

HEIDENHAIN



Adjusting and Testing Software (ATS)

User's Manual

PWM 20, PWM 21 Software ID 539862-xx Version 3.8.xx

English (en) 03/2024

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Fundamentals

1.1 Overview

This chapter contains information about the product and this manual.

1.2 Information on the product

The Adjusting and Testing Software (ATS is a component of an encoder diagnostic set. In combination with the testing and inspection devices of the PWM series, the Adjusting and Testing Software assists during mounting, functional checks and error diagnosis of HEIDENHAIN encoders. For this purpose, the Adjusting and Testing Software is installed on a computer and connected to the PWM.

Further information: "Overview of functions", Page 33

The Adjusting and Testing Software features an encoder database. The encoder database contains all ID numbers and variants of the encoders that existed when the software was released.

New versions of the Adjusting and Testing Software with up-to-date database are made available at regular intervals. You find the current software version in the download area at the HEIDENHAIN website.

Further information: "Updating software and encoder database", Page 40

1.3 Software options

Software options are available to increase the range of functions of the Adjusting and Testing Software. You can enable software options in the Adjusting and Testing Software by entering a license key.

Further information: "Enabling software options", Page 51

1.4 Validity of the documentation

This User's Manual is valid for version 3.8.xx of the Adjusting and Testing Software.

 Before using the documentation, make sure that the documentation and software version match.

Further information: "Viewing software information", Page 45Further information: "Updating software and encoder database", Page 40

1.5 Hardware compatibility

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The Adjusting and Testing Software is compatible with the following hardware:

Hardware	ID
PWM 20	731626-01
PWM 21	1200635-01

Special versions of the Adjusting and Testing Software and the associated documentation (e.g. for testing encoders with the IK 215) can be found at **www.heidenhain.com**.

HEIDENHAIN recommends returning the device to the HEIDENHAIN calibration service every two years in order to ensure traceable, accurate and error-free operation.

After the recommended time period has expired, a corresponding message is displayed in the Adjusting and Testing Software.

1.6 Notes on reading this document

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

Incorrect operation of the software may result in death, injury or property damage.

- Read the documentation carefully from beginning to end
- Keep the documentation

Be sure to have read and understood the documentation of the testing device and the encoder before connecting the Adjusting and Testing software to a testing device or encoder.

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

Documentation	Description
Addendum	An addendum supplements or supersedes the corresponding contents of the Operating Instructions and, if applicable, of the Installation Instructions. If an addendum is included in the shipment, it has the highest priority for reading. All other contents of the documentation retain their validity.
Mounting Instructions	The Mounting Instructions contain all the information and safety precautions needed for the proper mount- ing and installation of a product. Mounting Instruc- tions are included in every delivery. Mounting Instruc- tions have the second highest priority for reading.
Operating Instructions	The Operating Instructions contain all the information and safety precautions needed for the proper opera- tion of the product according to its intended use. The Operating Instructions are included on the supplied storage medium and can also be downloaded from the download area at www.heidenhain.com . The Operating Instructions must be read prior to commis- sioning the device. The Operating Instructions have the third highest priority for reading.
Software Release Notes	The Software Release Notes summarize the expan- sions and improvements implemented in the respec- tive software version.
User's Manual	The User's Manual provides all information required for installing the software on a computer and for using it as intended. The User's Manual is locat- ed in the installation folder of the software and can be downloaded from the download area at www.heidenhain.com .

Have you found any errors or would you like to suggest changes?

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

1.7 Storage and distribution of the documentation

The User's Manual must be kept in the immediate vicinity of the workplace and must be available to all personnel at all times. The operating company must inform the personnel where the User's Manual is kept. If the User's Manual has become illegible, the operating company must obtain a new copy from the manufacturer.

If the software is passed on to any other party, the User's Manual must also be passed on to the new owner.

1.8 Target groups

The User's Manual is intended for specialists for service, maintenance and commissioning.

The activities described may only be performed by persons with profound knowledge of electronics, electrical engineering and NC machine-tool technology.

This User's Manual must be read and observed by any person involved in diagnosing or adjusting encoders with the Adjusting and Testing Software.

1.9 Symbols and fonts used for marking text

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

Image	Meaning
►	Identifies an action and the result of this action
>	Example:
	Click OK
	> The message is closed
=	Identifies an item in a list
=	Example:
	TTL
	EnDat
	•
Bold	Identifies menus, displays, and buttons
	Example:
	 Click Close file

1.10 Figures

This User's Manual contains illustrations for the purpose of explanation and illustration. The actual GUI depends on the software configuration and on the connected encoder.

1.11 More information

For detailed information on hardware and connection technology, refer to the following documentation:

Documentation available in the Adjusting and Testing Software:

- "User's Manual Cables and Connection Technology"
- Brochure "Interfaces of HEIDENHAIN Encoders"
- PWM Operating Instructions

Further information: "Opening documentation", Page 45

Documentation of product manufacturers:

- Documentation of peripheral devices
- Documentation of the encoders
- Documentation of the machine tool

Documentation on EnDat 3:

For more information on EnDat 2.1EnDat 2.1, EnDat 2.2 and EnDat 3 visit **www.endat.de**.



Safety

2.1 Overview

This chapter provides important safety information needed for connecting the Adjusting and Testing Software to devices and for proper operation.

2.2 Notes in this documentation

Safety precautions

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

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

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

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

NOTICE

Notice indicates danger to material or data. If you do not follow the avoidance instructions, the hazard **could result in property damage**.

Informational notes

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

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The information symbol indicates a **tip**.

A tip provides important additional or supplementary information.

The gear symbol indicates a function that **depends on the machine**. The function described depends on the machine if, for example:

• Your machine features a certain software or hardware option

The behavior of the functions depends on the configurable machine settings

The book symbol indicates a **cross reference**.

A cross reference leads to external documentation for example the documentation of your machine manufacturer or other supplier.

2.3 Safety precautions in the Adjusting and Testing Software

The Adjusting and Testing Software displays safety precautions by means of symbols.

Examples:

lcon	Note
	If the selected encoder does not match the connect- ed encoder, the encoder or the computer may be damaged.
	Encoders which are subject to a laser protection class are marked accordingly. In this case, observe the information on the encoder, the encoder mount- ing instructions and all safety precautions contained therein.

2.4 Intended use

The Adjusting and Testing Software is intended solely for the following use:

Diagnostics and adjustment of HEIDENHAIN encoders

2.5 Improper use

Any use not specified in 'Intended use' is considered improper use. The company operating the encoder diagnostic set is solely liable for any damage resulting from improper use.

Especially its use as part of a safety function is not permitted.

2.6 Personnel qualification

The personnel installing and operating the software must be appropriately qualified for this work and must have obtained sufficient information from the documentation supplied with the software, the devices and the connected peripherals.

The personnel groups are specified in detail as follows with regard to their qualifications and tasks.

Qualified personnel

The qualified personnel are trained by the operating company to perform operation and parameterization. The qualified personnel have the required technical training, knowledge and experience and know the applicable regulations, and are thus capable of performing the assigned work regarding the application concerned and of proactively identifying and avoiding potential risks.

Electrical specialist

The electrical specialist has the required technical training, knowledge and experience and knows the applicable standards and regulations, and is thus capable of performing work on electrical systems and of proactively identifying and avoiding potential risks. Electrical specialists have been specially trained for the environment they work in. Electrical specialists must comply with the provisions of the applicable legal regulations on accident prevention.

2.7 Obligations of the operating company

The operating company owns or leases the software, the devices, and the peripheral devices. It is responsible that the intended use is complied with at all times. The operating company must:

- Assign the different tasks to be performed to appropriate, qualified, and authorized personnel
- Verifiably train the personnel in the authorizations and tasks
- Provide all materials and means necessary in order for the personnel to complete the assigned tasks
- Ensure that the devices are operated only when in perfect technical condition
- Ensure that the software and the devices are protected from unauthorized use

2.8 General safety precautions

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The safety of any system incorporating the use of this product is the responsibility of the assembler or installer of the system.

The software supports the use of a wide variety of peripheral devices. The safety precautions provided in the respective documentations of the devices must be observed. If there is no documentation at hand, it must be obtained from the manufacturer concerned.

The specific safety precautions required for the individual activities to be performed are indicated in the respective sections of this manual.



Inspecting encoders with the encoder diagnostic set

3.1 Overview

This chapter provides basic information on inspecting encoders with the encoder diagnostic set.

3.2 Measuring methods and interfaces

The scope of functions of the Adjusting and Testing Software depends on the connected encoder, in particular on its measuring method and interface type.

Measuring method

The following measuring methods are available for HEIDENHAIN encoders:

Measuring method	Description
Incremental measuring method	With the incremental measuring method, the position information is obtained by counting the individual increments (measuring steps) starting from some point of origin. Since an absolute reference point is necessary for determining the positions, a refer- ence-mark signal is output as well. As a general rule, encoders that operate with the incremental measur- ing method provide incremental signals.
Absolute measuring method	With the absolute measuring method the absolute position information is acquired directly from the grating of the measuring standard. The position value is available from the encoder immediately upon switch-on and can be requested at any time by the subsequent electronics. Absolute encoders do not require referencing. Some absolute encoders output incremental signals in addition to the position value. Some absolute encoders transmit valuation numbers providing information on the current encoder status.

Interfaces

The following interface types can be distinguished, depending on the encoder output signal:

Sinusoidal incremental signals	Description
1 V _{PP} 3 V _{PP}	The encoder outputs voltage signals (sinusoidal signals).
11 μΑ _{ΡΡ} 25 μΑ _{ΡΡ}	The encoder outputs current signals (sinusoidal signals).
Square-wave incremental signals	Description
TTL HTL HTLs	The integrated electronics (with or without inter- polation) digitizes the sinusoidal scanning signal and outputs it to the subsequent electronics as a sequence of square-wave pulses.
Serial data transmission	Description
EnDat 2.1EnDat 2.1, EnDat 2.2	Digital, bidirectional interface that is capable of trans- mitting position values, reading and updating informa- tion stored in the encoder, and storing new informa- tion.
	The ordering designation indicates whether the encoder outputs incremental signals in addition to the absolute position:
	 EnDat01, EnDat02: with 1 V_{PP} incremental signals
	 EnDat21, EnDat22: without incremental signals EnDatTy: with TTL incremental signals
	 EnDatTx: with TTL incremental signals EnDatHx: with HTL incremental signals
EnDat 3	EnDat 3 requires two wires for communication. For EnDat 3, usually two further wires are required to power the encoder. Since the digital data stream has no DC component, communication can be modulat- ed onto the supply wires, thereby reducing the overall number of wires to just two for certain applications (e.g., for hybrid motor cables).
	Ordering designation of the encoder:
	 E30-R2: Communication modulated onto the supply wires
	 E30-R2: Communication and separate supply wires
	E30-RB: Bus operation (daisy chain)E30-RM: Version with EnDat22 compatibility
DRIVE-CLiQ	Manufacturer-specific interfaces without incremental
Fanuc	_ signals
Mitsubishi	
Panasonic	_
Yaskawa	

Serial data transmission	Description
Indramat	
SSI	Synchronous serial interface with incremental signals

Signal converter

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Signal converters adapt the encoder signals to the interface of the subsequent electronics. They are used when the subsequent electronics cannot directly process the output signals encoders, or when the additional interpolation of the signals is necessary. The encoder diagnostic set allows you to test encoders in combination with different signal converters of the series **EIB**, **EXE**, **IBV**, and **APE**.

Transceiver unit for EnDat touch probes

Wireless touch probes transmit information via radio or infrared signals to a transceiver unit. With the encoder diagnostic set, you can test the EnDat touch probes **TS 460** and **TT 460** in combination with the transceiver unit **SE 661**. The encoder diagnostic set currently does not support other touch probes or transceiver units.

For more information on the encoder interfaces, please refer to the **Interfaces of HEIDENHAIN Encoders** brochure.

Further information: "Opening documentation", Page 45

You can find detailed information on the encoder interface in the encoder documentation that you can download from the HEIDENHAIN website.

Link: www.heidenhain.com

Path: Software ► Infobase

3.3 Operating modes of the testing device

The procedure for testing encoders depends on the operating mode of the testing device.

The following operating modes are available:

Encoder diagnostics:

The encoder is connected directly to the PWM. This makes a comprehensive analysis of the encoder functions possible, irrespective of the control loop of a machine tool

Monitoring mode:

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The PWM is integrated into the control loop of an NC-controlled machine tool. This permits monitoring of the encoder during operation

For information about which interface types support monitoring, see the Overview of functions.

Further information: "Overview of functions", Page 33

Read the operating instructions before connecting and operating the PWM. **Further information:** "Opening documentation", Page 45

3.3.1 Encoder diagnostics

Encoder diagnostics without signal adapter

The encoder is connected directly to the PWM. This makes a comprehensive analysis of the encoder functions possible, irrespective of the control loop of a machine tool.



Figure 1: PWM connected directly to the encoder

- 1 Control
- 2 Position controller
- 3 Speed controller
- 4 Motor
- 5 Encoder
- 6 PWM

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Property	Description
Connection of the PWM	The encoder input X1 or X4 is connected to the encoder
	The encoder input X2 is not connected
Power supply of the encoder	Via the PWM

If the power is supplied via the PWM, you can activate voltage readjustment in the Adjusting and Testing Software. This serves to compensate for voltage drops on the lines connecting the testing device and the encoder. The cabling between the testing device and the encoder must support voltage readjustment. The Adjusting and Testing Software may display a corresponding message.

Encoder traverse

Usually by hand; NC control is possible

Encoder diagnostics with signal adapter

The PWM is connected to the encoder via the signal adapter.



Figure 2: Encoder diagnostics with signal adapter

- 1 Control
- 2 Position controller
- 3 Speed controller
- 4 Motor
- 5 Encoder
- 6 Signal adapter
- 7 PWM

Property	Description
Connection of the PWM	The encoder input X1 is connected to the signal adapter
	The encoder input X2 is not connected
Power supply of the encoder	Via the PWM
Power supply of the signal adapter	Via the PWM
Encoder traverse	Usually by hand; NC control is possible

3.3.2 Monitoring mode

The PWM is integrated into the control loop of an NC-controlled machine tool. This permits monitoring of the encoder and the machine during operation.



The use of a signal adapter is advisable for the monitoring mode. The signal adapter ensures metallic isolation and enables floating testing.



For detailed information on the signal adapters SA 100 and SA 110, refer to the "User's Manual Cables and Connection Technology". **Further information:** "Opening documentation", Page 45



For encoders with EnDat 3 interfaces, testing in monitoring mode is currently not supported.



Touch probes currently do not support testing in monitoring mode.

Monitoring mode with signal adapter

The PWM is integrated into the control loop of the machine tool via the signal adapter. The test can be carried out potential-free.



Figure 3: Monitoring mode with signal adapter (potential segregation)

- 1 Control
- 2 Position controller
- 3 Speed controller
- 4 Motor
- 5 Encoder
- 6 Signal adapter
- 7 PWM

Property	Description
Connection of the PWM	 The encoder input X1 is connected to the signal adapter
	The encoder input X2 is not connected
Power supply of the encoder	Via the subsequent electronics
Power supply of the signal adapter	Via the PWM
Potential segregation	Yes, through the signal adapter
Encoder traverse	NC control possible

Monitoring mode without signal adapter

The PWM is directly integrated into the control loop of the machine tool.



Figure 4: Monitoring mode without signal adapter (no potential segregation)

- 1 Control
- 2 Position controller
- 3 Speed controller
- 4 Motor
- 5 Encoder
- 6 PWM

Property	Description
Connection of the testing device	 The encoder input X1 is connected to the encoder The encoder input X2 is connected to the subsequent electronics
Power supply of the encoder	Via subsequent electronics
Potential segregation	No
Encoder traverse	NC control possible

The following interface-specific properties apply when using the monitoring mode without a signal adapter:

Interface	Characteristic
1 V _{PP}	 The PWM picks off the signals without 120-ohm signal termination
	 The cutoff frequency is influenced by the test setup (e.g. adapter cables)
11 µА _{РР}	The line is interrupted in the monitoring mode, i.e. the PWM has an 11 µA _{PP} receiver and reproduces the (emulated) input signals at an 11 µA _{PP} output
	 The cutoff frequency is influenced by the test setup (e.g. adapter cables)
	 Signal interferences can occur, depending on the test setup (cable lengths, extension cables, cable configuration, machine type such as EDM)
TTL	 Without PWT switchover: The PWM picks off the RS-422 signals, i.e. a standard RS-422 receiver without 120-ohm terminating resistor is connected to the lines
Serial	 The PWM picks off the RS-485 signals, i.e. a standard RS-485 receiver without 120-ohm terminating resistor is connected to the lines

3.3.3 Signal adapter for EnDat 3 interface type

Depending on the version of the testing device, a signal adapter with an interface of the EnDat 3 type is required for certain encoders:

Ordering designation of the encoder	PWM 20	PWM 21
E30-R2	SA 2380	SA 1210
E30-R4	SA 2380	Signal adapter not required
E30-RM	SA 2380	Signal adapter not required
E30-RB	SA 2380	SA 2380 only required if the PWM 21 cannot provide maximum power

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The signal adapters SA 100 and SA 110 are designed for a supply voltage of 5.5 V maximum; thus they are not suitable for testing encoders with EnDat 3 interface.

3.3.4 Bus operation

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The Adjusting and Testing Software supports encoder diagnosis in EnDat 3 bus operation (daisy chain). Several participants are connected to the testing device in a bus chain.



Figure 5: Bus chain (daisy chain) with several participants

Observe the maximum power the **PWM 20** or **PWM 21** can provide. A signal adapter and an external power supply unit may be required. Contact HEIDENHAIN for more information.

3.4 Overview of functions

The following overview shows the range of functions of the encoder diagnostic set with PWM 21 depending on the encoder interface (if supported by the encoder).

	EnDat 3	EnDat 2.2	EnDat 2.1	1 V _{PP} /	µApp²∕ L	L 3)	DRIVE-CLIQ	Fanuc	Mitsubishi	Panasonic	Yaskawa	_
	E	E	Ш		: 1	HTL ³⁾	DR	Far	Mii	Pal	Ya	SSI
Diagnostics												
Display of online diagnostics	\checkmark	\checkmark	_	_	_	_	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Display of online diagnostics in the control loop ¹⁾	1	1	_	_	_	_	_	1	1	1	-	_
Monitoring mode permitted with the PWM 21	1	√	√	1	\checkmark	-	-	\checkmark	\checkmark	\checkmark	-	_
Display of operating status data	\checkmark	_	-	_	_	-	_	-	_	_	-	_
Display of encoder information	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Display of incremental signals in circular diagram	-	-	√	1	1	-	-	-	-	-	-	1
Evaluation of the reference signal	_	_	_	\checkmark	\checkmark	\checkmark	_	_	_	_	_	_
Incremental counter	_	-	\checkmark	\checkmark	\checkmark	\checkmark	_	_	_	_	_	_
Display of supply voltage and supply current	1	√	1	1	√	1	1	√	1	√	1	1
Homing/limit display	_	_	_	\checkmark	\checkmark	_	_	_	_	_	_	_
Signal recording	-	_	_	\checkmark	_	-	_	-	_	_	-	_
Connection dialog; encoder connection via:												
ID of encoder	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	✓
Entry of interface and supply voltage	√	√	√	1	√	√	1	1	√	1	√	1
ID of HEIDENHAIN motor	\checkmark	\checkmark	\checkmark	\checkmark	_	_	_	_	_	_	_	_
Position display												
Display of absolute positions	\checkmark	\checkmark	\checkmark	_	_	_	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	✓
Support of daisy chain bus	\checkmark	-	-	_	_	_	_	_	_	_	_	_
Display of the incremental position (if available)	1	1	1	1	1	1	_	1	1	_	_	1
Display and resetting of error messages	√	1	1	_	-	-	1	1	1	1	√	_
Display and resetting of warnings	\checkmark	\checkmark	\checkmark	_	_	-	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Display of the transmission status	1	1	1	_	_	_	1	1	1	1	1	(√)
PWT display of incremental signals	-	_	_	1	(√)	_	-	-	-	_	_	_

		.2	÷.	2)			CLIQ		shi	nic	a	
	EnDat 3	EnDat 2.	EnDat 2.	1 V _{PP} / 11 uA ₂₂ 3		HTL ³⁾	DRIVE-CLIC	Fanuc	Mitsubish	Panasonic	Yaskawa	SSI
Mounting wizards/ inspection wizards												
Mounting wizards	See "Mounting wizards"; for more informa- tion refer to the encoder documentation.											
Inspection wizard for encoders with functional safety	1	√	√	_	_	-	√	_	-	-	-	-
Tape tensioning wizard	_	\checkmark	\checkmark	\checkmark	_	-	-	\checkmark	\checkmark	_	-	_
Miscellaneous functions (M functions)												
Comparison of absolute position with incremental position	-	-	√	-	-	_	-	-	-	-	-	1
Datum shift ("electric zeroing"), including information display ⁴⁾	(√)	(•	(✔)	_	_	_	(•	(√)	(•	(•	(✔)	(✔)
Configuration wizard (addresses, sensor characteristics, etc.)	1	-	-	-	-	_	-	-	-	-	-	-
Display of temperatures	\checkmark	√ 5)	_	_	-	_	\checkmark	\checkmark	_	-	-	_
Display of further position values	\checkmark	\checkmark	_	_	_	_	\checkmark	_	_	_	_	_
Display of further sensors	\checkmark	\checkmark	_	_	_	_	_	_	_	_	_	_
Display of limit position signals	\checkmark	\checkmark	_	_	_	_	-	-	_	_	-	_
Expanded parameter display	\checkmark	\checkmark	_	_	_	_	-	_	-	-	-	_
Memory contents												
Display of memory contents and memory parameters	1	√	1	-	-	_	√	√	-	-	√	-
Modification of memory contents	1	√	√	-	-	_	-	-	-	-	-	-
Storing of memory assignments	\checkmark	\checkmark	\checkmark	_	_	_	\checkmark	_	_	_	_	_
Comparison of current memory contents with saved memory contents	1	√	1	_	_	-	_	-	-	-	-	_
Backing up of the encoder memory	1	√	1	_	_	_	1	\checkmark	~	1	1	_

- 1) In monitoring mode; preferably in combination with a signal adapter
- 2) $25 \,\mu A_{PP}/3 \,V_{pp}$ for servicing purposes
- 3) Via signal adapter, for servicing purposes
- 4) Product key is required and is available only for certain encoders
- 5) Including conversion for PT 1000 sensors when EnDat memory parameters are appropriately set
- (\checkmark) See information in this User's Manual

3.5 Transfer of values and signals

Which values and signals the encoder transfers and the Adjusting and Testing Software evaluates depends on both the encoder interface and the operating mode of the testing device.

Interface	Transmission	In Encoder Diagnostics mode of operation	In Monitoring mode of operation		
EnDat 3	Position value	Yes	Yes		
	Valuation numbers	Yes	Yes		
EnDat 2.1 (with	Position value	Yes	No		
incremental signals)	Incremental signals	Yes	Yes		
EnDat 2.2 (without	Position value	Yes	Yes		
incremental signals)	Valuation numbers	Yes	Yes ¹⁾		
DRIVE-CLiQ	Position value	Yes	No		
	Valuation numbers	Yes	No		
Fanuc	Position value	Yes	Yes		
	Valuation numbers	Yes	Yes		
Mitsubishi	Position value	Yes	Yes		
	Valuation numbers	Yes ⁴⁾	Yes ^{1) 4)}		
Panasonic	Position value	Yes	Yes		
	Valuation numbers	Yes	Yes ¹⁾		
Yaskawa	Position value	Yes	No		
	Valuation numbers	Yes ⁵⁾	No		
SSI	Position value	Yes	No		
	Incremental signals	Yes	Yes		
1 V _{PP}	Incremental signals	Yes	Yes		
11 µA _{PP}	Incremental signals	Yes	Yes		
TTL	Incremental signals	Yes	Yes		
	Scanning signals	Yes ³⁾	No		
HTL	Incremental signals	Yes ²⁾	No		
Commutation	Block commutation	Yes ²⁾	No		
	Sinusoidal commuta- tion	Yes	Yes		

1) Information must be requested and transferred by the control

- 2) Via appropriate signal adapter
- 3) If supported by the encoder (PWT function)
- 4) Not available for encoders with the ordering designation Mitsu01
- 5) Not available for the EIB 3391 Y
- 6) Being planned

3.6 Units and tolerances

The Adjusting and Testing Software automatically adapts units, scalings, and tolerances to the connected encoder.

The tolerance values displayed in the Adjusting and Testing Software are the HEIDENHAIN standard values for the encoder interface concerned.

For more information on signal amplitudes and tolerances, please refer to the "Interfaces of HEIDENHAIN Encoders".

Further information: "Opening documentation", Page 45

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The tolerances of high-accuracy measuring systems (e.g., angle encoders) and encoders with large temperature ranges (e.g., motor encoders) are tighter. In these cases, the tolerances of the Adjusting and Testing Software are invalid.

 Observe the tolerance specifications in the documentation of the encoder for each test



A license key (software option) is required to alter the tolerance limits in the Adjusting and Testing Software.

Further information: "Software options", Page 14

Revolutions

Multiturn encoders transmit the number of revolutions in addition to their singleturn position.

m = Number of distinguishable revolutions

Value range according to specification 0 ... m revolutions

Value range in the Adjusting and Testing 1 ... m-1 revolutions Software



Revolution 0 in the specification corresponds to revolution 1 in the Adjusting and Testing Software.

Typical gear-based multiturn encoders have 12 bits available for the transmission of the multiturn value. Therefore:

Number of distinguishable revolutions	$m = 2^{12} = 4096$ revolutions
Value range according to specification	0 4095 revolutions

Value range in the Adjusting and Testing 1 ... 4096 revolutions Software:


Installing the software

4.1 Overview

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This chapter provides all of the information needed for downloading and properly installing the software and the necessary drivers on a computer.

4.2 System requirements

Computer:	IBM PC or compatible PC
	≥ Pentium Dual Core; 2 GHz
Operating system:	Microsoft Windows 7 (32/64 Bit), Microsoft Windows 8 (32/64 Bit), Microsoft Windows 10 (32/64 Bit), Microsoft Windows 11
RAM:	≥2 GB
Hard disk:	≥ 500 MB (1 GB) of free disk space
Monitor	≥ 1024 x 768 pixels
Interface:	USB 2.0 type A
Windows user right:	Administrator

If the computer does not meet the described requirements, the consequences may be as follows:

- Data processing takes more time
- The Adjusting and Testing Software issues error messages
- The functionality of the Adjusting and Testing Software is reduced

4.3 Installing the software

You will find the installation files of the Adjusting and Testing Software in the download area of the HEIDENHAIN website.

- Path:Filebase ► Inspection and testing devices ► PWM 20 and PWM 21► Software ATS adjusting and testing package
- File: ATS Vx.x.xx Adjusting and Testing Software for PWM20 and PWM21.zip



Read the release notes for the software version before installing the Adjusting and Testing Software. You find the file **ReleaseNotes.pdf** in the folder of the installation file.

- Download the installation file from the HEIDENHAIN website
- Extract the downloaded ZIP file
- ▶ Navigate to the following folder: 539862xx ▶ FILES ▶ Software
- ► Run the installation file with the extension ".exe"
- > The installation wizard opens
- Click Next
- In the Select Destination Location installation step, select the storage location to which you want to save the software



In the **Select Destination Location** installation step, the installation wizard suggests an installation directory. We recommend retaining the standard installation directory. All paths stated in this User's Manual refer to the standard installation directory.

Click Next

- Click Install
- > The installation starts
- > The status of installation is shown in the progress bar
- ▶ When the installation is terminated, click Finish
- > The link to the Adjusting and Testing Software appears on the desktop.

4.4 Checking the installation

After the installation, check whether the Adjusting and Testing Software can access the PWM.

- Connect the PWM to the computer via the USB interface
- Switch on the PWM
- Start the Adjusting and Testing Software
 Further information: "Starting the software", Page 44
- If drivers are missing, the Adjusting and Testing Software issues the error message "No hardware was found"
 Further information: "Installing drivers", Page 40

4.5 Installing drivers

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The required drivers are located in the software installation folder.

Depending on the operating system of the computer, the procedure may differ from the description below.

- Navigate to the following folder in the installation package: 539862xx/FILES/Drivers/PWMxx
- Copy the driver files to the following program directory:
 C: ▶ Programs (x86) ▶ HEIDENHAIN ▶ ATS ▶ Drivers ▶ PWM20_PWM21
- Call the device manager of the computer
- Click Other devices
- ► Double-click **PWM**
- Click Update drivers
- Select the option for manual search and installation
- ▶ In the dialog, enter the storage location of the driver files
- Click Next
- > The drivers will now be installed

4.6 Updating software and encoder database

New versions of the Adjusting and Testing Software are made available at regular intervals. When you run a software update, the encoder database is updated as well. You find the current software version in the download area at the HEIDENHAIN website.

Link:	www.heidenhain.com/service/downloads/software/
Path:	 Filebase ► Inspection and testing devices ► PWM 20 and PWM 21 ► Software ATS adjusting and testing package
File:	ATS Vx.x.xx - Adjusting and Testing Software for PWM20 and PWM21.zip

4.7 Uninstalling the software

To uninstall the Adjusting and Testing Software from a computer, proceed as follows:

- Select the following in succession in Microsoft Windows:
 - Start
 - HEIDENHAIN Applications
 - Adjusting and Testing Software
- Click Uninstall
- > The uninstallation wizard opens
- ► To confirm uninstalling, click Yes
- > Uninstalling starts
- > The status of the uninstall process is shown in the progress bar
- After uninstallation has been completed successfully, close the uninstallation wizard with OK

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Basic Operation

5.1 Overview

This chapter describes the user interface, operating elements and basic functions of the Adjusting and Testing Software.

5.2 Structure of the user interface

The software is operated via a function menu. The functions in the function menu are combined in function groups.



The range of functions depend on the connected encoder and on the software configuration. When you connect an encoder, all functions are displayed that are available for this encoder.



Figure 6: User interface after connecting an encoder

- 1 Menu bar with the menus File and Help
- **2** Function group
- **3** Function
- 4 Information bar showing information on the connected encoder

5.3 Recurring displays and operating elements

Display of values

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	tive

Yalues are displayed as colored numerals. The significance of the color depends on the function. For a detailed description, please refer to the respecve section.

Status display



The color of the LED symbol indicates a status, e.g.

- Green: Measured value within the tolerance range
- Red: Measured value outside the tolerance range

The significance of the color depends on the function. For a detailed description, please refer to the respective section.

Bar graph



Bar graphs serve to display and evaluate measured values.

The significance of the color depends on the function. For a detailed description, please refer to the respective section.

Input fields with plus and minus operating elements

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- Enter the desired value
- Confirm with **Enter**
 - or
- ▶ Tap + or until the desired value is displayed
- Press and hold + or to change values faster

Operating element "Return to last view"

Return to the previous level or back to the main menu

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Symbols: Power supply

The symbols indicate whether power supply by the PWM is active.

Display	Description	
	Power supply is not active	
	Power supply is active	

When the computer goes to sleep mode or if there is a software error, the display in the Adjusting and Testing Software is no longer reliable. Therefore always observe the **L2** status LED on the PWM to see whether the PWM is outputting voltage. You will find a detailed description of the PWM status displays in the operating instructions. **Further information:** "Opening documentation", Page 45

Mouse-over text

When you move the mouse pointer over operating elements or displays, a mouseover text appears, giving a brief explanation, such as the unit of a value.

5.4 Starting the software

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- Double-click the icon of the Adjusting and Testing Software on the Microsoft Windows desktop
 - or
- Select in succession in Microsoft Windows
 - Start
 - HEIDENHAIN Applications
 - ATS Adjusting and Testing Software
- > The software opens

I HEIDENHAIN: ATS - Adjusting and Testing Software	8	×
File Help		
F. Connect the encoder		
Configuration		
Configure hardware		
Language selection		
Manage product keys		

Figure 7: User interface after startup

Firmware update

If the PWM is switched on and connected to the computer, the Adjusting and Testing Software checks the compatibility of the firmware of the device and the current software version. If a firmware update is required, you can run the update with the Adjusting and Testing Software. A software wizard will guide you through the required steps.

NOTICE

Damage to the product by interrupting a firmware update

If you disconnect the power supply of the PWM or separate the plug connection during a firmware update, the PWM may be damaged.

When updating the firmware, wait until the progress bar has reached 100% before you continue with further steps

5.5 Exiting the software

- Click File on the menu bar
- Click Exit
- If the software is connected to an encoder, the connection is separated
- > The software is terminated

5.6 Viewing software information

Display of information on software and database versions

- Click Help on the menu bar
- Click About

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> Information on the installed software version and database version is displayed

You can download the current software version from the HEIDENHAIN website.

Further information: "Updating software and encoder database", Page 40

Display of license information on open source software

- Click Help on the menu bar
- Position the mouse pointer at License hints
- Click Used Open Source Software
- > The license information for the installed open source software is displayed

5.7 Opening documentation

Prerequisite: A PDF viewer is installed on the computer. The following documents are available in the software in PDF format:

File name in the Help menu	Document
User's Manual	"Adjusting and Testing Software User's Manual"
Cables and Connection Technology	"User's Manual Cables and Connection Technology"
Interfaces	Brochure "Interfaces of HEIDENHAIN Encoders"
Operating Instructions	"PWM 20 / PWM 21 Operating Instructions"
Release Notes	Release Notes for the installed version of the Adjust- ing and Testing Software

- Click Help on the menu bar to open a document
- Click the file name
- > The document is opened in the PDF viewer

Documentation on EnDat 3:

For more information on EnDat 2.1EnDat 2.1, EnDat 2.2 and EnDat 3 visit **www.endat.de**.

5.8 Adjusting, exporting and printing diagrams

Some of the views of the Adjusting and Testing Software contain diagrams. You can adjust the diagram views and export and print diagrams.

5.8.1 Magnifying the diagram view

- Press and hold the left mouse button and starting at the left draw a square over the desired area
- > This area will be magnified

5.8.2 Moving an image section

When the diagram view is zoomed in, you can navigate in the diagram by moving the image section.

- To move the image section vertically, press and hold the left mouse button and turn the scroll wheel in the desired direction
- To navigate freely, move the diagram to the desired position while holding down the right mouse button

5.8.3 Reducing the diagram view

- > Press and hold the left mouse button and draw a square from right to left
- > The diagram view is reduced in size

5.8.4 Exporting diagrams

The Adjusting and Testing Software uses the **TeeChart** program offering the following export functions:

- Copy diagram to clipboard
- Save diagram
- Send diagram by e-mail
- Right-click the diagram
- Click Save diagram
- > The Save dialog appears

Colors: Default	
	Monochrome

Figure 8: Save dialog

- Select the desired parameters
- Click **Preview** to open the preview of the diagram
- Click **Copy** to copy the diagram to the clipboard
- Click **Save** to save the diagram to the local disk
- Click **Send** to send the diagram by e-mail
- ► Follow the instructions of the Windows dialog

5.8.5 Printing the diagram

- ► Right-click the diagram
- Click Print diagram
- > The dialog TeeChart Print Preview appears

TeeChart Print Pr	review	<u>_</u>	
Printer: \\de01	vs1481\SecurePrint-PCL V Setup	Print	Close
Orien <u>t</u> ation: Ortrait Candscape Detail: More Normal			
Margins Proportional Smooth Background Panel			

Figure 9: Dialog TeeChart Print Preview

- Select the desired parameters
- Click Print
- > The print job is sent to the selected printer



Configuring the software

6.1 Overview

This chapter describes how you can adapt the Adjusting and Testing Software to your requirements.

6.2 Switching the language

You can change the language of the user interface.

- Double-click Language selection in the function menu
- Click the desired national flag symbol
- Confirm with **OK**
- > The user interface is displayed in the selected language

6.3 Enabling software options

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Software options are available to increase the range of functions of the Adjusting and Testing Software. A product key must be entered to enable a software option. You can obtain the required product key from HEIDENHAIN.

Product keys are associated with the serial number of the device. Software options cannot be transferred to other devices.

Multiple software options can be activated per serial number.

There are various product keys, with different validity periods:

- Permanent
- Limited time (usually one year)
- Test license (usually one month)
- Double-click Manage product keys in the function menu
- > The Product keys dialog appears

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HEIDENHAIN: ATS - Adjusting and Help	esting software					- в
anage product keys						
	e the product keys. Product keys	s specify basic functions and options that are enabled in the program.				
Product key						
Product key entry						•
Status of license						
Serial number	Device	Product key / Option	Status of license	Beginning of license	End of license	Action

Figure 10: Product keys dialog

- Enter the product key
- Click Add
- > The software option is displayed in the Status of license field
- Click Close
- The additional functions will be active as soon as you connect an encoder supporting these functions

6.4 Deactivating software options

When you deactivate a software option, the associated functions will no longer be available. You can reactivate the software option at the same device by re-entering the product key.

- Double-click Manage product keys in the function menu
- > The **Product keys** dialog shows the active software options for each serial number

is dialog box is used to man	age the product keys. Product ke	ys specify basic functions and options that are enabled in the program.					
roduct key							
roduct key entry							Adi
tatus of license							
erial number	Device	Product key / Option	Status of license	Beginning of license	End of license	Action	
815663	PWM 20/21	Ae422deY5mgt6LswhfyiMjN3phDRxmxq	enabled	2024-02-07	2025-02-07	Delete	
	1 1111 2021	Option: Extended DRIVE-CLIQ functions	Chables	2024 02 07	2020 02 07	Dente	
		Ae4Z2deY5mjusqLe6DHY8n5Tmrm5oGSa	beldsne	2024-02-07	2024-07-07	Delete	
		Option: Extended DRIVE-CLIQ functions					
		Kx3z+J/Y2FzZxVaOs1fRHXwAOq1m//KT	Continuous			Delete	
		-+ Option: Extended DRIVE-CLIQ functions					

Figure 11: The **Product keys** dialog with activated software options

- Click Delete next to the desired software option
- ► Confirm with **Yes**
- > The software option is deactivated

6.5 Updating the documentation

The files listed below are stored in the Adjusting and Testing Software and can be replaced by new file versions.

File name	Document
um.pdf	"Adjusting and Testing Software User's Manual"
cct.pdf	"User's Manual Cables and Connection Technology"
i.pdf	Brochure "Interfaces of HEIDENHAIN Encoders"
oi.pdf	"PWM 20 / PWM 21 Operating Instructions"

You can download the current documentation from the HEIDENHAIN website.

Link:	www.heidenhain.com/service/downloads/software/
Path:	Filebase ► Inspection and testing devices ► PWM 20 and PWM 21
	Documentation

To store new documents in the Adjusting and Testing Software, open the program directory and navigate to the storage location you selected during the software installation:

 Dath: C:
 Dragrama (x86)
 HEIDENHAIN
 ATS
 dec

Path: C: ► Programs (x86) ► HEIDENHAIN ► ATS ► doc

- > The program directory contains a folder for each language in which the documentation is available
- Open the folder for the desired language
- Replace the existing files with the new files



The file names must be as specified in the table.

- Repeat for other languages, if required
- > The new documents are available in the Help menu in the selected language

6.6 Selecting the PWM as testing device

If your computer is connected to only one testing device, the Adjusting and Testing Software automatically selects this device; no further action is required.

Prerequisites:

- The PWM is connected to the computer via the USB interface
- The PWM is switched on
- The device drivers are installed

Further information: "Installing drivers", Page 40

If your computer is connected to several testing devices, select the device you are currently working with in the Adjusting and Testing Software:

- Double-click Configure hardware in the function menu
- > The dialog Configure hardware appears
- Check the box for the desired testing device
- Confirm with OK
- > The Adjusting and Testing Software will use the selected testing device

6.7 Saving log information

You can save log files (PDF format) with test results in the functions **Incremental** signal, **Online diagnostics** and **Functional-Safety encoder check**. In the logs, you can add information on the company and the tester.



Figure 12: Custom log header

File templates are available for creating content. The templates are located in the following directory:

Path: C: ► Programs ► HEIDENHAIN ► ATS ► db ► cfg ► templates

The file templates are available:

File name	Description
AtsCustomerAddress.txt	Company address
AtsCustomerName.txt	Company name
AtsTesterName.txt	Name of the tester
AtsReportLogoLeft.png	Company logo on the left side
AtsReportLogoRight.png	Company logo on the right side
AtsSignatureLogo.png	Signature of the tester

- Create a new directory with the name "ATS" on drive "C:" Path: C: > ATS
- Copy the required file templates to the new directory or
- Create files with the same names in the new directory



The file names must be as specified in the table. Graphics must be of the same file type and size as the template.

- Customize file contents
- Save the changes
- > The Adjusting and Testing Software will enter the file contents into every log



Connecting the encoder

7.1 Overview

This chapter describes how you can connect an encoder in the Adjusting and Testing Software. The procedure depends on the operating mode of the testing device.



Be sure to have read and understood the PWM Operating Instructions before connecting the encoder in the ATS. **Further information:** "Opening documentation", Page 45



For detailed information on the required adapter cables and signal adapters, refer to the "User's Manual Cables and Connection Technology". **Further information:** "Opening documentation", Page 45

Configuration of the encoder parameters in the connection dialog

To connect the Adjusting and Testing Software to an encoder, information on the interface type and supply voltage is required. The following options are available to configure the parameters:

Connection via encoder ID:

If you enter the encoder ID in the connection dialog, the interface type and supply voltage are automatically taken from the encoder database

Manual connection:

If you do not know the encoder ID, or if the encoder database does not yet comprise the encoder, you can select the interface type and power supply by hand



Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).



Perform regular software updates to keep the encoder database up to date. **Further information:** "Updating software and encoder database", Page 40

Encoder ID

The ID you have to enter in the connection dialog depends on the encoder type.

- With exposed or multi-section encoders: the ID of the scanning head
- With sealed linear encoders: the ID of the scale housing

The ID is printed on the ID label.



Figure 13: ID label

- **1** Encoder designation
- 2 Ordering designation/interface type of the encoder
- 3 Encoder ID

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4 Indication that the encoder supports functional safety

For modular rotary encoders integrated in HEIDENHAIN motors, you may enter the ID of the motor. The Adjusting and Testing Software will automatically determine the parameters of the modular rotary encoder.

If the encoder and the testing device are connected via a separate signal converter, the procedure depends on the output signal of the signal converter.

- With TTL output signals: Connect the encoder and select the parameters manually
- With serial output signals: Enter the ID of the signal converter

After you have entered the ID of the signal converter, a further input form may appear containing the **Monitoring Identifier** field. The monitoring identifier can be found in the encoder mounting instructions.

The Adjusting and Testing Software uses the monitoring identifier to determine the parameters that are required for the correct interpretation of the position format in the Encoder Diagnostics mode.

With touch probes connected to the PWM via a transceiver (SE), additional steps are required.

Further information: "Connecting touch probes", Page 77

7.2 Connection in the Encoder Diagnostics operating mode

NOTICE

Damage to the device due to engagement and disengagement of connecting elements during operation

If you engage or disengage any connecting elements during operation, internal components of the devices may be damaged.

Before engaging or disengaging any connectors:

- Disconnect the encoder in the Adjusting and Testing Software
- Switch off the testing device, the subsequent electronics and the peripherals

When you connect the encoder in the Adjusting and Testing Software, you also activate power supply by the PWM. Comply with the safety precautions in the Adjusting and Testing Software and in the mounting instructions.

