

J1 Line Shafted rotary position sensor J158 / J150 / J140 / J130 Shafted ; Brief / 1 of 2

# SHAFTED ROTARY POSITION SENSORS

# **J1 LINE SHAFTED ROTARY ENCODERS**

Joral manufactures J1 Line shafted rotary position sensors for the market of controls, power equipment, hydraulics, and off road vehicles.

The J1 shafted rotary position sensor marries a unique mechanical design with the latest in magnetic sensing technologies to provide a sensor that will survive in the most extreme real world environments.

- Rugged duty, bullet proof hardware (MIL STD 202)
- Totally encapsulated electronics & sealed bearings (IP67)
- Unique Captive Shaft Design
- Standard housings as well as application specific pages (standard housings 30mm, 40mm, 50mm, 58mm)
- LED indicators provide live feedback for power and output



### **UNIQUE CAPTIVE SHAFT DESIGN**

J1 Line sensor's shaft and bearing package is designed captive to provide extreme resistance to shaft push out forces.

- Solid aluminum body design
- Dual chrome steel ball bearings and heavy clamp ring captive shaft design
- · Simple mechanical design with minimum moving components
- Designed to withstand drop onto shaft and shaft push-out forces

# TOTALLY ENCAPSULATED ELECTRONICS

The J1 Line's electronics are 100% sealed in an automotive grade potting compound

- Provides protection from shock, vibration, and direct impact, as well as external contaminants and moisture
- · Clear compound allows LED indicators to be clearly viewed for live feedback

## **AT-A-GLANCE SPECIFICATIONS**

**Connection options include but not limited to:** M12, M12 Pigtail, M8, Terminal Block, Flying Lead Cable, and various Deutsch connectors

### Available Incremental Outputs:

- Quadrature Single Ended
- Quadrature Differential
- Step and Direction
- J1939 CAN Bus

### **Available Absolute Position Outputs:**

- SSI (Synchronous serial interface)
- Analog or Current Output
- PWM (Pulse width modulation)
- J1939 CAN Bus
- Modicon MODBUS

### ZERO POWER Multi-turn Capable Contact Joral for available Zero Power options



J150

J140

J130



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# SHAFTED ROTARY POSITION SENSORS

# **STANDARD OPERATING CHARACTERISTICS**

Encoder Output	Resolution	CHARACTERISTICS
Quadrature Single Ended Incremental Output	8 to 2048 PPR - Standard Resolutions: 8, 10, 16, 20, 32, 40, 50, 64, 80, 100, 125, 128, 200, 250, 256, 400, 500, 512, 1024, 2048	Format: Two channel quadrature A and B outputs with index pulse Z Driver: 7272 push-pull driver
Quadrature Differential Incremental Output	<b>8 to 2048 PPR -</b> Standard Resolutions: 8, 10, 16, 20, 32, 40, 50, 64, 80, 100, 125, 128, 200, 250, 256, 400, 500, 512, 1024, 2048	Format: Two channel quadrature A and B outputs with index pulse Z and complementary outputs A', B', and Z' Driver: 7272 push-pull driver
Step and Direction Incremental Output	<b>16 to 512 PPR -</b> Standard Resolutions: 16, 32, 64, 128, 256, 512	Format: One channel STEP output and one channel DIRECTION output with Index pulse Z Driver: 7272 push-pull driver
SSI Absolute Position Output Absolute Output	<b>8192 Positions</b> 0.0439 degrees per position	Format: Clock and data output Driver: Differential Output
<b>PWM Absolute Position Output</b> Absolute Output	1024 or 2048 Positions	<b>Format:</b> Pulse Width Modulation in 1 µsec increments <b>Driver:</b> 7272 push-pull driver
Analog Voltage Absolute Position Absolute Output	<b>0 to 5 VDC</b> -OR- <b>4 to 20 mA</b> 10 bit internal resolution	Format: Output Voltage/Current proportional to 0-360 degrees Output Loading: 10mA max
J1939 CAN Bus Absolute or Incremental Output	<b>1000 or 8192 Positions -</b> see J1939 output pages for message information	Format: Standard SAE J1939 CAN Bus - One message for status, one message for settings

### **ELECTRICAL SPECIFICATIONS**

Input Power6 to 30 VDC at approximately 60mA max, not including output loadsElectrical ProtectionOver-voltage, Reserve-voltage, Output short-circuit protectedLED IndicatorsPower and output channel statusConnection TypesM8, M12, M12 on pigtail, Terminal block, Flying lead cable, Deutsch - 4 or 6 pin

## **ENVIRONMENTAL SPECIFICATIONS**

<b>Operating Temperature</b>	-30 to +80 degrees C		
Storage Temperature	-40 to +100 degrees C		
Humidity	100%		
Vibration	5 to 3000 Hz, 20g (MIL STD 202)		
Shock	400g 6msec (MIL STD 202)		
Sensor Sealing	IP67 (connector Dependant) **Terminal block not IP rated**		

## **MECHANICAL SPECIFICATIONS**

Housing Diameter30mm, 40mm, 50mm, 58mmHousing MaterialAluminumStandard Shaft Diameter6mm (w/ flat spot)Standard Shaft Length0.411 inches (10.44mm)Shaft MaterialNon-magnetic stainless steelBearingsDual chrome ball-bearingsMax Speed3000 RPM

Model	HOUSING DIAM.	Weight	Ныднт	Ныднт w/ M12
J130	30mm	4 oz	1.49 inches (37.85mm)	2.15 inches (54.6mm)
J140	40mm	4 oz	1.7 inches (43.2mm)	2.13 inches (54.1mm)
J150	50mm	6 oz	1.53 inches (38.86mm)	2.08 inches (52.8mm)
J150 [63]	50mm w/ flange	7 oz	1.53 inches (38.86mm)	2.08 inches (52.8mm)
J158	58mm	8 oz	1.55 inches (39.4mm)	2.1 inches (53.3mm)



Top view of sensor displaying LED pack and colors

Shafted J140 w/

shell removed displaying total encapsulation





Shafted rotary position sensor

J130/J140 General Specifications

Shafted ; J130/J140 / 1 of 4

# SHAFTED ROTARY POSITION SENSORS

### **J130/J140 J1 Line** shafted rotary position sensor

- Multiple shaft and connector options available
- Shaft and captive bearing package resistant to shaft push out forces, withstands extreme mechanical vibration
- Extremely compact, J1939 capable
- LED indicators for power and output feedback
- 100% moisture resistant electronic package (IP67)
- Outputs: Quadrature, Step and Direction, SSI, PWM, Analog, Modicon MODBUS, & J1939 Can Bus

Above: 40mm Shafted (J140) Below: 30mm Shafted (J130)

## STANDARD OPERATING CHARACTERISTICS

Outputs         A - (PPR) - SEPP         Incremental 13 bit Quadrature w/ Single Ended Output   A B Z           A - (PPR) - DIPP         Incremental 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           A - 1939         J1939 13 bit Quadrature w/ Differential Output   A B Z & A' B'Z'           Y         Voltage Out / 6-36 VDC IN           Y         Voltage Out / 6-36 VDC OUT           Y         Voltage Out / 6-36 VDC IN, 0-5 VDC OUT           Y         Voltage Out / 6-36 VDC IN, 0-5 VDC OUT           Input Power         6 to 30 VDC at approx 60 mA max, not including output loads           Electrical Protection         Ouer-voltage, reserve-voltage, output short-circuit protected			
A - 1939       J1939 13 bit © 1000 positions (8192 positions max)         B - PWM       PWM absolute position         A - 531       S51 absolute position @ 8192 positions         VI       Voltage Out / 5 VDC IN, 0-5 VDC OUT         V2       Voltage Out / 5 VDC IN, 0-5 VDC OUT         Input Power       6 to 30 VDC at approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49° body; 2.15° w/ M12 (and) J140 - 1.7° body; 2.13° w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       Gorm w/ flat, 1/4° (0.250°) w/ flat, 10mm round, 3/8° slotted         Shaft Terral       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         <	ΕΙΕΛΤΡΙΟΛΙ		
B - PWM         PWM absolute position           A - SS11         SS1 absolute position @ 8192 positions           V1         Voltage Out / 5 VDC IN, 0-5 VDC OUT           V2         Voltage Out / 6-36 VDC IN, 0-5 VDC OUT           Input Power         6 to 30 VDC at approx 60 mA max, not including output loads           Electrical Protection         Over-voltage, reserve-voltage, output short-circuit protected           LED Indicators         Power and output channels           Connections         Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin           Resolution         0.3°           Repeatability         0.30%           Nonlinearity         <1%           Housing Diameter         30mm (J130) or 40mm (J140)           Housing Ing Height         J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12           Mounting         Mounting holes or servo groove           Weight         J130 & J140 - 4 oz           Shaft Form Factor         6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted           Shaft Speed         3000 RPM max           Operating Temperature         -30" to +80° C           Storage Temperature         -30" to +80° C           Storage Temperature         -40" to +90° C           Humidity<	ELECTRICAL	A - [PPR] - DIPP	Incremental 13 bit Quadrature w/ Differential Output   A B Z & A' B' Z'
A - SSI       SSI absolute position @ 8192 positions         V1       Voltage Out / 5 VDC IN, 0-5 VDC OUT         V2       Voltage Out / 6 -36 VDC IN, 0-5 VDC OUT         Input Power       6 to 30 VDC at approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49° body; 2.15″ w/ M12 (and) J140 - 1.7″ body; 2.13″ w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mr w/ flat, Extended 6mm w/ flat, 1/4″ (0.250″) w/ flat, 10mm round, 3/8″ slotted, Extended 3/8″ slotted         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to 99° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)	_	A - 1939	J1939 13 bit @ 1000 positions (8192 positions max)
V1       Voltage Out / 5 VDC IN, 0-5 VDC OUT         V2       Voltage Out / 6-36 VDC IN, 0-5 VDC OUT         11       Current Out / 0-24 VDC IN, 4-20 mA OUT         Input Power       6 to 30 VDC at approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting hodes or serve groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100% <th>_</th> <th>B - PWM</th> <th>PWM absolute position</th>	_	B - PWM	PWM absolute position
V2       Voltage Out / 6-36 VDC IN, 0-5 VDC OUT         Input Power       6 to 30 VDC 4 approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       Gmm w/ flat, Extended 5/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 RP.20g (MIL STD 202)	_	A - SSI1	SSI absolute position @ 8192 positions
In Current Out / 0-24 VDC IN, 4-20 mA OUT         Input Power       6 to 30 VDC at approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49° body; 2.15″ w/ M12 (and) J140 - 1.7″ body; 2.13″ w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4″ (0.250″) w/ flat, 10mm round, 3/8″ slotted, Extended 3/8″ slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration <td< th=""><th>_</th><th>V1</th><th>Voltage Out / 5 VDC IN, 0-5 VDC OUT</th></td<>	_	V1	Voltage Out / 5 VDC IN, 0-5 VDC OUT
Input Power       6 to 30 VDC at approx 60 mA max, not including output loads         Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Speed       3000 RPM max         Operating Temperature       -30" to +80" C         Storage Temperature       -30" to +80" C         Storage Temperature       -40" to +90" C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	_	V2	Voltage Out / 6-36 VDC IN, 0-5 VDC OUT
Electrical Protection       Over-voltage, reserve-voltage, output short-circuit protected         LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30" to +80" C         Storage Temperature       -40" to +90" C         Humidity       100%         Shock       400g/6ms (MIL STD 202)	_	I1	Current Out / 0-24 VDC IN, 4-20 mA OUT
LED Indicators       Power and output channels         Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 + 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 + 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 + 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & 4.02         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted.         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       30000 RPM max         Operating Temperature       -30° to +80° C	_	Input Power	6 to 30 VDC at approx 60 mA max, not including output loads
Connections       Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin         Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	_	Electrical Protection	
Image: Resolution       0.3°         Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49° body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	_	LED Indicators	Power and output channels
Repeatability       0.30%         Nonlinearity       <1%         Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)			
Nonlinearity       <1%         MECHANICAL       Housing Diameter       30mm (J130) or 40mm (J140)         Housing Material       Aluminum         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	Resolution		0.3°
MECHANICALHousing Diameter30mm (J130) or 40mm (J140)Housing MaterialAluminumHousing HeightJ130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12MountingMounting holes or servo grooveWeightJ130 & J140 - 4 ozShaft Form Factor6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slottedShaft MaterialNon-magnetic stainless steelBearing MaterialDual chrome ball-bearingsShaft Speed3000 RPM maxOperating Temperature-30° to +80° CStorage Temperature-40° to +90° CHumidity100%Shock400g/6ms (MIL STD 202)Vibration5 to 3000 Hz, 20g (MIL STD 202)		Repeatability	0.30%
MECHANICALHousing MaterialAluminumHousing MeterialAluminumHousing HeightJ130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12MountingMounting holes or servo grooveWeightJ130 & J140 - 4 ozShaft Form Factor6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slottedShaft MaterialNon-magnetic stainless steelBearing MaterialDual chrome ball-bearingsShaft Speed3000 RPM maxOperating Temperature-30° to +80° CStorage Temperature-40° to +90° CHumidity100%Shock400g/6ms (MIL STD 202)Vibration5 to 3000 Hz, 20g (MIL STD 202)	Nonlinearity		<1%
Housing Material       Addition         Housing Height       J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12         Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)		Housing Diameter	30mm (J130) or 40mm (J140)
Mounting       Mounting holes or servo groove         Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	MECHANICAL	Housing Material	Aluminum
Weight       J130 & J140 - 4 oz         Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	_	Housing Height	J130 - 1.49" body; 2.15" w/ M12 (and) J140 - 1.7" body; 2.13" w/ M12
Shaft Form Factor       6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)	_	Mounting	Mounting holes or servo groove
3/8" slotted, Extended 3/8" slotted         Shaft Material       Non-magnetic stainless steel         Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)		Weight	J130 & J140 - 4 oz
Bearing Material       Dual chrome ball-bearings         Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)		Shaft Form Factor	
Shaft Speed       3000 RPM max         Operating Temperature       -30° to +80° C         Storage Temperature       -40° to +90° C         Humidity       100%         Shock       400g/6ms (MIL STD 202)         Vibration       5 to 3000 Hz, 20g (MIL STD 202)		Shaft Material	Non-magnetic stainless steel
Operating Temperature         -30° to +80° C           Storage Temperature         -40° to +90° C           Humidity         100%           Shock         400g/6ms (MIL STD 202)           Vibration         5 to 3000 Hz, 20g (MIL STD 202)		Bearing Material	Dual chrome ball-bearings
ENVIRONMENTAL         Storage Temperature         -40° to +90° C           Humidity         100%           Shock         400g/6ms (MIL STD 202)           Vibration         5 to 3000 Hz, 20g (MIL STD 202)		Shaft Speed	3000 RPM max
Humidity         100%           Shock         400g/6ms (MIL STD 202)           Vibration         5 to 3000 Hz, 20g (MIL STD 202)		<b>Operating Temperature</b>	-30° to +80° C
Shock         400g/6ms (MIL STD 202)           Vibration         5 to 3000 Hz, 20g (MIL STD 202)	ENVIRONMENTAL	Storage Temperature	-40° to +90° C
Vibration         5 to 3000 Hz, 20g (MIL STD 202)		Humidity	100%
		Shock	400g/6ms (MIL STD 202)
Protection Class IP67 (connection dependent)		Vibration	5 to 3000 Hz, 20g (MIL STD 202)
		Protection Class	IP67 (connection dependent)

General ordering guide found on next page (S1; I2 / 2)



#### J1 Line Shafted rotary position sensor

J130/J140 General Ordering Guide

#### Shafted ; J130/J140 / 2 of 4

# SHAFTED ROTARY POSITION SENSORS

### J130/J140 GENERAL ORDERING GUIDE

Build part number first by selecting Housing Style (code 1), MagElec (code 2), and Connection (code 3). Add Special Codes (code 4) to the end of the Joral part number. Refer to 'Special Part Number Information' for explanation of modifiers.

