HEIDENHAIN

Product Information

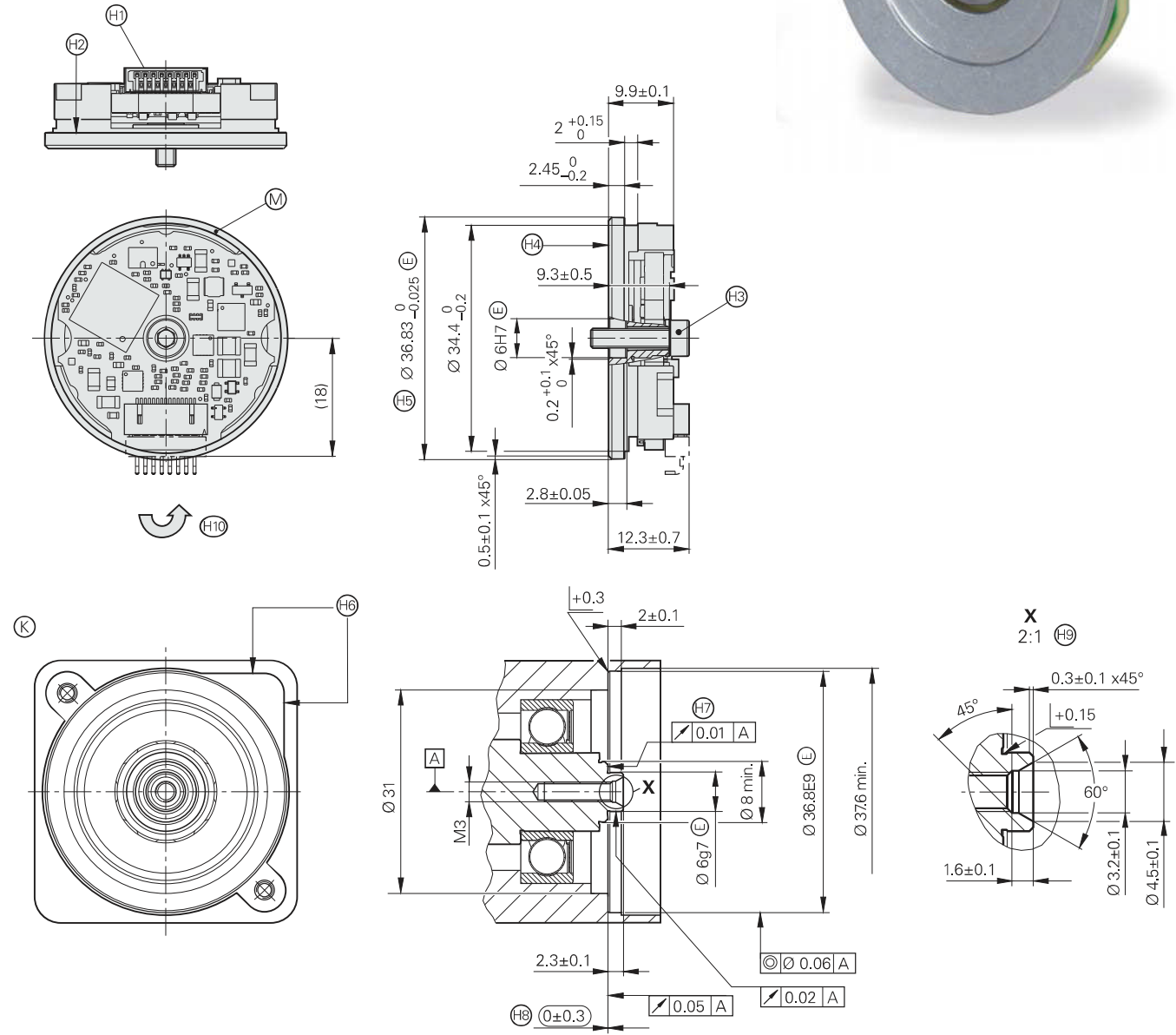## EBI 1135

Absolute Rotary Encoder
with Battery-Buffered
Multiturn Feature

EBI 1135

Rotary encoders without integral bearing for integration in motors
- **Installation diameter 36.83 mm**
- **Blind hollow shaft**
- **Battery-buffered multiturn function via external buffer battery**

mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

Ⓐ	= Bearing of mating shaft
Ⓚ	= Required mating dimensions
Ⓜ	= Measuring point for operating temperature
H1	= PCB connector, 15-pin
H2	= Clamping surface
H3	= Self-locking screw M3 ISO 4762 width A/F 2.5, tightening torque 1.2 ±0.1 Nm
H4	= Supporting surface of stator
H5	= Centering collar
H6	= Note the space required for cable
H7	= Shaft surface
H8	= Maximum permissible distance between shaft and bearing surface of stator during mounting and operation
H9	= Possible centering hole
H10	= Direction of shaft rotation for output signals as per the interface description

	Absolute **EBI 1135**
Absolute position values	EnDat 2.2
Ordering designation	EnDat 22 [1]
Position values/rev	262 144 (18 bits; 19-bit data word length with LSB = 0)
Revolutions	65 536 (16 bits)
Elec. permissible speed	$\leq 12\,000$ min^{-1} for continuous position value
Calculation time t_{cal}	≤ 6 µs
System accuracy	$\pm 120''$
Power supply	*Rotary encoder U_P:* DC 3.6 to 14 V *Buffer Battery U_{BAT}:* DC 3.6 to 5.25 V
Power consumption (maximum)	*Normal operation with 3.6 V:* 520 mW *Normal operation with 14 V:* 600 mW
Current consumption (typical)	*Normal operation with 5 V:* 80 mA (without load) *Buffer battery operation[2]:* 22 µA (with rotating shaft) 12 µA (at standstill)
Electrical connection	Via PCB connector, 15-pin
Shaft	Blind hollow shaft Ø 6 mm, axial clamping
Mech. permiss. speed n	$\leq 12\,000$ min^{-1}
Mech. permissible acceleration	$\leq 10^5$ rad/s^2
Moment of inertia of rotor	$0.14 \cdot 10^{-6}$ kgm^2
Permissible axial motion of measured shaft	± 0.3 mm
Vibration 55 to 2 000 Hz **Shock** 6 ms	$\leq\;\;\;300$ m/s^2 (EN 60068-2-6) $\leq 1\,000$ m/s^2 (EN 60068-2-27)
Max. operating temp.	115 °C
Min. operating temp.	–20 °C
Protection EN 60 529	IP 00 [3]
Weight	Approx. 0.02 kg

[1] External temperature sensor and online diagnostics are not supported. Compliance with the EnDat specification 297 403 and the EnDat Application Notes 722 024, Chapter 11, "Connecting the EBI 1135 Rotary Encoder with Battery-Buffered Revolution Counter" is required for correct control of the encoder.
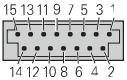[2] At T = 25 °C; U_{BAT} = 3.6 V
[3] CE compliance of the complete system must be ensured by taking the correct measures during installation.

Electrical Connection

Encoder Cable

Encoder cable With one connector		TPE 8xAWG26/19	640 055-xx

Pin Layout

15-pin PCB connector	15 13 11 9 7 5 3 1 14 12 10 8 6 4 2 15							

	Power supply				Absolute position values			
15	**13**	**11**	**14**	**12**	**7**	**8**	**9**	**10**
	U$_P$	**U$_{BAT}$**	**0 V**	**Battery 0 V**	**DATA**	**$\overline{DATA}$**	**CLOCK**	**$\overline{CLOCK}$**
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U$_P$** = power supply voltage; **U$_{BAT}$** = external buffer battery voltage
Vacant pins or wires must not be used!

Connection of the external buffer battery

The multiturn feature of the EBI 1135 is realized through a revolution counter. To prevent loss of the absolute position information during power failure, the EBI must be driven with an external buffer battery.

A lithium thionyl chloride battery with 3.6 V and 1 500 mAh is recommended as buffer battery. A service life of over 10 years in appropriate conditions (one EBI per battery; ambient temperature 25 °C; shaft at standstill, self-discharge < 1 % per year) can be expected.

