

Operating Instructions

ATS Software

Hardware Platform
PWM 20/IK 21544

Software
539 862-15
Version 2.4.xx

Representante oficial de:



HEIDENHAIN

[Argentina – Bolivia – Chile – Colombia - Costa Rica – Ecuador - El Salvador –
Guatemala – Honduras – Nicaragua – Panamá – Paraguay – Perú -
República Dominicana – Uruguay – Venezuela.]



Calle 49 N° 5764 - Villa Ballester (B1653AOX) - Prov. de Buenos Aires - ARGENTINA
Tel: (+54 11) 4768-4242 / Fax: (+54 11) 4849-1212
Mail: ventas@nakase.com.ar / Web: www.nakase.com.ar



1 General	5
1.1 How to Use these Operating Instructions.....	5
1.2 Safety Precautions.....	6
1.3 Information on the IK 215 Adjusting and Testing Package (ID 547858-xx).....	7
1.4 IK 215 Adjusting and Testing Package (ID 547858-xx): Items Supplied	8
1.5 Information on the PWM 20 Encoder Diagnostic Kit, ID 759251-xx	9
1.6 PWM 20 Basic Kit, ID 731626-51; Items Supplied.....	9
1.7 PWM 20 Encoder Diagnostic Kit , ID 759251-01; Items Supplied.....	10
1.8 Optional Accessories	11
2 Commissioning	15
2.1 System Requirements.....	15
2.2 Description of the Hardware	15
2.3 Installing the ATS Software	16
2.4 Uninstalling the ATS Software.....	16
2.5 Calibration.....	17
3 Software Description	19
3.1 Operating Concept	19
3.2 Connect Encoder.....	20
3.2.1 Automatic encoder identification by entering the ID	22
3.2.2 Manual encoder selection	25
3.3 Basic Functions	30
3.3.1 Position display	31
3.3.2 Display of incremental signals	53
3.3.3 Display encoder memory	56
3.3.4 Comparing contents of encoder memories	65
3.3.5 Voltage display	68
3.4 Additional Information (EnDat 2.2): Temperature Display	69
3.5 Diagnostics.....	71
3.5.1 Absolute-to-incremental deviation	71
3.5.2 Online diagnostics	75
3.6 Configuration	83
3.6.1 Configure hardware	84
3.6.2 Language selection	85
3.6.3 Manage product keys	86
3.6.4 Display software version	88
3.7 Mounting Wizard for ECI/EQI	89
3.7.1 ExI Check Function	90
3.7.2 ExI mounting function	96
3.8 LIC 4000 and LIP 200 Mounting Wizard.....	103
3.9 Supported Interfaces	104
3.9.1 SSI, SSI programmable	104
3.9.2 FANUC and MITSUBISHI	106
3.9.3 DRIVE-CLiQ	107
4 Overview of Cables and Adapters	113
4.1 SA 100 Service Adapter (Online Diagnosis).....	113
4.2 EnDat 2.1 / 2.2 with Incremental Signals	114
4.2.1 Measuring EnDat 2.1 interface signals without subsequent electronics	114
4.2.2 Connecting the PWM 20/IK 215 into an EnDat / SSI Mot.Enc. measuring circuit with 25-pin D-Sub connector	115
4.2.3 Connecting the PWM 20/IK 215 into an EnDat Pos.Enc. measuring circuit	116
4.2.4 Connecting the PWM 20/IK 215 into an EnDat Pos.Enc. measuring circuit (NC side) with 15-pin D-Sub connector	117
4.2.5 Connecting the PWM 20/IK 215 into an EnDat Mot.Enc. measuring circuit via an adapter connector	118
4.3 EnDat 2.2.....	119

4.3.1 Cable adapter for EnDat 2.2. interface	119
4.3.2 Cable adapter for APE 3xx and EIB 1xx/3xx	120
4.4 Adapter Cable for Adjusting ExI 11xx/13xx	121
4.5 FANUC	122
4.5.1 Measuring the FANUC SERIAL interface signals	122
4.6 MITSUBISHI	123
4.6.1 Measuring the MITSUBISHI high speed serial interface signals	123
4.7 SSI	124
4.7.1 Connecting the PWM 20/IK 215 into an SSI Mot.Enc. measuring circuit via an adapter connector	124
5 Pin Layouts	125
5.1 Pin Layout of PWM 20	125
5.2 Pin Layout of the IK 215	125
5.3 Pin Layout of PCB Connector of EnDat 2.2 Encoder to Subsequent Electronics.....	126
5.4 Pin Layout of PCB Connector of Cable Adapter (12/15-pin) D-sub (15-pin)	127
5.5 FANUC Pin Layout.....	128
5.6 MITSUBISHI Pin Layout	129
6 Contacts.....	131
6 Your HEIDENHAIN helpline	131
6 The HEIDENHAIN technical helpline	131
6 The HEIDENHAIN helpline for repairs, spare parts, exchange units, complaints and service contracts	131
6 Technical training.....	131

1 General

1.1 How to Use these Operating Instructions

About these operating instructions

These instructions refer to the ATS **A**djusting and **T**esting **S**oftware Version 2.4xx, ID 543734-15.

The ATS software is executable on the following hardware platforms:

- PWM 20 ID 731626-01 and
- PC expansion board IK 215 ID 386249-xx

Update service

These instructions are regularly updated.

The current (printable) version is available on the Internet in PDF format: www.heidenhain.de



Note

Printed copies are only distributed to the participants of our service training courses and are enclosed with new test units.

Explanation of the symbols

Symbols represent the type of information.



Note

E.g. reference to more detailed information in another chapter.



Attention

E.g. indication of error messages that may be displayed or repetition of program steps.



DANGER

E.g. information that incorrect operation may cause the danger of electrical shock or lead to the destruction of components.

Other documentation

For more information please refer to the following documentation:

- Documentation of the machine tool builder
- Interface descriptions (HEIDENHAIN)
- Mounting instructions of the encoders
- Encoder brochures (www.heidenhain.de, documentation, brochures and CD-ROMs)

Target group

The activities described in this manual may only be performed by specialists for service, maintenance and commissioning who have profound knowledge of electronics, electrical engineering and NC machine-tool technology.



Note

Keep these instructions for later reference.

Screen displays



Note

The screenshots and displayed information in these instructions depend on the encoder type connected and on the product key. Thus, they may differ from your testing situation. The images only serve as examples!

1.2 Safety Precautions

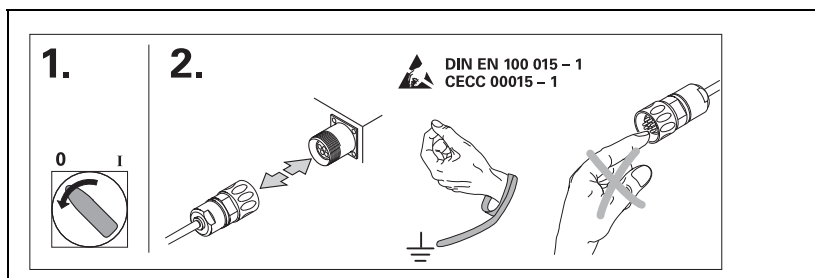


Note

Observe the safety precautions below to avoid injury or damage to persons or products. To avert potential dangers, only use the product in the manner described!

Before you integrate the test units into the position control loop of an NC controlled machine tool make sure that:

1. the machine is switched off and
2. all connectors are disengaged!
Observe the ESD precautions!



DANGER

Do not operate defective units!
Do not operate the device, if power cord, power supply unit or test unit are damaged!

Do not change any parameters or encoder voltages at the test units while the machine tool is moving and a test unit is connected to the position control loop!

Ensure that vertical axes cannot fall down!

The EnDat interface offers the possibility of storing machine or system-dependent data in the customer memory. The data may comprise safety-relevant information. When servicing, please take care to adjust this memory area. Ignoring this may cause machine damage or personal injury!

When troubleshooting always contact the machine tool builder for information (e.g. meaning of the data in the OEM memory).



Attention

Correct evaluation of the malfunction of an NC-controlled machine requires fundamental knowledge about the machine tool, its drives, inverters and NCs as well as their interaction with the measuring systems. Improper operation of the NC, incorrect NC programming or incorrect or non-optimized machine parameter values can lead to faulty machine performance.

Careless treatment or use may cause considerable damage or injury to property or persons.

HEIDENHAIN can accept no responsibility for direct or indirect damage or injury caused to property or persons through improper use or incorrect operation of the machine. Apart from the information in these instructions the general instructions for safety and the prevention of accidents must be observed.



Note

However, support will also be provided by HEIDENHAIN Traunreut or by the HEIDENHAIN agencies. See "Contacts" on page 131.

1.3 Information on the IK 215 Adjusting and Testing Package (ID 547858-xx)

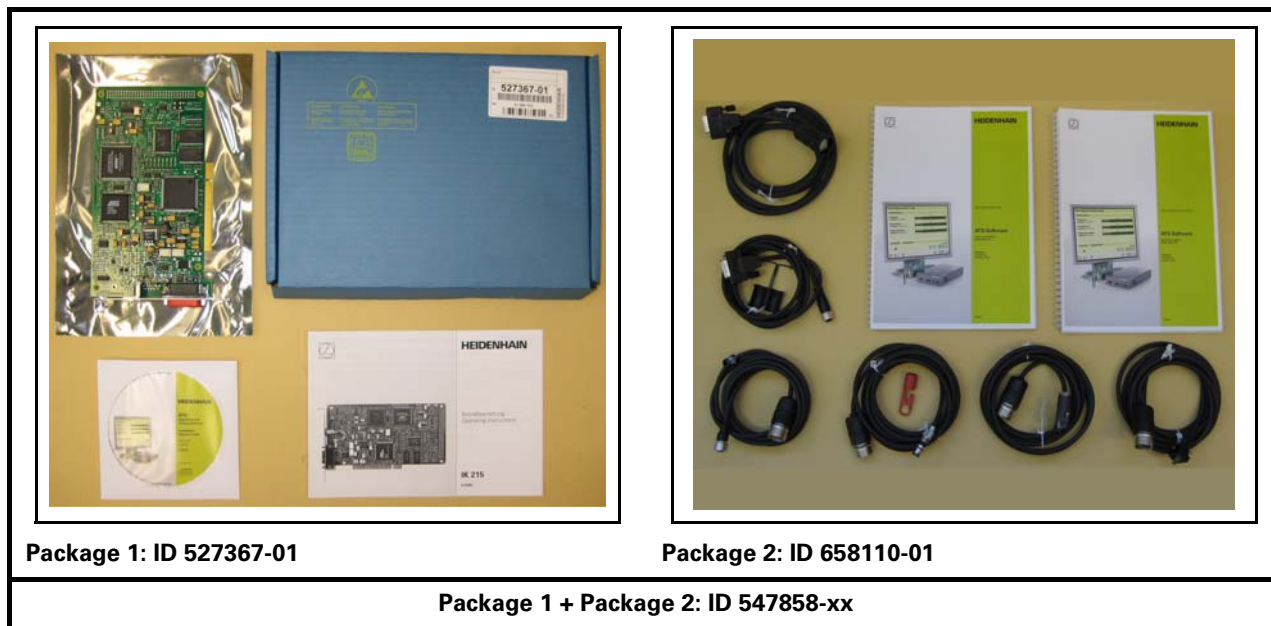
The IK 215 Adjusting and Testing Package serves to diagnose and adjust HEIDENHAIN absolute encoders with absolute interfaces.

The IK 215 Adjusting and Testing Package comprises:

- **IK 215** Interface Card for installation in a PCI expansion slot of a personal computer
- **Adjusting and Testing Software (ATS)** with integrated local encoder data base for automatic encoder identification
- Standard adapter cables for common testing procedures
- Other adapters and adapter cables are available (see table)

1.4 IK 215 Adjusting and Testing Package (ID 547858-xx): Items Supplied

The packages 1 and 2 are included in delivery.



Package 1 IK 215		ID 527367-01
Qty.	Description	ID
1	IK 215 PCI board	386249-02
1	ATS CD-ROM de/en software version 2.4.xx	539862-15
1	Operating Instructions (Commissioning)	549369-91

Package 2 PWM 20 / IK 215 Accessories kit		ID 658110-01
Qty.	Description	ID
1	Betriebsanleitung ATS-Software PWM 20 / IK 215 de	543734-xx
1	Operating Instructions ATS Software PWM 20 / IK 215 en	543734-xx
1	Adapter cable (with incremental signal) IK input 15/17-pin; D-Sub/M23; 2 m	324544-02
1	Adapter cable for IK input 15/8-pin;D-Sub/M23; 2 m	524599-02
1	Adapter cable for LC 18x scanning unit , 12/17-pin; 3 m	369124-03
1	Adapter cable for LC 48x scanning unit , 12/17-pin; 3 m	369129-03
1	Adapter cable for LC xx3, LC xx5, LC 20x scanning unit , 14/17-pin; M12/M23; 3 m	533631-03
1	Adapter cable RCN 82xx Ultra Lock 12/17-pin; M12/M23	643450-03

1.5 Information on the PWM 20 Encoder Diagnostic Kit, ID 759251-xx

The PWM 20 encoder diagnostic kit comprises:

- PWM 20 test unit for direct connection to a laptop/PC via USB interface
- ATS Adjusting and Testing Software on CD with integrated local encoder database for automatic encoder detection
- Standard adapter cables for common testing procedures
- Case for testing equipment
- Other adapters and adapter cables are available (see table)



Note

The PWM 20 test unit is available in three different combinations (see tables below):

- PWM 20 Basic kit
- PWM 20 Basic kit including case (aluminum)
- PWM 20 Basic kit including case, set of standard adapter cables and operating instructions

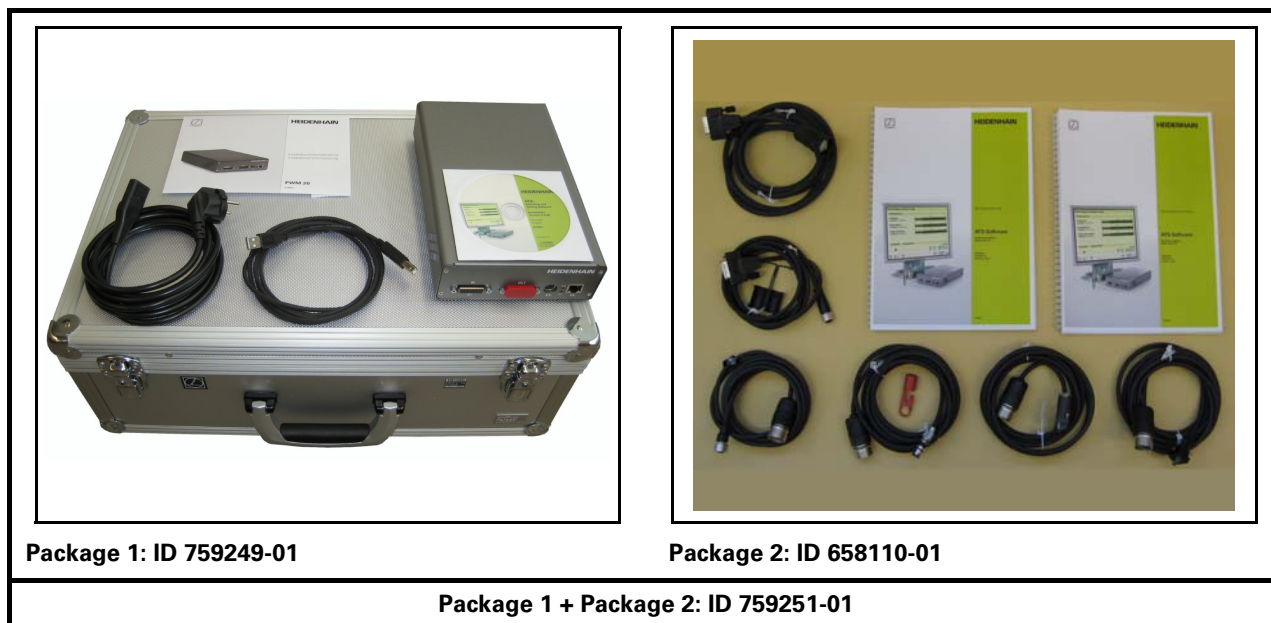
1.6 PWM 20 Basic Kit, ID 731626-51; Items Supplied



PWM 20 Basic kit		ID 731626-51
Qty.	Description	ID
1	PWM 20	731626-01
1	ATS CD-ROM de/en software version 2.4.xx	539862-15
1	Operating Instructions (Commissioning)	729905-xx
1	USB connecting cable, 2 m	354770-02
1	Power cable, 3 m	223775-01
1	Packaging PWM 20 (cardboard box)	730058-01

1.7 PWM 20 Encoder Diagnostic Kit , ID 759251-01; Items Supplied

The packages 1 and 2 are included in delivery.



Package 1: ID 759249-01

Package 2: ID 658110-01

Package 1 + Package 2: ID 759251-01

Package 1 PWM 20 Basic kit including case		ID 759249-01
Qty.	Description	ID
1	PWM 20	731626-01
1	ATS CD-ROM de/en software version 2.4.xx	539862-15
1	Operating Instructions (Commissioning)	729905-xx
1	USB connecting cable, 2 m	354770-02
1	Power cable, 3 m	223775-01
1	Case for testing equipment	785241-01

Package 2 PWM 20 / IK 215 Accessories kit		ID 658110-01
Qty.	Description	ID
1	Betriebsanleitung ATS-Software PWM 20 / IK 215 de	543734-xx
1	Operating Instructions ATS Software PWM 20 / IK 215 en	543734-xx
1	Adapter cable (with incremental signal) IK input 15/17-pin; D-Sub/M23; 2 m	324544-02
1	Adapter cable for IK input, 15/8-pin;D-Sub/M23; 2 m	524599-02
1	Adapter cable for LC 18x scanning unit, 12/17-pin; 3 m	369124-03
1	Adapter cable for LC 48x scanning unit, 12/17-pin; 3 m	369129-03
1	Adapter cable for LC xx3, LC xx5, LC 20x scanning unit, 14/17-pin; M12/M23; 3 m	533631-03
1	Adapter cable RCN 82xx Ultra Lock, 8/17-pin; M12/M23	643450-03

1.8 Optional Accessories

Optional adapter cables and adapters are available for the different interfaces:

Qty.	Description	ID
	EnDat 2.1 see chapter 4.2	
1	Adapter cable for LC 18x scanning unit, 12/17-pin; 3 m see chapters 4.2.1, 4.2.3, 4.2.4	369124-03
1	Adapter cable for LC 48x scanning unit, 12/17-pin; 3 m see chapters 4.2.1, 4.2.3, 4.2.4	369129-03
1	Adapter cable for LC 18x scanning unit, 12/15-pin; 3 m see chapter 4.2.4	370737-03
1	Adapter cable for LC 48x scanning unit, 12/15-pin; 3 m see chapter 4.2.4	370747-03
1	Adapter cable for IK input 15/17-pin; 2 m see chapters 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5	324544-02
1	Adapter Mot.Enc -> Pos.Enc. (assignment converter) see chapter 4.2.5	349312-03
1	Adapter Pos.Enc -> Mot.Enc. (assignment converter) see chapter 4.2.5	349312-04
1	Adapter cable with PCB connector 17/12-pin; 1 m see chapters 4.2.1, 4.2.5	349839-02
1	Adapter cable (extension) 17-pin, Pos.Enc. see chapters 4.2.2, 4.2.5	323897-xx
1	Adapter cable 17/15-pin; 3 m see chapters 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5	336376-03
1	Adapter cable (extension) 17/17-pin Mot.Enc. see chapter 4.2.5	340302-xx
1	Adapter cable 17/15-pin; 3 m see chapters 4.2.3, 4.2.4	332115-03
1	Adapter cable 17/25-pin; 0.3 m (assignment converter) see chapter 4.2.2	509667-N3
1	Adapter cable 17/25-pin; 0.3 m (assignment converter) see chapter 4.2.2	509666-N3
1	Adapter cable 17/15-pin; 0.3 m see chapter 4.2.4	510616-N3
1	Adapter cable 17/15-pin; 0.3 m see chapter 4.2.4	510617-N3
1	Voltage controller 5 V Pos.Enc. see chapters 4.2.3, 4.2.4, 4.2.5	370225-01
1	Voltage controller 5 V Mot.Enc. see chapter 4.2.5	370224-01
	EnDat 2.2 see chapter 4.3	
1	Adapter connector 17/8-pin SA 100 -> NC see chapter 4.3.1	in progress
1	Adapter connector 17/8-pin SA 100 -> encoder see chapter 4.3.1	in progress
1	Adapter cable 17-pin / 12-pin SA 100 -> PCB connector of encoder see chapter 4.3.1	349839-02
1	Adapter cable 17/15-pin SA 100 -> IK see chapters 4.3.1, 4.3.2	324544-02
1	Adapter cable 8/15-pin Encoder -> IK see chapter 4.3.1	524599-02
1	Adapter cable 8/8-pin (extension) Pos.Enc. see chapter 4.3.1	368330-xx
1	Adapter cable 8/12-pin (with PCB connector) see chapter 4.3.1	530351-03
1	SA 100 Service Adapter (listening-in mode EnDat 21 and 22, FANUC and MITSUBISHI) 17-pin M23 connector see chapter 4.1	363706-01

Qty.	Description		ID
	Exl 11xx/13xx adapter for adjustment	see chapter 4.4	
1	Adapter cable with 2 x 3 inserts for adapter connectors (12 and 15-pin)	see chapter 4.4	621742-01
1	3 Inserts (12-pin) for adapter connectors	see chapter 4.4	528694-01
1	3 Inserts (15-pin) for adapter connectors	see chapter 4.4	528694-02
	FANUC SERIAL Interface	see chapter 4.5	
1	Adapter cable for IK input, 15/17-pin, 2 m	see chapter 4.5.1	324544-02
1	Adapter cable for LC 19xF, 20-pin, 1 m	see chapter 4.5.1	341113-01
1	Adapter cable for LC 19xF, 17-pin, 1 m	see chapter 4.5.1	343421-01
1	Adapter cable for LC 49xF, 20-pin, 1 m	see chapter 4.5.1	341112-01
1	Adapter cable for LC 49xF, 17-pin, 1 m	see chapter 4.5.1	337439-01
1	Adapter cable 20-pin / 17-pin, 0.5 m (encoder -> SA 100)	see chapter 4.5.1	550161-01
1	Adapter cable 17-pin / 20-pin, 0.5 m (FANUC -> SA 100)	see chapter 4.5.1	550162-01
1	Adapter cable 17/17-pin (extension)	see chapter 4.5.1	349314-xx
1	SA 100 Service Adapter (monitoring mode EnDat 2.2 and FANUC) 17-pin M23 connector	see chapter 4.1	363706-01
	MITSUBISHI High Speed Serial Interface	see chapter 4.6	
1	Adapter cable for IK input, 15/17-pin, 2 m	see chapter 4.6.1	324544-02
1	Adapter cable for LC, 20-pin, 1 m	see chapter 4.6.1	368724-01
1	Adapter cable for LC 19xM, 17-pin, 1 m	see chapter 4.6.1	343421-01
1	Adapter cable for LC 49xM, 20-pin, 1 m	see chapter 4.6.1	367425-01
1	Adapter cable for LC 49xM, 17-pin, 1 m	see chapter 4.6.1	337439-01
1	Adapter cable 20-pin / 17-pin (encoder -> SA 100)	see chapter 4.6.1	in progress
1	Adapter cable, 17/20-pin, 1 m	see chapter 4.6.1	344625-01
1	Adapter cable 17/17-pin (extension)	see chapter 4.6.1	349314-xx
	SSI (synchronous serial interface)	see chapter 4.7	
1	Adapter cable for IK input, 15/17-pin, 2 m	see chapter 4.7.1	324544-02
1	Adapter Mot.Enc -> Pos.Enc. (assignment converter)	see chapter 4.7.1	349312-03
1	Adapter Pos.Enc -> Mot.Enc. (assignment converter)	see chapter 4.7.1	349312-04
1	Adapter cable with PCB connector 17/12-pin; 1 m	see chapter 4.7.1	349839-02
1	Adapter cable 17/25-pin; 3 m	see chapter 4.7.1	336376-03

Qty.	Description	ID
1	Adapter cable (extension) 17/17-pin (Mot.Enc.) see chapter 4.7.1	340302-xx
1	Adapter cable 17/15-pin; 3 m see chapter 4.7.1	332115-03
1	Adapter cable 17/25-pin; 0.3 m (assignment converter) see chapter 4.7.1	509667-N3
1	Adapter cable 17/25-pin; 0.3 m (assignment converter) see chapter 4.7.1	509666-N3
1	Adapter cable 17/15-pin; 0.3 m see chapter 4.7.1	510616-N3
1	Voltage controller 5 V Pos.Enc. see chapter 4.7.1	370225-01
1	Voltage controller 5 V Mot.Enc. see chapter 4.7.1	370224-01
1	Adapter cable (extension) 17-pin (Pos.Enc. assignment) see chapter 4.7.1	323897-xx
	DRIVE-CLiQ *	
1	Connecting cable SIEMENS DRIVE-CLiQ line MOTION-CONNECT	759314-01

* DRIVE-CLiQ is a registered trademark of the SIEMENS Aktiengesellschaft

2 Commissioning

2.1 System Requirements

- Dual-core processor with a clock frequency > 2 GHz
- At least 1 GB RAM
- Windows XP, Vista, Win7 (32 bits) operating system
- Free space on hard disk > 100 MB



Note

If these requirements are not met, this may lead to very slow data processing or even to error messages of the ATS software, indicating that certain functions cannot be performed.

System requirements for PWM 20 or IK 215: see respective commissioning instructions

2.2 Description of the Hardware

To be operable, the ATS software requires a hardware platform for connection of the encoders. The ATS software is executable on HEIDENHAIN PWM 20 or IK 215.



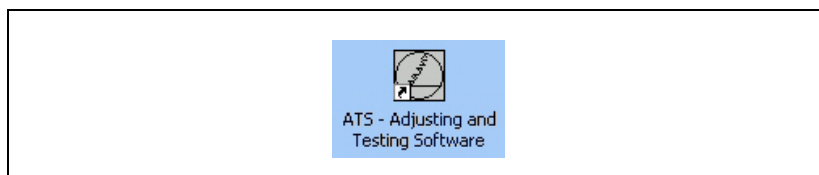
With the introduction of the ATS version 2.4 the PWM 20 entirely supersedes the IK 215. PWM 20 + ATS V2.4 feature all functions of IK 215. The improvement of the ATS software functions is focused on the PWM 20. Certain functions - such as connecting devices with DRIVE-CLiQ interface or working with the LIP 200 mounting wizard - are only possible with the PWM 20.

For more information on specifications, supported interfaces, hardware installation, etc., please refer to the respective commissioning instructions.

2.3 Installing the ATS Software

A CD-ROM with the required software is among the items supplied. The current ATS software is also available for downloading at www.heidenhain.de. The software is updated regularly.

To install the ATS software, insert the supplied CD into your CD-ROM drive or run the "setup.exe" file downloaded from the Internet. Follow the installation program instructions. If the setup wizard does not start automatically, please start "setup.exe" manually. Before you start the installation, please read the Release Notes. After successful completion of the installation, the icon of the ATS software is displayed on the desktop.



2.4 Uninstalling the ATS Software



The software can be uninstalled in different ways:

- Start the ATS Uninstall Routine via the corresponding Windows button.
- Via the "Control Panel" --> "Software" operating system function.
- Restart the "setup.exe" of the ATS Software; follow the installation wizard and select the "Remove" option.

2.5 Calibration

In general the PWM is maintenance-free, since it does not contain any components that are subject to wear.

To ensure exact and correct operation we recommend to send the PWM to the calibration service of HEIDENHAIN Traunreut every 2 years.

Calibration sticker on PWM 20	
Date of calibration Next recommended calibration date	

3 Software Description

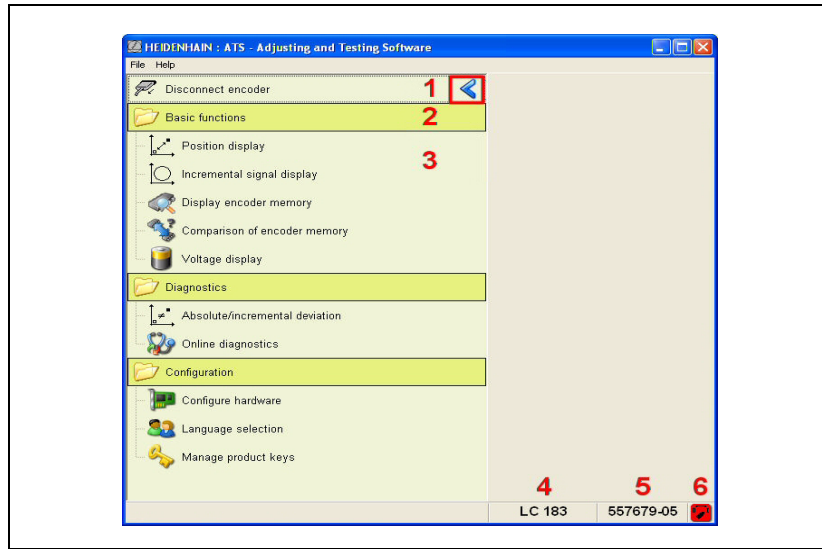
3.1 Operating Concept

The ATS software runs by a dynamic context menu. The function contains the function groups that are available for the connected encoder. Depending on the encoder the supported function groups / functions are displayed.

Example:

LC 183 encoder connected and activated.

Function group "Diagnostics" with 2 active functions ("Absolute-incremental deviation" and "Online diagnostics").



Explanation of the display

- 1 Selected function pointer (<)
- 2 Function group
- 3 Function
- 4 Connected encoder
- 5 ID number
- 6 Power supply symbol:



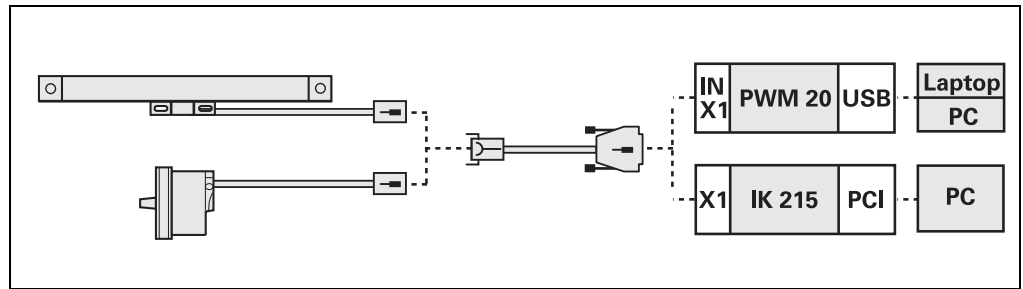
Encoder power supply OFF (green)



Encoder power supply ON (red)

3.2 Connect Encoder

- ▶ Connect the encoder to the test unit with an adapter cable.



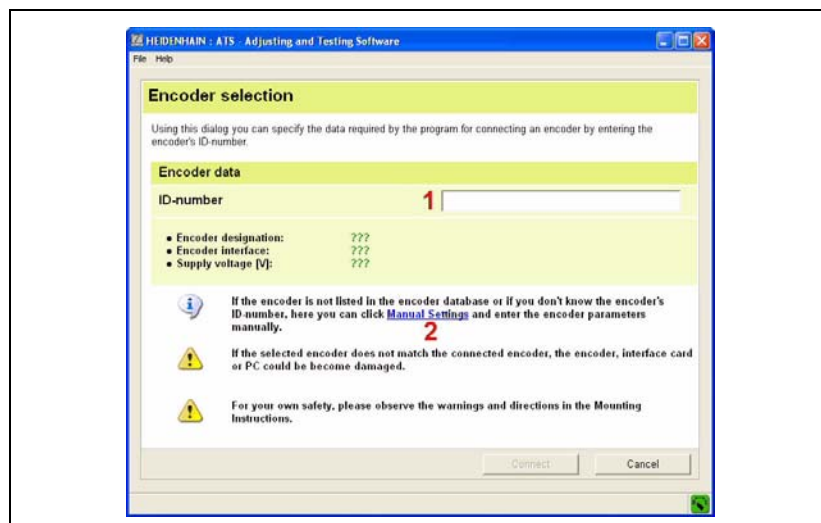
Note

Adapter cables: see chapter "Overview of Cables and Adapters" on page 113.

- ▶ In the ATS main menu double-click "Connect encoder".



The "Encoder selection" window offers two possibilities of powering the encoder and setting the encoder interface:



- 1 Automatic encoder identification by entering the ID of the encoder.
- 2 Use manual identification only, if the ATS database does not detect the encoder (EnDat interface only) or if the ID label on the encoder is missing or illegible.



Note

HEIDENHAIN recommends automatic identification. The relevant encoder data is read from a database. This database is part of the ATS software. The encoder database contains all ID numbers and variants of the absolute linear encoders that existed when the ATS software was released. It is updated about every 6 months; shorter intervals are sought for. You will find the most recent data at www.heidenhain.de.

**DANGER**

If the manual setting of the encoder parameters does not match the connected encoder, the encoder, the IK 215, the PWM 20 or the computer could become damaged.

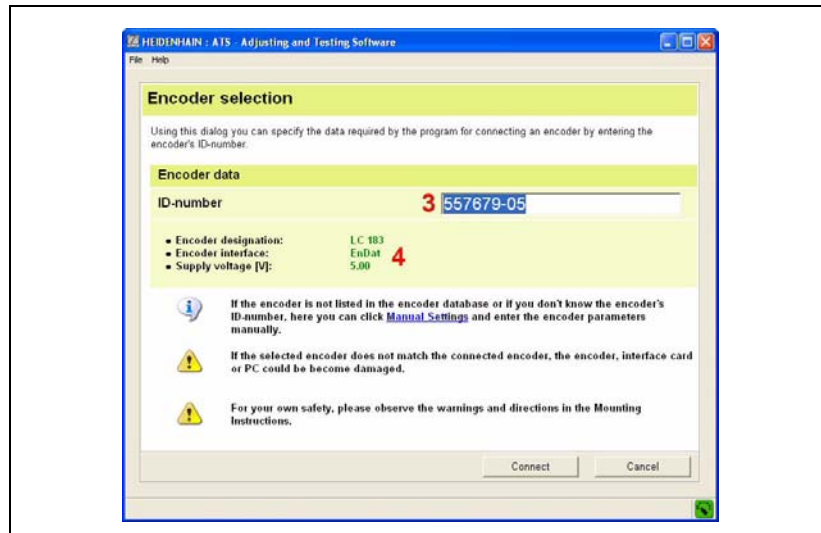
**Note**

For the encoder data please refer to the respective mounting instructions or machine documentation. Contact the machine manufacturer or the HEIDENHAIN Service.

3.2.1 Automatic encoder identification by entering the ID



- 1 ID label with encoder ID on scale housing
- 2 ID label with ID of scanning unit



- 3 Input field for ID
- 4 The encoder was identified.



Note

For linear encoders preferably use the ID on the label of the scale housing. The ID may be entered with or without hyphen (e.g. 368563-06 or 36856306).



Note

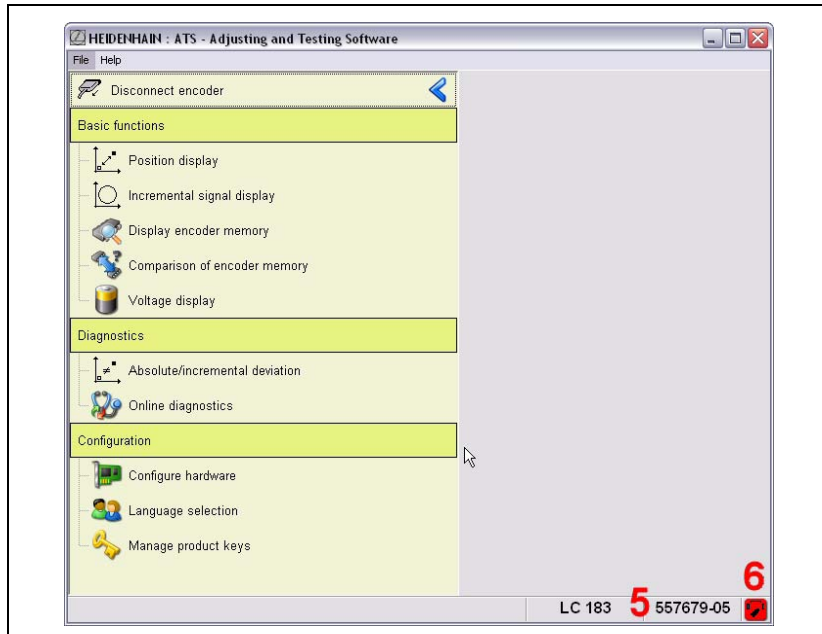
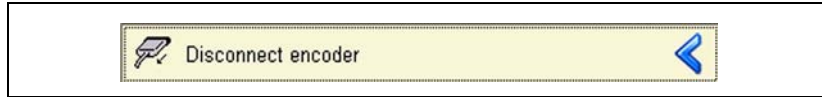
If the encoder cannot be identified the software enters three question marks "???". (See chapter "Manual encoder selection" on page 25.)

Switch on the power supply for the encoder.

- ▶ When you click the "Connect" button the power supply for the connected encoder is switched on.

Switch off the encoder power supply.

- ▶ To switch the power supply off, double-click "Disconnect encoder"; now the encoder cable may be disconnected.



- 5 Encoder type and ID
- 6 Power supply symbol:



Encoder power supply OFF (green)



Encoder power supply ON (red)

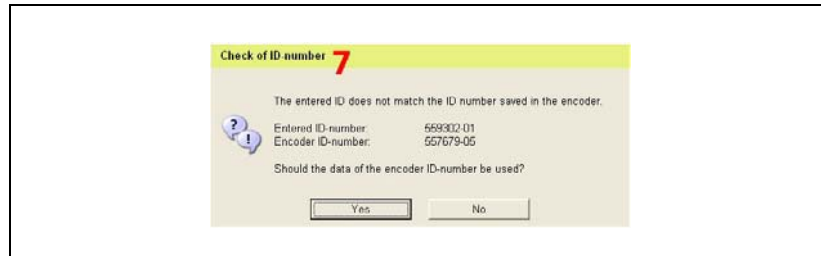


Note

Never disconnect any connectors while the encoder is under power.

If the ATS software has found a difference between the ID number typed in and the ID number saved in the encoder memory, an error message is generated. Confirm this message with "Yes" (recommended). Now, the ATS software connects to the encoder parameters.

- ▶ When you click the "Yes" button the encoder ID is used (ID of the scale housing).
- ▶ When you click "No" the ID that was entered is used.



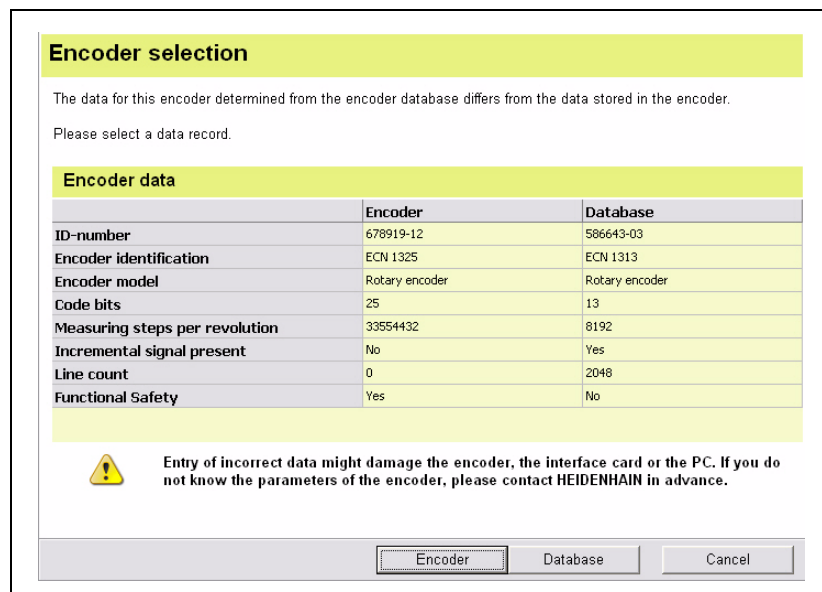
7 ID check message



Note

This message is displayed, for example, after entering the ID of the scanning unit of an LC linear encoder.

