

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

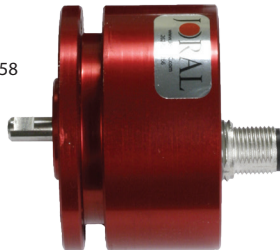
J1 Line sensor's shaft and bearing package is designed captive to provide extreme resistance to shaft push out forces.

- 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

J150 w/
Flange



J158



J150



J140



J130



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

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 | 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 and complementary outputs A', B', and Z' Driver: 7272 push-pull driver |
| Step and Direction Incremental Output | 16 to 512 PPR - 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 | 8192 Positions 0.0439 degrees per position | Format: Clock and data output Driver: Differential Output |
| PWM Absolute Position Output Absolute Output | 1024 or 2048 Positions | Format: Pulse Width Modulation in 1 μsec increments Driver: 7272 push-pull driver |
| Analog Voltage Absolute Position Absolute Output | 0 to 5 VDC -OR- 4 to 20 mA 10 bit internal resolution | Format: Output Voltage/Current proportional to 0-360 degrees Output Loading: 10mA max |
| J1939 CAN Bus Absolute or Incremental Output | 1000 or 8192 Positions - 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 |
| Electrical Protection | Over-voltage, Reserve-voltage, Output short-circuit protected |
| LED Indicators | Power and output channel status |
| Connection Types | M8, M12, M12 on pigtail, Terminal block, Flying lead cable, Deutsch - 4 or 6 pin |

ENVIRONMENTAL SPECIFICATIONS

| | |
|------------------------------|---|
| Operating Temperature | -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

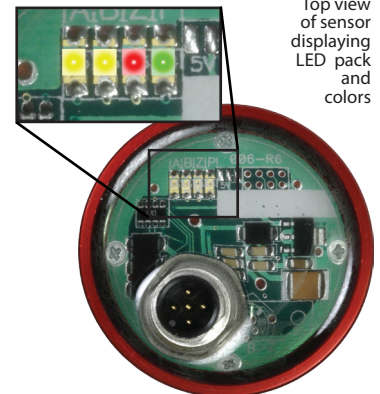
| | |
|--------------------------------|------------------------------|
| Housing Diameter | 30mm, 40mm, 50mm, 58mm |
| Housing Material | Aluminum |
| Standard Shaft Diameter | 6mm (w/ flat spot) |
| Standard Shaft Length | 0.411 inches (10.44mm) |
| Shaft Material | Non-magnetic stainless steel |
| Bearings | Dual chrome ball-bearings |
| Max Speed | 3000 RPM |

| MODEL | HOUSING DIAM. | WEIGHT | HEIGHT | HEIGHT 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) |

Shafted J140 w/
shell removed
displaying total
encapsulation



Top view
of sensor
displaying
LED pack
and
colors



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

| ELECTRICAL | Outputs | A - [PPR] - SEPP | Incremental 13 bit Quadrature w/ Single Ended Output A B Z |
|----------------------|------------------------------|-------------------------|---|
| | | A - [PPR] - DIPP | |
| | A - 1939 | | J1939 13 bit @ 1000 positions (8192 positions max) |
| | B - PWM | | 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 |
| | I1 | | Current Out / 0-24 VDC IN, 4-20 mA OUT |
| | Input Power | | 6 to 30 VDC at approx 60 mA max, <i>not including output loads</i> |
| | 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 | | 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 |
| ENVIRONMENTAL | 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) |
| | Protection Class | | IP67 (connection dependent) |

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



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 J130 = 30mm shafted made out of red aluminum, Connector orientation BACK EXIT only. | A - SEPP 13 bit single ended quadrature - A B Z | TRM Pluggable Terminal block | 40 1/4" (0.250") w/ flat |
| | | INS Wire insertion terminal | 41 10mm round |
| | A - DIPP 13 bit differential quadrature - A B Z, A' B' Z' | M8 M8 male | 42 3/8" slotted |
| | | M12 M12 male | 43 Extended 3/8" slotted |
| J140 J140 = 40mm shafted made out of red aluminum, Connector orientation BACK EXIT only. | A - 1939 13 bit J1939 @ 1000 positions | M12P M12 male on 18' pigtail | 44 Extended 6mm w/ flat |
| | | CXX Flying lead cable (enter XX as inches) | 45 6mm w/ flat |
| | B - PWM Absolute position PWM | SCXX Shielded cable (enter XX as inches) | 51 Red aluminum |
| | | | 53 Black aluminum |
| | A - SSI1 Absolute position SSI @ 8192 positions | CSP Cable with custom end | 90 13 bit @ 8192 counts per rotation (Typical J1939 option) |
| | | | |
| <i>* More outputs and connection options available, contact Joral if desired configuration is not listed</i> | V1 5 VDC IN, 0-5 VDC OUT | DE6 DT04 - 6 pin male Deutsch | |
| | V2 6-36 VDC IN, 0-5 VDC OUT | | |
| | I1 0-24 VDC IN, 4-20 mA OUT | | |

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)

- Enter Quadrature PPR in place of _____
- A = 13 bit PPR
- **Available 13 bit PPR:** 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256, 0400, 0500, 1024, 2048

A - 1939

- Standard J1939 output is 1000 positions
- A = 13 bit
- **MODIFIER 90** - for 8192 positions (max resolution) add code 90 to end of J130/J140 P/N

V1, V2, and I1 (Analog MagElec P/N Guide)

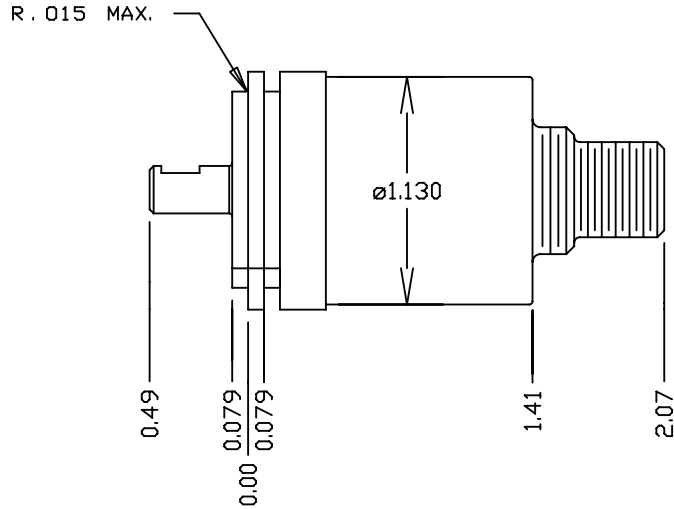
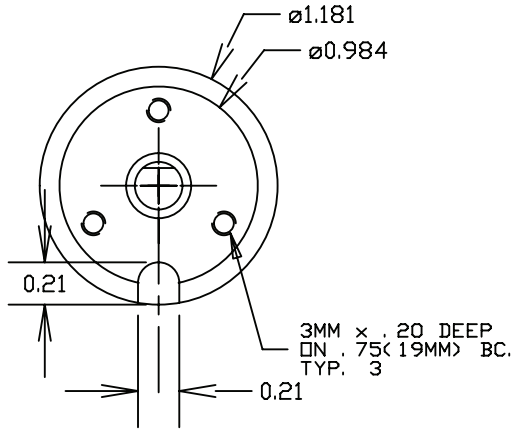
- First select MagElec code (**V1, V2 or I1**) then Angle Range (**A1-A2**), Voltage Range (**VR1-VR2**) and Signal Direction (**Clockwise [CW] or Counter [CCW]**)
- **PART NUMBER FORMULA**
(MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)
- **EXACT V1, V2, and I1 EXAMPLES**
J130 - **V1 - 0-360 - 0.5-4.5 - CW - C72**
J140 - **V2 - 0-180 - 0-5 - CCW - DE4**
J130 - **I1 - 180-270 - 4-20 - CW - M12**

Code 3: Connections

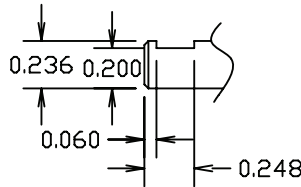
- **All Outputs, All Connections** - Connector exit back exit only (sensor epoxy side) for housing style J130 and J140
- **J1939 Output** - Addressing via varying value resistor in connection requires at least five conductors (*M12, DE6 and Cables addressing compatible*)
- **All Outputs w/ Deutsch** - DE4 and DE6 connection Deutsch connectors add \$20 to J130/J140 list



J130 DIMENSIONS & GENERAL PIN OUTS



6MM SHAFT WITH FLAT END DETAIL



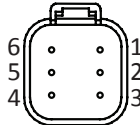
DT04-4P MALE FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

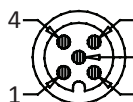
DT04-6P MALE FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

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 = CHANNEL Z

M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

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

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

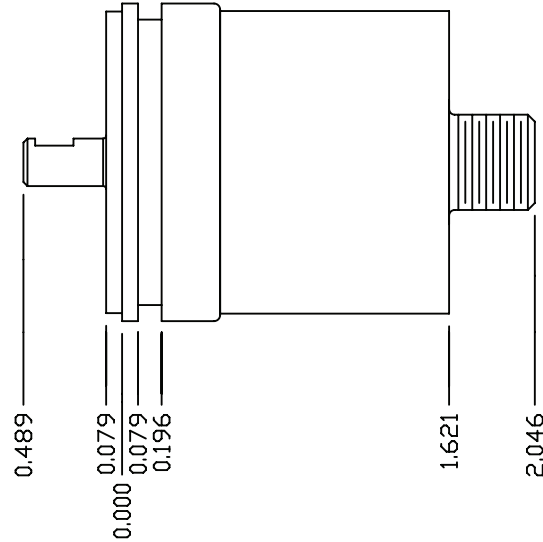
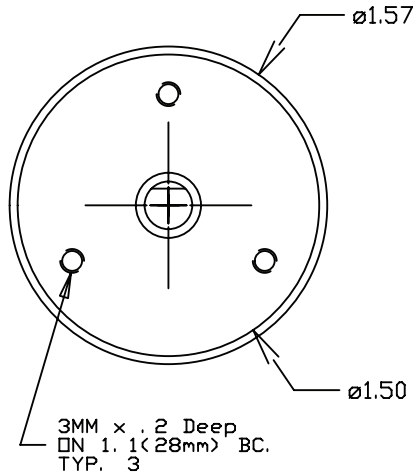
- 1 = BRN = +VDC (VIN)
- 2 = WHT = DIG. LIMIT OUT*
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = PROP. VDC OUTPUT
- 5 = GRY = NOT USED

*OPTION CONSULT FACTORY

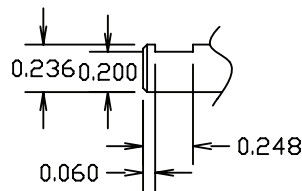
Dimensions informative only
For most recent dimensions please consult factory



J140 DIMENSIONS & GENERAL PIN OUTS



6MM SHAFT WITH FLAT
END DETAIL



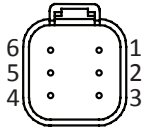
DT04-4P MALE
FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

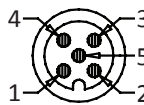
DT04-6P MALE
FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

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 = CHANNEL Z

M12-5P AND 5 CONDUCTOR
CABLE J1939 OUTPUT

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

Dimensions informative only
For most recent dimensions please consult factory



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



Left: 58mm Shafted (J158)
Right: 50mm Shafted (J150)

STANDARD OPERATING CHARACTERISTICS

| ELECTRICAL | 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 @ 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 (<i>code V3 for 2x redundant output</i>) | |
| | V2 | Voltage Out / 6-36 VDC IN, 0-5 VDC OUT | |
| | I1 | Current Out / 0-24 VDC IN, 4-20 mA OUT (<i>code I1 for 2x redundant output</i>) | |
| | Input Power | 6 to 30 VDC at approx 60 mA max, <i>not including output loads</i> | |
| | 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) | |
| | 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 | |
| ENVIRONMENTAL | Operating Temperature | -30° to +80° C | |
| | 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 | IP67 (<i>connection dependent</i>) | |

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



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 J150 = 50mm shafted made out of red aluminum, Connector orientation BACK EXIT only. Modifier Flange Mount: Special Code - 63 Add special code 63 to the end of J150 P/N for flange mount <i>Flange drawing found on S1; I3 / 4</i> | A - SEPP 13 bit single ended quadrature - A B Z | TRM Pluggable Terminal block | 40 1/4" (0.250") w/ flat |
| | A - DIPP 13 bit differential quadrature - A B Z, A' B' Z' | INS Wire insertion terminal | 41 10mm round |
| | A - 1939 13 bit J1939 @ 1000 positions | M8 M8 male | 42 3/8" slotted |
| | B - PWM Absolute position PWM | M12 M12 male | 43 Extended 3/8" slotted |
| | A - MOD1 13 bit Modicon MODBUS @ 8192 positions | M12P M12 male on 18' pigtail | 44 Extended 6mm w/ flat |
| | | CXX Flying lead cable (enter XX as inches) | 45 6mm w/ flat |
| J158 J158 = 58mm shafted made out of red aluminum, Connector orientation BACK EXIT only. | A - SSI1 Absolute position SSI @ 8192 positions | SCXX Shielded cable (enter XX as inches) | 53 Black aluminum |
| | V1 5 VDC IN, 0-5 VDC OUT | CSP Cable with custom end | 63 Flange Mount |
| | V2 6-36 VDC IN, 0-5 VDC OUT | DE4 DT04 - 4 pin male Deutsch | 90 13 bit @ 8192 counts per rotation (Typical J1939 option) |
| | V3 0-24 VDC IN, 4-20 mA OUT x2 (Redundant output) | DE6 DT04 - 6 pin male Deutsch | 91 13 bit @ 1000 counts per rotation (Typical MODBUS option) |
| | I1 0-24 VDC IN, 4-20 mA OUT | | |
| | I2 0-24 VDC IN, 4-20 mA OUT x2 (Redundant output) | | |
| <i>* More outputs and connection options available, contact Joral if desired configuration is not listed</i> | | | |

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

(A - SEPP) or (A - DIPP)

- Enter Quadrature PPR in place of _____
- A = 13 bit PPR
- **Available 13 bit PPR:** 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256, 0400, 0500, 1024, 2048

A - 1939

- Standard J1939 output is 1000 positions
- A = 13 bit
- **MODIFIER 90** - for 8192 positions (max resolution) add code 90 to end of J150/J158 P/N

A - MOD1

- Standard MOD1 output is 8192 positions
- A = 13 bit
- **MODIFIER 91** - for 1000 positions add code 91 to end of J150/J158 P/N

V1, V2, and I1 (Analog MagElec P/N Guide)

