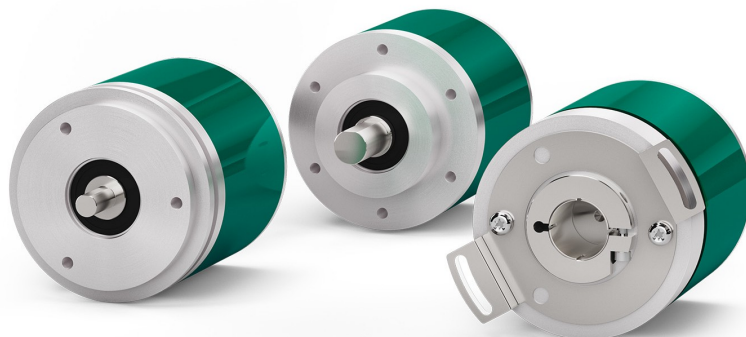


R. EH058 R. EHM58



- Designed to replace ES58, EM58, HS58 & HM58 encoders
- Singleturn and multiturn rotary encoders
- Singleturn resolution up to 20 bit (1,048,576 cpr)
- Total resolution up to 30 bit (1,073,741,824 counts)
- SSI and BiSS C-mode interfaces
- Additional incremental and Sine/Cosine signals on request
- With EHG Energy Harvesting Generator technology platform

Suitable for the following models:

- R. EH058-...
- R. EH058S-...
- R. EH058C-...
- R. EH059C-...
- R. EHM58-...
- R. EHM58S-...
- R. EHM58C-...
- R. EHM59C-...

Table of Contents

Preliminary information	7
1 - Safety summary	8
2 - Identification	10
3 - Mounting instructions	11
4 - Electrical connections	17
5 - SSI interface	23
6 - BiSS C-mode interface	30
7 - AB /AB incremental output signals	47
8 - Sine/Cosine 1 Vpp output signals	49
9 - Default parameters list	51

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The logo for Lika Electronic s.r.l. features the word "lika" in a bold, lowercase, sans-serif typeface. The letters are black and have a modern, clean appearance.

General contents

User's guide.....	1
General contents.....	3
Subject Index.....	5
Typographic and iconographic conventions.....	6
Preliminary information.....	7
1 – Safety summary.....	8
1.1 Safety.....	8
1.2 Electrical safety.....	8
1.3 Mechanical safety.....	9
2 – Identification.....	10
3 – Mounting instructions.....	11
3.1 Solid shaft encoders R. EHO58, R. EHO58S, R. EHM58, R. EHM58S.....	11
3.1.1 Customary installation.....	11
3.1.2 Installation using fixing clamps (code LKM386).....	12
3.1.3 Installation using the mounting bell (code PF4256).....	12
3.2 Hollow shaft encoders.....	13
3.2.1 R. EHO58C, R. EHM58C.....	13
3.2.2 R. EHO59C, R. EHM59C.....	14
3.2.3 R. EHO5xC, R. EHM5xC with optional KIT XX60.....	15
4 – Electrical connections.....	17
4.1 M23 12-pin CCW connector.....	17
4.2 M12 12-pin connector.....	18
4.3 M12 8-pin connector.....	18
4.4 MIL 7-pin connector.....	18
4.5 MIL 10-pin connector.....	18
4.6 TF12 cable specifications.....	18
4.7 Connection of the shield.....	19
4.8 GND connection.....	19
4.9 AB /AB incremental output signals.....	19
4.10 Sine/Cosine 1Vpp output signals.....	19
4.11 Angular resolution.....	19
4.12 Counting direction input.....	20
4.13 Zero setting / (Preset / Offset) input.....	21
5 – SSI interface.....	23
5.1 SSI (Synchronous Serial Interface).....	23
5.2 "TREE Format" protocol (BS, GS).....	24
5.3 "LSB Right Aligned" protocol (BA, GA, BV, GV, G1, G6).....	26
5.4 "MSB Left Aligned" protocol (BG, GG).....	27
5.5 Recommended transmission rates.....	28
5.6 Recommended SSI input circuit.....	29
6 – BiSS C-mode interface.....	30
6.1 Communication.....	30
6.2 Single Cycle Data.....	31
6.2.1 SCD structure.....	31
Position.....	31
Error.....	31

Warning.....	32
CRC.....	32
6.3 Control Data CD.....	32
Register address.....	32
RW.....	32
DATA.....	33
CRC.....	33
6.4 Used registers.....	34
Profile ID.....	35
Serial number.....	35
Command.....	35
Normal operation.....	35
Save parameters on EEPROM.....	35
Save parameters and activate Preset / Offset.....	35
Load and save default parameters.....	35
Configuration.....	36
Set preset / offset.....	36
Enable preset / offset.....	37
Output code.....	37
Code sequence.....	37
Counts per revolution.....	38
Number of revolutions.....	40
Preset / Offset.....	41
Device type.....	42
N° of bits used for singleturn.....	42
N° of bits used for multiturn.....	43
Incremental resolution.....	43
Number of clocks.....	43
Shift bits.....	43
Parity.....	43
Device ID.....	43
Manufacturer ID.....	44
6.5 Application note.....	44
6.6 EXAMPLES.....	44
6.6.1 Setting the Configuration register.....	44
6.6.2 Setting the Preset / Offset.....	45
6.7 Recommended BiSS input circuit.....	46
7 – AB /AB incremental output signals.....	47
7.1 Recommended Push-Pull incremental input circuit.....	47
7.2 Recommended Line Driver incremental input circuit.....	48
8 – Sine/Cosine 1 Vpp output signals.....	49
8.1 Output signals voltage level.....	49
8.2 Recommended input circuit.....	49
9 – Default parameters list.....	51

Subject Index

C

Command.....	35
Configuration.....	36
Counts per revolution.....	38
CRC.....	32p.

D

DATA.....	33
Device ID.....	43
Device type.....	42

E

Error.....	31
------------	----

I

Incremental resolution.....	43
-----------------------------	----

M

Manufacturer ID.....	44
----------------------	----

N

N° of bits used for multiturn.....	43
N° of bits used for singleturn.....	42
Number of clocks.....	43
Number of revolutions.....	40

P

Parity.....	43
Position.....	31
Preset / Offset.....	41
Profile ID.....	35

R

Register address.....	32
RW.....	32

S

Serial number.....	35
Shift bits.....	43

W

Warning.....	32
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Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects both of Lika device and interface are coloured in **GREEN**;
- alarms are coloured in **RED**;
- states are coloured in **FUCSIA**.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

	This icon, followed by the word WARNING , is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment.
	This icon, followed by the word NOTE , is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence.
	This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word EXAMPLE when instructions for setting parameters are accompanied by examples to clarify the explanation.

Preliminary information

This guide is designed to provide the most complete and exhaustive information the operator needs to correctly and safely install and operate the **R. EH058 and R. EHM58 absolute encoders with SSI and BiSS C-mode interfaces**. The R. EH058 and R. EHM58 absolute encoders are **designed to replace** the ES58, EM58, HS58, and HM58 series encoder that are phasing out.

The **R. EH058-R. EHM58 absolute encoders** can be equipped with either high accuracy **optical sensing technology** (R. EH058) or robust **magnetic sensing technology** (R. EHM58) and the SSI and BiSS interfaces.

They are built in a standard 58-mm flange diameter housing and can operate in typical industrial environments thanks to the **IP65 protection rate and the extended -40°C and +100°C (-40°F +212°F) operating temperature range**.

They integrate the **EHG Energy Harvesting Generator** technology platform. The advantage is that the multiturn counter is battery-free and gearless, allowing the encoder to be lighter and more compact and to reduce the risk of mechanical failures.

The absolute position is provided via the **SSI and BiSS C-mode interfaces** through cable and connector connections. Also the Universal power supply circuit is very useful, it enables an input voltage of +5Vdc +30Vdc.

The singleturn resolution can be up to 20 bits; the total resolution can be up to 30 bit.

For technical specifications please [refer to the product datasheet](#).

To make it easier to read and understand the text, this guide can be divided into three main sections.

In the first section some general information concerning the safety, the mechanical installation and the electrical connection as well as tips for setting up and running properly and efficiently the unit are provided.

In the second section, entitled **SSI interface**, both general and specific information is given on the SSI interface, see on page 23.

In the third section, entitled **BiSS C-mode interface**, both general and specific information is given on the BiSS C-mode interface. In this section the parameters implemented in the unit are fully described. See on page 30.

1 – Safety summary



1.1 Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic assumes no liability for the customer's failure to comply with these requirements.



1.2 Electrical safety

- Turn off the power supply before connecting the device;
- connect the encoder according to the explanation in the "4 - Electrical connections" section on page 17;
- connect +Vdc and 0Vdc and check the power supply is correct first before connecting the communication signals;
- if not used, connect the Zero setting (Preset / Offset) and Counting direction inputs to 0Vdc;
 - to activate the Zero / Preset, connect the Zero setting (Preset / Offset) input to +Vdc for 100 μ s at least, then disconnect +Vdc; normally voltage must be at 0Vdc; the Zero / Preset must be set after the Counting direction; we suggest setting the Zero / Preset when the encoder shaft is not running;
 - Counting direction: CW increasing count (viewed from the shaft side): connect to 0Vdc; CCW increasing count: connect to +Vdc;
- in compliance with the 2014/30/EU norm on electromagnetic compatibility, following precautions must be taken:
 - before handling and installing, discharge electrical charge from your body and tools which may come in touch with the device;
 - power supply must be stabilized without noise, install EMC filters on device power supply if needed;
 - always use shielded cables (twisted pair cables whenever possible);
 - avoid cables runs longer than necessary;
 - avoid running the signal cable near high voltage power cables;
 - mount the device as far as possible from any capacitive or inductive noise source, shield the device from noise source if needed;
 - to guarantee a correct working of the device, avoid using strong magnets on or near by the unit;



- minimize noise by connecting the shield and/or the connector housing and/or the frame to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user.



1.3 Mechanical safety

- Install the device following strictly the information in the "3 - Mounting instructions" section on page 11;
- mechanical installation has to be carried out with stationary mechanical parts;
- do not disassemble the encoder;
- do not tool the encoder or its shaft;
- delicate electronic equipment: handle with care; do not subject the device and the shaft to knocks or shocks;
- respect the environmental characteristics declared by manufacturer;
- unit with solid shaft: in order to guarantee the maximum reliability over time of the mechanical parts, we recommend a flexible coupling to be installed to connect the encoder and the installation shaft; make sure the misalignment tolerances of the flexible coupling are respected;
- unit with hollow shaft: the encoder can be mounted directly on a shaft whose diameter has to be according to the technical characteristics specified in the purchase order and clamped by means of the collar and the fixing plate into which an anti-rotation pin has to be inserted.

2 - Identification

The device can be identified through the **order code** and the **serial number** printed on the label applied to its housing. Information is listed in the delivery document too. Please always quote the order code and the serial number when reaching Lika Electronic for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product [refer to the technical catalog](#).



Warning: encoders whose order code ends with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

3 - Mounting instructions



WARNING

Installation and maintenance operations must be carried out by qualified personnel only, with power supply disconnected and mechanical parts absolutely in stop.