Prerequisites:

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- The PWM is connected according to the operating mode Further information: "Operating modes of the testing device", Page 26
- The PWM is switched on

7.2.1 Connection with encoder ID



- Double-click Connect encoder in the function menu
- > The Adjusting and Testing Software displays the **Encoder** selection dialog

TEDENI MIN. AL	S - Adjusting and Testing	Software					8 <u></u>		
Help									
	selection		7. H. da						
Encoder		encoder's ID number t	o specity the data requ	red by the program in or	der to connect the enco	der.			
ID numbe	er								
- Encoder	r designation: r interface: voltage [V]:	??? ??? ???							
Use po	ower supply from sub	equent electronic	s						
(j)	If the encoder is enter the encode	not listed in the ender parameters manu	coder database or if y ıally.	ou don't know the enc	oder's ID-number, you	can click <u>Manual Se</u>	ettings here a	nd	
i)		o the information in ders can have a dif		IDENHAIN Encoders" b	prochure. Pay attention	n to the documentation	on of the enc	oder,	
				coder, the encoder, int Mounting Instructions.		uld be become dama	iged. For you	r own	
	Encoders subject information and	t to a laser safety cl warnings in the end	ass are corresponding	gly identified. In this ca uctions.	ase please note the in	formation on the enc	oder and all		
	CAUTION: The la	ser is active once t	he 'Connect' button h	s been pressed!					
						Connect	Cance	el	Ĩ

Figure 14: Encoder selection dialog

- Enter the encoder ID in the ID-number field; the entry may be with or without a hyphen
- The determined encoder parameters are shown in the Encoder data field
- Click Connect
- > The connection to the encoder is set up



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- The voltage symbol in the information bar indicates that the encoder is powered by the PWM
- The function menu shows the available functions (depending on the encoder)

When you connect the encoder by entering the encoder ID, the Adjusting and Testing Software automatically activates voltage readjustment.

If read protection is set for a range in the electronic ID label of an encoder with an EnDat 3 interface type, an error will occur when data is read out. The encoder cannot be operated in the software. A corresponding message will appear.

7.2.2 Manual connection



- Double-click Connect encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

noodo	r selection			
incode	Selection			
Jsing this di	ialog you can enter an	ncoder's ID number to specify the data required by the program in order to connect the encoder.		
Encoder	r data			
ID numb	ber			
	er designation: er interface:	??? ???		
- Supply	voltage [V]:	???		
Use p	oower supply from su	sequent electronics		
Use pr	If the encoder is enter the encoder The data refers t	sequent electronics not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>h</u> r parameters manually. o the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the doc ders can have a different definition!		
J)	If the encoder is enter the encoder The data refers since some enco	not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>h</u> r parameters manually. o the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the doc	umentation of the er	icoder,
J)	If the encoder is enter the encoder The data refers i since some enco If the selected e safety, please of Encoders subject	not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>in</u> r parameters manually. The information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the doc ders can have a different definition! coder does not match the connected encoder, the encoder, interface card, or PC could be beco	umentation of the er ne damaged. For yc	ocoder, our own
J)	If the encoder is enter the encode The data refers since some enco If the selected e safety, please of Encoders subject information and	not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>in</u> r parameters manually. o the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the doc ders can have a different definition! coder does not match the connected encoder, the encoder, interface card, or PC could be beco serve the warnings and directions in the Mounting Instructions.	umentation of the er ne damaged. For yc	ocoder, our own

Figure 15: Encoder selection dialog

- Click Manual Settings
- The Adjusting and Testing Software displays safety precautions
- Click Next
- The Adjusting and Testing Software displays the encoder parameters that can be selected

p								
Encoder sele	ction							
On this page you mus	t set the supply voltag	je and the encoder's int	erface.					
Encoder supply	/ voltage							
⊙ 5.0 V	O 8.0 V	O 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0		
Adjust volta	ge over sensor lines							
Encoder interfa	ce							
Interface		En	Dat 2.1 / EnDat :	2.2			~	
							- 16 -	

Figure 16: Encoder selection dialog for manual selection of the encoder parameters

- To activate voltage readjustment by the PWM, check the box Adjust voltage over sensor lines (recommended for all encoders except touch probes)
- Select the permissible encoder supply voltage in the Encoder supply voltage section
- Select the interface type in the Encoder interface section
- Click Next
- The Adjusting and Testing Software displays safety precautions
- Click Connect
- > The connection to the encoder is set up



- The voltage symbol in the information bar indicates that the encoder is powered by the PWM
- The function menu shows the available functions (depending on the encoder)

7.2.3 Connecting in bus operation

When you connect to a bus chain, the Adjusting and Testing Software automatically detects the participants (bus node). For this purpose, the Adjusting and Testing Software performs a bus check and automatically assigns a new bus address for each participant. The encoder at the end of the chain is assigned the address "1". All other participants are assigned numbers in ascending order. The encoder that is directly connected to the testing device is assigned the address with the highest number.



Bus check and automatic address assignment may take a few seconds.

Connection with encoder ID



- Double-click Connect encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

ncoder	selection			
Jsing this dia	log you can enter an	encoder's ID number to specify the data required by the program in order to connect the encoder.		
Encoder	data			
ID numbe	r			
- Encoder	designation: interface: roltage [V]:	??? ??? ???		
Use po	wer supply from su	bsequent electronics		
1		not listed in the encoder database or if you don't know the encoder's ID-number, you can click Manua	I Settings here a	nd
	enter the encod	er parameters manually.		
•	The data refers	er parameters manually. to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documen oders can have a different definition!	tation of the end	oder
	The data refers since some enc If the selected e	to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documen		
	The data refers since some enc If the selected e safety, please o Encoders subject information and	to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documen oders can have a different definition! ncoder does not match the connected encoder, the encoder, interface card, or PC could be become do serve the warnings and directions in the Mounting Instructions. It to a laser safety class are correspondingly identified. In this case please note the information on the warnings in the encoder's mounting instructions.	amaged. For you	Ir ow
	The data refers since some enc If the selected e safety, please o Encoders subject information and	to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documen oders can have a different definition! ncoder does not match the connected encoder, the encoder, interface card, or PC could be become do serve the warnings and directions in the Mounting Instructions.	amaged. For you	Ir ow

Figure 17: Encoder selection dialog

- Enter the encoder ID of the encoder located at the end of the bus chain in the **ID number** field; the entry may be with or without a hyphen
- The determined encoder parameters are shown in the Encoder data field
- Click Connect
- > The bus is being checked
- > Automatic address assignment is performed
- > The connection to the bus chain is set up
- The voltage symbol in the information bar indicates that the bus chain is powered by the PWM
- > An overview of the detected bus participants is displayed

р					
Add The	resses success following table sho	fully assigned to ir with the bus participan	dividual bus participants. ts with the respective bus address.		
Bus address	Encoder ID	Туре	Serial number		_
1	1192204-01	LIC413	X636883785a		
2	1340668-01	LIC313	X636883781		
3	1378942-01	MC 15	X12345678a		
				0	×

Figure 18: Overview of bus participants after successful connection

- Confirm with **OK**
- The function menu shows the available functions (depending on the encoder)

Manual connection



- Double-click Connect encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

ncoder	selection						
Jsing this dial	log you can enter an	encoder's ID number to s	specify the data required by th	he program in order to con	nect the encoder.		
Encoder	data						
ID numbe	r						
- Encoder	designation: interface: roltage [V]:	??? ??? ???					
Use por	wer supply from su	bsequent electronics					
ij		not listed in the encoder parameters manual		't know the encoder's ID-	number, you can click <u>Manual Se</u> t	<mark>tings</mark> here a	nd
ij		to the information in th oders can have a differ		IN Encoders" brochure.	Pay attention to the documentatio	n of the enc	oder,
			h the <mark>connect</mark> ed encoder, t nd directions in the Mounti		rd, or PC could be become damag	jed. For you	r ow
^	Encoders subject information and	ct to a laser safety class warnings in the encod	ss are correspondingly iden der's mounting instructions	tified. In this case please	e note the information on the enco	der and all	
	CAUTION: The I	aser is active once the	Connect' button has been	pressed!			

Figure 19: Encoder selection dialog

- Click Manual Settings
- The Adjusting and Testing Software displays safety precautions
- Click Next
- > The Adjusting and Testing Software displays the encoder parameters that can be selected

Encoder sele							
Encoder sele	ction						
On this page you mus	t set the supply voltag	e and the encoder's in	terface.				
Encoder supply	voltage						
⊙ 5.0 V	O 8.0 V	O 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0	
Adjust voltag	ge over sensor lines						
Encoder interfa	ce						
Interface		En	Dat 2.1 / EnDat 3	2.2			~
Mounting code					< Back	lext >	Cancel

Figure 20: Encoder selection dialog for manual selection of the encoder parameters

- In the Encoder supply voltage section, select a value close to the maximum permissible supply voltage of the connected encoders (recommendation: 12 V)
- Select the interface type "EnDat 3 (E30-R4,E30-RM,E30-RB)" in the Encoder interface section
- Click Next
- The Adjusting and Testing Software displays safety precautions
- Click Connect
- > The bus is being checked
- > Automatic address assignment is performed
- > The connection to the bus chain is set up



- The voltage symbol in the information bar indicates that the bus chain is powered by the PWM
- > An overview of the detected bus participants is displayed

Bus address 1 2 3	1192204-01 1340668-01	Type LIC413 LIC313	X636883785a	
	1340668-01		X636883785a	
			X636883781	
	1378942-01	MC 15	X12345678a	
				O

Figure 21: Overview of bus participants after successful connection

> The function menu shows the available functions (depending on the encoder)

7.3 Connection in the monitoring mode – Option 1: with signal adapter

A WARNING
Danger due to uncontrolled axis movements upon start of monitoring mode
Integrating the PWM into the control loop of the machine tool influences the power supply of the encoder and the grounding conditions. Uncontrolled axis motions may occur when the monitoring mode is started. This may result in death or serious personal injury.
Before starting the monitoring mode:
Note the safety precautions in the Operating Instructions
Leave the traverse range of the machine tool
Move the machine axes to the middle of the traverse range
 Secure machine axes against falling down
Have one person at the emergency stop button so that this person can switch off the machine immediately in case of hazard
After having started the monitoring mode:
Check whether the machine axis can be traversed in a controlled manner
Hazard due to uncontrolled axis movements when engaging and disengaging connecting elements
If you engage or disengage any connecting elements in the monitoring mode, uncontrolled axis movements may occur. This may result in death or serious personal injury.
Before engaging or disengaging any connectors:
 Observe the manufacturer's documentation of the subsequent electronics, the peripherals and the machine tool
Secure the machine axes against uncontrolled movements
 Disconnect the encoder in the Adjusting and Testing Software
Switch off the testing device, the subsequent electronics and the peripherals
NOTICE
Damage to the product caused by overvoltage
If you select incorrect encoder parameters in the Adjusting and Testing Software, the encoder, the testing device, and the peripheral devices may be damaged.
 Connect via encoder ID and retrieve the encoder parameters from the encoder database
 For manual connection, observe the information provided by the encoder manufacturer

NOTICE

Damage to the device due to engagement and disengagement of connecting elements during operation

If you engage or disengage any connecting elements during operation, internal components of the devices may be damaged.

Before engaging or disengaging any connectors:

- Disconnect the encoder in the Adjusting and Testing Software
- Switch off the testing device, the subsequent electronics and the peripherals

Prerequisites:

- The subsequent electronics is switched off
- The PWM is connected according to the operating mode
 Further information: "Operating modes of the testing device", Page 26
- The PWM is switched on

7.3.1 Connection with encoder ID

WARNING

Damage to the signal adapter by overvoltage

The signal adapters SA 100 and SA 110 are designed for a supply voltage of 5.5 V maximum. If the encoder requires a higher supply voltage, the signal adapter may be damaged, if you establish the connection through the encoder ID. As a consequence, the encoder, the PWM and the subsequent electronics may be damaged.

- > Observe the encoder supply voltage displayed in the connection dialog
- ▶ Abort the procedure, if the supply voltage of the encoder exceeds 5.5 V



- Double-click Connect encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

Adjusting and Testing S	Software									
selection										
g you can enter an en	icoder's ID numb	er to specify the dat	a required by the p	rogram in order to co	onnect the enc	oder.				
ata										
	64019	640196-04								
lesignation: nterface: Itage [V]:	ERN 487 1 Vpp 5.00									
er supply from subs	equent electro	nics								
If the encoder is n enter the encoder	ot listed in the parameters m	encoder database anually.	or if you don't kr	ow the encoder's	D-number, yo	u can click <u>Manua</u>	al <u>Settings</u> her	e and		
The data refers to since some encod	the informatio ers can have a	n in the "Interfaces different definition	s of HEIDENHAIN I n!	ncoders" brochure	e. Pay attentio	on to the documer	ntation of the e	ncoder,		
					card, or PC co	ould be become d	amaged. For y	our owr		
				d. In this case plea	ase note the i	nformation on the	encoder and	all		
CAUTION: The lase	er is active ond	e the 'Connect' bu	tton has been pre	ssed!						
								ncel		
	esignation: therface: ttage [V]: er supply from subs of the encoder is n enter the encoder The data refers to since some encod If the selected enc safety, please obs Encoders subject 1 information and w	g you can enter an encoder's ID numb ata 640.19 esignation: EF IN 467 tage [M]: 5.00 F supply from subsequent electro If the encoder is not listed in the enter the encoder parameters m The data refers to the information since some encoders can have a If the selected encoder does not safety, please observe the warmin Encoders subject to a laser safety information and warmings in the	g you can enter an encoder's ID number to specify the dat ata 640196-04 esignation: ERN 487 tage [M]: 5.00 er supply from subsequent electronics If the encoder is not listed in the encoder database enter the encoder parameters manually. The data refers to the information in the "Interface: since some encoders can have a different definitio If the selected encoder does not match the connec safety, please observe the warnings and directions Encoders subject to a laser safety class are corresp information and warnings in the encoder's mountin	g you can enter an encoder's ID number to specify the data required by the pr ata 640196-04 esignation: ERN 487 thereface: 1 V Vpp Itage [V]: 5.00 er supply from subsequent electronics If the encoder is not listed in the encoder database or if you don't kn enter the encoder parameters manually. The data refers to the information in the "Interfaces of HEIDENHAIN E since some encoders can have a different definition! If the selected encoder does not match the connected encoder, the e safety, please observe the warnings and directions in the Mounting I Encoders subject to a laser safety class are correspondingly identifie information and warnings in the encoder's mounting instructions.	g you can enter an encoder's ID number to specify the data required by the program in order to co ata 640196-04 esignation: ERN 487 thereface: 1 Vpp thage [M]: 5.00 er supply from subsequent electronics If the encoder is not listed in the encoder database or if you don't know the encoder's le enter the encoder parameters manually. The data refers to the information in the "Interfaces of HEIDENHAIN Encoders" brochurs since some encoders can have a different definition! If the selected encoder does not match the connected encoder, the encoder, interface safety, please observe the warnings and directions in the Mounting Instructions. Encoders subject to a laser safety class are correspondingly identified. In this case plea	g you can enter an encoder's ID number to specify the data required by the program in order to connect the enco ata 640196-04 esignation: ERN 487 tage [M]: 5.00 er supply from subsequent electronics If the encoder is not listed in the encoder database or if you don't know the encoder's ID-number, yo enter the encoder parameters manually. The data refers to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attentiot since some encoders can have a different definition! If the selected encoder does not match the connected encoder, the encoder, interface card, or PC co safety, please observe the warnings and directions in the Mounting Instructions. Encoders subject to a laser safety class are correspondingly identified. In this case please note the i information and warnings in the encoder's mounting instructions.	g you can enter an encoder's ID number to specify the data required by the program in order to connect the encoder. ata	g you can enter an encoder's ID number to specify the data required by the program in order to connect the encoder. ata		

Figure 22: Encoder selection dialog

- Enter the encoder ID in the ID number field; the entry may be with or without a hyphen
- > The determined encoder parameters are shown in the **Encoder data** field
- Click Connect
- > The connection to the encoder is set up
- The voltage symbol in the information bar indicates that the signal adapter is powered by the PWM
- The function menu shows the available functions (depending on the encoder)
- Switch on the subsequent electronics
- > The encoder is powered by the subsequent electronics

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7.3.2 Manual connection

Damage to the signal adapter by overvoltage

The signal adapters SA 100 and SA 110 are designed for a supply voltage of 5.5 V maximum. If you select a higher supply voltage in the connection dialog, this may damage the signal adapter. As a consequence, the encoder, the PWM and the subsequent electronics may be damaged.

 Select the permissible supply voltage for the signal adapter (5 V) in the connection dialog

If you connect the encoder manually, the monitoring mode is only possible for incremental encoders.

With encoders with a serial interface, you can retrieve the encoder ID from the encoder memory: If you connect the encoder manually in the Encoder diagnostics mode, the Adjusting and Testing Software displays the encoder ID in the information bar.

Further information: "Connection in the Encoder Diagnostics operating mode", Page 58



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- Double-click Connect encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

incoder s	election										
Jsing this dialog	you can enter an en	coder's ID number to specif	fy the data required by	y the program in	order to connect the er	ncoder.					
Encoder da	ta										
ID number		640196-04	640196-04								
- Encoder de - Encoder in - Supply volt	terface:	ERN 487 1 Vpp 5.00									
	er supply from subs	equent electronics									
		ot listed in the encoder d parameters manually.	latabase or if you do	on't know the e	ncoder's ID-number, y	you can click <u>Manual S</u>	<mark>ettings</mark> here a	ind			
		the information in the "Ir ers can have a different o		HAIN Encoders'	" brochure. Pay atten	tion to the documentat	tion of the enc	oder,			
		oder does not match the erve the warnings and di				could be become dam	aged. For you	ir owr			
	Encoders subject t information and w	o a laser safety class are arnings in the encoder's	correspondingly ide mounting instruction	entified. In this	case please note the	information on the en	coder and all				
	CAUTION: The lase	er is active once the 'Con	nect' button has bee	en pressed!							
						Connect	Canc	el			

Figure 23: Encoder selection dialog

- Click Manual Settings
- The Adjusting and Testing Software displays safety precautions
- Click Next
- The Adjusting and Testing Software displays the encoder parameters that can be selected

et the supply voltag							
	e and the encoder's int	erface.					
oltage							
O 8.0 V	O 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0		
over sensor lines							
1							
	EnD	0at 2.1 / EnDat 2	2.2			~	
				< Back			
	over sensor lines	over sensor lines	over sensor lines	over sensor lines	over sensor lines	over sensor lines	over sensor lines

Figure 24: Encoder selection dialog for manual selection of the encoder parameters

- Select the value "5 V" in the Encoder supply voltage section (permissible supply voltage for the signal adapter)
- Select the interface type in the **Encoder interface** section
- Switch on the subsequent electronics
- > The encoder is powered by the subsequent electronics
- Click Next
- The Adjusting and Testing Software displays safety precautions
- Click Connect
- > The connection to the encoder is set up
- The voltage symbol in the information bar indicates that the signal adapter is powered by the PWM
- The function menu shows the available functions (depending on the encoder)



7.4 Connection the monitoring mode – Option 2: without signal adapter

Danger due to uncontrolled axis movements upon start of monitoring mode

Integrating the PWM into the control loop of the machine tool influences the power supply of the encoder and the grounding conditions. Uncontrolled axis motions may occur when the monitoring mode is started. This may result in death or serious personal injury.

Before starting the monitoring mode:

- Note the safety precautions in the Operating Instructions
- Leave the traverse range of the machine tool
- Move the machine axes to the middle of the traverse range
- Secure machine axes against falling down
- Have one person at the emergency stop button so that this person can switch off the machine immediately in case of hazard

After having started the monitoring mode:

• Check whether the machine axis can be traversed in a controlled manner

Hazard due to uncontrolled axis movements when engaging and disengaging connecting elements

If you engage or disengage any connecting elements in the monitoring mode, uncontrolled axis movements may occur. This may result in death or serious personal injury.

Before engaging or disengaging any connectors:

- Observe the manufacturer's documentation of the subsequent electronics, the peripherals and the machine tool
- Secure the machine axes against uncontrolled movements
- Disconnect the encoder in the Adjusting and Testing Software
- Switch off the testing device, the subsequent electronics and the peripherals

NOTICE

Damage to the product caused by overvoltage

If you select incorrect encoder parameters in the Adjusting and Testing Software, the encoder, the testing device, and the peripheral devices may be damaged.

- Connect via encoder ID and retrieve the encoder parameters from the encoder database
- For manual connection, observe the information provided by the encoder manufacturer
NOTICE

Damage to the device due to engagement and disengagement of connecting elements during operation

If you engage or disengage any connecting elements during operation, internal components of the devices may be damaged.

Before engaging or disengaging any connectors:

- Disconnect the encoder in the Adjusting and Testing Software
- Switch off the testing device, the subsequent electronics and the peripherals

Prerequisites:

- The subsequent electronics is switched off
- The PWM is connected according to the operating mode Further information: "Operating modes of the testing device", Page 26
- The PWM is switched on

7.4.1 Connection with encoder ID



- Double-click Connect encoder in the function menu
- > The Adjusting and Testing Software displays the **Encoder** selection dialog

	TS - Adjusting and Testing S	Software				× <u></u>	
Help							
Encode	r selection						
Using this di	ialog you can enter an er	coder's ID number to specify the da	ta required by the program	n in order to connect the en	coder.		
Encode	r data						
ID numb	per	640196-04					
- Encode	er designation: er interface: voltage [V]:	ERN 487 1 Vpp 5.00					
Use p	ower supply from subs	equent electronics					
J)		ot listed in the encoder database parameters manually.	e or if you don't know th	e encoder's ID-number, y	ou can click <mark>Manual S</mark>	<mark>ettings</mark> here an	nd
4		the information in the "Interface ers can have a different definitio		ers" brochure. Pay attent	ion to the documentat	ion of the enco	oder,
1		coder does not match the connec erve the warnings and directions			could be become dam	aged. For your	own
		to a laser safety class are corresp varnings in the encoder's mounti		this case please note the	information on the en	coder and all	
	CAUTION: The las	er is active once the 'Connect' bu	utton has been pressed!				
10 C							

Figure 25: Encoder selection dialog

- Enter the encoder ID in the ID number field; the entry may be with or without a hyphen
- The determined encoder parameters are shown in the Encoder data field
- Check the box for Use power supply from subsequent electronics
- Switch on the subsequent electronics
- Click Connect
- > The connection to the encoder is set up
- The voltage symbol in the information bar indicates that the PWM does not output any voltage
- The function menu shows the available functions (depending on the encoder)



7.4.2 Manual connection

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If you connect the encoder manually, the monitoring mode is only possible for incremental encoders.

With encoders with a serial interface, you can retrieve the encoder ID from the encoder memory: If you connect the encoder manually in the Encoder diagnostics mode, the Adjusting and Testing Software displays the encoder ID in the information bar.

Further information: "Connection in the Encoder Diagnostics operating mode", Page 58



- Double-click **Connect encoder** in the function menu
- > The Adjusting and Testing Software displays the **Encoder** selection dialog

ncoder	selection						
ing this dia	log you can enter an ei	ncoder's ID number to specif	iv the data required by the	program in order to con	nect the encoder		
Encoder	<i></i>	icodel a lo number to apecir	y the data required by the	pogram in order to con			
ID number		640196-04					
- Encoder	designation: interface: voltage [V]:	ERN 487 1 Vpp 5.00					
Use po	wer supply from sub	sequent electronics					
i)		not listed in the encoder d r parameters manually.	atabase or if you don't l	know the encoder's ID	-number, you can click <mark>Manu</mark>	<u>al Settings</u> here	and
•		the information in the "In ders can have a different d		Encoders" brochure.	Pay attention to the docume	ntation of the en	coder
		coder does not match the erve the warnings and dir			ard, or PC could be become o	damaged. For yo	ur ow
		to a laser safety class are varnings in the encoder's		fied. In this case pleas	e note the information on the	e encoder and al	1
	CAUTION: The las	er is active once the 'Con	nect' button has been p	ressed!			

Figure 26: Encoder selection dialog

- Click Manual Settings
- The Adjusting and Testing Software displays safety precautions
- Click Next
- The Adjusting and Testing Software displays the encoder parameters that can be selected

Encoder sele	otion							
Encouer sele	cuon							
On this page you mus	set the supply voltag	e and the encoder's int	erface.					
Encoder supply	voltage							
⊙ 5.0 V	O 8.0 V	○ 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0		
Adjust voltag	je over sensor lines							
Encoder interfa	ce							
Interface		EnD	Dat 2.1 / EnDat 3	2.2			~	
				- 274 294				

Figure 27: Encoder selection dialog for manual selection of the encoder parameters

In this case, the selection in the **Encoder supply voltage** section has no effect, since power is supplied by the subsequent electronics.

- Select the interface type in the Encoder interface section
- Switch on the subsequent electronics
- > The encoder is powered by the subsequent electronics
- Click Next
- The Adjusting and Testing Software displays safety precautions
- Click Connect
- > The connection to the encoder is set up
- The voltage symbol in the information bar indicates that the PWM does not output any voltage
- The function menu shows the available functions (depending on the encoder)

7.5 Disconnecting the encoder

When you disconnect the encoder, the voltage supply by the PWM is deactivated as well.

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ù	1		7			

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- Double-click Disconnect encoder in the function menu
- > The Adjusting and Testing Software separates the connection to the encoder



- The voltage symbol in the information bar indicates that the PWM does not output any voltage
- The Adjusting and Testing Software displays the opening screen

7.6 Connecting touch probes

The following steps are required in the Adjusting and Testing Software to connect a touch probe:

- Connect the transceiver unit (SE)
- Establish radio communication between the SE and the touch probe, either by pairing or by reading in the electronic ID label

NOTICE

Damage to the device due to engagement and disengagement of connecting elements during operation

If you engage or disengage any connecting elements during operation, internal components of the devices may be damaged.

Before engaging or disengaging any connectors:

- Disconnect the encoder in the Adjusting and Testing Software
- Switch off the testing device, the subsequent electronics and the peripherals



When you establish the connection to the transceiver unit in the Adjusting and Testing Software, you also activate the power supply by the PWM.

Prerequisites:

- The PWM is connected according to the operating mode Further information: "Operating modes of the testing device", Page 26
- The PWM is switched on

Connecting the transceiver unit (SE)



- ► To establish the connection to the SE, double-click **Connect** encoder in the function menu
- The Adjusting and Testing Software displays the Encoder selection dialog

Encoder data	
ID number	640196-04
- Encoder designation: - Encoder interface: - Supply voltage [V]:	ERN 487 1 Vpp 5.00
Use power supply from s	
	subsequent electronics
	subsequent electronics r is not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>Manual Settings</u> here and oder parameters manually.
The data refer	r is not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>Manual Settings</u> here and
The data refer since some en	r is not listed in the encoder database or if you don't know the encoder's ID-number, you can click Monual Settings here and oder parameters manually. rs to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documentation of the encoder
The data refer since some er Since some er Safety, please Encoders subj	r is not listed in the encoder database or if you don't know the encoder's ID-number, you can click <u>Manual Settings</u> here and oder parameters manually. rs to the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documentation of the encoder ncoders can have a different definition!

Figure 28: Encoder selection dialog

- Enter ID of the SE in the ID number field; the entry may be with or without a hyphen
- > The determined parameters are shown in the **Encoder data** field
- Click Connect
- > The connection to the SE is set up



- The voltage symbol in the information bar indicates that the SE is powered by the PWM
- The function menu shows the available functions (depending on the encoder)

I HEIDENHAIN: ATS - Adjusting and Testing Software		
File Help	_	
Basic functions		
Connect SE 661 to touch probe / switch touch probe on		
- 💦 Display encoder memory		
Comparison of encoder memory		
Voltage display		
Configuration		
Configure hardware		
Language selection		
Manage product keys		
	SE 661 10	87803

Figure 29: Function menu after connecting the transceiver unit

As an alternative, you can connect the SE manually. The procedure is the A same as for manually connecting an encoder in the Encoder diagnostics mode.

Further information: "Manual connection", Page 60

Establishing radio communication by pairing



Observe the mounting instructions of the touch probe before pairing the touch probe.



- To establish the radio communication between the SE and the touch probe, double-click Connect SE 661 to touch probe / switch touch probe on in the function menu
- When you establish the radio communication for the first time, select the option Pair touch probe in the dialog box
- Click OK
- ▶ Follow the instructions of the software wizard
- > The radio communication between the SE and the touch probe is established
- The Adjusting and Testing Software reads the electronic ID label of the touch probe



You can save the electronic ID label to a file and use it for reconnecting later on.

- Click Save in the dialog box to save the ID label to a file
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved
- Click Next
- > The Adjusting and Testing Software shows the data of the connected touch probe
- Click Exit
- > The function menu shows the available functions (depending on the encoder)

Establishing the radio communication by reading the electronic ID label

If you have saved the electronic ID label to a file when pairing the touch probe, you can now use this file for reconnecting.



- To establish the radio communication between the SE and the touch probe, double-click Connect SE 661 to touch probe / switch touch probe on in the function menu
- Select the option Connect the touch probe using the saved file in the dialog
- Click Load file
- Select the storage location of the file
- Click Open
- The Adjusting and Testing Software displays the data loaded from the file
- Click Next
- The Adjusting and Testing Software shows the data of the connected touch probe
- Click Exit
- The function menu shows the available functions (depending on the encoder)

7.7 Disconnecting the touch probe

The following steps are required in the Adjusting and Testing Software to disconnect a touch probe:

- Disconnect the radio communication between the touch probe and the SE transceiver unit
- Disconnect the connection between the PWM and the SE transceiver unit

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When you separate the connection between the PWM and the SE transceiver unit, the voltage supply by the PWM is deactivated as well.

Disconnecting radio communication



- Double-click Switch off touch probe in the function menu
- Click Switch off in the dialog
- Radio communication is terminated
- > The touch probe is in standby mode

Separating the connection to the SE transceiver unit



- Double-click Disconnect encoder in the function menu
- The Adjusting and Testing Software separates the connection to SE



- The voltage symbol in the information bar indicates that the PWM does not output any voltage
- The Adjusting and Testing Software displays the opening screen



Encoder mounting (mounting wizard)

8.1 Encoder mounting with mounting wizard

The Adjusting and Testing Software features special adjustment functions—referred to as mounting wizards/mounting assistants—for mounting certain encoders. In general, these are exposed encoders the scanning heads of which must be exactly aligned.

The **Mounting wizard** function is shown in the function menu after you have connected the encoder through the encoder ID. When you call this function, the mounting wizard will guide you through the required steps.

Depending on the encoder, further functions may be available, for example:

- Tension tape for replacing steel scale tapes
- Encoder settings for adapting certain encoder settings
- Report function

For more information on encoder mounting or encoder-specific functions such as **Tension tape** or **Encoder settings** refer to the documentation of the encoder.



If the encoder is not in the encoder database, you can connect it using an ATS code.

Further information: "Connecting with ATS code or communication code", Page 85

Connecting with ATS code or communication code

If a mounting wizard is required for correct encoder mounting, you may need to connect the encoder using an "ATS code" or "communication code" (depending on the encoder). Only then will the associated mounting wizard appear in the Adjusting and Testing Software. The ATS code or communication code is available on request.



For more information, refer to the supplied documentation on encoder mounting.

Proceed as follows to connect the encoder using an ATS code or communication code:



Double-click **Connect encoder** in the function menu

The Adjusting and Testing Software displays the Encoder selection dialog

ncoder selection	
sing this dialog you can enter an e	encoder's ID number to specify the data required by the program in order to connect the encoder.
Encoder data	
ID number	640196-04
- Encoder designation: - Encoder interface: - Supply voltage [V]:	ERN 487 1 Vpp 5.00
Use power supply from sub	osequent electronics
	not listed in the encoder database or if you don't know the encoder's ID-number, you can click Manual Settings here and r parameters manually.
	o the information in the "Interfaces of HEIDENHAIN Encoders" brochure. Pay attention to the documentation of the encoder, ders can have a different definition!
	ncoder does not match the connected encoder, the encoder, interface card, or PC could be become damaged. For your ow
If the selected en safety, please ob	serve the warnings and directions in the Mounting Instructions.
Encoders subjec	t to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all warnings in the encoder's mounting instructions.
Encoders subjec	t to a laser safety class are correspondingly identified. In this case please note the information on the encoder and all

Figure 30: Encoder selection dialog

- Click Manual Settings
- The Adjusting and Testing Software displays safety precautions
- Click Next
- The Adjusting and Testing Software displays the encoder parameters that can be selected

Encoder sele	ction							
On this page you mus		e and the encoder's int	erface.					
Encoder supply								
⊙ 5.0 V	O 8.0 V	O 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0		
Adjust volta	je over sensor lines							
Encoder interfa	:e							
Interface		EnD	0at 2.1 / EnDat 2	2.2			~	

Figure 31: **Encoder selection** dialog for manual selection of the encoder parameters

- To activate voltage readjustment by the PWM, check the box Adjust voltage over sensor lines (recommended)
- Select the permissible encoder supply voltage in the Encoder supply voltage section
- Select the interface type in the Encoder interface section
- Click Mounting code
- > The ATS/Communication code field is displayed

ENHAIN: ATS - Adjusting a P	nd Testing Software						<u></u> ;	
Encoder sele	ction							
On this page you must	set the supply voltage	and the encoder's int	erface.					
Encoder supply	voltage							
⊙ 5.0 V	O 8.0 V	O 10.0 V	O 12.0 V	O 24.0 V	O Input [V]:	5.0		
Adjust voltag	je over sensor lines							
Encoder interfac	ce							
Interface		Ent	Dat 2.1 / EnDat :	2.2			~	
Mounting code								
ATS / Comm	unication code							
					< Back	Next >	Cancel	

Figure 32: Encoder selection dialog box with ATS/Communication code field

- Enter the ATS or communication code
- Click Next
- The Adjusting and Testing Software displays safety precautions
- Click Connect
- > The connection to the encoder is set up
- The voltage symbol in the information bar indicates that the encoder is powered by the PWM
- > The function menu shows the available functions (depending on the encoder)

9

Inspecting encoders with sinusoidal incremental signals

9.1 Overview

The Adjusting and Testing Software offers the following functions for inspecting encoders with sinusoidal output signals (e.g. 1 V_{PP} or 11 μA_{PP}):

lcon	Function	Description
710	Incremental signal	Test functions for incremental signals, incl. tolerance check if required
6	Recording	Functions for recording and analyzing the incremental signals
	Voltage display	Measured values of voltage and current supply
Ê	Encoder information	Display of encoder information

The displays and the scope of functions of the Adjusting and Testing Software depend on the connected encoder and on the software configuration. When you establish the connection to the encoder, the function menu shows the available functions and operating elements.

9.2 Checking incremental signals

9.2.1 Incremental signal function

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Depending on the encoder the **Incremental signal** function comprises:

- Analog: Inspection of incremental signals, reference signal, and commutation signals
- Recording: Recording and analysis of incremental signals
- **Counter**: Check of counting function and reference function
- **PWT**: Check of incremental signals using bar graphs
- Homing Limit: Check of limit signals
- Protocol: Creation of logs
- Note: Display of notes on current measurement

Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).

The displayed tolerances are the HEIDENHAIN standard values (depending on the encoder).

Further information: "Units and tolerances", Page 36



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- Double-click Incremental signal in the function menu to call the function
- > The Adjusting and Testing Software displays the **Analog** screen

9.2.2 Analog screen

The Analog view allows you to examine the following signals:

- Incremental signals
- Reference signals
- Commutation signals



Figure 33: Analog screen of the Incremental signal function

For diagram display, you can toggle between X/Y graph and Y/t graph.

X/Y graph



Figure 34: X/Y graph

Depiction	Description
X axis	Amplitude of signal A
	Unit: volts or microamperes (depending on the Interface)
Y axis	Amplitude of signal B
	Unit: volts or microamperes (depending on the Interface)
Outer and inner circle	Tolerance limits
Blue circle	Signal circle of signals A and B

Y/t graph



Figure 35: Y/t graph

Depiction	Description
X axis (t)	Number of samples
Y axis	Signal amplitude
	Unit: volts or microamperes (depending on the Interface)
Red curve	Signal A
Blue curve	Signal B
Green curve	Reference signal
Dashed lines in the color of the signals	Tolerance limits of the respective signal

Encoder characteristics section

Display	Description
Position Current count of the position display [increments] Unit: Increments	
Freq	Input frequency Unit: kHz
Sig Mon	 Status displays of signal monitoring Green: The signal amplitudes are within the tolerance range Red: The signal amplitudes exceed at least one tolerance limit
	The left status display shows the current status. When a tolerance limit is exceeded, the status display turns red for about 5 seconds. The right status display shows the overall status of the measurement. When a tolernce limit is exceeded, the status display is permanently red.

Incremental signal section

The bar graph shows the measured values and the results of the tolerance check.





Measurement results are within the tolerance limits

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Several measurement results are outside the tolerance limits

Depiction	Description	
0.000	The indicator shows the measured value.	
	The color of the indicator represents the result of the tolerance check:	
	Green: Measured value within the tolerance range	
	Red: Measured value outside the tolerance range	
1.2	The red marks indicate the tolerance limits.	
<<	The arrows indicate that the measured value is	
>>	beyond the scale. The direction of the arrow shows the direction where the measured value lies.	

The following information refers to the signal diagrams in the document **Interfaces of HEIDENHAIN Encoders**. **Further information:** "Opening documentation", Page 45

Display	Description	
Sig A	Amplitude of signal A	
Sig B	Amplitude of signal B	
A / B	Signal ratio of signals A and Signal B	
	Signal ratio = A / B	
	Optimum condition: Signal ratio = 1	

Display	Description
Pha	Phase shift of signals A and B
	Optimum condition : Signal A precedes signal B by 90°
	0 90° 180° 270° 360°
	Phase shift = 90°
	Phase shift error = 0°
	The Adjusting and Testing Software shows the phase shift error, i.e. the deviation from the optimum condi- tion in degrees.
	Calculation: Pha = φA + φB / 2

Display	Description
TVA	On-to-off ratio of signal A
	The incremental signals are triggered at zero
	crossover and converted into square-wave signals.
	One signal period consists of the high time plus the
	low time of the square-wave signal and is subdivided
	into 360°.
	Optimum condition : High time and low time of a
	signal period have the same length.
	Signal A a TV1 (Signal B a TV2) 0 0 0 0 0 0 0 0 0 0 0 0 0
	High time = Low time = 180°
	On-off ratio error = 0°
	The Adjusting and Testing Software shows the on-off ratio error, i.e. the deviation from the optimum condi- tion in degrees.
	In the documentation, the ratio of high time and low
	time may also be specified as symmetry deviation (SYM) in radians.
	In contrast to the definition of the symmetry (SYM), the algebraic sign of the deviation is also output. This simplifies application cases, such as mounting an encoder.
	Coloulation
	Calculation:
	SYM = P - N / 2 · M TV = 2 · 180 / π · sin (2 · SYM)
TVB	On-to-off ratio of signal B
	For description, see "TV-A"

Operating elements

lcon	Function
	Stop the measurement Interrupts the measurement and shows the last
	measured values in the diagram and the displays
0	Switch to Y/t graph
	Displays the Y/t graph instead of the X/Y graph
Z1	Check the commutation signals
4 1	Shows the commutation signals C and D
	Show reference signal
/ BI	Displays the measured values for the reference signal
	Activate a filter
₹ 2	Suppresses interfering signals ≥ 100 kHz
2	Reset status displays
	Resets the status displays of signal monitoring (Sig Mon) back to "green"
6	Activate comparison circle
•	Retains the current signal circle in the X/Y diagram while the measurement is continued with a new signal circle
\frown	Activate persistance
	Retains a defined number of measured values in the diagram (persistance mode)
	Transfer data to the Protocol view
	Transfers the displayed data to the Protocol screen
HSP	Deactivate HSP
	Deactivates the HEIDENHAIN Signal Processing (HSP) function
	Sampling rate [kS/s]
	Specifies the sampling rate
	Number of samples
	Specifies the number of samples
<u>.</u>	Notes Indicates that there is new information on the current measurement

Sampling rate

The value in the **Sampling rate** field defines the clock rate at which the analog signals are measured and converted.

Unit:	Kilosamples per second (kS/s)
	1 kS/s = 1,000 signal conversions per second
Default setting:	100 kS/s
Setting range:	1 1,800 kS/s

The optimum sampling rate depends on the signal frequency (see Freq value in the Encoder characteristics section). The signal frequency increases with the traversing speed or shaft speed of the encoder. Recommended value:
Sampling rate = 10 · maximum signal frequency

If the sampling rate is too low, the original signal will be distorted:





Sufficiently high sampling rate with correct signal shape

Sampling rate too low with falsified signal shape; correct evaluation is not possible



When you exit the **Incremental signal** function, the **sampling rate** is reset to default.

Number of samples

The value in the **Number of samples** field defines how many measured values are displayed in the diagram.

Default setting:	2,000
Setting range:	2,000 100,000

The optimum value depends on the signal frequency (see **Freq** value in the **Encoder characteristics** section). The signal frequency increases with the traversing speed or shaft speed of the encoder. The higher the signal frequency, the lower you should set the value in the **Number of samples** field.



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A high value in the **Number of samples** field allows you to locate signal drops by determining the envelope curve over several signal periods.



When you exit the **Incremental signal** function, the value in the **Number of samples** field is reset to default.

9.2.3 Examining the incremental signals A and B (Analog view)

A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination.

Further information: "Displaying and deleting notes (Note view)", Page 141



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- Click Reset status displays to reset the status of the signal monitoring
- > The Sig Mon status displays are green
- Enter the desired value in the Sampling rate field
- Enter the desired value in the **Number of samples** field
- Traverse the entire measuring range
- The Adjusting and Testing Software acquires the measured values at the specified sampling rate
- > The diagram and the bar display show the measured values and tolerances of the signals A and B



Figure 36: Analog screen of the Incremental signal function

You can save and print the active diagram. **Further information:** "Adjusting, exporting and printing diagrams", Page 46

To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46

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Switching between the diagrams



Click Switch to Y/t graph

> The Y/t graph is displayed



Figure 37: Analog view with Y/t graph



Click the operating element again to return to the X/Y graph

Stopping the measurement

You can stop the measurement to analyze a specific point or take a screenshot.



- Click Stop measurement in the control bar
- > The diagram and the displays hold the last measured values
- Click the operating element again to continue the measurement

Activating a filter

For special adjustments, you can activate a filter suppressing interference frequencies \geq 100 kHz by attenuating the bandwidth of the input amplifier.



Activate the filter in exceptional cases only and use the full bandwidth of the PWM for standard measurements.

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- Click Activate filter in the control bar
- > Interference frequencies \geq 100 kHz are suppressed
- Click the operating element again to deactivate the filter

Activating the comparison circle

To make signal fluctuations better visible, you can activate the comparison circle in the X/Y diagram. The comparison circle is a snapshot of the current signal circle. The comparison circle is kept in the diagram while the measurement continues with a new signal circle.



- Click Activate comparison circle in the control bar
- > The current signal circle is held in the diagram



Figure 38: X/Y graph with comparison circle



 Click the operating element again to discard the comparison circle

Activating persistence

To make signal fluctuations better visible, you can activate persistence in the X/Y diagram. By this means, measured values are added continuously when the encoder is traversed. A maximum of 10,000 measured values can be shown simultaneously in the diagram. The progress bar indicates the percentage of diagram memory occupied. When 10,000 measured values are reached, the oldest values will be overwritten.

- Click Activate persistence in the control bar
- Traverse the encoder
- > Measured values are continuously added to the Y/X diagram



Figure 39: X/Y diagram with active persistence

Click the operating element again to deactivate persistence

Deactivating HEIDENHAIN Signal Processing (HSP)

Some encoders are equipped with the **HEIDENHAIN Signal Processing ASIC HSP**. If contamination on the measuring standard or scanning reticle result in signal changes, this ASIC almost completely compensates them. The result is a permanently stable measuring signal. For mounting and adjusting the encoder, you need to deactivate the HSP function.

Refer to the mounting instructions for the specific encoder. The cabling must support all signals as per the mounting instructions, e.g. the PWT signal.

HSP

- Click **Deactivate HSP** in the control bar
- > The blinking message **HSP off** is shown
- HEIDENHAIN: ATS Adjusting and Testing Software × File Help Analog Recording Counter PWT Homing - Limit Protocol Note HSP off! Analog X/Y-Display X=Sig A Y=Sig B **Encoder characteristics** Position[Increments] 2656 Frea 0.8 Sig Mon 🔵 🔵 **Incremental signal** 0.6 0.808 Sig A 0.4 0 80 Sig B 0.6 0.2 A/B Pha TVA -0.2 TV B -0.4 -0.6 -0.8 -0.8 -0.6 -0.4 -0.2 0.2 0.4 0.6 0.8 ń 🕨 🔘 🔄 🆓 🤣 🚱 🔘 🜉 HSP Sampl. rate [kS/s] 100 = 🗣 Number of samples 2000 = 🗣 £. Note 1154269-02 AK LIF 48R G8 RN 4000 BIS15-9J 17 ~1Vss 1 Vpp 05 H
- > The diagram and displays are updated

Figure 40: Incremental signal function with deactivated HSP function

HSP

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 Click the operating element again to reactivate the HSP function

When you exit the **Incremental signal** function, the HSP function is automatically reactivated.

