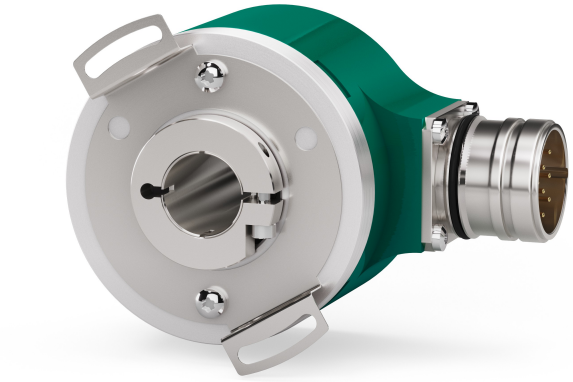
Smart encoders & actuators

User's guide

R. EHCT59



- Designed to replace HSCT & HMCT encoders
- Optical sensing technology, single- & multi-turn versions
- Single-turn resolution up to 20 bit (1,048,576 cpr)
- Total resolution up to 28 bit (268,435,456 counts)
- SSI and BiSS C-mode interfaces
- Additional incremental or Sine/Cosine signals on request
- With EHG Energy Harvesting Generator technology platform

Suitable for the following models:

- R. EHCT59-...

Table of Contents

This manual is periodically reviewed and revised. As required we suggest checking if a new or updated edition of this document is available at Lika Electronic s.r.l.'s website. Lika Electronic s.r.l. assumes no responsibility for any errors or omissions in this document. Critical evaluation of this manual by the user is welcomed. Your comments assist us in preparation of future documentation, in order to make it as clear and complete as possible. Please send an e-mail to the following address info@lika.it for submitting your comments, suggestions and criticisms.

General contents

Subject Index

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. EHCT59 absolute encoder with SSI and BiSS C-mode interfaces**. The R. EHCT59 absolute encoder is **designed to replace** the HSCT and HMCT series encoders that are phasing out.

The **R. EHCT59 absolute encoder** is equipped with the high accuracy **optical sensing technology** and the SSI and BISS interfaces.
It is built in a standard 58-mm flange diameter housing and is noted for the 14-mm and 15-mm through hollow shaft. It can operate in typical industrial environments thanks to the **protection rating of IP65.**
This encoder integrates 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. Some SSI versions can also output 2,048 PPR AB incremental signals using the Push-Pull or Line Driver circuits; or 1,024 Sine/Cosine 1Vpp signals. An additional advantage is the Universal power supply circuit which enables the range of the input voltage from +5Vdc to +30Vdc.
The singleturn resolution can be up to 20 bits; the total resolution can be up to 28 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 19.
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 24.

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 13;
- 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 µs 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;
- 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.

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).

