799000582 / Rev. 7 / 2018-04-12
Translation of the original operating manual

ELGO ELECTRONIC

Operating Manual

SERIES *GSI2*

Mechanically guided Magnetic Incremental Linear Encoder

- Cost-effective alternative to glass scales
- High-quality guiding unit with sensor
- Resolutions up to 0.001 mm (at 4-egde triggering)
- Power supply 5 V or 10 … 30 V
- HTL or TTL signal output levels
- Output channels A, A', B, B' and R, R'
- Adjustable reference pulse (channels R, R')
- Measuring lengths up to 1 meter
- Speed proportional square wave outputs
- Robust, resistant against dirt and shock

Publisher ELGO Electronic GmbH & Co. KG

Carl-Benz-Str. 1
D-78239 Rielasingen-Worblingen

Technical Support +49 (0) 7731 9339 – 0
+49 (0) 7731 2 13 11
info@elgo.de

Document- No. 799000582

Document – Name GSI2-00-MA-E_15-18

Document- Revision Rev. 7

Issue Date 2018-04-12

1 Contents

2 Image Directory

3 Table Directory

4 General, Safety, Transport and Storage

4.1 Information Operating Manual

This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions. Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed.

Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.

4.2 Explanation of Symbols

Special notes in this manual are characterized by symbols. The notes are introduced by signal words which express the magnitude of danger. Please follow this advice and act carefully in order to avoid accidents, damage, and injuries.

Warning notes:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	WARNING! This symbol in connection with the word „Warning" means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	CAUTION! This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to minor injuries or damage of property.

Special safety instructions:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.

Tips and recommendations:

	NOTE! …points out useful tips and recommendations as well as information for an efficient and trouble-free operation.

Reference marks:

☞ Marks a reference to another chapter of this manual.
🕮 Marks a reference to another chapter of another document.

4.3 Terms and Statement of Warranties

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

4.4 Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.
Before demounting, disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.
Disposal:
Recycle the decomposed elements: Metal components in scrap metal, Electronic components in electronic scrap, Recycle plastic components, dispose the remaining components according to their material consistence.

	CAUTION! Wrong disposal causes environmental damages! Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

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

Safety

	CAUTION! Please read the operating manual carefully, before using the device! Observe the installation instructions! Only start up the device if you have understood the operating manual. The operating company is obliged to take appropriate safety measure. The initial operation may only be performed by qualified and trained staff. Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

4.5 General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation. Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

4.6 Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.
Therefore: Change into protective clothing before performing the works and wear them throughout the process.
Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

	PROTECTIVE CLOTHING … is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other 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.

4.7 Conventional Use

The ELGO GSI2 length measuring system is only conceived for the conventional use described in this manual.
The ELGO GSI2 length measuring system only serves to measure linear sizes like lengths or distances.

CAUTION!
Danger through non-conventional use!
Non-intended use and non-observance of this operating manual can lead to dangerous situations.
Therefore:

- Only use the device as described
- Strictly follow the instructions of this manual

Avoid in particular:

- Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible.
Only the operator is liable for damages caused by non-conventional use.

4.8 Safety Instructions for Transport, Unpacking and Loading

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

4.9 Handling of Packaging Material

Notes for proper disposal: ☞4.4

4.10 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.
In case of externally recognizable transport damages:

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

NOTE!
Claim any damage immediately after recognizing it.
The claims for damage must be filed in the lawful reclaim periods.

4.11 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (☞ 6) needs to be observed
- Relative humidity (☞ 6) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

5 Product Features

5.1 General information

GSI2 is a guided magnetic incremental linear encoder with freely adjustable reference pulse, which can be adjusted at intervals of 5.0 mm as desired by using the enclosed reference pulse plate. The system consists of a sensor head, an integrated translation unit, a guiding body and a guiding rail with magnetic tape of the series MB20-50-10-1-R (with resolutions >0.001 mm) resp. a MB20-20-10-1-R (at 0.001 mm resolution). The guiding rail is available in different lengths up to 1 meter.

