Extended Range Proximity Transducers

25 mm, 35 mm and 50 mm Differential expansion applications

Differential expansion is an important measurement during startup of steam turbine generators. It allows operators to ensure that the machine casing and rotor thermally grow at nearly the same rate. Thermal growth at different rates can cause internal contact between the rotating and stationary elements of the turbine, which could prove hazardous.

Bently Nevada offers the 25 mm, 35 mm and 50 mm Extended Range Proximity Transducers for differential expansion measurements on medium and large steam turbines. These systems provide position information for machine monitoring as well as diagnostics. They are used successfully on steam turbines to measure and alarm on differential expansion of the shaft thermal growth relative to the machine casing.

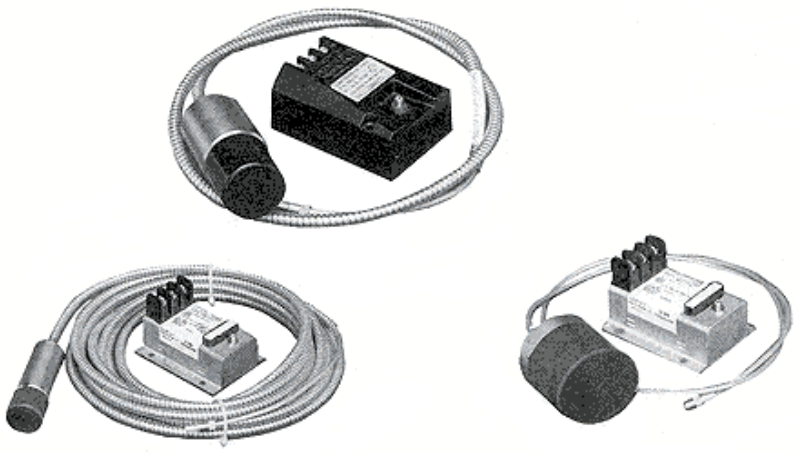
Extended range probes are constructed of a high performance thermoplastic capable of withstanding harsh environments and high temperatures. The proximity probe and extension cable of the system operate continuously in temperatures up to +350°F (+177°C).

Each transducer system consists of a probe, extension cable (which can be an integral part of the probe or an optional part), and Proximitor®. The transducer systems are designed for use in conjunction with the 3300 System Differential Expansion Monitors for Turbine Supervisory Instrumentation.

How a proximity transducer system works

Operating on the eddy current principle, the proximity probe senses the distance between the probe tip and the observed surface. The Proximitor® generates a radio frequency signal which is radiated through the probe tip into the observed surface. Eddy currents are generated on the surface and the loss in signal strength is detected by the Proximitor®. The Proximitor® then conditions the signal for input to the monitor.

Extended range refers to the extended *linear measurement* range in which these transducers operate.



25 mm *35 mm* *50 mm*

Extended Range Proximity Transducers

Why a proximity transducer system?

Since the proximity probe contains no moving parts, it is not subject to mechanical wear that occurs on other types of sensors such as shaft riders, linear variable differential transformers (LVDTs) and potentiometers. Reduced possibilities of mechanical failure results in higher reliability of the system.

More information

More detailed information on differential expansion applications for Turbine Supervisory Instrumentation (TSI) can be obtained by ordering Applications Note AN009. Contact your nearest sales representative for ordering information. Also, refer to the 3300/45 Dual Differential Expansion Monitor located in the Monitoring System Catalog.

25 mm, 35 mm, and 50 mm proximity probes

The 25 mm and 35 mm Extended Range Proximity Probes have a calibrated linear range of 500 mils (12.7 mm) with a scale factor of 20 mV/mil (.787 V/mm). The distinct difference between the 25 mm and 35 mm probes is that the 35 mm has been designed to withstand harsher environments, particularly water and/or steam.

The 50 mm Extended Range Proximity Probe has a calibrated linear range of 1000 mils (25.4 mm) with a scale factor of 10 mV/mil (.394 V/mm).

Two mounting configurations are available for the probes: 1) a threaded probe case for mounting in a tapped hole and locking in place with a jam nut, and 2) an unthreaded probe case for use with a mounting clamp. The unthreaded probe case is available with the cable exiting the rear of the probe or the side at a 90 degree angle. The side exit version is used when there is no room for the cable to exit straight out the back of the case. The mounting clamp is provided as standard with the 25 mm and 35 mm non-threaded probes. For the 50 mm side exit probe, the clamp is ordered as part of the option code for the probe.

Other configuration options for the probes include English or metric threading and protective armor for the cable.

The 25 mm, 35 mm, and 50 mm designations refer to the outside diameter of the probe tip.

Extended range Proximitors

Each probe is connected, via an integral cable or optional extension cable, to a Proximitor® that is powered from a –24 Vdc source (usually a monitor). The output from the Proximitor® is a negative dc voltage proportional to the distance between the target surface and the probe tip.

Extended Range Proximity Transducers

A three-conductor, shielded cable, ordered separately, provides the power input, common and signal output interface between the Proximitor® and a Bently Nevada monitor. The Proximitors can be placed up to 1,000 feet (305 metres) from standard monitors for signal connection.

