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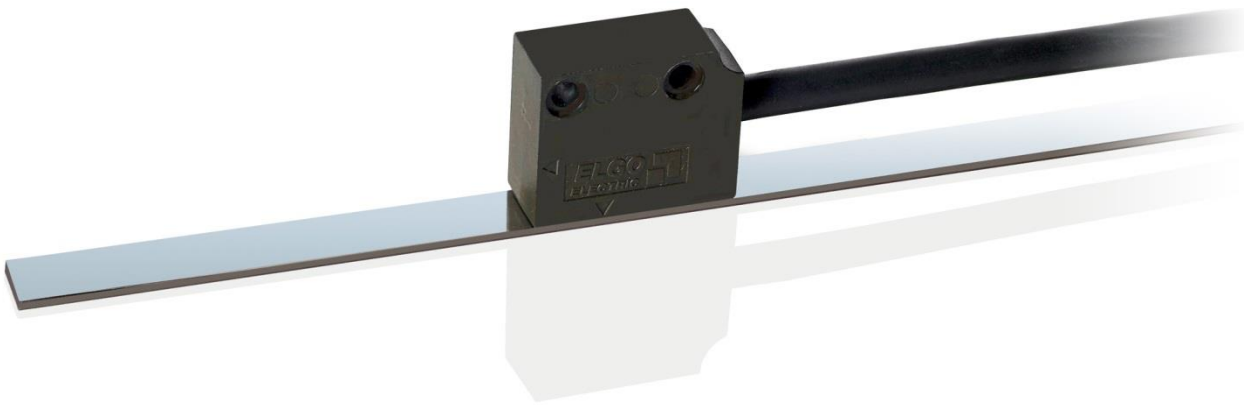
Translation of the original operating manual

ELGO ELECTRONIC

Operating Manual

SERIES *EMIX23*

Magnetic Linear Encoder with 1 µm resolution



- With periodically index pulse or optional reference pulse
- Direct and contactless measurement (allowed distance between sensor and magnetic tape: 0.1 … 0.8 mm)
- Optional LED distance monitoring available
- Measurement lengths theoretically unlimited
- High standard resolution of 1 µm
- Very robust against dust and dirt
- Speed proportional square wave outputs

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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.

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:

	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 jewellery.
	PROTECTIVE GLOVES …for protecting the hands against abrasion, wear and other injury of the skin.
	PROTECTIVE HELMET …for protection against injuries of the head.

4.7 Conventional Use

The ELGO-device is only conceived for the conventional use described in this manual.
The EMIX23 length measuring system only serves to measure 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
- The storage temperature (☞6 Technical Data) needs to be observed
- The relative humidity (☞6 Technical Data) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

5 Product Features

The EMIX23 is an incremental magnetic length measuring system. The sensor technology and translator are placed in the same housing. The magnetic tape is adhered to a flat base with the supplied adhesive tape. The EMIX23 can be installed up to a maximum distance of 0.8 mm.

The measuring system offers decisive advantages:

- Direct and contactless measurement
- Distance range between sensor and tape: 0.1... 0.8 mm
- Status LED for reading distance available (option only for version 5 VDC / 5 V-TTL)
- Theoretically unlimited measurement length
- High standard resolution of 1 µm
- Repeat accuracy:
  ± 1 increment at resolutions >10 µm
  ± 2 µm at resolutions ≤ 10 µm
- Very robust against dust and dirt
- Definable reference pulse (option)

Signal output with channels A, A´, B, B´, Z, Z´.

5.1 Functional principle

The basis of the magnetic incremental encoder 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 the interpolation refinement, together with the pole distance of the magnetic tape, the resolution of the measuring system is determined. The MB 20-20 magnetic tape has a pole pitch of 2 mm. A special evaluation electronic (translator) processes the sine/cosine wave into square output signals from the signal information of the magnetic tape. These square signals are equivalent to conventional optical rotary- or linear encoder outputs.

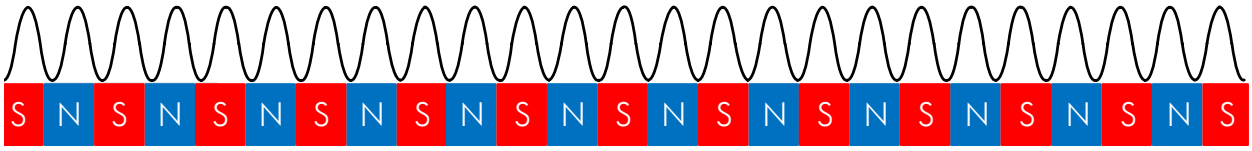
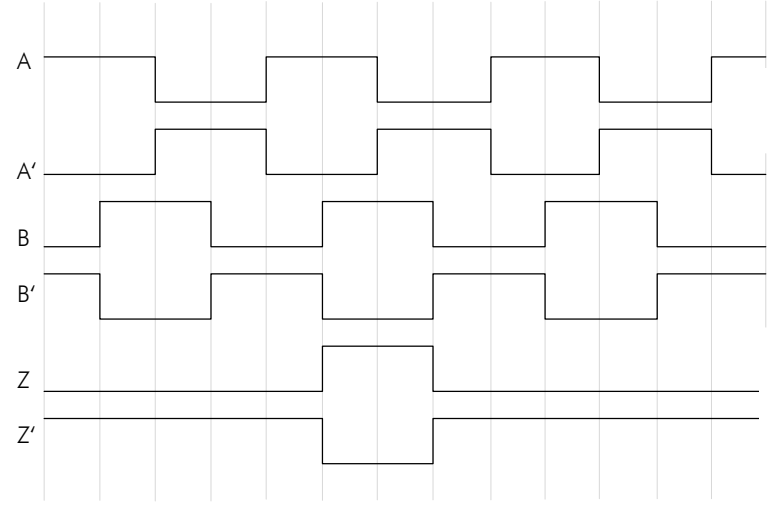


Figure 1: Code of the Magnetic Tape

5.2 Pulse diagram



The channels A and B are phase shifted by 90°.

The index pulse output occurs periodically every 2 mm or optionally as a free definable reference pulse (R / R').

Figure 2: Pulse Diagram

6 Technical Data

6.1 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 (=order reference, see type designation) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO always indicate this data.