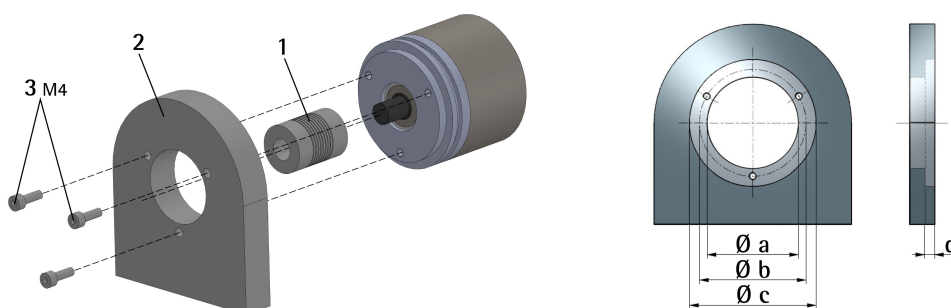
For any information on the mechanical data and the electrical characteristics of the encoder please refer to the technical catalog.

3.1 Solid shaft encoders R. EH058, R. EH058S, R. EHM58, R. EHM58S

- Mount the flexible coupling **1** on the encoder shaft.
- Fix the encoder to the flange **2** (or to the mounting bell **2**) by means of the screws type M4 **3**.
- Mount the flexible coupling **1** on the motor shaft, then secure the flange **2** to the support (or the mounting bell **2** to the motor).
- Ensure the misalignment tolerances of the flexible coupling **1** are met.

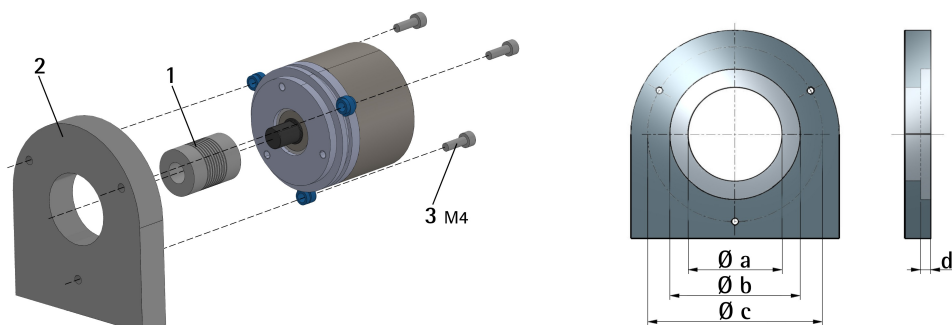
3.1.1 Customary installation

(R. EH058, R. EH058S, R. EHM58, & R. EHM58S)



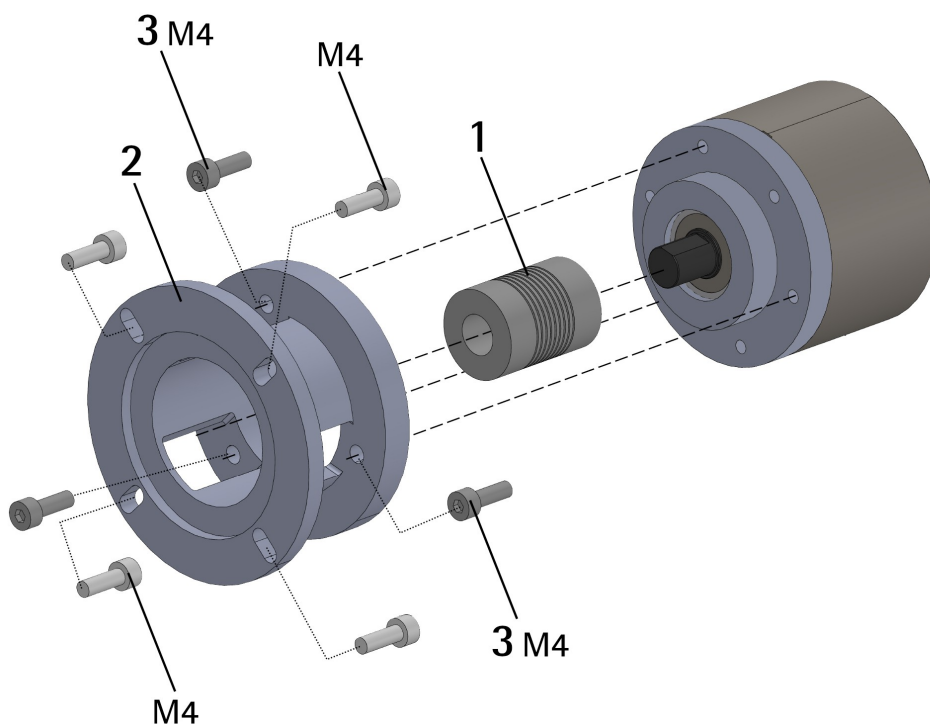
	a [mm]	b [mm]	c [mm]	d [mm]
R. EH058, R. EHM58	-	42	50 F7	4
R. EH058S, R. EHM58S	36 H7	48	-	-

3.1.2 Installation using fixing clamps (code LKM386) (R. EH058, R. EH058S, R. EHM58, & R. EHM58S)



	a [mm]	b [mm]	c [mm]	d [mm]
R. EH058, R. EHM58	-	50 F7	67	4
R. EH058S, R. EHM58S	36 H7	-	67	-

3.1.3 Installation using the mounting bell (code PF4256) (R. EH058S & R. EHM58S)



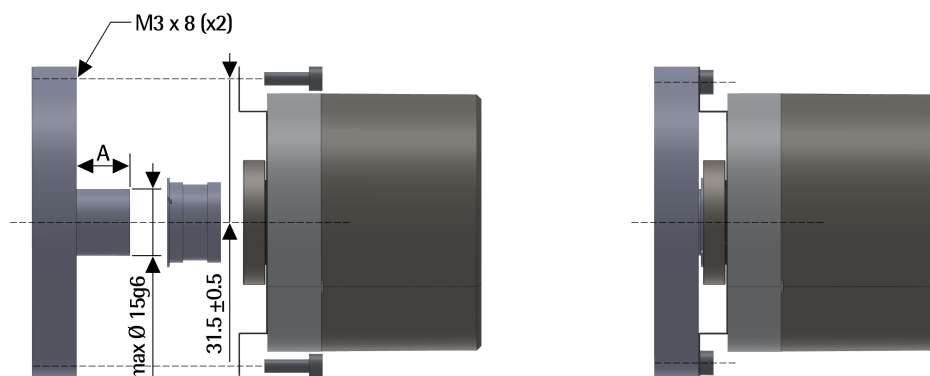
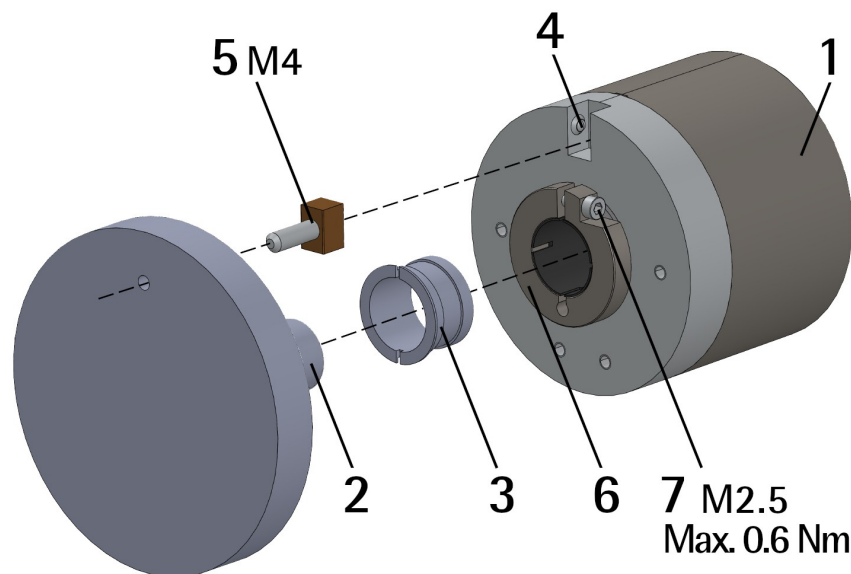
NOTE

In order to guarantee reliability over time of the encoder mechanical parts, we recommend a flexible coupling to be installed between the encoder and the motor shaft. Make sure the misalignment tolerances of the flexible coupling are respected.

3.2 Hollow shaft encoders

3.2.1 R. EH058C, R. EHM58C

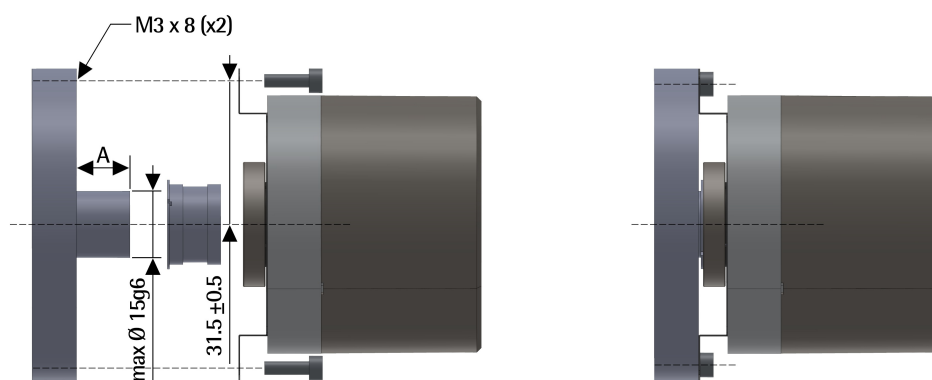
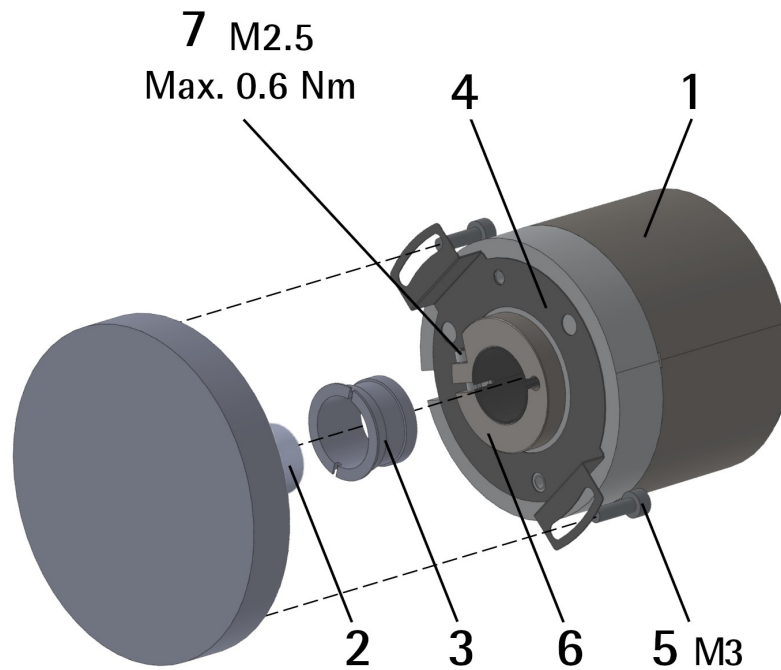
- Fasten the M4 anti-rotation pin **5** to the rear of the motor (secure it by using a locknut).
- Mount the encoder **1** on the motor shaft **2** using the reducing sleeve **3** (if required). Avoid forcing the encoder shaft.
- Insert the anti-rotation pin **5** into the slot on the flange of the encoder; this secures it in place by grub screw **4**, preset at Lika.
- Secure the collar **6** to the encoder shaft by means of the M2.5 screw **7** (apply some threadlocker to the screw **7**). Max. tightening torque: 0.6 Nm.



