## Series ETA25K

**Key features ETA25K:**

- Analogue outputs 0 to 5 V, 0 to 10 V, 4 to 20 mA
- Redundant versions available – see separate section
- Versatile connecting possibilities
- Several factory programming possibilities
- Supply voltages: 5 VDC ±10%, 15 to 30 VDC, 9 to 30 VDC

## Electrical data

| | | | |
|---|---|---|---|
| Effective electrical angle of rotation 1.) | 7° ≤ α ≤ 360° (programmable in factory), ±0.5° | | |
| Independent linearity (best straight line) 1.) | ±0.3% @ 360° | | |
| Absolute Linearity 1.) | ±0.6% @ 360° | | |
| Output signal | 0 to 5 V ratiometric | 0 to 10 V | 4 to 20 mA |
| Resolution | 12 Bit | | |
| Update rate | 200 µs | | |
| Supply voltage | 5 V ±10% | 15 to 30 V | 9 to 30 V |
| Power consumption (no load) | ≤18 mA | | |
| Output load | ≥ 5 kOhm | | ≤ 500 Ohm |
| Insulation voltage 1.) | 1000 VAC @ 50 Hz, 1 min | | |
| Insulation resistance 1.) | 2 MOhm @ 500 VDC, 1 min | | |
| MTTF (EN29500-2005-1) | 1173a | 965a | 379a |

1.) According IEC 60393

## Wire colour/pin assignment

| Function: | Option F (flat ribbon cable) | Option R (round signal cable) |
|---|---|---|
| OUT | Strand 2 | brown |
| VSUP | Strand 1 (red) | red |
| GND | Strand 3 | black |

**For details output programming see page 24.**

| Order Code ETA25K – singleturn, analogue output, not redundant | | | | | |
|---|---|---|---|---|---|
| **Description** | Selection: standard=**black/bold**, possible options=*grey/italic* | | | | |
| **Series** | **ETA25K** | | | | |
| **Supply voltage / output signal:** | | | | | |
| **VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric) | | **0505** | | | |
| **VSUP=24 V (15 to 30 V) / OUT=0 to 10 V** | | **2410** | | | |
| **VSUP=24 V (9 to 30 V) / OUT=4 to 20 mA** | | **2442** | | | |
| *VSUP=24 V (9 to 30 V) / OUT=0 to 5 V* | | *2405* | | | |
| **Sense of rotation:** (when looking at the encoder's front surface) | | | | | |
| **Clockwise** | | | **CW** | | |
| *Counterclockwise* | | | *CCW* | | |
| **Rotation angle* in [°]:** | | | | | |
| **360** | | | | **360** | |
| *320* | | | | *320* | |
| *270* | | | | *270* | |
| *180* | | | | *180* | |
| *90* | | | | *90* | |
| *Custom rotation angle* (≥7°, positive integer) | | | | *XXX* | |
| **Electrical connection, cable length:** | | | | | |
| **Flat ribbon cable, standard length 0.15 m** | | | | | **F0,15** |
| *Flat ribbon cable with custom length [x.xx m]* | | | | | *FX,XX* |
| **Round cable, standard length 1 m** | | | | | **R1,00** |
| *Round cable with custom length [x.xx m]* | | | | | *RX,XX* |

* For details see page 24.

## Order example ETA25K

**Requirements:**
VSUP=5 V / OUT=0 to 5 V, sense of rotation CW, rotation angle 360°, round cable 1.00 m

**Example for order code:**
ETA25K 0505 CW360 R1,00

## Series ETA25KX – singleturn, analogue output, redundant

**Key features ETA25KX :**

- Independent signal processing. The ETA25KX rotary encoder electronics are based mainly on one Hall IC in which two semiconductor dies independently capture, evaluate and output the measured values
- Supply voltage, signal output and ground are galvanically insulated => separate electrical connections
- Supply voltages: 2 x 5 VDC or 2 x 15 to 30 VDC
- Signal outputs: 2 x 0 to 5 V or 2 x 0 to 10 V

