MOVIDRIVE®
Extended Positioning via Bus
Edition
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Manual
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1  Important Notes

- This manual does not replace the detailed operating instructions!
- Installation and startup only by trained personnel observing applicable accident prevention regulations and the MOVIDRIVE® operating instructions!

Documentation
- Read this manual carefully before you commence installation and startup of MOVIDRIVE® drive inverters with this application module.
- This manual assumes that the user has access to and is familiar with the MOVIDRIVE® documentation, in particular the MOVIDRIVE® system manual.
- In this manual, cross references are marked with "→". For example, (→ Sec. X.X) means: Further information can be found in section X.X of this manual.
- A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that the documentation is observed.

Safety and warning instructions

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

- **Electrical hazard**
  Possible consequences: Severe or fatal injuries.

- **Hazard**
  Possible consequences: Severe or fatal injuries.

- **Hazardous situation**
  Possible consequences: Slight or minor injuries.

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

- **Tips and useful information.**
2 System Description

2.1 Application fields

The "Extended positioning via bus" module is particularly suited to applications in which it is necessary to move to any number of positions at different speeds and with different accelerating ramps. Positioning to an external encoder is necessary when there is a non-positive connection between the motor shaft and the load. In this case, either an incremental encoder or an absolute encoder can be used.

The "Extended positioning via bus" application module is especially suitable for the following sectors:

- **Materials handling technology**
  - Trolleys
  - Hoists
  - Rail vehicles

- **Logistics**
  - Storage and retrieval units for high-bay warehouses
  - Transverse carriages

"Extended positioning via bus" offers the following advantages in these applications:

- User-friendly user interface
- Enter only those parameters required for "Extended positioning via bus" (ratios, speeds, diameters)
- User-friendly application programs guide you through the process of setting parameters, so there is no need for complicated programming
- Monitor mode for optimum diagnosis
- No programming experience required
- Long travel distances available (2^{18} × travel unit)
- Incremental encoder or an absolute encoder can be used as external encoder.
- No extended training period required
2.2 Application example

Transverse carriage

A transverse carriage represents a typical application example of the "Extended positioning via bus" application module. The following figure shows a transverse carriage in a high-bay warehouse. Goods to be moved in and out are transported between the shelf aisles and the distribution table. The transverse carriage has to cover long distances in this process. It also has to accelerate with different ramps and move at different speeds depending on the load.

Fig. 1: Application example of a transverse carriage
2.3 Program identification

There are two ways in which you can identify the application program last loaded into the MOVIDRIVE® unit.

1. With PC and MOVITOOLS:
   - Connect MOVIDRIVE® to the PC via the serial port.
   - Start MOVITOOLS.
   - Select “Execute Program/Compiler”.
   - In Compiler, select “Display/Program Information”.

![Fig. 2: Starting the program information function](image)

- The “Program Information” window appears. The entries here tell you what application software is stored in MOVIDRIVE®. The version number is also displayed.

![Fig. 3: “Program Information” window](image)
2. Using the DBG11A keypad, no PC required:
   - Select parameter P940 “Edit IPOS variables”.
   - Set parameter P940 to ON. The keypad now displays “000V.”
   - Press the ↑ key to increment the numbers and the → key to move the cursor to the right. Set “128V.”
   - The keypad now displays the content of variable H128 in decimal and hexadecimal notation.

![Image of variable H128](image.png)

**Fig. 4: Variable H128**

- The meaning of the decimal value in the first line is as follows:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>4</th>
<th>1</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program version</td>
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<td></td>
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<tr>
<td>00001 = Table positioning</td>
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<td></td>
<td></td>
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<tr>
<td>00002 = Table positioning via fieldbus</td>
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<tr>
<td>00003 = Positioning via bus</td>
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<tr>
<td>00004 = Extended positioning via bus</td>
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<tr>
<td>00005 = Absolute positioning</td>
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<tr>
<td>00006 = Reserved</td>
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<tr>
<td>00007 = Reserved</td>
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<td>00008 = Reserved</td>
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<td>00009 = Reserved</td>
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<tr>
<td>00010 = Constant tension center winder</td>
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<td>00011 = Reserved</td>
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<td>00012 = Reserved</td>
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<td>00100 = Crane control</td>
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<td>1 = Positioning</td>
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<td>2 = Winding technology</td>
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<td>3 = Sequence control system</td>
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<td>4 = Multi-axis application</td>
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</table>
3 Project Planning

3.1 Pre-requisites

**PC and software**  
The "Extended positioning via bus" application module is implemented as an IPOSplus® program and forms part of the SEW MOVITOOLS software package. In order to use MOVITOOLS, you must have a PC with one of the following operating systems: Windows® 95, Windows® 98, Windows NT® version 4.0 or Windows® 2000.

**Inverters, motors and encoders**

### Inverters

"Extended positioning via bus" can only be implemented on MOVIDRIVE® units in technology version (...-0T).

**Encoder feedback**

It is essential for "Extended positioning via bus" to have encoder feedback, i.e. it can only be implemented on MOVIDRIVE® MDV/MDS or MOVIDRIVE® compact MCV/MCS, not on MOVIDRIVE® MDF or MOVIDRIVE® compact MCF.

"Extended positioning via bus" uses 6 process data words. As a result, it is only possible to use the "PROFIBUS" and "INTERBUS with fiber optic cable" fieldbus types. You need the MOVIDRIVE® DFP21A, DFP11A or DFI21A option corresponding to the bus type you will be using.

An external encoder is required for positioning in applications with a non-positive connection between the motor shaft and the load. The "absolute encoder interface type DIP11A" MOVIDRIVE® option is required in addition if an absolute encoder is used as the external encoder.

"Extended positioning via bus" uses 6 process data words. As a result, it is only possible to use the "PROFIBUS" and "INTERBUS with fiber optic cable" fieldbus types. You need the MOVIDRIVE® DFP21A, DFP11A or DFI21A option corresponding to the bus type you will be using.

**Motors**

- For operation on MOVIDRIVE® MDV or MOVIDRIVE® compact MCV: Asynchronous servomotors CT/CV (encoder installed as standard) or AC motors DR/DT/DV/D with encoder option.
- For operation on MOVIDRIVE® MDS or MOVIDRIVE® compact MCS: Synchronous servomotors DS/DY, resolver installed as standard.
• **External encoders**

  MOVIDRIVE® compact MCV/MCS41A cannot evaluate data from absolute encoders. Only incremental encoders with signals according to RS-422 (5 V TTL) can be used as external encoders in applications with non-positive connection between motor shaft and load.

  - Interlocking (= zero slip) connection between motor shaft and load: No external encoder required. If you also want to use an external encoder for positioning when there is an interlocking connection, you have to proceed in exactly the same way as with a non-positive connection.
  - Non-positive (= with slip) connection between motor shaft and load: An external encoder required as well as the motor encoder/resolver.
    - Incremental encoder as external encoder → Connection to basic unit X14.
    - **Only with MOVIDRIVE® MDV/MDS60A:** Absolute encoder as external encoder → Connection on DIP11A option X62.

