

Absolute Encoders with Pulse Width Modulation (PWM)

Series ETP25

Series ETP25 – singleturn, PWM output, not redundant

Key features ETP25:

- PWM signal output
- Frequency 244 Hz (constant)
- Pulse width (duty cycle) 10% (0°) to 90% (360°)
- Supply voltage: 5 VDC +/-10%



Electrical data ETP25 – singleturn, PWM output, not redundant

Effective electrical angle of rotation 1.)	$7^{\circ} \leq \alpha \leq 360^{\circ}$ (programmable ex works), $\pm 0.5^{\circ}$
Independent linearity (best straight line) 1.)	$\pm 0.4\%$ @ 360°
Absolute Linearity 1.)	$\pm 0.6\%$ @ 360°
Output signal	PWM (pulse width modulation)
Output signal voltage	5 V
Carrier frequency	244 Hz (constant)
Minimum duty cycle	10%, equal to app. 0.4 ms
Maximum duty cycle	90%, equal to app. 3.5 ms
Resolution	12 Bit
Supply voltage	5 V $\pm 10\%$
Power consumption (no load)	≤ 10 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)	1267a

1.) According IEC 60393

Function description PWM signal output ETP25

The ETP25 provides a constant carrier frequency with 244 Hz at the signal output, with HIGH and LOW signal levels which have a constant signal amplitude. A constant carrier frequency means a constant length of the period duration. The duty cycle and thus the pulse width changes in dependency of the rotating angle between 10% to 90% relative to the signal period. If the CW option is selected, the duty cycle increases clockwise when turning the shaft clockwise. If the CCW option is selected, the duty cycle decreases clockwise if the shaft is turned clockwise. Normally no signal conversion is required for further processing of the output signal, because many μ Controllers already have an input for PWM signals.

Cable and pin assignment

Function	Option L	Option F (flat ribbon)	Option R (round cable)
OUT	PIN 1	Lead 2	brown
VSUP	PIN 2	Lead 1 (red)	red
GND	PIN 3	Lead 3	black

For details on zero point definition and output programming see page 30.

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Order Code ETP25 – singleturn, PWM output, not redundant

Description	Selection: standard= black/bold , possible options= <i>grey/italic</i>									
Series	ETP25									
Shaft diameter, shaft length: Shaft diameter Ø 6 mm, shaft length 22 mm <i>Shaft diameter Ø 6.35 mm, shaft length 22 mm</i> <i>Custom shaft dimensions [mm] Ø ≤6.35 mm</i>		6x22 <i>6,35x22</i> <i>XxXX</i>								
Supply voltage / output signal: VSUP=5 V (4.5...5.5 V) / OUT=5 V / 244 Hz / PWM 10-90%			5PWM							
Mechanical stop/centre detent: None <i>Mechanical stop (90, 180, 270 or 320°)</i> <i>Stop and centre detent (at 0°)</i>				- <i>S</i> <i>M</i>						
Sense of rotation: (when looking at the shaft, from the front) Clockwise <i>Counterclockwise</i>					CW <i>CCW</i>					
Rotation angle* in [°]: 360 (not available with mechanical stop) <i>320</i> <i>270</i> <i>180</i> <i>90</i> <i>Custom rotation angle (≥7°, positive integer, not available with mechanical stop)</i>						<i>360</i> <i>320</i> <i>270</i> <i>180</i> <i>90</i> <i>XXX</i>				
Operational Torque: Standard torque <i>Improved/medium torque</i>							- <i>MT</i>			
Shaft sealing: None <i>With shaft sealing</i>								- <i>D</i>		
Electrical connection, cable length: Solder holes Flat ribbon cable, standard length 0.15 m <i>Flat ribbon cable with custom length [x,xx m]</i> Round cable, standard length 1 m <i>Round cable with custom length [x,xx m]</i>									L F0,15 <i>FX,XX</i> R1,00 <i>RX,XX</i>	
Anti-rotation pin, zero point definition: <i>Pin A (not available with mechanical stop)</i> Pin B <i>None (pins removed) (no zero point definition possible)</i>										A B <i>-</i>

* Without a mechanical stop, this value corresponds to the effective electrical angle. With a mechanical stop, the mechanical angle of rotation is determined by this value and the effective electrical angle of rotation is 10° smaller than the mechanical angle of rotation. For details see page 31.

