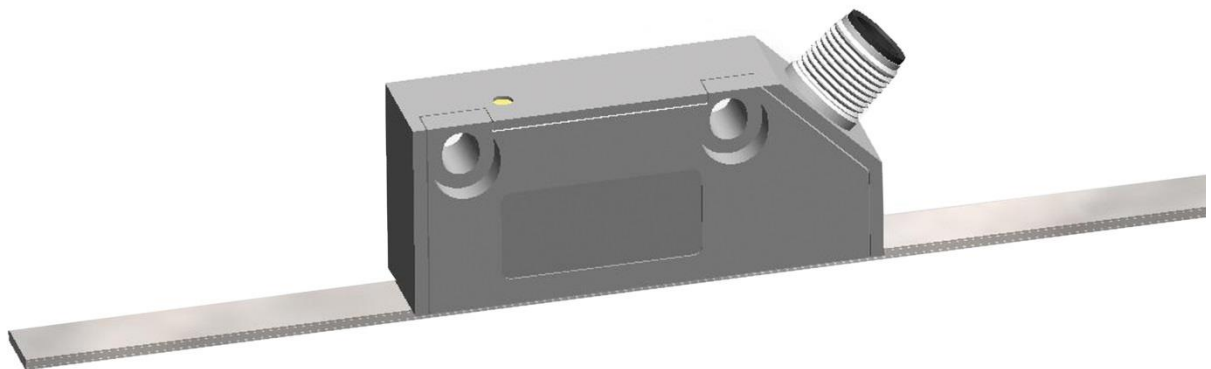


Operating Manual

SERIE EMAX-HI

Magnetic Absolute Length Measuring System



- High resolution - $1\mu\text{m}$
- For highly dynamic controls
- 8 m measuring length
- Automatic distance detection via LED
- Available Interfaces: SSI, CANopen or RS422
On request: BISS-C or CAN BASIC ELGO
- Optionally, incremental square wave signals (A, B)
or 1 Vss sine-cosine for dynamic movement control

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. 799000710

Document - Name EMAX-HI-00-MA-E_12-18

Document- Revision Rev. 4

Issue Date 2018-03-22

Copyright © 2018, ELGO Electronic GmbH & Co. KG

1 Contents

1	Contents	3
2	General, Safety, Transport and Storage	4
2.1	Information Operating Manual	4
2.2	Explanation of Symbols	4
2.3	Statement of Warranties	5
2.4	Demounting and Disposal	5
2.5	General Causes of Risk	5
2.6	Personal Protective Equipment	5
2.7	Conventional Use	6
2.8	Safety Instructions for Transport, Unpacking and Loading	6
2.9	Handling of Packaging Material	6
2.10	Inspection of Transport	6
2.11	Storage	6
3	Product Features	7
3.1	Functional principle	7
4	Technical Data	8
4.1	Identification	8
4.2	Dimensions Sensor	8
4.3	Technical Data Sensor	9
4.4	Technical Data Magnetic Tape	10
5	Installation and First Start-Up	11
5.1	Operating Area	11
5.2	Description installation / Installation of the indicator	12
5.3	Description installation / Mounting of the Magnetic Tape	13
6	Connections and Interfaces	16
6.1	SSI (Interface Option SB0 and SG0)	16
6.2	CANopen (Interface Option CA0)	16
6.3	RS422 (Interface Option 420)	16
6.4	Interfaces	17
7	Accessories	20
7.1	Type Designation - Signal Cable	21
8	Disturbances, Maintenance, Cleaning	22
8.1	Fault Clearance	22
8.2	Re-start after Fault Clearance	22
8.3	Maintenance	23
8.4	Cleaning	23
9	Type designation	24
10	Index	27

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 statement of warranties is enclosed separately in the sales documents.

Guarantee:

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

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:

	<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>

2.7 Conventional Use

The product described in this manual was developed to execute safety-related functions as a part of an entire assembly or machine. It is the responsibility of the manufacturer of a machine or installation to ensure the proper functioning of the system. The ELGO-device is only conceived for the conventional use described in this manual.

The EMAX-HI - 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:

- 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: ☞ 0

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

3 Product Features

EMAX-HI is a magnetic length measuring system. Sensor and translator are integrated in one housing. The magnetic tape is attached to a flat surface using the adhesive tape included in the delivery. *EMAX-HI* can be installed at a distance of up to 0.5mm from the magnetic tape (without cover tape).

The absolute measuring system provides the following advantages:

- No referencing necessary.
- Direct and contactless measurement.
- The distance between the sensor and the magnetic tape can vary between 0.1 and 0.5 mm (without covering tape). The LED on the housing of the sensor glows RED if this distance is crossed.
- Measuring length up to 8 m.
- High resolution: 0.001 mm.
- Repeating accuracy ± 1 Increment.
- Very robust against dirt.

Regarding the interface, different options are available SSI, RS422 or CANopen (DS 406). CAN VASIC ELGO (CNO) and BISS-C on request.

