



HEIDENHAIN



Product Information

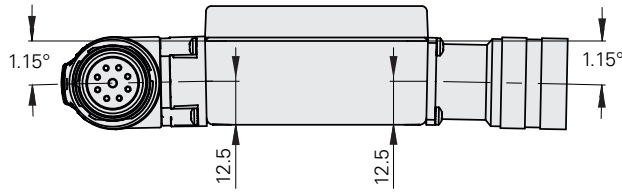
EBB 4000

External Battery Box

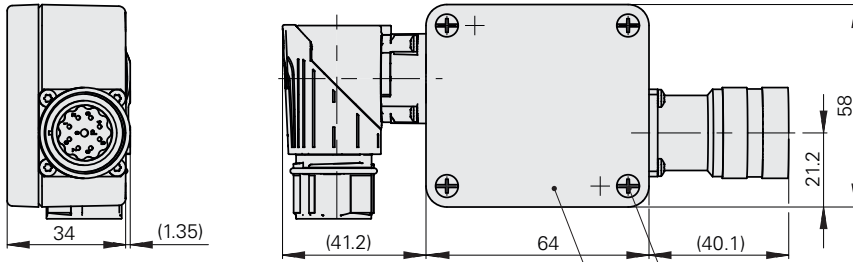
EBB 4000

External battery box

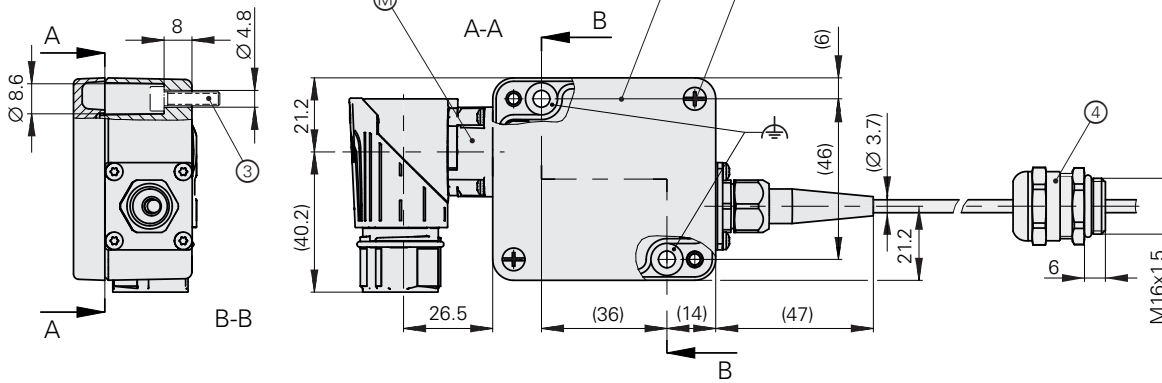
- Input: connection for battery-buffered HEIDENHAIN encoders with the EnDat22 interface
- Output: EnDat22 interface
- The EBB 4210 is optimized for the EBI 4010
- Suitable for up to two batteries of the type xR14250 (½ AA)



