

Incremental Encoder Magnetic



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Description

The MEM 16 is a magnetic incremental encoder. He is a reliable low cost hollow shaft encoder that can be fixed quickly and easily on different sizes of motor shafts.

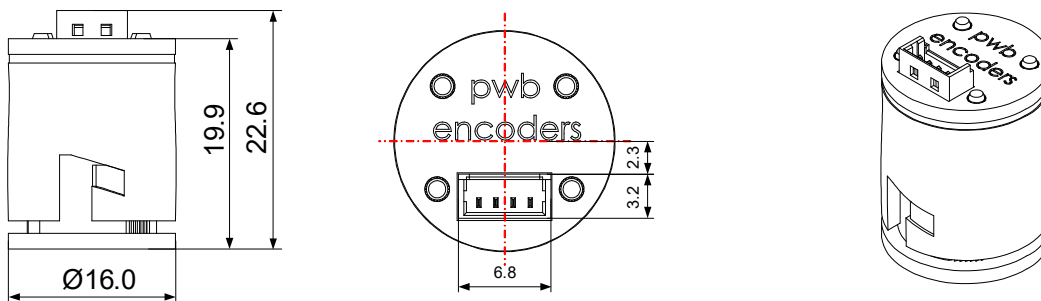
The encoder is developed for brushless motors, motor feedback applications and rotational speed control. The MEM 16 is a real time system for high speed applications and rough environments.

The encoder provides two square wave outputs in quadrature (90 degrees phase shifted) for counting and direction information.

The resolution of the encoder is determined by the number of counts per revolution (CPR).

The power supply is 5V. Power supply and signals are provided by a 4 pin Molex connector.

Dimensions



Features

- Small size: 16.0 mm diameter x 22.6 mm length
- Quick and easy assembly
- Output channels: 2 (quadrature)
- Power supply: 5 VDC.
- Resolution up to 1024 CPR (counts per revolution)
- Output type: TTL compatible
- Frequency up to 500 kHz
- Rotation speed up to 100.000 rpm
- Maximum shaft diameter: 3.175 mm (1/8")
- Operating temperature: -30 °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.

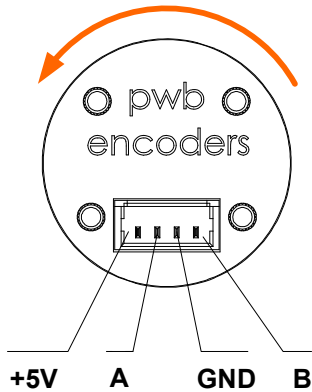
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply voltage	U_B	4.5	5.0	5.5	V _{DC}	
Supply current	I_{UB}	20	37	44	mA	no load
Output current per channel	I_{out}	-1.0		20	mA	
High level output voltage	V_{oH}	2.4		5.5	V _{DC}	
Low level output voltage	V_{oL}			0.7	V _{DC}	
Rise time	t_r	5	15	20	ns	$R_T = 120\Omega$
Fall time	t_f	5	15	20	ns	$R_T = 120\Omega$
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				$\pm 0,5$	DEG	
Load capacitance	C_T			100	pF	
Count frequency	f			500	kHz	$rpm * N / 60 * 10^{-3}$
Start up time	t_T			2	ms	
ESD voltage	U_{ESD}			2	kV	discharged over 1,5k Ω
Environment						
Operating temperature	T_A	-30	25	85	°C	
Storage temperature	T_S	-30		85	°C	
Humidity exposure				90	% RH	not condensing
Vibration				2000	Hz	20 g
Magnet axis displacement				0.1	mm	vs. center of sensor

