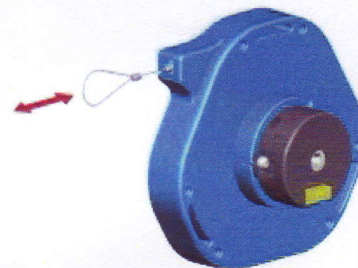


Data Sheet - Series M General-Capability Position Transducer

Flexible, Rugged, Affordable Displacement Measurement for OEM and High-Volume Uses

Summary Features

1. 85-Inch (2159-mm) Maximum Travel in a Ø3.5-Inch (Ø89-mm) Package
2. DirectConnect™ Sensor-To-Drum Technology = Zero Backlash, No Torsion Springs or Clutches
3. Optimum Fleet Angle for More Repeatable Displacement Cable Wrap
4. Fixed or Adjustable Mounting Features
5. Compatible with Self-Tapping or User-Supplied Washer/Nut/Screws
6. Low-Inertia Drum
7. High-Strength Engineering Plastic Cover and Case
8. Long-Life Spring (100,000 Full-Stroke Cycles Minimum)
9. Choice of Analog (Voltage Divider Or Rheostat) or Digital (Quadrature) Sensors
10. Upright Mounting Base (Optional)
11. Flexible Signal Conditioning (Optional)
12. Infinite-Resolution 360° Mounting Alignment
13. RoundAbout™ Cable Exit Capable (Optional)
14. Perfect for Cost-Sensitive, Large-Volume Applications



Sensor Specifications

EMBEDDED ANALOG SENSOR SPECIFICATIONS (voltage divider via precision potentiometer)

Item	8.5-Inch (216-mm) Ranges	21.3-Inch (541-mm), 43.0-Inch (1092-mm), and 85.0-Inch (2159-mm) Ranges
Resistance: Value, Tolerance	5K ohms, ±20%	5K ohms, ±5%
Power Rating	1.0 W at 104° F (40° C); 50 VDC / 12 mA max	1.5 W min at 104° F (40° C); 50 VDC / 12 mA max
Independent Linearity Error	±2.00% max per VRCI-P-100A	±0.25% max per VRCI-P-100A
Insulation Resistance	100 Mohms min at 500 VDC	100 Mohms min at 500 VDC
Resolution	infinite signal	0.044% (21.3-inch (541-mm) range), 0.034% (43.0-inch (1092-mm) range), 0.018% (85.0-inch (2159-mm) range)
Operating Temperature	-4° to 185° F (-20° to 85° C)	-4° to 185° F (-20° to 85° C)
Shock / Vibration	25 g for 6 ms / 10 to 2000 Hz at 5 g	25 g for 6 ms / 10 to 2000 Hz at 5 g

EMBEDDED DIGITAL SENSOR SPECIFICATIONS (incremental optical encoder)

Item	134.4 line/in. (5.29 line/mm) Type	3674 line/in. (144 line/mm) Type
Power Requirement	5 ±0.50 VDC	5 ±0.50 VDC
Supply Current	29 mA max at 5 VDC	110 mA max at 5 VDC
Logic Output	open collector and 3.3 Kohm pull-up resistor (TTL)	line driver that sources and sinks 20 mA
Resolution	134.4 line/inch (5.29 line/mm) (resolution is stated in quadrature pulses (X4 mode))	3674 line/inch (144 line/mm) (resolution is stated in quadrature pulses (X4 mode))
Output	2-bit (quadrature) code, A leads B by 90° with cable extraction	2-bit (quadrature) code, A leads B by 90° with cable extraction; complements with and without index available optionally
Operating Temperature	-4° to 185° F (-20° to 85° C)	-4° to 185° F (-20° to 85° C)
Shock / Vibration	25 g for 6 ms / 5 to 2000 Hz, 5 g	25 g for 11 ms / 50 to 500 Hz at 5 g

Electrical Outputs - Voltage Conditioner

VOLTAGE CONDITIONER (unregulated input)

Item	Unipolar (0-5 VDC, 0-10 VDC, Etc.)	Bipolar (±5 VDC, ±10 VDC, Etc.)
Supply Voltage	7 to 40 VDC for 0-5 VDC 12 to 40 VDC for 0-10 VDC	12 to 40 VDC for ±5 VDC 22 to 40 VDC for ±10 VDC
Supply Current	20 mA max	20 mA max
Reverse Polarity Protection	yes	yes
Increasing/Decreasing Output Options	yes	yes
Output Signal (User Adjustable)	0-5 VDC, 0-10 VDC, 5-0 VDC, 10-0 VDC, and user-adjustable values (adjustable output via 2 x trim potentiometers)	±5 VDC, ±10 VDC, and user-adjustable values (adjustable output via 2 x trim potentiometers)
Zero Adjust	0% to 100% of range	0% to 100% of range
Span Adjust	20% to 65% at 7 VDC supply 5% to 95% at 40 VDC supply	20% to 65% at 7 VDC supply 5% to 95% at 40 VDC supply
Insulation Resistance	1000 Mohms min	1000 Mohms min
Resolution	infinite signal	infinite signal
Thermal Coefficient	±0.01%/°C max	±0.01%/°C max

To change the output signal's range, follow these steps:

1. Remove the 2X sealing screws labeled Z and S to reveal the zero and span trim potentiometers.
2. Extend the displacement cable to the desired start location and adjust the zero trim potentiometer until you get the desired electrical output.
3. Extend the displacement cable to the desired finish location and adjust the span trim potentiometer until you get the desired electrical output.
4. Repeat steps 2 and 3.
5. Replaced the 2X sealing screws.

