




## Programming Manual for ETA25PM and MABxxAPM series

Series	ETA25PM	ETA25PM	ETA25PM
Design			
Option	F	R	K



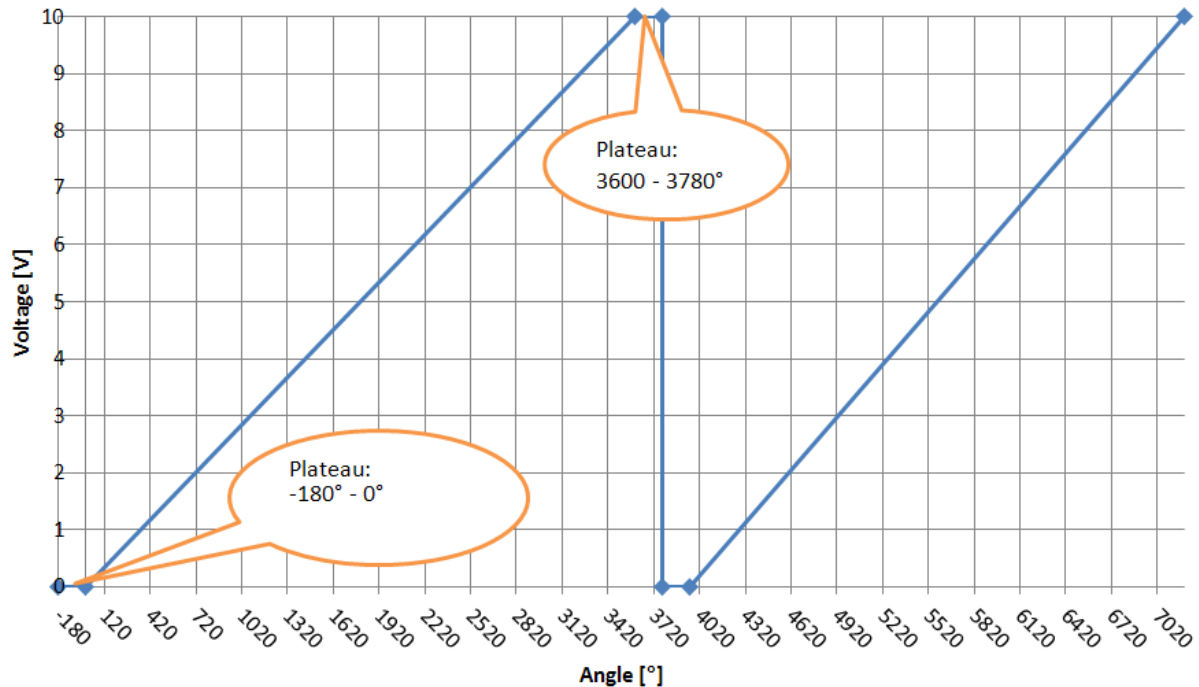
Series	ETA25PM	MABxxAPM
Design		
Option	Special Version (On request, only with MOQ orderable)	Multiturn rotary encoder Ininiturn series

Table 1: Overview sensor families

## 1. State of delivery



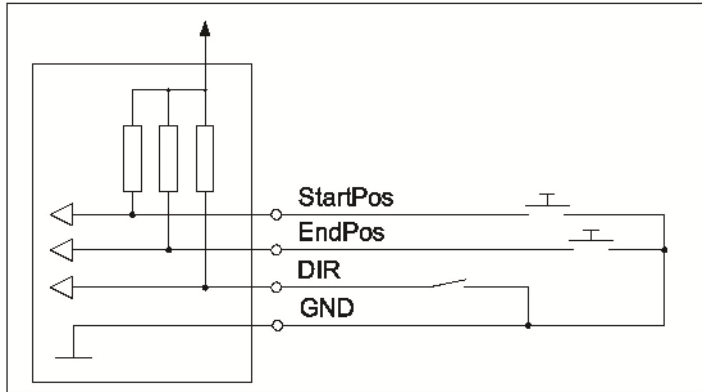
## 2. Picture 1: Signal output multi-turn encoder state of delivery

At the state of delivery there is an electrical angle of 10 turns adjusted (3600°).

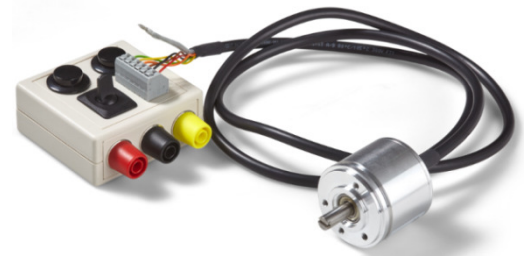
The signal is increasing if you turn the shaft clockwise while you view on the shaft end.

