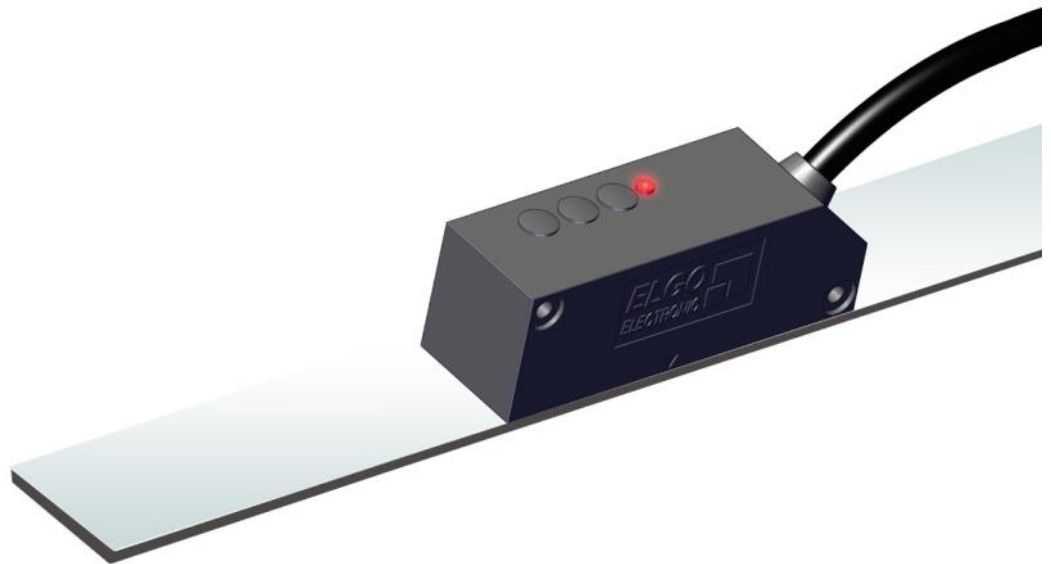


## **EMAX / EMAL**



- Absolute encoder with 10  $\mu\text{m}$  resolution
- Direct and contact free measurement
- Measuring length up to 10 m (EMAX) / 20 m (EMAL)
- No referencing required (changes of position are also recognized in the de-energized state)
- Too large distances between sensor and magnetic tape are automatically detected and signaled by an LED
- Additional incremental or sine-cosine signals for dynamic movement control available

# EMAX / EMAL - Magnetic Absolute Linear Encoders with distance detection

## General

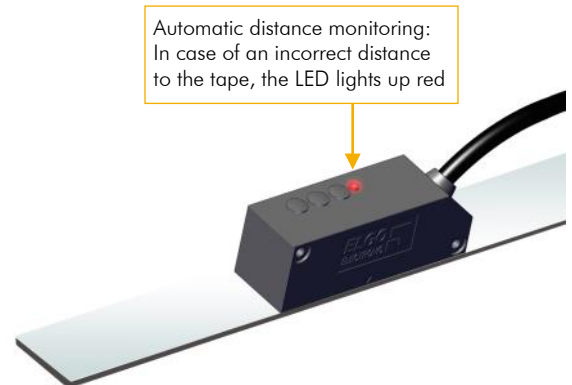
The series **EMAX / EMAL** is an absolute length measuring system. Sensor and translator and interpolation unit are together in the same compact housing. The magnetic tape of series EMAB is paste up to a plain area. The **EMAX / EMAL** encoders can be mounted with a maximum distance of 1.5 mm to the magnetic tape. With a reduced measuring accuracy the sensor distance can be up to 2.0 mm.

The only difference between **EMAX** and **EMAL** is the maximum measuring length:

- up to 10 m with version **EMAX**
- up to 20 m with version **EMAL**

### Product Features

- Absolute Measurement (No referencing required (changes of the position are also recognized in the de-energized state))
- Resolution 0.01 mm
- Contactless measuring principle
- Measuring length 10 m (resp. 20 m with version **EMAL**)
- Automatic distance monitoring: Too large distances between sensor and magnetic tape are signaled by an LED
- Additional incremental square wave or 1 V<sub>pp</sub> sine-cosine signals for dynamic movement control available



Different interfaces are available for **EMAX** and **EMAL**, e.g. RS232, RS422, addressable RS422, SSI, CANopen (according to DS406) or a CAN interface with the ELGO CAN standard protocol.

