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1 System Description

1.1 System overview of MOVIDRIVE® MDX60B/61B

1.1.1 Power components

3 x AC 380...500 V

3 x AC 200...240 V

Regenerative power supply option
MOVIDRIVE® MDR60A

MOVIDRIVE® MDX60/61B...-5_3

MOVIDRIVE® MDX61B...-2_3

DC link

Braking resistor option

Output filter option

Output choke option
1.1.2 Encoder and communication options

MDX60/61B standard variant with IPOS plus®

MDX60/61B application version for the use of "electronic cam", "Internal synchronous operation" or the application modules.

System bus (SBus)

DBG60B keypad option

MOVITOOLS® engineering software

Encoder options:
- DEU 21B
- DEH 11B
- DEH 21B
- DER 11B
- DIP 11B
- DIO 11B
- DRS 11B

Interface adapter option:
- UWS 21B
- UWS 11A
- USB 11A
1.1.3 Fieldbus options

DFC 11B  
DFD 11B  
DFI 11B  
DFI 21B  
DFP 21B  

DFE 24B  
DFE 32B  
DFE 33B  

1452375307
1.1.4 Control options

**MOVI-PLC®**

- DHP 11B
- OST 11B
- DHE 41B
- DHF 41B
- DHR 41B

![Control options diagram](image-url)
1.1.5 Safety options
**1.1.6 General description**

MOVIDRIVE® MDX60B/61B is the new generation of drive inverters from SEW-EURODRIVE. 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 315 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.

**1.1.7 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.

**1.1.8 Product family**

The MOVIDRIVE® product family includes three series:

- **MOVIDRIVE® MDX60B**: Drive inverter for asynchronous AC motors without encoder feedback. The units are not option-capable.

- **MOVIDRIVE® MDX61B**: Drive inverter for asynchronous AC motors with or without encoder feedback, or for asynchronous and synchronous servo-motors. The units are option-capable.

- **MOVIDRIVE® MDR60A**: Regenerative power supply unit; MOVIDRIVE® inverters (400/500 V units) operate in regenerative mode to feed energy back into the supply system.
1.1.9 Unit variants

MOVIDRIVE® MDX60/61B size 0-6 inverters are available in two variants, namely the standard variant and the application variant. MOVIDRIVE® MDX60B/61B size 7 inverters are only available as application variants with coated pcbs (-0T/L).

**Standard variant**

The units are equipped with integrated IPOSplus® positioning and sequence control as standard. MOVIDRIVE® MDX61B can be expanded with the available options. "00" at the end of the type designation indicates the standard variant.

**Application variant**

In addition to the features of the standard variant, these units include the technology functions "electronic cam" and "internal synchronous operation". Furthermore, you can use all the application modules available in the MOVITOOLS® MotionStudio engineering software with the application variants.

The application variant is indicated by "0T" following the type designation.

**Variants 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 variant with coated pcbs is indicated by "00/L" or "0T-/L" at the end of the type designation.
1.1.10 Modular unit concept

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

- Size 0 (0005 ... 0014) → 2 option card slots
  - 1 option card slot for encoder connection
  - 1 option card slot for a communication option
- Sizes 1 ... 7 (0015 ... 2500) → 3 option card slots
  - 1 option card slot for encoder connection
  - 1 option card slot for a communication option
  - 1 option card slot for an expansion option

INFORMATION

- Customers can only install or remove option cards later on in MDX61B sizes 1 to 7. 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 on by SEW-EURODRIVE. Please take this aspect into account when you place your order/perform project planning.

1.1.11 Option card slots of MOVIDRIVE® MDX61B

Size 0 (0005 ... 0014)          Size 1 ... 7 (0015 ... 2500)

[1] Encoder slot for encoder option
[2] Fieldbus slot for communication option
[3] Expansion slot for communication option (only sizes 1 - 7)

