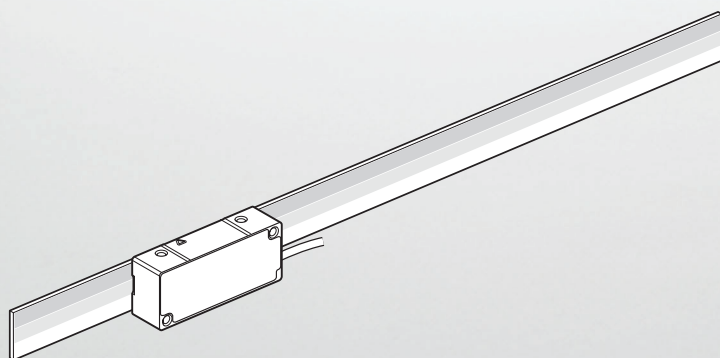




HEIDENHAIN



LIC 4119

LIC 4139

LIC 4199

Mounting Instructions

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1 Basic information

This chapter contains information about the product and the Mounting Instructions.

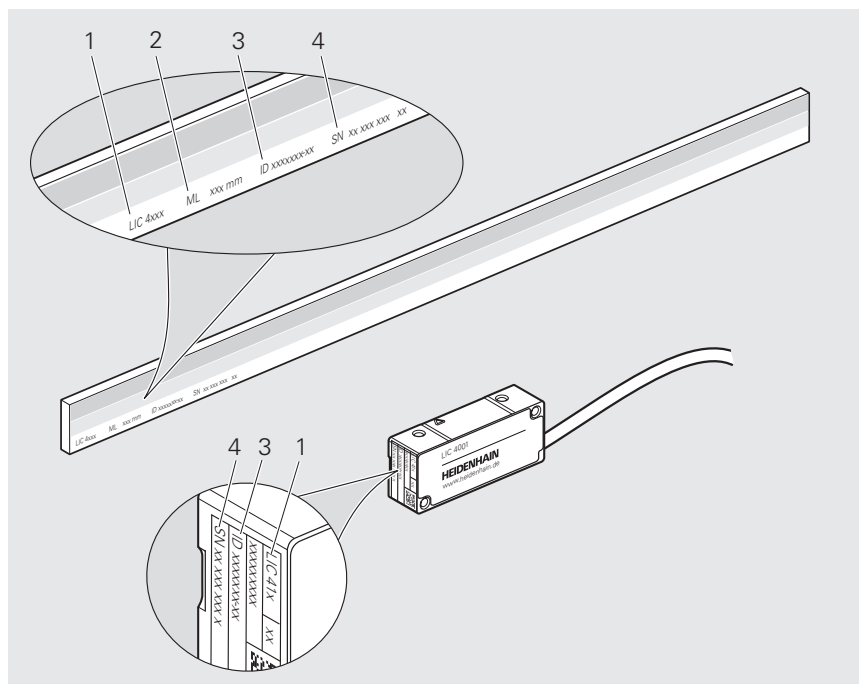
1.1 Applicability of the documentation

These Mounting Instructions are valid for the LIC 4009, LIC 411, LIC 413, LIC 419F, LIC 419M, LIC 419P, LIC 419Y.

► Prior to using the documentation, check whether the documentation and product model match

The designation of the product is printed on the ID label.

ID label



ID label with legend

- 1 Product name
- 2 Measuring length (ML)
- 3 Part number (ID)
- 4 Serial number (SN)

1.2 Target groups of the Mounting Instructions

The Mounting Instructions must be read and observed by every person who performs any of the following tasks:

- Design
- Mounting
- Removal

1.3 Notes on reading the documentation

WARNING

Fatal accidents, personal injury or property damage caused by non-compliance with the documentation!

Failure to comply with the documentation may result in fatal accidents, personal injury or property damage.

- ▶ Read the documentation carefully from beginning to end
- ▶ Keep the documentation for future reference

The following table lists the various parts of the documentation in their order of reading priority.

Document type	Description
Addendum	An Addendum supplements or supersedes the corresponding contents of the Operating Instructions and, if applicable, of the Mounting Instructions. If an Addendum is included in the shipment, it has the highest priority for reading. All other documentation content retains its validity.
Operating Instructions	The Operating Instructions contain all of the information and safety instructions for the proper and intended operation of the product. The Operating Instructions (English language version) are included in delivery and can also be downloaded in other languages from www.heidenhain.com/documentation . The Operating Instructions must be read prior to initial operation of the product. The Operating Instructions have the second highest priority for reading.
Mounting Instructions	The Mounting Instructions contain all the information and safety precautions needed for the proper mounting and installation of a product. The Mounting Instructions are not included in delivery and must be downloaded from www.heidenhain.com/documentation . The Mounting Instructions have the third highest priority for reading.

Would you like any changes, or have you found any errors?

We are continuously striving to improve our documentation for you. Please help us by sending your suggestions to the following e-mail address:

userdoc@heidenhain.de

1.4 Symbols and fonts used for marking text

In these instructions the following symbols and fonts are used for marking text:

Format	Meaning
▶ ...	Identifies an action and the result of this action
> ...	Example: ▶ Tilt the shipping brace to remove it (c) > The shipping brace has been removed now
■ ...	Identifies an item of a list
■ ...	Example: ■ Solid contaminants: class 3 ■ Max. pressure dew point: class 4

1.5 Notes in this documentation

Safety precautions

Precautionary statements warn of hazards in handling the product and provide information on their prevention. Precautionary statements are classified by hazard severity and divided into the following groups:

DANGER

Danger indicates hazards for persons. If you do not follow the avoidance instructions, the hazard **will result in death or severe injury**.

WARNING

Warning indicates hazards for persons. If you do not follow the avoidance instructions, the hazard **could result in death or serious injury**.

CAUTION

Caution indicates hazards for persons. If you do not follow the avoidance instructions, the hazard **could result in minor or moderate injury**.

NOTICE

Notice indicates danger to material or data. If you do not follow the avoidance instructions, the hazard **could result in things other than personal injury, such as property damage**.

Informational notes

Informational notes ensure reliable and efficient operation of the product. Informational notes are divided into the following groups:



The information symbol indicates a **tip**.
A tip provides important additional or supplementary information.



The book symbol indicates a **cross reference**.
A cross reference leads to external documentation, for example: further documentation from HEIDENHAIN or another supplier.



The globe symbol represents a **cross reference** to a source on the Internet, e.g. www.heidenhain.com

1.6 Units and tolerances

Unless otherwise specified, the dimensions stated in these Mounting Instructions are given in millimeters.

Unless otherwise specified, the tolerances stated in these Mounting Instructions conform to ISO 8015 and ISO 2768 standards.

mm



Tolerancing ISO 8015
ISO 2768:1989-mH
≤ 6 mm: ±0.2 mm

2 Safety

This chapter provides important safety information needed for the proper mounting and installation of the product.

2.1 Personnel qualification

Mounting, initial setup and removal must be conducted by a qualified specialist under compliance with local safety regulations.

2.2 General safety precautions

WARNING

Danger of electric shock due to connection to unsuitable downstream electronics!

If you connect unsuitable downstream electronics to the product, fatal accidents or severe personal injuries can occur.

- ▶ Connect the product only to downstream electronics whose supply voltage comes from PELV systems

WARNING

Risk of injury due to plug connections under voltage!

If you disengage plug connections while the equipment is under power, this may result in fatal accidents or severe personal injury.

- ▶ Do not engage or disengage any connecting elements while the product is under power

WARNING

Risk of injury from damaged or worn components!

Safety functions can fail if damaged or worn components are installed unintentionally. Failed safety functions can result in death or serious injury.

- ▶ Inspect the component for damage
- ▶ Do not use any damaged or worn components
- ▶ In case of replacement, repair the thread
- ▶ Use new screws, spring pins and nuts
- ▶ Secure screws and nuts with suitable material-bonding anti-rotation lock

CAUTION

Risk of injury due to sharp edges and corners of the scale tape!

If you do not guide the scale tape in a controlled manner during handling, this can cause cuts or eye injuries.

- ▶ Wear protective gloves and safety goggles
- ▶ Guide the scale tape slowly and in a controlled manner during handling
- ▶ Have a second person help you when handling long scale tapes

NOTICE**Property damage due to mechanical stress!**

Exposing the product to mechanical stress can cause damage to the product.

- ▶ Do not drop the product or subject it to major vibration
- ▶ Do not expose the product to mechanical stress
- ▶ Do not change the physical structure of the product

NOTICE**Property damage due to electrical stress!**

Improper handling of the connecting element can cause damage to the product.

- ▶ Do not engage or disengage any connecting elements while the product is under power
- ▶ Do not touch the contacts of the plug connections

NOTICE**Property damage due to electrostatic discharge (ESD)!**

This product contains electrostatically sensitive components that can be destroyed by electrostatic discharge (ESD).

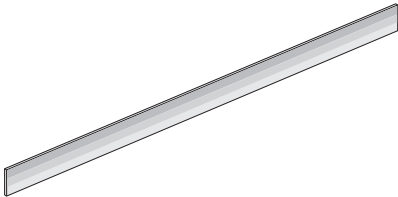
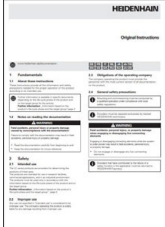
- ▶ It is essential to observe the safety precautions for handling ESD-sensitive components
- ▶ Never touch connector pins without ensuring proper grounding
- ▶ Wear a grounded ESD wristband when handling the connections of the product

3 Items supplied and accessories

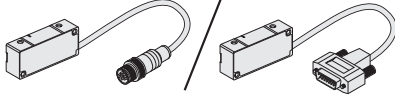
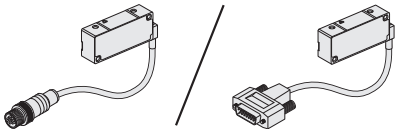
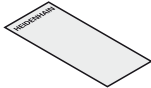
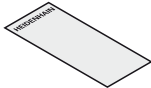
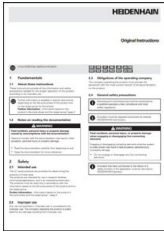
This chapter contains information on the items supplied and the available accessories of the product.

3.1 Items supplied

3.1.1 Items supplied: LIC 4009 scale tape

Component	Figure
Scale tape	
Operating Instructions	
Quality Inspection Document	

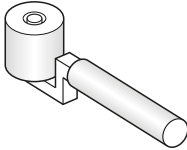
3.1.2 Items supplied: LIC 411, LIC 413, and LIC 419x scanning heads

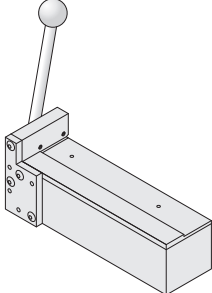
Component	Figure
Scanning head	
or	
Scanning head with angled cable outlet	
Spacer shim 0.15 mm (not needed)	
Spacer shim 0.75 mm	
Operating Instructions	
Manufacturer's Inspection Document	

3.2 Mounting accessories

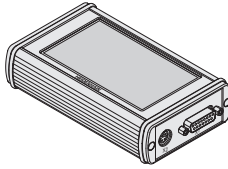
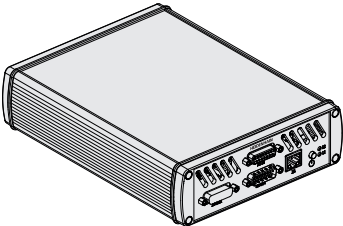
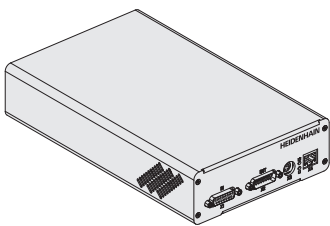
Accessories can be ordered separately from HEIDENHAIN.

3.2.1 Accessories for mounting the scale tape

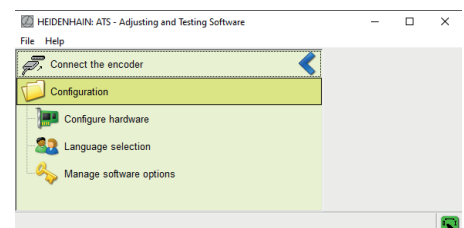
Designation	ID	Figure
Roller	276885-01	

Designation	ID	Figure
Cut-off device	303516-01	

3.2.2 Accessories for mounting the scanning head

Designation	ID	Figure
PWT 101 testing device	1261013-01	
or		
PWM 3000 inspection unit	1454173-01	
or		
PWM 21 inspection unit	1200635-51	

Adjusting and Testing Software (ATS)



The ATS is available for download free of charge.

- ▶ www.heidenhain.com/service/downloads/software/
- ▶ Open the **Categories** selection menu
- ▶ Select the **Inspection and testing devices** category

4 Mounting

This chapter describes the mounting requirements, different mounting variants, and all other tasks necessary when mounting.

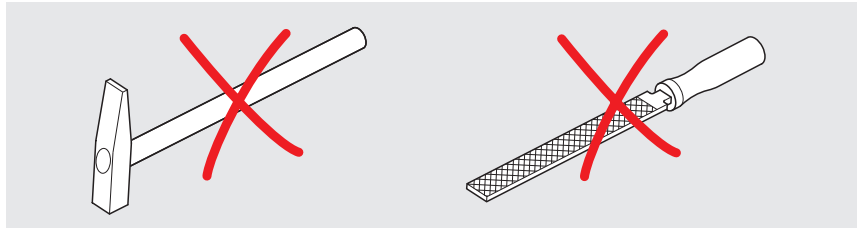
4.1 Requirements and notes

NOTICE

Property damage due to inappropriate tools!

Using inappropriate tools for mounting or removal of the encoder causes damage to the encoder.

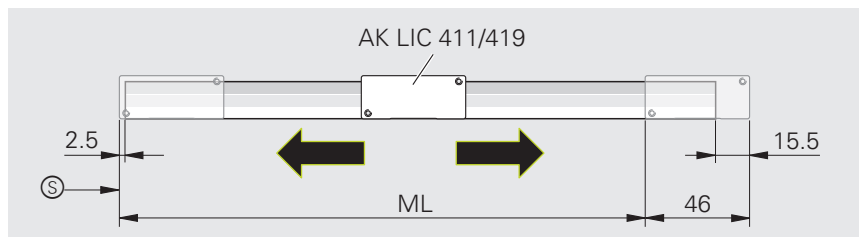
- ▶ Do not use hammers
- ▶ Do not use pointed or sharp-edged tools



Choose a mounting attitude such that the traverse range is within the measuring length (**ML**) of the encoder.

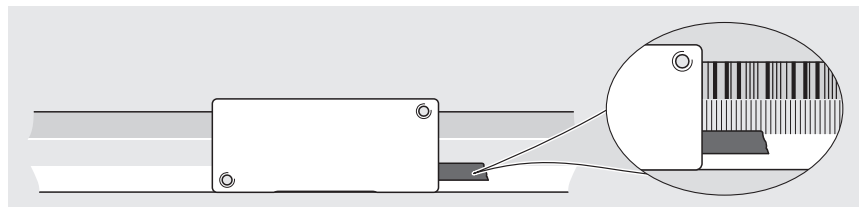
(S) = Beginning of measuring length (**ML**)

Protect the graduation from direct contamination.



In order to ensure correct operation of the encoder, the scale or scale tape must be positioned correctly relative to the scanning head.

Code track at top if cable outlet is to the right.



In order to avoid signal interferences, observe the minimum clearance from sources of interference (e.g., power lines).



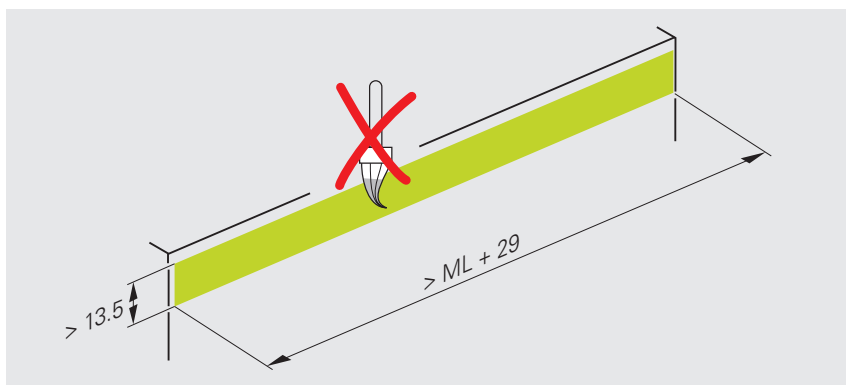
For more information on sources of interference, refer to the **Interfaces of HEIDENHAIN Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1078628**

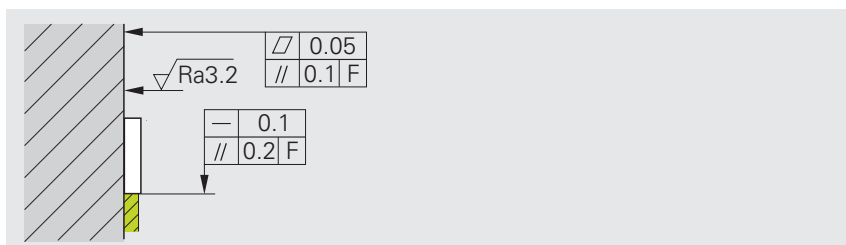
4.2 Mounting the scale tape

4.2.1 Mounting information

Note that the mounting surface, as well as the surface of the scale tape, must be clean and free of paint, dust or grease.



The mounting tolerances refer to the machine guideway (F).



4.2.2 Materials and tools

For this task, the following materials and tools are needed:

Included in delivery

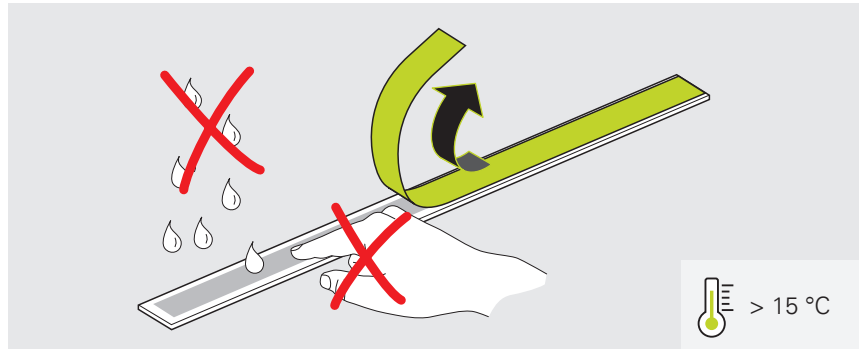
To be provided separately

- Aligning rail
- Roller

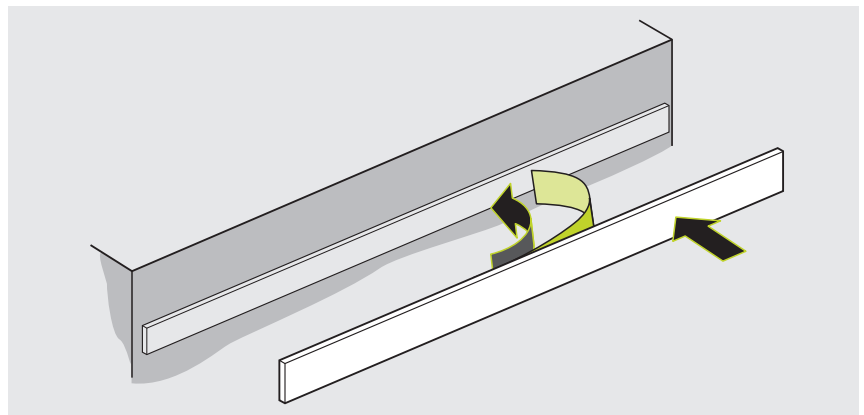
4.2.3 Bonding the scale tape

Attach the scale tape with adhesive mounting film only at a temperature of $> 15^{\circ}\text{C}$.

