P3 AMERICA
PRECISION SENSORS & JOYSTICKS

MEGATRON

Absolute Encoders with Current Loop or Voltage Output

Series ETA25

Series ETA25

Key features ETA25:

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.)	10° ≤ α ≤ 360° (programmable in factory), ±0.5° with mechanical stop: 310° (260°/170°/80°), ±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 L and K	Option F	Option R
OUT	Pin 1	Strand 2	brown
VSUP	Pin 2	Strand 1 (red)	red
GND	Pin 3	Strand 3	black

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Order Code ETA25 – singleturn, analogue output, not redundant

Description	Selection: standard=**black/bold**, possible options=*grey/italic*									
Series	**ETA25**									
Shaft diameter, shaft length: **Shaft diameter Ø 6 mm, shaft length 22 mm** *Shaft diameter Ø 6.35 mm, shaft length 22 mm* *Custom shaft dimensions [mm] Ø ≤6.35mm*		**6x22** *6,35x22* *XxXX*								
Supply voltage / output signal: **VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric) **VSUP=24 V (15 to 30 V) / OUT=0 to 10 V** **VSUP=24 V (9 to 30 V) / OUT=4 to 20 mA** *VSUP=24 V (9 to 30 V) / OUT=0 to 5 V*			**0505** **2410** **2442** *2405*							
Mechanical stop/centre detent*: **None** *Mechanical stop* (90, 180, 270 or 320°) *Stop and centre detent* (at 0°)				**-** *S* *M*						
Sense of rotation: (when looking at the shaft, from the front) **Clockwise** *Counterclockwise*					**CW** *CCW*					
Rotation angle* in [°]: **360** (not available with mechanical stop) *320* *270* *180* *90* *Custom rotation angle* (≥10°, positive integer, not available with mechanical stop)						**360** *320* *270* *180* *90* *XXX*				
Operational Torque: **Standard torque** *Improved/medium torque*							**-** *MT*			
Shaft sealing: **None** *With shaft sealing*								**-** *D*		
Electrical connection, cable length: **Solder holes** **Clamping terminals** **Flat ribbon cable, standard length 0.15 m** *Flat ribbon cable with custom length [x,xx m]* **Round cable, standard length 1 m** *Round cable with custom length [x,xx m]*									**L** **K** **F0,15** *FX,XX* **R1,00** *RX,XX*	
Anti-rotation pin, zero point definition**: *Pin A* (not available with mechanical stop) **Pin B** *None (pins removed)* (no zero point definition possible)										*A* **B** -

* 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 29.
** For details on zero point definition and output programming see page 28.

Order example ETA25

Requirements:
Shaft Ø 6.00 mm, shaft length 22 mm, VSUP=5 V / OUT=0 to 5 V, sense of rotation CW, rotation angle 360°
round cable 1.00 m, anti-rotation pin B

Example for order code:
ETA25 6x22 0505 CW 360 R1,00B

Series ETA25X – singleturn, analogue output, redundant

Key features ETA25X :

Independent signal processing. The ETA25X 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 ETA25X – singleturn, analogue output, redundant

Effective electrical angle of rotation 1.)	15° ≤ α ≤ 360° (programmable at factory), ±0.5° with mechanical stop: 310° (260°/170°/80°), ±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 ETA25X – 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