Typical applications are linear drives.

3.1 Functional principle

A Hall sensor and a magneto-resistive impedance measuring bridge are guided over a two-track magnetic tape with a fine-interpolation trace and an absolute trace. Together with the sensor line the absolute track provides an absolute value and the fine-interpolation trace provides together with the interpolation electronic the measuring systems high resolution.

The figure shows two magnetic traces, with north-pole and south-pole magnetization. The fine interpolation trace encloses alternately north and south-pole traces with a distance of 1 mm, these are scanned with resistance bridges and provide a resolution of 0.001 mm. The absolute value provides the sensor line with 16 single Hall sensors, these sensors are scanning the code sections of the north and south poles. The absolute value on the magnetic tape recurs every 8 m.

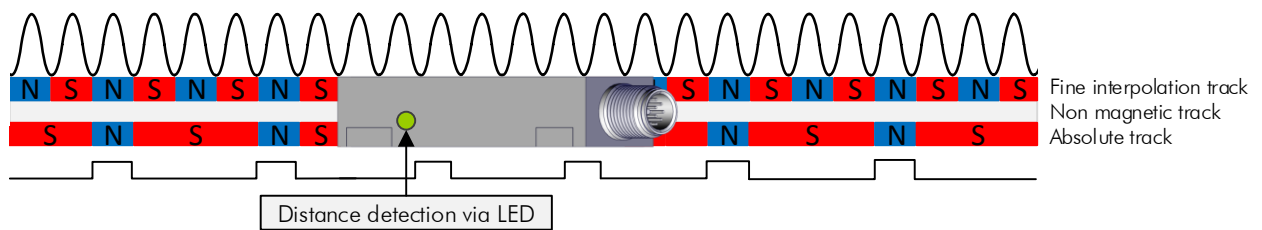


Figure1: Mounting direction

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 Sensor

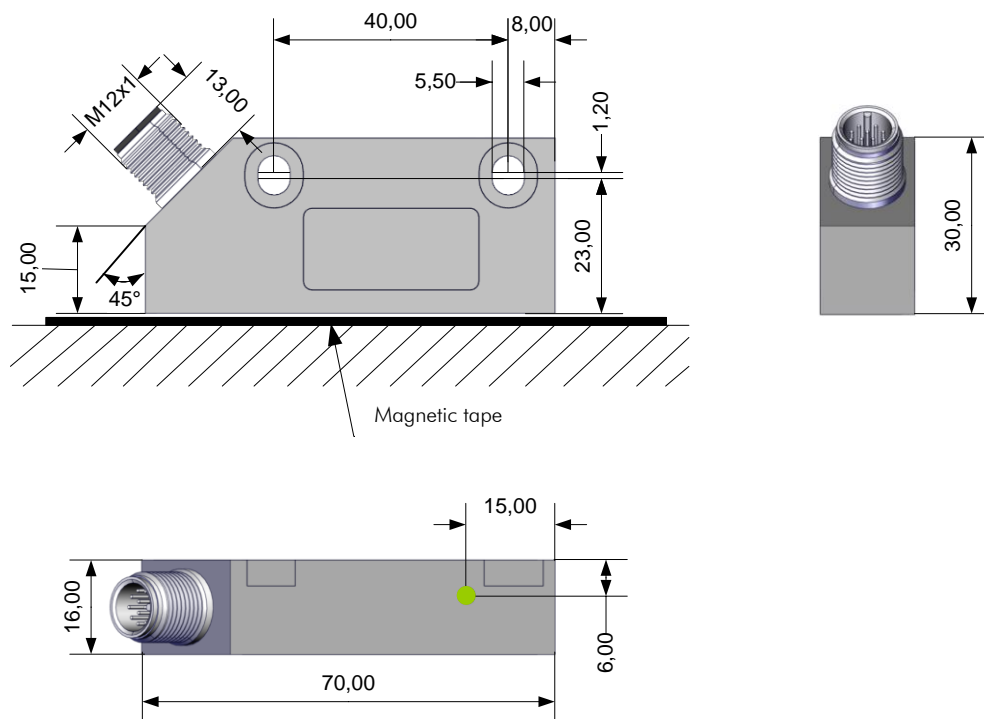


Figure 2: Dimensions Sensor

4.3 Technical Data Sensor

EMAX-HI (standard version)

Mechanical Data

Measuring principle	absolute
Repeat accuracy	±1 Increment
System accuracy in at 20° C	±(10 μm + 20 μm x L[m]) L = measuring length in meters
Distance sensor - magnetic tape	max. 0.5 mm (without covering tape)
Basic pole pitch	1 mm
Sensor housing material	aluminium
Sensor housing dimensions	L x W x H = 70 x 16 x 30 mm
Necessary type	AB20-10-10-2-R-11
Maximum measuring length	8 m
Connections	circular plug 12-pin M12 outboard
Sensor cable	5 m standard cable length (others upon request)
Weight	approx. 50 g without cable; cable approx. 60 g/m (accessories)

