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Translation of the original operating manual

ELGO ELECTRONIC

Operating Manual

SERIES *DMIX1-3*

Magnetic Incremental Linear Encoders with 1.00 mm resolution

- Direct and contactless measurement
- Allowed distance range between sensor and magnetic tape: 0.1 up to 10.0 mm
- System resolution 1.00 mm
- Repeat accuracy +/- 1 increment
- Very robust against dust and dirt
- DMIX3 with freely selectable reference impulse

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1 Contents

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:

	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.

2.7 Conventional Use

The ELGO-device is only conceived for the conventional use described in this manual.
The DMIX1-3 - ELGO- length measuring system only serves to measure lengths.

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:

- Remodelling, 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 (☞4) needs to be observed
- Relative humidity (☞4) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

3 Product Features

The DMIX1 is an incremental magnetic length measuring system. The sensor technology and translator are placed in two different housings (sensor in sensor head and translation unit in external SUB-D connector). The magnetic tape can also be fixed into a guiding rail with the provided adhesive tape. The DMIX1 can be installed up to a maximum distance of 10.0 mm.

DMIX3: The sensor technology and translator are placed in the same housing. The index signals are available as an index- or reference signals. The maximum allowed installation gap of 10.0 mm must not be exceeded.

Overview of features:

- Direct contactless measurement
- The distance between sensor and measuring tape can vary between 0.1 and 10.0 mm
- System resolution of 1.00 mm
- Repeating accuracy +/- 1 increment
- Very robust against pollution
- With freely selectable reference impulse

A, A´, B, B´, Z, Z´ signals are available

The DMIX3 has A, A ', B, B', Z, Z' signals. The Z and Z' signals are either as an index or as reference signal available. (Option R = reference signals, No option = index signal)

3.1 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.
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 encoders outputs.

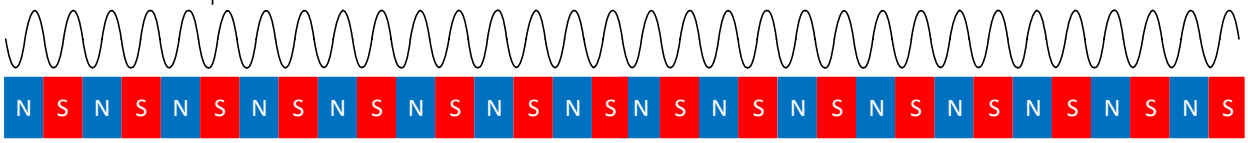
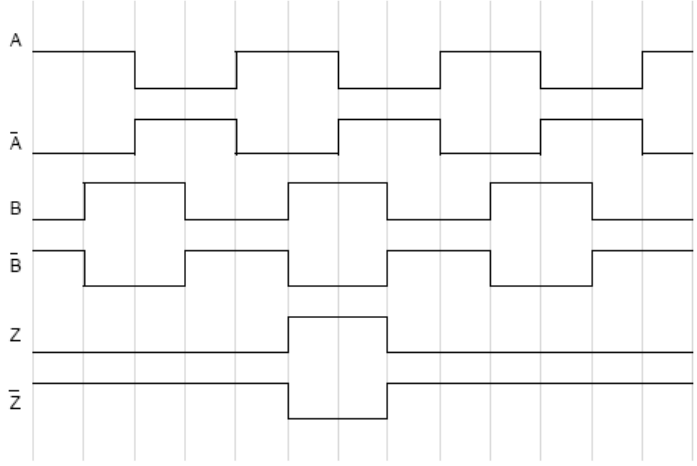


Figure 1 Magnetic Tape

3.2 Pulse diagram



The channels A, B, A´, B´ are 90° phase-shifted

DMIX1:
The index pulse output is periodically every 16 mm

DMIX3:
The output of the index pulse carried out periodically every 16 mm or as a one-time reference impulse respectively an inverted reference impulse.

Figure 2 Pulse diagram

4 Technical Data

4.1 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.