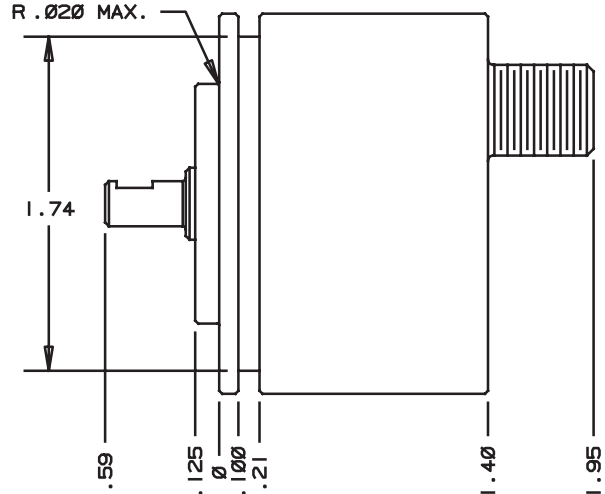
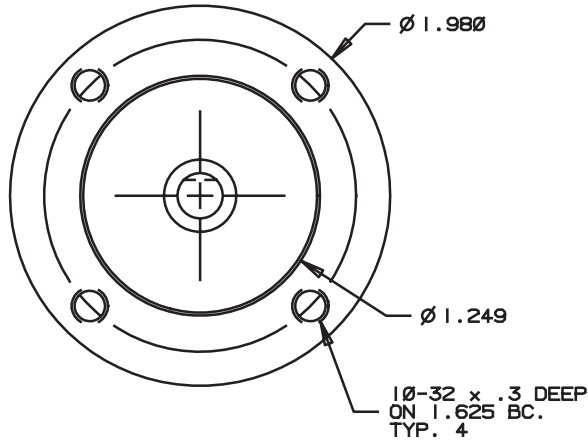
- First select MagElec code (**V1, V2 or I1**) then Angle Range (**A1-A2**), Voltage Range (**VR1-VR2**) and Signal Direction (**Clockwise [CW] or Counter [CCW]**)
- **PART NUMBER FORMULA** (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)
- **EXACT V1, V2, and I1 EXAMPLES**
 J150 - **V1 - 0-360 - 0.5-4.5 - CW - C72**
 J158 - **V2 - 0-180 - 0-5 - CCW - DE4**
 J158 - **I1 - 180-270 - 4-20 - CW - M12**

Code 3: Connections

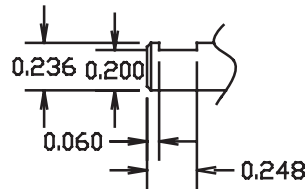
- **All Outputs, All Connections** - Connector exit back exit only (sensor epoxy side) for housing style J150 and J158
- **J1939 Output** - Addressing via varying value resistor in connection requires at least five conductors (*M12, DE6 and Cables addressing compatible*)
- **All Outputs w/ Deutsch**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



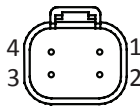
J150 DIMENSIONS & GENERAL PIN OUTS



6MM SHAFT WITH FLAT END DETAIL



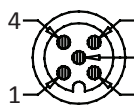
DT04-4P MALE
FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

M12-5P MALE
FACE VIEW



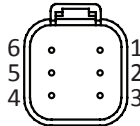
M12-5P/CABLE/FLYING LEAD
QUADRATURE OUTPUT

- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRY = CHANNEL Z

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

DT04-6P MALE
FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

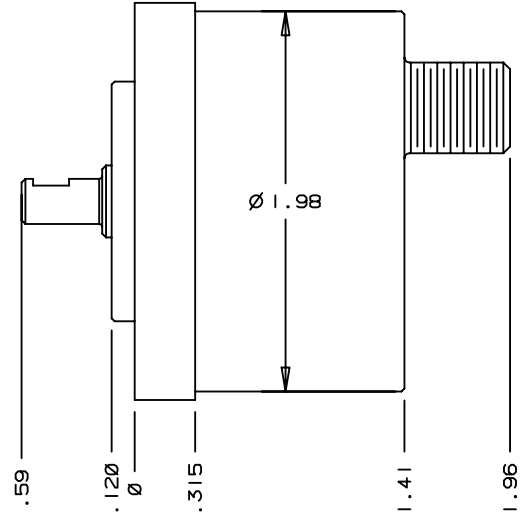
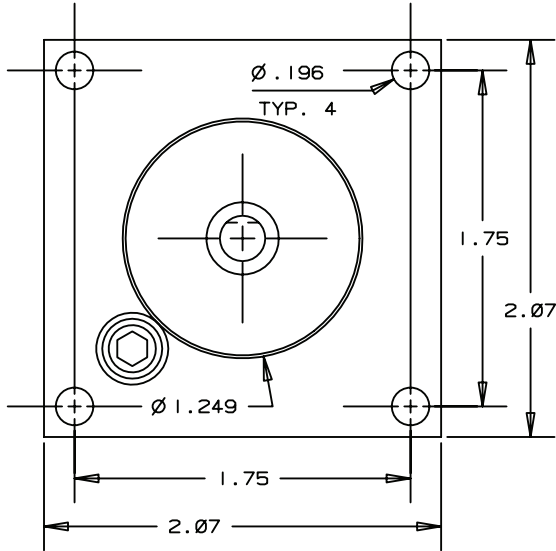
M12-5P AND 5 CONDUCTOR
CABLE J1939 OUTPUT

- 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



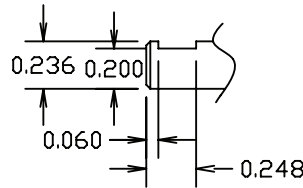
J150 FLANGE DIMENSIONS & GENERAL PIN OUTS



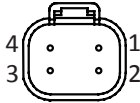
For Flange mount add special code 63 to end of Joral P/N

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

6MM SHAFT WITH FLAT END DETAIL



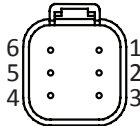
DT04-4P MALE FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

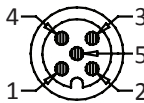
DT04-6P MALE FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

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 = CHANNEL Z

M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

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

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

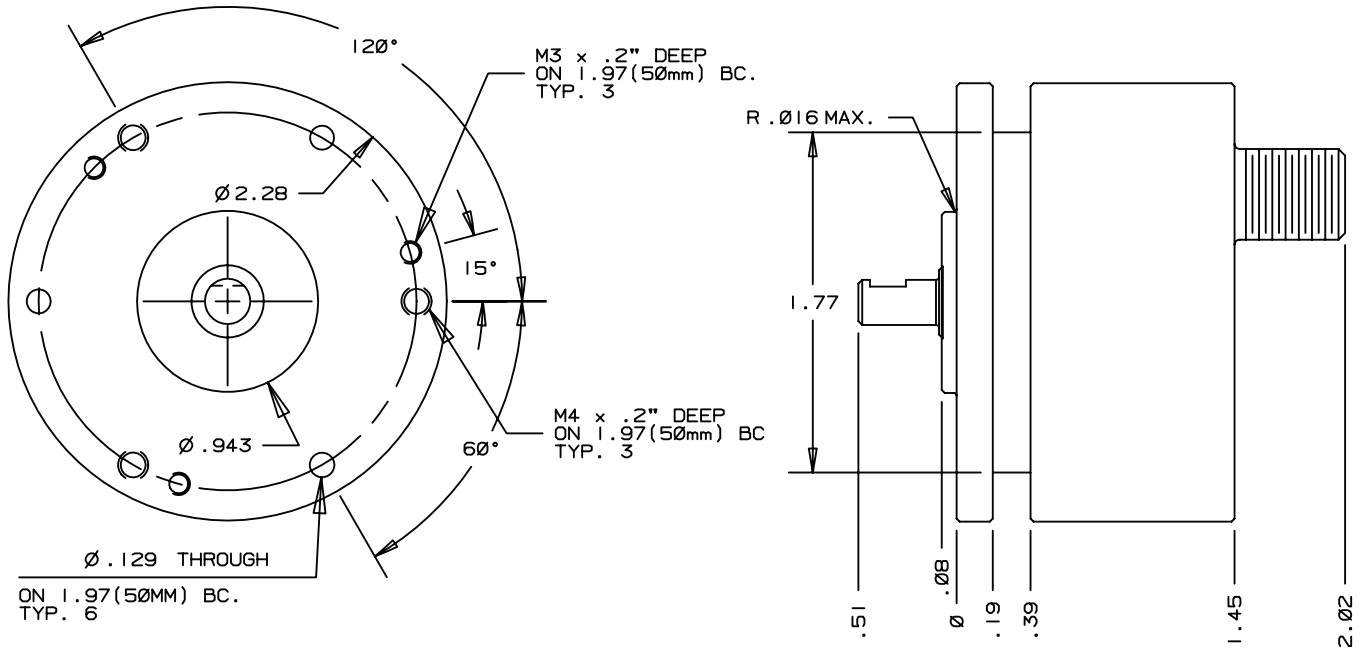
- 1 = BRN = +VDC (VIN)
- 2 = WHT = DIG. LIMIT OUT*
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = PROP. VDC OUTPUT
- 5 = GRY = NOT USED

*OPTION CONSULT FACTORY

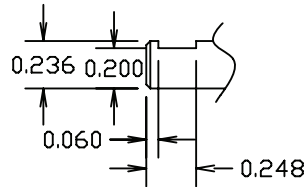
Dimensions informative only
For most recent dimensions please consult factory



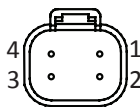
J158 DIMENSIONS & GENERAL PIN OUTS



6MM SHAFT WITH FLAT END DETAIL



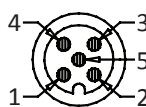
DT04-4P MALE FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

M12-5P MALE FACE VIEW



M12-5P/CABLE/FLYING LEAD QUADRATURE OUTPUT

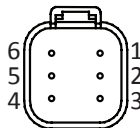
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRN = CHANNEL Z

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 = GRN = NOT USED

*OPTION CONSULT FACTORY

DT04-6P MALE FACE VIEW



DT04-6P J1939 OUTPUT

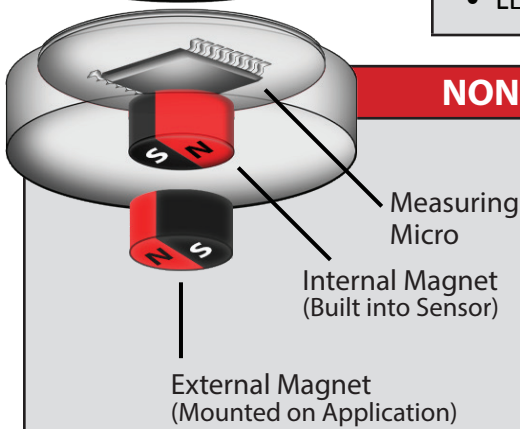
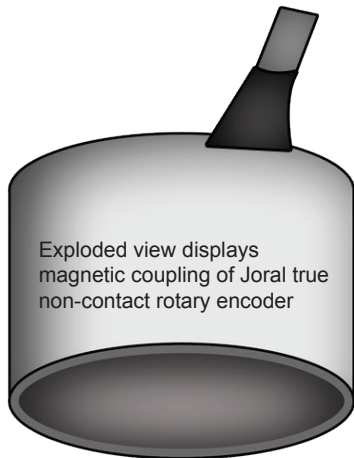
- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

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

Dimensions informative only
For most recent dimensions please consult factory





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.

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:

| | |
|---------------|--|
| GAP | 0.5" (12mm) between application magnet and encoder |
| AXIAL | 0.10" (2.5mm) center alignment |
| PLANAR | 30° tilt |

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

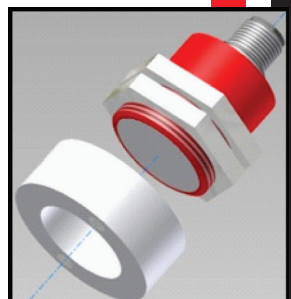
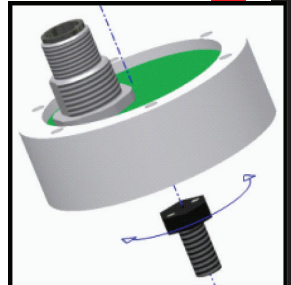
Available Incremental Outputs:

- 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



NON-CONTACT POSITION SENSORS

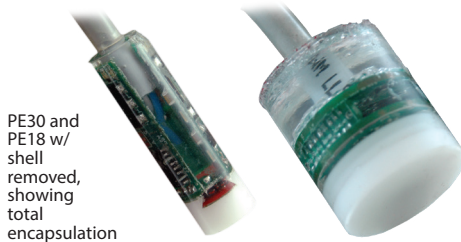
TRUE NON-CONTACT POSITION SENSING

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



HP58 showing sensor internal magnet and application magnet



PE30 and PE18 w/ shell removed, showing total encapsulation

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

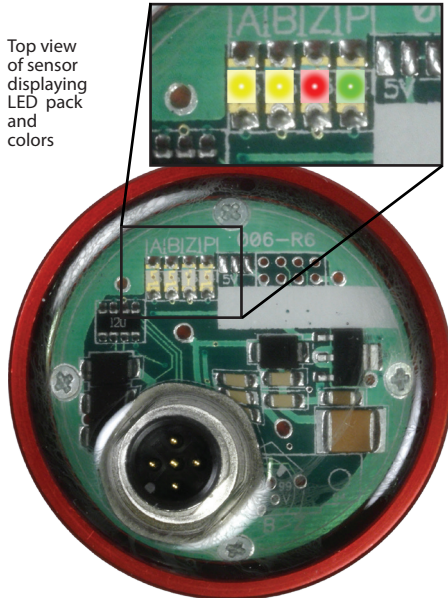
STANDARD PACKAGING STYLES

Joral non-contact sensors 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



Top view of sensor displaying LED pack and colors

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



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 | 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 and complementary outputs A', B', and Z' Driver: 7272 push-pull driver |
| Step and Direction Incremental Output | 16 to 512 PPR - 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 | 8192 Positions 0.0439 degrees per position | Format: Clock and data output Driver: Differential Output |
| PWM Absolute Position Output Absolute Output | 1024 or 2048 Positions | Format: Pulse Width Modulation in 1 μsec increments Driver: 7272 push-pull driver |
| Analog Voltage Absolute Position Absolute Output | 0 to 5 VDC -OR- 4 to 20 mA 10 bit internal resolution | Format: Output Voltage/Current proportional to 0-360 degrees Output Loading: 10mA max |
| J1939 CAN Bus Absolute or Incremental Output | 1000 or 8192 Positions - 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 |
| Electrical Protection | Over-voltage, Reserve-voltage, Output short-circuit protected |
| LED Indicators | Power and output channel status |
| Connection Types | M8, M12, M12 on pigtail, Terminal block, Flying lead cable, Deutsch - 4 or 6 pin |

ENVIRONMENTAL SPECIFICATIONS

| | |
|------------------------------|--|
| Operating Temperature | -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) <i>**Terminal block not IP rated**</i> |

MECHANICAL SPECIFICATIONS

| Housing Diameter | 18mm, 30mm, 38mm, and 58mm | | | |
|-------------------------|---------------------------------------|--------|----------------------|----------------------|
| Housing Material | Aluminum, Stainless Steel, or Delrin™ | | | |
| Max Speed | 3000 RPM | | | |
| MODEL | HOUSING DIAMETER | WEIGHT | HEIGHT | HEIGHT 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) |



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 | 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 @ 1000 positions (8192 positions max) | |
| | B - PWM | 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 | |
| | I1 | Current Out / 0-24 VDC IN, 4-20 mA OUT | |
| | Input Power | 6 to 30 VDC at approx 60 mA max, <i>not including output loads</i> | |
| | 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 | 30mm | |
| | Housing Material | Aluminum or Stainless Steel (<i>corrosion resistant</i>) | |
| | Housing Height | 1.2" (30.5mm) body; 1.86" (47.2mm) w/ M12 connector | |
| | Mounting | 30mm thread (<i>standard proximity switch thread style</i>) | |
| | Weight | 1.0 oz w/o mounting nuts; 2.2 oz w/ recommended mounting nuts | |
| | Magnet / sensor gap* | Standard 0.5" (12mm) (<i>Max w/ custom mag assembly up to 1" [30mm]</i>) | |
| | Rated planer tilt / axial gap* | Planar 30° (<i>Max 45°</i>) / Axial 0.1" (2.5mm) (<i>Max 0.16" [4mm]</i>) | |
| | Speed | 3000 RPM max | |
| ENVIRONMENTAL | Operating Temperature | -30° to +80° C | |
| | 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 (<i>connection dependent</i>) | |

* Non-contact tolerances rated using MAGH-RING 1/4x20 magnet accessory.

