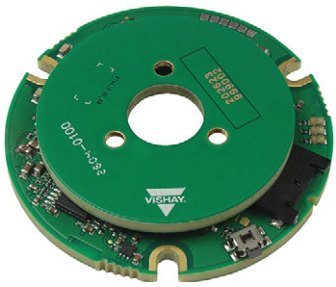
Rotational Absolute Inductive Kit Encoder Version 40 mm Position Sensor



LINKS TO ADDITIONAL RESOURCES

Infographics | Did You Know? | Capabilities and Custom Options

QUICK REFERENCE DATA	
Sensor type	ROTATIONAL, inductive technology
Output type	Connector Molex 5037630691
Market appliance	Industrial
Dimensions	Diameter 40 mm

FEATURES

Pb-free RoHS COMPLIANT

- Off-axis rotational absolute inductive encoder
- Especially dedicated to motor drive, to robot's position and industrial motion control with accurate positioning
- Self-calibration possible over a full turn or only a sector of angle
- Rotation speed up to 10 000 rpm
- High repeatability, high precision, high resolution, single turn
- Built-in self-calibration and built-in self-monitoring
- Easy assembly with status LED colors
- 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…)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

ELECTRICAL SPECIFICATIONS	
PARAMETER	**RAIK040I11318LB**
Voltage power supply	5 V_{DC} ± 0.25 V_{DC}
Supply current at 5 V_{DC}	≤ 100 mA
Output format	BiSS-C
Useful electrical angle	360°
Accuracy at 25 °C	≥ 13 bits (≤ 0.044°)
Repeatability	± 4 LSB typ. (± 0.0055° typ.)
Hysteresis	No hysteresis
Output noise	± 2 LSB typ. (± 0.0027° typ.)
Resolution	262 144 points (18 bits, ≈ 0.0014°)
Startup time	≤ 75 ms
Data latency time	≤ 5 µs
Maximum sampling rate	40 kHz with 10 MHz BiSS-C frequency
BiSS-C frequency	100 kHz to 10 MHz

MECHANICAL SPECIFICATIONS (All Versions)	
PARAMETER	
Mechanical angle	360°
Maximum rotation speed	10 000 rpm (more on request)
Rotor weight	3.1 g
Stator weight	5.7 g

SAP PART NUMBERING GUIDELINES

TYPE	MODEL	DESIGN	SIZE (mm)	TYPE	FUNCTION	ACCURACY (BITS)	RESOLUTION (BITS)	OUTPUT	PACKAGING	OPTION
R = rotational	AI	K = kit	040	I	1	13	18	L = BiSS-C	B = box	Single-turn

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	Random vibration, 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

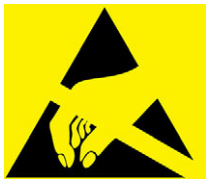
PARAMETER	STANDARD	LEVEL
Electrostatic discharge immunity (ESD)	61000-4-2 :2008	Level 4 (8 kV) - contact discharge
Immunity of radiated radio-frequency electromagnetic field (80 MHz to 6 GHz)	EN 61000-4-3:2020	Level 3 (10 V/m)
Immunity to conducted disturbances induced by radio-frequency fields (150 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



