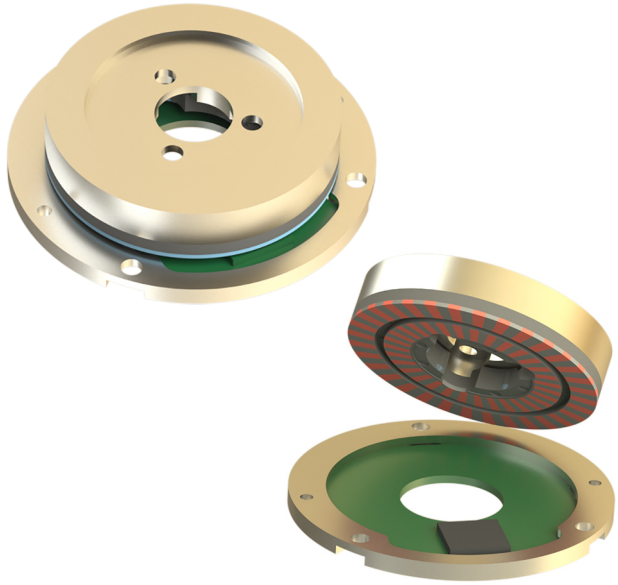
SUPREME SENSORING

Absolute rotary encoder
Model HBB
Interface: BiSS

Document no.:
HBB 17643 CE
31.08.2026



- **Magnetic sensor system**
- **Singleturn rotary encoder**
- **Bearingless version with external magnet disc with aluminum carrier plate (rotor)**
- **PCB version with aluminum carrier plate for sensor and interface (stator)**
- **Less than 10 mm thickness (rotor + stator)**
- **Hollow shaft version**
- **Resolution: up to 21 bit (depending on magnet disc diameter)**
- **Interface: BiSS**

KEY INFORMATION OVERVIEW

DESIGN & FUNCTION

With the HBB model, one rotation is recorded with a resolution up to 21 bit. The resolution depends on the diameter of the magnet disc (rotor). 21 bit are avialable with a rotor diameter of 44 mm (=32 master pole pairs).
The rotary encoder consists of two parts: the rotor and the stator. The rotor is a two track nonius magnetic disc with aluminum carrier plate. Various versions and sizes are possible. The disc is bipolar magnetized (x master pole pairs and x-1 nonius pole pairs). The stator contains a PCB with the sensor chip with BiSS interface. It is carried by an aluminum carrier plate (complete housing on request). Due to the off axis sensor system of the rotor-stator-pair the encoder can be used as a hollow shaft encoder with an inner diameter of 8 mm.

Standard version:

- Ø 37.6 mm outer diameter of stator
- Ø 30 mm outer diameter of rotor (20 master pole pairs, 19 nonius pole pairs)
- 17 bit resolution (up to 21 bit possible)
- Ø 8 mm inner diameter
- Total thickness <10 mm (rotor - gap - stator)
- Eccentricity compensation for increased accuracy
- Differential scanning for external magnetic field suppression
- Extensive self-diagnosis
- Internal temperature sensor
- Electrical connection via cable with open wires

FEATURES INTERFACE

Model HBB ist equipped with a BiSS interface with up to 10 MHz CLOCK frequency. HBB is a BiSS slave. With a low latency of less than 17 µs, the encoder is suitable for motor-feedback-systems.

The absolute angle information derived by the encoder is converted into serial information by an internal serial converter and the transmitted to a receiving electronic circuit in synchronism with a clock. Important advantages are:

- Low number of data lines
- High reliability
- High interference immunity by differential signal transmission (RS422)

The Single Cycle Data (SCD) contains the following information:

- 0...32 singleturn bits
- 1 error bit
- 1 warning bit
- 6 bit sign-of-life counter (optional)
- 6 or 16 bit CRC value

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TECHNICAL DATA

ELECTRICAL DATA

Sensor system	magnetic
Operating voltage	5 VDC, polarity-safe and short circuit proof
Power consumption	< 0.5 W
Measuring range	1 revolution (singleturn)
Total of measuring steps	max. 2.097.152 steps (21 bit)
Code sense	CW* or CCW**
Output code	binary
Absolute accuracy	± 0.03° within temperature range -40 °C to +125 °C
Repeatability	± 0.003° at +20 °C