4.2 Dimensions DMIX1 Sensor and D-SUB

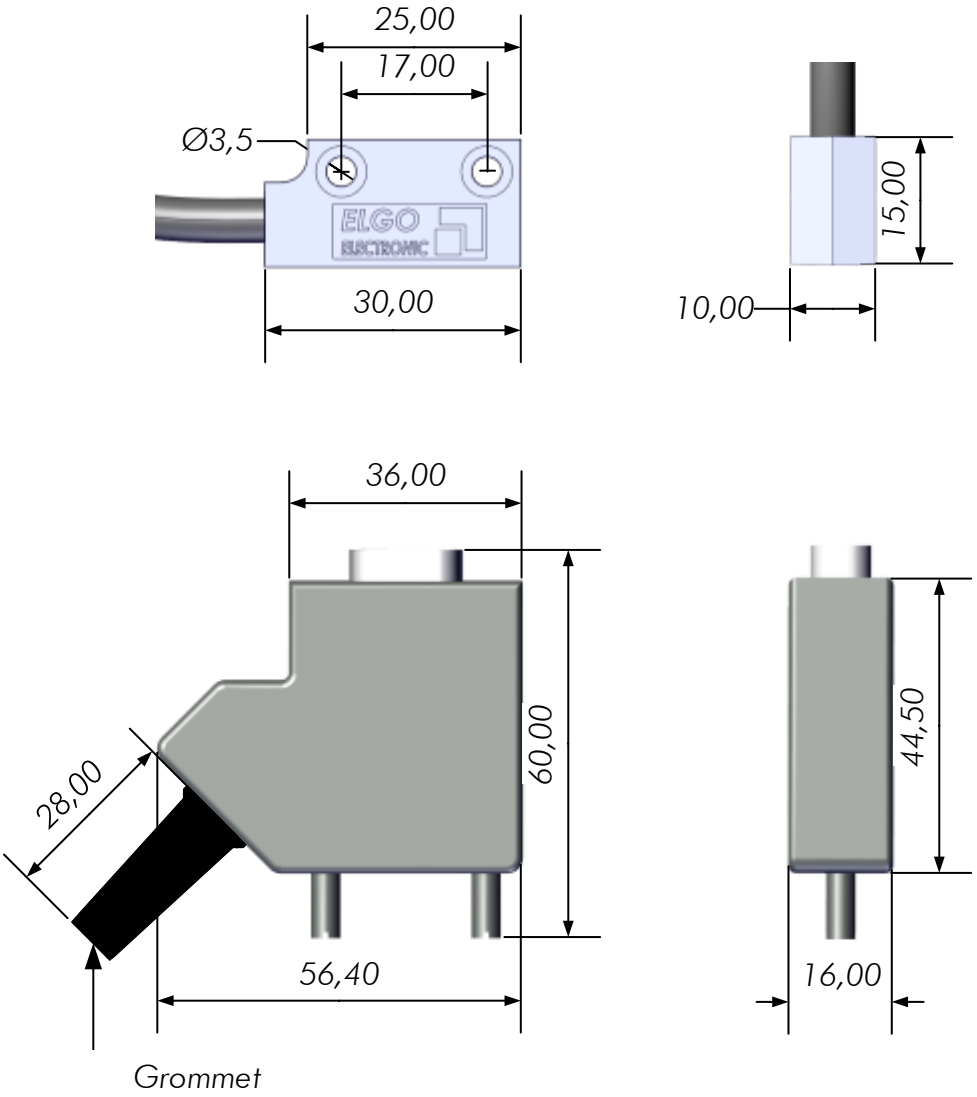


Figure 3: Dimensions DMIX1

4.3 Dimensions DMIX3

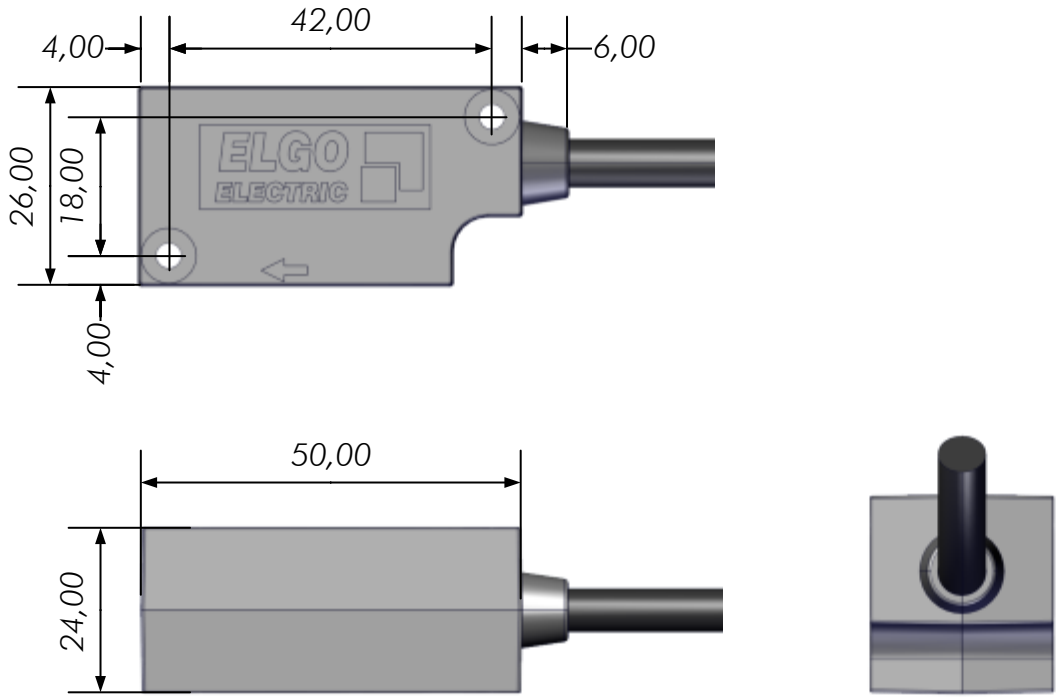


Figure 4: Dimensions DMIX3

4.4 Dimensions of MW-DMIX3 (Mounting Angle for Reference Pulse)

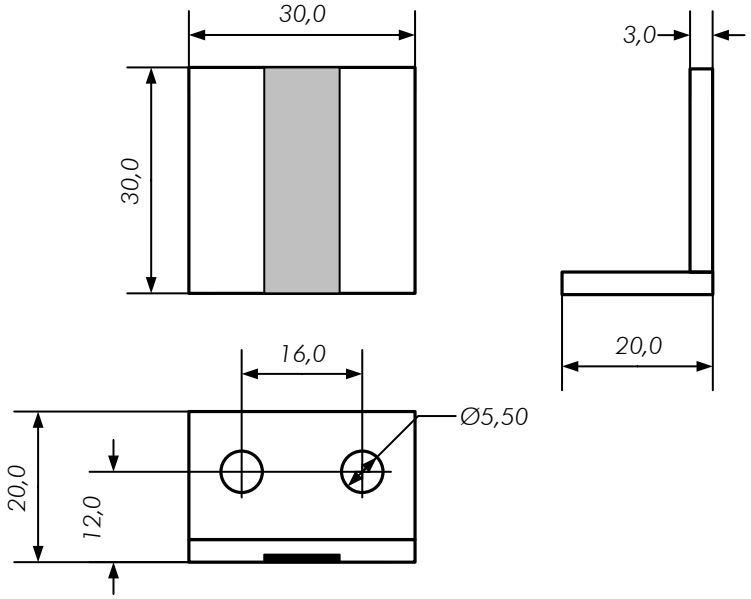


Figure 5: Dimensions MW-DMIX3 (mounting angle for reference pulse)

More information can be found in section ☞ 8.2 Accessories.

4.5 Technical Data Sensor

DMIX1-3 (Standard version)	
Mechanical Data	
Measuring principle	Incremental
Repeat accuracy	+ / - 1 Increment
System accuracy in µm at 20°C	+/- (1000 µm + 20 µm x L[m]) L = measuring length in meter
Distance from sensor to magnetic tape	max. 10.0 mm
Basic pole pitch	16 mm
Sensor housing material	Zinc die-cast
Sensor housing dimensions DMIX1 Sensor housing dimensions DMIX3	L x W x H = 30 x 10 x 15 mm L x W x H = 50 x 24 x 26 mm
Necessary type	MB20-160-10-1-R
Maximum measuring length	Theoretically unlimited
Connection DMIX1 Connection DMIX3	9-pin D-SUB-plug open cable ends
Weight DMIX1 Weight DMIX3 Cable	sensor + D-SUB-plug: approx. 40 g sensor approx. 60 g without cable cable approx. 60 g per meter