If the application requires compliance with DIN EN 60086-4 or UL 1642, an appropriate protective circuit is required for protection from wiring errors.

If the battery voltage falls below certain limits, the EBI issues warnings or error messages over the EnDat interface:
• **"M Battery" warning**
  2.8 to 3.2 V (typically 2.9 V)
• **"M All Power Down" error message**
  2.0 to 2.4 V (typically 2.2 V): the encoder has to be re-referenced.

The EBI uses low battery current even during normal operation. The amount of current depends on the ambient temperature.
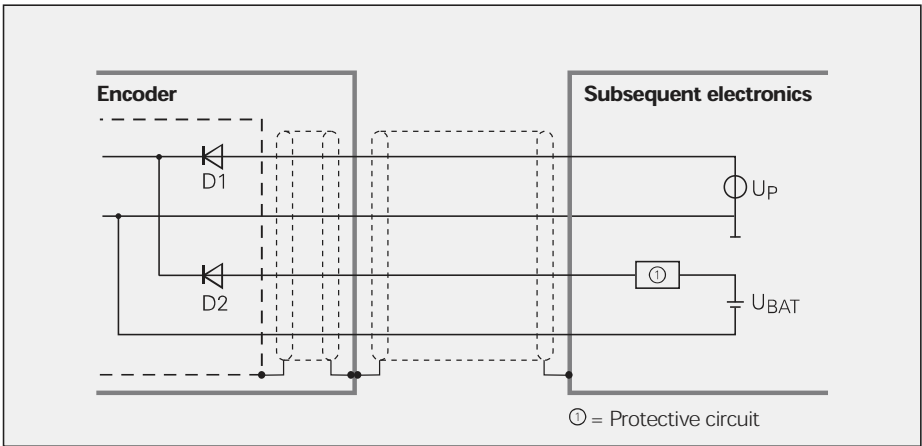
Connection of the Buffer Battery
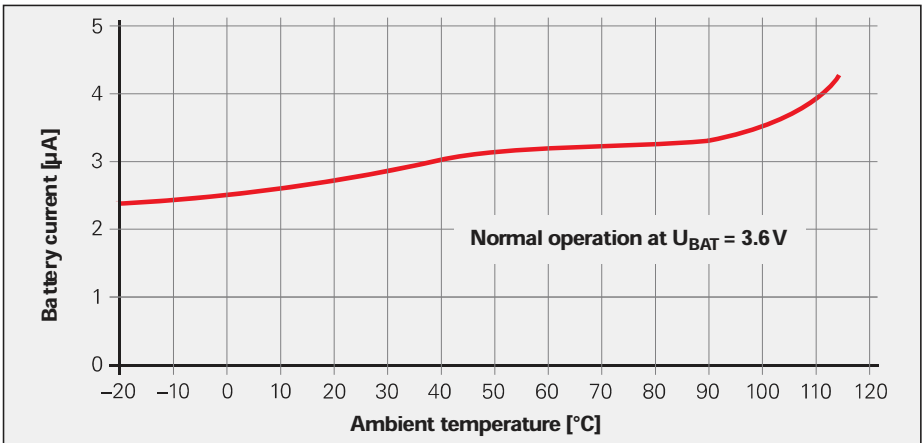
Typical discharge current in normal operation

Adjusting and Testing Software

PWM 20

Together with the ATS adjusting and testing software, the PWM 20 phase angle measuring unit serves for diagnosis and adjustment of HEIDENHAIN encoders.