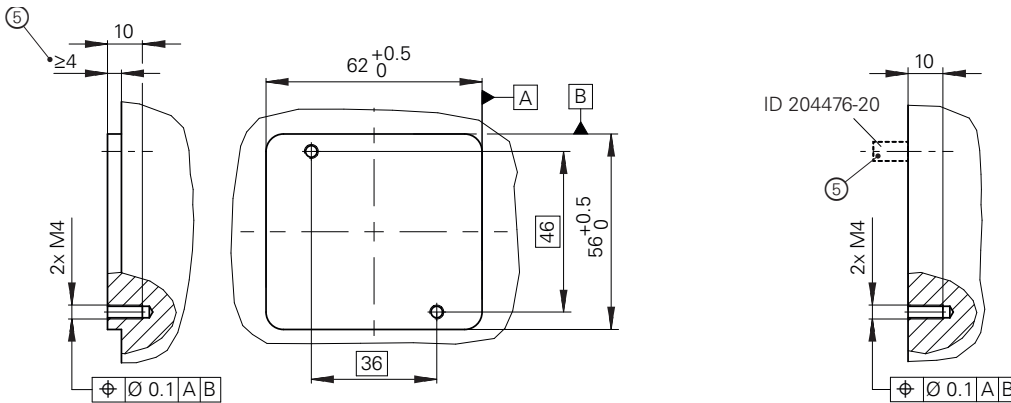
EBB 41x0



EBB 42x0



Required mating dimensions



Ⓜ = Measuring point for operating temperature/vibration

1 = Removable housing cover

2 = Four housing cover screws; tightening torque: 1.8 Nm ±0.11 Nm

3 = Two screws: ISO 4762 – M4 x 16 – A2-70 (not included in delivery); ensure electrical contact with the thread; tightening torque: 2.0 Nm ±0.12 Nm (the tightening torque is valid for the material type aluminum as per the *General mechanical information* in the current edition of the *Encoders for Servo Drives* brochure)

4 = M16 x 1.5 cable gland (not clamped to cable when shipped)

5 = Required due to protruding flange socket

mm



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

Specifications	EBB 4110	EBB 4210
Functional safety	Contingent on the connected encoder and subsequent electronics (e.g., their configuration); the EBB itself has no effect on the safe position	
Input		
Interface	EnDat 2.2	
Ordering designation	EnDat22 (for encoders with buffer battery backup)	
Electrical connection	9-pin M23 flange socket (female)	EPG cable Ø 3.7 mm, with 15-pin PCB connector and M16 x 1.5 cable gland (optionally available with wires for an external temperature sensor)
Cable length ^{1) 2)}	≤ 100 m	0.5 m (maximum of 6 m permitted)
Output		
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Electrical connection	9-pin M23 SpeedTEC nickel-plated flange socket (male), with vibration-dampening O-ring	
Cable length ^{1) 2)}	≤ 100 m	
Supply voltage (U _P)	The supply voltage from the subsequent electronics is passed on by the EBB to the connected encoder; designed for DC 3.6 V to 14 V (EnDat 2.2)	
Power consumption	The EBB is a passive device without its own power consumption	
Battery	Up to two batteries of the type xR14250 (½ AA), each with 3.6 V to 5.25 V	
Operating temperature ⁴⁾	-20 °C to 100 °C	
Storage temperature	-20 °C to 65 °C	
Vibration 55 Hz to 2000 Hz Shock 11 ms ³⁾	50 m/s ² (IEC 60068-2-6) 500 m/s ² (IEC 60068-2-27)	
Relative humidity	≤ 93 % (40 °C/21 d as per EN 60068-2-78); condensation excluded	
Protection EN 60529	IP66 (when connected and closed)	
Mass	≈ 0.35 kg	
ID number	1261762-xx	1200141-xx

¹⁾ The sum of the wire lengths from the encoder and from the control must not exceed the maximum cable length (see the *Interfaces of HEIDENHAIN Encoders* and *Cables and Connectors* brochures)

²⁾ With HEIDENHAIN cable. Comply with the supply voltage at the encoder

³⁾ The use of spacing bolts (accessory for mounting-height adjustment and thermal insulation) significantly lowers the permissible loads for vibration and shock

⁴⁾ The specific batteries used may limit the temperature range of the EBB

Intended use

The EBB 4000 provides a simple battery power supply for absolute rotary encoders with a battery-buffered revolution counter. For this purpose, the EBB is interposed in the connection between the encoder and the subsequent electronics. At present, the EBB can be used for operation of the following rotary encoders with the EnDat22 interface:

- EBI 1135
- EBI 1335
- EBI 135
- EBI 4010

Battery-buffered encoders require a battery power supply to ensure continued functioning of the revolution counter (and thus detection of the multiturn position) upon failure of the regular operating voltage U_p .

For this purpose, the EBB can be loaded with up to two batteries of the type xR14250 (½ AA). Operation is possible with either one or two batteries.

Battery life and replacement

The service life of the loaded batteries depends on the battery type, the operating conditions, and the encoder. For relevant information regarding the encoder, please refer to the product-specific documentation. The battery must meet the following minimum characteristics:

Type	xR14250 (½ AA)
Voltage	3.6 V to 5.25 V
Reverse current tolerance	≥ 8 mA
Required certification	UL 1642

The longest operating times are achieved through the use of Li-SOCI₂ batteries (lithium thionylchloride). Please be aware that the temperature range of the EBB may be limited by the type of battery used.