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



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 PE30 red aluminum, For stainless steel housing add special code 54 to Joral P/N. Modifier Extended Thread: Special Code - 61 Extended thread on PE30 housing increases available thread length by 0.5" (12.7mm). <i>* More outputs and connection options available, contact Joral if desired configuration is not listed</i> | A - _____ - SEPP | 13 bit single ended quadrature - A B Z | TRM Pluggable Terminal block INS Wire insertion terminal |
| | A - _____ - DIPP | 13 bit differential quadrature - A B Z, A' B' Z' | M8 M8 male M12 M12 male |
| | A - 1939 | 13 bit J1939 @ 1000 positions | M12P M12 male on 18' pigtail CXX Flying lead cable (enter XX as inches) |
| | B - PWM | Absolute position PWM | SCXX Shielded cable (enter XX as inches) |
| | A - SSI1 | Absolute position SSI @ 8192 positions | CSP Cable with custom end DE4 DT04 - 4 pin male Deutsch DE6 DT04 - 6 pin male Deutsch |
| | V1 | 5 VDC IN, 0-5 VDC OUT | |
| | V2 | 6-36 VDC IN, 0-5 VDC OUT | |
| | I1 | 0-24 VDC IN, 4-20 mA OUT | |
| | | | 51 Red Aluminum 53 Black Aluminum 54 Stainless Steel 61 Extended Thread 71 Roller 72 Spindle 90 13 bit @ 8192 counts per rotation (Typical J1939 option) |

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

(A - _____ - SEPP) or
 (A - _____ - DIPP)

- Enter Quadrature PPR in place of _____
- A = 13 bit PPR
- **Available 13 bit PPR:** 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256, 0400, 0500, 1024, 2048

A - 1939

- Standard J1939 output is 1000 positions
- A = 13 bit
- **MODIFIER 90** - for 8192 positions (max resolution) add code 90 to end of PE30 P/N

V1, V2, and I1 (Analog MagElec P/N Guide)

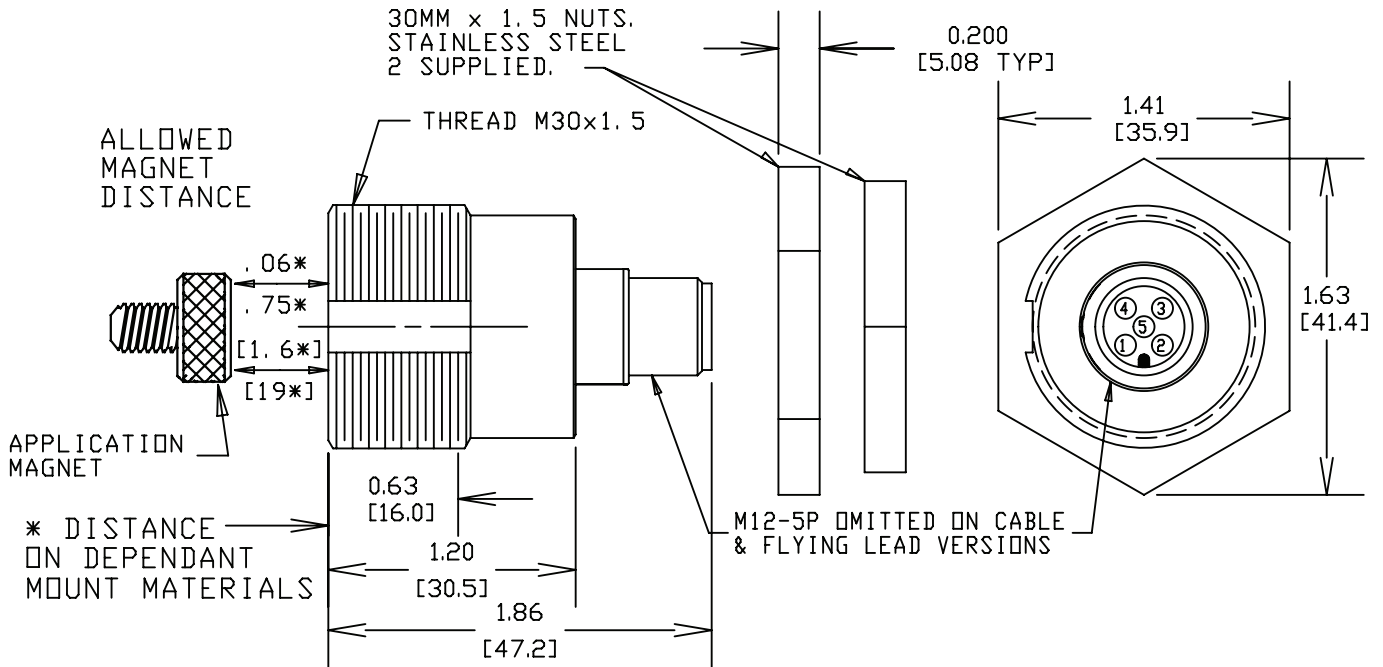
- First select MagElec code (**V1, V2 or I1**) then Angle Range (**A1-A2**), Voltage Range (**VR1-VR2**) and Signal Direction (**Clockwise [CW] or Counter [CCW]**)
- **PART NUMBER FORMULA** (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)
- **EXACT V1, V2, and I1 EXAMPLES**
 PE30 - **V1 - 0-360 - 0.5-4.5 - CW** - C72
 PE30 - **V2 - 0-180 - 0-5 - CCW** - DE4
 PE30 - **I1 - 180-270 - 4-20 - CW** - M12

Code 3: Connections

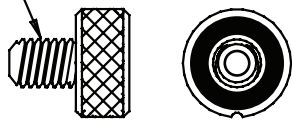
- **All Outputs, All Connections** - Connector exit back exit only (sensor epoxy side) for housing style PE30
- **J1939 Output** - Addressing via varying value resistor in connection requires at least five conductors (*M12, DE6 and Cables addressing compatible*)
- **All Outputs w/ Deutsch** - DE4 and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



PE30 DIMENSIONS & GENERAL PIN OUTS

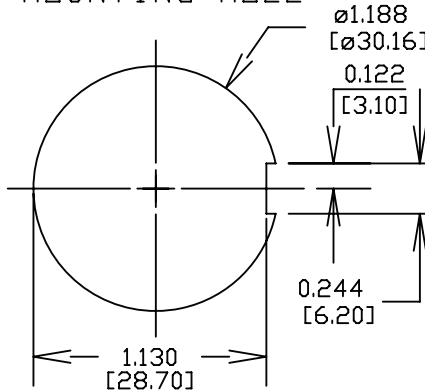


STANDARD MAGNET
MAG-H-RING-ASSM.
1/4-20 X .47

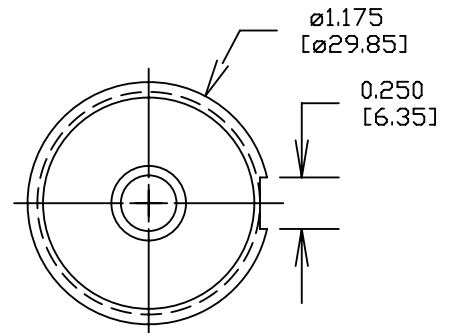


MAGNET NOTE:
STANDARD MAGNET INCLUDED AS ACCESSORY WITH PURCHASE OF NON-CONTACT SENSOR

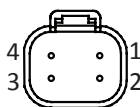
RECOMMENDED MOUNTING HOLE



SENSOR FACE



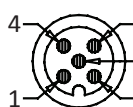
DT04-4P MALE FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

M12-5P MALE FACE VIEW



M12-5P/CABLE/FLYING LEAD QUADRATURE OUTPUT

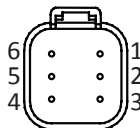
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRY = CHANNEL Z

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

DT04-6P MALE FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

- 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



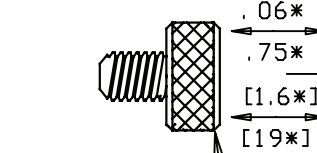
PE30 EXTENDED THREAD DIMENSIONS & GENERAL PIN OUTS

NOTE:

ADD 61 TO END OF PE30 P/N
FOR EXTENDED THREAD

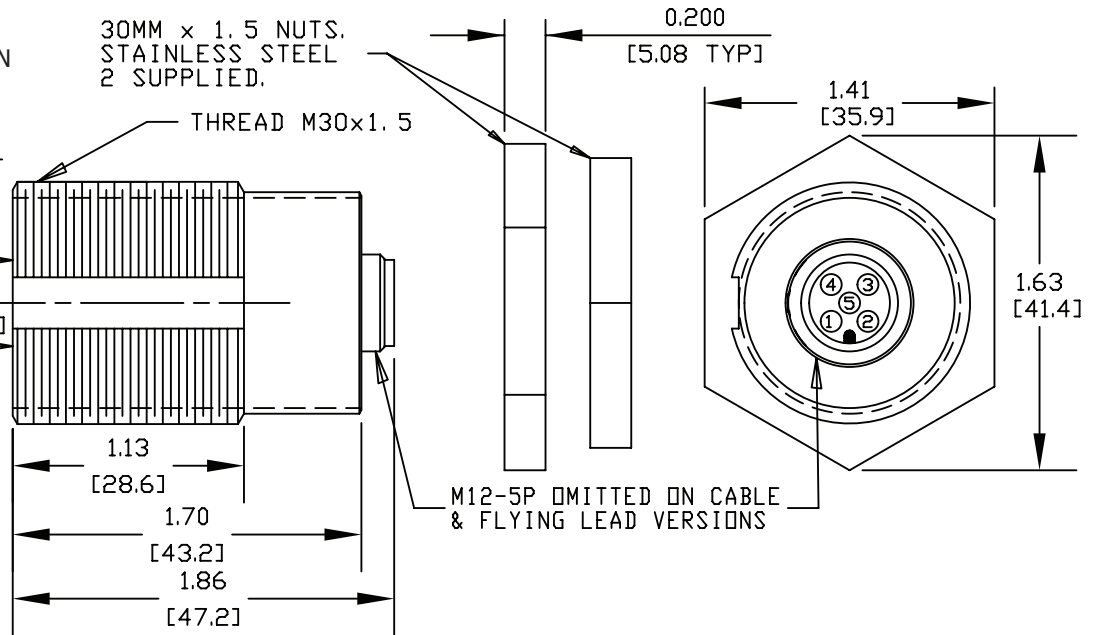
30MM x 1.5 NUTS.
STAINLESS STEEL
2 SUPPLIED.

ALLOWED MAGNET
DISTANCE

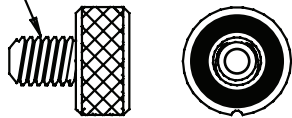


APPLICATION
MAGNET

* DISTANCE
DEPENDANT
ON MOUNT
MATERIALS



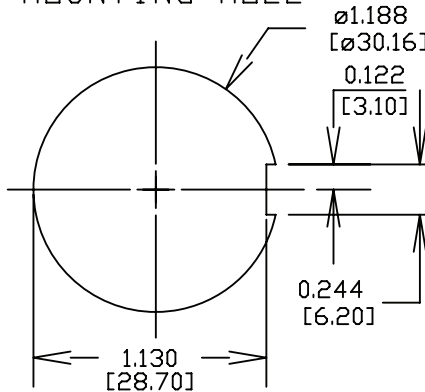
STANDARD MAGNET
MAG-H-RING-ASSM.
1/4-20 X .47



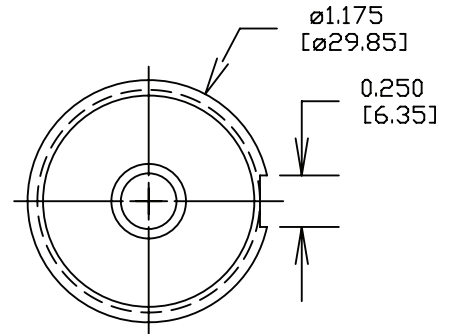
MAGNET NOTE:

STANDARD MAGNET INCLUDED AS
ACCESSORY WITH PURCHASE OF
NON-CONTACT SENSOR

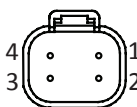
RECOMMENDED
MOUNTING HOLE



SENSOR FACE



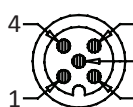
DT04-4P MALE
FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

M12-5P MALE
FACE VIEW



**M12-5P/CABLE/FLYING LEAD
QUADRATURE OUTPUT**

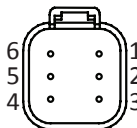
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRY = CHANNEL Z

**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

DT04-6P MALE
FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

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

- 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



HP38 Hockey Puck™ *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 | Outputs | B - [PPR] - SEPP Incremental 10 bit Quadrature w/ Single Ended Output A B Z B - 1939 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, <i>not including output loads</i> |
| | 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 |
| | Housing Material | Black Delrin™ (<i>standard</i>) |
| | Housing Height | 0.69" (17.5mm) body |
| | Mounting | 32mm (.884) spacing w/ 4mm diameter screws |
| | Weight | 1.3 oz |
| | Magnet / sensor gap* | Standard 0.5" (12mm) (<i>Max w/ custom mag assembly up to 1" [30mm]</i>) |
| | Rated planar tilt / axial gap* | Planar 30° (<i>Max 45°</i>) / Axial 0.1" (2.5mm) (<i>Max 0.16" [4mm]</i>) |
| | Speed | 3000 RPM max |
| ENVIRONMENTAL | Operating Temperature | -30° to +80° C |
| | 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 (<i>connection dependent</i>) |

