hz and V/f max 600 Hz) exceeded.		
09	Startup	Immediate switch-off	0	Startup missing	Inverter has not been started up for the selected operating mode.	Perform startup for the required operating mode.
			1	Wrong operating mode selected		
			2	Wrong encoder type or defective encoder card		
10	IPOS-ILLOP	Emergency stop	0	Invalid IPOS command	• Incorrect command detected during IPOS$^{plus®}$ program execution. • Incorrect conditions during command execution.	• Check the content of the program memory and, if necessary, correct. • Load the correct program into the program memory. • Check program sequence (→ IPOS$^{plus®}$ manual)

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
11	Overtempera-ture	Emergency stop (P)	0	Heat sink temperature too high or temperature sensor defective	Thermal overload of inverter	Reduce load and/or provide for adequate cooling.
			3	Overtemperature switched-mode power supply		
13	Control sig-nal source	Immediate switch-off	0	Control signal source not available, e.g. control sig-nal source fieldbus without fieldbus card	Control signal source not defined or defined incorrectly.	Set correct control signal source (P101).
14	Encoder	Immediate switch-off	0	Encoder not connected, defective encoder, defec-tive encoder cable	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
			25	Encoder fault X15 - Speed range exceeded. Encoder at X15 turns faster than 6542 rpm.		
			26	Encoder fault X15 - Card is faulty. Error in the quadrant eval-uation.		
			27	Encoder error - encoder connection or encoder is faulty.		
			28	Encoder error X15 - - Communication error RS485 channel.		
			29	Encoder error X14 - - Communication error RS485 channel.		
			30	Unknown encoder type at X14/X15		
			31	Error plausibility check Hiperface X14/X15 Increments have been lost.		
			32	Encoder error X15 Hiperface. Hiperface encoder at X15 reports fault.		
			33	Encoder error X14 Hiperface. Hiperface encoder at X14 reports fault.		
			34	Encoder error X15 Resolver. Encoder connection or encoder is faulty.		
17	System malfunction	Immediate switch-off	0	"Stack overflow" error	Inverter electronics disrupted, possibly due to effect of EMC.	Check ground connections and shielding and correct, if necessary. Contact SEW ser-vice if this error occurs again.
18			0	"Stack underflow" error		
19			0	"External NMI" error		
20			0	"Undefined opcode" error		
21			0	"Protection fault"		
22			0	"Illegal word operand access" error		
23			0	"Illegal instruction access" error		
24			0	"Illegal external bus access" error		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
25	EEPROM	Rapid stop	0	Read or write error on EEPROM power section	Access to the EEPROM of the memory card has failed	• Activate factory settings, perform reset and reset parameters. • Contact SEW service if the error occurs again. • Replace memory card.
			11	NV memory read error NV-RAM inside the unit		
			13	NV memory chip card System module defective		
			14	NV memory chip card Memory card defective		
			16	NV memory initialization error		
26	External terminal	Emergency stop (P)	0	External terminal	Read in external error signal via programmable input.	Eliminate respective cause; reprogram terminal if necessary.
27	limit switches are missing	Emergency stop	0	Both limit switches missing or open circuit	• Open circuit/both limit switches missing. • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches. • Swap over limit switch connections. • Reprogram terminals
			2	Limit switch reversed		
			3	Both limit switches are active simultaneously		
28	Fieldbus Timeout	Rapid stop (P)	0	"Fieldbus timeout" error	No communication between master and slave within the projected response monitoring.	• Check communication routine of the master • Extend fieldbus timeout time (P819) or deactivate monitoring
			2	Fieldbus card does not boot		
29	Limit switch contacted	Emergency stop	0	Hardware limit switch approached	A limit switch was reached in IPOS$^{plus®}$ operating mode.	• Check travel range. • Correct user program.
30	Emergency stop Timeout	Immediate switch-off	0	Time violation stop emergency stop rate	• Drive overloaded • Emergency stop ramp too short.	• Check project planning • Extend emergency stop ramp
31	TF/TH sensor tripped	No Response (P)	0	Thermal motor protection fault	• Motor too hot, TF/TH has triggered • TF/TH of the motor not connected or connected incorrectly • MOVIDRIVE® connection and TF/TH connection on motor interrupted	• Let motor cool off and reset fault • Check connections/link between MOVIDRIVE® and TF/TH. • If no TF/TH is connected: Jumper X10:1 with X10:2. • Set P835 to "NO RESPONSE"
32	IPOS index overflow	Emergency stop	0	IPOS program faulty	Programming principles violated leading to system internal stack overflow	Check and correct the IPOS$^{plus®}$ user program (see IPOS$^{plus®}$ manual).
33	Setpoint source	Immediate switch-off	0	Setpoint source not available, e.g. control signal source fieldbus without fieldbus card	Setpoint source not defined or defined incorrectly.	Set correct setpoint source (P100).
34	Ramp Timeout	Immediate switch-off	0	Time violation rapid stop ramp	Time of downward ramps exceeded, e.g. due to overload.	• Extend the downwards ramps • Eliminate overload
35	Duty cylce	Immediate switch-off	0	Operating mode not available	• 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 type that does not match the selected technology function. • P916 was used to set a ramp type that does not match the selected synchronization time (P888).	• Use P700 or P701 to set correct operating mode. • Use MOVIDRIVE® in technology version (..OT). • From the "Startup → Select technology function..." menu, select the technology function that matches P916 • Check the settings of P916 and P888
			1	Wrong assignment operating mode - hardware		
			2	Wrong assignment operating mode - technology function		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
36	Option missing	Immediate switch-off	0	Hardware is missing or not permitted.	• 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 DIP11B.	• 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
			2	Encoder slot error.		
			3	Fieldbus slot error.		
			4	Expansion slot error.		
37	System watchdog	Immediate switch-off	0	"System watchdog overflow" error	Fault during execution of system software	Contact SEW Service.
38	System software	Immediate switch-off	0	"System software" error	System malfunction	Contact SEW Service.
39	Reference travel	Immediate switch-off (P)	0	"Reference travel" error	• The reference cam is missing or does not switch • Limit switches are connected incorrectly • Reference travel type was changed during reference travel	• Check reference cam • Check limit switch connection • Check reference travel type setting and required parameters.
40	Boot synchronization	Immediate switch-off	0	Timeout at boot synchronization with option.	• Error during boot synchronization between inverter and option. • Synchronization ID not/incorrectly transmitted	Install a new option card if this fault reoccurs.
41	Watchdog option	Immediate switch-off	0	Error Watchdog timer from/to option.	• Error in communication between system software and option software • Watchdog in the IPOS$^{plus®}$ 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)
			17	Watchdog IPOS error.		
42	Lag error	Immediate switch-off (P)	0	Lag error positioning	• Encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrectly set speed controller parameters • Value of lag fault tolerance too small	• Check encoder connection • Extend ramps • Set P component to higher value • Reset speed controller parameters • Increase lag fault tolerance • Check wiring of encoder, motor and mains phase. • Check whether mechanical system components can move freely or if they are blocked
43	RS485-Timeout	Rapid stop (P)	0	Communication time-out at RS485 interface.	Error during communication via interface RS485	Check RS485 connection (e.g. inverter - PC, inverter - DBG60B). If necessary, contact SEW Service.
44	Unit utilization	Immediate switch-off	0	Unit utilization fault	• Unit utilization (IxT value) > 125 %	• Decrease power output • Extend ramps • If suggested actions not possible, use larger inverter. • Reduce load
			8	UL monitoring fault		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
45	Initialization	Immediate switch-off	0	General error during initialization	• No parameters set for EEPROM in power section, or parameters set incorrectly. • Option card not in contact with backplane bus.	• Restore factory settings Consult SEW Service if the error still cannot be reset. • Insert the option card correctly.
			3	Data bus error during RAM check		
			6	CPU clock error.		
			7	Error in the current evaluation.		
			10	Error setting the flash protection		
			11	Data bus error during RAM check		
			12	Parameter setting error synchronous operation (internal synchronous operation)		
46	System bus 2 timeout	Rapid stop (P)	0	Timeout system bus CAN2	Error during communication via system bus 2.	Check system bus connection.
47	System bus 1 timeout	Rapid stop (P)	0	Timeout system bus CAN1	Error during communication via system bus 1.	Check system bus connection.
48	Hardware DRS	Immediate switch-off	0	Hardware synchronous operation	**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 card.
77	IPOS control word	No Response (P)	0	Invalid control word IPOS	**Only in IPOS$^{plus®}$ operating mode:** • An attempt was made to set an invalid automatic mode (via external controller). • P916 = BUS RAMP is set.	• Check serial connection to external control. • Check write values of external control. • Set correct value for P016.
78	IPOS SW limit switch	No response (P)	0	Software limit switch reached	**Only in IPOS$^{plus®}$ operating mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check the user program • Check position of the software limit switches
79	Hardware configuration	Immediate switch-off	0	Deviating hardware configuration when replacing the memory card	The following items do not match anymore after having replaced the memory card: • Power • Rated voltage • Variant identification • Unit series • Application or standard version • Option cards	Ensure identical hardware or restore factory setting (parameter = factory setting).
80	RAM test	Immediate switch-off	0	"RAM test" error	Internal unit fault, RAM defective.	Contact SEW Service.
81	Start condition	Immediate switch-off	0	Error start condition at VFC hoist	**Only in "VFC hoist" operating mode:** The motor could not be supplied with the correct amount of current during the pre-magnetizing time: • Rated motor power too small in relation to rated inverter power. • Motor cable cross section too small.	• Check startup data and perform new startup, if necessary. • Check connection between inverter and motor. • Check cross section of motor cable and increase if necessary.
82	Open output	Immediate switch-off	0	Output open with VFC hoist	**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 perform new startup, if necessary.

