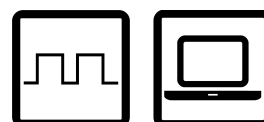


## SME54



- Programmable incremental linear encoder
- Resolution programmable between 0.08  $\mu\text{m}$  and 1250  $\mu\text{m}$
- Measuring length up to 100 m / 328 ft
- Protection rate up to IP67
- Wide mounting tolerances up to 2 mm / 0.078"

### Suitable for the following models:

- SME54-Y2-...
- SME54-YC2-...
- SME54-L1-...

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The logo for Lika Electronic s.r.l. features the word "lika" in a bold, lowercase, sans-serif typeface. The letter "i" is stylized with a dot that is slightly offset to the right. The letters "l", "k", and "a" are thick and solid.

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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 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 <b>WARNING</b> , 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 <b>NOTE</b> , 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 <b>EXAMPLE</b> 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 **SME54 programmable incremental linear encoder**.

SME54 programmable encoder is designed to offer a complete parametrization and the better configuration to perfectly suit specific needs in a variety of applications and machines. It allows to configure the desired resolution, the code sequence and the width of the Reference signal and to optimize the performances of the device as regards the speed of the individual application.

The parametrization and set up of the SME54 programmable encoder are achieved by using a software expressly developed and released by Lika Electronic. The program is supplied for free and can be installed in any PC fitted with a Windows operating system (Windows XP or later). It allows the operator to set the working parameters of the device and monitor whether the device is running properly. The connection between the encoder and the PC is established by using the USB connection kit order code **KIT IP/IQ58** provided by Lika Electronic; Fxxx connection devices need the kit to be matched with the cordset order code **EC-IP/IQ-M12**.

This encoder is designed to measure linear or angular displacements on industrial machines and automation systems. The measurement system includes a magnetic tape and a magnetic sensor. The tape has alternating magnetic north/south poles that are magnetized at a fixed distance (5 mm / 0.1968") called the pole pitch. The conversion electronics inside the sensor translates the magnetic fields of the tape into electrical signals equivalent to those of an incremental encoder or a linear scale. The readhead must be paired with the MTI-0500 magnetic tape. SME54 encoder can also integrate a sensor for detecting an external Reference magnet (order code LKM1309/5) and is equipped with four diagnostic LEDs.

To make it easier to read and understand the text, this guide is divided into two 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 **Programming Interface**, both general and specific information is given on the programming interface. In this section the software tool features and the parameters implemented in the unit are fully described.

# 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 according to the explanation in the "Electrical connection" section on page 17;
- the wires of unused output signals must be cut at different lengths and insulated singularly;
- in compliance with 2014/30/EU norm on electromagnetic compatibility, the following precautions must be taken:
  - before handling and installing the equipment, 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 cable shield (or the connector housing) and 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;
- do not stretch the cable; do not pull or carry by cable; do not use the cable as a handle.



### 1.3 Mechanical safety

- Install the device following strictly the information in the "Mechanical installation" section on page 10;
- mechanical installation must be carried out with stationary mechanical parts;
- do not disassemble the unit;
- do not tool the unit;
- delicate electronic equipment: handle with care; do not subject the device to knocks or shocks;
- protect the unit against acid solutions or chemicals that may damage it;
- respect the environmental characteristics of the product;
- we suggest installing the unit providing protection means against waste, especially swarf as turnings, chips, or fillings; should this not be possible, please make sure that adequate cleaning measures (as for instance brushes, scrapers, jets of compressed air, etc.) are in place in order to prevent the sensor and the magnetic tape from jamming.



## 2 Identification

Device can be identified through the **order code** and the **serial number** printed on the label applied to its enclosure. 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 catalogue.



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

### 3 Mechanical installation

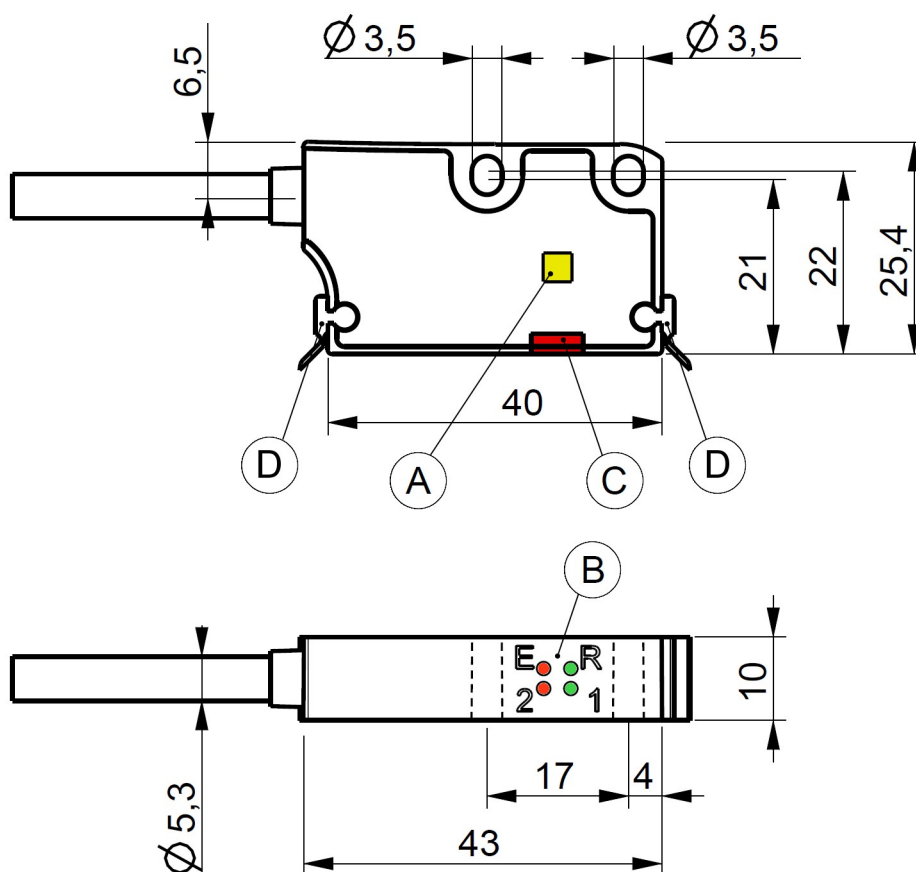


#### WARNING

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

#### 3.1 Overall dimensions

(values are expressed in mm)



A	Reference sensor "R" (page 21)	C	Incremental sensor
B	Diagnostic LEDs (page 23)	D	Optional cleaning wipers (page 16)

### 3.2 Magnetic tape

The sensor must be paired with the **MTI-0500 type magnetic tape** only. For detailed information on the MTI-0500 type tape and how to mount it properly, please refer to the specific technical documentation.

Install the unit providing protection means against waste, especially swarf as turnings, chips or filings; should this not be possible, please make sure that adequate cleaning measures (as for instance brushes, scrapers, jets of compressed air, etc.) are in place in order to prevent the sensor and the magnetic scale from jamming. We suggest installing the optional cleaning wipers order code **KIT WIPERS**.

Make sure that the mechanical installation complies with the system's requirements for distance, planarity and parallelism between the readhead and the scale indicated in Figure 2 all along the whole measuring length.

MTI-0500 magnetic tape can be provided with a cover strip to protect its magnetic surface (see the order code of the magnetic tape).

You can mount the readhead in both directions over the tape. The arrow in Figure 1 indicates the **standard counting direction** (the rising edge of A signal leads the rising edge of B signal) when the sensor moves in the direction indicated by the arrow; further information in the "4.8 Counting direction" section on page 21.

The external Reference "R" magnet order code **LKM1309/5** must be compulsorily installed as shown in Figure 3. For complete information please refer to the "3.4 Mounting the sensor with "R" Reference" section on page 13.