Before the starting point and after the end of the signal transition there is a plateau of a half turn each side (180°). That means the signal has a periodicity of 11 turns.

## 2.2 Function of the Control Inputs StartPos, EndPos and turning Direction DIR (CW, CCW)



Picture 2: Interface to adjust the encoder signal (internal Pull-Up: 470 Ohm against 3.3V)



Picture 3: Optional external programmer orderable from Megatron

In order to parameterize a programmable multiturn angle sensor, a circuit must be made as shown in picture 2, consisting of two push buttons and one switch. Alternatively, an external programmer (picture 3, smart box) can be ordered from Megatron, which has already integrated the circuit as shown in picture 2.

**This manual is applicable to both, for a self-built circuit (as shown in picture 2) or an external programmer (picture 3, smart-box).**

Further information regarding the external programmer can be found on the last page (page 9) of this manual.

The control inputs StartPos, EndPos and DIR can be switched by manual contacts or you can connect it with a control unit (PLC). Please take care to connect the ground potential of the encoder properly with the control unit. The signal inputs should be driven by relais contacts or open-collector outputs. If you put 24V at the signal inputs you would not harm the sensor because it is protected. But you should avoid this because it could interfere your output signal in the measurement mode.

That means after you have adjusted the sensor (details see below) there should NOT be a 24V voltage source at the control inputs.

The input line DIR to define the direction of rotation is read in the adjusting mode and in the reset mode (but not in the reference mode).

If you need a CCW sense of rotation you should connect the input DIR with ground.

For CW sense of rotation you can leave the input not connected.



### **Please take care**

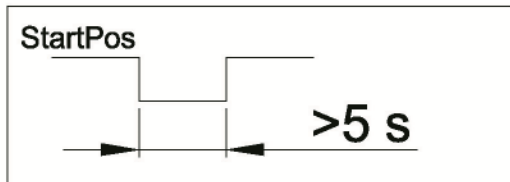
If you program start and stop, the turning sense has to be conform with the DIR input signal. That means in case of DIR signal input "High" (or not connected) you should turn the shaft clockwise to adjust the end position afterwards. If you need a counter clockwise signal output you have to tie the DIR input down to ground. If you do not stick to this rule your sensor does not function correctly.

Please note that the start and end position is stored in a flash memory. Because of this you should not do more than 10 000 adjusting cycles.

### 3. Adjusting Modes

#### 3.1 Teach-In Mode

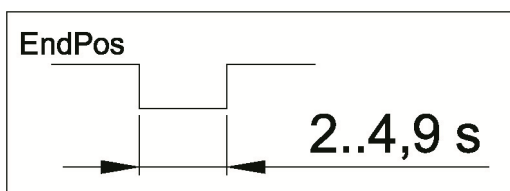
With the angle adjust mode you can define (teach in) the start- and end position and the turning sense in accordance with the sensor shaft movement.



Picture 4: Start of the angle adjust mode

To activate the angle adjust mode please switch the input line StartPos according to the above picture. At the same time you set the start position. That means the beginning of the signal transition is adjusted at the current shaft position. Afterwards the sensor should be moved to the end position. Please take care to do this in accordance with the signal input DIR. At the beginning of the movement away from the start position (0V or 4mA) the sensor does not know the correct slope. Because of this the output signal slope is based on the maximum number of turns 10V/200 rev. (16mA/200 rev.)