## Electrical data ETA25KX – singleturn, analogue output, redundant

| | | |
|---|---|---|
| Effective electrical angle of rotation 1.) | 7° ≤ α ≤ 360° (programmable at factory), ±0.5° | |
| Independent linearity (best straight line) 1.) | ±0.3% @ 360° | |
| Absolute Linearity 1.) | ±0.6% @ 360° | |
| Output signal | 0 to 5 V ratiometric | 0 to 10 V |
| Resolution | 12 Bit | |
| Update rate | 200 µs | |
| Supply voltage | 5 V ±10% | 15 to 30 V |
| Power consumption (no load) | ≤ 23 mA | |
| Output load | ≥ 5 kOhm | |
| Insulation voltage 1.) | 1000 VAC @ 50 Hz, 1 min | |
| Insulation resistance 1.) | 2 MOhm @ 500 VDC, 1 min | |
| MTTF (EN29500-2005-1) | 613a | 202a |

1.) According IEC 60393

## Cable and pin assignment ETA25KX – singleturn, analogue output, redundant

| Function: | Option F (flat ribbon cable) | Option R (round signal cable) |
|---|---|---|
| VSUP 1 | Lead 1 (red) | red |
| OUT 1 | Lead 2 | brown |
| GND 1 | Lead 3 | black |
| GND 2 | Lead 4 | green |
| OUT 2 | Lead 5 | yellow |
| VSUP 2 | Lead 6 | orange |

**For details on output programming see page 24.**

| Order Code ETA25KX – redundant, singleturn, analogue output | | | | | |
|---|---|---|---|---|---|
| **Description** | Selection: standard=**black/bold**, possible options=*grey/italic* | | | | |
| **Series** | **ETA25KX** | | | | |
| **Supply voltage / output signal:** | | | | | |
| **VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric) | | **0505** | | | |
| **VSUP=24 V (15 to 30 V) / OUT=0 to 10 V** | | **2410** | | | |
| **Sense of rotation:** (when looking at the encoder's front surface) | | | | | |
| **Clockwise/Clockwise (ganging)** | | | **CW CW** | | |
| *Clockwise/Counterclockwise (counterrotational)* | | | *CW CCW* | | |
| **Rotation angle* in [°]:** | | | | | |
| **360** | | | | *360* | |
| *320* | | | | *320* | |
| *270* | | | | *270* | |
| *180* | | | | *180* | |
| *90* | | | | *90* | |
| *Custom rotation angle* (≥7°, positive integer) | | | | *XXX* | |
| **Electrical connection, cable length:** | | | | | |
| **Flat ribbon cable, standard length 0.15 m** | | | | | **F0,15** |
| *Flat ribbon cable with custom length [x.xx m]* | | | | | *FX,XX* |
| **Round cable, standard length 1 m** | | | | | **R1,00** |
| *Round cable with custom length [x.xx m]* | | | | | *RX,XX* |

* For details see page 24.

## Order example ETA25KX – redundant, singleturn, analogue output

**Requirement:**
Redundant, VSUP=5 V /OUT=0...5 V, signal 1 sense of rotation CW, signal 2 sense of rotation CW, electrical rotation 360° signal 1 and 2, flat ribbon cable 0.15 m

