SPX2 Series
Smart Melt Pressure Transmitters

Intrinsically safe and explosion proof pressure transmitters with integrated amplifier for use in hazardous environments

OPERATING MANUAL

II 1 G

ATEX 100a

FM Approvals

Dynisco

P/N 974125
10/04 Rev. C
ECO # 29279

START

DYNISCO SPX SERIES QUICK START CARD

This Quick Start Setup guide can be used by experienced instrumentation technicians to configure the Transmitter using the Zero and Span push-buttons or via the optional Hart Communications. For more detailed information please consult the complete manual before operating. The Quick Start procedure with Hart is designed for users already familiar with the use of the Hart Communicator and loop powered instrumentation.

QUICK START UTILIZING PUSH BUTTONS

1. Insure the mounting hole is clear of any frozen polymer or debris and is machined to the proper dimensions. Apply a quality high temperature Anti-Seize lubricant to the snout tip threads. For flanged configuration units, apply Anti-Seize to mounting bolt threads and use proper Buttonseal gasket and install on transducer snout. Install unit into the process connection. (Do NOT torque transmitter into the hole at this time!) Allow time for the transmitter snout temperature to equalize to the process temperature. This will help eliminate thread galling and ease removal later. There should be NO pressure applied at this time.

2. Connect power to the transmitter. For a 2 wire conduit output configuration, Red wire is Sig+/Exc +, Black wire is Sig-/Exc-, Green wire is Ground. For a 6 pin connector version, Pin A is Sig+/Exc+ and pin B is Sig-/Exc-. Insure proper loop supply voltage is applied to transmitter.

3. After temperatures have equalized, apply proper torque as described in Section 5.2 of the Manual and tighten transmitter into mounting hole.

ATTENTION In hazardous areas do NOT remove screws when circuit is live.

4. Remove zero push-button seal screw.

5. To perform a Zero Calibration, use a 2 mm or smaller allen key and insert into push-button hole to make contact with push-button at the bottom. Depress the button for 1 second, release for 1 second then push again for 1 second.

6. Verify loop output is zero (4 mA).

7. Replace the Seal Screw.

ATTENTION Seal screw must remain in place to retain Explosion Proof certification.

Quick Start utilizing Hart Communicator

1. Follow Steps 1 through 3 from Quick Start Using Push-Buttons.

2. Connect Communicator to the loop. If unsure on how to do this, refer to "Connecting the Hart Handheld Communicator" (Fig. 6-1).

3. Power on Hart Communicator. See Hart Command tree on the following page for reference.

From the Main Menu:

4. Enter Tag (Quick Key 1,3,1)

5. Set Pressure Units (Quick Key 1,3,2), if required

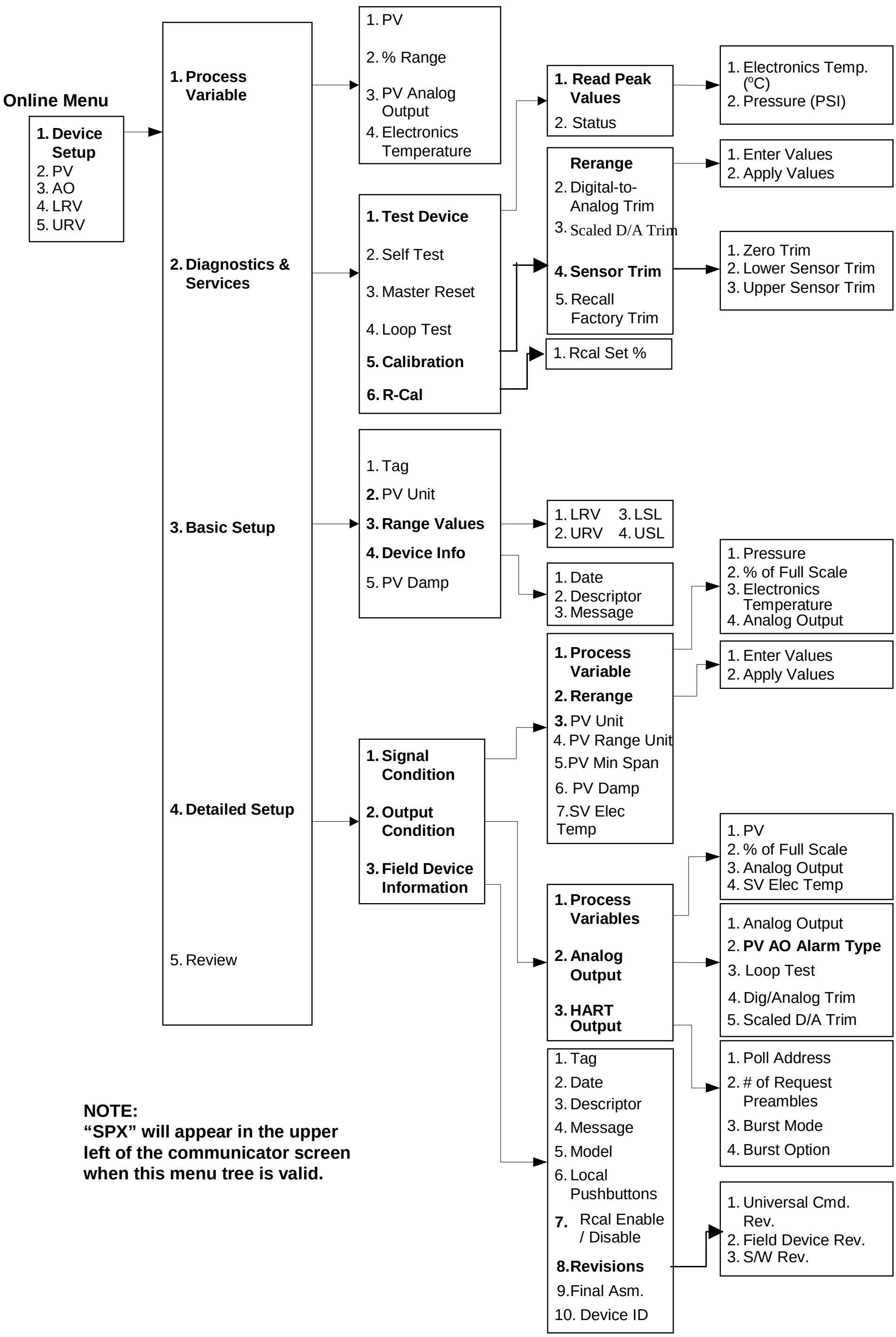
6. Set URV (Quick Key 1,3,3,2) if output turndown (rescaling), is required.

7. Perform Zero Trim (Quick Key 1,2,5,4,1)

8. Verify loop output is zero (4mA).

9. Remove Hart Communicator from loop.

Menu Tree for SPX



NOTE:
“SPX” will appear in the upper left of the communicator screen when this menu tree is valid.

TABLE OF CONTENTS

GENERAL

1. General

1.1 Important Information

This manual applies to the SPX 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 its entirety. This applies in particular to the notes on safety. Following the safety instructions will help to prevent accidents, defects and malfunctions.

Models covered by this manual include the 2241, 2242, 2243, 2244, 2290, 2291, 2292.

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

If the product malfunctions, in spite of having followed the operating instructions, please contact the **DYNISCO** customer service department (See the back of the manual for contact information). This applies in particular during the warranty period.

1.2 Copyright

Copyright law requires that this manual be used for intended purposes only.

It is strictly forbidden to allow reproduction of any kind "in whole or in part" to persons outside of Dynisco, without approval from Dynisco.

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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


Related to ATEX/Intrinsic Safety requirements

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

1.4 Abbreviations

The following abbreviations are used:

OM	Operating Manual
SPX	Smart Pressure Transmitter
f.s.	of full scale
PT	Pressure Transmitter
HART	Highway Addressable Remote Transducer
PV	Primary Variable (Pressure)
SV	Secondary Variable (Electronics Temperature)
URV	Upper Range Value
LRV	Lower Range Value
E^2PROM	Electrically Erasable Programmable Read Only Memory
Watchdog	An internal monitor for the electronics
BFSL	Best Fit Straight Line

1.5 Transmitter Principle of Operation

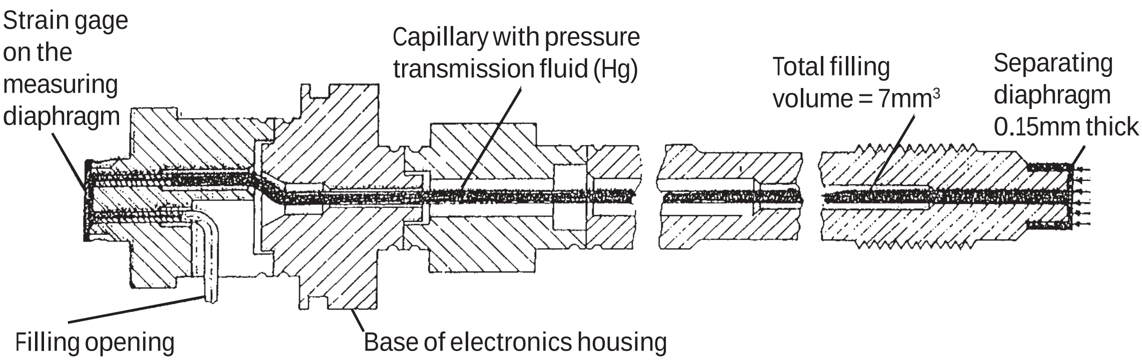
The mechanical system (filled assembly) consists of a lower diaphragm, a filled capillary tube, and an upper diaphragm with a strain gage. The filled assembly transmits pressure from the process to the strain gage diaphragm where it is converted to an electrical signal. The filled assembly isolates the electronics from the high process temperatures.

The 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 with Dymax™ coating. 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 strain gage element 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.

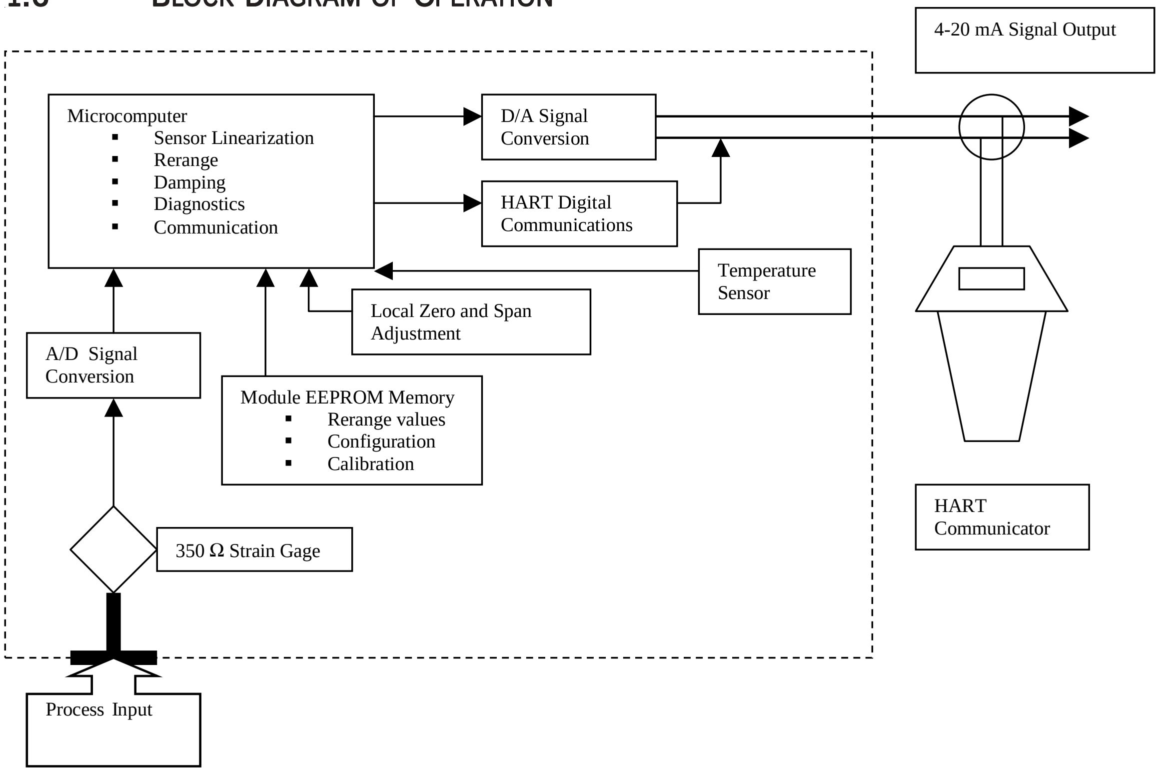
Fig. 1-1 Functioning Principle of the SPX Filled Assembly



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 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 milliamperes for an output current proportional to the applied pressure.

1.6 BLOCK DIAGRAM OF OPERATION



1.7 CORRECT USE

When using the SPX as a safety component in accordance with the EC Machine Directive, Annex IIc, the equipment manufacturer must take any necessary precautions to ensure that malfunction of the PT cannot cause damage or injury.

The installation of the device must be in accordance with European installation guidelines EN 60079-10. Over voltage protection shall be implemented as mentioned in EN 60079-14.

When planning machinery and using the SPX, follow the safety and accident prevention regulations that apply to your application, such as:

- EN 60204, Electrical equipment in machines
- EN 292, Machine safety, general design guidelines
- DIN 57 100 Part 410, Protection against electric shock
- EN 50014:1997 incl. Amendments A1, A2 General requirements
- EN 50020:2002 Intrinsically Safe Apparatus
- EN 50284:1999 Special Requirements for Group II Category 1G

1.8 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.

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

Toxic Hazard!
The SPX contains a very small amount of mercury (Hg) 0.00322 in^3 typically with a 6/18 configuration, as its transmission medium. If the diaphragm is damaged, mercury may escape. Never transport or store the SPX 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 PT's. If mercury escapes, use airtight packaging!

Warnings

ESD sensitive component. Electrostatic discharge may damage the SPX. Take ESD precautions.

Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

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!**

EMC/CE Compliant Connection

EX

Earth the machine section with the screw-in trunnion/mounting hole for the SPX in accordance with regulations. The SPX 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 correctly (cable gland, conducting, full contact, continuous) to the conductive housing or route it via a built-in cable connector that is also connected to the conductive housing. Connect unused cable cores or free cable ends correctly to the cable shield on both sides.

Temperature

The SPX series of pressure transmitters can be used in media temperatures up to 400°C. If the pressure transmitter is used in other applications, the safety and accident prevention regulations specific to that application must be followed. Ambient temperature for the electronics housing max. +85°C in areas that are not classified as hazardous.

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

Use in Hazardous Classified Areas

Several configurations of the SPX series are designed and approved for use in hazardous classified areas. **Units intended for installation in these areas must bear the applicable approval agency label.** After installation before operating the device the user must check that the complete installation and wiring is intrinsically safe. Care must be taken that the power source is a certified apparatus.

The SPX series of pressure transmitters is specially designed for measuring pressure in explosive atmospheres for Zone 0 under safety class II 1 G EEx ia IIC T4 (TA = -20 to + 60°C). The SPX is also approved for hazardous area Zone 1 under safety class II 2 G EEx ia IIC T4/T6 (T4, TA = -20 to + 85°C; T6, TA = -20 to + 50°C)

The maximum Tmed (medium temperature) for temperature class T6 is 60°C and for T4 is 85°C. The medium temperature for the SPX is defined as the temperature of the pressure transmission fluid below the measuring diaphragm. (See figure 1-1.) This temperature can be verified by measuring the surface temperature at the base of the electronics housing.

For category 1 (Zone 0) installations, care must be taken to avoid the danger of ignition due to electrostatic discharges (ESD). The chance for static build up on the cable surface during normal conditions of use, maintenance and cleaning must be eliminated. Install the cable in an appropriate conduit or use some other cable reliable installation technique to avoid static electricity at the cable surface. The free length of the cable must be below 5 cm. If metallic conduits are used they need to be grounded. If nonmetallic conduits are used they need to be antistatic ($<$ 1G Ohm/cm^2).

The SPX series of pressure transmitters are also designed for explosion proof areas approved by Factory Mutual for Class I, Division 1, Groups A, B, C & D.

Deviation of the supply voltage from the value given in the technical specifications, or reverse 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 4-20 mA output:

Supply Voltage max.	U_o =	30 V DC
Current Output max.	I_o =	100 mA
Power max.	P_o =	0.75W

The specified values of Lo and Co for the power supply need to be greater than Ci + Ccable and Li + Lcable.

Internal Inductance	$L_i < 40\ \mu H$
Internal Capacitance	$C_i < 4.5\ nF$

FM Approvals

For SPX's that are not approved or are explosion proof approved for Class I, Division 1, Groups A, B, C & D the power supply rating is 16-36 Vdc.

Additional Comments:

1) Do not remove the transmitter push-button seal screws in explosive environments when the circuit is live.
2) Transmitter push-button seal screws must be fully engaged to meet explosion proof requirements.
3) Before connecting a HART handheld communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

3. TECHNICAL DATA

3.1 Ordering Guide for SPX

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

22X X X X XX X XX XX XX X XX XX XXXX

- Model Type
- Process Style
- Hazardous Area Classifcations
- Diaphragm Material and Wear Coatings
- Process Connections
- Engineering Units
- Pressure Range
- Rigid Stem
- Rigid or Flexible Capillary
- Communications
- Electrical Connection
- Temperature Sensor
- Option Code

3.2 Ordering Example

229 1 S A 48 P 21 BU FF B AC AA B300

- Large Diaphragm
- Flange Mounted
- Intrinsically Safe Approval
- DyMax Coated 15-5 SST Diaphragm
- S8 Flange
- PSI Units
- 5,000 Pressure Range
- 5” Snout Length
- 30” Flexible Capillary
- 4 - 20 mA with HART Comms
- 6-Pin Hermetic Connector
- J-Type Thermocouple with 3” Flex
- R-Cal

3.3 Ordering Information

22XXXXXXXXXXXXXXXXXXXXXX

3.4 Model Type & Process Style

22**XX**XXXXXXXXXXXXXXXXXXXX

42	=	1/2 - 20 UNF 2A
41, 43, 44, 90 or 91	=	Flange Mounted
92	=	1 1/2 - 16 UN2A

3.5 Hazardous Area Classifications

22XX**X**XXXXXXXXXXXXXXXXXXX

N = No Approvals
E = Explosion Proof
S = ATEX/Intrinsically Safe

The SPX series of pressure transmitters are designed for explosion proof areas approved by Factory Mutual for Class I, Division 1, Groups A, B, C & D.

The SPX series of pressure transmitters is specially designed for measuring pressure in explosive atmospheres for Zone 0 under safety class II 1 G EEx ia IIC T4 (TA = -20 to + 60°C). The SPX is also approved for hazardous area Zone 1 under safety class II 2 G EEx ia IIC T4/T6 (T4, TA = -20 to + 85°C; T6, TA = -20 to + 50°C)

For category 1 (Zone 0) installations, care must be taken to avoid the danger of ignition due to electrostatic discharges (ESD). The chance for static build up on the cable surface during normal conditions of use, maintenance and cleaning must be eliminated. Install the cable in an appropriate conduit or use some other cable reliable installation technique to avoid static electricity at the cable surface. The free length of the cable shall be below 5 cm. If metallic conduits are used they need to be grounded. If nonmetallic conduits are used they need to be antistatic (< 1G Ohm/cm^2).