6.2 Dimensions Sensor

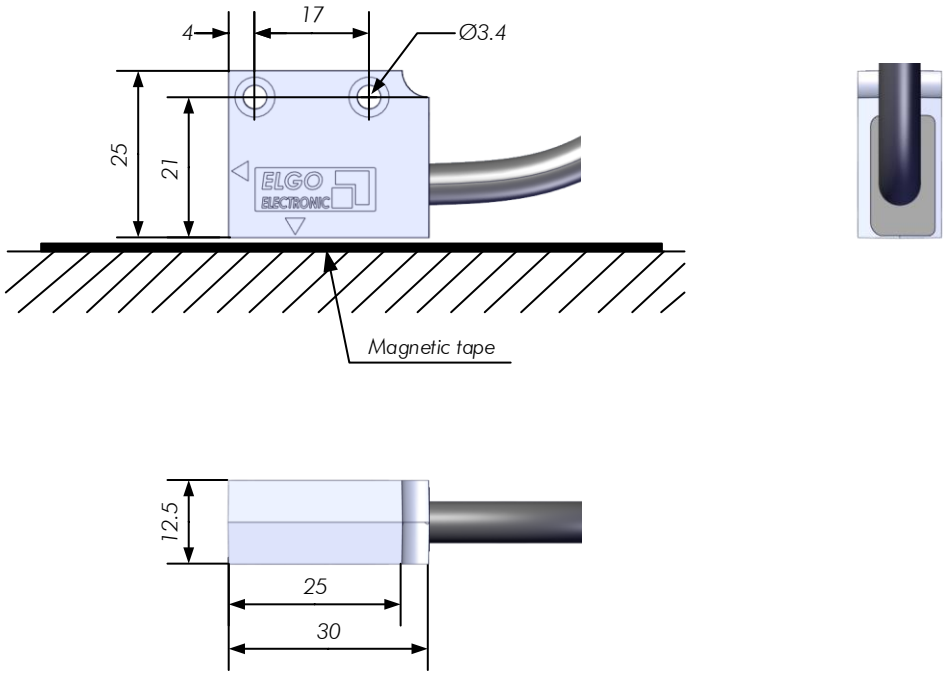


Figure 3: Dimensions Sensor

6.3 Dimensions FBK80 and End / Connection Profile AFBK80

Dimensions of the FBK80 (guiding profile for magnetic tape BK80)

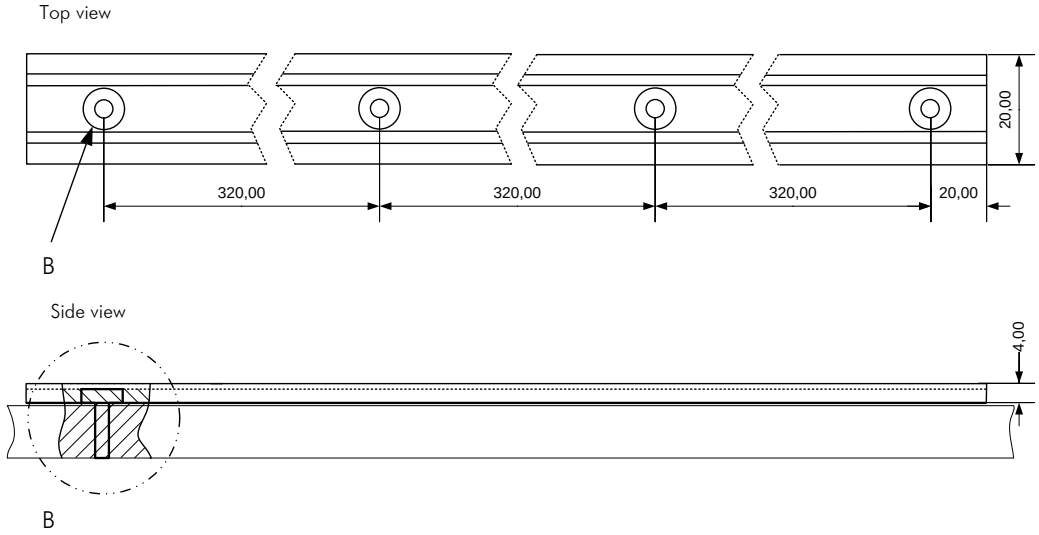


Figure 4: Dimensions FBK80

Dimensions of the End / Connection Profile AFBK80

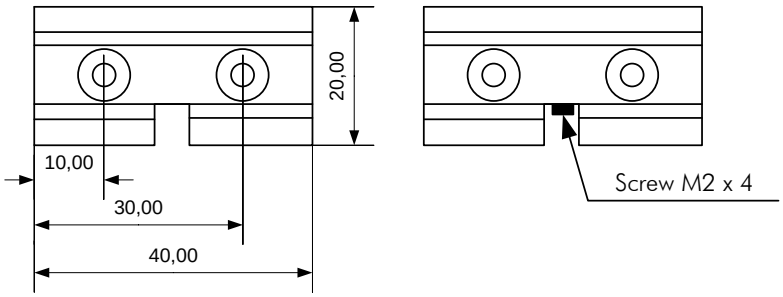


Figure 5: Dimensions AFBK80

6.4 Technical Data Sensor

EMIX23 (standard version)	
Mechanical Data	
Measuring principle:	incremental
Repeat accuracy:	± 1 increment at resolutions >10 µm ± 2 µm at resolutions ≤ 10 µm
System accuracy in µm at 20° C:	± (20 + 20 x L) L = measuring length in meters
Allowed distance sensor / tape:	max. 0.8 mm
Pole pitch:	2 mm
Sensor housing material:	zinc die cast
Sensor housing dimensions:	L x W x H = 30 x 12.5 x 25 mm
Required magnetic tape with higher resolutions ≤1 µm:	standard: MB20-20-10-1-R-EPS option REF: MB20-20-10-2-R-C-REFXXXX-EPS option BK80: MB20-20-10-1-R-D-BK80-EPS option BK80 + REF: MB20-20-10-2-R-D-BK80-REFXXXX-EPS
Required magnetic tape with coarser resolutions >1 µm:	standard: MB20-20-10-1-R option REF: MB20-20-10-2-R-C-REFXXXX option BK80: MB20-20-10-1-R-D-BK80 option BK80 + REF: MB20-20-10-2-R-D-BK80-REFXXXX
Maximum measuring length:	theoretically unlimited
Connection type:	open cable end or with plug connector (option D1, D3)
Sensor cable:	1.5 m standard length, others on request (max. 30 m)
Weight:	approx. 40 g without cable (cable approx. 60 g/m)
Electrical Data	
Power supply:	5 VDC or 10 … 30 VDC
Residual ripple:	5 V: +/-25 mV; 10-30 V: <10 %
Consumption:	max. 200 mA
Output channels:	A, A‘,B, B‘, Z, Z‘ (index pulse) resp. R, R‘ (reference pulse)
Output levels:	5 V-TTL / 10…30 V-HTL
Resolution (at 4-edge triggering):	0,001 mm
Index pulse:	2 mm periodically or free definable reference pulse (option R)
Max. output frequency per channel:	1 MHz
Max. movement speed:	2 m/s
Ambient conditions	
Storage temperature:	-20 … +85° C
Operation temperature:	-10 … +70° C (-25 … +85° C on request)