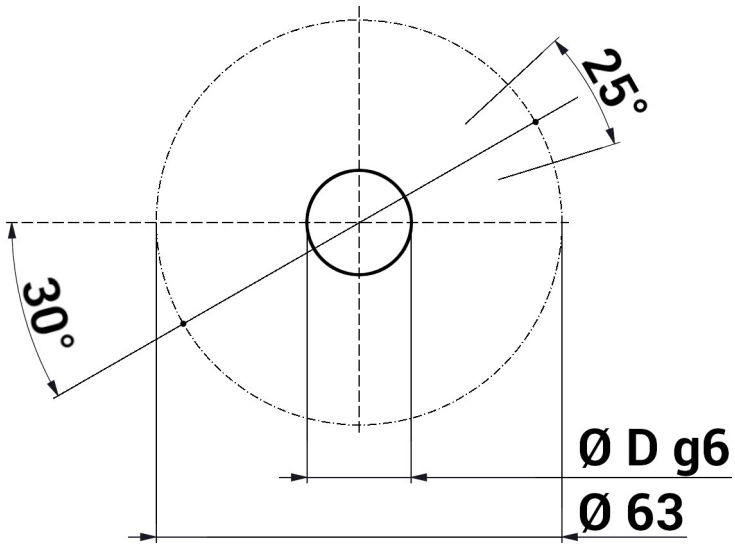
3 - Mounting instructions

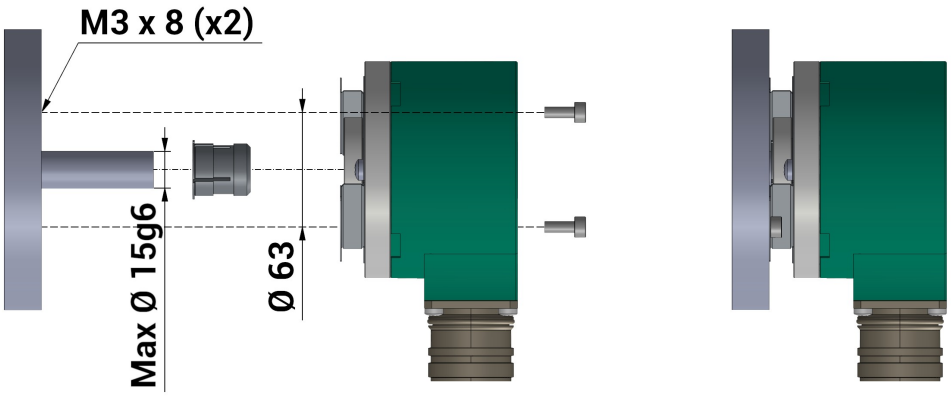
WARNING
Installation and maintenance operations must be carried out by qualified personnel only, with power supply disconnected and mechanical parts absolutely in stop.

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

3.1 Mounting support

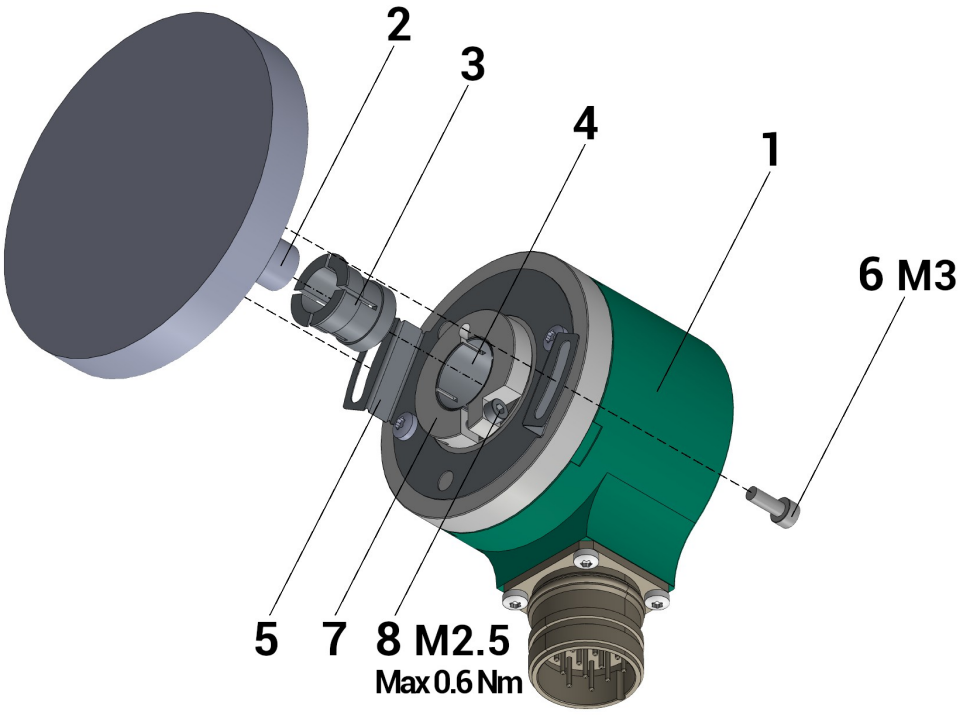
Values are expressed in millimetres (mm)





3.2 Mounting the encoder

- We recommend the connector or the cable to be aligned downwards to avoid moisture/liquid ingress;
- mount the encoder **1** on the motor shaft **2** using the reducing sleeve **3** (if required). Avoid forcing the encoder shaft **4**;
- fasten the fixing plate **5** to the rear of the motor using two M3 cylindrical head screws **6**; max. tightening torque: 1.1 Nm;
- fix the collar **7** of the encoder shaft **4** by means of the M2.5 screw **8** (apply some threadlocker to the screw **8**). Max. tightening torque: 0.6 Nm.