### 3.3 Mounting the readhead

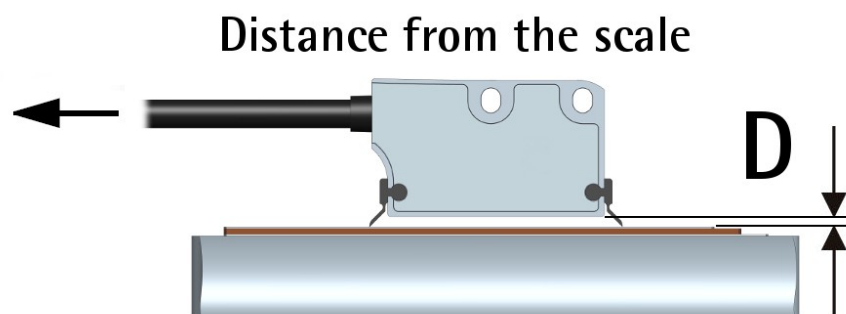


Figure 1 - Encoder / tape mounting gap

Make sure that the mechanical installation complies with the system requirements concerning distance, planarity and parallelism between the sensor and the scale as shown in Figure 2. Avoid contact between the parts.

Fix the sensor by means of **two M3 15 mm min. long cylinder head screws** inserted in the provided slots.

The recommended tightening torque is **1.1 Nm**.

The recommended **minimum bend radius** of the cable is:  **$R \geq 42 \text{ mm}$** .

Install the sensor and the magnetic scale as shown in the Figure. As previously stated, the arrow is intended to indicate the standard counting direction (the rising edge of A signal leads the rising edge of B signal).

Please note that the MTI-0500 magnetic scale can be provided with a cover strip to protect its magnetic surface (see the order code). Therefore the distance between the sensor and the magnetic scale is different whether the cover strip is applied.

**The distance D (see Figure 1) between the bottom of the encoder and the MTI-0500 magnetic scale must be as follows:**

without cover strip	with cover strip
0.1 mm ÷ 2.0 mm (0.004" ÷ 0.078")	0.1 mm ÷ 1.7 mm (0.004" ÷ 0.067")

**For better operation the suggested distance D is 1.0 mm (0.039").**



#### WARNING

Make sure that the mechanical installation complies with the system's requirements for distance, planarity and parallelism between the readhead and the scale as shown in Figure 2 all along the whole measuring length.

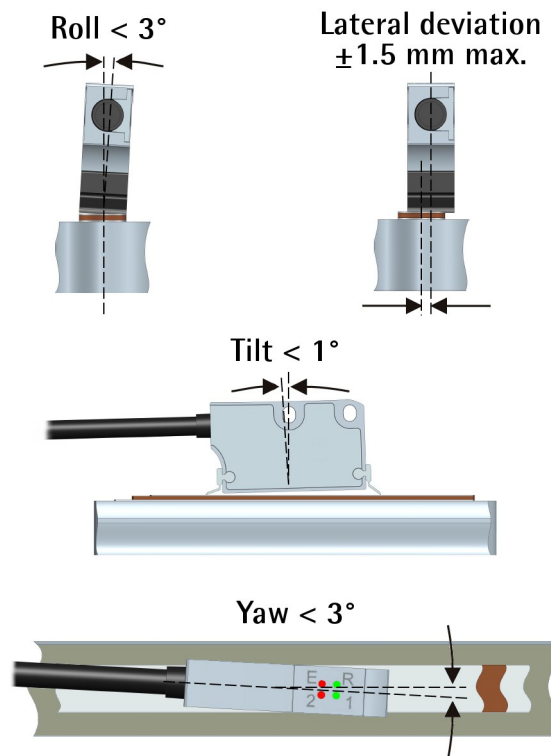
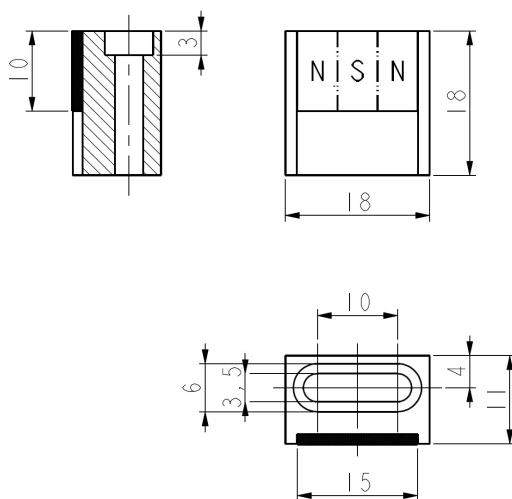


Figure 2 - Encoder / tape mounting tolerances

### 3.4 Mounting the sensor with "R" Reference



The Reference signal is available with "R" order code and in combination with **LKM1309/5** Reference pole support. It provides a datum position along the scale for use at power-up or following a loss of power. The external Reference magnet is placed next to the scale on the side shown in the Figure at the preferred location to mark a relevant position in the travel (the home position, for instance). The R LED lights up when the sensor detects the LKM1309/5 external reference.

Further information in the "4.9 Reference "R"" section on page 21.