Humidity:	max. 95 %, not condensing
Protection class:	IP67

6.5 Technical Data Magnetic Tape

The magnetic tape consists of two components:

- The actual magnetic tape which carries the position information
- A mechanical stainless steel back iron (interference band)

Magnetic Tape MB20-20-10-1-R	
Coding	incremental, single track system
Pole pitch	2 mm
Operation temperature installed	-20 … +65° C (-20 … +80° C usage without adhesive tape , options „B“ or „D“)
Storage temperature uninstalled	Short-term: -10 … +60° C Medium-term: 0°…+40° C Long-term: +18° C (-20 … +80° C usage without adhesive tape , options „B“ or „D“)
Gluing temperature:	+18 … +30° C
Relative humidity	max. 95 %, non-condensing
Accurateness 20°C in mm	± (0.025 + 0.02 x L) L = measuring length in meters
Material carrier tape	Precision strip 1.4310 / X10CrNi 18-8 (EN 10088-3)
Double-faced adhesive tape	3M-9088 (observe instructions), others on request
Dimensions	→ without adhesive tape: 10 mm (± 0.1) x 1.35 mm (± 0.11) → with adhesive tape (excl. carrier): 10 mm (± 0.1) x 1.56 mm (± 0.13) → with adhesive tape (incl. carrier): 10 mm (± 0.1) x 1.63 mm (± 0.14)
Length expansion coefficient	$\alpha \approx 16 \times 10^{-6}$ 1/K
Thermal length expansion	$\Delta L[m] = L[m] \times \alpha[1/K] \times \Delta\vartheta[K]$ (L = tape length in meters, $\Delta\vartheta$ = relative temperature change)
Bending radius	min. 150 mm, min. 50 mm in case of usage without adhesive tape (options B and D)
Available lengths	up to maximum 32 m
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

7 Installation and First Start-Up

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.

ELGO is not liable for any secondary damage and for damage to persons, property or assets.

The operator is obliged to take appropriate safety measures.

The first start-up may only be performed by staff that has been trained and authorized by the operator.

7.1 Operating Area

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!

CAUTION!
The electrical connections must be made by suitably qualified personnel in accordance with local regulations.

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)

Wiring works may only be performed in the de-energized state!

Thin cable strands have to be equipped with end sleeves!

Before switching on the device, connections and plug connectors have to be checked!

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.

7.2 Installation of the 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.

7.2.1 The Magnetic Tape MB20-20-10

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

IMPORTANT NOTE:

EMIX23 with a resolution of ≤1 µm (e.g. 0.001 mm) require single pole magnetized magnetic tapes with the addition "EPS" (see type designation ☞ 11.2). Otherwise the required accuracy cannot be guaranteed.

For resolutions >1 µm (e.g. 0.005 mm) the conventional magnetic tape can be used without the addition "EPS".

The magnetic tape consists of 2 pre-assembled components (see Figure 6):

- 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). The cover tape is not necessary for the measurement.

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

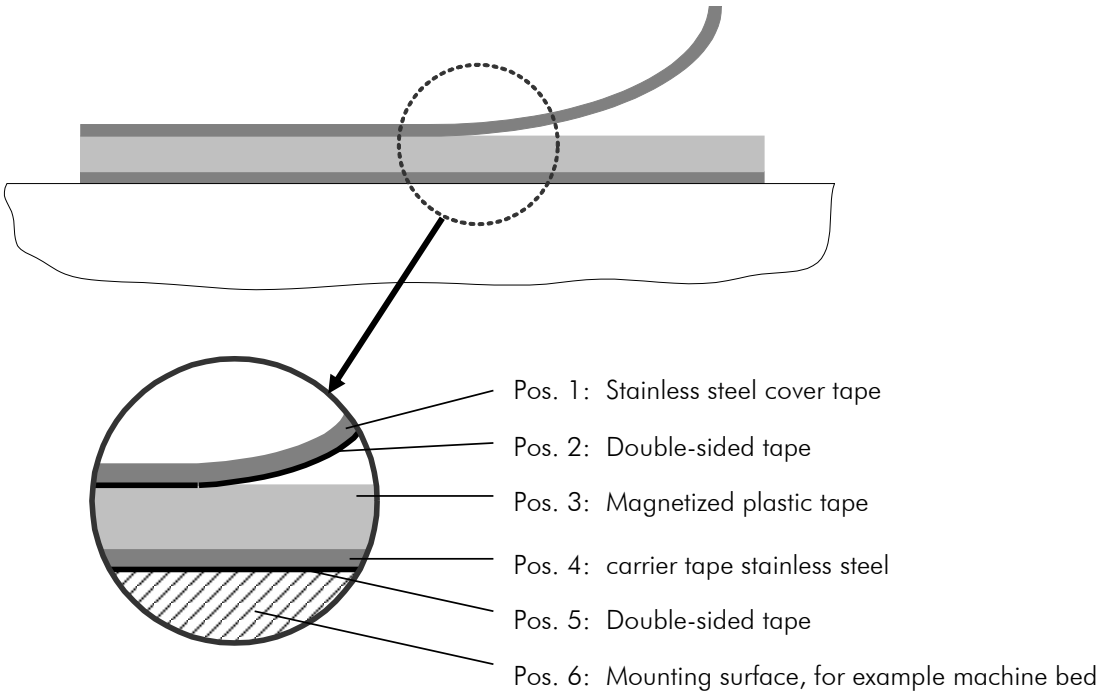


Figure 6: Magnetic Tape Structure

7.2.2 Magnetic Tape with Option BK80

Top view:

<SN XX/000000001/00000	MB20-20-10-1-R-D-BK80	*ELGO*

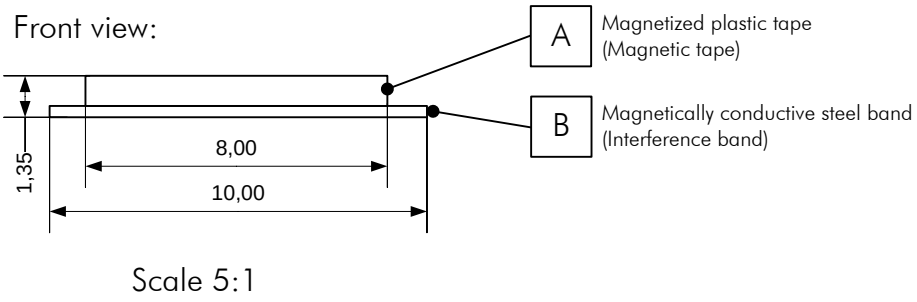


Figure 7: Magnetic Tape with Option BK80

The cover tape (C) is not included in the delivery of this version.