**Non-contact tolerances rated using MAGH-RING 1/4x20 magnet accessory.*

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



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 HP38 material black Delrin™, connector orientation SIDE EXIT. For REAR EXIT connector on HP38 add code 33 to end of P/N. | B - _____ - SEPP | 10 bit single ended quadrature - A B Z | TRM Pluggable Terminal block M8 M8 male |
| | B - 1939 | 10 bit J1939 @ 512 positions | M12P M12 male on 18' pigtail CXX Flying lead cable (enter XX as inches) |
| | B - SSI1 | Absolute position SSI @ 512 positions | SCXX Shielded cable (enter XX as inches) |
| | B - PWM | PWM absolute position | DE4 DT04 - 4 pin male Deutsch DE6 DT04 - 6 pin male Deutsch |
| | V1 | 5 VDC IN, 0-5 VDC OUT | |
| | V2 | 6-36 VDC IN, 0-5 VDC OUT | |
| | | | 31 Side Exit (housing wall) 33 Back Exit (epoxy side) 71 Roller 72 Spindle |
| * More outputs and connection options available, contact Joral if 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

(B - _____ - SEPP)

- Enter Quadrature PPR in place of _____
- B = 10 bit PPR
- **Available 10 bit PPR:** 0032, 0064, 0128, 0256

B - 1939

- 10 bit J1939 output is 512 positions
- B = 10 bit

V1, V2, and I1 (Analog MagElec P/N Guide)

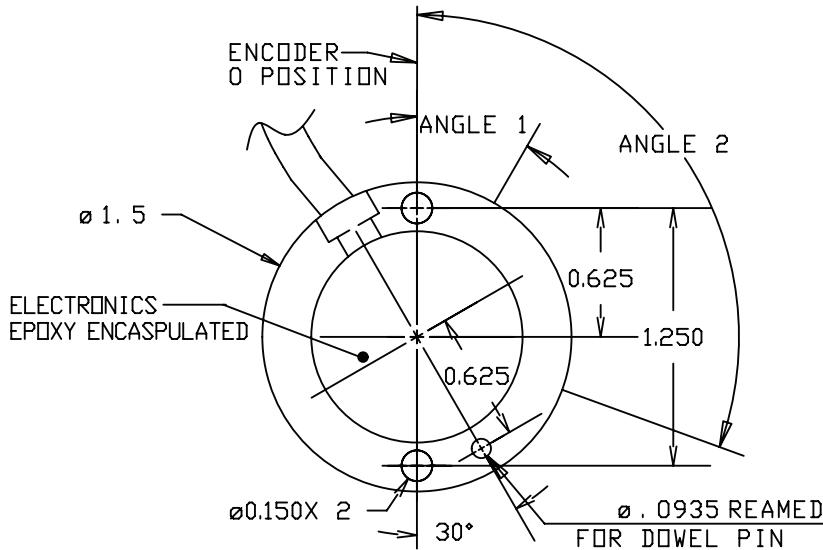
- First select MagElec code (**V1, V2 or I1**) then Angle Range (**A1-A2**), Voltage Range (**VR1-VR2**) and Signal Direction (**Clockwise [CW] or Counter [CCW]**)
- **PART NUMBER FORMULA**
(MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)
- **EXACT V1, V2, and I1 EXAMPLES**
 HP38 - **V1 - 0-360 - 0.5-4.5 - CW - C72**
 HP38 - **V2 - 0-180 - 0-5 - CCW - C72**
 HP38 - **I1 - 180-270 - 4-20 - CW - C72**

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



HP38 DIMENSIONS & GENERAL PIN OUTS

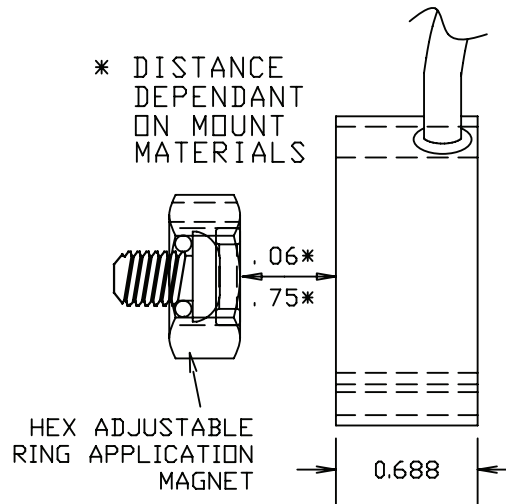


HOUSING/INSTALL NOTES:
MAGNET MOUNT MATERIALS
MUST HAVE Ø1.0 [25.4]
HOLE CENTERED ON SENSOR
CENTERLINE

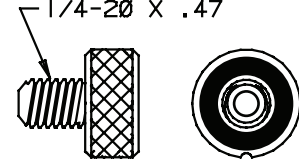
NON-MAGNETIC MOUNT
MATERIAL, MAY BE SOLID

MOUNT WITH 316 STAINLESS
STEEL 4-40 SCREWS

* DISTANCE
DEPENDANT
ON MOUNT
MATERIALS

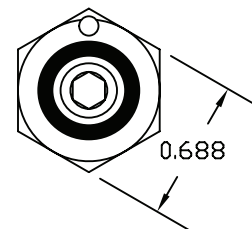


STANDARD MAGNET
MAG-H-RING-ASSM.
1/4-20 X .47



MAGNET NOTE:
STANDARD MAGNET INCLUDED AS
ACCESSORY WITH PURCHASE OF
NON-CONTACT SENSOR

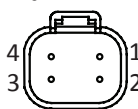
V1, V2, I1
HEX ADJUSTABLE
MAGNET DETAIL
(FACE VIEW)



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

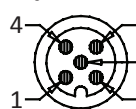
**DT04-4P MALE
FACE VIEW**



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

**M12-5P MALE
FACE VIEW**



**M12-5P/CABLE/FLYING LEAD
QUADRATURE OUTPUT**

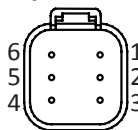
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRY = CHANNEL Z

**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

**DT04-6P MALE
FACE VIEW**



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

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

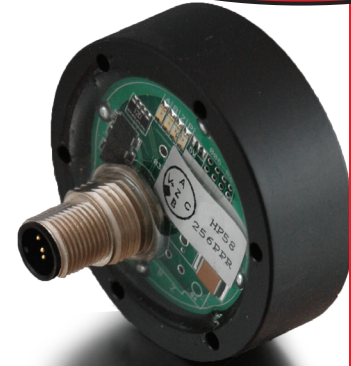
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CAN HIGH
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CAN LOW
- 5 = GRY = OPTIONAL ADDRESS
PROGRAMMING RESISTOR

Dimensions informative only
For most recent dimensions please consult factory



HP58 Hockey Puck™ 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 | 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 @ 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 (<i>code V3 for 2x redundant output</i>) | |
| | V2 | Voltage Out / 6-36 VDC IN, 0-5 VDC OUT | |
| | I1 | Current Out / 0-24 VDC IN, 4-20 mA OUT (<i>code I1 for 2x redundant output</i>) | |
| | Input Power | 6 to 30 VDC at approx 60 mA max, <i>not including output loads</i> | |
| | 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 | |
| | Housing Material | HP58 Black Delrin™ (<i>standard</i>) or White Delrin™; 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 | |
| | Magnet / sensor gap* | Standard 0.5" (12mm) (<i>Max w/ custom mag assembly up to 1" [30mm]</i>) | |
| | Rated planar tilt / axial gap* | Planar 30° (<i>Max 45°</i>) / Axial 0.1" (2.5mm) (<i>Max 0.16" [4mm]</i>) | |
| | Speed | 3000 RPM max | |
| ENVIRONMENTAL | Operating Temperature | -30° to +80° C | |
| | 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 (<i>connection dependent</i>) | |

* Non-contact tolerances rated using MAGH-RING 1/4x20 magnet accessory.

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



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 HP58 material Black Delrin™, connector orientation BACK EXIT standard. To designate SIDE EXIT connection use special code 31. (Side exit for HP58 CABLE ONLY) | A - _____ - SEPP 13 bit single ended quadrature - A B Z | TRM Pluggable Terminal block | 31 Side (housing wall) |
| | A - _____ - DIPP 13 bit differential quadrature - A B Z, A' B' Z' | INS Wire insertion terminal | 32 Front (magnet side) |
| | | M8 M8 male | 33 Back (epoxy side) |
| | A - 1939 13 bit J1939 @ 1000 positions | M12 M12 male | 50 White Delrin |
| | | M12P M12 male on 18' pigtail | 51 Red Aluminum |
| B - PWM Absolute position PWM | CXX Flying lead cable (enter XX as inches) | 71 Roller | |
| HP58SE HP58SE made out of Red Aluminum, connector orientation BACK EXIT standard. To designate SIDE EXIT connection use special code 31. | A - MOD1 13 bit Modicon MODBUS @8192 positions | SCXX Shielded cable (enter XX as inches) | 90 13 bit @ 8192 counts per rotation (Typical J1939 option) |
| | A - SS11 Absolute position SSI @ 8192 positions | CSP Cable with custom end | |
| | V1 5 VDC IN, 0-5 VDC OUT | DE4 DT04 - 4 pin male Deutsch | 91 13 bit @ 1000 counts per rotation (Typical MODBUS option) |
| | V2 6-36 VDC IN, 0-5 VDC OUT | DE6 DT04 - 6 pin male Deutsch | |
| | V3 0-24 VDC IN, 4-20 mA OUT x2 (Redundant output) | | |
| | I1 0-24 VDC IN, 4-20 mA OUT | | |
| | I2 0-24 VDC IN, 4-20 mA OUT x2 (Redundant output) | | |
| * More outputs and connection options available, contact Joral if desired configuration is not listed | | | |

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)

- Enter Quadrature PPR in place of _____
- A = 13 bit PPR
- **Available 13 bit PPR:** 0008, 0010, 0016, 0020, 0025, 0032, 0040, 0050, 0064, 0080, 0100, 0125, 0128, 0200, 0250, 0256, 0400, 0500, 1024, 2048

A - 1939

- Standard J1939 output is 1000 positions
- A = 13 bit
- **MODIFIER 90** - for 8192 positions (max resolution) add code 90 to end of HP58 P/N

A - MOD1

- Standard MOD1 output is 8192 positions
- A = 13 bit
- **MODIFIER 91** - for 1000 positions add code 90 to end of HP58 P/N

V1, V2, and I1 (Analog MagElec P/N Guide)

- 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]**)
- **PART NUMBER FORMULA**
 (MagElec)-(A1-A2)-(VR1-VR2)-(CW or CCW)
- **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**

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



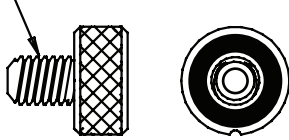
HP58 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 1 OF 2

MAGNET NOTE:

STANDARD MAGNET INCLUDED AS ACCESSORY WITH PURCHASE OF NON-CONTACT SENSOR

STANDARD MAGNET

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



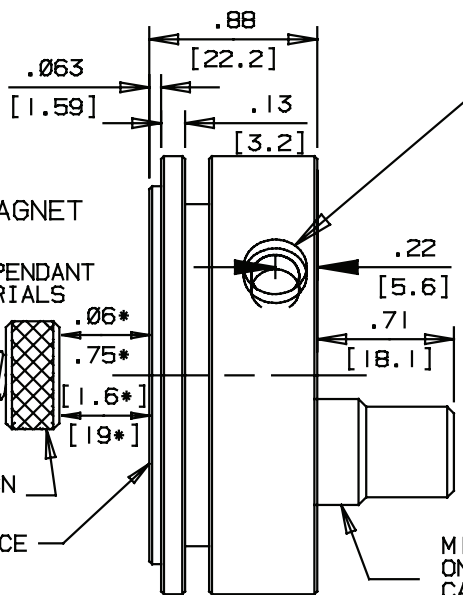
HOUSING/INSTALL NOTES:

MAGNET MOUNT MATERIALS MUST HAVE $\varnothing 1.0$ [25.4] HOLE CENTERED ON SENSOR CENTERLINE

NON-MAGNETIC MOUNT MATERIAL, MAY BE SOLID

MOUNT WITH 316 STAINLESS STEEL 4-40 SCREWS

OPTIONAL CABLE SIDE OUTLET
CABLE WITH FLYING LEADS
OR CABLE WITH M12-5



ALLOWED MAGNET DISTANCE

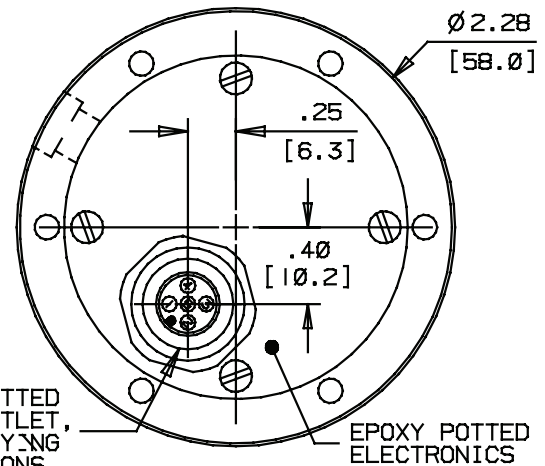
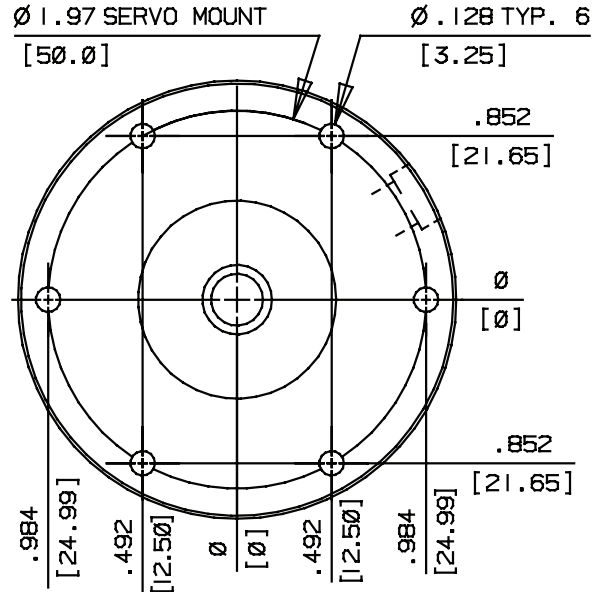
* DISTANCE DEPENDANT ON MOUNT MATERIALS

APPLICATION MAGNET

SENSOR FACE

M12-5P OMITTED ON SIDE OUTLET, CABLE & FLYING LEAD VERSIONS.

