

Operating Manual

SERIES IZ16-100

Battery powered Position Indicator with external Sensor and RS232 Interface



- Large 7-digit LCD-Display, digit height 14 mm
- With sign and special signs
- Battery status indicator
- „°“-symbol for angle measurement
- Fraction display in inch mode
- Internal or external battery case
- Resolution 0.1 mm / 0.01 mm switchable
- Display in inch mode „0.001 Inch“
- Tool-offset and incremental measurement
- Simple installation by snap-in housing
- RS232 interface via RJ45 connection

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4 General, Safety, Transport and Storage

4.1 Information Operating Manual




This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions. Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed.

Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.


4.2 Explanation of Symbols

Special notes in this manual are characterized by symbols. The notes are introduced by signal words which express the magnitude of danger. Please follow this advice and act carefully in order to avoid accidents, damage, and injuries.


Warning notes:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	WARNING! This symbol in connection with the word „Warning“ means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	CAUTION! This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to minor injuries or damage of property.



Special safety instructions:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.
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Tips and recommendations:

	NOTE! ...points out useful tips and recommendations as well as information for an efficient and trouble-free operation.
---	---

Reference marks:

-  Marks a reference to another chapter of this manual.
-  Marks a reference to another chapter of another document.

4.3 Statement of Warranties

The producer guarantees the functional capability of the process engineering and the selected parameters.

4.4 Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.

Before demounting, disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.

Disposal:

Recycle the decomposed elements: Metal components in scrap metal, Electronic components in electronic scrap, Recycle plastic components, dispose the remaining components according to their material consistence



CAUTION!

Wrong disposal causes environmental damages!
Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

Local authorities and waste management facilities provide information about environmentally sound disposal.

Safety



CAUTION!

Please read the operating manual carefully, before using the device! Observe the installation instructions!
Only start up the device if you have understood the operating manual.
The operating company is obliged to take appropriate safety measure.
The initial operation may only be performed by qualified and trained staff.
Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

4.5 General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation. Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

4.6 Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.

Therefore:

Change into protective clothing before performing the works and wear them throughout the process.
Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

	<p>PROTECTIVE CLOTHING ... is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewelry.</p>
	<p>PROTECTIVE GLOVES ...for protecting the hands against abrasion, wear and other injury of the skin.</p>
	<p>PROTECTIVE HELMET ...for protection against injuries of the head.</p>

4.7 Conventional Use

The ELGO-device is only conceived for the conventional use described in this manual.
The ELGO device type IZ16-100 only serves to measure and indicate lengths and positions.



CAUTION!

Danger through non-conventional use!
Non-intended use and non-observance of this operating manual can lead to dangerous situations.
Therefore:

- Only use the device as described
- Strictly follow the instructions of this manual

Avoid in particular:

- Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible.
Only the operator is liable for damages caused by non-conventional use.

4.8 Safety Instructions for Transport, Unpacking and Loading



CAUTION!

Transport the package (box, palette etc.) professionally.
Do not throw, hit or fold it.

4.9 Handling of Packaging Material

Notes for proper disposal: ↗ 4.4

4.10 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.
In case of externally recognizable transport damages:

- Do not accept the delivery or only accept under reserve.
- Note the extent of damages on the transportation documents or delivery note.
- File complaint immediately.



NOTE!

Claim any damage immediately after recognizing it.
The claims for damage must be filed in the lawful reclaim periods.

4.11 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (↗ 7) needs to be observed
- Relative humidity (↗ 7) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

5 Product Features

5.1 General

The length measuring system IZ16E is a combination of an external magnetic sensor that is connected via a drag-chain suitable cable to the display device. For the measurement a coded magnetic tape, which provides the sensor with the necessary information (current position), is glued along the distance that has to be measured. Therefore, the sensor is installed parallel without contact to the magnetic tape and therefore guided completely wear less over the entire measuring distance.



The external sensor with its protection class is resistant for any type of dust, dirt and water-jet and with its compact installation size it is easy to integrate in existing or new constructions.

The position indicator has extensive possibilities of parameterization (see section 9.3.6) and can be easily adapted to different applications. The basic functions, which are available in the standard-software, cover a wide range of applications. There are also customized versions (on request) available for special types of machines.

For the installation no special tools are needed, there are no wire or electrical connections required. The length measuring system IZ16E is therefore particularly suitable for e.g. mounting on movable slides and stop systems, since no power supply cables are to be accompanied. The new snap-in mounting (snap-in-housing) allows an easy installation in a defined panel cut out e.g. in a front panel.

The option built-on enclosure with mounting holder allows flexible assembling (mounting holder above / mounting holder below / angle adjustable). Retrofitting is also simplified. For mounting on a surface a built-on housing is optionally available (options AG or AG1, see 8.4.2 and 12.1).



NOTE!

In the power-off mode the movements or adjustments of the magnetic sensor are not covered! A reference has to be conducted after the start of operation (at a required mechanical position, the indicator is to set e.g. ZERO)



NOTE!

Depending on the selection in parameter P07 (9.3.6), the native resolution of the measuring system is either 0.1 mm or 0.01 mm! All settings of the multiplication factor refer to this resolution!

The version *IZ16E-100* is equipped with a serial RS232 interface (see 0).

6 Application Examples

6.1 Measurement with Magnetic Tape

6.1.1 Direct Distance Measurement

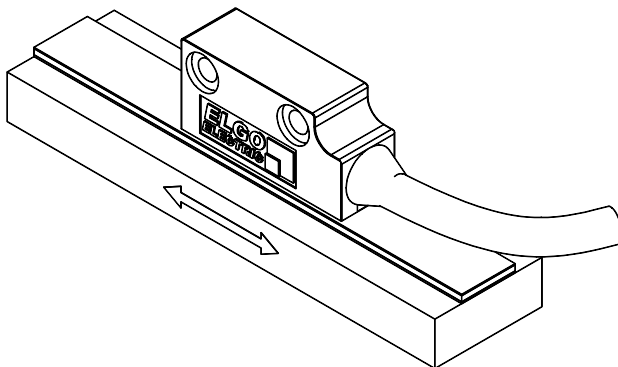


Figure 1: Direct Distance Measurement

The magnetic tape is glued on a solid ground (e.g. machine base) along the measuring distance.

Example 1) Indicator [mm], resolution 0.01 mm
→ P02=0 / P03=2 / P08=1.0000

Example 2) Indicator [m], resolution 0.001 m
→ P02=2 / P03=3 / P08=0.01

Example 3) Indicator [Inch], resolution 0.001 Inch
→ P02=1 / P03=fixed=3 / P08=1.0000

6.1.2 Angular Measurement 0 ... <360°

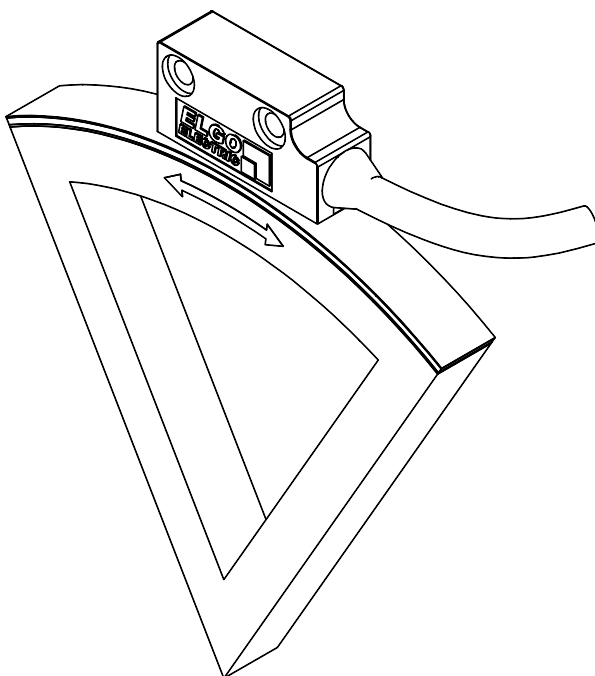


Figure 2: Angular Measurement 0 ... <360°

The magnetic tape is glued on a solid ground (e.g. angle stop) along the measuring distance.

To parameterize the indicator or to calculate the multiplication factor a low angle of 90° is very suggestive, the reason is that the actual measurement distance (=angle) is dependent on the bending radius of the magnetic tape.

Example: Indicator [°], resolution 0.01°
→ P02=3 / P03=2 / P08=1.0000 / P09=0

a) Start to the desired mechanical Zero point, then set the indicator to the reference value.

b) Start to the defined angle position (e.g. low angle, 90°) and note the actual value at the indicator (e.g. 471.20)

c) Calculate and enter the multiplication factor:

$$P08 = \text{Angle} / \text{Display Value}$$

(e.g. $P08 = 90^\circ / 471.20 = 0.1910$)

→ P02=3 / P03=2 / P08=0.1910

6.2 Measurement with Pole Ring

6.2.1 Indirect Distance Measurement

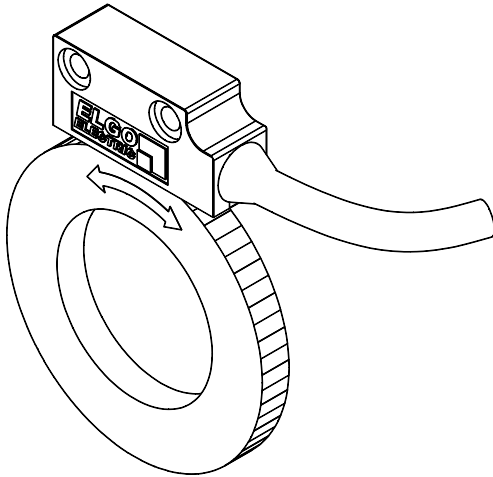


Figure 3: Indirect Distance Measurement

A pole ring / pole ring is mounted on a rotating axis (e.g. motor shaft).