  The approved absolute encoders are listed in the DIP selection list (→ MOVIDRIVE® MD_60A system manual, description of parameter P950).

• **MOVIDRIVE® MDV/MDS60A combinations:**

<table>
<thead>
<tr>
<th>Connection Motor shaft/load</th>
<th>Interlocking, no external encoder required</th>
<th>Non-positive, external encoder required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of external encoder</td>
<td>Incremental encoder</td>
<td>Absolute encoder</td>
</tr>
<tr>
<td>Reference travel</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bus type</td>
<td>PROFIBUS DP (12 Mbaud) → DFP21A</td>
<td>PROFIBUS FMS/DP → DFP11A</td>
</tr>
<tr>
<td></td>
<td>PROFIBUS LWL → DFI21A</td>
<td>INTERBUS LWL → DFI21A</td>
</tr>
<tr>
<td>Other MOVIDRIVE® option required</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Absolute encoder interface</td>
<td>Type DIP11A</td>
</tr>
</tbody>
</table>

• **MOVIDRIVE® compact MCV/MCS41A combinations:**

<table>
<thead>
<tr>
<th>Connection Motor shaft/load</th>
<th>Interlocking, no external encoder required</th>
<th>Non-positive, external encoder required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of external encoder</td>
<td>Incremental encoder</td>
<td></td>
</tr>
<tr>
<td>Reference travel</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
3.2 Functional description

**Functional characteristics**

The "Extended positioning via bus" application offers the following functional characteristics:

- Any number of target positions can be specified via the fieldbus.
- Long travel distance available. The maximum possible travel distance depends on the set travel unit, for example:

<table>
<thead>
<tr>
<th>Travel unit</th>
<th>Maximum possible travel distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10 mm</td>
<td>26.2144 m</td>
</tr>
<tr>
<td>mm</td>
<td>262.144 m</td>
</tr>
</tbody>
</table>

- The speed and ramps must be set using the bus for positioning.
- Software limit switches can be defined and evaluated.
- Incremental encoders or absolute encoders can be evaluated as external encoders.
- Simple connection to the machine control (PLC).

**Operating modes**

The functions are implemented with three operating modes:

- **Jog mode**
  - The drive is moved clockwise or counterclockwise using bits 9 or 10 in control word 2 (PO1).
  - The speed and the ramps are variable and specified via fieldbus.

- **Referencing mode**
  - Reference travel is started with bit 8 in control word 2 (PO1). Reference travel establishes the reference point (machine zero) for absolute positioning operations.
  - Reference travel can be performed even if an absolute encoder is used as the external encoder.

- **Automatic mode**
  - Positioning is started in automatic mode with bit 8 in control word 2 (PO1).
  - The target position is specified with process output data words PO2 and PO3.
  - The actual position is signaled back cyclically in user travel units with process input data words PI2 and PI3.
  - The set speed is specified with process output data word PO4.
  - The actual speed is signaled back cyclically with process input data word PI4.
  - Accelerating and deceleration ramps are specified with process output data words PO5 and PO6.
  - The active current and unit utilization are signaled back cyclically with process input data words PI5 and PI6.
  - Confirmation of the target position to which movement has taken place via virtual binary output "target position reached."
**Functional description**

**Limits**

The set speed for positioning movement is specified using process output data word PO4. For safety reasons, you can also limit the maximum permitted speed for automatic mode and jog mode.

Note that P302 "Maximal speed 1" must be at least 10 % higher than the set limits for automatic mode and jog mode.

In addition, the numerator factor for scaling the travel is restricted to the value 8192.
3.3 Scaling of the drive

The control needs to know the number of encoder pulses (increments) per travel unit so it can calculate the travel information and position the drive correctly. Furthermore, you can use the scaling function to set the user travel unit suitable for your application.

**Drives without an external encoder (interlocking connection)**

In drives without an external encoder, you can have scaling performed automatically by the "Extended positioning via bus" startup procedure. To do this, you have to enter the following data:

- Diameter of the drive wheel or the spindle pitch
- Gear unit ratio (i gear unit, speed reduction)
- Additional gear ratio (i additional gear, speed reduction)

The startup procedure then calculates the following scaling factors:

1. Pulses/distance scaling factor [inc/mm] according to the formula:
   
   \[
   \text{Pulses} = 4096 \times \frac{\text{i}_{\text{gear unit}} \times \text{i}_{\text{additional gear}}}{\pi \times d_{\text{drive wheel}} \text{ or } s_{\text{spindle pitch}}}
   \]

2. Speed scaling factor (numerator value in rpm and denominator value in mm/s)
   You can also enter m/min or rpm as the unit for the denominator value.

It is also possible to enter the pulses/distance and the scaling factor of the speed directly. If you enter a unit other than millimeter [mm] as the travel unit, this selected unit will also be used for position of the software limit switches, the reference offset and the bus positions.

**Drive with an external encoder (non-positive connection)**

In this case, you must have activated and scaled the external encoder before starting up "Extended positioning via bus." Make the following settings in MOVITOOLS/SHELL in order to do this:

- Set P941 "Source actual position," EXTERN.ENC (X14) with incremental encoder or ABSOL.ENC. (DIP). You can also make this setting during the startup of "Extended positioning via bus."

- Set P942 – P944 encoder factor numerator and denominator as well as encoder scaling ext. encoder. You have to make these settings in MOVITOOLS/SHELL before starting up "Extended positioning via bus."

Calculation of the scaling is now blocked during startup of "Extended positioning via bus."

For more information about scaling of an external encoder, please refer to the "IPOSplus® Positioning and Sequence Control System" manual.

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**Fig. 6: Setting the actual position source**

- Set P942 – P944 encoder factor numerator and denominator as well as encoder scaling ext. encoder. You have to make these settings in MOVITOOLS/SHELL before starting up "Extended positioning via bus."
**Activating the absolute encoder**

Only with MOVIDRIVE® MDV/MDS60A: If you are using an absolute encoder as the external encoder, you must start-up the absolute encoder before starting "Extended positioning via bus." Proceed as follows to do this:

- Start-up the inverter with "MOVITOOLS/Shell".

- Select "Startup / Startup for / DIP".

- Perform the startup procedure for the DIP absolute encoder.

Please refer to the “Positioning with Absolute Encoder and Absolute Encoder Interface DIP11A” manual for more information about starting up of absolute encoders.
3.4 Limit switches, reference cams and machine zero

Software limit switches

Software limit switches perform an additional safety function by defining the limits of the travel range. Note the following points:

- The software limit switches must be located within the travel range of the hardware limit switches.
- Travel commands are not performed if their target positions lie beyond the software limit switches.
- Error message F78 "IPOS SW limit switch" is generated if a target position beyond the software limit switch is specified using the fieldbus. This error message must be acknowledged with a reset. The drive loses its reference position when you do this.

