RoHS compliant

Service manual
Magnetic encoder MEM 22

Optical encoder MEM22

Description

The MEM 22 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 MEM22 is designed for applications where rough environments, high vibrations and low temperature are the topics to meet.

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 6 pin Molex connector.

Features

- Output channels: 2 (quadrature) + 1 index-channel
- Optional on request: UVW commutation signals
- Output type: HTL Compatible (TTL on request)
- Resolution: up to 1024 CPR (counts per revolution)
- Optional on request: up to 4 pole-pairs
- Frequency up to 500 kHz
- Power supply: 5 – 30 VDC
- Quick and easy assembly
- Small size: 22.0 mm diameter x 21.9 mm length
- Operating temperature: -40°C to +85°C
- Compliant EU-directive 2002/95/EG (RoHS)

Ordering information

MEM22	I	3	0512	05	G	S	LS
	Encoder Output	Number of channels	Encoder Resolution	Supply Voltage	Motor Shaft Diameter (mm)	Operating Temperature	Output option
	I= Inkremental	3 = 3 Channel	0001 = 1 cpr	05 = 5 V_{DC}	B = 2.000	S= - 40 / +85 °C	LS = Connector + standard cable
			0002 = 2 cpr	24 = 8-30 V_{DC}	C = 2.500		
			0003 = 3 cpr		D = 3.000		
			0004 = 4 cpr	12* = 8-30 V_{DC}	G = 4.000		
			xxxx = n cpr		I = 5.000		
			0125 = 125 cpr		J = 6.000		
			0126 = 126 cpr		K = 6.350 (1/4")		
			0127 = 127 cpr		L = 8.000		
			0128 = 128 cpr				
			0256 = 256 cpr				
			0512 = 512 cpr				
			1024 = 1024 cpr				

(*) TTL on request

Available accessories, see page 10

- cable 300 mm length (UL1061 / AWG28)
- centering gauge (not included as standard part)
- fastening screws DIN 84 M1.6x3

Recommended operating conditions

Electrical characteristics are only effective for the range of the operating temperatures.
Standard values at 25 °C and V_{DC} = 5 V.

Parameter	Symbol	Min.	Standard	Max.	Unit	Notes
Supply voltage	U_B	4.5	5.0	5.5	V_{CC}	version 5 V
		8.0	12.0	30.0	V_{CC}	version 8 - 30 V
Supply current	I_{UB}	20	37	44	mA	no load
Reverse polarity protection	U_B	-36		0	V_{CC}	version 8 - 30 V
		none				version 5 V
Output current perchannel	I_{out}	-1.0		20	mA	
Highleveloutputvoltage (*)	V_{OH}	2.4		5.5	V_{CC}	
Lowlevel outputvoltage	V_{OL}			0.7	V_{CC}	
Rise time	T_r	5	15	20	ns	R_T = 120 Ω
Fall time	T_f	5	15	20	ns	R_T = 120 Ω
Pulsewith			180		° e	
Phaseshift			90		° e	
Duty Cycle			1 : 1			
Relative angularaccuracy				40	%	$0{,}32\,e^{(0,4 * n)}$ [n = bit]
Load capacitance	C_T			100	pF	
Countfrequency	f			500	kHz	rpm* N/ 60 x 10^{-3}
Start uptime	T_T			2	ms	
ESD voltage	U_{ESD}			2	kV	discharged over 1,5 kΩ
Pole-pair	p	1		4		for blockcommutation

