OPERATING MANUAL

IPX II Series

Smart Pressure Transmitters for High Pressures and High Temperatures

II 1 G
ATEX100a

FM Approvals

P/N 974100
05/05 Rev. F
ECO # 29918

Dynisco

Table of Contents

1. GENERAL

1.1 IMPORTANT INFORMATION

This manual applies to the IPX II series only. It must be kept near the equipment in a readily and immediately accessible location at all times.

The content of this manual must be read, understood and followed in all points by all relevant people. This applies in particular to the notes on safety. Following the safety instructions will help to prevent accidents, defects and malfunctions.

DYNISCO will not be held liable for any injury, loss or damage resulting from failure to follow the instructions in this manual.

If malfunctions occur in spite of having followed the operating instructions, please contact the **DYNISCO** customer service department (see chapter 8, Maintenance).

This applies in particular during the warranty period.

1.2 COPYRIGHT

1.3 Explanation of icons

The manual uses icons to indicate information pertaining to safety:

ATTENTION Risk of destruction or damage to equipment, machines or installations

General danger to life or limb

Specific danger to life or limb

You MUST do this

The safety instructions are provided again in the individual chapters of the manual.

1.4 Abbreviations

The following abbreviations are used:

O M Operating manual
IPX Intelligent pressure transmitter
f.s. of full scale
PT pressure transmitter

1.5 Correct use

The IPX II pressure transmitter is specially designed for measuring pressure in explosive atmospheres (safety class, EEx ia IIC T4, Ta=-20°C to +80°C) as part of a larger overall system. It contains an integrated signal amplifier. The IPX II can be used in media temperatures up to 350°C. If the pressure transmitter is used in other applications, the safety and accident prevention regulations specific to that application must be followed.

When using the IPX II as a safety component in accordance with the EC Machine Directive, Annex IIc, the equipment manufacturer must take any necessary precautions to ensure that malfunctions of the PTcannot cause damage or injury.

The IPX II is also designed for explosion proof areas approved by factory mutual for Class I, Division 1, Groups B, C & D, Class II/III, Division 2, Group E, F & G.

1.6 User's obligations

The operator or owner of the larger overall system, e.g. a machine, is responsible for following the safety and accident prevention regulations that apply to the specific application.

2. NOTES ON SAFETY

The operator or owner of the larger overall system is responsible for following the safety and accident prevention regulations that apply to the specific application.

Toxic hazard!
The IPX II contains a small amount of mercury (Hg) as its transmission medium. If the diaphragm is damaged, mercury may escape.

Never transport or store the IPX II without the protective cap. Remove the cap shortly before installation.

If mercury is inhaled or swallowed, seek medical attention immediately!

Mercury is hazardous waste and must be disposed of in accordance with applicable laws. **DYNISCO** will accept defective PTs.

If mercury escapes, use airtight packaging!

When planning machinery and using the IPX II, follow the safety and accident prevention regulations that apply to your application, e.g.:

- EN 60204, Electrical equipment in machines.
- EN 292, Machine safety, general design guidelines.
- DIN 57 100 Part 410, Protection against electric shock.
- EN 50 014:1997, General Requirements
- EN 50 020:1994, Intrinsic safety apparatus
- EN50284:1999, Speical requirements for Group II Category 1G

Mounting and electrical connection of the PT must be done by specialists with EMC training, following all applicable regulations, and in **pressureless, voltage-free, intrinsically safe** condition with the **machine switched off**.

The machine must be secured against being switched back on!

Ambient temperature for the electronics housing **max. +80°C** (safety class T4 max.).

Higher temperatures can result in damage and malfunction. Do not install the pressure transmitter in places where this temperature is exceeded.

Explosion hazard!
Deviation of the supply voltage from the value given in the technical specifications, or false polarity, can damage the pressure transmitter and cause malfunctions that can pose a risk of explosion.

Operate only with an intrinsically safe, EMC compliant power supply with the following specifications when employing the pressure 4-20mA output:

Supply voltage max.	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0.26 mH
Capacity max.	9.7 nF

Operate only with an intrinsically safe, EMC compliant power supply with the following specifications when employing the temperature 4-20mA output:

Supply voltage max.	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0 mH
Capacity max.	52 nF

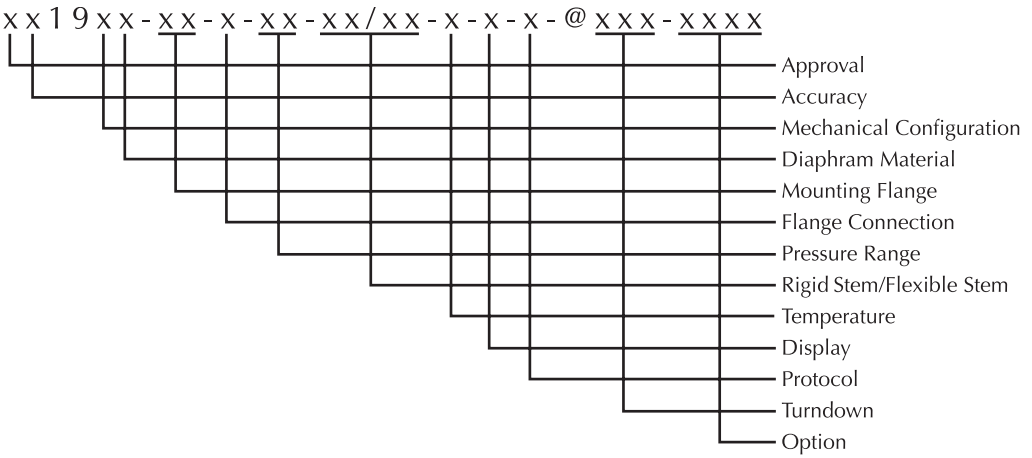
FM Approvals For PT that are explosion proof Class I, Division 1, Groups B, C & D, Class II/III, Division 2, Groups E, F and G. Power supply rating is 12-42 Vdc.

Explosion hazard!
The pressure transmitter must be connected using a 2x2-core, twisted cable (blue cable sheath).

Do not lay connecting cables in the direct vicinity of cables carrying higher voltage or used to switch inductive or capacitive loads.

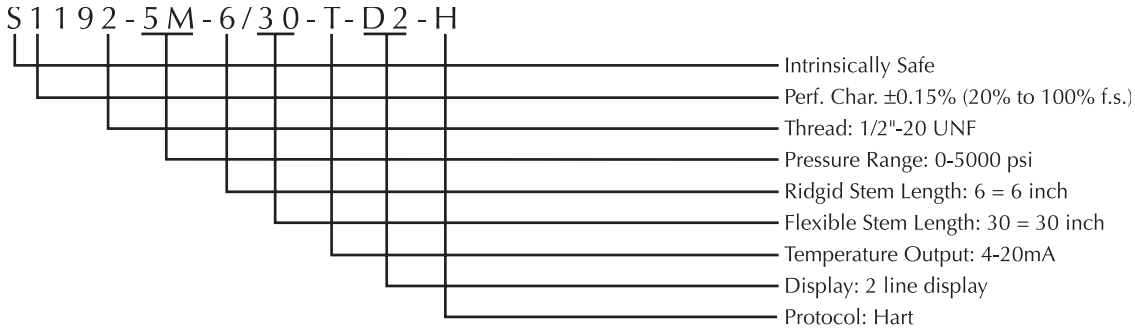
3. TECHNICAL DATA

3.1 ORDERING GUIDE



The exact meanings of the letter/digit combinations are given in the corresponding sections of chapter 3.

3.2 EXAMPLE FOR ORDERING



3.3 SAFETY RELATED SPECIFICATIONS

ATEX certificate	No.: SIRA 02ATEX2244X
EX-Safety class	EEx ia IIC T4 (Ta = -20°C to +80°C)
FM approvals	Class I, Division 1 Groups B, C & D
	Class II / III, Division 2 Groups E, F & G

Certified maximum values for EEx ia IIC T4

Associated electrical equipment must satisfy the following conditions:

Pressure:

Supply voltage max.	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0.26 mH
Capacity max.	9.7 nF

Temperature:

Supply voltage	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0 mH
Capacity max.	52 nF

3.4 PERFORMANCE CHARACTERISTICS

xx19xx - xx - x - xx - xx / xx - x - x - x - @xxx - xxxx

3.4.1 ACCURACY

(Linearity and repeatability)

3.4.1A X1192X, X1194X

±0.15% (20% to 100% f.s.)
±0.25% (0% to 20% f.s.)
(0-3000 psi and above)

±0.25% (20% to 100% f.s.)
±0.50% (0% to 20% f.s.)
(0-1500 psi)

3.4.1B X1193X, X1195X

±0.15% (20% to 100% f.s.)
±0.25% (0% to 20% f.s.)
(0-1500 psi and above)

±0.25% (20% to 100% f.s.)
±0.50% (0% to 20% f.s.)
(0-750 psi)

3.4.1C X2192X, X2194X

±0.25% (20% to 100% f.s.)
±0.50% (0% to 20% f.s.)
(0-3000 psi and above)

±0.50% (20% to 100% f.s.)
±1.00% (0% to 20% f.s.)
(0-1500 psi)

3.4.1D X2193X, X2195X

±0.25% (20% to 100% f.s.)
±0.50% (0% to 20% f.s.)
(0-1500 psi and above)

±0.50% (20% to 100% f.s.)
±1.00% (0% to 20% f.s.)
(0.750 psi and above)

3.4.2 RESOLUTION

0.035% f.s. or better

3.5 PRESSURE SIDE CONNECTION

2 = 1/2" 20 UNF 2A (xx192x-x . . .)
3 = M18 x 1.5 (xx193x-x . . .)
4 or 5 = flange (xx194x-x . . .) or (xx195x-x . . .)

3.6 PRESSURE RANGES (XX19XX)

3.6.1 PRESSURE RANGES IN PSI

Model number	Permitted pressure range in PSI
xx19xx-xx-x-7.5c-x	0-750 **(xx193xx & xx195xx only)**
xx19xx-xx-x-1.5c-xm	0-1500
xx19xx-xx-x-3c-xm	0-3000
xx19xx-xx-x-5c-xm	0-5000
xx19xx-xx-x-7.5c-xm	0-7500
xx19xx-xx-x-10c-xm	0-10000

3.6.2 MAX. OVERLOAD (WITHOUT INFLUENCING OPERATING DATA)

xx19xx 1.5 x full scale pressure up to 10,000 psi

3.6.3 BURST PRESSURE

3 x nominal value, max. 30,000 psi

3.6.4 NATURAL FREQUENCY

50 Hz [-3db]

3.7 RIGID STEM/FLEXIBLE STEM (XX19XX-)

6 = 152 mm standard length for rigid version
6/18 = 152 mm stem length / 457 mm flexible stem

Other lengths on request

3.8 ELECTRICAL DATA

Configuration 4-arm Wheatstone bridge strain gauge with int. amplifier

Output signal 2-wire 4 - 20 mA, optional 2nd 2-wire 4 - 20 mA

Supply voltage	12-30 VDC for EEx ia IIC T4 12-42 for FM approved explosion proof models
Power consumption	-20 mA
Zero balance	(xx192x and xx194x) 0.25% for 3000 psi and above 0.5% for 1500 psi (xx193x and xx195x) 0.25% for 1500 psi and above 0.5% for 750 psi

3.9 TEMPERATURE INFLUENCE

Electronics housing

Max. housing temperatures

Safety class T4	-20°C to +80°C
Compenstated temperature range	+25°C to +300°C (option to 350°C) - snout +25°C to +80°C - electronics

Zero and sensitivity shift due to temperature change on electronics housing

xx19xx	±0.15% f.s./55°C

Diaphragm (in contact with media)

Maximum temperature at the diaphragm

xx19xx	350°C

Zero shift due to temperature change on the diaphragm

xx19xx	±0.01 psi / 100°C

3.10 EMC REQUIREMENTS

Conforming to CE in accordance with EMC directive.

Electromagnetic Interference	DIN EN 550223 1995
Immunity	DIN EN 61000-4-2 1995
Radiated, Radio Freq, etc.	DIN EN 61000-4-3 1995 +A1:1998+A2:2000
Pulse Magnetic Field	DIN EN 61000-4-9 1993 + A1:2001

Surge Immunity	DIN EN 61000-4-5 1995 + A1:2000
Conducted Disturbences	DIN EN 61000-4-6 1996 + A1:2000
Power Frequency Magnetic Field	DIN EN 61000-4-8 1993 + A1:2001

3.11 MATERIALS

Diaphragm	15-5PH Mat. No. 1.4545 DyMax™ coated
Stem	17-4PH Mat. No. 517400

3.12 TORQUE

xx192x	xx193x	xx194x	xx195x
max. 56.5 Nm	max. 56.5 Nm	max. 5.6 Nm	max. 14.1 Nm
(500 inch-lbs.)	(500 inch-lbs.)	(50 inch-lbs.)	(125 inch-lbs.)
min. 11.3 Nm	min. 11.3 Nm	min. 4.5 Nm	min. 11.3 Nm
(100 inch-lbs.)	(100 inch-lbs.)	(40 inch-lbs.)	(100 inch-lbs.)

3.13 ENVIRONMENTAL PROTECTION TO IEC 529

Electronics housing	min. IP66, nema 4x

3.14 WEIGHT

5-10 lbs.

