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Translation of the original operating manual

ELGO ELECTRONIC

Operating Manual

SERIES *MIRE*

Rotative Magnetic Incremental Encoder

- Rotative angle measurement system
- 1.40625° resolution (at 4 edge triggering)
- Speeds up to 10,000 revolutions per minute
- Direct measurement at the motor shaft or axis
- Wear-free and contactless measuring principle

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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 jewelry.
	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 ELGO MIRE encoder only serves to measure angles and rotation speeds.

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 (☞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

3.1 General

The angle measurement system MIRE (a combination of a sensor and a round magnet) can be used for rotative measurement of angles or speeds. The abbreviation MIRE is short for "Magnetic Incremental Rotary Encoder". The DRM magnet (which is available as an accessory) can be mounted directly on an axis resp. motor shaft. Installation notes ☞ 5.2.

Figure 1: MIRE angle measurement system

Essential features:

- Rotative angle measurement system
- 1.40625° resolution (at 4 edge triggering)
- Speeds up to 10,000 revolutions per minute
- Direct measurement at the motor shaft or axis
- Wear-free and contactless measuring principle

3.2 Signal sequence

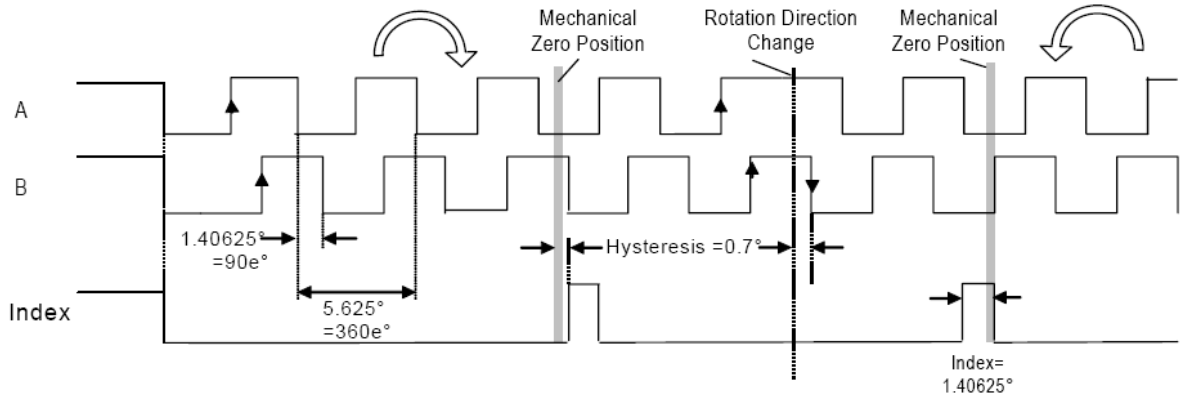


Figure 2: Signal sequence diagram

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 (☞ 7) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

4.2 Technical Data MIRE

Table 1: Technical data

MIRE (Standard version)	
Mechanical data	
Measurement principle	incremental, rotative
Repeat accuracy	+/- 1 increment
System accuracy in angular degrees at 20° C	+/- 1 increment resp. +/- 1.40625°
Distance Sensor - Round magnet	0.2 … 1.0 mm
Round magnet diameter	6 mm
Sensor housing material	Hotmelt plastic
Sensor housing dimensions	L x W x H = 35 x 10 x 25 mm
Required magnet	DRM round magnet; type designation „DRM-000-060-025“
Measurement angle	max. 360°
Type of connection	Open cable ends
Weight	approx. 25 g without cable cable: approx. 60 g per meter
Electrical data	
Power supply voltage	10 … 30 VDC or 5 VDC (see type designation ☞ 7)
Residual ripple	10 … 30 VDC: < 10 %, resp. 5 VDC +/- 25 mV
Consumption	40 mA (with unloaded output drivers)
Output signals	A, A‘, B, B‘, Z, Z‘ (push-pull, durable short circuit proof)
Output levels	10 … 30 V-HTL or 5 V-TTL (see type designation ☞ 7)
Resolution	1.40625° (at 4 edge triggering)
Edges per revolution	256 edges° (at 4 edge triggering) = 64 pulses
Output current	max. 50 mA / channel
Max. rotation speed	10,000 U/min
Sensor cable	1.5 m standard length (others on request), drag chain suitable
Available cable lengths	1.0 / 1.5 / 3.0 / 5.0 / 8.0 meter
Bending radius of sensor cable	min. 60 mm
Ambient conditions	
Operating temperature	-10 … +70° C, (-25 … +85° C on request)
Storage temperature	-25 … +85° C
Protection class	IP64
Humidity	max. 80 %, not condensing

