MEGATRON

## Hall effect encoders with bushing mount

ETx25
(round) control
cable

ETx25
flat ribbon cable

ETx25
clamping terminals

ETx25
solder holes

Key features

- Ø25 mm housing made of glass fibre reinforced thermoplastic
- Magnetic, gradient-based signal evaluation
- Digital signal processing
- Metal sleeve bearing > 100 million shaft revolutions
- Ø6 mm stainless steel shaft
- Sealing up to IP55M (IP66S with special sealing option)
- Operating temperature range -40..85°C
- Measurement range up to 360° singleturn, 72000° multiturn
- Electrical connection: 0.15 m flat ribbon cable, 1 m round cable, solder holes or clamping terminals
- Ex works programmable signal output functions (single turn), field-programmable signal output for multiturn version
- Mechanical stop and higher torque available for panel encoder applications

Applications

- Mechanical engineering
- Equipment manufacturing
- Speed measurement with low operational speeds (up to 100 rpm)
- Driverless transport systems
- Medical equipment
- Special vehicles
- High requirements on the lifetime
- Requirements of a user defined signal output function
- As panel encoder for manual input

Output variants	
Singleturn absolute encoders	▪ Analogue voltage or current loop output (12 bit resolution) ▪ Analogue PWM output (12 bit resolution) ▪ Digital output SPI (14 bit, also redundant) ▪ Absolute linearity up to 0.6%
Field-Programmable single or multiturn absolute encoder	▪ Analogue voltage or current loop output (12 bit resolution) ▪ Not True-Power-On, max. 200 revolutions (72000°)
Incremental encoders	▪ 1 to 1024 pulses per revolution (ppr.), selectable 1..128 or 256, 512, 1024 ▪ Outputs TTL, Push-Pull, Open Collector

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ETx25 encoders – compact and versatile

The encoders of the ETx25 series are specially designed where a high durability and an optimum adaptability of the sensors is important. The contactless encoders in the Ø25 mm glass fibre reinforced thermoplastic can be precisely matched to the respective area of application thanks to their numerous electronic and mechanical options. Whether as incremental or absolute value encoders, they cover a wide range of applications and, depending on the output electronics, are used in systems, laboratory devices and medical devices, for example.

ETx25 rotary encoders are among the most versatile encoders on the market. The encoders feature a high-grade sleeve bearing that is characterized by its high durability with over 100 million shaft revolutions. The signal processing is digital and based on magnetic recording of measured values. The gradient-based evaluation ensures high interference immunity, e.g. B. against temperature fluctuations and EMC influences. This technology leaves the disadvantages of conventional Hall sensors far behind. ETx25 rotary encoders are designed for maximum service life. The number of defects or failures in rotary encoders with this technological design is very low, even after decades of use.

In addition to a large number of standard options, the modular system of the ETx25 encoders enables optimal adaptation to the respective requirements of the application. In addition, the concept also allows timely customer-specific adjustments (even in small series) on the basis of a clearly structured price model. Typical modifications are, for example, customer-specific shaft geometries, signal output functions, special cable lengths or individually assembled electrical connection cables.

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Series overview
>>*Please refer to the following sections for details*

		Singleturn					Teach-In Multi/Singleturn
Series		ETI25	ETS25	ETS25X	ETA25	ETA25X	ETP25	ETA25PM
Electronics redundant		NO	NO	YES	NO	YES	NO	NO
Output signal(s)		Incremental A, B, Z	Digital absolute **SPI:** 14 bit	Digital absolute **SPI:** 14 bit	Analogue absolute 0 to 5 V 0 to 10 V 4 to 20 mA	Analogue absolute 0 to 5 V 0 to 10 V	PWM absolute 5 V / 244 Hz / PWM 10-90 %	Analogue absolute 0 to 5 V 0 to 10 V 4 to 20 mA
Effective electrical angle of rotation		360°	360°	360°	7° ≤ α ≤ 360° (programmable in factory)	7° ≤ α ≤ 360° (programmable in factory)	7° ≤ α ≤ 360° (programmable in factory)	0-10° to 0-72000° (programmable by user) factory programming 0 to 3600°
Resolution		-	**SPI:** 14 bit	**SPI:** 14 bit	12 bit	12 bit	12 bit	12 bit

Supply voltage(s)	**Output type**	Push-Pull, open collector	SPI	SPI	**Analogue 0 to 5 V**	**Analogue 0 to 5 V**	**PWM**	**Analogue 0 to 5 V**
	Supply voltage	24 V (10 to 30 V)	5 V ± 10%	5 V ± 10%	5 V ± 10% (ratiometric) or 24 V (9 to 30 V)	5 V ± 10%	5 V ± 10%	24 V (9 to 30 V)
	Output type	TTL			**Analogue 0 to 10 V**	**Analogue 0 to 10 V**		**Analogue 0 to 10 V**
	Supply voltage	5 V ± 10%			24 V (15 to 30 V)	24 V (15 to 30 V)		24 V (15 to 30 V)
	Output type				**Current loop 4 to 20 mA**			**Current loop 4 to 20 mA**
	Supply voltage				24 V (9 to 30 V)			24 V (11 to 30 V)

	Programming options						
Programmable by customer	NO	NO	NO	NO	NO	NO	YES
Programmable ex works	YES	YES	YES	YES	YES	YES	YES

	Electrical connection options						
Clamping terminals	YES	**SPI:** YES	NO	YES	NO	YES	YES
Solder holes	YES	**SPI:** YES	NO	YES	NO	YES	NO
Round cable	YES						
Flat ribbon cable	YES						

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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.)	7° ≤ 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

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Absolute Encoders with Redundant Voltage Output

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.)	$7° \leq \alpha \leq 360°$ (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

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

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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 (counter rotational)*					**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

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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° ≤ α ≤ 360° (programmable in factory), ±0.5°
Independent linearity (best straight line) 1.)	±0.4% @ 360°
Absolute Linearity 1.)	±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 ±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 µControllers 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 28.

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Order Code ETP25 – singleturn, PWM output, not redundant

Description		Selection: standard=**black/bold**, possible options=*grey/italic*							
Series	**ETP25**								
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...5.5 V) / OUT=5 V / 244 Hz / PWM 10-90%**			**5PWM**						
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** **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** **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.