3.15 DIMENSIONS

Fig. 3-1 IPX II Models S1192, S2192, N1192 & N2192

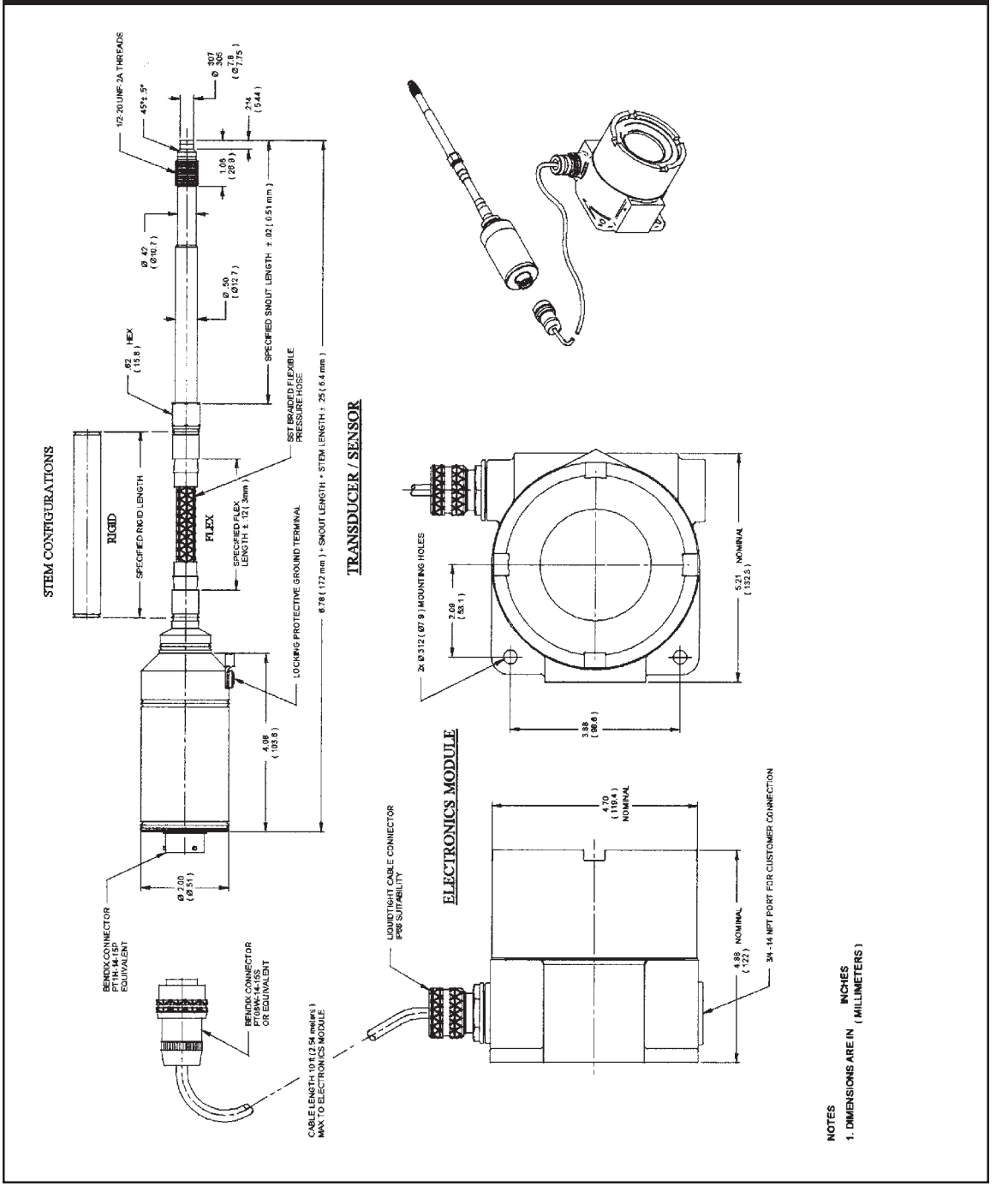


Fig. 3-2 IPX II Models S1193, S2193, N1193 & N2193

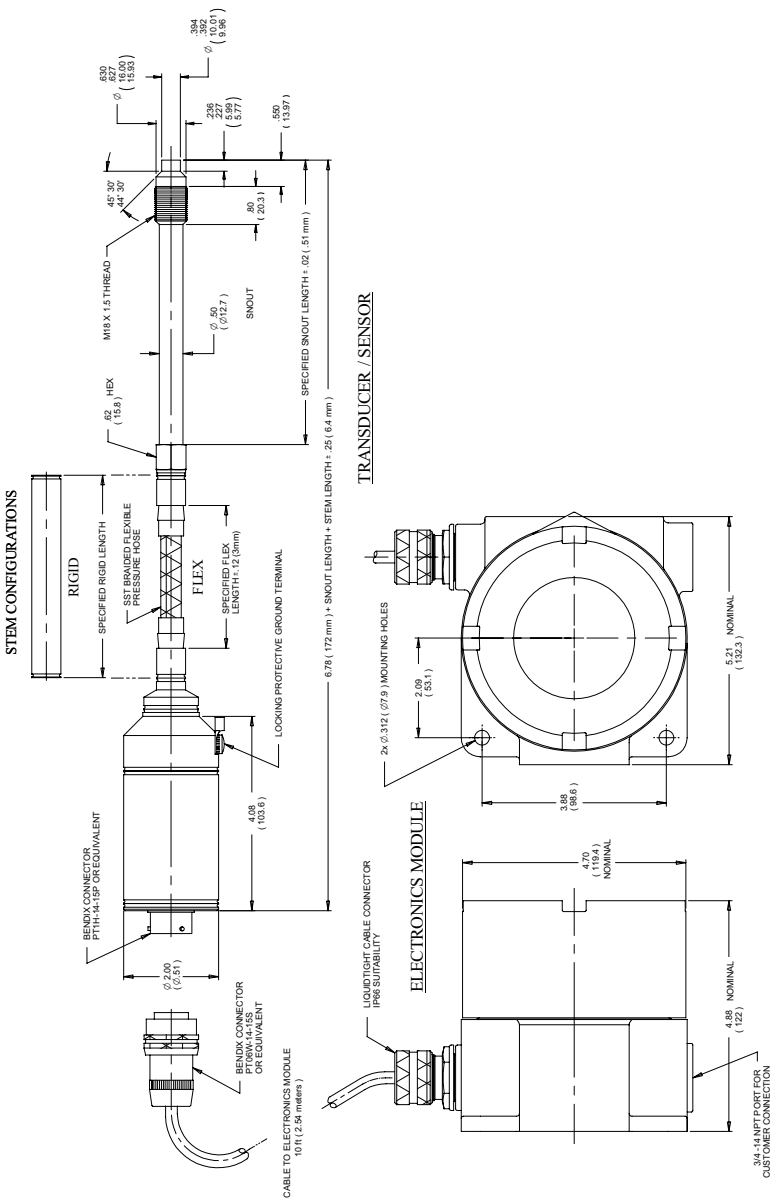


Fig. 3-3 IPX II Models S1194, S2194, N1194 & N2194

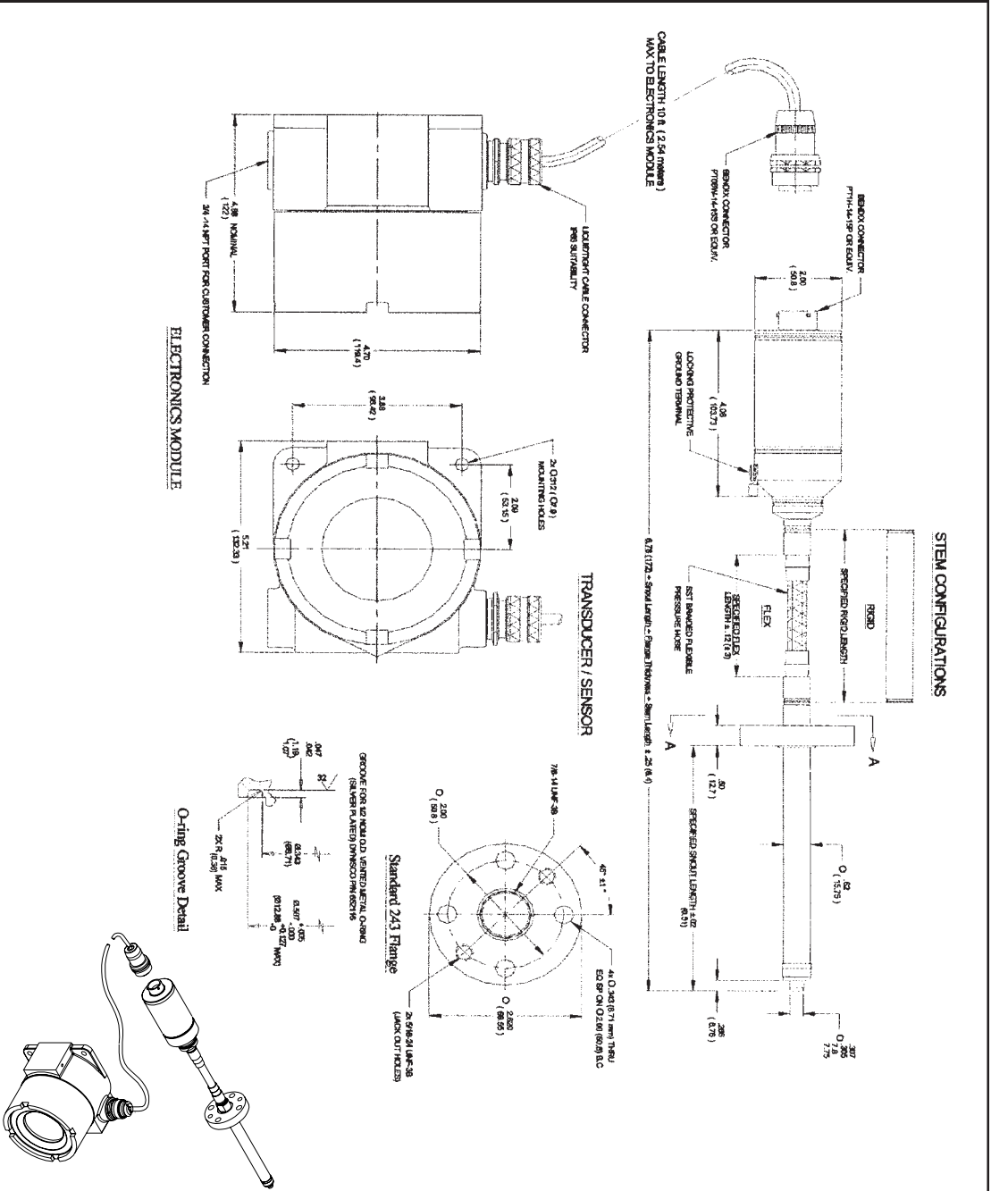


Fig. 3-4 IPX II Models S1195, S2195, N1195 & N2195

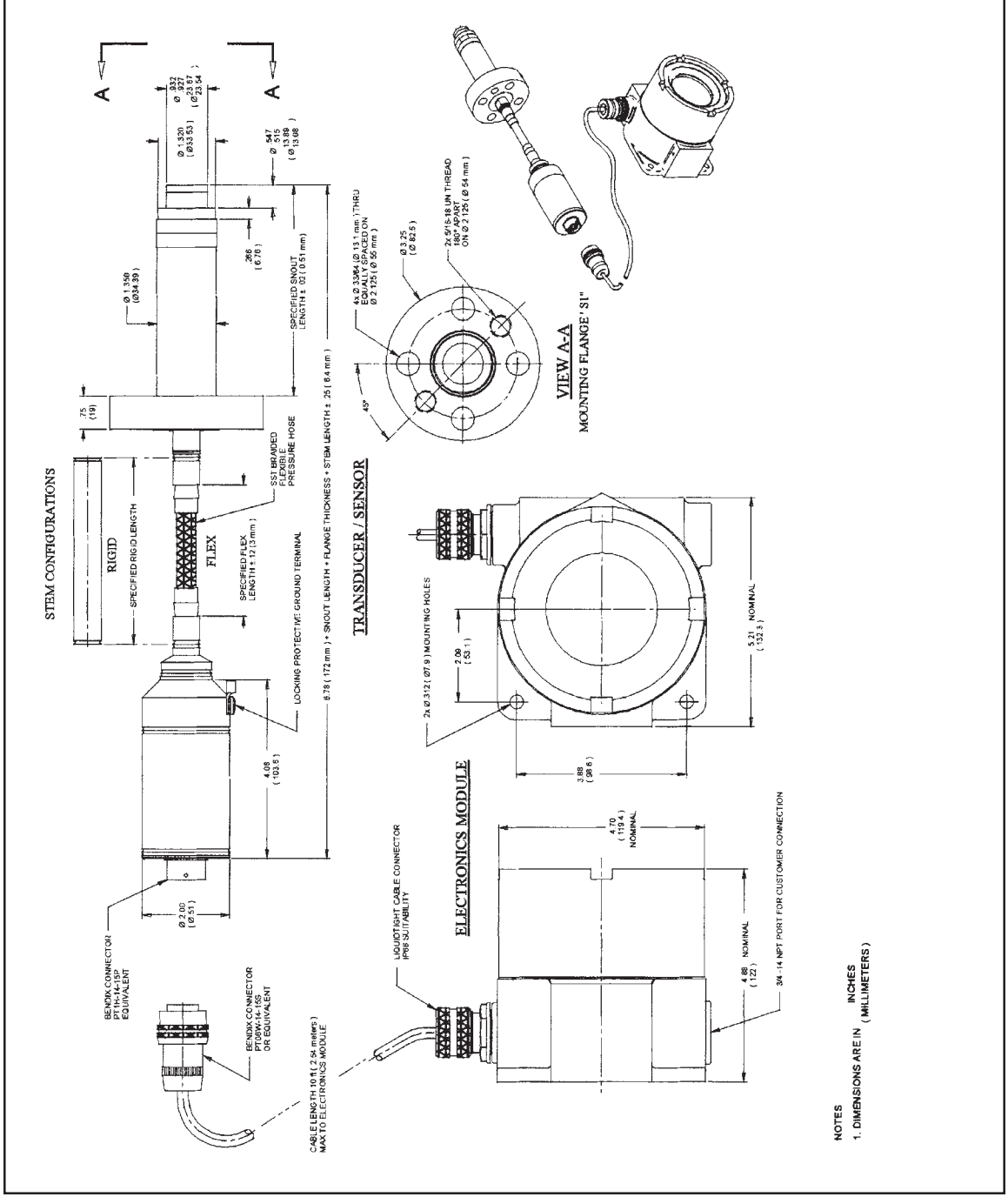


Fig. 3-5 IPX II Models E1192 & E2192

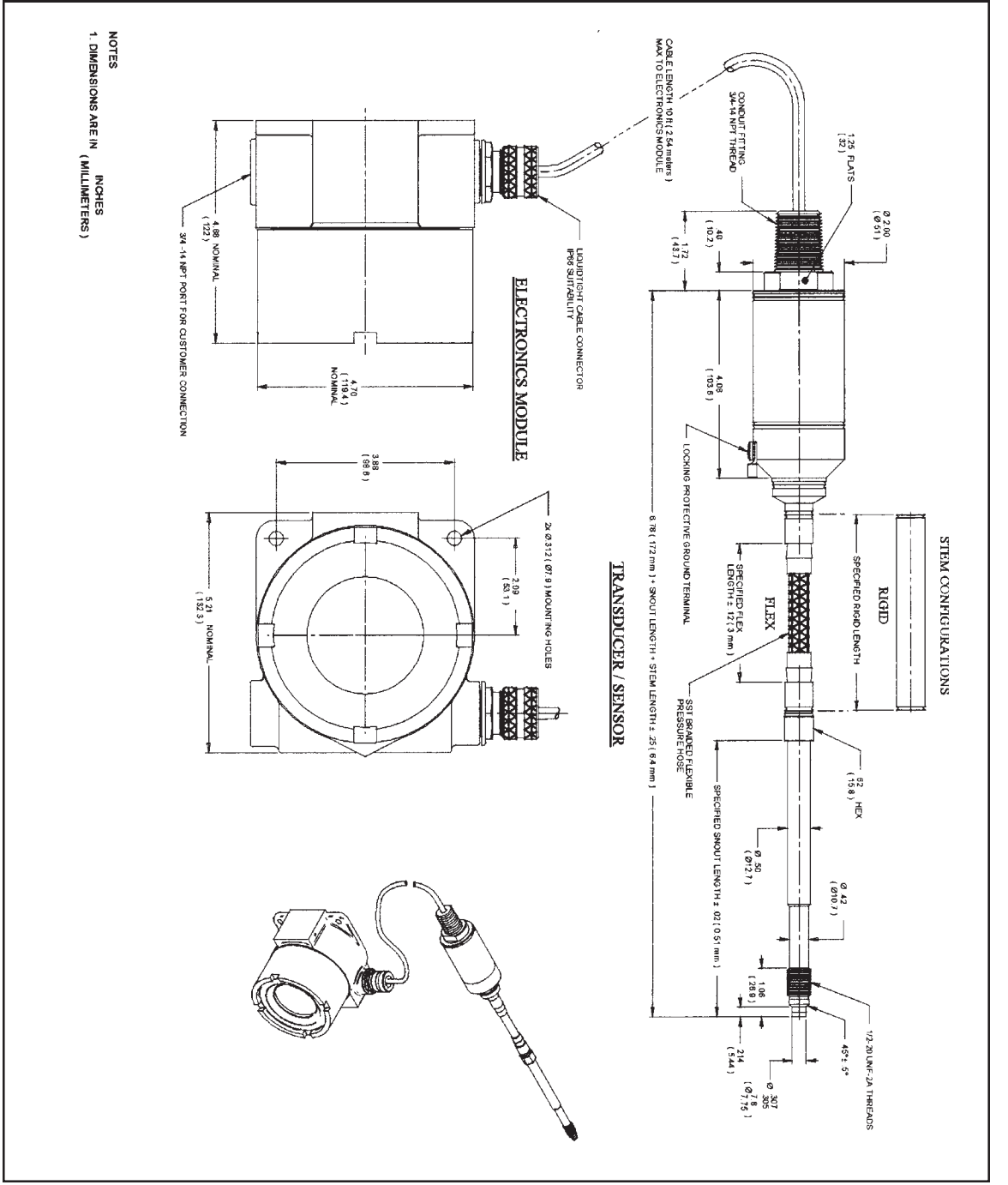


Fig. 3-6 IPX II Models E1193 & E2193

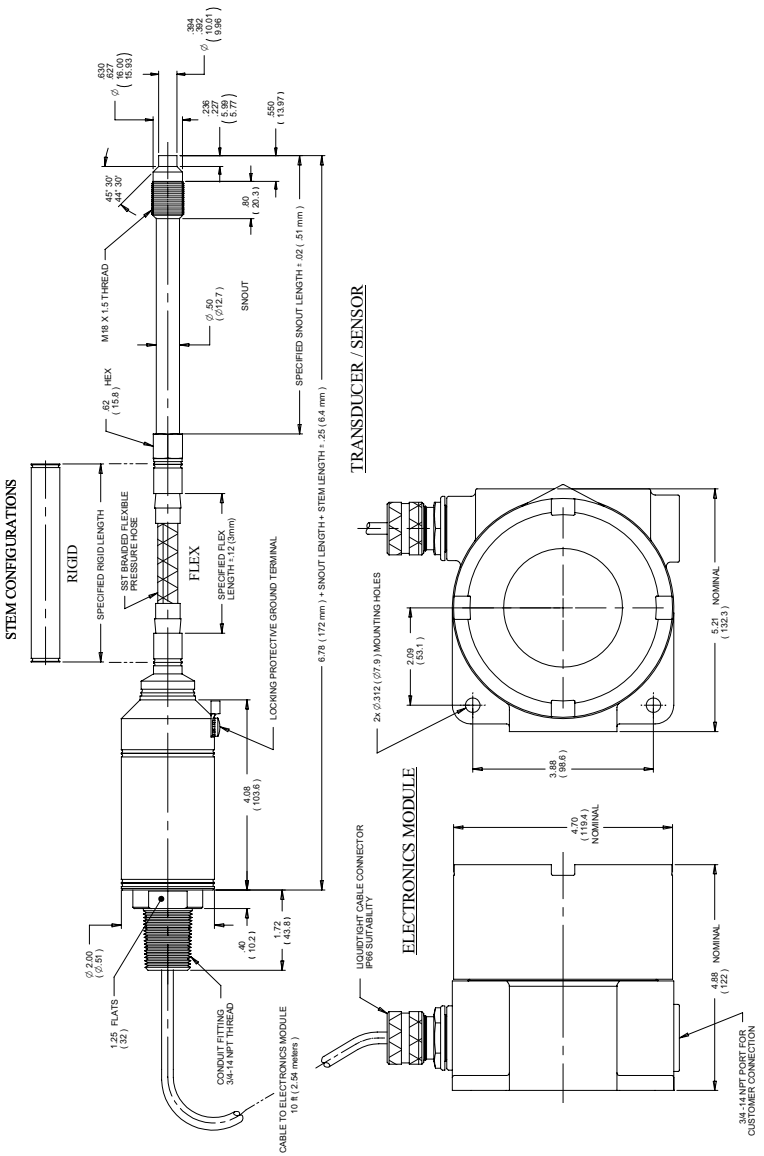
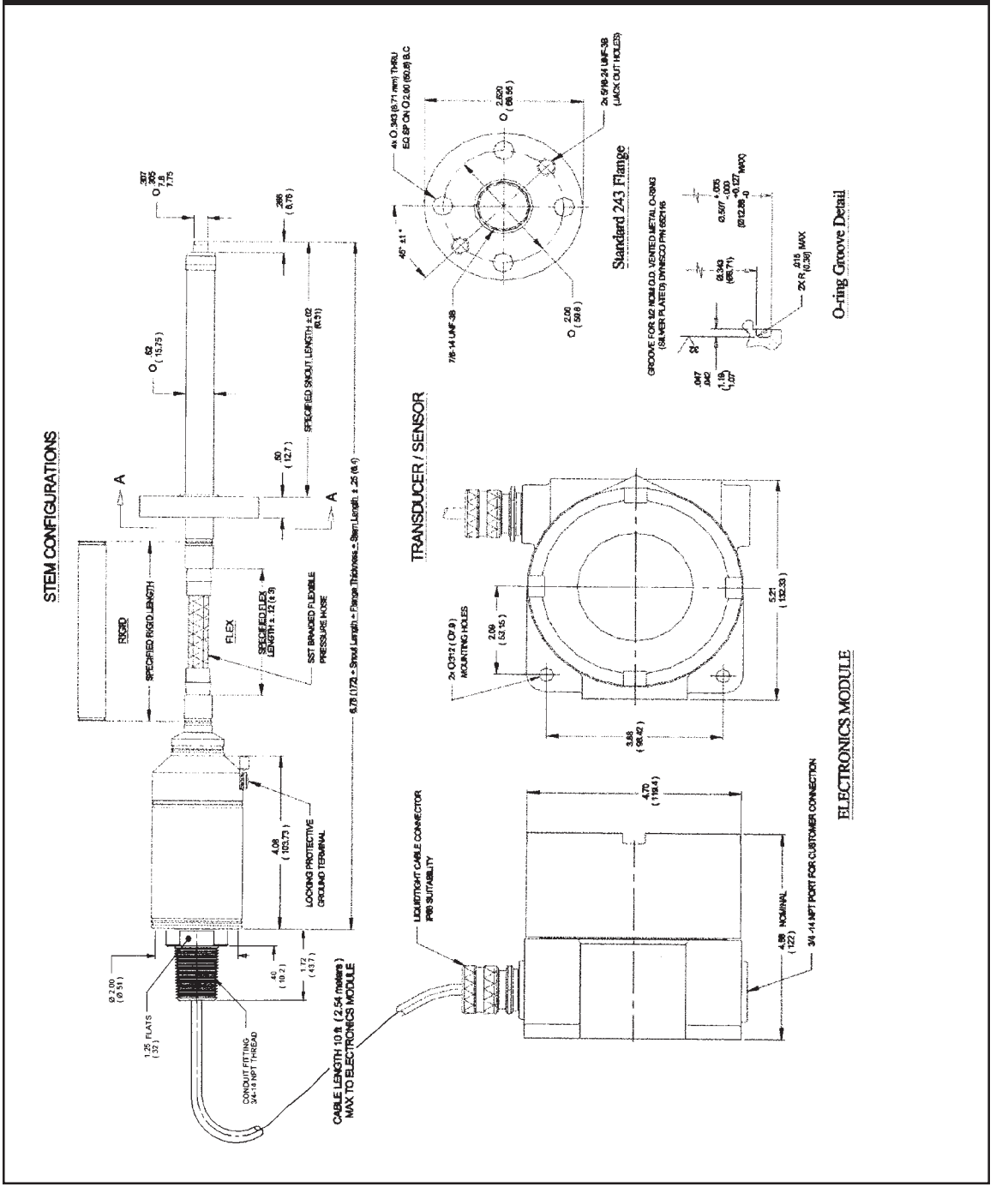
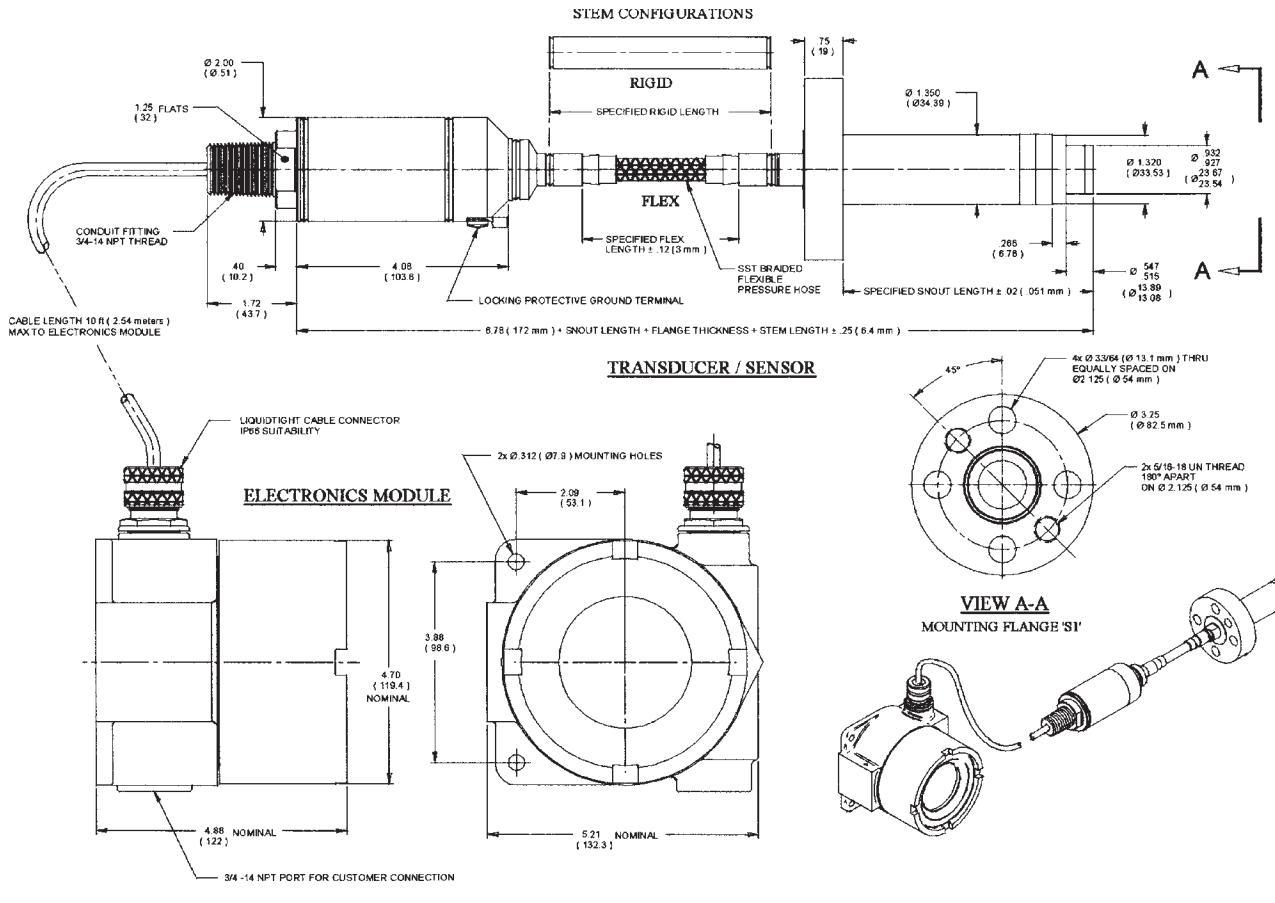


Fig. 3-7 IPX II Models E1194 & E2194





NOTES

1. DIMENSIONS ARE IN INCHES (MILLIMETERS)

Fig. 3-8 IPX II Models E1195 & E2195

4. FUNCTION

4.1 CONSTRUCTION

The PTs of series IPX II are industry standard.

The main advantages are:

- Intrinsically safe EEx ia IIC T4
- temperature compensated
- HART protocol based
- resistance to aggressive media
- insensitivity to electromagnetic radiation (EMC)
- liquid-filled transmission system (mercury)
- pressure measurements in plastic melt up to a temperature of 350°C

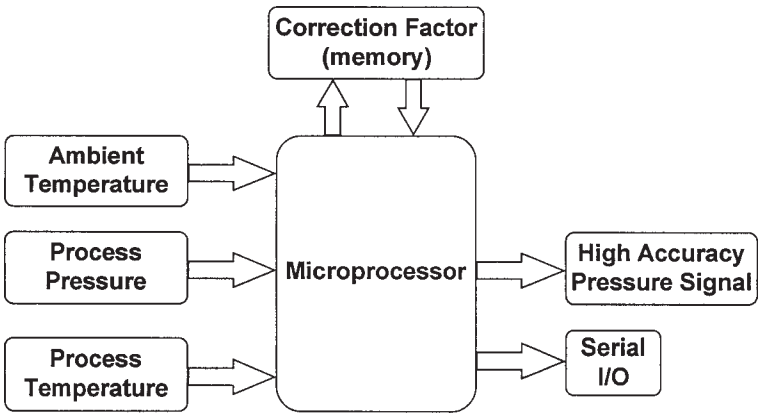
4.2 DESCRIPTION OF FUNCTIONS

The Dynisco IPX II Series of Smart Pressure Transmitters are microprocessor based instruments that incorporate advanced software techniques and modern sensor design. New, proprietary sensor processing methods ensure the highest quality and reliability to meet Dynisco's standards.

The IPX II Series is designed for applications that require high accuracy, even under wide variations in process temperature. With the capability for up to 6-to-1 span turndown, one pressure range can be used in several different applications, reducing spare parts inventory. And the IPX II Series' remote digital communication utilizing the industry standard HART protocol allows transmitter parameter changes to be made from safe areas, increasing operator safety.

The IPX II Series of Smart Pressure Transmitters are characterized for process temperature effects, providing an optional linearized stable, temperature reading via 4-20 mA output. Figure 4-1 illustrates the operation of the transmitter in the form of a block diagram. The process temperature signal is available through the HART protocol. An optional dual LCD will display pressure or temperature measurements in real-time.