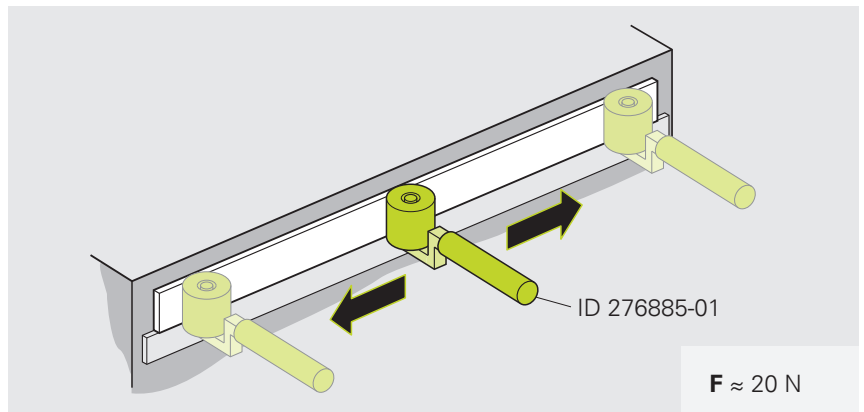
Pay attention to the expiration date on the package.



- ▶ Attach the aligning rail
- ▶ Remove about one-third of the protective foil from the adhesive film
- ▶ Gently glue the scale tape along the aligning rail. Remove the protective film while doing so



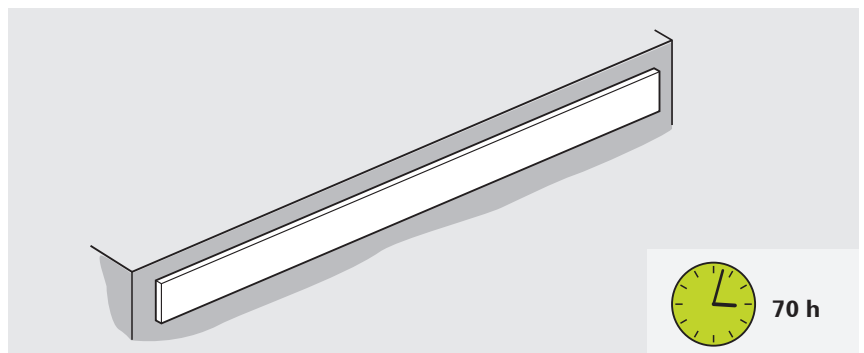
- ▶ Starting from the center, evenly press the scale tape onto the mounting surface using the roller
- ▶ Remove the aligning rail



- ▶ Do not perform further work on the scale tape until the maximum adhesive force has been reached



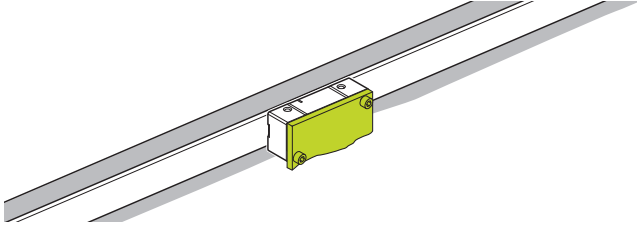
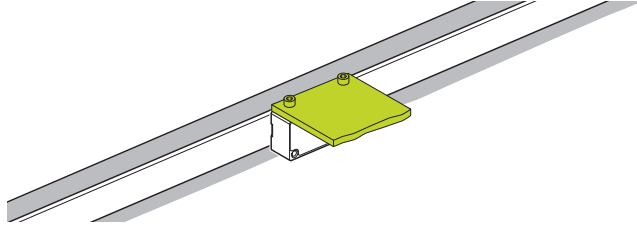
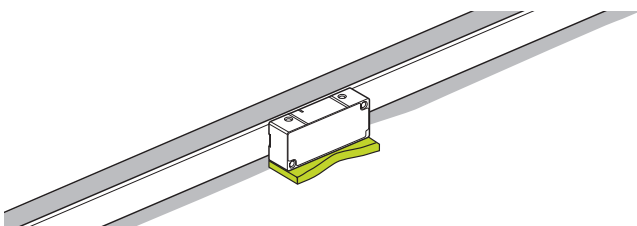
The maximum adhesive force of the mounting film is reached at room temperature after approx. 70 hours.



4.3 Mounting the scanning head

4.3.1 Choosing the mounting variant

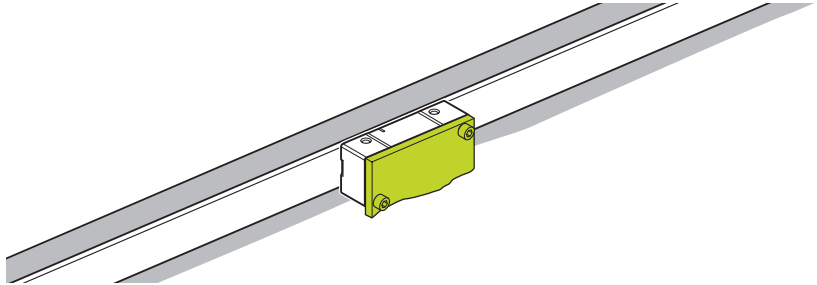
Mounting variants for the scanning head

Holder on the side	Holder at the top
 Page 17	 Page 21
Holder at the bottom	
 Page 25	

4.3.2 Variant: Mounting with the holder on the side

This chapter describes how to mount the scanning head with the holder on the side.

An overview of the mounting variants is provided on Page 16.



Notes on mounting the scanning head with the holder on the side



The tightening torques of the mounting screws are only valid for mounting on steel.

CAUTION

Irritation from isopropyl alcohol!

Contact with isopropyl alcohol or inhaling isopropyl alcohol fumes can cause irritation affecting the skin, eyes, or respiratory system.

- ▶ Wear protective gloves and safety goggles
- ▶ Wear respiratory protection
- ▶ Keep the workplace well ventilated
- ▶ Comply with the manufacturer's safety data sheets

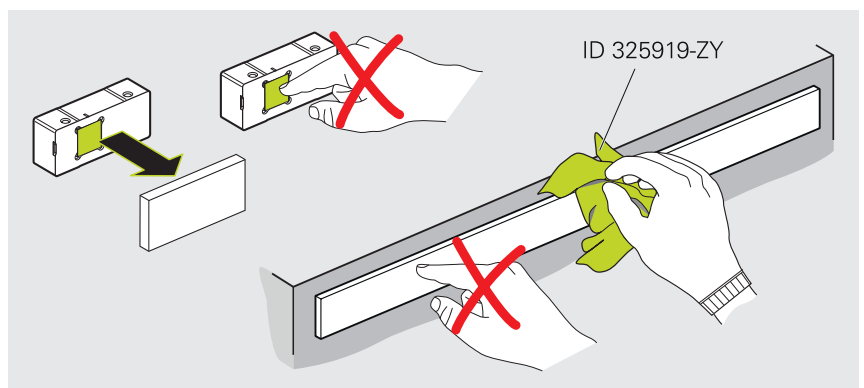
NOTICE

Property damage due to unsuitable cleaning agents!

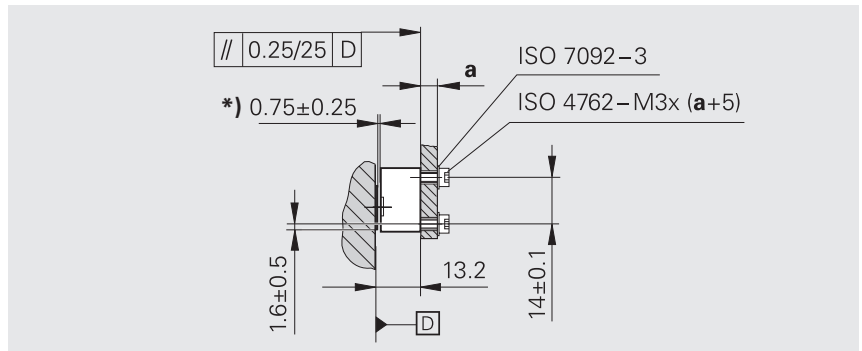
The use of inappropriate cleaning agents causes damage to the encoder.

- ▶ Use only isopropyl alcohol to clean the encoder
- ▶ Clean the encoder with a lint-free cloth

- ▶ If necessary, clean the graduation and the scanning head with a lint-free cloth and isopropyl alcohol



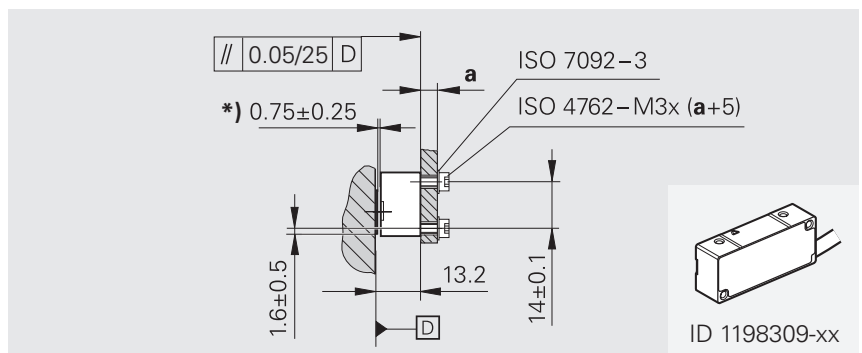
Pay attention to the mounting dimensions. Deviations from the mounting dimensions lead to imprecise measurement results during operation.



*) Mounting clearance between the scanning head and graduation.

Special case for ID 1196309-xx

Limited mounting tolerance resulting from deactivated code-connection expansion



*) Mounting clearance between the scanning head and graduation.

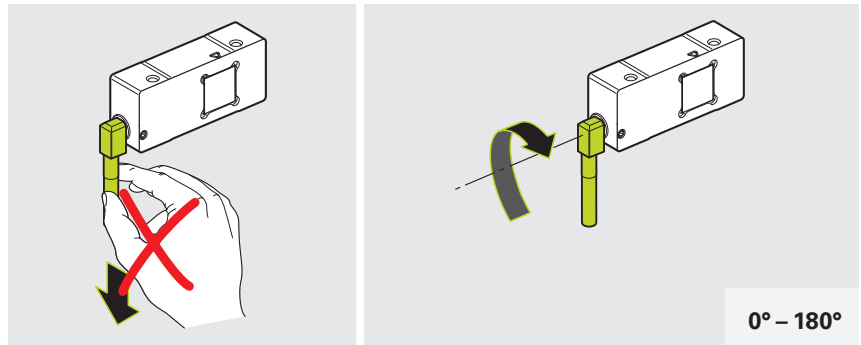
Additional notes on mounting the scanning head with angled cable outlet

NOTICE

Property damage due to mechanical stress!

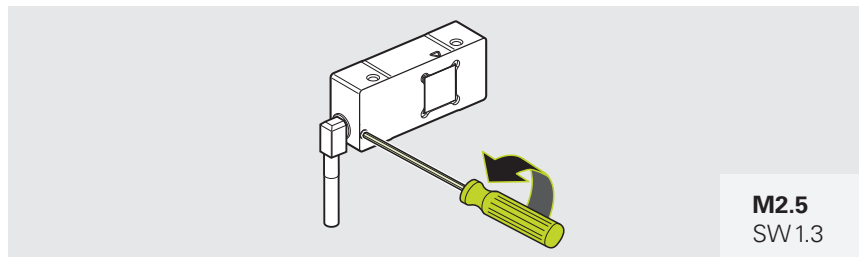
Exceeding the pivot range may damage the scanning head.

- Do not pull the cable
- Observe the maximum permissible pivot range of the adjustable cable outlet (0° to 180°)
- Rotate the cable only a few times (less than 10)



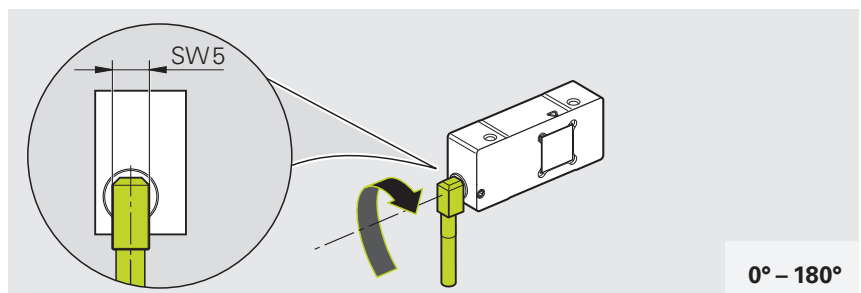
Adjusting the angular position of the cable

- Loosen the setscrew

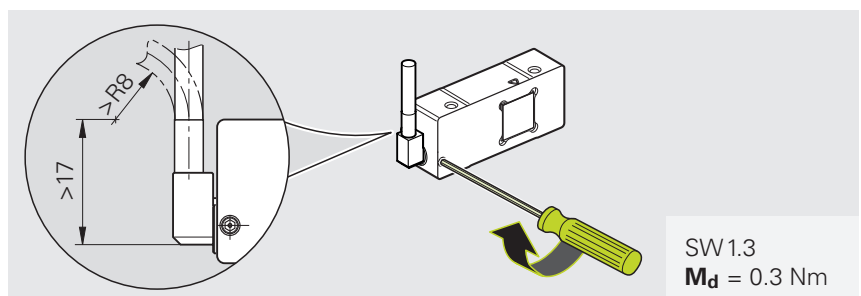


- Rotate the cable to the desired angular position

i If necessary, use a flat wrench to rotate the sleeve



- Tighten the setscrew with the specified torque



Materials and tools

For this task, the following materials and tools are needed:

Included in delivery

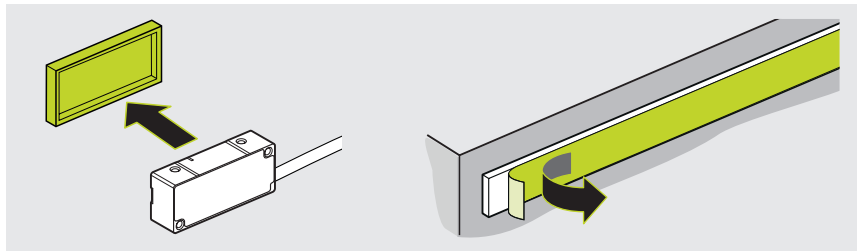
- Spacer shim

To be provided separately

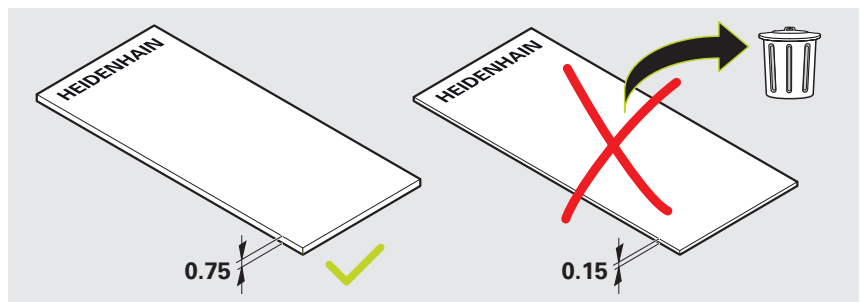
- Two screws (ISO 4762–M3×(a+5))
- Two washers (ISO 7092–3)
- Torque wrench (hexagon socket for 2.5 mm)

Mounting the scanning head

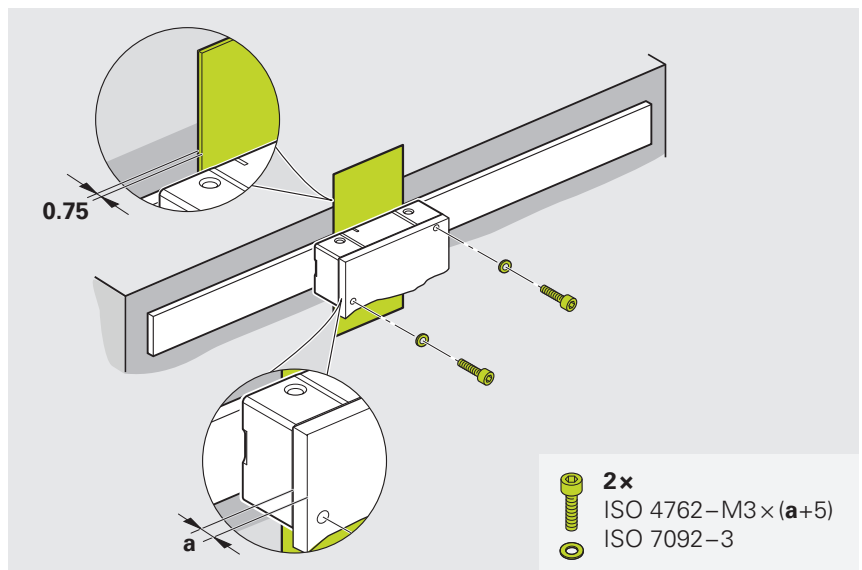
- ▶ If necessary, remove the protective cap from the scanning head
- ▶ If necessary, remove the protective film from the scale tape



- ▶ Prepare the spacer shim



- ▶ Use the spacer shim to set the mounting clearance
- ▶ Lightly tighten the screws on the scanning head
- ▶ Remove the spacer shim

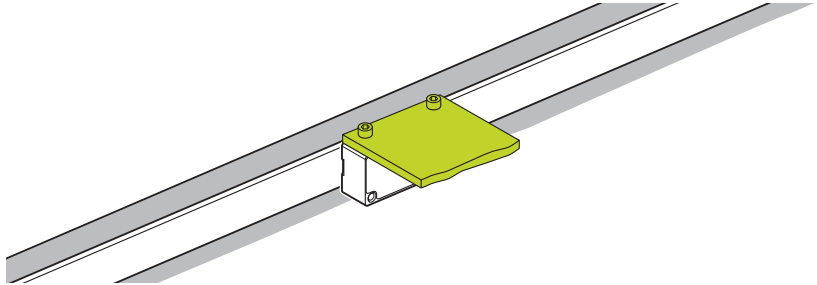


Next step: "Adjustment and diagnosis", Page 29

4.3.3 Variant: Mounting with the holder at top

This chapter describes how to mount the scanning head with the holder at top.

An overview of the mounting variants is provided on Page 16.



Notes on mounting the scanning head with the holder at top



The tightening torques of the mounting screws are only valid for mounting on steel.

CAUTION

Irritation from isopropyl alcohol!

Contact with isopropyl alcohol or inhaling isopropyl alcohol fumes can cause irritation affecting the skin, eyes, or respiratory system.

