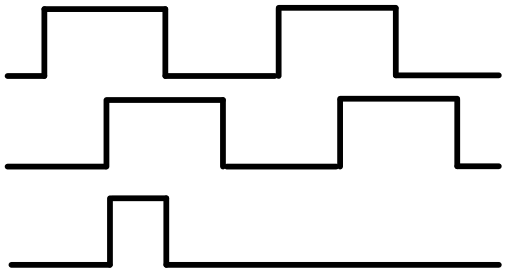
Incremental Encoder
Magnetic



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Description

The MEM 25 is a magnetic incremental encoder. He is a reliable hollow shaft encoder that can be fixed quickly and easily on different sizes of motor shafts.
The encoder is developed for brushless motors, motor feedback applications and rotational speed control. The MEM 25 is a real time system for high speed applications and rough environments.
The encoder provides two square wave outputs in quadrature (90 degrees phase shifted) for counting and direction information and one index channel (one pulse per revolution).
The resolution of the encoder is determined by the number of counts per revolution (CPR).
Optionally, the encoder is also available with UVW commutation signals (1, 2 or 4 pole-pairs).
The power supply is selectable in a wide voltage range (5V up to 30V).
Power supply and signals are provided by a 3x2x0,14mm^2 shilded cable with tinned ends.

Performance

Features

- Output channels: 2 (quadrature) + 1 index-channel
  optionally: UVW commutation signals
- Output type: TTL compatible or HTL compatible
- Resolution: up to 1024 CPR (counts per revolution)
  optionally: up to 4 pole-pairs
- Frequency up to 500 kHz
- Power supply: 5 – 30 VDC
- Protection class IP65
- Small size: 28.0 mm diameter x 31.8 mm length
- Maximum shaft diameter: 6 mm
- Operating temperature: -20°C to +85°C
- Compliant EU-directive 2011/65/EG (RoHS)

Recommended operating conditions

Electrical characteristics are only effective for the range of the operating temperatures.
Typical values at 25 °C and V_{CC} = 5 VDC.

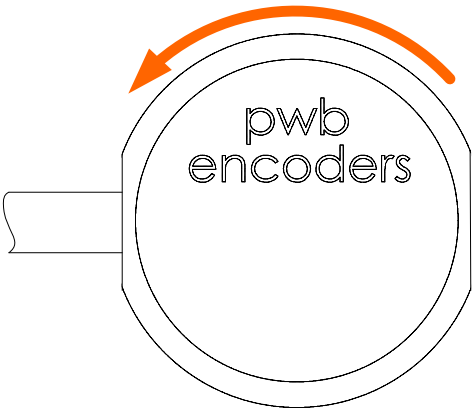
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply voltage	U_B	4.5	5.0	5.5	V_{DC}	
	U_B	8.0	12.0	30.0	V_{DC}	
Supply current	I_{UB}	20	37	44	mA	no load
Reverse polarity protection	U_B	-36		0	V_{DC}	8-30V Version
			None			5V Version
Output current per channel	I_{out}	-1.0		20	mA	
High level output voltage	V_{oH}	2.4		5.5	V_{DC}	TTL output
	V_{oH}	U_B - 3 V		30	V_{DC}	HTL output
Low level output voltage	V_{oL}			0.7	V_{DC}	TTL output
	V_{oL}			1.5	V_{DC}	HTL output
Rise time	t_r	5	15	20	ns	R_T = 120Ω
Fall time	t_f	5	15	20	ns	R_T = 120Ω
Pulse width	P	10:90	50:50	90:10	%	depended on resolution
						$\pm 0{,}32\ e^{(0{,}4 * n)}$ [n = bits]
Phase shift			90		°e	depended on resolution
Absolute angular accuracy				± 0,5	DEG	
Load capacitance	C_T			100	pF	
Count frequency	f			500	kHz	rpm * N / 60 x 10^{-3}
Start up time	t_T			2	ms	
ESD voltage	U_{ESD}			2	kV	discharged over 1,5kΩ
Pole-pair	p	1		4		for block commutation
Environment						
Operating temperature	T_A	-20	25	85	°C	
Storage temperature	T_S	-20		85	°C	
Humidity exposure				90	% RH	not codensing
Vibration				1000	Hz	10 g
Magnet axis displacement				0.1	mm	vs. center of sensor

Mechanical Notes

Parameter	Value	Tolerance	Unit
Max. allowable axial shaft play of motor	0.1	-	mm
Max. allowable radial shaft play of motor	0.02	-	mm
Mounting screw size (DIN 84)	M3	-	-
Pitch circle diameter	36.0	±0.1	mm
Shilded cable, twisted pair, tinned ends	3 x 2 x 0,14 mm	-	mm
Total weight	60	-	g
Moment of inertia of the hub with the code wheel	13.0	±1.0	gcm^2
Protection grade according to DIN 40500	IP65	-	-
max. speed (mechanical)	10,000	-	rpm