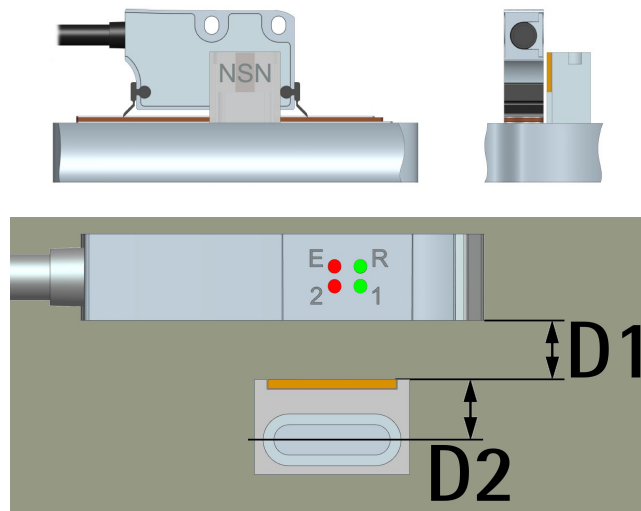


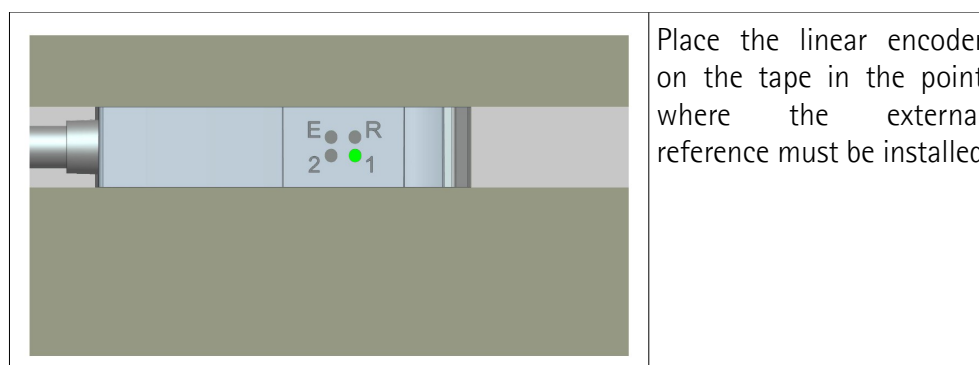
Figure 3 - External Reference

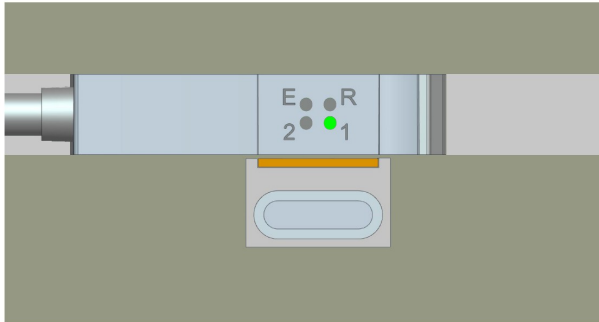
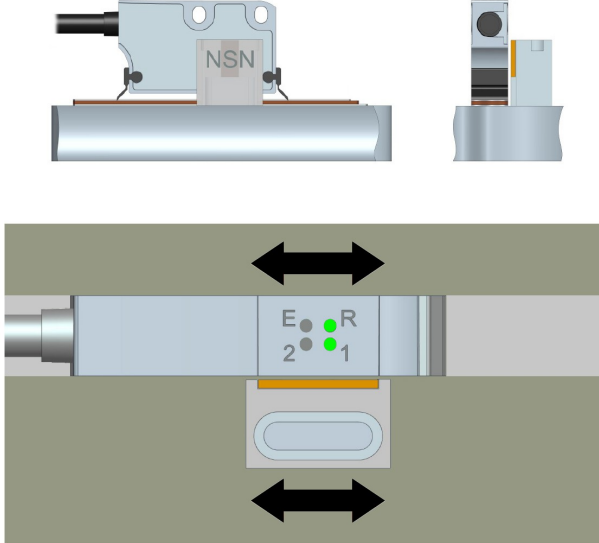
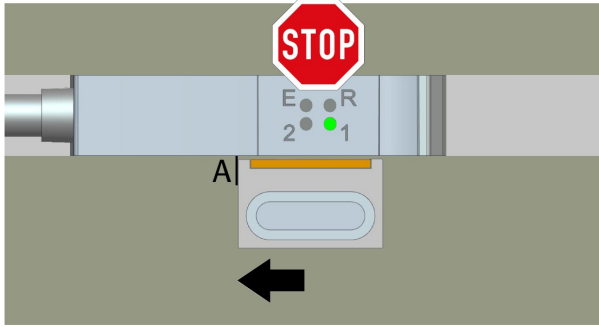
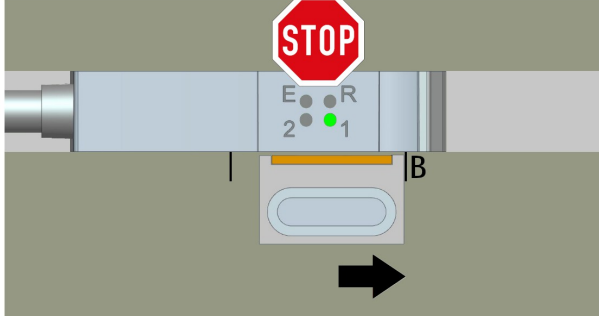
**D1:** gap to be compliant with between the sensor and the LKM1309/5 external magnet.

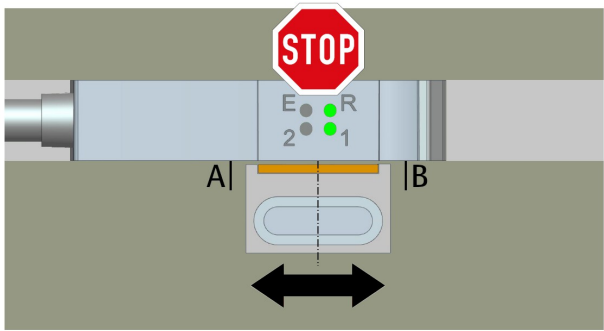
**D2:** distance from the centre of fixing hole to the edge of the Reference Mark.

	D1	D2
SME54 / LKM1309/5	0.5 – 1.0 mm 0.020" – 0.039"	7.5 mm 0.295"

To align the external Reference LKM1309/5 of the linear encoder please proceed as follows:



	<p>Place the external reference next to the reference sensor of the encoder. The distance of the external reference from the encoder must be less than the max. value D1</p>
	<p>Slightly move to the left and/or to the right both the encoder and the external reference until the green Reference LED lights up</p>
	<p>Keep the encoder steady, do not move it!</p> <p>Slightly move the external reference to the left until the green Reference LED goes off</p> <p>Make a mark A to indicate the left limit</p>
	<p>Then slightly move the external reference to the right. The green Reference LED lights up; move it to the right a little more until the green Reference LED goes off</p> <p>Make a mark B to indicate</p>

	the right limit
	<p>Now perfectly center the external reference between the marks A and B. Fasten it firmly</p> <p>Please note that, when the pole pitch is e.g. 1 mm wide, the above described play between the marks A and B is about 0.3 mm</p>

### 3.5 Measuring length

The **length of the tape** can be theoretically unlimited. The tape is supplied in rolls up to 100 m / 328 ft long.

The sensor area must always be fully within the limits of the tape magnetic surface, then the **maximum measuring length** is the maximum length of the tape minus the length of the sensor head (and further two safety sections at both end each one being min. 1-pole pitch long). For instance: if the travel in your application is 500 mm / 19.685", then the length of the tape to be installed will be: 500 mm / 19.685" (measuring length) + 40 mm / 1.575" (length of the readhead, see the Figure on page 10) + 2 x 5 mm (the length of two pole pitches for safety reasons) = 550 mm / 21.653".

### 3.6 Standard counting direction

The positive counting direction (the rising edge of A signal leads the rising edge of B signal) is achieved when the sensor moves on the tape according to the arrow shown in Figure 1. For further information see the "4.8 Counting direction" section on page 21.

### 3.7 Optional cleaning wipers (Figure 1)

This encoder can be optionally provided with rubber cleaning wipers to be mounted on the sensing head (order code **KIT WIPERS**). They are designed for debris removal from the magnetic taper surface in order to ensure a clear path of motion.



## 4 Electrical connection

**WARNING**

Electrical connection must be carried out by qualified personnel only, with power supply disconnected and mechanical parts compulsorily in stop.

**WARNING**

If wires of unused signals come in contact, irreparable damage could be caused to the device. Thus they must be cut at different lengths and insulated singularly.

### 4.1 Cable and connectors connections + 1-wire interface

Function	M10 cable	M12 12-pin
0Vdc	Black	1
+Vdc <sup>1</sup>	Red	2
A	Yellow	3
/A	Blue	4
B	Green	5
/B	Orange	6
0 <sup>2</sup>	White	9
/0 <sup>2</sup>	Grey	10
SDA	Violet	11
Shield	Shield	Case

1 See the order code for power supply voltage level

**EXAMPLE**

SME54-L1-... +Vdc = +5Vdc  $\pm$  5%

SME54-YC2-... +Vdc = +10Vdc +30Vdc

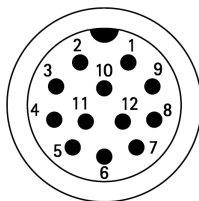
2 Reference "R" signals, see the order code. If the Reference signals are not used and the LKM1309/5 support is not installed, the wires must be cut at different lengths and insulated singularly. See the "4.9 Reference "R"" section on page 21.

#### 4.2 M10 cable specifications

Model:	LIKA HI-FLEX sensor cable type M10
Cross section:	2 x 0.22 mm <sup>2</sup> + 8 x 0.14 mm <sup>2</sup> (24/26AWG)
Jacket:	Matt Polyurethane (TPU) halogen free, oil, hydrolysis, abrasion resistant
Shield:	Tinned copper braid, coverage > 85%
Outer diameter:	5.7 ± 0.2 mm / 0.224" ± 0.008"
Min. bend radius:	Outer diameter x 7.5
Work temperature:	-50°C +90°C / -58°F +194°F, fixed application -40°C +90°C / -40°F +194°F, dynamic application
Conductor resistance:	<90 Ω/Km (0.22 mm <sup>2</sup> ), <148 Ω/Km (0.14 mm <sup>2</sup> )

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

#### 4.3 M12 12-pin connector specifications



Male  
Frontal side  
A coding

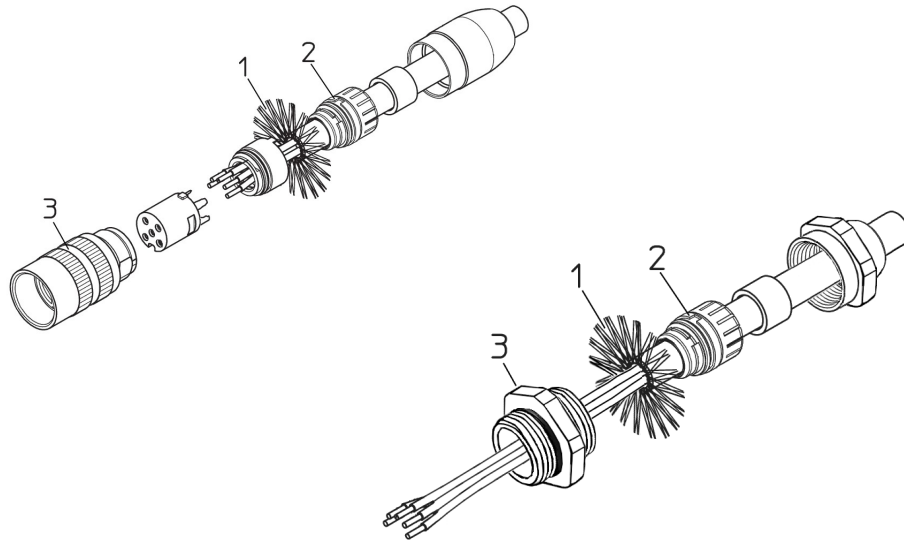
#### 4.4 T12 cable specifications

(This type of cable is used for EC-M12F12-LK-T12-x cordset)