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!

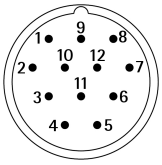
WARNING
If wires of unused signals come in contact, irreparable damage could be caused to the device. Please insulate them singularly.

Function	M23 12 pin	M12 12 pin	M12 8 pin	TF12 cable
Clock IN + / MA +	2	3	3	Violet
Clock IN – / MA -	1	4	4	Yellow
Data OUT + / SLO +	3	5	5	Grey
Data OUT – / SLO -	4	6	6	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	Blue
Zero setting / (Preset / Offset)	9	7	7	White
0Vdc	12	1	1	White_Green
+5Vdc +30Vdc	11	2	2	Brown_Green
Shielding	Case	Case	Case	Shield

1 AB /AB incremental or Sine/Cosine output signals are provided in specific versions only, see the order code. For complete information on the incremental signals refer to the "7 – AB /AB incremental output signals" section on page 40. For complete information on the Sine/Cosine signals refer to the "8 - Sine/Cosine 1Vpp output signals" section on page 42.

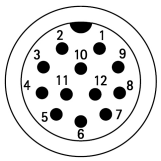
WARNING
Connect +Vdc and 0Vdc and check the power supply is correct first before connecting the communication signals.

4.1 M23 12-pin CCW connector



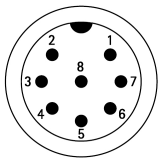
M23 12-pin connector
Counter-clockwise
Male frontal side

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 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 ±0.1 mm / 0.213" ±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.

4.5 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.

4.6 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.

4.7 AB /AB incremental output signals

For any information on the AB /AB incremental output signals, please refer to the "7 – AB /AB incremental output signals" section on page 40. AB /AB incremental output signals are provided in specific versions only, see the R. EHCT59-...-B14-..., R. EHCT59-...-G14-..., R. EHCT59-...-B64-..., and R. EHCT59-...-G64-... order codes.

4.8 Sine/Cosine 1Vpp output signals

For any information on the Sine/Cosine 1Vpp output signals, please refer to the "8 - Sine/Cosine 1Vpp output signals" section on page 42. Sine/cosine 1Vpp output signals are provided in specific versions only, see the R. EHCT59-...-BV4-... and R. EHCT59-...-GV4-... order codes.

4.9 Angular resolution

The encoder can have a singleturn resolution of 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 (19 bits), and 1,048,576 cpr (20 bits).
The angular resolution is:

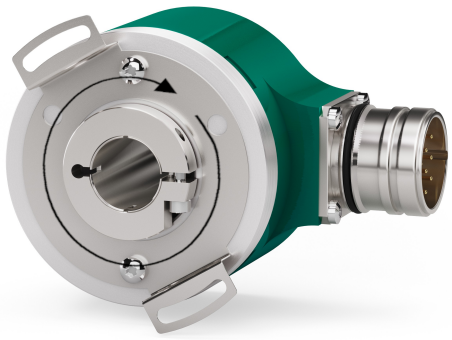
- 0.35156° (0° 21' 6") for 10 bit model;
- 0.17578° (0° 10' 32.81") for 11 bit model;
- 0.08789° (0° 5' 16") for 12 bit model;
- 0.04395° (0° 2' 38") for 13 bit model;
- 0.00549° (0° 0' 20") for 16 bit model;
- 0.00137° (0° 0' 5") for 18 bit model;
- 0.00068° (0° 0' 2.45") for 19 bit model;
- 0.00034° (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° / 8,192 cpr = 0.04395 °/cpr
angular position = position value * 1 step

EXAMPLE
Position value = 3,000
Angular position = 3,000 * 0.04395 = 131.85° = 131° 51' 0"

4.10 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, i.e. as viewed from the shaft side. 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 and sinusoidal signals.

4.11 Zero setting / (Preset / Offset) input

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 35). 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 35 and to the **Configuration** register on page 30.

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 31); 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 35); while in the second case (**Set preset / offset** = 1 = OFFSET) it is used to activate the offset (**Preset / Offset** registers, see on page 35).

