HEIDENHAIN

Product Information

EIB 2391 S
External Interface Box

EIB 2391S
ID 768 200-02 U7
SN X 58 571 197
Safety
HEIDENHAIN
www.heidenhain.de

Functional Safety

EIB 2391 S
External interface box with firmware version 15
- Input: HEIDENHAIN encoders with EnDat22 interface
- Output: DRIVE-CLiQ interface

Encoder requirements
The EIB 2391 S makes it possible to connect encoders with the ordering designation EnDat22 to the DRIVE-CLiQ interface.

Depending on the firmware version of the EIB and the subsequent electronics, it might be possible to also attach other encoders with an EnDat22 interface. Please contact HEIDENHAIN or the manufacturer of the subsequent electronics for further information.

After switch-on, the EIB tests various characteristics of the connected encoder and automatically adapts itself to it. If the encoder does not meet the necessary requirements, an error message is issued via the DRIVE-CLiQ interface.

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	Compatible with EIB 2391 S
Absolute sealed linear encoders, e.g., LC 100, LC 400, LC 200	✓
Absolute exposed linear encoders, e.g., LIC 4100, LIC 3100, LIC 2100	✓
Absolute angle encoders, e.g., RCN 2001, RCN 5001, RCN 8001, RCN 6000 ROC 2000, ROC 7000 ECN 2000 ECA 4000 ECM 2400 MRP 2000, MRP 5000, MRP 8000 SRP 5000	✓ ✓ ✓ ✓ ✓ ✓ ✓
Absolute singleturn encoders, e.g., ECN 100 ECI 100, ECI 1100, ECI 1300	✓ ✓
Absolute multiturn encoders, e.g., EQI 1100, EQI 1300	✓
Length gauges, e.g., AT 3000 AT 1200	✓ ✓
Incremental EnDat encoders, e.g., ERM 2400, LIP 200, EIB 100, EIB 300, EIB 1500	–
Encoders with battery-buffered revolution counter, e.g., EBI 100, EBI 1100, EBI 4000	–

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

2x ISO 4762–M4x12
10
M_d = 0.6 Nm ... 0.8 Nm
12.5
34
64
14
36±0.2
6
11.5
23
46±0.2
(48)
Ø 4.8
Ø 7.5
M4
M_d = 2.5 Nm ± 0.2 Nm
17.5
35
58
M_d = 0.6 Nm ... 0.8 Nm

Online diagnostics
With EnDat 2.2 encoders, valuation values can be read cyclically from the encoder to evaluate its functioning. These valuation numbers indicate the encoder's current status and can be used to determine its "function reserves." These function reserves are also transmitted via the DRIVE-CLiQ interface and can be displayed in the higher-level control. Further information is available from HEIDENHAIN upon request.

Temperature sensor information
The EIB 2391 S does not have a temperature sensor input, but it can evaluate the temperature sensor information from connected EnDat encoders and pass it through the DRIVE-CLiQ interface. Up to four types of temperature information can be transmitted. The EIB 2391 S supports transmission from:
- an internal temperature sensor (value is provided in the DRIVE-CLiQ parameter "Encoder Temperature")
- up to three external temperature sensors (values are provided in the DRIVE CLiQ parameter "Motor temperature 2-4"; the calculated highest value of the three sensors is output in the parameter "Motor temperature 1")

The EIB 2391 S can simultaneously process the information of one external and one internal temperature sensor. If more than one external temperature sensor is used, the value of the internal temperature sensor can no longer be provided.

The evaluation of the connected sensors can be set via the DRIVE-CLiQ interface, depending on the settings of the EnDat encoder. This allows temperature sensors of types KTY 84-130, PT 1000, and PTC to be evaluated. For more information, please contact HEIDENHAIN.

You can find further information on the availability and mapping of the temperature sensor information in the documentation of the connected EnDat encoder.

Firmware versions
Two firmware versions are available for the EIB 2391 S. The firmware version can be read out over the DRIVE-CLiQ parameter "Act_FW_Version" (index 0). The final two digits of the displayed value are decisive. The following information is given with reference to these two places.