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
84	Motor protection	Emergency stop (P)	0	"Motor temperature simulation" error	• Motor utilization too high. • I_N-U_L monitoring 1 triggered • P530 set later to "KTY"	• Reduce load. • Extend ramps. • Observe longer pause times. • Check P345/346 • Select a larger motor
			2	Short circuit or open circuit in the temperature sensor		
			3	No thermal motor model available		
			4	UL monitoring fault		
86	Memory module	Immediate switch-off	0	Error in connection with memory module	• No memory card • Memory card defective	• Tighten knurled screw • Insert and secure memory card • Replace memory card
			2	Hardware card detection wrong memory card		
87	Technology function	Immediate switch-off	0	Technology function selected with standard unit	A technology function was activated in a standard version.	Disable technology function
88	Flying start	Immediate switch-off	0	"Flying start" error	**Only in VFC n-CTRL operating mode:** Actual speed > 6000 rpm when inverter enabled.	Inverter not enabled before actual speed is ≤ 6000 rpm.
92	DIP encoder problem	Error display (P)	1	Soiling problem Stahl WCS3	Encoder signals an error	Possible cause: Encoder is dirty → clean encoder
93	DIP encoder error	Emergency stop (P)	0	"Absolute encoder" error	The encoder signals an error, e.g. power failure. • Connection cable between the encoder and DIP11B does not meet the requirements (twisted pair, shielded). • Cycle frequency for cable length too high. • Permitted max. speed/acceleration of encoder exceeded. • Encoder defective.	• Check absolute encoder connection. • Check connection cables. • Set correct cycle frequency. • Reduce maximum traveling velocity or ramp. • Replace absolute encoder.
94	EEPROM checksum	Immediate switch-off	0	Power section parameters	Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send unit in for repair.
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
95	DIP plausibility error	Emergency stop (P)	0	Validity check of absolute position	No plausible position could be determined. • 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. • After zero adjustment reset. • Replace absolute encoder.
97	Copy fault	Immediate switch-off	0	Parameter set upload is/was faulty	• Memory card cannot be written or read. • Fault during data transmission	• Repeat copying process • Restore default setting (P802) and repeat copying process
			1	Download of parameter set to unit cancelled.		
			2	Not possible to adopt parameters. Not possible to adopt parameters from memory card.		
98	CRC Error	Immediate switch-off	0	"CRC via internal flash" error	Internal unit fault Flash memory defective	Send unit in for repair.
99	IPOS ramp calculation	Immediate switch-off	0	"Ramp calculation" error	**Only in IPOS$^{plus®}$ operating mode:** Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter.	Rewrite the IPOS$^{plus®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
100	Vibration warning	Display error (P)	0	Vibrations diagnostics warning	Vibration sensor warns (→ "DUV10A" operating instructions).	Determine cause of vibrations. Continue operation until F101 occurs.
101	Vibration error	Rapid stop (P)	0	Vibration diagnostics error	Vibration sensor reports error.	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display error (P)	0	Oil aging warning	Error message from the oil aging sensor	Schedule oil change.
103	Oil aging error	Display error (P)	0	Oil aging error	Error message from the oil aging sensor	SEW-EURODRIVE recommends that you change the gear unit oil immediately.
104	Oil aging overtemperature	Display error (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
105	Oil aging ready signal	Display error (P)	0	Oil aging ready signal	Oil aging sensor is not ready for operation	• Check voltage supply of oil aging sensor • Check and, if necessary, replace the oil aging sensor
106	Brake wear	Display error (P)	0	Brake wear error	Brake lining worn	Change brake lining (→ "Motors" operating instructions).

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
108	DCS error	Immediate stop/mal-function (P)	0	DCS error		
			1	Error during transfer of configuration data to the monitoring unit.	Interruption in connection during program download	Send the configuration files again
			2	Configuration data for soft-ware version of the subas-sembly is invalid.	Subassembly configured with incorrect software version of the programming interface.	Configure subassembly with permitted version of the pro-gramming interface. Then switch subassembly off and on again.
			3	Unit was programmed with incorrect programming interface.	Program or configuration data was loaded into the unit with an incorrect programming interface.	Check the design of the subas-sembly. Configure again with a valid programming interface. Then switch the unit off and on again.
			4	Faulty reference voltage.	• Supply voltage of the subas-sembly is defective. • Faulty component in the subassembly	• Check supply voltage • Switch unit off and on again
			5			
			6	Faulty system voltage.		
			7			
			8	Faulty test voltage		
			9			
			10	Faulty DC 24 V voltage supply		
			11	Ambient temperature of the unit is not in the defined range.	Temperature at the place of operation is not in the permitted range.	Check the ambient tempera-ture.
			12	Plausibility error position changeover	For the position changeover, ZSC, JSS or DMC is perma-nently activated.	• Check ZSC activation • Check JSS activation • Check DMC activation (only for monitoring via position)
			13	Faulty switching of the LOSIDE driver DO02_P / DO02_M	Short circuit of the output.	Check wiring at the output.
			14	Faulty switching of the HISIDE driver DO02_P / DO02_M		
			15	Faulty switching of the LOSIDE driver DO0_M		
			16	Faulty switching of the HISIDE driver DO0_P		
			17	Faulty switching of the LOSIDE driver DO01_M		
			18	Faulty switching of the HISIDE driver DO01_P		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Emergency stop/mal-function (P)	0	DCS alarm		
			1	Communication error between CAN interface inverter	The DCS21B/31B option does not receive any valid data from the inverter.	• Check hardware connec-tion to the inverter • Check version of the inverter
			2 3	Plausibility error digital input at pulse P1	There is no pulse 1 voltage at the DI1 binary input.	• Check configuration of the DI1 binary input according to configuration and wiring diagram • Check wiring
			4 5	Plausibility error digital input at pulse P2		• Check configuration of the DI2 binary input according to configuration and wiring diagram • Check wiring
			6 7	Pulse 1 plausibility error at binary input DI3		• Check configuration of the DI3 binary input according to configuration and wiring diagram • Check wiring
			8 9	Pulse 1 plausibility error at binary input DI4		• Check configuration of the DI4 binary input according to configuration and wiring diagram • Check wiring
			10 11	Pulse 1 plausibility error at binary input DI5		• Check configuration of the DI5 binary input according to configuration and wiring diagram • Check wiring
			12 13	Pulse 1 plausibility error at binary input DI6		• Check configuration of the DI6 binary input according to configuration and wiring diagram • Check wiring
			14 15	Pulse 1 plausibility error at binary input DI7		• Check configuration of the DI7 binary input according to configuration and wiring diagram • Check wiring
			16 17	Pulse 1 plausibility error at binary input DI8		• Check configuration of the DI8 binary input according to configuration and wiring diagram • Check wiring

