SEW EURODRIVE

# MOVIDRIVE® MDX61B
# DIP11B / DEH21B Absolute Encoder Cards

Edition 12/2007
11702613 / EN

Manual


SEW
EURODRIVE

# 1 General Information

## 1.1 Structure of the safety notes

The safety notes in this manual are designed as follows:

| Symbol | SIGNAL WORD |
|---|---|
|  | Nature and source of hazard.<br>Possible consequence(s) if disregarded.<br>• Measure(s) to avoid the hazard. |

| Symbol | Signal word | Meaning | Consequences if disregarded |
|---|---|---|---|
| | | | |
| Example:<br>  <br>General hazard<br>  <br>Specific hazard, e.g. electric shock | **HAZARD!** | Imminent hazard | Severe or fatal injuries |
| | **WARNING** | Possible hazardous situation | Severe or fatal injuries |
| | **CAUTION!** | Possible hazardous situation | Minor injuries |
|  | **STOP!** | Possible damage to property | Damage to the drive system or its environment |
|  | **NOTE** | Useful information or tip<br>Simplifies drive system handling | |

## 1.2 Right to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Therefore, read the manual before you start operating the device!

Make sure that the manual is available to persons responsible for the plant and its operation, as well as to persons who work independently on the device. You must also ensure that the documentation is legible.

## 1.3 Exclusion of liability

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

# 2 Safety Notes

## 2.1 Other applicable documentation

- Only electrical specialists are allowed to perform installation and startup observing relevant accident prevention regulations and the MOVIDRIVE® MDX60B/61B operating instructions:
- Read through this publication carefully before you commence installation and startup of the DIP11B/DEH21B options.
- As a prerequisite to fault-free operation and fulfillment of warranty claims, you must adhere to the information in the documentation.

## 2.2 Safety functions

The MOVIDRIVE® MDX60B/61B drive inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel. For safety applications, ensure that the information in the following publications is observed: "Safe Disconnection for MOVIDRIVE® MDX60B/61B".

## 2.3 Hoist applications

MOVIDRIVE® MDX60B/61B may not be used as a safety device in hoist applications.

Use monitoring systems or mechanical protection devices as safety equipment to avoid possible damage to property or injury to people.

## 2.4 Product names and trademarks

The brands and product names in this manual are trademarks or registered trademarks of the titleholders.

## 2.5 Disposal

**Please follow the current national regulations.**

Dispose of the following materials separately in accordance with the country-specific regulations in force, as:

- Electronics scrap
- Plastics
- Sheet metal
- Copper

# 3 System Description

## 3.1 Areas of application

The DIP11B/DEH21B absolute encoder card options expands the MOVIDRIVE® system to include an SSI connection for absolute encoders. This permits positioning functions to be implemented with IPOS$^{plus®}$ that offer the following opportunities:

- No reference travel required when the system is started or after a power failure.
- Positioning can take place either with the absolute encoder or the motor encoder.
- Replacement of positioning switches along the travel distance even without motor encoder feedback.
- Free processing of the absolute position in the IPOS$^{plus®}$ program.
- Both synchronous and asynchronous motors can be used in all MOVIDRIVE® operating modes (P700P701).
- The absolute encoder can be mounted either on the motor or along the track (e.g. high-bay warehouse).
- Simple encoder adjustment with user-guided startup.
- Endless positioning in combination with activated modulo function. Pay attention to the notes in the "IPOS$^{plus®}$ manual" as well as the MOVIDRIVE® MDX60B/61B system manual (→ section "Parameter descriptions").

| | |
|---|---|
| | **NOTE** |
| | It is not possible to operate the DIP11B and the DEH21B simultaneously. |

## 3.2 Applicable absolute encoders

Connect only those encoders listed in the following table to the DIP11B and the DEH21B option.

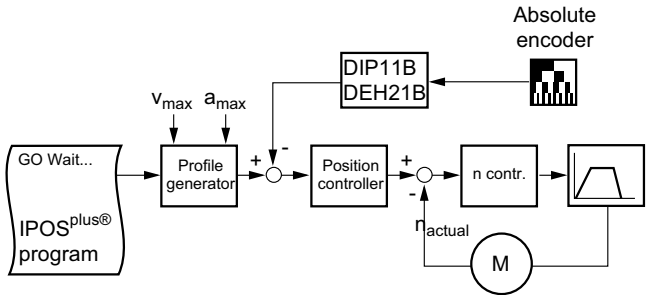
| Manufacturer | Encoder designation | Order designation | Comments |
|---|---|---|---|
| Hübner | HMG161-S24 H2048 (AH7Y) | - | Rotary encoder |
| Heidenhain | ROQ 424 (AV1Y) | 586638-82 | Rotary encoder |
| Elgo | LIMAX2-00-030-0125-SSG1-D9M3 | - | Linear distance sensor |
| Balluf | BTL5-S112-M1500-P-S32 | - | Linear distance sensor |
| TR-Electronic | TR CE58 | Cx58xxxSSI | Rotary encoder |
| | TR CE65 | Cx65xxxSSI | Rotary encoder |
| | TR CE100MSSI | Cx100xxxMSSI | Rotary encoder |
| | TR ZE65 M | Zx65xxxSSI | Rotary encoder |
| | TR LA41K SSI | 304-00319-xxxx | Linear distance sensor |
| | TR LA66K SSI | - | Linear distance sensor |
| | TR LE100 SSI | LE100SSI | Laser distance measuring instrument |
| | TR LE200 | 2200-20002 | Laser distance measuring instrument |
| Leuze-electronic | Leuze BPS37 | BPS37xx MA4.7 | Barcode measuring system |
| | Leuze OMS1 | - | Laser distance measuring instrument |
| | Leuze OMS2 | OMS2xx PB | Laser distance measuring instrument |
| | AMS200 | - | Laser distance measuring instrument |
| Fritz Kübler | 9081 | 9081 | Rotary encoder |
| MTS Sensors | Temposonics RP | RP-x-xxxxM-xxx-1-S3Gx105 | Linear distance sensor |
| | Temposonics RH | RH-x-xxxxM-xxx-1-S3Gx105 | Linear distance sensor |
| | Temposonics RF | RF-x-xxxxM-xxx-1-S3Gx105 | Linear distance sensor |
| | Temposonics RD3 | RD3-x-xxxxM-xxx-1-S3Gx105 | Linear distance sensor |
| IVO | GM 401 | GM401.x20 xxxx | Rotary encoder |
| | GXMMW | GXMMW.x20 2PA2 | Rotary encoder |
| Sick / Stegmann | Sick ATM60 | ATM60 AxA12*12 | Rotary encoder |
| | Sick DME 3000 | DME 3000-x11 | Laser distance measuring instrument |
| | Sick DME 4000 | DME 4000-x11 | Laser distance measuring instrument |
| | Sick DME 5000 | DME 5000-x11 | Laser distance measuring instrument |
| | Stegmann AG100 MSSI | - | Rotary encoder |
| | Stegmann AG626 | ATM60 AxA12*12 | Rotary encoder |
| | POMUX KH53 | - | Linear distance sensor |
| Pepperl & Fuchs | AVM58X-1212 | - | Rotary encoder |
| | WCS2A[1)] | WCS2A-LS311 | Barcode distance sensor |
| | WCS3A[1)] | WCS3A-LS311 | Barcode distance sensor |
| | EDM[2)] | - | Laser distance measuring instrument |

1) Previously STAHL

2) Previously VISOLUX

## 3.3 DIP11B/DEH21B and processing in IPOS$^{plus®}$

***Direct position control with absolute encoder (case 1)***

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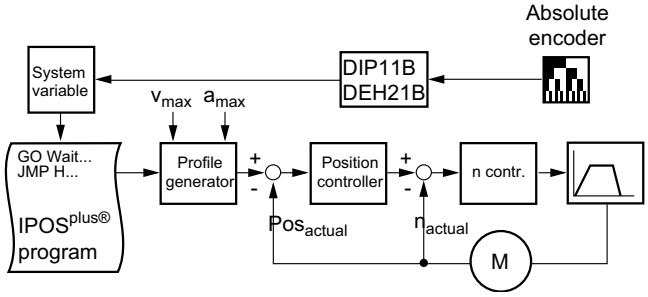
- Direct position control in IPOS$^{plus®}$ by means of the absolute encoder connected via DIP11B/DEH21B option.
- An encoder (X15) is always required on the motor for speed feedback.
- Automatic slip compensation between the encoder of the motor and the absolute encoder.
- In IPOS$^{plus®}$, positioning commands such as GOA ..." are performed with reference to the source actual position (in this case: absolute encoder connected to the DIP11B/DEH21B.
- The dynamic response that can be achieved depends on the properties and the installation of the absolute encoder as well as the position resolution.

***Position control with incremental encoder on motor, processing of absolute encoder position in the IPOS$^{plus®}$ program (case 2)***

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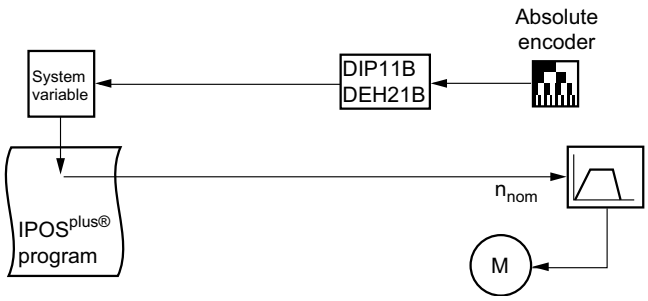
- Position control takes place in IPOS$^{plus®}$ with motor encoder connected to motor.
- An encoder is always required on the motor for speed feedback.
- The high dynamic response of the inverter can be used directly for positioning.
- The position information of the absolute encoder is automatically reflected in an IPOS$^{plus®}$ variable and can be processed using program control.
- With DIP11B/DEH21B, a reference travel is not necessary.

***Processing of the absolute encoder position in the IPOS$^{plus®}$ program (case 3)***

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- The position information of the absolute encoder is automatically reflected in an IPOS$^{plus®}$ variable and can be processed using program control.
- The DIP11B and DEH21B options can be used in particular to replace applications in which positioning usually takes place using rapid speed/creep speed by means of several proximity switches.
- No encoder is required on the motor for speed feedback; a standard asynchronous motor can be used.

## 3.4 Encoder sensing

- The counting direction can be set using parameters.
- When an encoder is replaced, startup must be repeated using MOVITOOLS®. Individual parameters can also be altered using the DBG60B keypad.
- The unit comes equipped with an automatic setting function for parameters in case the encoder is replaced.

## 3.5 Encoder monitoring

The DIP11B/DEH21B options come equipped with the following monitoring and correction mechanisms; these are necessary because the SSI interface does not have its own protocol safeguard feature.

- If supported by the encoder: Evaluation of a power failure or error bit (bit 25).
- Plausibility check of the actual position signaled by the encoder.
- Compensation of delays due to read cycles of the encoder (refresh time).

## 3.6 Control functions

- **Touch-Probe function**

  Touch probe makes it possible to detect the current position of the absolute encoder with minimum time delay. For example, this makes it possible to register positions very precisely using proximity switch signals and process these positions in the program.

- **Modulo function**

  Applications with infinite rotation, such as conveyor belts or rotary tables can be represented in modulo format (360° ≙ $2^{16}$).

  There will be no position loss (even in case of a gear unit ratio i with a relatively large number of decimal positions).

  It can be positioned endlessly without a position loss.

# 4 Assembly/Installation

***Before you begin*** **Do not use the DIP11B and the DEH21B simultaneously.**

**Read the following notes before installing or removing the DIP11B or DEH21B option card:**

- Disconnect the inverter from the power. Switch off the DC 24 V and the supply voltage.
- Take appropriate measures to protect the option card from electrostatic charge (use discharge strap, conductive shoes, etc.) before touching it.
- **Before installing** the option card, remove the keypad and the front cover.
- **After installing** the option card, replace the front cover and the keypad.
- Keep the option card in its original packaging until immediately before you are ready to install it.
- Hold the option card by its edges only. Do not touch any components.

## *4.1 Mounting the DIP11B option card*

| | **NOTES** |
|---|---|
|  | • **The DIP11B option can only be installed in MOVIDRIVE® MDX61B sizes 1 to 6, not in MOVIDRIVE® MDX61B size 0.**<br>• The DIPI11B option card must be installed in the expansion slot.<br>• The DIP11B option must be supplied with 24V DC. Observe the 'Project Planning' chapter in the MOVIDRIVE® MDX60B/61B system manual. |

## *4.2 Mounting the DEH21B option card*

| | **NOTES** |
|---|---|
|  | • **The DEH21B option card can be installed in MOVIDRIVE® MDX61B sizes 0 to 6. Only SEW-EURODRIVE staff may install or remove the DEH21B option for MOVIDRIVE® MDX61B size 0.**<br>• The DEH21B option card must be plugged into the encoder slot.<br>• The DEH21B option must be supplied with 24V DC. Observe the 'Project Planning' chapter in the MOVIDRIVE® MDX60B/61B system manual. |

***Basic procedure for installing and removing option cards (MDX61B, sizes 1 to 6)***

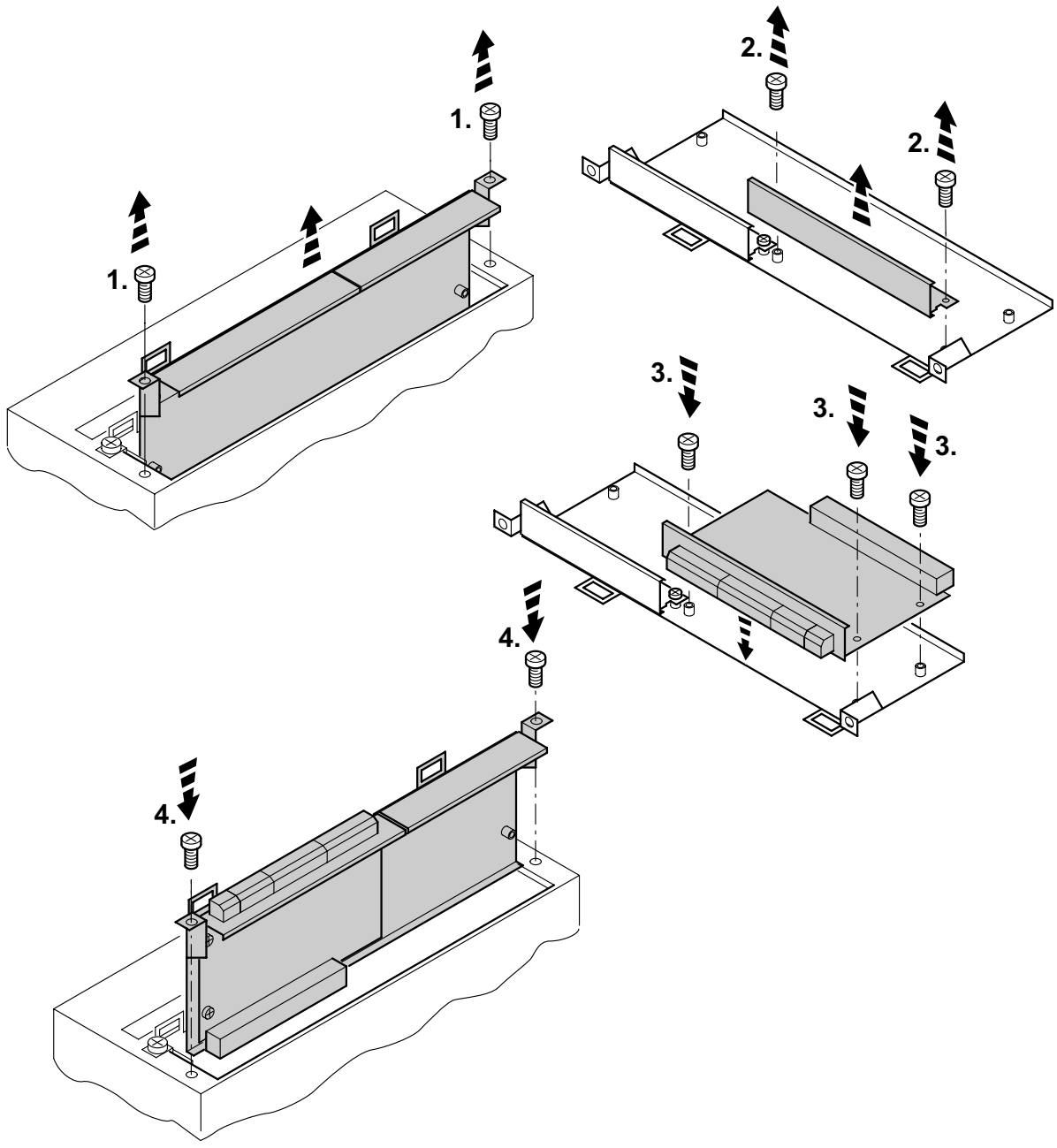


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*Figure 1: Installing an option card in MOVIDRIVE® MDX61B sizes 1 to 6*

1. Remove the retaining screws holding the card retaining bracket. Pull the card retaining bracket out evenly from the slot (do not twist).
2. Remove the retaining screws of the black cover plate on the card retaining bracket. Remove the black cover plate.
3. Position the option card onto the retaining bracket so that the retaining screws fit into the corresponding bores on the card retaining bracket.
4. Insert the retaining bracket with installed option card into the slot, pressing slightly so it is seated properly. Secure the card retaining bracket with the retaining screws.
5. To remove the option card, follow the instructions in reverse order.

