

# Operation Manual

## SERIES SMIX

Magnetic Length Measuring System with 0.01 mm resolution



- Integrated limit switches (MIN/MAX)
- Direct contact free measurement
- The distance between sensor and magnetic tape can be between 0.1 and 2.0mm
- Measuring lengths up to 32 m
- High resolution of 0,01 mm
- Repeat accuracy +/- 0,01 mm
- Insensitive against dirt

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## 1. General Information

### 1.1 Information Operation Manual

The manual contains important information regarding the handling of the controller. Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, observe the existing local accident prevention regulation and general safety rules.

Please read the operation manual carefully before starting to work. The manual should be kept accessible at anytime. The illustrations in the manual are for better representation of the facts they are not necessarily to scale and can be slightly different to the actual construction

### 1.2 Explanation of Symbols

#### Warning notices

Warning notices are characterised by symbols in the operation manual. The notes will be introduced by signal words to express the magnitude of the danger.

Follow these advices in order to avoid accidents and injuries to persons and property.



#### **DANGER!**

... adverts to direct dangerous situations that can lead to death or severe injuries.



#### **CAUTION!**

... advices to potentially dangerous situations that can lead to death or severe injuries.



#### **ATTENTION!**

... advices to potentially dangerous situations that can lead to damages on property.

### Hints and Commendations

**ADVERT!**

...highlights helpful hints and recommendations for efficient and failure-free operation.

### Specific Safety Instructions

The following symbols in conjunction with safety instructions are used in order to point out possible hazards:

**DANGER!**

...marks perilous situations by electricity. By non-observance of the safety instructions the possibility of death or severe injuries exists. The operations have to be carried out only by an electrician.

## 1.3 Statement of Warranties

The warranty conditions are in a separate document.

### Guarantee

The producer guarantees the functional capability of the process engineering and the selected parameter. The period of warranty is one year and begins with the date of delivery.

## 1.4 Demounting and Disposal

Unless otherwise authorized, dispose the item considering the safety instructions.

### Before demounting

- Disconnect the power supply
- Secure against re-start
- Disconnect supply lines physically and discharge remaining energy
- Dispose operating supplies with respect to the environment

### Disposal

Recycle the decomposed elements:

- Scrap metal elements
- Recycle plastic parts
- Dispose the rest of the components according to their material consistence



#### **ATTENTION!**

Wrong disposal → damage caused to the environment!

Electronic waste, electronic components, lubricants and operating supplies are liable to treatment of hazardous waste.

Only approved specialized companies should perform disposal.

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

## 2 Safety

### 2.1 General Cause of Risks

This chapter gives an overview about all important safety aspects to guarantee an optimal protection of employees.

Non-observance of the instructions mentioned in this operation manual can result in hazardous situations.

### 2.2 Personal Protective Equipment

Employees should wear protective clothing during installation of the device to minimize the risk of accidents.

Therefore:

Change into protective clothing before beginning the work process. Also observe any labels in the operating area regarding protective clothing.

#### Protective clothing



#### Safety working clothing

- ... is close-fitting
- ... is tear proof
- ... has tight sleeves without distant parts

**Also wear no rings, necklaces or other jewellery.**



#### Protective gloves

- ... for protecting the hands against abrasion and cuts



#### Hardhat

- ... for protection of the head during work

## 2.3 Conventional Use

The ELGO **SMIX** length measuring system is for the limited purpose as described in this manual:

The **SMIX** length measuring system is constructed for measuring distances.



### CAUTION!

Danger through non conventional use!

Non-intended use and non-observance of this operation manual can lead to dangerous situations.

Therefore:

- Use **SMIX** only as described.
- Strictly follow this manual.

Avoid in particular:

Remodelling, refitting or changing of the device or parts of it with the intention to alter functionality or scope of the **SMIX**.

ELGO is not liable for any damages resulting from improper use of the product.

## 3 Transport and Storage

### 3.1 Safety Instructions for Transport / Unpacking and Loading

**ATTENTION!**

Professional transport only.  
Do not throw, hit or fold the package.

### 3.2 Handling of Packaging Material

Adverts for proper disposal refer to 1.4.

### 3.3 Check of Transport

Examine delivery immediately after receiving for completeness and transport damages.

In case of externally recognizable transport damages:

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

**ADVERT!**

Claim any damages you recognize as soon as possible. The claims for damage must be filed in the lawful reclaim periods.

