

SPX Product Family Smart Melt Pressure Transmitters

Intrinsically safe and Explosion-proof
Pressure transmitters with integrated amplifier
For use in hazardous environments

Operating Manual



DYNISCO SPX QUICK START CARD

This Quick Start Setup guide can be used by experienced instrumentation technicians to configure the Transmitter using the Zero and Span actuators 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 Using Zero Actuator

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 button seal 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 conduit output configurations, Red wire is Sig+/Exc +, Black wire is Sig-/Exc-, Green wire is Ground. For a 6 or 8 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 of the Manual and tighten transmitter into mounting hole.
4. Perform Zero Function
 - a. SPX 2XXX/4XXX/5XXX (Pushbutton)

ATTENTION

- Do not remove seal screw when the circuit is live in a hazardous area
- Remove zero pushbutton seal screw
- Using a 2mm or smaller Allen key, depress the pushbutton for a ½ second
- Release pushbutton for a ½ second
- Depress the pushbutton again for a ½ second and release

b. SPX 3XXX (Hall Effect Switch)

- Unthread Zero screw from endplate
- Depress screw
- Release screw
- Depress screw
- Release screw
- Restore screw in endplate

Note: The screw must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

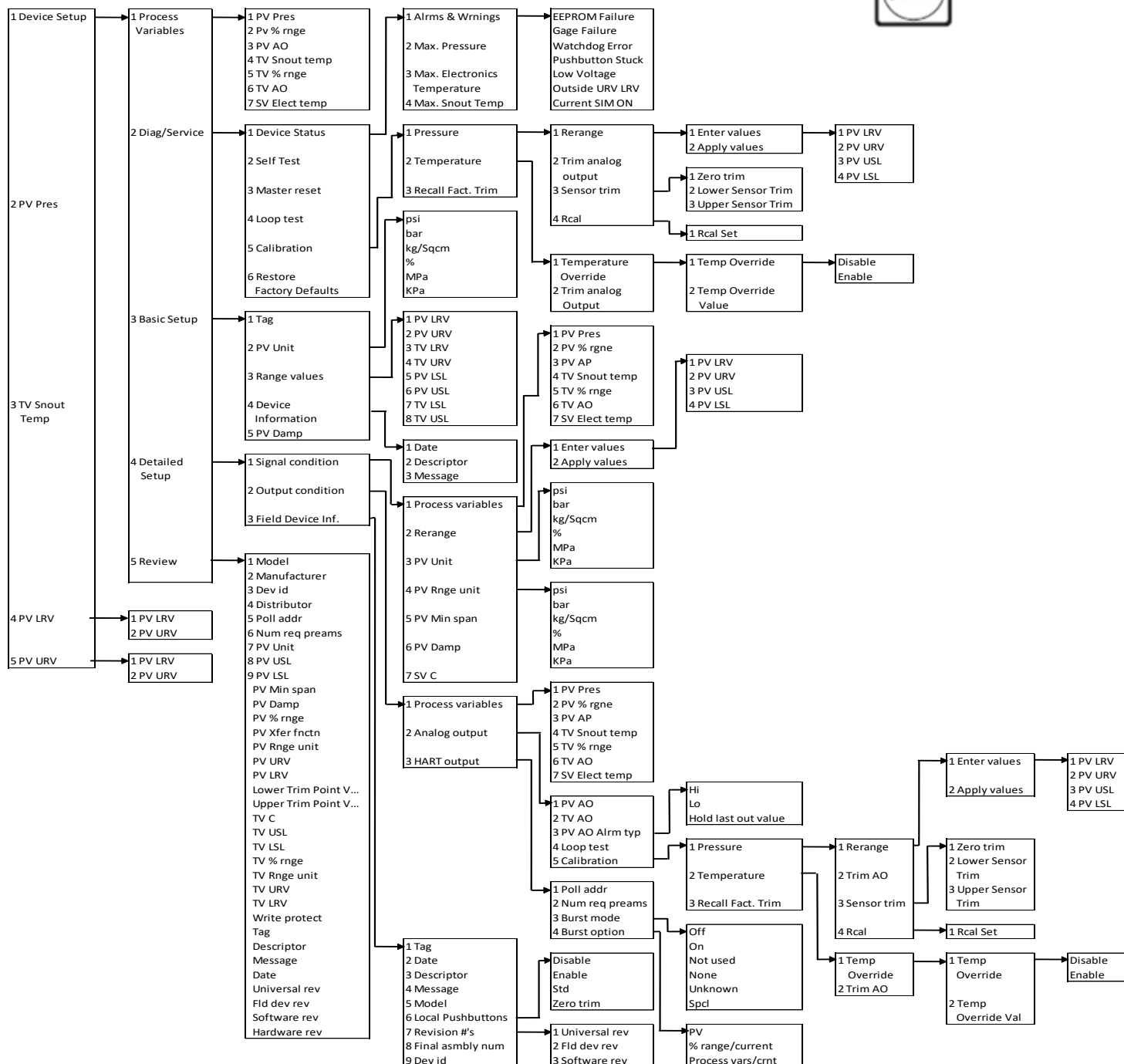


5. Verify loop output is zero (4 mA).

QUICK START UTILIZING HART COMMUNICATOR

1. Follow Steps 1 through 3 from Quick Start Using Zero Actuator.
2. Connect Communicator to the loop. If unsure on how to do this, refer to “Connecting the HART Handheld Communicator” (Figure 6-1).
3. Power on HART Communicator. See HART Command tree on the following page for reference.
4. From the Main Menu:
 - a. Enter Tag (Quick Key 1, 3, 1)
 - b. Set Pressure Units (Quick Key 1, 3, 2), if required
 - c. Set URV (Quick Key 1, 3, 3, 2) if output turndown (rescaling), is required
 - d. Perform Zero Trim (Quick Key 1, 2, 5, 1, 3, 1)
5. Verify loop output is zero (4mA).
6. Remove HART Communicator from loop.

Menu Tree



NOTE: Above is the Menu Tree for the latest Device Descriptor. For units with software revision < 100 refer to Appendix 2 for appropriate Menu Tree.

Table of Contents

1	GENERAL.....	6
2	NOTES ON SAFETY	11
3	TECHNICAL DATA.....	21
4	TRANSPORT/DELIVERY	26
5	INSTALLATION	27
6	COMMISSIONING	36
7	MAINTENANCE	50
8	TROUBLESHOOTING	52
9	ACCESSORIES	53
10	APPROVALS/CERTIFICATES.....	54
11	APPENDIX 1 - DEFAULT VALUES	74
12	APPENDIX 2 – Menu Tree (Software Revision < 100).....	75
13	APPENDIX 3 – Oil Fill Offset.....	76
14	OUTLINE DRAWINGS	77
15	DYNISCO CONTACT INFORMATION.....	93

1 GENERAL

1.1 IMPORTANT INFORMATION

This manual applies to the SPX melt pressure product family. The SPX industrial pressure family is covered in a separate manual. This manual 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.

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 customer service from our website:

www.dynisco.com

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.

HART is a registered trademark of HART Communication Foundation.

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



CE EMC specific requirements



ATEX Intrinsic Safety specific requirements



FM Approvals Explosion proof specific requirements



CSA Explosion proof specific requirements



NEPSI Intrinsic Safety or Explosion proof specific requirements



Related to Safety Integrity and Performance Level Applications

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



1.4 ABBREVIATIONS

The following abbreviations are used:

BSL	Best Straight Line
DD	Device Descriptor
EEPROM	Electrically Erasable Programmable Read Only Memory
FS	Full Scale
HART	Highway Addressable Remote Transducer
LRV	Lower Range Value
PT	Pressure Transmitter
PV	Primary Variable (Pressure)
RTD	Resistance Temperature Detector (A very accurate temperature sensor)
SV	Secondary Variable (Electronics Temperature)
TV	Tertiary Variable (Snout Temperature)
URV	Upper Range Value
Watchdog	An internal monitor for the electronics

1.5 NAMING CONVENTION

SPX	Melt Smart Pressure Transmitters (SPX 2xxx/3xxx/4xxx/5xxx Series)
SPX-L	Melt Smart Pressure Transmitters with Linearity Correction (SPX 5xxx series)
SPX-T	Melt Smart Pressure Transmitters with Linearity Correction and Process Temperature Compensation (SPX 3xxx series)

1.6 TRANSMITTER PRINCIPLES 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 with a liquid (typically Hg, mercury) 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. Other fill liquids are available, please consult the factory.

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.

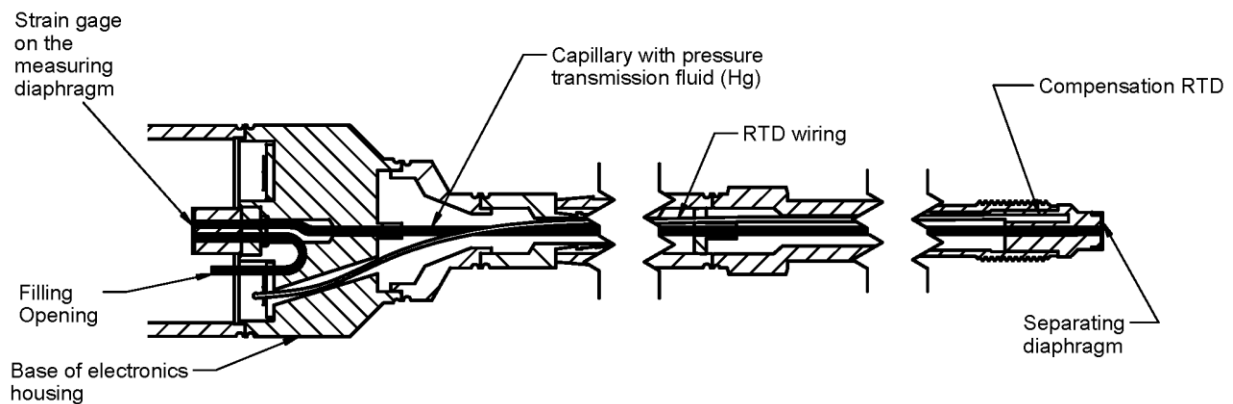


Figure 1-1 Functioning Principle of the SPX 3xxx Filled Assembly

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 mA for an output current proportional to the applied pressure.

There is also a resistance temperature detector (RTD) in the tip of the sensor (SPX 3XXX Models only). This sensor is used to measure the temperature of the snout tip to improve accuracy by compensating for snout temperature effects on the pressure measurement. The temperature sensed by this RTD can be accessed digitally via HART or via an optional 4-20 mA temperature output. 4 mA and 20 mA correspond to 0 and 400 Celsius, respectively.

An alternative 3 wire RTD temperature output option is available. The 3 wire RTD temperature output comes from a second RTD located in the snout tip (SPX 3XXX Models only, not available with 4-20 mA temperature output). The RTD is a 100 ohm RTD with an alpha of 0.00385 ohms/°C.

1.7 CORRECT USE



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



For installation in explosive gas atmospheres the device must be installed in accordance with European installation guidelines EN 60079-14. For category 1 (zone 0) installations, over voltage protection of the electrical connections shall be in accordance to EN 60079-14.

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

- EN 60204, Electrical equipment in machines
- EN 12100, Machine safety, general design guidelines
- DIN 57 100 Part 410, Protection against electric shock
- EN 60079-0 Explosive atmospheres - General Requirements
- EN 60079-11 Explosive atmospheres - Intrinsically Safe Apparatus
- EN 60079-26 Special Requirements for EPL Ga

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



2.1 GENERAL DANGER TO LIFE OR LIMB

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.

The SPX is an 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 **pressure-less, voltage-free, intrinsically safe** condition with the **machine switched off. The machine must be secured against being switched back on!**

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.

Several configurations of the SPX are designed and approved for use in hazardous classified areas. **Units intended for installation in these areas must bear the applicable approval agency label.**

The SPX can be used in media temperatures up to +400°C (based on configuration). 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 is +85°C maximum in areas that are not classified as hazardous.

Higher temperatures can result in damage and malfunction. Do not install the pressure transmitter in places where these temperatures are exceeded.

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.



2.2 SPECIFIC DANGER TO LIFE OR LIMB

Toxic Hazard!

The SPX typically contains a very small amount of mercury, Hg (approx. 0.00322 in³ for 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!



2.3 CE EMC SPECIFIC REQUIREMENTS

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, and 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.



2.4 ATEX INTRINSIC SAFETY APPROVAL SPECIFIC REQUIREMENTS

The housing of the SPX shall be connected reliably to the local equipotential bonding system. The housing is electrically bonded to the process equipment through the process connection.

The installation of the SPX must be in accordance with European installation guidelines EN 60079-10.

For category 1 (zone 0) installations, over voltage protection of the electrical connections shall be in accordance to EN 60079-14.

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 ($< 1\text{G Ohm/cm}^2$).

For application as category-1-equipment the connecting cable shall be equipped with a suitable conductive coating ($R_{\text{surface}} < 10^9 \text{ ohms}$) to avoid possible electrostatic charge.

Those variants of the SPX that include the material aluminum shall be installed in such a way that sparking as a result of impact or friction between aluminum and steel is excluded. Impact or friction between aluminum and stainless steel is allowed if the existence of rust particles can be excluded.

After installation before operating the device the user must check that the complete installation and wiring is intrinsically safe. Special care must be taken to insure that the power source is a certified apparatus.

If the transmitter is installed in hazardous areas, only passive devices like switches or resistors may be connected between the RCAL+ and RCAL- signals. Connection of any active electronic circuits or voltage or current sources is not allowed.

In non-conduit units with the secondary 4-20mA option proper creepage and clearance distances must be maintained between the mating connector and cabling per EN/IEC 60079-11. Proper creepage and clearance distances are maintained using Dynisco SPX-T ATEX Intrinsically Safe mating connector cable assemblies;

PT style connector cable assy's - 50 ft cable - p/n 641002, 100 ft cable - 641004

PC style connector cable assy's - 50 ft cable - p/n 641012, 100 ft cable - 641014

Additional ATEX Intrinsically Safe approval specific requirements are provided on the EC Type Examination certificate, Dynisco drawing number 975161, located in section 10 of this manual. The medium temperature (T_{med}) listed in the EC Type Examination certificate 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.