Model:	LIKA High-Flex Twisted Encoder cable type T12
Cross section:	4 x 2 x 0.14 mm <sup>2</sup> + 4 x 0.25 mm <sup>2</sup> twisted pairs (26/24 AWG)
Jacket:	Matt Polyurethane (TPU) halogen free, oil, hydrolysis, abrasion resistant
Shield:	Tinned copper braid, coverage ≥ 85%
Outer diameter:	6.1 mm ± 0.10 mm / 0.24" ± 0.004"
Min. bend radius:	Outer diameter x 7.5
Work temperature:	-50°C +90°C / -58°F +194°F, fixed application -40°C +90°C / -40°F +194°F, dynamic application
Conductor resistance:	≤148 Ω/km (0.14 mm <sup>2</sup> ), ≤90 Ω/km (0.25 mm <sup>2</sup> )

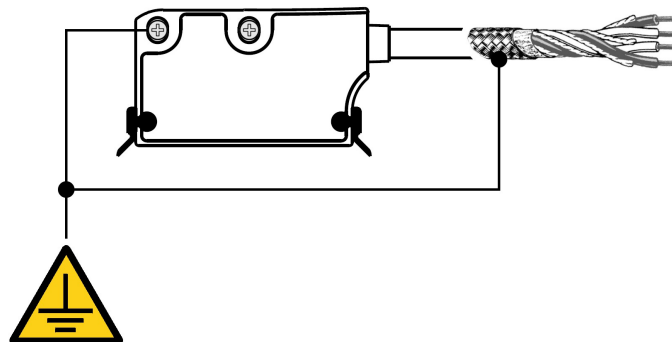
#### 4.5 Connection of the shield

For signals transmission always use shielded cables. The cable shielding must be connected properly to the metal ring nut **3** of the connector in order to ensure a good earthing through the frame of the device. To do this disentangle and shorten the shielding **1** and then bend it over the part **2**; finally place the ring nut **3** of the connector. Be sure that the shielding **1** is in tight contact with the ring nut **3**.



#### 4.6 Ground connection

Minimize noise by connecting the cable shield (or the connector housing) and the sensor 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 the user's side. The best solution to minimize the interference must be carried out by the user. You are advised to provide the ground connection as close as possible to the encoder.



#### 4.7 AB0, /AB0 output channels

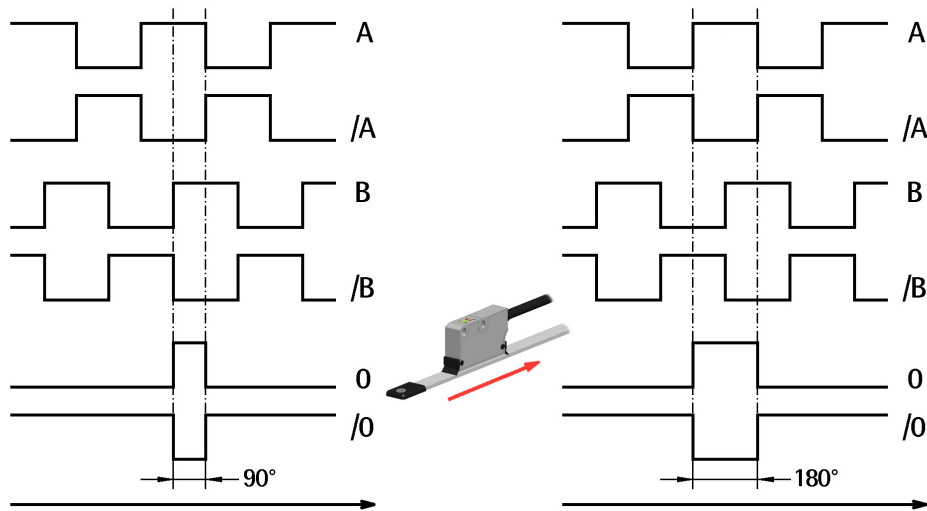


Figure 4 - AB0, /AB0 output channels

The conversion electronics inside the sensor translates the magnetic fields of the scale into electrical signals equivalent to those of an incremental encoder or similar incremental optical devices.

The frequency of the output signal is proportional to the measuring speed and the displacement of the sensor.

The resolution can be programmed through the supplied programming interface.

If you need to know the interpolation factor, then you have to divide the pole pitch value by the resolution set via software tool.



#### EXAMPLE

Let's suppose we are using an SME54-... linear encoder paired with the MTI-0500 magnetic scale; the set resolution is  $50 \mu\text{m} = 0.05 \text{ mm}$ ; as the pole pitch is  $5 \text{ mm} / 0.1968''$  long, this means that the interpolation factor is  $\times 100$  ( $5 \text{ mm} / 0.05 \text{ mm}$ ).



#### WARNING

The position value issued by the sensor is expressed in pulses; to convert the pulses into a metric measuring unit you must multiply the number of detected pulses by the resolution expressed in millimetres or micrometres.



#### EXAMPLE

SME54-... with resolution set to  $50 \mu\text{m} = 0.05 \text{ mm}$   
 detected pulses = 71  
 position value =  $71 * 50 = 3550 \mu\text{m} = 3.55 \text{ mm}$

**NOTE**

The **standard counting direction** (the channel A leads the channel B) is to be intended with sensor moving as shown in Figure 4.

#### 4.8 Counting direction

By default the phase relationship between A and B channels is so that the rising edge of A channel leads the rising edge of B channel when the encoder moves in the direction shown by the arrow in Figure 4 (see the "4.7 AB0, /AB0 output channels" section on page 20). Thus the counter in the subsequent electronics will get a count up. The **Count direction** parameter in the programming tool allows to have a count up also when the encoder moves in the direction opposite to the one shown by the arrow in Figure 4 (otherwise a count down when the encoder moves in the direction shown by the arrow in Figure 4). When the counting direction is set to **STANDARD** -**Count direction** = **STANDARD**-, the encoder will provide the increasing count when the encoder moves in the direction shown by the arrow in Figure 4 (and the decreasing count when the encoder moves in the direction opposite to the one shown by the arrow in Figure 4). When the **INVERTED** option is set -**Count direction** = **INVERTED**-, the encoder will provide the increasing count when the encoder moves in the direction opposite to the one shown by the arrow in Figure 4 (and the decreasing count when the encoder moves in the direction shown by the arrow in Figure 4).

#### 4.9 Reference "R"

Reference signals (0, /0) are available with "R" order code and in combination with LKM1309/5 support. They provide a datum position along the scale for use at power-up or following a loss of power. The external Reference magnet is placed next to the scale on the side shown in Figure 3 at the preferred location to mark a relevant position in the travel (the home position, for instance). The R LED lights up when the sensor detects the LKM1309/5 external reference. Please note that this does not mean that the Reference pulse is output in the same time: the Reference pulse is synchronized with A and B channels within the South pole (Figure 5) and has the set duration. Thus, it may be either not output yet or already output while the LED is lit.

The Reference signal can have a duration of 90° or 180°.

The width of the 0 pulse can be set next to the **Reference length** parameter. Two options are available: **90° el (gated A, B)** and **180° el (gated A)**. Please note that the 0 pulse having a width of 90 electrical degrees is synchronised

with A and B pulses, while the 0 pulse having a width of 180 electrical degrees is synchronised with A pulse. For further information please refer to page 35. The amplitude is according to the power supply voltage level.