3.6 Diaphragm Material and Wear Coatings

22XXX**X**XXXXXXXXXXXXXXXXXX

A = DyMax™ Coated 15-5 PH SST
D = Titanium Nitride Coated 15-5 PH SST
E = DyMaxTM Coated Thick 15-5 PH SST
M = Uncoated Hastelloy
N = Borofuse Coated Inconel
P = Uncoated Inconel
R = Borofuse Coated Extra Thick Inconel
S = Uncoated Extra Thick Inconel

TECHNICAL DATA

Note: Accuracy can be affected with choice of diaphragm and coating.

Other diaphragm and wear coating combinations exist, please consult factory for other configurations. Certain models do are not available in some configurations.

3.7 PROCESS CONNECTIONS

22XXXX**XX**XXXXXXXXXXXXXXXX

3.7.1 2241

90 = Standard Flange (K1)
91 = One Piece Flange (K2)
92 = One Piece Flange (K3)
93 = One Piece Flange (K4)
94 = One Piece Flange (K5)
95 = One Piece Flange (K6)
96 = One Piece Flange (K7)

Please see Figure 5-9 for dimensions for specific flanges. For other mounting flanges/process connections not listed for the 2241 please consult factory.

3.7.2 2242

00 = 1/2-20 UNF
01 = 1/2 BSP Thread
02 = 1/2-20 with Loose Nut
03 = M10 X 1.5 Thread
04 = M14 x 1.5 Thread
05 = M18 x 1.5 Thread
06 = G1/4 Thread with Loose Nut
07 = G1/4 Thread with Taper Seat
08 = G3/8 Thread with Flat Seat
09 = G3/8 Thread with Loose Nut
10 = G3/8 Thread with Taper Seat
11 = 1/2-14 BSP with Flat seal
12 = 1/2-20 Jam Nut
13 = G1 Thread with Loose Nut
14 = M18 x 2.5 Thread Jam Nut
15 = M18 x 1.5 Thread JamNut

For other process connections of the 2242 please consult factory.

3.7.3 2243

25 = Standard Flat Faced Flange
26 = Flat Faced Flange (F1)
27 = Raised Face Flange (F2)
28 = Raised Face Flange (F3)
29 = Raised Face Flange (F4)
30 = Raised Face Flange (F5)
31 = TPT Face Flange (F6)
32 = Raised Face Flange (F7)
33 = Raised Face Flange (F8)
34 = Standard Face Flange (F9)
35 = Raised Face Flange (F10)
36 = Ring Joint Flange (F11)
37 = Flat Face Flange (F12)
38 = Raised Face Flange (F13)
39 = Raised Face Flange (F14)
40 = Flat Face Flange (F15)

Please see Figure 5-10 for dimensions for specific flanges. For other mounting flanges/process connections not listed for the 2243 please consult factory.

3.7.4 2244

88 = Flat Faced Flange

3.7.5 2290

69 = No Flange
70 = Standard Split Flange (T1)
71 = Split Flange (T2)
72 = Split Flange (T3)
73 = Split Flange (T4)
74 = Split Flange (T5)
75 = Split Flange (T6)
76 = Split Flange (T7)
77 = Split Flange (T8)
78 = Split Flange (T9)
79 = Split Flange (T10)

Please see Figure 5-12 for dimensions for specific flanges. For other mounting flanges/process connections not listed for the 2290 please consult factory.

3.7.6 2291

48 = Standard Flange (S1)
49 = One Piece Flange (S2)
50 = One Piece Flange (S3)
51 = One Piece Flange (S4)
52 = One Piece Flange (S5)
53 = One Piece Flange (S6)
54 = One Piece Flange (S7)
55 = One Piece Flange (S8)
56 = One Piece Flange (S9)
57 = One Piece Flange (S10)
58 = One Piece Flange (S11)
59 = One Piece Flange (S12)
60 = One Piece Flange (S13)
61 = One Piece Flange (S14)
62 = One Piece Flange (S15)
63 = One Piece Flange (S16)

Please see Figure 5-11 for dimensions for specific flanges. For other mounting flanges/process connections not listed for the 2244 or 2291 please consult factory.

3.7.7 2292

89 = 1 1/2 - 16 UN2A Thread

3.8 Engineering Units

22XXXXXX**X**XXXXXXXXXXXXXXX

B = Bar
C = kPa
K = kgf/cm2
M = MPa
P = psi

3.9 Pressure Range -Full Scale

22XXXXXXX**XX**XXXXXXXXXXXXX

Code	psi	Bar	kgf/cm2	MPa	kPa	
08	25	1.75	1.75	0.175	175	(2241 and 229X only)
09	50	3.5	3.5	0.35	350	(2241 and 229X only)
11	100	7	7	0.7	700	(2241 and 229X only)
13	250	17.5	17.5	1.75	1750	(for 2242, M18 process connection only)
14	500	35	35	3.5	3500	
15	750	50	50	5	5000	
16	1000	70	70	7	7000	
17	1500	100	100	10	10000	
20	3000	200	200	20	20000	
21	5000	350	350	35	35000	
22	7500	500	500	50	50000	
23	10000	700	700	70	70000	
24	15000	1000	1000	100	100000	(2242 and 2243)
25	20000	1400	1400	140	140000	(2242 and 2243)
27	30000	2000	2000	200	200000	(2242 and 2243)

Other approved ranges may exist, please consult factory.

3.10 Rigid stem and Rigid or flexible Capillary Length

22XXXXXXXXX**XXXX**XXXXXXXXX

3.10.1 2242/2243

CEAA = 6” (152 mm) Rigid Stem/0” (0 mm) Flexible Capillary
CEDD = 6” (152 mm) Rigid Stem/18” (457 mm) Flexible Capillary
CEFF = 6” (152 mm) Rigid Stem/30” (762 mm) Flexible Capillary

Other combinations of lengths available, please consult factory.

3.10.2 2241

NEDD = 2.031” Rigid Stem/18” Flexible Capillary

3.10.3 2244

NNDD = 2.406" Rigid Stem/18" Flexible Capillary

Other lengths available, please consult factory.

3.10.4 229X

BUFF = 5" Rigid Stem/30" Flexible Capillary

Other lengths available, please consult factory.

3.11 COMMUNICATIONS/TURNDOWN

22XXXXXXXXXXXXX**X**XXXXXXXX

The SPX is a 4 - 20 mA pressure transmitter. HART Protocol is available as an option.

A = 4 - 20 mA without HART Communications
B = 4 - 20 mA with HART Communications
C = 4 - 20 mA with HART Modified Setting (Turndown)

3.12 ELECTRICAL CONNECTIONS

22XXXXXXXXXXXXXX**XX**XXXXXX

AC = PT1H-10-6P Connector
CA = 1/2-14 NPT Conduit Fitting with 42" Leads
Other lead lengths and connectors are available, please consult factory.

3.13 TEMPERATURE SENSORS

22XXXXXXXXXXXXXXXX**XX**XXXX

ZZ = No Thermocouple
AA = Single J TC with 3" Flex
CA = Dual J TC with 3" Flex

Other thermocouples and RTD configurations are available. Please consult factory.

TECHNICAL DATA

3.14 OPTION CODES

22XXXXXXXXXXXXXXXXXX**XXXX**

Transmitters are available with certain approved option codes. Please consult factory for list of approved options.

3.15 SAFETY SPECIFICATIONS

Power supply for Intrinsically Safe areas must satisfy the following conditions:

Supply Voltage max.	U0 =	30 V DC
Current Output max.	Io =	100 mA
Power max.	Po =	0.75W

The specified values of Lo and Co for the power supply need to be greater than Ci + Ccable and Li + Lcable.

Internal Inductance	Li < 40 µH
Internal Capacitance	Ci < 4.5 nF

3.16 PERFORMANCE CHARACTERISTICS

3.16.1 COMBINED ERROR (ACCURACY)

Combined error is also known as accuracy which includes linearity, hysteresis and repeatability, and is determined by BFSL (Best Fit Straight Line).

3.16.1A 2242/2243

±0.25% of full scale (1,500 psi and above)
±0.5% of full scale (1,000 psi and below)

3.16.1B 2241

±0.5% of full scale (1,500 psi and above)
±1.0 of full scale (1000 psi and below)

3.16.1C 2244

±0.25% of full scale (500 psi and above)

TECHNICAL DATA

±0.5% of full scale (250 psi)

3.16.1D 229X

±0.5% of full scale

3.16.2 Resolution

±0.035% full scale or better

3.16.3 Repeatability

±0.10% of full scale

3.16.4 Max. Overload (without influencing operating data)

2242/2243	2 x full scale pressure or 35,000 psi, whichever is less.
2241/2244	2 x full scale pressure or 15,000 psi, whichever is less.
229X	2 x full scale pressure

3.16.5 Burst pressure

6 x nominal value, max. 45,000 psi

3.16.6 Natural frequency

20 Hz [-3db]

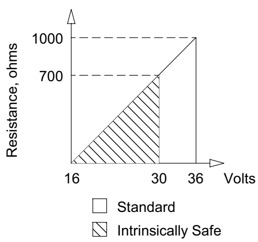
3.16.7 Response Time

50 mS

3.17 Electrical data

Configuration	4-arm Wheatstone bridge strain gauge with internal amplifier
Output Signal	2-wire 4 - 20 mA
Saturation Levels	3.8 mA and 20.5 mA
Fail Safe Levels	3.6 mA for Low Level 21.5 mA for High Level

Current Consumption ≤ 25 mA
Supply Voltage 16 - 30 VDC for EEx ia IIC
16 - 36 VDC for non-approved and explosion proof models



Note: Transmitter incorporates overvoltage protection and reverse polarity protection and will not operate if inputs are reversed.

3.18 TEMPERATURE INFLUENCE

ELECTRONICS HOUSING

Housing Temperature Range -20°C to +85°C

Compensated Temperature Range

224X -20°C to +65°C
229X -20°C to +60°C

Zero shift due to temperature change on electronics housing

22XX 0.01% full scale/°F max. (0.02% f.s./°C max.)

Diaphragm (in contact with media) span shift due to temperature change on electronics housing.

22XX 0.01% full scale /°F max.(0.02% f.s./°C max.)

Zero shift due to temperature change on the diaphragm.

2242, 2243 15 psi/100°F typical
2 bar/100°C typical
2241, 2244, 229X 1 psi/100°F typical (from 75°F to 450°F)
2 psi/100°F typical (from 450°F to 600°F)
0.07 bar/38°C typical (from 24°C to 232°C)

0.14 bar/38°C typical (from 233°C to 315°C)

3.19 EMC Requirements

Conforming to CE in accordance with EMC directive.

Electromagnetic Interference	DIN EN 61000-6-3:1996 mod.
Immunity	DIN EN 61000-6-2:1999 mod.
Radio Disturbance	DIN EN 55022 (IEC/CISPR 22:1997, mod. + A1:2000)
Electrostatic Discharge	DIN EN 61000-4-2:1995 + A1:1998 + A2:2000
Radiated, Radio Freq, etc.	DIN EN 61000-4-3: 1995 + A1:1998 + A2:2000
Electrical Fast Transient	DIN EN 61000-4-4:1995 + A1:2000 + A2:2001
Surge Immunity	DIN EN 61000-4-5:1995 + A1:2000
Conducted Disturbances	DIN EN 61000-4-6:1996 + A1:2000
Power Frequency Magnetic Field	DIN EN 61000-4-8:1993 + A1:2001
Pulse Magnetic Field	DIN EN 61000-4-9:1993 + A1:2000

3.20 Materials

Standard Diaphragm	15-5PH Mat. No. 1.4545 Various proprietary coatings
Standard Stem(Snout)	17-4PH Mat. No. 517400

Please note other diaphragm and stem materials may be substituted.

3.21 Torque

2242	2243	2292	2241, 2244, 2290, 2291
max. 56.5 Nm (500 inch-lbs.)	max. 5.6 Nm (50 inch-lbs.)	max. 14.1 Nm (125 inch-lbs.)	max. 14.1 Nm (125 inch-lbs.)
min. 11.3 Nm (100 inch-lbs.)	min. 4.5 Nm (40 inch-lbs.)	min. 11.3 Nm (100 inch-lbs.)	min. 11.3 Nm (100 inch-lbs.)

3.22 Environmental protection to IEC 529

SPX2 Series with sealed conduit or PT1H-10-6P	IP67, nema 4x

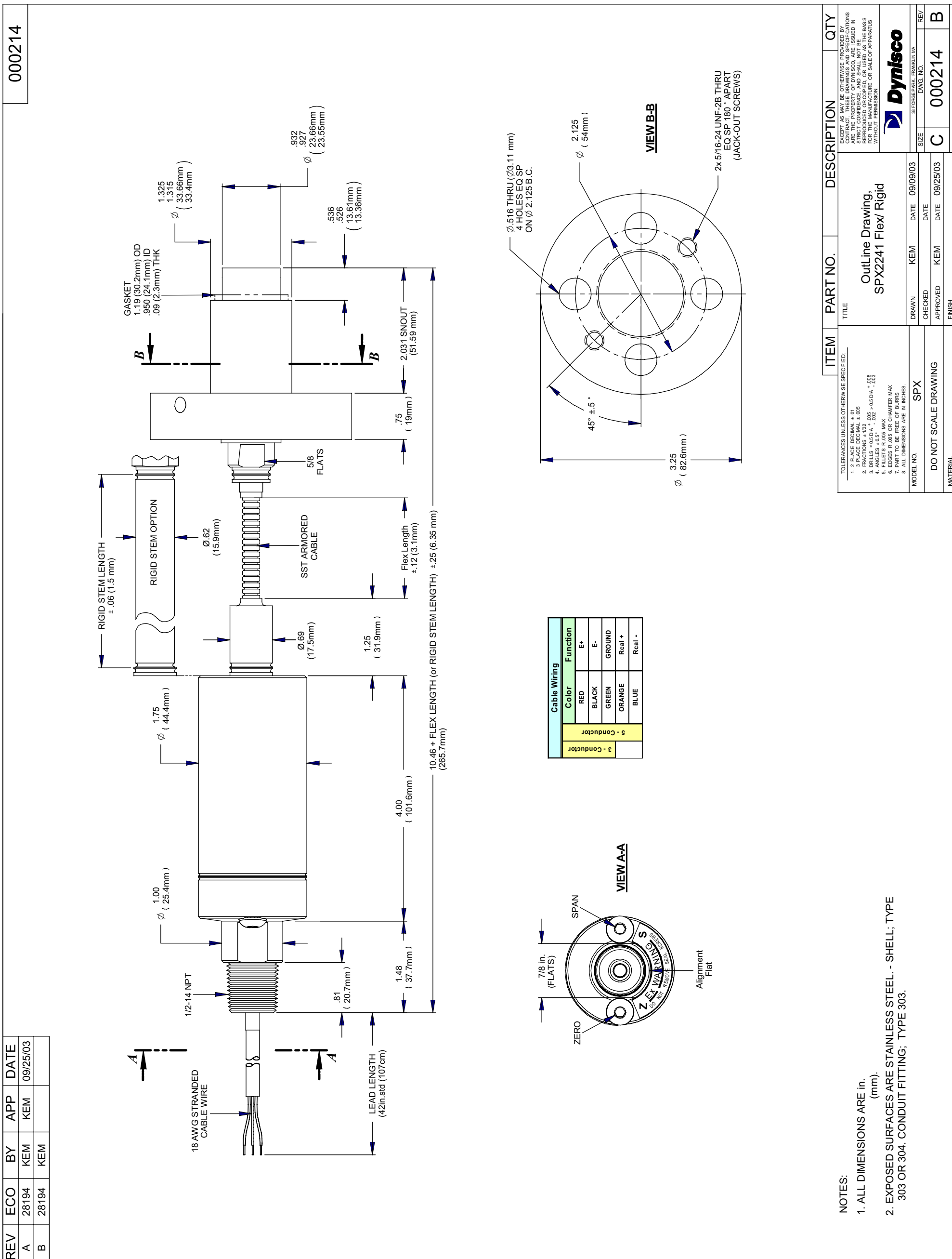
3.23 Weight

The weight varies depending on product configuration. Average weight range is 1 to 5 pounds.