Electrical Data

Supply voltage	10 ... 30 VDC
Residual ripple	10 ... 30 VDC < 10%
Power input	max. 150 mA
Interfaces	standard: SSI-Interface or CANopen on request: CAN BASIC ELGO or BISS-C
Resolution	0.001 mm
Speed	1 m/s at permanent absolute position readout 10 m/s at SC10 readout 2 m/s at TTL square wave readout

Conditions

Storage temperature	-20 ... +85° C
Operation temperature	-10 ... +70° C (-20 ... +75° C upon request)
Relative humidity	max. 95 %, non-condensing
Air pressure (storage/transport)	700 ... 1060 hPa
Air pressure (operation)	750 ... 1060 hPa
Protection class	IP50 (standard) IP65 (option V) higher protection class on request

4.4 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 AB20-10-10-2-R-11

Coding	absolute, two tracks system
Pole pitch	1 mm
Operation temperature installed	-20 ... +65 °C (-20... +80° C when using without adhesive tape, options „B“ or „D“)
Storage temperature uninstalled	Short-term: -10 ... +60° C Medium-term: 0 ... +40° C Long-term: +18° C (-20 ... +80° C when using without adhesive tape, options „B“ or „D“)
Gluing temperature:	+18°C ... +30°C
Relative humidity	max. 95 %, non-condensing
Accurateness 20°C in mm	±(10 + 20 x L[m]) (L = measuring length in meters)
Material carrier tape	Precision strip 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	$\alpha \approx 16 \times 10^{-6} \text{ 1/K}$
Thermal length expansion	$\Delta L[\text{m}] = L[\text{m}] \times \alpha[\text{1/K}] \times \Delta \vartheta[\text{K}]$ (L = tape length in meters, $\Delta \vartheta$ = relative temperature change)
Available lengths	Up to 8 m
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 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 / Installation of the indicator

5.2.1 Mounting Tolerance



NOTE!

Pay attention to correct distance sensor / magnetic tape 0,1 mm...max. 0,5 mm! The LED-Indicator on the sensor housing flashes red, if this distance is exceeded. The direction arrow have to point in the same direction by the assembly.

Notice by the installation of the system the compliance of the given tolerance! Outside these areas the function is not guaranteed!

Install the sensor with M3 screws, see chapter "Dimensions of sensor".

Table 1: Mounting Tolerances

Tolerances	
Magnetic tape type	AB20-10-10-2-R-11
Ride height	0.1 mm...max. 0.5 mm (without cover band) 0.02 mm...max. 0.2 mm (with cover band)
Pitch	max. distance 0.5 mm must not be exceeded at any position
Yaw angle	$< \pm 1^\circ$
Roll	max. distance 0.5 mm must not be exceeded at any position
Lateral offset	± 0.5 mm