## 4.3 Notes for combining DIP11B with DIO11B

The DIPI11B option card must be installed in the expansion slot. All parameters relevant to the DIP11B can be set using the DBG60B keypad.

***Observe terminal assignment***

MOVIDRIVE® MDX61B allows for the assignment of eight binary input terminals and eight binary output terminals on one option card. In case the DIP11B option is used with the DIO11B option card or a fieldbus option, note the listed grouping of input and output terminals.

*Terminal assignment of the input terminals (DI10 ... DI17)*

| Function | | | Option | | | |
|---|---|---|---|---|---|---|
| | | | DIO11B | DIP11B | DIO11B | DIP11B |
| Read terminals with | Variable | | H483[1] | | H520 | |
| | Bit | DIP11B with DIO11B | 6 ... 13 | 14 ... 21 | 8 ... 15 | 16 ... 23 |
| | | DIP11B with or without fieldbus card | - | 6 ... 13 | - | 8 ... 15 |
| Parameter 61.. effective for | DIP11B with DIO11B | | Yes | - | Yes | - |
| | DIP11B with or without fieldbus card | | - | Yes | - | Yes |

1) H483 is only documented for compatibility reasons. SEW-EURODRIVE recommends to use the H520 variable with MOVIDRIVE® B.

*Terminal assignment of the output terminals (DO10 ... DO17)*

| Function | | | Option | | | |
|---|---|---|---|---|---|---|
| | | | DIO11B | DIP11B | DIO11B | DIP11B |
| Read terminals with | Variable | | H480[1] | | H521 | |
| | Bit | DIP11B with DIO11B | 0 ... 7 | 8 ... 15 | 6 ... 13 | 14 ... 21 |
| | | DIP11B with or without fieldbus card | - | 0 ... 7 | - | 8 ... 15 |
| Parameter 63.. effective for | DIP11B with DIO11B | | Yes | - | Yes | - |
| | DIP11B with or without fieldbus card | | - | Yes | - | Yes |

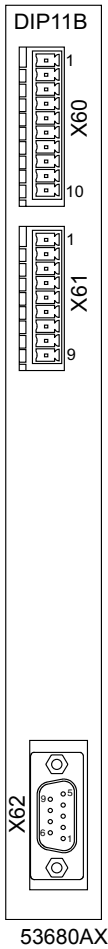
1) H480 is only documented for compatibility reasons. SEW-EURODRIVE recommends to use the H521 variable with MOVIDRIVE® B.

It is always possible to set and read terminals with variables, regardless of the additional option used along with the DIP11B. If the DIP11B is used in conjunction with a fieldbus card, the virtual fieldbus terminals are only available in IPOS$^{plus®}$ by reading the process output data (GETSYS Hxxx PO-DATA).

## 4.4 Connection and terminal description of the DIP11B option

***Part number*** Absolute encoder card option type DIP11B: 824 969 5

| | |
|---|---|
| | **NOTE** |
| | The DIP11B option must be supplied with 24V DC. Observe the 'Project Planning' chapter in the MOVIDRIVE® MDX60B/61B system manual. |

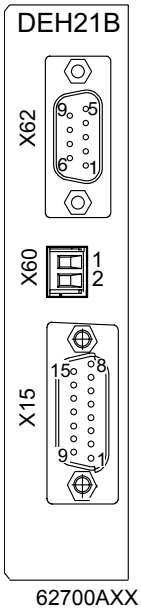
| Front view of DIP11B | Description | Terminal | Function |
|---|---|---|---|
|  | **X60: Connection binary inputs** | **X60:1 ... 8**<br><br><br><br><br>**X60:9**<br>**X60:10** | Connection binary inputs DI10 ... DI17 isolated via optocoupler ($R_i$=3 kΩ , $I_E$=10 mA, scanning time 1 ms, PLC compatible)<br>Signal level (according to EN 61131-2):<br>"1" = DC+13 V ... DC+30 V<br>"0" = DC–3 V ... DC+5 V<br><br>DCOM reference for binary inputs<br>DGND reference potential for binary signals and 24VIN (X61:9):<br>• Without jumper X60:9-X60:10 (DCOM-DGND) → Isolated binary inputs<br>• With jumper X60:9-X60:10 (DCOM-DGND) → Non-isolated binary inputs |
| | **X61: Connection binary outputs** | **X61:1 ... 8**<br><br><br><br><br><br>**X61:9** | Connection binary outputs DO10 ... DO17 (response time 1 ms, PLC compatible)<br>Signal level **(Do not apply external voltage!)**:<br>"1" = DC 24 V<br>"0" = DC 0 V<br>$I_{max}$ = DC 50 mA, short-circuit proof and protected against external voltage to DC 30 V<br><br>24VIN Input supply voltage:<br>Mandatory for binary outputs and encoders (reference potential DGND) |
| | **X62: Connection absolute encoder** | **X62:1**<br>**X62:2**<br>**X62:3**<br>**X62:4**<br>**X62:5**<br>**X62:6**<br>**X62:7**<br>**X62:8**<br>**X62:9** | Data +<br>Reserved<br>Cycle +<br>Reserved<br>DGND<br>Data –<br>Reserved<br>Cycle –<br>DC 24 V output |

| | |
|---|---|
| | **STOP!** |
| | You must neither install nor remove an encoder connected to X62 during operation.<br>Electrical components in the encoder or on the encoder card could be destroyed.<br>De-energize the inverter before plugging or removing the encoder connection. Switch off the mains voltage and the DC 24 V (X10:9 at the inverter and X61:9 at the DIP11B option) |

## 4.5 Connection and terminal description of the DEH21B option

***Part number*** Encoder card option DEH21B: 1820 818 5

| | |
|---|---|
| | **NOTE** |
| | The DC 24 V power supply of an encoder connected to X62 is ensured when X60 is supplied with DC 24 V. Observe the 'Project Planning' chapter in the MOVIDRIVE® MDX60B/61B system manual. |

| Front view of DEH21B | Description | Terminal | Function |
|---|---|---|---|
|  | **X62: Connection absolute encoder** | **X62:1**<br>**X62:2**<br>**X62:3**<br>**X62:4**<br>**X62:5**<br>**X62:6**<br>**X62:7**<br>**X62:8**<br>**X62:9** | Data +<br>Reserved<br>Cycle +<br>Reserved<br>DGND<br>Data –<br>Reserved<br>Cycle –<br>DC 24 V output |
| | **X60: Power supply** | **X60:1**<br>**X60:2** | 24VIN<br>DGND |
| | **X15: Motor encoder input** | **X15:1**<br>**X15:2**<br>**X15:3**<br>**X15:4**<br>**X15:5**<br>**X15:6**<br>**X15:7**<br>**X15:8**<br>**X15:9**<br>**X15:10**<br>**X15:11**<br>**X15:12**<br>**X15:13**<br>**X15:14**<br>**X15:15** | (COS+) signal track A (K1)<br>(SIN+) signal track B (K2)<br>Signal track C (K0)<br>DATA +<br>Reserved<br>Reference potential TF/TH/KTY–<br>Reserved<br>Reference potential DGND<br>(COS–) Signal track $\overline{A}$ ($\overline{K1}$)<br>(SIN–) Signal track $\overline{B}$ ($\overline{K2}$)<br>Signal track $\overline{C}$ ($\overline{K0}$)<br>DATA -<br>Reserved<br>TF/TH/KTY+ connection<br>DC+12 V (tolerance range DC 10.5 ... 13 V)<br>(max. load DC 650 mA) |

| | |
|---|---|
| | **STOP!** |
| STOP | Encoders connected to X15 and X62 must not be installed or removed during operation.<br>Electrical components in the encoder or on the encoder card could be destroyed.<br>De-energize the inverter before plugging or removing the encoder connections. Switch off the mains voltage and the DC 24 V (X10:9 at the inverter and X60:1 at the DEH21B option). |

| | |
|---|---|
| | **NOTE** |
| | The DC 12 V supply voltage from X15 is sufficient to operate SEW encoders (except HTL encoders) with a DC 24 V supply voltage. With all other encoders, check whether they can be connected to the DC 12 V supply voltage. |

## 4.6 DC 24 V power supply of the DIP11B/DEH21B

The DIP11B/DEH21B absolute encoder cards must be supplied with DC 24 V at the 24VIN voltage input (DIP11B at X61:9, DEH21B at X60:1) You have the following two options to provide this DC 24 V power supply.

***Option 1: Power supply via basic unit***

DC 24 V power supply via the auxiliary voltage output VO24 (X10:8) of the basic unit. This is only permitted if

- the total load of all outputs of the basic unit and the currently connected options (including encoder) is less than 400 mA.
- and the total power output of the switched mode power supply is < 29 W

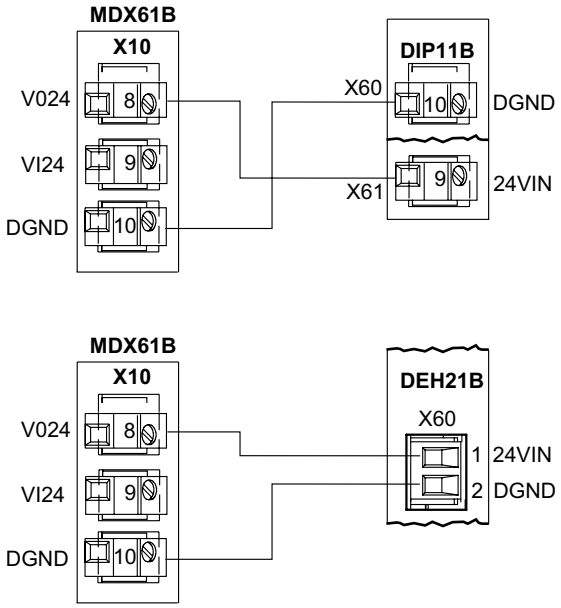



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*Figure 2: Wiring diagram of the auxiliary voltage output VO24*

***Option 2: External power supply***

DC 24 V power supply via an external 24 V power supply unit. This is necessary when

- the total load of all outputs of the basic unit and the currently connected options (including encoder) is more than 400 mA.
- and the total power output of the switched mode power supply is > 29 W

The following figure shows two wiring examples (A and B).

In wiring example B, make sure that the **external DC 24 V power supply of the DIP11B/DEH21B option is switched on before or together with the MOVIDRIVE® B power supply.** This ensures that the connected encoder is initialized in time.

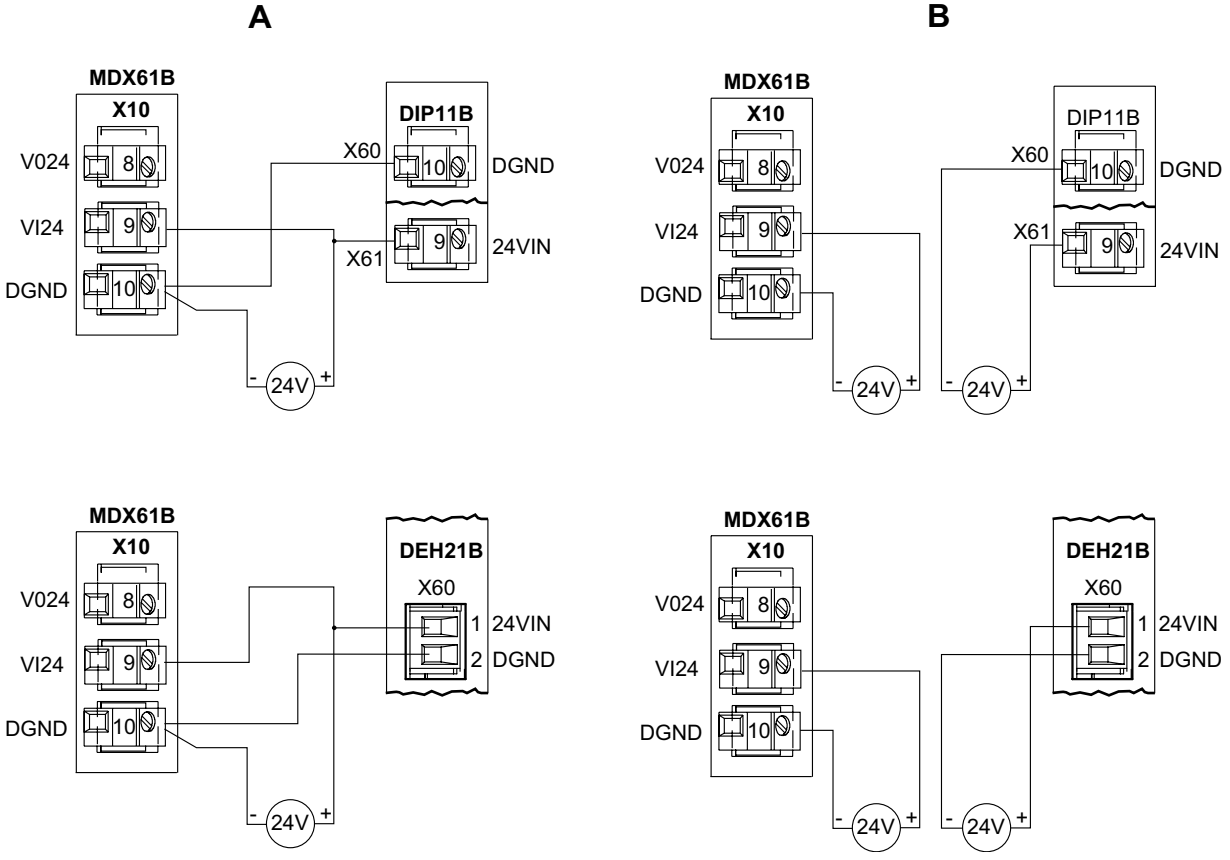



*Figure 3: External power supply (wiring examples A and B)*

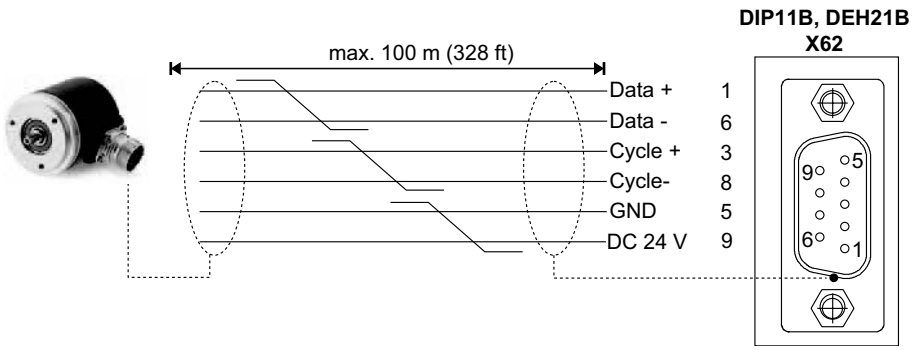
## 4.7 Connecting an absolute encoder

***General installation notes***

- Max. line length DIP11B/DEH21B option (inverter) - absolute encoder:
  100 m (328 ft) with a capacitance per unit length  120 nF/km (exception: 10 m (33 ft) for Stahl WCS2-LS311, WCS3)
- Core cross section: 0,20 ... 0,5 $mm^2$ (AWG24 ... AWG21)
- Use shielded cables with twisted pair conductors and make sure they are grounded on both ends over a large surface area:
  - At the encoder in the cable gland or in the encoder plug
  - to the inverter in the housing of the sub D plug or
  - to the metal clamp/strain relief on the bottom of the inverter
- Route the encoder cable separately from the power cables.