### 3.4 Storage

Store device only under 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: -25 to +85 °C
- Relative humidity: max. 80%
- Inspect packages regularly if stored for an extensive period of time (> 3 months)



## 4 Product Features

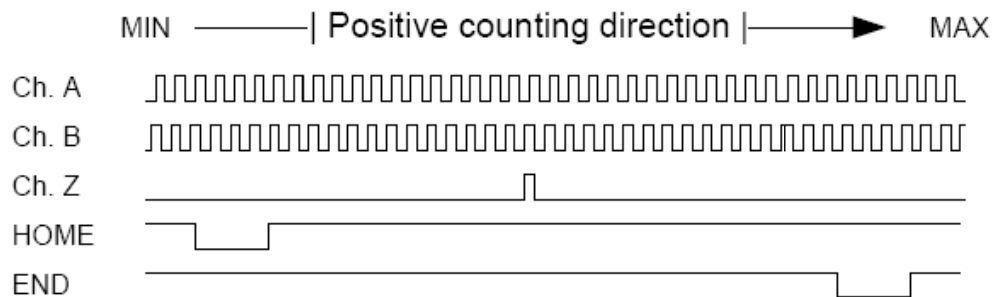
The series **SMIX** is a magnetic length measuring system. The sensor technology and translator are both placed in housing. The magnetic tape is fixed to a plane base with the provided sticky tape. The **SMIX** can be installed up to a maximum distance of 2.0 mm.

The measuring system offers decisive advantages:

- Direct contactless measurement
- The distance between sensor and measuring tape can vary between 0.1 and 2.0 mm
- Measuring lengths up to 32 m
- High resolution of 0,01 mm
- Repeating accuracy +/- 0,01 mm
- Very robust against pollution

Signal Outputs: A, A', B, B', Z, Z' and two Push-Pull outputs for Min/Max limits

**Pulse diagram:**



-> Supply-Voltage: 24 V (10-30 V)

-> Resolution: 10 μm

-> Channel A, /A, B, /B, Z, /Z: 24V-Push-Pull (HTL)

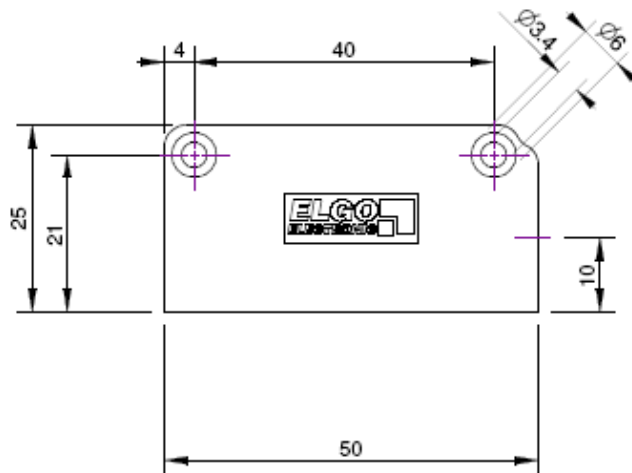
-> Limit Switches: 24V-Push-Pull (HTL) Inverted Logic: active „Low“

## 5 Technical specifications

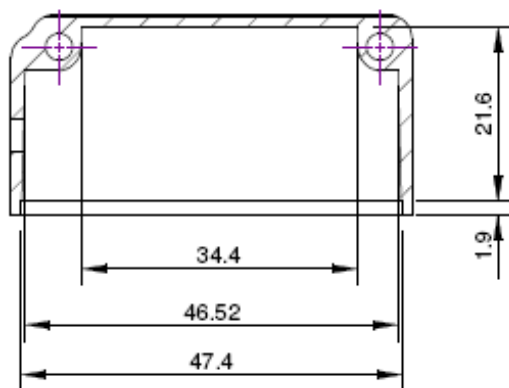
|  |   |
|--|---|
| nominal voltage                          | 10-30 VDC   |
| consumption                              | 10... 30 VDC: max. 150mA  |
| signal level                             | 5 V-TTL Line Driver / 10... 30 V HTL  |
| resolution                               | 0,01 mm   |
| repeating accuracy                       | +/- 1 increment   |
| maximum operation speed                  | 4 m/s   |
| signal outputs                           | A, A',B, B', Z, Z'<br>Push – Pull Outputs (MIN/MAX)   |
| max. measuring length*                   | theoretical no limit  |
| distance sensor/tape                     | max. 2,0 mm   |
| system accuracy in $\mu\text{m}$ at 20°C | +/- 200 +20 x L (L= measuring length in meter)  |
| operation temperature                    | -10... +70 °C<br>(-25... +85 °C) on request   |
| storage temperature                      | -25... +85 °C   |
| humidity                                 | not condensing, max. 80%  |
| protection class                         | IP67  |
| dimensions sensor                        | SMIX-Housing: 50 x 25 x 12 mm   |
| cable                                    | Length max. 30.0 m<br>Weight ca. 58.0 g/m<br>Cores: 10 x 0.14 mm <sup>2</sup><br>min. bend radius 60 mm   |
| magnetic tape MB20-50-10-2-R             | Length Extension coefficient $\alpha = 16 \times 10^{-6} \text{K}^{-1}$<br>Length extension $\Delta L = L \times \alpha \times \Delta\vartheta$<br>20 mm x ca. 1.8 mm (W x H)<br>min. bend radius 80 mm |