Typical applications are handling systems, conveyor and storage technology, hydraulic presses, stamping machines, casting machines, linear slides, linear drives and pick and place systems.

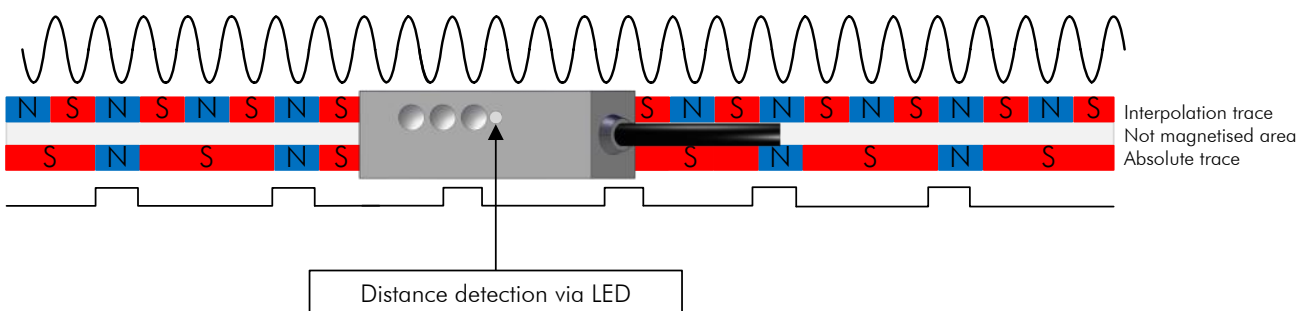
The guided version is delivered completely with magnetic tape guide and a guide carriage.

## 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 fine interpolation trace encloses alternately north and south pole traces with a distance of 5 mm, these are scanned with resistance bridges and provide a resolution of 0.01 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 10 m with an **EMAX** resp. every 20 m with an **EMAL** system.

## Measurement principle and coding of the magnetic tape



## Technical Data

EMAX2 (Standard version)	
<b>Mechanical Data</b>	
Measuring principle	absolute
Measurement	linear
Repeat accuracy	+/- 1 increment
System accuracy in $\mu\text{m}$ at 20° C	010 (+/- 150 $\mu\text{m}$ + 20 $\mu\text{m}$ x L [m]) F10 (+/- 50 $\mu\text{m}$ + 20 $\mu\text{m}$ x L [m]) L = measuring length in meter
Distance from sensor to the magnetic tape	max. 1.5 mm (2.0 mm with reduced measuring accuracy)
Basic pole pitch	5 mm
Sensor housing material	Zinc die cast
Sensor housing dimensions	Sensor: L x W x H = 75 x 24 x 26 mm Sensor with guide carriage: L x W x H = 100 x 34 x 48 mm
Required magnetic tape	EMAX: AB20-50-20-R-11 EMAL: AB20-50-10-R-12
Measuring length	EMAX: max. 10 m EMAL: max. 20 m
Connection	Open cable ends (diverse plug connectors optionally available, see Type Designation)
Sensor cable	1.5 m standard cable length (others on request)
Weight	approx. 100 g, cable approx. 60 g/m
<b>Electrical Data</b>	
Supply voltage	+ 10 ... 30 VDC
Residual ripple	10 - 30 V: <10 %
Power input	max. 150 mA
Interfaces	SSI, CANopen (DS406), RS422, RS232
Resolution	See Type Designation
Speed	max. 4 m/s
<b>Environment Conditions</b>	
Storage temperature	-20 ... +85° C
Operation temperature	-10 ... +70° C (-20 ... +85° C on request)
Humidity	max. 95 %, not condensing
Protection Class	IP40 (Standard) IP65 (Option V)