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Emergency stop/mal-function (P)	18 19	Pulse 2 plausibility error at binary input DI1	There is no pulse 2 voltage at the DI1 binary input.	• Check configuration of the DI1 binary input according to configuration and wiring diagram • Check wiring
			20 21	Pulse 2 plausibility error at binary input DI2		• Check configuration of the DI2 binary input according to configuration and wiring diagram • Check wiring
			22 23	Pulse 2 plausibility error at binary input DI3		• Check configuration of the DI3 binary input according to configuration and wiring diagram • Check wiring
			24 25	Pulse 2 plausibility error at binary input DI4		• Check configuration of the DI4 binary input according to configuration and wiring diagram • Check wiring
			26 27	Pulse 2 plausibility error at binary input DI5		• Check configuration of the DI5 binary input according to configuration and wiring diagram • Check wiring
			28 29	Pulse 2 plausibility error at binary input DI6		• Check configuration of the DI6 binary input according to configuration and wiring diagram • Check wiring
			30 31	Pulse 2 plausibility error at binary input DI7		• Check configuration of the DI7 binary input according to configuration and wiring diagram • Check wiring
			32 33	Pulse 2 plausibility error at binary input DI8		• Check configuration of the DI8 binary input according to configuration and wiring diagram • Check wiring
			34 35	Plausibility error in the velocity acquisition	The difference between the two velocity sensors is higher than the configured speed cut-off threshold.	• Check track again with the data of the encoder configuration. • Check the velocity sensor • Use the SCOPE function to set speed signals so that they are congruent
			36 37	Plausibility error in the position acquisition	The difference between the two position sensors is higher than the configured value.	• Check track with the configured data of the encoder setting • Check position signal • Are all signals connected correctly to the 9-pin encoder connector? • Check the encoder connector for correct wiring. Is the jumper between pin 1 and pin 2 on the 9-pin encoder connector closed (SSI absolute encoder)? • Use the SCOPE function to set positions signals so that they are congruent

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Rapid stop/warning (P)	38 39	Plausibility error incorrect position range.	The current position is outside the configured range.	• Check track with the configured data of the encoder setting • Check position signal, correct offset if necessary • Use the SCOPE function to read off the position and set in ratio to the configured values
			40 41	Plausibility error incorrect speed.	The current velocity exceeds the configured maximum velocity.	• The drive moves outside the permitted and configured velocity range • Check configuration (set max. velocity) • Analyze the velocity development using the SCOPE function
			42 43	Configuration error: Acceleration	The current acceleration is outside the configured acceleration range.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder
			44 45	Plausibility error in encoder interface (A3401 = encoder 1 and A3402 = encoder 2).	The wiring of the encoder does not correspond to the configured data.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder
			46 47	Encoder supply voltage error (A3403=encoder 1 and A3404 = encoder 2)	Encoder voltage supply is outside the defined range (min. DC 20 V / max. DC 29 V).	• Overload in the supply voltage of the encoder; internal fuse has triggered • Check supply voltage of the DCS21B/31B option
			48 49	Reference voltage error	The reference voltage input of the encoder system is outside the defined range.	Check reference voltage input of the encoder system.
			50 51	Difference level RS485 driver 1 (error INC_B or SSI_CLK) faulty	No encoder connection, incorrect encoder type.	Check the encoder connection.
			52 53	Difference level RS485 driver 2 (error INC_A or SSI_DATA) faulty.		
			54 55	Incremental counter deviation.		
			56 57	Plausibility error in encoder interface (A3401 = encoder 1 and A3402 = encoder 2)	The wiring of the encoder does not correspond to the configured data.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder

Error			Suberror			
Code	**Designation**	**Response (P)**	**Code**	**Designation**	**Possible cause**	**Measure**
109	DCS alarm	Rapid stop/warning (P)	58	Plausibility error SIN/COS encoder connection.	Incorrect encoder type connected.	• Check the encoder connection • Check the encoder connection (jumper between pin 1 and pin 2)
			59			
			60	Plausibility error SSI encoder connection		
			61			
			62		Phase error of the incremental or sin/cos encoder.	• Check the encoder connection • Replace the defective encoder
			63			
			64	Plausibility error - SSI encoder connection.	Connected encoder type does not correspond to the configuration.	• Check the encoder connection • Check connected encoder
			65			
			66	Plausibility error - SSI Listener encoder connection.		
			67			
			68	Faulty switching of the LOSIDE driver DO2_M	DC 0 V short circuit at the output.	Check wiring at the output.
			69	Faulty switching of the HISIDE driver DO2_P		
			70	Faulty switching of the LOSIDE driver DO0_M		
			71	Faulty switching of the HISIDE driver DO0_P		
			72	Faulty switching of the LOSIDE driver DO1_M		
			73	Faulty switching of the HISIDE driver DO1_P		
			74	Watchdog undervoltage test for LOSIDE driver	DC 0 V short circuit at on of the DC 0 V outputs.	Check wiring at the outputs.
			75	Watchdog undervoltage test for HISIDE driver	DC 24 V short circuit at on of the DC 24 V outputs.	
			76	CCW and CW monitoring (in DMC module) activated simultaneously.	Multiple activation.	Only one direction of rotation can be activated in the DMC module.
			77			
			78	CCW and CW monitoring range of the OLC activated simultaneously		
			79			
			80	CCW and CW monitoring (in JSS module) was activated simultaneously.		
			81			
			82	Timeout error MET. Time monitoring start signal for confirmation button.	Input element with time monitoring is faulty.	• Check wiring of input element • Input element is faulty
			83			
			84	Timeout error MEZ. Time monitoring for two-hand button.	Two-hand operation with time monitoring is faulty.	
			85			
			86	EMU1 monitoring error	Faulty monitoring of the external disconnection channel	• Check hardware connections • Pick-up or release time to short • Check switching contacts
			87			
			88	EMU2 monitoring error		
			89			
110	"Ex-e protection" error	Emergency stop	0	Duration of operation below 5 Hz exceeded	Duration of operation below 5 Hz exceeded	• Check project planning • Shorten duration of operation below 5 Hz
113	Analog input open circuit	No response (P)	0	AI1 analog input open circuit	AI1 analog input open circuit	Check wiring
116	"Timeout MOVI-PLC" error	Rapid stop / warning	0	MOVI-PLC® communication timeout		• Check startup • Check wiring

12.3 SEW electronics service

Sending in for repair

Please contact the **SEW-EURODRIVE electronics service if an error cannot be rectified** (→ "Customer and spare parts service").

When contacting SEW electronics service, always quote the digits on the status label so that our service personnel can 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 on the status label
- Short description of application (drive application, control via terminals or serial)
- Connected motor (motor type, motor voltage, ⅄ or Δ connection)
- Type of fault
- Accompanying circumstances
- Your own presumptions as to what has happened
- Any unusual events preceding the problem, etc.

12.4 Extended storage

If the unit is being stored for a long time, connect it to the line voltage for at least 5 minutes every 2 years. Otherwise, the unit's service life may be reduced.

Procedure when maintenance has been neglected:

Electrolytic capacitors are used in the inverters. They are subject to aging effects when deenergized. This effect can damage the capacitors if the unit is connected using the rated voltage after a longer period of storage.

If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview.

The following stages are recommended:

AC 400/500 V units:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

AC 230 V units:

- Stage 1: AC 170 V for 15 minutes
- Stage 2: AC 200 V for 15 minutes
- Stage 3: AC 240 V for 1 hour

After you have completed the regeneration process, the unit can be used immediately or stored again for an extended period with maintenance.