7.2.3 Handling

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

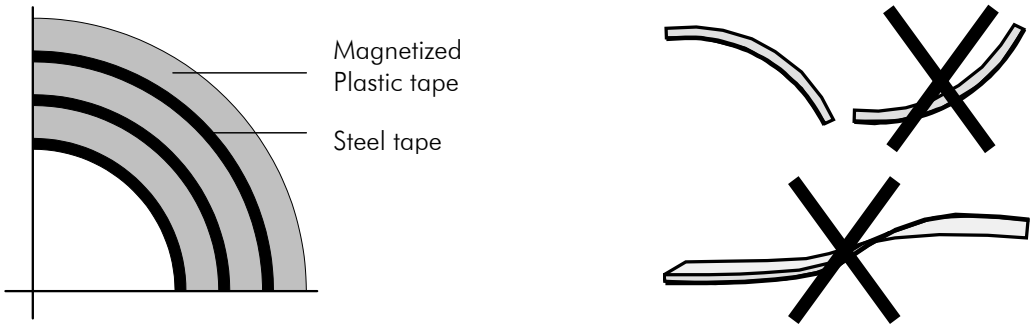


Figure 8: Handling

7.2.4 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/cm^2).

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.

7.2.5 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. 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 (☞ 12) 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 approximately 30 minutes so that the temperature matches. This prevents strain in the tape due to thermal expansion.

Mounting steps:

- Thoroughly clean surface (☞ 7.2.4)
- Let magnetic tape and cover tape adjust their temperature
- Remove protection foil of adhesive tape on magnetic tape
- Glue magnetic tape using great pressure
- Thoroughly clean surface of magnetic tape
- Remove protection foil of adhesive tape on cover tape
- Glue cover tape using great pressure
- Safeguard the ends of the cover tape against peeling off (using end caps see chapter 9.2)

7.2.6 Resistance against Chemical Influence

Table 1: Resistance against Chemical Influence

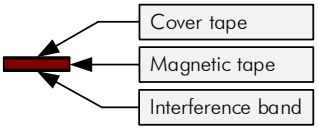
Show no or little effect in constant contact after 2-5 years:			
formic acid	glycerol 93°C	linseed oil	soy beans oil
cotton seed oil	N-hexane	lactic acid	
formaldehyde 40%	Iso octane	petroleum	
Show weak to moderate effects in constant contact after approximately 1 year:			
acetone	gasoline	acetic acid 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

7.2.7 Magnetic Tape Variants

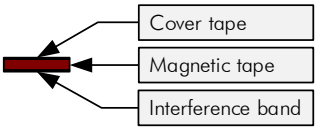
Standard (1 track)
Magnetic tape: MB20-20-10-1-R

Top view

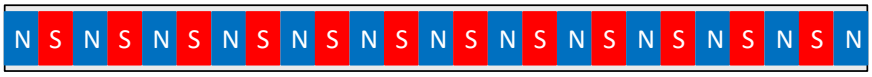
Front view

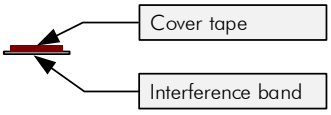


Option REF (reference pulse, 2 tracks)
Magnetic tape: MB20-20-10-2-R-C-REFXXXX

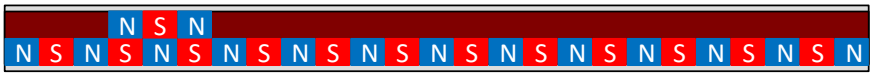


Standard BK80 - 1 track (compatible with guiding profile FBK80)
Magnetic tape: MB20-20-10-1-R-D-BK80





Option BK80 - REF - 2 tracks (compatible with guiding profile FBK80)
Magnetic tape: MB20-20-10-2-R-D-BK80-REFXXXX



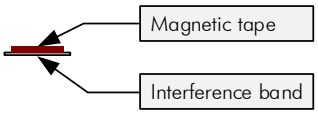
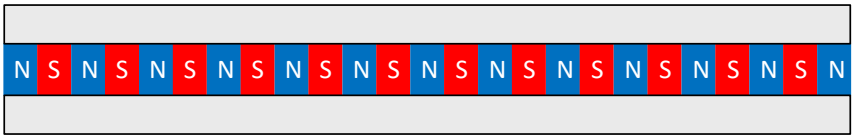
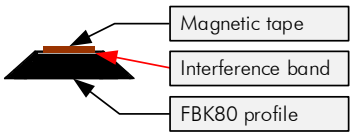


Figure 9: Magnetic Tape Variants

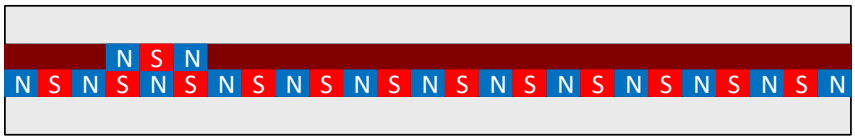
Magnetic Tape with guiding profile FBK80

Standard BK80 - 1 track with guiding profile FBK80
Magnetic tape: MB20-20-10-1-R-D-BK80





Option BK80 – REF - 2 tracks with guiding profile FBK80
Magnetic tape: MB20-20-10-2-RD-BK80-REFXXXX



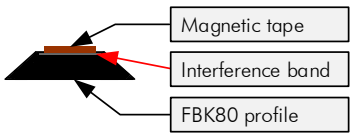
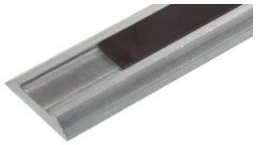


Figure 10: Magnetic Tape Variants with FBK80



7.3 Mounting of the Sensor

When mounting the sensor head, two M3 screws must be used.
The specified mounting tolerances must be adhered to.

