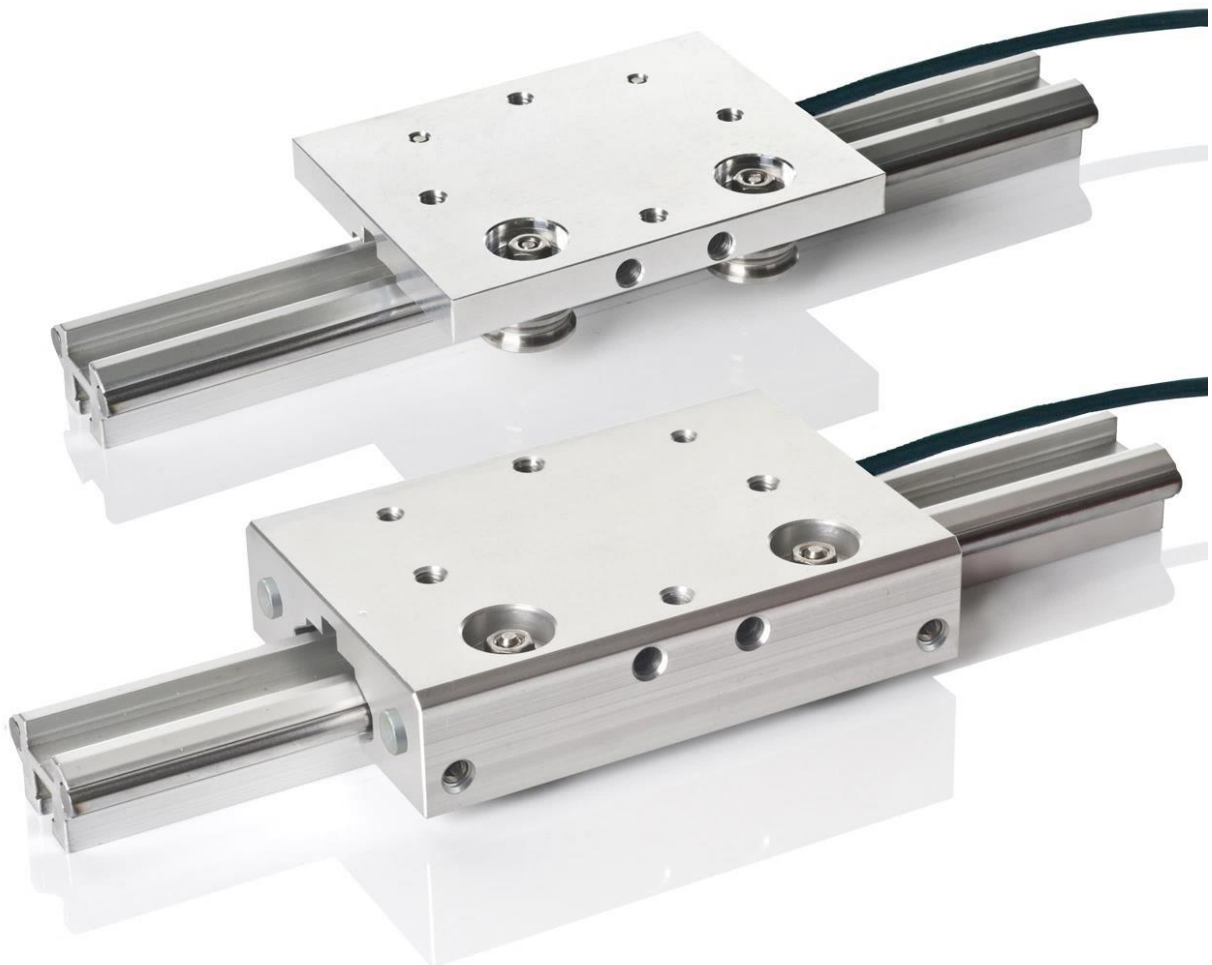


Operating Manual

SERIES FOW/FLW-000

Guided Linear Units with Magnetic Incremental Linear Encoder



- Guide carriage available in open (FOW) or closed (FLW) design
- Roller guides with high guiding accuracy and smooth running
- Optionally with already installed incremental magnetic sensor
Available encoder resolutions: 0.1 mm, 0.025 mm and 0.01 mm
- The IP67-protected magnetic sensor is integrated directly and in the correct reading position into the guide carriage
- Additional position indicators with 24 VDC or battery supply available (external and mounting on carriage possible)

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2 General, Safety, Transport and Storage

2.1 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.


2.2 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.

2.3 Statement of Warranties

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

2.4 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.

2.5 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.

2.6 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>

2.7 Conventional Use

The ELGO-device is only conceived for the conventional use described in this manual.
The linear measuring and guiding unit FOW/FLW-000 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.

2.8 Safety Instructions for Transport, Unpacking and Loading



CAUTION!

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

2.9 Handling of Packaging Material

Notes for proper disposal: ↗ 2.4

2.10 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.

2.11 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 (↗ 5) needs to be observed
- Relative humidity (↗ 5) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

3 Introduction

3.1 Essential Features

- High speeds and accelerations due to low mass and minimal rolling friction
- Very good guiding accuracy and smooth running
- Good load-bearing capacity for forces and moments
- High operational reliability due to robust construction and insensitivity to dirt
- Wide range of possible applications due to any installation position and almost unlimited travel distances
- Simple assembly, as complete system
- Long wear-free service life
- Integrated lubrication / scraper elements
- Optionally with incremental magnetic linear encoder
- Rust-protected design without load reduction



Figure 1: FLW and FOW with guide rail

3.2 System Structure and Features

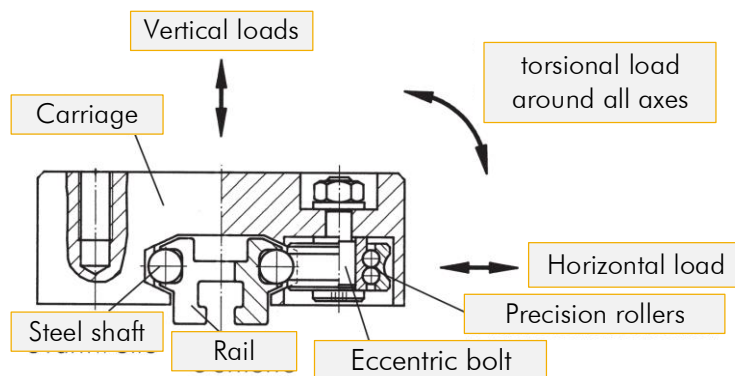


Figure 2: Mechanical system structure

The FLW and FOW linear guides consist of composite rails with high-precision guideways and a carriage with four precision rollers. The rail body consists of a high-quality aluminium alloy in which hardened steel shafts are mounted.

