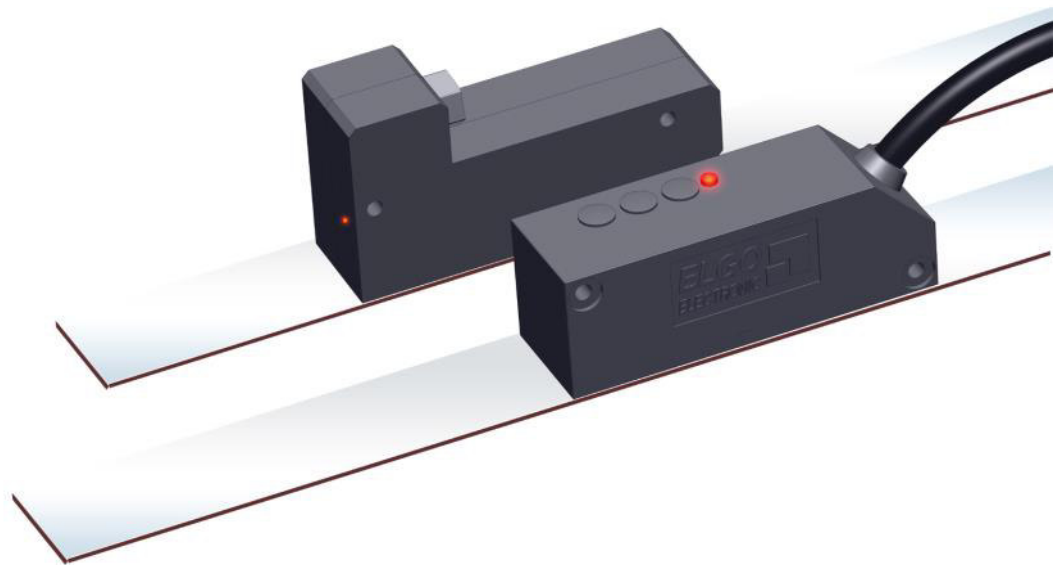


EMAX/EMAL

Magnetic Absolute Linear Encoder with 10 μm resolution



- Absolute encoder with 10 μm 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
- Sensor with fixed cable outlet or optionally with M9 round connector on sensor housing
- Additional incremental or sine-cosine signals for dynamic movement control available
- Available interfaces: SSI, CANopen, RS422, RS232
New: IO-Link acc. to IEC 61131-9

EMAX/EMAL - Magnetic Absolute Linear Encoders with Distance Detection

General

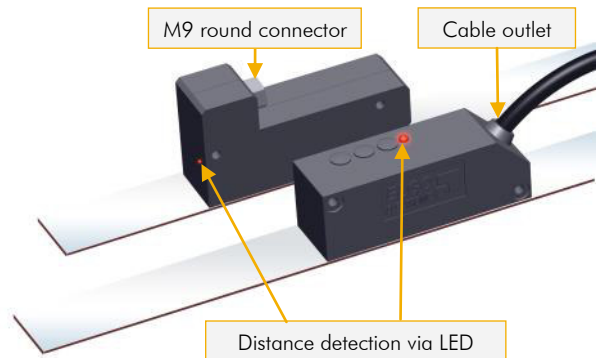
The series *EMAX / EMAL* is an absolute length measuring system. Sensor and translator and interpolation unit are together in the same compact housing. The magnetic tape of series EMAB is paste up to a plain area. The *EMAX / EMAL* encoders can be mounted with a maximum distance of 1.5 mm to the magnetic 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
- Two designs: Housing with cable outlet or round connector
- Measuring length: *EMAX* max.10 m / *EMAL* max. 20 m
- Automatic distance monitoring: LED glows red if the distance between sensor and magnetic tape is too large
- Additional incremental square wave or 1 Vpp sine-cosine signals for dynamic movement control available (only for housing design with fixed cable outlet available)



Available Interfaces

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. In addition, *EMAX / EMAL* is also available with an IO-Link interface according to the IEC 61131-9 standard.

Applications

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

Versions with IO interface are also predestined for integration into modern industry 4.0 concepts.

Guide Carriage and Rails

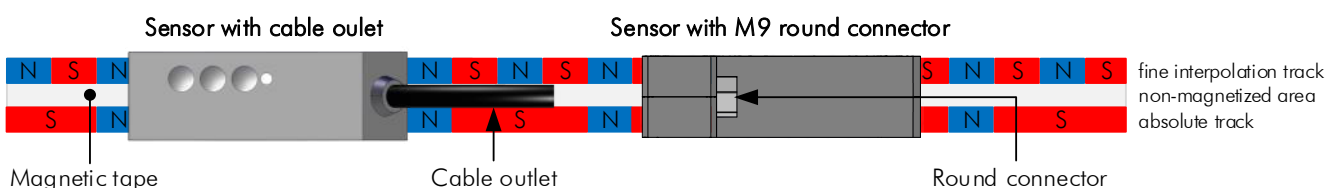
The guide carriage type *FW2080* is available for the design with fixed cable outlet. In combination with the *EMAX / EMAL* sensor and the ELGO guide rails *FS1000*, *FS1500* or *FS2000*, it forms a completely guided linear measuring unit. For details see "Accessories" on the last page .