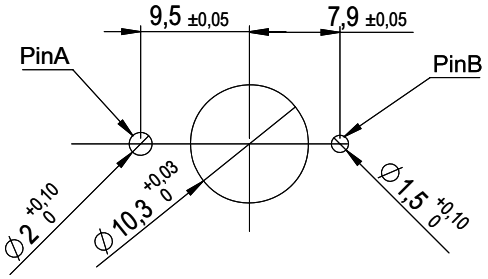
Order Code ETA25X – redundant, singleturn, analogue output										
Description	Selection: standard=**black/bold**, possible options=*grey/italic*									
Series	**ETA25X**									
Shaft diameter, shaft length: **Shaft diameter Ø 6 mm, shaft length 22 mm** *Shaft diameter Ø 6.35 mm, shaft length 22 mm* *Custom shaft dimensions [mm] Ø ≤6.35mm*		**6x22** *6,35x22* *XxXX*								
Supply voltage / output signal: **VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V** (ratiometric) **VSUP=24 V (15 to 30 V) / OUT=0 to 10 V**			**0505** **2410**							
Mechanical stop/centre detent: **None** *Mechanical stop* (90, 180, 270 or 320°) *Stop and centre detent* (at 0°)				**-** *S* *M*						
Sense of rotation: (when looking at the shaft, from the front) **Clockwise/Clockwise (ganging)** *Clockwise/Counterclockwise (counterrotational)*					**CW CW** *CW CCW*					
Rotation angle* in [°]: **360** (not available with mechanical stop) *320* *270* *180* *90* *Custom rotation angle* (≥10°, positive integer, not available with mechanical stop)						*360* *320* *270* *180* *90* *XXX*				
Operational Torque: **Standard torque** *Improved/medium torque*							**-** *MT*			
Shaft sealing: **None** *With shaft sealing*								**-** *D*		
Electrical connection, cable length: **Flat ribbon cable, standard length 0.15 m** *Flat ribbon cable with custom length [x,xx m]* **Round cable, standard length 1 m** *Round cable with custom length [x,xx m]*									**F0,15** *FX,XX* **R1,00** *RX,XX*	
Anti-rotation pin, zero point definition**: *Pin A* (not available with mechanical stop) **Pin B** *None (pins removed)* (no zero point definition possible)										*A* **B** -

* 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 29.
** For details on zero point definition and output programming see page 28.

Order example ETA25X – redundant, singleturn, analogue output
Requirement: Redundant, shaft Ø 6.00 mm, shaft length 22 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 B
Example for order code: ETA25X 6x22 0505 CW CW 360 F0.15B

Drilling pattern

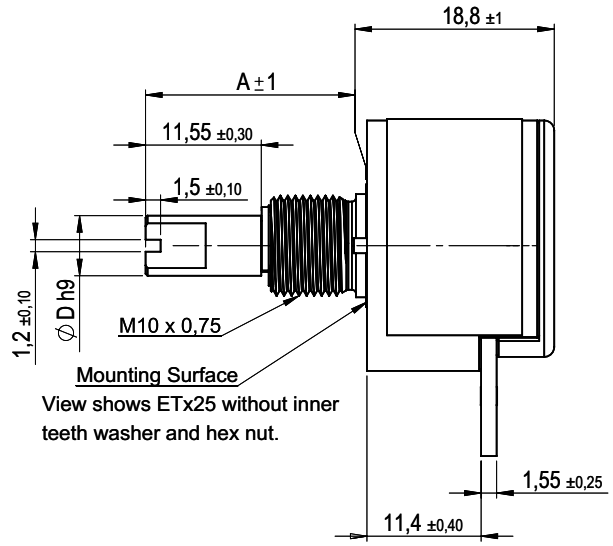
Pattern of Drilling

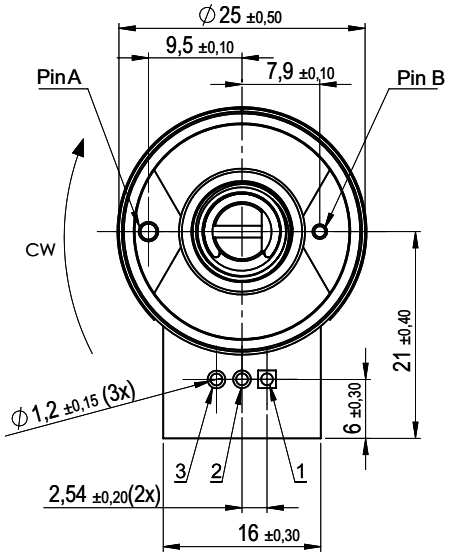


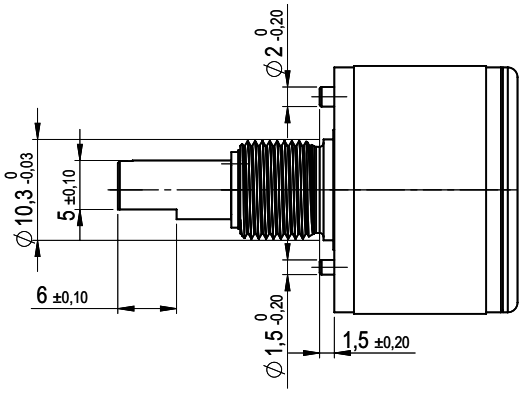
Either pin A or pin B must be chosen as anti-rotation pin. Please select by specifying the variant in the order code.The unused pin can be left out when drilling.