### 5.1 Dimensions SMIX

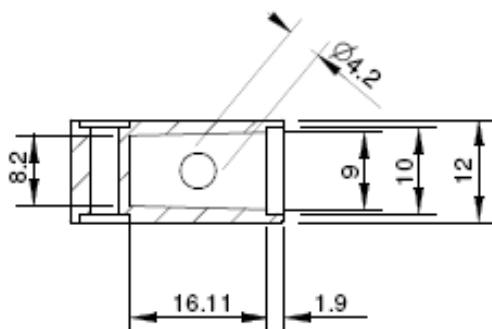
Front view:



Back view:



Side view:



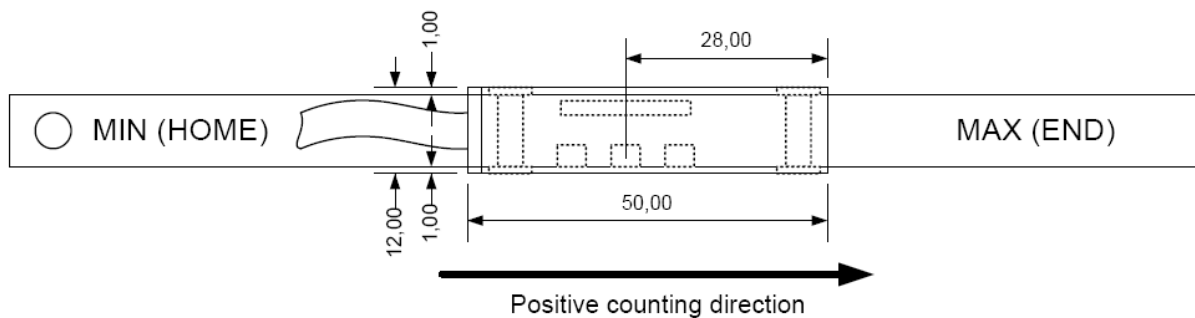
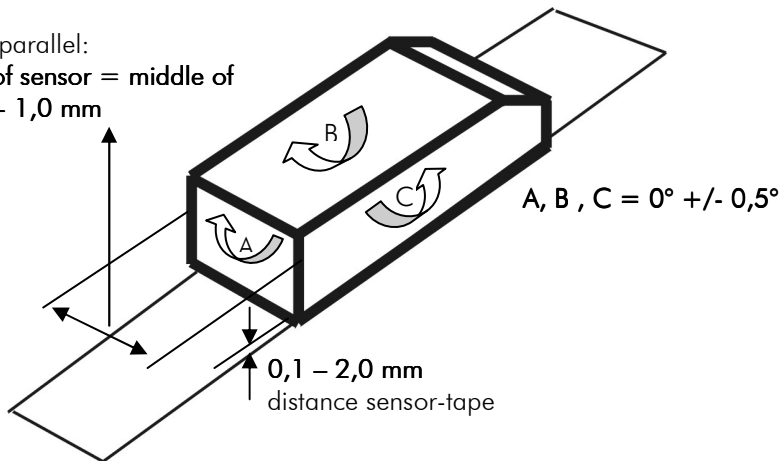
## 6 Installation/ Initial start-up

### 6.1 Mounting sensor

When installing the sensor head use two M3 screws.  
Tolerances for distance and angle must be observed (see picture 3).

