

Operating Manual

SERIES GSI4

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-edge 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. 799000753

Document – Name GSI4-00-MA-E_39-17

Document- Revision Rev. 2

Issue Date 2017-09-25

Copyright © 2017, ELGO Electronic GmbH & Co. KG

1 Contents

1	Contents	3
2	Image Directory	4
3	Table Directory.....	4
4	General, Safety, Transport and Storage	5
4.1	Information Operating Manual	5
4.2	Explanation of Symbols	5
4.3	Terms and Statement of Warranties.....	6
4.4	Demounting and Disposal	6
4.5	General Causes of Risk.....	6
4.6	Personal Protective Equipment.....	6
4.7	Conventional Use	7
4.8	Safety Instructions for Transport, Unpacking and Loading	7
4.9	Handling of Packaging Material	7
4.10	Inspection of Transport	7
4.11	Storage	7
5	Product Features	8
5.1	General information.....	8
5.2	Pulse diagram	8
6	Technical Data	9
6.1	Identification	9
6.2	Dimensions of the GSI4 Guide Unit	9
6.3	Technical Data GSI4	11
6.4	Technical Data Mounting Kit (Accessory).....	12
7	Installation and First Start-Up.....	13
7.1	Operating Area	13
7.2	Fixing the Guide Rail	14
7.3	Coupling the Guide Carriage to the Machine.....	14
7.4	Defining the Reference Pulse Position	15
7.5	Example of a GSI4 System.....	16
8	Connections.....	17
9	Disturbances, Maintenance, Cleaning.....	19
9.1	Fault Clearance.....	19
9.2	Re-start after Fault Clearance.....	19
9.3	Maintenance.....	20
9.4	Cleaning	20
10	Type Designation	21

11	Accessories	21
12	Index	23

2 Image Directory

Figure 1: Pulse diagram	8
Figure 2: Dimensions of the GSI4 guide unit	9
Figure 3: Dimensions Guide Carriage	10
Figure 4: Dimensions Joint Head	10
Figure 5: Mounting kit GS-I-001-MK.....	12
Figure 6: Plastic end piece.....	14
Figure 7: Coupling adaptor for mounting kit GS-I-001-MK	14
Figure 8: Reference pulse example 1	15
Figure 9: Reference pulse example 2	15
Figure 10: Position of the reference pulse	15
Figure 11: Example of a GSI4 system	16

3 Table Directory

Table 1: Technical Data of GSI4	11
Table 2: Technical Data Mounting Kit.....	12
Table 3: Pin Assignment open cable ends (standard).....	17
Table 4: Pin Assignment 12 pin round connector.....	17
Table 5: Pin Assignment 8 pin round connector.....	17
Table 6: Pin Assignment D-SUB connector	18

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:

	<p>PROTECTIVE CLOTHING ... is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewelry.</p>
	<p>PROTECTIVE GLOVES ...for protecting the hands against abrasion, wear and other injury of the skin.</p>
	<p>PROTECTIVE HELMET ...for protection against injuries of the head.</p>

4.7 Conventional Use

The ELGO GSI4 length measuring system is only conceived for the conventional use described in this manual.
The ELGO GSI4 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 (4 °C) needs to be observed
- Relative humidity (60%) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

5 Product Features

5.1 General information

GSI4 is a guided magnetic incremental linear encoder with freely adjustable reference pulse, which can be adjusted at intervals of 2.0 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 MB20-20-10-1-R-HG. The guiding rail is available in different lengths up to one meter.