12.5 Disposal

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

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

13 Abbreviation Key and Index

13.1 Abbreviation key

Quantity	Meaning	Unit
cosφ	Power factor of motor	
f_{mains}	Mains frequency	[Hz]
h	Installation altitude	[m above sea level]
η	Effeciency	
I_d	Magnetization current	[A]
I_{mains}	Input current, mains current	[A]
I_F	Trip current	[A]
I_N	Rated current	[A]
I_D	Continuous output current	[A]
I_q	Torque-forming current	[A]
I_{tot}	Total current	[A]
IP..	Degree of protection	
i_{tot}	Gear ratios in total	
ϑ_{Umg}	Ambient temperature	[°C]
J_{Last}	Mass moment of inertia to be driven	[kgm^2]
J_{Mot}	Mass moment of inertia of the motor	[kgm^2]
J_X	Mass moment of inertia reduced to the motor shaft	[kgm^2]
k_T	Torque constant	[Nm/A]
n_A	Output speed	[rpm]
n_{Eck}	Transition speed	[rpm]
n_E	Input speed	[rpm]
n_M	Motor speed	[rpm]
n_N	Rated speed	[rpm]
P_a	Output power	[W]
P_e	Mathematical input power of the gear unit	[W]
P_N	Rated power	[W]
$P_{reduziert}$	Reduced motor power	[W]
P_v	Power loss	[W]
R_{BWmin}	Minimum permitted braking resistance value for 4Q operation	[W]
S.., %cdf	Duty type and relative cyclic duration factor cdf	
T	Cycle duration	[min]
U_{mains}	Supply voltage, mains voltage	[V]
U_N	Rated voltage	[V]
U_A	Output voltage	[V]
f_A	Output frequency	[Hz]
S_N	Apparent power	[VA]

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	Stuttgart	SEW-EURODRIVE GmbH & Co KG Friedrich-List-Straße 46 D-70771 Leinfelden-Echterdingen	Tel. +49 711 16072-0 Fax +49 711 16072-72 tb-stuttgart@sew-eurodrive.de
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 14 D-89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 tb-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 D-97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 tb-wuerzburg@sew-eurodrive.de
	Zwickau / Meerane	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg1 D-08393 Meerane	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 tb-zwickau@sew-eurodrive.de

France			
Production **Sales** **Service**	**Haguenau**	SEW-USOCOME 48-54, route de Soufflenheim B. P. 20185 F-67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Production	**Forbach**	SEW-EUROCOME Zone Industrielle Technopôle Forbach Sud B. P. 30269 F-57604 Forbach Cedex	Tel. +33 3 87 29 38 00
Assembly **Sales** **Service**	**Bordeaux**	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan - B. P. 182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil l'Etang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
Technical Offices	**Alsace Franche-Comté**	SEW-USOCOME 1, rue Auguste Gasser F-68360 Soultz	Tel. +33 3 89 74 51 62 Fax +33 3 89 76 58 71
	Alsace Nord	SEW-USOCOME 15, rue Mambourg F-68240 Sigolsheim	Tel. +33 3 89 78 45 11 Fax +33 3 89 78 45 12
	Aquitaine	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan B.P.182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09

France			
	Ardennes Lorraine	SEW-USOCOME 1, rue de la Forêt F-54250 Champigneulles	Tel. +33 3 83 96 28 04 Fax +33 3 83 96 28 07
	Bourgogne	SEW-USOCOME 10, rue de la Poste F-71350 Saint Loup Géanges	Tel. +33 3 85 49 92 18 Fax +33 3 85 49 92 19
	Bretagne Ouest	SEW-USOCOME 4, rue des Châtaigniers F-44830 Brains	Tel. +33 2 51 70 54 04 Fax +33 2 51 70 54 05
	Centre Auvergne	SEW-USOCOME 27, avenue du Colombier F-19150 Laguenne	Tel. +33 5 55 20 12 10 Fax +33 5 55 20 12 11
	Centre Pays de Loire	SEW-USOCOME 9, rue des Erables F-37540 Saint Cyr sur Loire	Tel. +33 2 47 41 33 23 Fax +33 2 47 41 34 03
	Champagne	SEW-USOCOME Impasse des Ouises F-10120 Saint André les Vergers	Tel. +33 3 25 79 63 24 Fax +33 3 25 79 63 25
	Lyon Nord-Est	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 03 Fax +33 4 72 15 37 15
	Lyon Ouest	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 04 Fax +33 4 72 15 37 15
	Lyon Sud-Est	SEW-USOCOME Montée de la Garenne F-26750 Génissieux	Tel. +33 4 75 05 65 95 Fax +33 4 75 05 65 96
	Nord	SEW-USOCOME 30, rue Léon Garet F-62520 Le Touquet	Tel. +33 3 21 90 21 40 Fax +33 3 21 90 21 44
	Normandie	SEW-USOCOME 5 rue de la Limare F-14250 Brouay	Tel. +33 2 31 37 92 86 Fax +33 2 31 74 68 15
	Paris Est	SEW-USOCOME Résidence Le Bois de Grâce 2, allée des Souches Vertes F-77420 Champs sur Marne	Tel. +33 1 64 68 40 50 Fax +33 1 64 68 45 00
	Paris Ouest	SEW-USOCOME 42 avenue Jean Jaurès F-78580 Maule	Tel. +33 1 30 90 89 86 Fax +33 1 30 90 93 15
	Paris Picardie	SEW-USOCOME 25 bis, rue Kléber F-92300 Levallois Perret	Tel. +33 1 41 05 92 74 Fax +33 1 41 05 92 75
	Paris Sud	SEW-USOCOME 6. chemin des Bergers Lieu-dit Marchais F-91410 Roinville sous Dourdan	Tel. +33 1 60 81 10 56 Fax +33 1 60 81 10 57
	Provence	SEW-USOCOME Résidence Les Hespérides Bât. B2 67, boulevard des Alpes F-13012 Marseille	Tel. +33 4 91 18 00 11 Fax +33 4 91 18 00 12
	Pyrénées	SEW-USOCOME 179, route de Grazac F-31190 Caujac	Tel. +33 5 61 08 15 85 Fax +33 5 61 08 16 44

France			
	Sud-Atlantique	SEW-USOCOME 12, rue des Pinsons F-44120 Vertou	Tel. +33 2 40 80 32 23 Fax +33 2 40 80 32 13

Algeria			
Sales	**Alger**	Réducom 16, rue des Frères Zaghnoun Bellevue El-Harrach 16200 Alger	Tel. +213 21 8222-84 Fax +213 21 8222-84 reducom_sew@yahoo.fr

Argentina			
Assembly **Sales** **Service**	**Buenos Aires**	SEW EURODRIVE ARGENTINA S.A. Centro Industrial Garin, Lote 35 Ruta Panamericana Km 37,5 1619 Garin	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 sewar@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar

Australia			
Assembly **Sales** **Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
	Perth	SEW-EURODRIVE PTY. LTD. 105 Robinson Avenue Belmont, W.A. 6104	Tel. +61 8 9478-2688 Fax +61 8 9277-7572 enquires@sew-eurodrive.com.au
	Brisbane	SEW-EURODRIVE PTY.LTD. 1 /34 Collinsvale St Rocklea, Queensland, 4106	Tel. +61 7 3272-7900 Fax +61 7 3272-7901 enquires@sew-eurodrive.com.au
Technical Offices	**Adelaide**	SEW-EURODRIVE PTY. LTD. Unit 1/601 Anzac Highway Glenelg, S.A. 5045	Tel. +61 8 8294-8277 Fax +61 8 8294-2893 enquires@sew-eurodrive.com.au
	Townsville	SEW-EURODRIVE PTY. LTD. 12 Leyland Street Garbutt, QLD 4814	Tel. +61 7 4779 4333 Fax +61 7 4779 5333 enquires@sew-eurodrive.com.au