Maximum allowed pressure range of each SPX by pressure range model code:

Pressure Range					
XX					
Code	PSI	Bar	Kgf/cm ²	MPa	KPa
01	1	0.07	0.07	0.007	7
02	2	0.14	0.14	0.014	14
03	3	0.2	0.2	0.02	20
04	4	0.27	0.27	0.027	27
05	5	0.35	0.35	0.035	35
06	10	0.7	0.7	0.07	70
07	15	1	1	0.1	100
08	25	1.75	1.75	0.175	175
09	50	3.5	3.5	0.35	350
10	75	5	5	0.5	500
11	100	7	7	0.7	700
12	150	10	10	1	1000
13	250	17.5	17.5	1.75	1750
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
18	2000	140	140	14	14000
19	2500	175	175	17.5	17500
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
25	20000	1400	1400	140	140000
26	25000	1750	1750	175	175000
27	30000	2000	2000	200	200000
33	200	14	14	1.4	1400

2.5 FM EXPLOSIONPROOF APPROVAL SPECIFIC REQUIREMENTS

Installation shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70)

Installation shall comply with the latest edition of the instruction manual. The latest edition of the instruction manual is available for download from the Dynisco website:

www.dynisco.com

Replacement with non-factory components may adversely affect the safe use of the systems.

Additional SPX-T FM Explosionproof Approval specific installation requirements are provided on the SPX-T FM Explosionproof Control drawing, Dynisco drawing number 000610, located in section 5 of this manual.

Also see section 10 of this manual ([Approvals and Certificates](#)) for FM certificates of compliances that list hazardous location limitations and approved model code configurations.

For SPX units that are explosion-proof approved the power supply rating is 13-30 Vdc.

- 1) Do not remove the transmitter push-button seal screws in explosive environments when the circuit is live (applicable to all models except SPX-T).
- 2) Transmitter push-button seal screws must be fully engaged to meet Explosion-proof requirements (applicable to all models except SPX-T).



2.6 CSA EXPLOSIONPROOF APPROVAL SPECIFIC REQUIREMENTS

SPX-T CSA Explosionproof Approval specific installation requirements are provided on the SPX-T CSA Explosionproof Control drawing, Dynisco drawing number 000611, of this manual.

Contact factory for CSA certificates of compliances that list hazardous location limitations and approved model code configurations.

SPX-T units are Explosionproof with Intrinsically Safe Output, Exia

Maximum non-hazardous voltage not to exceed 250V.

For SPX units the power supply rating is 13-30 Vdc.

- 1) Do not remove the transmitter push-button seal screws in explosive environments when the circuit is live (applicable to all models except SPX-T).
- 2) Transmitter push-button seal screws must be fully engaged to meet Explosion-proof requirements (applicable to all models except SPX-T).

See pressure range table in section 2.4 for maximum allowed pressure range of each SPX by pressure range model code:

2.7 NEPSI INTRINSIC SAFETY REQUIREMENTS



一、产品安全使用特殊条件

产品防爆合格证号后缀“X”代表产品安全使用有特殊条件：

1. 产品外壳含有轻金属，用于 0 区时需注意防止由于冲击或摩擦产生的点燃危险。
2. 产品外壳含非金属，使用时须防止产生静电火花，只能用湿布清理。

二、产品使用注意事项

1. 产品温度组别与使用环境温度范围和介质温度范围之间关系为：

温度组别	T6	T4
使用环境温度范围	-20℃～+50℃	-20℃～+85℃
介质温度范围	-20℃～+60℃	-20℃～+85℃

2. 本安电气参数：

最高输入电压 U_i (V)	最大输入电流 I_i (mA)	最大输入功率 P_i (W)	最大内部等效参数	
			C_i (nF)	L_i (μH)
30	100	0.75	4.5	40

3. 该产品必须与已通过防爆认证的关联设备配套共同组成本安防爆系统方可使用于爆炸性气体环境。其系统接线必须同时遵守本产品 and 所配关联设备的使用说明书要求，接线端子不得接错。

4. 用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。

5. 产品的安装、使用和维护应同时遵守产品使用说明书、GB3836.13-2013“爆炸性环境 第13部分：设备的修理、检修、修复和改造”、GB3836.15-2017“爆炸性环境第15部分：电气装置的设计、选型和安装”、GB3836.16-2017“爆炸性环境第16部分：电气装置的检查和维护”、GB50257-2014“电气装置安装工程爆炸和火灾危险环境电力装置施工及验收规范”的有关规定。



2.8 NEPSI EXPLOSIONPROOF SPECIFIC REQUIREMENTS

二、产品安全使用特殊条件

产品防爆合格证号后缀“X”代表产品安全使用有特殊条件：

1. 产品外壳含非金属，使用时须防止产生静电火花，只能用湿布清理。
2. 涉及隔爆结合面的维修须联系产品制造商。

二、产品使用注意事项

1. 产品温度组别与使用环境温度范围和介质温度范围之间关系为：

温度组别	使用环境温度
T6	-20℃ ~ +60℃
T5	-20℃ ~ +85℃

2. 用户在使用时应将产品外壳可靠接地。
3. 安装现场应不存在对产品外壳有腐蚀作用的有害气体。
4. 用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。
5. 产品的安装、使用和维护应同时遵守产品使用说明书、GB3836.13-2013“爆炸性环境 第13部分：设备的修理、检修、修复和改造”、GB3836.15-2017“爆炸性环境第15部分：电气装置的设计、选型和安装”、GB3836.16-2017“爆炸性环境第16部分：电气装置的检查和维护”和GB50257-2014“电气装置安装工程爆炸和火灾危险环境电力装置施工及验收规范”的有关规定。

2.9 SAFETY INTEGRITY AND PERFORMANCE LEVEL APPLICATIONS



Product Safety
Functional
Safety

www.tuv.com
ID 0600000000

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.

Intended Use

[See Certificate in section 10.5](#)

Safety Function

[See Certificate in section 10.5](#)

For units with the optional monitoring channel (Guardian Series, Option Code = GCxxx):

Under normal operating conditions the relay contacts are closed. In the event that a failure is detected the relay contacts open. Detectable failures include:

- 1) Loss of Power
- 2) Open Gage
- 3) Input over a predefined (customer selectable at time of order) threshold

The Guardian Series transducer has been designed to provide a protective measure. This has been done by the avoidance and control of systematic and random failures.

This product will:

Measure the pressure and provide a safety relay output. Since this is being used to perform a protective measure, this sensor should only be used for monitoring the pressure and not controlling the process. Best practices declare that safety and control must be independent from each other.

The Guardian Series transducer detects many hardware failures including an open or short in the measuring gage and if there is an overpressure condition. If any of these failures occur, the output relay will open. It is the user's responsibility to connect this relay to the system in such a way that when this relay opens, it brings the system to a safe state.

This fault state is not latched. It is up to the user to latch this error if desired.

Recommended practices

This Guardian Series transducer must be installed in such a way that the opening of the output relay will bring the system to a safe state. In this safe state the instrument that is monitoring the pressure should be left operational.

This error indication is not latched. If it is necessary to latch the error until it is manually reset, this is the user's responsibility.

At startup and on a periodic basis the safety system should be tested to ensure proper operation. This will require applying a pressure to the Guardian Series transducer that is over the safe level but less than the maximum pressure. Verify that the protective measure is initiated to take the machine to a safe operating condition.

Use of qualified personnel

The product may only be assembled, installed, configured, commissioned, operated and maintained by persons with proven skills. Persons with proven skills are suitably experienced to operate devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.

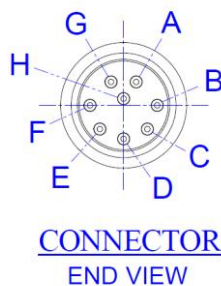
It is the user's responsibility only to employ personnel who:

- Are familiar with the basic regulations concerning health and safety and accident prevention
- Have read and understood the safety guidelines given in this description
- Have a good knowledge of the generic and specialist standards applicable to the specific application

Connecting Safety Relay

Relay specs: Maximum switching voltage: 200Vdc; Maximum switching current: 0.5A

Device pinout



CONNECTOR WIRING mA-HART	
PIN	FUNCTION
A	POWER +
B	SIGNAL -
C	POWER -
D	N/C
E	RCAL +
F	RCAL -
G	RELAY CONTACT
H	RELAY CONTACT

3.1 MODEL CODE BREAKDOWN

Diagram illustrating the mapping of input parameters to output parameters using a 16-bit binary code. The input parameters and their corresponding 4-bit codes are:

- Model: XXXXXX
- Accuracy: XXXXXX
- Process Style: XXXXXX
- Hazardous Area Classification: XXXXXX
- Diaphragm Material: XXXXXX
- Process Connection: XXXXXX
- Pressure Engineering Units: XXXXXX

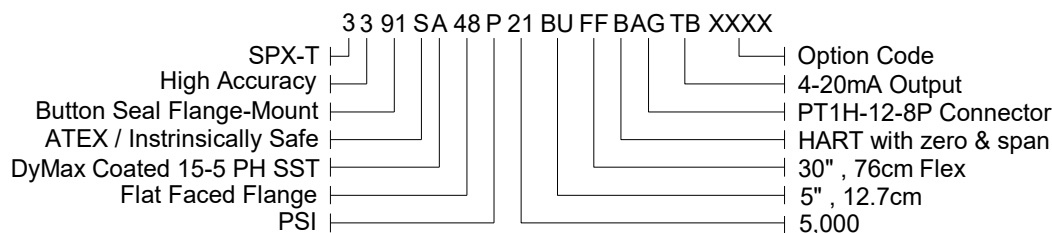
The output parameters and their corresponding 4-bit codes are:

- Option Code: XXXXXX
- Temperature Sensor: XXXXXX
- Electrical Connection: XXXXXX
- Communications: XXXXXX
- Rigid or Flexible Capillary Length: XXXXXX
- Rigid Stem (Snout) Length: XXXXXX
- Pressure Range: XXXXXX

The diagram shows the mapping of the input parameters to the output parameters using the 16-bit binary code. The mapping is as follows:

- Model (XXXXXX) maps to Option Code (XXXXXX)
- Accuracy (XXXXXX) maps to Temperature Sensor (XXXXXX)
- Process Style (XXXXXX) maps to Electrical Connection (XXXXXX)
- Hazardous Area Classification (XXXXXX) maps to Communications (XXXXXX)
- Diaphragm Material (XXXXXX) maps to Rigid or Flexible Capillary Length (XXXXXX)
- Process Connection (XXXXXX) maps to Rigid Stem (Snout) Length (XXXXXX)
- Pressure Engineering Units (XXXXXX) maps to Pressure Range (XXXXXX)

3.2 ORDERING EXAMPLE



- 1) Review section 3.4 Performance Characteristics for accuracy definition and details.
- 2) Review “Notes on Safety” (Section 2) before installation in Hazardous locations.
- 3) Accuracy can be affected with choice of diaphragm and coating.
- 4) Certain models are not available in some configurations.
- 5) For other process connections please consult factory.
- 6) Please see the appropriate figure in section 5 for dimensions of your specific flange.
- 7) For other mounting flanges/process connections not listed please consult factory.
- 8) Other approved ranges may exist, please consult factory.
- 9) Other lengths available, please consult factory.
- 10) Transmitters are available with certain approved option codes. Please consult factory for list of approved options.

3.3 SAFETY SPECIFICATIONS

Please see “Notes on Safety” (Section 2).

3.4 PERFORMANCE CHARACTERISTICS

3.15.1 ACCURACY

Accuracy is defined as combined error expressed as a percentage of full scale (% F.S.) output based on the following standard configurations/conditions:

- 1) Mercury Filled Capillary $\leq 36''$
- 2) Dymax Coated 15-5 SST Process Diaphragm
- 3) Best Straight Line % F.S. as per ISA-37.3
- 4) $+20^{\circ}\text{C}$ ambient electronics

*Consult factory for availability of NaK filled units or other non-standard configurations.

Model	Snout Temp	Range	Accuracy (% of FS)
SPX 32XX	$20^{\circ}\text{C} - 300^{\circ}\text{C}$	$< 1500 \text{ PSI}$	± 0.75
		1500 PSI	± 0.50
		$\geq 1500 \text{ PSI}$	± 0.25
SPX 33XX	$20^{\circ}\text{C} - 300^{\circ}\text{C}$	$< 1500 \text{ PSI}$	± 0.50
		1500 PSI	± 0.25
		$\geq 1500 \text{ PSI}$	± 0.15
SPX 2242/2243	20°C	$< 1500 \text{ PSI}$	± 0.50
		$\geq 1500 \text{ PSI}$	± 0.25
SPX 2241	20°C	Entire Range	± 1.0
SPX 2244	20°C	$< 500 \text{ PSI}$	± 0.50
		$\geq 500 \text{ PSI}$	± 0.25
SPX 229X	20°C	Entire Range	± 0.50
SPX 4222/4232/4352	20°C	$< 1500 \text{ PSI}$	± 0.50
		$\geq 1500 \text{ PSI}$	± 0.25
SPX 4622/4672/4502	20°C	Entire Range	± 0.50
SPX 5342	20°C	Entire Range	± 0.20
SPX 5343	20°C	Entire Range	± 0.20
SPX5344	20°C	Entire Range	± 0.20
SPX5390	20°C	Entire Range	± 0.20
SPX5391	20°C	Entire Range	± 0.20
SPX5392	20°C	Entire Range	± 0.20

3.15.2 RESOLUTION

$\pm 0.035\%$ full scale or better

3.15.3 REPEATABILITY

± 0.10% of full scale

3.15.4 OVERLOAD PRESSURE (MAX PRESSURE WITHOUT INVALIDATING SPECIFIED ACCURACY)

Model	Pressure
SPX 2242/2243/5342/5343	2 X FSP or 35,000 PSI, whichever is less
SPX 2241/2244/5344	2 X FSP or 15,000 PSI, whichever is less
SPX 229X/539X	2 x FSP
SPX 4222/4232/4352/4622/4672	2 x FSP or 35,000 PSI, whichever is less
SPX 4502	3 x FSP
SPX 3X42/3X43/3X9X	1.5 x FSP

