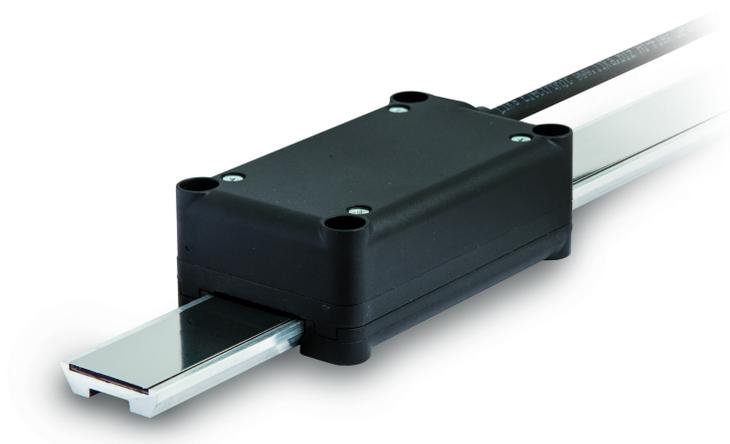


SMIG + MTIG



- SMIG incremental linear encoder
- MTIG guided profile unaffected by dust and liquids
- Measuring length from 115 mm to 570 mm
- Resolution range from 0.05 mm to 0.005 mm
- Push-Pull and Line Driver output circuits

Suitable for the following models:

- SMIG -xx-x-50-...
- SMIG -xx-x-25-...
- SMIG -xx-x-10-...
- SMIG -xx-x-5-...

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The logo for Lika Electronic s.r.l. consists of the word "lika" in a bold, lowercase, sans-serif font. The letter "i" has a dot above it. The logo is positioned in the bottom right corner of the page.

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Typographic and iconographic conventions

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

- parameters and objects both of the device and the 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 information the operator needs to correctly and safely install and operate the linear encoders with guided profile of the **SMIG series**. The measuring system is designed to provide square wave digital signals.

The SMIG sensors are engineered to measure linear displacements in industrial machines and automation lines.

The measuring system consists of a magnetic tape mounted on a rigid profile and a magnetic sensor. The tape has alternating magnetic north/south poles that are magnetized at a fixed distance referred to as "pole pitch". The sensor moves along the magnetic tape (or, on the contrary, the magnetic tape is moved under the sensor), thus the sensor detects the displacement and issues an output signal equivalent to the one generated by an incremental encoder or an optical linear scale.

The sensor must be compulsorily paired with the **MTIG magnetic tape**. The measuring length is from 115 mm (4.528") to 570 mm (22.441"), see the order code.

For technical specifications please refer to the product datasheet.

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 devices;
- 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 "Errore: sorgente del riferimento non trovata" section on page Errore: sorgente del riferimento non trovata;
- wires of output signals which are not used must be insulated singularly;
- in compliance with 2014/30/EU norm on electromagnetic compatibility, 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 shield or the connector housing 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 "3 – Mechanical installation" section on page 9;
- mechanical installation has to be carried out with stationary mechanical devices;
- do not disassemble the unit;
- do not tool the unit;
- delicate electronic equipment: handle with care; do not subject the unit to knocks or shocks;
- protect the unit against acid solutions or chemicals that may damage it;
- respect the environmental characteristics declared by manufacturer;
- we suggest installing 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.

2 - Identification

Device can be identified through the **order code** and the **serial number** printed on the label applied to its body. 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: devices 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 and maintenance operations must be carried out by qualified personnel only, with power supply disconnected and mechanical parts absolutely in stop.

3.1 Overall dimensions (Figure 1)

(values are expressed in mm)

