Rotational Absolute Inductive Kit Encoder Version 60 mm Position Sensor
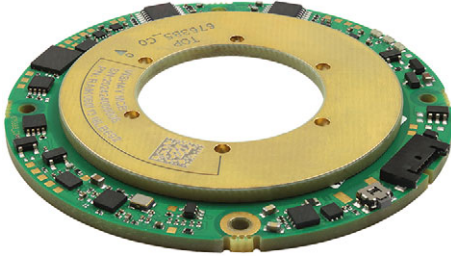
LINKS TO ADDITIONAL RESOURCES

3D Models   Infographics   Did You Know?

FEATURES

- Off-axis rotational absolute inductive encoder
- Especially dedicated to motor drive, to robot's position and industrial motion control with accurate positioning
- Rotation speed up to 10 000 rpm
- High repeatability, high precision, high resolution, single or multi-turns variant
- Embedded self-calibration
- Easy assembly with status LED colors
- Memorization of last position before power off
- Not sensitive to external magnetic fields (no hall effect cells), electrical fields and temperature
- Not sensitive to moisture and pollution
- Especially dedicated for harsh conditions (vibrations, shocks, EMC…)
- Built-in self-monitoring
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT (Pb-free)

QUICK REFERENCE DATA	
Sensor type	ROTATIONAL, inductive technology
Output type	Connector Molex 5037630691
Market appliance	Industrial
Dimensions	Diameter 60 mm

ELECTRICAL SPECIFICATIONS

PARAMETER	RAIK060I11318
Voltage power supply (on sensor connector)	5 V_{DC} ± 0.25 V_{DC}
Supply current at 5 V_{DC}	≤ 100 mA
Standard output format	BiSS-C
Optional output format	SSI or SPI (on request)
Useful electrical angle	360°
Accuracy at 25 °C	Better than 13 bits (0.044°)
Repeatability	≥ 17 bits
Resolution	262 144 points (18 bits, ≈ 0.0014°)
Startup time	≤ 5 ms
Data latency time	≤ 5 µs
Maximum sampling rate	33 kHz (BiSS-C multi-turn version, MA 10 MHz)
Variant multi-turn counter	65 536 turns (16 bits, two's complement, -32 768 to +32 767)
For multi-turns options	Memorization of the position and the multi-turn counter values at power-off

MECHANICAL SPECIFICATIONS (All Versions)

PARAMETER	
Mechanical angle	360°
Maximum rotation speed	10 000 rpm (more on request)
Rotor weight	≤ 5.5 g
Stator weight	< 10 g

SAP PART NUMBERING GUIDELINES (CORRESPONDING TO ASSEMBLY CASE 1) [1]

TYPE	MODEL	DESIGN	SIZE (mm)	TYPE	FUNCTION	ACCURACY (BITS)	RESOLUTION (BITS)	OUTPUT	PACKAGING	OPTION
R = rotational	AI	K = kit	060	I	1	13	18	F = SPI CCW	B = box	713 = option single-turn
								J = SSI CCW	B = box	714 = option single-turn
								L = BiSS-C	B = box	715 = option single-turn
								F = SPI CCW	B = box	717 = option multi-turn counting
								J = SSI CCW	B = box	718 = option multi-turn counting
								L = BiSS-C	B = box	716 = option multi-turn counting

SAP PART NUMBERING GUIDELINES (CORRESPONDING TO ASSEMBLY CASE 2) [1]

TYPE	MODEL	DESIGN	SIZE (mm)	TYPE	FUNCTION	ACCURACY (BITS)	RESOLUTION (BITS)	OUTPUT	PACKAGING	OPTION
R = rotational	AI	K = kit	060	I	1	13	18	F = SPI CCW / J = SSI CCW / L = BiSS-C CCW	B = box	Single-turn
								F = SPI CCW		693 = multi-turn counting
								J = SSI CCW		694 = multi-turn counting
								L = BiSS-C CCW		692 = multi-turn counting

Notes
• SPI output version on request
[1] See section "Mounting and Electrical Connection Procedure" for details of assembly

ACCESSORY

External connector equipped with wires to obtain a wires output (see section "Accessories on Request")	ACCSRAIKWIRESOB073

PERFORMANCE

PARAMETER	
Standard operating temperature range	-40 °C to +105 °C
Storage temperature range	-55 °C to +125 °C
Humidity	≤ 80 % no condensing
Environmental protection	Coating on PCB components side (on request)
Vibrations	0.05 g^2/Hz, 20 Hz to 2000 Hz for 1 hour along three major axis
Shocks	100 g, 6 ms, ½ sine (one on each axis)

EMC PARAMETERS

PARAMETER	STANDARD	LEVEL
Electrostatic discharge immunity (ESD)	61000-4-2 :2008	Level 4 (8 kV) - contact discharge (important: valid only on the connector interface)
Immunity of radiated radio-frequency electromagnetic field (80 MHz to 6 GHz)	EN 61000-4-3:2020	Level 3 (10 V/m)
Immunity to conducted disturbances induced by radio-frequency fields (150 kHz to 80 GHz)	EN 61000-4-6:2014	Level 3 (10 V)
Immunity to power frequency magnetic field (at 50 Hz)	EN 61000-4-8:2010	Level X (1500 A/m, 2 mT)
Radiated emission (30 MHz to 1 GHz)	EN 55011	Class A Group 1 (Industrial [1])

Notes

- Levels compliant with EN IEC 61326-1, industrial
- The sensor does not integrate protection against surges caused by overvoltages from switching and lightning transients (61000-4-5). It is recommended to use external protection if this standard is to be applied. To minimize the risk, we recommend that the power supply cable does not exceed 3 meters, and the data line does not exceed 30 meters

[1] This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments
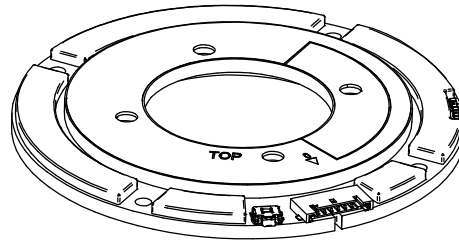
OTHER INFORMATION

ATTENTION!
Observe Precautions for Handling Electrostatic Sensitive Devices!