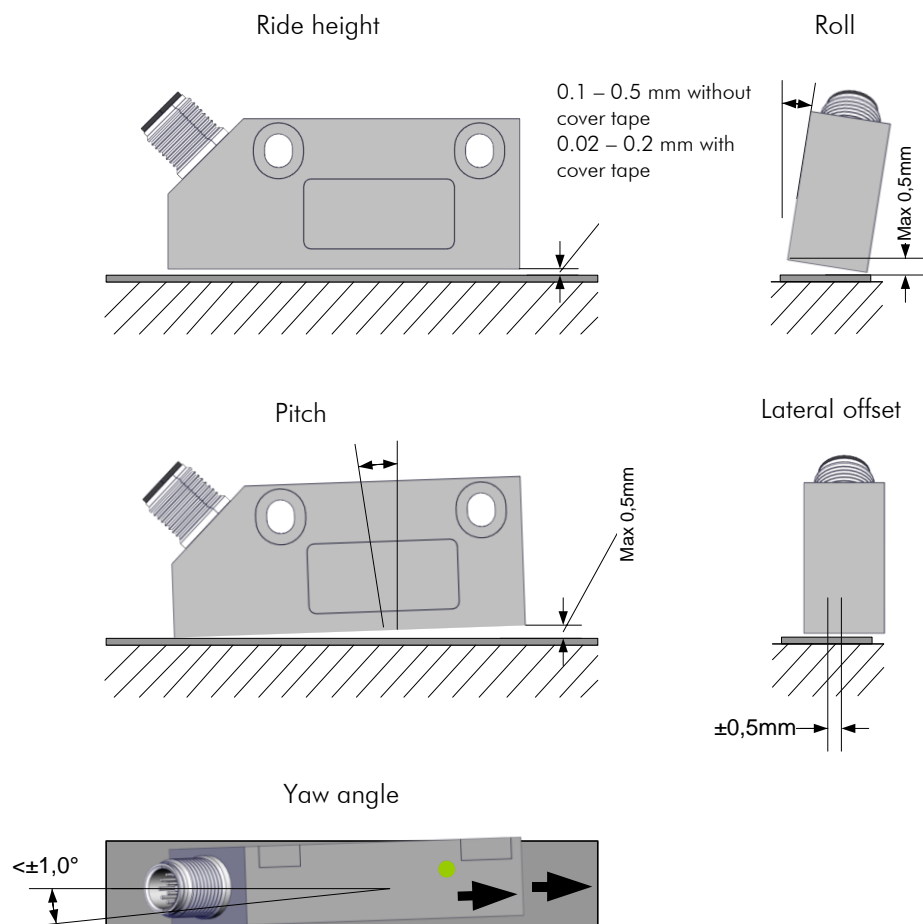


Figure 3: Mounting Tolerances

5.3 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.

5.3.1 The Magnetic Tape AB20-10-10-2-R-11

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 (see Figure 4: Components of the magnetic tape below):

- 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

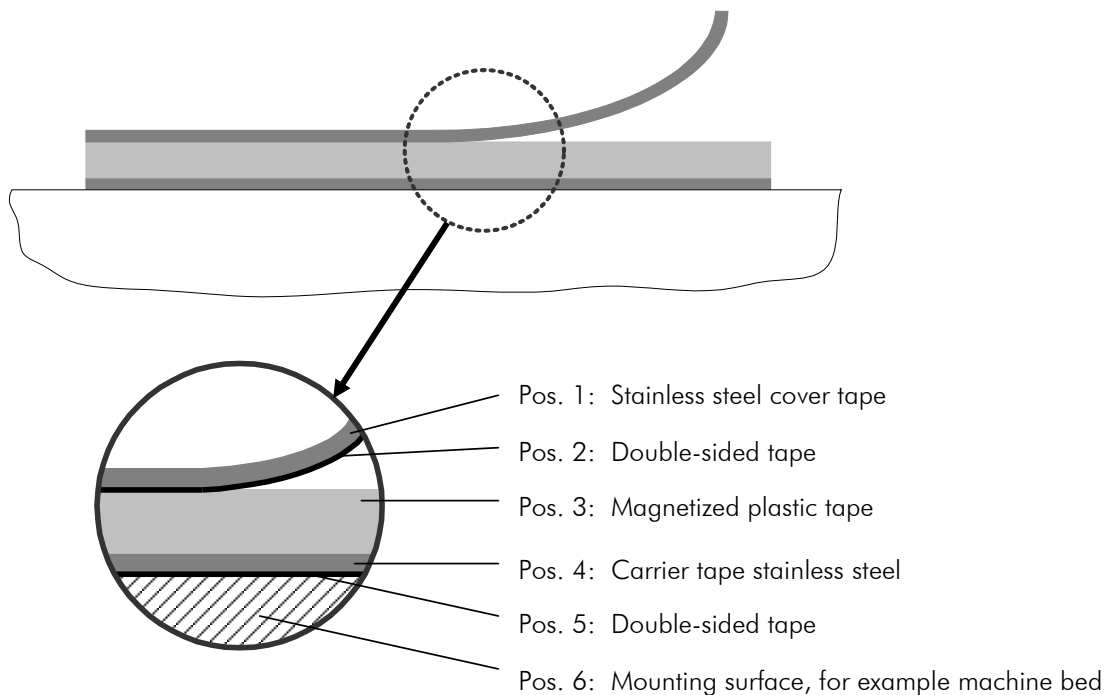


Figure 4: Components of the magnetic tape

5.3.2 Handling

In order to avoid tension in the tape, it must not be stretched, compressed or twisted. It should be stored or used with the magnetized plastic tape to the outside. The minimum bending radius is 150 mm.

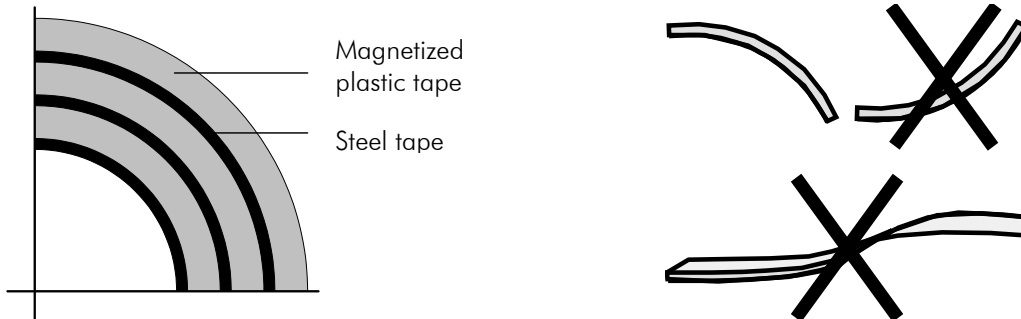


Figure 5: Handling

5.3.3 Processing hint for the gluing of magnetic tapes

Surface-Preparation: In order to guarantee optimal adhesion, all anti-adhesive 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 heptane. 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/cm²).