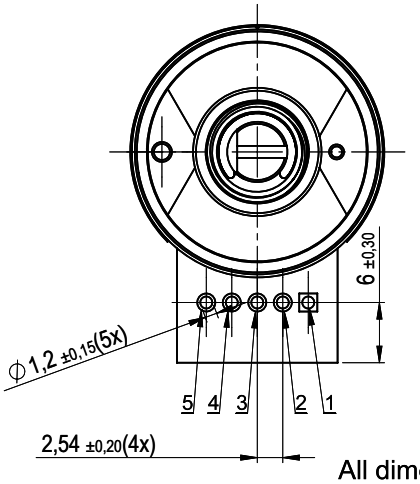
Drawings ETx25 – with solder holes (option L)

Option L







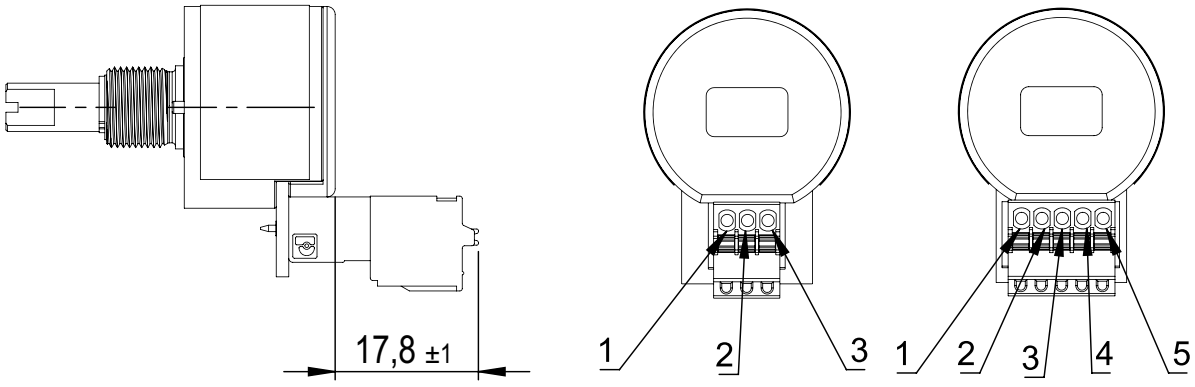


Standard shaft dimensions / tolerances	
Shaft length A	22 +/- 1 mm
Shaft diameter D	6 h9 mm, 6.35 h9 mm
Shaft flattening (D-flat)	6 +/- 0.1 mm

All dimensions in mm

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

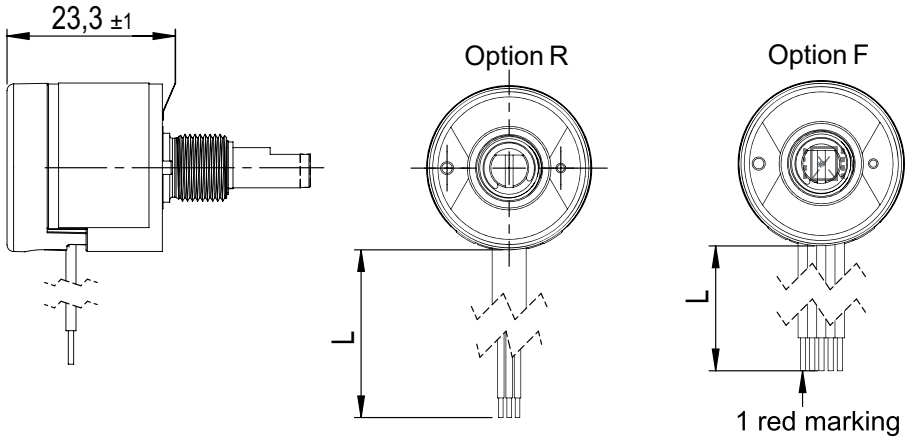
Option K (clamping terminals)