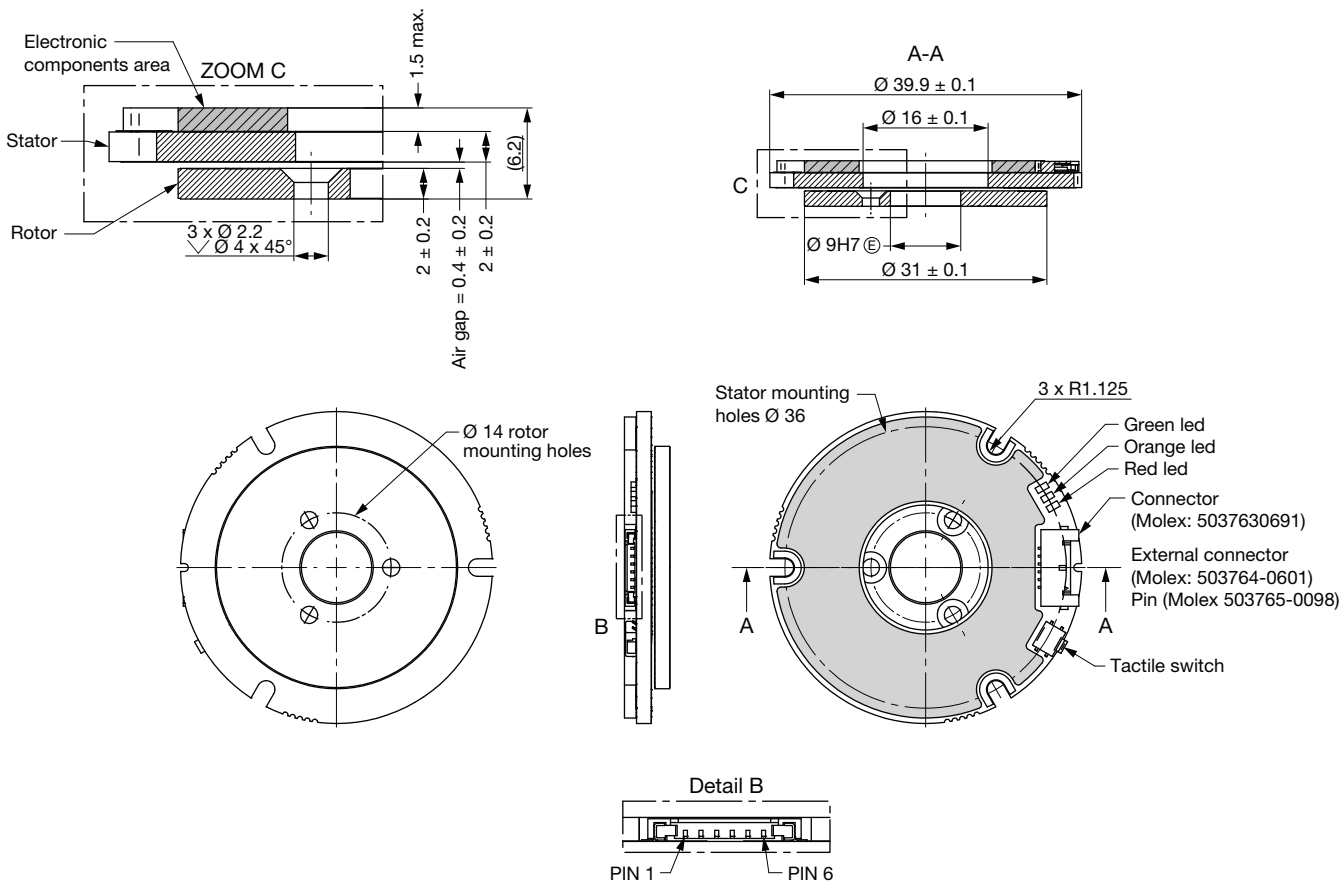
ATTENTION!
Observe Precautions for Handling Electrostatic Sensitive Devices!

Warning: the rotor and the stator must have the same serial number!

- The sensor is delivered in an ESD packaging. To ensure safe handling, remove the sensor from its ESD bag only in an Electrostatic Protected Area (EPA)
- 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...)