Warning: the rotor and the stator must have the same serial number!
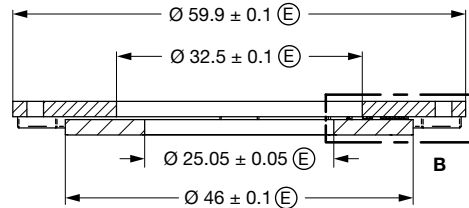
- Do not damage the rotor disk surface

- Do not use cleaning product or chemical product

Environmental protection: conformal coating or potting on request for use in heavy-duty environments (metallic particles, oils, greases, salt spray, moisture, corrosion...)
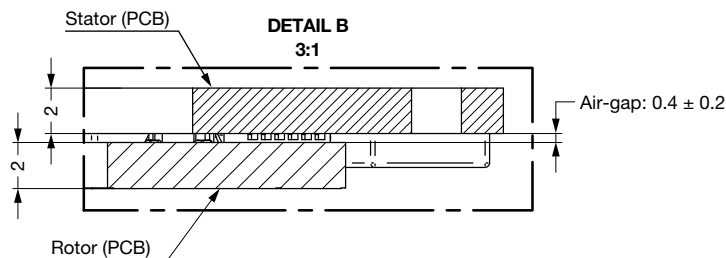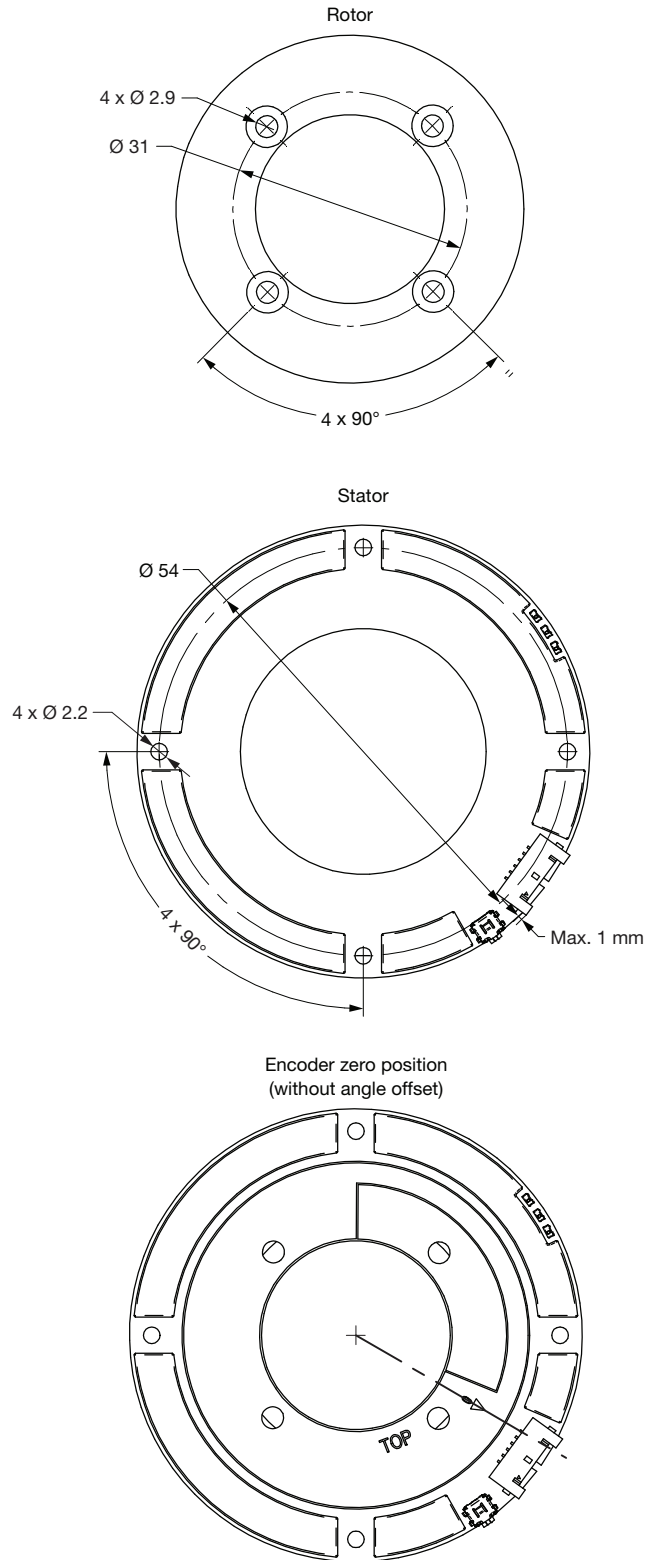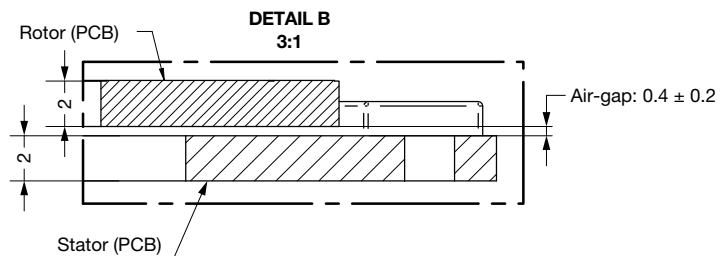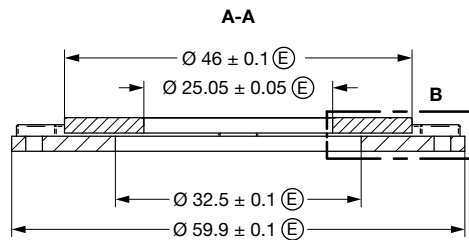
SENSOR DIMENSIONS CASE 1

Electronic components

A   A

54°

TOP

Connector Molex 5037630691

Tactile switch

A-A

Ø 59.9 ± 0.1 Ⓔ

Ø 32.5 ± 0.1 Ⓔ

Ø 25.05 ± 0.05 Ⓔ

B

Ø 46 ± 0.1 Ⓔ

Stator (PCB)