Electrical interface

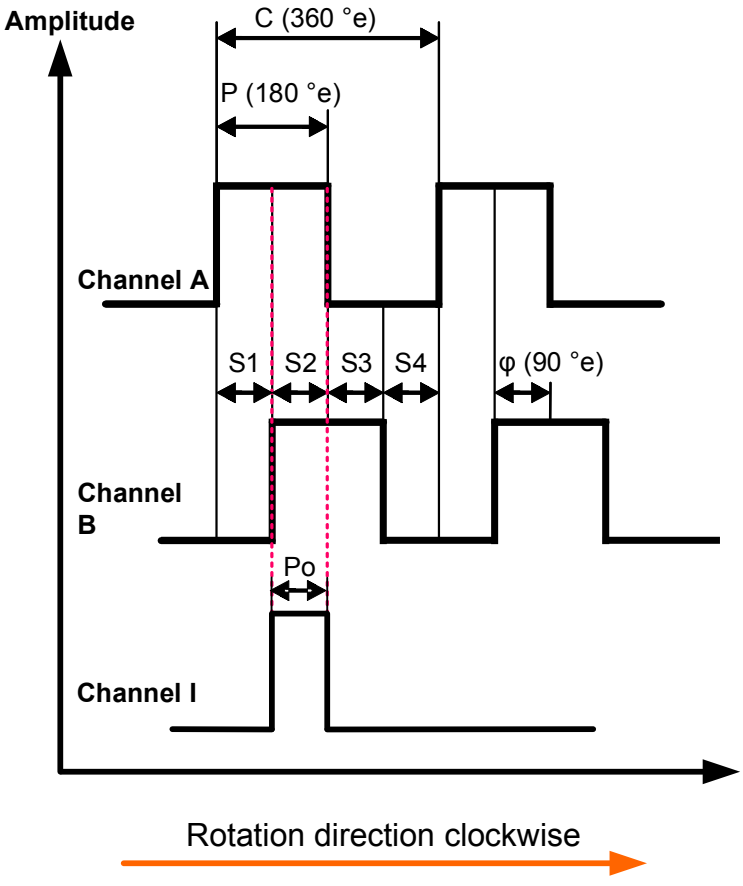
Rotation direction clockwise



with ABI
incremental signals

Pin-out description

Signal	Cable Wire color
UB	white
GND	brown
NC	green
Ch. I	yellow
Ch. A	grey
Ch. B	pink



Definitions

Counts per Revolution (CPR):
The number of increments per revolution.

One Cycle (C):
360 electrical degrees (°e), one period of the signal.

Cycle Error (ΔC): The deviation in electrical degrees of the pulse width from its ideal value. It is an indication of cycle uniformity.

Pulse Width (P): The number of electrical degrees when an output is "HIGH" during one cycle, nominally 180 °e or half a cycle.

Pulse Width Error (ΔP): The deviation in electrical degrees of the pulse width from its ideal value of 180 °e.

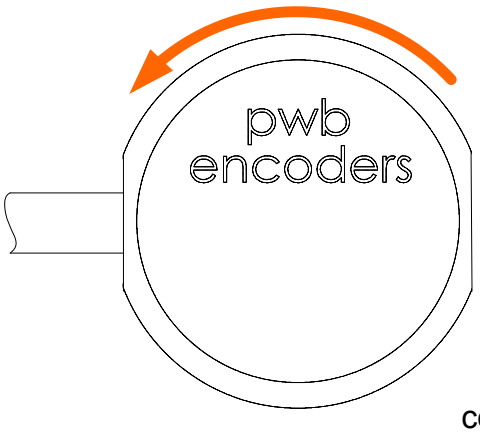
State Width (S): The number of electrical degrees between a transition in the output of channel A and the neighbouring transition in the output of channel B. There are 4 states per cycle, each nominally 90 °e (S1 – S4).

Phase (ϕ): The number of electrical degrees between the centre of the high state on channel A and the centre of the high state on channel B. This value is nominally 90 °e (the signals A and B can be used for quadrature).

Index pulse width (Po): The number of electrical degrees when the index is high during one full shaft revolution.