A = min. 8, max. 18 mm

3.2.2 R. EH059C, R. EHM59C

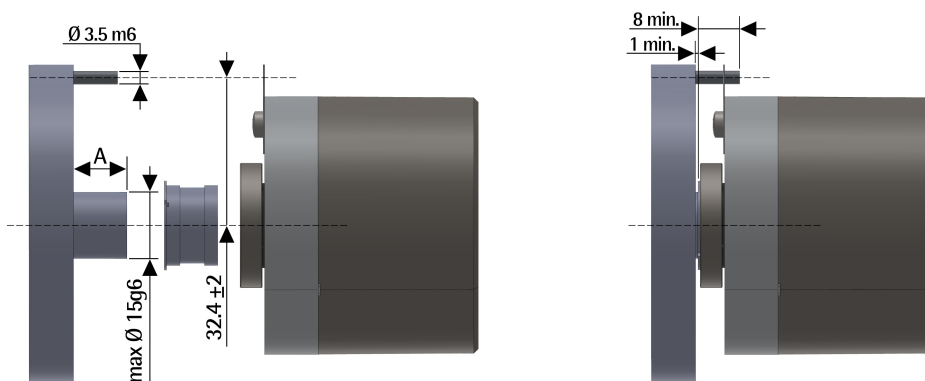
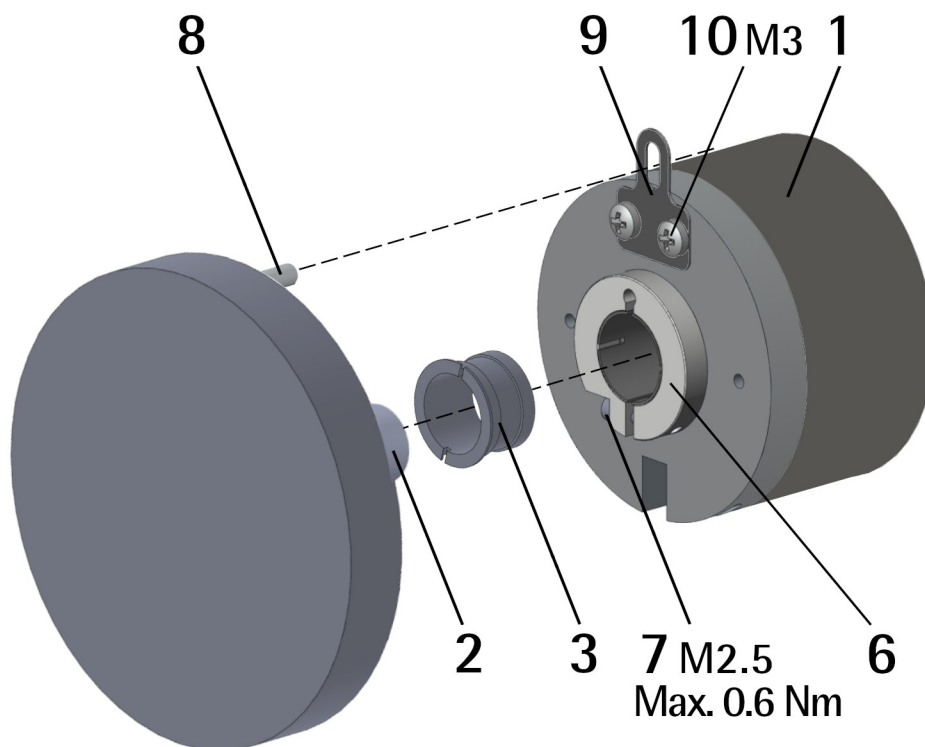
- Mount the encoder **1** on the motor shaft **2** using the reducing sleeve **3** (if required). Avoid forcing the encoder shaft.
- Fasten the fixing plate **4** to the rear of the motor using two M3 cylindrical head screws **5**;
- Fasten the collar **6** to the encoder shaft by means of the M2.5 screw **7** (apply some threadlocker to the screw **7**). Max. tightening torque: 0.6 Nm.



A = min. 8, max. 18 mm

3.2.3 R. EH05xC, R. EHM5xC with optional KIT XX60

- Remove the anti-rotation pin **5** and the grub screw **4** or the fixing plate **4** (see the previous sections).
- Mount the fixing plate **9** using the M3 x 5 DIN7500 screws **10**.
- Fix the tempered pin **8** to the rear of the motor.
- Mount the encoder **1** on the motor shaft **2** using the reducing sleeve **3** (if required). Avoid forcing the encoder shaft.
- Ensure the anti-rotation pin **8** is inserted properly into the fixing plate **9**.
- Fasten the collar **6** to the encoder shaft by means of the M2.5 screw **7** (apply some threadlocker to the screw **7**). Max. tightening torque: 0.6 Nm.



A = min. 8, max. 18 mm

**NOTE**

You are strongly advised not to carry out any mechanical operations (drilling, milling, etc.) on the encoder shaft. This could cause serious damages to the internal parts and an immediate warranty loss. Please contact our technical personnel for the complete availability of "custom made" shafts.

4 - Electrical connections



WARNING

Power supply must be turned off before performing any electrical connection!



WARNING

If wires of unused signals come in contact, irreparable damage could be caused to the device. Please insulate them singularly.

Function	M23 12 pin	M12 12 pin	M12 8 pin	MIL 7 pin	MIL 10 pin	TF12 cable
Clock IN + / MA +	2	3	3	A	A	Violet
Clock IN - / MA -	1	4	4	B	B	Yellow
Data OUT + / SLO +	3	5	5	C	C	Grey
Data OUT - / SLO -	4	6	6	D	D	Pink
A (Cos+) ¹	5	9	-	-	-	Green
/A (Cos-) ¹	6	10	-	-	-	Brown
B (Sin+) ¹	7	11	-	-	-	Red
/B (Sin-) ¹	10	12	-	-	-	Black
Counting direction	8	8	8	E	F	Blue
Zero setting / (Preset / Offset) ²	9	7	7	-	H	White
0Vdc	12	1	1	F	I	White_Green
+5Vdc +30Vdc	11	2	2	G	J	Brown_Green
Shielding	Case	Case	Case	Case	Case	Shield

¹ Incremental or Sine/cosine output signals are provided in specific versions only; for example, see the R. EH058-...-G14-... and R. EH058-...-G64-... order codes. For complete information on the incremental signals, please refer to the "7 - AB /AB incremental output signals" section on page 47. For complete information on the Sine/Cosine signals, please refer to the "8 - Sine/Cosine 1 Vpp output signals" section on page 49.

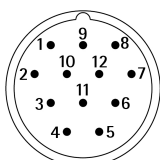
² The Zero setting input signal is provided in specific versions only.



WARNING

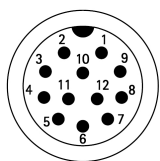
Connect +Vdc and 0Vdc and check the power supply is correct first before connecting the communication signals.

4.1 M23 12-pin CCW connector



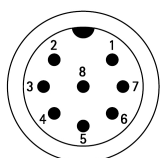
M23 12-pin connector
Counter-clockwise
Male frontal side

4.2 M12 12-pin connector



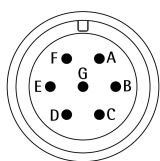
M12 12-pin connector
Male frontal side
A coding

4.3 M12 8-pin connector



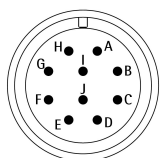
M12 8-pin connector
Male frontal side
A coding

4.4 MIL 7-pin connector



MIL 7-pin connector
Male frontal side

4.5 MIL 10-pin connector



MIL 10-pin connector
Male frontal side

4.6 TF12 cable specifications

Model:	LIKA TF12 encoder cable
Cross section:	6 x 2 x 28AWG twisted pairs
Jacket:	Special flame retardant PVC compound, RZ-TM2 quality
Shield:	Tinned copper braid, coverage > 80% with tinned copper drain wire
Outer diameter:	5.4 mm $\pm$ 0.1 mm / 0.213" $\pm$ 0.004"
Min. bend radius:	Outer diameter x 10
Work temperature:	-15°C +80°C / +5°F +176°F
Conductor resistance:	< 242.02 Ω /Km (+20°C / +68°F) (UL 758 table 5.2.1)

The total length of the cable that connects the encoder and the receiving device should not exceed the values stated in the "Cable lengths" section of the rotary encoders' catalogue or indicated in this manual; they are specific for each type of output circuit. If you need to reach greater distances please contact Lika Electronic Technical Dept.

4.7 Connection of the shield

For signals transmission always use shielded cables. The cable shielding must be connected properly in order to ensure a good earthing.

4.8 GND connection

Minimize noise by connecting the shield and/or the connector housing and/or the frame to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user.

4.9 AB /AB incremental output signals

For any information on the AB /AB incremental output signals, refer to the "7 – AB /AB incremental output signals" section on page 47. AB /AB incremental output signals are provided in specific versions only, see the R. EH058-...-G14-... and R. EH058-...-G64-... order codes.

4.10 Sine/Cosine 1Vpp output signals

For any information on the Sine/Cosine 1Vpp output signals, refer to the "8 – Sine/Cosine 1 Vpp output signals" section on page 49. Sine/Cosine output signals are provided in specific versions only, see the R. EH058-...-BV4-..., R. EH058-...-GV4-..., and R. EH058-...-SC4-... order codes.

4.11 Angular resolution

The encoder can have a singleturn resolution of 256 cpr (8 bits), 512 cpr (9 bits), 1,024 cpr (10 bits), 2,048 cpr (11 bits), 4,096 cpr (12 bits), 8,192 cpr (13 bits), 65,536 cpr (16 bits), 262,144 cpr (18 bits), 524,288 cpr (19 bits), and 1,048,576 cpr (20 bits).

The angular resolution is:

- 1.40625° (1° 24' 22.5") for 8 bit model;
- 0.703125° (0° 42' 11.25") for 9 bit model;

- 0.35156° (0° 21' 6") for 10 bit model;
- 0.17578° (0° 10' 32.81") for 11 bit model;
- 0.08789° (0° 5' 16") for 12 bit model;
- 0.04395° (0° 2' 38") for 13 bit model;
- 0.00549° (0° 0' 20") for 16 bit model;
- 0.00137° (0° 0' 5") for 18 bit model;
- 0.00068° (0° 0' 2.47") for 19 bit model;
- 0.00034° (0° 0' 1.24") for 20 bit model.



