OMRON

Contact Linear Displacement Sensor

D5M

For Highly Accurate Measurements of Object Shape, Dimensions, and Displacement with Application of Differential Transformer

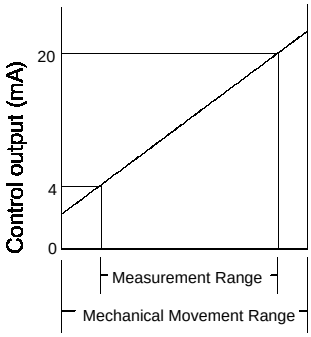
- Roller-style actuators for large objects, and point-style actuators for small objects
- High repeat accuracy of 10 or 20 μm
- 5 mm or 10 mm sensing range with ±0.5% FS linearity
- Easy installation using either mounting bracket or M18 nut
- 4 to 20 mA analog output proportional to actuator stroke
- IP67 protection, resisting water and oil spray
- User-adjustable offset ±5% FS

Ordering Information

Note: Sensors and Amplifiers are matched to assure accurate performance. The part numbers below include both a Sensor and an Amplifier.

Measurement range	Actuator type	Mounting	**Part number**
0 to 5 mm (0 to 0.197 inch)	Ball plunger	M18	**D5M-5B**
		Block	**D5M-5BB**
	Roller plunger	M18	**D5M-5R**
		Block	**D5M-5RB**
0 to 10 mm (0 to 0.394 inch)	Ball plunger	M18	**D5M-10B**
		Block	**D5M-10BB**
	Roller plunger	M18	**D5M-10R**
		Block	**D5M-10RB**

■ LINEAR OUTPUT VS. MECHANICAL MOVEMENT

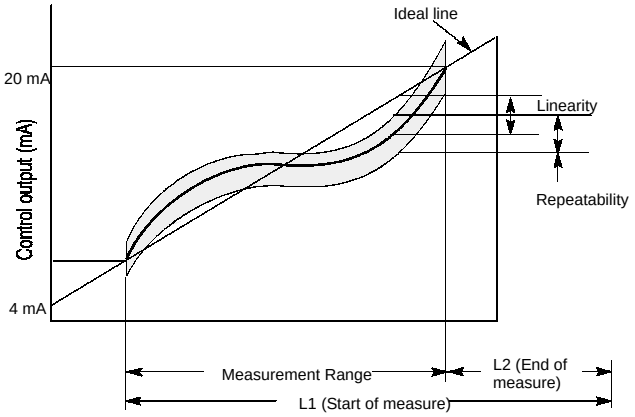


Specifications

■ RATINGS

Part number		D5M-5□□	D5M-10□□
Measurement range		5 mm (0.197 in.)	10 mm (0.394 in.)
Mechanical movement range		Approx. 6 mm (0.236 in.)	Approx. 12 mm (0.472 in.)
Allowable operating speed		0.3 m/s max.	
Offset adjustment range		±0.25 mm	±0.05 mm
Operating force		600 gf (8.34 oz.-inch) max.	
Indicator		Power indicator (Power), Warning (Over)	
Output		4 to 20 mA (max. load impedance: 300 Ω max.)	
Output characteristics Note: See: Output Characteristics Diagram provided in this section.	Repeatability	10 μm minimum	20 μm minimum
	Linearity	±0.5% FS max.	

Output Characteristics Diagram



Repeatability

The sensor's ability to produce the same output repeatedly under identical conditions.

Linearity

Signifies the difference between the ideal straight line and measured value.

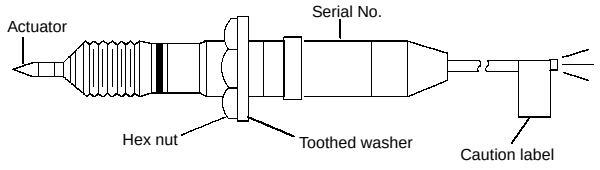
- The ideal straight line can be obtained by connecting the output point for 4 mA to that for 20 mA. Refer to L1 and L2 (provided in outline dimensions).
- Normally, % Full Scale (%FS) is used as a unit for linearity. FS signifies measurement range: 5 mm for D5M-S5 and 10 mm for D5M-S10.