Extension cables

Several extension cable options are available for Extended Range Proximity Transducers. The extension cable, when ordered with probes having 1 metre (electrical) cable lengths, allows for ease of installation or machine maintenance. The combination of the probe cable length and extension cable is designed for total system electrical lengths of ***either 5 or 9 metres*** ±20%. Total system length is measured from probe tip to the Proximitor®.

Probes are available with 5 or 9 metre integral cables that connect directly to the Proximitor®, thus eliminating connections inside the machine case.

The 25 mm and 50 mm probes use the same 24710 extension cable. The 35 mm probe uses extension cable part number 76684.

Special applications

Extended Range Proximity Transducers can be used in special applications to solve a particular measurement problem. These applications could include:

- Measuring shaft axial position relative to the thrust bearing for indication of thrust bearing wear and failure as well as abnormal axial shaft motion.
- Machine radial vibration measurements where the gap distance between the probe and observed surface requires an extended probe range.
- Measurements on machines that have an excessive amount of vibration, 160 mils (4.064 mm) or more.
- Field or laboratory measurements in which extended range probes are necessary.

Special applications may require modifications to the intended monitor.

Before ordering, contact your nearest sales representative to assist you with your application.

Specifications

Specifications were determined with a –24 Vdc supply, 10 kΩ load, and a 4.5-inch diameter AISI 4140 steel target at +22°C (+72°F).

INPUT

Power: –18 Vdc to –24 Vdc at 12 mA maximum consumption.

Leadwire Length: 1,000 feet (305 metres) maximum between Proximitors® and 3300 monitors. Consult manual for frequency roll-off at longer lengths.

OUTPUTS

Calibrated Range:

25 mm and 35 mm: 500 mils (12.7 mm). Range begins at approximately 50 mils (1.3 mm) from probe face.

50 mm: 1000 mils (25.4 mm). Range begins at approximately 100 mils (2.5 mm) from probe face.

Scale Factor:

25 mm and 35 mm: 20 mV/mil (.787 V/mm) ±4% typical (measured over calibrated range).

50 mm: 10 mV/mil (.394 V/mm) ±6% typical when interchangeability errors are included.

Linearity:

25 mm and 35 mm: Less than 9 mils (0.15 mm) deviation from 20 mV/mil (.787 V/mm) straight line if Proximitor® is calibrated for specific probe and cable; within 13 mils (0.33 mm) of 20 mV/mil (.787 V/mm) straight line with interchangeability errors included.

50 mm: Less than 14.5 mils (0.37 mm) deviation from 10 mV/mil (.394 V/mm) straight line if Proximitor® is calibrated for specific probe and cable; within 26 mils (0.66 mm) of 10 mV/mil (.394 V/mm) straight line with interchangeability errors included.

Frequency Response: 0 to 10 kHz (0 to 600,000 cpm); –5% at 10 kHz (600,000 cpm).

Temperature Sensitivity:

25 mm and 35 mm: –1% of full scale change at +150°F (+65°C) at 300 mils (7.6 mm), typical.

50 mm: –2.5% of full scale change at +150°F (+65°C) at 600 mils (15.2 mm), typical.

Minimum Target Size: ①

25 mm: 2.00 inches (51 mm) in diameter.

35 mm: 2.25 inches (57 mm) in diameter.

50 mm: 4.00 inches (102 mm) in diameter.

ENVIRONMENTAL LIMITS

Operating Temperature:

Proximitor®:

35 mm: –30°F to +212°F (–34°C to +100°C).

25 mm and 50 mm: Options -01 and -02, +32°F to +158°F (0°C to +70°C). Options -03 and -04, –30°F to +212°F (–34°C to +100°C).

Probe and Cable:

25 mm: 0°F to +350°F (–18°C to +177°C).

35 mm: 0°F to +350°F (–18°C to +177°C).

50 mm: 0°F to +350°F (–18°C to +177°C).

Humidity: To 95%, non-condensing.

Tip Material:

25 mm and 50 mm: polyamide thermoplastic.

35 mm: polyphenylene sulfide (PPS).

① *Reducing target size generally results in an increase in scale factor. The effects on scale factor for smaller targets must be determined and corrected for each application.*

Extended Range Proximity Transducers

PHYSICAL

Proximitor®:

35 mm:

Size:

Height: 1.6 inches (41 mm).

Width: 2.4 inches (61 mm).

Length: 3.4 inches (86 mm).

25 and 50 mm:

Size:

Height: 2 inches (51 mm).

Width: 2.4 inches (61 mm).

Length: 3.1 inches (79 mm).

System Weight:

25 mm and 35 mm: 1.9 pounds (860 g) typical.