SENSOR FACE



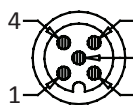
DT04-4P MALE FACE VIEW



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

M12-5P MALE FACE VIEW



M12-5P/CABLE/FLYING LEAD QUADRATURE OUTPUT

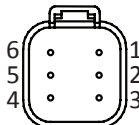
- 1 = BRN = +VDC (VIN)
- 2 = WHT = CHANNEL B
- 3 = BLUE = COMMON/GROUND
- 4 = BLK = CHANNEL A
- 5 = GRY = CHANNEL Z

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

DT04-6P MALE FACE VIEW



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

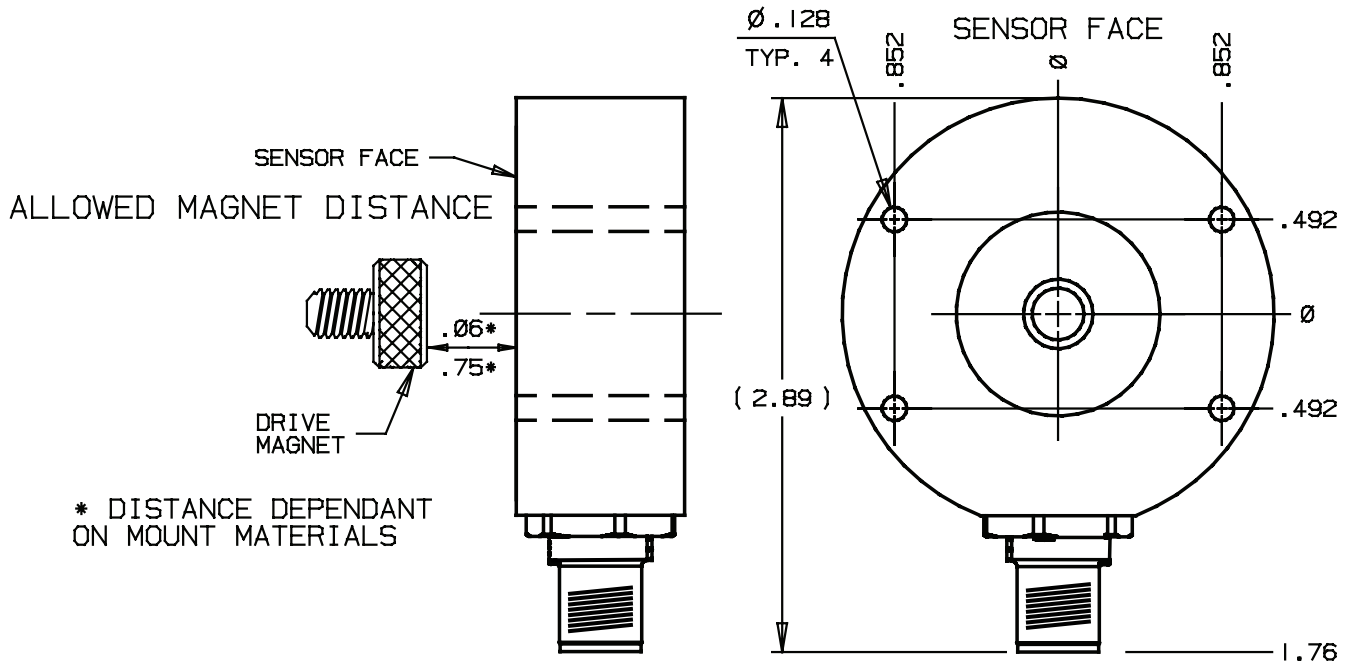
M12-5P AND 5 CONDUCTOR CABLE J1939 OUTPUT

- 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

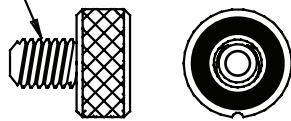


HP58SE DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 2 OF 2



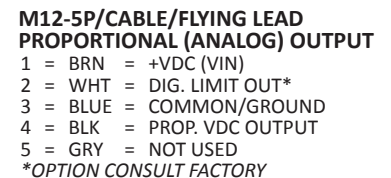
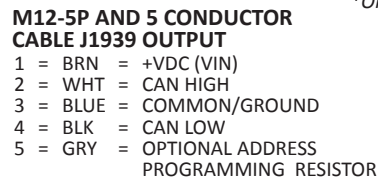
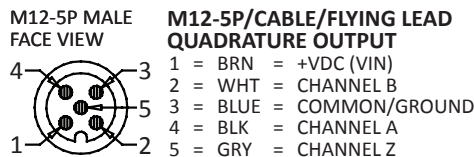
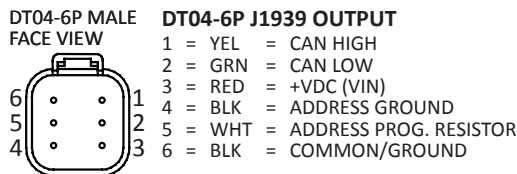
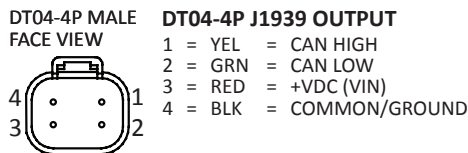
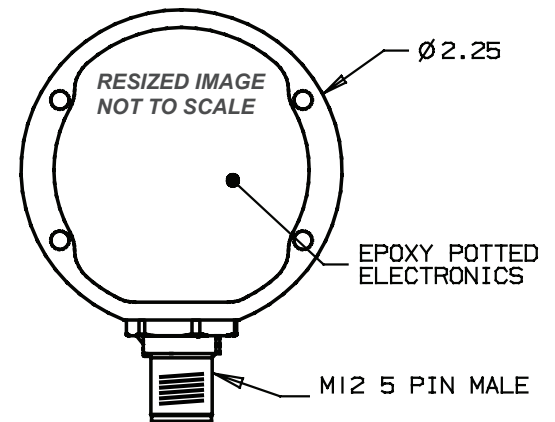
MAGNET NOTE:
STANDARD MAGNET INCLUDED AS ACCESSORY WITH PURCHASE OF NON-CONTACT SENSOR

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



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

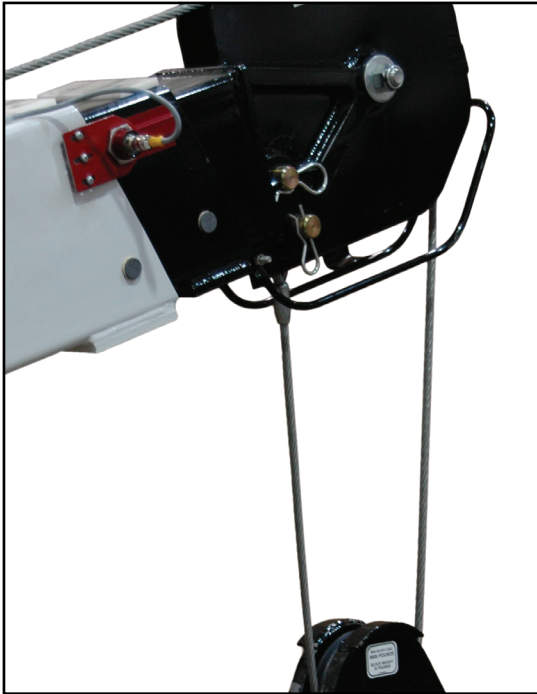


Dimensions informative only
For most recent dimensions please consult factory



LP30 - NON-CONTACT LINEAR POSITION

Alternative to wire-reel method for linear extension measurement



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 / string-pot boom measure systems



STANDARD OPERATING CHARACTERISTICS

| ELECTRICAL | Outputs | A - 1939 J1939, Addressable, Incremental position <i>(attached message sheets S3 ; I2 / 5 - 7)</i> |
|---------------|----------------------------|--|
| | 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" (<i>custom resolution packages available, contact Joral</i>) |
| MECHANICAL | Housing Diameter | 30mm |
| | Housing Material | Aluminum or Stainless Steel (<i>corrosion resistant</i>) |
| | Housing Height | 1.2" (30.5mm) body; 1.86" (47.2mm) w/ M12 connector |
| | Mounting | 30mm thread (<i>standard proximity switch thread style</i>) |
| | Weight | 1.0 oz w/o mounting nuts; 2.2 oz w/ recommended mounting nuts |
| | Magnet strip / sensor gap* | Standard 0.5" |
| ENVIRONMENTAL | Operating Temperature | -40° 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) |
| | Protection Class | IP69K (<i>connection dependent</i>) |

* Non-contact tolerances rated using MAG-STRP magnet accessory.

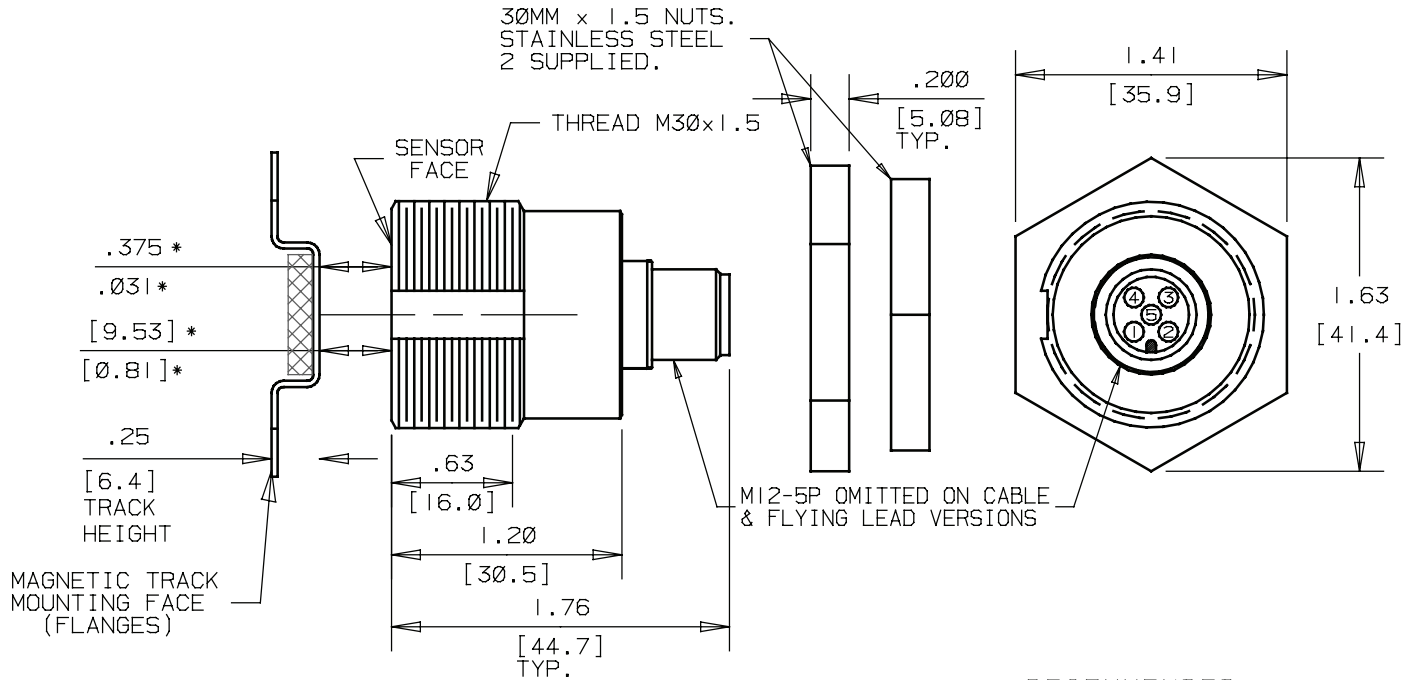
LP30 GENERAL ORDERING GUIDE

| Code 1: Housing Style | Code 2: MagElec (Sensor Output) | Code 3: Connection | Code 4: Special Codes |
|--|---|---|--------------------------------------|
| LP30 LP30 red aluminum, for 1/2" extended thread add 61 to end of P/N. Increases total shell body by 1/2" LP30 Modifier Stainless Steel: LP30 - [Code 2] - [Code 3] - 54 Code 54 for stainless steel corrosion resistant housing 30mm non-contact | A - 1939 J1939, Addressable, Incremental signal <div style="background-color: red; color: white; padding: 5px; text-align: center;"> * More outputs and connection options available, contact Joral if desired configuration is not listed </div> | M12 M12 male | 51 Red Aluminum |
| | | M12P M12 male on 18' pigtail | 53 Black Aluminum |
| | | CXX Flying lead cable (enter XX as inches) | 54 Stainless Steel |
| | | | 61 Extended Thread |
| | | SCXX Shielded cable (enter XX as inches) | DE4 DT04 - 4 pin male Deutsch |
| | | | 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)



LP30 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 1 OF 2

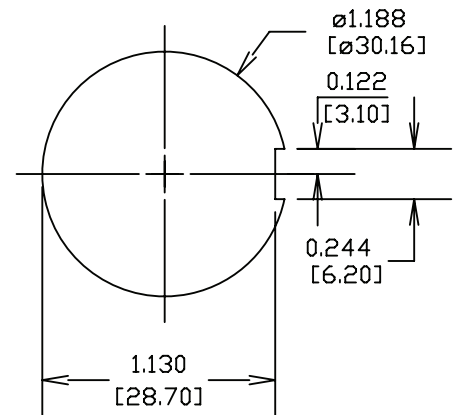


MAGNET TRACK/SENSOR INSTALL NOTE:
SENSING WINDOW MAY BE SMALLER
DEPENDANT ON SENSOR MOUNT MATERIALS

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

RECOMMENDED
MOUNTING HOLE

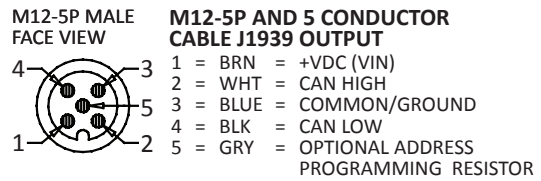
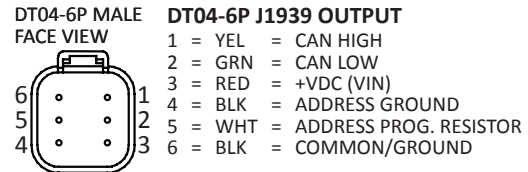
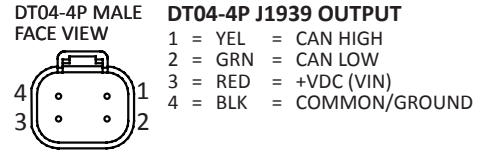
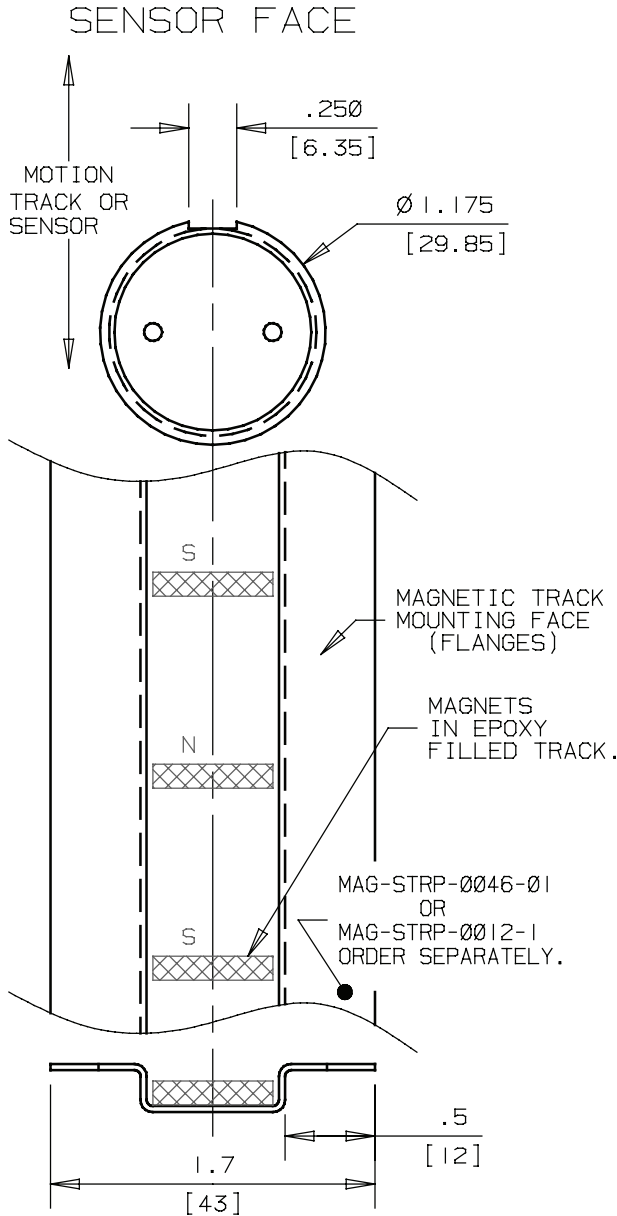