For technical questions, contact: mcbprecisionpot@vishay.com

SENSOR DIMENSIONS in millimeters **AND FASTENING POINTS**



MOUNTING CONDITIONS

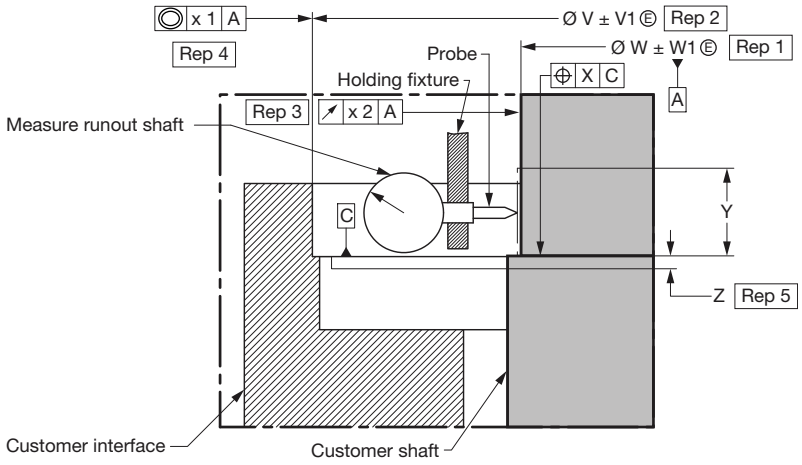


Fig. 1 - Mounting Detail

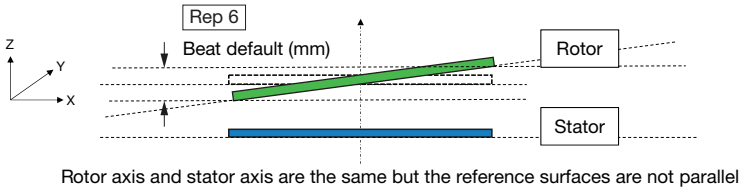


Fig. 2 - Beat

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 9 g6 (8.986 mm to 8.995 mm)
Rep 2	Customer interface diameter for centering of the stator (see Fig. 1)	Diameter Ø 16 mm ± 0.1 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)	< 0.15 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

Note

- Values at room temperature

COMMUNICATION INTERFACES

One protocol is currently possible: BiSS-C

BiSS-C signal 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-

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 RAIK040: Molex 5037630691

Customer connector equipped of wires gauge 28 to plug:

- Female connector Molex 503764-0601
- Contacts Molex 503765-0098

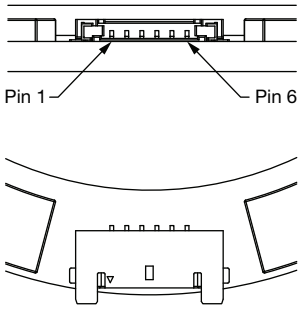


Fig. 3

BISS-C PINOUT				
PIN NO.	NAME (BiSS-C / SSI)	DESCRIPTION	TYPE	OPTIONAL: WIRE EQUIPED CONNECTOR (P/N: ACCSRAIKWIRESOB073)
1	VCC	Power supply input	Power	Red
2	MA+ / CLK+	Positive clock input	Input	Orange
3	MA- / CLK-	Negative clock input	Input	Yellow
4	SLO- / DATA-	Negative data output	Output	White
5	SLO+ / DATA+	Positive data output	Output	Green
6	GND	Ground	Power	

Note

- See section “Accessories on Request” for details on the wire equipped connector

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 self-calibration is possible whatever the rotation speed! In addition, the self-calibration is possible over a full turn (360°) or only a sector angle. 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

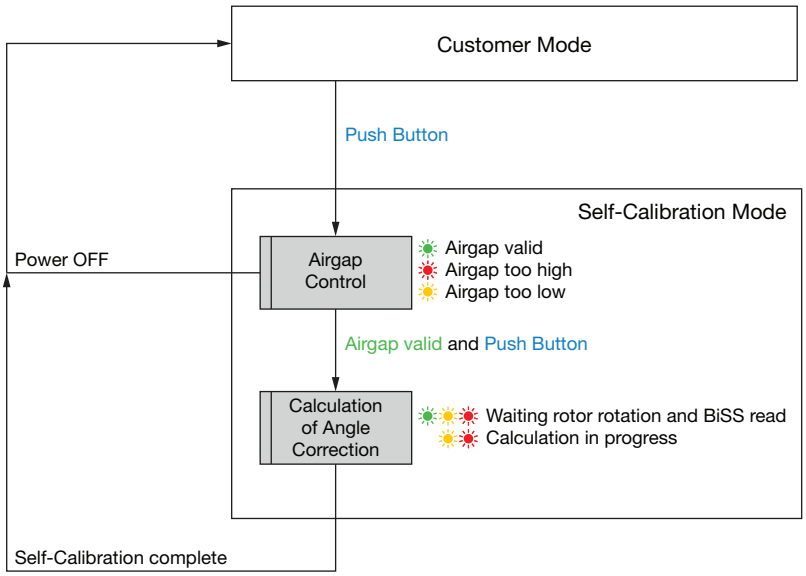
These two methods are described below.

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.