Electrical interface

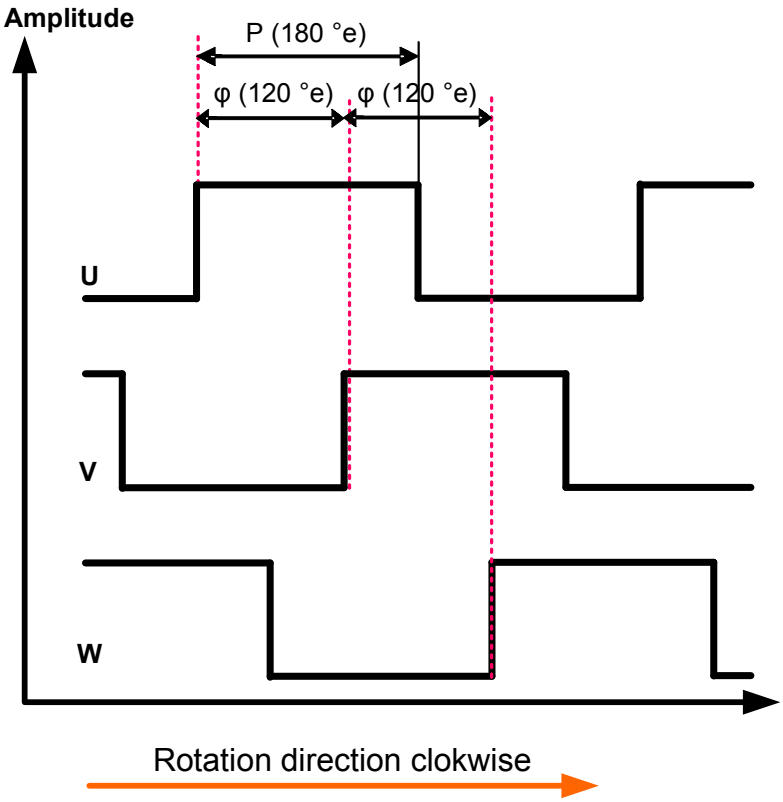
Rotation direction clockwise



with UVW
commutation signals

Pin-out description

Signal	Cable Wire color
UB	white
GND	brown
NC	green
V	yellow
U	grey
W	pink



Definitions

Counts per Revolution (CPR):
The number of pole per revolution.

One Cycle (C):
360 electrical degrees (°e), one period of the signal.

Cycle Error (ΔC): The deviation in electrical degrees of the pulse width from its ideal value. It is an indication of cycle uniformity.

Pulse Width (P): The number of electrical degrees when an output is "HIGH" during one cycle, nominally 180 °e or half a cycle.

Pulse Width Error (ΔP): The deviation in electrical degrees of the pulse width from its ideal value of 180 °e.

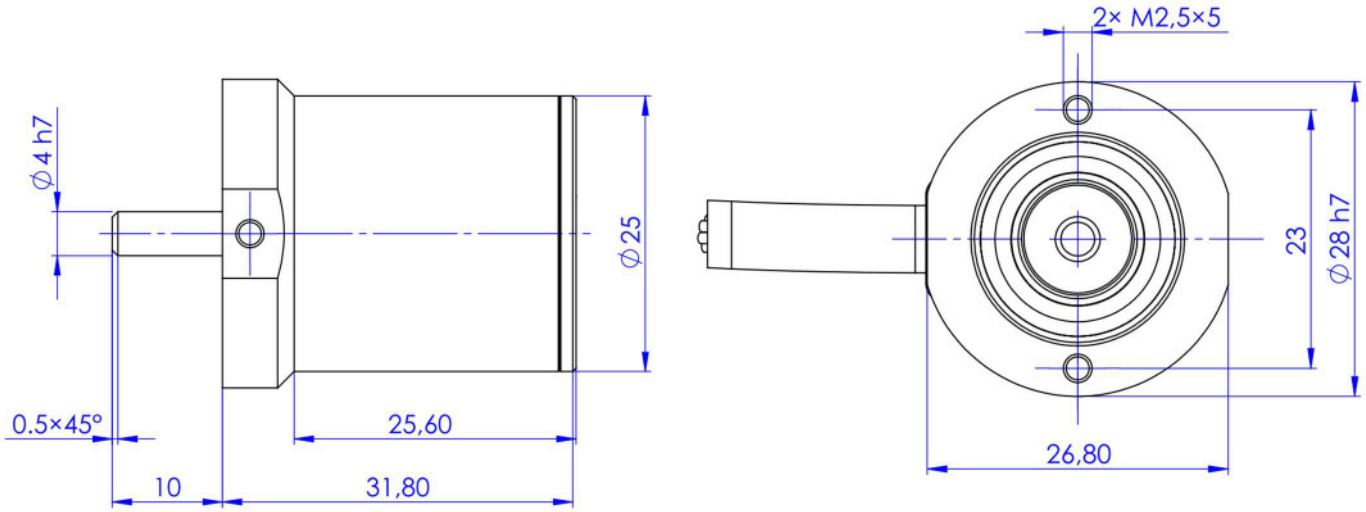
State Width (S): The number of electrical degrees between a transition in the output of channel U and the neighbouring transition in the output of channel V.