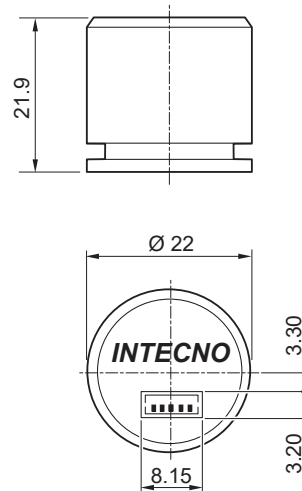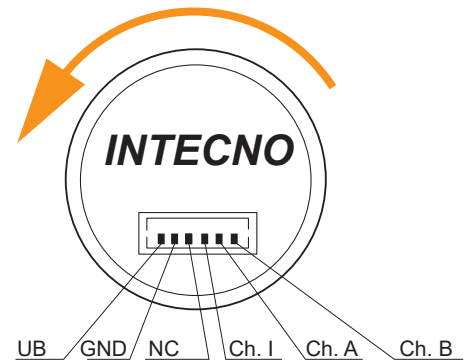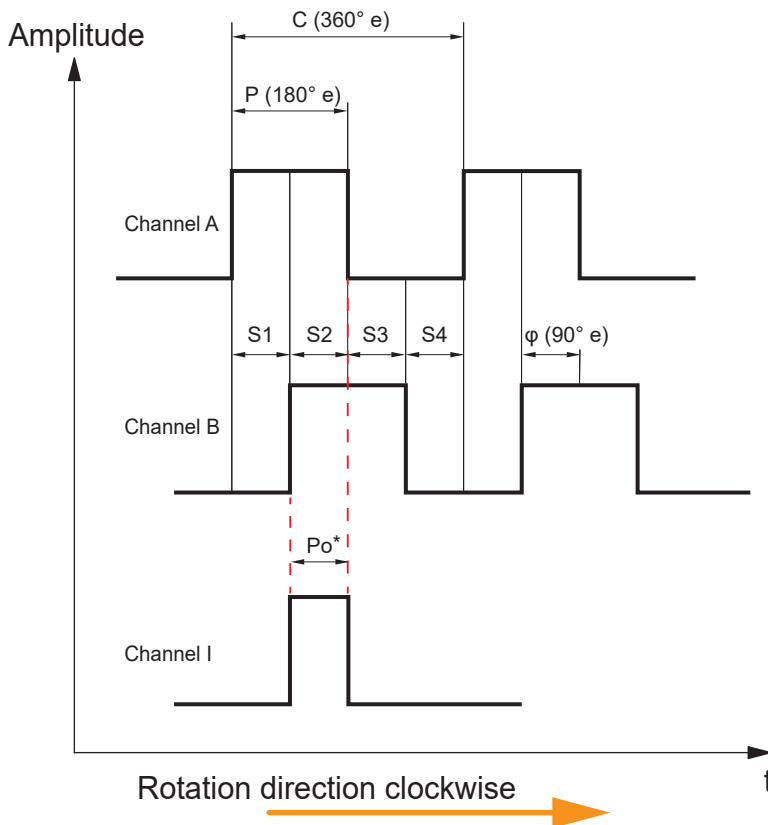| Environment	Symbol	Min.	Standard	Max.	Unit	Notes
Operating temperature	T_A	- 20	+25	+ 85	°C	
Storage temperature	T_S	-40		+ 85	°C	
Humidity exposure				90	% RH	not codensing
Vibration				2000	Hz	20 g
Magnetaxis displacement				0.2	mm	vs. center ofsensor

(*) for TTL version

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

Optical encoder MEM22

Dimensions

21.9

Ø 22

3.30

3.20

8.15

INTECNO

RoHS compliant

Electrical interface with ABI incremental signals

Amplitude

C (360° e)

P (180° e)

Channel A

S1 S2 S3 S4   φ (90° e)

Channel B

Po*

Channel I

Rotation direction clockwise   t

INTECNO

UB GND NC   Ch. I Ch. A   Ch. B

Connector Pin	Connector Signal	Cable Wire color
1	UB	red
2	GND	purple
3	NC	brown
4	Ch. I	yellow
5	Ch. A	orange
6	Ch. B	black

Definitions:

- **CPR -** Counts per Revolution: The number of increments per revolution.
- **C -** One cycle: 360 electrical degrees (°e), one period of the signal.
- **ΔC -** Cycle Error: The deviation in electrical degrees of the pulse width from its ideal value. It is an indication of cycle uniformity.
- **P -** Pulse Width: The number of electrical degrees that an output is high during one cycle. This value is nominally 180 °e or half a cycle.
- **ΔP -** Pulse Width Error: The deviation in electrical degrees of the pulse width from its ideal value of 180 °e.
- **S -** State Width: 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).
- **ΔS -** State Width Error: The deviation in electrical degrees of each state width from its ideal value of 90 °e.
- **φ -** Phase: 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 °e (the signals A and B can be used for quadrature).
- **Po -** Index pulse width: The number of electrical degrees when the index is high during one full shaft revolution.