Examples: J130-A-0512-SEPP-M12-42 - 30mm Red aluminum (J130), 3/8" slotted shaft (modifier 42), 13 bit incremental quadrature @ 512 PPR

J140-A-1939-SC72-90 - 40mm Red aluminum (J140), 72" Shielded cable (SC72), 13 bit J1939 @ 8192 counts per rotation (modifier 90)

J130-V1-0-270-0-5-CW-C72 - Red aluminum (J130), 72" Cable (C72), 5v input (V1) @ 0-270°, 0v to 5v out, clockwise direction (CW)

Code 1: Housing Style	Code 2: MagElec (Sensor Output)		Code 3: Connection		Code 4: Special Codes	
J130	A SEPP		TRM	Pluggable Terminal block	40	1/4" (0.250") w/ flat
J130 = 30mm shafted made out of		quadrature - A B Z	INS	Wire insertion terminal	41	10mm round
red aluminum, Connector orientation BACK EXIT only.	A DIPP	13 bit differential	M8	M8 male	42	3/8" slotted
		quadrature - A B Z, A' B' Z'	M12	M12 male	43	Extended 3/8" slotted
J140	A - 1939	13 bit J1939	M12P	M12 male on 18' pigtail	44	Extended 6mm w/ flat
J140 = 40mm shafted made out of red aluminum, Connector orientation BACK EXIT only.	@ 1000 po	@ 1000 positions	СХХ		45	6mm w/ flat
	B - PWM	Absolute position PWM		(enter XX as inches)	51	Red aluminum
	A - SSI1	Absolute position SSI	SCXX		53	Black aluminum
		@ 8192 positions		(enter XX as inches)	90	13 bit @ 8192 counts
* More outputs and connection	V1	5 VDC IN, 0-5 VDC OUT	CSP	Cable with custom end		per rotation
options available, contact Joral if	V2	6-36 VDC IN, 0-5 VDC OUT	DE4	DT04 - 4 pin male Deutsch		(Typical J1939 option)
desired configuration is not listed	l1	0-24 VDC IN, 4-20 mA OUT	DE6	DT04 - 6 pin male Deutsch		

Special Part Number Information Review below code sections for important P/N build information

#### **Code 1: Housing Style**

• J130 - 30mm, Red aluminum / Back exit connections only

• J140 - 40mm, Red aluminum / Back exit connections only

Code 2: MagElec					
(A SEPP) or (A DIPP)	A - 1939	V1, V2, and I1 (Analog MagElec P/N Guide)			
<ul> <li>Enter Quadrature PPR in place of</li> </ul>	<ul> <li>Standard J1939 output is 1000 positions</li> <li>A = 13 bit</li> </ul>	<ul> <li>First select MagElec code (V1, V2 or I1) then Angle Range (A1-A2), Voltage Range (VR1-VR2) and Signal Direction (Clockwise [CW] or Counter [CCW])</li> </ul>			
<ul> <li>A = 13 bit PPR</li> <li>Available 13 bit PPR: 0008, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256, 0400, 0500, 1024, 2048</li> </ul>	<ul> <li>MODIFIER 90 - for 8192 positions (max resolution) add code 90 to end of J130/J140 P/N</li> </ul>	<ul> <li>PART NUMBER FORMULA (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)</li> <li>EXACT V1, V2, and I1 EXAMPLES J130 - V1 - 0-360 - 0.5-4.5 - CW - C72 J140 - V2 - 0-180 - 0-5 - CCW - DE4 J130 - I1 - 180-270 - 4-20 - CW - M12</li> </ul>			
Codo 2. Connectio		L			

#### **Code 3: Connections**

• All Outputs, All Connections - Connector exit back exit only (sensor epoxy side) for housing style J130 and J140

- J1939 Output Addressing via varying value resistor in connection requires at least five conductors (M12, DE6 and Cables addressing compatible)
- All Outputs w/ Deutsch DE4 and DE6 connection Deutsch connectors add \$20 to J130/J140 list



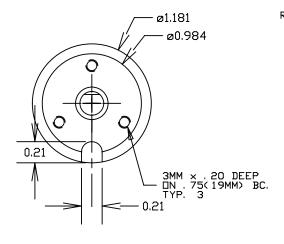
#### J1 Line

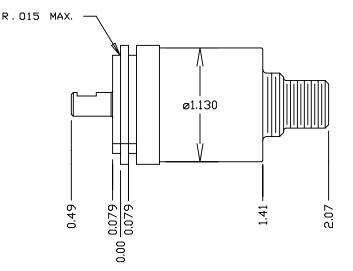
Shafted rotary position sensor J130 Dimensions & General Pin-outs

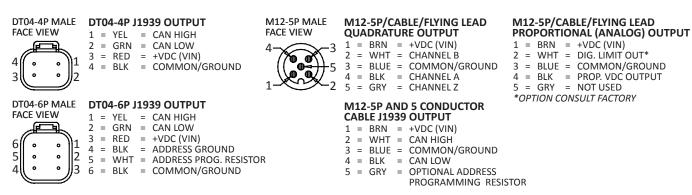
Shafted ; J130/J140 / 3 of 4

# SHAFTED ROTARY POSITION SENSORS

# **J130 DIMENSIONS & GENERAL PIN OUTS**







Dimensions informative only For most recent dimensions please consult factory



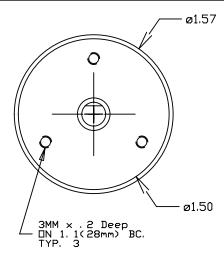
#### J1 Line

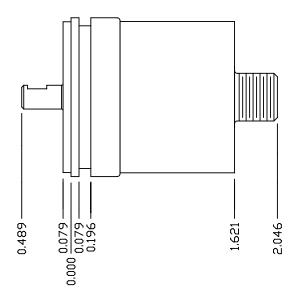
Shafted rotary position sensor J140 Dimensions & General Pin-outs

Shafted ; J130/J140 / 4 of 4

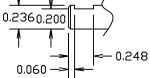
# SHAFTED ROTARY POSITION SENSORS

### **J140 DIMENSIONS & GENERAL PIN OUTS**





6MM SHAFT WITH FLAT



M12-5P MALE

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FACE VIEW

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### M12-5P/CABLE/FLYING LEAD PROPORTIONAL (ANALOG) OUTPUT

- 1 = BRN = +VDC (VIN)
- 2 = WHT = DIG. LIMIT OUT\*
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = PROP. VDC OUTPUT
- 5 = GRY = NOT USED \*OPTION CONSULT FACTORY

#### M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

M12-5P/CABLE/FLYING LEAD

3 = BLUE = COMMON/GROUND

QUADRATURE OUTPUT

1 = BRN = +VDC(VIN)

2 = WHT = CHANNEL B

4 = BLK = CHANNELA

5 = GRY = CHANNELZ

- 1 = BRN = +VDC(VIN)
- 2 = WHT = CAN HIGH
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CAN LOW
- 5 = GRY = OPTIONAL ADDRESS PROGRAMMING RESISTOR

Dimensions informative only For most recent dimensions please consult factory

6

DT04-4P J1939 OUTPUT

2 = GRN = CAN LOW

DT04-6P J1939 OUTPUT

1 = YEL = CAN HIGH

2 = GRN = CANIOW

3 = RED = +VDC(VIN)

4 = BLK = ADDRESS GROUND

= WHT = ADDRESS PROG. RESISTOR

= BLK = COMMON/GROUND

= CAN HIGH

= +VDC (VIN)

4 = BLK = COMMON/GROUND

1 = YEL

3 = RED

DT04-4P MALE

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DT04-6P MALE

FACE VIEW

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FACE VIEW

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S1; l2 / 4





Shafted rotary position sensor

J150/J158 General Specifications

Shafted ; J150/J158 / 1 of 5

# SHAFTED ROTARY POSITION SENSORS

### J150/J158 J1 Line shafted rotary position sensor

- 100% moisture resistant electronic package (IP67)
- Multiple shaft and connector options available
- Shaft and captive bearing package resistant to shaft push out forces, withstands extreme mechanical vibration
- LED indicators for power and output feedback
- Incremental or Absolute position
- Outputs: Quadrature, Step and Direction, SSI, PWM, Analog, Modicon MODBUS, & J1939 Can Bus



# **STANDARD OPERATING CHARACTERISTICS**

ELECTRICAL		Incremental 13 bit Quadrature w/ Single Ended Output   A B Z
		Incremental 13 bit Quadrature w/ Differential Output   A B Z & A' B' Z'
_		J1939 13 bit @ 1000 positions (8192 positions max)
_	A - MOD1	Modicon MODBUS @ 8192 positions
_		PWM absolute position
_	A - SSI1	SSI absolute position @ 8192 positions
_	V1	Voltage Out / 5 VDC IN, 0-5 VDC OUT (code V3 for 2x redundant output)
_	V2	Voltage Out / 6-36 VDC IN, 0-5 VDC OUT
	1	Current Out / 0-24 VDC IN, 4-20 mA OUT (code I1 for 2x redundant output)
_	Input Power	6 to 30 VDC at approx 60 mA max, not including output loads
	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
_	LED Indicators	Power and output channels
_	Connections	Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
_	Resolution	0.3°
	Repeatability	0.30%
	Nonlinearity	<1%
MECHANICAL	Housing Diameter	50mm (J150) or 58mm (J158)
MECHANICAL	Housing Material	Aluminum
	Housing Height	J150 - 1.53" body; 2.1" w/ M12 (and) J158 - 1.55" body; 2.1" w/ M12
_	Mounting	Mounting holes or servo groove
	Weight	J150 - 6 oz / J158 - 8 oz
	Shaft Form Factor	6mm w/ flat, Extended 6mm w/ flat, 1/4" (0.250") w/ flat, 10mm round, 3/8" slotted, Extended 3/8" slotted
	Shaft Material	Non-magnetic stainless steel
	Bearing Material	Dual chrome ball-bearings
	Shaft Speed	3000 RPM max
	<b>Operating Temperature</b>	-30° to +80° C
ENVIRONMENTAL	Storage Temperature	-40° to +90° C
	Humidity	100%
	Shock	400g/6ms (MIL STD 202)
	Vibration	5 to 3000 Hz, 20g ( <i>MIL STD 202</i> )
-	Protection Class	IP67 (connection dependent)

General ordering guide found on next page (S1; I3 / 2)





#### J1 Line

Shafted rotary position sensor J150/J158 General Ordering Guide

Shafted ; J150/J158 / 2 of 5

# SHAFTED ROTARY POSITION SENSORS

# J150/J158 GENERAL ORDERING GUIDE

Build part number first by selecting Housing Style (code 1), MagElec (code 2), and Connection (code 3). Add Special Codes (code 4) to the end of the Joral part number. Refer to 'Special Part Number Information' for explanation of modifiers.

Examples: J150-A-0080-SEPP-M12-41 - 50mm Red aluminum (J150), 10mm round shaft (modifier 41), 13 bit incremental quadrature @ 80 PPR

J150-A-1939-SC72-90 - 50mm Red aluminum (J150), 72" Shielded cable (SC72), 13 bit J1939 @ 8192 counts per rotation (modifier 90)

J158-V1-0-180-0-5-CW-C72 - 58mm Red alu. (J158), 72" Cable (C72), 5v input (V1) @ 0-180°, 0v to 5v out, clockwise direction (CW)

Code 1: Housing Style	Code 2: MagElec (Sensor Output)		Code 3: Connection		Code 4: Special Codes	
J150	A SEPP	13 bit single ended	TRM	Pluggable Terminal block	40	1/4" (0.250") w/ flat
J150 = 50mm shafted made out of		quadrature - A B Z	INS	Wire insertion terminal	41	10mm round
red aluminum, Connector orientation BACK EXIT only.	A DIPP	13 bit differential	M8	M8 male	42	3/8" slotted
onentation back exit only.		quadrature - A B Z, A' B' Z'	M12	M12 male	43	Extended 3/8" slotted
Modifier Flange Mount:	A - 1939	13 bit J1939	M12P	M12 male on 18' pigtail	44	Extended 6mm w/ flat
Special Code - 63		@ 1000 positions	СХХ	Flying lead cable	45	6mm w/ flat
Add special code 63 to the end of	B - PWM	Absolute position PWM		(enter XX as inches)	51	Red aluminum
J150 P/N for flange mount	A - MOD1	13 bit Modicon MODBUS	SCXX	Shielded cable	53	Black aluminum
Flange drawing found on S1; I3 / 4		@ 8192 positions		(enter XX as inches)	63	Flange Mount
J158	A - SSI1	Absolute position SSI	CSP	Cable with custom end	90	13 bit @ 8192 counts
J158 = 58mm shafted made out of		@ 8192 positions	DE4	DT04 - 4 pin male Deutsch		per rotation (Typical J1939 option)
red aluminum, Connector orientation BACK EXIT only.	V1	5 VDC IN, 0-5 VDC OUT	DE6	DT04 - 6 pin male Deutsch		(Typical J 1959 Option)
Unentation BACK EXIT Only.	V2	6-36 VDC IN, 0-5 VDC OUT			91	13 bit @ 1000 counts
	V3	0-24 VDC IN, 4-20 mA OUT				per rotation (Typical MODBUS option)
		x2 (Redundant output)				
* More outputs and connection	11	0-24 VDC IN, 4-20 mA OUT				
options available, contact Joral if	12	0-24 VDC IN, 4-20 mA OUT				
desired configuration is not listed		x2 (Redundant output)				

#### Special Part Number Information Review below code sections for important P/N build information

### **Code 1: Housing Style**

- Modifier 63 For flange mount (J150 only) add code 63 to end of Joral P/N
- J150 50mm, Red aluminum / Back exit connections only
- J158 58mm, Red aluminum / Back exit connections only

### Code 2: MagElec

<ul> <li>Standard J1939 output is 1000 positions</li> <li>A = 13 bit</li> <li>Standard MOD1 output is 8192 positions</li> <li>First select MagElec code (V1, V2 or I1) then Ang Range (A1-A2), Voltage Range (VR1-VR2) and Signal Direction (Clockwise [CW] or Counter [CO</li> </ul>	(A SEPP) or (A DIPP)	A - 1939	A - MOD1	V1, V2, and I1 (Analog MagElec P/N Guide)
<ul> <li>A = 13 bit PPR</li> <li>MODIFIER 90 - for 8192 positions (max resolution) add code 90 to end of J150/J158 P/N</li> <li>MODIFIER 91 - for 1000 positions add code 91 to end of J150/J158 P/N</li> <li>EXACT V1, V2, and I1 EXAMPLES J150 - V1 - 0-360 - 0.5 - 4.5 - CW - C72 J158 - V2 - 0-180 - 0.5 - CCW - DE4 J158 - I1 - 180-270 - 4-20 - CW - M12</li> </ul>	<ul> <li>Enter Quadrature PPR in place of</li> <li>A = 13 bit PPR</li> <li>Available 13 bit PPR: 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256,</li> </ul>	<ul> <li>is 1000 positions</li> <li>A = 13 bit</li> <li>MODIFIER 90 - for 8192 positions (max resolution) add code 90 to end of</li> </ul>	<ul> <li>is 8192 positions</li> <li>A = 13 bit</li> <li>MODIFIER 91 - for 1000 positions add code 91 to</li> </ul>	Signal Direction (Clockwise [CW] or Counter [CCW])  PART NUMBER FORMULA (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)  EXACT V1, V2, and I1 EXAMPLES J150 - V1 - 0-360 - 0.5-4.5 - CW - C72 J158 - V2 - 0-180 - 0-5 - CCW - DE4

#### **Code 3: Connections**

- All Outputs, All Connections Connector exit back exit only (sensor epoxy side) for housing style J150 and J158
- J1939 Output Addressing via varying value resistor in connection requires at least five conductors (M12, DE6 and Cables addressing compatible)
- All Outputs w/ Deutsch DE4 and DE6 connection Deutsch connectors add \$20 to J150/J158 list



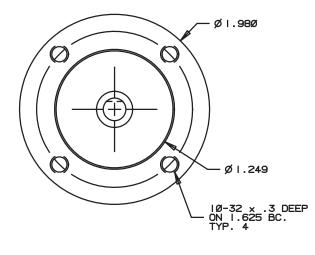
#### J1 Line

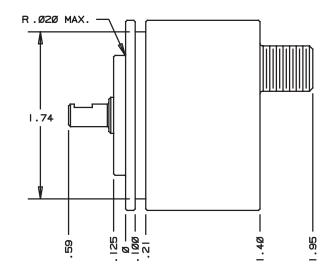
Shafted rotary position sensor J150 Dimensions & General Pin-outs