**Example for order code:**
ETA25KX 0505 CW CW 360 F0,15

## Drawing ETx25K Family

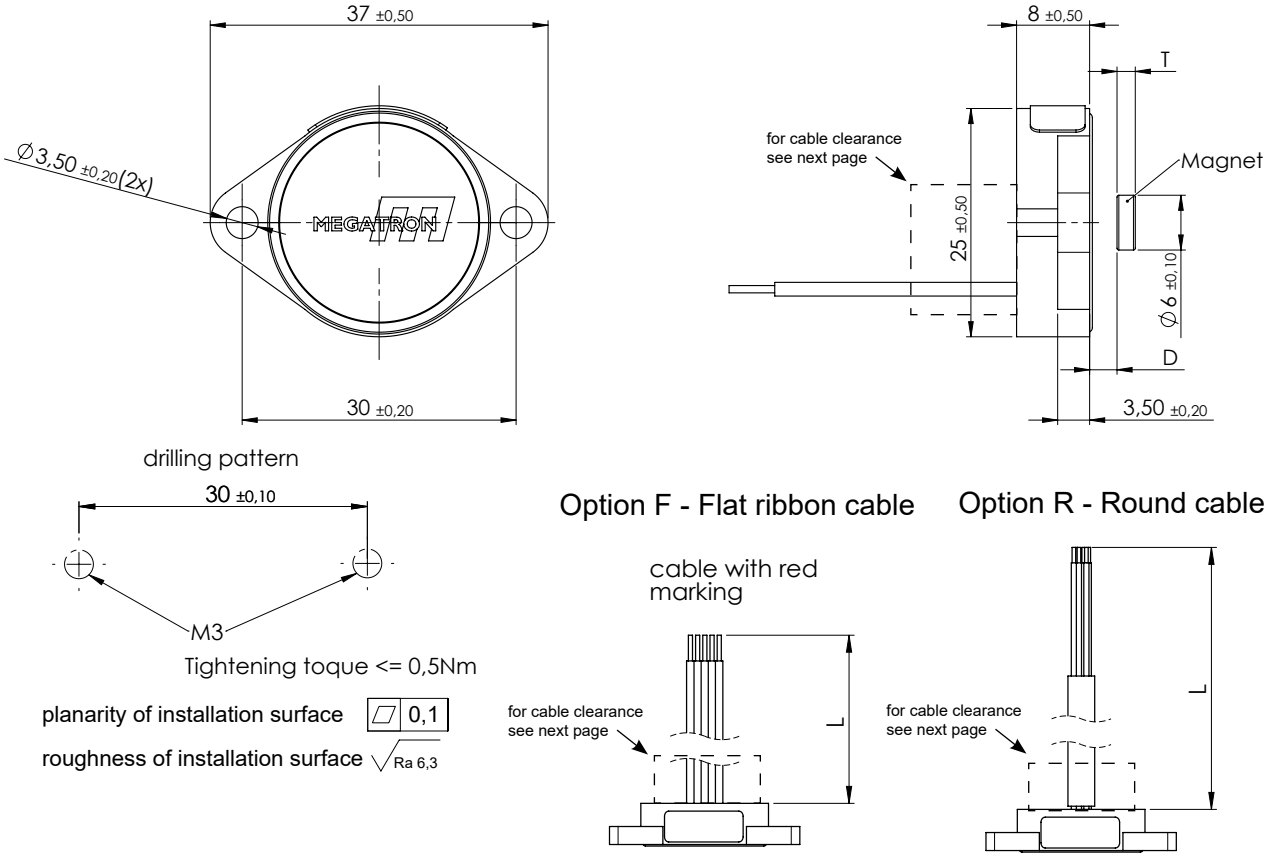
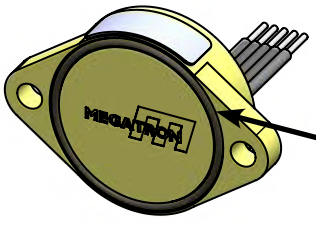



Table for parameter L see next page

| **Magnet thickness and distance from sensor surface (standard magnet only)** | | |
|---|---|---|
| **Electronics** | **Thickness T of the magnet** | **Mounting distance D** |
| Analogue single turn not redundant, ETA25K, ETP25K, ETS25K (SPI only) | 2 mm | 1.00 +/- 0.15 mm |
| Serial single turn ETS25K mit SER (veraltet) | 4 mm | 0.20 +/- 0.15 mm |
| Analogue/ Serial redundant, ETA25KX, ETS25KX | 2.5 mm | 0.50 +/- 0.15 mm |
| Incremental ETI25K | 4 mm | 0.20 +/- 0.15 mm |
| Analogue Multi/singleturn ETA25KPM | 4 mm | 0.20 +/- 0.15 mm |

| **Angular error in dependency of the deviation of the magnet to the center axis** | |
|---|---|
| *Deviation from the center axis* | *Angular error* |
| 0.50 mm | 0.6° |
| 0.75 mm | 1.2° |