The position value is not lost by a reset if you are using an absolute encoder for positioning. Just enter a new target position in between the software limit switches and then perform the reset. Otherwise, error F78 is generated again.

Reference cam

- Make sure there is no overlap when defining the reference position (position of the reference cam) and the software limit switches. Error message F78 "IPOS SW limit switch" is generated in the event of an overlap during referencing.

Machine zero

- You must enter a reference offset during startup of "Extended positioning via bus" if you do not want the machine zero (= reference point for bus positioning) to be located on the reference point.
- The following formula applies: Machine zero = Reference position + Reference offset

In this way, you can alter the machine zero without having to move the reference cam.
3.5 Process data assignment

The machine control (PLC) sends 6 process output data words (PA1 – PA6) to the inverter and receives 6 process input data words (PE1 – PE6) from the inverter.

\[\text{PA} = \text{Process output data} \quad \text{PE} = \text{Process input data}\]

\[\text{PA1} = \text{Control word 2} \quad \text{PE1} = \text{Status word (IPOS PI data)}\]
\[\text{PA2} = \text{Target position high} \quad \text{PE2} = \text{Actual position high (IPOS PI data)}\]
\[\text{PA3} = \text{Target position low} \quad \text{PE3} = \text{Actual position low (IPOS PI data)}\]
\[\text{PA4} = \text{Set speed (IPOS PO data)} \quad \text{PE4} = \text{Actual speed (IPOS PI data)}\]
\[\text{PA5} = \text{Accelerating ramp (IPOS PO data)} \quad \text{PE5} = \text{Active current (IPOS PI data)}\]
\[\text{PA6} = \text{Deceleration ramp (IPOS PO data)} \quad \text{PE6} = \text{Unit utilization (IPOS PI data)}\]

**Process output data**

The assignment of the process output data words is as follows:

- **PA1**: Control word 2

<table>
<thead>
<tr>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Res.</td>
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<td></td>
<td>Reserved Controller inhibit/ enable</td>
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<tr>
<td>Res.</td>
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<td>Reserved Enable/rapid stop</td>
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<td>Res.</td>
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<td></td>
<td>Reserved Enable/stop</td>
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<td>Mode select high</td>
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<td>/Hold control</td>
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<td>Mode select low</td>
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<td>Ramp switchover</td>
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<td>Jog -</td>
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<td>Parameter set switchover</td>
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<td>Jog +</td>
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<td>Error reset</td>
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<td>Start</td>
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</table>

- **PA2 + PA3**: Target position

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<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
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<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td>Target position [user-defined travel unit]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **PA4**: Set speed

<table>
<thead>
<tr>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set speed [rpm]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Process data assignment

- **PA5 + PA6: Acceleration ramp and deceleration ramp**

<table>
<thead>
<tr>
<th>Ramp</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA5</td>
<td>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>PA6</td>
<td>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

### Process input data

The assignment of the process input data words is as follows:

- **PE1: Status word**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Inverter status/error code</td>
</tr>
<tr>
<td>1</td>
<td>Inverter ready</td>
</tr>
<tr>
<td>2</td>
<td>IPOS reference (= drive referenced)</td>
</tr>
<tr>
<td>3</td>
<td>Target position reached</td>
</tr>
<tr>
<td>4</td>
<td>Brake released</td>
</tr>
<tr>
<td>5</td>
<td>Fault/warning</td>
</tr>
<tr>
<td>6</td>
<td>CW limit switch</td>
</tr>
<tr>
<td>7</td>
<td>CCW limit switch</td>
</tr>
<tr>
<td>8</td>
<td>Motor turning (n ≠ 0)</td>
</tr>
</tbody>
</table>

- **PE2 + PE3: Actual position**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PE2 Actual position high</td>
</tr>
<tr>
<td>1</td>
<td>PE3 Actual position low</td>
</tr>
</tbody>
</table>

- **PE4: Actual speed**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PE4 Actual speed</td>
</tr>
</tbody>
</table>

- **PE5: Active current**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PE5 Active current</td>
</tr>
</tbody>
</table>

- **PE6: Unit utilization**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PE6 Unit utilization</td>
</tr>
</tbody>
</table>
4 Installation

4.1 Software

**MOVITOOLS**

The "Extended positioning via bus" application module is part of the SEW MOVITOOLS software package (version 2.60 and higher). Proceed as follows to install MOVITOOLS on your computer:

- Insert the MOVITOOLS CD into the CD ROM drive of your PC.
- Select "Start/Run...".
- Type "[Drive letter of your CD drive]:setup" and press the Enter key.
- The MOVITOOLS setup menu appears. Follow the instructions of the installation wizard.

You can now use Program Manager to start MOVITOOLS. If a MOVIDRIVE® unit is connected to your PC, select the correct port (PC COM port) and set point-to-point connection. Select <Update> to display the inverter in the "Connected Units" window.

**Technology version (from version 2.70)**

The "Extended positioning via bus" application module can be used with MOVIDRIVE® MDV/MD60A units in the technology version (-0T). The application modules cannot be used with units in the standard version (-00).
4.2 MDV/MDS60A with "type DIP11A absolute encoder interface" option

Fig. 11: Wiring diagram for basic unit with DIP11A option

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4.3 MOVIDRIVE® MDV/MDS60A bus installation

Overview

For bus installation, please note the information in the relevant fieldbus manuals enclosed with the fieldbus interfaces.

Fig. 12: Bus types

04827AXX
The PROFIBUS documentation package contains detailed information. This package can be ordered from SEW. The documentation package contains the GSD files and type files for MOVIDRIVE® in order to help with project planning and to facilitate startup.

### Technical data

<table>
<thead>
<tr>
<th>Option</th>
<th>PROFIBUS fieldbus interface type DFP21A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>823 618 6</td>
</tr>
<tr>
<td>Resources for startup/diagnostics</td>
<td>MOVITOOLS software and DBG11A keypad</td>
</tr>
<tr>
<td>Protocol option</td>
<td>PROFIBUS-DP to EN 50170 V2 / DIN E 19245 P3</td>
</tr>
<tr>
<td>Supported baud rates</td>
<td>Automatic detection of baud rate from 9.6 kbaud – 12 Mbaud</td>
</tr>
<tr>
<td>Connection</td>
<td>9-pin sub D socket Assignment to EN 50170 V2 / DIN 19245 P3</td>
</tr>
<tr>
<td>Bus termination</td>
<td>Not integrated, must be implemented in the PROFIBUS connector.</td>
</tr>
<tr>
<td>Station address</td>
<td>0...125, can be set using DIP switch</td>
</tr>
<tr>
<td>GSD file</td>
<td>SEW_6003.GSD</td>
</tr>
<tr>
<td>DP identity number</td>
<td>6003 hex = 24579 dec</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2 kg (0.44 lb)</td>
</tr>
</tbody>
</table>

1. Green LED: RUN
2. Red LED: BUS FAULT
3. DIP switch for setting the station address.
4. 9-pin sub D socket: bus connection

### Pin assignment

![Pin assignment diagram](image-url)

**Fig. 13: Assignment of 9-pin sub D plug to EN 50170 V2**

1. 9-pin sub D plug
2. Twist the signal wires together!
3. Conductive connection is necessary between the plug housing and the shield!
The PROFIBUS documentation package contains detailed information. This package can be ordered from SEW. This documentation package contains the GSD files and type files for MOVIDRIVE® in order to help with project planning and to facilitate startup.