Example: Spindle drive with gear box, the pole ring at the engine, indicator [mm], resolution 0.01 mm, pole ring (D=48mm) with 60 poles per ≈ 2.5 mm, transmission reduction = 10:1, Distance per spindle revolution = 3mm

→ P02=0 / P03=2 / P08=

Displayed Value / $R_{\text{pole ring}}$ =
Number of poles * 250

(e.g.: $60 * 250 = 150.00$ mm)

Measuring Distance / $R_{\text{pole ring}} = 3 \text{ mm} / 10 = 0.3 \text{ mm}$

→ P08 = Measuring Distance / $R_{\text{pole ring}}$ / Displayed Value / $R_{\text{pole ring}} = 0.002$

→ P02=0 / P03=2 / P08=0.002

6.2.2 Angular Measurement 0 ... 360°

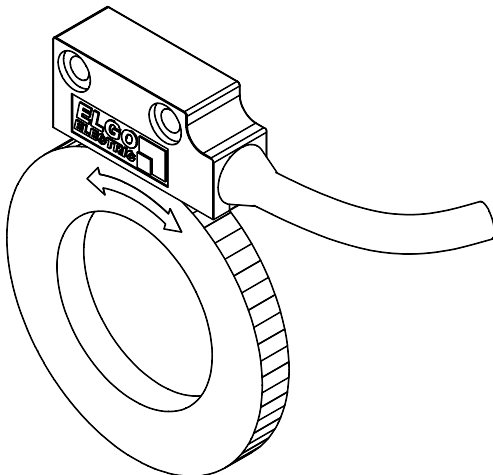


Figure 4: Angular Measurement 0 ... 360°

A pole ring / magnet wheel is mounted on a rotating axis.

Example: Angle measurement, Indicator [°], resolution 0.1°, pole ring (D=48mm) with 60 poles per ≈ 2.5 mm

→ P02=3 / P03=1 / P08=

P08 = (360° / resolution) / (Number of poles * 250)

(e.g.: $(360^\circ / 0,1^\circ) / (60 * 250) = 3600 / 15000 = 0,24$)

→ P02=3 / P03=1 / P08=0,2400

7 Technical Data

7.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the sensor and gives the exact type designation (☞ 12) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

7.2 Dimensions IZ16E-100 Indicator

7.2.1 Front View / Valid for all Versions

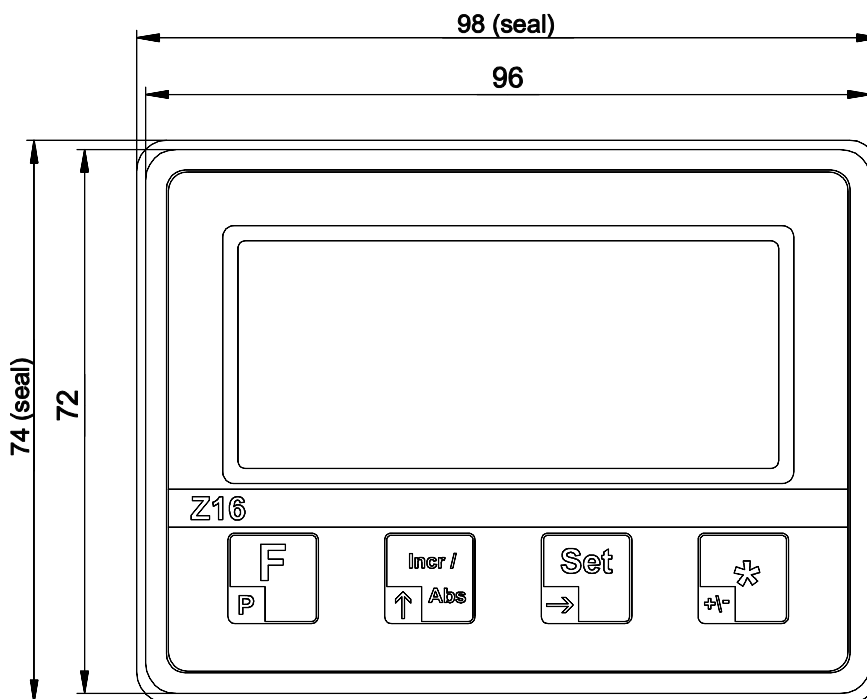


Figure 5: Dimensions of IZ16E – Front View

Panel cut-out:	(W x H) = 93 mm x 67 mm
Suitable panel thicknesses:	With installed seal: 1.0 / 1.5 / 2.0 / 2.5 mm Without seal: 2.5 / 3.0 / 3.5 mm

