POSITAL
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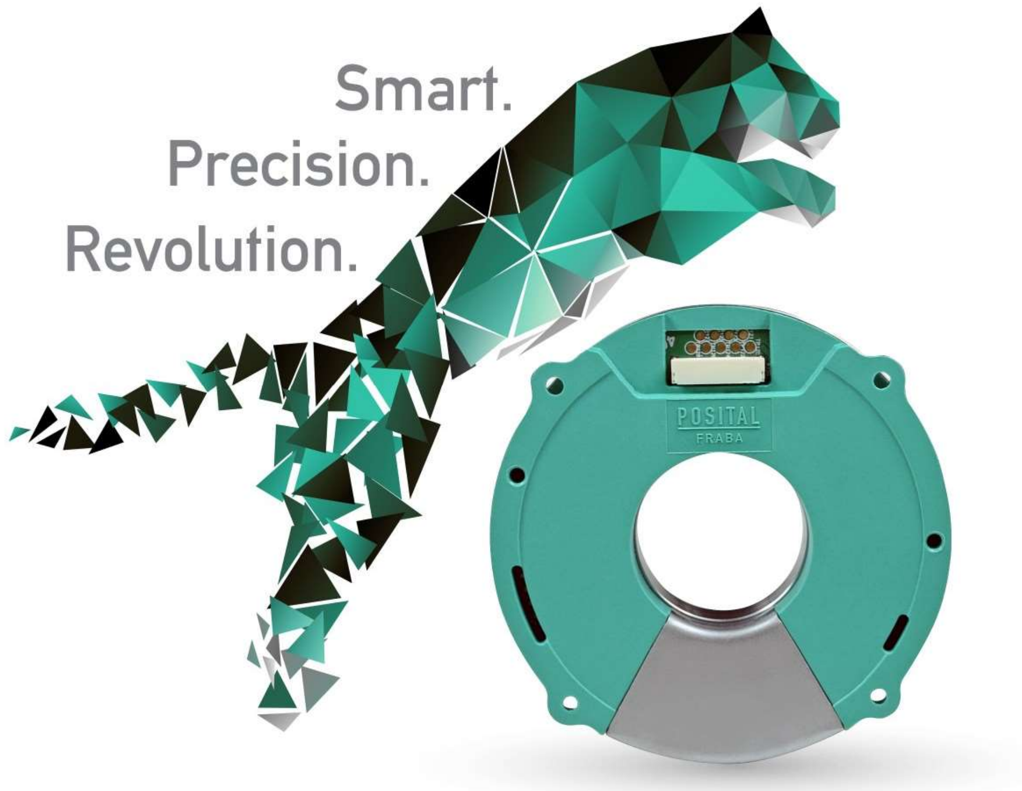
INSTRUCTION LEAFLET

IXARC HOLLOW SHAFT KIT ENCODERS WITH BISS-C INTERFACE



General Information

This leaflet is provided for BiSS C Encoder Hollow Shaft Kits with type key CCD-BCxxB-xxxx-Txxx-xxx, with x as placeholder. The use of these kit encoders for the production of industrial rotary encoders if prohibited. Applications in rotary encoders are protected by serveral worldwide patents (such as WO 2004/046735 A1) and require licensing.

Safety

- The encoder must be installed by qualified personnel only, exhibiting knowledge in electronics and mechanics.
- Consider all safety and accident regulations valid for your country.
- Switch off the supply voltage of all devices connected to the encoder before installation.
- Avoid an electrical supply voltage while connecting the encoder.
- Avoid exerting shocks on motor shaft and mounting flange to prevent the encoder from being mechanically damaged.
- Rotary machine shafts may catch hair and cloths and cause injury.
- Mount the encoder in an ESD-conform fashion, avoid high voltages, e.g. static electricity discharged from a human body.
- Consider the specifications of the encoder. The device must be operated in the specified range.

Interface

Interface	BiSS C
Programming Function	Wiegand sensor test
Min Interface Cycle Time	18 μs

Electrical Data

Supply Voltage	4.5-26.4V DC
Current Consumption	Typical 80mA @ 10V DC
Start-up time	Max 100 ms
Clock Input	RS 422
Clock Frequency	70 KHz – 10 MHz
Reverse Polarity Protection	Yes
Short Circuit Protection	Yes
Max. Permissible Electrical Speed	6.000 RPM
Operating Temperature	-40 - +105°C
Humidity	<90%RH, no condensation
Diagostic Signal	Low Level: 0V…0.3V DC High Level: 3.3V…3.9V DC
EMC	Kit encoder is a sub-assembly and not considered to be an independent system, therefore compliance with CE requirements has to be ensured by the integrator for the overall set-up.