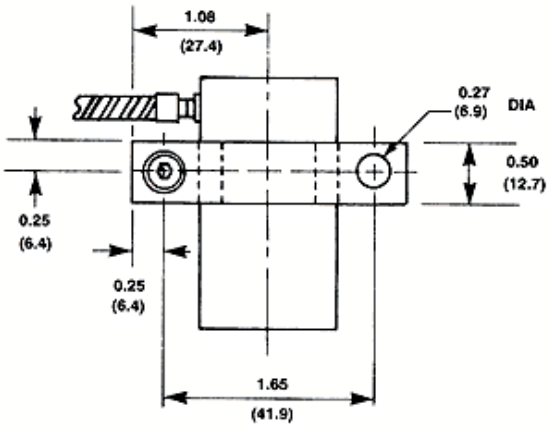
50 mm: 2.25 pounds (1.0 kg) typical.

Proximitor® Mounting Holes:

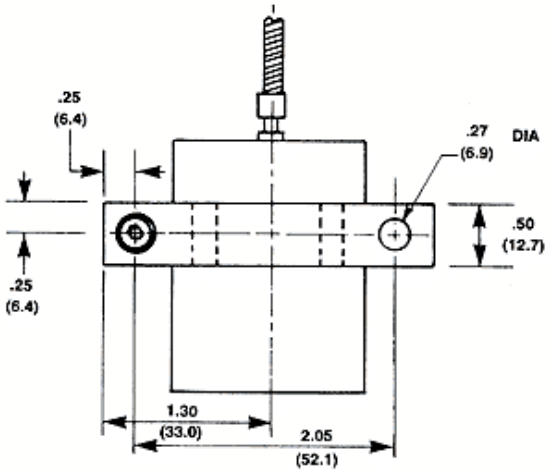
35 mm: Two 0.17 inch (4.3 mm) diameter holes centered in alternate corners of a 2 inch (50.8 mm) square.

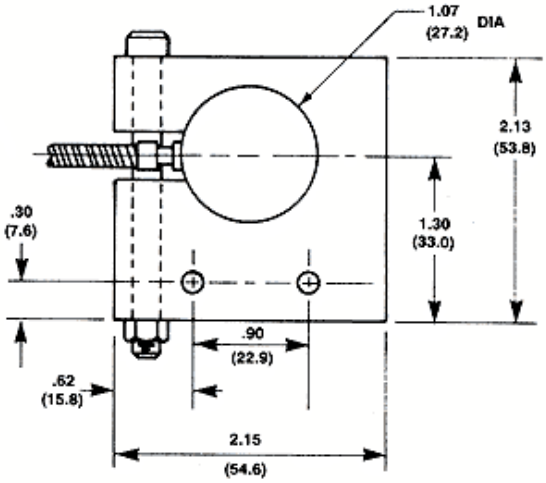
25 and 50 mm: Four 0.19 inch (4.8 mm) diameter holes centered in all corners of a 2 inch (50.8 mm) square.

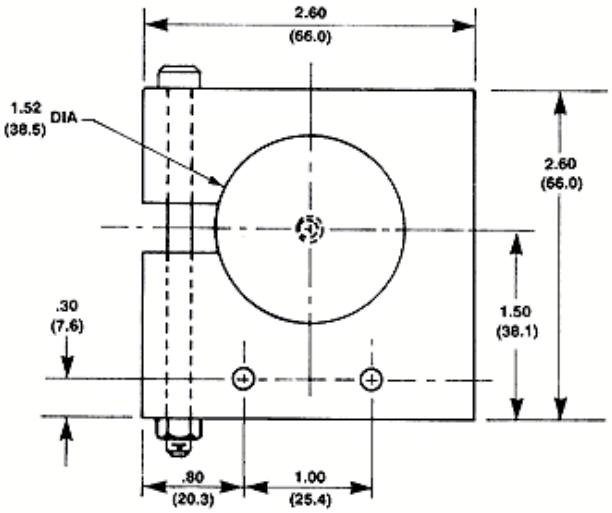
25 mm Clamp Probe Mount
(side exit probe shown)



35 mm Clamp Probe Mount
(rear exit probe shown)







NOTES:
1. Mounting clamps are included with 25 mm & 35 mm Non-threaded Probes.
2. Mounting clamps should never extend beyond metal probe case onto the probe tip.
3. Dimensions in parentheses are in millimetres.

25 mm and 35 mm non-threaded probe mounting clamps

Extended Range Proximity Transducers

Ordering Information

25 MM SYSTEM

25 mm Standard Proximity Probe

1.25-12 UNF English Thread:

	A	B	C	D	E
27890	- ☐	- ☐☐	- ☐☐	- ☐☐	- ☐

M30X2 Metric Thread:

	A	B	C	D	E
27891	- ☐	- ☐☐	- ☐☐	- ☐☐	- ☐

Option Descriptions

A ☐ Armor Option
- 1 Without armor.
- 2 With armor.

B ☐☐ Unthreaded Length Option

English thread configurations:
Order in increments of
0.10 inch [0][1]

Maximum unthreaded length:
8.4 inches [8][4]

Minimum unthreaded length:
0 inches [0][0]

Metric thread configurations:
Order in increments of
10 mm [0][1]

Maximum unthreaded length:
220 mm [2][2]

Minimum unthreaded length:
0 mm [0][0]

C ☐☐ Case Length Option

English thread configurations:
Order in increments of
0.10 inch [0][1]

Maximum case length:
9.8 inches [9][8]

Minimum case length:
1.4 inches [1][4]

Metric thread configurations:
Order in increments of
10 mm [0][1]

Maximum case length:
250 mm [2][5]

Minimum case length:
30 mm [0][3]

Note: Case length must exceed unthreaded length by 1.4 inches for the English threaded probe and 30 mm for the metric version.