#### NOTE

If the set resolution (see the **Resolution [μm]** parameter on page 33) results from an interpolation factor which is not a multiple of 4 (for more information on how to calculate the interpolation factor refer to the "4.7 ABO, /ABO output channels" section on page 20), the reference signals may be NOT synchronised with A and B signals, but with any A, /A, B or /B signal, according to the position where the Reference support is mounted.

For additional information refer to the "3.4 Mounting the sensor with "R" Reference" section on page 13.

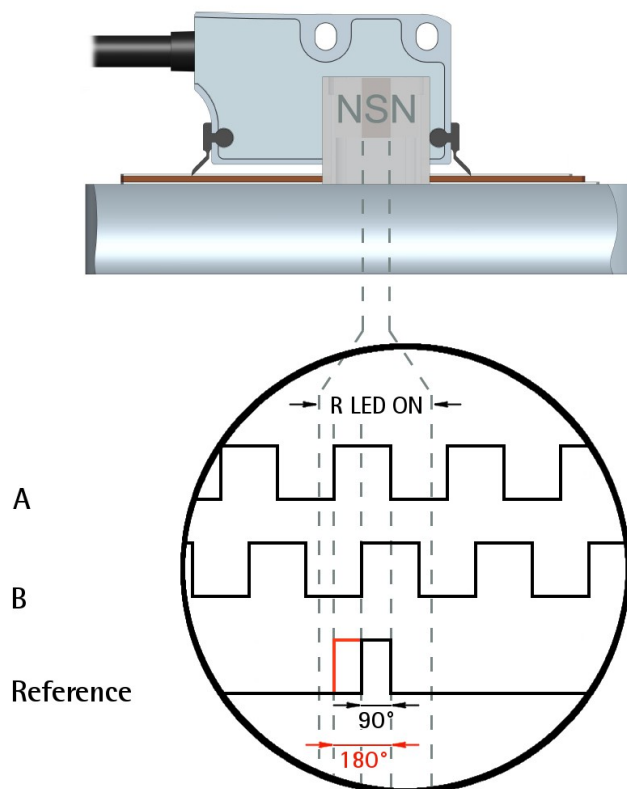


Figure 5 - Reference

#### 4.10 Diagnostic LEDs (Figure 6)

Four LEDs located in the upper face of the encoder enclosure are intended to show visually the work status of the device as explained in the following table.

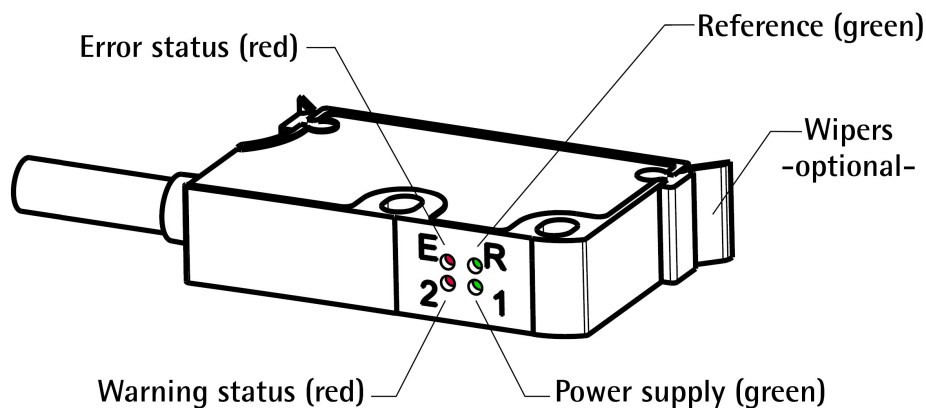


Figure 6 - Diagnostic LEDs and optional cleaning wipers

1 GREEN LED (power supply)	Description
ON Green	The encoder is supplied and running properly.
OFF	The encoder is off, the power is not supplied.

2 RED LED (warning status)	Description
ON Red	It warns of the presence of a warning. <ul style="list-style-type: none"> <li>Distance warning: the distance between the readhead and the tape is not optimal; please refer to the "3.3 Mounting the readhead" section on page 11.</li> <li>Speed warning: the sensor is travelling near to the frequency limit; please refer to the "Max m/s" section on page 36.</li> </ul>
OFF	No warning is active currently.

E RED LED (error status)	Description
ON Red	It warns of the presence of an error. <ul style="list-style-type: none"> <li>Distance error: the specified mounting</li> </ul>

	<p>tolerances are not met; please refer to the "3.3 Mounting the readhead" section on page 11.</p> <ul style="list-style-type: none"> <li>• Speed error: overspeed detected, the sensor exceeded the frequency limit and the zero may be lost; switch off and then on the power supply. Please refer to the "Max m/s" section on page 36.</li> <li>• Tape error: the surface of the tape is damaged or maybe you installed a tape which is not suitable for this encoder.</li> <li>• Internal error of the conversion electronic (interpolator).</li> <li>• The presence of external noise may cause malfunctioning or a decrease in the quality of the signals.</li> </ul>
OFF	No error is active currently.

R <b>GREEN</b> LED (Reference)	Description
ON <b>Green</b>	LKM1309/5 Reference detection and enabling. It is ON for the whole period length (see Figure 5). Refer to the "4.9 Reference "R"" section on page 21.
OFF	LKM1309/5 Reference not detected.

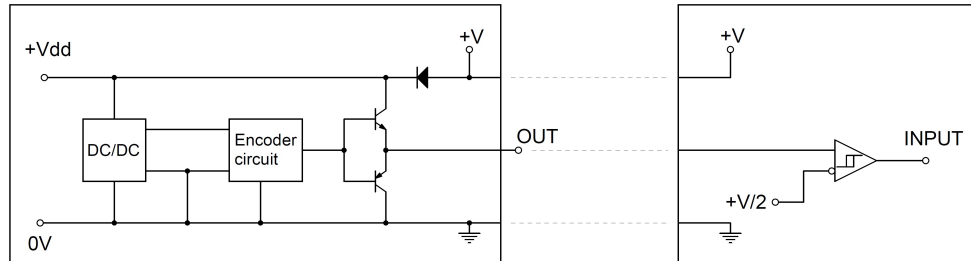

**NOTE**

If a warning or an error occurs switch off and then on again the encoder and check whether the problem is cleared up and the LED turns off.

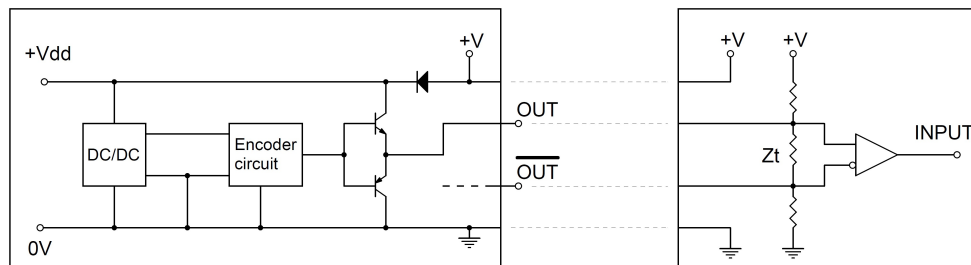


#### 4.11 Recommended circuit

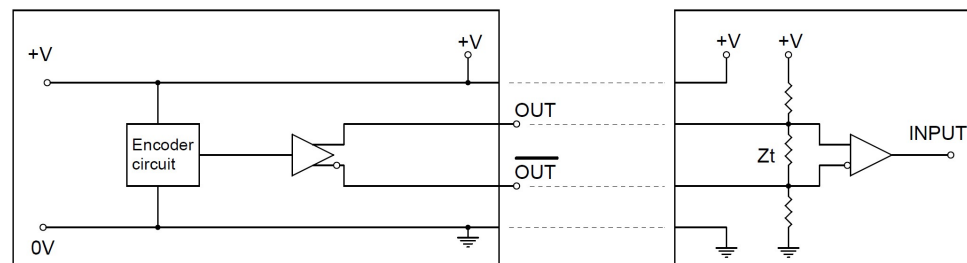
##### Push-Pull (Y order code)



##### Push-Pull (YC order code)



##### Line Driver (L order code)



#### 4.12 1-wire connection



SME54 programmable encoder is equipped with a 1-wire connection for the parametrization and set-up of the device. If you need to communicate with the encoder and configure it, you must connect the device to the personal computer through a USB socket using the specific connection kit supplied by Lika Electronic upon request. The code of the connection kit is **KIT IP/IQ58**.