PWM 20	
Encoder input	• EnDat 2.1 or EnDat 2.2 (absolute value with/without incremental signals) • DRIVE-CLiQ • Fanuc Serial Interface • Mitsubishi High Speed Serial Interface • SSI
Interface	USB 2.0
Power supply	AC 100 to 240 V or DC 24 V
Dimensions	258 mm 154 mm 55 mm

ATS	
Languages	Choice between English or German
Functions	• Position display • Connection dialog • Diagnostics • Mounting wizard for EBI/ECI/EQI, LIP 200, LIC 4000 • Additional functions (if supported by the encoder) • Memory contents
System requirements	PC (Dual-Core processor; > 2 GHz); main memory> 1 GB; Windows XP, Vista, 7 (32 Bit); 100 MB free space on hard disk

Cables for PWM 20

Test of battery buffering possible

Cable
Wired with 15-pin PCB connector for EBI and M23 coupling (male), 17-pin
Length 1.00 m
ID 573 552-01

Adapter cable
With 15-pin D-sub connector for IK 215, PWM 20 and 17-pin M23 connector (female)
ID 324 544-xx

Adapter
For providing an external buffer voltage (to test the buffer function)
With 17-pin M23 connector and coupling
ID 652 780-01

Mounting accessories
Aid for connecting or disconnecting the PCB connector
ID 592 818-01

Without test of battery buffering

Cable
For IK 215, PWM 20, incl. three 12-pin adapter connectors and three 15-pin adapter connectors
ID 621 742-01

15-pin adapter connector
Three connectors for replacement
ID 528 694-02

Mounting accessories
Aid for connecting or disconnecting the PCB connector
ID 592 818-01

Mounting Information

The EBI 1135 is an encoder without integral bearing. This means that mounting and operating conditions influence the functional reserves of the encoder. It is essential to ensure that the specified mating dimensions and tolerances are maintained in all operating conditions. The following in particular must be kept in mind:

- Axial runout of flange mounting surface
- Radial runout of the motor shaft
- Maintaining the scanning gap (a), while taking into account the superimposition of motions, such as:
  - The length relation of the motor shaft and housing under temperature influence (T_1; T_2; α_1; α_2) depending on the position of the fixed bearing (b)
  - The bearing play (Cx)
  - Nondynamic shaft offsets due to load (X_1)
  - The effect of engaging motor brakes (X_2)

The application analysis must result in values within specification under all operating conditions (above all under max. load and at minimum and maximum operating temperature) for the measured

- max. radial runout of the motor shaft
- max. axial runout of the motor shaft with respect to the mounting surface
- max. scanning gap (a)
- minimum scanning gap (a)

and under consideration of the signal amplitude (by inspecting the scanning gap at room temperature) by means of the ATS software.
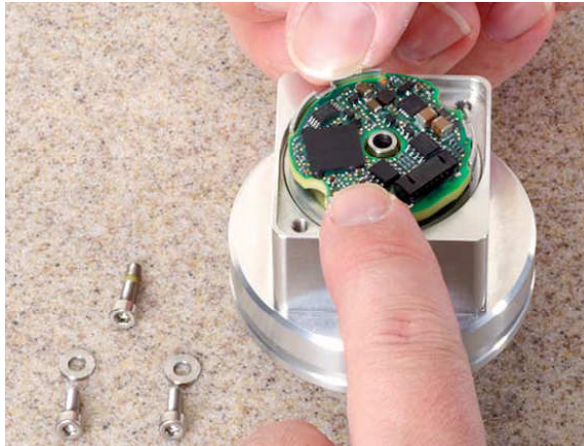
Furthermore, the general mechanical and electrical information in the current *Position Encoders for Servo Drives* brochure must be kept in mind!
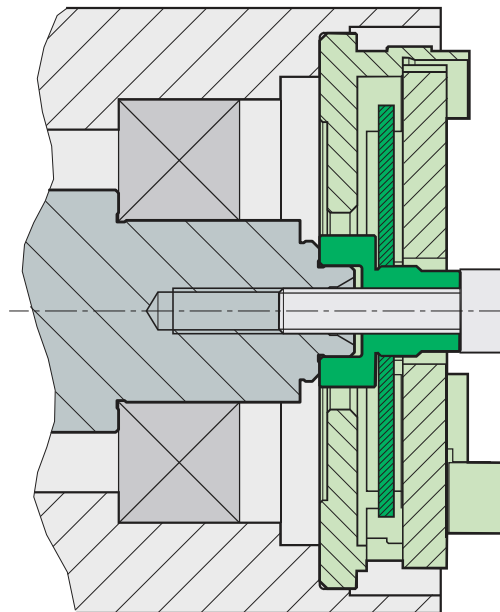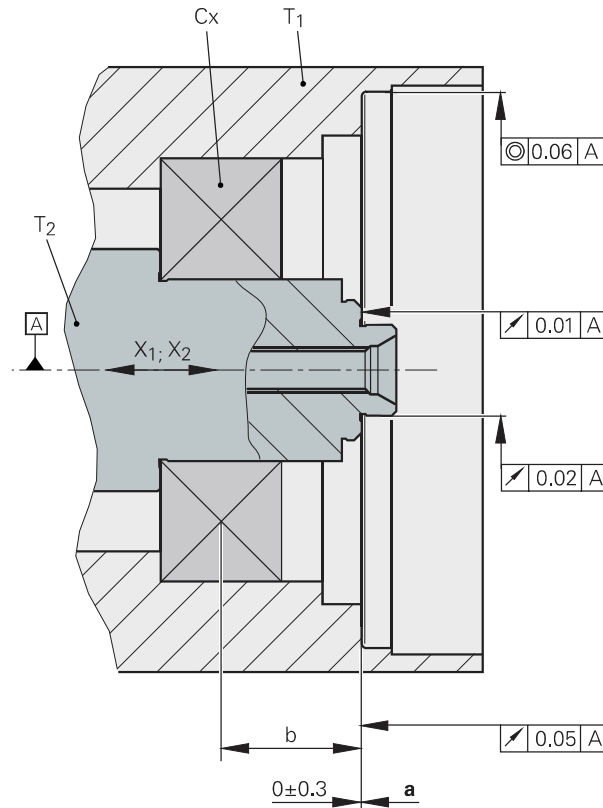
Mounting/Removing the Rotary Encoder