The track rollers are optimized double row angular contact ball bearings. A reinforced outer ring with high-precision support profile ensures precise rolling with high radial and axial load capacity at the same time. They are fixed with steel bolts in the carriage; two eccentric bolts are used to adjust the carriage without backlash.

3.3 Integrated Measuring System

On request, the mechanical FOW/FLW-000 linear units are supplied complete with an integrated incremental measuring system, which is available in various versions and resolutions (0.1 mm / 0.025 mm / 0.01 mm). More information about the measuring systems can be found in section 4.5.

The IP67-protected magnetic sensor is integrated directly and in the correct reading position into the guide carriage. The sensor scans the magnetic tape in the guide rail without contact and therefore absolutely wear-free. In addition, the system can be equipped with a 24 VDC- or battery-operated position indicator which can be installed external or directly on the guide carriage. For more information refer to section 4.6.

3.4 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. Depending on the selected measuring system, the magnetic tape has a pole pitch of 2 mm, 2.5 mm or 5 mm.

A special evaluation electronic (translator) which is integrated in the housing of the 9-pin D-SUB connector 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. This section is not relevant for systems in combination with battery-powered ELGO indicators.

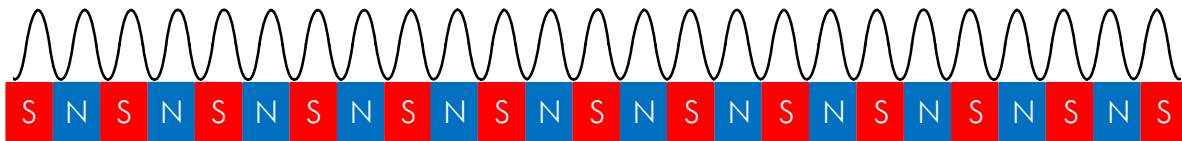
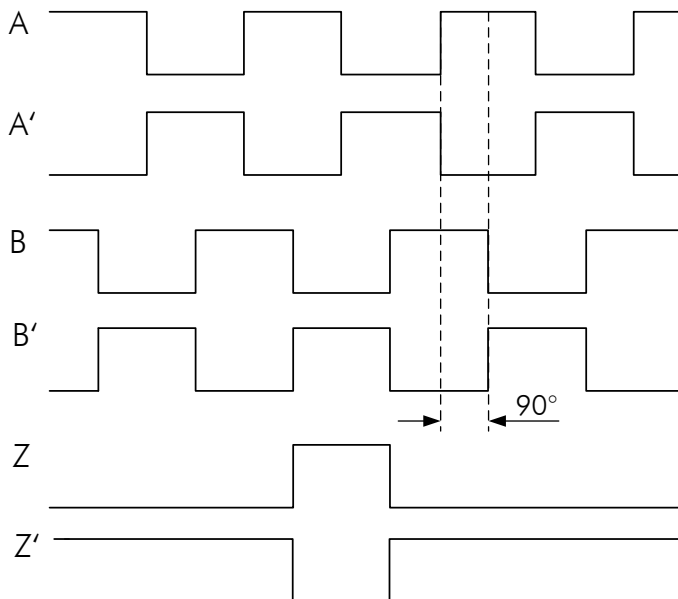


Figure 3: Magnetic tape coding

3.5 Pulse Diagram (LMIX1 / EMIX1)

When using the basic measuring systems LMIX or EMIX (see § 4.5), an encoder-compatible square wave signal output is provided as shown in the following figure:



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

Further a periodic index pulse occurs every 5 mm (for LMIX1) resp. 2 mm (for EMIX1).

Figure 4: Pulse diagram

In combination with the battery-powered ELGO indicator IZ15E or IZ16E there is no square wave signal output, as the sine signals supplied by the MS-250 sensor used here (§ 3.4) are processed directly by the display unit.

4 Guide Carriages: Variants and Components

4.1 FLW (closed Guide Carriage)

The "FLW" carriages are characterized by their compact, closed design, low mass and an optimized arrangement of the precision guide rollers. The application-oriented guide clearance resp. a slight pretensioning to the rail is continuously adjustable.

- The installation position is not subject to any restrictions
- The aluminium bodies are anodized on all sides
- Standardly equipped with wipers and lubricating elements for the guideways
- The track rollers are generally maintenance-free



Figure 5: FOW (closed guide carriage)

4.2 FOW (open Guide Carriage)

The open carriage "FOW" is a simple variant of the closed carriages.

As with the closed version, the track rollers are fitted with 2 concentric and 2 eccentric axes in order to enable the guide to be adjusted without backlash.

Wipers and lubrication elements are not required for of this variant.



Figure 6: FOW (open guide carriage)

4.3 Guide Rail FS25

The "FS25" guide rail is a composite construction that combines the high precision and hardness of the steel shaft with the low mass of the aluminium profile. The advantageous design of the cross-section allows different mounting options for easy installation.

- T-slot mounting with hexagonal bolts (DIN 931/933) is generally applicable
- The rail profile is standardly anodized
- Stainless steel versions on request
- Order reference see type designation (☞ 8.3)



Figure 7: Guide rail FS25



IMPORTANT:

Only standard lengths up to a maximum of 2000 mm are available. Higher lengths can be achieved by arranging several rail elements in one row. For example 4000 mm can be achieved by arranging two 2000 mm elements together.