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. EHCT59-...-BA4-..., R. EHCT59-...-GA4-...**
R. EHCT59-...-BB4-..., R. EHCT59-...-GB4-...
R. EHCT59-...-BG4-..., R. EHCT59-...-GG4-...
R. EHCT59-...-BV4-..., R. EHCT59-...-GV4-...
R. EHCT59-...-B14-..., R. EHCT59-...-G14-...
R. EHCT59-...-B64-..., R. EHCT59-...-G64-...

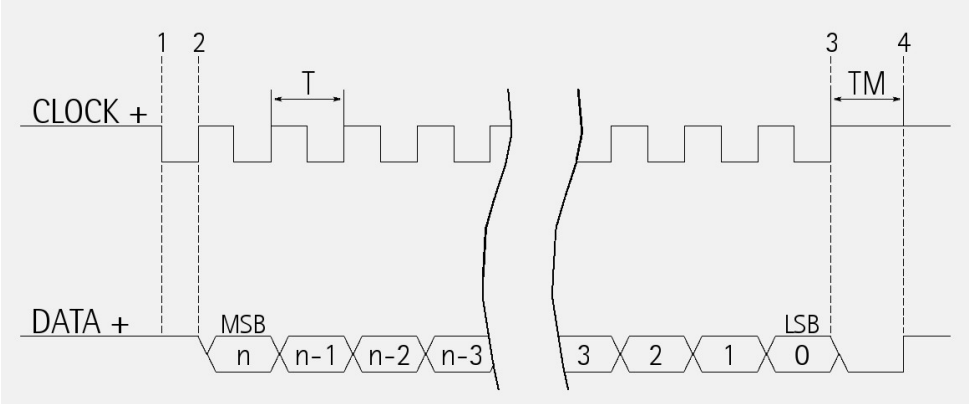
5.1 SSI (Synchronous Serial Interface)

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 insulting 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 Tm 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 "LSB Right Aligned" protocol (BA, GA, BB, GB, 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. EHCT59-16-00-...	25	16 bits	65,536
R. EHCT59-18-00-...	25	18 bits	262,144
R. EHCT59-19-00-...	25	19 bits	524,288
R. EHCT59-20-00-...	25	20 bits	1,048,576
R. EHCT59-10-15-... R. EHCT59-11-14-... R. EHCT59-12-13-... R. EHCT59-13-12-...	25	25 bits	33,554,432
R. EHCT59-16-12-...	32	28 bits	268,435,456

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

Structure of the position information

R. EHCT59-16-00-...	24 ... 16	15	...	0
R. EHCT59-18-00-...	24 ... 18	17	...	0
R. EHCT59-19-00-...	24 ... 19	18	...	0
R. EHCT59-20-00-...	24 ... 20	19	...	0
R. EHCT59-10-15-... R. EHCT59-11-14-... R. EHCT59-12-13-... R. EHCT59-13-12-...	-	24	...	0
R. EHCT59-16-12-...	31 ... 28	27	...	0
	0	MSB	...	LSB

5.3 "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. EHCT59-16-00-...	16	16 bits	65,536
R. EHCT59-18-00-...	18	18 bits	262,144
R. EHCT59-19-00-...	19	19 bits	524,288
R. EHCT59-20-00-...	20	20 bits	1,048,576
R. EHCT59-10-15-... **R. EHCT59-11-14-...** **R. EHCT59-12-13-...** **R. EHCT59-13-12-...**	25	25 bits	33,554,432
R. EHCT59-16-12-...	28	28 bits	268,435,456

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

Structure of the position information

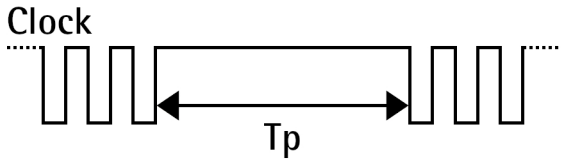
R. EHCT59-16-00-...	**bit**	**15**	**...**	**0**
R. EHCT59-18-00-...	**bit**	**17**	**...**	**0**
R. EHCT59-19-00-...	**bit**	**18**	**...**	**0**
R. EHCT59-20-00-...	**bit**	**19**	**...**	**0**
R. EHCT59-10-15-... **R. EHCT59-11-14-...** **R. EHCT59-12-13-...** **R. EHCT59-13-12-...**	**bit**	**24**	**...**	**0**
R. EHCT59-16-12-...	**bit**	**27**	**...**	**0**
	value	MSB	...	LSB