Shafted ; J150/J158 / 3 of 5

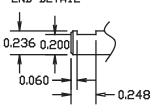
# SHAFTED ROTARY **POSITION SENSORS**

### **J150 DIMENSIONS & GENERAL PIN OUTS**





6MM SHAFT WITH FLAT END DETAIL



DT04-4P MALE FACE VIEW 4 3 • • 1 2	<b>DT04-4P J1939 OUTPUT</b> 1 = YEL = CAN HIGH 2 = GRN = CAN LOW 3 = RED = +VDC (VIN) 4 = BLK = COMMON/GROUND	M12-5P MALE FACE VIEW	M12-5P/CABLE/FLYIN         QUADRATURE OUTPU         1       =       BRN       =       +VDC (VII)         2       =       WHT       =       CHANNEL         3       =       BLUE       =       COMMOD         4       =       BLK       =       CHANNEL         5       =       GRY       =       CHANNEL
$\begin{array}{c} \text{DT04-6P MALE} \\ \text{FACE VIEW} \\ \\ 6 \\ 5 \\ 4 \\ \hline \end{array} \\ \begin{array}{c} \bullet & \bullet \\ \bullet \\ \bullet \\ 3 \end{array} \\ \begin{array}{c} \bullet \\ 1 \\ 2 \\ 3 \end{array} \\ \begin{array}{c} \end{array} \\ \end{array}$	DT04-6P J1939 OUTPUT 1 = YEL = CAN HIGH 2 = GRN = CAN LOW 3 = RED = +VDC (VIN) 4 = BLK = ADDRESS GROUND 5 = WHT = ADDRESS PROG. RESISTO 6 = BLK = COMMON/GROUND	R	M12-5P AND 5 COND CABLE J1939 OUTPUT 1 = BRN = +VDC (VII 2 = WHT = CAN HIGH 3 = BLUE = COMMOU 4 = BLK = CAN LOW 5 = GRY = OPTIONA PROGRAM

#### NG LEAD ŪŤ

IN) EL B DN/GROUND ELA

#### ELZ DUCTOR

- IT
- 'IN)
- iΗ
- N/GROUND Λ/
- - AL ADDRESS PROGRAMMING RESISTOR

#### M12-5P/CABLE/FLYING LEAD PROPORTIONAL (ANALOG) OUTPUT

- 1 = BRN = +VDC(VIN)
- 2 = WHT = DIG. LIMIT OUT\*
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = PROP. VDC OUTPUT 5 = GRY = NOT USED
- \*OPTION CONSULT FACTORY

Dimensions informative only

For most recent dimensions please consult factory



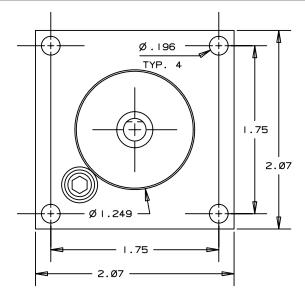


### J1 Line Shafted rotary position sensor

J150 Flange Dimensions & General Pin-outs Shafted ; J150/J158 / 4 of 5

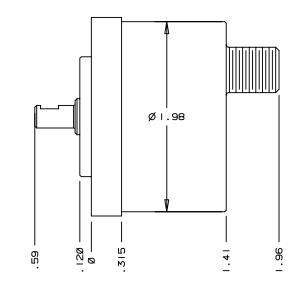
# SHAFTED ROTARY POSITION SENSORS

### **J150 FLANGE DIMENSIONS & GENERAL PIN OUTS**

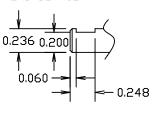


For Flange mount add special code 63 to end of Joral P/N

Example: J150-A-0080-SEPP-M12-63



6MM SHAFT WITH FLAT END DETAIL



DT04-4P MALE	DT04-4P J1939 OUTPUT	M
FACE VIEW	1 = YEL = CAN HIGH	FA
	2 = GRN = CAN LOW 3 = RED = +VDC (VIN) 4 = BLK = COMMON/GROUND	4
		1
DT04-6P MALE FACE VIEW	DT04-6P J1939 OUTPUT 1 = YEL = CAN HIGH	
6 1	2 = GRN = CAN LOW 3 = RED = +VDC (VIN) 4 = RIK = ADDRESS CROUND	
$ \begin{array}{c} 6 \\ 5 \\ 4 \\ \end{array} \begin{array}{c} \bullet & \bullet \\ \bullet & \bullet \\ \bullet & \bullet \\ \end{array} \begin{array}{c} \bullet \\ 1 \\ 2 \\ 3 \end{array} $		ЭR

Dimensions informative only For most recent dimensions please consult factory M12-5P MALE FACE VIEW



#### M12-5P/CABLE/FLYING LEAD QUADRATURE OUTPUT 1 = BRN = +VDC (VIN) 2 = WHT = CHANNEL B

- 3 = BLUE = COMMON/GROUND 4 = BLK = CHANNEL A
- 5 = GRY = CHANNELZ

#### M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

- 1 = BRN = +VDC(VIN)
- 2 = WHT = CAN HIGH 3 = BLUE = COMMON/GROUND
- 3 = BLUE = CONTINION/GROUN4 = BLK = CAN LOW
- 4 = GRY = OPTIONAL ADDRESS
  - PROGRAMMING RESISTOR

#### M12-5P/CABLE/FLYING LEAD PROPORTIONAL (ANALOG) OUTPUT

- 1 = BRN = +VDC(VIN)
- 2 = WHT = DIG. LIMIT OUT\*
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = PROP. VDC OUTPUT 5 = GRY = NOT USED
- \*OPTION CONSULT FACTORY





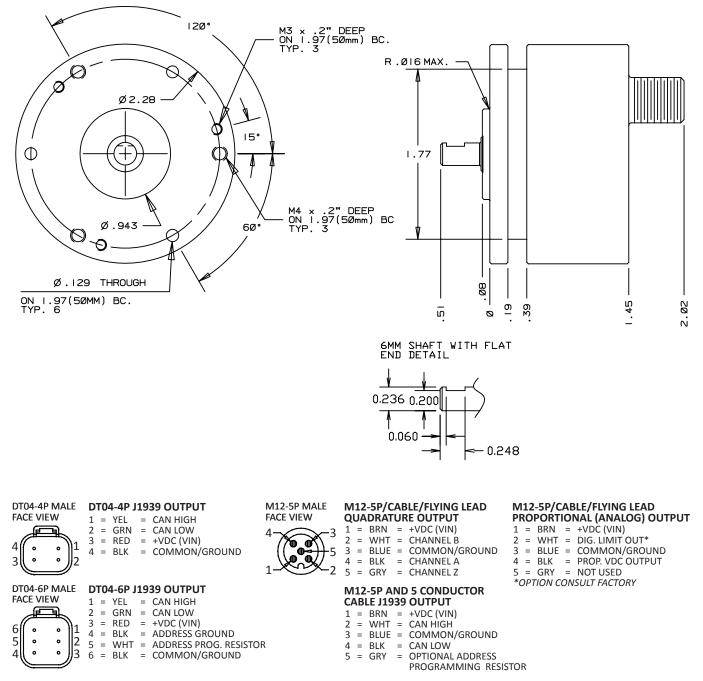
#### J1 Line

Shafted rotary position sensor J158 Dimensions & General Pin-outs

Shafted ; J150/J158 / 5 of 5

# SHAFTED ROTARY POSITION SENSORS

### **J158 DIMENSIONS & GENERAL PIN OUTS**

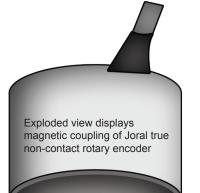


Dimensions informative only For most recent dimensions please consult factory



Hockey Puck™ & Prox Encoder™ Non-contact rotary position sensor HP58 / HP38 / PE30 / PE18 Non-contact ; Brief / 1 of 3

# NON-CONTACT POSITION SENSORS



# PATENTED NON-CONTACT TECHNOLOGY

Joral true non-contact position sensors utilize patented technology developed in-house by Joral, LLC. Rare earth magnets take the place of physical shaft coupling for true non-contact installation. Proven in mobile hydraulics Joral non-contact position sensing enables fast installation, extreme tolerances, and exceptional durability.

- True non-contact technology for extreme installation tolerances
- Watertight, totally encapsulated electronics (IP69K)
- Rugged-duty, bullet-proof hardware
- Standard housings as well as application specific pages (standard housings 18mm, 30mm, 38mm, 58mm)
- LED indicators provide live feedback for power and output

# **NON-CONTACT GENERAL OPERATION**

A magnetic coupling is made between an *internal rotating magnet* (built into the position sensor) and an *external rotating magnet* (mounted on the application).

The non-contact sensor's *internal rotating magnet* couples with the *external rotating magnet* installed on the application.

External Magnet (Mounted on Application) The *external rotating magnet* (mounted on the application) and the *internal rotating magnet* (built into the encoder) magnetically couple and track as if they were physically connected.

## **AT-A-GLANCE SPECIFICATIONS**

Installation Tolerances:GAP0.5" (12mm) between application magnet<br/>and encoderAXIAL0.10" (2.5mm) center alignment

Measuring

Micro

Internal Magnet (Built into Sensor)

PLANAR 30° tilt

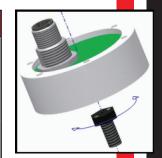
**Connection options include but not limited to:** M12, M12 Pigtail, M8, Terminal Block, Flying Lead Cable, and various Deutsch connectors

### Available Incremental Outputs:

- Quadrature Single Ended
- Quadrature Differential
- Step and Direction
- J1939 CAN Bus

- **Available Absolute Position Outputs:**
- SSI (Synchronous serial interface)
- Analog or Current Output
- PWM (Pulse width modulation)
- J1939 CAN Bus
- Modicon MODBUS

ZERO POWER Multi-turn Capable Contact Joral for available Zero Power options







Hockey Puck<sup>™</sup> & Prox Encoder<sup>™</sup> Non-contact rotary position sensor HP58 / HP38 / PE30 / PE18 Non-contact; Brief / 2 of 3

# NON-CONTACT **POSITION SENSORS**

# TRUE NON-CONTACT POSITION SENSING

Joral true non-contact position sensors compensate for variations in distance, tilt, and off-center positioning of the magnet.

- Tolerances of 0.5" (12mm) gap, 30° tilt, and 0.1" (2.5mm) axial
- True non-contact limits mechanical wear
- Magnetic coupling makes for flexible installation





# TOTALLY ENCAPSULATED ELECTRONICS

Automotive grade transparent potting compound protects electronic components and ensures a complete seal from external forces.

- Protection from shock, vibration, and direct impact
- IP69K protection for total moisture resistance
- Clear compound allows for LED indicators to be viewed

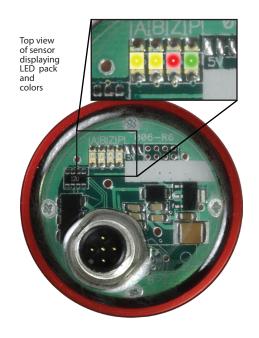
## **STANDARD PACKAGING STYLES**

Joral non-contact senors available in prox-style and puck-style housings; 18mm & 30mm housings make for compact rotary position sensing.

- Small, standard, and convenient housing options
- Standard diameter and thread patterns
- Uses standard prox mounting hardware



PE18 ProxEncoder™ non-contact rotary position sensor displaying compact proximity sensor housing



# LED INDICATORS FOR LIVE FEEDBACK

LED indicators allow for constant monitoring of the sensor's operation.

- Power LED displays the status of sensor's power connections
- Channel and index LEDs relay the status of encoder output
- LEDs make for simple in-field troubleshooting and diagnostics

### **RUGGED-DUTY HARDWARE**

Additional protection from electrical surges and mis-wiring are built into Joral non-contact rotary position sensors.

- Surge protectors for every input/output
- Reverse voltage protection provided against mis-wiring
- Internal auto-resettable fuse for extreme protection



Hockey Puck<sup>™</sup> & Prox Encoder<sup>™</sup> Non-contact rotary position sensor HP58 / HP38 / PE30 / PE18 Non-contact ; Brief / 3 of 3

# NON-CONTACT POSITION SENSORS

# **STANDARD OPERATING CHARACTERISTICS**

ENCODER OUTPUT	Resolution	CHARACTERISTICS
Quadrature Single Ended Incremental Output	<b>8 to 2048 PPR -</b> Standard Resolutions: 8, 10, 16, 20, 32, 40, 50, 64, 80, 100, 125, 128, 200, 250, 256, 400, 500, 512, 1024, 2048	Format: Two channel quadrature A and B outputs with index pulse Z Driver: 7272 push-pull driver
Quadrature Differential Incremental Output	<b>8 to 2048 PPR -</b> Standard Resolutions: 8, 10, 16, 20, 32, 40, 50, 64, 80, 100, 125, 128, 200, 250, 256, 400, 500, 512, 1024, 2048	<ul> <li>Format: Two channel quadrature A and B outputs with index pulse Z and complementary outputs A', B', and Z'</li> <li>Driver: 7272 push-pull driver</li> </ul>
Step and Direction Incremental Output	<b>16 to 512 PPR -</b> Standard Resolutions: 16, 32, 64, 128, 256, 512	<ul> <li>Format: One channel STEP output and one channel DIRECTION output with Index pulse Z</li> <li>Driver: 7272 push-pull driver</li> </ul>
SSI Absolute Position Output Absolute Output	<b>8192 Positions</b> 0.0439 degrees per position	Format: Clock and data output Driver: Differential Output
<b>PWM Absolute Position Output</b> Absolute Output	1024 or 2048 Positions	<b>Format:</b> Pulse Width Modulation in 1 μsec increments <b>Driver:</b> 7272 push-pull driver
Analog Voltage Absolute Position Absolute Output	<b>0 to 5 VDC</b> -OR- <b>4 to 20 mA</b> 10 bit internal resolution	Format: Output Voltage/Current proportional to 0-360 degrees Output Loading: 10mA max
J1939 CAN Bus Absolute or Incremental Output	<b>1000 or 8192 Positions -</b> see J1939 output pages for message information	Format: Standard SAE J1939 CAN Bus - One message for status, one message for settings

### **ELECTRICAL SPECIFICATIONS**

Input Power	6 to 30 VDC at approximately 60mA max, not including output loads
<b>Electrical Protection</b>	Over-voltage, Reserve-voltage, Output short-circuit protected
LED Indicators	Power and output channel status
<b>Connection Types</b>	M8, M12, M12 on pigtail, Terminal block, Flying lead cable, Deutsch - 4 or 6 pin

# **ENVIRONMENTAL SPECIFICATIONS**

<b>Operating Temperature</b>	-30 to +80 degrees C		
Storage Temperature	-40 to +100 degrees C		
Humidity	100%		
Vibration	5 to 3000 Hz, 20g		
Shock	400g 6msec (MIL STD 202)		
Sensor Sealing	IP69K (connector dependent)	**Terminal block not IP rated**	

# **MECHANICAL SPECIFICATIONS**

Housing Diameter 18mm, 30mm, 38mm, and 58mmHousing Material Aluminum, Stainless Steel, or Delrin™

Max Speed 3000 RPM

	max speca sooo ni m								
Model	HOUSING DIAMETER	WEIGHT	Неіднт	Ныднт w/ M12					
PE18	18mm	1 oz	1.87 inches (47.5mm)	N/A					
PE30	30mm	1.5 oz	1.2 inches (30.5mm)	1.75 inches (44.5mm)					
HP38	38mm	1.3 oz	0.69 inches (17.5mm)	N/A					
HP58	58mm	2 oz	0.75 inches (19.1mm)	1.5 inches (38.1mm)					



Prox Encoder™ Non-contact rotary position sensor PE30 General Specifications Non-contact ; PE30 / 1 of 4

# NON-CONTACT POSITION SENSORS

### **PE30 Prox Encoder™** non-contact rotary position sensor

- Extremely compact, J1939 capable
  - Shell body 1.2" (30.5mm) tall w/o connector
- Patented true non-contact position sensing
  - 0.5" (12mm) gap between sensor and application
  - 0.10" (2.5mm) center alignment
  - 30° planar tilt
- Totally sealed IP69K (connector dependent)
- LED indicators for power and output feedback
- Incremental or Absolute position
- Outputs: Quadrature, Step and Direction, SSI, PWM, Analog, Modicon MODBUS, & J1939 Can Bus



### STANDARD OPERATING CHARACTERISTICS

ELECTRICAL	Outputs		Incremental 13 bit Quadrature w/ Single Ended Output   A B Z
ELECTRICAL			Incremental 13 bit Quadrature w/ Differential Output   A B Z & A' B' Z'
_		A - 1939	J1939 13 bit @ 1000 positions (8192 positions max)
_			PWM absolute position
_		A - SSI1	SSI absolute position @ 8192 positions
_		V1	Voltage Out / 5 VDC IN, 0-5 VDC OUT
_		V2	Voltage Out / 6-36 VDC IN, 0-5 VDC OUT
_		1	Current Out / 0-24 VDC IN, 4-20 mA OUT
_	Input Power		6 to 30 VDC at approx 60 mA max, not including output loads
_	Electrical Pro	otection	Over-voltage, reserve-voltage, output short-circuit protected
_	LED Indicato	rs	Power and output channels
	Connections		Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
	Resolution		0.3°
	Repeatabilit	у	0.30%
	Nonlinearity	,	<1%
MECHANICAL	Housing Dia	meter	30mm
MECHANICAL	Housing Mat	terial	Aluminum or Stainless Steel (corrosion resistant)
	<b>Housing Hei</b>	ght	1.2" (30.5mm) body; 1.86" (47.2mm) w/ M12 connector
_	Mounting		30mm thread (standard proximity switch thread style)
	Weight		1.0 oz w/o mounting nuts; 2.2 oz w/ recommended mounting nuts
* Non-contact tolerances – rated using MAGH-RING –	Magnet / sen	isor gap*	Standard 0.5" (12mm) (Max w/ custom mag assembly up to 1" [30mm])
1/4x20 magnet accessory. –	Rated planer tilt / axial gap*		Planar 30° (Max 45°) / Axial 0.1" (2.5mm) (Max 0.16" [4mm])
in hize magnet decessory.	Speed		3000 RPM max
ENVIRONMENTAL	<b>Operating Te</b>	emperature	-30° to +80° C
ENVIRONMENTAL	Storage Tem	perature	-40° to +90° C
	Humidity		100%
	Shock		400g/6ms (MIL STD 202)
	Vibration		5 to 3000 Hz, 20g (MIL STD 202)
	Protection C	lass	IP69K (connection dependent)

General ordering guide found on next page (S2; I3 / 2)



Prox Encoder™ Non-contact rotary position sensor **PE30 General Ordering Guide** 

# **NON-CONTACT POSITION SENSORS**

Non-contact; PE30 / 2 of 4

### PE30 GENERAL ORDERING GUIDE

Build part number first by selecting Housing Style (code 1), MagElec (code 2), and Connection (code 3). Add Special Codes (code 4) to the end of the Joral part number. Refer to 'Special Part Number Information' for explanation of modifiers.