3.15.5 BURST PRESSURE

Model	Pressure
SPX 2XXX/4XXX/5XXX	6 x FSP or 45,000 PSI, whichever is less
SPX 3XXX	Greater than 2 x FSP

3.15.6 FREQUENCY RESPONSE

20 Hz [-3db]

3.15.7 RESPONSE TIME

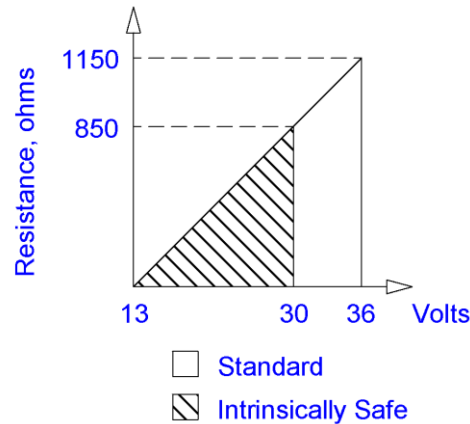
50 mS

3.5 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 > 21mA for High Level
Current Consumption	< 25 mA
Supply Voltage	13 - 30 VDC for PTB ATEX IS and FM XP approved models 13 - 32 VDC for non-approved models

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

Sense Resistor Load Line



250 ohms minimum for HART communication

3.6 TEMPERATURE INFLUENCE

ELECTRONICS HOUSING

Operating Temperature Range -29°C to +85°C

Compensated Temperature Range (SPX 2XXX/4XXX/5XXX) -20°C to +65°C

Compensated Temperature Range (SPX 3XXX) 20°C to +85°C

Zero Shift due to temperature change on electronics housing

SPX 2XXX/4XXX/5XXX 0.01% FS/°F max. (0.02% FS/°C max.)
SPX 3XXX Included in accuracy specification

Span shift due to temperature change on electronics housing

SPX 2XXX/4XXX/5XXX 0.01% FS/°F max. (0.02% FS/°C max.)
SPX 3XXX Included in accuracy specification

PROCESS CONNECTION

Zero shift due to temperature change on the diaphragm

SPX 2242/2243/4xxx/5xxx (except SPX 4502)	15 PSI/100°F typical 2 BAR/100°C typical
SPX 2241/2244/229X/4502	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 232°C to 315°C)
SPX 3XXX	Included in accuracy specification

3.7 EMC REQUIREMENTS

The SPX Conforms to CE in accordance with EMC directive. See Declaration of Conformity for more details.

3.8 MATERIALS

Standard Diaphragm	15-5PH Mat. No. 1.4545 Various proprietary coatings
Standard Stem (Snout)	17-4PH Mat. No. S17400

Please note other diaphragm and stem materials may be substituted.

3.9 TORQUE

[See section 5.2](#)

3.10 ENVIRONMENTAL PROTECTION TO ANSI/IEC-60529 & ANSI/NEMA-250

SPX with sealed conduit to IP67, NEMA 4X

3.11 WEIGHT

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

3.12 DIMENSIONS

The dimensions vary based on product configuration. Contact Dynisco if product dimensions are required.

4 TRANSPORT/DELIVERY



Toxic hazard!

The SPX contains a small amount of mercury (Hg) as its standard transmission medium. If the diaphragm is damaged, mercury may escape. For alternate (non-Hg) transmission mediums please consult factory.

Never transport or store the SPX without the protective cap 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 SPXs.

If mercury escapes, use airtight packaging!

ATTENTION

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

4.1 TRANSPORT/PACKING/TRANSPORT DAMAGE

- Do not let the SPX 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 SPX in original packaging only
- Protect against dust and moisture

4.3 SCOPE OF DELIVERY

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

5 INSTALLATION

NOTES: Follow all Notes on Safety in Section 2 during installation.

5.1 MOUNTING HOLE DIMENSIONS

Please contact Dynisco if mounting hole dimensions are required.

5.2 MOUNTING HOLE MACHINING TOOLS

Dynisco offers a set of mounting hole-machining tools with all the necessary drills, taps, and reamers for the Dynisco standard ½-20 UNF-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.

5.3 CHECKING THE MOUNTING HOLE

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

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.

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, may result in erroneous pressure measurement, difficult transducer removal, premature sensor failure, process fluid leaks, and personnel hazard.

Insure the mounting hole is clear of any frozen polymer or debris and is machined to the proper dimensions, per section 5.2 above.

One procedure to check the mounting hole is to coat a gauge plug (Dynisco Part Number 200908 for the 1/2 –20 standard port, 435901 for the short tip ½ – 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°

ATTENTION

sealing chamfer. If bluing has been removed from other surfaces, the mounting hole has not been machined properly.

5.4 INSTALLING THE THREADED SNOOT PRESSURE TRANSMITTER

If installing XX92 model, select proper snout tip sealing gasket as specified in table below and install gasket on transducer tip.

Model XX92 Recommended gasket:

Pressure Range	Gasket	Part Number
3,000 psi	Aluminum	494602
10,000 psi	Parkerized Carbon Steel	634001
10,000 psi	Hastelloy	634002
10,000 psi	303 Stainless Steel	634004

Coat the threads of the snout with a high temperature anti-seize grease or a suitable parting agent to help prevent thread galling and ease later removal.

Thread snout into the mounting hole by hand until the snout touches down on the port seat (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.

After temperatures have equalized, apply proper torque as specified in the table below to tighten the transmitter into the mounting hole. Always use a torque wrench applied to the designated hexagon collar while screwing the transmitter in and out of the port. Do NOT apply the torque wrench to the housing or housing/sensor connection.

THREADED SNOOT MOUNTING TORQUES (Threaded configurations)

Model	SPX 2242, 3X42 4222/4622/4352/4672 SPX 5342	SPX2292
	57 Nm	109Nm
Max Torque	500 inch-lbf	960 inch-lbf
	42 ft-lbf	80 ft-lbf

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.

5.5 INSTALLING THE FLANGED SNOOT PRESSURE TRANSMITTER

Select high strength hex bolts that conform to ASTM A193 Grade B7. Alternate bolting materials may be acceptable, but must have Design stress values equal to or greater than the design stress values specified for A193 Grade B7 bolts per Table A-2 in ASME B31.1 of 22 ksi or greater at an operating temperature of 350°C.

Select bolts with a thread engagement length into the process connection of at least 1.5x bolt diameter.

Select proper snout tip sealing gasket as specified below and install gasket on transducer tip. Note that the pressure seal on flange mounted units is made at the lower o-ring or gasket on the snout tip, not the flange.

Recommended gaskets (Flanged Configurations):

Models XX41, XX90, XX91

Pressure Range	Gasket	Part Number
3,000 psi	Aluminum	494602
10,000 psi	Parkerized Carbon Steel	634001
10,000 psi	Hastelloy	634002
10,000 psi	303 Stainless Steel	634004

Models XX43

Pressure Range	O-ring Seal	Part Number
10,000 psi	Inconel 718 (UNS N07718)	652116

Confirm the snout flange is fully threaded onto the snout, and secure flange to snout using set screw (if applicable). Slide the snout with sealing gasket into the mounting hole until the snout touches down on the port seat. Apply anti-Seize to hex bolt threads. Hand tighten bolts into the process connection until the bolt heads bottom out on the flange surface (Do NOT torque flange bolts at this time!).

Allow time for the transmitter snout and flange bolt temperatures 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.

After temperatures have equalized, use a torque wrench set to torque level specified in the table below to tighten the mounting bolts in an alternating four bolt tightening pattern, tighten transmitter into mounting hole.

Always use a torque wrench to apply torque to the flange mounting bolt heads.

FLANGED SNOOT HEX BOLT MOUNTING TORQUES (Flanged configurations)

Model	SPX 2243	SPX 2241/2244/2290/2291
	SPX 3X43	SPX 3X9X
	SPX 4232	SPX 4502
	SPX 5343	SPX 539X/5344
Max Torque	5.6 Nm	34 Nm
	50 inch-lbf	300 inch-lbf
	4.2 ft-lbf	25 ft-lbf

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.

5.6 REMOVING THE SPX TRANSMITTER

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.



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!



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.

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.

5.7 ELECTRICAL CONNECTION

ATTENTION

The SPX is an 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 **pressure less, voltage-free, intrinsically safe condition with the machine switched off.**



The machine must be secured against being switched back on!

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

It is recommended 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.



For FM approved SPX 3XXX Explosionproof installations, install in accordance with controlled drawing 000610.



For CSA approved SPX 3XXX Explosionproof installations, install in accordance with controlled drawing 000611.

5.8 CONNECTION ASSIGNMENTS

The device must be connected to a certified power supply. Each unit will include a primary 4-20mA output. The unit may also have one of the options listed in the table below. [See section 2.9](#) for wiring details of units with GCxxx option code.

Signal	Terminal Description	Connection Type		
		Conduit-Lead Wire Color	6-Pin	8-Pin
Primary 4-20mA	PWR+/SIG+	Red	A	A
	PWR-/SIG-	Black	B	B
	CASE	Green	-	-
Options				
Optional RCAL Only	RCAL+	Orange	F	E
	RCAL-	Blue	E	D
SPX 3XXX Only Options				
Optional RCAL with Secondary 4-20mA only	RCAL+	Orange	-	E
	RCAL-	Blue	-	D
	2nd PWR+/SIG+	Violet	-	G
	2nd PWR-/SIG-	Yellow	-	H
Optional Secondary 4-20mA only	2nd PWR+/SIG+	Violet	-	G
	2nd PWR-/SIG-	Yellow	-	H
Optional Dual RTD only	RTD (-)	White	-	D
	RTD (+)	Grey	-	E
	RTD (+)	Brown	-	F
Color Code				
SPX				
SPX 3XXX ONLY				

Note: The Optional Dual RTD option (TA) is a second RTD in the snout tip that is brought to the connector. The RTD is a 100 Ohm RTD with an alpha of 0.00385 Ohms/°C.



If the transmitter is installed in hazardous areas, only passive devices like switches or resistors may be connected between the RCAL+ and RCAL- signals. Connection of any active electronic circuits or voltage or current source is not allowed.

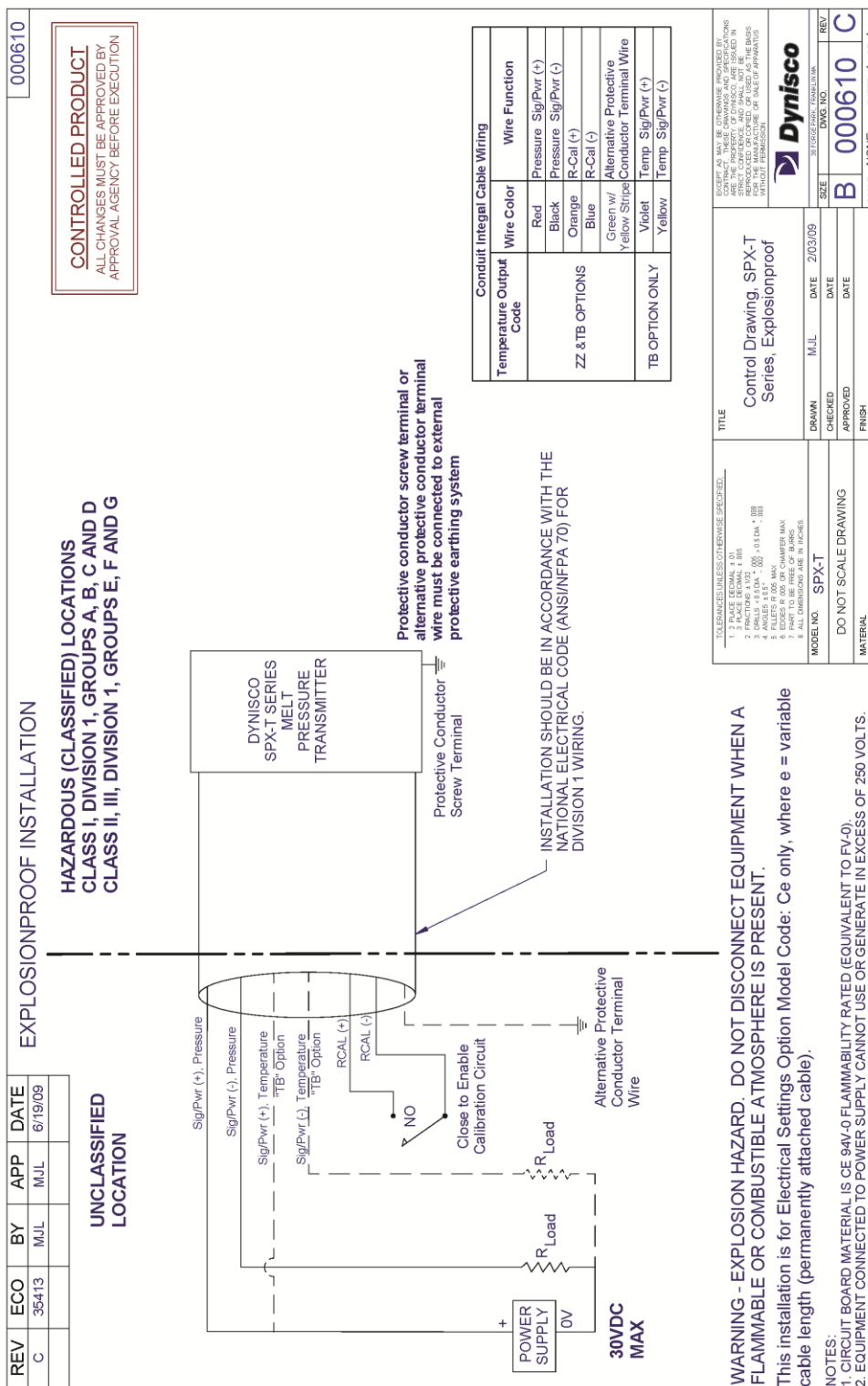


Figure 5-1 Electrical Configuration for FM Approved Explosionproof SPX 3XXX Installations

