SEW EURODRIVE

MOVIDRIVE® MDX61B
Sensor Based Positioning via Bus Application

FA362000

Edition 01/2005

11313528 / EN

Manual

SEW
EURODRIVE

1 Important notes

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

1.1 Explanation of the icons

Hazard

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

Warning

Indicates an imminently hazardous situation caused by the product which, if not avoided, WILL result in death or serious injury. You will also find this signal to indicate the potential for damage to property.

Caution

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor injury or damage to products.

Note

Indicates a reference to additional information, for example on startup, or other useful data.

Documentation reference

Indicates a reference to a document, such as operating instructions, catalog, data sheet.

1.2 Safety notes and general information

Risk of an electrical shock

Possible consequences: Death or serious injury.

Only electrical specialists are allowed to install and start up MOVIDRIVE® drive inverters observing the applicable accident prevention regulations and the MOVIDRIVE® operating instructions.

Potentially hazardous situation which, if not avoided, may result in damage to products or the surrounding area.

Possible consequences: Damage to the product

Read through this manual carefully before you commence installation and startup of MOVIDRIVE® drive inverters with this application module. This manual does not replace the detailed operating instructions!

A requirement of fault-free operation and the possibility of any rights to claim under guarantee is that you observe the information in the documentation.

Documentation reference

This manual was written assuming that the user 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.

2 System Description

2.1 Application areas

In the fields of materials handling technology and packaging technology, different items are often transport on a number of conveyor systems (roller, belt and chain conveyors, etc.). The distance between the items on the conveyors can vary. Positioning to a "remaining distance" from the time the item is detected, is often required to prepare, distribute or sort the individual items, without having to stop them at a specific point. The application module "Sensor based positioning via bus" can be used to solve this problem.

To detect the current position of an item, each item passes a proximity switch or sensor (touch probe). After an edge change at the proximity switch, the drive positions the item by the remaining distance specified.

The "Sensor based positioning via bus" application module is particularly suitable for the following sectors:

- Materials handling technology
  - Trolleys
  - Hoists
  - Rail vehicles
- Logistics
  - Storage and retrieval systems
  - Transverse carriages
- Palletizing / Handling
  - Multi-axis handling robots
  - Gantries

The "Sensor based positioning via bus" module offers the following advantages in these applications:

- User-friendly user interface
- You only have to enter the parameters required for "Sensor based positioning via bus" (ratios, speeds, diameters).
- Guided parameter setting process instead of complicated programming.
- Monitor mode for optimum diagnostics.
- Users do not require any programming experience.
- It does not take long to get to know the system.
- Application module for conveyor systems, in which material or items can be positioned accurately by recording the current position using an external sensor (touch probe).
- The current position is detected during movement.
- Variable specification of the remaining distance via process output data word PO3.

2.2 Program identification

You can use the MOVITOOLS® software package to identify which application program was last loaded into the MOVIDRIVE® MDX61B unit. Proceed as follows:

- Connect MOVIDRIVE® to the PC via the serial port.
- Start MOVITOOLS®.
- In MOVITOOLS® start the program "Shell".
- In the Shell program, choose [Display] / [IPOS Information].

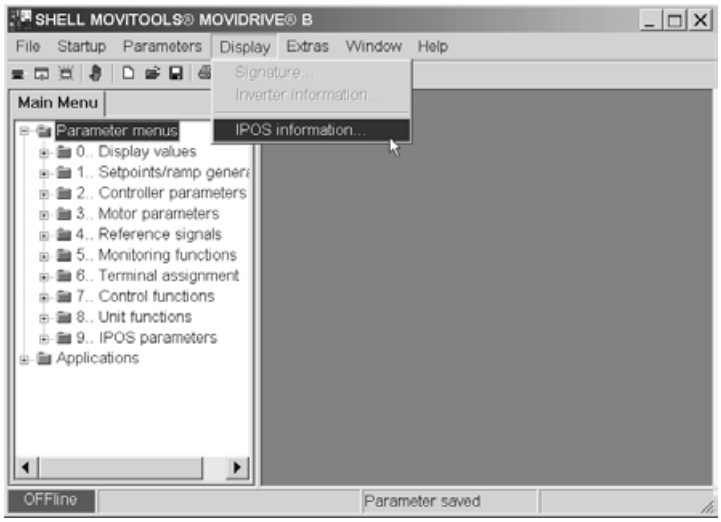

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Figure 1: IPOS information in Shell

- The "IPOS-Status" window appears. The entries in this window tell you which application software is stored in MOVIDRIVE® MDX61B.

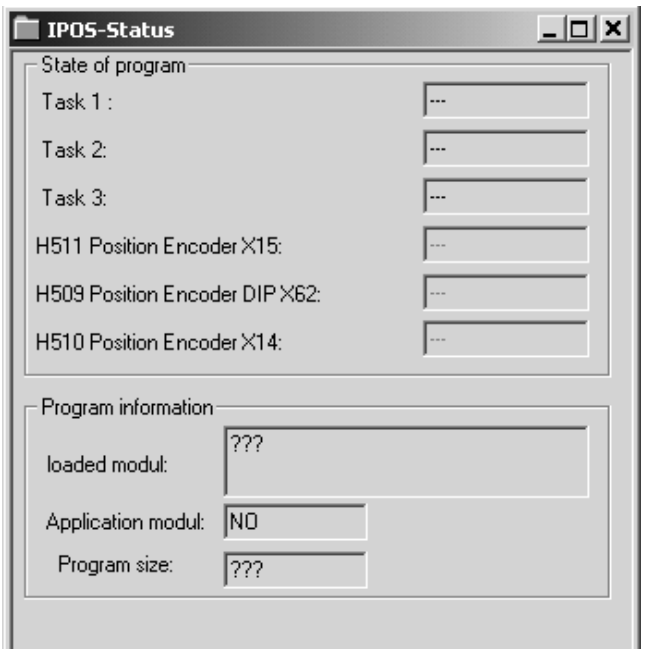

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Figure 2: Display of the current IPOS program version

3 Project Planning

3.1 Prerequisites

PC and software

The "Sensor-based positioning via bus" application module is implemented as an IPOS$^{plus®}$ program and forms part of the SEW MOVITOOLS® software package from version 4.20. To use MOVITOOLS®, you must have a PC with one of the following operating systems: Windows® 95, Windows® 98, Windows NT® 4.0, Windows® Me or Windows® 2000.

Inverters, motors and encoders

- **Inverter**

  The "Sensor based positioning via bus" can only be implemented on MOVIDRIVE® MDX61B units in application version (...-0T). You need the option (DFP, DFI, DFC or DFD) corresponding to the bus type you are going to be using. You do not have to use any of the options named above if control is realized via SBUS. An external encoder is required for positioning in applications with a non-positive connection between the motor shaft and the load. If an absolute encoder is used as the external encoder, you will need the DIP11B absolute encoder card option.

  It is essential for the "sensor based positioning via bus" function to have encoder feedback, and consequently it **cannot** be implemented with MOVIDRIVE® MDX60B.

- **Motors and encoders**
  - For operation on MOVIDRIVE® MDX61B with DEH11B: CT/CV asynchronous servomotors (encoder installed as standard) or DR/DT/DV AC motors with encoder (Hiperface®, sin/cos or TTL).
  - For operation on MOVIDRIVE® MDX61B with DER11B: CM/DS synchronous servomotors with resolver.

- **External encoders**
  - Interlocking connection between the motor shaft and the load:
    An external encoder is not 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 connection between the motor shaft and the load:
    An additional external encoder is required in addition to the motor encoder/resolver.
    Incremental encoder as external encoder: Connection to basic unit at X14.
    Absolute encoder as external encoder: Connection to option DIP11 at X62.

- **Possible combinations**

	Motor shaft/load connection		
	Interlocking: No external encoder is needed	**Non-positive: External encoder is needed**	
Encoder type (external encoder)	-	Incremental encoder	Absolute encoder
Bus type (required option)	PROFIBUS → DFP / InterBus → DFI / CAN-Bus → DFC / DeviceNet → DFD System bus (SBus) → No option required		
Other MOVIDRIVE® option required	DEH11B or DER11B		DIP11 / DEH11B / DER11B

3.2 Description of functions

Functional characteristics

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

- Absolute positioning based on the machine zero.
- Relative positioning for cyclical operation.
- Positioning the drive by a specified reminaing distance from the detection of a touch probe signal.
- Stopping the drive when a defined maximum position has been reached when the sensor in the "Remaining travel" mode is not triggered.
- Endless operation option in the "Remaining travel" mode.
- Specification of the target position via fieldbus
- Speed selection via fieldbus (for the LINEAR and JERK LIMITED ramp functions, the changes can be made during movement).
- Startup of two positioning functions. You can switch between the functions via a bit in the control word.
- Activation of software limit switches.
- Cyclical checkback of actual speed and actual position in the user unit via process input data (PI2 and PI3).
- Confirmation of the target position to which movement has taken place via bit PI1:3 "Target position reached" in the status word.
- Source actual position (motor encoder, external encoder or absolute encoder) can be selected.
- Simple connection to the machine control (PLC).

Operating modes

The functions are implemented with three operating modes:

- **Jog mode (DI11 = "1" and DI12 = "0")**
  - In jog mode, the drive can be moved right or left via bits 9 and 10 in control word 2 (PO1).
  - The speed in jog mode is variable and is specified by the PLC via the bus.

- **Referencing mode (DI11 = "0" and DI12 = "1")**

  In referenceing mode, reference travel can be started via bit 8 in control word 2 (PO1). Reference travel establishes the reference position (machine zero) for absolute positioning operations.

- **Automatic mode (DI11 = "1" and DI12 = "1")**

  In automatic mode you can select from four different positioning attributes:

  - Absolute:
    The target position is based on the machine zero, which was determined beforehand by reference travel. Reference travel is mandatory.

  - Relative:
    The reference point is the current position (= setpoint position). The target position sent to PO3 (cycle distance) is added to the current position. The cycle is started when a positive edge is detected at PO1:8 (start). To start a new cycle, an edge change must be detected at PO1:8.

  - Remaining travel left / Remaining travel right:
    The reference point is the current position (= setpoint position). Positioning is started when a positive edge is detected at PO1:8 (Start). The target position is calculated from the current position (= setpoint position) plus the value entered in the "Maximum position right/left" input field during startup (→ Sec. "Startup"). If the endless positioning option (bit PO1:10 EndlessPos) is activated, the drive moves endlessly in the selected direction. Digital input DI02 is monitored during positioning. When a positive edge change is detected, the remaining distance specified via fieldbus is added to the position at the time of the touch probe event as an offset.

The maximum possible travel distance depends on the travel unit set. Examples:

- Travel unit [1/ 10 mm] → Travel distance = 3.27 m
- Travel unit [mm] → Travel distance = 32.7 m

3.3 Scaling the drive

The controller must be able to detect the number of encoder pulses (increments) per travel unit to position the drive. You can use the scaling function to set the user unit suitable to your application.

Drive without external encoder (interlocking connection)

In drives without an external encoder, the system can calculate the scaling automatically **during startup** of the sensor based position via bus function. Enter the following data:

- Diameter of the drive wheel ($d_{drive\ wheel}$) or slope of the spindle ($s_{spindle}$)
- Gear ratio of the gear unit ($i_{gear\ unit}$, speed-reduction)
- Gear ratio of the additional gear ($i_{gear\ unit}$, speed-reduction)

The following scaling factors are calculated:

- Pulses / distance scaling factor [inc/mm] using the formula:

  Pulses = $4096 \times i_{gear\ unit} \times i_{additional\ gear}$

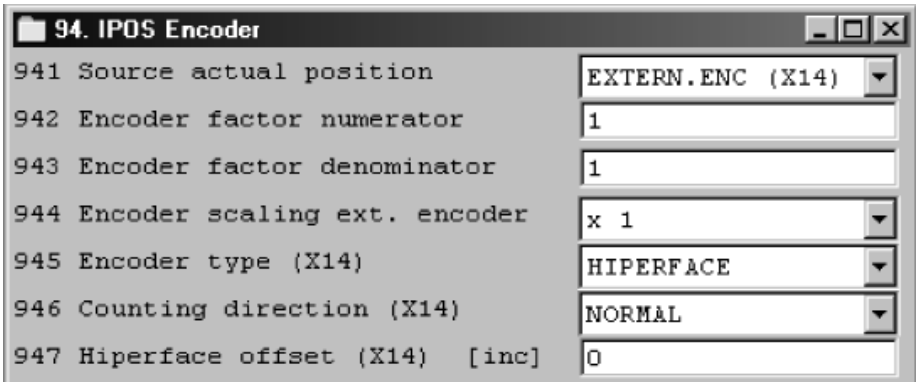
  Distance = $\Pi \times d_{drive\ wheel}$ or $\Pi \times s_{spindle}$
- Speed scaling factor

  Numerator factor in [1/min] and denominator value in "speed unit".

You can also enter the distance and speed scaling factors directly. If you enter a unit other than [mm] or [1/10 mm] as the travel unit, this user unit will also be used for the position of the software limit switches, the reference offset and the maximum travel distances.

Drive with external encoder (non-positive connection)

In this case, you must have activated and scaled the external encoder **before starting up** the sensor based positioning via bus function. To do so, make the following settings in the Shell program **before starting** the sensor based positiong via bus function (→ following figure).



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- P941 Source actual position

  If an incremental encoder or an absolute encoder (DIP11) is connected, set P941 to "EXT. ENCODER (X14)". You can also make this setting during the startup up procedure of the sensor based positioning function.
- P942 Encoder factor numerator / P943 Encoder factor denominator / P944 Encoder scaling ext. encoder

Calculation of the scaling is blocked during startup of the sensor-based positioning.

- For more information about scaling an external encoder, refer to the "IPOS$^{plus®}$ Positioning and Sequence Control System" manual.
- When using an absolute encoder, note the startup instructions in the "MOVIDRIVE® MDX61B0 Absolute Encoder Card DIP11B" manual.

3.4 Limit switches, reference cams and machine zero

Note the following points during project planning:

- The software limit switches must be located within the travel range of the hardware limit switches.
- When defining the reference position (position of the reference cam) and the software limit switches, make sure they **do not** overlap. Fault message F78 "IPOS SW limit switch" is generated in the event of an overlap during referencing.
- You can enter a reference offset during startup if you do not want the machine zero to be located on the reference cam. The following formula applies: Machine zero = Reference position + Reference offset 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 three process output data words (PO1 PO3) to the inverter and receives three process input data words (PI1 PI3) from the inverter.

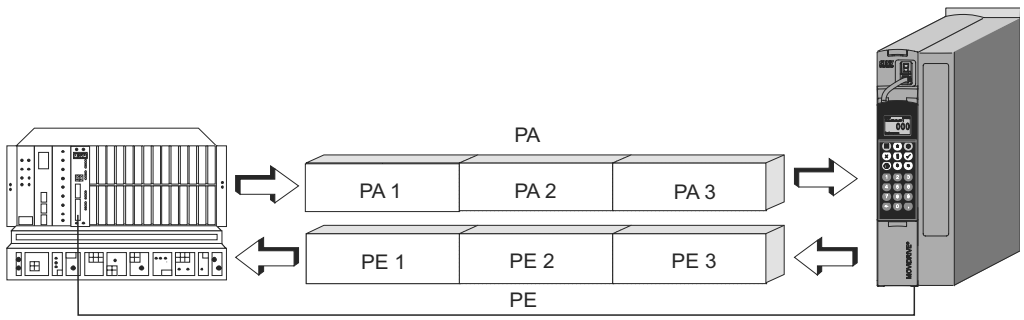


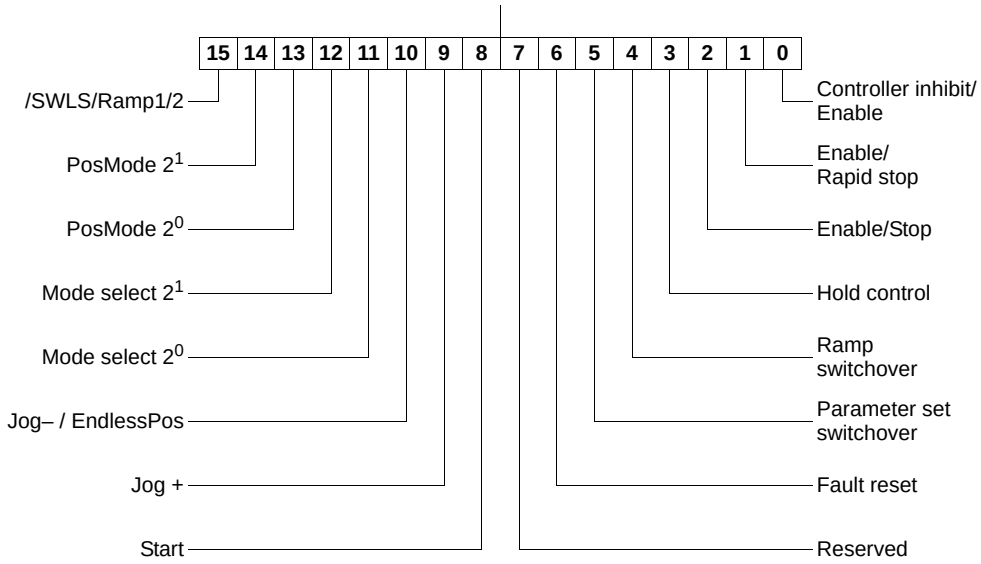
Figure 3: Data exchange via process data

PO = Process output data
PO1 = Control word 2
PO2 = Setpoint speed (IPOS PO DATA)
PO3 = Setpoint position (IPOS PO DATA)
PE = Process input data
PI1 = Status word (IPOS PI DATA)
PI2 = Actual speed (IPOS PI DATA)
PI3 = Actual position (IPOS PI DATA)
PE = Process input data

Process output data

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

- PO1: Control word 2



The "Endless positioning" option (Bit 10:EndlessPos) in the "remaining travel right/left" modes and the "Moving clear of the software limit switches" in jog mode ((Bit 15:/SWLS) are only available with MOVIDRIVE® MDX61B.

Operating mode	Bit 12: Mode select 2^1	Bit 11: Mode select 2^0
Invalid mode	0	0
Jog mode	0	1
Referencing mode	1	0
Automatic mode	1	1

PosMode	Bit 14: Mode select 2^1	Bit 13: Mode select 2^0
Absolute	0	0
Relative	0	1
Remaining travel right	1	0
Remaining travel left	1	1

- PO2: Setpoint speed

PO2 Setpoint speed

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

- PO3: Setpoint position

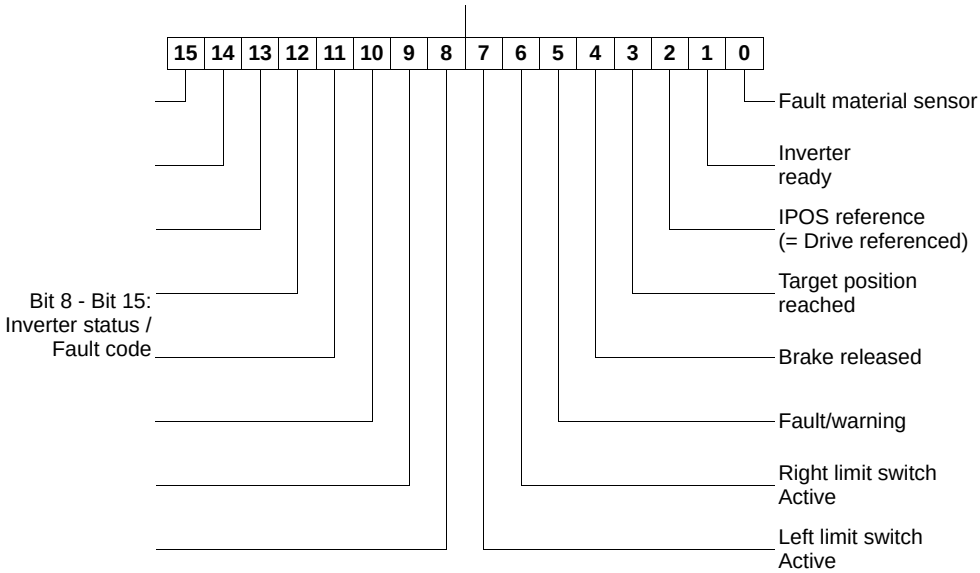
PO3 setpoint position

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

Process input data

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

- PI1: Status word



- PI2: Actual speed

PI2 Actual speed

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

- PI3: Actual position

PI3 Actual position

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

3.6 Software limit switches

General information

The "software limit switch" monitoring function is used to check that the target position is set to appropriate values. During this process, it is not important where the drive is positioned. In contrast to the monitoring of the hardware limit switches, the monitoring function for the software limit switches makes it possible to detect whether there is an error in the target specifications before the axis starts to move. The software limit switches are active when the axis is referenced; that is, when Bit 1 "IPOS reference" is set in PI1.

Moving clear of the software limit switch

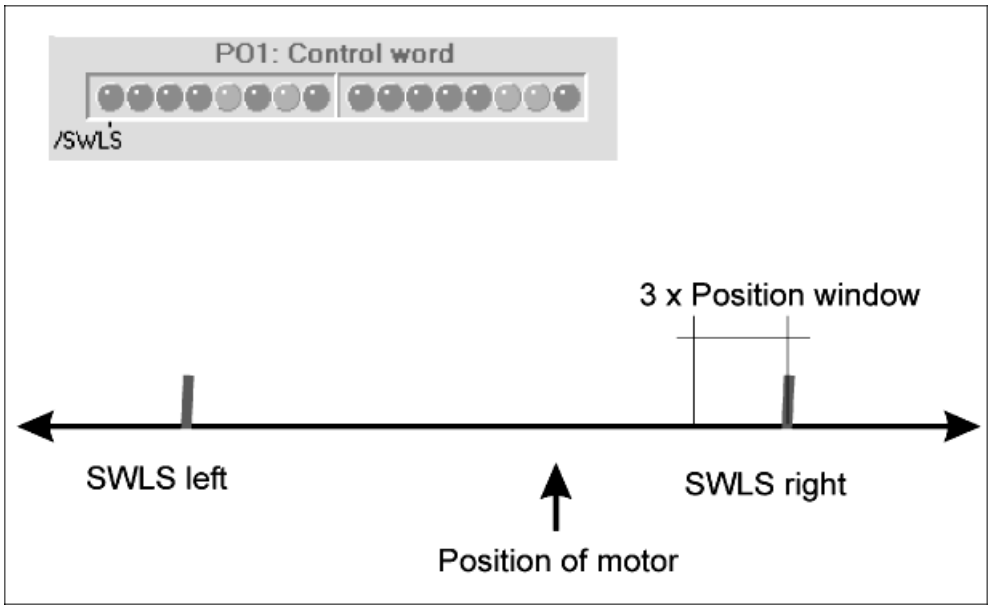
When using an absolute encoder or Multiturn Hiperface® encoder it may be necessary for the drive to be moved within the range of the software limit switches (for example, after an encoder has been replaced). For this purpose, Bit 15 in the process ouput data word 1 (PO1) is set to "/SWES" (= Moving clear of the software limit switch).

Bit 15 "/SWLS" is only available in jog mode and referencing mode. If Bit 15 is set, the drive can be moved out of the valid positioning range into the software limit switches (→ Example 3).

It is necessary to differentiate between the following three examples:

Example 1

- Prerequisites:
  - Bit 15 "/SWLS" in the process output data word 1 (PO1) is not set.
  - Drive is within valid positioning area
  - Software limit switch monitoring function is active.



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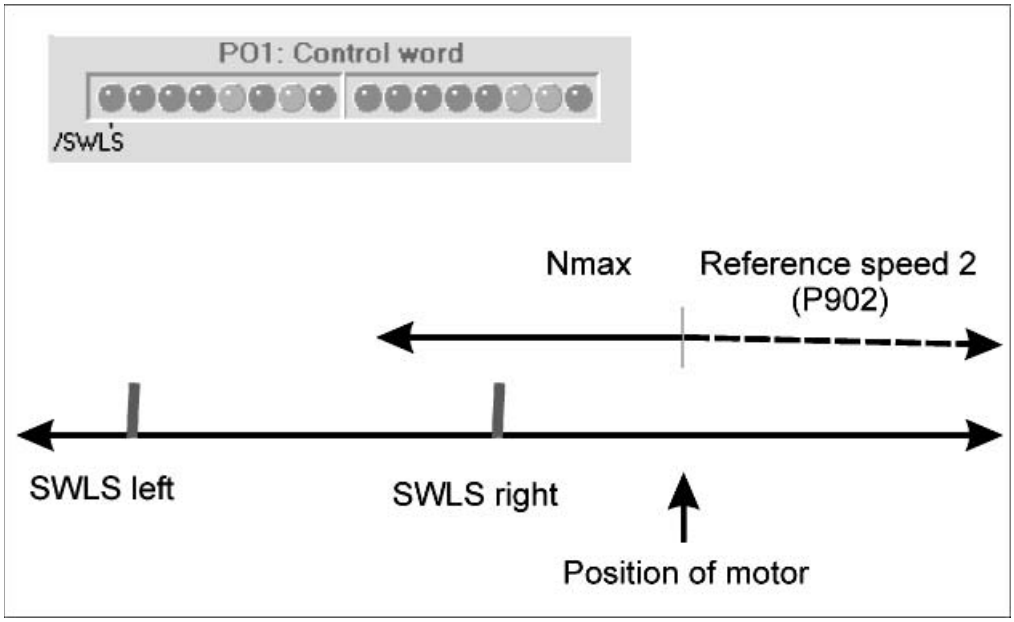
In jog mode, the drive runs until it is three position windows (P922) before the software limit switch and then stays there.