State Width Error (ΔS): The deviation in electrical degrees of each state width from its ideal value of 120 °e.

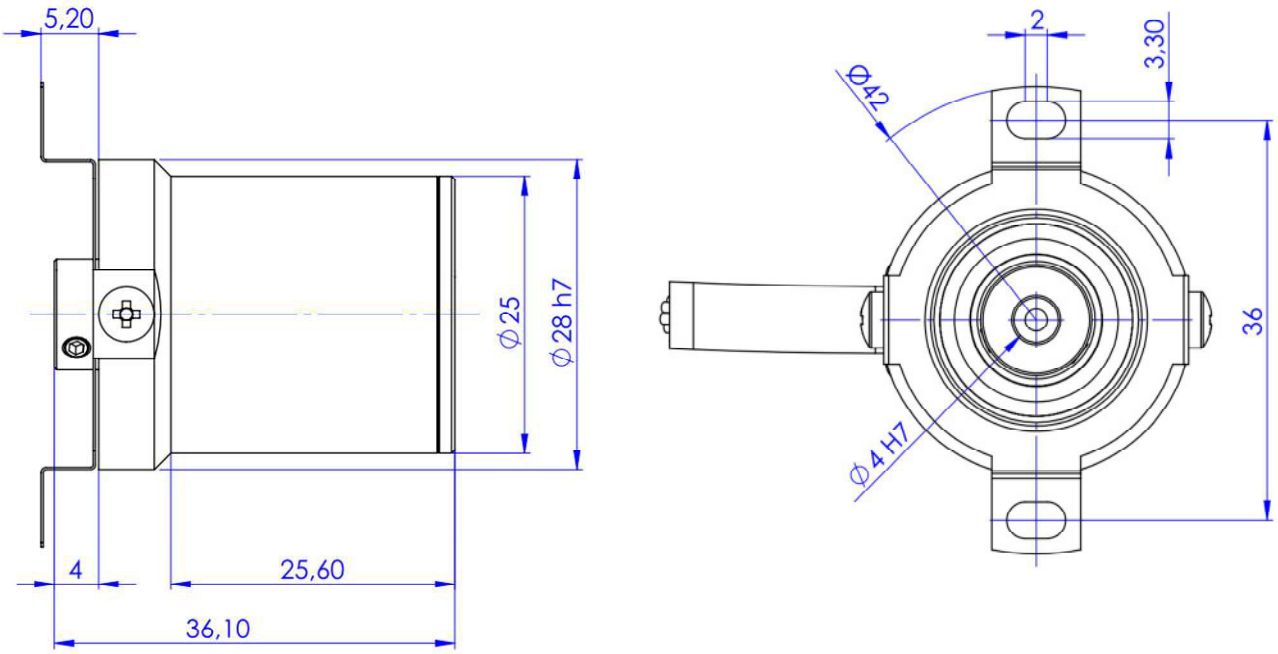
Phase (ϕ): The number of electrical degrees between the centre of the high state on channel U and the centre of the high state on channel V. This value is nominally 120 °e

Phase Error (Δϕ): The deviation in electrical degrees of the phase from its ideal value of 120 °e.

Mechanic performance: K (shaft)



Mechanic performance: C (hollow shaft)



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Ordering information

Ordering code:

MEM 25 X - X - XXXX - XX - X - S - XX

Mechanic Performance	Encoder Output	Encoder Resolution	Supply Voltage	Motor Shaft Diameter	Encoder Option	Output option cable length (m)
K: shaft	I : Inkremental	0001 : 1 cpr	05 : 5V_{DC}	B : 2,000 mm	S : Standard	05 : 0,5m
C: hollow shaft	U : Commutation	0002 : 2 cpr	12 : 8-30V_{DC} *	C : 2,500 mm	E: Extended ***	10 : 1,0m
		0003 : 3 cpr	24 : 8-30V_{DC}**	D : 3,000 mm		20 : 2,0m
		0004 : 4 cpr		G : 4,000 mm		
		xxxx : n cpr		I : 5,000 mm		
		0125 : 125 cpr		J : 6,000 mm		
		0126 : 126 cpr				
		0127 : 127 cpr				
		0128 : 128 cpr				
		0256 : 256 cpr				
		0512 : 512 cpr				
		1024 : 1024 cpr				

Note:

* TTL output
** HTL output

*** for example: further torque supports (customized)

IMPORTANT NOTICE

The guarantee will be voided by misuse, accident, modification, unsuitable physical or operating environment, operation in other than the specified operating environment, or failure caused by a product for which ***PWB encoders GmbH*** is not responsible.

PWB encoders GmbH reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services also datasheets at any time.

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