### Order examples:

EMAX 00015010S B0 - - - - - - - - - - - - - - - -  
B B C C C D D D E E E F F F F G H H H H I J K K K K

EMAX with SSI binary interface, 25 bit and 1.5 m cable

EMAX 00015010S B0 - - - - - M 8 F 0 - - - - -  
B B C C C D D D E E E F F F F G H H H H I J K K K K

EMAX with SSI binary interface, 25 bit, 1.5 m cable and M16 cable socket for PNO1

EMAX 00015010S G0 - - - - - - - - - - - T 2 N 5  
B B C C C D D D E E E F F F F G H H H H I J K K K K

EMAX with SSI Gray interface, 25 bit, 1.5 m cable, TTL square wave signals, 2.5  $\mu\text{m}$  resolution

EMAL 00015010C N 0 1 2 5 k 0 - - - - - - - - - -  
B B C C C D D D E E E F F F F G H H H H I J K K K K

EMAL with 20 m measuring length, 1.5 m cable, CAN BASIC ELGO interface, 125 kbit/s and device address = 0

## Type Designation

Please use the following code to order:

AAAA BB CCC DDD EEE FFFF G HHHH I J KKKK

### A Series / Type

EMAX Measuring length up to 10 m  
EMAL Measuring length up to 20 m (at extra charges)

### B SN Number

00 0 ... 99  
11 EMAX / EMAL sends automatically without NMT command and has 4 bytes position output without velocity output

### C Signal cable length (please specify in dm)

015  $\pm$  1,5 m

### D Resolution in $\mu\text{m}$

010 10  $\mu\text{m}$  - for system accuracy in  $\mu\text{m}$  +/- (150+20xL)  
F10 \* 10  $\mu\text{m}$  - for system accuracy in  $\mu\text{m}$  +/- (50+20xL)  
\* Version F10 at extra charge

### E Interface

SBO SSI interface (25 bit binary code)  
SG0 SSI interface (25 bit Gray code)  
CA0 CANopen (DS406)  
CN0 CAN BASIC ELGO  
420 RS422  
A20 RS422 addressable  
230 RS232

On request, the settings of the rotary code switch can be done ex works.

### F Bit rate

09k6 9600 bit/s - standard bit rate for RS232 (230) and 422 (420/A20)  
19k2 19200 bit/s for RS232 or RS422  
38k4 38400 bit/s for RS232 or RS422  
125k 125000 bit/s for CAN  
250k 250000 bit/s for CAN  
500k 500000 bit/s for CAN  
1MHz 1000000 bit/s for CAN

### Additional options

G Address Device address 0.. F (standard setting = 0)

### H Connectors

D9M 9 pin (male) D-SUB (only for CAN interfaces)  
D9M0 9 pin (male) D-SUB, ELGO standard pin assignment (only for RS232, RS422 and SSI interfaces)  
D9M5 9 pin (male) D-SUB (only for RS422 with Bit rate 09k6) with option 5 (pin assignment suitable for Z25 indicators)  
M8F0 8 pin (female) M16 connector with ELGO standard SSI pin assignment (suitable for ELGO PNO1)  
M8M0 8 pin (male) M16 connector (only for RS422 and SSI)  
R5M0 5 pin (male) M12 connector, ELGO pin assignment (CAN)  
MCM0 12 pin (male) M16 connector (only SSI with Sin/Cos or A/B)  
MCF0 12 pin (female) M16 connector (only SSI with Sin/Cos or A/B)

### I V

Sealed IP65 version (without rotary code switches - please specify the desired configuration when order)