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.
### System Description

System overview of MOVIDRIVE® MDX60B/61B

#### Use

<table>
<thead>
<tr>
<th>Option</th>
<th>Required option</th>
<th>Option card slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder option</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asynchronous AC motor with encoder feedback (Hiperface®, sin/cos, TTL)</td>
<td>Hiperface® encoder card DEH11B</td>
<td>1</td>
</tr>
<tr>
<td>Asynchronous or synchronous servomotor with Hiperface® encoder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronous servomotor with resolver</td>
<td>Resolver card type DER11B</td>
<td></td>
</tr>
<tr>
<td>Asynchronous or synchronous motors with absolute encoder</td>
<td>DEU21B multi-encoder card</td>
<td></td>
</tr>
<tr>
<td>SSI encoder interface</td>
<td>DEH21B absolute encoder card</td>
<td></td>
</tr>
</tbody>
</table>

#### Communication options (fieldbus, control)

<table>
<thead>
<tr>
<th>Option</th>
<th>Required option</th>
<th>Option card slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>User-programmable MOVI-PLC® controller</td>
<td>MOVI-PLC® basic DHP11B controller</td>
<td>2 (3 only if slot 2 is occupied)</td>
</tr>
<tr>
<td>Additional RS485 interface (only in combination with option DHP11B)</td>
<td>DHP11B + OST11B</td>
<td></td>
</tr>
<tr>
<td>Freely programmable motion and logic controller (MOVI-PLC®)</td>
<td>Controller</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• DHE21B (standard)</td>
<td>2 (3 only if slot 2 is occupied)</td>
</tr>
<tr>
<td></td>
<td>• DHE41B (advanced)</td>
<td></td>
</tr>
<tr>
<td>Additional analog and binary inputs/outputs are required</td>
<td>Input/output card type DIO11B</td>
<td>2 (3 only if slot 2 is occupied)</td>
</tr>
<tr>
<td>Integration into a PROFIBUS system</td>
<td>PROFIBUS interface type DFP21B</td>
<td></td>
</tr>
<tr>
<td>Integration into a PROFIBUS system with PROFIsafe</td>
<td>DFS11B fieldbus interface</td>
<td></td>
</tr>
<tr>
<td>Integration into an INTERBUS system</td>
<td>INTERBUS interface type DFI11B / DFI21B</td>
<td></td>
</tr>
<tr>
<td>Integration into an Ethernet system with PROFIsafe</td>
<td>DFS21B fieldbus interface</td>
<td>2</td>
</tr>
<tr>
<td>Integration into an EtherCAT® system</td>
<td>EtherCAT® interface type DFE24B</td>
<td></td>
</tr>
<tr>
<td>Integration into a DeviceNet system</td>
<td>DeviceNet interface type DFD11B</td>
<td></td>
</tr>
<tr>
<td>Integration into a CANopen system</td>
<td>CANopen interface type DFC11B</td>
<td></td>
</tr>
</tbody>
</table>

#### Expansion option

<table>
<thead>
<tr>
<th>Option</th>
<th>Required option</th>
<th>Option card slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSI encoder interface</td>
<td>DIP11B absolute encoder card</td>
<td></td>
</tr>
<tr>
<td>Phase-synchronous operation</td>
<td>Synchronous operation card DRS11B</td>
<td>3</td>
</tr>
<tr>
<td>Safety module</td>
<td>DCS21B option (only in conjunction with DFS12B/22B option) / DCS31B</td>
<td></td>
</tr>
</tbody>
</table>
1.1.12 Control modes

The VFC (Voltage Mode Flux Control) and CFC (Current Mode 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.

<table>
<thead>
<tr>
<th>VFC control mode</th>
<th>Control modes CFC (Current Mode Flux Control)/SERVO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage-controlled control mode for asynchronous AC motors with and without encoder feedback.</td>
<td></td>
</tr>
<tr>
<td>• With encoder feedback</td>
<td></td>
</tr>
<tr>
<td>• At least 150% torque, with a power-matched, stopped motor</td>
<td></td>
</tr>
<tr>
<td>• Characteristics similar to servo operation</td>
<td></td>
</tr>
<tr>
<td>• Without encoder feedback</td>
<td></td>
</tr>
<tr>
<td>• min. 150% torque up to 0.5 Hz, with a power-matched motor</td>
<td></td>
</tr>
</tbody>
</table>

Current-controlled control mode for asynchronous and synchronous servomotors. Encoder feedback is always required.