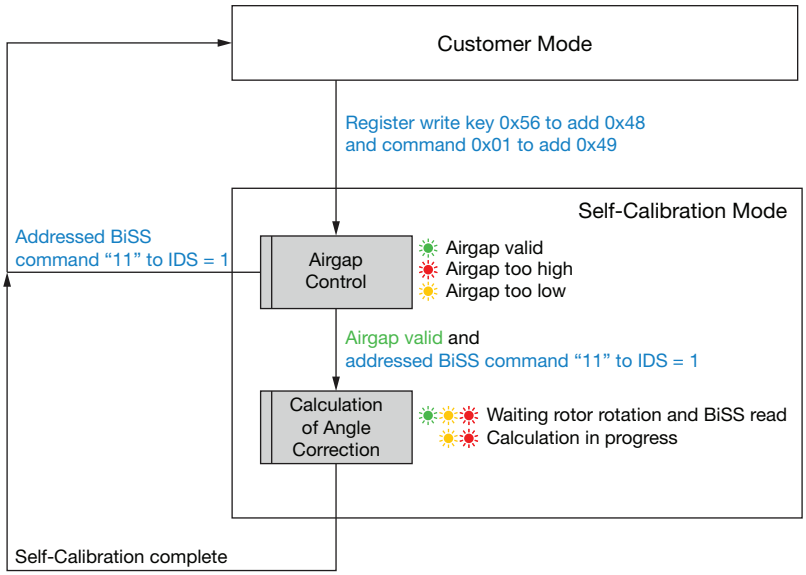
1. Press the Push-Button to enter the Self-Calibration Mode (the sensor will restart in Self-Calibration Mode).
2. In the self-calibration **Step 1** (Airgap Control), the green LED should blink fastly if airgap is valid. If orange or red LED are blinking, the sensor detects an incorrect airgap. Refer to the “Self-Calibration Procedure” section for details.
3. When airgap is valid, press the push button a second time to start calibration: The orange and red LEDs will flash simultaneously to indicate that calibration is in progress.
4. Move through the angular sector: you can move “manually” or use the angle output available during this step as feedback to drive a motor. During this step, the sensor is calculating calibration. It is possible to move back and forth between the lower and upper mechanical stops to refine the calibration.
5. Press the push button a third time to finalize calibration: the sensor will save the parameters in memory (all three LEDs flashing simultaneously), then automatically restart in customer mode. At any time during calibration, it is possible to cancel the process and return to client mode: press and hold the push button for 3 s to 5 s, wait until the green LED is steady, then release. In this version:
   - The new calibration overwrites the previous one.
   - Once calibration is completed, when the sensor is in the “lower stop” position, the output angle will be between 0° and 5.625°.
   - It is still possible to perform a full 360° calibration: the sensor will automatically detect a complete rotation and then restart in client mode.



USING BiSS-C COMMAND

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 (multi-turn value change during self-calibration procedure).
   c. A fix red LED indicates that a calibration error occurs (need to restart the self-calibration procedure).



