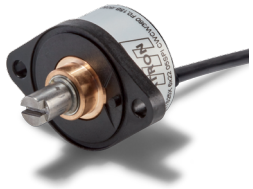
## Series ETA25F

**Key features ETA25F:**
- Analogue outputs 0 to 5 V, 0 to 10 V, 4 to 20 mA
- Redundant versions available – see separate section
- 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 ex works), ±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 to IEC 60393

## Wire colour/pin assignment

| Function: | Option F | Option R |
|---|---|---|
| OUT | Strand 2 | brown |
| VSUP | Strand 1 (red) | red |
| GND | Strand 3 | black |

**For details on zero point definition and output programming see page 25.**

## Order Code ETA25F – singleturn, analogue output, not redundant

| Description | Selection: standard=**black/bold**, possible options=*grey/italic* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Series** | **ETA25F** | | | | | | | | |
| **Shaft diameter, shaft length:**<br>**Shaft diameter Ø 6 mm, shaft length 15.6 mm**<br>*Shaft diameter Ø 6.35 mm, shaft length 15.6 mm*<br>*Custom shaft dimensions [mm] Ø ≤ 6.35 mm* | | **6x15,6**<br>*6,35x15,6*<br>*XxXX* | | | | | | | |
| **Supply voltage / output signal:**<br>**VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric)<br>**VSUP=24 V (15 to 30 V) / OUT=0 to 10 V**<br>**VSUP=24 V (9 to 30 V) / OUT=4 to 20 mA**<br>*VSUP=24 V (9 to 30 V) / OUT=0 to 5 V* | | | **0505**<br>**2410**<br>**2442**<br>*2405* | | | | | | |
| **Sense of rotation:** (when looking at the shaft, from the front)<br>**Clockwise**<br>*Counterclockwise* | | | | **CW**<br>*CCW* | | | | | |
| **Rotation angle in [°]:**<br>**360**<br>*320*<br>*270*<br>*180*<br>*90*<br>*Custom rotation angle* (≥7°, positive integer) | | | | | **360**<br>*320*<br>*270*<br>*180*<br>*90*<br>*XXX* | | | | |
| **Operational Torque:**<br>**Standard torque**<br>*Improved/medium torque* | | | | | | **-**<br>*MT* | | | |
| **Shaft sealing:**<br>**None**<br>*With shaft sealing* | | | | | | | **-**<br>*D* | | |
| **Electrical connection, cable length:**<br>**Solder holes**<br>**Clamping terminals**<br>**Flat ribbon cable, standard length 0.15 m**<br>*Flat ribbon cable with custom length [x,xx m]*<br>**Round cable, standard length 1 m**<br>*Round cable with custom length [x,xx m]* | | | | | | | | **L**<br>**K**<br>**F0,15**<br>*FX,XX*<br>**R1,00**<br>*RX,XX* | |
| **Anti-rotation pin:**<br>**Pin A**<br>*None (pin removed)* | | | | | | | | | **A**<br>- |

## Order example ETA25F

**Requirements:**
Shaft Ø 6.00 mm, shaft length 15.6 mm, VSUP=5 V / OUT=0 to 5 V, sense of rotation CW, rotation angle 360°
round cable 1.00 m, anti-rotation pin A

**Example for order code:**
ETA25F 6x15,6 0505 CW 360 R1,00A

## Series ETA25FX – singleturn, analogue output, redundant

**Key features ETA25FX :**

- Independent signal processing. The ETA25FX 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 ETA25FX – singleturn, analogue output, redundant

| | | |
|---|---|---|
| Effective electrical angle of rotation 1.) | 7° ≤ α ≤ 360° (programmable ex works), ±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 to IEC 60393

## Cable and pin assignment ETA25FX – singleturn, analogue output, redundant

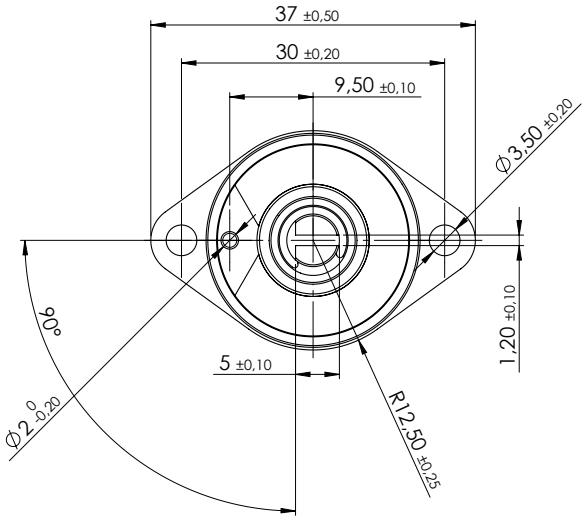
| Function: | Option F | Option R |
|---|---|---|
| VSUP 1 | Lead 1 (red) | red |
| OUT 1 | Lead 2 | brown |
| GND 1 | Lead 3 | black |
| GND 2 | Lead 4 | green |
| OUT 2 | Lead 5 | yellow |
| VSUP 2 | Lead 6 | orange |