**Technical data**

<table>
<thead>
<tr>
<th>Option</th>
<th>PROFIBUS fieldbus interface type DFP11A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>822 724 1</td>
</tr>
<tr>
<td>Resources for startup/diagnosis</td>
<td>MOVITOOLS software and DBG11A keypad</td>
</tr>
<tr>
<td>Protocol options</td>
<td>• PROFIBUS-DP to EN 50170 V2 / DIN E 19245 P3&lt;br&gt;• PROFIBUS-FMS to EN 50170 V2 / DIN E 19245 P3&lt;br&gt;• Mixed mode PROFIBUS DP/FMS (combi-slave)</td>
</tr>
<tr>
<td>Supported baud rates</td>
<td>Automatic detection of baud rate:&lt;br&gt;• 9.6 kbaud&lt;br&gt;• 19.2 kbaud&lt;br&gt;• 93.75 kbaud&lt;br&gt;• 187.5 kbaud&lt;br&gt;• 500 kbaud&lt;br&gt;• 1500 kbaud</td>
</tr>
<tr>
<td>Connection</td>
<td>9-pin sub D socket Assignment to EN 50170 V2 / DIN 19245 P3</td>
</tr>
<tr>
<td>Bus termination</td>
<td>Can be activated for cable type A (up to 1500 kbaud) to EN 50170 V2 / DIN 19245 P3</td>
</tr>
<tr>
<td>Station address</td>
<td>0...125, can be set using DIP switch</td>
</tr>
<tr>
<td>GSD file</td>
<td>SEW_6000.GSD</td>
</tr>
<tr>
<td>DP identity number</td>
<td>6000 hex = 24576 dec</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2 kg (0.44 lb)</td>
</tr>
</tbody>
</table>

1. Green LED: RUN<br>2. Red LED: BUS FAULT<br>3. DIP switch for setting the station address and changing from FMS/DP mixed mode to straightforward DP mode.<br>4. DIP switch for switching the bus terminating resistor on and off<br>5. 9-pin sub D socket: bus connection

**Pin assignment**

(1) 9-pin sub D plug<br>(2) Twist the signal wires together!<br>(3) Conductive connection is necessary between the plug housing and the shield!
The INTERBUS-LWL documentation package contains detailed information. This package can be ordered from SEW.

**Technical data**

<table>
<thead>
<tr>
<th>Option</th>
<th>INTERBUS fieldbus interface type DFI21A (FO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>823 093 5</td>
</tr>
<tr>
<td>Resources for startup/diagnosis</td>
<td>MOVITOOLS software, DBG11A keypad and CMD tool</td>
</tr>
<tr>
<td>Supported baud rates</td>
<td>500 kbaud and 2 Mbaud, toggle via DIP switch</td>
</tr>
</tbody>
</table>
| Connection | Remote bus input: 2 F-SMA plugs  
Remote bus output: 2 F-SMA plugs  
Optically regulated FO interface |
| Weight | 0.2 kg (0.44 lb) |

**Connection assignment**

<table>
<thead>
<tr>
<th>Position</th>
<th>Signal</th>
<th>Direction</th>
<th>FO core color</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>FO remote IN</td>
<td>Receive data</td>
<td>Orange (OG)</td>
</tr>
<tr>
<td>4</td>
<td>Incoming remote bus</td>
<td>Send data</td>
<td>Black (BK)</td>
</tr>
<tr>
<td>5</td>
<td>FO remote OUT</td>
<td>Receive data</td>
<td>Black (BK)</td>
</tr>
<tr>
<td>6</td>
<td>Outgoing remote bus</td>
<td>Send data</td>
<td>Orange (OG)</td>
</tr>
</tbody>
</table>
4.4 MOVIDRIVE® compact MCV/MCS41A

Fig. 15: Wiring diagram for MOVIDRIVE® compact MCV/MCS41A

PROFIBUS-DP pin assignment

Refer to the instructions in the MOVIDRIVE® compact MC_41A operating instructions.

Fig. 16: Assignment of 9-pin sub D plug to EN 50170 V2

(1) X30: 9-pin sub D plug
(2) Twist the signal wires together!
(3) Conductive connection is necessary between the plug housing and the shield!
4.5 Connecting the limit switches

The cams of the limit switches must cover the travel range up to the stop.

Use limit switches with NC contacts (low-active) only!

Fig. 17: Connecting the limit switches

- CW = Clockwise drive inverter
- X = Travel
- LS CW = Limit switch clockwise
- LS CCW = Limit switch counterclockwise

Make sure the limit switch assignment is correct. This means clockwise movement (CW) should be towards the clockwise limit switch (LS CW) and counterclockwise movement (CCW) should be towards the counterclockwise limit switch (LS CCW).
General information

5 Startup

5.1 General information

Correct project planning and installation are the pre-requisites for successful startup. Refer to the MOVIDRIVE® MD_60A and MOVIDRIVE® compact system manuals for detailed project planning instructions. These system manuals form part of the MOVIDRIVE® MD_60A and MOVIDRIVE® compact documentation packages which you can order from SEW.

Check the installation, including the encoder connection, by following the installation instructions in the MOVIDRIVE® operating instructions and in this manual (→ Sec. Installation).

If you are using an absolute encoder, please also follow the installation and startup instructions for the absolute encoder in the "Positioning with Absolute Encoder and Absolute Encoder Interface DIP11A" manual available from SEW.

5.2 Preliminary work

Perform the following steps before startup:

• Connect the inverter to the PC using the serial port (RS-232, USS21A on PC-COM).
• Install the SEW MOVITOOLS software (version 2.60 or higher).
• Start-up the inverter with "MOVITOOLS/Shell."

![Fig. 18: Inverter start-up](04941AEN)

Set the following operating modes:

<table>
<thead>
<tr>
<th>Inverters</th>
<th>DR/DT/DV/D</th>
<th>Motor type</th>
<th>CT/CV</th>
<th>DS/DY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOVIDRIVE® MDV60A or MOVIDRIVE® compact MCV41A</td>
<td>VFC-n-CTRL&amp; IPOS</td>
<td>CFC &amp; IPOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOVIDRIVE® MDS60A or MOVIDRIVE® compact MCS41A</td>
<td>-</td>
<td>-</td>
<td></td>
<td>SERVO&amp;IPOS</td>
</tr>
</tbody>
</table>
• Operating with incremental encoder on basic unit: X14 as external encoder:
  – In MOVITOOLS/SHELL, set P942...P944 encoder factor numerator, encoder
    factor denominator and encoder scaling ext. encoder. Refer to the "IPOSplus®
    Positioning and Sequence Control System" manual for a detailed description of
    parameters P942...P944.