D ☐☐ Cable Length Option
- 10 1.0 metre.
- 50 5.0 metres.①
- 90 9.0 metres.

E ☐ Connector Option
- 0 Without connector.
- 2 With miniature coaxial male connector.

25 mm Side and Rear Exit, Smooth Body Proximity Probe

	A	B	C	D	E
24653	- ☐	- ☐	- ☐☐	- ☐☐	- ☐

Option Descriptions

A ☐ Cable Exit Option
- 1 Side exit.
- 2 Rear exit.

B ☐ Armor Option
- 1 Without armor.
- 2 With armor.

C ☐☐ Case Length Option

Ordering in increments of
0.10 inch [0][1]

For side exit configuration

Minimum probe length:
2.7 inches [2][7]

Maximum probe length:
9.9 inches [9][9]

For rear exit configuration

Minimum probe length:
1.7 inches [1][7]

Maximum probe length:
9.9 inches [9][9]

D ☐☐ Cable Length Option
- 10 1 metre.
- 50 5 metres.①
- 90 9 metres.

E ☐ Connector Option
- 0 Without connector.
- 2 With miniature coaxial male connector.

Proximitor® for 25 mm Proximity Transducer System.

24654 - ☐☐

- 01 For combined system electrical length of 5 metres and standard temperature of +32°F to +149°F (0°C to +65°C).
- 02 For combined system electrical length of 9 metres and standard temperature of +32°F to +149°F (0°C to +65°C).
- 03 For combined system electrical length of 5 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).
- 04 For combined system electrical length of 9 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).