If the ATS Software finds differences between the characteristics of the encoder and the data in the database, the following "Encoder selection" screen may be displayed.



In this case, it is recommended to check the ID of the connected encoder and the entered data.



Attention

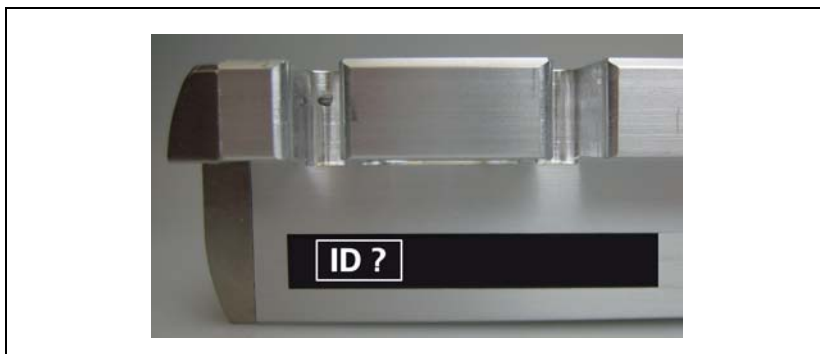
If wrong data from the encoder memory (connect "encoder") or the encoder database (connect to "database") are used for connecting, the encoder, the test unit or the computer can become destroyed. The tolerance ranges of the wizards may be influenced as well.



Note

Please contact HEIDENHAIN if it is impossible to determine the encoder parameters.

3.2.2 Manual encoder selection



If it is impossible to identify the encoder type (ID label missing or illegible), or if the encoder is not in the ATS database, most EnDat interfaces offer the possibility of entering the encoder data by hand.

The function below serves to read out the encoder ID from the encoder memory and display it on the screen (lower right).

With this ID displayed, "automatic" encoder identification is possible then.

Prerequisite is a functioning encoder interface!



Note

Regarding the encoder data, please refer to:

- Encoder mounting instructions
- HEIDENHAIN sales literature

Or contact the HEIDENHAIN Service.



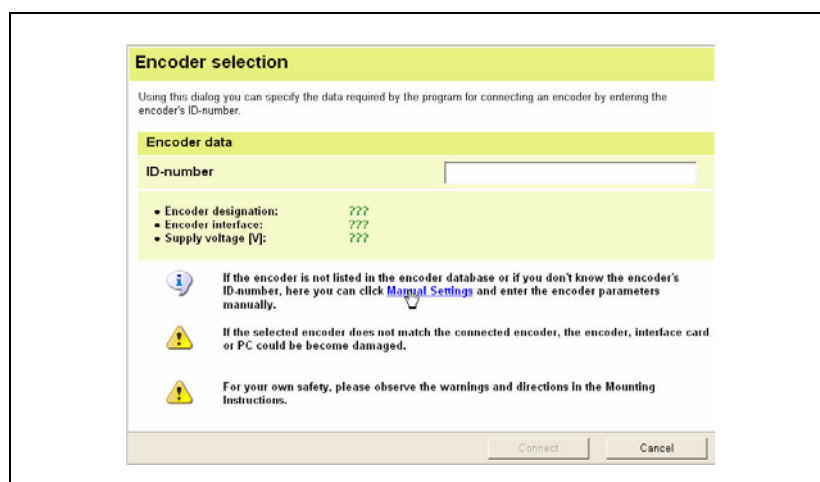
Attention

Observe the warnings!

- ▶ The "Connect encoder" button opens the "Encoder selection" box.

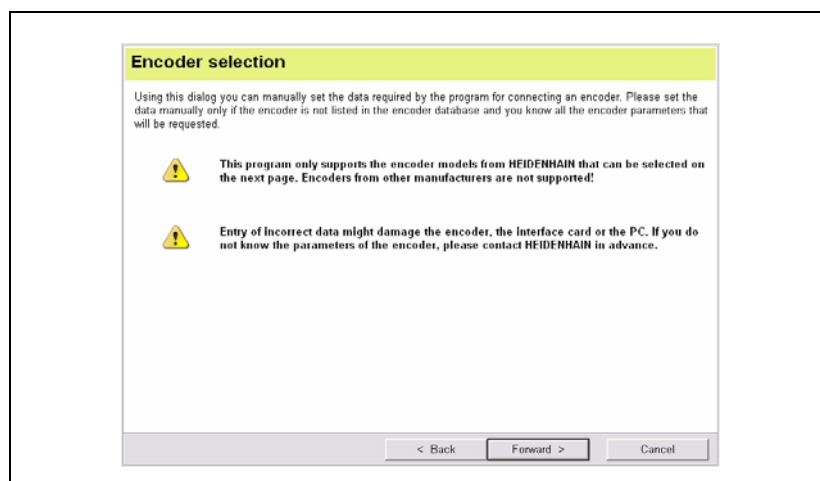


► In the Encoder selection box, click "[Manual Settings](#)".



Note

This option is only recommended for advanced users!
Incorrect entries may cause damage to the scanning unit, the test unit or the computer.
The setting of the encoder power supply is of particular importance!



Attention

Observe the warnings!

- ▶ Clicking the "Forward" button opens the encoder data screen (power supply, encoder interface).

- 1 Input of encoder power supply
- 2 Input of voltage readjustment over sensor lines
- 3 Data interface used by the encoder



Note

To compensate for voltage drops on the lines between test unit and encoder HEIDENHAIN recommends to activate "Adjust voltage over sensor lines" (item 2). When you select the encoder through its ID number, voltage adjustment is automatically activated.

- ▶ Clicking the "Forward" button opens an overview of the data you have entered.



Attention

Observe the warnings!
If the selected supply voltage is too high (e.g. 24 V), the electronics of an encoder operating with 5 V will be destroyed.

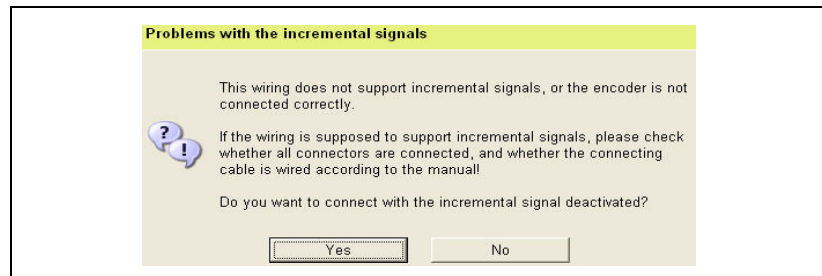


Note

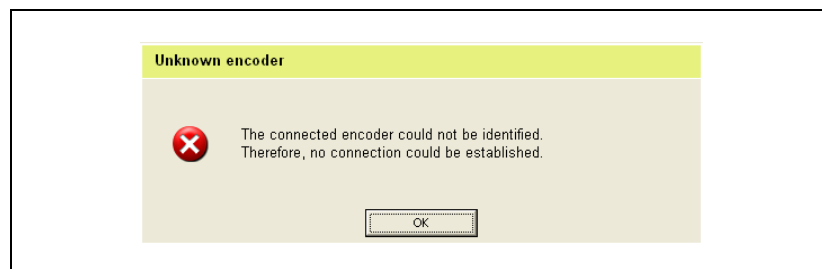
Check the values you have entered.

- ▶ After clicking the "Connect" button the connected encoder is supplied with power.

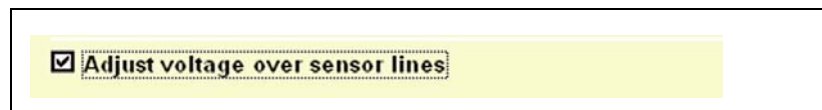
Typical error message of purely serial EnDat 2.2. encoders without incremental signals. Confirm this message with "Yes" to connect without incremental signals. The EnDat designation is printed on the ID label.



If this error message is generated, the voltage drop caused by the cable length (for LC approx. ≥ 5 m) is probably too high.



► In this event voltage adjustment needs to be activated.

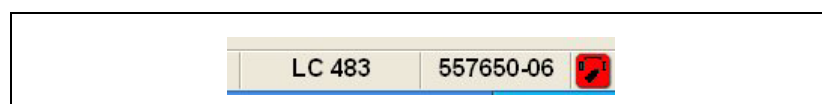


The function group window is displayed. The encoder ID appears at the lower right.



- 1 Display of encoder model and ID
- 2 The red symbol means that the encoder is under power.

► Write down the encoder ID!



- In a next step perform "automatic" encoder identification by entering the encoder ID (see chapter "Automatic encoder identification by entering the ID" on page 22.)

Encoder selection

Using this dialog you can specify the data required by the program for connecting an encoder by entering the encoder's ID-number.

Encoder data

ID-number: 557679-02

- Encoder designation: LC 183
- Encoder interface: EnDat
- Supply voltage [V]: 5.00

If the encoder is not listed in the encoder database or if you don't know the encoder's ID-number, here you can click [Manual Settings](#) and enter the encoder parameters manually.

If the selected encoder does not match the connected encoder, the encoder, interface card or PC could be become damaged.

Connect Cancel



Note

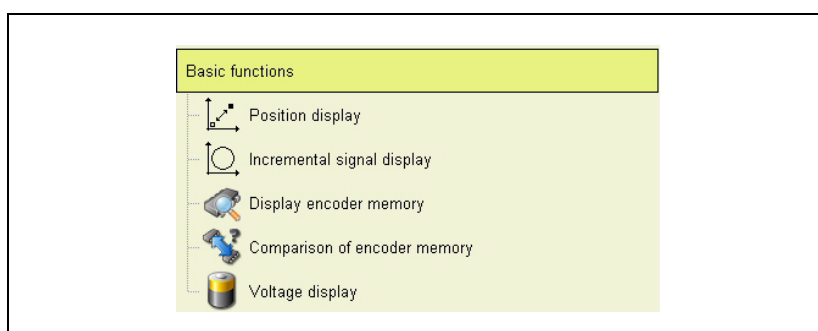
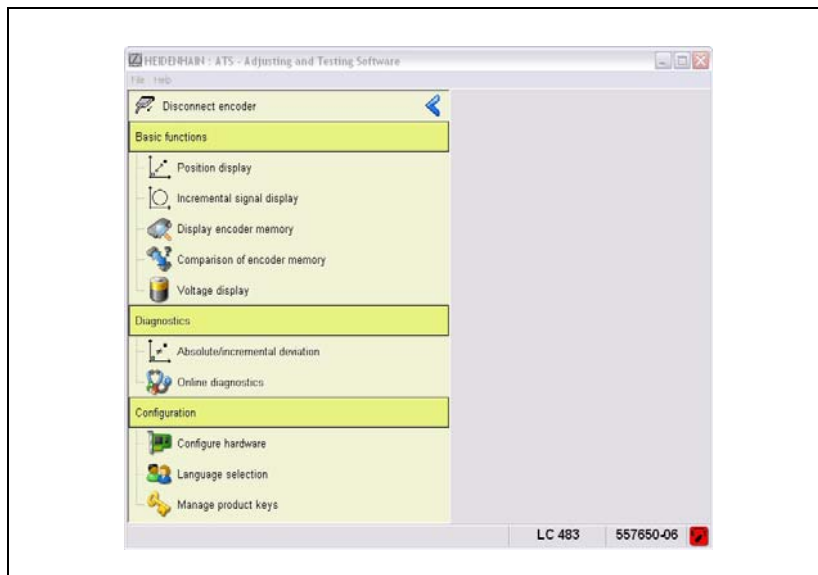
The ATS software "remembers" the ID and automatically enters it in the "ID number field" of the encoder identification screen.

3.3 Basic Functions

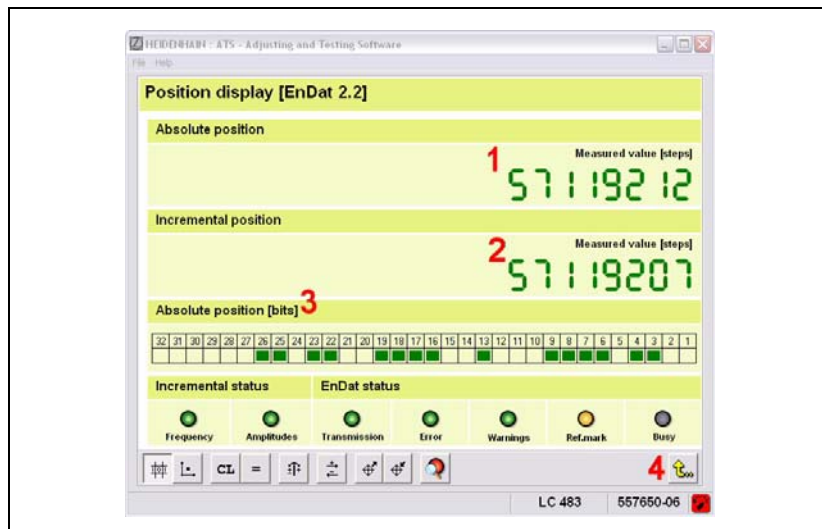


Note

Display and functions may vary depending on the product key and the connected encoder model!



3.3.1 Position display



- 1 Absolute encoder position
- 2 Incremental current count
- 3 Binary display of the absolute position
(1:1 display of the transferred, non-converted position data)
1 corresponds to bit 1 = LSB (least significant bit)
- 4 Yellow arrow = one step back



Note

For encoders with purely serial data interface (e.g. EnDat 2.2, FANUC) the incremental position is not displayed.

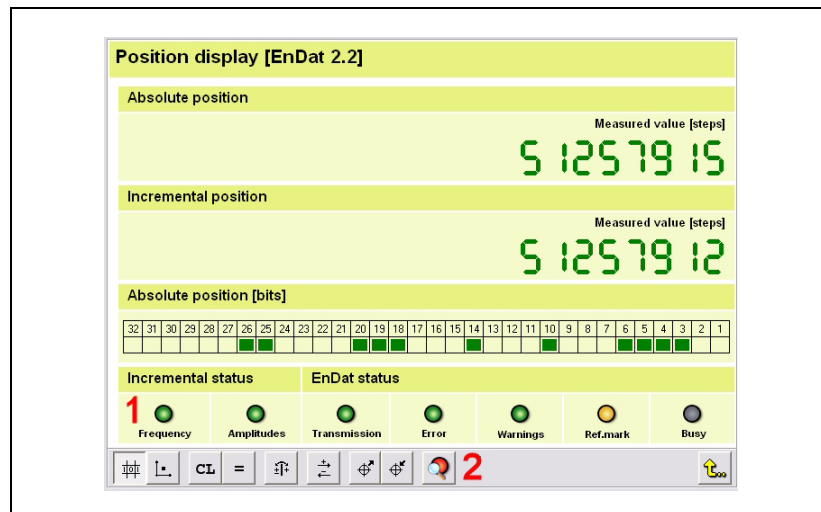


Note

The number of bits depends on the connected encoder.

Status display

Each time position data are transferred, status information is included and evaluated. Depending on the encoder model, information on encoder alarms and warnings and on the quality of the incremental signal are available.



- 1 In shortened form (group signal) the encoder status is displayed in the lower area of the position display screen as a colored LED symbol.
- 2 Use the magnifying glass symbol to display detailed information.

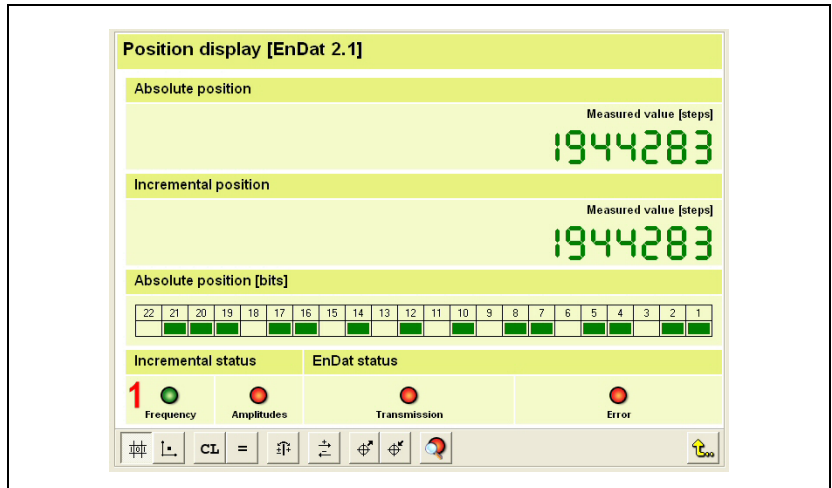
EnDat 2.1 status display

The EnDat interface allows for extensive monitoring of the encoder. Ein An **alarm** becomes active if there is a malfunction in the encoder that is presumably causing incorrect position values.

Some examples of alarms:

- Failure of the light unit
- Signal amplitude too low
- Incorrect position value
- Supply voltage too high / too small
- Excessive current consumption

Warnings indicate that certain tolerances of the encoder were reached or exceeded (e.g. speed, control reserve of the light unit) but the position value is not incorrect. If a warning is displayed the encoder concerned should be inspected or exchanged as soon as possible in order to avoid down times.



1 LED symbols for error messages and warnings



Green symbol = OK

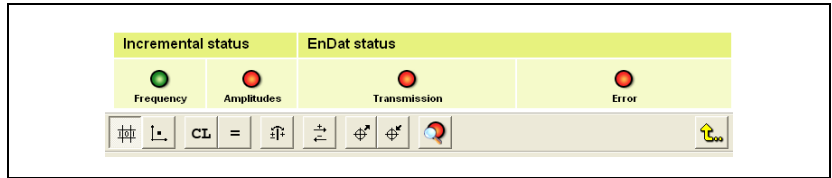


Red symbol = Error / warning



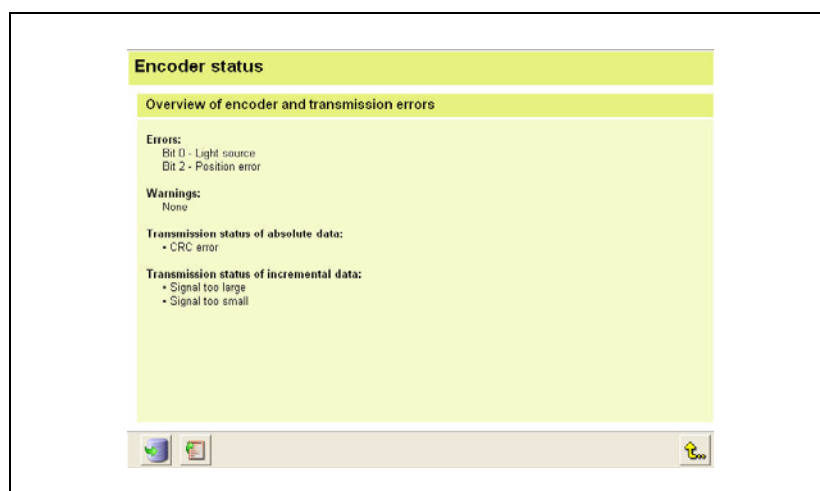
Note

Group signal - At least one "error" present!



Display detailed status information

Detailed display of encoder status

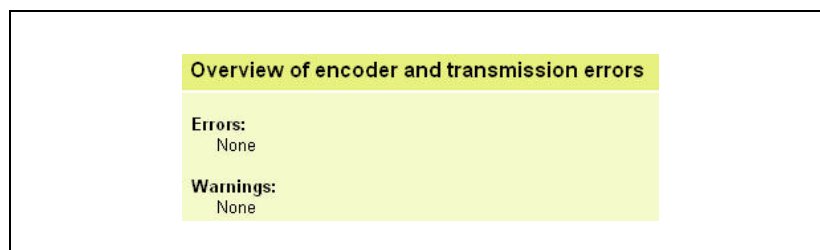


Reset errors / warnings



Attention

Please reset the errors and warnings before starting!
After you connect the encoder by means of the ATS software, errors caused by encoder components may be displayed, although actually there is no malfunction.
If the error messages cannot be reset and new error messages are generated, the encoder needs to be replaced or repaired.

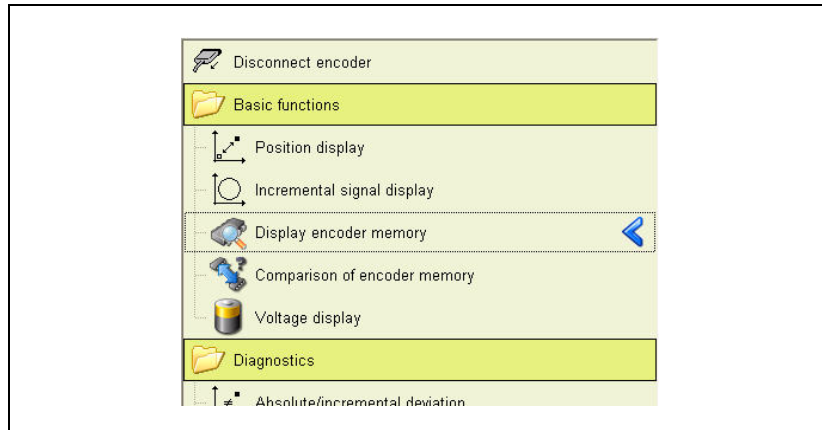




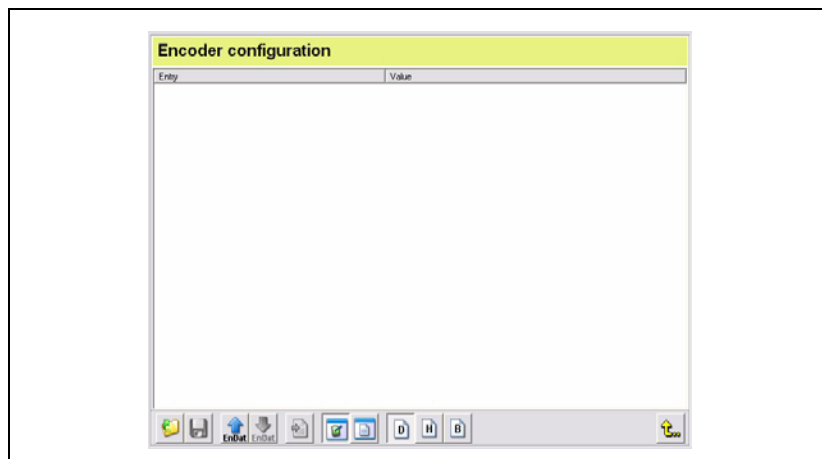
Note

A given encoder does not necessarily support all monitoring functions. The information which errors and warnings an encoder supports can be read out and displayed with the following ATS software function.

- ▶ Select "Display encoder memory" from the basic functions list.



The encoder configuration window is activated.



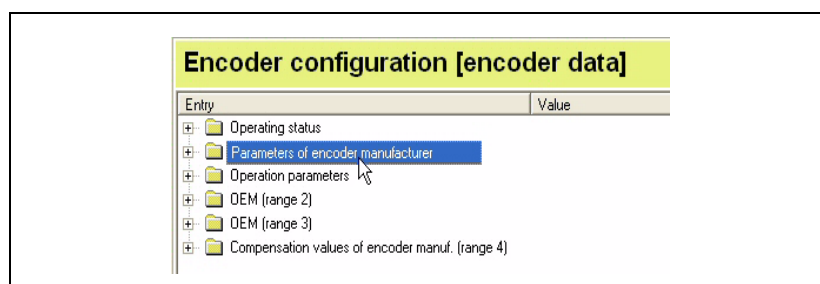
- ▶ Press the "function-specific view" button (display in plain language).



- ▶ Press the "EnDat" button.

The encoder data are transferred from the encoder memory to the test unit.

- ▶ Open the directory tree "Parameters of encoder manufacturer".



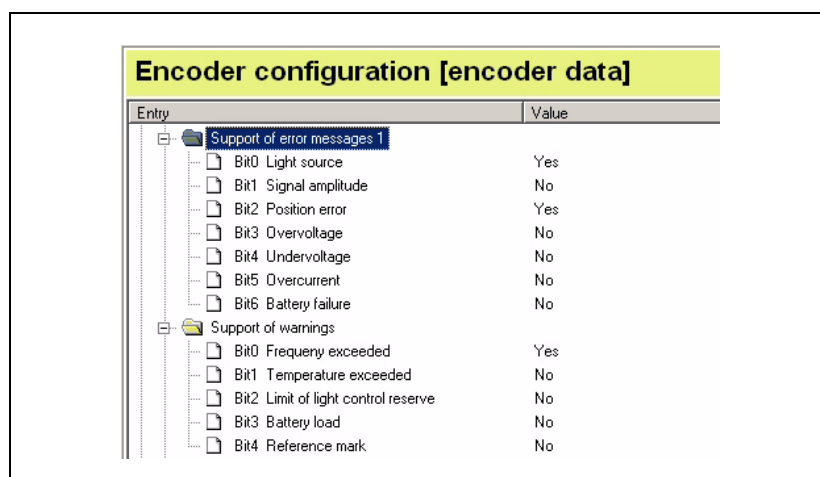
Scroll down in the directory and open the directory trees

- Support of error messages 1

or

- Support of warnings

Supported error messages and warnings are distinguished by "Yes".



Note

For detailed information on the encoder status please refer to the EnDat interface manual.



Attention

PWM 20 and IK 215 evaluate the incremental signals only quite roughly! Faulty incremental signals may cause serious problems with signal evaluation in the subsequent electronics even below the threshold sensitivity of the signal monitor (before the test unit generates an error message).

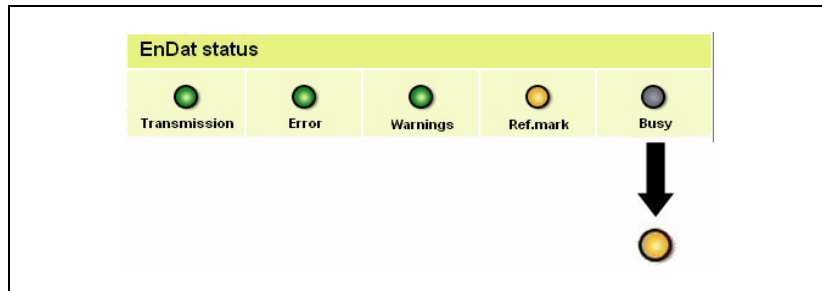
To inspect the incremental signals in detail HEIDENHAIN recommends the PWM 9 test unit. The PWM 9 can be purchased from the HEIDENHAIN Service department. (Contact: see "Spare parts" in chapter "Contacts" on page 131.)

Examples of threshold sensitivities of incremental signals (approximate values):

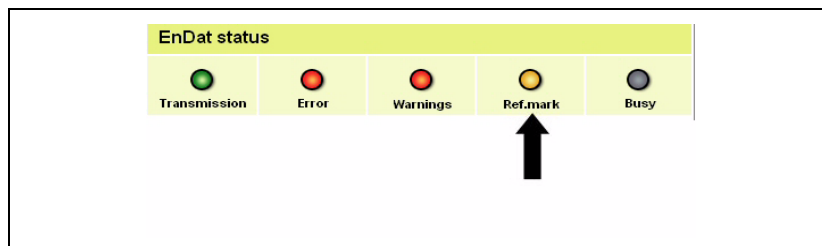
- Amplitude overshoot ≥ 1.25 Vpp
- Amplitude undershoot ≤ 0.25 Vpp
- Frequency overshoot ≥ 2 MHz

EnDat 2.2 status display

A yellow "Busy" symbol indicates access to the memory of the encoder EEPROM (12 ms max.)
Otherwise the "Busy" LED is gray.



The "Reference mark" LED gives information on whether a reference run is terminated (only for incremental encoders with EIB EnDat interface). If an EIB electronics is connected and with incremental encoders, the LED is displayed in gray color and turns yellow as soon as the reference mark has been traversed.



Note

The "Reference mark" LED of absolute encoders is always yellow.
For encoders without incremental signals the incremental status is masked out!
This status display is required for synchronization with the reference mark when using HEIDENHAIN EIB interface electronics.

Detailed display of encoder status EnDat 2.2

Operating status error sources

The function "Operating status error sources" provides detailed information on errors. An error message is set if a malfunction causes incorrect position values.



Note

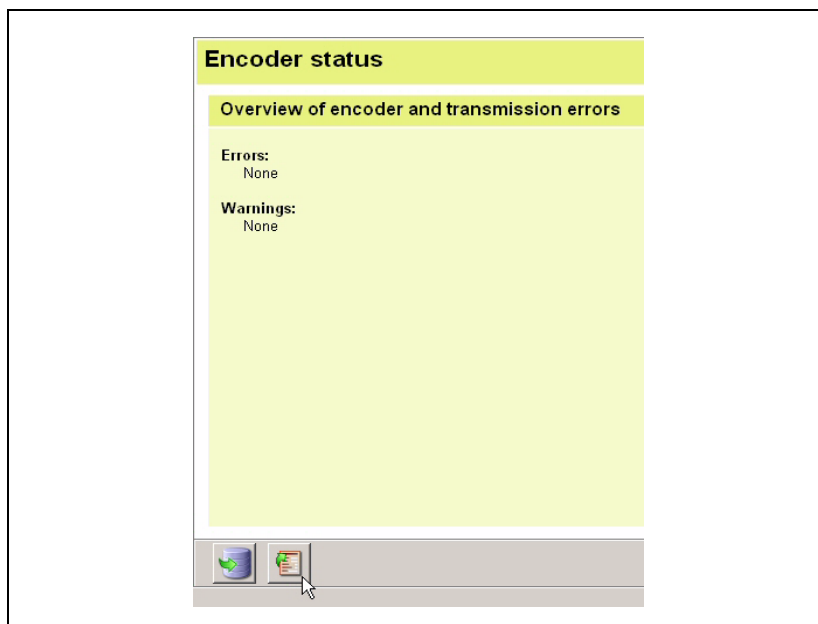
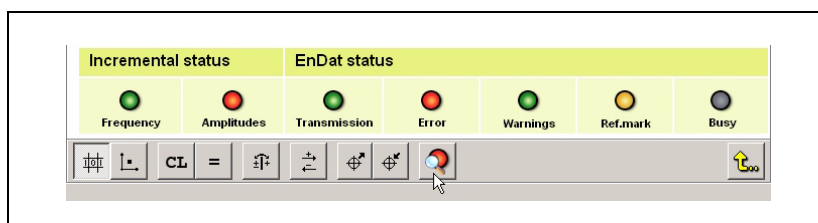
Operating status error sources are only supported by EnDat 2.2.

A given encoder does not necessarily support this function. The error messages are encoder-specific!

Whether this function is supported and which error sources it comprises is defined in the encoder memory/manufacture parameters EnDat 2.2/Support of operating status error sources.

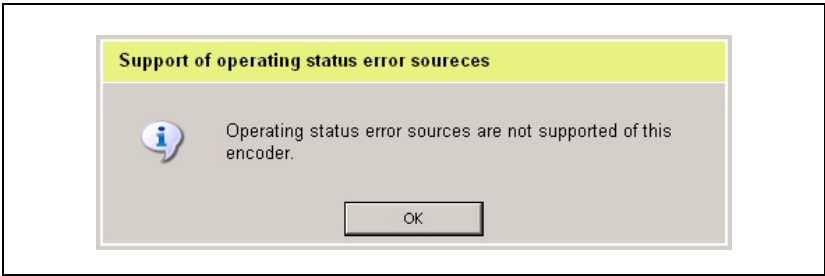


Press the "Detailed status display" key to call the function.

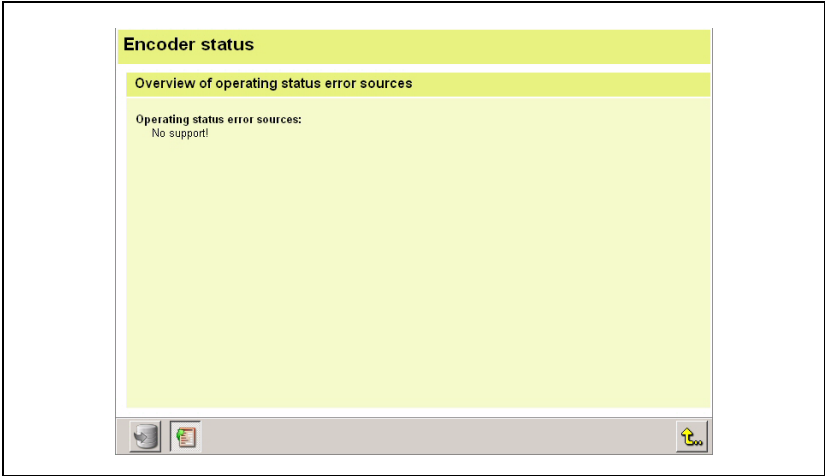


► Press the "Read operating status error sources" key.

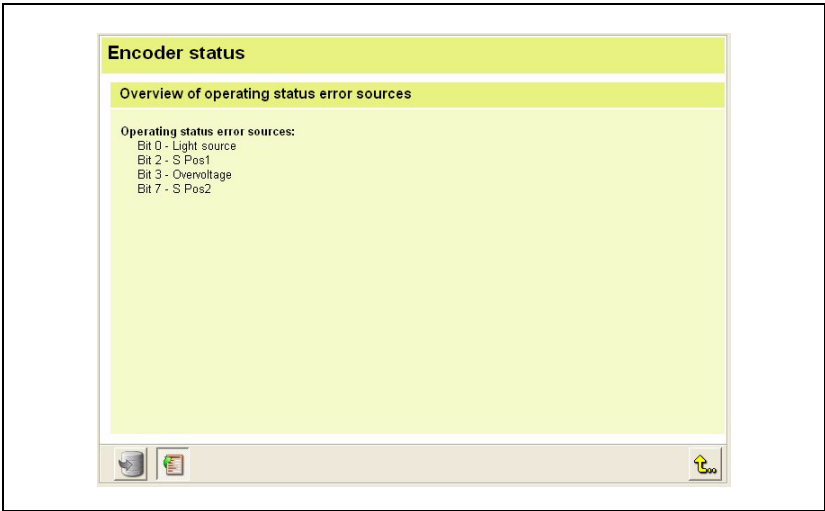
Display if the encoder does not support the "Operating status error sources" function:



Display after "OK" was pressed:



Display if the encoder supports the "Operating status error sources" function; details on errors:



Connection to EIB interface electronics

The EIB (Extended Interface Box) interpolates the sinusoidal output signals (1 Vpp) of incremental HEIDENHAIN encoders and transforms them into absolute position values. After the reference mark has been crossed, the position value is defined with respect to a fixed position.

Permitted output signal interfaces:

- EnDat 2.2
- Fanuc serial interface
- Mitsubishi high speed interface

EIB 192



EIB 392



To check the EIB a suitable incremental encoder must be connected to the EIB input (follow the EIB operating instructions).

- ▶ Connect the EIB and the encoder to PWM 20 or IK 215 and connect them by means of the ATS software.

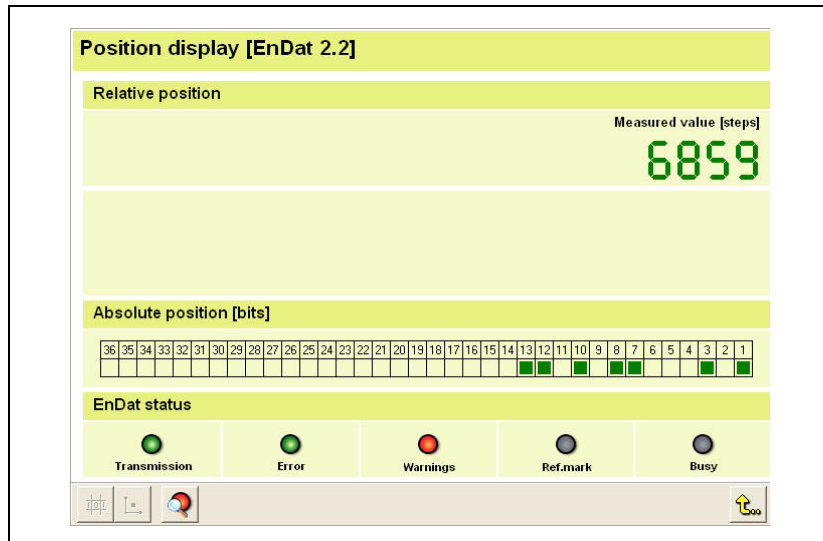


Note

Use the ID of the EIB for connecting to the ATS software.

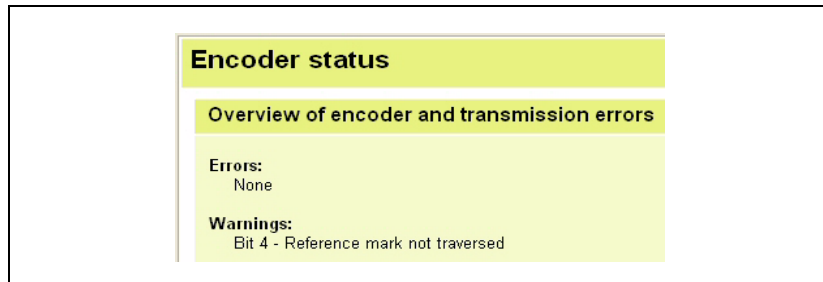
- ▶ In the "Basic functions" main menu click the function "Position display".

In the display field for the EnDat status a warning (red LED) is displayed.



► Click the "Detailed status information" button.

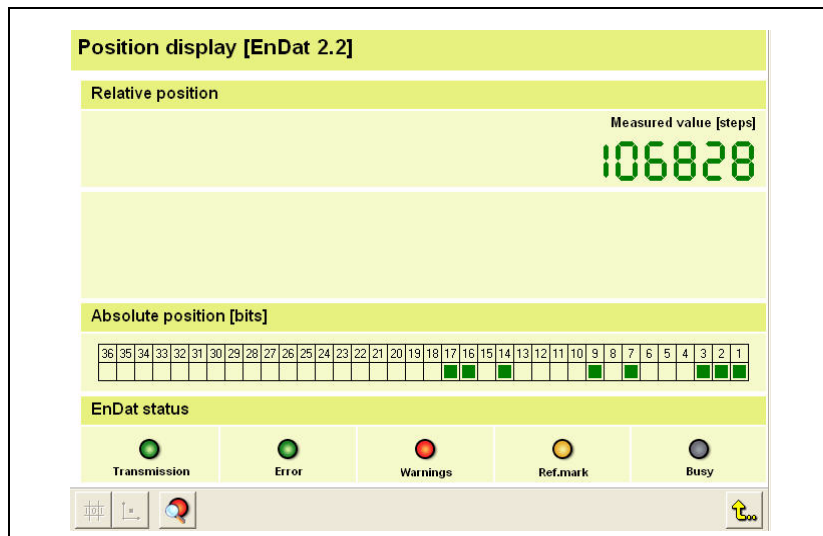
The warning "Bit 4 – Reference mark not traversed" is displayed. The "Ref. mark" EnDat status is displayed in gray color.