Transferring data to the Protocol view

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

The data are temporarily retained in the **Protocol** view until you exit the **Incremental signal** function.

- To store data temporarily, click on Transfer data to the Protocol view
- The Adjusting and Testing Software displays the Protocol screen with the buffered values

Further information: "Protocol view", Page 139

Examples of a faulty encoder

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Figure 41: Analog view with X/Y graph



Figure 42: Analog view with Y/t graph

9.2.4 Checking the reference signal (Analog view)

You can display the reference signal in the **Analog** view to check the signal quality and the position of the reference marks. The reference signal is displayed graphically in the Y/t diagram.



The following information refers to the signal diagrams in the document "Interfaces of HEIDENHAIN Encoders".

Further information: "Opening documentation", Page 45

Recommended sampling rate

Select the sampling rate according to the required display accuracy.

Sampling rate = Maximum frequency · 360° / Display accuracy in degrees Recommended value: 1°

Further information: "Sampling rate", Page 98

Recommended number of samples

The signal evaluation is based on the values that are displayed in the Y/t diagram. Therefore, select the number of samples such that one complete reference pulse is visible in the diagram when a reference mark is traversed.





Figure 43: Complete reference pulse including quiescent value and usable component

Figure 44: Incomplete reference pulse; correct evaluation is not possible

Further information: "Number of samples", Page 99

For encoders with selectable reference mark (via magnet or selector plate), the quiescent value "H" must also be visible in the diagram.



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Click Switch to Y/t graph

- Click Show reference signal
- > The **Reference signal** section is shown
- Enter the desired value in the Sampling rate field
- Enter the desired value in the Number of samples field
- ► Traverse the reference mark
- As soon as the reference signal crosses the trigger line, the reference pulse is shown in the Y/t diagram
- The Reference signal section shows the values of the traversed reference mark
- Traverse further reference marks, if required
- > The Y/t graph and the values in the **Reference signal** section are updated each time a reference mark is traversed

The Adjusting and Testing Software records a reference pulse as soon as the reference signal crosses the trigger line. In the diagram, you can adapt the threshold value for reference mark detection by holding the mouse button and dragging the trigger line to the desired position.



Figure 45: Incremental signal function with reference signal

Depiction	Description
X axis (t)	Number of samples
Y axis	Signal amplitude
	Unit: volts or microamperes (depending on the interface)
Red curve	Signal A
Blue curve	Signal B
Green curve	Reference signal
Dashed lines in the color of the signals	Tolerance limits of the respective signal
Dark blue dashed line	Trigger line
Reference signal section

Depiction	Description						
Ref Mon	Status displays of reference signal monitoring						
	 Green: no status message available 						
	Red: status message available						
	The left status display shows the current status. When a status message is recorded, the status display remains red for about 5 seconds.						
	The right status display shows the overall status of the measurement. When a status message is recorded, the status display remains permanently red.						
Trigger	Status display of reference mark detection						
	 Gray: no reference mark was detected 						
	 Green: a reference mark was detected 						
	When a reference mark was detected, the status display changes back to gray color after 5 seconds. If several reference marks follow each other, the status display may be permanently green.						
LR	Position of the reference pulse						
	Formula: (K – L) / 2						
BR	Width of the reference pulse						
	Formula: K + L						
RR	Quiescent value H of the reference pulse						
NR Usable component G of the reference pulse							
SR	Switching threshold of the reference pulse						
	Formula: E / G						

Traverse the reference mark(s) in both directions. Perform spot checks on encoders with distance-coded reference marks and check defective areas several times.

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

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9.2.5 Checking commutation signals C and D (Analog view)

The incremental signals A and B are generated by the incremental track Zn. Some encoders feature an additional incremental track Z1, providing one sine signal (C) and one cosine signal (D) per revolution. For electronic commutation, the rotor position can thus already be determined before the motor is started.

Incremental track	Characteristics						
Zn: signals A and B	High resolution: One revolution corresponds to e.g. 2048 signal periods (depends on encoder)						
Z1: signals C and D	Low resolution: One revolution corresponds to one signal period						

You can check the commutation signals C and D in the **Analog** view.

Prerequisites:

- The encoder was connected to the Adjusting and Testing Software by entering the encoder ID
 - or
- The interface type **1** V_{PP} + **Z1** was selected during manual connection

Recommended sampling rate and number of samples

The signal evaluation is based on the values that are displayed in the diagram. One complete signal amplitude must be recorded in order that PHA, TV A and TV B can be calculated. Select the sampling rate and the number of samples such that a full circle is displayed in the X/Y diagram when the encoder is traversed.

Check of commutation signals



- Click Check commutation signals in the control bar
- The diagram and the displays show the measured values and tolerances of the signals C and D



The further procedure is the same as for checking the incremental signals A and B. Below you will find a description of the differences in diagrams and displays.

X/Y graph



Figure 46: X/Y graph when checking the commutation signals C and D

Depiction	Description			
X axis	Amplitude of signal C			
	Unit: volts			
Y axis Amplitude of signal D				
	Unit: volts			
Inner and outer circle	Tolerance limits of signals C and D			
Green circle	Signal circle of signals C and D			

Incremental signal section

Depiction	Description
Sig C	Amplitude of signal C Unit: volts
Sig D	Amplitude of signal D Unit: volts
C/D	Signal ratio of signal C to signal D Signal ratio = C / D Optimum condition: Signal ratio = 1

Y/t graph and Z1/Zn graph



Figure 47: Y/t graph and Z1/Zn graph when checking the commutation signals C and D

The Z1/Zn graph is displayed in addition to the Y/t graph. The Z1/Zn graph shows the deviations between the calculated position values of Z1 track and Zn track. In optimum condition, the curve is close to the zero line.

Description
Line count of the encoder per revolution
Angle deviation Unit: degrees

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9.2.6 Recording view

In the **Recording** view, you can record several signal periods of the incremental signals and analyze them using the diagram view. You can individually define the number of signal periods to be recorded per measurement and the sampling rate for recording.



Figure 48: Recording view of the Incremental signal function

Diagram 1

Diagram 1 shows a section of the recorded signal periods. This section corresponds to the area marked in blue in the diagrams 2 and 3.

Depiction	Description				
X axis	Number of signal periods				
Y axis	Signal amplitude				
	Unit: volts or microamperes (depending on the encoder)				
Red	Signal A				
Blue	Signal B				
Green	Reference signal				

Optimum condition: The amplitudes are symmetrical to the X axis and are within the tolerance limits.

Diagram 2

Diagram 2 shows the signal amplitude of all recorded signal periods.

Depiction	Description					
X axis Number of signal periods						
Y axis	Signal amplitude Unit: volts or microamperes (depending on the encoder)					
Red	Signal A					
Blue	Signal B					
Dashed lines	Tolerance limits (in the color of the associated curve)					

Optimum condition: The amplitudes are symmetrical to the X axis and are within the tolerance limits.

Diagram 3

Diagram 3 shows the on-off ratio and the phase shift all recorded signal periods.

Depiction	Description					
X axis Number of signal periods						
Y axis	Measurement error					
	Unit: degrees					
Red	On-to-off ratio of signal A					
Blue	On-to-off ratio of signal B					
Brown	Phase shift of signals A and B					
Dashed lines	Tolerance limits (in the color of the associated curve)					

Optimum condition: The amplitudes are symmetrical to the X axis and are within the tolerance limits.

Recommended sampling rate (minimum value) Sampling rate = Input frequency · 20

Further information: "Sampling rate", Page 98

Number of periods

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The value in the **Number of signal periods** field defines the measuring range to be recorded. Recording ends automatically as soon as the specified number of signal periods has been reached.

Setting range:	1 10,000,000
Default setting:	1,000

To check the entire measuring range, select the number of periods as follows:

- For rotatory encoders: Number of periods = Line count per revolution
- For linear encoders: Number of periods = (Measuring length [mm] x 1.000) / Length of one signal period [µm]

For information on the line count or the length of a signal period, refer to the encoder documentation.

High values for the sampling rate or the number of periods can result in long processing times. Use the following formula to assess the amount of data generated during recording:

File size [bytes] = Sampling rate x Recording time x 12 bytes Example: Sampling rate = 1,000 [kS/s] Recording time = 100 [s] File size [bytes] = 1,000 x 1,000 x 12 bytes = approx. 1.2 GB

Operating elements

Icon	Function
	Start recording
	Starts recording with the specified sampling rate and number of periods
	Activate a filter
Y	Suppresses interfering signals ≥ 100 kHz
2	Reset diagram view
	Resets all diagrams to default view
	Open file
	Opens the dialog for reloading saved records from a DAT file
	Saving a file
	Opens the dialog for saving records to a DAT file
	Exporting data
	Opens the dialog for exporting records to a TXT or ASC file
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
uen	Deactivate HSP
HSP	Deactivates the HEIDENHAIN Signal Processing (HSP) function

9.2.7 Recording and analyzing signal periods (Recording view)

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- Double-click Incremental signal in the function menu
- Click the **Recording** tab to display the **Recording** screen

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File Help	Recording	Counter	PWT	Protocol	Note														
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Figure 49: Recording view of the Incremental signal function

- Enter the desired value in the Sampling rate field
- Enter the desired value in the Number of periods field
- Click Start recording in the control bar
 - > The **Recording** dialog is displayed

Recording		
	Please wait!	
Position		8 160
Time[s]		57.1
	82%	
	Cancel	

Figure 50: Recording dialog

- Traverse the desired measuring range
- > The signal periods are recorded at the specified sampling rate
- > The progress bar shows how many percent of the signal periods have been recorded
- Recording ends automatically as soon as the specified number of signal periods has been reached or
- ► Click **Cancel** to stop recording manually
- > The Read file dialog is displayed



Figure 51: Read file dialog box

- The progress bar shows how many percent of the recorded data have been processed
- > When saving is complete, the diagrams show the recorded signal periods



Figure 52: Recorded signal periods without error

Optimum condition: If the output signals are faultless, no drops are visible in the upper diagram. The curves in the middle and lower diagram are almost congruent and are entirely within the tolerance range.

The signal periods are adjusted such that the standstill periods of the encoder can be displayed consistently in the diagrams. Since the values for the signal periods or the position do not change when the encoder is at a standstill, an additional signal period is inserted after 5,000 samples (see Sampling rate). The inserted signal periods are not counted for the recording, but only the actual signal periods of the encoder.

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Example of a faulty encoder



Figure 53: Recorded signal periods with irregularities

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Signal drops as well as on-off ratio errors and phase shift errors are visible at the end of the measuring range. This may be due to heavy contamination, for example.

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Adjusting the diagram view



Figure 54: Diagrams of the Recording view

Use the **Position** slider to navigate through the recorded data.

- Hold the mouse button and drag the slider to the desired position
- > Diagram 1 shows the selected detail of the recorded data
- In diagram 2 and diagram 3 the blue section is moved to the selected position

You can save and print the active diagram.

Further information: "Adjusting, exporting and printing diagrams", Page 46



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To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46



- Click Reset diagram view in the control bar to restore the default view
- > The blue section is shifted left to the beginning
- > Zooming is reset

Saving recorded data to a file

The Adjusting and Testing Software saves the recorded data in the file "SignalData.dat".

Path: C: ► Users ► ... ► AppData ► Roaming ► HEIDENHAIN ► ATS

When you make a new recording, the file contents are overwritten. If you want to preserve the recorded data permanently, you can save the data under a different file name.

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- Click Save file in the control bar
- Select the desired storage location in the dialog
- Enter the desired file name
- Click Save
- > The file is saved



You can reload recorded data in DAT format in the Adjusting and Testing Software.

Loading recorded data from a file

Prerequisite: The recorded data are available in a DAT file.



- Click Open file in the control bar
- Select the storage location in the dialog
- Click Open
- > The diagrams show the recorded data from the file



Below the diagrams, the Adjusting and Testing Software displays the name of the file and the sampling rate at which the recording was made.

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Exporting recorded data

For further processing in other programs, you can export the recorded data to a TXT or ASC file.

It is not possible to load the recorded data from a TXT or ASC file in the Adjusting and Testing Software.

►	Click Exp	oort fil	e in the o	control	bar	
	<u> </u>					

- Select the desired storage location in the dialog ►
- Enter the desired file name
- Click Save ►
- The file is saved >

9.2.8 **Counter view**

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In the **Counter** view, you can check the counting function and the reference function of incremental encoders. The Counter view shows the distances between the reference marks as the encoder moves.



Figure 56: Counter view of the Incremental signal function

Table

When a reference mark is passed over, the distance to the preceding reference mark is determined and an entry added to the table. The table contains the following information:

- The asterisk marks the count value at the current position
- The arrows show the direction of traverse
- With distance-coded reference marks, the nominal increment is shown in addition to the count values

Bar graph

Depiction	Description					
X axis	Number of captured reference marks					
Y axis	Number of signal periods					
Red	Reference mark spacing					
Blue	Current position					

Counter section

Display	Description
Position in [unit]	Current count of the incremental counter Unit: Depends on the settings in the Counter charac- teristics section

Counter characteristics section

Display	Description
Position [increments]	Current count
	Unit: increments
Reference [increments]	Distance between the two reference marks traversed last
	Unit: increments
Direction	The arrow shows the traverse directionArrow to the right: positive count value recordedArrow to the left: negative count value recorded
Trigger	 Status display of reference mark detection Gray: no reference mark was detected Green: a reference mark was detected When a reference mark was detected, the status display changes back to gray color after 5 seconds. If several reference marks follow each other, the status display may be permanently green.
Sig Mon	 Status display of signal monitoring Green: The signal amplitudes are within the tolerance range Red: The signal amplitudes exceed at least one tolerance limit The left status display shows the current status. When a tolerance limit is exceeded, the status display turns red for about 5 seconds. The right status display shows the overall status of the measurement. When a tolerance limit is exceeded, the status display shows the status of the status display is permanently red.

Settings in the Counter characteristics section

In the **Counter characteristics** section you can adjust the settings for the counter value display **Position in [unit]**. The position value is calculated according to these settings.

Display	Description
Preset	Input field for presetting a count value
Resolution	Counter resolution
IncrementalRotatoryLinear	 Type of incremental counter The count value is converted into the corresponding unit as per the selection: Incremental: Measuring steps Rotatory: Selected unit (see below); Standard setting: Degrees Linear: Micrometers Depending on the selection, the following settings are displayed.
Line count	Input field for the encoder line count per revolution to calculate the count value
DegreesRadian measureDMS	Unit of the incremental counter The value of the incremental counter is converted into the selected unit. Degrees Radian measure DMS: Degrees, minutes, seconds
Signal period	Input field for the length of a signal period to calculate the count value

Operating elements

lcon	Function						
	Stop the measurement						
	Interrupts the measurement and shows the last measured values in the diagram and the displays						
0	Activate a filter						
V	Suppresses interfering signals \geq 100 kHz						
2	Reset status displays						
	Resets the status displays of signal monitoring (Sig Mon) back to "green"						
¥	Delete measured values						
~	Deletes the measured values recorded from the table and graphics						
- and	Transfer data to Protocol view						
	Transfers the displayed data to the Protocol screen						
HSP	Deactivate HSP						
1151	Deactivates the HEIDENHAIN Signal Processing (HSP) function						
CT	Clear the counter						
CL	Sets the counter to zero						
2	Preset the count value						
	Loads the value from the Set field as new count value						
ЛЛ	Clear the counter with every reference mark						
<u>, , , ,</u>	Activates zero reset of count value and position each time a reference mark is traversed						
Π	Clear the counter and start with next reference mark						
	Sets counter and position to zero and starts capture when the next reference mark is traversed						
	Clear the counter and determine the position again						
	Sets counter and position to zero and redetermines the position via the distance-coded reference marks						
<u>+</u> →	Invert counting direction						
,	Inverts the positive or negative counting direction						
	Evaluate the inverted reference pulse						
	Inverts the evaluation of the reference pulse						
	Notes Indicates that there is new information on the current measurement						

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9.2.9 Checking the counting function (Counter view)

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- Double-click Incremental signal in the function menu
- Click the Counter tab to switch to the Counter view

File Help	HAIN: ATS - Adju	isting and Test	ting Softwa	re								×		×
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Figure 57: Counter view of the Incremental signal function

The further procedure depends on the type of reference marks the encoder features.

Procedure with one reference mark

- ► Traverse the reference mark
- ▶ Traverse the reference mark in the opposite direction
- ► Repeat the procedure several times
- A measured value is added to the table and the diagram each time the reference mark is traversed



Figure 58: Counter view when examining an encoder with one reference mark

Counter and reference functions are error-free if the distance is "0" each time the reference mark is traversed.

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Procedure with multiple reference marks without distance coding

- Traverse several reference marks
- A measured value is added to the table and the diagram each time a reference mark is traversed
- ▶ Traverse the reference marks in the opposite direction
- > When the direction is reversed, the value "0" is added to the table and the diagram

Counter and reference functions are error-free if the spacing is the same between all reference marks.

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You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Procedure with distance-coded reference marks

When you examine encoders with distance-coded reference marks, the Adjusting and Testing Software first determines the nominal increment.

- Traverse several reference marks to determine the nominal increment
- If the traverse path of the encoder is short, you may need to traverse it in both directions repeatedly
- > After the Adjusting and Testing Software has determined the nominal increment, the table also includes the nominal increment and the position



Figure 59: Display during determination of nominal increment



Figure 60: Display after the nominal increment has been determined

Columr	n Description
1	Reference mark spacing 1
2	Reference mark spacing 2
3	base: Nominal increment
4	pos.: Position determined from distance coding
5	Value "Direction!": Appears if the counting direction determined from the incremental signals differs from the sequence of reference mark spacings 1,2
	 Traverse the entire measuring range A measured value is added to the table and the diagram each time a reference mark is traversed
	 Traverse the reference marks in the opposite direction When the direction is reversed, the value "0" is added to the table and the diagram
0	Counter and reference functions are error-free if the determined distances are the same as the actual distance coding of the encoder. The sum of the values in the columns 1 and 2 must correspond to the nominal increment (value in column 3).
6	Deviations indicate a malfunction or improper mounting of the encoder.
6	If the value "Direction!" is shown in the last column, check the counting direction and the encoder wiring.
1	You can transfer the displayed data to the Protocol screen and save them later on as a log file (PDF format).
	Further information: "Transferring data to the Protocol view", Page 105

Adjusting the counter display

The counter display can be adjusted in the **Counter characteristics** section.

- Set the desired counter resolution with the plus and minus buttons
- Select desired display options:
 - Incremental: Count value is displayed in increments
 - Rotatory: Count value is displayed in the selected angle unit
 - Degrees
 - Radian measure
 - DMS (degrees, arc minutes, arc seconds)
 - Linear: Count value is displayed in micrometers
- If you select Rotatory, enter the line count per encoder revolution in the Line count field
- If you select Linear, enter the length of a signal period in micrometers in the Signal period field
- The count value is converted and displayed according to the setting

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A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination.

Further information: "Displaying and deleting notes (Note view)", Page 141

Presetting the count value

To compare the counter e.g. with the counter of the subsequent electronics, you can preset a certain count value at the current position.

Enter the desired position value in the Preset field



- Click Preset count value in the control bar
- > The entered count value is adopted as the new position

Clearing the counter

CL		Click Clear counter in the control bar
CL	>	The counter is set to zero

Clearing the counter with every reference mark

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- To start counting at every reference mark, click Clear counter with every reference mark in the control bar
- The counter is set to zero each time a reference mark is traversed

Clearing the counter and starting with next reference mark



- Click Clear counter and start with next reference mark in the control bar
- The counter is set to zero and will start counting when the next reference mark is traversed

Inverting the counting direction

The counting direction of some encoders can be configured. You can adapt the counting direction to the encoder in the Adjusting and Testing Software.



- Click Invert counting direction in the control bar to adapt the counting direction
- The Adjusting and Testing Software inverts the positive or negative counting direction

Clearing the counter and determining the position again

For encoders with distance-coded reference marks, you can set the position and the counter to zero and then determine the position again.

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Click Clear counter and determine position again in the control bar

- > The counter is set to zero
- Traverse several reference marks
- > The position is determined again

Evaluating the inverted reference pulse

The reference signal of some encoders is inverted. In order that inverted reference pulses can be detected and correctly evaluated, you need to adapt the evaluation logic of the Adjusting and Testing Software.



Click Evaluate inverted reference pulse in the control bar

 The Adjusting and Testing Software inverts the evaluation logic

Deleting measured values

For a new examination you can delete the recorded measured values from the table and from the diagram.



- Click Delete measured values in the control bar
- > The table and the diagram are reset

9.2.10 PWT view

The **PWT** view allows for a rapid test of incremental signals and reference mark signals. The results are displayed graphically as bar graphs.

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Figure 61: PWT view of the Incremental signal function

The following signal characteristics are evaluated in the bar graphs:

- Signal amplitude
- Signal deviation
- RI position: Reference mark position
- RI zero crossing: Zero crossovers of reference-mark signal

The tolerance ranges are indicated by color in the bar graphs:

Image	Tolerance range	Description
Green	Pass	Measured values are within the restrict- ed tolerance range
Yellow	Adequate	Measured values are within tolerance
Gray	Not adequate	Measured values are outside the tolerance range
	Out of scale	At least one measured value is beyond the tolerance range and out of scale. The direction of the arrow shows the direction where the measured value lies.

The shown tolerances are HEIDENHAIN standard values! In certain cases, the tolerance limits of the encoder may differ from the tolerance limits displayed.

Note the tolerances specified in the documentation of the encoder.

Depiction	Description
	The bar shows the current measured value.
	The drag indicators show the minimum and maximum measured values of the measurement.

Depiction	Description
Position [increments]	Count value of incremental counter
	Unit: Increments
Freq	Input frequency
	Unit: kHz
Trigger	Status display of reference mark detec- tion
	 Gray: no reference mark was detected
	 Green: a reference mark was detected
	When a reference mark was detect- ed, the status display changes back to gray color after 0.5 seconds. If sever- al reference marks follow each other, the status display may be permanently green.

Signal amplitude bar graph

The position of the black bar indicates the signal amplitude.



Signal deviation bar graph

Signal deviations are errors in the signal ratio, on-off ratio and phase shift. The larger the signal deviation is, the broader the black bar becomes.

Optimum condition: The black bar is as narrow as possible and is positioned within the green area.

Depiction	Description
	Optimum condition
	Signal deviation at the tolerance limit
	Signal deviation too large

RI position bar graph

The reference mark signal is at a specified nominal position. The position of the black bar indicates the deviation from the optimum position.

Depiction	Description
	Deviation of reference mark position at the tolerance limit

RI zero crossover bar graph

The positions of two black bars show the deviation of the zero crossovers from the nominal values.

Depiction	Description
	Deviations of the reference pulse zero crossovers within the tolerance range

Operating elements

lcon	Function
	Activate a filter
Y	Suppresses interfering signals \geq 100 kHz
2	Delete measured values
	Deletes the measured values for a new measurement
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
HSP	Deactivate HSP
	Deactivates the HEIDENHAIN Signal Processing (HSP) function
	Notes
	Indicates that there is new information on the current measurement

9.2.11 Running a rapid test with the PWT test function (PWT view)

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- Double-click Incremental signal in the function menu
- Click the **PWT** tab to switch to the **PWT** view

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Figure 62: PWT view of the Incremental signal function

A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination. **Further information:** "Displaying and deleting notes (Note view)",

Page 141

- ► Traverse the entire measuring range
- > The Signal deviation bar graph is activated
- When a reference mark is traversed, the bar graphs RI position and RI zero crossing are activated
- > The bar graphs show the current measured values



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- To reset the minimum and maximum value for a new measurement, click Delete measured values in the control bar
- > The drag indicators are reset to the current measured value

If the encoder stops for several seconds, the bar graphs for **Signal deviation**, **RI position** and **RI zero crossing** become inactive again.

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You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

9.2.12 Homing – Limit view

The **Homing – Limit** view provides a functional check of limit switching signals.



Figure 63: Homing – Limit view of the Incremental signal function

Bar graph

In the diagram, the signals with their respective traverse directions are color-coded.

Depiction	Description
Green	Reference signal
Blue	Homing backward
Dark blue	Homing forward
Olive green	Limit backward
Brown	Limit forward

Encoder characteristics section

All values in mm

Depiction	Description
Position	Count value of incremental counter Unit: millimeters
Direction	 The arrow symbol shows the traverse direction Arrow to the right: positive count value recorded Arrow to the left: negative count value recorded

Homing/L1/Pin 6 (depending on encoder)

Depiction	Description			
Status	Status display of the homing level			
	 Gray: low level 			
	 Green: high level 			
Position	Distance between homing edge and reference mark R			
	Unit: millimeters			

Limit/L2/Pin 8 (depending on encoder)

Depiction	Description
Status	Status display of the limit level
	 Gray: low level
	 Green: high level
Position 1	Distance between limit edge 1 and reference mark R
	Unit: millimeters
Position 2	Distance between limit edge 2 and reference mark R
	Unit: millimeters
Distance	Distance between limit edge 1 and limit edge 2
	Distance = Limit edge 1 + Limit edge 2

Operating elements

lcon	Function
21	Delete measured values
	Deletes the measured values for a new measurement
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
LIOD	Deactivate HSP
nər	Deactivates the HEIDENHAIN Signal Processing (HSP) function
	Notes
	Indicates that there is new information on the current measurement

9.2.13 Checking Limit switching signals (Homing – Limit view)

Prerequisites:

- The encoder features limit switching signals
- The encoder is correctly mounted and electrically adjusted according to the mounting instructions
- The encoder was connected to the Adjusting and Testing Software by entering the encoder ID

For detailed information on the availability and function of switching signals, refer to the encoder documentation or the brochure "Interfaces of HEIDENHAIN Encoders".

Further information: "Opening documentation", Page 45



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- Double-click **Incremental signal** in the function menu
- Click the Homing Limit tab to switch to the Homing Limit view

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Analog Recording Counter PWT Homing - Limit Protocol Note	
Homing - Limit	
Green = Refernce position	Encoder characteristics
Bue = Homing backward	Unit for all values is mm
Dark blue = Homing forward	Homing / Limit
Olive = Limit backward	Position
Brown = limit forward	Direction 🔇
6	Homing
	Status
5	Position
	Limit
4	Status
	Position 1
3	Position 2
	Distance
2	
1	
0	
1	
0	
🔁 🔜 HSP	Note
1154269-02 AK LIF 48R G8 RN 4000 BIS15-9J 17 ~1Vss 05 H	1 Vpp

Figure 64: Homing – Limit view of the Incremental signal function

- Traverse the entire measuring range
- Recording of the measured values in the diagram starts as soon as the first reference mark is traversed.
- When the last reference mark is traversed, the entire measuring range is displayed in the diagram with homing and limit switching edges (depending on the encoder)

File Help	NHAIN: ATS - Adju	isting and Test	ing Softwa	ire						×		×
Analog	Recording	Counter	PWT	Homing - Limit	Protocol No	te						
					Homi	ng - Lim	it					
Green =	Refernce po	sition							Encoder ch	aract	erist	lics
Bue = H	loming back	ward							Unit for all values	is mm		
Dark blu	ue = Homing	forward							Homing / Limit			
Olive = I	Limit backwa	ard							Position		99.8	200
Brown	= limit forwar	ď							Direction	C		
6									Homing			
									Status	0		
5				1					Position		- 0	404
									Limit			
4				1				•	Status	0		
									Position 1			
3									Position 2		6.8.8	360
2									Distance			
2												
'Ŧ												
0												
.1	-											
		-50		0		50						
2 🗖	HSP									No	ote	L
115426	9-02 AK	IF 48R	G8 R	N 4000 BIS	15-9J 17	~1Vss	05	н			1	Vpp

Figure 65: Homing – Limit with reference mark and switching edges

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

You can save and print the active diagram.

Further information: "Adjusting, exporting and printing diagrams", Page 46

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► To reset the diagram for a new measurement, click **Delete measured values** in the control bar

9.2.14 Protocol view

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You can transfer data from the views of the **Incremental signal** function to the **Protocol** view.

Further information: "Transferring data to the Protocol view", Page 105 The data recorded in the **Protocol** view can be saved to a PDF file. The **Protocol** view shows the data in various tabs, according to the view in which the data was captured.

The data are temporarily retained in the **Protocol** view until you exit the **Incremental signal** function.

If there are any test limits for the signal then they are saved to the protocol.



Operating elements

lcon	Function
	Save log
I	Opens the Protocol dialog

9.2.15 Saving log data (Protocol view)

You can save the test results in a PDF file.

Click Save log

Click the Protocol tab to switch to the Protocol view



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- > The **Protocol** dialog shows the available contents
- Select the data to be logged
- Click **Preview** to open a preview of the PDF file
- ▶ If necessary, close the preview
- Click **Save** in the dialog to save the file
- Select the desired storage location
- Enter the file name
- Click Save
- > The file is saved
- Click Close to close the dialog

In the Adjusting and Testing Software, you can add an individual header and details on the examiner to the logs.
 Further information: "Soving log information" Page 54

Further information: "Saving log information", Page 54

To display the PDF contents correctly, the font "Arial Unicode MS" must be installed on the computer.

9.2.16 Note view

The Note screen contains information on the current measurement.

De HEIDENI File Help	HAIN: ATS	i - Adjustir	ng and Test	ing Softw	are							-		×
	Record	ding C	ounter	PWT	Protoc	ol Note								
								N	ote					
Descri	ption									N	umber			^
Calcul	ation	refer	rence:	Speed	l to hi	gh.								
2														£.
512132	-02 R	OD 28	80 C	CD	18000	03 S12- 0	3 02	R4 ~	1Vss ()	07		1	Vpp
igure	66: 	Note	view	of t	he Inc	remen	tal si	ignal	funct	ion				

The notes refer to problems with signal calculation, e.g.:

- Signal frequencies are too high, e.g. due to excessive traversing speed or shaft speed
- Signal frequency fluctuates
- Displayed signal detail is too small to calculate the reference mark correctly

Operating elements

lcon	Function
2	Delete notes
	Deletes the notes for a new measurement

9.2.17 Displaying and deleting notes (Note view)



A warning symbol appears in the control bar when there is a new note. Go to the **Note** view to read the note.

- Click **Note** in the control bar
- > The **Note** view shows a list of all notes



Notes are retained until you exit the **Incremental signal** function or delete the notes by hand.

Deleting notes



Click Delete notes in the control bar to delete all notes

9.3 Recording and analyzing incremental signals

9.3.1 Recording function

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With the **Recording** function, you can record several signal periods of the incremental signals and analyze them using the diagram view. You can individually define the number of signal periods to be recorded per measurement and the sampling rate for recording.

The new **Recording** function described here has an extended range of functions compared to the previous Recording function (see "Recording view", Page 113). However, the previous function has been retained to ensure downward compatibility.

Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).



The displayed tolerances are the HEIDENHAIN standard values (depending on the encoder).

Further information: "Units and tolerances", Page 36



 To call this function, double-click **Recording** in the function menu

9.3.2 Recording view

HEIDENHAIN: ATS - Adjusting and Testing Sof File Help	tware			- 0	×
1 0.5 0 -0.5 -1 -1 -0.5 0 0.5 1			Position[Increments] Frequency [kHz]	- 1006 2.1	3
Counter characteristics	Zähler löschen + Start	Start		Stop	
Sampl. rate [kS/s]	5				
Recording to: O Position positiv	O Position negative	Number of signal periods	000 😽 🔮		
File name SignalData.dat					
			1	1	£.
			ROD 280C	512132-02	

Figure 67: **Recording** function

X/Y graph



Figure 68: X/Y graph

Depiction	Description
X axis	Amplitude of signal A
	Unit: volts or microamperes (depending on the interface)
Y axis	Amplitude of signal B
	Unit: volts or microamperes (depending on the interface)
Blue circle	Signal circle of signals A and B

Y/t graph

1							
-1	****			*****	*****		*****
0	5	10	15	20	25	30	35

Figure 69: Y/t graph

Depiction	Description	
X axis (t)	Number of samples	
Y axis	Signal amplitude	
	Unit: volts or microamperes (depending on the interface)	
Red curve	rve Signal A	
Blue curve	Signal B	

Samples/Period

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Sample	s/Period					
			37			
8	16	24	32	40	48	56

Figure 70: Samples/Period bar graph

The bar graph shows the current number of samples per signal period.

Optimum value:	32 samples per signal period
Recommended range:	16 to 48 samples per signal period

You can see from the color and position of the display element whether the current value is within the recommended range:

Color	Description
Green	The value is within the recommended range
Red	The value is below or above the recommended range

If the values fall below or significantly exceed the recommended values (from 1,000 sampling points per signal period), the signal deviations cannot be calculated anymore or not with sufficient accuracy.

High values for the sampling rate or the number of periods can result in long processing times. Use the following formula to assess the amount of data generated during recording:

File size [bytes] = Sampling rate x Recording time x 12 bytes Example:

Sampling rate = 1,000 [kS/s]

Recording time = 100 [s]

File size [bytes] = 1,000 x 1,000 x 12 bytes = approx. 1.2 GB

Encoder characteristics

Position[Increments] - 10063 Frequency [kHz] 2.13

Figure 71: Position display and frequency display

Display	Description
Position [increments]	Current count of the position display
	Unit: increments
Freq	Input frequency
	Unit: kHz
Sampling rate

A

The value in the **Sampling rate** field defines the clock rate at which the analog signals are measured and converted.

Kilosamples per second (kS/s)				
l kS/s = 1,000 signal conversions per second				
100 kS/s				
I 1,800 kS/s				
1				

The optimum sampling rate depends on the signal frequency (see **Freq** value in the **Encoder characteristics** section). The signal frequency increases with the traversing speed or shaft speed of the encoder. Recommended value: **Sampling rate = 32 · maximum signal frequency**

If the sampling rate is too low, the original signal will be distorted:





Sufficiently high sampling rate with correct signal shape

Sampling rate too low with falsified signal shape; correct evaluation is not possible

When you exit the **Recording** function, the **sampling rate** is reset to default.

Recording to:

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Recording to:	O Position positiv	O Position negative	Number of signal periods	5000	

Figure 72: Position display and frequency display

The selection in the **Recording to:** section determines the point at which the recording will end automatically.

Options	Description				
Position positive	The input field to the right defines a position in positive direction. Recording ends as soon as the position is reached.				
Position negative	The input field to the right defines a position in negative direction. Recording ends as soon as the position is reached.				
Number of signal periods	The input field to the right defines the number of signal periods to be recorded. Recording ends as soon as the number is reached, irrespective of the traverse direction. Changes of direction are permitted.				

Operating elements

Operating element	Function
Clear counter	Sets the Position [increments] counter to zero
Reset counter + start	Sets the Position [increments] counter to zero and starts the measurement
Start	Starts the measurement from the current value of the Position [increments] counter
Stop	Stops the measurement
lcon	Function
	Stop the measurement
	Interrupts the measurement and shows the last measured values in diagrams and displays
	Open file
	Opens the dialog for reloading saved records from a DAT file

Double-click Recording in the function menu

9.3.3 Recording and analyzing signal periods

HEDENHAIN ATS - Adjusting and Testing Software File Help	- 0	×
6		
Position[increments] Position[increments] Frequency [kHz] Samples/Period	0	0.00
-1 0 1 8 16 24 32 40 48 56 Counter characteristics Reset counter + start Start Stop		_
Sampl. rate [kS/s] 100 0 Position negative O Position negative Number of signal periods 5000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
File name SignalData.dat		-
		£.

Figure 73: **Recording** function

- Enter the desired value in the Sampling rate field
- Make the desired selection in the Recording to field
- Click Start
- > The values are recorded
- Traverse the desired measuring range; observe the recommended number of samples
- > The signal periods are recorded at the specified sampling rate
- Recording ends automatically as soon as the specified number of signal periods has been reached or
- Click Stop to stop the measurement manually
- > The result of the recording is displayed

9.3.4 Display of measurement results



Figure 74: Recording function with measurement results

Diagram 1

Diagram 1 shows a section of the recorded signal periods. This section corresponds to the area marked in green in the diagrams 2, 3, and 4.

Depiction	Description
X axis	Depending on the option selected in the X Axis section:
	 Scanning period (number of signal periods)
	If the encoder is in motion , the sampling period equals the number of signal periods.
	If the encoder is at a standstill : The signal periods are adjusted such that the standstill periods of the encoder can be displayed consistently in the diagrams. Since the values for the signal periods or the position do not change when the encoder is at a standstill, an additional signal period is inserted after 1,000 samples (see Sampling rate). The sum of the actual signal periods of the encoder and the inserted signal periods is referred to as the sampling period. The inserted signal periods are not counted for the recording, but only the actual signal periods of the encoder. Position (increments)
	 Time (unit: seconds)
Y axis	Signal amplitude
	Unit: volts or microamperes (depending on the encoder)
Red	Signal A
Blue	Signal B
Green	Reference signal

Optimum condition: The amplitudes are symmetrical to the X axis.

Diagram 2

Diagram 2 shows the signal amplitude of all recorded signal periods.

Depiction	Description		
X axis	Depending on the option selected in the X Axis section:		
	 Sampling period (number of signal periods, see "Diagram 1", Page 149) 		
	Position (increments)		
	Time (unit: seconds)		
Y axis	Signal amplitude		
	Unit: volts or microamperes (depending on the encoder)		
Red	Signal A		
Blue	Signal B		
Dashed lines Tolerance limits (in the color of the associated cu			

Optimum condition: The amplitudes are at the nominal value or in the tolerance range (dashed lines).

Diagram 3

Diagram 3 shows the on-off ratio and the phase shift all recorded signal periods.

Depiction	Description				
X axis	Depending on the option selected in the X Axis section:				
	 Sampling period (number of signal periods, see "Diagram 1", Page 149)) 				
	Position (increments)				
	Time (unit: seconds)				
Y axis	Measurement error				
	Unit: degrees				
Red	On-to-off ratio of signal A				
Blue	On-to-off ratio of signal B				
Brown	Phase shift of signals A and B				
Dashed lines	Tolerance limits (in the color of the associated curve)				

Optimum condition: The values are symmetrical around the zero line or within the tolerance range (dashed lines).

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Diagram 4

Diagram 4 can be configured individually.

Depiction	Description					
X axis	Depending on the option selected in the X Axis section:					
	 Sampling period (number of signal periods, see "Diagram 1", Page 149)) 					
	Position (increments)					
	Time (unit: seconds)					
Y axis	Depending on the option selected in the Chart 3 section:					
	Position (increments)					
	Time (unit: seconds)					
	Frequency (unit: kilohertz)					
	Number of samples					
Red	Depending on the option selected in the Chart 3 section:					
	Position					
	Time					
	Frequency					
	Number of samples					
Dashed lines	Recommended number of samples:					
Displayed if the Samples	Green: recommended range					
option is selected in the Chart 3 section	 Red: functional limit of the Adjusting and Testing Software 					
	If the function limits are exceeded, the correct calculation of the signal deviations is not guaranteed.					

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If the **Signal periods** or **Position** option is selected in the **X Axis** section, the diagrams for the encoder standstill periods show constant values. This allows for a consistent representation throughout all diagrams.

Operating elements

Symbol	Function
21	Reset diagram view
	Resets all diagrams to default view
	Open file
	Opens the dialog for reloading saved records from a DAT file
E	Save file
I	Opens the dialog for saving records to a DAT file
	Export data
	Opens the dialog for exporting records to a TXT file

9.3.5 Adjusting the diagram view

Configuring the X axis

- To change the reference of the X axis, select the desired option in the X Axis field
 - Sampling period
 - Position
 - Time

Configuring the Y axis of diagram 4

- ► To change the reference of the Y axis of diagram 4, select the desired option in the **Chart 3** field
 - Position
 - Time
 - Frequency
 - Number of samples

Navigating through recorded data

Use the slider to navigate through the recorded data.

- 0
- Hold the mouse button and drag the slider to the desired position
- > Diagram 1 shows the selected detail of the recorded data
- In the diagrams 2, 3, and 4, the blue section is moved to the selected position



You can save and print the active diagram.

Further information: "Adjusting, exporting and printing diagrams", Page 46



To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46



- Click Reset diagram view in the control bar to restore the default view
- > The blue section is shifted left to the beginning
- > Zooming is reset

9.3.6 Saving recorded data to a file

The Adjusting and Testing Software saves the recorded data in the file "SignalData.dat".

Path: C: ► Users ► ... ► AppData ► Roaming ► HEIDENHAIN ► ATS

When you make a new recording, the file contents are overwritten. If you want to preserve the recorded data permanently, you can save the data under a different file name.

1	=1	1
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- Click Save file in the control bar
- Select the desired storage location in the dialog
- Enter the desired file name
- Click Save
- > The file is saved



You can reload recorded data in DAT format in the Adjusting and Testing Software.

9.3.7 Loading recorded data from a file

Prerequisite: The recorded data are available in a DAT file.



- Click Open file in the control bar
- Select the storage location in the dialog
- Click Open
- > The diagrams show the recorded data from the file

HEIDENHAIN:	ATS - Adjusting a	nd Testing Software								
Datei Hilfe										
	\checkmark			— Sig A	[V] — Sig B[V] — Si	ig R[M]	anila (h. ilia	dist		
0.02	0.12	0.22	0.32	0.42	0.52 Signalperioden	0.62	0.72	0.82	0.92 1	.02
0.5				-Sig A Signa	ligröße[V] — Sig B Si	gnalgröße[V]				
0	500	1 000	1 500	2 000	2 500 Abtastperiode	3 000	3 500	4 000	4 500	5 000
20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			TV AJ as	tverhättnis(*) =	-TVB Tastverhältnis(*) - Pha Phas	æawinkel(°)			
0	500	1 000	1 500	2 000	2 500 Abtastperiode	3 000	3 500	4 000	4 500	5 000
20 000					- Position[Inkremente]					
0	500	1 000	1 500	2 000	2 500 Abtastperiode	3 000	3 500	4 000	4 500	5 000
X Axis					Chart 3					
Abtastperiod	le OF	osition	⊖ Zeit		Position	⊖ Zeit			O Abtastpunkt	e
					100%					
Dateiname t	et.dat									
2 🖉 🖡	4 🖪				Position aut	f x-Achse				L
								ROD 486	376886	6-0A 🗾

Figure 75: Recorded data loaded from a file

The Adjusting and Testing Software displays the name of the called file below the diagrams.

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9.3.8 Exporting recorded data

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For further processing in other programs, you can export the recorded data to a TXT file.

It is not possible to reload the recorded data from a TXT to the Adjusting and Testing Software.

- Click Export file in the control bar
- Select the desired storage location in the dialog
- Enter the desired file name
- Click Save
- > The file is saved

The sampling rate and the column designations of the measured values are also indicated in the two header lines of the TXT file,

9.4 Checking voltage supply

9.4.1 Voltage display function

The **Voltage display** function shows the measured values and status of the voltage supply. The display depends on the operating mode of the testing device.

Operating mode of the testing device	Displayed voltage values	
Encoder diagnostics	Encoder powered by the PWM	
Monitoring operation with signal adapter	Signal adapter powered by the PWM	
Monitoring operation without signal adapter	Encoder powered by the subsequent electronics	



> Double-click Voltage display in the function menu

HEIDENHAIN: ATS - Adjusting and Te File Help	sting Software			-	o x
Voltage display					
Voltage [Remote Sense]		Voltage			
			5.		
Current					
			8.0		alue [A]
Power [Remote Sense]					
			0.3		
					L
			ERN 48	640196	-04 🔽

Figure 76: Voltage display function

Display Description	
Voltage [Remote Sense]	Operating voltage at the encoder
	Voltage drops on the encoder supply lines are taken into account.
	[Remote Sense] : Indicates that voltage readjustment is active
Voltage	Voltage output by the PWM or the subsequent electronics
Current	Current consumption of the encoder or the signal adapter

Display	Description
	If the encoder does not consume any current, the measured value is displayed in red.
Power [Remote Sense]	Power consumption of the encoder
	[Remote Sense] : Indicates that voltage readjustment is active
Operating elements	
Icon	Function
T_	Deactivate terminating resistor

П 🕋	Deactivate terminating resistor	
₽ø	Switches the terminating resistor off	
<u>п</u>	Activate terminating resistor	
<u> </u>	Switches the terminating resistor on	

9.4.2 Deactivating the terminating resistor

In the Encoder Diagnostics mode, the terminating resistor is activated by default. You can deactivate the terminating resistor to check whether the current consumption of the encoder corresponds to the technical specifications (e.g., the typical current consumption).