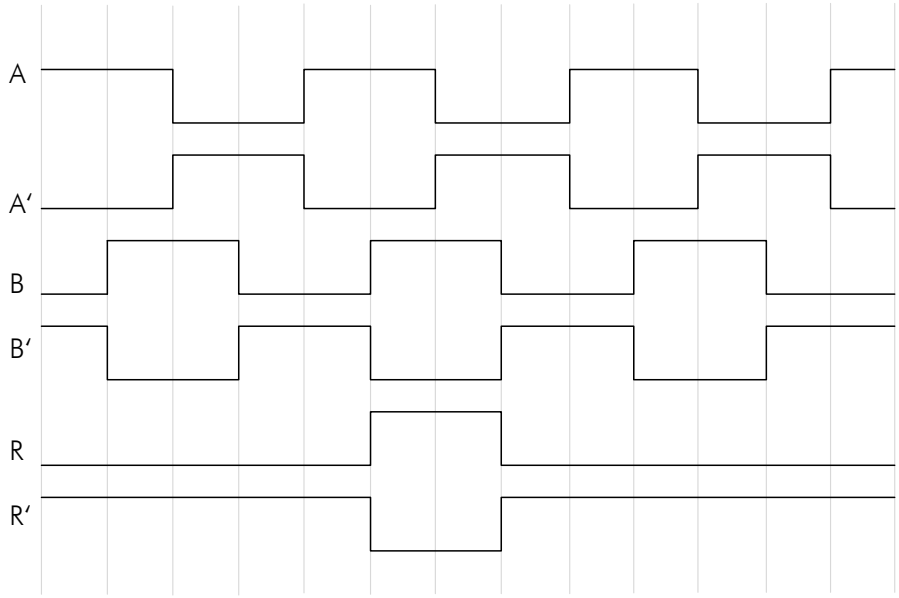
The GSI2 measuring system operates with a resolution of up to 0.001 mm at 4-edge triggering. The repeat accuracy is ± 1 increment. The desired resolution can be specified in the order (see ☞ 10 Type Designation). The ELGO length measuring system GSI2 is conceived for dynamic applications up to 4 m/s operation speed (e. g. press brakes and similar machines).

The translation unit converts the sinusoidal signals into speed-proportional, 90° phase shifted square waves in 5 V-TTL- line driver or 10 … 30 V-HTL push-pull. The sensor head is moved without contact and at the correct reading distance over the magnetic tape. This is ensured by the mechanic guiding system. Thus, the measuring system is totally maintenance free and free of wear. Due to a direct measuring, tolerances like slip or pitch are balanced.

Essential features:

- Cost-effective alternative to glass scales
- High-quality guiding unit with magnetic sensor
- High resolutions up to 0.001 mm at 4-edge triggering (☞ 10)
- Power supply 5 V or 10 … 30 V / output levels HTL or TTL
- Output channels A, A', B, B' and R, R'
- Adjustable reference pulse (channels R, R')
- Measuring lengths up to 1 meter possible
- Speed-proportional square wave outputs
- Robust, resistant to dirt and shock

5.2 Pulse diagram



The A and B channels are phase shifted by 90°

The reference pulse R occurs at the defined position of the reference pulse plate.

Figure 1: Pulse diagram

6 Technical Data

6.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the sensor and indicates the exact type designation (☞ 10) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

6.2 Dimensions of the GSI2 Guide Unit

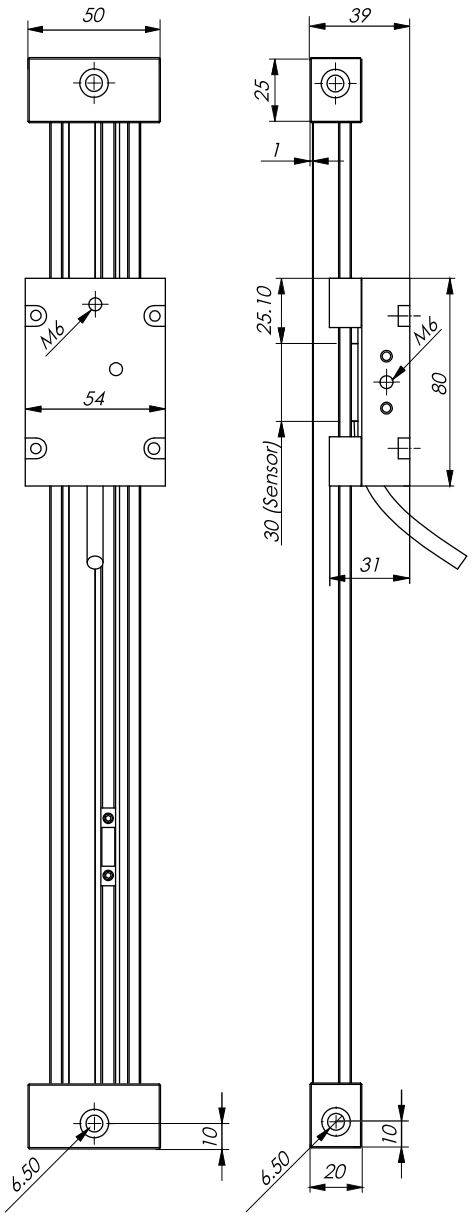


Figure 2: Dimensions of the GSI2 guide unit

- Total length = ordered measuring length + 150 mm
- Drilling distance = ordered measuring length + 130 mm
- Guide carriage dimensions (L x W x H) = 80 x 54 x 31 mm (without cable). More details ☞ 6.2.1.