Fig. 4-1 Operation in Block Form



In addition to the standard analog output, the IPX II Series supports remote digital communications compatible with the HART Communicator (product of Emerson). The Model 275 can communicate with IPX II Series transmitters from the control room, at the transmitter site, or from any convenient junction box or wiring termination point in the measurement loop. The model 275 may be used to configure the IPX II Series of transmitters or to test the control loop.

4.2.1 Theory of Operation

The IPX II Smart Pressure Transmitter is a microprocessor-based device capable of measuring process pressure to within 0.15% of the specified range. It is compensated for temperature effects at the process end as well as the electronics end by using RTD's and compensating software customized for each unit.

The IPX II Series can be broken down into two distinct subsections, mechanical and electrical. The following describes each in detail.

4.2.2 Mechanical

The mechanical system (filled assembly) consists of a lower diaphragm, a filled capillary tube, and an upper diaphragm with a sputtered thin film strain gage. The filled assembly transmits pressure from the process to the strain gage diaphragm where it is converted to an electrical signal. The filled assembly isolates the electronics from the high process temperatures. **The electronics housing is mated with a specific sensor assembly. Do not mix and match housings and sensors.**

The lower diaphragm is the surface in contact with the media being measured. This diaphragm can be made from a choice of materials. The standard material is heat-treated 15-5 stainless steel. This has average corrosion and abrasion resistance and is similar to 17-4 stainless steel. Other materials are

also available including Hastelloy C-276 which has excellent corrosion resistant properties (but is not good for abrasion). For other materials please consult the factory.

Behind the lower diaphragm is a capillary tube filled to the upper diaphragm. As the process pressure deflects the lower diaphragm, the fill is displaced through the capillary tube to deflect the upper diaphragm.