Examples: PE30-A-1024-SEPP-M12-54 - Stainless Steel (PE30, modifier 54), M12 Connector (M12), 13 bit incremental quadrature @ 1024 PPR

PE30-A-1939-SC72-61 - Red aluminum (PE30), Extended thread (modifier 61), 72" Shielded cable (SC72)

PE30-V1-0-180-0-5-CW-C72 - Red aluminum (PE30), 72" Cable (C72), 0-5v out (V1) @ 0-180°, 0v to 5v out, clockwise direction (CW)

Code 1: Housing Style	Code 2: MagElec (Sensor Output)			Code 3: Connection		Code 4: Special Codes	
PE30	A SEPP	13 bit single ended	TRM	Pluggable Terminal block	51	Red Aluminum	
PE30 red aluminum,		quadrature - A B Z	INS	Wire insertion terminal	53	Black Aluminum	
For stainless steel housing add special code 54 to Joral P/N.	A DIPP	13 bit differential	M8	M8 male	54	Stainless Steel	
special code 54 to Jorar P/N.	quadrature - A B Z, A' B' Z'		M12	M12 male	61	Extended Thread	
Modifier Extended Thread:	A - 1939 13 bit J1939		M12P	M12 male on 18' pigtail	71	Roller	
Special Code - 61		@ 1000 positions	СХХ		72	Spindle	
Extended thread on PE30 housing increases available thread	B - PWM	Absolute position PWM		(enter XX as inches)	90	13 bit @ 8192 counts	
length by 0.5" (12.7mm).	A - SSI1	Absolute position SSI @ 8192 positions	SCXX	Shielded cable (enter XX as inches)		per rotation (Typical J1939 option)	
* More outputs and connection	V1	5 VDC IN, 0-5 VDC OUT	CSP	Cable with custom end		·	
options available, contact Joral if	V2	6-36 VDC IN, 0-5 VDC OUT	DE4	DT04 - 4 pin male Deutsch			
desired configuration is not listed	1	0-24 VDC IN, 4-20 mA OUT	DE6	DT04 - 6 pin male Deutsch			

Special Part Number Information Review below code sections for important P/N build information

#### Code 1: Housing Style

- Modifier 54 PE30 Stainless steel housing for corrosive applications.
- Modifier 61 Add 61 to P/N for extended thread. Standard shell length w/o M12 1.2" (30mm), Extended length w/o M12 1.7" (43mm). Code 61 adds 0.5" (12.7mm) length to thread for more access in threaded mounting.

### Code 2: MagElec

<ul> <li>(A SEPP) or</li> <li>(A DIPP)</li> <li>Enter Quadrature PPR in place of</li> <li>A = 13 bit PPR</li> <li>Available 13 bit PPR:</li> <li>Available 13 bit PPR:</li> </ul>	<ul> <li>A - 1939</li> <li>Standard J1939 output is 1000 positions</li> <li>A = 13 bit</li> <li>MODIFIER 90 - for 8192 positions (max resolution)</li> </ul>	<ul> <li>V1, V2, and I1 (Analog MagElec P/N Guide)</li> <li>First select MagElec code (V1, V2 or I1) then Angle Range (A1-A2), Voltage Range (VR1-VR2) and Signal Direction (Clockwise [CW] or Counter [CCW])</li> <li>PART NUMBER FORMULA (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)</li> </ul>	

### **Code 3: Connections**

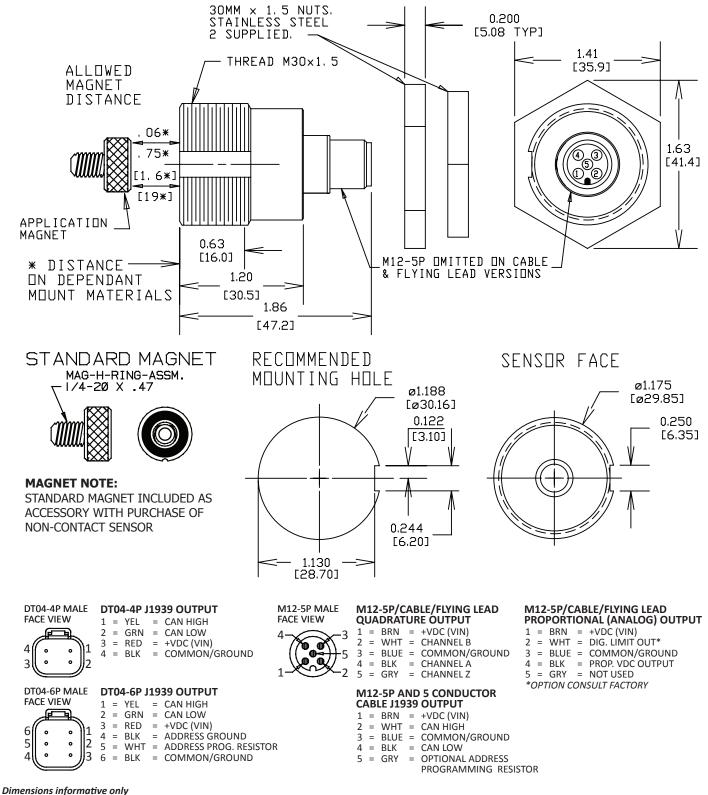
- All Outputs, All Connections Connector exit back exit only (sensor epoxy side) for housing style PE30
- J1939 Output Addressing via varying value resistor in connection requires at least five conductors (M12, DE6 and Cables addressing compatible)
- All Outputs w/ Deutsch DE4 and DE6 connection Deutsch connectors add \$20 to PE30 list



Prox Encoder™ Non-contact rotary position sensor PE30 Dimensions & General Pin-outs Non-contact ; PE30 / 3 of 4

# NON-CONTACT POSITION SENSORS

### **PE30 DIMENSIONS & GENERAL PIN OUTS**

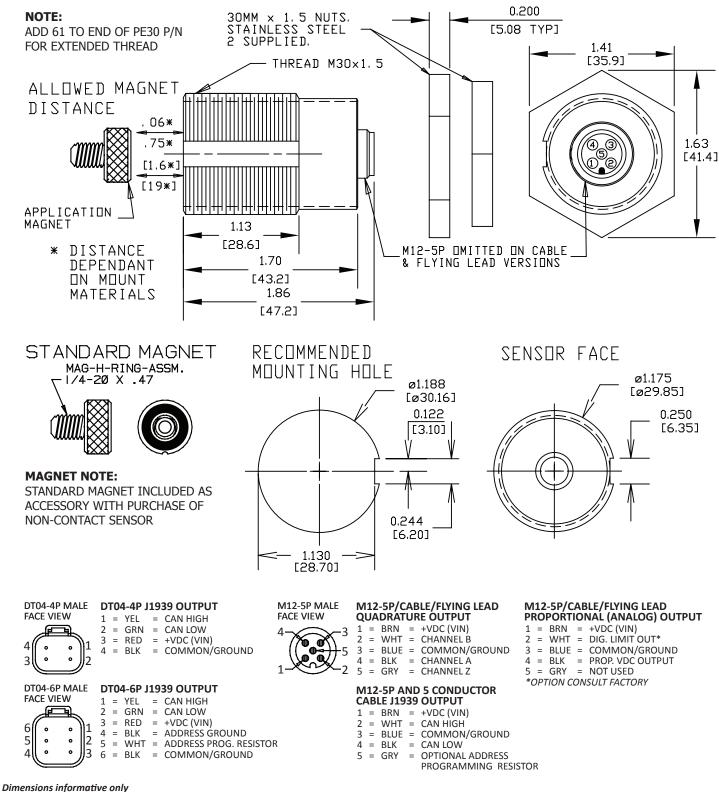


For most recent dimensions please consult factory



# NON-CONTACT POSITION SENSORS

### **PE30 EXTENDED THREAD DIMENSIONS & GENERAL PIN OUTS**



For most recent dimensions please consult factory



Hockey Puck<sup>™</sup> Non-contact rotary position sensor HP38 General Specifications Non-contact ; HP38 / 1 of 3

# NON-CONTACT POSITION SENSORS

# HP38 Hockey Puck<sup>™</sup> non-contact rotary position sensor

- OEM driven solution with minimum order quantities
- Compact bare bones non-contact rotary encoder
  - Body only 0.69" (17.5mm) tall
- Patented true non-contact position sensing
  - 0.5" (12mm) gap between sensor and application
  - 0.10" (2.5mm) center alignment
  - 30° planar tilt
- Totally sealed IP69K (connector dependent)
- LED indicators for power and output feedback
- Outputs: Quadrature, SSI, Analog, & J1939 Can Bus



# STANDARD OPERATING CHARACTERISTICS

ELECTRICAL		Incremental 10 bit Quadrature w/ Single Ended Output   A B Z
LEECTRICAL		J1939 10 bit @ 512 positions
_	B - PWM	PWM absolute position
	B - SSI1	SSI absolute position @ 512 positions
	V1	Voltage Out / 5 VDC IN, 0-5 VDC OUT
	V2	Voltage Out / 6-36 VDC IN, 0-5 VDC OUT
	Input Power	6 to 30 VDC at approx 60 mA max, not including output loads
	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
	LED Indicators	Power and output channels
	Connections	M8, M12 Pigtail, Terminal Block, Flying Lead Cable, or Deutsch (4 or 6 pin)
	Resolution	0.3°
	Repeatability	0.30%
	Nonlinearity	<1%
MECHANICAL	Housing Diameter	38mm
MECHANICAL	Housing Material	Black Delrin™ (standard)
	Housing Height	0.69" (17.5mm) body
_	Mounting	32mm (.884) spacing w/ 4mm diameter screws
	Weight	1.3 oz
* Non-contact tolerances – rated using MAGH-RING –	Magnet / sensor gap*	Standard 0.5" (12mm) (Max w/ custom mag assembly up to 1" [30mm])
1/4x20 magnet accessory. –	Rated planer tilt / axial gap*	Planar 30° ( <i>Max 45°</i> ) / Axial 0.1" (2.5mm) ( <i>Max 0.16"</i> [4mm])
III III IIII IIII IIIIIIIIIIIIIIIIIIII	Speed	3000 RPM max
ENVIRONMENTAL	Operating Temperature	-30° to +80° C
ENVIRONMENTAL	Storage Temperature	-40° to +90° C
	Humidity	100%
	Shock	400g/6ms (MIL STD 202)
	Vibration	5 to 3000 Hz, 20g ( <i>MIL STD 202</i> )
	Protection Class	IP69K (connection dependent)

General ordering guide found on next page (S2; I4 / 2)





**Hockey Puck**<sup>™</sup> Non-contact rotary position sensor HP38 General Ordering Guide

# **NON-CONTACT POSITION SENSORS**

Non-contact; HP38 / 2 of 3

# HP38 GENERAL ORDERING GUIDE

Build part number first by selecting Housing Style (code 1), MagElec (code 2), and Connection (code 3). Add Special Codes (code 4) to the end of the Joral part number. Refer to 'Special Part Number Information' for explanation of modifiers.

Examples: HP38-B-0256-SEPP-M12P - Black Delrin™ (HP38), M12 pigtail (M12P), 10 bit incremental quadrature @ 256 ppr

HP38-B-1939-SC72 - Black Delrin™ (HP38), 72" Shielded cable, 10 bit J1939 @ 512 positions

HP38-V1-0-360-0.5-4.5-CW-C72 - Black Delrin™ (HP38), 72" Cable (SC72), 0-5v Voltage Out (V1) @ 0-360°, 0.5-4.5v out, clockwise signal

Code 1: Housing Style	Code 2: MagElec (Sensor Output)			Code 3: Connection	Code 4: Special Codes	
HP38	B SEPP		TRM Pluggable Terminal block		31	Side Exit (housing wall)
HP38 material black Delrin™,		quadrature - A B Z	M8	M8 male	33	Back Exit (epoxy side)
connector orientation SIDE EXIT. For REAR EXIT connector on HP38	B - 1939	10 bit J1939	M12P	M12 male on 18' pigtail	71	Roller
add code 33 to end of P/N.		@ 512 positions	СХХ		72	Spindle
	B - SSI1	Absolute position SSI		(enter XX as inches)		
		@ 512 positions	SCXX			
	B - PWM	<b>B - PWM</b> PWM absolute position		(enter XX as inches)		
* More outputs and connection	V1	5 VDC IN, 0-5 VDC OUT	DE4	DT04 - 4 pin male Deutsch		
options available, contact Joral if	V2	6-36 VDC IN, 0-5 VDC OUT	DE6	DT04 - 6 pin male Deutsch		
desired configuration is not listed						

#### Special Part Number Information Review below code sections for important P/N build information

#### Code 1: Housing Style

• Modifier 33 - For BACK EXIT connector orientation on HP38 add 33 to end of Joral P/N

HP38 - Handles ALL back exit and CABLE ONLY side exit connections

### Code 2. MagElec

Code 2. Magliet		
(B SEPP)	B - 1939	V1, V2, and I1 (Analog MagElec P/N Guide)
<ul> <li>Enter Quadrature PPR in place of</li> <li>B = 10 bit PPR</li> <li>Available 10 bit PPR: 0032, 0064, 0128, 0256</li> </ul>	<ul> <li>10 bit J1939 output is 512 positions</li> <li>B = 10 bit</li> </ul>	<ul> <li>First select MagElec code (V1, V2 or I1) then Angle Range (A1-A2), Voltage Range (VR1-VR2) and Signal Direction (Clockwise [CW] or Counter [CCW])</li> <li>PART NUMBER FORMULA (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)</li> <li>EXACT V1, V2, and I1 EXAMPLES HP38 - V1 - 0-360 - 0.5-4.5 - CW - C72 HP38 - V2 - 0-180 - 0-5 - CCW - C72 HP38 - I1 - 180-270 - 4-20 - CW - C72</li> </ul>
	1	

#### Code 3: Connections

All Outputs, All Connections - Standard connection orientation SIDE EXIT. For BACK EXIT connector on HP38 add 33 to end of Joral HP38 P/N

• J1939 Output - Addressing via varying value resistor in connection requires at least five conductors (M12, DE6 and Cables addressing compatible)