6.2.1 Dimensions Guide Carriage

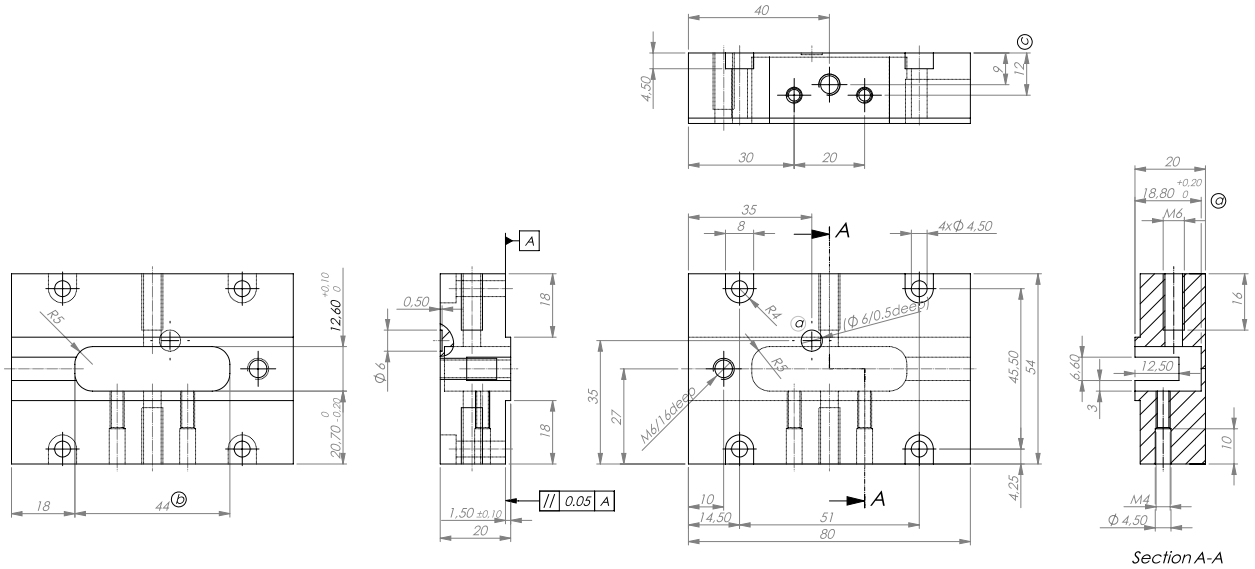


Figure 3: Dimensions Guide Carriage

6.2.2 Dimensions Joint Head (Accessory)

This section shows the dimensions of the joint head which is a part of the accessorial mounting kit. For more details about the mounting kit, see ☞6.5 Technical Data Mounting Kit (Accessory) and ☞ 11 Accessories.

Dimensions Joint Head	
A	20 mm
F	30 mm
L	40 mm
B	9 mm
D	6 mm
GL	12 mm
G	M6
SW	11 mm

