

# Data Sheet for Angle Sensors

## Optical incremental Encoder

Series PP



- Optical resolution until 10.000 pulses per revolution
- Only 16.51 mm housing depth
- Sleeve bearing or ball bearing
- 6 mm or 6.35 mm shaft diameter
- 2 channels + index
- Supply voltage 5 VDC
- Output electronics TTL, line driver
- Electrical connection plug with latch
- Temperature range -25 °C up to 100 °C

The PP is a shaft encoder with a very high optical resolution. The secure electrical connection of the signal cable, based on a connector with latch, is worthy of note. A choice of sleeve or ball bearings and three different operating torques complete the positive picture.

Electrical Data	TTL	Line Driver
Output signal	5 V A, B (option A, B, Z-Index)	differential 5 V -
Number of pulses	1000..10000 pulses per rev. (other resolutions on request)	
Output voltage high	≥ 2 V @ IOH = -5 mA max. ≥ 4000 ppr. (3.5 V typ. @ no load ≥ 4000 ppr.)	≥ 2.4 V @ -20 mA load (3.4 V typ. @ no load)
Output voltage low	≤ 0.5 V @ IOL = 5 mA max. ≥ 4000 ppr. (0.25 V typ. @ no load ≥ 4000 ppr.)	≤ 0.4 V @ 20 mA load (0.22 V typ. @ no load)
Differential output voltage	-	≥ 3.0 V @ RL = 100 Ω (typ. 3.8 V)
Limit frequency	300 kHz	
Supply voltage	5 VDC ±10 %	
Power consumption (no load)	≤ 85 mA (typ. 72 mA) @ ≥ 4000 ppr.	≤ 88 mA (typ. 74 mA) @ ≥ 4000 ppr
Output capacity (per channel)	-5 min. / 5 max. mA @ ≥ 3600 ppr.	-
Output electronics	TTL	Line driver
Switch-on delay	50 ns (rise time) / 50 ns (fall time) @ ≥ 4000 ppr.	15 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	10.000 rev./min
Max. acceleration	
Sleeve bearing or ball bearing	250000 rad/sec <sup>2</sup>
Operational torque @ RT 1.) 2.)	
Sleeve bearing smooth running (option NT)	0.2 Ncm
Sleeve bearing with increased torque	0.3 ±0.2 Ncm
Ball bearing (option KL)	0.04 Ncm

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## Mechanical and Environmental Data, Miscellaneous

Operating temperature range	-25 °C up to +100 °C @ $\geq 3600$ ppr.
Storage temperature range	40 °C up to 100 °C
Protection grade shaft side (IEC 60529) standard	IP40
Vibration (IEC 68-2-6, Test Fc)	20 g / 5 bis 2000 Hz / sine waveform
Housing diameter / length	56.39 mm / 76.2 mm
Housing depth	16.51 mm
Shaft diameter	6 mm, 6.35 mm
Shaft type	Solid shaft
Max. radial load	< 1 N
Max. axial load	< 8.9 N (sleeve bearing) / < 4.4 N (ball bearing)
Connection type	Molex plug
Connection position	Radial
Sensor mounting	Bushing
Mass:	
With TTL electronics	ca. 55 g sleeve bearing / ca. 50 g ball bearing
With line driver electronics	ca. 57 g sleeve bearing / ca. 53 g ball bearing
Fastening parts included in delivery	Hex nut and tooth washer
Fastening torque mounting nut	< 2.25 Nm
Material shaft	Stainless steel
Material housing	Plastic
Material disc	Mylar
Immunity ESD IEC 61000-4-2 Human Body Model	
With TTL electronics	$\pm 4$ kV
With line driver electronics	$\pm 2$ kV

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## Order Code

Description	Selection: <b>standard=black/bold</b> , possible <i>options=grey/italic</i>						
<b>Series:</b>	<b>PP</b>						
<b>Shaft diameter, shaft length*:</b> <b>Ø6 mm x length depends on type</b> <i>Option Ø6.35 mm (1/4") x length depends on type</i> <i>Option Shaft length in mm</i> <i>Option Shaft diameter in mm (≤6.35 mm)</i>		<b>6</b> <i>6,35</i> <i>Ax,xx</i> <i>DMx,xx</i>					
<b>Resolution in pulses per revolution:</b> <i>Option 1000 ppr.</i> <i>Option 2048 ppr.</i> <b>4000 ppr.</b> <i>Option 4096 ppr.</i> <i>Option 5000 ppr.</i> <b>7200 ppr.</b> <i>Option 8000 ppr.</i> <i>Option 8192 ppr.</i> <i>Option 10000 ppr.</i>			<i>1000</i> <i>2048</i> <b>4000</b> <i>4096</i> <i>5000</i> <b>7200</b> <i>8000</i> <i>8192</i> <i>10000</i>				
<b>Supply voltage:</b> <b>5 V</b>				<b>5</b>			
<b>Output signal:</b> <b>A+B</b> <i>Option A+B+Z-Index</i>					<b>B</b> <i>BZ</i>		
<b>Output electronics:</b> <b>TTL</b> <i>Option line driver differential</i>						<b>TTL</b> <i>N</i>	
<b>Bearing:</b> <b>Sleeve bearing with increased torque (0.3 ±0.2 Ncm)</b> <i>Option Sleeve bearing with low torque (0,2 Ncm)</i> <i>Option ball bearing very low torque (0,04 Ncm)</i>							- <i>NT</i> <i>KL</i>

\*The shaft length depends on the shaft diameter and the shaft bearing. Regarding the shaft length please refer to the table on the next page.