When used improperly, lithium batteries can be hazardous. The EBB therefore contains appropriate protective circuits that protect the battery from the following faults:

- Inverse polarity due to incorrect insertion into the battery holder
- A short circuit between U_{BAT} and $0V_{BAT}$ on the encoder connector or EBB cable
- Excessive reverse current to the batteries due to leakage currents from the encoder

If batteries with a total capacitance of 1200 mAh are used, then the typical service life is nine years (EBI 1135/135) or six years (EBI 1335/4010) under typical operating conditions; namely, two 10-hour shifts under normal operation, four hours in battery-buffered mode, a battery temperature of 25 °C, and typical self-discharge.

The encoder contains an integrated monitoring circuit for the battery. If the battery voltage falls below certain thresholds, then the encoder issues the following warnings or error messages, which are transmitted over the EnDat interface:

- Warning: "Battery charge" ≤ 2.8 V ± 0.2 V in normal mode
- Error message: "M Power interruption" ≤ 2.2 V ± 0.2 V in battery-buffered mode (transmission to subsequent electronics only after switching to normal mode)

The failure indicated by the error message "M Power interruption" results in the loss of the multiturn position, requiring the encoder to be re-homed in the application (the singleturn position is not affected). This can be avoided through a timely battery change. HEIDENHAIN recommends that the battery be exchanged with the encoder under power (U_p) because this eliminates the risk of losing the multiturn position. When the encoder is under power, neighboring components may be electrically charged. Relevant information must be obtained from the machine manufacturer. Alternatively, if two batteries are used, then they should be replaced separately, one after the other.

Functional safety

The EBB constitutes a passive component and thus does not affect operation in safety-related applications. Any characteristics related to functional safety are determined solely by the connected encoder and the subsequent electronics (contact the manufacturer where applicable).

Mounting accessories

Screws

For fastening the EBB
ISO 4762 – M4 x 16 – A2-70
(two for every EBB)
ID 200507-12

Spacer bolts



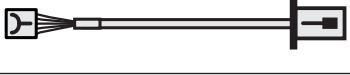



For thermally insulated installation
M4 x 10 (steel: X12CrNiS18-8)
(two for every EBB)
ID 204476-20

Notes

- HEIDENHAIN recommends that each encoder be operated with a separate EBB.
- During or immediately after connection of the battery, the main power supply U_p must be applied to the encoder so that the encoder will fully initialize after having been in a completely de-energized state. Otherwise, the encoder will consume a significantly higher amount of battery current until main power is first supplied.
- The loading and changing of batteries must be performed by qualified personnel!
- Even during normal operation of the battery-buffered encoder (i.e., under main power U_p), a small amount of battery current continues to flow. The amount of this current depends on the operating temperature and is stated in the respective product documentation.
- For proper control of the battery-buffered encoder, EnDat Specification 297403 and the EnDat Application Notes 722024 (Chapter 13, on battery-buffered encoders) must be adhered to.
- Batteries are not included in delivery.

Electrical connection: cables

Encoder output cables

EBI 1335	EPG Ø 3.7 mm (with shield crimping Ø 6.1 mm) 1 x (4 x 0.06 mm ²) + 4 x 0.06 mm ² and TPE wires, 2 x 0.16 mm ² for temperature sensor; 16-pin PCB connector and 9-pin M23 SpeedTEC angle flange socket (male)		ID 1120948-xx ¹⁾
	EPG Ø 3.7 mm (with shield crimping Ø 6.1 mm) 1 x (4 x 0.06 mm ²) + 4 x 0.06 mm ² ; 16-pin PCB connector and 9-pin M23 SpeedTEC angle flange socket (male)		ID 1141001-xx
EBI 1135	TPE single wires with net sleeve, without shield (8 x 0.16 mm ²); 15-pin PCB connector and 8-pin M12 flange socket (male)		ID 804201-xx
EBI 1135/EBI 135	EPG Ø 3.7 mm (cable clamp mounted over crimp sleeve), 1 x (4 x 0.06 mm ²) + 4 x 0.06 mm ² and TPE wires, 2 x 0.16 mm ² for temperature sensor; 15-pin PCB connector and 9-pin M23 SpeedTEC angle flange socket (male)		ID 1120947-xx ¹⁾
EBI 4010 ²⁾	EPG Ø 3.7 mm (with shield crimping Ø 4.3 mm), 1 x (4 x 0.06 mm ²) + 4 x 0.06 mm ² and TPE wires, 2 x 0.16 mm ² for temperature sensor; 15-pin PCB connector and 9-pin M23 SpeedTEC angle flange socket (male)		ID 1120940-xx ¹⁾
	EPG Ø 3.7 mm (with shield crimping Ø 4.3 mm), 1 x (4 x 0.06 mm ²) + 4 x 0.06 mm ² ; 15-pin PCB connector and 9-pin M23 SpeedTEC angle flange socket (male)		ID 1121041-xx