7.2.2 Version IZ16E-100-1-XX.X-1

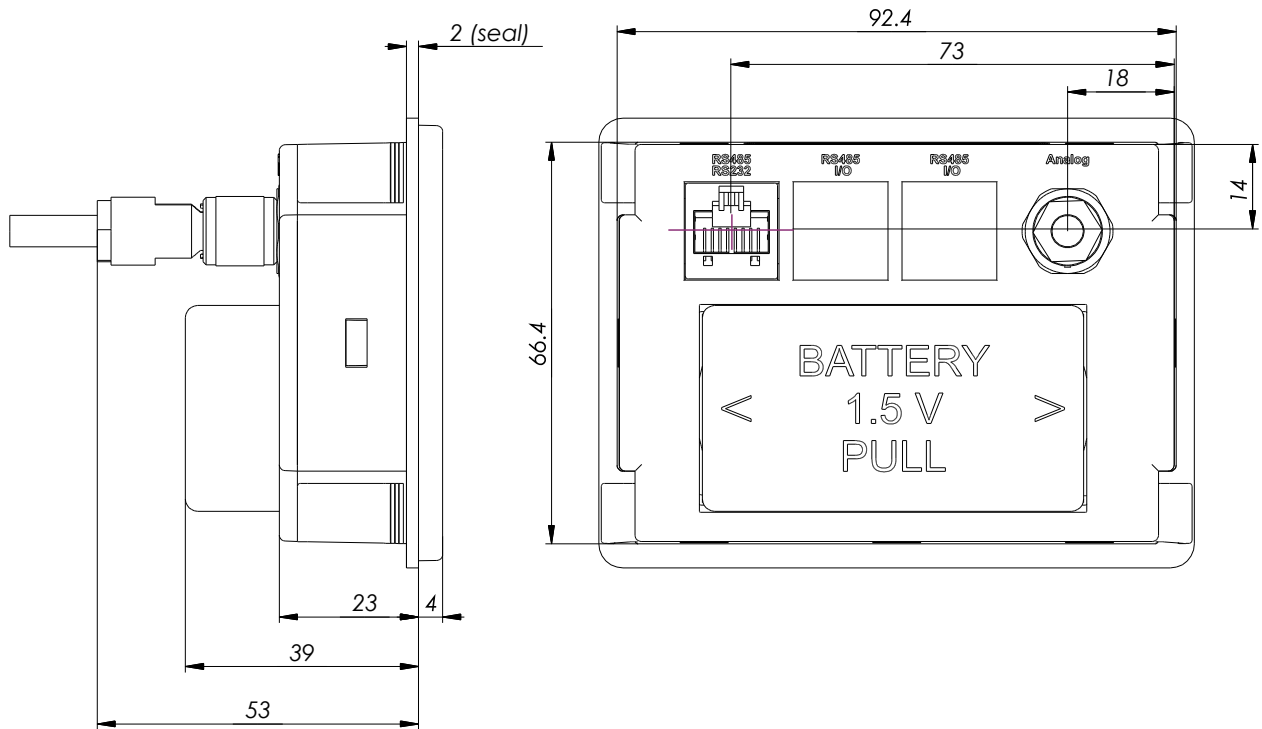


Figure 6: Dimensions of IZ16E-100-1-XX.X-1

7.2.3 Version IZ16E-100-6-XX.X-1

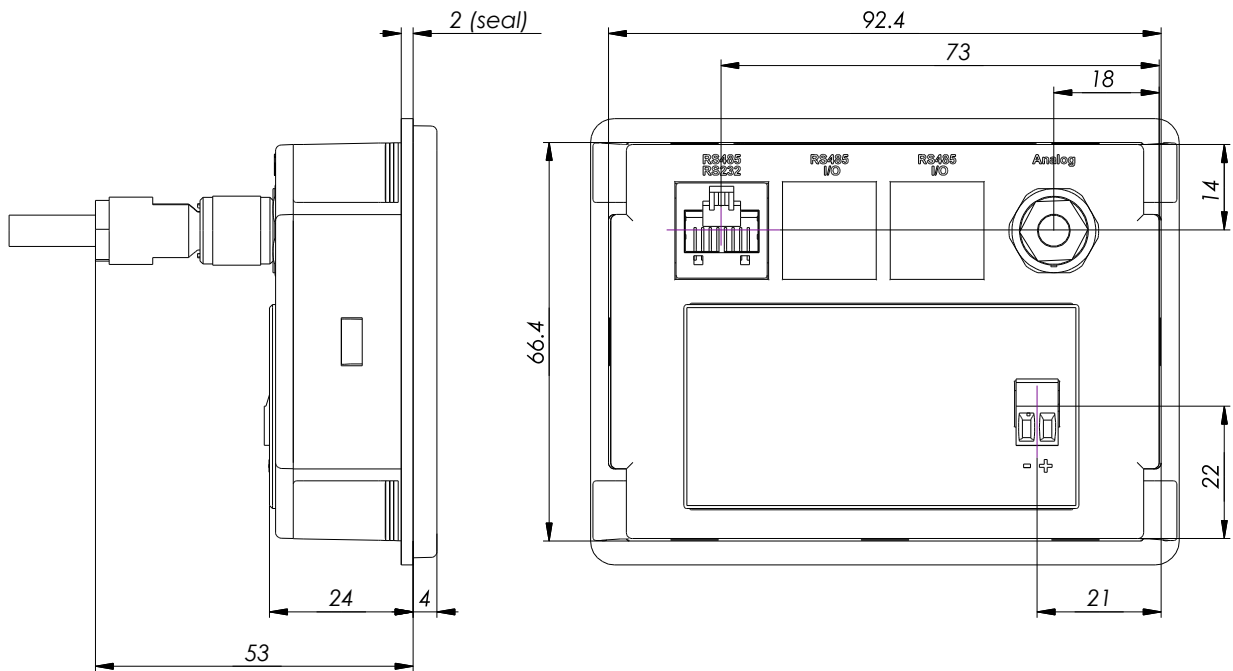


Figure 7: Dimensions of IZ16E-100-6-XX.X-1

7.3 Dimensions of Magnetic Sensor MS-250

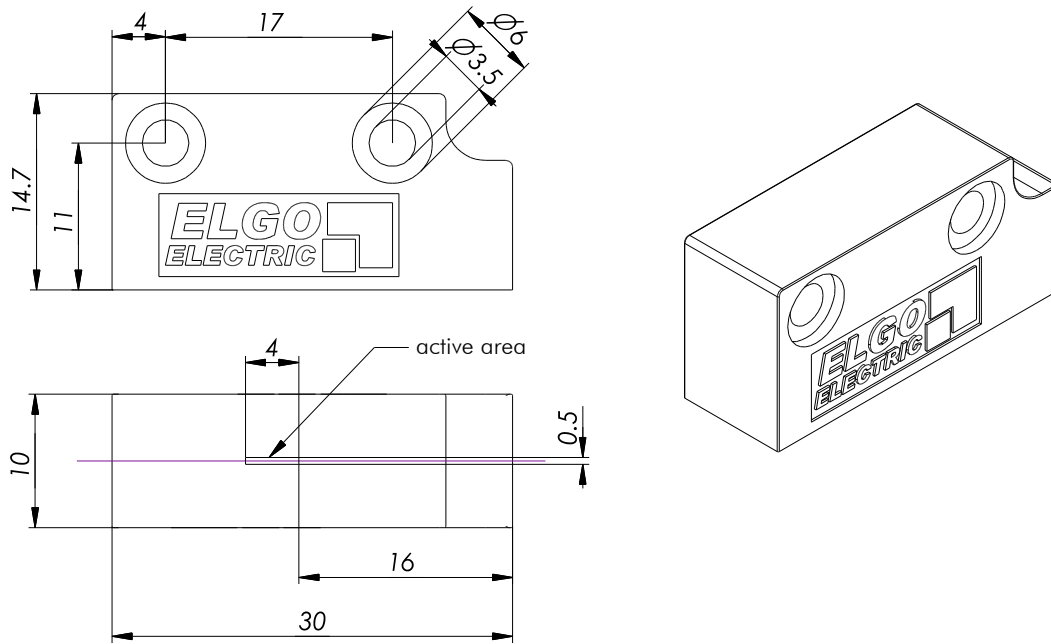


Figure 8: Dimensions of Magnetic Sensor MS-250

7.4 Dimensions of the Magnetic Tape

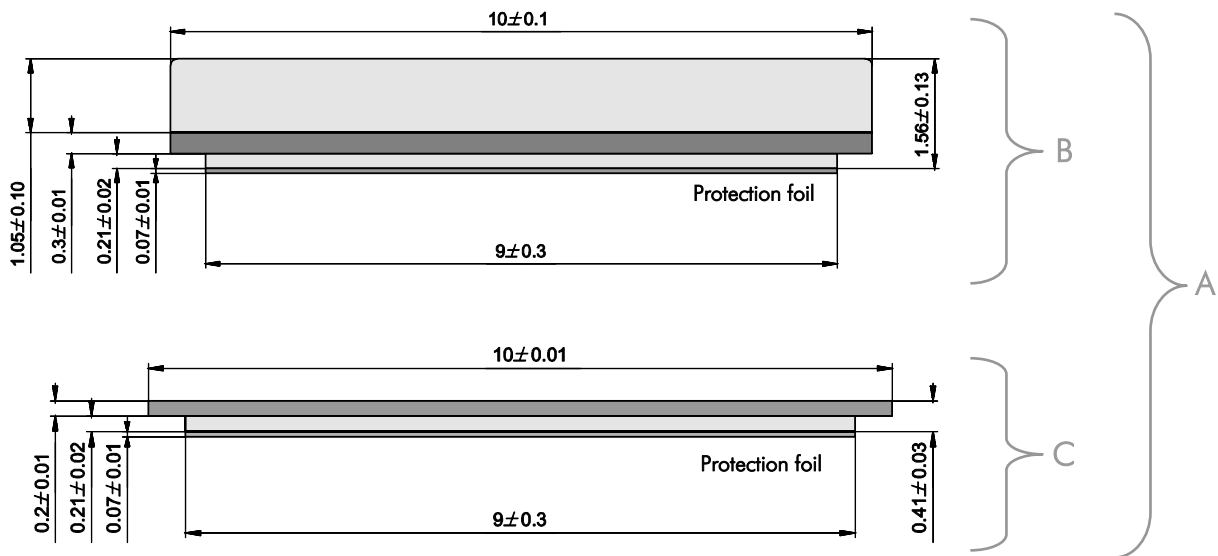


Figure 9: Dimensions of the Magnetic Tape

A) Magnetic tape set: **MB20-25-10-1-R** (standard scope of delivery)

consisting of the basic components:

B) Magnetic tape: **MB20-25-10-1-R-C** (without cover tape)

C) Cover tape: **SB-20-10-01-14404** (AB10)

7.5 Technical Data - IZ16-100

Table 1: Technical Data IZ16-100

IZ16E-100

Mechanical Data

Housing	norm panel housing
Housing material	plastic, black
Housing dimensions (W x H)	96 x 72 mm
Panel cut out (W x H)	93 x 67 mm
Keyboard	foil with short stroke keys
Installation depth (complete)	min. 30 mm (depends on version)
Weight	Standard: approx. 100 g (without battery and holder) Option AG or AG1: approx. 370 g (inclusive battery)

Electrical Data

Display	7 digit LCD (14 mm high) with sign, battery state and measurement units
Perspective	12 o'clock
Measurement units	mm / inch / m / °
Accuracy	± 1 Digit
Power supply voltage	1.5 V resp. 3 V battery integrated or external. 24 VDC on request.
Current consumption	< 1 mA at 1.5 V (with measuring system)
Battery service life	1 ... 3 years (depending on battery type)
Interface	RS232
External outputs	2 x 5 ... 30 V (on request)
Analog outputs	2 x 30 V open collector (on request)

Magnetic Sensor MS-250

Dimensions (L x W x H)	30 x 10 x 15 mm
Measuring principle	magnetic, incremental
Required magnetic tape	MB20-25-10-1-R
Magnetic tape pole pitch	2.5 mm
Distance sensor / tape	max. 0,8 mm
Resolution	0.1 ... 0.01 mm
Repeat accuracy	± 2 increments
Maximum measuring length	theoretically unlimited
Operation speed	max. 4 m/s
Housing material	zinc die cast
Protection class	IP67
Connections	fixed connection with indicator or round connector (optionally)
Sensor cable	drag-chain suitable, 6-wire, twisted pairs and double-shielded
Sensor cable length	0.1 ... max. 2.0 m
Sensor cable bending radius	min. 60 mm
Weight	approx. 30 g (without cable), cable: approx. 60 g/m
Influence of external magnetic fields	External magnetic fields > 1 mT, which directly impinge upon the sensor, can affect the system accuracy.

Environmental conditions

Operating temperature	0 ... + 50° C
Storage temperature	- 10 ... + 60° C
Humidity	Indicator: max. 80 %, Sensor: max. 95 % (each non-condensing)
Protection class	Indicator: IP54 (front) / IP40 (rear) Sensor: IP67


7.6 Technical Data - Magnetic Tape

Table 2: Technical Data Magnetic Tape


Magnetic Tape MB20-25-10-1-R







Coding	incremental, single-track system
Pole pitch	2.5 mm
Operating temperature	0° C ... +50° C
Storage temperature uninstalled	Short-term: -10 ... +60° C Medium-term: 0 ... +40° C Long-term: +18° C
Relative humidity	max. 95 %, non-condensing
Accurateness at 20°C in μm	$\pm (25 + 20 \times L)$ L = measuring length in meters
Thermal length expansion	$\Delta L[\text{m}] = L[\text{m}] \times \alpha[1/\text{K}] \times \Delta\vartheta[\text{K}]$ (L = tape length in meters, $\Delta\vartheta$ = relative temperature change)
Length expansion coefficient	$\alpha \approx 16 \times 10^{-6} 1/\text{K}$
Bending radius	min. 150 mm
Available lengths	32 m (up to 70 m on request)
Weight magnetic tape	approx. 62 g/m (incl. magnetic tape and cover tape)
Tape imprint	ELGO standard, printing color black, digit height ≥ 5 mm
Influence of external magnets	External magnetic fields must not exceed 64 mT (640 Oe; 52 kA/m) on the surface of the magnetic tape because this could damage or destroy the code on the tape.
Protection class	IP65

8 Installation and First Start-Up

	<p>CAUTION Please read the operating manual carefully before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe this operating manual, the warranty expires.</p> <p>ELGO is not liable for any secondary damage and for damage to persons, property or assets.</p> <p>The operator is obliged to take appropriate safety measures.</p> <p>The first start-up may only be performed by qualified staff that has been trained and authorized by the operator.</p>
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8.1 Operating Area

	<p>WARNING! Do not use the device in explosive or corrosive environments! The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!</p>
---	---

	<p>CAUTION! The electrical connections must be made by suitably qualified personnel in accordance with local regulations.</p>
	<p>The device may be designed for switchboard mounting. During work on the switchboard, all components must be de-energized if there is a danger of touching the energized parts! (protection against contacts)</p>
	<p>Wiring works may only be performed in the de-energized state!</p>
	<p>Thin cable strands have to be equipped with end sleeves!</p>
	<p>Before switching on the device, connections and plug connectors have to be checked!</p>
	<p>The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.</p>

8.2 Power Supply / Battery Change



NOTE!

For a long operating time, the use of commercially branded batteries is recommended.