• Operating with an absolute encoder on DIP: X62 as external encoder:
  – Select "Startup / Startup for / DIP absolute encoder."

```
Fig. 19: Absolute encoder startup
```

  – Perform the startup procedure for the DIP absolute encoder.

• "0" signal at terminal X13:1 (DIØØ, /Controller inhibit).
5.3 Starting the "Extended positioning via bus" program

**General information**

- Start "MOVITOOLS/Shell."
- Select "Startup/Extended positioning via bus."

**Initial startup**

The startup window appears immediately when "Extended positioning via bus" is started for the first time.
Starting the "Extended positioning via bus" program

**Fieldbus parameters**

- Set the correct fieldbus type.
- Set the required bus parameters.
- Press "Forward >>" to open the next startup window.

![Fig. 21: Setting the fieldbus parameters](image)

04830AEN
Starting the "Extended positioning via bus" program

Scaling

**Fig. 22: Setting the scaling**

- Set the "Source actual position." The following settings are possible:
  - "MOTOR ENC. (X15)" for operation without an external encoder.
  - "EXTERN.ENC (X14)" with an incremental encoder as the external encoder.
  - "ABSOL.ENC. (DIP)" with the DIP11A option and an absolute encoder as the external encoder.

- **Only if "Source actual position = MOTOR ENC. (X15)"**: Perform "Calculation of the scaling." Enter the following values to do this:
  - Enter the value for "Diameter of driving wheel" or "Spindle slope" in the unit millimeter [mm] or 1/10 millimeter [1/10 mm].
  - Enter the ratio (i) values for the gear unit and additional gear.
  - Select the "Unit for speed."
  - Press <Calculation> to calculate the scaling factor. The "Increments/distance" values are entered in [inc/mm].

You can also calculate the "Scaling factor for distance" yourself and enter the value directly. In this case, you can enter a unit other than millimeters for the distance.
Starting the "Extended positioning via bus" program

- "Calculation of the scaling" is blocked when operating with an external encoder.
- "Scaling factor for distance"
  The "Scaling factor for distance" is calculated and entered automatically if you have the scaling calculated by the program. The numerator factor is limited to max. 8192 inc in this case. You have to calculate and enter the scaling factor yourself if you do not have it calculated by the program, for example if you are using an external encoder.

Note that the numerator factor is not to exceed 8192 increments in this case.

Example for calculating the "Scaling factor for distance:"
Positioning to an absolute encoder type WCS2 (Stahl).
Physical encoder resolution = 1.25 increments/mm
Encoder scaling P955 = 8
Encoder resolution with encoder scaling = 10 increments/millimeter [inc/mm]
Set "Increments/Distance = 10/1 [inc/mm]."

- "Scaling factor for speed"
  The "Scaling factor for speed" is entered automatically if you have the scaling calculated by the program. The unit for the denominator is the same as set previously in "Unit for speed." You have to calculate and enter the scaling factor yourself if you do not have it calculated by the program, for example if you are using an external encoder.

Example for calculating the "Scaling factor for speed:"
Positioning to an absolute encoder type WCS2 (Stahl).
Numerator = \( i_{\text{gear unit}} \times i_{\text{additional gear}} \times \text{Conversion factor for speed} \)
Numerator = \( 2 \times 1 \times 60 \text{ s/min} = 120 \text{ s/min} \)
Denominator = Circumference = \( \pi \times d = 3.14159 \times 50 \text{ mm} = 157.08 \text{ mm} \)

Set the following values:
Numerator = 12000
Denominator = 15708

Note that the numerator and the denominator value are not to exceed 32,767.
Starting the "Extended positioning via bus" program

Setting limits

- Enter the position of the software limit switches. Entering "0" for both limit switches deactivates the software limit switches. Make sure the positions of the software limit switches puts them within the travel limits of the hardware limit switches. The position of the software limit switches is displayed on the speed line in the bottom part of the screen.

- Enter the reference offset. The reference offset corrects the machine zero. The following formula applies: Machine zero = Reference position + Reference offset.
Starting the "Extended positioning via bus" program

- Select the correct type of reference travel (0...7):
  - **Type 0**: No reference travel. The reference position is the zero pulse CCW of the current position. Machine zero = Zero pulse CCW of the current position + Reference offset
  - **Type 1**: The reference position is the CCW end of the reference cam. Machine zero = Reference position + Reference offset
  - **Type 2**: The reference position is the CW end of the reference cam. Machine zero = Reference position + Reference offset
  - **Type 3**: The reference position is the CW limit switch. No reference cam is required for this. Machine zero = Reference position + Reference offset
  - **Type 4**: The reference position is the CCW limit switch. No reference cam is required for this step. Machine zero = Reference position + Reference offset
  - **Type 5**: No reference travel. The reference position is the current position without reference to a zero pulse. Machine zero = Current position + Reference offset
  - **Type 6**: The reference position is the CCW end of the reference cam. Machine zero = Reference position + Reference offset
  - **Type 7**: The reference position is the CW end of the reference cam. Machine zero = Reference position + Reference offset

- In the "Maximum values" box, enter the maximum approved speeds for automatic mode, jog mode and the speed controller. Note that the maximum approved speed for the speed controller must be at least 10 % greater than for automatic mode and jog mode.

**Saving changes**

The program prompts you to save the entries you have made.
Starting the "Extended positioning via bus" program

**Download**
Press "Download." All necessary settings are automatically made in the inverter and the "Extended positioning via bus" IPOS program is started.

![Download window](image)

**Switching to the monitor**
After the download, the program asks you if you want to switch to the monitor.

![Monitor Yes/No](image)

Select "Yes" to switch to the monitor and start in the desired operating mode. Select "No" to switch to MOVITOOLS/Shell.
Repeat startup

The "Extended positioning via bus" monitor appears immediately if "Extended positioning via bus" is restarted after initial startup has already been performed. You can select whether the process data should be decoded or displayed in hexadecimal notation.

Decoded view

![Monitor for "Extended positioning via bus," decoded view](image)

Fig. 27: Monitor for "Extended positioning via bus," decoded view
Hexadecimal view

Press "Startup" if you want to repeat the startup. The startup window then appears (→ Initial startup).
Starting the "Extended positioning via bus" program

**Monitor**

The "Extended positioning via bus" monitor displays the process data that are transmitted via the fieldbus. The states of the individual bits of "PO1: Control word 2" and "PI1: Status word" are also displayed.