Slide on the encoder

Without applying too much force, slide the encoder onto the mating shaft; do not jam it.

Clamp the encoder shaft

Secure the encoder shaft with the central screw.
- Self-locking screw M3 x 12 mm as per DIN EN ISO 4762-A2 W/F 2.5
- Tightening torque: 1.2 ± 0.1 Nm (with torque wrench)

Appropriate tools are available from HEIDENHAIN.

Clamp the encoder flange

Fasten the encoder housing to the clamping surface with at least two sets of screws and washers by evenly tightening them crosswise with increasing tightening torque.
- Self-locking screws as per DIN EN ISO 4762 (e.g. 2x M3 x 20 mm SW 2.5)
- Washers as per ISO 7092
- Tightening torque (e.g. 1.2 ± 0.1 Nm) to be set in accordance with the selected screw (use a torque wrench)

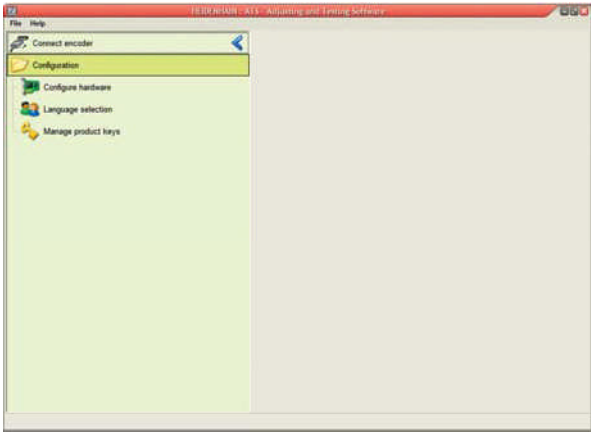Appropriate tools are available from HEIDENHAIN.

Removing the rotary encoder

The encoder is removed in the opposite sequence. Remount only if the encoder and mounting parts are in faultless condition.

Checking the Mounting

Examination with the ATS software
(At room temperature, U_P = 3.6 to 14 V)
Start the ATS software.