justified parallel:

middle of sensor = middle of  
tape +/- 1,0 mm



### 6.2 Terminal assignment

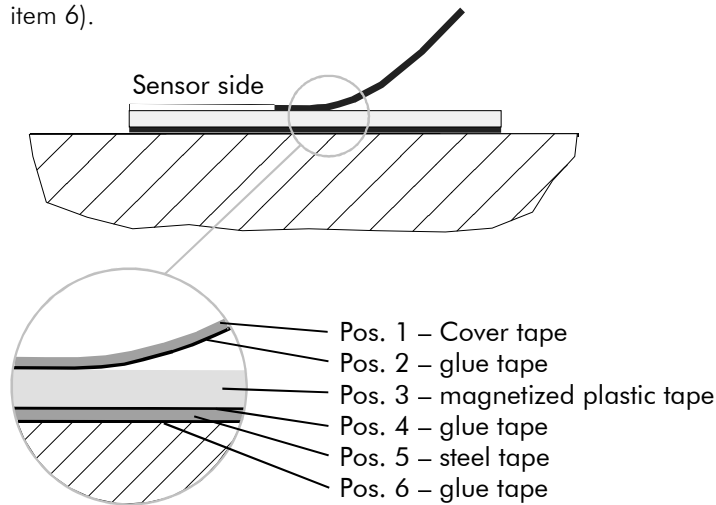
| Pin | function | colour |
|-----|----------|--------|
| 1   | GND      | white  |
| 2   | VCC      | brown  |
| 3   | A        | green  |
| 4   | A'       | yellow |
| 5   | B        | grey   |
| 6   | B'       | pink   |
| 7   | Z        | blue   |
| 8   | Z'       | red    |
| 9   | Min      | black  |
| 10  | Max      | violet |

## 7 Option Magnetic tape

### 7.1 Magnetic tape

The tape consists of 3 components (see Figure 5), a magnetized, flexible plastic band (Item 3), which is connected with a steel band (Item 5) and a masking tape (item 1), which is for protection of the plastic band. The Masking tape have to be glued for the mechanical protection of the magnetic tape. In addition, it protects the magnetic tape from extreme external magnetic influences.

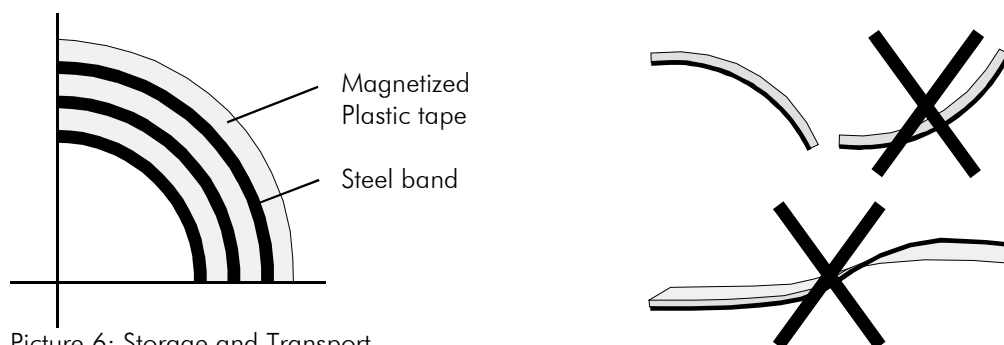
For the complete bonding between the different materials is a special glue tape used (item 2, item 4, and item 6).



Picture 5: components of magnetic tape

#### 7.1.1 Handling

To avoid tension in the tape, it should not be twisted or stored with the magnetized plastic tape to the inside minimum radius of curvature 80 mm).



Picture 6: Storage and Transport

### 7.1.2 Processing hint for the sticking of magnetic tapes

**Materials to stick:** The provided sticky tapes stick well on clean, dry and plain surfaces. Typical solvent for cleaning surfaces are a 50/50 mixed isopropyl-alcohol / water mixture or heptane. (Important: Please observe carefully the caution hints of the producer when using the solvent.) The surfaces of materials as copper, brass etc. should be sealed to avoid an oxidation. **Proof:** The stability of the adhesion is directly depending on the contact, which the adhesive develops to the surfaces stuck together. A high proof results in a good surface contact. **Sticking temperature:** The optimal sticking temperature is between + 21° C and 38° C. Avoid colder sticking surfaces than + 10°C, because in this case the adhesive becomes to 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).



**Note for storage:** In order to avoid tensions in the tape, it should be stored in stretched or rolled up condition - with the magnetized plastic tape resp. scanning side outward (see image).