- At least 160% torque, with a power-matched, stopped motor
- Maximum precision and concentric running characteristics right down to standstill.
- Servo characteristics and torque control even for asynchronous AC motors
- Reacts to load changes within a few milliseconds

1.1.13 System bus (SBus)

The system bus (SBus), which is installed as standard, allows 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 universal SEW-EURODRIVE standard for serial communication. The SBus can be switched to CANopen.

1.1.14 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.

1.1.15 IPOSplus®

A significant feature of MOVIDRIVE® inverters is that the IPOSplus® positioning and sequence control system is integrated as standard. IPOSplus® enables you to control motion sequences directly in the inverter close to the machine. This way, load is taken off the higher-level controller and modular concepts can be implemented more easily.
### 1.1.16 Overview of the units

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

<table>
<thead>
<tr>
<th>Recommended motor power (VFC)</th>
<th>Continuous output current</th>
<th>MOVIDRIVE® type (CFC)</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4Q units (with brake chopper)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.55 kW (0.74 HP)</td>
<td>0.75 kW (1.0 HP)</td>
<td>AC 2.0 A</td>
<td>0005-5A3-4-..</td>
</tr>
<tr>
<td>0.75 kW (1.0 HP)</td>
<td>1.1 kW (1.5 HP)</td>
<td>AC 2.4 A</td>
<td>0008-5A3-4-..</td>
</tr>
<tr>
<td>1.1 kW (1.5 HP)</td>
<td>1.5 kW (2.0 HP)</td>
<td>AC 3.1 A</td>
<td>0011-5A3-4-..</td>
</tr>
<tr>
<td>1.5 kW (2.0 HP)</td>
<td>2.2 kW (3.0 HP)</td>
<td>AC 4.0 A</td>
<td>0014-5A3-4-..</td>
</tr>
<tr>
<td>1.5 kW (2.0 HP)</td>
<td>2.2 kW (3.0 HP)</td>
<td>AC 4.0 A</td>
<td>-</td>
</tr>
<tr>
<td>2.2 kW (3.0 HP)</td>
<td>3.0 kW (4.0 HP)</td>
<td>AC 5.5 A</td>
<td>-</td>
</tr>
<tr>
<td>3.0 kW (4.0 HP)</td>
<td>4.0 kW (5.4 HP)</td>
<td>AC 7.0 A</td>
<td>-</td>
</tr>
<tr>
<td>4.0 kW (5.4 HP)</td>
<td>5.5 kW (7.4 HP)</td>
<td>AC 9.5 A</td>
<td>-</td>
</tr>
<tr>
<td>5.5 kW (7.4 HP)</td>
<td>7.5 kW (10 HP)</td>
<td>AC 12.5 A</td>
<td>-</td>
</tr>
<tr>
<td>7.5 kW (10 HP)</td>
<td>11 kW (15 HP)</td>
<td>AC 16 A</td>
<td>-</td>
</tr>
<tr>
<td>11 kW (15 HP)</td>
<td>15 kW (20 HP)</td>
<td>AC 24 A</td>
<td>-</td>
</tr>
<tr>
<td>15 kW (20 HP)</td>
<td>22 kW (30 HP)</td>
<td>AC 32 A</td>
<td>-</td>
</tr>
<tr>
<td>22 kW (30 HP)</td>
<td>30 kW (40 HP)</td>
<td>AC 46 A</td>
<td>-</td>
</tr>
<tr>
<td>30 kW (40 HP)</td>
<td>37 kW (50 HP)</td>
<td>AC 60 A</td>
<td>-</td>
</tr>
<tr>
<td>37 kW (50 HP)</td>
<td>45 kW (60 HP)</td>
<td>AC 73 A</td>
<td>-</td>
</tr>
<tr>
<td>45 kW (60 HP)</td>
<td>55 kW (74 HP)</td>
<td>AC 89 A</td>
<td>-</td>
</tr>
<tr>
<td>55 kW (74 HP)</td>
<td>75 kW (100 HP)</td>
<td>AC 105 A</td>
<td>-</td>
</tr>
<tr>
<td>75 kW (100 HP)</td>
<td>90 kW (120 HP)</td>
<td>AC 130 A</td>
<td>-</td>
</tr>
<tr>
<td>90 kW (120 HP)</td>
<td>110 kW (148 HP)</td>
<td>AC 170 A</td>
<td>-</td>
</tr>
<tr>
<td>110 kW (148 HP)</td>
<td>132 kW (177 HP)</td>
<td>AC 200 A</td>
<td>-</td>
</tr>
<tr>
<td>132 kW (177 HP)</td>
<td>160 kW (215 HP)</td>
<td>AC 250 A</td>
<td>-</td>
</tr>
<tr>
<td><strong>2Q units (without brake chopper)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160 kW (215 HP)</td>
<td>200 kW (268 HP)</td>
<td>AC 300 A</td>
<td>-</td>
</tr>
<tr>
<td>200 kW (268 HP)</td>
<td>250 kW (335 HP)</td>
<td>AC 380 A</td>
<td>-</td>
</tr>
<tr>
<td>250 kW (335 HP)</td>
<td>315 kW (422 HP)</td>
<td>AC 470 A</td>
<td>-</td>
</tr>
</tbody>
</table>