Extension Cable for 25 mm Proximity Transducer Systems

	A	B
24710 -	☐☐☐	- ☐☐

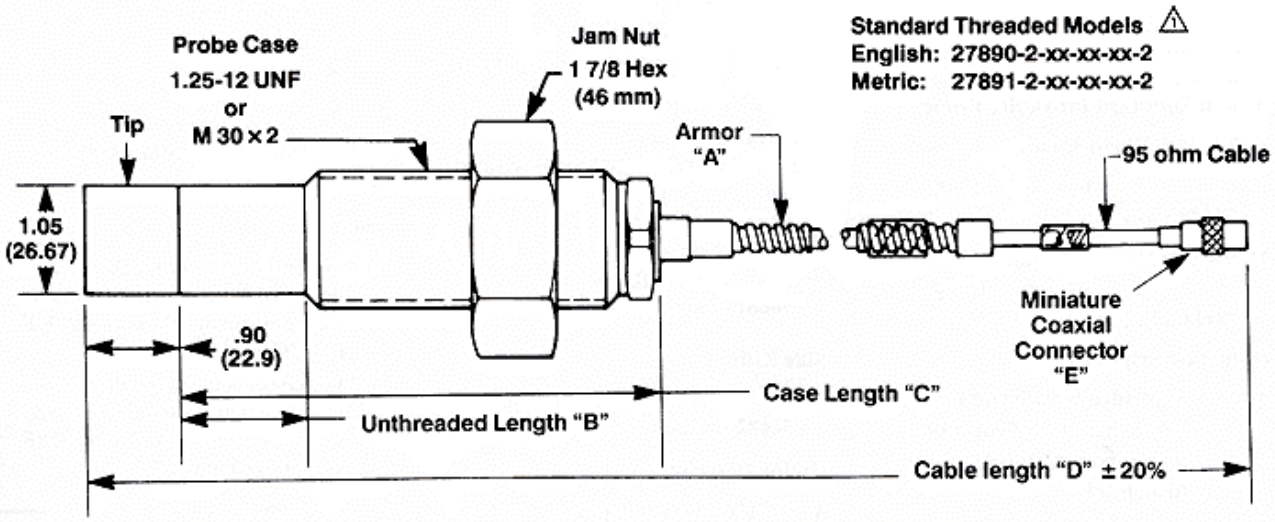
Option Descriptions

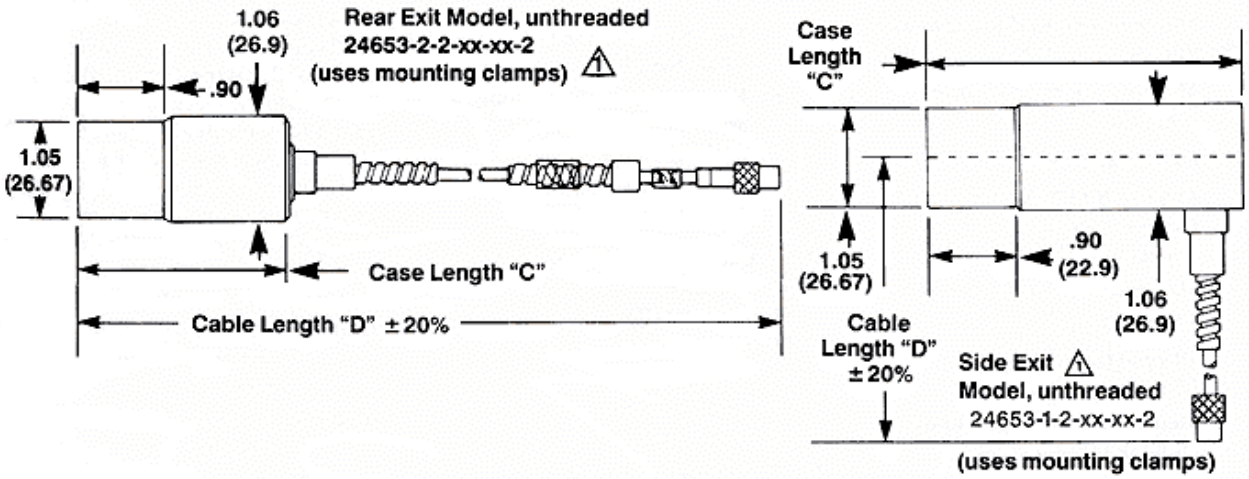
A ☐☐☐ Cable Length Option
- 040 4.0 metres (157 inches).①
- 080 8.0 metres (315 inches).

B ☐☐ Armor Option
- 00 Without armor.
- 01 With armor.

① *For use with 5 metre Proximitor® only.*

Extended Range Proximity Transducers





Bend Radius: 1.00 (25.4) minimum for 95 ohm Cable
1.50 (38.1) minimum for Armor Cable

NOTES: 1. See previous ordering information for options.
2. Dimensions in parentheses are in millimetres.
3. Letters inside quotation marks refer to probe ordering options.

25 mm Probe Configurations

Extended Range Proximity Transducers

35 MM SYSTEM

35 mm Standard Proximity Probe

1.50-12 UNF English Thread:

	A	B	C	D	E
76679 -	□□	- □□	- □□	- □	- □

M39 × 1.50 Metric Thread:

	A	B	C	D	E
76680 -	□□	- □□	- □□	- □	- □

Option Descriptions

A □□ Unthreaded Length Option

English thread configurations:
Order in increments of
0.10 inch [0 1]

Maximum unthreaded length:
8.1 inches [8 1]

Minimum unthreaded length:
0 inches [0 0]

Metric thread configurations:
Order in increments of

Maximum unthreaded length:
210 mm [2 1]

Minimum unthreaded length:
0 mm [0 0]

B □□ Case Length Option ③

English thread configurations:
Order in increments of
0.10 inch [0 1]

Maximum case length:
9.8 inches [9 8]

Minimum case length:
1.7 inches [1 7]

Metric thread configurations:
Order in increments of
10 mm [0 1]

Maximum threaded length:
250 mm [2 5]

Minimum threaded length:
40 mm [0 4]

C □□ Cable Length Option

10 1.0 metre.
50 5.0 metres. ②
90 9.0 metres.

D □ Armor Option

0 Without armor.
1 With armor.

E □ Connector Option

0 Without connector.
2 With miniature coaxial male connector.

35 mm Rear and Side Exit Proximity Probe

Rear Exit:

	A	B	C	D
76681 -	□□	- □□	- □	- □

Side Exit:

	A	B	C	D
76682 -	□□	- □□	- □	- □

Option Descriptions

A □□ Case Length Option

Order in increments of
0.10 inch [0 1]

1 For side exit configuration
Minimum case length:
1.6 inches [1 6]

Maximum case length:
9.8 inches [9 8]

2 For rear exit configuration
Minimum case length:
0.5 inches [0 5]

Maximum case length:
9.8 inches [9 8]

B □□ Cable Length Option

10 1.0 metre.
50 5.0 metres. ②
90 9.0 metres.

C □ Armor Option

0 Without armor.
1 With armor.

D □ Connector Option

0 Without connector.
2 With miniature coaxial male connector.

35 mm Extension Cable

	A	B
76684 -	□□□	- □□

Option Descriptions

A □□□ Cable Length Option

040 4.00 metres (157 inches) ②
080 8.00 metres (315 inches)

B □□ Armor Option

00 Without armor
01 With armor

Proximitor® for 35 mm Proximity Transducer System

76683 - □□

01 For combined system electrical length of 5 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).
02 For combined system electrical length of 9 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).