### J A

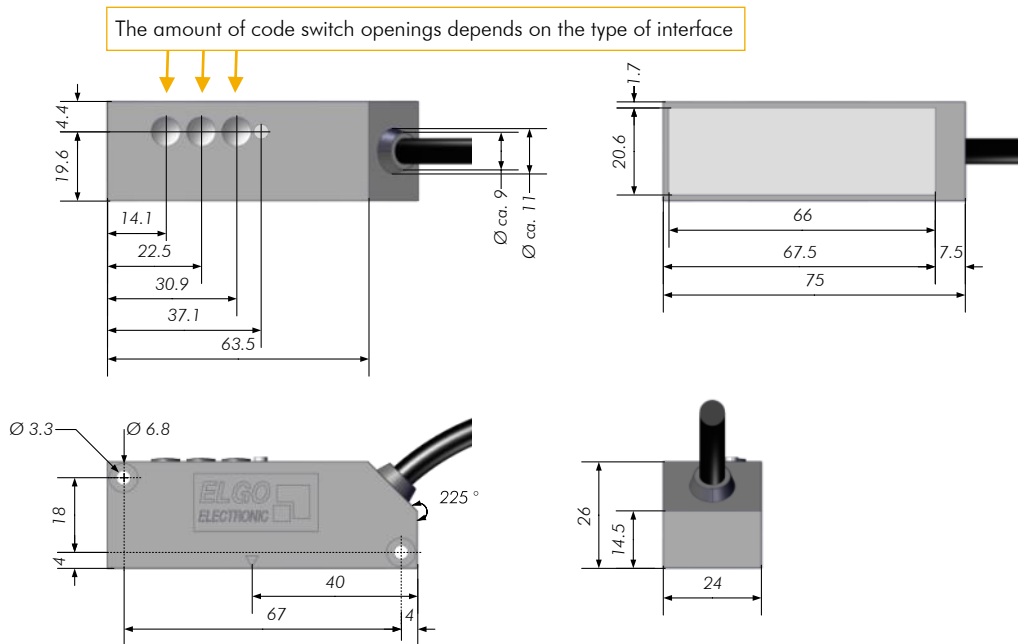
without termination resistor

### K Additional Incremental Signals

H2N5 HTL square wave signals with 2,5  $\mu\text{m}$  resolution  
H005 HTL square wave signals with 5  $\mu\text{m}$  resolution  
H010 HTL square wave signals with 10  $\mu\text{m}$  resolution  
H025 HTL square wave signals with 25  $\mu\text{m}$  resolution  
T2N5 TTL square wave signals with 2,5  $\mu\text{m}$  resolution  
T005 TTL square wave signals with 5  $\mu\text{m}$  resolution  
T010 TTL square wave signals with 10  $\mu\text{m}$  resolution  
T025 TTL square wave signals with 25  $\mu\text{m}$  resolution  
SC50 1 Vpp Sine-Cosine signals with 5 mm pole pitch

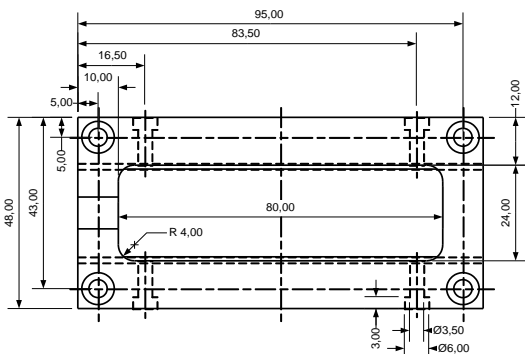
Note: Please fill in "-" for ordering options which are not desired.

## Dimensions of the sensor housing

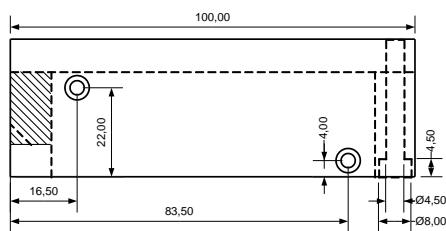


## Dimensions of the guide carriage

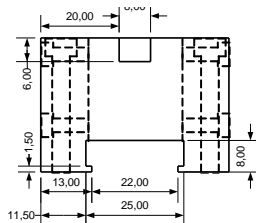
Top view:



Side view:



Front view:



## Accessories

AB20-50-20-2-R-11  
AB20-50-20-2-R-12

Magnetic tape for **EMAX** (measuring length 10 m)  
Magnetic tape for **EMAL** (measuring length 20 m)

Magnetic tape 20 mm end cap set

2 end caps (20 mm) and 2 x M3 screws;  
Additional fixation in radial and linear area  
and protection of the magnetic tape ends  
Art. Nr. 731031003

Magnetic tape 20 mm end cap

1 End cap (20 mm)  
Art. Nr. 731031001

FW2080

Guide carriage for **EMAX / EMAL**

FS-1000, FS-1500, FS-2000

Guide rail for **EMAX / EMAL** (length specification in mm)

PNO1

SSI / PROFIBUS converter

