Manual

MOVITRAC® B
Simple Positioning Application Module

Edition 04/2010

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1 General Information ................................................................. 4
  1.1 Structure of the safety notes ................................................. 4
  1.2 Right to claim under limited warranty ............................... 4
  1.3 Exclusion of liability .............................................................. 4
  1.4 Other applicable documentation ......................................... 5

2 System Description ........................................................................ 6
  2.1 Areas of application ............................................................... 6
  2.2 Speed characteristics of simple positioning with EI7C encoder 7
  2.3 Speed characteristics of simple positioning with HTL encoder 8

3 Project Planning ............................................................................. 9
  3.1 Requirements ........................................................................ 9
    3.1.1 PC and software ............................................................... 9
    3.1.2 Inverters, motors and encoders .................................... 9
  3.2 Description of functions ....................................................... 10
    3.2.1 Four operating modes .................................................. 10
    3.2.2 Limit switches, reference position and machine zero .... 10
  3.3 Process data assignment for control via fieldbus gateway (SBus) 11

4 Installation ..................................................................................... 13
  4.1 MOVITOOLS® MotionStudio engineering software ............. 13
  4.2 Wiring diagram MOVITRAC® B ........................................... 14
  4.3 Bus installation MOVITRAC® B .......................................... 15
  4.4 Terminal control via digital module FIO21B ....................... 16

5 Startup ........................................................................................... 17
  5.1 General requirements ............................................................ 17
  5.2 Starting the "Simple positioning" application module ........... 17
  5.3 Monitoring function setup ...................................................... 24
  5.4 Completing startup ............................................................... 25
  5.5 Parameters and IPOSplus® variables ................................. 26

6 Operation and Service ................................................................. 28
  6.1 Starting the drive ................................................................. 28
  6.2 Monitoring functions ............................................................ 29
  6.3 Diagnostics ........................................................................... 31
  6.4 Control mode ........................................................................ 33

7 Appendix ........................................................................................ 34
  7.1 Compatibility comparison positioning MOVIDRIVE® B/MOVITRAC® B 34

8 Index ............................................................................................... 35
1 General Information

1.1 Structure of the safety notes

The safety notes in this documentation are structured as follows:

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Signal word</th>
<th>Meaning</th>
<th>Consequences if disregarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>General danger</td>
<td><img src="image" alt="DANGER" /></td>
<td>Imminent danger</td>
<td>Severe or fatal injuries</td>
</tr>
<tr>
<td>Specific danger, e.g. electric shock</td>
<td><img src="image" alt="WARNING" /></td>
<td>Possible dangerous situation</td>
<td>Severe or fatal injuries</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="CAUTION" /></td>
<td>Possible dangerous situation</td>
<td>Minor injuries</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="NOTICE" /></td>
<td>Possible damage to property</td>
<td>Damage to the drive system or its environment</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="INFORMATION" /></td>
<td>Useful information or tip. Simplifies the handling of the drive system.</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Right to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the MOVITRAC® B documentation. Consequently, read the operating instructions and manuals before you start working with the unit!

Make sure that the operating instructions and manuals are available to persons responsible for the plant and its operation, as well as to person who work independently on the unit. You must also ensure that the documentation is legible.

1.3 Exclusion of liability

You must comply with the information in the MOVITRAC® B documentation to ensure safe operation of the MOVITRAC® B frequency inverters and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.
1.4 **Other applicable documentation**

- This manual does not replace the detailed operating instructions and the corresponding manuals.
- Installation and startup only by trained personnel observing the relevant accident prevention regulations and the following documents:
  - "MOVITRAC® B" operating instructions and associated manuals
2 System Description

2.1 Areas of application

The "Simple Positioning" application module replaces applications previously realized with rapid/creep switch-over and initiator evaluation. The variable definition of any setpoint position along with different speeds and acceleration ramps ensures more flexibility.

With an accuracy of 1/4 of a motor revolution, the "Simple Positioning" application module is suitable for the following industries and applications with non-dynamic positioning:

- **Materials handling technology**
  - Trolleys
  - Roller conveyers

- **Logistics**
  - Trolleys
  - Transverse carriages

- **Format adjustment**

The "Simple Positioning" module offers the following advantages:

- User-friendly user interface.
- You only have to enter the parameters required for simple positioning (reduction ratios, speeds, diameters).
- Guided parameter setting process instead of complicated programming.
- Monitor mode for optimum diagnostics.
- Users do not need any programming experience.
- It does not take long to get to know the system.

Consider the following properties for project planning:

- No direct position control
  To hold a position, the application of the brake is activated in the position window.
- No time-critical positioning tasks.
- Supported encoder types:
  - Built-in encoder EI7C (96 increments/revolution)
  - HTL encoder

Simple Positioning can be operated in two ways:

- Control via fieldbus gateway (SBus) using 3 process data words (functionally compatible with bus positioning of MOVIDRIVE® B)
- Control via terminals using digital module FIO21B
2.2 Speed characteristics of simple positioning with EI7C encoder

The following figure [2] shows the speed characteristics of a typical positioning process when using an EI7C encoder. For project planning take into account that the specified ramp time directly affects the stability of the positioning process.

The IPOS profile generator calculates the position setpoint, which is derived from the following setpoints:

- Position difference
- Setpoint speed
- Ramp specification

A correction value is created from the cyclical creation of the position difference (lag error = difference from position setpoint and actual position). The actual position is then adjusted to this correction value. In this way, the lag error distance is usually corrected to < 1 motor revolution.
2.3 Speed characteristics of simple positioning with HTL encoder

The following figure [2] shows the speed characteristics of a typical positioning process when using an HTL encoder. For project planning take into account that the specified ramp time directly affects the stability of the positioning process.

