- 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 signalized by an LED
- Additional incremental or sine-cosine signals for dynamic movement control available
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 pasted 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 Vpp 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)**

**Mechanical Data**

- Measuring principle: absolute
- Measurement: linear
- Repeat accuracy: +/- 1 increment
- System accuracy in µm at 20°C: EMAX: 0.010 (+/- 1.50 µm + 20 µm x L [m]), F10: (+/- 0.05 µm + 20 µm 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, 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

**Electrical Data**

- 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

**Environment Conditions**

- Storage temperature: -20 ... +85° C
- Operation temperature: -10 ... +70° C (at 20 ... +85° C on request)
- Humidity: max. 95 %, not condensing

**Protection Class**: IP40 (Standard)

**Order examples:**

<table>
<thead>
<tr>
<th>Model Prefix</th>
<th>EMAX</th>
<th>Technical Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMAX2 00 01 S 80</td>
<td>EMAX with SSI binary interface, 25 bit and 1.5 m cable</td>
<td></td>
</tr>
<tr>
<td>EMAX 00 01 S 80</td>
<td>EMAX with SSI binary interface, 25 bit, 1.5 m cable and M16 cable socket for PNO1</td>
<td></td>
</tr>
<tr>
<td>EMAX 00 01 S G0</td>
<td>EMAX with SSI Gray interface, 25 bit, 1.5 m cable, TTL square wave signals, 2.5 µm resolution</td>
<td></td>
</tr>
<tr>
<td>EMA-00 01 01 125 k 0</td>
<td>EMA with 20 m measuring length, 1.5 m cable, CAN BASIC ELGO interface, 125 kbit/s and device address = 0</td>
<td></td>
</tr>
</tbody>
</table>

### 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

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

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

- 015: ∆ 1,5 m

**D** Resolution in µm

- EMAX: 10 µm - for system accuracy in µm +/- (150+20xL)
- EMAL: 10 µm - for system accuracy in µm +/- (50+20xL)

**E** Interface

- SBO: SSI interface (25 bit binary code)
- SG0: SSI interface (25 bit Gray code)
- CANopen (DS406)
- CAN BASIC ELGO
- RS422: 420
- RS232: 230

**F** Bit rate

- 09k6: 9600 bit/s - standard bit rate for RS232 (230) and 422 (420/2A0)
- 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

**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 SII interfaces)
- D9M5: 9 pin (male) D-SUB (only for RS422 with Bit rate 09k6) with option 5 (pin assignment suitable for 225 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 SII)
- RSM0: 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 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 signals with 5 mm pole pitch

**Note:** Please fill in „-“ for ordering options which are not desired.
**Dimensions of the sensor housing**

The amount of code switch openings depends on the type of interface.

**Dimensions of the guide carriage**

**Top view:**

**Side view:**

**Front view:**

**Accessories**

**AB20-50-20-2-R-11** Magnetic tape for **EMAX** (measuring length 10 m)

**AB20-50-20-2-R-12** 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