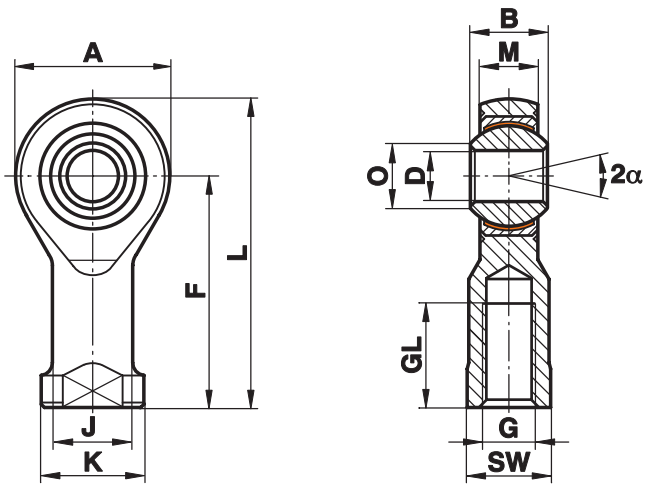


Figure 4: Dimensions Joint Head

6.3 Technical Data GSI2

Table 1: Technical Data of GSI2

GSI2 (standard version)	
Mechanical Data	
Measuring principle	incremental
Measuring length	max. 1000 mm resp. 1 meter
Repeat accuracy	±1 increment (depending on order)
Distance sensor / magnetic tape	fixed by guide carriage
Dimensions guiding carriage	L x W x H = 80 x 54 x 31 mm (without cable)
Dimensions of guide rail	L x W x H = (150 + measuring length) x 55 x 20 mm
Sensor housing material	zinc die cast
Guide carriage material	aluminium
Connection type	Open cable ends or diverse connectors (☞ 10 Type Designation)
Sensor cable	1.5 m standard cable length (others on request), drag chain suitable
Weight	approx. 620 g with a measuring length of 330 mm
Electrical Data	
Power supply voltage:	+ 10 … 30 VDC / 5 VDC (stabilized)
Residual ripple:	10 … 30 VDC <10 % 5 VDC ±25 mV
Consumption	10 ... 30 VDC max. 50 mA 5 VDC max 100 mA (with unloaded outputs)
Output signals	channels A, A', B, B', phase shifted by 90° (phase shift ±20%)
Output levels	HTL or TTL (☞ 10 order information)
Reference pulse	channels R, R', position adjustable ☞ 7.2
Output current	max. 20 mA per channel
Resolution	depends on order information (☞ 10)
Max. output frequency per channel	depends on selected resolution
Operating speed (measuring system)	depends on selected resolution e. g. max. 4 m/s at 0.1 mm resolution
Environmental conditions	
Storage temperature	-25 … +85 °C
Operation temperature	-10 … +70 °C (-25 … +85 °C on request)
Humidity	95 %, non-condensing
Protection class	IP67 (sensor head) IP54 (mechanical parts)

6.4 Technical Data Guide Rail

Table 2: Wear of the Guide Rail

Wear of the Guide Rail	
Running distance in km	2000 km
Rails length	500 mm
Wear y-direction	0,02 mm
Wear z-direction	0,01 mm

Example:

For 2000 km (4 Mio liftings) and a guide rail length of 500 mm there is a wear of 0.01 mm in Z-direction and 0.02 mm in Y-direction.

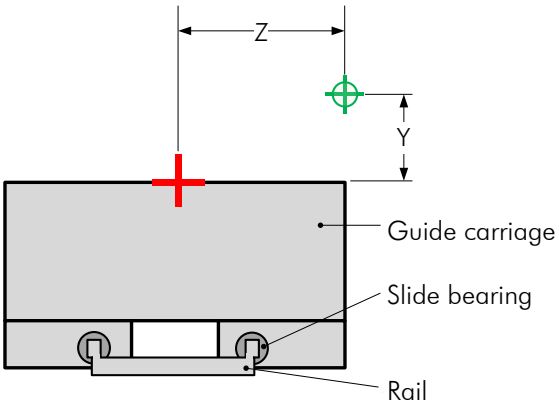


Figure 5: Wear of the Guide Rail

6.5 Technical Data Mounting Kit (Accessory)

Table 3: Technical Data Mounting Kit

Mounting kit GS-I-000-MK	
1 x Threaded rod M6 x 75	DIN 975
2 x Nut M6	DIN 934
2 x Washer A6,4	DIN 125
1 x Hexagon socket screw M6 x 25	DIN 912

Figure 6: Mounting kit GS-I-000-MK

Dimensions of the joint head see ☞ 6.2.2

7 Installation and First Start-Up

CAUTION
Please read the operating manual carefully before using the device! Strictly observe the Installation instructions!
In case of damage caused by failure to observe this operating manual, the warranty expires.

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

The operator is obliged to take appropriate safety measures.

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

7.1 Operating Area

WARNING!
Do not use the device in explosive or corrosive environments!
The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!

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

The device may be designed for switchboard mounting. During work on the switchboard, all components must be de-energized if there is a danger of touching the energized parts!
(protection against contacts)

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

Thin cable strands have to be equipped with end sleeves!

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

The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.

7.2 Fixing the Guide Rail

Normal fixing:

The guide rail is attached to the machine via the two plastic end pieces. In most cases, the 6.5 mm hole shown in the upper figure is used for this purpose.