***Prefabricated cables/wiring diagrams***

- Wiring diagram for absolute encoder at the DIP11B or DEH21B option:

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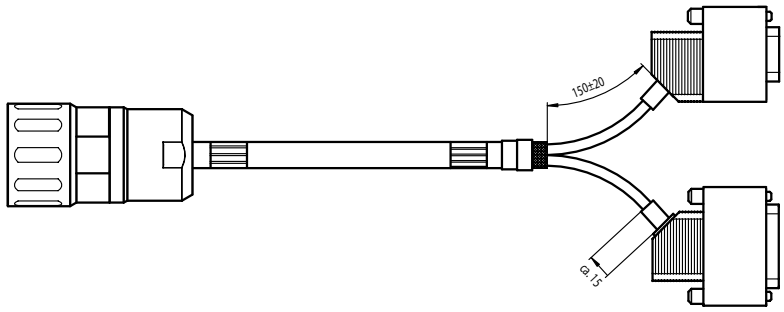
- Y cable to connect the AV1Y absolute encoder with plug connector on the motor side. The following encoder tracks are evaluated with the Y cable:
  - SSI track of the AV1Y absolute encoder at X62 of the DIP11B or DEH21B
  - sin/cos track of the AV1Y absolute encoder at X15 DEH11B or DEH21B

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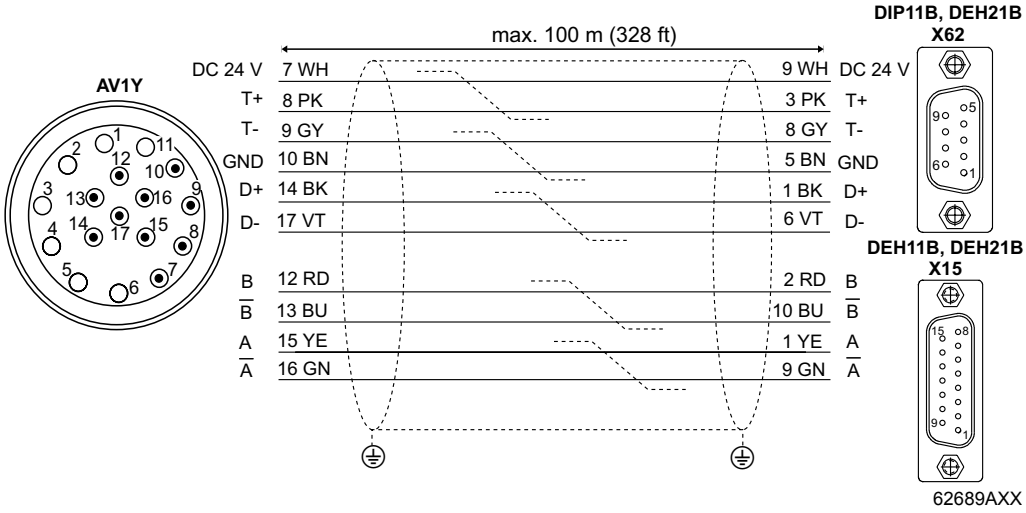
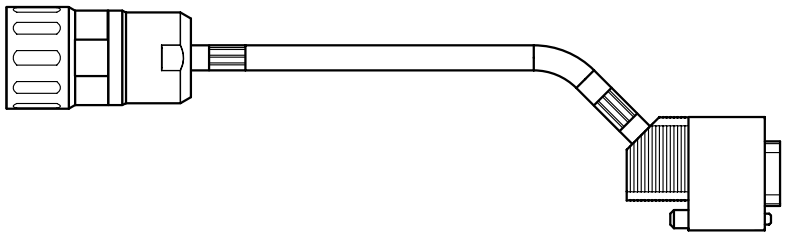
Part numbers of the prefabricated cables:

- For fixed routing: 1332 813 1
- For cable carrier routing: 1332 812 3

Wiring diagram for the Y cable:




- CM and DS motors with integrated resolver: Additional cable to connect the AV1Y absolute encoder with plug connector connection on the motor side to DIP11B X62. A connection to the DEH21B X62 is not possible.



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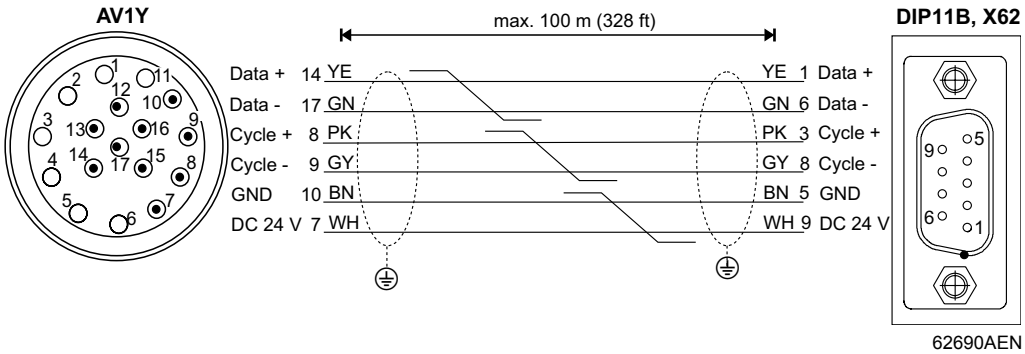
Part numbers of the prefabricated cables:

– For fixed routing: 198 929 4
– For cable carrier routing: 198 930 8

Wiring diagram:



# 5 Project Planning

## 5.1 Encoder selection

When selecting the absolute encoder, the following points should be considered to achieve optimum travel characteristics and good dynamic properties in the system:

- **Position measurement should be conducted without slip.**

  Operate the encoder in positive engagement via toothed belt. Avoid all friction wheel connections.
- **Position measurement must be rigid.**

  Avoid elasticity and clearance.
- **The resolution of the position measurement must be as high as possible.**

  The more increments the encoder counts per unit-distance traveled,

  – the more exactly it approaches the target position
  – and the more rigid the control system can be set.
- **The "refresh time"** (the time taken for the absolute encoder to determine a new actual position) **should be less than 1 ms**.

  This value exerts a decisive influence on the dynamic characteristics of the drive.
- **The position output by the absolute encoder should not be averaged or filtered,** otherwise the dynamic properties of the drive are severely reduced.

Encoders which can be used with the DIP11B/DEH21B option are divided into three categories as follows:

- Multiturn encoder, e.g. T&R CE58, CE 65, Sick ATM60
- Laser distance measuring devices, e.g. T&R LE200, Sick DME5000
- Linear distance measuring devices, e.g. Leuze BPS37, Stahl WCS2, Stahl WCS3

***Multiturn encoder***

- Multiturn encoders are ideally suited in applications with positive power transmission from the motor shaft to the load.

  In this case, the absolute encoder can be mounted onto the motor shaft of the drive. This keeps the installation costs very low while the position resolution is generally very high due to the gear ratio.
- If the position measurement is performed using an externally mounted incremental encoder (synchronous encoder), it is essential to make sure the ratio between the encoder and the toothed belt is adequate.

| | **NOTE** |
|---|---|
| | The ratio of position resolution between motor encoder and synchronous encoder must not exceed factor 8. |

*Example*

Travel drive with the following data:

- Gearmotor: R97DV160L4BMIG11, i = 25.03
- Drive wheel diameter: 150 mm
- Encoder wheel diameter: 65 mm
- Encoder T&R CE65MSSI with:4096 x 4096 increments

Calculation of position resolution with encoder mounted to motor shaft:

→ i x 4096 / (π x 150 mm) = 217 increments/mm

Calculation of position resolution with encoder mounted on the line:

→ 4096 / (π x 65 mm) = 20 increments/mm

Result: The ratio between the position resolution of the motor/track is 10.9 (greater than 8). The diameter of the encoder wheel should be reduced.

***Laser distance measuring units***

Distance measurement with laser systems is based on a run-time measurement of pulsed infrared beams. Various measurement values have to be processed in the encoder to determine an accurate position with this procedure. The result is a delay in position measurement with these systems of up to 50 ms. This delay has a negative effect on the dynamics and positioning accuracy of the drive.

Consider the following points when using and configuring laser distance measuring devices:

- Ensure a vibration-free design when mounting the measurement system, e.g. in case of travel drives for storage/retrieval systems. Install the measuring system on the bottom in this instance because the swinging motion of the tower will otherwise have an adverse effect on the measurement.
- The maximum acceleration of the drive is not to exceed 0.8 $ms^{-2}$.
- The encoder characteristics will usually result in a positioning accuracy of ± 1 ... 3 mm.
- The long delay
  - may demand a drastic reduction in velocity precontrol (P915).
  - may limit the amplification of the position controller (P910) to small values (0.1 ... 0.4). This means high dynamic properties cannot be achieved.
- There is a lag fault which is dependent on the speed, making it harder to monitor the drive (delayed shut-off in the event of a fault).

***Material measure via metal rule***

The operating principle of this system corresponds to that of the multiturn encoder. There is no averaging, so this system is not subject to a delay in position measurement.

A linear position measuring system offers the following advantages:

- No reduction in dynamic properties.
- Velocity precontrol (P915) of 100% means there is no lag fault.
- The monitoring functions are fully effective; a small lag fault window is possible.

Disadvantages of a linear position measuring system:

- Position resolution of 0.8 mm. The required positioning accuracy should not be less than ± 2 mm.
- Rather complicated mechanical installation due to the need for routing the metal rule.

## 5.2 Configuring the encoders

The following points must be observed in the design and construction of encoders and when setting their parameters:

- **For all configurable encoders applies:**
  - The interface must be set to "SSI".
  - 24 data bits + error bit or 24 data bits + 0 must be set in cycle 25.
  - Plausibility must be set to normal = 0 when the plausibility check is activated.
  - The coding must be set to "Gray".

- **HEIDENHAIN ROQ 424 (AV1Y)**

  The SSI version with 10 ... 30 V is supported. The unit designation specifies all additional conditions.

- **T&R CE 58, CE 65, CE 100 MSSI, LE 100 SSI, LE 200, LA 66K-SSI, ZE 65**
  - Make a setting of 24 data bits and program signal bits to logical 0. Bit no. 25 may either contain 0 or an error or power fail bit. Other special bits following the position will not be evaluated. The 25-bit version is not supported.
  - The output mode must be "Direct".
  - The interface must be set to "SSI".

- **STEGMANN AG100 MSSI, AG626, ATM60**

  Only the 24-bit version is supported.

- **SICK DME-5000-111**
  - The interface must be set to "SSI".
  - Set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.
  - The plausibility must be set to "Normal".

- **STAHL WCS2-LS311, WCS3**

  The unit designation specifies all necessary conditions. The line length to the encoder is not to exceed 10 m (33 ft.).

- **VISOLUX EDM 30/120/140 - 2347/2440**

  All modes are supported. Recommendation: Mode 0 (DIP switches 3 and 4 in ON position) or mode 3 (DIP switches 3 and 4 in OFF position) and measuring for triple reflector (DIP switch 2 in OFF position).

- **LEUZE AMS200, OMS1, OMS2, BPS37**
  - Set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.

# 6 Startup

## 6.1 General startup notes

The drive must be started up in conjunction with the MOVIDRIVE® MDX61B drive inverter as described in the MOVIDRIVE® MDX60B/61B system manual. It must be possible to move the drive using a suitable setpoint and control source.

Make sure that

- the installation of the DIP11B/DEH21B option
- Cabling
- the terminal assignment and
- Safety cut-outs

have been configured correctly and are suited to the application.

There is no need to activate the factory settings. If you call up a factory setting, the MOVIDRIVE® MDX61B parameters will be reset to the default values. This also affects the terminal assignment, which must be altered to the required settings if necessary.

## 6.2 Startup with PC and MOVITOOLS®

MOVITOOLS® software version 4.60 or higher is required for startup with a PC.

***General information***

- Terminal X13:1 (DIØØ "/CONTROLLER.INHIBIT") must receive a "0" signal!
- Start MOVITOOLS®.
- Select the language you want in the "Language" selection field.
- From the "PC-COM" drop down menu, select the PC port (e.g. COM 1) to which the inverter is connected.
- In the "Device type" field, select "MOVIDRIVE B".
- In the "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.

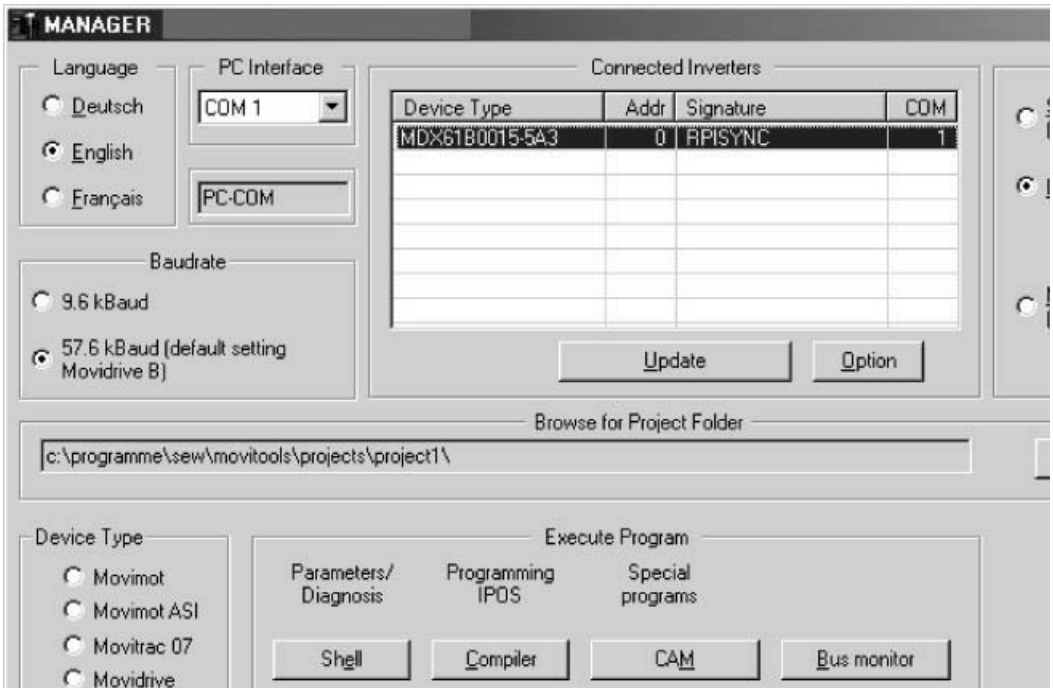



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*Figure 4: MOVITOOLS® initial screen*

- Before you startup up the DIP11B/DEH21B option, you have to startup the connected MOVIDRIVE B® unit.