Order example ETP25 – singleturn, PWM output, not redundant

Requirement:
Shaft Ø 6.00 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

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Series ETS25 – singleturn, digital output, not redundant

Key features ETS25:
- Supply voltage 5 VDC +/-10%
- High-speed efficient signal transmission
  (only possible via short signal cables limited by clock rate)

Electrical data ETS25 – singleturn, digital output, not redundant

Output signal	SPI
Effective electrical angle of rotation 1.)	360°
Independent linearity (best straight line) 1.)	±0,3% @ 360°
Absolute linearity 1.)	±0,6% @ 360°
Resolution	14 Bit
Update rate (cable length 15 cm max.)	200 µs
Supply voltage	5 VDC ±10%
Power consumption (no load)	≤ 12 mA
Insulation voltage 1.)	1000 VAC @ 50 Hz, 1 min
Insulation resistance 1.)	2 MOhm @ 500 VDC, 1 min
MTTF (EN29500-2005-1)	2046a

1.) According IEC 60393

Cable/colour assignment – option 05SPI, not redundant

Function:	Option R (round signal cable)	Option F (flatribbon cable)
VSUP	red	Lead 1
GND	black	Lead 2
CS, MOSI	yellow	Lead 3
CLK	green	Lead 4
DATA	orange	Lead 5
-	brown n/c	

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Order Code ETS25 – singleturn, digital output, not redundant

Description	Selection: standard=**black/bold**, possible options=*grey/italic*						
Series	**ETS25**						
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 ≤6.35 mm*		**6x22** *6,35x22* *XxXX*					
Supply voltage / output signal: **5 VDC ± 10% / SPI (14 Bit)**			**05SPI**				
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** *Flat ribbon cable with custom length [x,xx m]* *Round cable with custom length [x,xx m]* *(max. 1 m for SPI, recommended < 15 cm)*						**F0,15** *FX,XX* *RX,XX*	
Anti-rotation pin, zero point definition: **Pin A** *Pin B* *None (pins removed)* *(no zero point definition possible)*							**A** *B* *-*

Order example ETS25 – singleturn, digital output, not redundant

Requirement:
Shaft Ø 6.00 mm, shaft length 22 mm, 14 Bit/5 VDC/SPI, no shaft sealing, flat ribbon cable 0.15 m, anti-rotation pin B

Example for order code:
ETS25 6x22 05SPI F0,15B

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Protocol description ETS25 – Serial Peripheral Interface (SPI)

Introduction
The encoder is configured as a Slave node. The serial protocol of the is a three wires protocol (/SS, SCLK, MOSI-MISO):

- /SS output is a 5 V tolerant digital input
- SCLK output is a 5 V tolerant digital input
- MOSI-MISO output is a 5 V tolerant open drain digital input/output

Basic knowledge of the standard SPI specification is required for the good understanding of the present section.

Even clock changes are used to sample the data. The positive going edge shifts a bit to the Slave's output stage and the negative going edge samples the bit at the Master's input stage.

MOSI (Master Out Slave In)
The Master sends a command to the Slave to get the angle information.

MISO (Master In Slave Out)
The MISO of the slave is an open-collector stage. Due to the capacitive load, a >1 kΩ pull-up is used for the recessive high level (in fast mode). Note that MOSI and MISO use the same physical wire of the ETS25.

/SS (Slave Select)
The /SS output enables a frame transfer. It allows a re-synchronization between Slave and Master in case of a communication error.

Master Start-Up
/SS, SCLK, MISO can be undefined during the Master start-up as long as the Slave is re-synchronized before the first frame transfer.

Slave Start-Up
The slave start-up (after power-up or an internal failure) takes 16 ms. Within this time /SS and SCLK is ignored by the Slave. The first frame can therefore be sent after 16 ms. MISO is Hi-Z (i.e. Hi-Impedance) until the Slave is selected by its /SS input. The encoder will cope with any signal from the Master while starting up.

Timing
To synchronize communication, the Master deactivates /SS high for at least t5 (1.5 ms). In this case, the Slave will be ready to receive a new frame. The Master can re-synchronize at any time, even in the middle of a byte transfer. Note: Any time shorter than t5 leads to an undefined frame state, because the Slave may or may not have seen /SS inactive.

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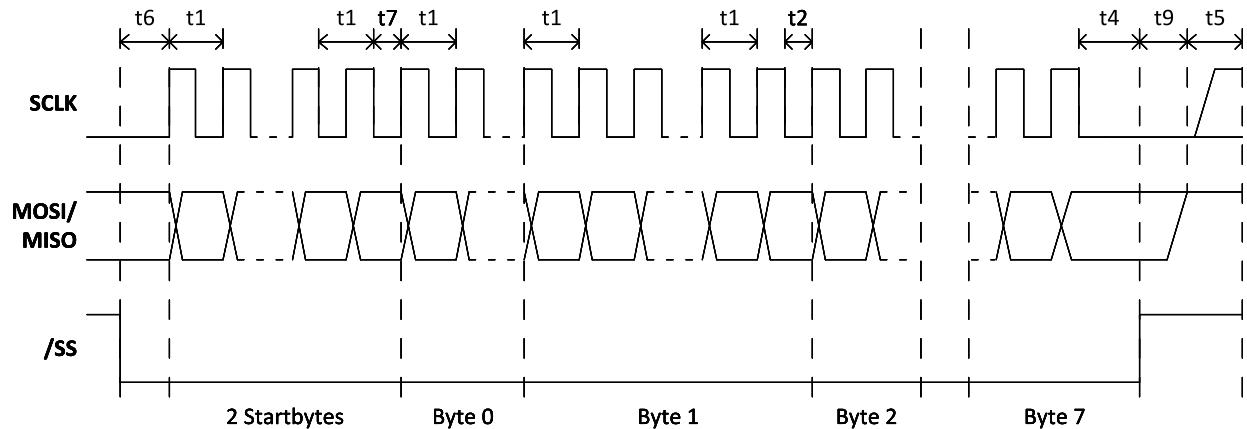
Protocol description ETS25 – Serial Peripheral Interface (SPI) (continuation)