Electrical Data	
Supply voltage	+ 10 … 30 VDC / 5 VDC
Residual ripple	5 V: +/- 25 mV; 10 … 30 V: <10 %
Consumption	5 VDC: max. 200 mA / 10 – 30 VDC: 150 mA
Output signals DMIX1 Output signals DMIX3	A/A', B/B', Z/Z', push/pull, durable short-circuit-proof A/A', B/B', Z/Z' or Ref/Ref', push/pull, durable short-circuit-proof
Output level	10 … 30 V-HTL / 5 V-TTL
Resolution	1.0 mm
Index pulse	16 mm periodically
Max. output frequency per channel	20 kHz
Speed	max. 20 m/s
Sensor cable DMIX1	drag chain suitable, length max.: 30 m cable wires: 6 x 0.08 mm² bending radius: min. 60 mm
Sensor cable DMIX3	drag chain suitable, length max.: 30 m cable wires: 6 x 0.14 mm² bending radius: min. 60 mm
Conditions	
Storage temperature	−25 °C … +85 °C
Operation temperature	−10 °C … +70 °C (−25 °C … +85 °C on request) (−40 °C … +85 °C = special version 001[1], see ☞ 8)
Humidity	max. 80 %, non-condensing
Protection class DMIX1 Protection class DMIX3	Sensor: IP67; Translator IP40 IP40; Option V: IP65

[1] The extended temperature range for version DMIX1 applies only to the sensor head (not to the evaluation electronics).