- ▶ Wear protective gloves and safety goggles
- ▶ Wear respiratory protection
- ▶ Keep the workplace well ventilated
- ▶ Comply with the manufacturer's safety data sheets

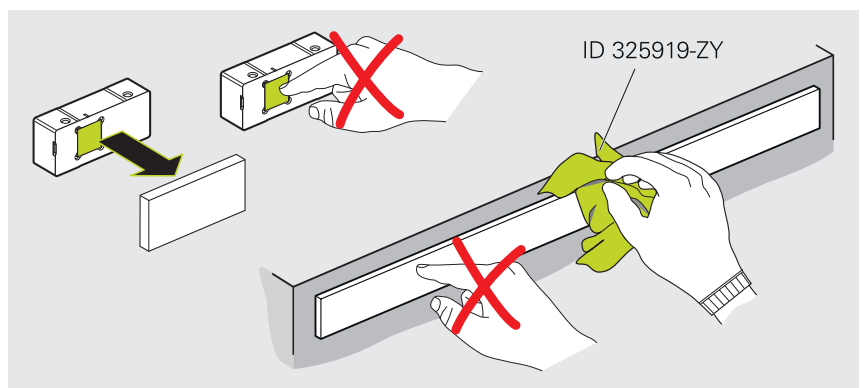
NOTICE

Property damage due to unsuitable cleaning agents!

The use of inappropriate cleaning agents causes damage to the encoder.

- ▶ Use only isopropyl alcohol to clean the encoder
- ▶ Clean the encoder with a lint-free cloth

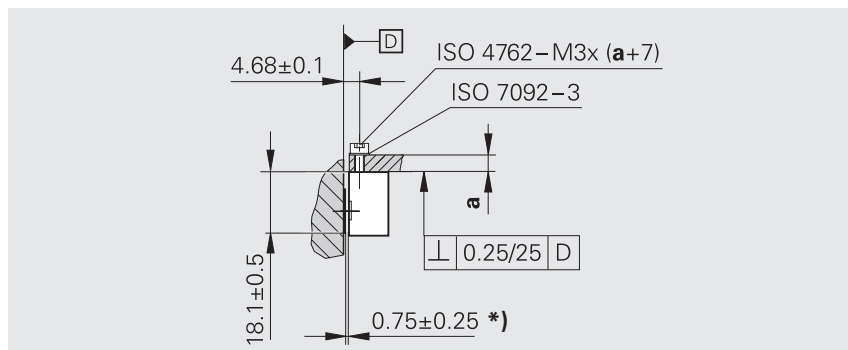
- ▶ If necessary, clean the graduation and the scanning head with a lint-free cloth and isopropyl alcohol



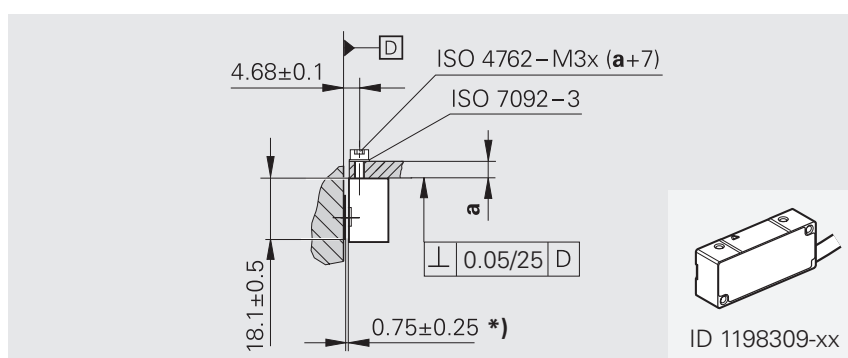
Pay attention to the mounting dimensions. Deviations from the mounting dimensions lead to imprecise measurement results during operation.

Special case for ID 1196309-xx

Limited mounting tolerance resulting from deactivated code-connection expansion



*) Mounting clearance between the scanning head and graduation.



*) Mounting clearance between the scanning head and graduation.

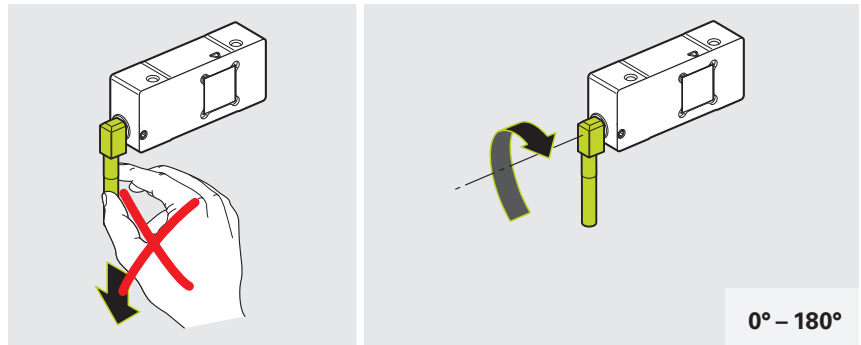
Additional notes on mounting the scanning head with angled cable outlet

NOTICE

Property damage due to mechanical stress!

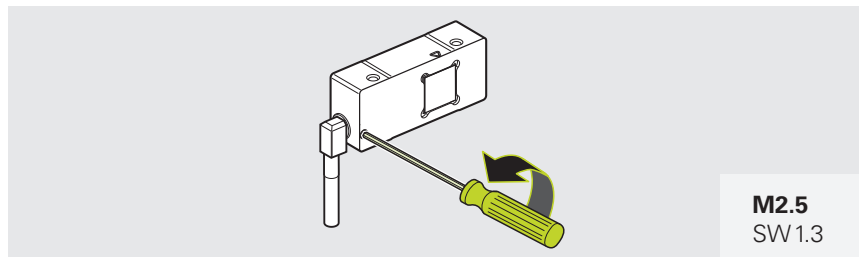
Exceeding the pivot range may damage the scanning head.

- Do not pull the cable
- Observe the maximum permissible pivot range of the adjustable cable outlet (0° to 180°)
- Rotate the cable only a few times (less than 10)



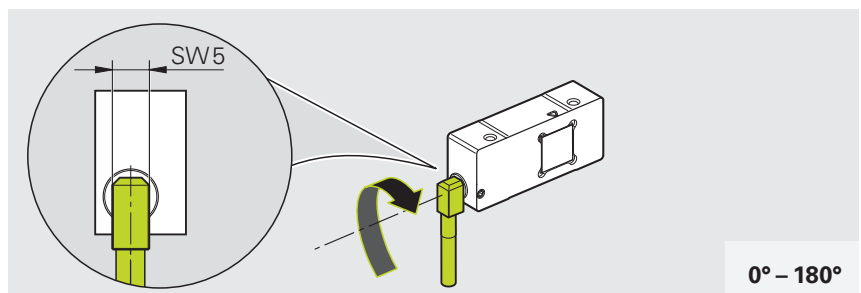
Adjusting the angular position of the cable

- Loosen the setscrew

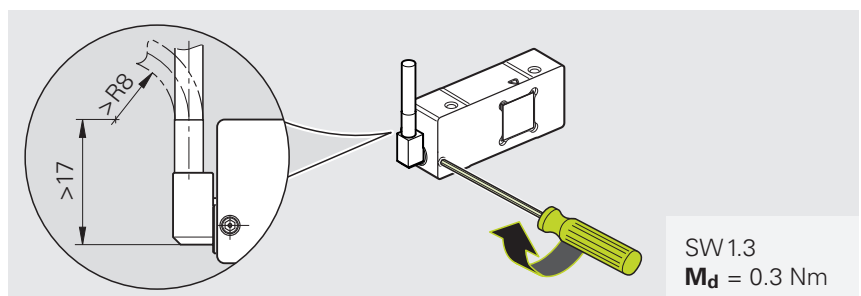


- Rotate the cable to the desired angular position

i If necessary, use a flat wrench to rotate the sleeve



- Tighten the setscrew with the specified torque



Materials and tools

For this task, the following materials and tools are needed:

Included in delivery

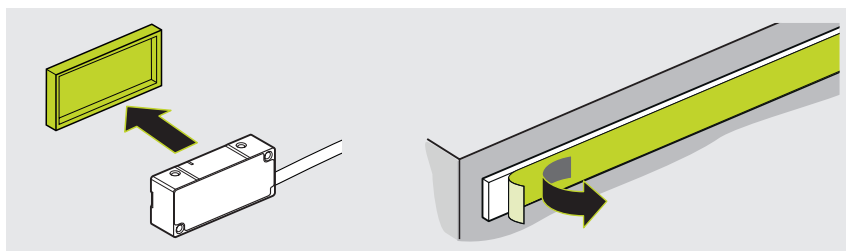
- Spacer shim

To be provided separately

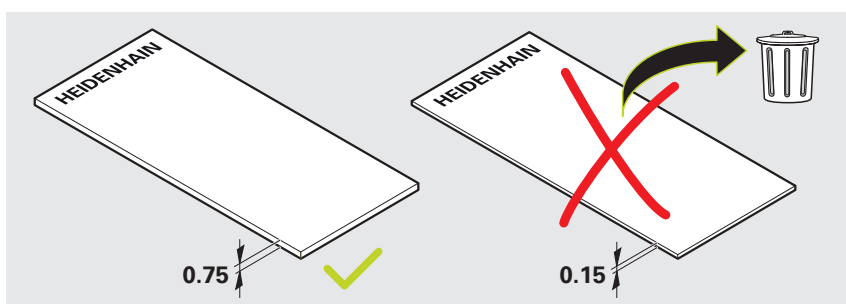
- Two screws (ISO 4762–M3×(a+7))
- Two washers (ISO 7092–3)
- Torque wrench (hexagon socket for 2.5 mm)

Mounting the scanning head

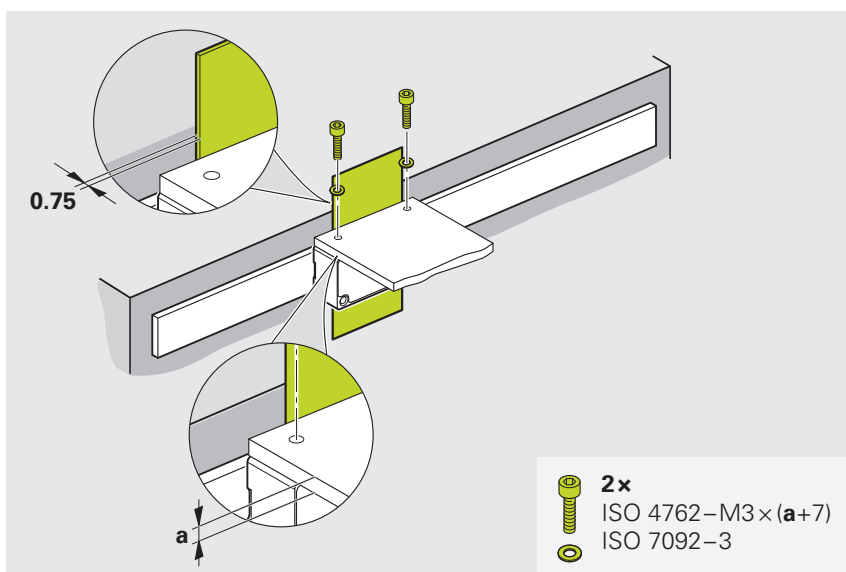
- ▶ If necessary, remove the protective cap from the scanning head
- ▶ If necessary, remove the protective film from the scale tape



- ▶ Prepare the spacer shim



- ▶ Use the spacer shim to set the mounting clearance
- ▶ Lightly tighten the screws on the scanning head
- ▶ Remove the spacer shim

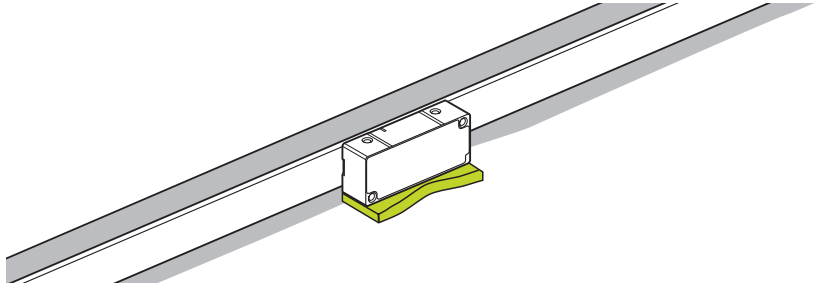


Next step: "Adjustment and diagnosis", Page 29

4.3.4 Variant: Mounting with the holder at bottom

This chapter describes how to mount the scanning head with the holder at bottom.

An overview of the mounting variants is provided on Page 16.



Notes on mounting the scanning head with the holder at bottom



The tightening torques of the mounting screws are only valid for mounting on steel.

CAUTION

Irritation from isopropyl alcohol!

Contact with isopropyl alcohol or inhaling isopropyl alcohol fumes can cause irritation affecting the skin, eyes, or respiratory system.

- ▶ Wear protective gloves and safety goggles
- ▶ Wear respiratory protection
- ▶ Keep the workplace well ventilated
- ▶ Comply with the manufacturer's safety data sheets

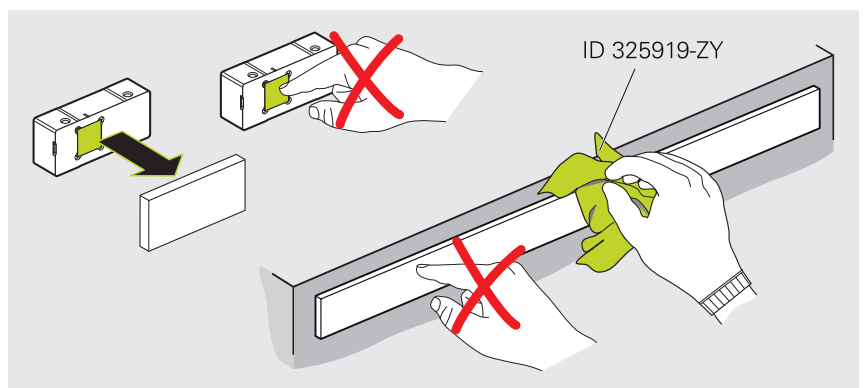
NOTICE

Property damage due to unsuitable cleaning agents!

The use of inappropriate cleaning agents causes damage to the encoder.

- ▶ Use only isopropyl alcohol to clean the encoder
- ▶ Clean the encoder with a lint-free cloth

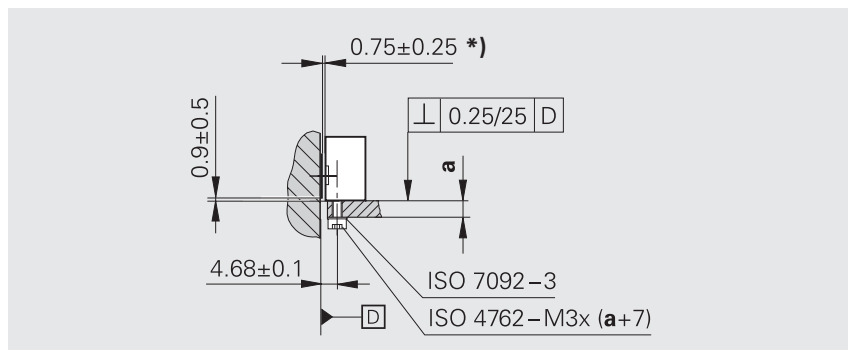
- ▶ If necessary, clean the graduation and the scanning head with a lint-free cloth and isopropyl alcohol



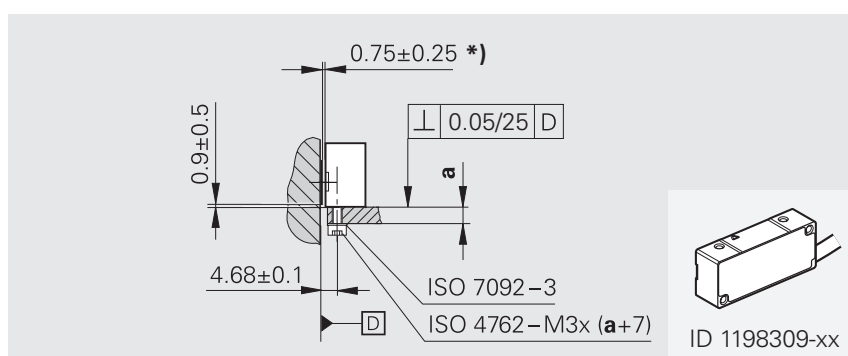
Pay attention to the mounting dimensions. Deviations from the mounting dimensions lead to imprecise measurement results during operation.

Special case for ID 1196309-xx

Limited mounting tolerance resulting from deactivated code-connection expansion



*) Mounting clearance between the scanning head and graduation.



*) Mounting clearance between the scanning head and graduation.

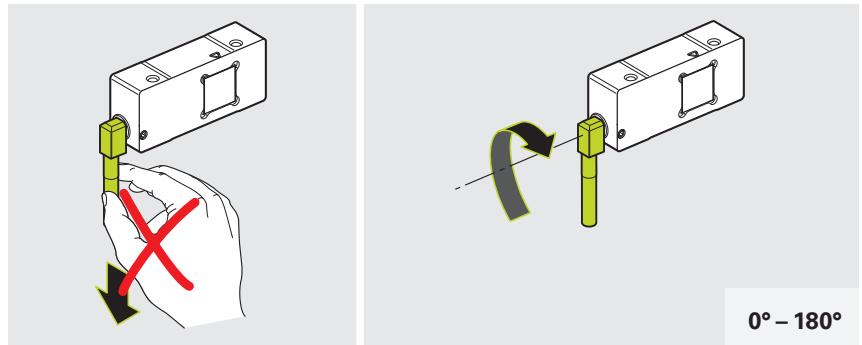
Additional notes on mounting the scanning head with angled cable outlet

NOTICE

Property damage due to mechanical stress!

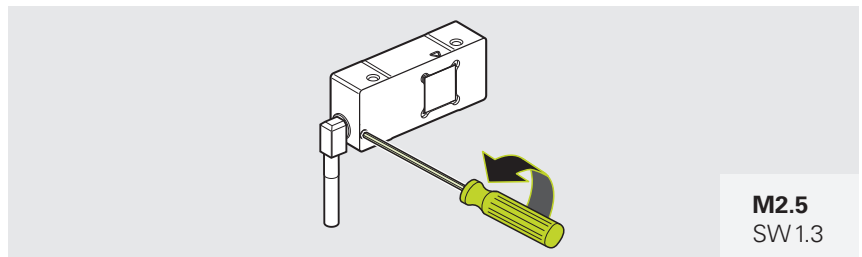
Exceeding the pivot range may damage the scanning head.