Description Timings

Timings	Min	Max	Remarks
t1	2.3 µs / 6.9 µs	-	No capacitive load on MISO. t1 is the minimum clock period for any bits within a byte.
t2	12.5 µs / 37.5 µs	-	t2 the minimum time between any other byte
t4	2.3 µs / 6.9 µs	-	Time between last clock and /SS=high=chip de-selection
t5	300 µs / 1500 µs	-	Minimum /SS = Hi time where it's guaranteed that a frame re-synchronizations will be started
t5	0 µs	-	Maximum /SS = Hi time where it's guaranteed that NO frame re-synchronizations will be started.
t6	2.3 µs / 6.9 µs	-	The time t6 defines the minimum time between /SS = Loand the first clock edge
t7	15 µs / 45 µs	-	t7 is the minimum time between the StartByte and the Byte0
t9	-	< 1 µs	Maximum time between /SS = Hi and MISO Bus HighImpedance
$T_{Startup}$	-	< 10 ms / 16 ms	Minimum time between reset-inactive and any master signal change

Slave Reset

On internal soft failures the Slave resets after 1 second or after an (error) frame is sent. On internal hard failures the Slave resets itself. In that case, the Serial Protocol will not come up. The serial protocol link is enabled only after the completion of the first synchronization (the Master deactivates /SS for at least t5).

Frame Layer

Command Device Mechanism

Before each transmission of a data frame, the Master should send a byte AAh to enable a frame transfer.
The latch point for the angle measurement is at the last clock before the first data frame byte.
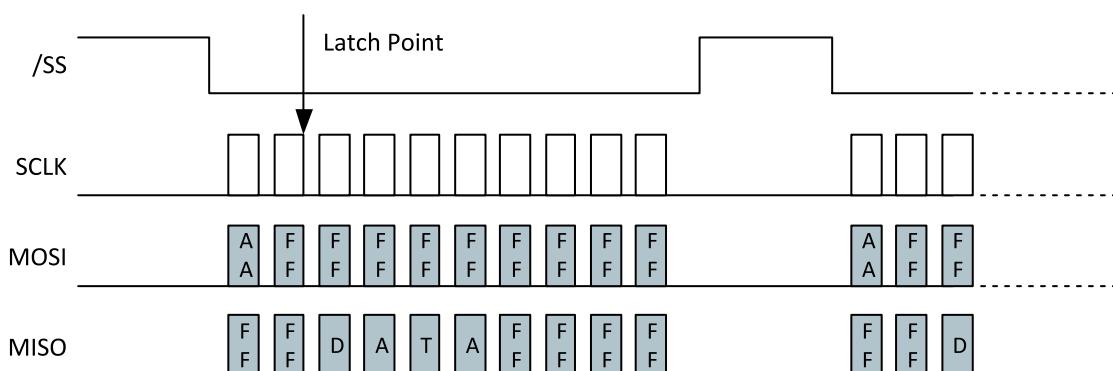
Data Frame Structure

A data frame consists of 10 bytes:

- 2 start bytes (AAh followed by FFh)
- 2 data bytes (DATA16 – most significant byte first)
- 2 inverted data bytes (/DATA16 - most significant byte first)
- 4 all-Hi bytes

The Master should send AAh (55h in case of inverting transistor) followed by 9 bytes FFh. The Slave will answer with two bytes FFh followed by 4 data bytes and 4 bytes FFh.

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Protocol description ETS25 – Serial Peripheral Interface (SPI) (Fortsetzung)

Timing
There are no timing limits for frames: a frame transmission could be initiated at any time. There is no interframe time defined.

Data Structure
The DATA16 could be a valid angle or an error condition. The two meanings are distinguished by the LSB.

DATA16: Angle A[13:0] with (Angle Span)/2^{14}

Most Significant Byte								Least Significant Byte							
MSB							LSB	MSB							LSB
A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	0	1

DATA16: Error

Most Significant Byte								Least Significant Byte							
MSB							LSB	MSB							LSB
E15	E14	E13	E12	E11	E10	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0

DATA16: Error

BIT	Name	Description
E0	0	
E1	1	
E2	F_ADCMONITOR	ADC Failure
E3	F_ADCSATURA	ADC Saturation (Electrical failure or field too strong)
E4	F_RGTOOLOW	Analog Gain Below Trimmed Threshold (Likely reason: field too weak)
E5	F_MAGTOOLOW	Magnetic Field Too Weak
E6	F_MAGTOOHIGH	Magnetic Field Too Strong
E7	F_RGTOOHIGH	Analog Gain Above Trimmed Threshold (Likely reason: field too strong)
E8	F_FGCLAMP	Never occurring in serial protocol
E9	F_ROCLAMP	Analog Chain Rough Offset Compensation: Clipping
E10	F_MT7V	Device Supply VDD Greater than 7V
E11	-	
E12	-	
E13	-	
E14	F_DACMONITOR	Never occurring in serial protocol
E15	-	

Angle Calculation
All communication timing is independent (asynchronous) of the angle data processing. The angle is calculated continuously by the Slave every 350 µs at most. The last angle calculated is hold to be read by the Master at any time. Only valid angles are transferred by the Slave, because any internal failure of the Slave will lead to a soft reset.

Error Handling
In case of any errors listed above, the Serial protocol will be initialized and the error condition can be read by the master. The slave will perform a soft reset once the error frame is sent. In case of any other errors (ROM CRC error, EEPROM CRC error, RAM check error, intelligent watchdog error…) the Slave's serial protocol is not initialized. The MOSI/MISO output will stay Hi-impedant (no error frames are sent).

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Series ETS25X – singleturn, SPI output, redundant

Key features ETS25X:
- Independent signal processing. The ETS25X rotary encoder electronics are based on one Hall IC in which two semiconductor elements independently capture, evaluate and output measured values
- Supply voltage, signal output and ground are galvanically insulated => separate electrical connections
- Supply voltage: 2 x 5 VDC ±10%
- Signal output: 2 x SPI
- Maximum allowed signal cable length (each) 0.6 m

Electrical data ETS25X – singleturn, SPI output, redundant

Effective electrical angle of rotation 1.)	360°
Sense of rotation (when looking at the shaft, from the front)	Clockwise/clockwise (ganging)
Independent linearity (best straight line) 1.)	±0.4% @ 360°
Absolute linearity 1.)	±0.8% @ 360°
Output signal	SPI
Resolution	14 Bit
Update rate	200 µs
Supply voltage	5 VDC ±10%
Power consumption (no load)	≤ 24 mA
Insulation voltage 1.)	1000 VAC @ 50 Hz, 1 min
Insulation resistance 1.)	2 MOhm @ 500 VDC, 1 min
MTTF (EN29500-2005-1)	2046a