Austria			
Assembly **Sales** **Service**	**Wien**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 A-1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://sew-eurodrive.at sew@sew-eurodrive.at
Technical Offices	**Linz**	SEW-EURODRIVE Ges.m.b.H. Reuchlinstr. 6/3 A-4020 Linz	Tel. +43 732 655 109-0 Fax +43 732 655 109-20 tb-linz@sew-eurodrive.at
	Graz	SEW-EURODRIVE Ges.m.b.H. Grabenstraße 231 A-8045 Graz	Tel. +43 316 685 756-0 Fax +43 316 685 755 tb-graz@sew-eurodrive.at
	Dornbirn	SEW-EURODRIVE Ges.m.b.H. Lustenauerstraße 27/1 A-6850 Dornbirn	Tel. +43 5572 3725 99-0 Fax +43 5572 3725 99-20 tb-dornbirn@sew-eurodrive.at

Bangladesh			
Sales	**Dhaka**	Jainex Industrial and Engineering Ltd B 12 Apon Nibash East Nasirabad Bangladesh	Tel. +880 1713103502 Fax +880 31 613041 jainexbd@onlinectg.net

Belarus			
Sales	**Minsk**	SEW-EURODRIVE BY RybalkoStr. 26 BY-220033 Minsk	Tel.+375 (17) 298 38 50 Fax +375 (17) 29838 50 sales@sew.by

Belgium			
Assembly **Sales** **Service**	**Brüssel**	SEW Caron-Vector S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.sew-eurodrive.be info@caron-vector.be
Service Competence Center	**Industrial Gears**	SEW Caron-Vector S.A. Rue de Parc Industriel, 31 BE-6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-wallonie@sew-eurodrive.be
Technical Office	**Vlaanderen**	SEW Caron-Vector S.A. Verlorenbroodstraat, 122, bus 6 B-9820 Merelbeke	Tel. +32 92 1686 25 Fax +32 92 2741 55

Brazil			
Production **Sales** **Service**	**Sao Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 152 - Rodovia Presidente Dutra Km 208 Guarulhos - 07251-250 - SP SAT - SEW ATENDE - 0800 7700496	Tel. +55 11 6489-9133 Fax +55 11 6480-3328 http://www.sew-eurodrive.com.br sew@sew.com.br
	Additional addresses for service in Brazil provided on request!		

Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GmbH Bogdanovetz Str.1 BG-1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@fastbg.net

Cameroon			
Sales	**Douala**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 33 431137 Fax +237 33 431137

Canada			
Assembly **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca marketing@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1 E2	Tel. +1 604 946-5535 Fax +1 604 946-2513 marketing@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger LaSalle, Quebec H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 marketing@sew-eurodrive.ca
	Additional addresses for service in Canada provided on request!		

Chile			
Assembly **Sales** **Service**	**Santiago de Chile**	SEW-EURODRIVE CHILE LTDA. Las Encinas 1295 Parque Industrial Valle Grande LAMPA RCH-Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 75770-00 Fax +56 2 75770-01 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl

China			
Production **Assembly** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 info@sew-eurodrive.cn http://www.sew-eurodrive.cn
Assembly **Sales** **Service**	**Suzhou**	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267891 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478398 Fax +86 27 84478388

Colombia			
Assembly **Sales** **Service**	**Bogotá**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sewcol@sew-eurodrive.com.co

Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. PIT Erdödy 4 II HR 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr

Czech Republic			
Sales	**Praha**	SEW-EURODRIVE CZ S.R.O. Business Centrum Praha Lužná 591 CZ-16000 Praha 6 - Vokovice	Tel. +420 255 709 601 Fax +420 220 121 237 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
Technical Offices	**Brno**	SEW-EURODRIVE CZ S.R.O. Křenová 52 CZ -60200 Brno	Tel. +420 543256151 + 543256163 Fax +420 543256845
	Hradec Králové	SEW-EURODRIVE CZ S.R.O. Čechova 498 CZ-50202 Hradec Králové	Tel. +420 495510141 Fax +420 495521313
	Plzeň	SEW-EURODRIVE CZ S.R.O. Areal KRPA a.s. Zahradni 173/2 CZ-32600 Plzeň	Tel. +420 378775300 Fax +420 377970710
	Klatovy	SEW-EURODRIVE CZ S.R.O. Technická kancelář Klatovy Domažlická 800 CZ-33901 Klatovy	Tel. +420 376310729 Fax +420 376310725

Denmark			
Assembly **Sales** **Service**	**Kopenhagen**	SEW-EURODRIVEA/S Geminivej 28-30 DK-2670 Greve	Tel. +45 43 9585-00 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk

Egypt			
Sales **Service**	**Cairo**	Copam Egypt for Engineering & Agencies 33 El Hegaz ST, Heliopolis, Cairo	Tel. +20 2 22566-299 + 1 23143088 Fax +20 2 22594-757 http://www.copam-egypt.com/ copam@datum.com.eg

Estonia			
Sales	**Tallin**	ALAS-KUUL AS Reti tee 4 EE-75301 Peetri küla, Rae vald, Harjumaa	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee

Finland			
Assembly **Sales** **Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 201 589-300 Fax +358 3 780-6211 sew@sew.fi http://www.sew-eurodrive.fi
Technical Offices	**Helsinki**	SEW-EURODRIVE OY Luutnantintie 5 FIN-00410 Helsinki	Tel. +358 201 589-300 Fax + 358 9 5666-311 sew@sew.fi
	Vaasa	SEW-EURODRIVE OY Hietasaarenkatu 18 FIN-65100 Vaasa	Tel. +358 201 589-300 Fax +358 6 3127-470 sew@sew.fi
	Rovaniemi	SEW-EURODRIVE OY Valtakatu 4 A FIN-96100 Rovaniemi	Tel. +358 201 589-300 Fax +358 201 589-239 sew@sew.fi
Production **Assembly** **Service**	**Karkkila**	SEW Industrial Gears OY Valurinkatu 6 FIN-03600 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 sew@sew.fi http://www.sew-eurodrive.fi

Gabon			
Sales	**Libreville**	Electro-Services B.P. 1889 Libreville	Tel. +241 7340-11 Fax +241 7340-12

Great Britain			
Assembly **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Technical Offices	**London**	SEW-EURODRIVE Ltd. 764 Finchely Road, Temple Fortune GB-London N.W.11 7TH	Tel. +44 20 8458-8949 Fax +44 20 8458-7417
	Midlands	SEW-EURODRIVE Ltd. 5 Sugar Brook court, Aston Road, Bromsgrove, Worcs B60 3EX	Tel. +44 1527 877-319 Fax +44 1527 575-245
	Scotland	SEW-EURODRIVE Ltd. Scottish Office No 37 Enterprise House Springkerse Business Park GB-Stirling FK7 7UF Scotland	Tel. +44 17 8647-8730 Fax +44 17 8645-0223

Greece			
Sales **Service**	**Athen**	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr

Greece			
Technical Office	**Thessaloniki**	Christ. Boznos & Son S.A. Maiandrou 21 562 24 Evosmos, Thessaloniki	Tel. +30 2 310 7054-00 Fax +30 2 310 7055-15 info@boznos.gr

Hong Kong			
Assembly **Sales** **Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 2 7960477 + 79604654 Fax +852 2 7959129 contact@sew-eurodrive.hk

Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. H-1037 Budapest Kunigunda u. 18	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 office@sew-eurodrive.hu

Iceland			
Sales	**Reykjavik**	Vélaverk ehf. Bolholti 8, 3h. IS - 105 Reykjavik	Tel. +354 568 3536 Fax +354 568 3537 velaverk@velaverk.is

