

**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  $\pm 10\%$ , 15 to 30 VDC, 9 to 30 VDC


**Electrical data**

Effective electrical angle of rotation 1.)	$7^\circ \leq \alpha \leq 360^\circ$ (programmable ex works), $\pm 0.5^\circ$ with mechanical stop: $310^\circ$ ( $260^\circ/170^\circ/80^\circ$ ), $\pm 0.5^\circ$		
Independent linearity (best straight line) 1.)	$\pm 0.3\%$ @ $360^\circ$		
Absolute Linearity 1.)	$\pm 0.6\%$ @ $360^\circ$		
Output signal	0 to 5 V ratiometric	0 to 10 V	4 to 20 mA
Resolution	12 Bit		
Update rate	200 $\mu$ s		
Supply voltage	5 V $\pm 10\%$	15 to 30 V	9 to 30 V
Power consumption (no load)	$\leq 18$ mA		
Output load	$\geq 5$ kOhm		$\leq 500$ 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

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

Order Code ETA25 – singleturn, analogue output, not redundant									
Description	Selection: standard= <b>black/bold</b> , possible options= <i>grey/italic</i>								
<b>Series</b>	<b>ETA25</b>								
<b>Shaft diameter, shaft length:</b> 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>		<b>6x22</b> <i>6,35x22</i> <i>XxXX</i>							
<b>Supply voltage / output signal:</b> VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V ( <i>ratiometric</i> ) VSUP=24 V (15 to 30 V) / OUT=0 to 10 V VSUP=24 V (9 to 30 V) / OUT=4 to 20 mA <i>VSUP=24 V (9 to 30 V) / OUT=0 to 5 V</i>						<b>0505</b> <b>2410</b> <b>2442</b> <i>2405</i>			
<b>Mechanical stop/centre detent*:</b> None <i>Mechanical stop (90, 180, 270 or 320°)</i> <i>Stop and centre detent (at 0°)</i>								- S M	
<b>Sense of rotation:</b> (when looking at the shaft, from the front) <b>Clockwise</b> <i>Counterclockwise</i>								<b>CW</b> <i>CCW</i>	
<b>Rotation angle* in [°]:</b> <b>360</b> (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>								<b>360</b> <i>320</i> <i>270</i> <i>180</i> <i>90</i> <i>XXX</i>	
<b>Operational Torque:</b> <b>Standard torque</b> <i>Improved/medium torque</i>									- <i>MT</i>
<b>Shaft sealing:</b> None <i>With shaft sealing</i>									- <i>D</i>
<b>Electrical connection, cable length:</b> <b>Solder holes</b> <b>Clamping terminals</b> <b>Flat ribbon cable, standard length 0.15 m</b> <i>Flat ribbon cable with custom length [x,xx m]</i> <b>Round cable, standard length 1 m</b> <i>Round cable with custom length [x,xx m]</i>									<b>L</b> <b>K</b> <b>F0,15</b> <i>FX,XX</i> <b>R1,00</b> <i>RX,XX</i>
<b>Anti-rotation pin, zero point definition**:</b> <i>Pin A (not available with mechanical stop)</i> <b>Pin B</b> <i>None (pins removed) (no zero point definition possible)</i>									<b>A</b> <b>B</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 31.

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

**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.)	7° ≤ α ≤ 360° (programmable ex works), ±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