ACCESSORIES

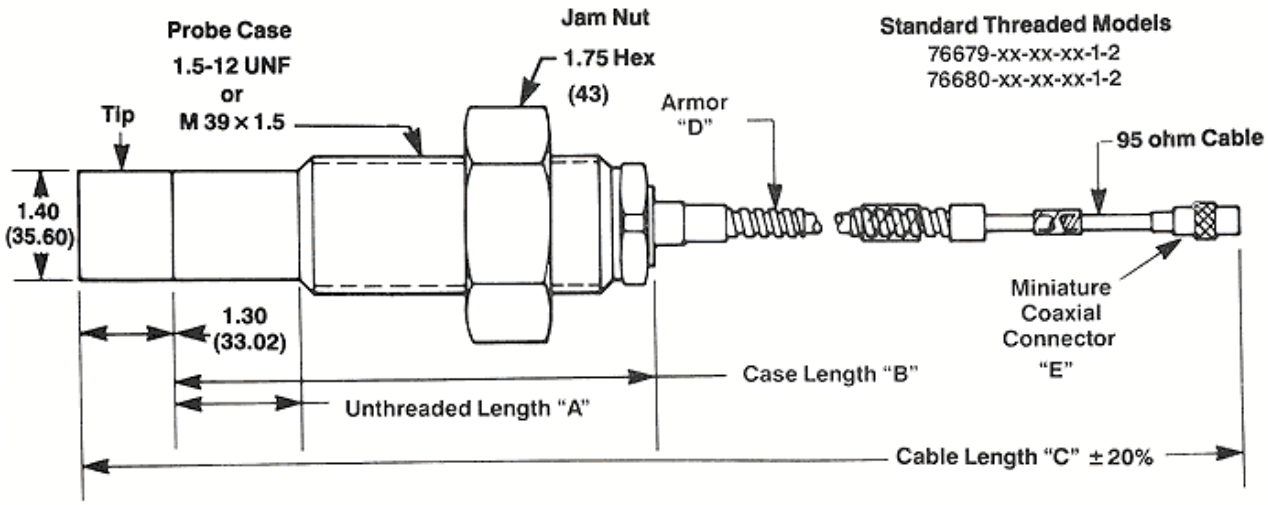
35 mm Probe

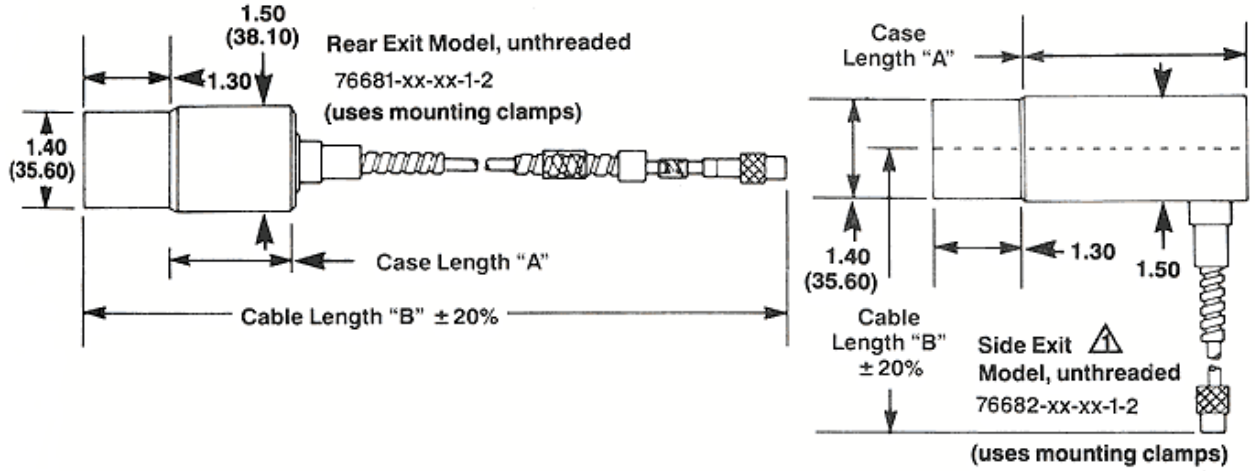
For extremely harsh environments, it is recommended that the probe lead be protected using rigid stainless steel armor to exit the environment. Stainless steel compression fittings are used to attach and seal the armor to the probe case and to the machine casing. Where armor runs are greater than 36 inches (914 mm), select a probe lead length of five or nine metres or install a coupling or junction box 36 inches from the probe to access the connector. *Rigid armor cannot be used with the flexible probe armor option or with Connector Protectors.*

03010897 3/8-inch rigid stainless steel armor 6 foot lengths (1800 mm)
03839501 3/8-inch tube to 3/8-inch tube coupling
03839516 3/8-inch tube to 1/4-inch male pipe thread (used to attach armor to probe case)
03839517 3/8-inch tube to 1/4-inch female pipe thread
77298-01 1/4-inch pipe thread to probe seal lead (neoprene gland)
04404490 3/8-inch tube bender, 1 3/4-inch radius
40113-02 Connector Protector Kit

② *For use with 5 metre Proximitor® only.*
③ *Case length must exceed unthreaded length by 1.7 inches for the English threaded probe and 40 mm for the metric version.*

Extended Range Proximity Transducers





Bend Radius: **1.00 (25.4) minimum for 95 ohm Cable**
1.50 (38.1) minimum for Armor Cable

NOTES: 1. See previous ordering information for options.
2. Dimensions in parentheses are in millimetres.
3. Letters inside quotation marks refer to probe ordering options.

35 mm Probe Configurations

Extended Range Proximity Transducers

50 MM SYSTEM

50 mm Threaded Proximity Probe

A B C D
24582 - □□ - □□ - □□ - □

Option Descriptions

A □□ Thread Option
- 01 ½-20 UNF-2A thread.
- 02 M14 × 1.5 thread.