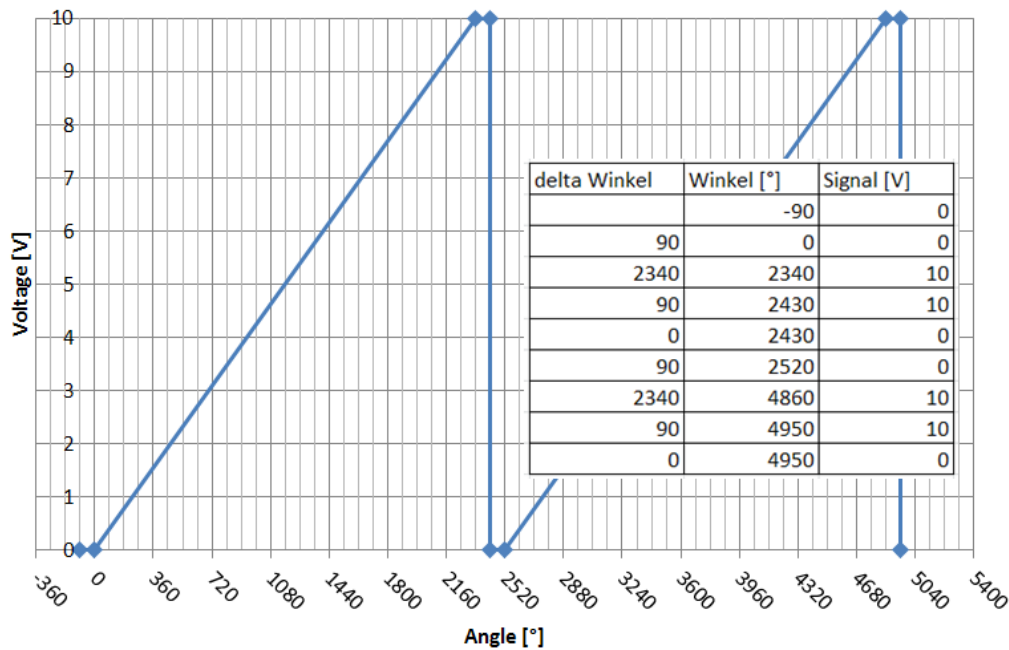
When you set the end position the maximum signal level is set at the current shaft position (10V respectively 20mA).



Picture 5: Setting of the end position and closing the angle adjustment mode.

Afterwards the internal micro controller calculates the signal characteristic line. For this purpose the distance to the next full turn is rounded up and the difference angle is divided into two equal parts that are set as plateaus beyond the StartPos and the EndPos.

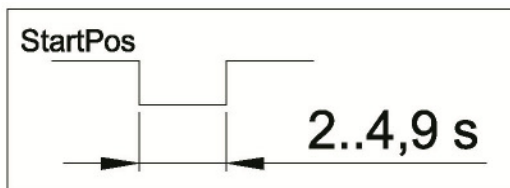
Example how the signal characteristic and the plateaus are calculated



Picture 5: Example how to adjust StartPos, sense of rotation (DIR) and the EndPos

Signalslope over 6.5 rev. =  $6,5 \cdot 360^\circ = 2340^\circ$   
 Periodicity 7,0 rev. =  $7,0 \cdot 360^\circ = 2520^\circ$   
 Difference =  $180^\circ$   
 Width of the plateaus =  $2 \times 90^\circ$

### 3.2 Reference mode

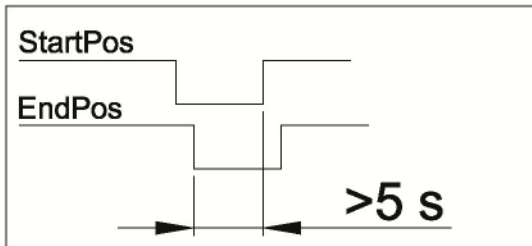


Picture 6: Readjustment of the zero position

After setting the control input StartPos according to the above time interval, the zero point (minimum signal level) is moved to the current shaft position. The electrical signal angle and the turning sense are not affected. The signal input DIR is not considered.

This function is helpful if the sensor was moved without power supply more than  $\pm 179^\circ$  and due to this lost the reference to the zero point of the multi turn information.

### 3.3 Reset Mode – to reset the electrical Angle to Delivery State



Picture 7: Resetmode

If you switch both control inputs StartPos and EndPos according to picture 6, the electrical angle will be reseted to the delivery state (10-turns). Furthermore the zero position of the signal will be moved to the current signal position and the turning sense is set according to the state of the DIR input. That means if DIR is not connected you will get a clockwise signal characteristic

## 4. Technical Data

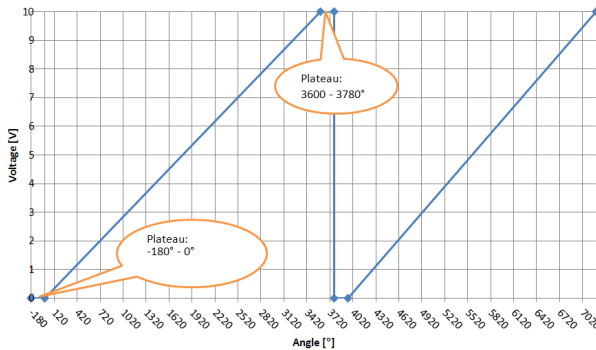
Minimum electrical angle	10°
Maximum electrical angle	72 000° (200 Udr.)
Maximum number of adjustment cycles (flash-storage write cycles)	10 000
Resolution	
>= 360°	12 Bit
180°	11 Bit
90°	10 Bit
45°	9 Bit