BISS DATA

Output / Input	Differential data output, data input acc. to RS 422/485 Note: cable specification, use of shielded twisted-pair cable recommended
Max. clock frequency	up to 10 MHz
Signal level	5 V CMOS level compatible with RS 422/485 (120 Ω resistor implemented at MA/NMA lines)
Time out	20 ± 4 µs
Single Cycle Data (SCD) lengths	max. 64 bit + 16 bit CRC
Maximum transmission length	500 m at any clock rate
Latency time	max. 17 µs

MECHANICAL DATA

Operating speed	max.10,000 rpm
Angular acceleration	10^5 rad/s^2 max.
Moment of inertia (magnet disc)	10 gcm^2 (magnet disc with aluminium carrier Ø 30 mm, height 5 mm)
Weight	ca. 0.015 kg (rotor) + ca. 0.015 kg (stator)

ENVIRONMENTAL DATA

Operating temperature range	- 40 °C to + 125 °C		
Storage temperature range	- 20 °C to + 60 °C		(due to packaging)
Resistance	To shock	250 m/s², 6 ms, je 100 x in 3 axes every 100x	(higher values optional), DIN EN 60068-2-27
	To vibration	100 m/s², 5 Hz ... 2000 Hz, in 1 h in 3 axes	(higher values optional), DIN EN 60068-2-6
Protection grade (DIN EN 60529)	IP00		(higher values on request)

*) CW = increasing output signal for clockwise sensor shaft rotation, viewed looking towards the shaft
**) CCW = increasing output signal for counter clockwise sensor shaft rotation, viewed looking towards the shaft

PRODUCT CHARACTERISTICS

BISS INTERFACE

The BiSS-C (unidirectional) protocol enables the simultaneous transmission of sensor data (SD) from all slaves to the master.

The BiSS frame (transmission frame) is started by the master transmitting the clock on the MA line. Here the first rising edge on MA is used for the synchronization of all slaves to enable the isochronous scanning of sensor data. With the 2nd rising edge from MA, all slaves generate their "Ack" (Acknowledge) signal by setting their SLO line to "0"; it remains active (SLO = "0") until the start bit arrives at the input SLI of the particular slave.

In point-to-point configuration, the start bit received by the Master is generated by the last slave; it detects point-to-point configuration from the fact that its input SLI is already "0" at the start of a frame. The start bit is then passed on synchronously with the clock MA from each slave delayed by one clock pulse. The bit following the start bit is always "0" in BiSS C unidirectional. Beginning with the 2nd bit after the start bit and up to the timeout of the BiSS frame, the data range follows, which transmits the sensor data from the slaves to the master according to the data format of the slave.

The BiSS frame ends with the BiSS timeout. In this time no further clock pulses are sent on the MA line by the master. At the end of data transmission, the master sets its output MO to the idle state "1". The slaves then pass on this "1" received at SLI to their output SLO as soon as they have detected the expiration of the timeout themselves. This ensures that the BiSS timeout on the line SL is only signalled to the master when all connected slaves have detected the timeout. When the BiSS timeout expires, all slaves return to the idle state; all lines are set to the high signal level ("1") in the process.

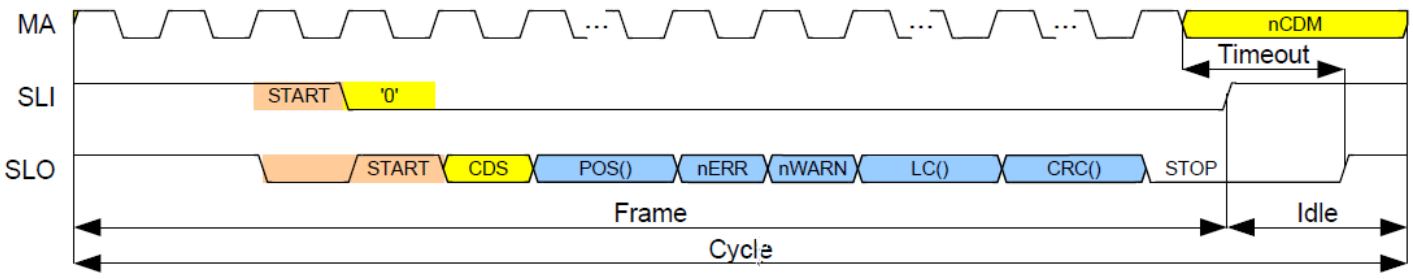
In point-to-point configuration, the last slave signals expiry of the BiSS time-out without waiting for a predecessor. The other slaves then pass on the "1" received at SLI to their output SLO.