Two M6 hexagon socket head screws are used for bolting.

Figure 7: Normal fixing

Lateral fixing:

Alternatively, the rail can also be mounted laterally. For this purpose, there are already prepared lateral mounting holes in the end pieces. For reasons of material stability with "normal fastening", however, these holes are only pre-drilled.

If the rail is actually to be fixed laterally, the holes can be drilled through completely by using a 6.5 mm drill bit and the rail can be fastened via these holes.

Figure 8: Lateral fixing

	PLEASE NOTE: To avoid damaging the plastic end pieces 1. please use a washer 2. tighten the M6 screws with maximum 12 Nm.

7.3 Coupling the Guide Carriage to the Machine

With the accessorial mounting kit (see sections ☞ 6.5 and ☞ 11), the guide carriage can be coupled to the mobile unit of the machine via a threaded rod with 2 joint heads. For screwing, 3 corresponding M6 tapped holes are already integrated in the guide carriage (1 x at the top and 1 x each side). The photos below show the type of fastening 1 x at the top and 1 x laterally.

Figure 9: Attached mounting kit GS-I-000MK

7.4 Defining the Reference Pulse Position

In order to place the reference pulse, measure from the fixing screw on the side of the cable outlet to the lower edge of the reference pulse plate. The plate can be placed every 5.0 mm:

Desired position of reference pulse plate + 55.0 mm = Actual position of reference pulse plate

Example:

Desired position of reference pulse at 120.0 mm

120.0 mm + 55.0 mm = 175.0 mm

175.0 mm = Actual position of reference pulse plate
(measured from the center of the fixing screw hole on the side of the cable outlet)

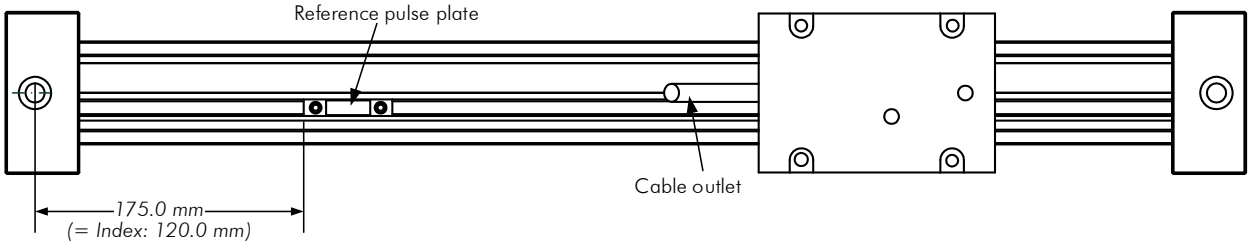


Figure 10: Reference pulse example 1

The first possible position for the reference pulse plate is at 55.0 mm. After that, it can be placed every 5.0 mm.

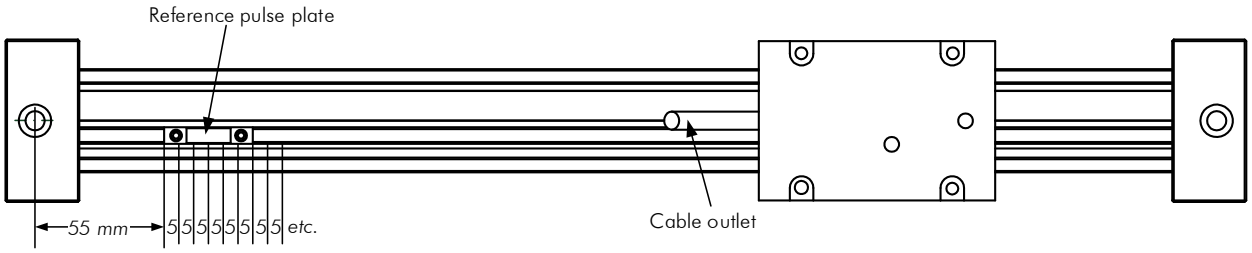


Figure 11: Reference pulse example 2

Make sure to place the pole of the reference pulse plate in such a way that it is parallel to a 5 mm pole of the magnetic tape. For this purpose a pole search foil is enclosed which makes the poles visible (see figure below).