O-ring, part no. 133324
DIN 3771-22x1-NBR 70

- for sealing between sensor front and installation surface,
- not included in delivery, please order separately

**Important note:**
The correct thickness T of the magnet, the mounting distance D and the positioning relative to the central axis of the kit encoder are crucial for its correct function.

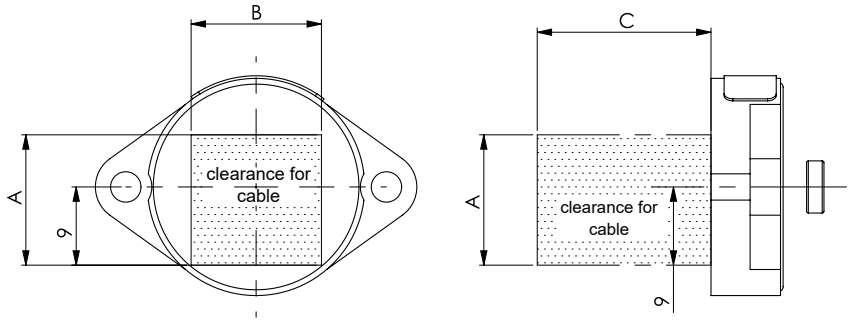
| Cable specs for option F (flat ribbon cable) and R (round control cable) | | | | | | |
|---|---|---|---|---|---|---|
| **Option** | **Standard cable length L** | **Number of single strands (depends on electronics)** | **Cable sheath Ø or width** | **Single strands cross section** | **Allowed tolerance (L)** | **Minimum bending radius** |
| R | Standard 1000 mm | 3 | 4.3 mm | AWG26 | -20 mm to +50 mm | 3 x D Ø (D = cable sheath diameter Ø) |
| | | 6 | 5.2 mm | | | |
| | | 8 | 5.6 mm | | | |
| | | 12 | 6 mm | AWG28 | | |
| F | 150 mm | 3 to 12 | ca. 1.25 per strand | AWG26 | -20 mm to +25 mm | - |
| Cables without cable shield | | | | | | |

(*) Tolerances according IPC Association

| Cable length tolerances – custom lengths | |
|---|---|
| **Length L** | **Tolerance** |
| ≤ 0.3 m | +25 mm / -20 mm |
| > 0.3 m - 1.5 m | +50 mm / -20 mm |
| > 1.5 m - 3 m | +100 mm / -40 mm |
| > 3 m - 7.5 m | +150 mm / -60 mm |

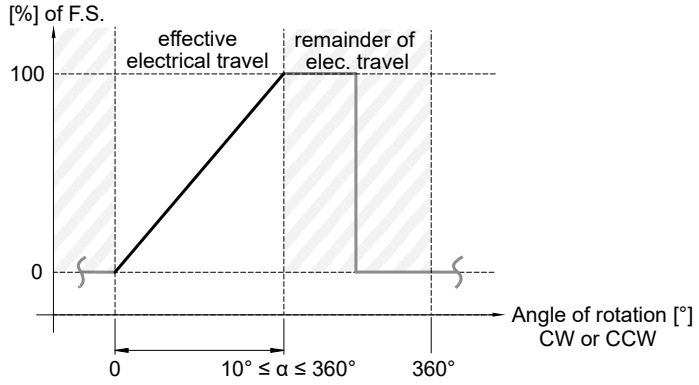
Cable harness length measured from sensor surface or soldering pad including connector.
Minimum cable length: 0.08 m (for round cable), 0.05 m for ribbon cable