The upper diaphragm has a 5000 ohm thin film strain gage element deposited on it in the configuration of a Wheatstone Bridge. The deflection of the upper diaphragm causes a change in the resistance of the strain gage and hence a change in the balance of the bridge. The amount of imbalance is directly proportional to the applied pressure. This completes the translation of pressure applied to the lower diaphragm into a usable electrical signal.

4.2.3 ELECTRICAL

The low level output signal from the bridge is amplified via an instrumentation amp circuit. The amplified signal then goes to the input of the analog-to-digital (A/D) converter.

Once the microprocessor has the converted voltage input from the A/D converter, the compensation algorithms are executed. The unit is compensated for any errors introduced by temperature effects on the gauge, snout electronics, and the nonlinearities of the pressure measurement itself. The corrected digital signal is sent to a digital-to-analog (D/A) converter which modulates the current of the unit's power supply between 4 and 20 milliamps for an output current proportional to the applied pressure.

Fig. 4-2 Functioning Principle of the PT of the IPX II Series

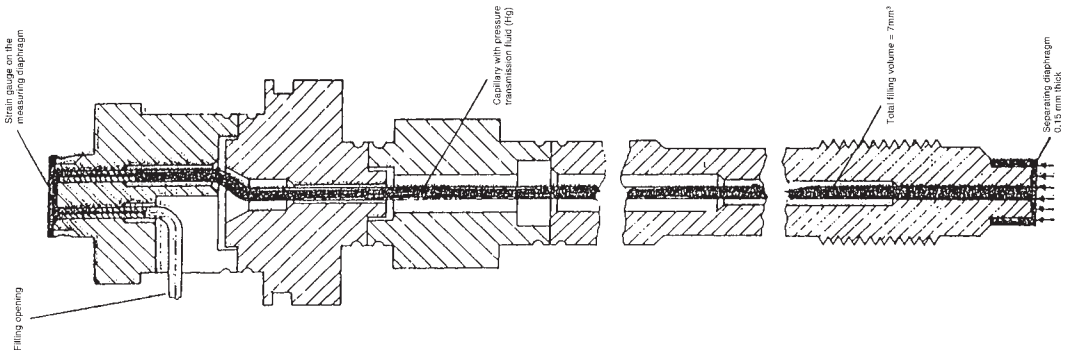
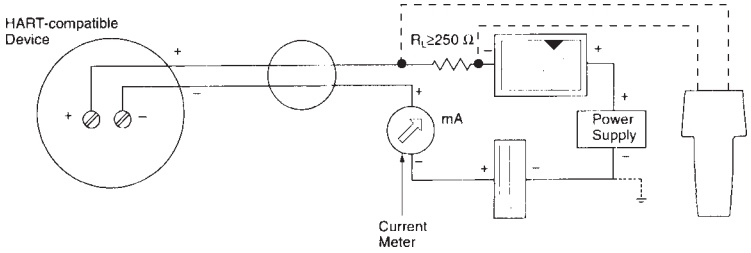


Figure 4-3 illustrates typical wiring connections between the HART Communicator and any compatible device.

Fig. 4-3 Connecting the HART Communicator to the IPX II



ATTENTION Explosion can result in death or serious injury. Before connecting the HART Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or nonincentive fields wiring practices. For intrinsically safe and FM wiring connections, see the HART 275 Communication Manual.

5. TRANSPORT / DELIVERY

Toxic hazard!
The PT contains a small amount of mercury (Hg) as its transmission medium. If the diaphragm is damaged, mercury may escape.

Never transport or store the PT without the protective shell bolted in place. Remove the shell shortly before installation.

If mercury is inhaled or swallowed, seek medical attention immediately.

Mercury is hazardous waste and must be disposed of in accordance with applicable laws. **DYNISCO** will accept defective PTs.

If mercury escapes, use airtight packaging!

ATTENTION ESD sensitive component. Electrostatic discharge may damage the PT. Take ESD precautions.

5.1 TRANSPORT/PACKING/TRANSPORT DAMAGE

- Do not let the PT be damaged by other items during transit.
- Use only the original packaging.
- Report transport damage to **DYNISCO** immediately in writing.

5.2 STORAGE

- Store the PT in original packaging only.
- Protect against dust and moisture.

5.3 SCOPE OF DELIVERY

- PT with diaphragm protection cap
- Fastening clip (transmitter with flexible stem only)
- Calibration sheet
- Operating manual with declaration of conformity

6. ASSEMBLY

Ambient temperature for the electronics housing max. +80°C (safety class T4 max.).

Higher temperatures can result in damage and malfunction.

Do not install the pressure transmitter in places where this temperature is exceeded.

6.1 MOUNTING HOLE

ATTENTION To produce the 1/2-20 UNF mounting hole, use only **DYNISCO** machining tool kit (DYNISCO P/N 200925). To produce the M18 x 1.5 moutning hole, use only **DYNISCO** machining tool kit (DYNISCO P/N 200105).

- Drill the mounting hole as shown in fig. 6-1, 6-2, 6-3, 6-4.

Fig. 6-1 Mounting Hole xx192x

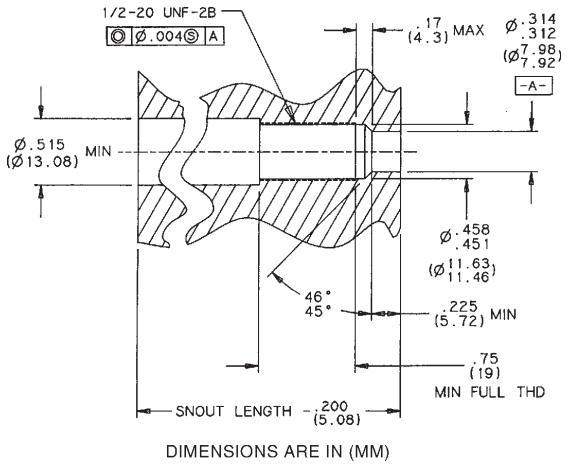


Fig. 6-2 Mounting hole xx193xx

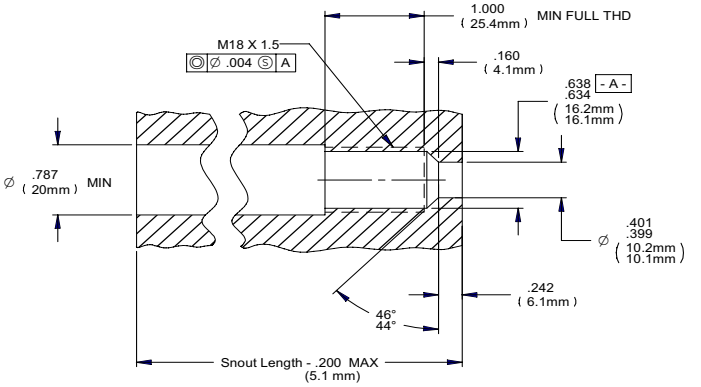
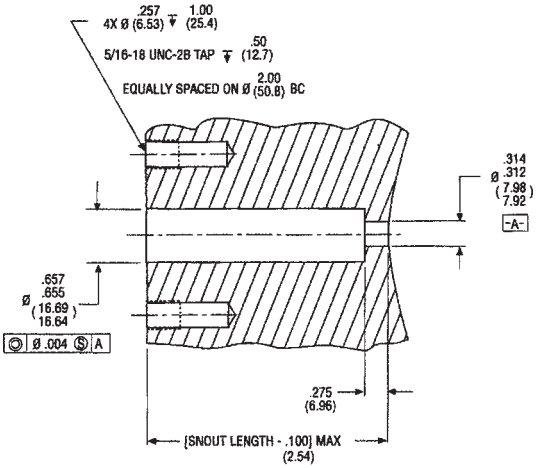
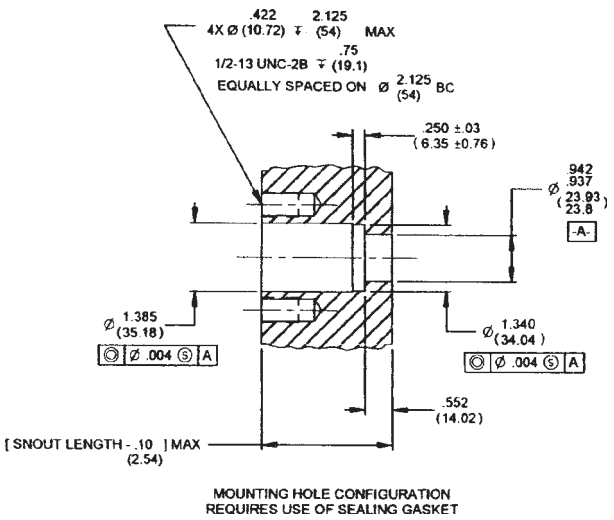


Fig. 6-2 Mounting hole xx194xx



DIMENSIONS ARE IN (MM)

Fig. 6-4 Mounting hole xx195xx



When reworking the mounting hole, pay particular attention to the centricity of:
- the hole,
- the thread and
- the sealing surface.

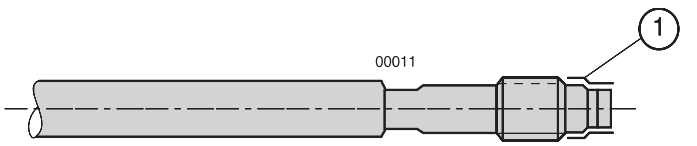
Pressure sealing takes place on the 45° beveled sealing surface or on the front cylindrical section of the PT with an O-ring (see figures 6-1, 6-2, 6-3, 6-4).

The sealing surface must be:
- correctly machined
- free from marks and rough edges
- free from solidified plastic residue.

6.2 Checking the mounting hole (not flanged models)

- Paint the test bolt DYNISCO on the marked area (figure 6-5, item 1) with marking ink up to the thread.

Fig. 6-5 Test Bolt with Marking Ink



- Insert the test bolt in the mounting hole.
- Twist it in by hand until the two sealing surfaces make contact.
- Remove and examine the test bolt.

The only acceptable abrasion of marking ink is at the sealing edge (45°), evenly over the entire circumference.

If the ink has been rubbed off in other places too:

- rework the mounting hole.

6.3 Mounting the Pressure Transmitter

Mounting and electrical connection of the PT must be done by specialists with EMC training, following all applicable regulations, and in **pressureless, voltage-free, intrinsically safe** condition with the **machine switched off**.

The machine must be secured against being switched back on!

Toxic hazard!
The PT contains a small amount of mercury (Hg) as its transmission medium. If the diaphragm is damaged, mercury may escape.

Never transport or store the PT without the protective cap bolted in place. Remove the cap shortly before installation.

If mercury is inhaled or swallowed, seek medical attention immediately!

ATTENTION ESD sensitive component. Electrostatic discharge may damage the PT. Take ESD precautions.

ATTENTION Before mounting the PT, check the mounting hole carefully. The PT must only be mounted in holes that satisfy the requirements stipulated in section 6.1. A hole that does not satisfy these requirements can damage the PT.

ATTENTION Before mounting the PT, ensure that the mounting hole is free from plastic residue. Remove plastic residue with the **DYNISCO** cleaning tool kit. A test bolt is included with this cleaning set.

ATTENTION To prevent the PT from sticking permanently in the mounting hole, coat the thread section of the transmitter with high temperature resistant grease or a suitable parting agent.

- Check the mounting hole with the test bolt, and clean with cleaning set if necessary.
- Coat the thread section of the transmitter with high temperature resistant grease or a suitable parting agent.

ATTENTION Always use a spanner applied to the designated hexagon collar when screwing the PT in and out. Do not apply the tool to the housing or housing / sensor connection!

ATTENTION Maximum mounting torque 500 inch-pounds. If the mounting torque is too high, the PT may be damaged or its zero point may shift.

- Screw the PT into the mounting hole and tighten.

6.4 Mounting PTs with Flexible Stem

Mounting a PT with a flexible stem to the pressure sensor is done analogously to the procedure in 6.3.

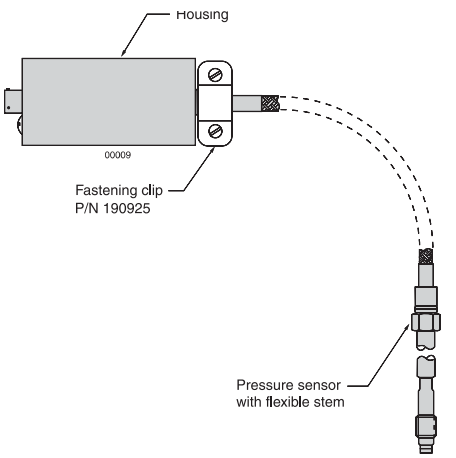
ATTENTION Avoid kinking or crushing the flexible stem.

Minimum bending radius
- **1" (25 mm)** for protected capillary

The connector must be easily accessible (on connector versions).

- Mount the electronics housing of the PT with the fastening clip. See mounting example in figure 6-6.
- Additionally secure the flexible stem between the electronics housing with a standard cable clip.

Fig. 6-6 Mounting Example for Sensor Portion of IPX II with Flexible Stem



6.5 Installing the Flanged Pressure Transmitter

Installation of the pressure transmitter with flexible connection to the pressure transducer is analogous to the procedure described under 6.3, except mounting torque is different. See specification section for details.

6.6 Electrical Connection

Mounting and electrical connection of the PT must be done by specialists with EMC training, following all applicable regulations, and in **pressureless, voltage-free, intrinsically safe** condition with the **machine switched off**.

The machine must be secured against being switched back on!

Explosion hazard!
The pressure transmitter must be connected using a 2x2-core, twisted cable (blue cable sheath).

Do not lay connecting cables in the direct vicinity of cables carrying higher voltage or used to switch inductive or capacitive loads.

Operate only with an intrinsically safe, EMC compliant power supply with the following specifications when employing the pressure 4-20 mA output:

Supply voltage max.	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0.26 mH
Capacity max.	9.7 nF

Operate only with an intrinsically safe, EMC compliant power supply with the following specifications when employing the temperature 4-20 mA output:

Supply voltage max.	30 V DC
Current output max.	125 mA
Power output max.	900 mW
Inductivity max.	0 mH
Capacity max.	52 nF

ATTENTION ESD sensitive component. Electrostatic discharge may damage the PT. Take ESD precautions.

ATTENTION The electrical connection must comply with EMC requirements.

ATTENTION If the electrical connection is not made as described in chapter 6.6.1, or if cables / cable connectors / cable glands other than those stipulated by **DYNISCO** are used, **DYNISCO** cannot guarantee that EMC requirements will be satisfied.

6.6.1 EMC / CE Compliant Connection

- Earth the machine section with the screw-in trunnion / mounting hole for the PT in accordance with regulations. The PT must be connected to earth via the screw-in trunnion / mounting hole.
- Connect the shield of the connecting cable on both sides, making sure it conducts with full and continuous contact.
- When introducing the connecting cable into an EMC compliant switch cabinet, for example, connect the shield correctely (cable gland, conducting, full contact, continuous) to the conductive housing or route it via built-in cable connector that is also connected to the conductive housing.
- Connect unused cable cores or free cable ends correctely to the cable shield on both sides.

6.7 Connection Assignments

Pressure	Red	(+)
	Black	(-)
Temperature	Brown	(+)
	Black	(-)

START

7. COMMISSIONING

7.1 INSTALLATION AND MOUNTING

Please read the entire manual prior to installation and use.