NOTE

To convert the absolute position value detected by the encoder into an angular position use the following formula:

e.g. 1 STEP = $360^\circ / 8,192 \text{ cpr} = 0.04395^\circ/\text{cpr}$

angular position = position value * 1 step



EXAMPLE

Position value = 3,000

Angular position = $3,000 * 0.04395^\circ = 131.85^\circ = 131^\circ 51' 0"$

4.12 Counting direction input

The Counting direction input allows to set whether the position value output by the encoder increases when the encoder shaft rotates clockwise (CW) or counter-clockwise (CCW). The clockwise rotation is intended as shown in the Figure. If the Counting direction input is connected to 0Vdc, the position value increases when the encoder shaft rotates clockwise; on the contrary, if the Counting direction input is connected to +Vdc, the position value increases when the encoder shaft rotates counter-clockwise. If not used, connect the Counting direction input to 0Vdc (standard counting direction, see the Figure).



WARNING

The counting direction can be set also via the BiSS interface. The **Code sequence** parameter in the **Configuration** register allows the operator to

choose the options 0 = CW (clockwise direction) and 1 = CCW (counter-clockwise direction). When the counting direction is set to 0 = CW (default option) -**Code sequence** = 0 = CW-, if the Counting direction input has LOW logic level (0Vdc) the encoder will provide the increasing count when the encoder is turning clockwise (and the decreasing count when the encoder is turning counter-clockwise); on the contrary if the Counting direction input has HIGH logic level (+Vdc) the encoder will provide the increasing count when the encoder is turning counter-clockwise (and the decreasing count when the encoder is turning clockwise). When the option 1 = CCW is set -**Code sequence** = 1 = CCW-, if the Counting direction input has LOW logic level (0Vdc) the encoder will provide the increasing count when the encoder is turning counter-clockwise (and the decreasing count when the encoder is turning clockwise); on the contrary if the Counting direction input has HIGH logic level (+Vdc) the encoder will provide the increasing count when the encoder is turning clockwise (and the decreasing count when the encoder is turning counter-clockwise).



WARNING

After changing the counting direction you are required to set a new preset / offset.



NOTE

The counting direction function affects the absolute position information, not the incremental signals.

4.13 Zero setting / (Preset / Offset) input



WARNING

The Zero setting input signal is not available with the D002 order code.

The output position information at any point in the shaft rotation can be set either to 0 (SSI interface), or to a desired value called preset / offset (BiSS C interface; the preset / offset value has to be set next to the **Preset / Offset** registers, see on page 41). The Zero setting / (Preset / Offset) input allows the operator to activate the zero / (preset / offset) value through an input signal sent by a PLC or other controller. This can be very useful for setting -for instance- the zero position of both the encoder and the machine. If not used, connect the Zero setting / (Preset / Offset) input to 0Vdc. To activate the zero setting / (preset / offset) function, connect the Zero setting / (Preset / Offset) input to +Vdc for 100 µs at least, then disconnect +Vdc; normally the voltage must be at 0Vdc; the Zero setting / (Preset / Offset) must be set after the Counting direction. We suggest setting the zero / (preset / offset) when the encoder is in stop.



NOTE

In the BiSS interface the preset / offset can be activated also by setting the **Set preset / offset** bit in the **Configuration** register. Furthermore it must be

enabled by setting the **Enable preset / offset** bit in the **Configuration** register. For detailed information please refer to the **Preset / Offset** registers on page 41 and to the **Configuration** register on page 36.

In the BiSS interface the Zero setting / (Preset / Offset) input is active only when the **Enable preset / offset** bit in the **Configuration** register is enabled (see on page 37); otherwise the hardware function is disabled. Furthermore it performs two different functions depending on the value of the **Set preset / offset** parameter in the **Configuration** register whether it is set to 0 = PRESET or to 1 = OFFSET. In the first case (**Set preset / offset** = 0 = PRESET) the input is used to activate the preset (**Preset / Offset** registers, see on page 41); while in the second case (**Set preset / offset** = 1 = OFFSET) it is used to activate the offset (**Preset / Offset** registers, see on page 41).

The output information can be forced to a desired value (set next to the **Preset / Offset** registers) through a command sent via the Zero setting / (Preset / Offset) input by a PLC or a button. To activate the preset / offset, stop the encoder in the desired position and then connect the Zero setting / (Preset / Offset) input to +Vdc for 100 µs at least.

After this, the position information output by the encoder in that point will be the one set (and then loaded to the encoder) next to the **Preset / Offset** registers. By default the preset / offset value is 0.



WARNING

Check and set the value in the **Preset / Offset** registers (either through the Zero setting / (Preset / Offset) input or by using the **Configuration** register) every time you change the value next to the **Counts per revolution** and/or **Number of revolutions** registers as well as the **Code sequence** parameter in the **Configuration** register.

5 - SSI interface

Order code: R. EHx58-...-BA4-... & R. EHx58-...-GA4-...
 R. EH058-...-BG4-... & R. EH058-...-GG4-...
 R. EH058-...-BV4-... & R. EH058-...-GV4-...
 R. EH058-...-G14-...
 R. EH058-...-G64-...
 R. EHM58-...-BS4-... & R. EHM58-...-GS4-...

5.1 SSI (Synchronous Serial Interface)



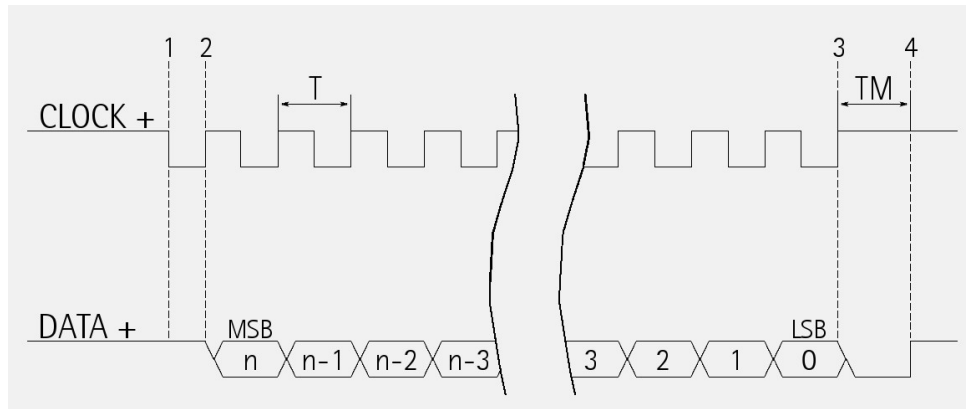
SSI (the acronym for **Synchronous Serial Interface**) is a synchronous point-to-point serial interface engineered for unidirectional data transmission between one Master and one Slave. Developed in the first eighties, it is based on the RS-422 serial standard. Its most peculiar feature is that data transmission is achieved by synchronizing both the Master and the Slave devices to a common clock signal generated by the controller; in this way the output information is clocked out at each controller's request. Furthermore only two pairs of twisted wires are used for data and clock signals, thus a six-wire cable is required. The main advantages in comparison with parallel or asynchronous data transmissions are:

- less conductors are required for transmission;
- less electronic components;
- possibility of insulating the circuits galvanically by means of optocouplers;
- high data transmission frequency;
- hardware interface independent from the resolution of the absolute encoder.

Furthermore the differential transmission increases the noise immunity and decreases the noise emissions. It allows multiplexing from several encoders, thus process controls are more reliable with simplified line design and easier data management.

Data transmission is carried out as follows.

At the first falling edge of the clock signal (**1**, the logic level changes from high to low) the absolute position value is stored while at the following rising edge (**2**) the transmission of data information begins starting from the MSB.



At each change of the clock signal and at each subsequent rising edge (2) one bit is clocked out at a time, up to LSB, so completing the data word transmission. The cycle ends at the last rising edge of the clock signal (3). This means that up to $n + 1$ rising edges of the clock signals are required for each data word transmission (where n is the bit resolution); for instance, a 13-bit encoder needs 14 clock edges. If the number of clocks is greater than the number of bits of the data word, then the system will send a zero (low logic level signal) at each additional clock, zeros will either lead (LSB ALIGNED protocol) or follow (MSB ALIGNED protocol) or lead and/or follow (TREE FORMAT protocol) the data word. After the period T_m monoflop time, having a typical duration of 12 μsec , calculated from the end of the clock signal transmission, the encoder is then ready for the next transmission and therefore the data signal is switched high.

The clock signals and the output signals have a logic level in compliance with the RS-422 standard.

The output code can be either Binary or Gray (see the order code).

5.2 "TREE Format" protocol (BS, GS)

"Tree format" has been the most common protocol and the SSI standard for many years. It is typically used in the singleturn encoders having a resolution up to 13 bits and in the multiturn encoders having a resolution up to 25 bits (13-bit singleturn + 12-bit multiturn). The whole transmitted data is divided into 12 bits on the left side of the central axes dedicated to the information on the number of revolutions; and into 13 bits on the right side of the axes dedicated to the information on the number of counts per revolution.

Thus the multiturn information is transmitted first. If less than 13 + 12 bits are required, then unused bits are forced to logic level low (0); they lead the multiturn information on one hand and follow the singleturn information on the other hand.

The "Tree format" protocol is not compatible with singleturn encoders having a resolution higher than 13 bits and with multiturn encoders having an overall resolution higher than 25 bits and a singleturn information higher than 13 bits anyway. In singleturn encoders the protocol will provide 13 clock signals; while in multiturn encoders the protocol will provide 25 clock signals.

Model	Clocks required	Length of the position value	Max. number of information
R. EHM...-08-00-...	13	8 bits	256
R. EHM...-09-00-...	13	9 bits	512
R. EHM...-10-00-...	13	10 bits	1,024
R. EHM...-11-00-...	13	11 bits	2,048
R. EHM...-12-00-...	13	12 bits	4,096
R. EHM...-08-04-...			
R. EHM...-13-00-...	13	13 bits	8,192
R. EHM...-09-04-...			
R. EHM...-10-04-...	25	14 bits	16,384
R. EHM...-11-04-...	25	15 bits	32,768
R. EHM...-12-04-...	25	16 bits	65,536
R. EHM...-08-08-...			
R. EHM...-13-04-...	25	17 bits	131,072
R. EHM...-09-08-...			
R. EHM...-10-08-...	25	18 bits	262,144
R. EHM...-11-08-...	25	19 bits	524,288
R. EHM...-12-08-...	25	20 bits	1,048,576
R. EHM...-08-12-...			
R. EHM...-13-08-...	25	21 bits	2,097,152
R. EHM...-09-12-...			
R. EHM...-10-12-...	25	22 bits	4,194,304
R. EHM...-11-12-...	25	23 bits	8,388,608
R. EHM...-12-12-...	25	24 bits	16,777,216
R. EHM...-13-12-...	25	25 bits	33,554,432

The output code can be either BINARY or GRAY (see the order code).