■ CHARACTERISTICS

Part number		D5M-5□□	D5M-10 □□
Power supply voltage		24 VDC ±10%	
Current consumption		100 mA max.	
Ambient temperature	Sensor	-20° to 60°C (-4° to 140°F) with no icing	
	Amplifier	-10° to 55°C (-14° to 131°F) with no icing	
Ambient humidity	Sensor	35 to 95% RH	
	Amplifier	35 to 85% RH	
Temperature influence	Sensor	±0.3% FS/°C	
	Amplifier	±0.3% FS/°C	
Isolation resistance		100 MΩ min. at 100 VDC between current carrying part and ground	
Dielectric strength		1000 VAC, 50/60 Hz for 1 minute between current carrying part and ground	
Mechanical life		10,000,000 operations minimum	
Vibration resistance	Sensor	10 to 55 Hz, double amplitude 2 mm in the direction of X, Y, Z for 2H each	
	Amplifier	10 to 55 Hz, double amplitude 0.75 mm in the direction of X, Y, Z for 2H each	
Shock resistance	Sensor	500 m/s^2 (50G) 3 times each in X, Y, and Z directions	
	Amplifier	200 m/s^2 (20G) 3 times each in X, Y, and Z directions	
Cable		2 m (6.56 ft.) shielded cable with 3 conductors	
Weight	Sensor	Approx. 200 g (7.05 oz.)	Approx. 300 g (10.58 oz.)
	Amplifier	Approx. 100 g (3.52 oz.)	
Material	Sensor	Stainless steel	
	Amplifier	ABS resin	
Enclosure rating	Sensor (only)	IP67	
	Amplifier	–	

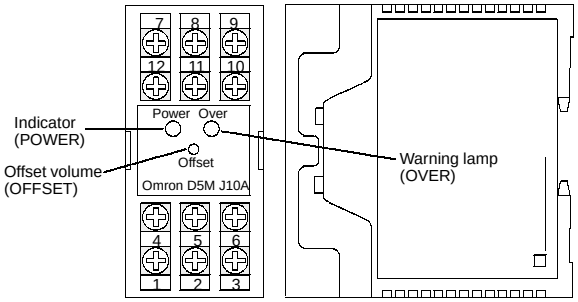
Nomenclature

■ SENSOR



Note: D5M Sensor and Amplifier are adjusted as a set and have the same serial number. Neither sensor or amplifier can be used with another amplifier or sensor having a different serial number.

■ AMPLIFIER



Sensor

D 5 M-S □ □ □ (1) (2) (3) (4) (5)	(1) Basic designation	(2) Sensor	(3) Measurement range		(4) Actuator		(5) Accessory	
	D5M	S	Key	Range	Key	Plunger	Key	Mounting
			5	5 mm (0.20)	R	Roller plunger	Blank	M18 thread
			10	10 mm (0.39)	B	Ball plunger	B	With block

Amplifier

D 5 M-J □ A (1) (2) (3) (4)	(1) Basic designation	(2) Amplifier	(3) Measurement range		(4) Linear output
	D5M	J	Sensor	Range	Output
			5 mm	5 (0.20)	A = 4 to 20 mA
			10 mm	10 (0.39)	

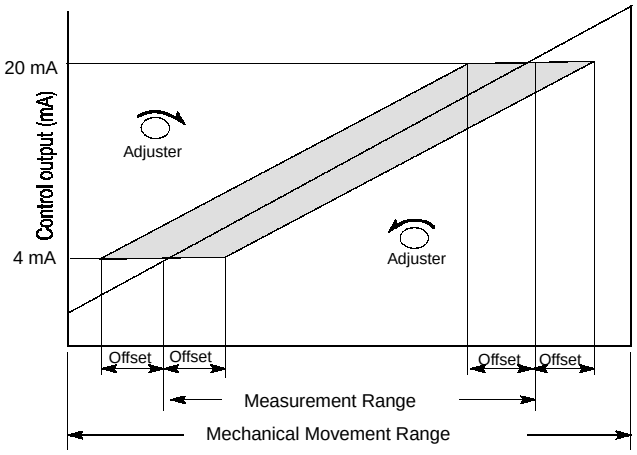
Note: Part numbers are provided for identification purposes only.