1.) According IEC 60393

Cable and pin assignment ETS25X

Function:	Option F:	Explanation:
VSUP 1	Lead 1 (red)	5 pol. flat ribbon cable no. 1
GND 1	Lead 2	5 pol. flat ribbon cable no. 1
Data 1	Lead 3	5 pol. flat ribbon cable no. 1
Clock 1	Lead 4	5 pol. flat ribbon cable no. 1
Chipselect 1	Lead 5	5 pol. flat ribbon cable no. 1
VSUP 2	Lead 1 (red)	5 pol. flat ribbon cable no. 2
GND 2	Lead 2	5 pol. flat ribbon cable no. 2
Data 2	Lead 3	5 pol. flat ribbon cable no. 2
Clock 2	Lead 4	5 pol. flat ribbon cable no. 2
Chipselect 2	Lead 5	5 pol. flat ribbon cable no. 2

Further information regarding the signal outputs can be found in the data sheet of the IC manufacturer.
SPI-Interface
MLX90316EDC DUAL (redundant version)
URL: www.melexis.com

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

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Date: 12/13/2022

Order Code ETS25X – redundant, singleturn, digital output

Description	Selection: standard=**black/bold**, possible options=*grey/italic*						
Series	**ETS25X**						
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 ≤ 6.35 mm*		**6x22** *6,35x22* *XxXX*					
Supply voltage / output signal: **5 VDC ± 10% / SPI (14 Bit), redundant**			**05SPI**				
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, two arranged above each other** *Flat ribbon cable with custom length [x,xx m], two arranged above each other* *Round cable with custom length [x,xx m]* (max. 0.6 m)						**F0,15** *FX,XX* *RX,XX*	
Anti-rotation pin, zero point definition: *Pin A* **Pin B** *None (pins removed)* (no zero point definition possible)							*A* **B** -

Order example ETS25X

Specifications:
Shaft Ø 6.00 mm, shaft length 22 mm, 14 Bit/5 VDC/SPI, no shaft sealing, two 5 pol. flat ribbon cables arranged one above the other with cable length 0.15 m for each flat ribbon cable, anti-rotation pin B

Example for order code:
ETS25X 6x22 05SPI F0,15B

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Series ETI25 – singleturn, incremental output, not redundant

Key features ETI25:
- Channels: A, B and index signal Z
- TTL, Push Pull or Open Collector electronics
- Maximum number of pulses per channel 1024 pulses per revolution (4096 steps)
- Option: ex works programmable number of pulses from 1 to 128 ppr in one pulse step-width, as well as 256, 512, 1024 ppr

Electrical data ETI25 – singleturn, incremental output, not redundant

Output Signal	TTL	Push-Pull	Open Collector
Number of pulses	1 to 128 ppr, 256, 512, 1024 ppr		1 to 128 ppr, 256 ppr.
Limit frequency	100 kHz		10 kHz
Switch-on delay	20 ms		
Supply voltage	3.3 or 5 VDC ±10%	10 to 30 V	10 to 30 V
Power consumption (no load)	≤ 15 mA	≤ 50 mA	≤ 25 mA
Output load	≥ 5 kOhm		
Max. pull-up voltage	-		30 VDC
Insulation voltage 1.)	1000 VAC @ 50 Hz, 1 min		
Insulation resistance 1.)	2 MOhm @ 500 VDC, 1 min		
MTTF (EN29500-2005-1)	473a	462a	570a

1.) According to IEC 60393

Output circuit ETI25 per channel
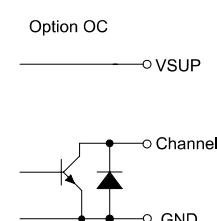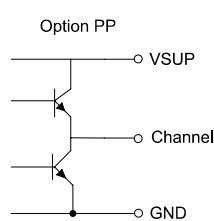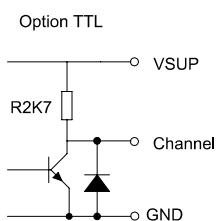
Option TTL R2K7 VSUP / Channel / GND

Option PP VSUP / Channel / GND

Option OC VSUP / Channel / GND

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

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Order Code ETI25 – singleturn, incremental output

Description	Selection: standard=**black/bold**, possible options=*grey/italic*						
Series	**ETI25**						
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*					
Number of pulses (ppr): *32* *64* *128* *256* *512* (only for TTL and push-pull) **1024** (only for TTL and push-pull) *User-defined number of pulses 1 to 128, increment 1 pulse*			*32* *64* *128* *256* *512* **1024** *0XXX*				
Supply voltage / output signal: **VSUP=24 V (10 to 30 V) / OUT=push-pull A, B, Z** **VSUP=5 V ± 10% / OUT=TTL A, B, Z** **VSUP=24 V (10 to 30 V) / OUT=open collector A, B, Z**				**24BZPP** **05BZTTL** **24BZOC**			
Operational Torque: **Standard torque** *Improved/medium torque*					**-** *MT*		
Shaft sealing: **None** *With shaft sealing*						*-* *D*	
Electrical connection, cable length: *Solder holes* (not for UVW) *Clamping terminals* (not for UVW) **Flat ribbon cable, standard length 0.15 m** (not for UVW) *Flat ribbon cable with custom length [x,xx m]* (not for UVW) **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** **Pin B** *None (pins removed)* (no zero point definition possible)							**A** **B** *-*

Order example ETI25 – singleturn, incremental output

Requirement:
Shaft Ø 6.00 mm, shaft length 22 mm, number of pulses 1024 TTL output, VSUP=5 V/TTL, no shaft sealing, flat ribbon cable 0,15 m, anti-rotation pin B

Example for order code:
ETA25 6x22 1024 05BZTTL R1,20B

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Cable and pin assignments – (option 24BZPP, 05BZTTL and 24BZOC)

Solder holes (option L) and clamping terminals (option K)		Flat ribbon cable (option F)			Round signal cable (option R)	
Pin	**PP, TLL, OC**	**Lead**	**TTL, OC**	**push-pull (PP)**	**Wire colour**	**PP, TTL, OC**
PIN 1	VSUP	Lead 1 (red)	VSUP	VSUP	red	VSUP
PIN 2	GND	Lead 2	GND	Z	black	GND
PIN 3	A	Lead 3	A	B	brown	A
PIN 4	B	Lead 4	B	A	orange	B
PIN 5	Z	Lead 5	Z	GND	yellow	Z
					green	n/c