All Outputs w/ Deutsch - DE4 and DE6 connection Deutsch connectors add \$20 to HP38 list



Hockey Puck™ Non-contact rotary position sensor HP38 Dimensions & General Pin-outs Non-contact; HP38 / 3 of 3

### **HP38 DIMENSIONS & GENERAL PIN OUTS**

ENCODER-O POSITION ANGLE 1 ANGLE 2 ø1.5 -0.625 ELECTRONICS · EPEXY ENCASPULATED 1.250 0.625 ø0.150X 2 ø. 0935 REAMED 30° FOR DOWEL PIN

#### **HOUSING/INSTALL NOTES:**

MAGNET MOUNT MATERIALS MUST HAVE Ø1.0 [25.4] HOLE CENTERED ON SENSOR CENTERLINE

NON-MAGNETIC MOUNT MATERIAL, MAY BE SOLID

MOUNT WITH 316 STAINLESS STEEL 4-40 SCREWS

DT04-4P MALE

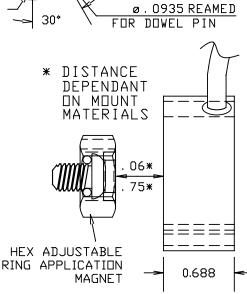
FACE VIEW

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M12-5P MALE

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FACE VIEW

**MAGNET NOTE:** STANDARD MAGNET INCLUDED AS ACCESSORY WITH PURCHASE OF NON-CONTACT SENSOR V1, V2, I1 HEX ADJUSTABLE MAGNET DETAIL (FACE VIEW) 0.688

STANDARD MAGNET

MAG-H-RING-ASSM. 1/4-20 X .47

**NON-CONTACT** 

**POSITION SENSORS** 

**HEX ADJUSTABLE MAGNET NOTE:** ADJUSTABLE RING MAGNET INCLUDED AS ACCESSORY WITH PURCHASE OF ANALOG/VOLTAGE NON-CONTACT SENSOR (OUPUTS V1, V2, I1)

FOR ZERO/HOME POSITION CAPABILITY WITH ALL ANALOG ABSOLUTE NON-CONTACT POSITION SENSORS

#### M12-5P/CABLE/FLYING LEAD **PROPORTIONAL (ANALOG) OUTPUT**

- 1 = BRN = +VDC(VIN)2 = WHT = DIG. LIMIT OUT\*
- 3 = BLUE = COMMON/GROUND 3 = BLUE = COMMON/GROUND

M12-5P/CABLE/FLYING LEAD

CHANNEL B

CHANNEL A

= CHANNEL Z

CAN HIGH

CAN LOW

COMMON/GROUND

**OPTIONAL ADDRESS** 

PROGRAMMING RESISTOR

M12-5P AND 5 CONDUCTOR

QUADRATURE OUTPUT

1 = BRN = +VDC(VIN)

=

**CABLE J1939 OUTPUT** 1 = BRN = +VDC(VIN)

=

=

= WHT =

2 = WHT =

3 = BLUE =

4 = BLK

5 = GRY

- - 4 = BLK = PROP. VDC OUTPUT 5 = GRY = NOT USED
  - **\*OPTION CONSULT FACTORY**

3(	Ľ	_	<i>)</i> 2					
	04-61		LE	D	то	4-6P J	19	39 OUTPUT
FA	CE VI	EW		1	=	YEL	=	CAN HIGH
	Æ	Ъ.		2	=	GRN	=	CAN LOW
61	(.		1					+VDC (VIN)
6 5	•	۰						ADDRESS GROUN
5	•	•	12	5	=	WHT	=	ADDRESS PROG. F

DT04-4P J1939 OUTPUT

2 = GRN = CAN LOW3 = RED = +VDC (VIN)

= CAN HIGH

1 = YEL

4 = BLK

= WHT = ADDRESS PROG. RESISTOR 6 = BLK = COMMON/GROUND

= COMMON/GROUND

Dimensions informative only For most recent dimensions please consult factory

JZ, 14 / J
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2

4 = BLK

5 = GRY



Hockey Puck<sup>™</sup> Non-contact rotary position sensor HP58 General Specifications Non-contact ; HP58 / 1 of 4

# NON-CONTACT POSITION SENSORS

# HP58 Hockey Puck<sup>™</sup> non-contact rotary position sensor

- Patented true non-contact position sensing
  - 0.5" (12mm) gap between sensor and application
    - 0.10" (2.5mm) center alignment
    - 30° planar tilt
- Totally sealed IP69K (connector dependent)
- LED indicators for power and output feedback
- Incremental or Absolute position
- Outputs: Quadrature, Step and Direction, SSI, PWM, Analog, Modicon MODBUS, & J1939 Can Bus
- Detects rotation through non-ferrous barriers; Special applications include use in explosion proof housings, high PSI zone separation, and enclosed rotational measurement



### STANDARD OPERATING CHARACTERISTICS

ELECTRICAL	•	Incremental 13 bit Quadrature w/ Single Ended Output   A B Z
ELECTRICAL		Incremental 13 bit Quadrature w/ Differential Output   A B Z & A' B' Z'
_	A - 1939	J1939 13 bit @ 1000 positions (8192 positions max)
_	A - MOD1	Modicon MODBUS @ 8192 positions
	B - PWM	PWM absolute position
	A - SSI1	SSI absolute position @ 8192 positions
	V1	Voltage Out / 5 VDC IN, 0-5 VDC OUT (code V3 for 2x redundant output)
	V2	Voltage Out / 6-36 VDC IN, 0-5 VDC OUT
	1	Current Out / 0-24 VDC IN, 4-20 mA OUT (code 11 for 2x redundant output)
	Input Power	6 to 30 VDC at approx 60 mA max, not including output loads
_	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
	LED Indicators	Power and output channels
	Connections	Terminal Plug, M8, M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
	Resolution	0.3°
	Repeatability	0.30%
	Nonlinearity	<1%
MECHANICAL	Housing Diameter	58mm
MECHANICAL	Housing Material	HP58 Black Delrin <sup>™</sup> (standard) or White Delrin <sup>™</sup> ; HP58SE Red Aluminum
_	Housing Height	0.75" (19mm) body; 1.5" (38.1mm) w/ M12 connector
_	Mounting	60.128 mounting holes
	Weight	2.6 oz
* Non-contact tolerances	Magnet / sensor gap*	Standard 0.5" (12mm) (Max w/ custom mag assembly up to 1" [30mm])
rated using MAGH-RING - 1/4x20 magnet accessory	Rated planer tilt / axial gap*	Planar 30° ( <i>Max 45°</i> ) / Axial 0.1" (2.5mm) (Max 0.16" [4mm])
	Speed	3000 RPM max
ENVIRONMENTAL	Operating Temperature	-30° to +80° C
ENVIRONMENTAL	Storage Temperature	-40° to +90° C
	Humidity	100%
	Shock	400g/6ms ( <i>MIL STD 202</i> )
	Vibration	5 to 3000 Hz, 20g ( <i>MIL STD 202</i> )
	Protection Class	IP69K (connection dependent)

General ordering guide found on next page (S2; I5 / 2)





Hockey Puck<sup>™</sup> Non-contact rotary position sensor **HP58 General Ordering Guide** 

# **NON-CONTACT POSITION SENSORS**

#### Non-contact; HP58 / 2 of 4

## **HP58 GENERAL ORDERING GUIDE**

Build part number first by selecting Housing Style (code 1), MagElec (code 2), and Connection (code 3). Add Special Codes (code 4) to the end of the Joral part number. Refer to 'Special Part Number Information' for explanation of modifiers.

Examples: HP58-A-0080-SEPP-SC72-31 - Black Delrin™ (HP58), Side exit (31), 72" shielded cable (SC72), 13 bit incremental quadrature @ 80 PPR

HP58-A-1939-M12-90 - Black Delrin™ (HP58), Back exit (standard), M12 connector (M12), J1939 @ 8192 positions (modifier 90 for 8192)

HP58SE-V1-0-180-0.5-4.5-CW-C72-31 - Red Aluminum (HP58SE), Side exit (31), 0-5v Out (V1) @ 0-180°, 0.5-4.5v out, clockwise signal

Code 1: Housing Style	Code 2: MagElec (Sensor Output)		Code 3: Connection		Code 4: Special Codes	
HP58	A SEPP		TRM	Pluggable Terminal block	31	Side (housing wall)
HP58 material Black Delrin™,		quadrature - A B Z	INS	Wire insertion terminal	32	Front (magnet side)
connector orientation BACK EXIT standard. To designate SIDE EXIT	A DIPP	13 bit differential	M8	M8 male	33	Back (epoxy side)
connection use special code 31.		quadrature - A B Z, A' B' Z'	M12	M12 male	50	White Delrin
(Side exit for HP58 CABLE ONLY)	A - 1939		M12P	M12 male on 18' pigtail	51	Red Aluminum
		@ 1000 positions	СХХ		71	Roller
	B - PWM	Absolute position PWM		(enter XX as inches)	72	Spindle
HP58SE HP58SE made out of Red Aluminum,	A - MOD1	13 bit Modicon MODBUS @8192 positions	SCXX	Shielded cable (enter XX as inches)	90	13 bit @ 8192 counts per rotation
connector orientation BACK EXIT	A - SSI1	Absolute position SSI @ 8192 positions	CSP	Cable with custom end	1	(Typical J1939 option)
standard. To designate SIDE EXIT			DE4	DT04 - 4 pin male Deutsch	91	13 bit @ 1000 counts
connection use special code 31.	V1	5 VDC IN, 0-5 VDC OUT	DE6	DT04 - 6 pin male Deutsch	1	per rotation (Typical
	V2	6-36 VDC IN, 0-5 VDC OUT			]	MODBUS option)
	V3	0-24 VDC IN, 4-20 mA OUT				
		x2 (Redundant output)				
* More outputs and connection	11	0-24 VDC IN, 4-20 mA OUT				
options available, contact Joral if	12	0-24 VDC IN, 4-20 mA OUT				
desired configuration is not listed		x2 (Redundant output)				

#### Special Part Number Information Review below code sections for important P/N build information

### Code 1: Housing Style

- Modifier 31 For side exit connector on HP58 and HP58SE add 31 to end of Joral P/N
- HP58 Handles all back exit connections and CABLE ONLY side exit connections (M12P, CXX, SCXX, DE4 & DE6)
- HP58SE Handles ALL back and side exit connections (including M12 leaded side exit)

### Code 2: MagElec

(A SEPP) or (A DIPP)	A - 1939	A - MOD1	V1, V2, and I1 (Analog MagElec P/N Guide)
<ul> <li>Enter Quadrature PPR in place of</li> <li>A = 13 bit PPR</li> <li>Available 13 bit PPR: 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256,</li> </ul>	<ul> <li>Standard J1939 output is 1000 positions</li> <li>A = 13 bit</li> <li>MODIFIER 90 - for 8192 positions (max resolution) add code 90 to end of HP58 P/N</li> </ul>	<ul> <li>Standard MOD1 output is 8192 positions</li> <li>A = 13 bit</li> <li>MODIFIER 91 - for 1000 positions add code 90 to end of HP58 P/N</li> </ul>	<ul> <li>First select MagElec code (V1, V2 or I1) then Angle Range (A1-A2), Voltage Range (VR1-VR2) and Signal Direction (Clockwise [CW] or Counter [CCW])</li> <li>PART NUMBER FORMULA (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)</li> <li>EXACT V1, V2, and I1 EXAMPLES HP58 - V1 - 0-360 - 0.5-4.5 - CW - C72 HP58 - V2 - 0-180 - 0-5 - CCW - DE4 HP58 - I1 - 180-270 - 4-20 - CW - M12</li> </ul>
0400, 0500, 1024, 2048			

#### Code 3: Connections

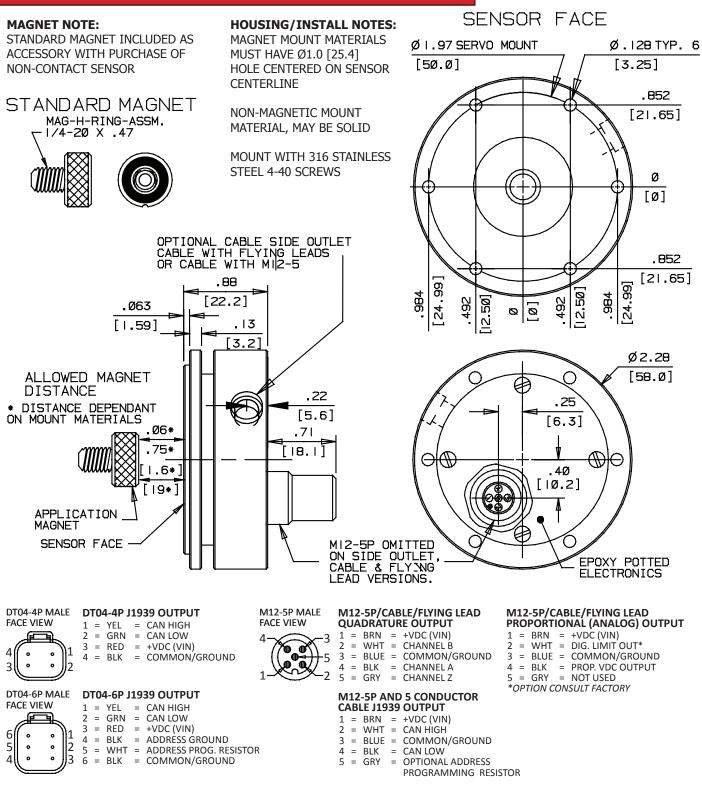
- All Outputs, All Connections Connector exit standard is BACK EXIT (sensor epoxy side) for housing HP58 and HP58SE (for SIDE EXIT use modifier 31)
- J1939 Output Addressing via varying value resistor in connection requires at least five conductors (M12, DE6 and Cables addressing compatible)
- All Outputs w/ Deutsch DE4 and DE6 connection Deutsch connectors add \$20 to HP58 list



Hockey Puck™ Non-contact rotary position sensor HP58 Dimensions & General Pin-outs Non-contact ; HP58 / 3 of 4

# NON-CONTACT POSITION SENSORS

### HP58 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 1 OF 2



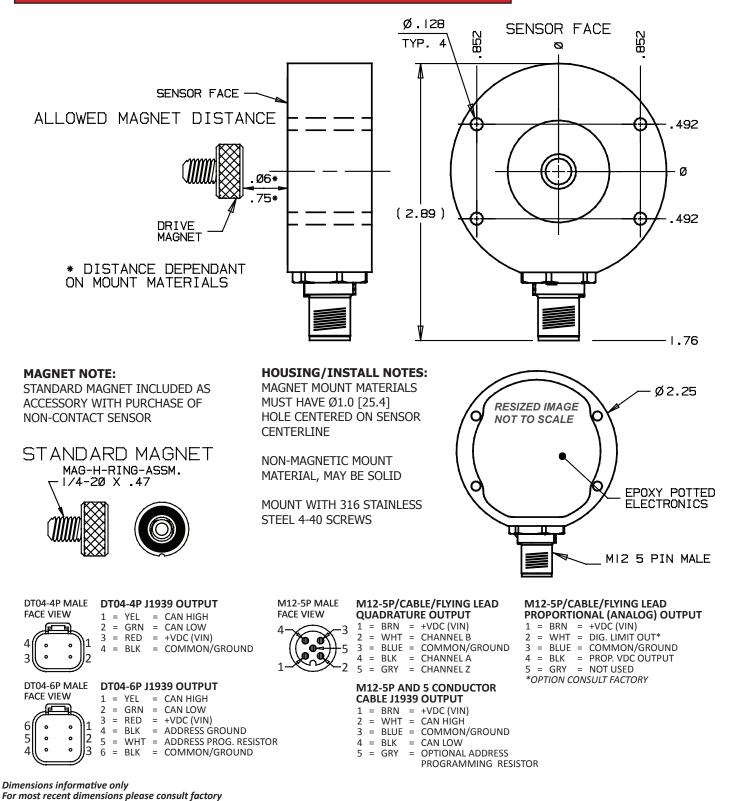
Dimensions informative only For most recent dimensions please consult factory



#### Hockey Puck<sup>™</sup> Non-contact rotary position sensor HP58 Dimensions & General Pin-outs Non-contact ; HP58SE / 4 of 4