REMARK:

Several rail elements, which are arranged in one row, have flush milled joints.

4.4 Measuring System Integration

Both carriage types (FLW and FOW) can be equipped with an incremental measuring system (magnetic sensor) for scanning ELGO magnetic tapes.

For this purpose, there is a corresponding milling groove on the underside of the carriage, into which the sensor is integrated and fixed with the correct distance to the magnetic tape.

This is done with two set screws through the two mounting holes on the side of the carriage (see figure). The signal cable of the IP67 protected sensor is additionally provided with a strain relief.

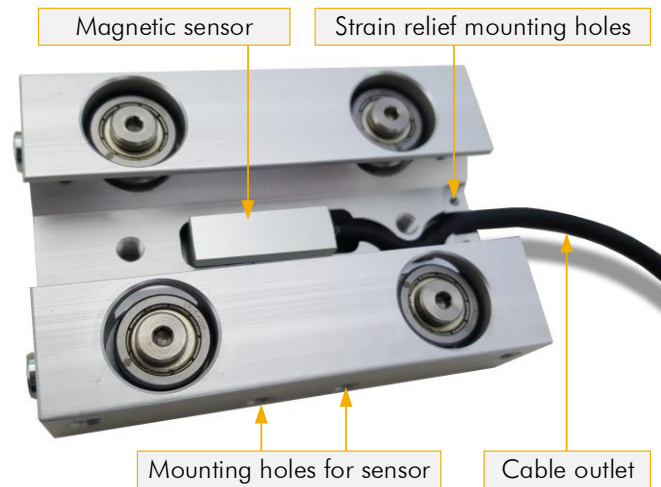


Figure 8: Sensor groove in the carriage

4.5 Available Measuring Systems

Depending on the requirements, different measuring systems with different resolutions are available. The corresponding variants are clearly presented in the following table:

Table 1: Available measuring systems

Base System →	LMIX1	EMIX1	IZ15E (☞ 4.6)	IZ16E (☞ 4.6)
Resolution	-	-	0.1 / 0.01 mm (switchable)	0.1 / 0.01 mm (switchable)
Resolution (1-edge triggering)	0.025 mm	0.01 mm	-	-
Resolution (4-edge triggering)	0.1 mm	0.025 mm	-	-
Repeat accuracy	± 1 increment	± 1 increment	± 2 increments	± 2 increments
Power supply	10 ... 30 VDC or 5 VDC	10 ... 30 VDC or 5 VDC	1.5 V battery	1.5 V battery
Signal levels	HTL 10 ... 30 VDC or TTL-Line-Driver	HTL 10 ... 30 VDC or TTL-Line-Driver	-	-
Operating speed	max. 4 m/s	max. 4 m/s	max. 4 m/s	max. 4 m/s
System accuracy in μm at 20 °C	$\pm (25 + 20 \times L)$ L = measuring length in m	$\pm (20 + 20 \times L)$ L = measuring length in m	$\pm (25 + 20 \times L)$ L = measuring length in m	$\pm (25 + 20 \times L)$ L = measuring length in m
Standard cable length	1.5 m	1.5 m	1.5 m	1.5 m
Max. cable length	30 m	30 m	2 m	2 m
Order code of rail	FS25-xxx0-1	FS25-xxx0-2	FS25-xxx0-Z	FS25-xxx0-Z
Order code of tape	MB20-50-10-1-R	MB20-20-10-1-R	MB20-25-10-1-R	MB20-25-10-1-R
Tape pole pitch	5 mm	2 mm	2.5 mm	2.5 mm
Sensor protection class	IP67	IP67	IP67	IP67
Online information	☞ LMIX1	☞ EMIX1	☞ IZ15E	☞ IZ16E

The respective order references and options can be found in section ☞ 8.1.

4.6 Available ELGO Indicators

In addition to the basic measuring systems LMIX1 or EMIX1, the position indicators Z25 and Z50 with 24 VDC power supply voltage are available (see 4.5). Alternatively, ELGO offers the battery-operated indicators IZ16E and IZ15E, which do not require an external measuring system, since both indicators are equipped with a fix connected MS-250 magnetic sensor.

4.6.1 Indicators for external Mounting



Figure 9: Indicators for external Mounting

All position displays are easy to operate via membrane keyboard. They allow the input of a pulse multiplier, the number of decimal places, the counting direction and a reference value. In addition, they can be switched from absolute to incremental measurement and from mm to inch.

The following table shows the most important key data of these indicators. Further information can be found by clicking the links in the line "Online information" or on the elgo.de homepage. There are also downloads of the corresponding operating instructions as well as flyers/data sheets.

Table 2: Available position indicators

Indicator unit →	Z25	Z50	IZ15E	IZ16E
Order reference	Z25-000	Z50-000	IZ15E-002	IZ16E-043
Maximum resolution	0.01 mm	0.01 mm	0.01 mm	0.01 mm
Power supply voltage	24 VDC ± 20 %	24 VDC ± 20 %	1.5 V battery	1.5 V battery
Current consumption	max. 25 mA	max. 50 mA	max. 1 mA	max. 1 mA
Housing dimensions	72 x 48 x 27 mm	96 x 72 x 27 mm	72 x 48 x 36 mm	96 x 72 x 53 mm
Panel cut out	W x H = 68 x 45 mm	W x H = 93 x 67 mm	W x H = 68 x 45 mm	W x H = 93 x 67 mm
Protection (installed)	IP54 (with seal)	IP54 (with seal)	IP54 (with seal)	IP54 (with seal)
Online information	Z25	Z50	IZ15E	IZ16E

In section "Accessories" (8.4) the following additional information can be found:

- Order references for Z25 and Z50
- External 24 VDC power supply for Z25 and Z50
- Order references for IZ16E and IZ15 as replacement device

4.6.2 Carriage with battery powered IZ16E Indicator

Both carriages can optionally be equipped with battery powered IZ16E indicator. The indicator has a surface mounting housing with a mounting bracket which is fastened directly on the carriage. No wiring is required, as the indicator is already connected with to the MS-250 magnetic sensor.