| **4Q units (with brake chopper)** |
| 160 kW (215 HP) | 200 kW (268 HP) | AC 300 A | - | 1600-503-4-0T/L |
| 200 kW (268 HP) | 250 kW (335 HP) | AC 380 A | - | 2000-503-4-0T/L |
| 250 kW (335 HP) | 315 kW (422 HP) | AC 470 A | - | 2500-503-4-0T/L |
### System Overview of MOVIDRIVE® MDX60B/61B

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

<table>
<thead>
<tr>
<th>Recommended motor power (VFC)</th>
<th>Continuous output current (CFC)</th>
<th>MOVIDRIVE® type</th>
<th>Size (technical data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 kW (2.0 HP)</td>
<td>2.2 kW (3.0 HP)</td>
<td>AC 7.3 A</td>
<td>0015-2A3-4...</td>
</tr>
<tr>
<td>2.2 kW (3.0 HP)</td>
<td>3.7 kW (5.0 HP)</td>
<td>AC 8.6 A</td>
<td>0022-2A3-4...</td>
</tr>
<tr>
<td>3.7 kW (5.0 HP)</td>
<td>5.0 kW (7.0 HP)</td>
<td>AC 14.5 A</td>
<td>0037-2A3-4...</td>
</tr>
<tr>
<td>5.5 kW (7.4 HP)</td>
<td>7.5 kW (10.0 HP)</td>
<td>AC 22 A</td>
<td>0055-2A3-4...</td>
</tr>
<tr>
<td>7.5 kW (10 HP)</td>
<td>11 kW (15 HP)</td>
<td>AC 29 A</td>
<td>0075-2A3-4...</td>
</tr>
<tr>
<td>11 kW (15 HP)</td>
<td>15 kW (20 HP)</td>
<td>AC 42 A</td>
<td>0110-203-4...</td>
</tr>
<tr>
<td>15 kW (20 HP)</td>
<td>22 kW (30 HP)</td>
<td>AC 54 A</td>
<td>0150-203-4...</td>
</tr>
<tr>
<td>22 kW (30 HP)</td>
<td>30 kW (40 HP)</td>
<td>AC 80 A</td>
<td>0220-203-4...</td>
</tr>
<tr>
<td>30 kW (40 HP)</td>
<td>37 kW (50 HP)</td>
<td>AC 95 A</td>
<td>0300-203-4...</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>MOVIDRIVE® MDR60A regenerative power supply units</th>
<th>Size (technical data)</th>
<th>MOVIDRIVE® MDX60B/61B...-5_3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0150-503-01</td>
<td>I_{line} = AC 29 A, I_{DC link} = DC 35 A</td>
<td>0005 ... 0150</td>
</tr>
<tr>
<td>0370-503-00</td>
<td>I_{line} = AC 66 A, I_{DC link} = DC 70 A</td>
<td>0005 ... 0370</td>
</tr>
<tr>
<td>0750-503-00</td>
<td>I_{line} = AC 117 A, I_{DC link} = DC 141 A</td>
<td>0005 ... 0750</td>
</tr>
<tr>
<td>1320-503-00</td>
<td>I_{line} = AC 225 A, I_{DC link} = DC 270 A</td>
<td>0005 ... 1320</td>
</tr>
<tr>
<td>1320-503-00 (As of series no. DCV2000100)</td>
<td>I_{line} = AC 260 A, I_{DC link} = DC 324 A</td>
<td>0005 ... 1600</td>
</tr>
</tbody>
</table>
System Description