► Traverse the reference mark(s) of the encoder.


Only after the reference mark has been traversed refer the absolute position values to this fixed reference point.

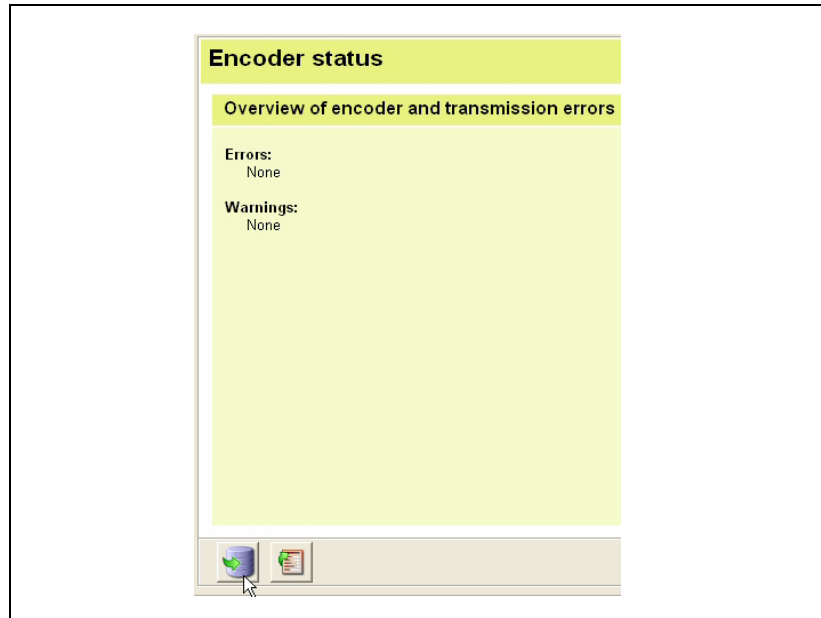
As soon as the reference mark has been detected, the "Ref. mark" EnDat status display changes to yellow.



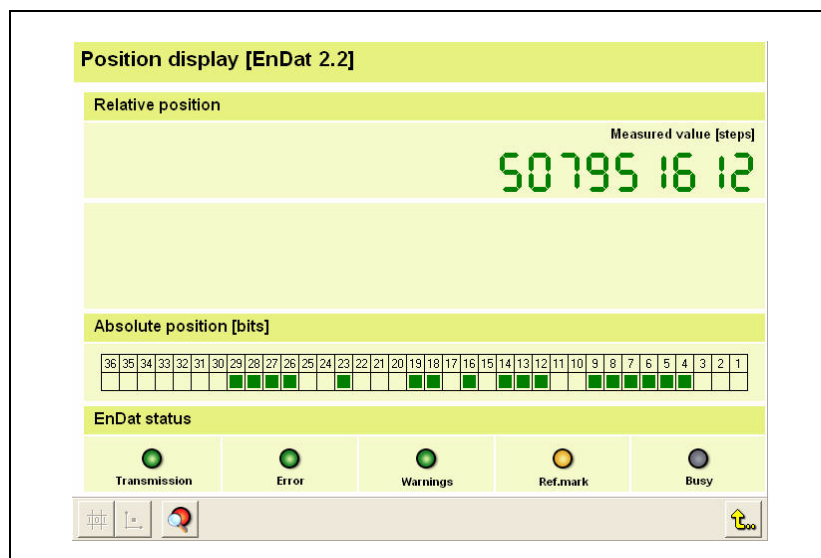


Note

The warning in the Encoder status field can only be deleted by hand after the reference mark has been detected. For this purpose, press  ..



► Delete the warning.



Measured values view



The measured values are displayed as they are transferred from the encoder.

Absolute position	
	Measured value [steps]
	1944283
Incremental position	
	Measured value [steps]
	1944283

Position view



The measured values are converted into linear [μm] or angular [degrees] data according to the settings of the encoder parameters.

Absolute position	
	Position [μm]
	1807284
Incremental position	
	Position [μm]
	1807284

Display for a multiturn encoder:

Absolute position		
	Revolution	Angle [degrees]
	24	125.68
Incremental position		
	Revolution	Angle [degrees]
	24	125.68



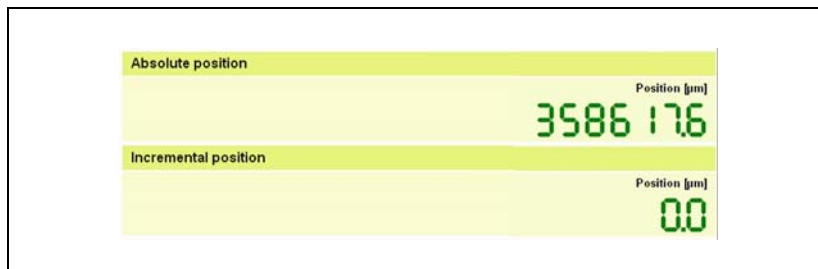
Note

For encoders without incremental signals the incremental display is inactive!

Clear incremental counter



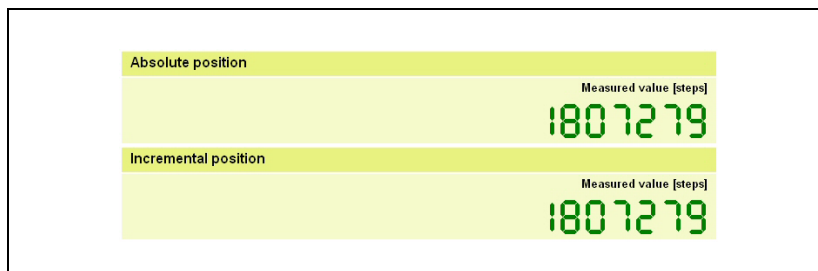
The incremental counter is set to zero (0.0).



Equate function



The incremental counter loads the absolute position (displays of absolute and incremental positions are the same).

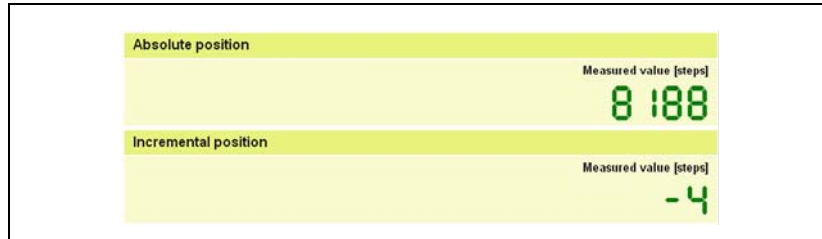


Synchronization mode

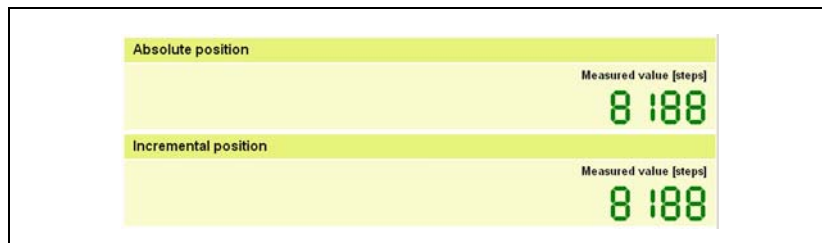


The absolute and the incremental positions are synchronized with each other at the counting limits (zero crossover of absolute and incremental tracks).

Synchronization inactive:



Synchronization mode active:

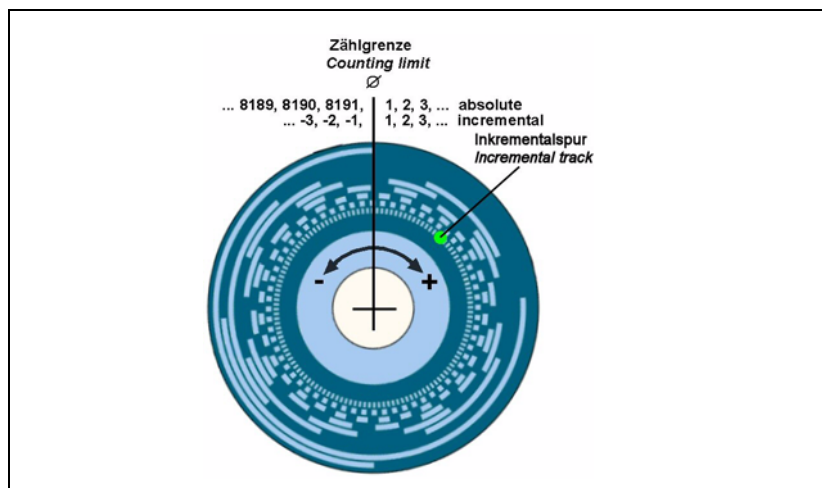


Invert counting direction of incremental positions

Example: 13-bit rotary encoder

If the zero position is rotated into the "minus" range, the absolute code of the absolute track restarts with the highest position value (in the example: 8191), whereas the incremental counter starts to count backwards, i.e. -1, -2 ...

When the synchronization mode is activated, the incremental counter also starts with the highest absolute value (in the example: 8191).



Counting limit = Absolute value 'Zero' (Ø)

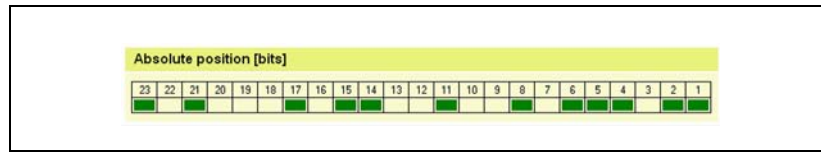
Absolute position [bits] display

The displayed value corresponds to the position value transmitted by the encoder. (1:1 display of the transferred, non-converted data)

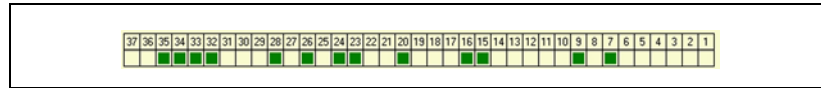
The absolute encoder position is displayed as binary value.

Position 1 represents bit 1 which is the LSB (**L**east **S**ignificant **B**it) of the position value.

The bit length may vary and depends on the connected encoder.



Example: Rotary encoder with 37 bits



The counting direction for the incremental positions is reversed. For certain encoders (e.g. SSI rotary encoders) the counting direction of the incremental counters can be programmed; the ATS software can be adjusted for parallel measurement.

Datum shift

Customer-specific datum shift can be performed with EnDat encoders. This serves to adapt the encoder (e.g. to capture the rotor position of a synchronous motor) to the machine/motor individually for each axis.



Attention

The datum shift can only be performed correctly while the encoder is in standstill.



DANGER

An incorrectly set datum (with synchronous motors: field angle) can lead to undesirable reactions of the motor, including uncontrollability. It might even move in the wrong direction!

Ensure that vertical or hanging axes cannot fall!

Please contact the machine manufacturer or HEIDENHAIN, if you have any questions.

Set datum shift



► Click the symbol.

There are two types of datum shift:

1. EnDat-compliant datum shift

This type considers the relation of datum and signal period (incremental signal).



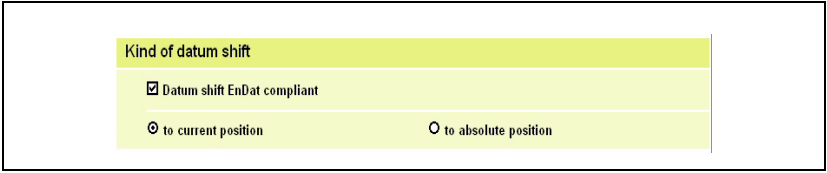
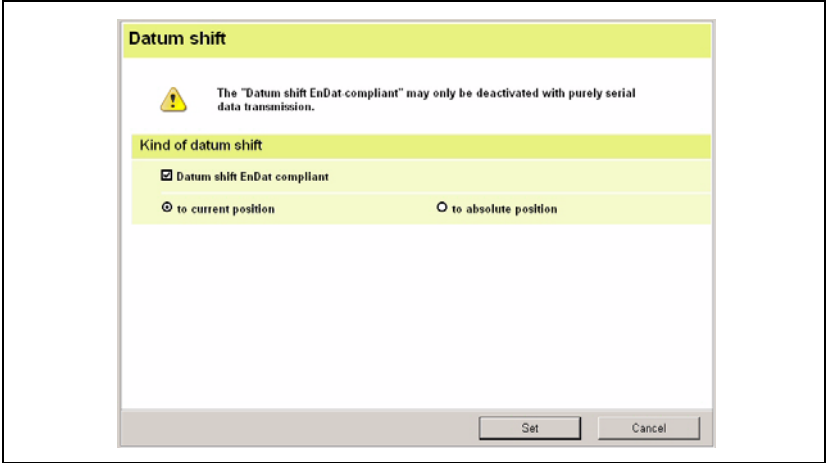
Note

After the datum shift the absolute datum will not always be exactly the current position. The ATS program calculates the new datum such that in relation to the incremental signals its position corresponds to the EnDat specification, i.e. is as close as possible to the desired position.



Attention

For encoder types "with incremental signals" (interface names EnDat 01 and EnDat 02) the setting "EnDat-compliant datum shift" must be displayed.



2. Non EnDat-compliant datum shift

An assignment of datum and signal period (incremental signal) is **not** considered!



Note

This setting is used for purely serial measuring systems (interface names EnDat 22 and EnDat 21).

- ▶ Set datum "to current position".

to current position to absolute position



Note

Before the datum shift is performed the measuring system must be positioned to the point at which the new datum should be set.

- ▶ Set datum "to absolute position".

The desired datum shift can be entered as numerical value into the field marked in blue.

to current position to absolute position

Set to absolute position

Datum shift in steps

Position [steps]

0

The absolute value can be entered in [steps] or in [μm].

Set to absolute position **Set to absolute position**

Datum shift in steps Datum shift in steps

Position [steps] Position [μm]

241256 24125.6

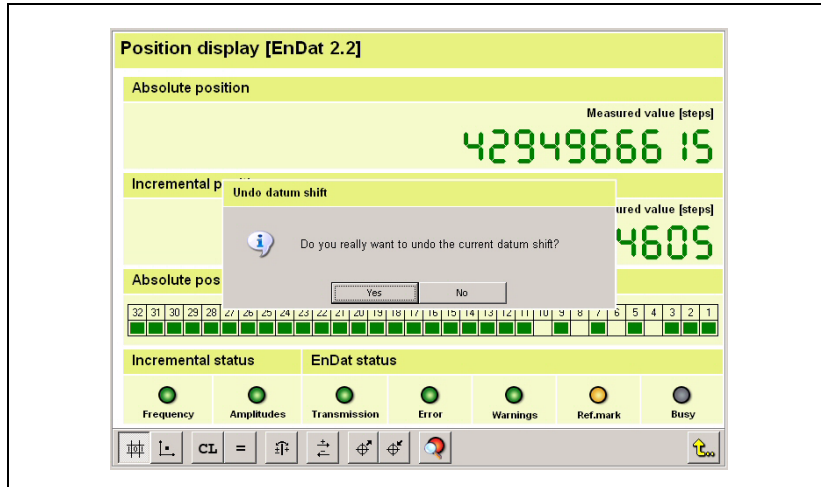
- ▶ After clicking the "Set" button the datum is saved in the encoder memory.

Set Cancel

Cancel datum shift



► To reset the datum shift to the factory default setting click the button "Undo datum shift" and confirm the prompt with "Yes".

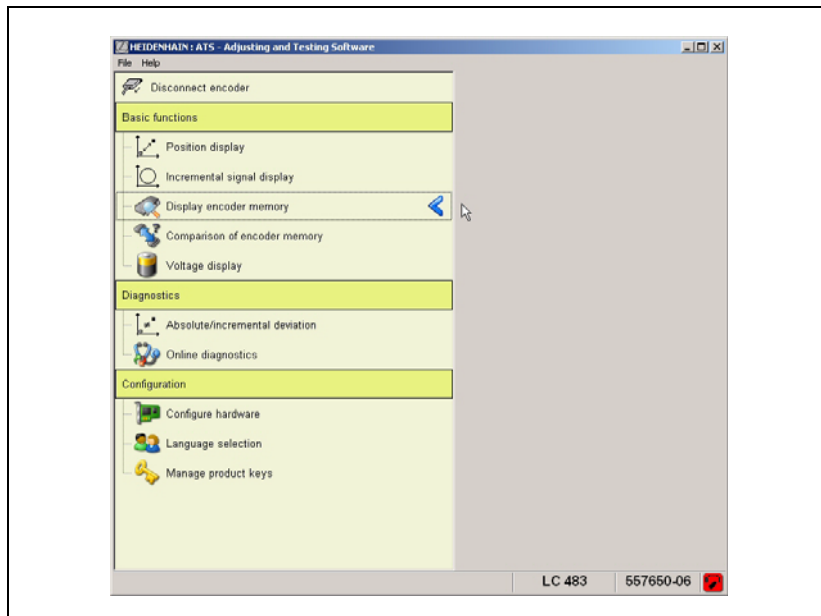


Checking the datum shift in the encoder memory

In the "Operating parameters" section of the encoder memory you can check the specified datum shift.

For this purpose the configuration of the encoder must be read out first.

► In the basic functions window select "Display encoder memory".

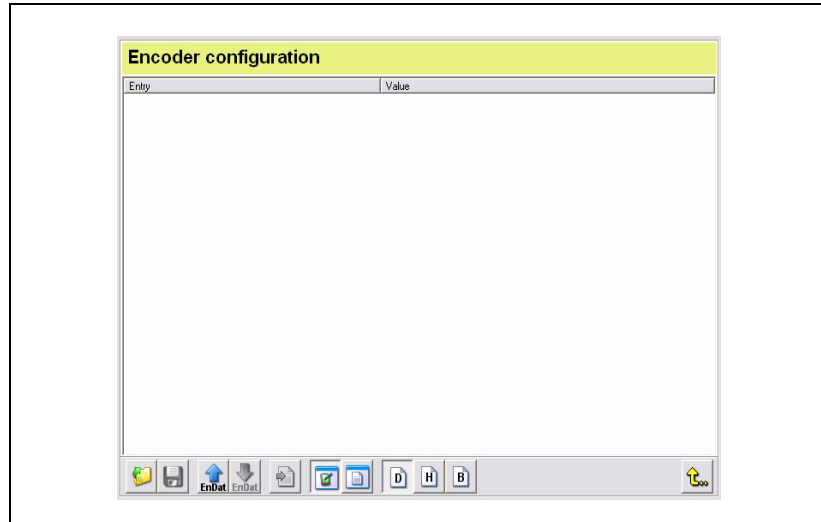




▶ Press the "function-specific view" button (display in plain language).

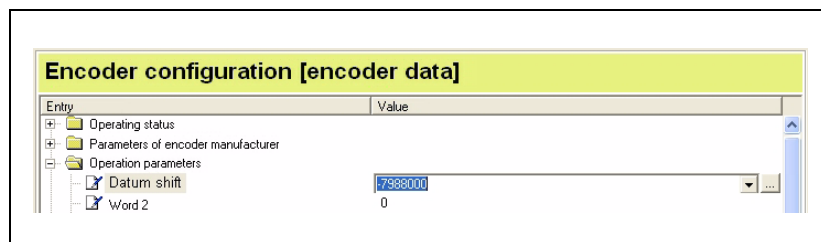


▶ Press the "EnDat" key ("Load encoder configuration from encoder").



The encoder data are transferred from the encoder memory to the test unit.

▶ Open the tree structure of the "Operation parameters" directory.



In the "Value" column of the table you find the datum shift in measuring steps. For measuring lengths up to 32 bits word 0 and word 1 are used, for measuring lengths up to 48 bits word 2 is used in addition.

Edit datum shift value



Note

Manual editing of the datum shift is only recommended to expert users. Datums can be set and canceled easily with the symbol keys in the "Position display" function.

1. Editing in the datum shift line (word 0):

- ▶ Click the datum shift value.
Enter a new value. If you intend to cancel the datum shift, enter the value 0.

To activate the edited datum shift the encoder configuration must be saved in the encoder.



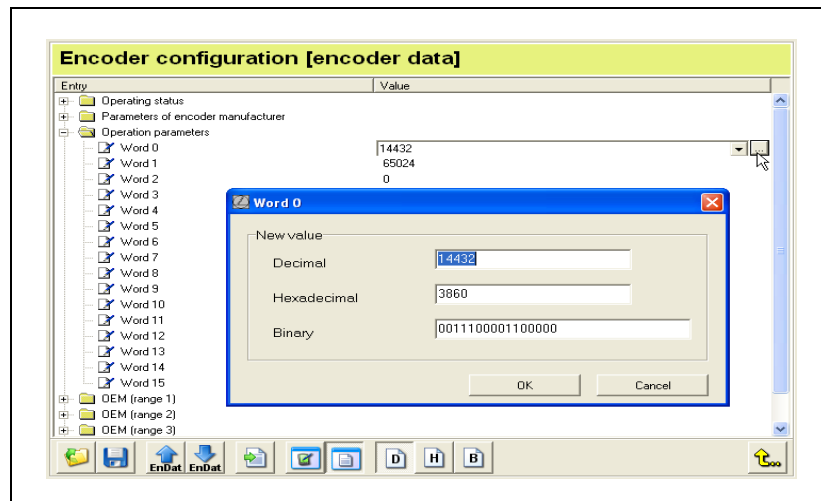
- ▶ Click the "EnDat" button ("Save encoder configuration in encoder") to open the window for selecting the memory area.

- ▶ Select the "Operating parameters" memory area.
- ▶ Click the "Transfer" button to save the data in the encoder.

2. Editing in the datum shift window:



- ▶ Clicking the button right from "Datum shift value" opens the "Datum shift" window.



Here the value (decimal/hexadecimal/binary) can be edited; click OK to confirm.



Note

Entering the value 0 cancels the datum shift.

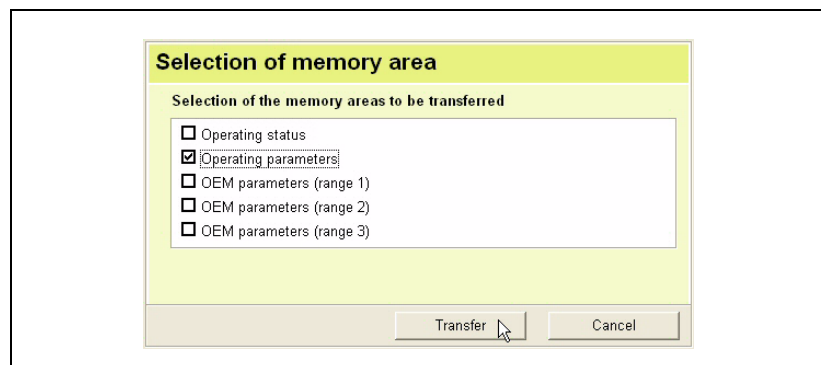


Attention

If the datum shift is edited in the operating parameters area, the ATS software does not check, whether the entry value is EnDat-compatible.



- ▶ Click the "EnDat" button ("Save encoder configuration in encoder") to open the window for selecting the memory area.



- ▶ Select the "Operating parameters" memory area.
- ▶ Click the "Transfer" button to save the data in the encoder.

3.3.2 Display of incremental signals

In the basic function "Incremental signal display" the incremental signal (1 Vpp A/B signal) is displayed in a circular diagram (scope display X/Y; also known as Lissajous figure).

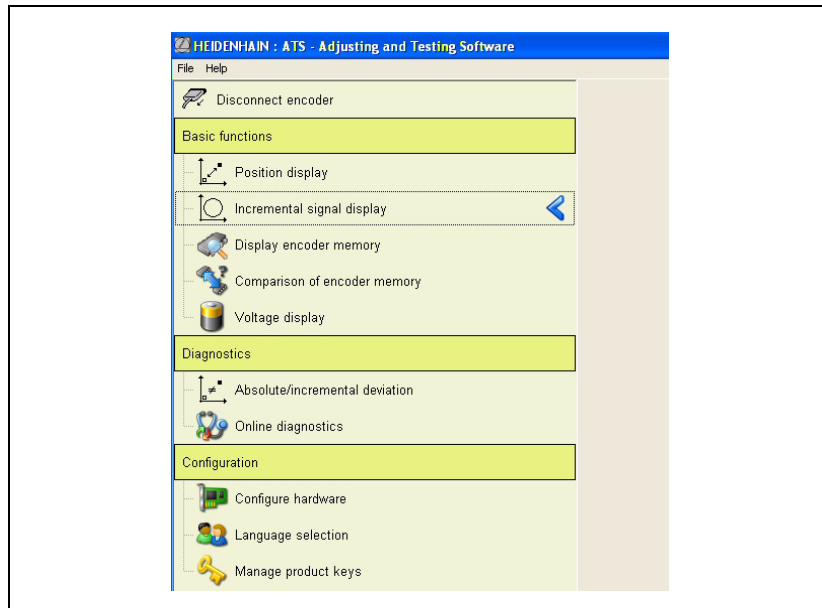


Note

The circular graphic is a very simple oscilloscope function; fast changes in amplitude or error spikes cannot be displayed.

For this purpose additional testing equipment, such as a PWM 9 and a digital oscilloscope are required.

- ▶ To select the function double-click "Incremental signal display".



In the "Incremental signal display" the amplitude height is displayed digitally in Vpp; it is calculated with trigonometric functions and is also available in standstill.



Note

In standstill only the current position is displayed.

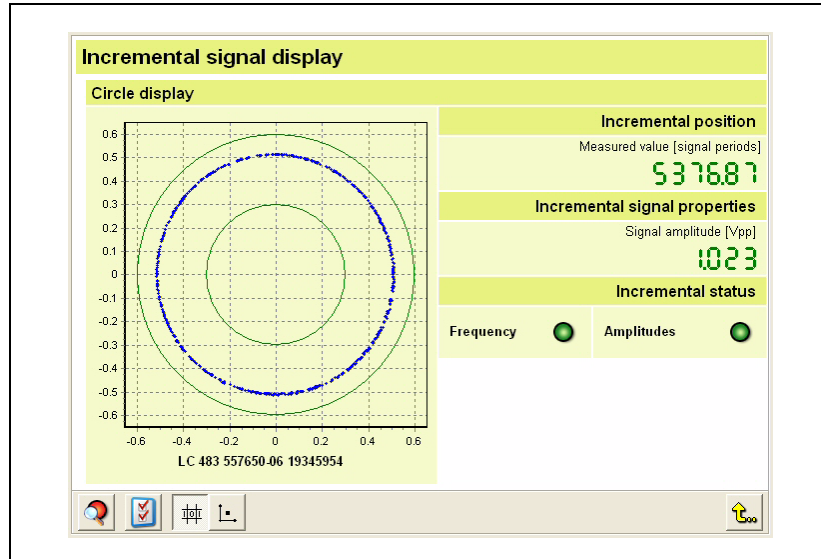
For an exact amplitude check always traverse the entire measuring range!

The green annulus represents the tolerance range of the signal amplitude:
 Inner circle: 0.6 Vpp
 Outer circle: 1.2 Vpp

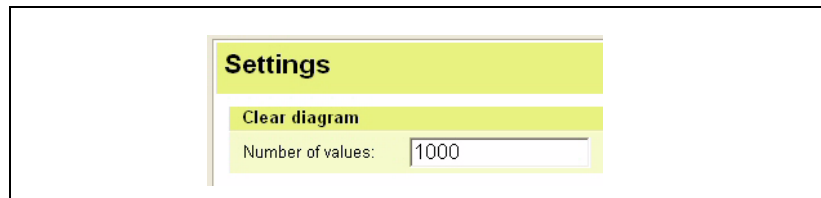


Note

The blue circle must be between the two green circles.

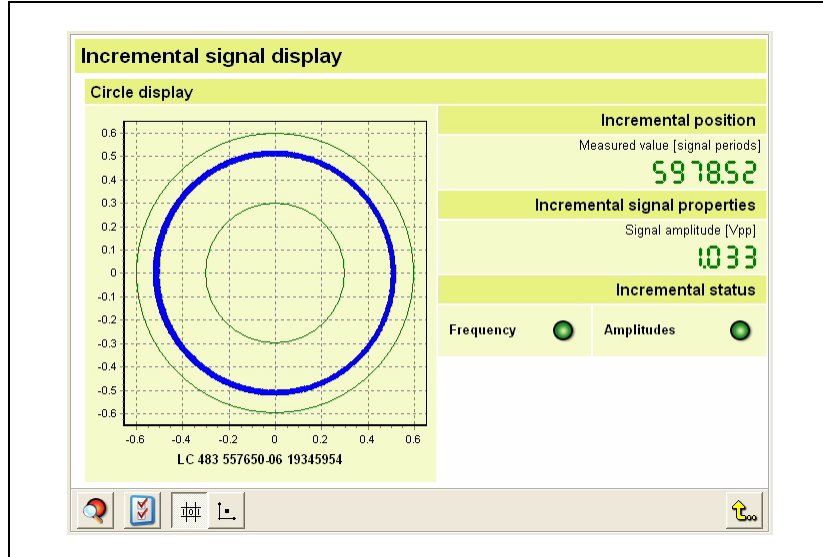


With the "Settings" button you can adjust the number of displayed points to the measuring situation.
 The sampling rate of the oscilloscope is 100 μs. The number of displayed values is 100 minimum; no upper limit is given.
 The standard setting is 1000. With this standard value the graphics is cleared and redrawn every 100 μs x 1000 = **100 ms**.



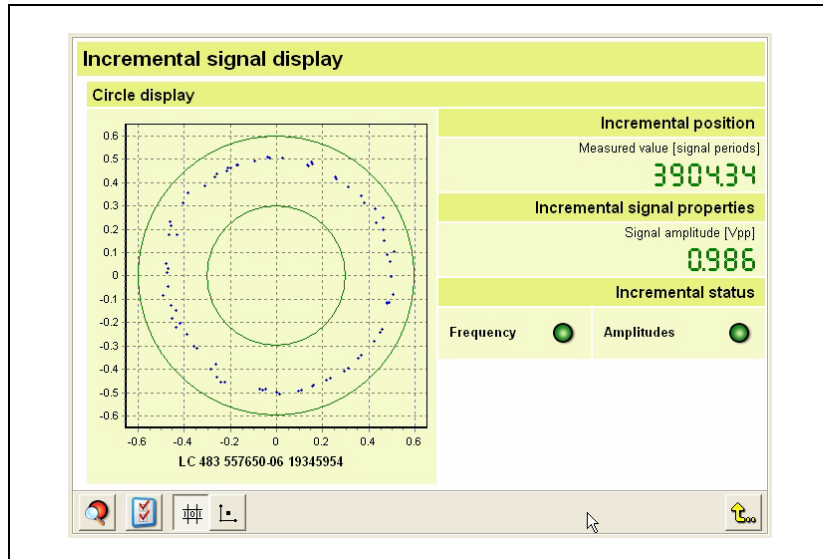
Example: Number of values increased to 10000

The diagram is generated from 10000 measured values, i.e. after 10000 measured values were displayed the graphics is cleared and the display redrawn (afterglow effect; the ATS requires more processing power and memory). This display mode is appropriate for low-frequency output signals.



Example: Number of values reduced to 100 (minimum)

The diagram is generated from 100 measured values (agile display).



Other values, such as the Incremental status etc., see the Basic functions.

3.3.3 Display encoder memory

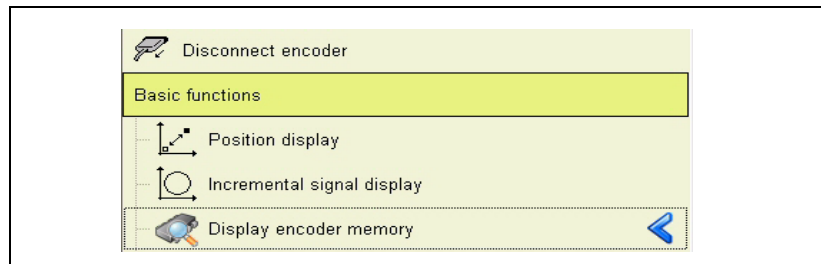
Absolute HEIDENHAIN encoders with EnDat interface feature an internal encoder configuration memory. The layout of the configuration memory and the meaning of the individual data words is described in the interface specification entitled "EnDat Interface: Bidirectional synchronous serial interface for position encoders."

This specification is available from HEIDENHAIN as a separate document.

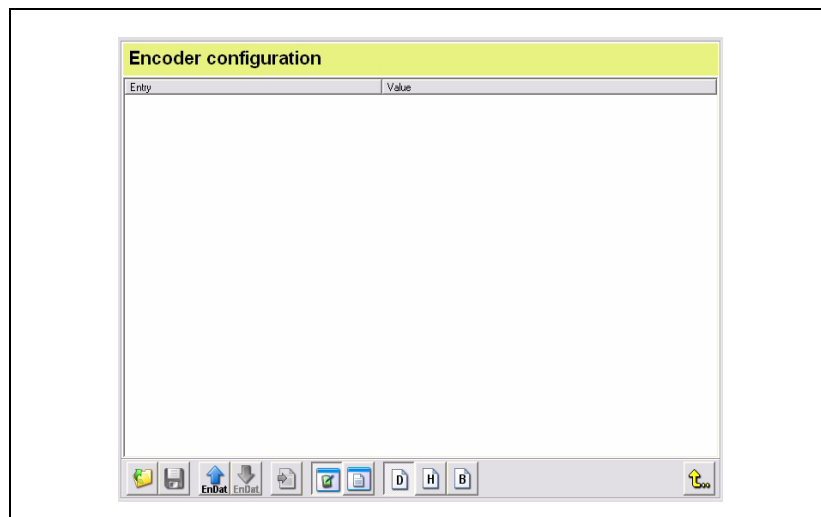
Therefore, this manual does not provide explanations of the individual memory areas and data words.

Calling the encoder configuration

- ▶ Click the function "Display encoder memory".



The encoder configuration window is activated.



Loading the encoder configuration from the encoder

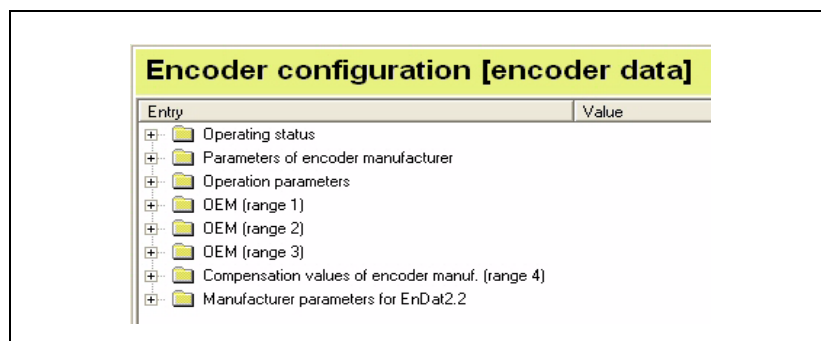


- ▶ Press the "EnDat" key ("Load encoder configuration from encoder").

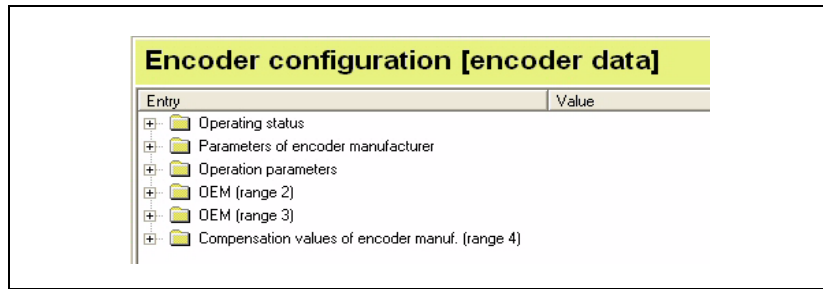
The encoder configuration is transferred **from the encoder memory** to the computer.

The encoder data are displayed in a tree structure.

Display of the tree structure with EnDat 2.2 encoder connected:



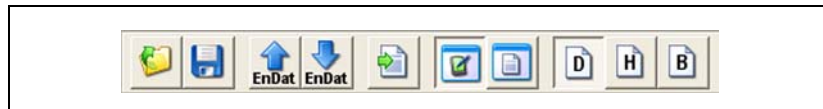
Display of the tree structure with EnDat 2.1 encoder connected:



Note

These tree views are examples.
The display may vary depending on the encoder and interface specifications and on the product key used.

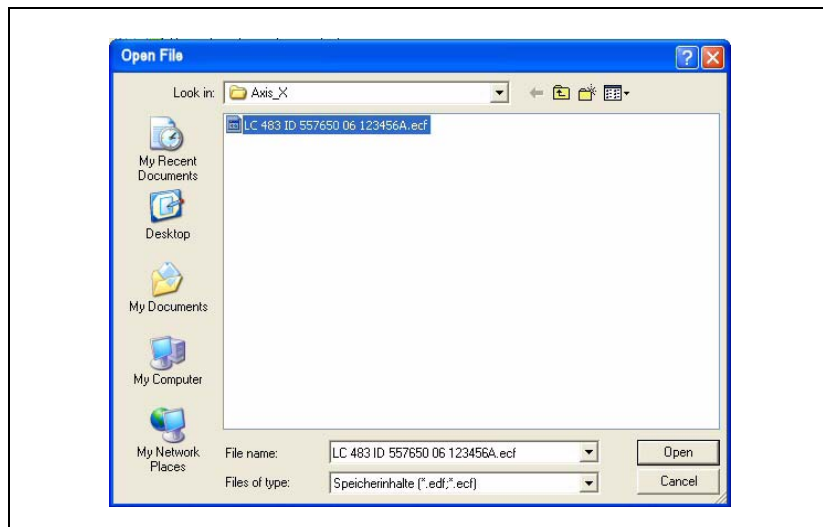
Tool bar for encoder configuration



Load encoder configuration from a file



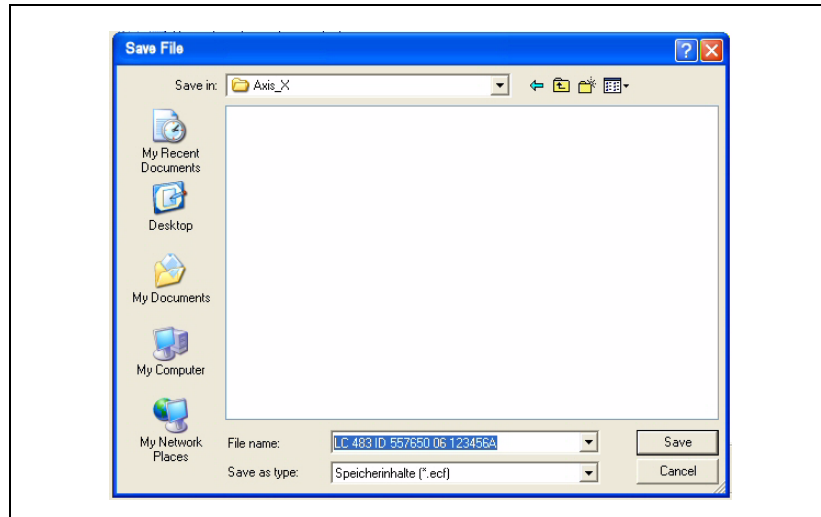
► When you click this button the "Open file" window is displayed. Similar to the Windows Explorer you can e.g. search for and open backup files. Only files with the extensions x.edf and x.ecf can be read.