**Control in the monitor**

You can also simulate a control when the monitor is operating. Proceed as follows to activate the control:

- "0" signal at terminal DIØØ '/CONTROLLER INHIBIT/.'
- Switch to the "Decoded view" display.
- To do this, activate "Control" for "PO1: Control word 2."
- You can now activate and deactivate the individual bits of the control word (PO1) and specify values for the process output data words.
- Press "Send PA" to send these control words to the inverter.

The inverter now performs the travel command in accordance with these specifications.

- You can only change from "Control" to "Monitor" when DIØØ '/CONTROLLER INHIBIT' = "0."
- "Monitor" must be active in order for you to exit the "Extended positioning via bus" program.
## 5.4 Parameters

The following parameters are automatically set during startup:

<table>
<thead>
<tr>
<th>Parameter number</th>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P100</td>
<td>Setpoint source</td>
<td>Fieldbus</td>
</tr>
<tr>
<td>P101</td>
<td>Control signal source</td>
<td>Fieldbus</td>
</tr>
<tr>
<td>P136</td>
<td>Stop ramp</td>
<td>0.5 s</td>
</tr>
<tr>
<td>P137</td>
<td>Emergency ramp</td>
<td>0.5 s</td>
</tr>
<tr>
<td>P600</td>
<td>Binary input DIØ1</td>
<td>Enable/Rapid stop</td>
</tr>
<tr>
<td>P601</td>
<td>Binary input DIØ2</td>
<td>Reset</td>
</tr>
<tr>
<td>P602</td>
<td>Binary input DIØ3</td>
<td>Reference cams</td>
</tr>
<tr>
<td>P603</td>
<td>Binary input DIØ4</td>
<td>/LIM. SWITCH CW</td>
</tr>
<tr>
<td>P604</td>
<td>Binary input DIØ5</td>
<td>/LIM. SWITCH CCW</td>
</tr>
<tr>
<td>P605</td>
<td>Binary input DIØ6</td>
<td></td>
</tr>
<tr>
<td>P819</td>
<td>Fieldbus timeout delay</td>
<td>0 – 650 s</td>
</tr>
<tr>
<td>P815</td>
<td>SBus timeout delay</td>
<td></td>
</tr>
<tr>
<td>P831</td>
<td>Response Fieldbus Timeout</td>
<td>No response, Display error, Immediate stop/Fault, Emergency stop/Fault, Rapid stop/Fault, Immediate stop/Warning, Emergency stop/Warning, Rapid stop/Warning</td>
</tr>
<tr>
<td>P870</td>
<td>Setpoint description PO1</td>
<td>Control word 2</td>
</tr>
<tr>
<td>P871</td>
<td>Setpoint description PO2</td>
<td>Position HI</td>
</tr>
<tr>
<td>P872</td>
<td>Setpoint description PO3</td>
<td>Position LO</td>
</tr>
<tr>
<td>P873</td>
<td>Actual value description P11</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P874</td>
<td>Actual value description P12</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P875</td>
<td>Actual value description P13</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P876</td>
<td>Actual value description P14</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P877</td>
<td>Actual value description P15</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P878</td>
<td>Actual value description P16</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P879</td>
<td>Actual value description P17</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P880</td>
<td>Actual value description P18</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P881</td>
<td>Actual value description P19</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P882</td>
<td>Actual value description P20</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P883</td>
<td>Actual value description P21</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P884</td>
<td>Actual value description P22</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P885</td>
<td>Actual value description P23</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P886</td>
<td>Actual value description P24</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P887</td>
<td>Actual value description P25</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P888</td>
<td>Actual value description P26</td>
<td>IPOS PI-DATA</td>
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<tr>
<td>P889</td>
<td>Actual value description P27</td>
<td>IPOS PI-DATA</td>
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<td>P890</td>
<td>Actual value description P28</td>
<td>IPOS PI-DATA</td>
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<tr>
<td>P891</td>
<td>Actual value description P29</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P892</td>
<td>Actual value description P30</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P893</td>
<td>Actual value description P31</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P894</td>
<td>Actual value description P32</td>
<td>IPOS PI-DATA</td>
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<td>P895</td>
<td>Actual value description P33</td>
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<tr>
<td>P896</td>
<td>Actual value description P34</td>
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<tr>
<td>P897</td>
<td>Actual value description P35</td>
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<td>P898</td>
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<tr>
<td>P904</td>
<td>Actual value description P42</td>
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<tr>
<td>P905</td>
<td>Actual value description P43</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P906</td>
<td>Actual value description P44</td>
<td>IPOS PI-DATA</td>
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<tr>
<td>P907</td>
<td>Actual value description P45</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P908</td>
<td>Actual value description P46</td>
<td>IPOS PI-DATA</td>
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<tr>
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<td>Actual value description P47</td>
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<td>P911</td>
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<tr>
<td>P912</td>
<td>Actual value description P50</td>
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<td>P913</td>
<td>Actual value description P51</td>
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<td>P914</td>
<td>Actual value description P52</td>
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<tr>
<td>P915</td>
<td>Actual value description P53</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P916</td>
<td>Actual value description P54</td>
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</tr>
<tr>
<td>P917</td>
<td>Actual value description P55</td>
<td>IPOS PI-DATA</td>
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<td>P918</td>
<td>Actual value description P56</td>
<td>IPOS PI-DATA</td>
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<td>P919</td>
<td>Actual value description P57</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P920</td>
<td>Actual value description P58</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P921</td>
<td>Actual value description P59</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P922</td>
<td>Actual value description P60</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P923</td>
<td>Actual value description P61</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P924</td>
<td>Actual value description P62</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P925</td>
<td>Actual value description P63</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P926</td>
<td>Actual value description P64</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P927</td>
<td>Actual value description P65</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P928</td>
<td>Actual value description P66</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P929</td>
<td>Actual value description P67</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P930</td>
<td>Actual value description P68</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P931</td>
<td>Actual value description P69</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P932</td>
<td>Actual value description P70</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P933</td>
<td>Actual value description P71</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P934</td>
<td>Actual value description P72</td>
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</tr>
<tr>
<td>P935</td>
<td>Actual value description P73</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P936</td>
<td>Actual value description P74</td>
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</tr>
<tr>
<td>P937</td>
<td>Actual value description P75</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P938</td>
<td>Actual value description P76</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P939</td>
<td>Actual value description P77</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P940</td>
<td>Actual value description P78</td>
<td>IPOS PI-DATA</td>
</tr>
<tr>
<td>P941</td>
<td>Source of actual position</td>
<td>Motor encoder, external encoder, absolute encoder</td>
</tr>
</tbody>
</table>

STOP

These parameters must not be altered after startup!
5.5 Starting the drive

Following the download, switch to the "Extended positioning via bus" monitor by selecting "Yes." You can select the operating mode using bits 11 and 12 of "PO1: Control word 2."

