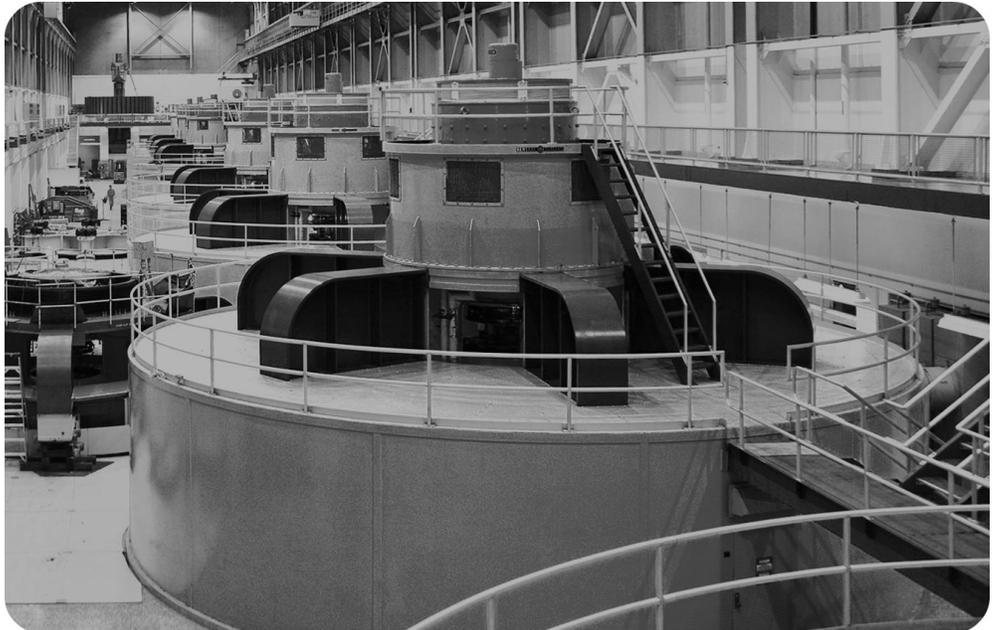


# 1442 Eddy Current Probe System



## Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

---

### IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

---

Labels may also be on or inside the equipment to provide specific precautions.



**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

---

This manual contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the right of this paragraph.

### New and Updated Information

Temperature ranges and wire sizes were corrected as appropriate in this manual.

Topic	Page
Corrected temperature range	13, 17
Added Speed Measurements section and relocated speed measurement figure	16
Corrected wire size	37, 51

**Notes:**

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**Appendix A**

**Wire the Unit to a Monitor System  
Index**

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This manual describes how to install and use the 1442 Series Eddy Current Probe System.

The 1442 Series eddy current probe system performs non-contact measurement of the distance between the sensor and the measured object (target), and outputs a proportional voltage signal. The static component of the measurement is the "gap," the absolute (DC) distance from the target surface to the probe tip. The dynamic component of the measurement is the "vibration," the cyclical (AC) movement of the target toward and away from the probe.

By combining this system with an Allen-Bradley® 1440 or 1444 Series measurement module, you can measure the vibration of a rotating shaft, its eccentricity, thrust position and rotating speed. The system is used for continuous measurement or monitoring of shafts rotating at high speeds, such as turbines, generators, and compressors.

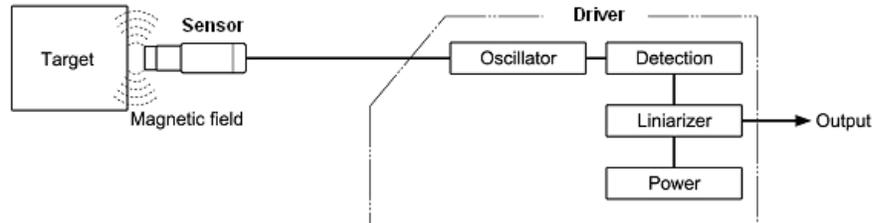
## Measurement Principles

The gap between the sensor and the target is found according to the following principles:

- When an approximately 1 MHz high frequency current is supplied from the oscillator to the sensor, a high frequency magnetic field is created at the sensor tip.
- The inter-linkage of the high frequency magnetic flux on the target induces an eddy current that flows on the target surface.
- When the eddy current flows on the target surface, a magnetic field is created at the target side, and the sensor impedance changes.
- When this change in output of the oscillator is detected, the distance versus output voltage is made linear by a linearizer circuit, and the result is output.

You can find the gap between the sensor and the target by measuring the sensor impedance if the following relationships are identified:

- Relationship between the sensor and the target gap.
- Relationship of the sensor impedance.



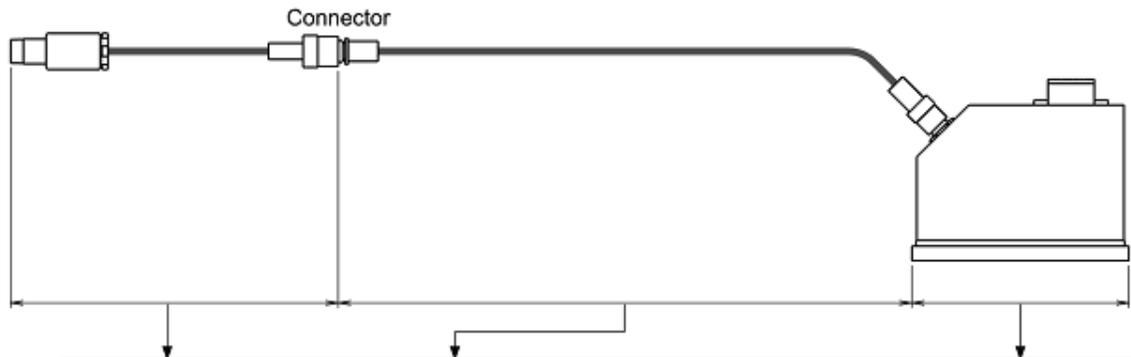
## System Configuration Example

This system is designed to fulfill the specifications when used under the following configuration.

**IMPORTANT**

Always combine the components of this system (sensor, extension cable, and driver) to configure it as follows. If this system is not configured as shown below, or if the 1442 extension cable is not used in combining the 1442 sensor and driver, the output characteristics will differ dramatically.

**Figure 1 - System Configuration Example**



Sensor		Extension Cable	=	System Cable Length		Driver <sup>(1)</sup>
0.5 m (1.64 ft)	+	4.5 m (14.76 ft)	=	5.0 m (16.40 ft)	→	1442-DR-xx50
1.0 m (3.28 ft)	+	4.0 m (13.12 ft)	=	5.0 m (16.40 ft)	→	1442-DR-xx50
0.5 m (1.64 ft)	+	8.5 m (27.89 ft)	=	9.0 m (29.53 ft)	→	1442-DR-xx90
1.0 m (3.28 ft)	+	8.0 m (26.25 ft)	=	9.0 m (29.53 ft)	→	1442-DR-xx90

(1) Where xx = appropriate code for probe size.

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
1442 Eddy Current Probe Systems Specifications Technical Data, publication <a href="#">1442-TD001</a> .	Provides specifications for the 1442 Eddy Current Probe System.
Turbine Supervisory Instrumentation System Selection Guide, publication <a href="#">GMSI10-SG002</a> .	Provides details to help you choose a Turbine Supervisory Instrumentation system.

You can view or download Rockwell Automation publications at <http://www.rockwellautomation.com/literature>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

**Notes:**

## Installation

This chapter describes how to install a 1442 Series Eddy Current Probe System.



**ATTENTION:** Always ground the system. Never apply power until all wiring work and connection work has been completed. If this is not followed, there is a possibility of electrocution.

Installation work, wiring, and connections must be performed by a person with knowledge in instrumentation.

---



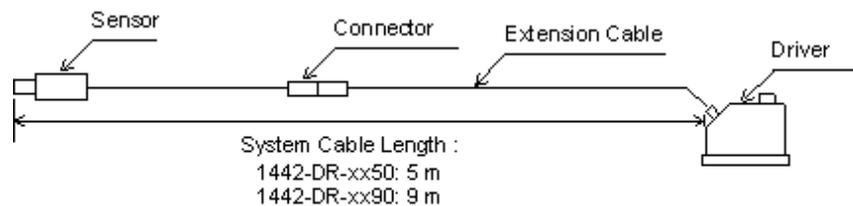
**ATTENTION:** Be sure to adhere to the following guidelines:

- Before touching this unit, be sure to touch a metal section near by to discharge any static electricity. The device can be damaged if exposed to static electricity from a person's body.
  - Before applying power, make sure that all wiring is properly connected. There is a possibility of damage to the unit and fire if improperly connected.
  - Install this unit away from motors and relays.
  - Install the input/output signal cables away from power system and control system cables. Noise occurring from the motor or relay can adversely affect the measurement value. We recommend using separate wiring ducts.
  - Do not pull or bend the sensor cables and extension cables with excessive force. The conductor in the cable can get cut off.
  - The allowable tension of the sensor cables and extension cables is 98.1 N•m (10 kgf•m). The allowable bend radius is as follows:
    - Without armored cable: 30 mm (1.18 in.)
    - With armored cable: 50 mm (1.97 in.)
  - After completing the installation, make sure all connections are correct and tight before powering the system.
- 

**TIP**

Refer to Appendix A on [page 51](#) for recommended cable wiring, and installation methods.

## Installation Environment



## Driver Installation Environment

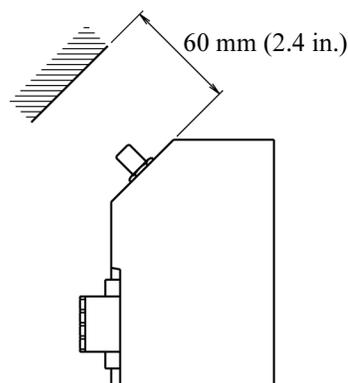
Install the driver in a location that satisfies the following environmental and installation conditions.

### Environmental Conditions

Feature	Specification
Ambient temperature	Must be in a range of -30...80 °C (-22...176 °F) when devices are operating.
Ambient humidity	Must be in a range of 30...95% RH (noncondensing) when devices are operating.
Vibration condition	Must be 10 m/s <sup>2</sup> (1 g) or less at 10...150 Hz.
Air cleanliness	<p>We recommend an air dust-particle amount of 0.2 mg/m<sup>3</sup> or less.</p> <p>We recommend an especially low amount of corrosive gasses, such as hydrogen sulfide, NOx gas, and chlorine, and conductive particles, such as iron dust and carbon. The allowable amounts of hydrogen sulfide and NOx gas, based on JEIDA-29 (1979) Class S1, are shown below.</p> <p>JEIDA: Japanese Electronic Industry Development Association                      JEIDA-29 (1979) CLASS S1                      Hydrogen sulfide: 0.01 ppm or less, NOx gas: 0.05 ppm or less                      (Ambient temperature: 25 °C ± 5 °C (77 °F ± 9 °F), humidity: 40...80% RH)</p>

### Install Conditions

- If there are walls or other obstacles at the cable connection surface of the driver, make sure to keep spacing as illustrated below. Take care not to bend the cable excessively.



- Do not locate above heat emitting objects.

## Sensor Installation Environment

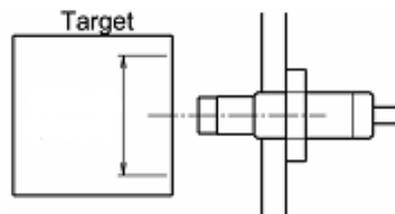
Install the sensor at a location that satisfies the following environmental and installation conditions.

### Environmental Conditions

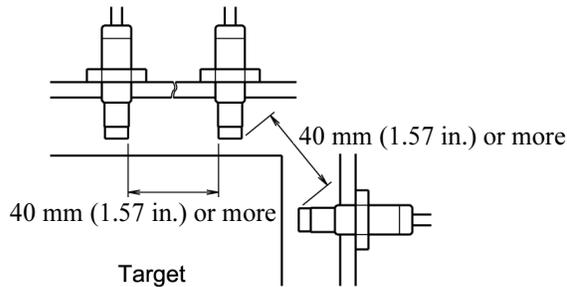
Feature	Specification
Ambient temperature	ATEX applications must be in a range of -35...80 °C (-31...176 °F) when devices are operating. CSA applications must be in a range of -35...85 °C (-31...185 °F) when devices are operating. Other applications must be in a range of -35...177 °C (-31...350 °F) when devices are operating
Ambient humidity	Must be in a range of 30...95% RH (noncondensing) when devices are operating.
Vibrational conditions	Must be 10 m/s <sup>2</sup> (1 g) or less at 10...150 Hz. (If the sensor vibrates, an accurate measurement cannot be made.)
Air cleanliness	We recommend an air dust-particle amount of 0.2 mg/m <sup>3</sup> or less.  We recommend an especially low amount of corrosive gasses, such as hydrogen sulfide, NOx gas, and chlorine, and conductive particles, such as iron dust and carbon. The allowable amount of hydrogen sulfide and NOx gas, based on JEIDA-29 (1979) Class S1, are shown below.  JEIDA: Japanese Electronic Industry Development Association JEIDA-29 (1979) CLASS S1 Hydrogen sulfide: 0.01 ppm or less, NOx gas: 0.05 ppm or less (Ambient temperature: 25 °C ± 5 °C (77 °F ± 9 °F), humidity: 40...80% RH)

### Installation Conditions

- Do not install at a location exposed to rain or other moisture. Moisture can lead to reduced sensitivity of the sensor, and reduced insulation.
- A target surface area of not less than three times the tip diameter centered on the sensor is required, as illustrated below.