Connector Phönix:
MCV0,5-3-G2,5
FK-MC0,5-3-St2,5

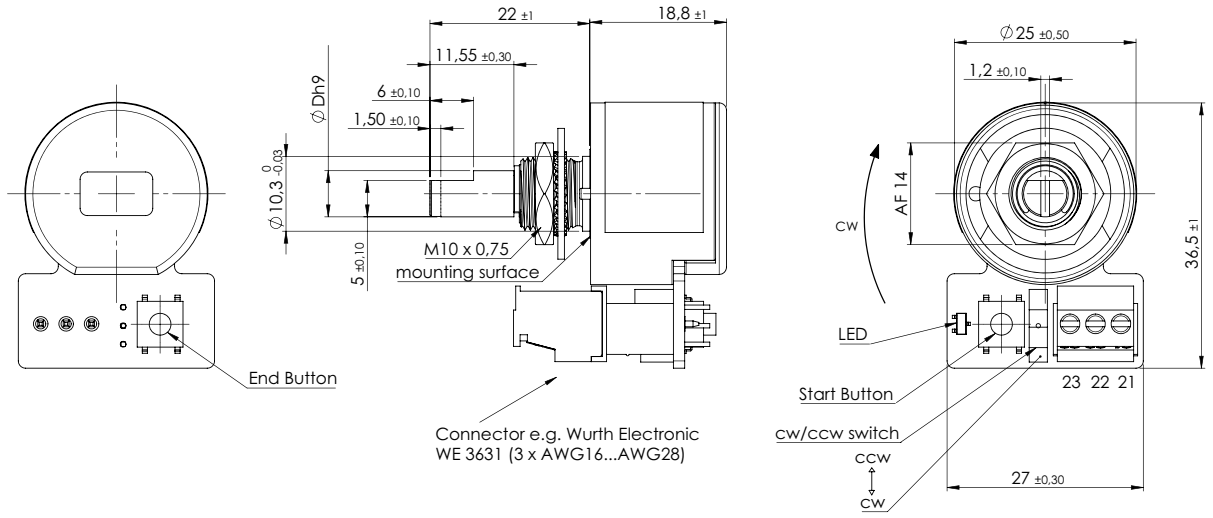
Connector Phönix:
MCV0,5-5-G2,5
FK-MC0,5-5-St2,5

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



Drawings ETx25PM – teach-in feature

ETA25PM – Multiturn (option TS) with teach-in feature



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 ≥ 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 (AF14) 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
Material housing	Plastic / Bronze

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 3.)	Class B
REACH Regulation (EC) 1907/2006 including the SVHC list	
RoHS Directive 2011/65/EU	

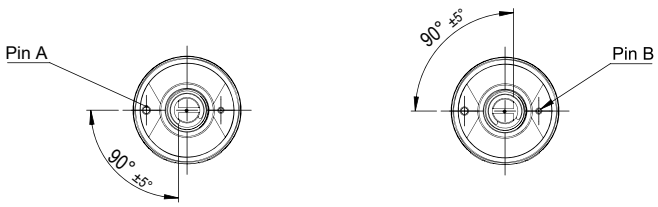
3.) Not tested for Option TS

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.), for option 05SER no zero point alignment is available ex works
ETI25 (incremental output): The index signal is output (Z)

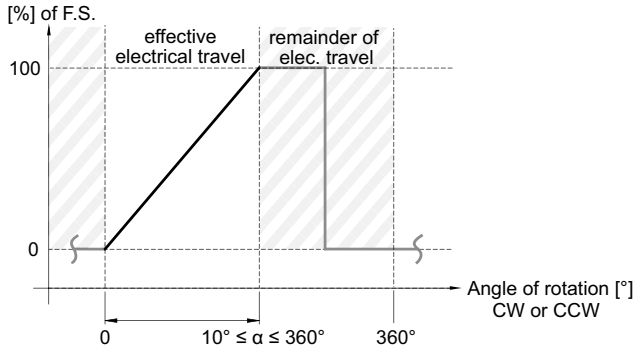
Position of the zero position:

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 A



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

③ A mechanical stop limits the rotation to either 320°, 270°, 180° or 90° (±5°). Other angles are not available. Due to the mechanical tolerances (±5°), the effective electrical angle is reduced by 10°.

③ 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

③ 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 (±5°)	Effective electrical angle of rotation (±0.5°)
320°	310°
270°	260°
180°	170°
90°	80°