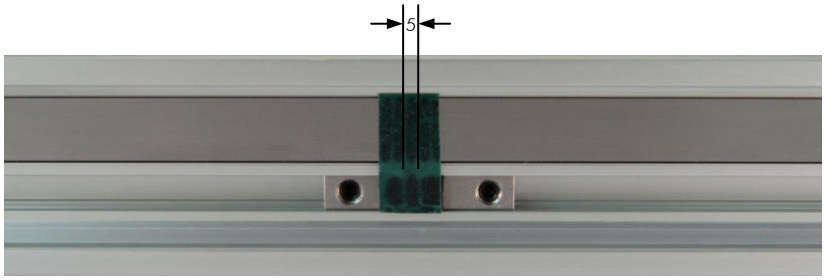


Figure 12: Position of the reference pulse

7.5 Example of a GSI2 System

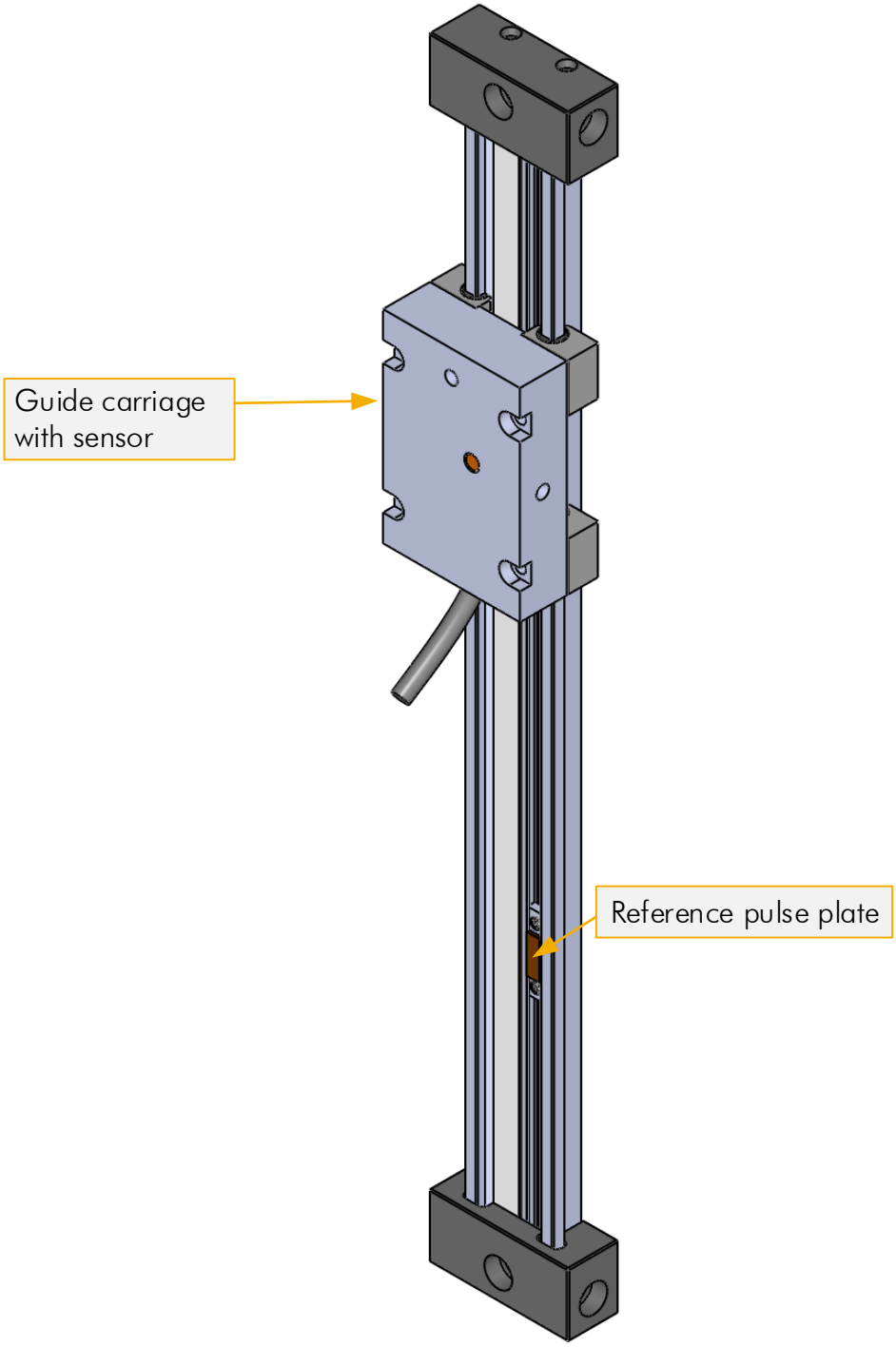


Figure 13: Example of a GSI2 system

8 Connections

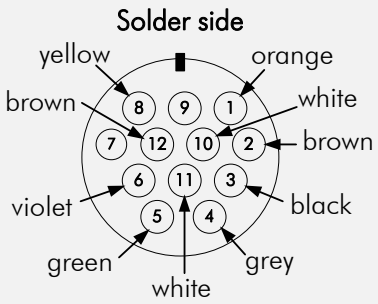
8.1.1 Pin Assignment (standard)