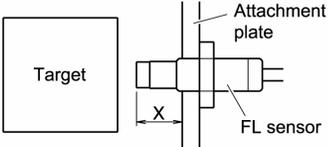
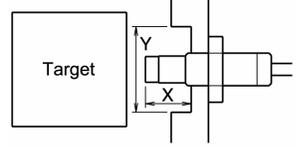
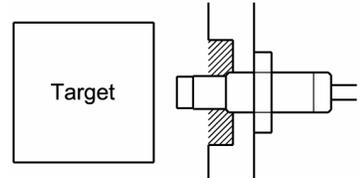
- When placing other sensors next to each other, separate the sensor tops by not less than 10 times the sensor tip diameter to prevent interference.



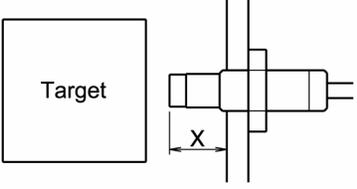
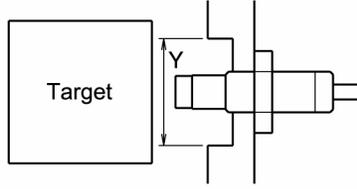
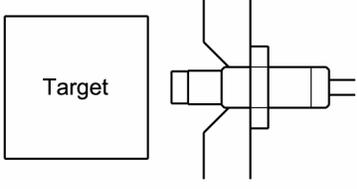
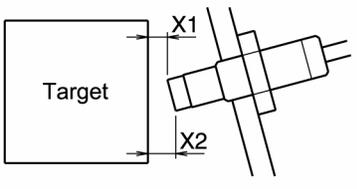
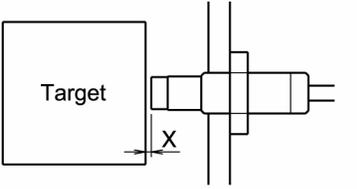
- The sensor must be installed on a surface with adequate rigidity that is not affected by an outside vibration. If the sensor vibrates, an accurate measurement cannot be taken.
- For shapes and dimensions around the sensor, refer to the installation examples (1...3) below. If a piece of metal other than the target is near the sensor, an accurate reading cannot be taken.

If it is unavoidable to install the sensor as illustrated in examples 4...7, check the characteristics at the attachment completed conditions.

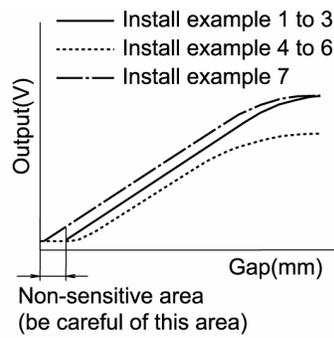
**Table 1 - Installation Examples**

Example	Description
<p>Example 1 (most recommended)</p> 	<p>Dimension X is to be not less than 1.2 times the tip diameter.</p>
<p>Example 2 (recommended)</p> 	<p>Dimension X is to be not less than 1.2 times the tip diameter Dimension Y is to be not less than 3 times the tip diameter.</p>
<p>Example 3 (recommended)</p> 	<p>After constructing as shown in example 2, the area shown by the shaded line in the illustration is filled with resin or other insulating material.</p>

**Table 1 - Installation Examples**

Example	Description
<p>Example 4</p> 	<p>If dimension X is less than 1.2 times the tip diameter, the measurement will be affected by the attachment plate.</p>
<p>Example 5</p> 	<p>If dimension Y is less than 3 times the tip diameter, the measurement will be affected by the attachment plate.</p>
<p>Example 6</p> 	<p>If the attachment plate around the sensor top is chamfered, it will be affected by the attachment plate.</p>
<p>Example 7</p> 	<p>If the target and the sensor top are not parallel (dimension X1 and X2 are not the same), it will affect the reading.</p>
<p>Example 8</p> 	<p>If dimension X is less than the minimum linear range from sensor tip specification for the sensor, the measurement will not be accurate.</p>

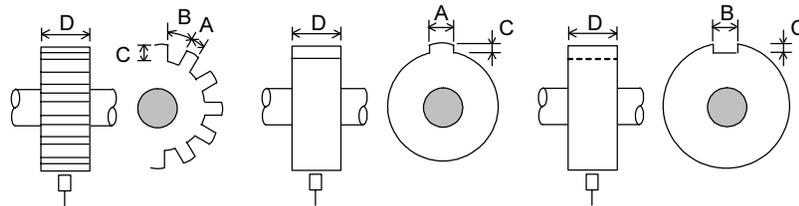
The characteristics of output (V) and gap (mm) are as shown in the graph below.



### Speed Measurements

Assumes measurements are made with a 5 mm or 8 mm probe.

**Figure 2 - Dimension of target (recommended for rotational speed measurement):**



	mm	mils
Recommended dimension of target (mm)	$A \geq 6$	$A \geq 236$
	$B \geq 7$	$B \geq 275$
	$C \geq 2.5$	$C \geq 98$
	$D \geq 15$	$D \geq 590$
Recommended set gap (mm)	1.0...1.5	39...59

## Extension Cable Installation Environment

Install the extension cable in a location that satisfies the following environmental and installation conditions.

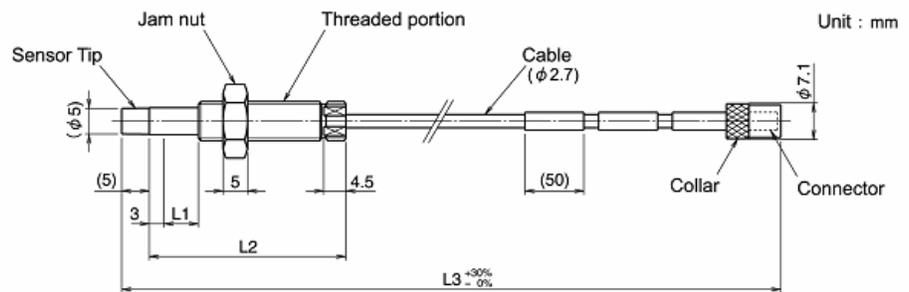
Feature	Specification
Ambient temperature	Cable must be in a range of -35...177 °C (-31...350 °F) when devices are operating. Connector must be in a range of -35...125 °C (-31...257 °F) when devices are operating. ATEX applications must be in a range of -35...80 °C (-31...176 °F) when devices are operating. CSA applications must be in a range of -35...85 °C (-31...185 °F) when devices are operating.
Ambient humidity	Must be in a range of 30...95% RH (noncondensing) when devices are operating.

## Outer Dimensions and Part Nomenclature

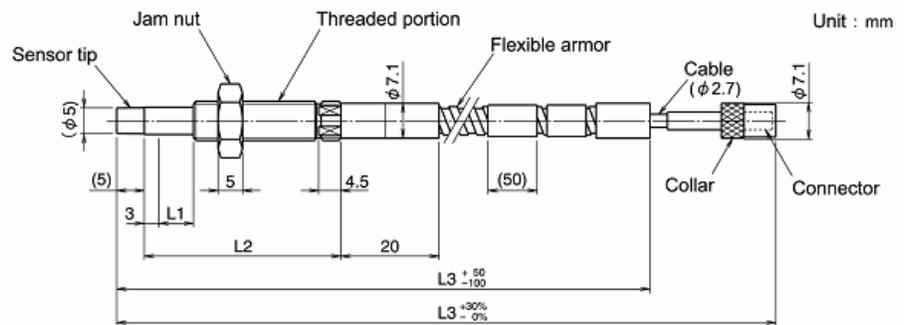
### 1442 Sensor Outer Dimensions and Part Nomenclature