Electrical Connection

Connection Orientation	Axial
Connector	JST SM10B-GHS-TB

Pin Assignment

Pin	Signal
1	Data- (SLO-)
2	Data+ (SLO+)
3	N.C
4	PRESET
5	CLK+ (MA+)
6	CLK- (MA-)
7	VCC
8	GND
9	CONFIG
10	DIAGNOSTIC

Mechanical Data

Air Gap	0.7mm
Max. Axial / Radial Misalignment	±0.1mm / ±0.2 mm
Max. Permissible Mechanical Speed	6000 RPM
Max. Permissible Mechanical Speed during start-up*	0.4 RPM

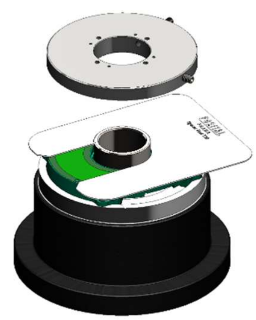
* Please carefully review Start-up and Initalization and Hardware Diagnostic Function sections for more information relevant for start-up phase.

Encoder Installation

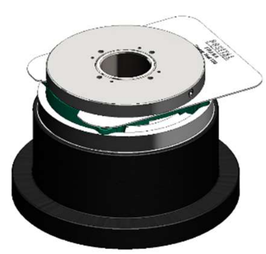
Mounting

Step 1:
Slide the kit-stator over the shaft and place it onto the mounting surface. Tighten the mounting screws with the washers.
Recommended torque: 1 Nm ±10 %

Step 2:
Place the spacer tool onto the stator. Leave enough space between the shaft and the spacer tool to fit the collar of the rotor. Slide the rotor onto the shaft until it comes in contact with the spacer tool.



Step 3:
Tighten the set screws while pressing down on the rotor.
Recommended torque: 0.5 Nm ±10 %. Remove the spacer tool.



Start-up and Initialization Process

During the start-up phase, the rotational speed should not exceed 0.4 rpm.

After the physical installation, write 0x07 into register 0x10 in bank 1 after the encoder is powered on, this will trigger the initialization process and will make the error bit active high. Rotate the kit rotor by at least one turn for synchronization purposes. The error bit will automatically switch to inactive after the synchronization is done.

Multiturn Counter Verification

The BiSS C kit encoder uses a magnetic Wiegand counter to provide absolute multiturn values. The software integrated Wiegand sensor test measures the Wiegand sensor properties, by analyzing Wiegand pulses for 255 motor shaft revolutions. The test must be carried out for both clockwise (CW) and counterclockwise (CCW) rotations and can be performed by the following sequence. Carry out the sequence for CW first and afterwards for CCW direction.

No.	Register Address	Value	OP	Remark
1	-	-	-	**Run the motor** at constant rotation speed in CW direction. A rotation speed of 500-2000 rpm is recommended.
2	0x6B (direct register)	0x2A	W	**Enable device mode** configuration: Write password 0x2A to register.
3	0x6A (direct register)	0x02	W	**Change device mode** to Wiegand sensor test mode.
4	0x40 (direct register)	0x00	W	**Select bank 0:** Write value 0x00 to the bank selection register.
5	0x06 (bank 0)	0x01	W	**Start Wiegand sensor test**, **CW direction.** The duration of the test routine depends on the rotation speed of the motor. The test must run for at least 255 motor revolutions.

6	0x07 (bank 0)		R	**Check the result of the test** by reading the Wiegand sensor test status register. If the pulse collection in CW direction is finished, the routine waits for the change of motor direction to CCW (value 0x03).
7	-	-	-	**Run the motor in CCW direction**.
8	0x06 (bank 0)	0x02	W	**Start Wiegand sensor test**, **CCW direction.**
9	0x07 (bank 0)		R	**Check the result of the test** by reading the Wiegand sensor test status register. If the pulse collection in CCW direction is finished, the test is completed (value 0x06).
10	0x06 (bank 0)	0x05	W	**(Optional)** Save the acquired result data permanently.
11	0x6A (direct register)	0x00	W	**Change device mode** back to operation mode.