3.24 Dimensions

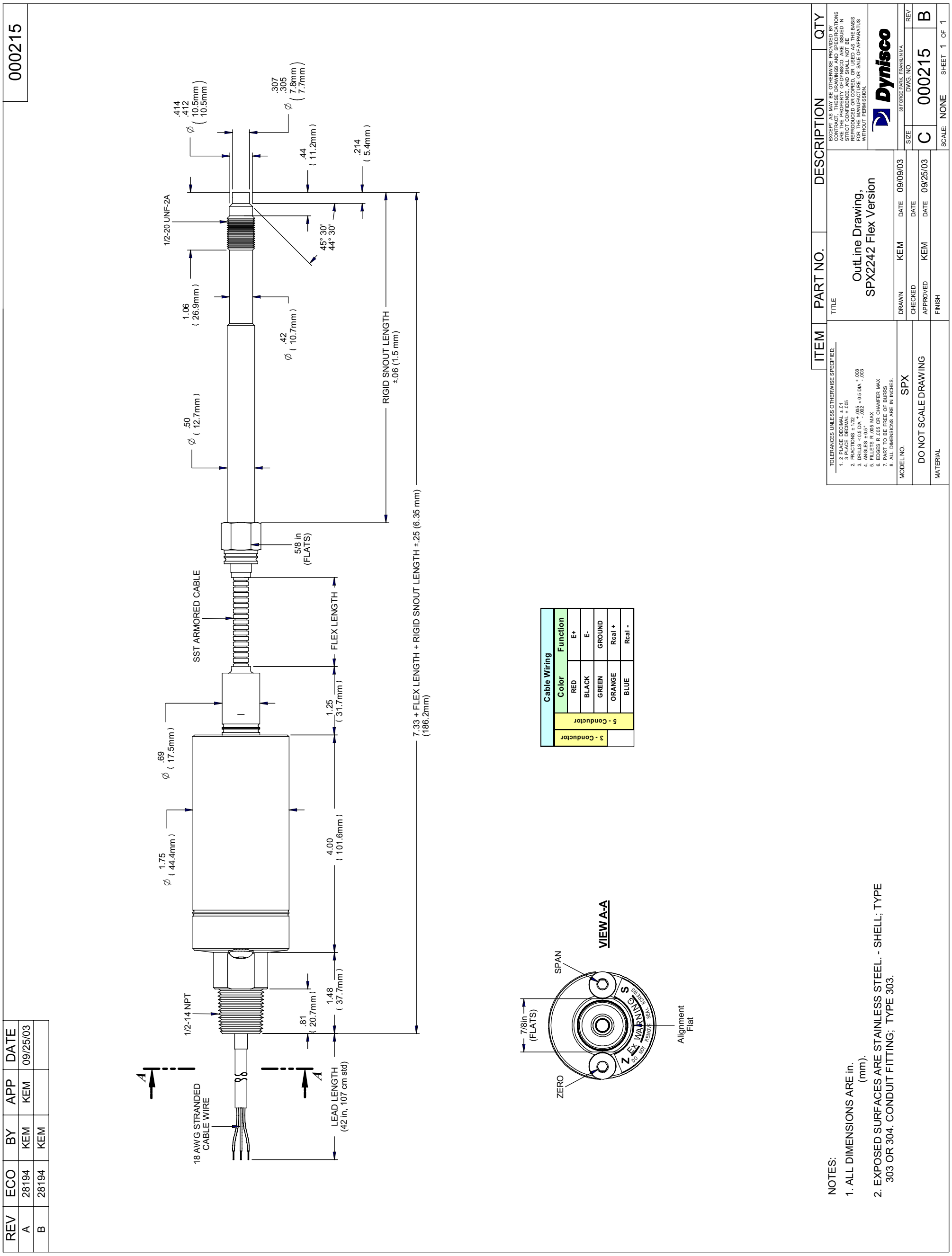
TECHNICAL DATA

Fig. 3-1 2241



TECHNICAL DATA

Fig. 3-2 2242



TECHNICAL DATA

Fig. 3-3 2242 with Temperature Sensor

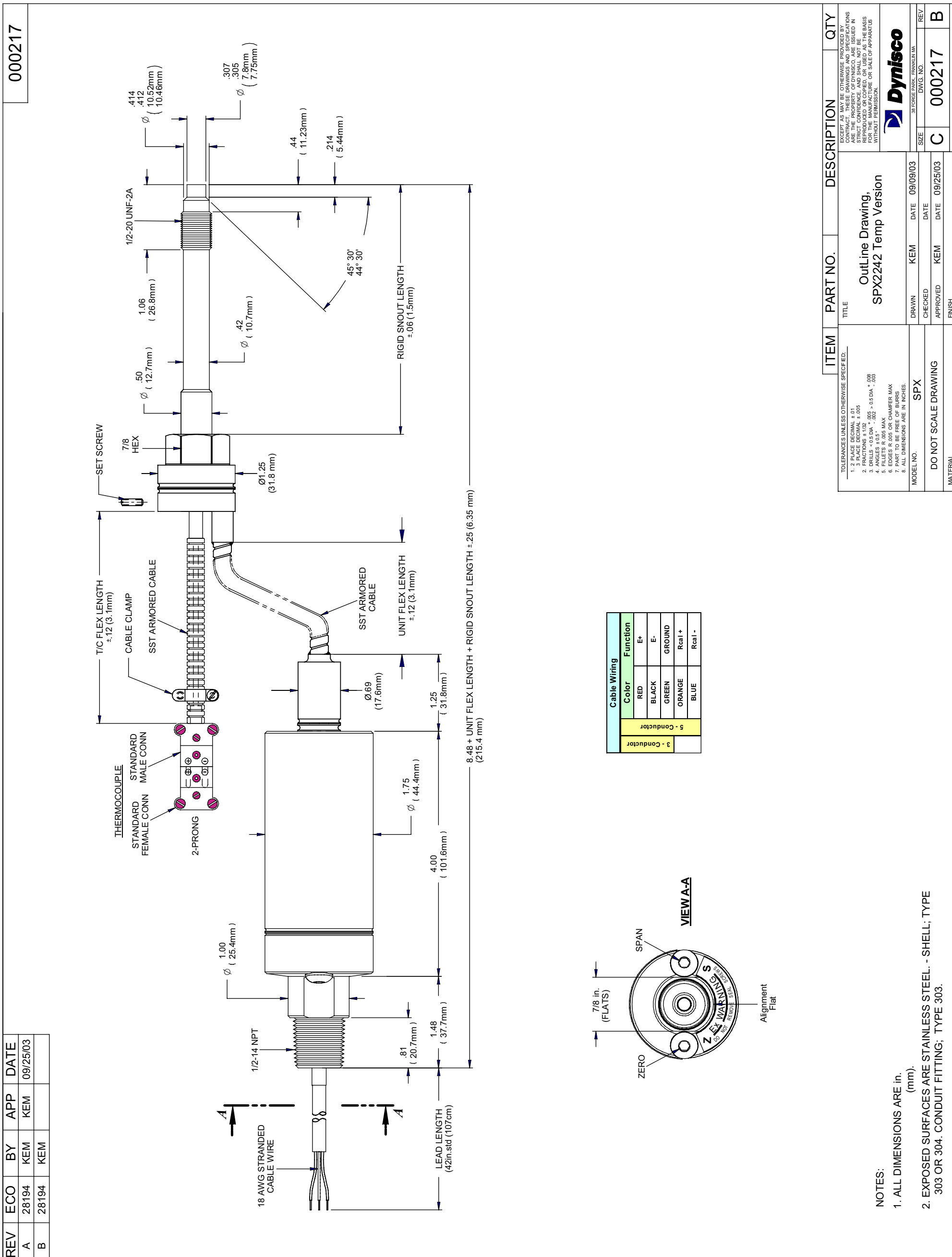
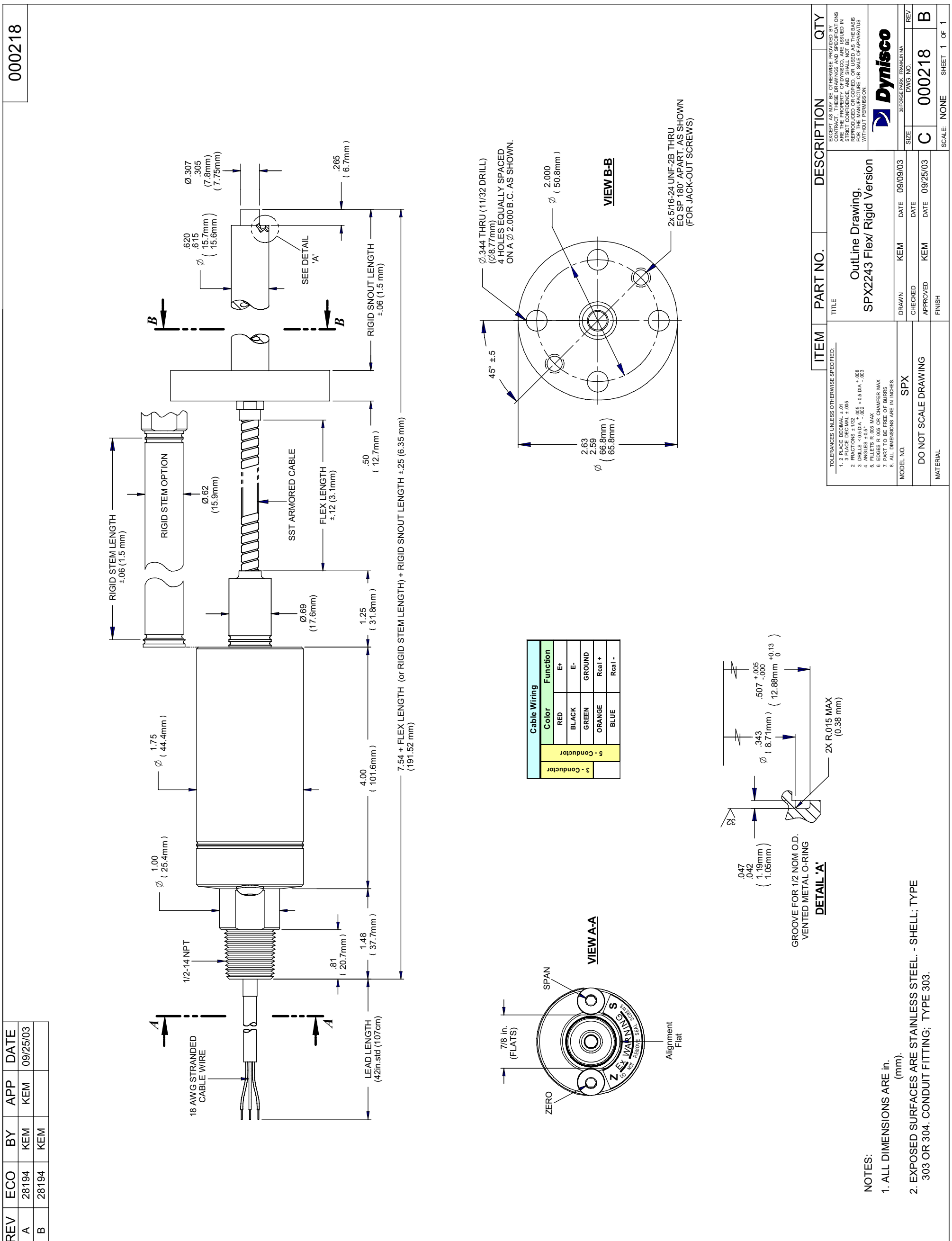


Fig. 3-4 2243



TECHNICAL DATA

Fig. 3-5 2243 with Temperature Sensor

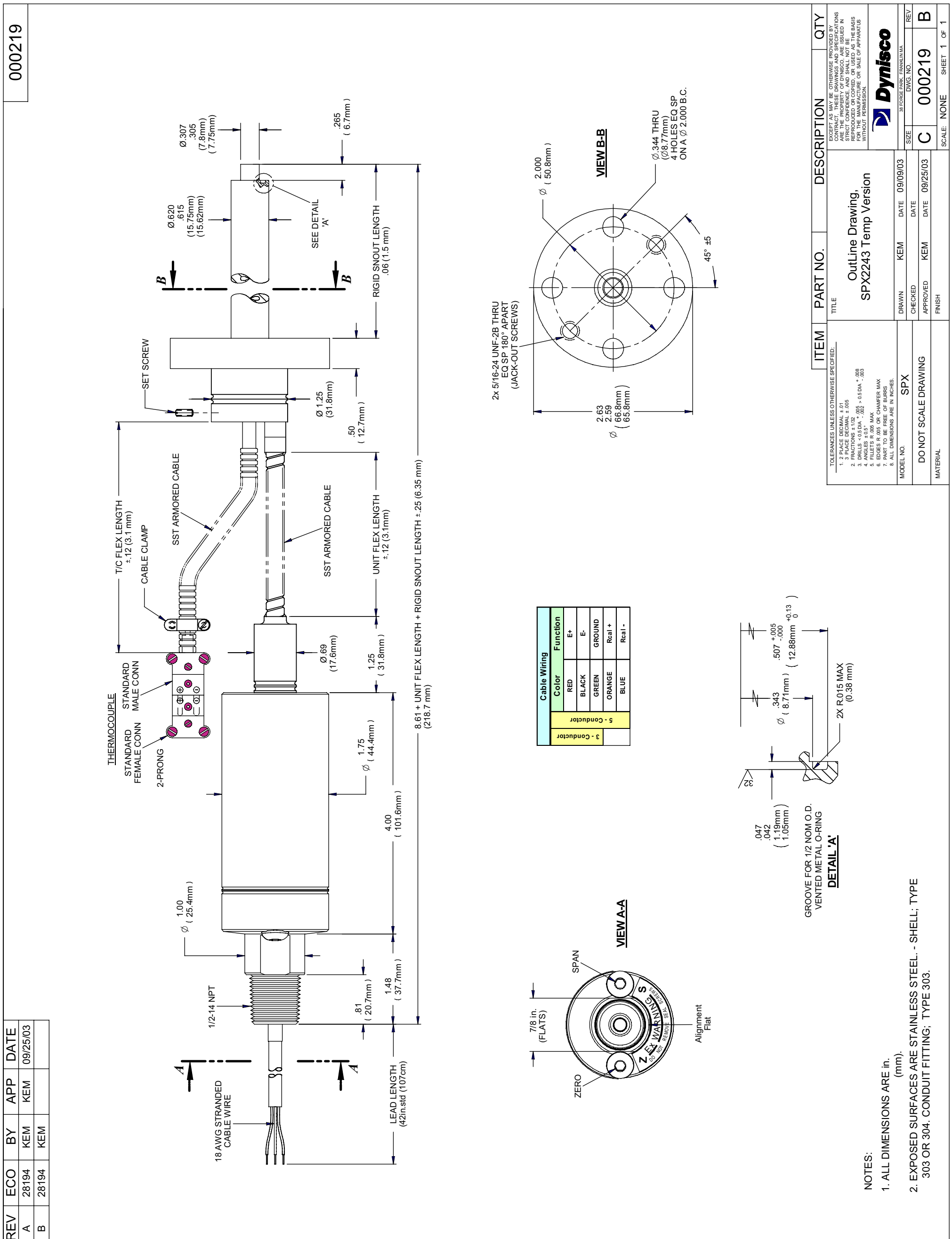
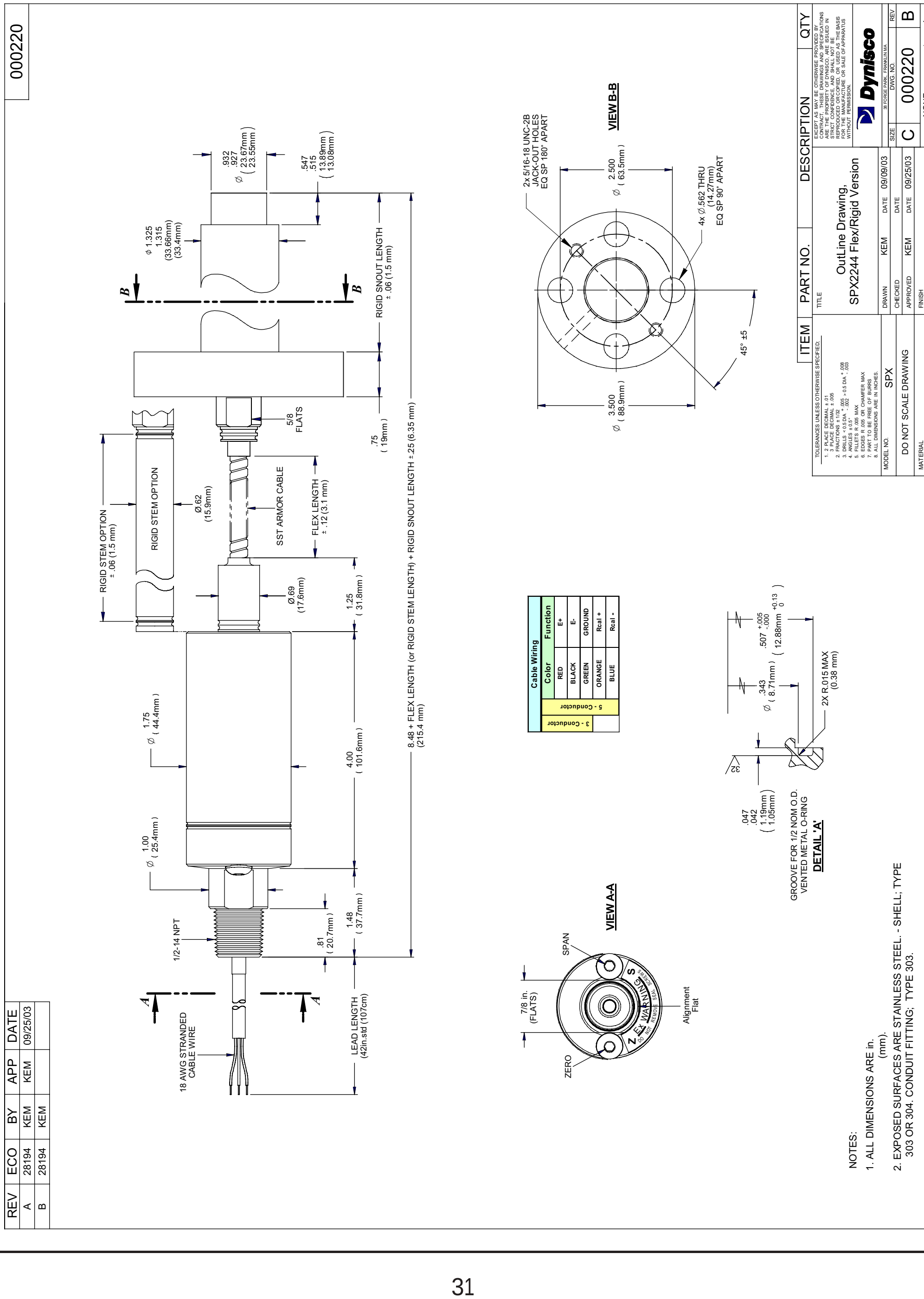