- Do not pull the cable
- Observe the maximum permissible pivot range of the adjustable cable outlet (0° to 180°)
- Rotate the cable only a few times (less than 10)



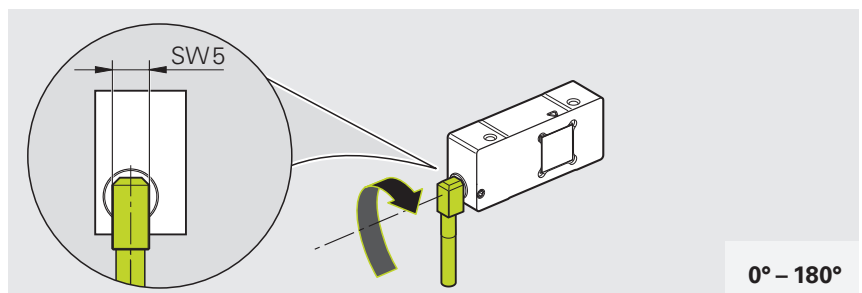
Adjusting the angular position of the cable

- Loosen the setscrew

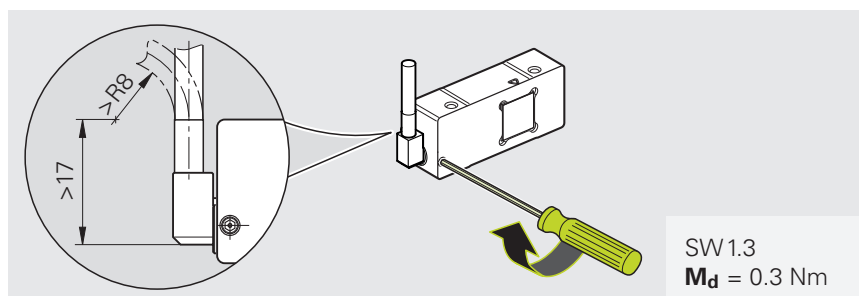


- Rotate the cable to the desired angular position

i If necessary, use a flat wrench to rotate the sleeve



- Tighten the setscrew with the specified torque



Materials and tools

For this task, the following materials and tools are needed:

Included in delivery

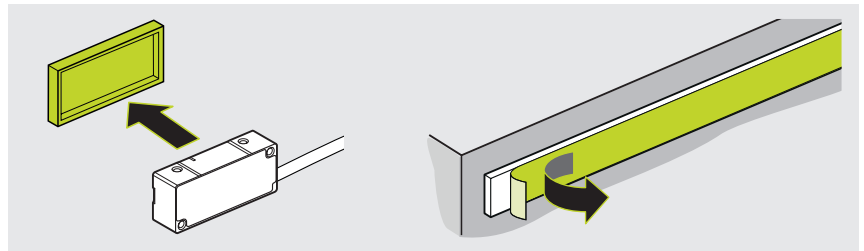
- Spacer shim

To be provided separately

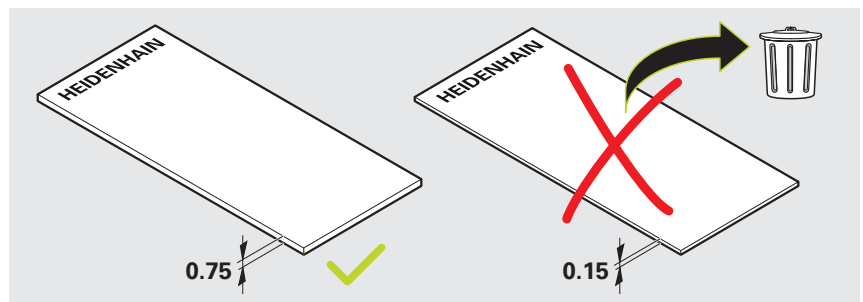
- Two screws (ISO 4762-M3×(a+7))
- Two washers (ISO 7092-3)
- Torque wrench (hexagon socket for 2.5 mm)

Mounting the scanning head

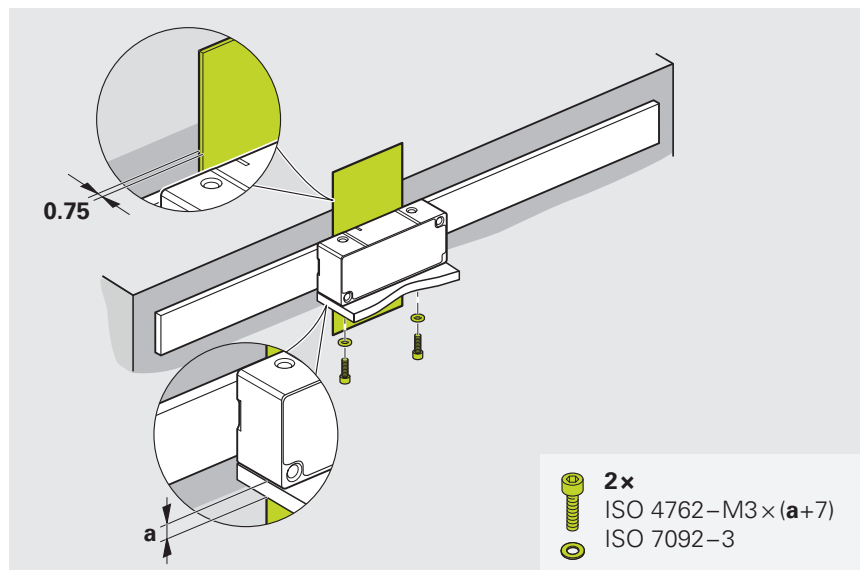
- ▶ If necessary, remove the protective cap from the scanning head
- ▶ If necessary, remove the protective film from the scale tape



- ▶ Prepare the spacer shim



- ▶ Use the spacer shim to set the mounting clearance
- ▶ Lightly tighten the screws on the scanning head
- ▶ Remove the spacer shim

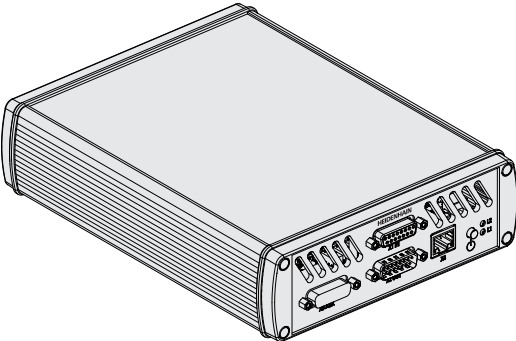
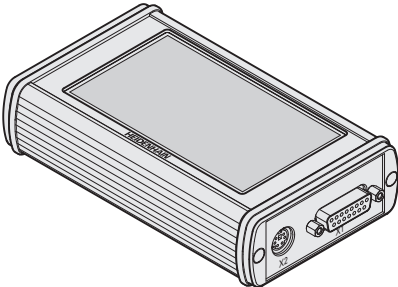


Next step: "Adjustment and diagnosis", Page 29

5 Adjustment and diagnosis

This chapter describes the continuity test as well as the adjustment and diagnosis performed with an inspection unit (e.g., PWM 3000 or PWM 21) and the Adjusting and Testing Software (ATS) or with a testing unit (e.g., PWT 101 or PWT 100).

5.1 Choosing the inspection or testing unit

Adjustment and diagnosis options	
Adjustment and diagnosis with PWM inspection unit and ATS	Adjustment and diagnosis with testing unit
 Page 30	 Page 58

5.2 Adjustment and diagnosis with PWM inspection unit and ATS

5.2.1 Requirements and notes

The following components are needed for the adjustment and diagnosis of HEIDENHAIN encoders:

- PWM 3000 or PWM 21
- ATS – if a special version (SVxx.x.x) for a specific device is available, use the special version.
If no special version is available, use the latest version (Vx.x.xx).



The ATS is available for download free of charge.

- ▶ www.heidenhain.com/service/downloads/software/
- ▶ Open the **Categories** selection menu
- ▶ Select the **Inspection and testing devices** category



For more information, refer to the applicable **Adjusting and Testing Software** documentation.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **543734**



For more information, see the **Exposed Linear Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **208960**

5.2.2 Continuity check

Materials and tools

For this mounting step, the following materials and tools are needed:

Included in delivery

To be provided separately

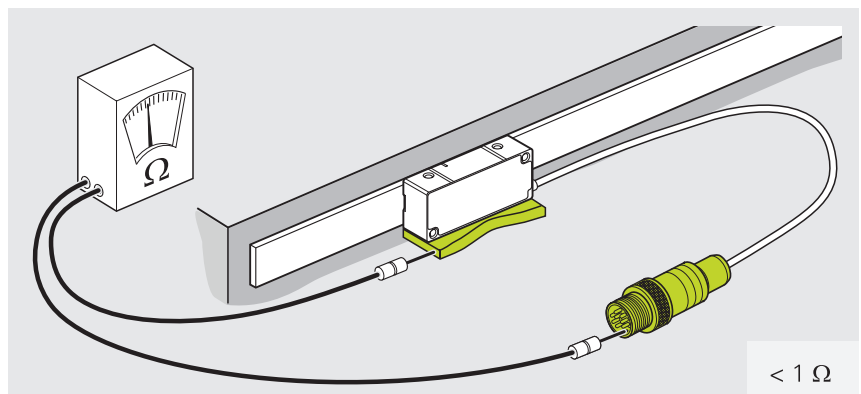
- Resistance measuring device

Measuring the electrical resistance

- ▶ Check the electrical resistance between the connector housing and the machine



The electrical resistance between the connector housing and the machine must be $< 1 \Omega$.



5.2.3 Selecting the scanning head

Scanning head variants		
LIC 411, LIC 419x	LIC 413	LIC 413 in bus operation
Scanning head with the EnDat 2.2, Fanuc, Mitsubishi, Panasonic or Yaskawa interface Page 32	Scanning head with the EnDat 3 interface Page 40	Scanning head with the EnDat 3 interface in bus operation Page 49

5.2.4 Adjustment and diagnosis of LIC 411, LIC 419x

Connecting the encoder to the ATS

Connecting the encoder

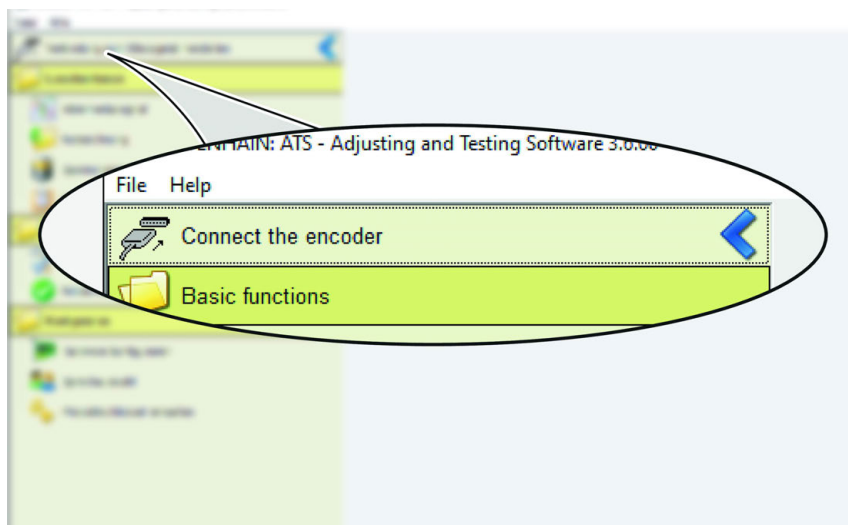
- ▶ Connect the encoder to the PWM
- ▶ Switch on the PWM

Selecting the connection

Connection options	
Connecting the encoder using its ID	Connecting the encoder manually
Recommended option with automatic determination of the measuring parameters.	Alternative option if the encoder cannot be connected using its ID.
Page 33	Page 35

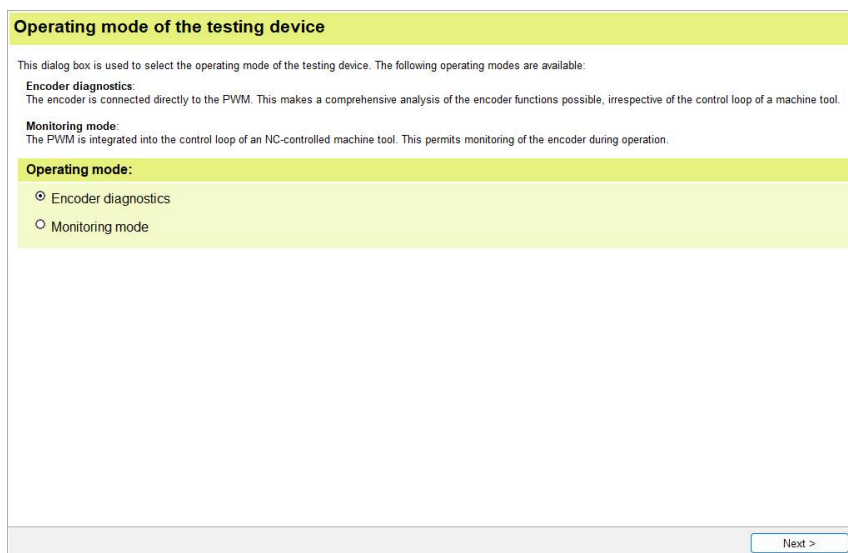
Connecting the encoder using its ID

- ▶ Double-click **Connect the encoder** in the Function menu
- > The **Operating mode of the testing device** dialog opens.



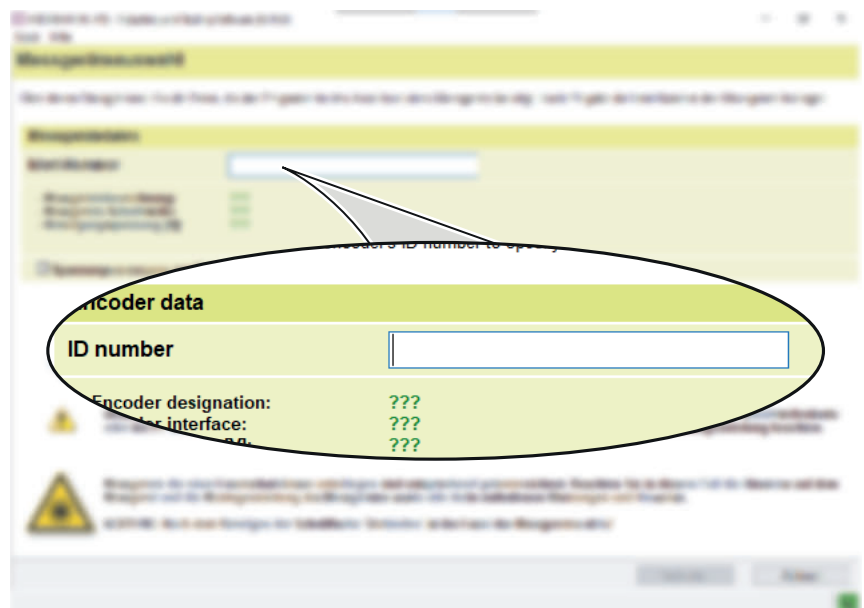
The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- > The **Encoder selection** dialog opens.



The **Operating mode of the testing device** dialog

- ▶ Enter the product ID of the scanning head in the **ID number** field
- > The determined encoder parameters are shown in the **Encoder data** field.
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **Function menu** opens.



The **Encoder selection** dialog

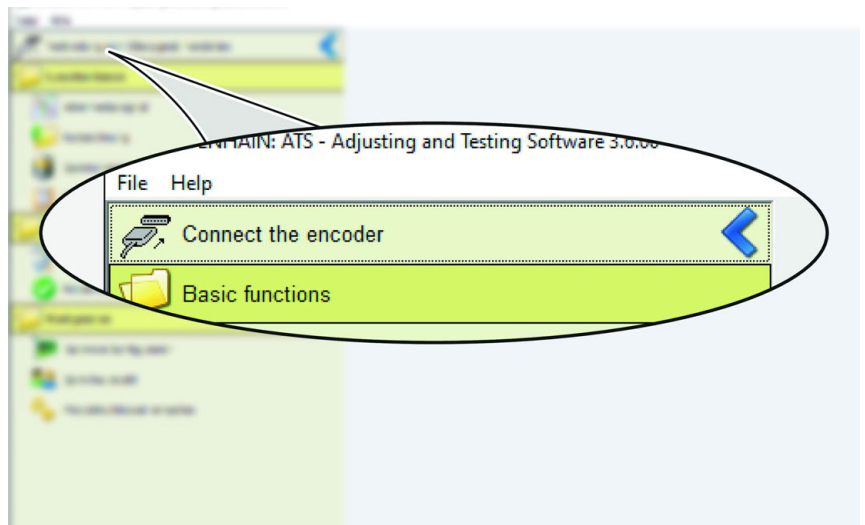


If you cannot connect the encoder using its ID, proceed as described in the "**Connecting the encoder manually**" chapter.

Next step: "Adjusting the scanning head", Page 38

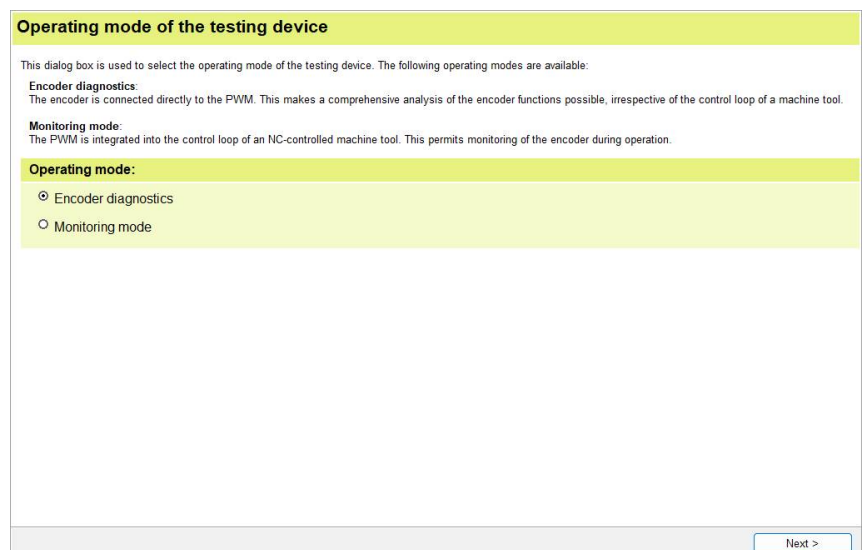
Connecting the encoder manually

- ▶ Double-click **Connect the encoder** in the Function menu
- > The **Operating mode of the testing device** dialog opens.



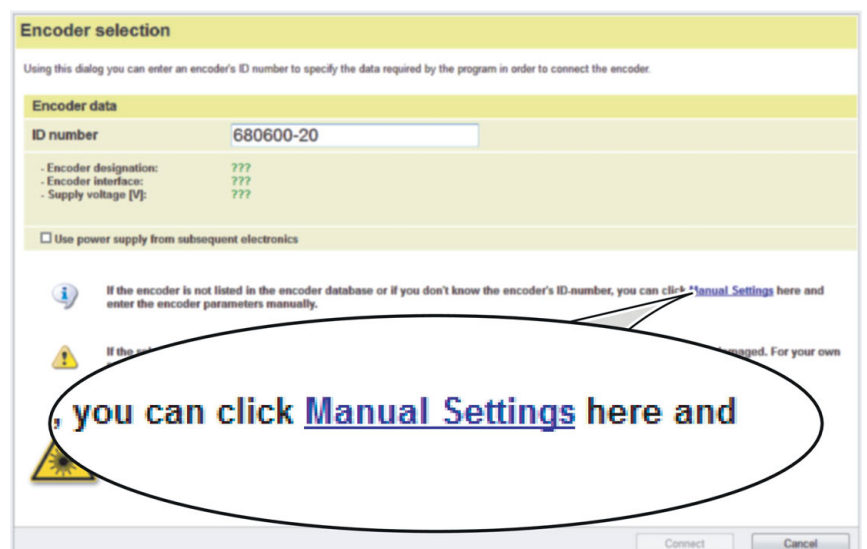
The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- > The **Encoder selection** dialog opens.



The **Operating mode of the testing device** dialog

- ▶ Click **Manual Settings**
- > The **Encoder selection** dialog opens.



The **Encoder selection** dialog

- ▶ Follow the safety instructions
- ▶ Click **Next**
- ▶ The **Encoder selection** dialog opens.