- Do not remove protective cap until ready to install.
- Prior to initial installation, verify correct machining of mounting hole.
- When reinstalling, make sure mounting hole is clear of frozen plastic.
- Transducer should be removed when at operating temperature (no pressure in system).

7.1.1A HAZARDOUS AREA INSTALLATIONS

Dynisco's IPX II Series of Smart Pressure Transmitters are designed with circuitry suitable for operation in a Class I , Division 1, Groups B, C & D, Class I/II, Division 2, Groups E, F & G hazardous area. An explosion-proof electronics housing is standard on all IPX II Series models. The specific approvals carried by individual transmitters are marked on the label. Refer to the product data sheet for the most current information on these approvals.

7.1.1B INTRINSICALLY SAFE INSTALLATIONS

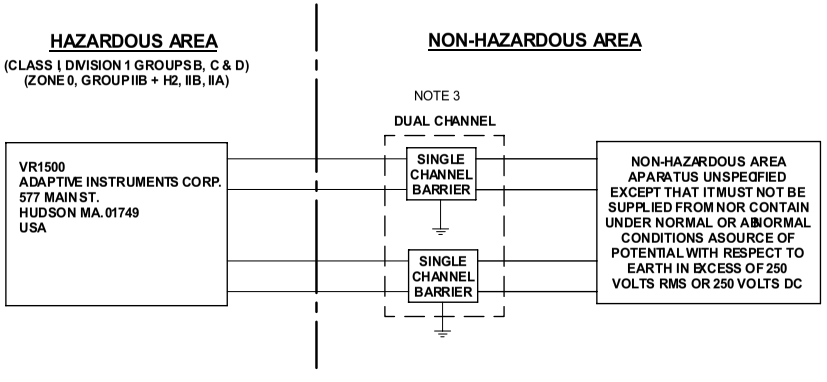
Dynisco's IPX II Series of Smart Pressure Transmitters are designed with circuitry suitable for operation in Intrinsically safe environments, with an approval code of EEx ia IIC T4.

The customer is required to install an approved galvanic barrier with entity parameters from Drawing 000092.

The specific approvals carried by individual transmitters are marked on the label. Refer to the product data sheet for the most current information on these approvals.

ATTENTION Each sensor cable supplied with a cap plug (Dynisco P/N 598091) to protect the Bendix connector from environmental conditions. Do not remove cap plug until you are ready to connect to the sensor assembly.

INSTALLATION DRAWING FOR INTRINSICALLY SAFE MODELS



NOTES:

1. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING AN AC TEST VOLTAGE OF 230 VOLTS R.M.S. TO EARTH OR FRAME OF THE APPARATUS FOR ONE MINUTE.

2. CABLE CAPACITANCE AND INDUCTANCE PLUS THE I.S. APPARATUS UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) MUST NOT EXCEED THE ALLOWED CAPACITANCE (Ca) AND INDUCTANCE (La) INDICATED ON THE ASSOCIATED APPARATUS.

3. ANY POSITIVE POLARITY SHUNT ZENER DIODE BARRIER APPROVED BY THE APPLICABLE AGENCY USED IN THE APPLICABLE GROUPS:
   FMRC & CSA - GROUPS B, C & D
   CENELEC - GROUPS IIB +H2, IIB & IIA

   WITH THE FOLLOWING OUTPUT PARAMETERS:
   Voc or Vt less than or equal to 30VDC
   Isc or It less than or equal to 125 mA
   Ca greater than or equal to Ci + C cable
   La greater than or equal to Li + L cable

4. THE INSTALLATION INCLUDING THE BARRIER EARTHING ARRANGEMENTS MUST COMPLY WITH THE INSTALLATION REQUIREMENTS OF THE COUNTRY OF USE:

   * FOR CENELEC MEMBERS: IEC 1010-PT1 (Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use - General Requirements) which is similar to BS EN 61010.

5. SYSTEM LABEL TO BE AFFIXED AT THE INTERFACE OF 'IS' OR 'NON-IS'' CIRCUITS OR ADJACENT TO THE PRINCIPAL APPARATUS.

7.1.1C Temperature Environment

IPX II Series transmitter electronics will operate within specifications over the ambient temperature range of 0°C to 80°C (32°F to 176°F). The location of the electronics housing should be in an area where the ambient temperature is within this range.

7.1.1D Electrical Guidelines

Dynisco's IPX II Series of Smart Pressure Transmitters provide a digitally enhanced 4-20 mA current signal output that is transmitted to the control room via two wires. Proper electrical installation is necessary to prevent errors due to electrical noise.

7.1.2 Power Supply

7.1.2A Non-Intrinsically Safe Power Supply

The power supply should provide 12-42 V dc. The load resistance is the sum of the resistance of the signal leads and the load resistance of any indicator, controller, or other devices in the loop. Total load resistance must be **250 ohms** or greater for communication with the Model 275 HART Communicator. Refer to Table 7-3.

7.1.2B Intrinsically Safe Power Supply

The power supply should provide 12-30 V dc. The load resistance is the sum of the resistance of the signal leads and the load resistance of any indicator, controller, or other devices in the loop. See technical specifications for complete power supply requirements.

7.1.3 Mounting the Transmitter

Failure to use the recommended mounting hole may result in erroneous pressure measurement, difficult transmitter removal, premature sensor failure, process fluid leaks, and personnel hazard. In applications involving high temperature operation and/or repeated thermal cycling a good, high quality anti-seize compound should be applied to threaded surfaces.

7.1.3A Gaskets for Mounting XX195X Transmitter

Different mounting gaskets are available. Refer to Table 7-1 for the correct mounting configuration for proper installation.

Table 7-1 Various Mounting Gaskets

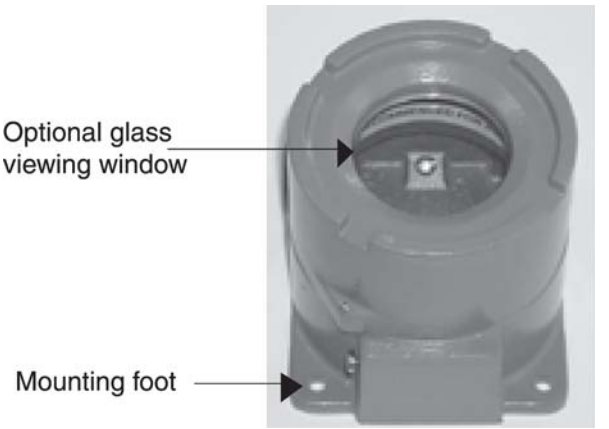
PRESSURE RANGE	GASKET P/N
0 - 3M	**494602** (ALUMINUM)
0 - 10M	**634001** PARKERIZED CARBON STEEL
	634002 (HASTELLOY)
	634004 (303 SST)

7.1.4 Installation of the Electronics

7.1.4A Process Electronics Housing

The IPX II Series of Smart Pressure Transmitters process housing always includes an electronics module. An optional dual LCD display may be ordered. If the display option is selected the IPX II Series Smart Pressure Transmitter is supplied with a glass viewing window. Figure 7-1 is an example of the process housing with an optional glass viewing window.

Fig. 7-1 Process Housing



7.1.4B MOUNTING THE PROCESS ELECTRONICS HOUSING

The IPX II Series Smart Pressure Transmitter housing has two “feet” used for mounting on a flat surface or on a pipe using a u-bolt pipe mounting bracket, see Figure 7-1.

The optional 2” Pipe Mounting Bracket kit can be supplied with the process electronics housing. This mounting bracket can be set-up in a number of different orientations. The metal plate is attached to the process housing with the kit’s enclosed hardware.

ATTENTION To remove the cover of the IPX II in a hazardous location the power to the transmitter must be off. With the Intrinsically Safe product, galvanic barrier limits the power so it is safe to remove cover.

In addition, if the LCD display option is utilized, the electronics inside the housing can be rotated in 900 intervals. To do this remove the two 6-32 machined screws, rotate the electronics to the required position, and replace the two machined screws. Note the position of the screws may change depending on the position of the electronics module.

7.1.4C CONDUIT MOUNTING

The weatherproof housing has two 3/4” female NPT conduit entries (one is used for the pressure sensor input). These can be used to mount the housing directly onto the 3/4” male NPT ends of rigid conduits. Alternatively, a union coupling can be placed between the weatherproof housing and the wiring from the signal source.

All connections must be accessible in a Class 1 Division 1, Groups B, C & D instrument enclosure (customer supplied), installed per NEC (NFPA 70, Article 500). A junction box is required, per NFDA 70, Article 500, so to terminate the output cables.

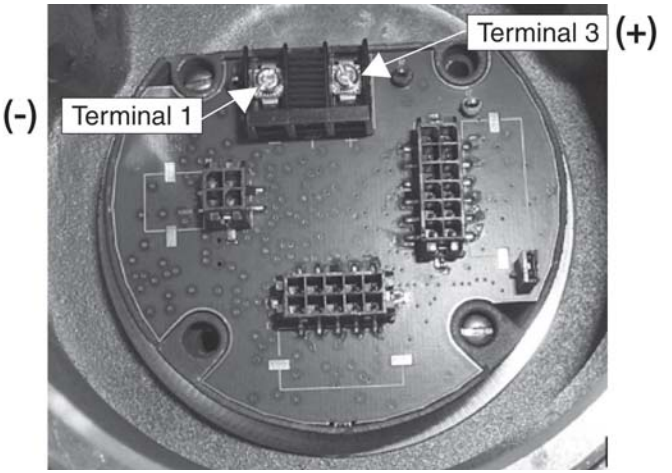
7.1.5 ELECTRICAL INSTALLATION

The IPX II Series Smart Pressure Transmitter has two groups of terminals.

HAZARD: Never power an explosion proof product in a hazardous area with the instrument enclosure open.

Terminals 1 and 3 are the 4 to 20 mA output terminals. Terminal 2 is not used. These are normally connected to the corresponding polarity terminals of the power supply of the current loop. Refer to Figure 7-2 for the terminal connections arrangement.

Fig. 7-2 Terminal Connections



ATTENTION The use of an appropriate power supply is important. A 24 V dc supply having a current handling capacity of at least 0.1A is commonly used. Always use a dc (direct current) supply, or suitable size battery. **Never connect the IPX II Series Smart Pressure Transmitter directly to 115VAC or 230VAC.**

With the power supply off, connect the (+) side of the power supply to the (+) OUT terminal of the electronics module. Connect the (-) side of the power supply through a 250Ω resistor to the (-) OUT terminal of the electronics module. See Figure 7-2. Connect the input terminals 1 and 3 in series with the current loop to be measured. Terminal 1 should be more positive than 3.

Current Input High (+MA)
Current Input Low (-COM)

The output can be monitored by connecting a multi-meter in series with either of the two output terminals, or by connecting a high impedance voltmeter across the 250Ω resistor. Turn on the power supply. In about 5 seconds the IPX II Series Smart Pressure Transmitter loop current will settle to its normal value in the range of 4 to 20 mA.

If the unit has been ordered with optional dual LCD display, the display and display adapter must be removed to connect the 24 V dc power to the unit. The display pulls off the display adapter, see Figure 7-3.

There are two types of display adapters, the standard without a second 4-20mA output for temperature or an adapter with a second 4-20 mA output for temperature. The display adapter is connected through standoff posts by two 6-32 screws.

Fig 7-3 Dual LCD Display with an optional 2nd 4-20 mA Output

Remove the screws to remove the adapter board. Carefully handle the adapter board and wiring to avoid any damage. With the power supply off, connect the (+) side of the power supply to the (+) OUT terminal of the electronics module. Connect the (-) side of the power supply through a 250Ω resistor to the (-) OUT terminal of the electronics module. See Figure 7-2. Connect the input terminals 1 and 3 in series with the current loop to be measured. Terminal 1 should be more positive than 3.

7.1.5A Temperature Output

If the optional second 4-20 mA adapter board was ordered, the terminals 1 (+), 2 (-) on the adapter board would also be connected to the 24 V dc power supply. This will provide the snout temperature from the RTD in the process (located next to the diaphragm). Replace the display by aligning the holes with pins and pushing the display gently into place. At this time you are ready for set-up using the display, or the optional SmartLink software/modem or the optional HART 275 communicator.

7.1.5B 4–20 mA Transmitter Output Cable

The IPX II is supplied with a 11.5' (3.5 m) cable for the transmitter output. A breakdown of the wiring schematic is displayed in Table 7-2.

Table 7-2 Output Cable Wiring Specifications

Pressure	Red	(+)
	Black	(-)
Temperature	Brown	(+)
	Black	(-)

7.1.5C OUTPUT TERMINALS/CABLE

The output terminals are connected to a power supply having a nominal 24 V dc voltage and capable of supplying 100 mA for the IPX II. In the analog mode, these units require a maximum of only 24 mA. Optionally a load resistor, typically **250Ω**, may be connected in series with either terminal of the pressure transmitter (for HART digital communications with the IPX II, this 250Ω resistor is required). The maximum series resistance in the circuit (including wiring lead resistance) can be calculated using the formula:

$$Rs = \frac{Vs - 12}{0.023}$$

Table 7-3 gives maximum series resistance:

Table 7-3 Maximum Series Resistance

Max. Series Resistance Ωx	Min. Supply Voltage (V)
1300	42.0
520	24.0
417	21.6
250	18.0
0	12.0

7.1.5D CASE GROUND

For safety, optimum performance and EMI immunity the case of the instrument should be connected to a good local earth ground. When using grounded sensors that are connected to the local electrical ground, the pressure transmitter case should be connected to that same ground point.

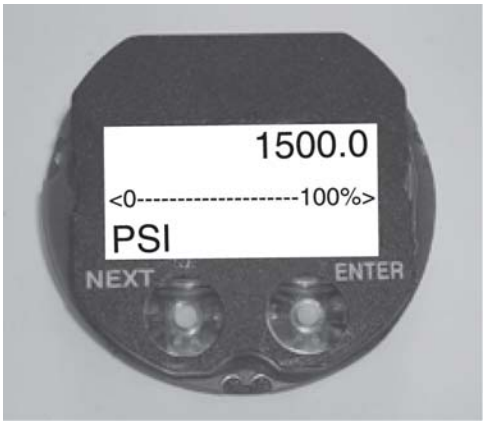
7.2 Configuration Using the Display

7.2.1 Optional Analog Operating Mode with Display

If the IPX II Series Smart Pressure Transmitter was ordered with the display option, it has a small local dual LCD display module plugged into the display adapter. The display option can be ordered from the factory installed on the IPX II Series Smart Pressure Transmitter or can be ordered at a later date and installed on site. Having the display option as part of the IPX II Series Smart Pressure Transmitter does not affect its operation in the analog mode and the description of the previous section applies.

However, the display option does provide some very useful local indication of the measured pressure, temperature and other diagnostic functions. Figure 7-4 below indicates the arrangement of the display screen and some of the symbols that are available.

Fig. 7-4 Dual LCD display with simulated readout



The top row displays the measured variable. A minus sign can be displayed if applicable. Depending on the input selected the number of decimal places displayed changes.

The mid portion is an analog bar graph display showing the % of range based on the ZERO and FULL-SCALE setting of the IPX II Series Smart Pressure Transmitter. When power is applied, the leftmost segment of the bar graph, the 0%, and the 100% become energized. If the input signal is below what the ZERO is set to, then the left arrow is energized. If the input signal is above the FULL-SCALE setting, then the right arrow becomes energized.

The bottom portion of the LCD is capable of displaying alphanumeric messages. In normal operation this row shows a label, which is factory set to display the model number and pressure unit. Seven or eight characters are available per screen. The user may order a desired label in place of the model number.