Fig. 3-6 2244



TECHNICAL DATA

TECHNICAL DATA

Fig. 3-7 2290

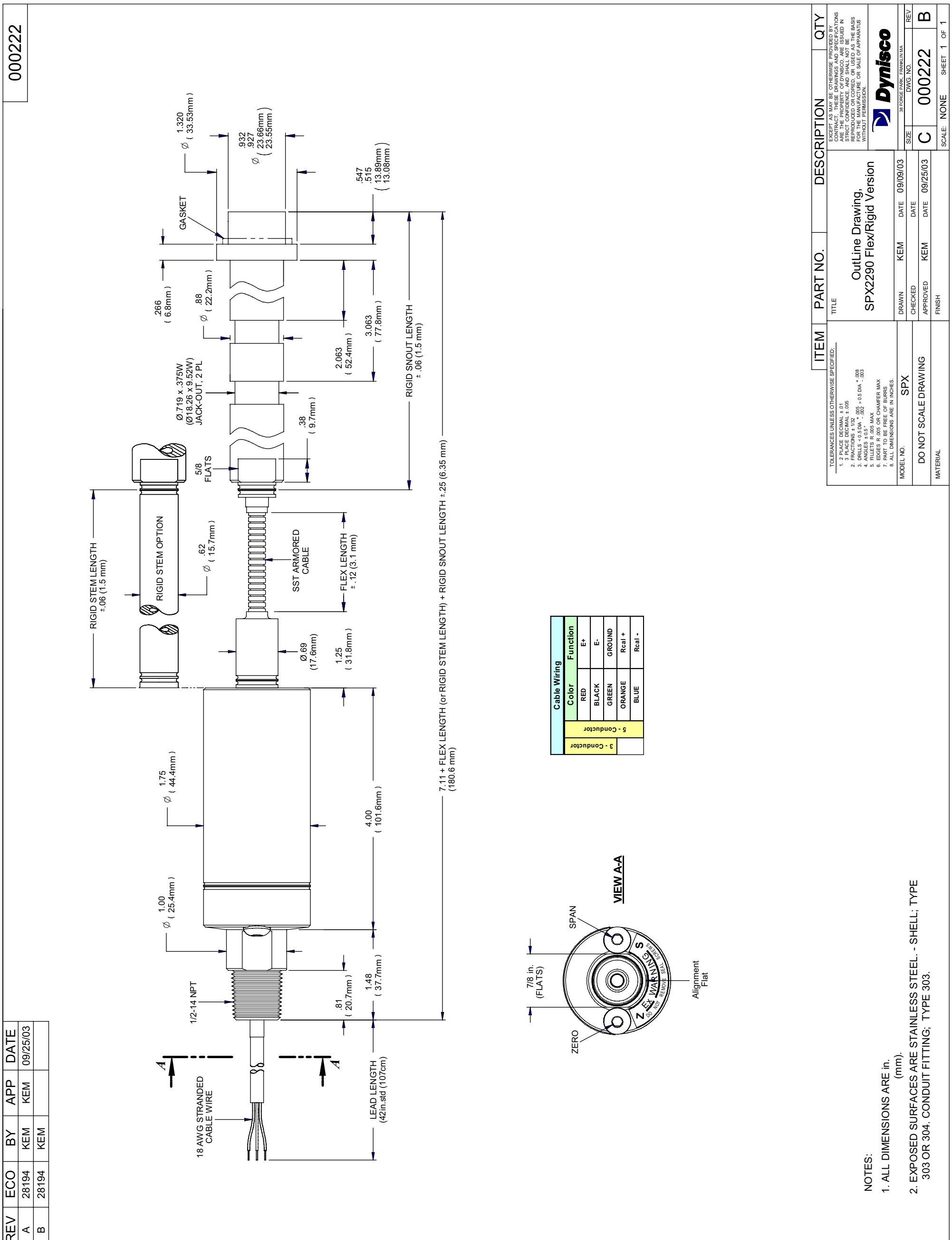
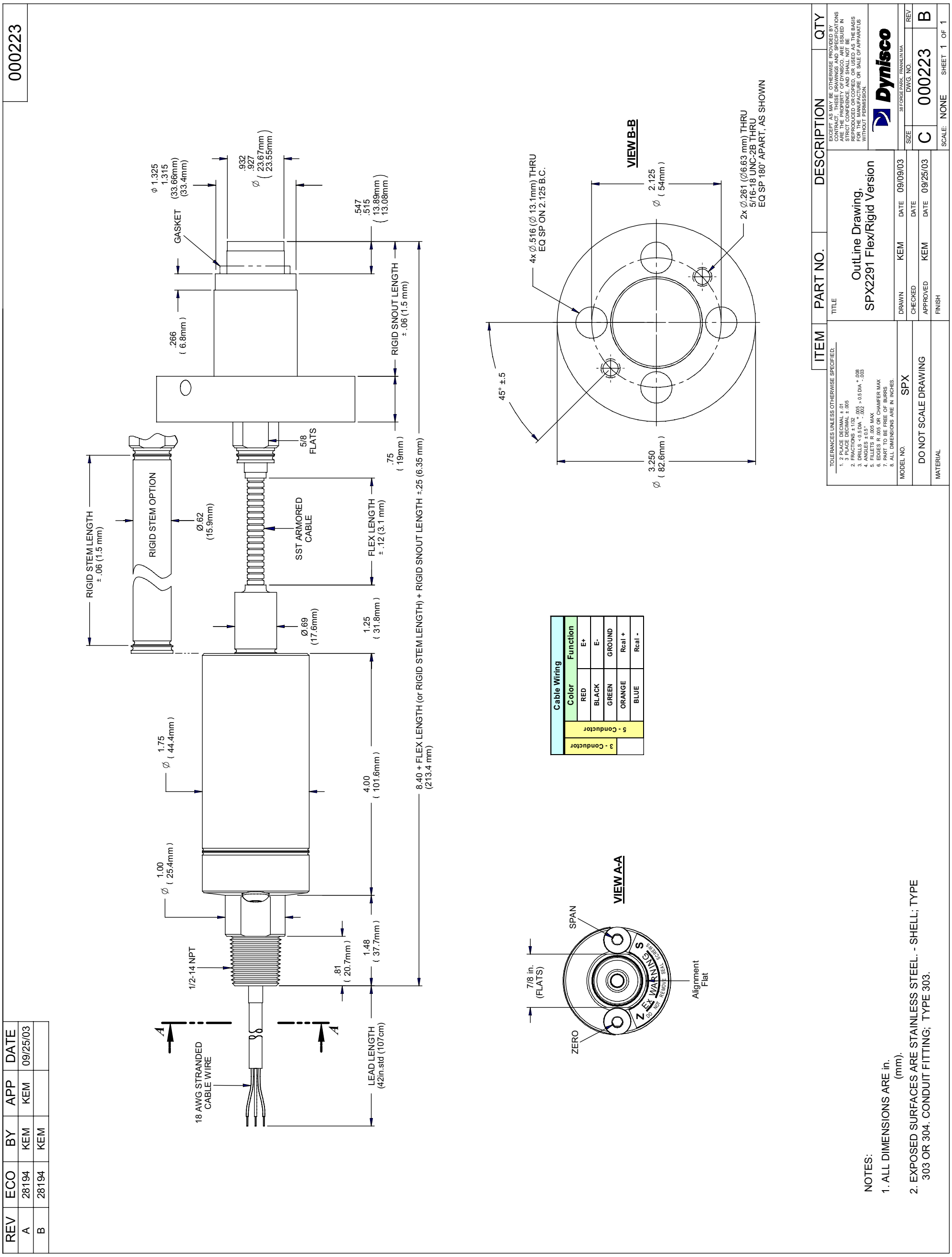


Fig. 3-8 2291



TECHNICAL DATA

Fig. 3-9 2291 with Temperature Sensor

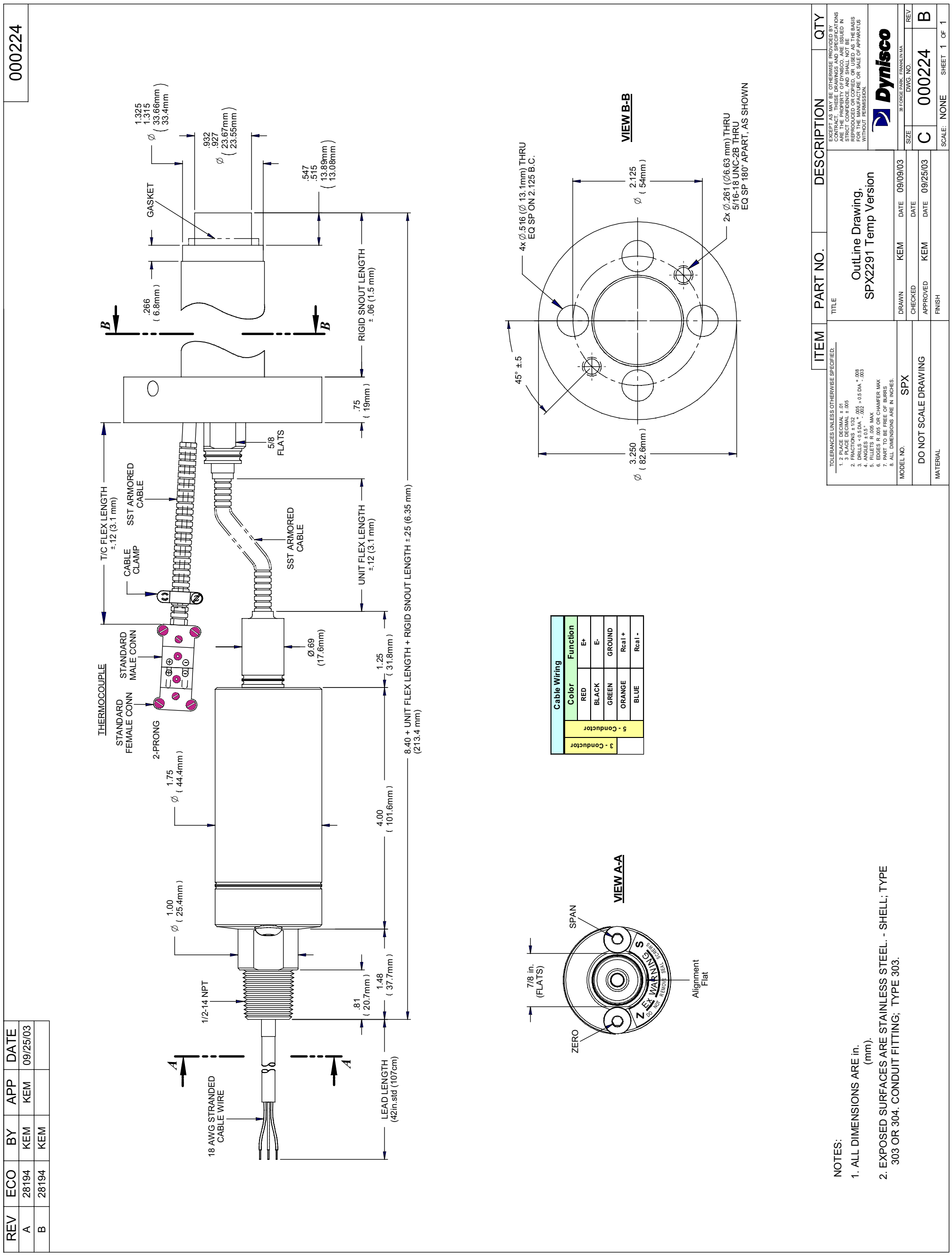
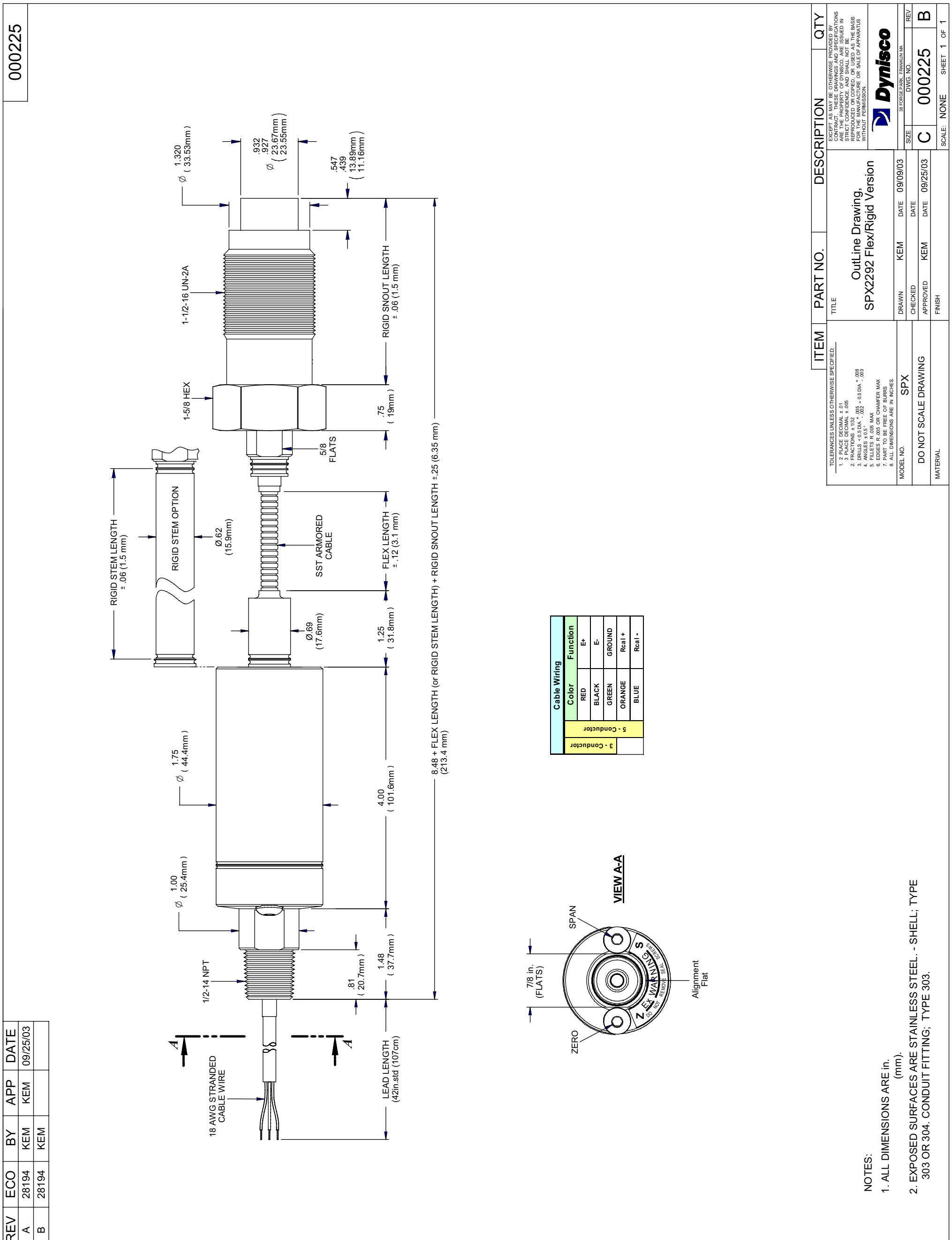


Fig. 3-10 2292



TECHNICAL DATA

4. 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.

4.1 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.

4.2 STORAGE

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

4.3 SCOPE OF DELIVERY

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

5. Installation

5.1 General Mounting Information

Do not remove the protective cap on the SPX until ready to install.

Before mounting the SPX, check mounting hole carefully. The SPX must only be mounted in holes that satisfy the requirements below. A hole that does not satisfy these requirements can damage the Transmitter.

Insure the mounting hole is clear of any frozen polymer or debris and is machined to the proper dimensions.

For threaded SPX transmitters coat the threads with a high temperature anti-seize grease or a suitable parting agent, this will help prevent the SPX snout from sticking permanently in the mounting hole. For flanged configuration units, apply Anti-Seize to mounting bolt threads. Use proper Buttonseal gasket and install on transducer tip.

Install unit into the process connection. (Do NOT torque transmitter into the hole at this time!) Allow time for the transmitter snout temperature to equalize to the process temperature. This will help eliminate thread galling and ease removal later. There should be NO pressure applied at this time.

Always use a torque wrench applied to the designated hexagon collar or mounting bolts while screwing the transmitter in and out. Do not apply the tool to the housing or housing/sensor connection.

After temperatures have equalized, apply proper torque as described in Section 5.2 of the Manual and tighten transmitter into mounting hole.

After the correct torque has been applied units with flexible capillary require the electronics to be mounted away from the process heat using mounting hardware, P/N 200941.

Connect power to the transmitter. For a 2 wire conduit output configuration, Red wire is Sig+/Exc +, Black wire is Sig-/Exc-, Green wire is Ground. For a 6 pin connector version, Pin A is Sig+/Exc+ and pin B is Sig-/Exc-. Insure proper loop supply voltage is applied to transmitter.

Make sure that the medium is in molten condition during transmitter removal. Removing the transmitter while the medium is in solidified condition can damage the sensor diaphragm.

When removing the SPX, carefully clean the diaphragm of the transmitter with a soft cloth while the medium is still malleable.

Always remove the SPX prior to cleaning the machine with abrasives or steel wire brushes. Also, do not clean the SPX with hard objects, such as a screwdriver, a wire brush, etc. this will possibly damage the transmitter.

Before reinstalling the SPX, ensure that the mounting hole is free from hardened plastic. A mounting hole cleaning tool kit is available to aid in removing of the material. (Dynisco Part Number 200100 for ½-20, 200101 for M18 and 200102 for M10 ports.) A gauge plug to check the hole is included in this kit.

ATTENTION

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

Mounting and electrical connection of the SPX 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!

ATTENTION

The most common causes of transducer damage are: installation in improperly machined or plugged mounting holes and cold starts. The tip of the transducer consists of a stainless steel diaphragm that must be protected from severe abrasives, dents and scores.

Burn Hazard! The SPX must be removed with the melt in the molten condition. The SPX can be very hot when removed. WEAR PROTECTIVE GLOVES!

Careful attention should be paid to correctly machine the mounting port. Failure to use the recommended mounting port may result in erroneous pressure measurement, difficult transducer 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 the threaded surfaces.

5.2 MOUNTING HOLE TORQUE

2242	2243	2292	2241, 2244, 2290, 2291
max. 56.5 Nm (500 inch-lbs.) min. 11.3 Nm (100 inch-lbs.)	max. 5.6 Nm (50 inch-lbs.) min. 4.5 Nm (40 inch-lbs.)	max. 14.1 Nm (125 inch-lbs.) min. 11.3 Nm (100 inch-lbs.)	max. 14.1 Nm (125 inch-lbs.) min. 11.3 Nm (100 inch-lbs.)

5.3 MOUNTING HOLE DIMENSIONS

Depending on the SPX being used drill the mounting hole as shown in Fig. 5-1, 5-2, 5-3, 5-4, 5-5, 5-6 or 5-7.

Please consult factory for other mounting configurations.

Fig. 5-1 2241 Mounting Hole

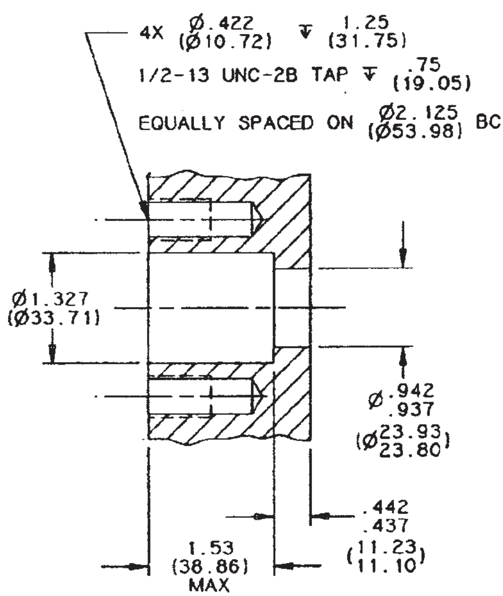
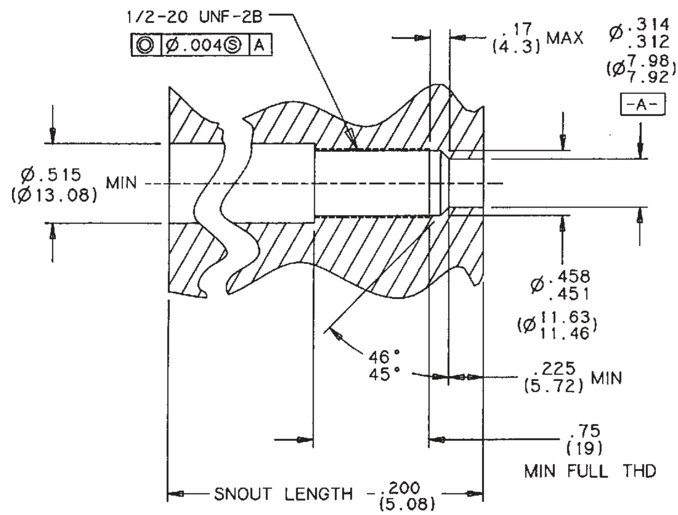


Fig. 5-2 2242 (1/2-20 UNF) Mounting Hole



DIMENSIONS ARE IN (MM)