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.

5.3.4 Cutting and Gluing

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

$$\text{Length cover tape} = \text{measuring length} + \text{sensor length} + 50\text{mm (end caps)}$$



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 (☞ 7) 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 mounting 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 the surface (☞ 5.3.3)
2. Acclimatization: let magnetic tape and cover tape adjust their temperature
3. Remove the protection foil from the magnetic tape
4. Glue magnetic tape under great pressure
5. Thoroughly clean surface of magnetic tape
6. Remove the protection foil from the cover tape
7. Glue the cover tape under great pressure
8. Safeguard the ends of the cover tape against peeling off, e.g. by using end caps (☞ 7)

5.3.1 Resistance against Chemical Influence

Table 2: Resistance against Chemical Influence

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

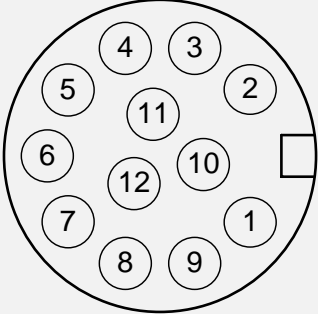
Have strong effects when contacting permanently after 1-5 months:

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

6 Connections and Interfaces

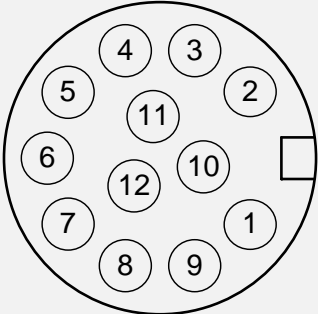
6.1 SSI (Interface Option SB0 and SG0)

Table 3: Pin assignment SSI / with optional incremental signals

Cable connector 12-pin M12 x 1	PIN	Function	Color DKA cable (see Accessories ☞ 7)
	1	0 V/GND	white
	2	10 ... 30 VDC	brown
	3	CLK +	green)
	4	CLK –	yellow
	5	DATA +	grey
	6	DATA –	pink
	7	COS + or B +	blue
	8	COS – or B –	red)
	9	SIN + or A +	black
	10	SIN – or A –	violet
	11	NC	-
	12	NC	-

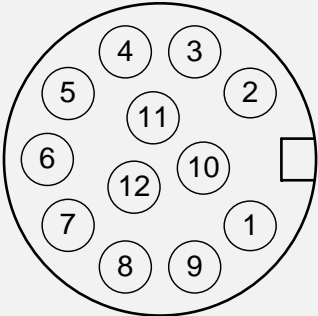
6.2 CANopen (Interface Option CA0)

Table 4: Pin assignment CA0 / with optional incremental signals

Cable connector 12-pin M12 x 1	PIN	Function	Color DKA cable (see Accessories ☞ 7)
	1	0 V/GND	white
	2	10 ... 30 VDC	brown
	3	CAN-L	green)
	4	CAN-H	yellow
	5	NC	grey
	6	NC	pink
	7	COS + or B +	blue
	8	COS – or B –	red)
	9	SIN + or A +	black
	10	SIN – or A –	violet
	11	NC	-
	12	NC	-

6.3 RS422 (Interface Option 420)

Table 5: Pin assignment RS422 / with optional incremental signals

Cable connector 12-pin M12 x 1	PIN	Function	Color DKA cable (see Accessories ☞ 7)
	1	0 V/GND	white
	2	10 ... 30 VDC	brown
	3	RX +	green)
	4	RX –	yellow
	5	TX +	grey
	6	TX –	pink
	7	COS + or B +	blue
	8	COS – or B –	red)
	9	SIN + or A +	black
	10	SIN – or A –	violet
	11	NC	-
	12	NC	-

6.4 Interfaces

6.4.1 SSI (Interface Option SB0 and SG0)

If the clock is not interrupted for the time $T_m - T/2$ (output of further 25 periods), the shift register clocks once again the same data value (error recognition in evaluation).

Some encoders contain a **Power Failure Bit (PFB)**:

With EMAX-HI the PFB is always „low“.