In the event of certain IPX II Series Smart Pressure Transmitter failure modes, the lower portion of the display changes to either **S FAULT** or **X FAULT**.

This LCD display takes full advantage of the precision of the IPX II Series Smart Pressure Transmitter. The digital display of the measurement does not include the small D/A error present in the analog output. It provides highly accurate local indication of the measurement, local fault diagnostics, and the IPX II Series Smart Pressure Transmitter identification. The LCD continues to display the measured variable even if it is beyond the zero and span limits set for the analog output. The value of this display as a set-up, calibration and reconfiguration tool may even be greater.

7.2.2 CONFIGURING THE IPX II

If the optional dual LCD display is ordered, configuration of an IPX II Series Pressure Transmitter is possible. This inexpensive option makes reconfiguration or re-ranging of the transmitter simple and easy.

In the event that the dual LCD display is not purchased at the same time as the transmitter, one must follow the field installation instructions supplied with the display very carefully to avoid damage to the transmitter or the display, itself.

7.2.2A OPERATE MODE

The **Operate Mode** will allow the user to do the following:

- See Display Status
- Select Pressure Units
- Select Process Temperature Units
- Sensor Position Adjust
- Change ZERO (Change the 4 mA Lower Range Value)
- Change FULL SCALE (Change the 20 mA Full Scale Value)
- Set Line Frequency Filter
- Select Transmitter Fail-safe
- Trim 4 mA (Trim the 4.0 mA output current)
- Trim 20 mA (Trim the 20.0 mA output current)
- Set Sensor Zero Trim
- Set Sensor Full Scale Trim
- Reset Sensor Trim
- Set Offset
- Change Language
- Return to Operate Mode

Each of these functions is presented in sequence on the LCD display.

To start the **Operate Mode**, first connect the IPX II Series Smart Pressure Transmitter to an appropriate DC power supply. Typically a 24 V dc supply is connected to the IPX II Transmitter. The power supply's (+) terminal is connected to the transmitter's output (+) terminal and the (-) side of the power supply is connected to the transmitter's output (-) terminal. A minimum **250Ω** series resistor in the loop is required. A process sensor must be connected to the transmitter's input connectors for setting up the transmitter.

7.2.2B ENTERING OPERATE MODE

Once the IPX II Series Smart Pressure Transmitter is powered up, the display comes on in the standard operating mode. With the standard factory set-up and precess sensor connected, the dual LCD display will give the following indication:

0000.0	0000.0	0000.0
0%----------100%	0%----------100%	0%----------100%
IPX II	**XMITTER**	**PSI**

Note that when more than seven or eight characters are required to describe a function's label, the display will continuously alternate through multiple screens. In this section of the manual, placing two or more display messages adjacently indicates alternating displays, as above. The dual LCD display, with some functions, will display a numeric value on the top line of the display in addition to a message on the lower display line.

The IPX II Smart Pressure transmitter may display a pressure, this is caused by the difference in the elevation between the sensor and process connection. This is corrected in a set-up procedure called Set Position Adjust.

Please note that if the display is plugged into the IPX II while it is powered up, the menu sequence may not start at the beginning. To return the display to the normal operating mode power down the IPX II without disconnecting the display or simply wait about two minutes for the transmitter to reset itself.

Press and release the **NEXT** key immediately followed by the **ENTER** key. This will start the Operate Mode. The **DISPLAY MODE** is the first set-up menu.

DISPLAY	**MODE?**

NOTE: Whenever the IPX II Series Smart Pressure Transmitter is in the display set-up mode, if after approximately 2 minutes there is no activation of the keypad the transmitter will return to the **OPERATE MODE**. One can also return to the **OPERATE MODE** at any point in during the **DISPLAY MODE** by removing power from the transmitter for about 30 seconds, then reapplying power.

7.2.2C SELECT DISPLAY STATUS

Press the **ENTER** key. This will allow you to set-up the transmitter using the Operate Mode. A flow chart summarizing the operation is in section 7.2.3.

The **DISPLAY STATUS** is the first function in the sequence. The display will read as follows to indicate this position on the menu:

DISPLAY	**STATUS?**

Press the **ENTER** key to see the current set-up of the IPX II Series Smart Pressure Transmitter. Use the **NEXT** key to continue onto the next function.

7.2.2D SENSOR UNITS

The **SELECT PRESSURE UNITS** is the next function in the sequence. The display will sequence as follows:

SELECT	**PRESS**	**UNITS?**

The factory set default is **PSI**. If the factory set default is the required pressure unit press the **NEXT** key to move onto the next function. If a change is required, press the **ENTER** key to go into the list of pressure units. Use the **NEXT** key to sequence through the selectable pressure units. One can stop at any one of the pressure selections by pressing the **ENTER** key, this changes the IPX II to the required units of pressure. The list of pressure units is listed below:

PSI?

(Pounds per square inch)

Press the **NEXT** key to go to the next unit (continue to do this until the desired pressure unit is listed and then press **ENTER**).

BAR?

(Bar)

MBAR?
(Millibar)

GM/SQCM
(Grams per square centimeter)

KG/SQCM
(Kilograms per square centimeter)

PASCAL?
(Pascal)

KPASCAL
(Kilopascal)

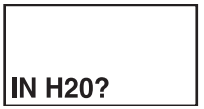
TORR?
(Torr)

ATMS?
(Atmospheres)

PER FS?
(Percent full scale)

MPASCAL?
(Megapascal)

(The “special” pressure units is a programmable engineering unit that is not already listed.)



(Inches of water)

(Inches of mercury)

(Feet of water)

(Millimeters of water)

After pressing **ENTER** to select the desired pressure units the display returns to:

Press the **NEXT** key to move on to the next function.

7.2.2E SENSOR TEMPERATURE UNITS

The **SELECT TEMPERATURE UNITS** is the next function in the sequence. The display will read as follows to indicate this position on the menu:

The factory set default is **DEG C** (°C). If the factory set default is the required temperature unit press

the **NEXT** key to move onto the next function. If a change is required, press the **ENTER** key to go into the list of temperature units. Use the **NEXT** key to sequence through the selectable temperature units. One can stop at any one of the temperature selections by pressing the **ENTER** key. This changes the IPX II Series Smart Pressure Transmitter mode to the required temperature units. The list of temperature units is listed below:

DEG C?

(Degrees Celcius)

Press the **NEXT** key to go to the next unit (continue to do this until the desired temperature unit is listed and then press **ENTER**).

DEG F?

(Degrees Fahrenheit)

DEG R?

(Degrees Rankin)

DEG K?

(Degrees Kelvin)

After pressing **ENTER** to select the desired temperature units the display returns to:

SELECT	TEMP	UNITS?

Press the **NEXT** key to move onto the next function.

7.2.2F SENSOR POSITION ADJUSTMENT

The next function of the IPX II Series Smart Pressure Transmitter will adjust the actual installed sensor position. Any "shift" caused by elevation will be removed using this adjustment.

ATTENTION Failure to apply sensor position adjustment may cause inaccuracy in the pressure measurement.

The display will sequence as follows:

SENSOR	POSIT~~N	ADJUST?

Press the **ENTER** key to begin the **SENSOR POSITION ADJUSTMENT** sequence of displays. The sequence of displays will be follows (there are seven displays in this sequence):

XXXX.X SET	XXXX.X SENSOR	XXXX.X TO ZERO
XXXX.X ENTER	XXXX.X TO CONT	XXXX.X NEXT
XXXX.X TO EXIT		

Press the **ENTER** key to set the sensor to zero. Press the **NEXT** key to exit out of the **SENSOR POSITION ADJUSTMENT** sequence. After pressing the **NEXT** key the display returns to:

SENSOR	POSIT~~N	ADJUST?

Press the **NEXT** key again to go onto the next function.

7.2.2G CHANGE ZERO

The next function of the IPX II Series Smart Pressure Transmitter is **CHANGE ZERO**. The display will read as follows:

0000.0 CHANGE	0000.0 ZERO?

The electronics will adjust the 4.0 mA output signal to the lower range value. Typically, this value is set to zero. The numeric value in the upper portion of the LCD display is the current **ZERO** value. The **ZERO** (known as the LOWER RANGE VALUE or LRV) can be changed, totally independent of the FULL

SCALE VALUE (known as the UPPER RANGE VALUE or URV) or the sensor position adjustment without the use of any calibrators or external sensor inputs. To change to **ZERO**, press the **ENTER** key. The display changes to:

```
      0000.0

PLUS?
```

This indicates the existing **ZERO** is set to "plus" oooo.o. The question is asking if this value is to remain positive. By pressing the **NEXT** key the display will change to:

```
     -0000.0

MINUS?
```

After determining whether the LRV, is to remain positive (PLUS ?) or negative (MINUS ?), press the **ENTER** key. This display will change to:

```
      40000.0

10THOU?
```

The leftmost digit position will start blinking (shown in italics) denoting that the ten thousands position needs to be changed. To change the thousands position, press the **NEXT** key. The leftmost digit will increment through 1 2 3 4 5 6 7 8 9 0. When the desired numeral is reached stop. Press the **ENTER** key to accept the selection. If the numeral selected is zero then the display would change to:

```
      04000.0

THOUSN?
```

ATTENTION Selecting different pressure units will give you different upper range limits. Not all units of pressure will, for example, allow you to change the thousands digit. These different units will then have more rangability at the low end of the scale.

It is possible to apply and offset of the LRV up to 84% of the full-scale value. In certain applications, the increased resolution would provide additional process data.

The second digit from the left will start blinking (shown above in italics) denoting the thousands position is ready to be changed. As before, change the number in this digit position by continuously pressing the **NEXT** key until the desired numeral is reached. Then press the **ENTER** key to select the

desired number and move to the next lower significant digit position. Each time the **NEXT** key will cycle through the ten choices for that digit position, the **ENTER** key will display the selected number. Once the digit position is changed, the next significant digit will blink. The legend on the display will change to:

00400.0
HUNDRD?

00040.0
TENS?

00004.0
ONES?

00000.4
TENTHS?

Continue to modify the significant digits until the desired number is reached. After the final digit position has been changed, pressing of the **ENTER** key returns the transmitter to the alternating display of:

0000.0
CHANGE

0000.0
ZERO?

Press the **NEXT** key to proceed to the next menu selection, **CHANGE FULL SCALE**.

7.2.2H CHANGING FULL SCALE VALUE

The next function of the IPX II Series Smart Pressure Transmitter is **CHANGE FULL SCALE**. The display will read:

1500.0
CHANGE

1500.0
FULL

1500.0
SCALE?

To change the full-scale value press the **ENTER** key. The procedure for selecting PLUS ? or MINUS ? is identical to that described for **CHANGE ZERO**. Similarly, the procedure for changing each of the digit positions is identical to that described for **CHANGE ZERO**.

The displays are listed below for changing the full scale value.

1500.0	1500.0
CHANGE	PLUS?

Press the **NEXT** key to toggle between displays:

1500.0	-1500.0
PLUS	MINUS?

After determining whether the URV, is to remain positive (PLUS ?) or negative (MINUS ?), press the **ENTER** key. The display will change to:

*0*1500.0
10THOU?

0*1*500.0
THOUSN?

01*5*00.0
HUNDRD?

015*0*0.0
TENS?

0150*0*.0
ONES?

01500.*0*
TENTHS?

Continue to modify the significant digits until the desired number is reached. After the final digit position has been changed, press the **ENTER** key to return the transmitter to the alternating display of:

1500.0	1500.0	1500.0
CHANGE	FULL	SCALE?

Press the **NEXT** key to proceed to the next menu selection, **LINE FREQUENCY FILTER**.

7.2.21 LINE FREQUENCY FILTER

The next function of the IPX II Series Smart Pressure Transmitter is **LINE FREQUENCY FILTER**. This function allows for selecting filtering of the signal based upon the input voltage. The display will sequence as follows:

LINE	FREQUEN	FILTER?

If the factory set default, **60 Hz**, is the required frequency of filtering press the **NEXT** key to move onto the next function. If different filtering is required, press the **ENTER** key to enter into the list of filter choices. Use the **NEXT** key to sequence through the selectable filter options. Stop at the desired filter, select it by pressing the **ENTER** key. The list of filter options are:

60 HZ

Press the **NEXT** key to go to the next option (continue to do this until the desired additional filter is listed and then press **ENTER**).

50 HZ

After the filtering has been added, press the **ENTER** key to return the transmitter to the alternating display of:

LINE	FREQUEN	FILTER?

Press the **NEXT** key to proceed to the next menu selection, **SELECT TRANSMITTER FAIL SAFE**.

7.2.2J SELECT TRANSMITTER FAIL SAFE

The next function of the IPX II Series Smart Pressure Transmitter is **SELECT TRANSMITTER FAIL SAFE**. The display will sequence as follows (there are 4 displays):

SELECT	XMITTER
FAIL	SAFE?

Fail-safe allows the transmitter to change the 4-20 mA loop to display a failure condition. This failure may be a sensor failure or a transmitter failure. The user may select to drive the loop to 22.0 mA, corresponding to the "HIGH" selection, and/or to 3.6 mA, corresponding to the "LOW" selection, or to turn the function "OFF".

Press the **NEXT** key to move onto the next function. To change the Fail Safe setting, press the **ENTER** key to enter into the list of Fail Safe options use the **NEXT** key to sequence through the selectable Fail Safe options. Stop at desired Fail Safe options by pressing the **ENTER** key. The list of Fail Safe options are listed below:

OFF?

Press the **NEXT** key to go through the Fail Safe options (continue to do this until the desired option is reached and then press **ENTER**).

LOW?
HIGH?

After the desired Fail Safe option has been selected, the transmitter will return to the alternating display of:

SELECT	XMITTER

FAIL	SAFE?

Press the **NEXT** key to proceed to the next menu selection, **TRIM 4 MA**.

7.2.2K TRIM 4 MA

The next function of the IPX II Series Smart Pressure Transmitter is **TRIM 4 MA.** This allows trimming of the 4 mA output current. The display will sequence as follows:

TRIM	4 MA?

ATTENTION This function is only for the purpose of adjusting the 4 mA limit of the IPX II Series Smart Pressure Transmitter loop current to be exactly 4 mA according to the plant's local standard. This is NOT for the purpose of ranging the transmitter!

The 4 mA limit is factory calibrated to a precision standard. Do not arbitrarily trim the output unless a qualified and accurate local standard is available to measure the adjusted 4 mA output! Also note that the 4 mA limit should not be trimmed by more than about + 50 µA, or the transmitter operation may be impaired.

If trimming the 4 mA limit is still required press the **ENTER** key. The IPX II Series Pressure Transmitter will now output a current equal to its internally set 4 mA current. This 4 mA value should be read on an external meter and compared to a local standard. It is advisable to use a well calibrated voltmeter to make these comparisons. It is very possible that the IPX II Series transmitter will be more accurate than many voltmeters. In this case, trimming will make the IPX II Series Smart Pressure Transmitter less accurate rather than more accurate!

Once **TRIM 4 MA** has been selected, the display will alternate as follows:

RAISE	MA OUT?

By pressing the **NEXT** key the display then changes to and alternates:

LOWER	MA OUT?

When it is decided whether to raise or lower the output current, press the **NEXT** key, to raise (lower) the 4 mA output signal. Now every time the **NEXT** key is pressed, the display blinks, and the 4 mA output limit decreases (-) or increases (+). The decrease or increase is in approximately 2µA increments.