Operation

■ POWER ON AND WARM-UP

To ensure accurate measurement — a warm-up time of 10 minutes is required after the D5M is powered up.

■ INITIALIZE



Actuator Position. Set the actuator at the L1 position as shown in Measurement Range.

Check Output Current. Use an ammeter between terminals 4 and 5; current should register 4 mA.

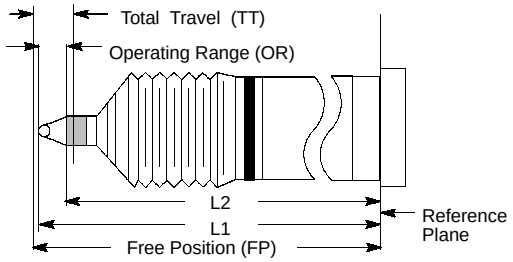
Offset Adjustment. Offset adjustment can be set within ±5% FS: 0.8 mA (±0.25 mm for D5M-S5, and ±0.5 mm for D5M-S10). To make adjustments, turn the offset adjuster clockwise to increase output.

Avoid Measurement Errors

- Do not allow the D5M's operating force 600 gf-cm (8.34 oz-in) to depress the material being measured.
- When measuring moving objects, use the Roller-Plunger Type D5M-S☐☐R.
- Never use the D5M in a strong magnetic field. Errors may occur in sensor accuracy or linearity.
- Do not install in locations having high levels of humidity, dust, extreme temperatures, or vibration.

Note: Refer to other precautions in *Precautions Section.*

■ MEASUREMENT RANGE



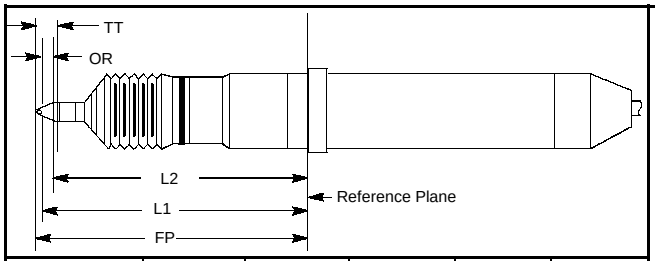
Reference Plane. All D5M measurement ranges are calculated from the Reference Plane. Refer to the illustrations on this page to identify applicable L1 and L2 measurement settings and the Reference Plane.

- L1 starts the Measurement Range which has an output value of 4 mA.
- L2 ends the Measurement Range which has a maximum output value of 20 mA.

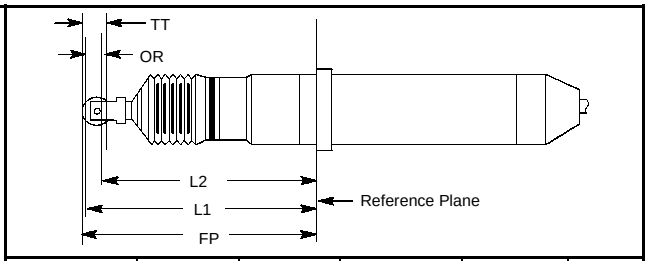
Total Travel (TT). Indicates the full range of actuator movement.

Operating Range (OR). Indicates the Measurement Range for analog output.

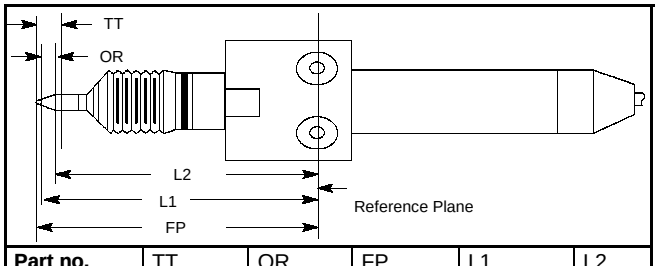
Free Position (FP). Indicates the distance from the Reference Plane to a fully extended actuator tip.