If all the battery icons on the LCD-Display are extinguished (see also section 9.1), a battery change should be made as soon as possible.

By changing the batteries strictly observe the polarity, take for orientation the markings on the battery-case!

All data and parameters are obtained at the battery change, apart from the current actual value.

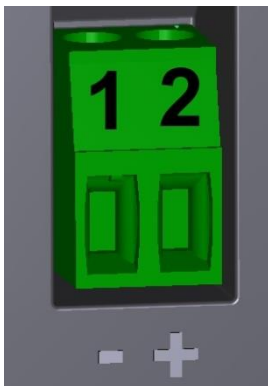
8.2.1 Devices with Battery Case

All components of the series IZ16E-XXX-1-XX.X-X have a built-in battery-case for a battery of the type C=LR14=baby cell (supplied). The battery is accessible by loosening the screwed cover on the rear.

8.2.2 Devices with Screw Terminal

All components of the series IZ16E-XXX-6-XX.X-X have a pluggable 2-pin screw clamp (1.5 mm²) for connection with an external battery with 1.5 V or 3.0 V (not supplied; as an accessory available) or as an external stabilized power supply with 1.5 V / 3.0 V or 24 V*.

Following battery-holder configurations are possible:



- 1x Battery Type C or Type D (1.5 V)
- 2x Battery Type AA / C / D parallel (1.5 V)
- 2x Battery Type AA / C / D connected in series (3.0 V)

Pin Assignment for plug::

PIN	FUNCTION
1	0 V / GND
2	+1.5 V / +3.0 V / +24 V* (VCC)

(* only on request)



NOTE!

The version IZ16E-100† can also be supplied via RJ45 Interface (see section 10.1). In this case, neither a battery may be present in the device nor may the plug be connected!

8.3 Activation of the Device

After applying the power supply voltage (e. g. by inserting the battery) the device starts automatically.

8.4 Installation of the Indicator

8.4.1 Panel Housing (standard):

Due to the snap-in housing with 4 attached mounting clips, the device can be quickly and easily installed into the panel cutout. The rubber seal (supplied with the delivery) increases the front protection class against dust, dirt and splash and should generally be used.

If no panel cutout available, or if the display unit should be mounted on a fixed or movable surface, the accessorial mounting angle MW-IZ16E (made of 2 mm galvanized steel sheet) can be used (details see § 13.6).

This is provided with a suitable cutout for the display housing, which can be snapped in as described above. In this case, the rubber seal additionally improves the fit in the cutout. The inclination of the mounting angle ensures good readability of the display.

8.4.2 Built-on Housing (option AG or AG1):

The built-on housing (available as an option, see § 12) is equipped with an inclinable mounting bracket, which can be screwed on a fixed or movable surface.

The viewing angle can be adjusted by tilting the indicator to the optimum position.

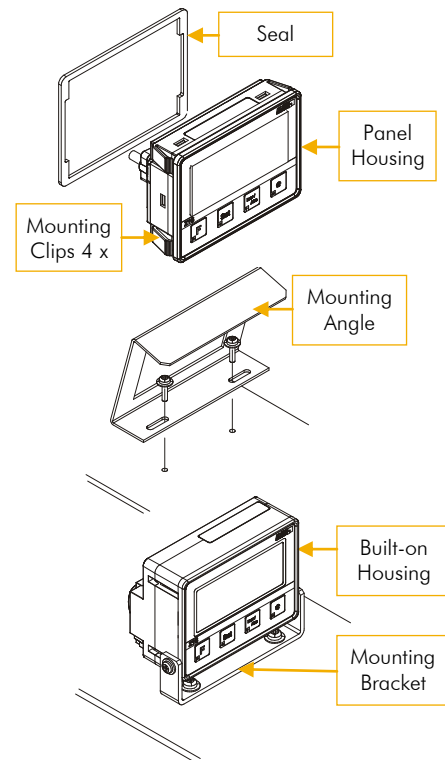


Figure 10: Indicator Installation

8.5 Installation Magnetic Tape



NOTE: External Magnetic Fields

The magnetic tape must not be influenced by external magnetic fields! The magnetic tape must not come into direct contact with other magnetic fields (e.g. permanent magnets, magnetic clamps, electromagnets, magnetic stands)! This may cause irreparable damage, which will compromise the measuring accuracy or even the functioning.

8.5.1 Identification Magnetic Tape

The tape is characterized by continuous with a unique serial number and type of tape. Only the scope of delivery (see § 12.2 „Option“) is not apparent on the printing.

8.5.2 Functional Principle

The basis of the magnetic incremental encoders consists of a scanning technology, which scans the north and south poles on the coded magnetic tape and produces a single Sine/Cosine wave for each pole. The complete sine/cosine signal process is interpolated electronically. Depending on refinement of the interpolation, together with the pole distance of the magnetic tape, the resolution of the measuring system is determined.

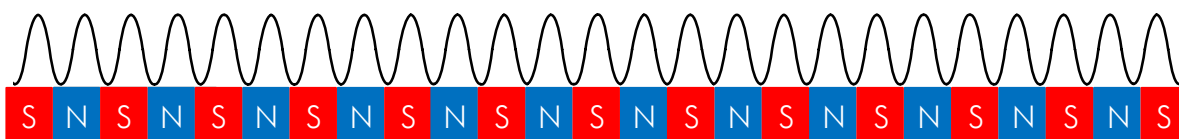


Figure 11: Magnetic Tape Coding

8.5.3 The Magnetic Tape MB20-25-10-1-R

In the standard case, the magnetic tape is delivered as described
It is installed by gluing it to the respective mounting surface.

The magnetic tape consists of 2 pre-assembled components (see Fehler! Verweisquelle konnte nicht gefunden werden. below):

- A magnetized, flexible plastic tape (Pos. 3), which is connected with a magnetically conductive steel tape as inference band (Pos. 4) and is supplied with an adhesive tape (Pos. 5).
- A magnetized permeable cover tape (Pos. 1), which serves for the mechanical protection of the plastic tape (not required for the measurement) and is supplied with an adhesive tape (Pos. 2).

Therefore a divergent tape structure and scope of delivery is also possible.
The cover tape is also available separately

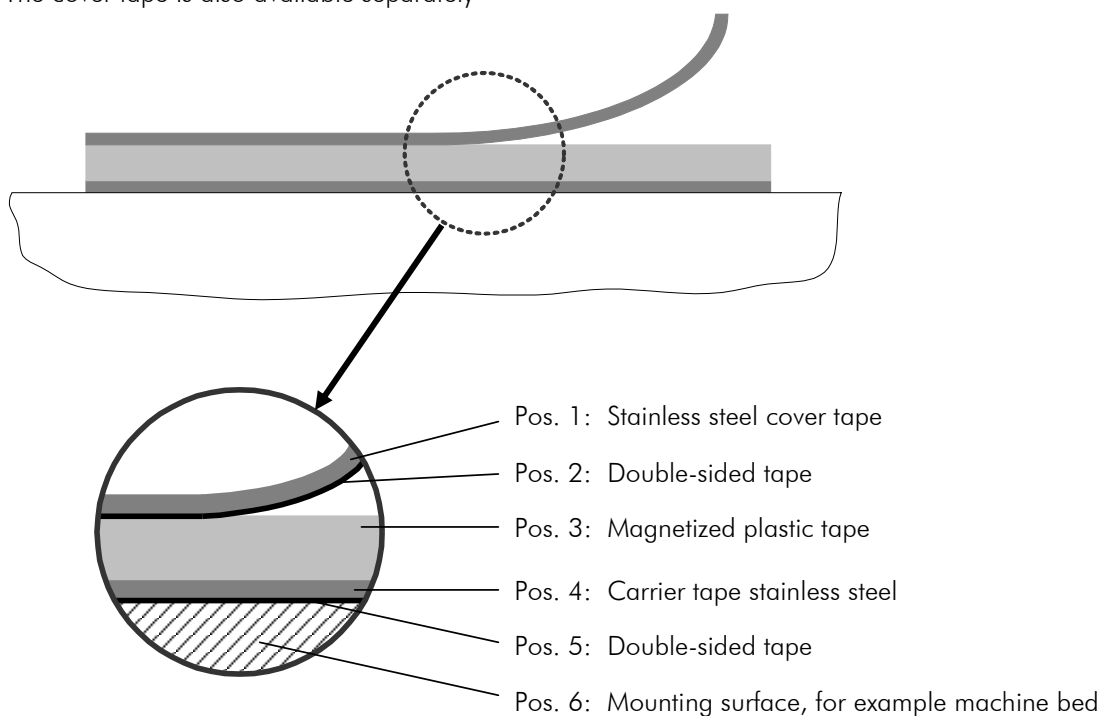


Figure 12: Components of the magnetic tape

8.5.4 Handling

In order to avoid tension in the tape, it must not be stretched, compressed or twisted. It should be stored with the magnetized plastic tape to the outside. The minimum bending radius is 150 mm.

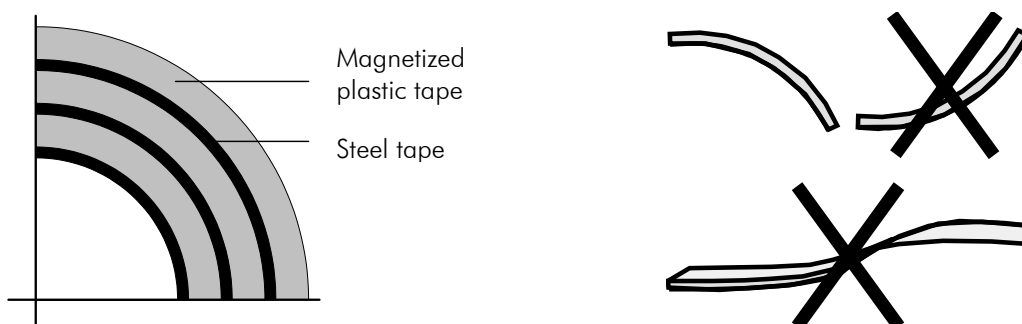


Figure 13: Handling

8.5.5 Processing hint for the gluing of magnetic tapes

Surface-Preparation: In order to guarantee optimal adhesion, all anti-adhesive contamination (e.g. oil, grease, dust, separating agents) has to be removed using solvents with residue-free evaporation. Suitable agents are ketones or alcohols. Typical solvents for cleaning the surface are a 50/50 isopropyl alcohol/water mixture or heptane. Those agents are offered by Loctite and 3M among others as surface cleaners. When using solvents, always observe the manufacturer instructions! If the surface is copper, brass etc., it should be sealed to avoid oxidation.