***Commencing startup***

- In the "Execute Program" selection field, press the "Shell" button under "Parameters/Diagnosis". The Shell program is started.
- In the Shell program, select [Startup]/[DIP/DEH21B Startup] menu command.

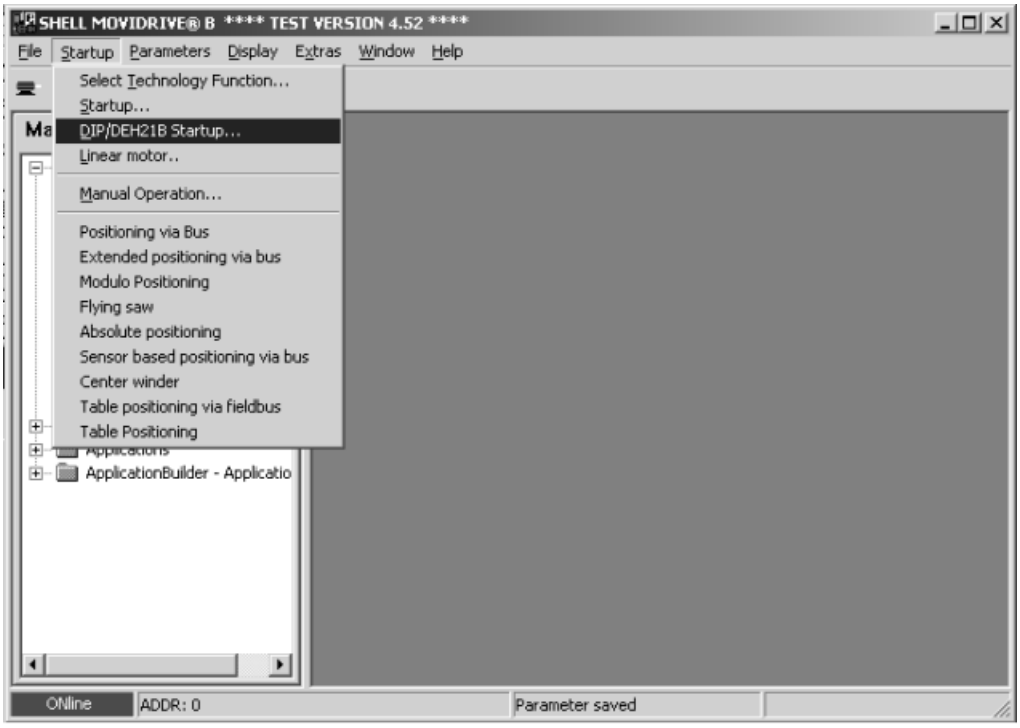


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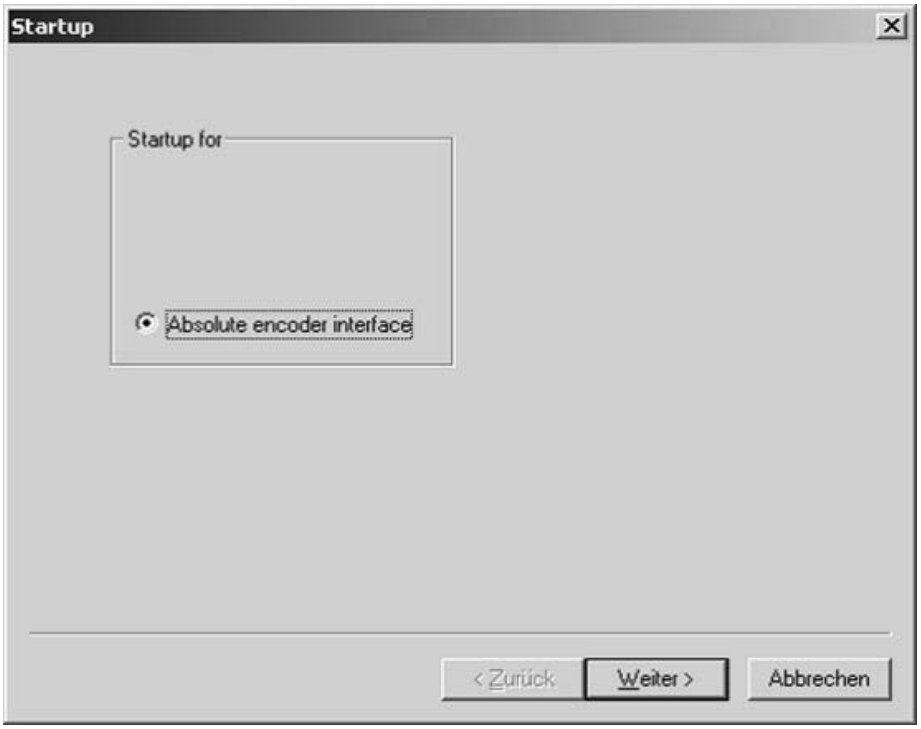
*Figure 5: Open DIP/DEH21B-startup*

- MOVITOOLS® opens the startup menu for DIP/DEH21B absolute encoders (→ following figure). For questions on startup, refer to the MOVITOOLS® online help. Click [Next] to continue.

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***New startup of the DIP11B/DEH21B***

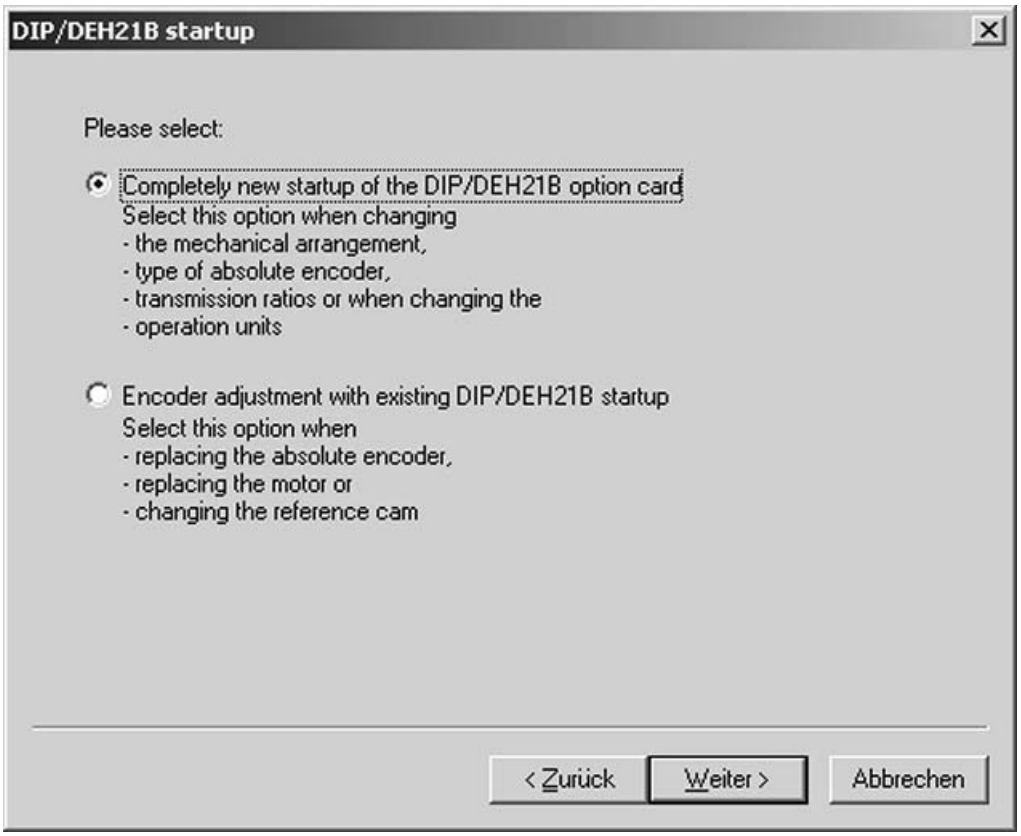


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*Figure 6: Set desired startup*

- Choose one of the following options and click the [Next] button:
  - Completely new startup of the DIP11B/DEH21B option card after initial installation, for example
  - Restartup of the DIP11B/DEH21B , for example after having replaced the absolute encoder (→ "Restartup of the DIP11B/DEH21B").
- The following sections describe a complete new installation of the DIP11B/DEH21B option card.

*Setting the cycle frequency*

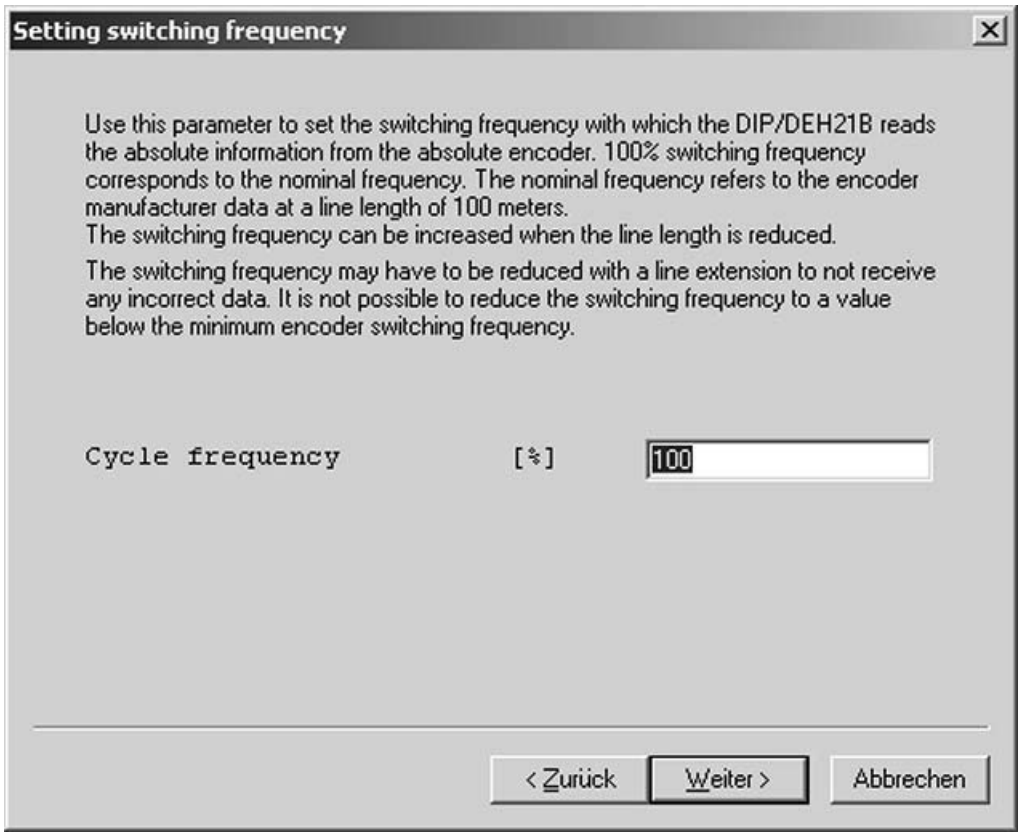


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*Figure 7: Setting the cycle frequency*

- Set the cycle frequency at which the DIP11B/DEH21B reads the absolute information of the absolute encoder. 100% cycle frequency corresponds to the nominal frequency. The nominal frequency relates to the encoder manufacturers information for a cable length of 100 m (→ Section "Encoder connection").
- If the line length is < 100 m (328 ft.), you can increase the cycle frequency. Reading out the position values more quickly improves the closed-loop control properties. The cycle frequency may not be less than the minimum encoder cycle frequency.
- Click [Next].

*Select absolute encoder*

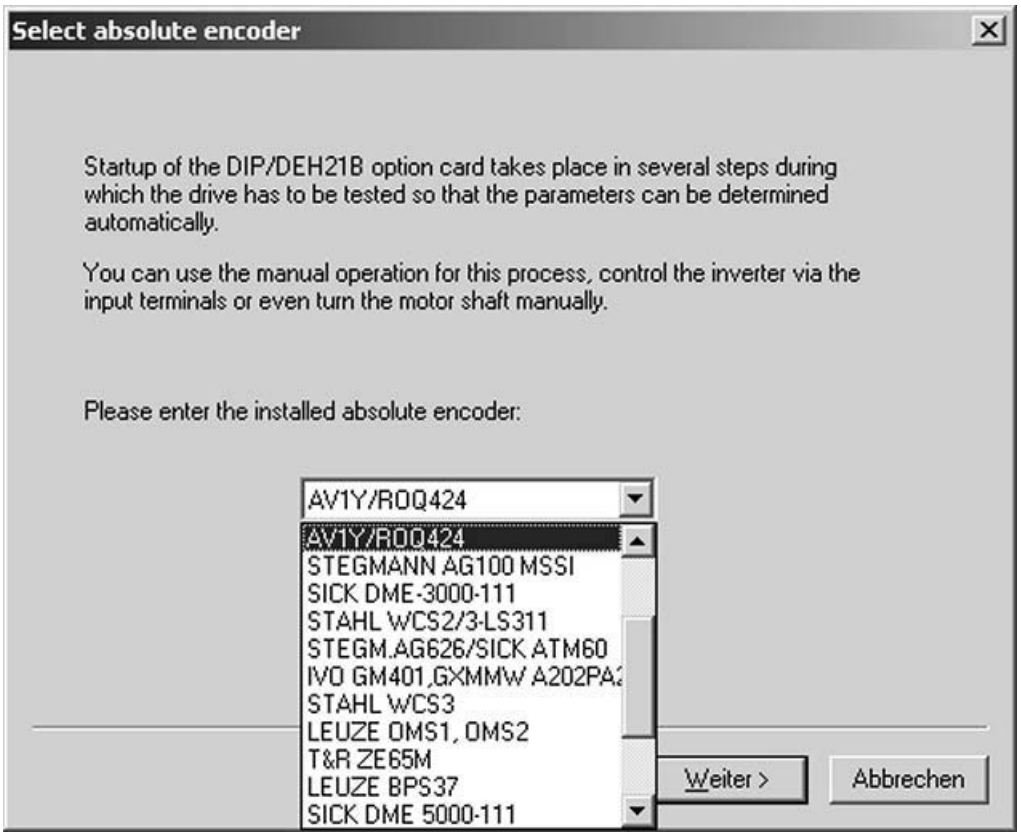


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*Figure 8: Select absolute encoder*

- Select the connected absolute encoder from the list of possible encoders.
- Click [Next].

*Choose the increments or user units option*


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*Figure 9: Select increment option*

- Select one of the two options "I would like to use increments" or "I would like to use operation units". Click [Next] to continue.

*Set the operation range of the encoder*

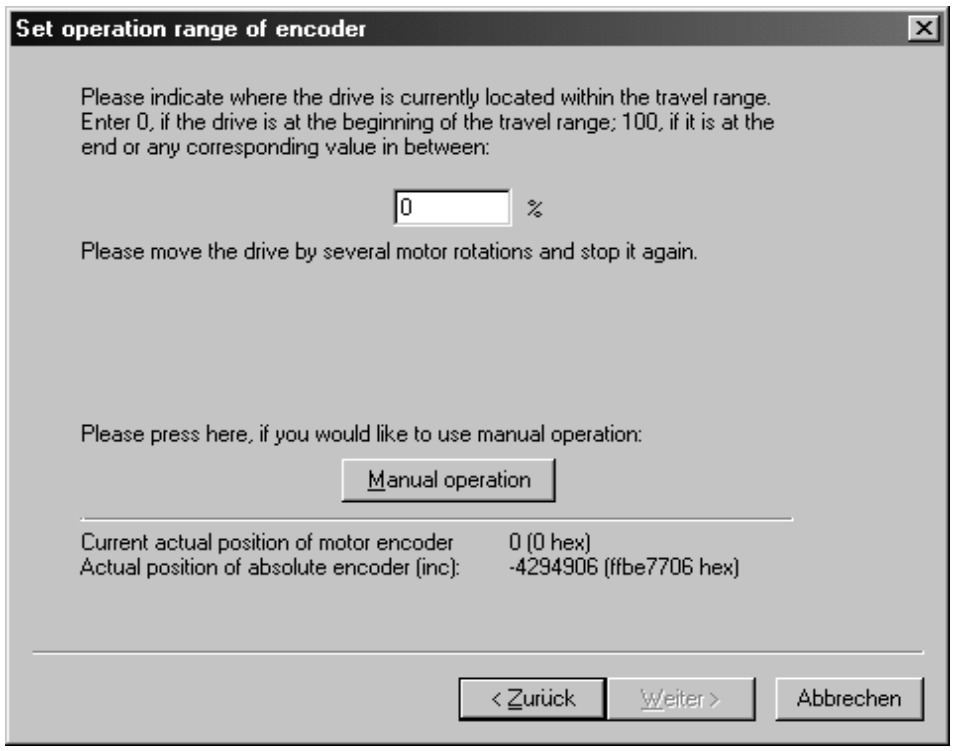


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*Figure 10: Setting the relation between connected encoder and motor encoder*

- You will have to move the drive by a few motor revolutions to set the relation between connected encoder and motor encoder. Click [Next]. The "Parameter" window opens (→ section "Entering IPOS$^{plus®}$ parameters").
- If you want to operate the drive in manual mode, click the "Manual operation" button. The "Manual operation" window opens (→ section "Manual operation").