India			
Assembly **Sales** **Service**	**Vadodara**	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 2831086 Fax +91 265 2831087 http://www.seweurodriveindia.com sales@seweurodriveindia.com subodh.ladwa@seweurodriveindia.com
Technical Offices	**Bangalore**	SEW-EURODRIVE India Private Limited 308, Prestige Centre Point 7, Edward Road Bangalore - 560052 - Karnataka	Tel. +91 80 22266565 Fax +91 80 22266569 salesbang@seweurodriveindia.com ganesh@seweurodriveindia.com
	Kolkata	SEW EURODRIVE India Private Limited 2nd floor, Room No. 35 Chowringhee Court 55, Chowringhee Road Kolkata - 700 071 - West Bengal	Tel. +91 33 22827457 Fax +91 33 22894204 saleskal@seweurodriveindia.com a.j.biswas@seweurodriveindia.com
	Chandigarh	SEW EURODRIVE India Private Limited Sujit Kumar Mishra H.No.5464/3 Modern Housing Complex Manimajra Chandigarh -160101	Tel. +91 9878469579 Fax +91 1722738664 saleschand@seweurodriveindia.com
	Chennai	SEW-EURODRIVE India Private Limited 2nd Floor, Josmans Complex, No. 5, McNichols Road, Chetpet Chennai - 600031 - Tamil Nadu	Tel. +91 44 42849813 Fax +91 44 42849816 saleschen@seweurodriveindia.com c.v.shivkumar@seweurodriveindia.com
	Coimbatore	SEW-EURODRIVE India Private Limited Office No 60 Arpee Centre (Opp Annapoorna Hotel) 420 N, NSR Road, Saibaba Colony Coimbatore 641 0111 - Tamil Nadu	Tel. +91 422 2455420 Fax +91 422 2443988 salescmb@seweurodriveindia.com p.selvakumar@seweurodriveindia.com
	Madgaon	SEW-EURODRIVE India Private Limited Flat No.-G1, Shivas-Laxmi Prasad Co-Operative Housing Society, Padmanarayan Estate, Near Jivottaam Math, Gagole Madgao, Goa - 403 602	samrat.chakravorty@seweurodriveindia.com

India			
	Hyderabad	SEW-EURODRIVE India Private Limited 408, 4th Floor, Meridian Place Green Park Road Amerpeet Hyderabad - 500016 - Andhra Pradesh	Tel. +91 40 23414698 Fax +91 40 23413884 saleshyd@seweurodriveindia.com ma.choudary@seweurodriveindia.com
	Jamshedpur	SEW-EURODRIVE India Private Limited Flat No.: B/2, B.S. Apartment Road No.: 4, Contractor's area, Bistupur Jamshedpur 831 001 - Jharkhand	Tel. +91 9934123671 siddhartha.mishra@seweurodriveindia.com
	Mumbai	SEW-EURODRIVE India Private Limited 312 A, 3rd Floor, Acme Plaza, J.B. Nagar, Andheri Kurla Road, Andheri (E) Mumbai - 400059 - Maharashtra	Tel. +91 22 28348440 Fax +91 22 28217858 salesmumbai@seweurodriveindia.com p.s.ray@seweurodriveindia.com
	New Delhi	SEW-EURODRIVE India Private Limited 418-419, Suneja Tower-1 District Centre, Janak Puri New Delhi 110 058	Tel. +91 11 25544111 Fax +91 11 25544113 salesdelhi@seweurodriveindia.com vikram.juneja@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Office No. 2 & 7, First Floor, Triveni Apartment Model Colony, Gokhale Road Pune 411016 - Maharashtra	Tel. +91 20 25671751 Fax +91 20 25661668 salespune@seweurodriveindia.com praveen.hosur@seweurodriveindia.com
	Raipur	SEW-EURODRIVE India Private Limited Flat No-0-102, First Floor Satyam Appt., Golchha Park Nr Mining Office, Ring Road-1 Raipur 492 001 - Chhattisgarh	Tel. +91 9893290624 sutanu.sarkar@seweurodriveindia.com

Indonesia			
Technical Office	**Jakarta**	SEW-EURODRIVE Pte Ltd. Jakarta Liaison Office, Menara Graha Kencana Jl. Perjuangan No. 88, LT 3 B, Kebun Jeruk, Jakarta 11530, Indonesia	Tel. +62 21 5359066 Fax +62 21 5363686 Service Hotline: +65 61000 739 sew@cbn.net.id

Ireland			
Sales **Service**	**Dublin**	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 info@alperton.ie http://www.alperton.ie

Israel			
Sales	**Tel-Aviv**	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il

Italy			
Assembly **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 02 96 9801 Fax +39 02 96 799781 http://www.sew-eurodrive.it sewit@sew-eurodrive.it
Technical Offices	**Bologna**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via della Grafica, 47 I-40064 Ozzano dell'Emilia (Bo)	Tel. +39 051 65-23-801 Fax +39 051 796-595
	Caserta	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Carlo III Km. 23,300 I-81020 S. Nicola la Strada (Caserta)	Tel. +39 0823 219011 Fax +39 0823 421414

Italy			
	Firenze	RIMA Via Einstein, 14 I-50013 Campi Bisenzio (Firenze)	Tel. +39 055 898 58-21 Fax +39 055 898 58-30
	Pescara	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Europa,132 I-65010 Villa Raspa di Spoltore (PE)	Tel. +39 085 41-59-427 Fax +39 085 41-59-643
	Torino	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Filiale Torino c.so Unione Sovietica 612/15 - int. C I-11035 Torino	Tel. +39 011 3473780 Fax +39 011 3473783
	Verona	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via P. Sgulmero, 27/A I-37132 Verona	Tel. +39 045 89-239-11 Fax +39 045 97-6079

Ivory Coast			
Sales	**Abidjan**	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 2579-44 Fax +225 2584-36

Japan			
Assembly **Sales** **Service**	**Iwata**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp
Technical Offices	**Fukuoka**	SEW-EURODRIVE JAPAN CO., LTD. C-go, 5th-floor, Yakuin-Hiruzu-Bldg. 1-5-11, Yakuin, Chuo-ku Fukuoka, 810-0022	Tel. +81 92 713-6955 Fax +81 92 713-6860 sewkyushu@jasmine.ocn.ne.jp
	Osaka	SEW-EURODRIVE JAPAN CO., LTD. B-Space EIRAI Bldg., 3rd Floor 1-6-9 Kyoumachibori, Nishi-ku, Osaka, 550-0003	Tel. +81 6 6444--8330 Fax +81 6 6444--8338 sewosaka@crocus.ocn.ne.jp
	Tokyo	SEW-EURODRIVE JAPAN CO., LTD. Izumi-Bldg. 5 F 3-2-15 Misaki-cho Chiyoda-ku, Tokyo 101-0061	Tel. +81 3 3239-0469 Fax +81 3 3239-0943 sewtokyo@basil.ocn.ne.jp

Korea			
Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-korea.co.kr master@sew-korea.co.kr
	Busan	SEW-EURODRIVE KOREA Co., Ltd. No. 1720 - 11, Songjeong - dong Gangseo-ku Busan 618-270	Tel. +82 51 832-0204 Fax +82 51 832-0230 master@sew-korea.co.kr
Technical Offices	**Daegu**	SEW-EURODRIVE KOREA Co., Ltd. No.1108 Sungan officetel 87-36, Duryu 2-dong, Dalseo-ku Daegu 704-712	Tel. +82 53 650-7111 Fax +82 53 650-7112
	DaeJeon	SEW-EURODRIVE KOREA Co., Ltd. No. 1502, Hongin officetel 536-9, Bongmyung-dong, Yusung-ku Daejeon 305-301	Tel. +82 42 828-6461 Fax +82 42 828-6463

Korea			
	Kwangju	SEW-EURODRIVE KOREA Co., Ltd. 4fl., Dae-Myeong B/D 96-16 Unam-dong, Buk-ku Kwangju 500-170	Tel. +82 62 511-9172 Fax +82 62 511-9174
	Seoul	SEW-EURODRIVE KOREA Co., Ltd. No.504 Sunkyung officetel 106-4 Kuro 6-dong, Kuro-ku Seoul 152-054	Tel. +82 2 862-8051 Fax +82 2 862-8199

Latvia			
Sales	**Riga**	SIA Alas-Kuul Katlakalna 11C LV-1073 Riga	Tel. +371 7139253 Fax +371 7139386 http://www.alas-kuul.com info@alas-kuul.com

Lebanon			
Sales	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 4947-86 +961 1 4982-72 +961 3 2745-39 Fax +961 1 4949-71 gacar@beirut.com