Figure 10: IZ16E indicator for carriage mounting

The resolution can be switched via parameter level between 0.1 mm and 0.01 mm.

The system works completely self-sufficient. Since there is no external power supply, no cables are required.

Optionally, the device can also be mounted externally (e. g. in a panel cut-out). In this case, the indicator must be ordered separately under the order designation "IZ16E-043".

Alternatively, the slightly smaller battery-powered indicator "IZ15E-002" can be used. However, this is only intended for external mounting.

Further information can be found in section „ Indicators for external Mounting“ (☞ 4.6.1).

- Order references for IZ16E and IZ15E see “Type Designation” in section ☞ 8.1
- Order references for IZ16E and IZ15E as replacement device see “Accessories” ☞ 8.4

5 Technical Data

5.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the guide carriage and (if also ordered) on the measuring system and indicator unit. The label indicates the exact type designation (=order reference 8) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

5.2 Dimensions Carriage FLW (closed)

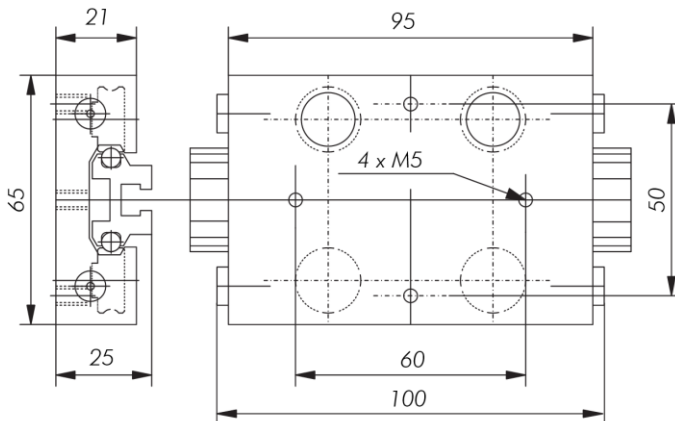


Figure 11: Dimensions FLW

5.3 Dimensions Carriage FOW (open)

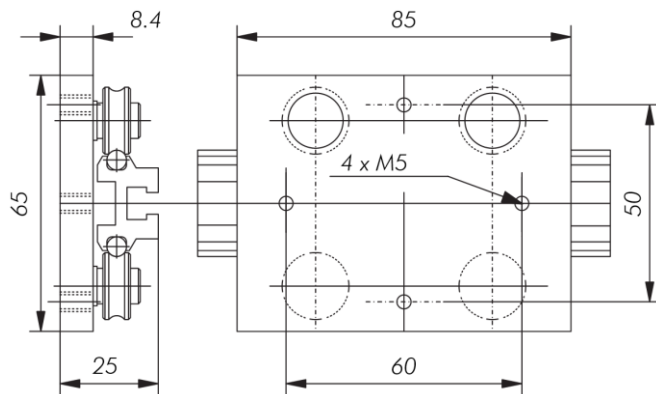


Figure 12: Dimensions FOW

5.4 Dimensions Guide Rail FS25

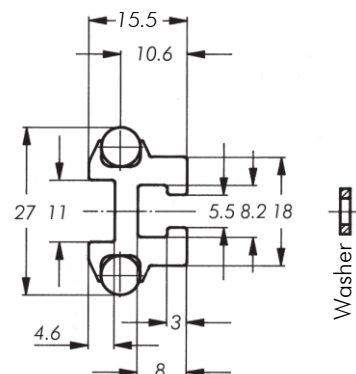


Figure 13: Dimensions guide rail FS25

5.5 Technical Data FLW / FOW

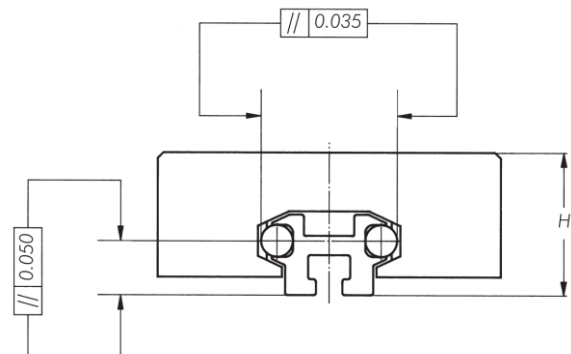
Table 3: Technical data FLW / FOW

Scope of Application	
Speed	$V_{\max} = 10 \text{ m/s}$ (mechanically)
Acceleration	$a_{\max} = 50 \text{ m/s}^2$
Temperature range	$T = -20^\circ \text{C} \dots + 80^\circ \text{C}$
Weight	
FLW (without sensor)	ca. 270 g
FOW (without sensor)	ca. 160 g
Guide rail FS25-XXXX	ca. 800 g per meter
Length of Guide Rail	
Guide rail FS25-XXXX	max. 2000 mm (higher lengths possible by arrangement in one row ☞ 4.3)
Measuring Systems and Position Indicators	
Sensor LMIX1	Technical data, Information and documents are available on elgo.de ☞ LMIX1
Sensor EMIX1	Technical data, Information and documents are available on elgo.de ☞ EMIX1
Sensor + Indicator IZ15E	Technical data, Information and documents are available on elgo.de ☞ IZ15E
Sensor + Indicator IZ16E	Technical data, Information and documents are available on elgo.de ☞ IZ16E
Indicator Z25	Technical data, Information and documents are available on elgo.de ☞ Z25
Indicator Z50	Technical data, Information and documents are available on elgo.de ☞ Z50

5.6 Guiding Precision FLW / FOW

Table 4: Guiding precision FLW / FOW

Guiding precision	
Guiding accuracy	0.5 mm/m
Installation height H - tolerance	$\pm 0.2 \text{ mm}$
Maximum deviation on one rail	$\pm 0.1 \text{ mm}$