*Manual operation*

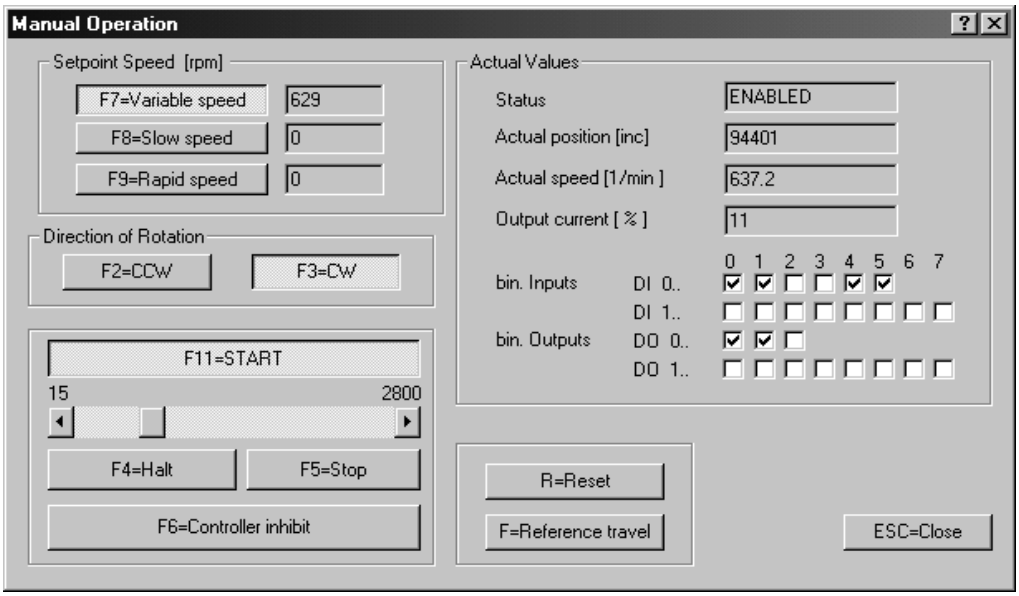


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*Figure 11: Setting reference travel in manual operation*

- Use buttons [F7=variable speed], [F8=slow speed] or [F9=fast speed] to set the setpoint speed.
- Set binary input DI00 "/Controller inhibit" to the value "1".
- Use buttons [F2=CCW] and [F3=CW] to set direction of rotation.
- Click on button [F11=START] and move the drive by a few motor revolutions.
- Click on button [F5=Stop] and reset binary input DI00 to "0". Click ESC=Close[. The current encoder setpoint will be activated. Confirm the next message with [OK].
- The window "Operation range of the encoder" will open up once again. Click [Next] to continue.

*Enter IPOS$^{plus®}$ parameters*

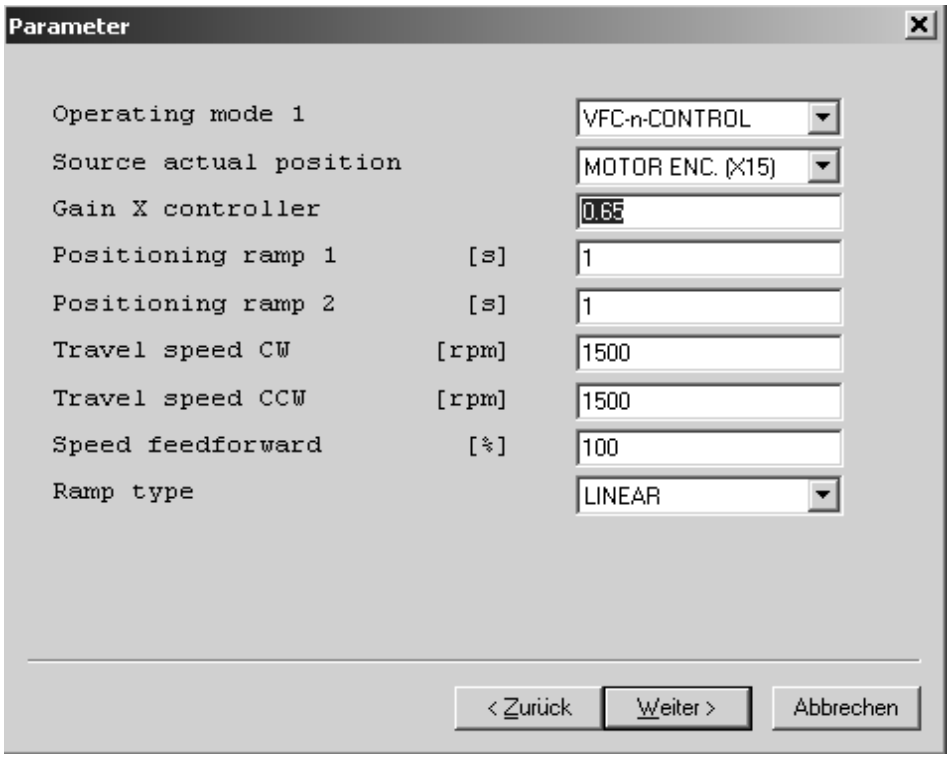


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*Figure 12: Enter IPOS$^{plus®}$ parameters*

- Enter all parameters (P910 et seq.) that are important for IPOS$^{plus®}$ programming. The parameters become effective in "...&IPOS" operating mode only.
- Click [Next] to continue.

*Set parameters for reference travel*

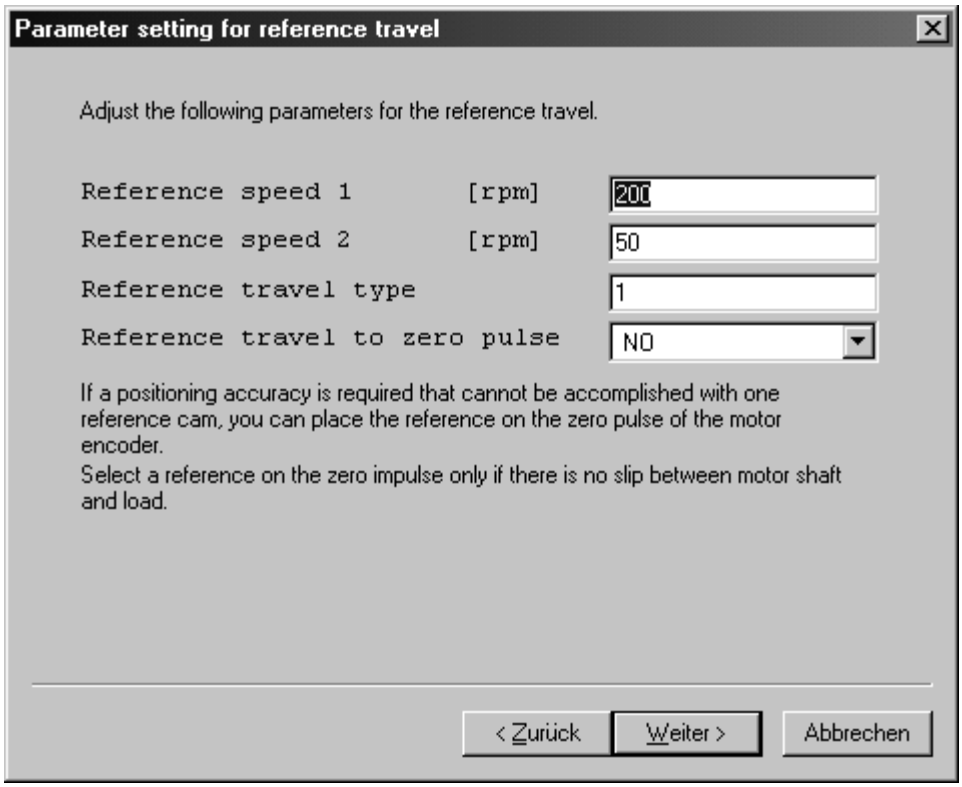


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*Figure 13: Set parameters for reference travel*

- A reference travel is necessary for precise assignment of the absolute encoder value to a mechanical reference point. Enter the necessary parameters (P900 et seq.). Click [Next] to start reference travel.

*Start reference travel*

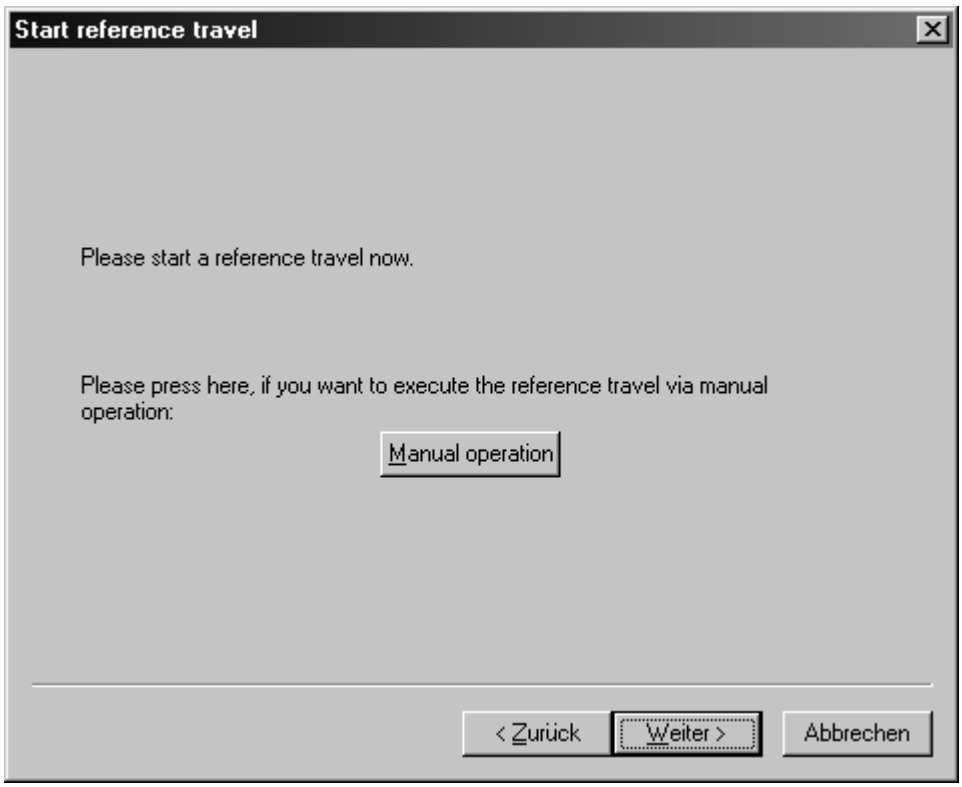


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*Figure 14: Start reference travel*

- If you want to perform reference travel by manual operation, click the [Manual operation] button. The "Manual operation" window opens (→ section "Perform reference travel by manual operation").
- After reference travel, click [Next] to continue. The window "Identify current absolute position" opens (→ section "Indicate current absolute position").

*Perform reference travel by manual operation*

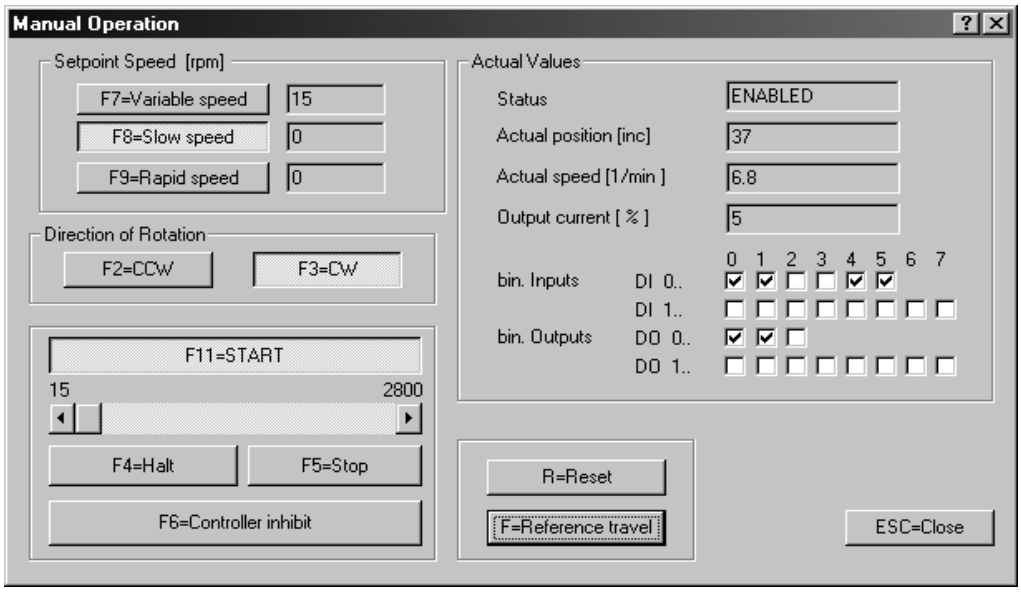


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*Figure 15: Perform reference travel by manual operation*

- Set binary input DI00 "/Controller inhibit" to "1".
- Use buttons [F2=CCW] and [F3=CW] to set direction of rotation.
- To start reference travel, click [F11=START] and then [F=Reference travel].
- After reference travel, click the [F5=STOP] button. Reset the binary input DI00 to "0". Click ESC=Close[. Confirm the next message with [OK].
- The window "Identify current absolute position" opens. Click the [Next] button.