4.3 Sensor dimensions

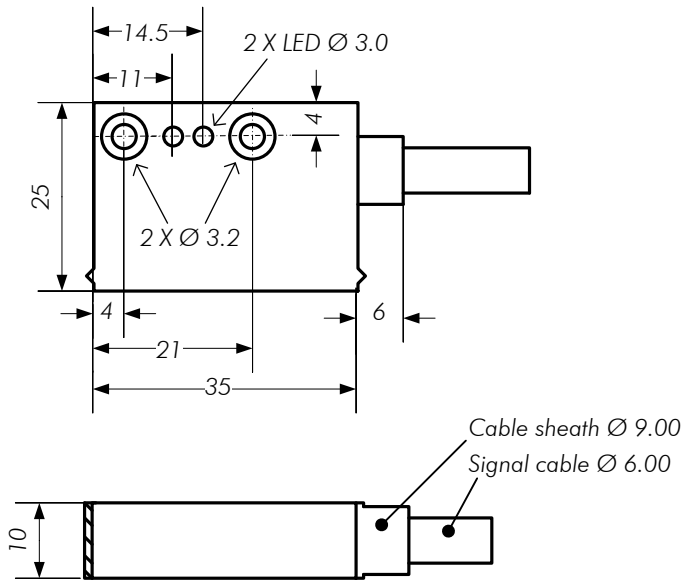


Figure 3: MIRE sensor dimensions

4.4 Round magnet dimensions

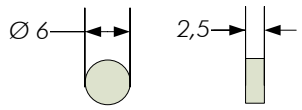


Figure 4: DRM magnet dimensions

4.5 Connections

Table 2: Connections

Signal cable	Function
White	GND
Brown	VCC
Green	Channel A
Violet	Channel A inverted
Yellow	Channel B
Orange	Channel B inverted
Black	Channel Z
Grey	Channel Z inverted
Screen/shield	PE

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 qualified 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 Installation of the Sensor and DRM magnet

5.2.1 Fixing the round magnet

The magnet can either be glued or for example be bedded directly in a shaft or a guiding system, as long as they are made out of non-magnetic metal such as high-grade steel, V2A, V4A or aluminum. The magnet and the bonding surface have to be clean and greaseless before gluing the parts together. When gluing on plastic it is advisable to rub the plastic with fine sandpaper.

Suitable adhesives are:

- LOCTITE 405 (viscosity liquid, curing in about one minute)
- LOCTITE 409 (viscosity gel-like, curing in about two minutes)

5.2.2 Alignment Sensor / Magnet

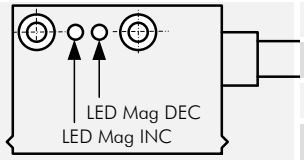
The center of the magnet must be exactly aligned with the center to the sensor area (figure in chapter ☞ 5.2.4). It does not matter which flat side of the magnet points to the sensor direction.

Please note: The MIRE encoder can exclusively be operated in combination with a DRM round magnet type "DRM-XXX-060-025", which is available as an accessory (☞ 7.1)!

5.2.3 LED functions

Two LEDs in the sensor housing are used to support an exact positioning of the sensor to the round magnet.

Table 3: LED functions

LED arrangement	LED Mag INC	LED Mag DEC	Description
	OFF	OFF	Distance between sensor and magnet is correct
	OFF	ON	Distance between sensor and magnet is too big
	ON	OFF	Distance between sensor and magnet is too small
	ON	ON	Distance is outside of the range

5.2.4 Round magnet: sensor area and tolerances

During installation resp. sticking the DRM magnet, make sure that this is exactly within the active sensor area of the MIRE sensor. In order to guarantee a perfect function the determined position and tolerances must be exactly adhered to.