PINOUTS ON DIMENSIONS PAGE 2 OF 2

*Dimensions informative only
For most recent dimensions please consult factory*



LP30 DIMENSIONS & GENERAL PIN OUTS DIMENSIONS 2 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

Dimensions informative only
For most recent dimensions please consult factory



J1939 LP30 LINEAR SENSOR - STATUS Message 65450

MESSAGE PARAMETERS

This message is transmitted by sensor at REP Rate

| | |
|------------------------------|----------------|
| PGN: 65450 (FFAA hex) | |
| Transmission Repetition Rate | 50ms |
| Data Length | 8 bytes |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 170 (AA hex) |
| Priority | 4 |
| Source Address | 214 (D6 hex) |
| Communication Bit Rate | 250 K bits/sec |

PART NUMBERS

| | |
|--|------------------|
| 5 pin M12 | LP30-A-1939-M12 |
| 4 pin DT04 | LP30-A-1939-DE4 |
| 6 pin DT04 | LP30-A-1939-DE6 |
| Flying Lead | LP30-A-1939-SCXX |
| <i>For flying lead replace XX with desired length in inches</i> | |
| <i>For high corrosive applications use stainless steel housing. Add modifier 53 to end of Joral P/N for stainless steel housing.</i> | |

CONNECTIONS / WIRING

| Signal | M12 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 | 65450 |
| 590 (id-tag 1) | 215 | 65450 |
| 976 (id-tag 2) | 216 | 65450 |
| 1500 (id-tag 3) | 217 | 65450 |
| 2260 (id-tag 4) | 218 | 65450 |
| 3400 (id-tag 5) | 219 | 65450 |
| 5360 (id-tag 6) | 220 | 65450 |
| 9530 (id-tag 7) | 221 | 65450 |

8 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|------------|------------------------|---|
| BYTE 1 | 1 | SPEED Setting LSB | SPEED Setting (2 bits) 00 = Slow; 01 = Medium; 10 = Fast |
| | 2 | SPEED Setting MSB | |
| | 3 | DIRECTION Setting LSB | DIRECTION Setting (2 bits) 00 = FWD direction counts up; 01 = REV direction counts up |
| | 4 | DIRECTION Setting MSB | |
| | 5 | SAVE CNT Setting LSB | SAVE COUNT Setting (2 bits) At power : 00 = Counter resets to 0; 01 = Counter will start from last saved count |
| | 6 | SAVE CNT Setting MSB | |
| | 7 | SAVE ON SPEED LSB | SAVE ON ZERO SPEED Setting (2 bits) 00 = Do not save count on speed becoming 0; 01 = Save count when speed becomes 0 |
| | 8 | SAVE ON SPEED MSB | |
| BYTE 2 | 9 | unused | NOTE: Set reserved and unused bits to all 0's or all 1's |
| | 10 | unused | |
| | 11 | unused | |
| | 12 | unused | |
| | 13 | REV direction Flag LSB | |
| BYTE 3 | 14 | REV direction Flag MSB | FWD DIRECTION (2 bits) 01 means counting up |
| | 15 | FWD direction Flag LSB | |
| | 16 | FWD direction Flag MSB | SPEED (10 bits) 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) SPEED is calculated by running average on 100msec intervals 00 (slow) averages 3 seconds of counts per calculation 01 (medium) averages 1 second of counts per calculation 02 (fast) averages 100 msecs of counts per calculation |
| | 17 | SPEED bit0 LSB | |
| 18 | SPEED bit1 | | |
| 19 | SPEED bit2 | | |
| BYTE 4 | 20 | SPEED bit3 | POSITIVE COUNT Flag (2 bits) 01 means count is positive |
| | 21 | SPEED bit4 | |
| | 22 | SPEED bit5 | |
| | 23 | SPEED bit6 | |
| | 24 | SPEED bit7 | |
| | 25 | SPEED bit8 | |
| | 26 | SPEED bit9 MSB | |
| | 27 | unused | |
| BYTE 5 | 28 | unused | NEGATIVE COUNT Flag (2 bits) 01 means count is negative |
| | 29 | POS Count Flag LSB | |
| | 30 | POS Count Flag MSB | COUNT (32 bits) Incremental Count, 0.5" per count (0.25" per bit per second if 1/4" resolution option is installed) Count maximum value is 2, 147, 483, 647 |
| | 31 | NEG Count LSB | |
| | 32 | NEG Count MSB | |
| | 33 | Count bit0 LSB | |
| 34 | Count bit1 | | |
| 35 | Count bit2 | | |
| BYTE 6 | 36 | Count bit3 | |
| | 37 | Count bit4 | |
| | 38 | Count bit5 | |
| | 39 | Count bit6 | |
| | 40 | Count bit7 | |
| | 41 | Count bit8 | |
| | 42 | Count bit9 | |
| | 43 | Count bit10 | |
| | 44 | Count bit11 | |
| | 45 | Count bit12 | |
| | 46 | Count bit13 | |
| | 47 | Count bit14 | |
| BYTE 7 | 48 | Count bit15 | |
| | 49 | Count bit16 | |
| | 50 | Count bit17 | |
| | 51 | Count bit18 | |
| | 52 | Count bit19 | |
| | 53 | Count bit20 | |
| | 54 | Count bit21 | |
| | 55 | Count bit22 | |
| | 56 | Count bit23 | |
| BYTE 8 | 57 | Count bit24 | |
| | 58 | Count bit25 | |
| | 59 | Count bit26 | |
| | 60 | Count bit27 | |
| | 61 | Count bit28 | |
| | 62 | Count bit29 | |
| | 63 | Count bit30 | |
| | 64 | Count bit31 MSB | |



J1939 LP30 LINEAR SENSOR - SETTING Message 65449

MESSAGE PARAMETERS

This message is transmitted by the controller

| | |
|------------------------------|----------------|
| PGN: 65449 (FFA9 hex) | |
| Transmission Repetition Rate | 50 ms |
| Data Length | 8 bytes |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 169 (A9 hex) |
| Priority | 4 |
| Source Address | 214 (D6 hex) |
| Communication Bit Rate | 250 K bits/sec |

CONNECTIONS / WIRING

| Signal | M12 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 | 65449 |
| 590 (id-tag 1) | 215 | 65449 |
| 976 (id-tag 2) | 216 | 65449 |
| 1500 (id-tag 3) | 217 | 65449 |
| 2260 (id-tag 4) | 218 | 65449 |
| 3400 (id-tag 5) | 219 | 65449 |
| 5360 (id-tag 6) | 220 | 65449 |
| 9530 (id-tag 7) | 221 | 65449 |

8 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|-----|-----------------------|---|
| BYTE 1 | 1 | SPEED Setting LSB | SPEED Settings (2 bits) 00 = Slow; 01 = Medium; 10 = Fast |
| | 2 | SPEED Setting MSB | |
| | 3 | DIRECTION Setting LSB | DIRECTION Setting (2 bits) 00 = CW direction counts up; 01 = CCW direction counts up |
| | 4 | DIRECTION Setting MSB | |
| | 5 | SAVE CNT Setting LSB | SAVE COUNT Setting (2 bits) At power : 00 = Counter resets to 0; 01 = Counter will start from last saved count |
| | 6 | SAVE CNT Setting MSB | |
| | 7 | SAVE ON SPEED LSB | SAVE ON ZERO SPEED Setting (2 bits) 00 = Do not save count on speed becoming 0; 01 = Save count when speed becomes 0 |
| | 8 | SAVE ON SPEED MSB | |
| BYTE 2 | 9 | unused | NOTE: Set reserved and unused bits to all 0's or all 1's |
| | 10 | unused | |
| | 11 | unused | |
| | 12 | unused | |
| | 13 | unused | |
| | 14 | unused | |
| | 15 | unused | |
| | 16 | unused | |
| BYTE 3 | 17 | unused | |
| | 18 | unused | |
| | 19 | unused | |
| | 20 | unused | |
| | 21 | unused | |
| | 22 | unused | |
| | 23 | unused | |
| | 24 | unused | |
| BYTE 4 | 25 | unused | |
| | 26 | unused | |
| | 27 | unused | |
| | 28 | unused | |
| | 29 | unused | |
| | 30 | unused | |
| | 31 | unused | |
| | 32 | unused | |
| BYTE 5 | 33 | unused | |
| | 34 | unused | |
| | 35 | unused | |
| | 36 | unused | |
| | 37 | unused | |
| | 38 | unused | |
| | 39 | unused | |
| | 40 | unused | |
| BYTE 6 | 41 | unused | |
| | 42 | unused | |
| | 43 | unused | |
| | 44 | unused | |
| | 45 | unused | |
| | 46 | unused | |
| | 47 | unused | |
| | 48 | unused | |
| BYTE 7 | 49 | unused | |
| | 50 | unused | |
| | 51 | unused | |
| | 52 | unused | |
| | 53 | unused | |
| | 54 | unused | |
| | 55 | unused | |
| | 56 | unused | |
| BYTE 8 | 57 | unused | |
| | 58 | unused | |
| | 59 | unused | |
| | 60 | unused | |
| | 61 | unused | |
| | 62 | unused | |
| | 63 | unused | |
| | 64 | unused | |



J1939 LP30 LINEAR SENSOR - SETTING Message 65451

MESSAGE PARAMETERS

This message is transmitted by the controller

| | |
|------------------------------|----------------|
| PGN: 65451 (FBAB hex) | |
| Transmission Repetition Rate | n/a |
| Data Length | n/a |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 171 (AB hex) |
| Priority | X |
| Source Address | 39 (27 hex) |
| Communication Bit Rate | 250 K bits/sec |

CONNECTIONS / WIRING

| Signal | M12 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 |

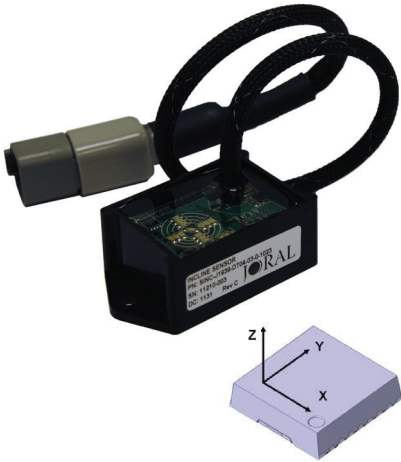
SOURCE ADDRESS SELECTION

| 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 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|-----|-----------------------|---|
| BYTE 1 | 1 | RESET COUNT LSB | RESET COUNTER (2 bits) 01 = Reset counter to zero |
| | 2 | RESET COUNT MSB | |
| | 3 | reserved | |
| | 4 | reserved | |
| | 5 | RPM RATE LSB | RPM RATE (2 bits) 00 = Slow; 01 = Medium; 10 = Fast |
| | 6 | RPM RATE MSB | |
| | 7 | DIRECTION Setting LSB | DIRECTION (2 bits) 00 = FWD direction counts up; 01 = REV direction counts up |
| | 8 | DIRECTION Setting MSB | |
| BYTE 2 | 9 | SAVE CNT Setting LSB | SAVE COUNT Setting (2 bits) At power : 00 = Counter resets to 0; 01 = Counter will start from last saved count |
| | 10 | SAVE CNT Setting MSB | |
| | 11 | CLEAR CNT Setting LSB | CLEAR COUNT (2 bits) 01 = Clear saved Count; If clear is the last saved sensor will start from 0 |
| | 12 | CLEAR CNT Setting MSB | |
| | 13 | SAVE ON SPEED LSB | SAVE ON ZERO SPEED Setting (2 bits) 00 = Do not save count on speed becoming 0; 01 = Save count when speed becomes 0 |
| | 14 | SAVE ON SPEED MSB | |
| | 15 | ENABLE STAT MSG LSB | ENABLE SETTING STATUS MESSAGE (2 bits) At power : 00 = Do not enable setting status message; 01 = Enable setting status msg 65449 for transmission |
| | 16 | ENABLE STAT MSG MSB | |
| BYTE 3 | 17 | unused | NOTE: Set reserved and unused bits to all 0's or all 1's |
| | 18 | unused | |
| | 19 | unused | |
| | 20 | unused | |
| | 21 | unused | |
| | 22 | unused | |
| | 23 | unused | |
| | 24 | unused | |
| BYTE 4 | 25 | unused | |
| | 26 | unused | |
| | 27 | unused | |
| | 28 | unused | |
| | 29 | unused | |
| | 30 | unused | |
| | 31 | unused | |
| | 32 | unused | |
| BYTE 5 | 33 | unused | |
| | 34 | unused | |
| | 35 | unused | |
| | 36 | unused | |
| | 37 | unused | |
| | 38 | unused | |
| | 39 | unused | |
| | 40 | unused | |
| BYTE 6 | 41 | unused | |
| | 42 | unused | |
| | 43 | unused | |
| | 44 | unused | |
| | 45 | unused | |
| | 46 | unused | |
| | 47 | unused | |
| | 48 | unused | |
| BYTE 7 | 49 | unused | |
| | 50 | unused | |
| | 51 | unused | |
| | 52 | unused | |
| | 53 | unused | |
| | 54 | unused | |
| | 55 | unused | |
| | 56 | unused | |
| BYTE 8 | 57 | unused | |
| | 58 | unused | |
| | 59 | unused | |
| | 60 | unused | |
| | 61 | unused | |
| | 62 | unused | |
| | 63 | unused | |
| | 64 | unused | |





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.

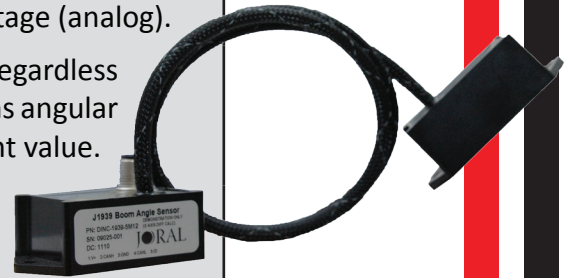
- J1939 CAN Bus or varying voltage output
- Easy mounting, 3 axis sensing detects true change in angle (X, Y, Z) regardless of installed orientation
- Configuration available through J1939 for sensitivity and range settings
- Completely potted and sealed (IP69K)
- Standard connector options available (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.