*Identifying the current absolute position*

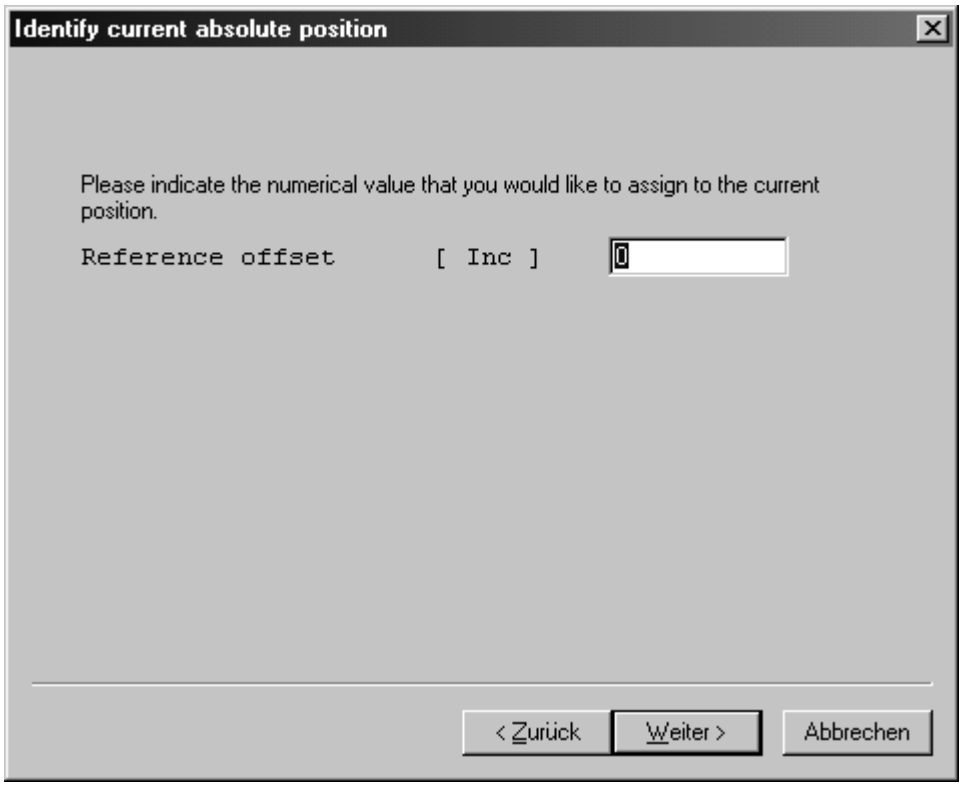


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*Figure 16: Enter reference offset as incremental value*

- Enter the numeric value that the current position is to correspond to in increments in the "Reference offset" entry field. Click [Next] to continue.

*Saving the DIP/DEH21 parameters*

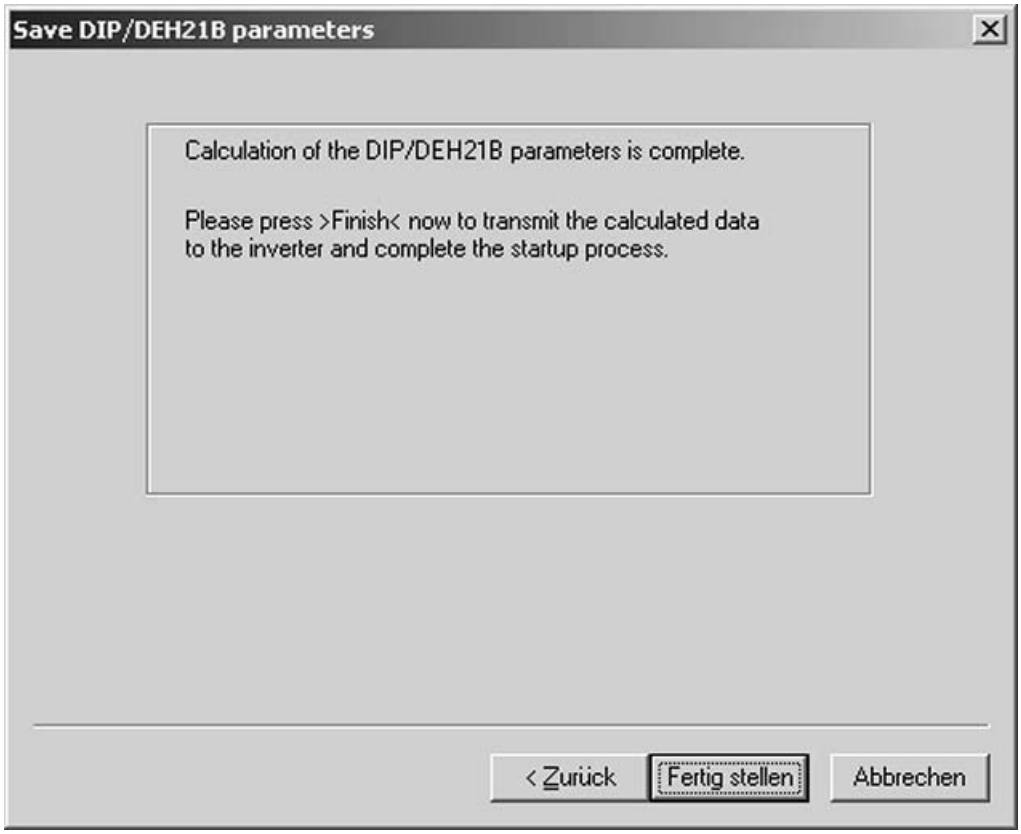


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*Figure 17: Save DIP parameters*

- Click [Finish] to transmit data to the inverter. This means the initial start is complete.

***Restartup of the DIP11B/DEH21B***

If the startup of the DIP11B/DEH21B option has been performed before, the following window appears.

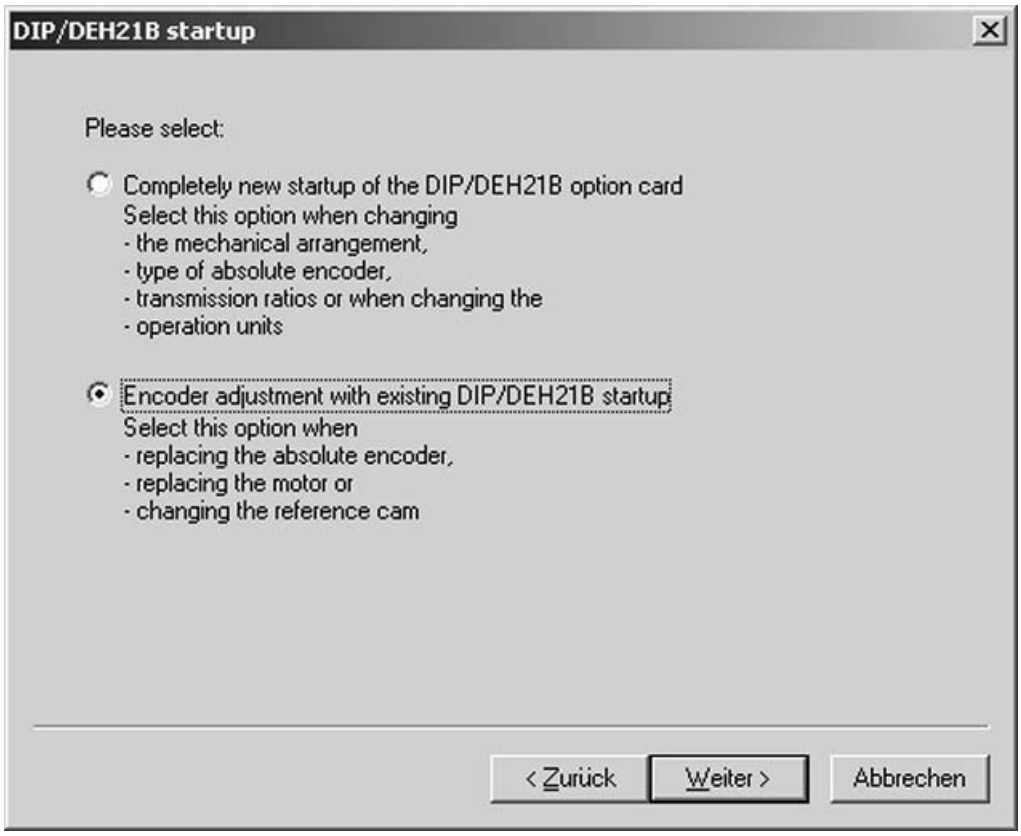


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*Figure 18: Restartup of the DIP11B/DEH21B*

- Select the option "Encoder adjustment with existing DIP/DEH21B startup" (e. g. after replacement of the absolute encoder).
- The following sections describe an encoder adjustment of the DIP11B/DEH21B.

*Encoder adjustment*

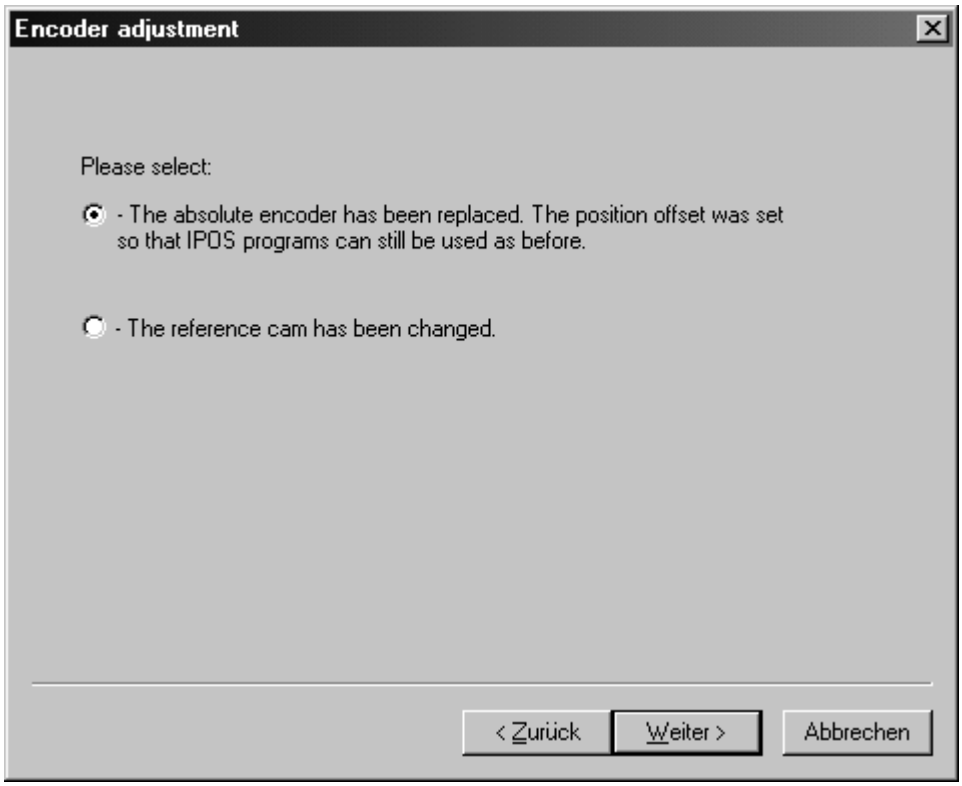


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*Figure 19: Encoder adjustment*

- Select one of the following options, depending on the particular application:
  - The absolute encoder has been replaced. The position offset was set so that the IPOS$^{plus®}$ programs can be used without being edited.
  - The reference cam has been changed.
- Click [Next] to continue.

*Start reference travel*

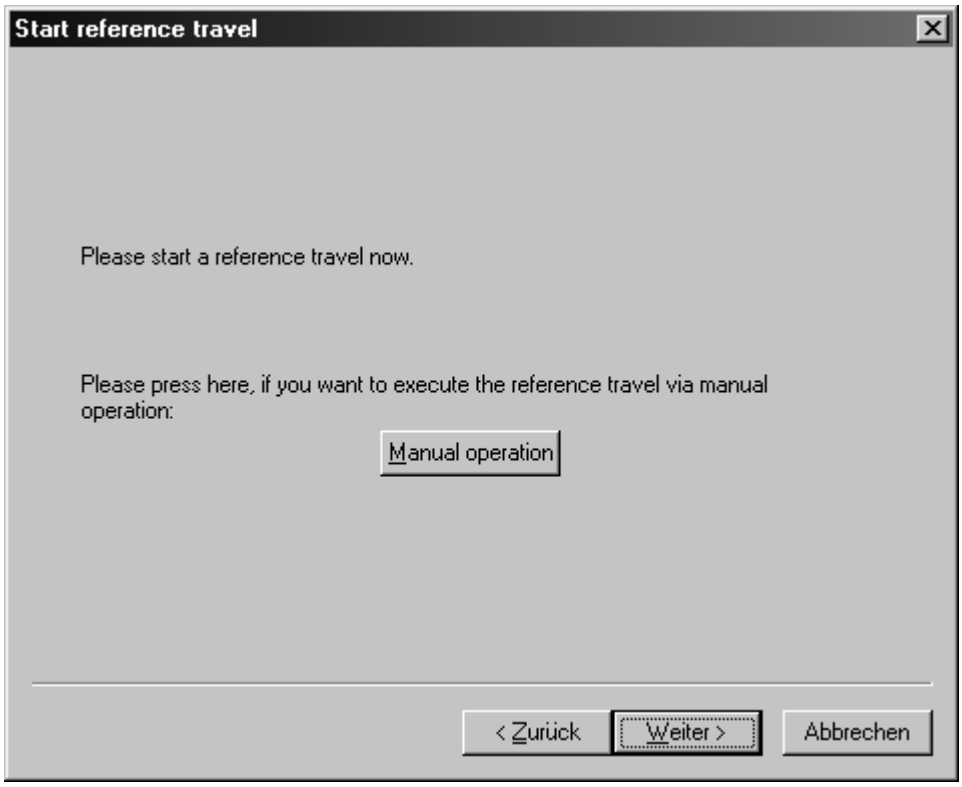


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*Figure 20: Perform reference travel*

- If you want to perform reference travel by manual operation, click the [Manual operation] button. The "Manual operation" window opens (→ section "Perform reference travel by manual operation").
- After reference travel, click [Finish]. The data are automatically loaded to the inverter. This means the encoder adjustment is complete.

*Perform reference travel by manual operation*

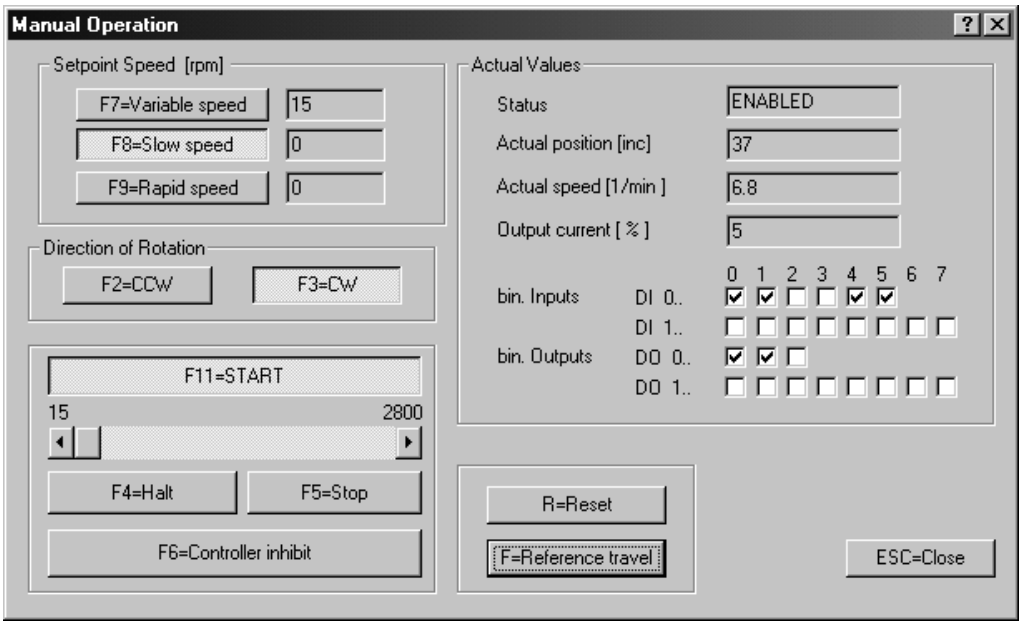


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*Figure 21: Perform reference travel by manual operation*

- Set binary input DI00 "/Controller inhibit" to the value "1".
- Use buttons [F2=CCW] and [F3=CW] to set direction of rotation.
- To start reference travel, click the button [F11=START] and next [F=Reference travel].
- After reference travel, click the [F5=STOP] button. Reset the binary input DI00 to "0". Click [ESC=Close]. Confirm the next message with [OK].
- The "Start reference travel" window opens. Click the [Finish] button. The data are loaded to the inverter. This means the encoder adjustment is complete.

## 6.3 Manual startup

Alternatively, you can perform the startup step-by-step with the DIP11B/DEH21B option as described below.