5.4 Recommended transmission rates

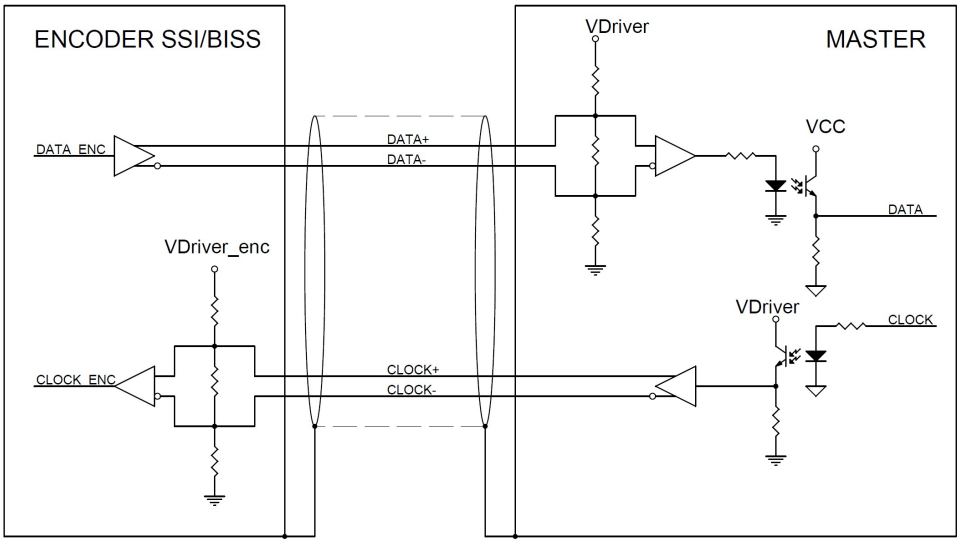
The SSI interface has a frequency of data transmission ranging between 100 kHz and 4 MHz.
CLOCK IN and DATA OUT signals comply with the "EIA standard RS-422".
The SSI clock frequency (baud rate) depends on the length of the cable and must comply with the technical information reported in the following 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 (Tp > 12 µs).



5.5 Recommended SSI input circuit



6 - BiSS C-mode interface

Order code: R. EHCT59-...-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).

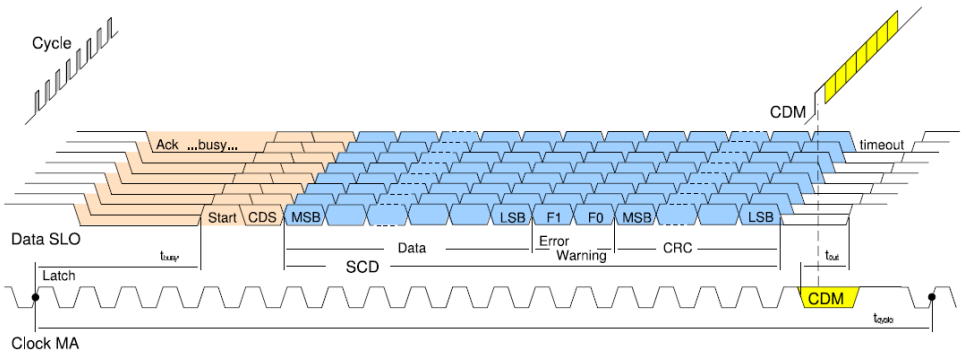
CLOCK IN (MA) and DATA OUT (SLO) signal levels comply with the "EIA standard RS-422".

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 25.
- **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 26.



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 nbitres+7 long where "nbitres" 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	nbitres+7 ... 8	7	6	5 ... 0
function	Position	Error	Warning	CRC

EXAMPLE
The R. EHCT59-20-00-... 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). "Nbitres" is the resolution of the encoder expressed in bits.

bit	nbitres+7	...	...	8
value	msb	...	...	lsb

EXAMPLE
The R. EHCT59-18-00-... singleturn encoder provides an overall resolution of 18 bits.
Position will be as follows.