Save encoder configuration to a file



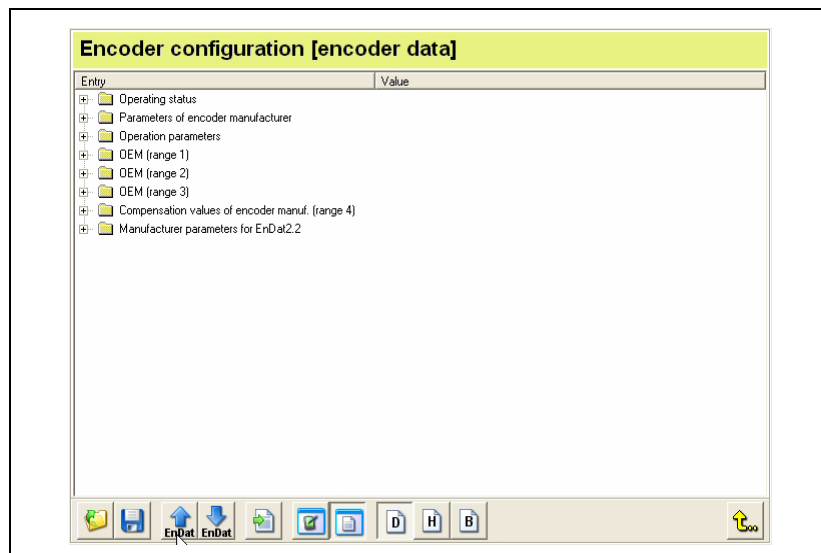
► This button serves to save the current encoder configuration on your computer. When the "Save file" window is displayed you can create a new folder to save the encoder configuration data (backup) on your computer. The data are stored as x.ecf or x.edf files.



Load encoder configuration from encoder



► With the button "Load encoder configuration from encoder" the data stored in the encoder are transferred to the computer and the tree view of the encoder configuration is displayed (see chapter "Display encoder memory" on page 56 and "Loading the encoder configuration from the encoder" on page 56).

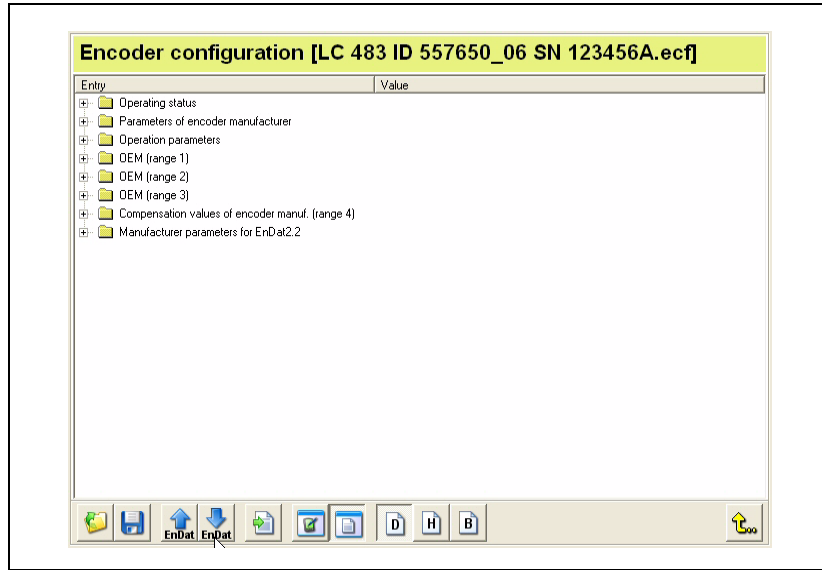


Note

HEIDENHAIN recommends to save the loaded encoder data on a computer. (See chapter "Save encoder configuration to a file" on page 57.)

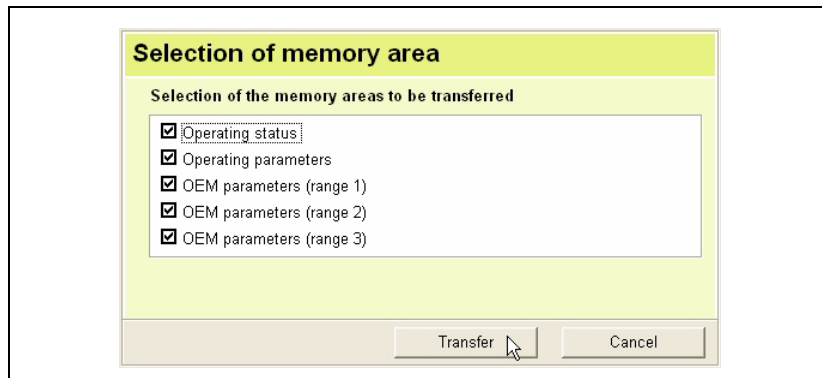
Save encoder configuration in encoder

- ▶ With the button "Save encoder configuration in encoder" an encoder configuration stored in the computer is transferred to the encoder where it is saved in selected memory areas.



- ▶ After clicking this button you can select the memory area to be transferred in the "Selection of memory area" window.

- ▶ Click the "Transfer" button to write the "new" data to the selected memory areas.



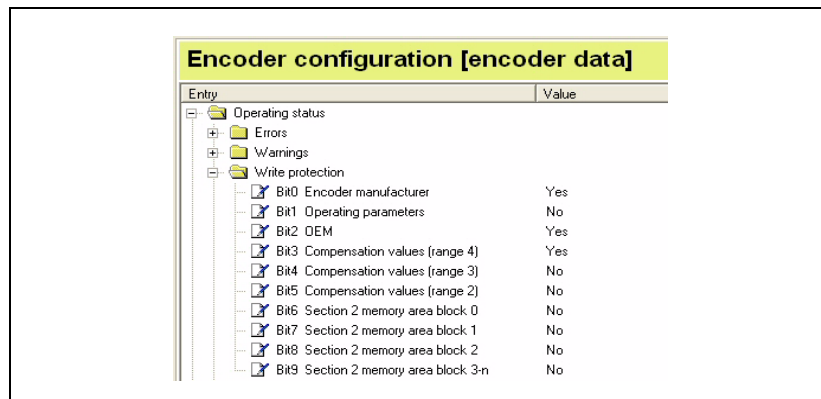
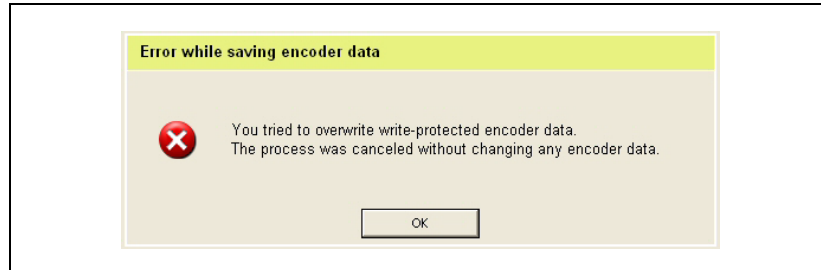
Attention

Data already saved in the encoder will be overwritten! We recommend that you back up the "old" encoder configuration (see chapter "Save encoder configuration to a file" on page 57).



Note

Some memory areas may be write-protected (can be seen from Encoder configuration -> Operating status -> Write protection).
An attempt to transfer data to a write-protected area will be aborted by an error message.



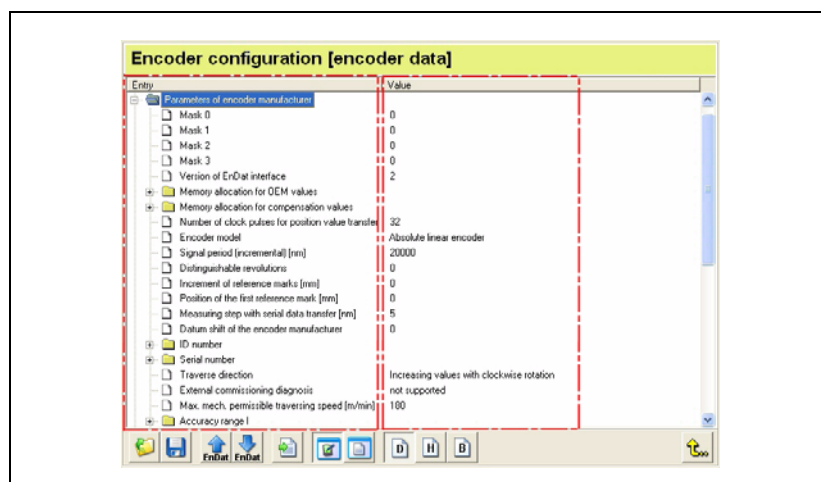
Apply encoder configuration



► When you click this button the basic view of the encoder configuration is loaded (display of directory tree reduced to main directories).

View of the encoder configuration

The display of the configuration values data consists of two columns. The left side (Entry) shows the available memory areas in a tree structure. On the right side (Value) the data words assigned to the selected memory area are displayed. The display may be function-related or data-related.



Function-related view of encoder configuration data

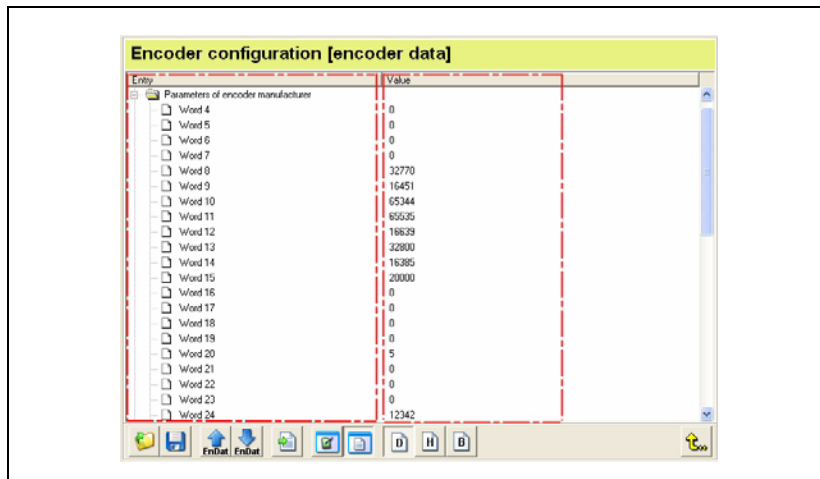


► When you click this button the data words and values are interpreted according to the EnDat specification as far as possible and displayed in plain language.

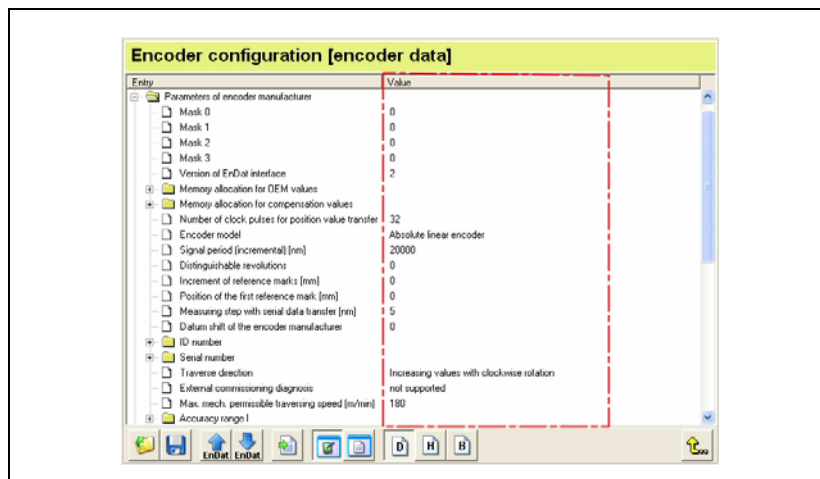
Data-related view of encoder configuration data



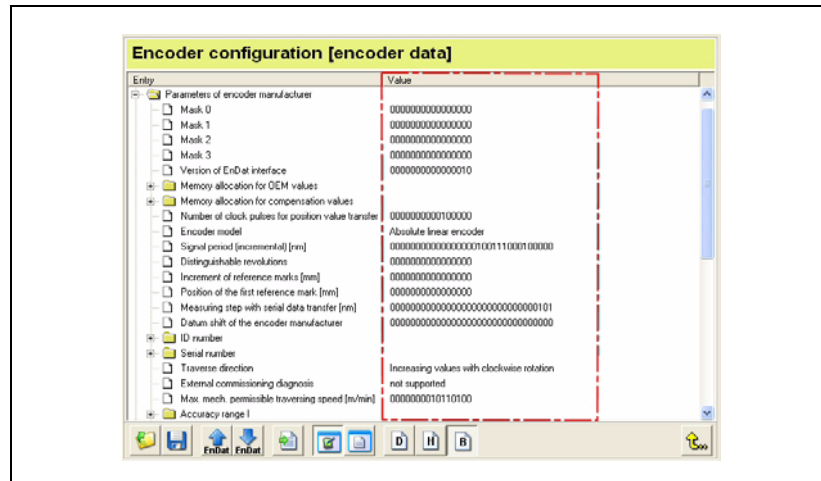
► When you click this button the numerical values of the data words are displayed.



Decimal value display



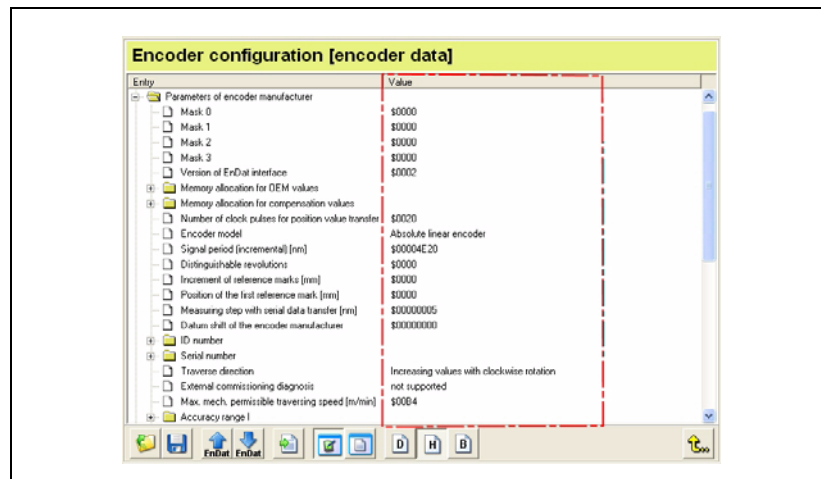
Binary value display



Note

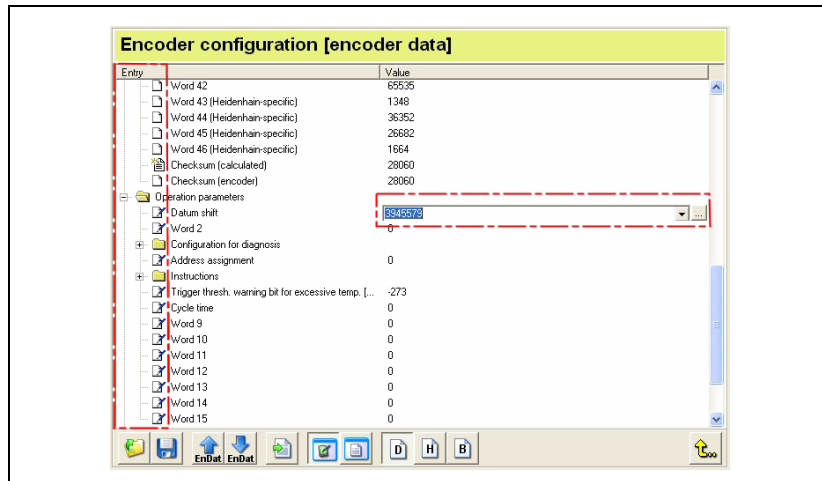
This display mode is used in the EnDat interface description.

Hexadecimal value display



Editing the encoder configuration

- ▶ Use the left mouse button to mark the value to be edited. (In the example: Datum shift)



Value can be edited



Value cannot be edited

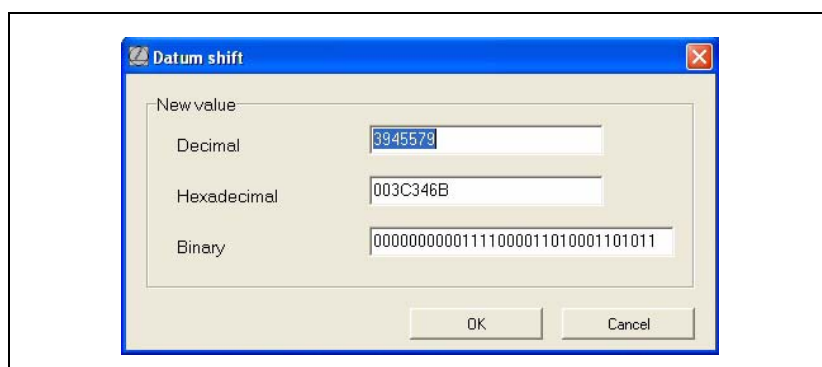


Value cannot be edited, since it is the result of a calculation or it consists of several words for easy-to-read display (e. g. ID 557 650-06)

The drop-down list opens.



- ▶ Open the editing window by clicking this button (to the right of the drop-down list).



Second option:



- ▶ Click the button to open the list from which you can select predetermined values.

Third option (no screenshot):

Yes ▶ Select Yes/No (check mark in check box = yes, check box empty = no).
No
 Yes



Attention

When you have successfully edited the encoder configuration on your computer, you must transfer it to the encoder.



Press

Only then will the data in the encoder memory be active.
(See "Save encoder configuration in encoder" on page 59.)
The old data will be overwritten.
We recommend that you back up the "old" encoder configuration!

Setting write protection for memory areas

For EnDat encoders there is the possibility of assigning a write-protection to the memory areas so that the data are protected from unintended editing. This is necessary, particularly to ensure machine safety and system reliability.

HEIDENHAIN therefore protects the "parameters of encoder manufacturer" memory area with the corresponding write-protection bit. Among other information the encoder adjustment data are stored here; editing these data would render the encoder inoperable.

We recommend setting the appropriate write-protection bit after setting the machine-relevant parameters in the OEM memory areas and after "datum shift" (operating parameters)!



Attention

The write-protection cannot be reset after the encoder configuration was saved in the encoder.

Only JH Traunreut or an authorized HEIDENHAIN representation can cancel write-protection!

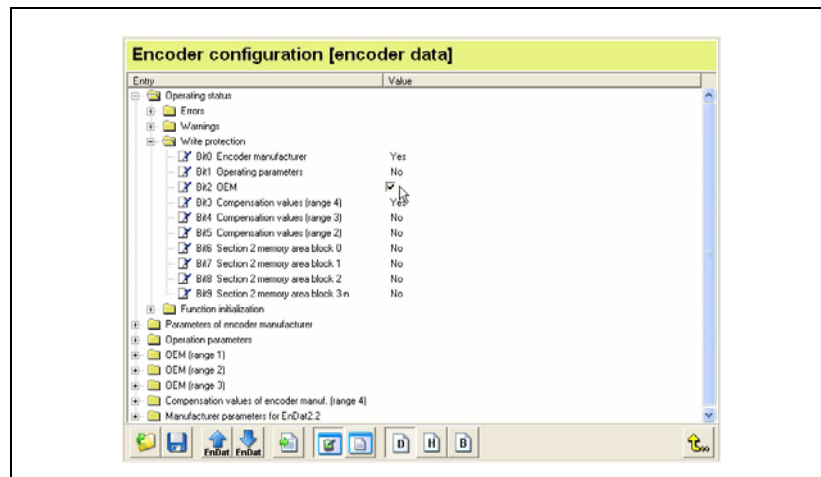
Example: Setting write-protection



means "YES" = Write-protection set.



▶ When you click this button the data is transferred to the encoder memory and write-protection is active.



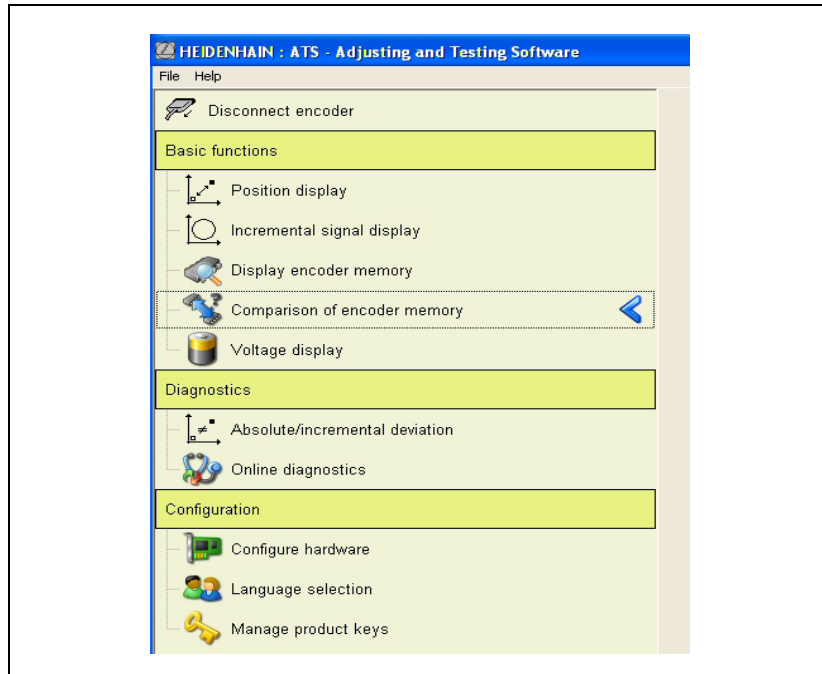
3.3.4 Comparing contents of encoder memories

With this function you can compare the configuration of the connected encoder to a reference file.



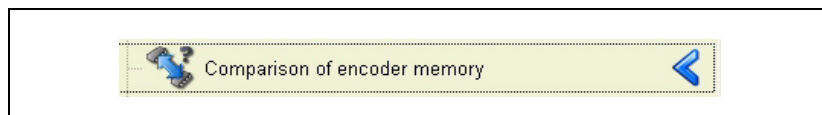
Note

This comparison function is only recommended to advanced users!



The encoder to be compared must be connected and identified. A reference file with an encoder configuration must be available.

► Click the function "Comparison of encoder memory".



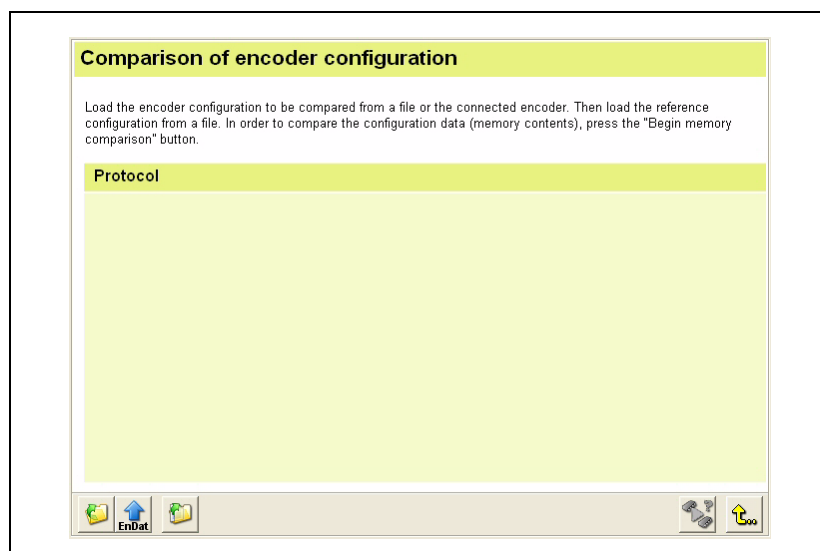
The log window ("Protocol") appears and you are prompted to load the configuration of the encoder currently connected.



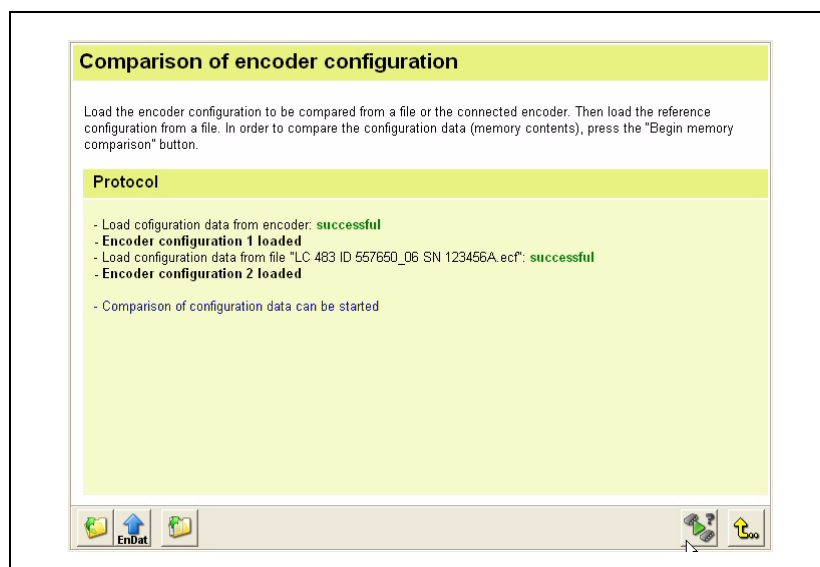
When you click this button the current encoder configuration of the connected encoder is loaded into the comparison register (= encoder configuration 1).



The button to the left loads a saved encoder configuration (e.g. received by e-mail) from a file into the comparison register (= encoder configuration 1).



The button to the right loads a comparison configuration into the comparison register (= encoder configuration 2).



▶ Clicking this button starts the comparison of the two memories. (This may take several seconds.)

The differences of the encoder configurations 1 and 2 are entered into the log file.



Note

Additional documentation is required to understand and evaluate the entries! (EnDat specifications upon request.)

Original encoders – even with the same ID – always differ from each other, since e.g. signal compensation values are determined individually and saved for every encoder!

Section	Word	Config. data 1	Config. data 2
Parameter of encoder manufacturer	24	12340	12342
Parameter of encoder manufacturer	25	33361	33362
Parameter of encoder manufacturer	27	13600	8736
Parameter of encoder manufacturer	28	8982	10034
Parameter of encoder manufacturer	33	65380	65480
Parameter of encoder manufacturer	34	65380	65480
Parameter of encoder manufacturer	47	31674	28060
Compensation values of encoder manuf. (range 4)	106	12340	12342
Compensation values of encoder manuf. (range 4)	107	33361	33362
Compensation values of encoder manuf. (range 4)	109	13600	8736
Compensation values of encoder manuf. (range 4)	110	8982	10034
Compensation values of encoder manuf. (range 4)	115	3267	3203
Compensation values of encoder manuf. (range 4)	124	21357	16236
Compensation values of encoder manuf. (range 4)	127	43218	48339

Example of an error message, if encoder configurations cannot be compared (different EnDat command sets):

Comparison of encoder configuration

STOP

The EnDat command set of the encoder configurations to be compared differs (EnDat2.1 and EnDat2.2).
A comparison of the configuration data is not recommended, since these are obviously different encoders.

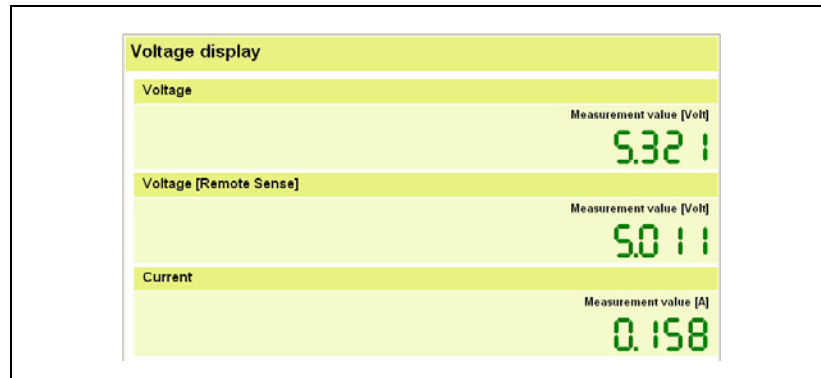
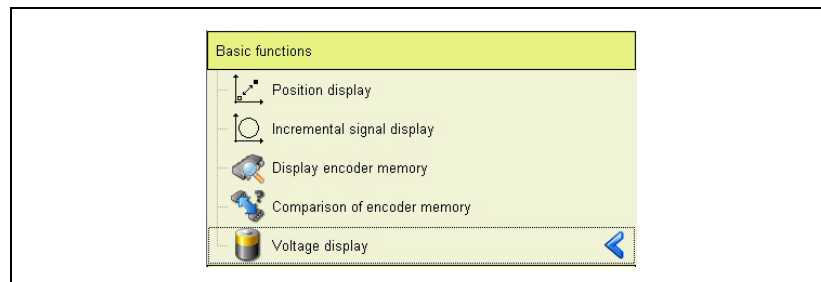
i

Please press the "Load configuration data" button to open the dialog box for loading the encoder configurations, and load the encoder configuration of the same encoder.



► Click this button to terminate the function and return to the main menu.

3.3.5 Voltage display



Voltage:

Display of the voltage provided by the test unit to power the encoder

Voltage [Remote Sense]:

Operating voltage at the measuring system; voltage drops on the encoder supply lines are taken into account.

Current:

Display of the encoder current consumption



Note

The display may be different, depending on the type of power supply selected and on the encoders connected.
In "closed-loop operation" and when the **S**ervice **A**dapter (e.g. SA 100) is used, power supply and current consumption of the SA (not of the encoder) are displayed!

3.4 Additional Information (EnDat 2.2): Temperature Display



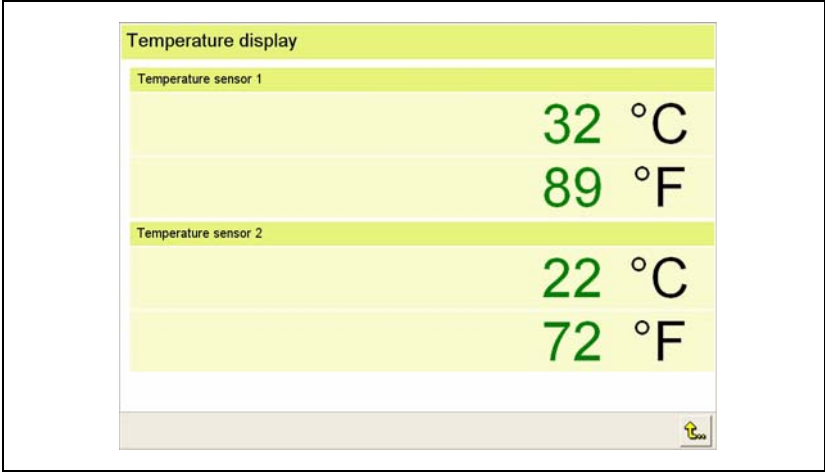
Note

Display and functions may vary depending on the EnDat interface, the product key and the connected encoder!

Not all encoders support temperature display. From the "Temperature display" icon you can see, whether the function is available.



► When you double-click the "Temperature display" button the current temperature values of sensor 1 and 2 are displayed.



Temperature sensor 1:

External sensor, e.g. in the drive (temperature switch or temperature-dependent resistor)

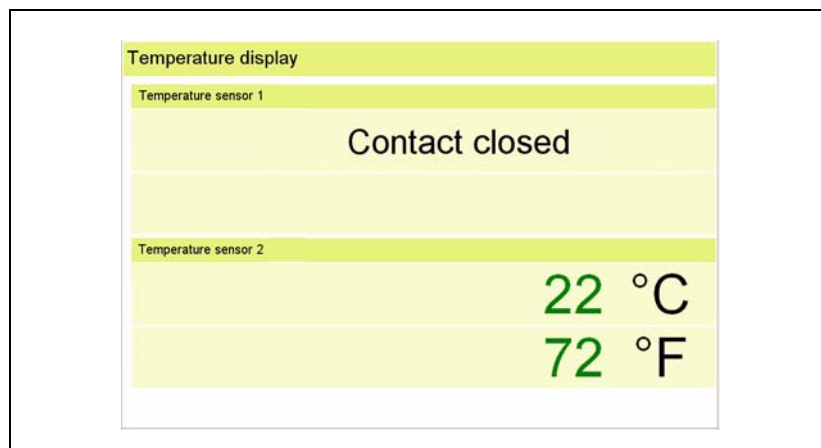
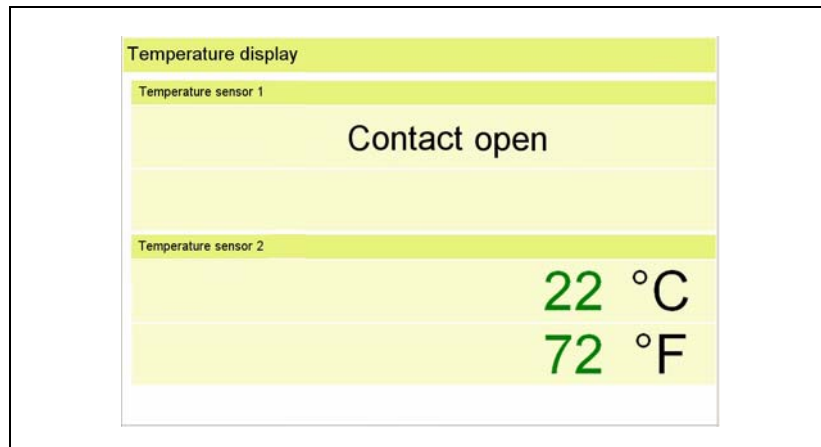
Temperature sensor 2:

Temperature sensor inside the encoder



Note

Not all encoders support the temperature data for the evaluation of the EnDat status (error message / warning).



3.5 Diagnostics

3.5.1 Absolute-to-incremental deviation



Note

Display and functions may vary depending on the product key and the connected encoder!

With the function "Comparison of absolute and incremental values" absolute encoders can be checked for the following defects:

- Code transition errors between absolute and incremental values
- Scale contamination and resulting signal and position errors
- Signal interferences (interference problems with resulting positioning errors)

Internal propagation and calculation times etc. may cause a difference between the absolute and the incremental position values.



Note

The absolute value is calculated at the scanning point (scanning unit or electronics of rotary encoder) and is serially transferred to the PWM 20 or IK 215 as absolute data word.

The incremental signals are transferred to the subsequent electronics via the analog interface and are processed there (interpolated, digitized).

In the test unit the absolute and the incremental position values are compared to each other and the difference is displayed as deviation span.

The different signal paths (propagation times, calculations, etc.) result in a deviation between the absolute and the incremental position display; the deviations must not exceed the specified accuracy ranges.

Deviation span and accuracy (displayed in LSBs) are defined for different velocity ranges.

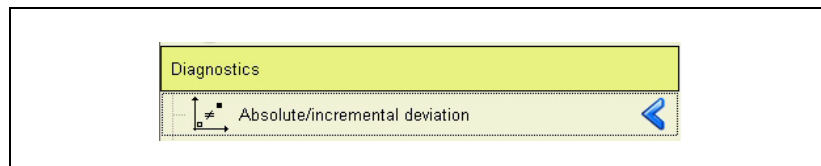
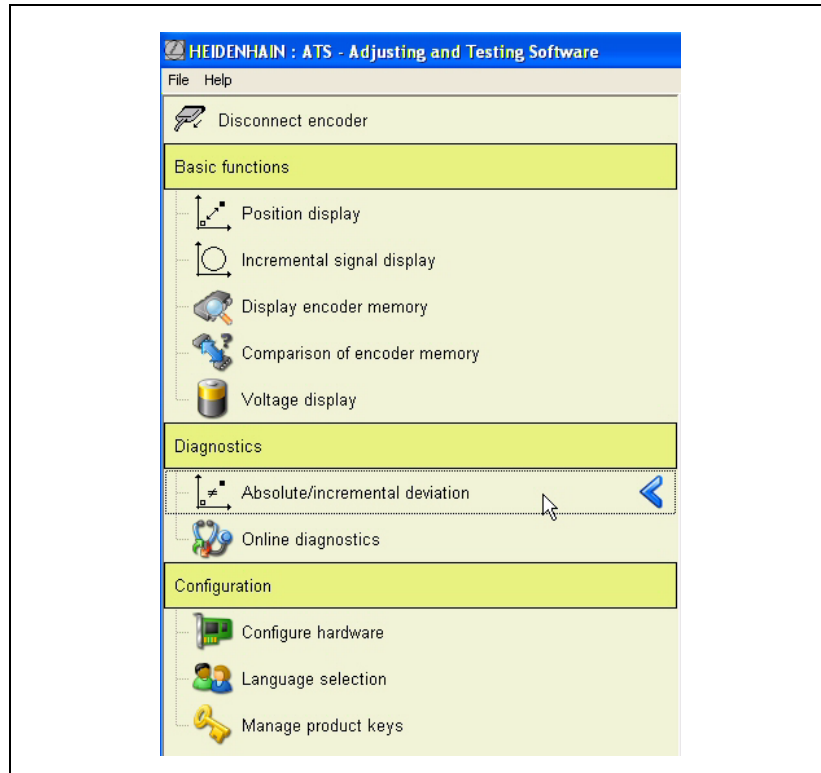


Attention

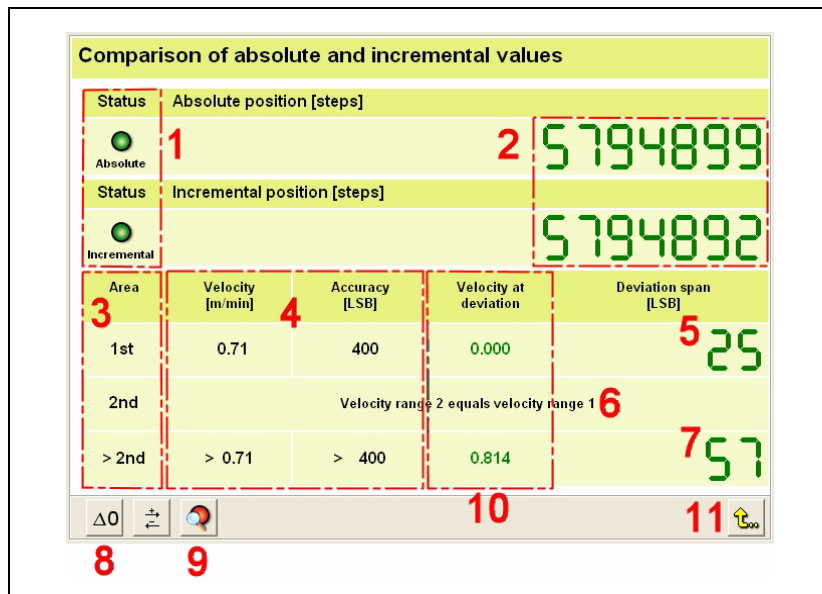
The absolute value of the deviation span must not exceed the specified accuracy of the velocity range.

The deviation span is displayed in red color, if the tolerance is exceeded.