B □□ Armor Option
- 01 Without armor.
- 02 With armor.

C □□ Cable Length Option
- 10 1.0 metre.
- 50 5.0 metres.②
- 90 9.0 metres.

D □ Connector Option
- 0 Without connector.
- 2 With miniature coaxial male connector.

50 mm Non-Threaded Proximity Probe

A B C D
28480 - □□ - □□ - □ - □

Option Descriptions

A □□ Armor Option
- 01 Without armor.
- 02 With armor.

B □□ Cable Length Option
- 10 1.0 metre.
- 50 5.0 metres.②
- 90 9.0 metres.

C □ Connector Option
- 0 Without connector.
- 2 With miniature coaxial male connector.

D □ Mounting Option
- 1 Probe clamp.
- 2 Bracket probe mounting side exit cable.
- 3 Bracket probe mounting end exit cable.

Extension Cable for 50 mm Proximity Transducer Systems

A B
24710 - □□□ - □□

Option Descriptions

A □□□ Cable Length Option
- 040 4.0 metres (157 inches). ②
- 080 8.0 metres (315 inches).

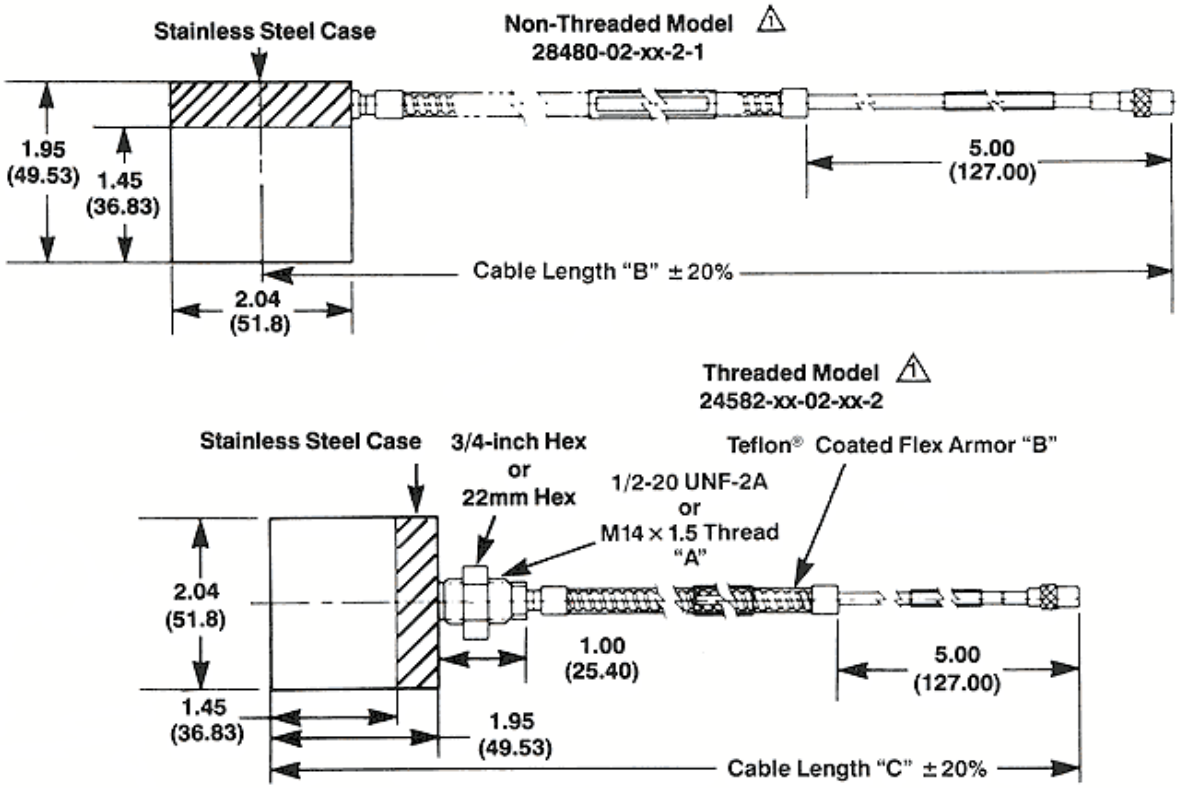
B □□ Armor Option
- 00 Without armor.
- 01 With armor.

Proximitor® for 50 mm Proximity Transducer System

24583 - □□
- 01 For combined system electrical length of 5 metres and standard temperature of +32°F to +149°F (0°C to +65°C).
- 02 For combined system electrical length of 9 metres and standard temperature of +32°F to +149°F (0°C to +65°C).
- 03 For combined system electrical length of 5 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).
- 04 For combined system electrical length of 9 metres and extended temperature of –30°F to +212°F (–34°C to +100°C).