- ▶ Click Deactivate terminating resistor in the control bar
- > The operating element indicates that the terminating resistor is inactive
- Click Activate terminating resistor to reactivate the terminating resistor
- > The operating element indicates that the terminating resistor is active

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When you exit the function view, the terminating resistor is automatically reactivated.



In the monitoring mode, the terminating resistor is inactive and cannot be switched on.

9.5 Displaying and copying encoder information

9.5.1 Encoder information function

With the **Encoder information** function you can view information on the connected encoder and copy it to the clipboard to reuse the texts in other applications.

Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).

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 To call this function, double-click Encoder information in the function menu

ncoder information			
System information			
Identifier	Value		
Description	ROD 280C		
Ordering designation	1Vpp		
Туре	R = rotatory encoder		
ID number	512132-02		
Signal periods per revolution	18000		

Figure 77: Encoder information function

Operating elements

Symbol	Function
F	Copy encoder information
	Copies the displayed encoder information to the clipboard as text

10

Inspecting encoders with square-wave incremental signals

10.1 Overview

The Adjusting and Testing Software features the following functions for inspecting encoders with square-wave output signals (e.g. HTL or TTL):

lcon	Function	Description
1	Incremental signal	Functions for testing incremen- tal signals, if necessary including tolerance check
9	Voltage display	Measured values of voltage and current supply
Ê	Encoder information	Display of encoder information
0	The displays and the scope of func Software depend on the connected configuration. When you establish t function menu shows the available	encoder and on the software the connection to the encoder, the
0	function"), so that the encoder mou For a detailed description of how to the sections "Analog screen", Page The 11 µApp signals of the PWT tes for HEIDENHAIN inspection and tes mark signal, square-wave signals w	y means of PWT switch-over ("PWT test inting can be checked and optimized. o examine incremental signals refer to

10.2 Checking incremental signals

10.2.1 Incremental signal function

Depending on the connected encoder, the **Incremental signal** function includes the following displays:

- Level: Examine incremental signals
- **Logic**: Record and analyze incremental signals
- Counter: Test counting and reference functions
- Protocol: Create logs
- Note: Display information on the current measurement

Additionally for encoders that switch the analog incremental signals to the output via PWT switch-over:

- Analog: Examine incremental signals
- **PWT**: Examine incremental signals using bar displays

Some encoders also feature the option to switch the sinusoidal incremental signals to the output by means of PWT switch-over, so that the encoder mounting can be checked and optimized. For a detailed description of how to examine incremental signals refer to the sections "Analog screen" and "PWT view".

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Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).



- To call this function, double-click Incremental signal in the function menu
- > The Adjusting and Testing Software displays the Level view

10.2.2 Level view

The Level view allows you to check the levels of the following signals:

- Incremental signals and inverted incremental signals
- Reference signal and inverted reference signal
- Fault-detection signal



Figure 78: Level view of the Incremental signal function

Diagrams

The diagrams show the signal levels.

Depiction	Description
X axis	Number of samples
Y axis	Signal amplitude Unit: volts
Red curve	Incremental signal Ua1
Blue curve	Incremental signal Ua2
Green curve	Reference signal Ua0
Dashed lines	Tolerance limits

Encoder characteristics section

Display	Description
Position	Count value of the position display
[increments]	Unit: Increments
Freq	Input frequency
	Unit: Kilohertz
Failure signal	Status displays of signal monitoring
	Green: High level of UaS fault-detection signal
	Red: Low level of UaS fault-detection signal
	The left status display shows the current status. When the fault-detection signal is at low level, the status display turns red for about 5 seconds.
	The right status display shows the overall status of the measurement. When the fault-detection signal is at low level, the status display is permanently red.

Level display

When the encoder is traversed, the Adjusting and Testing Software captures the high levels (H) and the low levels (L) of signal and inverted signal. The bars show the measured values and the results of the tolerance check.





Measured values are within tolerance

Several measured values are outside the tolerance limits

Depiction	Description
0.000	The indicator shows the measured value.
0.000	The color of the indicator shows the result of the tolerance check:
	 Green: Measured value is within the tolerance range
	 Red: Measured value is outside the tolerance range
1.2	The red markings mark the tolerance limits.
<< >>	The arrow symbols indicate that the measured value is beyond the scale. The direction of the arrow shows the direction where the measured value lies.



The Adjusting and Testing Software captures the signal levels, but does not evaluate the differences in the levels. The shown tolerances are HEIDENHAIN standard values! In certain cases, the tolerance limits of the encoder may differ from the tolerance limits displayed.

Note the tolerances specified in the documentation of the encoder.



The following information refers to the signal diagrams in the document **Interfaces of HEIDENHAIN Encoders**.

Further information: "Opening documentation", Page 45

Display	Description
Ua1 L	Low level of incremental signal Ua1 Unit: volts
Ua1 H	High level of incremental signal Ua1 Unit: volts
Ua2 L	Low level of incremental signal Ua2 Unit: volts
Ua2 H	High level of incremental signal Ua2 Unit: volts
Ua0 L	Low level of reference signal Ua0 Unit: volts
Ua0 H	High level of reference signal Ua0 Unit: volts

Operating elements

Icon	Function
	Stop the measurement
	Interrupts the measurement and shows the last measured values in the diagram and the displays
	Evaluate the reference signal
/ RI	Shows the Trigger status display and switches the diagrams to reference pulse detection
JUL	Switch the signal display
.nn	Switches to the measured values of the inverted signals
2	Reset status displays
	Resets the Failure signal status displays to green
ļ.	Deactivate the terminating resistor
<u> </u>	Switches the terminating resistor off
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
<u>.</u>	Show notes
	Indicates that there is new information on the current measurement

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Number of samples

The value in the **Number of samples** field determines how many measured values are displayed in the diagram.

Default setting:	2,000
Setting range:	2,000 100,000

The optimum value depends on the signal frequency (see **Freq** value in the **Encoder characteristics** section). The signal frequency increases with the traversing speed or shaft speed of the encoder. The higher the signal frequency, the lower a value you should select in the **Number of samples** field. For level evaluation, a maximum of ten signal periods should be shown in the diagram.



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When you exit the **Incremental signal** function, the value in the **Number of samples** field is reset to default.

10.2.3 Checking incremental signals (Level view)

To detect signal interruptions or short-circuits, check both the incremental signals and the inverted incremental signals, each with the terminating resistor active and inactive.

A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination.

Further information: "Displaying and deleting notes (Note view)", Page 194

Checking incremental signals



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- Click Reset status displays in the control bar to reset the signal monitoring status
- > The Failure signal status displays are green
- Enter the desired value in the Number of samples field
- Traverse the entire measuring range
- The diagram and the bar display show the measured values and tolerances of the incremental signals



Figure 79: Level view of the Incremental signal function

You can save and print the active diagram. **Further information:** "Adjusting, exporting and printing diagrams", Page 46

To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46

Repeat the examination with the terminating resistor inactive.Further information: "Deactivating the terminating resistor", Page 167

Checking inverted incremental signals



- Click Switch signal display in the control bar to display the inverted signals
- Traverse the entire measuring range
- The diagram and the bar display show the measured values > and tolerances of the inverted signals



Figure 80: Level view when evaluating inverted signals

The Adjusting and Testing Software displays the fault-detection signal UaS in an additional diagram and an additional bar graph. During fault-free operation the high level is shown. In the event of error the fault-detection signal switches to low level.

Repeat the examination with the terminating resistor inactive. Further information: "Deactivating the terminating resistor", Page 167

Deactivating the terminating resistor

Click Deactivate terminating resistor in the control bar

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- The terminating resistor is deactivated >
- Click the operating element again to reactivate the terminating ► resistor



When you exit the function view, the terminating resistor is automatically reactivated.



In the monitoring mode, the terminating resistor is inactive and cannot be switched on.

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Stopping the measurement

You can stop the measurement to analyze a specific point or take a screenshot.



- Click Stop measurement in the control bar
- > The diagram and the displays hold the last measured values
- Click the operating element again to continue the measurement

Transferring data to the Protocol view

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).



The data are temporarily retained in the **Protocol** view until you exit the **Incremental signal** function.



- To store data temporarily, click on Transfer data to the Protocol view
- > The Adjusting and Testing Software displays the **Protocol** screen with the buffered values

Further information: "Protocol view", Page 139

10.2.4 Checking the reference signal (Level view)

The Level view allows you to check the levels of the reference signal.

- Click Evaluate reference signal in the control bar

... / RI

- > The **Reference trigger** status display is shown
- Enter the desired value in the Number of samples field
- ► Traverse the reference mark
- > The diagram **Ua0** shows the reference pulse
- The Reference signal section shows the values of the traversed reference mark
- > Traverse further reference marks, if required
- The diagrams are refreshed each time a reference mark is traversed



Figure 81: Incremental signal function when evaluating the reference signal

Depiction	Description
X axis (t)	Number of samples
Y axis	Signal amplitude
	Unit: volts
Red curve	Incremental signal Ua1
Blue curve	Incremental signal Ua2
Green curve	Reference signal Ua0
Dashed lines in the color of the signals	Tolerance limits of the respective signal

Trigger status display

Depiction	Description
Trigger	Status display of reference mark detection
	 Gray: no reference mark was detected
	 Green: a reference mark was detected
	When a reference mark was detected, the status display changes back to gray color after 0.5 seconds. If several reference marks follow each other, the status display may be permanently green.
You can tra	unsfer the displayed data to the Protocol screen and save them

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

10.2.5 Logic view

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In the **Logic** view, you can perform a logic analysis and check the signal quality and the position of the reference marks.



Figure 82: Logic view of the Incremental signal function

In the **Logic** function, the measured values are recorded at a sampling rate of 200 MS/s.

Diagrams

The diagrams show the signal levels.

Depiction	Description
X axis	Time
	Unit: milliseconds
Y axis	Level
	1= high level
	0= low level
Red curve	Incremental signal Ua1
Blue curve	Incremental signal Ua2
Green curve	Reference signal Ua0

Encoder characteristics section

Display	Description
Position	Count value of the position display
[increments]	Unit: Increments
Freq	Input frequency
	Unit: kilohertz
Failure signal	Status displays of signal monitoring
	Green: High level of UaS fault-detection signal
	Red: Low level of UaS fault-detection signal
	The left status display shows the current status. When the fault-detection signal is at low level, the status display turns red for about 5 seconds.
	The right status display shows the overall status of the measurement. When the fault-detection signal is at low level, the status display is permanently red.

Characteristics of the incremental signals section

The bars show the measured values and the results of the tolerance check.



Measured values are within tolerance



Several measured values are outside the tolerance limits

Depict	ion Description
0.000	 The indicator shows the measured value. The color of the indicator shows the result of the tolerance check: Green: Measured value is within the tolerance range Red: Measured value is outside the tolerance range
1.2	The red markings mark the tolerance limits.
<< >>	The arrow symbols indicate that the measured value is beyond the scale. The direction of the arrow shows the direction where the measured value lies.
	The following information refers to the signal diagrams in the document Interfaces of HEIDENHAIN Encoders. Further information: "Opening documentation", Page 45
1	The following figures illustrate the description using sinusoidal signals. The information is equally valid for square-wave signals.
Displa	Description
Pha	Phase shift of signals A and B Optimum condition : Signal A precedes signal B by 90°.
	Phase shift = 90° Phase shift error = 0° The Adjusting and Testing Software displays the phase shift error—i.e. the deviation from the optimum condition—in degrees. Calculation: Pha = $\phi A + \phi B / 2$

Display	Description
TV A	On-off ratio of signal A
	The signals are triggered at zero crossover. A signal period consists of the high time plus the low time of the square-wave signal and is subdivided into 360°.
	Optimum condition : High time and low time of a signal period are equally long.
	Signal A $rac{1}{2}$ TV1 (Signal B $rac{1}{2}$ TV2) 0 0 0 0 0 0 0 0 0 0 0 0 0
	High time = Low time = 180°
	On-off ratio error = 0°
	The Adjusting and Testing Software displays the on off ratio error—i.e. the deviation from the optimum condition—in degrees.
	In the documentation, the ratio of high time to low time may also be specified as symmetry deviation (SYM) in radians.
	In contrast to the definition of the symmetry (SYM), the algebraic sign of the deviation is also output. This simplifies application cases, such as mounting an encoder.
	Calculation:
	SYM = P - N / 2 · M TV = 2 · 180 / π · sin (2 · SYM)
TV B	On-off ratio of signal B Description see "TV A"

with non-clocked interpolators. In the case of clocked interpolators, the interpolator considerably influences the measurement results.

Reference signal section

Depict	tion Description
LR	Position of the reference pulse
	Formula: (K – L) / 2
BR	Width of the reference pulse
	Formula: K + L
1	The measurement results for LR and BR are particularly significant with non-clocked interpolators. In the case of clocked interpolators, the interpolator considerably influences the measurement results.

Minimum edge separation section

Depict	ion Description
FA	Minimum edge separation of the overall measure- ment
	Unit: microseconds
A	The edge separation depends on the frequency of the output signal: The

higher the frequency of the output signal, the shorter the edge separation.

Operating elements

lcon	Function
	Start recording
	Starts recording with the specified number of periods
	Hold the reference pulse
/ RI	Freezes the diagram view when reference marks are traversed
2	Reset the edge separation
	Resets the FA counter and restarts determination of the edge separation
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
	Notes
	Indicates that there is new information on the current measurement
Number of periods	
The value in the Number displayed in the diagram	r of periods field determines how many signal periods are

Default setting: 10

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When you exit the **Incremental signal** function, the value in the **Number of periods** field is reset to default.

10.2.6 Performing logic analysis (Logic view)

A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination.

Further information: "Displaying and deleting notes (Note view)", Page 194

Click the Logic tab to switch to the Logic view

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Double-click Incremental signal in the function menu

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Level Logic Counter Protocol Note				
	Lo	gic		
Red=A1 X-Axis[ms]				Encoder characteristics
1				Freq 0.01 Failure signal 💿 💿
0				Incremental signal characteristi
				TVA
.10				TV B 0.000
lue=A2 X-Axis[ms]				Pha55 5555 5
2				Reference signal
1				LR 0.0
0				BR 0.0 50 100
-1 -1				Minimum edge separatio
ireen=A0 X-Axis[ms]				FA 0.01
1				
0				
.1				
Image: Second	+			Note
05802-03 LS 628C 20000 0MS14-2F	TTLx1 50	90 OT	5V+-5%	т

Figure 83: Logic view of the Incremental signal function

- Enter the desired value in the Number of periods field
- ► Traverse the entire measuring range
- The diagrams and the bar displays show the measured values and tolerances
- > The FA counter displays the minimum edge separation



Figure 84: Logic view with measured values

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You can save and print the active diagram.

Further information: "Adjusting, exporting and printing diagrams", Page 46

To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46

Checking the reference signal

►

You can record the reference pulses in the diagram view to check the position of the reference marks. The diagram view is then refreshed each time a reference mark is traversed.

- Click Hold the reference pulse in the control bar
- ... / RI
- Traverse the reference mark
- > The diagram shows the reference pulse
- > The diagram view will be refreshed when the next reference mark is traversed



Figure 85: Logic view with measured values

Stopping the measurement

You can stop the measurement to analyze a specific point or take a screenshot.



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- Click Stop measurement in the control bar
- > The diagram and the displays hold the last measured values
- Click the operating element again to continue the measurement

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Resetting the Minimum edge separation counter

To repeat the measurement, you can reset the value of the Minimum edge separation counter.



- Click **Reset edge separation** in the control bar
- > The FA counter displays the value "0"

10.2.7 Counter view

In the **Counter** view, you can check the counting function and the reference function of incremental encoders. The **Counter** view shows the distances between the reference marks as the encoder moves.



Figure 86: Counter view of the Incremental signal function

Table

When a reference mark is passed over, the distance to the preceding reference mark is determined and an entry added to the table. The table contains the following information:

- The asterisk marks the count value at the current position
- The arrows show the direction of traverse
- With distance-coded reference marks, the nominal increment is shown in addition to the count values

Bar graph

Depiction	Description
X axis	Number of captured reference marks
Y axis	Number of signal periods
Red	Reference mark spacing
Blue	Current position

Counter section

Display	Description
Position in [unit]	Current count of the incremental counter
	Unit: Depends on the settings in the Counter charac- teristics section

Counter characteristics section

Display	Description
Position [increments]	Current count
	Unit: increments
Reference [increments]	Distance between the two reference marks traversed last
	Unit: increments
Direction	The arrow shows the traverse direction
	 Arrow to the right: positive count value recorded
	Arrow to the left: negative count value recorded
Trigger	Status display of reference mark detection
	 Gray: no reference mark was detected
	 Green: a reference mark was detected
	When a reference mark was detected, the status display changes back to gray color after 0.5 seconds. If several reference marks follow each other, the status display may be permanently green.
Failure signal	Status display of signal monitoring
	Green: High level of UaS fault-detection signal
	Red: Low level of UaS fault-detection signal
	The left status display shows the current status. When the fault-detection signal is at low level, the status display turns red for about 5 seconds.
	The right status display shows the overall status of the measurement. When the fault-detection signal is at low level, the status display is permanently red.

Settings in the Counter characteristics section

In the **Counter characteristics** section you can adjust the settings for the counter value display **Position in [unit]**. The position value is calculated according to these settings.

Display	Description
Preset	Input field for presetting a count value
Resolution	Counter resolution
IncrementalRotatoryLinear	Type of incremental counter The count value is converted into the corresponding unit as per the selection:
	 Incremental: Measuring steps Rotatory: Selected unit (see below); Standard setting: Degrees Linear: Micrometers Depending on the selection, the following settings are displayed.
Line count	Input field for the encoder line count per revolution to calculate the count value
DegreesRadian measureDMS	Unit of the incremental counter The value of the incremental counter is converted into the selected unit. Degrees Radian measure DMS: Degrees, minutes, seconds
Signal period	Input field for the length of a signal period to calculate the count value

Operating elements

lcon	Function
	Stop the measurement
	Interrupts the measurement and shows the last measured values in the diagram and the displays
2	Reset status displays
	Resets the Failure signal status displays to green
×	Delete measured values
	Deletes the measured values recorded from the table and graphics
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
	Notes
	Indicates that there is new information on the current measurement
10.2.8 Checking the counting function (Counter view)

A warning symbol appears in the control bar when there are notes. Delete existing notes before you start the examination.

Further information: "Displaying and deleting notes (Note view)", Page 194

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Double-click **Incremental signal** in the function menu

D HEID		S - Adjusting	and Testing Sof	tware					8 <u></u>		×
	Trans Mill	Counter	Protocol	Note							
						Counter					
			Posit	ion in	increments			Counter charac	teristic	cs	
			-	<u> </u>	2 (75	0	Position[Increments] Reference[Increments] Direction Trigger	3	1.	18 I 0
					Red=Ref			Failure signal	0.00	1 10	- 4
	2 🗶	W							Not	te	£.
38542	0-21	ERN 420	1024	4 2751	2-03 RV TT	L 300 MT	07				TTL

Figure 87: Counter view of the Incremental signal function



The further procedure depends on the type of reference marks the encoder features.

Procedure with one reference mark

- Traverse the reference mark
- Traverse the reference mark in the opposite direction
- Repeat the procedure several times
- > A measured value is added to the table and the diagram each time the reference mark is traversed

Click the Counter tab to switch to the Counter view



Figure 88: Counter view when examining an encoder with one reference mark

Counter and reference functions are error-free if the distance is "0" each time the reference mark is traversed.

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Procedure with multiple reference marks without distance coding

- ► Traverse several reference marks
- A measured value is added to the table and the diagram each time a reference mark is traversed
- ▶ Traverse the reference marks in the opposite direction
- > When the direction is reversed, the value "0" is added to the table and the diagram

Counter and reference functions are error-free if the spacing between all reference marks is the same.



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You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Procedure with distance-coded reference marks

When you examine encoders with distance-coded reference marks, the Adjusting and Testing Software first determines the nominal increment.

- Traverse several reference marks to determine the nominal increment
- If the traverse path of the encoder is short, you may need to traverse it in both directions repeatedly
- After the Adjusting and Testing Software has determined the nominal increment, the table also includes the nominal increment and the position



Figure 89: Display during determination of nominal increment



Figure 90: Display after the nominal increment has been determined

	Reference mark spacing 1
	Reference mark spacing 2
	base: Nominal increment
	pos.: Position determined from distance coding
	Value "Direction!": Appears if the counting direction determined from the incremental signals differs from the sequence of reference mark spacings 1,2
	 Traverse the entire measuring range A measured value is added to the table and the diagram each time a reference mark is traversed Traverse the reference marks in the opposite direction When the direction is reversed, the value "0" is added to the table and the diagram
•	Counter and reference functions are error-free if the determined distances are the same as the actual distance coding of the encoder. The sum of the values in the columns 1 and 2 must correspond to the nominal increment (value in column 3).
)	If the value "Direction!" is shown in the last column, check the counting direction and the encoder wiring.
	Deviations indicate a malfunction or improper mounting of the encoder.

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Column

 $\begin{array}{c}
1\\
2\\
3\\
4\\
5
\end{array}$

Description

You can transfer the displayed data to the $\ensuremath{\text{Protocol}}$ screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

Adjusting the counter display

The counter display can be adjusted in the **Counter characteristics** section.

- Set the desired counter resolution with the plus and minus buttons
- Select desired display options:
 - Incremental: Count value is displayed in increments
 - Rotatory: Count value is displayed in the selected angle unit
 - Degrees
 - Radian measure
 - DMS (degrees, arc minutes, arc seconds)
 - Linear: Count value is displayed in micrometers
- If you select Rotatory, enter the line count per encoder revolution in the Line count field
- If you select Linear, enter the length of a signal period in micrometers in the Signal period field
- The count value is converted and displayed according to the setting

Presetting the count value

To compare the counter e.g. with the counter of the subsequent electronics, you can preset a certain count value at the current position.

- \sim
- Enter the desired position value in the **Preset** field
- Click Preset count value in the control bar
- > The entered count value is adopted as the new position

Clearing the counter

- CL Click Clear counter in the control bar
 - > The counter is set to zero

Clearing the counter with every reference mark

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- To start counting at every reference mark, click Clear counter with every reference mark in the control bar
- The counter is set to zero each time a reference mark is traversed

Clearing the counter and starting with next reference mark



- Click Clear counter and start with next reference mark in the control bar
- > The counter is set to zero and will start counting when the next reference mark is traversed

Inverting the counting direction

The counting direction of some encoders can be configured. You can adapt the counting direction to the encoder in the Adjusting and Testing Software.



- Click Invert counting direction in the control bar to adapt the counting direction
- The Adjusting and Testing Software inverts the positive or negative counting direction

Clearing the counter and determining the position again

For encoders with distance-coded reference marks, you can set the position and the counter to zero and then determine the position again.

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- Click Clear counter and determine position again in the control bar
- > The counter is set to zero
- Traverse several reference marks
- > The position is determined again

Evaluating the inverted reference pulse

The reference signal of some encoders is inverted. In order that inverted reference pulses can be detected and correctly evaluated, you need to adapt the evaluation logic of the Adjusting and Testing Software.



Click Evaluate inverted reference pulse in the control bar

 The Adjusting and Testing Software inverts the evaluation logic

Deleting measured values

For a new examination you can delete the recorded measured values from the table and from the diagram.



- Click **Delete measured values** in the control bar
- > The table and the diagram are reset

10.2.9 Homing – Limit view

The Homing - Limit view provides a functional check of limit switching signals.



Bar graph

In the diagram, the signals with their respective traverse directions are color-coded.

Depiction	Description
Green	Reference signal
Blue	Homing backward
Dark blue	Homing forward
Olive green	Limit backward
Brown	Limit forward

Encoder characteristics section

All values in mm

Depiction	Description
Position	Count value of incremental counter Unit: millimeters
Direction	 The arrow symbol shows the traverse direction Arrow to the right: positive count value recorded Arrow to the left: negative count value recorded

Homing/L1/Pin 6 (depending on encoder)

Depiction	Description
Status	Status display of the homing level Gray: low level
	Green: high level
Position	Distance between homing edge and reference mark R Unit: millimeters

Limit/L2/Pin 8 (depending on encoder)

Depiction	Description		
Status	Status display of the limit level		
	 Gray: low level 		
	 Green: high level 		
Position 1	Distance between limit edge 1 and reference mark R		
	Unit: millimeters		
Position 2	Distance between limit edge 2 and reference mark R		
	Unit: millimeters		
Distance	Distance between limit edge 1 and limit edge 2		
	Distance = Limit edge 1 + Limit edge 2		

Operating elements

lcon	Function
2	Delete measured values
	Deletes the measured values for a new measurement
	Transfer data to Protocol view
	Transfers the displayed data to the Protocol screen
	Notes
	Indicates that there is new information on the current measurement

Prerequisites:

- The encoder features limit switching signals
- The encoder is correctly mounted and electrically adjusted according to the mounting instructions
- The encoder was connected to the Adjusting and Testing Software by entering the encoder ID

For detailed information on the availability and function of switching signals, refer to the encoder documentation or the brochure "Interfaces of HEIDENHAIN Encoders".

Further information: "Opening documentation", Page 45



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- Double-click **Incremental signal** in the function menu
- Click the Homing Limit tab to switch to the Homing Limit view

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Analog Level Logic Recording Counter PWT Homing-Limit Protocol Note		
Homing - Limit		
Green = Refernce position	Encoder chai	racteristics
Bue = L1 backward	Unit for all values is	mm
Dark blue = L1 forward	L1/L2	
Olive = L2 backward	Position	- 0.362
Brown = L2 forward	Direction	0
6	7 L1	
	Status	0
4	Position1 Position 2 Distance	
3	Status	0
	Position 1 Position 2 Distance	
2 🔜		Note 🗘
1116324-13 AK LIDA 47 G8 RN 2000 16S15-9I 21 TTLx10 100 90 MT OF	H 07 H	TTL

Figure 92: Homing – Limit view of the Incremental signal function

- Traverse the entire measuring range
- Recording of the measured values in the diagram starts as soon as the first reference mark is traversed
- When the last reference mark has been traversed, the entire measuring range is displayed in the diagram with homing and limit switching edges (depending on the encoder)



Figure 93: Homing - Limit with reference mark and switching edges

You can save and print the active diagram.

Further information: "Adjusting, exporting and printing diagrams", Page 46

You can transfer the displayed data to the **Protocol** screen and save them later on as a log file (PDF format).

Further information: "Transferring data to the Protocol view", Page 105

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To reset the diagram for a new measurement, click Delete measured values in the control bar

10.2.11 Protocol view

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You can transfer data from the views of the **Incremental signal** function to the **Protocol** view.

Further information: "Transferring data to the Protocol view", Page 105 The data recorded in the **Protocol** view can be saved to a PDF file. The **Protocol** view shows the data in various tabs, according to the view in which the data was captured.

The data are temporarily retained in the **Protocol** view until you exit the **Incremental signal** function.

If there are any test limits for the signal then they are saved to the protocol.

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Analog Recording Cour	nter PWT	Protocol No	ote						
				Protoc	ol				
Analog Level L	ogic Re	cording	Counter	PWT	Homing - Lim	it			
				PWT	-				
Peak-to-peak amplit Deviation1[V]:	10:: 3.4 512: ROD 1 VJ 180' 51: 100' s]: 786' 2.6' ude [Vpp] -0.1: 0.1: [°]: -16.']: -11.'	132-02 280C pp 00 88 04 : 1.018 38 38 713 8666	-						
12132-02 ROD 2800	CD 18	8000 03 S 1	2-03 02	R4 ~1V	ss 0 07			1 V	p

Operating elements

lcon	Function
	Save log
T	Opens the Protocol dialog

10.2.12 Saving log data (Protocol view)

You can save the test results in a PDF file.

Click Save log

Click the Protocol tab to switch to the Protocol view



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- > The **Protocol** dialog shows the available contents
- Select the data to be logged
- Click **Preview** to open a preview of the PDF file
- ▶ If necessary, close the preview
- Click **Save** in the dialog to save the file
- Select the desired storage location
- Enter the file name
- Click Save
- > The file is saved
- Click Close to close the dialog

In the Adjusting and Testing Software, you can add an individual header and details on the examiner to the logs.
 Further information: "Soving log information" Page 54

Further information: "Saving log information", Page 54

To display the PDF contents correctly, the font "Arial Unicode MS" must be installed on the computer.

10.2.13 Note view

The Note screen contains information on the current measurement.
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		Counter	Protoc	ol No	e						
						Note					
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alcul alcul alcul	ation ation ation	referen referen referen	nce: Sp nce: Sp nce: Sp	peed t peed o peed t	to high. to high. eviation. to high. to high.]]]	15] 2] 7] 7]			
2											٩

Figure 94: Note view of the Incremental signal function

The notes refer to problems with signal calculation, e.g.:

- Signal frequencies are too high, e.g. due to excessive traversing speed or shaft speed
- Signal frequency fluctuates
- Displayed signal detail is too small to calculate the reference mark correctly

Operating elements

Icon	Function
2	Delete notes
	Deletes the notes for a new measurement

10.2.14 Displaying and deleting notes (Note view)



A warning symbol appears in the control bar when there is a new note. Go to the **Note** view to read the note.

- Click **Note** in the control bar
- > The Note view shows a list of all notes



Notes are retained until you exit the **Incremental signal** function or delete the notes by hand.

Deleting notes



Click Delete notes in the control bar to delete all notes

10.3 Checking voltage supply

10.3.1 Voltage display function

The **Voltage display** function shows the measured values and status of the voltage supply. The display depends on the operating mode of the testing device.

Operating mode of the testing device	Displayed voltage values
Encoder diagnostics	Encoder powered by the PWM
Monitoring operation with signal adapter	Signal adapter powered by the PWM
Monitoring operation without signal adapter	Encoder powered by the subsequent electronics

• Double-click **Voltage display** in the function menu

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Voltage display	
Voltage [Remote Sense]	Voltage
	S.09 I
Current	
Power [Remote Sense]	
0	°.
	LS 628C 605802-03

Figure 95: Voltage display function

Display	Description
Voltage [Remote Sense]	Operating voltage at the encoder
	Voltage drops on the encoder supply lines are taken into account.
	[Remote Sense] : Indicates that voltage readjustment is active
Voltage	Voltage output by the PWM or the subsequent electronics
Current	Current consumption of the encoder or the signal adapter
	If the encoder does not consume any current, the measured value is displayed in red.
Power [Remote Sense]	Power consumption of the encoder [Remote Sense]: Indicates that voltage readjustment is active

Operating elements

lcon	Function
	Deactivate terminating resistor
Ч	Switches the terminating resistor off
<u>–</u>	Activate terminating resistor
<u> Ц 🎮</u>	Switches the terminating resistor on

10.3.2 Deactivating the terminating resistor

In the Encoder Diagnostics mode, the terminating resistor is activated by default. You can deactivate the terminating resistor to check whether the current consumption of the encoder corresponds to the technical specifications (e.g., the typical current consumption).



- Click Deactivate terminating resistor in the control bar
- The operating element indicates that the terminating resistor is inactive
- Click Activate terminating resistor to reactivate the terminating resistor
- > The operating element indicates that the terminating resistor is active



When you exit the function view, the terminating resistor is automatically reactivated.



In the monitoring mode, the terminating resistor is inactive and cannot be switched on.

10.4 Displaying and copying encoder information

10.4.1 Encoder information function

With the **Encoder information** function you can view information on the connected encoder and copy it to the clipboard to reuse the texts in other applications.

Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).

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 To call this function, double-click Encoder information in the function menu

Incoder information			
System information			
Identifier	Value		
Description	ROD 280C		
Ordering designation	1Vpp		
Туре	R = rotatory encoder		
ID number	512132-02		
Signal periods per revolution	18000		

Figure 96: Encoder information function

Operating elements

Symbol	Function
E	Copy encoder information
	Copies the displayed encoder information to the clipboard as text

Inspecting encoders with serial interface (EnDat 2.1, EnDat 2.2 and

> proprietary interfaces)

11.1 Overview

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In this chapter, the procedure and user interface are described using the EnDat 2.2 interface as an example.

For differences and special functions of other serial interfaces, refer to the chapter "Special interface-specific functions".

The procedure and user interface for encoders with EnDat 3 interface are in the chapter Messgerät mit serieller Schnittstelle vom Typ EnDat 3 prüfen.

The Adjusting and Testing Software features the following functions for inspecting encoders with serial interface:

lcon	Function	Description
_ ∠•	Position display	Current encoder position and status information
ÌO,	Incremental signal display	Tolerance check of the incre- mental signals
9	Voltage display	Measured values of voltage and current supply
_ ≠•,	Absolute to incremental deviation	Check agreement of absolute track and incremental track
Ø	Online diagnostics	Determine the function reserves of the encoder based on valua- tion numbers
EDION.	Functional-safety encoder check	Check safety-relevant encoder functions
R	Display encoder memory	Load the encoder configura- tion from the encoder, edit the configuration and transmit it to the encoder; save the encoder configuration to a file
<}	Compare contents of encoder memories	Compare encoder configurations to each other
1, ¤2 ⊡1,	Additional information Position value 2	Display of position values 1 and 2
1	The displays and the scope of functions Software depend on the connected enc configuration. When you establish the c function menu shows the available func	oder and on the software onnection to the encoder, the

11.2 Checking position values, transmission and encoder status

11.2.1 Position display function

For linear and rotary encoders, the position display shows the current encoder position.

For touch probes, the position display shows information on the trigger information and the status of the touch probe.

Depending on the encoder model, information on encoder alarms and warnings and on the quality of the incremental signals are available in addition.



To call this function, double-click **Position display** in the function menu



Figure 97: Position display function

Display	Description
Absolute position	For linear and rotary encoders:
	Absolute encoder position
	Unit: increments
	For encoders with strain sensor:
	Absolute encoder position
	Unit: nano-epsilon
Incremental position	For linear and rotary encoders:
	Count value of incremental counter
	Unit: increments

Display	Description
Absolute position [bits]	For linear and rotary encoders:
	Binary display of the absolute encoder position
	The number of bits depends on the encoder.
	Bit 1 = LSB (Least Significant Bit)
	For touch probes:
	The binary display provides information on the following signals:
	 Bit 1: Trigger state
	 Bit 2: Trigger state valid
	Bit 3: Sensor is ready
	 Bit 4: Touch probe is ready
	Bit 5: Battery warning
	Bit 6: Collision
	Correct behavior of the touch probe: If there is no probing event and if the battery voltage is within the tolerance range, then the bits 2, 3 and 4 are set.
Frequency	Status display of signal frequency
	 Green: Signal frequency is within tolerance
	 Red: Signal frequency is outside the tolerance range
Amplitudes	Status display of signal amplitudes
	 Green: The signal amplitudes are within the tolerance range
	 Red: The signal amplitudes exceed at least one tolerance limit
Transmission	Status display of data transfer between encoder and testing device
	Green: No status message available
	Red: Status message available
Fault	Status display of encoder errors
	 Green: No status message available
	Red: Status message available
Warnings	Status display of encoder warnings
5	 Green: No status message available
	Red: Status message available
Ref.mark	Status display of reference mark detection
	 Gray: No reference mark was detected
	 Yellow: Reference mark detected or absolute
	encoder
Busy	Status display of memory access
-	Gray: No access to encoder memory detected
	 Yellow: Access to encoder memory detected
	At this point, access to the encoder memory suggests an encoder error.

Operating elements

lcon	Function
ildi	Show measured values
44	Displays the measured value in increments
t-	Show position values
↓− •	Converts the measured value into a position value
	Unit: micrometers, degrees, or nano-epsilons (depending on the encoder)
4	Display in degrees
*	Converts the measured value into degrees
CL	Clear counter
СП	Sets the incremental position to zero
=	Equate counter
	Sets the incremental position to the absolute position value
ŝ	Synchronize counter
±]+	Synchronizes the counters at zero position
+	Invert counting direction
<u> </u>	Inverts the positive or negative counting direction
љ	Set datum shift
∯ <u>+</u> + + + + + + + + + + + + +	Opens the dialog for setting the datum shift
₼¥	Cancel datum shift
Φ	Opens the dialog for deleting the datum shift
$\Phi^{(1)}$	Show datum shift
Ψ	Displays information on existing datum shift
	Show status information
	Displays a list of errors and warnings

11.2.2 Classification of the status messages

Status report	Description
Warnings	Warnings indicate that certain tolerance limits of the encoder have been reached or exceeded.
	Examples of encoder warnings that may be displayed by encoders with EnDat interface:
	 Bit 0 – Frequency exceeded
	 Bit 1 – Temperature exceeded
	 Bit 2 – Light source control reserve
	Encoder warnings do not indicate whether the trans- mitted position values are correct.
Errors	Errors indicate a malfunction of the encoder.
	Examples of encoder errors that may be displayed by encoders with EnDat interface:
	 Bit 0 – Light source failure
	 Bit 1 – Signal amplitude faulty
	 Bit 2 – Position faulty
	 Bit 3 – Overvoltage
	 Bit 4 - Undervoltage supply
	 Operating status error sources
	If there are status messages on encoder errors, the transmitted position values are not reliable.
Transmission	Transmission errors indicate communication errors that may be caused by EMC influences, for example.
	Examples of transmission errors that may be displayed by encoders with EnDat interface: Timeout CRC error
	tatus dialog shows the errors and warnings transmitted by Ind the status messages on transmission.
Further inform	ation: "Displaying status messages", Page 213
To see which s configuration.	status messages the encoder supports, refer to the encoder
Further inform warnings", Pag	ation: "Overview of supported error messages and

11.2.3 Switching between measured values view and position view

You can switch the counter display between measured values view and position view.

Measured values view

The Measured values view shows the count value in increments.



Figure 98: Measured values view of the Position display function

Position view

In the **Position view**, the Adjusting and Testing Software converts the count value into a position value. The position value is displayed in micrometers, degrees, or increments (depending on the encoder).

For multiturn rotary encoders, the Adjusting and Testing Software in addition displays the number of revolutions in the **Position display**.



Figure 99: Position view of the Position display function

Switching between the views



 Click Show measured values in the control bar to switch to the measured values view



 Click Show position values in the control bar to switch to the position view

11.2.4 Converting the measured value into degrees

For linear encoders designed to scan a segment of a circle, you can switch the measured value display to degrees.

Prerequisite: The encoder was connected to the Adjusting and Testing Software by entering the encoder ID. The software uses the ID to determine the encoder scanning diameter required for the calculation.



 Click **Display in degrees** in the control bar to show the calculated angular value



The displayed value can be outside the value range 0° ... 360°, since the angle is calculated directly from the measured linear value.

11.2.5 Clearing the incremental counter

- CL
- Click Clear counter in the control bar to delete the incremental counter
- > The incremental counter is set to zero

	N: ATS - A	Adjustir	ng and	Testing	g Softwa	re																	34 <u>-</u>		×
File Help																									
Positi	on di	ispl	ay [EnD	at 2	.2]																			
Abso	lute po	ositio	n																						
															_				_				_	[steps]	
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															_	-	J						J	U	
Incre	mental	posi	ition																						
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25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
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THE L	- 2	-		-1,	+	Ψ	Ψ	Ψ	~															500	
																			EQ	N 13	25	8	32703	3 <mark>9-06</mark>	1

Figure 100: Position display after clearing the incremental counter

11.2.6 Equating the incremental counter with the absolute position

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- Click Equate counter in the control bar to equate the count values
 - > The incremental counter assumes the count value of the absolute position

ncrei	menta	l posit	tion												Measu	ured value	e (ste
											2	2	-		S	Q	ſ
											J	J	1	IC			L
Abso	lute po	osition	n [bits]														
25	24	23	22 2	1 20	19	18 1	7 16	15 14	13	12 11	10	9 8	7 6	5	4	3 2	1
					10												
ncrei	menta	statu	IS			EnDa	at status										

Figure 101: Position display with incremental and absolute positions set equal

11.2.7 Synchronizing the counters

When an encoder passes zero crossover in negative direction, the counters behave as follows:

- The Absolute position counter jumps to the highest position value, in the example 8191
- The Incremental position counter jumps to -1



Figure 102: Counter limit of a 13-bit rotary encoder

When you activate the synchronization mode, both counters jump to the highest position value when the zero crossover is passed.

- £ĴŦ
- Click Synchronize counters in the control bar to switch the counting logic of the incremental counter

11.2.8 Inverting the counting direction of the incremental counter

On some encoders, the counting direction of the incremental counter can be configured. You can adapt the counting direction to the encoder in the Adjusting and Testing Software.



- Click Invert counting direction in the control bar to adapt the counting direction
- > The Adjusting and Testing Software inverts the positive or negative counting direction

11.2.9 Setting datum shift

In the **Position display** function, you can shift the datum of the connected encoder. The datum shift enables you to adapt the encoder to the machine for each individual axis (e.g., for measuring the rotor position on synchronous motors).

Precondition: The encoder supports datum shift.

WARNING

Danger of uncontrolled axis movements due to datum shift

If you select an incorrect value for datum shift, uncontrolled movements of the machine axes may occur. This may result in death, serious injuries, or damage to equipment.

- Observe the documentation of the machine tool and the encoder
- Change the datum shift only if absolutely necessary (e.g., if the encoder is exchanged)
- Shift the datum only while the encoder is at a standstill
- ▶ Leave the traverse range of the machine before setting a datum shift
- Cancel any datum shift before setting a new one
- Only execute datum shifts in the **Position display** function
- ▶ Do not manually change the "Zero point" value in the encoder configuration

Danger from falling machine axes

Non-secured vertical or hanging machine axes may fall down due to datum shift. This may result in death or serious injuries.

Before setting a datum shift:

Secure the machine axes

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Leave the traverse range of the machine

Linear encoders with EnDat interface do not support negative position values. Instead of the negative sign, the following position value is output: 2Number of clock pulses for transfer of position value

 For linear encoders with EnDat interface, select the datum such that only position values > 0 are output

A datum shift may require a new acceptance test (e.g., in the case of functionally safe applications).

First check whether a datum shift is active and reset it if necessary. **Further information:** "Checking the datum shift", Page 212 **Further information:** "Resetting a datum shift", Page 213 The following options are available for setting a datum shift:

- Set datum to current position: Approach the desired position and adopt this position as zero point
- Set datum to absolute position: Enter the desired position value manually



Which options are available for the datum shift depends on the connected encoder.

Setting the datum to current position

- Move to the desired position
- Click Set datum shift in the control bar
- The Adjusting and Testing Software displays information on datum shift
- Click Yes
- > The **Datum shift** dialog is displayed

	Adjusting and Testing Software				<u> </u>	
lelp						
Datum sh	ift					
	The "Datum shift compliant with increment (Corresponds to EnDat for the setting "EnDa	al signals" checkbox at compliant")	may only be deactivated for p	oure serial data transmission.		
Type of da	tum shift					
Datum	shift compliant with incremental signals					
⊙ to cur	rent position		O to position absolute			
				Preset	Cance	4
				EQN 1325	8270	30.06

Figure 103: Datum shift dialog

 For encoders with incremental signals, place a check mark at Datum shift compliant with incremental signals



- In the Type of datum shift section, select the option to current position
- Click Preset
- > The current position is saved in the encoder as new datum

Setting the datum to absolute position



- Click Set datum shift in the control bar
- > The Adjusting and Testing Software displays a note
- Click Yes
- > The Datum shift dialog is displayed

	S - Adjusting and Testing Software				14 <u>-</u>	
Help						
Datum s	shift					
	The "Datum shift compliant with increme (Corresponds to EnDat for the setting "En	ntal signals" <mark>checkbox</mark> Dat compliant")	may only be deactivated for pure se	rial data transmission.		
Type of	latum shift					
🗹 Dat	um shift compliant with incremental signals					
⊙ to	current position		O to position absolute			
					Cancel	
				Preset	Cancel	
					1	
				EQN 1325	82703	9-06

Figure 104: Datum shift dialog

 For encoders with incremental signals, place a check mark at Datum shift compliant with incremental signals



- In the Type of datum shift section, select the option to absolute position
- > The Set to absolute position section is displayed
- > The values in the **Position** field are displayed in increments
- To change the unit of the **Position** field to micrometers or degrees (depending on the encoder), remove the check mark at **Datum shift in steps**
- > The values in the **Position** field are displayed in the respective unit

Set to absolute position	Set to absolute position	
☑ Datum shift in steps	Datum shift in steps	
Position [steps]	Position of current Revolution [Revolutions]	Position within the revolution [degrees]

Figure 105: **Position** input field in increments Figure 106: **Position** input field in degrees

- Enter the desired position value
- Click Set
- The entered position value is saved in the encoder as new datum

11.2.10 Checking the datum shift

In the **Position display** function you can check whether a datum shift is active.