***Select P950 encoder type***

Select the absolute encoder connected to the DIP11B/DEH21B (X62) option. At present, the following **encoders** are **permitted**:

- VISOLUX EDM
- T&R CE65, CE58, CE100 MSSI
- T&R LE100, LE200
- T&R LA66K
- AV1Y / ROQ424
- STEGMANN AG100 MSSI
- SICK DME-3000-111
- STAHL WCS2-LS311
- Stegmann AG626
- IVO GM401, GXMMW A202PA2
- STAHL WCS3
- LEUZE OMS1, OMS2
- T&R ZE 65M
- LEUZE BPS37
- SICK DME5000-111
- POMUX KH53
- KÜBLER 9081
- LEUZE AMS200
- MTS TEMPOSONICS RP
- P+F AVM58X-1212
- Hübner HMG161 S24 H2048
- Balluf BTL5-S112B-M1500
- T&R LA41K
- Elgo LIMAX2

You must check whether other encoders are suitable and released for use by SEW-EURODRIVE.

***Set P35x Direction of motor rotation***

Move the drive in the positive direction at low speed. If the actual position P003 counts upwards, it is possible to leave parameter *P350 Change direction of rotation* unchanged (→ use SHELL or DBG60B keypad to display the actual position). Change P350 if the actual position counts downwards.

***P951 Set the counting direction for the SSI absolute encoder***

Move the drive in the positive direction at low speed. If the absolute encoder position (*H509 ACTPOS. ABS*) counts upwards, you do not have to change parameter *P951 Counting direction*. Change P951 if the absolute encoder position counts downwards.

***Set P955 Encoder scaling***

Set P955 to "1" if there is no motor encoder (no speed control). The position information from the absolute encoder is multiplied by this value. The parameter is set so the travel information ratio between the motor encoder and the absolute encoder is as close to "1" as possible.

Proceed as follows:

- Set P955 to "1" initially.
- Note the values of the variables *H509 ACTPOS.ABS* and *H511 ACTPOS.MOT*.
- Move the drive by about one increment.
- Calculate the difference between the values you wrote down and the new values of the variables:
  - H509 old – H509 new = H509 difference
  - H511 old – H511 new = H511 difference
- Get the quotient Q from H509 difference and H511 difference:

  Q = H511 difference / H509 difference
- Set *P955 Encoder scaling* to the value closest to the calculated quotient Q, preferably to the lower of the closest values.

***Set P954 Zero offset***

Zero offset is used for assigning the value you want to a specific position. The range of values can adopt positive or negative position values. The maximum valid parameter must not be exceeded. The limit is determined by the range of values of the numerator $\pm(2^{31}-1)$ and the range of values of the absolute encoder. Move the drive to a known position. Read in the value of variable *H509 ACT.POS.ABS* and enter the following value in parameter *P954 Zero offset*: P954 = Variable H509 – required value.

The required value is the display value you wish to have for the current position.

***Set P942 / P943 encoder factor numerator / denominator***

In the event of positioning to an external encoder (X14) or an absolute encoder (X62), then these two parameters are used for adapting the resolution to the motor encoder (X15).

Proceed as follows:

- Note the values of the variables *H509 ACTPOS.ABS* and *H511 ACTPOS.MOT*.
- Move the drive by about 30 000 increments (H511).
- Calculate the difference between the values you wrote down and the new values of the variables:
  - H509 old – H509 new = H509 difference
  - H511 old – H511 new = H511 difference
- The values must not differ by more than 32 767 ($2^{15}-1$). If the values are greater, divide both differentials by the same number to obtain correspondingly smaller values. Alternatively, repeat the procedure with a shorter travel distance.
- Enter the result H511 difference in *P942 Encoder factor nominator* and H509 difference in *P943 Encoder factor denominator*.

If there is no motor encoder installed (no speed control by MOVIDRIVE®), we recommend that you at least make an estimation of the relationship between encoder resolution and motor revolution. Use a value of 4,096 increments per motor revolution for the motor encoder.

Determine the *P943 Encoder factor denominator* as described above. Set for *P942 Encoder factor numerator* the value "4096 x number of performed motor revolutions".

In this case, the accuracy of the encoder factors is not so important (no speed control). The values merely serve for checking the absolute values in the DIP11B/DEH21B which occurs at a subordinate level.

***Set P941 Source actual position***

This parameter determines the position encoder used for position control if an operating mode & IPOS" is set in *P700 Operating mode*.

There are positioning commands in the IPOS$^{plus®}$ program to control the motor connected to MOVIDRIVE® MDX61B. Set *P941 Source actual position* to "Absolute encoder DIP" if the motor is to be positioned using the absolute encoder.

| | **NOTE** |
|---|---|
| | The circuit gain for position control of IPOS$^{plus®}$, parameter *P910 Gain X controller* was preset during startup of the speed control loop. This presetting means positioning control is performed with the motor encoder. The difference in encoder resolution or the time characteristics of the absolute encoder (e.g. laser distance measuring instrument) may require a lower value setting. |

- Set half the value of the calculated preset value.
- Start an IPOS$^{plus®}$ program with a positioning operation between two valid points at moderate speed.
- Reduce or increase parameter *P910 Gain X controller* step-by-step until the best movement and positioning characteristics have been set.
- The position value provided by the absolute encoder is available in variable *H509 ACTPOS.ABS*. The position value can be processed with the internal IPOS$^{plus®}$ control even without direct positioning.

| | **NOTE** |
|---|---|
| | When a reference travel is started **after the manual startup**, only the motor encoder is referenced **independent** of the setting of parameter P941.<br>When a reference travel is started after the startup with PC and MOVITOOLS®, as described in chapter 5.2, the absolute encoder and the motor encoder are referenced **independent** of the setting of parameter P941. |

# 7 Unit Functions

## 7.1 Encoder evaluation

All connected encoders are always evaluated regardless of the operating mode (P700). Operating modes with positioning (VFC-n-Reg. & IPOS, CFC & IPOS, SERVO & IPOS) always require a motor encoder at X15. The actual positions can be evaluated with the touch-probe function.

| Encoder type | | Absolute encoder on DIP11B/DEH21B P941: Absolute encoder (DIP) | Ext. encoder on X14 (P941: external encoder) | Motor encoder on X15 (P941: Motor encoder) |
|---|---|---|---|---|
| **Connection** | | X62 on DIP11B/DEH21B | X14 on DEH11B/DER11B option[1)] | X15 on DEH11B/DEH21B/DER11B option |
| **Actual value on variable** | | H509 ACTPOS.ABS | H510 ACTPOS.EXT | H511 ACTPOS.MOT |
| **Resolution** | | Absolute position **after** conversion with:<br>• Zero offset (P954),<br>• Position offset (P953),<br>• Counting direction (P951). | **Actual** number of encoder PPR count (with four time evaluation) | **Always** 4096 inc./motor revolution, regardless of the actual encoder resolution |
| **Touch probe** | **Edge at DI02** | H503 TP.POS1ABS | H506 TP.POS1EXT | H507 TP.POS1MOT |
| | **Edge at DI03** | H502 TP.POS2ABS | H504 TP.POS2EXT | H505 TP.POS2MOT |
| | **Max. delay time** | 1 ms | 100 µs | |

1) It is not possible to operate the DEH11B and the DEH21B simultaneously.

## 7.2 Functions relevant for absolute encoders

The following monitoring functions do not depend on the use of the DIP11B/DEH21B. However, knowledge of the range of functions is important for optimum use.

***Speed monitoring***

Speed monitoring checks the correcting variable of the n-controller and, in M control mode, the actual speed range. The motor encoder is always used for the speed signal, so the "DIP11B/DEH21B encoder" is either not checked with speed monitoring P50_ or not 'checked' directly.

***Lag error monitoring***

When lag error monitoring is active, it checks the difference between the current setpoint position and the actual position. The maximum permitted amount is set using *P923 Lag error window*. Lag error monitoring is only effective if the drive is in positioning status. The resolution is always "encoder increments" (exception: *P941 Source actual position* = Motor encoder (X15)), independent of PPR count 4,096 incr./motor revolution).

***Axis in position message***

The function operates with the resolution encoder increments of the encoder set via P941 (exception: *P941 Source actual position* = Motor encoder (X15)), independent of PPR count 4,096 incr./motor revolution).

If no positioning operation has been set via P700 or if the drive is in reference travel status, the function will always show "Axis in position = 0".

***Reference travel***

| | NOTE |
|---|---|
| | **The reference travel and the associated parameters P900 ... P903 as well as the reference travel commands refer to the motor position (X15) and therefore to the motor encoder.** |

The message "Axis referenced" refers to a referencing of the motor position.

The variable *H510 ACTPOS.EXT* (X14) may be set with IPOS$^{plus®}$.

The DIP11B/DEH21B position at variable *H509 ACTPOS.ABS* is the processed position value. It is created with the absolute value supplied from the encoder, taking account of the DIP11B parameters *P952 Counting direction* and *P954 Zero offset*.

***Modulo function***

You activate the modulo function with the Shell parameters (P960 and following) (→ MOVIDRIVE® MDX60B/61B system manual). You then have the option to represent the positioning process directly in the scaling 360° = $2^{16}$.

The actual position is displayed in variable *H455 ModActPos*. Positioning processes are triggered in case the target position (variable *H454 ModTagPos*) is written in enabled state. You will find additional information in the "MOVIDRIVE® IPOS$^{plus®}$ positioning and sequence control" manual.

***System variables relevant for absolute encoders***

| System variable | Meaning |
|---|---|
| H503 TP.POS1ABS | Touch probe position DIP11B/DEH21B encoder |
| H502 TP.POS2ABS | Touch probe position DIP11B/DEH21B encoder |
| H509 ACTPOS.ABS | Absolute position after conversion with zero offset, position offset, counting direction, encoder scaling |

***Software limit switch***

The function of the software limit switches monitors whether the current target position (H492 TARGET POSITION) is in the valid range. The function is active when the drive is referenced or parameter *P941 = source actual position* = absolute encoder (DIP) is set and the drive is in positioning status. If you position to "external encoder" and need the limit switches, you will have to perform a reference travel.

## *7.3 Display values*

The SHELL operating software and the DBG60B keypad display in parameter group *P00_ Display values / Process values* the position information of the motor encoder. This also applies to the fieldbus information of the PI data "ACTUAL position LOW and HIGH".

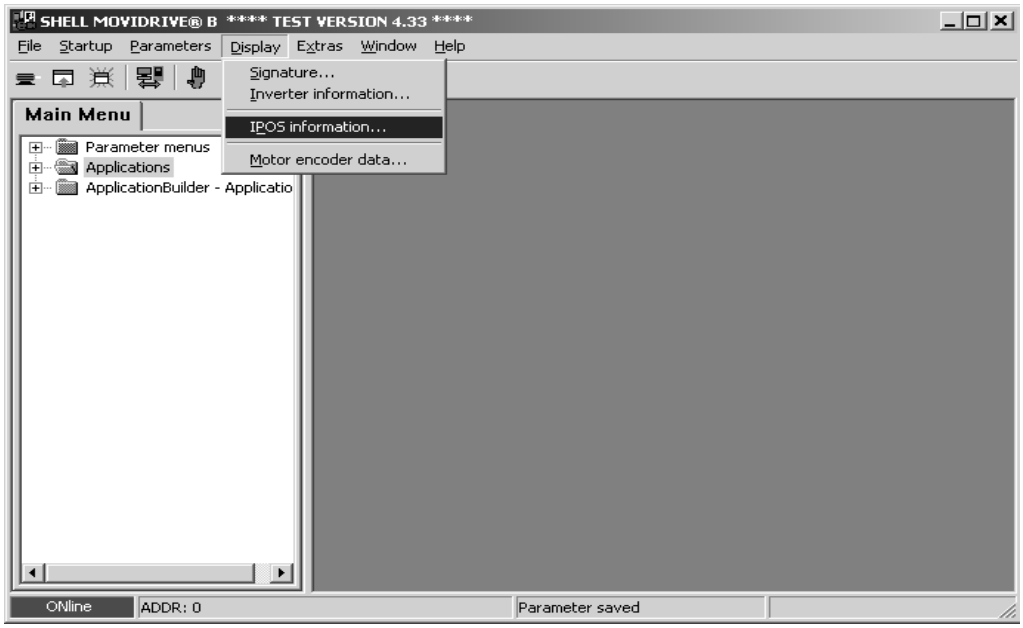
The system variable *H509 ACTPOS.ABS* includes the processed position value of the absolute encoder. You can view the value with SHELL and DBG60B. Transmission with the fieldbus is implemented by setting the PI data transfer P873/4/5 to "IPOS PI DATA" and writing the PI data with the *SetSys* command in the IPOS$^{plus®}$ program.

You can write PI data with the *SetSys* command if an actual position (regardless of the encoder) can be transmitted scaled.

## 7.4 Diagnostics option in the Shell program

You have the option to display the current program status (such as the current actual position of the absolute encoder). Proceed as follows:

In Shell, open the menu item [Display]/[IPOS Information].

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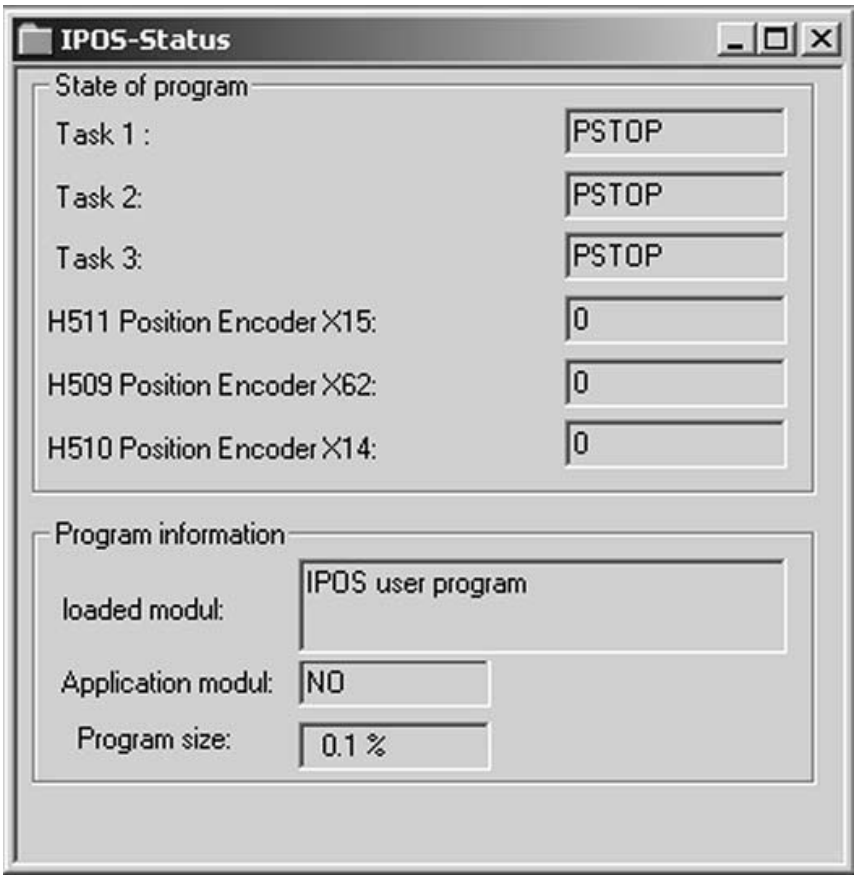
The window [IPOS status display] opens. Here you can find the information on the current program status (→ following figure).

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# 8 IPOS$^{plus®}$ Parameters

## 8.1 Parameter description

The following is a description of the IPOS$^{plus®}$ parameters. The factory setting is indicated by underline.

***P072 Option/firmware encoder slot***

Displays the encoder card currently installed in the encoder slot and the program version.

***P074 Option/firmware expansion slot***

Displays the option card currently installed in the expansion slot and the program version, if this option has a program memory.