In automatic mode, the drive can be positioned up to the software limit switches but not beyond.

In referencing mode, the software limit switches are not active, which means the drive can move past the software limit switches during reference travel.

Example 2

- Prerequisites:
  - Bit 15 "/SWLS" in the process output data word 1 (PO1) is not set.
  - The drive is outside the software limit switches.



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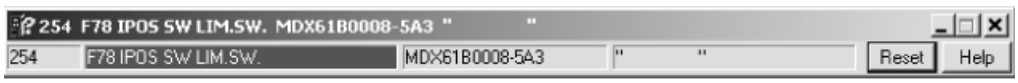
The following error message appears after the drive is enabled:



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You can confirm the error message by pressing the reset button. The monitoring function is deactivated. In the area of the software limit switches, the drive can be moved at two different speeds as follows:

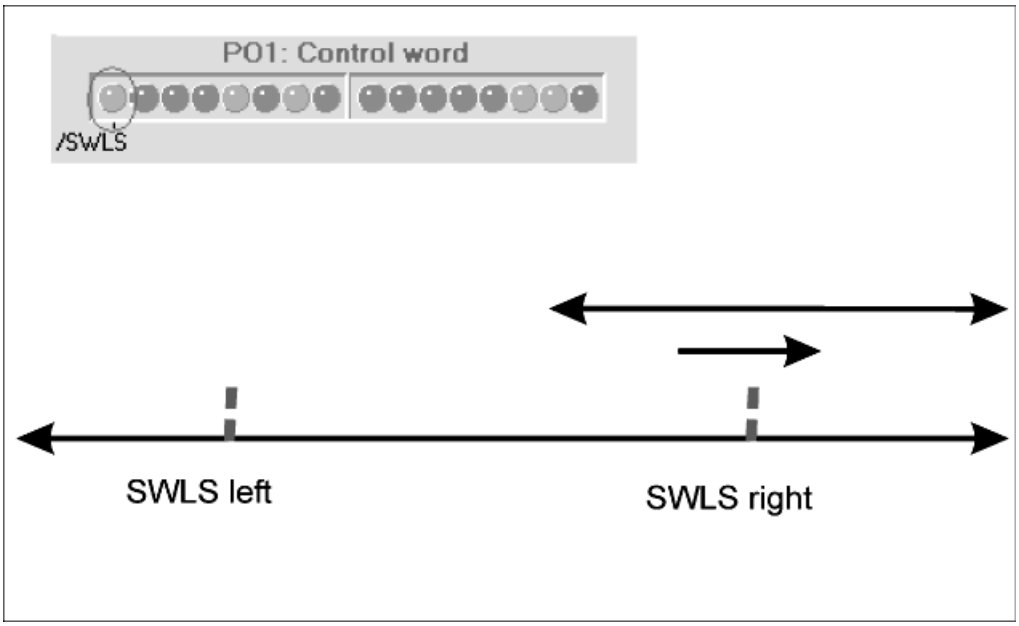
- Closer toward the travel range of the software limit switch at reference speed 2 (P902).
- Away from the travel range of the software limit switches at maximum speed.

The monitoring function is reactivated when:

- The actual position of the drive set using P941 is once more in the permitted positioning range.
- A positioning job is issued via the opposite software limit switch.
- The unit is switched off and on again.

Example 3

- Requirement:
  - Bit 15 "/SWLS" in the process output data word 1 (PO1) is set.



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The monitoring function is deactivated in the "Jog mode" and "Referencing mode". The drive can be moved within the travel area of the software limit switches and from the valid positioning range into the area of the software limit switches without an error message being generated. The speed can be varied.

Changing the monitoring function of the software limit switches during operation!

Possible consequences: Injury

You must not change the monitoring function of the software limit switches (PO1, Bit 15 "/SWLS") during operation (i.e. when the axis is in motion).

IPOS$^{plus®}$ processing speed

The speed of the IPOS$^{plus®}$ program in MOVIDRIVE® MDX61B can be changed using the following parameters:

- P938 IPOS speed TASK1, setting range 0 - 9
- P939 IPOS speed TASK2, setting range 0 - 9

Setting value "0" for both parameters results in the same IPOS$^{plus®}$ processing speed as for MOVIDRIVE® MD_60A.

- P938 = 0 ≙ TASK1 = 1 command/ms
- P938 = 0 ≙ TASK2 = 2 commands/ms

Values greater than zero are added to the IPOS$^{plus®}$ processing speed of MOVIDRIVE® MD_60A. Note that the total of the commands per millisecond (commands/ms) for TASK1 and TASK2 must not be greater than 9.

Startup of the application module on a MOVIDRIVE® MDX61B unit causes the parameters to be set as follows for a sequence with optimized timing:

- P938 = 5 ≙ TASK1 = 1 command / ms + 5 commands / ms = 6 commands / ms
- P939 = 4 ≙ TASK2 = 2 commands / ms + 4 commands / ms = 6 commands / ms

3.7 Safe stop

A "Safe stop" can only be achieved by safe disconnection of the jumpers at terminal X17 (through safety switch or safety PLC).

The "Safe stop active" state is indicated by a "U" in the 7-segment display. In the application module, this state is treated like the "CONTROLLER INHIBIT" state.

For more information on the "Safe stop" function, refer to the following publications:

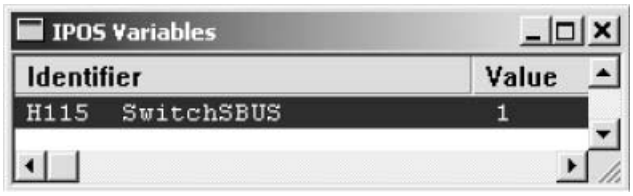
- MOVIDRIVE® MDX60B / 61B Safe Disconnection - Conditions
- MOVIDRIVE® MDX60B/61B Safe Disconnection - Applications

3.8 SBus send object

You have the option of setting up an SBus send object for transferring the cyclical actual position of the drive. In this way, the "Sensor based positioning via bus" application can be used as a master for the "DriveSync" application module or any IPOS$^{plus®}$ program.

Activating the SBus send object

To set up the SBus send object set the IPOS$^{plus®}$ variable *H115 SwitchSBUS* to "1" and restart the IPOS$^{plus®}$ program (→following screenshot).



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Settings for the SBus objects

The send and synchronization objects are initialized automatically once the IPOS$^{plus®}$ program has been restarted. The content of the send object is set to IPOS$^{plus®}$ encoder.

	Send object	Synchronization object
ObjectNo	2	1
CycleTime	1	5
Offset	0	0
Format	4	0
DPointer	IPOS encoder	-

4 Installation

4.1 MOVITOOLS® software

MOVITOOLS®

The "Sensor based positioning via bus" application module is part of the MOVITOOLS® software (version 4.20 and higher). Proceed as follows to install MOVITOOLS® on your computer:

- Insert the MOVITOOLS® CD into the CD-ROM drive of your PC.
- The MOVITOOLS® setup menu is started. Follow the instructions of the installation wizard.

You can now use the Program Manager to start MOVITOOLS®. Proceed as follows to perform startup for the inverter using the MOVITOOLS® Manager:

- Select the language you want in the "Language" selection field.
- In the "PC Interface" selection field, select the PC port (e.g. COM 1) to which the inverter is connected.
- In the "Device Type" field, select "Movidrive B".
- In the "Baudrate" field, select the baud rate set on the basic unit with the DIP switch S13 (standard setting → "57.6 kBaud").
- Click the <Update> button to display the connected inverter.

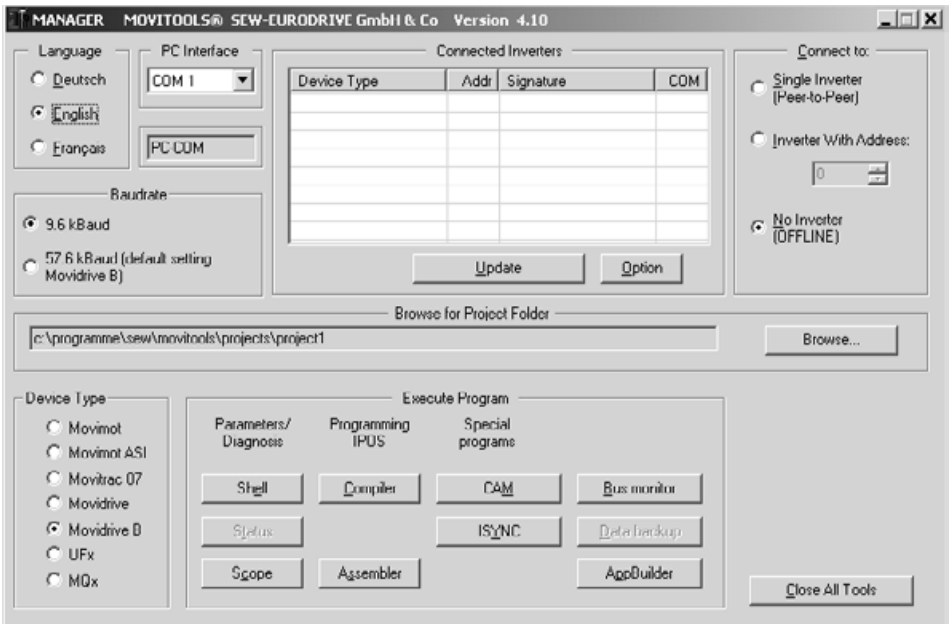

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Figure 4: MOVITOOLS® window

Application version

The "Sensor based positioning via bus" application module can be used on MOVIDRIVE® units in application version (...-0T). The application modules cannot be used with units in the standard version (-00).

4.2 Wiring diagram for MOVIDRIVE® MDX61B

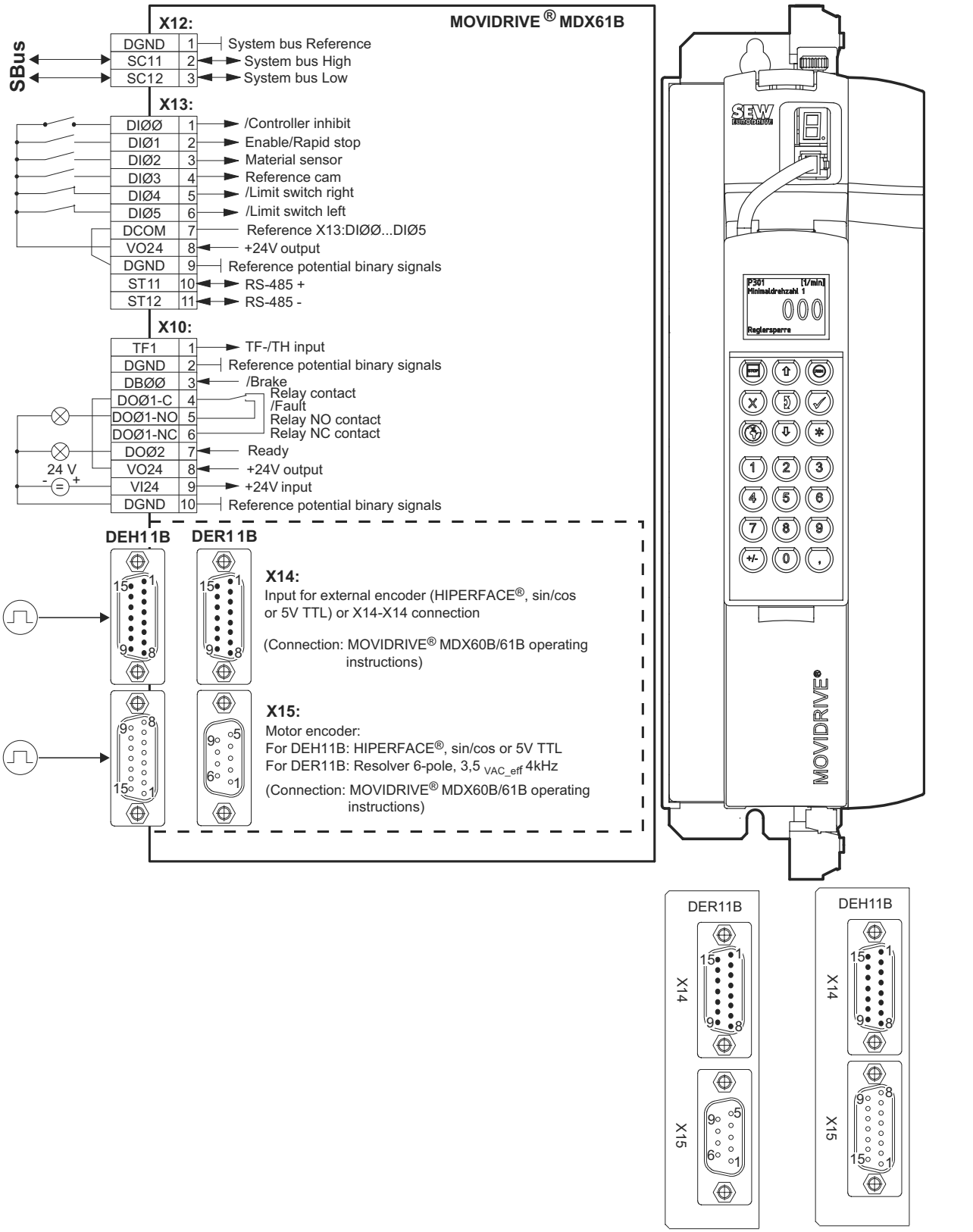

Figure 5: Wiring diagram for MOVIDRIVE® MDX61B with option DEH11B or DER11B

4.3 Bus installation for MOVIDRIVE® MDX61B

Overview

For the bus installation, please note the information in the relevant fieldbus manuals supplied with the fieldbus interfaces. Please refer to the MOVIDRIVE® MDX60B/61B operating instructions for information on installing the system bus (SBus).

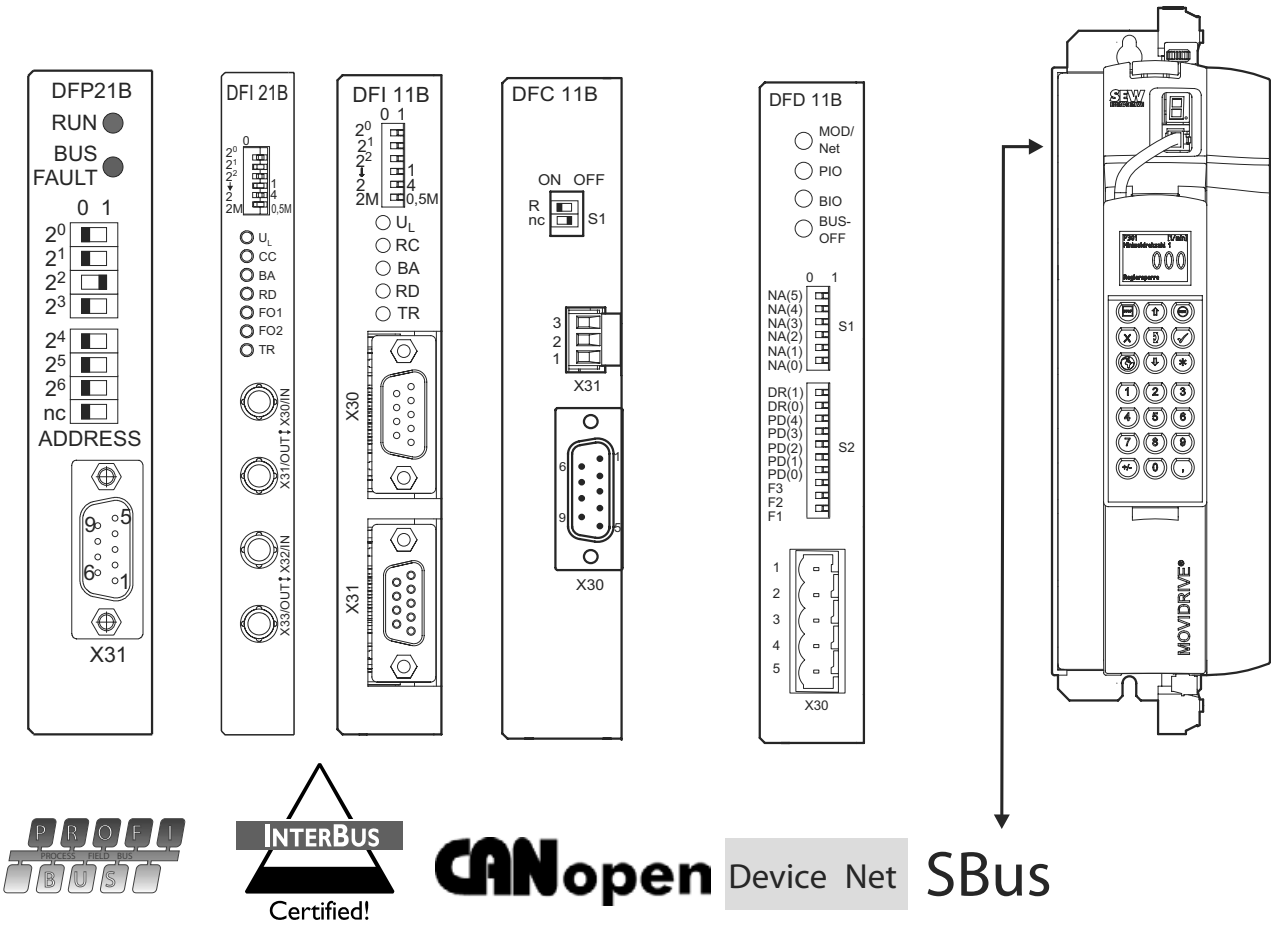

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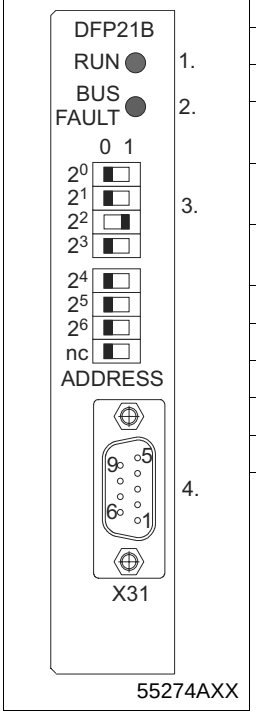
Figure 6: Bus types

PROFIBUS (DFP21B)

For more detailed information, refer to the "MOVIDRIVE® MDX61B Fieldbus Interface DFP21B PROFIBUS DP" manual. This manual can be ordered from SEW-EURODRIVE. You can download the unit master data files (GSD) and type files for MOVIDRIVE® MDX61B from the SEW homepage (under the heading "Software") to facilitate startup.

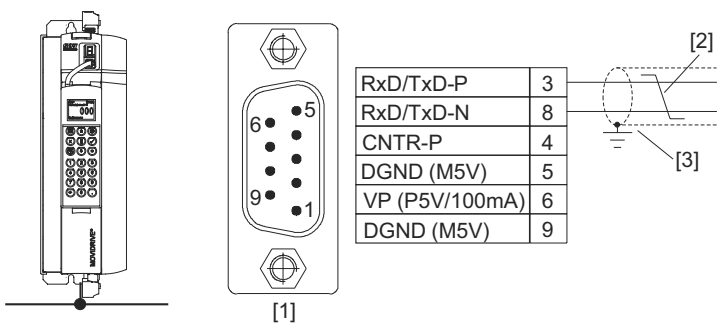
Technical data



Option	PROFIBUS fieldbus interface type DFP21B
Part number	824 240 2
Resources for startup/diagnostics	MOVITOOLS® software and DBG60B keypad
Protocol option	PROFIBUS DP and DP-V1 to IEC 61158
Supported baud rates	Automatic baud rate detection from 9.6 kbaud ... 12 Mbaud
Connection	9-pin Sub-D socket Assigment to IEC 61158
Bus termination	Not integrated, must be implemented in the PROFIBUS connector.
Station address	0 ... 125, can be set using DIP switch
GSD file	SEWA6003.GSD
DP ident number	6003 hex = 24579 dec
Max. number of process data	10 process data
Weight	0.2 kg (0.44 lb)

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



RxD/TxD-P	3
RxD/TxD-N	8
CNTR-P	4
DGND (M5V)	5
VP (P5V/100mA)	6
DGND (M5V)	9

55276AXX

Figure 7: Assignment of 9-pin sub D plug to IEC 61158

(1) 9-pin sub D connector

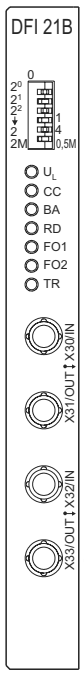
(2) Twist the signal wires together!

(3) Conductive connection is necessary between the plug housing and the shield!

INTERBUS with fiber optic cable (DFI21B)

For more detailed information, refer to the "MOVIDRIVE® MDX61B Fieldbus Interface DFI21B INTERBUS with Fiber Optic Cable" manual. This manual can be ordered from SEW-EURODRIVE.

Technical data

	Option	INTERBUS fieldbus interface type DFI21B (FO)
	Part number	824 311 5
	Resources for startup/diagnostics	MOVITOOLS® software, DBG60B keypad and CMD tool
	Supported baud rates	500 kbaud and 2 Mbaud, can be selected via DIP switch
	Connection	Remote bus input: 2 F-SMA connectors Remote bus output: 2 F-SMA connectors Optically controlled FO interface
	Weight	0.2 kg (0.44 lb)

1. DIP switches for setting the process data length, PCP length and baud rate
2. Diagnostic LEDs
3. FO: Remote IN
4. FO: Incoming remote bus
5. FO: Remote OUT
6. FO: Outgoing remote bus

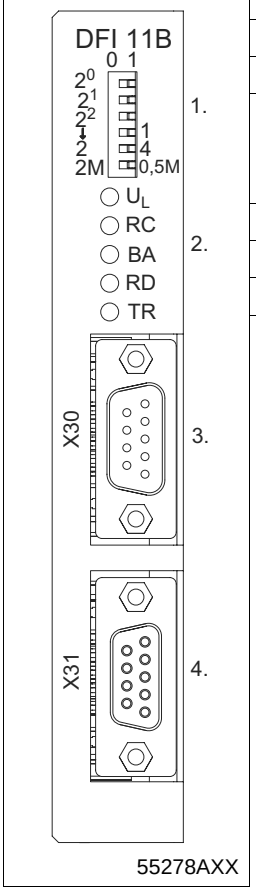
Connection assignment

Position	Signal	Direction	Wire color of FO cable
3	FO remote IN	Receive data	Orange (OG)
4	Incoming remote bus	Send data	Black (BK)
5	FO remote OUT	Receive data	Black (BK)
6	Outgoing remote bus	Send data	Orange (OG)

INTERBUS (DFI11B)

For more detailed information, refer to the "MOVIDRIVE® MDX61B Fieldbus Interface DFI11B INTERBUS" manual. This manual can be ordered from SEW-EURODRIVE.

Technical data

	Option	INTERBUS fieldbus interface type DFI11B
	Part number	824 309 3
	Resources for startup/diagnostics	MOVITOOLS® software and DBG60B keypad
	Supported baud rates	500 kbaud and 2 Mbaud, can be selected via DIP switch
	Connection	Remote bus input: 9-pin sub D connector Remote bus output: 9-pin Sub-D socket RS-485 transmission technology, 6-core shielded and twisted-pair cable
	Module ID	$E3_{hex} = 227_{dec}$
	Max. number of process data	6 process data
	Weight	0.2 kg (0.44 lb)

1. DIP switches for setting the process data length, PCP length and baud rate
2. Diagnostic LEDs: 4 x green LED (U_L, RC, BA, TR); 1 x red LED (RD)
3. 9-pin sub D plug: Remote bus input
4. 9-pin sub D socket: Remote bus output

Pin assignment

Conductor color abbreviations to IEC 757.