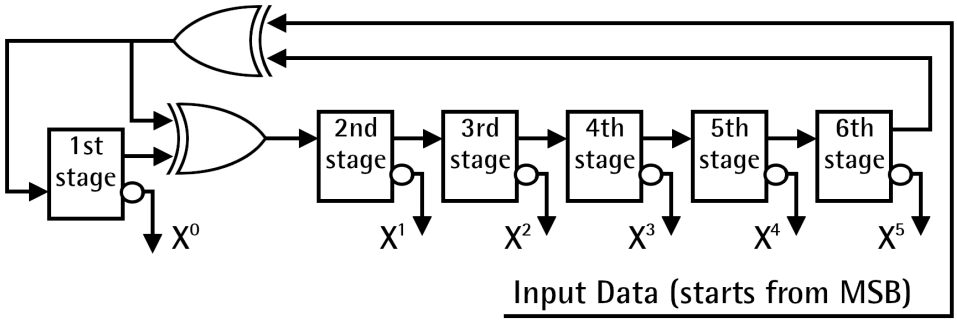
bit	25	...	...	8
value	msb	...	...	lsb

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.

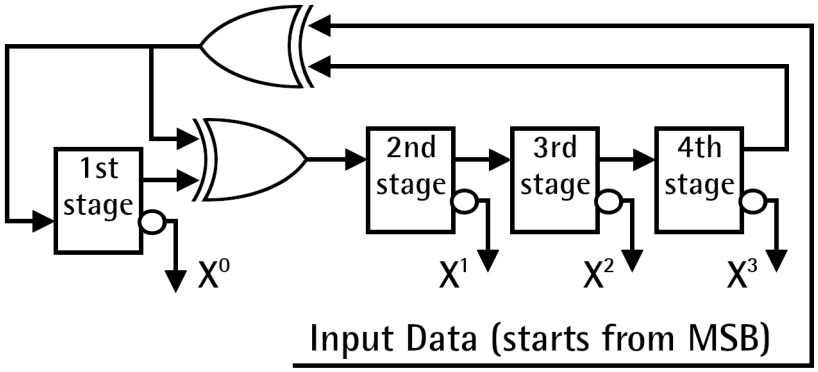
RW
(2 bits)
RW = "01": when you need to write in the register.
RW = "10": when you need to read in the register.
It is 2-bit long.

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 00 01 02 04	Command **Normal operation** **Save parameters on EEPROM** **Save parameters and activate Preset / Offset** **Load and save default parameters**
49 bit 1 bit 2 bit 5 bit 6	Configuration **Set preset / offset** **Enable preset / offset** **Output code** **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} ... 2^{24}	2^{23} ... 2^{16}	2^{15} ... 2^{8}	2^{7} ... 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 44. 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 (00100000_2)**

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 then 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 17.
For any information on the preset and offset functions refer to the **Preset / Offset** register on page 35.

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 17) 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 16) 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 "4.10 Counting direction input" section on page 16.

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	42
	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	
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. EHCT59-**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. EHCT59-**16-12**-SC4-...".
"Hardware counts per revolution" = **16** bits/turn (2^{16} = 65,536 cpr)
"Hardware number of turns" = **12** bits (2^{12} = 4,096 turns)
"Hardware total resolution" = **28** bits (2^{16+12} = 65,536 * 4,096 = 268,435,456)

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 17.

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 17.

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 17.
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:

Reg.	78	79	7A	7B	7C	7D
	2^{47} ... 2^{40}	2^{39} ... 2^{32}	2^{31} ... 2^{24}	2^{23} ... 2^{16}	2^{15} ... 2^{8}	2^{7} ... 2^{0}
Hex	45	48	43	43	xx	xx
ASCII	E	H	C	C	xx	xx

xx = software version

Registers 78 to 7A: name of the encoder: EHC = R. EHCT59 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