- Click Show datum shift in the control bar
- > The Info dialog about customer-specific datum shift is displayed

Help						>
	Info dialo	g about customer-specific d	atum shift			
	into anato	g usour ouoronnor opoonno u				
		Datum shift property:				
		Datum shift [steps]	-19591984			
	(1)	Datum shift [°]	-215.86			
	~	Datum shift revolutions	-2391			
		Datum shift compliant with incremental signals?	Yes			
				°C.		

Figure 107: Info dialog about customer-specific datum shift

- If a datum shift is active, the Info dialog about customerspecific datum shift contains the following information:
 - Datum shift in steps
 - Datum shift in micrometers or degrees (depending on the encoder)
 - Datum shift in revolutions (depending on the encoder)
 - Datum shift compliant with incremental signals

11.2.11 Resetting a datum shift

You can reset the datum to the factory default setting of the encoder.

- Click Cancel datum shift in the control bar
- > The Cancel datum shift dialog is displayed
- Click Yes
- > The datum shift is reset

11.2.12 Displaying status messages

The **Encoder status** dialog shows the errors and warnings transmitted by the encoder and the status messages on transmission.



To see which status messages the encoder supports, refer to the encoder configuration.

Further information: "Overview of supported error messages and warnings", Page 263

 Click Show status information in the control bar to show the Encoder status dialog

IEIDENHAIN: ATS - Adjusting and Testing Software			1 <u>-</u>		
Help					
Encoder status					
Overview of encoder and transmission errors					
Errors:					
None					
Warnings: None					
None					
				C	
	Functional Safety	LC 415	68967	74-03	1

Figure 108: Encoder status screen

11.2.13 Displaying operating status error sources

The operating status error sources are an expansion of the EnDat 2.2. error register. They provide detailed information on the encoder errors that have occurred.

To see which operating status error sources the encoder supports, refer to the encoder configuration.

Further information: "Overview of supported operating status error sources", Page 264



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 Click Show status information in the control bar to show the Encoder status dialog

EIDENHAIN: ATS - Adjusting and Testing Software Help	-	. 🗆
nop		
Encoder status		
Overview of encoder and transmission errors		
Errors: None		
Warnings: None		
		C

Figure 109: Encoder status screen



- Click Read operating status error sources
- > The Encoder status screen displays the Overview of operating status error sources

	HEIDENHAIN: ATS - Adjusting and Testing Software			×
File	Help			
	Encoder status			1
	Overview of operating status error sources			
	Operating status error sources: None			
			¢	Transmission of the second s
-	Functional STATUT LC 415	68967	4-03	

Figure 110: Encoder status screen with the Overview of operating status error sources

11.2.14 Resetting status messages

You should delete any existing status messages before each check.



 Click Show status information in the control bar to show the Encoder status dialog



- Click Delete status messages
- > The status messages are deleted

If there are still status messages in the **Encoder status** detail view, this indicates that the corresponding errors are still present.

11.3 Checking incremental signals

11.3.1 Incremental signal function

If the encoder provides incremental signals, you can examine these signals with the **Incremental signal** function. The procedure is the same as for checking incremental encoders.

More information on checking sinusoidal incremental signals: "Incremental signal function", Page 90

More information on checking square-wave incremental signals:

"Incremental signal function", Page 161

11.4 Checking voltage supply

11.4.1 Voltage display function

The **Voltage display** function shows the measured values and status of the voltage supply. The display depends on the operating mode of the testing device.

Operating mode of the testing device	Displayed voltage values
Encoder diagnostics	Encoder powered by the PWM
Monitoring operation with signal adapter	Signal adapter powered by the PWM
Monitoring operation without signal adapter	Encoder powered by the subsequent electronics



> Double-click Voltage display in the function menu

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Voltage display	
Voltage	
Current	
	Measurement value [A]
Power	
	0.598
	t.
	Encional LC 415 689674-03

Figure 111: Voltage display function

Display	Description			
Voltage [Remote Sense]	Operating voltage at the encoder Voltage drops on the encoder supply lines are taken into account.			
	[Remote Sense]: Indicates that voltage readjustment is active			
Voltage	Voltage output by the PWM or the subsequent electronics			
Current	Current consumption of the encoder or the signal adapter			
Display	Description			
----------------------	--	--	--	--
	If the encoder does not consume any current, the measured value is displayed in red.			
Power [Remote Sense]	Power consumption of the encoder			
	[Remote Sense] : Indicates that voltage readjustment is active			
Operating elements				
lcon	Function			
1	Deactivate terminating resistor			
<u><u> </u></u>	Switches the terminating resistor off			

Activate terminating resistor

Switches the terminating resistor on

11.4.2 Deactivating the terminating resistor

In the Encoder Diagnostics mode, the terminating resistor is activated by default. You can deactivate the terminating resistor to check whether the current consumption of the encoder corresponds to the technical specifications (e.g., the typical current consumption).

- ▶ Click Deactivate terminating resistor in the control bar
- > The operating element indicates that the terminating resistor is inactive
- Click Activate terminating resistor to reactivate the terminating resistor
- > The operating element indicates that the terminating resistor is active

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When you exit the function view, the terminating resistor is automatically reactivated.

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In the monitoring mode, the terminating resistor is inactive and cannot be switched on.

11.5 Displaying and copying encoder information

11.5.1 Encoder information function

With the **Encoder information** function you can view information on the connected encoder and copy it to the clipboard to reuse the texts in other applications.

Some functions of the Adjusting and Testing Software are only available if you connect the encoder through its encoder ID (recommended procedure).

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					1	
	а.	-				

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 To call this function, double-click Encoder information in the function menu

Identifier	Value			
Description	EQN 1337			
Ordering designation	EnDat22			
Туре	R = rotatory encoder			
ID number	586649-02			
Serial number	X20565114			
Number of clock pulses for position	37			
Measuring steps per revolution	33554432			
Signal periods per revolution	2048			
Distinguishable revolutions	4096			
Functional safety	enabled			
Datum shift active	No			
Internal temperature sensor	Yes			
External temperature sensor	Yes			
			E û	200

Figure 112: Encoder information function

Operating elements

Symbol	Function
E	Copy encoder information Copies the displayed encoder information to the clipboard as text

11.6 Checking the agreement of absolute track and incremental track

11.6.1 Absolute to incremental deviation function

With the **absolute to incremental deviation** function you can check whether the deviation between the absolute position and the incremental position is within the tolerance range.

Description of function:

The different signal paths and propagation times result in differences between the absolute and the incremental position values. The Adjusting and Testing Software compares the position values and displays the difference as deviation span. The deviation span is determined for different speed ranges and must not exceed the specified tolerance limits (accuracy ranges).



► To call this function, click **Absolute to incremental deviation** in the function menu

Status	Signal position	Absolute positi	ion	Measured value [step:
Absolute	EnDat-compliant			33 172689
Status	Incremental pos	ition		
Incremental				33 172689
Area	Rotational speed [rpm]	Accuracy [LSB]	Speed at deviation [rpm]	Deviation span [LSB]
1st	1500.00	2		6
2nd	12000.00	100		6
> 2nd	>12000.00	> 100	-	

Figure 113: Absolute to incremental deviation function

Depiction	Description
Status – Absolute	Status display of encoder errors and encoder warnings for the absolute value
	 Green: No status message available
	 Red: Status message available
	Further information: "Classification of the status messages", Page 204
Status – Incremental	Status display of encoder errors and encoder warnings for the incremental value
	Description see "Status – Absolute"

Depiction	Description
Signal position – EnDat- compliant	Status display of signal position The Adjusting and Testing Software checks whether the position of the incremental signal corresponds to the EnDat specification, i.e. whether the correct relation can be established between the relative and the absolute position values.
	 Green: Signal position is EnDat-compliant; zero position is assigned to the signal period Yellow: Signal position not EnDat-compliant Further information: "Setting datum shift", Page 209
	Depending on the signal resolution, an EnDat non-compliant datum shift may result in a dimensional error that is outside the machine's accuracy specifications.
Absolute position	Current count of the position display Unit: increments
Incremental position	Count value of incremental counter Unit: increments
Range	Linear or rotational velocity range
Speed [m/min]	Display for linear encoders: Speed in the respective speed range Unit: m/min
Rotational speed [rpm]	Display for rotatory encoders: Rotational speed in the respective speed range Unit: rpm
Accuracy [LSB]	Permissible deviation in the respective speed range Unit: LSB ¹
Speed at deviation [m/min]	Display for linear encoders: Speed when determining the deviation span If a dash is displayed instead of a value, the encoder does not support the corresponding speed range.
Speed at deviation [rpm]	Display for rotatory encoders: Rotational speed when determining the deviation span If a dash is displayed instead of a value, the encoder does not support the corresponding speed range.

Depiction	Description
Deviation span [LSB]	Determined deviation span Unit: LSB ¹ The color of the value indicates whether or not the
	value is within tolerance:
	 Green: Deviation span is within the tolerance range
	 Red: Deviation span is outside the tolerance range
	If the deviation span is outside the tolerance limits, check whether the counting direction of the incremental counter corresponds to that of the encoder.
	Further information: "Inverting the counting direction of the incremental counter", Page 208

¹ LSB = Least significant bit

Example: For a linear encoder with a resolution of 10 nm, 1 LSB corresponds to a measuring distance of 10 nm.

Operating elements

lcon	Function
ildi	Show measured values
<u>1011</u>	Displays the measured value in increments
Ť-	Show position values
L +	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the encoder)
∆0	Reset deviation span
	Equates the incremental position with the absolute position, thus resetting the deviation span to zero
_+ ,	Invert counting direction
+ -	Inverts the positive or negative counting direction
A	Show status information
	Displays a list of errors and warnings

11.6.2 Running the inspection

- Traverse the entire measuring range several times, if possible at different speeds
- > The Adjusting and Testing Software determines the deviation span and displays the result of the tolerance check

Status	Signal position	Absolute positi	on					
Absolute	EnDat-compliant				ł	138		d value (ste
Status	Incremental pos	sition						
Incremental					1	140		
Area	Velocity [m/min]	Accuracy [LSB]	Velocity at deviation [m/min]			ation span [LSB]		
1st	0.71	400	0.065			- 2	41	li
2nd			Velocity	range 2 equals velocity range	1			
> 2nd	> 0.71	> 400	0.745					29

Figure 114: **Absolute to incremental deviation** function when the tolerance limits are exceeded (red value)

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 204

On the **Encoder status** screen, you can view status messages and delete them if necessary.

Further information: "Displaying status messages", Page 213

11.6.3 Inverting the counting direction of the incremental counter

On some encoders, the counting direction of the incremental counter can be configured. You can adapt the counting direction to the encoder in the Adjusting and Testing Software.

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	-	1
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- Click Invert counting direction in the control bar to adapt the counting direction
- The Adjusting and Testing Software inverts the positive or negative counting direction

11.6.4 Resetting the deviation span

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You can reset the deviation span to repeat the examination.

- Click Reset deviation span in the control bar
 - The count value of the incremental counter is set equal to the absolute position
 - > The deviation span is set to zero

11.7 Evaluating the encoder status with the online diagnostics

11.7.1 Online diagnostics function

You can monitor the encoder status with the **Online diagnostics** function.

The Adjusting and Testing Software records valuation numbers, which are transmitted together with the position value when the encoder is traversed. On the basis of these valuation numbers, the Adjusting and Testing Software determines the current function reserves of the encoder.

The **Online diagnostics** functions comprises:

- the Protocol screen for entry of log data
- the Measurement screen to determine the function reserves
 - Bar graph
 - X/Y display

Protocol screen

In the **Protocol** screen, you can enter additional log data. After the measurement, you can save the log as a PDF file.

	tics [En	coder diagnostic	s]			
Encoder data			Machine dat	a		
Encoder model ID-number Serial number		EQN 1337 586649-02 X20565117	Machine type D-number Serial number Axis			
Measuring range			Recording p	eriod		
Smallest position: Greatest position:	??? ???		Start: End:	??? ???		
Notes						

Figure 115: **Protocol** screen of the **Online diagnostics** function

Depiction	Description
Encoder data	The fields are filled automatically; the data are adopt- ed from the encoder memory
Machine data	Fields for entering machine data
Measuring range	The fields are filled automatically at the end of the measurement
Recording period	The fields are filled automatically at the end of the measurement
Notes	Field for entering notes

Operating elements

lcon	Function
24	Export data
	Opens the dialog for exporting records to a TXT file
	Save file
	Opens the dialog for saving the log to a PDF file
	Switch to Protocol view
	Shows the screen for entering log data
Tester 1	Switch to Measurement view
-1V-	Shows the screen for running measurements

Measurement screen

In the **Measurement** view, you can monitor the status of the encoder.

The Adjusting and Testing Software records valuation numbers, which are transmitted together with the position value when the encoder is traversed. On the basis of these valuation numbers, the Adjusting and Testing Software determines the current function reserves of the encoder.



Figure 116: Measurement screen of the Online diagnostics function

Display	Description
Functional reserves	The following valuation numbers are transferred and displayed, depending on the connected encoder:
	 Valuation number 1: Evaluation of the incremental or scanning track
	Valuation number 3:
	 For absolute encoders: Evaluation of the absolute track
	 For incremental encoders: Evaluation of the reference pulse width or sum
	 Valuation number 4: Evaluation of position value formation/reference pulse position
	 For absolute encoders: Evaluation of position value formation
	 For incremental encoders: Evaluation of the reference pulse position
	 Valuation number 5: Evaluation of the battery voltage of touch probes
	 Valuation number 6: Evaluation of the transmission quality of touch probes

Display	Description
Mounting parameters	Display of the mounting clearance, e.g. for rotary encoders without integral bearing
	 Mounting clearance: Distance at the current position
	 Minimum: Smallest distance in the traversed area
	 Maximum: Greatest distance in the traversed area
	 Current internal temperature: Measured value from the sensor in the encoder
Status – Absolute	Status display of encoder errors and encoder warnings for the absolute value
	 Green: No status message available
	 Red: Status message available
	Further information: "Classification of the status messages", Page 204
Status – Incremental	Status display of encoder errors and encoder warnings for the incremental value
	Description see "Status – Absolute"
Absolute position	Absolute encoder position (position value 1)
	Unit: micrometers or degrees (depending on the encoder)
	For multiturn rotary encoders, the Adjusting and Testing Software in addition displays the number of revolutions
Incremental position	Count value of incremental counter
	Unit: increments

To see which valuation numbers the encoder supports, refer to the encoder configuration.

Further information: "Overview of supported valuation numbers", Page 266

The **evaluation of the reference pulse sum** (valuation number 3) refers to the function reserve during the acquisition and evaluation of the reference pulse by the signal converter or the encoder. Thus, it does not evaluate the reference pulse itself (e.g., its position and width), but its entire evaluation function including the characteristic properties of the reference pulse and the signal converter or encoder. With the components "Incremental signal" and "Evaluation of the reference pulse sum", the online diagnostics thus allows for diagnosing during operation and supports regular functional checks.

If a valuation number cannot be determined during operation, it is marked as invalid in the overview. A description of the possible causes can be found in the encoder documentation.

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Bar graph



Figure 117: Bar graph of the **Online diagnostics** function

The bar display of the Adjusting and Testing Software shows each valuation number in a bar graph. The scale of the bar corresponds to the maximum function reserve of the encoder. The minimum, i.e. the smallest value within the traversed range, is determined for each valuation number. The drag indicator marks the minimum. The black bar shows the value transferred last.

Display	Function reserve	Description
Yellow	0 to 25%	 Minimum is outside the specification
		 Encoder maintenance recommended
Green	26 to 100%	 Minimum is within the specification
		 Encoder function reserves are sufficient

The tolerance ranges are indicated by color in each bar graph:

X/Y display

The X/Y display may be additionally available, depending on the encoder. It shows the course of the function reserves over the entire traverse path.



Figure 118: X/Y display of the **Online diagnostics** function

Depiction	Description
X axis	Position
	Input: millimeters or degrees (depending on the encoder)
Y axis	Function reserve

Operating elements

lcon	Function
	Start recording
	Starts recording of the measured values
	Stop recording
	Terminates recording and freezes the last view
th	Show measured values
491	Displays the measured value in increments
t-	Show position values
L	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the
	encoder)
5	Show status information
4	Displays a list of errors and warnings
2	Delete values
	Deletes the recorded values and resets the drag indicators to 100%
	Switch to bar display
	Shows the bar graphs
CW3	Switch to X/Y display
	Shows the X/Y display
74	Export data
	Opens the dialog for exporting records to a TXT file
	Save file
	Opens the dialog for saving the log to a PDF file
	Switch to Protocol view
	Shows the screen for entering log data
at all	Switch to Measurement view
	Shows the screen for running measurements

11.7.2 Performing online diagnostics

Prerequisites:

- The encoder was connected to the Adjusting and Testing Software by entering the encoder ID
- In the monitoring mode: The subsequent electronics supports the diagnostic function (request of diagnostic data); the diagnostic function is active in the subsequent electronics



To call this function, double-click Online diagnostics in the function menu

EIDENHAIN: ATS - Adju: Help	sting and Testing Software		-	
Online diagn	ostics			
Please select the	online diagnostics mode of operation.			
Diagnostic mo	de			
• Mode:	Encoder diagnostics			
• Mode:	Monitoring mode Encoder connected to the IK/PWM in feed-through mode.			
				£
				12000

Figure 119: Online diagnostics function

- In the **Diagnostics mode** section, select the option that corresponds to the operating mode of the testing device:
 - Encoder diagnostics
 - Monitoring mode

Further information: "Operating modes of the testing device", Page 26

> The Protocol screen is shown

	tics [Encoder d	agnostics				
Encoder data			Machine data			
Encoder model	EQN 13		Machine type			
ID-number	586649-		ID-number			
Serial number	X205651	117	Serial number			
			Axis			_
Measuring range			Recording peri	od		
Smallest position:	???		Start:	???		
Greatest position:	???		End:	<u> ???</u>		
Notes						

Figure 120: Protocol screen of the Online diagnostics function

- ► Add log data, if necessary
- -11-
- Click Show measurement screen in the control bar
 The Measurement screen is shown

			-	
	s [Encoder diagnostics]			
Function reserves				
Mounting diagnostics	5			
Mounting diagnostics	3			
Mounting diagnostics				
Mounting diagnostics Status	Absolute position			
			Angle [de	egrees
Status	Absolute position		Angle [de	egrees
Status O Absolute	Absolute position Revolution		Angle [d	egrees
Status	Absolute position Revolution		Angle [d	egrees
Status O Absolute	Absolute position Revolution	24	Angle (de	egrees —
Status Absolute	Absolute position Revolution	<u>M</u>		-

Figure 121: Measurement screen of the Online diagnostics function

Running the measurement with bar display



If necessary, click Switch to bar display in the control bar

Click Start measurement

- Traverse the entire measuring range
- > The valuation numbers are recorded
- > The minimum is displayed for each valuation number

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Click Terminate measurement

> The displays show the last view

Online diagnostics [I	Encoder diagnostics	5]			
Function reserves					
Absolute track Minimum 91 % at 4052 rev.	250°	0	50		100
Incremental or scanning Minimum 79 % at 4052 rev.		0	50		100
		0	50		100
Position-value formation Minimum 67 % at 4052 rev.	250°				
	250°				
▲ Minimum 67 % at 4052 rev.	250° Absolute position				
Minimum 67 % at 4052 rev. Mounting diagnostics		Revolution	Ч	6.02 ŠČ	[degrees

Figure 122: Result of the online diagnostics in the bar display

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 204

On the **Encoder status** screen, you can view status messages and delete them if necessary.

Further information: "Displaying status messages", Page 213

You can save the measuring result to a log file. **Further information:** "Saving the log", Page 235

Running the measurement in the X/Y display

Prerequisite for incremental encoders: The encoder reference run has been completed; otherwise the X/Y display may show position jumps when reference marks are crossed over

▶ If necessary, click Switch to X/Y display in the control bar

HEIDENHAIN: Help	ATS - Adjusting and Testin	Software			1	
Online	diagnostics [I	ncoder diagnostics]				
,						-
serves						
nal res						
Functional reserves						
l						
		Angle [degrees]				
	Status	Absolute position			Angle (d	araaal
	0	4051		4602		
	Absolute			10.01	JU	U
	# 🕒 🝳 🗟	2		24 🔒 🖸	<u>*</u>	<u>C</u> .
			Functional	EQN 1337	58664	0-02

Figure 123: Measurement view with X/Y display



Click Start measurement

- Traverse the entire measuring range
- > The valuation numbers are recorded
- > The diagram shows the function reserve at the respective position



Click Terminate measurement

> The displays show the last view



Figure 124: Result of the online diagnostics in the X/Y display

If you position the mouse pointer on a point in the diagram, a mouseover text appears with brief information, e.g. the number of revolutions of a multiturn encoder.

On the **Encoder status** screen, you can view status messages and delete them if necessary.

Further information: "Displaying status messages", Page 213

You can export the data shown in the diagram to a TXT file. **Further information:** "Exporting data", Page 235

You can save and print the active diagram. **Further information:** "Adjusting, exporting and printing diagrams", Page 46

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To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46

11.7.3 Saving the log

You can save the results of the online diagnostics in a PDF file.

- Click Switch to Protocol view in the control bar
- Complete the log data, if necessary
- Click Save log
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The input field **Comment in inspection report** is displayed
- ► If necessary, enter a comment
- Click OK
- > The file is saved



In the Adjusting and Testing Software, you can add an individual header and details on the examiner to the logs. **Further information:** "Saving log information", Page 54

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To display the PDF contents correctly, the font "Arial Unicode $\ensuremath{\mathsf{MS}}$ " must be installed on the computer.

11.7.4 Exporting data

You can save the recorded data to a TXT file.

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	.74	ς.,		
-	15	10	ι.	_
1				з
-				

- Click Export data in the control bar
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved

11.7.5 Deleting values

You can delete the recorded values to perform a new measurement.



- Click Delete values in the control bar
- > The Minimum value of each valuation number is deleted



The bar display is reset as soon as you start a new measurement.

11.8 Checking the functional safety of the encoder

11.8.1 Functional-safety encoder check

The functional-safety encoder check serves to check safety-relevant functions of encoders. A software wizard will you through the required steps.

Prerequisites:

- The encoder supports the functional-safety encoder check
- The encoder was connected to the Adjusting and Testing Software by entering the encoder ID

Encoders with Functional Safety can typically be identified by the word "Safety" printed on the ID label.

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If the functional-safety encoder check results in errors, the encoder does not comply with the functional safety specifications. Repairs may only be carried out by the HEIDENHAIN Service.



After installing and exchanging functional safety components, repeat the acceptance test according to the specifications of the machine tool builder.

Description of function:

The safety strategy of the position encoder is based on two mutually independent position values and additional error bits (error 1 and error 2) produced in the encoder and transmitted over the EnDat 2.2 protocol. The subsequent electronics compares the two position values and checks the error bits. In addition, the protocol structure of EnDat transmission provides the subsequent electronics with further monitoring information. The internal failure mechanisms of the encoder are also tested for proper functioning at specified intervals; this is called forced dynamic sampling.



- To call this function, double-click Functional-safety encoder check in the function menu
- > The dialog **Manual entry of measuring length** may be displayed (depending on the encoder)
- Enter the measuring length in millimeters
- Confirm the entry with Accept
- The software wizard shows a list of the supported diagnostic functions

	unctional Safety" encoder		
u can use tr	is application to perform the necessary tests of encoders for safety-oriented applications (ID label: "Functional Safety").		
Supported	I diagnostic functions		
~	Functional-Safety encoder		
~	Forced dynamic sampling		
V	Position value 2		
-	Operating status error sources		
~	Online diagnostics		
-	Offline diagnostics		
	If it is a "Functional Safety" encoder, and if <u>all</u> safety-related applications are to be checked, then the Wizard must run throug	gh to the e	nd!
	< Back Next >	Cance	1

Figure 125: Overview of supported diagnostic functions

The overview shows the diagnostic functions the encoder supports.

Depiction	Description		
Functional-Safety encoder	Check of safety-relevant memory areas		
Forced dynamic sampling	Check of internal failure mechanisms of the encoder		
Position value 2	Transfer of second position value		
Operating status error sources	Transfer of expanded error messages		
Online diagnostics	Transfer of valuation numbers		
Offline diagnostics	Recording of valuation numbers in the encoder		

lcon	Description		
~	Diagnostic function is supported		
	Diagnostic function is not supported; diagnostic function is not mandatory for the functional-safety encoder check		
×	Diagnostic function is not supported; functional-safety encoder check cannot be performed		

Checking safety-relevant memory areas

The Adjusting and Testing Software checks the safety-relevant memory parameters for consistency with the encoder database.

- Click **Next** to check the safety-relevant memory areas
- > The Adjusting and Testing Software compares the memories
- > The software wizard shows the result of the comparison

Help	- Adjusting and Testing Software				- C	
Check "F	unctional Safety" en	ncoder				
In this step a p	art of the safety-relevant memory p	parameters in the encoder memory will be check	ed. The encoder database is n	ecessary for some of the	e parameters for t	his.
Checking	of safety-relevant memory	parameters				
0	Checking of the safety-	relevant memory parameters in the e	ncoder memory was co	mpleted successf	ully.	
			< Back	Next >	Cancel	
			Functional Safety			

Figure 126: Result of the comparison of encoder memory and encoder database

- Click **Next** to continue
- > The software wizard shows information on **forced dynamic** sampling

Forced dynamic sampling

International form message 1Upforce top message 1For a generate top message 1For a generate top message 1Consistence top message 1Consistence	Error message	Error type	Supported	Frror 1 generated	Frror 2 generated	Error type output	Error deactivated	Test successful
For message 1 Signal amplitude Yes Image: Constraint of the sector o			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Lifer I generated	Entri 2 generated	Life cupe	Lifer deactivated	Test successful
Poston error Yes Poston Yes Poston Poston<								
Drow message 1 Overvoltage No Image 1 Overvoltage Image 1 Overvoltage No Image 1 Overvoltage Image 1								
Dror message 1 Under voltage No Image Image <td>and a second second second</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	and a second second second							
For message 1 Overcure M No Image: Mode M								
Battery falure No Image: Constraint of the state of								
Error message 2 Ught source No. Mode								
Brow message 2 Signal amplitude Yes Period								
Error message 2 Position error Yes Position error Position e								
Error message 2 Overvoltage No Image: Comparison of the comparis		-	A VERO					
Error message 2 Under voltage No Image: Constraint of the state of the sta								
Error message 2 Overcurrent No								

Figure 127: Forced dynamic sampling screen with supported error types

During forced dynamization, the internal failure mechanisms of the encoder are tested for proper functioning. The monitoring is divided into two groups (error message 1 and error message 2). Each group supports seven error types.

The table shows the error types the encoder supports. In forced dynamic sampling, the error types are stimulated individually and the response of the encoder is evaluated. Supported error types must generate a corresponding error 1 or error 2. Error types that are not supported must not generate an error when stimulated. The error type read out must correspond to the stimulated error type. Moreover, it must be possible to deactivate the error after stimulation.

- Click Start to start forced dynamic sampling
- > A message appears if error messages already exist
- Click Yes to confirm the deletion of existing error messages
- > Forced dynamic sampling is performed
- > The table contains the test result

Red entries in the table indicate faulty behavior of the encoder.

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Forced dynamic Error message Error message 1 Error message 1 Error message 1 Error message 1	sampling Error type Light source Signal amplitude Position error	Supported No	Error 1 generated	Error 2 generated	Error type output	Error deactivated	Test successful
Error message 1 Error message 1 Error message 1 Error message 1	Light source Signal amplitude	No		Error 2 generated	Error type output	Error deactivated	Track assessed
Error message 1 Error message 1 Error message 1	Signal amplitude		No			circi acaccivacca	Test successiu
Error message 1 Error message 1			110	No		Yes	ОК
Error message 1	Position error	Yes	Yes	No	Signal amplitude	Yes	ок
		Yes	Yes	No	Position error	Yes	ок
	Overvoltage	No	No	No		Yes	ок
Error message 1	Under voltage	No	No	No		Yes	ОК
Error message 1	Overcurrent	No	No	No		Yes	ок
Error message 1	Battery failure	No	No	No		Yes	ок
Error message 2	Light source	No	No	No	200	Yes	ок
Error message 2	Signal amplitude	Yes	No	Yes	Signal amplitude	Yes	ок
Error message 2	Position error	Yes	No	Yes	Position error	Yes	ок
Error message 2	Overvoltage	No	No	No		Yes	ок
Error message 2	Under voltage	No	No	No		Yes	ок
Error message 2	Overcurrent	No	No	No		Yes	ок
Error message 2	Battery failure	No	No	No		Yes	ОК

Figure 128: Result for correct behavior of the encoder

Light source	Nave.			Error type output	Error deactivated	Test successfu
	No	No	Yes		No	not OK
Signal amplitude	Yes	Yes	Yes	Several errors	No	not OK
Position error	Yes	Yes	Yes	Position error	No	not OK
Overvoltage	Yes	Yes	Yes	Several errors	No	not OK
Under voltage	Yes	Yes	Yes	Several errors	No	not OK
Overcurrent	No	No	Yes	57.5	No	not OK
Battery failure	No	No	Yes		No	not OK
Light source	No	Yes	No		No	not OK
Signal amplitude	No	Yes	No	223	No	not OK
Position error	Yes	Yes	Yes	Position error	No	not OK
Overvoltage	No	Yes	No		No	not OK
Under voltage	No	Yes	No		No	not OK
Overcurrent	No	Yes	No		No	not OK
Battery failure	No	Yes	No		No	not OK
	Position error Overvoltage Under voltage Overcurrent Eattery failure Light source Signal amplitude Position error Overvoltage Under voltage Overcurrent	Position error Yes Overvoltage Yes Under voltage Yes Overcurrent No Battery failure No Light source No Signal amplitude No Position error Yes Overvoltage No Under voltage No Under voltage No Overvoltage No Overvoltage No	Position error Yes Voervoltage Yes Under voltage Yes Under voltage Yes Vercurrent No Battery failure No Light source No Signal amplitude No Position error Yes Overvoltage No Under voltage No Versource No Versource No Voervoltage No Versource No Versource No	Position error Yes Yes Overvoltage Yes Yes Under voltage Yes Yes Under voltage Yes Yes Overvoltage Yes Yes Signal amplitude No Yes Position error Yes Yes Overvoltage No Yes Overvoltage No Yes Under voltage No Yes Overvoltage No Yes Under voltage No Yes Overvoltage No Yes	Position error Yes Yes Position error Overvaluege Yes Yes Position error Under voltage Yes Yes Yes Several errors Under voltage Yes Yes Yes Several errors Overvaluege Yes Yes Yes Several errors Overvaluege No No Yes Battery failure No No Yes Ught source No Yes No Signal amplitude No Yes No Position error Yes Yes No Overvoltage No Yes No Under voltage No Yes No Overcurrent No Yes No	Position error Yes Position error No Overvoltage Yes Yes Position error No Under voltage Yes Yes Several errors No Under voltage Yes Yes Several errors No Overvoltage Yes Yes Several errors No Overvoltage Yes Yes No Battery failure No No Yes No Ught source No Yes No No Signal amplitude No Yes No No Overvoltage No Yes Yes Position error No Overvoltage No Yes No No Under voltage No Yes No No Overcurrent No Yes No No

Figure 129: Result for faulty behavior of the encoder

- Click **Next** to continue
- > The software wizard shows information on the **test for consistency**

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Test for consistency

Encoders supporting functional safety output two position values: the high-resolution position 1 and a lesser resolved position 2. During the test for consistency, the Adjusting and Testing Software scales the position value 1 to the resolution of position value 2 and checks position value 2 for consistency. The test is considered passed if the maximum position jump results in a deviation ≤ 3 .

Check "Funct	ional Safety" encode	ər			
The test for consistency position jump must not	y checks position value 1 (absolute exceed two bits.	position) for its consistency. The fine i	nformation (interpolation) of pos	sition value 1 is hidden fo	or this purpose. 1
Test for consiste	ency				
(i)		raverse range is to be covere s shown in % in the traverse-r		aningful measurin	ng result.
	The maximum speed v = high speed.	= 781 rpm may not be exceed	ed, since position jumps	s may otherwise o	ccur due to t
Go to measurement			< Back	Next >	Cancel

Figure 130: Information on the test for consistency

- Click Go to measurement to run the test for consistency
- > The Measurement screen is shown

Help Test for consistency						
Absolute position						
				Mea	sured value (steps
		36620	1529	58	1	
Maximum position jump		Scaled absolute position				
	Deviation					step
EnDat status						step
EnDat status		Error 1		Error 2		siep
•		•		Error 2		step
Transmission		•		Error 2		
Transmission		Error 1		Error 2		

Figure 131: Measurement screen of the test for consistency

Depiction	Description					
Absolute position	Absolute position 1					
	Unit: increments					
Maximum position jump	Deviation of scaled position value 1					
Scaled absolute position	Position value 1, scaled to resolution of position value 2					
EnDat status	Status displays					
	 Status display of data transfer between encoder and testing device (CRC test) 					
	 Green: No status message available 					
	Red: Status message available					
	Error 1: Status display of the encoder error group 1					
	 Green: No status message available 					
	Red: Status message available					
	Error 2: Status display of the encoder error group 2					
	 Green: No status message available 					
	 Red: Status message available 					
Traverse path	Traversed measuring distance in percent					
	The traverse path is read out from the encoder memory or the encoder database (depending on the encoder).					

Operating elements

lcon	Function
	Start recording
	Starts recording and evaluation of the measured values
	Stop recording
	Terminates recording and freezes the evaluation of the measured values
tati	Show measured values
44	Displays the measured value in increments
t-	Show position values
L - •	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the encoder)
A	Show status information
4	Displays a list of errors and warnings
	Click Start measurement in the control bar
	 Traverse the entire measuring range
	> The progress bar shows the traversed distance in percent
	The traverse path of encoders mounted to a machine



The traverse path of encoders mounted to a machine may be limited such that the progress bar cannot reach 100%.

Click Terminate measurement

> The Adjusting and Testing Software shows the result of the test for consistency

EIDENHAIN: ATS - Adjusting and Testing So	ftware				×	
Help						
Test for consistency						
Absolute position						
				Measu	red value	e [steps]
	138	5660	844	{ 4'	-	1
Maximum position jump	Scaled	absolute position				
	Deviation			Measured val	ue [scale	d steps]
EnDat status						
Transmission		Error 1		Error 2		
Traverse path [%]						
		100%				
▶ 🗰 Ŀ 🔍						Ê.
			Functional		5966	

Figure 132: Result of the test for consistency

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 204

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On the **Encoder status** screen, you can view status messages and delete them if necessary.

Further information: "Displaying status messages", Page 213



Click Return to last view to return to the software wizard

- Click **Next** to continue
- The software wizard shows information on the Comparison of position values

Comparison of position values

The Adjusting and Testing Software scales the position value 1 to position value 2 and checks both position values. The position values must not differ by more than 1 bit. An active datum shift and other offset parameters are taken into account.

EIDENHAIN: ATS - Adjust	ng and Testing Software			- 0
Help				
Check "Func	tional Safety" encoder			
The comparison of pos permitted to be more t	ition values 1 and 2 checks the deviation betwe han one bit.	en Pos.1 and Pos.2. The fine information (inter	polation) of position value 1 is hid	Iden. The deviation is
Comparison of	position values 1 and 2			
i)	As large as possible a traverse r should cover 100 % of this rang The captured positions will be s		ain a meaningful measur	ing result. The te
Go to measurement		< 8	lack Next >	Cancel
		,		
		E	EQN 1337	586649-0

Figure 133: Information on comparison of position values

- Click Go to measurement to run the comparison of position values
- > The **Measurement** screen is shown



Figure 134: Measurement screen of the comparison of position values

Depiction	Description
Position 1	Status display of absolute position 1
	The status display comprises the data transfer between the encoder and the testing device (CRC test) as well as the error group 1 and the error group 2.
	 Green: No status message available
	 Red: Status message available
Scaled position value 1	Position value 1, scaled to resolution of position value 2
	Unit: increments
Position 2	Status display of absolute position 2
	The status display comprises the data transfer between the encoder and the testing device (CRC test) as well as the error group 1 and the error group 2
	 Green: No status message available
	 Red: Status message available
Position value 2	Position value 2 output by the encoder
	Unit: increments
Monitoring function	Status display of comparison of position values
	■ Green: Maximum deviation ≤ 1
	Red: Maximum deviation > 1

Depiction	Description
Maximum deviation difference	Maximum deviation of the scaled position value 1 from position value 2



If the maximum deviation is > 1, the value is displayed in red color.

Collected positions diagram

The position values for the comparison of position values are captured by traversing the encoder. The Adjusting and Testing Software displays positions not yet captured as edges. Once all positions have been captured, a continuous line is displayed at Y = 1.

Collec	ted	pos	sition	ns																							
1 🛉	_		-	1					n –	-			-10				-		r-	-11	-	-h			T	-	1
0.5																											
0						_																					
0		20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	
								Х	axis:	enco	der-po	sition		Yax	is: 1 =	Posit	ion co	llecte	d								

Figure 135: Collected positions diagram

Depiction	Description
X axis	Encoder position
Y axis	Value 0 = Position not captured
	Value 1 = Position captured

Operating elements

lcon	Function
2	Show status information
~	Displays a list of errors and warnings

- Traverse the entire measuring range several times until the Collected positions diagram contains no more edges
- The Adjusting and Testing Software shows the maximum deviation difference of the collected position values

Status	Scaled position value 1		[Pos.2 steps
Status	ocaled position value i		[F US.2 Steps
Position 1		L L	450
Status	Position value 2		[Pos.2 steps
Position 2		L	450
Monitoring	function	Maximum deviation difference	[Pos.2 steps
	Deviation difference > 1		
Collected p	ositions		
0.5			

Figure 136: Result of comparison of position values

The encoder is working correctly, if the determined deviation difference is no more than 1.

On the **Encoder status** screen, you can view status messages and delete them if necessary.

Further information: "Displaying status messages", Page 213

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	-

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- Click Return to last view in the control bar to return to the software wizard
- Click **Next** to continue
- The software wizard displays the results of the functionalsafety encoder check

Results overview of the functional-safety encoder check

The overview shows the results of the functional-safety encoder check.

		er				
Checking of sa	fety-relevant memory range	s				
Test result						
0	Safety-relevant memory parameters checked successfully.					
Forced dynami	ic sampling					
Test result						
0	All error bits were dynamically sampled correctly					
Test for consis	tency					
Test result						
0	Max. difference [Pos	s.2 steps]: 1	Trav	verse range checked:	100 %	
Comparison of	f position values 1 and 2					
Test result	Monitoring function			Trave	erse range: 100.0	%
0	[Deviation] <= 1	Max. deviation [Po	os.2 steps]: 1	Test	coverage: 100.0	%
Status						
Test result	•	0	0	0		0
	Error 1:	Error 2:	Transmission:	Error Pos2:	DL	l error:
0	Error 1:					

Figure 137: Results overview of the functional-safety encoder check

Red values or status displays indicate a malfunction of the encoder.

Depiction	Description	
Checking of Result of memory comparison safety-relevant memory ranges		
Forced dynamic sampling	Result of forced dynamic sampling	
	If the test returned errors, an overview of the error types concerned is displayed.	
Test for consistency	Result of the test for consistency	
	 Max. difference: Maximum deviation of scaled position value 1 	
	 Traverse range checked: Measuring distance traversed during the test Unit: Percent 	

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Depiction	Description			
Comparison of position	Result of comparison of position values			
values	 Monitoring function: Status display of comparison of position values 			
	 Green: Maximum deviation ≤ 1 			
	Red: Maximum deviation > 1			
	Max. deviation: Maximum deviation of the scaled position value 1 from position value 2			
	 Traverse range: Measuring distance traversed during the test Unit: Percent 			
	 Test coverage: Position values captured in the traversed path Unit: Percent 			
	If the captured area is less than 5%, the result is displayed in red color. However, for an evaluation of the encoder in the specific application, the maximum traversing range needs to be examined.			
Status	Status displays:			
	Error 1: Error group 1			
	Error 2: Error group 2			
	 Transmission: Data transfer between encoder and testing device (CRC test) 			
	Error Pos2: Error of position value 2			
	DU error: Internal safety-relevant encoder errors			
	Status:			
	Green: No status message available			
	 Red: Status message available 			
The symbol in column 1 ir performed.	ndicates whether and with which result a test was			
-	Description			
lcon	Description			

	 Test performed
	 Test completed without error
	 Test not performed
X	or
	Test found errors

Operating elements

lcon	Function
	Save file
	Opens the dialog for saving the log to a TXT file

Procedure in the event of errors

If the functional-safety encoder check returns errors, proceed as follows:

- ► Abort the functional-safety encoder check
- Reset status messages
 Further information: "Resetting status messages", Page 215
- Repeat the functional-safety encoder check
- ▶ If errors are found again, contact the HEIDENHAIN Service

11.8.2 Saving the log

You can save the results of the functional-safety encoder check in a PDF file.



- Click **Save log** in the control bar
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved



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In the Adjusting and Testing Software, you can add an individual header and details on the examiner to the logs. **Further information:** "Saving log information", Page 54

To display the PDF contents correctly, the font "Arial Unicode MS" must be installed on the computer.

11.9 Loading and editing the encoder configuration

Encoders with EnDat interface feature an internal encoder memory. You can access the encoder memory via the Adjusting and Testing Software. Thus you have the following options:

- Load encoder configuration from encoder
- Save encoder configuration to a file
- Load encoder configuration from a file
- Edit encoder configuration and transfer it to the encoder

A detailed description of the memory areas and data words can be found in the document "Bidirectional synchronous serial interface for position encoders" with the document ID D297403 (available on request).

11.9.1 Display encoder memory function

With the **Display encoder memory** function you can load the encoder configuration from the connected encoder to the Adjusting and Testing Software and navigate in the folder structure.



To call this function, double-click **Display encoder memory** in the function menu

	£.
EQN 1337	EQN 1337 58664

Figure 138: Display encoder memory function
Operating elements

lcon	Function
6	Load file Opens the dialog for selecting the file containing the encoder configuration
	Save file Opens the dialog for saving the encoder configuration to an ECF file
EnDat	Load encoder memory Starts the export of the encoder memory
EnDat	Save in encoder Opens the dialog for overwriting selected memory areas in the encoder
1	Close all folders Reduces folder display to the first level
	Display functions Shows the encoder data in functions
	Display data words Displays the encoder data in data words
D	Decimal format Shows numerical values in decimal format
B	Hexadecimal format Shows numerical values in hexadecimal format
H	Binary format Shows numerical values in binary format
	Save encoder information Opens the dialog for saving the encoder information to a TXT file

11.9.2 Loading the encoder configuration from the encoder memory

- Click Load encoder memory in the control bar
- > The encoder memory is read out
- > The folder structure of the encoder configuration is displayed

DENHAIN: ATS - Adjusting and Testing Software		
ncoder configuration [en	oder data	
ty To perating status Parameter of encoder manufacturer Denating parameters Denating parameters Denating e1 Denating e2	Value /	
DEM (range 3) DEM (range 3) Dem (range 3) Dem compensation values of encoder manuf. (range Dem Parameters of encoder manufacturer for EnDat2		
💴 🛃 🔒 🛃 😰) D H B 🛼	£.