Order example ETP25 – singleturn, PWM output, not redundant

Requirement:

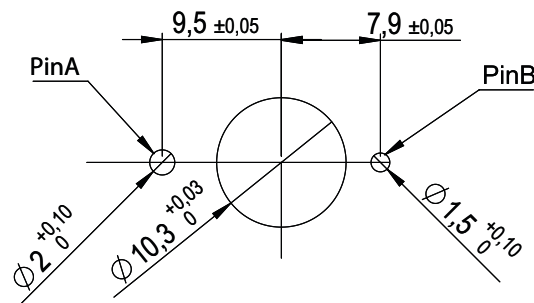
Shaft Ø 6.35 mm, shaft length 22 mm, VSUP=5 V / OUT=244 Hz, sense of rotation CW, rotation angle 360°, no shaft sealing, electrical connection solder holes, anti-rotation pin A

Example for order code:

ETP25 6,35x22 5PWM CW 360 LA

Drilling pattern

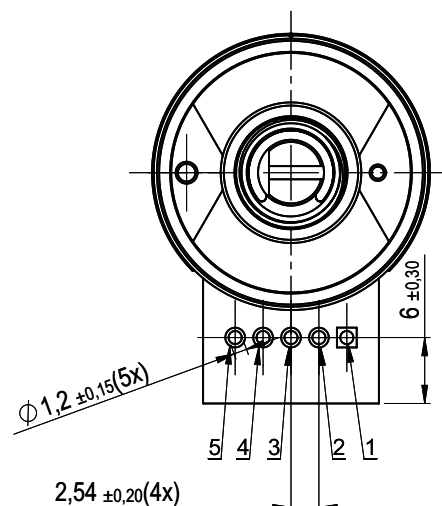
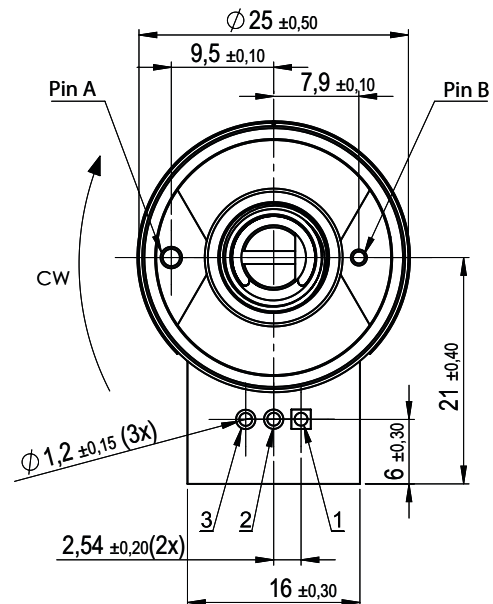
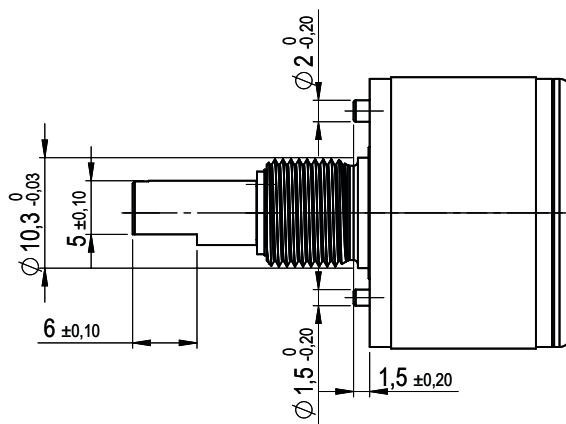
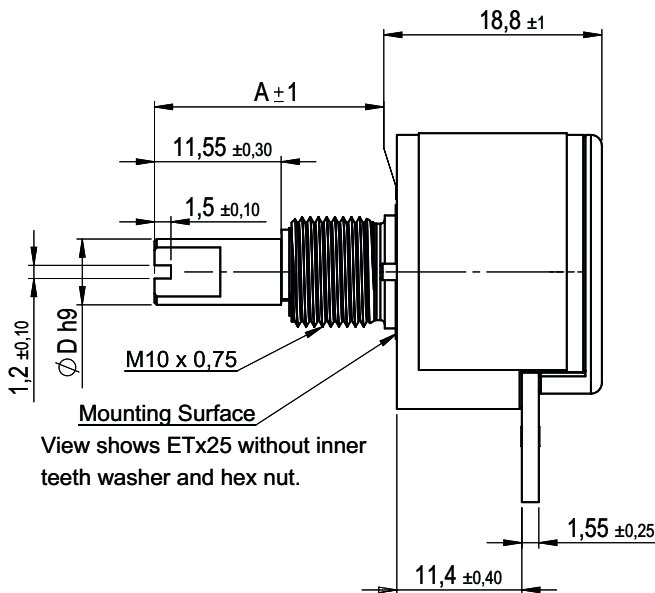
Pattern of Drilling



Either pin A or pin B must be chosen as anti-rotation pin. Please select by specifying the variant in the order code. The unused pin can be left out when drilling.