7.3.1 Mounting Tolerances EMIX23

Table 2: Mounting Tolerances EMIX23

Tolerances	
Distance sensor / tape	max. 0.8 mm
Pitch	the maximum allowed distance of 0.8 mm may not be exceeded at any position
Yaw and Roll angle	<± 0.5°
Lateral offset	± 2.5 mm (for standard magnetic tape) ± 0.5 mm (for magnetic tape with option REF)

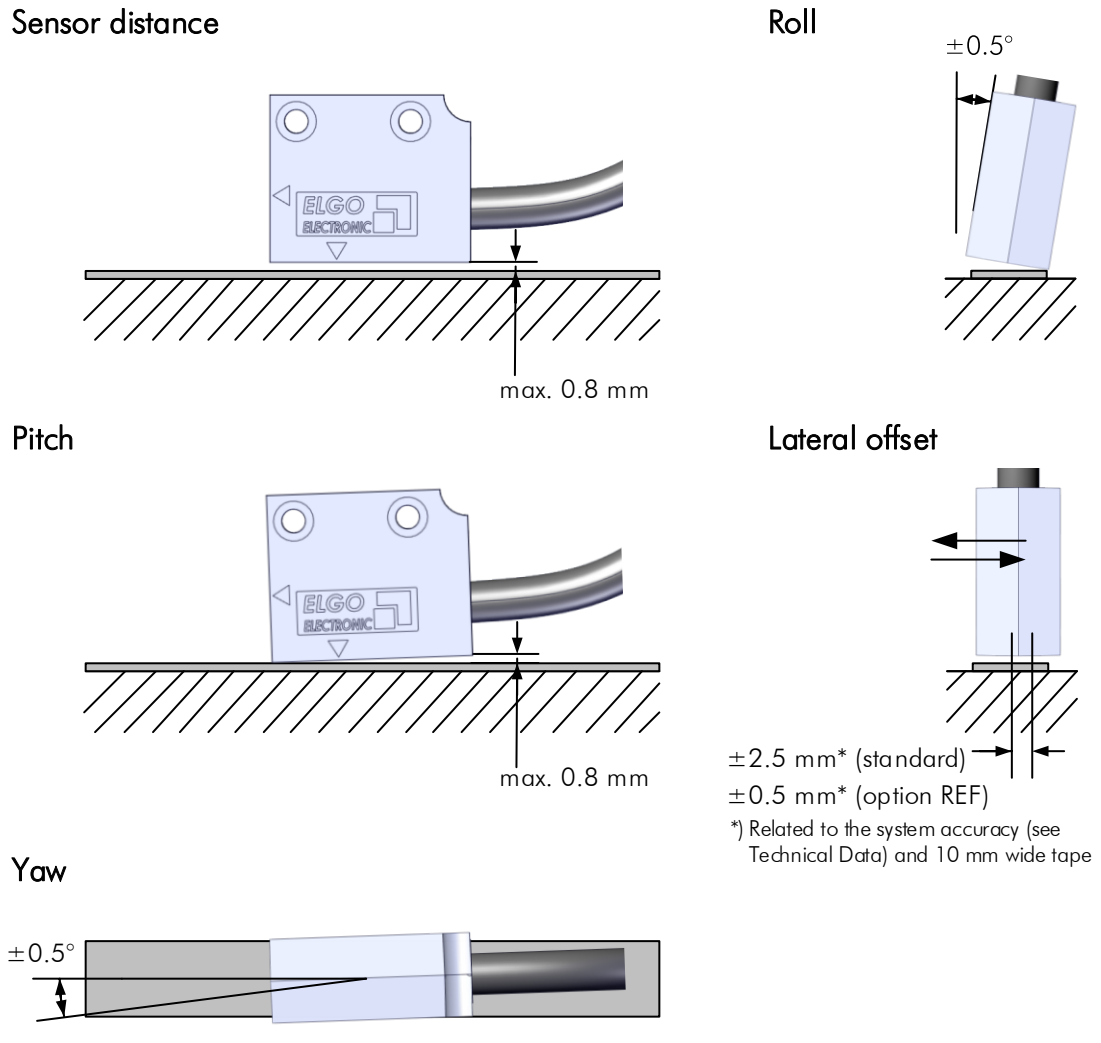


Figure 11: Sensor Tolerances

7.3.3 Active Sensor Areas

7.3.3.1 Sensor areas for horizontal mounting

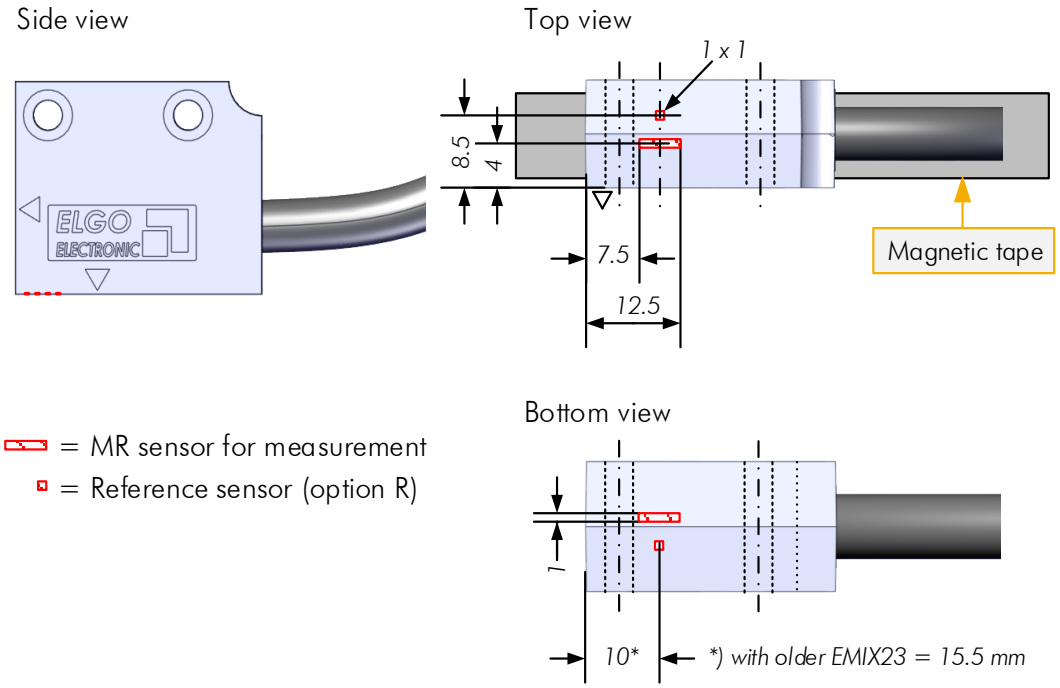


Figure 12: Sensor areas for horizontal mounting

7.3.3.2 Sensor areas for vertical mounting (option L)

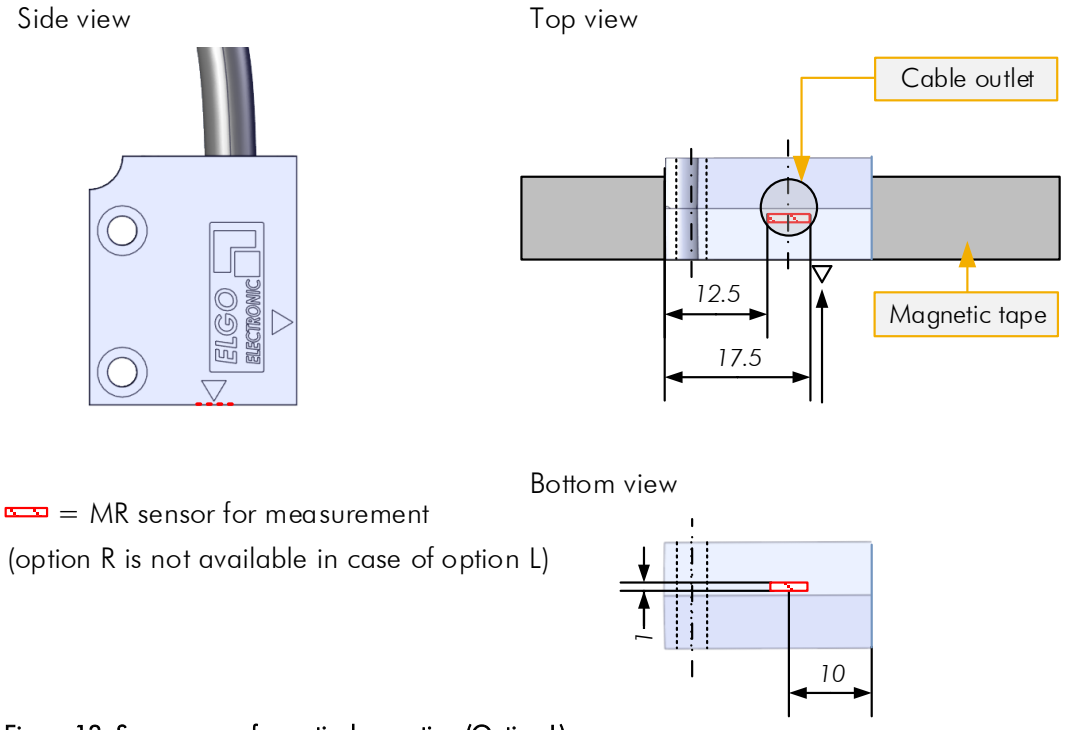


Figure 13: Sensor areas for vertical mounting (Option L)

7.3.4 Mounting Options of the Sensor

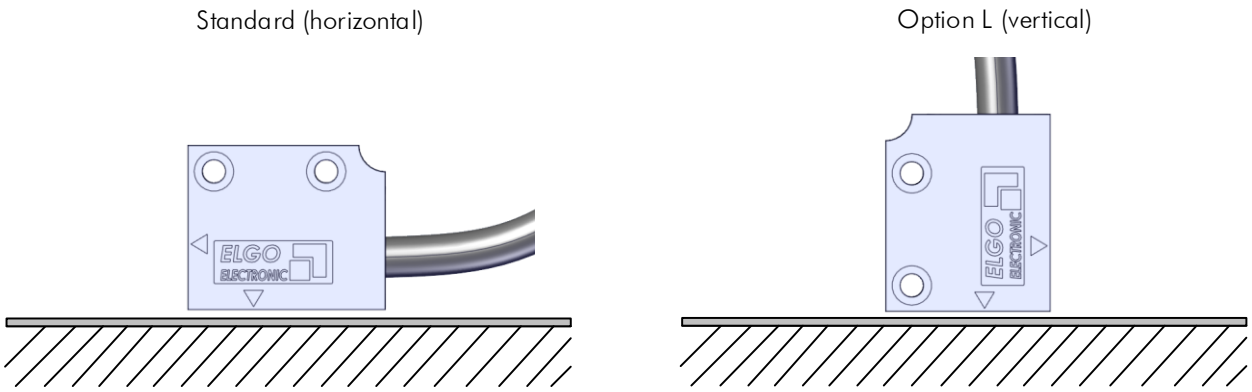


Figure 14: Sensor - Mounting Options