## Order example PP:

### Requirement:

Shaft diameter 6 mm, resolution 4000 pulses per revolution, supply voltage 5 V, 2 channels A+B, output electronics TTL, sleeve bearing with increased torque

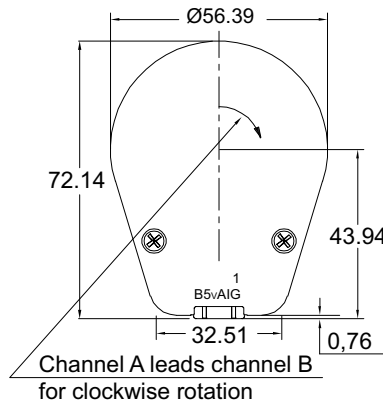
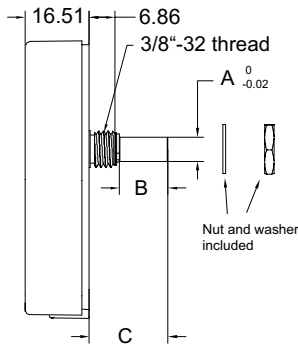
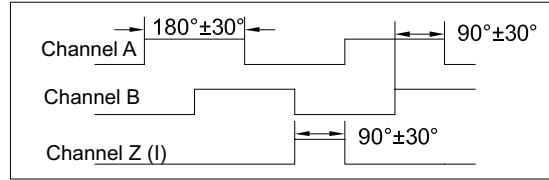
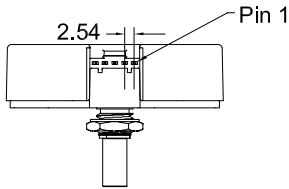
**Example for order code:** PP 6 4000 5 B TTL

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

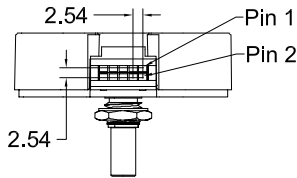
- Special connector and cable design

### Drawing

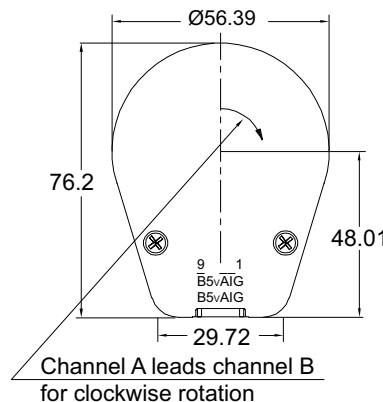
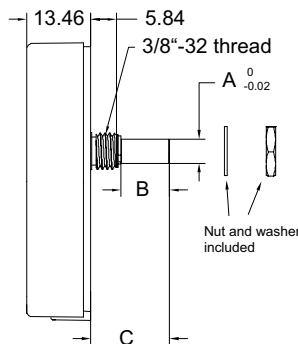
Single Ended TTL



Differential Line Driver



	A	B	C
1/4" sleeve bearing [mm]	6.35	12.7	20.57
1/4" ball bearing [mm]	6.35	12.45	20.3
6 mm sleeve bearing [mm]	6	11.94	20.57
6 mm ball bearing [mm]	6	12.45	20.3



	Connection diagram	
	TTL	Line Driver
PIN 1	GND	Ground
PIN 2	Index Z (I)	Ground
PIN 3	Channel A	Index- Z (I)
PIN 4	+5 VDC	Index+ Z (I)
PIN 5	Channel B	Channel -A
PIN 6	not-existent	Channel +A
PIN 7	not-existent	+5 VDC
PIN 8	not-existent	+5 VDC
PIN 9	not-existent	Channel -B
PIN 10	not-existent	Channel +B

Dimensions in mm

#### Recommendations for connectors (MOLEX article numbers)

##### For TTL output (gold plated contacts):

- Plug 14-56-7052 (AWG22)
- Plug 14-60-0052 (AWG24)
- Plug 14-60-0054 (AWG26)
- Plug 14-60-0056 (AWG28)

##### For line driver output:

- Plug 15-04-5104 with 2 inlets
- 14-56-3054 (AWG24, 0,38µm Gold plated) or
- 14-56-4051 (AWG24, 0,76µm Gold plated)