Lithuania			
Sales	**Alytus**	UAB Irseva Naujoji 19 LT-62175 Alytus	Tel. +370 315 79204 Fax +370 315 56175 info@irseva.lt http://www.sew-eurodrive.lt

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.sew-eurodrive.lu info@caron-vector.be

Malaysia			
Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Technical Offices	**Kota Kinabalu**	SEW-EURODRIVE Sdn Bhd (Kota Kinabalu Branch) Lot No. 2,1st Floor, Inanam Baru Phase III, Miles 5.1 /2, Jalan Tuaran, Inanam 89350 Kota Kinabalu Sabah, Malaysia	Tel. +60 88 424792 Fax +60 88 424807
	Kuala Lumpur	SEW-EURODRIVE Sdn. Bhd. No. 2, Jalan Anggerik Mokara 31/46 Kota Kemuning Seksyen 31 40460 Shah Alam Selangor Darul Ehsan	Tel. +60 3 5229633 Fax +60 3 5229622 sewpjy@po.jaring.my
	Kuching	SEW-EURODRIVE Sdn. Bhd. Lot 268, Section 9 KTLD Lorong 9, Jalan Satok 93400 Kuching, Sarawak East Malaysia	Tel. +60 82 232380 Fax +60 82 242380

Malaysia			
	Penang	SEW-EURODRIVE Sdn. Bhd. No. 38, Jalan Bawal Kimsar Garden 13700 Prai, Penang	Tel. +60 4 3999349 Fax +60 4 3999348 seweurodrive@po.jaring.my

Mauritania			
Sales	**Zouérate**	AFRICOM - SARL En Face Marché Dumez P.B. 88 Zouérate	Tel. +222 54 40134 Fax +222 54 40538 cybertiris@mauritel.mr

Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE MEXIKO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Queretaro C.P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	Afit 5, rue Emir Abdelkader MA 20300 Casablanca	Tel. +212 22618372 Fax +212 22618351 ali.alami@premium.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Technical Office	**Palmerston North**	SEW-EURODRIVE NEW ZEALAND LTD. C/-Grant Shearman, RD 5, Aronui Road Palmerston North	Tel. +64 6 355-2165 Fax +64 6 355-2316 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no

Peru			
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 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe

Philippines			
Technical Office	**Manila**	SEW-EURODRIVE Pte Ltd Manila Liaison Office Suite 110, Ground Floor Comfoods Building Senator Gil Puyat Avenue 1200 Makati City	Tel. +63 2 894275254 Fax +63 2 8942744 sewmla@i-next.net

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Łódź	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
		24 Hour Service	Tel. +48 602 739 739 (+48 602 SEW SEW) sewis@sew-eurodrive.pl
Technical Office	**Tychy**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Nad Jeziorem 87 PL-43-100 Tychy	Tel. +48 32 2175026 + 32 2175027 Fax +48 32 2277910
	Bydgoszcz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Fordońska 246 PL-85-959 Bydgoszcz	Tel. +48 52 3606590 Fax +48 52 3606591
	Poznan	SEW-EURODRIVE Polska Sp.z.o.o. ul. Romana Maya 1 PL-61-371 Poznań	Tel. +48 61 8741640 Fax +48 61 8741641
	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

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Technical Offices	**Lisboa**	SEW-EURODRIVE, LDA. Núcleo Empresarial I de São Julião do Tojal Rua de Entremuros, 54 Fracção I P-2660-533 São Julião do Tojal	Tel. +351 21 958-0198 Fax +351 21 958-0245 esc.lisboa@sew-eurodrive.pt
	Porto	SEW-EURODRIVE, LDA. Av. 25 de Abril, 68 4440-502 Valongo	Tel. +351 229 350 383 Fax +351 229 350 384 MobilTel. +351 9 32559110 esc.porto@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucureşti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 195220 St. Petersburg Russia	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Technical Office	**Yekaterinburg**	ZAO SEW-EURODRIVE Kominterna Str. 16 Office 614 RUS-620078 Ekaterinburg	Tel. +7 343 310 3977 Fax +7 343 310 3978 eso@sew-eurodrive.ru

Russia			
	Irkutsk	ZAO SEW-EURODRIVE 5-Armii Str., 31 RUS-664011 Irkutsk	Tel. +7 3952 25 5880 Fax +7 3952 25 5881 iso@sew-eurodrive.ru
	Moskau	ZAO SEW-EURODRIVE RUS-107023 Moskau	Tel. +7 495 9337090 Fax +7 495 9337094 mso@sew-eurodrive.ru
	Novosibirsk	ZAO SEW-EURODRIVE pr. K Marksa, d.30 RUS-630087 Novosibirsk	Tel. +7 383 3350200 Fax +7 383 3462544 nso@sew-eurodrive.ru
	Togliatti	ZAO SEW-EURODRIVE Sportivnaya Str. 4B, office 2 Samarskaya obl. RUS-445057 Togliatti	Tel. +7 8482 710529 Fax +7 8482 810590

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 senemeca@sentoo.sn

Serbia			
Sales	**Beograd**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor SCG-11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.co.yu

Singapore			
Assembly **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com

Slovakia			
Sales	**Bratislava**	SEW-Eurodrive SK s.r.o. Rybničná 40 SK-831 06 Bratislava	Tel. +421 2 33595 202 Fax +421 2 33595 200 sew@sew-eurodrive.sk http://www.sew-eurodrive.sk
	Žilina	SEW-Eurodrive SK s.r.o. Industry Park – PChZ ulica M.R.Štefánika 71 SK-010 01 Žilina	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk
	Banská Bystrica	SEW-Eurodrive SK s.r.o. Rudlovská cesta 85 SK-974 11 Banská Bystrica	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 SK-040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO - 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 494-3104 http://www.sew.co.za dross@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 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
	Nelspruit	SEW-EURODRIVE (PTY) LTD. 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
Technical Offices	**Port Elizabeth**	SEW-EURODRIVE PTY LTD. 8 Ruan Access Park Old Cape Road Greenbushes 6000 Port Elizabeth	Tel. +27 41 3722246 Fax +27 41 3722247 dtait@sew.co.za
	Richards Bay	SEW-EURODRIVE PTY LTD. 25 Eagle Industrial Park Alton Richards Bay P.O. Box 458 Richards Bay 3900	Tel. +27 35 797-3805 Fax +27 35 797-3819 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 Fax +34 94 43184-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Technical Offices	**Barcelona**	Delegación Barcelona Avenida Francesc Maciá 40-44 Oficina 4.2 E-08208 Sabadell (Barcelona)	Tel. +34 93 7162200 Fax +34 93 7233007
	Lugo	Delegación Noroeste Apartado, 1003 E-27080 Lugo	Tel. +34 639 403348 Fax +34 982 202934
	Madrid	Delegación Madrid Gran Via. 48-2° A-D E-28220 Majadahonda (Madrid)	Tel. +34 91 6342250 Fax +34 91 6340899
	Seville	MEB Pólogono Calonge, C/A Nave 2 - C E-41.077 Sevilla	Tel. +34 954 356 361 Fax +34 954 356 274 mebsa.sevilla@mebsa.com
	Valencia	MEB Músico Andreu i Piqueres, 4 E-46.900 Torrente (Valencia)	Tel. +34 961 565 493 Fax +34 961 566 688 mebsa.valencia@mebsa.com

Sri Lanka			
Sales	**Colombo**	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442 00 Fax +46 36 3442 80 http://www.sew-eurodrive.se info@sew-eurodrive.se
Technical Offices	**Göteborg**	SEW-EURODRIVE AB Gustaf Werners gata 8 S-42132 Västra Frölunda	Tel. +46 31 70968 80 Fax +46 31 70968 93
	Malmö	SEW-EURODRIVE AB Borrgatan 5 S-21124 Malmö	Tel. +46 40 68064 80 Fax +46 40 68064 93
	Stockholm	SEW-EURODRIVE AB Björkholmsvägen 10 S-14146 Huddinge	Tel. +46 8 44986 80 Fax +46 8 44986 93
	Skellefteå	SEW-EURODRIVE AB Trädgårdsgatan 8 S-93131 Skellefteå	Tel. +46 910 7153 80 Fax +46 910 7153 93