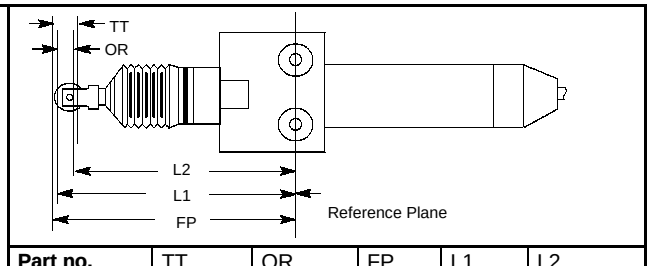
Part no.	TT	OR	FP	L1	L2
D5M-S5B	6 (0.24)	5 (0.20)	61 (2.40)	60.5 (2.38)	55.5 (2.19)
D5M-S10B	11 (0.43)	10 (0.39)	67 (2.64)	66 (2.60)	56 (2.20)



Part no.	TT	OR	FP	L1	L2
D5M-S5R	6 (0.24)	5 (0.20)	66.5 (2.62)	66 (2.60)	61 (2.40)
D5M-S10R	11 (0.43)	10 (0.39)	72.5 (2.85)	71.5 (2.81)	61.5 (2.42)



Part no.	TT	OR	FP	L1	L2
D5M-S5BB	6 (0.24)	5 (0.20)	61 (2.40)	60.5 (2.38)	55.5 (2.19)
D5M-S10BB	11 (0.43)	10 (0.39)	67 (2.64)	66 (2.60)	56 (2.20)



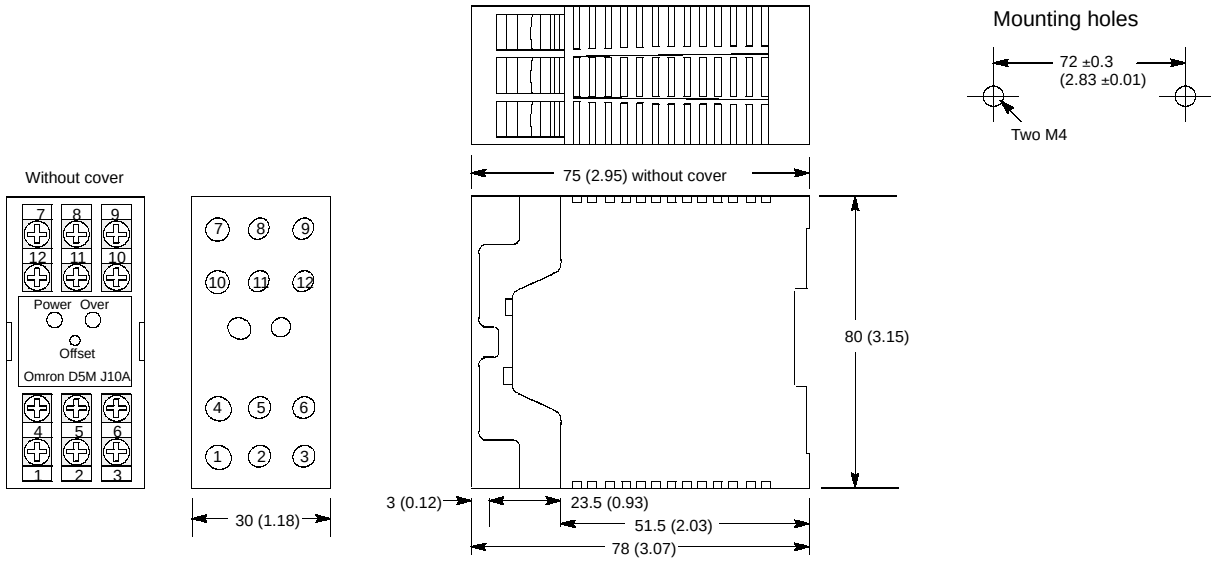
Part no.	TT	OR	FP	L1	L2
D5M-S5RB	6 (0.24)	5 (0.20)	66.5 (2.62)	66 (2.60)	61 (2.40)
D5M-S10RB	11 (0.43)	10 (0.39)	72.5 (2.85)	71.5 (2.81)	61.5 (2.42)

Dimensions

Unit: mm (inch)