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

EMAX (Standard version)	
Mechanical Data	
Measuring principle	absolute
Repeat accuracy	±1 increment
System accuracy in μm at 20° C	Standard F10: $\pm(150 + 20 \times L)$ Option F10: $\pm(50 + 20 \times L)$ L = measuring length in meters
Distance from sensor to the magnetic tape	max. 1.5 mm (2.0 mm at reduced measuring accuracy)
Basic pole pitch	5 mm
Sensor housing material	with cable outlet = zinc die cast, with round connector = aluminium
Sensor housing dimensions	with cable outlet = 75 x 24 x 26 mm, with round connector = 75 x 22 x 39 mm
Required magnetic tape	EMAX: AB20-50-20-R-11 EMAL: AB20-50-20-R-12
Measuring length	EMAX: max. 10 m EMAL: max. 20 m
Connection	version with cable outlet: open cable ends (connectors optionally), version with round connector: via DKA cable (accessorial part)
Sensor cable	1.5 m standard cable length (others on request)
Weight	approx. 100 g, cable approx. 60 g/m
Electrical Data	
Supply voltage	+ 10 ... 30 VDC
Residual ripple	10 - 30 V: <10 %
Power input	max. 150 mA
Interfaces	SSI, CANopen (DS406), RS422, RS232 or IO-Link according to IEC 61131-9
Resolution	0.01 mm
Speed	max. 4 m/s
Environment Conditions	
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 00015 010 S B 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 and 1.5 m cable

EMAX 00015 010 S B 0 - - - - - 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 00015 010 S G 0 - - - - - - - - - - - I 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 μm resolution

EMAL 00015 010 C 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

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

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 charge)

B Version

00 = 00 (standard) / 01 ... 99 (special versions)
11 = EMAX / EMAL sends automatically without NMT command
and has 4 bytes position output without velocity output

C Sensor housing / Connections:

000 = no cable, sensor housing with M9 round connector
(DKA cable available, see accessories)
015 = sensor housing with fixed cable outlet (1.5 m standard
cable length, other lengths on request available)

D Resolution in μm

010 = 10 μm - for system accuracy in $\mu\text{m} \pm(150 + 20 \times L)$
F10* = 10 μm - for system accuracy in $\mu\text{m} \pm(50 + 20 \times L)$
* Variant F10 at extra charge

E Interface

SBO = SSI interface (25 bit binary)
SGO = SSI interface (25 bit Gray)
CA0 = CANopen (DS406)
CN0 = CAN BASIC ELGO
420 = RS422
A20 = RS422 addressable
230 = RS232
IOL = IO-Link according to IEC 61131-9

Coding switch presetting of bit
rate / address is possible ex
factory on request. For option V
or housing with round connect-
or, please always specify the
desired configuration when
ordering, as no rotary coding
switches are available.

F Bit rate

09k6 = 9600 bit/s - standard bit rate for RS232 and RS422
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
230k = 230400 bit/s for IO-Link (factory setting)

Additional options

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

H Connection Options (only for versions with fixed cable outlet)

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)
RCM0 = 12-pin M12 connector (only IO-Link + Sin/Cos or A/B)
MCM0 = 12-pin (male) M16 connector (only SSI + Sin/Cos or A/B)
MCF0 = 12-pin (female) M16 connector (only SSI + Sin/Cos or A/B)