- ▶ Double-click "Absolute/incremental deviation" to open the window "Comparison of absolute and incremental values":

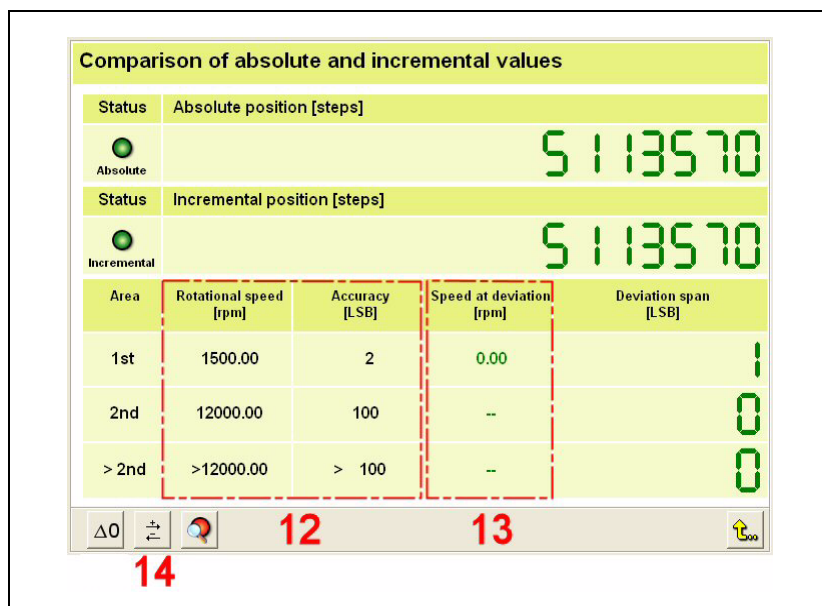


Example: LC






- 1** Status display
- 2** Position display
- 3** Speed ranges
- 4** Tolerance limit of the accuracy [LSB] for the specified speed [m/min]
- 5** Deviation in velocity range 1
- 6** Deviation in velocity range 2
- 7** Deviation in velocity range 3
- 8** Reset deviation
- 9** Display detailed status information
- 10** Velocity at deviation
- 11** One step back





Example: EQN rotary encoder



- 12** Tolerance limit of the accuracy [LSB] for the specified rotational speed [rpm]
- 13** Velocity at deviation (- = Range not supported)
- 14** Invert counting direction of incremental positions

If the deviation span is extremely high (red display), check the setting of the incremental counting direction  .

Comparison of absolute and incremental values				
Status	Absolute position [steps]			
 Absolute	19 175596			
Status	Incremental position [steps]			
 Incremental	16 780772			
Area	Velocity [m/min]	Accuracy [LSB]	Velocity at deviation	Deviation span [LSB]
1st	0.71	200	0.000	2394869
2nd	Velocity range 2 equals velocity range 1			
> 2nd	> 0.71	> 200	0.886	2379551

3.5.2 Online diagnostics

Encoders with purely digital, serial interfaces (e.g. EnDat 21 and 22, Fanuc, Mitsubishi, DRIVE-CLiQ) do not provide incremental signals. Therefore, the encoders cyclically output the valuation numbers in order to evaluate the functions of the encoder. The ATS software displays these as bar diagrams. The valuation numbers provide the current state of the encoder and ascertain the encoder's "functional reserves."

The scaling is the same for all HEIDENHAIN encoders; it is indicated as function reserve (0 – 100 %).

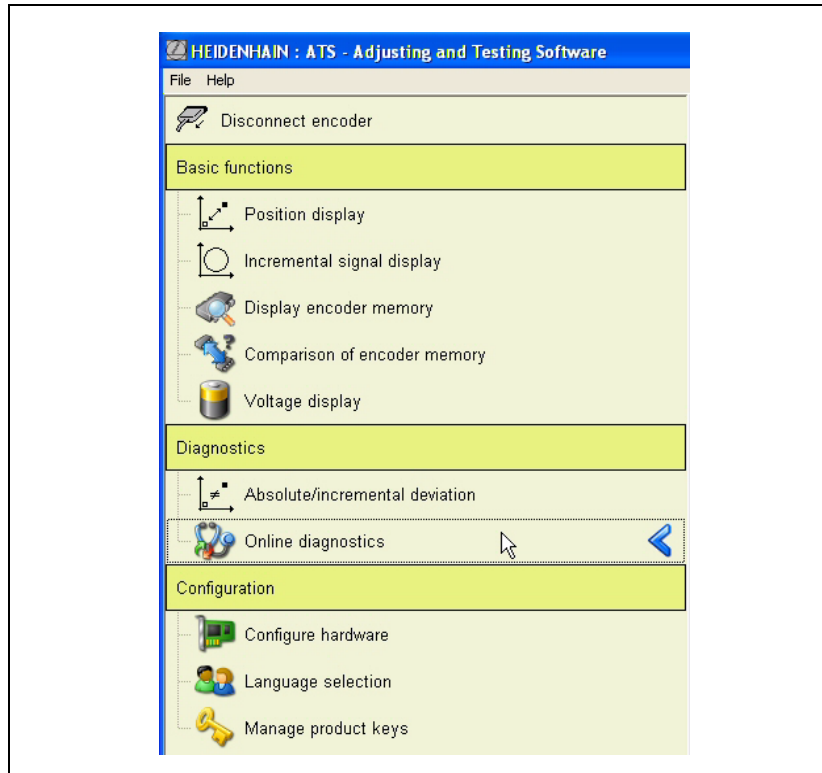
The valuation numbers supported by the respective encoder (number of displayed bars) are saved in the encoder memory (with EnDat encoders: visible in "Manufacturer parameters EnDat 2.2/Diagnostic status").



Note

Display and functions may vary depending on the product key and the connected encoder! If the "Online diagnostics" is not displayed in the ATS menu, the encoder interface does not support this function.

The screenshots below show Online diagnostics of an EnDat interface.

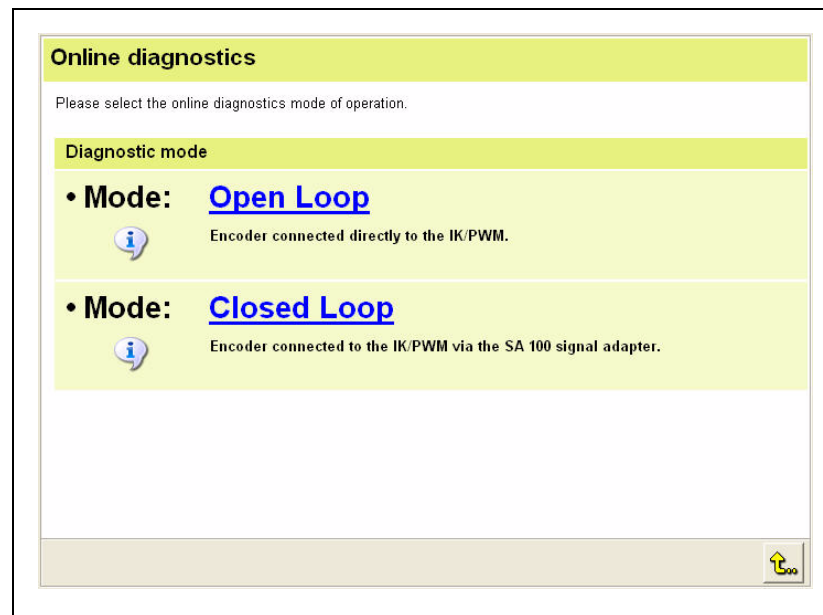


- ▶ Double-click "Online diagnostics" to open the window: "Online diagnostics/Diagnostic mode"

At the beginning of the Diagnostic dialog you must select:

Open Loop: The encoder is directly connected to the test unit (open loop).

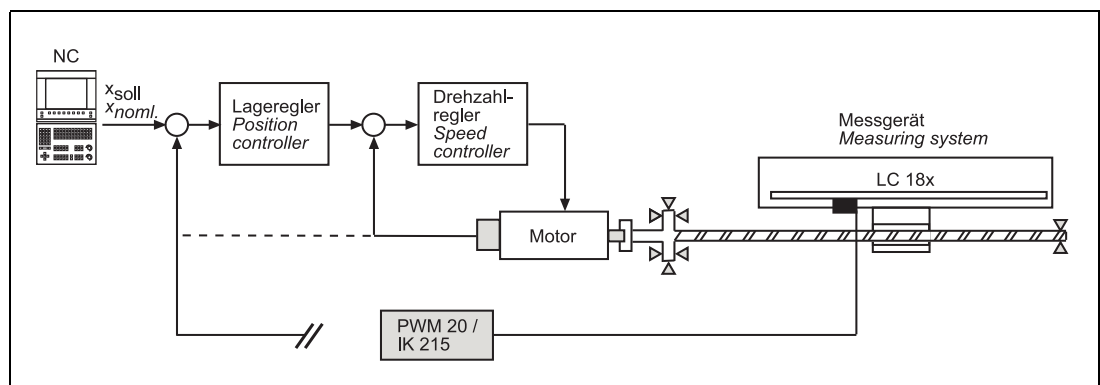
Closed Loop: The test unit is operated via a signal splitter (closed loop).



Two diagnostic modes are available:

Open Loop

The control loop of the machine is open, and the encoder is directly connected to the test unit (without subsequent electronics). For the inspection the encoder must be traversed by hand.



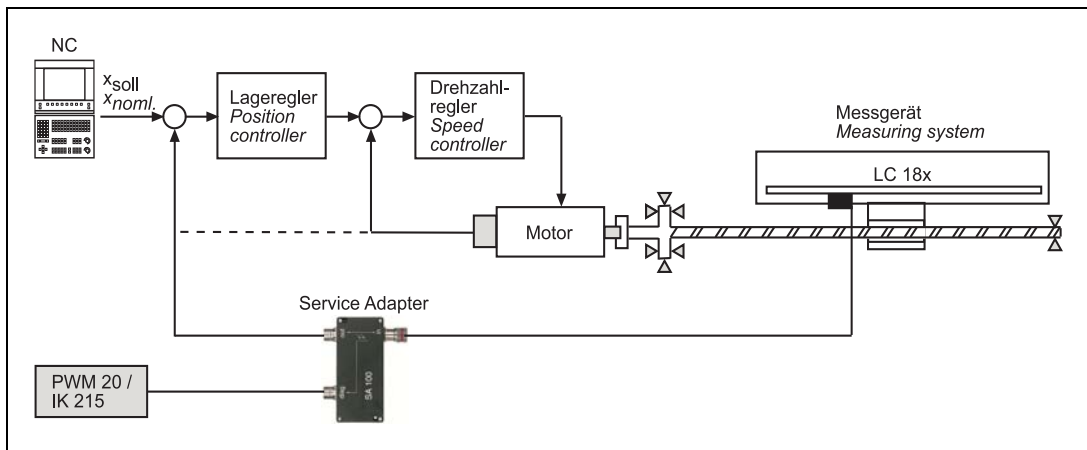
Closed Loop

The control loop of the machine axis is closed, a T-coupler/signal splitter (**S**ervice **A**dapter SA 1x0) is connected between the encoder and the subsequent electronics.
 The PWM 20 or the IK 215 are connected to the diagnostic output which is metallically isolated.
 Now, the ATS software can monitor the data stream between subsequent electronics and encoder.

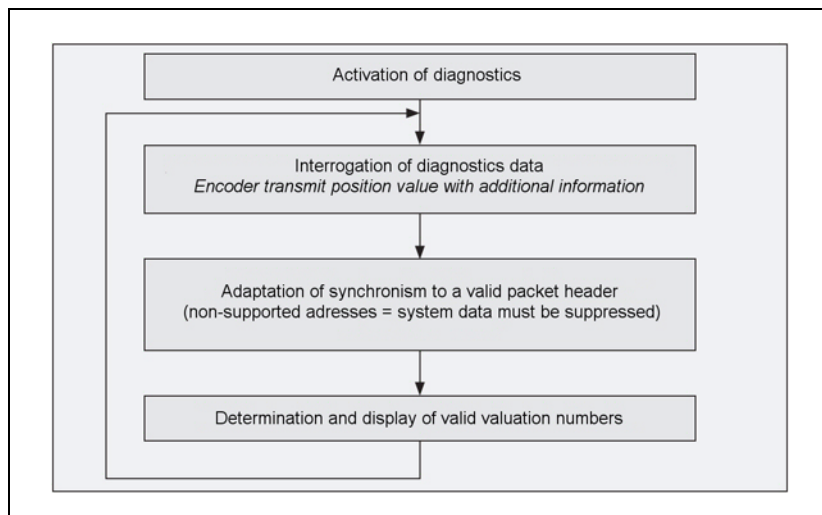


Note

The ATS software cannot request data actively; it can only passively monitor data communication between subsequent electronics and encoder. The closed-loop functionality only works for interfaces at which the subsequent electronics permanently requests diagnostic data. (**The diagnostic function of the subsequent electronics must be active!**)
 Otherwise, no data communication can be monitored (possible with EnDat 02, 21 und 22, Fanuc, Mitsubishi)!



Flow chart for interrogation of diagnostics data:



3.5.3.1 Open Loop function

► Click Open Loop function.

The log window opens, containing the existing encoder data. You can add machine data and notes. The software automatically enters measuring range and recording period as soon as the recording stops.



► Click this button to open the "Function reserves" window.



► Click this button to start the recording.



Note

Cover the entire traverse range!

The function reserves of absolute track, incremental track and position value formation are evaluated in bar diagrams; the result is displayed in %. A drag indicator (triangle below the bar display) marks the minimum.

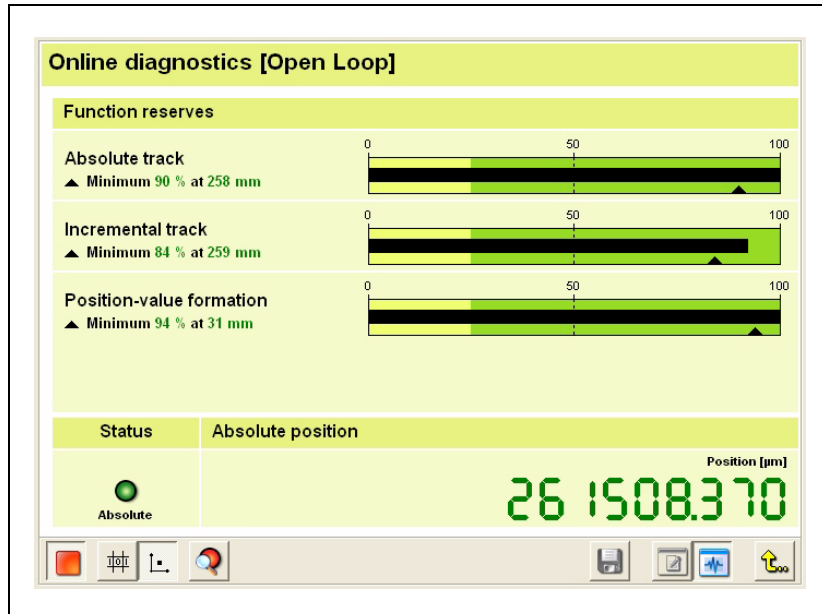
Green range: The output signal is within the specifications.

Yellow range: The output signal is outside the specifications, but no counting or calculation errors are to be expected. No alarms are generated, warnings may occur.



Note

The yellow range indicates: Service or maintenance recommended!







► Click this button to stop the recording.



- ▶ When you click the "Encoder parameters" button, the log display appears. Measuring range and recording period are displayed now in green color.

Example: Input of encoder and machine data

Online diagnostics [Open Loop]			
Encoder data		Machine data	
Encoder model	LC 483	Machine type	JS
ID-number	557650-06	ID-number	123
Serial number	19345954	Serial number	456
		Axis	X
Measuring range		Recording period	
Smallest position:	52 mm	Start:	14.01.2009 14:23
Greatest position:	292 mm	End:	14.01.2009 14:24
Notes			
test protokoll			
   			



- ▶ Click this button to save the data in a text file. The file location is defined in a context menu.

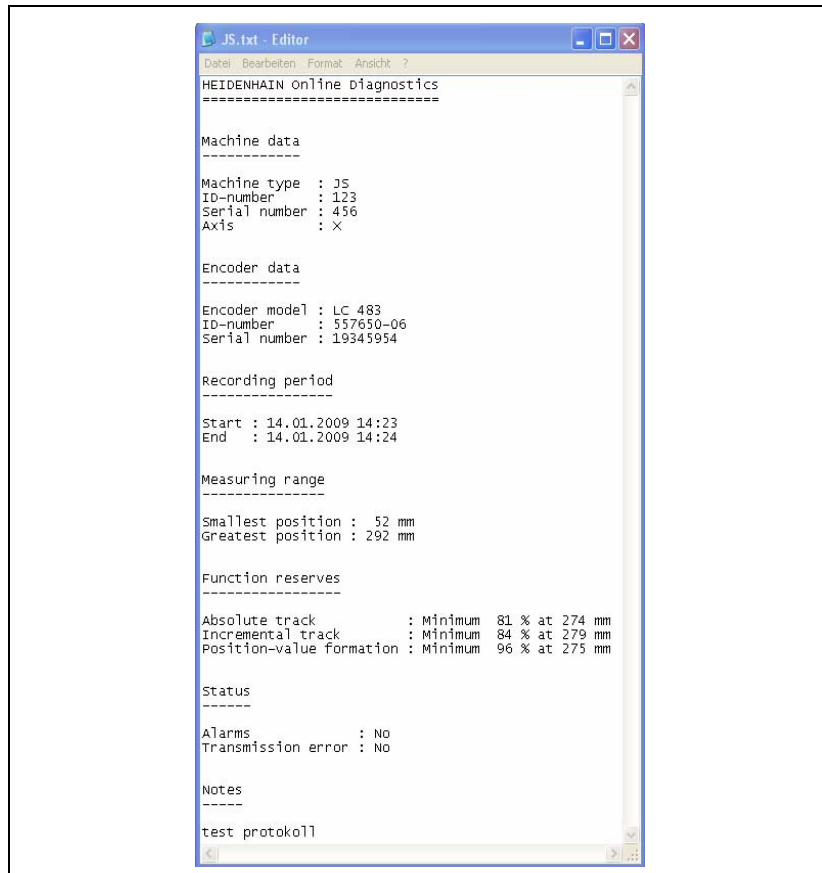


Note

The text file can be archived when the machine is shipped, and it can be used to describe the faults, if the encoder needs to be repaired.

Example:

The text file (*.txt) is saved in the program directory of the ATS software.



```
JS.txt - Editor
Datei Bearbeiten Format Ansicht ?
HEIDENHAIN Online Diagnostics
-----

Machine data
-----

Machine type : JS
ID-number   : 123
Serial number : 456
Axis        : X

Encoder data
-----

Encoder model : LC 483
ID-number     : 557650-06
Serial number  : 19345954

Recording period
-----

Start : 14.01.2009 14:23
End   : 14.01.2009 14:24

Measuring range
-----

Smallest position : 52 mm
Greatest position : 292 mm

Function reserves
-----

Absolute track      : Minimum 81 % at 274 mm
Incremental track   : Minimum 84 % at 279 mm
Position-value formation : Minimum 96 % at 275 mm

Status
-----

Alarms      : No
Transmission error : No

Notes
-----

test protokol1
```

3.5.4.2 Closed Loop function

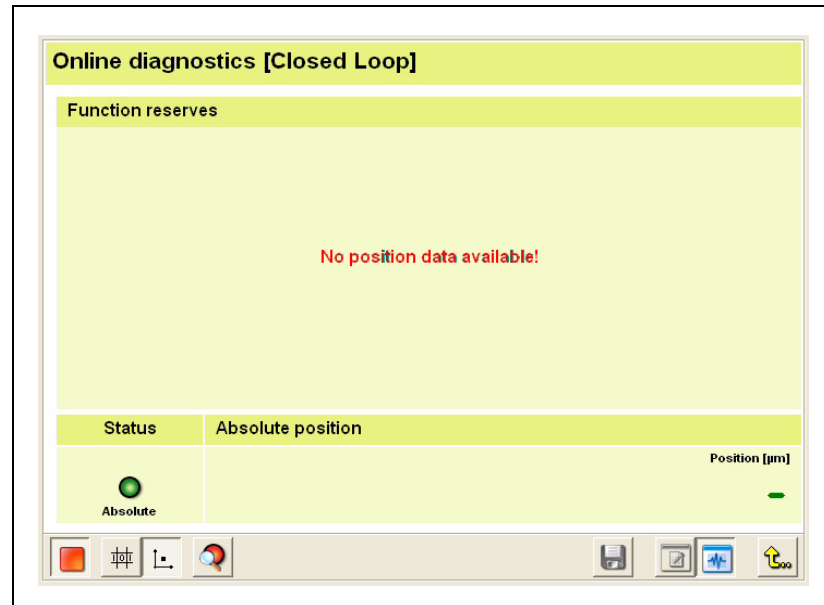
- ▶ Click the Closed Loop function.

Data communication between control (TNC/NC) and encoder is picked up by a signal splitter (in the example: SA 100 Service Adapter, ID 363706-01). The encoder loop remains closed and the NC control can still traverse the machine axis.

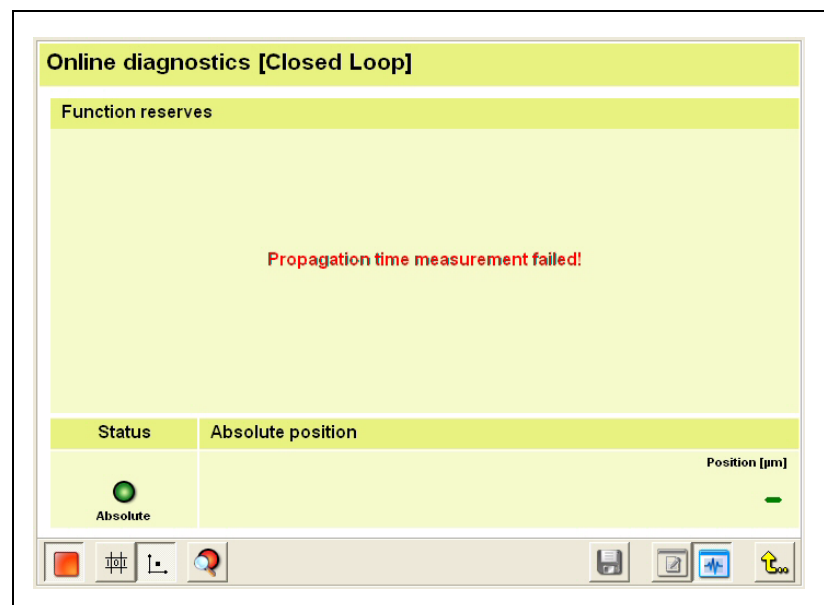
Prerequisite:

"Listening in" is only possible with purely serial interfaces (EnDat 21 and 22, Fanuc, Mitsubishi, DRIVE-CLiQ). The subsequent electronics must support the diagnostic function! The diagnostic function of the subsequent electronics (TNC control) must be active!

Message, if data communication fails:



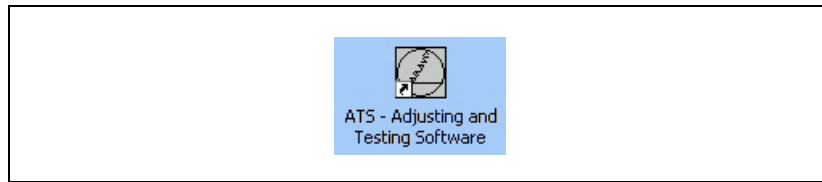
Message, if the test unit cannot synchronize with the data stream (diagnostic function of subsequent electronics inactive):



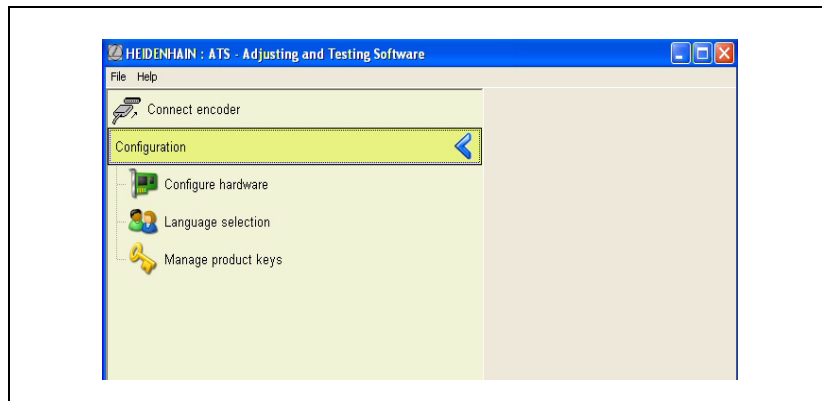
The further procedure is similar to the open-loop measurement, see chapter "Open Loop function" on page 78.

3.6 Configuration

- ▶ Start the ATS software.



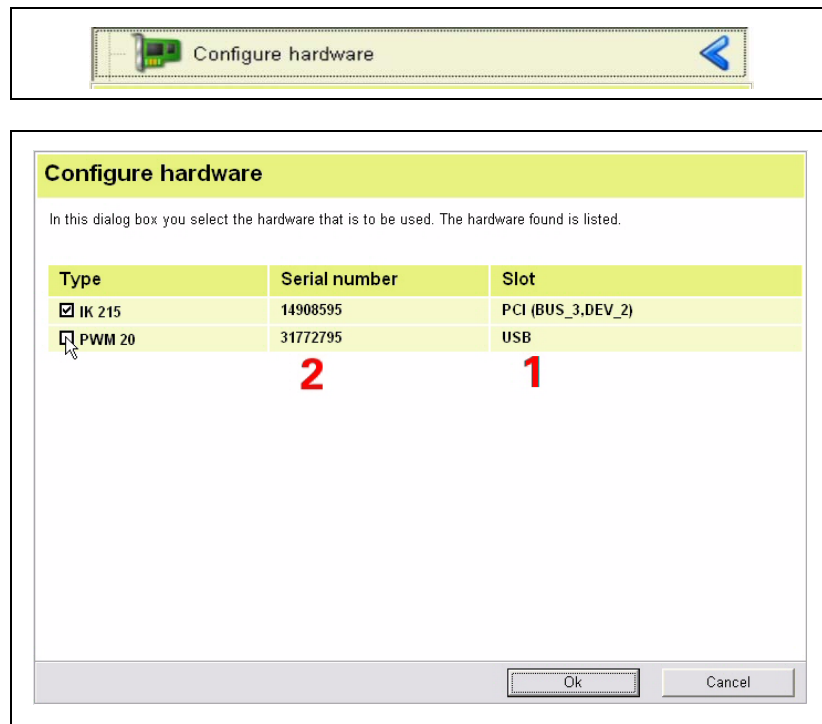
- ▶ Select the "Configuration" group.



In the "Configuration" group you can make the following settings:

- Configure hardware
- Language selection
- Manage product keys

3.6.1 Configure hardware



- 1** PCI bus number and the PCI device number of the installed test unit
- 2** Serial number of the test unit

This function scans the computer and lists the test unit hardware that was found.

- ▶ Confirm with OK to return to previous screen.
- ▶ From the list select the desired test unit.



Note

The serial number is required to generate a product key.

3.6.2 Language selection



- 1 Select German or English
- ▶ Set the operating language.
 - ▶ Confirm with OK to return to previous screen.

3.6.3 Manage product keys

In addition to the function groups and functions of the ATS software (see chapter "Operating Concept" on page 19) HEIDENHAIN reserves additional special functions (e.g. for the HEIDENHAIN Service) that can be activated by product keys.



Note

The product key generated by HEIDENHAIN is linked to the serial number of the hardware. The special functions cannot be transferred to other hardware by means of the product key!




Product keys

This dialog box is used to manage the product keys. Product keys specify the options that are permitted in the program.

Product keys

Product key entry **1**

Registered serial numbers: **2**

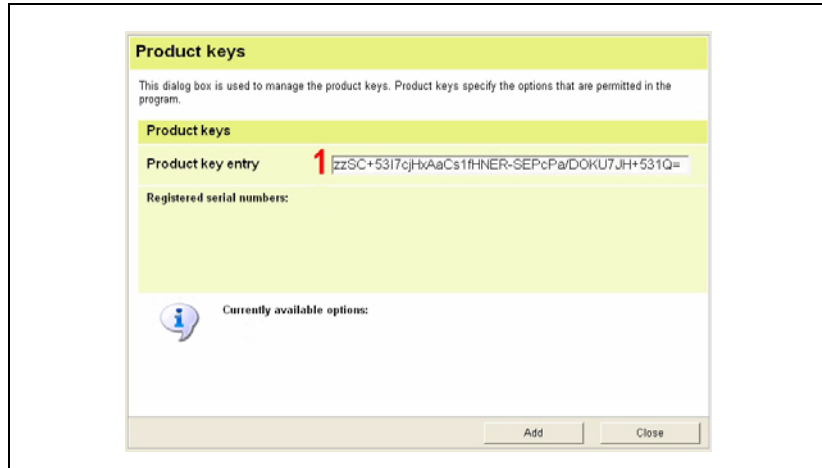
 Currently available options: **3**

- 1** Input box for product key
- 2** Serial number of the hardware
- 3** Display field for new optional function groups

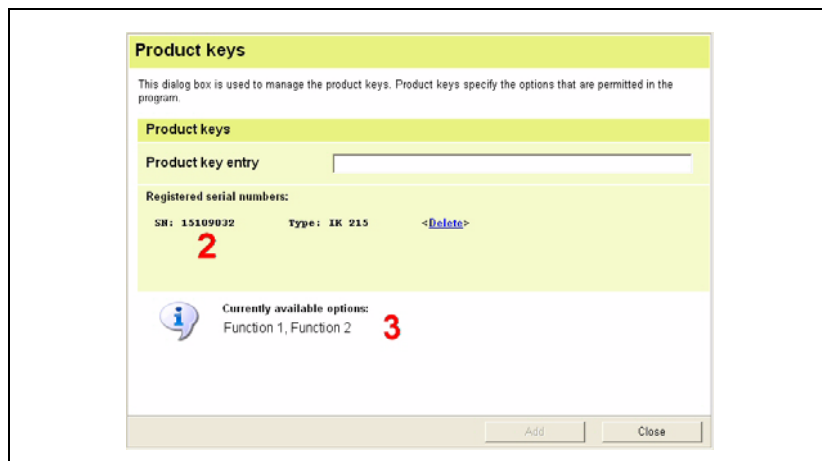
Example: Entering a product key

An optional function is enabled by HEIDENHAIN Traunreut. The product key is generated and sent by e-mail.

- ▶ Click "Add" to activate the product key.



- 1 Product key input field



- 2 Serial number 14908595 (example) of the installed IK 215
If further hardware is installed, the list is expanded and the active hardware is marked or can be selected.

- 3 Names of the enabled options

- ▶ Click "Close" to terminate product key entry.

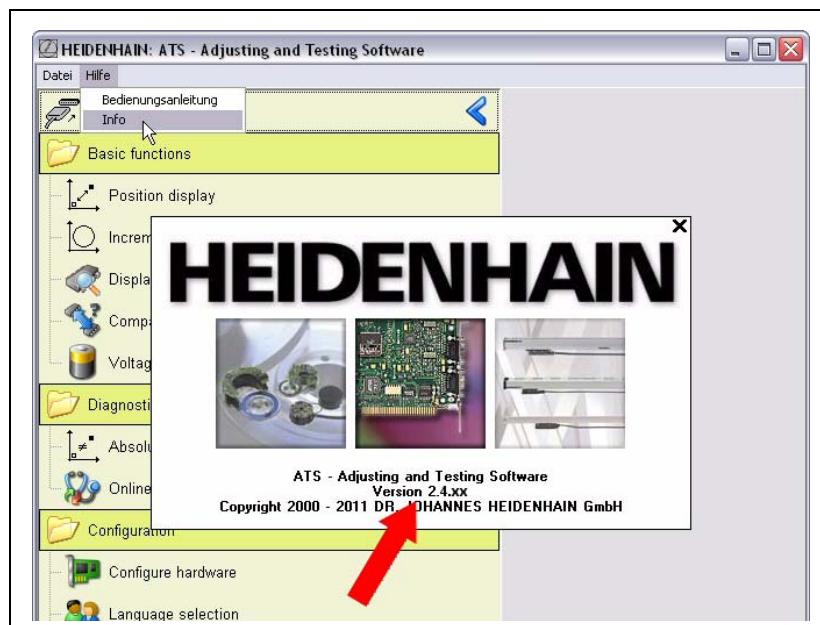


Note

The enabled function groups/functions become only visible in the ATS main menu after the encoder was selected.

3.6.4 Display software version

To display the installed version of the ATS software proceed as follows:



3.7 Mounting Wizard for ECI/EQI

Use the "Mounting" function group to check inductive motor encoders (ECI or EQI) on servo drives and to adjust them mechanically and electrically.
For detailed mounting information please refer to the ECI/EQI mounting instructions and product information.



Attention

The encoders may only be mounted and adjusted by especially trained staff. Special tools (product key for ATS software, adjusting tools) and documentation are required to adjust the encoders.

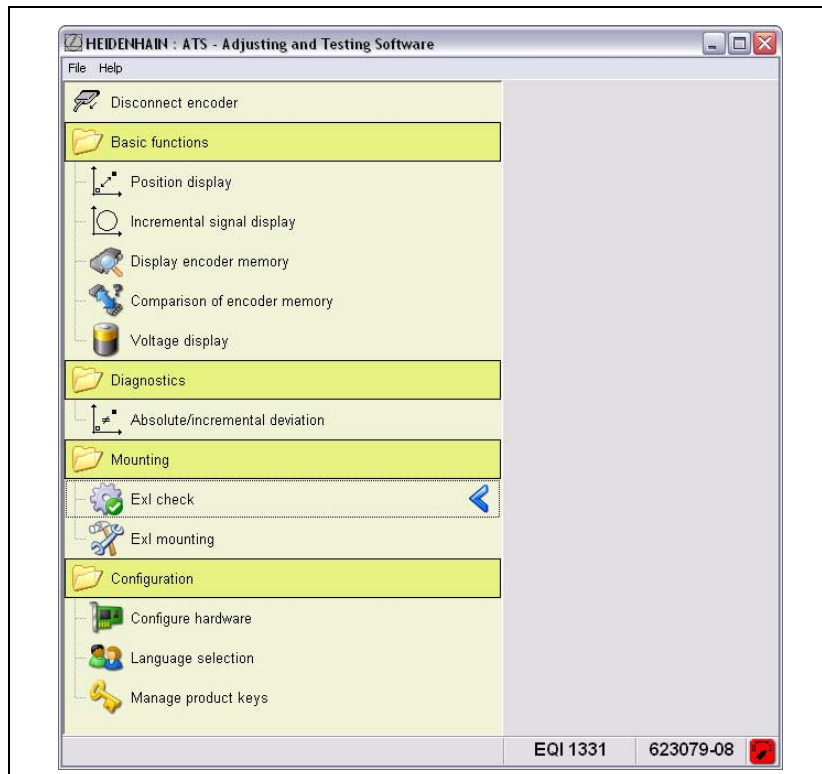
The inductive ECI/EQI series are rotary encoders for integration without integral bearing. The scanning gap between rotor and stator must be set by hand. The actual scanning gap is determined indirectly from the output voltage in the encoder. Various ambient conditions (thermal influence at max. working temperature, changes in supply voltage +/- 5 %, encoder tolerances) have an effect on the scanning gap. To ensure the optimum scanning gap, tolerance values (drive-specific lead factors, depending on the materials of the motor and the temperature range) were determined for the different motor series. The manufacturer of the servo drive enters these values in the ATS software and uses them to adjust the encoders. In the factory default setting, the ATS software works with the standard tolerances HEIDENHAIN uses in encoder production. These settings cannot be altered without the correct product key. HEIDENHAIN reserves the right to provide product keys after consultation only.

An exact diagnosis of the encoder mounting is only meaningful together with the values determined for the motor. If the ECI/EQI encoders are adjusted with incorrect setting values, the servo drive may fail before the maximum operating temperature is reached, or the encoder may be destroyed because the scanning gap is too small.




Note

The "Mounting" function group is only active, when an inductive ECI/EQI motor encoder is connected to the ATS software. Display and functions depend on the ECI/EQI model connected and on the active product key.



3.7.1 Exl Check Function

This function test is recommended for standard inductive Exl encoders for axial mounting.

The function  serves to check the scanning gap, the signal amplitude and the mounting quality.



Note

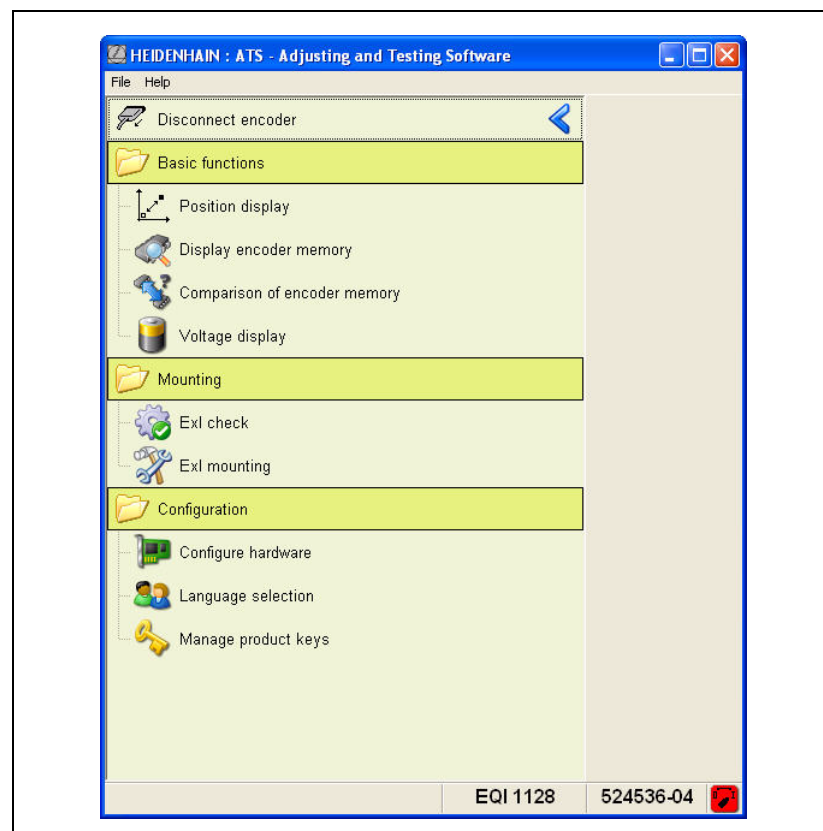
The stated tolerances are standard values.

Note for inductive Exl encoders that are not prepared for axial mounting:

The manufacturer of the servo motor may have altered standard tolerances (motor-specific lead factors) depending on the materials of the motor and the temperature range.

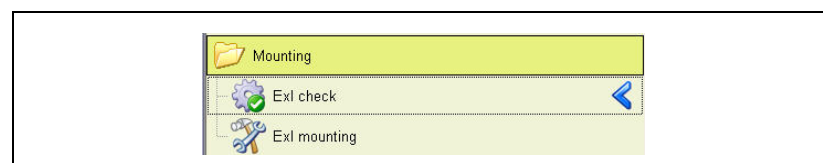
Please observe the notes in "ECI/EQI mounting wizard"!

After successfully connecting and mounting an inductive ECI or EQI encoder, the "Exl Check" function appears in the "Mounting" group of the ATS main menu.



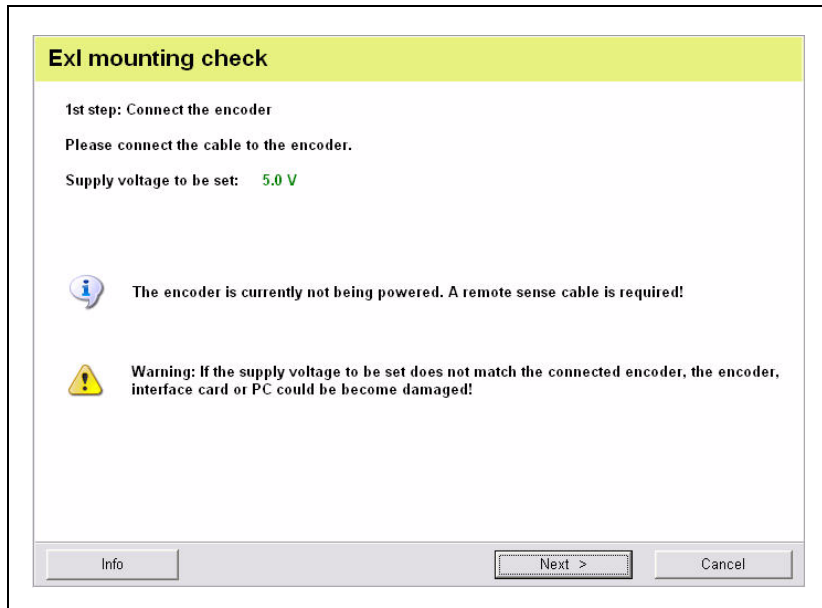
Step 1: Connecting the encoder

- ▶ Double-click "Exl Check" to activate the software wizard.