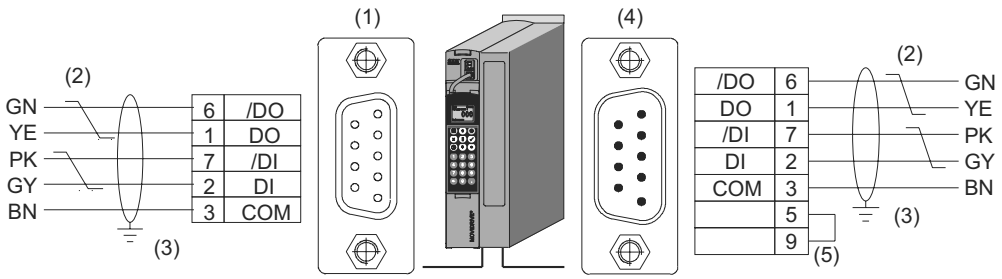


Figure 8: Assignment of the 9-pin sub D socket of the incoming remote bus cable and the 9-pin sub D plug of the outgoing remote bus cable

(1) 9-pin sub D socket of the incoming remote bus cable

(2) Twist the signal wires together!

(3) Conductive connection is necessary between the plug housing and the shield!

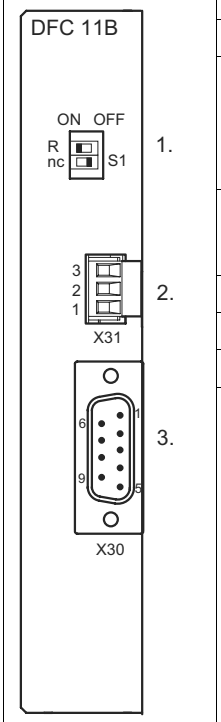
(4) 9-pin sub D plug of the outgoing remote bus cable

(5) Jumper pin 5 with pin 9!

CANopen (DFC11B)

For more information, refer to the "Communication" manual. This manual can be ordered from SEW-EURODRIVE (provisionally from 03/2005).

Technical data

	Option	CANopen fieldbus interface type DFC11B
	Part number	824 317 4
	Resources for startup/diagnostics	MOVITOOLS® software and DBG60B keypad
	Supported baud rates	Setting using parameter P894: • 125 kbaud • 250 kbaud • 500 kbaud • 1000 kbaud
	Connection	9-pin sub D connector (X30) Assignment to CiA standard 2-core twisted cable to ISO 11898
	Bus termination	Can be activated using DIP switch (120 Ω)
	Address range	1 ... 127, can be selected using DIP switch
	Weight	0.2 kg (0.44 lb)

1. DIP switch for setting the bus terminating resistor
2. X31: CANBus connection
3. X30: 9-pin sub D plug: CAN bus connection

Connection MOVIDRIVE® - CAN

The DFC11B option is connected to the CAN-Bus at X30 or X31 in the same way as the SBus in the basic unit (X12). In contrast to the SBus1, SBus2 is electrically isolated and made available via option DFC11B.

Pin assignment (X30)

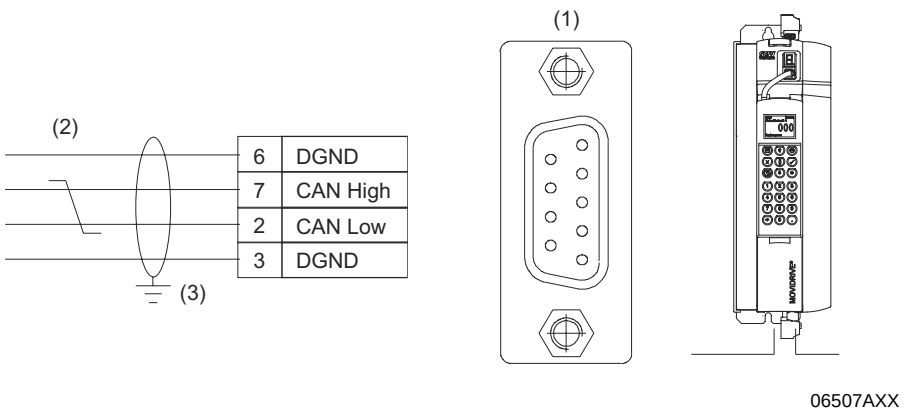


Figure 9: Assignment of 9-pin sub D socket of the bus cable

(1) 9-pin Sub-D socket

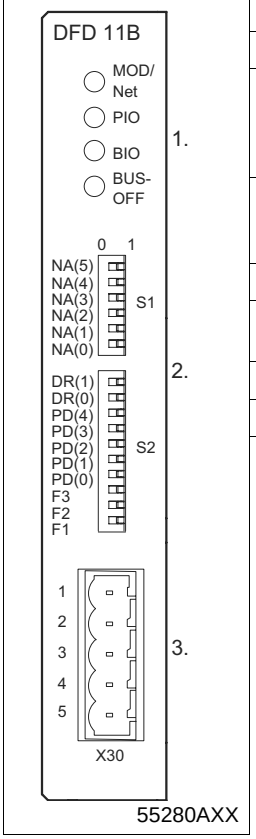
(2) Twist the signal wires together!

(3) Conductive connection is necessary between the plug housing and the shield!

DeviceNet (DFD11B)

For more detailed information, refer to the "MOVIDRIVE® MDX61B Fieldbus Interface DFD11B DeviceNet" manual. This manual can be ordered from SEW-EURODRIVE. You can download the EDS files for MOVIDRIVE® MDX61B from the SEW homepage (under the heading "Software") to facilitate startup.

Technical data

	Option	DeviceNet fieldbus interface type DFD11B
	Part number	824 972 5
	Resources for startup/diagnostics	MOVITOOLS® software and DBG60B keypad
	Supported baud rates	Can be selected using DIP switch: • 125 kbaud • 250 kbaud • 500 kbaud
	Connection	5-pin Phoenix terminal Assignment according to DeviceNet specification (Volume I, Appendix A)
	Permitted line cross section	According to DeviceNet specification
	Bus termination	Use of bus connectors with integrated bus terminating resistor (120 Ω) at the start and finish of a bus segment.
	Address range that can be set (MAC-ID)	0 ... 63, can be selected using DIP switch
	Weight	0.2 kg (0.44 lb)

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1. LED display
2. DIP switch for setting the node address (MAC-ID), the process data lengths and baud rate
3. 5-pin Phoenix terminal: bus connection

Terminal assignment

The assignment of connecting terminals is described in the DeviceNet specification Volume I, Appendix A.

Terminal	Meaning	Color
X30:1	V- (0V24)	Black (BK)
X30:2	CAN_L	Blue (BU)
X30:3	DRAIN	Blank
X30:4	CAN_H	White (WH)
X30:5	V+ (+24 V)	Red (RD)

4.4 System bus connection (SBus 1)

Only if P816 "SBus baud rate" = 1000 kbaud:

MOVIDRIVE® *compact* MCH4_A units must not be combined with other MOVIDRIVE® units in the same system bus combination.

The units may be combined at baud rates ≠ 1000 kbaud.

Max. 64 CAN bus stations can be addressed using the system bus (SBus). Use a repeater after 20 or 30 stations, depending on the length of the cables and the cable capacity. The SBus supports transmission technology compliant with ISO 11898.

The "Serial Communication" manual contains detailed information about the system bus. This manual can be obtained from SEW-EURODRIVE.

Wiring diagram SBus

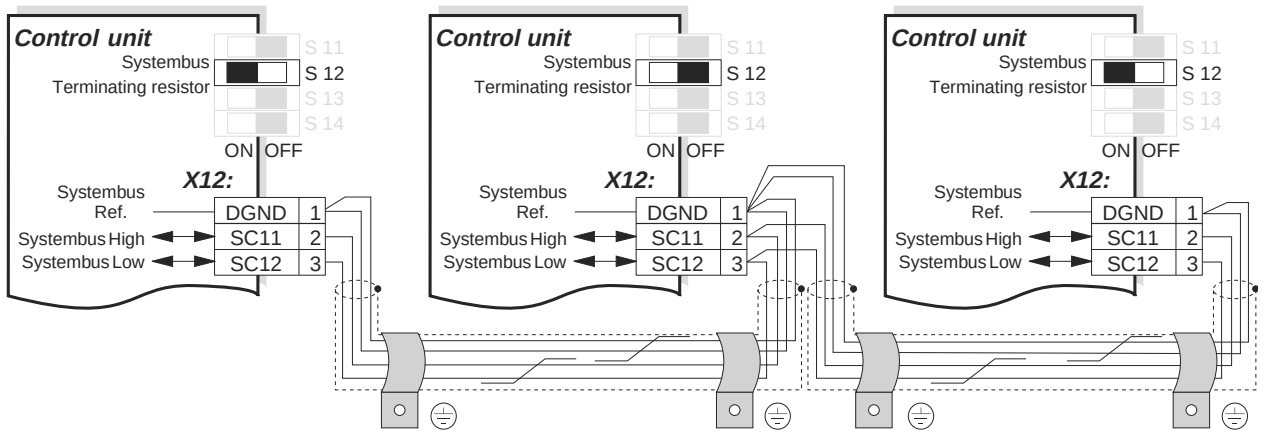

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Figure 10: System bus connection

Cable specification

- Use a 4-core twisted and shielded copper cable (data transmission cable with braided copper shield). The cable must meet the following specifications:
  - Core cross section 0.25 ... 0.75 mm^2 (AWG 23 ... AWG 18)
  - Line resistance 120 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  Suitable cables include CAN bus or DeviceNet cables.

Shielding

- Connect the shield to the electronics shield clamp on the inverter or master controller and make sure it is connected over a wide area at both ends.

Line length

- The permitted total cable length depends on the baud rate setting of the SBus (P816):
  - 125 kBaud → 320 m (1056 ft)
  - 250 kBaud → 160 m (528 ft)
  - **500 kbaud → 80 m (264 ft)**
  - 1000 kBaud → 40 m (132 ft)

Terminating resistor

- Switch on the system bus terminating resistor (S12 = ON) at the start and end of the system bus connection. Switch off the terminating resistor on the other units (S12 = OFF).

- There must not be any difference of potential between the units connected with the SBus. Take suitable measures to avoid a difference of potential, such as connecting the unit ground connectors using a separate line.

4.5 Connecting hardware limit switches

The cams of the hardware limit switches must cover the travel range up to the stop. Only use hardware limit switches with normally closed contacts (low-active)!

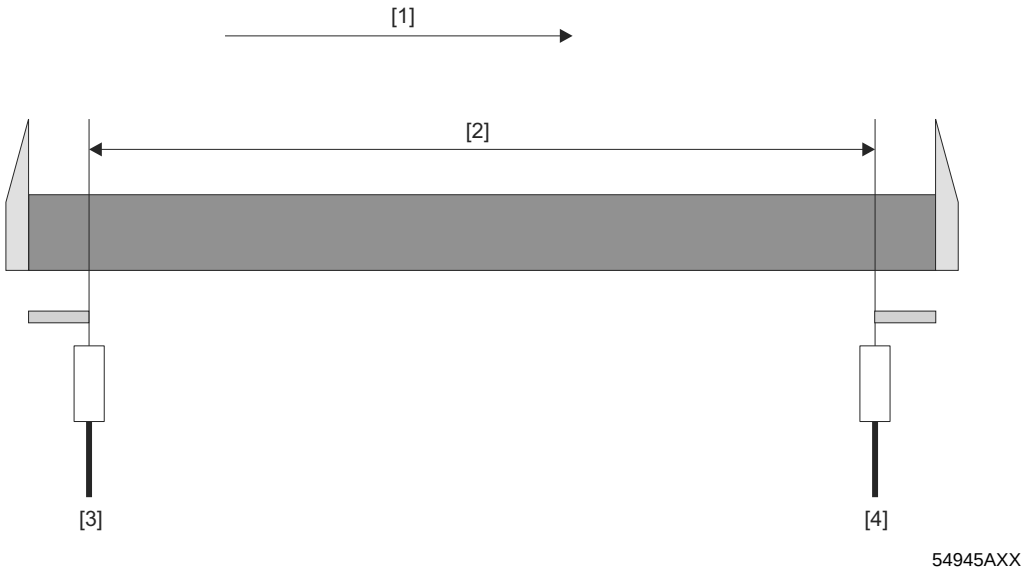

Figure 11: Connecting hardware limit switches

[1] Clockwise drive inverter

[2] Travel distance

[3] Hardware limit switch left

[3] Hardware limit switch right

5 Startup

5.1 General information

Correct project planning and installation are the prerequisites for successful startup. Refer to the MOVIDRIVE® MDX60/61B system manual for detailed project planning instructions.

Check the installation, the encoder connection and the installation of the fieldbus cards by following the installation instructions in the MOVIDRIVE® MDX60B/61B operating instructions, in the fieldbus manuals and in this manual (→ Sec. Installation).

Use an absolute encoder as the external encoder (connect to DIP11B, X62). Also note the information on installation and startup in the "MOVIDRIVE® MDX61B Absolute Encoder Card DIP11B" manual.

5.2 Preliminary work

Perform the following steps before starting the sensor based positioning via bus application:

- Connect the "Xterminal" connection on the inverter to PC-COM via the UWS21A option (serial interface).
- Install the MOVITOOLS® software (version 4.20 or higher).
- Start up the inverter with "MOVITOOLS/Shell."
  - MDX61B with asynchronous motor: **CFC operating modes / VFC n-control**
  - MDX61B with synchronous motor: **SERVO operating modes**
- Only for operation with an external encoder (absolute or incremental encoder):
  - Absolute encoder: Start up the DIP11B absolute encoder card. Set the parameters P942 ... P944 (→ "MOVIDRIVE® MDX61B Absolute encoder Card DIP11B" manual).
  - Incremental encoder: Set the parameters 942 ... P944 *Encoder factor numerator*, *Encoder factor denominator* and *Encoder scaling ext. encoder* in the Shell program. Refer to the "IPOS$^{plus®}$ Positioning and Sequence Control System" manual for a detailed description of the parameters.
- In [MOVITOOLS] / [Shell] / choose the menu item [Startup] and select the technology function "Sensor based positioning via bus".
- Enter a "0" signal at terminal DIØØ "/CONTROLLER INHIBIT/".

5.3 Starting the program "Sensor based positioning via bus"

General information

- Start [MOVITOOLS] / [Shell].
- Choose [Startup] / [Sensor based positioning via bus].

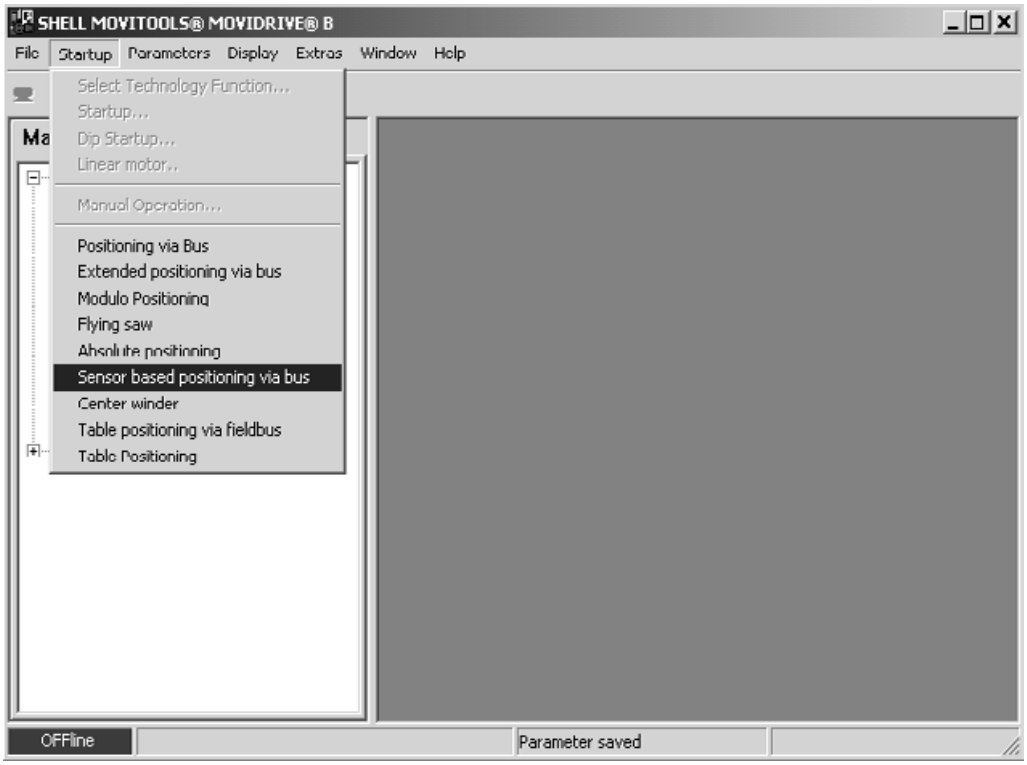

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Figure 12: Start the program "Sensor based positioning via bus"

Setting the fieldbus parameters

All parameters which are important for sensor based positioning are read in after sensor based positioning has started.

The following window appears after sensor based positioning has started if no valid application module has been loaded into the inverter.

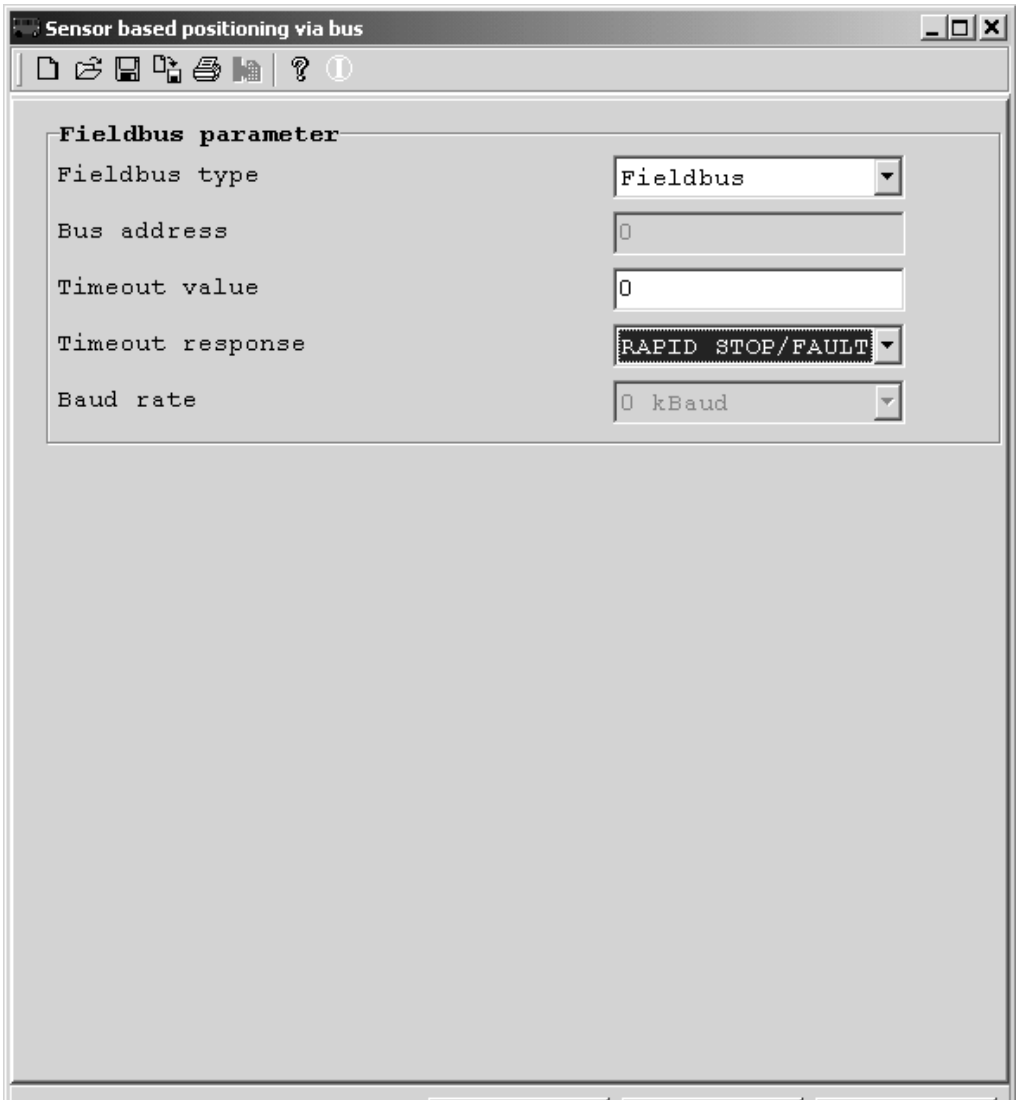

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Figure 13: Setting the fieldbus parameters

You have to make the following settings in this window:

- **Setting the fieldbus parameters:** Set the fieldbus parameters. Fixed parameters are blocked and cannot be changed.

  The system bus (SBus) can always be set; no option is required for this.

  If a fieldbus card (DFP, DFI, DFC, DFD or DFE) is plugged into the fieldbus slot, ROFIBUS, INTERBUS, CAN, DEVICENET or ETHERNET can also be selected.

Setting the distance and speed scaling factors

You can set the scaling factors for distance and speed in this window.

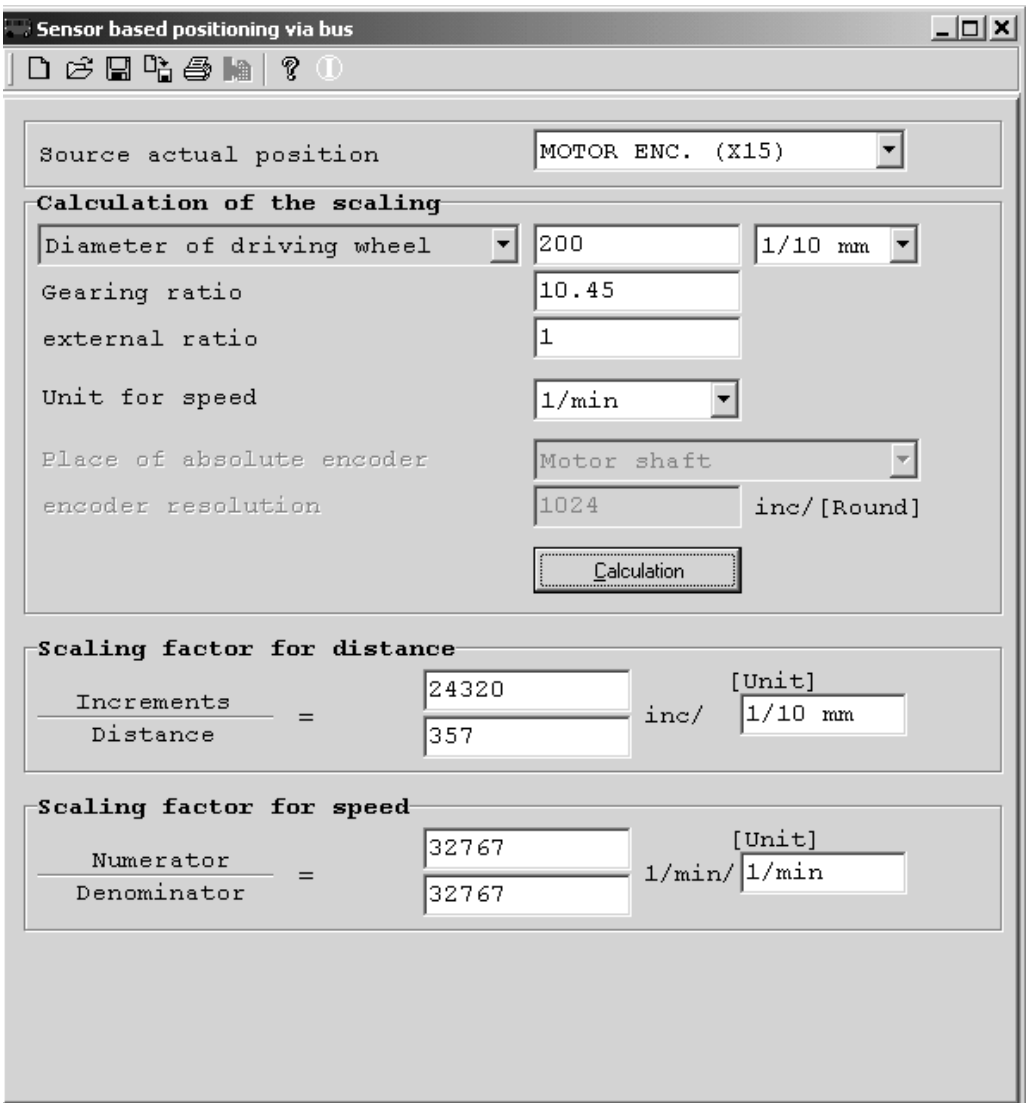

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Figure 14: Setting the scaling

You have to make the following settings in this window:

- **Source actual position selection field:** Select which encoder is to be used for distance measurement in positioning:
  - MOTOR ENCODRE (X15)
  - EXT. ENCODER (X14) with an incremental encoder as the external encoder.
  - ABSOLUTE ENCODER (DIP) with an absolute encoder as the external encoder or on the motor shaft

If you use an absolute encoder, you must start up the DIP11B option **before** you start the "Sensor based positioning via bus" application module.