The saved result data can be checked at any time, if step 10 was executed. The average pulse height of the analyzed pulses and its standard deviation is saved for CW and CCW direction. A Wiegand pulse height average minus 4x standard deviation greater than 5.3 V is recommended for operation.

Wiegand Sensor Test Status Register	**Register Value**
Test stopped	0x00
Pulse Collection active (CW)	0x01
Wait for change of motor rotation direction	0x03
Pulse Collection active (CCW)	0x04
Test complete	0x06
Test failed	0x07

Result Data (last test)	**Register Address (bank 0)**
Average Pulses (CW)	0x09

Average minus 4x Standard Deviation (CW)	0x0A
Average Pulses (CCW)	0x0B
Average minus 4x Standard Deviation (CCW)	0x0C

Result Data (saved)	**Register Address (bank 0)**
Average Pulses (CW)	0x11
Average minus 4x Standard Deviation (CW)	0x12
Average Pulses (CCW)	0x13
Average minus 4x Standard Deviation (CCW)	0x14

Note

- The result data values must be divided by 10 to get the value in volts.
- The Wiegand sensor test can be stopped at any time by writing value 0x03 to the pulse testing command register (0x06, bank 0).
- The measured pulses are not depended on rotation speed, but low rotation speeds can lead to long test times.

Attention

- The encoder cannot be used as a feedback system during the test!
- It is required to run the Multiturn Counter Verification once after installation is finished.
- The encoder is not able to identify the rotation direction of the motor during the test, so make sure rotation and test direction match.

Preset Function

The preset function can be used to adapt the encoder position to the mechanical alignment of the system. By performing a preset, the actual position value of the encoder (both, singleturn and multiturn) is set to the desired preset value via software.

The preset value is specified in registers 0x02 to 0x07 (bank 1) e.g. 0x070605040302. In registers 0x02 to 0x04 (bank 1) the singleturn preset value is saved in little endian format. In registers 0x05 to 0x07 (bank 1) the multiturn preset value is saved in little endian format. The preset can be triggered via software.

Preset Value	Singleturn preset value			Multiturn preset value		
Register Address (bank 1)	0x02	0x03	0x04	0x05	0x06	0x07
Endianness	LSB		MSB	LSB		MSB

Software preset

To change the preset value and perform a preset via software, follow the steps below:

No.	Register Address	Value	OP	Remark
1	0x6B (direct register)		W	**Enable device mode** configuration: Write password 0x2A to register.
2	0x6A (direct register)	0x07	W	**Change device mode** to preset mode.
3	0x40 (direct register)	0x01	W	**Select bank 1:** Write value 0x01 to the bank selection register.
4	0x00 (bank 1)	0x02	W	**Enable preset value edit.**
5	0x02 – 0x04 (bank 1).		W	Enter singleturn preset value.
6	0x05 – 0x07 (bank 1).		W	Enter multiturn preset value.
7	0x00 (bank 1)	0x03	W	Save preset value. Note: The preset value is saved in a volatile memory and will change back to the default value of 0 after any power cycle.
8	0x00 (bank 1)	0x01	W	**Perform preset.**
9	0x6A (direct register)	0x00	W	**Change the device mode** back to operation mode.

Example:

Assuming it is desired to preset the singleturn position of a kit encoder with 18 bit singleturn resolution.

Desired singleturn position: 270°

Corresponding decimal value in digits: 196608

Expressed as a hex value: 0x30000

For this configuration, the register entries must be set as followed:

Register Address (bank 1)	0x02	0x03	0x04
Register Value	0x00	0x00	0x03

Preset Register	**Register Address (bank 1)**
Command register	0x00
Singleturn preset value	0x02 – 0x04
Multiturn preset value	0x05 – 0x07

Commands	**Register Value**
Perform preset	0x01
Enable preset value edit	0x02
Save preset value	0x03

Hardware Diagnostic Function

The diagnostic pin output can be used to detect any error or warning state. The output voltage level will be pulled to high level (see table electrical data) when the encoder is in an error or warning state. This may be used to verify and adjust the air gap between rotor and stator.