4.6 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

Magnetic Tape MB20-160-10-1-R1	
Coding	Incremental, single track system
Pole pitch	16 mm
Operation temperature installed	−20 °C … +65 °C (−20 °C … +80 °C if usage without adhesive tape resp. options „B“ or „D“)
Storage temperature uninstalled	Short-term: −10 °C … +60 °C Medium-term: 0 °C … +40 °C Long-term: +18 °C (−20 °C … +80 °C if usage without adhesive tape resp. options „B“ or „D“)
Gluing temperature:	+18°C … +30°C
Relative humidity	Max. 95 %, non-condensing
Accurateness 20°C in mm	+/- (0.025 + 0.02 x L[m]) (L = measuring length in meters)
Material carrier tape	Precision strip steel 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 if usage without adhesive tape resp. options „B“ or „D“)
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 as this could damage or destroy the code on the magnetic tape.
Protection class	IP65

5 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.

5.1 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.

5.2 Description installation / Mounting 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.

5.2.1 The Magnetic Tape MB20-160-10-1-R

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

The magnetic tape consists of 2 pre-assembled components:

- 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

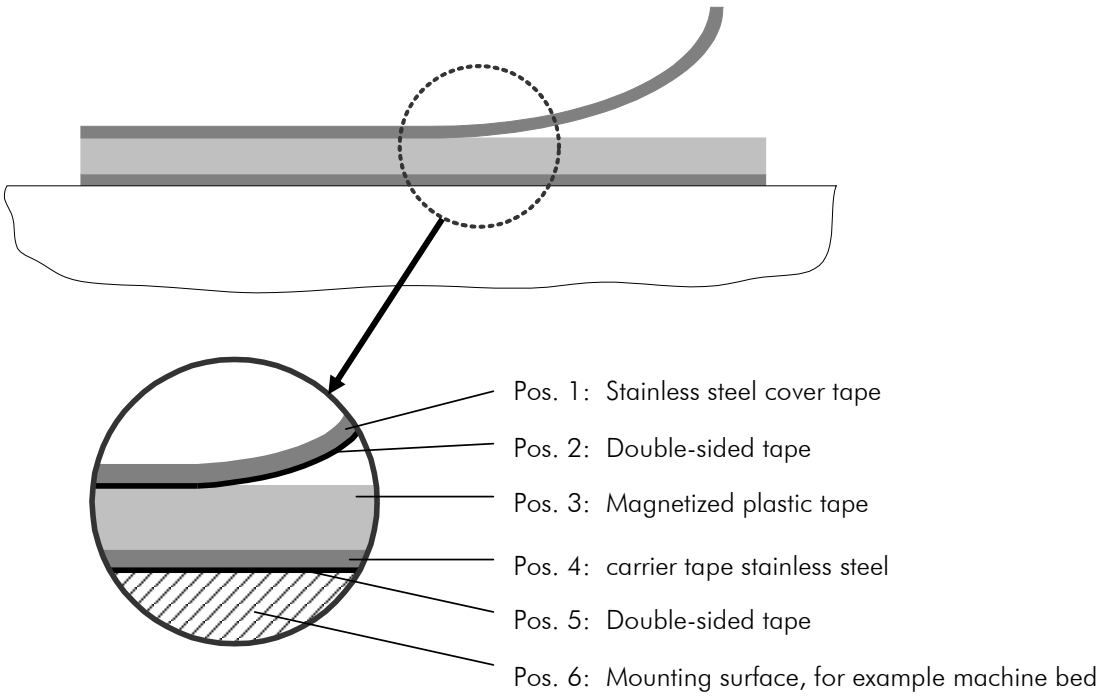


Figure 6: Components of the magnetic tape

5.2.2 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; (min. bending radius 150 mm).

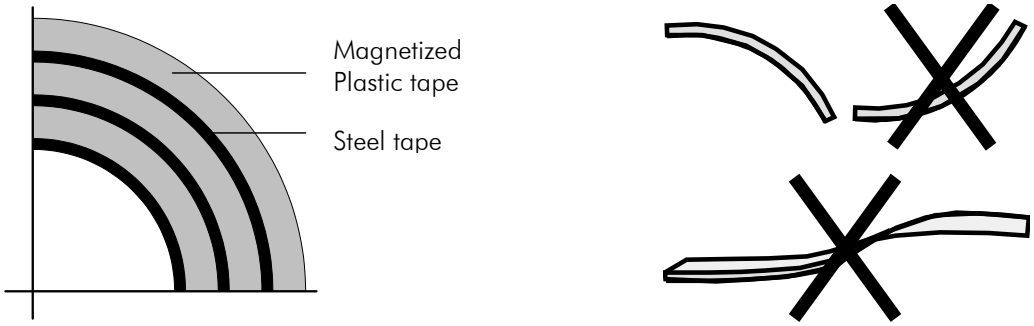


Figure7: Storage and transport

5.2.3 Processing hint for the gluing of magnetic tapes

Surface-Preparation: In order to guarantee optimal adhesion, all antiadhesive 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 heptanes. 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.

5.2.4 Cutting and Gluing

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

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

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

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

When unprotected, the cover tape may peel off!