Calculating the scalung factors

- **Example 1: Motor encoder or absolute encoder on the motor shaft (source actual position)**
  - Choose the unit you require in the selection fields "Diameter of driving wheel" or "Spindle slope" (only for motor encoder). For the unit you can choose from millimeters [mm] or 1/10 millimeters [1/10 mm].
  - In the "Gearing ratio" input field enter the ratio of the gear unit. In the "External ratio" input field enter the gear ratio of the additional gear.
  - In the "Unit for speed" selection field, choose from [mm/s], [m/min] and [1/min]
  - For positioning with an absolute encoder, in the "Place of absolute encoder" selection field, choose "Motor shaft".
  - Click <Calculation>. The "distance" and "speed" scaling factors are calculated by the program.

- **Example 2: External encoder or absolute encoder on the track (source actual position)**

  When using an external encoder or an absolute encoder on the track, you have to calculate the distance scaling factor manually. The scaling factor for the speed can be calculated automatically (→ following section) or manually (→ example 2).

  Automatic calculation of the scaling factor for speed:

  - In the "Source actual position" selection field, select the entry "Motor encoder".
  - Enter a value in the "Diameter of driving wheel" field or the "Spindle slope" field. Select the unit [mm] or [1/10 mm] in the adjacent selection field.
  - In the input box "Gearing ratio" and "External ratio" enter the respective values for the gear ratios.
  - Click <Calculation>. The scaling factor for speed is calculated by the program.

  Calculating the scaling factor for distance:

  - In the "Source actual position" selection field, select the entry "External encoder" or "Absolute encoder". For positioning with an absolute encoder, in the "Place of absolute encoder" selection field, choose the entry "Way".
  - In the group box "Scaling factor for distance", enter the number of pulses supplied by the encoder per travel unit in the "Increments" input field. The unit of the pulses is always increments [inc]. In the "Distance" input field, enter the corresponding track distance.
  - In the "Scaling factor for distance" group box, enter the unit of the scaling factor for the distance in the "Unit" input field. Any other information, such as the software limit switch, reference offset or the target position are specified in the selected unit.

Converting the distance resolution into user travel units

The scaling factor for distance (increments / distance) is used to determine the user travel unit (e.g. mm, revolutions, ft). For positioning with a motor encoder, the scaling factor for distance can be calculated automatically. The following units can be selected for the automatic calculation:

- mm
- 1/10 mm

When using an external encoder or an absolute encoder on the track, you have to calculate the distance scaling factor manually (→ Examples 1 and 2).

Example 1: A drive is to be positioned using an **Absolute encoder on the track**. The speed should be specified in the unit [m/min].

- Drive data:
  - Gear unit ratio (i gear unit) = 12.34
  - Gear ratio of the additional gear (i additional gear) = 1
  - Diameter of the carrying wheel = 200 mm
- Encoder data:
  - Type: Stahltronik WCS3 absolute encoder
  - Physical resolution = 1 increment / 0.8mm
  - Encoder scaling P955 = x8 (→ set automatically during startup of the DIP11B option).
- Automatic calculation of the scaling factor for speed:

  Numerator / denominator = 32759 / 1668 unit [m/min]
- Calculating the scaling factor for distance manually:
  - Electrical resolution = 1 increment / 0.8 mm × P955 encoder scaling
    Result: 1 increment / 0.8 mm × 8 = 8 [inc/0.8 mm]

  Result: Pulses / Distance = 80 / 8 [mm]

Example 2: A drive is to be positioned using an **external encoder on the track**.

- Drive data:
  - Gear unit ratio (i gear unit) = 12.34
  - Gear ratio of the additional gear (i additional gear) = 1
- Encoder data:
  - Physical resolution = 1024 increments / revolution
  - Diameter of the carrying wheel ($d_{carrying\ wheel}$) = 65 mm
  - Encoder scaling P944 = x2
- Calculating the scaling factor for distance manually:
  - Pulses = Number of increments / revolution × 4 × P944
    Pulses = 1024 increments / revolution × 4 × 2 = 8192 increments
  - Distance = $\Pi \times d_{carrying\ wheel}$
    Distance = 3.14 × 65 mm = 204.2 mm

  Result: Pulses / distance = 8192 / 204 unit [mm]

If the numerator (pulses) or denominator (distance) are non-integer values, the conversion can be made more accurate if both numerator and denominator are multiplied by the same expansion factor (e.g. 10, 100, 1000, etc.). This expansion does not limit the maximum travel range. The maximum value for "pulses" or the "distance" is 32767.

Converting the speed into user travel units

In the group box "Calculation of the scaling", choose one of the three entries in the drop-down menu "Unit for speed". The scaling factors can be calculated automatically. The following speed units are available:

- 1/min
- mm/sec
- m/min

If you want to enter the speed in a different unit, you can calculate the scaling factor for speed (→ following example).

Example 1: A drive is to be positioned using an **Absolute encoder on the track**. The speed is to be specified in mm/s.

- Drive data:
  - Gear unit ratio (i gear unit) = 15.5
  - Gear ratio of the additional gear (i additional gear) = 2
  - Diameter of the drive wheel ($d_{drive\ wheel}$) = 200 mm
- Encoder data:
  - Type: Stahltronik WCS2 linear distance measuring system
  - Physical resolution = 0.833 mm ≙ 1.2 increments /mm
  - Encoder scaling P955 = x8 (→ set automatically during startup of the DIP11B option)

- Numerator = $i_{gear\ unit} \times i_{add.\ gear} \times 60$
  Numerator = $15.5 \times 2 \times 60 = 1860$
- Denominator = $\Pi \times d_{drive\ wheel}$ (or spindle slope)
  Denominator = $3.14 \times 200 = 628$
  Unit = mm/s

If the numerator or denominator are non-integer values, the conversion can be made more accurate if both numerator and denominator are multiplied by the same expansion factor (e.g. 10, 100, 1000, etc.). This expansion does not limit the maximum travel range. The maximum value for the numerator or denominator is 32767.

Setting the ramp times and limits

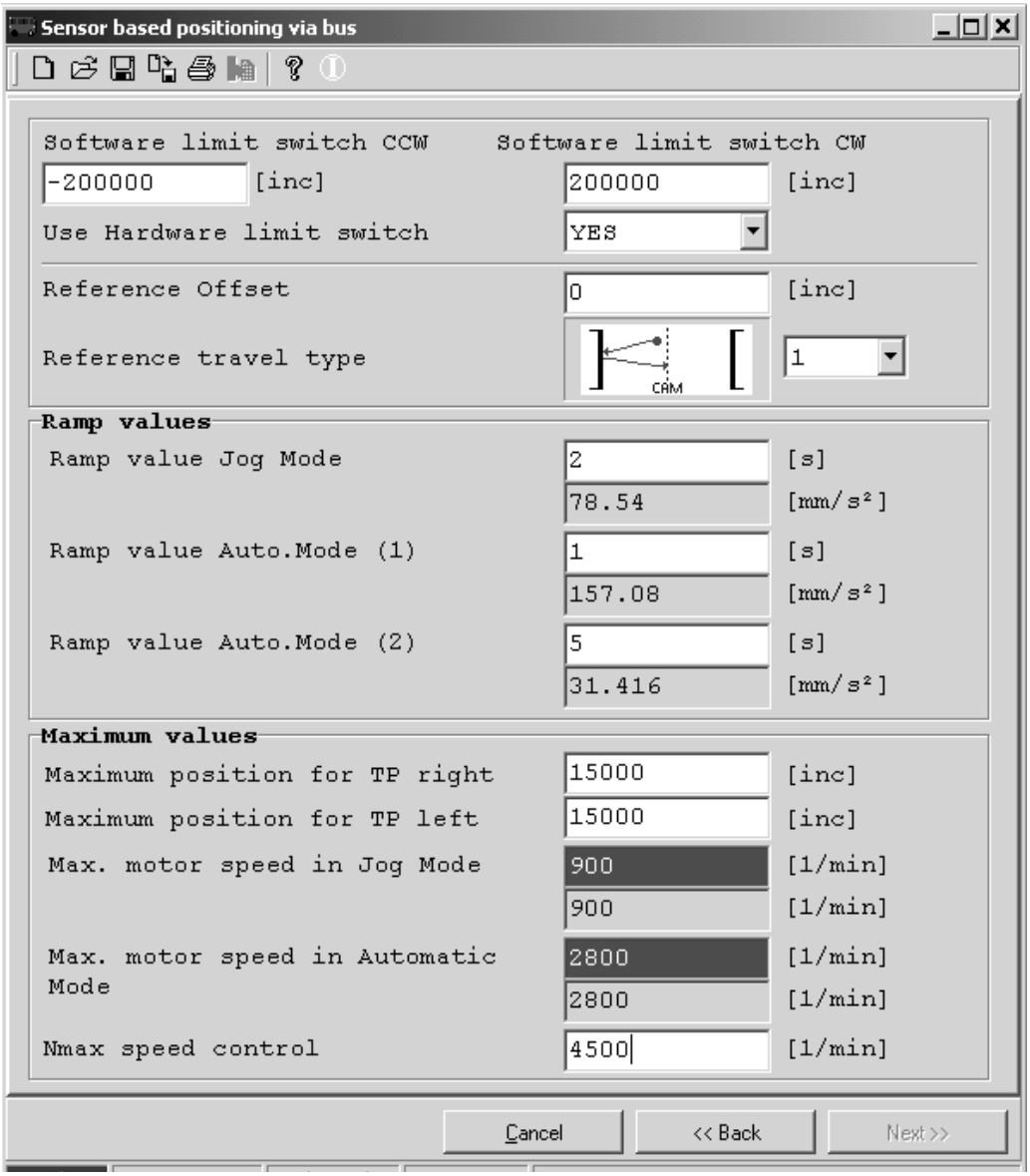

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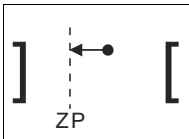
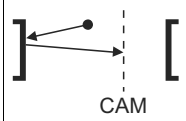
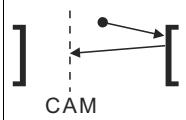
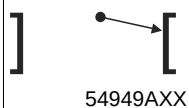
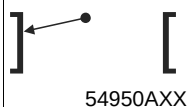
Figure 15: Setting ramp times and limits

In this window, you can enter the position of the software limit switches, the reference offset, the reference travel type, ramp times and limits. The entries are made in the user units of the scaling.

- 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.
- In the "Reference offset" input field, enter the reference offset. The machine zero is corrected using the reference offset. The following formula applies:

  Machine zero = reference position + reference offset

- Select the correct type of reference travel (0 8) from the "Reference travel type" selection box. The reference travel type specifies the reference travel strategy with which the machine zero of a machine should be established. The IPOS$^{plus®}$ variable *H127 ZeroPulse* specifies whether reference travel should react to an edge change of the reference cam ("0") or the following zero pulse of the encoder ("1"). The IPOS$^{plus®}$ variable *H127* can be edited using the IPOS Compiler.

 55260AXX	**Type 0:** The reference position is the first zero pulse left of the starting position of the reference travel.
 54947AXX	**Type 1:** The reference position is the left end of the reference cam. Machine zero = reference position + reference offset H127 = "1" Referencing to encoder zero pulse H127 = "0" Referencing to edge change
 54948AXX	**Type 2**: The reference position is the right end of the reference cam. Machine zero = reference position + reference offset H127 = "1" Referencing to encoder zero pulse H127 = "0" Referencing to edge change
 54949AXX	**Type 3**: The reference position is the right hardware limit switch. No reference cam is required. After leaving the hardware limit switch (positive edge), the drive continues to move clear of it by 4096 increments. Machine zero = reference position + reference offset – 4096
 54950AXX	**Type 4**: The reference position is the left hardware limit switch. No reference cam is required. After leaving the hardware limit switch (positive edge), the drive continues to move clear of it by 4096 increments. Machine zero = reference position + reference offset + 4096
 54951AXX	**Type 5**: No reference travel. The reference position is the current position without reference to a zero pulse. Machine zero = current position + reference offset
 54952AXX	**Type 6**: The reference position is the left end of the reference cam. Machine zero = reference position + reference offset
 54953AXX	**Type 7**: The reference position is the left end of the reference cam. Machine zero = reference position + reference offset
 54951AXX	**Type 8**: No reference travel. The reference position is the current position without reference to a zero pulse. In contrast to type 5, type 8 reference travel can also be performed when the system status is not set to "A". Machine zero = current position + reference offset

Setting the ramp times in jog and automative mode

- In the "Ramp values" group box, enter the ramp times in the input fields "Ramp value jog mode" and "Ramp value auto.mode (1) and (2)". Bit 15 in process output data word 1 is used to change between ramp 1 and ramp 2 in automatic mode. The corresponding acceleration is displayed in the unit [mm/s^2].

The ramp time always refers to a speed of 3000 min^{-1}.

For a ramp time of 1 s the drive would be accelerated to a speed of 1500 min^{-1} in 500 ms.

Setting the limits

- **Limiting the maximum travel distance:** In "Automatic mode", you have to enter the maximum travel distance for movement to the right or left to position the drive in the modes "Remaing travel right" or "Remaining travel left".

  Enter both values without signs in the "Maximum values" group box in the input fields "Maximum position for TP right" and "Maximum position for TP left". The values are processed in the positioning mode to determine the target position when the travel strategy "Remaining travel right" or "Remaining travel left" is selected.

  The maximum travel distance is the position at which the drive stops when a touch probe signal is not detected and the option "Endless positioning" (Bit 10 "Endless-Pos" in the control word) has not been activated. The numerical value is evaluated as "Cycle distance". Reference position is the current position (= setpoint position) prior to the positive edge change at the "Start bit".

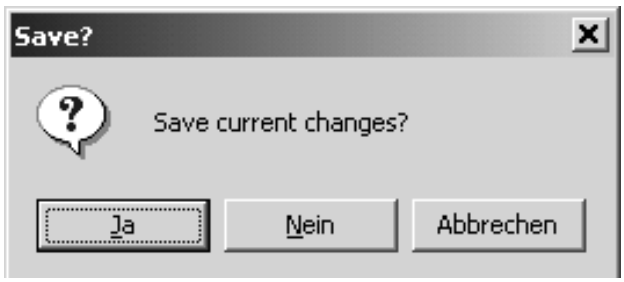
  Target position = setpoint position ± maximum travel distance right

- The drive only stops at the maximum travel distances if "Endless positioning" (Bit 10 "Endlesspos" in control word) in the "Remaining travel right" or "Remaining travel left" modes is not activated. The "Endless positioning" option is only available with MOVIDRIVE® MDX61B!
- If a positive edge is detected at sensor input DI02, a new target positiong is calculated. The target position can exceed the maximum travel distance right/left if the sensor is placed before the position of the maximum travel distance or if the sensor is faulty. In this case, the drive would move past the maximum travel distance.

- **Speed limits:** In the "Maximum values" group box, enter the maximum speeds:
  - For jog mode, enter the speed in the "Max. motor speed in Jog mode" input field
  - For automatic mode, enter the speed in the "Max. motor speed in Automatic Mode" input field
  - For speed control, enter the speed in the "Nmax speed control" input field.

  The speed values for automatic mode and jog mode must be at least 10 % less than for the speed controller (P302 Maximum speed 1).

Click on <Next> when you have entered all the values you require.



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Click <Yes> to save the startup data.

Download

The download window appears after the settings have been saved.

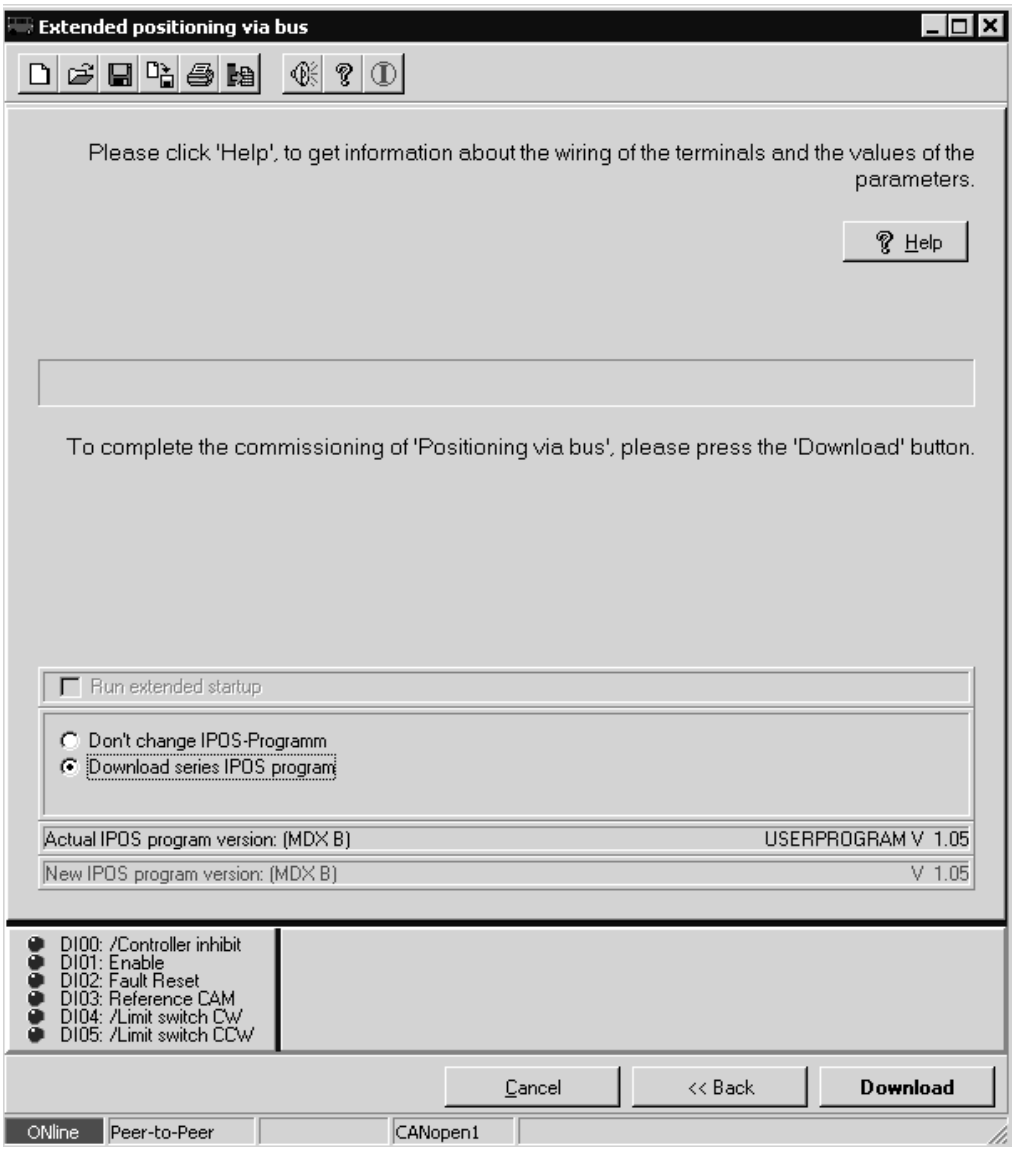

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Figure 16: Download window

Click the <Download> button. All the required settings are made automatically in the inverter, and the IPOS$^{plus®}$ program for "Sensor based positioning via bus" is started.

After the download, the program asks you if you want to start the monitor. In the monitor, you can run a diagnostic of your application and check the control signals.

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Figure 17: Start monitor: Yes/No

Select <Yes> to switch to the monitor where you can start in the required operating mode. Select <No> to switch to MOVITOOLS/Shell.

Monitor

If "Sensor based positioning via bus" is started **after** the startup procedure has been performed, the monitor appears immediately.

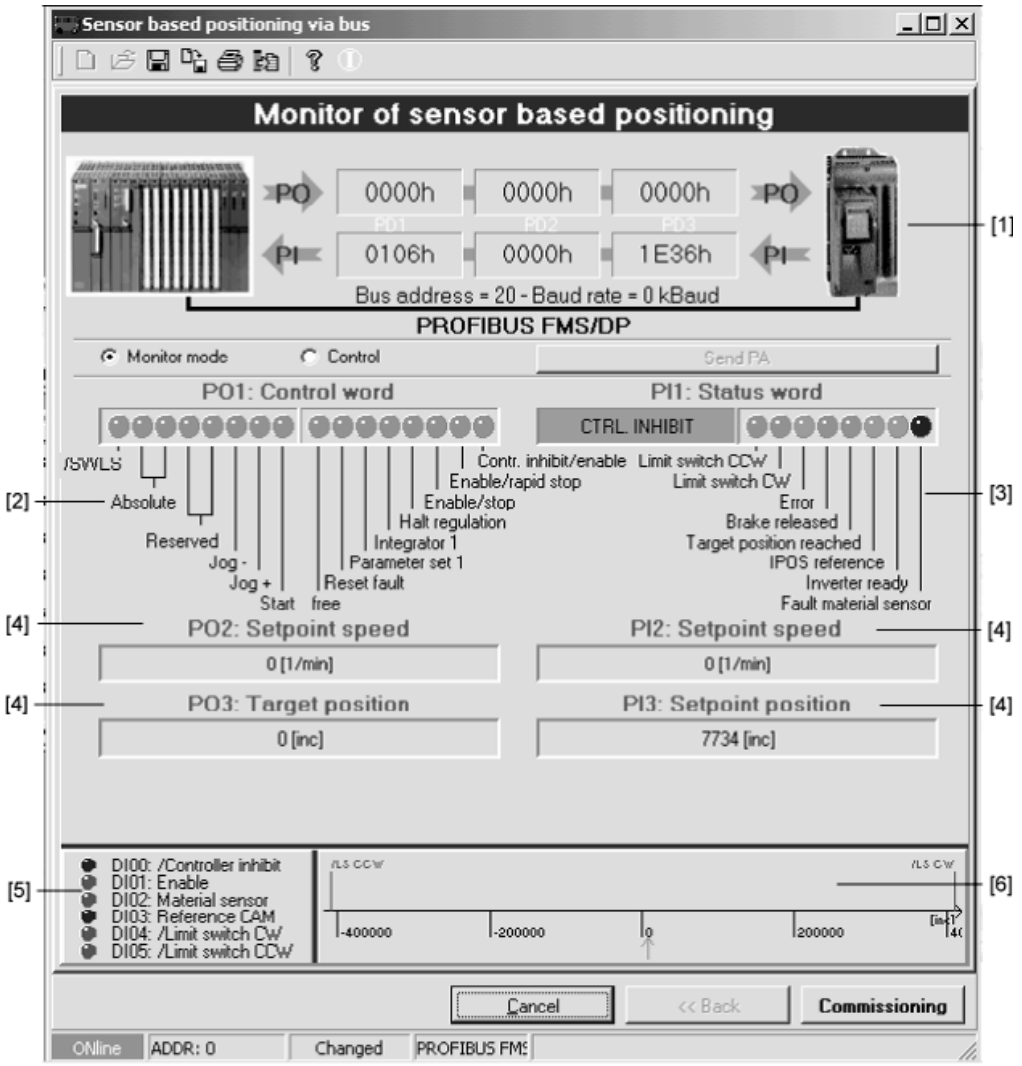

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Figure 18: Monitor for sensor based positioning via bus

[1] Process data communication (PI, PO) in hexadecimal format

[2] PO1 control word 2, decoded into individual bits

[3] PI1 status word, decoded into individual bits

[4] Process data in decimal format and with user units

[5] Status of the binary inputs of the basic unit

[6] Position of the software limit switches and current position of the drive

Repeated startup

Press <Startup> if you want to repeat startup. A window appears in which you can enter the settings for the fielbus parameters (→ Section "Setting fieldbus parameters").