Contact-Pressure: The strength of the adhesion is directly dependent on the contact the adhesive can form with the surface. Therefore it is important to use as much pressure as possible when gluing the tape, possibly by using aids such as draw rolls. The optimum contact pressure is 4...5 kg/cm².

Gluing temperature: The optimal gluing temperature is between + 18° C and 30° C. Avoid colder sticking surfaces than + 10°C, because in this case the adhesive becomes too hard and perhaps a sufficient immediate adhesion is hardly to achieve. After proper sticking, the stability of the connection is ensured also when the temperature is below zero. The final tackiness of a sticking is from experience reached after approximately 72 hours (at + 21° C). For gluing use only the supplied adhesive tape.

8.5.6 Cutting and Gluing

Before starting the gluing process, both the magnetic and the cover tape have to be cut to the required length

Length cover tape = measuring length + sensor length + 50mm (end caps)



NOTE!

When sticking the magnetic tape pay attention to the markings on the tape and the Sensor. Improper installation does not provide the correct values. A already glued magnetic tape is destroyed after the removal, and cannot be used again. Note also the direction of counting of the measuring system

Preferably the magnetic tape should be glued close to an edge or into a groove, which should be deep enough to embed the magnetic tape and the cover tape.

When unprotected, the cover tape may peel off!

Therefore:

Use tape end caps (☞ 13.5) or let the cover tape overlap the end of the magnetic tape and fix it with a screw.

The tape must be glued smoothly on the surface. The measuring accuracy decreases if the tape is not even!

Before gluing the magnetic tape and the cover tape onto the surface, they should be left lying on the mounting surface for ca. 30 minutes so that the temperature matches. This prevents strain in the tape due to thermal expansion.

Mounting steps:

1. Thoroughly clean the surface (☞ 8.5.5)
2. Acclimatization: let magnetic tape and cover tape adjust their temperature
3. Remove the protection foil from the magnetic tape
4. Glue magnetic tape under great pressure
5. Thoroughly clean surface of magnetic tape
6. Remove the protection foil from the cover tape
7. Glue the cover tape under great pressure
8. Safeguard the ends of the cover tape against peeling off, e.g. by using end caps (☞ 13.5)

8.5.1 Resistance against Chemical Influence

Table 3: Resistance against Chemical Influence

Show no or little effect in constant contact after 2-5 years:

formic acid	glycerol 93°C	linseed oil	soy beans oil
cotton seed oil	N-hexane	lactic acid	
formaldehyde 40%	Iso octane	petroleum	

Show weak to moderate effects in constant contact after approximately 1 year:

acetone	gasoline	acetic acid 30%	oleic acid
acetylene	steam	acetic acid, pure acetic acid	sea water
ammonia	acetic acid 20%	isopropyl ether	stearic acid 70°C, anhydrous
kerosene			

Have strong effects when contacting permanently after 1-5 months:

benzene	nitric acid 70%	turpentine	toluene
lacquer solvent	nitric acid, red, vitriolic	carbon tetrachloride	tetrahydrofuran
trichloroethylene	nitrobenzene	hydrochloric acid 37%, 93°C	xylene

8.6 Installation Magnetic Sensor

The magnetic sensor can be mounted over the mounting holes (see figure below) by using two M3 screws. The permissible reading distance of the sensor to the magnetic tape surface is **max. 0.8 mm**.

Furthermore, the following maximum angular tolerances must be observed over the entire measuring distance:

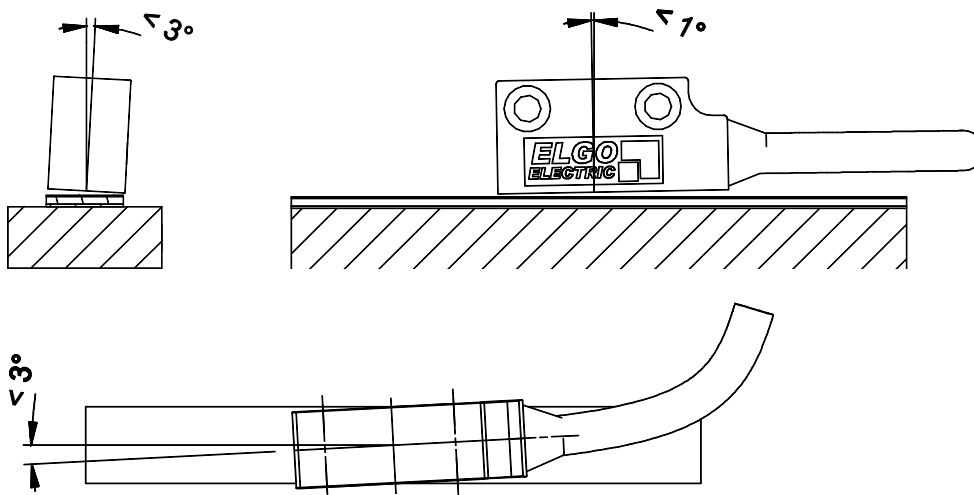


Figure 14: Angular Tolerances of the Sensor

The cable should be routed so that there is no risk of damage, e. g. by pulling or crushing. If necessary, use a drag chain or protective hose and provide strain relief.

9 Design and Function

The operation of the device is divided into the parameter level (☞ Fehler! Verweisquelle konnte nicht gefunden werden.), the operator level (☞ 0) and the initialization level.

All operating parameters can be put in through the **parameter level** (see section ☞ 9.3.6).

At the **operator level** the basic functions are available (depending on the software version).

In the **initialization level** only the basic operations such as sensor calibration or resetting the unit will run on default parameters (company setting).

All entries are made solely on the 4 front-mounted buttons or keyboard shortcuts of those, the displays occur via the integrated LCD.

9.1 Display Overview

The following display icons or segments of the LCD-display are used in this software version:

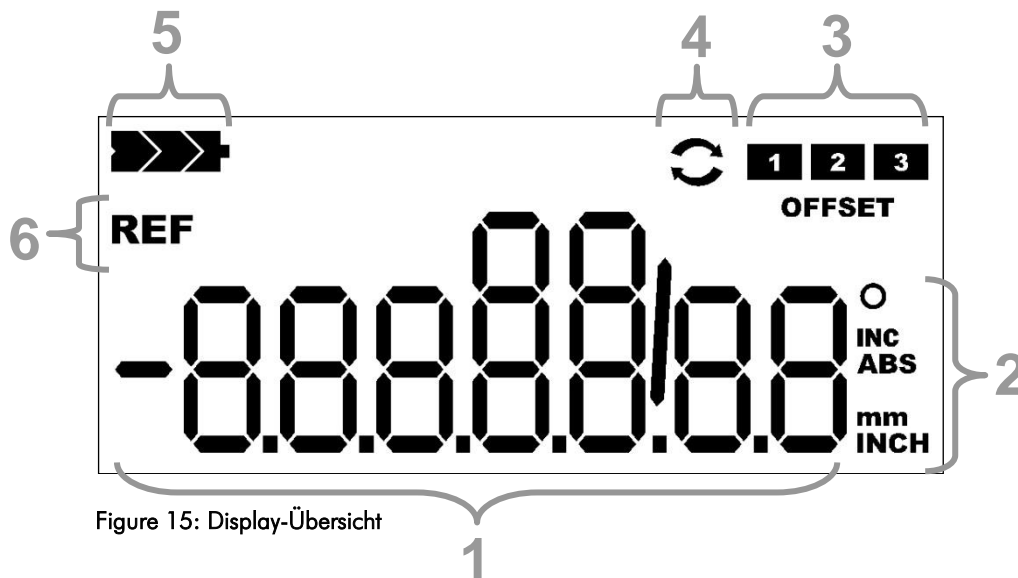


Figure 15: Display-Übersicht

No.	Meaning
1	Segments for numeric and text display (including signs, decimal places, fraction display)
2	Symbols for units and display mode
3	Icons for active tool-offsets 1 ... 3
4	Icon interface activated
5	Battery-Status Icons
6	REF symbol: unit needs to be referenced





For different applications the symbol may be changed for the unit by parameter (P02), e. g. the „^o“ - symbol for angle measurement (see section ☞ 9.3.6).



The standardization of the indicator value must be done manually with the corresponding multiplication factor (P08) and the decimal point (P03) (see section ☞ 9.3.6).

In the Inch-mode an additional fraction display is available..

9.2 Key Functions

The function of the keys in the parameter level is shown on the button in the dark box on the left below the function at the operating level is shown in the bright field size:

Key	Function at the operating level (☞ 0)	Function at the parameter level (☞ Fehler! Verweisquelle konnte nicht gefunden werden.)
	Base-keys for keyboard shortcuts	Parameter level enable/disable
	Fraction display in the Inch mode and transmit active value via interface	Next digit (decades) select
	Incremental enable/disable	Increases the value by 1
	Tool-offsets enable/disable	Sign change

Key	Function at the initialization level (☞ 9.4)
	If the device is activated the calibration is triggered
	If the device is activated the parameters are reset to factory settings and causes a calibration

9.3 Parameter Level

→ Adjusting settings

9.3.1 Activate the Parameter Level



Keep key pressed for about 3 seconds / then press 1x again

The parameter level is activated with this key. After about 3 seconds the display shows „P01“ for the first parameter. When the button is actuated again, the corresponding parameter value is displayed, which can then be changed. With the help of this all parameters are successfully selected.