#### 5 mm Sensor

##### ■ 5 mm Probes - Not Armored



##### ■ 5 mm Probes - Armored



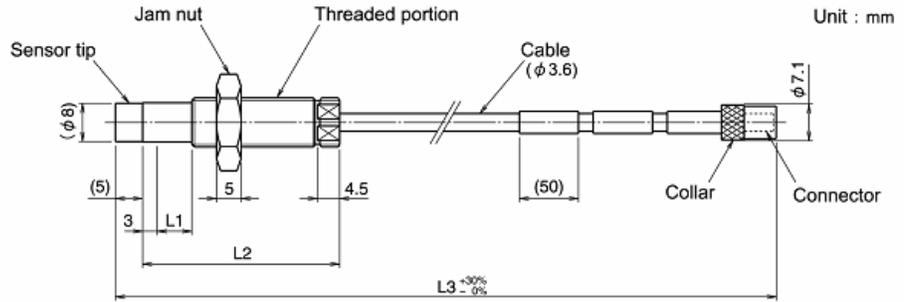
L1 = Unthreaded length

L2 = Case length

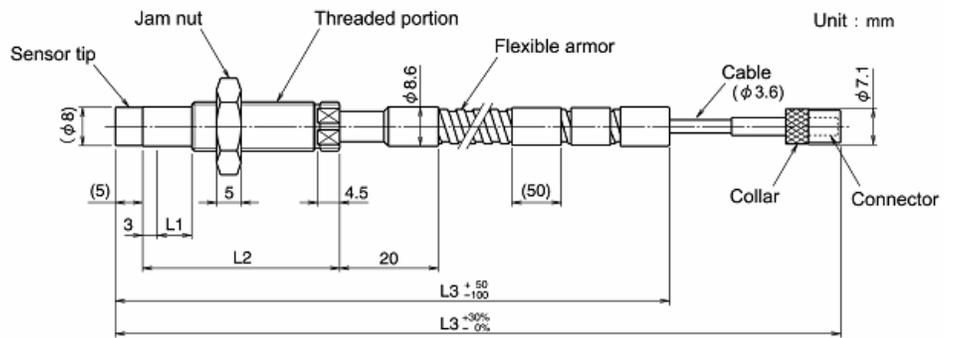
L3 = Cable length

### 8 mm Sensor

■ 8 mm Probes - Not Armored



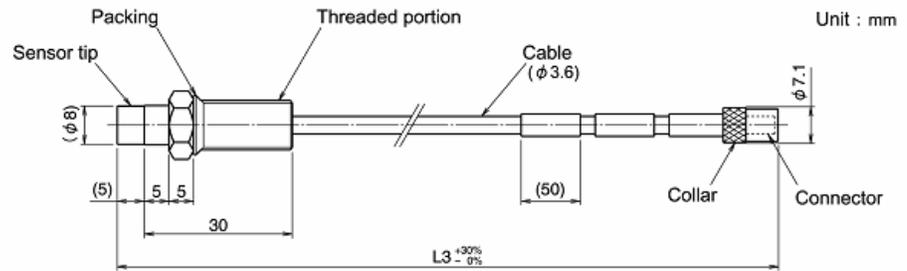
■ 8 mm Probes - Armored



- L1 = Unthreaded length
- L2 = Case length
- L3 = Cable length

### Reverse 8 mm Sensor

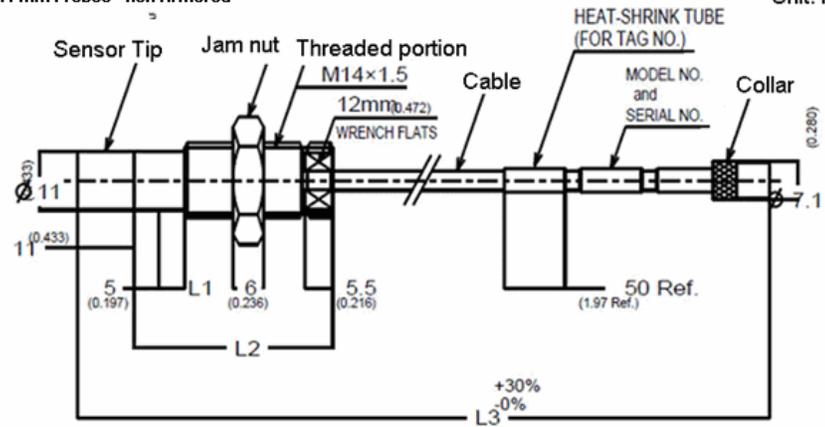
■ Reverse 8 mm Sensor - Not Armored



- L3 = Cable length

### 11 mm Probes - Non Armored

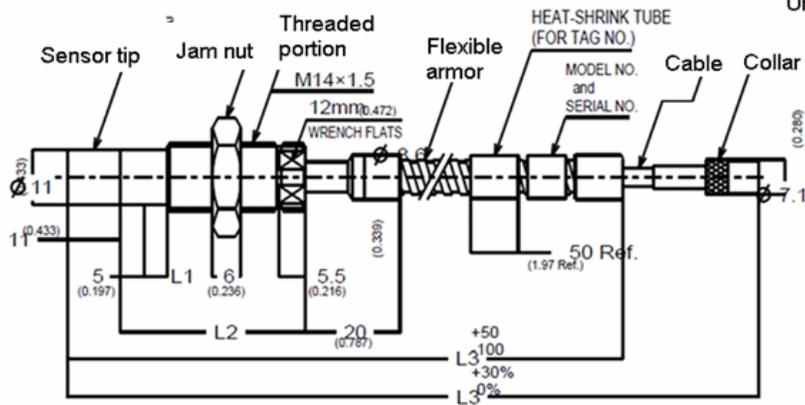
■ 11 mm Probes - Non Armored Unit: mm



- L1 = Unthreaded length
- L2 = Body length
- L3 = Cable length

### 11 mm Probes - Armored

■ 11 mm Probes - Armored Unit : mm

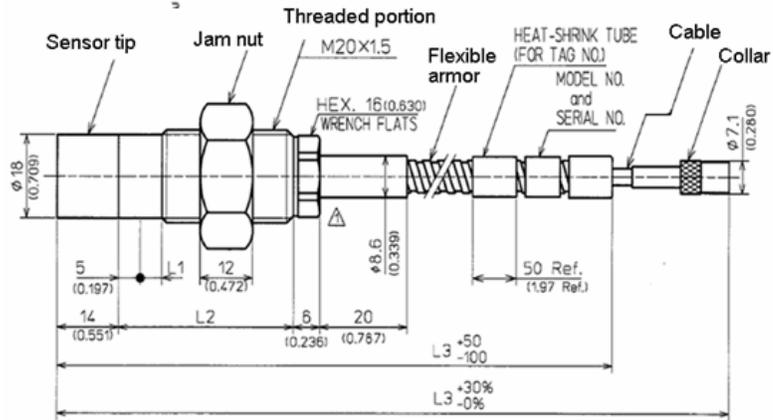


- L1 = Unthreaded length
- L2 = Body length
- L3 = Cable length

### 18 mm Probes - Armored

■ 18 mm Probes - Armored

Unit : mm



L1 = Unthreaded length

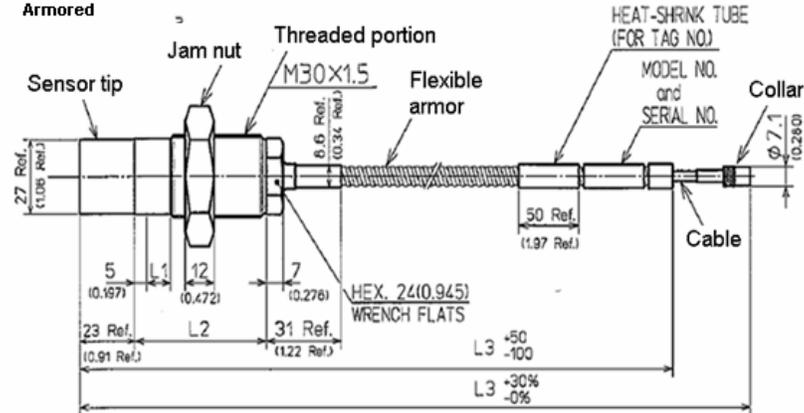
L2 = Body length

L3 = Cable length

### 25 mm Probes - Armored

■ 25 mm Probes - Armored

Unit : mm

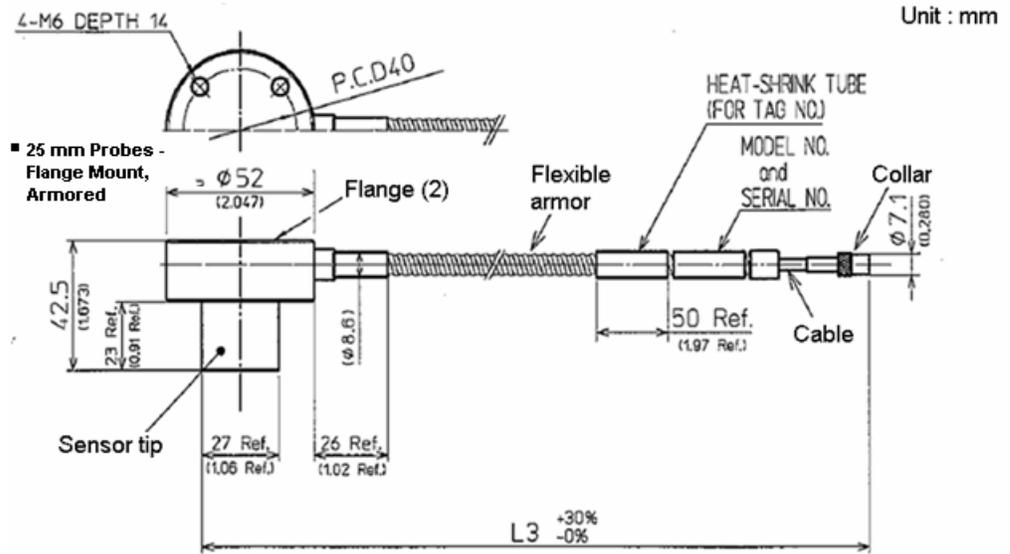


L1 = Unthreaded length

L2 = Body length

L3 = Cable length

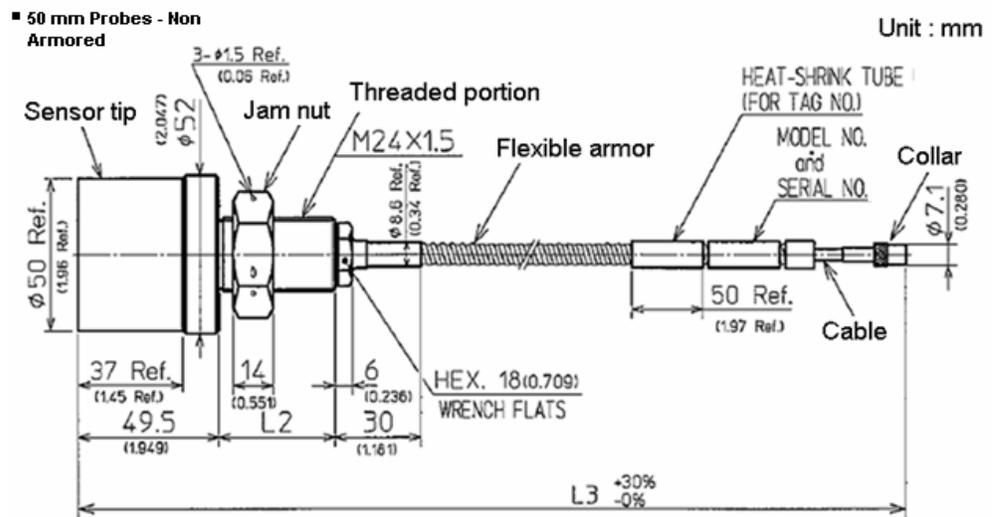
25 mm Probes - Flange Mount, Armored



2 = 4 holes in flange, 14 mm deep with M6 threads

L3 = Cable length, +30% / -0%

50 mm Probes - Armored

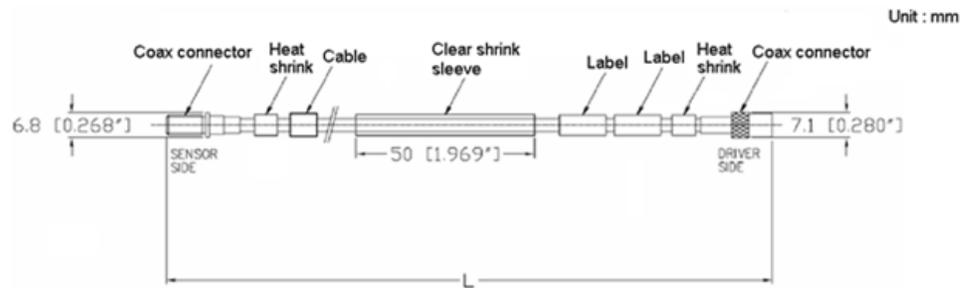


L2 = Body length

L3 = Cable length

## Extension Cable Outer Dimensions and Part Nomenclature

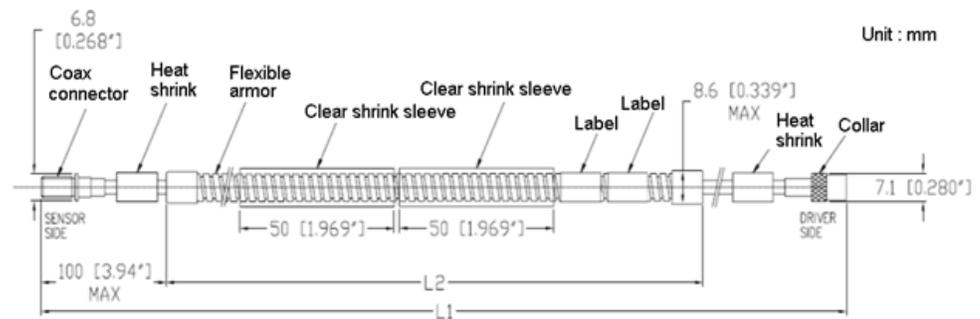
### 5, 8, and 11 mm Probe Extension Cables - Non Armored



ALLEN BRADLEY MODEL NUMBER	L (+20% -0%)
1442-EC-5840N	4.0m
1442-EC-5845N	4.5m
1442-EC-5880N	8.0m
1442-EC-5885N	8.5m
1442-EC-1140N	4.0m
1442-EC-1180N	8.0m

■ 5, 8, and 11 mm Probe Extension Cables - Non Armored

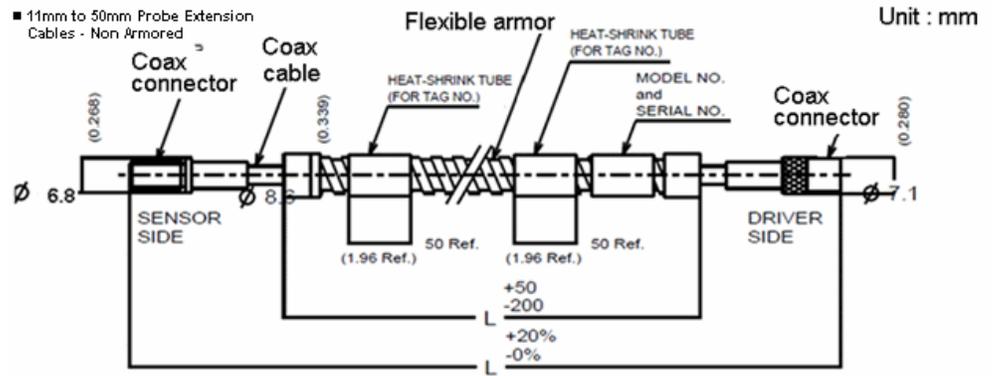
### 5 and 8 mm Probe Extension Cables - Armored



ALLEN BRADLEY MODEL NUMBER	L1 (+20% -0%)	L2 (MIN)
1442-EC-5840A	4.0m	3.8m
1442-EC-5845A	4.5m	4.3m
1442-EC-5880A	8.0m	7.8m
1442-EC-5885A	8.5m	8.3m

■ 5 and 8 mm Probe Extension Cables - Armored

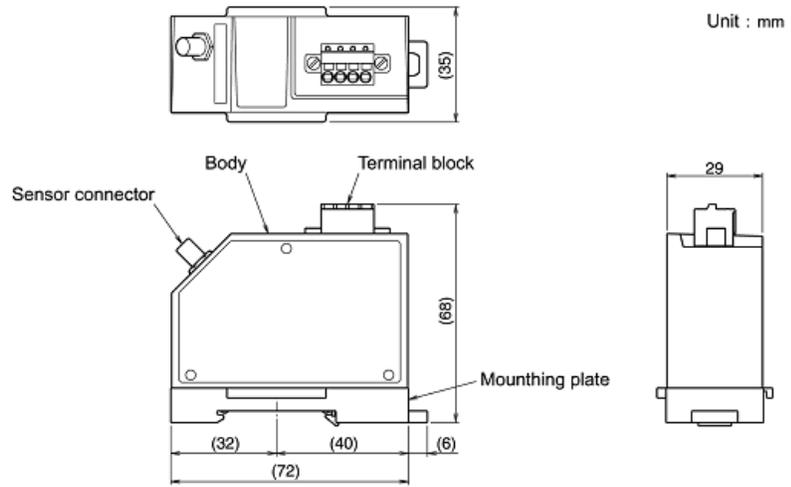
11 mm to 50 mm Probe Extension Cables - Armored



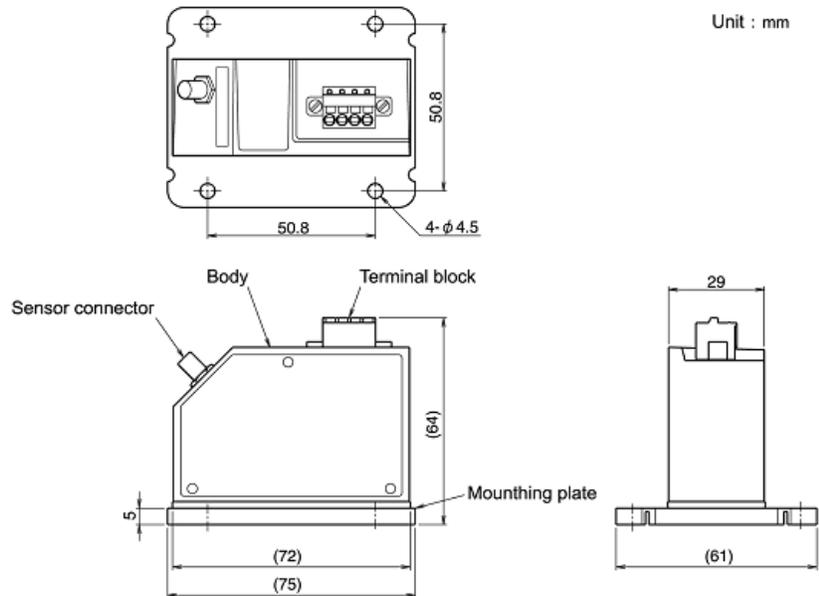
Catalog Number	Length L
1442-EC-1140A	4.0m(13ft)
1442-EC-1180A	8.0m(26ft)
1442-EC-1840A	4.0m(13ft)
1442-EC-1880A	8.0m(26ft)
1442-EC-2540A	4.0m(13ft)
1442-EC-2580A	8.0m(26ft)
1442-EC-5040A	4.0m(13ft)
1442-EC-5080A	8.0m(26ft)

## Driver Outer Dimensions and Part Nomenclature

### ■ Driver with DIN Rail Mount



### ■ Driver with Screw Mount



## Install the Driver

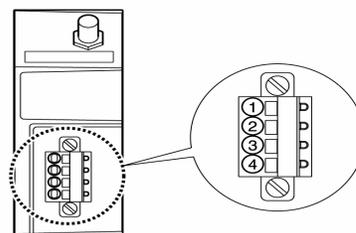
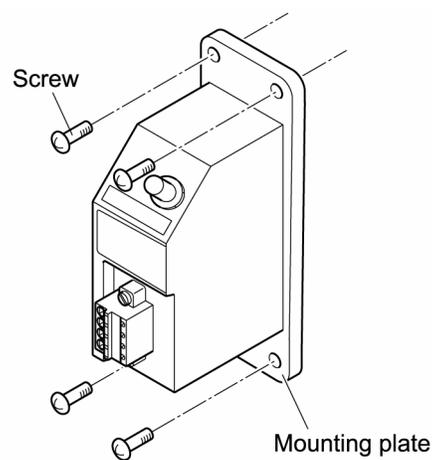
The driver can be installed on a DIN rail, or it can be mounted on a panel or wall by using the provided adapter.