DETAIL B
3:1

Air-gap: 0.4 ± 0.2

2

2

Rotor (PCB)

FASTENING POINTS CASE 1

Rotor

4 x Ø 2.9

Ø 31

4 x 90°

Stator

Ø 54

4 x Ø 2.2

4 x 90°

Max. 1 mm

Encoder zero position
(without angle offset)

TOP

SENSOR DIMENSIONS CASE 2

Electronic components

54°

TOP

Connector
Molex 5037630691

Tactile switch

A-A

Ø 46 ± 0.1 Ⓔ

Ø 25.05 ± 0.05 Ⓔ

B

Ø 32.5 ± 0.1 Ⓔ

Ø 59.9 ± 0.1 Ⓔ

DETAIL B
3:1

Rotor (PCB)

Air-gap: 0.4 ± 0.2

Stator (PCB)

FASTENING POINTS CASE 2

Rotor

Ø 28.5

6 x Ø 2

6 x 60°

TOP

Encoder zero position
(without angle offset)

TOP

MOUNTING CONDITIONS
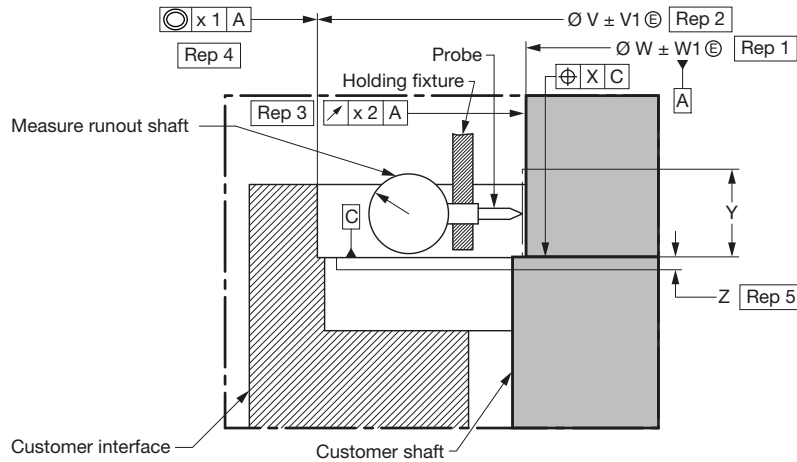
Fig. 1 - Mounting Detail
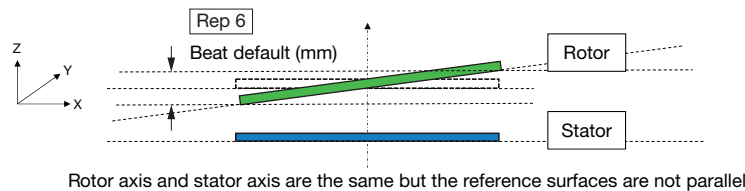
Rotor axis and stator axis are the same but the reference surfaces are not parallel

Fig. 2 - Beat

| RECOMMENDED DIMENSIONS AND TOLERANCES OF CUSTOMER INTERFACES TO USE THE SELF-CALIBRATION		
Rep 1	Customer shaft diameter for centering of the rotor (see Fig.1)	Diameter Ø 25 g6 (25 mm - 0.007 mm - 0.020 mm)
Rep 2	Customer interface diameter for centering of the stator (see Fig.1)	Diameter Ø 60 H7 (60 mm + 0.030 mm - 0.000 mm)
Rep 3	Diameter runout of the customer shaft for the rotor centering (included gap between customer shaft and inner rotor diameter) (see Fig.1)	< 0.120 mm
Rep 4	Misalignment: concentricity of the stator centering diameter versus shaft centering diameter (included tolerances of customer holder and stator interface) (see Fig.1)	< 0.250 mm
Rep 5	Position of the stator reference upper surface versus rotor reference bottom surface (see Fig.1) (air-gap: the condition of previous line avoids to measure the air-gap)	0.4 mm ± 0.2 mm
Rep 6	Total beat included in the air-gap between ref. C (rotor) and ref. D (stator) (see Fig.2)	< 0.2 mm

Note
• Values at room temperature

MOUNTING AND ELECTRICAL CONNECTION PROCEDURE

1. Observe precautions for handling electrostatic sensitive devices.

Case 1: Rotor Below to the Stator

2. Mount the rotor with recommended screws: M2 according to ISO 10642 (stainless steel A4 with recommended torque = 0.3 Nm ± 10 %) on the customer interface according to recommended mounting conditions. It is recommended to threadlocker on screws threads in function of environmental and use conditions. Its marking "TOP" shall be on the opposite side of the stator.

3. Mount the stator with recommended screws: M2 according to ISO 4762 (stainless steel A4 with recommended torque = 0.3 Nm ± 10 %) on the customer interface according to recommended mounting conditions. It is recommended to threadlocker on screws threads in function of environmental and use conditions. The electronic components side of the stator shall be in front of the rotor.
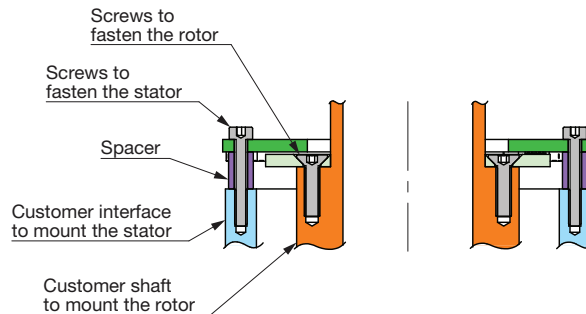
Case 2: Stator Below to the Rotor

2. Mount the stator with recommended screws: M2 according to ISO 4762 (stainless steel A4 with recommended torque = 0.3 Nm ± 10 %) on the customer interface according to recommended mounting conditions. It is recommended to threadlocker on screws threads in function of environmental and use conditions. The electronic components side of the stator shall be in front of the rotor.