9.3.2 Election of the Decade



press 1x

Use this key, to jump with the decade one step from left to right. The selected, changeable decade is flashing on the display.

9.3.3 Change Value



press 1x

Use this key to increase the value of the decade by 1 digit (0 ... 9 resp. 0/1)

9.3.4 Change Sign



With this key the sign can be changed for some parameters (a negative sign is only possible if the value is not ZERO)

9.3.5 Exit Parameter Level



press this key for about 3 seconds in the parameter level

All parameters will be retentively stored in the internal flash memory when leaving the parameter level.

9.3.6 Parameter List

Table 4: Parameter List

Parameter:	Description:	Default:
P01: AB	System configuration: A = 0: RS232 transmission periodic (every 125 ms) A = 1: RS232 transmission via button SET B = 0: Counting positively B = 1: Counting negatively	00
P02: A	Display mode (affect only the display of symbols!) A = 0: mm-Mode / Display symbol „ mm “ A = 1: Inch-Mode / Display symbol „ Inch “ A = 2: mm-Mode / Display symbol „ m “ A = 3: mm-Mode / Display symbol „ ° “ A = 4: mm-Mode / Display no symbol	0
P03: A	Decimal point (0 ... 4) → only for mm-Mode	2
P05: ABC	Key lock: A: Key „Set“ (0= activated / 1= deactivated) B: Key „Incr/Abs“ (0= activated / 1= deactivated) C: Key „*“ (0= activated / 1= deactivated)	000
P07: A	Basic Resolution: A = 0: resolution 0.01mm A = 1: resolution 0.1mm	0
P08:	Multiplication factor (0.0001 ... 9.9999)	1.0000
P09:	Reference value (-9999999 ... +9999999)	0
P10:	Offset 1 (-9999999 ... +9999999)	0
P11:	Offset 2 (-9999999 ... +9999999)	0
P12:	Offset 3 (-9999999 ... +9999999)	0
P13: A	Configuration Offset (0...3) A = 0: offset cannot be activated A = 1: offset 1 can be activated A = 2: offset 1 & 2 can be activated A = 3: offset 1 & 2 & 3 can be activated	3
P90: A	RS232 Interface: A = 0: interface not activated A = 1: transmission protocol type A A = 2: transmission protocol type B A = 3: transmission protocol type C	0
P99:	Actual firmware version	x.xx

9.4 Initialization Level

→ Resetting parameters and calibration

9.4.1 Calibration



NOTE!

The calibration is already factory-made and must not run again normally.

In a few cases a re-calibration of the device after the installation can achieve an advancement of the accuracy, because with a re-calibration the additional mounting factors (angular deviation, parallelism, etc.) are included.

Caution:

The magnetic sensor must be in the maximum distance range on the tape during the calibration!

⇒ Switch off the device (remove battery or remove plug)



Keep the key pressed

⇒ While pressing the key the device is turning on again

The sensor calibration is initiated and „CAL 0“ is displayed. The sensor now has to be moved slowly in a direction on the magnetic tape, the process of the calibration is shown by the display „CAL 1 ... CAL 4“. After finishing the calibration the device will start automatically in the operator level.

If you receive an error code “ERROR 1 ... ERROR 10” after the calibration, then the installation of the sensor has to be verified and the calibration has to be repeated.

9.4.2 Load the Default Parameters and simultaneous Calibration



NOTE!

Already changed parameters will be overwritten by the default parameter!
If it is necessary write down the setting before.

⇒ Switch off the device (remove battery or remove plug)



Keep the key pressed

⇒ While pressing the key the device is turning on again

All parameters are reset to factory settings. Furthermore the sensor calibration is triggered.

➔ Approach see ↗ 9.4.2

9.5 Operator Level Function

→ Working with the device

9.5.1 Preset Reference Value



Press both keys 1x shortly at the same time

With this shortcut, the actual value (display value) is set to the reference value deposited in **P09** (in absolute mode only possible when the offset is not enabled). The reference value can be defined in parameter **P09** (see 9.3).

9.5.2 Direct Entry of the Reference Value

(Function is available from firmware 1.30 on)



Press both keys 1x for min. 3 seconds at the same time

With this key combination, the value to reference **P09** can be entered without the need to change into the parameter level. After pressing the keys for approximately 3 seconds, the display shows the text "P09". If the keys are released, the reference value appears and can be changed directly.



Press the key 1x to save the new reference value

9.5.3 Switching Incremental or Absolute



Press key 1x

With this key the indicator is switched from absolute mode to incremental mode:

→ The display value is temporarily set to ZERO and the symbol „INC“ appears in the display. Actuating the key again the absolute is activated and the symbol “ABS” is displayed.

9.5.4 Activation Offset Measurements



Press key 1x

This key enables/disables each of the three adjustable offset dimensions (only possible in the absolute mode). In each case an offset is added to the display value.

The activation of an offset level is indicated by the symbols **1**, **2** or **3**. The offset measurements can be entered in the parameter **P10**, **P11** and **P12**. Additionally, parameters can be determined with **P13**, whether and how many offset measurements can be selected.

9.5.5 Fraction Display in the Inch-Mode



Press key 1x

With this key the display can be changed in the Inch-mode (parameter $P02 = 1$) as follows:

- 1x key pressed: Display Inch-fraction display 1/64 Inch
- 1x key pressed: Display Inch-fraction display 1/32 Inch
- 1x key pressed: Display Inch-fraction display 1/16 Inch
- 1x key pressed: Inch-Decimal Display 0.001 Inch etc.

In the mm mode the transmission of the display value via RS232 can be released, if this has been configured in parameter $P01$ (see section 9.3.6).

10 Serial RS232 Interface

For setting the parameters of the serial interface RS232, the parameters $P01$ and $P90$ must be used (see parameter list in section 9.3.6).

Interface parameters: 9600 Baud / 8 Data Bits / 1 Stop Bit / no Parity

Transmission protocol:

Parameter $P90 = 1$:

Protocol Position, Display-Value (Type A: ASCII)

Start	Sign	Position	Position	Position	Position	Position	Position	Position	Position	Stop
0x02	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x03
STX										ETX

	'+'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	
0x02	0x2B	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x03

Example: +123456,7 mm
(+12345,67 mm)

Parameter $P90 = 2$:

Protocol Position, Display-Value (Type B: ASCII & Frame-Info)

Start	Packet Type	Opcode	Data-Length_0	Data-Length_1	Checksum	Sign	Position	Position	Position	Position	Position	Position	Position	Status	Stop
0x02	0x59	0x81	0x09	0x00	0xE3	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x..	0x03
STX		BCC				Data									ETX

STATUS: 0: no Error

	'+'	'1'	'2'	'3'	'4'	'5'	'6'	'7'							
0x02	0x59	0x81	0x09	0x00	0xE3	0x2B	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x00	0x03

Example: +123456,7 mm
(+12345,67 mm)

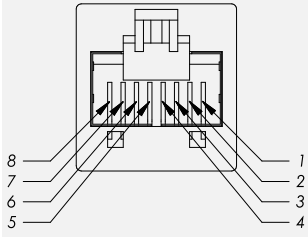
Parameter $P90 = 3$:

Protocol Position, Display-Value (Type C: Hex)

MSB	MSB-1	MSB-2	LSB
0x..	0x..	0x..	0x..

LSB = 0,01 mm (-2147483648 2147483647)

10.1 Pin Assignment RJ45


Connector	Drawing	Pin	Function
RJ45 plug		1	Reserved (don't connect)
		2	Reserved (don't connect)
		3	Reserved (don't connect)
		4	Reserved (don't connect)
		5	VCC +1,5 V / +3,0 V / +24 V (additional power supply Fehler! Verweisquelle konnte nicht gefunden werden.)
		6	IZ16E-100_RS232-TX (transmit RS232)
		7	IZ16E-100_RS232-RX (receive RS232)
		8	0 V / GND
Screen	PE / Earth		


→ Suitable interface cables are available as accessories (see 13.7).


10.2 Interface Function Table

(see also parameter list 9.3.6)

P01	P90	Action
1X	0	No transmission
1X	1 / 2 / 3	Serial transmission via button SET → protocol type A/B/C
0X	0	No transmission
0X	1 / 2 / 3	Automatic serial transmission every 125 ms → protocol type A/B/C

While interface is active, the symbol  will be shown.

	<p>NOTE! After activation or deactivation of the interface, the unit has to be rebooted (remove the battery for approx. 10 seconds).</p>
---	---

	<p>NOTE! The transmission will just work, if the system is connected to a standard-RS232 Interface and the receiving unit is active. Because of saving current while receiving unit is turned off.</p>
---	---

11 Disturbances, Maintenance, Cleaning

This chapter describes possible causes for disturbances and measures for their removal. In case of increased disturbances, please follow the measures for fault clearance in chapter 11.1. In case of disturbances that cannot be eliminated by following the advice and the fault clearance measures given here, please contact the manufacturer (see second page).

11.1 Fault Clearance



CAUTION!

The device, the connection line and the signal cable must not be installed next to sources of interference that emit strong inductive or capacitive interference or strong electrostatic fields.

External perturbations can be avoided through suitable cable routing.



The screen of the signal output cable should only be connected to the following circuit on one side. The screens should not be grounded on both sides. Signal cables always have to be routed separately from the load power line. A safety distance of at least 0.5 m has to be kept from inductive and capacitive sources of interference such as contactors, relays, motors, switching power supplies, clocked controllers etc.!

If interferences occur in spite of all the items stated above being observed, please proceed as follows:

1. Installation of RC-circuits via contactor coils of AC-contactors (e.g. 0.1 μ F / 100 Ω)
2. Installation of recovery diodes via DC-inductors
3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
4. Do not connect protective earth and ground
5. Connect a mains filter ahead of the external power pack

11.2 Re-start after Fault Clearance

After the fault clearance:

1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary.
3. Ensure that there are no persons in the danger area.
4. Follow the instructions from chapter 8.