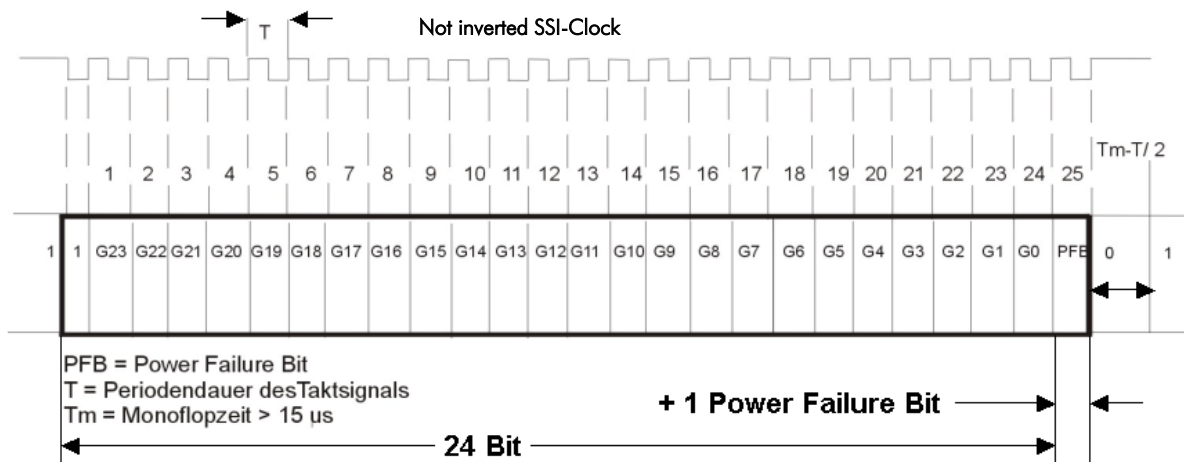


Figure 6: Interface SSI

6.4.2 CANopen (Interface Option CA0)

When ordering option CA0, the EMAX-HI measuring system is equipped with a CAN interface according to CANopen standard DS406.

The following identifiers are given:

CAN - Identifier

(4 Byte telegram)

181 (16) = Identifier with device address 1

4 bytes = Position

Baud rate = depends on order information (☞ 9 Type designation)

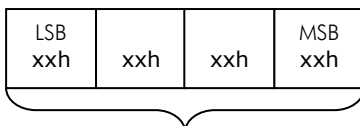


Figure 7: Interface CAN

Available CAN options and further information about the DS406 device profile can be found in the downloadable XDD file. Download link: https://www.elgo.de/fileadmin/user_upload/software/EMAXHI_DS406.zip

6.4.3 RS422 (Interface Option 420)

Depending on the order specification the encoder can be equipped with a RS422 interface (option 420).

The data transmission has the following format:

9600 baud / 1 Start Bit / 8 Data Bits / 1 Stop Bit / No Parity

Data protocol:

The actual value is transmitted with the programmed Baud rate, 8 Data bits, 1 Stop bit, without parity bit in the following format:

02h STX

xxh ABS data MSB

xxh ABS data

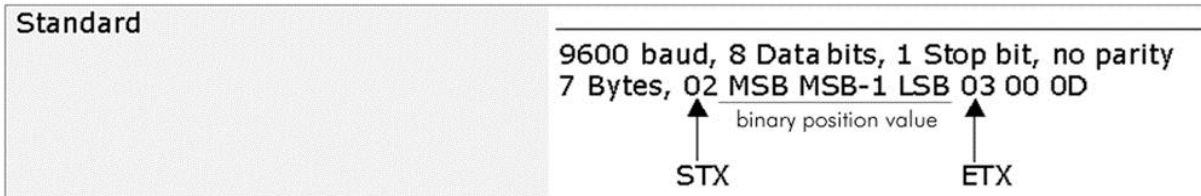
xxh ABS data LSB

03h ETX

00h

0Dh

The measured absolute position is shown binary with 0.001 mm resolution in the 3 ABS data bytes.



Other protocols on request

6.4.4 Incremental A/B Signals TTL / HTL

As an option, there are two 90° phase shifted rectangle signals (compatible to rotary encoders) with HTL output level (push-pull, push / pull).

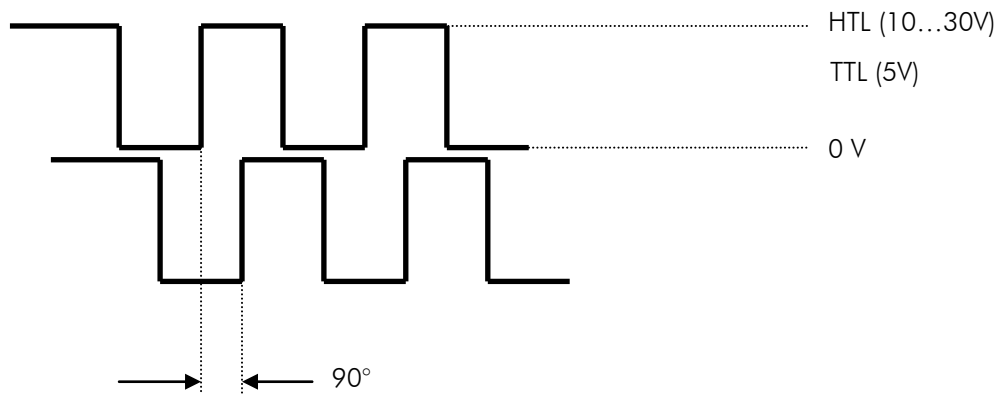


Figure 8: A/B - Incremental Signal TTL / HTL

6.4.5 Incremental Sine-Cosine Signals (Option SC10)

Sine-Cosine signals with 1 V_{ss} are available as an option (push-pull output stage, short-circuit proof)