Encoder selection

Using this dialog you can manually set the data required by the program in order to connect an encoder. Please set the data manually only if the encoder is not listed in the encoder database and you know all the encoder parameters that will be requested.

This program only supports the encoder models from HEIDENHAIN that can be selected on the next page. Encoders from other manufacturers are not supported.

Entry of incorrect data might damage the encoder, the interface card, or the PC. If you do not know the parameters of the encoder, please contact HEIDENHAIN in advance.

Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the 'Connect' button has been pressed!

< Back Next > Cancel

The **Encoder selection** dialog

NOTICE

Property damage due to incorrect encoder data settings!

Incorrect encoder data settings can cause damage to the encoder, the interface card, or the PC.

- ▶ Check the encoder data before connecting the encoder

Encoder interface:	EnDat 3 (E30-R4/R8/RB/RM)	EnDat 2.2, TTL, 1 V _{PP}	Fanuc, Mitsubishi, Panasonic, or Yaskawa
Supply voltage [V]:	12.0	5.0	5.0
Voltage adjustment:	Yes	Yes	Yes



For more information on the supply voltage and interfaces, refer to the **Exposed Linear Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **208960**

- ▶ Select the permissible encoder supply voltage in the **Encoder supply voltage** section
- ▶ To activate voltage adjustment by the PWM, select the **Adjust voltage over sensor lines** checkbox
- ▶ Select the appropriate interface type in the **Encoder interface** section
- ▶ Click **Next**
- ▶ The **Encoder selection** dialog with the encoder data opens.

Encoder selection

On this page you must set the supply voltage and the encoder's interface.

Encoder supply voltage

☐ 5.0 V
 ☐ 8.0 V
 ☐ 10.0 V
 ☐ 12.0 V
 ☐ 24.0 V
 ☐ Input [V]:

☒ Adjust voltage over sensor lines

Encoder interface

Interface

EnDat 2.1 / EnDat 2.2
 1 Vpp
 TTL
 EnDat 3 (E30-R4/R8/RB/RM)
 EnDat 3 (E30-R2)
 DRIVE-CLiQ
 SSI
 Fanuc
 Fanuc ALPHA i
 Mitsubishi
 Yaskawa
 Panasonic

Mounting code < Back Next > Cancel

The **Encoder selection** dialog

- ▶ Check the encoder data
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **Function menu** opens.

Encoder selection

All data for connecting the encoder have now been entered. Before connecting the encoder to the interface card and establishing the connection to the encoder via the "Connect" button, check all data shown under "Encoder data."

Encoder data

- Encoder interface:
 - Supply voltage [V]:
 - Adjust voltage:
 - ATS code:

L

Entry of incorrect data might damage the encoder, the interface card, or the PC.

Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the "Connect" button has been pressed!

< Back
Connect
Cancel

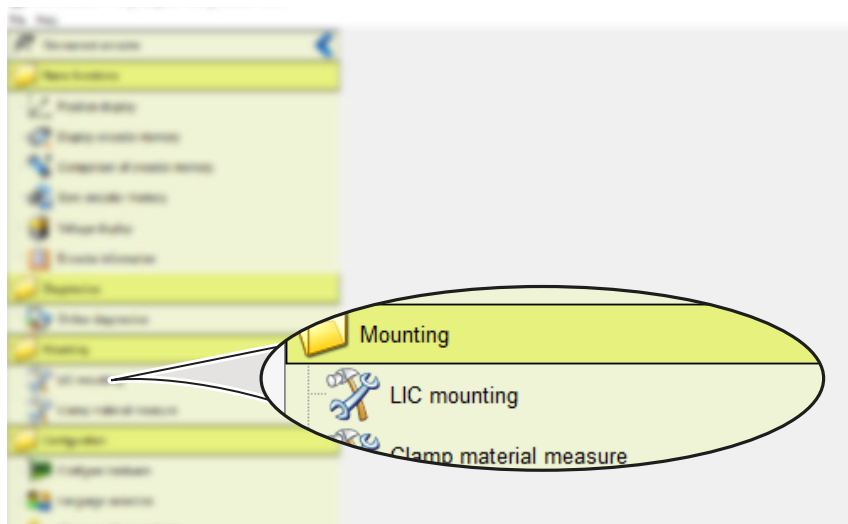
The **Encoder selection** dialog with the encoder data

Next step: "Adjusting the scanning head", Page 38

Adjusting the scanning head

Using the mounting wizard

- ▶ Double-click **LIC mounting**
- > The **LIC mounting wizard** opens.



The **Function menu**

Adjust the scanning head in the area of the midpoint of the measuring length.

- ▶ Set the absolute track to the maximum attainable bar length by slightly turning the scanning head
- ▶ Tighten the screws with the specified torque
- ▶ Click **Next**
- > The **Step 2: Verify mounting** dialog opens.

i If an error message occurs, it is because the maximum incremental signal was not achieved.

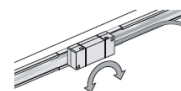
- ▶ Repeat the installation

LIC mounting assistant

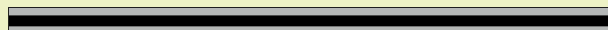
1st step: Mounting



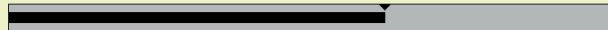
Attach the scanning head and rotate slightly until the maximum bar length is attained for both tracks.
Note: The bar does not need to reach all the way to the right edge.
Then tighten the scanning head screws.



Absolute track

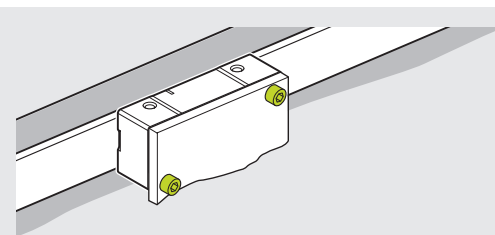


Incremental track



Next >

Cancel



2x
 $M_d = 1.15 \text{ Nm}$

- ▶ Traverse the scanning head over the entire measuring length
- ▶ Ensure that the minimum markers remain within the green ranges



If the green ranges are not reached or if strong signal jitter occurs over the entire measuring length, check the mounting tolerances and inspect for contamination.

- ▶ Click **Exit**
- > The **Installation successful** message appears.

LIC mounting assistant

2nd step: Check the installation



Move over the entire measuring length.
The minimum markers ▲ must not leave the green range!

Absolute track



Incremental track



Position-value formation

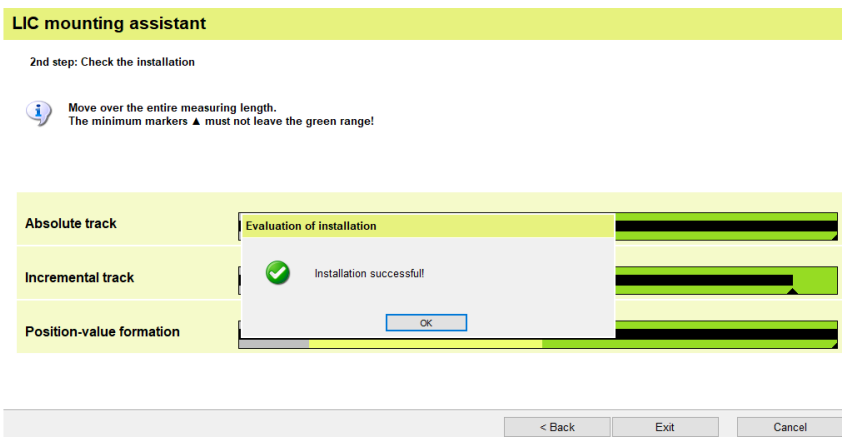


< Back

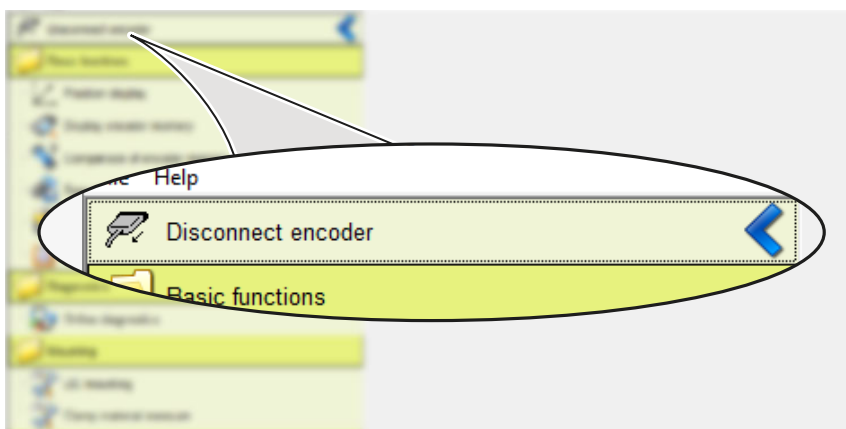
Exit

Cancel

- ▶ Click **OK**
- > The **Function menu** opens.
- > Mounting was successfully concluded.



- ▶ Double-click **Disconnect encoder**



Next step: "Final steps", Page 65

5.2.5 Adjustment and diagnosis of LIC 413

Connecting the encoder to the ATS

Connecting the encoder

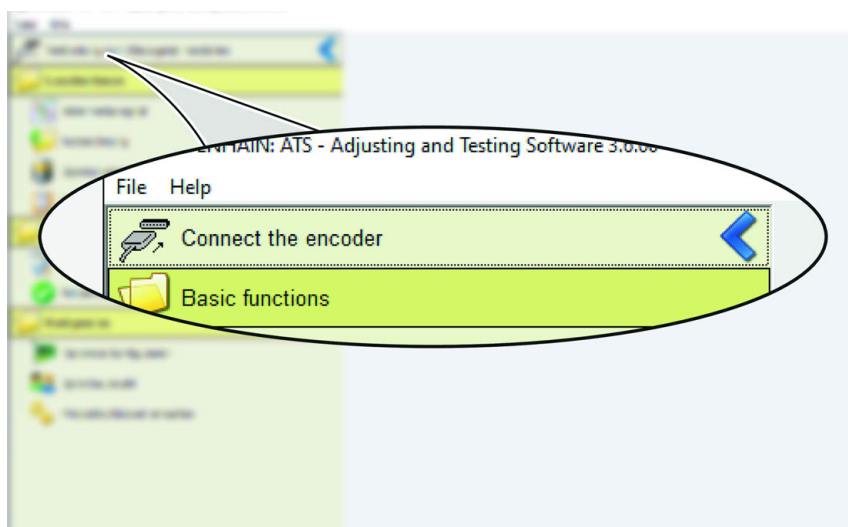
- ▶ Connect the encoder to the PWM
- ▶ Switch on the PWM

Selecting the connection

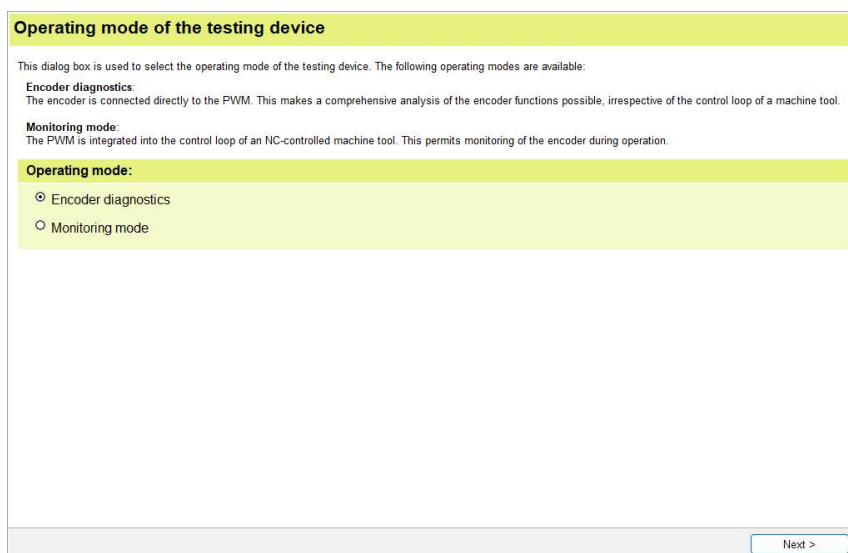
Connection options	
Connecting the encoder using its ID	Connecting the encoder manually
Recommended option with automatic determination of the measuring parameters.	Alternative option if the encoder cannot be connected using its ID.
Page 41	Page 43

Connecting the encoder using its ID

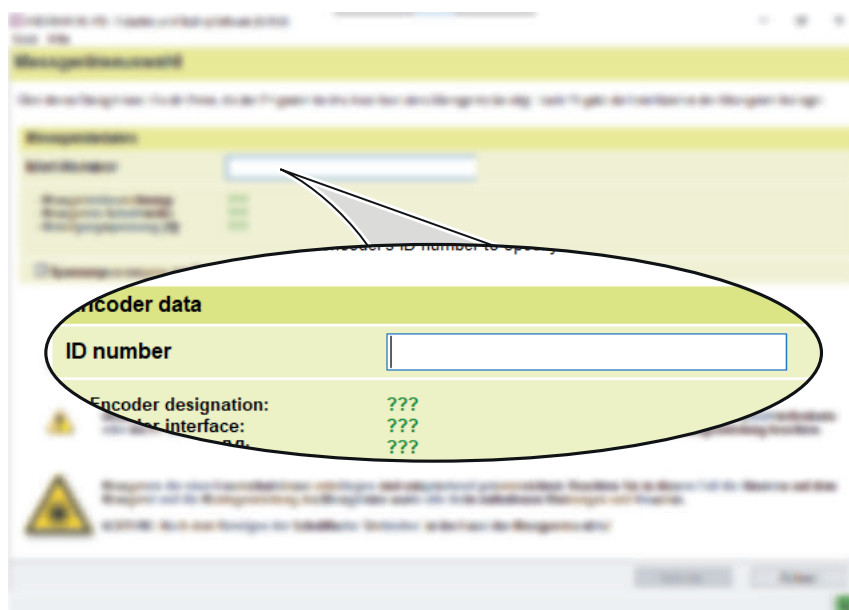
- ▶ Double-click **Connect the encoder** in the Function menu
- > The **Operating mode of the testing device** dialog opens.

The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- > The **Encoder selection** dialog opens.

The **Operating mode of the testing device** dialog

- ▶ Enter the product ID of the scanning head in the **ID number** field
- > The determined encoder parameters are shown in the **Encoder data** field.
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **position display** opens.



The **Encoder selection** dialog

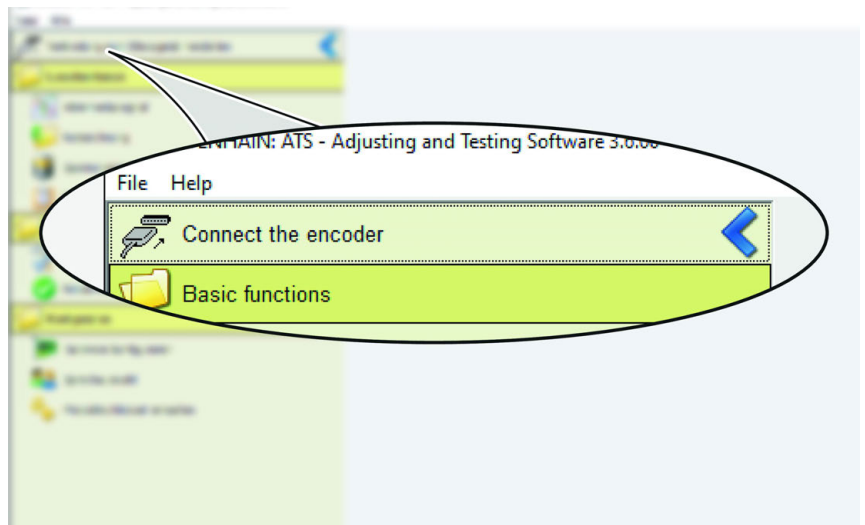


If you cannot connect the encoder using its ID, proceed as described in the "**Connecting the encoder manually**" chapter.

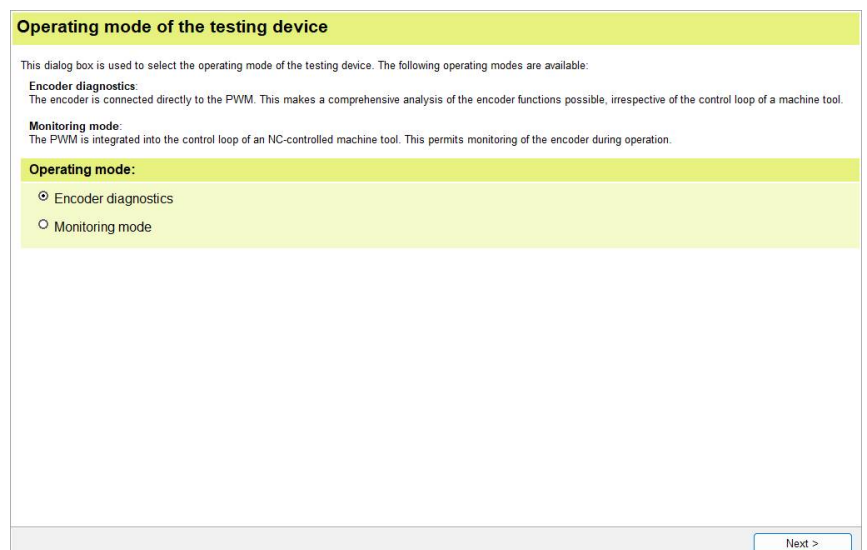
Next step: "Adjusting the scanning head", Page 46

Connecting the encoder manually

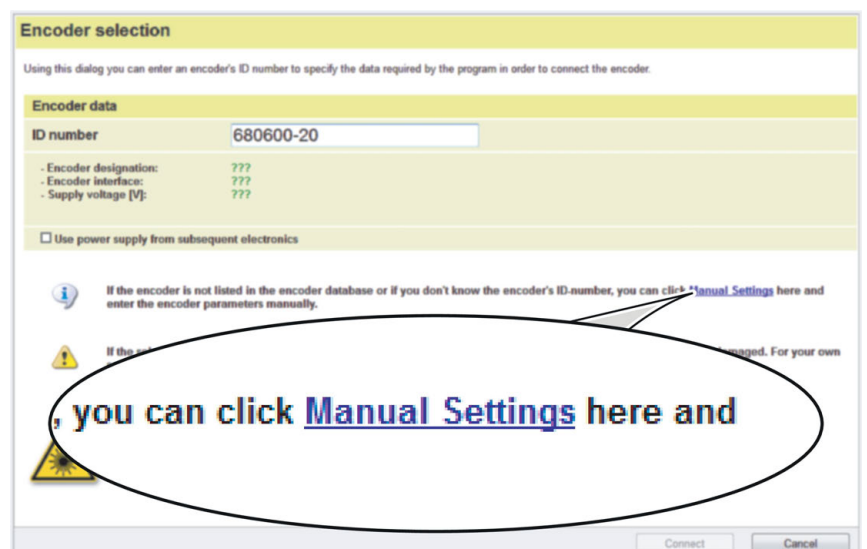
- ▶ Double-click **Connect the encoder** in the Function menu
- > The **Operating mode of the testing device** dialog opens.

The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- > The **Encoder selection** dialog opens.

The **Operating mode of the testing device** dialog

- ▶ Click **Manual Settings**
- > The **Encoder selection** dialog opens.

The **Encoder selection** dialog

- ▶ Follow the safety instructions
- ▶ Click **Next**
- The **Encoder selection** dialog opens.