### Mount the Driver on the Housing or Panel

The driver can be directly mounted on the panel.

**TIP** When attaching to panels or mounts, make sure the surface is strong and flat.

Attach the driver to the panel mounting plate and affix with the provided four screws (M4 x 12 mm).



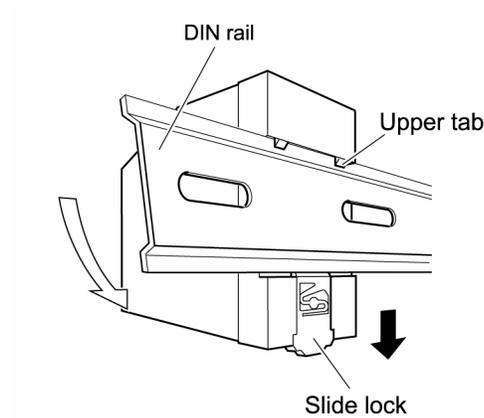
#### Terminal Arrangement

Terminal No.	Signal
1	OUTPUT
2	COM
3	-24V
4	Shield (COM)

## Mount the Driver to a DIN Rail

The driver can be mounted to a 35 mm DIN rail.

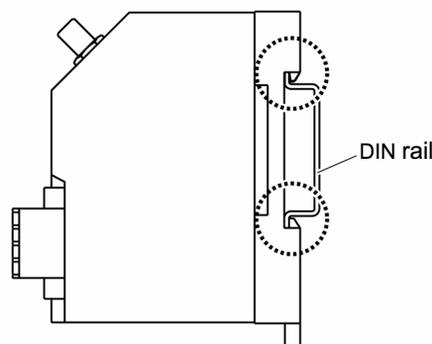
1. Hook the upper tabs on the back of the driver onto the DIN rail.



2. Push the driver into the DIN rail until a click is heard from the slide lock.

If the driver does not fit onto the DIN rail well, pull on the slide lock and push the driver against the DIN rail.

3. Make sure the upper tabs and the slide lock are securely fixed on the DIN rail.



**TIP** Remove the driver by pushing down on the slide lock with a flat-blade screwdriver.

## Install the Sensor

Install according to the conditions described in the [Sensor Installation Environment](#) on [page 13](#).



**ATTENTION:** Do not drop or otherwise subject the sensor to shock.

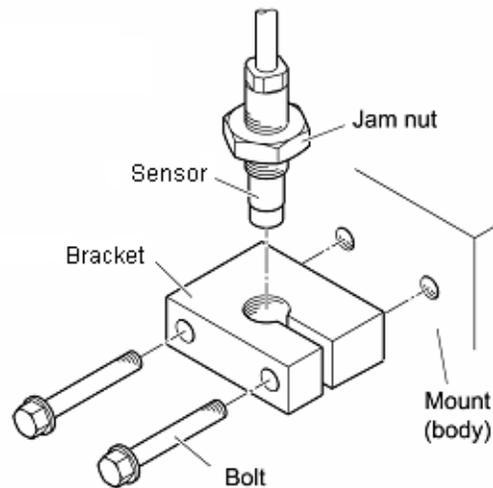
**TIP** The sensor installation instructions comply with API Standard 670.

## Use a Sensor Mounting Bracket

If you need a mounting bracket for the sensor, construct your own mounting bracket. The mounting bracket can be readily machined at your site. The bracket must provide a stable, secure, platform that satisfies the conditions described in the [Sensor Installation Environment on page 13](#).

When using a sensor mounting bracket, use the following steps to install the sensor.

1. Attach the sensor mounting bracket to the mount (body), and temporarily attach with bolts.

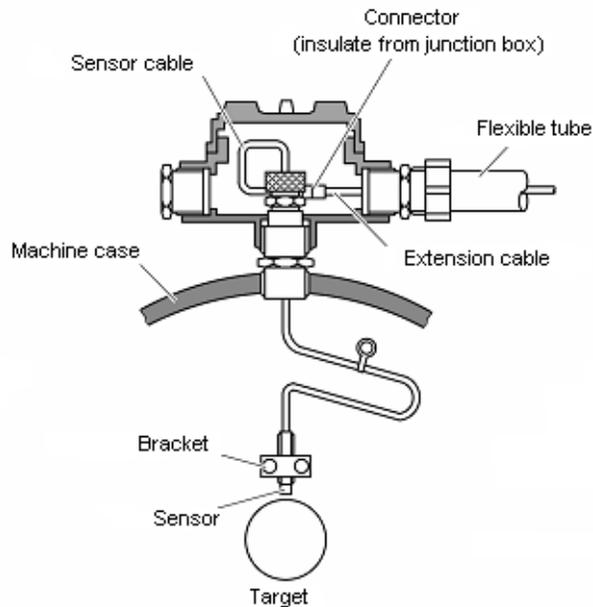


Insert the sensor into the sensor mounting brackets screw hole, and adjust the gap between the sensor top face and the target.

[Refer to Set Gap Voltage on page 35](#).

2. Tighten the bolts further, and affix the sensor mounting bracket.
3. Retighten the lock nut gain at the specified torque.

Figure 3 - Sensor Mounting Bracket Installation Example



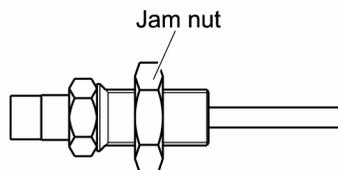
## Use a Stinger

1442 Series 8-mm reverse-mount probes can be used with commonly available probe holders. Stingers (also known as sensor sleeve), are provided with the probe holder. Stingers can also be purchased from probe holder suppliers or can often be machined locally.

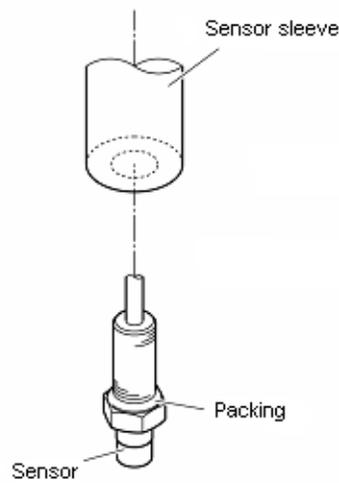
The following instruction is a general guide based on common probe holder designs. Consult your specific probe holder installation instructions for additional details.

**TIP** Install the probe holder and stinger assembly per installation instructions before mounting the probe onto the stinger.

1. Remove the jam nut of the reverse mount sensor. (Remove at the Jam nut attachment.)

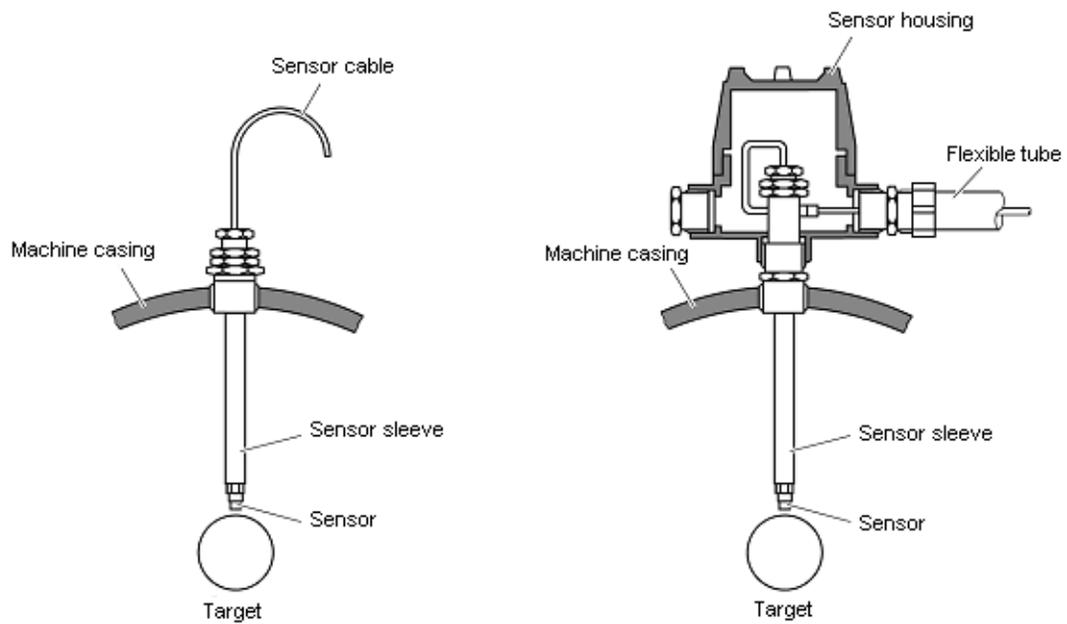


2. Attach the sensor to the sensor sleeve.



3. Attach the sensor sleeve to the mounting (machine casing).
4. Adjust the gap between the sensor top face and the target.

**Figure 4 - Sensor Sleeve Installation Example**



## Adjust the Gap

Adjust the gap by using the following procedures.

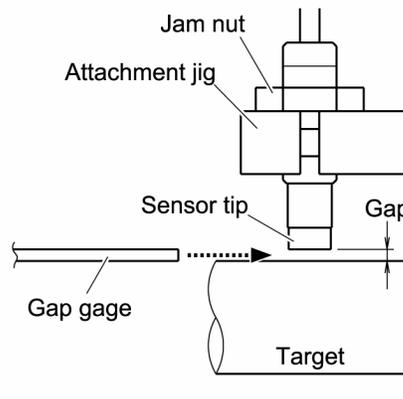
**TIP** After completing all wiring connections, you can perform gap adjustment by using a tester.

Make sure to fully understand the content described in this chapter and complete all connection work, then perform the gap adjustment by using the [Set Gap Voltage](#) procedures on [page 35](#).

1. [Refer to Standard Static Characteristics on page 41](#), and prepare a gap gage matching the gap to produce the desired characteristics.

Consider the following items for the gap:

- Set the gap so that even when the target is at the nearest point to the sensor, the target does not come into direct contact with the sensor.
  - Set the gap so that it does not go beyond the linear range of the connection monitor.
2. Being careful not to scratch the sensor top and target surface, insert the gap gage between the sensor top and target.



3. Adjust the sensor to a position where the gap gage just moves freely, and affix in place with the jam nut.
4. Tighten the jam nut with the following torque.

**Table 2 - Torque Requirements**

Sensor	Example	Tightening Torque		
		N·m	kgf·cm	lb·in
1442-PS-05xxM (5 mm metric)	1442-PS-0503M0010N	4	41	35.4
1442-PS-05xxE (5 mm English)	1442-PS-0512E0010N	1.4	15	12.4
1442-PS-08xxM (8 mm metric)	1442-PS-0803M0010N	8.5	87	75.2
1442-PS-08xxE (8 mm English)	1442-PS-0812E0010N	6.8	69	60.2
1442-PS-11xxM (11 mm metric)	1442-PS-1104M0510N	26.1	266	231
1442-PS-11xxE (11 mm English)	1442-PS-1116E0510N	18.6	190	164
1442-PS-18xxM (18 mm metric)	1442-PS-1805M0510A	58.8	600	520

**Table 2 - Torque Requirements**

Sensor	Example	Tightening Torque		
		N·m	kgf·cm	lb·in
1442-PS-18xxE (18 mm English)	1442-PS-1820E0510A	88.2	900	780
1442-PS-25xxM (25 mm metric)	1442-PS-2505M0510A	176	1800	1557
1442-PS-25xxE (25 mm English)	1442-PS-2520E0510A	196	2000	1734
1442-PS-50xxM (50 mm metric)	1442-PS-5005M0010A	176	1800	1557
1442-PS-50xxE (50 mm English)	1442-PS-5020E0010A	196	2000	1734
1442-PR-08xxM (8 mm rev mnt metric)	1442-PR-0803M0505N	8.5	87	75.2
1442-PR-08xxE (8 mm rev mnt English)	1442-PR-0812E0205N	6.8	69	60.2



**ATTENTION:** Make sure to tighten the jam nut at the specified torque. If tightened with excessive torque, the sensor can be damaged. If the tightening torque is too small, it can come loose.

## Connect the Wiring

This section describes the wiring connections for the 1442 Series Eddy Current Probe system.

The 1442 Series includes color-coded bands on the ends of each component. The color-coded bands help you identify the length of the extension cable and the length of the probe so that the total system length (5 or 9 meters) can be matched to the appropriate driver. When the system is properly "sized," the color bands for the probe, extension cable, and driver will match.

**Table 3 - 1442 Series Color Band Table**

Sensor		Extension Cable			Driver	
Cable Length	Color Band	Length	Probe End Color Band	Driver End Color Band	System Cable Length	Color Band
0.5 m	Yellow	4.0 m	Black	Blue	5.0	Blue
1.0 m	Black	4.5	Yellow	Blue	9.0	Red
5.0 m	Blue	8.0	Black	Red		
9.0 m	Red	8.5	Yellow	Red		



**WARNING:** Make sure the wiring and connections are performed by a person with knowledge in instrumentation.



**WARNING:** Make sure you ground your system. Never apply power until all wiring and connection work has been completed. If this is not followed there is a possibility of electrocution.



**ATTENTION:** Make sure to tighten the collar of the connector by hand. Using a tool to tighten the collar can damage the connector. If the installation environment does not allow proper tightening by hand and there is a possibility that it can come loose, tighten an additional 1/4 turn using pliers after tightening by hand:

- Do not apply excessive force on the screws of the connector. The connector can be damaged
- Do not cut the sensor or extension cables shorter. It can cause problems, such as not being able to perform up to specifications.