It is provided with terminals for connecting the cable of the devices having Lxxx connection code.

Devices having Fxxx connection code need the kit to be matched with a cable - M12 12-pin female connector cordset, **EC-IP/IQ58-M12** order code.

To connect the encoder to the connection kit, please refer to the following table and the label applied to the connection kit terminal:

Function	Encoder cable	Terminal	
		IP/IQ	SME54
+5Vdc power supply *	Red	PWR +	
0Vdc	Black	PWR -	
SCL	(Not to be connected)	SCL	n.c.
SDA	Violet	SDA	



**\* WARNING**

+5Vdc power supply from the USB connection. Do not connect any external power supply sources.



**WARNING**

Please make sure that only one encoder is connected to the KIT IP/IQ58 when you activate the USB connection !

**NOTE**

Before configuring the encoder by means of the programming interface, you must connect it to the personal computer through the KIT IP/IQ58 connection cable. You are required to install the drivers of the USB Serial Converter and the USB Serial Port first. The drivers are available for download at the address <https://www.lika.it/eng/products/linear-encoders/incremental-1> .

**4.12.1 Installing the KIT IP/IQ58 USB drivers**

Please follow the steps in the documents listed below to install the drivers of both the USB Serial Converter and the USB Serial Port of the KIT IP/IQ58. The drivers package and the relevant documents are found inside the WINDOWS 2.12.28 folder. As stated, the drivers are available for download at the address <https://www.lika.it/eng/products/linear-encoders/incremental-1> .

If you need to install the drivers under **Microsoft Windows XP** operating system, please refer to the following document: [Installation\\_Guide\\_for\\_WindowsXP.pdf](#).

If you need to install the drivers under **Microsoft Windows Vista** operating system, please refer to the following document: [Installation\\_Guide\\_for\\_VISTA.pdf](#).

If you need to install the drivers under **Microsoft Windows 7** operating system, please refer to the following document: [Installation\\_Guide\\_for\\_Windows7.pdf](#).

If you need to install the drivers under **Microsoft Windows 8** operating system, please refer to the following document: [Installation\\_Guide\\_for\\_Windows8.pdf](#).

If you need to install the drivers under **Microsoft Windows 10** operating system, please refer to the following document: [Installation\\_Guide\\_for\\_Windows10.pdf](#).

As a preliminary operation please:

1. connect the encoder to the KIT IP/IQ58 terminal through the encoder cable or using the M12 12-pin connector cordset (for the cable connection scheme please refer to the table in the previous page); you do not need to power the encoder by means of an external power pack as the device gets the power from USB;
2. connect the cable fitted with the USB connector to a USB socket of your PC; after a few seconds a message will appear in the notification area of the Windows taskbar and the USB Serial Converter drivers installation wizard will start. Then follow the instructions in the above mentioned pdf documents.

---

After installation you can launch the executable file and open the encoder programming interface; to know more refer to the "Programming interface" section on page 29.

## 5 Programming interface

### 5.1 Configuring the encoder using the software tool

SME54 programmable incremental encoder is equipped with a software expressly developed and released by Lika Electronic in order to easily programme and configure the device. It allows the operator to set the working parameters of the device and monitor whether the device is running properly. The program is supplied for free and can be installed in any PC fitted with a Windows operating system (Windows XP or later). The name of the program executable file is **KIT\_IP\_IQ58\_vx.x.exe** where vx.x is the release version of the file. You must use the release from V2.7 on. The program is available for download at the following address [http://www.lika.it/eng/prodotti.php?id\\_titolo=SME54](http://www.lika.it/eng/prodotti.php?id_titolo=SME54).

The program is designed to be installed simply by copying the executable file (\*.exe file) to the desired location and there is **no installation** process. To launch the program just double-click the file icon. To close the program press the **EXIT** button in the title bar.



#### WARNING

Please be aware that the following compatibilities between the hardware-software version of the device and the software version of the executable file have to be respected compulsorily.

Compatibility	HW	Connection kit	EXE FILE
SME54	1.0	KIT IP/IQ58	From v2.7 up to ...

The programming interface allows the connection to the SME54 encoder using the KIT IP/IQ58.



#### NOTE

Before starting the program and establishing a communication with the device, it is necessary to connect it to the personal computer. The interface is a 1-wire interface. To communicate with the encoder and configure it, you must connect the device to the personal computer through a USB port using the specific connection kit order code **KIT IP/IQ58** supplied by Lika Electronic.

For any further information please refer to the "4.12 1-wire connection" section on page 26.

**WARNING**

Please make sure that only one encoder is connected to the KIT IP/IQ58 when you activate the USB connection !



**WARNING**

Please always close the programming interface before disconnecting the encoder !

## 5.2 Starting the program

To launch the program just double-click the **KIT IP\_IQ58\_vx.x.EXE** executable file.

The main page of the configuration interface will appear on the screen. A further page is dedicated to the diagnostic information; it can be accessed by pressing the **ADVANCED DIAGNOSTICS** button below in the page (see on page 38).

First of all the main page allows the operator to choose the language used to display texts and items in the user interface. Click the **Italian flag**  icon on the top-right side of the page to choose the Italian language; click the **UK flag**  icon to choose the English language.

Two sections can be found in the main page of the configuration interface:

1. a top section groups the items needful for establishing the connection between the encoder and the interface, the connection buttons as well as the drop-down boxes designed to select the interface type and the series of the encoder to connect;
2. a bottom section called PROGRAMMABLE PARAMETERS shows the list of the parameters that are available to program the encoder; also the buttons needful for checking the work status of the encoder and entering the diagnostic information page can be found below in this section.

lika Encoder set up

lika

Interface type: KIT IP/IQ58 ✓ Connect

Encoder: SME54-YC2 ✓ Connect

Internal pos. register: 0 ▶ ■

**Programmable parameters:**

Resolution [ $\mu\text{m}$ ]: 5,0000 interpolation: 1000

Count direction: Standard

Reference length: 90°el (gated A, B)

Max m/s: 10,000 m/s (500 KHz) best performance setting m/s / edge distance filter

Encoder status: Read ✓ No error Clear error

Advanced diagnostics

### 5.3 Connection with the encoder

When you start the program, the system automatically recognizes the type of interface you plugged into (**INTERFACE TYPE**: "KIT IP/IQ58"). No action is required.

You must select the series of the encoder you need to connect to instead. To do this open the **ENCODER** drop-down box and select from the options in the list: "IP58, IP58S, CKP58" or "IQ58, IQ58S, CKQ58" or "IQ36, CKQ36" or "SME54-L1" or "SME54-Y2" or "SME54-YC2". Select the right SME54 encoder model. The encoder model can be found in the label applied to the device enclosure.



#### WARNING

Please make sure that you always select the right SME54 encoder model in order to better configure the encoder and optimize its performances.



#### NOTE

As stated (see the "4.12 1-wire connection" section on page 26), the encoder is supplied with +5Vdc through the USB connection of the KIT IP/IQ58 independently of the voltage level required for operation by the specific encoder model. In all models +5Vdc power supply is suitable to programming purposes. When you connect with Push-Pull encoder models (see -Y2-... and -YC2-... order codes) that require +10Vdc +30Vdc power supply for proper operation, alarms may appear and the encoder may not be able to read the tape correctly. In such event please do not consider the position information and the alarm messages that might appear.

If the connection is established properly, a green tick ✓ appears next to both the **CONNECT** buttons; on the contrary, if the program is not able to establish a connection to the encoder, a red ✗ appears next to either button or next to both buttons. If you do not choose the right encoder model, a red ✗ appears next to the **ENCODER** field and the items in the PROGRAMMABLE PARAMETERS section are not available. After positive connection the fields in the page are filled with information acquired from the connected device. Furthermore the buttons and the commands become active.