3. Mount the rotor with recommended screws: M1.6 according to ISO 4762 (stainless steel A4 with recommended torque = 0.1 Nm ± 10 %) on the customer interface according to recommended mounting conditions. It is recommended to threadlocker on screws threads in function of environmental and use conditions. Its marking "TOP" shall be on the opposite side of the stator; the word "TOP" can be read after mounting!

4. Plug the "wires user connector" in the encoder according to Fig. 4 and "Encoder pinout" (see "BiSS-C Compatible Connector" table).

For technical questions, contact: mcbprecisionpot@vishay.com
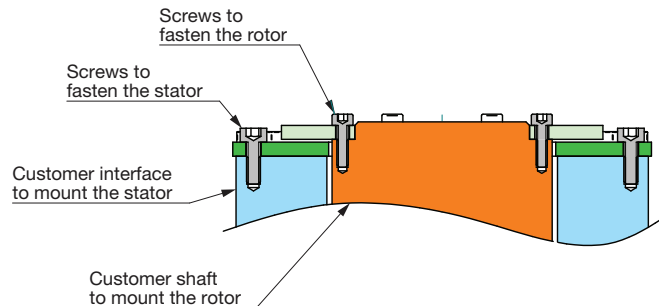
COMMUNICATION INTERFACES

Three protocols are possible: SSI protocol, BiSS-C protocol, or SPI protocol.

SSI and BiSS-C signals comply with the RS-422 standard, employing Low Voltage Differential Signal (LVDS). To ensure robust EMC immunity, it is highly recommended to use twisted pair wire:

• **BiSS-C:** MA+ twisted with MA- / SLO+ twisted with SLO-

• **SSI:** CLK+ twisted with CLK- / DATA+ twisted with DATA-

Power supply signal (VCC, GND) does not need to be twisted pair.

The typical impedance of signal lines is 120 Ω. The requirement for termination resistors depends on the total length of the communication bus and the communication speed employed.

CONNECTOR TYPES:

Output connector mounted on the RAIK060: Molex 5037630691

Customer connector equipped of wires gauge 28 to plug:

• female connector Molex 503764-0601

• contacts Molex 503765-0098
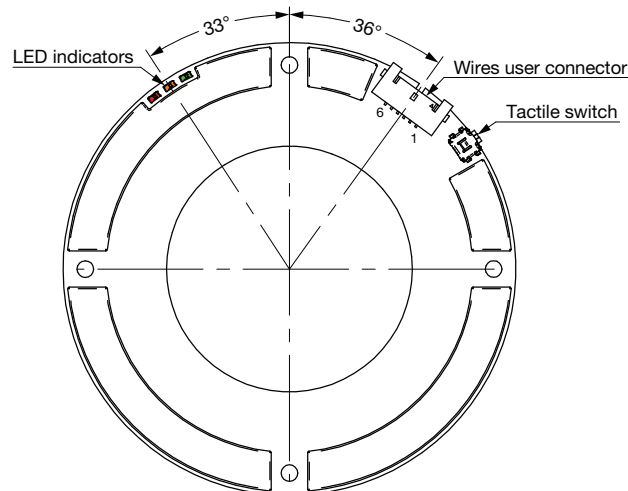
Fig. 3 - User Connector
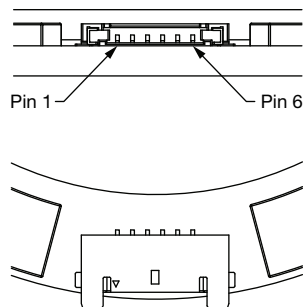
Fig. 4

CONNECTOR PINOUT

PIN NO.	BiSS-C	SSI	DESCRIPTION
1	VCC	VCC	Power supply input
2	MA+	CLK+	Positive clock input
3	MA-	CLK-	Negative clock output
4	SLO-	DATA-	Negative data output
5	SLO+	DATA+	Positive data output
6	GND	GND	Ground

SELF-CALIBRATION PROCEDURE

GENERAL

After each sensor assembly or mechanical mounting change, a self-calibration must be performed to ensure that the sensor reaches its maximum performance. Self-calibration consists of two steps:

- **Step 1:** automatic control of the airgap (distance between the lower part of the rotor and the upper part of the stator). If the airgap is out of range, it is not possible to move on to the next step. During this step, angle position is still available from interface communication; the accuracy is reduced to 13 bits (instead of 18 bits).

LED INDICATORS	DESCRIPTION	RECOMMENDED ACTION
FAST BLINKING	Valid airgap. The airgap is in the correct range (0.4 mm ± 0.2 mm).	Go to the self-calibration Step 2.
FAST BLINKING	Airgap is too low (< 0.2 mm).	Increase the distance between the rotor and stator.
FAST BLINKING	Airgap is too high (> 0.6 mm) or missing rotor.	Check the presence of the rotor and decrease the airgap between the rotor and stator.

- **Step 2:** calculation of the angle correction table. During this step, the rotor must rotate at a speed between 100 rpm and 500 rpm and the communication master must provide clocks on the line to scan the angle data.

LED INDICATORS	DESCRIPTION	RECOMMENDED ACTION
FAST BLINKING	Waiting for rotor rotation and clock on communication interface. If no rotation is detected after 30 seconds, the sensor automatically return to "Customer Mode".	Start motor rotation (100 rpm to 500 rpm) and provide clocks on communication interface.
FAST BLINKING	Computation and recording of the self-calibration parameters (typically 2 seconds at 100 rpm). The sensor automatically return to "Customer Mode" after calibration is complete.	Keep motor rotation to a fix speed (100 rpm to 500 rpm).

There are two methods of initiating this procedure:

- Using Push-Button
- Using BiSS-C commands

These two methods are described below.

USING PUSH-BUTTON

The self-calibration can be launched using the mechanical push-button on the sensor.

Important: use a soft non-metallic tool (wood, plastic, …) to press the button to not damage the sensor with ElectroStatic Discharges.

1. Press the Push-Button to enter the Self-Calibration Mode (the sensor will restart in Self-Calibration Mode).

2. In the self-calibration **Step 1** (Airgap Control), the green LED should blink fastly if airgap is valid. If orange or red LED are blinking, the sensor detects an incorrect airgap. Refer to the "Self-Calibration Procedure" section for details.