Therefore:
Use tape end caps (see chapter 9.2) 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 mouning 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 surface (☞ 5.2.3)
2. Let magnetic tape and cover tape adjust their temperature
3. Remove protection foil of adhesive tape on magnetic tape
4. Glue magnetic tape using great pressure
5. Thoroughly clean surface of magnetic tape
6. Remove protection foil of adhesive tape on cover tape
7. Glue cover tape using great pressure
1. Safeguard the ends of the cover tape against peeling off (☞ 8.2)

5.2.1 Resistance against Chemical Influences

Table 1: Chemical Influences

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	Petrol/gasoline	Acetic acid 30%	Oleic acid
Acetylene	Steam	Acetic acid (pure)8	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

5.3 Description installation / Mounting of the Sensor

When installing the sensor head use two M3 screws.
All tolerances for distance and angle must be observed.

5.3.1 Tolerances DMIX1

Table 2: Tolerances DMIX1

Tolerances DMIX1	
Ride height	0.1 mm … max. 10.0 mm
Pitch/Roll	The max. Distance of 10 mm must not be exceeded at any position
Lateral offset	The max. Distance of 10 mm must not be exceeded at any position
Yaw	<+/- 1,5°

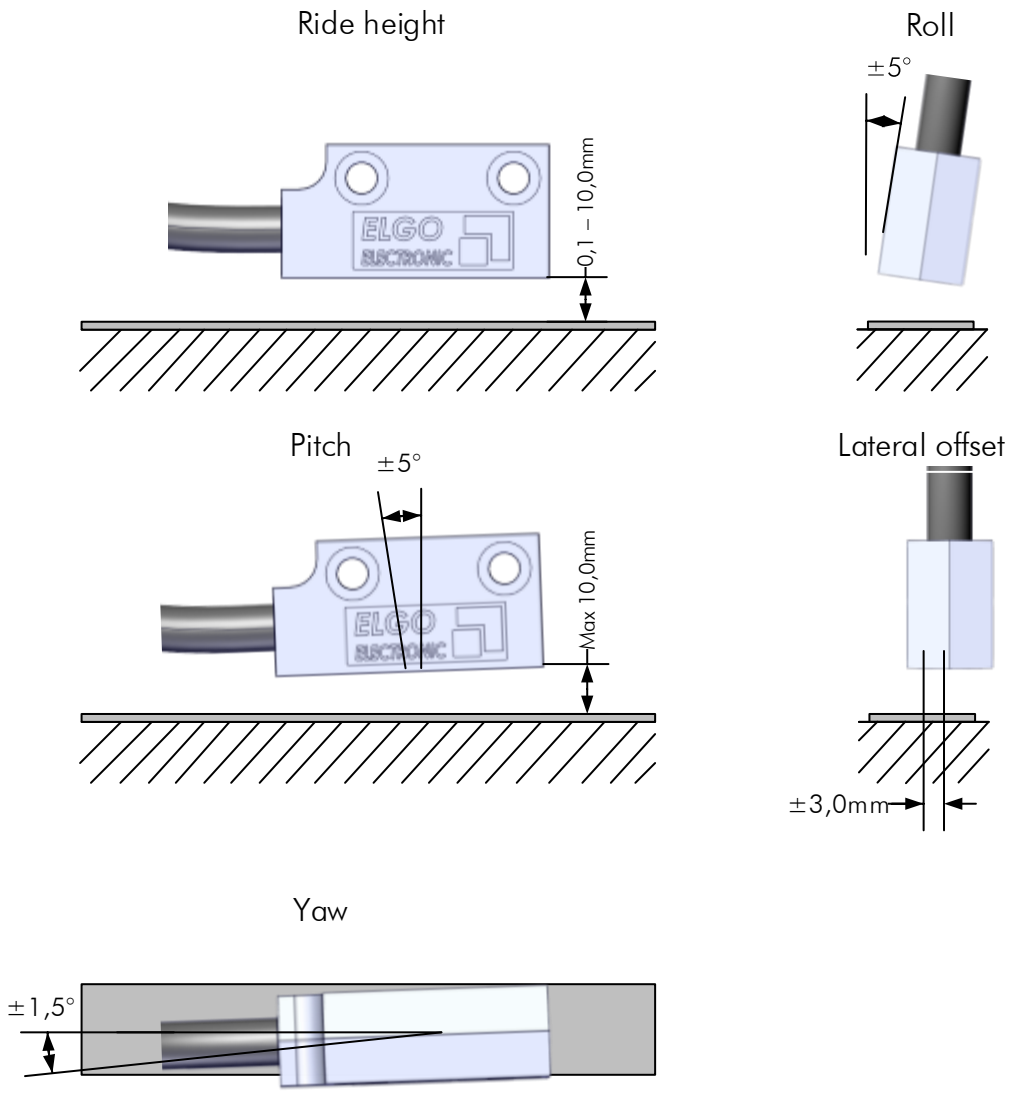


Figure 8: Tolerances DMIX1

5.3.2 Tolerances DMIX3

Table 3: Tolerances DMIX3

Tolerances DMIX3	
Ride height	0.1 mm … max. 10.0 mm
Pitch/Roll	The max. distance of 10 mm must not be exceeded at any position
Lateral offset	The max. distance of 10 mm must not be exceeded at any position
Yaw	<+/- 1,5°