## 5.4 Setting the parameters





### WARNING

To save the data on the EEPROM permanently, you must press the **ENTER** button in the keyboard after having entered the new value. The parameter is saved instantly.

### Internal pos. register

It is used to show the absolute position value within each pole that is available in the internal position register. Displayed value depends on the set resolution and the relevant interpolation. For example, let's suppose we are using an SME54-... linear encoder and we set the **Resolution [μm]** to 50 μm = 0.05 mm; as the pole pitch of the MTI-0500 magnetic tape is 5 mm long, this means that the interpolation factor is x100 (5 mm / 0.05 mm). Thus the displayed value will be between 0 and 99 within each pole. The interpolation factor will be shown next to the **Resolution [μm]** field after programming the resolution.

After proper connection, press the **START**  button to start the routine which allows to continuously read and display the current internal position: the current position of the encoder within each pole appears on the field. Press the **STOP**  button to stop the routine; the last position value is kept "frozen" in the display field.

If **Count direction** = **STANDARD**, when the encoder moves as shown by the arrow in the picture on page 35 the count is decreasing (from 99 down to 0 in the example above).

### Resolution [μm]

This parameter is used to set a custom resolution (measuring step) expressed in micrometres.

The resolution can be defined as the smallest change in the underlying quantity that produces a response in the measurement, the response being the information that is provided to output.

By default the resolution is 5 μm, you are allowed to set whatever value between 0.08 μm and 1250 μm. Please enter the desired value and then press the **ENTER** button to confirm. The interpolation factor will be shown on the right. We suggest setting a resolution value so that the resulting interpolation factor is a multiple of 4 (please refer to the note below).

If you set a value that is out of range (lower or greater than allowed), the system automatically sets either the minimum or the maximum value in the range.

After having set the resolution, set also the encoder maximum speed among the values available in the drop-down box, see the **Max m/s** parameter. Please always consider the interpolation factor of the subsequent electronics before entering a new resolution value.

Default = 5 (min. value = 0.08; max. value = 1250)

**NOTE**

If the set resolution results from an interpolation factor which is not a multiple of 4 (for more information on how to calculate the interpolation factor refer to the "4.7 ABO, /ABO output channels" section on page 20), the reference signals may be NOT synchronised with A and B signals, but with any A, /A, B or /B signal, according to the position where the Reference support is mounted. Refer to the "4.9 Reference "R"" section on page 21.

**NOTE**

To calculate the interpolation factor, you have to divide the pole pitch value by the resolution set via software tool.

**EXAMPLE**

Let's suppose we are using an SME54-... linear encoder paired with the MTI-0500 magnetic scale; the set resolution is  $50\text{ }\mu\text{m} = 0.05\text{ mm}$ ; as the pole pitch is 5 mm long, this means that the interpolation factor is x100 ( $5\text{ mm} / 0.05\text{ mm}$ ).

**WARNING**

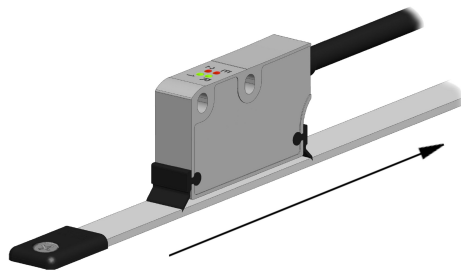
The position value issued by the sensor is expressed in pulses; to convert the pulses into a metric measuring unit you must multiply the number of detected pulses by the resolution expressed in millimetres or micrometres.

**EXAMPLE**

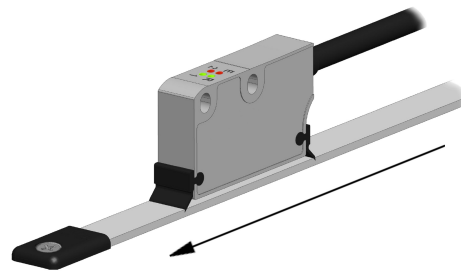
SME54-... with resolution set to  $50\text{ }\mu\text{m} = 0.05\text{ mm}$   
detected pulses = 71  
position value =  $71 * 50 = 3550\text{ }\mu\text{m} = 3.55\text{ mm}$

### Count direction

By default the phase relationship between A and B channels is so that the rising edge of A channel leads the rising edge of B channel when the encoder moves as shown by the arrow in the left picture below.



**STANDARD**



**INVERTED**

Thus the counter in the subsequent electronics will get a count up. This parameter allows to have a count up also when the encoder moves in the opposite direction as shown by the arrow in the right picture above (otherwise a count down when the encoder moves as shown by the arrow in the left picture). Set **Count direction** = **STANDARD** to have the increasing count when the encoder moves as shown by the arrow in the left picture; set **Count direction** = **INVERTED** to have the increasing count when the encoder moves as shown by the arrow in the right picture.

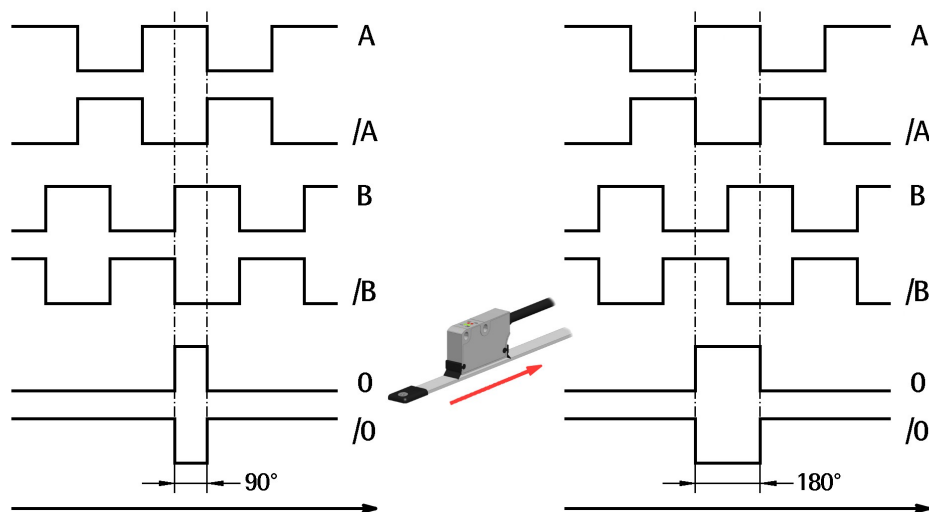
Default = STANDARD (min. value = INVERTED; max. value = STANDARD)

### Reference length

This parameter allows to set the width of the Reference pulse (0 pulse) expressed in electrical degrees. Two options are available and selectable in the drop-down box: **90° el (gated A, B)** and **180° el (gated A)**. Please note that the 0 pulse having a width of 90 electrical degrees is synchronised with A and B pulses, while the 0 pulse having a width of 180 electrical degrees is synchronised with A pulse. See the Figure below. Refer also to the NOTE below. For more information on the Reference signals refer to the "4.9 Reference "R"" section on page 21.

Default = 90° el (gated A, B)

Min. value = 90° el (gated A, B); max. value = 180° el (gated A)

**NOTE**

If the set resolution (see the **Resolution [μm]** parameter on page 33) results from an interpolation factor which is not a multiple of 4 (for more information on how to calculate the interpolation factor refer to the "4.7 AB0, /AB0 output channels" section on page 20), the reference signals may be NOT synchronised with A and B signals, but with any A, /A, B or /B signal, according to the position where the Reference support is mounted. Refer to the "4.9 Reference "R"" section on page 21.

**Max m/s**

It allows to optimize the encoder performance and to have the most efficient ratio between the linear speed and the edge distance of the output encoder signals, depending on the maximum speed the application is able to reach. Since the maximum speed (and the frequency as well), the resolution and the output circuit characteristics are strictly correlated, some options may be disabled or limited as you enter increasing resolutions. If more options are available, the operator has to select the speed value option that is immediately higher than the maximum speed of the application. If you do not know the maximum speed the application is able to reach, please enter the maximum linear speed option that is allowed.