Fig. 5-3 2242 (M18 x 1.5) Mounting Hole

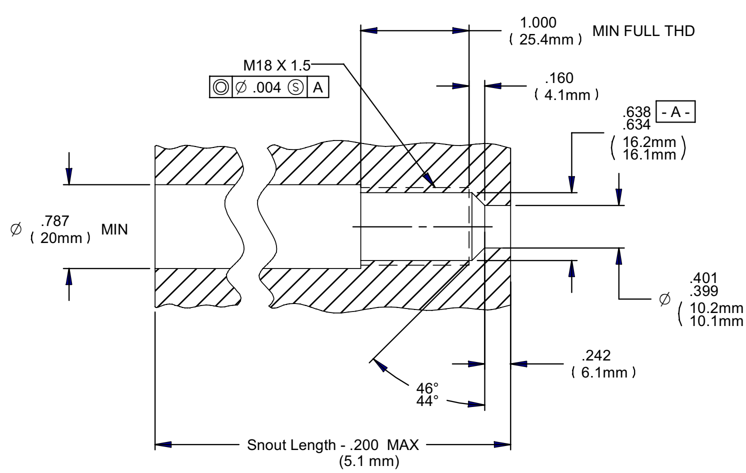


Fig. 5-4 2243 Mounting Hole

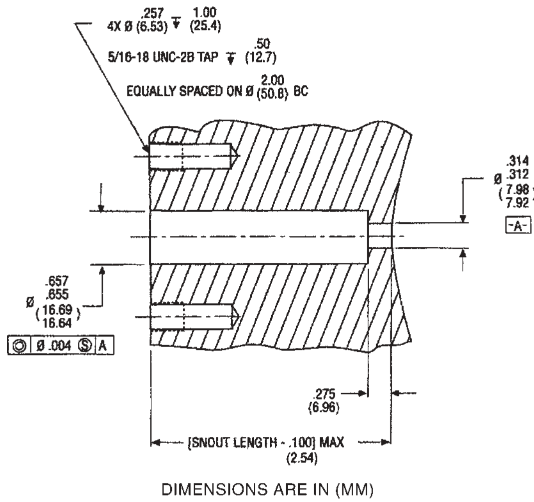


Fig. 5-5 2244 Mounting Hole

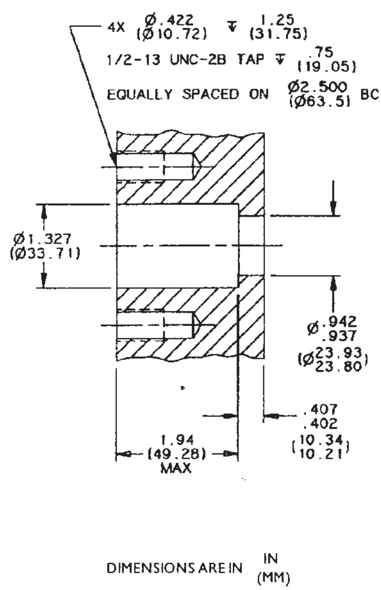


Fig. 5-6 2290 & 2291 Mounting Hole

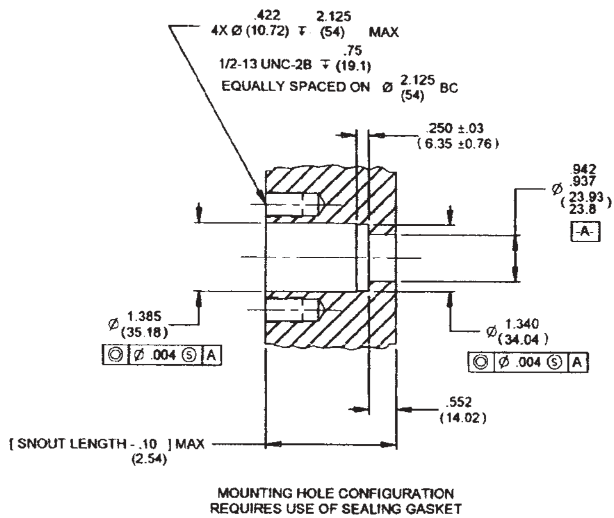
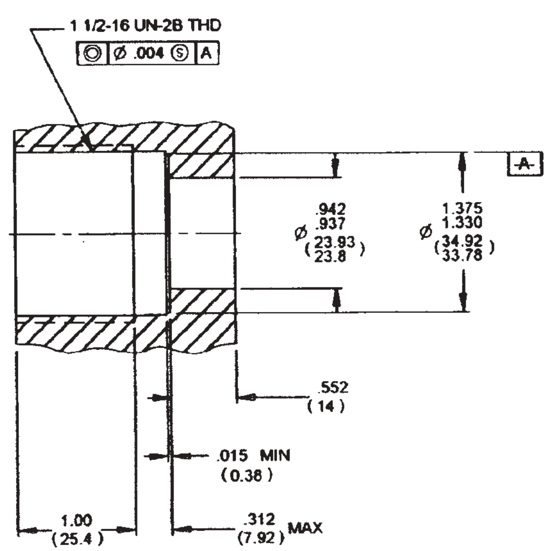


Fig. 5-7 2292 Mounting Hole



5.4 MOUNTING THE PRESSURE TRANSMITTER

Dynisco offers a set of mounting hole-machining tools with all the necessary drills, taps, and reamers for the Dynisco standard ½-20UNF-2A and M18 and M10 mounting holes used in high temperature and plastics processing applications (Dynisco Part Numbers 200925, 200105 and 901949 respectively). Detailed instructions are sent with the machining kits. Copies of the instructions are available from Dynisco upon request.

When machining the hole pay careful attention to the concentricity between the threads and the 0.312/ 0.314 diameter. Since the pressure seal is on the 45° seating surface, this surface should be examined for good finish, free from burrs, etc.

It is general good practice to check the mounting hole before installing the transducer. One procedure is to coat a gauge plug (Dynisco Part Number 200908 for the 1/2 –20 standard port, 435901 for the short tip 1/2 –20 version, 200960 for the M18), with Dykem machine bluing on surfaces below the thread. Insert the gauge plug into the mounting hole and rotate until surface binding is encountered. Remove and inspect. Bluing should only be scraped off of the 45° sealing chamfer. If bluing has been removed from other surfaces, the mounting hole has not been machined properly.

5.5 INSTALLING THE FLANGED PRESSURE TRANSMITTER

Note that the pressure seal on flange mounted units is made at the lower o-ring or gasket, not the flange.

See section 5.2 for recommended mounting torques.

Recommended mounting torques to crush appropriate gasket material:

Pressure Range	Gasket	Part Number	Torque
3,000 psi	Aluminum	494602	15 ft/lbs
10,000 psi	Parkerized Carbon Steel	634001	60 ft/lbs
10,000 psi	Hastelloy	634002	60 ft/lbs
10,000 psi	303 Stainless Steel	634004	60 ft/lbs

5.6 THERMOCOUPLE OR RTD ASSEMBLY REMOVAL AND INSTALLATION

1. To remove, loosen setscrew on side of snout.
2. Without twisting, pull the thermocouple probe or RTD stem carefully out of snout.
3. To install slide the new thermocouple or RTD into the snout.
4. Lock in place with setscrew.

5.7 ELECTRICAL CONNECTION

The SPX Series transmitters have 4-20 mA output. The transmitter power supply and output are supplied over the same pair of wires.

We recommend that you use twisted, shielded cables as connecting wires.

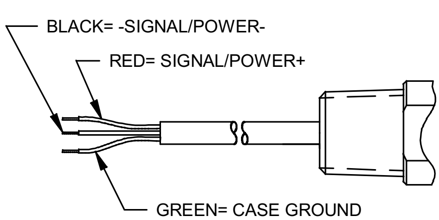
Observe National Electric Code and national regulations for applications in hazardous areas.

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

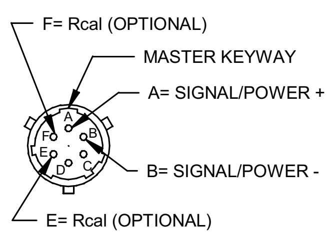
5.8 CONNECTION ASSIGNMENTS

Conduit /Leads	
Red	+ Signal / Power
Black	- Signal / Power
Green	Case Ground
Blue	RCal (Option)
Orange	RCal (Option)

Connector	
A	+ Signal / Power
B	- Signal / Power
C	No Connection
D	No Connection
E	RCal (Option)
F	RCal (Option)



CONDUIT/LEADS



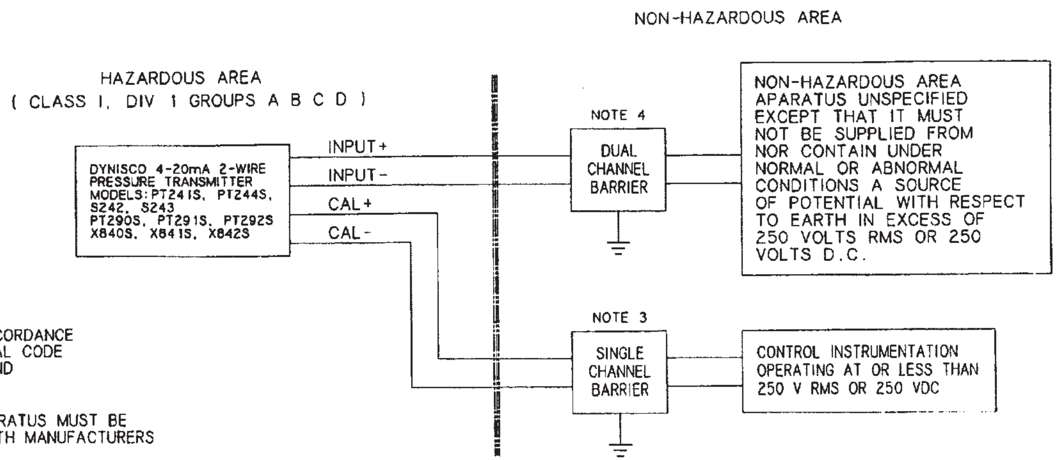
CONNECTOR

Pins C & D are reserved for a special option. In normal operation, they must be left disconnected (floating).

EX

If the transmitter is installed in hazardous areas, only passive devices such as switches or resistors may be connected between Rcal functions or any other special functions. Connection of any active electrostatic circuit or voltage or current source other than IS supply for the current loop is not allowed.

Fig. 5.8 Electrical Configuration for Explosion Proof Hazardous Areas



NOTES:

1. INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70, ARTICLE 504) AND ANSI/ISA RP12.6.

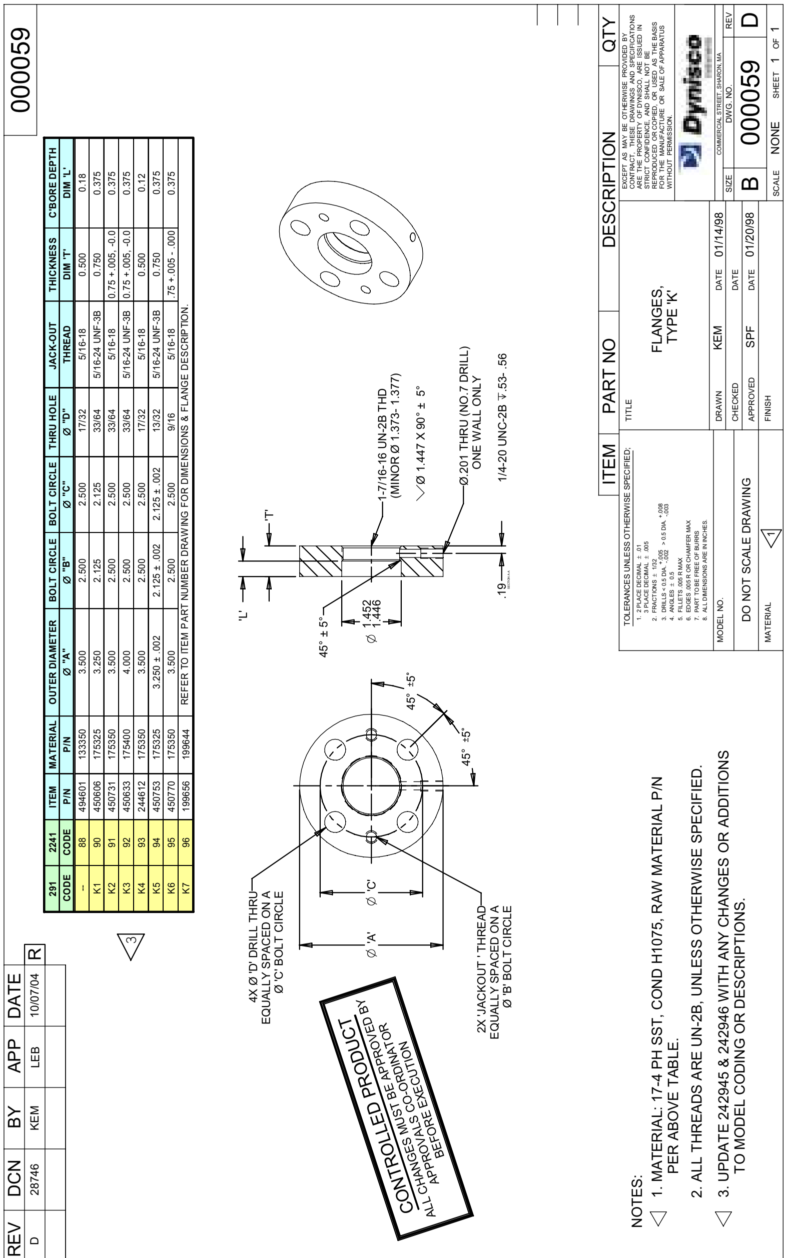
2. PROTECTIVE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTALLATION DRAWING.

3. ANY FMRC APPROVED SINGLE OR DUAL CHANNEL BARRIER WITH ENTITY PARAMETERS OF Voc OR Vt ≤ 25V, Isc OR It ≤ 100mA, Ca > 0.017uf, La > 0mH OR PROTECTIVE BARRIER PEPPERL/FUCHS Z111/Ex.

4. ANY FMRC APPROVED SINGLE OR DUAL CHANNEL BARRIER WITH ENTITY PARAMETERS OF Voc OR Vt ≤ 40V, Isc OR It ≤ 100mA, Ca > 0.017uf, La > 0mH OR ONE OF THE FOLLOWING PROTECTIVE BARRIERS: MTL2441B OR PEPPERL/FUCHS ZG30/Ex OR PEPPERL/FUCHS ZG31Ex OR PEPPERL/FUCHS KHD3-1CR/Ex130 200 Y71688 OR OR PEPPERL/FUCHS KHD2-STC3-Ex1.P OR PEPPERL/FUCHS KHD2-STC3-Ex1.

5.9 Flange Configurations

Fig. 5-9 2241 & 2244 "K" Flange Configurations



291 CODE	2241 CODE	ITEM P/N	MATERIAL P/N	OUTER DIAMETER Ø "A"	BOLT CIRCLE Ø "B"	BOLT CIRCLE Ø "C"	THRU HOLE Ø "D"	JACK-OUT THREAD	THICKNESS DIM 'T'	C'BORE DEPTH DIM 'L'
--	88	494601	133350	3.500	2.500	2.500	17/32	5/16-18	0.500	0.18
K1	90	450606	175325	3.250	2.125	2.125	33/64	5/16-24 UNF-3B	0.750	0.375
K2	91	450731	175350	3.500	2.500	2.500	33/64	5/16-18	0.75 +.005, -0.0	0.375
K3	92	450633	175400	4.000	2.500	2.500	33/64	5/16-24 UNF-3B	0.75 +.005, -0.0	0.375
K4	93	244612	175350	3.500	2.500	2.500	17/32	5/16-18	0.500	0.12
K5	94	450753	175325	3.250 ± .002	2.125 ± .002	2.125 ± .002	13/32	5/16-24 UNF-3B	0.750	0.375
K6	95	450770	175350	3.500	2.500	2.500	9/16	5/16-18	.75 +.005 - .000	0.375
K7	96	199656	199644	REFER TO ITEM PART NUMBER DRAWING FOR DIMENSIONS & FLANGE DESCRIPTION.						

Fig. 5-10 2243 “F” Flange Configurations

REV	ECO	BY	APP	DATE	
T	28746	KEM	LEB	10/07/04	R

000053

CONTROLLED PRODUCT
ALL CHANGES MUST BE APPROVED BY APPROVALS CO-ORDINATOR BEFORE EXECUTION

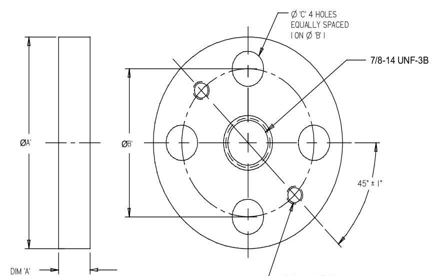


FIG 1

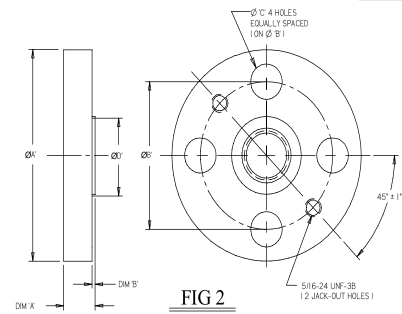


FIG 2

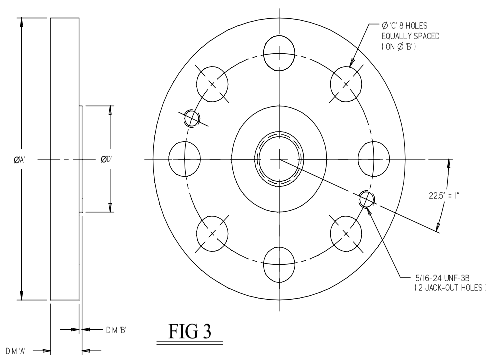


FIG 3

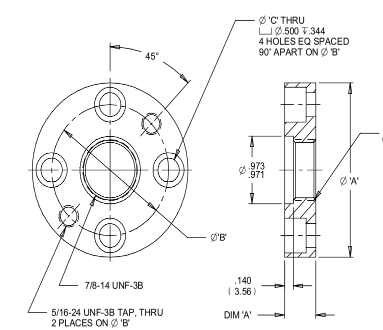


FIG 4

FLANGE MOUNTING CONFIGURATIONS ◁3

243 CODE	2243 CODE	DESCRIPTION	FIG	Ø'A'	Ø'B'	Ø'C'	Ø'D'	DIM 'A'	DIM 'B'	PART& DWG NUMBER	NOTES
N/A	25	STANDARD FLANGE	1	2.62 (66.6)	2.00 (50.8)	.343 (8.71)	N/A	.50 (12.7)	N/A	183802	
F1	26	FLAT FACE	1	2.62 (66.6)	2.00 (50.8)	.375 (9.5)	N/A	.50 (12.7)	N/A	243652	5/16-18 JACKOUT HOLES
F2	27	RAISED FACE 1500 LB, 1in	2	5.88 (149.4)	4.00 (101.6)	1.00 (25.4)	2.00 (50.8)	1.37 (34.8)	.25 (6.35)	243659	
F3	28	RAISED FACE 600 LB, 1/2in	2	3.75 (95.3)	2.62 (66.6)	.625 (15.9)	1.38 (35)	.81 (20.6)	.25 (6.35)	243831	WELDED NO SET SCREW
F4	29	RAISED FACE 150 LB, 2in	2	6.00 (152.4)	4.75 (120.6)	.750 (19)	3.62 (92)	.75 (19)	.06 (1.52)	243680	
F5	30	RAISED FACE 600 LB, 2in	3	6.50 (165.1)	5.00 (127)	.750 (19)	3.62 (92)	1.25 (31.8)	.25 (6.35)	243683	
F6	31	TPT STANDARD	1	2.62 (66.6)	2.00 (50.8)	.343 (8.71)	N/A	.50 (12.7)	N/A	483607	EXCEPT THREAD = 1-12 UNF-3B
F7	32	RAISED FACE 1500 LB, 1in	2	5.88 (149.4)	4.00 (101.6)	1.00 (25.4)	2.00 (50.8)	1.37 (34.8)	.25 (6.35)	243806	WELDED NO SET SCREW
F8	33	RAISED FACE 150 LB, .5in	1	3.50 (88.9)	2.38 (60.5)	.62 (15.7)	1.38 (35.1)	.44 (11.2)	.06 (1.52)	243824	
F9	34	STANDARD IPX184 FLANGE	4	2.50 (63.5)	1.876 (47.6)	.344 (8.73)	N/A	.500 (12.7)	N/A	183649	
F10	35	RAISED FACE 1500 LB, 1in	2	5.88 (149.4)	4.00 (101.6)	1.00 (25.4)	2.00 (50.8)	1.37 (34.8)	.25 (6.35)	243858	M12 JACKOUT HOLES
F11	36	RING TYPE JOINT 2500 LB, 1in, TPT	2	6.25 (158.8)	4.25 (108.0)	1.00 (25.4)	2.25 (57.2)	N/A	N/A	243703	RING JOINT FACING DIM ON DWG
F12	37	RAISED FACE 150 LB, 1in	2	4.25 (108)	3.12 (79.2)	.62 (15.7)	2.00 (50.8)	.56 (14.2)	.06 (1.52)	243866	
F13	38	RAISED FACE 1500 LB, 1in	2	5.88 (149.4)	4.00 (101.6)	1.00 (25.4)	2.00 (50.8)	1.37 (34.8)	.25 (6.35)	243867	WELDED NO SET SCREW
F14	39	RAISED FACE, 300 LB, 2 in	3	6.50 (165.1)	5.00 (127)	.750 (19)	3.62 (92)	.88 (22.35)	.06 (1.52)	243869	
F15	40	FLAT FACE, TPT FLANGE	N/A	2.62 (66.6)	2.00 (50.8)	.375 (9.5)	N/A	.500 (12.7)	N/A	243863	MODEL TPT243

NOTES:
1. ALL DIMENSIONS ARE IN IN (mm).
2. UNLESS NOTED OTHERWISE, FLANGE SECURED TO SNOUT VIA SET SCREW.
◁ 3. UPDATE 242945 & 242946 WITH ANY CHANGES OR ADDITIONS TO MODEL CODING OR DESCRIPTIONS.