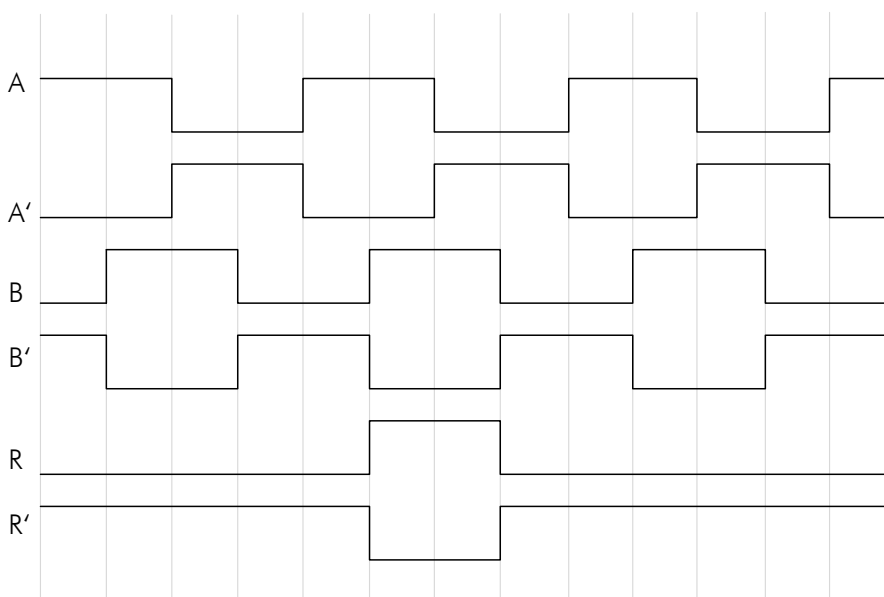
The GSI4 measuring system operates with a resolution of up to 0.001 mm at 4-edge triggering. The repeat accuracy is ± 1 increment. The desired resolution can be specified in the order (see ☞ 10 Type Designation). The ELGO length measuring system GSI4 is conceived for dynamic applications up to 4 m/s 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 GSI4 Guide Unit

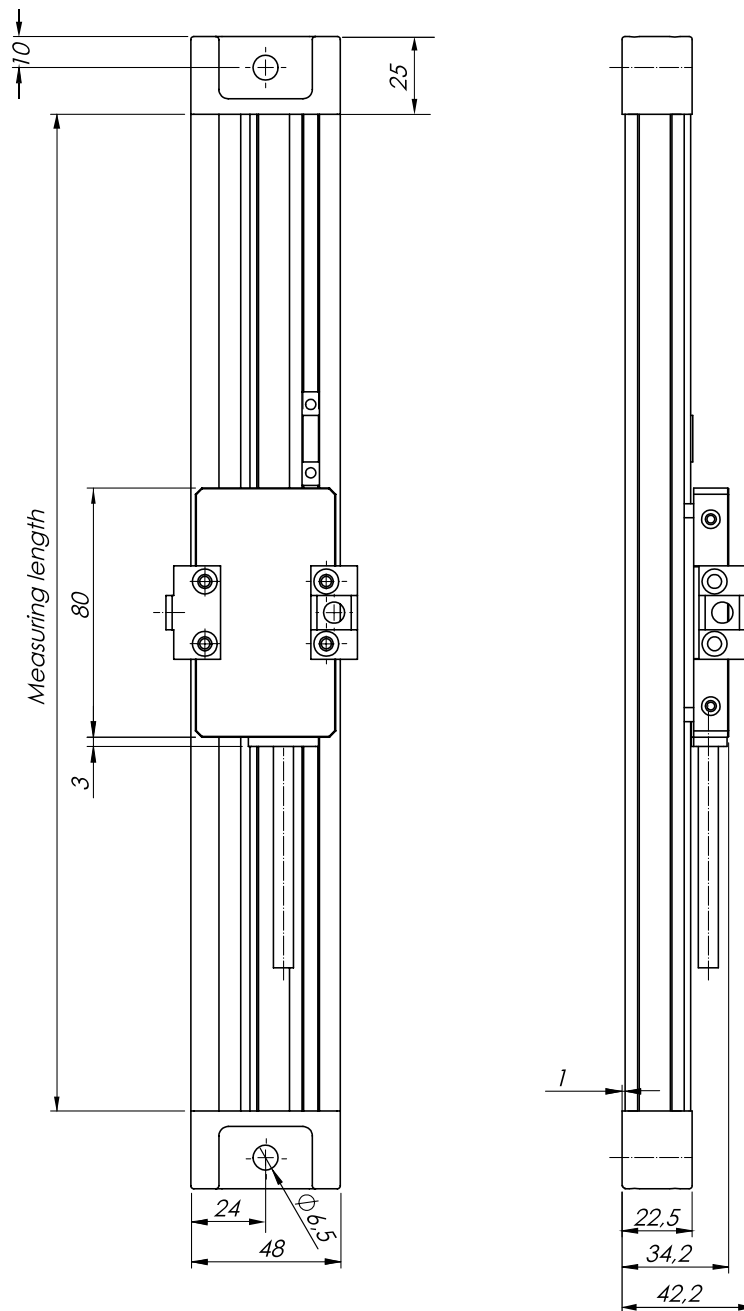


Figure 2: Dimensions of the GSI4 guide unit

- Total length = ordered measuring length + 150 mm
- Drilling distance = ordered measuring length + 130 mm
- Guide carriage (L x W x H) = 80 x 50 x 12 mm (without cable and coupling adaptor). Details ☞ 6.2.1.