Encoder selection

Using this dialog you can manually set the data required by the program in order to connect an encoder. Please set the data manually only if the encoder is not listed in the encoder database and you know all the encoder parameters that will be requested.

This program only supports the encoder models from HEIDENHAIN that can be selected on the next page. Encoders from other manufacturers are not supported.

Entry of incorrect data might damage the encoder, the interface card, or the PC. If you do not know the parameters of the encoder, please contact HEIDENHAIN in advance.

Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the 'Connect' button has been pressed!

< Back Next > Cancel

The **Encoder selection** dialog

NOTICE

Property damage due to incorrect encoder data settings!

Incorrect encoder data settings can cause damage to the encoder, the interface card, or the PC.

- ▶ Check the encoder data before connecting the encoder

Encoder interface:	EnDat 3 (E30-R4/R8/RB/RM)	EnDat 2.2, TTL, 1 V _{PP}	Fanuc, Mitsubishi, Panasonic, or Yaskawa
Supply voltage [V]:	12.0	5.0	5.0
Voltage adjustment:	Yes	Yes	Yes



For more information on the supply voltage and interfaces, refer to the **Exposed Linear Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **208960**

- ▶ Select the permissible encoder supply voltage in the **Encoder supply voltage** section
- ▶ To activate voltage adjustment by the PWM, select the **Adjust voltage over sensor lines** checkbox
- ▶ Select the interface type EnDat 3 (E30-R4/R8/RB/RM) in the **Encoder interface** section
- ▶ Click **Next**
- The **Encoder selection** dialog with the encoder data opens.

Encoder selection

On this page you must set the supply voltage and the encoder's interface.

Encoder supply voltage

☐ 5.0 V
 ☐ 8.0 V
 ☐ 10.0 V
 ☒ 12.0 V
 ☐ 24.0 V
 Input [V]:

☒ Adjust voltage over sensor lines

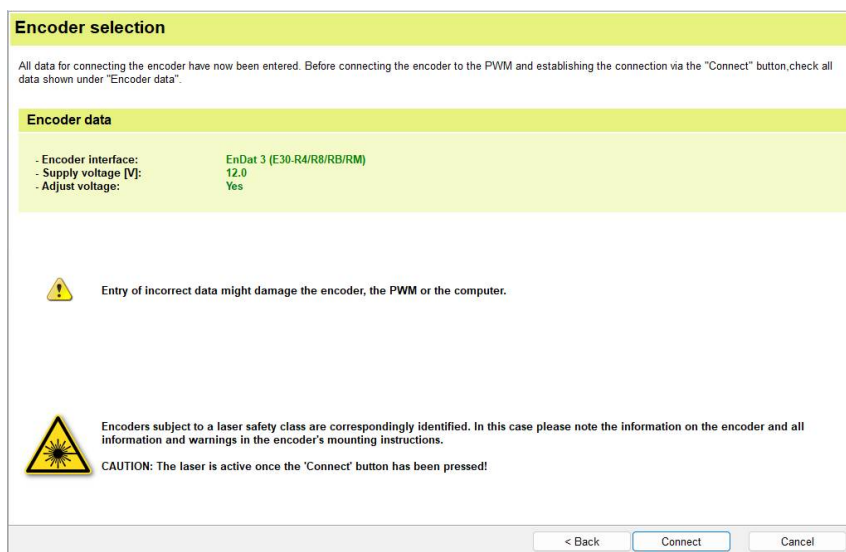
Encoder interface

Interface:

< Back Next > Cancel

The **Encoder selection** dialog

- ▶ Check the encoder data
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **position display** opens.



The image shows a software dialog box titled "Encoder selection". It contains a section for "Encoder data" with the following values: Encoder interface: EnDat 3 (E30-R4/R8/RB/RM), Supply voltage [V]: 12.0, and Adjust voltage: Yes. Below this, there are two warning icons. The first is a yellow triangle with an exclamation mark, with the text "Entry of incorrect data might damage the encoder, the PWM or the computer." The second is a yellow triangle with a laser symbol, with the text "Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions." and "CAUTION: The laser is active once the 'Connect' button has been pressed!". At the bottom right, there are three buttons: "< Back", "Connect", and "Cancel".

Encoder selection

All data for connecting the encoder have now been entered. Before connecting the encoder to the PWM and establishing the connection via the "Connect" button, check all data shown under "Encoder data".

Encoder data

- Encoder interface: EnDat 3 (E30-R4/R8/RB/RM)
- Supply voltage [V]: 12.0
- Adjust voltage: Yes

 Entry of incorrect data might damage the encoder, the PWM or the computer.

 Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the "Connect" button has been pressed!

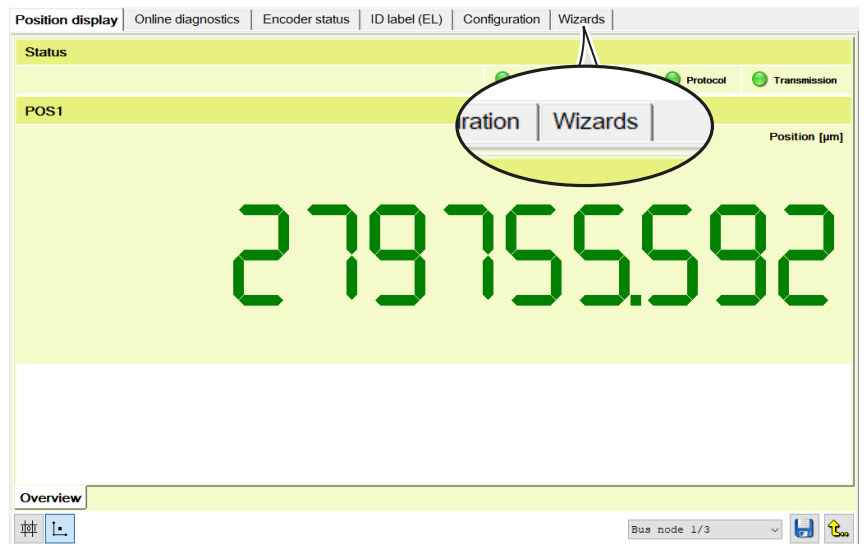
< Back Connect Cancel

The **Encoder selection** dialog with the encoder data

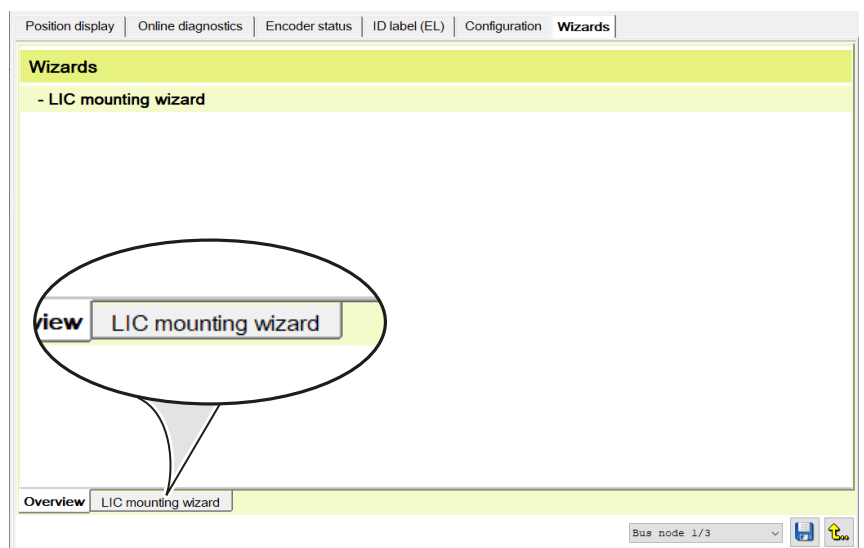
Next step: "Adjusting the scanning head", Page 46

Adjusting the scanning head Using the mounting wizard

- Click **Wizards**



- Click **LIC mounting wizard**
- > The **Step 1: Mounting** dialog opens.



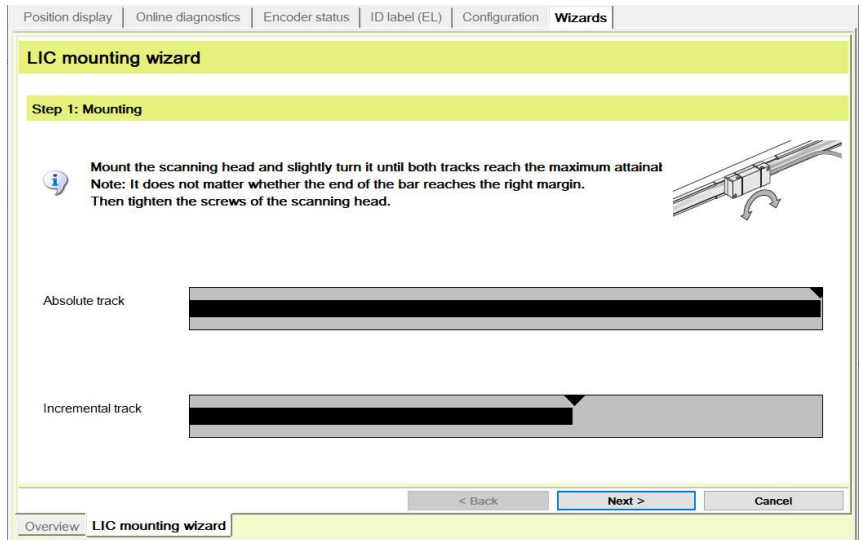
Adjust the scanning head in the area of the midpoint of the measuring length.

- ▶ Set the absolute track to the maximum attainable bar length by slightly turning the scanning head
- ▶ Tighten the screws with the specified torque
- ▶ Click **Next**
- ▶ The **Step 2: Verify mounting** dialog opens.



If an error message occurs, it is because the maximum incremental signal was not achieved.

- ▶ Repeat the installation

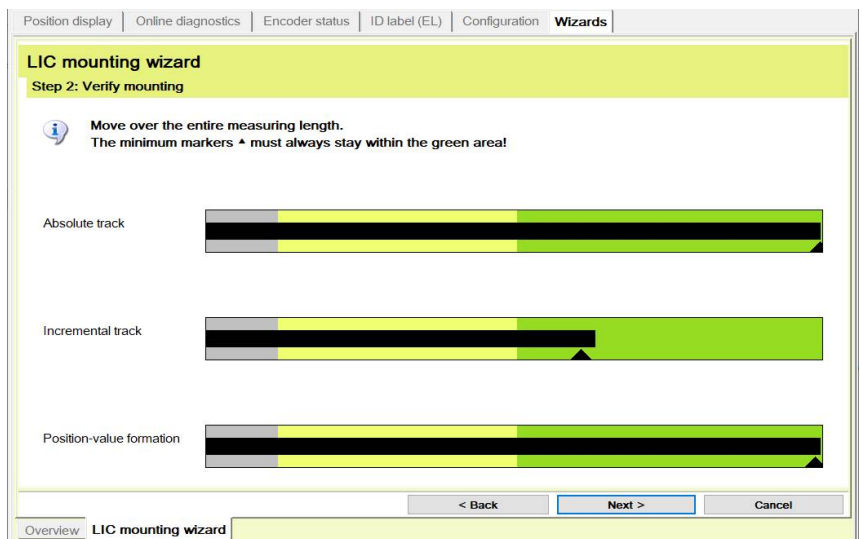


- ▶ Traverse the scanning head over the entire measuring length
- ▶ Ensure that the minimum markers remain within the green ranges

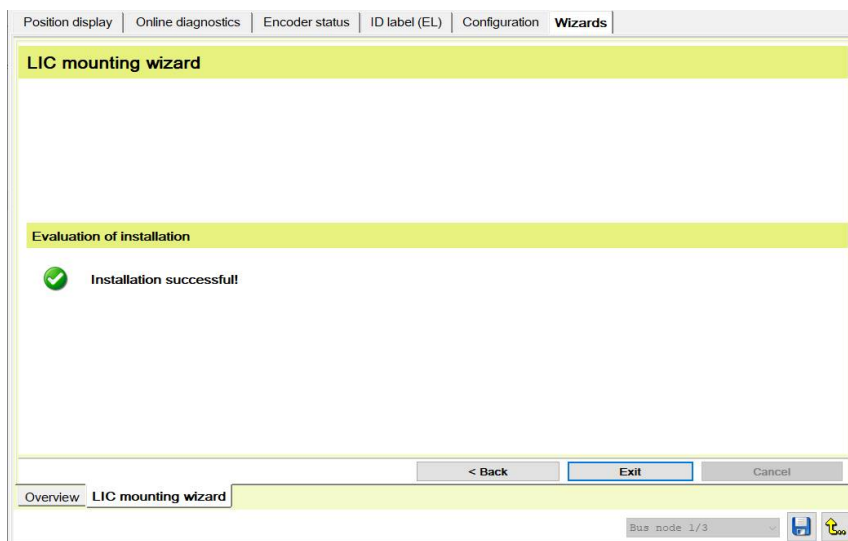


If the green ranges are not reached or if strong signal jitter occurs over the entire measuring length, check the mounting tolerances and inspect for contamination.

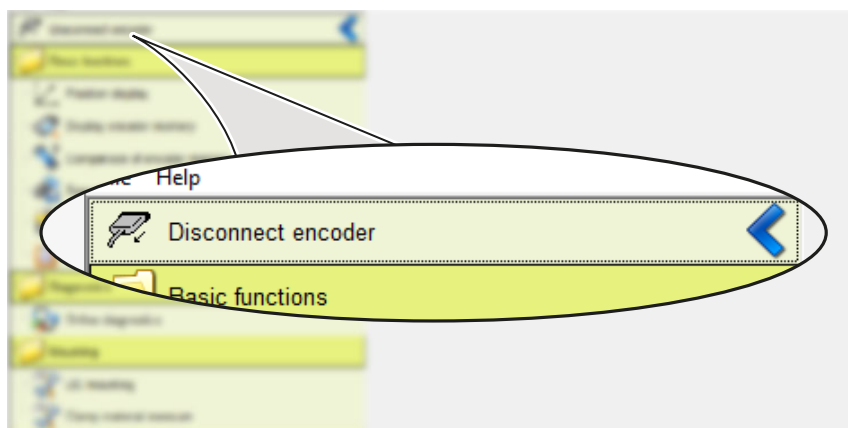
- ▶ Click **Next**
- ▶ The **Installation successful** message appears.



- ▶ Click **Exit**
- > The **Function menu** opens.
- > Mounting was successfully concluded.



- ▶ Double-click **Disconnect encoder**



Next step: "Final steps", Page 65

5.2.6 Adjustment and diagnosis of LIC 413 in bus operation

Connecting the encoder to the ATS

Connecting the encoder

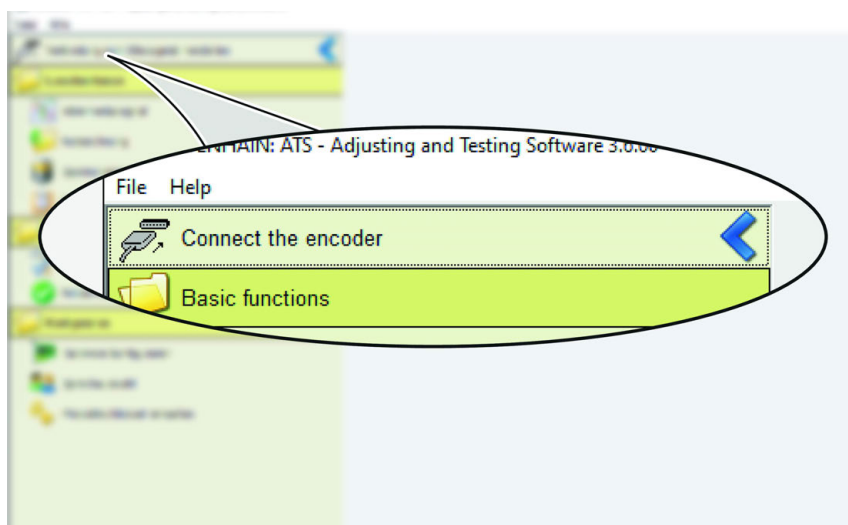
- Connect the encoder to the PWM
- Switch on the PWM

Selecting the connection

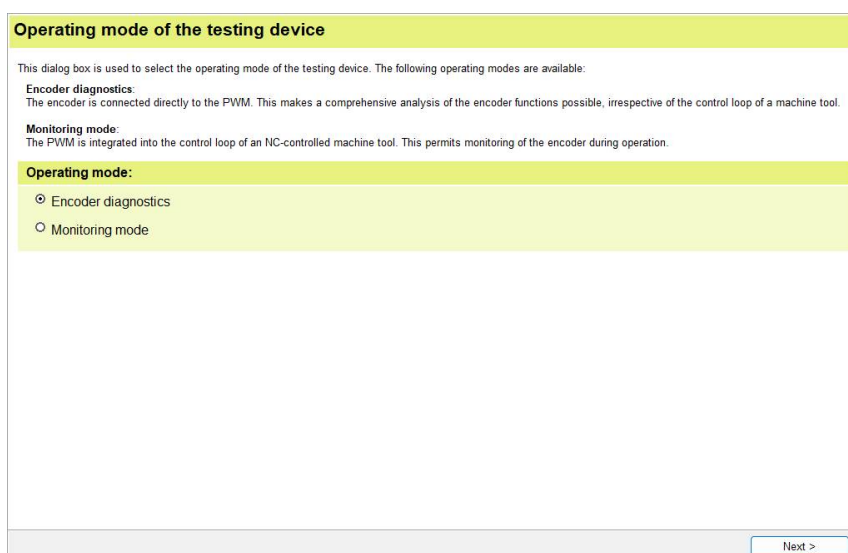
Connection options	
Connecting the encoder using its ID	Connecting the encoder manually
Recommended option with automatic determination of the measuring parameters.	Alternative option if the encoder cannot be connected using its ID.
Page 50	Page 52

Connecting the encoder using its ID

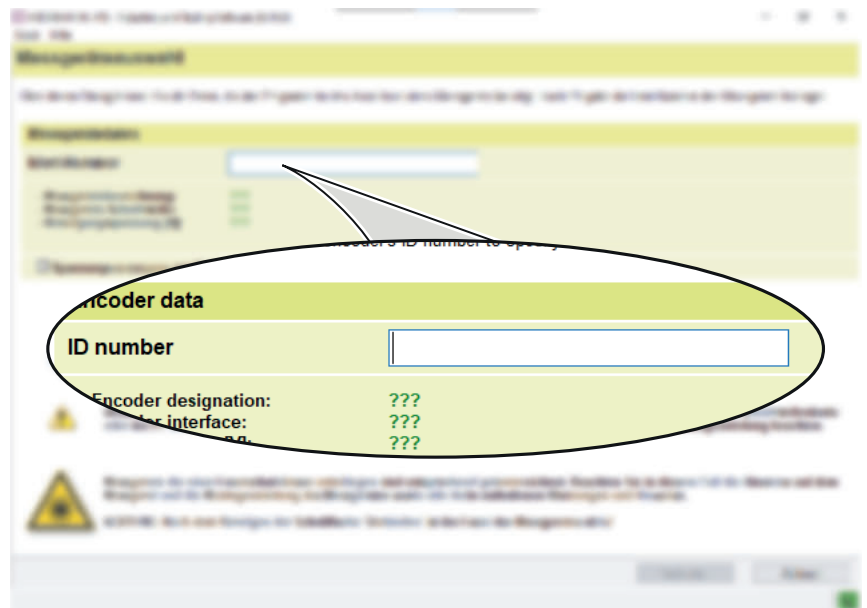
- ▶ Double-click **Connect the encoder** in the Function menu
- ▶ The **Operating mode of the testing device** dialog opens.