5.4 Parameters and IPOS$^{plus®}$ variables

The following parameters and IPOS$^{plus®}$ variables are set automatically during startup and are loaded into the inverter during the download:

Parameter number P...	Index	Description	Value
100	8461	Setpoint source	Fieldbus
101	8462	Control signal source	Fieldbus
302		Maximum speed 1	Can be set in the interface
600	8335	Binary input DI01	Enable/Rapid stop
601	8336	Binary input DI02	No function
602	8337	Binary input DI03	Reference cam
603	8338	Binary input DI04	/Right limit switch
604	8339	Binary input DI05	/Left limit switch
605	8919	Binary input DI06 (MDX61B only)	No change
606	8920	Binary input DI07 (MDX61B only)	No change
610	8340	Binary input DI10	No function
611	8341	Binary input DI11	
612	8342	Binary input DI12	
613	8343	Binary input DI13	
614	8344	Binary input DI14	
615	8345	Binary input DI15	
616	8346	Binary input DI16	
617	8347	Binary input DI17	
620	8350	Binary output D001	/Fault
621	8351	Binary output D002	Ready
630	8352	Binary output D010	No function
631	8353	Binary output D011	
632	8354	Binary output D012	
633	8355	Binary output D013	
634	8356	Binary output D014	
635	8357	Binary output D015	
636	8358	Binary output D016	
637	8359	Binary output D017	
700	8574	Operating mode	... & IPOS
813	8600	SBus address	Can be set in the interface
815	8602	SBus timeout delay	
816	8603	SBus baud rate	
819	8606	Fieldbus timeout delay	
831	8610	Response fieldbus timeout	
836	8615	Response SBus timeout	

Parameter number P...	Index	Description	Value
870	8304	Setpoint description PO1	Control word 2
871	8305	Setpoint description PO2	IPOS PO-DATA
872	8306	Setpoint description PO3	
873	8307	Actual value description PI1	
874	8308	Actual value description PI2	
875	8309	Actual value description PI3	
876	8622	PO data enable	ON
900	8623	Reference offset	Can be set in the interface
903	8626	Reference travel type	
941		Source actual position	

IPOS$^{plus®}$ variable	Description
H1	Max. motor speed in automatic mode
H2	Max. motor speed in jog mode
H3	Scaling factor for distance numerator
H4	Scaling factor for distance denominator
H5	Scaling factor for speed numerator
H6	Scaling factor for speed denominator
H7	Ramp 1 automatic mode
H8	Ramp for jog mode
H16	Ramp 2 automatic mode
H17	Maximum travel distance right (INCR)
H18	Maximum travel distance left (INCR)
H102	Drive wheel diameter (x1000)
H103	Gear ratio (x1000)
H104	Additional gear ratio (x1000)
H115	SwitchSBUS
H125	Pointer to Scope variable H474
H126	Pointer to Scope variable H475
H127	Referencing to encoder zero pulse
H496 SLS_right	Software limit switch right (INCR)
H497 SLS_left	Software limit switch left (INCR)
H503 TpPos1_Abs	Position (DIP) at time of touchprobe signal
H506 TpPos1_Ext	Position (X14) at time of touchprobe signal
H507 TpPos1_Mot	Position (X15) at time of touchprobe signal
H509 ActPos_Abs	Actual position DIP
H510 ActPos_Ext	Actual position X14
H511 ActPos_Mot	Actual position X15
H1002	ScopeDelay

Do not alter these parameters and IPOS$^{plus®}$ variables after startup!

5.5 Recording IPOS$^{plus®}$ variables

IPOS$^{plus®}$ variables can be recorded during operation using the "Scope" program in MOVITOOLS® This is only possible for the MOVIDRIVE® MDX61B inverter.

The two 32-Bit IPOS$^{plus®}$ variables *H474* and *H475* are available for recording. Two pointer variables (H1000/H1001) to *H474* and *H475* can be used to record any IPOS$^{plus®}$ variable using the "Scope" program:

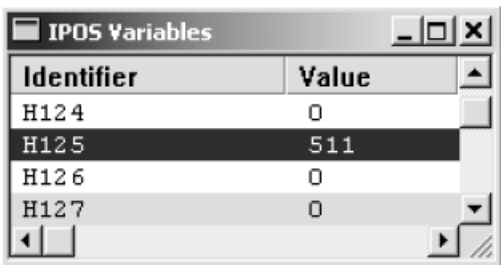
- H1000 → Scope474Pointer
- H1001 → Scope475Pointer

The number of the IPOS$^{plus®}$ variable that is to be recorded in "Scope" must be entered in the variable window of the IPOS Assembler or Compiler in one of the pointer variables H1000 or H1001.

Example

The IPOS$^{plus®}$ variable *H511 Current motor position* is to be recorded. Proceed as follows:

- In the "Scope" program, enter the value 511 in variable H1000 in the variable window.



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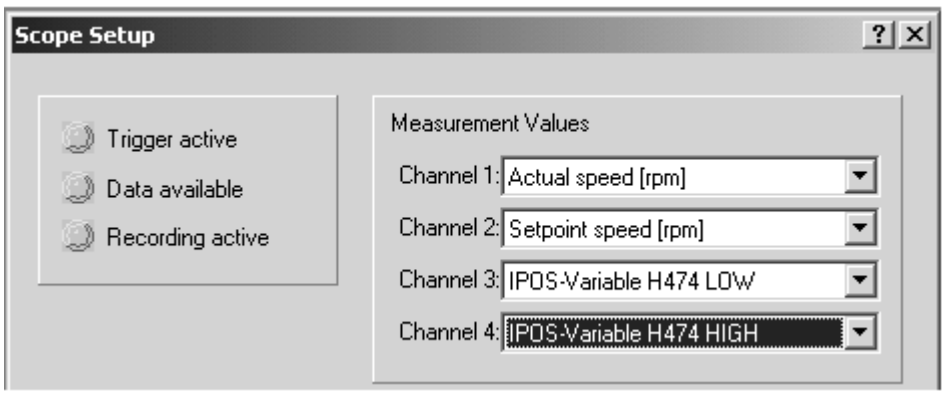
- In the "Scope" program, choose [File] / [New]. Set channel 3 to *IPOS variable H474 LOW* and channel 4 to *IPOS variable H474 HIGH*. The "Scope" program now records the value of the IPOS$^{plus®}$ variable H511.



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- The pointer variables are copied to the IPOS$^{plus®}$ H474 or H475 variables in TASK3 of the IPOS$^{plus®}$ program.
- The speed (commands / ms) of task 3 is dependent on the processor utilization of MOVIDRIVE MDX61B.
- The time (ms) required in task 3 to copy the values from the pointer variable to the IPOS$^{plus®}$ variables H474 or H475 is contained in variable H1002. If the value is zero, the copy process lasts less than 1 ms.

6 Operation and Service

6.1 Starting the drive

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

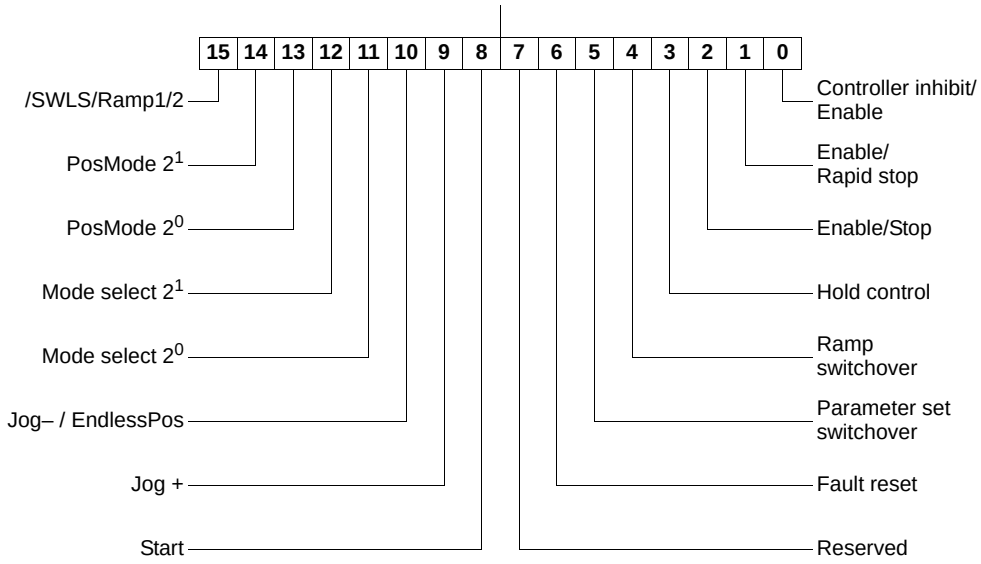
Note the following points to start the drive. This procedure applies to all operating modes:

- Binary inputs DIØØ "//CONTROLLER INHIBIT//" and DIØ3 "ENABLE/RAPID STOP/ must have a "1" signal.
- **For control via fieldbus or system bus:** 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

The process output data word 1 (PO1) has the following assignment:

- PO1: Control word 2



The "Endless positioning" option (Bit 10:EndlessPos) in the /Remaining travel right/left" modes and the "Moving clear of the software limit switches" in jog mode ((Bit 15:/SWLS) are only available with MOVIDRIVE® MDX61B.

Operating mode	PO:Bit 12 (Mode selection 2^1)	PO:Bit 11 (Mode selection 2^0)
Invalid mode	"0"	"0"
Jog mode	"0"	"1"
Referencing mode	"1"	"0"
Automatic mode	"1"	"1"

Positioning mode	PO:Bit 14 (Mode selection 2^1)	PO:Bit 13 (Mode selection 2^0)
Absolute	"0"	"0"
Relative	"0"	"1"
Remaining travel right	"1"	"0"
Remaining travel left	"1"	"1"

- **Jog mode**
  - The drive can be moved to the left or right using PO1:Bit 9 and PO1: Bit10.
  - The speed is specified in PO2 set speed.

- **Referencing mode**
  - Reference travel is started with PO1:Bit 8.
  - Reference travel establishes the reference point (machine zero) for absolute positioning operations.
  - The following formula applies: Machine zero = reference position + reference offset

- **Automatic mode**

  There are four positioning options in automatic mode:
  - Absolute
  - Relative
  - Remaining travel right after detection of a sensor signal
  - Remaining travel left after detection of a sensor signal

  If a MOVIDRIVE® MDX61B is used, the "Endless positioning" option can also be activated in the "Remaining travel right" or "Remaining travel left" positioning modes

  Positioning is started with PO1:Bit 8. The controller specifies the setpoint speed via PO2 and the setpoint position via PO3.

  The inverter sends the actual speed via PI2 and the actual position via PI3 to the controller.

  The ramps set for the automatic mode during startup can be changed over using PO1:Bit 15.

6.2 Monitor mode

The "sensor based positioning via bus" monitor mode displays the data that is transmitted via the fieldbus. The process input and output data are read in cyclically and displayed in hexadecimal format.

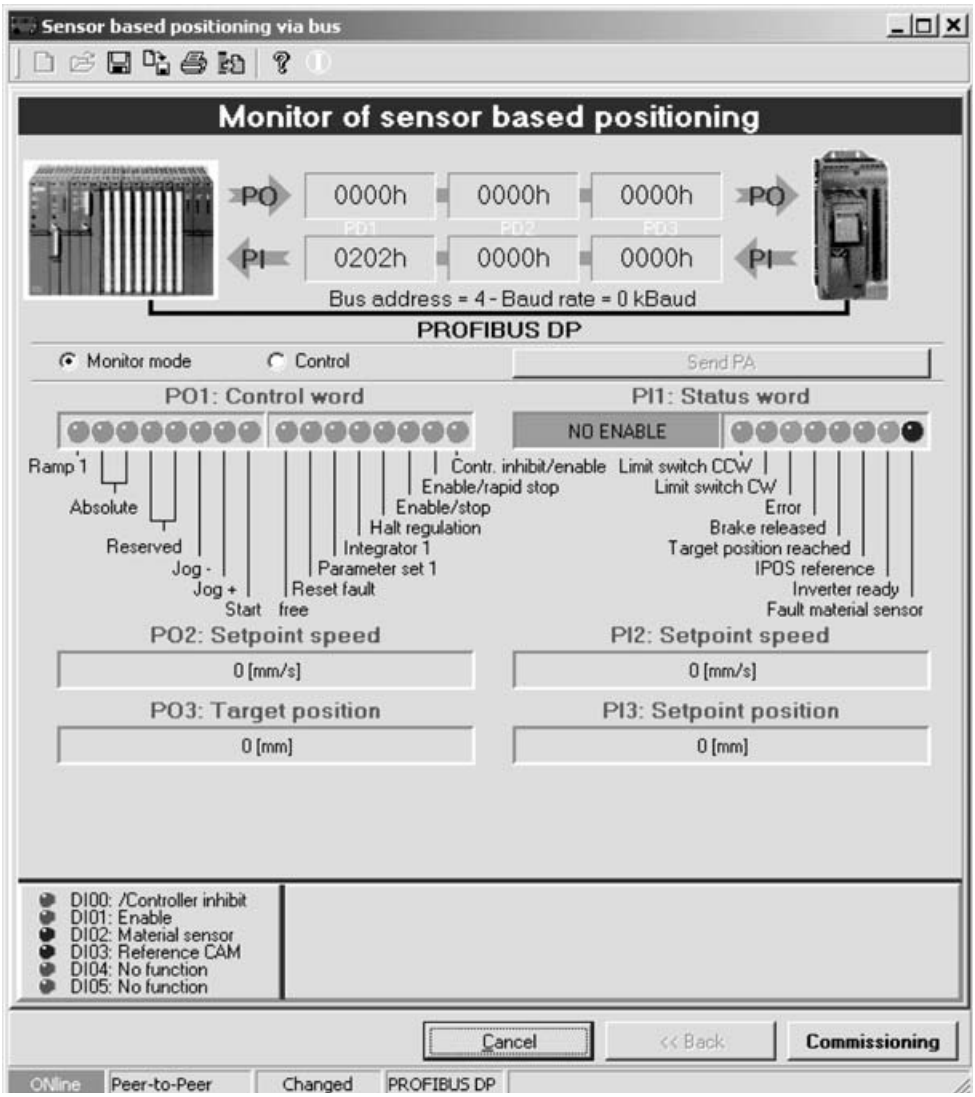


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Figure 19: Monitor mode

- The process input and output data is displayed in the middle of the window.
- You can change the control source by marking the radio button "Monitor" or "Control":
  - Monitor: The process data is read from a higher-level controller via fieldbus.
  - Control: The process data is specified using a PC. The drive can be controlled without a higher-level controller with a PC. You can use the mouse to set or delete the individual bits in control word PO1. You have to enter the values in the input fields PO2 "Setpoint speed" and PO3 "Target position" as numerical values. To send the process data to the inverter, click the <Send PO> button.

6.3 Jog mode

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

You can use the jog mode when the unit is serviced to move the drive independently of the automatic mode. No reference travel is required beforehand.

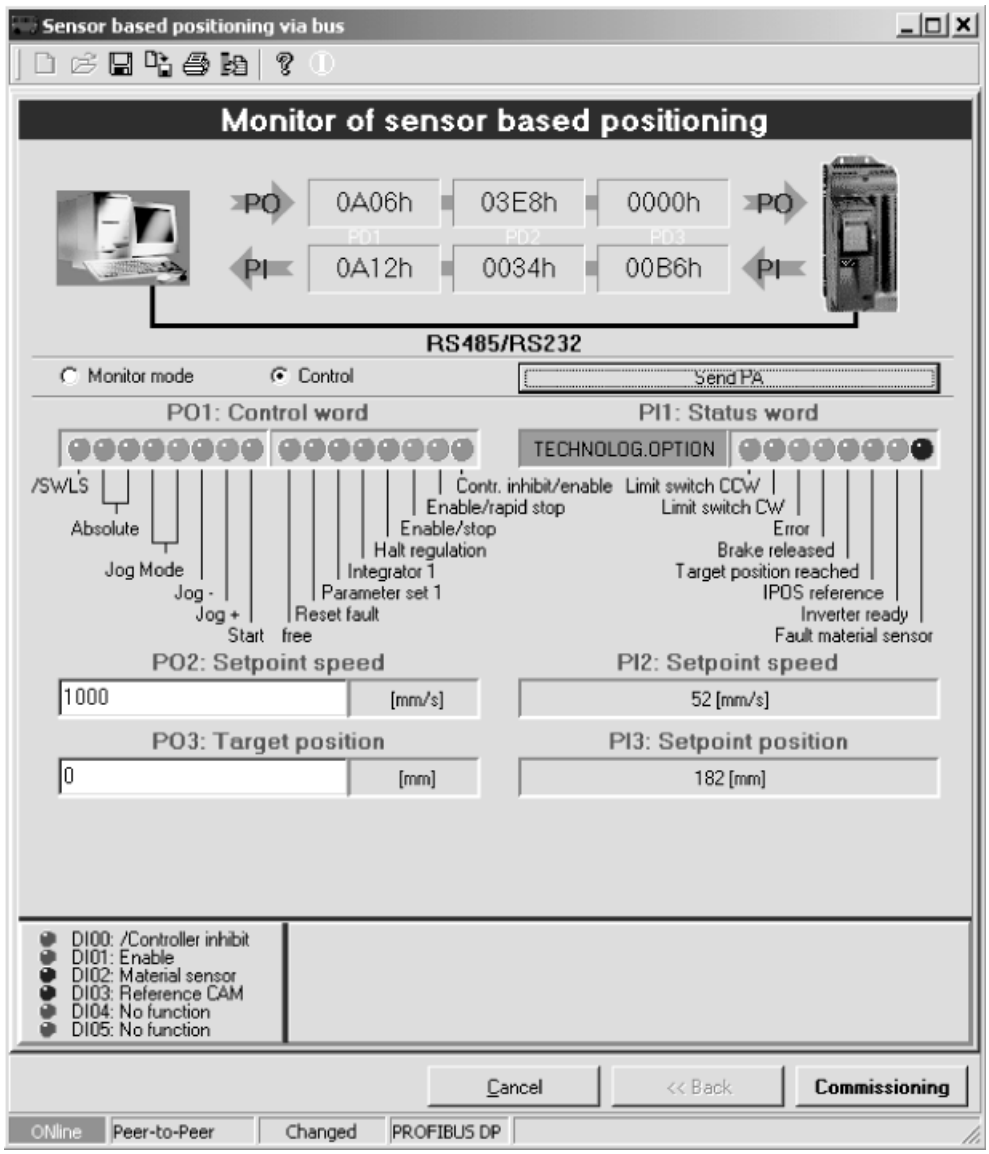

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Figure 20: Jog mode

- Start the drive by setting the control bit PO1:9 "Jog +" or PO1:10 "Jog–". This means you can move the drive in both directions. If the setting "Jog +" or "Jog –" is deleted, the drive stops.
- The speed is specified via PO2:Setpoint speed.

Please also refer to the information in the section "Software limit switches".

6.4 Referencing mode

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

The reference position is defined by reference travel (e.g. to one of the two hardware limit switches).

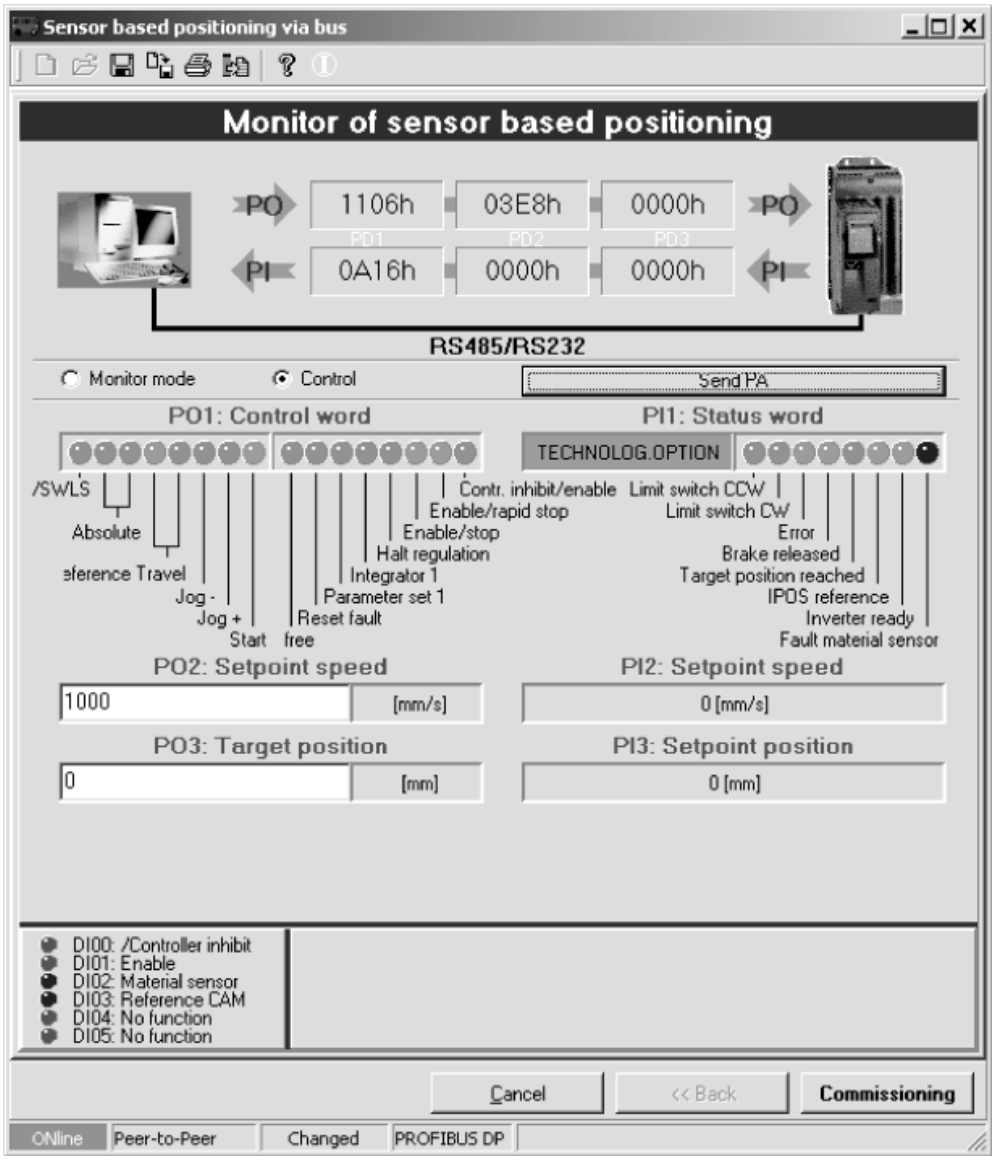

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Figure 21: Referencing mode

- Ensure that you have set the correct reference travel type (P903) **before starting** reference travel. If this is not the case, restart the startup procedure and set the required type of reference travel.
- Set PO1:8 "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, PI1:2 "IPOS reference" is set. The "1" signal at PO1:8 "Start" can now be revoked. The drive is now referenced.
- You can set the speeds for reference travel in parameters P901 and P902.

- The stop ramp (P136) is used for reference travel. If reference travel is interrupted by revoking the start bit, positioning ramp 1 (P911) is used.
- If referencing is set to the hardware limit switches (type 3 and 4), the drive continues to turn for 4096 increments after leaving the hardware limit switch.
- Please also refer to the information in the section "Software limit switches".

6.5 Automatic mode

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

Four different positioning modes can be selected with PO1:13 and PO1:14:

- Absolute (PO1:13 = "0" and PO1:14 = "0")
- Relative (PO1:13 = "1" and PO1:14 = "0")
- Remaining travel right (PO1:13 = "0" and PO1:14 = "1")
- Remaining travel left (PO1:13 = "1" and PO1:14 = "1")

Absolute positioning mode

In the "Absolute" positioning mode, the drive can be positioned absolutely based on the machine zero point (reference position). The axis must be reference:

1. The target position is specified via PO3, the speed is specified via PO2.
2. You can switch between the two positioning ramps entered during startup using PO1:15.
3. If the ramp function (P916) is set to "LINEAR" or "JERK LIMITED", you can change the speed and ramp time while the drive is moving. With all other ramp types, you can only change the speed and the ramp time when the drive is at standstill or if the axis is not enabled.

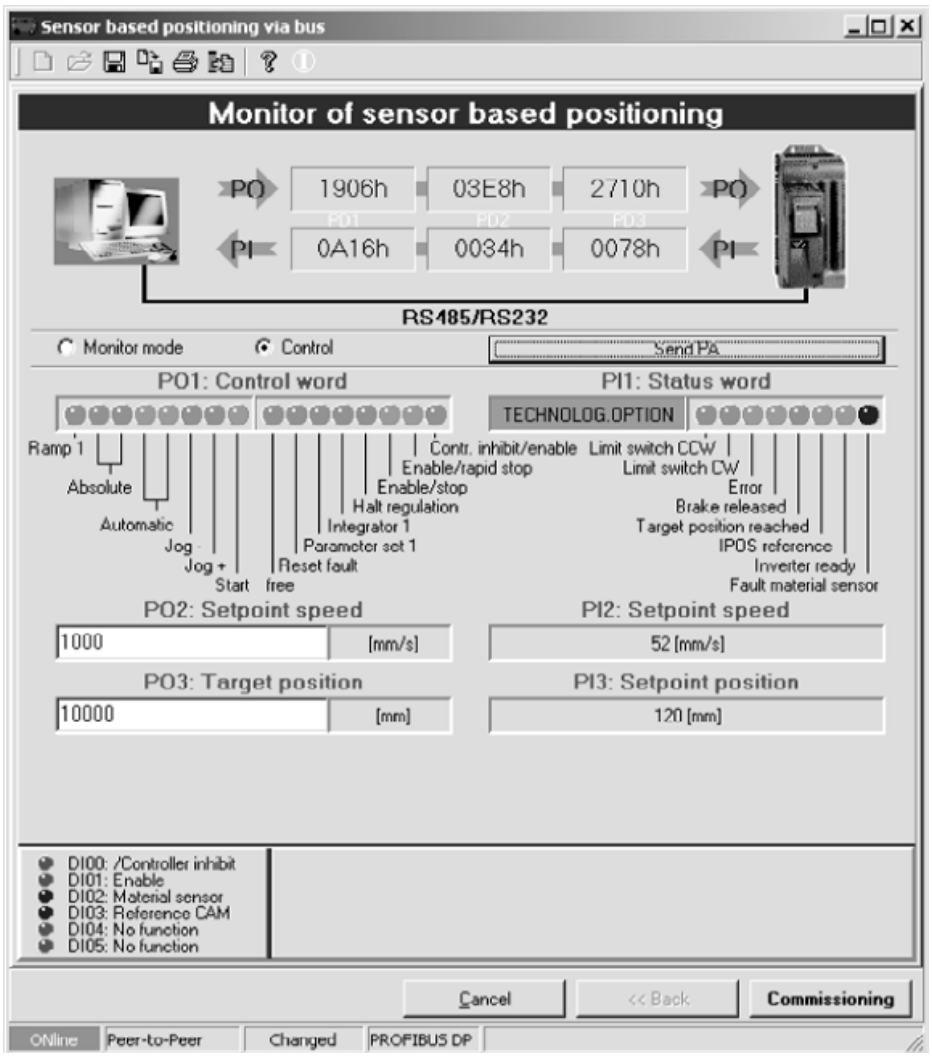

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Figure 22: Automatic operation in absolute positioning mode

- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.
- Once positioning has been completed successfully, PI1:3 "Target position reached" is set. The drive comes to a standstill subject to position control.
- The drive moves immediately to a new position if control bit PO1:8 "Start" is set and a new target position is specified via PO3.