EIB 2391 S with ID 768200-01
- Delivered with **firmware version 11**
- An update from firmware version 11 to version 15 is possible via the DRIVE-CLiQ series electronics
- Will be replaced by EIB 2391 S with ID 768200-02

EIB 2391 S with ID 768200-02
- Delivered with **firmware version 15**
- Replaces the EIB 2391 S with ID 768200-01 because it is backwards compatible

Please note:
A downgrade from firmware version 15 to version 11 is not permissible

Functional safety
In principle, the EIB can be used in safety-related applications only if functional safety is supported by the connected encoder. The characteristics with regard to functional safety are substantially determined by the connected encoder and the subsequent electronics (if required, contact the manufacturer; the EIB basically conveys the characteristics of the encoder).

The **safe position** is also substantially determined by the connected encoder and the subsequent electronics. The EIB itself does not influence the safe position. The "safe position" and "safety-related measuring step (SM)" of the connected EnDat encoder are required to calculate the safe position. For more information, please contact the manufacturer of the subsequent electronics.

The **PFH value** of the total system (EIB 2391 S + encoder) is the sum of the PFH values of the EIB 2391 S and the connected encoder. For information on the encoder, please refer to its documentation (Product Information document, brochure, and mounting instructions). The EIB 2391 S is designed for a service life of 20 years (in accordance with ISO 13849).

Please contact the manufacturer of the subsequent electronics for more information on the application of the EIB and encoder in safety-related applications.

Restrictions
With linear encoders featuring measuring lengths greater than 50 m, there may under certain circumstances be limitations in the output of the commutation angle via the DRIVE-CLiQ interface. Please contact HEIDENHAIN in such cases. HEIDENHAIN recommends setting the datum shift in the subsequent electronics. If the datum shift is used in the EnDat area, it must be less than 3 m, and no position values less than zero may result.

TIME_MAX_ACTVAL
The calculation time TIME_MAX_ACTVAL specifies the earliest time (relative to the request time) after which the transfer of data from the encoder to the control can begin. The value depends on the parameters of the connected encoder (calculation time and resolution) and the cable length. Furthermore, there can be restrictions when setting the cycle times. For more information, please refer to the documentation for the DRIVE-CLiQ subsequent electronics.
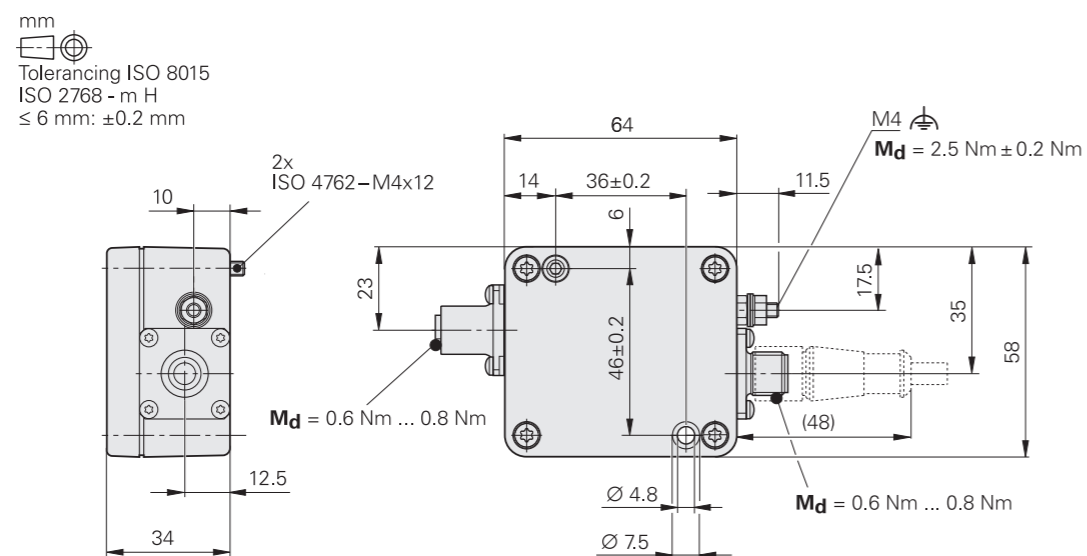
NOTE:
The software of the DRIVE-CLiQ subsequent electronics must be designed for operation of the EIB 2391 S in safety-related applications. For more information on availability, please refer to the manufacturer.