5.7 Forces and Torques FLW / FOW

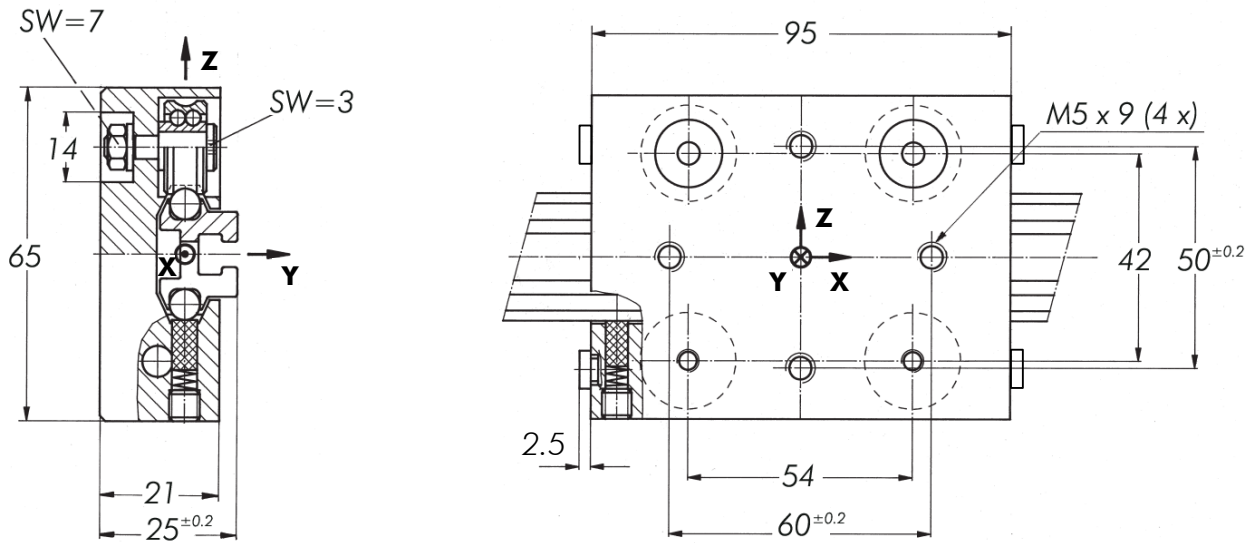


Figure 14: Forces and Torques FLW

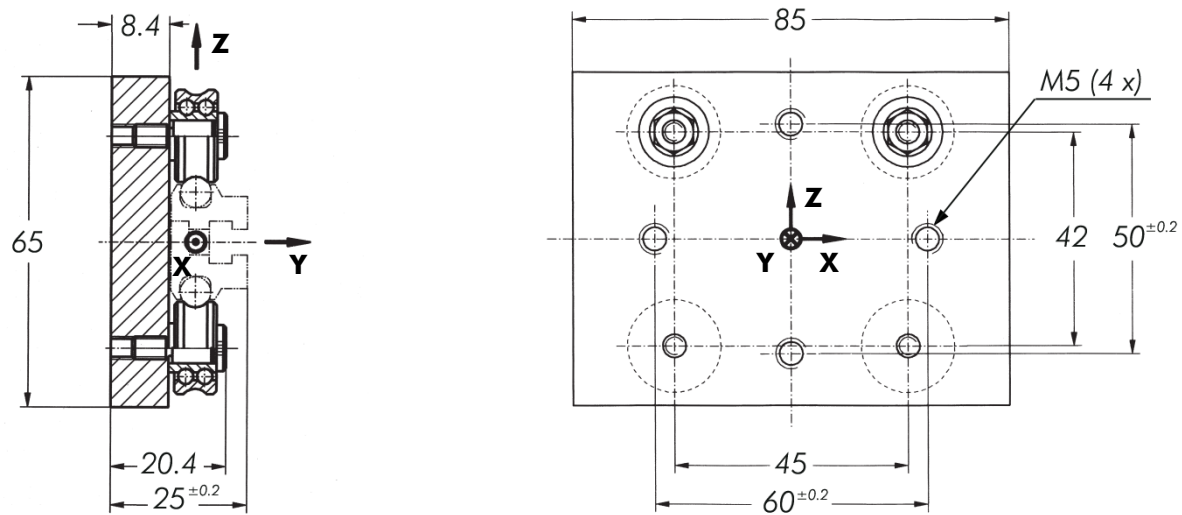


Figure 15: Forces and Torques FOW

Table 5: Forces and Torques FLW / FOW

Magnitude	Maximum permissible loads: Forces in N				Torques in Nm					
	$F_{y,per.}$	$F_{0y,per.}$	$F_{z,per.}$	$F_{0z,per.}$	$M_{x,per.}$	$M_{0x,per.}$	$M_{y,per.}$	$M_{0y,per.}$	$M_{z,per.}$	$M_{0z,per.}$
FLW / FOW	400	650	700	700	4,4	7,2	19	19	11	18

5.8 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

Table 6: Technical data magnetic tape

Magnetic Tape MB20-XX-10-1-R	
Coding	incremental, single track system
Magnetic tape for LMIX1	MB20-50-10-1-R → pole pitch 5.0 mm (see ↗ 8.2)
Magnetic tape for EMIX1	MB20-20-10-1-R → pole pitch 2.0 mm (see ↗ 8.2)
Magnetic tape for IZ16E / IZ15E	MB20-25-10-1-R → pole pitch 2.5 mm (see ↗ 8.2)
Operation temperature installed	-20 ... +65° C
Storage temperature uninstalled	Short-term: -10 ... +60° C Medium-term: 0 ... +40° C Long-term: +18° C
Gluing temperature:	+18 ... +30° C
Relative humidity	max. 95 %, non-condensing
Accurateness 20°C in mm (L = measuring length in meters)	LMIX1: ± (25 μm + 20 μm x L) EMIX1: ± (20 μm + 20 μm x L) IZ16E / IZ15E: ± (25 μm + 20 μm x L)
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	10 mm (± 0.2 mm) x 1.8 mm (± 0.1 mm), tape construction "R" (↗ 8.2)
Length expansion coefficient	$\alpha \approx 16 \times 10^{-6} \text{ 1/K}$
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)
Bending radius	min. 150 mm
Available lengths	32 m (up to 70m on request)
Weight magnetic tape	ca. 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

