



# HEIDENHAIN



**Functional  
Safety**

Product Information

## **EIB 2391 S** External Interface Box

# 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 EnDat22 ordering designation to the DRIVE-CLiQ interface.

Depending on the firmware version of the EIB and the downstream electronics, it may be possible to connect other encoders with an EnDat22 interface. For more information, please contact HEIDENHAIN or the manufacturer of the downstream electronics.

After switch-on, the EIB checks 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
<b>Absolute enclosed linear encoders</b> , e.g., LC 100, LC 400, LC 200	✓
<b>Absolute exposed linear encoders</b> , e.g., LIC 4100, LIC 3100, LIC 2100	✓
<b>Absolute angle encoders</b> , 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	✓
	✓
	✓
	✓
	✓
	✓
<b>Absolute singletum rotary encoders</b> , e.g., ECN 100 ECI 100, ECI 1100, ECI 1300	✓
<b>Absolute multitum rotary encoders</b> , e.g., EQI 1100, EQI 1300	✓
<b>Length gauges</b> , e.g., AT 3000 AT 1200	✓
<b>Incremental EnDat encoders</b> , e.g., ERM 2400, LIP 200, EIB 100, EIB 300, EIB 1500	—
<b>Encoders with a battery-buffered revolution counter</b> , e.g., EBI 100, EBI 1100, EBI 4000	—

## Online diagnostics

With EnDat 2.2 encoders, valuation numbers can be read cyclically from the encoder in order to evaluate its functionality. 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 along via the DRIVE-CLiQ interface. Information from up to four temperature sensors can be transmitted. The EIB 2391 S supports transmission from:

- One internal temperature sensor (the value is provided in the DRIVE-CLiQ parameter "Encoder Temperature")
- Up to three external temperature sensors (the values are provided in the DRIVE-CLiQ parameter "Motor temperature 2-4"; the highest calculated 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, then 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 enables evaluation of KTY 84-130, PT 1000 and PTC temperature sensors. For more information, please contact HEIDENHAIN.

For more information about the availability and mapping of the temperature sensor information, please refer to 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 via 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 digits.

- 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 downstream electronics (DRIVE-CLiQ).
  - 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

The EIB can be used in safety-related applications, but only if functional safety is supported by the connected encoder. The characteristics pertaining to functional safety are largely determined by the connected encoder and the downstream electronics (if required, contact the manufacturer; the EIB passes on the main characteristics of the encoder).

The **safe position** is also largely determined by the connected encoder and the downstream 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 in order for the safe position to be calculated. For more information, please contact the manufacturer of the downstream electronics.

The **PFH value** of the overall system (EIB 2391 S + encoder) is the sum of the PFH values of the EIB 2391 S and the connected encoder. For information about 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). For more information about using the EIB and the encoder in safety-related applications, please contact the manufacturer of the downstream electronics.

## Limitations

For linear encoders with measuring lengths greater than 50 m, there may be limitations to the output of the commutation angle via the DRIVE-CLiQ interface under certain circumstances. Please contact HEIDENHAIN in such cases. HEIDENHAIN recommends setting the datum shift in the downstream electronics. If the datum shift is used in the EnDat area, then it must be less than 3 m and not result in position values less than zero.

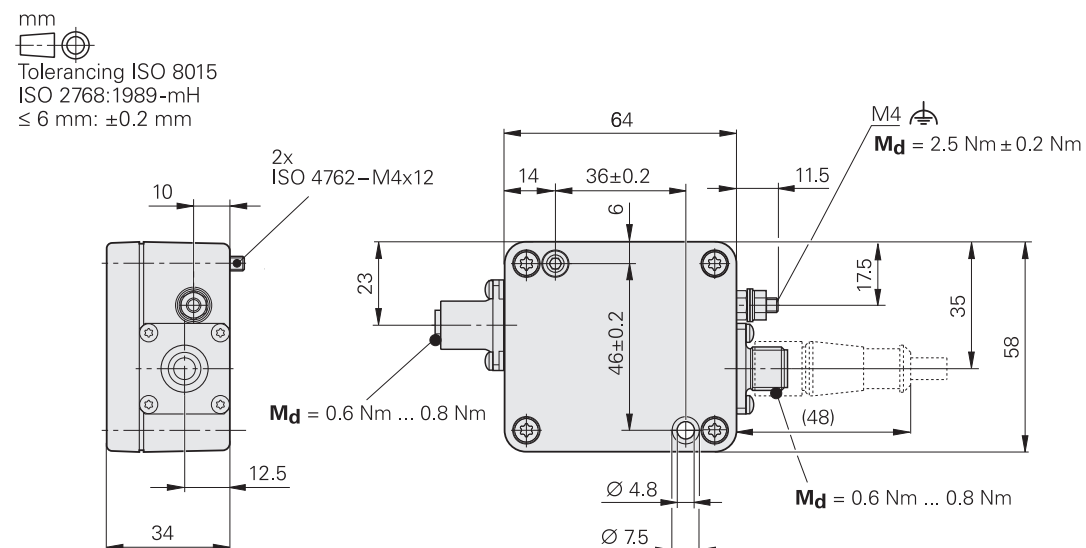
## TIME\_MAX\_ACTVAL

The calculation time TIME\_MAX\_ACTVAL specifies the earliest time (relative to the request time) after which data transfer 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. There can also be limitations with regard to setting the cycle times. For more information, please refer to the documentation of the downstream electronics (DRIVE-CLiQ).