Relative positioning mode

In the "Relative" positioning mode, you can move the drive by the position specified in PI3 relative to the current position (= setpoint position). Example: Cyclical operation with a conveyor belt.

1. The cycle distance is specified via PO3, the speed is specified via PO2.
2. You can switch between the two positioning ramps entered during startup using PO1:15.
3. If the ramp function (P916) is set to "LINEAR" or "JERK LIMITED", you can change the speed and ramp time while the drive is moving. With all other ramp types, you can only change the speed and the ramp time when the drive is at standstill or if the axis is not enabled.

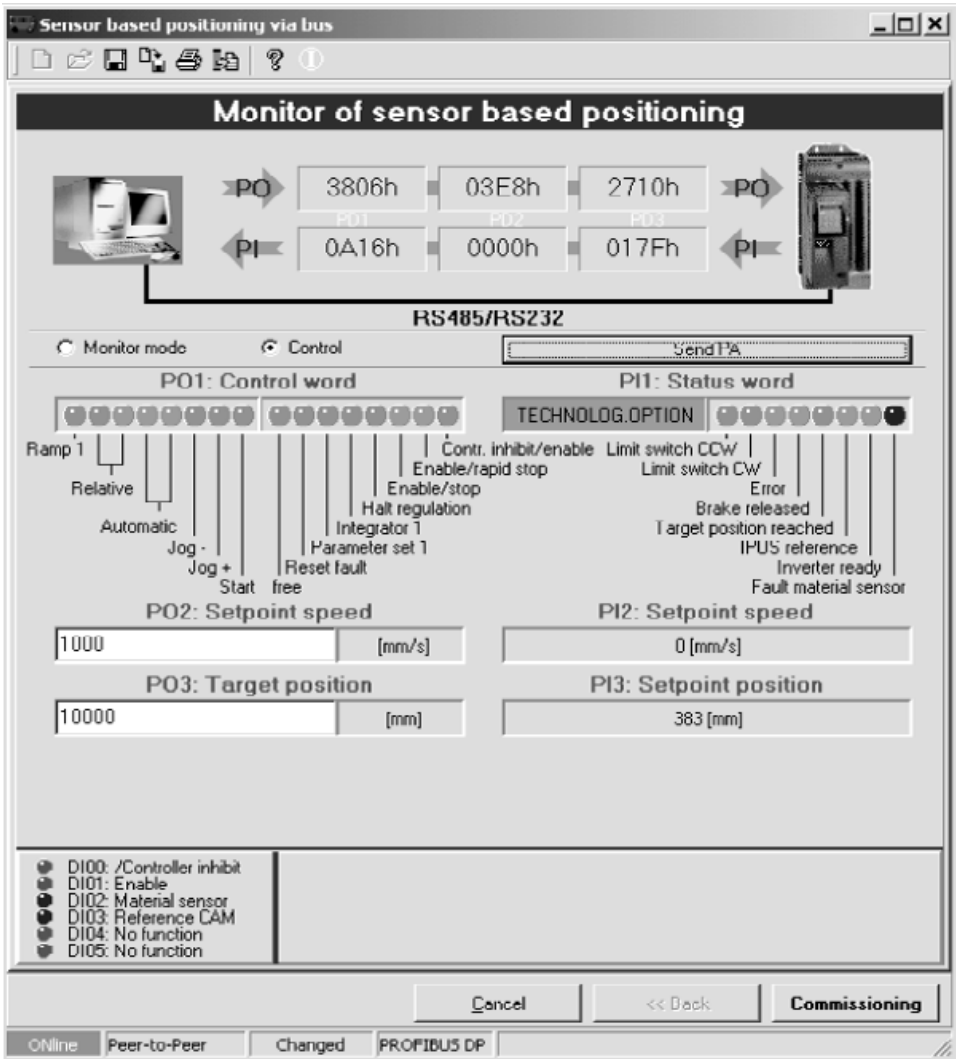

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Figure 23: Automatic operation in relative positioning mode

- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.
- The target position is calculated with the positive edge at PO1:8 "Start". The target position specified in PO3 is calculated relative to the current position (= setpoint position). In this case, a positive sign produces movment to the right, a negative sign produces movement to the left. Once the drive has reached the required position, bit PI1:3 "Target position reached" is set in the status word. The drive comes to a standstill subject to position control.
- The position sent to PO3 is the relative distance traveled.
- Bit PO1:8 "Start" must be toggled to perform a new cycle once the target position has been reached. The actual position is reset to "0".
- A machine cycle can be interrupted by deleting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel right → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

- The new target postion for the next cycle is only calculated when the bit PI1:3 "Target position reached" is set when the "Start" bit is changed from "1" to "0" and the drive is enabled (caution when the drive overshoots).
- Also refer to the cycle diagrams in the section "Operation and service".

Remaining travel right

PO1:14 = "1", PO1:13 = "0", PO1:12 = "1" and PO1:11 = "1"

In the "Remaining travel right" positioning mode, you can position the drive by a specified remaining distance once a sensor has been triggered.

- The remaining distance is specified via PO3, the speed is specified via PO2.
- You can switch between the two positioning ramps entered during startup using PO1:15.
- If the ramp function (P916) is set to "LINEAR" or "JERK LIMITED", you can change the speed and ramp time while the drive is moving. With all other ramp types, you can only change the speed and the ramp time when the drive is at standstill or if the axis is not enabled.
- In the "Remaining travel right" positioning mode, there are **two different strategies** if the sensor input is not attenuated after the axis is started: that is, if a positve edge is not detected at DIO2:
  1. The axis stops when it reaches the position "Maximum travel distance TP right".
  2. Only with MOVIDRIVE® MDX61B: Axis moves "endlessly" in one direction as long as a "1" signal is present at PO1:8 "Start".

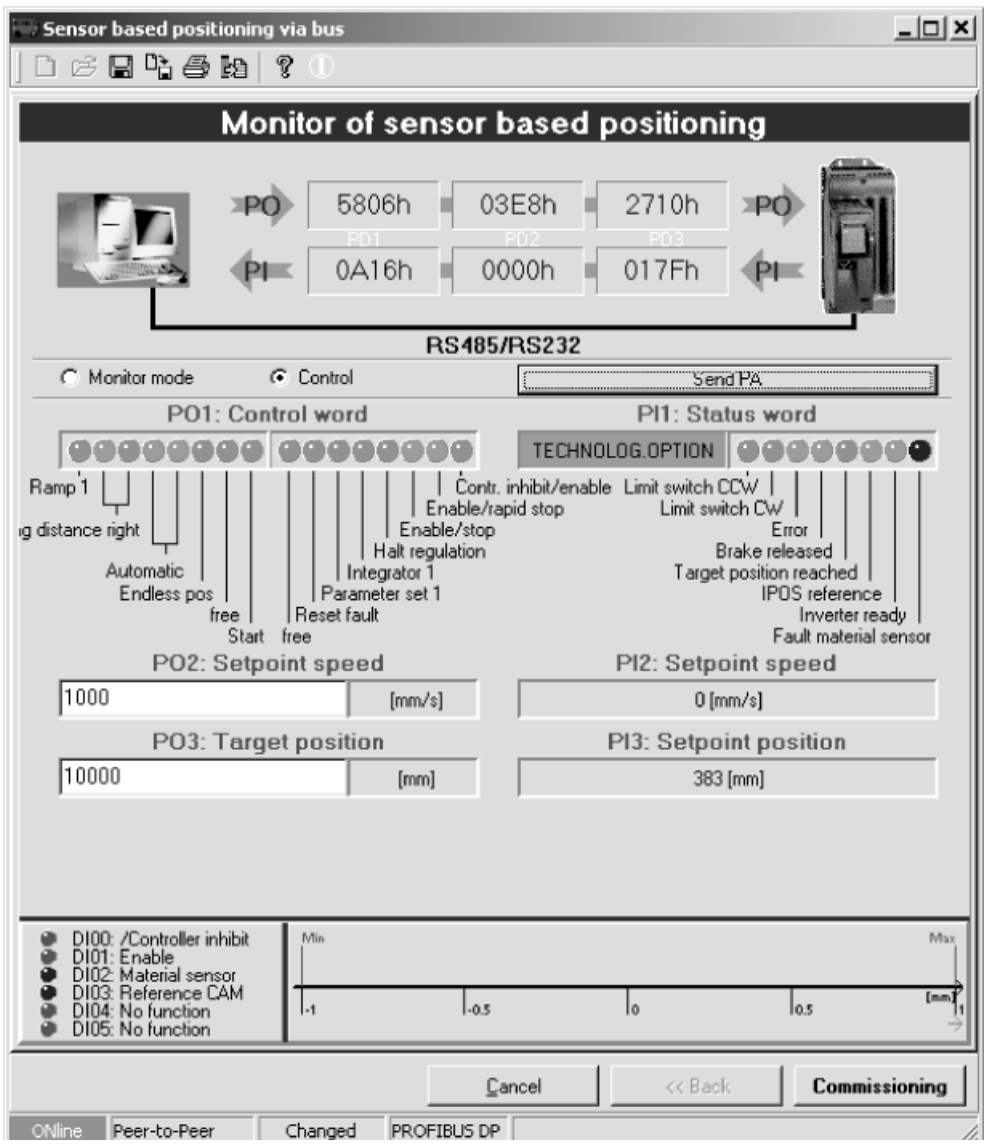

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Figure 24: Automatic operation in remaing travel right positioning mode

Strategy 1 "Maximum position for TP right"

- PO1:14 = "1", PO1:13 = "0", PO1:12 = "1", PO1:11 = "1" and PO1:10 = "0"
- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.

Example 1: No edge change at DIO2 - Sensor (touchprobe) does not trigger

- The drive moves to the target position and remains there subject to position control.

  Target position = "Setpoint position at start signal" + "Maximum position for TP right"
- The bits PI1:0 "Fault material sensor" and PI1:3 "Target position reached" are set. The "Fault material sensor" bit signals to the master controller that the touch probe input has not been attenuated and the drive has reached the maximum position specified at startup.
- When a negative edge is detected at PO1:8 "Start", the current position PI3 is reset and a new target position is calculated. Bit PO1:0 "Fault material sensor" is reset and a new cycle begins.

The new target postion for the next cycle is only calculated when the bit PI1:3 "Target position reached" is set when an edge change ("1" → "0") is detected for bit PO1:8 "Start" and the drive is enabled (caution when the drive overshoots).

- A machine cycle can be interrupted by deleting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel right → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

Example 2: Edge change at DIO2 - Sensor (touchprobe) triggers

- The drive moves to the target position and remains there subject to position control.

  Target position = "Setpoint position at start signal" + "Remaining distance (PO3)"
- Once the drive has reached its target position, bit PI1:3 "Target position reached" is set.
- When a negative edge is detected at PO1:8 "Start", the current position PI3 is reset and a new target position is calculated.

The new target postion for the next cycle is **only** calculated when the bit PI1:3 "Target position reached" is set when an edge change ("1" → "0") is detected for bit PI1:8 "Start" and the drive is enabled (caution when the drive overshoots).

- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel right → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

- If the sensor is placed just before the position "Maximum position for TP right" or if the sensor outputs a positive edge at DIO2 due to a fault just before reaching the maximum position, then the calculated target position can be positioned after the "Maximum position for TP right". The drive would then move past the "Maximum position for TP right". If you do not want this to happen, this special case must be prevented by using additional hardware or software limit switches.
- If a "short" remaining distance is specified when the drive is traveling at high speed over a long ramp, the drive can change its direction of rotation and move back to the specified target position (remaining travel).
- Also refer to the cycle diagrams in the section "Operation and service".

Strategy 2 "Endless positioning" (only for MOVIDRIVE® MDX61B)

The endless positioning option is only available for positioning with a motor encoder or an external encoder. For positioning with an absolute encoder, the bit PO1:10 "Endless-Pos" is not evaluated.

- PO1:14 = "1", PO1:13 = "0", PO1:12 = "1", PO1:11 = "1" and PO1:10 = "1"
- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.

Example 1: No edge change at DIO2 - Sensor (touchprobe) does not trigger

- The drive moves endlessly in a clockwise direction as long as bit PO1:8 is set. The actual position in PI3 switches between the positions "Maximum position for TP right" and "Maximum position for TP left" specified at startup. The bit PI1:0 "Fault material sensor" is not set.
- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel right → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

Example 2: Edge change at DIO2 - Sensor (touchprobe) triggers

- The position at PO3 is read when the touch probe signal is detected (TP event) and a new target position is calculated.

  Target position = "Setpoint position at TP event" + "Remaining distance (PO3)"
- Once the drive has reached the new target position, the bit PI1:3 "Target position reached" is set.
- When a negative edge is detected at PO1:8 "Start", the current position PI3 is reset and a new target position is calculated. A new cycle begins.

The new target postion for the next cycle is **only** calculated when the bit PI1:3 "Target position reached" is set when an edge change ("1" → "0") is detected for bit PO1:8 "Start" and the drive is enabled (caution when the drive overshoots).

- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) , the positioning mode (e.g. remaining travel right → relative) or the travel strategy during one cycle (at least 50 ms). The drive must be enabled for this purpose.

- If a "short" remaining distance is specified when the drive is traveling at high speed over a long ramp, the drive can change its direction of rotation and move back to the specified target position (remaining travel).
- Also refer to the cycle diagrams in the section "Operation and service".

Remaining travel left positioning mode

PO1:14 = "1", PO1:13 = "1", PO1:12 = "1" and PO1:11 = "1"

In the "Remaining travel left" positioning mode, you can position the drive by a specified remaining distance once a sensor has been triggered.

- The remaining distance is specified via PO3, the speed is specified via PO2.
- You can switch between the two positioning ramps entered during startup using PO1:15.
- If the ramp function (P916) is set to "LINEAR" or "JERK LIMITED", you can change the speed and ramp time while the drive is moving. With all other ramp types, you can only change the speed and the ramp time when the drive is at standstill or if the axis is not enabled.
- In the "Remaining travel left" positioning mode, there are **two different strategies** if the sensor input is not triggered after the axis is started: that is, if a positve edge is not detected at DIO2:
  1. The axis stops when it reaches the position "Maximum position for TP right".
  2. Only with MOVIDRIVE® MDX61B: Axis moves "endlessly" in one direction as long as a "1" signal is present at PO1:8 "Start".

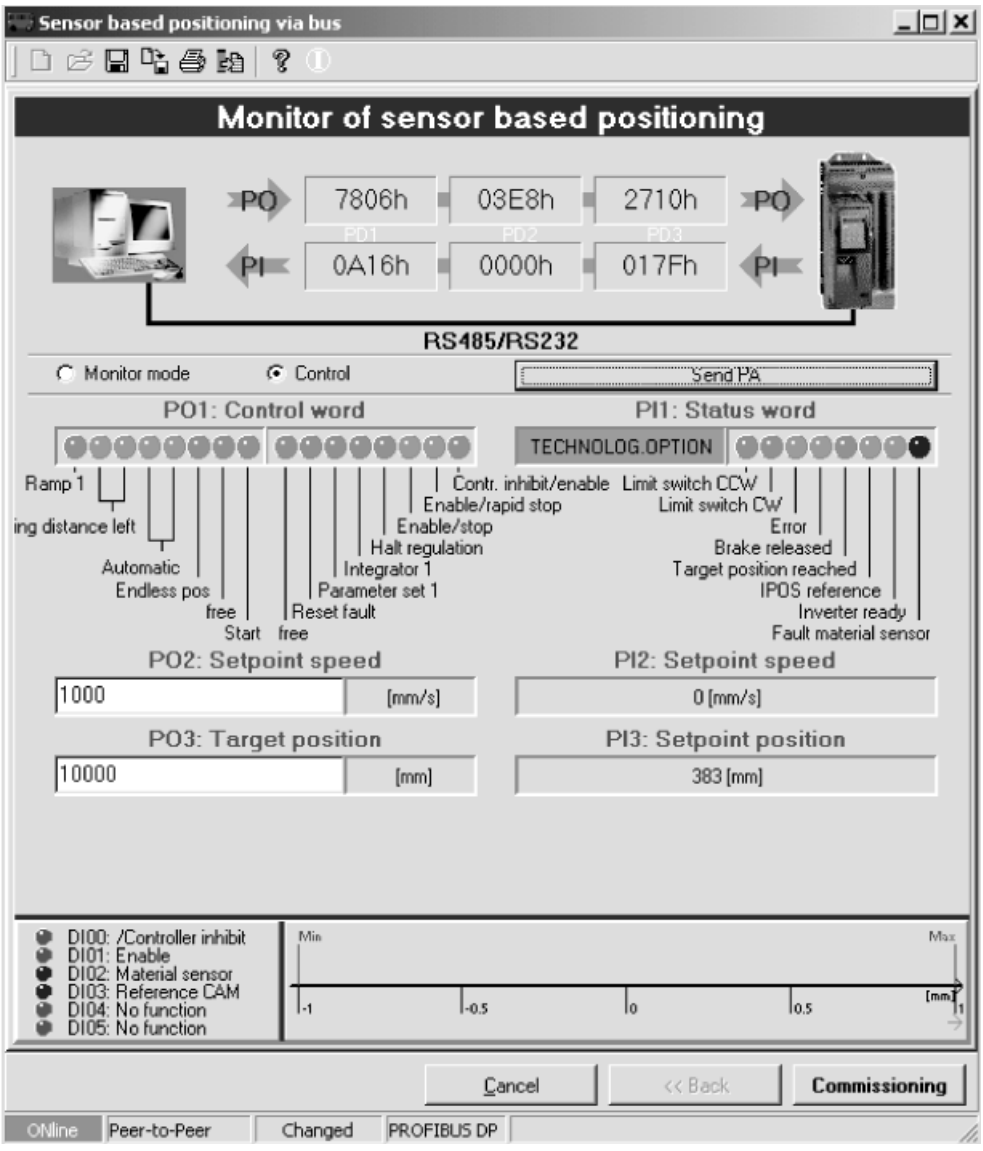

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Figure 25: Automatic operation in remaing travel left positioning mode

Strategy 1 "Maximum position for TP left"

- PO1:14 = "1", PO1:13 = "1", PO1:12 = "1", PO1:11 = "1" and PO1:10 = "0"
- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.

Example 1: No edge change at DIO2 - Sensor (touchprobe) does not trigger

- The drive moves to the target position and remains there subject to position control.

  Target position = "Setpoint position at start signal" – "Maximum position for TP left"
- The bits PI1:0 "Fault material sensor" and PI1:3 "Target position reached" are set. The "Fault material sensor" bit signals to the master controller that the sensor input has not been triggered and the drive has reached the maximum position specified at startup.
- When a negative edge is detected at PO1:8 "Start" the actual position PI3 is reset and a new target position is calculated. Bit PI1:0 "Fault material sensor" is reset and a new cycle begins.

The new target postion for the next cycle is **only** calculated when the bit PI1:3 "Target position reached" is set when an edge change ("1" → "0") is detected for bit PO1:8 "Start" and the drive is enabled (caution when the drive overshoots).

- A machine cycle can be interrupted by deleting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel right → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

Example 2: Edge change at DIO2 - Sensor (touchprobe) triggers

- The position at PO3 is read when the touch probe signal is detected (that is, when a sensor is triggered) and a new target position is calculated from this value.

  Target position = "Setpoint position at TP event" – "Remaining distance (PO3)"
- Once the drive has reached the new target position, the bit PI1:3 "Target position reached" is set.
- When a negative edge is detected at PO1:8 "Start", the current position PI3 is reset and a new target position is calculated. A new cycle begins.
- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or positioning mode (e.g. remaining travel left → relative) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

- If the sensor is placed just before the position "Maximum position for TP left" or if the sensor outputs a positive edge at DIO2 due to a fault just before reaching the maximum position, then the calculated target position can be positioned after the "Maximum position for TP left". The drive would then move past the "Maximum position for TP left". If you do not want this to happen, this special case must be prevented by using additional hardware or software limit switches.
- If a "short" remaining distance is specified when the drive is traveling at high speed over a long ramp, the drive can change its direction of rotation and move back to the specified target position (remaining travel).
- Also refer to the cycle diagrams in the section "Operation and service".

Strategy 2 "Endless positioning" (only for MOVIDRIVE® MDX61B)

The endless positioning option is only available for positioning with a motor encoder or an external encoder. For positioning with an absolute encoder, the bit PO1:10 "EndlessPos" is not evaluated.

- PO1:14 = "1", PO1:13 = "1", PO1:12 = "1", PO1:11 = "1" and PO1:10 = "1"
- Set PO1:8 "Start" to "1" to start positioning. The "1" signal must be present for the entire duration of the positioning procedure.

Example 1: No edge change at DIO2 - Sensor (touchprobe) does not trigger

- The drive moves endlessly in a counterclockwise direction as long as bit PO1:8 is set. The actual position in PI3 switches between the positions "Maximum position for TP left" and "Maximum position for TP right" specified at startup. The bit PI1:0 "Fault material sensor" is not set.
- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or the travel strategy (e.g. EndlessPos → max. travel distance) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

Example 2: Edge change at DIO2 - Sensor (touchprobe) triggers

- The position at PO3 is read when the touch probe signal is detected (that is, when a sensor is triggered) and a new target position is calculated.

  Target position = –Setpoint position at TP event" – "Remaining distance (PO3)"
- Once the drive has reached the new target position, the bit PI1:3 "Target position reached" is set.
- When a negative edge is detected at PO1:8 "Start", the current position PI3 is reset and a new target position is calculated. A new cycle begins.

The new target postion for the next cycle is **only** calculated when the bit PI1:3 "Target position reached" is set when an edge change ("1" → "0") is detected for bit PO1:8 "Start" and the drive is enabled (caution when the drive overshoots).

- A machine cycle can be interrupted by resetting the bit PO1:8 "Start" and changing the operating mode (e.g. automatic mode → jog mode) or the travel strategy (e.g. EndlessPos → max. travel distance) during one cycle (at least 50 ms). The drive must be enabled for this purpose.

- If a "short" remaining distance is specified when the drive is traveling at high speed over a long ramp, the drive can change its direction of rotation and move back to the specified target position (remaining travel).
- Also refer to the cycle diagrams in the section "Operation and service".