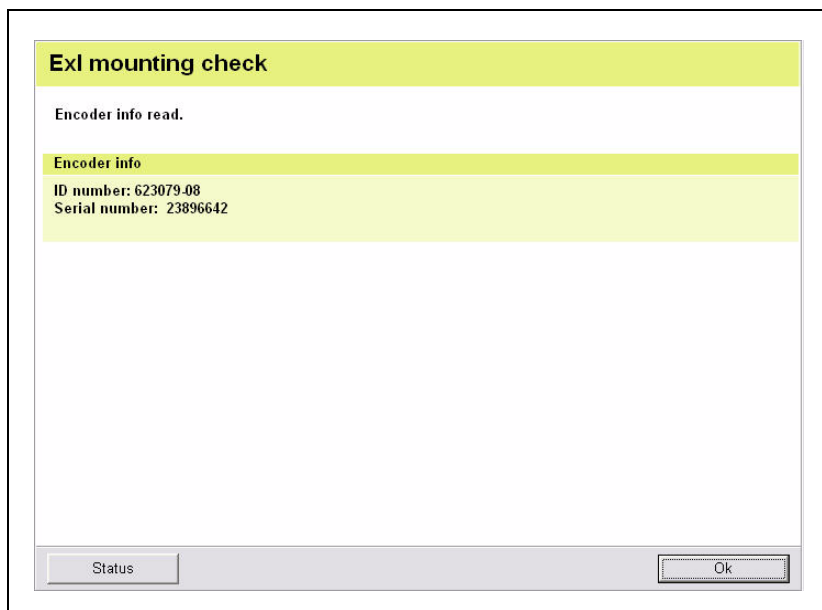



Note

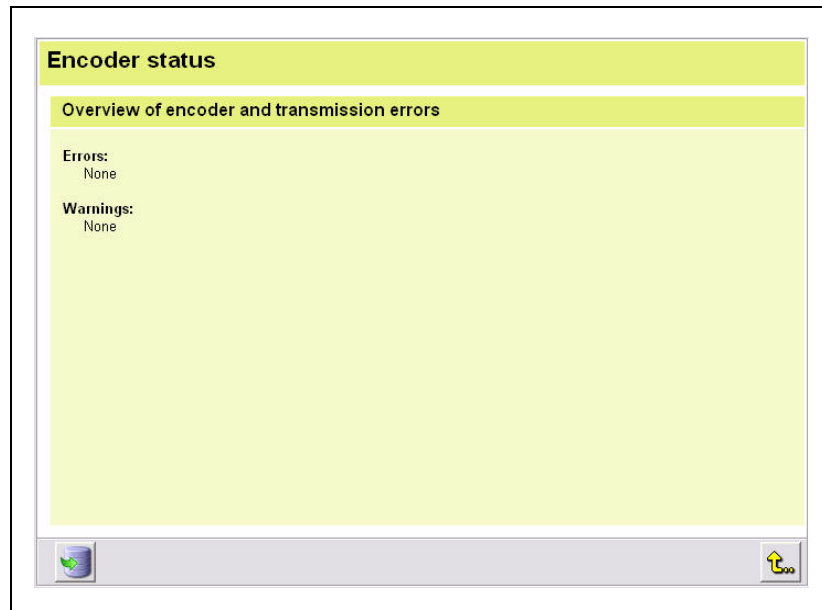
The power supply to the encoder is activated by pressing the "Next" key. This allows for convenient change of encoders (of the same ID number) in the series production of servo motors.



- ▶ Press the "Info" button to display the ID and SN of the encoder.
- ▶ The "Status" button displays errors and warnings.



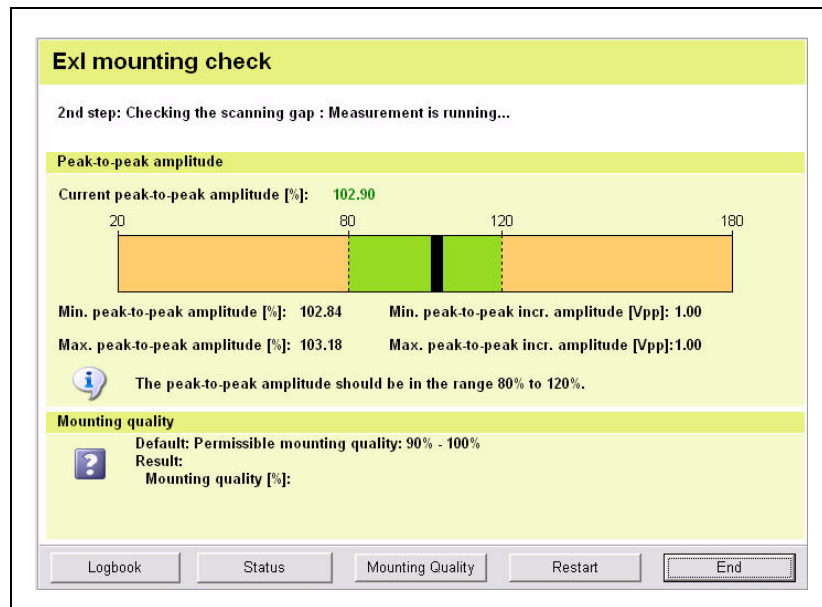
- ▶ Press the  button to clear errors and warnings.



- ▶ Click the "Next>" button to start the 2nd step: Checking the scanning gap

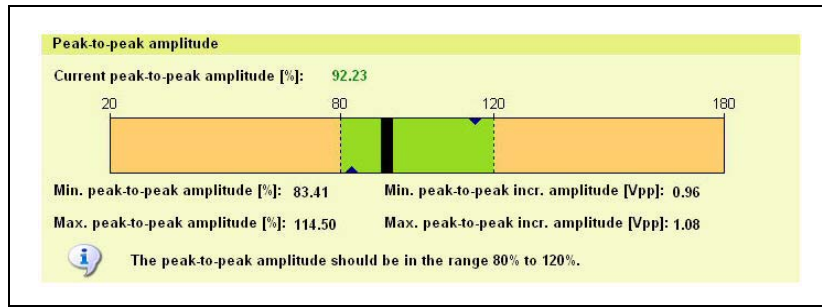
Step 2: Checking the scanning gap

The display shows the current signal amplitude at the actual angle position. The "Mounting quality" check is inactive.



To check the entire measuring range the encoder must cover 1 revolution (360°).

In the image below the drag indicators (2 arrows) for the min/max values are visible.



Explanation of the Peak-to-peak amplitude diagram

The green area represents the standard tolerance; the optimum area (green) is between 80 % and 120 %.

The two drag indicators mark the minimum and the maximum amplitude.

The value of the min/max signal amplitude [%] is displayed below (to the left) as well as the voltage [Vpp] of the min/max amplitude of the incremental signal (below the diagram, to the right).



Note

The signal amplitude is derived from and influenced by the scanning gap (air gap between rotor and stator).
The min/max signal amplitude of ExI encoders with EnDat interface and without incremental signals is not displayed.

Red figures indicate that the tolerance was exceeded. If the tolerance range is heavily exceeded, red double arrows are displayed.



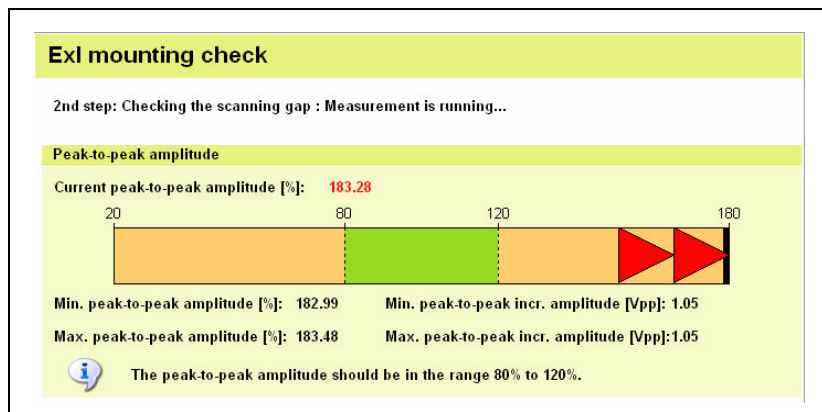
DANGER

When the red double arrows are displayed (e.g. 180 %), the encoder may be destroyed (no air gap between rotor and stator)!



Note

With display in red color the encoder is not functional.
Replace the motor or encoder, or correct the mounting!

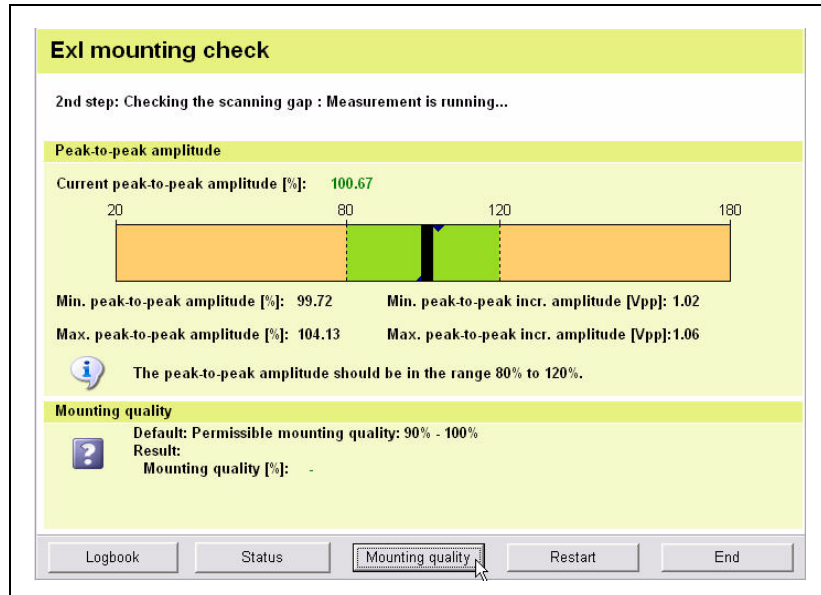


► Press the "Mounting quality" button to start the check.



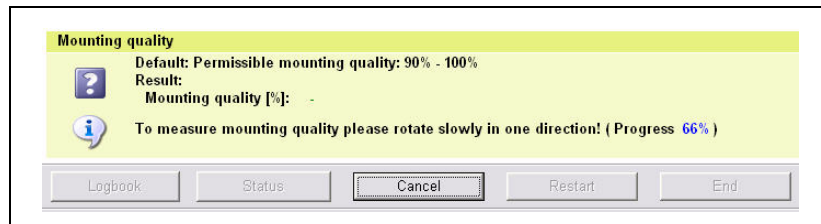
Note

During the "Mounting quality" check, the check of the "Peak to peak amplitude" is inactive.

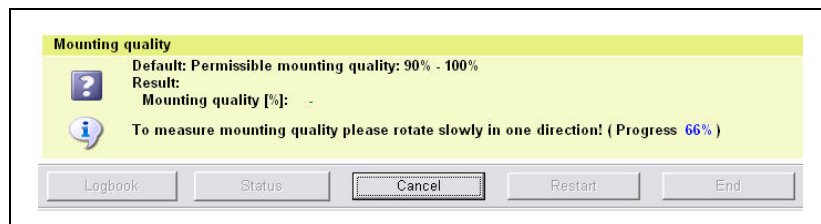


Explanation on mounting quality:

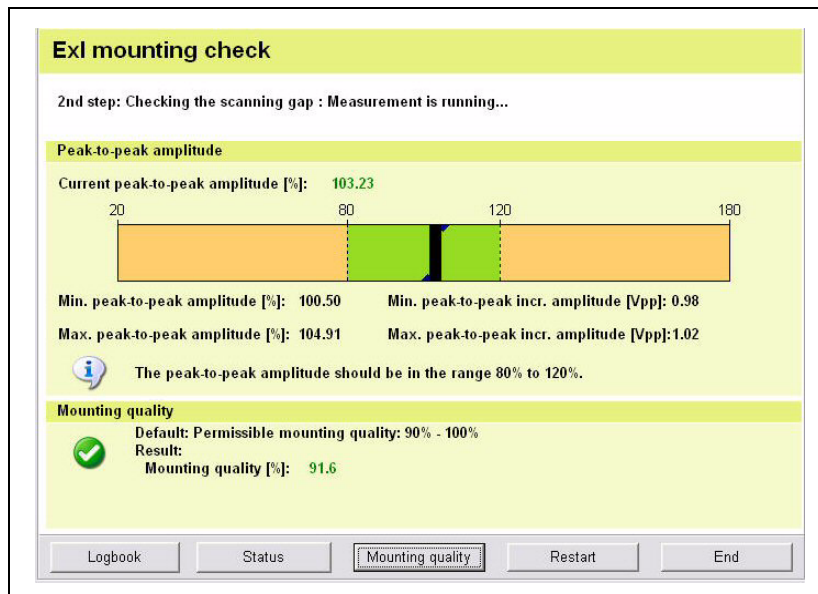
The mounting quality (numerical value) must be between 90 % and 100 %. Wobble and/or misalignment of the rotor may cause the tolerance to be exceeded. In this event check the mechanical mounting! For the measurement, slowly rotate the encoder by 360° in one direction. At the lower right of the display (blue figures) you can observe the progress in [%].



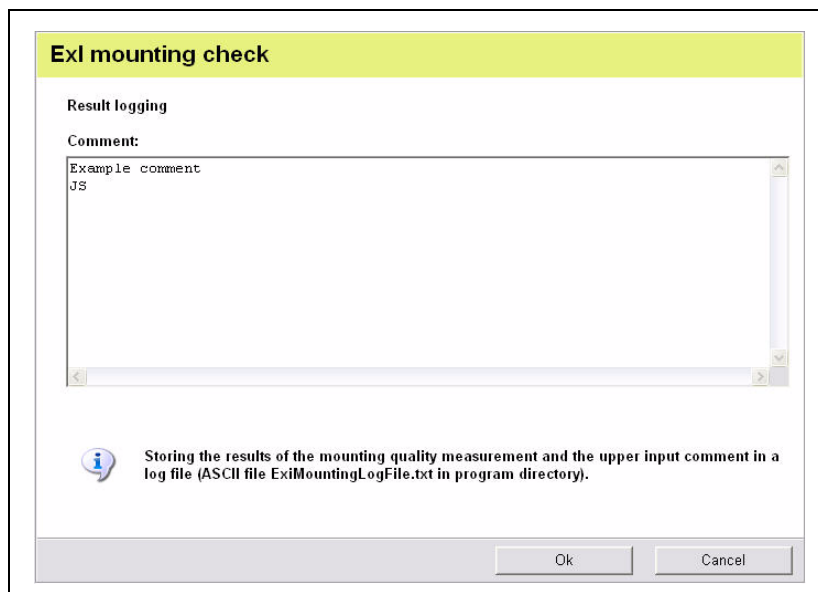
As soon as the progress display reaches 100 %, the mounting quality is displayed in [%].



The image below shows a good test result; all parameters are within the tolerance range.



- Click the "Logbook" button to save the results in the log together with a comment (for the memory location refer to Info, Display).



```

[24.06.2010 14:40:13]
Encoder SNR: 21825965
Encoder ID: 598412-02
Peak-to-peak amplitude:
- Limits:
  - Lower limit of mean value [%]: 80
  - Upper limit of mean value [%]: 120
- Result:
  - Minimum value [%]: 102.93
  - Current value [%]: 103.50
  - Maximum value [%]: 105.71
Mounting quality:
- Limits:
  - Lower limit [%]: 90
  - Upper limit [%]: 100
- Result:
  Mounting quality [%]: 96.0
Comment:
test
JS

```

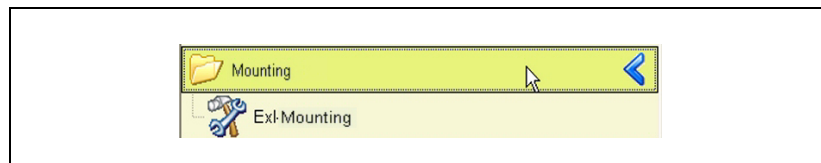
The ExI inspection is completed.

- ▶ Press the "Restart" button to check a further encoder of the same ID.
- ▶ Pressing "End" leads you to the ATS main menu, where you can select another check function.

3.7.2 ExI mounting function

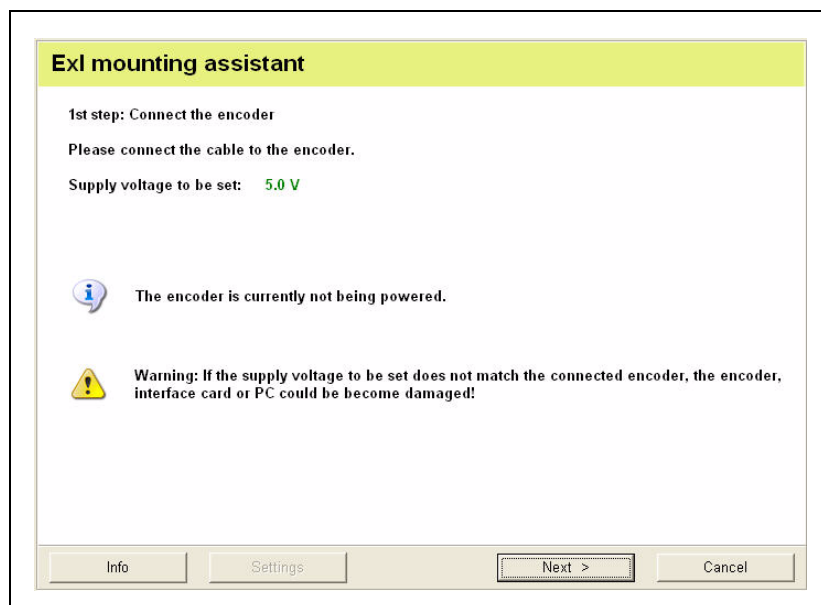
Step 1: Connecting the encoder

- ▶ Double-click "EXI Mounting" to call the ECI/EQI mounting wizard.

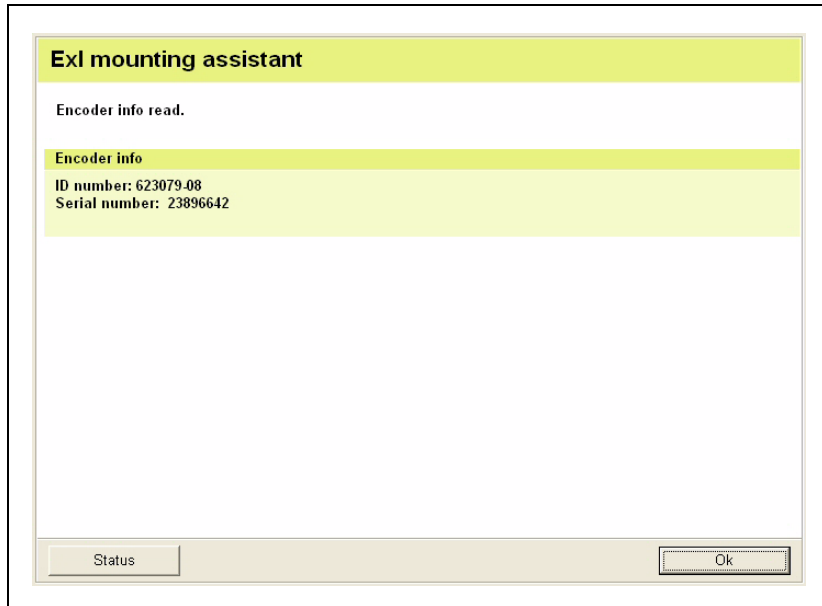


Note

The ECI/EQI mounting wizard activates the encoder power only after the "Next >" button was pressed.



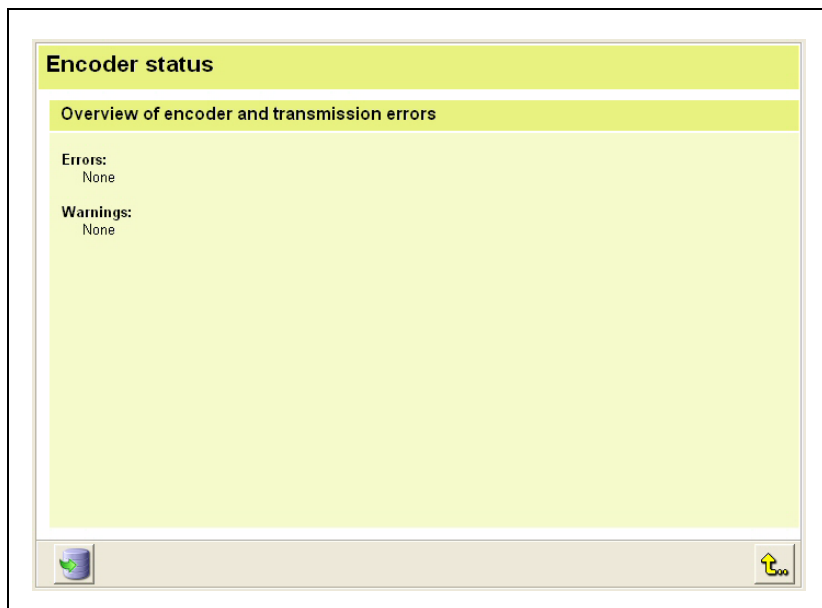
- ▶ When you click the "Info" button, the ID and the serial number of the encoder are displayed.



► Clicking "Status" displays the errors and warnings.



Reset errors and warnings.



Step 2: Adjusting the scanning gap

- ▶ After you have clicked the "Next" button in step 1 the window **2nd step: Adjusting the scanning gap** opens.

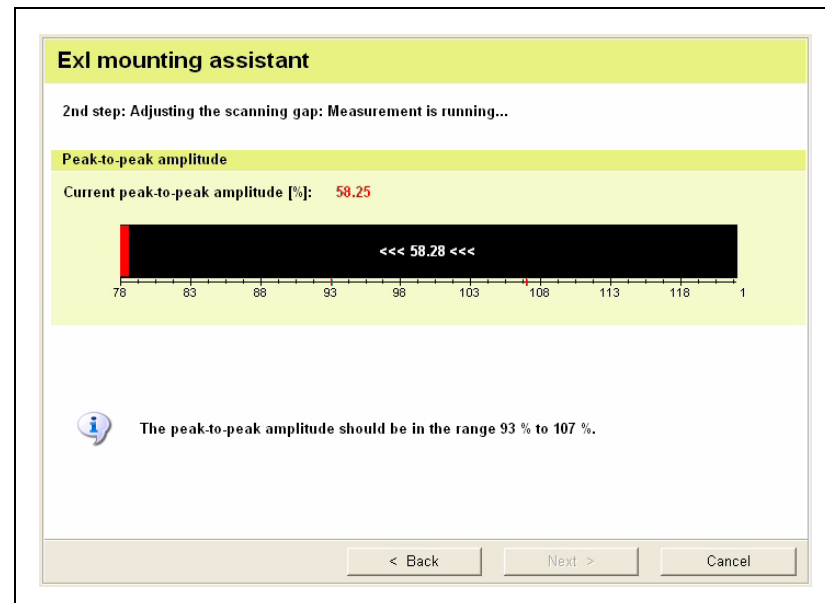
The graphics shows the signal amplitude in [%].

100% represents the optimum signal amplitude with optimum scanning gap. The tolerance limit is shown as red marking line in the scaling. A red bar means that the tolerance was exceeded, a green bar indicates that the signal amplitude is within the tolerances.



Note

This tolerance range may vary depending on the ID of the connected encoder. The tolerance range is the standard tolerance of the factory default setting of the ECI/EQI that is used for the HEIDENHAIN testing devices; also see "Attention" on page 89.

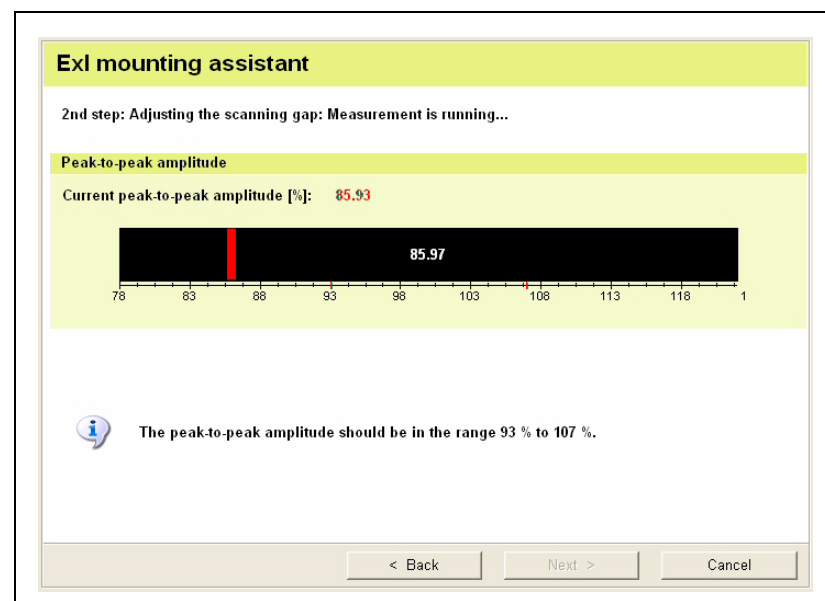


By adjusting the scanning gap mechanically (moving the graduated disk in axial direction) you must attempt to optimize the signal amplitude as closely as possible to 100 % in the tolerance range.

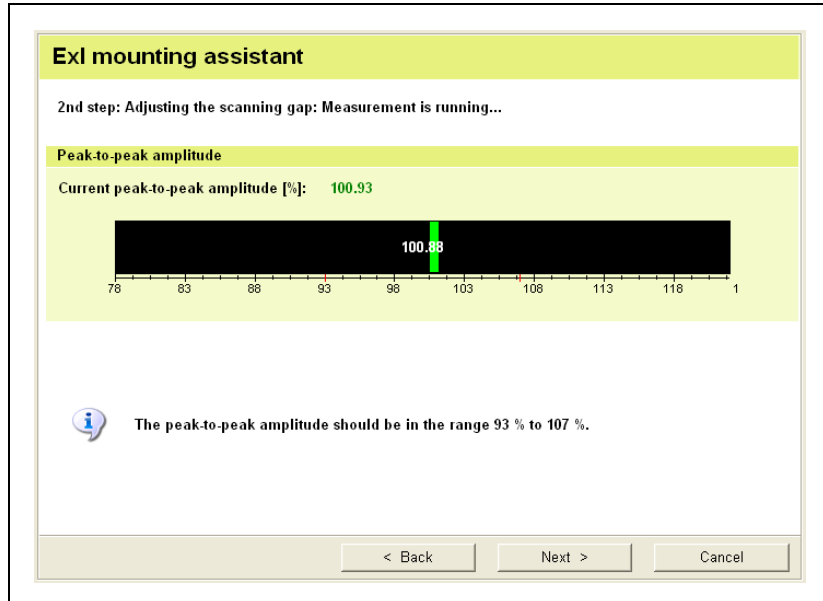


Note

Observe the product information and/or the mounting instructions of the ECI/EQI!



The tolerance range (between the red lines on the scale) must be reached to continue the program; otherwise the "Next" button will not be activated.
The example below shows an optimally adjusted encoder.

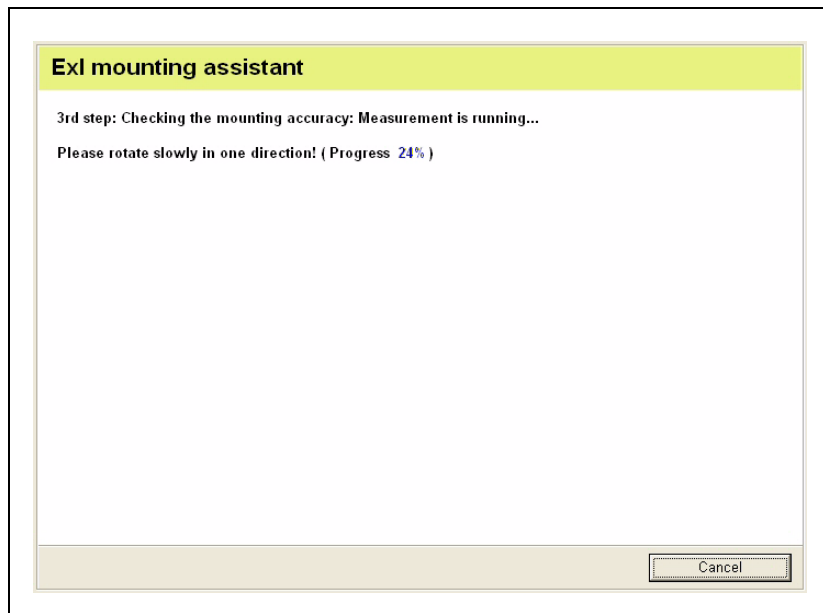


Note

A product key is required to expand the tolerance range; also see "Attention" on page 89.

Step 3: Checking the mounting accuracy

- ▶ Clicking the "Next" button leads you to **3rd step: Checking the mounting accuracy.**
- ▶ Slowly rotate the encoder shaft in one direction until "**Progress 100%**" is reached.



As soon as 100 % are reached, the display changes to **3rd step: Measurement of the mounting accuracy completed.**

The tolerance range must be reached to continue the program; otherwise the "Next" button will not be activated.



Note

Other display versions are possible (depending on the ECI/EQI model connected.)

Meaning of the symbols:



The tolerance range was observed.



The tolerance range was exceeded.

The image below shows a summary of the measuring results including the tolerance ranges.

Exl mounting assistant

3rd step: Measurement of the mounting accuracy completed!

Incremental signals 1Vpp

Results:

- Minimum: 0.958 Vpp
- Mean: 1.003 Vpp
- Maximum: 1.040 Vpp

Peak-to-peak amplitude

Default: Permissible mean peak-to-peak amplitude: 93% - 107%

Results:

- Minimum: 103.2%
- Mean: 104.5%
- Maximum: 105.9%

Mounting quality

Default: Permissible mounting quality: 90% - 100%

Result:

Mounting quality: 94.7%

The accuracy of mounting is OK.

Status Logbook < Back **Next >** Cancel

The image below shows the result, if the mounting accuracy was not observed. The "Next" button is replaced by "Restart" to force a repetition of the mounting accuracy check (step 1).

Exl mounting assistant

3rd step: Measurement of the mounting accuracy completed!

Incremental signals 1Vpp

Results:

- Minimum: 0.921 Vpp
- Mean: 0.983 Vpp
- Maximum: 1.039 Vpp

Peak-to-peak amplitude

Default: Permissible mean peak-to-peak amplitude: 93% - 107%

Results:

- Minimum: 90.4%
- Mean: 91.6% => **MOUNTING IS OUT-OF-LIMITS!**
- Maximum: 94.0%

Mounting quality

Default: Permissible mounting quality: 90% - 100%

Result:

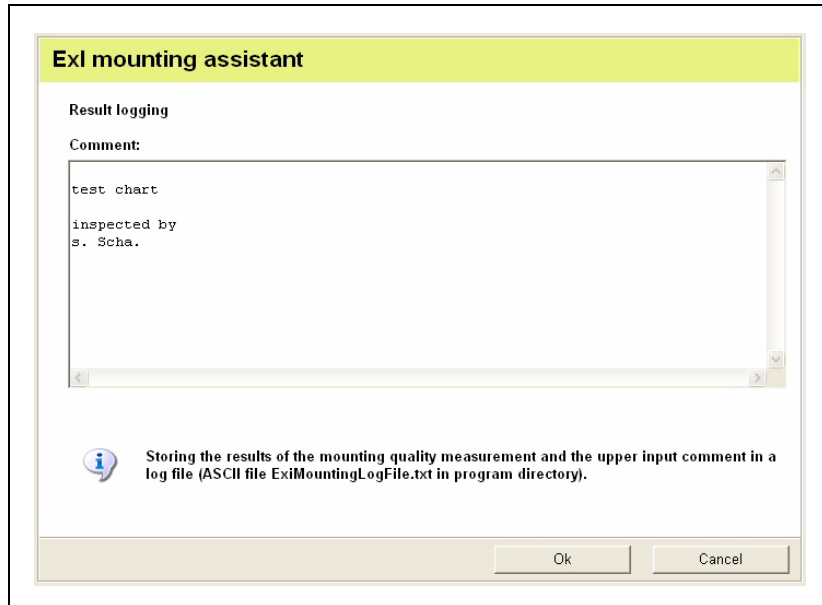
Mounting quality: 86.5% => **MOUNTING IS OUT-OF-LIMITS!**

The accuracy of mounting is out of limits. Please remount the encoder!

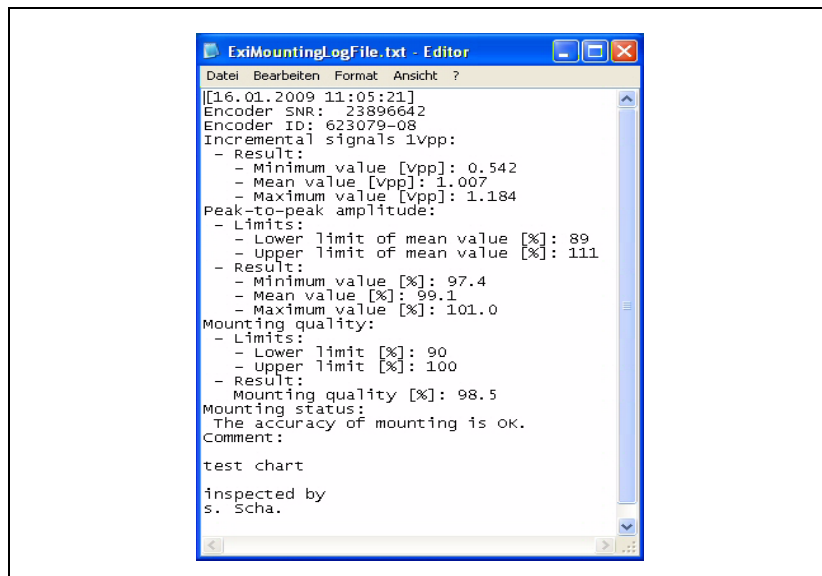
Status Logbook **Restart** End

Log entry

- ▶ Click the "Log" button to save the results in the log.
- ▶ In the log, click "OK" to save the file and the comment.



The text file will be saved in C:\Programs\HEIDENHAIN\ATS.
The file names are "ExiMountingLogFile.txt" and – for error messages – "ExiMountingErrorLogFile.txt".



Step 4: Adjusting the encoder position

- ▶ Clicking the "Next" button leads you to
4th step: Adjusting the encoder position: Measurement is running ...
With this function the encoder is aligned to the motor emf (motor commutation).



Note

To adjust the motor encoder of a synchronous motor, the rotor must be optimally positioned toward the stator. To make these settings (motor power supply and rotor alignment) further information is required.

Please contact the motor manufacturer for this purpose.

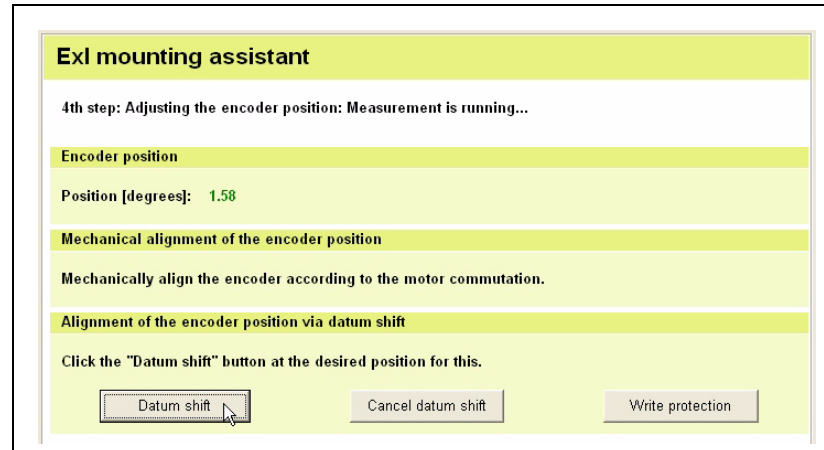
The software supports two alignment methods:

1. Mechanical alignment of the encoder position

- ▶ The encoder is aligned manually by rotating it in the motor mating seat. Use the "Position display" function to position the encoder.

2. Alignment of the encoder position via datum shift

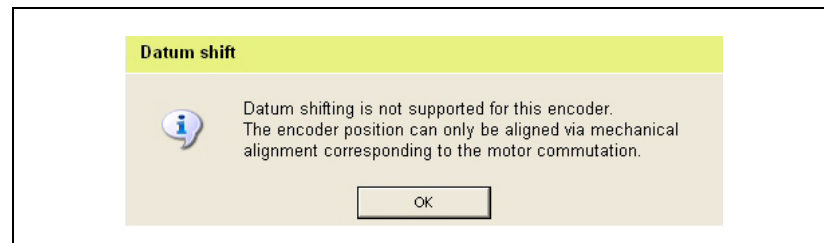
- ▶ Click the "Datum shift" button to program the datum at the current angular position.
- ▶ When you click the "Cancel datum shift" button the active datum shift is deleted and the encoder datum reset to the HEIDENHAIN factory default setting.



Note

Depending on the software configuration (product key required) buttons may be inactive!

If the ECI/EQI encoder does not support datum-shift programming (older encoder models), the message "Datum shift" is generated.

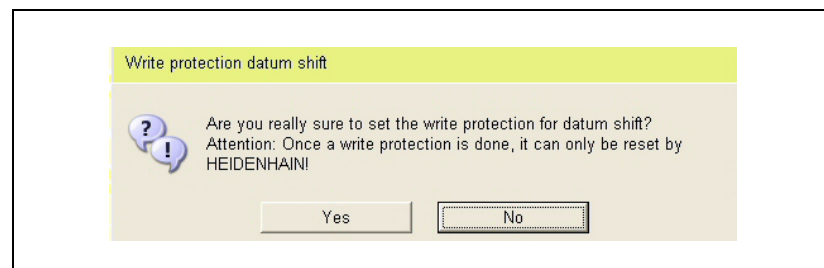


- ▶ Press "Write protection" to protect the datum shift from being overwritten.



Note

Once write-protection has been activated (by clicking the "Yes" button in the message window), it can only be rescinded by HEIDENHAIN.