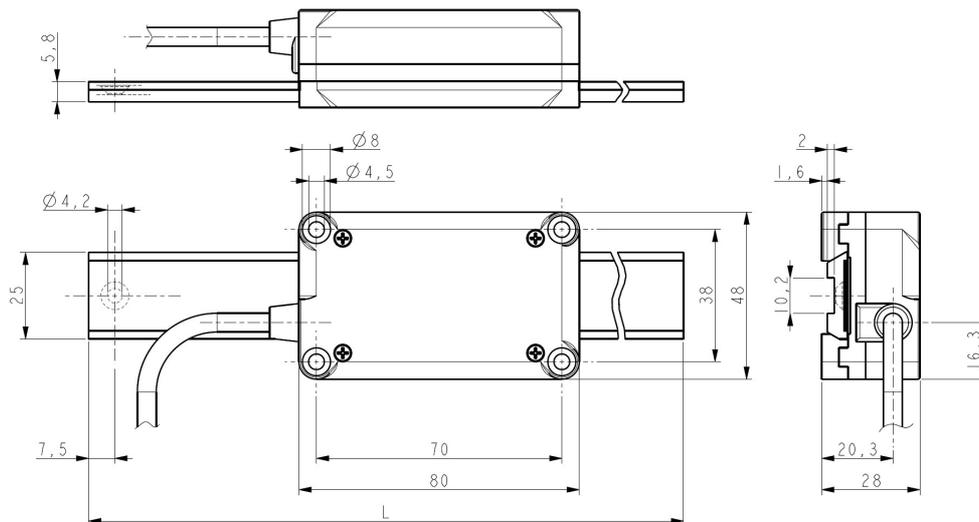


Figure 1

$L = 195 \text{ mm} / 7.677'' \div 650 \text{ mm} / 25.59''$ (see the order code of the MTIG profile)

3.2 Mounting instructions

Install and use the product in conformance with the protection level it has been designed to. Protect the unit against knocks, frictions and solvents and avoid temperatures over the allowed range.

Make sure the unit is mounted where hard or sharp objects (e.g. turnings, chips or filings) do not come into contact with the magnetic tape and the bottom of the sensor head. If these conditions cannot be avoided provide adequate cleaning measures (as for instance brushes, scrapers, jets of compressed air, etc.) in order to prevent the sensor and the magnetic tape from jamming.

The profile of the magnetic tape must be inserted in the track at the bottom of the sensor enclosure; the shape of the track is univocal in order to prevent mounting errors.

Two mounting options are allowed:

1. you can fasten the profile of the magnetic tape to a fixed support and move the sensor;

2. or, on the contrary, you can fasten the sensor to a fixed support and move the profile of the magnetic tape.

It is customer's duty to evaluate the type of installation that is most suitable for his application. Anyway both the sensor and the profile (according to your choice) must be able to slide freely and accomplish a smooth linear travel.



Figure 2

3.3 Sensor (Figure 2)

The sensor can be secured:

1. to a sliding carriage;
2. to an actuator;
3. to a mobile support;
4. or to a fixed support.

Use **four TCEI M4 UNI 5931 type cylinder head screws** inserted from the top in the holes provided at the four angles of the enclosure. The screws must be 30 mm min. long (see Figure 1). **The maximum tightening torque is 1.2 Nm.** We suggest adding a few drops of threadlocker of medium bond strength.

The fixing support will be placed at the bottom of the sensor case. Make sure the cable does not block or hamper the movement of the sensor.

3.4 Profile of the magnetic tape (Figure 2)

It is mandatory to pair the sensor with the **MTIG type magnetic tape**.

The profile of the magnetic tape can be secured:

1. to a sliding device driven manually, pneumatically or by a motor; in this first case the tape will move back and forth while the sensor will be mounted in a fixed position;
2. or to a fixed support: in this case, the tape will be mounted in a fixed position while the sensor will move back and forth.

The profile must be installed so that the active magnetic surface (black side) is turned towards the active surface of the sensor (electronic card).

Use **one TSP M4 UNI 7688 type countersunk head screw** to secure the profile of the magnetic tape; insert the screw in the hole provided at one end of the profile. The screw is 10 mm min. long. **The maximum tightening torque is 2.5 Nm.**

The length of the profile ranges between 195 mm / 7.677" and 650 mm / 25.59".



WARNING

Do not expose the sensor and the magnetic tape to magnetic fields. Avoid any possible interference of the unit with magnetic fields.

3.5 Measuring length (Figure 1)

The **maximum tape length L** is between 195 mm / 7.677" and 650 mm / 25.59" (for further information refer the order code in the product datasheet). As the sensor area has always to be fully within the limits of the tape magnetic surface, then the **maximum measuring length ML** is the maximum tape length minus the sensor length (see the Figure 1) = $L - 80 \text{ mm} / 3.149" (115 \text{ mm} / 4.528" \div 570 \text{ mm} / 22.441")$.