### TIP

Make sure that the cable is not twisted when connecting the connectors. Twisting stress on the cable can slowly loosen the connection.

If a twisting force is applied to the direction where the collar is loosened, twist the extension cable slightly to the opposite direction of the collar tightening direction before connecting. Then connect the connector and tighten the collar.

### TIP

We recommend that excessive extension cables be stored in the cable storage box. If it is unavoidable to store inside the driver housing, do not force excessive cables into the housing.

Connections are performed in the following order.

1. Connect the extension cable (when using the extension cable).
2. Connect the sensor.
3. Connect the XM® module.
4. Verify the connections.
5. Check the gap voltage.

## Connect the Extension Cable

Use the following steps to connect the sensor and extension cable.

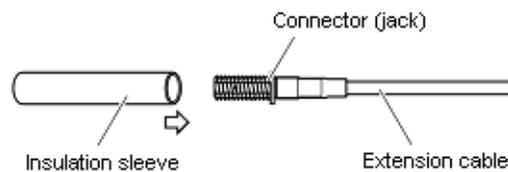
**TIP** The connection area of the connector must not be exposed to water or oil. If water or oil enters the connector, the cable capacity increases, and causes a loss in sensitivity.

**TIP** Make sure the color band on the sensor cable matches the color band on the probe end of the extension cable. [See 1442 Series Color Band Table on page 32.](#)

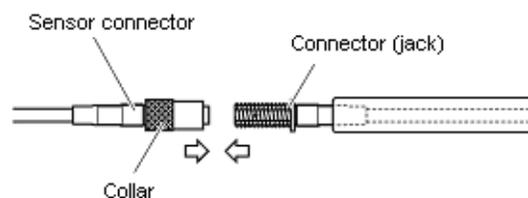
1. Confirm that there are no foreign objects in the sensor and extension cable connectors.

Foreign objects in the connector cause faulty connections or faulty characteristics.

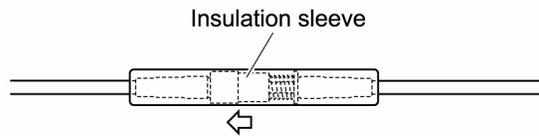
2. Insert the extension cable through the provided insulation sleeve (clear heat shrink tube).



3. Connect the sensor connector and extension cable connectors, and tighten the collar by hand.



4. Cover the insulation sleeve over the connector.



5. Apply hot air on the insulation sleeve to shrink the insulation sleeve.



**ATTENTION:** Never use vinyl tape to insulate.

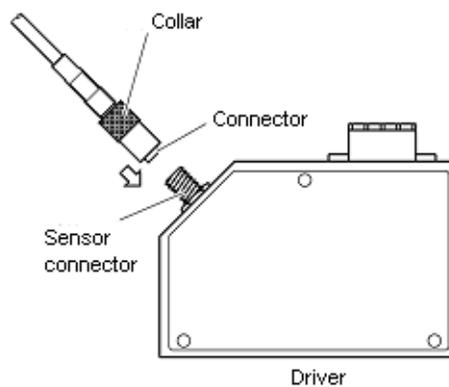
- During extended periods of use or when the connector temperature exceeds 80 °C (176 °F), vinyl electrical tape can harden or the adhesive can deteriorate, leading to a dirty connector and faulty insulation.
- If there is not a spare insulation sleeve available, protect the connector with a fluorine resin tape. Recommended insulation tape is:
  - Manufacturer: Nitto Denko Corporation
  - Product Name: Nitoflon adhesive tape (Model Number: NO. 903UL)
- Temperature spec: -60...180 °C (-76...356 °F) 0.08 mm thickness.

## Connect the Sensor

Connect the sensor by using the following steps. Connection is performed in the same manner when using an extension cable.

**TIP** Make sure the color band on the extension cable matches the color band on the probe driver. [See 1442 Series Color Band Table on page 32.](#)

1. Confirm that there are no foreign objects in the sensor (or extension cable) and in the driver sensor input connector.
2. Connect the sensor (or extension cable) connector and the sensor input connector, and tighten the collar by hand.



## Connect the Module

The 1442 sensors can be connected to many different Allen-Bradley 1440 XM Series or 1444 Dynamix® Series modules. Refer to the appropriate Module User Manual for wiring requirements and instructions on how to wire the sensor to the module.

## Verify the Connections

Before turning on the power, verify the following connections:

- Be sure that there are no loose terminals, and that all wiring is properly connected.
- Check that the power line for the power source is connected to NEGATIVE PWR (-24V) on the measurement module or its terminal base.
- Be sure that the driver and sensor are installed at locations where the installation environmental conditions are satisfied.
- Be sure that there are no problems with the driver and sensor installation, and they are **not** installed at the following types of locations:
  - Locations with high temperatures and high humidity.
  - Locations with dust.
  - Location exposed to vibration.
  - Locations where there are metal objects, other than the target, near the sensor.

After checking all items, check the set gap voltage values.

## Set Gap Voltage

Perform confirmation of set gap voltage to maintain the performance of this unit when doing the following:

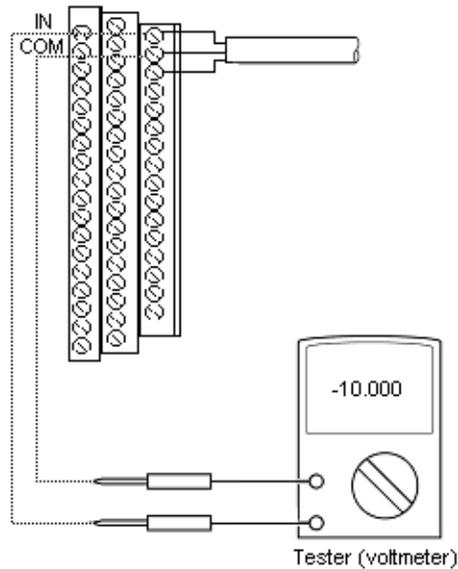
- Supplying power to the unit for the first time
- More than one year has passed from the last confirmation
- The performance of this unit has been reduced due to a problem of some sort

Follow these steps to check the set gap voltage.

1. Turn on the power.
2. Allow the unit to warm up for 5 minutes to stabilize the output.

Warm-up is necessary to collect accurate data.

3. Connect the tester (voltmeter) across the Input Signal and Input Common terminals on the measurement module base and read the voltage.

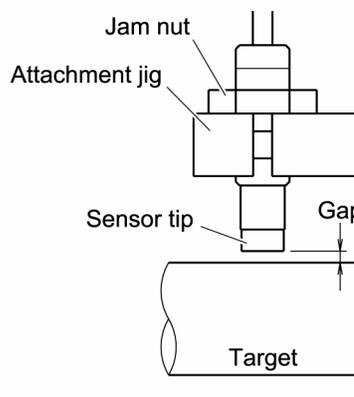


4. [Refer to Standard Static Characteristics on page 41](#) to make sure that the desired set gap voltage is indicate

**IMPORTANT**

Data indicated in [Standard Static Characteristics \(on page 41\)](#) are measured for a SCM440 flat target (diameter more than 33 mm). When the target material or shapes differ, the output characteristics (gain) differ, making it necessary to compensate with later equipment.

5. If the desired set gap voltage is not attained, readjust the sensor position by using the following procedure.
  - a. Loosen the sensor jam nut.



- b. Adjust the sensor position so that the desired set gap voltage is attained.

- c. After adjustment, tighten the sensor jam nut to the specified torque value (see table on [page 30](#)).



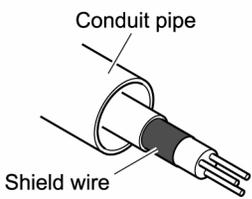
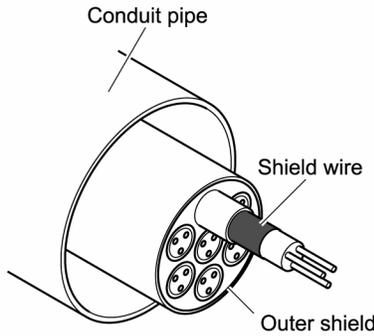
**ATTENTION:** Always tighten the lock nut at the specified torque.

**TIP**

The measurement precision described in the specifications will be satisfied approximately five minutes after turning on the power.

### Recommended Specifications for the Monitor Cable

Use a commercially sold cable to connect the probe driver to the monitor. A CVVS 3 core shielded cable (straight) is recommended, but if it is not available, a 3 line multiple core cable for light electrical instruments (individually shielded) can be used. Use 0.75 mm<sup>2</sup>...1.25 mm<sup>2</sup> (18...16 AWG) cables.

Cable Name	Note
<p>CVVS 3 core shielded cable (straight)</p> 	<p>The CVVS 3 core shield is also recommended in the API Standard 670.  <b>Recommendation:</b> Copper tape shield (core wire; soft copper wire); (Normally, silver plated braid)                      Use conduit pipe (cable rack) for wiring.</p>
<p>3 line multiple core cable for light electrical instruments (individually shielded)</p> 	<p><b>Recommendation:</b> Outer shield is aluminum tape, copper tape shield                      The multipair cable can contain a mixture of vibration signals and displacement signals. However, vibration signals for a high amplitude vibration can affect other vibration signals and displacement signals negatively; and these need to be wired on a separate cable.</p>

**Notes:**

## Maintenance and Inspection

This chapter describes the maintenance and inspection procedures for the unit.

### Periodic Inspection Intervals

To maintain performance and secure system stability of the unit, inspect the system and its mounts for corrosion, properly-tightened or torqued fittings and connections, and component conditions annually. Check sensor gap settings annually and at any time measurements become suspect. [Refer to Set Gap Voltage on page 36.](#)

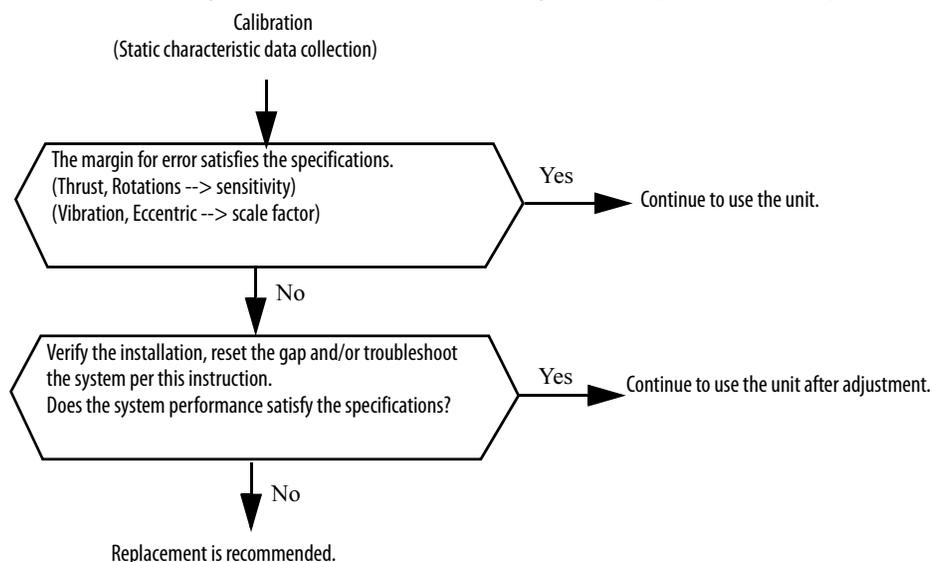
### Unit Life

Plan to replace eddy current probe systems approximately every 10 years.

#### IMPORTANT

Ten years is a general guideline for replacement. If otherwise undisturbed, eddy current probe systems deteriorate over time due to temperature and erosion. The deterioration rate for sensors, extension cables, and drivers depends on the specific environmental conditions to which each component is subjected.

The following is a flowchart for determining when a replacement is required.



## Troubleshoot the Unit

Use the table below to troubleshoot problems with the unit.

Symptom	Possible Cause	Recommended Action
Output is 0V DC and does not change.	Power is not on.	Turn on the power.
	Unit is not connected properly.	<a href="#">Refer to Connect the Wiring on page 32</a> to make sure the unit is wired correctly.
	The driver is faulty.	Replace the driver.
Output is approximately -0.7V DC and does not change.	The target is beyond the measurement range.	<a href="#">Refer to Set Gap Voltage on page 36</a> to adjust the gap.
	The sensor failed or the sensor cable is shorted or disconnected.	Measure the resistance between the sensor connector, and if not normal, replace the sensor. Normal value: Sensor coil resistance: Approx. 5.5 $\Omega$ Sensor cable resistance: Approx. 0.25 $\Omega$ /m
	The extension cable is shorted or disconnected.	Measure the resistance of the extension cable, and if it is not normal, replace the extension cable. Normal value: Center conductor resistance: Approx. 0.25 $\Omega$ /m Outer conductor resistance: 0 $\Omega$ Center pin to outer conductor resistance: $\infty\Omega$
	There is a foreign object in the connector.	Disconnect the connector, and remove foreign object in the connector.
	The driver is faulty.	Replace the driver.
Output is approximately -22V DC and does not change.	The target is outside the possible measurement range.	<a href="#">Refer to Set Gap Voltage on page 36</a> to adjust the gap.
	The driver is faulty.	Replace the driver.