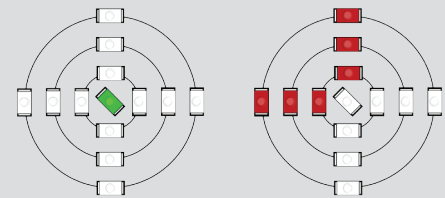
The sensor can be mounted to fit the requirements of the application, installed orientation does not influence output.



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.



GREEN "LEVEL" LED

RED X/Y AXIS TILT LEDES

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)

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 (<i>attached message sheets S4 ; I2 / 3 - 4</i>) |
|---------------|------------------------------------|---|
| | | B - ANLG Contact Joral to build custom analog signal |
| | Input Power | 6 to 30 VDC (<i>90 mA</i>) |
| | 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 |
| | Housing Material | Plastic or Anodized Aluminum (<i>high temperature applications</i>) |
| | Housing Height | Plastic - 1.0"; Aluminum - <i>Contact Joral</i> |
| | Housing Width | Plastic - 1.5"; Aluminum - <i>Contact Joral</i> |
| | Housing Length w/ Tabs | Plastic - 3.0"; Aluminum - <i>Contact Joral</i> |
| | Mounting | Tabs (0.187 diameter holes) |
| | Weight | 3.0 oz |
| ENVIRONMENTAL | Operating Temperature | -40° to +80° C |
| | Temperature Drift | ± 0.3 degrees across specified operating temperature limits |
| | 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 (<i>connection dependent</i>) |

SINC GENERAL ORDERING GUIDE

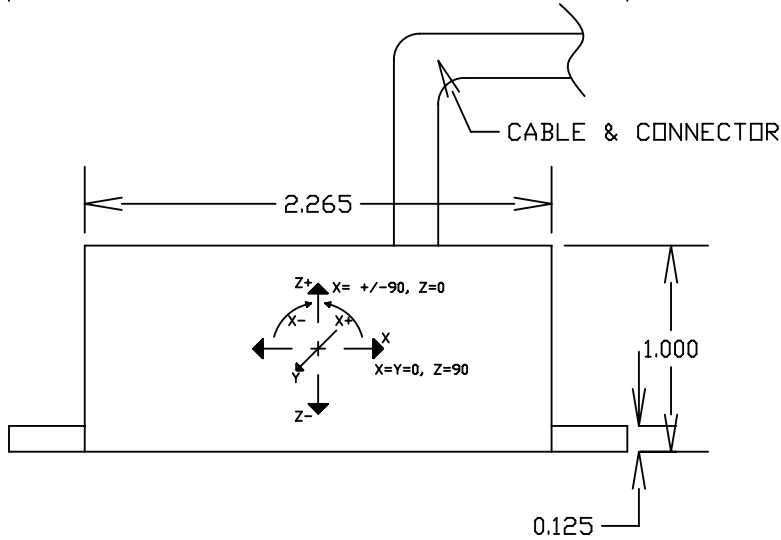
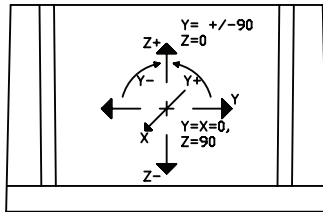
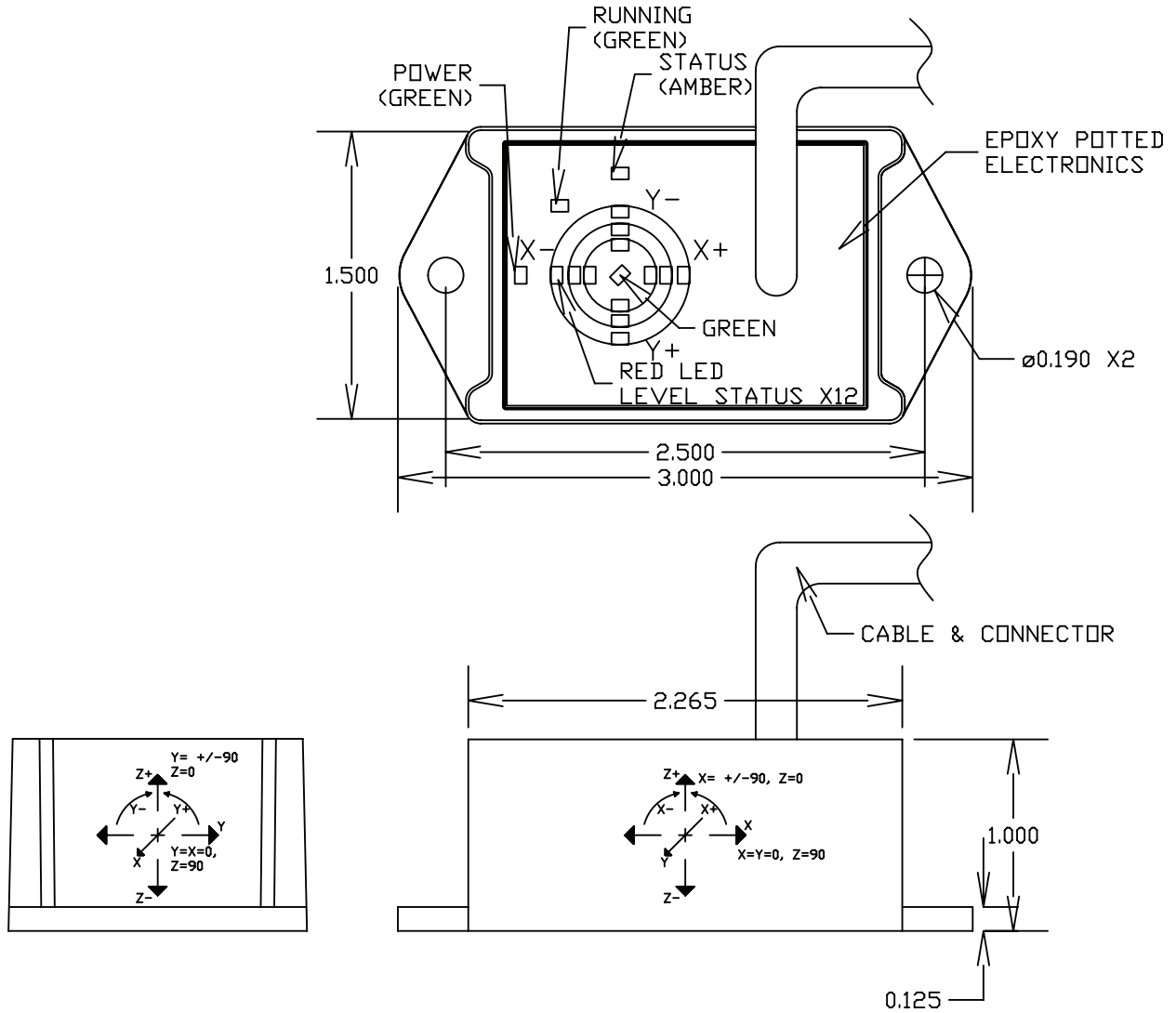
| Code 1: Housing Style | Code 2: MagElec (Sensor Output) | Code 3: Connection | Code 4: Special Codes | |
|--|--|---|---|--|
| SINC Black plastic housing standard, not rated for high temp applications SINC Modifier Red Aluminum: SINC - [Code 2] - [Code 3] - 51 Special code 51(53) for anodized red (black)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

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

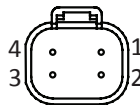
J1939 setting/status message found on pages three and four (S4 ; I2 / 3 - 4)



SINC DIMENSIONS & GENERAL PIN OUTS



**DT04-4P MALE
FACE VIEW**



DT04-4P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = COMMON/GROUND

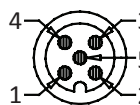
**DT04-6P MALE
FACE VIEW**



DT04-6P J1939 OUTPUT

- 1 = YEL = CAN HIGH
- 2 = GRN = CAN LOW
- 3 = RED = +VDC (VIN)
- 4 = BLK = ADDRESS GROUND
- 5 = WHT = ADDRESS PROG. RESISTOR
- 6 = BLK = COMMON/GROUND

**M12-5P MALE
FACE VIEW**



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

- 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*



J1939 3 Axis Incline Sensor - STATUS Message 65465 (SINC)

MESSAGE PARAMETERS

This message is transmitted by sensor at REP Rate

| | |
|------------------------------|----------------|
| PGN: 65465 (FFB9 hex) | |
| Transmission Repetition Rate | 50ms |
| Data Length | 8 bytes |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 185 (B9 hex) |
| Priority | 4 |
| Source Address | 220 (DBC hex) |
| Communication Bit Rate | 250 K bits/sec |

PART NUMBERS

| | |
|--|------------------|
| 5 pin M12 | SINC-B-1939-M12 |
| 4 pin DT04 | SINC-B-1939-DE4 |
| 6 pin DT04 | SINC-B-1939-DE6 |
| Flying Lead | SINC-B-1939-SCXX |
| <i>For flying lead replace XX with desired length in inches</i> | |
| <i>For high temperature applications use aluminum housing. Add modifier 51 (red) or 53 (black) to end of Joral P/N for aluminum.</i> | |

CONNECTIONS / WIRING

| Signal | M12 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 | 220 | 65465 |
| 590 (id-tag 1) | 221 | 65465 |
| 976 (id-tag 2) | 222 | 65465 |
| 1500 (id-tag 3) | 223 | 65465 |
| 2260 (id-tag 4) | 224 | 65465 |
| 3400 (id-tag 5) | 225 | 65465 |
| 5360 (id-tag 6) | 226 | 65465 |
| 9530 (id-tag 7) | 227 | 65465 |

8 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|------------------|----------------------|--|
| BYTE 1 | 1 | X Angle bit0 LSB | X ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 2 | X Angle bit1 | |
| | 3 | X Angle bit2 | |
| | 4 | X Angle bit3 | |
| | 5 | X Angle bit4 | |
| | 6 | X Angle bit5 | |
| | 7 | X Angle bit6 | |
| | 8 | X Angle bit7 | |
| BYTE 2 | 9 | X Angle bit8 | X ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 10 | X Angle bit9 MSB | |
| | 11 | X Positive Flag LSB | X ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 12 | X Positive Flag MSB | |
| | 13 | X Negative Flag LSB | Y ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 14 | X Negative Flag MSB | |
| 15 | Y Angle bit0 LSB | | |
| 16 | Y Angle bit1 | | |
| BYTE 3 | 17 | Y Angle bit2 | Y ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 18 | Y Angle bit3 | |
| | 19 | Y Angle bit4 | |
| | 20 | Y Angle bit5 | |
| | 21 | Y Angle bit6 | |
| | 22 | Y Angle bit7 | |
| | 23 | Y Angle bit8 | |
| | 24 | Y Angle bit9 MSB | |
| BYTE 4 | 25 | Y Positive Flag LSB | Y ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 26 | Y Positive Flag MSB | |
| | 27 | Y Negative Flag LSB | Z ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 28 | Y Negative Flag MSB | |
| BYTE 5 | 29 | Z Angle bit0 LSB | Z ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 30 | Z Angle bit1 | |
| | 31 | Z Angle bit2 | |
| | 32 | Z Angle bit3 | |
| | 33 | Z Angle bit4 | |
| | 34 | Z Angle bit5 | |
| | 35 | Z Angle bit6 | |
| | 36 | Z Angle bit7 | |
| | 37 | Z Angle bit8 | |
| | 38 | Z Angle bit9 MSB | |
| BYTE 6 | 39 | Z Positive Flag LSB | Z ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 40 | Z Positive Flag MSB | |
| BYTE 7 | 41 | Z Negative Flag LSB | used |
| | 42 | Z Negative Flag MSB | |
| | 43 | unused | |
| | 44 | unused | |
| | 45 | unused | |
| | 46 | unused | |
| | 47 | unused | |
| | 48 | unused | |
| BYTE 8 | 49 | unused | SENSITIVITY Setting (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4) |
| | 50 | unused | |
| | 51 | unused | |
| | 52 | unused | LED WEIGHT Setting (3 bits) Field contains value of current setting Degrees per LED Indicator, 1 to 7 (default 1) |
| | 53 | unused | |
| | 54 | unused | |
| | 55 | unused | |
| | 56 | unused | |
| BYTE 8 | 57 | Sensitivity bit0 LSB | LED WEIGHT Setting (3 bits) Field contains value of current setting Degrees per LED Indicator, 1 to 7 (default 1) |
| | 58 | Sensitivity bit1 | |
| | 59 | Sensitivity bit2 MSB | |
| | 60 | LED Weight bit0 LSB | used |
| | 61 | LED Weight bit1 | |
| | 62 | LED Weight bit2 MSB | |
| | 63 | unused | |
| | 64 | unused | |



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

MESSAGE PARAMETERS

This message is transmitted by the controller

PGN: 65281 (FF01 hex)

| | |
|------------------------------|----------------|
| Transmission Repetition Rate | n/a |
| Data Length | n/a |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 1 (01 hex) |
| Priority | x |
| Source Address | 39 (27 hex) |
| Communication Bit Rate | 250 K bits/sec |

CONNECTIONS / WIRING

| Signal | M12 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 | 220 | 65281 |
| 590 (id-tag 1) | 221 | 65282 |
| 976 (id-tag 2) | 222 | 65283 |
| 1500 (id-tag 3) | 223 | 65284 |
| 2260 (id-tag 4) | 224 | 65285 |
| 3400 (id-tag 5) | 225 | 65286 |
| 5360 (id-tag 6) | 226 | 65287 |
| 9530 (id-tag 7) | 227 | 65288 |

8 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|--------|-----------------------|--|
| BYTE 1 | 1 | SENS Setting bit0 LSB | SENSITIVITY SETTING (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4) |
| | 2 | SENS Setting bit1 | |
| | 3 | SENS Setting bit2 MSB | |
| | 4 | reserved | LED WEIGHT SETTING (3 bits) Field contains value of current setting Degrees per LED indicator, 1 to 7 (default 1) |
| | 5 | reserved | |
| | 6 | Direction Setting LSB | |
| | 7 | Direction Setting LSB | |
| | 8 | Direction Setting MSB | |
| BYTE 2 | 9 | CAL LSB | CALIBRATE/HOME FLAG (2 bits) 01 = Calibrate / Home the sensor |
| | 10 | CAL MSB | |
| | 11 | unused | NOTE: Set reserved and unused bits to all 0's or all 1's |
| | 12 | unused | |
| | 13 | unused | |
| | 14 | unused | |
| | 15 | unused | |
| | 16 | unused | |
| 17 | unused | | |
| BYTE 3 | 18 | unused | |
| | 19 | unused | |
| | 20 | unused | |
| | 21 | unused | |
| | 22 | unused | |
| | 23 | unused | |
| | 24 | unused | |
| | 25 | unused | |
| BYTE 4 | 26 | unused | |
| | 27 | unused | |
| | 28 | unused | |
| | 29 | unused | |
| | 30 | unused | |
| | 31 | unused | |
| | 32 | unused | |
| | 33 | unused | |
| BYTE 5 | 34 | unused | |
| | 35 | unused | |
| | 36 | unused | |
| | 37 | unused | |
| | 38 | unused | |
| | 39 | unused | |
| | 40 | unused | |
| | 41 | unused | |
| BYTE 6 | 42 | unused | |
| | 43 | unused | |
| | 44 | unused | |
| | 45 | unused | |
| | 46 | unused | |
| | 47 | unused | |
| | 48 | unused | |
| | 49 | unused | |
| BYTE 7 | 50 | unused | |
| | 51 | unused | |
| | 52 | unused | |
| | 53 | unused | |
| | 54 | unused | |
| | 55 | unused | |
| | 56 | unused | |
| | 57 | unused | |
| BYTE 8 | 58 | unused | |
| | 59 | unused | |
| | 60 | unused | |
| | 61 | unused | |
| | 62 | unused | |
| | 63 | unused | |
| | 64 | unused | |