3.6 Standard counting direction (Figure 2)

The standard counting direction (A channel leads B channel) is achieved when the sensor moves on the tape according to the white arrow shown in Figure 2; or, on the contrary, when the tape moves according to the black arrow shown in Figure 2.

4 – Electrical connections



WARNING

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

Function	M8 cable	M12 8-pin
0Vdc	Black	1
+Vdc ¹	Red	2
A	Yellow	3
/A	Blue	4
B	Green	5
/B	Orange	6
0 ²	White	7
/0 ²	Grey	8
Shielding	Shield	Case

1 See the order code



EXAMPLE

SMIG-L-1-... +Vdc = +5Vdc ± 5%

SMIG-YC-2-... +Vdc = +10Vdc +30Vdc

2 Index signal, see the "I" order code; with "N" order code the signal is not provided, see also on page 15.



WARNING

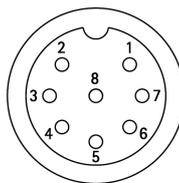
Connecting /A, /B, or /0 together, to +Vdc or to 0Vdc may cause permanent damage to the sensor.

4.1 M8 cable specifications

- Model : LIKA HI-FLEX sensor cable type M8
- Wires : 2 x 0.22 mm² + 6 x 0.14 mm² (24/26 AWG)
- Jacket : Matt Polyurethane (TPU) halogen free, oil, hydrolysis, abrasion resistant
- Screening : tinned copper braid, coverage ≥ 85%
- Outer diameter : 5.3 mm ÷ 5.6 mm (0.209" ± 0.220")
- Min. bending radius : Ø x 7.5
- Work temperature : -40°C +90°C (-40°F +194°F) – dynamic installation
-50°C +90°C (-58°F +194°F) – fixed installation
- Conductor resistance : ≤ 90 Ω/km / ≤ 148 Ω/km

4.2 M12 8-pin connector specifications

Male
Frontal side
A coding



4.3 Connection of the shield

For signals transmission always use shielded cables. The cable shielding must be connected properly to the metal ring nut of the connector in order to ensure a good earthing through the frame of the device.

4.4 Ground connection

Minimize noise by connecting the shield or the connector housing 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.

4.5 Output signals

The conversion electronics inside the sensor translates the magnetic fields of the scale / ring into electrical signals equivalent to those of an incremental encoder or a linear scale.

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

Resolution after quadrature (4 edges reading) can be determined by the order code of the sensor.

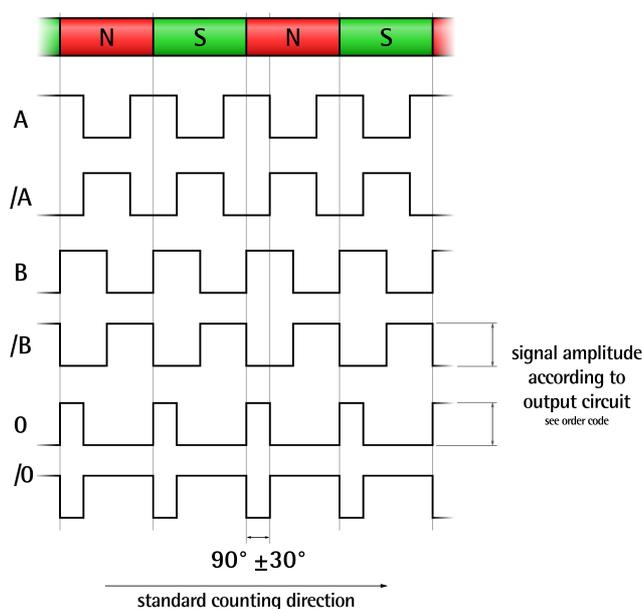


Figure 3 - Example with interpolation factor 4x

If you need to know the interpolation factor, then you have to divide the pole pitch value by the resolution indicated in the order code.

**EXAMPLE**

Let's suppose we are using a SMIG-xx-x-**50**-... linear encoder paired with the MTIG magnetic tape; as the pole pitch is 5 mm long and the resolution is 0.05 mm (order code = 50), this means that the interpolation factor is 100x (5 mm / 0.05 mm).