Rotary encoder inspection is supported as of ATS version 2.2.00. The software version can be called over "Help" in the menu bar.
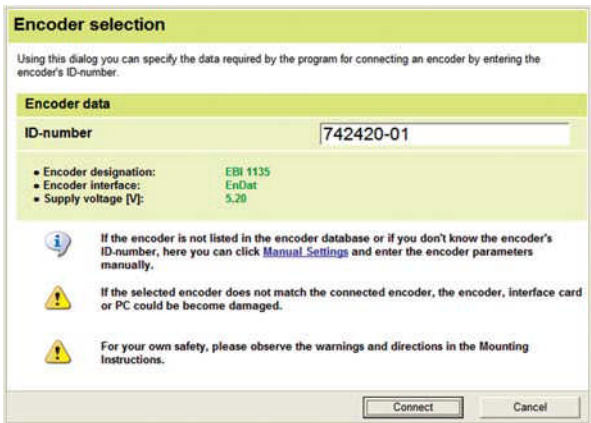

Connect the testing cable
(15-pin PCB connector; ensure proper polarization).
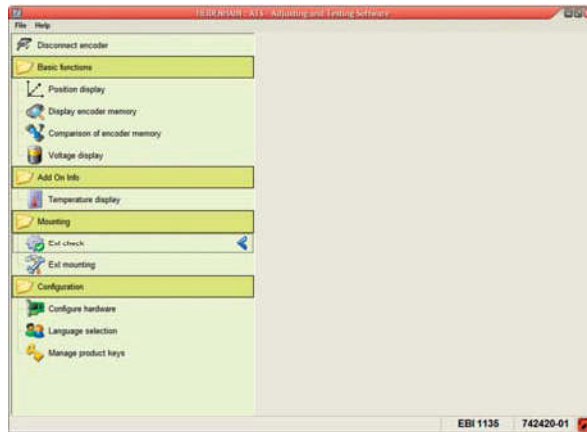Check the mounting quality by means of the ATS software.
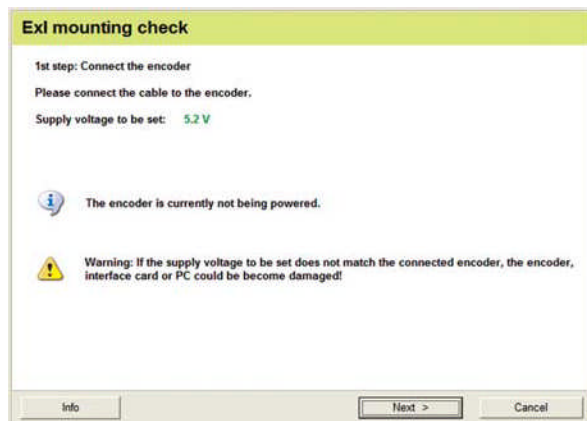

Connection setup
Select "Connect encoder" and enter the ID number.
Then select "Connect."
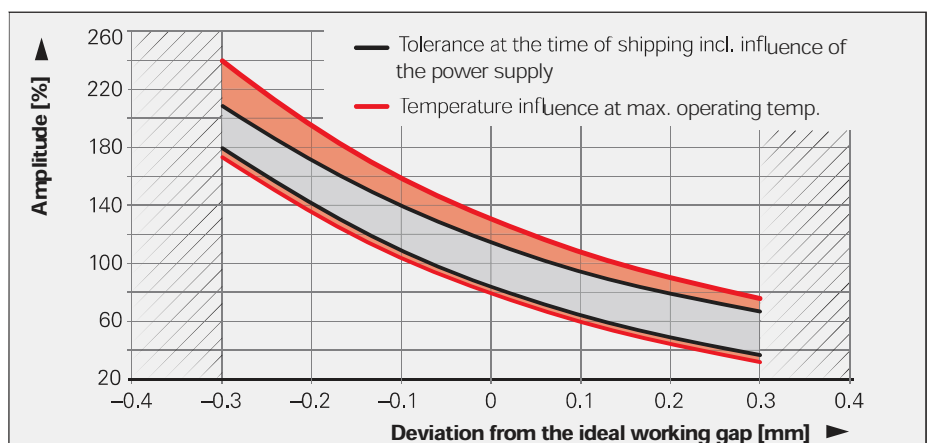
Select "Exl check" under "Mounting."