# NON-CONTACT POSITION SENSORS

### HP58SE DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 2 OF 2





Linear Position ; LP30 / 1 of 7

# LINEAR POSITION SENSORS (IP69K)

# **LP30 - NON-CONTACT LINEAR POSITION**

Alternative to wire-reel method for linear extension measurement







Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 General Specifications / Order Guide Linear Position ; LP30 / 2 of 7

# LINEAR POSITION SENSORS (IP69K)

### LP30 Linear Position incremental or absolute non-contact

- ) J1939 CAN Bus incremental or absolute linear
- Totally sealed IP69K (connector dependent)
- Non-contact with wide sensing range
- Compact housings for simple integration
- MILSPEC 202 ratings for shock and vibration
- 1/4" to 1" resolution standards
  - Custom resolution and magnet assemblies available
- Intelligent and rugged replacement to wire-reel cable / stringpot boom measure systems

# **STANDARD OPERATING CHARACTERISTICS**

FLECTRICAL	Outputs A - 1939	J1939, Addressable, Incremental position
ELECTRICAL		(attached message sheets S3 ; 12 / 5- 7)
	Input Power	6 to 30 VDC (30 mA)
	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
	LED Indicators	Power, J1939 communication status
	Connections	M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
	Resolution	1/2" or 1/4" (custom resolution packages available, contact Joral)
MECHANICAL	Housing Diameter	30mm
MECHANICAL	Housing Material	Aluminum or Stainless Steel (corrosion resistant)
	Housing Height	1.2" (30.5mm) body; 1.86" (47.2mm) w/ M12 connector
* Non-contact tolerances	Mounting	30mm thread (standard proximity switch thread style)
rated using MAG-STRP magnet accessory.	Weight	1.0 oz w/o mounting nuts; 2.2 oz w/ recommended mounting nuts
magnet accessory.	Magnet strip / sensor gap*	Standard 0.5"
ENVIRONMENTAL	<b>Operating Temperature</b>	-40° to +80° C
ENVIRONMENTAL	Storage Temperature	-40° to +90° C
	Humidity	100%
	Shock	400g/6ms (MIL STD 202)
	Vibration	5 to 3000 Hz, 20g (MIL STD 202)
	Protection Class	IP69K (connection dependent)

# LP30 GENERAL ORDERING GUIDE

Code 1: Housing Style		Code 2:Code 3:MagElec (Sensor Output)Connection			Code 4: Special Codes	
LP30	A - 1939	J1939, Addressable,	M12	M12 male	51	Red Aluminum
LP30 red aluminum, for 1/2"	Incremental signal		M12P	M12 male on 18' pigtail	53	Black Aluminum
extended thread add 61 to end of P/N. Increases total shell body by 1/2"			СХХ		54	Stainless Steel
				(enter XX as inches)	61	Extended Thread
LP30 Modifier Stainless Steel: LP30 - [Code 2] - [Code 3] - 54	* More outputs and connection options available, contact Joral if		SCXX	Shielded cable (enter XX as inches)		
Code 54 for stainless steel corrosion			DE4	DT04 - 4 pin male Deutsch	]	
resistant housing 30mm non-contact	desired	configuration is not listed	DE6	DT04 - 6 pin male Deutsch		

General dimensions found on next page (S3 ; I2 / 3 - 4) J1939 setting/status message found on pages three and four (S3 ; I2 / 5 - 7)



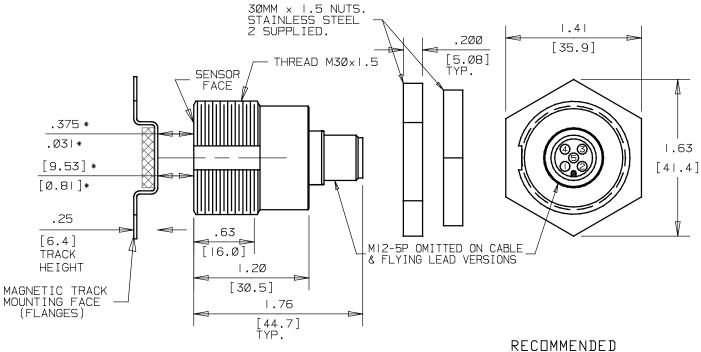


Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 Dimensions & General Pin-outs

Linear Position ; LP30 / 3 of 7

# LINEAR POSITION SENSORS (IP69K)

### LP30 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 1 OF 2

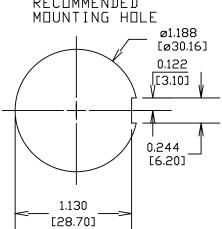


#### **MAGNET TRACK/SENSOR INSTALL NOTE:**

SENSING WINDOW MAY BE SMALLER DEPENDANT ON SENSOR MOUNT MATERIALS

MAGNETIC TRACK IS MOUNTED BY ITS FLANGES USING VHB DOUBLE FACED ADHESIVE TAPE OR POP RIVETS OR SCREWS (NOT SUPPLIED)

WHEN EXTENDING MAGNETIC TRACS THE TRACK END FEATURES MUST BE NESTED



#### **PINOUTS ON DIMENSIONS PAGE 2 OF 2**

Dimensions informative only For most recent dimensions please consult factory

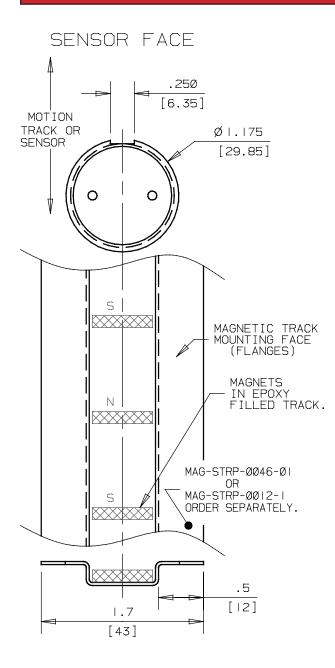


Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 Dimensions & General Pin-outs

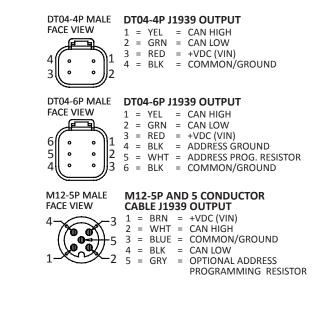
#### Linear Position ; LP30 / 4 of 7

# LINEAR POSITION SENSORS (IP69K)

### LP30 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 2 OF 2



Dimensions informative only For most recent dimensions please consult factory



#### MAGNET TRACK/SENSOR INSTALL NOTE: SENSING WINDOW MAY BE SMALLER DEPENDANT ON SENSOR MOUNT MATERIALS

MAGNETIC TRACK IS MOUNTED BY ITS FLANGES USING VHB DOUBLE FACED ADHESIVE TAPE OR POP RIVETS OR SCREWS (NOT SUPPLIED)

WHEN EXTENDING MAGNETIC TRACS THE TRACK END FEATURES MUST BE NESTED

S3; I2 / 4



Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 J1939 Setting/Status Message

#### Linear Position ; LP30 / 5 of 7

# LINEAR POSITION SENSORS (IP69K)

# J1939 LP30 LINEAR SENSOR - STATUS Message 65450

Message Parameters	<b>8 В</b> үті	e / 64 Bit Data Field Bi	IT POSITIONS
This message is transmitted by	BYTE BI	T BIT FUNCTION	FIELD DESCRIPTION
sensor at REP Rate		1 SPEED Setting LSB	SPEED Setting (2 bits)
PGN: 65450 (FFAA hex)	2	2 SPEED Setting MSB 3 DIRECTION Setting LSB	00 = Slow; 01 = Medium; 10 = Fast
Transmission 50ms Repetition Rate		DIRECTION Setting MSB	DIRECTION Setting (2 bits) 00 = FWD direction counts up; 01 = REV direction counts up
Data Length 8 bytes		5 SAVE CNT Setting LSB	SAVE COUNT Setting (2 bits)
Data Page 0		6 SAVE CNT Setting MSB	At power : 00 = Counter resets to 0;
PDU Format 255 (FF hex)			01 = Counter will start from last saved count
PDU Specific 170 (AA hex) Priority 4	F	SAVE ON SPEED LSB	SAVE ON ZERO SPEED Setting (2 bits)
Source Address 214 (D6 hex)	BYTE	SAVE ON SPEED MSB	00 = Do not save <i>count</i> on <i>speed</i> becoming 0; 01 = Save <i>count</i> when <i>speed</i> becomes 0
Communication 250 K bits/sec		) unused	01 – Save count when speed becomes 0
Bit Rate	1		NOTE: Set reserved and unused bits to all 0's or all 1's
	1		
Part Numbers	n		
5 pin M12 LP30-A-1939-M12		Ŭ	REV DIRECTION (2 bits) 01 means counting down
4 pin DT04 LP30-A-1939-DE4	т ВYTE		FWD DIRECTION (2 bits)
6 pin DT04 LP30-A-1939-DE6 Flying Lead LP30-A-1939-SCXX		6 FWD direction Flag MSB	01 means counting up
For flying lead replace XX with	1		SPEED (10 bits)
desired length in inches	1		Speed in inches per second, 0.5" per second per bit, 0 to 1000 (0.25" per bit per second if 1/4" resolution option is installed)
For high corrosive applications use stainless steel housing. Add			
use stainless steel housing. Add modifier 53 to end of Joral P/N for			
stainless steel housing.	2	2 SPEED bit5	
	BYTE BYTE		SPEED is calculated by running average on 100msec intervals
Connections / Wiring	<u>2</u>		00 (slow) averages 3 seconds of counts per calculation 01 (medium) averages 1 second of counts per calculation
M12	2		02 (fast) averages 100 msecs of counts per calculation
ignal 5 pin DE4 DE6	2		
+ 1 3 RED 3 RED	<b>4</b> 2		
ommon     2     4 BLACK     4 BLACK       ANH     3     1 YELLOW     1 YELLOW			POSITIVE COUNT Flag (2 bits)
ANL 4 2 GREEN 2 GREEN	BYTE BYTE		01 means count is positive NEGATIVE COUNT Flag (2 bits)
A Select 5 5 WHITE common 6 BLACK			01 means count is negative
0 BLACK	3		COUNT (32 bits)
SOURCE ADDRESS SELECTION	3		Incremental Count, 0.5" per count
	3		(0.25" per bit per second if 1/4" resolution option is installed)
Value (ohms)AddressPGNIo Resistor21465450	<b>S</b> 3		Count maximum value is 2, 147, 483, 647
90 <i>(id-tag 1)</i> 215 65450			
76 ( <i>id-tag 2</i> ) 216 65450	≻   3	9 Count bit6	
500 ( <i>id-tag 3</i> ) 217 65450			
260 (id-tag 4)21865450400 (id-tag 5)21965450	4		
400 (id-tag 5)         219         65450           360 (id-tag 6)         220         65450	4		
530 (id-tag 7) 221 65450	4 9		
	4	5 Count bit12	
	<b> -</b>   4		
	$\left  \sum_{A} \right _{4}^{4}$		
	<u> </u>		
	5		
	5	1 Count bit18	
	ш 5		
	BYTE BYTE		
	5		
	5	8 Count bit25	
	5		
	<b>∞</b> 6		
	BYTE 9999		

D)



Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 J1939 Setting/Status Message Linear Position ; LP30 / 6 of 7

# LINEAR POSITION SENSORS (IP69K)

# J1939 LP30 LINEAR SENSOR - SETTING Message 65449

Message Parameters	8 RVTE	/ 64 Bit Data Field B	
This message is transmitted by the controller		BIT FUNCTION	FIELD DESCRIPTION
PGN: 65449 (FFA9 hex)	1 2	SPEED Setting LSB SPEED Setting MSB	SPEED Settings (2 bits) 00 = Slow; 01 = Medium; 10 = Fast
Transmission 50 ms	3	DIRECTION Setting LSB	DIRECTION Setting (2 bits)
Repetition Rate	4	DIRECTION Setting MSB	00 = CW direction counts up; $01 = CCW$ direction counts up
Data Length 8 bytes	5	SAVE CNT Setting LSB	SAVE COUNT Setting (2 bits)
Data Page 0	6	SAVE CNT Setting MSB	At power : $00 = Counter$ resets to 0;
PDU Format 255 (FF hex)		5	01 = Counter will start from last saved count
PDU Specific 169 (A9 hex)	BVTE 8	SAVE ON SPEED LSB	SAVE ON ZERO SPEED Setting (2 bits)
Priority 4	8 📈 1	SAVE ON SPEED MSB	00 = Do not save <i>count</i> on <i>speed</i> becoming 0;
Source Address 214 (D6 hex)			01 = Save <i>count</i> when <i>speed</i> becomes 0
Communication 250 K bits/sec Bit Rate	9	unused	
Bit Rate	10	unused unused	NOTE: Set reserved and unused bits to all 0's or all 1's
<b>C</b>	<b>∧</b> 12	unused	
<b>C</b> ONNECTIONS / <b>W</b> IRING	Ш 13	unused	
M12		unused	
Signal         5 pin         DE4         DE6           V+         1         3 RED         3 RED	L 14 15 16	unused	
V+         1         3 RED         3 RED           Common         2         4 BLACK         4 BLACK		unused	
CANH 3 1 YELLOW 1 YELLOW	17	unused	
CANL 4 2 GREEN 2 GREEN	18	unused unused	
SA Select 5 5 WHITE	m 20	unused	
Common 6 BLACK	111 21	unused	
	<b>⊢</b> 22	unused	
Source Address Selection	L 22 23 24	unused	
Value (ohms) Address PGN	<u>24</u> 25	unused unused	
No Resistor 214 65449	25	unused	
590 (id-tag 1) 215 65449	27	unused	
976 ( <i>id-tag 2</i> ) 216 65449	<b>4</b> 28	unused	
1500 ( <i>id-tag</i> 3) 217 65449	<b>□ □ □ □ □ □ □ □ □ □</b>	unused	
2260 (id-tag 4)         218         65449           3400 (id-tag 5)         219         65449		unused	
5360 ( <i>id-tag</i> 6) 220 65449	<b>A</b> 31 32	unused unused	
9530 ( <i>id-tag</i> 7) 221 65449	33	unused	
	34	unused	
	35	unused	
	<b>L</b> 36	unused	
		unused unused	
		unused	
	<b>A</b> 39 40	unused	
	41	unused	
	42	unused	
	<b>9</b> 43 44	unused unused	
		unused	
	H 46	unused	
	$\begin{vmatrix} \mathbf{A} \\ \mathbf{A} \end{vmatrix} = \begin{vmatrix} 47 \\ 48 \end{vmatrix}$	unused	
		unused	
	49 50	unused unused	
	51	unused	
	<b>N</b> 52	unused	
	<b>Ш</b> 53	unused	
		unused	
	<b>A</b> 55 56 56	unused unused	
	57	unused	
	58	unused	
	59	unused	
	<b>∞</b> 60	unused	
	<u>Ш</u> 61	unused	
	$\left  \begin{array}{c} \mathbf{L} \\ \mathbf{L} \\ 63 \end{array} \right  \stackrel{62}{63}$	unused unused	
	$\begin{bmatrix} 63\\64 \end{bmatrix}$	unused unused	
	04	นแนรยน	

D)



Linear Position Sensors (IP69K) Incremental or absolute non-contact linear LP30 J1939 Setting/Status Message Linear Position ; LP30 / 7 of 7

# LINEAR POSITION SENSORS (IP69K)

# J1939 LP30 LINEAR SENSOR - SETTING Message 65451

Message Par	RAMETERS	
This message is the controller	transmitted by	
PGN: 65451 (FB	AB her)	
Transmission Repetition Rate	n/a	
Data Length	n/a	
Data Page	0	
PDU Format	255 (FF hex)	
PDU Specific	171 (AB hex)	
Priority	Х	- [
Source Address	39 (27 hex)	
Communication Bit Rate	250 K bits/sec	

CONNE		Wiri	ING
	1440		

	11/12		
Signal	5 pin	DE4	DE6
V+	1	3 RED	3 RED
Common	2	4 BLACK	4 BLACK
CANH	3	1 YELLOW	1 YELLOW
CANL	4	2 GREEN	2 GREEN
SA Select	5		5 WHITE
Common			6 BLACK

Source Address Selection					
Value (ohms)	Address	PGN			
No Resistor	214	65451			
590 (id-tag 1)	215	65452			
976 (id-tag 2)	216	65453			
1500 (id-tag 3)	217	65454			
2260 (id-tag 4)	218	65455			
3400 (id-tag 5)	219	65456			
5360 (id-tag 6)	220	65457			
9530 (id-tag 7)	221	65458			