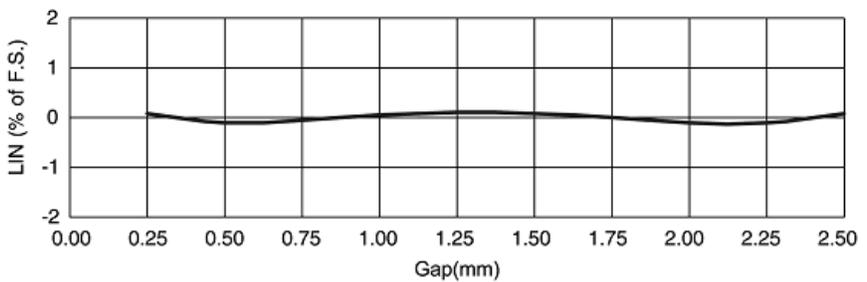
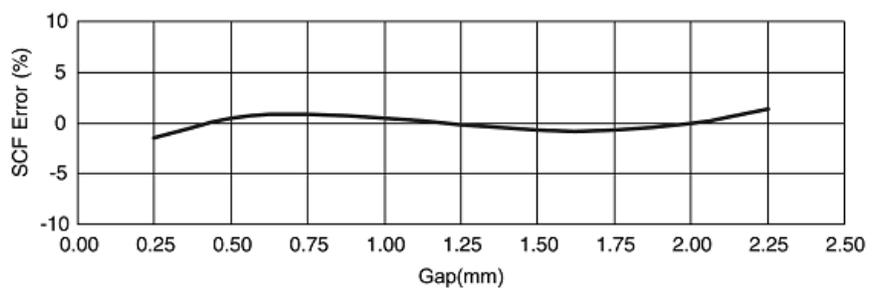
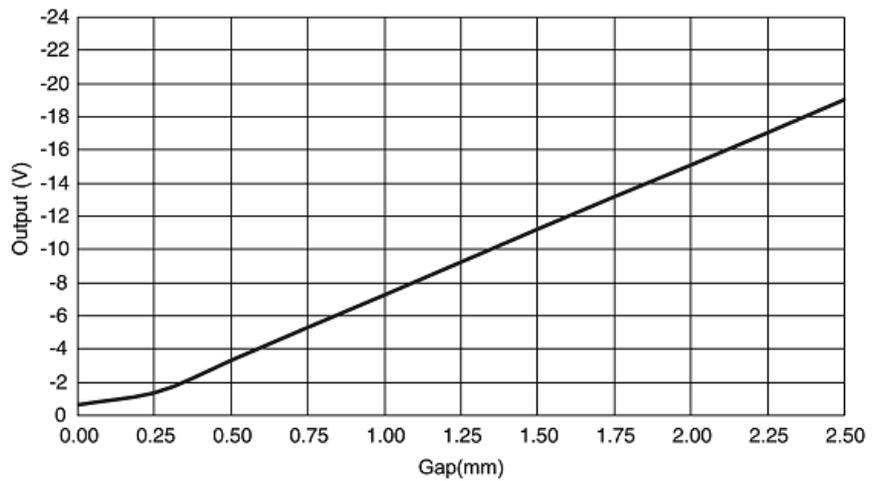
## Individual Characteristic Data

### Characteristic Data

This chapter describes static characteristics, temperature characteristics, and other characteristic data. Use this data to determine the gap.

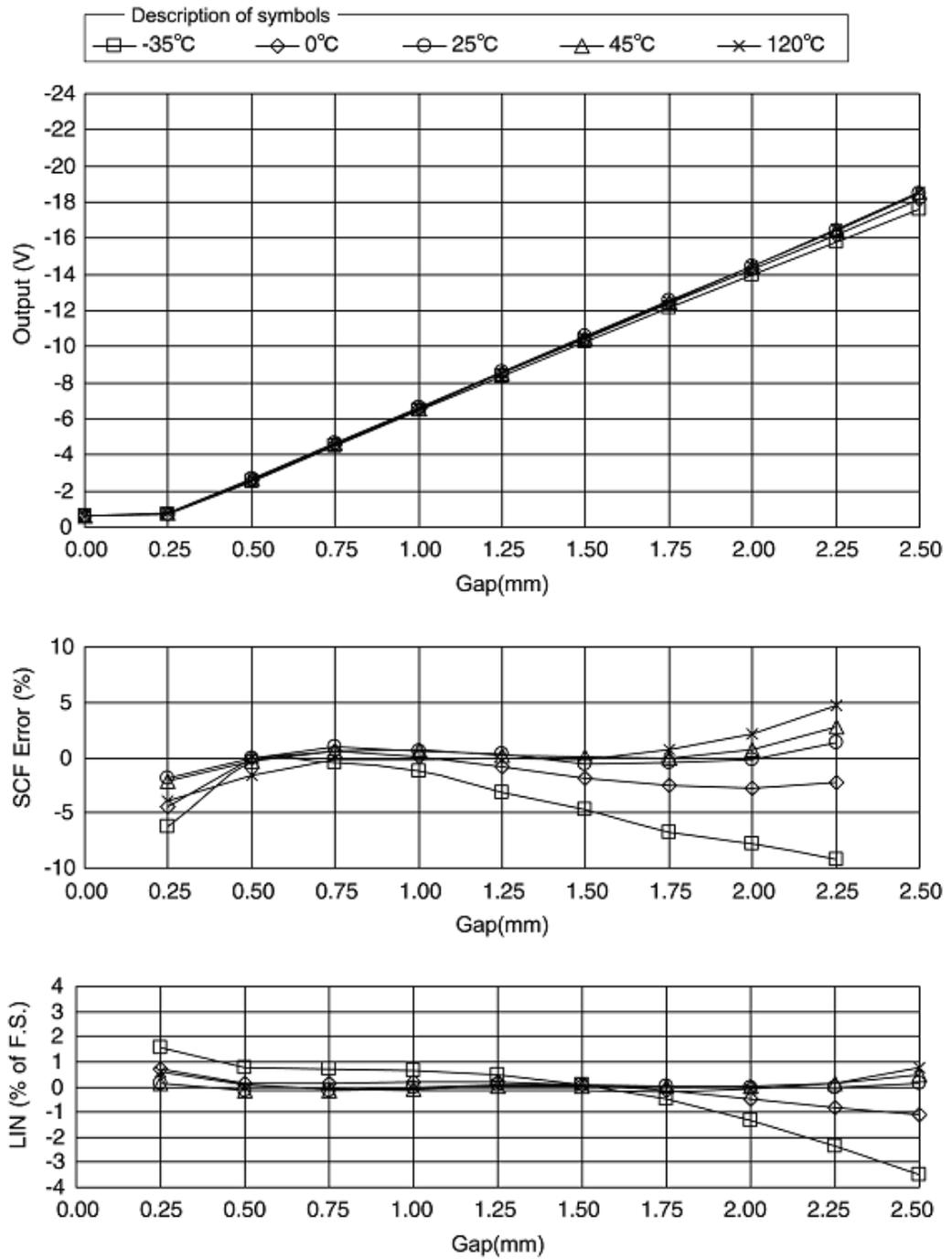
### Standard Static Characteristics

Target material is SCM440 flat face (diameter 15 mm or more).



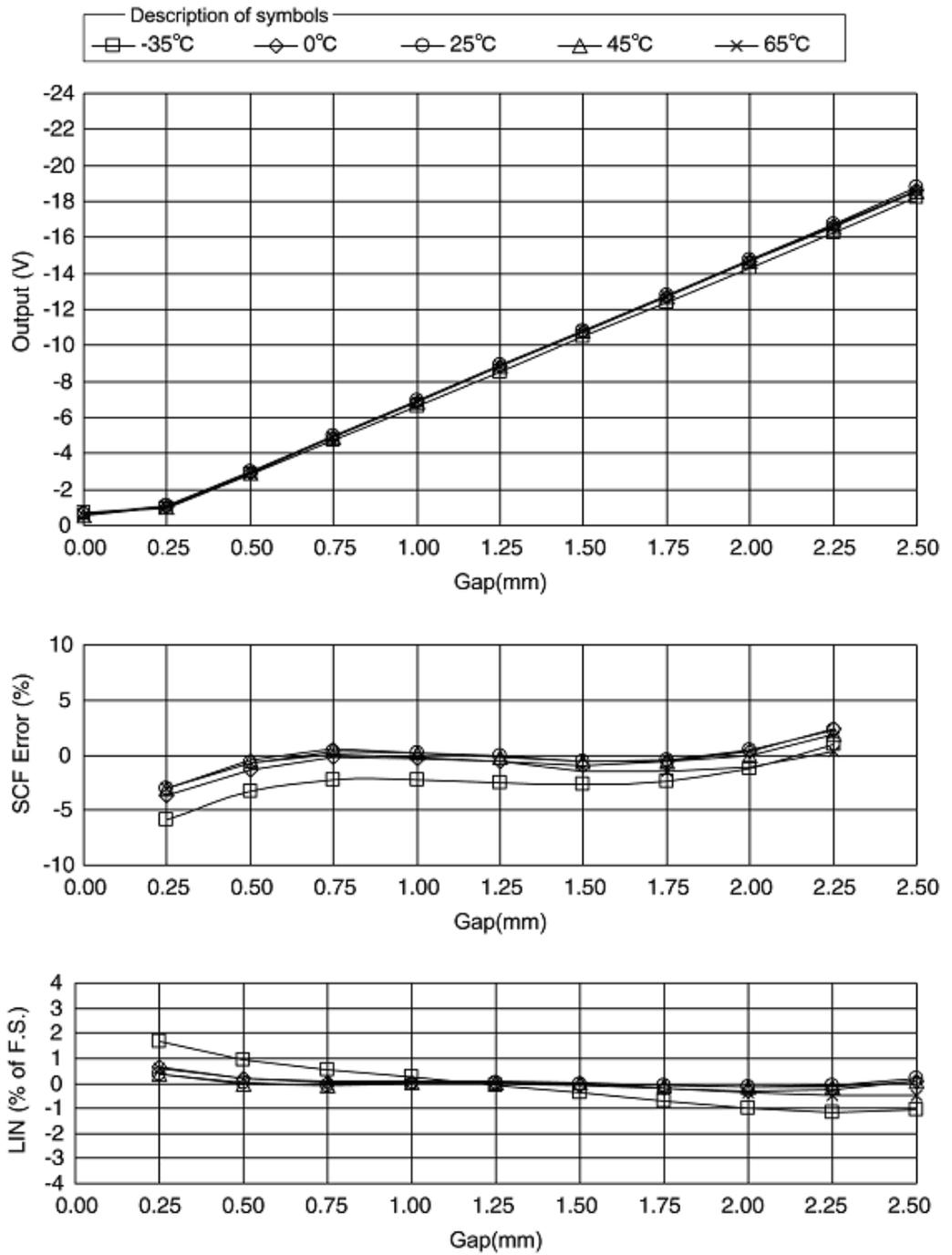
### Sensor Temperature Characteristics

System cable length is 5 m.