More information about the magnetic tape can be found in section ↗ 6.4

6 Installation and First Start-Up

6.1 Installation of the FLW / FOW Mechanics

6.1.1 Backlash-free Adjustment

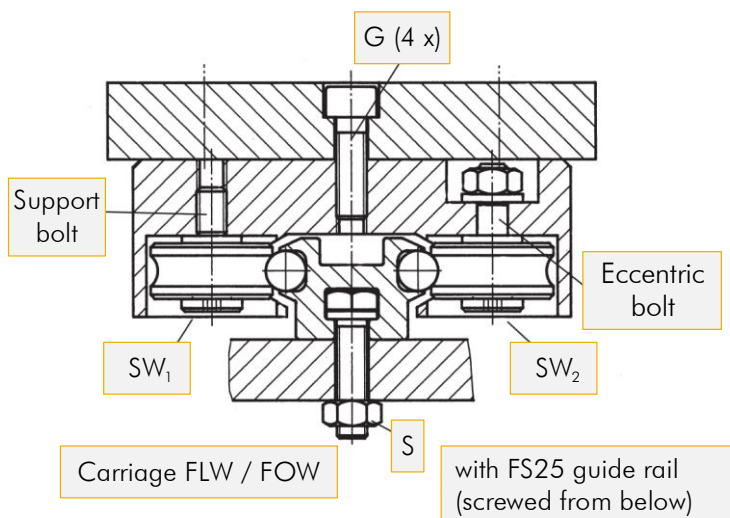
To do this, place the carriage over the support bolts on the rail and adjust the backlash-free condition by using the eccentric bolts. When correctly adjusted, the carriage can be moved easily and all rollers rotate.



PLEASE NOTE: Unnecessarily high initial tension reduces the service life!

Table 7: Tightening torques M_A

Tightening torques M_A	
Guide carriage	FLW / FOW
Connection threads G	5,5 Nm
Eccentric bolts (SW ₂)	2,4 Nm
Support bolts centr. (SW ₁)	2,4 Nm
Guide rail	FS25
Screw size S	M5
Tightening torque	6 Nm



6.1.2 Wipers and Lubrication Elements (FLW only)

The closed carriages of type FLW have 4 integrated wipers and lubrication elements on the side. In order to achieve a long, wear-free service life of the systems, it is recommended to lubricate the guideway. The oil chambers of the integrated lubricating elements with felt wipers (see figure right) are supplied by the 4 lubricating nipples on the front. These must be filled with lubricating oil before commissioning.

- The viscosity should be approx. 300 mm²/s at T = 40° C
- The relubrication interval depends on the respective application and environmental conditions

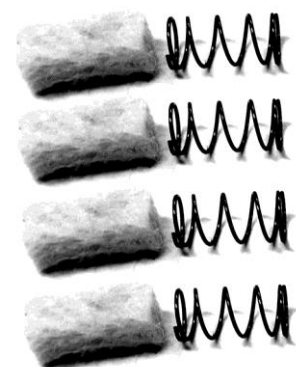


Figure 16: Felt wipers

The track rollers do not require re-lubrication, they are sealed and service life greased.



REMARK:

If necessary, the felt wipers and springs can be removed by loosening the side set screw. However, the grease nipples cannot be removed. In this case, we therefore recommend the use of the open and more compact guide carriage type "FOW".

6.2 Installation Measuring System / Indicator

In order to install and commission the respective measuring system and (if ordered) position indicator, please follow the corresponding operating manuals in addition to this document. The documents are available for download as PDF files on www.elgo.de:

Table 8: Operating manuals of measuring systems and indicators

Download links to the operating manuals

Sensor LMIX1	https://www.elgo.de/fileadmin/user_upload/pdf/manual/sensors/LMIX1-000-MA-E.pdf
Sensor EMIX1	https://www.elgo.de/fileadmin/user_upload/pdf/manual/sensors/EMIX1-000-MA-E.pdf
System IZ15E	https://www.elgo.de/fileadmin/user_upload/pdf/manual/indicators/IZ15E-001-SI-DE.pdf
System IZ16E	https://www.elgo.de/fileadmin/user_upload/pdf/manual/indicators/IZ16E-000-SI-DE.pdf
Indicator Z25	https://www.elgo.de/fileadmin/user_upload/pdf/manual/indicators/Z25-000-MA-E.pdf
Indicator Z50	https://www.elgo.de/fileadmin/user_upload/pdf/manual/indicators/Z50-000-MA-E.pdf



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 qualified staff that has been trained and authorized by the operator.

6.3 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.



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.

6.4 Installation of the Magnetic Tape

For rail lengths up to 2 meters, the magnetic tape (if ordered) is already installed in the rectangular groove of the FS25 rail. No further steps are required. Since the maximum available rail length is 2 m, higher rail lengths can be achieved by arranging several rail elements in one row. In this case, the magnetic tape must be installed by the customer. The necessary steps are described below.



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.

6.4.1 The Magnetic Tape MB20-XX-10-1-R

The exact type designation of the magnetic tape depends on the selected basic measuring system. Detailed information can be found in sections 5.8 and 8.2.

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 Figure 17: Components of the magnetic tape

- 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.