7.3.5 Alignment of the Sensor to the Magnetic Tape

7.3.5.1 Alignment without Reference Pulse (standard)

Standard without reference pulse
Required single-track magnetic tape: MB20-20-10-**1**-R

Top view

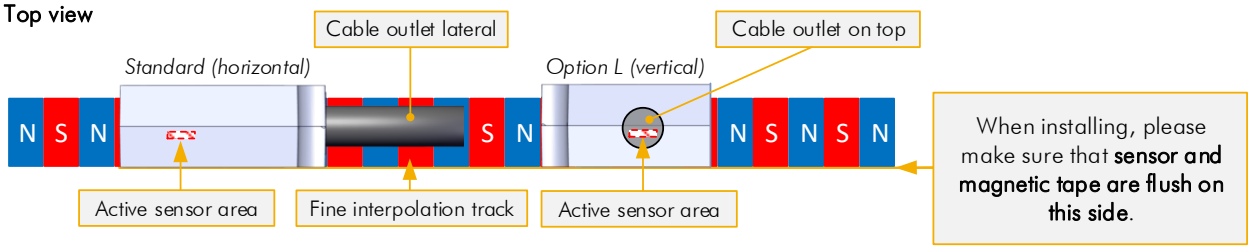


Figure 15: Alignment without Reference Pulse (standard)

7.3.5.2 Alignment with Reference Pulse (Option R)

To ensure that both sensor surfaces (measuring sensor and reference sensor) are positioned correctly above the corresponding magnetic track, make sure that the sensor head is aligned centrically to the magnetic tape center. When ordering, the reference pulse position is starting from the right side of the magnetic tape. The position of the reference pulse can be determined by using the pole finder card available as an accessory (see ☞ 12).