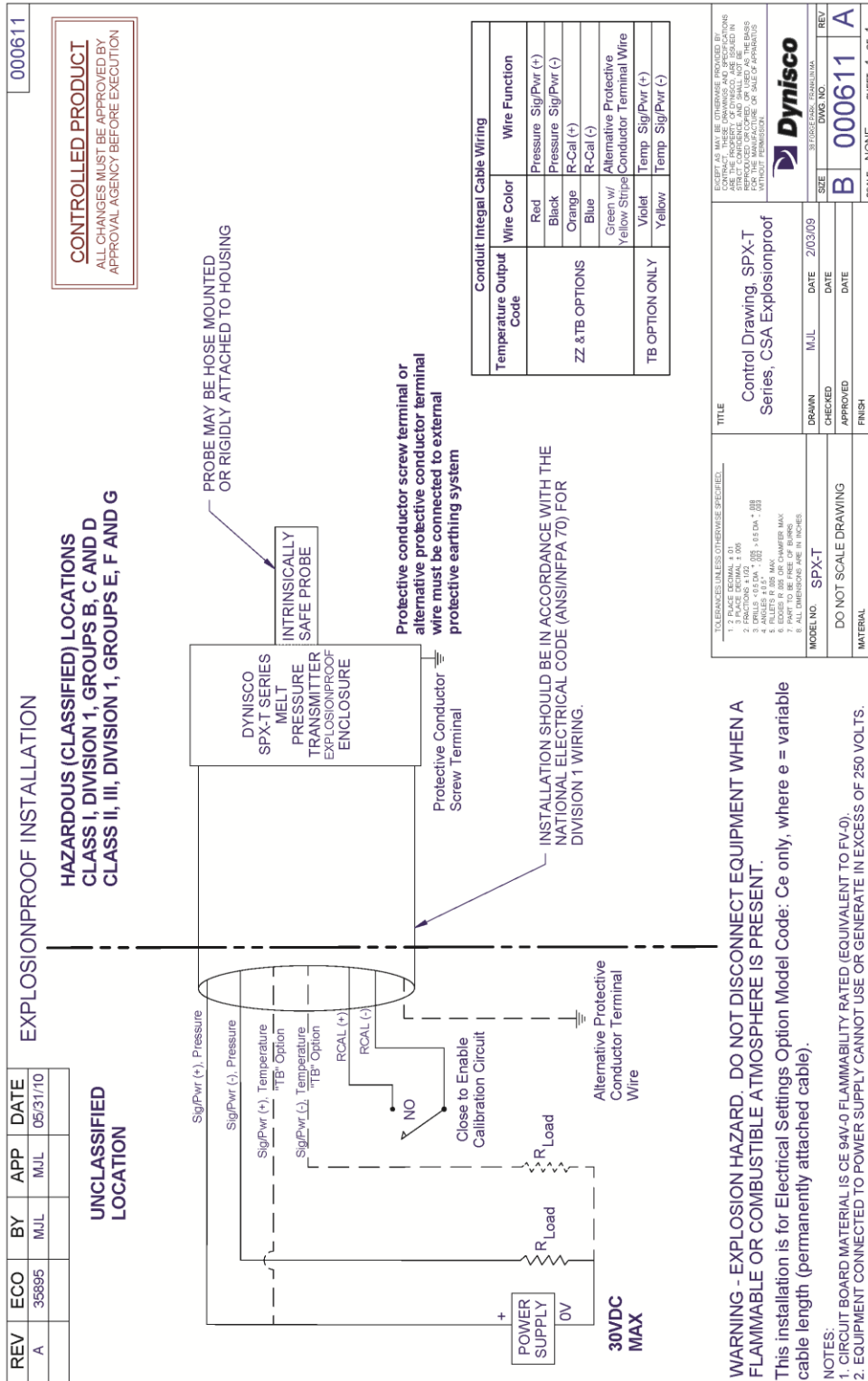


Figure 5-2 Electrical Configuration for CSA Approved Explosionproof SPX 3XXX Installations

5.9 FLANGE CONFIGURATIONS

While many flange configurations shown on Dwg's 000053, 000057 and 000059 are offered on the various SPX models (xx43, xx91, xx41 and xx44)

There are specific flanges which have been demonstrated to conform to ASME piping code B31.3. Flanges meeting the requirements of ASME B31.3 (and having CRN registration) are identified on the Model Coding Sheets/ Dwg's 242945 – 242948 and are listed below.

Models XX43 Flange Codes: 25, 26, 31, 40, 43, 44 and 45

Models XX91, XX41, XX44 Flange Codes: 51, 56, 57, 67 and 92

6 COMMISSIONING

There are two ways of commissioning the SPX transmitters. This can be done by utilizing the ZERO and SPAN actuators 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 zero/span actuators on the sensor.

If the transmitter is not equipped with HART then the zero/span actuators 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 stabilized 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. Even with the advanced temperature correction performed by the SPX 3XXX, there is a slight residual temperature offset so rezero may be beneficial.

Also, depending on the orientation of the sensor, the weight 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).

There are some other effects that may affect 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 ACTUATORS

When the transmitter output needs to be corrected due to mounting location and temperature shift the zero actuator can be used (if a HART Communicator is not available.) Please wait until the process has been brought to operating temperature before zeroing. The zero procedure is only recommended after the process temperature has stabilized and the SPX electronics housing has been permanently installed.

When the actuator 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 actuator. This is performed by applying a known calibrated full scale pressure to the transmitter and depressing the Span actuator 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 actuator should never be used to set the URV without zeroing the PT with the zero actuator 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 ZERO AND SPAN PROCEDURE

1. Connect Power Supply to SPX signal leads with 250 ohm load and milliamp meter in series with loop.
2. If commissioning on the bench with a dead weight tester or calibrated pressure source, ensure 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 Zero Function
 - a. SPX 2XXX/4XXX/5XXX (Pushbutton)



ATTENTION

- i. Do not remove seal screw when the circuit is live in a hazardous area.
- ii. Remove zero pushbutton seal screw.
- iii. Using a 2mm or smaller Allen key, depress the pushbutton for a ½ second.
- iv. Release pushbutton for a ½ second.
- v. Depress the pushbutton again for a ½ second and release.

b. SPX 3XXX (Hall Effect Switch)

- i. Unthread Zero screw from endplate
- ii. Depress screw
- iii. Release screw
- iv. Depress screw
- v. Release screw
- vi. Restore screw in endplate

Note: The screw must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

The available pressure is now adopted as the new lower range value

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.

ATTENTION

5. Apply Full Scale pressure and verify output is 20 mA. If output is other than 20 mA, perform Local Span adjustment:

a. SPX 2XXX/4XXX/5XXX (Pushbutton)

- i. Do not remove seal screw when the circuit is live in a hazardous area.
- ii. Remove span pushbutton seal screw.
- iii. Using a 2mm or smaller Allen key, depress the pushbutton for a ½ second.
- iv. Release pushbutton for a ½ second.
- v. Depress the pushbutton again for a ½ second and release.

ATTENTION

b. SPX 3XXX (Hall Effect Switch)

- i. Unthread Span screw from endplate
- ii. Depress screw
- iii. Release screw
- iv. Depress screw
- v. Release screw
- vi. Restore screw in endplate

Note: The screw must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

The available pressure is now adopted as the new upper range value.

6.3 UTILIZING THE HART COMMUNICATIONS

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 1,2,5,1,3,1) the output will be corrected to reflect zero pressure. 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, 1, 3, 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, 1, 3, 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.

ATTENTION	Never perform upper sensor trim without performing lower sensor trim first.
-----------	---

6.3.2 CONNECTING THE HART HANDHELD COMMUNICATOR



In hazardous areas, refer to the handheld communicator instruction manual for instructions for HART Communicator to function properly.

ATTENTION

A minimum of 250 Ohms resistance must be present in the loop.

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.

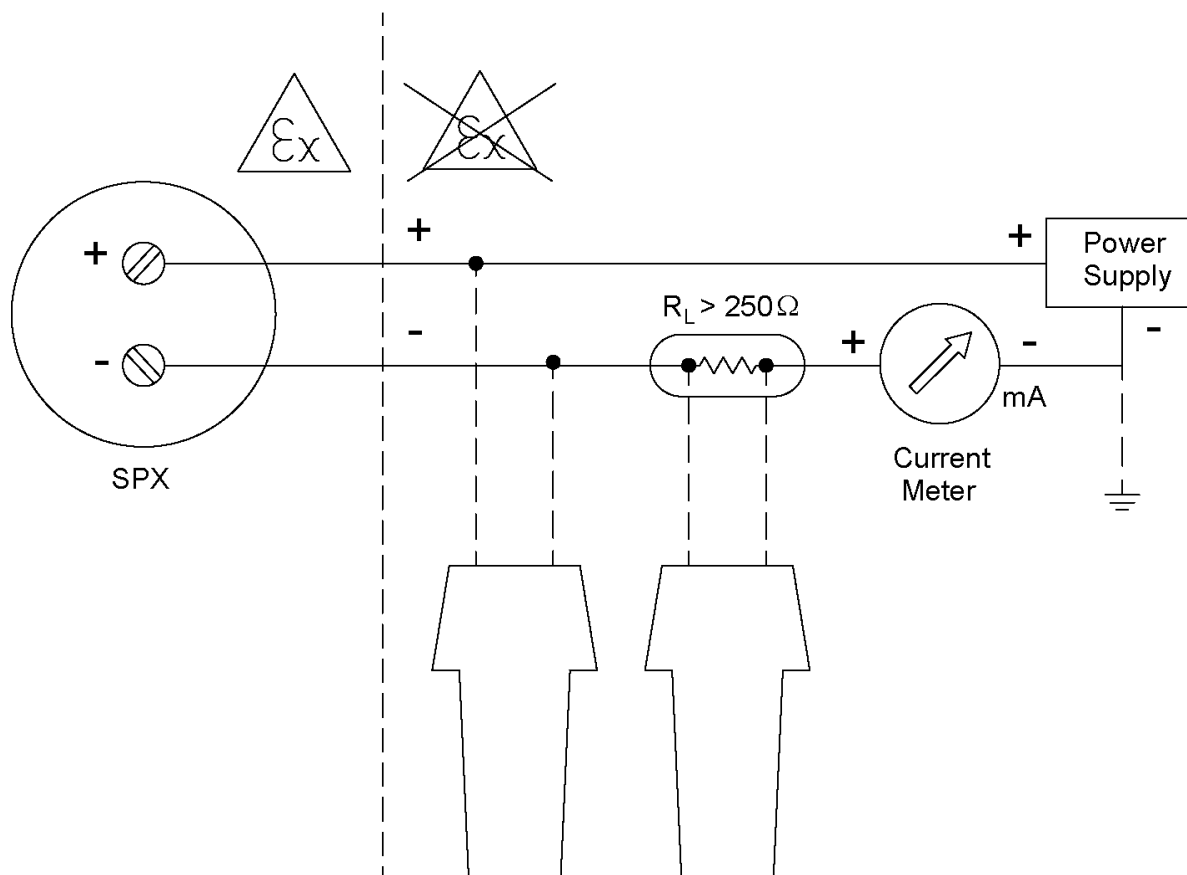


Figure 6-1 HART Communicator Interface

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-T or SPX depending on model] 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/cm², 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 1,2,5,1,3,1)
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 full scale pressure of unit. Next perform Upper Sensor Trim (Fast Key 1,2,5,1,3,2). Output should now equal full scale pressure.
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 then turn the 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.

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 mA

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 handheld 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)
EEPROM 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	Unchanged
Zero/Span Actuator stuck	Set to configured fail safe mode
Low voltage detected	Unchanged
Outside URV or LRV	Unchanged
Rcal simulation on	Unchanged

6.5 ALARM & SATURATION VALVES BURST MODE

No special requirements are defined for the burst mode.

6.6 ALARM & SATURATION VALUES IN 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

Zero Trim (1,2,5,1,3,1)

Digital Correction to zero which affects the digital output. This differs from Lower Sensor Trim in that zero trim is ONLY performed at zero pressure.

Lower Sensor Trim (1,2,5,1,3,2)

Digital Correction to zero which affects the digital 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 (1,2,5,1,3,3)

Digital correction to Full Scale which affect digital 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 (1,2,5,1,2)

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 6:1 is possible. Accuracy specifications remain dependent upon the Full Sensor Range without any turndown applied. Three methods of Reranging the SPX Transmitter are outlined below.

Note: If pressure applied to the transmitter is not in the range of the 6:1 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 Actuator.

Reranging TV (SPX 3XXX) with “TB” option only

On a SPX 3XXX with the TB option, there is a second 4-20mA output that is proportional to the snout temperature. By default the TV LRV and TV URV are set to 0 and 400C respectively. The secondary 4-20mA output can be reranged by changing TV LRV and TV URV.

Reranging via Zero/Span Actuators

When HART Communication is not used, LRV and URV values are entered by applying zero pressure to the SPX 3XXX and “Rezeroing” by:

- a. SPX 2XXX/4XXX/5XXX (Pushbutton)
 - i. Do not remove seal screw when the circuit is live in a hazardous area.
 - ii. Remove zero pushbutton seal screw.
 - iii. Using a 2mm or smaller Allen key, depress the pushbutton for a ½ second.
 - iv. Release pushbutton for a ½ second.
 - v. Depress the pushbutton again for a ½ second and release.

ATTENTION

- b. SPX 3XXX (Hall Effect Switch)
 - i. Unthread Zero screw from endplate
 - ii. Depress screw
 - iii. Release screw
 - iv. Depress screw
 - v. Release screw
 - vi. Restore screw in endplate

Note: The screw must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

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 actuator. The span actuator should never be used to adjust the URV without using the zero actuator to set the LRV first.

URV or Full Scale Turndown is performed by applying any pressure, within the 6:1 ratio of the transmitter that you want to be the 20 mA point. When the pressure is held steady:

- a. SPX 2XXX/4XXX/5XXX (Pushbutton)
 - i. Do not remove seal screw when the circuit is live in a hazardous area.
 - ii. Remove span pushbutton seal screw.
 - iii. Using a 2mm or smaller Allen key, depress the pushbutton for a ½ second.
 - iv. Release pushbutton for a ½ second.
 - v. Depress the pushbutton again for a ½ second and release.