Structure of the position information

R. EHM...-08-00-...	12 ... 8	7	...	0
R. EHM...-09-00-...	12 ... 9	8	...	0
R. EHM...-10-00-...	12 ... 10	9	...	0
R. EHM...-11-00-...	12 & 11	10	...	0
R. EHM...-12-00-...	12	11	...	0
R. EHM...-08-04-...				
R. EHM...-13-00-...	-	12	...	0
R. EHM...-09-04-...				
R. EHM...-10-04-...	24 ... 14	13	...	0
R. EHM...-11-04-...	24 ... 15	14	...	0
R. EHM...-12-04-...	24 ... 16	15	...	0
R. EHM...-08-08-...				
R. EHM...-13-04-...	24 ... 17	16	...	0
R. EHM...-09-08-...				
R. EHM...-10-08-...	24 ... 18	17	...	0
R. EHM...-11-08-...	24 ... 19	18	...	0
R. EHM...-12-08-...	24 ... 20	19	...	0
R. EHM...-08-12-...				

R. EHM...-13-08-...	24 ... 21	20	...	0
R. EHM...-09-12-...				
R. EHM...-10-12-...	24 ... 22	21	...	0
R. EHM...-11-12-...	24 & 23	22	...	0
R. EHM...-12-12-...	24	23	...	0
R. EHM...-13-12-...	-	24	...	0
	0	MSB	...	LSB

5.3 "LSB Right Aligned" protocol (BA, GA, BV, GV, G1, G6)

"LSB right aligned" protocol allows to right align the bits, the transmission begins from MSB (most significant bit) to LSB (least significant bit); LSB is then sent at the last clock cycle. If the number of clock signals is higher than the data bits, then unused bits are forced to low logic level (0) and lead the data word. So, for instance, if the device needs 20 clocks to provide the position information, then unused bits (from 21 to 25) are set to 0 (zero). This protocol can be used in encoders having any resolution. Information can be variously arranged for singleturn and multiturn versions.

When the overall resolution of the encoder is less than or equal to 13 bits, then 13 clock signals will be always required; when it is between 14 and 25 bits, then 25 clock signals will be always required; when it is higher than 25 bits, then 32 clock signals will be required.

Model	Clocks required	Length of the position value	Max. number of information
R. EHM...-08-00-...	13	8 bits	256
R. EHM...-09-00-...	13	9 bits	512
R. EHM...-10-00-...	13	10 bits	1,024
R. EHM...-11-00-...	13	11 bits	2,048
R. EHM...-12-00-...	13	12 bits	4,096
R. EHM...-08-04-...			
R. EHx...-13-00-...	13	13 bits	8,192
R. EHM...-09-04-...			
R. EHM...-10-04-...	25	14 bits	16,384
R. EHM...-11-04-...	25	15 bits	32,768
R. EHO...-16-00-...			
R. EHM...-12-04-...	25	16 bits	65,536
R. EHM...-08-08-...			
R. EHM...-13-04-...	25	17 bits	131,072
R. EHM...-09-08-...			
R. EHO...-18-00-...	25	18 bits	262,144
R. EHM...-10-08-...			
R. EHO...-19-00-...	25	19 bits	524,288
R. EHM...-11-08-...			
R. EHO...-20-00-...	25	20 bits	1,048,576
R. EHM...-12-08-...			
R. EHM...-08-12-...			
R. EHM...-13-08-...	25	21 bits	2,097,152
R. EHM...-09-12-...			
R. EHM...-10-12-...	25	22 bits	4,194,304

R. EHM...-11-12-...	25	23 bits	8,388,608
R. EHM...-12-12-...	25	24 bits	16,777,216
R. EHx...-13-12-...	25	25 bits	33,554,432
R. EHO...-16-14-...	32	30 bits	1,073,741,824

The output code can be either BINARY or GRAY (see the order code).

Structure of the position information

R. EHM...-08-00-...	12 ... 8	7	...	0
R. EHM...-09-00-...	12 ... 9	8	...	0
R. EHM...-10-00-...	12 ... 10	9	...	0
R. EHM...-11-00-...	12 & 11	10	...	0
R. EHM...-12-00-...	12	11	...	0
R. EHM...-08-04-...				
R. EHx...-13-00-...	-	12	...	0
R. EHM...-09-04-...				
R. EHM...-10-04-...	24 ... 14	13	...	0
R. EHM...-11-04-...	24 ... 15	14	...	0
R. EHO...-16-00-...				
R. EHM...-12-04-...	24 ... 16	15	...	0
R. EHM...-08-08-...				
R. EHM...-13-04-...	24 ... 17	16	...	0
R. EHM...-09-08-...				
R. EHO...-18-00-...	24 ... 18	17	...	0
R. EHM...-10-08-...				
R. EHO...-19-00-...	24 ... 19	18	...	0
R. EHM...-11-08-...				
R. EHO...-20-00-...	24 ... 20	19	...	0
R. EHM...-12-08-...				
R. EHM...-08-12-...				
R. EHM...-13-08-...	24 ... 21	20	...	0
R. EHM...-09-12-...				
R. EHM...-10-12-...	24 ... 22	21	...	0
R. EHM...-11-12-...	24 & 23	22	...	0
R. EHM...-12-12-...	24	23	...	0
R. EHx...-13-12-...	-	24	...	0
R. EHO...-16-14-...	31 & 30	29	...	0
	0	MSB	...	LSB

5.4 "MSB Left Aligned" protocol (BG, GG)

The "MSB Left Aligned" protocol allows to left align the bits, beginning from the MSB (most significant bit) to the LSB (least significant bit); so the MSB is sent at the first clock cycle. If the number of clock signals is higher than the data bits, then unused bits are forced to logic level low (0) and follow the data word. This protocol can be used in encoders having any resolution.

The number of clocks to be sent to the encoder must equal the number of data bits at least, anyway it can be higher, as stated previously. The great advantage

of this protocol over the TREE format or the LSB RIGHT ALIGNED format is that data can be transmitted with a minimum time loss and Tm monoflop time can immediately follow the data bits without any additional clock signal.

The length of the word is variable according to the resolution, as shown in the following table.

Model	Clocks required	Length of the position value	Max. number of information
R. EHO...-13-00-...	13	13 bits	8,192
R. EHO...-16-00-...	16	16 bits	65,536
R. EHO...-18-00-...	18	18 bits	262,144
R. EHO...-19-00-...	19	19 bits	524,288
R. EHO...-20-00-...	20	20 bits	1,048,576
R. EHO...-13-12-...	25	25 bits	33,554,432
R. EHO...-16-14-...	30	30 bits	1,073,741,824

The output code can be either BINARY or GRAY (see the order code).

Structure of the position information

R. EHO...-13-00-...	bit	12	...	0
R. EHO...-16-00-...	bit	15	...	0
R. EHO...-18-00-...	bit	17	...	0
R. EHO...-19-00-...	bit	18	...	0
R. EHO...-20-00-...	bit	19	...	0
R. EHO...-13-12-...	bit	24	...	0
R. EHO...-16-14-...	bit	29	...	0
	value	MSB	...	LSB

5.5 Recommended transmission rates

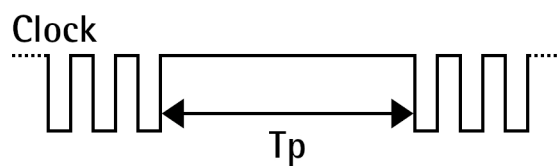
The SSI interface has a frequency of data transmission ranging between 100 kHz and 4 MHz.

CLOCK IN and DATA OUT signals comply with the "EIA standard RS-422".

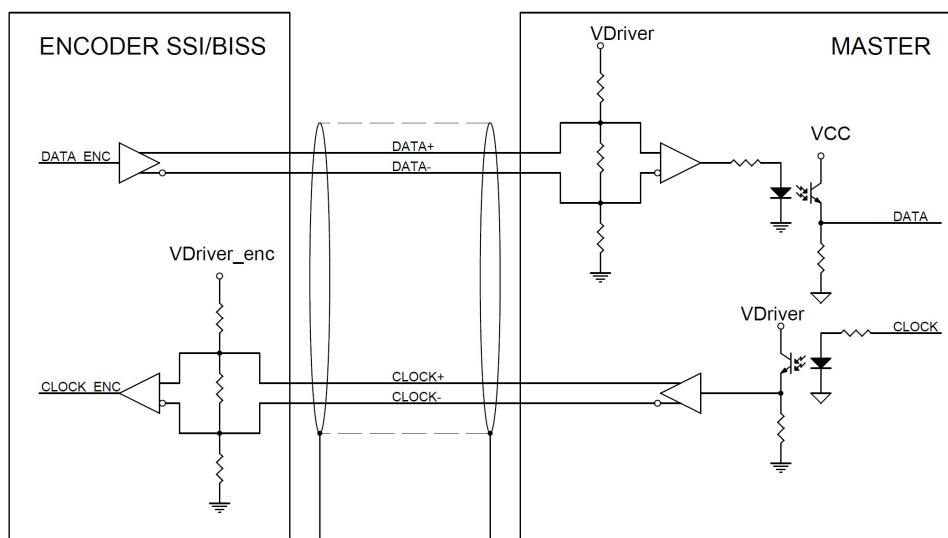
The SSI clock frequency (baud rate) depends on the length of the cable and must comply with the technical information reported in the following table:

Cable length	Baud rate
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

The time interval between two Clock sequence transmissions must be at least 12 μs ($T_p > 12 \mu\text{s}$).



5.6 Recommended SSI input circuit



6 - BiSS C-mode interface

Order code: R. EH058-...-SC4-...



Lika encoders are always Slave devices and comply with the "BiSS C-mode interface" and the "Standard encoder profile".

Refer to the official BiSS website for all information not listed in this manual (www.biss-interface.com).

The device is designed to work in a point-to-point configuration and must be installed in a "single Master, single Slave" network (not on a "single Master, multi Slave" network).

CLOCK IN (MA) and DATA OUT (SLO) signal levels comply with the "EIA standard RS-422".



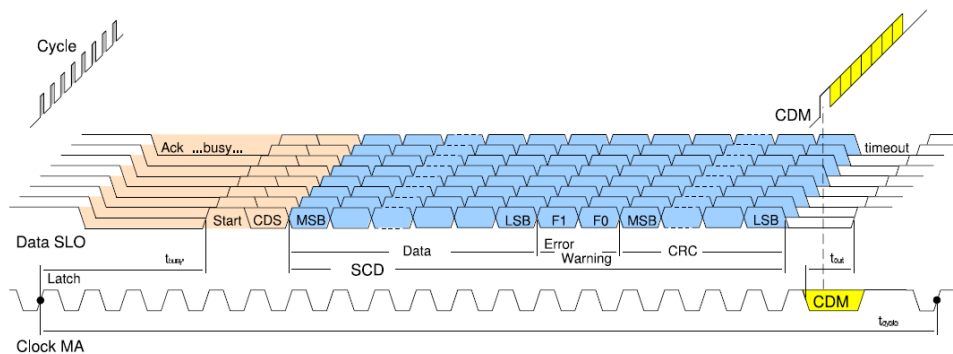
WARNING

Never install the encoder in a "single Master, multi Slave" network.