With Reference pulse (Option R) via separate magnetic tape track
Required dual-track magnetic tape: MB20-20-10-**2**-R-REF0154 (example)*

Top view

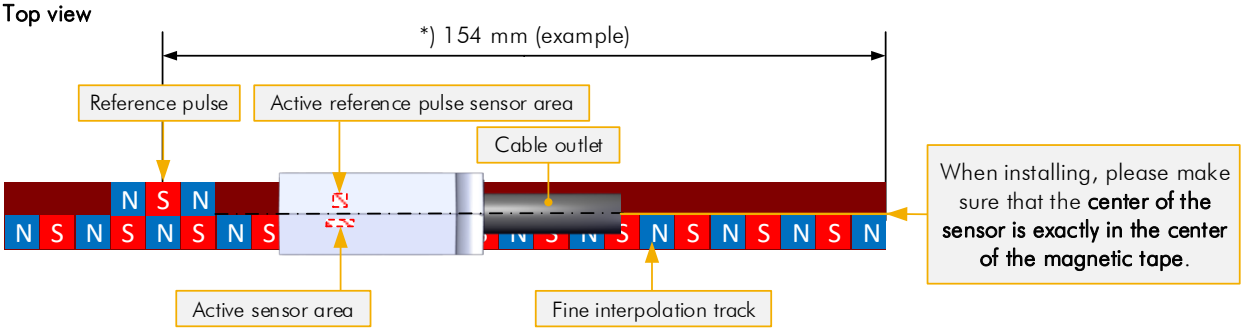


Figure 16: Alignment with Reference Pulse (Option R)

	NOTE: Option R (reference pulse) is only available for the horizontal version (see ☞ 7.3.3).

7.3.6 Mounting of the Guiding Profile FBK80 and End / Connection Profile AFBK80

Controlled thermal expansion:
The magnetic tape can be fixed left, right or centrally - depending on the terminal expansion.

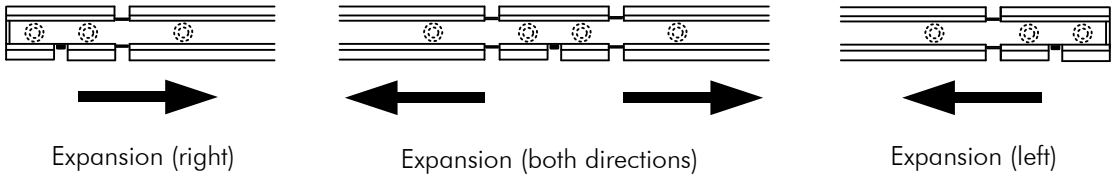


Figure 17: Mounting of FBK80 / AFBK80

7.3.7 Mounting of the FBK80 on beams with different heights

The guide rail is able to compensate unevenness up to max. +/- 0.5mm

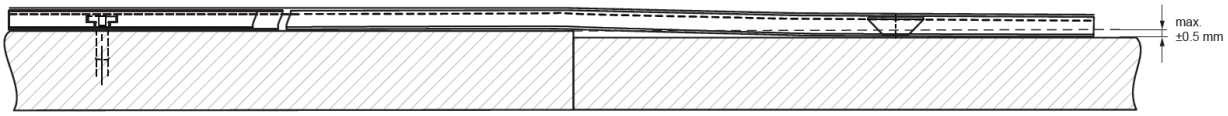


Figure 18: FBK80 on beams with different heights

8 LED for Distance Monitoring (Option E)

EMIX23 encoders which are equipped with an LED are able to indicate the correct or incorrect reading distance between sensor and magnetic tape.

- LED lights green → Reading distance is ok
- LED lights red → Reading distance is not ok

NOTE:
This option is (currently) only available for the version with 5 VDC supply / TTL output levels.

More information about the reading distance ☞ 7.3.1

9 Connections

9.1 Pin Assignments

Table 3: Pin assignment with open cable ends

Connection type	Color	Function	Description
Open cable ends	white	GND	0 V
	brown	VCC	10-30 V / 5 VDC
	green	A	Channel A
	yellow	B	Channel B
	black	Z resp. R[1]	Channel Z / R
	violet	A‘	Channel A inverted
	orange	B‘	Channel B inverted
	grey	Z‘ resp. R‘[1]	Channel Z / R inverted
	Screen[2]	PE	Shield / Earth

Table 4: Pin assignment of option D1 (ELGO standard assignment)

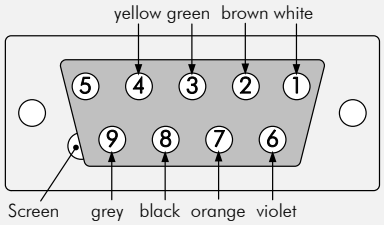
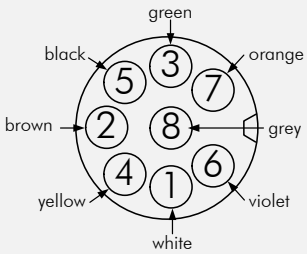
Connection type	Drawing	Pin	Function	Description
9 pin D-SUB connector	 (solder side)	1	GND	0 V
		2	VCC	10-30 V / 5 VDC
		3	A	Channel A
		4	B	Channel B
		6	A‘	Channel A inverted
		7	B‘	Channel B inverted
		8	Z resp. R[1]	Channel Z / R
		9	Z‘ resp. R‘[1]	Channel Z / R inverted
		Screen[2]	PE	Connected to housing

Table 5: Pin assignment of option D3 (round connector suitable for SKA-1)

Connection type	Drawing	Pin	Function	Description
8 pin Round connector	 (solder side)	1	GND	0 V
		2	VCC	10-30 V / 5 VDC
		3	A	Channel A
		4	B	Channel B
		5	Z resp. R[1]	Channel Z / R
		6	A‘	Channel A inverted
		7	B‘	Channel B inverted
		8	Z‘ resp. R‘[1]	Channel Z / R inverted
		Screen[2]	PE	Connected to housing

[1] With reference pulse versions the index pulse output (Z / Z‘) is used as reference pulse output (R / R‘).
[2] Connect shield only at the machine side!

10 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 10.1.
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).

10.1 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 thorough 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 µF / 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

10.2 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 7 .

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

10.3 Maintenance

The device is maintenance-free.

WARNING!
Danger through non-conventional maintenance!

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

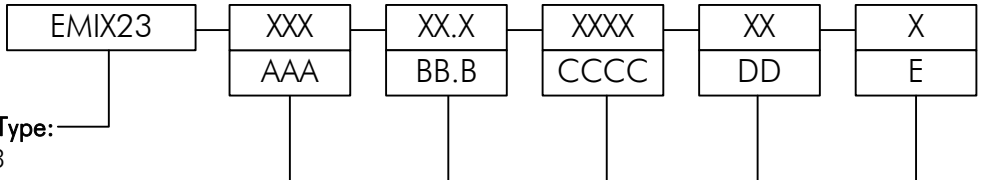
Therefore:
Maintenance works may only be completed by staff that has been authorized and trained by the operator.