Once the desired trim is reached, press the **ENTER** key to return to either:

RAISE	**MA OUT?**

or

LOWER	**MA OUT?**

Pressing the **NEXT** key changes to the next function.

7.2.2L TRIM 20 MA

The next function of the IPX II Series Smart Pressure Transmitter is **TRIM 20 MA**. This allows trimming of the 20 mA output current. The display will sequence as follows:

TRIM	**20 MA?**

ATTENTION This function is only for the purpose of adjusting the 20 mA limit of the IPX II Series Smart Pressure Transmitter loop current to be exactly 20 mA according to the plants local standard. This is NOT for the purpose of ranging the transmitter!

The 20 mA limit is factory calibrated to a precision standard. Do not arbitrarily trim the output unless a qualified and accurate local standard is available to measure the adjusted 20 mA output! Also note that the 20 mA limit should not be trimmed by more than about + 50 µA, or the transmitter operation may be impaired.

If trimming the 20 mA limit is still desired press **ENTER**. The IPX II Series Smart Pressure Transmitter will now output a current equal to its internally set 20 mA current. This 20 mA value should be read on an external meter and compared to a local standard. It is advisable to use a well calibrated voltmeter to make these comparisons. It is very possible that the IPX II Series Smart Pressure Transmitter will be more accurate than many voltmeters. In this case, trimming will make the IPX II Series Smart Pressure Transmitter less accurate rather than more accurate!

Once **TRIM 20 MA** has been selected, the display will alternate as follows:

RAISE	MA OUT?

By pressing the **NEXT** key the display changes to:

LOWER	MA OUT?

When it is decided whether to raise or lower the output current, press the **NEXT** key, to raise (lower) the 20 mA output signal. Now every time the **NEXT** key is pressed, the display blinks, and the 20 mA output limit decreases (-) or increases (+). The decrease or increase is in approximately 2µA increments.

Once the desired trim is reached, press the **ENTER** key to return to either:

RAISE	MA OUT?

or

LOWER	MA OUT?

At this point one may still go back and do further trimming of the 20 mA limit by pressing the **ENTER** key. Pressing the **NEXT** key returns to the following display sequence:

TRIM	20 MA?

Pressing the **NEXT** key changes to the next function.

7.2.2M SENSOR ZERO TRIM

This function allows the user to apply the **LOWER RANGE VALUE** (LRV) to the transmitter. The display sequence is:

SENSOR	ZERO	TRIM?

ATTENTION This function is only for the purpose of applying the ZERO TRIM of the IPX II Series Smart Pressure Transmitter pressure to be exactly the LRV value. This is **NOT** for the purpose of ranging the transmitter!

The ZERO output is factory calibrated to a precision pressure standard. Do not arbitrarily ZERO the output unless a qualified and accurate local standard is available to measure the adjusted pressure!

If applying the **LOWER RANGE VALUE** is not needed press the **NEXT** key to move onto the next function. If a **LOWER RANGE VALUE** is still desired, press the **ENTER** key. The display will change to:

XXXX.X APPLY	XXXX.X LVR TO	XXXX.X SENSOR
XXXX.X THEN	XXXX.X PRESS	XXXX.X ENTER

To apply the LRV press the **ENTER** key. Press the **NEXT** key to return the display to the following sequence:

SENSOR	ZERO	TRIM?

Press the **NEXT** key to proceed to the next menu selection, **SENSOR FULL SCALE TRIM**.

7.2.2N SENSOR FULL SCALE TRIM

This function allows the user to apply the **UPPER RANGE VALUE** (URV) to the transmitter. The display sequence is:

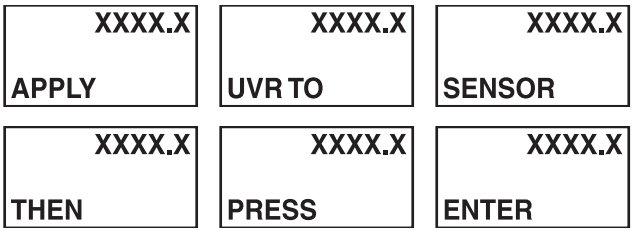
SENSOR	FULL
SCALE	TRIM?

ATTENTION This function is only for the purpose of applying the **FULL SCALE TRIM** of the IPX II

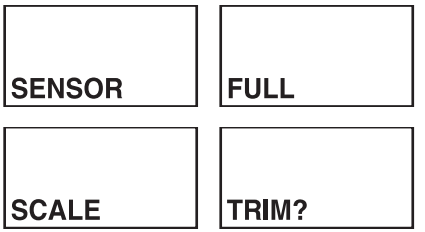
Series Smart Pressure Transmitter pressure to be exactly the URV value. This is **NOT** for the purpose of ranging the transmitter!

FULL SCALE TRIM output is factory calibrated to a precision pressure standard. Do not arbitrarily **FULL SCALE TRIM** the output unless a qualified and accurate local standard is available to measure the adjusted pressure!

If applying the **UPPER RANGE VALUE** is not needed press the **NEXT** key to move onto the next function. If a **UPPER RANGE VALUE** is still desired, press the **ENTER** key.



To apply the URV press the **ENTER** key. Pressing the **NEXT** key to return the display to the following sequence:



Press the **NEXT** key to proceed to the next menu selection, **RESET SENSOR TRIM**.

7.2.20 RESET SENSOR TRIM

The next function of the IPX II Series Smart Pressure Transmitter is **RESET SENSOR TRIM**. This function allows for resetting the sensor trim back to factory default. The display will sequence as follows:

If the sensor trim does not need to be reset press the **NEXT** key to move onto the next function. Otherwise press the **ENTER** key.

CONFIRM	RESET?

To confirm the resetting of the trim press the **ENTER** key. After the trim has been reset the display will return to:

RESET	SENSOR	TRIM?

Press the **NEXT** key to proceed to the next menu selection, **OFFSET**.

7.2.2P OFFSET

The next function of the IPX II Series Smart Pressure Transmitter is **OFFSET**. This function provides an additional offset to the display. The display will sequence as follows:

0.0
OFFSET?

If an additional offset is not needed press the **NEXT** key to move onto the next function. To add an additional offset press the **ENTER** key. To toggle through the offset options press the **NEXT** key. They are listed below:

0.0
PLUS?

0.0
MINUS?

After determining whether the **OFFSET**, is to be added to (PLUS ?) or subtracted from (MINUS ?), press the **ENTER** key. The leftmost digit position will start blinking (shown in italics). Press the **NEXT** key to increment through 1 2 3 4 5 6 7 8 9 0. When the desired numeral is reached, press the **ENTER** key to accept the selection.

The second digit from the left will start blinking. As before, change the number in this digit position by continuously pressing the **NEXT** key until the desired numeral is reached. Then press the **ENTER** key to move to the next lower significant digit position. Each time the **NEXT** key will cycle through

the ten choices for that digit position, press the **ENTER** key to select the desired number. Once the digit position is changed, the next significant digit will blink.

Continue to modify the significant digits until the desired number is reached. After the final digit position has been changed, pressing of the **ENTER** key returns the transmitter to the display of:

Press the **NEXT** key to proceed to the next menu selection, SELECT LANGUAGE.

7.2.2Q SELECT LANGUAGE

The next function of the IPX II Series Smart Pressure Transmitter is **SELECT LANGUAGE**. The display provides the option of changing the language from English to French, German, Spanish or Italian. The display will sequence as follows:

The factory set default is **ENGLISH**. If the factory set default is the required language press the **NEXT** key to move onto the next function. If a change is required, press the **ENTER** key to go into the list of selectable languages. Use the **NEXT** key to sequence through the options. One can stop at any one of the language selections by pressing the **ENTER** key. The list of languages are below:

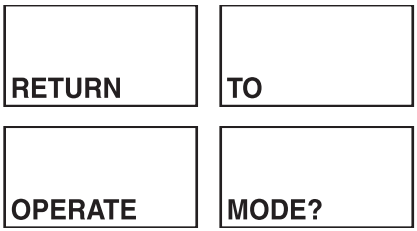
Press the **NEXT** key to go to the next language (continue to do this until the desired language is listed and then press **ENTER**).

After pressing **ENTER** to select the desired language the display returns to:

Press the **NEXT** key to proceed to the next menu selection, **RETURN TO OPERATE MODE**.

7.2.2R RETURN TO OPERATE MODE

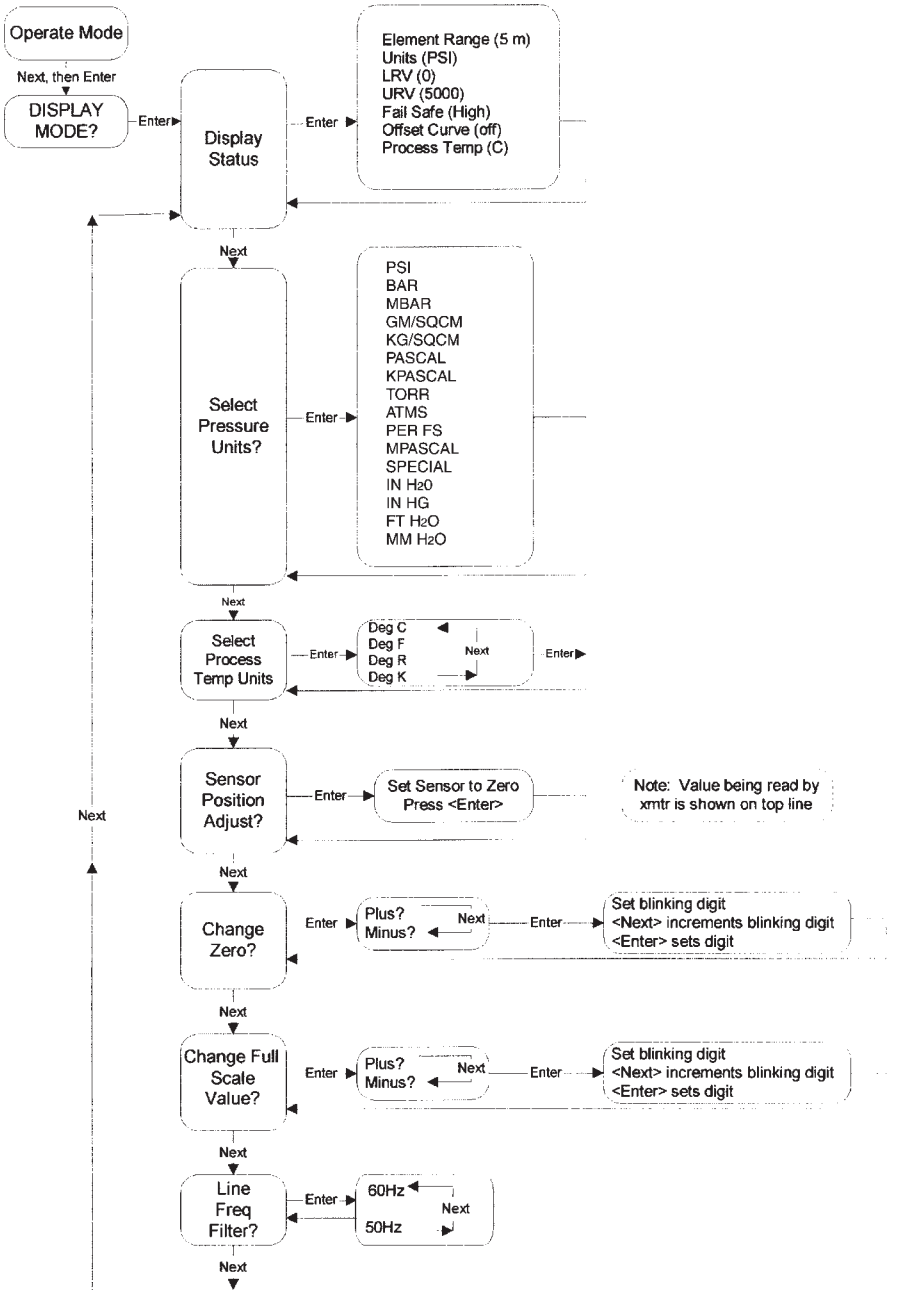
The final function of the IPX II Series Smart Pressure Transmitter is **RETURN TO OPERATE MODE**. The display will sequence as follows:



If all of the set-up and re-ranging operations have been completed, either press the **ENTER** key or wait five (5) seconds. At this point the transmitter will return to the normal operating mode.

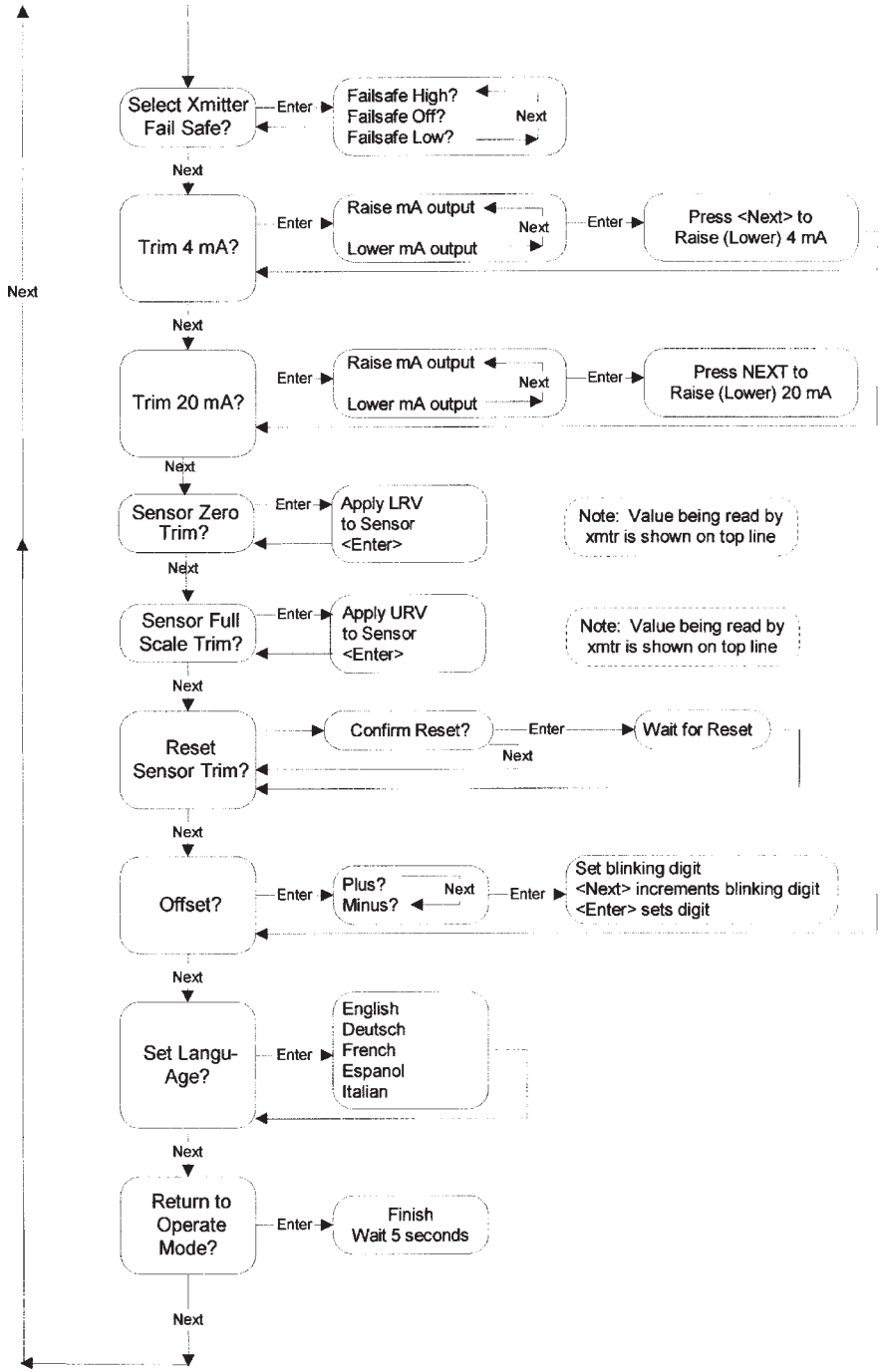
ATTENTION Whenever the IPX II Series Smart Pressure Transmitter is in the display set-up mode, if after approximately 2 minutes there is no activation of the keypad the transmitter will return to the **OPERATE MODE**. One can also return to the **OPERATE MODE** at any point in during the **DISPLAY MODE** by removing power from the transmitter for about 30 seconds, then reapplying power.