Electrical Outputs - 4-20 mA

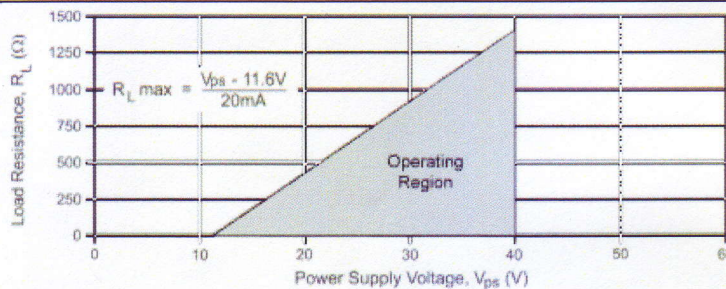
4-20 mA (2-wire current transmitter)

Item	Value
Supply Voltage	12 to 40 VDC with reverse polarity protection
Supply Current	35 mA max
Output Signal	4-20 mA (user adjustable) with increasing and decreasing output options
Zero Adjust	0 to 5% of range (adjustable output via 2 x trim potentiometers)
Span Adjust	50 to 100% of range (adjustable output via 2 x trim potentiometers)
Insulation Resistance	1000 Mohms min at 750 Vrms
Resolution	infinite signal
Thermal Coefficient	±0.01%/°C max

A Note on Load Resistance in 4-20 mA Current Loops - The maximum load resistance or loop resistance is the maximum resistance of all the loads that are connected in series with the circuit. This includes all instrumentation equipment such as power supply and multimeter. The maximum load resistance (RLmax) depends on 2 factors: the voltage supply (Vps) and the maximum loop current (Iloop). For the Series 6 4-20 mA circuit, $RL_{max} = (Vps - 11.6) / Iloop$

Example:

$Vps = 24\text{ V}$
 $Iloop = 30\text{ mA}$
 $RL_{max} = (24 - 11.6) / 30 = 0.413\text{ Kohms}$



To change the output signal's range, follow these steps:

1. Remove the 2X sealing screws labeled Z and S to reveal the zero and span trim potentiometers.
2. Extend the displacement cable to the desired start location and adjust the zero trim potentiometer until you get the desired electrical output.
3. Extend the displacement cable to the desired finish location and adjust the span trim potentiometer until you get the desired electrical output.
4. Repeat steps 2 and 3.
5. Replaced the 2X sealing screws.

Other Specifications

Case / Drum / Optional Mounting Base Materials	engineering-grade plastic / engineering-grade plastic / stainless steel
Displacement Cable	0.018 inch (0.4572 mm) diameter, 7-by-7 stranded stainless steel, 40-lb (178-N) min breaking strength
Displacement Cable Hardware	301250 circular thimble (brass or stainless steel)
Compatible Mounting Hardware	A quantity of 3 self-tapping screws (roughly equivalent to No. 6 screws in size) are supplied for fixed mounting directly into the transducer housing in any 3 of the 6 mounting holes located on the transducer housing. These screws may be used to mount the sensor from the back side through panels up to 0.125 inch (3.175 mm) thick (recommended clearance-hole size in the mounting panel is .145 inch (3.683 mm) minimum). These screws are pre-installed on transducers with the mounting bases. The mounting holes and slots on the sensor are sized to accept alternative user-provided fasteners through the body up to No. 4 or 3 mm in size. See Technical Documents below for detailed information on installation options.
Mass	8 oz (227 g) nominal
Environmental Sealing	NEMA 12 / IP 53
Estimated Lifetime	100,000 full-stroke cycles min

Related Products

Part Number	Description
4112-01	base: mounting, flat / L
4113-01	screw: 6-19, .500-in long, panhead
160001-01	installation kit

Options (25-Unit Minimum Order)

Mounting	custom mounting designs such as flat bases, magnetic bases, adhesive-secured bases, and others
Displacement Cable Termination	300899 threaded plug, 300400 thimble, 160026 swivel, 301003 swivel, 300495 pull ring, and others
Electrical Connection	user-specified connector (such as MIL-C-5015, DIN 45326, Lemo, etc.)
Environmental Protection	NEMA 4X / IP 66

Technical Documents

1. Configuration List (Part Number List) (pdf)
2. Configuration Images by Part (pdf)
3. Mounting Options and Ideas (pdf)
4. Mechanical and Electrical Interface Details (pdf)

Product Selection Tool

1 Sensor 2 Mounting 3 Electrical Interface 4 Signal
Conditioner