¹⁾ Information for safety-related applications:

- Document the bit error rate in accordance with Specification 533095!
- The electromagnetic compatibility of the complete system must be ensured!




²⁾ Alternatively, the EBB 4210 can be used

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Adapter cables and connecting cables from the flange socket to the EBB


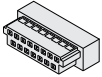
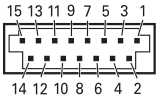




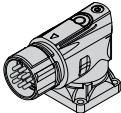




APK PUR Ø 6 mm, 2 x (2 x 0.09 mm ²) + 2 x (2 x 0.16 mm ²); 8-pin M12 connector (female) and 9-pin M23 coupling (male)		ID 1253412-xx
VBK PUR Ø 6 mm, 2 x (2 x 0.09 mm ²) + 2 x (2 x 0.16 mm ²); 9-pin M23 connector (female) and 9-pin M23 coupling (male)		ID 1253363-xx

Adapter cables and connecting cables from the EBB to the subsequent electronics / PWM 2x

APK PUR Ø 6 mm, 2 x (2 x 0.09 mm ²) + 2 x (2 x 0.16 mm ²); 9-pin M23 connector (female) and 15-pin, 2-row D-sub connector (male) with locking screws for connection to the PWM 2x		ID 1173166-xx
APK PUR Ø 6 mm, 2 x (2 x 0.09 mm ²) + 2 x (2 x 0.16 mm ²); 9-pin M23 connector (female) and 8-pin M12 coupling (male)		ID 1136863-xx
VBK PUR Ø 6 mm, 2 x (2 x 0.09 mm ²) + 2 x (2 x 0.16 mm ²); 9-pin M23 connector (female) and 9-pin M23 coupling (male)		ID 1253363-xx

Electrical connection: pin layout

EBB pin layout

15-pin socket housing		9-pin M23 flange socket									
											
9-pin M23 SpeedTEC angle flange socket											
											
		Power supply				Serial data transmission				Other signals ¹⁾	
Input	 15	13	11	14	12	7	8	9	10	5	6
	 9	3	7	4	8	5	6	1	2	/	/
		U_P	U_{BAT}	0V	0V _{BAT}	DATA	\overline{DATA}	CLOCK	\overline{CLOCK}	T+	T-
Output	 9	3	7	4	8	5	6	1	2	/	/
			U_P	Sensor U_P	0V	Sensor 0V	DATA	\overline{DATA}	CLOCK	\overline{CLOCK}	/

U_P = Power supply; U_{BAT} = External battery (inverse polarity can cause damage to the encoder)

Sensor: The sense line is connected in the EBB with the corresponding power line. Sense functionality is possible only for the cable section between the EBB output and the subsequent electronics.

Vacant pins or wires must not be used!

¹⁾ Applies only to an EBB 42xx with wires for an external temperature sensor

SpeedTEC is a registered trademark of TE Connectivity Industrial GmbH.

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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 made.



Further information:

Information on correct and intended operation is provided in the following documents:

- Brochure: *Encoders for Servo Drives* 208922-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Brochure: *Cables and Connectors* 1206103-xx
- Technical Information: *Safety-Related Position Measuring Systems* 596632-xx
- Mounting Instructions: *EBB 4xx0* 1266788-xx

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

- Information from the manufacturer of the subsequent electronics regarding the use of the EBB 4000 in safety-related applications