Drawings ETx25 – with solder holes (option L)

Option L



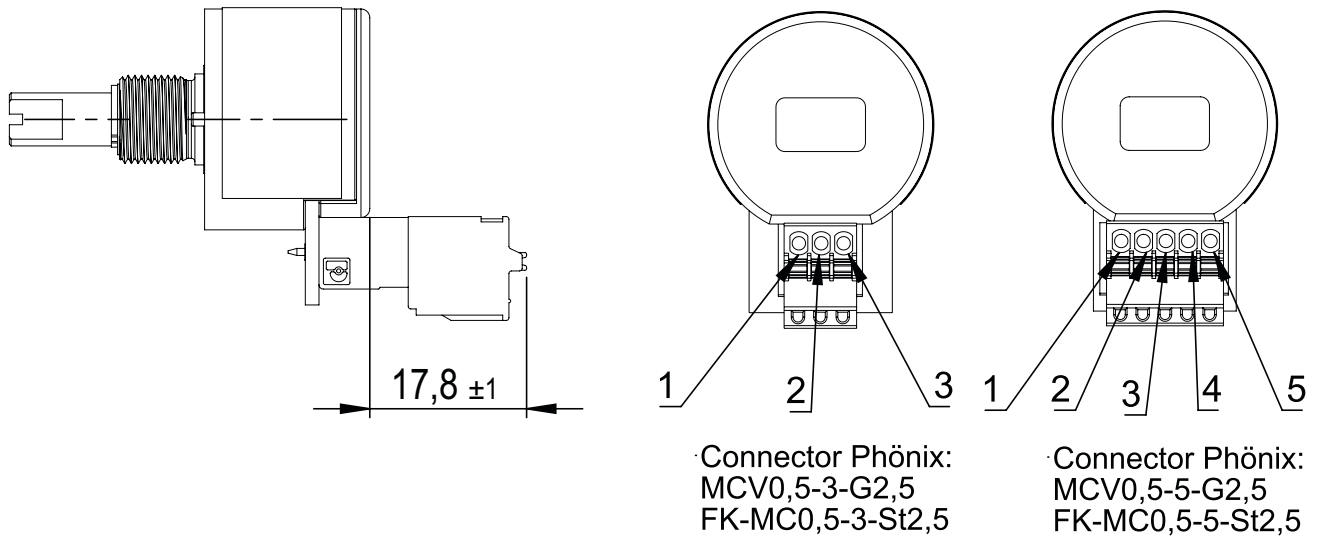
All dimensions in mm

Standard shaft dimensions / tolerances

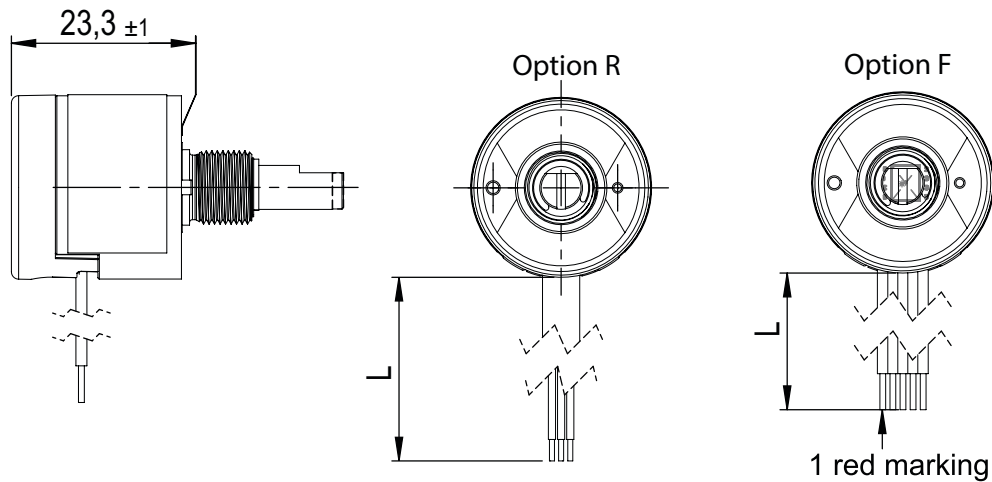
Shaft length A	22 +/- 1 mm
Shaft diameter D	6 h9 mm, 6.35 h9 mm
Shaft flattening (D-flat)	6 +/- 0.1 mm

Drawings ETx25 – clamping terminals (option K) and cable versions (options R and F)

Option K (clamping terminals)



Options F (flat ribbon cable) and R (round control cable)