6.1 Communication

The BiSS C-mode protocol uses two types of data transmission protocols:

- **Single Cycle Data (SCD):** it is the main data transmission protocol. It is used to send process data from the Slave to the Master. For any information refer to the "6.2 Single Cycle Data" section on page 31.
- **Control Data (CD):** transmission of a single bit following the SCD data. It is used to read or write data into the registers of the Slave. For any information refer to the "6.3 Control Data CD" section on page 32.



6.2 Single Cycle Data

6.2.1 SCD structure

SCD data has a variable length according to the resolution of the encoder. It is $n_{\text{bitres}}+7$ long where " n_{bitres} " is the resolution of the encoder expressed in bits. It consists of the following elements: position value (**Position**), 1 error bit nE (**Error**), 1 warning bit nW (**Warning**) and a 6-bit CRC Cyclic Redundancy Check (**CRC**).

bit	$n_{\text{bitres}}+7 \dots 8$	7	6	5 ... 0
function	Position	Error	Warning	CRC



EXAMPLE

The R. EH058-20-00-... singleturn encoder provides an overall resolution of 20 bits.

The SCD data will be as follows.

bit	27 ... 8	7	6	5 ... 0
function	Position	Error	Warning	CRC

Position

(according to the resolution)

It is the process data transmitted from the Slave to the Master. The position value has a variable length, it is as long as the resolution of the encoder expressed in bits.

The transmission starts with msb (most significant bit) and ends with lsb (least significant bit). " n_{bitres} " is the resolution of the encoder expressed in bits.

bit	$n_{\text{bitres}}+7$	...	...	8
value	msb	...	...	lsb



EXAMPLE

The R. EH058-20-00-... singleturn encoder provides an overall resolution of 20 bits.

Position will be as follows.

bit	27	...	...	8
value	msb	...	...	lsb

Error

(1 bit)

Not used ($nE = "1"$)

Warning

(1 bit)

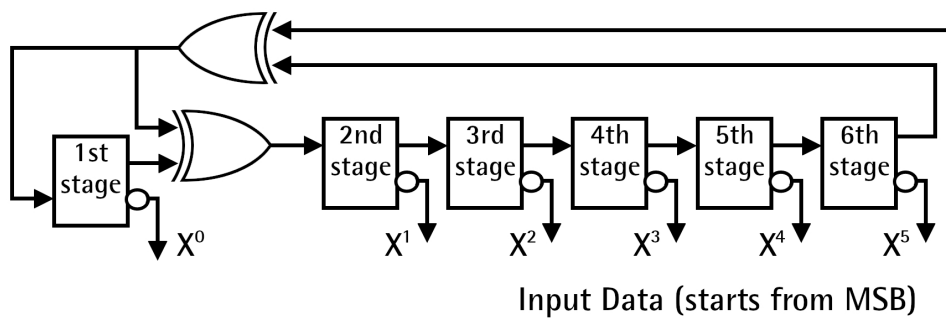
Not used (nW = "1")

CRC

(6 bits)

Correct transmission control (inverted output). Cyclic Redundancy Check is an error checking which is the result of a "Redundancy Check" calculation performed on the message contents. This is intended to check whether transmission has been performed properly. It is 6-bit long.

Polynomial: X^6+X^1+1 (binary: 1000011)

Logic circuit:**6.3 Control Data CD**

Main control data is described in this section. Please refer to the official BiSS documents for complete CD structure: "BiSS C Protocol Description" in the BiSS homepage.

Register address

(7 bits)

It sets the number of the register you need either to read or to write. It is 7-bit long.

RW

(2 bits)

RW = "01": when you need to write in the register.

RW = "10": when you need to read in the register.

It is 2-bit long.

DATA

(8 bits)

When you need to write in a register (**DATA** = "01"), it allows to enter the value to be written in the register (transmitted from the Master to the Slave).

When you need to read in a register (**DATA** = "10"), it shows the value read in the register (transmitted from the Slave to the Master).

It is 8-bit long.

Data bit structure:

bit	7	...	...	0
	msb	...	...	lsb

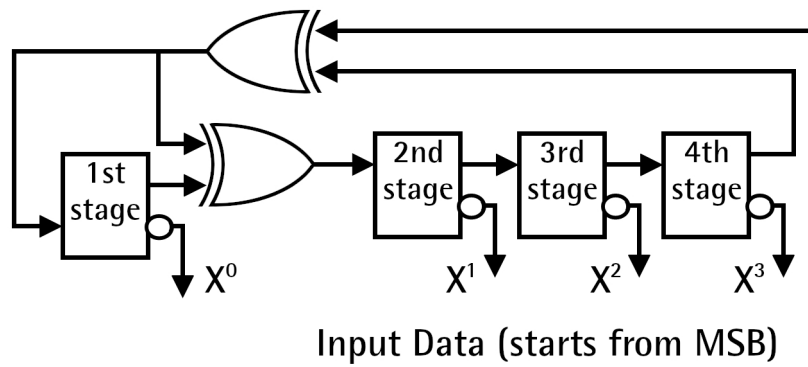
CRC

(4 bits)

Correct transmission control (inverted output). Cyclic Redundancy Check is an error checking which is the result of a "Redundancy Check" calculation performed on the message contents. This is intended to check whether transmission has been performed properly. It is 4-bit long.

Polynomial: $X^4 + X^1 + 1$ (binary: 10011)

Logic circuit:



6.4 Used registers

Register (hex)	Function
42 and 43	Profile ID
44 ... 47	Serial number
48	Command
00	Normal operation
01	Save parameters on EEPROM
02	Save parameters and activate
04	Preset / Offset
	Load and save default parameters
49	Configuration
bit 1	Set preset / offset
bit 2	Enable preset / offset
bit 5	Output code
bit 6	Code sequence
4A ... 4D	Counts per revolution
4E and 4F	Number of revolutions
50 ... 53	Preset / Offset
55	Device type
56	N° of bits used for singleturn
57	N° of bits used for multiturn
58	Incremental resolution
59	Number of clocks
5A	Shift bits
5C	Parity
78 ... 7D	Device ID
7E and 7F	Manufacturer ID

All registers described in this section are listed as follows:

Function name

[Address, Attribute]

Description of the function and specification of the default value.

- Address: the register address is expressed in hexadecimal notation.
- Attribute:
 - ro = read only
 - rw = read and write
 - wo = write only
- Default parameter value is written in **bold**.

Profile ID

[42 e 43, ro]

These registers contain the identification code of the used profile.

They are not used and both set to 0.

Default = **00 00h**: these registers are not used

Serial number

[44 ... 47, ro]

These registers contain the serial number of the device expressed in hexadecimal notation. They are intended to inform about the year of production, the week of production, and the serial number.

Serial number registers structure:

Register	44	45	46	47
	Serial number			
	MSB	...	...	LSB
	$2^{31} \dots 2^{24}$	$2^{23} \dots 2^{16}$	$2^{15} \dots 2^8$	$2^7 \dots 2^0$

The conversion of the hexadecimal value into a decimal value will provide the information about the year of production, the week of production, and the serial number, as described in the example below.



EXAMPLE

The serial number 0A E8 69 EE has to be interpreted as follows:

Register	44	45	46	47
Hex	0A	E8	69	EE
Dec	18 30 03630			

18 = year of production (first two digits)

30 = week of production (third and fourth digit)

03630 = serial number in ascending order (remaining digits)

Command

[48, wo]

Value	Function
00	Normal operation
01	Save parameters on EEPROM
02	Save parameters and activate Preset / Offset
04	Load and save default parameters

After setting a new value in a register, use the **Save parameters on EEPROM** function in this register to store it. Set "01" in the register.

After setting a new value in a register, use the **Save parameters and activate Preset / Offset** function in this register to both store it and activate the preset / offset function in the same time. Set "02" in the register.

As soon as the command is sent, the register is set back to "00" (**Normal operation**) automatically.

Wait min. 30 ms (EEPROM writing time) before using a new function.

Load and save default parameters: default parameters are set at the factory by Lika Electronic engineers to allow the operator to run the device for standard operation in a safe mode. As soon as the command is sent the default parameters are uploaded and activated. All parameters which have been set previously are overwritten, thus previously set values are lost. The complete list of machine data and relevant default parameters preset by Lika Electronic engineers is available on page 51. Set "04" in the register.



WARNING

As soon as the command is sent, all parameters which have been set previously are overwritten, thus previously set values are lost!

Configuration

[49, rw]

Bit	Function	Bit = 0	Bit = 1
0 lsb	Not used	0	
1	Set preset / offset	Preset	Offset
2	Enable preset / offset	Enable	Disable
3	Not used	0	
4	Not used	0	
5	Output code	Gray	Binary
6	Code sequence	CW	CCW
7 msb	Not used	0	

Default = 20h (00100000₂)

Set preset / offset

This parameter is available only if the parameter **Enable preset / offset** is set to 0 = ENABLE. It allows to activate either the preset function (**Set preset / offset** = 0 = PRESET) or the offset function (**Set preset / offset** = 1 = OFFSET); the Preset or Offset value has to be set in the **Preset / Offset** register. After enabling the preset / offset functions (**Enable preset / offset** = 0 = ENABLE), this item allows to activate either the preset function or the offset function. The value set in the **Preset / Offset** register will have a different meaning

depending on the value of this parameter whether it is set to 0 = PRESET or 1 = OFFSET. In the first case (**Set preset / offset** = 0 = PRESET) the **Preset / Offset** register is used to set the preset, i.e. any desired position value (less than the total resolution) can be set for the actual position of the encoder shaft (e.g. "0", zero setting); while in the second case (**Set preset / offset** = 1 = OFFSET) the **Preset / Offset** register is used to set the offset, i.e. the system adds an offset to the actual position: transmitted position = actual position + Offset. To activate the preset / offset value use the **Save parameters and activate Preset / Offset** function in the **Command** register (set "02" in the register 48); or use the Zero setting / (Preset / Offset) input, see on page 21.

For any information on the preset and offset functions refer to the **Preset / Offset** register on page 41.

Enable preset / offset

It enables (0) or disables (1) the preset/offset function. After enabling the use of the functions you have to choose whether to activate the preset or the offset in the previous **Set preset / offset** parameter. Then set the preset value next to the **Preset / Offset** register and send the **Save parameters and activate Preset / Offset** function (set "02" in the register 48 **Command**) or use the Preset / Offset input (see on page 21) to activate a new value.

Output code

It allows to select the code for the transmission of the position value: 0 = Gray code; 1 = Binary code.