**WARNING**

Please note that the position value issued by the sensor is expressed in pulses; thus you have then to convert the number of pulses into a linear measuring unit.

To convert the position value into millimetres (mm) or micrometres (μm) you have to multiply the pulses by the linear resolution of the encoder expressed in millimetres or micrometres.

The resolution of the encoder is available in the order code.

**EXAMPLE 1**

SMIG-xx-x-**50**-...

resolution = 50 μm = 0.05 mm

detected pulses = 71

position value = 71 * 50 = 3550 μm = 3.55 mm

**EXAMPLE 2**

SMIG-xx-x-**10**-...

resolution = 10 μm = 0.01 mm

detected pulses = 1569

position value = 1569 * 10 = 15690 μm = 15.69 mm

4.5.1 Standard counting direction (Figure 2)

The standard counting direction (A channel leads B channel) is achieved when the sensor moves on the tape according to the white arrow shown in Figure 2; or, on the contrary, when the tape moves according to the black arrow shown in Figure 2.

4.5.2 Inverted signals

All sensors can provide inverted signals.

A = A signal;

/A = inverted A signal (or complementary signal).

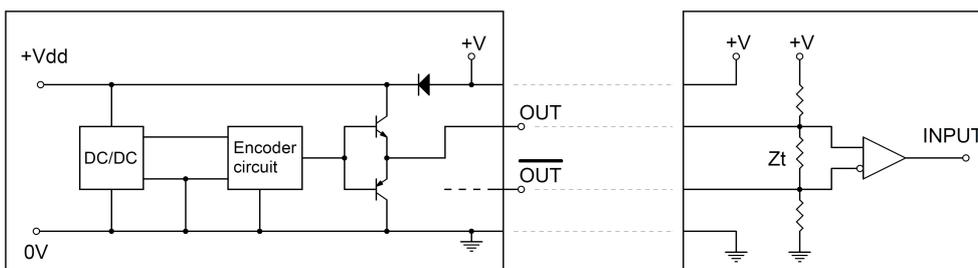
All our magnetic sensors can provide ABO, /ABO output signals. We advise the inverted signals always be connected if the receiving device will accept them. Otherwise each output must be insulated singularly.

4.5.3 Index "I"

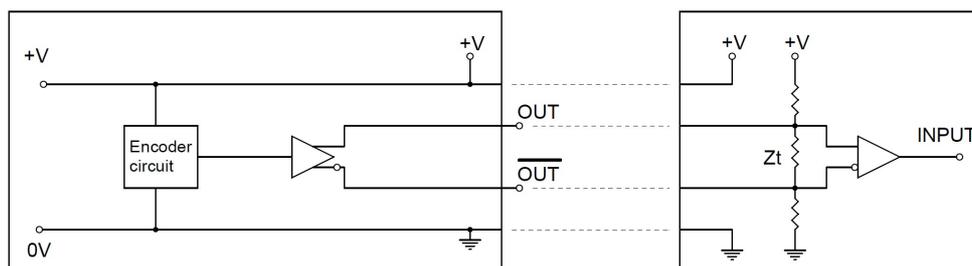
Index signal is available only with "I" order code. With "N" order code the Index output signal is not available. As shown in Figure 3, the periodic Index pulse is synchronized with A and B channels and is provided once per pole. It is always sent at the same position inside the pole, thus the distance between two Index pulses is the pole pitch. It has a duration of one measuring step (90 electrical degrees $\pm 30^\circ$).

4.6 Recommended circuit

Push-Pull (YC order code)



Line Driver (L order code)



5 - Maintenance

This magnetic measurement system does not need any particular maintenance; anyway it has to be handled with the utmost care as it is a delicate electronic equipment. From time to time we recommend the following operations to be performed:

- periodically check the soundness of the structure and make sure that there are no loose screws; tighten them if necessary;
- the surface of the magnetic tape has to be cleaned regularly using a soft and clean cloth to remove dust, chips, moisture etc.

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Document release	Release date	Description	HW	SW	Installation file version
1.0	14.12.2011	First issue	-	-	-
1.1	06.02.2012	General review	-	-	-
1.2	14.02.2017	General review, Italian and English versions separated, "3 - Mechanical installation" and "4 - Electrical connections" sections updated	-	-	-



Dispose separately

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