Table 4: Pin Assignment open cable ends (standard)

Connection type	Colour	Function	Description
Open cable ends	White	0 V / GND	Ground
	Brown	VCC	10 … 30 VDC / 5 VDC
	Green	A	Channel A
	Yellow	B	Channel B
	Black	R	Channel R
	Violet	A‘	Channel A inverted
	Orange	B‘	Channel B inverted
	Grey	R‘	Channel R inverted
	Screen	PE	Shield / Earth

8.1.2 Pin Assignment 12 pin Round Connector M23

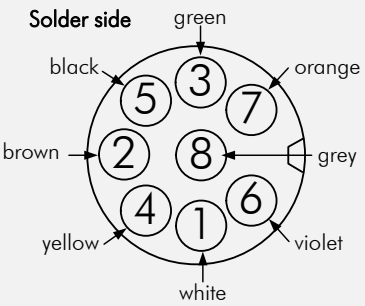
Table 5: Pin Assignment 12 pin round connector

Connection type	Drawing	Pin	Function	Description
12 pin round connector (Order index: 1)		1	B’	Channel B inverted
		2	VCC	10 … 30 VDC / 5 VDC
		3	R	Channel R
		4	R’	Channel R inverted
		5	A	Channel A
		6	A’	Channel A inverted
		7	-	not connected
		8	B	Channel B
		9	-	not connected
		10	0 V / GND	Ground
		11	0 V / GND	Ground
		12	VCC	10-30 VDC / 5 VDC
		Screen	PE	Connected to housing

PLEASE NOTE: Pin 2 and 12 (VCC) are internally bridged. Pin 10 and 11 (GND) are internally bridged. The connection of VCC / GND is only required at one of the two pins.

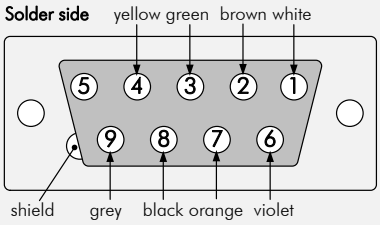
8.1.3 Pin Assignment 8 pin Round Connector M16

Table 6: Pin Assignment 8 pin round connector

Connection type	Drawing	Pin	Function	Description
8 pin round connector (Order index: 2)		1	0 V / GND	Ground
		2	VCC	10 … 30 VDC / 5 VDC
		3	A	Channel A
		4	B	Channel B
		5	R	Channel R
		6	A‘	Channel A inverted
		7	B‘	Channel B inverted
		8	R ‘	Channel R inverted
		Screen	PE	Connected to housing

8.1.4 Pin Assignment 9 pin D-SUB Connector

Table 7: Pin Assignment D-SUB connector

Connection type	Drawing	Pin	Function	Description
9 pin D-SUB connector (Order index: 3)		1	0 V / GND	Ground
		2	VCC	10 … 30 VDC / 5 VDC
		3	A	Channel A
		4	B	Channel B
		6	A‘	Channel A inverted
		7	B‘	Channel B inverted
		8	R	Channel R
		9	R‘	Channel R inverted
		Screen	PE	Connected to housing

9 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 9.1.
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).

9.1 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

9.2 Re-start after Fault Clearance

After the fault clearance:

1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary.
3. Ensure that there are no persons in the danger area.
4. Follow the instructions from chapter 7.

WARNING!
Danger of injury through non-conventional fault clearance!

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

Therefore:

- Any work to clear the faults may only be performed by sufficiently qualified staff
- Arrange enough space before starting the works
- Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.

If components need to be replaced:

- Pay attention to a correct installation of the spare parts.
- Reinstall all the fixing elements properly
- Before turning on the device, ensure that all covers and safety equipment is installed correctly and functions properly

9.3 Maintenance

The device is maintenance-free.

WARNING!
Danger through non-conventional maintenance!