- b. SPX 3XXX (Hall Effect Switch)
 - i. Unthread Span screw from endplate
 - ii. Depress screw
 - iii. Release screw
 - iv. Depress screw
 - v. Release screw
 - vi. Restore screw in endplate

Note: The screw must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

The SPX has now adjusted the URV 20 mA point to match the 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 TV LRV (1,3,3,3) SPX 3XXX “TB” option only

This is the temperature at which the transmitter will output 4 mA on the secondary mA output as entered directly by the user.

Rerange TV URV (1,3,3,4) SPX 3XXX “TB” option only

This is the temperature at which the transmitter will output 20 mA on the secondary mA output as entered directly by the user.

Rerange LRV By Applying Pressure (1,2,5,1,1,1,1)

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 (1,2,5,1,1,1,2)

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 (1,2,5,3)

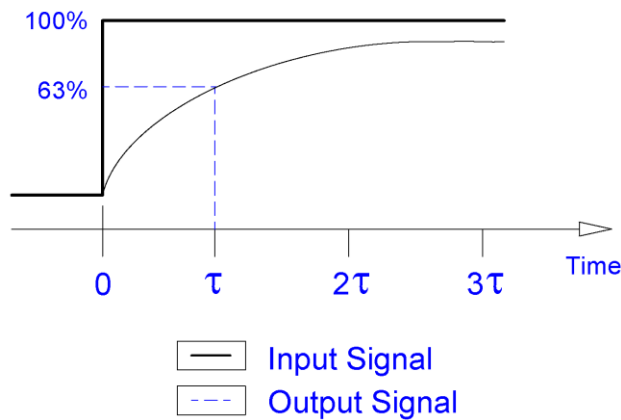
This is used to restore the Zero, Lower, and Upper Trim to the Values as set from the Factory.

R-Cal Set % (1,2,5,1,4,1)

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%. Setting Rcal to 0%, disables the Rcal function.

Damping (1,3,5)

The damping time constant affects the speed with which the primary 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 Actuator Disable (1,4,3,6)

Local zero and span actuators 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 actuators. 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:

$$1 \text{ psi} = 0.068947 \text{ Bar} = 0.0068947 \text{ MPa} = 0.070309 \text{ kgf/cm}^2$$

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 (1,1,7)

Temperature measured on the Electronics Assembly is used for reference and factory diagnostics only.

TV Snout Temperature (1,1,4)

Temperature measured at the snout tip (SPX 3XXX only).

Poll Address (1,4,3,3,3)

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. Note: Analog output is set to 4mA when in multi-drop mode.

Burst Mode (1,4,2,3,1)

When the SPX 3XXX 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.

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 Zero/Span Actuators or the HART communicator. The list of parameters restored is shown below.

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 actuators, use the following procedure:

ATTENTION

- a. SPX 2XXX/4XXX/5XXX (Pushbutton)
 - i. Do not remove seal screw when the circuit is live in a hazardous area.
 - ii. Remove zero and span pushbutton seal screws.
 - iii. Using a 2mm or smaller Allen key, depress the pushbuttons for a ½ second.
 - iv. Release pushbuttons for a ½ second.
 - v. Depress the pushbuttons again for a ½ second and release.
- b. SPX 3XXX (Hall Effect Switch)
 - i. Unthread Zero and Span screws from endplate
 - ii. Depress screws
 - iii. Release screws
 - iv. Depress screws
 - v. Release screws
 - vi. Restore screws in endplate

Note: The screws must be threaded into the endplate for normal operation. Failing to do so will cause the device to go into failsafe.

At this point, the LRV and URV will be set to factory defaults.

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 its value at shipment.
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. Set actuators to the settings they were when shipped from DYNISCO.

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	2
Read % of Full Scale	1,1,2
Read Analog Output (PV)	1,1,3
Read SV Electronics Temperature	1,1,7
Read Peak Pressure Value	1,2,1,2
Read Peak Electronic Temp Value (SV)	1,2,1,3
Read Sensor Diagnostic Status	1,2,1,1
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 (PV)	1,2,5,1,2
Perform Zero Trim	1,2,1,3,1
Perform Lower Sensor Trim	1,2,5,1,3,2
Perform Upper Sensor Trim	1,2,5,1,3,3
Recall Factory Trim	1,2,5,3
Set Rcal %	1,2,5,1,4,1
Set Tag	1,3,1
Set PV Unit	1,3,2
Set Lower Range Value (LRV) (PV)	1,3,3,1
Set Upper Range Value (URV) (PV)	1,3,3,2
Display Lower Set Limit (LSL) (PV)	1,3,3,5
Display Upper Set Limit (USL) (PV)	1,3,3,6
Set Date	1,3,4,1
Set Descriptor	1,3,4,2
Set Message	1,3,4,3
Set PV Damping	1,3,5
Set SV Temperature Unit	1,4,1,7
Set PV Analog Output Alarm Type	1,4,2,2,3
Set Poll Address	1,4,2,3,1
Set # of Request Preambles	1,4,2,3,2
Set Burst Mode	1,4,2,3,3
Set Burst Option	1,4,2,3,4
Read Analog Output (TV)	1,1,6
Read Peak Temp Value (TV)	1,2,3,4
Perform D/A Trim (TV)	1,2,5,2,2
Set Lower Range Value (LRV) (TV)	1,3,3,3
Set Upper Range Value (URV) (TV)	1,3,3,4
Temperature Override	1,2,5,2,1,1
Temperature Override Value	1,2,5,2,1,2

7 MAINTENANCE

7.1 MAINTENANCE

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!**



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 REPAIR/DISPOSAL



Toxic hazard!

The SPX contains a small amount of mercury (Hg) as its standard transmission medium. If the diaphragm is damaged, mercury may escape. For alternate (non-Hg) transmission mediums please consult factory.

Never transport or store the SPX without the protective cap 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 SPXs.

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.

7.3 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 on the "warranty" link under the "Post-Sales Support" tab at the top of the web page for complete details.

8 TROUBLESHOOTING

Symptom	Corrective Actions
Milliamp 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
Primary Milliamp 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 4) Check if in multi-drop mode
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 5) Confirm HART communicator is connected to primary (Pressure) output 4-20mA
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
Secondary output at or below 3.6mA (Failsafe low)	1) Confirm output option is specified in Model configuration 2) Confirm that primary output is properly powered
Primary output =3.6mA or > 21mA	1) Unit is in fail safe, consult fail safe section



9 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



10 APPROVALS/CERTIFICATES

Note additional approvals available; please consult factory

10.0 IECEx CERTIFICATE OF CONFORMITY

Certificate No: IECEx PTB 17.0038X

For the latest certificate which includes a listing of applied standards please refer to the IECEx website:

<https://www.iecex.com/>

10.1 EU DECLARATION OF CONFORMITY



Dynisco

EU Declaration of Conformity



We, the manufacturer, **Dynisco Instruments LLC, 38 Forge Parkway, Franklin, MA 02038 USA** declare under our sole responsibility that the products:

Product Series: SPX GEN2, SPX-T & SPX-L Pressure Transmitters
Partial Type Designations: 2* (SPX2 GEN2)**
3* (SPX-T)**
4* (SPX4 GEN2)**
5* (SPX-L)**
 where an asterisk "*" represents any letter, number, or character where partial type designations above represents the first 4 characters of the full type designation

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

EMC Directive 2014/30/EU – Electromagnetic Compatibility

All Type Designations
 EN 61326-1:2013 (IEC 61326-1:2012)
 CISPR 11:2009+A1:2010 Radiated Electromagnetic Emissions
 IEC 61000-4-2:2008 Electrostatic Discharge Immunity
 IEC 61000-4-3:2010 Radiated Electromagnetic Field Immunity
 IEC 61000-4-4:2012 Electric Fast Transient Burst Immunity
 IEC 61000-4-5:2005 Surge Immunity
 IEC 61000-4-6:2008 Radio Frequency Common Mode Immunity

PED Directive 2014/68/EU – Pressure Equipment

Partial Type Designations 228* and 538* with:
Pressure Range Code less than or equal to "20" (200 Bar/3000 psi)
 Sound Engineering Practice (SEP) applies.

Partial Type Designations 228* and 538* with:
Pressure Range Code greater than "20" (200 Bar/3000 psi)
 Conformity Assessment Module "A" applies.

All other Type Designations
 These models fall outside the scope of the PED directive and therefore the PED directive shall not apply.

Per the PED directive article 2, number (5); pressure equipment must have "a pressure bearing housing", which is compellingly related to an identifiable pressure chamber.

ATEX Directive 2014/34/EU – Potentially Explosive Atmospheres

Partial Type Designations 2*, 3***, 4*** & 5*** with:**
Hazardous Area Classification Code "S" (Intrinsically Safe ATEX, EU)
 The declared products described above are in conformity with the relevant Union harmonization legislation. Fulfillment of the essential health and safety requirements set out in Annex II has been demonstrated by compliance with:

Current Harmonized Standards
 BS EN IEC 60079-0:2018 General requirements
 EN 60079-11:2012 Intrinsic safety "I"
 EN 60079-26:2015 Equipment with equipment protection level (EPL) Ga
 EN 1127-1:2019 Explosion prevention and protection. Basic concepts and methodology

Page 1 of 3

P/N 973002 ECO# 51286 Rev. M



The current harmonized standards have been compared to the superseded standards listed on the EC-type-Examination Certificate (listed below) and no changes in the "state of the art" apply to the equipment. Annual Gap Analysis Report P/N 973003. See below for specific standard gap analysis reports.

Superseded Standards listed on the EU-Type-Examination Certificate

EN 60079-0:2012+A11:2013 (gap analysis P/N 975356)

EN 1127-1:2011 (gap analysis P/N 975357)

Equipment Group II, Category 1 G Ex ia IIC T6/T4 Ga or Category 2 G Ex ia IIC T6/T4 Gb

EU-Type-Examination Certificate Number.: PTB 09 ATEX 2038 X Issue: 1

ATEX Notified Body for EU Type Examination Certificate:

Konformitätsbewertungsstelle der Physikalisch-Technischen Bundesanstalt (PTB)

Bundesallee 100

38116 Braunschweig, Germany

Notified Body Number: 0102

ATEX Notified Body involved in the Production Control Stage:

CSA Group Netherlands B.V. (CSA)

Utrechtseweg 310 (B42)

6812AR Arnhem, Netherlands

Notified Body Number: 2813

ATEX Directive 2014/34/EU – Potentially Explosive Atmospheres

Partial Type Designations 2* and 5*** with:**

Hazardous Area Classification Code "W" (Intrinsically Safe & Dust ignition protection by enclosure ATEX, EU)

The declared products described above are in conformity with the relevant Union harmonization legislation. Fulfillment of the essential health and safety requirements set out in Annex II has been demonstrated by compliance with:

Current Harmonized Standards

BS EN IEC 60079-0:2018 General requirements

EN 60079-11:2012 Intrinsic safety "i"

EN 60079-26:2015 Equipment with equipment protection level (EPL) Ga

EN 1127-1:2019 Explosion prevention and protection. Basic concepts and methodology

EN 60079-31:2014 Equipment dust ignition protection by enclosure "t"

The current harmonized standards have been compared to the superseded standards listed on the EC-type-Examination Certificate (listed below) and no changes in the "state of the art" apply to the equipment. Annual Gap Analysis Report P/N 973003. See below for specific standard gap analysis reports.

Superseded Standards listed on the EU-Type-Examination Certificate

EN 60079-0:2012+A11:2013 (gap analysis P/N 975356)

EN 1127-1:2011 (gap analysis P/N 975357)

Equipment Group II, Category 3 G Ex ia IIC T4 Gc and Category 3 D Ex tc IIIC T100°C Dc

EU-Type-Examination Certificate Number.: PTB 09 ATEX 2038 X, Issue: 1

ATEX Notified Body for EU Type Examination Certificate:

Konformitätsbewertungsstelle der Physikalisch-Technischen Bundesanstalt (PTB)

Bundesallee 100

38116 Braunschweig, Germany

Notified Body Number: 0102



ATEX Notified Body involved in the Production Control Stage:
CSA Group Netherlands B.V. (CSA)
Utrechtseweg 310 (B42)
6812AR Arnhem, Netherlands
Notified Body Number: 2813

ATEX Directive 2014/34/EU – Potentially Explosive Atmospheres

Partial Type Designations 2* and 5*** with:**

Hazardous Area Classification Code "T" (Dust ignition protection by enclosure ATEX, EU)

The declared products described above are in conformity with the relevant Union harmonization legislation. Fulfillment of the essential health and safety requirements set out in Annex II has been demonstrated by compliance with:

Current Harmonized Standards

BS EN IEC 60079-0:2018 General requirements

EN 60079-31:2014 Equipment dust ignition protection by enclosure "t"

The current harmonized standards have been compared to the superseded standards listed in the SPX Dust ATEX tc technical file (P/N 974140) and no changes in the "state of the art" apply to the equipment. Annual Gap Analysis Report P/N 973003. See below for specific standard gap analysis reports.

Superseded Standards listed in the SPX Dust ATEX tc technical file

EN 60079-0:2012+A11:2013 (gap analysis P/N 975356)

Equipment Group II, Category 3 D Ex tc IIIC T100°C Dc

Authorized Representative established within the Community:

Dynisco Europe GmbH
Pfaffenstr. 21
74078 Heilbronn, Germany

Other information:

1. Device testing per normative standards following the EMC Directive (2014/30/EU) was conducted by: Chomerics Test Services, Woburn, Massachusetts, USA / 24-26 June 2013 / American Association for Laboratory Accreditation (A2LA) accredited facility, Certificate Number 1980.01.
2. Dust ignition protection by enclosure device testing and documentation per normative standards following Annex VIII of the ATEX Directive (2014/34/EU) were conducted and prepared by the manufacturer, Dynisco Instruments LLC / January 2018.

Date of issue: 04 March 2020
Place of issue: Franklin, MA USA



John Czazasty
Vice President of Engineering

10.2 EU-TYPE EXAMINATION CERTIFICATE



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut



(1) EU-TYPE-EXAMINATION CERTIFICATE (Translation)

(2) Equipment or Protective Systems Intended for Use in
Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 09 ATEX 2038 X

Issue: 1

(4) Product: Pressure transmitter, type series SPX-T and SPXGEN2

(5) Manufacturer: Dynisco Instruments

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

(7) This product and any acceptable variation thereto is 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 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 17-27058.