Signal details

A, B, Z (Standard)
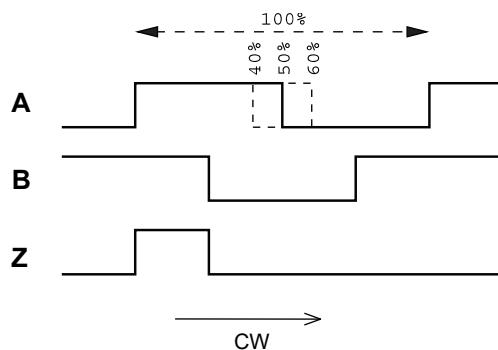
The percentage information describes the proportion of a pulse in dependency to the duration of one period

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Programmable Multi/Singleturn Encoders

Series ETA25PM – single/multiturn, programmable, analogue output, not redundant

Key features ETA25PM :

- Measuring range 10° to max. 72000° (200 shaft revolutions)
- Programmable by the user using teach-in function. Programmable are the sense of rotation (CW/ CCW) and the effective electrical angle [°]
- Programmable up to 10000 times
- Can also be used as a programmable singleturn rotary encoder
- Maximum rotation of the shaft in a voltage-free state without loss of the angle information +/-179°
- Factory programming (ex works): effective electrical angle of rotation 3600° (10 shaft revolutions), sense rotation CW
- Supply voltage: 9 to 30 VDC, 15 to 30 VDC
- Output signal: 4 to 20 mA, 0 to 5 V, 0 to 10 V

Electrical data ETA25PM – multi/singleturn, programmable, analogue output, not redundant

Effective electrical angle of rotation 1.)	0 to 10° - 0 to 72000° (max. 200 turns) Start point, endpoint and sense of rotation programmable by the customer. Ex works the angle is set to 3600°. For detecting absolute position >360° the sensor should not be turned more than ±179° without supply voltage.		
Independent linearity (best straight line) 1.)	±0.05% @ 3600°		
Absolute Linearity 1.)	±0.1% @ 3600°		
Output signal	0 to 5 V	0 to 10 V	4 to 20 mA
Resolution 1.)	12 Bit		
Update rate	3 ms		
Supply voltage	9 to 30 V	15 to 30 V	11 to 30 V
Power consumption (no load)	< 10 mA		< 14 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		
Max. number of programming cycles	10000		
MTTF (EN29500-2005-1)	224a		229a

1.) According IEC 60393

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Order Code ETA25PM – multi/singleturn, analogue output, not redundant

Description			Selection: standard=**black/bold**, possible options=*grey/italic*				
Series	**ETA25PM**						
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 ≤6.35 mm*		**6x22** *6,35x22* *XxXX*					
Supply voltage / output signal: **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** (not available for TS)			**2410** **2442** **2405**				
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]* *Clamping terminals with programming buttons*						**F0,15** *FX,XX* **R1,00** *RX,XX* *TS*	
Anti-rotation pin, zero point definition: *Pin A* **Pin B** *None (pins removed)* (no zero point definition possible)							*A* **B** *-*

Order example ETA25PM

Requirement:
Shaft Ø 6.00 mm, shaft length 22 mm, VSUP=24 V / OUT=0...5 V, sense of rotation CW, rotation angle ex works 3600° (can be programmed by customer), no shaft sealing, flat ribbon cable 1.00 m, anti-rotation pin B

Example for order code:
ETA25PM 6x22 2405 R1.00B

Cable and pin assignment			Connector assignment	
Function	**Option F**	**Option R**	**Function**	**Option TS**
DIR	Strand 1 (red)	orange	VSUP	23
END	Strand 2	grün	OUT	22
START	Strand 3	gelb	GND	21
VSUP	Strand 4	rot		
OUT	Strand 5	braun		
GND	Strand 6	schwarz		

For details on zero point definition see next page and page 28.

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Programming device PRO for programming the encoder in the field

Key features programmer:
- Programmable measuring range from 10° to max. 72000° (200 shaft revolutions)
- Programmable: sense of rotation (CW/CCW), effective electrical angle [°]
- Up to 10.000 programming cycles per rotary encoder

Order number:	Order code:
135945	Programmer Tool for ETA HTA PM

Programming of ETA25PM

The programming guide is available for download on the MEGATRON web page https://www.megatron.de/

To program the HTA36PM rotary encoder either the following circuit must be built, or the programmer must be ordered from MEGATRON.

StartPos
EndPos
DIR
GND
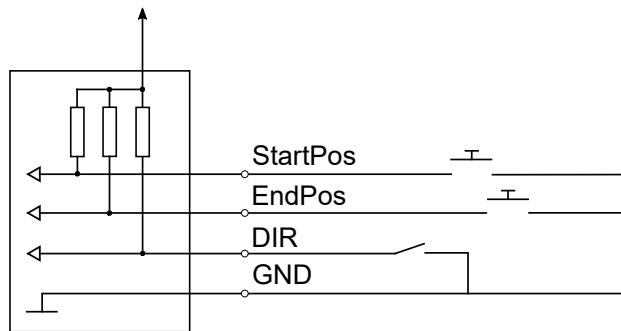
Signal output function (factory programming only). Automatic function for inserting signal plateaus

The function represents the relationship between the zero degree marking on the rotary encoder housing in dependency to the 0° position of the shaft and the resulting output signal in the state of delivery, when turning the shaft clockwise (sense of rotation CW). The effective electrical angle of rotation is 3600° ex works. Before and after the linearly rising output signal for 3600° the ETA25PM integrates automatically signal plateaus for a rotation angle of each 180° .
The following example shows the output signal pattern when actuating the shaft in the delivery state for 11 revolutions clockwise (sense of rotation CW), starting at the 0° position:
1. 10 rotations of the shaft clockwise 0° to 3600°, linearly increasing output signal 0% to 100% FS
2. 1/2 rotation of the shaft 180° (3600° to 3780°) signal plateau 100% FS
3. 1/2 rotation of the shaft 180° (3780° to 3960°) signal plateau 0% FS