3. When airgap is valid, press the push button to go to **Step 2** (Correction Calculation). At this step, the only way to return in customer mode is to reboot the sensor.

4. In the self-calibration **Step 2** (Correction Calculation), the sensor start calculates only if the rotor is in rotation and the BiSS master send clocks to read data.

5. When the calculation is complete, the sensor return automatically in Customer Mode and the LED stop blinking.

   a. A fix green LED indicates a valid calibration.

   b. A fix orange LED indicates a valid calibration, with a power-off motion warning (multiturn value change during self-calibration procedure).

   c. A fix red LED indicates that a calibration error.
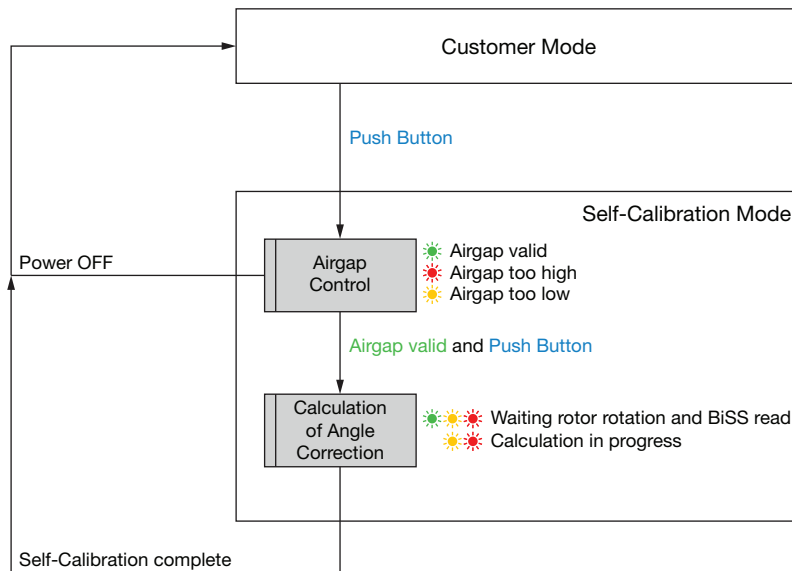
USING BiSS-C COMMANDS

The self-calibration can be launched using BiSS-C commands:

1. Unlock the command by writing **key code 0x56** to address **0x48**.

2. Write **command code 0x01** to address **0x49** to enter the Self-Calibration Mode (the sensor will restart in Self-Calibration Mode).

3. In the self-calibration **Step 1** (Airgap Control), the green LED should blink fastly if airgap is valid. If orange or red LED are blinking, the sensor detects an incorrect airgap. Refer to the "Self-Calibration Procedure" section for details.

4. When airgap is valid, there are two possibilities:

   a. Return in Customer Mode: **write addressed BiSS command "10" to IDS = 1**.

   b. Start calculation of angle correction table: **write addressed BiSS command "11" to IDS = 1**.

5. In the self-calibration **Step 2** (Correction Calculation), the sensor start calculates only if the rotor is in rotation and the BiSS master send clocks to read data.

6. When the calculation is complete, the sensor return automatically in Customer Mode and the LED stop blinking.

   a. A fix green LED indicates a valid calibration.

   b. A fix orange LED indicates a valid calibration, with a power-off motion warning (multiturn value change during self-calibration procedure).

   c. A fix red LED indicates that a calibration error occurs (need to restart the self-calibration procedure).
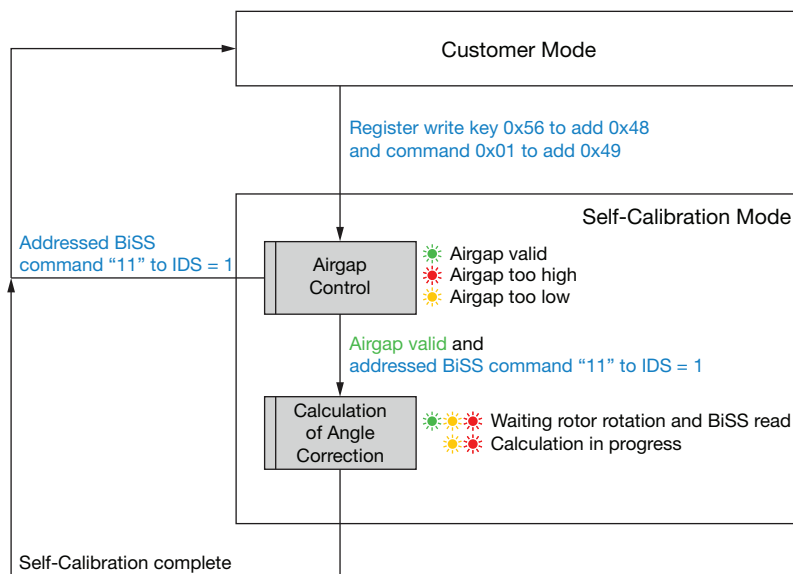
VARIANT MULTI-TURNS COUNTER

First Possible Option: Counting of Turns Without Battery Backup Connector and Memorization of Last Position Before Power-Off!

In normal operation, when the power is on, the counting of the turns is made in both directions (clockwise and anticlockwise). The counter value is sent in the output frame in two's complement. The maximum value of the counter is +32 767, the minimum is -32 768: once the counter has reached the maximum value (+32 767), the next counter value is automatically set to -32 768. Once the counter has reached the minimum value (-32 768), the next value is set to +32 767.

Please note that no counting operations are performed during power-off. When the power is turn off, the last position before power cutting (multi-turn counter and position value) is stored in a non-volatile memory. This allows the encoder to accept a movement of up to ± 90° during power off, which is then calculated and released as soon as the power comes back. Upon power-on, if the angle variation exceeds ± 90°, the frame warning flag is set. This warning is reset at the next power-on or after 50 frames have been read on the communication port. The orange LED is "ON" when the warning is active.

The number of non-volatile memory write-in cycles is unlimited.

The multi-turn counter is reset when the sensor performs a self-calibration.