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

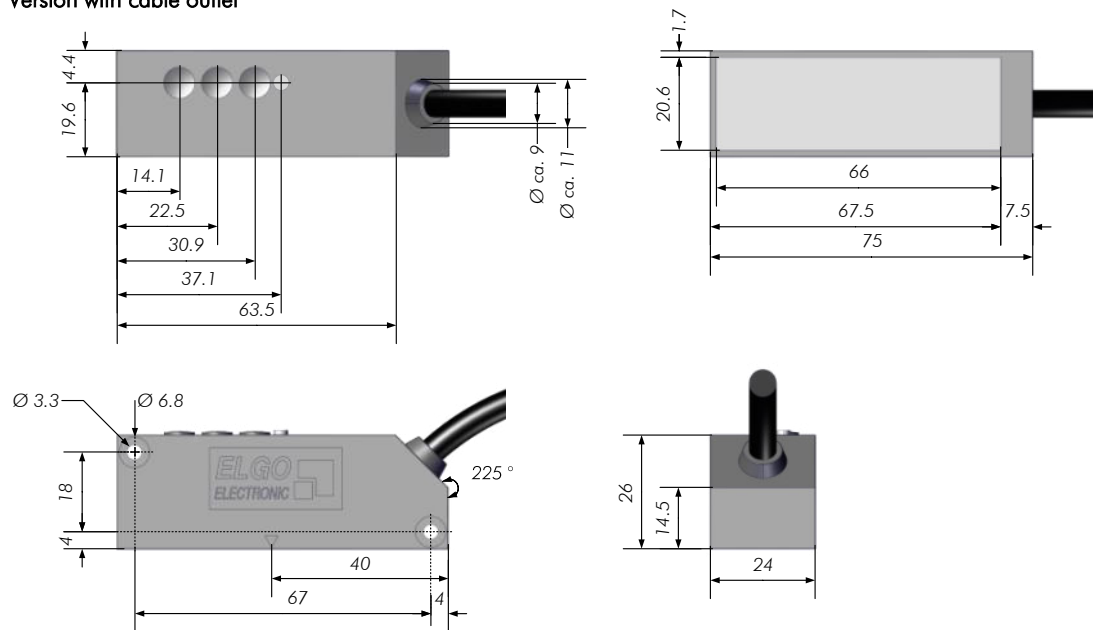
J A = without termination resistor

K Additional Incremental Signals (only versions with fixed cable outlet)

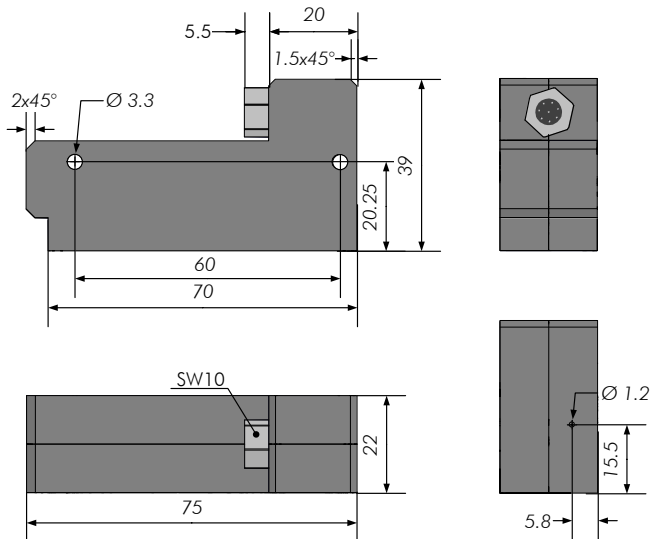
H2N5 = HTL square wave signals with 2.5 μm resolution
H005 = HTL square wave signals with 5 μm resolution
H010 = HTL square wave signals with 10 μm resolution
H025 = HTL square wave signals with 25 μm resolution
T2N5 = TTL square wave signals with 2.5 μm resolution
T005 = TTL square wave signals with 5 μm resolution
T010 = TTL square wave signals with 10 μm resolution
T025 = TTL square wave signals with 25 μm resolution
SC50 = 1 Vpp Sine-Cosine signals with 5 mm pole pitch

Sensor Housing Dimensions

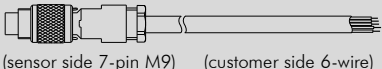
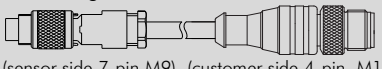
Version with cable outlet



Version with round connector



Accessories

Order Designation	Description
AB20-50-20-2-R-11	Absolute coded magnetic tape for EMAX
AB20-50-20-2-R-12	Absolute coded magnetic tape for EMAL
End cap set (20 mm)	2 end caps (20 mm) and two M3 screws; additional fixation in the radial and linear range and protection of the magnetic tape ends
FS1000, FS1500 or FS2000	Guide rail for magnetic tape (length 1.0, 1.5 or max. 2.0 m). For larger distances several guide rails can be rowed together.
FW2080	Guide carriage for EMAX / EMAL (only versions with connector housing) L x W x H = 100 x 48 x 34 mm
DKA-00-Q7F0-050*-XXXX-06-N-N-N	Standard signal cable for versions with connector on housing: )* 050 = standard length 5 m 020 = 2 m 100 = 10 m (others on request) (sensor side 7-pin M9) (customer side 6-wire)
DKA-00-Q7F0-050*-R4MA-04-N-N-N	IO-Link signal cable for versions with connector on housing. )* 050 = standard length 5 m 020 = 2 m 100 = 10 m (others on request) (sensor side 7-pin M9) (customer side 4-pin. M12)
POSU	Pole finder card 85 x 55 mm