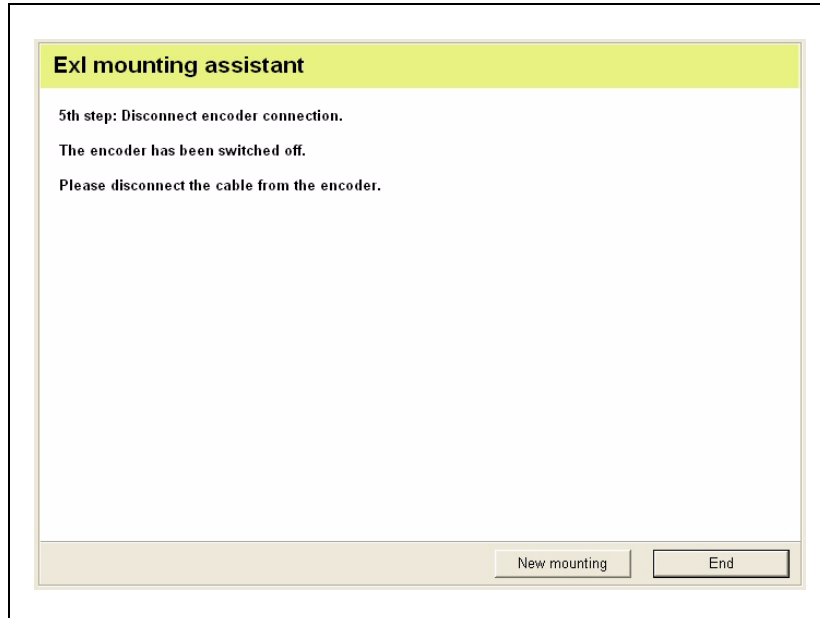


Step 5: Disconnect encoder connection

- ▶ Clicking the "Next" button leads you to **5th step: Disconnect encoder connection.**
The encoder power supply is switched off and may be disconnected.

Now, there are two possibilities:

- ▶ Clicking the "New mounting" button, takes you to the function ECI/EQI mounting, **1st step: Connecting the encoder**
- ▶ Clicking "End" directly opens the main menu.



3.8 LIC 4000 and LIP 200 Mounting Wizard



Note

The mounting wizards for LIC 4000 and LIP 200 are described in the mounting instructions of the encoders.

3.9 Supported Interfaces

3.9.1 SSI, SSI programmable

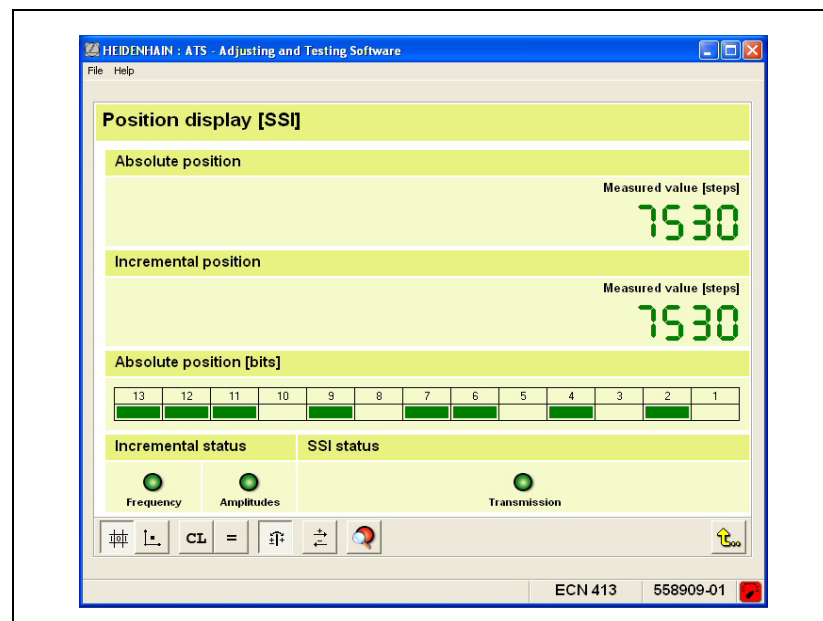
The software functions are basically those of the EnDat interfaces. The interface is unidirectional. Therefore, no functions are supported that write data into the encoder. (Resetting error messages, online diagnostics, datum shift, display of memory contents, etc. is not possible!)

Information in the status display:

Incremental status "Frequency" indicates that the input frequency of the incremental signal is exceeded.

Incremental status "Amplitudes" indicates that the amplitudes of the incremental signal are exceeded or underrun.

Incremental status "Transmission" indicates that data transfer is correct (CRC test).



Comparison of absolute and incremental values

Unlike with EnDat encoders, speed ranges or permissible tolerances are not displayed, since these are not available.

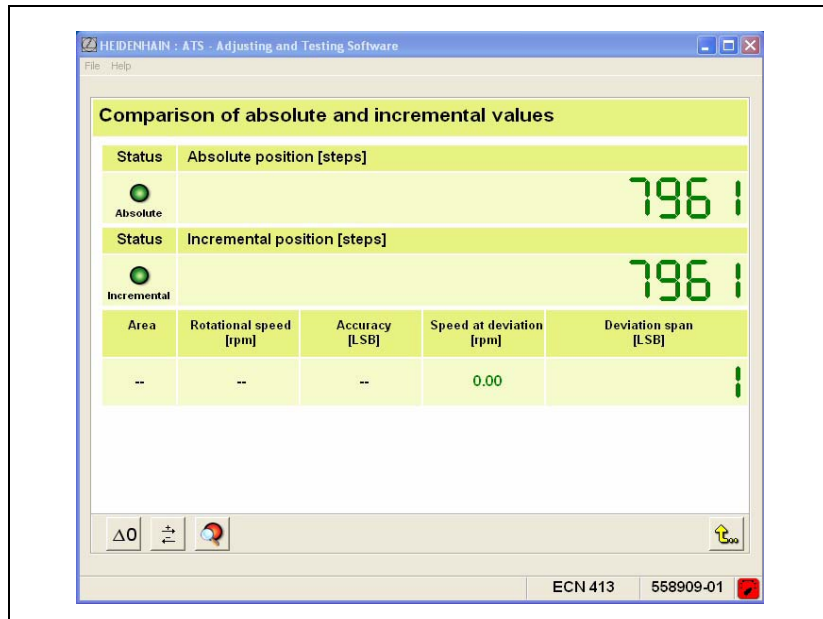
The deviation span is displayed in red color, if the difference of absolute and incremental position exceeds the absolute measuring steps per revolution. (Example: For a 13-bit encoder the display color changes to red as of 8192 LSB.)



The deviation span can be set to zero.



The counting direction can be changed.



3.9.2 FANUC and MITSUBISHI

The software functions are basically those of the EnDat interfaces.

FANUC and MITSUBISHI interfaces are purely serial interfaces; incremental signals are not transferred. The interfaces are unidirectional. Therefore, no functions are supported that write data into the encoder. (Resetting error messages, display of memory contents, etc. is not possible!)

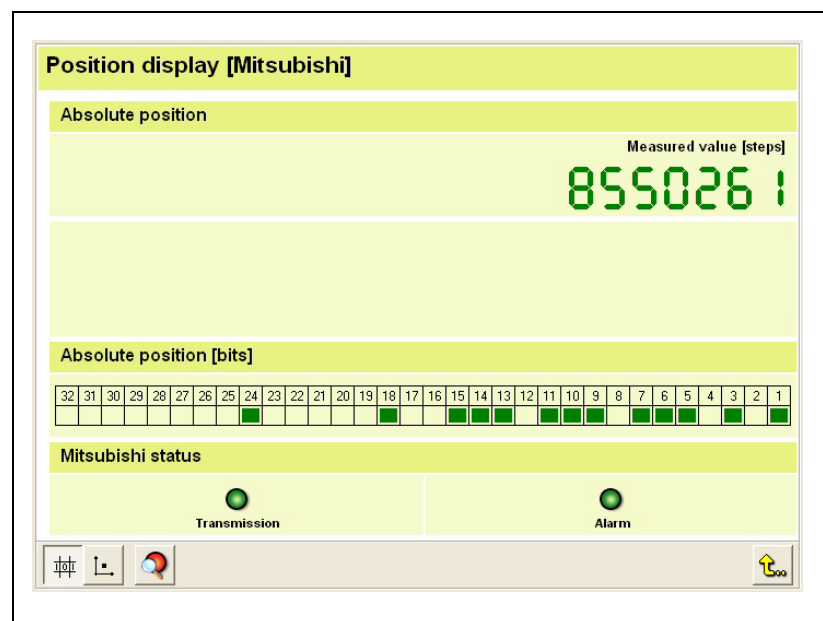
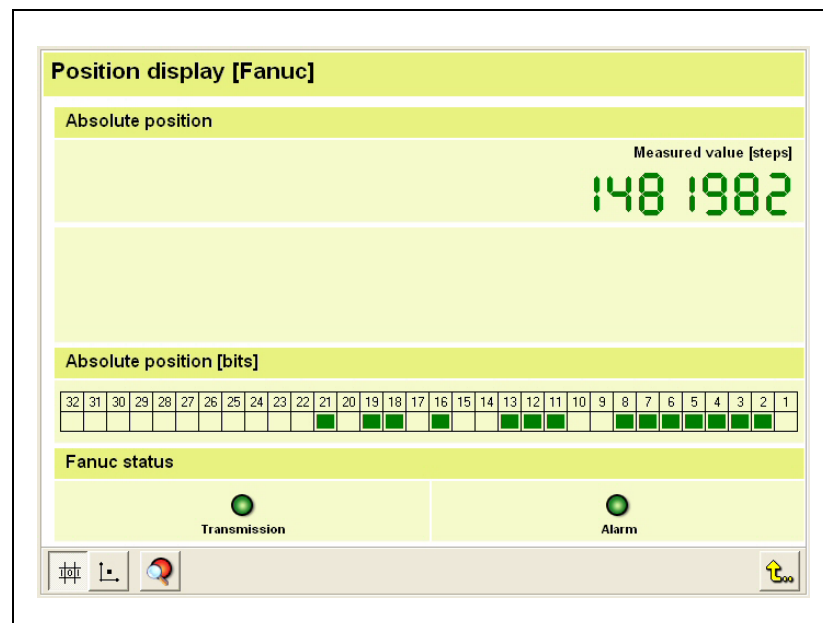
Examples of displays in the status line

FANUC/MITSUBISHI status "Transmission" indicates that data transfer is correct (CRC test).

FANUC/MITSUBISHI status "Alarm" is a group signal to indicate that one or several error messages are set in the encoder.

With the FANUC interface the status display can only be reset by switching the encoder off and on.

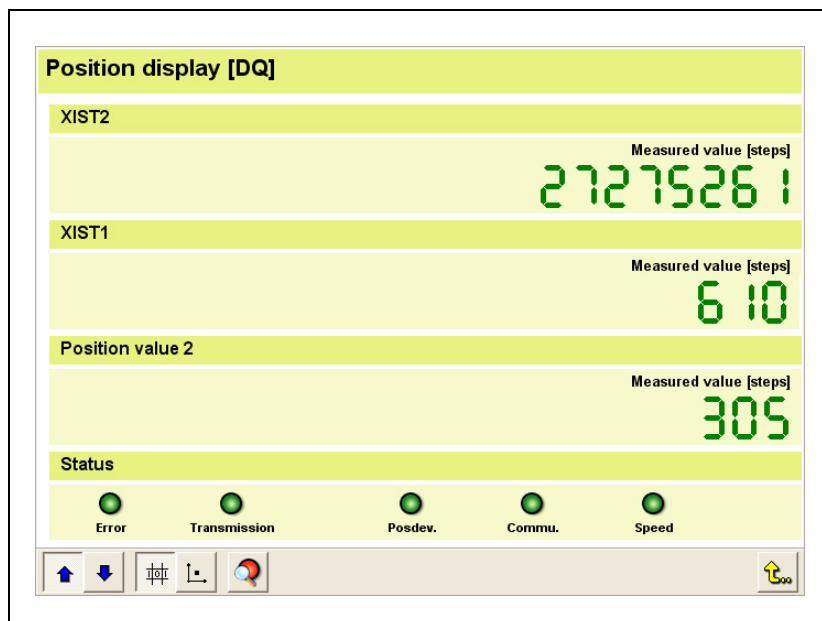
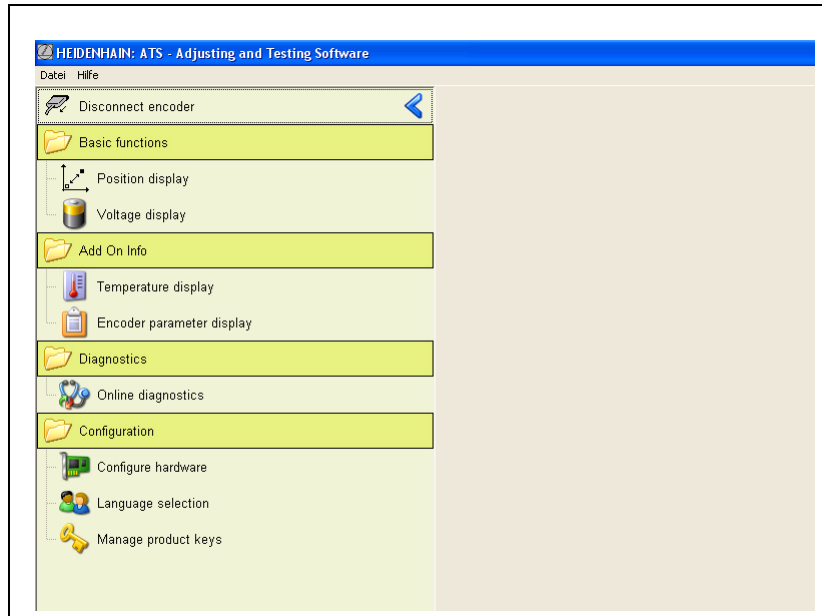
With MITSUBISHI the ATS delete symbol can be used for resetting.



3.9.3 DRIVE-CLiQ

DRIVE-CLiQ is the system interface of the Sinamics drive system by SIEMENS. For more information on DRIVE-CLiQ, please contact SIEMENS. DRIVE-CLiQ is a registered trademark of the SIEMENS AG.

The software functions are basically those of the EnDat interfaces. In the following, only the software functions and control elements are described that differ essentially from already described functions and elements. The DRIVE-CLiQ interface is a purely serial interface; incremental signals are not transferred.



Switching between position display screen and auxiliary information screen:



Display position screen



Display auxiliary information screen

The information transferred via DRIVE-CLiQ is defined in the PROFIdrive profile (available through the Profibus user organization.)

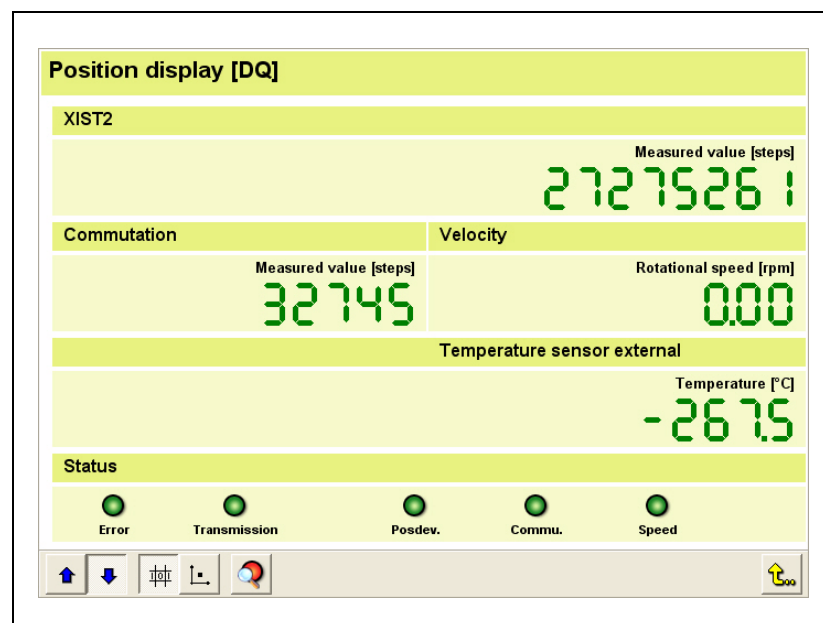
Displayed position values:

- XIST1: Incremental value (X actl.)
- XIST2: Absolute value (X actl.)
- Position value 2: Redundant position value of encoders that support 'Functional safety', or incremental position value for conversion EnDat 2.2 → DRIVE-CLiQ

Status information

- Error: Error message from connected encoder
- Transmission: Error in data transmission, e.g. CRC, packet loss, ...
- Pos. dev.: Position comparison of XIST1 with Pos2 of encoders supporting 'Functional safety'
- Commu. or Speed: The ATS software compares the values for the commutation angle or speed transferred from the encoder on the basis on XIST1.

Auxiliary information screen:



Commutation or Speed:

Encoders with a DRIVE-CLiQ interface compute these values in the encoder and then transfer them to the interface.

Temperature sensor external:

Display of the temperature of an external temperature sensor, if supported by the encoder. (An extremely low or high value indicates that no temperature sensor is connected.)



Display detailed status information:

Encoder status

Overview of encoder and transmission errors

Errors:
135 - Position error HISI

Fault value:
Bit 0 - Error 1
Bit 1 - Error 2
Bit 4 - Position error
Bit 18 - Singleturn Position1

Status word:
Bit 5 - XG1: Error Group 1
Bit 10 - CO: Commutation failed
Bit 11 - SO: Speed failed
Bit 12 - PO: Position failed
Bit 14 - AI: multiplexed alarm word

Safety status:
Bit12 (F1) oder Bit13 (F2)

Errors:

Several error groups are distinguished:

- Encoder error
- Software error
- Kernel error
- Safety error

Fault value:

Detailed informatin on the error. Not available for all error numbers.

Status word:

The encoder status is included in each cyclic telegram. Information on internal calculations (position, commutation, speed, etc.) are saved here.

Safety status:

Safety-related error messages

Display of encoder parameters

The most important parameters of the DRIVE-CLiQ interface are displayed. The information is distributed over several screens. Press the arrow keys to page through the screens.



Logistic information:

Encoder parameter display	
Logistic informations	
Identifier	Value
Node id	24.01.01.41.43.30.30.33.09.00.02.60
- Device type	Integrated encoder
- DSA ports	1
- Vendor	SIEMENS
- Version	65
- Serial number	C0030900038
- Index	Node number = 0
MLFB	6FX2001-5JE24-2DA0
FW version	34
ROM version	64

Node ID:

Terminal identification within the DRIVE-CLiQ drive system; worldwide unique number

Device type:

To specify the encoder type, e.g. integrated encoder, sealed encoder, EnDat 2.2 → DRIVE-CLiQ converter

DSA ports:

For HEIDENHAIN encoders, the entry value is "1" (single-ended module).

Vendor:

Manufacturer code

Version:

Version number of connected encoder

Serial number:

Serial number of connected encoder

Index:

Always assigned 0

MLFB:


Ordering designation of connected encoder

FW version / ROM version:

Version number


Encoder information

Encoder parameter display	
Encoder informations	
Identifier	Value
Signal periods per revolution	2048
Distinguishable revolutions	4096
Measuring steps per revolution	16777216
Functional safety	enabled



Display of the most important properties of the connected encoder
Example: Single-turn encoder

Encoder parameter display	
Encoder functionality	
Identifier	Value
Supported features (p12000)	649813



p12000:

This value identifies the supported functions and characteristics of the encoder.

Encoder parameter display	
Encoder configuration	
Identifier	Value
Configuration (p10101)	1049606

p10101:

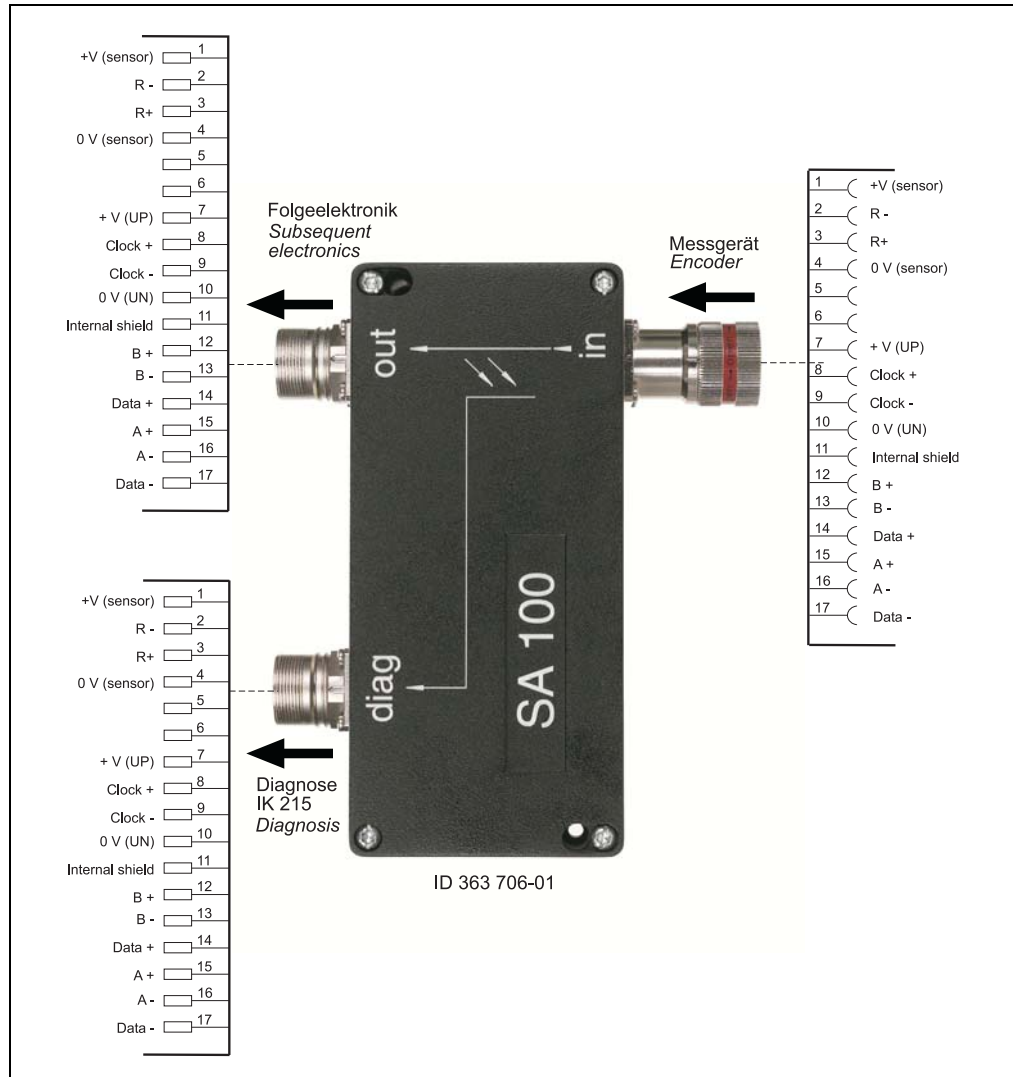
This parameter defines the most important properties of the encoder. With this parameter, the CU software detects, whether the connected encoder meets the expectations, i.e. matches the configuration.

4 Overview of Cables and Adapters

4.1 SA 100 Service Adapter (Online Diagnosis)

The SA 100 **S**ervice **A**dapter serves to connect the PWM 20 and the IK 215 into the measuring circuit of the machine axis ("closed loop").

Using the SA 100 allows for controlled traverse of the machine axis during measurement.



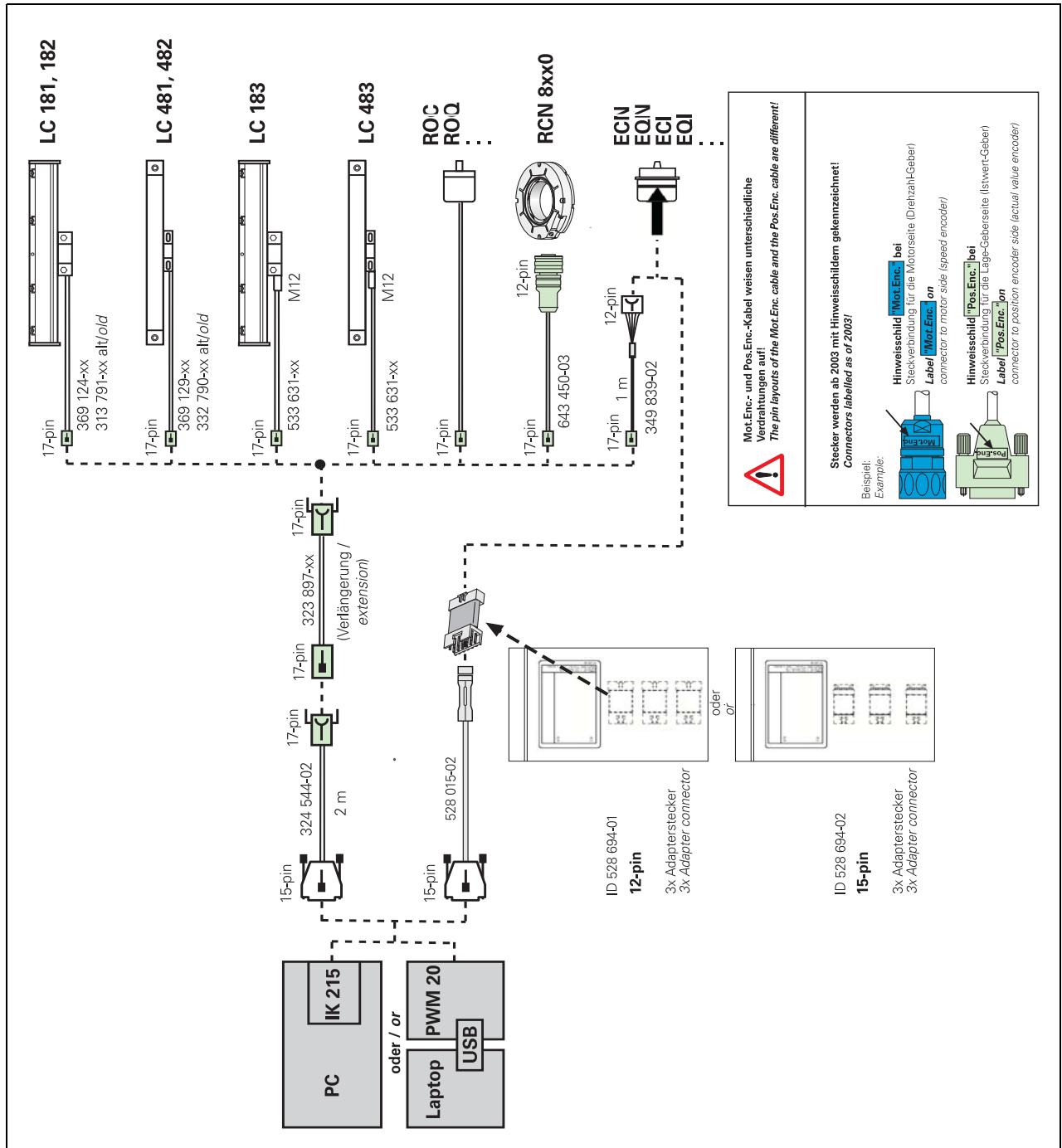
Note

Closed-loop operation with SA 100 is possible with the EnDat 02, 21 and 22, FANUC and MITSUBISHI interfaces. Moreover, the encoder and the control must support the diagnostic function.

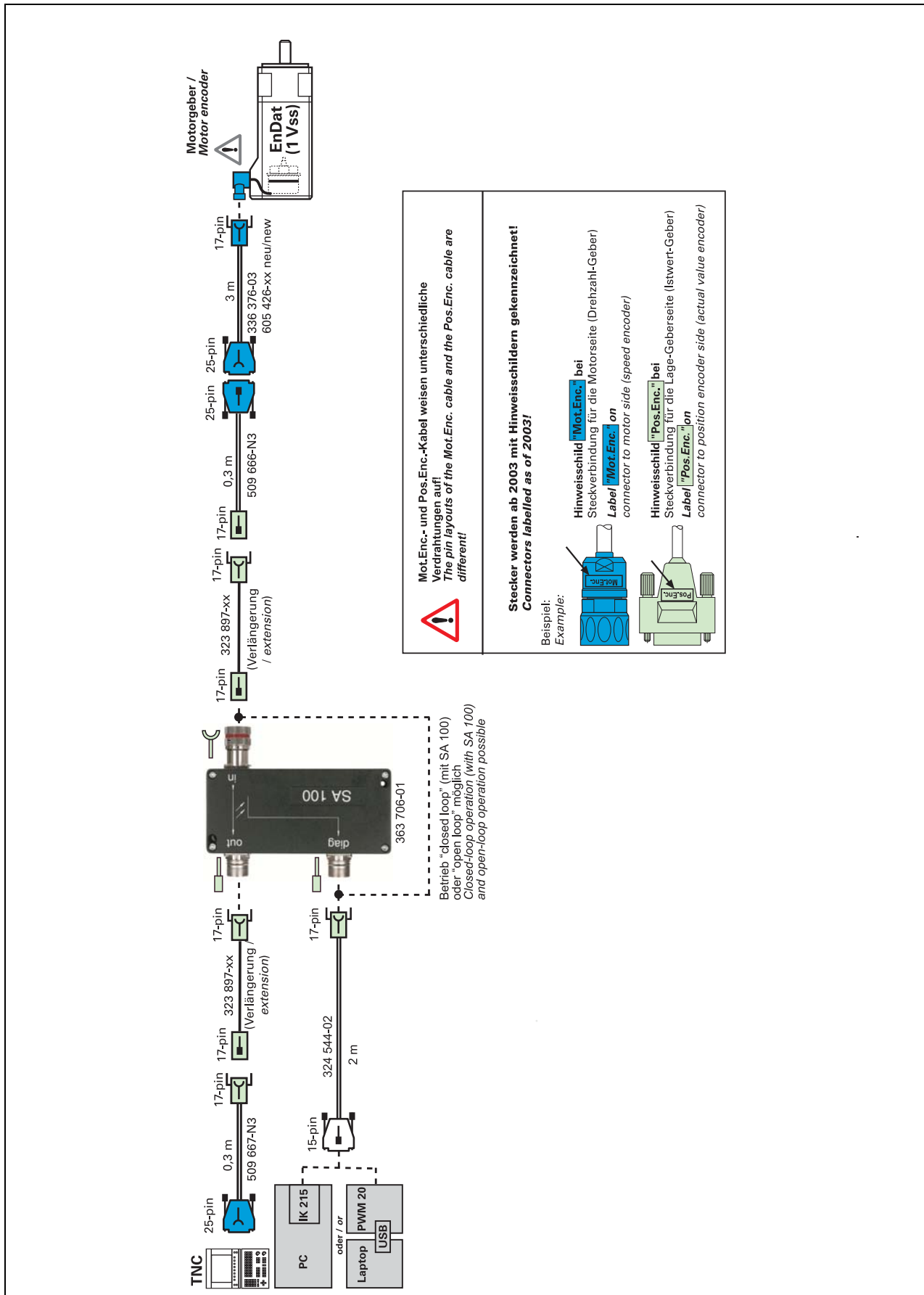
The data transfer can only be listened in (monitored)!

4.2 EnDat 2.1 / 2.2 with Incremental Signals

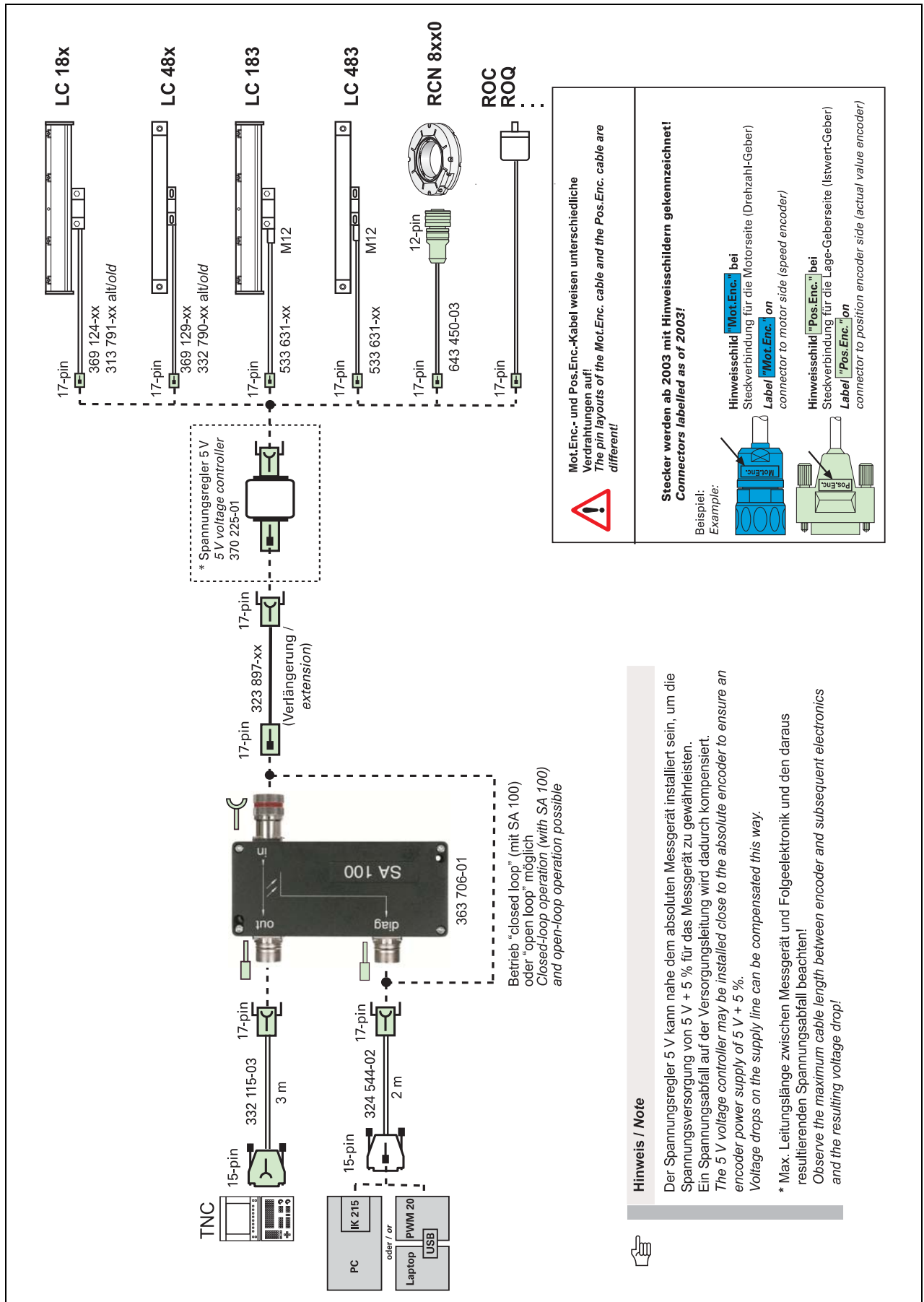
4.2.1 Measuring EnDat 2.1 interface signals without subsequent electronics



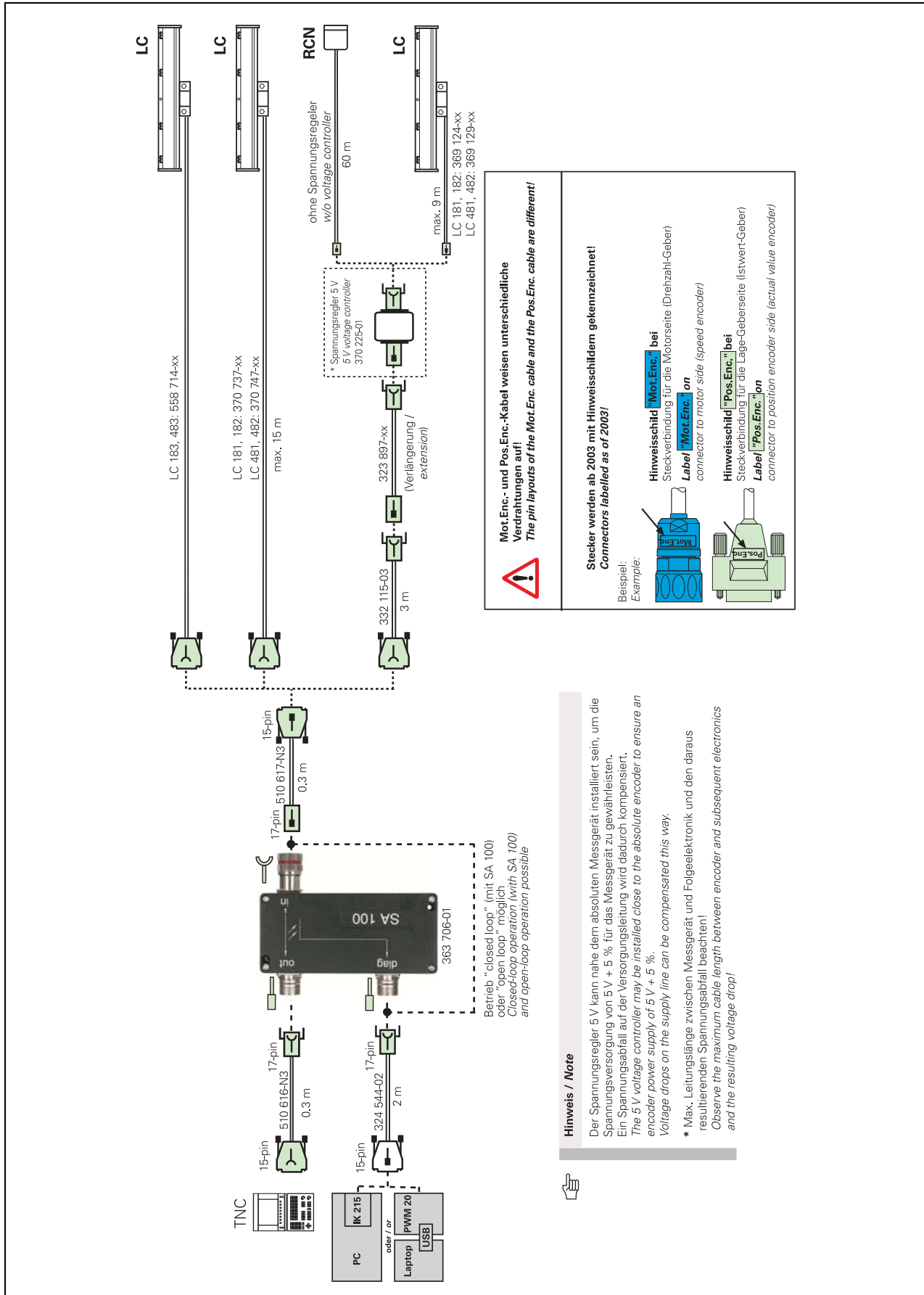
4.2.2 Connecting the PWM 20/IK 215 into an EnDat / SSI Mot.Enc. measuring circuit with 25-pin D-Sub connector



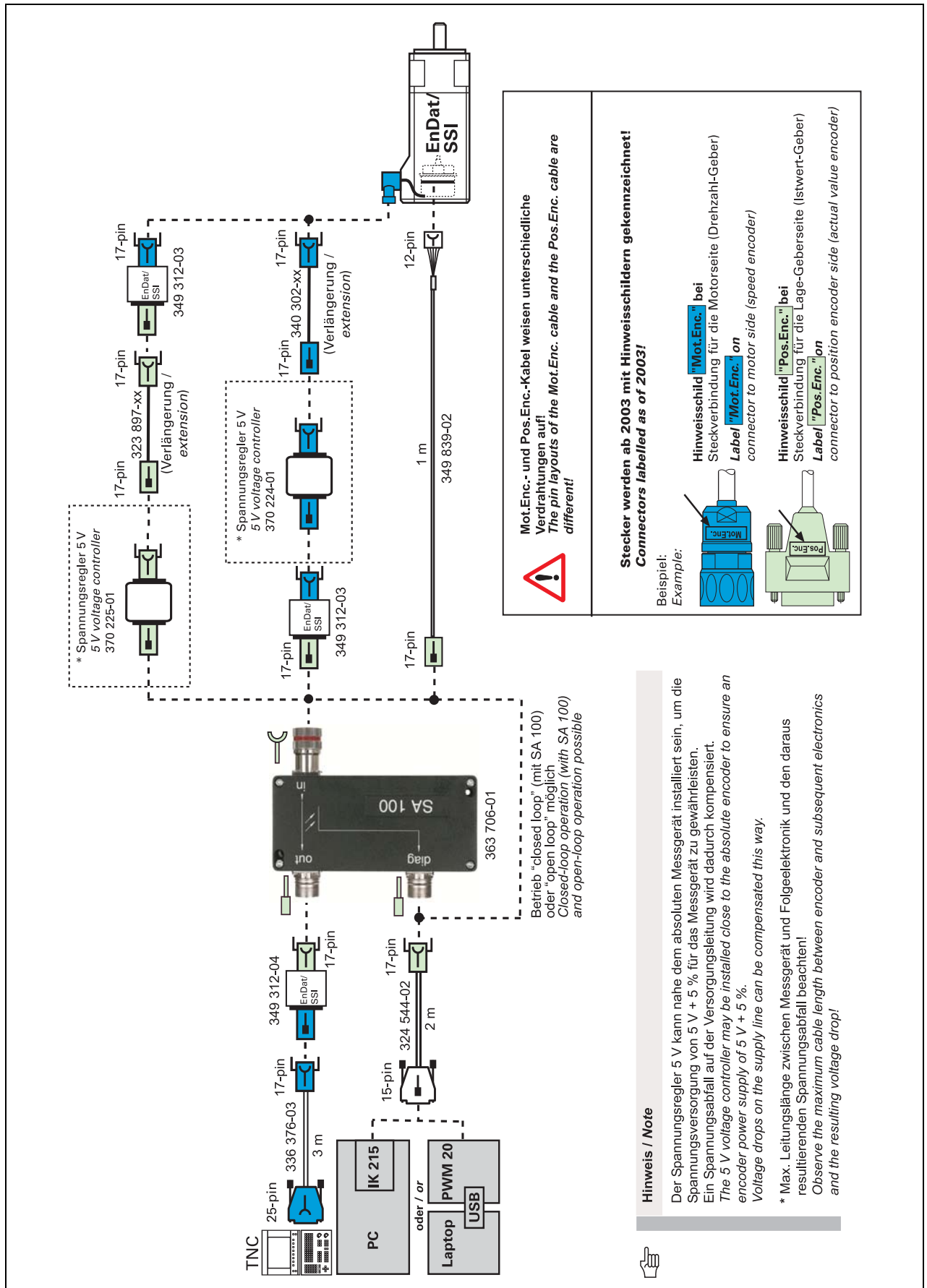
4.2.3 Connecting the PWM 20/IK 215 into an EnDat Pos.Enc. measuring circuit



4.2.4 Connecting the PWM 20/IK 215 into an EnDat Pos.Enc. measuring circuit (NC side) with 15-pin D-Sub connector



4.2.5 Connecting the PWM 20/IK 215 into an EnDat Mot.Enc. measuring circuit via an adapter connector



Mot.Enc.- und Pos.Enc.-Kabel weisen unterschiedliche Verdrahtungen auf!
The pin layouts of the Mot.Enc. cable and the Pos.Enc. cable are different!