The Single Cycle Data (SCD) is transmitted in the format highlighted in blue in the figure below (SLO). The format includes after the control data bit (CDS, depending on BiSS master bit nCDM): The multiturn position (MT, if available, right aligned) followed by the singleturn position (ST, left aligned), one low-active error bit (nE), one low-active warning bit (nW), an optional 6-bit sign-of-life counter (LC) and a 6-bit (Hamming Distance: 3) or 16-bit (Hamming Distance: 6) CRC value (bit inverted transmission, polynomial 0x43 (0x190D9), adjustable start value). The position data is affected by offsets. The total data length (MT, ST, nE, nW, LC) is limited to 57 bits for the 6-bit CRC polynomial and 64 bits for the 16-bit CRC polynomial excluding the bits needed for the CRC value.

The encoder can be parameterized (e.g., resolution, code direction CW/CCW) and calibrated (e.g., eccentricity compensation for adaptation to the application) via the four connection cables for the BiSS interface.

Further Information can be gathered from the BiSS Association website: https://biss-interface.com/

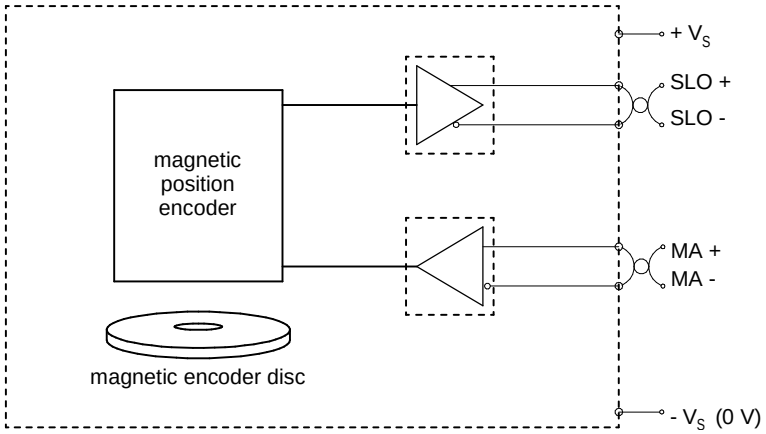
INTERFACE-PROFILE BISS (SCD)



ELECTRICAL CONNECTION - PINOUT

PRINCIPLE CIRCUIT DIAGRAM

MA / NMA (= MA+/-) are the clock signals (twisted pair recommended).
SLO / NSLO (= SLO+/-) are the data signals (twisted pair recommended).



ELECTRICAL CONNECTION

Cable with open wires.

The connection diagram is included in the scope of delivery and is enclosed with every device.

OPEN WIRES (STANDARD)

COLOR . . . . . Function
white (wh) . . . . . +V_S
brown (bn) . . . . . -V_S (0 VDC)
green (gn) . . . . . MA (= MA+)
yellow (ye) . . . . . NMA (= MA-)
grey (gy) . . . . . SLO (= SL+)
pink (pk). . . . . NSLO (= SL-)

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ORDER CODE FORMAT

HBB	38 -	E	A	17	R	W	Kx	B	01	STANDARD VERSION

HBB	Singleturn rotary encoder with BiSS-Interface		
38	Design form	38	Ø 37.6 mm with inner diameter Ø 8 mm
E	Flange	E	Bearingless version with external magnet
A	Housing material	A	PCB with aluminium carrier plate 3.2315 - (AlMgSi1)
17	Resolution	12 ••• 17 ••• 21	12 bit = 4096 steps / 360° ••• 17 bit = 131.072 steps / 360° ••• 21 bit = 2.097.152 steps / 360° (on request)
R	Code	R	Binary
W	Code sense	W C	CW CCW
Kx	Electrical connection	Kx	Cable with length x meters (e. g. 0,5 for 0.5 m or 2 for 2 m)
B	Output	B	BiSS-Interface
01	Electrical and mechanical variants*	01	Standard

* The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented at TWK.

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DOCUMENTATION

DOCUMENTATION

The following documents can be found in the Internet under www.twk.de/en in the documentation area, model HBB.

Data sheet HBB17643
Installation instructions AN16169
Declaration of conformity. . . . . CE: ZE12467, UKCA: ZE16569
Reach compliant QS15286
RoHS compliant QS13284
POP Declaration of conformity QS17238

INSTALLATION DRAWINGS

MODEL HBB38 - EA 17 R W KX B01

Dimensions in mm

Permissible assembly tolerances:

Rotor wobble eccentricity: ≤±0.1 mm
Stator off-axis eccentricity: ≤±0.2 mm
Rotor - stator - gap: 0,6 mm ±0.2 mm