6.6 Cycle diagrams

The following prerequisites apply to the cycle diagrams:

- DIØØ "/CONTROLLER INHIBIT" = "1" (no lock)
- DIØ1 "ENABLE/RAPID STOP" = "1"
- PA1:1 "ENABLE /RAPID STOP" = "1"
- PA1:2 "ENABLE/STOP" = "1"

The output DB00 "/Brake" is set, the brake is released and the drive stops subject to position control (→ 7-segment display = "A")

Jog mode

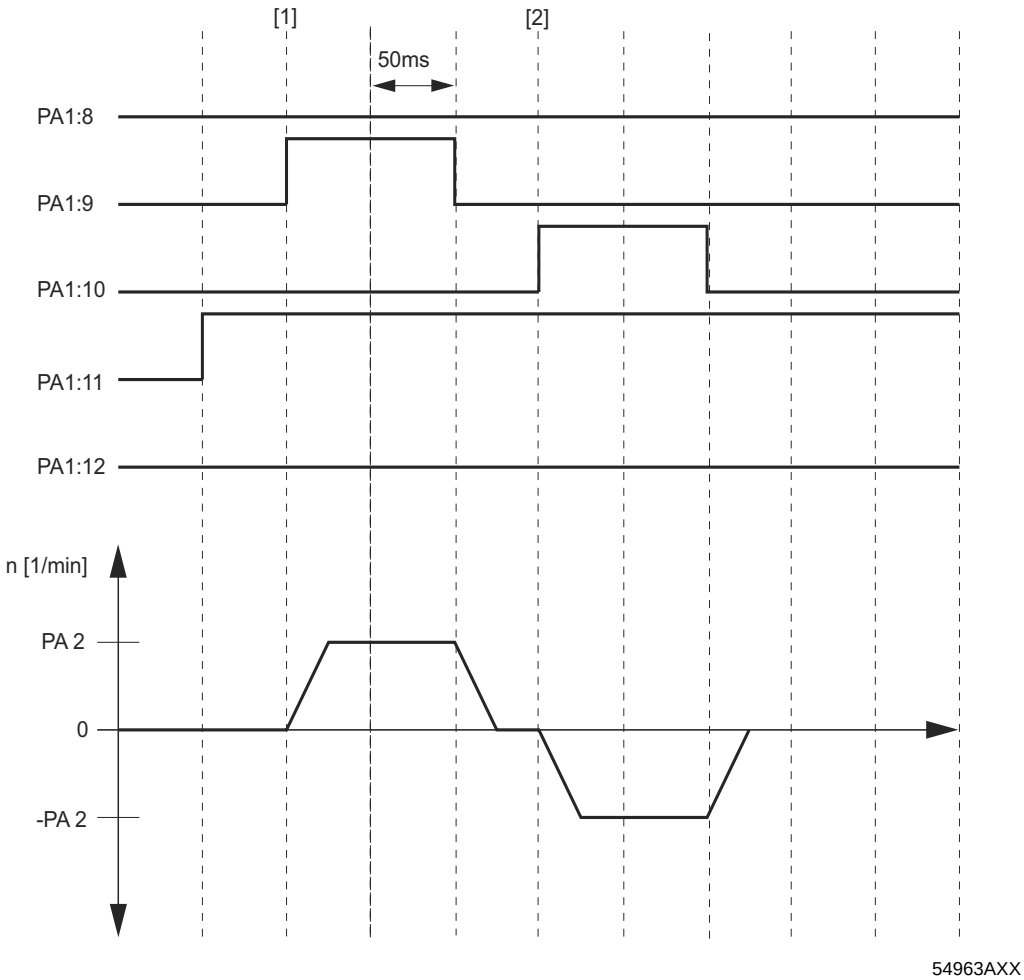

Figure 26: Cycle diagram: Jog mode

PA1:8	= Start	[1] = Axis starts when the bit "Jog +" is set
PA1:9	= Jog +	[2] = Axis starts when the bit "Jog –" is set
PA1:10	= Jog –	
PA1:11	= Mode Low	
PA1:12	= Mode High	

Referencing mode

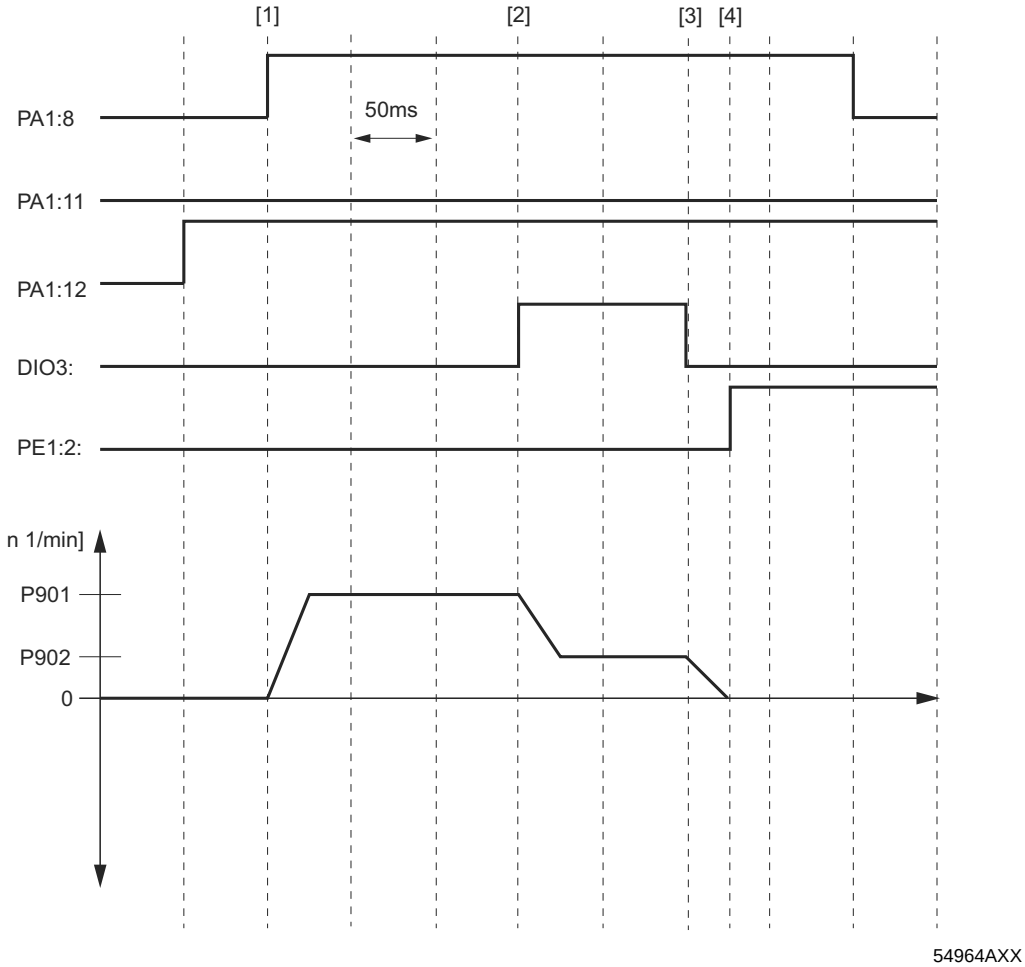

Figure 27: Cycle diagram: Referencing mode

PA1:8 = Start
PA1:11 = Mode Low
PA1:12 = Mode High
DI03 = Reference cam
PI1:2 = IPOS reference

[1] = Start of reference travel (reference travel type 2)
[2] = Drive reaches reference cam
[3] = Drive leaves reference cam
[4] = When the drive is at a standstill, PE1:2 "IPOS reference" is set. The drive is now referenced.

Automatic mode

Absolute / Relative

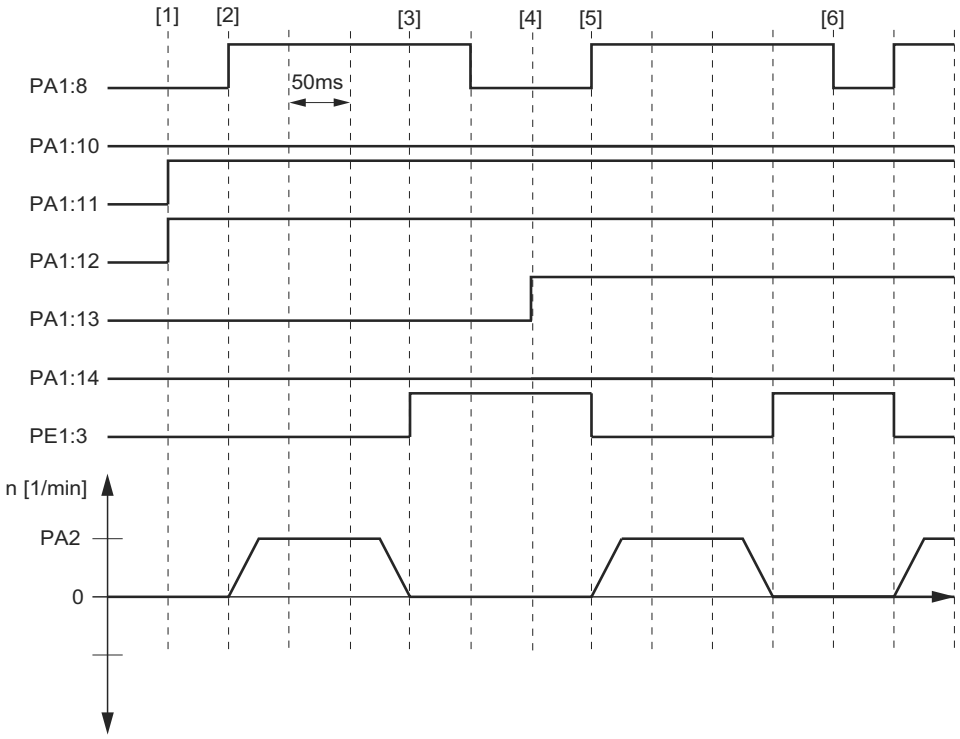

Figure 28: Cycle diagram: Automatic mode - absolute / relative

PA1:8 = Start
PA1:10 = EndlessPos
PA1:11 = Mode Low
PA1:12 = Mode High
PA1:13 = AutoMode Low
PA1:14 = AutoMode High
PI1:3 = Target position reached

[1] = Automatic absolute selected
[2] = Start positioning (target position = PA3)
[3] = Target position reached
[4] = Automatic relative selected
[5] = Start positioning (target position = setpoint position + PA3)
[6] = When a negative edge is detected at PA1:8 "Start", the new target position is calculated for the next cycle. PE1:3 "Target position reached" must be set when the edge is detected.

Automatic mode

Remaining travel right

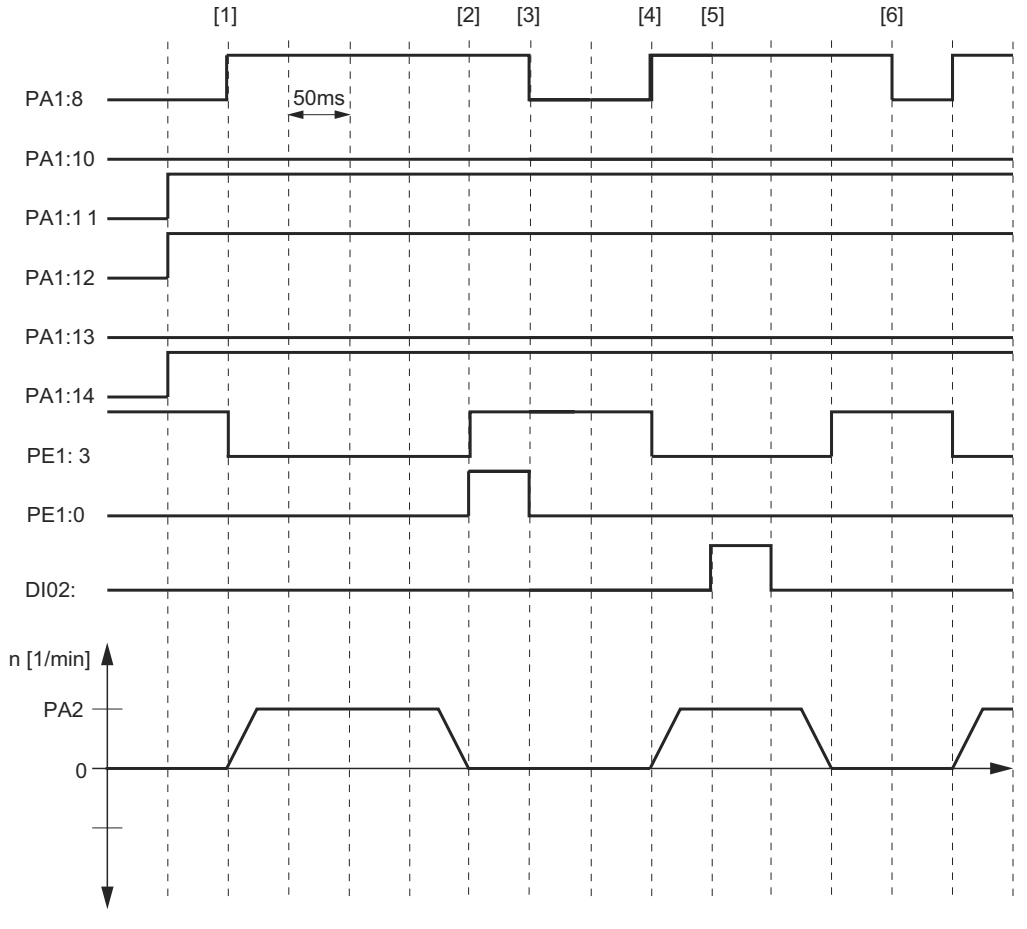

Figure 29: Cycle diagram: Automatic mode - remaining travel right

PA1:8	= Start	PA1:13	= AutoMode Low
PA1:10	= EndlessPos	PA1:14	= AutoMode High
PA1:11	= Mode Low	PI1:3	= Target position reached
PA1:12	= Mode High	PI1:0	= Material sensor

[1] = Start positioning (target position = setpoint position + "Maximum travel distance right").

[2] = Touch probe input has not been attenuated. The bits PE1:0 "Fault material sensor" and PE1:3 "Target position reached" are set.

[3] = When a negative edge is detected at PA1:8 "Start", the new target position is calculated for the next cycle. PE1:3 "Target position reached" must be set when the edge is detected. PE1:0 "Fault material sensor" is reset.

[4] = Start positioning (target position = setpoint position + "Maximum travel distance right"). PE1:3 "Target position is reached" is reset.

[5] = Touch probe input is attenuated, new target position is calculated (target position = position at time of touch proble + PA3).

[6] = When a negative edge is detected at PA1:8 "Start", the new target position is calculated for the next cycle. PE1:3 "Target position reached" must be set when the edge is detected.

Cancellation of a cycle in the modes relative, remaining travel right/left after enable has been revoked

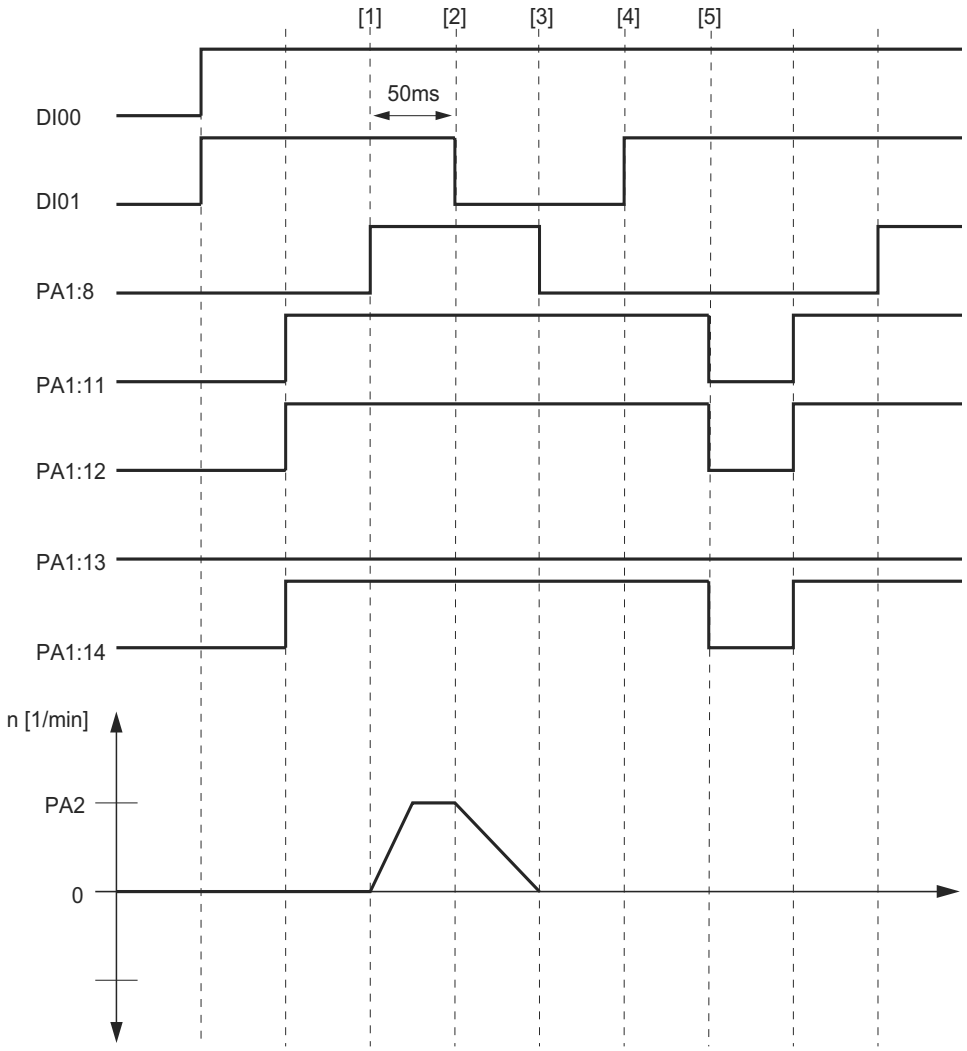

Figure 30: Cycle diagram: Automatic mode - cancellation of a cycle

PA1:8	= Start	PA1:13	= AutoMode Low
PA1:11	= Mode Low	PA1:14	= AutoMode High
PA1:12	= Mode High	DI00	= /Controller inhibit
		DI01	= Enable

[1] = Axis is started in the "Remaining travel right" mode.

[2] = Positioning is cancelled by revoking the enable DI01.

[3] = Bit PA1:8 "Start" is revoked This prevents the drive from starting automatically after it is enabled again.

[4] = Drive DI01 is enabled = "1".

[5] = When the axis is enabled again, the automatic mode must be selected. In the next cycle (at least 50 ms), the mode bits are set again for the automatic mode. Setting the start bits enables a new cycle to be started.

Moving clear of hardware limit switches

Once a hardware limit switch (DI04 = "0" or DI05 ="0") has been reached, the bit PI1:5 "Fault" is set and the drive comes to a standstill using an emergency stop.

Proceed as follows to move the drive clear again:

- Jog mode: Set the bits PO1:9 "Jog+" = "0" and PO1:10 "Jog– " = "0".
- Automatic mode: Set bit PO1:8 "Start" = "0".
- Set bit PO1:6 "Reset" to "1". The bit PI1:5 "Fault" is deleted.
- The drive automatically moves clear of the hardware limit switch at the speed specified in *P902 Reference speed 2*.
- Once the drive has moved clear of the hardware limit switch, you can delete PO1:6 "Reset" and select the required operating mode.

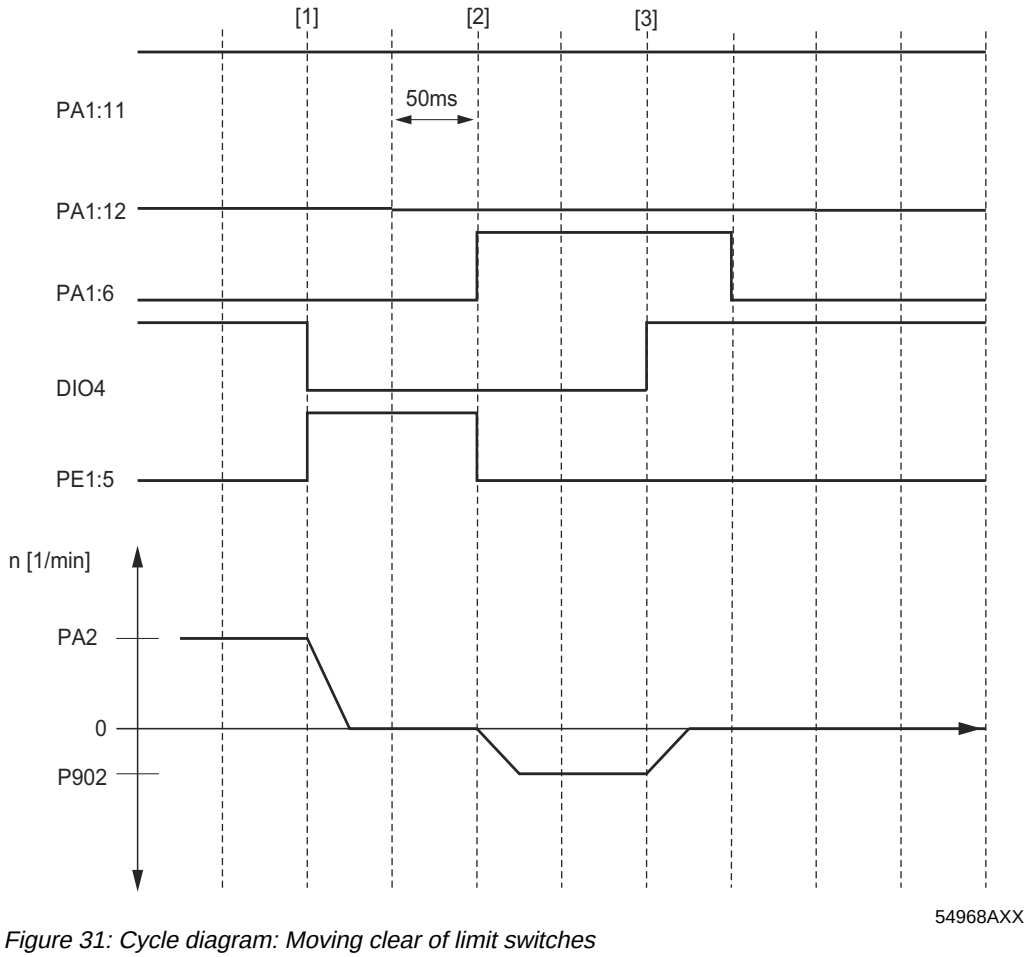

Figure 31: Cycle diagram: Moving clear of limit switches

PA1:11= Mode Low	PA1:6 = Reset
PA1:12= Mode High	PI1:5 = Fault
	DI04 = Right limit switch

[1] = The drive has reached the right hardware limit switch and comes to a halt using an emergency stop ramp.

[2] = PA1:6 "Reset" is set. Drive moves clear of hardware limit switch.

[3] = Drive moves clear of hardware limit switch

If the hardware limit switch with which the drive has come into contact is faulty (no positive edge at DI04 or DI05 as the drive moves clear), the drive must be stopped by revoking the enable (terminal or bus).

6.7 Malfunction information

The fault memory (P080) stores the last five fault messages (faults t-0 to t-4). The fault message of longest standing is deleted whenever more than five fault messages have occurred. The following information is stored when a malfunction occurs:

Fault that occurred • Status of binary inputs/outputs • Operating status of the inverter • Inverter status • Heat sink temperature • Speed • Output current • Active current • Unit utilization • DC link voltage • ON hours • Enable hours • Parameter set • Motor utilization.

There are three switch-off responses depending on the fault; the inverter remains blocked in fault status:

- **Immediate switch-off:**

  The unit can no longer brake the drive; the output stage goes to high resistance in the event of a fault and the brake is applied immediately (DBØØ "/Brake" = "0").

- **Rapid stop:**

  The drive is braked with the stop ramp t13/t23. The brake is applied once the stop speed is reached (DBØØ "/Brake" = "0"). The output stage goes to high resistance after the brake reaction time has elapsed (P732 / P735).

- **Emergency stop:**

  The drive is braked with the emergency ramp t14/t24. The brake is applied once the stop speed is reached (DBØØ "/Brake" = "0"). The output stage goes to high resistance after the brake reaction time has elapsed (P732 / P735).

Reset

A fault message can be acknowledged by:

- Switching the power supply off and on again.

  Recommendation: Observe a minimum switch-off time of 10 s for the input contactor K11.

- Reset by binary input DIØ3. Startup of the "Sensor based positioning via bus" application causes this binary input to be assigned with the "Reset" function.
- Only for control with fieldbus/system bus: "0"→∀1"→"1" signal at bit PO1:6 in control word PO1.
- Press the reset button in the MOVITOOLS® Manager.

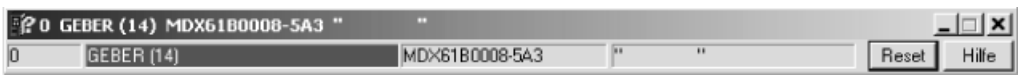

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Figure 32: Reset with MOVITOOLS®

- Manual reset in MOVITOOLS/Shell (P840 = "YES" or [Parameter] / [Manual reset]).
- Manual reset with DBG60B (MDX61B) or DBG11A (MCH4_A).

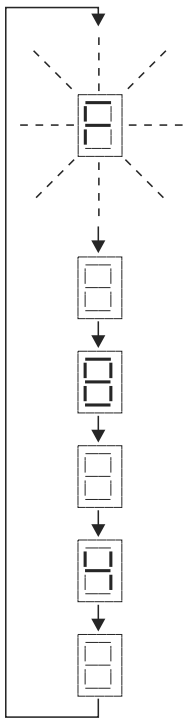
Timeout active

If the inverter is controlled via a communication interface (fieldbus, RS485 or SBus) and the power was switched off and back on again or a fault reset was performed, then the enable remains ineffective until the inverter once again receives valid data via the interface, which is monitored with a timeout.