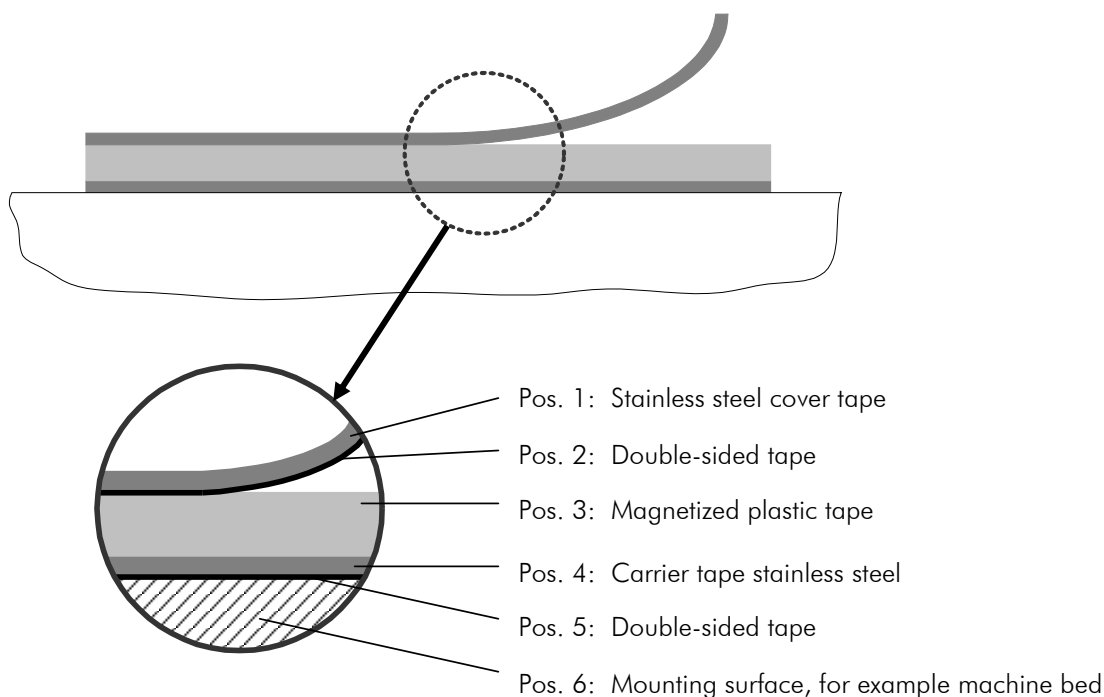


Figure 17: Components of the magnetic tape

6.4.2 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.

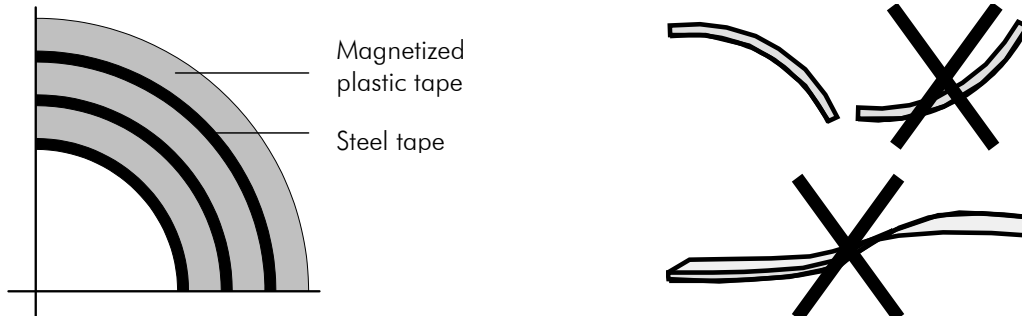


Figure 18: Handling

6.4.3 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.

6.4.4 Cutting and Gluing

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

$$\text{Length of the Magnetic Tape} = \text{Measuring Length} + \text{Length of the Guide Carriage}$$



NOTE!

An already glued magnetic tape is destroyed after the removal, and cannot be used again.

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.

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 (☞ 6.4.3)
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

6.4.1 Resistance against Chemical Influence

Table 9: 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 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 7.1. 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).

7.1 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 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

7.2 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 6.



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

7.3 Maintenance

The electronic components of the overall system (sensor, display) are maintenance-free.

The track rollers do not require re-lubrication. They are sealed and greased for their service life.

The carriage type "FLW" has scraper and lubrication elements. For more information see  6.1.2.