<table>
<thead>
<tr>
<th>INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important:</td>
</tr>
<tr>
<td>• Ramp times below 1.5 s can cause the drive to overshoot.</td>
</tr>
<tr>
<td>• With longer ramp times and higher positioning speeds, the actually traveled ramp can be increased by up to 80%.</td>
</tr>
</tbody>
</table>

[1] Speed characteristics for positioning via rapid/creep speed switchover with initiator evaluation


The movement is started with the specified travel parameters (setpoint position, setpoint speed, specified ramp). The position/time of changeover is calculated during ongoing movement. The setpoint speed is decreased cyclically once the changeover position is exceeded. This results in the shown asymptotic actual speed.
3 Project Planning

3.1 Requirements

3.1.1 PC and software

The "Simple Positioning" application module is implemented as an IPOSPlus® program and forms part of the SEW MOVITOOLS® MotionStudio software version 4.20 and higher. To use MOVITOOLS® MotionStudio, you need a PC with one of the following operating systems: Windows® 95, Windows® 98, Windows NT® 4.0, or Windows® 2000.

3.1.2 Inverters, motors and encoders

Inverter

The "Simple Positioning" application module can only be used with MOVITRAC® B units in technology version (/T).

Motors

Asynchronous DR motors with built-in EI7C encoder.

Encoder

The encoder must be mounted directly to the motor. External mounting, e.g. in applications with non-positive connection between motor shaft and load, is not supported.

Technical data of the encoder input

<table>
<thead>
<tr>
<th>Technical data of encoder input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder signals (2 tracks)</td>
<td>Tracks A and B</td>
</tr>
<tr>
<td>Phase position</td>
<td>90° ± 20°</td>
</tr>
<tr>
<td>Mark space ratio</td>
<td>1:1 ± 20 %</td>
</tr>
<tr>
<td>Max. pulse frequency</td>
<td>120 kHz</td>
</tr>
<tr>
<td>Connection of track A</td>
<td>MOVITRAC® B: Terminal X12:5 (DI04)</td>
</tr>
<tr>
<td>Connection of track B</td>
<td>MOVITRAC® B: Terminal X12:4 (DI03)</td>
</tr>
<tr>
<td>Reference potential</td>
<td>GND to PE potential</td>
</tr>
</tbody>
</table>
3.2 Description of functions

3.2.1 Four operating modes

- Jog mode
  - The direction is selected via the 2 signals "Jog +" and "Jog -".
  - With control via fieldbus, the speed can be specified variably, and the ramp can be switched via control bit.
  - With control via terminals, a terminal input switches between rapid and creep speed. The ramp is predefined during startup.

- Teach mode (only with terminal control)
  - In a referenced axis status, the actual position can be saved to the selected table position.

- Referencing mode
  - Reference travel establishes the reference point (machine zero) for absolute positioning operations.

- Positioning mode
  - With control via fieldbus, the speed and target position can be specified variably, and the ramp can be switched via a control bit.
  - Control via terminals allows for binary selection of 8 positions with corresponding ramp and speed.

3.2.2 Limit switches, reference position and machine zero

The hardware and software limit switches are evaluated in IPOSplus®. Note the following points during project planning:

- Software limit switches must be located within the travel distance of the hardware limit switches.

- You can enter a reference offset during startup if you do not want the machine zero to be located on the reference position. The following formula applies: Machine zero = reference position + reference offset. This way, you can alter the machine zero without having to move the reference position.
### 3.3 Process data assignment for control via fieldbus gateway (SBus)

The higher-level controller (PLC) sends three process output data words (PO1, PO2, PO3) to the inverter and receives three process input data words (PI1, PI2, PI3) from the inverter.

**Process output data**

The process output data words are assigned as follows:

- **PO1**: Control word 2

  
  \[
  \begin{array}{cccccccccccccccc}
  15 & 14 & 13 & 12 & 11 & 10 & 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\
  \hline
  /SWLS & Ramp switch-over & Reserved & Mode select \textsuperscript{1} & Mode select \textsuperscript{2} & Jog & Jog + & Start & /Controller inhibit & Enable/ Rapid stop & Enable/stop & Reserved & Reserved & Error reset & Reserved & Reserved
  \end{array}
  \]

- **PO2**: Setpoint speed

  PO2 setpoint speed (user unit)

  \[
  \begin{array}{cccccccccccccccc}
  15 & 14 & 13 & 12 & 11 & 10 & 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\
  \end{array}
  \]

- **PO3**: Setpoint position

  PO3 setpoint position (user unit)

  \[
  \begin{array}{cccccccccccccccc}
  15 & 14 & 13 & 12 & 11 & 10 & 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\
  \end{array}
  \]
Process input data

The process input data words are assigned as follows:

- PI1: Status word 1

  Bit 8 - bit 15:
  - Inverter status/fault code
  - Motor is turning
  - Inverter Ready
  - Drive referenced
  - Target position reached
  - Brake released
  - Fault/warning
  - Limit switch CW active
  - Limit switch CCW active

- PI2: Actual speed

  Actual speed (user unit)

  Bit 8 - bit 15:
  - 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

- PI3: Actual position

  Actual position (user unit)

  Bit 8 - bit 15:
  - 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 0
4 Installation

4.1 MOVITOOLS® MotionStudio engineering software

MOVITOOLS MotionStudio®

The "Simple Positioning" application module is available in MOVITOOLS® MotionStudio version 5.60 and higher. Proceed as follows to install MOVITOOLS® MotionStudio on your computer:

- Insert the MOVITOOLS® MotionStudio CD into the CD-ROM drive of your PC.
- Wait until the installation starts automatically. The "Start.htm" file is displayed in the browser.

