

# 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°..100° C

The PP is a shaft encoder, which offers a very high optical resolution. Remarkable is the secure electrical connection of the signal cable based on a plug with latch. The possibility to choice between sleeve bearing and ball bearing and between three different operating torques complete the positive overall picture.

Electrical Data	TTL	Line Driver
Output signal	5 V A, B (option A, B, Z-Index)	differential 5 V A, /A, B, /B (option A, /A, B, /B, Z)
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..+100 °C @ $\geq$ 3600 ppr.
Storage temperature range	40..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: standard=black/bold, possible options=grey/cursive					
<b>Series:</b>	<b>PP</b>						
<b>Shaft diameter, shaft length</b> >>> The shaft length depends on the shaft diameter and the shaft bearing. Regarding the shaft length please refer to the table on the following page. <<< <b>Standard: Ø6 mm x length (length depends on shaft diameter and bearing)</b> <i>Standard: Ø6.35 mm (1/4") x length (length depends on shaft diameter and bearing)</i> <i>Option Shaft length in mm</i> <i>Option Shaft diameter in mm (≤6.35 mm)</i>	<b>6</b>  6,35  <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>Standard: 4000 ppr.</b> <i>Option 4096 ppr.</i> <i>Option 5000 ppr.</i> <b>Standard: 7200 ppr.</b> <i>Option 8000 ppr.</i> <i>Option 8192 ppr.</i> <i>Option 10000 ppr.</i>			1000 2048 <b>4000</b> 4096 5000 <b>7200</b> 8000 8192 10000				
<b>Supply voltage:</b> <b>Standard: 5 V</b>				<b>5</b>			
<b>Output signal:</b> <b>Standard: A+B</b> <i>Option A+B+Z-Index</i>					<b>B</b> <i>BZ</i>		
<b>Output electronics:</b> <b>Standard: TTL</b> <i>Option line driver differential</i>						<b>TTL</b> <i>N</i>	
<b>Bearing:</b> <b>Standard: 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>

## 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

For example:

- Other number of pulses: 64, 100, 200, 400, 512, 1024, 1800, 2000, 2500, 3600 pulses per revolution
- Special shaft design
- Special torque
- Special connector and cable design

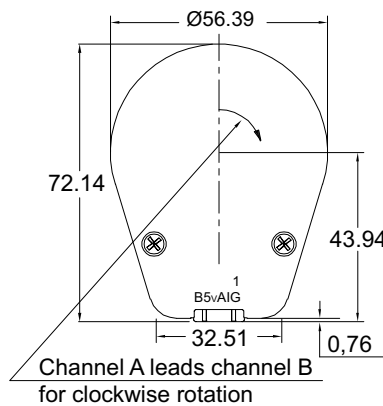
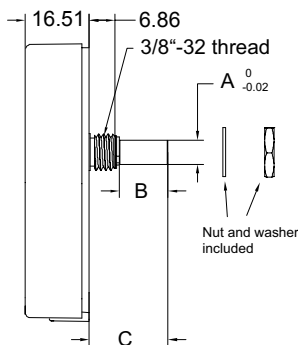
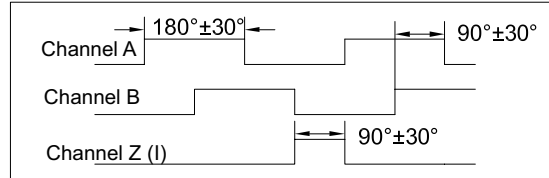
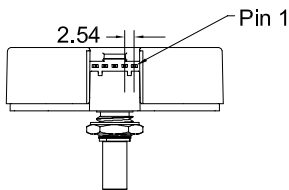
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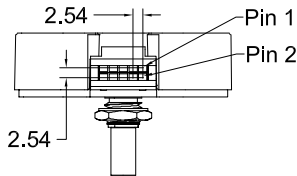
Series PP

## Technical Drawing

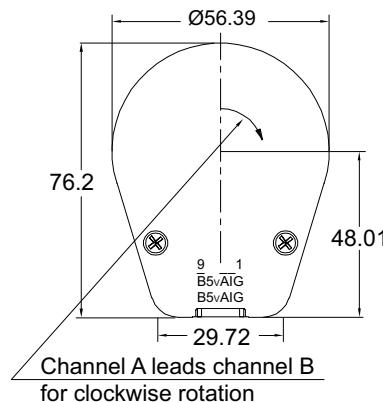
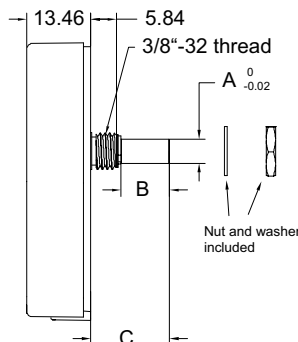
Single Ended TTL



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)	
<b>For TTL output (gold plated contacts):</b>	<b>For line driver output:</b>
Plug 14-56-7052 (AWG22)	Plug 15-04-5104 with 2 inlets 14-56-3054 (AWG24, 0,38µm Gold plated) or 14-56-4051 (AWG24, 0,76µm Gold plated)
Plug 14-60-0052 (AWG24)	
Plug 14-60-0054 (AWG26)	
Plug 14-60-0056 (AWG28)	