01100000_2 = 60 hex

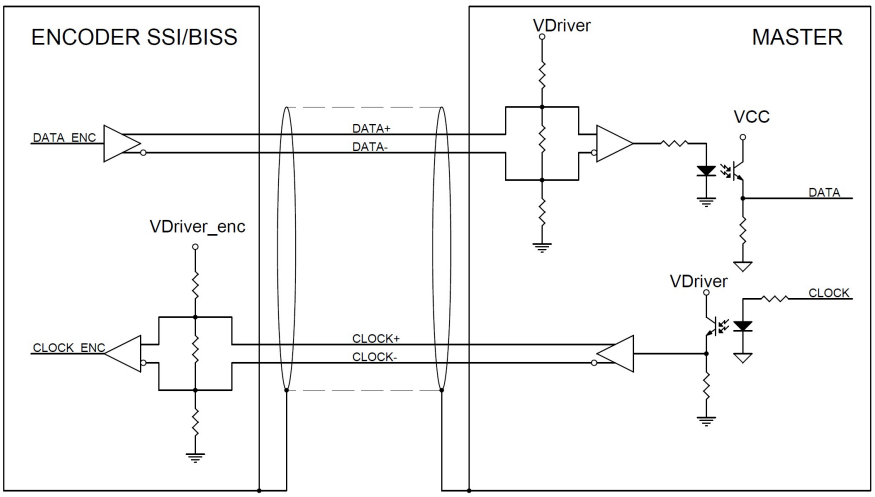
Function	ADR	DATA Tx
writing the Configuration register	49	60
Save parameters on EEPROM register 48 Command	48	01

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 = $100{,}000_{10}$ = 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. EHCT59-...-B14-... (= SSI interface, LSB Right Aligned protocol, binary output code, + 2,048 AB /AB Line Driver incremental signals); R. EHCT59-...-G14-... (= SSI interface, LSB Right Aligned protocol, Gray output code, + 2,048 AB /AB Line Driver incremental signals); R. EHCT58-...-B64-... (SSI interface, LSB Right Aligned protocol, binary output code, + 2,048 AB /AB Push-Pull incremental signals); R. EHCT58-...-G64-... (SSI interface, LSB Right Aligned protocol, Gray output code, + 2,048 AB /AB Push-Pull incremental signals).

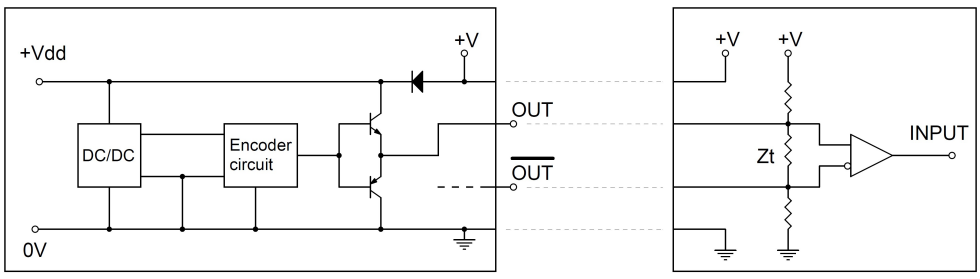
In addition to the absolute position information, the R. EHCT59 encoder can provide AB /AB incremental signals through either the Line Driver or Push-Pull output circuit.
The incremental resolution is 2,048 PPR.
The output circuit can be:

- Line Driver / Line Driver (RS-422)/TTL level type (-B14- and -G14- order codes). 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 (-B64- and -G64- order codes). It is operated at +5Vdc +30Vdc and the signal amplitude is according to the supply voltage (Vin – 1.25). It provides AB /AB signals.

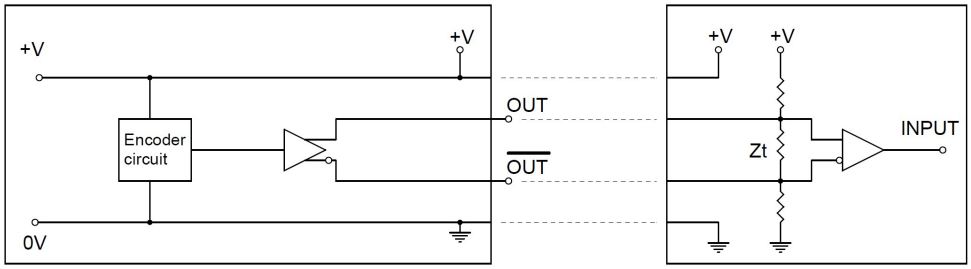
I_{out} = 20 mA max.
Thermal and short-circuit protections are not provided.