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

EN 60079-0:2012 + A11:2013
EN 1127-1:2011

EN 60079-11:2012

EN 60079-26:2015

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

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

 **II 1 G Ex ia IIC T6/T4 Ga** or  **II 2 G Ex ia IIC T6/T4 Gb**

ZSEX001e c

Konformitätsbewertungsstelle - Sektor Explosionsschutz
On behalf of PTB:

Braunschweig, October 20, 2017

Dr.-Ing. F. Lienesch
Direktor und Professor



sheet 1/4

EU-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.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

Dynisco
P/N 975161
Rev B
ECO 48679



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut



(13)

SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 09 ATEX 2038 X, Issue: 1**

(15) Description of Product

The pressure transmitters of type series SPX-T and SPXGEN2 are used to convert a mechanical quantity (pressure) into a proportional electrical quantity in the field of process control. Both type series 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. Type series SPX-T is optionally provided with an additional intrinsically safe 4...20 mA current loop which is used to display temperature, however, without digital data communication, as well as an optionally available secondary resistive temperature detector (RTD). HALL-switches (SPX-T) or pushbuttons (SPXGEN2) enable adjustments of Zero and Span. These are installed inside the enclosure. 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:  **II 1 G Ex ia IIC T6/T4 Ga**

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.

Category-2-equipment:

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

Marking:  **II 2 G Ex ia IIC T6/T4 Gb**

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	60 °C	85 °C
max. permissible medium temperature	60 °C	85 °C

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

sheet 2/4

EU-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.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

Dynisco
P/N 975161
Rev B
ECO 48679



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut



SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 09 ATEX 2038 X, Issue: 1

Electrical data:

SPX-T and SPXGEN2

Supply and evaluation circuit
(plug connector or open ended cable,
terminals: PWR+/SIG+, PWR-/SIG-,
RCAL+, RCAL-)

type of protection Intrinsic Safety Ex ia IIC
only for connection to a certified intrinsically safe
circuit

Maximum values:

$U_i = 30 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 750 \text{ mW}$
 $C_i \leq 4.5 \text{ nF}$
 $L_i \leq 40 \text{ } \mu\text{H}$

only passive components without internal power
source and without external circuits shall be
connected to the terminals RCAL+/ RCAL-

Sensor circuit

internal, in type of protection Intrinsic Safety

SPX-T

Supply and evaluation circuit
(plug connector or open ended cable,
terminals: PWR+/SIG+, PWR-/SIG-,
RCAL+, RCAL-,
RTD-, RTD+, RTD+

type of protection Intrinsic Safety Ex ia IIC
only for connection to a certified intrinsically safe
circuit

Maximum values per circuit:

$U_i = 30 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 750 \text{ mW}$
 $C_i \leq 4.5 \text{ nF}$
 $L_i \leq 40 \text{ } \mu\text{H}$

only passive components without internal power
source and without external circuits shall be
connected to the terminals RCAL+/ RCAL-

Sensor circuit

internal, in type of protection Intrinsic Safety

sheet 3/4

EU-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.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

Dynisco
P/N 975161
Rev B
ECO 48679



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut



SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 09 ATEX 2038 X, Issue: 1

Changes with respect to previous issues

- Adaption to the current state of standards
- Change of marking (EPL added)
- Revision of the type labels
- Revision of the operating manual
- Update of the revision state of the label drawings
- Summarization of the specifications from the initial certificate with the changes mentioned above to represent the current state of production of the equipment. Technical modifications have not been carried out.

(16) Test Report PTB Ex17-27058

(17) Specific conditions of use

1. The housing of the pressure transmitters, type series SPX-T and SPXGEN2 shall be connected reliably to the local equipotential bonding system.
2. Those variants of the pressure transmitters, type series SPX-T and SPXGEN2 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 is excluded. Impact or friction between aluminium and stainless steel is allowed if the existence of rust particles can be excluded.
3. For application as category-1-equipment the connecting cable shall be equipped with a suitable conductive coating ($R_{\text{surface}} < 10^9 \Omega$) to avoid possible electrostatic charge.

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle - Sektor Explosionsschutz
On behalf of PTB:


Dr.-Ing. F. Lienesch
Direktor und Professor



Braunschweig, October 20, 2017

sheet 4/4

EU-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.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

Dynisco
P/N 975161
Rev B
ECO 48679

10.3 EX FM CERTIFICATE OF CONFORMITY – SPX 22XX & 53XX



Member of the FM Global Group

CERTIFICATE OF CONFORMITY

1. **HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT PER US REQUIREMENTS**
2. **Certificate No:** FM19US0195
3. **Equipment:** Series SPX 22 & 53 Pressure Transducer
(Type Reference and Name)
4. **Name of Listing Company:** Dynisco Inc
5. **Address of Listing Company:** 38 Forge Parkway
Franklin, MA 02038
USA
6. The examination and test results are recorded in confidential report number:

3018521 dated 22nd July 2004
7. FM Approvals LLC, certifies that the equipment described has been found to comply with the following Approval standards and other documents:

FM Class 3600:2018, FM Class 3615:2018, FM Class 3810:2005,
ANSI/NEMA 250:1991, ANSI/IEC 60529:2004
8. If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.
9. This certificate relates to the design, examination and testing of the products specified herein. The FM Approvals surveillance audit program has further determined that the manufacturing processes and quality control procedures in place are satisfactory to manufacture the product as examined, tested and Approved.
10. **Equipment Ratings:**

Explosionproof for Class I, Division 1, Groups A, B, C and D; Dust-ignitionproof for Class II, III, Division 1, Groups E, F and G hazardous (classified) locations, indoors and outdoors (Type 4X, IP67) with an ambient temperature rating of T5 Ta = -20°C to +85°C, T6 Ta = -20°C to +60°C

Certificate issued by:



J.E. Marquardt
VP, Manager - Electrical Systems

23 October 2019
Date

To verify the availability of the Approved product, please refer to www.approvalguide.com

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16) Page 1 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

SCHEDULE



Member of the FM Global Group

US Certificate Of Conformity No: FM19US0195

11. The marking of the equipment shall include:

Class I, Division 1, Groups A, B, C, D
Class II / III, Division 1, Groups E, F, G
T5 Ta = -20°C to +85°C, T6 Ta = -20°C to +60°C
Type 4X, IP67

12. Description of Equipment:

The transducers are comprised of a stainless steel single compartment 1.74 inch diameter cylindrical housing approximately six inches long, depending on the pressure rating and model. One end of the enclosure has a male 1/2-14 NPT male conduit connection. Model 228X transducers referenced to gage pressure and rated below 500 psi have a 3.25 inch long capillary vent in the wall of the enclosure and are not Approved as NEMA Type 4X or IP67. All other models have filled systems and are never configured with a vent tube regardless of pressure range.

The input/output wiring passes through the conduit connection and is sealed with Emerson & Cuming, Stycast 2651 potting compound with Catalyst 9. There are two 1/4-20 UNC 2A/2B seal screws for accessing the internal zero and span adjustments. The other end of the enclosure has a threaded process connection with pressure sensing strain gages or a selection of fluid filled flexible or rigid snout assemblies with a separate process diaphragm. The conduit connection and process connection are welded to the cylindrical portion of the enclosure.

The transducers are available in working pressure ranges 1 psi to 60,000 psi. The ambient temperature range of the transducers is -20°C to 85°C. The input voltage rating is 16-36 Vdc, 4-20mA.

228aEbcCdefghi. SPX Pressure Transmitter

a = Accuracy 0, 1 or 2
b = Pressure reference E, N H, R, A, B, K, C, M, G, D, L, F, P or S.
c = Process connection A, B, C, D, E, F, G, H, K, L, M, N, P, R or S.
d = Cable length code (one digit alpha-numeric).
e = Wiring connection 4 or 9.
f = Pressure units B, C, K, M or P.
g = Pressure range code 10 through 32.
h = Hart communications A, B or C.
i = Option code (four digits alpha-numeric).
* If Pressure Range Code is less than 14 and Pressure Reference Code (b = B, K, C, M or G) then Type 4X and IP67 ratings are not included

229aEbcdefghCiZZj. SPX Pressure Transmitter

a = Mounting configuration 0, 1 or 2.
b = Process diaphragm material (one digit alpha-numeric).
c = Process connection code (two digits alpha-numeric).
d = Engineering units B, C, K, M or P.
e = Pressure range 08 through 23, 33
f = Rigid snout length code (two digits alpha-numeric).

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmaprovals.com www.fmaprovals.com

F 347 (Mar 16)

Page 2 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

SCHEDULE



Member of the FM Global Group

US Certificate Of Conformity No: FM19US0195

g = Flex length code (two digits alpha-numeric).
h = Hart communications A, B or C.
i = Cable length code (one digit alpha-numeric).
j = Option codes (four digits alpha-numeric).

2241EabcfgChZZi. SPX Pressure Transducer.

a = Process diaphragm material code (one digit alpha-numeric).
b = Process connection (two digits alpha-numeric).
c = Engineering units B, C, K, M or P.
d = Pressure range 09 through 23, 33
e = Rigid Snout length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four characters alpha-numeric).

2242EabcfgChZZi. SPX Pressure Transducer

a = Process diaphragm material code (one digit alpha-numeric).
b = Process connection (two digits alpha-numeric).
c = Engineering units B, C, K, M or P.
d = Pressure range 09 through 27, 33
e = Rigid length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

2243EabcfgChZZi. SPX Pressure Transducer.

a = Process diaphragm material code (one digit alpha-numeric).
b = Process connection (two digits alpha-numeric).
c = Engineering units B, C, K, M or P.
d = Pressure range 08 through 27, 33
e = Rigid length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

2244EabcfgChZZi. SPX Pressure Transducer.

a = Process diaphragm material code (one digit alpha-numeric).
b = Process connection (two digits alpha-numeric).
c = Engineering units B, C, K, M or P.
d = Pressure range 08 through 23, 33
e = Rigid length code (two digits alphanumeric).
f = Flex length code (two digits alphanumeric).
g = Hart communications A, B or C.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA.
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16)

Page 3 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

SCHEDULE



Member of the FM Global Group

US Certificate Of Conformity No: FM19US0195

h = Cable length code (one digit alphanumeric).
i = Option codes (four digits alpha-numeric).

538aEbcCdefghi. SPX Smart Pressure Transmitter

a = Accuracy 0, 1, or 2.
b = Pressure reference E, N, H, R, A, B, K, C, M, G, D, L, F, P, or S.
c = Process connection A, B, C, D, E, F, G, H, K, L, M, N, P, R, or S.
d = Cable length code (one digit alpha-numeric)
e = Wiring Connections 4 or 9.
f = Pressure units B, C, K, M, or P.
g = Pressure range code 10 through 32.
h = Hart communications A, B or C.
i = Option code (four digits alpha-numeric)
*If pressure Range code is less than 14 and Pressure Reference Code (b= B, K, C, M or G) then Type 4X and IP67 ratings are not included.

539aEbcdefghCIZZj. SPX Smart Pressure Transmitter

a = Mounting configuration 0, 1, or 2.
b = Process diaphragm material (one digit alpha-numeric).
c = Process connection code (two digits alpha-numeric).
d = Pressure units B, C, K, M, or P.
e = Pressure range 08 through 23, 33
f = Rigid snout length code (two digits alpha-numeric).
g = Flex length code (two digits alpha-numeric).
h = Hart communications A, B or C.
i = Cable length code (one digit alpha-numeric).
j = Option codes (four digits alpha-numeric).

5341EabcfgChZZi. SPX Smart Pressure Transmitter

a = Process diaphragm material (one digit alpha-numeric).
b = Process connection code (two digits alpha-numeric).
c = Pressure units B, C, K, M, or P.
d = Pressure range 09 through 23, 33
e = Rigid snout length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

5342EabcfgChZZi. SPX Smart Pressure Transmitter

a = Process diaphragm material (one digit alpha-numeric).
b = Process connection code (two digits alpha-numeric).
c = Pressure units B, C, K, M, or P.
d = Pressure range 09 through 27, 33
e = Rigid snout length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16)

Page 4 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

SCHEDULE



Member of the FM Global Group

US Certificate Of Conformity No: FM19US0195

g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

5343EabcfgChZZi. SPX Smart Pressure Transmitter

a = Process diaphragm material (one digit alpha-numeric).
b = Process connection code (two digits alpha-numeric).
c = Pressure units B, C, K, M, or P
d = Pressure range 08 through 27, 33
e = Rigid snout length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

5344EabcfgChZZi. SPX Smart Pressure Transmitter

a = Process diaphragm material (one digit alpha-numeric).
b = Process connection code (two digits alpha-numeric).
c = Pressure units B, C, K, M, or P.
d = Pressure range 08 through 23, 33
e = Rigid snout length code (two digits alpha-numeric).
f = Flex length code (two digits alpha-numeric).
g = Hart communications A, B or C.
h = Cable length code (one digit alpha-numeric).
i = Option codes (four digits alpha-numeric).

13. Specific Conditions of Use:

None

14. Test and Assessment Procedure and Conditions:

This Certificate has been issued in accordance with FM Approvals US Certification Requirements.