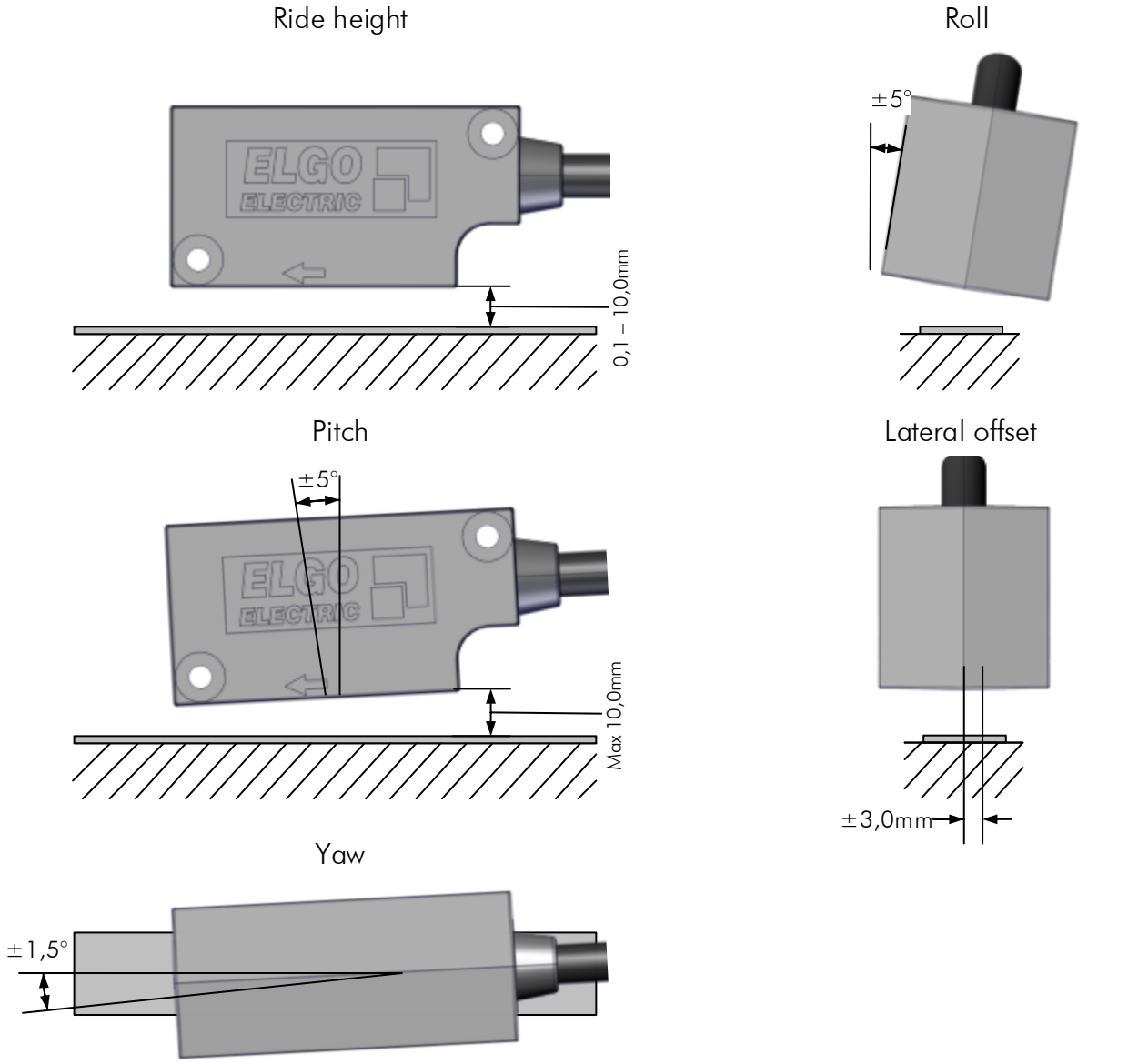


Figure 9: Tolerances DMIX3

5.3.3 Mounting of the Mounting Angle (only DMIX3 - Option R)

The Mounting Angle "MW-DMIX3" for the reference pulse with DMIX3 is only required with the Option R (see Type Designation ☞ 8). The angle available as an accessory (see ☞ 8.2) is already equipped with the necessary magnetic tape that generates the reference pulse.