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

Order Code ETA25X – redundant, singleturn, analogue output									
Description	Selection: standard= <b>black/bold</b> , possible options= <i>grey/italic</i>								
<b>Series</b>	<b>ETA25X</b>								
<b>Shaft diameter, shaft length:</b> <b>Shaft diameter Ø 6 mm, shaft length 22 mm</b> <i>Shaft diameter Ø 6.35 mm, shaft length 22 mm</i> <i>Custom shaft dimensions [mm] Ø ≤6.35 mm</i>		<b>6x22</b> <i>6,35x22</i> <i>XxXX</i>							
<b>Supply voltage / output signal:</b> <b>VSUP=5 V (4.5 to 5.5 V) / OUT=0 to 5 V (ratiometric)</b> <b>VSUP=24 V (15 to 30 V) / OUT=0 to 10 V</b>			<b>0505</b> <b>2410</b>						
<b>Mechanical stop/centre detent:</b> <b>None</b> <i>Mechanical stop (90, 180, 270 or 320°)</i> <i>Stop and centre detent (at 0°)</i>								- S M	
<b>Sense of rotation:</b> (when looking at the shaft, from the front) <b>Clockwise/Clockwise (ganging)</b> <i>Clockwise/Counterclockwise (counter rotational)</i>								<b>CW CW</b> <i>CW CCW</i>	
<b>Rotation angle* in [°]:</b> <b>360</b> (not available with mechanical stop) 320 270 180 90 <i>Custom rotation angle (≥7°, positive integer, not available with mechanical stop)</i>									360 320 270 180 90 XXX
<b>Operational Torque:</b> <b>Standard torque</b> <i>Improved/medium torque</i>									- MT
<b>Shaft sealing:</b> <b>None</b> <i>With shaft sealing</i>									- D
<b>Electrical connection, cable length:</b> <b>Flat ribbon cable, standard length 0.15 m</b> <i>Flat ribbon cable with custom length [x,xx m]</i> <b>Round cable, standard length 1 m</b> <i>Round cable with custom length [x,xx m]</i>									<b>F0,15</b> <i>FX,XX</i> <b>R1,00</b> <i>RX,XX</i>
<b>Anti-rotation pin, zero point definition**:</b> <i>Pin A (not available with mechanical stop)</i> <b>Pin B</b> <i>None (pins removed) (no zero point definition possible)</i>									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 31.

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

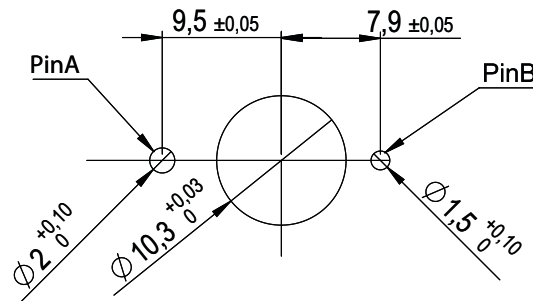
**Order example ETA25X – redundant, singleturn, analogue output**

**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

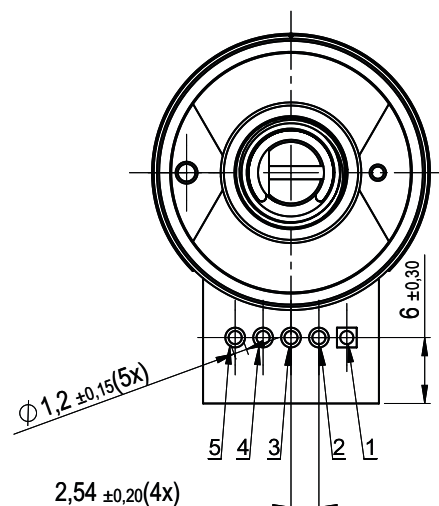
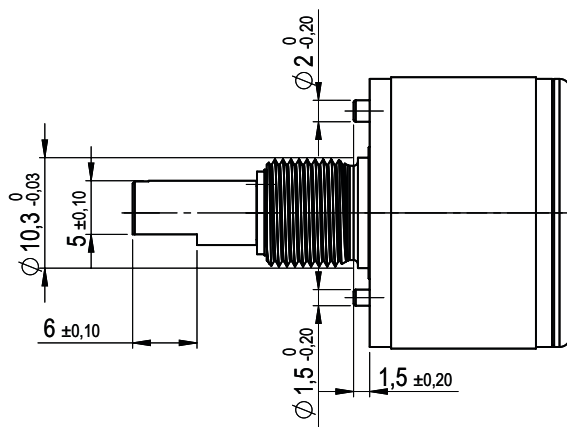
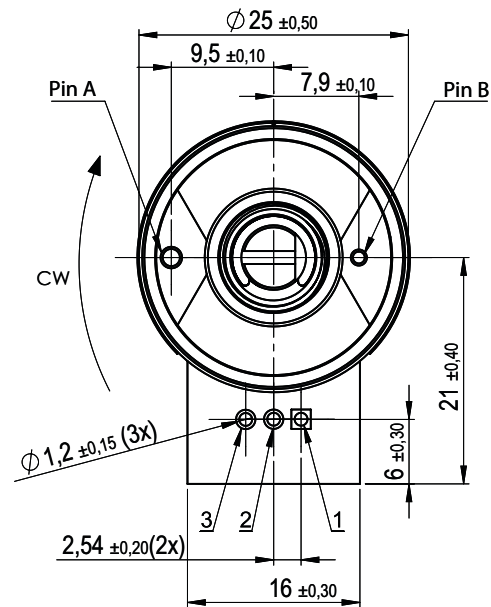
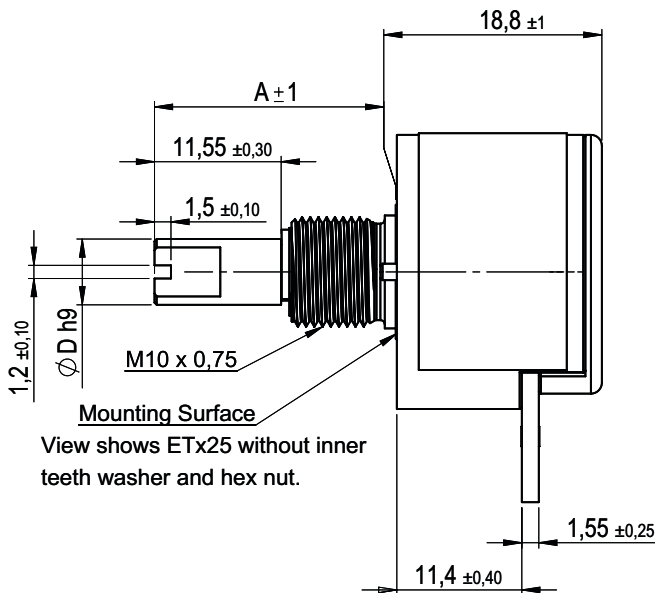
Pattern of Drilling