Table 2:

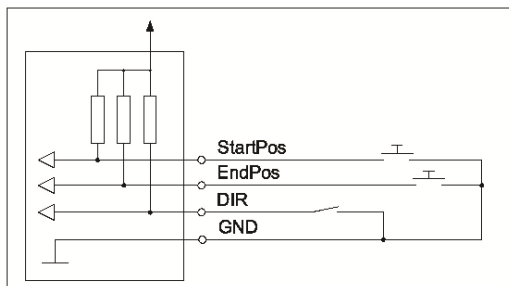
### Technical Data

The single turn encoders (MAB36APS, MAB40APS, MAB50APS) have been cancelled because you can utilize all the functions with the adjustment procedurtes of the multiturn encoders. But please note that the timing requirements have been changed in comparison with the former firware.

### Short description ETA25PM



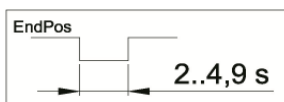
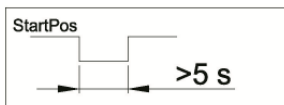
State of delivery: 10-turn + 2x Plateau (0,5 rev). The zero point is not positioned. The sense of rotation is CW (with DIR input not connected). If you need sense of rotation CCW please connect DIR with GND meanwhile programming. Afterwards you can disconnect (but this is not a must).



Programming interface with internal „Pull-Up-Resistors“

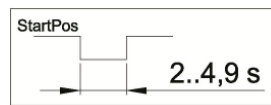
#### Programming Modes

##### Teach-In Mode



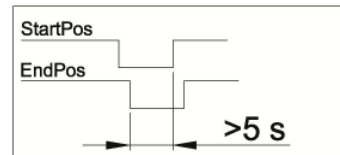
Teach StartPos and EndPos  
Take care:  
Startpos is the minimum signal level.  
Please take care to connect the DIR-Input accordingly!

##### Reference Mode



Moves the zero position to the current position.  
The programmed angle is not affected

##### Reset Mode



Moves the zero position to the current position.  
The sense of rotation is programmed according to the input signal.  
Output signal 10-turn with Plateaus

**Programming instructions for special version:** ETA25PM 6,35 12 2410 (with integrated switch and push button switches for programming procedure)

Programming status at delivery:  
(START and ZERO position not set to a mechanical reference)

Teach-in procedure (Teach-in modus):

- Turn sensor to desired START position and press START button

LED starts flashing RED at 4 Hz for 2s and changes to 2 Hz from 2s to 5s

- Release button when LED starts flashing at 2 Hz after 5s LED lights in RED continuously (= confirmation of START position)
- Turn sensor to desired END position and press END button:

The RED LED light disappears and starts flashing GREEN at 4 Hz for 2s and changes to continuously light in GREEN for 5s

- Release button when LED starts to light continuously after 5s the LED goes out (= confirmation of END position)

In case of false sense of rotation (e.g. CW/CCW-switch set to CW, teach-in was done CCW) LED starts to flash alternating from RED to GREEN (= fault indication) after 4-8s

FYI: START position at teach-in is set to ZERO-degree location of effective electrical travel

Setting ZERO-degree location (Reference modus):

- Turn sensor to desired ZERO position and press START button
- LED starts flashing RED at 4 Hz for 2s
- Release button when LED starts to flash

LED lights in RED continuously for 5s and goes out afterwards (= confirmation of ZERO position)