6.2.1 Dimensions Guide Carriage

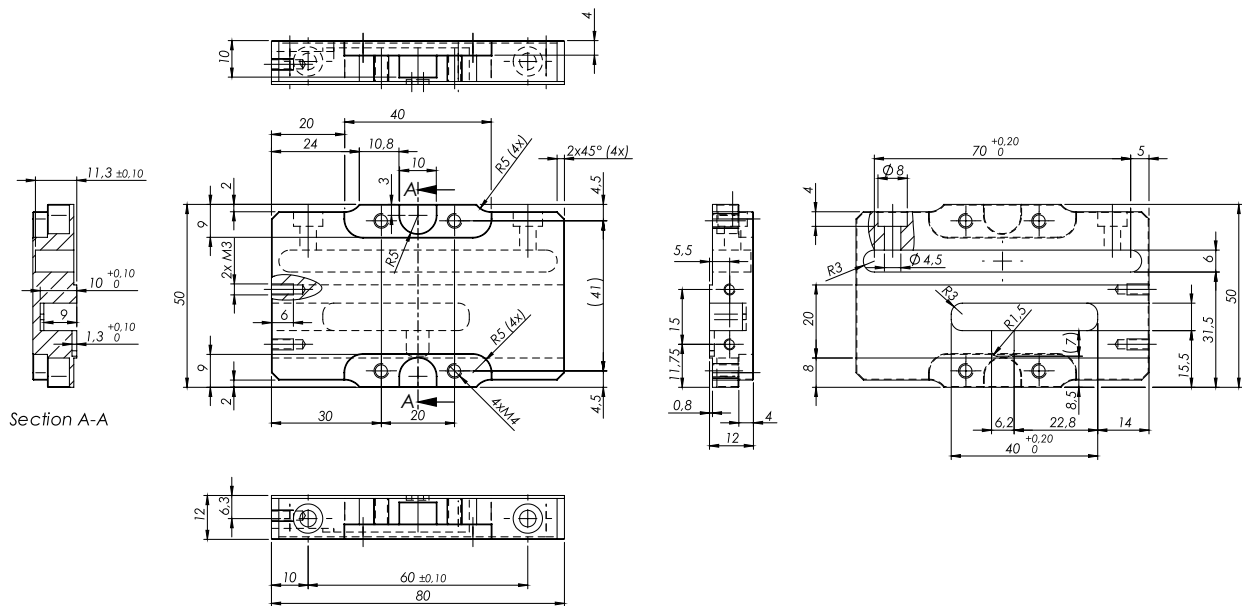


Figure 3: Dimensions Guide Carriage

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 6.4 Technical Data Mounting Kit (Accessory) and 11 Accessories.

Dimensions Joint Head

A	24 mm
F	36 mm
L	48 mm
B	12 mm
D	8 mm
GL	16 mm
G	M8
SW	13 mm

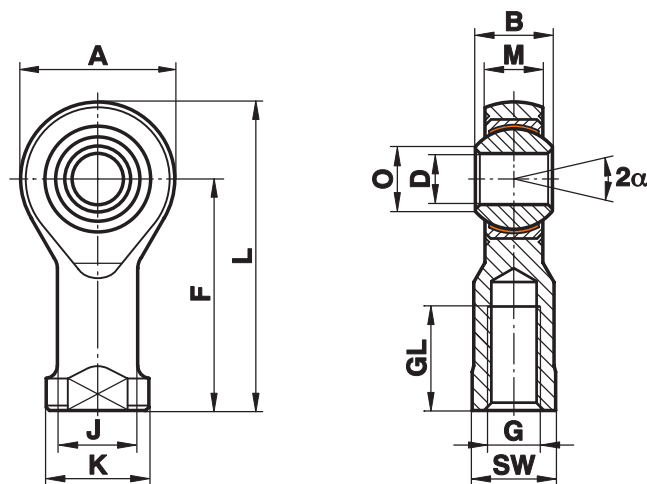


Figure 4: Dimensions Joint Head

6.3 Technical Data GSI4

Table 1: Technical Data of GSI4

GSI4 (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 50 x 12 mm (without cable and coupling adaptor)
Dimensions of guide rail	L x W x H = (150 + measuring length) x 48 x 22,5 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 ☞ 7.4
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 Mounting Kit (Accessory)