Stecker werden ab 2003 mit Hinweisschildern gekennzeichnet!
Connectors labelled as of 2003!

Beispiel:
 Example:

Hinweisschild "Mot.Enc." bei
 Steckverbindung für die Motorseite (Drehzahl-Geber)
Label "Mot.Enc." on
 connector to motor side (speed encoder)

Hinweisschild "Pos.Enc." bei
 Steckverbindung für die Lage-Geberseite (Istwert-Geber)
Label "Pos.Enc." on
 connector to position encoder side (actual value encoder)

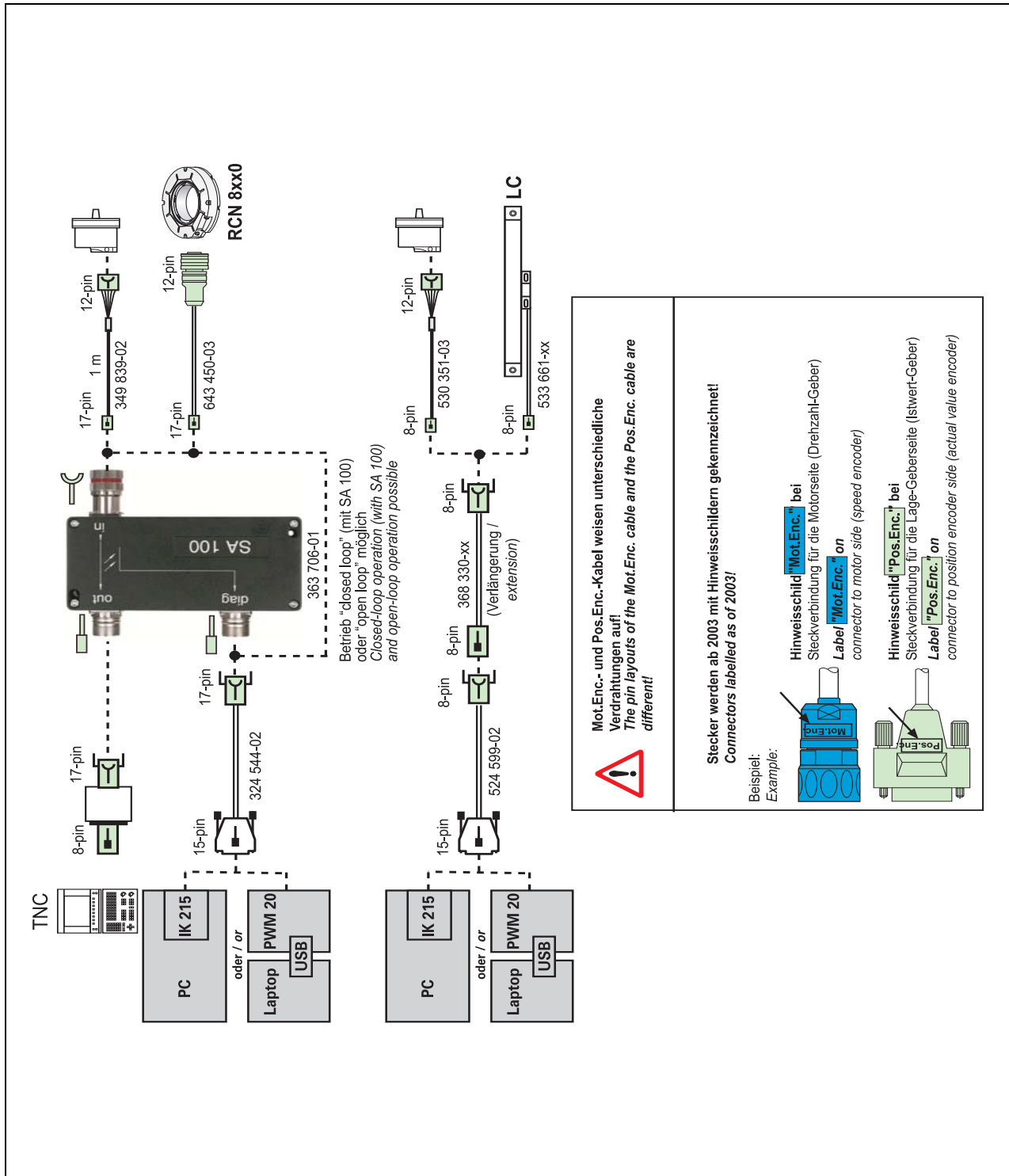
Hinweis / Note

Der Spannungsregler 5 V kann nahe dem absoluten Messgerät installiert sein, um die Spannungsversorgung von 5 V + 5 % für das Messgerät zu gewährleisten.
 Ein Spannungsabfall auf der Versorgungsleitung wird dadurch kompensiert.
 The 5 V voltage controller may be installed close to the absolute encoder to ensure an encoder power supply of 5 V + 5 %.
 Voltage drops on the supply line can be compensated this way.

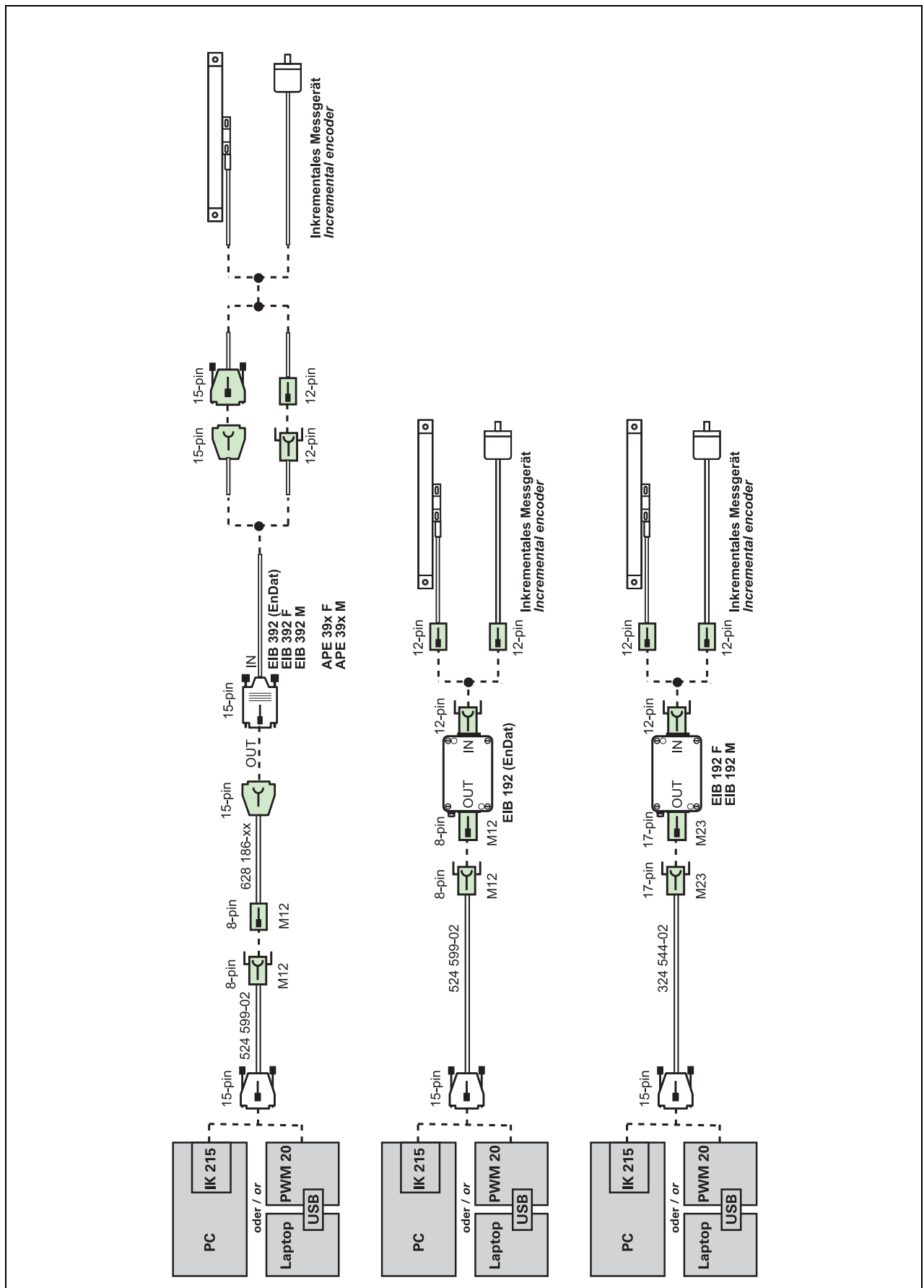
* Max. Leitungslänge zwischen Messgerät und Folgeelektronik und den daraus resultierenden Spannungsabfall beachten!
 Observe the maximum cable length between encoder and subsequent electronics and the resulting voltage drop!

4.3 EnDat 2.2

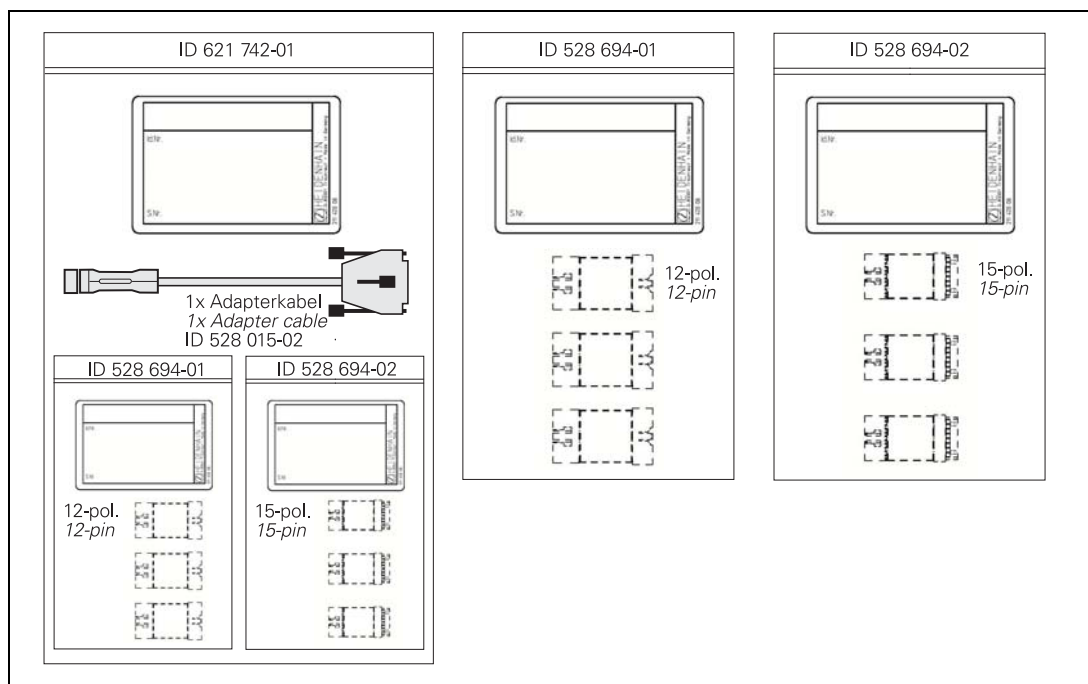
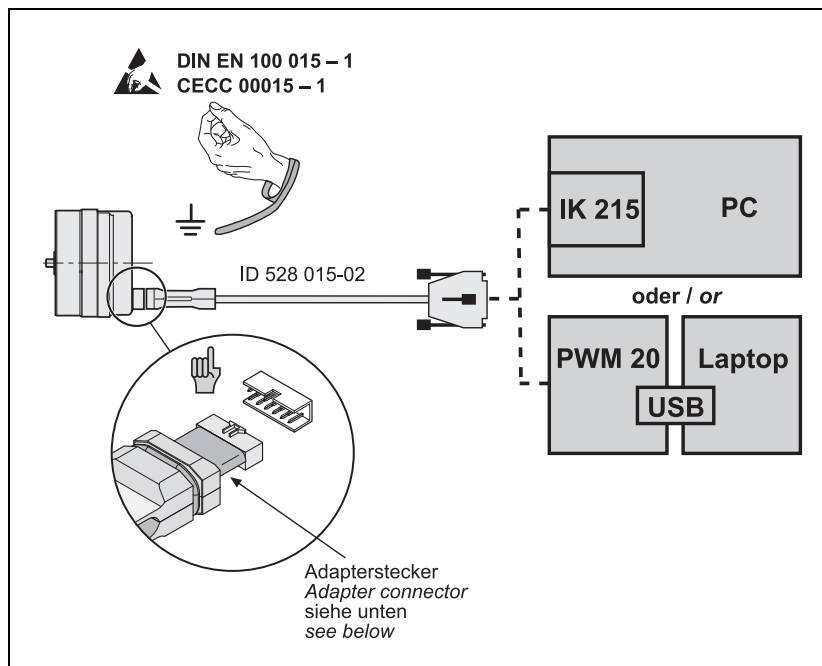
4.3.1 Cable adapter for EnDat 2.2. interface



4.3.2 Cable adapter for APE 3xx and EIB 1xx/3xx



4.4 Adapter Cable for Adjusting Exl 11xx/13xx



Set of 1 adapter cable,
3 adapter connectors (12-pin) and
3 adapter connectors (15-pin)

Set of 3 adapter connectors
(12-pin)

Set of 3 adapter connectors
(15-pin, new mini jacks)

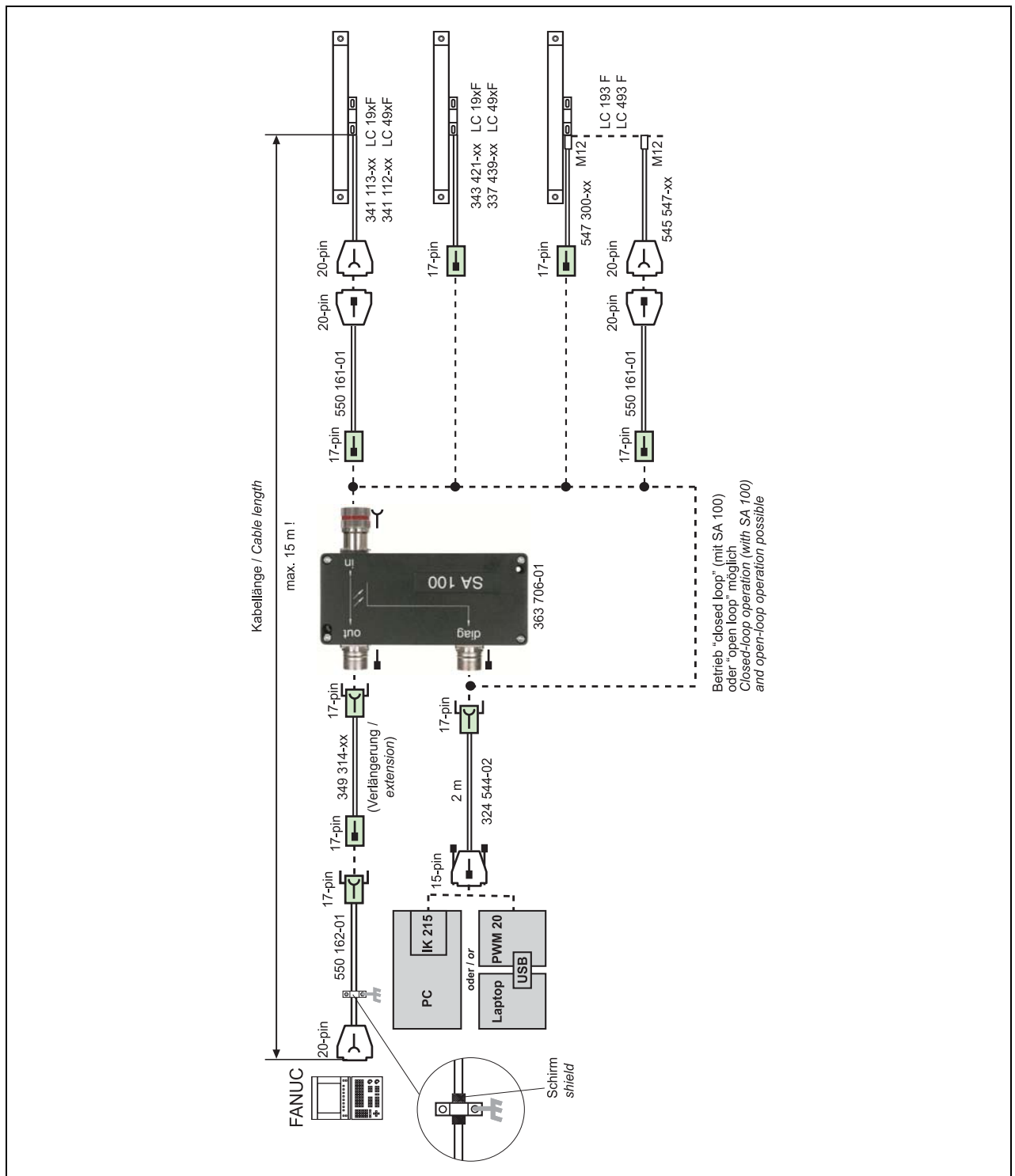


Note

To ensure good contact we recommend to replace the adapter insert after approx. 500 insertion/withdrawal cycles!
See HEIDENHAI Mounting Instructions: ID 526 838-xx (12-pin adapter) or ID 647 671-xx (15-pin adapter) "Encoder Cable Adapter for Installation of the Exl 11xx/13xx Inductive Rotary Encoder".

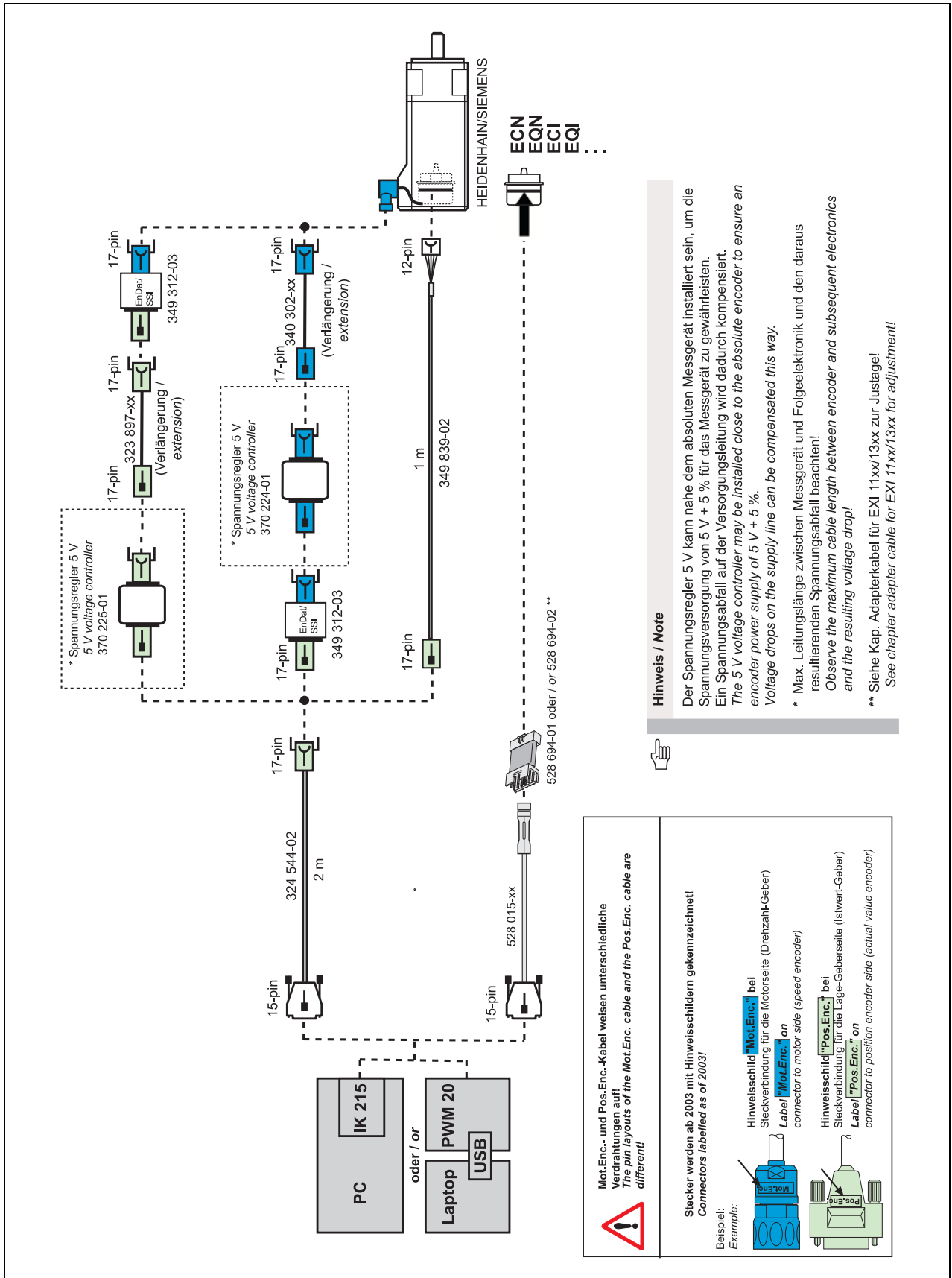
4.5 FANUC

4.5.1 Measuring the FANUC SERIAL interface signals



4.7 SSI

4.7.1 Connecting the PWM 20/IK 215 into an SSI Mot.Enc. measuring circuit via an adapter connector



5 Pin Layouts

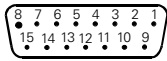

5.1 Pin Layout of PWM 20

The pin layout of PWM 20 is described in the PWM 20 instructions for installation/commissioning, ID 729905-xx (see PWM 20 basic kit).

5.2 Pin Layout of the IK 215

Connection of encoder X1

The encoder is connected to the encoder input X1. The layout of the 15-pin D-sub connector is as follows:

															
X1	Spannungsversorgung <i>Power Supply</i>					Inkrementalsignale <i>Incremental Signals</i>						Absolute Positionswerte <i>Absolute Position Values</i>			
	4	12	2	10	6	1	9	3	11	14	7	5	13	8	15
	Up	Sensor Up	0 V	Sensor 0 V	Innen- schirm <i>Internal Shield</i>	A+	A-	B+	B-	R+	R-	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$

Shield on housing; **Up** = power supply
Unused pins must not be assigned!



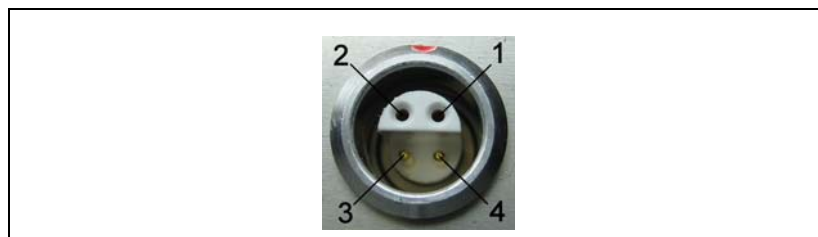
Attention

The power supply of the encoder (pin 4) can be selected by software. Care must be taken that the correct supply voltage is set at the encoder, since otherwise the encoder, the IK or the computer may be damaged! Connect or disconnect the encoders only while the power supply is switched off!


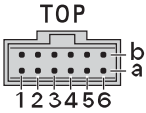

Connection for the external functions X3

For external functions, a 4-pin female connection is available through which the recording of measured values can be externally controlled. The required connector can be ordered from HEIDENHAIN under the ID 282 168-01. The signals are arranged as follows (view of the connection from outside):

Pin	Pin layout
1	Input: Latch pulse (HEIDENHAIN internal use)
2	Output: Synchronization pulse (HEIDENHAIN internal use)
3	Output: MSB of position value (singleturn), serves as mounting aid for EnDat motor encoders.
4	GND



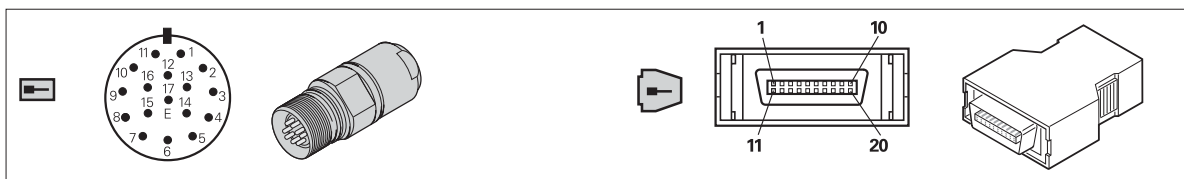
5.3 Pin Layout of PCB Connector of EnDat 2.2 Encoder to Subsequent Electronics



Adapterkabel EnDat 2.2 Id.Nr. 530 351-03 Adapter cable EnDat 2.2 Id.No. 530 351-03			
			
 TOP	Signal	Farbe color	
Platinenstecker 12-pol. 12-pin PCB connector			Stecker 8-pol. Stift 8-pin male connector
3a	UN (parallel geführte Versorgungsleitung) / UN (power supply line in parallel)	weiß/white	1
6a	UP (parallel geführte Versorgungsleitung) / UP (power supply line in parallel)	blau/blue	2
6b	DATA+	grau/grey	3
1a	DATA-	rosa/pink	4
4b	UN	weiß/grün white/green	5
5a	CLOCK-	gelb/yellow	6
2b	CLOCK+	violett/violet	7
1b	UP	braun/grün brown/green	8

5.4 Pin Layout of PCB Connector of Cable Adapter (12-/15-pin) D-sub (15-pin)

Kabeladapter Platinenstecker (12-/15-pol.) Sub-D (15-pol.) Adapter cable for PCB connector (12-/15-pin) D-sub (15-pin)				
Platinenstecker 12-/15-pol. Stift PCB connector 12-/15-pin male				Sub-D-Stecker 15-pol. 15-pin D-sub connector
12-pin	15-pin			
2a	1	A+	grün/schwarz green/black	1
4b	14	0 V	weiß/grün white/green	2
4a	3	B+	blau/schwarz blue/black	3
1b	13	Up	braun/grün brown/green	4
6b	7	DATA	grau grey	5
-	-	-	Innenschirm Internal shield	6
-	-	-	schwarz black	7
2b	9	CLOCK	violett violet	8
5b	2	A-	gelb/schwarz yellow/black	9
3a	12	0 V Sensor	weiß white	10
3b	4	B-	rot/schwarz red/black	11
6a	11	Up Sensor	blau blue	12
1a	8	DATA-	rosa pink	13
-	-	-	rot red	14
5a	10	CLOCK-	gelb yellow	15

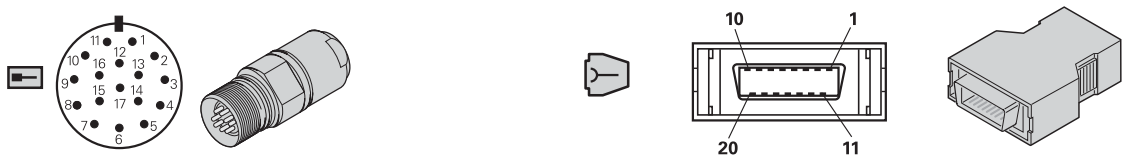
5.5 FANUC Pin Layout





	14	17	8	9	7	1	*)	10	4
	1	2	5	6	9	18/20	16	12	14
	DATA	DATA	Request	Request	5 V U_P	5 V sensor	Schirm Shield Blindage Schermo Blindaje	0 V U_N	0 V sensor
	grau gray gris grigio gris	rosa pink rose rosa rosa	violett violet violet viola violeta	gelb yellow jaune giallo amarillo	braun/grün brown/green brun/vert marrone/verde marron/verde	blau blue bleu azzurro azul		weiß/grün white/green blanc/vert bianco/verde blanco/verde	weiß white blanc bianco blanco

*) Außenschirm Gehäuse
 External shield on housing
 Blindage externe sur boîtier
 Schermo esterno sulla carcassa
 Blindaje externo a carcasa

5.6 MITSUBISHI Pin Layout



	14	17	8	9	7	1	10	4
	6	16	7	17	20	19	1	11
	DATA	DATA	Request Frame	Request Frame	5 V Up	5 V sensor	0 V U_N	0 V sensor
	grau gray gris grigio gris	rosa pink rose rosa rosa	violett violet violet viola violeta	gelb yellow jaune giallo amarillo	braun/grün brown/green brun/vert marrone/verde marron/verde	blau blue bleu azzurro azul	weiß/grün white/green blanc/vert bianco/verde blanco/verde	weiß white blanc bianco blanco

Außenschirm Gehäuse
External shield on housing
 Blindage externe sur le boîtier
Schermo esterno sulla carcassa
 Blindaje externo a carcasa

6 Contacts

Your HEIDENHAIN helpline

The **HEIDENHAIN helpline** in Traunreut consists of qualified, multi-lingual specialists who will support you in solving your problems.

Especially if you need **technical support** the HEIDENHAIN helpline team can provide detailed advice and information on measuring systems, controls, and NC and PLC programming.

The HEIDENHAIN technical helpline

Measuring Systems / Machine Calibration
+49 (8669) 31-3104
E-mail: service.ms-support@heidenhain.de

NC Programming
+49 (8669) 31-3103
E-mail: service.nc-pgm@heidenhain.de

NC Support
+49 (8669) 31-3101
E-mail: service.nc-support@heidenhain.de

PLC Programming for TNC
+49 (8669) 31-3102
E-mail: service-plc@heidenhain.de

Lathe Controls
+49 (8669) 31-3105
E-mail: service.lathe-support@heidenhain.de

The HEIDENHAIN helpline for repairs, spare parts, exchange units, complaints and service contracts

Domestic Team
+49 (8669) 31-3121

Foreign Team
+49 (8669) 31-3123

Complaint management, service contracts and calibration services
+49 (8669) 31-3135

E-mail: service.order@heidenhain.de

Technical training

+49 (8669) 31-2293, 31-1695
Fax: +49 (8669) 31-1999
E-mail: mtt@heidenhain.de

HEIDENHAIN

DR. JOHANNES HEIDENHAIN GmbH

Dr.-Johannes-Heidenhain-Straße 5

83301 Traunreut, Germany

☎ +49 8669 31-0

FAX +49 8669 5061

E-mail: info@heidenhain.de

www.heidenhain.de

Vollständige und weitere Adressen siehe www.heidenhain.de
For complete and further addresses see www.heidenhain.de

DE	HEIDENHAIN Technisches Büro Nord 12681 Berlin, Deutschland ☎ 030 54705-240	ES	FARRESA ELECTRONICA S.A. 08028 Barcelona, Spain www.farresa.es	PH	Machinebanks` Corporation Quezon City, Philippines 1113 E-mail: info@machinebanks.com
	HEIDENHAIN Technisches Büro Mitte 08468 Heinsdorfergrund, Deutschland ☎ 03765 69544	FI	HEIDENHAIN Scandinavia AB 02770 Espoo, Finland www.heidenhain.fi	PL	APS 02-489 Warszawa, Poland www.apservis.com.pl
	HEIDENHAIN Technisches Büro West 44379 Dortmund, Deutschland ☎ 0231 618083-0	FR	HEIDENHAIN FRANCE sarl 92310 Sèvres, France www.heidenhain.fr	PT	FARRESA ELECTRÓNICA, LDA. 4470 - 177 Maia, Portugal www.farresa.pt
	HEIDENHAIN Technisches Büro Südwest 70771 Leinfelden-Echterdingen, Deutschland ☎ 0711 993395-0	GB	HEIDENHAIN (G.B.) Limited Burgess Hill RH15 9RD, United Kingdom www.heidenhain.co.uk	RO	HEIDENHAIN Reprezentantă Romania Braşov, 500338, Romania www.heidenhain.ro
	HEIDENHAIN Technisches Büro Südost 83301 Traunreut, Deutschland ☎ 08669 31-1345	GR	MB Milionis Vassilis 17341 Athens, Greece www.heidenhain.gr	RS	Serbia → BG
		HK	HEIDENHAIN LTD Kowloon, Hong Kong E-mail: sales@heidenhain.com.hk	RU	OOO HEIDENHAIN 125315 Moscow, Russia www.heidenhain.ru
AR	NAKASE SRL. B1653AOX Villa Ballester, Argentina www.heidenhain.com.ar	HR	Croatia → SL	SE	HEIDENHAIN Scandinavia AB 12739 Skärholmen, Sweden www.heidenhain.se
AT	HEIDENHAIN Techn. Büro Österreich 83301 Traunreut, Germany www.heidenhain.de	HU	HEIDENHAIN Kereskedelmi Képviselet 1239 Budapest, Hungary www.heidenhain.hu	SG	HEIDENHAIN PACIFIC PTE LTD. Singapore 408593 www.heidenhain.com.sg
AU	FCR Motion Technology Pty. Ltd Laverton North 3026, Australia E-mail: vicsales@fcrmotion.com	ID	PT Servitama Era Toolsindo Jakarta 13930, Indonesia E-mail: ptset@group.gts.co.id	SK	KOPRETINA TN s.r.o. 91101 Trenčín, Slovakia www.kopretina.sk
BA	Bosnia and Herzegovina → SL	IL	NEUMO VARGUS MARKETING LTD. Tel Aviv 61570, Israel E-mail: neumo@neumo-vargus.co.il	SL	Posredništvo HEIDENHAIN NAVO d.o.o. 2000 Maribor, Slovenia www.heidenhain-hubl.si
BE	HEIDENHAIN NV/SA 1760 Roosdaal, Belgium www.heidenhain.be	IN	HEIDENHAIN Optics & Electronics India Private Limited Chetpet, Chennai 600 031, India www.heidenhain.in	TH	HEIDENHAIN (THAILAND) LTD Bangkok 10250, Thailand www.heidenhain.co.th
BG	ESD Bulgaria Ltd. Sofia 1172, Bulgaria www.esd.bg	IT	HEIDENHAIN ITALIANA S.r.l. 20128 Milano, Italy www.heidenhain.it	TR	T&M Mühendislik San. ve Tic. LTD. ŞTİ. 34728 Ümraniye-Istanbul, Turkey www.heidenhain.com.tr
BR	DIADUR Indústria e Comércio Ltda. 04763-070 – São Paulo – SP, Brazil www.heidenhain.com.br	JP	HEIDENHAIN K.K. Tokyo 102-0083, Japan www.heidenhain.co.jp	TW	HEIDENHAIN Co., Ltd. Taichung 40768, Taiwan R.O.C. www.heidenhain.com.tw
BY	Belarus GERTNER Service GmbH 50354 Huert, Germany www.gertner.biz	KR	HEIDENHAIN Korea LTD. Gasam-Dong, Seoul, Korea 153-782 www.heidenhain.co.kr	UA	Gertner Service GmbH Büro Kiev 01133 Kiev, Ukraine www.gertner.biz
CA	HEIDENHAIN CORPORATION Mississauga, Ontario L5T2N2, Canada www.heidenhain.com	ME	Montenegro → SL	US	HEIDENHAIN CORPORATION Schaumburg, IL 60173-5337, USA www.heidenhain.com
CH	HEIDENHAIN (SCHWEIZ) AG 8603 Schwerzenbach, Switzerland www.heidenhain.ch	MK	Macedonia → BG	VE	Maquinaria Diekmann S.A. Caracas, 1040-A, Venezuela E-mail: purchase@diekmann.com.ve
CN	DR. JOHANNES HEIDENHAIN (CHINA) Co., Ltd. Beijing 101312, China www.heidenhain.com.cn	MX	HEIDENHAIN CORPORATION MEXICO 20235 Aguascalientes, Ags., Mexico E-mail: info@heidenhain.com	VN	AMS Co. Ltd HCM City, Vietnam E-mail: davidgoh@amsvn.com
CZ	HEIDENHAIN s.r.o. 102 00 Praha 10, Czech Republic www.heidenhain.cz	MY	ISOSERVE Sdn. Bhd 56100 Kuala Lumpur, Malaysia E-mail: isoserve@po.jaring.my	ZA	MAFEMA SALES SERVICES C.C. Midrand 1685, South Africa www.heidenhain.co.za
DK	TPTEKNIK A/S 2670 Greve, Denmark www.tp-gruppen.dk	NL	HEIDENHAIN NEDERLAND B.V. 6716 BM Ede, Netherlands www.heidenhain.nl		
		NO	HEIDENHAIN Scandinavia AB 7300 Orkanger, Norway www.heidenhain.no		