ITEM	PART NO.	DESCRIPTION	QTY

TOLERANCES UNLESS OTHERWISE SPECIFIED:
1. 2 PLACE DECIMAL ±.01
3 PLACE DECIMAL ±.005
2. FRACTIONS ± 1/32
3. DRILLS < 0.5 DIA +.005 -.002 > 0.5 DIA +.008 -.003
4. ANGLES ± 0.5°
5. FILLETS R .005 MAX
6. EDGES R .005 OR CHAMFER MAX
7. PART TO BE FREE OF BURRS
8. ALL DIMENSIONS ARE IN INCHES.

MODEL NO. 243, 2243
DO NOT SCALE DRAWING
MATERIAL

TITLE
Certification Drawing, Flange Configurations

DRAWN	DRG	DATE	12/9/96
CHECKED		DATE	
APPROVED	WBM	DATE	06/02/97
FINISH			

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Dynisco
38 FORGE PARK, FRANKLIN MA

SIZE	DWG. NO.	REV
C	000053	T

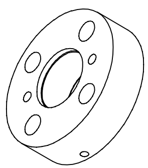
SCALE: NONE SHEET 1 OF 1

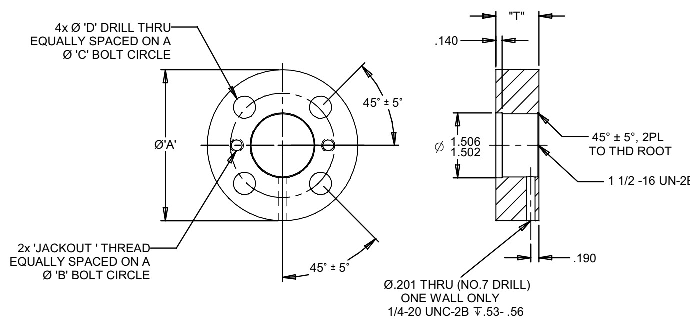
Fig. 5-11 2291 "S" Flange Configurations

REV	DCN	BY	APP	DATE	
T	28746	KEM	LEB	10/07/04	R

000057

291 CODE	2291 CODE	ITEM P/N	MATERIAL P/N	OUTER DIAMETER Ø "A"	BOLT CIRCLE Ø "B"	BOLT CIRCLE Ø "C"	THRU HOLE Ø "D"	JACK-OUT THREAD	THICKNESS DIM 'T'	PART REV
S1	48	291625	175325	3.250	2.125	2.125	33/64	5/16-18	0.75	A
S2	49	291682	175325	3.220	2.250	2.250	17/32	1/2-13	1.00	A
S3	50	291685	175325	3.250	2.250	2.250	17/32	5/16-18	0.75	A
S4	51	291620	175350	3.500	3.000	2.500	17/32	5/16-18	1.00	B
S5	52	199654	REFER TO SEPERATE DRAWING FOR DIMENSIONS AND MATERIAL							
S6	53	195639	PER DRAWING 195639, 2" 600 LB RF 304 SST ANSI FLANGE, SECURED BY SET-SCREW							
S7	54	291762	175350	3.500	2.500	2.500	9/16	M12 x 1.75	0.75	A
S8	55	185603	175350	3.500	2.500	2.500	9/16	5/16-18	0.75	B
S9	56	291606	175350	3.500	2.500	2.500	17/32	1/2-13	1.00	A
S10	57	291696	175325	3.250	2.125	2.520	33/64	5/16-18	1.00	A
S11	58	291772	REFER TO SEPERATE DRAWING FOR DIMENSIONS AND MATERIAL							
S12	59	199650	REFER TO SEPERATE DRAWING FOR DIMENSIONS AND MATERIAL							
S13	60	195632	PER DRAWING 195632, 1-1/2 300 LB RF 316 SST FLANGE, w/ 1/2-20 JACKOUT HOLES,WELDED, NO SET-SCREW							
S14	61	291853	175350	3.500	2.500	2.500	17/32	1/2 -13	0.75	A
S15	62	291858	PER DRAWING 291858, 2" 300 LB RF 304 SST ANSI FLANGE, SECURED BY SET-SCREW							
S16	63	195645	PER DRAWING 195645, 2" 600 LB RF 316 SST ANSI FLANGE, WELDED, NO SET-SCREW HOLE							





CONTROLLED PRODUCT
ALL CHANGES MUST BE APPROVED BY
APPROVALS CO-ORDINATOR
BEFORE EXECUTION

NOTES:

1. MATERIAL: 17-4 PH SST, COND H1075. RAW MATERIAL P/N PER ABOVE TABLE.
2. ALL THREADS ARE UN-2B, UNLESS OTHERWISE SPECIFIED.
3. S5 IS A 150 LB - 2 1/2" RAISED FACE ANSI FLANGE, SEE STANDARD ASME B16.5 FOR DIMENSIONS.
4. S11 IS A 600 LB - 2" RAISED FACE ANSI FLANGE, SEE STANDARD ASME B16.5 FOR DIMENSIONS.
5. UPDATE 242945 & 242946 WITH ANY CHANGES OR ADDITIONS TO MODEL CODING OR DESCRIPTIONS.

ITEM	PART NO	DESCRIPTION	QTY

TOLERANCES UNLESS OTHERWISE SPECIFIED;
1. 2 PLACE DECIMAL ± .01
   3 PLACE DECIMAL ± .005
2. FRACTIONS ± 1/32
3. DRILLS < 0.5 DIA. $^{+.005}_{-.002}$ > 0.5 DIA. $^{+.008}_{-.003}$
4. ANGLES ± 0.5
5. FILLETS .005 R MAX
6. EDGES .005 R OR CHAMFER MAX
7. PART TO BE FREE OF BURRS
8. ALL DIMENSIONS ARE IN INCHES.

MODEL NO.

DO NOT SCALE DRAWING

MATERIAL SEE NOTE 1.

TITLE **FLANGES, TYPE 'S'**

DRAWN	KEM	DATE	07/23/97
CHECKED	SFP	DATE	10/09/97
APPROVED	SFP	DATE	10/09/97

FINISH

Dynisco Instruments
FORGE PARKWAY, FRANKLIN, MA

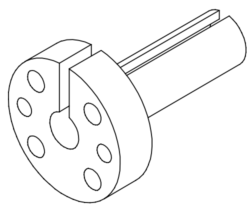
SIZE	DWG. NO.	REV
B	000057	T

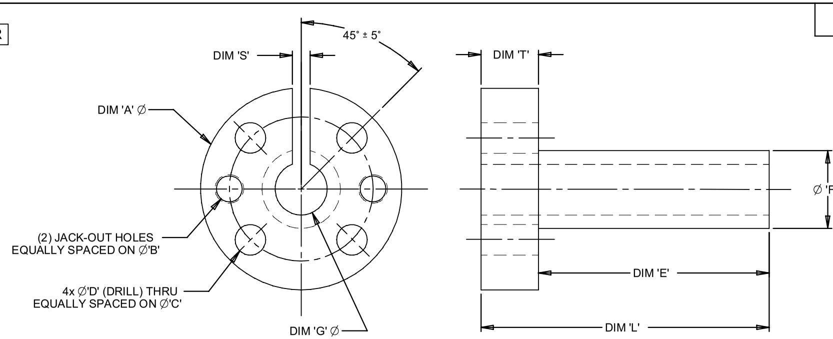
SCALE NONE SHEET 1 OF 1

Fig. 5-12 2290 "T" Flange Configurations

REV	ECO	BY	APP	DATE	
N	28746	KEM	LEB	10/07/04	R

000058





290 CODE	2290 CODE	ITEM P/N	PART REV	"ORDERED" SNOUT LENGTH	DIM 'A' (DIA)	DIM 'T' THICKNESS	BOLT CIRCLE 'B' DIA	BOLT CIRCLE 'C' DIA	THRU HOLE 'D' DIA	DIM 'E'	DIM 'F' (DIA)	DIM 'G' (DIA)	DIM 'L' OVERALL LENGTH	DIM 'S'	JACKOUT THREAD
T1	70	291623	G	4.847	3.500	1.00	2.500	2.500	17/32	4.050			5.050	0.31	1/2-13
T2	71	291614	G	5.047	3.500	1.00	2.500	2.500	17/32	4.250			5.250	0.31	1/2-13
T3	72	291618	G	4.847	3.250	0.75	2.125	2.125	33/64	4.050		0.906	4.800	0.31	5/16-18
T4	73	291601	G	4.547	3.500	1.00	2.500	2.500	17/32	3.750	1.365		4.750	0.31	1/2-13
T5	74	291600	G	2.047	3.250	0.75	2.125	2.125	33/64	1.250		(29/32)	2.000	N/A	5/16-18
T6	75	291610	G	5.847	3.250	0.75	2.125	2.125	33/64	5.050		drill	5.800	N/A	5/16-18
T7	76	291616	G	4.847	3.500	1.00	2.500	2.500	17/32	4.050			5.050	0.31	1/2-13
T8	77	291429	G	2.00	3.250	0.75	2.125	2.125	33/64	1.220	1.310		1.970	N/A	5/16-18
T9	78	291924	C		4.000	1.00	3.000	3.000	11/16	9.000	1.375	1.000	10.000	0.50	1/2-13
T10	79	291851	A	5.94	3.500	1.00	2.500	2.500	17/32	5.140	1.365	0.906	6.140	0.31	1/2-13

2

CONTROLLED PRODUCT
ALL CHANGES MUST BE APPROVED BY APPROVALS CO-ORDINATOR BEFORE EXECUTION

NOTES:

1. MATERIAL: 17-4 SST, CONDITION 1075.
2. UPDATE 242945 & 242946 WITH ANY CHANGES OR ADDITIONS TO MODEL CODING OR DESCRIPTIONS.

ITEM	PART NO.	DESCRIPTION	QTY

TOLERANCES UNLESS OTHERWISE SPECIFIED:
1. 2 PLACE DECIMAL ± .01
   3 PLACE DECIMAL ± .005
2. FRACTIONS ± 1/32
3. DRILLS < 0.5 DIA + .005 / - .002 > 0.5 DIA + .008 / - .003
4. ANGLES ± 0.5°
5. FILLETS R .005 MAX
6. EDGES R .005 OR CHAMFER MAX
7. PART TO BE FREE OF BURRS
8. ALL DIMENSIONS ARE IN INCHES.

MODEL NO.

DO NOT SCALE DRAWING

MATERIAL 1

TITLE

SPLIT FLANGES
TYPE 'T'

DRAWN	KEM	DATE	06/30/97
CHECKED	SFP	DATE	10/09/97
APPROVED	SFP	DATE	10/09/97

FINISH 63

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Dynisco
FORGE PARKWAY, FRANKLIN, MA

SIZE	DWG. NO.	REV
B	000058	N

SCALE NONE SHEET 1 OF 1

6. COMMISSIONING

There are two ways of commissioning the SPX transmitters. This can be done by utilizing the ZERO and SPAN Push-buttons, or by HART Communications via a communicator connected to the pressure loop.

If the SPX is equipped with the optional HART communications, it is not necessary to access the push buttons on the sensor.

If the transmitter is not equipped with HART then the push buttons must be utilized. However, Sections 6.3 through 6.8 and 6.11 may be skipped.

6.1 WHY A TRANSMITTER MUST BE REZEROED

The transmitter output must be nulled at zero pressure after installation when the machine has stablized at operating temperature. This is easy to understand why when considering the mechanical properties of the sensor.

As described in section 1.5, a fill fluid transmits the process pressure from the sensor tip of the transmitter (at process temperature) to the electronics housing (at ambient temperature). As the transmitter sensing tip is brought from ambient to process temperature, the fill fluid expands and increases the amount of deflection on the sensing diaphragm. This creates a positive pressure reading, as if a small pressure was actually applied, even with zero pressure on the system.

Also, depending on the orientation of the sensor, the wieght of the fluid will have an effect on the sensing diaphragm. The weight of the fluid will either increase the deflection of the diaphragm as if a small pressure is applied or may pull on the diaphragm as if pressure was pulling away from the sensor (a negative reading).

START

There are some other effects that may effect the zero as well, such as torque, side loading, etc. For more information contact Dynisco.

All of these effects can be compensated for by setting the transmitter zero after the machine has stabilized at operating temperature.

6.2 Utilizing the Zero and Span Push-buttons

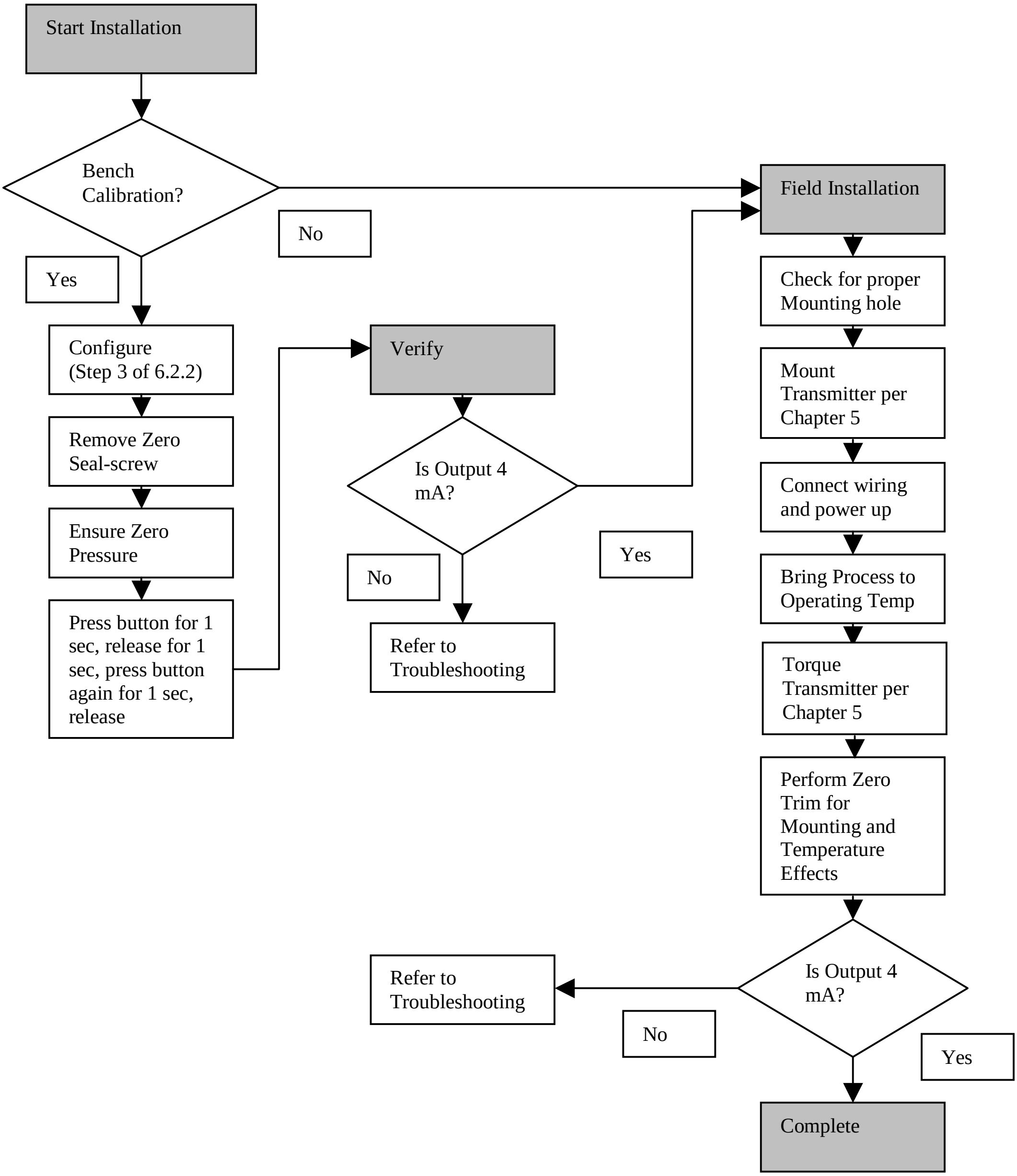
When the transmitter output needs to be corrected due to mounting location and temperature shift after the process has been brought to operating temperature and a Hart Communicator is not available, the zero push-button is located under the seal screw can be used. The zero procedure is only recommended after the process temperature has stabilized and the SPX electronics housing has been permanently installed.

When the button is depressed in a certain sequence, the output will be corrected to reflect 4 mA. This is done by the transmitter electronics automatically by adjusting the LRV and URV settings simultaneously to the offset required to obtain 4 mA. Normally a Zero calibration is all that is required after installation since the Transmitter span has been calibrated at the factory. In the event the Full Scale output is not correct when checked against a calibrated pressure source or dead weight tester, the Transmitter span can be adjusted via the Span push-button. This is performed by applying a known calibrated full scale pressure to the transmitter and pressing the Span button located under the seal screw in a certain sequence. When complete, the transmitter electronics will have adjusted the URV to correct to output to equal 20 mA.

ATTENTION The span pushbutton should never be used to set the URV without zeroing the PT with the zero push-button first.