Table 2: Technical Data Mounting Kit

Mounting kit GS-I-001-MK


1 x Threaded rod M8 x 75	DIN 975
2 x Nut M8	DIN 934
2 x Washer A8,4	DIN 125
1 x Hexagon socket screw M8 x 25	DIN 912




Figure 5: Mounting kit GS-I-001-MK






Dimensions of the joint head see ☞ 6.2.2
Order designation see ☞ 11 Accessories

7 Installation and First Start-Up

	<p>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.</p> <p>ELGO is not liable for any secondary damage and for damage to persons, property or assets.</p> <p>The operator is obliged to take appropriate safety measures.</p> <p>The first start-up may only be performed by qualified staff that has been trained and authorized by the operator.</p>
---	--

7.1 Operating Area

	<p>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!</p>
---	---

	<p>CAUTION! The electrical connections must be made by suitably qualified personnel in accordance with local regulations.</p>
	<p>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)</p>
	<p>Wiring works may only be performed in the de-energized state!</p>
	<p>Thin cable strands have to be equipped with end sleeves! Before switching on the device, connections and plug connectors have to be checked!</p>
	<p>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.</p>

7.2 Fixing the Guide Rail



The guide rail is attached to the machine via the 6.5 mm holes, which are located on the two plastic end pieces. For screwing, two M6 cylinder head screws with internal hexagon must be used.

Figure 6: Plastic end piece



PLEASE NOTE: To avoid damaging the plastic end pieces, the M6 screws may be tightened with a maximum of 6 Nm.

7.3 Coupling the Guide Carriage to the Machine

With the accessorial mounting kit (see sections 6.4 and 11), the guide carriage can be coupled to the mobile unit of the machine via a threaded rod with 2 joint heads. For this purpose, the included coupling adaptor is used, which allows to fix the mounting kit as well from the top as laterally. The guide carriage has two recesses with corresponding mounting holes for fastening the adapter. The photos below show the type of fastening 1 x at the top and 1 x laterally.

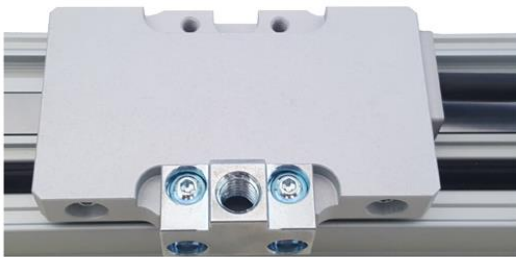


Figure 7: Coupling adaptor for mounting kit GS-I-001-MK

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 2.0 mm:

Desired position of reference pulse plate + 40.0 mm = Actual position of reference pulse plate

Example:

Desired position of reference pulse at 120.0 mm

$$120.0 \text{ mm} + 40.0 \text{ mm} = 160.0 \text{ mm}$$

$$160.0 \text{ mm} = \text{Actual position of reference pulse plate}$$

(measured from the center of the fixing screw hole on the side of the cable outlet)

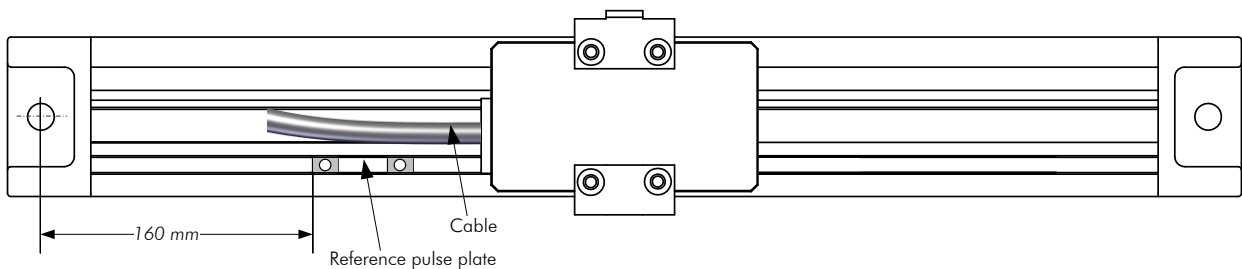


Figure 8: Reference pulse example 1

The first possible position for the reference pulse plate is at 40.0 mm. After that, it can be placed every 2.0 mm.