***P941 Source actual position***

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

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

***Set P942/P943 encoder factor numerator/denominator***

Setting range: 1 ... 32767

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

In the event of positioning to an external encoder (X14) or an absolute encoder (X62), then these two parameters are used for adapting the resolution to the motor encoder (X15).

Proceed as follows:

- Write down the values of variables *H509 absolute position* (H510 with external encoder) and *H511 Current motor position*.
- Move the drive by about 30 000 increments (H511).
- Calculate the difference between the values you wrote down and the new values of the variables:
  - H509 new– H509 old= H509 difference
  - H511 new – H511 old= H511 difference
- The values must not differ by more than 32 767 ($2^{15}$ –1). If the values are greater, divide both differentials by the same number to obtain correspondingly smaller values. Alternatively, repeat the procedure with a shorter travel distance.
- Enter the result H511 difference in *P942 Encoder factor nominator* and H509 in *P943 Encoder factor denominator*.

***P950 Encoder type***

The absolute encoder connected to the DIP11B/DEH21B option at X62 is selected. At present, encoders can be selected from the following list:

- VISOLUX EDM
- T&R CE65, CE58, CE100 MSSI
- T&R LE100, LE200
- T&R LA66K
- AV1Y / ROQ424
- STEGMANN AG100 MSSI
- SICK DME-3000-111
- STAHL WCS2-LS311
- Stegmann AG626
- IVO GM401, GXMMW A202PA2
- STAHL WCS3
- LEUZE OMS1, OMS2
- T&R ZE 65M
- LEUZE BPS37
- SICK DME5000-111
- POMUX KH53
- KÜBLER 9081
- LEUZE AMS200
- MTS TEMPOSONICS RP
- P+F AVM58X-1212
- Hübner HMG161 S24 H2048
- Balluf BTL5-S112B-M1500
- T&R LA41K
- Elgo LIMAX2

***P951 Counting direction***

Setting range: NORMAL / INVERTED

Defines the counting direction of the absolute encoder. The setting must be made so the counting direction of the motor encoder (X15) and the absolute encoder (X62) match.

***P952 Clock frequency***

Setting range: 1 ... 200 %

Defines the cycle frequency at which absolute encoder information is transmitted from the encoder to the inverter. A cycle frequency of 100 % corresponds to the nominal frequency of the encoder in relation to a 100 m cable length.

***P954 Zero offset***

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

Zero offset is used for assigning the value you want to a specific position. The range of values can adopt positive or negative position values. The maximum valid parameter must not be exceeded. The limit is determined by the range of values of the numerator ($2^{31}$) and the range of values of the absolute encoder. Move the drive to a known position. Read off the value of variable *H509 ACT.POS.ABS* and enter the following value in parameter P954 Zero offset: P954 = Variable H509 – required value.

The required value is the display value you wish to have for the current position.

***P955 Encoder scaling***

Setting range: x1 / x2 / x4 / x8 / x16 / x32 / x64

**Before** setting P955, make sure that P942 and P943 are set to "1".

The significance of the travel resolution of the motor encoder and absolute encoder is adapted. The parameter is set so the travel information ratio between the motor encoder and the absolute encoder is as close to 1 as possible. Set the parameter initially to "x1." To do this, note the values in variables H509 and H511.

- Move the drive by about 1000 increments (H511).
- Calculate the difference between the values you wrote down and the current values:
  - H509 new – H509 old= H509 difference
  - H511 new – H511 old= H511 difference
- Calculate the quotient from H511 difference divided by H509 difference. Set parameter *P955 Encoder scaling* to the value that is closest to the calculated quotient.

.

**Important**: The encoder scaling directly influences the parameters *P900 Reference offset*, *P942 Encoder factor numerator* and *P943 Encoder factor denominator* and the parameter group *P92x IPOS monitoring*. All positions of the IPOS$^{plus®}$ program have to be adjusted when using the encoder. The setting of all listed parameters has to be adjusted every time the encoder scaling is changed.

# 9 Application Example

## 9.1 Storage and retrieval system with extended positioning via bus

The "Extended positioning via bus" application module is particularly suited to applications in which it is necessary to move to any number of positions at different speeds and with different acceleration ramps. If you use an external encoder for positioning, which is necessary when there is a non-positive connection between motor shaft and load, you can either use an incremental encoder or an absolute encoder.

The "Extended positioning via bus" application module is especially suitable for the following branches of industry and applications:

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

- **Logistics**
  - Storage and retrieval units
  - Transverse carriages

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

- User-friendly user interface
- You only have to enter the parameters required for "Extended positioning via bus" (ratios, speeds, diameters).
- Guided parameter setting process instead of complicated programming.
- Monitor mode for optimum diagnostics.
- Users do not need any programming experience.
- Long travel distances possible ($2^{18} \times$ travel unit)
- Incremental encoders or absolute encoders can be used as external encoders.
- It does not take long to get to know the system.

***Functional characteristics***

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

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

| Travel unit | Maximum possible travel distance |
|---|---|
| **1/ 10 mm** | 26.2144 m |
| **mm** | 262.144 m |

- You have to set the speed and the ramps via the bus.
- Software limit switches can be defined and evaluated.
- Either incremental or absolute encoders can be evaluated as external encoders.
- Simple connection to the master controller (PLC).

***Operating modes*** The functions are implemented with three operating modes:

- Jog mode
  - The drive is moved clockwise or counter clockwise via bit 9 or 10 in the control word (PO1). The speed and the ramps are variable and are set via the fieldbus.

- Referencing mode
  - A reference travel is started via bit 8 in the control word (PO1). Reference travel establishes the reference point (**machine zero**) for absolute positioning operations.
  - Reference travel can also be performed when using an absolute encoder as external encoder.

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

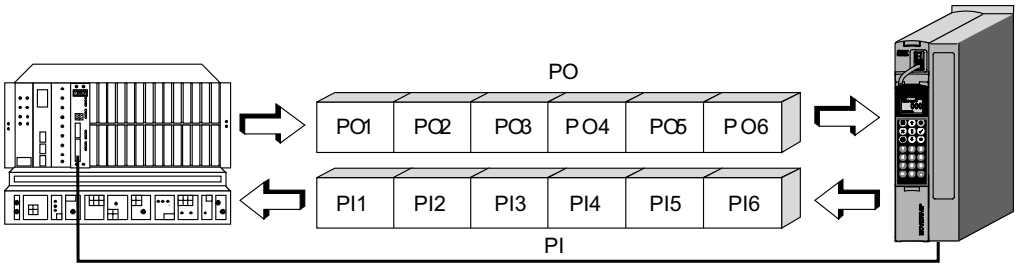


*Figure 22: Data exchange via process data*

| | | | |
|---|---|---|---|
| PO | = Process output data | PI | = Process input data |
| PO1 | = Control word 2 | PI1 | = Status word |
| PO2 | = Target position high | PI2 | = Actual position high |
| PO3 | = Target position low | PI3 | = Actual position low |
| PO4 | = Set speed | PI4 | = Actual speed |
| PO5 | = Acceleration ramp | PI5 | = Active current |
| PO6 | = Deceleration ramp | PI6 | = Unit utilization |

# 10 Error Messages

## 10.1 MOVIDRIVE® MDX61B with DIP11B/DEH21B option

The factory set error response appears in the "Response (P)" column. (P) indicates that the response is programmable (via IPOS$^{plus®}$).

| Fault code | Designation | Response (P) | Sub-error code | Designation | Possible cause | Measure |
|---|---|---|---|---|---|---|
| **36** | Option missing | Immediate switch-off | 0 | Hardware is missing or not permitted. | • Type of option card not allowed<br>• Setpoint source, control signal source or operating mode not permitted for this option card<br>• Incorrect encoder type set for DIP11B/DEH21B | • Use correct option card<br>• Set correct setpoint source (P100)<br>• Set correct control signal source (P101)<br>• Set correct operating mode (P700 or P701)<br>• Set the correct encoder type |
| | | | 2 | Fault encoder slot. | | |
| | | | 3 | Fault fieldbus slot. | | |
| | | | 4 | Fault expansion slot. | | |
| **40** | Boot synchronization | Immediate switch-off | 0 | Timeout at boot synchronization with option. | Error during boot synchronization between inverter and option. | Install a new option card if this fault reoccurs. |
| **41** | Watchdog option IPOS watchdog | Immediate switch-off | 0 | Fault Watchdog timer from/to option. | • Error in communication between system software and option software<br>• Watchdog in the IPOS$^{plus®}$ program<br>• An application module without the application version has been loaded in a MOVIDRIVE® B unit<br>• The wrong technology function has been set if an application module is used | • Contact SEW Service.<br>• Check IPOS program<br>• Check whether the unit has been activated for the application version (P079)<br>• Check the selected technology function (P078) |
| | | | 17 | Fault Watchdog IPOS. | | |
| **92** | DIP encoder problem | Error message | 1 | Soiling problem Stahl WCS3 | Encoder on DIP11B/DEH21B reports an error. | Possible cause:<br>Encoder is dirty → clean encoder |
| **93** | DIP encoder error | Emergency stop (P) | 0 | Error "absolute encoder" | The encoder signals a fault, e.g. power failure.<br>• Connection cable between the encoder and DIP11B/DEH21B does not meet the requirements (twisted pair, shielded).<br>• Cycle frequency for cable length too high.<br>• Permitted max. speed/acceleration of encoder exceeded.<br>• Encoder defective. | • Check absolute encoder connection.<br>• Check connection cables.<br>• Set correct cycle frequency.<br>• Reduce maximum traveling velocity or ramp.<br>• Replace absolute encoder. |
| **95** | DIP plausibility error | Emergency stop (P) | 0 | Validity check of absolute position | No plausible position could be determined.<br>• Incorrect encoder type set.<br>• IPOS$^{plus®}$ travel parameter set incorrectly.<br>• Numerator/denominator factor set incorrectly.<br>• Zero adjustment performed.<br>• Encoder defective. | • Set the correct encoder type.<br>• Check IPOS$^{plus®}$ travel parameters.<br>• Check traveling velocity.<br>• Correct numerator/denominator factor.<br>• After zero adjustment reset.<br>• Replace absolute encoder. |
| **99** | IPOS ramp calculation error | Immediate stop | 0 | Ramp or positioning speed modified (sine or square) | **Only in IPOS$^{plus®}$ operating mode:**<br>Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter. | Rewrite the IPOS$^{plus®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited. |

# 11 Technical Data

## 11.1 Electronics data DIP11B option

| Description | | Function |
|---|---|---|
| **Connection binary inputs X60:1 ... 8** | | DI10 ... DI17 isolated via optocoupler, scanning time 1 ms, PLC compatible (EN 61131) |
| **Internal resistance**<br>**Signal level (EN 61131)**<br>**Function** | **X60:1 ... 8** | $R_i$= 3 kΩ, $I_E$= 10 mA<br>"1" = DC+13 V ... +30 V "0" = DC–3 V ... +5 V<br>DI10 ... DI17: Selection option → Parameter menu P61_ |
| **Connection binary outputs** | **X61:1 ... 8** | DO10 ... DO17, PLC compatible (EN 61131), response time 1 ms<br>$I_{max}$ = DC 50 mA, short-circuit proof and protected against external voltage to DC 30 V |
| **Signal level (EN 61131)**<br>**Function X61:1 ... 8** | | "1" = DC+24 V "0" = DC 0 V **Important**: Do not apply external voltage!<br>DO10 ... DO17: Selection option → Parameter menu P63_ |
| **Encoder connection** | **X62:** | SSI encoder input |
| **Reference terminals** | **X60:9**<br>**X60:10** | DCOM: Reference potential for binary inputs (DI10 ... DI17)<br>DGND: Reference potential for binary signals and 24VIN<br>• without jumper X60:9-X60:10 (DCOM-DGND) isolated binary inputs<br>• With jumper X60:9-X60:10 (DCOM-DGND) non-isolated binary inputs |
| **Voltage input** | **X61:9** | 24VIN: Supply voltage DC+24 V for binary outputs DO10 ... DO17 and encoder (mandatory) |

## 11.2 Electronics data DIP11B option

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

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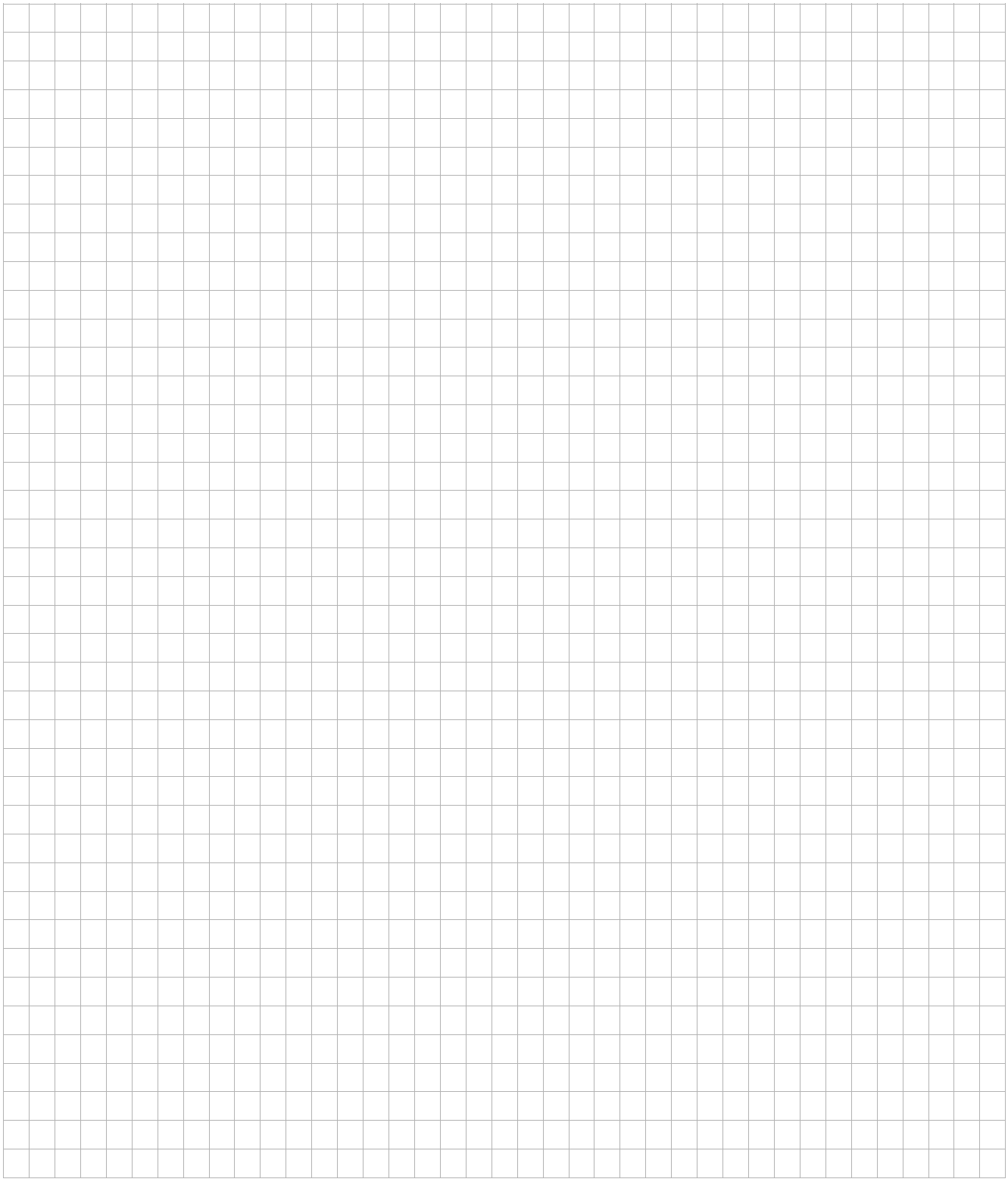

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