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



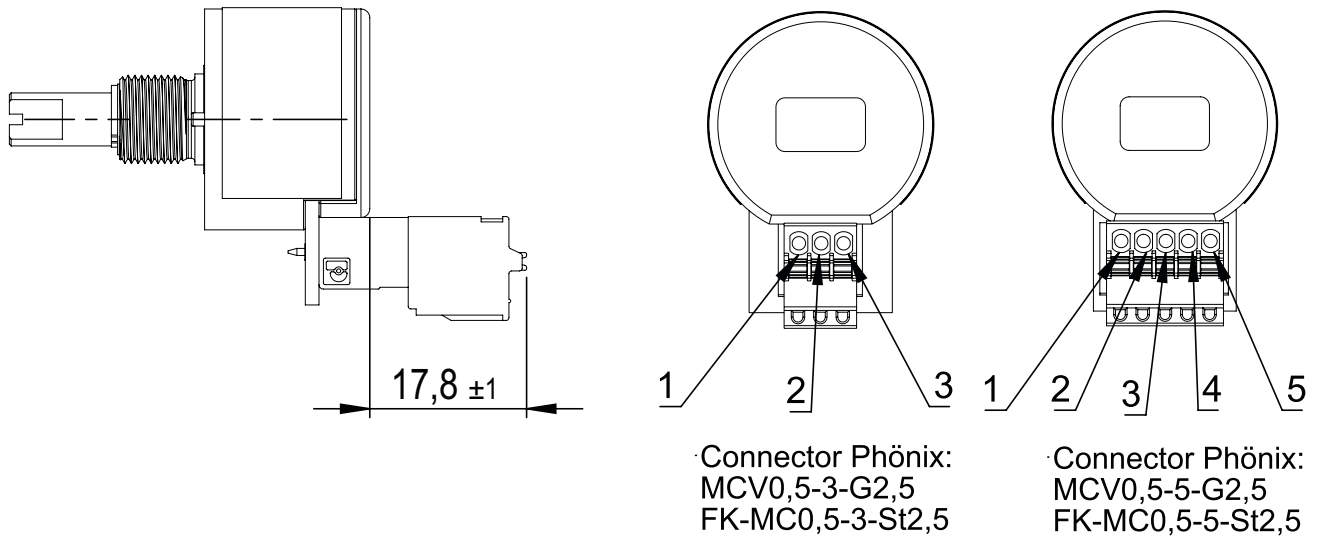
All dimensions in mm

Standard shaft dimensions / tolerances

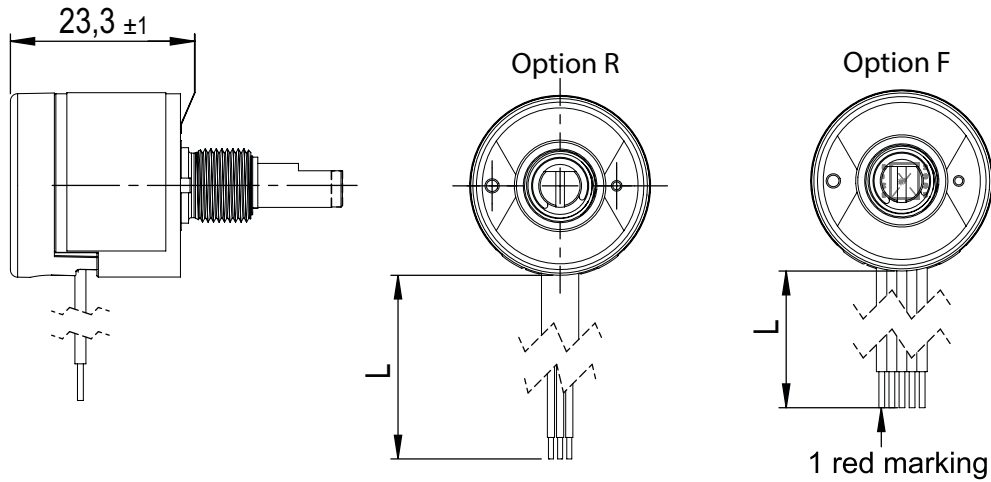
Shaft length A	22 +/- 1 mm
Shaft diameter D	6 h9 mm, 6.35 h9 mm
Shaft flattening (D-flat)	6 +/- 0.1 mm

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: <ul style="list-style-type: none"> <li>▪ IP40 standard</li> <li>▪ IP55M (IP66S) with shaft sealing (option D)</li> </ul>
Protection grade (IEC 60529) rear side	<ul style="list-style-type: none"> <li>▪ IP50 Solder holes / clamping terminals (solder holes / connector excluded)</li> <li>▪ IP66 flat ribbon and round signal cable (cable ends excluded)</li> <li>▪ IP00 option TS (teach-in multiturn)</li> </ul>
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)	<ul style="list-style-type: none"> <li>▪ ca. 26 g (option L: solder lugs)</li> <li>▪ ca. 60 g (option R: cable, valid for 1 m only)</li> <li>▪ ca. 32 g (option F: flat ribbon cable, valid for 15 cm only)</li> <li>▪ ca. 27 g (option K: clamping terminals)</li> <li>▪ ca. 31 g (option TS: teach-In multiturn)</li> </ul>