7.4 Cleaning

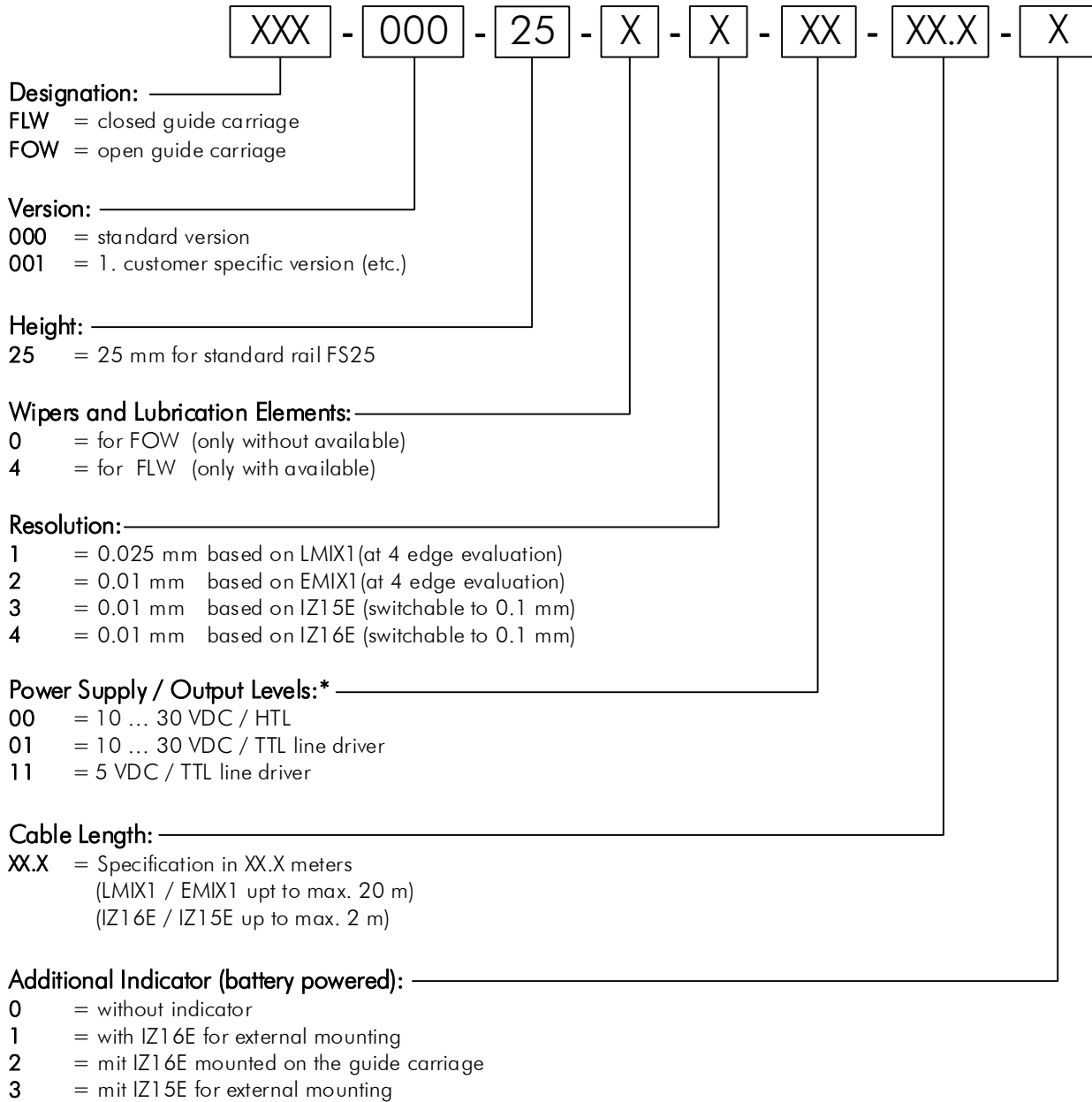


WARNING!

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

8 Type Designation

8.1 Type Designation Guide Carriage FLW / FOW



*) Power Supply and Output Levels are not relevant for IZ16E / IZ15E, please indicate „XX“

8.2 Type Designation Magnetic Tape

MB20 - XX - 10 - 1 - R

Designation: _____

MB20 = incremental magnetic tape

Basic Pole Pitch: _____

20 = 2.0 mm for EMIX1

25 = 2.5 mm for IZ16E and IZ15E

50 = 5.0 mm for LMIX1

Magnetic Tape Width: _____

10 = 10 mm for FS25 guide rail

Number of Magnetic Tracks: _____

1 = single track system

Magnetic Tape Construction: _____

R = standard construction: magnetic tape on magnetized steel band (bonded on the magnetic short-circuit side with a separate cover band and equipped with sticky tape)

Available magnetic tape lengths: 0.5 ... 70 m

Please indicate the required length in XX.X meters

8.3 Type Designation Guide Rail

FS25 - XXX0 - X

Designation: _____

FS25 = Guide rail for FLW / FOW

Guide Rail Length: _____

XXX0 = Length in mm (e.g. 1000 mm or 0350 mm)

- maximum available rail length: 2000 mm

- higher lengths are possible by arranging in one row*

FOW: Total Length = Measuring Length + 85 mm

FLW: Total Length = Measuring Length + 100 mm

Magnetic Tape: _____

0 = without magnetic tape

Z = with glued-in MB20-25 magnetic tape (for IZ16E / IZ15E)

1 = with glued-in MB20-50 magnetic tape (for LMIX1)

2 = with glued-in MB20-20 magnetic tape (for EMIX1)

*) Several rails, which are arranged in one row, have flush milled joints

The following applies to magnetic tape orders:

- For lengths up to 2000 mm, the magnetic tape is already factory-installed.
- For lengths over 2000 mm the customer installs the magnetic tape because the rail elements have to be arranged together during assembly.

8.4 Accessories

Table 10: Accessories

Order Designation	Description
IZ16E-043-8-XX.X*-0-AG	Battery powered IZ16E indicator in a built-on housing for <u>carriage mounting</u> . The housing is equipped with an adjustable mounting bracket. The sensor cable is connected via a <u>fixed cable outlet</u> to the indicator. *) Please indicate the required length in XX.X meters (max. 2.0 m available)!
IZ16E-043-8-XX.X*-1-AG	Battery powered IZ16E indicator in a built-on housing for <u>carriage mounting</u> . The housing is equipped with an adjustable mounting bracket. With <u>screwable round connector</u> instead of fixed cable outlet. *) Please indicate the required length in XX.X meters (max. 2.0 m available)!
IZ16E-043-1-XX.X*-0	Battery powered IZ16E indicator in a built-in housing for <u>panel mounting</u> . The sensor cable is connected via a <u>fixed cable outlet</u> to the indicator. *) Please indicate the required length in XX.X meters (max. 2.0 m available)!
IZ16E-043-1-XX.X*-1	Battery powered IZ16E indicator in a built-in housing for <u>panel mounting</u> . With <u>screwable round connector</u> instead of fixed cable outlet. *) Please indicate the required length in XX.X meters (max. 2.0 m available)!
IZ15E-002-4-XX.X*-0	Battery powered IZ15E indicator in a built-in housing for <u>panel mounting</u> . The sensor cable is connected via a <u>fixed cable outlet</u> to the indicator. *) Please indicate the required length in XX.X meters (max. 2.0 m available)!
Z25-000-024-X*	24 VDC supplied Z25 indicator in a built-in housing for <u>panel mounting</u> . *) X = 0 : for 10 ... 30 V HTL signals (channels: A and B) X = 2 : for 5 V-TTL signals (channels: A, A', B, B', Z, Z')
Z50-000-024-X*	24 VDC supplied Z50 indicator in a built-in housing for <u>panel mounting</u> . *) X = 0 : for 10 ... 30 V HTL signals (channels: A and B), 24 V encoder supply X = 2 : for 5 V-TTL signals (channels: A, A', B, B', Z, Z'), 24 V encoder supply X = 3 : for 5 V-TTL signals (channels: A, A', B, B', Z, Z'), 5 V encoder supply X = 6 : for 5 V-TTL signals (channels: A, B, Z), 5 V encoder supply
NG24.0	External 24 VDC power supply (primary 115 / 230 VAC) for Z25 or Z50

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