INFORMATION

If the "Start.htm" file does NOT open automatically. Open the file manually from the root directory of the installation CD.

- Click on the link "MOVITOOLS® MotionStudio".
- Click on the link "Start installation".
- The MOVITOOLS® MotionStudio setup wizard is started. You will be guided through the installation process: Follow the instructions.

Technology version

The "Simple Positioning" application module can be used with MOVITRAC® B units in technology version (/T). The application module cannot be used with units in the standard version (-00).
4.2 Wiring diagram MOVITRAC® B

Irrespective of the bus type used, you must wire the basic MOVITRAC® B unit according to the following wiring diagram.

### Binary input

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>X12:1 (DI00)</td>
<td>No function / IPOS input (limit switch right)</td>
</tr>
<tr>
<td>X12:2 (DI01)</td>
<td>CW / Stop</td>
</tr>
<tr>
<td>X12:3 (DI02)</td>
<td>No function / IPOS input (limit switch left)</td>
</tr>
<tr>
<td>X12:4 (DI03)</td>
<td>IPOS input (connection of track B of encoder evaluation)</td>
</tr>
<tr>
<td>X12:5 (DI04)</td>
<td>IPOS input (connection of track A of encoder evaluation)</td>
</tr>
<tr>
<td>X12:6 (DI05)</td>
<td>No function / TF signal</td>
</tr>
</tbody>
</table>
4.3 Bus installation MOVITRAC® B

The fieldbus gateways convert standard fieldbuses to SBus. This means that up to 8 inverters can be addressed through one fieldbus gateway.

The gateway is available in 2 different variants:

- Integrated in the inverter: The fieldbus interface DF.B is installed in the inverter (see following figure).

- In separate housing: The fieldbus interface DF.B is installed in a UOH11B housing, or is available as gateway (e.g. UFI1B for INTERBUS) (see following figure).

Fieldbus gateways are available for connecting fieldbuses the following bus systems.

<table>
<thead>
<tr>
<th>Bus</th>
<th>Separate housing</th>
<th>Integrated in the inverter (not size 0XS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS</td>
<td>DFP21B / UOH11B</td>
<td>MC07B / FSC11B / DFP21B</td>
</tr>
<tr>
<td>DeviceNet</td>
<td>DFD11B / UOH11B</td>
<td>MC07B / FSC11B / DFD11B</td>
</tr>
<tr>
<td>EtherCAT</td>
<td>DFE24B / UOH11B</td>
<td>MC07B / FSC11B / DFE24B</td>
</tr>
<tr>
<td>PROFINET</td>
<td>DFE32B / UOH11B</td>
<td>MC07B / FSC11B / DFE32B</td>
</tr>
<tr>
<td>EtherNet/IP</td>
<td>DFE33B / UOH11B</td>
<td>MC07B / FSC11B / DFE33B</td>
</tr>
<tr>
<td>PROFINET / PROFIsafe</td>
<td>DFS11B / UOH11B</td>
<td>MC07B / FSC11B / DFS11B</td>
</tr>
<tr>
<td>PROFIBUS / PROFIsafe</td>
<td>DFS21B / UOH11B</td>
<td>MC07B / FSC11B / DFS21B</td>
</tr>
<tr>
<td>INTERBUS</td>
<td>UFI11A (823 898 7)</td>
<td>-</td>
</tr>
</tbody>
</table>
4.4 Terminal control via digital module FIO21B

Functions of the input terminals X42:1 - 7 at the FIO21B digital module:

<table>
<thead>
<tr>
<th>Binary input terminal X42</th>
<th>Jog mode</th>
<th>Teach mode</th>
<th>Referencing mode</th>
<th>Positioning mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI10/X42:1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DI11/X42:2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DI12/X42:3</td>
<td>/SWLS</td>
<td>Start</td>
<td>Start</td>
<td>Start</td>
</tr>
<tr>
<td>DI13/X42:4</td>
<td>Jog +</td>
<td>Position 2⁰</td>
<td>Reserved</td>
<td>Position 2⁰</td>
</tr>
<tr>
<td>DI14/X42:5</td>
<td>Jog</td>
<td>Position 2¹</td>
<td>Reserved</td>
<td>Position 2¹</td>
</tr>
<tr>
<td>DI15/X42:6</td>
<td>Rapid speed</td>
<td>Position 2²</td>
<td>Reserved</td>
<td>Position 2²</td>
</tr>
<tr>
<td>DI16/X42:7</td>
<td>Error reset</td>
<td>Error reset</td>
<td>Error reset</td>
<td>Error reset</td>
</tr>
</tbody>
</table>

Function of the output terminals (basic unit):

<table>
<thead>
<tr>
<th>Binary output terminal X13</th>
<th>Jog mode</th>
<th>Teach mode</th>
<th>Referencing mode</th>
<th>Positioning mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO01/X13:1</td>
<td>/Fault</td>
<td>/Fault</td>
<td>/Fault</td>
<td>/Fault</td>
</tr>
<tr>
<td>DO02/X13:2</td>
<td>Brake released</td>
<td>Brake released</td>
<td>Brake released</td>
<td>Brake released</td>
</tr>
<tr>
<td>DO03/X13:3</td>
<td>No function</td>
<td>Position saved</td>
<td>Drive referenced</td>
<td>Drive in position</td>
</tr>
</tbody>
</table>
5 Startup

5.1 General requirements

Correct project planning and installation are mandatory for successful startup. Refer to the MOVITRAC® B system manual for detailed project planning instructions.