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 (<i>attached message sheets S4 ; I3 / 3 - 4</i>) |
|---------------|------------------------------------|---|
| | | B - ANLG Contact Joral to build custom analog signal |
| | Input Power | 6 to 30 VDC (<i>90 mA</i>) |
| | 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 |
| | Housing Material | Plastic or Anodized Aluminum (<i>high temperature applications</i>) |
| | Housing Height | Plastic - 1.0"; Aluminum - <i>Contact Joral</i> |
| | Housing Width | Plastic - 1.5"; Aluminum - <i>Contact Joral</i> |
| | Housing Length w/ Tabs | Plastic - 3.0"; Aluminum - <i>Contact Joral</i> |
| | Mounting | Tabs (0.187 diameter holes) |
| | Weight | Master - 3.0 oz; Slave - 2.0 oz |
| ENVIRONMENTAL | Operating Temperature | -40° to +80° C |
| | Temperature Drift | ± 0.3 degrees across specified operating temperature limits |
| | 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 (<i>connection dependent</i>) |

DINC GENERAL ORDERING GUIDE

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

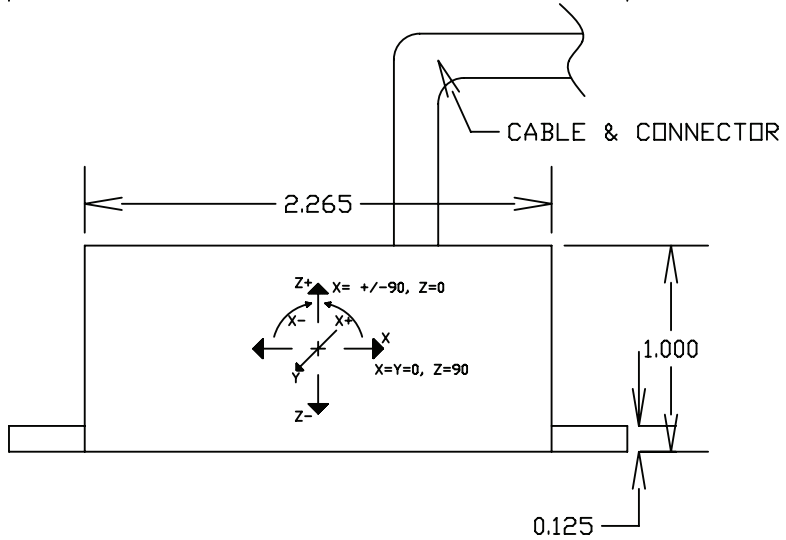
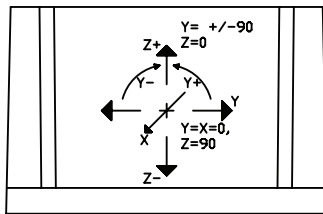
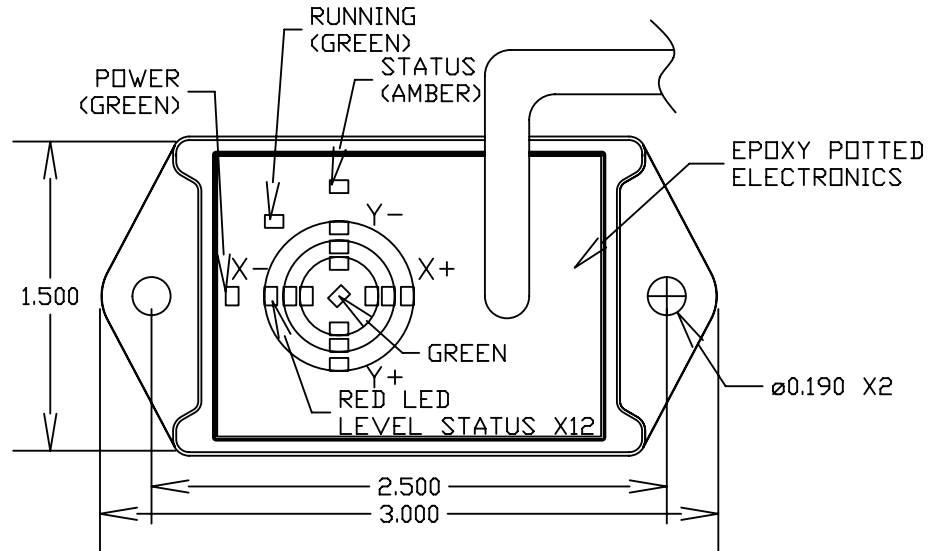


DINC DIMENSIONS & GENERAL PIN OUTS

BOOM ANGLE NOTE:

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

DINC slave can be provided
without LED indicators

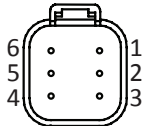


**DT04-4P MALE
FACE VIEW**



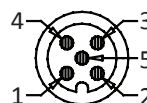
- DT04-4P J1939 OUTPUT**
1 = YEL = CAN HIGH
2 = GRN = CAN LOW
3 = RED = +VDC (VIN)
4 = BLK = COMMON/GROUND

**DT04-6P MALE
FACE VIEW**



- DT04-6P J1939 OUTPUT**
1 = YEL = CAN HIGH
2 = GRN = CAN LOW
3 = RED = +VDC (VIN)
4 = BLK = ADDRESS GROUND
5 = WHT = ADDRESS PROG. RESISTOR
6 = BLK = COMMON/GROUND

**M12-5P MALE
FACE VIEW**



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



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

MESSAGE PARAMETERS

This message is transmitted by sensor at REP Rate

| | |
|------------------------------|----------------|
| PGN: 65467 (FFBB hex) | |
| Transmission Repetition Rate | 50ms |
| Data Length | 8 bytes |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 187 (BB hex) |
| Priority | 4 |
| Source Address | 219 (DB hex) |
| Communication Bit Rate | 250 K bits/sec |

PART NUMBERS

| | |
|--|------------------|
| 5 pin M12 | DINC-B-1939-M12 |
| 4 pin DT04 | DINC-B-1939-DE4 |
| 6 pin DT04 | DINC-B-1939-DE6 |
| Flying Lead | DINC-B-1939-SCXX |
| <i>For flying lead replace XX with desired length in inches</i> | |
| <i>For high temperature applications use aluminum housing. Add modifier 51 (red) or 53 (black) to end of Joral P/N for aluminum.</i> | |

CONNECTIONS / WIRING

| Signal | M12 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 | 219 | 65467 |
| 590 (id-tag 1) | 220 | 65467 |
| 976 (id-tag 2) | 221 | 65467 |
| 1500 (id-tag 3) | 222 | 65467 |
| 2260 (id-tag 4) | 223 | 65467 |
| 3400 (id-tag 5) | 224 | 65467 |
| 5360 (id-tag 6) | 225 | 65467 |
| 9530 (id-tag 7) | 226 | 65467 |

8 BYTE / 64 BIT DATA FIELD BIT POSITIONS

| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION |
|--------|----------------------|----------------------|--|
| BYTE 1 | 1 | X Angle bit0 LSB | MASTER X ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 2 | X Angle bit1 | |
| | 3 | X Angle bit2 | |
| | 4 | X Angle bit3 | |
| | 5 | X Angle bit4 | |
| | 6 | X Angle bit5 | |
| | 7 | X Angle bit6 | |
| | 8 | X Angle bit7 | |
| BYTE 2 | 9 | X Angle bit8 | X ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 10 | X Angle bit9 MSB | |
| | 11 | X Positive Flag LSB | X ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 12 | X Positive Flag MSB | |
| | 13 | X Negative Flag LSB | MASTER Y ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 14 | X Negative Flag MSB | |
| 15 | Y Angle bit0 LSB | | |
| 16 | Y Angle bit1 | | |
| BYTE 3 | 17 | Y Angle bit2 | Y ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 18 | Y Angle bit3 | |
| | 19 | Y Angle bit4 | |
| | 20 | Y Angle bit5 | |
| | 21 | Y Angle bit6 | |
| | 22 | Y Angle bit7 | |
| | 23 | Y Angle bit8 | |
| | 24 | Y Angle bit9 MSB | |
| BYTE 4 | 25 | Y Positive Flag LSB | Y ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 26 | Y Positive Flag MSB | |
| | 27 | Y Negative Flag LSB | MASTER Z ANGLE (10 bits) 0 to 1000, 0.1° per bit |
| | 28 | Y Negative Flag MSB | |
| BYTE 5 | 29 | Z Angle bit0 LSB | Z ANGLE POS SIGN FLAG (2 bits) 01 = Positive Angle |
| | 30 | Z Angle bit1 | |
| | 31 | Z Angle bit2 | |
| | 32 | Z Angle bit3 | |
| | 33 | Z Angle bit4 | |
| | 34 | Z Angle bit5 | |
| | 35 | Z Angle bit6 | |
| | 36 | Z Angle bit7 | |
| | 37 | Z Angle bit8 | |
| | 38 | Z Angle bit9 MSB | |
| BYTE 6 | 39 | Z Positive Flag LSB | Z ANGLE NEGATIVE SIGN FLAG (2 bits) 01 = Negative Angle |
| | 40 | Z Positive Flag MSB | |
| | 41 | Z Negative Flag LSB | used |
| | 42 | Z Negative Flag MSB | |
| BYTE 7 | 43 | unused | used |
| | 44 | unused | |
| | 45 | unused | |
| | 46 | unused | |
| | 47 | unused | |
| | 48 | unused | |
| | 49 | unused | |
| | 50 | unused | |
| BYTE 8 | 51 | unused | SENSITIVITY Setting (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4) |
| | 52 | unused | |
| | 53 | unused | |
| | 54 | unused | LED WEIGHT Setting (3 bits) Field contains value of current setting Degrees per LED Indicator, 1 to 7 (default 1) |
| | 55 | unused | |
| | 56 | unused | |
| | 57 | Sensitivity bit0 LSB | used |
| | 58 | Sensitivity bit1 | |
| 59 | Sensitivity bit2 MSB | | |
| 60 | LED Weight bit0 LSB | used | |
| 61 | LED Weight bit1 | | |
| 62 | LED Weight bit2 MSB | | |
| 63 | unused | used | |
| 64 | unused | | |



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

MESSAGE PARAMETERS

| | |
|---|----------------|
| This message is transmitted by sensor at REP Rate | |
| PGN: 65466 (FFBA hex) | |
| Transmission Repetition Rate | 50ms |
| 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 Bit Rate | 250 K bits/sec |

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 BYTE / 64 BIT DATA FIELD BIT POSITIONS

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



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

| MESSAGE PARAMETERS | |
|---|----------------|
| This message is transmitted by the controller | |
| PGN: 65290 (FF0A hex) | |
| Transmission Repetition Rate | n/a |
| Data Length | n/a |
| Data Page | 0 |
| PDU Format | 255 (FF hex) |
| PDU Specific | 10 (0A hex) |
| Priority | 7 |
| Source Address | 249 (F9 hex) |
| Communication Bit Rate | 250 K bits/sec |

| SOURCE ADDRESS SELECTION | | |
|--------------------------|---------|-------|
| Value (ohms) | Address | PGN |
| No Resistor | 219 | 65290 |
| 590 (id-tag 1) | 220 | 65291 |
| 976 (id-tag 2) | 221 | 65292 |
| 1500 (id-tag 3) | 222 | 65293 |
| 2260 (id-tag 4) | 223 | 65294 |
| 3400 (id-tag 5) | 224 | 65295 |
| 5360 (id-tag 6) | 225 | 65296 |
| 9530 (id-tag 7) | 226 | 65297 |

NOTE: SOURCE ADDRESS AND PRIORITY CHANGED 08 NOV 2011

| 8 BYTE / 64 BIT DATA FIELD BIT POSITIONS | | | | |
|--|-----|-----------------------|--|---|
| BYTE | BIT | BIT FUNCTION | FIELD DESCRIPTION | |
| BYTE 1 | 1 | SENS Setting bit0 LSB | SENSITIVITY SETTING (3 bits) Field contains value of current setting 0 = most sensitive, 7 = most sluggish (default 4) | |
| | 2 | SENS Setting bit1 | | |
| | 3 | SENS Setting bit2 MSB | | |
| | 4 | reserved | LED WEIGHT SETTING (3 bits) Field contains value of current setting Degrees per LED indicator, 1 to 7 (default 1) | |
| | 5 | reserved | | |
| | 6 | Direction Setting LSB | | |
| | 7 | Direction Setting LSB | | |
| | 8 | Direction Setting MSB | | |
| BYTE 2 | 9 | CAL Master LSB | | CALIBRATE/HOME MASTER FLAG (2 bits) 01 = Calibrate/Home the Master sensor |
| | 10 | CAL Master MSB | | |
| | 11 | CAL Slave LSB | | CALIBRATE/HOME SLAVE FLAG (2 bits) 01 = Calibrate/Home the Slave sensor |
| | 12 | CAL Slave MSB | | |
| | 13 | unused | NOTE: Set reserved and unused bits to all 0's or all 1's | |
| | 14 | unused | | |
| | 15 | unused | | |
| | 16 | unused | | |
| BYTE 3 | 17 | unused | | |
| | 18 | unused | | |
| | 19 | unused | | |
| | 20 | unused | | |
| | 21 | unused | | |
| | 22 | unused | | |
| | 23 | unused | | |
| | 24 | unused | | |
| BYTE 4 | 25 | unused | | |
| | 26 | unused | | |
| | 27 | unused | | |
| | 28 | unused | | |
| | 29 | unused | | |
| | 30 | unused | | |
| | 31 | unused | | |
| | 32 | unused | | |
| BYTE 5 | 33 | unused | | |
| | 34 | unused | | |
| | 35 | unused | | |
| | 36 | unused | | |
| | 37 | unused | | |
| | 38 | unused | | |
| | 39 | unused | | |
| | 40 | unused | | |
| BYTE 6 | 41 | unused | | |
| | 42 | unused | | |
| | 43 | unused | | |
| | 44 | unused | | |
| | 45 | unused | | |
| | 46 | unused | | |
| | 47 | unused | | |
| | 48 | unused | | |
| BYTE 7 | 49 | unused | | |
| | 50 | unused | | |
| | 51 | unused | | |
| | 52 | unused | | |
| | 53 | unused | | |
| | 54 | unused | | |
| | 55 | unused | | |
| | 56 | unused | | |
| BYTE 8 | 57 | unused | | |
| | 58 | unused | | |
| | 59 | unused | | |
| | 60 | unused | | |
| | 61 | unused | | |
| | 62 | unused | | |
| | 63 | unused | | |
| | 64 | unused | | |