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Technical Offices	**Rhaetian Switzerland**	André Gerber Es Perreyres CH-1436 Chamblon	Tel. +41 24 445 3850 Fax +41 24 445 4887
	Bern / Solothurn	Rudolf Bühler Muntersweg 5 CH-2540 Grenchen	Tel. +41 32 652 2339 Fax +41 32 652 2331
	Central Switzerland and Ticino	Beat Lütolf Baumacher 11 CH-6244 Nebikon	Tel. +41 62 756 4780 Fax +41 62 756 4786
	Zürich	René Rothenbühler Nörgelbach 7 CH-8493 Saland	Tel. +41 52 386 3150 Fax +41 52 386 3213
	Bodensee and East Switzerland	Markus Künzle Eichweg 4 CH-9403 Goldach	Tel. +41 71 845 2808 Fax +41 71 845 2809

Taiwan (R.O.C.)			
Sales	**Nan Tou**	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878
	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

Thailand			
Assembly **Sales** **Service**	**Chonburi**	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Technical Offices	**Bangkok**	SEW-EURODRIVE (Thailand) Ltd. 6th floor, TPS Building 1023, Phattanakarn Road Suanluang Bangkok,10250	Tel. +66 2 7178149 Fax +66 2 7178152 sewthailand@sew-eurodrive.com
	Hadyai	SEW-EURODRIVE (Thailand) Ltd. Hadyai Country Home Condominium 59/101 Soi.17/1 Rachas-Utid Road. Hadyai, Songkhla 90110	Tel. +66 74 359441 Fax +66 74 359442 sewthailand@sew-eurodrive.com
	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 sew-thailand@sew-eurodrive.com

Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 5, Rue El Houdaibiah 1000 Tunis	Tel. +216 71 4340-64 + 71 4320-29 Fax +216 71 4329-76 tms@tms.com.tn

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419164, 3838014, 3738015 Fax +90 216 3055867 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Technical Offices	**Adana**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Kizilay Caddesi 8 Sokak No 6 Daðtekin Is Merkezi Kat 4 Daire 2 TR-01170 SEYHAN / ADANA	Tel. +90 322 359 94 15 Fax +90 322 359 94 16
	Ankara	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Özcelik Is Merkezi, 14. Sok, No. 4/42 TR-06370 Ostim/Ankara	Tel. +90 312 3853390 / +90 312 3544715 / +90 312 3546109 Fax +90 312 3853258
	Bursa	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Besevler Küçük Sanayi Parkoop Parçacilar Sitesi 48. Sokak No. 47 TR Nilüfer/Bursa	Tel. +90 224 443 4556 Fax +90 224 443 4558
	Izmir	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. 1203/11 Sok. No. 4/613 Hasan Atli Is Merkezi TR-35110 Yenisehir-Izmir	Tel. +90 232 4696264 Fax +90 232 4336105

Ukraine			
Sales **Service**	**Dnepropetrovsk**	SEW-EURODRIVE Str. Rabochaja 23-B, Office 409 49008 Dnepropetrovsk	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

Ukraine			
Sales	**Kiev**	SEW-EURODRIVE GmbH S. Oleynika str. 21 02068 Kiev	Tel. +380 44 503 95 77 Fax +380 44 503 95 78 kso@sew-eurodrive.ua
	Donetsk	SEW-EURODRIVE GmbH 25th anniversary of RKKA av. 1-B, of. 805 Donetsk 83000	Tel. +380 62 38 80 545 Fax +380 62 38 80 533 dso@sew-eurodrive.ua

Uruguay			
Sales	**Montevideo**	SEW-EURODRIVE Uruguay, S. A. German Barbato 1526 CP 11200 Montevideo	Tel. +598 2 90181-89 Fax +598 2 90181-88 sewuy@sew-eurodrive.com.uy

USA			
Production **Assembly** **Sales** **Service** **Cooporate Offices**	**Southeast Region**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manufacturing +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**Northeast Region**	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
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve ventas@sew-eurodrive.com.ve sewfinanzas@cantv.net

Connection of signal terminals

	7-segment display Operating status
0	Inverter not ready
1	Controller inhibit active
2	No enable
3	Standstill current
4	VFC operation
5	n-control
6	M-control
7	Hold control
8	Factory setting
9	Limit switch contacted
A	Technology option
c	IPOS reference travel
d	Flying start
E	Calibrate encoder
F	Fault display
H	Manual operation
t	Waiting for data
U	Safe stop active
•	IPOS program Runnning (flashing dot)

* 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®.

DGND (X10, X12, X13, X16, X17) is electrically isolated as standard. The electrical isolation can be disabled by means of a M4 x 8 or M4 x 10 grounding screw (tightening torque 1.4 ... 1.6 Nm). The grounding screw is not included in the scope of delivery.

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 set to V-signal. System bus terminating resistor on/off, factory set to off. Set baud rate for the RS485 interface XT. Either 9.6 or 57.6 kBaud, factory set to 57.6 kBaud. Frequency input on/off, factory set to off.	
X12:1 **X12:2** **X12:3**	**DGND** **SC11** **SC12**	Reference potential for 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 of 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 set to "CW/Halt" Binary input 3, factory set to "CCW/Halt" Binary input 4, factory set to "Enable/Stop" Binary input 5, factory set to "n11/n21" Binary input 6, factory set to "n12/n22"	• The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 2 to 6 (DIØ1...DIØ5) → Parameter menu P60_
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 external voltage required. – Without jumber X13:7-X13:9 (DCOM-DGND) → isolated binary inputs – With jumper X13:7-X13:9 (DCOM-DGND) → non-isolated binary inputs • Switching 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 voltage output DC+24 V (max. load X13:8 **and** X10:8 = 400 mA) for external command switches Reference potential for binary signals RS485+ (fixed setting for baud rate: 9.6 kBaud) RS485-	
X16:1 **X16:2** **X16:3** **X16:4** **X16:5** **X16:6**	**DIØ6** **DIØ7** **DOØ3** **DOØ4** **DOØ5** **DGND**	Binary input 7, factory set to "No function" Binary input 8, factory set to "No function" Binary output 3, factory set to "IPOS output" Binary output 4, factory set to "IPOS output" Binary output 5, factory set to "IPOS output" **Do not apply external voltage to binary outputs X16:3 (DOØ3) to X16:5 (DOØ5)!** Reference potential for binary signals	• The binary inputs are electrically isolated by optocouplers. • Selection options for binary inputs 7 and 8 (DIØ6/DIØ7) → Parameter menu P60_ • Selection options for binary outputs 3 to 5 (DOØ3...DOØ5) → Parameter menu P62_
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 set to "No response" (→ P835) Reference potential for binary signals / KTY– Binary output DBØØ, fixed assignment "/Brake“, load capacity max. DC 150 mA (short-circuit proof, protected against external voltage up to DC 30 V) Shared contact binary output 1, factory set to "Ready" NO contact binary output 1, load capacity of relay contacts max. DC 30 V and DC 0.8 A NC contact binary input 1 Binary output DBØ2, factory set to "/Fault", load capacity max. DC 50 mA (short-circuit proof, protected against external voltage up to DC 30 V). Selection options for binary outputs 1 and 2 (DOØ1 and 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 = 400 mA) for external command switches Input DC+24 V voltage supply (backup voltage depends on options, unit diagnostics for for power 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 of the same unit** Reference potential for DC+24 V input "Safe stop" (safety contact) DC+24 V input "Safe stop" (safety contact)	
XT		Only service interface. Slot for option: DBG60B / UWS21B / USB11A	
		3 slots for option cards (size 0: 2 slots for option cards)	

	Note
	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 to the power section and brake

* With sizes 1, 2 and 2S, 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).

** **Caution:** Adhere to the connection sequence of the brake connector. Incorrect connection will lead to irreparable damage of the brake. When connecting the brake via the terminal box, observe the operating instructions of the respective motor!

	NOTES
	• Connect the brake rectifier using a separate supply system lead. • **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 resonse time, and
– 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 control 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.

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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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