**Please note:**

In order for the EIB 2391 S to be operated in safety-related applications, the software must be designed in conformity with the downstream DRIVE-CLiQ electronics. For more information on availability, please contact the manufacturer.



Specifications	EIB 2391 S
<b>Functional safety</b>	Depending on the connected encoder and downstream electronics, suitable for applications with up to: <ul style="list-style-type: none"> <li>SIL 2 as per EN 61508 (further basis for testing: EN 61800-5-2)</li> <li>Category 3, PL d, in accordance with EN ISO 13849-1:2015</li> </ul>
PFH	$26 \cdot 10^{-9}$ (with respect to an operating elevation of $\leq 1000$ m above sea level)
Safe position	Determined by the connected encoder and the downstream electronics (including through the configuration); the EIB has no influence on the safe position
<b>Input</b>	
Interface	EnDat 2.2
Ordering designation	EnDat22 (note the <i>Encoder requirements</i> )
Electrical connection	8-pin M12 connector (female)
Encoder supply voltage ( $U_{P2}$ )	DC 5.1 V $\pm 0.15$ V, max. 2500 mW
Cable length	$\leq 100$ m <sup>2)</sup>
<b>Output</b>	
Interface	DRIVE-CLiQ
Firmware	01.32.27.15
SINAMICS, SIMOTION <sup>1)</sup>	$\geq V4.6HF3$
SINUMERIK with safety <sup>1)</sup>	$\geq V4.7 SP1 HF1$
SINUMERIK without safety <sup>1)</sup>	$\geq V4.5 SP2 HF4$
Calculation time TIME_MAX_ACTVAL	Refer to <i>TIME_MAX_ACTVAL</i> on page 3
Ordering designation	DQ01
Electrical connection	8-pin M12 connector (male)
Cable length	$\leq 95$ m <sup>3)</sup>
<b>Supply voltage</b> ( $U_{P1}$ )	DC 24 V (16.0 V to 28.8 V) (up to DC 36.0 V possible without impairing functional safety)
Power consumption	<i>Maximum</i> At 16.0 V: $\leq 4.1$ W At 28.8 V: $\leq 4.35$ W <i>Typical</i> At 24 V: $1.1$ W + $1.15 \cdot P_{Mtyp}$ (with $P_{Mtyp}$ = Typical power consumption of the encoder)
<b>Elevation</b>	$\leq 1000$ m
<b>Operating temperature</b>	0 °C to 60 °C
<b>Storage temperature</b>	-30 °C to 70 °C
<b>Vibration</b> 55 to 2000 Hz <b>Shock</b> 11 ms	100 m/s <sup>2</sup> (IEC 60068-2-6) 200 m/s <sup>2</sup> (IEC 60068-2-27)
<b>Protection rating</b> EN 60529	IP65
<b>Mass</b>	$\approx 180$ g

<sup>1)</sup> 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)

<sup>2)</sup> With HEIDENHAIN cable. Comply with the supply voltage at the encoder

<sup>3)</sup> Depending on the output cable; the plug connection to the EIB is to be considered a DRIVE-CLiQ coupling.

## Interfaces

### Pin layout of the EIB input

Mating connector 8-pin M12 coupling (male)								
Power supply				Serial data transmission				
	8	2	5	1	3	4	7	6
EnDat	$U_{P2}$	Sensor $U_{P2}$	0V	Sensor 0V	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$
	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		
	1	5	3	4	7	6	2	8
DRIVE-CLiQ	$U_{P1}$	0V	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 <sup>2</sup> ) + (2 x 0.24 mm <sup>2</sup> )] ; $A_p = 0.24$ mm <sup>2</sup>			
<b>Adapter cable</b> With 8-pin M12 connector (female) and RJ45 Siemens connector (IP67); cable length: 1 m		Ø 6.8 mm	1094652-01
<b>Adapter cable</b> With 8-pin M12 connector (female) and RJ45 Siemens connector (IP20)		Ø 6.8 mm	1093042-xx
<b>Connecting cable</b> 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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## HEIDENHAIN

**DR. JOHANNES HEIDENHAIN GmbH**

Dr.-Johannes-Heidenhain-Straße 5

83301 Traunreut, Germany

+49 8669 31-0

+49 8669 32-5061

info@heidenhain.de

[www.heidenhain.com](http://www.heidenhain.com)

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.

### More 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: *Safety-Related Position Measuring Systems* 596632
- Operating Instructions: *EIB 2391 S* 1380729

For implementation in a control or inverter, comply with the following:

- Information from the manufacturer of the downstream electronics about the use of the EIB 2391 S in safety-related applications