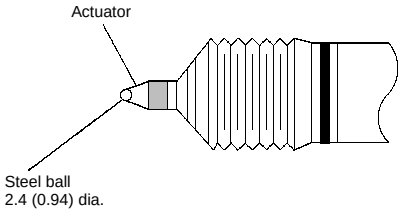
■ AMPLIFIER

D5M-J5/D5M-J10

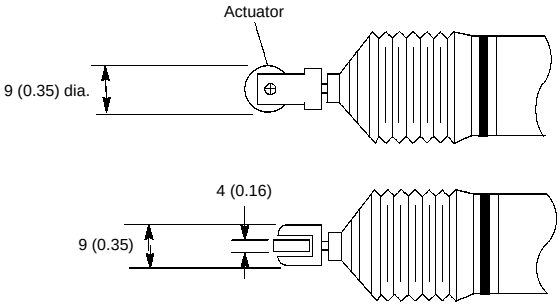


■ SENSOR ACTUATORS

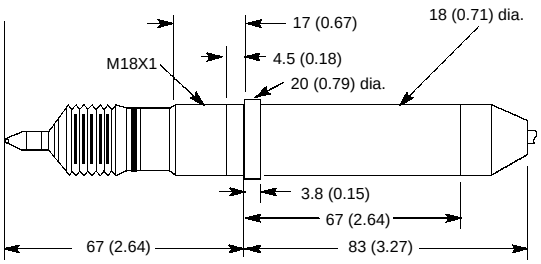
D5M-S□B



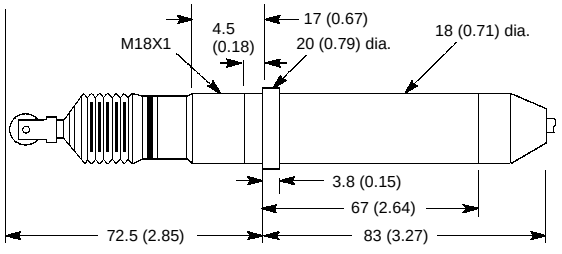
D5M-S□R



D5M-S10B



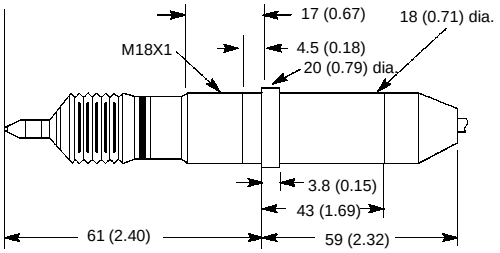
D5M-S10R



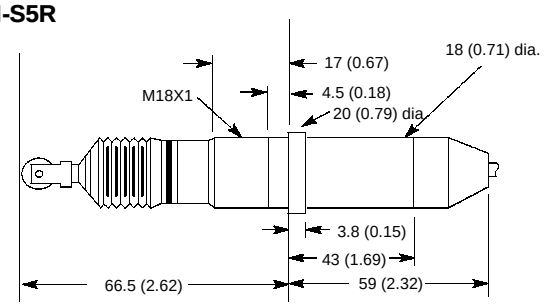
Unit: mm (inch)

■ SENSOR ACTUATORS (CONTINUED)