Check the installation, the encoder connection and the installation of the fieldbus interfaces by following the installation instructions in the MOVITRAC® B operating instructions, in the fieldbus manuals and in this manual.

5.2 Starting the “Simple positioning” application module

General information

- Start MOVITOOLS® MotionStudio.
- Check the unit firmware (at least 1822.563.2.10). To do so, choose [Startup] / [Parameter tree] from the context menu of the unit. Select parameter P076 Firmware of basic unit.
- Start up the motor. Test in manual operation whether the motor has been started up correctly.
- Inhibit the unit (X12:2 DI01 CW/stop to "0")
- Start the "Simple Positioning" application module. To do so, choose [Application module] / [Simple positioning] from the context menu of the unit (see following figure).
Starting the "Simple positioning" application module

Initial screen

The initial screen of the "Simple Positioning" application module opens (see following figure).

- To commence startup, click the [Startup] button.
  Select one of the following options:
  - "Create new" to perform initial startup
  - "Read from file" to load an existing parameter set
  - "Upload from device" to perform re-startup
  The following chapters describe the next steps.

- To monitor or control the started up application, click the [Monitor] button. For more information, refer to the "Operation and Service" chapter.
  The [Monitor] button is disabled if
  - you are not online
  - the application module has not been detected
**Select setpoint source**

In this window, you specify the setpoint/control signal sources (see following figure).

In the "setpoint/control signal source" dropdown menu, you set whether the application is controlled via fieldbus gateway (setting: fieldbus gateway SBus) or via terminals (setting: terminal with FI021B).
Calculating the scaling factors

In this window, you can set the scaling factors for distance and speed.

Make the following settings in this window:

- **Calculation of the scaling**
  - Enter values in the "Diameter of driving wheel" field or the "Spindle pitch" field according to your application.
  - In the input fields "Gearing ratio" and "External ratio", enter the total gear ratio of the drive with up to 2 decimal places.
  - Select the unit of speed.
  - "Encoder type" dropdown list
    Encoder type "EI7C" is set by default. The control mode "IPOS profile generator" is activated. Doing so will correct the lag distance during the movement. If you use another encoder type, select "HTL". You can use the "HTL" setting also for applications with EI7C encoders (recommendation for systems prone to slip). The control mode "Speed control of the deceleration ramp" is activated. Consider the internal quadrupling of the physical resolution when choosing the "HTL" setting. This means that for an encoder with a physical resolution of 24 increments/revolution, for example, you must enter the value "96".
  - Click the [Calculation] button. The "Distance" scaling factor is determined and displayed in the "Pulses/distance" display field. The "Speed" scaling factor is determined and displayed in the "Numerator/denominator" display field.
  The scaling factors are limited to $2^{13}$. 

In this window, you can enter the position of the software limit switches, the reference offset, the reference travel type, and the speed limits.

**"Limit switches" section**

In the input fields "Software limit switch left/right", enter the position of the software limit switches. Make sure the positions of the software limit switches are **within** the travel distance of the hardware limit switches and that they do not overlap the reference position. If you enter the value "0" in both input fields, the software limit switches are deactivated.

The processing of hardware and software limit switches is implemented in IPOSplus®.

**"Reference travel" section**

Enter the reference offset in user units in the "Reference offset" input field. The reference offset is used to correct the machine zero. The following formula applies:

\[
\text{Machine zero} = \text{reference position} + \text{reference offset}
\]
• Select the correct reference travel type (3, 4, 5, 8) from the "Reference travel type" selection box. The reference travel type specifies the reference travel strategy that is used to establish the machine zero of a machine.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>The reference position is the CW hardware limit switch. No reference cam is required. Machine zero = reference position + reference offset</td>
</tr>
<tr>
<td>4</td>
<td>The reference position is the CCW hardware limit switch. No reference cam is required. Machine zero = reference position + reference offset</td>
</tr>
<tr>
<td>5</td>
<td>No reference travel. The reference position is the current position. Machine zero = current position + reference offset</td>
</tr>
<tr>
<td>8</td>
<td>No reference travel. The reference position is the current position. In contrast to type 5, type 8 reference travel can also be performed when the system is in status &quot;No enable/controller inhibit&quot;. Machine zero = current position + reference offset</td>
</tr>
</tbody>
</table>

• Input fields for reference travel speed 1 and 2
  When selecting reference travel type 3 or 4, the hardware limit switch is "searched" with reference travel speed 1. Next, the drive moves away from the hardware limit switch with reference travel speed 2.

• "Speed limitation" section
  - "Maximum speed in positioning mode" edit box
    You can limit the specified positioning speed by entering a value here.
  - "Maximum speed in jog mode" edit box
    You can limit the specified jog speed by entering a value here.
  - "Maximum motor speed" edit box
    Enter a value at least 10% higher than the maximum positioning or jog speed.

• "Ramps" section (only for fieldbus control)
  - "Ramp 1", "Ramp 2" edit box
    You can switch between the ramp times via PO1:Bit 14 when using fieldbus gateway control.
Setting parameters for terminal control

For terminal control (setting "Terminal with FIO21B" in the "Setpoint/control signal source" selection field, see section "Setpoint selection"), you have to set the following parameters for jog and positioning mode (see following figure).

- **"Jog mode" section**
  Enter the values for rapid and slow speed and the ramp time.