BiSS-C OUTPUT FORMAT
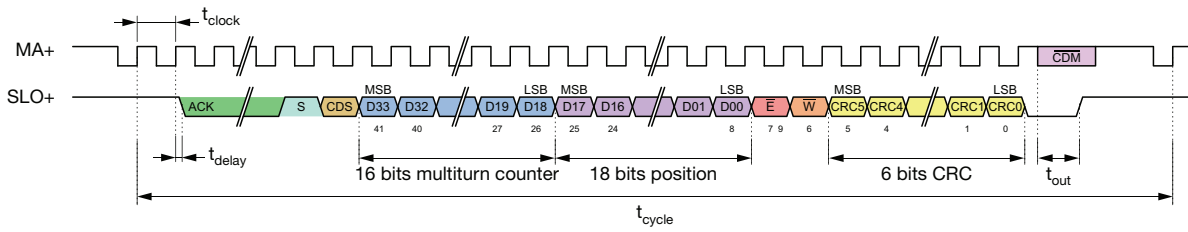
BiSS-C Frame Timing Diagram (Multi-Turn Version)

Fig. 5

BiSS-C Frame Timing Diagram (Multi-Turn Version) in Self-Calibration Mode
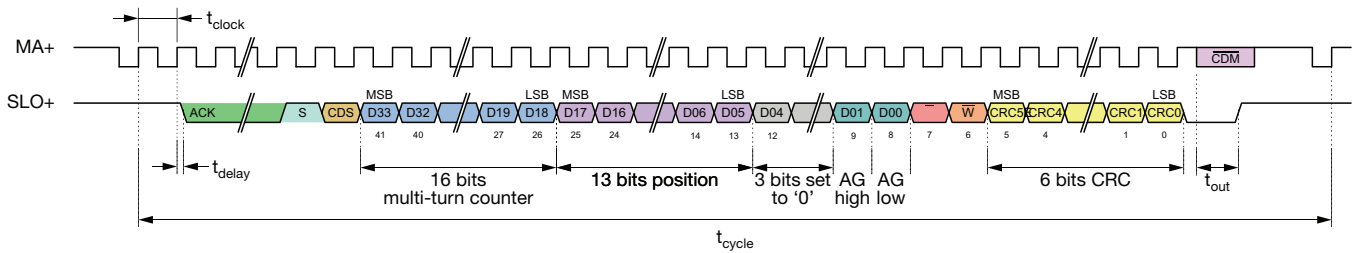

Fig. 6

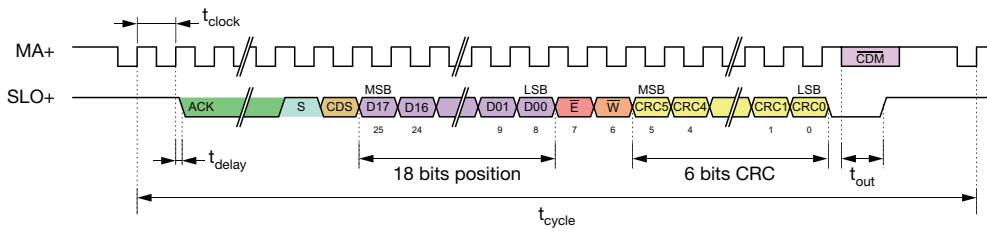### BiSS-C Frame Timing Diagram (Single-Turn Version)

Fig. 7

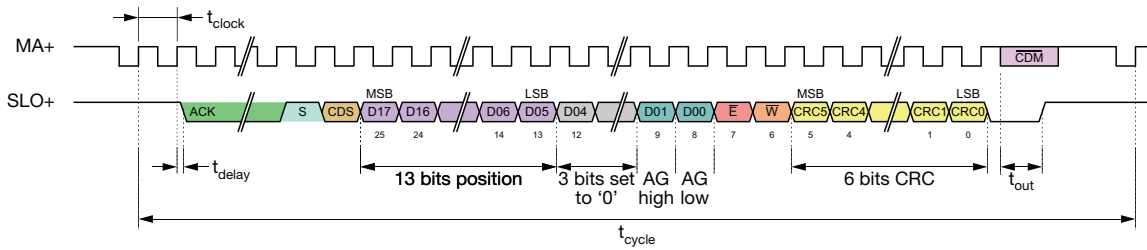### BiSS-C Frame Timing Diagram (Single-Turn Version) in Self-Calibration Mode

Fig. 8

Note
• The total number of clock period after the CDS bit can be higher than the number of data bits, depending on propagation delays and processing timing. Tests must be carried out depending on the specific installation

BiSS-C COMPATIBLE PARAMETERS

PARAMETER	INFORMATION
BiSS-C compatible configuration	Point to point (multi-slave not supported)
Clock and data differential interface	RS422 according to the EIA-RS422
Acknowledgment (ACK) duration	10 x t_{clock} for 100 kHz $\leq f_{clock} \leq$ 2.5 MHz or 4.2 µs typ. for 2.5 kHz < $f_{clock} \leq$ 10 MHz
Start (S)	1 bit always to "1"
Control data slave (CDS)	1 bit
Multiturn counter data (D33 to D18)	16 bits two's complement binary code (-32 768 to +32 767)
Position data (D17 to D00)	18 bits binary code (0 to 262 143)
Error bit (E)	1 bit (active low)
Warning bit (W)	1 bit (active low)
Cyclic redundancy check data (CRC5 to CRC0)	CRC polynomial X6 + X1 + X0 = 0 x 43 - CRC bit length 6 bits; inverted; CRC start value = "0"
Inverted control data master data (/CDM)	Generated by master on clock signal
Clock frequency (f_{clock} = 1/t_{clock})	$\leq$ 10 MHz
Request rate (f_{cycle} = 1/t_{cycle})	$\leq$ 33 kHz (t_{req} = 30 µs) [1]
Propagation delay (t_{delay})	20 ns to 50 ns
BiSS-C compatible timeout (t_{out})	15 µs