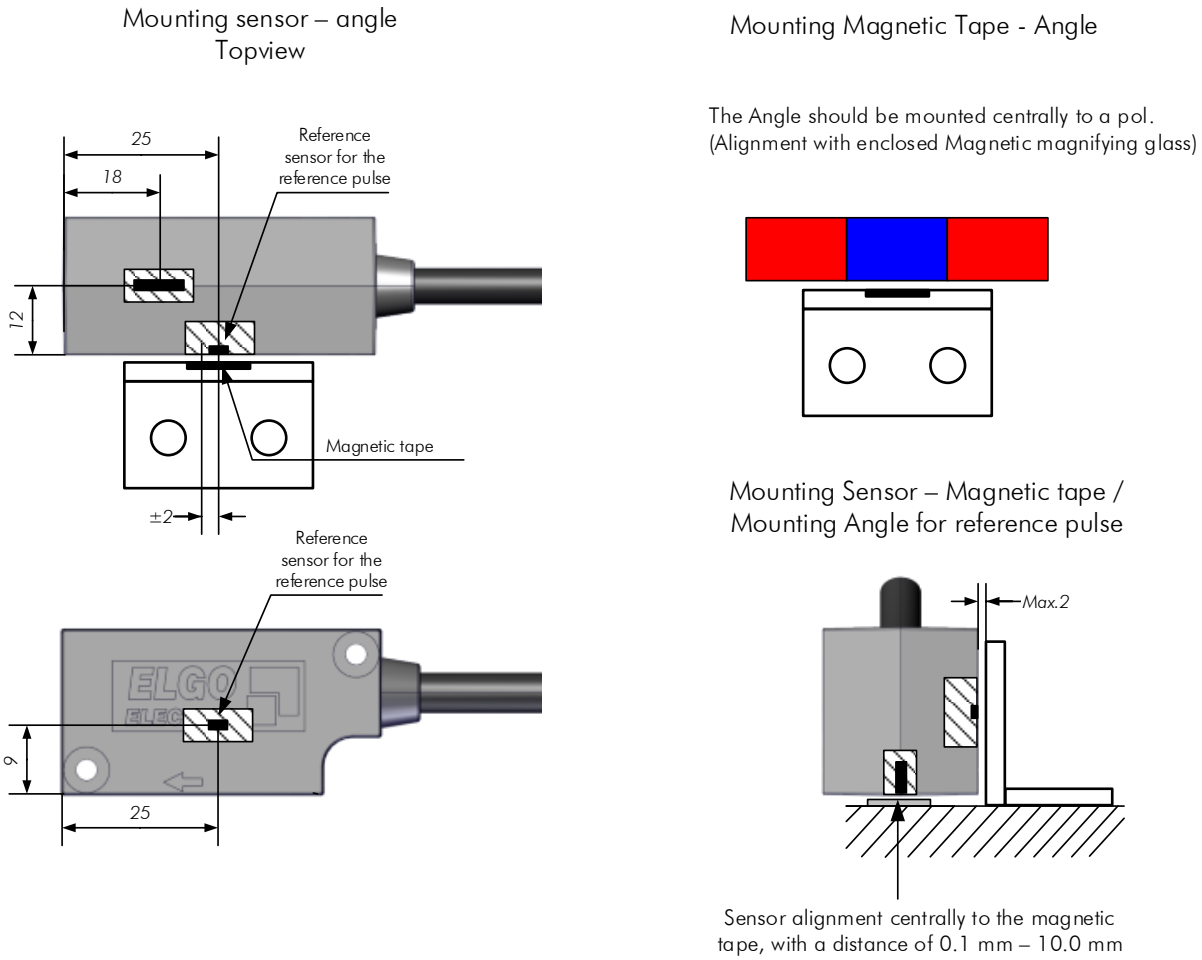
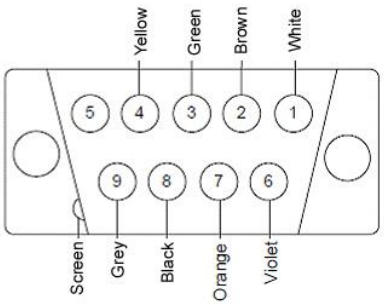


Figure 10: Mounting of MW-DMIX3

6 Pin Assignment

6.1 Pin Assignment DMIX1

Table 4: Pin Assignment DMIX1

Connection	Drawing	Pin	Function	Description
9-pin D-SUB plug		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	Channel Z
		9	Z‘	Channel Z inverted

6.2 Pin Assignment DMIX3

Table 5: Pin Assignment DMIX3

Connection	Color	Function	Description
Open cable ends	White	GND	0V
	Brown	VCC	10-30V / 5V DC
	Green	A	Channel A
	Yellow	B	Channel B
	Violet	A‘	Channel A inverted
	Orange	B‘	Channel B inverted
	Black	Z or Ref	Channel Z or reference
	Grey	Z‘ or Ref‘	Channel Z inverted or reference inverted

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 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

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 5.