15. Schedule Drawings

A copy of the technical documentation has been kept by FM Approvals.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmaprovals.com www.fmaprovals.com

F 347 (Mar 16)

Page 5 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

SCHEDULE



US Certificate Of Conformity No: FM19US0195

16. Certificate History

Details of the supplements to this certificate are described below:

Date	Description
22 nd July 2004	Original Issue.
23 rd October 2019	Supplement 4: Report Reference: – RR220986 dated 23 rd October 2019. Description of the Change: (1) Model Code options added (2) FM3600 and FM3615 updated to latest edition (2018) (3) Certificate updated to latest format

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
 T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16)

Page 6 of 6

Dynisco P/N 975174 ECO# 51054 Rev. B

10.4 EX FM CERTIFICATE OF CONFORMITY – SPX 3XXX

CERTIFICATE OF CONFORMITY



Member of the FM Global Group

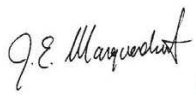
1. **HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT PER US REQUIREMENTS**
2. **Certificate No:** FM19US0196
3. **Equipment:** SPX-T 3XXX Series Smart Pressure Transmitter
(Type Reference and Name)
4. **Name of Listing Company:** Dynisco Inc
5. **Address of Listing Company:** 38 Forge Parkway
Franklin, MA 02038
USA
6. The examination and test results are recorded in confidential report number:

3035512 dated June 24th, 2009
7. FM Approvals LLC, certifies that the equipment described has been found to comply with the following Approval standards and other documents:

FM Class 3600:2018, FM Class 3610: 2007, FM Class 3615:2018, FM Class 3810:2005,
ANSI/NEMA 250:1991, ANSI/IEC 60529:2004
8. If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.
9. This certificate relates to the design, examination and testing of the products specified herein. The FM Approvals surveillance audit program has further determined that the manufacturing processes and quality control procedures in place are satisfactory to manufacture the product as examined, tested and Approved.
10. **Equipment Ratings:**

Explosionproof with Intrinsically Safe Probe for use in Class I, Division 1, Groups A, B, C and D; Dust-Ignitionproof with Intrinsically Safe Probe for use in Class II, III, Division 1, Groups E, F and G Hazardous (classified) Locations in accordance with Control Drawing 000610; indoor / outdoor Type 4X / IP67 with an ambient temperature range of T5 Ta = -20°C to +85°C, T6 Ta = -20°C to +60°C

Certificate issued by:



J. E. Marquedant
VP, Manager, Electrical Systems

23 October 2019

Date

To verify the availability of the Approved product, please refer to www.approvalguide.com

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16)

Page 1 of 4

Dynisco P/N 975158 ECO# 51054 Rev. B

SCHEDULE



US Certificate Of Conformity No: FM19US0196

11. The marking of the equipment shall include:

Class I, Division 1, Groups A, B, C, D

Class II / III, Division 1, Groups E, F, G

T5 Ta = -20°C to +85°C, T6 Ta = -20°C to +60°C

Type 4X, IP67

12. Description of Equipment:

The SPX-T 3XXX Series Smart Pressure Transmitters are designed for use in Class I, Division 1 and Class II, III Division 1 locations. The apparatus consists of a stainless steel compartment which is 1.74 inches in diameter and the cylindrical housing is approximately 5 inches long, depending on the pressure rating and model. One end of the enclosure has a male 1/2 inch-14NPT conduit connection. The model SPX-T 3X42 has working pressure ranges from 25psig to 30,000psig, the model SPX-T 3X43 has working pressure ranges from 25psig to 30,000psig, and the model SPX-T 3X9X has working pressure ranges from 25psig to 10,000psig. The SPX-T models 3X43 and 3X9X is flange mounted, while the SPX-T 3X42 is available with a rigid snout with 1/2-20 UNF-2A threaded connection. The input/output Teflon wiring passes through the conduit connection and is sealed with Emerson & Cummings Stycast 2651 & Catalyst No. 9. The Teflon wires are pretreated with Tetra-Etch® to promote bonding of the potting material to the wires. This is an essential part of the manufacturing process. The conduit connector and the process connections are welded to the cylindrical portion of the enclosure. The transmitter housing is continuously welded stainless steel with a free internal volume of 5.9 in³. All circuitry of the SPX-T is contained within the Explosionproof SPX-T housing except the electrical output of the RTD Protection Board. This electrical output passes through a poured seal that creates an Explosionproof enclosure boundary. The electrical output of the RTD Protection Board has been designed to be intrinsically safe for installation in a Division 1 environment.

The SPX-T 3XXX Series is a 4-20 mA temperature compensated pressure transmitter for use in hazardous (classified) locations. The SPX-T Series Smart Pressure transmitter is an all welded construction that features a 1/2-20 UNF or M18 x 1.5 threads for installation in standard transducer mounting holes. The construction of the SPX-T Series Smart Pressure transmitters is based on the design of the FFX Smart Transmitter housings previously satisfactorily examined and tested under FM Approvals project ID 3025446. The SPX-T Series Transmitter's free internal volume is slightly larger than the previously examined FFX Smart Transmitter housings.

3a42Ebcdefghijk. SPX-T Smart Pressure Transmitter

a = Accuracy Code: 2 or 3.

b = Process Diaphragm Material Code: A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, or Y.

c = Process Connection Code: 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, or 15.

d = Engineering Units Code: B, C, K, M, or P.

e = Pressure Range Code: 08 to 27.

f = Rigid Snout Length Code: representing 1.19" to 36.5"

g = Flex Length Code: representing 0" to 35.3"

h = Hart Communications Code: A, B, or C.

i = Electrical Connections Code: CA, CB, CC, CD, CE, CF, CG, CW, CX, or CY.

j = Temperature Sensors Code: ZZ or TB.

k = Option Code: (four digits alpha-numeric)

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA

T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmaprovals.com www.fmaprovals.com

F 347 (Mar 16)

Page 2 of 4

Dynisco P/N 975158 ECO# 51054 Rev. B

SCHEDULE



US Certificate Of Conformity No: FM19US0196

3a43Ebcdefghijk. SPX-T Smart Pressure Transmitter.

- a = Accuracy Code: 2 or 3.
- b = Process Diaphragm Material Code: A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, or Y.
- c = Process Connection Code: 25 to 46, A6
- d = Engineering Units Code: B, C, K, M, or P.
- e = Pressure Range Code: 08 to 27
- f = Rigid Snout Length Code: representing 1.19" to 36.5"
- g = Flex Length Code: representing 0" to 35.3"
- h = Hart Communications Code: A, B, or C.
- i = Electrical Connections Code: CA, CB, CC, CD, CE, CF, CG, CW, CX, or CY.
- j = Temperature Sensors Code: ZZ or TB.
- k = Option Code: (four digits alpha-numeric)

3a9bEcddefghijkl. SPX-T Smart Pressure Transmitter.

- a = Accuracy Code: 2 or 3.
- b = Mounting Configuration Code: 0 or 1.
- c = Process Diaphragm Material Code: A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, or Y.
- d = Process Connection Code: 24, 48-68, 70-79.
- e = Engineering Units Code: B, C, K, M, or P.
- f = Pressure Range Code: 08 to 23.
- g = Rigid Snout Length Code: representing 1.19" to 18".
- h = Flex Length Code: representing 0" to 35.3"
- i = Hart Communications Code: A, B, or C.
- j = Electrical Connections Code: CA, CB, CC, CD, CE, CF, CG, CW, CX, or CY.
- k = Temperature Sensors Code: ZZ or TB.
- l = Option Code: (four digits alpha-numeric)

13. Specific Conditions of Use:

None

14. Test and Assessment Procedure and Conditions:

This Certificate has been issued in accordance with FM Approvals US Certification Requirements.

15. Schedule Drawings

A copy of the technical documentation has been kept by FM Approvals.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmaprovals.com www.fmaprovals.com

F 347 (Mar 16)

Page 3 of 4

Dynisco P/N 975158 ECO# 51054 Rev. B

SCHEDULE



US Certificate Of Conformity No: FM19US0196

16. Certificate History

Details of the supplements to this certificate are described below:

Date	Description
June 24 th , 2009	Original Issue.
23 rd October 2019	<u>Supplement 2:</u> Report Reference: – RR220986 dated 23 rd October 2019. Description of the Change: (1) Model Code options added (2) FM3600 and FM3615 updated to latest edition (2018) (3) Certificate updated to latest format

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

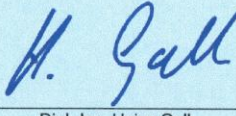
FM Approvals LLC, 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA
 T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: information@fmapprovals.com www.fmapprovals.com

F 347 (Mar 16)

Page 4 of 4

Dynisco P/N 975158 ECO# 51054 Rev. B

10.5 Safety Integrity and Performance Level Applications

Certificate	
	 Product Safety Functional Safety www.tuv.com ID 0600000000
No.: 968/FSP 1205.01/16	
Product tested	Pressure Transmitter and Transducer
Type designation	SPX 2xxx-..., SPX 3xxx-... (with linearity correction and process temperature compensation) (SPX-T 3xxx), SPX 4xxx-..., SPX 5xxx-... (with linearity correction) (SPX-L 5xxx), each optionally with separate monitoring channel for over-pressure (Guardian series, option code at the end of the model code: GCxxx)
Codes and standards	IEC 61508 Parts 1-7:2010 IEC 61511-1:2016 IEC 62061:2015 ISO 13849-1:2015
Intended application	Pressure measurement and monitoring, 4 - 20mA output proportional to the pressure. The transmitters meet the requirements for SIL 1 and SIL 2 (low demand mode of operation) in HFT=0 architecture and SIL 2 (any mode of operation) in HFT=1 architecture acc. to IEC 61508 and IEC 61511-1 (Route 2) and may be used accordingly. They further meet in a HFT=0 architecture SIL 1 and in HFT=1 SIL 2 requirements of IEC 62061. The monitoring channel in the Guardian Series Transducers meets Cat. 1 / PL c acc. to ISO 13849-1 and may be used accordingly in safety functions up to PL c and SIL 1 acc. to IEC 62061/IEC 61508/IEC 61511-1. If 2 monitoring channels are used (HFT = 1 architecture), they may be used in safety functions up to PL d and SIL 2.
Specific requirements	The instructions of the associated Operating Manual and the Datasheets shall be considered. Further information see page 2 of this certificate.
Valid until 2021-06-20	
The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/FSP 1205.01/16 dated 2016-06-20. This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.	
TÜV Rheinland Industrie Service GmbH Bereich Automation Funktionale Sicherheit Am Grauen Stein, 51105 Köln Köln, 2016-06-20  Dipl.-Ing. Heinz Gall Certification Body Safety & Security for Automation & Grid	

10/222 12 1/2 E A4 © TÜV, TÜV and TÜV are registered trademarks. Utilisation and application requires prior approval.

TÜV Rheinland Industrie Service GmbH, Am Grauen Stein, 51105 Köln / Germany
Tel.: +49 221 806-1790, Fax: +49 221 806-1539, E-Mail: industrie-service@de.tuv.com

www.fs-products.com
www.tuv.com

 **TÜVRheinland®**
Precisely Right.

Safety function: Measuring of pressure and output of an analogue signal 4 – 20mA proportional to the volume pressure applied to the sensor. The total valid range of the output signal shall be configured to a minimum of 3.8 mA and a maximum of 20.5 mA (Factory Default).
The safety related function of the transmitter is the safe measurement of the pressure with a tolerance of $\pm 0.5\%$ of the span (worst-case). Monitoring for an excessive pressure condition has to be performed in the downstream safety device, the transmitter is connected to. This safety device has to treat output currents lower than 3.6 mA or greater than 21 mA as failure conditions. It must be configured to recognize the configured pressure range for the high alarms or low alarms as a safety trip and secondary alarms as defined by NAMUR are diagnostic failure.

The transmitters of the Guardian Series contain a separate HW monitoring channel for excessive pressure. In case the configured over-pressure value is exceeded the contact of the output relay opens.
It has to be considered, that it is not allowed to use the analogue output of a combi-transmitter for the control of a pressure and the monitoring output of the same transmitter for monitoring of an over-pressure condition at the same machine. In this case 2 different devices have to be used (see EN 1114-1, cl. 5.2.5).