WARNING!

Danger of injury through non-conventional fault clearance!

Non-conventional fault clearance can lead to severe injuries and damage of property.

Therefore:

- Any work to clear the faults may only be performed by sufficiently qualified staff
- Arrange enough space before starting the works
- Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.

If components need to be replaced:

- Pay attention to a correct installation of the spare parts.
- Reinstall all the fixing elements properly
- Before turning on the device, ensure that all covers and safety equipment is installed correctly and functions properly

11.3 Maintenance

The device is maintenance-free.



WARNING!

Danger through non-conventional maintenance!

Non-conventional maintenance can lead to severe injuries and damage of property.

Therefore:

Maintenance works may only be completed by staff that has been authorized and trained by the operator.

11.4 Cleaning



WARNING!

The device can only be cleaned with a damp cloth, do not use aggressive cleanser!

12 Type Designation

12.1 IZ16E Indicator Unit

IZ16E - 100 - 1 - 01.0 - 1 - X

Device Designation

IZ16E: Indicator with external sensor

SN number:

100 = Version with serial RS232 interface (via RJ45)

Power Supply:

1 = Integrated battery case with cover (1x type C / LR14 / baby)
6 = Pluggable screw terminal (2-pin. / 1 mm²) for 1.5 resp 3.0 V

Sensor Cable Length:

(maximum 2m)

Cable Option:

1 = Round connector (sensor connection)

Options:

CAP = with integrated backup-capacitor to keep the actual value during batter changing
24V = with external power supply of 10...30 VDC



NOTE

When ordering, please use the here described ordering code (Type Designation). Options that are not required are filled in with „-“.

12.2 Type Designation of the Magnetic Tape

MB20-	25-	10-	1-	R-	X
-------	-----	-----	----	----	---

Designation: _____

MB20 -> Incremental Magnetic Tape

Basic Pole Pitch: _____

Basic pole pitch at a resolution of 100 μm :
25 = 2.5 mm pole pitch

Tape Width: _____

in mm:
10 = 10 mm

Number of Tracks: _____

Number of magnetic tracks:
1 = single track system

Tape Construction: _____

R = Standard: magnetic tape on interference material
(bonded with adhesive tape and provided cover tape)

Optionen: _____

B = Without adhesive tape on interference side
C = Without provided cover tape
D = Without adhesive and cover tape (equivalent to option B+C)

12.2.1 Available Variants of Magnetic Tape

Order Designation	Description
MB20-25-10-1-R	Magnetic tape in the standard package with cover band and adhesive tape
MB20-25-10-1-R-B	Without tape on the back side/ with enclosed adhesive tape
MB20-25-10-1-R-C	With tape on the back side/ without cover band
MB20-25-10-1-R-D	Without tape on the back side/ without cover tape

Available lengths: 0.5 m ... 70 m
Order example: MB20-25-10-1-R / L=1.5 m



NOTE!

For technical reasons, the measurement cannot be directly carried to the end of the tape; there should always be a gap of 50 mm to adhere to the cutting edge.

→ TAPE LENGTH = MEASURING LENGTH + SENSOR LENGTH + 50 mm ←

13 Accessories

13.1 Battery Holders

Closed version:

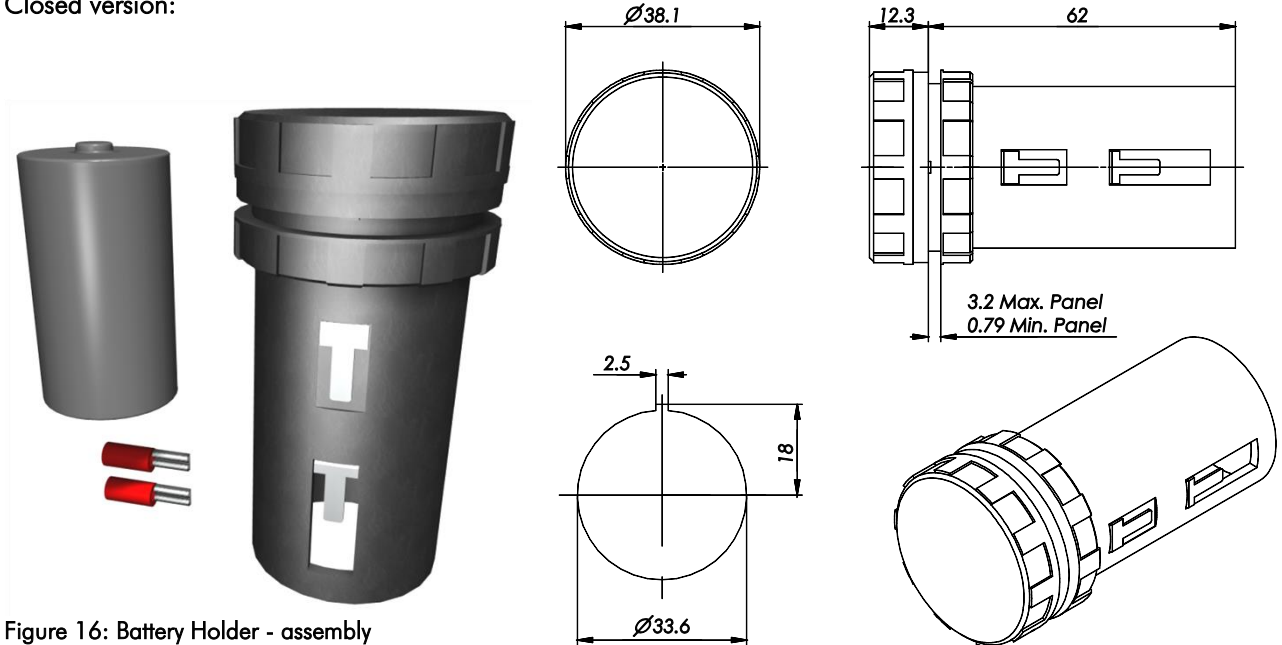


Figure 16: Battery Holder - assembly

Open version:

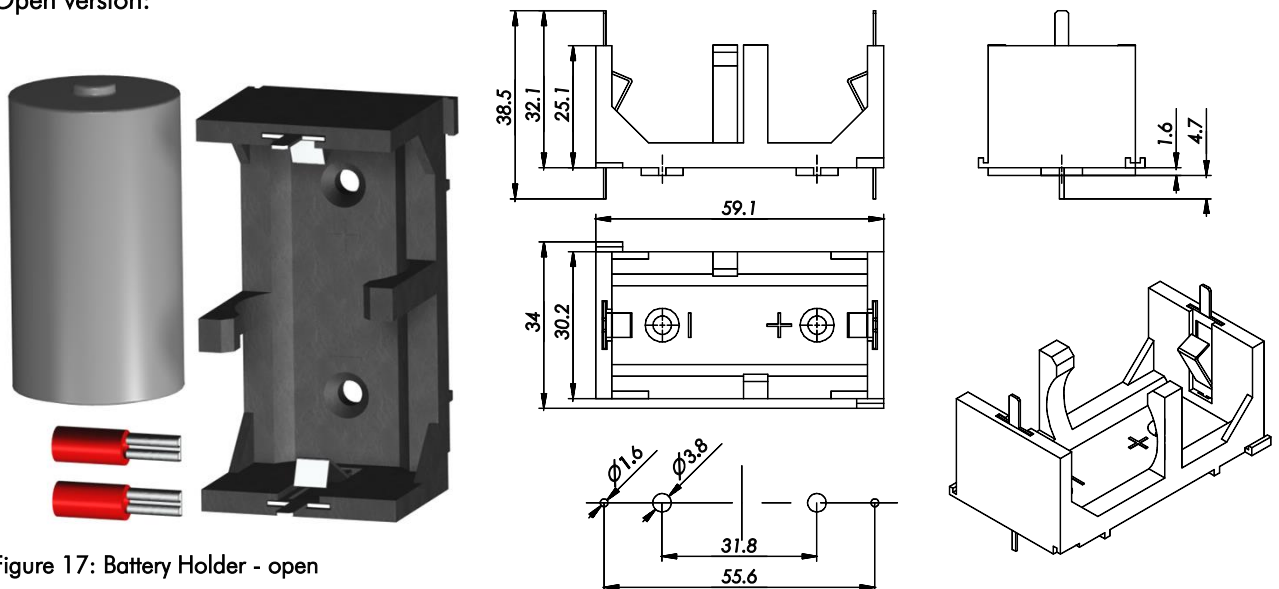


Figure 17: Battery Holder - open

Order Designation	Description
Battery holder set 1 x C assembly	inclusive battery holder (Type C), battery and 2x cable shoes
Battery holder set 1 x C open	inclusive battery holder (Type C), battery and 2x cable shoes

13.2 Cover Tape individual

Drawings see section 7.4.

Order Designation	Description
SB-20-10-01-14404 (AB10)	Cover tape, 10mm wide, single with double-sided adhesive tape

13.3 Aluminium Guide Rail

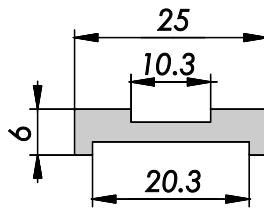


Figure 18: Aluminium Guide Rail

Order Designation	Description
FS-20.25-XXXX	Aluminium rail with pre-glued magnetic tape MB20-25-10-1-R
FS-XXXX	Aluminium rail with 2 slots for embedding a 10 mm or a 20 mm wide magnetic tape. Without magnetic tape!

(XXXX = length in mm)

The guide rail is available up to a maximum length of 2000 mm.