Connection type	<ul style="list-style-type: none"> <li>▪ Solder lugs (option L)</li> <li>▪ Ribbon cable (option F)</li> <li>▪ Cable (option R)</li> <li>▪ Connector (option K)</li> </ul>
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



**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

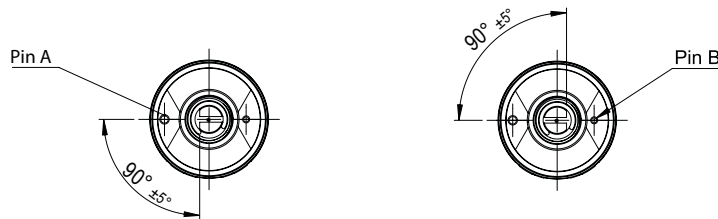
**Definition of the zero position / anti-rotation pin**

**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:**

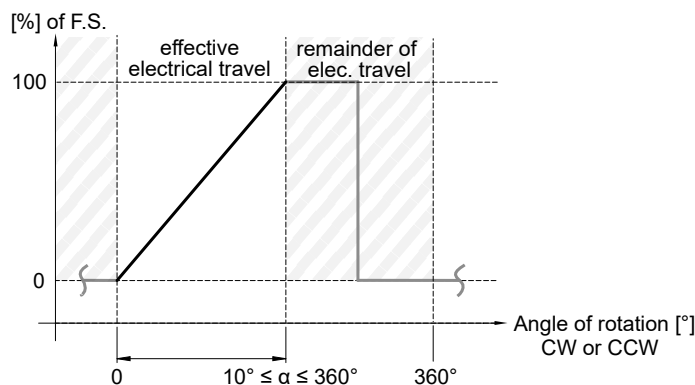
Option anti-rotation pin A	Zero position when shaft flattening faces anti-rotation pin A
Option anti-rotation pin B	Zero position when shaft flattening faces anti-rotation pin B



**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° (±5°). Other angles are not available. Due to the mechanical tolerances (±5°), 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 (±5°)	Effective electrical angle of rotation (±0.5°)
320°	310°
270°	260°
180°	170°
90°	80°