10.4 Cleaning

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

11 Type Designation

11.1 Type Designation EMIX23



Series/Type:
EMIX23
Linear encoder

Version No.:
000 = Standard version

Signal cable length (in m):
01.5 = 1.5 m standard length

Resolution in µm:
0001 = 0.001 mm at 4 edge triggering

Power supply / output levels:
00 = 10-30 VDC / 10-30 V-HTL
01 = 10-30 VDC / 5 V-TTL
11 = 5 VDC / 5 V-TTL

Options:
D1 = Connection by 9 pin D-SUB, ELGO standard assignment
D3 = Connection by round connector (compatible with SKA1 signal cable)
L = Vertical position of the sensor*
R = With free defineable single reference pulse
E = LED > green LED = reading distance is ok / red LED = reading distance is not ok.**

* Option L cannot be combined with Option R
** Currently only available with power supply: 5 VDC / output levels: 5 V-TTL

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

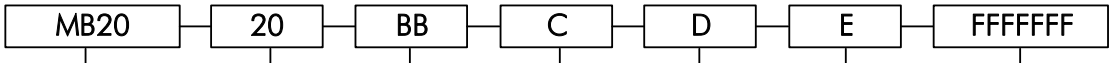
11.1.1 Ordering Examples for EMIX23

EMIX23-000-01.5-0001-00
EMIX23 standard, with 1.5 m signal cable, 0.001 mm resolution, 10 … 30 VDC power supply, output levels HTL, connections via pre-assembled cables (open wires)

EMIX23-000-01.5-0001-00-D1-R-E
EMIX23 standard, with 1.5 m signal cable, 0.001 mm resolution, 10 … 30 VDC power supply, output levels HTL, connections via 9pin. D-SUB, reference pulse and LED for reading distance

EMIX23-000-01.5-0005-11
EMIX23 standard, with 1.5 m signal cable, 0.005 mm resolution, 5 VDC power supply, output levels TTL, connections via pre-assembled cables (open wires)

11.2 Type Designation Magnetic Tape



Bezeichnung:
MB20 = Incremental magnetic tape

Basic pole pitch:
20 = 2 mm pole pitch

Tape Widht in mm:
10 = 10 mm

Number of Tracks:
Number of tracks
1 = Single track system
2 = Dual track system (necessary for reference pulse)

Tape Structure:
R = Standard: Magnetic tape on interference band
(glued with adhesive tape on the interference band side
and glued cover tape (supplied)

Options:
B = Without adhesive tape on the interference band side
C = Without supplied cover tape
D = Without adhesive tape and cover tape (B+C)

Additional Information:
REF 0154 = Reference pulse after 154 mm
BK80 = 8 mm magnetized plastic tape on a 10 mm carrier tape
EPS = single pole mangetized (necessary with a resolution of ≤ 1 µm!)

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

11.2.1 Ordering Examples for Magnetic Tape

MB20-20-10-1-R-EPS (standard)

Magnetic tape with 2 mm pole pitch, 10 mm wide, single track system, bonded with interference material.
With single-pole magnetization (required for high sensor-resolutions from 1 µm on).

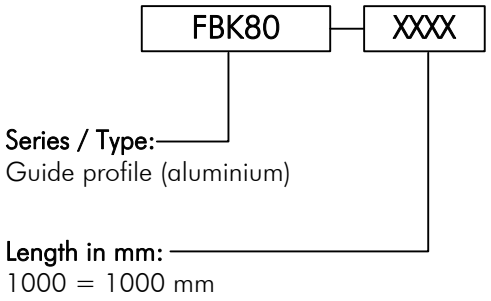
MB20-20-10-1-R (standard)

Magnetic tape with 2 mm pole pitch, 10 mm wide, single track system, bonded with interference material.
Without single-pole magnetization (suitable for sensor-resolutions coarser than 1 µm, e.g. 0.005 mm).

MB20-20-10-2-R-D-BK80-REF0154

Magnetic tape with 2 mm pole pitch, 10 mm wide, dual track system, standard: magnetic tape bonded with interference material, without adhesive tape and cover band, 8 mm plastic tape on a 10 mm carrier tape, single reference pulse 154 mm from the right side (cable output right). Without single-pole magnetization (suitable for sensor-resolutions coarser than 1 µm, e.g. 0.005 mm).

11.3 Type Designation Guide Profile



Standard length in stock
(FBK80-0997)

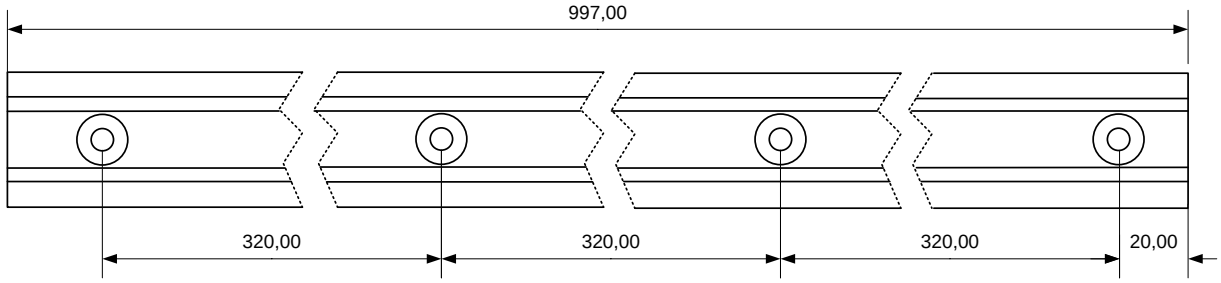


Figure 19: FBK80 Drawing

NOTES

To order the guide profile, please use the order code above (type designation).

12 Accessories

Table 1: Accessories

Type designation	Description
FW2070	Guide carriage for EMIX23
FS1000, FS1500 or FS2000	Guide rail for magnetic tape (length 1.0, 1.5 or max. 2.0 m). For larger distances several guide rails can be rowed together.
AP-00-XX	Cover profile (length: AP-00-1m = 1.0 m / AP-00-2m = 2.0 m)
Magnetic tape end cap set (10 mm)	2 end caps (10 mm) and two M3 screws; additional fixation in the radial and linear range and protection of the magnetic tape ends
FBK80	Guiding profile for magnetic tape BK80
AFBK80	Connection profile for the connection of FBK80
POSU	Pole finder card 85 x 55 mm for magnetic tapes

Notes:

Notes:

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