- **"Positioning mode" section**
  Here, you can enter up to 8 setpoint positions with corresponding ramp and speed values.
5.3 Monitoring function setup

Startup window for setting the monitoring functions (see following figure).

- **"Monitoring 1" section**
  - "Positioning window" edit box
    Positioning is completed (i.e. brake is applied) when the actual position is in this range (target position ± position window).
  - "Lag error window" edit box
    Selecting the EI7C encoder type lets you activate additional lag error monitoring. The function is used to monitor deviations between actual position and calculated position setpoint. If the lag distance exceeds the specified lag error window, error message F116, suberror code 42 (lag error) will be issued.

- **"Monitoring 2" section**
  - "Motor temperature detection" edit box
    Activate or deactivate temperature sensor evaluation (TF signal) via binary input DI05.
  - "Encoder monitoring" edit box
    Activate or deactivate encoder monitoring. When encoder monitoring is activated, the encoder signals are monitored with respect to plausibility (direction of rotation) and wire breakage.
  - "Encoder monitoring timeout" edit box
    After the timeout interval set here has elapsed, the error message F116, suberror code 14 (encoder) is issued during startup when encoder monitoring is active and an error occurs.
5.4 Completing startup

Once you have entered all the parameters, save the configuration by clicking the [Save configuration] button [1]. To generate a PDF file with the current configuration, click on [Create documentation] [2].

Click the [Download] button [3] to download the data into the inverter (see following figure).

The following functions are performed when completing startup (download):

- Downloading the SHELL parameters
- Downloading the IPOSPlus® variables
- Downloading the IPOSPlus® program, if the option "Download with application" has been selected. This option is selected automatically during initial startup.

INFORMATION
See section "Monitoring functions" for additional information.
5.5 Parameters and IPOSplus® variables

The following parameters and IPOSplus® variables are set automatically during startup and are loaded into the inverter during the download.

<table>
<thead>
<tr>
<th>Parameter P...</th>
<th>Index</th>
<th>Description</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>8461</td>
<td>Setpoint source</td>
<td>IPOS</td>
</tr>
<tr>
<td>101</td>
<td>8462</td>
<td>Control signal source</td>
<td>SBus1 or terminals</td>
</tr>
<tr>
<td>130</td>
<td>8807</td>
<td>Ramp t11 up</td>
<td>Reserved</td>
</tr>
<tr>
<td>131</td>
<td>8808</td>
<td>Ramp t11 down</td>
<td>Reserved</td>
</tr>
<tr>
<td>134</td>
<td>8474</td>
<td>Ramp t12 up = down</td>
<td>100 ms (reserved)</td>
</tr>
<tr>
<td>136</td>
<td>8476</td>
<td>Stop ramp t13</td>
<td>Reserved</td>
</tr>
<tr>
<td>300</td>
<td>8515</td>
<td>Start/stop speed</td>
<td>Motor startup parameter</td>
</tr>
<tr>
<td>301</td>
<td>8516</td>
<td>Minimum speed</td>
<td>Motor startup parameter</td>
</tr>
<tr>
<td>302</td>
<td>8517</td>
<td>Maximum speed</td>
<td>Motor startup parameter</td>
</tr>
<tr>
<td>608</td>
<td>8844</td>
<td>Binary input DI00</td>
<td>IPOS input / No function</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
<td>Binary input DI01</td>
<td>CW/Stop (fixed assignment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 0: No unit enable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 1: Unit enabled</td>
</tr>
<tr>
<td>601</td>
<td>8336</td>
<td>Binary input DI02</td>
<td>IPOS input / No function</td>
</tr>
<tr>
<td>602</td>
<td>8337</td>
<td>Binary input DI03</td>
<td>IPOS input (position)</td>
</tr>
<tr>
<td>603</td>
<td>8338</td>
<td>Binary input DI04</td>
<td>IPOS input (position)</td>
</tr>
<tr>
<td>604</td>
<td>8339</td>
<td>Binary input DI05</td>
<td>TF signal / No function</td>
</tr>
<tr>
<td>620</td>
<td>8350</td>
<td>Binary output DO01</td>
<td>IPOS output</td>
</tr>
<tr>
<td>621</td>
<td>8351</td>
<td>Binary output DO02</td>
<td>Brake released</td>
</tr>
<tr>
<td>622</td>
<td>8916</td>
<td>Binary output DO03</td>
<td>IPOS output</td>
</tr>
<tr>
<td>809</td>
<td>10204</td>
<td>IPOS enable</td>
<td>ON</td>
</tr>
<tr>
<td>870</td>
<td>8304</td>
<td>Setpoint description PO1</td>
<td>Control word 2</td>
</tr>
<tr>
<td>871</td>
<td>8305</td>
<td>Setpoint description PO2</td>
<td>IPOS PO data</td>
</tr>
<tr>
<td>872</td>
<td>8306</td>
<td>Setpoint description PO3</td>
<td>IPOS PO data</td>
</tr>
<tr>
<td>873</td>
<td>8307</td>
<td>Actual value description P1</td>
<td>IPOS PI data</td>
</tr>
<tr>
<td>874</td>
<td>8308</td>
<td>Actual value description P2</td>
<td>IPOS PI data</td>
</tr>
<tr>
<td>875</td>
<td>8309</td>
<td>Actual value description P3</td>
<td>IPOS PI data</td>
</tr>
<tr>
<td>876</td>
<td>8622</td>
<td>Process data enable</td>
<td>1: Yes</td>
</tr>
<tr>
<td>938</td>
<td>8888</td>
<td>Task 1 speed</td>
<td>5</td>
</tr>
<tr>
<td>939</td>
<td>8962</td>
<td>Task 2 speed</td>
<td>4</td>
</tr>
</tbody>
</table>
### Parameters and IPOSplus® variables