Note

[1] With 10 MHz master clock frequency and multi-turn version

BiSS-C CUSTOMER MODE

STATUS BIT		STATUS	INFORMATION	ACTION	LED INDICATOR		
$\overline{E}$	$\overline{W}$				GREEN	ORANGE	RED
1	1	Normal operation	Frame and datas are valid with full accuracy / resolution	No action required	🟢		
1	0	Power-off motion warning	This warning occurs at power up if the sensor has detected an excessive displacement (> ± 90°) during power-off; this warning is reset at the next power-on or after 50 frames have been read on the communication port; the orange LED is "on" when the warning is active	Take decision according to the warning		🟠	
0	1	Self-calibration error	This error occurs if self-calibration is not completed correctly	The self-calibration shall be restarted			🔴
1	1	Airgap valid (only in self-calibration mode, STEP 1)	Valid Airgap; the airgap is in the correct range (0.4 mm ± 0.2 mm); the two LSB of the position indicates the "airgap valid" state: D01 = low / D00 = low	Go to the self-calibration STEP 2	🟢		
0	1	Airgap too low (only in self-calibration mode, STEP 1)	Airgap is too low (< 0.2 mm); the two LSB of the position indicates the "airgap too low" state: D01 = low / D00 = high	Increase the distance between the rotor and stator		🟡	
0	1	Airgap too high (only in self-calibration mode, STEP 1)	Airgap is too high (> 0.6 mm) or the rotor is missing; the two LSB of the position indicates the "airgap too high" state: D01 = high / D00 = low	Check the presence of the rotor and / or reduce the distance between the rotor and stator			🔴
0	1	Waiting rotor rotation and communication read (only in self-calibration mode, STEP 2)	Waiting for rotor rotation and clock on communication interface; if no rotation is detected after 30 s, the sensor automatically return to "Customer Mode"	Start motor rotation (from 100 to 1000 rpm) and provide clocks on communication interface	🟢	🟡	🔴
0	1	Angle correction calculation in progress (only in self-calibration mode, STEP 2)	Computation and recording of the self-calibration parameters (typically 2 s at 100 rpm); the sensor automatically return to "Customer Mode" after calibration is complete	Keep motor rotation speed to a fix value		🟡	🔴

Note
- **MANDATORY: a self-calibration shall be performed after the initial mounting and after each change of mechanical assembly of the encoder**

BiSS-C COMPATIBLE CONNECTOR

PIN NO.	NAME	DESCRIPTION	OPTIONAL: WIRE EQUIPED CONNECTOR (P/N: TBD)
1	VCC	Power supply input	Red
2	MA+	Positive clock input	Orange
3	MA-	Negative clock input	Yellow
4	SLO-	Negative data output	White
5	SLO+	Positive data output	Green
6	GND	Ground	Black

For technical questions, contact: mcbprecisionpot@vishay.com

SSI OUTPUT FORMAT

SSI Frame Timing Diagram (Multi-Turn Version)
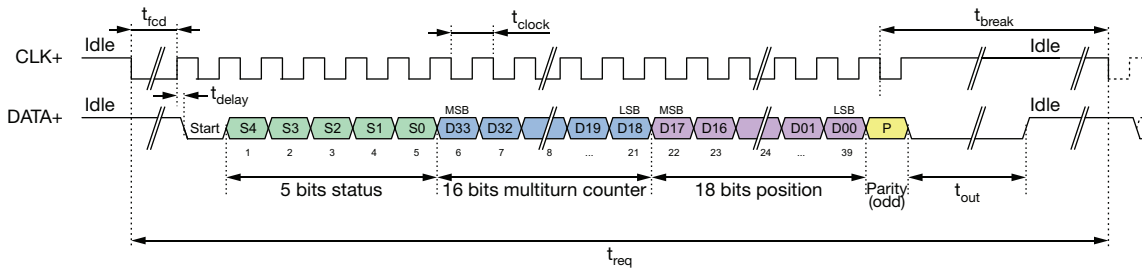

Fig. 9

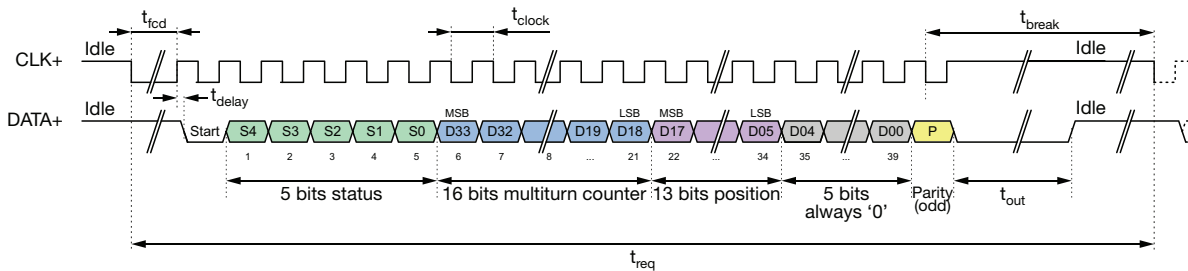### SSI Frame Timing Diagram (Multi-Turn Version) in Self-Calibration Mode

Fig. 10

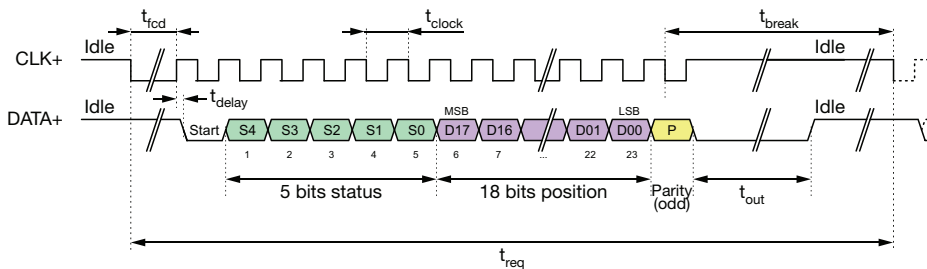### SSI Frame Timing Diagram (Single-Turn Version)