If for some reason the calibration is incorrect and the user wishes to revert back to the Factory Calibration, a procedure can be performed to revert the calibration back to factory state. Refer to “Resetting to Factory Default Settings” in this Chapter.

6.2.1 Installation Flowchart Using Push-Buttons



6.2.2 PROCEDURE

EX

Transmitter push-button seal screws must be fully engaged to meet explosion proof requirements. **Do not remove the transmitter push-button seal screws in explosive environments when the circuit is live.**

1. Connect Power Supply to SPX signal leads with 250 ohm load and milliampere meter in series with loop.
2. If commissioning on the bench with a dead weight tester or calibrated pressure source, insure pressure connection is free of leaks.
3. Apply power to the SPX transmitter and observe loop current with zero pressure applied. It should be 4 mA. If other than 4 mA proceed to step 4.
4. Perform Local Zero adjustment. Use an Allen key to remove the seal screw to access the Zero push-button.
5. Insert an allen key, paper clip or object of similar diameter into the opening and gently depress the Zero push-button for approximately 1 second.
6. Release the button.
7. Press the button for a second time within approximately 1 second.
8. Hold down the button for 1 second. The available pressure is now adopted as the new lower range value.
9. Replace the seal screw.

ATTENTION

Steps past this point are not part of a normal bench setup and should only be performed by qualified individuals, as the SPX is highly stable and has been factory calibrated with highly accurate pressure generators. This function should only be performed on such equipment.

10. Apply Full Scale pressure and verify output is 20 mA. If output is other than 20 mA, proceed to step 11.
11. To perform the Span adjustment, use an Allen key to remove the seal screw to access the Span push-button.
12. Insert an allen key, paper clip or object of similar diameter into the opening and gently depress the Span push-button for 1 second.
13. Release the button.
14. Press the button for a second time within approximately 1 second.
15. Hold down the button for 1 second. The available pressure is now adopted as the new upper range value.
16. Replace the seal screw.

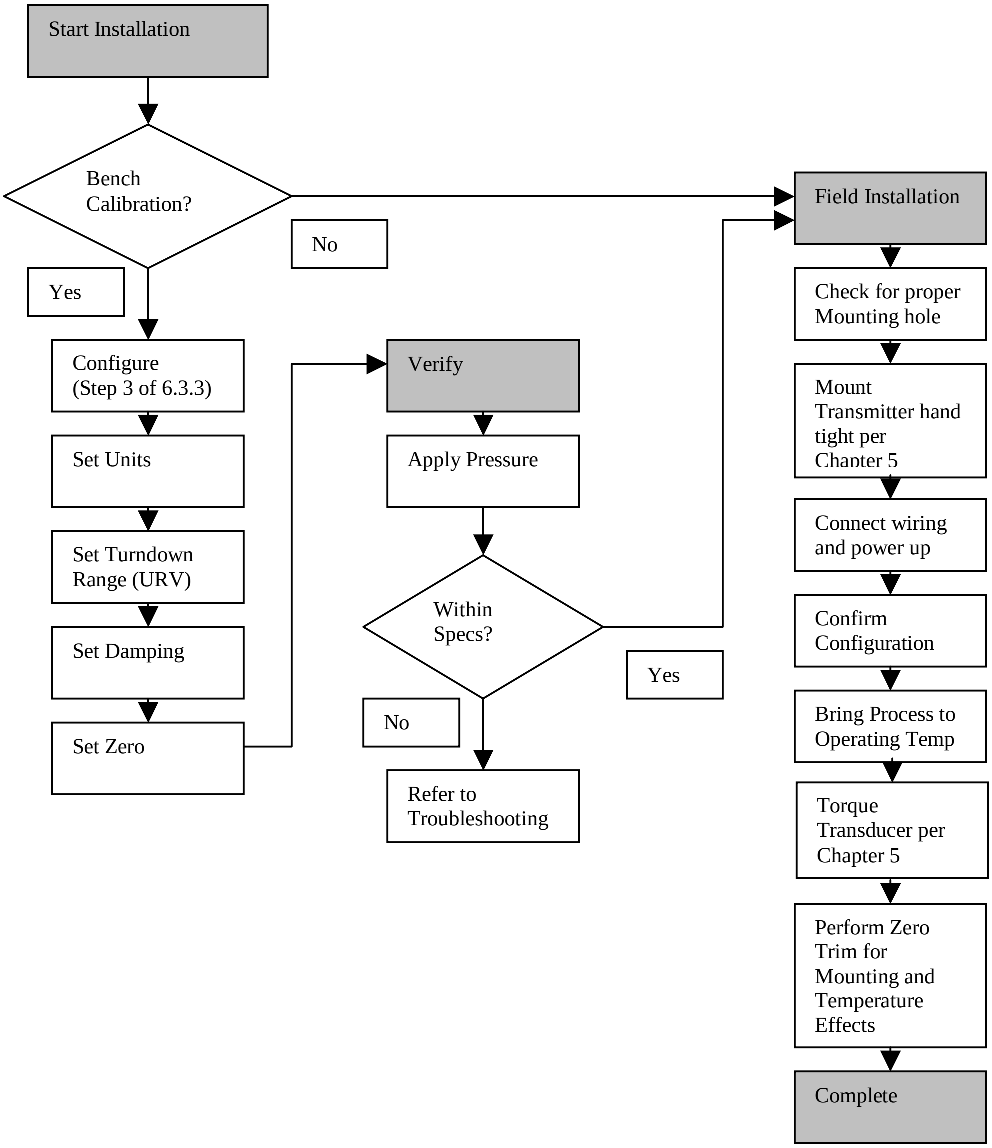
6.3 UTILIZING THE HART COMMUNICATIONS

When the transmitter output needs to be corrected due to mounting location and temperature shift after the process has been brought to operating temperature, a Hart Communicator can be used. The zero procedure is only recommended after the process temperature has stabilized and the SPX electronics housing has been permanently installed. When the zero trim function is selected (Hart Quick key 1,2,5,4,1) the output will be corrected to reflect 4 mA. This is done by the transmitter electronics automatically by adjusting digital PV to zero and analog output will be 4 mA. Normally a Zero Trim is all that is required after installation since the Transmitter span has been calibrated at the factory.

In the event the Full Scale output is not correct when checked against a calibrated pressure source or dead weight tester, the Transmitter span can be adjusted by performing the Sensor Trim function. This is performed by first applying Zero Pressure and selecting Lower Sensor Trim (Hart Quick Key 1,2,5,4,2) and following the prompts on the Hart Communicator. When complete, apply a known calibrated full scale pressure to the Transmitter and selecting Upper Sensor Trim (Hart Quick Key 1,2,5,4,3) and follow the prompts on the Hart Communicator. When complete, the transmitter electronics will have adjusted the digital PV to correct to full scale output to equal 20 mA. Never perform upper sensor trim without perfroming lower sensor trim first.

If for some reason the calibration is correct and the user wishes to revert back to the Factory Calibration, a procedure can be using the Hart Communicator. Refer to the Hart Menu Tree, Recall Factory Trim (Hart Quick Key sequence 1,2,5,5) will return Calibration back to Factory state.

6.3.1 Installation Flowchart Using HART Communicator



6.3.2 Connecting the HART Handheld Communicator

In hazardous areas, refer to the handheld communicator instruction manual for instructions.

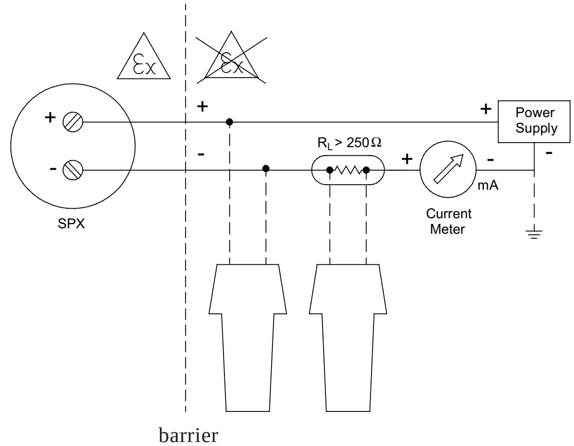
ATTENTION For HART Communicator to function properly, a minimum of 250 ohms resistance must be present in the loop.

START

The HART Communicator does not measure loop current directly.

The HART Communicator can interface with the SPX anywhere along the 4 - 20 mA cable as shown in the following figure.

Fig. 6-1 HART Communicator Interface



6.3.3 PROCEDURE

1. Connect Power Supply and Hart Communicator per the above diagram.
2. If commissioning on the bench with a dead weight tester or calibrated pressure source, insure pressure connection is free of leaks.
3. Apply power to the SPX transmitter and turn on the Hart Communicator by pressing the ON/OFF key. The LCD display should show [SPX] in the upper left corner. If this is not present, consult the Troubleshooting section of this manual.
4. Set PV Units (Fast Key 1,3,2) to appropriate pressure unit. (e.g. psi, Bar, kgf/cm^2, MPa)
5. Set Tag (Fast Key 1,3,1).
6. If transmitter output needs to be re-ranged, set the appropriate LRV (Fast Key 4,1) and URV (Fast Key 4,2)

Note: URV cannot be turned down below the PV Minimum span (Fast Key 1,4,1,5)

7. Set Lower Trim (Fast Key 1,2,5,4,2)
8. Verify SPX transmitter output. Zero pressure output should read 4 mA.

ATTENTION **Steps past this point are not part of a normal bench setup and should only be performed by qualified individuals, as the SPX is highly stable and has been factory calibrated with highly accurate pressure generators. This function should only be performed on such equipment.**

9. Next, using calibrated pressure source, apply pressure equal to value set in URV in step 6. Output should equal 20 mA. If output does not equal 20 mA proceed to step 10.
10. To calibrate full scale output, first apply pressure equal to URV. Next perform Upper Sensor Trim (Fast Key 1,2,5,4,3). Output should now equal 20 mA.
11. If Transmitter Output Damping is required, set PV Damping (Fast Key 1,3,5) to the appropriate value.
12. Press the left arrow key until the Hart Communicator is off-line and turn power off.

The SPX pressure transmitter is now ready to be installed in the process.

6.4 SPX Analog Output

The SPX has a 4 - 20 mA output proportional to pressure for normal operating conditions. However, unlike a traditional sensor, the SPX performs self-diagnostic routines continually during operation. If a special condition is detected, the transmitter drives its analog output outside the normal saturation values to indicate that investigation is necessary. (This condition is called fail-safe mode alarm.) The conditions detected by the self-diagnostic routines (and the corresponding effect on the analog output) are listed later in this section.

When a special condition is detected, the SPX goes into fail-safe mode and the transmitter output goes high, by default. However, using a HART communicator, the transmitter can also be configured to drive its output low or to freeze the output where it was just before the fail-safe was detected. The actual analog output levels are indicated below.

ATTENTION A low alarm (≤3.6 mA) is possible but not recommended because HART communications are not guaranteed until the cause of the alarm is removed.

Using the HART communicator, the specific condition that triggered the fail-safe mode alarm can be read for diagnostic purposes. (See Status in the HART menu tree.)

In a fail-safe condition the PV is not affected and can still be read using the handheld HART communicator. For process related fail-safe conditions, the transmitter will remain in the alarm state until the source of error disappears. If certain electronics errors are detected, the fail-safe condition will latch until a reset is performed by either cycling the power or through a software command.

NAMUR Compliant Saturation and Alarm Values

	4 - 20 mA Saturation	4 - 20 mA Alarm
Low	**3.8 mA**	**≤ 3.6 mA**
High	**20.5 mA**	**≥ 21.5 mA**

ATTENTION **You can alter the actual transmitter mA output values by performing an analog output trim using the HART Communicator.**

When a transmitter is in an alarm condition, the analog output displayed by the hand-held indicates the alarm value of the analog output – NOT the value the transmitter would have, if the sensor had not detected the failure.

Special Conditions and the Corresponding Analog Output

Condition	Alarm Value (fail safe)
E^2Prom failure detected	Set to configured fail safe mode
Cold start	Set to fail safe mode low
Pressure above upper limit	Unchanged
Pressure below lower limit	Unchanged
Electronics temp above upper limit	Unchanged
Electronics temp above lower limit	Unchanged
Strain gage open detected	Set to configured fail safe mode
Analog output saturated	Unchanged
Watchdog error detected	Set to configured fail safe mode
Push-button stuck	Set to configured fail safe mode
Low voltage detected	Unchanged
Outside URV or LRV	Unchanged
Rcal simulation on	Unchanged

6.5 Alarm & Saturation Values for Transmitters Set to Burst Mode

No special requirements are defined for the burst mode.

6.6 Alarm & Saturation Values for Transmitters Set to Multidrop Mode

If the device is in multidrop mode, the NAMUR levels are no longer achievable. Instead the fail safe condition is indicated by the field device status and the additional diagnostics.

6.7 SPX Transmitter Functions via HART (with Fast Key Sequences)

Zero Trim (1,2,5,4,1)
Digital Correction to zero which affects both the digital and analog output. This differs from Lower Sensor Trim in that zero trim is ONLY performed at zero pressure.

Lower Sensor Trim (1,2,5,4,2)
Digital Correction to zero which affects both the digital and analog output. This differs from Zero Trim in that Lower Sensor Trim can be performed at pressures above zero.
Note: This must be performed before Upper Sensor Trim. Only perform this function with a known calibrated pressure source.

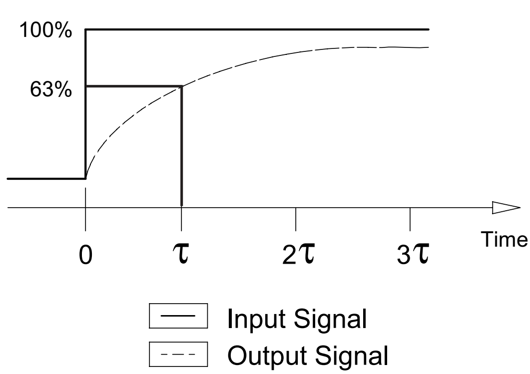
Upper Sensor Trim (1,2,5,4,3)
Digital correction to Full Scale which affect both digital and analog output.
Note: Lower Sensor Trim must be performed before Upper Sensor Trim. Only perform this function with a known calibrated pressure source.

Digital to Analog trim (1,2,5,2)
This is used to match the digital representation of the analog output with its actual analog loop current.
Note: This should only be performed with a known Calibrated Current (mA) meter.

Reranging
The SPX allows for the 4 mA and 20 mA points (LRV and URV respectively) to be adjusted so that output resolution can be improved. A Re-range or "Turndown" ratio of 3:1 is possible. Accuracy specifications remain dependent upon the Full Sensor Range without any turndown applied. Three methods of Re-ranging the SPX Transmitter are outlined below.
Note: If pressure applied to the transmitter is not in the range of the 3:1 turndown ratio, the transmitter will reject the Span attempt. This will be indicated by the output not adjusting to 20 mA after a few attempts using the Span Push-buttons.

Reranging via Push-buttons
When Hart Communication is not used, LRV and URV values are entered by applying zero pressure to the SPX and "Rezeroing" by pushing the zero push-button for one second, releasing for one second, pushing again for one second then releasing. The LRV and URV have now been adjusted to zero the device without affecting the span.

After Rezeroing, it is possible to set the span by adjusting the URV with the span push-button. The span push-button should never be used to adjust the URV without using the zero push-button to set the LRV first.



URV or Full Scale Turndown is performed by applying any pressure, within the 3:1 ratio of the transmitter, that you want to be the 20 mA point. When the pressure is held steady, push the Span push-button for one second, release for one second, then push again for one second, then release. The SPX has now adjusted the URV 20 mA point to match the Full Scale pressure applied.

6.8 Reranging via HART

Rerange LRV (4)
This is the pressure at which the transmitter will output 4 mA as entered directly by the user. Changing the LRV affects the transmitter span so the is range is limited by the minimum span value found in Fast Key (1,4,1,5)

Rerange URV (5)
This is the pressure at which the transmitter will output 20 mA as entered directly by the user. This range is limited by the minimum span value found in Fast Key (1,4,1,5)

Rerange LRV By Applying Pressure (1,2,5,1,2)
This is done by applying a known pressure and initiating the procedure so that the transmitter adopts the pressure as the 4 mA point.
Note: This should only be performed with a Calibrated Pressure Source.

Rerange URV By Applying Pressure (1,2,5,1,2)
This is done by applying a known pressure and initiating the procedure so that the transmitter adopts the pressure as the 20 mA point.
Note: This should only be performed with a Calibrated Pressure Source.

Recall Factory Trim (1,2,5,5)
This is used to restore the Zero, Lower, and Upper Trim to the Values as set from the Factory.

R-Cal Enable/Disable (1,4,3,7)
This is used to Enable or Disable the R-Cal function. This is used to calibrate the instrument connected to the output of the SPX. If enabled, when Pins E and F or the Orange and Blue wires are connected together, the output will become fixed at a setting specified in the R-Cal Set % of span.

R-Cal Set % (1,2,6,1)
This is used on versions with a Rcal. By activating R-Cal, the output will be set to the percentage of span set by this function. Default is 80%.

Damping (1,3,5)
The damping time constant affects the speed with which the output signal reacts to changes in pressure as shown in the figure on the following page. Damping is off by default but values between 0 and 30 seconds can be set using the handheld communicator. The damping value must be entered in integers. If non-integers are entered, the system rounds to the next integer.

Local Push-button Disable (1,4,3,6)
Local zero and span push-buttons can be disabled using the HART handheld communicator function "Local Push-buttons." When turned off, the software Lock Out prevents changes to transmitter range points via the local zero and span push-buttons. With local Push-buttons disabled, changes to configuration are still possible via HART.

Status (1,2,1,2)
Reads Device Status from SPX.

PV Unit (1,3,2)
The pressure unit defines the unit of measure that the pressure-specific parameters are transmitted in. The SPX can be configured in the engineering units of psi, Bar, MPa, and kgf/cm² or as a percentage of Full Scale (FS). After selecting a new pressure unit, all entries for pressure are recalculated to the new unit, using the following conversion rules:

1 psi = 0.068947 Bar = 0.0068947 MPa = 0.070309 kgf/cm²

Tag (1,3,1)
An inventory "Tag" identification number may be stored in transmitter memory (8 characters maximum). Software tag is a single question mark by default.

Descriptor (1,3,4,2)
A 16 character text can be entered for further description of transmitter e.g. location, function, position, etc.

Message (1,3,4,3)
A 20 character message can be set and displayed on the Hart Communicator.

SV Electronics Temperature (1,1,4)
Temperature measured on the Electronics Assembly is ued for reference and factory diagnostics only.

Poll Address (1,4,3,3,1)
Use in Multidrop mode allows more than one transmitter (up to 15) on a single loop. If this value is other than zero, the transmitter is in Multidrop mode. An example of Multidrop mode would be a group of Hart devices wired in parallel on a single powered loop and each device being assigned a unique Poll address (1-15). The Hart communicator would prompt for the individual address of the transmitter to communicate with and would only poll that specific device. All others would remain unchanged.

Burst Mode (1,4,2,3,3)
When the SPX is used in Burst Mode, the transmitter outputs one-way digital communications from the transmitter to the Host. Communication rate is faster since the transmitter does not have to be polled to send data. Information transmitted in Burst Mode includes Pressure Variable, Analog Output value, Pressure in % of range. Access to other information can still be obtained through normal Hart Comms.