#### Startup

<table>
<thead>
<tr>
<th>IPOSplus® variable H..</th>
<th>Index</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scaling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H018</td>
<td>11018</td>
<td>Encoder resolution</td>
<td>Increments/revolution</td>
</tr>
<tr>
<td>H020</td>
<td>11020</td>
<td>Scaling distance numerator</td>
<td></td>
</tr>
<tr>
<td>H021</td>
<td>11021</td>
<td>Scaling distance denominator</td>
<td></td>
</tr>
<tr>
<td>H022</td>
<td>11022</td>
<td>Scaling speed numerator</td>
<td></td>
</tr>
<tr>
<td>H023</td>
<td>11023</td>
<td>Scaling speed denominator</td>
<td></td>
</tr>
<tr>
<td><strong>Limits and reference travel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H030</td>
<td>11030</td>
<td>Software limit switch left</td>
<td>User-defined unit</td>
</tr>
<tr>
<td>H031</td>
<td>11031</td>
<td>Software limit switch right</td>
<td>User-defined unit</td>
</tr>
<tr>
<td>H032</td>
<td>11032</td>
<td>Hardware limit switch</td>
<td>1 = active / 0 = inactive</td>
</tr>
<tr>
<td>H033</td>
<td>11033</td>
<td>Reference offset</td>
<td>User-defined unit</td>
</tr>
<tr>
<td>H034</td>
<td>11034</td>
<td>Reference type</td>
<td></td>
</tr>
<tr>
<td>H035</td>
<td>11035</td>
<td>Reference speed 1</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H036</td>
<td>11036</td>
<td>Reference speed 2</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H040</td>
<td>11037</td>
<td>Maximum speed in positioning mode</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H041</td>
<td>11038</td>
<td>Maximum speed in jog mode</td>
<td>0.1/min</td>
</tr>
<tr>
<td><strong>Ramps (with fieldbus gateway control)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H042</td>
<td>11042</td>
<td>Ramp 1</td>
<td>ms</td>
</tr>
<tr>
<td>H043</td>
<td>11043</td>
<td>Ramp 2</td>
<td>ms</td>
</tr>
<tr>
<td><strong>Speeds and ramps (with terminal control): Jog mode</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H061</td>
<td>11061</td>
<td>Slow speed</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H062</td>
<td>11062</td>
<td>Rapid speed</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H063</td>
<td>11063</td>
<td>Ramp</td>
<td>ms</td>
</tr>
<tr>
<td><strong>Speeds and ramps (with terminal control): Positioning mode</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H065</td>
<td>11065</td>
<td>Table 0: Position</td>
<td>User-defined unit</td>
</tr>
<tr>
<td>H066</td>
<td>11066</td>
<td>Table 0: Speed</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H067</td>
<td>11067</td>
<td>Table 0: Ramp</td>
<td>ms</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>H086</td>
<td>11086</td>
<td>Table 7: Position</td>
<td>User-defined unit</td>
</tr>
<tr>
<td>H087</td>
<td>11087</td>
<td>Table 7: Speed</td>
<td>0.1/min</td>
</tr>
<tr>
<td>H088</td>
<td>11088</td>
<td>Table 7: Ramp</td>
<td>ms</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H050</td>
<td>11050</td>
<td>Position window</td>
<td>Increments</td>
</tr>
<tr>
<td>H053</td>
<td>11053</td>
<td>Function available with &quot;encoder type EI7C&quot; setting</td>
<td></td>
</tr>
<tr>
<td>H056</td>
<td>11056</td>
<td>Encoder monitoring</td>
<td>1 = on / 0 = off</td>
</tr>
<tr>
<td>H057</td>
<td>11957</td>
<td>Encoder monitoring timeout</td>
<td>ms</td>
</tr>
</tbody>
</table>

#### INFORMATION

Do not alter these parameters and IPOSplus® variables after startup!
6 Operation and Service

6.1 Starting the drive

After the download, click on "Continue" to go to the "Simple Positioning" monitor.

Operating modes

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

Control via fieldbus:

Control via terminals:

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Jog mode</th>
<th>Teach mode</th>
<th>Referencing mode</th>
<th>Positioning mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI10</td>
<td>&quot;0&quot;</td>
<td>&quot;1&quot;</td>
<td>&quot;0&quot;</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>DI11</td>
<td>&quot;0&quot;</td>
<td>&quot;0&quot;</td>
<td>&quot;1&quot;</td>
<td>&quot;1&quot;</td>
</tr>
</tbody>
</table>

- **Jog mode**
  
The drive can be moved via the Jog + and Jog - signals.
  
  - Fieldbus control:
    
    Specify the setpoint speed with process output data word PO2. With a value = 0, the drive runs at minimum speed.
    
    If PO2:Bit 14 (ramp switch-over) is set to "1", ramp 2 is active instead of ramp 1.
  
  - Terminal control (see section "Setting parameters for terminal control"):
    
    The drive is moved with "Creep speed" and the ramp set during startup in jog mode. If the binary input DI15 is set to "1", "Rapid speed" is selected.

- **Teach mode (only with terminal control)**

  In a referenced state, the current position can be saved to the previously selected table position through an edge change (min. 200 ms per status) "1" - "0" - "0" at binary input DI12 (Start). The teaching process is successfully completed when binary output DO03 is set to "1" (position saved).