Press "Next."
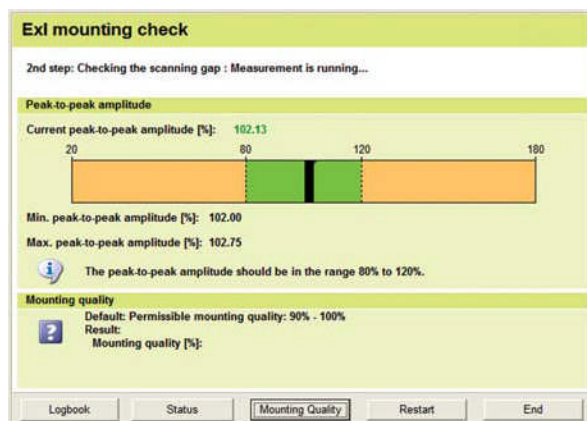
Exl mounting check

1st step: Connect the encoder

Please connect the cable to the encoder.

Supply voltage to be set: 5.2 V

(i)   The encoder is currently not being powered.

⚠   Warning: If the supply voltage to be set does not match the connected encoder, the encoder, interface card or PC could be become damaged!

| Info | | Next > | Cancel |

Checking the scanning gap

Important note
A signal amplitude deviating from 100 % limits permissible axial motion for operation (see diagram).

Exl mounting check

2nd step: Checking the scanning gap : Measurement is running...

Peak-to-peak amplitude

Current peak-to-peak amplitude [%]:   102.13
20   80   120   180

Min. peak-to-peak amplitude [%]: 102.00
Max. peak-to-peak amplitude [%]: 102.75

(i)   The peak-to-peak amplitude should be in the range 80% to 120%.

Mounting quality
Default: Permissible mounting quality: 90% - 100%
Result:
    Mounting quality [%]:

| Logbook | Status | Mounting Quality | Restart | End |

Checking the mounting quality
Select "Mounting quality."
Then rotate the encoder shaft slowly until the value for mounting quality is shown.

Important note
The mounting quality should lie within 90 % to 100 %. A mounting quality of < 90 % indicates an inadequate mounting situation. If necessary, check the mating dimensions and repeat the mounting procedure.
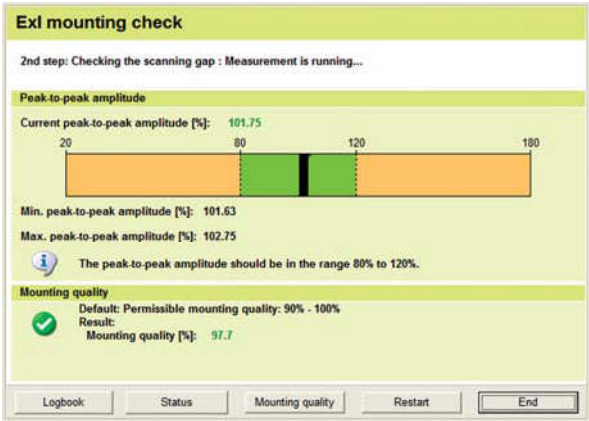
Active warnings and alarms can be displayed through "Status."
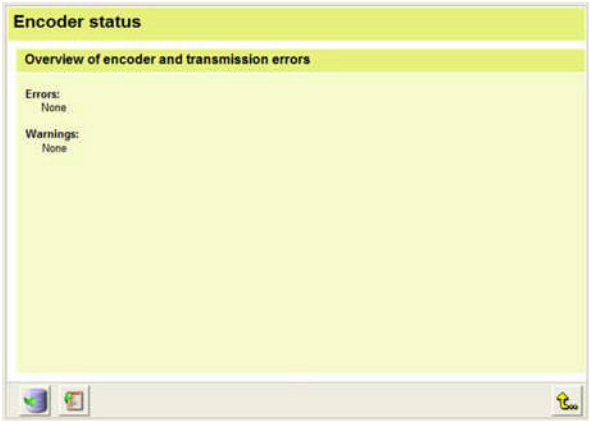
The detailed results of all measurements are saved in the log file through the "Logbook." Comments can be entered.
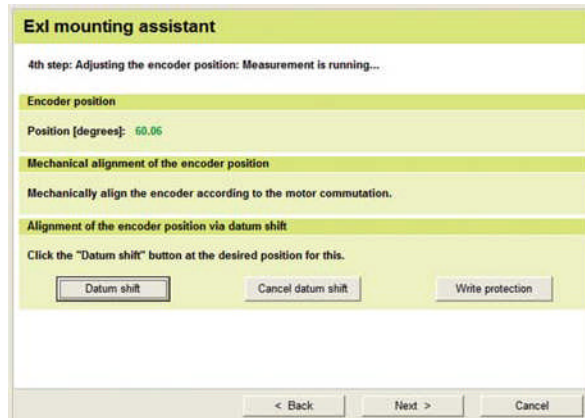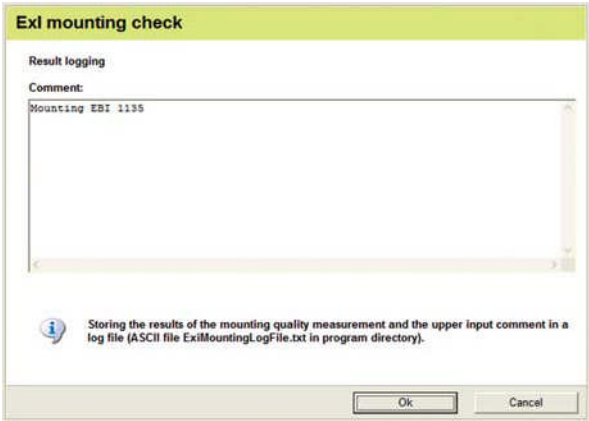