8 B)	/TF /	64 Bit Data Field B	
BYTE		BIT FUNCTION	FIELD DESCRIPTION
	1	RESET COUNT LSB	RESET COUNTER (2 bits)
	2	RESET COUNT MSB	01 = Reset counter to zero
	3 4	reserved	
	5	reserved RPM RATE LSB	RPM RATE (2 bits)
Ë	6	RPM RATE MSB	00 = Slow; 01 = Medium; 10 = Fast
вүте	7	DIRECTION Setting LSB	DIRECTION (2 bits)
	8	DIRECTION Setting MSB SAVE CNT Setting LSB	00 = FWD direction counts up; 01 = REV direction counts up SAVE COUNT Setting (2 bits)
	10	SAVE CNT Setting MSB	At power : $00 = Counter$ resets to 0;
			01 = Counter will start from last saved count
	11 12	CLEAR CNT Setting LSB CLEAR CNT Setting MSB	CLEAR COUNT (2 bits) 01 = Clear saved Count;
	12	OLLAN ON TOELLING WOD	If clear is the last saved sensor will start from 0
	13	SAVE ON SPEED LSB	SAVE ON ZERO SPEED Setting (2 bits)
2	14	SAVE ON SPEED MSB	00 = Do not save <i>count</i> on <i>speed</i> becoming 0;
	15	ENABLE STAT MSG LSB	01 = Save count when speed becomes 0 ENABLE SETTING STATUS MESSAGE (2 bits)
вүте	15	ENABLE STAT MSG LSB	At power : 00 = Do not enable setting status message;
B			01 = Enable setting status msg 65449 for transmission
	17 18	unused unused	NOTE: Set reserved and unused bits to all 0's or all 1's
	19	unused	
3	20 21	unused	
Ë	22	unused unused	
вүте	23	unused	
	24 25	unused unused	
	26	unused	
4	27 28	unused unused	
ш	20	unused	
Ĺ	30	unused	
вүте	31 32	unused unused	
	33	unused	
	34 35	unused unused	
5	36	unused	
Ш	37	unused	
BYTE	38 39	unused unused	
В	40	unused	
	41 42	unused unused	
	43	unused	
E 6	44 45	unused unused	
	46	unused	
ВҮТ	47 48	unused	
	48 49	unused unused	
	50	unused	
7	51 52	unused unused	
Ш	52	unused	
F	54	unused	
ВҮТЕ	55 56	unused unused	
	57	unused	
	58 59	unused unused	
8	60	unused	
μЦ	61	unused	
ВҮТЕ	62 63	unused unused	
Έ	64	unused	
ш	64	unused	

D)



**3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor SINC / DINC Inclinometers; Brief / 1 of 1

# **3-AXIS INCLINE** SENSORS (IP69K)



# **3 AXIS INCLINOMETERS GENERAL OVERVIEW**

The Joral Inclinometer provides rugged duty incline sensing that supports the standard and reliable CAN bus protocol. The solid state device is fully potted and sealed for IP69K protection.

- J1939 CAN Bus or varying voltage output
- Easy mounting, 3 axis sensing detects true change in angle (X, Y, Z) regardless of installed orientation
- Configuration available through J1939 for sensitivity and range settings
- Completely potted and sealed (IP69K)
- Standard connector options available (M12, Deutsch, flying lead)
- 'Electronic Bubble' LEDs display level status

### **DINC & SINC APPLICATION OVERVIEW**

The Joral 3 axis incline sensor is packaged as a single or dual module which communicates angular position via J1939 CAN Bus or varying voltage (analog).

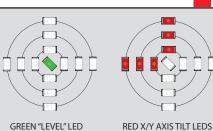
Solid-state microchip technology allows true position sensing regardless orientation to programmed zero. J1939 standard message contains angular position for X, Y, and Z. Each axis has its own independent current value.

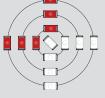
The sensor can be mounted to fit the requirements of the application, installed orientation does not influence output.

## **LED LEVEL ELECTRONIC BUBBLE** Real time visual feedback

Current angle for X and Y axis are displayed on LED indicators to show level and varying degrees out of level.

LED display handy for installation and at a glance level check. Red LEDs display level condition and green LED shows sensor is level.





**AT-A-GLANCE SPECIFICATIONS** 

### **Available Outputs:**

- J1939 CAN Bus
- Analog (voltage across specified range)

Part # Single Incline Sensor SINC-B-1939-[connector code]

> **Boom Angle Sensor** DINC-B-1939-[connector code]

For Analog incline configuration P/N consult Joral factory

**Connection options include but not limited to:** M12, M12 Pigtail, Flying Lead Cable, and various Deutsch connectors





3 Axis Incline Sensors IP69K inclinometer and boom angle sensor SINC General Specifications / Order Guide Inclinometers ; SINC / 1 of 4

# 3-AXIS INCLINE SENSORS (IP69K)

### SINC Incline Sensor 3 axis inclinometer, single module

- Easy mounting, sense true position regardless orientation
   3 axis sensing (X, Y and Z)
- Totally sealed IP69K (connector dependent)
- Wide operating temperature range, -40°C to +85°C
- J1939 CAN Bus or varying voltage output
- 'Electronic Bubble' LEDs display level status
- Configuration available through J1939 for sensitivity and angular range settings



# STANDARD OPERATING CHARACTERISTICS

ELECTRICAL	Outputs B - 1939	J1939, Addressable, 3 axis reporting (attached message sheets S4; I2 / 3 - 4)
ELECTRICAL	B - ANLG	Contact Joral to build custom analog signal
_	Input Power	6 to 30 VDC (90 mA)
	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
	LED Indicators	Power, J1939 communication status, level status and X/Y level condition
	Connections	M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
	Resolution	0.1°
	Absolute Accuracy (at 25°C)	± 0.3°
MECHANICAL	Housing Style	Rectangular tabbed
MECHANICAL	Housing Material	Plastic or Anodized Aluminum (high temperature applications)
	Housing Height	Plastic - 1.0"; Aluminum - <i>Contact Joral</i>
	Housing Width	Plastic - 1.5"; Aluminum - Contact Joral
	Housing Length w/ Tabs	Plastic - 3.0"; Aluminum - Contact Joral
	Mounting	Tabs (0.187 diameter holes)
	Weight	3.0 oz
	Operating Temperature	-40° to +80° C
ENVIRONMENTAL	Temperature Drift	$\pm$ 0.3 degrees across specified operating temperature limits
	Storage Temperature	-40° to +90° C
-	Humidity	100%
_	Shock	400g/6ms (MIL STD 202)
_	Vibration	5 to 3000 Hz, 20g (MIL STD 202)
-	Protection Class	IP69K (connection dependent)

### SINC GENERAL ORDERING GUIDE

Code 1: Housing Style	Code 2: MagElec (Sensor Output)		Code 3: Connection		Code 4: Special Codes	
SINC	B - 1939	, ,	M12	M12 male	51	Red Aluminum
Black plastic housing standard, not		position reporting	M12P	M12 male on 18' pigtail	53	Black Aluminum
rated for high temp applications	D-ANLO	Contact Joral to build custom analog signal	СХХ	Flying lead cable (enter XX as inches)		
SINC Modifier Red Aluminum: SINC - [Code 2] - [Code 3] - 51	* 14-	re outputs and connection	SCXX	Shielded cable (enter XX as inches)		
Special code 51(53) for anodized red (black) aluminum high temp housing	options available, contact Joral if desired configuration is not listed		DE4	DT04 - 4 pin male Deutsch	]	
(			DE6	DT04 - 6 pin male Deutsch		

General dimensions found on next page (S4 ; I2 / 2)

J1939 setting/status message found on pages three and four (S4; I2/3-4)



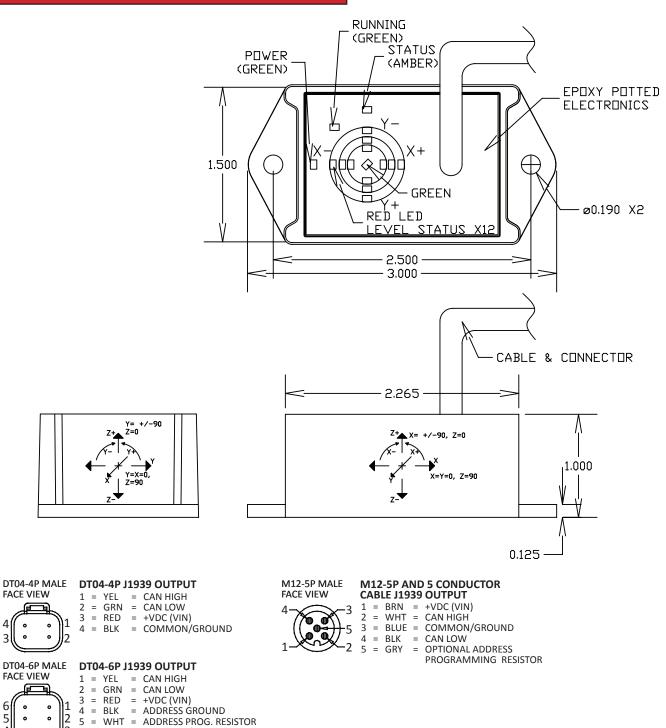


**3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor **SINC Dimensions & General Pin-outs** Inclinometers ; SINC / 2 of 4

**3-AXIS INCLINE** SENSORS (IP69K)

D)

### **SINC DIMENSIONS & GENERAL PIN OUTS**



Dimensions informative only For most recent dimensions please consult factory

= BLK

= COMMON/GROUND

3 6

6 ۰

5 ۰

4



**3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor SINC J1939 Setting/Status Message Inclinometers ; SINC / 3 of 4

# **3-AXIS INCLINE** SENSORS (IP69K)

J1939 3 Axis Incline	Sense	or - STATUS Mes	sage 65465 (SINC)
Message Parameters		E / 64 BIT DATA FIELD B	
This message is transmitted by sensor at REP Rate		BIT FUNCTION 1 X Angle bit0 LSB	FIELD DESCRIPTION X ANGLE (10 bits)
PGN: 65465 (FFB9 hex)		2   X Angle bit1	0 to 1000, 0.1° per bit
Transmission 50ms		3 X Angle bit2	
Repetition RateData Length8 bytes		4 X Angle bit3 5 X Angle bit4	
Data Page 0		6   X Angle bit5	
PDU Format 255 (FF hex)	$\succ$	7 X Angle bit6	
PDU Specific 185 (B9 hex) Priority 4		8 X Angle bit7 9 X Angle bit8	
Source Address 220 (DBC hex)		10 X Angle bit9 MSB	
Communication 250 K bits/sec	· ·	11 X Positive Flag LSB	X ANGLE POS SIGN FLAG (2 bits)
Bit Rate		12 X Positive Flag MSB 13 X Negative Flag LSB	01 = Positive Angle X ANGLE NEGATIVE SIGN FLAG (2 bits)
Part Numbers		14 X Negative Flag MSB	01 = Negative Angle
5 pin M12 SINC-B-1939-M12		15 Y Angle bit0 LSB	Y ANGLE (10 bits)
4 pin DT04 SINC-B-1939-DE4		16 Y Angle bit1	0 to 1000, 0.1° per bit
6 pin DT04 SINC-B-1939-DE6		17 Y Angle bit2 18 Y Angle bit3	
Flying Lead SINC-B-1939-SCXX	· ·	19 Y Angle bit4	
For flying lead replace XX with desired length in inches		20 Y Angle bit5	
For high temperature applications		21 Y Angle bit6 22 Y Angle bit7	
use aluminum housing. Add modifier 51 (red) or 53 (black) to	$  \rangle   2$	23 Y Angle bit8	
end of Joral P/N for aluminum.		24 Y Angle bit9 MSB	VANCLE DOS SIGNELAC (2 hits)
		25 Y Positive Flag LSB 26 Y Positive Flag MSB	Y ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle
CONNECTIONS / WIRING		27 Y Negative Flag LSB	Y ANGLE NEGATIVE SIGN FLAG (2 bits)
M12		28 Y Negative Flag MSB	01 = Negative Angle
Signal         5 pin         DE4         DE6           '+         1         3 RED         3 RED		29 Z Angle bit0 LSB 30 Z Angle bit1	<b>Z ANGLE (10 bits)</b> 0 to 1000, 0.1° per bit
ommon 2 4 BLACK 4 BLACK		31 Z Angle bit2	
ANH 3 1 YELLOW 1 YELLOW ANL 4 2 GREEN 2 GREEN		32 Z Angle bit3	
A Select 5 5 WHITE		<ul><li>33 Z Angle bit4</li><li>34 Z Angle bit5</li></ul>	
ommon 6 BLACK		35 Z Angle bit6	
Source Address Selection		36 Z Angle bit7	
alue (ohms) Address PGN		37 Z Angle bit8 38 Z Angle bit9 MSB	
lo Resistor 220 65465		39 Z Positive Flag LSB	Z ANGLE POS SIGN FLAG (2 bits)
90 ( <i>id-tag 1</i> ) 221 65465		10 Z Positive Flag MSB	01 = Positive Angle Z ANGLE NEGATIVE SIGN FLAG (2 bits)
76 (id-tag 2)         222         65465           500 (id-tag 3)         223         65465		1 Z Negative Flag LSB 2 Z Negative Flag MSB	01 = Negative Angle
260 ( <i>id-tag 4</i> ) 224 65465	4	13 unused	
400 (id-tag 5) 225 65465		44 unused	
360 (id-tag 6)         226         65465           530 (id-tag 7)         227         65465		45 unused 46 unused	
550 (Id-lag 7)  227  65465		17 unused	
		48 unused	
		19 unused 50 unused	
		51 unused	
		52 unused	
		53 unused 54 unused	
		55 unused	
		56 unused	CENCITIVITY Cotting (2 kite) Fight a state of a state of the
		57 Sensitivity bit0 LSB 58 Sensitivity bit1	SENSITIVITY Setting (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4)
		59 Sensitivity bit2 MSB	
		50 LED Weight bit0 LSB	LED WEIGHT Setting (3 bits) Field contains value of current setting
		61 LED Weight bit1 62 LED Weight bit2 MSB	Degrees per LED Indicator, 1 to 7 (default 1)
		63 unused	
		64 unused	



### **3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor SINC J1939 Setting/Status Message

# **3-AXIS INCLINE** SENSORS (IP69K)

Inclinometers ; SINC / 4 of 4

# J1939 3 Axis Incline Sensor - SETTING Message 65281 (SINC)

Message Parameters	8 RVTE	/ 64 Bit Data Field B	
This message is transmitted by the controller <b>PGN: 65281 (FF01 hex)</b> Transmission n/a	BYTE BI 2 3	SENS Setting bit1	FIELD DESCRIPTION SENSITIVITY SETTING (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4)
Repetition Rate       Data Length	<del>-</del> 4	reserved	
Data Page 0 PDU Format 255 (FF hex) PDU Specific 1 (01 hex)	BYTE 8	Direction Setting LSB Direction Setting LSB	LED WEIGHT SETTING (3 bits) Field contains value of current setting Degrees per LED indicator, 1 to 7 (default 1)
Priority x Source Address 39 (27 hex)	9 10	CAL LSB CAL MSB	CALIBRATE/HOME FLAG (2 bits) 01 = Calibrate / Home the sensor
Communication 250 K bits/sec Bit Rate	N 11 N 12	2 unused	NOTE: Set reserved and unused bits to all 0's or all 1's
CONNECTIONS / WIRING	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>	unused	
M12           Signal         5 pin         DE4         DE6           V+         1         3 RED         3 RED	17	' unused	
Common         2         4 BLACK         4 BLACK           CANH         3         1 YELLOW         1 YELLOW           CANL         4         2 GREEN         2 GREEN	18 19 20	) unused	
SA Select         5         5         WHITE           Common         6         6         BLACK		unused 2 unused	
Source Address Selection	23 24 25	unused	
Value (ohms)AddressPGNNo Resistor22065281500 (110 - 100	26	) unused   unused	
590 (id-tag 1)         221         65282           976 (id-tag 2)         222         65283           1500 (id-tag 3)         223         65284	日 日 日 28 28	) unused	
2260 (id-tag 4)         224         65285           3400 (id-tag 5)         225         65286	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>	unused	
5360 (id-tag 6)         226         65287           9530 (id-tag 7)         227         65288	33	B unused Unused	
	35 10 37	6 unused	
	$H = \frac{38}{39}$	3 unused 9 unused	
		unused	
	43 9 42	3 unused	
		6 unused	
		3 unused	
	50 51	) unused unused	
	<b>2</b> 52 53 54	3 unused	
	<b>→</b> 8 55 56	5 unused 5 unused	
	57 58 59	3 unused	
	ородина ор	) unused	
		2 unused 3 unused	
	<b>m</b> 64	unused	