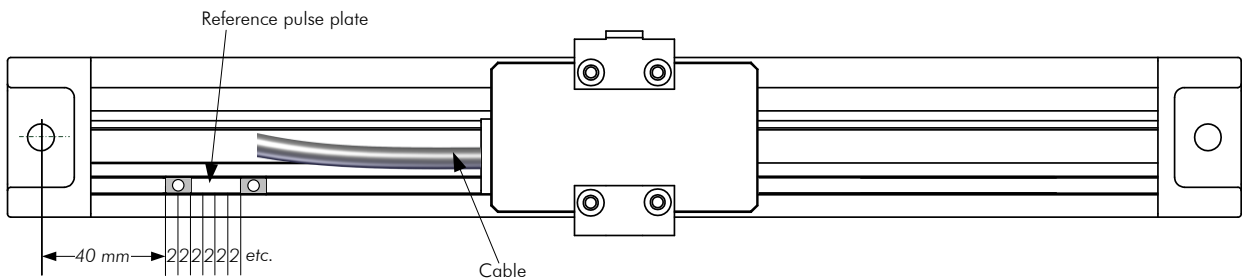


Figure 9: Reference pulse example 2

Make sure to place the pole of the reference pulse plate in such a way that it is parallel to a 2 mm pole of the magnetic tape. For this purpose a pole search foil is enclosed which makes the poles visible (see figure below).