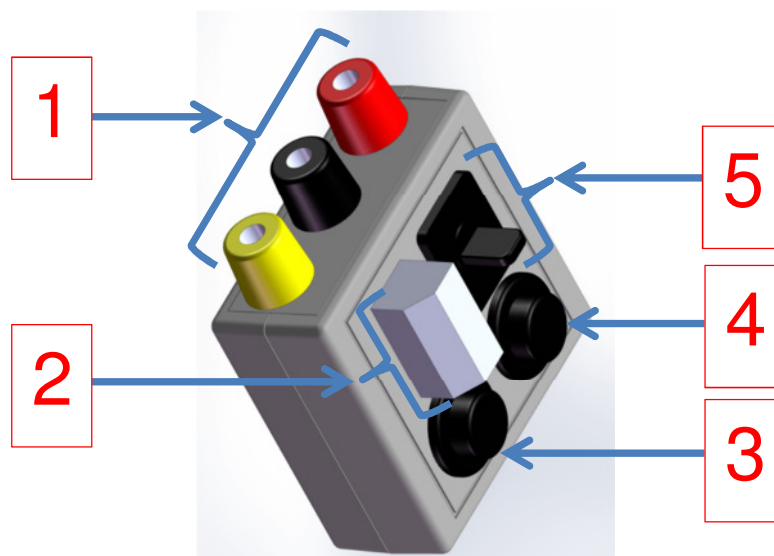
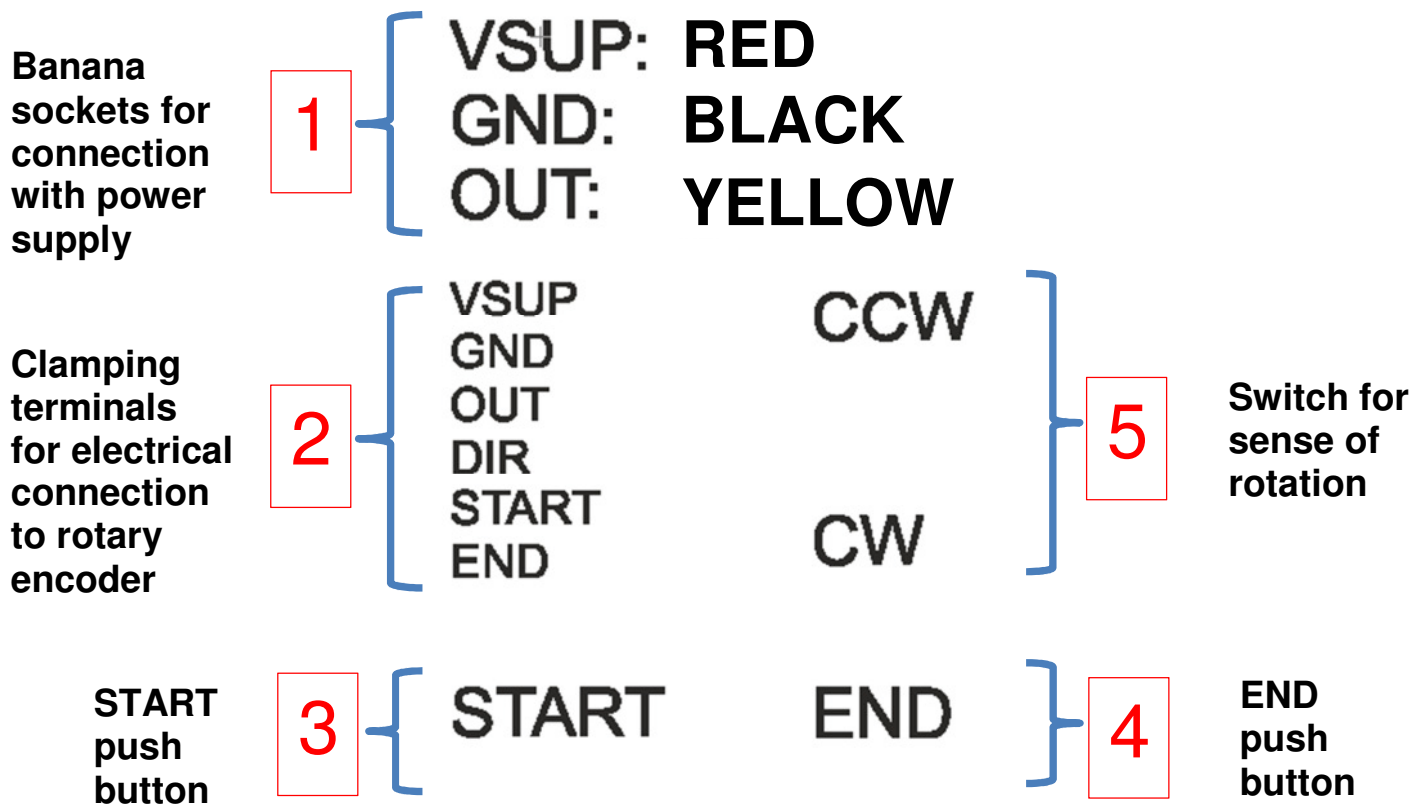
Reset to status at delivery (Reset modus):

- Press START and END button simultaneously
- LED starts flashing RED and GREEN at 4 Hz for 5s
- Release buttons when LED starts to light continuously

LED lights continuously in RED and GREEN for 5s and goes out (= confirmation of reset)



## Programmer (Smart-Box) for ETx and MABxxAPM Multiturn rotary encoders



Subject to change without notice.