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

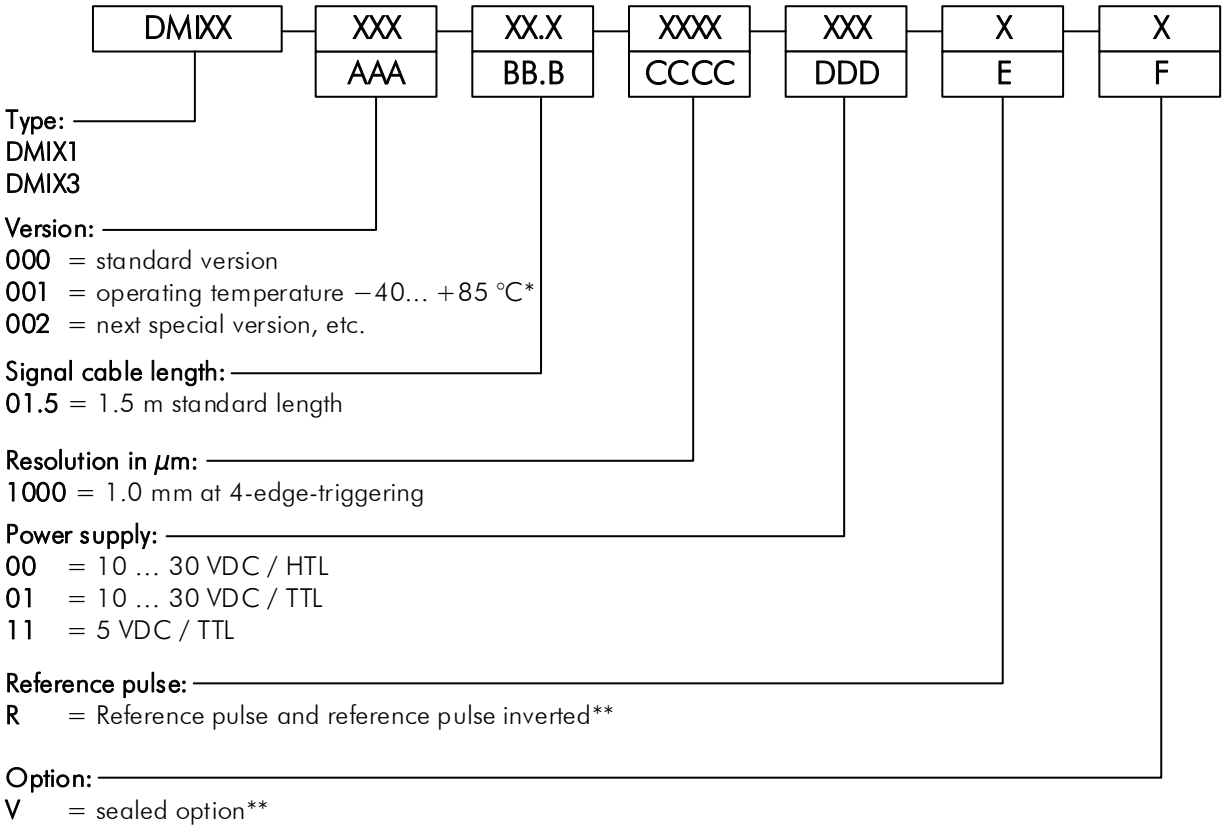
7.3 Maintenance

The device is maintenance-free.

7.4 Cleaning

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

8 Type Designation



*) Extended temperature range: DMIX1 only sensor head (without external evaluation)

**) Only for DMIX3 available

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

8.1 Order Examples

DMIX1-000-01.5-1000-11
DMIX1 with 1.5 m cable, 5 VDC power supply and TTL output signals und index signal

DMIX3-000-01.5-1000-00
DMIX3 with 3 m cable, 24 VDC power supply, HTL output signals und index signal

DMIX3-000-01.5-1000-00-R-V
DMIX3 with 3 m cable, 24VDC power supply, HTL output signals, reference signal and sealed version

8.2 Accessories

Table 6: Accessories

Order Designation	Description
MB20-160-10-1-R1	Magnetic Tape for DMIX1 and DMIX3
End cap set 10mm	2 end caps for fixation and protection of magnetic tape ends
Magnetic tape end cap 10	1 end cap (10 mm)
FS-1000, 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.
FW2060	Guide carriage for DMIX1
FW2070	Guide carriage for DMIX3
AP-00-XX*	Aluminium cover profile for magnetic tapes (as alternative to the cover tape) *) AP-00-1m = 1m long / AP-00-2m = 2 m long
MW-DMIX3	Mounting angle with magnetic tape for DMIX3 reference pulse (Option R only)
POSU	Pole finder card 85 x 55 mm, to align the MW-DMIX3 angle (Option R only)

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