13.4 Guide Carriage for Guide Rail

It is the ideal complement to the guide rail above

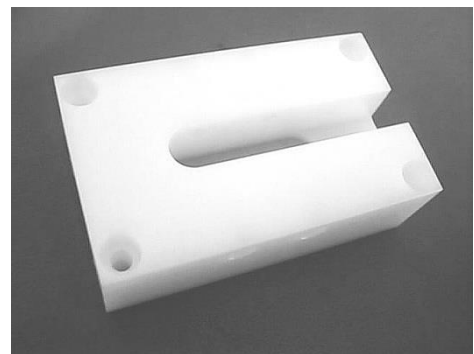


Figure 19: Guide Carriage

Order Designation	Description
FW-20.60	Guiding carriage, made of special plastic (dimensions: L x W x H = 80 x 48 x 33mm)

13.5 Magnetic Tape End Caps

The magnetic tape end cap is offering the optimal protection against the peeling of the magnetic tape/ cover band (see chapter 8.5.6). Furthermore, in the working area the risk of injury by any existing sharp edges is minimized with the end caps.

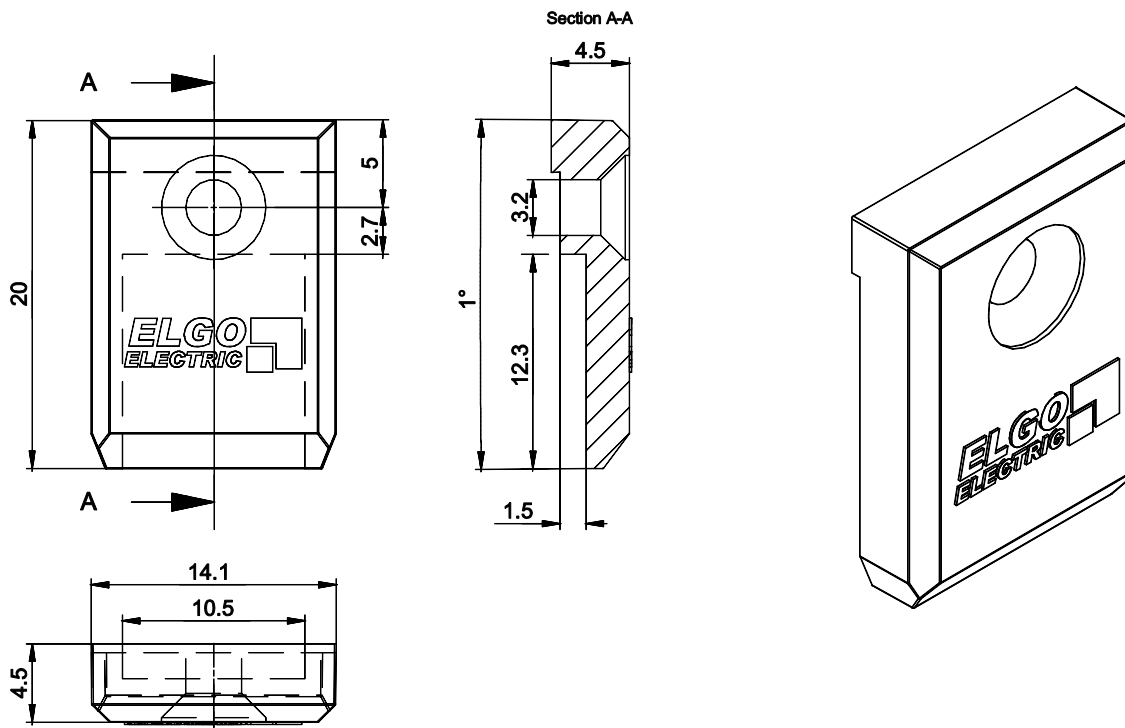
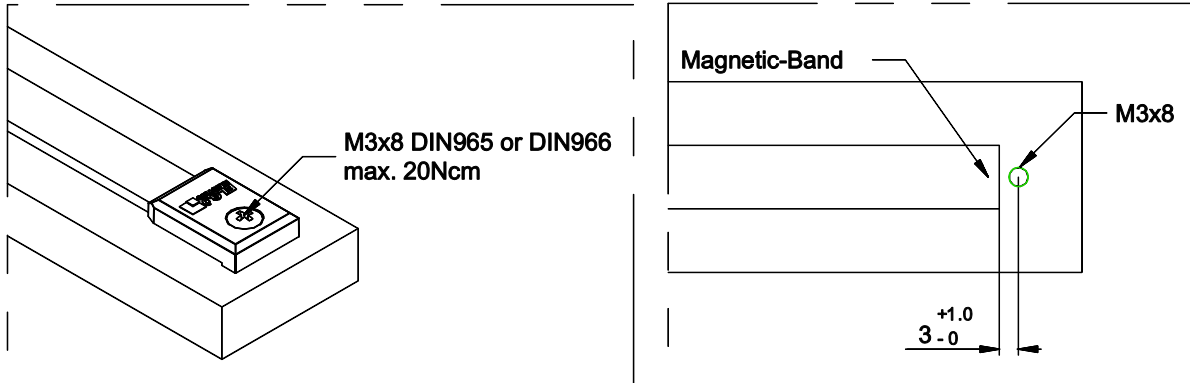


Figure 20: Magnetic Tape End Caps

Order Designation	Description
MB End Cap 10mm / single	Single end cap, loosely packed
MB End Cap 10mm / SET	Set, consisting of 2 end caps and 2 countersunk screw M3 X 8

13.6 Mounting Angle MW-IZ16E

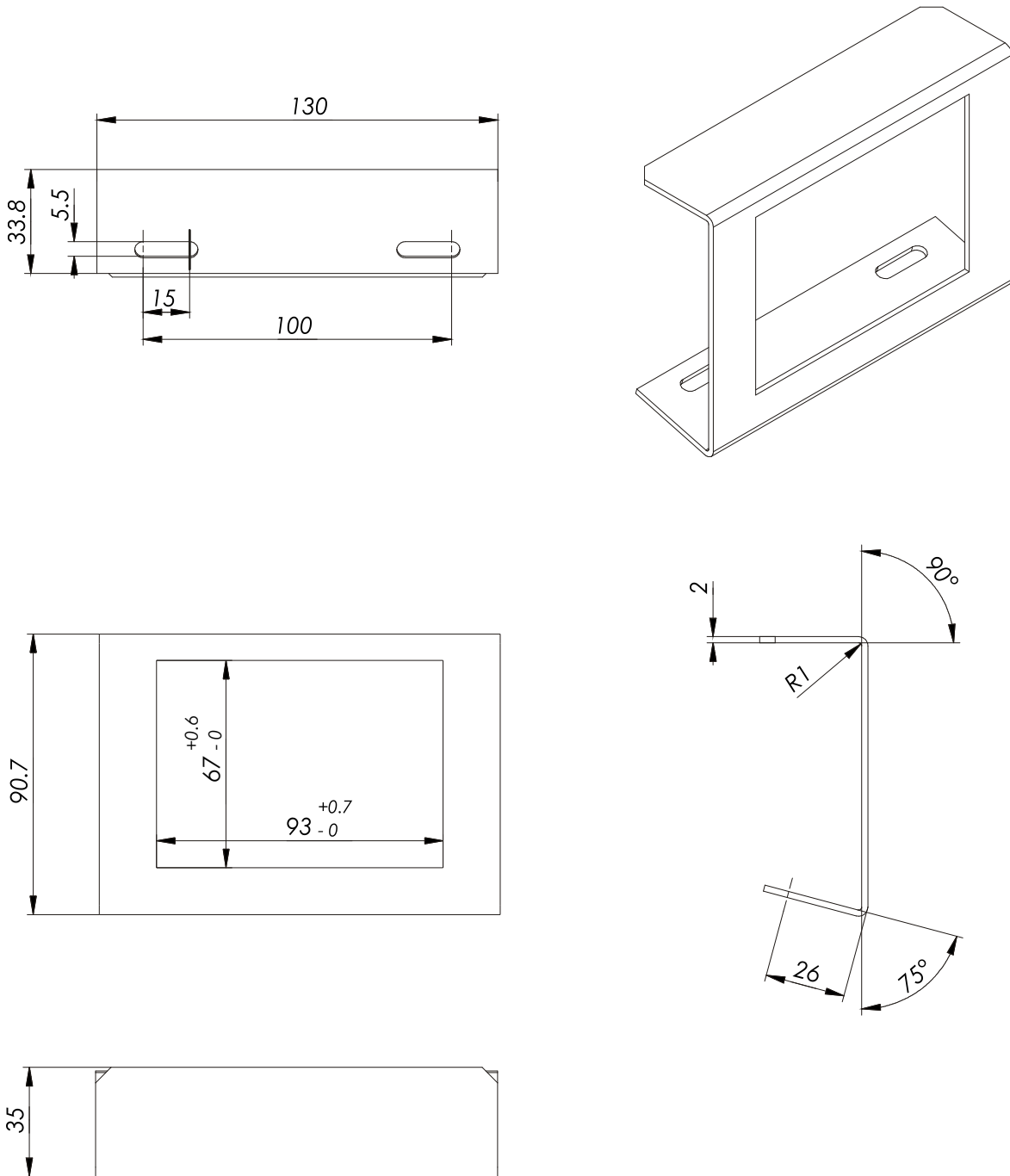


Figure 21: Mounting Angle MW-IZ16E

Order Designation	Description
MW-IZ16E	Mounting angle for IZ16E; made of 2 mm galvanized steel sheet

13.7 Interface Cables

Order Designation	Description
CABLE-RS232-RJ45-01.0	RS232 interface cable, 1 m → Device-side: RJ45 plug → Connection-side: open wires
	Wire color
	black
	brown
	red
	orange
	screen
CABLE-RS232-RJ45-01.0-DSUB	RS232 interface cable, 1 m → Device-side: RJ45 plug → Connection-side: 9-pin D-SUB (female) connector (suitable e.g. for direct connection to a PC-COM-port, extendable with standard 1: 1 extension cable male-female)
	PIN
	2
	3
	5
	Housing
	CABLE-RS232-RJ45-01.0-DSUB1
PIN	
2	
3	
5	
Housing	

13.8 Further Accessories

Order Designation	Description
MR3848	Magnetic ring; pole pitch 2.5 mm; 48 poles; outer Ø 38 mm / inner Ø 30 mm

Notes:

Notes:

Notes:

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