BiSS-C OUTPUT FORMAT

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

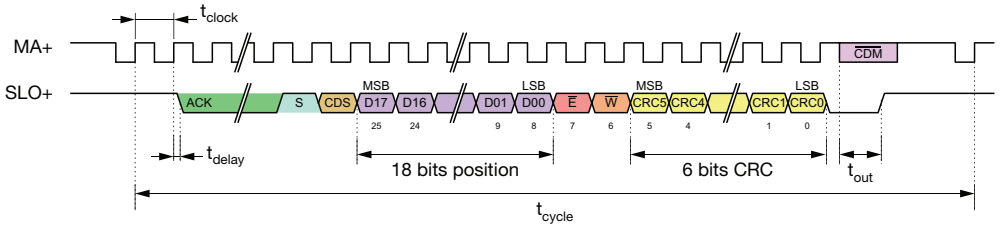


Fig. 4

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

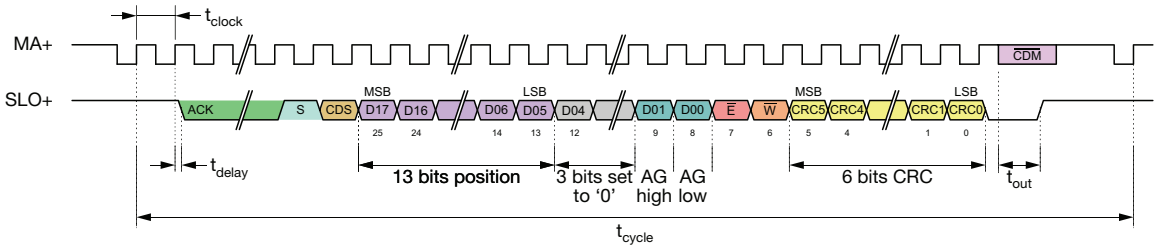


Fig. 5

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 ≤ f_{clock} ≤ 2.5 MHz or 4.2 µs typ. for 2.5 MHz < f_{clock} ≤ 10 MHz
Start (S)	1 bit always to "1"
Control data slave (CDS)	1 bit
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})	100 kHz to 10 MHz
Request rate (f_{cycle} = 1/t_{cycle})	Master clock = 100 kHz → sampling rate up to 2 kS/s Master clock = 500 kHz → sampling rate up to 9 kS/s Master clock = 1 MHz → sampling rate up to 15 kS/s Master clock = 2.5 MHz → sampling rate up to 27 kS/s Master clock = 5 MHz → sampling rate up to 33 kS/s Master clock = 10 MHz → sampling rate up to 40 kS/s
Propagation delay (t_{delay})	20 ns to 50 ns
BiSS-C compatible timeout (t_{out})	15 µs

Position Offset Command (Encoder Zero Position)

ADDR 0x4A								ADDR 0x4B								ADDR 0x4C							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
						OFF [17]	OFF [16]	OFF [15]	OFF [14]	OFF [13]	OFF [12]	OFF [11]	OFF [10]	OFF [9]	OFF [8]	OFF [7]	OFF [6]	OFF [5]	OFF [4]	OFF [3]	OFF [2]	OFF [1]	OFF [0]

Note

- The position offset OFFSET_ANGLE [17:0] is mapped to registers 0x4A, 0x4B, and 0x4C of the direct access memory in a big-endian format

There is two ways to apply a zero position:

A. Using command:

1. Unlock the command by writing **key code 0x56** to address **0x48**
2. Write **command code 0x12** to address **0x49** to apply the position offset. The position is then automatically shifted by the value of the current position
3. It is also possible to **cancel** the position offset with the command **code 0x13** to address **0x49**

B. Using register access:

It is also possible to set the offset position directly by writing to registers 0x4A, 0x4B and 0x4C. To do so, user must write independently to the registers. Note that register 0x4A stores the two MSB OFFSET_ANGLE[17] and OFFSET_ANGLE[16] of the 18 bits offset position, and ignores the 6 other bits.

The position offset is saved in non-volatile memory and will not change after the sensor is restarted.

Applying a new position offset change the multi-turn counter origin to the new zero position (if present).

BiSS-C MEMORY ORGANIZATION

1. LEXICON		
TYPE	**DESCRIPTION**	**COMMENT**
ST	Single-turn sensor version	For example, RAIK060I11318LB (BiSS-C Single-turn)
MT	Multi-turn sensor version	For example, RAIK060I11318LB692 (BiSS-C Multi-turn)
R	“Read only” access	Register readable but not writable. Read access also support sequential reading method.
R/W	“Read and Write” access	Register readable and writable. Write access also support sequential writing method.
U8	Unsigned 8 bits	Values are saved as a Big Endian, i.e. with the highest-value byte at the lowest-value address
U16	Unsigned 16 bits	
U24	Unsigned 24 bits	
U32	Unsigned 32 bits	
U48	Unsigned 48 bits	

2. BANKS			
BANK N°	**ADDRESS**	**DETAIL**	**R / W**
0	0x00 to 0x3F	Device configuration	R
1	0x00 to 0x3F	EDS common part	R
2	0x00 to 0x3F	EDS BiSS profil 3	R
3 to 6	0x00 to 0x3F	User bank	R / W

Note for user bank memory: four user banks of 64 bytes are available in banks 3 to 6 for free R / W access by the user, representing 256 bytes of non-volatile memory read and write access supports sequential read / write method.

3. BiSS-C DIRECT ACCESS

ADDR	R / W	SYMBOL	DESCRIPTION	FORMAT	VALUES
0x40	R / W	BSEL	Blank selection	U8	-
0x41	R	EDS_BANK	Point to EDS bank	U8	0x01
0x42	R	BP_ID [15:8]	BiSS profile ID	U16	0x62
0x43	R	BP_ID [7:0]			
0x44	R	DEV_SN [31:24]	Device serial number	U32	Unique number for each sensor
0x45	R	DEV_SN [23:16]			
0x46	R	DEV_SN [15:8]			
0x47	R	DEV_SN [7:0]			
0x48	R / W	KEY	Key register (1)	U8	-
0x49	R / W	CMD	Command register	U8	-
0x4A	R / W	“0000 00” and OFFSET_ANGLE [17:16]	Offset angle register	U24	-
0x4B	R / W	OFFSET_ANGLE [15:8]			
0x4C	R / W	OFFSET_ANGLE [7:0]			
0x4D to 0x77	R / W	Free registers	Free registers	U8	-
0x78	R	DEV_ID [47:40]	Device ID	U48	0x343137373338
0x79	R	DEV_ID [39:32]			
0x7A	R	DEV_ID [31:24]			
0x7B	R	DEV_ID [23:16]			
0x7C	R	DEV_ID [15:8]			
0x7D	R	DEV_ID [7:0]			
0x7E	R	MFR_ID [15:8]	Manufacturer ID (2)	U16	0x56
0x7F	R	MFR_ID [7:0]			0x59