Note: Index Channel I = Channel A & Channel B (Standard) Other combinations are possible on customer request

Electrical interface with UVW commutation signals

Amplitude

P (180° e)

φ (120° e) φ (120° e)

U

V

W

Rotation direction clockwise

t

INTECNO

UB GND NC V U W

Connector Pin	Connector Signal	Cable Wire color
1	UB	red
2	GND	purple
3	NC	brown
4	Ch. I	yellow
5	Ch. A	orange
6	Ch. B	black

Definitions:

- **CPR -** Counts per Revolution: The number of increments per revolution.
- **C -** One cycle: 360 electrical degrees (°e), one period of the signal.
- **ΔC -** Cycle Error: The deviation in electrical degrees of the pulse width from its ideal value. It is an indication of cycle uniformity.
- **P -** Pulse Width: The number of electrical degrees that an output is high during one cycle. This value is nominally 180 °e or half a cycle.
- **ΔP -** Pulse Width Error: The deviation in electrical degrees of the pulse width from its ideal value of 180 °e.
- **S -** State Width: The number of electrical degrees between a transition in the output of channel U and the neighbouring transition in the output of channel V
- **ΔS -** State Width Error: The deviation in electrical degrees of each state width from its ideal value of 120 °e.
- **φ -** Phase: 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.
- **Δφ -** Phase Error: The deviation in electrical degrees of the phase from its ideal value of 120 °e.

Mechanical Notes

Parameter	Symbol	Value	Tolerance	Unit
Outer dimensions		Ø 22,0 x 21,9	-	mm
Shaft diameter	**Øw**	2.0 / 2.5 / 3.0 / 4.0 / 5.0 / 6.0 / 6.35 / 8.0	± 0.01	mm
Required shaft length	**Lw**	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	**Øc**	17,0	± 1.0	mm
Flange inside bore diameter	**Øz**	10,1	+ 0.03	mm
Mounting boss diameter	**Øm**	10.1	- 0.03	mm
Max. mounting boss height	**hz**	1.5	- 0.1	mm
Mating connector (Molex)		6 pin 50079-8000 housing 51021-0500	-	
Total weight		8	-	g
Moment of inertia of the hubwiththe magnet		6.0	± 1.0	g·mm^2
Protection grade according to DIN 40500		IP50	-	-

Mounting considerations

The MEM22 encoder is designed to self align by using a mounting boss. **You need a tool centering gauge.** 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.
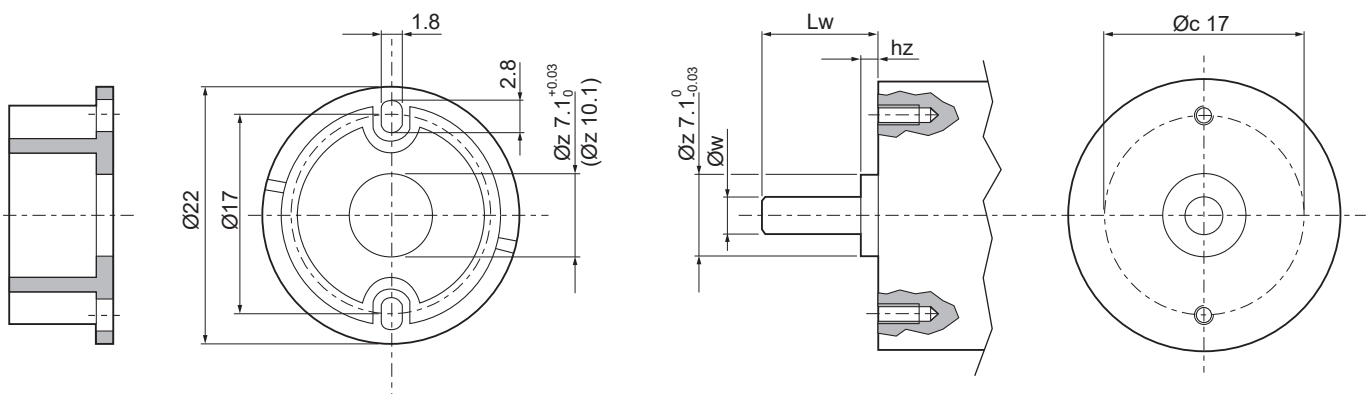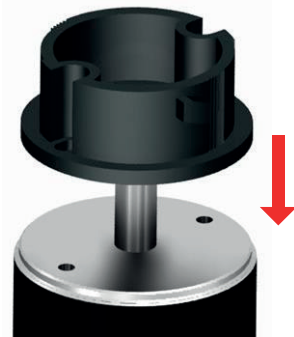
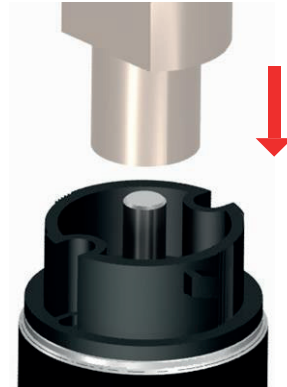**MEM22 mounting instructions**