**For details on zero point definition and output programming see page 25.**

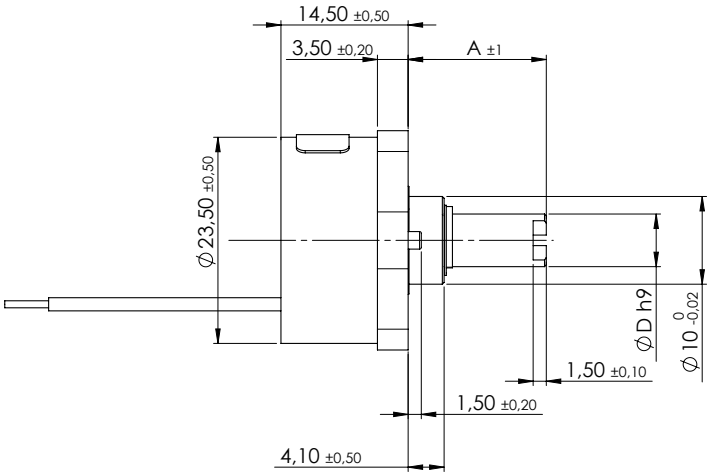
| Order Code ETA25FX – redundant, singleturn, analogue output | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Description** | Selection: standard=**black/bold**, possible options=*grey/italic* | | | | | | | | |
| **Series** | **ETA25FX** | | | | | | | | |
| **Shaft diameter, shaft length:**<br>**Shaft diameter Ø 6 mm, shaft length 15.6 mm**<br>*Shaft diameter Ø 6.35 mm, shaft length 15.6 mm*<br>*Custom shaft dimensions [mm] Ø ≤ 6.35 mm* | | **6x15,6**<br>*6,35x15,6*<br>*XxXX* | | | | | | | |
| **Supply voltage / output signal:**<br>**VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric)<br>**VSUP=24 V (15 to 30 V) / OUT=0 to 10 V** | | | **0505**<br>**2410** | | | | | | |
| **Sense of rotation:** (when looking at the shaft, from the front)<br>**Clockwise/Clockwise (ganging)**<br>*Clockwise/Counterclockwise (counter rotational)* | | | | **CW CW**<br>*CW CCW* | | | | | |
| **Rotation angle in [°]:**<br>**360**<br>*320*<br>*270*<br>*180*<br>*90*<br>*Custom rotation angle* (≥7°, positive integer) | | | | | *360*<br>*320*<br>*270*<br>*180*<br>*90*<br>*XXX* | | | | |
| **Operational Torque:**<br>**Standard torque**<br>*Improved/medium torque* | | | | | | **-**<br>*MT* | | | |
| **Shaft sealing:**<br>**None**<br>*With shaft sealing* | | | | | | | **-**<br>*D* | | |
| **Electrical connection, cable length:**<br>**Flat ribbon cable, standard length 0.15 m**<br>*Flat ribbon cable with custom length [x,xx m]*<br>**Round cable, standard length 1 m**<br>*Round cable with custom length [x,xx m]* | | | | | | | | **F0,15**<br>*FX,XX*<br>**R1,00**<br>*RX,XX* | |
| **Anti-rotation pin:**<br>**Pin A**<br>*None (pin removed)* | | | | | | | | | **A**<br>*-* |

| Order example ETA25FX – redundant, singleturn, analogue output |
|---|
| **Requirement:**<br>Redundant, shaft Ø 6.00 mm, shaft length 15.6 mm, 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, no shaft sealing, flat ribbon cable 0.15 m, anti-rotation pin A |
| **Example for order code:**<br>ETA25FX 6x15,6 0505 CW CW 360 F0.15A |

## Drawing ETx25F Family




View shows 0° position

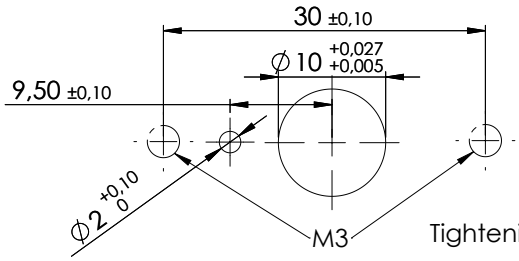



| Standard shaft dimensions | |
|---|---|
| Shaft length A | 15,6 mm |
| Shaft diameter D | 6 mm |