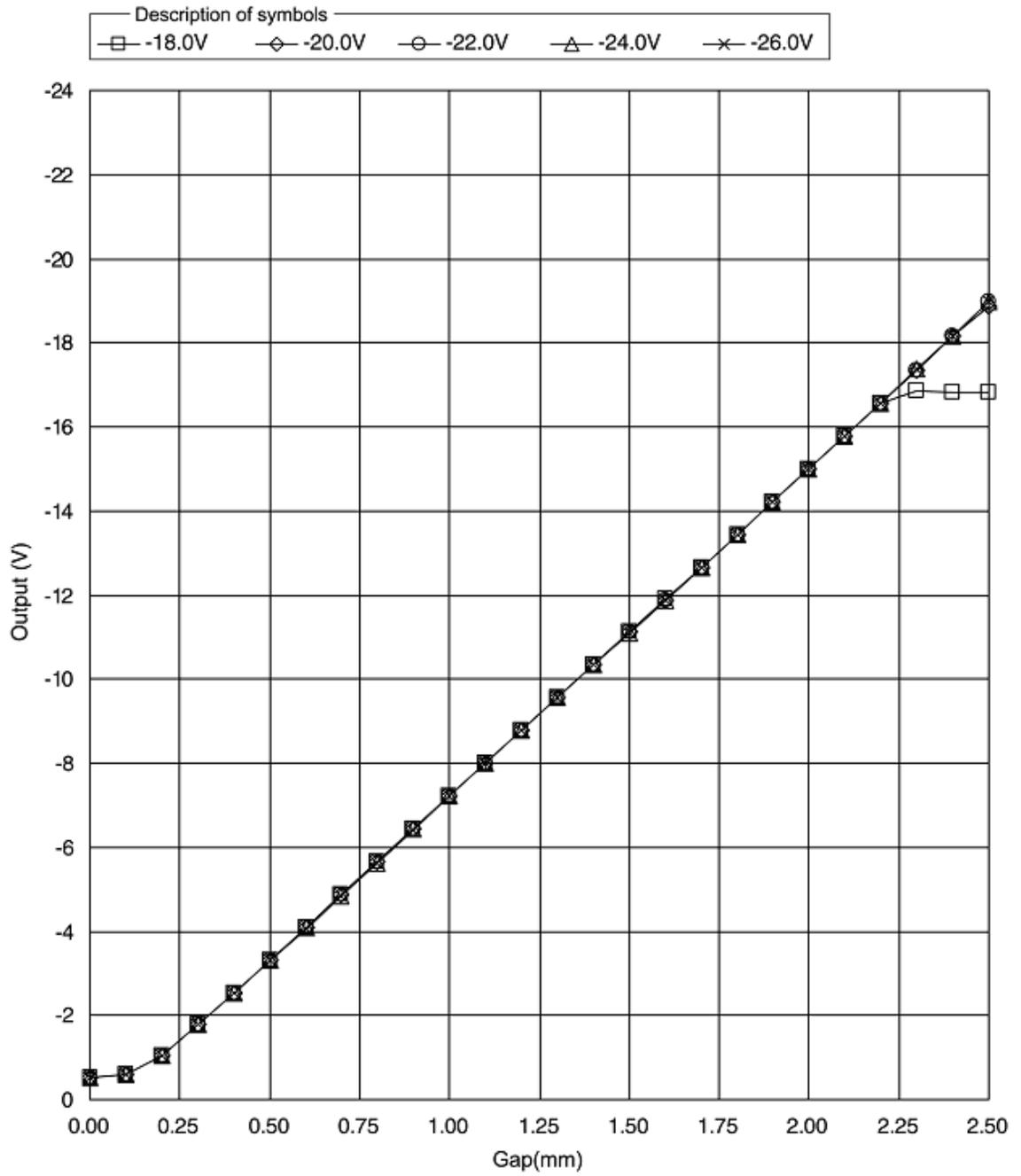


### Driver Temperature Characteristics

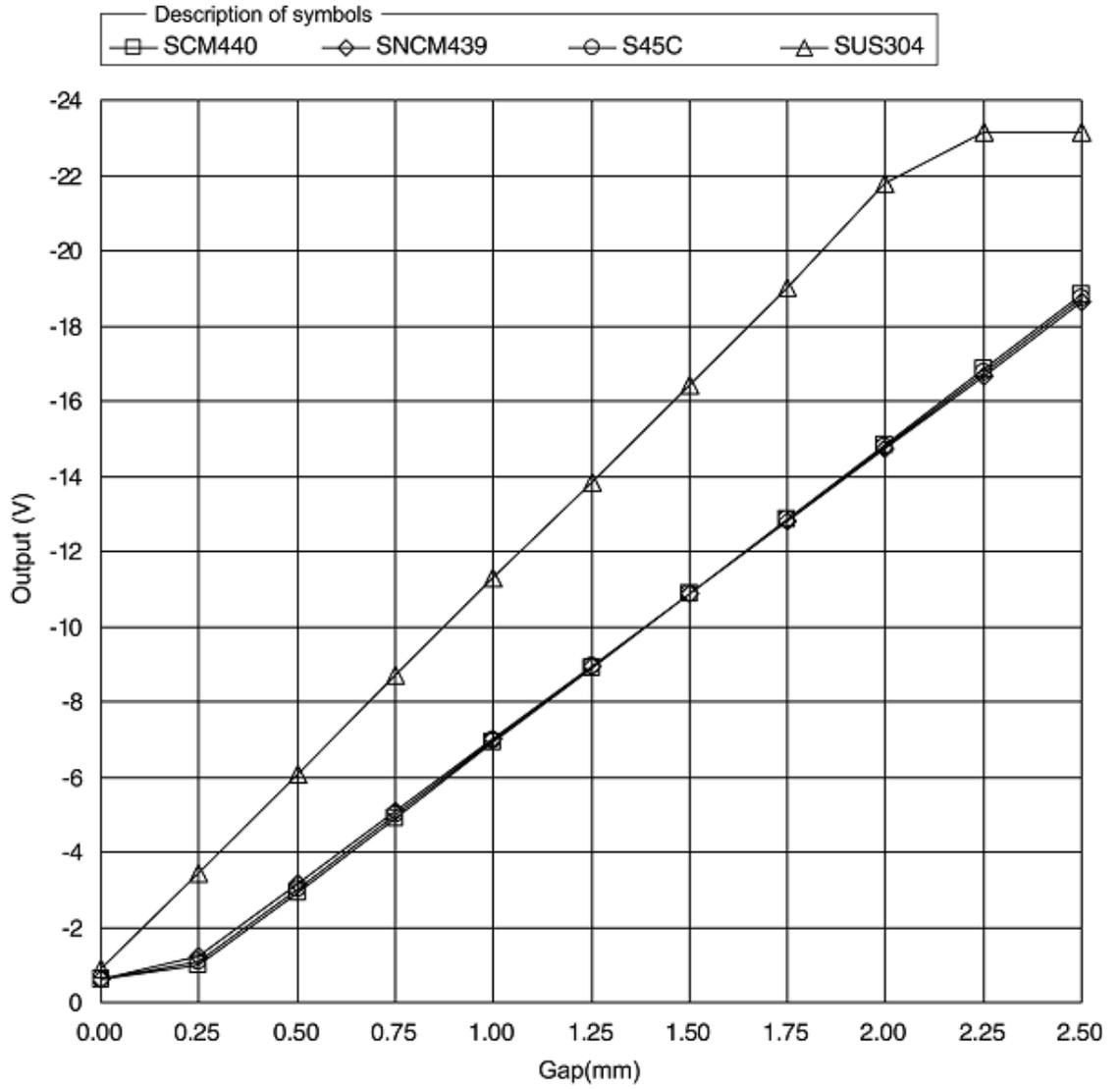
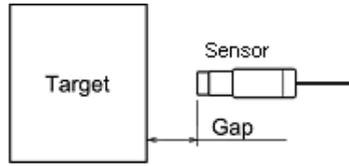
System cable length is 5 m.



### Static Characteristic Effect Due to Power Source Voltage Variation

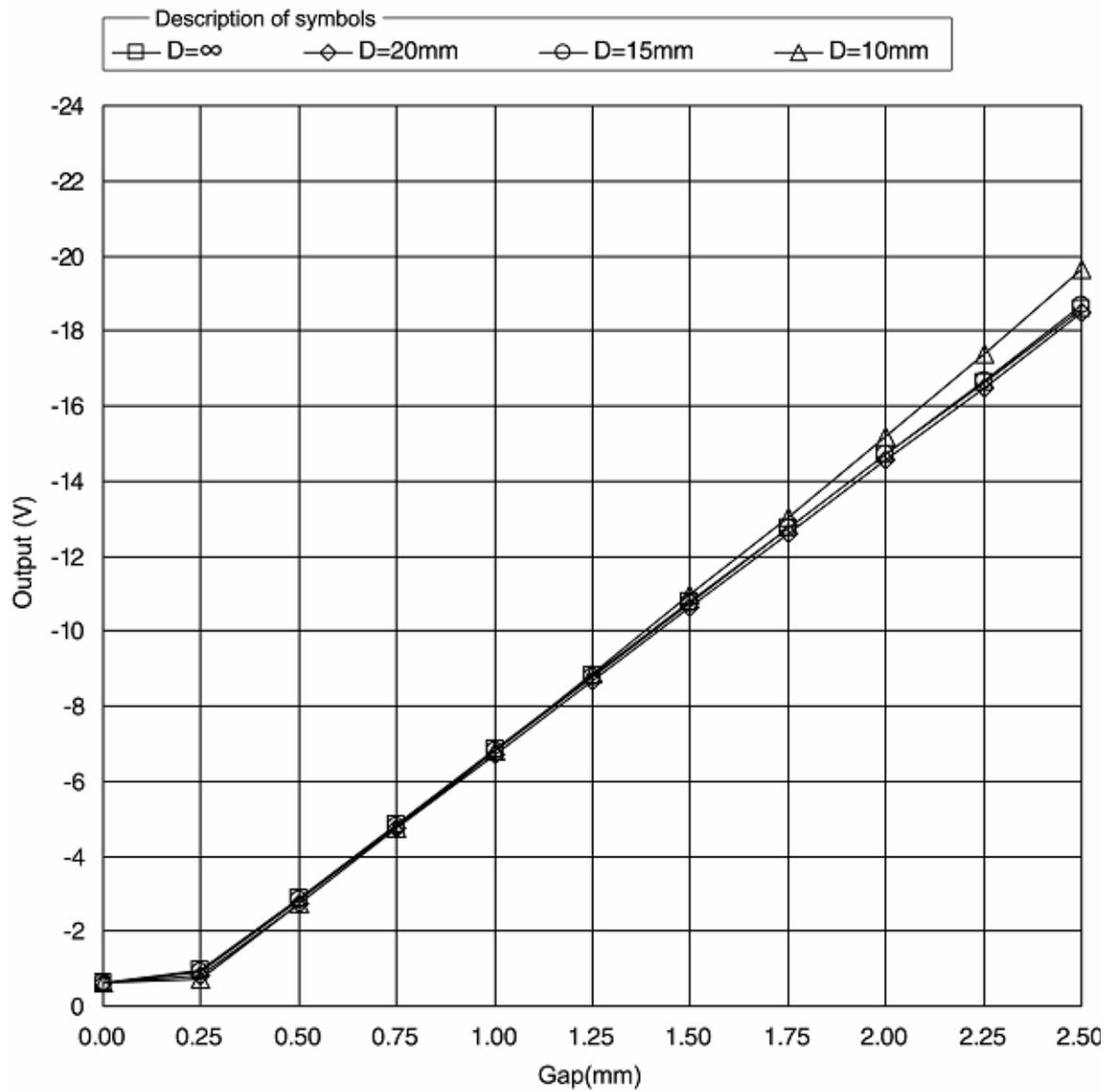
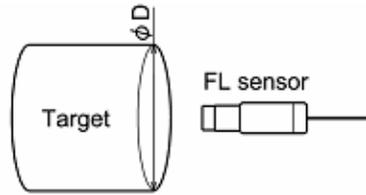


### Static Characteristic Effect by Target Material



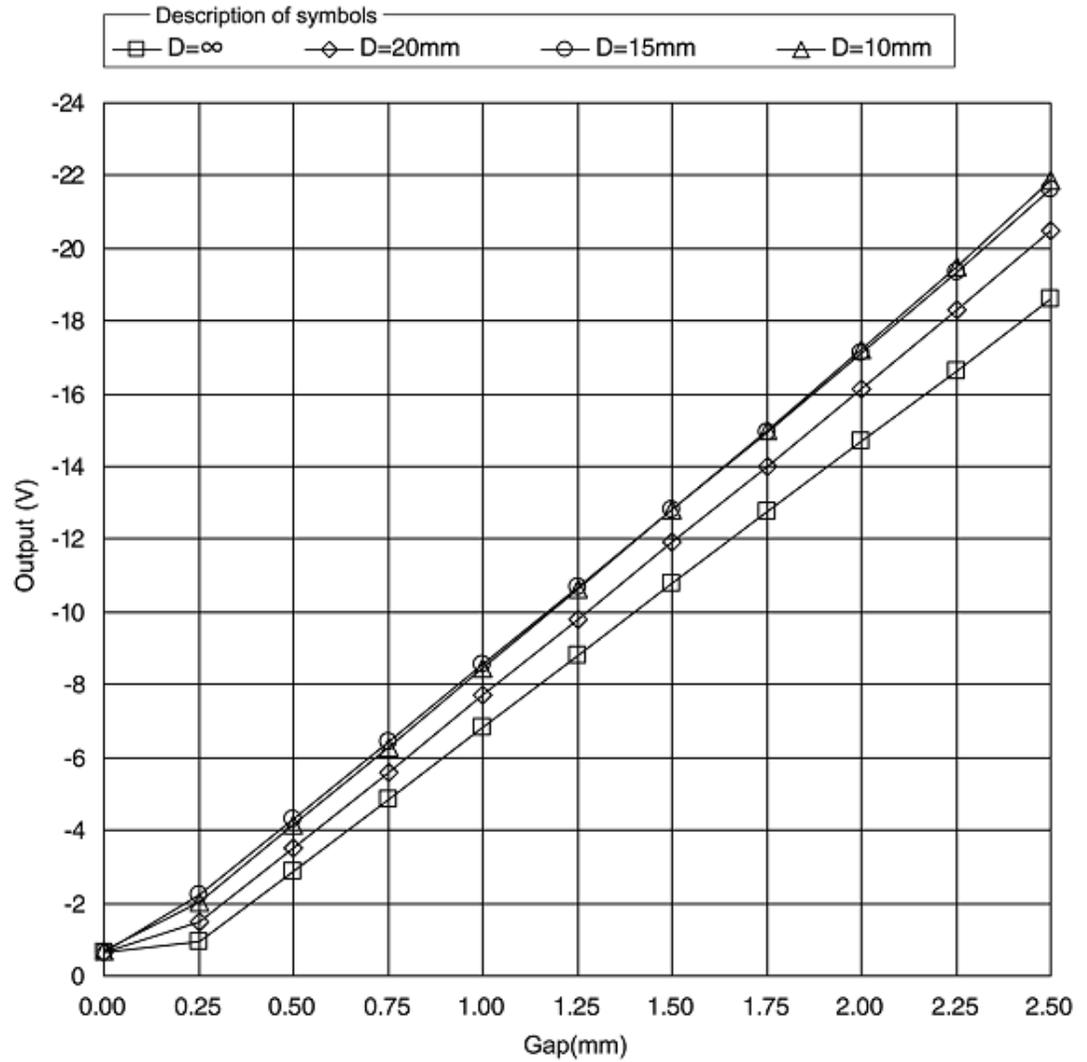
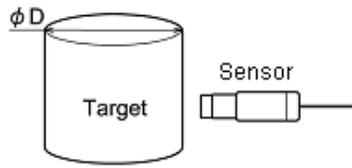
### Static Characteristic Effect Due to Target Diameter

Target material is SCM440.