Specifications	EIB 2391 S
Functional safety	Depending on the connected encoder and subsequent electronics, suited for applications with up to • SIL 2 as per EN 61508 (further basis for testing: EN 61800-5-2) • Category 3 PL d as per EN ISO 13849-1:2016-06
PFH	$26 \cdot 10^{-9}$ (with respect to an operating elevation of ≤ 1000 m above sea level)
Safe position	Determined by the connected encoder and the subsequent electronics (i.e. through the configuration); the EIB has no influence on the safe position
Input	
Interface	EnDat 2.2
Ordering designation	EnDat22 (note the *Encoder requirements*)
Electrical connection	8-pin M12 connector (female)
Encoder supply voltage (U_{P2})	DC 5.1 V ±0.15 V, max. 2500 mW
Cable length	≤ 100 m[2]
Output	
Interface	DRIVE-CLiQ
Firmware	01.32.27.15
SINAMICS, SIMOTION[1]	$\geq$ V4.6 HF3
SINUMERIK with safety[1]	$\geq$ V4.7 SP1 HF1
SINUMERIK without safety[1]	$\geq$ V4.5 SP2 HF4
Calculation time TIME_MAX_ACTVAL	Refer to *TIME_MAX_ACTVAL* on page 3
Ordering designation	DQ01
Electrical connection	8-pin M12 connector (male)
Cable length	≤ 95 m[3]
Supply voltage (U_{P1})	DC 24 V (16.0 V to 28.8 V) (up to DC 36.0 V possible without impairing functional safety)
Power consumption	*Maximum* At 16.0 V: ≤ 4.1 W At 28.8 V: ≤ 4.35 W *Typical* At 24 V: 1.1 W + 1.15 · P_{Mtyp} (with P_{Mtyp} = typical power consumption of the encoder)
Elevation	≤ 1000 m
Operating temperature	0 °C to 60 °C
Storage temperature	–30 °C to 70 °C
Vibration 55 to 2000 Hz **Shock** 11 ms	100 m/s^2 (IEC 60068-2-6) 200 m/s^2 (IEC 60068-2-27)
Protection EN 60529	IP65
Mass	$\approx$ 180 g

[1] Information from Siemens as per the document *"Certified encoders with DRIVE-CLiQ Dependencies on SIMOTION / SINUMERIK and SINAMICS Hardware and Software versions"* (version: 04/2019)
[2] With HEIDENHAIN cable. Comply with the supply voltage at the encoder
[3] Depending on the output cable; the plug connection to the EIB is to be considered a DRIVE-CLiQ coupling.

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Interfaces

Pin layout of the EIB input

Mating connector
8-pin M12 coupling (male)

	Power supply				Serial data transmission			
EnDat	**8**	**2**	**5**	**1**	**3**	**4**	**7**	**6**
	U_{P2}	**Sensor** U_{P2}	0 V	**Sensor** 0 V	**DATA**	$\overline{DATA}$	**CLOCK**	$\overline{CLOCK}$
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Pin layout of the EIB output

On the EIB 2391 S
8-pin M12 flange socket (male)

	Power supply		Serial data transmission				Miscellaneous	
DRIVE-CLiQ	**1**	**5**	**3**	**4**	**7**	**6**	**2**	**8**
	U_{P1}	0 V	**RXP**	**RXN**	**TXP**	**TXN**	/	/

Cable shield connected to housing; U_P = Power supply voltage
Sensor: The sense line is connected in the EIB with the corresponding power line
Vacant pins or wires must not be used!

Adapter cables and connecting cable for DRIVE-CLiQ

PUR [2(2 x 0.17 mm^2) + (2 x 0.24 mm^2)]; A_P = 0.24 mm^2

		Ø	ID
Adapter cable With 8-pin M12 connector (female) and RJ45 Siemens connector (IP67) Cable length: 1 m		Ø 6.8 mm	1094652-01
Adapter cable With 8-pin M12 connector (female) and RJ45 Siemens connector (IP20)		Ø 6.8 mm	1093042-xx
Connecting cable With 8-pin M12 connector (female) and 8-pin M12 coupling (male)		Ø 6.8 mm	822504-xx

A_P: Cross section of power supply lines

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This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.

📖 **Further information:**

Comply with the requirements described in the following documents to ensure correct and intended operation:
• Brochure, Product Information, and Mounting Instructions of the connected encoder
• Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
• Brochure: *Cables and Connectors* 1206103-xx
• Technical Information document: *Safety-Related Position Measuring Systems* 596632
• Mounting Instructions: *EIB 2391 S* 895532
Applicable for implementation in a control or inverter:
• Data of the subsequent electronics manufacturer for use of the EIB 2391 S in safety-related applications