Figure 139: Folder structure of the encoder configuration for EnDat 2.2 interface (example)

- 1 Entry: Memory areas
- 2 Value: Values assigned to the memory area



The folder structure depends on the connected encoder.

11.9.3 Adapting the encoder configuration view

Switching between data view and functions view

In the **Encoder configuration** function you can switch between the following views:

- Data view
- Function view

Data view

The Adjusting and Testing Software shows the memory contents in data words (image of the encoder memory).

Structure	EIDENHAIN: ATS - Adjusting and Testing Software Help				_	
Important Value Operating status 0 Varad 0 0 Varad 0 9 Varad 0 5534 Parameter of encoder manufacturer 5534 Operating status 5534						
Operating status Vord 0 Vord 0 Parameter 0 encoder manufacturer Operating parameters Oth (range 2) Oth (range 3) Deb (range 3) Parameters 0 encoder manufacturer to EnDad2	Encoder configuration [end	oder data]				
Ward 0 0 Word 0 3 Varia 0 65534 Parameters of encoder manufacturer Deparing parameters DEM (range 3) Comperation values of encoder manufacturer for EnDal2.2	intry	Value				
Ward 0 0 Ward 0 5554 Parameter of encoder manufacturer Description parameters DE (fange 1) D DM (fange 2) D DM (range 3) D Description values of encoder manuf. (range 4) Parameters of encoder manuf. (range 4) Parameters of encoder manuf. (range 4)						
Ward 0 9 Parameter of encoder manufacturer Deparing parameters Defair (ange 1) Defair (ange 3) Defair (ange 3) Defair (ange 4) Parameters of encoder manufacturer for EnDa22						
Vadu 0 9534 Parameter of encoder manufacturer 900 (minge 1) 0 Det (minge 2) 900 (minge 3) 0 Det (minge 3) 900 (minge 3) 0 Det manufacturer for EnDad2 900 (minge 3) 0 Parameters of encoder manufacturer for EnDad2 900 (minge 3) 0 Det manufacturer for EnDad2 900 (minge 4) 0 Det m						
Parameter of encoder manufacturer Coefficients Coefficie						
 Comparison values of encoder manuf. (singe 4) Comparison values of encoder manuf. (singe 4) Parameters of encoder manufacturer for EnDat2. 		65534				
 Cell (range 1) Debl (range 3) Congremation values of encoder manuf. (range 4) Parameters of encoder manufacturer for EnDat2 						
 Contension values of encoder manuf. (range 4) Parameters of encoder manufacturer for EnDat2.2 						
Compensation values of encoder manuf. (range 4) Parameters of encoder manufacturer for EnDad2 Parameters of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation values of encoder manufacturer for EnDad2 Compensation						
 Compensation values of encoder manuf. (mage 4) Parameters of encoder manufacturer for EnDat2.2 						
Parameters of encoder manufacturer for EnDa22						
	Parameters of encoder manufacturer for EnDat2.					
						Procession in the second
	🖸 🞑 🛧 🤚 🖓 🔽 🗖	D H B 🔤				
EQN 1337 586649-02	EnDat EnDat					Goo
EQN 1337 586649-02						
			Functional EQI	N 1337	5866	49-02

Figure 140: Data view

Function view

The Adjusting and Testing Software interprets the data words according to the EnDat specification and assigns functions to the memory contents.



Figure 141: Function view

Switching between the views

When the **Display memory contents** function is called, the data view is displayed.



 Click **Display functions** in the control bar to switch to the function view



Click Display data words in the control bar to return to the data view

Adjusting the number format

You can choose between different number formats for displaying numerical values.

D	 Click Decimal format in the control bar to display numerical values in decimal format
H	 Click Hexadecimal format in the control bar to display numerical values in hexadecimal format

 Click **Binary format** in the control bar to display numerical values in binary format

Closing all folders

You can reduce the folder structure to the top level in the **Encoder configuration** function.



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- Click Close all folders in the control bar
- > The folder structure is reduced to the top level

11.9.4 Saving the encoder configuration to a file

If you have loaded an encoder configuration in the Adjusting and Testing Software you can save this configuration in an ECF file. You can then open this file again in the Adjusting and Testing Software and transfer the data to the encoder.



- Click Save file in the control bar
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved

11.9.5 Saving encoder information to a file

You can save important information on the connected encoder—such as serial number, length of measuring step, datum shift—in a TXT file. Which information the TXT file comprises depends on the encoder.

ı	-			я.	
l	-	12		н.	
l	-	- 24	1	n	
ĩ	-	24		м.	
	_			-2	٠

- Click Save encoder information in the control bar
- Select the desired storage location in the dialog
- ► Enter the file name
- Click Save
- > The file is saved

11.9.6 Loading the encoder configuration from a file

You can load an encoder configuration from an ECF file in the Adjusting and Testing Software.



- Click Load file in the control bar
- Select the storage location of the file
- Click Open
- > The encoder configuration is loaded from the file
- > The folder structure of the encoder configuration is displayed
- > The file name is shown in the title bar

11.9.7 Editing the encoder configuration

You can edit individual values in the displayed encoder configuration. Afterwards you can transfer the changed encoder configuration to the encoder.

The document symbol in the line indicates whether a value can be edited:

Display	Description
Z	Value can be edited
Ľ	Value cannot be edited
省	Value cannot be edited; the data word is the result of a calculation or consists of several data words (e.g., ID 557650-06)
6	Memory areas may be write-protected. You will find an overview of the write-protected memory areas in the encoder configuration.

Further information: "Overview of write-protected memory areas", Page 265

Editing values

Danger of uncontrolled axis movements due to datum shift

Overwriting the "Zero point" value in the encoder memory can cause uncontrolled movements of the machine axes. This may result in death, serious injuries, or damage to equipment.

- > Only execute datum shifts in the **Position display** function
- ▶ Do not manually change the "Zero point" value in the encoder configuration

Editing numerical values

- Click the value
- > The input field is activated
- Enter the desired value
- ► Confirm with Enter
- > The new value is shown in the encoder configuration

or

....

- Click the value
- > The input field is activated
- Click Edit next to the input field
- > The editing window is displayed

🗷 🧰 Operating status	Value			
Parameter of encoder manufacturer				
Parameter or encoder manuracturer Operating parameters				
Datum shift	0			
Details shit Details shit Details shit Details shit	0			
Address assignment	0			
Trigger thresh. warning bit for excessive te	mp (115			
Cycle time	1000000			~
Temperature sensor type	Resistor			- JL
Temperature sensor type connected	Unknown temp, sensor type			
Word 11	0			
Word 12	ō			
Word 13	0			
Word 14	0			
Word 15	0	[
🖲 🦲 OEM (range 1)		Cycle time		×
🗄 🦲 OEM (range 2)				
OEM (range 3)		New value		
⊕ ☐ 0EM (range 3) ⊕ ☐ Compensation values of encoder manuf. (rang			1000000	
🗉 🧰 OEM (range 3)		New value Decimal	1000000	
 DEM (range 3) Compensation values of encoder manuf. (rang 		Decimal		
⊕ ☐ 0EM (range 3) ⊕ ☐ Compensation values of encoder manuf. (rang			000F4240	T
⊕ ☐ 0EM (range 3) ⊕ ☐ Compensation values of encoder manuf. (rang		Decimal Hexadecimal	000F4240	
 DEM (range 3) Compensation values of encoder manuf. (rang 		Decimal		00000
 DEM (range 3) Compensation values of encoder manuf. (rang 		Decimal Hexadecimal	000F4240	00000
⊕ ☐ 0EM (range 3) ⊕ ☐ Compensation values of encoder manuf. (rang		Decimal Hexadecimal	000F4240	000000
 DEM (range 3) Compensation values of encoder manuf. (rang 		Decimal Hexadecimal	000F4240	000000 Cancel
 DEM (range 3) Compensation values of encoder manuf. (rang 		Decimal Hexadecimal	000F4240	

Figure 142: Encoder configuration with editing window

- Enter the value in one of the following number formats in the corresponding field
 - Decimal
 - Hexadecimal
 - Binary
- ► Confirm with **OK**
- > The new value is shown in the encoder configuration

Editing text values

- Click the value
- Select the desired value from the drop-down list
- > The new value is shown in the encoder configuration

HEIDENHAIN: ATS - Adjusting and Testing Software Help				-	
Encoder configuration [enc	oder data]				
Enty Paramiter of encoder manufacturer Paramiter of encoder manufacturer Paramiter of encoder manufacturer Parameter of encoder manufacturer Parameters Para	Value 0 0 0 Resistor Resistor Resistor Resistor Resistor 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				v
👂 🖶 🍙 🛃 💽 🖸	DHB E				Ê.
		Functional Safety	EQN 1337	58664	0.00

Editing yes/no values

- Click the value
- > A check box is displayed instead of the value
- Check the box to select the value "Yes"
- Remove the tick from the checkbox to select "No"
- Confirm with Enter
- > The new value is shown in the encoder configuration

Encoder configuration [e	ncoder data]	
Entry	Value	
🕀 🔄 Operating status		
Errors		
🕀 🧰 Warnings		
🖹 🧙 Write protection		
Bit0 Encoder manufacturer		
Bit1 Operating parameters	No	
BI2 DEM	No	
 Bit3 Compensation values (range 4 Bit4 Compensation values (range 3 		
Bit4 Lompensation values (range -		
Bits Compensation values (range a		
Bito Section 2 memory area block		
Bit/ Section 2 memory area block		
Bito Section 2 memory area block		
Bito Section 2 memory area block		
E Intro Sector 2 memory area man E Intro Sector 2 memory area man	acturer NO	
Parameter of encoder manufacturer		
Operating parameters		
OEM (range 1)		
OEM (range 2)		
OEM (range 3)		
Compensation values of encoder manuf. (r.	one 4)	
Parameters of encoder manufacturer for Er		
n 🗈 🔺 🖪 🖂		
🌮 🔒 🔒 🛃 🛃 🖉	D H B 🛼	t

Afterwards you can transfer the changed encoder configuration to the encoder or save it to a file.

Further information: "Saving the encoder configuration in the encoder", Page 262

Further information: "Saving the encoder configuration to a file", Page 256

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Setting write-protection

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To prevent machine-relevant parameters from being changed, you can assign write protection to individual memory areas. This is necessary, particularly to ensure machine safety and system reliability.

The **Parameters of encoder manufacturer** memory area is write-protected by default.

Write protection can only be canceled by the HEIDENHAIN Service.

- Click Load encoder memory in the control bar
- > The encoder memory is read out
- > The folder structure of the encoder configuration is displayed
- Navigate to the Write protection folder
 Path: Operating status
 Write protection

Help				
Encoder configuration [enco	der data]			
Entry	Value			
🕀 🔄 Operating status				
🕀 🧰 Errors				
🕀 🧰 Warnings				
🖹 🔄 Write protection				
Bit0 Encoder manufacturer	Yes			
Bit1 Operating parameters	No			
Bit2 DEM	No			
 Bit3 Compensation values (range 4) 	Yes			
 Bit4 Compensation values (range 3) 	No			
Bit5 Compensation values (range 2)	No			
Bit6 Section 2 memory area block 0	No			
Bit7 Section 2 memory area block 1	No			
Bit8 Section 2 memory area block 2	No			
Bit9 Section 2 memory area block 3-n	No			
Bit10 Section 2 memory area manufacturer	No			
🐵 🧰 Function initialization				
Parameter of encoder manufacturer				
Operating parameters				
OEM (range 1)				
OEM (range 2)				
OEM (range 3)				
Compensation values of encoder manuf. (range 4)				
Parameters of encoder manufacturer for EnDat2.2				
		-		
🔒 🏦 🦊 🕙 🔽 🗋	D H B			£ .

Figure 143: Function view with Write protection folder

- Click the value "No" in the line of the desired memory area
- > A check box is displayed instead of the value
- Check the box to select the value "Yes"
- Confirm with Enter
- To activate write protection in the encoder, save the changed encoder configuration in the encoder

Further information: "Saving the encoder configuration in the encoder", Page 262

Saving the encoder configuration in the encoder

You can use the Adjusting and Testing Software to overwrite memory areas of the encoder, for example to restore the default configuration using a backup file.



- Click Load file in the control bar to load the encoder configuration you wish to save in the encoder
- Select the storage location of the file
- Click Open
- > The encoder configuration is loaded from the file
- > The folder structure of the encoder configuration is displayed



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- Click Save in encoder to transfer the displayed encoder configuration to the encoder
- > The Selection of memory area dialog appears
- Select the memory areas you want to overwrite
- Click Transfer
- > The encoder configuration is transferred to the encoder
- > The selected memory areas are overwritten

Memory areas may be write-protected. You will find an overview of the write-protected memory areas in the encoder configuration. **Further information:** "Overview of write-protected memory areas", Page 265

11.9.8 Overviews

Below you will find some example overviews of the encoder configuration.

Overview of supported error messages and warnings

The encoder configuration provides an overview of the error messages and warnings the encoder supports.

Path to the overview of the error messages:

Parameters of the encoder manufacturer ► **Support of error messages** Path to the overview of the warnings:

Parameters of the encoder manufacturer ► Support of warnings

Supported error messages and warnings are identified by the value "Yes".

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Figure 144: Function view with the folders **Support of error messages** and **Support of warnings**

Overview of supported operating status error sources

The encoder configuration of encoders with EnDat 2.2 interface provides an overview of the operating status error sources the encoder supports.

Path: Parameters of the encoder manufacturer ► Manufacturer parameters EnDat 2.2 ► Support of operating status error sources

Supported operating status error sources are identified by the value "Yes".

Encoder configuration [enco	der data]	
Entry	Value	
😑 🔄 Support of Operating Status Error Sources		
Light source	No	
- 🗋 Signal amplitude	No	
- D S Pos1	No	
- 🗋 Overvoltage	No	
Undervoltage	No	
- Overcurrent	No	
- Temperature exceeded	No	
S Pos2	No	
S System	No	
S All power down	No	
-D M Post	No	
- D M Pos2	No	
- 🗋 M System	No	
- 🗋 M All power down	No	
- M Overflow	No	
M Battery	No	
safety relevant measuring steps	0	
Not safety relevant subdivision rel. position	0	
Not safety-relevant subdivison Pos2	0	
🖲 🧰 Warning caused through limit signals		
😟 🧰 Support state of touch probe		
Time unit for timestamp (touch probe)	Specification not supported	
Referencing of incremental encoders		
- 📝 1/0 support	0	
- 📝 Word 48	0	
- 📝 Word 49	0	- 1
🕀 🧰 Support temperature sensor type		
- 🖸 Word 51	0	
- D Word 52	0	
D Word 53	0	

Figure 145: Function view with the folder **Support of operating status error sources**

Overview of write-protected memory areas

The encoder configuration provides an overview of the write-protected memory areas.

Path: Operating status > Write protection

Write-protected memory areas are identified by the value "Yes".

Entry	Value		
🖻 🔄 Operating status			
🖲 🧰 Errors			
🗉 🧰 Warnings			
🖹 🔄 Write protection			
Bit0 Encoder manufacturer	Yes		
Bit1 Operating parameters W Bit2 OEM	No		
→ Bit2 UEM → 🔐 Bit3 Compensation values (range 4)	No Yes		
Bit3 Compensation values (range 4) Bit4 Compensation values (range 3)	Tes No		
Bits Compensation values (range 3)	No		
Bito Compensation Values (range 2)	No		
Bit7 Section 2 memory area block 0	No		
Bit8 Section 2 memory area block 2	No		
→ Bit9 Section 2 memory area block 2	Ne		
Bit10 Section 2 memory area manufacturer	No		
Function initialization	110		
Parameter of encoder manufacturer			
🗉 🦲 Operating parameters			
🗉 🧰 OEM (range 1)			
OEM (range 2)			
🗄 🧰 OEM (range 3)			
🗄 🦲 Compensation values of encoder manuf. (range 4)			
Parameters of encoder manufacturer for EnDat2.2			
👂 🚽 🔒 🛃 🛃 🙆 🔯 🛅	D H B		હ

Figure 146: Function view with Write protection folder

Overview of supported valuation numbers

The encoder configuration provides an overview of the valuation numbers the encoder supports.

Path: Parameters of the encoder manufacturer for EnDat 2.2 Diagnostic Status

Supported valuation numbers are identified by the value "Yes".

Encoder configuration [encod Enty Diagnostic status Bi0 Valuation number 1 Bi2 Valuation number 2 Bi2 Valuation number 4 Bi3 Valuation number 5 Bi3 Valuation number 5 Bi5 Valuation number 5 Bi5 Valuation number 6 Bi5 Valuation number 8 Bi5 Valuation number 9 Bi5 Valuation number 9 Bi5 Valuation number 8 Bi5 Valuation number 9 Bi5 Valuation number 9	er data] Value Yes No Yes Yes S12	
Diagnostic status Bi0 Valuation number 1 Bi0 Valuation number 2 Bi1 Valuation number 3 Bi2 Valuation number 4 Bi1 Valuation number 4 Bi1 Valuation number 5 Bi1 System:specific data Support of error messages 2 Dynamication statue error 1 Dynamication statue error 1 Accuracy Pol.2 range 1 Accuracy Pol.2 range 1 Accuracy Pol.2 range 1 Dynamication statue error 2	Yes No Yes No No Yes	
Bitl Valuation number 1 Bitl Valuation number 2 Bitl Valuation number 3 Bitl Valuation number 3 Bitl Valuation number 4 Bitl Valuation number 5 Bitl Valuation number 6 Bitl System-specific data Support of error messages 2 Dynamication status error 1 Dynamication status error 1 Accuracy Pos 2 (ange 1 Coursey Pos 2 (ange 1 D) Course 1 Accuracy Pos 2 (ange 1 D)	No Yes No Yes 512	
Bit 1 Valuation number 2 Bit2 Valuation number 3 Bit2 Valuation number 4 Bit3 Valuation number 4 Bit4 Valuation number 5 Bit15 System-specific data Bit15 System-specific data Dynamication statue error 1 Dynamication statue error 2 Accuracy Pos.2 range 1 Accuracy Pos.2 range 1 Dynamication statue error 2	No Yes No Yes 512	
Bit2 Valuation number 3 Bit2 Valuation number 4 Bit3 Valuation number 5 Bit5 Valuation number 5 Bit5 System-specific data Support of error messager 2 Dynamication status error 1 Dynamication status error 2 Accuracy Pos 2 range I Ditinguishable revolution pos. value 2	Yes Yes No Yes 512	
BR3 Valuation number 4 BR4 Valuation number 5 BR5 Valuation number 6 BR15 System-specific data Support of error messages 2 Dynamication status error 1 Dynamication status error 2 Accuracy Pos.2 range 1 C Accuracy Pos.2 range 1 D C Accuracy Pos.2 range 1 D C Accuracy Pos.2 range 1	Yes No Yes 512	
Bit4 Valuation number 5 Bit5 System-specific data Support of error messages 2 Dynamication tatuse error 1 Dynamication statuse error 2 Measuring steps per revolution pos: value 2 Accuracy Pos 2: range 1 Accuracy Pos 2: range 1 Dynamication statuse error 2	No No Yes 512	
Bit5 Valuation number 6 Bit5 System-specific data Sub5 Sub5 System Specific data Sub5 Sub5 System Specific data Sub5 Sub5 System Specific data System Specific data Sub5 Syst	No Yes 512	
Bi15 System-specific data Support of error messages 2 Dynamication status error 1 Dynamication status error 2 Accuracy Post 2 range 1 Accuracy Post 2 range 1 Dynamication status error 2	Yes 512	
Gupport of error messages 2 Gip Dynamication status error 1 Dynamication status error 2 Measuring steps per revolution pos. value 2 Accuracy Pos 2 range II Custry Distriguishable revolutions pos. value 2	512	
Dynamization status error 1 Dynamization status error 2 Dynamization stratus error 2 Accuracy Pos 2 range 1 D Accuracy Pos 2 range 1 Dutinguishable revolutions pos. value 2		
Dynamization status error 2 Measuring steps per revolution pos. value 2 Macuracy Doz. 2 range 1 Macuracy Pos.2 range 1 Distinguishable revolutions pos. value 2		
Measuring steps per revolution pos. value 2 Generatory Pos.2 range 1 Generatory Pos.2 range 1 Couracy Pos.2 range 11 Distinguishable revolutions pos. value 2		
Accuracy Pos.2 range I Accuracy Pos.2 range I Accuracy Pos.2 range II Distinguishable revolutions pos. value 2		
Accuracy Pos.2 range II Distinguishable revolutions pos. value 2	n	
Distinguishable revolutions pos. value 2	0	
	0	
Direction of rotation position value 2		
	Increasing values with clockwise rotation	
Encoder designation	EQN 1337	
Support of instructions		
Maximum permissible encoder temp. [*C]	115	
Maximum permissible mech. acceleration [1/s²]	100000	
Number of blocks for section 2 memory area	0	
Maximum clock frequency	8000	
Number of bits for position comparison	9	
Scaling factor for resolution		
Meas. steps / rev. or subdivision val. of grating	0	
Maximum revolutions per minute [rpm]	12000	
Offset between pos. value and pos. value 2	63	
🕀 🧰 Distinguishable rev. with scaling factor		
🐵 🧰 Support of Operating Status Error Sources		
safety relevant measuring steps	0	
□ Not safety relevant subdivision rel. position	0	
💋 🛃 👔 🛃 🔁 🔽 🗈	D H B 🛃	£.

Figure 147: Function view with the folder **Diagnostic status**

11.10 Comparing encoder configurations

11.10.1 Comparison of encoder memory function

You compare two encoder configurations using the Adjusting and Testing Software. The following options are available for comparing two encoder configurations:

- Load the encoder configuration from the encoder and compare it to a file
- Load the encoder configuration from a file and compare it to another file



	r configuration				
Load the encoder configuration to be co data (memory contents), press the "Be	ompared from a file or the connected gin memory comparison" button.	encoder. Then load the reference	ce configuration from a file.	In order to compare	the configuration
Log					
🜮 💼					

Figure 148: Comparison of encoder memory contents function

Operating elements

Icon	Function
	Load file
	Opens the dialog for selecting the file containing the encoder configuration
	Load encoder memory
EnDat	Starts the export of the encoder memory
8 0	Load comparison file
	Opens the dialog for selecting the file containing the encoder configuration
· ?	Start comparison
- B	Starts the comparison of the loaded encoder configurations

11.10.2 Loading and comparing encoder configurations

For comparison, load two encoder configurations in the Adjusting and Testing Software. You can load the encoder configuration 1 from the encoder or from a file. Then load the encoder configuration 2 from a file and start the comparison.

Loading encoder configuration 1 from encoder



- Click Load encoder memory in the control bar
- > The encoder memory is read out
- The following message appears in the Log section: Encoder configuration 1 loaded

or

Loading encoder configuration 1 from a file



- Click Load file in the control bar
- Select the storage location of the file
- Click Open
- The following message appears in the Log section: Encoder configuration 1 loaded

Loading encoder configuration 2 from a file



Click Load comparison file in the control bar

- Select the storage location of the file
- Click Open
- The following message appears in the Log section:
 Encoder configuration 2 loaded

Starting the comparison

As soon as the Adjusting and Testing Software has loaded the two encoder configurations, you can start the comparison.



- Click Start comparison in the control bar
- The differences between the two encoder configurations are listed in a table

omparison of encod	er configuration				
Compare "Encoder data" a	nd "config ecf"				
ection	Word	Config. data 1	Config. data 2		
perating parameters	7	58208	16960		
perating parameters	8	22	15		
perating parameters	9	2	0		
Operating parameters	10	2	0		

Figure 149: Table with differences between the encoder configurations

There may be differences even between encoders with identical encoder ID, e.g. the serial number or signal correction values that are determined individually for every encoder.

Operating elements

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lcon	Function
	Decimal format
	Shows numerical values in decimal format
	Binary format
н	Shows numerical values in binary format
	Load encoder memory
EnDat	Shows the screen for loading encoder configurations

Adjusting the number format

You can choose between different number formats for displaying numerical values.

D

 Click Decimal format in the control bar to display numerical values in decimal format

H

 Click Hexadecimal format in the control bar to display numerical values in hexadecimal format 11

Repeating the comparison

In order to perform another comparison you can return to the selection of the encoder configuration.



- Click Load encoder memory in the control bar
- > The Adjusting and Testing Software displays the **Log** section

11.11 Saving the encoder memory

11.11.1 Save encoder memory function

With the function **Save encoder memory** you can read out the memory of the connected encoder and save it as an encrypted ZIP file.

A note can be added to this file.

Only the HEIDENHAIN can read (decode) the ZIP file.

The ZIP file must be e-mailed to the HEIDENHAIN technical helpline for encoders **service.ms-support@heidenhain.de** for evaluation.

This function should not be used in general, but only in coordination with the HEIDENHAIN technical helpline (e.g. sporadic positioning errors that are not due to contamination or signal transmission).



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► To call this function, double-click **Save encoder memory** in the function menu

ave encoder memory [EnDat 2.2]		
1: Read out encoder memory		
Data 0 bytes read		
2: Insert notes in the file		
		6
		(CD)

Click Save to save the data to a file

11.11.2 Saving the encoder memory

Symbol	Function
	Read encoder memory
Data	Starts the export of the encoder memory
	Save file
	Opens the dialog for saving the data

11.12 Additional information Position value 2

11.12.1 Function Additional information Position value 2

With safety-related position encoders (functional safety encoders) the Additional information Position value 2 function is used to display the position values 1 and 2. Incremental encoders can also transmit a second position value (depending on the encoder).

Additional information Position value 2 with safety-related position encoders



To call this function, double-click **Additional information Position value 2** in the function menu



Figure 151: Function Position values 1 and 2 (safety-related position encoder)

Additional information Position value 2 with incremental encoders



- To call this function, double-click Additional information
 Position value 2 in the function menu
- If the reference mark has not yet been detected, both counters display the incremental position
- ► Traverse the reference mark
- > The **Ref.mark** status switches to yellow
- > The Position value 2 counter shows the absolute position

Position value 1 and 2	2				
Position value 1					
		- 42	108	Measured value [s	teps]
Position value 2					
		- 2	98		teps]
EnDat status					
Transmission	Error	Warnings	Ref.mark	Busy	

Figure 152: Function Position value 1 and 2 (incremental encoder)

Display	Description
Position value 1	With incremental encoders: incremental position
	With other encoders: absolute position
Position value 2	With incremental encoders:
	 Before referencing: incremental position
	After referencing: absolute position
	For encoders that support functional safety: absolute position
Transmission	Status display of data transfer between encoder and testing device
	 Green: No status message available
	 Red: Status message available
Fault	Status display of encoder errors
	 Green: No status message available
	 Red: Status message available
Warnings	Status display of encoder warnings

Display	Description
	Green: No status message available
	 Red: Status message available
 Ref.mark	Status display of reference mark detection
	 Gray: No reference mark was detected
	 Yellow: Reference mark detected or absolute encoder
Busy	Status display of memory access
	 Gray: No access to encoder memory detected
	 Yellow: Access to encoder memory detected
	At this point, access to the encoder memory suggests an encoder error.

11.12.2 Operating elements

Symbol	Function
ilali	Show measured values
101	Displays the measured value in increments
t_	Show position values
↓− •	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the encoder)
A	Show status information
~	Displays a list of errors and warnings
љ"	Set datum shift
Ψ	Opens the dialog for setting the datum shift
	Further information: "Setting datum shift", Page 209
*	Canceling datum shift
Φ	Opens the dialog for deleting the datum shift
	Further information: "Resetting a datum shift", Page 213

11.13 Display of additional sensors

Some encoders feature multiple sensors, e.g. temperature sensors of a direct drive. You can view the measured values of the sensors in the **Additional sensors** function.



- Double-click **Additional sensors** in the function menu
- The Adjusting and Testing Software displays the measured values of the sensors

Operating elements



11.14 Measuring temperature

Some encoders feature temperature sensors. You can view the current temperature values in the **Temperature display** function. Depending on the encoder, internal and external temperature sensors are displayed (e.g., temperature switches or temperature-dependent resistors in the drive).



- Double-click Temperature display in the function menu to call the function
- > The Adjusting and Testing Software displays the current temperatures

HEIDENHAIN: ATS - Adjusting and Testing Software Help			- 0
Temperature display			
Temperature sensor 1			
		29	°C
		84	°F
Temperature sensor 2			
		35	°C
		95	°F
			£
	Safety EC	QN 1337	678921-03

Figure 153: Temperature display function

i

Extremely high temperature values indicate that the temperature sensor is not connected, a contact is open or a cable has broken. Extremely low temperature values may suggest a short circuit.

Conversion of the temperature value for the PT 1000 temperature sensor

The internal temperature evaluation of HEIDENHAIN encoders typically refers to the **KTY 84-130** temperature sensor. For measurement with the **PT 1000** temperature sensor, the temperature value must be converted.

The conversion can be performed by the encoder, by the Adjusting and Testing Software or by the subsequent electronics (depending on the encoder). For this purpose the corresponding parameters must be configured in the encoder configuration.

found in t temperat	d description of the temperature value conversion can be he "Encoders for Servo Drives" brochure, chapter "Connectable ure sensors". The brochure is available in the download area of ENHAIN website.
Link:	www.heidenhain.com
Path:	Documentation 🕨 Brochures

Supported temperature sensor types (word 50)

Temperature value conversion within the encoder is only possible if the encoder supports the evaluation of the **PT 1000** temperature sensor. To see which temperature sensor types the encoder supports, refer to the encoder configuration.

Path: Parameters of the encoder manufacturer for EnDat 2.2 > Support	
emperature sensor type (word 50)	

	Value	
Entry 	value	
😟 🧰 Support of Operating Status Error Sources		
safety relevant measuring steps	0	
Not safety relevant subdivision rel. position	0	
Not safety-relevant subdivison Pos2	0	
😟 🧰 Warning caused through limit signals		
Support state of touch probe		
Time unit for timestamp (touch probe)	Specification not supported	
😟 🧰 Referencing of incremental encoders		
- 📝 1/0 support	0	
- 📝 Word 48	0	
- X Word 49	0	
😑 🚖 Support temperature sensor type		
Resistor	No	
- X KTY 84-130	No	
	No	
Attribute supported	No	
- 🗅 Word 51	0	
	0	
	0	
- 🗋 Word 54	0	
- 🗅 Word 55	0	
- D Word 56	0	
- D Word 57	0	
	0	
- Word 59	0	
- D Word 60	0	
- C1 Word 61	0	
Word 62	0	
Checksum (calculated)	30289	
	30289	

Figure 154: **Support temperature sensor type** parameter in the encoder configuration

Supported temperature sensor types are identified by the value "Yes".

Conversion of the temperature value by the encoder (word 9)

Prerequisite: The encoder supports the evaluation of the **PT 1000** temperature sensor.

If the value **PT 1000** is defined in the **Temperature sensor type** parameter, the conversion is performed by the encoder. The Adjusting and Testing Software displays the temperature value converted by the encoder.

Path: **Operating parameters > Temperature sensor type** (word 9)

Entry	Value		
🗉 🧰 Operating status			
Parameter of encoder manufacturer			
🕀 🔄 Operating parameters			
🗌 📝 Datum shift	0		
🕀 🧰 Configuration for diagnosis			
- 📝 Address assignment	0		
Instructions			
Trigger thresh, warning bit for excessive ten			
Cycle time	1000000		
Temperature sensor type	Resistor		
Temperature sensor type connected	Resistor KTY 84-130		
Word 11	PT 1000		
- 🔐 Word 12	not defined		
- 🔐 Word 13	0		
Word 14	0		
Word 15	0		
🗷 🧰 OEM (range 1)			
🕀 🦲 OEM (range 2)			
DEM (range 3)			
Compensation values of encoder manuf. (range			
Parameters of encoder manufacturer for EnDat.	22		
			1000
📁 🔒 🚖 🛃 🗟 🗹	D H B 🛼		Û

Figure 155: Temperature sensor type parameter in the encoder configuration

Conversion of the temperature value by the Adjusting and Testing Software (word 10)

If the encoder does not support the evaluation of the **PT 1000** temperature sensor, the conversion can be performed by the Adjusting and Testing Software. The conversion is active if the value **PT 1000** is defined for the **Temperature sensor type connected** parameter (word 10) in the encoder configuration. The setting has no effect on the internal temperature evaluation of the encoder, but can be used for display by the subsequent electronics.



Figure 156: **Temperature sensor type connected** parameter in the encoder configuration



Inspecting encoders with serial interface of the EnDat 3 type

12.1 Overview

The Adjusting and Testing Software features the following functions for inspecting encoders with EnDat 3 interfaces:

Symbo	I Function	Description				
_ ≁•	EnDat 3	Tests for encoders with interfaces of the EnDat 3 type				
9	Voltage display	Measured values of voltage and current supply				
0	The displays and the scope of functions of the Adjusting and Testing Software depend on the connected encoder and on the software configuration. When you establish the connection to the encoder, the function menu shows the available functions and operating elements.					

12.2 Performing EnDat 3 tests

EnDat 3 function

The **EnDat 3** function consists of the following screens, which can be displayed by clicking the tabs:

- Position display: Current encoder position
- Online diagnostics: Determine the function reserves of the encoder based on valuation numbers
- **Encoder status**: Display of current status information
- Sensors: Display of sensor measured values
- ID label (EL): Excerpt from the encoder memory
- **Configuration**: Adjust the encoder configuration in the encoder memory
- Wizards: Run wizard-assisted tests, e.g. Functional-safety encoder check
- Operating status data: Display the operating status data from the encoder memory; reset extreme values



Double-click EnDat 3 in the function menu to call this function



Figure 157: EnDat 3 function

12.2.1 Position display view

The **Position display** view shows the current encoder position and the status of the connected encoder.

• Click the **Position display** tab to call this view

	djusting and Testing Software									×
File Help										
	Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuratio	n Wizards				
Status										
				🔵 FSC	Errors	🔵 Warnings	Protocol	🔵 Tr	ansmiss	ion
POS1										
		Revolution						Angle	e (degre	ees]
			-		C (
										Į.
				24						
		•					-			
神 L.										L
					Functional Safety EnD	at 3 EQ	N 1337	12632	49-02	

Figure 158: Position display view

Status section

Display	Description
Reference mark	Status display of reference mark detection
	 Gray: No reference mark was detected
	 Blue: A reference mark was detected
FSC	Status display of the safety-relevant functions
	 Green: Tests completed without errors
	Red: At least one test returned an error
	Blue: FDS test is running
	The Adjusting and Testing Software performs the following tests for each position request:
	CSS test
	 SOL test
	SF status
	 AA test
	Data test
	WD test
	The FDS test (forced dynamic sampling; cyclic testing of the monitoring function in the encoder) takes place approx. every 200 seconds and when changing to a different view.
Errors	Status display of encoder errors (evaluation of error messages and error codes according to EnDat 3 inter- face specification)
	 Green: No status message available
	Red: Status message available
Warnings	Status display of encoder warnings (evaluation of warning according to EnDat 3 interface specification)
	 Green: No status message available
	Red: Status message available
Protocol (log)	Status display of the validity of the transmitted data (log and possibly other information)
	 Green: No status message available
	 Red: Status marked; information identified as invalid by the encoder
Transmission	Status display of data transfer between encoder and testing device
	 Green: No status message available
	 Red: Status message available
Perform a functions of the	display does not comprise all safety-relevant functions. tional-safety encoder check to test all safety-relevant e encoder. ation: "Checking the functional safety of the encoder",
Page 319	ation. Checking the functional safety of the encoder,



For more information on EnDat and functional safety, visit: **www.endat.de**

If the status displays indicate errors, you can view the corresponding status messages in the **Encoder status** screen. **Further information:** "Encoder status screen", Page 296

POS1 section

A

Display	Description				
POS1	Absolute encoder position (position value 1)				
	Unit: micrometers, degrees, or nano-epsilons (depending on the encoder)				
	For multiturn rotary encoders, the Adjusting and Testing Software in addition displays the number of revolutions.				

Operating elements

Symbol	Function				
tati	Show measured values				
	Displays the measured value in increments				
t_	Show position values				
L.	Converts the measured value into a position value				
	Unit: micrometers, degrees, or nano-epsilons (depending on the encoder)				
E	Save file				
	Opens the dialog for saving the log to a PDF file				
	Further information: "Saving log data", Page 332				

Switching between measured values view and position view

You can switch the counter display between measured values view and position view.

Measured values view

The Measured values view shows the count value in increments.



Figure 159: Measured values view of the Position display function

Position view

In the **Position view**, the Adjusting and Testing Software converts the count value into a position value. The position value is displayed in micrometers or degrees (depending on the encoder).

For multiturn rotary encoders, the Adjusting and Testing Software in addition displays the number of revolutions.

	djusting and Testing Software								
File Help									
Status	Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuratio	on Wizards			
Status				•	•	•		•	
				SC 🔵	Errors	🔵 Warnings	Protocol	U Tra	nsmission
POS1									
		Revolution						Angle	[degrees]
			-		C				
			_						
				24					
		•		•					
苹 Ŀ.									
					Functional En	Dat 3 EQ	N 1337	126324	

Figure 160: Position view of the Position display function

Switching between the views



- Click Show measured values in the control bar to switch to the measured values view
- Click Show position values in the control bar to switch to the position view

Position display view for multidimensional positions

The Adjusting and Testing Software supports the display of multidimensional positions.

🖉 HEIDENHAIN: ATS - Ac	djusting and Testing Software						- 0	×
Position display	Online diagnostics	Encoder status ID label	(EL) Configuration	Wizards				
Status								
			Reference mark	Errors	O Warnings	Protocol	Transmis:	sion
POS_ABS								
						Mea	sured value (st	eps]
				-		0		
			151					I.
POSY_ABS								
Reference mark						Mea	sured value [st	eps]
				-				
			196					Ļ
				_				
Overview Multi	idimensional positions	Multidimensional abso	lute positions					
蛼 Ŀ.							H	£
				É	nDat 3 AK LIP	603 Dplus	1340141-0	1

Figure 161: Position display view with multiple positions

With incremental encoders, successful reference mark recognition is required for the absolute values to be displayed. Otherwise, all counters show the incremental position values. Each axis has its own **Reference mark** status display.

- Reference all axes to examine an encoder with multidimensional positions
- > The Reference mark status displays switch to blue
- > The counters for the absolute positions show the absolute values

Click the desired tab in the lower navigation bar to switch between the views The positions that are displayed depend on the connected encoder. The encoder in the example transmits the following positions:

Display Description		
POS1	Incremental position of the principal axis (main direction of measurement)	
POS_AB	Current position of the principal axis	
POSY Incremental position of the Y axis		
POSY_A	S Absolute position of the Y axis	
	OS1 is transmitted in the main frame via the HPF with each query. he other positions are transmitted via the LPF as additional information.	

12.2.2 Online diagnostics screen

You can monitor the encoder status with the **Online diagnostics** screen.

The Adjusting and Testing Software records valuation numbers, which are transmitted together with the position value when the encoder is traversed. On the basis of these valuation numbers, the Adjusting and Testing Software determines the current function reserves of the encoder.

• Click the **Online diagnostics** tab to call this view

HEIDENHAIN: ATS - Adjusting and Testing Softwar File Help	•						-	n ×
Position display Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuratio	n Wizards			
Status								
			🔵 FSC	Errors	🔵 Warnings	Protocol	🔵 Tran	ISMISSION
Functional reserves								
Absolute track ▲ Minimum 100 % at 3593 U 259°	0		25		50			100
Incremental or scanning track ▲ Minimum 100 % at 3593 U 259°	0		25		50			100
Position-value formation ▲ Minimum 100 % at 3593 U 259°	0		25		50			100
Mounting diagnostics								
Minimum 1.999 mm at 259°, maximum 2.000 Current internal temperature: 38.2 °C	mm at 259°					Moun	ting clearar	
POS1								
	Revolution						Angle [(degrees)
359	33		29	58	9	4(]9	3
🗰 Ŀ 🗓 🧞 💽 🖄							24	.
				Safety Ent	Dat 3 EG	al 1131	1259532	2-01 🥫

Figure 162: Online diagnostics screen

Display	Description				
Status	 The status displays correspond to those of the Position display view. Further information: "Status displays of the position display", Page 283 				
Functional reserves	 The following valuation numbers are transferred and displayed, depending on the connected encoder: Valuation number 3: Evaluation of the absolute track or evaluation of the reference pulse width or sum 				
	 Valuation number 1: Evaluation of the incremental track or scanning track 				
	 Valuation number 4: Evaluation of the position value formation 				

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Display	Description
Mounting parameters	Display of the mounting clearance (e.g., for rotary encoders without integral bearing)
	 Mounting clearance: Distance at the current position
	Minimum: Smallest distance in the traversed area
	Maximum: Greatest distance in the traversed area
	 Current internal temperature: Measured value from the sensor in the encoder
POS1	Absolute encoder position (position value 1)
	Unit: micrometers or degrees (depending on the encoder)
	For multiturn rotary encoders, the Adjusting and Testing Software in addition displays the number of revolutions
the function rese pulse by the sign reference pulse in function includin	f the reference pulse sum (valuation number 3) refers to rve during the acquisition and evaluation of the reference al converter or the encoder. Thus, it does not evaluate the tself, e.g. its position and width, but its entire evaluation g the characteristic properties of the reference pulse and ter or encoder. With the components "Incremental signal"

and "Evaluation of the reference pulse sum", the online diagnostics thus allows for diagnosing during operation and supports regular functional checks.

The **Online diagnostics** view comprises:

- Bar graph
- X/Y display

Bar graph



Figure 163: Bar graph of the **Online diagnostics** function

The bar display of the Adjusting and Testing Software shows each valuation number in a bar graph. The scale of the bar corresponds to the maximum function reserve of the encoder. The minimum, i.e. the smallest value within the traversed range, is determined for each valuation number. The drag indicator marks the minimum. The black bar shows the value transferred last.

The tolerance ranges are indicated by color in each bar graph:

Display	Function reserve	Description
Yellow	0 – 25 %	 Minimum is outside the specification
		 Encoder maintenance recommended
Green	26 - 100 %	 Minimum is within the specification
		 Encoder function reserves are sufficient

X/Y display

The X/Y display may be additionally available, depending on the encoder. It shows the course of the function reserves over the entire traverse path.



Figure 164: X/Y display of the **Online diagnostics** function

Depiction	Description
X axis	Position
	Input: millimeters or degrees (depending on the encoder)
Y axis	Function reserve

Operating elements

Symbol	Function
ildi	Show measured values
1011	Displays the measured value in increments
t_	Show position values
L - .	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the encoder)
F	Display of measured value in degrees Celsius or Fahrenheit
	Switches the measured value display from Celsius to Fahrenheit or vice versa
2	Delete values
	Deletes the recorded values and resets the drag indicators to 100%
	Switch to bar display
	Shows the bar graphs
200	Switch to X/Y display
	Shows the X/Y display
24	Export data
	Opens the dialog for exporting records to a TXT file
	Save file
T I	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332

Performing online diagnostics

Run the measurement in the bar display

- ▶ If necessary, click Switch to bar display in the control bar
- > The Adjusting and Testing Software displays the **minimum** value and the starting position of the measurement for each valuation number
- Traverse the entire measuring range
- > The valuation numbers are recorded
- If one of the minimum values is not reached, the Adjusting and Testing Software updates the display

HEIDENHAIN: ATS - Adjusting and Testing Software File Help	e						- 1	n x
Position display Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuratio	on Wizards			
Status								
			SC 🔵	Errors	🔵 Warnings	Protocol	🔵 Tran	smission
Functional reserves								
Absolute track ▲ Minimum 95 % at 3592 U 131°	0		25		50			100
Incremental or scanning track ▲ Minimum 90 % at 3592 U 122°	°		25		50		_	100
Position-value formation ▲ Minimum 100 % at 3592 U 115°	°		25		50			100
Mounting diagnostics								
Minimum 2.114 mm at 122°, maximum 2.123 Current internal temperature: 38.2 °C	mm at 122°					Moun	B	-
POS1								
المراج ويحمدون ويحمدون	Revolution						Angle (degrees]
359	33		29	58	88].]
神 🕒 🗓 🤣 🖹 🖄							26	1 t
				Safety En	Dat 3 EG	al 1131	1259532	2-01 🗾

Figure 165: Result of the online diagnostics in the bar display

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 285

f

Running the measurement in the X/Y display



- ▶ If necessary, click Switch to X/Y display in the control bar
- Traverse the entire measuring range
- > The valuation numbers are recorded
- The diagram shows the function reserve at the respective position



Figure 166: Result of the online diagnostics in the X/Y display

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 285

If you position the mouse pointer on a point in the diagram, a mouseover text appears with brief information, e.g. the number of revolutions of a multiturn encoder.