The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- ▶ The **Encoder selection** dialog opens.

The **Operating mode of the testing device** dialog

- ▶ Enter the product ID of the scanning head in the **ID number** field
- > The determined encoder parameters are shown in the **Encoder data** field.
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **overview of the bus addresses** opens.



The **Encoder selection** dialog

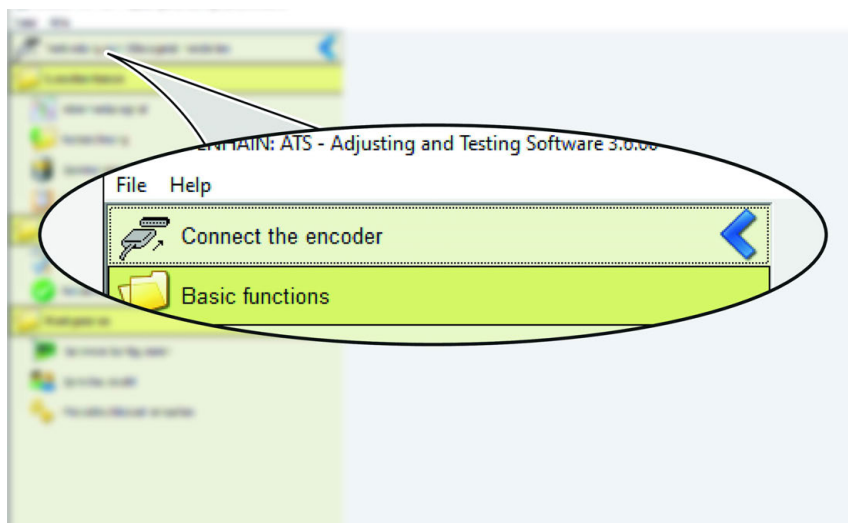


If you cannot connect the encoder using its ID, proceed as described in the "**Connecting the encoder manually**" chapter.

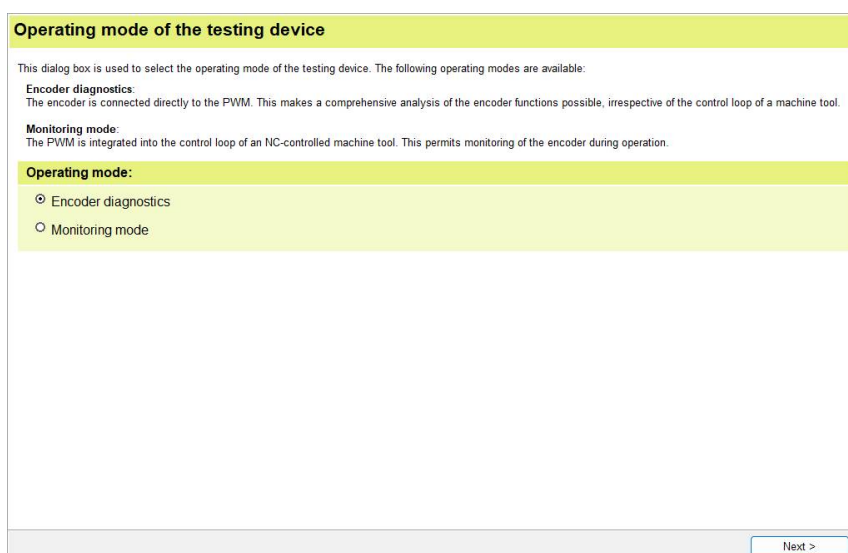
Next step: "Adjusting the scanning head", Page 55

Connecting the encoder manually

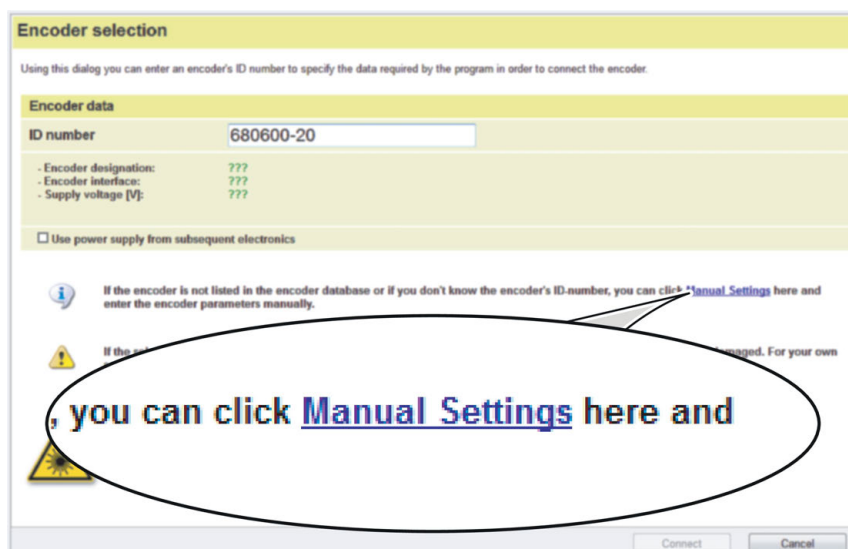
- ▶ Double-click **Connect the encoder** in the Function menu
- ▶ The **Operating mode of the testing device** dialog opens.

The **Function** menu

- ▶ Select the **Encoder Diagnostics** mode
- ▶ Click **Next**
- ▶ The **Encoder selection** dialog opens.

The **Operating mode of the testing device** dialog

- ▶ Click **Manual Settings**
- ▶ The **Encoder selection** dialog opens.

The **Encoder selection** dialog

- Follow the safety instructions
- Click **Next**
- The **Encoder selection** dialog opens.

Encoder selection

Using this dialog you can manually set the data required by the program in order to connect an encoder. Please set the data manually only if the encoder is not listed in the encoder database and you know all the encoder parameters that will be requested.

This program only supports the encoder models from HEIDENHAIN that can be selected on the next page. Encoders from other manufacturers are not supported.

Entry of incorrect data might damage the encoder, the interface card, or the PC. If you do not know the parameters of the encoder, please contact HEIDENHAIN in advance.

Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the 'Connect' button has been pressed!

< Back Next > Cancel

The **Encoder selection** dialog

NOTICE

Property damage due to incorrect encoder data settings!

Incorrect encoder data settings can cause damage to the encoder, the interface card, or the PC.

- Check the encoder data before connecting the encoder

Encoder interface:	EnDat 3 (E30-R4/R8/RB/RM)	EnDat 2.2, TTL, 1 V _{PP}	Fanuc, Mitsubishi, Panasonic, or Yaskawa
Supply voltage [V]:	12.0	5.0	5.0
Voltage adjustment:	Yes	Yes	Yes



For more information on the supply voltage and interfaces, refer to the **Exposed Linear Encoders** brochure.

- www.heidenhain.com/documentation
- Enter the document ID **208960**

- Select the permissible encoder supply voltage in the **Encoder supply voltage** section
- To activate voltage adjustment by the PWM, select the **Adjust voltage over sensor lines** checkbox
- Select the interface type EnDat 3 (E30-R4/R8/RB/RM) in the **Encoder interface** section
- Click **Next**
- The **Encoder selection** dialog with the encoder data opens.

Encoder selection

On this page you must set the supply voltage and the encoder's interface.

Encoder supply voltage

☐ 5.0 V
 ☐ 8.0 V
 ☐ 10.0 V
 ☒ 12.0 V
 ☐ 24.0 V
 Input [V]:

☒ Adjust voltage over sensor lines

Encoder interface

Interface:

< Back Next > Cancel

The **Encoder selection** dialog

- ▶ Check the encoder data
- ▶ Click **Connect**
- > The connection to the encoder is established.
- > The **overview of the bus addresses** opens.

Encoder selection

All data for connecting the encoder have now been entered. Before connecting the encoder to the interface card and establishing the connection to the encoder via the "Connect" button, check all data shown under "Encoder data."

Encoder data

- Encoder interface:
- Supply voltage [V]:
- Adjust voltage:
- ATS code:



Entry of incorrect data might damage the encoder, the interface card, or the PC.



Encoders subject to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all information and warnings in the encoder's mounting instructions.
CAUTION: The laser is active once the "Connect" button has been pressed!

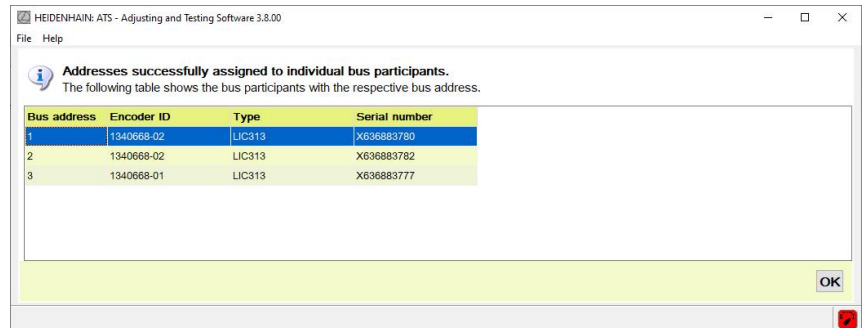
< Back
Connect
Cancel

The **Encoder selection** dialog with the encoder data

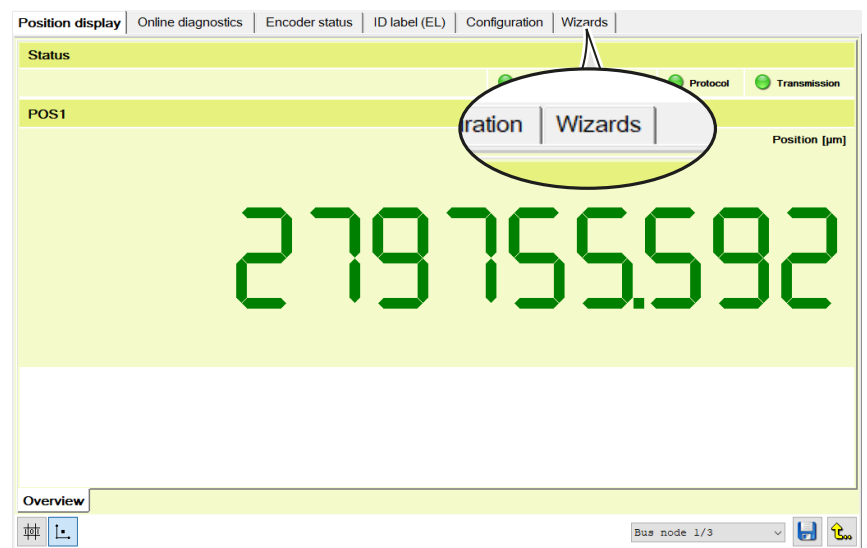
Next step: "Adjusting the scanning head", Page 55

Adjusting the scanning head Using the mounting wizard

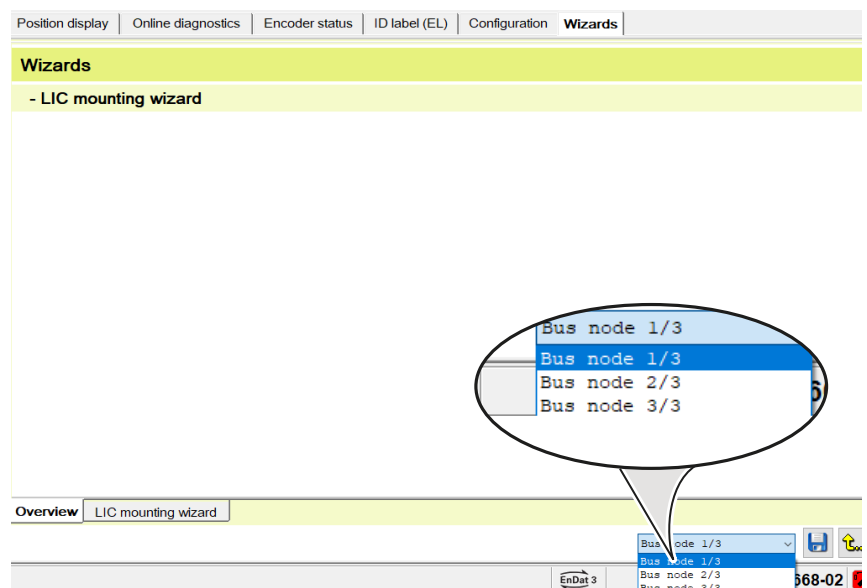
- Click **OK**
- > The **position display** appears.



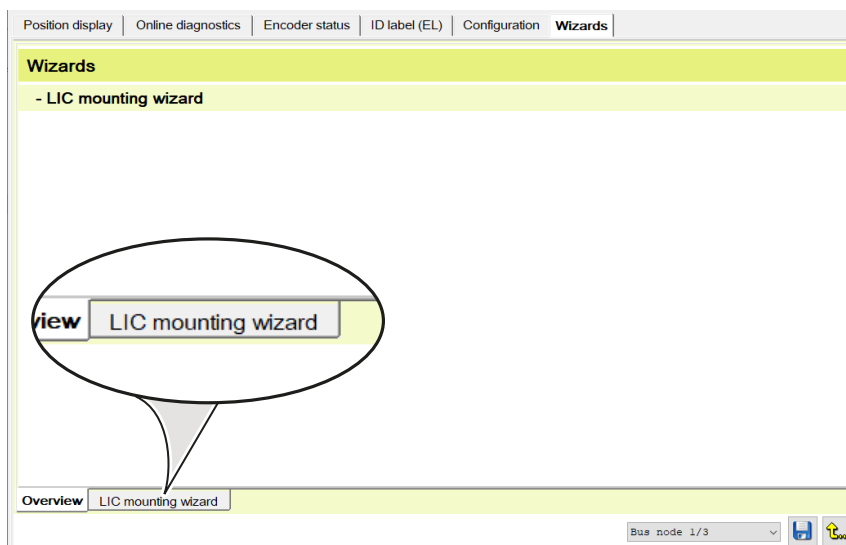
- Click **Wizards**



- Select **Bus node 1/3**

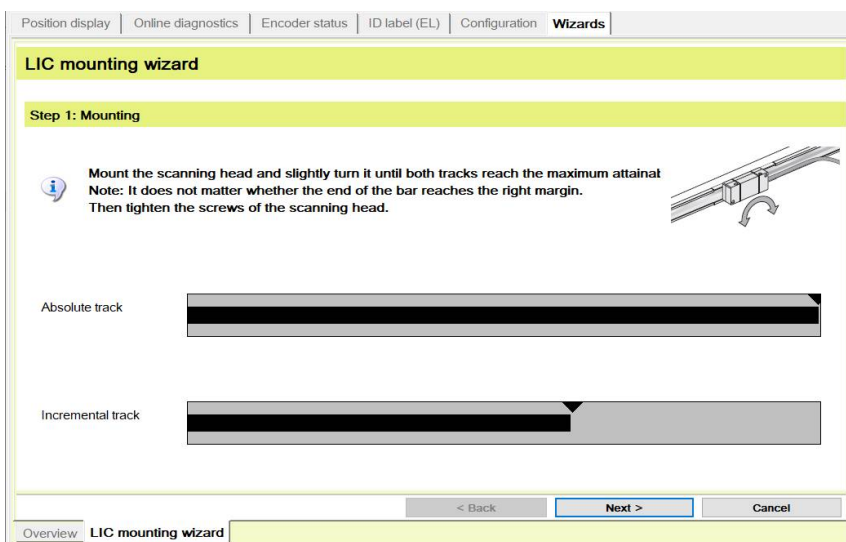


- Click **LIC mounting wizard**
- The **Step 1: Mounting** dialog opens.



Adjust the scanning head in the area of the midpoint of the measuring length.

- Set the absolute track to the maximum attainable bar length by slightly turning the scanning head
- Tighten the screws with the specified torque
- Click **Next**
- The **Step 2: Verify mounting** dialog opens.



If an error message occurs, it is because the maximum incremental signal was not achieved.

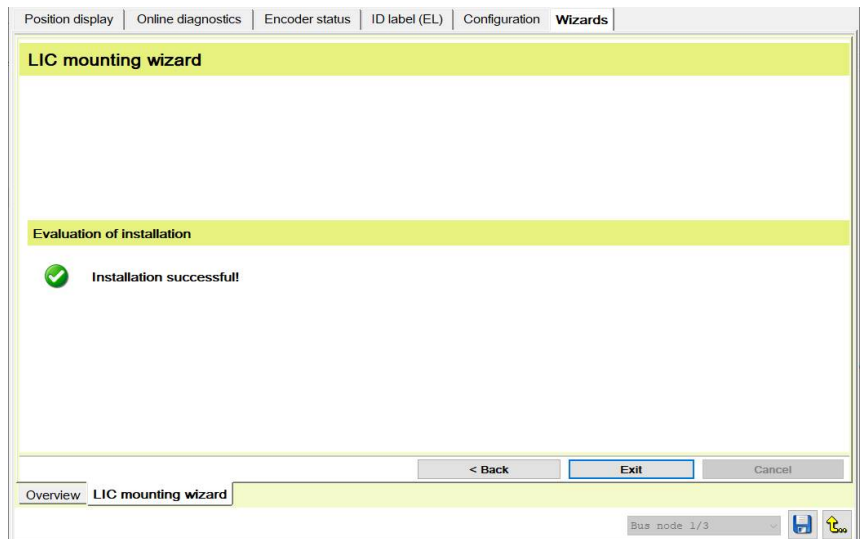
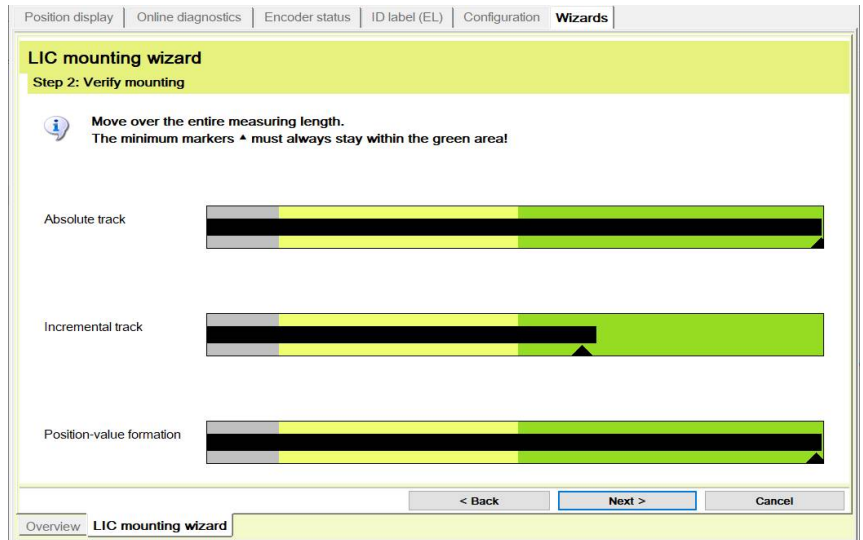
- Repeat the installation



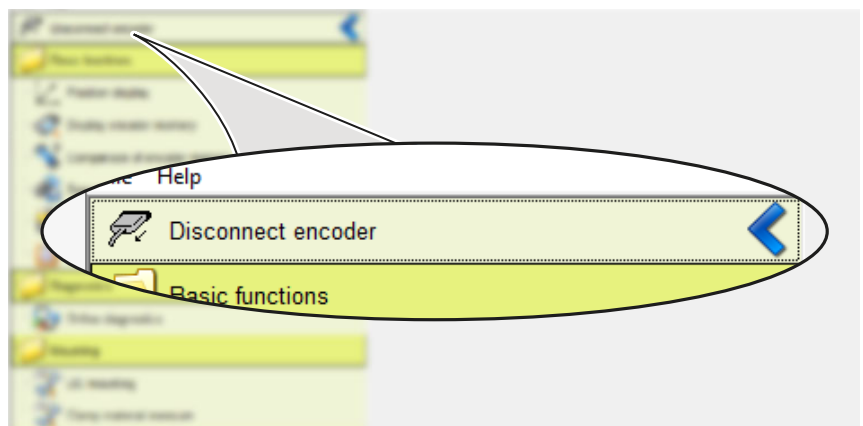
- ▶ Traverse the scanning head over the entire measuring length
- ▶ Ensure that the minimum markers remain within the green ranges

i If the green ranges are not reached or if strong signal jitter occurs over the entire measuring length, check the mounting tolerances and inspect for contamination.