1

Set the base plate onto the motor

2

Align the base plate to the motor shaft by using the centering gauge
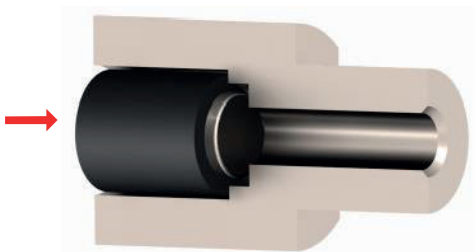
3

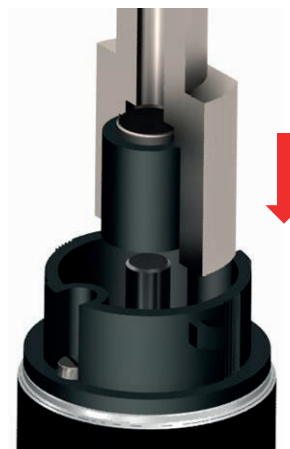Aferwards fix the base plate to the motor flange using two screws

4

Remove the centering gauge

5

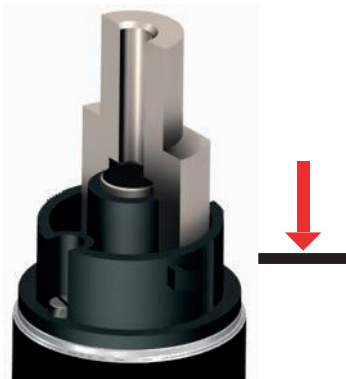Set the hub with magnet into the centering gauge

6

Press the hub with magnet onto the motor shaft by the centering gauge

MEM22 mounting instructions

7

Press the centering gauge down to the final position

8

Afterwards remove the centering gauge

9

Aling the housing to the base plate, slide the housing onto the base plate

10

Press the housing into the final position

11

Turn the housing into its final position, the encoder is now ready for use
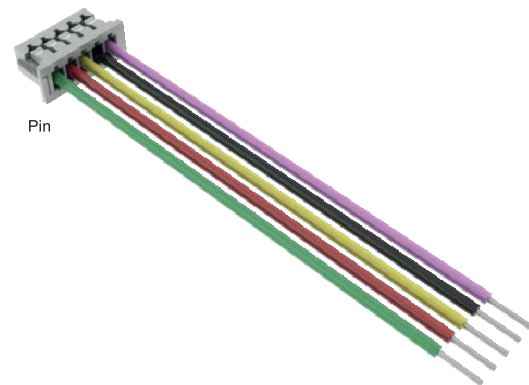
WARNING

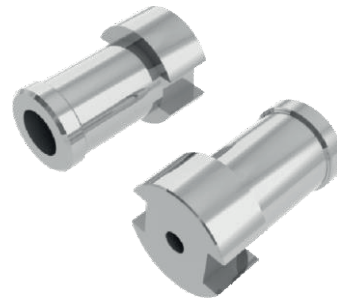**DO NOT ROTATE AND PULL OUT THE ENCODER AFTER ASSEMBLY OR WHEN IT IS IN OPERATION.**

ATTENTION
The encoder is designed that it may be assembled only one time, otherwise the guarantee will be voided. Note: see IMPORTANT NOTICE (page 10)

Available accessories

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

Pin

- Centering gauge for centering the ME base plate on the motor flange or an adapter plate

- Screws DIN84 M1.6 X 3

IMPORTANT NOTICE

The encoder is 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 the manufacturer is not responsible.

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