Code sequence

It allows to set whether the position information that is output by the encoder increases when the shaft rotates clockwise or counter-clockwise. Clockwise and counter-clockwise rotations are viewed from the shaft side. Please note that the counting direction affects the absolute position information, not the incremental signals. It is possible to choose the following options: 0 = CW and 1 = CCW. When the counting direction is set to CW - **Code sequence** = 0 = CW-, if the Counting direction input (see on page 20) has LOW logic level (0Vdc) the encoder will provide the increasing count when the encoder is turning clockwise (and the decreasing count when the encoder is turning counter-clockwise); on the contrary if the Counting direction input has HIGH logic level (+Vdc) the encoder will provide the increasing count when the encoder is turning counter-clockwise (and the decreasing count when the encoder is turning clockwise). When the option CCW is set - **Code sequence** = 1 = CCW-, if the Counting direction input has LOW logic level (0Vdc) the encoder will provide the increasing count when the encoder is turning counter-clockwise (and the decreasing count when the encoder is turning clockwise); on the contrary if the Counting direction input has HIGH logic level (+Vdc) the encoder will provide the increasing count when the encoder is turning clockwise (and the decreasing count when the encoder is turning counter-clockwise). For any information on

the Counting direction input refer to the "4.12 Counting direction input" section on page 20.

The new setting will be active immediately after the transmission. Use the **Save parameters on EEPROM** function (set "01" in the register 48 **Command**) to store the new value.

Refer to the registers 4A ... 4D **Counts per revolution** for a programming example.

Counts per revolution

[4A ... 4D, ro]

Reg.	4A	4B	4C	4D
	MSB	...	...	LSB
	$2^{31} - 2^{24}$	$2^{23} - 2^{16}$	$2^{15} - 2^8$	$2^7 - 2^0$



These registers 4A ... 4D **Counts per revolution** are **read-only** registers and cannot be set. **They show the number of counts per revolution of the encoder.** The following description and examples are provided only for future reference.

These registers set the number of information per revolution (aka counts per revolution, singleturn resolution). You are allowed to set whatever integer value less than or equal to the number of physical information per revolution. Anyway we suggest always setting a value which is a power of 2 in order to prevent the encoder from causing a jump in the position value.

The counts per revolution will be forced to the default value (number of physical information per revolution) if the entered value is out of the allowed range.

The new setting will be active immediately after the transmission. Use the **Save parameters on EEPROM** function (set "01" in the register 48 **Command**) to store the new value.

You can see the number of bits used for the current singleturn resolution at the register 56 **N° of bits used for singleturn**.

After changing the value in the registers 4A ... 4D **Counts per revolution**, the Preset and Offset positions must be updated according to the new resolution!



EXAMPLE

Let's say we need to set the encoder as follows: singleturn 3,600 cpr, Gray shifted code.

- Registers 4A ... 4D **Counts per revolution** = 3,600 cpr (00 00 0E 10 hex);
- registers 4E and 4F **Number of revolutions** = 1 revolution (00 01 hex);
- output code: Gray code (**Output code** bit 5 in the **Configuration** register = 0);
- CCW counter-clockwise counting direction (**Code sequence** bit 6 in the **Configuration** register = 1);
- the Offset must be enabled as we need the shifted code (**Set preset / offset** bit 1 in the **Configuration** register = 1; **Enable preset / offset** bit 2 in the **Configuration** register = 0);
- registers 50 ... 53 **Preset / Offset** = 00 00 00 F8 hex = 248);

To do this, proceed as follows:

Function	ADR	DATA Tx
writing the Counts per revolution registers	4A	00
	4B	00
	4C	0E
	4D	10
writing the Number of revolutions registers	4E	00
	4F	01
writing the Preset / Offset registers	50	00
	51	00
	52	00
	53	F8

Function	ADR	DATA Tx
writing the Configuration register	49, bit 7	0
	49, bit 6	1
	49, bit 5	0
	49, bit 4	0
	49, bit 3	0
	49, bit 2	0
	49, bit 1	1
	49, bit 0	0
		42
Save parameters on EEPROM Register 48 Command	48	01
Save parameters and activate Preset / Offset Register 48 Command	48	02

The encoder will be set to a singleturn resolution of 3,600 cpr and the counting range will be from 248 to 3,847.

Number of revolutions

[4E and 4F, ro]

Register	4E	4F
	MSB	LSB
	$2^{15} - 2^8$	$2^7 - 2^0$



These registers 4E and 4F **Number of revolutions** are **read-only** registers and cannot be set. **They show the number of revolutions of the encoder.** The following description and examples are provided only for future reference.

These registers set the number of revolutions (multiturn resolution). Possible values are less than or equal to the number of physical revolutions. We suggest always setting a value which is a power of 2 (1, 2, 4, ...2048, 4096, ...) in order to prevent the encoder from causing jumps in the counting values. The number of revolutions will be forced to the default value (number of physical revolutions) if the entered value is out of the allowed range. The new setting will be active immediately after transmission. Use the **"Save parameters on EEPROM"** function (set "01" in the register 48 **Command**) to store the new value. You can see the number of bits used for the current multiturn resolution at the register 57 **N° of bits used for multiturn**.

After the modification of the registers 4E and 4F **Number of revolutions**, the Preset and Offset positions must be updated according to the new resolution!



EXAMPLE

Let's suppose you need to set the following encoder: singleturn encoder "R. EH058-18-00-SC4-...".

"Hardware counts per revolution" = **18** bits/turn ($2^{18} = 262,144$ cpr)

"Hardware number of turns" = **0** bits ($2^0 = 1$ turn)

"Hardware total resolution" = **18** bits ($2^{18+0} = 262,144 * 1 = 262,144$)

You need to set: 8,192 steps per revolution:

"**Counts per revolution**" = 8,192: registers 4A ... 4D = 00 00 20 00
hex

"**Number of revolutions**" = 1: registers 4E and 4F = 00 01 hex

"Total custom resolution" = 8,192 * 1 = 8,192.



EXAMPLE

Let's suppose you need to set the following encoder: multiturn encoder "R. EH058-16-14-SC4-...".

"Hardware counts per revolution" = **16** bits/turn ($2^{16} = 65,536$ cpr)
 "Hardware number of turns" = **14** bits ($2^{14} = 16,384$ turns)
 "Hardware total resolution" = **30** bits ($2^{16+14} = 65,536 * 16,384 = 1,073,741,824$)

You need to set: 2,048 steps per revolution * 1,024 turns:

"Counts per revolution" = 2,048: registers 4A ... 4D = 00 00 08 00 hex
 "Number of revolutions" = 1,024: registers 4E and 4F = 04 00 hex
 "Total custom resolution" = 2,048 * 1,024 = 2,097,152.

Preset / Offset

[50 ... 53, rw]

This function is available only if the parameter **Enable preset / offset** bit 2 in the **Configuration** register is set to 0 = ENABLE. Furthermore it has a double function depending on whether the parameter **Set preset / offset** bit 1 in the **Configuration** register is set to 0 = PRESET or 1 = OFFSET. In the first case (bit 1 **Set preset / offset** = 0 = PRESET) the **Preset / Offset** register is used to set the preset; in the second case (bit 1 **Set preset / offset** = 1 = OFFSET) the **Preset / Offset** register is used to set the offset. Activate the preset / offset value only when the device is not moving.

Preset

The Preset function is designed to assign a value to a desired physical position of the encoder. The chosen physical position will get the value set next to this item and all the previous and following positions will get a value according to it. This function is useful, for example, when the zero position of the encoder and the zero position of the axis need to match. The preset value will be set for the position of the encoder in the moment when the preset value is activated.

To activate the preset:

- stop the encoder in the desired position;
- if required, enter the desired value next to this **Preset / Offset** register;
- then send the **Save parameters and activate Preset / Offset** command in the **Command** register (set "02" in the register 48); otherwise connect the Zero setting (Preset / Offset) input as explained on page 21.

Offset

The offset function is designed to assign a value to a desired physical position of the encoder so that the output position information is shifted according to the value set next to this **Preset / Offset** register. In other words, it adds an offset to the actual position so that: output position = actual position + Offset. The number of transmitted values will match the set resolution, but the output

information will range between the **Preset / Offset** value (minimum value) and the sum of the set resolution + the **Preset / Offset** value (maximum value). The offset value will be set for the position of the encoder in the moment when the offset value is activated.

To activate the offset:

- stop the encoder in the desired position;
- enter the desired value next to this **Preset / Offset** register;
- then send the **Save parameters and activate Preset / Offset** command in the **Command** register (set "02" in the register 48); otherwise connect the Zero setting (Preset / Offset) input as explained on page 21.

Preset / Offset registers structure:

Reg.	50	51	52	53
	MSB	...	...	LSB
	$2^{31} - 2^{24}$	$2^{23} - 2^{16}$	$2^{15} - 2^8$	$2^7 - 2^0$

Use the "**Save parameters and activate Preset / Offset**" function (set "02" in the register 48 **Command**) to store and activate the new value; otherwise connect the Zero setting (Preset / Offset) input as explained on page 21.

The Preset value must be less than the "Total resolution". The Offset value must be less than or equal to the difference between the hardware total resolution and the total resolution.

Default = **00 00 00 00h**.

Device type

[55, ro]

It describes the type of device.

The following options are available:

- **01h**: singleturn rotary encoder with BiSS C-mode interface
- **02h**: multiturn rotary encoder with BiSS C-mode interface

Default = specific to each device type

N° of bits used for singleturn

[56, ro]

This register contains the number of bits of the singleturn resolution according to the value set next to the **Counts per revolution** registers (registers 4A ... 4D).

Default = according to the **Counts per revolution** registers

N° of bits used for multiturn

[57, ro]

This register contains the number of bits of the multiturn resolution according to the value set next to the **Number of revolutions** registers (registers 4E and 4F).

Default = according to the **Number of revolutions** registers

Incremental resolution

[58, ro]

Default = 00h: this register is not used

Number of clocks

[59, ro]

It shows the number of clocks required by the encoder.

Shift bits

[5A, ro]

This register is password protected, its use is reserved to Lika Electronic.

Parity

[5C, ro]

This register is password protected, its use is reserved to Lika Electronic.

Device ID

[78 ... 7D, ro]

These registers show the identification specifications of the device (Device ID, name and software release). The identification name is expressed in hexadecimal ASCII code.

Registers 78 ... 7A show the name of the device.

Register 7B show the type of interface.

Registers 7C e 7D show the software release.

Device ID registers structure:

R. EH058 encoder:

Reg.	78	79	7A	7B	7C	7D
	$2^{47} \dots 2^{40}$	$2^{39} \dots 2^{32}$	$2^{31} \dots 2^{24}$	$2^{23} \dots 2^{16}$	$2^{15} \dots 2^8$	$2^7 \dots 2^0$
Hex	45	48	4F	43	xx	xx

ASCII	E	H	O	C	xx	xx
-------	---	---	---	---	----	----

xx = software version

R. EHM58 encoder:

Reg.	78	79	7A	7B	7C	7D
Hex	45	48	4D	43	xx	xx
ASCII	E	H	M	C	xx	xx

xx = software version

Registers 78 to 7A: name of the encoder: EHO = R. EH058 series encoder; EHM = R. EHM58 series encoder.

Register 7B: type of interface: C = BiSS C-Mode interface.

Registers 7C and 7D: software version: this value is device dependent.

Manufacturer ID

[7E and 7F, ro]

These registers contain the Manufacturer ID. The Manufacturer ID is expressed in hexadecimal ASCII code.

Manufacturer ID registers structure:

Reg.	7E	7F
Hex	4C	69
ASCII	L	i

Li = Lika Electronic.