- ▶ Click **Next**
- ▶ The **Installation successful** message appears.
- ▶ Click **Exit**
- ▶ The **Function menu** opens.
- ▶ Mounting was successfully concluded.



- ▶ Follow the same procedure for **Bus node 2/3** and **Bus node 3/3**
- ▶ Double-click **Disconnect encoder**



Next step: "Final steps", Page 65

5.3 Adjustment and diagnosis with testing unit

5.3.1 Requirements and notes

A testing unit (e.g., PWT 101 or PWT 100) is needed for the adjustment and diagnosis.



For more information, refer to the **PWT 100/PWT 101 Operating Instructions**.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1162581**



For more information, see the **Exposed Linear Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **208960**

5.3.2 Continuity check

Materials and tools

For this mounting step, the following materials and tools are needed:

Included in delivery

To be provided separately

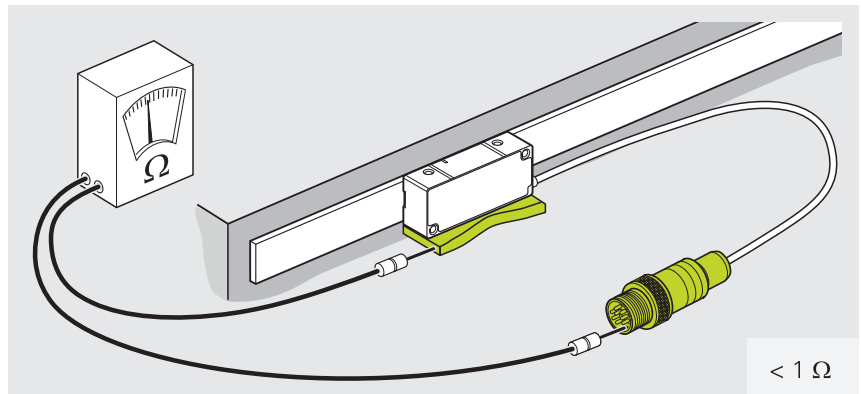
- Resistance measuring device

Measuring the electrical resistance

- ▶ Check the electrical resistance between the connector housing and the machine



The electrical resistance between the connector housing and the machine must be $< 1 \Omega$.



5.3.3 Connecting the encoder to the PWT

Connecting the encoder

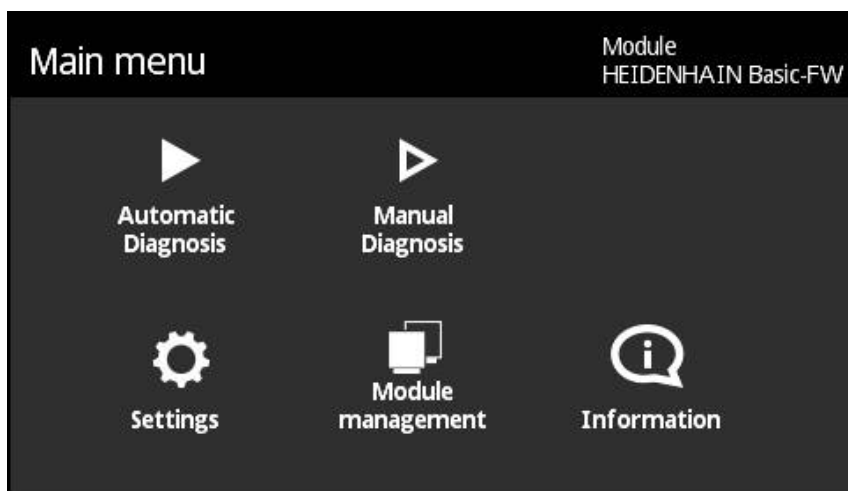
- ▶ Connect the encoder to the PWT
- ▶ Connect the PWT to the power supply

Selecting the connection

Connection options	
Connecting the encoder automatically	Connecting the encoder manually
Recommended option with automatic determination of the measuring parameters. Page 60	Alternative option if the encoder cannot be connected automatically. Page 61

Connecting the encoder automatically

- ▶ Tap **Automatic Diagnosis** in the main menu
- > The **Automatic Diagnosis** is performed.
- > The **Online diagnostics** screen is opened.



The **Main menu**

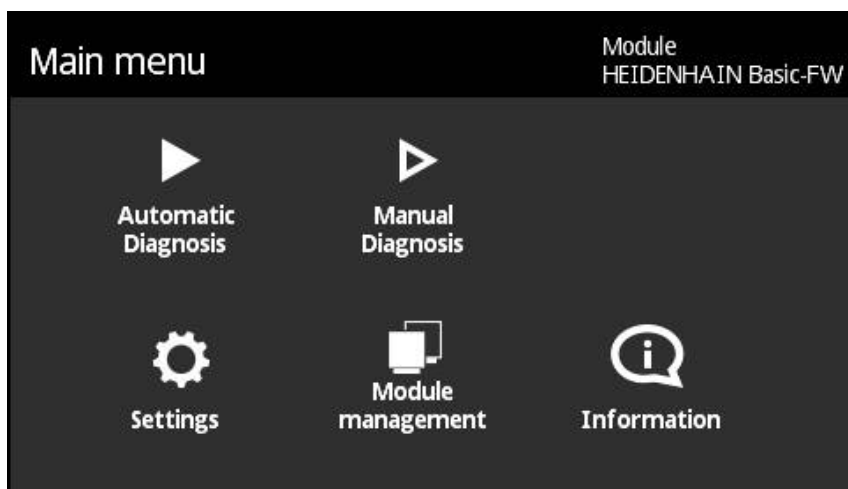


If you cannot connect the encoder automatically, proceed as described in the **Connecting the encoder manually** chapter.

Next step: "Adjusting the scanning head", Page 63

Connecting the encoder manually

- ▶ Tap **Manual diagnostics** in the main menu
- > The **Supply voltage of encoder** screen is opened.



The **Main menu**

NOTICE

Property damage due to incorrect encoder data settings!

Incorrect encoder data settings can cause damage to the encoder, the interface card, or the PC.

- ▶ Check the encoder data before connecting the encoder

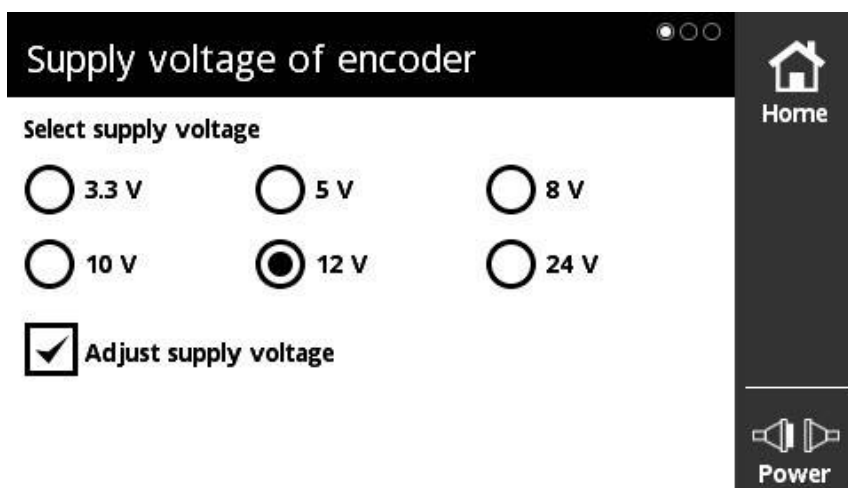
Encoder interface:	EnDat 3 (E30-R4/R8/RB/RM)	EnDat 2.2, TTL, 1 V _{PP}	Fanuc, Mitsubishi, Panasonic, or Yaskawa
Supply voltage [V]:	12.0	5.0	5.0
Voltage adjustment:	Yes	Yes	Yes



For more information on the supply voltage and interfaces, refer to the **Exposed Linear Encoders** brochure.

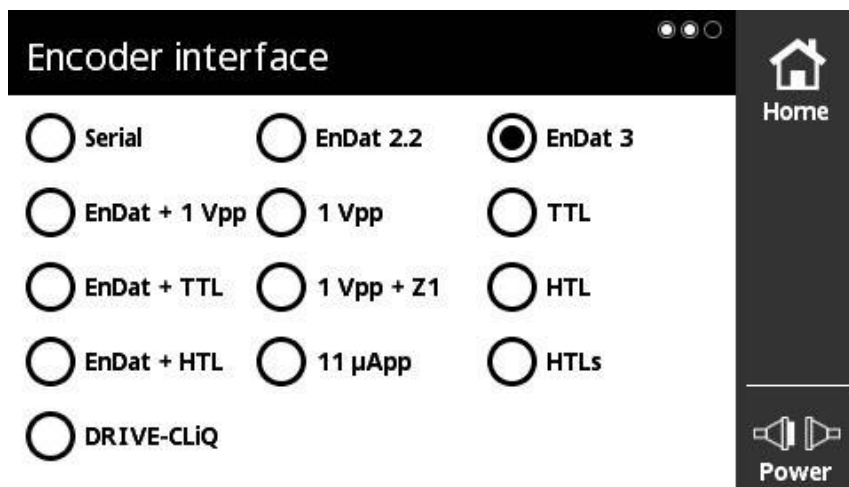
- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **208960**

- ▶ Select the supply voltage
- ▶ To activate voltage adjustment by the PWT, select the **Adjust supply voltage** checkbox
- ▶ Swipe right to left
- > The **Encoder interface** screen is opened.



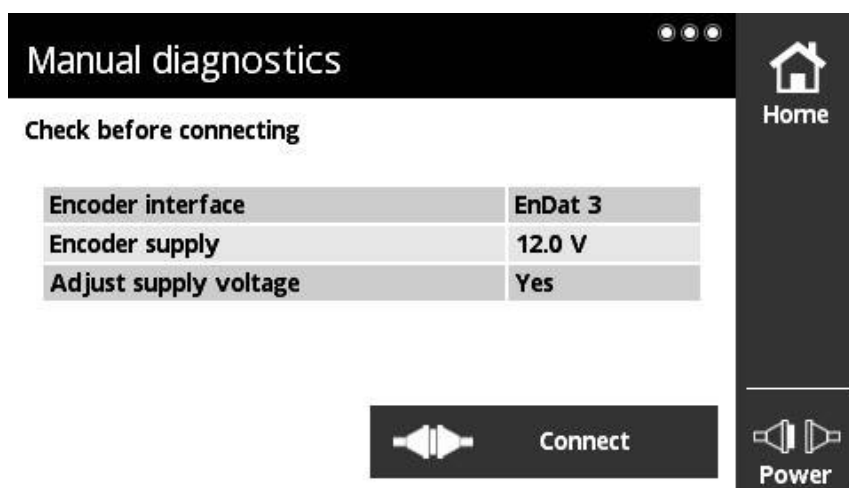
The **Supply voltage of encoder** screen

- ▶ Select the appropriate encoder interface
- ▶ Swipe right to left
- > The **Manual diagnostics** screen is opened.



The **Encoder interface** screen

- ▶ Check the encoder data
- ▶ Tap **Connect**
- > The connection to the encoder is established.
- > The **Online diagnostics** screen is opened.

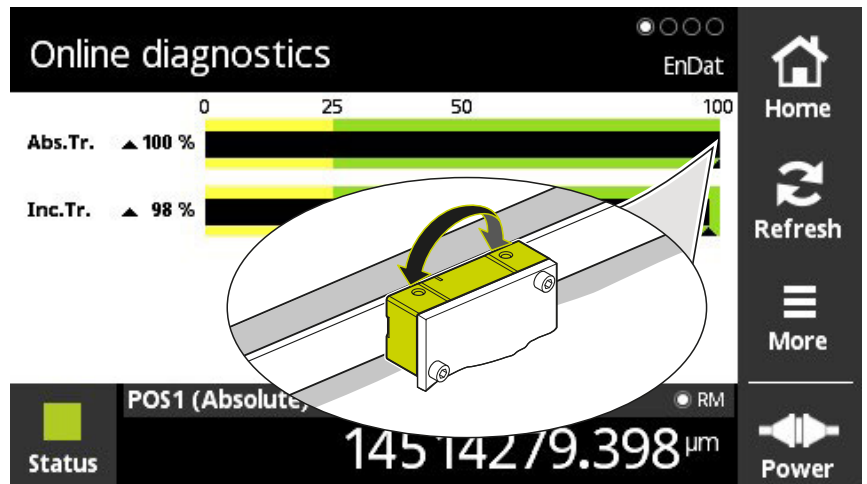


The **Manual diagnostics** screen

Next step: "Adjusting the scanning head", Page 63

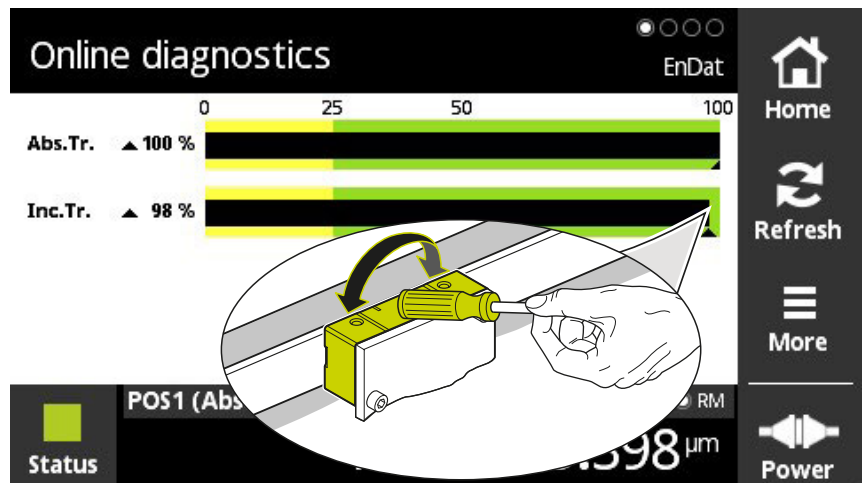
5.3.4 Adjusting the scanning head

- Set the absolute track to the maximum attainable bar length by slightly turning the scanning head



The **Online diagnostics** screen

- Set the incremental track to the maximum value by slightly turning and, if necessary, lightly tapping the scanning head



The **Online diagnostics** screen

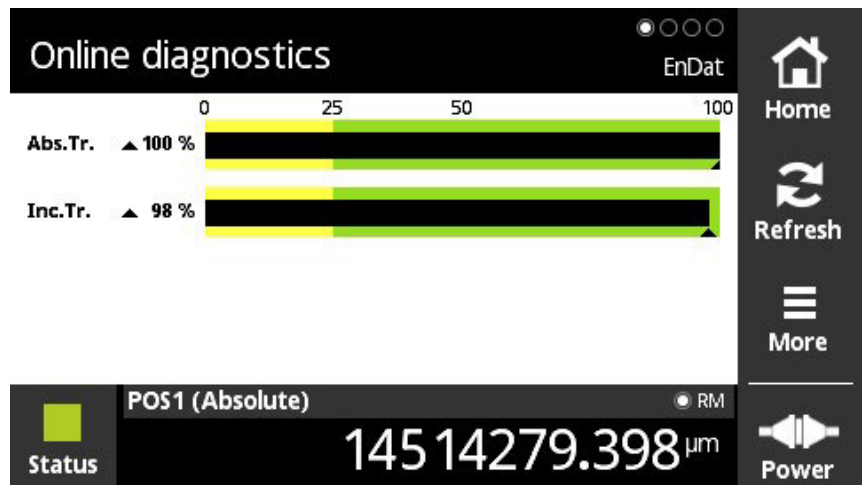
- Tighten the screws with the specified torque



- ▶ Traverse the scanning head over the entire measuring length
- ▶ Ensure that the minimum markers remain within the green ranges



If the green ranges are not reached or if strong signal jitter occurs over the entire measuring length, check the mounting tolerances and inspect for contamination.



Next step: "Final steps", Page 65

6 Final steps

This chapter describes the necessary final steps.

6.1 Connecting the encoder to the downstream electronics

WARNING

Danger of electric shock due to plug connections under power!

Connecting and disconnecting live cables and connecting elements in the equipment can result in death or serious injury.

- ▶ Do not connect or disconnect any cable or connecting element when they are under power
- ▶ Disconnect the downstream electronics from power before connecting the product
- ▶ For cables without connectors, pay attention to the pin layout

- ▶ Connecting the encoder to the downstream electronics

NOTICE

Property damage resulting from incorrect routing of the connecting cable!

Connecting cables may become damaged as a result of incorrect routing.

- ▶ Observe the maximum permissible bend radii
- ▶ Do not cross connecting cables in drag chains
- ▶ Route connecting cables professionally



For more information on the cable characteristics and cable routing, refer to the **Cables and Connectors** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1206103**



For more information on the pin layouts of pre-assembled cables, refer to the **Cables and Connectors** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1206103**



For more information on sources of interference, refer to the **Interfaces of HEIDENHAIN Encoders** brochure.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1078628**

7 Removal

This chapter describes the disassembly of the product.

7.1 Safety precautions regarding removal

WARNING

Risk of injury due to plug connections under voltage!

If you disengage plug connections while the equipment is under power, this may result in fatal accidents or severe personal injury.

- ▶ Do not engage or disengage any connecting elements while the product is under power

WARNING

Risk of injury due to moving machine parts!

Depending on the installation location and the application, there is a high risk of injury due to moving machine parts.

- ▶ Observe all of the machine manufacturer's notes on working on the machine (e.g., always disconnect the machine from the power supply)

CAUTION

Risk of injury from splinters and sharp edges of the carrier material!

If you remove fragile carrier material incorrectly, this can result in material breakage with splinters and sharp edges.

- ▶ Wear protective gloves
- ▶ Wear protective glasses
- ▶ Do not bend or deform the carrier material excessively

7.2 Removing the scanning head

- ▶ Disconnect the encoder from the downstream electronics
 - ▶ Remove the scanning head in the reversed sequence of mounting
- Further information:** "Mounting the scanning head", Page 16

7.3 Removing the scale tape



Further information can be found in the **Disassembly Instructions**.

- ▶ www.heidenhain.com/documentation
- ▶ Enter the document ID **1185755**

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