The drawing shows the signal-amplitude function for 0 to 10V signal output

Plateau

Plateau
3600° - 3780°

Output Voltage [V]
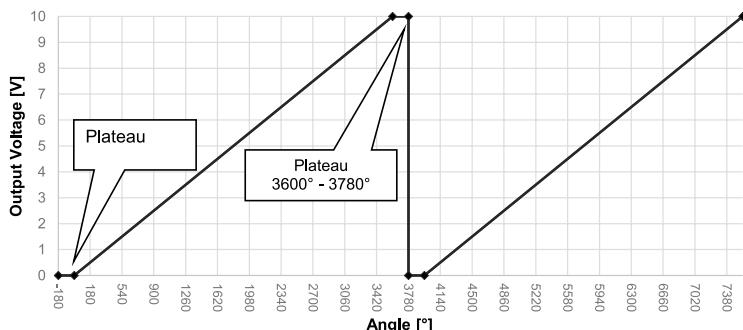
Angle [°]

Teach-In function – manual field programming

When manual programming in the field using the teach-in function, the remaining angle for the next full revolution is divided equally into high and low. There are no further signal plateaus. Please see the programming guide on our website for more details.

Drilling pattern

Pattern of Drilling

9,5 ±0,05   7,9 ±0,05

PinA   PinB

ϕ 2 $^{+0,10}_{0}$ ϕ 10,3 $^{+0,03}_{0}$ ϕ 1,5 $^{+0,10}_{0}$
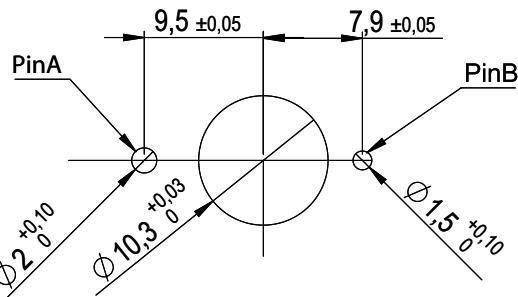
Either pin A or pin B must be chosen as anti-rotation pin. Please select by specifying the variant in the order code. The unused pin can be left out when drilling.

Drawings ETx25 – with solder holes (option L)

Option L

18,8 ±1

A ±1

11,55 ±0,30

1,5 ±0,10

1,2 ±0,10

ϕ D h9

M10 x 0,75

Mounting Surface

View shows ETx25 without inner teeth washer and hex nut.

1,55 ±0,25

11,4 ±0,40

ϕ 25 ±0,50

9,5 ±0,10

7,9 ±0,10

Pin A   Pin B

CW

21 ±0,40

6 ±0,30

ϕ 1,2 ±0,15 (3x)

3   2   1

2,54 ±0,20(2x)

16 ±0,30

ϕ 2 $^{0}_{-0,20}$

ϕ 10,3 $^{0}_{-0,03}$

5 ±0,10

6 ±0,10

ϕ 1,5 $^{0}_{-0,20}$

1,5 ±0,20

6 ±0,30

ϕ 1,2 ±0,15(5x)

5   4   3   2   1

2,54 ±0,20(4x)

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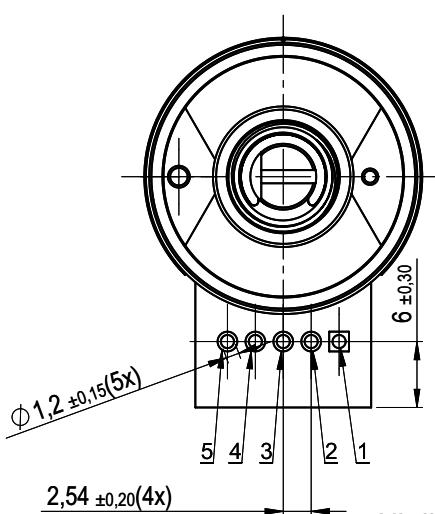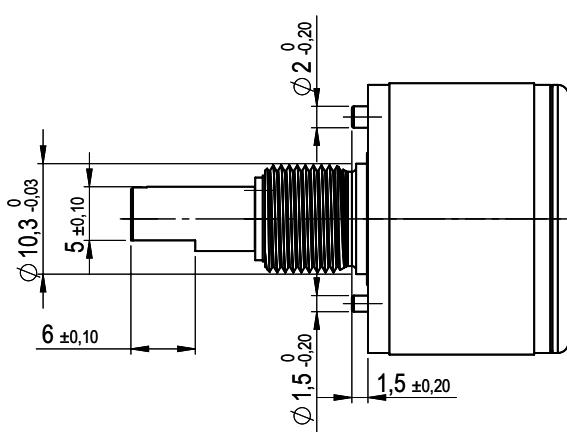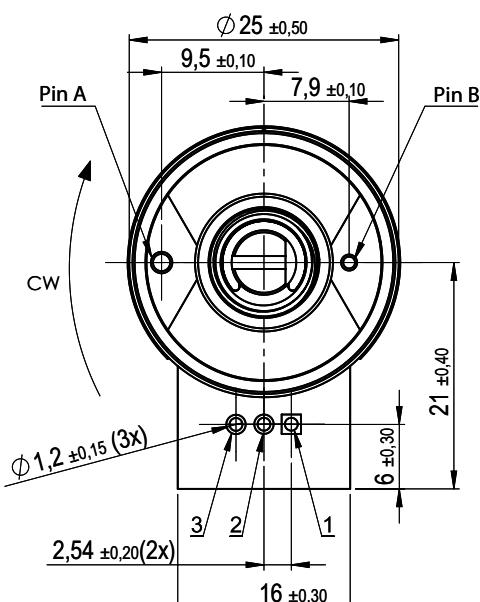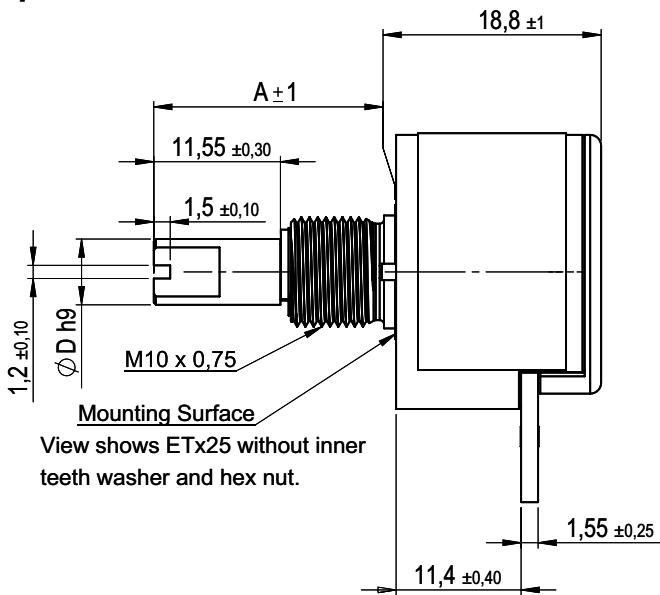
Standard shaft dimensions / tolerances	
Shaft length A	22 +/- 1 mm
Shaft diameter D	6 h9 mm, 6.35 h9 mm
Shaft flattening (D-flat)	6 +/- 0.1 mm