6.5 Application note

Data transmission:

Parameter	Value
Clock Frequency	Min 200 KHz, max 10 MHz
BiSS Timeout	Self-adaptable to clock, max 10 µs



6.6 EXAMPLES

All values are expressed in hexadecimal notation.

6.6.1 Setting the Configuration register

We need to set the preset, the Binary output code, and the inverted code sequence.

Bit 0	= not used	= 0
Bit 1 Set preset / offset	= PRESET	= 0
Bit 2 Enable preset / offset	= ENABLE	= 0
Bit 3	= not used	= 0
Bit 4	= not used	= 0
Bit 5 Output code	= BINARY	= 1
Bit 6 Code sequence	= CCW	= 1
Bit 7	= non used	= 0

01100000₂ = 60 hex

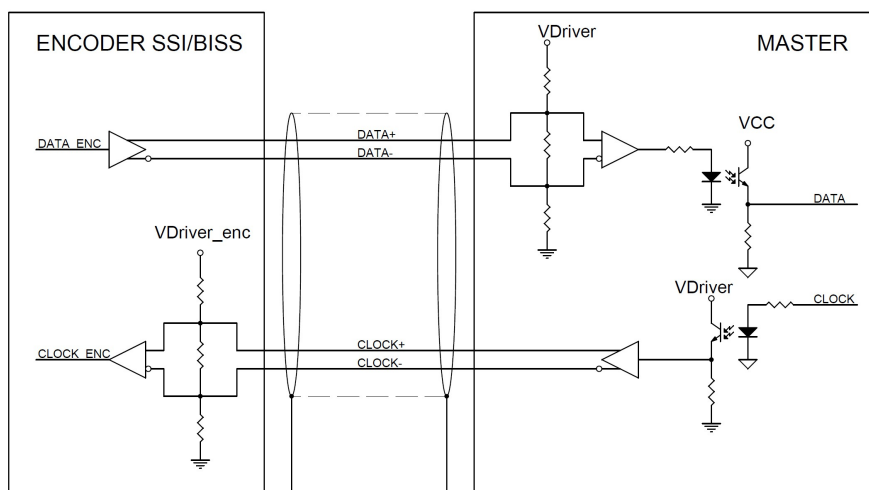
Function	ADR	DATA Tx
writing the Configuration register	49	60
Save parameters on EEPROM register 48 Command	48	01

6.6.2 Setting the **Preset / Offset**

After activating the PRESET function (**Enable preset / offset** = 0 = ENABLE; **Set preset / offset** = 0 = PRESET in the **Configuration** register, see the previous section), you want to set the new Preset value = 100,000₁₀ = 00 01 86 A0h

Function	ADR	DATA Tx
writing the Preset / Offset registers	50	00
	51	01
	52	86
	53	A0
Save parameters and activate Preset / Offset register 48 Command	48	02

6.7 Recommended BiSS input circuit



7 – AB /AB incremental output signals



WARNING

AB /AB incremental output signals are provided in specific versions only, see the order code: R. EH058-...-G14-... (= SSI interface, LSB Right Aligned protocol, Gray output code, + AB /AB Line Driver incremental signals); R. EH058-...-G64-... (SSI interface, LSB Right Aligned protocol, Gray output code, + AB /AB Push-Pull incremental signals).

In addition to the absolute position information, the R. EH058 encoder can provide AB /AB incremental signals through either the Line Driver or Push-Pull output circuits.

The incremental resolution is 2,048 PPR.

The output circuit can be:

- Line Driver / Line Driver (RS-422)/TTL level type (-G14- order code). It is operated at +5Vdc +30Vdc and the signal amplitude is in compliance with the EIA RS-422 standard). It provides AB /AB signals.
- Push-Pull HTL level type (-G64- order code). It is operated at +5Vdc +30Vdc and the signal amplitude is according to the supply voltage ($V_{in} - 1.25$). It provides AB /AB signals.

$I_{out} = 20 \text{ mA max.}$

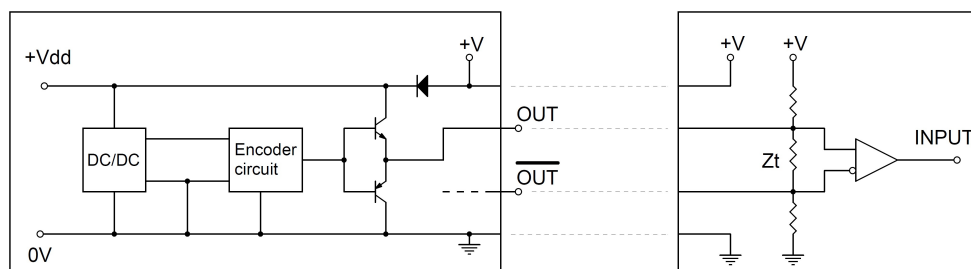
Thermal and short-circuit protections are not provided.



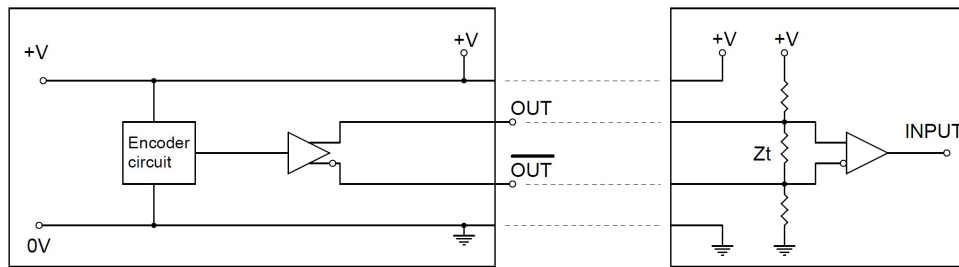
NOTE

Please note that the Counting direction input (see on page 20) as well as the bit 6 **Code sequence** parameter in the **Configuration** register of the BiSS C-mode interface (see on page 37) affect the absolute position information, not the AB /AB incremental signals.

7.1 Recommended Push-Pull incremental input circuit



7.2 Recommended Line Driver incremental input circuit

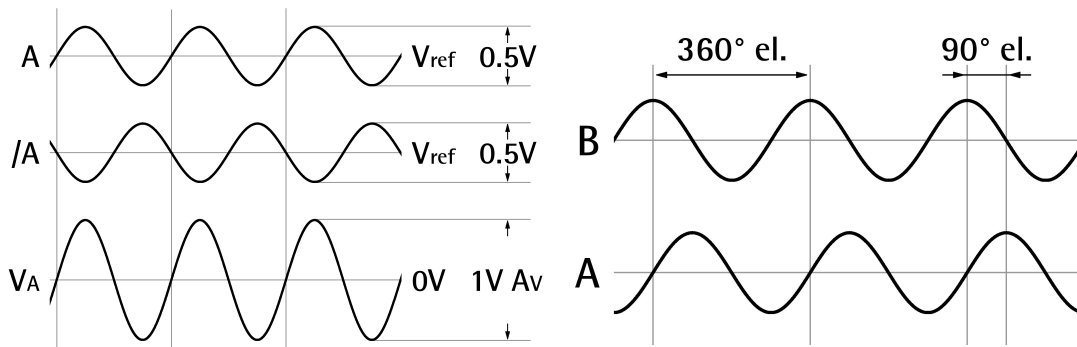


8 – Sine/Cosine 1 Vpp output signals



WARNING

Sine/Cosine 1Vpp output signals are provided in specific versions only, see the order code: R. EH058-...-BV4-... (= SSI interface, LSB Right Aligned protocol, Binary output code, + Sine/Cosine signals); R. EH058-...-GV4-... (SSI interface, LSB Right Aligned protocol, Gray output code, + Sine/Cosine signals); R. EH058-...-SC4-... (BiSS C-Mode interface + Sine/Cosine signals).

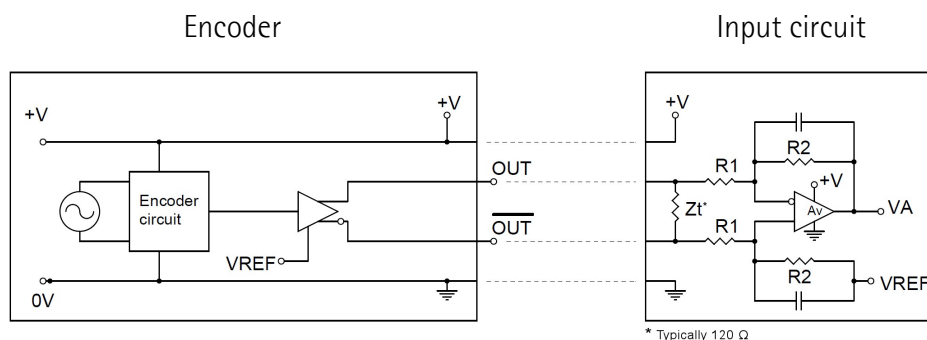


A (COSINE) and B (SINE) signals are to be intended with CW rotation as viewed from the flange side (see the Figure on page 20). They provide 512 sinusoidal waves per each mechanical revolution with amplitude 1Vpp. 1Vpp output level results from differential signals detection. The frequency of output signals is proportional to the rotational speed of the encoder.

8.1 Output signals voltage level

The voltage level refers to the differential value between normal and inverted signal (differential).

8.2 Recommended input circuit

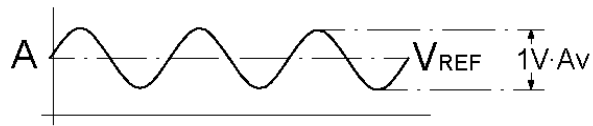


* Typically 120 Ω

$$V_{REF} = 2.5V \pm 0.5V$$

$$V_A = 1V_{pp} * A_v$$

$$A_v = R_2/R_1$$



9 – Default parameters list

Parameters list	Default value *		
Profile ID	00 00		
Serial number	specific to each device		
Command	00		
Configuration	20		
Bit 0 not used	0		
Bit 1 Set preset / offset	0 = Preset		
Bit 2 Enable preset / offset	0 = Enable		
Bit 3 not used	0		
Bit 4 not used	0		
Bit 5 Output code	1 = Binary		
Bit 6 Code sequence	0 = CW		
Bit 7 not used	0		
Counts per revolution	see the order code		
Number of revolutions	see the order code		
Preset / Offset	00 00 00 00		
Device type	01: singleturn rotary encoder 02: multiturn rotary encoder		
Device ID	45 48 4F 43 xx xx = EHOC 45 48 4D 43 xx xx = EMMC		
Manufacturer ID	4C 69		

* All values are expressed in hexadecimal notation.

Document release	Release date	Description	HW	SW	File version
1.0	13.01.2026	First issue	-	-	-
1.1	21.01.2026	Minor amendments	-	-	-



This device is to be supplied by a Class 2 Circuit or Low-Voltage Limited Energy or Energy Source not exceeding 30 Vdc. Refer to the order code for supply voltage rate.

Ce dispositif doit être alimenté par un circuit de Classe 2 ou à très basse tension ou bien en appliquant une tension maxi de 30Vcc. Voir le code de commande pour la tension d'alimentation.



Dispose separately

lika

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