System overview of MOVIDRIVE® MDX60B/61B

1.1.17 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

1.2.1 Unit features

- 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, continuous operation without overload (pumps, fans)
- Sizes 0 ... 6:
  - With 4 kHz switching frequency, I_N is permitted for an ambient temperature of ϑ = 50 °C
  - 4Q capability due to integrated brake chopper installed as standard
- Size 7:
  - With 2.5 kHz switching frequency, I_N is permitted for an ambient temperature of ϑ = 50 °C
  - 2Q units without brake chopper or 4Q units with brake chopper can be selected
- Compact unit design 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
- STO in accordance with EN 61800-5-2, up to
  - Category 3 according to EN 954-1
  - Performance level d according to EN ISO 13849-1

1.2.2 Control functions

- VFC or CFC control modes for field-oriented operation (asynchronous servo)
- IPOS® positioning and sequence control system integrated as standard
- Two complete parameter sets
- Automatic motor calibration
- Automatic brake control by the inverter
- DC braking to decelerate the motor even in 1Q mode
- 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 that 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 to avoid condensation build-up in the motor
• Parameter lock for protection against changes to parameters
• Speed controller and encoder input for incremental, Hiperface® or SSI encoders and resolvers. 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 (8 channels, real-time capable)
• Fault memory (5 memory locations) with all relevant operating data at the time of the fault
• Operating hours counter for hours of operation (unit connected to supply system 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

1.2.3 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 ... 20 mA)
• S pattern for jerk-free speed changes
• Programmable input characteristic curve 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

1.2.4 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 a keypad or PC
• Pluggable memory module for quick unit replacement during service
1.2.5 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® MotionStudio with SCOPE process data visualization
- Application version with access to technology functions and application modules to solve drive tasks quickly and easily
- 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.

1.2.6 Standards and approvals

- 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) has been 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 plants equipped with MOVIDRIVE® on the basis of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC. Complies with the EMC product standard EN 61800-3.
- STO in accordance with EN 61800-5-2, up to
  - Category 3 according to EN 954-1
  - Performance level d according to EN ISO 13849-1
1.3 Additional functions of the application variants

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

The following additional functions are available:

- Electronic cam
- Internal synchronous operation

INFORMATION

Please refer to the "Electronic Cam" and "Internal Synchronous Operation" manuals for detailed information about the additional functions.

1.3.1 Electronic cam

You can use the MOVIDRIVE® product series with the "electronic cam" module 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 the MOVIDRIVE® MDX61B 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.
- "Electrical cam" is only available in parameter set 1.
- The "DRS11B synchronous operation card" 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 motor with incremental encoder, 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 example for the "electronic cam." Filled yogurt pots are transported for further processing. The "electronic cam" enables smooth movement, which is an important requirement for this application.
1.3.2 Internal synchronous operation

You can use the MOVIDRIVE® unit series 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 application versions (...-0T).

• Encoder feedback is mandatory. This is why "internal synchronization 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 "DRS11B synchronous operation card" 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 motor with incremental encoder, 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 "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 used.
Example

The figure below shows a typical application with "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.
1.4 Application modules for MOVIDRIVE® MDX61B

1.4.1 The drive task

The drive task 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. Increasingly complex drive applications have to be solved, without this resulting in lengthy configuration and startup processes.

1.4.2 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 MOVITOOLS® MotionStudio and can be used with the application variants.

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 this information to create the control program and loads it into the inverter. MOVIDRIVE® takes over complete control of the motion processes, the load is taken off the machine control and decentralized concepts are easier to implement.

The advantages at a glance

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

1.4.3 Scope of delivery and documentation

The application modules are part of the MOVITOOLS® MotionStudio engineering software and can be used with MOVIDRIVE® MDX61B application versions (...-0T). The individual application manuals can also be downloaded as PDFs from the SEW website.
1.4.4 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 movement:
- Module positioning via terminals: The inverter manages the movement records
- Module positioning via fieldbus: The PLC manages the movement records

**Winding**
- Center winder

**Control**
- Flying saw
- DriveSync via fieldbus
- Sensor-based positioning
1.4.5 Application

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

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

The application modules for "Positioning" are suited to all applications in which target positions are specified and movement then takes place to those positions. Movement can either be linear or rotary.