NOTE
Please note that the Counting direction input (see on page 16) affects the absolute position information, not the AB /AB incremental signals.

7.1 Recommended Push-Pull incremental input circuit



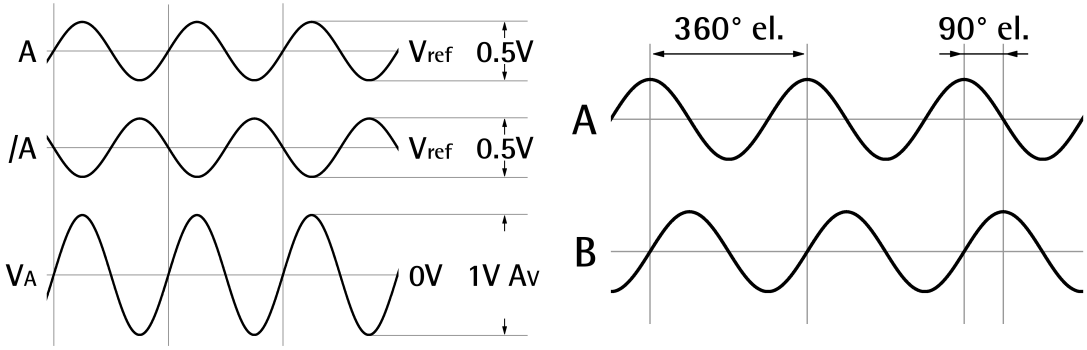
7.2 Recommended Line Driver incremental input circuit



8 - Sine/Cosine 1Vpp output signals

NOTE
Sine/Cosine output signals are provided in specific versions only, see the order code: R. EHCT59-...-BV4-... (= SSI interface, LSB Right Aligned protocol, binary output code, + 1,024 Sine/Cosine 1Vpp signals); R. EHCT59-...-GV4-... (= SSI interface, LSB Right Aligned protocol, Gray output code, + 1,024 Sine/Cosine 1Vpp signals).

A (COSINE) and B (SINE) signals are to be intended with CW rotation as viewed from the shaft side. They provide 1,024 sinusoidal waves per 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.

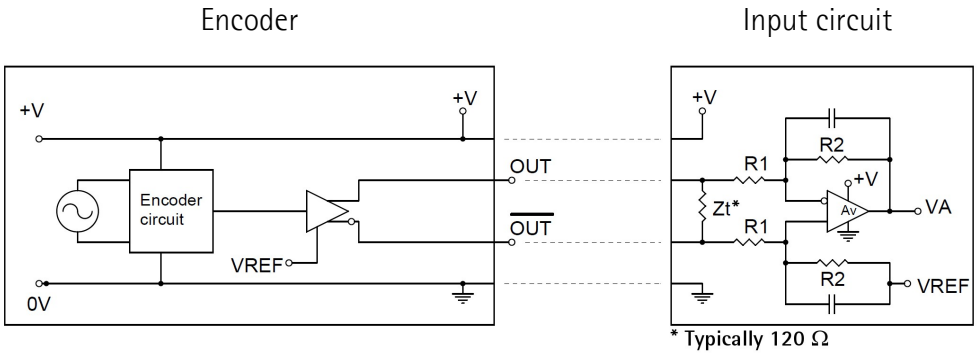


NOTE
Please note that the Counting direction input (see on page 16) affects the absolute position information, not the Sine/Cosine 1Vpp signals.

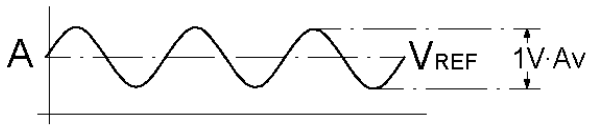
8.1 Output signals voltage level

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

8.2 Recommended Sine/Cosine 1Vpp input circuit



V_{REF} = 2.5V ± 0.5V V_A = 1Vpp * Av Av = R2 / R1



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 43 43 xx xx = EHCC		
Manufacturer ID	4C 69		

* All values are expressed in hexadecimal notation.

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Document release	Release date	Description	HW	SW	File version
1.0	22.01.2026	First issue	-	-	-

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

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