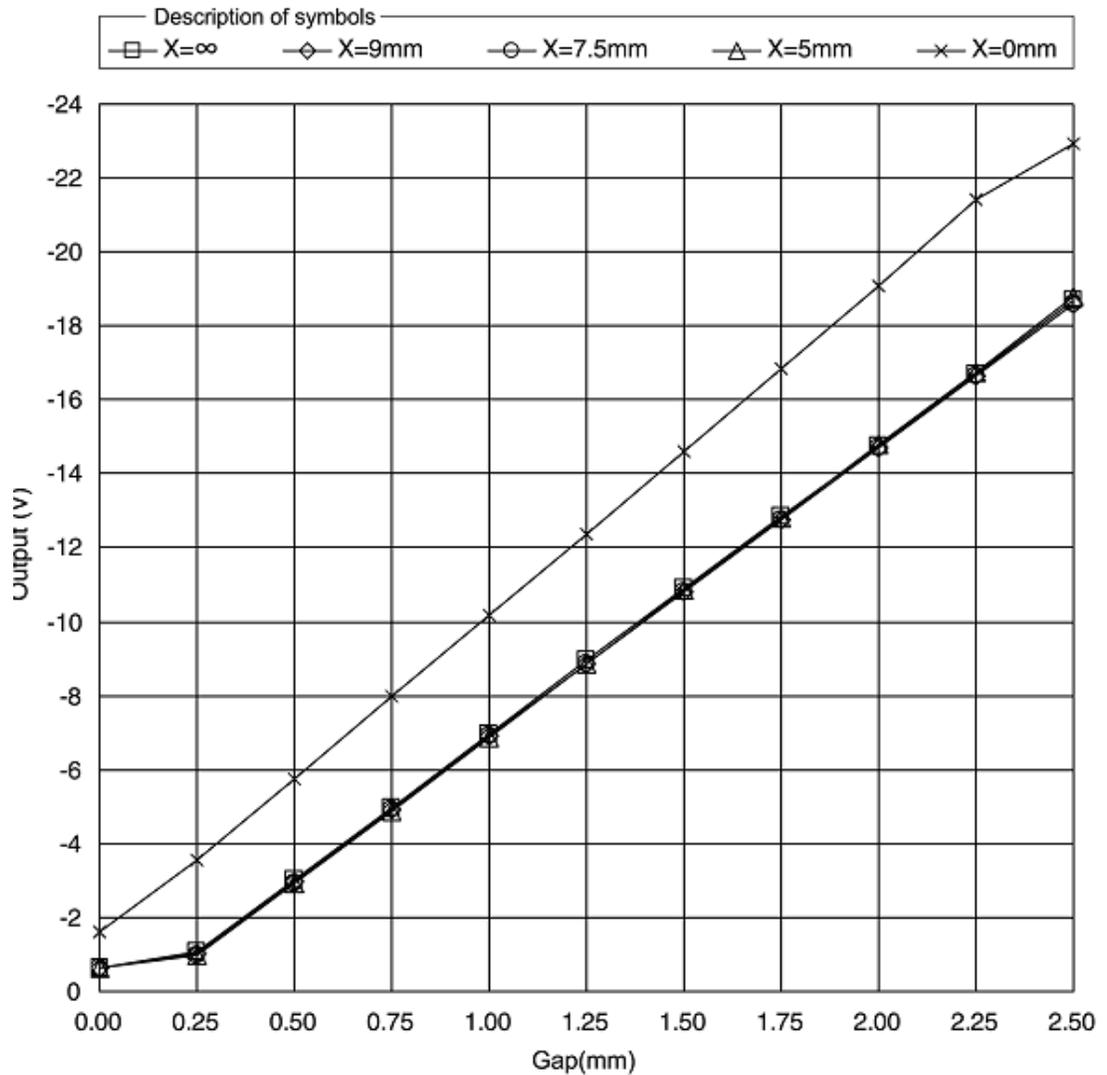
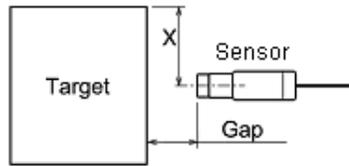
### Static Effect by Target Curved Surface

Target material is SCM440.



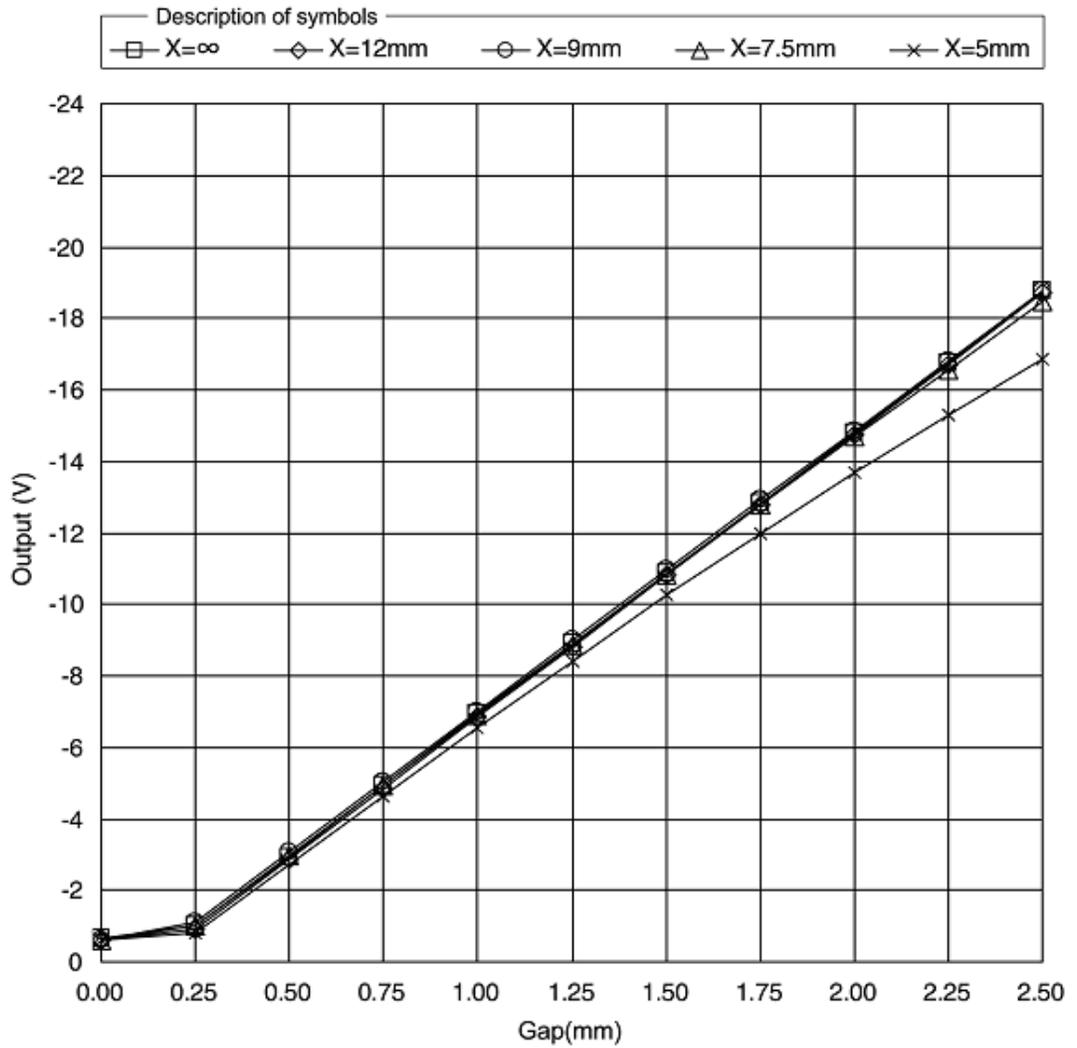
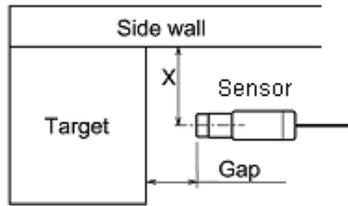
### Static Characteristic Effect Due to Target End Face

Target material is SCM440.

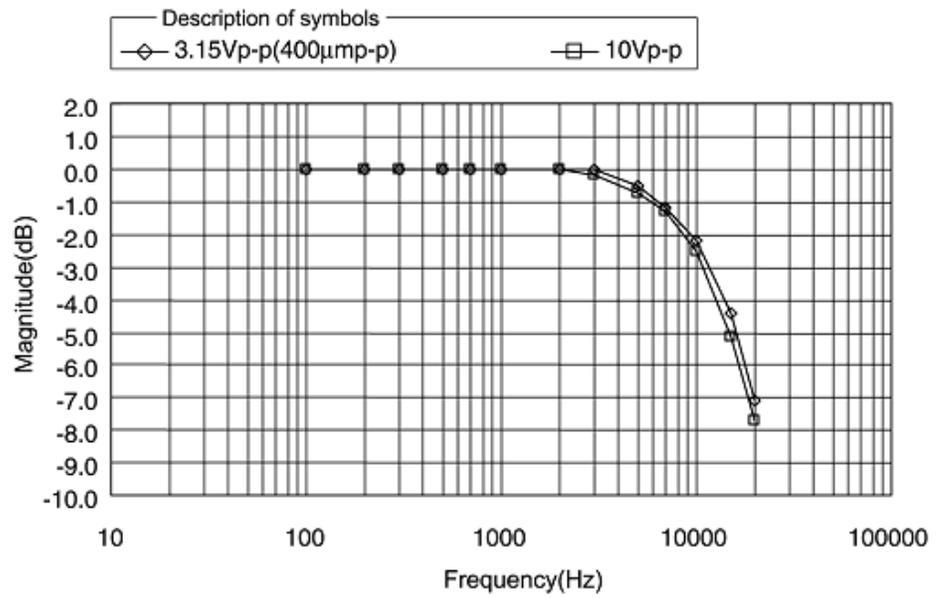


### Static Characteristic Effect Due to Side Wall

Target and side wall material is SCM440.



### Frequency Characteristics



## Wire the Unit to a Monitor System

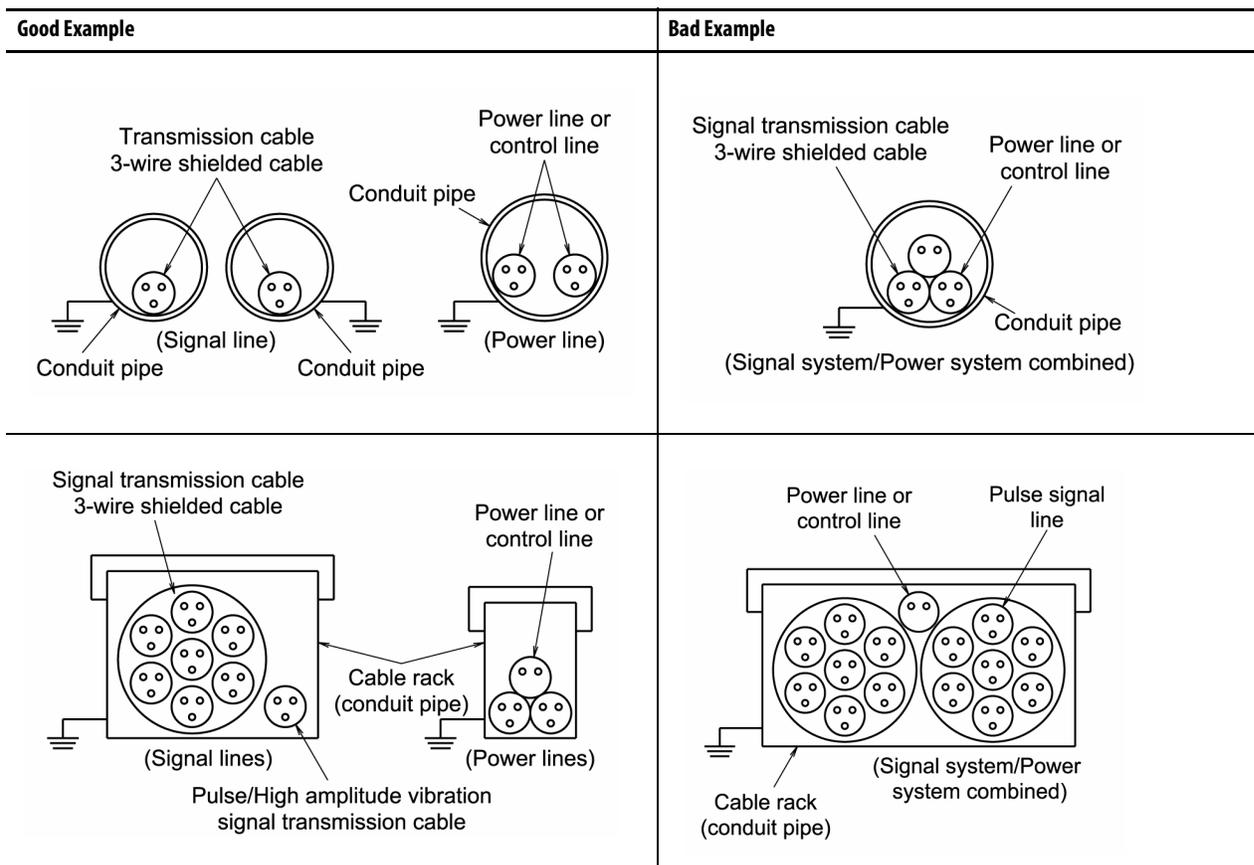
The 1442 Series Probe System is designed to satisfy the API-670 standard. Any monitor designed to connect API-670 probes can be used with these sensors.

Consider the following recommendations when wiring the probe driver to a monitor:

- Use a good quality instrumentation cable with three-conductor stranded wire and shield.
  - Wire must be rated with a maximum capacitance of 60 pF/ft (197 pF/m) and inductance of 0.3  $\mu$ H/ft (1  $\mu$ H/m).
  - Use wire with insulation suitable for the environment and with adequate tensile strength and flexibility for the application.
  - Use wire with a foil shield for use in environments where radio frequency interference (RFI) may be present. Use a wire with a braid shield for environments where electromagnetic interference (EMI) may be present.
  - Use 0.75...1.25 mm<sup>2</sup> (18...16 AWG) gauge wire.
- Make sure the wire is isolated from power cables and any other wiring that may be transmitting high-voltage power or control signals.
- Any cable transmitting pulse-type vibration signals such as a phase marker or speed pulse must be isolated from displacement and vibration signals.
- Run wire within conduit and cable trays and as per any local electrical codes.
- Do not exceed a wire length of 500 m (546.81 yds). However, limiting the length to 300 m (328.08 yds) transmits vibration signals in the 0...10 kHz frequency range with minimal attenuation. When longer lengths are needed the capacitance of the cable and the desired frequency response of the system must be considered.
- In most cases, ground the cable shield at only one point, generally at the monitor.

## Cable Wiring/Laying Examples

The following illustrations provide examples on how to wire and lay the cable.



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## Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.

At <http://www.rockwellautomation.com/support> you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at <https://rockwellautomation.custhelp.com/> for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/services/online-phone>.

## Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the <a href="#">Worldwide Locator</a> at <a href="http://www.rockwellautomation.com/rockwellautomation/support/overview.page">http://www.rockwellautomation.com/rockwellautomation/support/overview.page</a> , or contact your local Rockwell Automation representative.

## New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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