| Clearance for cable exit at back side | | | | |
|---|---|---|---|---|
| **Series** | **Electronics** | **Clearance parameters [mm]** | | |
| | | **A** | **B** | **C** |
| **ETP25K** | PWM, single turn | 6 | 8 | 15 |
| **ETA25K** | Analogue, single turn | 6 | 8 | 15 |
| **ETA25KPM** | Analogue, programmable multiturn | 6 | 14 | 15 |
| **ETA25KX** | Analogue, redundant single turn | 18 | 8 | 15 |
| **ETI25K** | Incremental, single turn, A, B, Z | 6 | 14 | 15 |
| | Serial, single turn, SER (deprecated) | 6 | 14 | 15 |
| | Serial, single turn, SPI | 9 | 14 | 15 |
| **ETS25KX** | Serial, redundant, single turn (SPI) | 18 | 12 | 20 |



## Signal definition for custom rotation angles

| | |
|---|---|
| Custom angles <360° | When programming the electrical angle of rotation of <360°, the remaining non-effective range of rotation is divided equally into high and low. |



| Mechanical and environmental data - ETx25K Family | |
|---|---|
| Mechanical angle of rotation 1.) | Endless |
| Lifetime 2.) | Mechanically unlimited |
| Max. operational speed | The maximum actuation speed is not limited mechanically.<br>The maximum permissible actuation speed [rev./min] is calculated in relation to the resolution. For absolute encoders:<br>$rev./min.(@max.\ resolution) = \frac{1}{2^{\text{Resolution in Bit}} * Updaterate\ in\ s} * 60s$<br>For incremental encoders:<br>$Max.\ rev./min. = \frac{Limit\ Frequency\ \frac{1}{s} * 60s}{Number\ of\ Pulses}$ |
| Operating temperature range | -40..+85°C (fixed cable) |
| Storage temperature range | -40..+105°C |
| Protection grade front side (IEC 60529) | IP6 |
| Protection grade rear side (IEC 60529) | IP67 (end of cable excluded) - standard with encapsulated electronics<br>IP00 (end of cable excluded) - option without encapsulated electronics |
| Vibration (IEC 68-2-6, Test Fc) | ±1.5 mm / 20 g / 10 bis 2000 Hz / 16 frequency cycles (3x4 h) |
| Mechanical shock (IEC 68-27, Test Ea) | 50 g / 11 ms / halfsine (3x6 shocks) |
| Housing diameter / length | 25 mm (dimensions of the mounting flange, height: 37 mm, width 25 mm) |
| Housing depth | 8 mm |
| Shaft diameter | No limitation |
| Mass | Option F (0.15 m flat ribbon cable) approx. 15 g<br>Option R (1.00 m round cable) approx. 40 g |
| Connection type | ▪ Flat ribbon cable (AWG26, 0.15 m with tinned cable endings)<br>▪ Round cable (AWG26, 1 m with tinned cable endings)<br>▪ Other connection types on request |
| Connection position | Axial |
| Sensor mounting | Flange, by means of two pieces of screws M3 |
| Delivery content | Kit Encoder and Magnet. O-ring/gasket must be ordered separately<br>(Screws for fastening the rotary encoder are not part of the scope of delivery) |
| Fastening torque (per screw or nut) | ≤ 0.5 Nm |
| Housing material | Glass-fibre reinforced thermoplastic |

1.) According IEC 60393
2.) Determined by climatic conditions according to IEC 68-1, para. 5.3.1 without load collectives

| Immunity / Electrostatic Discharge / REACH / RoHS | |
|---|---|
| EN 61000-4-3 RF sine wave | Class A |
| EN 61000-4-6 Conducted sine wave | Class A |
| EN 61000-4-8 Power frequency magnetic fields | Class A |
| EN 61000-4-2 ESD | Class B |
| REACH Regulation (EC) 1907/2006 including the SVHC list | |
| RoHS Directive 2011/65/EU | |