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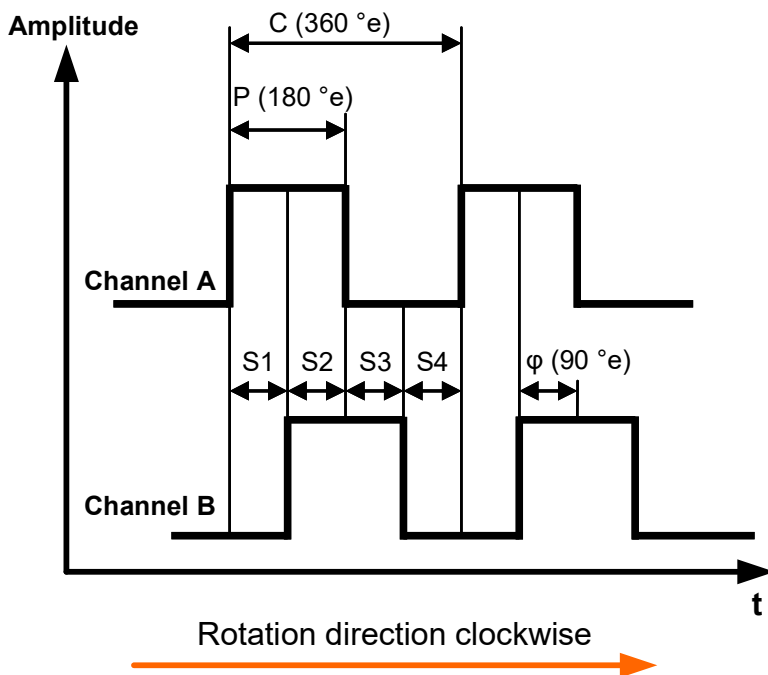
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Electrical interface



LS version

Connector Pin	Connector Signal	Cable Wire color
1	UB	red
2	Ch. A	yellow
3	GND	black
4	Ch. B	purple



Definitions

Counts per Revolution (CPR):

The number of bar and window pairs or increments per revolution of the code wheel.

One Cycle (C):

360 electrical degrees ($^{\circ}e$), one period of the signal, caused by one pair of bar and window.

Pulse Width (P):

The number of electrical degrees that an output is high during one cycle. This value is nominally $180^{\circ}e$.

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 $90^{\circ}e$.

Phase (ϕ):

The number of electrical degrees between the centre of the high state of channel A and the center of the high state of channel B. This value is nominally $90^{\circ}e$.

Position Error (ΔQ):

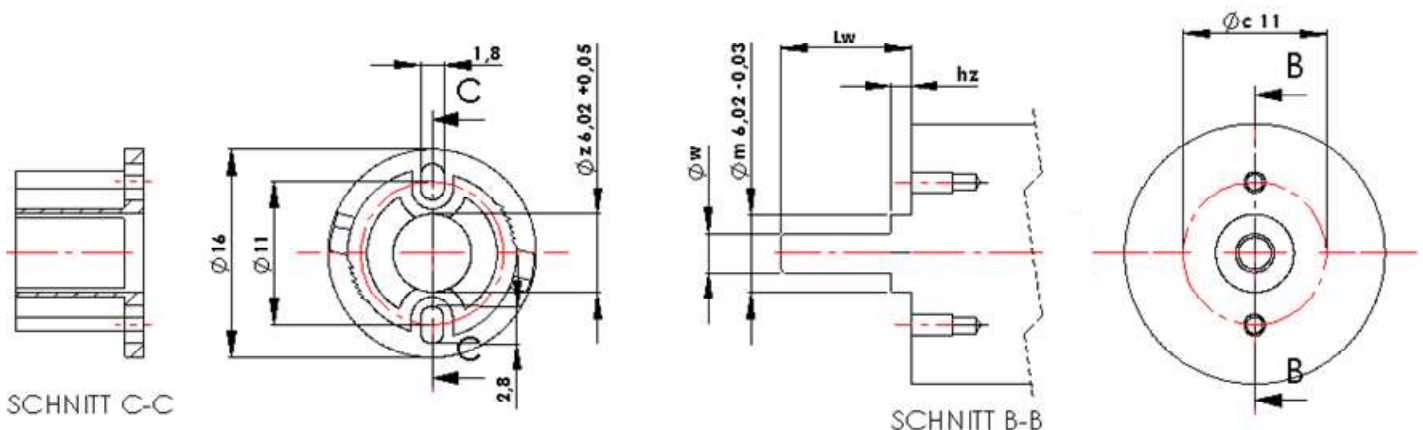
The angular difference between the actual angular shaft position and the position indicated by the encoder cycle count.