**INFORMATION**

A non-referenced drive is signaled via DO01 (malfunction) = "0". Note that MOVITRAC® B does not display an error in this case.
• **Referencing mode**
  The reference position is defined through reference travel (e.g. to one of the two hardware limit switches). Set PO1:Bit 8 (or DI12) "Start" to "1" to start reference travel. The "1" signal must be present for the entire duration of the reference travel. Once reference travel has been completed successfully, PI1:Bit 2 (or DO04) "Drive referenced" is set. The "1" signal at PO1:Bit 8 (or DI12) "Start" can now be revoked. The drive is now referenced.

• **Positioning mode**
  – In positioning mode, the drive can be positioned absolutely based on the machine zero point (reference position).
  – After you have specified the setpoint speed via PO2 and the setpoint position via PO3 (or binarily selected the table cell with position bits DI13 - DI15), you can start the positioning process via PO1:Bit 8 (or DI12) "Start".
  – With a setpoint speed selection = 0, the drive runs at minimum speed.
  – With terminal control, the ramp assigned to the selected table position is active.
  – If PO2:Bit 14 (ramp switch-over) is set to "1" in fieldbus control mode, ramp 2 is active instead of ramp 1.
  – If the software limit switch is activated, the drive cannot travel outside the limit switch ranges.
  – A new target position is immediately adopted during traveling.
  – Once the target position has been reached (± position window), the brake is applied and PI1:Bit 3 (or DO03) "Target position reached" is set.

---

**INFORMATION**

With terminal control, a non-referenced drive is signaled via DO01 (/malfunction) = "0". Note that MOVITRAC® B does not display an error in this case.

---

### 6.2 Monitoring functions

• **Function of the hardware limit switches**
  If the hardware limit switches were activated during startup, the axis is stopped (ramp t11) when it reaches a hardware limit switch. The error message F116, suberror code 29 (limit switch reached) is displayed. The error message can be deleted by reversing the direction of travel. An error reset is not necessary.

• **Moving clear of hardware limit switches**
  In opposite direction of travel, moving clear of the hardware limit switches is achieved by selecting "jog mode" and with set "reset" input bit.

• **Function of the software limit switches**
  – Monitoring of the software limit switches is activated if the value of the right software limit switch is larger than the value of the left software limit switch during startup and if the axis is referenced.
  – In jog mode, the axis is stopped when three position windows before the software limit switch position are reached (stop ramp t13), and the error message F116, suberror code 78 (software limit switch reached) is issued. The error message can be cleared by reversing the direction of travel and resetting the error.
– In jog mode, setting PO1:Bit 15 (or DI12) switches off monitoring of the software limit switches.
– In positioning mode, specifying a setpoint position outside the software limit switches also leads to the error message F116, suberror code 78 (software limit switch reached). The error message can be deleted by specifying a setpoint position inside the software limit switches and by resetting the error.

• **Moving clear of the software limit switch**
  – Opposite direction of travel
    The travel range of the software limit switches can be left by selecting "jog mode", with set "reset" input bit and by selecting "opposite direction".
  – Direction of travel in both directions
    The axis can be moved by selecting "jog mode", with input bits set to "reset" and "/SWLS" (deactivated software limit switches) as well as selection of direction. It is possible to move further into the travel range of the software limit switches.
  – Reference travel
    The axis is referenced again when selecting reference travel and input bit set to "reset". The drive can then be moved again in the travel range of the software limit switches.

• **Encoder monitoring function**
  When encoder monitoring is activated, the encoder signals are monitored with respect to plausibility (direction of rotation) and wire breakage. In case of an error, error message F116, suberror code 14 (encoder) is issued when the timeout interval set during startup has elapsed.

• **Lag error monitoring function**
  When lag error monitoring is active, error message F116, suberror code 42 (lag error) will be issued in the event of an error.

• **Display of suberror codes**
  – Terminal control:
    The suberror code pertaining to F116 is displayed on the interface of the application module and via the parameter tree in error status (P012).
  – Fieldbus control:
    In addition to terminal control, the suberror code is issued via PI1:Bit 8 - 15.
6.3 Diagnostics

Monitor mode

You can call up the monitor during operation by selecting [MotionStudio] / [Application modules] / [Simple Positioning]. Next click the [Monitor] button (see chapter "Start Simple Positioning", section "Start monitor").

Fieldbus operation

The process input and output data transferred via fieldbus are displayed in decoded form (see following figure).
Terminal mode

The binary input and output signals are displayed in decoded form (see following figure).

The assignment of input and output signals depends on the selected operating mode. Read chapter "Terminal control via digital module FIO21B".
6.4 Control mode

You can use the [Control] button to move the drive manually via the user interface. The process data (in fieldbus mode) or the binary signals (in terminal mode) are ignored. Before control mode becomes active, you must acknowledge the following safety note.

- If communication is interrupted, the drive stops after the timeout interval set here.
- In control mode, you can specify the respective signals and send them to the drive by clicking [Send data].
- You can stop the drive at any time using the [Stop] button.