Notes

(1) Vishay key code: 0x56

(2) Vishay manufacturer ID: 0x5659

4. BiSS-C BANK N° 0 - DEVICE CONFIGURATION

ADDR	SYMBOL	DESCRIPTION	FORMAT	VALUES	COMMENT
0x00	FW_MAJOR_VERS	Major firmware version	U8	-	Example for firmware version A4: FW_MAJOR_VERS = 0x41 FW_MINOR_VERS = 0x34
0x01	FW_MINOR_VERS	Minor firmware version	U8	-	
0x02 to 003F	Reserved	-	U8	0x00	-

5. BiSS-C BANK N° 1 - EDS COMMON PART

ADDR	SYMBOL	DESCRIPTION	FORMAT	UNIT	VALUES	COMMENT
0x00	EDS_VER	EDS version (continuous number)	U8		0x01	
0x01	EDS_LEN	EDS length (bank count completely)	U8	BANKS	0x02	
0x02	USR_STA	Bank address USER start (bank selection in address 64, 255= not available)	U8		0x03	
0x03	USR_END	Bank address USER end (bank selection address 64)	U8		0x07	
0x04	TMA	Minimum permitted clock period on MA (TMA)	U8	1 ns	0x64	100 ns
0x05	TO_MIN	Minimum BiSS timeout (0= adaptive)	U8	250 ns	0x3C	15 µs
0x06	TO_MAX	Maximum BiSS timeout (0= adaptive)	U8	250 ns	0x4C	19 µs
0x07	TOS_MIN	Minimum BiSS timeout_S (0= adaptive)	U8	25 ns	0x3C	15 µs
0x08	TOS_MAX	Maximum BiSS timeout_S (0= adaptive)	U8	25 ns	0x4C	19 µs
0x09	TCLK_MIN	Minimum sampling period adaptive timeout (0= adaptives timeout not available)	U8	25 ns	0x00	
0x0A	TCLK_MAX	Maximum sampling period adaptive timeout (0= adaptives timeout not available)	U8	25 ns	0x00	
0x0B	TCYC	Minimum cycle time (0= no limitation)	U8	250 ns	0x00	
0x0C	TBUSY_S	Maximum processing time SCD	U8	250 ns	0x12	4.5 µs
0x0D	BUSY_S	Additional processing time SCD in clocks	U8	TMA	0x0A	10 clocks