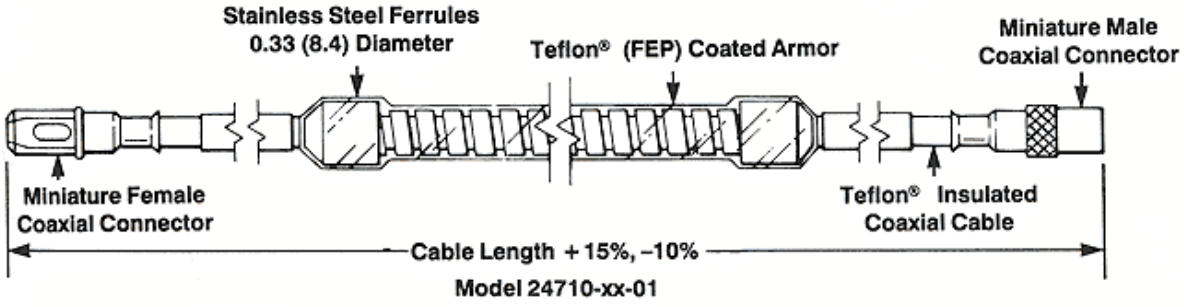
② *For use with 5 metre Proximitor® only.*

Extended Range Proximity Transducers



Bend Radius: 1.00 (25.4) minimum for 95 ohm Cable
1.50 (38.1) minimum for Armor Cable

50 mm Probe Configurations

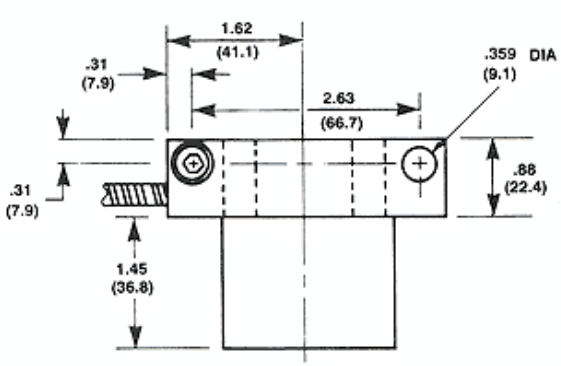


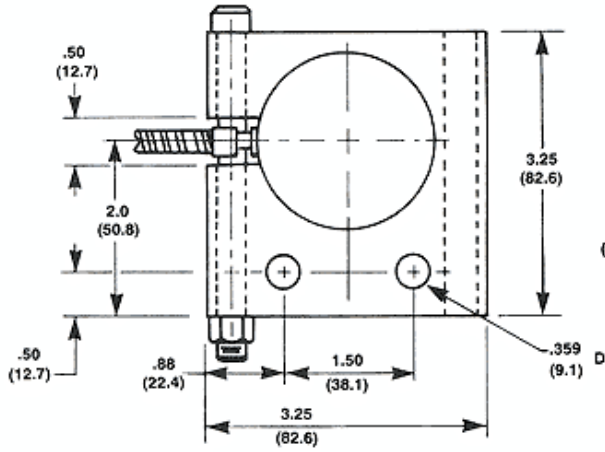
NOTES: 1. See previous ordering information for options.
2. Dimensions in parentheses are in millimetres.
3. Letters inside quotation marks refer to probe ordering options.

25 mm and 50 mm Extension Cable

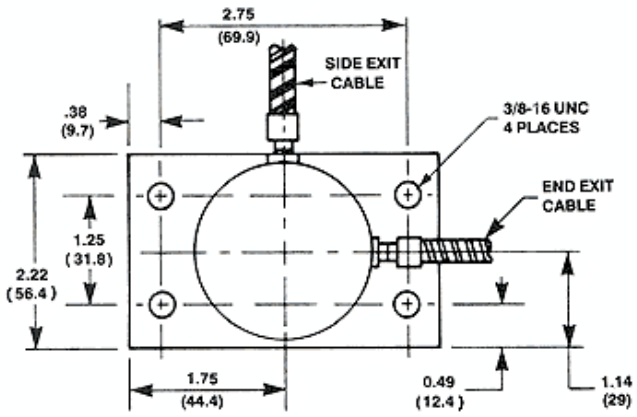
Extended Range Proximity Transducers

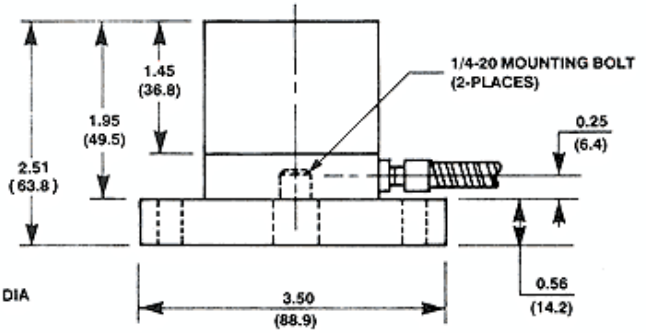
50 mm Clamp Probe Mount
("D" option 1)





50 mm Bracket Probe Mount
("D" options 2 and 3)





NOTES: 1. 28480 "D" mounting option 1 includes clamp. Mounting options 2 or 3 include bracket.
2. Mounting clamp should never extend beyond metal probe case onto the probe tip.
3. Dimensions in parentheses are in millimetres.

50 mm non-threaded probe mounting clamp and bracket