START

6.9 Resetting to Factory Default Settings

The factory settings for the sensor (including zero and span) can be restored if they are changed inadvertently using the Push-buttons or the HART communicator. The list of parameters restored is later in this section.

ATTENTION Make sure Control System is in Manual mode. Temporary loss of Loop Output during Electronics Re-boot may occur.

To reset the sensor using the Push-buttons, use the following procedure:

1. Use an allen key, paper clip or object of similar size to remove the seal screws to access the Zero and Span Push-buttons.
2. Insert an allen key, paper clip or object of similar size into each opening and gently depress the Zero and Span push-buttons simultaneously for 1 second.
3. Release the buttons.
4. Press both buttons for a second time within approximately 1 second and hold down the button for at least 1 second.
5. Release the buttons. At this point, the LRV and URV will be set to factory defaults.
6. Replace the seal screws.

6.10 Definition of "Restore factory defaults"

1. Restore LRV and URV to their values at shipment.
2. Restore the Pressure Unit (psi, Bar, etc.) to its value at shipment.
3. Set the Analog Output Alarm Level to High.
4. Remove all Pressure Damping.
5. Clear all Sensor and Analog Output Trim values.
6. Clear Burst Mode.
7. Restore the Address to Zero.
8. Restore the Rcal option to its value at shipment. (Enable or Disable the Rcal option.)
9. Enable push-buttons.

START

6.11 HART Communicator Fast Key Sequences

Below defines the Hart Communicator Fast Key sequences. Fast Keys are a means of supplying a shortcut to navigate through the menu tree.

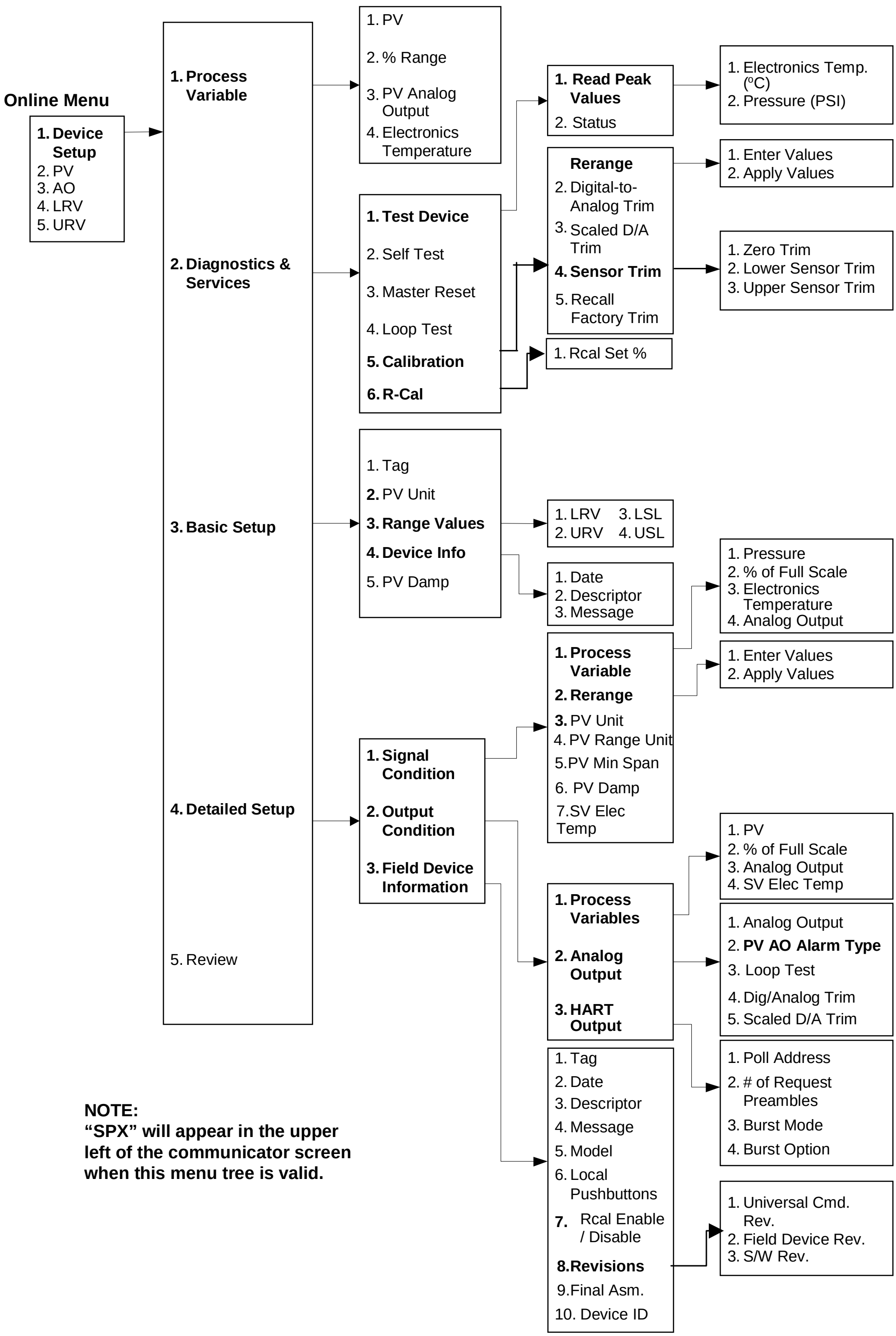
Hart Communicator Fast Key Sequences

Function	Fast Key Sequence
Read PV Pressure	1,1
Read % of Full Scale	1,2
Read Analog Output	1,3
Read SV Electronics Temperature	1,4
Read Peak Pressure Value	1,2,1,1,2
Read Peak Temperature Value	1,2,1,1,1
Read Sensor Diagnostic Status	1,2,1,2
Read PV Minimum Span	1,4,1,5
Perform Sensor Self-Test	1,2,2
Perform Sensor Master Reset	1,2,3
Perform Loop Test	1,2,4
Perform D/A Trim	1,2,5,2
Perform Scaled D/A Trim	1,2,5,3
Perform Zero Trim	1,2,5,4,1
Perform Lower Sensor Trim	1,2,5,4,2
Perform Upper Sensor Trim	1,2,5,4,3
Recall Factory Trim	1,2,5,5
Set Rcal %	1,2,5,6,1
Set Tag	1,3,1
Set PV Unit	1,3,2
Set Lower Range Value (LRV)	1,3,3,1
Set Upper Range Value (URV)	1,3,3,2
Display Lower Set Limit (LSL)	1,3,3,3
Display Upper Set Limit (USL)	1,3,3,4
Set Date	1,3,4,1
Set Descriptor	1,3,4,2
Set Message	1,3,4,3
Set PV Dampening	1,3,5
Set SV Temperature Unit	1,4,1,7
Set PV Analog Output Alarm Type	1,4,2,2
Set Poll Address	1,4,2,3,1
Set Number Request Preambles	1,4,2,3,2
Set Burst Mode	1,4,2,3,3
Set Burst Option	1,4,2,3,4
Enable/Disable Local Push-Buttons	1,4,3,6

START

COMMISSIONING

Menu Tree for SPX



NOTE:
"SPX" will appear in the upper left of the communicator screen when this menu tree is valid.

7. MAINTENANCE

7.1 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!

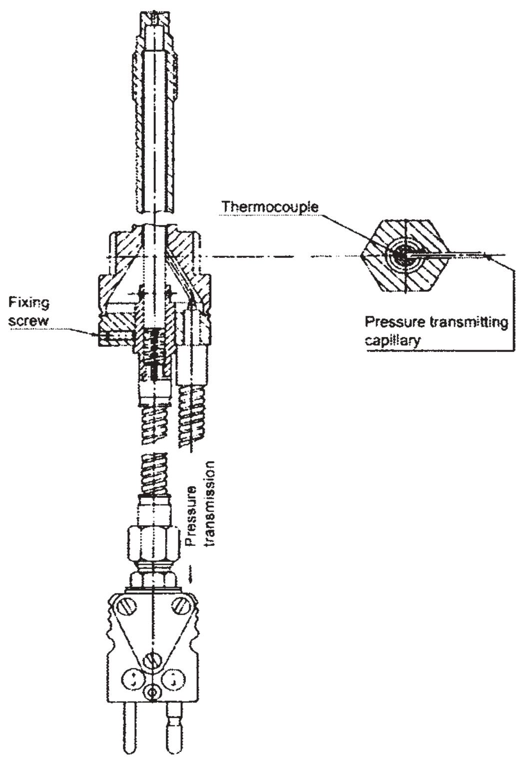
Installation and Removal Instructions

- 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 DEBRIS OR HARDENED PLASTIC.
- THE MEDIUM MUST BE IN MOLTEN CONDITION DURING TRANSDUCER REMOVAL. (Removing the transducer with the medium in a solidified condition can damage the sensor diaphragm.)
- ALWAYS REMOVE THE SPX BEFORE CLEANING THE MACHINE WITH ABRASIVES OR STEEL WIRE BRUSHES, ETC.
- DO NOT CLEAN THE “SCREWED-IN” SECTION OF THE SPX WITH HARD OBJECTS – THIS WILL DAMAGE THE SPX.
- ALWAYS USE A TORQUE WRENCH APPLIED TO THE DESIGNATED HEXAGONAL COLLAR WHEN SCREWING THE PT IN AND OUT. DO NOT APPLY THE TOOL TO THE HOUSING OR HOUSING/ SENSOR CONNECTION.
- ELECTROSTATIC DISCHARGE MAY DAMAGE THE SPX – TAKE ESD PRECAUTIONS.

7.2 THERMOCOUPLE/RTD REPLACEMENT

1. To remove, loosen setscrew on side of snout.
2. Without twisting, pull the thermocouple probe or RTD stem carefully out of snout.
3. To install, align slot on probe stem with pressure capillary tube and press into snout carefully until top of probe shoulders against snout.
4. Lock in place with setscrew.

Fig. 7-1 Thermocouple



MAINTENANCE

7.3 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 SPX units back to your **DYNISCO** representative. For **DYNISCO** addresses, see the back cover of the operating manual.

7.4 WARRANTY

The SPX Series Dynisco Pressure transmitters will provide excellent service and superior performance if proper care is taken during handling, installation, and use. 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.

8. ACCESSORIES

- Machining tool kit 1/2”-20UNF-2A P/N 200295
- Cleaning tool kit 1/2”-20UNF-2A P/N 200100
- Machining tool kit M18 x1.5 P/N 200105
- Cleaning tool kit M18 x1.5 P/N 200100
- Mounting Bracket P/N 190925

9. TROUBLESHOOTING

Symptom	Corrective Actions
Milliampere Reading is Zero	1) Check if Power Polarity is Reversed 2) Verify Voltage Across Transmitter Pins
Large Zero Shift when Screwing In	1) Check Hole with Gage Plug and Rework Hole as Required 2) Check Mounting Torque
Milliampere Reading is Low or High	1) Check Pressure Variable Reading for Saturation 2) Check if Output in Alarm Condition 3) Verify 4 and 20 mA Range Points or Simply Reset 4) Perform 4 - 20 mA Output Trim with HART Communicator
No Response to Changes in Applied Pressure	1) Check Test Equipment 2) Check Port/Pipe for Blockage or Solidified Plastic 3) Check if Output in Alarm Condition
Pressure Variable Reading is Low or High	1) Check Test Equipment 2) Check Port/Pipe for Blockage or Solidified Plastic 3) Perform Full Sensor Trim
Pressure Variable Reading is Erratic	1) Check Port/Pipe for Blockage or Solidified Plastic 2) Check Damping 3) Check for EMI
Transmitter Not Communicating with HART Communicator	1) Check Power Supply Voltage at Transmitter 2) Check Load Resistance (250 Ohm minimum) 3) Check Communicator Connection Across Power Supply 4) Check if Unit is Addressed Properly
HART Communicator missing SPX Features Described in Manual	From the Communicator's Main Menu, Access the On-Line Menu. The Name SPX Should be Displayed on the Top Line of the LCD. If the Name is not Present, Contact Dynisco to Arrange for DD Upgrade

10. CE Declaration of Conformity

Dynisco

Declaration of Conformity

We,

Dynisco LLC
38 Forge Parkway
Franklin, MA 02038
USA

declare under our sole responsibility that the products,

Model SPX4 Pressure Transmitter
Model SPX2 Pressure Transmitter
Model SPX228 Pressure Transmitter

to which this declaration relates are in conformity with the standards or other normative documents following the provisions of the respective Council Directives listed below:

Directive 89/336/EEC - Electromagnetic Compatibility

EN 61000-6-3:2001	Electromagnetic compatibility (EMC) -- Part 6-3: Generic standards – Emission standard for residential, commercial, and light-industrial environments
EN 61000-6-2:2001	Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-4-2:1995 + A1:1998 + A2:2001	Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
EN 61000-4-3:2002 + A1:2002	Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4:1995 + A1:2001 + A2;2001	Electromagnetic compatibility (EMC) -- Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
EN 61000-4-5:1995 + A1:2001	Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques - Surge immunity test
EN 61000-4-6:1996 + A1:2001	Electromagnetic compatibility (EMC) -- Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 55011B, Gruppe 1:1998 + A1:2000	Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement

CE

Directive 97/23/EC - Pressure Equipment

Sound Engineering Practice (SEP) applies to all models except the SPX228 with a maximum pressure of 200 bar (3000 psi) or greater.

Conformity Assessment Module "A" applies to Model SPX228 with a maximum pressure of 200 bar (3000 psi) or greater.

Directive 94/9/EC – ATEX

EN50014 :1997 + A1 + A2	Electrical apparatus for potentially explosive atmospheres - General requirements
EN50020 :2002	Electrical apparatus for potentially explosive atmospheres - Intrinsic safety 'i'
EN50284 :1999	Special requirements for construction, test and marking of electrical apparatus of equipment group II, Category 1 G

ATEX notified body for EC type evaluation and certificate no.: PTB 04 ATEX 2045 X

Identification No. of ATEX notified body for "Production Control": 0518

The authorized representative located within the Community is:
Dynisco Europe GmbH
Wannenäckerstr. 24
D-74028 Heilbronn

Other information:

1. Device testing per normative standards following the EMC Directive (89/336/EEC) was conducted by: S-Team Elektronic GmbH, Schleifweg 2, D-74257 Untereisesheim, Germany / 13 February 2004 / Nr. 109.0204
2. Safety Description per normative standards following the ATEX Directive (94/9/EC) was prepared by: Mesco Engineering GmbH, Wiesentalstrasse 74 D-79539 Lörrach, Germany

Date of issue: 14 April 2004

Place of issue: Franklin, MA USA

C. Kenneth Holmes
Vice President of Engineering

CE-DECLARATION

11. Ex Declaration of Conformity

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

(1) **EC-TYPE-EXAMINATION CERTIFICATE**

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 04 ATEX 2045 X

(4) Equipment: Pressure transmitter, type series SPX

(5) Manufacturer: Dynisco Instruments

(6) Address: 38 Forge Parkway, Franklin, MA 02038, USA

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

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council 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 and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 04-23405 .

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014:1997 + A1 + A2 **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, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

Ex **II 1 G EEx ia IIC T4** or

Ex **II 2 G EEx ia IIC T4 / T6**

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, April 29, 2004

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 56

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EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

(13) **S C H E D U L E**

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 04 ATEX 2045 X**

(15) Description of equipment

The pressure transmitters of type series SPX are used to convert a mechanical quantity (pressure) into a proportional electrical quantity in the field of process control. The transmitters are supplied by an intrinsically safe 4...20 mA current loop with superimposed digital data communication in accordance with the HART-protocol. The conditioned measured value is available as an analog 4...20 mA current signal. The transmitters may be operated as category-1- or category-2-equipment according to the specifications listed below.

Category-1-equipment:

For application as category-1-equipment the following marking and ambient temperatures apply:

Marking: Ex II 1 G EEx ia IIC T4

Permissible range of the ambient temperature: T_{amb} = -20 °C up to +60 °C

Category-2-equipment:

For application as category-2-equipment the following marking and ambient temperatures apply:

Marking: Ex II 2 G EEx ia IIC T4 / T6

For relationship between maximum permissible ambient temperature, maximum permissible medium temperature and temperature class reference is made to the following table:

temperature class	T6	T4
max. permissible ambient temperature	50 °C	85 °C
max. permissible medium temperature	60 °C	85 °C

The minimum permissible ambient and medium temperature is: -20 °C.

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PTB

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SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 04 ATEX 2045 X

Electrical data:

Supply and evaluation circuit (plug connector or open ended cable, terminals: 4-20+, 4-20-/ZERO-/RCAL-, ZERO+, RCAL+)	type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit Maximum values: U_i = 30 V I_i = 100 mA P_i = 750 mW C_i 4.5 nF L_i 40 µH only passive components without internal power source and without external circuits shall be connected to the terminals ZERO+/ZERO- or RCAL+/ RCAL- respectively
Sensor circuit	internal, in type of protection Intrinsic Safety

(16) Test report PTB Ex 04-23405

(17) Special conditions for safe use

1. The housing of the SPX-pressure transmitter shall be connected reliably to the local equipotential bonding system.
2. Those variants of the SPX-pressure transmitter which include the material aluminium, shall be installed in such a way that sparking as a result of impact or friction between aluminium and steel (with the exception of stainless steel if the existence of rust particles can be excluded) is excluded.
3. For application as category-1-equipment the connecting cable shall be equipped with a suitable conductive coating ($R_{surface} < 10^9$) to avoid possible electrostatic charge.

(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, April 29, 2004

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12. Appendix 1 - Default Values

Variable	Default Value	Access	Options
Analog Output Alarm Flag	High	RW	High Low Hold Last
Burst Command Enable	Off	RW	
Burst Option Variable	PV	RW	
Date of Last Factory Calibration	Date of Calibration	RO	
User Selectable Date	Date of Calibration	RW	
Manufacturer Identification Code	0 x 72	RO	
Dev ID (Device Identifier)	Unique number set by Factory	RO	
Final Assembly Number	<BLANK>	RW	
Local Push-button Enable	Enable	RW	Enabled Disabled
Factory Default LRV	0	RO	
Lower Sensor Limit	-0.04 * full scale of SPX	RO	
Message Text	HTTP://WWW.DYNISCO.COM/	RW	
PV Minimum Span Value	Factory Default PV_URV divided by 3		
Number of Request Preambles	5	RW	
PV Damping Constant Value	0 Seconds	RW	0-30
PV Lower Range Value	0	RW	
PV Engineering Unit Code	Per Customer Order 0 x 06 – PSI 0 x 07 – Bar 0 x 0A – kg/cm² 0 x 39 – % of FS 0 x ED – MPa	RW	
PV Upper Range Value	Full scale of SPX as indicated on label	RW	
PV Transfer Function Code	Linear	RO	
Rcal Calibration Percentage	80%	RW	20 - 100%
Field Device Serial Number	As Set at Factory	RO	
Tag	?	RW	
Transmit Address	0	RW	0-15
Factory Default URV	Per Customer Order	RO	
Upper Sensor Limit	1.5 * full scale of SPX	RO	

Dynisco

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