Mechanical specifications

Parameter	Value	Tolerance	Unit
Outer dimensions connector version	Ø16.0 x 22.6	-	mm
Shaft diameter \varnothing_w	1.5 / 2.0 / 2.3 / 2.5 / 3.0 / 3.175	± 0.01	mm
Required shaft length L_w	9.5	+ 2.0	mm
Max. allowable axial shaft play of motor	0.3	-	mm
Max. allowable radial shaft play of motor	0.025	-	mm
Mounting screw size (DIN 84)	M1.6	-	-
Tightening torque of the screws	15	-5	Ncm
Pitch circle diameter \varnothing_c	11.0	± 1.0	mm
Flange bore diameter diameter \varnothing_z	6.02	+0.05	mm
Mounting boss diameter \varnothing_m	6.02	-0.03	mm
Max. mounting boss height h_z	1.5	-0.1	mm
Mating connector (Molex)	contact 4x 50079-8000 housing 1x 51021-0400	-	-
Total weight	4	-	g
Moment of inertia of the hub with the code wheel	2.35	± 1.0	gmm ²
Protection grade according to DIN 40500	IP50	-	-

Mounting considerations:

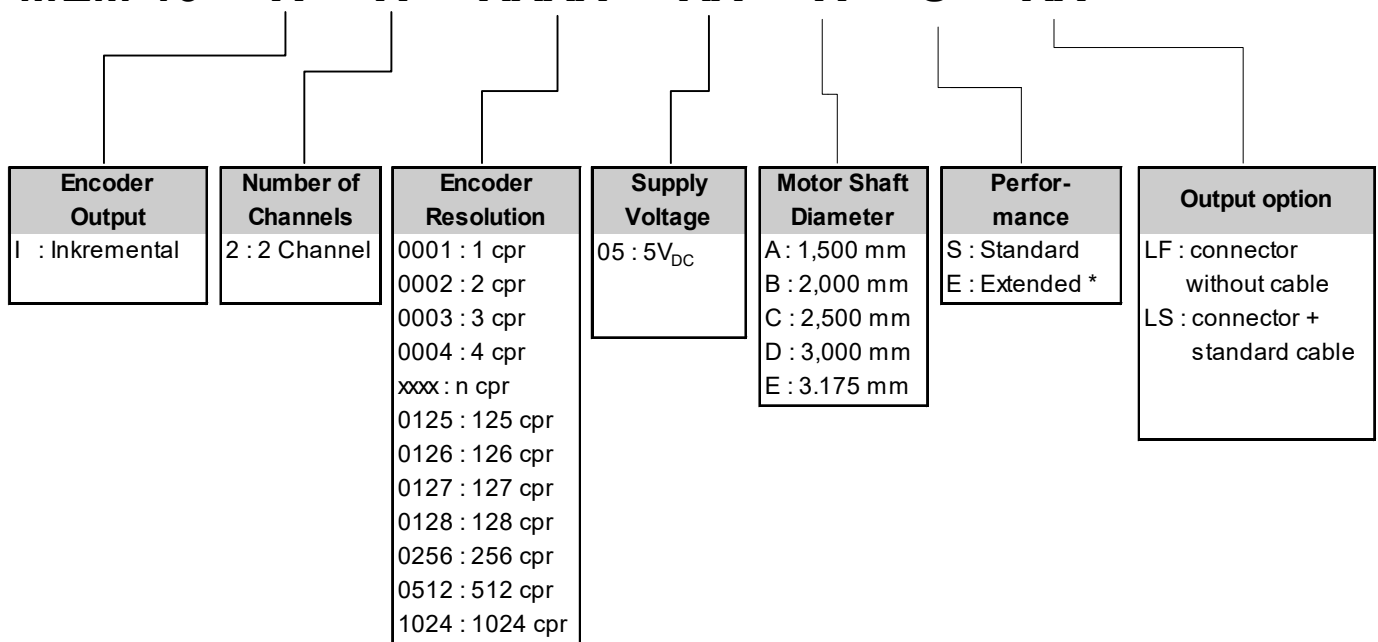
The MEM 16 encoder is designed to self align by using a mounting boss. The drawing shows the configuration of the mounting boss along with the location of the mounting screw holes. Shaft diameter and tolerances are given in the above mentioned chart.



Ordering information

Ordering code:

MEM 16 - X - X - XXXX - XX - X - S - XX



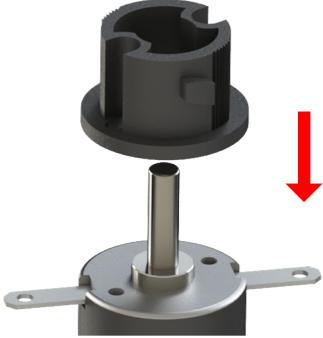
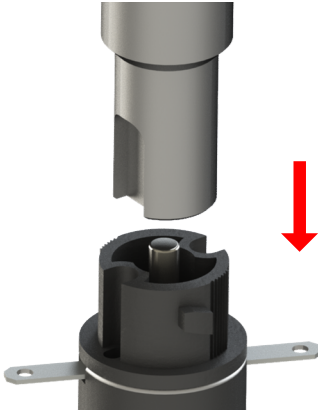
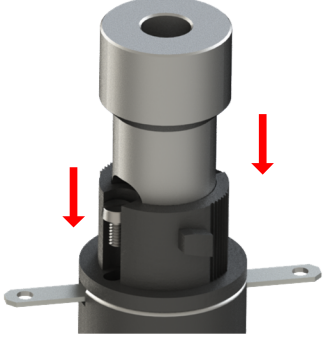
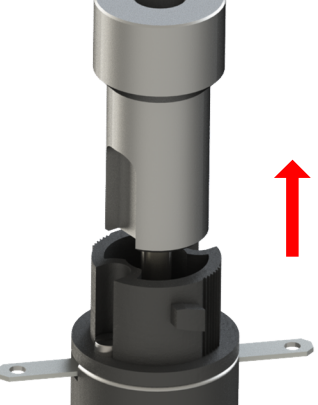
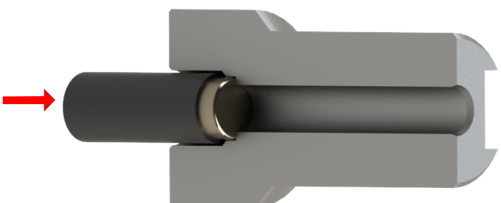
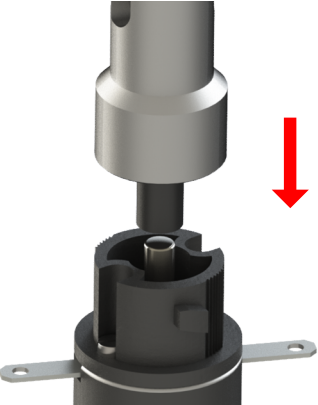
* customer version

Available accessories see page 9 (no parts of standard delivery):

- cable 300 mm length (UL1061 / AWG28)
- adapter plates for different motors
- centering and assembly gauge for different motor shafts
- fastening screws DIN 84 M1.6x3 or M1.6x4

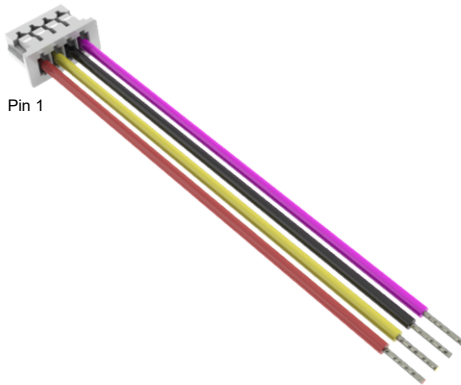
Patents: U.S 5,828,047 ; U.S 5,508,088 ; U.S 5,859,425 ; U.S 6,462,442

ESD Warning: Normal handling precautions should be taken to avoid static discharge damage to the sensor.

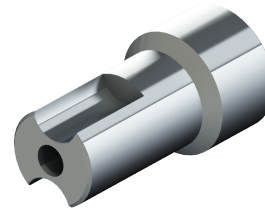
MEM 16 MOUNTING INSTRUCTION	
1	 <p>Set the base plate onto the motor</p>
2	 <p>Align the base plate to the motor shaft by using the centering gauge</p>
3	 <p>Afterwards fix the base plate to the motor flange using two screws</p>
4	 <p>Remove the centering gauge</p>
5	 <p>Set the hub with magnet into the centering gauge</p>
6	 <p>Press the hub with magnet onto the motor shaft by the centering gauge</p>

MEM 16 MOUNTING INSTRUCTION	
7	 <p>Press the centering gauge down to the final position</p>
8	 <p>Afterwards remove the centering gauge</p>
9	 <p>Align the housing to the base plate, slide the housing onto the base plate</p>
10	 <p>Press the housing into the final position</p>
11	 <p>Turn the housing into its final position, the encoder is now ready for use</p>
12	<p><u>WARNING</u></p>  <p>Do not rotate and pull out the encoder after assembly or when it is in operation.</p>

Available accessories



Standard cable length 300 mm
(UL 1061 / AWG 28)



Centering and assembly gauge for centering
the base plate on the motor flange or an
adapter plate and also positioning the magnet



Customized adapter plate



Screws DIN84 M1.6 X 3 or M1.6 X 4

IMPORTANT NOTICE

The encoder is so designed that it may be assembled only one time, otherwise the guarantee will be voided.

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.

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