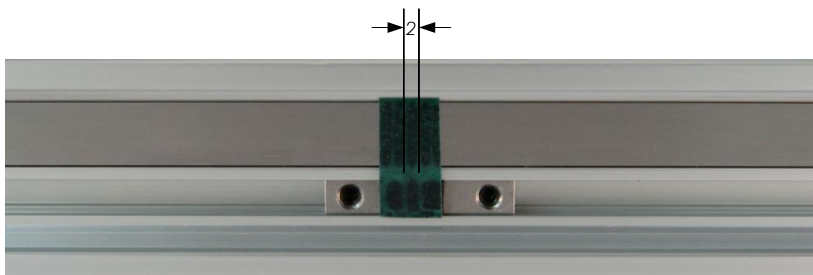


Figure 10: Position of the reference pulse

7.5 Example of a GSI4 System

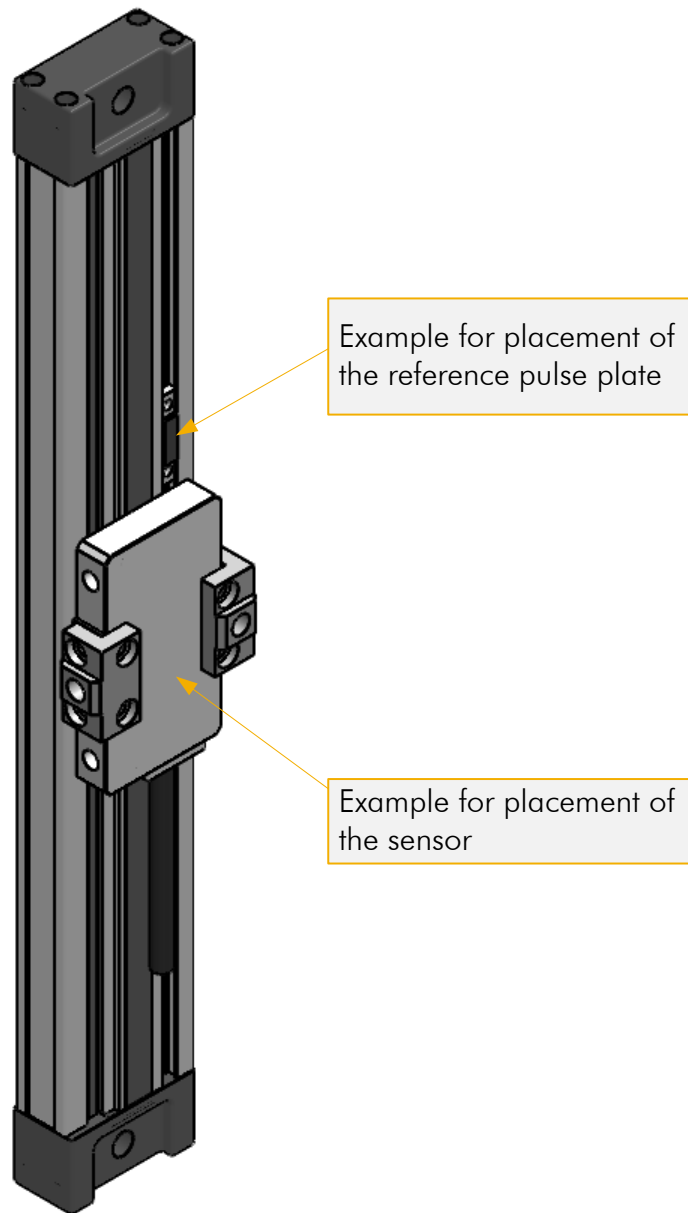


Figure 11: Example of a GSI4 system

8 Connections

8.1.1 Pin Assignment (standard)

Table 3: 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 4: Pin Assignment 12 pin round connector

Connection type	Drawing	Pin	Function	Description
12 pin round connector (Order index: 1)	<p style="text-align: center;">Solder side</p>	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 5: Pin Assignment 8 pin round connector

Connection type	Drawing	Pin	Function	Description
8 pin round connector (Order index: 2)	<p style="text-align: center;">Solder side</p>	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 6: Pin Assignment D-SUB connector

Connection type	Drawing	Pin	Function	Description
9 pin D-SUB connector (Order index: 3)	<p>Solder side yellow green brown white</p> <p>shield grey black orange violet</p>	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 μ F / 100 Ω)
2. Installation of recovery diodes via DC-inductors
3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
4. Do not connect protective earth and ground
5. Connect a mains filter ahead of the external power pack

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.

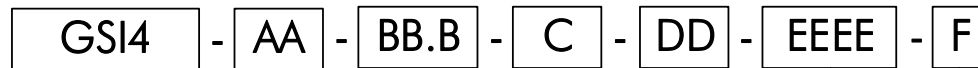
9.4 Cleaning



WARNING!

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

10 Type Designation



Series/Type:

GSI4 = Guided Incremental
Linear Encoder Unit

SN Number:

- 00 = Elgo standard
- 01 = first special version
- 02 = second special version etc.

Signal cable length:

01.5 = 1.5 mm standard length

Resolution:

- 1 = 0.1 mm
- 2 = 0.01 mm
- 3 = 0.005 mm
- 4 = 0.5 mm
- 5 = 0.05 mm
- 6 = 0.0025 mm
- 7 = 0.001 mm

Power supply / Output levels:

- 00 = 10 ... 30 VDC / HTL
- 01 = 10 ... 30 VDC / TTL
- 11 = 5 VDC / TTL

Measuring length in XXXX mm:

Example:

0330 = 330 mm

(maximum length: 1000 mm)

Connections:

- X = without connector (open cable ends)
- 1 = 12 pin M23 round connector
- 2 = 8 pin M16 round connector
- 3 = 9 pin D-SUB connector

11 Accessories

Order designation	Description
Mounting kit GS-I-001-MK	Set for M8 mounting: Consists of two joint heads, one M8 threaded rod, two M8 nuts, two M8 washers and an M8 hexagon socket screw for fastening the unit to the guide carriage

Notes:

12 Index

Accessories	21	Installation	13
Accident prevention regulations.....	5	Maintenance.....	8, 19, 20
Causes of risk.....	6	Operating area	13
Cleaning.....	19, 20	Operational safety.....	5
Connections	17	Order reference	9
Conventional use.....	7	Packaging material.....	7
Coupling the Guide Carriage to the Machine	14	Product Features	8
Defining the Reference Pulse Position.....	15	Protection against contact	13
Demounting	6	Protective equipment	6
Device number	9	Pulse diagram	8
Dimensions Guide Carriage	10	Repeat accuracy.....	8
Dimensions of the GSI4 Guide Unit.....	9	Safety	5, 6
Dimensions of the Joint Head	10	Safety instructions	5
Disposal.....	6	Safety rules	5
Disturbances	19	Start-up	13
Example of a GSI4 System	16	Storage	7
Explanation of symbols.....	5	Technical Data GSI4	11
Fault clearance.....	19	Technical Data Mounting Kit	10, 12
First start-up	13	Transport.....	7
Fixing the Guide Rail.....	14	Transport damage.....	7
General information	8	Type Designation	21
Identification	9		

Document- No.: 799000753 / Rev. 2
Document- Name: GSI4-00-MA-E_39-17
Subject to change - © 2017
ELGO Electronic GmbH & Co. KG

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