Fig. 11

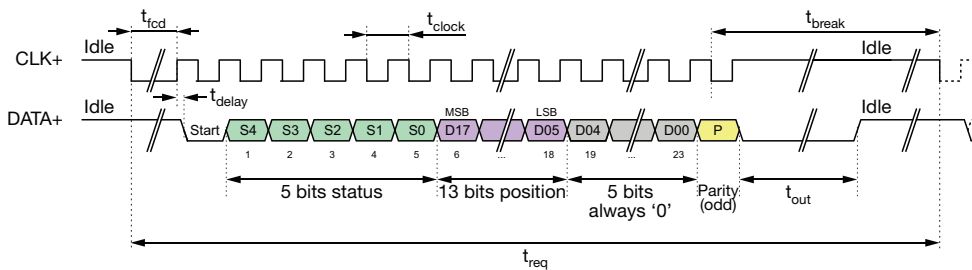### SSI Frame Timing Diagram (Single-Turn Version) in Self-Calibration Mode

Fig. 12

SSI COMPATIBLE PARAMETERS

PARAMETER	INFORMATION	
	MIN.	MAX.
SSI configuration	SLAVE mode only	
Clock and data differential interface	RS422 according to the EIA-RS422	
Multiturn counter data (D33 to D18)	16 bits two's complement binary code (-32 768 to +32 767)	
Position data (D17 to D00)	18 bits binary code (0 to 262 143)	
Parity bit	Odd parity (does not include the start bit)	
First clock delay period (t_{fcd}) [1]	4.2 µs	14 µs
Propagation delay (t_{delay}) [2]	20 ns	50 ns
Transfer time-out period - monoflop time (t_{out})	15 µs	
Time period between two consecutive clock sequences (t_{break})	20 µs	-
Master clock frequency ($f_{clk} = 1/t_{clock}$)	100 kHz	3 MHz
Master request frequency ($f_{req} = 1/t_{req}$)	-	33 kHz ($t_{req} = 30$ µs) [3]

Notes

[1] Position acquisition is synchronized with the first falling edge of CLK. The first clock delay period is required for data acquisition, calculation, and storage in the communication buffer

[2] Measured with ACCSRAIKWIRESOB073 cord (20 cm) at 25 °C ambient temperature

[3] With 10 MHz master clock frequency and multi-turn frame

SSI CUSTOMER MODE

| STATUS BIT					STATUS	INORMATION	ACTION	LED INDICATOR		
S4	S3	S2	S1	S0				GREEN	ORANGE	RED
0	0	0	0	0	Normal operation	Frame and datas are valid with full accuracy / resolution	No action required	🟢		
0	0	0	0	1	Power-off motion warning	This warning occurs at power up if the sensor has detected an excessive displacement (> ± 90°) during power-off; this warning is reset at the next power-on or after 50 frames have been read on the communication port; the orange LED is "on" when the warning is active	Take decision according to the warning		🟡	
0	0	0	1	0	Self-calibration error	This error occurs if self-calibration is not completed correctly	The self-calibration shall be restarted			🔴
1	1	0	0	0	Airgap valid (only in self-calibration mode, STEP 1)	Valid Airgap; the airgap is in the correct range (0.4 mm ± 0.2 mm)	Go to the self-calibration STEP 2	🟢(blinking)		
1	1	0	0	1	Airgap too low (only in self-calibration mode, STEP 1)	Airgap is too low (< 0.2 mm)	Increase the distance between the rotor and stator		🟡(blinking)	
1	1	0	1	0	Airgap too high (only in self-calibration mode, STEP 1)	Airgap is too high (> 0.6 mm) or the rotor is missing	Check the presence of the rotor and / or reduce the distance between the rotor and stator			🔴(blinking)
1	1	1	0	0	Waiting rotor rotation and communication read (only in self-calibration mode, STEP 2)	Waiting for rotor rotation and clock on communication interface; if no rotation is detected after 30 s, the sensor automatically return to "Customer Mode"	Start motor rotation (from 100 to 1000 rpm) and provide clocks on communication interface	🟢(blinking)	🟡(blinking)	🔴(blinking)
1	1	1	0	1	Angle correction calculation in progress (only in self-calibration mode, STEP 2)	Computation and recording of the self-calibration parameters (typically 2 s at 100 rpm); the sensor automatically return to "Customer Mode" after calibration is complete	Keep motor rotation speed to a fix value		🟡(blinking)	🔴(blinking)
Others					RFU (reserved for future use)					

Note

- **MANDATORY: a self-calibration shall be performed after the initial mounting and after each change of mechanical assembly of the encoder**

ACCESSORIES ON REQUEST

EXTERNAL CONNECTOR EQUIPPED OF WIRES TO OBTAIN A WIRES OUTPUT (ACCSRAIKWIRESOB073)
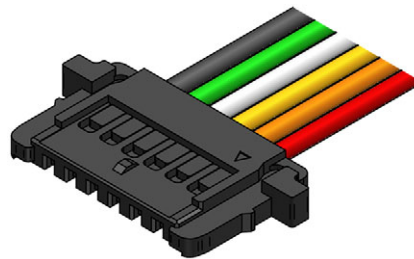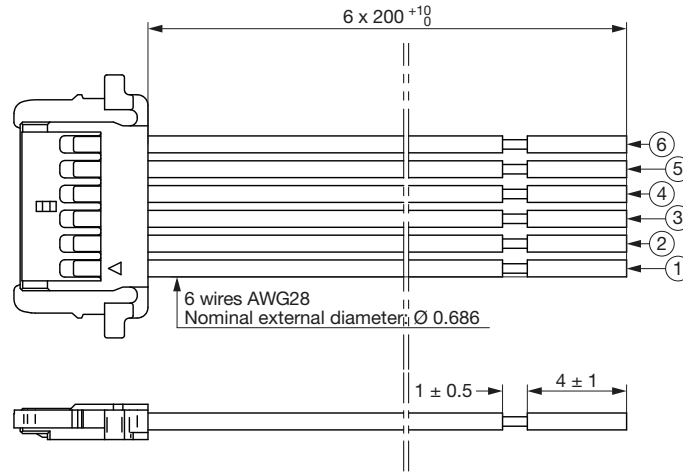
Note
- General tolerancing according to ISO 8015

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