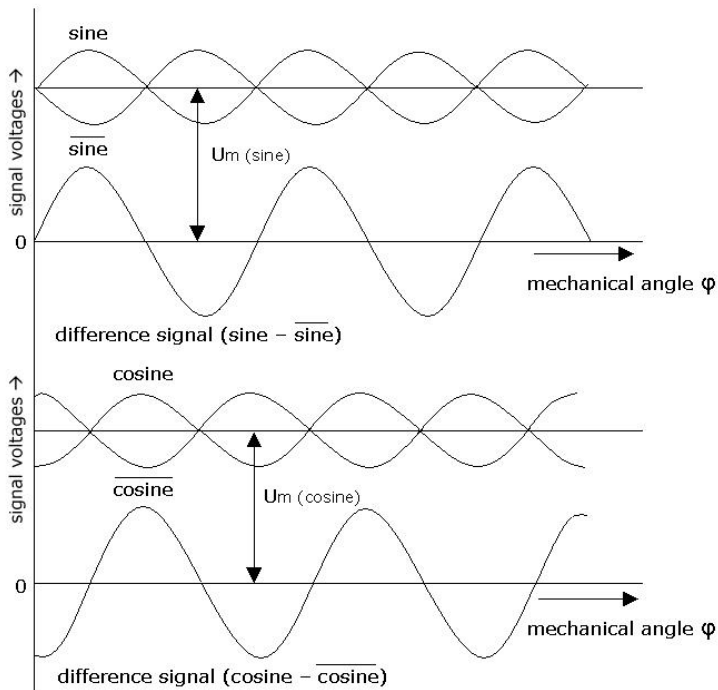


Figure 9: Incremental sine-cosine signals

Parameter	Description	min.	typ.	max.	unit
Medium voltage	at (sin), at (cos)	2.4	2.5	2.6	V
Amplitude	$\frac{\sin - \overline{\sin}}{\cos - \overline{\cos}}$	400	500	600	mV
proportion	$\frac{(\sin - \overline{\sin})}{(\cos - \overline{\cos})}$	0.9	1.0	1.1	-
Phase shift	φ	89	90	91	° Grad
Distortion factor	K	-	-	2	%

7 Accessories

Order Designation	Description
AB20-10-10-2-R-11	Magnetic Tape for EMAX-HI (max. measuring length 8 m)
Magnetic tape end cap set 10mm	2 end caps (10 mm) and 2 x M3 screws; Additional fixation for linear or radial application, as well as for protection of magnetic tape ends
FS-1000	FS=Guide rail (1000=length in mm)
PNO1	SSI/ PROFIBUS converter
DKA-00-RCF0-050-XXXX-12-T-D-S	Connection cable for EMAX-HI with 12-pole M12 female connector, cable length 5.0 m, customer sided with open cable end, 12-wire, twisted pairs, drag chain suitable, with screen/shield

7.1 Type Designation - Signal Cable

DKA	-AA	-BBBB	-CCC	-DDDD	-EE	-F	-G	-H
-----	-----	-------	------	-------	-----	----	----	----

SN-Number: _____

00 = Standard version

Connection unit-side: _____

RCF0 = M12 thread, 12 pin cable connector female, 0 = Elgo standard pin assignment

Cable length in dm: _____

Available cable length:
050 = 5 m
Other lengths on request

Connection customer side: _____

XXXX = open wires, twisted and tinned
Other connectors on request

Wire quantity : _____

08 = 8 wires
12 = 12 wires

Cable model: _____

T = Twisted pair

Drag chain suitable : _____

D = Drag chain

Schield protection: _____

S = with shield
N = without shield

8 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 8.1.

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).

8.1 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 through 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

8.2 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

8.3 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.