3 Axis Incline Sensors IP69K inclinometer and boom angle sensor DINC General Specifications / Order Guide Inclinometers ; DINC / 1 of 5

# 3-AXIS INCLINE SENSORS (IP69K)

### DINC Boom Angle Sensor 3 axis inclinometer, dual module

- Two inclinometers which report master and slave position via one J1939 communication line
- Sense true position regardless orientation (X, Y and Z)
   Easily find change in position between base and boom
  - Totally sealed IP69K (connector dependent)
- Wide operating temperature range, -40°C to +85°C
- J1939 CAN Bus or varying voltage output
- 'Electronic Bubble' LEDs display level status
- Configuration available through J1939 for sensitivity and angular range settings



# STANDARD OPERATING CHARACTERISTICS

ELECTRICAL	Outputs B - 1939	J1939, Addressable, 3 axis reporting (attached message sheets S4; I3 / 3 - 4)
ELECIRICAL	B - ANLG	Contact Joral to build custom analog signal
	Input Power	6 to 30 VDC (90 mA)
_	Electrical Protection	Over-voltage, reserve-voltage, output short-circuit protected
	LED Indicators	Power, J1939 communication status, level status and X/Y level condition
	Connections	M12, M12 Pigtail, Flying Lead Cable, Shielded Flying Lead, or Deutsch - 4 or 6 pin
	Resolution	0.1°
	Absolute Accuracy (at 25°C)	± 0.3°
MECHANICAL	Housing Style	Rectangular tabbed
MECHANICAL	Housing Material	Plastic or Anodized Aluminum (high temperature applications)
	Housing Height	Plastic - 1.0"; Aluminum - <i>Contact Joral</i>
	Housing Width	Plastic - 1.5"; Aluminum - Contact Joral
	Housing Length w/ Tabs	Plastic - 3.0"; Aluminum - Contact Joral
	Mounting	Tabs (0.187 diameter holes)
	Weight	Master - 3.0 oz; Slave - 2.0 oz
ENVIRONMENTAL	<b>Operating Temperature</b>	-40° to +80° C
ENVIRONMENTAL	Temperature Drift	$\pm$ 0.3 degrees across specified operating temperature limits
	Storage Temperature	-40° to +90° C
-	Humidity	100%
_	Shock	400g/6ms (MIL STD 202)
-	Vibration	5 to 3000 Hz, 20g (MIL STD 202)
-	Protection Class	IP69K (connection dependent)

#### **DINC GENERAL ORDERING GUIDE** Code 1: Code 3: Code 4: Code 2: **Housing Style Special Codes** MagElec (Sensor Output) Connection DINC B - 1939 J1939, Addressable, 3 axis M12 M12 male 51 Red Aluminum position reporting M12 male on 18' pigtail Black plastic housing standard, not M12P 53 **Black Aluminum** rated for high temp applications B - ANLG Contact Joral to build СХХ Flying lead cable custom analog signal (enter XX as inches) **DINC Modifier Red Aluminum:** SCXX Shielded cable DINC - [Code 2] - [Code 3] - 51 (enter XX as inches) \* More outputs and connection Special code 51(53) for anodized red options available, contact Joral if DE4 DT04 - 4 pin male Deutsch (black) aluminum high temp housing desired configuration is not listed DE6 DT04 - 6 pin male Deutsch

General dimensions found on next page (S4; I3/2)

J1939 setting/status message found on pages three and four (S4; I3 / 3 - 5)





**3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor **DINC Dimensions & General Pin-outs** Inclinometers; DINC / 2 of 5

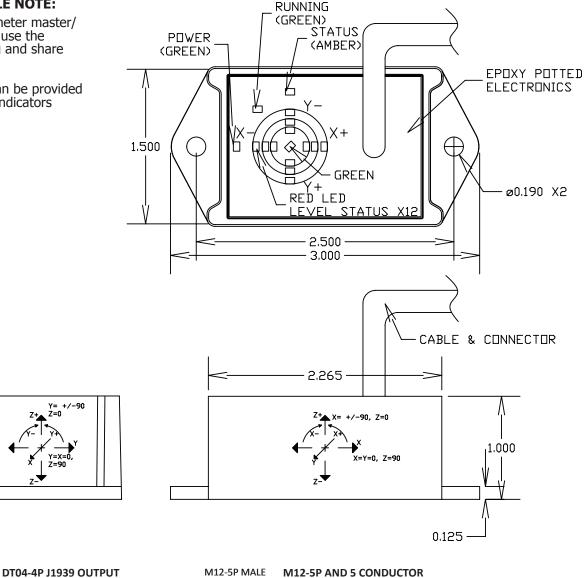
**3-AXIS INCLINE** SENSORS (IP69K)

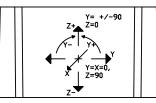
## **DINC DIMENSIONS & GENERAL PIN OUTS**

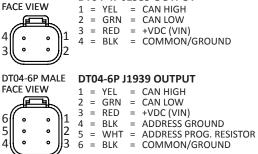
#### **BOOM ANGLE NOTE:**

DINC inclinometer master/ slave module use the same housing and share dimensions

DINC slave can be provided without LED indicators







FACE VIEW 0

1

M12-5P AND 5 CONDUCTOR CAB

> = GRY

1 = 3 2 = സ് 3 5 4 2 5

٩B	LE J19	39	OUTPUT
=	BRN	=	+VDC (VIN)
=	WHT	=	CAN HIGH
=	BLUE	=	COMMON/G
=	BLK	=	CAN LOW

- GROUND
- an low **OPTIONAL ADDRESS** =

PROGRAMMING RESISTOR

Dimensions informative only For most recent dimensions please consult factory

DT04-4P MALE



3 Axis Incline Sensors IP69K inclinometer and boom angle sensor DINC J1939 Setting/Status Message Inclinometers ; DINC / 3 of 5

# 3-AXIS INCLINE SENSORS (IP69K)

D)

# J1939 Dual 3 Axis Incline Sensor - Master STATUS Message 65467 (DINC)

Message Parameters		/ 64 Bit Data Field B	
This message is transmitted by sensor at REP Rate	BYTE BIT	BIT FUNCTION X Angle bit0 LSB	FIELD DESCRIPTION MASTER X ANGLE (10 bits)
PGN: 65467 (FFBB hex)	2	X Angle bit1	0 to 1000, 0.1° per bit
Transmission 50ms	3	X Angle bit2	
Repetition Rate	<del>-</del> 4	X Angle bit3	
Data Length 8 bytes Data Page 0		X Angle bit4 X Angle bit5	
PDU Format 255 (FF hex)		X Angle bit6	
PDU Specific 187 (BB hex)		X Angle bit7	
Priority 4	9	X Angle bit8	
Source Address 219 (DB hex) Communication 250 K bits/sec	10	X Angle bit9 MSB X Positive Flag LSB	X ANGLE POS SIGN FLAG (2 bits)
Bit Rate	N 12		01 = Positive Angle
		X Negative Flag LSB	X ANGLE NEGATIVE SIGN FLAG (2 bits)
Part Numbers	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>		01 = Negative Angle
5 pin M12 DINC-B-1939-M12	<b>A</b> 15 16		MASTER Y ANGLE (10 bits) 0 to 1000, 0.1° per bit
4 pin DT04 DINC-B-1939-DE4	17	Y Angle bit2	
6 pin DT04 DINC-B-1939-DE6 Flying Lead DINC-B-1939-SCXX	18	Y Angle bit3	
For flying lead replace XX with	n 19 20	Y Angle bit4 Y Angle bit5	
desired length in inches		Y Angle bit6	
For high temperature applications use aluminum housing. Add		Y Angle bit7	
modifier 51 (red) or 53 (black) to	L 22 23 24		
end of Joral P/Ń for aluminum.	<b>2</b> 4 25		Y ANGLE POS SIGN FLAG (2 bits)
	26	Y Positive Flag MSB	01 = Positive Angle
<b>C</b> ONNECTIONS / <b>W</b> IRING	27	Y Negative Flag LSB	Y ANGLE NEGATIVE SIGN FLAG (2 bits)
M12 Signal 5 pin DE4 DE6	<b>4</b> 28 29		01 = Negative Angle MASTER Z ANGLE (10 bits)
Signal         5 pin         DE4         DE6           V+         1         3 RED         3 RED			0 to 1000, 0.1° per bit
Common 2 4 BLACK 4 BLACK	$\begin{bmatrix} \mathbf{L} & 30 \\ \mathbf{J} & 31 \\ \mathbf{J} & 32 \end{bmatrix}$	Z Angle bit2	
CANH31 YELLOW1 YELLOWCANL42 GREEN2 GREEN	<u> </u>		
SA Select 5 5 WHITE	33		
Common 6 BLACK	35		
SOURCE ADDRESS SELECTION	<b>L</b> 36		
	<b>37</b> 38 39 40		
Value (ohms)AddressPGNNo Resistor21965467			Z ANGLE POS SIGN FLAG (2 bits)
590 ( <i>id-tag 1</i> ) 220 65467		Z Positive Flag MSB	01 = Positive Angle
976 (id-tag 2) 221 65467	41		Z ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle
1500 (id-tag 3)         222         65467           2260 (id-tag 4)         223         65467	42		
3400 (id-tag 5) 224 65467	v 44	unused	
5360 (id-tag 6) 225 65467	<u></u> ш 45		
9530 (id-tag 7) 226 65467		unused unused	
	<u>6</u> 48		
	49	unused	
	50		
	<b>N</b> 51		
	Б 53		
	54		
	LA 55 56		
	57		SENSITIVITY Setting (3 bits) Field contains value of current setting
	58	Sensitivity bit1	0 = most sensitive, 7 = most sluggish (default 4)
	<b>6</b> 0		LED WEIGHT Setting (3 bits) Field contains value of current setting
	の 60 山 61		Degrees per LED Indicator, 1 to 7 (default 1)
	<b>H</b> 62	LED Weight bit2 MSB	
	$\begin{vmatrix} \mathbf{A} \\ \mathbf{B} \end{vmatrix} = \begin{bmatrix} 63 \\ 64 \end{bmatrix}$		
	04	4114304	



**3 Axis Incline Sensors** IP69K inclinometer and boom angle sensor DINC J1939 Setting/Status Message Inclinometers ; DINC / 4 of 5

# **3-AXIS INCLINE** SENSORS (IP69K)

# J1939 Dual 3 Axis Incline Sensor - Slave STATUS Message 65466 (DINC)

Message Par	AMETERS
This message is	
sensor at REP Ra	ate
PGN: 65466 (FF	
Transmission	50ms
Repetition Rate	
Data Length	8 bytes
Data Page	0
PDU Format	255 (FF hex)
PDU Specific	186 (BA hex)
Priority	4
Source Address	219 (DB hex)
Communication	250 K bits/sec
Bit Rate	

SOURCE ADDRESS SELECTION					
Value (ohms)	Address	PGN			
No Resistor	219	65466			
590 (id-tag 1)	220	65466			
976 (id-tag 2)	221	65466			
1500 (id-tag 3)	222	65466			
2260 (id-tag 4)	223	65466			
3400 (id-tag 5)	224	65466			
5360 (id-tag 6)	225	65466			
9530 (id-tag 7)	226	65466			

8 B'	8 Byte / 64 Bit Data Field Bit Positions					
BYTE		BIT FUNCTION	FIELD DESCRIPTION			
BYTE 1	1 2 3 4 5 6 7 8	X Angle bit0 LSB X Angle bit1 X Angle bit2 X Angle bit3 X Angle bit4 X Angle bit5 X Angle bit6 X Angle bit7	SLAVE X ANGLE (10 bits) 0 to 1000, 0.1° per bit			
BYTE 2	9 10 11 12 13 14 15 16	X Angle bit8 X Angle bit9 MSB X Positive Flag LSB X Positive Flag MSB X Negative Flag MSB X Negative Flag MSB Y Angle bit0 LSB Y Angle bit1	X ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle X ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle SLAVE Y ANGLE (10 bits) 0 to 1000, 0.1° per bit			
BYTE 3	17 18 19 20 21 22 23 24	Y Angle bit2 Y Angle bit3 Y Angle bit4 Y Angle bit5 Y Angle bit6 Y Angle bit7 Y Angle bit8 Y Angle bit8 Y Angle bit9 MSB				
BYTE 4	25 26 27 28 29 30 31 32	Y Positive Flag LSB Y Positive Flag MSB Y Negative Flag MSB Z Angle bit0 LSB Z Angle bit1 Z Angle bit1 Z Angle bit2 Z Angle bit3	Y ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle Y ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle SLAVE Z ANGLE (10 bits) 0 to 1000, 0.1° per bit			
BYTE 5	33 34 35 36 37 38 39 40	Z Angle bit4 Z Angle bit5 Z Angle bit6 Z Angle bit7 Z Angle bit8 Z Angle bit9 MSB Z Positive Flag LSB Z Positive Flag MSB	Z ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle			
BYTE 6	41 42 43 44 45 46 47 48	Z Negative Flag LSB Z Negative Flag MSB unused unused unused unused unused unused	ZANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle			
BYTE 7	49 50 51 52 53 54 55 56	unused unused unused unused unused unused unused unused				
BYTE 8	57 58 59 60 61 62 63 64	unused unused unused unused unused unused unused unused				



3 Axis Incline Sensors IP69K inclinometer and boom angle sensor DINC J1939 Setting/Status Message Inclinometers ; DINC / 5 of 5

# 3-AXIS INCLINE SENSORS (IP69K)

# J1939 Dual 3 Axis Incline Sensor - SETTING Message 65290 (DINC)

Message Parameters	<b>8 В</b> уте	/ 64 Bit Data Field B	TT Positions
This message is transmitted by	BYTE BIT	BIT FUNCTION	FIELD DESCRIPTION
the controller	1	SENS Setting bit0 LSB	SENSITIVITY SETTING (3 bits) Field contains value of current setting
PGN: 65290 (FF0A hex)	2	SENS Setting bit1	0 = most sensitive, 7 = most sluggish (default 4)
Transmission n/a	3	SENS Setting bit2 MSB	
Repetition Rate	<del>-</del> 4	reserved	
Data Length n/a	<u>ш</u> 5	reserved	
Data Page 0 PDU Format 255 (FF hex)	E 6	Direction Setting LSB	LED WEIGHT SETTING (3 bits) Field contains value of current setting
PDU Format 255 (FF hex) PDU Specific 10 (0A hex)	BYTE 8	Direction Setting LSB Direction Setting MSB	Degrees per LED indicator, 1 to 7 (default 1)
Priority 7	9	CAL Master LSB	CALIBRATE/HOME MASTER FLAG (2 bits)
Source Address 249 (F9 hex)	10		01 = Calibrate/Home the Master sensor
Communication 250 K bits/sec	11	CAL Slave LSB	CALIBRATE/HOME SLAVE FLAG (2 bits)
Bit Rate	$  \cap  ^{12}$		01 = Calibrate/Home the Slave sensor
Source Address Selection	$ F ^{14}$		NOTE: Set reserved and unused bits to all 0's or all 1's
/alue (ohms) Address PGN	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>		
No Resistor 219 65290	<u> </u>		
90 (id-tag 1) 220 65291	18		
76 ( <i>id-tag 2</i> ) 221 65292	19		
500 ( <i>id-tag 3</i> ) 222 65293	m 20		
260 (id-tag 4)         223         65294           400 (id-tag 5)         224         65295			
400 (Id-tag 5)         224         65295           360 (id-tag 6)         225         65296	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>		
530 (id-tag 7) 226 65297			
TE: SOURCE ADDRESS AND	25		
IORITY CHANGED 08 NOV 2011	20		
	4 28		
	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>	unused	
	31		
	33		
	34		
	<b>LD</b> 36		
	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>		
	39	unused	
	41		
	42		
	31 45 46 47 48		
	→ 47	unused	
	49		
	50		
	<b>5</b> 1		
	<b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b> <b>J</b>		
	<b>í</b> 56		
	57		
	58		
	59		
	<b>∞</b> 60		
	<u></u> Ш 61		