To go back to the status view, click the [Status] button and acknowledge the following safety information (see following figure).
## Appendix

### 7.1 Compatibility comparison positioning MOVIDRIVE® B / MOVITRAC® B

<table>
<thead>
<tr>
<th>Fieldbus interface</th>
<th>MOVIDRIVE® B Positioning</th>
<th>MOVITRAC® B Simple positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 PD</td>
<td>3 PD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal assignment</th>
<th>MOVIDRIVE® B Positioning</th>
<th>MOVITRAC® B Simple positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI00: /Controller inhibit</td>
<td>DI00: CW limit switch</td>
<td></td>
</tr>
<tr>
<td>DI01: Enable</td>
<td>DI01: CW stop</td>
<td></td>
</tr>
<tr>
<td>DI02: Error reset</td>
<td>DI02: CCW limit switch</td>
<td></td>
</tr>
<tr>
<td>DI03: Cam</td>
<td>DI03: IPOS input for encoder evaluation</td>
<td></td>
</tr>
<tr>
<td>DI04: /Limit switch right</td>
<td>DI04: IPOS input for encoder evaluation</td>
<td></td>
</tr>
<tr>
<td>DI05: /Limit switch left</td>
<td>DI05: TF evaluation</td>
<td></td>
</tr>
<tr>
<td>DO00: No error</td>
<td>DO00: No malfunction</td>
<td></td>
</tr>
<tr>
<td>DO01: Ready</td>
<td>DO02: Brake released</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DO02: IPOS output</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor encoder</th>
<th>Direct position control</th>
<th>Open loop – no position control</th>
</tr>
</thead>
<tbody>
<tr>
<td>External encoder</td>
<td>Direct position control</td>
<td>Not possible</td>
</tr>
<tr>
<td>Hiperface® encoder</td>
<td>Direct position control</td>
<td>Not possible</td>
</tr>
<tr>
<td>Encoder monitoring</td>
<td>Realized via firmware</td>
<td>Realized via IPOSplus®</td>
</tr>
<tr>
<td>Position control</td>
<td>Yes (drive remains energized)</td>
<td>No (brake is applied, de-energized drive)</td>
</tr>
<tr>
<td>Setting range</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Ramp type</td>
<td>Linear</td>
<td>Linear or asymmetrical</td>
</tr>
<tr>
<td>Additional ramp type</td>
<td>Sine, square, jerk</td>
<td>Not possible</td>
</tr>
<tr>
<td>Reference travel</td>
<td>Realized via firmware (type 0 - 8)</td>
<td>Realized via IPOSplus® program (type 3, 4, 5, 8)</td>
</tr>
<tr>
<td>Jog mode</td>
<td>Position-controlled</td>
<td>Speed-controlled</td>
</tr>
<tr>
<td>Positioning mode</td>
<td>Position-controlled</td>
<td>Speed-controlled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positioning characteristics</th>
<th>MOVIDRIVE® B Positioning</th>
<th>MOVITRAC® B Simple positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct position control (via firmware)</td>
<td>• E17C encoder type: IPOSplus® profile generator with lag error correction and controlled brake application.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• HTL encoder type: IPOSplus® controlled run-in to target with asymptotic deceleration ramp with controlled brake application.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On-the-fly</th>
<th>MOVIDRIVE® B Positioning</th>
<th>MOVITRAC® B Simple positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Setpoint position</td>
<td>• Setpoint position</td>
</tr>
<tr>
<td></td>
<td>• Setpoint speed</td>
<td>• Setpoint speed</td>
</tr>
<tr>
<td></td>
<td>• Ramp switch-over</td>
<td>• Ramp switch-over</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error messages:</th>
<th>MOVIDRIVE® B Positioning</th>
<th>MOVITRAC® B Simple positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• F78 software limit switch</td>
<td>Firmware generates inverter error and stops the drive</td>
<td></td>
</tr>
<tr>
<td>• F79 hardware limit switch approached</td>
<td>IPOSplus® stops movement and displays error.</td>
<td></td>
</tr>
<tr>
<td>• F14 encoder error</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Index

A
Application version .............................................. 13

C
Compatibility comparison MDX B / MC B ........... 34
Control mode .......................................................... 33

D
Description of functions
   Four operating modes ....................................... 10
Diagnostics ............................................................. 31

E
Exclusion of liability .............................................. 4

G
General information .............................................. 4
General notes
   Exclusion of liability ........................................ 4
   Other applicable documentation ......................... 5
   Structure of the safety notes ............................... 4

I
Initial screen ........................................................ 18
Installation
   MOVITOOLS® MotionStudio ................................ 13
   MOVITRAC® .................................................. 15

M
Monitoring functions ............................................. 29

O
Operating modes, overview .................................... 28
Other applicable documentation ......................... 5

P
Parameters and IPOS variables ............................... 26
Process data assignment for control
   via fieldbus gateway ........................................ 11
   Process input data .......................................... 12
   Process output data ....................................... 11
Process input data .............................................. 12
Process output data ............................................ 11
Project planning .................................................. 9
   Description of functions .................................. 10
   Inverters, motors and encoders .......................... 9
   Limit switches, reference position
      and machine zero ....................................... 10
   PC and software ........................................... 9
   Prerequisites ................................................ 9

R
Right to claim under limited warranty ....................... 4

S
Scaling factors distance and velocity ..................... 20
Select setpoint source ............................................ 19
Speed characteristics of simple positioning ............ 7, 8
Starting the drive ................................................ 28
Startup .................................................................... 17
   Calculating the scaling factors
distance and velocity ........................................ 20
   Completion ....................................................... 25
   General prerequisites ....................................... 17
   Initial screen ................................................... 18
   Monitoring function setup ................................ 24
   Parameters and IPOS variables ......................... 26
   Setting parameters and limits............................ 21
   Setting parameters for terminal control ............... 23
   Starting the Simple Positioning program ............ 17
   Structure of the safety notes ............................... 4
   System description ............................................ 6
   Areas of application ......................................... 6

T
Terminal control via digital module FIO21B ................ 16

W
Wiring diagram MOVITRAC® B ............................... 14