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

Option K (clamping terminals)

17,8 ±1

1   2   3   1   2   3   4   5
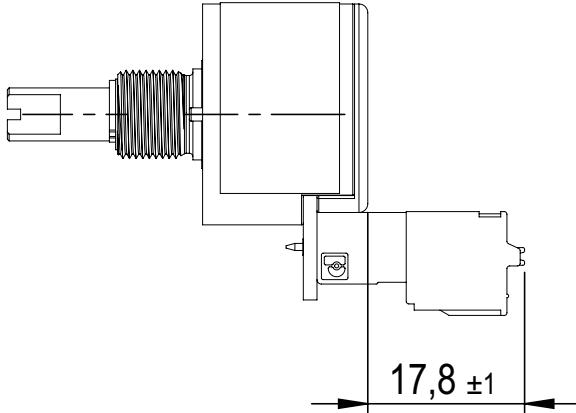
Connector Phönix:
MCV0,5-3-G2,5
FK-MC0,5-3-St2,5
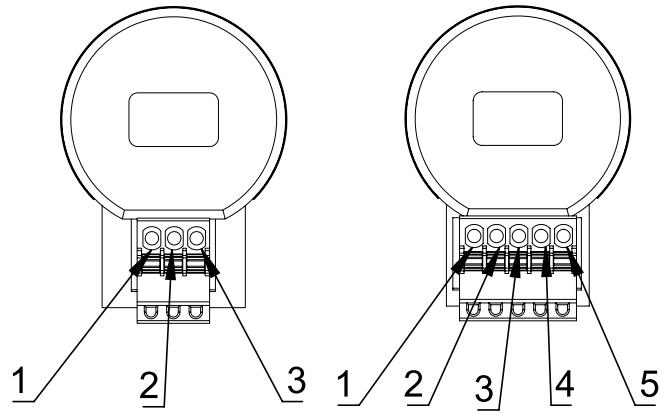
Connector Phönix:
MCV0,5-5-G2,5
FK-MC0,5-5-St2,5

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

23,3 ±1

Option R   Option F

L   L

1 red marking

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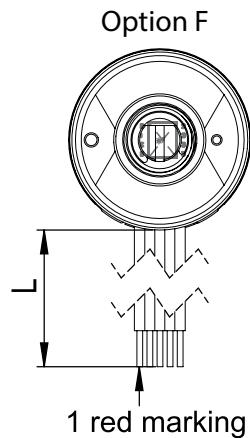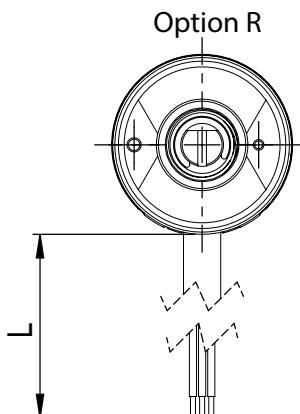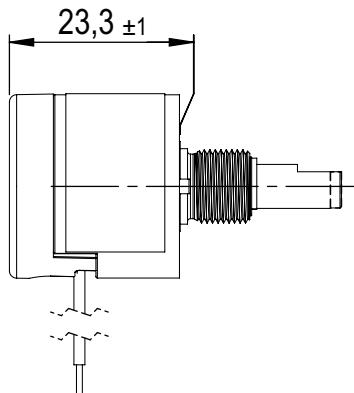
Drawings ETx25PM – teach-in feature

ETA25PM – Multiturn (option TS) with teach-in feature
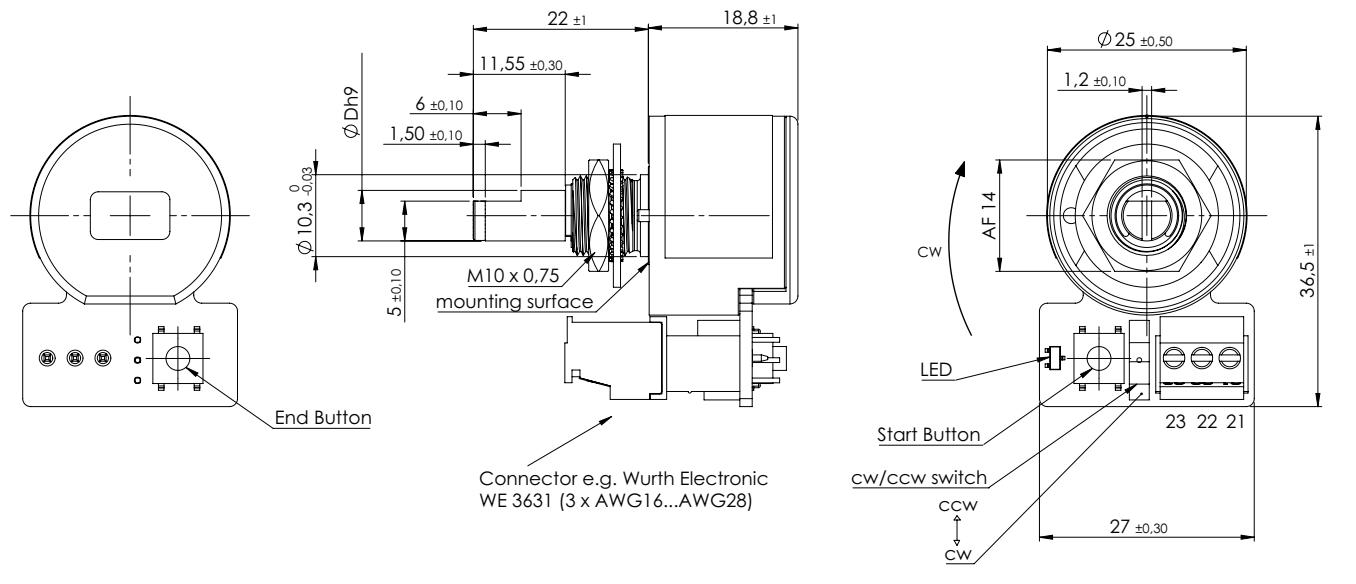
Cable specs for option F (flat ribbon cable) and R (round control cable)