7.2.3 IPX II Display Flow Chart for Configuring Using the Display



See Next Page

7.2.3 IPX II DISPLAY FLOW CHART FOR CONFIGURING USING THE DISPLAY (CONT.)



8. MAINTENANCE

8.1 MAINTENANCE

Mounting and electrical connection of the PT must be done by specialists with EMC training, following all applicable regulations, and in **pressureless, voltage-free, intrinsically safe** condition with the **machine switched off**.

The machine must be secured against being switched back on!

Burn hazard!
The PT must be removed with the melt in molten condition. The PT can be very hot when removed.

Wear protective gloves!

ATTENTION ESD sensitive component. Electrostatic discharge may damage the PT. Take ESD precautions.

ATTENTION Always remove the PT before cleaning the machine with abrasives or steel wire brushes or suchlike.

ATTENTION Before removing the PT, the medium must be in molten condition.

ATTENTION Removing the transmitter with the medium in solidified condition can damage the diaphragm of the PT.

ATTENTION Do not clean the screw-in section of the PT with hard objects. This will damage the PT!

ATTENTION Always use a torque wrench applied to the designated hexagon collar when screwing the PT in and out. Do not apply the tool to the housing or housing/sensor connection!

- Remove the PT.
- Carefully clean the diaphragm of the transmitter with a soft cloth, while the medium is still malleable.

8.2 REPAIR/DISPOSAL

Toxic hazard!
The PT contains a small amount of mercury (Hg) as its transmission medium. If the

diaphragm is damaged, mercury may escape.

Never transport or store the PT without the protective cap bolted in place. Remove the cap shortly before installation.

If mercury is inhaled or swallowed, seek medical attention immediately!

Mercury is hazardous waste and must be disposed of in accordance with applicable laws. **DYNISCO** will accept defective PTs.

If mercury escapes, use airtight packaging!

Please send defective PTs to your **DYNISCO** representative.

For addresses, see the back cover of the operating manual.

8.3 WARRANTY

This DYNISCO product is warranted under terms and conditions set forth in the DYNISCO web pages. Go to www.dynisco.com and click “warranty” at the bottom of any page for complete details.

9. ACCESSORIES

- Machining tool kit 1/2”-20UNF-2A P/N 200295
- Cleaning tool kit 1/2”-20UNF-2A P/N 200100
- Mounting Bracket P/N 190750
- Machining tool kit M18 x 1.5 P/N 200105
- Cleaning tool kit M18 x 1.5 P/N 200101

10. TROUBLESHOOTING

10.1 TROUBLESHOOTING

Fault	Possible Cause	Resolution
No signal	Cable breakage or poor contact	Check cable and contact, or replace
	No supply voltage	Check supply voltage
Strong zero shift when screwing in	Mounting hole incorrectly produced (alignment error)	Check hole with test bolt, rework with tool if necessary
	Mounting torque too high	Adjust to recommended mounting torque
No signal change despite pressure rise	Plug forming in front of diaphragm	Check mounting hole; remove solidified plastic
	Diaphragm damaged	Send pressure transmitter to **DYNISCO** for repair

10.2 TROUBLESHOOTING HART COMMUNICATOR PROBELMS

Synopsis:

Methods for troubleshooting HART Networks that are experiencing problems communicating between a Field Device and a 275 HART Communicator.

Required information for technical assistance and documentation:

Hardware: Manufacturer and model of Control Systems?
Manufacturer and model of Field Device?
Loop diagram of the problem loop

Location: Look at plant layout, proximity to other equipment?
Does HART Communication work when certain devices or processes are not running?

What is the total cable length run from the termination panel to the Field device?

Alarms: What does the 275 say on its screen when attempting to communicate with field device? (i.e. device not found)

Quantities: How many HART loops are there in facility?
How many HART loops are failing? (i.e. no communication?)

Troubleshooting Tips:

1. Verify loop current and voltage on the Field device. Almost all field devices need at least 4 mA and 12 V dc to operate properly.

2. If the field device is set for multidrop mode then set HART Communicator to digital polling mode?

3. Inspection of the loop wiring can often times reveal problems. The shield is normally grounded.

4. Does the control system have HART communication capabilities? Is it configured to communicate HART currently? If so, is it reporting communication problems? If not, stop HART communications on the control system and test communication with the 275 HART Communicator again.

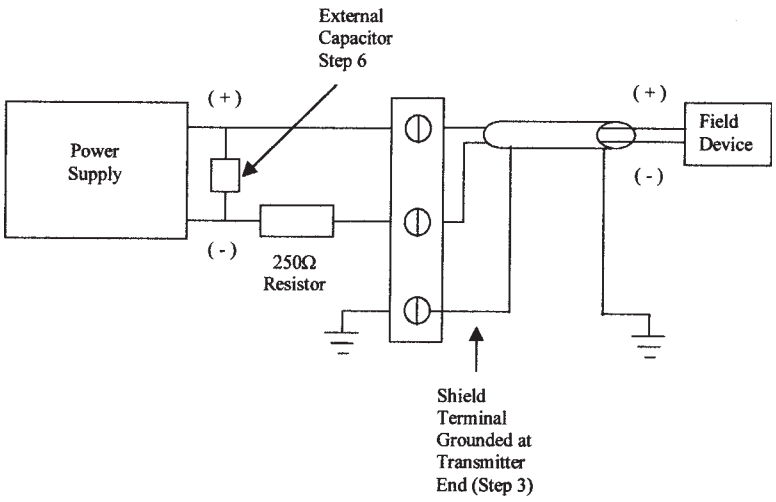
5. If an Analog input point verify that the loop has a minimum of **250 ohms** resistance. This can be calculated by measuring the dc voltage across the control system field termination blocks and dividing the current that the transmitter is currently putting on the loop (i.e. Voltage = Current * Resistance ----- Resistance = Voltage / Current) or consulting the control system manuals for value. Regardless of the value measured, add an additional **250 ohms** of resistance in series with the loop and place 275 HART Communicator leads across resistor and verify if communication is restored. See Figure 10-1.

6. Try placing an external 0.1 microfarad (uF) to 0.22uF (Capacitor parameters: working voltage: 100 V dc, no polarity) across the terminal blocks going out to transmitter. Verify if communication has been restored to the loop by connecting the 275 Communicator. If communication improves, this may indicate a noise problem. See Figure 10-1.

7. If step 6 allows communication, but not reliably then try adding an additional **250 ohms** of resistance in series with the loop. Be careful. Do not put too much load for a given voltage.

8. If an oscilloscope is available for use then use it to look for noise on the loop. It is necessary to use a scope with differential mode capability to avoid grounding one side of the loop. Noise with a frequency of 800 to 3300 Hz is of particular interest, as this represents frequencies near the HART frequencies of 1200 and 2200 Hz.

Fig. 10-1 Electrical Schematics



11. CE DECLARATION OF CONFORMITY

Dynisco
Instruments

DECLARATION OF CONFORMITY

We: Dynisco Instruments
38 Forge Parkway
Franklin, MA 02038
USA

Declare in our sole responsibility, that the following product(s):
IPX II Series-SX19X (with cable #190485)

To which this declaration relates is in conformity with the following standard(s): or other normative document(s):
Electromagnetic Compatibility (EMC)
Operating Conditions-Industrial Environment
Immunity according to (EN 50082-2 / 1996):

- EN 61000-4-2 1995----------passed
- EN 61000-4-3 1996 + A1:1998----------passed, except excursions to +/-0.7% are possible at some frequencies
- EN 61000-4-4 1995----------passed
- EN 61000-4-5 1995----------passed
- EN 61000-4-6 1996----------passed, except excursions to +/-0.4% are possible at some frequencies
- EN 61000-4-8 1993----------passed

Emission according to (EN 50081-1 / 1993):

- EN 55022 B 1995----------passed

Following the provisions of the directive:

- EMC Directives: 89/336/EEC, 93/68/EEC, 93/44/EEC
- National Implementation: EMVG September 18, 1998

Date: December 28, 2000

H. Jackson Merchant
Vice President of Research & Development

Note: Tested by S-Team Elektronic GmbH, Schleifweg 2, 74257 Untereisesheim/August 15, 2000/Nr. 140 .0800

12. EX DECLARATION OF CONFORMITY

sira
Certification Service

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: Sira 02ATEX2244X

4 Equipment: X19X Multi-Variable Pressure Transmitter

5 Applicant: Dynisco Instruments

6 Address: 38 Forge Parkway
Franklin, MA 02038
USA

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report number R52A9298A.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 50014:1997 incl amendments 1 & 2
EN 50020:2002
EN 50284:1999

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

II 1G
EEx ia IIC T4 (Ta = -20°C to +80°C)

D R Stubbings BA MIEE
Certification Manager

Project Number 52A9298
Date 13 October 2003
C. Index 13

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900 Fax: +44 (0) 1244 681330
Email: exhazard@siratc.co.uk
Sira Certification Service is a service of Sira Test & Certification Ltd

ST&C(Chester) Form 9176 Issue 8

sira
Certification Service

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE Sira 02ATEX2244X

13 **DESCRIPTION OF EQUIPMENT**

The X19X Multivariable Pressure Transducer consists of a sensing element contained within a welded steel enclosure and a component certified electronics module housed within a component certified flameproof enclosure. The interconnecting cable shall not exceed 10 ft (3 m). The electronics module can be supplied in its basic form or alternatively with an optional Display and/or Position Output.

The X19X is powered via a Beau, three position terminal block, which is located on the electronics module. The input parameters associated with this terminal block (labelled J8) are:

U_i = 30 V C_i = 9.7 nF
I_i = 125 mA L_i = 0.27 mH
P_i = 900 mW

When the Position Output option is available, a second power source may be connected via a two position terminal block which again is located on the electronics module. The input parameters associated with this terminal block (labelled J3) are:

$U_o = I_o = P_o = 0$ U_i = 30 V
C_i = 52 nF I_i = 125 mA
L_i = 0 P_i = 900 mW

14 **DESCRIPTIVE DOCUMENTS**

14.1 Drawings

Number	Sheets	Rev.	Date	Description
194525	1 of 1	C	26 Jan 01	Generic filled assembly XX194
190901	1 of 1	A	21 Sep 00	Interconnection diagram, IPX11
952219C	1 of 1	A	06 Jun 01	Interface & compensation PCB schematic
190450	1 of 1	D	15 Sep 00	Connector/RTD board assembly
952219B	1 of 5	A	15 Sep 00	PcBd Certification Dwg Interconnect PcBd
952219B	2 of 5	A	15 Sep 00	PcBd Certification Dwg Interconnect PcBd
952219B	3 of 5	A	15 Sep 00	PcBd Certification Dwg Interconnect PcBd
952219B	4 of 5	A	15 Sep 00	PcBd Certification Dwg Interconnect PcBd
952219B	5 of 5	A	15 Sep 00	PcBd Certification Dwg Interconnect PcBd
999521A	1 of 1	C	15 Sep 00	RTD protection board assembly
999521C	1 of 1	C	21 Sep 00	Schematic, RTD protection bd
952216B	1 of 3	D	15 Sep 00	PcBd certification dwg XX191X RTD protection bd
952216B	2 of 3	D	15 Sep 00	PcBd certification dwg XX19X RTD protection bd
952216B	3 of 3	D	15 Sep 00	PcBd certification dwg XX19X RTD protection bd
000093	1 of 2	C	06 Sep 02	Intrinsically safe certification drawing
000093	2 of 2	C	06 Sep 02	Intrinsically safe certification drawing
190001	1 of 1	C	29 Sep 03*	Sira assembly certification, model SX19X
856316	1 of 1	F	10 Jun 03	Intrinsically safe label SX19X
856326	1 of 1	E	15 Sep 03	Nameplate models XX19X w/ce approval

* This is the date that the drawing was stamped by Sira.

14.2 Report No. R52A9298A

Date 13 October 2003

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900 Fax: +44 (0) 1244 681330
Email: exhazard@siratc.co.uk
Sira Certification Service is a service of Sira Test & Certification Ltd

sira
Certification Service

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE Sira 02ATEX2244X

15 **SPECIAL CONDITIONS FOR SAFE USE** (denoted by X after the certificate number)

15.1 Some of the electrical circuits within the X19X Multivariable Pressure Transmitter are bonded to a steel diaphragm, the apparatus therefore will not withstand a $500V_{rms}$ test voltage, account of this shall be taken when installing the apparatus.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in Report No. R52A9298A.

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

17.3 This certificate relies on the following certified products when used as part of the X19X Multivariable Pressure Transmitter, the key attributes listed in the table below shall still be maintained by the original certificate.

Description	Certificate Number	Key Attributes
AIC VR1500 electronics module	Sira 03ATEX2453U	• EEx ia IIC • The following parameters: **Beau 3 Position Terminal Block, J8 (Power Source)** U_i = 30 V, I_i = 125 mA, P_i = 900 mW C_i = 9.7 nF, L_i = 0.27 mH **Position Terminal Block, J3 (Position Output)** $U_o = I_o = P_o = 0$, C_i = 52 nF, L_i = 0, U_i = 30 V, I_i = 125 mA, P_i = 900 mW **Molex 4 & 10 Position Header, J2/J3 (RTD 1/RTD 2/Pressure Sensor)** U_o = 30 V, I_o = 44 mA, P_o = 328 mW **Molex 12 Position Header, J5 (Optional Circuits – no user interface)** • The component is suitable for a T4 temperature classification in the ambient temperature range -20°C to +80°C.
Adalet XIHM enclosure	DEMKO 02 ATEX 0205350U	• IP66 • Stainless steel construction

17.4 The apparatus label shall incorporate a serial number in the form yyyy/nnnn; where yyyy represents the year of manufacture and nnnn represents a unique sequential number.

Date 13 October 2003

Sira Certification Service
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sira
Certification Service

EC TYPE-EXAMINATION CERTIFICATE VARIATION

CERTIFICATE NUMBER	Sira 02ATEX2244X	Dated	13 October 2003
VARIATION NUMBER	1 (ONE)	Dated	19 February 2005

VARIATION TO EQUIPMENT/COMPONENT

To permit:

1 The introduction of an alternative, M18 x 1.5 threaded connection.

2 The introduction of an alternative, pressure range, 750 PSIG – 10,000 PSIG.

DESCRIPTIVE DOCUMENTS

Number	Sheet	Rev	Date	Description
00093	1 to 2	D	-	Intrinsically Safe Certification Drawing

ADDITIONAL CONDITIONS OF CERTIFICATION

None

File No. 52V12822

Report No. R52V12822A

C Ellaby
Certification Officer

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