6.8 Error messages

Display

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



Flashes, ca. 1 s

Display off, ca. 0.2 s

Tens, ca. 1 s

Display off, ca. 0.2 s

Ones, ca. 1 s

Display off, ca. 0.2 s

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Following a reset or if the error or warning code resumes the value “0“, the display switches to the operating display again.

List of Errors

The following table shows a selection from the complete error list (→ MOVIDRIVE® operating instructions). Only those errors are listed that can occur specifically with this application.

A dot in the "P" column indicates that the response is programmable (P83_ Fault response). The factory set fault response appears in the "Response" column.

Error code	Designation	Response	P	Possible cause	Action
00	No error	-			
07	U_Z overvoltage	Immediate switch-off		DC link voltage too high	• Extend deceleration ramps • Check connection leads to the braking resistor • Check technical data of braking resistor
08	n-monitoring	Immediate switch-off		• Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase failure in the power supply or motor. • Encoder not connected correctly or incorrect direction of rotation. • n_{max} is exceeded during torque control.	• Reduce load • Increase deceleration time setting (P501 or P503). • Check encoder connection, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limitation • Extend ramps if necessary • Check motor cable and motor • Check mains phases

Error code	Designation	Response	P	Possible cause	Action
10	IPOS-ILLOP	Emergency stop		• Incorrect command detected during running of IPOS$^{plus®}$ program. • Incorrect conditions during command execution.	• Check program memory content and correct if necessary. • Load correct program into program memory. • Check program sequence (→ IPOS$^{plus®}$ manual)
14	Encoder	Immediate switch-off		• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
25	EEPROM	Rapid stop		Access to the EEPROM of the memory card has failed	• Call up default setting, perform reset and set parameters again. • Contact SEW service if the error occurs again. • Replace memory card.
28	Fieldbus Timeout	Rapid stop	•	No communication between master and slave within the projected response monitoring.	• Check communications routine of the master • Extend fieldbus timeout time (P819)/deactivate monitoring
29	Limit switch reached	Emergency stop		A limit switch was reached in IPOS$^{plus®}$ operating mode.	• Check travel range. • Correct user program.
31	TF sensor	None Response	•	• Motor too hot, TF sensor has tripped • TF sensor of motor not connected or not connected properly • Connection of MOVIDRIVE® and TF on motor interrupted • No jumper between X10:1 and X10:2.	• Let motor cool off and reset fault • Check connections/link between MOVIDRIVE® and TF. • If no TF is connected: Jumper X10:1 with X10:2. • Set P835 to "NO RESPONSE"
36	No option	Immediate switch-off		• Type of option card not allowed. • Setpoint source, control signal source or operating mode not permitted for this option card. • Incorrect encoder type set for DIP11A.	• Use correct option card. • Set correct setpoint source (P100). • Set correct control signal source (P101). • Set correct operating mode (P700 or P701). • Set the correct encoder type.
42	Lag fault	Immediate switch-off	•	• Incremental encoder connected incorrectly • Accelerating ramps too short • P component of positioning controller too small • Speed controller parameters set incorrectly • Value of lag fault tolerance too small	• Check rotary encoder connection • Extend ramps • Set P component to higher value • Set speed controller parameters again • Increase lag fault tolerance • Check encoder, motor and mains phase wiring • Check mechanical components can move freely, possibly blocked up
94	EEPROM checksum	Immediate switch-off		Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send the unit in for repair.

7 Compatibility Between MOVIDRIVE® A / B / *compact*

7.1 Important notes

The "Sensor based positioning via bus" application module for MOVIDRIVE® MDX61B offers a number of additional functions that are not available with MOVIDRIVE® MD_60A or MOVIDRIVE® *compact*. This section provides you with information on the differences between the application module when using a MOVIDRIVE® MD_60A or MOVIDRIVE® *compact* unit and gives you important information on project planning.

Project planning for MOVIDRIVE® MD_60A / MOVIDRIVE® compact

- Drive inverter

  It is essential for the "Sensor based positioning via bus" application module to have encoder feedback, which means it can only be implemented with the following drive inverters:

  – MOVIDRIVE® MDV60A / MDS60A
  – MOVIDRIVE® *compact* MCV / MCS
  – MOVIDRIVE® *compact* MCH41A /MCH42A

- Bus installation for MOVIDRIVE® MDV / MDS60A

  Please read the information in the relevant fieldbus manuals.

Compatibility between the hardware terminals

Compared to MOVIDRIVE® MD_60A, MOVIDRIVE® MDX61B has two extra digital inputs (DI06, DI07) and three additional digital outputs (DO03, DO04, DO05). The additional hardware inputs and outputs are set to "No function" during initial startup and are not processed in the program.

Software limit switches

The function to move clear of the software limit switches is only possible as of the following firmware versions for MOVIDRIVE® MD_60A, MOVIDRIVE® *compact* MCx / MCH

– MOVIDRIVE® MD_60A: 823 854 5.15
– MOVIDRIVE® *compact* MCx: 823 859 6.14
– MOVIDRIVE® *comapct* MCH: 823 947 9.17

Recording IPOS$^{plus®}$ variables

Recording IPOS$^{plus®}$ variables using the MOVITOOLS® program "Scope" is only possible with MOVIDRIVE® MDX61B.

SBus send object for DriveSync Slave

If you use MOVIDRIVE® MD_60A or MOVIDRIVE® *compact* MCx / MCH, you do not have the option of setting up an SBus send object to transfer the actual position. It is also not possible to integrate the "DriveSync" application module.

Wiring diagrams

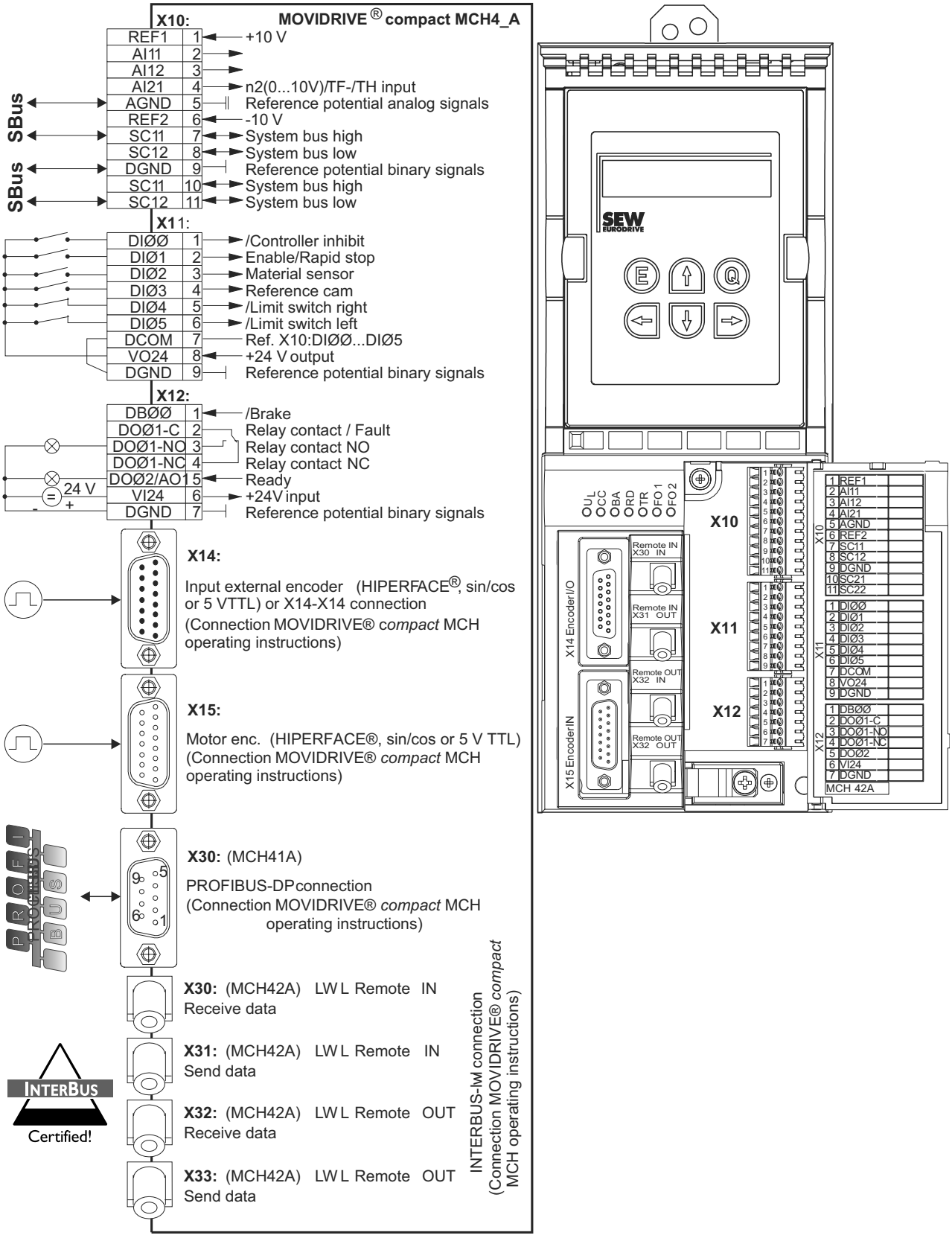

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Figure 33: MOVIDRIVE® compact MCH4_A

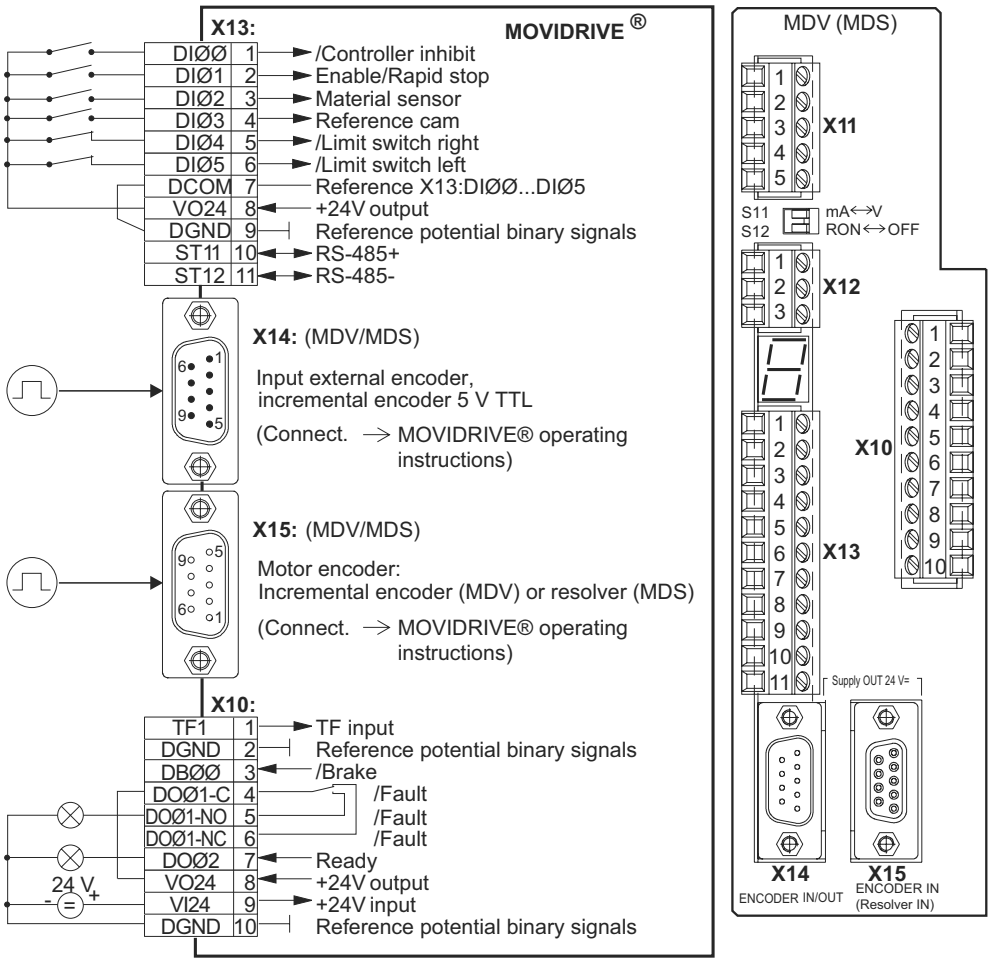

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Figure 34: MOVIDRIVE® MDV / MDS60_A

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Address List

Germany			
Headquarters **Production** **Sales**	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 · D-76642 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Service **Competence Center**	**Central** Gear units / Motors	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 sc-mitte-gm@sew-eurodrive.de
	Central Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-mitte-e@sew-eurodrive.de
	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 D-30823 Garbsen (near Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 D-08393 Meerane (near Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 sc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim (near München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Drive Service Hotline / 24 Hour Service		+49 180 5 SEWHELP +49 180 5 7394357
	Additional addresses for service in Germany provided on request!		

France			
Production **Sales** **Service**	**Haguenau**	SEW-USOCOME 48-54, route de Soufflenheim B. P. 20185 F-67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Assembly **Sales** **Service**	**Bordeaux**	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan - B. P. 182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil l'Etang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
	Additional addresses for service in France provided on request!		

Algeria			
Sales	**Alger**	Réducom 16, rue des Frères Zaghnoun Bellevue El-Harrach 16200 Alger	Tel. +213 21 8222-84 Fax +213 21 8222-84

Argentina			
Assembly **Sales** **Service**	**Buenos Aires**	SEW EURODRIVE ARGENTINA S.A. Centro Industrial Garin, Lote 35 Ruta Panamericana Km 37,5 1619 Garin	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 sewar@sew-eurodrive.com.ar

Australia			
Assembly **Sales** **Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au

Austria			
Assembly **Sales** **Service**	**Wien**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 A-1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://sew-eurodrive.at sew@sew-eurodrive.at

Belgium			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.caron-vector.be info@caron-vector.be

Brazil			
Production **Sales** **Service**	**Sao Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 50 Caixa Postal: 201-07111-970 Guarulhos/SP - Cep.: 07251-250	Tel. +55 11 6489-9133 Fax +55 11 6480-3328 http://www.sew.com.br sew@sew.com.br
	Additional addresses for service in Brazil provided on request!		

Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GmbH Bogdanovetz Str.1 BG-1606 Sofia	Tel. +359 2 9532565 Fax +359 2 9549345 bever@fastbg.net

Cameroon			
Sales	**Douala**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 4322-99 Fax +237 4277-03

Canada			
Assembly **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.reynolds@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1 E2	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Street LaSalle, Quebec H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 a.peluso@sew-eurodrive.ca
	Additional addresses for service in Canada provided on request!		

Chile			
Assembly **Sales** **Service**	**Santiago de Chile**	SEW-EURODRIVE CHILE LTDA. Las Encinas 1295 Parque Industrial Valle Grande LAMPA RCH-Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 75770-00 Fax +56 2 75770-01 ventas@sew-eurodrive.cl

China			
Production **Assembly** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 gm-tianjin@sew-eurodrive.cn http://www.sew.com.cn

China			
Assembly **Sales** **Service**	**Suzhou**	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021 P. R. China	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew.com.cn

Colombia			
Assembly **Sales** **Service**	**Bogotá**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 sewcol@andinet.com

Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. PIT Erdödy 4 II HR 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@net.hr

Czech Republic			
Sales	**Praha**	SEW-EURODRIVE CZ S.R.O. Business Centrum Praha Luná 591 CZ-16000 Praha 6 - Vokovice	Tel. +420 a220121236 Fax +420 220121237 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz

Denmark			
Assembly **Sales** **Service**	**Kopenhagen**	SEW-EURODRIVEA/S Geminivej 28-30, P.O. Box 100 DK-2670 Greve	Tel. +45 43 9585-00 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk

Estonia			
Sales	**Tallin**	ALAS-KUUL AS Paldiski mnt.125 EE 0006 Tallin	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee

Finland			
Assembly **Sales** **Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi

Gabon			
Sales	**Libreville**	Electro-Services B.P. 1889 Libreville	Tel. +241 7340-11 Fax +241 7340-12

Great Britain			
Assembly **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk

Greece			
Sales **Service**	**Athen**	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr

Hong Kong			
Assembly **Sales** **Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 2 7960477 + 79604654 Fax +852 2 7959129 sew@sewhk.com

Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. H-1037 Budapest Kunigunda u. 18	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 office@sew-eurodrive.hu

India			
Assembly **Sales** **Service**	**Baroda**	SEW-EURODRIVE India Pvt. Ltd. Plot No. 4, Gidc Por Ramangamdi · Baroda - 391 243 Gujarat	Tel. +91 265 2831086 Fax +91 265 2831087 mdoffice@seweurodriveindia.com
Technical Offices	**Bangalore**	SEW-EURODRIVE India Private Limited 308, Prestige Centre Point 7, Edward Road Bangalore	Tel. +91 80 22266565 Fax +91 80 22266569 sewbangalore@sify.com
	Mumbai	SEW-EURODRIVE India Private Limited 312 A, 3rd Floor, Acme Plaza Andheri Kurla Road, Andheri (E) Mumbai	Tel. +91 22 28348440 Fax +91 22 28217858 sewmumbai@vsnl.net

Ireland			
Sales **Service**	**Dublin**	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458

Israel			
Sales	**Tel-Aviv**	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 lirazhandasa@barak-online.net

Italy			
Assembly **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 2 96 9801 Fax +39 2 96 799781 sewit@sew-eurodrive.it

Ivory Coast			
Sales	**Abidjan**	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 2579-44 Fax +225 2584-36

Japan			
Assembly **Sales** **Service**	**Toyoda-cho**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Toyoda-cho, Iwata gun Shizuoka prefecture, 438-0818	Tel. +81 538 373811 Fax +81 538 373814 sewjapan@sew-eurodrive.co.jp

Korea			
Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate Unit 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 31 492-8051 Fax +82 31 492-8056 master@sew-korea.co.kr

Latvia			
Sales	**Riga**	SIA Alas-Kuul Katlakalna 11C LV-1073 Riga	Tel. +371 7139386 Fax +371 7139386 info@alas-kuul.ee

Lebanon			
Sales	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 4947-86 +961 1 4982-72 +961 3 2745-39 Fax +961 1 4949-71 gacar@beirut.com

Lithuania			
Sales	**Alytus**	UAB Irseva Merkines g. 2A LT-62252 Alytus	Tel. +370 315 79204 Fax +370 315 56175 info@irseva.lt www.sew-eurodrive.lt

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.caron-vector.be info@caron-vector.be

Malaysia			
Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 kchtan@pd.jaring.my

Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE, Sales and Distribution, S. A. de C. V. Privada Tequisquiapan No. 102 Parque Ind. Queretaro C. P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	S. R. M. Société de Réalisations Mécaniques 5, rue Emir Abdelkader 05 Casablanca	Tel. +212 2 6186-69 + 6186-70 + 6186-71 Fax +212 2 6215-88 srm@marocnet.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 241-020 Fax +47 69 241-040 sew@sew-eurodrive.no

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 sewperu@sew-eurodrive.com.pe

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Lodz	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucuresti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Sales	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 263 RUS-195220 St. Petersburg	Tel. +7 812 5357142 +812 5350430 Fax +7 812 5352287 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 849 47-70 Fax +221 849 47-71 senemeca@sentoo.sn

Serbia and Montenegro			
Sales	**Beograd**	DIPAR d.o.o. Kajmakcalanska 54 SCG-11000 Beograd	Tel. +381 11 3088677 / +381 11 3088678 Fax +381 11 3809380 dipar@yubc.net

Singapore			
Assembly **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 sewsingapore@sew-eurodrive.com

Slovakia			
Sales	**Sered**	SEW-Eurodrive SK s.r.o. Trnavska 920 SK-926 01 Sered	Tel. +421 31 7891311 Fax +421 31 7891312 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO – 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 494-3104 dross@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 dswanepoel@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 700-3451 Fax +27 31 700-3847 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 9 4431 84-70 Fax +34 9 4431 84-71 sew.spain@sew-eurodrive.es

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442-00 Fax +46 36 3442-80 http://www.sew-eurodrive.se info@sew-eurodrive.se

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 41717-17 Fax +41 61 41717-00 http://www.imhof-sew.ch info@imhof-sew.ch

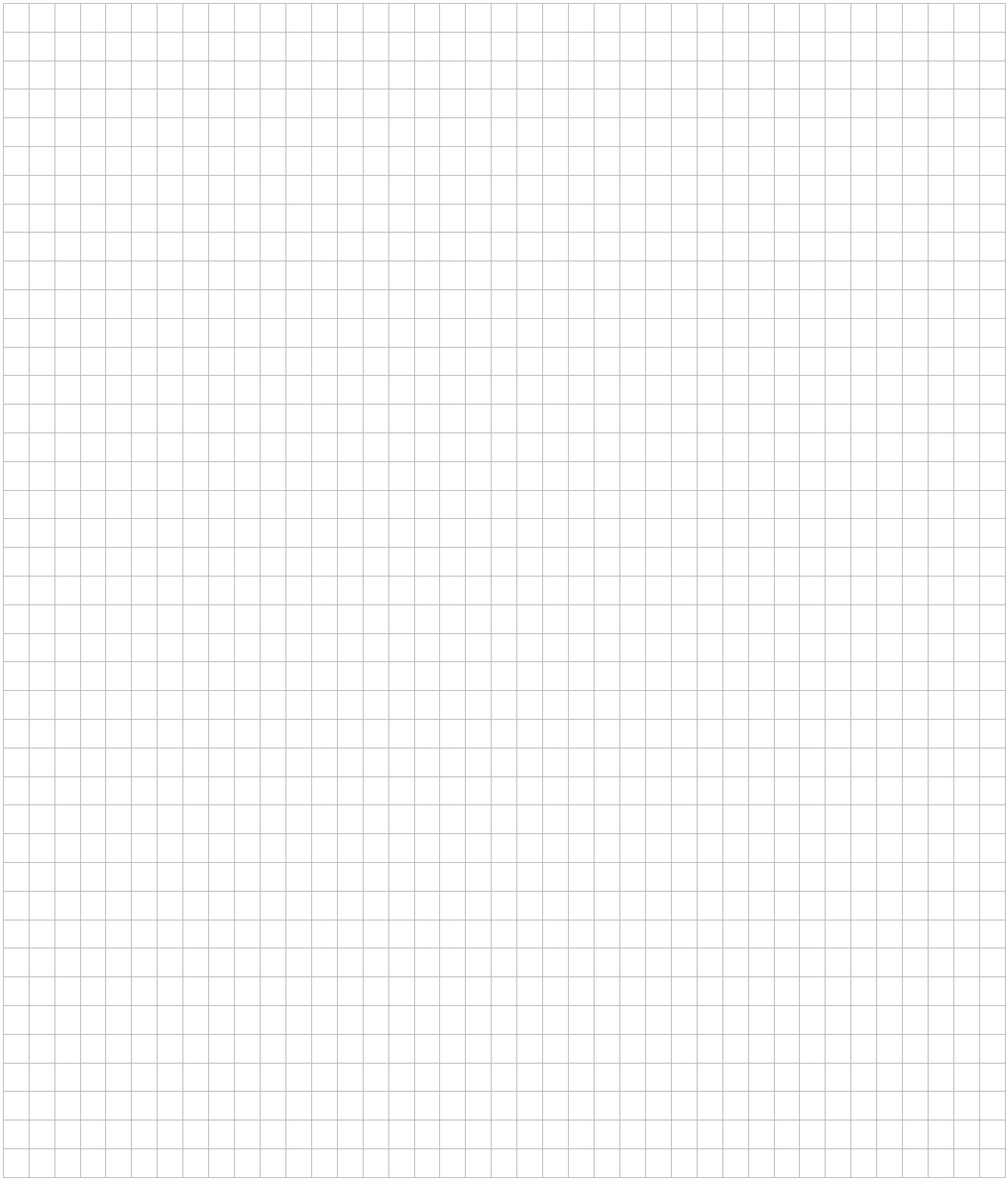
Thailand			
Assembly **Sales** **Service**	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, Moo.7, Tambol Donhuaroh Muang District Chon Buri 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.co.th

Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 7, rue Ibn EI Heithem Z.I. SMMT 2014 Mégrine Erriadh	Tel. +216 1 4340-64 + 1 4320-29 Fax +216 1 4329-76

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri Sirketi Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419163 + 216 4419164 + 216 3838014 Fax +90 216 3055867 sew@sew-eurodrive.com.tr

USA			
Production **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manuf. +1 864 439-9948 Fax Ass. +1 864 439-0566 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, California 94544-7101	Tel. +1 510 487-3560 Fax +1 510 487-6381 cshayward@seweurodrive.com
	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 sewventas@cantv.net sewfinanzas@cantv.net



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