

Data Sheet for Angle Sensors

Optical incremental Encoder

Series SPE



- Optical resolution up to 1000 pulses per revolution
- 22 mm housing diameter
- 11.7 mm housing depth
- Shaft diameters: 6 mm, 6.35 mm, 3.175 mm
- Ball or sleeve bearing
- Supply voltage 5 VDC
- Signal Output TTL
- Molex Connector

Compact optical incremental encoder with a choice of three different operating torques. With the increased torque option, the SPE can also be used as a high quality optical panel encoder.

Electrical Data	TTL	Line Driver
Output signal	5 V - A, B	differential 3.8 V - A, /A, B, /B
Number of pulses	100..1000 Imp./U	
Output voltage high	≥ 2.4 V @ -8 mA with load (4 V @ no load)	≥ 4.75 V @ 25 mA with load (5 V typ. @ no load)
Output voltage low	≤ 0.4 V @ 8 mA with load (0.035 V @ no load)	≤ 0.6 V @ 4.5 mA with load (0.25 V typ. @ no load)
Differential output voltage	-	≥ 3.0 V @ RL = 100 Ω (typ. 3.8 V)
Limit frequency	100 kHz	
Supply voltage	5 VDC ±10 %	
Power consumption no load	≤ 30 mA (typ. 25 mA)	≤ 32 mA (typ. 27 mA)
Output capacity	8 mA per output channel (A or B)	
Output electronics	TTL	Line Driver
Switch on-delay	100 ns (rise time) / 50 ns (fall time)	20 ns (rise/fall time)

Mechanical and Environmental Data, Miscellaneous	
Mechanical angle of rotation /stroke 1.)	360° without stop
Lifetime 2.)	> 1 Mio. shaft revolutions for sleeve bearing
Bearing	Sleeve bearing or ball bearing
Max. operational speed	
Sleeve bearing	100 rev./min
Ball bearing	15000 rev./min
Max. acceleration	
Sleeve bearing	10000 rad/sec ²
Ball bearing	250000 rad/sec ²
Operational torque @ RT 1.) 2.)	
Sleeve bearing with low torque (Version NT)	0.2 Ncm
Sleeve bearing with increased torque	0.4 ±0,1 Ncm
Ball bearing with very low torque (Version KL)	0.01 Ncm
Operating temperature range	-20 °C up to +100 °C
Storage temperature range	-20 °C up to +100 °C
Protection grade shaft side (IEC 60529) standard	IP40

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Mechanical and Environmental Data, Miscellaneous

Vibration (IEC 68-2-6, Test Fc)	20 g / 20 bis 2000 Hz / sine waveform
Shock (IEC 68-2-27, Test Ea)	75 g / 6 ms / halfsine
Housing diameter / length	22 mm
Housing depth	11.73 mm
Shaft diameter	6 mm, 6.35 mm, 3.175 mm
Shaft type	Solid shaft
Max. radial load	< 1 N
Max. shaft load	< 8.9 N (sleeve bearing) / < 4.4 N (ball bearing)
Connection type	Molex coupling
Connection position	Radial
Sensor mounting	Bushing
Mass	app. 13 g
Fastening parts included in delivery	Hex nut and tooth washer
Fastening torque mounting nut	< 2.25 Nm
Material shaft	Stainless steel with sleeve bearing Brass with ball bearing
Material housing	Plastic
Material disc	Mylar
Immunity ESD, human body model (MIL-STD-883, Method 3015.8)	± 7 kV (TTL) / ± 12 kV (Line Driver)

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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Order code

>>> The shaft length depends on the shaft diameter and the shaft bearing. Please refer to the table in the drawing - next page - for the shaft length. <<<

Description	Selection: standard=black/bold , possible <i>options=grey/italic</i>					
Series	SPE					
Shaft diameter, shaft length: <i>Option Ø3.17 mm (1/8") x length</i> Standard: Ø6 mm x length Standard: Ø6.35 mm (1/4") x length <i>Option shaft length in mm</i> <i>Option shaft length in mm (≤6.35 mm)</i>						
		3,17				
		6				
		6,35				
		<i>x,xx</i>				
		<i>DMx,xx</i>				
Resolution in pulses per revolution: Standard: 100 ppr. <i>Option 108 ppr.</i> <i>Option 120 ppr.</i> <i>Option 125 ppr.</i> <i>Option 128 ppr.</i> <i>Option 200 ppr.</i> <i>Option 250 ppr.</i> <i>Option 256 ppr.</i> <i>Option 300 ppr.</i> Standard: 360 ppr. <i>Option 400 ppr.</i> <i>Option 500 ppr.</i> <i>Option 512 ppr.</i> <i>Option 720 ppr.</i> <i>Option 800 ppr.</i> <i>Option 1000 ppr.</i>						
				100		
				<i>108</i>		
				<i>120</i>		
				<i>125</i>		
				<i>128</i>		
				<i>200</i>		
				<i>250</i>		
				<i>256</i>		
				<i>300</i>		
				360		
				<i>400</i>		
				<i>500</i>		
				<i>512</i>		
				<i>720</i>		
				<i>800</i>		
				<i>1000</i>		
Supply voltage: Standard: 5 V					5	
Output signal: Standard: A+B						B
Output electronics: Standard: TTL <i>Option Line Driver differential</i>						TTL <i>N</i>
Bearing: Standard: Sleeve bearing with increased torque 0.4 ±0.1 Ncm Standard: sleeve bearing with low torque 0.2 Ncm <i>Option: ball bearing with very low torque 0.01 Ncm</i>						- NT <i>KL</i>

Order example SPE

Requirement:

Shaft diameter 6 mm, resolution 100 pulses per revolution, supply voltage 5 V, 2 channels A+B, output electronics TTL, sleeve bearing with increased torque 0.4 ±0.1 Ncm

Example for order code: SPE 6 100 5 B TTL

For higher quantities or on-going demand, additional options are available as described below

- Special connector and cable design

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Drawing

Technical drawing showing front, side, and detail views of the optical incremental encoder. Dimensions are in mm.

Dimensions:

- Front view: $\Phi 22$ (outer diameter), 14.61 (width), 12.83 (height)
- Side view: B (total length), C (bearing length), $\Phi A H7 g6$ (shaft diameter)
- Detail view (left): 10.46 (total height), 7.92 (housing height), 2.79 (connector height), 0 (reference), 1.27 (thread length), 8.10 (thread length), $\Phi 17.74$ (thread diameter), 3/8-32 THREAD
- Detail view (right): PIN 1 (output pin)

Accessories:

- NUT (INCLUDED)
- STAR WASHER (INCLUDED)

	A	B	C
SLEEVE BEARING	$\Phi 3,17$	18,54	8.89
	$\Phi 6$	18,54	8.89
	$\Phi 6,35$	18,54	9.53
BALL BEARING	$\Phi 3,17$	18,80	9.53
	$\Phi 6$	18,42	9.53
	$\Phi 6,35$	18,42	9.53

Dimensions in mm

Connection diagram		
	TTL	Line Driver
PIN 1	+5 VDC	Ground
PIN 2	Channel A	Channel A
PIN 3	GND	Channel A/
PIN 4	Channel B	+5 VDC
PIN 5	not existing	Channel B
PIN 6	not existing	Channel B/

Output waveform

A leads B for clockwise shaft rotation (view onto the shaft end)

Timing diagram showing A phase and B phase square waves. A phase leads B phase.

Matting Connector:

- Housing: Molex# 51021-0400
- Pins: Molex # 50079-8100

Accessories:

- Accessory not included in delivery: Matting connector with 500 mm AWG28 leads