Note the following points in order to start the drive. These points apply to all operating modes:

- Binary input X13:1 "DIØØ, "/Controller inhibit" must get a "1" signal.
- Set the control bit PO1:0 "Controller inhibit/enable" = "0" and the control bits PO1:1 "Enable/rapid stop" and PO1:2 "Enable/stop" = "1."

### Operating modes

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>PO1:12</th>
<th>PO1:11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jog mode</td>
<td>&quot;0&quot;</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>Referencing mode</td>
<td>&quot;1&quot;</td>
<td>&quot;0&quot;</td>
</tr>
<tr>
<td>Automatic mode</td>
<td>&quot;1&quot;</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>Invalid</td>
<td>&quot;0&quot;</td>
<td>&quot;0&quot;</td>
</tr>
</tbody>
</table>

- **Jog mode**: Set bits PO1:9 "Jog+" or PO1:10 "Jog-" to move the drive clockwise or counterclockwise. The speed and ramps are specified using process data words PO4...PO6.

- **Referencing mode**: Reference travel to the reference cam defines the reference position. The reference offset can be set during startup and you can use it to alter the machine zero without having to move the reference cam. The following formula applies:
  
  Machine zero = Reference position + Reference offset

- **Automatic mode**:  
  - The control sends the following specifications to the inverter using process output data: the target position (PO2 and PO3), the set speed (PO4), the acceleration ramp (PO5) and the deceleration ramp (PO6).
  - The control starts positioning with PO1:8 "Start" = "1." The "1" signal must be present for the entire duration of the positioning sequence. You stop the positioning process with PO1:8 = "0."
  - The inverter regularly signals the actual position (PI2 and PI3), the actual speed (PI4), the active current (PI5) and the unit utilization (PI6) to the control using process input data.
  - The inverter uses PI3:3 "Target position reached" = "1" to signal to the control that it has reached the selected target position.

The drive is not yet referenced or has to be referenced again: Select "Referencing mode" using control word 2 (PO1).

You cannot select the automatic mode until the reference travel has been performed successfully.

Exception: No reference travel is required when you use an absolute encoder (MOVIDRIVE® MDV/MDS60A with DIP11A option).
5.6 Jog mode

- PO1:12 = "0" and PO1:11 = "1"

In jog mode, you can set the control bits PO1:9 "Jog +" and PO1:10 "Jog -" to move the drive clockwise or counterclockwise.

You specify the set speed using process output data word PO4.

You specify the ramps using process output data words PO5 and PO6.

The current position of the drive is indicated by the green arrow on the speed line.
5.7 Referencing mode

- PO1:12 = "1" and PO1:11 = "0"

The reference position is defined by reference travel to the reference cam. The reference offset can be set during startup and you can use it to alter the machine zero without having to move the reference cam.

The following formula applies: Machine zero = Reference position + Reference offset

- You must have set the correct type of reference travel during startup. If this is not the case, restart the startup procedure and set the correct type of reference travel.

- Start reference travel with bit PO1:8 "Start" = "1". The "1" signal must be present for the entire duration of the reference travel. Note that no reference travel is performed in reference travel types 0 and 5 (→ page 32).

- If the drive reaches the reference position (DI03 "Reference cam" = "1"), the drive continues moving at reference speed 2 and stops with position control when it leaves the reference position (DI03 "1" → "0"). Bit PI1:2 "IPOS reference" is set to "1" in status word PI1. Now revoke the "1" signal at PO1:8.

- The drive is now referenced. You can now start automatic mode.
5.8 **Automatic mode**

- PO1:12 = "1" and PO1:11 = "1"

Start positioning travel with bit PO1:8 "Start" = "1". The drive now moves to the target position which you specify using process output data words PO2 and PO3. Positioning travel is interrupted with PO1:8 = "0."

The inverter regularly signals the actual position to the control using process input data words PI2 and PI3. In addition, the inverter signals the actual speed, the active current and the unit utilization to the control via PI4, PI5 and PI6.

Bit PI1:3 "Target position reached" = "1" is set in status word PI1 when the drive has reached the target position.

The drive immediately moves to this new position if control bit PO1:8 remains "1" and you specify a new target position using process output data words PO2 and PO3.

Parameter P916 "Ramp type" must be set to LINEAR if you want to change the target position and the set speed together during movement. With ramp types SQUARED or SINE, DIØØ */CONTROLLER INHIBIT* must be "0" if you want to change the target position and the set speed together.

Travel takes place immediately to the target position set with PO2 and PO3 if control bit PO1:8 = "1" and when you switch to automatic mode.

---

The current position of the drive is indicated by the green arrow on the speed line.
6 Operation and Service

6.1 Timing diagrams

The following prerequisites apply to the timing diagrams:

- Startup performed correctly
- DIØ0 "Controller inhibit" = "1" (no inhibit)
- DIØ1 "Enable/rapid stop" = "1"

**Jog mode**

![Timing diagram of jog mode]

**Fig. 33: Timing diagram of jog mode**

- PO1:0 = Controller inhibit/enable
- PO1:1 = Enable/rapid stop
- PO1:2 = Enable/stop
- PO1:11 = Mode selection
- PO1:12 = Mode selection
- PO1:9 = Jog+
- PO1:10 = Jog-
- PO4 = Process data word set speed
- DBØØ = /Brake

(1) = Start jog mode, Jog+
(2) = New set speed via PO4
(3) = Start jog mode, Jog-
**Referencing mode**

Fig. 34: Timing diagram of referencing mode

PO1:0=PA1:0= Controller inhibit/enable  (1) = Start referencing mode
PO1:1=PA1:1= Enable/rapid stop  (2) = Reference position reached
PO1:2=PA1:2= Enable/stop
PO1:11=PA1:11= Mode selection
PO1:12=PA1:12= Mode selection
DIØ3 = Reference cams
PI1:2=PE1:2= IPOS reference
DBØØ = /Brake
**Automatic mode**

**Fig. 35: Timing diagram of automatic mode**

PO1:0=PA1:0= Controller inhibit/enable  
(1) = Start jog mode

PO1:1=PA1:1= Enable/rapid stop  
(2) = Position 50000 reached

PO1:2=PA1:2= Enable/stop  
(3) = Position 100000 reached

PO1:11=PA1:11= Mode selection  
(4) = Position 75000 reached

PO1:12=PA1:12= Mode selection

PO4=PA4= Process data word set speed  
\( n_1 \) = Speed 1

PO1:8=PA1:8= Start  
\( n_2 \) = Speed 2

PO2=PA2= Target position high

PO3=PA3= Target position low

PI1:3=PE1:3= Target position reached

DBØØ = /Brake
When the drive moves onto a limit switch (DI04 or DI05 = "0"), bit PI1:5 "Fault" is set to "1" and the drive is stopped with an emergency stop.

Proceed as follows to move the drive clear again.