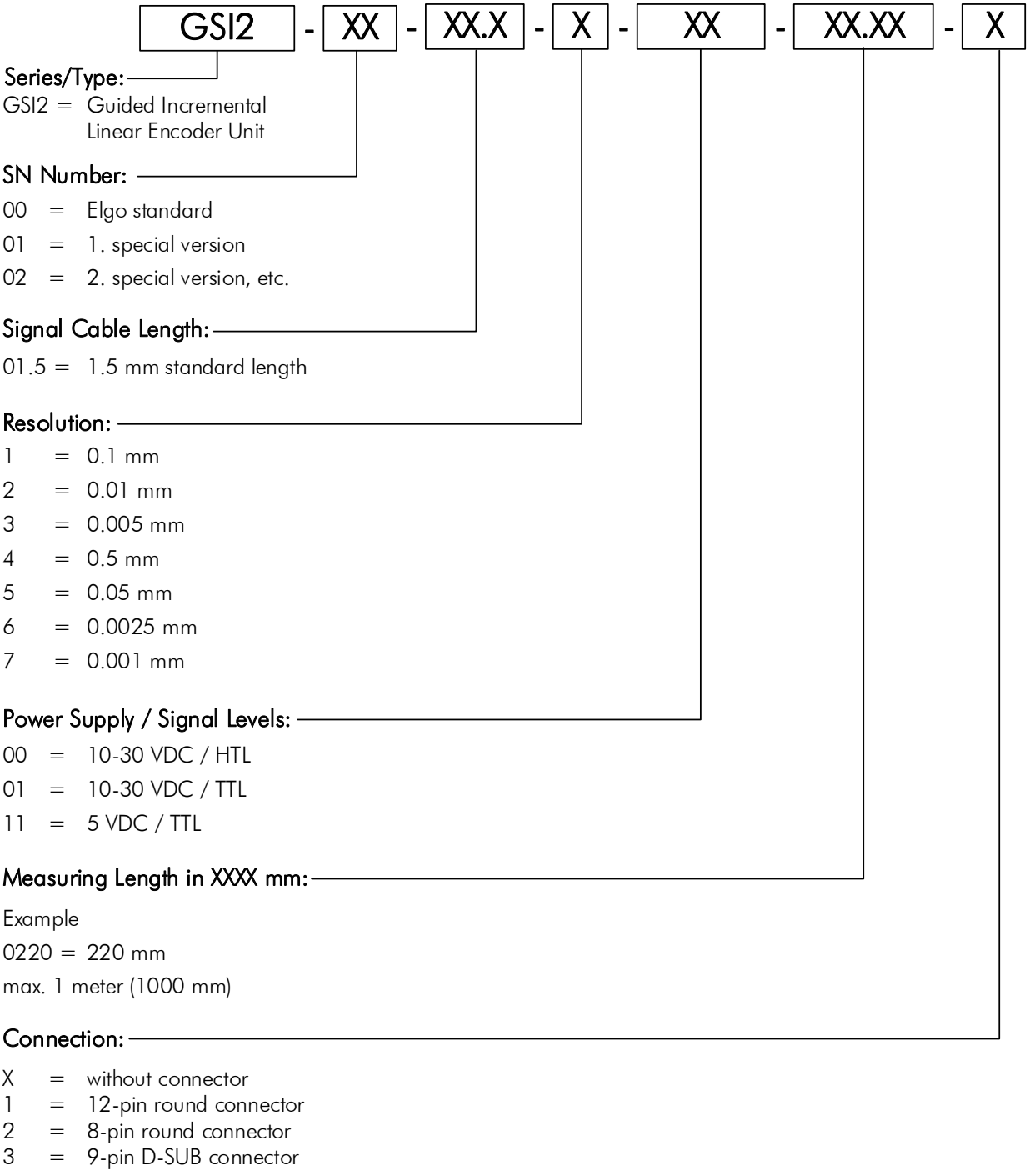
Non-conventional maintenance can lead to severe injuries and damage of property.

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

9.4 Cleaning

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

10 Type Designation



11 Accessories

Order designation	Description
Mounting kit GS-I-**000**-MK	Set for M6 mounting: Consists of two joint heads, one M6 threaded rod, two M6 nuts, two M6 washers and an M6 hexagon socket screw for fastening the unit to the guide carriage

Notes:

12 Index

ELGO Electronic GmbH & Co. KG
Measuring | Positioning | Control
Carl - Benz - Str. 1, D-78239 Rielasingen
Fon:+49 (0) 7731 9339-0, Fax:+49 (0) 7731 28803
Internet: www.elgo.de, Mail: info@elgo.de