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

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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 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

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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.)
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

Pin A

90° ±5°

90° ±5°

Pin B
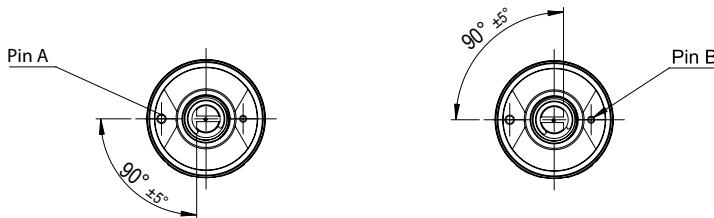
Signal definition for custom rotation angles (without mechanical stop)

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!

[%] of F.S.

effective electrical travel

remainder of elec. travel

100

0

Angle of rotation [°] CW or CCW

0   10° ≤ α ≤ 360°   360°

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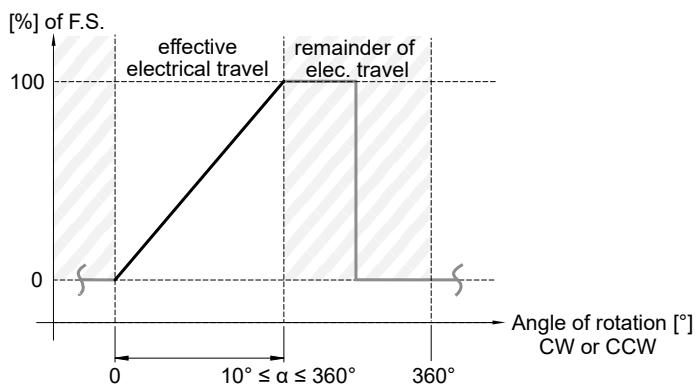
Mechanical stop and centre detent for manual encoder applications

- 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°

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Order Code – Full Overview >>*Please refer to the series sections for details and valid selection criteria*

Series

ETA25	- single turn absolute, analogue voltage or current loop output
ETA25X	- redundant, single turn absolute analogue voltage output
ETA25PM	- multi-/singleturn absolute, analogue voltage or current output
ETP25	- single turn absolute, PWM output
ETS25	- single turn absolute, serial output (SPI)
ETS25X	- redundant single turn serial output (SPI)
ETI25	- single turn incremental
ETAM25	- *single turn, panel encoder, deprecated, please use ETA25*

Effective electrical angle
(only applicable for analogue and PWM outputs)

360	- 360°
320	- 320°
270	- 270°
180	- 180°
90	- 90°
XXXX	- custom [integer]
blank	- not applicable

(Shaft diameter) x (length)

6x22	- Ø 6 mm, length 22 mm
6,35x22	- Ø 6.35 mm, length 22 mm
XxXX	- User-defined [mm] Ø ≤ 6.35 mm

Cable length
(only applicable for flat ribbon or round signal cable)

0,15	- 150 mm
1,00	- 1 m
X,XX	- custom
blank	- not applicable/no cable

Pulses per revolution
(only applicable for ETI25)

blank	- not applicable
XXX	- custom ppr value
128	- 128 ppr
256	- 256 ppr
512	- 512 ppr
1024	- 1024 ppr

Sense of rotation
(only applicable for analogue and PWM outputs)

blank	- not applicable
CW	- clockwise
CCW	- counterclockwise
CW CW	- (redundant) both CW
CW CCW	- (redundant) counterrotational

Shaft sealing

blank	- none
D	- with sealing

ETA25	6x22		0505		CW	360			F	0,15	A

Mechanical stop

blank	- none
S	- with stop
M	- stop and centre detent

Electrical connection

F	- flat ribbon cable
R	- round signal cable
L	- solder holes
K	- clamping terminals

Electronics: supply voltage / output signal

0505	- VSUP = 4.5 to 5.5 V / OUT = 0 to 5 V
2410	- VSUP = 15 to 30 V / OUT = 0 to 10 V
2442	- VSUP = 9 or 11 to 30 V / OUT = 4 to 20 mA
2405	- VSUP = 9 to 30 V / OUT = 0 to 5 V
5PWM	- VSUP = 4.5 to 5.5 V / OUT = 5 V / PWM 10-90%
24BZPP	- VSUP = 10 to 30 V / OUT = Push-Pull A, B, Z
24BZOC	- VSUP = 10 to 30 V / OUT = Open Collector A, B, Z
05BZTTL	- VSUP = 5 V ± 10% / OUT = TTL A, B, Z
05SPI	- VSUP = 5 V ± 10% / OUT = SPI 14 bit
05SER	- *(deprecated) VSUP = 5 V ± 10% / OUT = SER 12 bit*

Operational torque

blank	- standard (low)
MT	- medium torque

Anti-rotation pin

blank	- none / pins removed
A	- anti-rotation pin A
B	- anti-rotation pin B

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Shaft couplings for encoders with solid shaft

- Connect two shafts, even with different diameters
- Absorb larger angular and radial deviations
- Have a low inertia
- Do not cause a change in the transmission speed
- Damp torsional vibrations
- Serves as mechanical protection against oversized pairs of forces
- Made of plastic (also with metal hubs) act electrically and heat insulating

Counter ICs for incremental encoders

- LS7083 in DIP or SOIC form factor, generates from incremental-signals quadrature-signals
- LS7166 24-Bit counter IC

LS7083/4N-S

LS7166

LS7083/4N

Programmer for multiturn encoder ETA25PM

- For programming of the sense of rotation (CCW/CW)
- For programming of the effective electrical angle of rotation [°]

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