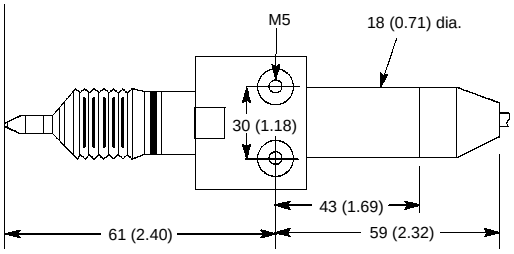
D5M-S5B



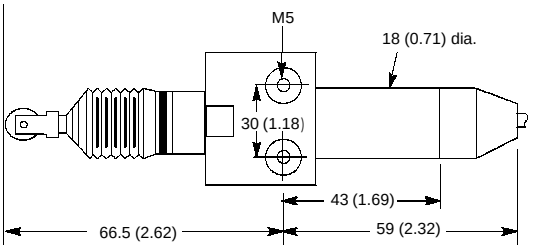
D5M-S5R



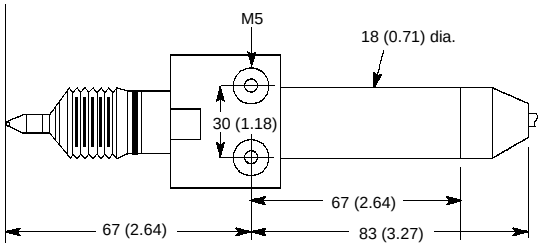
D5M-S5BB



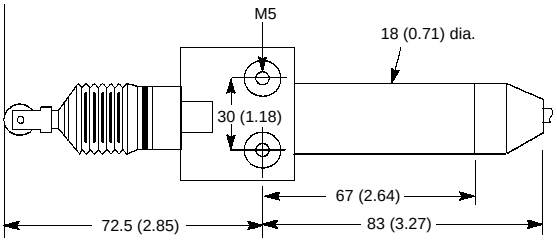
D5M-S5RB



D5M-S10BB

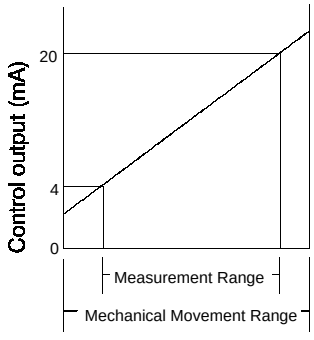


D5M-S10RB



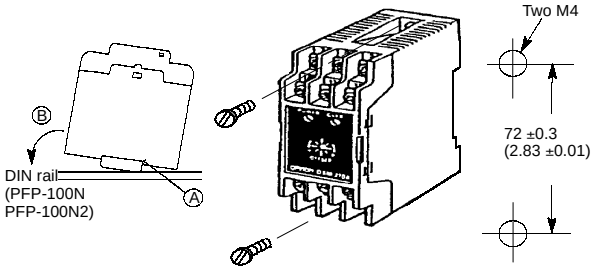
Engineering Data

■ OUTPUT CHARACTERISTICS



Installation

■ AMPLIFIER INSTALLATION



To install the Amplifier on a DIN rail:

1. Insert Part A of the Amplifier into the rail as shown.
2. Press the Amplifier in Direction B as shown.

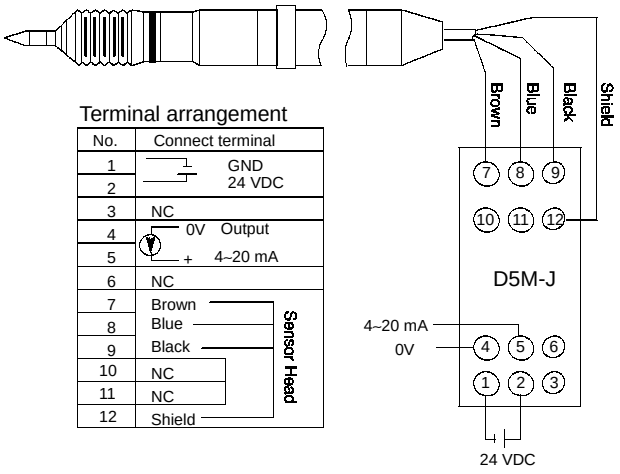
To install the Amplifier on a panel:

1. Use two mounting screws.
2. Refer to the mounting hole locations provided here.

- Do not install in locations having high levels of humidity, dust, extreme temperatures, or vibration.

Note: Refer to other precautions provided in the *Precautions Section.*

■ WIRING SENSOR TO AMPLIFIER



Terminal arrangement

No.	Connect terminal	
1	GND 24 VDC	
2		
3	NC	
4	0V Output	
5	+ 4–20 mA	
6	NC	
7	Brown	Sensor Head
8	Blue	
9	Black	
10	NC	
11	NC	
12	Shield	