5. BiSS-C BANK N° 1 - EDS COMMON PART

ADDR	SYMBOL	DESCRIPTION	FORMAT	UNIT	VALUES	COMMENT
0x0E	PON_DLY [15:8]	Maximum “power on delay” until control communication is available	U16	1 ms	0x00	75 ms
0x0F	PON_DLY [7:0]				0x4B	
0x10	DC_NUM	Number of data channel in this device (number of words)	U8	-	0x01	
0x11	SL_NUM	Area of validity for this EDS (number of slave addresses)	U8	-	0x01	
0x12	SL_OFF	Memory location for this EDS (slave ID within this device)	U8	-	0x00	
0x13	Reserved	-				
0x14	BANK1	Bank address for content description data channel 1 (profile EDS)	U8		0x02	
0x15	DLEN1	Data length data channel 1	U8	Bit	0x14	20 bits
0x16	FORMAT1	Data format data channel 1	U8	Bit	0x00	
0x17	CPOLY1	CRC polynome [8:1] for data channel 1	U8	-	0x21	= 0x43 polynome
0x18	BANK2	Bank address for content description data channel 2 (profile EDS)	U8	-	0x00	
0x19	DLEN2	Data length data channel 2	U8	Bit	0x00	
0x1A	FORMAT2	Data format data channel 2	U8	Bit	0x00	
0x1B	CPOLY2	CRC polynome [8:1] for data channel 2	U8	-	0x00	
0x1C	BANK3	Bank address for content description data channel 3 (profile EDS)	U8	-	0x00	
0x1D	DLEN3	Data length data channel 3	U8	Bit	0x00	
0x1E	FORMAT3	Data format data channel 3	U8	Bit	0x00	
0x1F	CPOLY3	CRC polynome(8:1) for data channel 3	U8	-	0x00	
0x20	BANK4	Bank address for content description data channel 4 (profile EDS)	U8	-	0x00	
0x21	DLEN4	Data length data channel 4	U8	Bit	0x00	
0x22	FORMAT4	Data format data channel 4	U8	Bit	0x00	
0x23	CPOLY4	CRC polynome [8:1] for data channel 4	U8	-	0x00	
0x24	BANK5	Bank address for content description data channel 5 (profile EDS)	U8	-	0x00	
0x25	DLEN5	Data length data channel 5	U8	Bit	0x00	
0x26	FORMAT5	Data format data channel 5	U8	Bit	0x00	
0x27	CPOLY5	CRC polynome [8:1] for data channel 5	U8	-	0x00	
0x28	BANK6	Bank address for content description data channel 6 (profile EDS)	U8	-	0x00	
0x29	DLEN6	Data length data channel 6	U8	Bit	0x00	
0x2A	FORMAT6	Data format data channel 6	U8	Bit	0x00	
0x2B	CPOLY6	CRC polynome [8:1] for data channel 6	U8	-	0x00	
0x2C	BANK7	Bank address for content description data channel 7 (profile EDS)	U8	-	0x00	
0x2D	DLEN7	Data length data channel 7	U8	Bit	0x00	
0x2E	FORMAT7	Data format data channel 7	U8	Bit	0x00	
0x2F	CPOLY7	CRC polynome [8:1] for data channel 7	U8	-	0x00	
0x30	BANK8	Bank address for content description data channel 8 (profile EDS)	U8	-	0x00	
0x31	DLEN8	Data length data channel 8	U8	Bit	0x00	
0x32	FORMAT8	Data format data channel 8	U8	Bit	0x00	
0x33	CPOLY8	CRC polynome [8:1] for data channel 8	U8	-	0x00	
0x34	BC_OFF	Bus coupler control location for this device (slave ID within this device)	U8	-	0x00	
0x35 to 0x3E	Reserved	-	U8	-	0x00	
0x3F	CHKSUM	Check sum (addition of all bytes within this bank)	U8	-	-	

Note

- Bank N° 1 store the electronic datasheet (EDS) parameters

6. BiSS-C BANK N° 2 - BiSS PROFIL 3

ADDR	SYMBOL	DESCRIPTION	FORMAT	UNIT	VALUES	COMMENT
0x00	BP_VER	BiSS profile 3 version	U8	-	0x01	
0x01	BP_LEN	Length of this profile	U8	Banks	0x01	
0x02	BP_ID	Profile identification BP3 (content also available in address 0x42 and 0x43)	U8	-	0x62	
0x03			U8	-	0x14	20 bits
0x04	FB1	Feedback bit 1 low active error status nE	U8	Table B	0x01	Error bit low active
0x05	FB2	Feedback bit 2 low active warning status nW	U8	Table B	0x02	Warning bit low active
0x06	PON_PDL	Maximum “power on delay” until position data are available	U8	ms	0x05	5 ms
0x07	Reserved	Reserved	-	-	-	
0x08	EN_TYP	Encoder type	U8	-	0x00	Rotary encoder
0x09	POS_NUM	Position value	U8	Table N	0x01	Position value 1
0x0A	MT_LEN	Data length MULTI-TURN	U8	Bit	0x00	
0x0B	MT_FMT	Data format MULTI-TURN	U8	Table F	0x00	
0x0C	CO_LEN	Data length COARSE	U8	Bit	0x00	
0x0D	CO_FMT	Data format COARSE	U8	Table F	0x00	
0x0E	FI_LEN	Data length FINE	U8	Bit	0x12	0x12 = 18 bits position
0x0F	FI_FMT	Data format FINE	U8	Table F	0x01	Left-aligned
0x10	MT_CNT	Number of distinguishable revolutions/periods	U32	-	0x00	
0x11					0x00	
0x12					0x00	
0x13					0x00	
0x14	SIP_CNT	Number of signal periods per revolution / length of signal period	U32	PPR (rotary) nm (linear)	0x00	0x01=1period per revolution
0x15					0x00	
0x16					0x00	
0x17					0x01	
0x18	SIP_RES	resolution factor per signal period (LSB of the interpolation)	U32	LSB	0x00	0x40000 = 262 144
0x19					0x04	
0x1A					0x00	
0x1B					0x00	
0x1C	CPOLY	CRC polynomial (32:1) of 0x43 = 0x21	U32	-	0x00	= 0x43 polynome
0x1D					0x00	
0x1E					0x00	
0x1F					0x21	
0x20	CSTART	CRC start value	U32	-	0x00	
0x21					0x00	
0x22					0x00	
0x23					0x00	
0x24	ABS_ACU	Absolute accuracy	U16	LSB/2	0x00	
0x25					0x00	
0x26	REL_ACU	Repeat accuracy	U16	LSB/2	0x00	
0x27					0x00	
0x28	SPD_ACU	Angular speed / speed depending accuracy	U16	LSB/2	0x00	
0x29					0x00	
0x2A	HYST	Hysteresis	U16	LSB/2	0x00	
0x2B					0x00	
0x2C	SPD_MAX	Maximum revolution speed / maximum speed	U16	1/min m/min	0x27	10 000 rpm
0x2D					0x10	
0x2E	ACC_MAX	Maximum angular acceleration / maximum acceleration	U16	1/min² m/min²	0x00	
0x2F					0x00	