planarity of installation surface ⏥ 0,1

roughness of installation surface √Ra 6,3

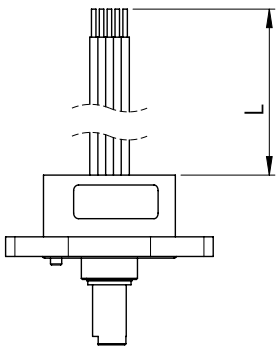
drilling pattern



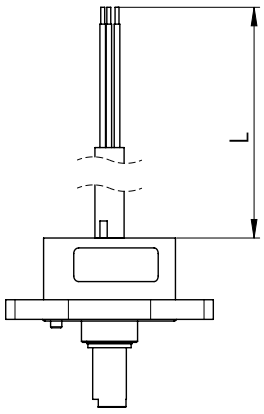

Tightening toque <= 0,5Nm

### Option F - Flat ribbon cable

red marking = PIN 1




### Option R - Round cable




| **Standard shaft dimensions** | |
|---|---|
| Shaft length A | 15.6 +/- 1 mm |
| Shaft diameter D | 6 h9 mm, 6.35 h9 mm |
| Shaft flattening (D-flat) | 1 +/- 0.1 mm |

All dimensions in mm

| 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.<br>Minimum cable length: 0.08 m (for round cable), 0.05 m for ribbon cable | |

| Mechanical and environmental data, miscellaneous | |
|---|---|
| Mechanical angle of rotation 1.) | Endless |
| Lifetime 2.) | > 100 Mio. shaft rotation movements<br>Option D: Sealing specified for ≥ 200 000 shaft rotation movements |
| Bearing | Sleeve bearing |
| Max. operational speed | 100 rpm (< 1 min. 800 rpm) |
| Operational torque | 0.1 ≤ M ≤ 0.6 Ncm (without shaft sealing)<br>0.3 ≤ M ≤ 1.3 Ncm (@RT, 10 rpm) (with increased torque) |
| Operating temperature range | Standard: -40 to +85 °C (cable not moving) |
| Storage temperature range | Standard: -40 to +105 °C |
| Protection grade (IEC 60529) front side | ▪ IP40 standard<br>▪ IP55M (IP66S) with shaft sealing (option D) |
| Protection grade (IEC 60529) rear side | IP66 (cable ends excluded) |
| Vibration (DIN EN 60068-2-6) | ±1.5 mm / 30 g / 10 to 2000 Hz / 16 frequency cycles (3x4 h) |
| Shock (DIN EN 60068-2-27) | 50 g / 11 ms / half sine (3x6 shocks) |
| Housing diameter | Ø 23.5 mm (dimensions of the mounting flange, height: 37 mm, width 25 mm) |
| Housing depth | 14.5 mm |
| Shaft diameter | Standards: Ø 6 mm, Ø 6.35 mm<br>Option: User defined shaft diameter [mm] |
| Max. radial load | 1 N |
| Max. axial load | 1 N |
| Mass (circa) | ▪ ca. 40 g (option R: cable, valid for 1 m only)<br>▪ ca. 23 g (option F: flat ribbon cable, valid for 15 cm only) |
| Connection type | ▪ Ribbon cable (option F)<br>▪ Cable (option R) |
| Connection position | Axial |
| Sensor mounting | Flange, by means of two screws M3 (not enclosed) |
| Fastening parts included in delivery | If option D is ordered an additional O-Ring is part of delivery as sealing between mounting panel and rotary encoder. |
| Fastening torque mounting nut | ≤ 3 Nm |
| Material shaft | Stainless steel |
| Material housing | Plastic / Bronze |

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

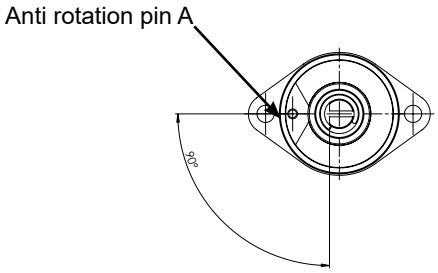
| Immunity / Electrostatic Discharge / REACH / RoHS | |
|---|---|
| EN 61000-4-3 RF sine wave | Class A |
| EN 61000-4-6 Conducted sine wave | Class A |
| EN 61000-4-8 Power frequency magnetic fields | Class A |
| EN 61000-4-2 ESD | Class B |
| REACH Regulation (EC) 1907/2006 including the SVHC list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

## Definition of the zero position / anti-rotation pin

**Output at the zero point:**
ETA25F (analogue outputs): Output signal 0% full scale (F. S.)
ETP25F (PWM output): duty cycle 10% (10% duty cycle)
ETS25F (serial output): Output signal 0% full scale (F. S.)
ETI25F (incremental output): The index signal is output (Z)

**Position of the zero position:**

| | |
|---|---|
| anti-rotation pin A | Zero position when shaft flattening faces anti-rotation pin A |




## 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. |