### 7.1.3 Resistance against chemical influences

**Chemicals, showing no or only small effects:**

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

**Chemicals, showing small to medium effects:**

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

**Chemicals, showing strong effects:**

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

#### 7.1.4 Stick and Cut

**Note!**

When gluing the magnetic tape is to the markings on magnetic tape and on the sensor head to be respected. Improper installation does not have correct values. A previously sticked tape is destroyed after removal and can not be reused. Also of note is the counting of the measuring system. Before the start of the bonding are magnetic tape and masking tape to the exact length basis.

Length of magnetic tape = Measuring length + Sensor length

At best, the tape stuck in a groove or an edge concern.

Stick in that way:

The tape is already connected to the steel tape. On the carrier side (steel), the attached tape pasted. Now the magnetic tape should be adjusted and glued.

## 8 Interferences

The following chapters describe possible causes for malfunction and the instructions to correct them. If you encounter problems check for proper installation first. Make sure that power is supplied to the system. If you observe recurring errors you might consider electrical interference suppression measures as described in section 7. If errors cannot be corrected with the following instructions please contact the manufacturer (see last page).

### 8.1 Security

#### Basics



#### CAUTION!

##### Risks of injury from improper fault clearances!

Improper fault clearances can cause serious personal or property damage.

Therefore:

- Fault clearance may only be carried out by qualified and instructed personnel
- Prior to the beginning of work provide sufficient room to assemble the equipment
- Please look for cleanliness at the place of installation; loosely around laying parts and tools are sources of accidents

If components have to be replaced:

- Look for correct installation of spare parts
- All mounting elements have to be assembled correctly
- Before resetting please ensure that all covers and protective devices are installed correctly and function properly



## 8.2 Electrical interference suppression



Signal wires should be installed separately from load power lines and with a safe distance of at least 0.5 m to capacitive and inductive interferences such as contactors, relays, motors, switching power supplies, timed controllers.

If interferences occur in spite of applying all above mentioned measures proceed as follows:

1. Add RC elements over contactor coils of AC contactors (for example 0,1  $\mu$ F/100  $\Omega$ )
  2. Add recovery diodes over DC inductances
  3. Add RC elements over each drive phase (in connector box of the drive).
  4. Do not connect the GND potential with PE (earth potential)!
- Install a power filter before the external power supply

## 8.3 Restart after fault clearance

After fault clearance:

1. Reset emergency stop switch.
2. Quit disturbance on controller.
3. Make sure that no person is located in the danger zone.
4. Start operating as explained in the instructions.

## 8.4 EMC information

A trouble-free operation of the control devices of the company ELGO Electric GmbH can only be guaranteed if in assembly, wiring and operating the following basic rules are observed and adhered to:

- use only shielded signal lines with a minimum diameter of 0.15 mm<sup>2</sup>
- to protect against electrical fields, connect the cable shield unilaterally, low resistance and low inductive with the operating lightning protection.
- unused arteries in signal lines should be isolated from each other separately
- isolate signal and power lines separately in long parallel lines (a distance of 300 mm is respected ) therefore, should never be different voltage levels, e.g. 230V/50 Hz power supply and measuring signal 24V DC in one cable together
- low the emission by the Installation of filter networks in plants with frequency. In the operating instructions of the manufacturer FU find the appropriate instructions.
- wireless phones and Walky-talkies should never be used in the immediate vicinity of electronic devices

## **9. Maintenance**

The unit works maintenance-free.

## 10. Type Designation SMIX

### Sensor head

**SMIX - XXX - XX.X - XXXX - XX - XX**

Series

SMIX

Version

000 = Standard

001 = 1. special version

Signal cable length

01,5 = 1,5m (Standard)

Resolution

0010

Supply / Signal

00 = 10-30 VDC / 10-30 VDC

01 = 10-30 VDC / 5V-TTL line driver

11 = 5 VDC / 5V-TTL line driver

Limits Signal / Logic

00 = 10 – 30 VDC / logic not inverted ("HIGH" - active)

01 = 10 – 30 VDC / logic inverted ("LOW" - active)

10 = 5 VDC / logic not inverted ("HIGH" - active)

11 = 5 VDC / logic inverted ("LOW" - active)

### Accessories:

#### **Magnetic tape MB20-50-10-2-R:**

- 0,2 m minimum length
- 32,0 m maximum length

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