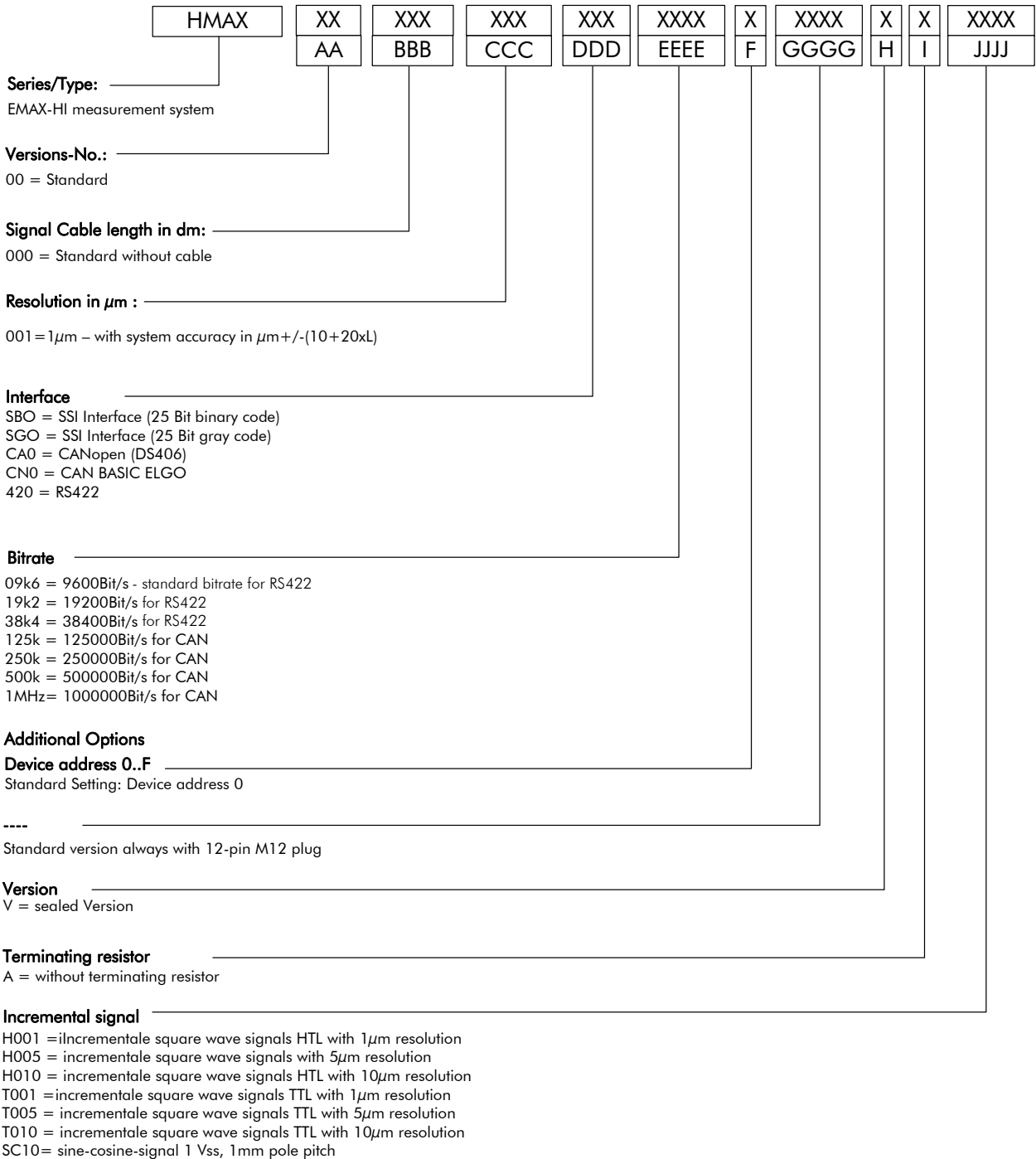
8.4 Cleaning



WARNING!

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

9 Type designation



9.1.1 Ordering Examples

HMAX	00	000	001	SBO	----	-	----	-	-	----
	AA	BBB	CCC	DDD	EEEE	F	GGGG	H	I	JJJ

EMAX-HI with SSI Binary interface , 25Bit

HMAX	00	000	001	SG0	----	-	----	-	-	T005
	AA	BBB	CCC	DDD	EEEE	F	GGGG	H	I	JJJ

EMAX-HI with SSI Gray interface, 25Bit TTL-Square wave and 5µm resolution

HMAX	00	000	001	CN0	125k	0	----	-	-	----
	AA	BBB	CCC							

EMAX-HI with CAN BASIC ELGO – Interface 125 kbit/s and device address: 0



NOTE

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



Notes:

10 Index

Accessories	20	Operating area	11
Accident prevention regulations.....	4	Operational safety.....	4
CANopen (Interface Option CA0)	17	Order reference	8
Causes of risk.....	5	Ordering Example	25
Cleaning.....	22, 23	Packaging material.....	6
Conventional use.....	6	Product features	7
Demounting	5	Protection against contact	11
Device number	8	Protective equipment	5
Dimensions Sensor.....	8	RS422 (Interface Option 420)	18
Disposal.....	5	Safety	4
Disturbances	22	Safety instructions	4
Explanation of symbols.....	4	Safety rules	4
Fault clearance.....	22	SSI (Interface Option SB0 and SG0).....	17
First start-up	11	Start-up	11
Identification	8	Statement of warranties.....	5
Incremental A/B Signals TTL / HTL.....	18	Storage	6
Incremental Sine-Cosine Signals (Option SC10) .	19	Technical Data Magnetic Tape	10
Installation	11	Technical Data Sensor	9
Interfaces	17	Transport.....	6
Magnetic tape structure	10	Transport damage	6
Maintenance	22, 23	Type designation	8, 21
Mounting Tolerance.....	12		

Document No.: 799000710 / Rev. 4
Document Name: EMAX-HI-00-MA-E_12-18
Subject to change - © 2018
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