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You can save and print the active diagram. **Further information:** "Adjusting, exporting and printing diagrams", Page 46



To examine a section more closely, you can zoom in on the diagram view. **Further information:** "Magnifying the diagram view", Page 46

Switching the unit



Click Show measured value in degrees Celsius or Fahrenheit in the control bar to switch temperature displays between Celsius and Fahrenheit

Exporting data

You can save the recorded data to a TXT file.



- Click **Export data** in the control bar
- Select the desired storage location in the dialog
- ► Enter the file name
- Click Save
- > The file is saved

Deleting values

You can delete the recorded values to perform a new measurement.



- Click Delete values in the control bar
- > The Minimum value of each valuation number is deleted



The bar display is reset as soon as you start a new measurement.

12.2.3 Encoder status screen

The **Encoder status** screen shows the errors and warnings transmitted by the encoder and the status messages on transmission.

Click the Encoder status tab to call this view

	djusting and Testing Software							38 <u>—</u>		×
File Help	Online diagnostics	Encoder status	Soncore	ID label (EL)	Configur	ation Wiza	rde			
Error class	Error code		use of failu		Conligui	auon wiza	lus		Num	nber
			encoder wor							
<										>
									H	C
					Safety	EnDat 3	EQN 1337	126324	49-02	2 🔽

Figure 167: Encoder status screen

Operating elements

Symbol	Function
2	Clear status messages
	Clears the displayed status messages and resets reference mark detection for incremental encoders
	Save file
	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332
-	
10	maccadac

Resetting status messages

You should delete any existing status messages before each check.

- Click Delete status messages
 - > The status messages are deleted
 - > For incremental encoders, the reference mark detection is reset



If there are still status messages in the **Encoder status** view, this indicates that the corresponding errors are still present.

12.2.4 Sensors view

In the **Sensors** view you can see the current measured values of the connected sensors. Depending on the encoder, internal and external temperature sensors are supported, such as temperature switches or temperature-dependent resistors in the drive.

Click the Sensors tab to call this view

HEIDENHAIN: ATS - Adjusting and Testing Software File Help						- 🗆 ×
Position display Online diagnostics Encod	er status Sensors	ID label (EL)	Configuratio	n Wizards		
Status						
			Errors	🔵 Warnings	Protocol	Transmission
Sensors:						
Max. external temperature of	motor winding	25.8 °	C			
Internal temperature of encod	er	33.8 °	С			
External temperature of motor	winding 1	25.8 °	C			
E.] 2.
			Functional Safety Enl	Dat 3 EQ	1131	1259532-01

Figure 168: Sensors view

Extremely high temperature values indicate that the temperature sensor is not connected, a contact is open or a cable has broken. Extremely low temperature values may suggest a short circuit.

Operating elements

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Symbol	Function
F J C	Display of measured value in degrees Celsius or Fahrenheit
	Switches the measured value display from Celsius to Fahrenheit or vice versa
	Save file
	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332
Switching the unit	

Switching the unit



Click Show measured value in degrees Celsius or Fahrenheit

in the control bar to switch temperature displays between Celsius and Fahrenheit

12.2.5 ID label (EL) view

Encoders with EnDat interface feature an internal encoder memory. You can access the encoder memory via the Adjusting and Testing Software. The **ID label (EL)** view shows an excerpt from the configuration of the connected encoder.

Click the ID label (EL) tab to call this view

Position display Online diagnostic	s Encoder status Sensors ID I	abel (EL) Configuration Wizards	Operating status data	1		
ID label from encoder (e	xcerpt)					
Description	Value	Identifier				
Logistic information (EL)						
Device designation	ECI1122	EL.deviceName				
Encoder ID	1334659-12	EL.deviceIdent				
Serial number	X642337052	EL.deviceSerial				
Ordering designation	E30-R2	EL.orderDesignation				
Encoder type	1	EL.xType				
Manufacturer code	HEIDENHAIN	EL.manufacturer				
Supported data transfer rate:		EL.phyDatarate				
- 12.5 Mbit/s	supported					
- 25 Mbit/s	supported					
dentifier for the mounting wizard		EL.mountAssist				
Features of the protocol		EL.protocolFeatures				
- Bus in daisy chain operation:	not supported					
Memory size OEM1 [words]	1000	EL.oem1Size				
Memory size OEM2 [words]	400	EL.oem2Size				
Memory size OEM3 [words]	100	EL.oem3Size				
Data checksum		EL.cs				
- Calculated	2191307788					
- Saved	2191307788					
D label (EL) Memory contents						
nDat EnDat					6	C

Figure 169: ID label (EL) view

The ID label (EL) tab comprises the following views:

- ID label (EL)
- Memory contents
- Click the desired tab in the lower navigation bar to switch between the views.

ID label (EL)

In the ID label (EL) view you can do the following:

- Save the entire encoder configuration to a file
- Load the encoder configuration from a file to the **ID label (EL)** screen



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Values displayed in green can be edited in the **Configuration** screen. **Further information:** "Configuration view", Page 301

Values displayed in orange indicate faulty structure checksums.

Further information: "Correcting structure checksums", Page 299

Operating elements

Symbol	Function
	Save the encoder configuration to a file
EnDat	Opens the dialog for saving the encoder configuration to a JSON file
	Load the encoder configuration from a file
EnDat	Opens the dialog for selecting the JSON file contain- ing the encoder configuration
	Correct the SET and XSET structure checksums
	Corrects the SET and XSET structure checksums
	Save file
	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332

Saving the encoder configuration to a file

You can save the encoder configuration as a JSON file on the computer for diagnostic purposes.



Click Save encoder configuration to a file in the control bar

- Select the desired storage location in the dialog
- ► Enter the file name
- Click Save
- > The complete encoder configuration is saved to a file

Loading the encoder configuration from a file

You can load the encoder configuration from a JSON file to the ID label (EL) screen.



- Click Load encoder configuration from file in the control bar
- Select the storage location in the dialog
- Click Open
- > The encoder configuration is loaded from the file
- > The **ID label (EL)** view shows an excerpt from the loaded encoder configuration
- > The file name is shown in the title bar
- To return to the configuration of the connected encoder, the ID label (EL) view must be reloaded:
 - Click any desired tab
 - Click the ID label (EL) tab once again

Correcting structure checksums



- Click Correct SET and XSET structure checksums in the control bar
- > The structure checksums are corrected

12

Memory contents

You can load the encoder configuration from the encoder and save it as a ZIP file on the computer for backup or diagnostic purposes.

	e ZIP file is IDENHAIN	s protected Service.	by a pa	assword	and can	only b	e decodeo	d by the	e der
	djusting and Testing Softv	vare						-	
· Help Position display	Online diagnostic	s Encoder status	Sensors	ID label (EL)	Configuration	Wizards	Operating status	data	
Encoder me	emory								
Save memory of	contents in file								
Comment:				*					
Progress:		0%							
The entire e	ncoder memory will	be read and stored in a	ile.						
D label (EL) M	emory contents								t
					Functional Safety	EnDat 3	ECI1122	133465	59-12

Figure 170: **Memory contents** view



- Click Save memory contents to a file in the control bar
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved

12.2.6 Configuration view

You can edit individual values of displayed encoder configuration in the Configuration view.

• Click the **Configuration** tab to call this view

HEIDENHAIN: ATS - Adjusting and Testing Software Help	23		×
Position display Online diagnostics Encoder status Sensors ID label (EL) Configuration Wizards			
Configuration of software:			
Configuration of encoder:			
A Changing the settings can lead to problems during encoder operation!			
- Bus operation			
- Encoder addresses			
- Datum shift			
- Sensor technology			
- Activation code (SETPASS)			
- Authentication (AUTH)			
- Write-protection (PROTECT)			
Overview Bus operation Encoder addresses Datum shift Sensor technology Activation code Authenticate W	rite protection		
		H	£
Safety EQN 13	37 1263	249-02	2 🐷

Figure 171: Configuration view

The editable parameters are grouped. The overview shows the available groups.



For more information on EnDat 3 visit: www.endat.de.

Operating elements

Symbol	Function
	Save file
C III	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332

Assigning the bus address

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In the **Bus operation** view, you can repeat the address assignment for the entire bus chain. If the testing device is only connected to a single encoder, you can set the bus address manually.

Each time you connect to a bus chain with several participants, the Adjusting and Testing Software automatically repeats the automatic address assignment. Manual changes are overwritten in the encoder memory. Errors in bus addressing can be avoided this way.

- Click the Configuration tab to call this view
- Click the Bus operation tab in the lower navigation bar

Automatic address assignment

Help	djusting and Testing So	ntware							
osition display	Online diagnos	tics Encoder sta	itus ID label (E	L) Configura	tion Wizards				
Bus operation	on								
Note on bus op	peration								
Bus addr	esses are not freely	uration can lead to un y configurable! form automatic addre		of various bus pa	rticipants.				
Jbersicht Busk									
Bus address		Encoder ID		Туре		Serial n	umber		
1		1192204-01		LIC413		X63688	3785a		
2		1340668-01		LIC313		X63688	3781		
3		1378942-01		MC 15		X12345	678a		
Für eine I Nach er		Adressvergabe autor			um Messgerät	herstellen"-Dialog			
					Automatic addre	ess assignment		Cancel	
Overview Bus	operation Enc	oder parameters	Datum shift A	ctivation code	Authenticate	Write protection			
						-	-1- 1/0		5
						Bus	node 1/3	~	1.0

Figure 172: **Bus operation** screen with multiple participants

- Click Automatic address assignment to start automatic address assignment
- > The bus is checked and automatic address assignment performed
- > The new bus addresses are written to the encoder memory
- Confirm with OK when address assignment is complete
- > The connection to the bus chain is separated automatically

Manual address assignment

			1		1			
osition display	Online dia	gnostics Encode	r status ID labe	(EL) Configura	tion Wizards			
us operatio	n							
lote on bus ope	eration							
Bus addres The bus ad	sses are not ddress may doubt, please	onfiguration can lead to freely configurable! be changed manually e perform automatic a	only if a single de	vice is connected, a		n.		
Ibersicht Buske	tte	Encoder ID				Serial number		
sus address		1 1192204-01		Type LIC413		X636883785a		
	uskette kanr olgreicher /	n die Adressvergabe a Adressvergabe ist o			zum Messgerät	herstellen"-Dialog		
			Set 1	he address	Automat	tic address assignment	Can	cel
	E C	Encoder parameter	rs Datum shift	Activation code	Authenticate	Write protection		
verview Bus o	peration	Encoder parameter	<u> </u>		- indirendente			

Figure 173: Bus operation screen with only one participant

- Enter the desired value in the **Bus address** field
- Click Set the address
- > The new bus address is written to the encoder memory
- ► Confirm with **OK**

Editing encoder addresses

In the **Encoder addresses** view, you can check the bus address and the axis address of the connected encoder.

- Click the **Configuration** tab to call this view
- Click the Encoder addresses tab in the lower navigation bar

HEIDENHAIN: ATS	- Adjusting and	Testing Software	(SV11.2)							<u></u>		2
Position displa	y Online d	iagnostics	Encoder sta	tus Senso	rs ID label (EL	Configuration	Wizards					
Encoder a	ddresse	s										
Bus address	of the enco	der										
SET.busAddr	ess 0x	00										
Axis address	of the enco	der										
SET.axisAdd	ress Ox	00										
						1	Apply			Cancel		
Overview Bu	s operation	Encoder	addresses C	Datum shift	Sensor techno	logy Activation	code Aut	henticate	Write pro	tection		
											H	٢
						Safety	EnDat 3	EQN	337	12632	49-02	2

Figure 174: Encoder addresses view

- Enter the desired values in the input fields
- Click **Apply** to transfer the changes to the encoder

Setting a datum shift

In the **Datum shift** view, you can shift the datum of the connected encoder. The datum shift enables you to adapt the encoder to the machine for each individual axis (e.g. for measuring the rotor position on synchronous motors).

Precondition: The encoder supports datum shift.

- Click the **Configuration** tab to call this view
- Click the **Datum shift** tab in the lower navigation bar

HEIDENHAIN le Help	: ATS - Adjusting and	Testing Software									×
Position dis	play Online o	liagnostics	Encoder st	tatus Senso	rs ID label (El) Configuration	Wizards	5			
Datum	shift										
i) Sel	ect how you want	t to proceed a	nd then press	the "Next >" bu	tton.						
Current d	atum shift										
Measured	values view:	0 Measuri	ng steps								
Position v	iew:	0°									
Further p	ocedure:										
Selection	ו:										
• Set da	atum shift										
O Resci	nd datum shift										
						< Back	N	lext >	Cance	l.	
Overview	Bus operation	Encoder	addresses	Datum shift	Sensor techno	ology Activation	code Au	thenticate Write	protection		ŵ
						Functional				C)	
						Functional Safety	EnDat 3	EQN 1337	12632	49-02	2

Figure 175: Datum shift view

WARNING

Danger of uncontrolled axis movements due to datum shift

If you select an incorrect value for datum shift, uncontrolled movements of the machine axes may occur. This may result in death, serious injuries, or damage to equipment.

- Observe the documentation of the machine tool and the encoder
- Change the datum shift only if absolutely necessary (e.g. if the encoder is exchanged)
- Shift the datum only while the encoder is at a standstill
- Leave the traverse range of the machine before setting a datum shift
- Cancel any datum shift before setting a new one

Danger from falling machine axes

Non-secured vertical or hanging machine axes may fall down due to datum shift. This may result in death or serious injuries.

Before setting a datum shift:

- Secure the machine axes
- Leave the traverse range of the machine

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For linear encoders, select the datum such that only position values > 0 are output.



A datum shift may require a new acceptance test, e.g. in the case of functionally safe applications.



Cancel any existing datum shift before setting a new one. **Further information:** "Canceling datum shift", Page 310

The following options are available for setting a datum shift:

Set datum to current position:

Approach the desired position and adopt this position as zero point

Set datum to absolute position: Enter the desired position value manually



Which options are available for the datum shift depends on the connected encoder.

Setting the datum to current position

- Click the Datum shift tab in the lower navigation bar
- ▶ In the Further procedure section, select the option Set datum shift
- Click Next
- > The Adjusting and Testing Software displays information on datum shift
- Click Yes
- The Adjusting and Testing Software shows the current position in the POS1 section
- Move to the desired position
- ▶ In the Type of datum shift section, select the option Current position

e Help	-				Configuration	Monada			
osition display Online	diagnostics Enco	Jer status a	ensors	ID IADEI (EL)	Configuration	WIZAIUS			
Datum shift									
Status									
					Errors	Warnings		🔵 Transmi:	ssion
POS1									
Measured values view:	1021464767	6416 Me	easuri	ng steps					
Position view:	2379 rpm 10	01.87755	°						
Type of datum shift									
Set to									
Ourrent position									
O Position, absolute									
				<	Back	Preset		Cancel	
Overview Bus operation	on Encoder addres	ses Datum	shift Se	ensor technolo	gy Activation	code Authentic	ate Write pro	tection	
								-	t
					Functional Safety	EnDat 3 E	QN 1337	1263249-	00 (

Figure 176: Current position option selected in the Datum shift view

- Click **Preset** to transfer the change to the encoder
- > The current position is saved in the encoder as the new datum

Setting the datum to absolute position

- Click the Datum shift tab in the lower navigation bar
- ▶ In the Further procedure section, select the option Set datum shift
- Click Next
- > The Adjusting and Testing Software displays information on datum shift
- Click Yes
- The Adjusting and Testing Software shows the current position in the POS1 section
- ▶ In the Type of datum shift section, select the option Position, absolute

osition display Online	diagnostics Enco	der status	Sensor	s ID label (E	L) Con	figuration	Wizards			
Datum shift										
Status										
						errors	🔵 Warning	s 🔴 Protocol	O Trans	smissio
POS1										
Measured values view:	102146476	80384 N	/ easu	ring step	s					
Position view:	2379 rpm 1	01.8778	38°							
Type of datum shift										
Set to										
O Current position										
Position, absolute										
Set to absolute position	n									
Datum shift in steps										
Position, current		Position w	ithin							
Revolution [revolutions]		of the revo	olution [°]							
	0					0				
						_				,
Overview Bus operatio	n Encoder addre	sses Datu	ım shift	Sensor techr	nology /	Activation c	ode Authen	ticate Write pro	otection	
									I	

Figure 177: Position, absolute option selected in the Datum shift view

- > The Set to absolute position section is displayed
- > The unit used in the input fields depends on the encoder: micrometers or degrees and, if necessary, revolutions
- > To change the unit to increments, set the check mark at Datum shift in steps

sition display	Online diagnostics	Encoder status	Sensors I	D label (EL)	Configuration	Wizards		
Datum shif	t							
Status								
					Errors	🔵 Warnings	Protocol	🔵 Transmissio
POS1								
Measured valu	es view: 10214	647680384	Measuri	ng steps				
Position view:	2379 1	pm 101.877	88°					
Type of datum	shift							
Set to								
O Current pos	sition							
Position, at	osolute							
Set to absolute	e position							
Datum shift i	n steps							
Position [steps]								
			0					
				< 1	Back	Preset		Cancel
verview Bus o	peration Encoder	addresses Datu	m shift Set	nsor technolo	av Activation of	code Authentica	ate Write pro	otection

Figure 178: Datum shift in steps option selected in the Datum shift view

- Enter the position value in the correct unit
- Click **Preset** to transfer the change to the encoder
- > The current position is saved in the encoder as the new datum

Canceling datum shift

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In the **Datum shift** view, you can reset the datum to the default condition of the encoder.

- Click the **Configuration** tab to call this view
- Click the Datum shift tab in the lower navigation bar
- > The current datum is shown in the Current datum shift section

Assistion display Online diagnostics Encoder status Sensors ID label (EL) Configuration Wizards Output shift Image: Configuration with the proceed and then press the "Next >" button. Image: Configuration with the proceed and then press the "Next >" button. Selection: Image: Selection: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection: Image: Selection:<	HEIDENHAIN Help	: ATS - Adjusting and	Testing Software								
Select how you want to proceed and then press the "Next >" button. Current datum shift Measured values view: 0 Measuring steps Position view: 0 " Curther procedure: Selection: Selection: Se	osition dis	splay Online d	liagnostics Encoder s	tatus Senso	rs ID label (E	L) Configura	ation Wiza	rds			
Current datum shift Measured values view: 0 Measuring steps Position view: 0 * wither procedure: Selection: © Set datum shift Set datum shift	Datum	shift									
Measured values view. 0 Measuring steps Position view. 0 * Further procedure: Selection: • Set datum shift	i) Sel	ect how you want	to proceed and then press	the "Next >" but	ton.						
Position view: 0 * truther procedure: Selection: © Set datum shift	Current d	atum shift									
	Measured	d values view:	0 Measuring steps								
Selection: • Set datum shift	Position v	view:	0 °								
Set datum shift	⁼ urther p	rocedure:									
	Selection	n:									
O Rescind datum shift	Set da	atum shift									
	O Resci	nd <mark>d</mark> atum shift									
						< Back		Next >	Car	ncel	

Figure 179: Datum shift view with active datum shift

- ► In the Further procedure section, select the option Rescind datum shift
- Click Next
- > The Adjusting and Testing Software displays information on datum shift
- Click Yes
- Click **Yes** to transfer the change to the encoder
- > The datum shift is reset

Adapting sensor parameters

In the **Sensor technology** screen, you can adapt the sensor parameters (depending on the encoder).

- Click the **Configuration** tab to call this view
- Click the Sensor technology tab in the lower navigation bar

Help osition di	splay Online d	iagnostics Encoder statu	s Sensors I	D label (EL) Config	uration Wiza	irds		
Sensor	technology	,						
FID nar	ne:	Characteristic curve of s	ensor type:	Deactivate sensor	Connecte	d sensor type:		
		SET.formatSensorX		SET.formatSensorX	SET.actual	SensorX		
SENSOR	R_TEMP_MAX	Temperature	~	Deactivate	2: PT1	.000		~
SENSOR	R_TEMP_INT	Temperature	~	Deactivate	1: KTY	84-130		~
SENSOR	R_TEMP_M1	PT1000	~	Deactivate	2: PT1	.000		~
rep./ew	Bus operation	Encoder addresses Da	um chift Coo		App		 Cancel	

Figure 180: Sensor technology view

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A rotary encoder with an external and an internal temperature sensor is shown in the example. The sensors and values that are displayed in the **Sensor technology** view depend on the connected encoder.

For more information on EnDat 3 visit: **www.endat.de**.

Display	Description
FID name	Sensor name (FID = Frame Identifier)
SENSOR_TEMP_MAX	Transfers the highest measured value of the sensors SENSOR_TEMP_M1, SENSOR_TEMP_M2 and SENSOR_TEMP_M3
	Default setting: Temperature
	The setting "Reserved" is currently not supported and has no effect.
SENSOR_TEMP_INT	Transfers the measured value of an internal temperature sensor.
	Default setting: Temperature
	The setting "Reserved" is currently not supported and has effect.

Display	Description						
SENSOR_TEMP_M1 SENSOR_TEMP_M2 SENSOR_TEMP_M3	Transfers the measured value of an external temperature sensor Selection of the evaluation characteristic for the temperature sensor concerned (sensor-dependent)						
	The setting "Reserved" is currently not supported and results in the transmission of invalid data.						
Characteristic curve of sensor type	Selection of the evaluation characteristic supported by the sensor, for temperature sensor; examples for temperature sensors: KTY84-130 or PT 1000						
Deactivate sensor	Deactivates the sensor; the encoder does not transmit values measured by the sensor.						
	"Deactivated" is displayed for the sensor in the Sensors view and in the ID label (EL) view.						
Connected sensor type	The installed sensor type is displayed.						
	The value is for information only and has no functional effect.						
	The value "0: Not specified" indicates that no information is available on the sensor type.						
Temperature warning threshold (SENSOR_TEMP_INT)	Setting of the temperature value above which the encoder issues a warning						

Operating elements

Symbol	Function
Felc	Display of measured value in degrees Celsius or Fahrenheit
	Switches the measured value display from Celsius to Fahrenheit or vice versa

Adapting parameters

- ► For external temperature sensors, select the corresponding characteristic curve in the **Sensor type** column
- To deactivate the data transmission for individual sensors, check the box in the Deactivate sensor column
- If necessary, enter the desired value in the Temperature warning threshold (SENSOR_TEMP_INT) section
- Click **Apply** to transfer the changes to the encoder

Switching the unit



- Click Show measured value in degrees Celsius or Fahrenheit in the control bar to switch temperature displays between
 - In the control bar to switch temperature displays between Celsius and Fahrenheit

Setting and changing the activation code (SETPASS)

In this view you can set the activation code for the authentication of a user level or change an already existing activation code. You can enter the activation code directly, or use a .BAT file for calculation. If an activation code is successfully set or changed, authentication is carried out automatically with the corresponding user level.

- Click the **Configuration** tab to call this view
- Click the Activation code (SETPASS) tab in the lower navigation bar

HEIDENHAIN	l: ATS - Adjusti	ing and Test	ing Software										<u>100</u> 0		×
osition di	splay On	line dia	gnostics	Encoder s	tatus	Sensors	ID label (EL) Config	uration	Wizards	5				
Set/Cha	ange ac	ctivatio	on cod	e (SETP	ASS)										
							et or changed. be entered direct	ly.							
Initial ent	ry														
Activatio	on code														
Set in	itially														
O Chan	ge														
Activatio		gh .BAT	(C:\ATSV	AtsAuthCalcF	assE3	bat)									
												-			
					Deter					Save		100.00	Cancel		
verview	bus oper	rauon t	Incoder	audresses	Datur	n snift S	Sensor techno	iogy Ac	livation	code AL	unenticat	e white p	olection		
														9	Ľ
									Safety	EnDat 3	EQI	1337	12632	49-0	2

Figure 181: Set activation code (SETPASS) screen

Display	Description				
User level	Drop-down list for selecting the desired user level (OEM2 or OEM1). No authentication takes place in the USER level, since the device always is in the USER level after booting.				

Display	Description					
Activation code – Calculate through .BAT	Create a .BAT file with the name AtsAuthCalcPassE3.bat in C:\ATS\AtsAuthCalcPassE3.bat.					
(C:\ATS\AtsAuth- CalcPassE3.bat)	The .BAT file contains a calculation algorithm, a link, or a fixed password. The machine tool builder must define this.					
	The file is called by the Adjusting and Testing Software and outputs a password.					
	It is recommended to define the algorithm on the basis of the serial number of the encoder, as this is a unique number. The serial number is available as a transfer parameter in the .BAT file along with other information.					
	 Transfer parameter: String with EL.deviceSerial, EL.deviceIdent, EL.deviceName 					
	 Return parameter: Password as a decimal number with 32 bits maximum 					
	An example of the .BAT file (only the frame, without the algorithm) can be found in the file path where the information about the logs is stored. Further information: "Saving log information", Page 54					
Activation code – Manual input	Manual input of a number (32 bits max.) in the input window					

Setting the activation code once

- Click Set initially at Initial entry
- Select your preferred user level
- Click Calculate through .BAT at Activation code or
- Click Manual input Here you can enter a new activation code in the input window
- Click Save
- > The result is shown in a corresponding message.

Changing the activation code

- Click Change at Initial entry
- > The menu for entering the old activation code is displayed.
- ▶ In the **Old activation code** field, select the user level of the old activation code
- Click Manual input. Here you can enter the old activation code in the input window
- In the Activation code field, select the user level for the new activation code. For authentication, at least the same or a higher user level (OEM2, OEM1) must be selected in the Old activation code field
- Click Calculate through .BAT at Activation code or
- Click Manual input. Here you can enter a new activation code in the input window
- Click Save
- > The result is shown in a corresponding message.

HEIDENHAIN: ATS - Adj Help	justing and Testing Software										
osition display	Online diagnostics	Encoder status	Sensors	ID label (EL)	Configura	ation	Wizards				
Set/Change	activation cod	e (SETPASS)								
	tivation code for auther can be used for calcula				y.						
nitial entry											
Activation code											
O Set initially											
Change											
Old activation c	ode			Activation cod	е						
User level: US	ER 🗸			User level:	ISER	~					
Activation code				Activation cod	le						
O Calculate thr	ough .BAT			Calculate the second	nrough .BAT	(C:\A1	TS\AtsAut	hCalcPassE3.bat)			
Manual input	l)			O Manual inp	ut						
Activation code ((decimal)										
		0									
							Save		Cancel		
verview Bus o	peration Encoder	addresses Datu	m shift S	ensor technol	ogy Activa	tion c	ode Aut	henticate Write p	protection		
										H	4
					Fun	fety	EnDat 3	EQN 1337	12632	240-0	2

Figure 182: Change activation code screen

Authentication (AUTH)

In this view you can enter an activation code to authenticate for an encoder. The current user level can the changed. The activation code can be typed in as a password. Automatic password generation via a .BAT file is also possible.

Further information: "Setting and changing the activation code (SETPASS) ", Page 313

- Click the Configuration tab to call this view
- Click the Authenticate (AUTH) tab in the lower navigation bar

Help	: ATS - Adjusting and "	esung sottware						_		
osition dis	splay Online d	iagnostics	Encoder stat	us Senso	rs ID label (EL)	Configuration	Wizards			
Authen	tication (AU	TH)								
	e dialog serves to a scan switch the c			ctivation code						
Activation	n code									
User lev	el: USER	~								
Activatio	on code									
O Calcu	late through .BA		tsAuthCalcPas	sE3.bat)						
Manu	ial input									
							AUTH	Cancel		
verview	Bus operation	Encoder	addresses D	atum shift	Sensor technolo	gy Activation	code Authentica	Write protection		
									H	
						Functional Safety	EnDat 3 EQ	N 1337 1263	249-0	

Figure 183: Authentication (AUTH) screen

For the authentication, proceed as follows:

- Click the drop-down list for the user level
- > The drop-down list opens
- Select the desired user level
- Click Calculate through .BAT at Activation code or
- Click Manual input to enter a number in the input field
- Click AUTH
- > Authentication starts
- > The result is shown in a corresponding message

Setting write-protection (PROTECT)

In this view you can set write protection for specific memory areas. First, you must authenticate yourself with the appropriate access level.

- Click the Configuration tab to call this view
- Click the Write protection (PROTECT) tab in the lower navigation bar

ocition dieplay	Online diagnostics	Encodor status	Soncore	ID label (EL)	Configuration	Wizarde				
USILION DISPLAY	Online diagnostics	Encoder status	Sensors	ID Iabel (EL)	Comgulation	WIZAIUS				_
Set write-pr	otection (PROT	TECT)								
(1) The user i	cess level you can here must first authenticate hi authentication is succes	imself with the approp	oriate acces	s level or a higher	one.	SET.offsetPos).				
Write protection	n									
Memory area		Current write-pro	tection		Access level		Write prote	ection		
	SET	none			USER	~	Set			
x	SET	none			USER	~	✓ Set			
XSET.	offsetPos	Set accl	evel: OEM	1	USER ~		✓ Delete			
LP	FSET	r	none		USER ~		Set			
0	EM1	r	none		USER	~	✓ Set			
0	EM2	r	none		USER	~	Set			
0	EM3	r	none		USER	~	Set			
						Preset		Cancel		
Overview Bus	operation Encoder	addresses Datu	m shift Se	ensor technolo	gy Activation	ode Authen	ticate Write	protection		
										C

Figure 184: Set write-protection (PROTECT) screen

Column	Description					
Memory area	Memory areas for which read or write protection can be set					
Current write-protection	Display of the current write protection of the memory area					
Access level	Selection of the access level with which a write protection is set for the respective memory area.					
	Authentication is required before selecting the access level (Further information: "Authentication (AUTH)", Page 316).					
	The access level you used for authentication is automat- ically selected for all memory areas					

Column	Description					
Write protection / read protection	Set or delete the read or write protection for the respec- tive memory area.					
	Please note:					
	The checkbox is disabled if the authentication level is lower than the authentication of the access level					
	The checkbox is disabled if the access level of an active read or write protection is higher than the current authentication level					
	The access level of an existing write protection / read protection cannot be increased. Delete the write protection / read protection and set it again					
	Datum shift can be protected with an access level different from that of the XSET area. This only works if the datum shift is set first (or at the same time as the XSET area). If the entire XSET area is protected first, the datum shift can no longer be protected separately afterwards					

 Click the drop-down list in the Access level column of the desired memory area

- > The selection menu opens
- Select the access level

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- Click Set for the desired memory area in the column Write protection / Read protection
- > The result is shown in a corresponding message

Setting write protection—and in particular read protection—may cause problems when operating the encoder.

12.2.7 Wizards view

In the **Wizards** view, you can start the wizard-assisted procedures, for example the Functional-safety encoder check (depending on the encoder).

Click the Wizards tab to call this view

HEIDENHAIN: ATS - Adjusting and Testing Software File Help						-		×
Position display Online diagnostics Encode	er status Sensors	ID label (EL)	Configuration	Wizards				
Wizards								
- Wizard for "Functional Safety" en	coder check							
Overview Functional-Safety encoder check	ĸ							
							H	£
			Safety EnD	ថ្ថិ₃ EC	2N 1337	12632	49-02	

Figure 185: Wizards view

The overview shows the available wizards.

• Click the corresponding tab in the lower navigation bar to start a wizard

Checking the functional safety of the encoder

You can use the wizard for the **Functional-safety encoder check** to check safetyrelevant functions of encoders. The wizard guides you through the required steps.

You can see from the ID label on the encoder whether the encoder supports functional safety.

Further information: "ID label", Page 57

If the functional-safety encoder check results in errors, the encoder does not comply with the functional safety specifications. Repairs may only be carried out by the HEIDENHAIN Service.

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After installing and exchanging functional safety components, repeat the acceptance test according to the specifications of the machine tool builder.



For more information on EnDat 3 visit: **www.endat.de**.

- Click the Wizards tab
- > Click the Functional-safety encoder check tab in the lower navigation bar
- > The Functional-safety encoder check starts
- > The Adjusting and Testing Software checks the safety-relevant memory areas

					Safety	Dat 3 EQI	1337	126324	19-02	1
									H	£.
Overview	Functional-Safety encode	er check								
				< Baci	¢	Next >		Cancel		
0	Checking of the safety-re	levant memory p	arameters	in the encode	er memory w	as completed s	uccessfully.			
Checking	of safety-relevant memo	ry parameters								
Check '	'Functional Safety"	encoder								
	play Online diagnostics		Sensors	ID label (EL)	Configurati	on wizards				
Help		-				Menanda				
	ATS - Adjusting and Testing Software									

Figure 186: Checking of safety-relevant memory parameters

Checking of safety-relevant memory parameters

The Adjusting and Testing Software checks the safety-relevant memory parameters (XEL.safetyCsPos1 check) for consistency.

- > The wizard shows the result of the memory comparison
- Click Next to continue
- > The wizard shows information on the test for consistency

Checking of functional safety

HEIDENHAIN: File Help	ATS - Adjusting and Testing Software						<u> </u>		×
Position dis	play Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuration	Wizards			
Check "	Functional Safety"	encoder							
Test for c	onsistency and safe com	parison of data							
J)	As large as possible a t The distance covered is					aningful measuring	g result.		
!	Do not exceed the max because otherwise pos				ive speed.				
				< Bac	k 🗌	Next >	Canc	el	
Overview	Functional-Safety encode	er check						-	
								H	C
					Safety EnD	EQN 13	37 12632	249-02	2 🔽

Figure 187: Notes on the inspection

The **functional-safety check** comprises the following tests:

- CSS test
- SOL test
- SF status
- AA test
- Data test
- WD test
- FDS test (forced dynamic sampling; testing of the monitoring function in the encoder)

A test for consistency is performed in addition: Encoders supporting functional safety output two position values, the high-resolution position 1 and a lesser resolved position 2. During the test for consistency, the Adjusting and Testing Software scales the position value 1 to the resolution of position value 2 and checks the consistency of the two values. The test is considered passed if the maximum position jump results in a deviation ≤ 1 .

- Click Next to continue
- > The wizard displays the screen for running the measurement

POS1 Revolution Revolu	sition display Online diagnostics	Encoder status Sensors ID label (E	L) Configuration Wizards	
POS1 Revolution Revolu	Check "Functional Safety"	encoder		
POSI Revolution Revolu	Status and data monitoring			
Revolution Angle (degle B B			🔵 FSC 🔵 Errors 🎯 Warnings 🌘	Protocol 🔵 Transmiss
POS2 Revolution Revolu	POS1			
POS2 Revolution Revolu		Revolution		Angle (degr
Revolution Angle [deg USA USA Consistency Scaled position step - max Scaled position step - max Scaled position step - co Speed reserve Traversing range 100.0 % 0%		3	132603	305
Consistency Scaled position step - max Scaled position step - max Scaled position step - co Image: Speed reserve Traversing range 100.0 % 0%	POS2			
Scaled position step - max Scaled position step - max Sc		Revolution		Angle [degr
Scaled position step - max Scaled position step - max Sc			4995	195
Speed reserve 100.0 % Traversing range Cancel Cancel	Consistency			
100.0 % 0% Cancel		Scaled position step – ma		Scaled position step – cur
₩ L. < Back Next > Cancel	Speed reserve Traversing range			
	100.0 %		0%	
verview Functional-Safety encoder check			< Back Next >	Cancel
	¤ I			

Figure 188: Measurement screen of the test for consistency

Depiction	Description					
Status and data monitoring	Further information: "Description of the status displays", Page 283					
POS1	Position value1, high resolution					
POS2	Redundant position value 2, lower resolution					
	POS2 is transmitted inverted. However, to simplify the display, POS2 is not shown inverted.					
Consistency	Deviation detected during the measurement					
	Scaled position step – max: Maximum deviation					
	Scaled position step – current: Current deviation					
Speed reserve	Remaining speed reserve until the maximum traversing speed is reached Unit: Percent					
	A speed reserve of 0 % means that the maximum traversing speed has been reached. The maximum traversing speed must not be exceeded, as this could cause position jumps.					

Depiction	Description
Traversing range	Traversing distance covered
	Unit: Percent
	The traverse path is read out from the encoder memory or the encoder database (depending on the encoder).

Operating elements

A

Symbol	Function
dalı	Show measured values
<u>1011</u>	Displays the measured value in increments
Ť-	Show position values
L.	Converts the measured value into a position value
	Unit: micrometers or degrees (depending on the encoder)

- ► Traverse the entire measuring range
- > The progress bar shows the traversed distance in percent

The traverse path of encoders mounted to a machine may be limited such that the progress bar cannot reach 100%. In this case check the longest possible traverse path.

EIDENHAIN: ATS - Ad Help	djusting and Testing Softwa	re							- (
ition display	Online diagnostics	s Encoder status	Sensors	ID label (EL)	Configuration V	/izards				
heck "Fund	ctional Safety	' encoder								
tatus and data										
					🔵 FSC	errors	🔵 Warni	ngs 🔵 Protoci	ol 🔵 Trans	missic
'OS1										
		Revolut	ion						Angle (d	egrec
					14	-18	58	99	7	
OS2										
		Revolut	ion		6	18	3-	15	Angle [d	egree
onsistency										
			Scaled position	on step - max				Scaled p	bosition step -	
Speed reserve	Traversing range									
100.0 %					100%					
I 🕒					< Back		Next >	•	Cancel	
erview Funct	ional-Safety enco	der check								
									Ŀ	3
						Functional Safety	EnDat 3	EQN 1337	1263249	0.02

Figure 189: Result of the test for consistency

You can switch the counter display between measured values view and position view.

Further information: "Switching between measured values view and position view", Page 285

Click Next to continue

A

> The wizard displays the results of the functional-safety encoder check

Results of the functional-safety encoder check



Figure 190: Results of the functional-safety encoder check

The overview shows the results of the functional-safety encoder check. The overview is subdivided into the following sections:

- **Functional safety tests**: Functions required for functional safety
- Status of transmission and encoder: Functions that have no effect on functional safety

Depiction	Description					
Checking of memory parameters	Result of memory comparison					
Safety status	Status check of the safety packets					
Safety tests	Complex test sequences, e.g. testing over several sampling cycles or safety packets DU error: Internal safety-relevant encoder errors					
Depiction	Description					
---------------------------------------	---					
Test for consistency	 Result of the test for consistency Max. difference: Maximum deviation of the scaled position value 1 from position value 2 Traversing range: Measuring distance traversed during the test Unit: Percent 					
	If the captured area is less than 5%, the result is displayed in red color. However, for an evaluation of the encoder in the specific application, the maximum traversing range needs to be examined.					
Status of transmission and encoder	 The tests shown in the Status section correspond to the status indicators of the Position display. Further information: "Status displays of the position display", Page 283 					

6

Red values or symbols indicate a malfunction of the encoder.

Symbols

Symbols are used to show the result of the respective test:

Symbol	Description
0	 Test completed without error
	Test found errors

The symbol in the first column represents the overall result of the line.

Operating elements

Symbol	Function
A	Show status information
4	Displays a list of errors and warnings
	Save file
	Opens the dialog for saving the log to a PDF file
	Further information: "Saving log data", Page 332

Show status information



i

 Click Show status information to display the status information provided by the encoder

If you click on the **Encoder status** tab instead, the functional-safety encoder check is terminated.

sition display	Online diagnostics	Encoder status	Sensors	ID label (EL)	Configur	ation Wiza	ards			
or class	Error code		ise of failu		3				Nun	mbr
		The	encoder wor	ks correctly						
								$\overline{2}$		
					Functional	\rightarrow				
					Safety	EnDat 3	EQN 1337	12632	49-0	2

Figure 191: Encoder status screen

Operating elements

Symbol	Function
	Return to overview
	Returns to the results overview of the functional-safety encoder check
	Save file
	Opens the dialog for saving the log to a PDF file

Returning to the functional-safety encoder check



 Click Return to overview to return to the functional-safety encoder check

Procedure in the event of errors

If the functional-safety encoder check returns errors, proceed as follows:

- ▶ Abort the functional-safety encoder check and save the log
- Reset the status messages
 Further information: "Resetting status messages", Page 296
- Repeat the functional-safety encoder check
- ▶ If errors are found again, contact the HEIDENHAIN Service

12.2.8 Operating status data view

The **Operating status data** screen shows information on the operating status and extreme values provided by the encoder. Depending on the encoder, further alarm-triggered data are transmitted.

Click the Operating status data tab to call this view

HEIDENHAIN: ,	ATS - Adju	usting and Testing So	oftware								×
Position disp	lay	Online diagnos	tics Encoder sta	tus Sensors	ID label (EL)	Configuration	Wizards	Operating status da	ta		
Operatir	ng sta	atus data:									
- Data											
- Histog - Reset		me values									
Overview	Data	Histograms	Extremwerte zuri	icksetzen							
											î.
		S-18 - 6 -				Safety	EnDat 3	EQI 1134	13346	i <mark>59-11</mark>	

Figure 192: Operating status data view

The Operating status data tab comprises:

- Overview
- Data
- Histograms
- Reset extreme values
- Click the desired tab in the lower navigation bar to switch between the views

Displaying data logger contents

Click the Data tab to call the view Data contents of the data logger

Position display	Online diagnostics	Encoder status	Sensors	ID label (EL)	Configuration	Wizards	Operating status dat	a		
Data conte	nts of the data I	ogger								
feaning		Value	Unit	Timestamp						
status				201 201 201 202 202 102						
1199 (1997)	esses to the OEM memory	0								
lumber of restarts	· · · · · ·	60								
operating status	data									
perating time		25:11:38								
ctive time		0:01:22								
istance traveled		112	Umdrehunge	en						
umber of reversals		156								
lumber of strokes		79								
xtreme values										
lax. speed		442.50	1/min	20:44:49						
fax. acceleration		1105.84	rad/s ^z	20:45:01						
lax. internal temper	ature	40.9	°C	22:46:56						
1in. internal tempera	iture	40.9	°C	23:38:12						
lax. external tempe	rature	730.9	°C	20:42:17						
lax. mounting clear	ance	4.095	mm	20:42:17						
lin mounting cloars	nco	9 709	mm	00-00-10					-	
2									EnDat I	ł
Overview Dat	a Histograms Ext	remwerte zurückse	etzen							
									H	

Figure 193: Data contents of the data logger view

Status section

Display	Description				
Number of write-access- es to the OEM memory	Number of write accesses to OEM1, OEM2, and OEM3 during the total operating time				
Number of encoder restarts	Number of restarts during the total operating time				

Operating status data section

Display	Description
Operating time	Total time the encoder was switched on
Active time	Time during which encoder was switched on and in motion
Distance traveled	Traverse path of the encoder during the total operat- ing time
Number of reversals	Number of changes of direction of the encoder during the entire operating time
Number of strokes	Stroke definition: The moving encoder comes to a standstill and then continues to be moved in the same direction

Extreme values section

The encoder transmits the saved extreme values of the following measurands:

- Max. speed (absolute value)
- Max. acceleration (absolute value)
- Min. internal temperature
- Max. internal temperature
- Max. external temperature
- Max. mounting clearance
- Min. mounting clearance

You can reset the extreme values in the encoder memory.

Further information: "Resetting extreme values", Page 332

Alarm-triggered data section

The **Alarm-triggered data** section displays status-triggered data (depending on the encoder).



For more information on EnDat 3 visit: www.endat.de.

Refreshing data



Click Refresh data

- > The encoder transmits the current data to the Adjusting and Testing Software
- > The display is refreshed

Displaying histograms

The Adjusting and Testing Software graphically displays measured values in the form of histograms. The type of histogram depends on the data and measured values transmitted by the connected encoder. The example described in this chapter is to explain the procedure.