**EXAMPLE**

Let's assume that the resolution of an SME54-YC2-... encoder with Push-Pull output circuit is 1 μm; in this case three options are available for the operator to choose from: **0.500 m/s (125 kHz)**, **1.000 m/s (250 kHz)** and **2.000 m/s (500 kHz)**. If the maximum speed of the application is 0.750 m/s, he has to select the 250 kHz option; if the maximum speed of the application is 1.5 m/s,

he has to select the 500 kHz option; if he does not know the maximum speed of the application, then he has to select the 500 kHz option.

**NOTE**

Please always consider the max. permissible speed and the counting frequency in order to be sure that they comply with the characteristics of your mechanical system and the following electronics as well as with the run of the cables.

Note that the higher the resolution and the maximum travel speed of the encoder, the higher the counting frequency.

Furthermore, there is a straight relation between the counting frequency and the signal distortion. The longer is the cable in fact, the greater is its capacitance; and the capacitance affects the signal quality causing the higher frequencies to be "filtered", so distorting the signal.

**Encoder status**

It displays the work status of the encoder.

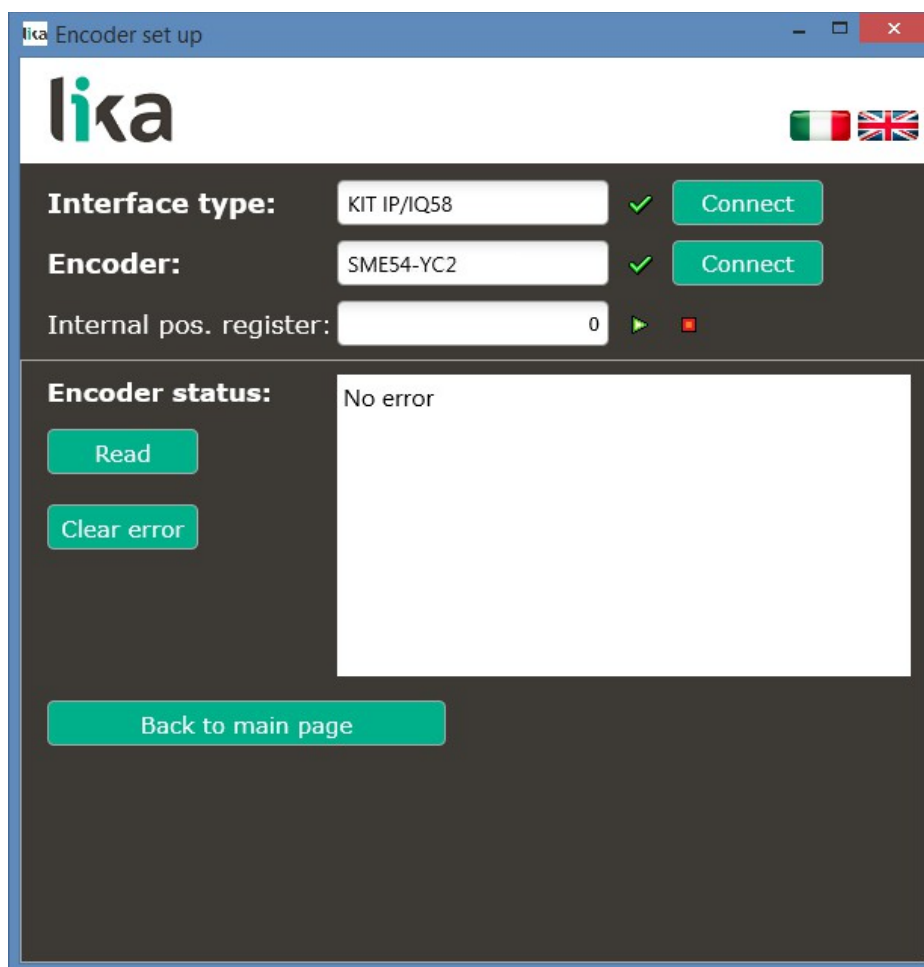
Press the **READ** button to update the status visualization.

If the encoder is working properly, the **NO ERROR** message appears on the right of the **READ** button. If a fault condition arises, the **WARNING** message and symbol ⚠ are invoked to appear. As you press the **CLEAR ERROR** button the system tries to solve the problem. If this is not possible, please press the **ADVANCED DIAGNOSTICS** button to learn more about the fault occurred.

## 5.5 Diagnostics page

When you press the **ADVANCED DIAGNOSTICS** button in the main page, you enter the DIAGNOSTICS page.

In this page you can find detailed information on the work status of the encoder. The current status is described in the window in the middle-right side of the page.



The screenshot shows a web application window titled "lika Encoder set up". The interface includes the Lika logo, language flags (Italian and British), and configuration fields. The "Interface type" is set to "KIT IP/IQ58" with a green checkmark and a "Connect" button. The "Encoder" is set to "SME54-YC2" with a green checkmark and a "Connect" button. The "Internal pos. register" is set to "0" with a green play button and a red stop button. Below these, the "Encoder status" section shows "No error" in a large white box. To the left of this box are "Read" and "Clear error" buttons. At the bottom is a "Back to main page" button.

Press the **READ** button to update the status visualization.

If an error occurs and the system is not able to solve it by pressing the **CLEAR ERROR** button, please take note of the error code that appears in the window and reach Lika Electronic's After Sales and Technical Service.

Press the **BACK TO MAIN PAGE** button to display back the main page.

## 6 Maintenance and troubleshooting

The magnetic measurement system does not need any particular maintenance; please always consider it is a delicate electronic equipment and therefore it must be handled with care. From time to time we recommend the following operations:

- Check the mounting tolerances between the sensor and the magnetic scale all along the measuring length. Wear of the machine may increase the tolerances.
- The surface of the magnetic scale should be cleaned periodically using a soft cloth to remove dust, chips, moisture etc.

The following list shows some typical faults and errors that may occur during installation and operation of the magnetic measurement system. Refer also to the "4.10 Diagnostic LEDs (Figure 6)" section on page 23.

**Fault:**

The system does not work (no pulse output).

**Possible cause:**

- The scale or the sensor has been mounted incorrectly (the active part of the scale does not match the active side of the sensor).
- A magnetic piece or an inappropriate strip is in between the sensor and the scale. Only non-magnetic materials are allowed between the sensor and the scale.
- The sensor touches the scale: the mounting tolerances are not met. Check if the active side of the sensor is damaged.
- The sensor has been damaged by a short circuit or a wrong connection.
- An internal error of the conversion electronics has occurred (interpolator).

**Fault:**

The measured values are inaccurate.

**Possible cause:**

- The mounting tolerances between the sensor and the scale are not met all along the whole measurement length.
- The connection cable runs near to high voltage cable or shield is not connected correctly. See the "4 -Electrical connection" section on page 17.
- The presence of external noise may cause malfunctioning or a decrease in the quality of the signals.
- The max. counting frequency of your receiving device is too low.

- A section of the magnetic scale has been damaged mechanically or magnetically along the measuring length.
- The measuring error is caused by torsion of the machine structure. Check parallelism and symmetry of machine movement.

**NOTE**

If a warning or an error occurs switch off and then on again the encoder and check whether the problem is cleared up and the LED turns off.



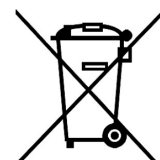
## 7 Default parameters list

Parameters list	Default value		
Resolution [ $\mu\text{m}$ ]	5 $\mu\text{m}$		
Count direction	Standard		
Reference length	90° el (gated A, B)		
Max m/s	10.000 m/s (500 kHz)		

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Document release	Release date	Description	HW	SW	Interface
1.0	19.05.2017	First issue	1	1.0	(2.0, 2.1, 2.2, 2.3, 2.4) 2.7
1.1	24.10.2017	Resolution information updated	1	1.0	2.7
1.2	16.02.2018	Internal position register information updated	1	1.0	2.7
1.3	10.07.2018	Mechanical design updating	1	1.0	2.7, 2.10
1.4	04.01.2024	Information on reference installation updated, new order codes	1	1.0	2.10



Dispose separately

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