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

Mechanical and environmental data, miscellaneous	
Mechanical angle of rotation 1.)	Endless or 320° (270°/180°/90°), ±5° with mechanical stop option
Lifetime 2.)	≤ 100 Mio. shaft rotation movements Option D: Sealing of the shaft is working up to 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) 0.3 ≤ M ≤ 1.3 Ncm (@RT, 10 rpm) (with increased torque)
Operating temperature range	Standard: -40 to +85 °C (cable fixed installed) Option TS: -25 to +70 °C
Storage temperature range	Standard: -40 to +105 °C Option TS: -40 to +90 °C (teach-In multiturn)
Protection grade (IEC 60529) front side	From shaft side: ▪ IP40 standard ▪ IP55M (IP66S) with shaft sealing (option D)
Protection grade (IEC 60529) rear side	▪ IP50 Solder holes / clamping terminals (solder holes / connector excluded) ▪ IP66 flat ribbon and round signal cable (cable ends excluded) ▪ IP00 option TS (teach-in multiturn)
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)	100 g / 6 ms / half sine (3x6 shocks)
Housing diameter	Ø 25 mm
Housing depth	see drawings
Shaft diameter	Standards: Ø 6 mm, Ø 6.35 mm Option: User defined shaft diameter [mm]
Max. radial load	1 N
Max. axial load	1 N
Mass (circa)	▪ ca. 26 g (option L: solder lugs) ▪ ca. 60 g (option R: cable, valid for 1 m only) ▪ ca. 32 g (option F: flat ribbon cable, valid for 15 cm only) ▪ ca. 27 g (option K: clamping terminals) ▪ ca. 31 g (option TS: teach-In multiturn)
Connection type	▪ Solder lugs (option L) ▪ Ribbon cable (option F) ▪ Cable (option R) ▪ Connector (option K)
Connection position	Radial
Sensor mounting	Bushing via M10 x 0,75
Fastening parts included in delivery	Hex nut and tooth washer, if option D is ordered then 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

1.) According IEC 60393

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

Mechanical Data

Family ETx25

Immunity / Electrostatic Discharge

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 3.)	Class B

3.) Not tested for Option TS

Definition of the zero position / anti-rotation pin

Output at the zero point:

ETA25 (analogue outputs): Output signal 0% full scale (F. S.)

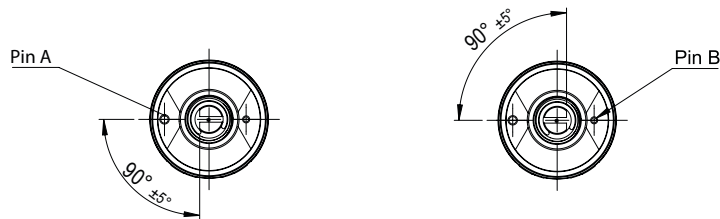
ETP25 (PWM output): duty cycle 10% (10% duty cycle)

ETS25 (serial output): Output signal 0% full scale (F. S.)

ETI25 (incremental output): The index signal is output (Z)

Position of the zero position:

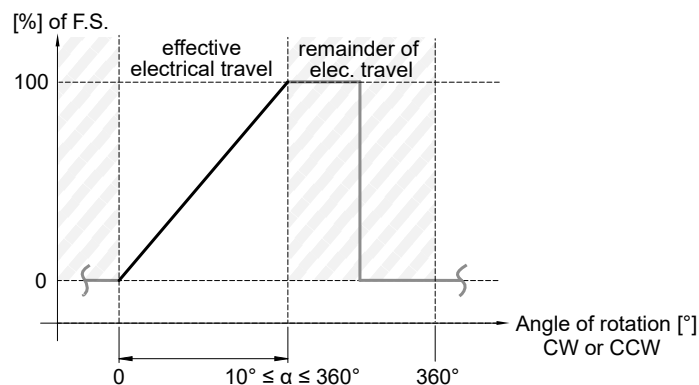
Option anti-rotation pin A	Zero position when shaft flattening faces anti-rotation pin A
Option anti-rotation pin B	Zero position when shaft flattening faces anti-rotation pin B



Signal definition for custom rotation angles (without mechanical stop)

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. Valid only for encoders without mechanical stop!



Mechanical stop and centre detent for manual encoder applications

- A mechanical stop limits the rotation to either 320°, 270°, 180° or 90° ($\pm 5^\circ$). Other angles are not available. Due to the mechanical tolerances ($\pm 5^\circ$), the effective electrical angle is reduced by 10°.
- Optionally a centre detent can be selected in addition to the mechanical stop. It enables the operator to e. g. feel the centre position when operating the encoder by hand
- The zero point definition for mechanical stop option differs from the standard zero point definition. Only drilling pattern B (pin B) is available. See the details below.

Mechanical stop only: relationship between mechanical and effective electrical angle of rotation

Mechanical angle of rotation ($\pm 5^\circ$)	Effective electrical angle of rotation ($\pm 0.5^\circ$)
320°	310°
270°	260°
180°	170°
90°	80°