1. Set "Jog mode" as the operating mode (PO1:12 = "0" and PO1:11 = "1").
2. Set bit PO1:6 or binary input DI02 "Error reset" to "1," this sets bit PI1:5 "Fault" to "0."
3. Set bit PO1:6 or binary input DI02 back to "0" as soon as bit PI1:5 = "0."
4. This causes the drive to move clear automatically at a motor speed n = 100 rpm.
5. Once the drive has moved clear, DI04 or DI05 is set from "0" → "1". Now set PO1:6 = "0". Set the required operating mode, for instance automatic mode (PO1:12 = "1" and PO1:11 = "1").

---

**Fig. 36: Moving clear of limit switches**

- PA1:0 = Controller inhibit/enable
- PA1:1 = Enable/rapid stop
- PA1:2 = Enable/stop
- DI04 = CW limit switch
- PA1:11 = Mode selection
- PA1:12 = Mode selection
- PE1:5 = PI1:5 = Fault
- PA1:6 = PO1:6 = Reset

(1) Limit switch reached
(2) Moved clear of limit switch
(3) Automatic mode
(4) Jog mode
6.2 Fault information

The error memory (P080) saves the last five error messages (error t-0...t-4). The error message of longest standing is deleted whenever more than five error messages have occurred. The following information is saved in case a problem occurs:

- Error that 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.

There are three switch-off responses depending on the fault; the inverter is inhibited when in fault status:

- **Immediate switch-off:**
  The unit can no longer brake the drive; the output stage goes to high resistance in the event of an error and the brake is applied immediately (DB00 "/Brake" = "0").

- **Rapid stop:**
  The drive is braked with the stop ramp t13/t123. Once the stop speed is reached, the brake is applied (DB00 "/Brake" = "0"). The output stage goes to high-resistance after the brake reaction time has elapsed (P732 / P735).

- **Emergency stop:**
  The drive is braked with the emergency ramp t14/t24. Once the stop speed is reached, the brake is applied (DB00 "/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 power supply off and on again.
  Recommendation: Observe a minimum switch-off time of 10 s for the mains contactor K11.
- Reset by binary input DI02. Startup of the "Extended positioning via bus" causes this binary input to be assigned the "Reset" function.
- Press the reset button in the MOVITOOLS manager.
- In control word 2 bit PO1:6 "Reset" = "0" → "1" → "0".

Timeout active

If the inverter is controlled via a communications interface (fieldbus, RS-485 or SBus) and the power was switched off and back on again or an error reset was performed, then the enable remains ineffective until the inverter once again receives valid data via the interface which is monitored with a timeout.
6.3 Error messages

Display

The error or warning code is displayed in BCD format. The following display sequence is adhered to:

- Flashes, approx. 1 s
- Display off, approx. 0.2 s
- Tens, approx. 1 s
- Display off, approx. 0.2 s
- Ones, approx. 1 s
- Display off, approx. 0.2 s

The display switches over to the operating display following a reset or if the error or warning code resumes the value “0” once more.

List of errors

The following table shows a selection from the complete list of errors (→ MOVIDRIVE® MD_60A Operating Instructions). It only lists those errors which can occur specifically with the “Extended positioning via bus.”

A dot in the “P” column means that the response is programmable (P83_ Error response). The factory set error response is listed in the “Response” column.

<table>
<thead>
<tr>
<th>Fault code</th>
<th>Name</th>
<th>Response</th>
<th>P Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>No error</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>DC link overvoltage</td>
<td>Immediate switch-off</td>
<td>DC link voltage too high</td>
<td>- Extend deceleration ramps&lt;br&gt;- Check connecting harness for braking resistor&lt;br&gt;- Check technical data of braking resistor</td>
</tr>
<tr>
<td>Fault code</td>
<td>Name</td>
<td>Response</td>
<td>Possible cause</td>
<td>Action</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 08        | n-monitoring                  | Immediate switch-off | • Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase fault in the mains or motor  
• Encoder not connected correctly or incorrect direction of rotation  
• $n_{\text{max}}$ is exceeded during torque control | • Reduce load  
• Increase deceleration time setting (P501 or P503)  
• Check encoder connection, swap over A/A and B/B pairs if necessary  
• Check encoder voltage supply  
• Check current limitation  
• Extend ramps if appropriate  
• Check motor feeder and motor  
• Check mains phases |
| 14        | Encoder                       | Immediate switch-off | • Encoder cable or shield not connected correctly  
• Short circuit/open circuit in encoder cable  
• Encoder defective | Check encoder cable and shield for correct connection, short circuit and open circuit. |
| 27        | Limit switches missing        | Emergency stop   | • Open circuit/both limit switches missing  
• Limit switches are swapped over in relation to direction of rotation of motor | • Check wiring of limit switches  
• Swap over limit switch connections  
• Reprogram terminals |
| 28        | Fieldbus timeout              | Rapid stop       | No master-slave communication took place within the configured response monitoring period. | • Check master communication routine  
• Extend fieldbus timeout time (P819) or switch off monitoring |
| 29        | Limit switch reached          | Emergency stop   | Limit switch was reached in IPOS operating mode. | • Check travel range  
• Correct user program |
| 31        | TF sensor                     | No response      | • Motor too hot, TF sensor has tripped  
• TF sensor of motor not connected or not connected properly  
• MOVIDRIVE® connection and TF connection on motor interrupted  
• No link between X10:1 and X10:2. With MDS: X15:9 – X15:5 connection missing. | • Let motor cool down and reset error  
• Check connections/link between MOVIDRIVE® and TF  
• If no TF is connected; Jumper X10:1 to X10:2. With MDS: Jumper X15:9 to X15:5.  
• Set P834 to "No response" |
| 36        | No option                     | Immediate switch-off | • Option card not approved  
• Setpoint source, control source or operating mode not approved for this option card  
• Incorrect encoder type set for DIP11A | • Use correct option card  
• Set correct setpoint source (P100)  
• Set correct control signal source (P101)  
• Set correct operating mode (P700 or P701)  
• Set the correct encoder type |
| 39        | Reference travel              | Immediate switch-off | • Reference cam missing or does not switch  
• Limit switches not connected correctly  
• Reference travel type changed during reference travel | • Check reference cam  
• Check connection of limit switches  
• Check reference travel type setting and the parameters required for it |
| 42        | Lag error                     | Immediate switch-off | • Incremental encoder connected incorrectly  
• Acceleration ramps too short  
• P-component of positioning controller too small  
• Speed controller parameters set incorrectly  
• Value of lag error tolerance too small | • Check rotary encoder connection  
• Extend ramps  
• Set P-component to higher value  
• Set speed controller parameters again  
• Increase lag error tolerance  
• Check encoder, motor and mains phase wiring  
• Check mechanical components can move freely, possibly blocked up |
## Error messages

<table>
<thead>
<tr>
<th>Fault code</th>
<th>Name</th>
<th>Response</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
</table>
| 78         | IPOS SW limit switches      | No response    | Only in IPOS operating mode: Programmed target position is outside travel range delimited by software limit switches. | • Check user program  
• Check position of software limit switches |