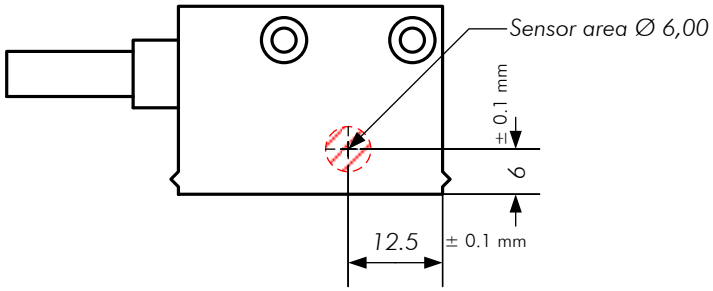


Figure 5: Round magnet: sensor area and tolerances

6 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 6.1. 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).

6.1 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

6.2 RS422 line termination

The inputs of an RS422 compatible translator circuit should be terminated as follows:

- 120 Ohm between channel A and A inverted
- 120 Ohm between channel B and B inverted
- 120 Ohm between channel Z and Z inverted

6.3 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

6.4 Maintenance

The correct alignment of the active sensor area to the magnet (☞ 5.2) should be checked at regular intervals.

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.

6.5 Cleaning

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

7 Type designation

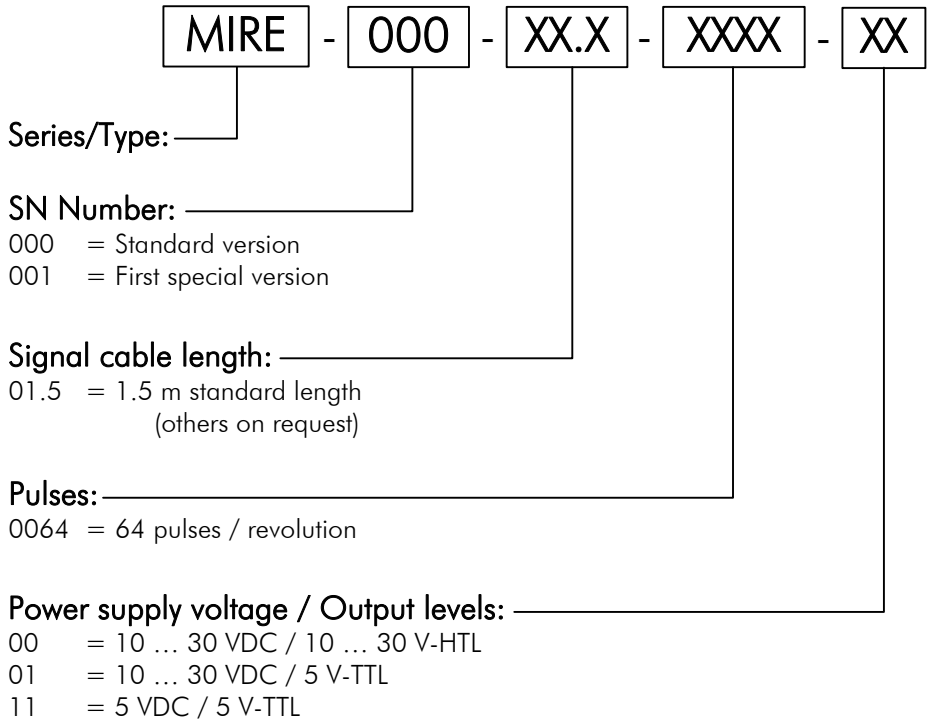


Figure 6: Type designation

Example:

MIRE -0 0 0 - 0 3.0 - 0 0 6 4 - 0 0
AAA - BB.B - CCCC - DD

Order example:
MIRE after ELGO standard, with 3.0 cable length, 64 pulses / revolution, power supply 10 … 30 VDC and output levels 10 … 30 V-HTL.

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

7.1 Accessories

Table 4: Accessories

Type designation	Description
DRM-000-060-025	DRM round magnet for MIRE angle measurement system

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Measure - Control - Position
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