Note
The measurement results (amplitude, mounting quality, etc.) can be called, printed and archived with "Log file." The log file is in the ATS program folder and has to be opened using Windows Explorer.
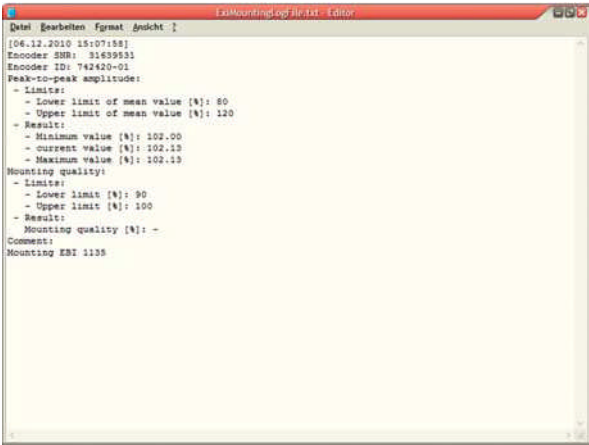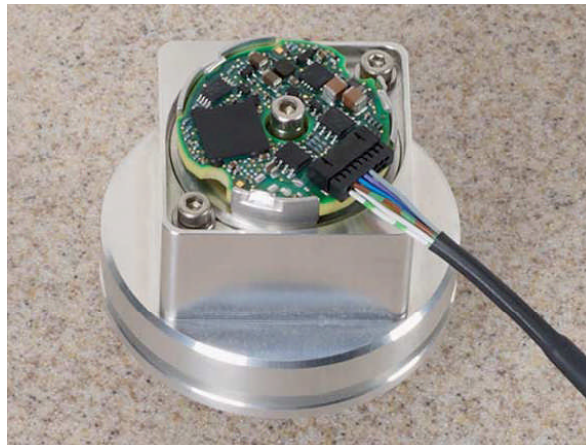
Inspection complete. Select **End** or **Restart**.

Note
For synchronous motors, an optional EnDat datum shift can be conducted (select **Datum shift**) to align the encoder signals to the motor commutation.

Remove testing cable, mount encoder cable.

For more information
- Catalog: *Position Encoders for Servo Drives*
- *EnDat Specification*   297 403
- *EnDat Application Notes*   722 024