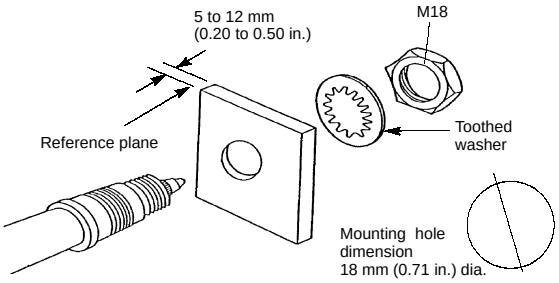
Wiring Precautions

- Do not apply power while connecting Sensor.
- Do not wire the Sensor Cable in the same conduit with high voltage lines or power lines.
- Do not apply excessive winding or twist to cable and do not pull the cable more than is necessary.
- Never attempt to substitute another Sensor or Amplifier for the one included in the matched set. The Sensor and Amplifier have been adjusted as a set (and have the same serial number).

Note: Note: Refer to other precautions provided in the *Precautions Section.*

■ SENSOR INSTALLATION

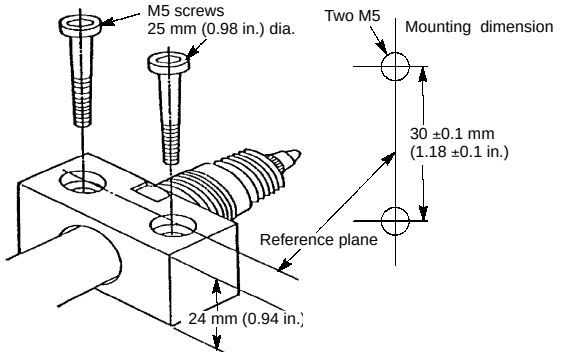
D5M-S□□



Refer to the *Measurement Range* section for the reference plane and measuring position.

- Install the hex nut; tighten it with 150 to 300 kgf/cm (10.8 to 21.7 lbs-ft) force.

D5M-S□□B



- Install the hex nut; tighten it with 50 to 60 kgf/cm (3.6 to 4.4 lbs-ft) force.

Precautions

■ AVOID MEASUREMENT ERRORS

- Do not allow the D5M's operating force 600 gf-cm (8.34 oz-in) to depress the material being measured.
- When measuring moving objects, use the Roller-Plunger Type D5M-S□□R.
- Do not use the sensor as a mechanical stop.

■ ENVIRONMENT

- Do not install in locations having high levels of humidity, dust, extreme temperatures, or vibration.
- Never use the D5M in a strong magnetic field. Errors may occur in sensor accuracy or linearity.

■ REPLACE ONLY AS A SET

- Never attempt to substitute another Sensor or Amplifier for the one included in the matched set. To assure accurate performance, the Sensor and Amplifier have been adjusted as a set (and have the same serial number).

■ WIRING

- Do not wire the Sensor cable in the same conduit with high voltage lines or power lines.
- Do not apply power while connecting Sensor.
- Do not apply excessive winding or twist to cable and do not pull the cable more than is necessary.

Troubleshooting

■ OPERATION CHECK

Item	Check
Connection to power	Power indicator (green) for Amplifier should be lit.
Load impedance	Load impedance should be less than 300 Ω.
Output	Output should be proportional to plunger stroke.
Measuring position	Red LED is not lit.

■ SOURCES OF ERROR

Condition	Causes
Power indicator is not lit.	• Power is not connected. Check connection to power cable.
Output does not change if actuator is pressed.	• Sensor has become disconnected. Check the Sensor connection to the amplifier. • Sensor cable is broken. Contact your Omron dealer. • Output cable is disconnected. • Check output terminal on the Amplifier.
Output does not reach 20 mA.	• Load impedance is too high. Reduce it to less than 300 Ω.
Output is out of the 4 to 20 mA range.	• Sensor has become disconnected. • Check Sensor connection to Amplifier. • Sensor cable is broken. Contact your Omron dealer.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

OMRON®
OMRON ELECTRONICS LLC
One East Commerce Drive
Schaumburg, IL 60173
1-800-55-OMRON

OMRON ON-LINE
Global - http://www.omron.com
USA - http://www.omron.com/oei
Canada - http://www.omron.com/oci

OMRON CANADA, INC.
885 Milner Avenue
Scarborough, Ontario M1B 5V8
416-286-6465

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