6. BiSS-C BANK N° 2 - BiSS PROFIL 3

ADDR	SYMBOL	DESCRIPTION	FORMAT	UNIT	VALUES	COMMENT
0x30	TMP_MIN	Minimum operating temperature	U16	K	0x00	233 K / -40 °C
0x31					0xE9	
0x32	TMP_MAX	Maximum operating temperature	U16	K	0x01	378 K / +105 °C
0x33					0x7A	
0x34	VLT_MIN	Minimum operating voltage	U16	mV	0x12	4.75 V
0x35					0x8E	
0x36	VLT_MAX	Maximum operating voltage	U16	mV	0x14	5.25 V
0x37					0x82	
0x38	CUR_MAX	Maximum current consumption	U16	mA	0x00	120 mA
0x39					0x78	
0x3A to 0x3E	Reserved	Reserved	-	-	0x00	
0x3F	CHKSUM	Checksum (sum of bytes in 0x00 to 0x3E)	U8	-		

Note

- Bank N° 2 store the encoder profile BP3 parameters

BiSS-C STATUS BIT

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 500 rpm) and provide clocks on communication interface			

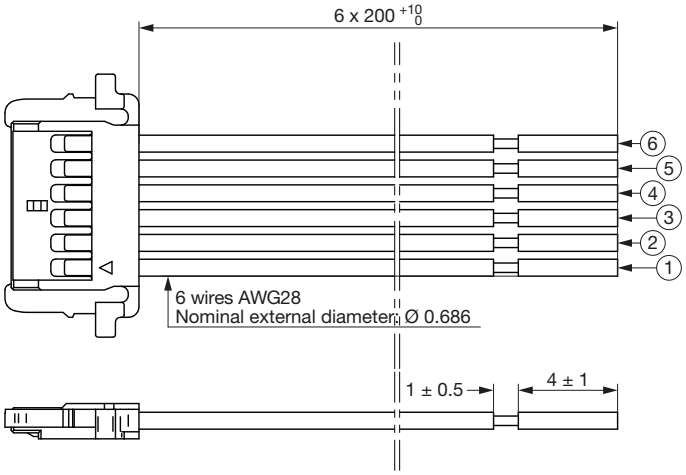
BiSS-C STATUS BIT							
STATUS BIT		STATUS	INFORMATION	ACTION	LED INDICATOR		
$\overline{E}$	$\overline{W}$				GREEN	ORANGE	RED
0	1	Angle correction calculation in progress (only in Self-Calibration Mode, STEP 2)	Computation and recording of the self-calibration parameters (typically 2 s at 100 rpm); the sensor automatically return to “Customer Mode” after calibration is complete	Keep motor rotation speed to a fix value			

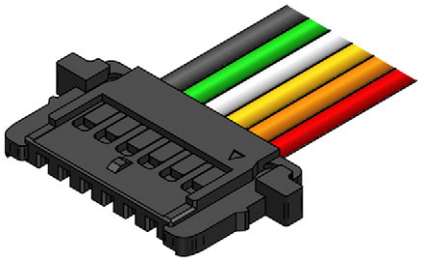
Note

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

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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