For example, trolleys, hoists, gantries, rotary tables, swiveling devices, and storage and retrieval systems.

1.4.7 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 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 have the following 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 incremental or absolute encoders can be evaluated.
- Guided startup and diagnostics.

Four operating modes are available 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: The higher-level PLC controls the process automatically.
System Description
Application modules for MOVIDRIVE® MDX61B

Movement records in the PLC

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

These application modules are suited to applications with a high 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 have the following 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 incremental or absolute encoders can be evaluated.
- Easy connection to the higher-level controller.
- Guided startup and diagnostics.

Three operating modes are available 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: The 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 has the following features:

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

Two operating modes are available for controlling the machine:

- Jog mode: The machine can be moved manually.
- Automatic mode: The higher-level PLC controls the process automatically.
1.4.8 Rotatory positioning

- Modulo positioning

A large number of movements has to be controlled in automated conveyor and logistics applications to transport the material. Linear movements in the form of trolleys or hoists, and rotatory movements via rotary tables play a key role in these applications.

Rotary movements are often synchronized (rotary 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:

- A user-friendly GUI
- 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
1.4.9 Winding

- **Center winder**

  The "Center 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 via the virtual terminals (fieldbus, system bus).

  The "center winder" application module has the following 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 higher-level controller (PLC).
  - Guided startup and diagnostics.

Four operating modes are available 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.
1.4.10 Control

• **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 has the following features:

• Choice of fieldbus or terminal control.
• Cut edge protection or singling using the "Draw gap" function.
• Immediate cut function by manual interrupt.
• Counter for material length.
• Easy connection to the higher-level controller.
• Guided startup and diagnostics.

Four operating modes are available for controlling the machine:

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

• **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 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 has the following features:

• Guided startup and extensive diagnostics functions.
• High degree of similarity with procedures learned for the “Extended positioning”.
• One program module for master and slave drive.
• The selected IPOSplus® encoder source is also effective in synchronous operation.
• The master value for "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 systems
    - Transverse carriages
1.5 **MOVITOOLS® MotionStudio engineering software**

1.5.1 **Tasks**

The software package enables you to perform the following tasks:

- Establishing communication with units
- Executing functions with the units

1.5.2 **Establishing communication with the units**

The SEW Communication Server is integrated into the MOVITOOLS® MotionStudio software package for establishing communication with the units.

The SEW Communication Server allows you to create **communication channels**. Once the channels are established, the units communicate via these communication channels using their communication options. You can operate up to four communication channels at the same time.

MOVITOOLS® MotionStudio supports the following types of communication channels:

- Serial (RS-485) via interface adapters
- System bus (SBus) via interface adapters
- Ethernet
- EtherCAT®
- Fieldbus (PROFIBUS DP/DP-V1)
- Tool Calling Interface

The available channels can vary depending on the unit and its communication options.

1.5.3 **Executing functions with the units**

The software package offers uniformity in executing the following functions:

- Parameterization (for example in the parameter tree of the unit)
- Startup
- Visualization and diagnostics
- Programming

The following basic components are integrated into the MOVITOOLS® MotionStudio software package, allowing you to use the units to execute functions:

- MotionStudio
- MOVITOOLS®

All functions communicate using **tools**. MOVITOOLS® MotionStudio provides the right tools for every unit type.
1.5.4 Technical support

SEW-EURODRIVE offers you a 24-hour service hotline.

Simply dial (+49) 0 18 05 and then enter the letters SEWHELP via the telephone keypad. Of course, you can also dial (+49) 0 18 05 - 7 39 43 57.

1.5.5 Online help

After installation, the following types of help are available to you:

- This documentation is displayed in a help window after you start the software.

  If the help window does not appear at the start, deactivate the "Display" control field, in the menu under [Settings] / [Options] / [Help].

  If the help window appears again, activate the "Display" control field, in the menu under [Settings] / [Options] / [Help].

- Context-sensitive help is available for the fields which require you to enter values.

  For example, you can use the <F1> key to display the ranges of values for the unit parameters.