- Click the Histograms tab to call the view Histograms of the data logger
- > The **Heatmap** is displayed

Heat map



Figure 194: Data contents of the data logger view with heat map

The **heat map** graphically depicts the distribution of the measured values and provides information on how often the encoder was in a certain speed range and temperature range.

Depiction	Description
X axis	Velocity
	Unit: depends on the encoder
Y axis	Temperature
	Unit: degrees
Green fields	The lighter the color of a field, the more measured values are in this range.
Gray fields	There are no or few measured values in this range.

To display the temperature range:

- Double-click a histogram in the Heatmap
- > The temperature range is displayed

Histograms T1 to T8 (example)

The example comprises the histograms **T1** to **T8**, which plot the data according to the specified temperature ranges:

- **T1**: <-10 °C
- **T2**: <15 °C
- **T3**: <50 °C
- **T4**: <85 °C
- **T5**: <100 °C
- **T6**: <115 °C
- **T7**: <125 °C
- **T8**: <=125 °C
- To switch between histograms, click on the selection menu where the current option is displayed (e.g., Heatmap)
- Select the desired histogram
- > The selected histogram is displayed



Figure 195: Histograms of the data logger view with histogram T5 (example)

Depiction	Description
X axis	Velocity
	Unit: depends on the encoder
Y axis	Operating hours

Refreshing data



Click Refresh data

- The encoder transmits the current data to the Adjusting and Testing Software
- > The display is refreshed

Resetting extreme values

You can delete the saved **extreme values** from the encoder memory. Afterwards, the encoder starts again to record extreme values.

- Click the Reset extreme values tab to delete the extreme values
- Click Reset
- Click OK to confirm the deletion the extreme values
- > The extreme values are deleted

12.2.9 Saving log data

You can save the test results in a PDF file.

The results of the performed tests are available to be selected as log contents. The results of a test remain in temporary memory until you disconnect the encoder or repeat the test. You can also add the status messages as log content.

The status messages are available for selection as log content if you have called the **Encoder status** view once during the test.

Click the Encoder status tab to call this view

i

Click Save log

> The **Log** dialog is displayed

				×
Log:				
Cover sheet Online diagnostics Functional safety tests Encoder status				
Comment for report:				~
<				>
	Save	Preview	Exit	

Figure 196: Log dialog

- To select log contents, tick the box in front of the desired content
- If necessary, enter a comment in the Comment for report box
- Click **Preview** to open the preview of the log
- Click Save to save the log to a PDF file
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved

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In the Adjusting and Testing Software, you can add an individual header and details on the examiner to the logs. **Further information:** "Saving log information", Page 54



To display the PDF contents correctly, the font "Arial Unicode $\ensuremath{\mathsf{MS}}$ " must be installed on the computer.

12.3 Checking voltage supply

Voltage display function

The **Voltage display** function shows the measured values and the status of the voltage supply. If the encoder and the testing device are connected via a signal adapter, the measured values also include the current consumption of the signal adapter (does not apply to SA 1210 and SA 2380).

Double-click **Voltage display** in the function menu

E H	EIDENHAIN: ATS - Adjusting and Testing Software				<u> -</u>	
-	oltage display					
١	Voltage					
					Measureme	nt value [V]
				10		
C	Current					
			_		Measureme	nt value [A]
			Ĺ	<u></u>		
F	Power					
				'	Measuremer	it value [W]
					\square	
				i ii		E I
						۔
		Safety	EnDat 3	EQN 1337	12632	249-02

Figure 197: Voltage display function

Display	Description
Voltage	Voltage output by the PWM
Current	Current consumption of the encoder and possibly the signal adapter
	If the encoder does not consume any current, the measured value is displayed in red.
Power	Power consumption of the encoder and possibly the signal adapter

334



Figure 198: User interface in bus operation

The selection menu in the information bar shows how many participants (bus nodes) are present. All displays and values refer to the selected participant. Thus you can work in the bus mode with all known functions, analogous to the operation with a single encoder.

- > To select another participant, click on the selection menu in the information bar
- > The selection menu opens

HEIDENHAIN: ATS - Ac File Help	justing and Testing Software							-	D X
Position display	Online diagnostics	Encoder status	ID label (EL)	Configuration	Wizards				
Status									
					🔵 Errors	🔵 Warnings	Protocol	🔵 Trans	mission
POS1									
								Posit	ion (µm)
		28	39	15		5.8	34	{{	5
Overview									
蛼 Ŀ.						Bus	node 1/3	~	.
					Ē	nDat 3 Bus	node 1/3 node 2/3 node 3/3		4-01

Figure 199: Selection menu with available bus nodes

- Click the desired bus node
- > The bus node is activated

The selection menu is shown in all functions.



Special interfacespecific functions

13.1 Overview

This chapter describes special functions of company-specific encoders.

13.2 DRIVE-CLiQ

The Adjusting and Testing Software supports the following interfaces.

DRIVE-CLiQ interface



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DRIVE-CLiQ is a registered trademark of Siemens AG.

The configuration of the encoder by the PWM differs from the configuration for real operation at the machine tool. This concerns, for example, the time of transmission. During real operation errors may occur that do not occur during encoder diagnostics with the PWM. In addition to the test with the encoder diagnostic set, an additional test during actual operation is therefore recommended.

Position display

HEIDENHAIN: ATS - Adjusting and Testing Software						5 <u>-</u>		×
ile Help								
Position display[DRI	VE-CLiQ]						1
XIST2								
					Measu	red value	[steps]	
				146	28	3 1	0	
XIST1								
					Measu	red value	[steps]	
					- Iā	26	8	
Position value 2								
					Measu	red value	[steps]	
					L	15	6	
Status								
Error Transmission	Position	Commutation	O Speed					
★ ➡ 性.							£	
				Safety EC	2N1336S	10422	276-01	

Figure 200: Position display function

Display	Description			
XIST2	Absolute encoder position			
	Unit: Increments			
XIST1	Incremental value of the encoder position			
	Unit: Increments			
Position value 2	For encoders that support functional safety: Redundant position value			
Error	Status display of encoder errors			
	 Green: No status message available 			
	 Red: Status message available 			
Transmission	Status display of data transfer between encoder and testing device			
	 Green: No status message available 			
	 Red: Status message available 			
Position	Position status display			
	 Green: No status message available 			
	 Red: Status message available 			
Commutation	Status display of commutation			
	 Green: No status message available 			
	 Red: Status message available 			
Speed	Status display of speed			
	 Green: No status message available 			
	Red: Status message available			

Supplementary screen of the position display

The Position display function features a supplementary screen with further information. To switch between the screens, the following operating elements are available in the control bar:

lcon	Function
₽	Switch to standard view
	Displays the standard view
	Switch to supplementary view
	Displays supplementary information

Position di	splavIDR	VE-CLig	21			
XIST2						
					Meas	sured value [steps
					14231	8 10
Commutation	Number of pole	oairs: 1		Speed		
		Measu	red value [steps]		Rota	itional speed [rpn
		25.	155		- [0.03
				Temperatur	re sensor external	
						Temperature [°C
					S!	50.S
Status						
O Error T	Tansmission	Position	Commutation	O Speed		

Figure 201: Supplementary screen of the Position display function

Display	Description
Commutation	Commutation angle with reference to the pole pair width:
	 The pole pair width for linear encoders is 25 mm; i.e. 0° to 360° are displayed within 25 mm
	 The pole pair width for rotary or angle encoders is 1; i.e. 0° to 360° are displayed within one revolution
	Unit: Increments
Speed	Current traversing speed or shaft speed
	Unit: Meters per second or revolutions per minute (depending on the encoder)
External temperature sensor	Current temperature measured by the external temperature sensor, e.g. winding temperature
	ture values indicate that the temperature sensor is not tact is open or a cable has broken.

Encoder status screen

The Encoder status screen provides detailed information on errors.



 Click Status information in the control bar to call the Encoder status screen

Help		
Encoder status		
Overview of encoder and transmission errors		
Errors: None		
Fault value: None		
Status information: None		
Safety status: o.k.		
Transmission status: o.k.		
a		£

Figure 202: Encoder status screen

Display	Description
Errors	Information about malfunctions of the encoder, e.g.:
	Encoder error
	 Software error
	 Kernel error
	 Safety error
Fault value	Detailed information on errors (if available for the respective error number)
Status information	Messages about the encoder status
Safety status	Messages about safety-relevant functions
Transmission status	Messages about communication errors, (e.g., CRC error or packet loss)

Backing up the encoder configuration

You can load the encoder configuration from the encoder and save it as a ZIP file on the computer for backup or diagnostic purposes.



The ZIP file is protected by a password and can only be decoded by the den HEIDENHAIN Service.

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	46	n	-	
			ч.	л

- Double-click **Save encoder memory** in the function menu
- > The **Save encoder memory** screen is displayed

DENHAIN: ATS - Adjusting and Testing Software			
ave encoder memory [DRIVE-CLiQ	1		
1: Read out encoder memory			
Data 0 bytes read			
2: Insert notes in the file			

Figure 203: Save encoder memory screen



- Click Read out encoder memory in the control bar
- > The Adjusting and Testing Software shows the reading progress
- > When the data has been read out, the **Save file** operating element is displayed as active
- Enter comments in the **Notes** field, if required
- Click Save file
- Select the desired storage location in the dialog
- Enter the file name
- Click Save
- > The file is saved

Encoder parameter display function

Encoders with **DRIVE-CLiQ interface** feature the additional function **Encoder parameter display**. The **Encoder parameter display** provides information required for putting the encoder into service with Siemens controls. If the encoder is connected via an external signal converter, information on the signal converter is displayed, too.



- To call this function, double-click Encoder parameter display in the function menu
- The Adjusting and Testing Software displays information on the connected encoder

Encoder parameter display		
Identifier	Value	
Encoder information		1
Encoder name	EQN1336S	
Encoder ID	1042276-01	
Serial number	X44275620	
Encoder type		
	integrated DRIVE-CLiQ encoder	
18	rotatory, multiturn	
	absolute	
Distinguishable revolutions	4096	
Signal periods per revolution (virtual)	2048	
Measuring steps per revolution	16777216	
Motor temperature sensor 1	supported (KTY84)	
External temperature sensors 2-4	not supported	
Internal temperature sensor	not supported	
Logistic information		
Node ID [hex]	22.11.20.41.43.30.30.34.2A.12.76.40	
- Device type	Sealed encoder	
- DSA ports	1	
- Vendor	HEIDENHAIN	

Figure 204: Encoder parameter display function

Loaistic	information	section
Logiotio	monution	00001011

Display	Description
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, converter from EnDat 2.2 to DRIVE-CLiQ
DSA ports	For HEIDENHAIN encoders, the value "1" is entered here (single-ended module)
Vendor	Manufacturer code
Version	Version number of the encoder
Serial number	Serial number of the encoder
Index	Always assigned 0
MLFB	Ordering designation of the encoder
FW version	Firmware version and functionality of the device
ROM version	This information is relevant for R&D
EEPROM version	Total of the encoder memory contents; this informa- tion is relevant for R&D

Functional safety section

The plausibility of the values to each other is tested in the "Functional-Safety encoder check". Thus, the values displayed here are for information only. For position comparison, the types "binary" and "non-binary" are relevant. This refers to the ratio of XACT1 and Pos2. Linear encoders are usually "non-binary". Rotational encoders are usually "binary".

Display	Description
Supported forced dynamic sampling	Supported error message for the validation test
Error bit F1	Test cases 1 to 16
Error bit F2	Test cases 1 to 16
Comparison algorithm	Algorithm for position value comparison
Pos2 configuration	Characteristics of position value 2
Pos2 shift value	Resolution of position value 2, relevant bits
Pos2 number bits fin res	Resolution characteristics of position value 2
Relevant Pos2 bits	Number of bits of position 2 that are used in the safety comparison algorithm; value only not equal to zero for encoders with binary position comparison
Offset Pos1-Pos2	Offset between position 1 (XACT1) and position 2 in the resolution of position 2
nsrPos1	Not safety-relevant measuring steps of position 1 (XACT1); generally not supported on encoders with binary position comparison
nsrPos2	Not safety-relevant measuring steps of position 2 (XACT2); generally not supported on encoders with binary position comparison
srM	Safety-relevant measuring steps that are taken into account for position comparison; generally not supported on encoders with binary position compari- son
Offset2	Offset between position 1 (XACT1) and position 2 in the resolution of position 1 (XACT1); generally not supported on encoders with binary position compari- son

Further information section

Display of the datum shift, if saved in the encoder Size of the memory range reserved for information by the OEM
, , , , , , , , , , , , , , , , , , , ,
Maximum time after which the encoder can commu- nicate via DRIVE-CLiQ
If no value is displayed, the switch-on time tSOT applies (stated in the brochure).
Earliest transmission time of a DRIVE-CLiQ packet after position latch
r I E

(virtual) are derived from the measuring step and correspond to the parameter settings in the DRIVE-CLiQ encoder configuration. The values are not related to the physical properties (signal period) of the encoder.

Functional-safety encoder check function

The **Functional-safety encoder check** is also available for encoders without functional safety and allows for examining basic parameters and settings. If the Functional-safety encoder check is not available, this indicates a malfunction of the encoder.

If the functional-safety encoder check results in errors, the encoder does i not comply with the functional safety specifications. Repairs may only be carried out by the HEIDENHAIN Service. After installing and exchanging functional safety components, repeat the i acceptance test according to the specifications of the machine tool builder. To call this function, double-click Functional-safety encoder check in the function menu > The dialog Manual entry of measuring length may be displayed (depending on the encoder) • Enter the measuring length in millimeters Confirm the entry with Accept > The software wizard shows a list of the supported diagnostic functions HEIDENHAIN: ATS - Adjusting and Testing Software × _ File Help **Check "Functional Safety" encoder** You can use this application to perform the necessary tests of encoders for safety-oriented applications Diagnostic functions to do Check the safety-relevant parameters Forced dynamic sampling Test for consistency Comparison of XIST1/XIST2 and position value 2 Data transfer, life signs If it is a "Functional Safety" encoder, and if all safety-oriented applications are to be checked, then the Wizard must run through to the end! Next > Cancel < Back Safety EQN1336S 1042276-01 🔽

Figure 205: List of the diagnostic functions for encoders with functional safety

Depiction	Description
Check the safety-relevant parameters	Check of safety-relevant memory areas
Forced dynamic sampling	Check of the error generators in the encoder and of the consistency of the data stored in the encoder
	The tests performed depend on the supported error messages (depending on the encoder).
Test for consistency	Test for consistency of position value 2
Comparison of XIST1/ XIST2 and position value 2	Position-comparison triple: Comparison of Pos1, Pos2 and the parameter p12020 in the encoder configuration
Data transfer, life signs	Check of data transfer and life signs of the encoder hardware and software

EIDENHAIN: ATS Help	- Adjusting and Testing Software				- 0	
rreip						
Check pa	arameters at 'non safe' encoders					
However, the b	not functionally safe! ehavior of the safety-relevant parameters and functions is ation to check for correct behavior.	: defined.				
Diagnosti	c functions to do					
Safety-re	evant parameters may neither be present nor fi	led.				
0 must co	nstantly be transmitted for the safety signals XI	ST1*, POS2, and CRC-POS2				
No samp	able assemblies may be selected					
The cycli	software life signs LS1 and LS2 are not to be	updated				
The cycli	hardware life signs LZ1 and LZ2 will not be up	dated				
	If it is a "Functional Safety" encoder, and if <u>all</u> se	fety-oriented applications are to	be checked, then the Wizard	must run through to) the end!	
			< Back Next	> C	ancel	

Figure 206: Overview of the diagnostic functions of encoders without functional safety

- ► Click **Next** to check the safety-relevant memory areas
- The Adjusting and Testing Software checks whether the safety-relevant parameters are available and filled with values
- > The software wizard shows the result of the examination

al Safety" encoder			
afety-relevant DRIVE-CLiQ parameters are checked.			
elevant parameters			
Meaning:	Available:	Filled:	Result:
Resolution of position value 2	0	0	0
Configuration of position value 2	0	0	0
Offset position value 1 and position value 2	٢	٢	٢
DRIVE-CLiQ ProfiBus on-off ratio	0	0	0
Safety mode	9	0	0
Interval of the safety FDS	0		0
Interval between two FDSs	and a second		٢
Information about supported FDSs	0	0	0
	elevant DRIVE-CLIQ parameters are checked. elevant parameters Meaning: Resolution of position value 2 Configuration of position value 2 Offset position value 1 and position value 2 DRIVE-CLIQ ProfiBus on-off ratio Safety mode	afety-relevant DRIVE-CLIQ parameters are checked. elevant parameters Meaning: Available: Resolution of position value 2 Configuration of position value 2 Offset position value 1 and position value 2 DRIVE-CLIQ ProfiBus on-off ratio Safety mode Interval of the safety FDS Interval between two FDSs	afety-relevant DRIVE-CLIQ parameters are checked. elevant parameters Meaning: Available: Filled: Resolution of position value 2 0 0 Offset position value 2 0 Offset position value 1 and position value 2 0 DRIVE-CLIQ ProfiBus on-off ratio Safety mode 0 Interval of the safety FDS 0 Interval between two FDSs 0

Figure 207: Test results for safety-relevant parameters

lcon	Description
	Test successful for parameters that must be available and filled with values
	Test successful for parameters that do not have to be available or filled with values
8	Test failed
►	Click Next to run forced dynamic sampling

The following symbols are used to show the test result:

- The Adjusting and Testing Software executes forced dynamic sampling
- The software wizard shows the result of forced dynamic sampling

ynamic s	e													
ted samp	lable er	rors 1												
T15	T14	T13	T12	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
ted samp	lable er	rors 2			.)				1	
T15	T14	T13	T12	T11	T10	T9	T8	17	T6	T5	T4	T3	T2	T1
2		d dynam ailable co			s succes		ssfully							
	T15 ted samp	ted samplable err	ted samplable errors 2 T15 T14 T13	T15 T14 T13 T12 ted samplable errors 2 Comparison Comparison Comparison	T15 T14 T13 T12 T11 ted samplable errors 2 T15 T14 T13 T12 T11	T15 T14 T13 T12 T11 T10 ted samplable errors 2 T15 T14 T13 T12 T11 T10	T15 T14 T13 T12 T11 T10 T9 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9	T15 T14 T13 T12 T11 T10 T9 T8 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9 T8	T15 T14 T13 T12 T11 T10 T9 T8 T7 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9 T8 T7	T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 115 T14 T13 T12 T11 T10 T9 T8 T7 T6	T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 115 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5	T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 ted samplable errors 2 115 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 115 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4	T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 ted samplable errors 2 115 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 115 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3	T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 T2 ted samplable errors 2 T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 T2 T15 T14 T13 T12 T11 T10 T9 T8 T7 T6 T5 T4 T3 T2

Figure 208: Result of forced dynamic sampling

- Click **Next** to continue
- The Adjusting and Testing Software displays information on the test for consistency and the comparison of position values

Check "Fund	ctional Safety" encod	der				
During the Compari		never be greater than one step of the safety-relevant n value 2 the deviations between XIST1 and position measuring steps.		between XIST2 and posit	ion value 2 are	
Test for consis	stency and comparison of X	(IST1 and XIST2 with position value 2				
		a traverse range is to be covered, in ord I is shown in % in the traverse-range dis		eaningful measurin	g result.	
2						
	The maximum speed	v = 625 rpm may not be exceeded in the nps during the test for consistency.	following test,	since otherwise th	e high spee	ed
Â	The maximum speed		following test,	since otherwise th	e high spec	ed
Comparison w	The maximum speed results in position jun rith position triple (p12020) n to the safe (cyclic) operating mod		-			ed
Comparison w	The maximum speed results in position jun rith position triple (p12020) n to the safe (cyclic) operating mod	nps during the test for consistency.	position comparison		52	ed
Comparison w	The maximum speed results in position jun rith position triple (p12020) In to the safe (cyclic) operating mod 2020.	nps during the test for consistency.	position comparison	between POS1' and PO	52	ed

Figure 209: Result of the test for consistency

- Click Next to run the test for consistency and the comparison of position values
- Traverse the entire measuring range
- > The software wizard shows the result of the tests

HEIDENHAIN: ATS - Adjusting and Testing Softwa	are				-	
ile Help						
DRIVE-CLIQ	- Functional Safety					
ositions						
IST1 (scaled)		158				
(IST2 (scaled)		421				
Position value 2 (scaled)		858				
Data transfer						
F1/F2	9					
Software life sign	9					
Hardware life sign	9					
Position value 2 - CRC16	0					
Nonitor dynamic sampling (Tfd bit)	0					
racing of positions						
XIST1 - Position value 2 - maximum		0				
(IST1 - Position value 2 - current		0				
(IST2 - Position value 2 - maximum		:				
(IST2 - Position value 2 - current		:				
Consistency						
Position jump - max		0				
Position jump - current		0				
Fraversing range	0%					
revious measurements (wiza	rd)					
Forced dynamic sampling	0					
Safety relevant DRIVE-CLiQ parameters	0					
Comparison with position triple (p12020)	9					
	2	🔚 🭳 🐍				
			Functional		40.400	70.0
			Safety	EQN1336S	10422	10-01

Red values or status displays indicate a malfunction of the encoder.

i

Positions section

Display	Description
XIST1 (scaled)	Scaled position value XIST1
	The resolution used for the test complies with the functional safety specifications
XIST2 (scaled)	Scaled position value XIST2
	The resolution used for the test complies with the functional safety specifications
Position value 2 (scaled)	Scaled position value 2
	The resolution used for the test complies with the functional safety specifications

Data transfer section

Display	Description
F1/F2	Position error bits (encoder-internal)
Software life sign	Life sign generated by the encoder software
Hardware life sign	Life sign generated by the encoder hardware
Position value 2 – CRC16	The position 2 created by the scanning ASIC of the encoder is verified by means of an additional CRC in the encoder
Monitor dynamic sampling (Tfd bit)	Monitoring bit indicating that an error occurred during forced dynamic sampling "Tfd = test failed"

Tracing of positions section

Description
Maximum value of the comparison of incremental position and redundant absolute position
Current value of the comparison of incremental position and redundant absolute position
Maximum value of the comparison of absolute position and redundant absolute position
Current value of the comparison of absolute position and redundant absolute position
-

Consistency section

Display	Description
Position jump – max	Maximum position jump during the entire test
Position jump – current	Current position jump
Traversing range	Measuring distance traversed during the test Unit: Percent

Previous measurements (wizard) section

Display	Description
Forced dynamic sampling	Result of forced dynamic sampling
Safety-relevant DRIVE- CLiQ parameters	Test results for safety-relevant DRIVE-CLiQ parameters
Comparison with position	Result of position comparison

triple (p12020)

Repeating test for consistency and comparison of position values



- Click Delete measured values in the control bar to repeat the test for consistency and the comparison of position values
- > The measured values and status displays are reset
- ► Traverse the entire measuring range
- > The software wizard shows the result of the tests

Online diagnostics function

6

Since encoders with DRIVE-CLiQ interface do not support monitoring operation, the software wizard automatically selects the operating mode **Encoder diagnostics**.

13.3 Fanuc

The Adjusting and Testing Software supports the following interfaces:

- **Fanuc Serial Interface** α
- Fanuc Serial Interface αi

Position display



Figure 211: Position display function

Display	Description
Absolute position	Absolute encoder position
	Unit: Increments
Absolute position [bits]	Binary display of the absolute encoder position
	The number of bits depends on the encoder.
	Bit 1 = LSB (Least Significant Bit)
Transmission	Status display of data transfer between encoder and testing device
	 Green: No status message available
	 Red: Status message available
Ref.mark	Status display of reference mark detection
	Absolute encoders with serial interfaces:
	 Gray: No reference mark was detected
	 Yellow: Reference mark detected or absolute encoder
	Incremental encoders with external signal converter:
	 Gray: No reference mark was detected
	 Yellow: Reference run finished, absolute position value available

Display	Description
Alarm	Status display of encoder alarms Green: No status message available
	Red: Status message available
Warning	Status display of encoder warningsGreen: No status message availableRed: Status message available

Resetting status messages

The following steps are necessary in order to reset status messages:



- Double-click **Disconnect encoder** in the function menu
- Switch off the PWM

Fanuc ALPHA i ID data display function

Encoders with Fanuc Serial Interface αi feature the additional function Fanuc ALPHA i ID data display.

 - 60		- 1	
	-	-	τ.
		-	5
			1
	-		

- To call this function, double-click Fanuc ALPHA i ID data display in the function menu
- The Adjusting and Testing Software displays information on the connected encoder

ANUC ALPHA i ID data disp				
nternal information				
ID-information	Value	1		
ID number	760932-03			
Serial number	38464410B			
Encoder name and type	LC 495F			
Manufacturer	1 = HEIDENHAIN			
Encoder design	L = linear encoder			
Interpolation for Fanuc ALPHA i resolution	400			
Signal pitch [nm]	2000			
Signal pitch [nm]	20000			

Figure 212: Fanuc ALPHA i ID data display function

Online diagnostics function in the monitoring mode

On encoders with ordering designation "Fanuc 05", you can switch between ALPHAi mode and ALPHA mode to adapt the evaluation of the Adjusting and Testing Software to the parameterization of the subsequent electronics. For this purpose, the control bar contains the following operating elements:

lcon	Function		
2	Switch to ALPHA mode		
α	Evaluates the communication between subse electronics and encoder in the ALPHA mode	equent	
αί	Switch to ALPHAi mode		
ui -	Evaluates the communication between subsequence subsequence and encoder in the ALPHAi mode		
HEIDENHAIN: ATS - Adjusting and Testing Software File Help	e	- 0	×
Online diagnostics [Monit	oring mode]		
runcuon reserves			
	lute position	Position [ım]
•		-	

Status	Absolute position		
•			Position
Absolute			
Please start the re-	cording.		

Figure 213: **Online diagnostics** function in the monitoring mode

13.4 Mitsubishi

The Adjusting and Testing Software supports the following interface:

Mitsubishi High Speed Interface

Position display function



Figure 214: Position display function

Display	Description
Absolute position	Absolute encoder position
	Unit: Increments
Absolute position [bits]	Binary display of the absolute encoder position; the number of bits depends on the encoder
	Bit 1 = LSB (Least Significant Bit)
Transmission	Status display of data transfer between encoder and testing device
	 Green: No status message available
	Red: Status message available
Status field SF	Display of the status information output by the encoder; with incremental encoders including the status of reference mark detection
	Green: No status message available
	Red: Status message available
Alarm	Status display of encoder alarms
	 Green: No status message available
	Red: Status message available

13.5 Panasonic

The Adjusting and Testing Software supports the following interfaces:

Panasonic Serial Interface

Position display

The **Position display** function displays the following information:

Description
Absolute encoder position
Unit: Increments
Binary display of the absolute encoder position; the number of bits depends on the encoder
Bit 1 = LSB (Least Significant Bit)
Status display of data transfer between encoder and testing device
 Green: No status message available
 Red: Status message available
Status display of encoder alarms
 Green: No status message available
 Red: Status message available

13.6 Yaskawa

The Adjusting and Testing Software supports the following interfaces:

Yaskawa Serial Interface

Position display

	'askawa]					
Absolute position			Ч	IS4	<u>15r</u>	sured value [ste
Absolute position [bi	ts]					
36 35 34 33 32 3	30 29 28 27 26 25	24 23 22 21 20 19	18 17 16 15 14	13 12 11 10	98765	4 3 2 1
Yaskawa status						
	Transmission			Ali) arm	

Figure 215: Position display function

Display	Description	
Absolute position	Absolute encoder position	
	Unit: Increments	
Absolute position [bits]	Binary display of the absolute encoder position	
	The number of bits depends on the encoder.	
	Bit 1 = LSB (Least Significant Bit)	
Transmission	Status display of data transfer between encoder and testing device	
	 Green: No status message available 	
	Red: Status message available	
Alarm	Status display of encoder alarms	
	 Green: No status message available 	
	Red: Status message available	

Yaskawa parameter display function

Encoders with Yaskawa Serial Interface feature the additional function Yaskawa Encoder Parameters.



- ► To call this function, double-click **Yaskawa parameter display** in the function menu
- > The Adjusting and Testing Software displays information on the connected encoder

askawa Encoder Param	otore		
askawa Elicouel Palalli	elers		
ID-information	Value		
Encoder model	JZDP-N009		
Year of manufacture	2019		
Month of manufacture	February		
Serial number	X62986453		
Sensor type	Absolute		
Resolution [nm]	5		
Support of additional information	Temperature, Diagnostics		
Product/software version	0		
Product/software version	0		



13.7 SSI

Position display



Figure 217: Position display function

Display	Description
Absolute position	Absolute encoder position
	Unit: Increments
Incremental position	Count value of incremental counter
	Unit: Increments
Absolute position [bits]	Binary display of the absolute encoder position
	The number of bits depends on the encoder.
	Bit 1 = LSB (Least Significant Bit)
Frequency	Status display of signal frequency
	 Green: Signal frequency is within tolerance
	 Red: Signal frequency is outside the tolerance range
Amplitudes	Status display of signal amplitudes
	 Green: The signal amplitudes are within the tolerance range
	 Red: The signal amplitudes exceed at least one tolerance limit
Transmission	Status display of data transfer between encoder and testing device
	 Green: No status message available
	Red: Status message available

Absolute to incremental deviation function

-		5 - Adjusting and Testing	Software			-	
File	Help						
	Compari	son of absol	ute and incre	mental values	;		
	Status	Absolute position	on				
	Absolute						B
	Status	Incremental pos	sition				
	Incremental					BB	2
	Area	Rotational speed [rpm]	Accuracy [LSB]	Speed at deviation [rpm]	Deviation span [LSB]		
	s :	-	-	0.00			ł
	₩ [•.	∆0 ‡ 🤇)				£
					ROC 413	113175	0-05 [

Figure 218: Ascertainment of the absolute to incremental deviation

No velocity ranges or tolerance values are available when determining the **absolute to incremental deviation**. The deviation span is considered too high and displayed in red color, if the difference between the absolute position and the incremental position exceeds the absolute number of measuring steps per revolution.

13.8 Indramat

Connecting the encoder

Encoders with Indramat interface must be identified by entering the encoder ID in order that the test functions are available in the Adjusting and Testing Software.


Optional special functions (software options)

14.1 Overview

This chapter describes the special functions of the Adjusting and Testing Software that can be enabled by entering a license key.

Further information: "Enabling software options", Page 51

14.2 Advanced DRIVE-CLiQ functions (software option 14)

The following functions are available upon activation of the software option:

Setting the datum shift on encoders with interfaces of the DRIVE CLiQ type Precondition: The encoder supports datum shift.



The procedure is the same as for encoders with EnDat interface. **Further information:** "Setting datum shift", Page 209

Expanded parameter display
 Further information: "Expanded parameter display function", Page 362

14.2.1 Expanded parameter display function

With the **Expanded parameter display** function, you can search for a parameter number or save a parameter list.

When querying the parameters, you can choose between cyclic mode and acyclic mode. In cyclic mode, communication takes place in a defined time grid that is monitored. Master and encoder exchange both cyclic data, e.g. positions, and asynchronous data, e.g. parameters. In acyclic mode, the master controls the parameter request. Communication does not take place according to fixed time grid.



- To call this function, double-click **Expanded parameter display** in the function menu
- > The Adjusting and Testing Software displays the **Acyclic parameter display** screen

Parameter selection Desired parameter-number			
Parameter selection			
dentifier	Hex value	Interpreted value	1

Figure 219: Acyclic parameter display view of the Extended parameter display function

lcon	Function
	Enter parameters individually
	An individual parameter is displayed
	Show all parameters
-14-	All parameters are displayed
500	Query parameters in acyclic mode
2005	Activates acyclic parameter request
500	Query parameters in cyclic mode
2	Activates cyclic parameter request
	Save file
	Opens the dialog for saving the displayed parameters to a TXT file

14.2.2 Entering parameters individually

Precondition: The encoder supports the parameter.



- To display an individual parameter, click Enter parameter individually in the control bar
- Enter the desired parameter number
- The Adjusting and Testing Software displays the contents of the parameter

14.2.3 Showing all parameters



- Click Display all parameters in the control bar
- > The Adjusting and Testing Software shows a list of all parameters



The query may take several seconds.

6

You can save the parameter list in a file. **Further information:** "Saving the parameter list to a file", Page 364

14.2.4 Switching to cyclic parameter display



 To switch to the cyclic query mode, click Query parameters in cyclic mode in the control bar

14.2.5 Switching to acyclic parameter display



To switch to the acyclic query mode, click Query parameters in acyclic mode in the control bar

14.2.6 Saving the parameter list to a file

You can save the displayed parameters in a TXT file.



- Click Save file in the control bar
- Select the desired storage location in the dialog
- Enter the desired file name
- Click Save
- > The file is saved

14.3 Adjusting the tolerance limits of incremental signals (software option 20)

When you activate this software option you can adjust the tolerance limits the Adjusting and Testing Software uses for the current check of the incremental signals.

You can save the changed limit values in an INI file. You can load the limit values from this INI file back into the Adjusting and Testing Software and use them for later tolerance checks.



When you exit the **Incremental signal** function, the Adjusting and Testing Software resets the tolerance limits to default.

Further information: "Units and tolerances", Page 36

14.3.1 Customizing screen

In the **Customizing** view you can edit the **minimum** and **maximum** tolerance limits. The **Default** column shows the standard value saved in the encoder database.

malog Rec	oraing Counter	r Customizing	PWI Proto	col Note			
				Custo	mizing		
Name	Default	Minimum	Default	Maxim			
SigA	0.60 0	.6 😽 😭	1.20	1.2	3		
SigB	0.60	.6 👌 😭	1.20	1.2	3		
SigAB	0.80	.8	1.25	1.25	3		
TvA	-15.00 -	15 😽 😭	15.00	15	3 2		
ΤvΒ	-15.00 -	15 👌 😭	15.00	15	3 2		
Pha	-10.00 -	10 😽 😭	10.00	10	3 2		
Sig	0.30 0	.3 👌 😭	1.35	1.35	3		
NR	0.20 0	.2 👌 😭	1.60	1.6	3		
SR	0.20 0	.2 👌 😭	0.80	0.8	3 3		
RR	0.04 0	.04 😼 😭	1.70	1.7	3 8		
LR	-90.0 -	90 🕹 😭	90.0	90	3 3		
BR	180.0	80 🕹 😧	540.0	540	3 3		
B R digital	180.0	80 🕹 🔮	540.0	540	3		
Freq	0.0	3 2	1000000.0	100	3 2		
FA	0 0	3 😧	1000000000	100000000	o 🚯 😭		
¥ 🗳 📙	52						Û
	ERN 1387	2048 62S	14-70 RA	~1Vss	0 05		1 Vp

Figure 220: Customizing view of the Incremental signal function

Possible modifications

Name	Description
SigA	Signal amplitude
	Unit: volts
SigB	Signal amplitude
	Unit: volts
SigAB	Signal amplitude ratio
TvA	On-off ratio
	Unit: degrees
ТvВ	On-off ratio
	Unit: degrees
Pha	Phase angle
	Unit: degrees
Sig	Current signal monitoring
NR	Reference – usable component
	Unit: volts
SR	Reference – trigger threshold
	Unit: volts
RR	Reference – quiescent value
	Unit: volts

Name	Description
LR	Reference position
	Unit: degrees
BR	Reference width
	Unit: degrees
B R digital	Reference width
	Unit: degrees
Freq	Frequency
	Unit: kHz
FA	Minimum edge separation
	Unit: Microseconds

Operating elements

lcon	Function
	Reduce value
\checkmark	Reduces the value in the input field
A	Increase value
1	Increases the value in the input field
2	Load the changes
C de la companya de l	Adopts the changed values as new tolerance limits
	Open file
	Opens the dialog for reloading saved tolerance limits from an INI file
	Save file
	Opens the dialog for saving the tolerance limits to an INI file, or saves the tolerance limits under the displayed file name
	Save file as
	Opens the dialog for saving the tolerance limits to an INI file
~	Load default values
R	Loads the standard tolerance limits into the input fields

14.3.2 Customizing tolerance limits

-	
D	α
1	W
ن ا	1

- > Double-click Incremental signal in the function menu
- Click the Customizing tab to switch to the Customizing view

File Help	ATS - Adjusting and Te						-		×
Analog Red	ording Counte	r Customizing	PWT Proto	col Note					
				Custo	mizing				
Name	Default	Minimum	Default	Maxim	um				
SigA	0.60	.6 👌 😭	1.20	1.2	3				
SigB	0.60	.6 🕹 😭	1.20	1.2	3 4				
SigAB	0.80	.8 👌 😭	1.25	1.25	3 3				
TvA	-15.00	15 😽 🛊	15.00	15	3				
TvB	-15.00 -	15 🕹 😭	15.00	15	3				
Pha	-10.00 -	10 👌 😭	10.00	10	3				
Sig	0.30	.3 👌 😭	1.35	1.35	3 3				
NR	0.20 0	.2 👌 😭	1.60	1.6	3 3				
SR	0.20	.2 👌 😭	0.80	0.8	3 2				
RR	0.04	.04 👌 😭	1.70	1.7	3 3				
LR	-90.0	90 😽 🔮	90.0	90	3 3				
BR	180.0 1	80 🕹 🔮	540.0	540	3 3				
B R digital	180.0 1	80 🕹 🔮	540.0	540	3 3				
Freq	0.0	3 8	1000000.0	100	3 3				
FA	0	3 8	100000000	100000000	0 🐉 😭				
V 🔁 🗜									Û
85488-02	ERN 1387	2048 62S	14.70 DA	~1Vss	0 05			1 V	

Figure 221: Customizing view of the Incremental signal function

- To change a tolerance limit, enter the desired value in the input field
- Confirm with Enter or



- Click on Decrease value or Increase value next to the input field until the desired value is displayed
- Press and hold the operating element to change values more quickly

Lines .	HAIN: ATS - Adju	usting and T	esting Software							3	- 🗆	×
File Help		120.0										
Analog	Recording	Counte	er Customiz	ing PV	NT Proto	col Note						
						Custo	omizin	g				
					Ini t	file : Custor	mizing_cha	nged.ini				
Name	e Def	ault	Minimum	i.	Default	Maxin	num					
SigA	<	0.60	D.8		1.20	1	3 2					
SigB	B	0.60	D.8		1.20	1	3 2					
SigA	в	0.80	D.9		1.25	1.1	3 2					
TvA	-	15.00	-10		15.00	10	3 2					
TvB	-	15.00 -	-10	•	15.00	10	3 🔂					
Pha	-	10.00	-5	•	10.00	5	3 🔒					
Sig		0.30	0.5		1.35	1	3 2					
NR		0.20	D.4		1.60	1.4	3 2					
SR		0.20	0.4		0.80	0.6	3 2					
RR		0.04	D.4		1.70	1.4	3 2					
LR		-90.0 -	-45		90.0	45	3 2					
BR		180.0 1	181		540.0	539	3 2					
B R dig	jital	180.0	181		540.0	539	3 2					
Freq		0.0	1		1000000.0	99	3 2					
FA		0 1	1		1000000000	9999999999	3 3					
?		Z										î.
385488	-02 ERN	1387	2048 6	2814-	70 RA	~1Vss	0	05	Customizing	g_changed.ini	1	Vpp

Figure 222: Customizing view with changed tolerance limits

- ► To use the displayed tolerance limits for the current examination, click **Apply changes** in the control bar
- > The Adjusting and Testing Software will apply the new tolerance limits

The effect of the changes is as follows:

2

- X/Y graph: The positions of the gray circles correspond to the changed tolerance limits
- Bar graphs: The red marks correspond to the changed tolerance limits
- **Sig Mon** status displays: Signal monitoring uses the changed tolerance limits



Figure 223: Analog view with changed tolerance limits

14.3.3 Saving tolerance limits to a file

You can save the changed tolerance values in an INI file. You can create a new file for this purpose or overwrite an existing file.

Saving tolerance limits to a new file



- Click Save as in the control bar
- Select the desired storage location in the dialog
- Enter the desired file name
- Click Save
- > The file is saved
- The Adjusting and Testing Software shows the name of the file

Saving tolerance limits to an existing file

If you have saved tolerance limits in a file or loaded them from a file, you can overwrite the tolerance values of the displayed file.

- Load the desired file, if necessary
 Further information: "Loading tolerance limits from a file", Page 370
- The Adjusting and Testing Software shows the name of the file
- Customize tolerance limits
- Click Save file in the control bar
- > The file is overwritten

14

Loading tolerance limits from a file 14.3.4

Prerequisite: The values are available in an INI file.

To load tolerance limits from a file to the **Customizing** screen, proceed as follows:



- Click Open file in the control bar
- Select the storage location in the dialog
- Click Open
- > The Adjusting and Testing Software writes the limit values to the input fields



- To use the tolerance limits in the Adjusting and Testing Software, click Apply changes in the control bar
- The Adjusting and Testing Software will apply the new > tolerance limits

14.3.5 Resetting tolerance limits to default

When you exit the Incremental signal function, the Adjusting and Testing Software will automatically reset the tolerance limits to default.

If you would like to continue in the Incremental signal function and reset the tolerance limits to default, proceed as follows:



Click Load defaults in the control bar



- The Adjusting and Testing Software writes the default values to the input fields
- To use the tolerance limits in the Adjusting and Testing Software, click Apply changes in the control bar
- The Adjusting and Testing Software will apply the new > tolerance limits

option 20)

14.4 Setting the datum shift on encoders with companyspecific interfaces (software option 24)

If you activate this software option, you can also set a datum shift for encoders with the following interfaces:

- Fanuc
- Mitsubishi
- Panasonic
- Yaskawa

Precondition: The encoder supports datum shift.



The procedure is the same as for encoders with EnDat interface. **Further information:** "Setting datum shift", Page 209

14.5 Setting the datum shift on encoders with EnDat interfaces (software option 29)

If you activate this software option, you can also set a datum shift for encoders with the following interfaces:

EnDat

Precondition: The encoder supports datum shifting. **Further information:** "Setting datum shift", Page 209

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What to do if ...

15.1 Overview

This chapter describes the causes of faults or malfunctions and the appropriate corrective actions.

15.2 Troubleshooting

Fault	Cause of fault	Correction of fault
The Adjusting and Testing Software does not recognize the PWM	The PWM is not connected correctly, or supply voltage is missing	 Check whether the PWM is connected as specified in the operating instructions Further information: "Opening documentation", Page 45 Check the power cable Check whether the PWM is switched on Check whether the PWM has been selected as testing device Further information: "Selecting the PWM as testing device", Page 53
	Device drivers are missing	Further information: "Installing drivers", Page 40
	Device function faulty	 Contact a HEIDENHAIN service agency
The Adjusting and Testing Software does not recognize the encoder, or functions	Excessive voltage drop on the lines connecting the testing device and the encoder	 Activate voltage readjustment by the PWM Further information: "Connection in the Encoder Diagnostics operating mode", Page 58
cannot be performed	The cables are not suitable	 Check whether the prescribed cables are used (see "User's Manual Cables and Connection Technology") Further information: "Opening documentation", Page 45
The encoder ID cannot	The encoder has not	 Update the encoder database
be found in the encoder database	yet been added to the encoder database	Further information: "Updating software and encoder database", Page 40
		 Connect the encoder manually
		Further information: "Connecting the encoder", Page 55
		 Contact the HEIDENHAIN Service and ask for the ATS code
		Further information: "Connecting with ATS code or communication code", Page 85
	The ID is not correct	 Check whether correct ID was entered, e.g.: With exposed or multi-section encoders: the ID of the scanning head With sealed linear encoders: the ID of the scale housing Further information: "Connecting the encoder", Page 55
No signal is shown in the monitoring mode	The encoder is not supplied with power	 Check whether the subsequent electronics is switched on

Fault	Cause of fault	Correction of fault
The Adjusting and Testing Software does not display any infor- mation on incremental signals	The encoder does not output incremental signals	 Check if the encoder provides incremental signals Further information: "Measuring methods and interfaces", Page 24
Computer performance problems occur while the Adjusting and Testing Software is running	Processing power is insufficient or limited, e.g. because the PWM is connected to the computer via keyboard, USB hub or docking station	 Check the system requirements Further information: "System requirements", Page 38 Connect the PWM directly to the computer

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