Characteristics as per IEC 61508	Value												
SIL	SIL 2 (HFT = 0 architecture, 1oo1)												
Device Type	B												
Mode of operation	Low demand mode												
SFF	<table> <tr><td>SPX Series 2</td><td>78 %</td></tr> <tr><td>SPX Series 3</td><td>79 %</td></tr> <tr><td>SPX Series 4</td><td>78 %</td></tr> <tr><td>SPX Series 5</td><td>78 %</td></tr> <tr><td>SPX Series Industrial</td><td>78 %</td></tr> <tr><td>Guardian</td><td>71 %</td></tr> </table>	SPX Series 2	78 %	SPX Series 3	79 %	SPX Series 4	78 %	SPX Series 5	78 %	SPX Series Industrial	78 %	Guardian	71 %
SPX Series 2	78 %												
SPX Series 3	79 %												
SPX Series 4	78 %												
SPX Series 5	78 %												
SPX Series Industrial	78 %												
Guardian	71 %												
Recommended time interval for proof-testing T1	1 year												
PFD _{avg} for T1 = 1 year	<table> <tr><td>SPX Series 2</td><td>4.8×10^{-5}</td></tr> <tr><td>SPX Series 3</td><td>2.1×10^{-5}</td></tr> <tr><td>SPX Series 4</td><td>4.8×10^{-5}</td></tr> <tr><td>SPX Series 5</td><td>4.8×10^{-5}</td></tr> <tr><td>SPX Series Industrial</td><td>4.8×10^{-5}</td></tr> <tr><td>Guardian</td><td>4.8×10^{-5}</td></tr> </table>	SPX Series 2	4.8×10^{-5}	SPX Series 3	2.1×10^{-5}	SPX Series 4	4.8×10^{-5}	SPX Series 5	4.8×10^{-5}	SPX Series Industrial	4.8×10^{-5}	Guardian	4.8×10^{-5}
SPX Series 2	4.8×10^{-5}												
SPX Series 3	2.1×10^{-5}												
SPX Series 4	4.8×10^{-5}												
SPX Series 5	4.8×10^{-5}												
SPX Series Industrial	4.8×10^{-5}												
Guardian	4.8×10^{-5}												
PFH	<table> <tr><td>SPX Series 2</td><td>2.2×10^{-8} 1/h</td></tr> <tr><td>SPX Series 3</td><td>9.4×10^{-9} 1/h</td></tr> <tr><td>SPX Series 4</td><td>2.2×10^{-8} 1/h</td></tr> <tr><td>SPX Series 5</td><td>2.2×10^{-8} 1/h</td></tr> <tr><td>SPX Series Industrial</td><td>2.2×10^{-8} 1/h</td></tr> <tr><td>Guardian</td><td>2.3×10^{-8} 1/h</td></tr> </table>	SPX Series 2	2.2×10^{-8} 1/h	SPX Series 3	9.4×10^{-9} 1/h	SPX Series 4	2.2×10^{-8} 1/h	SPX Series 5	2.2×10^{-8} 1/h	SPX Series Industrial	2.2×10^{-8} 1/h	Guardian	2.3×10^{-8} 1/h
SPX Series 2	2.2×10^{-8} 1/h												
SPX Series 3	9.4×10^{-9} 1/h												
SPX Series 4	2.2×10^{-8} 1/h												
SPX Series 5	2.2×10^{-8} 1/h												
SPX Series Industrial	2.2×10^{-8} 1/h												
Guardian	2.3×10^{-8} 1/h												
λ_{tot}	<table> <tr><td>SPX Series 2</td><td>99.2 FIT</td></tr> <tr><td>SPX Series 3</td><td>44.6 FIT</td></tr> <tr><td>SPX Series 4</td><td>99.2 FIT</td></tr> <tr><td>SPX Series 5</td><td>99.2 FIT</td></tr> <tr><td>SPX Series Industrial</td><td>99.2 FIT</td></tr> <tr><td>Guardian</td><td>79.6 FIT</td></tr> </table>	SPX Series 2	99.2 FIT	SPX Series 3	44.6 FIT	SPX Series 4	99.2 FIT	SPX Series 5	99.2 FIT	SPX Series Industrial	99.2 FIT	Guardian	79.6 FIT
SPX Series 2	99.2 FIT												
SPX Series 3	44.6 FIT												
SPX Series 4	99.2 FIT												
SPX Series 5	99.2 FIT												
SPX Series Industrial	99.2 FIT												
Guardian	79.6 FIT												
λ_s	<table> <tr><td>SPX Series 2</td><td>77.2 FIT</td></tr> <tr><td>SPX Series 3</td><td>35.1 FIT</td></tr> <tr><td>SPX Series 4</td><td>77.2 FIT</td></tr> <tr><td>SPX Series 5</td><td>77.2 FIT</td></tr> <tr><td>SPX Series Industrial</td><td>77.2 FIT</td></tr> <tr><td>Guardian</td><td>56.5 FIT</td></tr> </table>	SPX Series 2	77.2 FIT	SPX Series 3	35.1 FIT	SPX Series 4	77.2 FIT	SPX Series 5	77.2 FIT	SPX Series Industrial	77.2 FIT	Guardian	56.5 FIT
SPX Series 2	77.2 FIT												
SPX Series 3	35.1 FIT												
SPX Series 4	77.2 FIT												
SPX Series 5	77.2 FIT												
SPX Series Industrial	77.2 FIT												
Guardian	56.5 FIT												
λ_d	<table> <tr><td>SPX Series 2</td><td>22.0 FIT</td></tr> <tr><td>SPX Series 3</td><td>9.4 FIT</td></tr> <tr><td>SPX Series 4</td><td>22.0 FIT</td></tr> <tr><td>SPX Series 5</td><td>22.0 FIT</td></tr> <tr><td>SPX Series Industrial</td><td>22.0 FIT</td></tr> <tr><td>Guardian</td><td>23.2 FIT</td></tr> </table>	SPX Series 2	22.0 FIT	SPX Series 3	9.4 FIT	SPX Series 4	22.0 FIT	SPX Series 5	22.0 FIT	SPX Series Industrial	22.0 FIT	Guardian	23.2 FIT
SPX Series 2	22.0 FIT												
SPX Series 3	9.4 FIT												
SPX Series 4	22.0 FIT												
SPX Series 5	22.0 FIT												
SPX Series Industrial	22.0 FIT												
Guardian	23.2 FIT												
λ_{du}	<table> <tr><td>SPX Series 2</td><td>22.0 FIT</td></tr> <tr><td>SPX Series 3</td><td>9.4 FIT</td></tr> <tr><td>SPX Series 4</td><td>22.0 FIT</td></tr> <tr><td>SPX Series 5</td><td>22.0 FIT</td></tr> <tr><td>SPX Series Industrial</td><td>22.0 FIT</td></tr> <tr><td>Guardian</td><td>23.2 FIT</td></tr> </table>	SPX Series 2	22.0 FIT	SPX Series 3	9.4 FIT	SPX Series 4	22.0 FIT	SPX Series 5	22.0 FIT	SPX Series Industrial	22.0 FIT	Guardian	23.2 FIT
SPX Series 2	22.0 FIT												
SPX Series 3	9.4 FIT												
SPX Series 4	22.0 FIT												
SPX Series 5	22.0 FIT												
SPX Series Industrial	22.0 FIT												
Guardian	23.2 FIT												

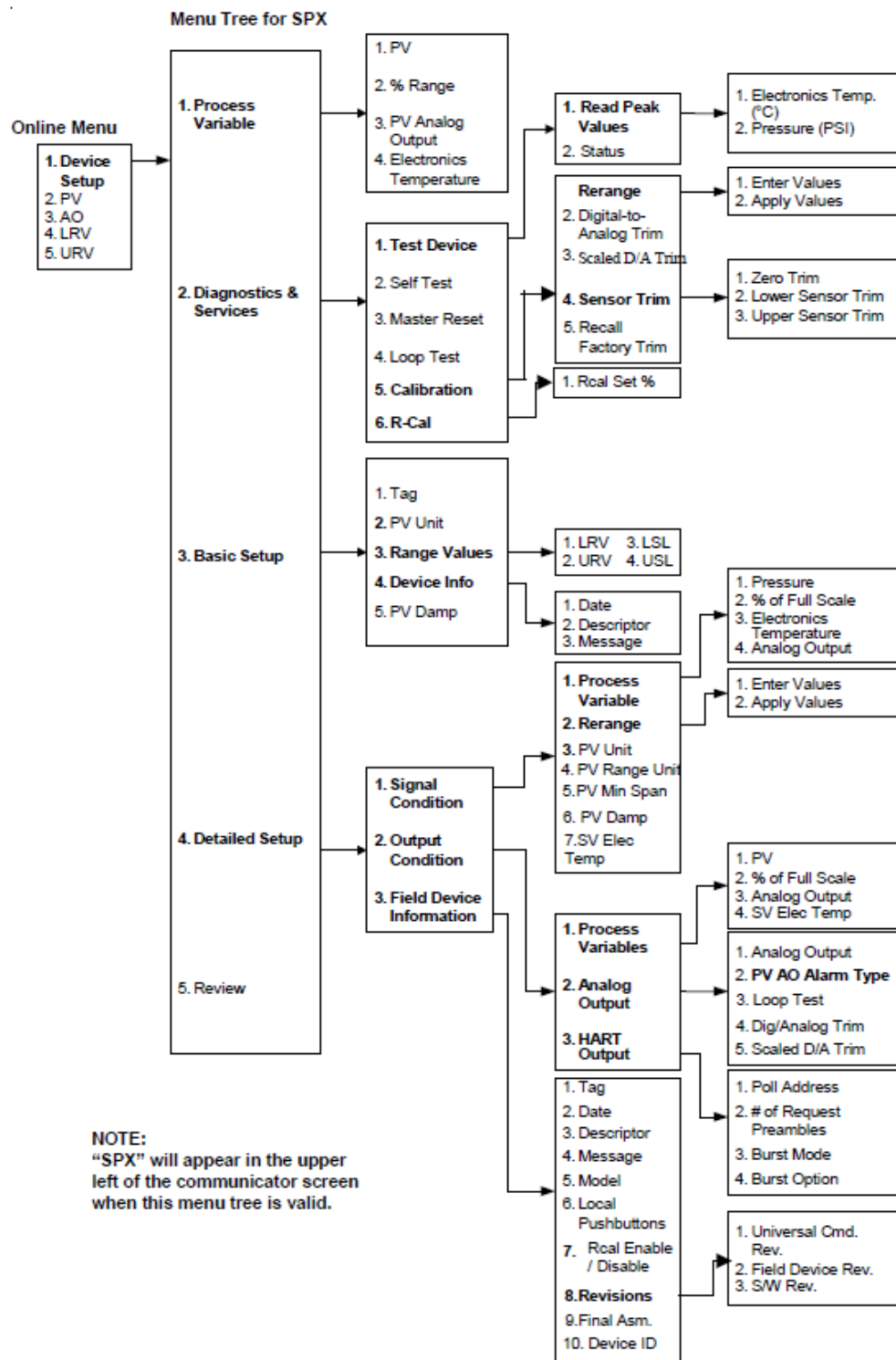
1 FIT = 1 E-09 1/h

Remark: Failure rates of the electronic components as per Siemens SN 29500, calculated based upon an ambient temperature of 85 °C.

11 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 3XXX	RO	
Message Text	HTTP://WWW.DYNISCO.COM/	RW	
PV Minimum Span Value	Factory Default PV_URV divided by 5	RO	
Number of Request Preambles	5	RW	
PV Damping Constant Value	0 Seconds	RW	0-30
PV Lower Range Value	0	RW	0-30
PV Engineering Unit Code	Per Customer Order	RW	0 x 06 – PSI 0 x 07 – Bar 0 x 0A – kg/cm ² 0 x 39 – % of FS 0 x ED – MPa
PV Upper Range Value	Full scale (same as 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	

12 APPENDIX 2 – Menu Tree (Software Revision < 100)



Menu Tree for software revision < 100

13 APPENDIX 3 – Oil Fill Offset

An oil-filled sensor has the advantage of being non-toxic and therefore compliant for many food, medical or other critical applications. A disadvantage of an oil-filled system is that the organic oil fill can degrade over time at high temperatures. Over a period of months and continuously operating at elevated temperatures ($>275^{\circ}\text{C}$ / 525°F), some long chain molecules in the oil can degrade and generate gas molecules. While in continued operation, these gases remain in solution in the oil and have no effect on the performance of the sensor. However, if/when the sensor is returned to room temperature and zero pressure, the gas may come out of the solution (outgas) over a short period of time (minutes to hours), creating a bubble(s) in a closed fill system. At non-operating room temperature and zero pressure, the gas exerts a small additional pressure (on the order of 50-100 psi) and results in an apparent increase in the Zero Output. Therefore, the gas offset error represents a higher percentage effect in lower versus higher pressure range systems. The actual magnitude will depend on the percentage of oil which has degraded over time at temperature.

When the sensor is returned to operation with increased pressure and temperature, the gas bubble(s) will go back into solution. Testing has shown that the gas is typically reabsorbed with temperatures exceeding 100°C / 212°F . With the gas reabsorbed, the sensor is reading the true pressure at specified accuracies. When the sensor is installed and brought to operating temperature and before applying pressure, it can then be re-zeroed without any impact on the calibration accuracy.

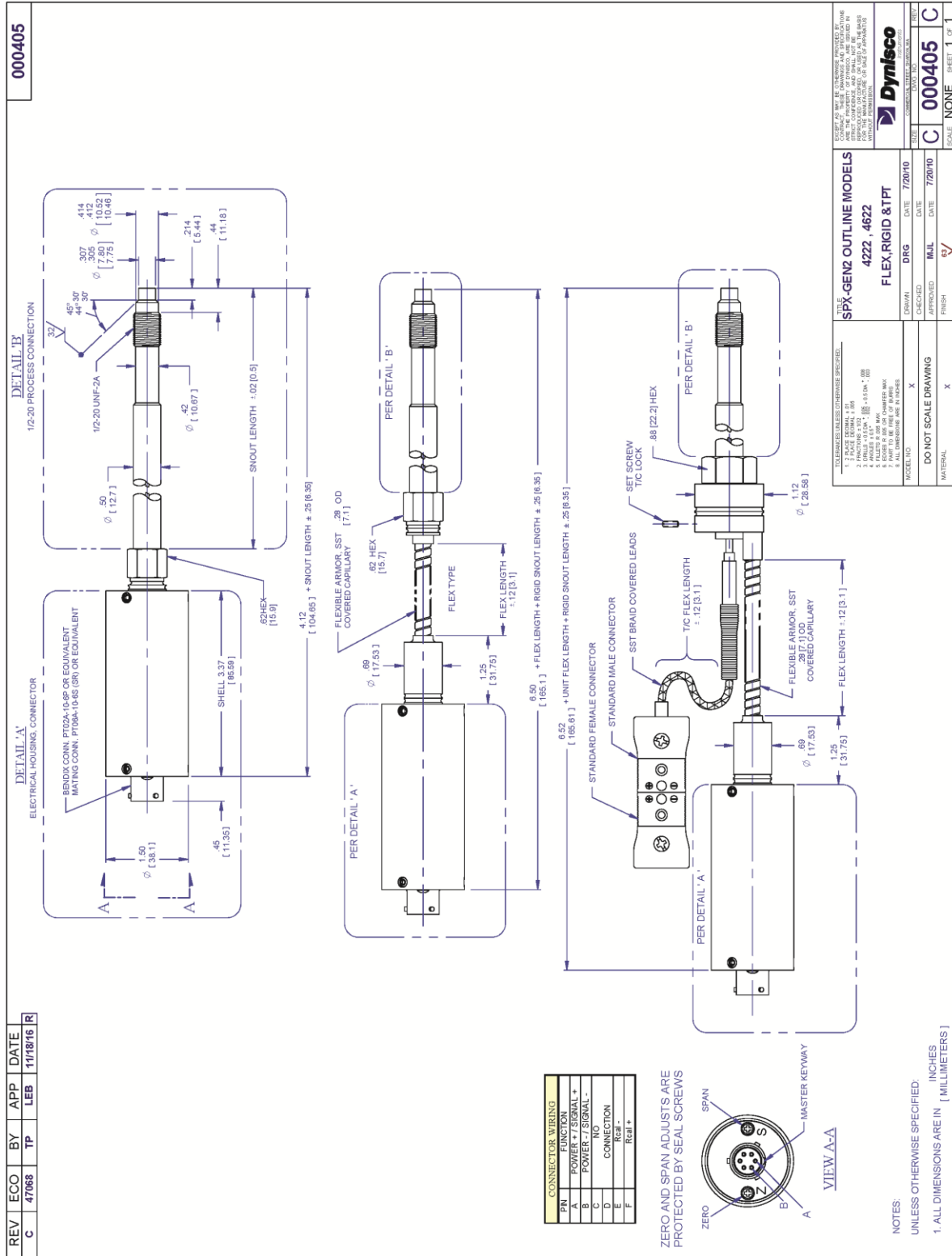
Recommended Zero Adjustment

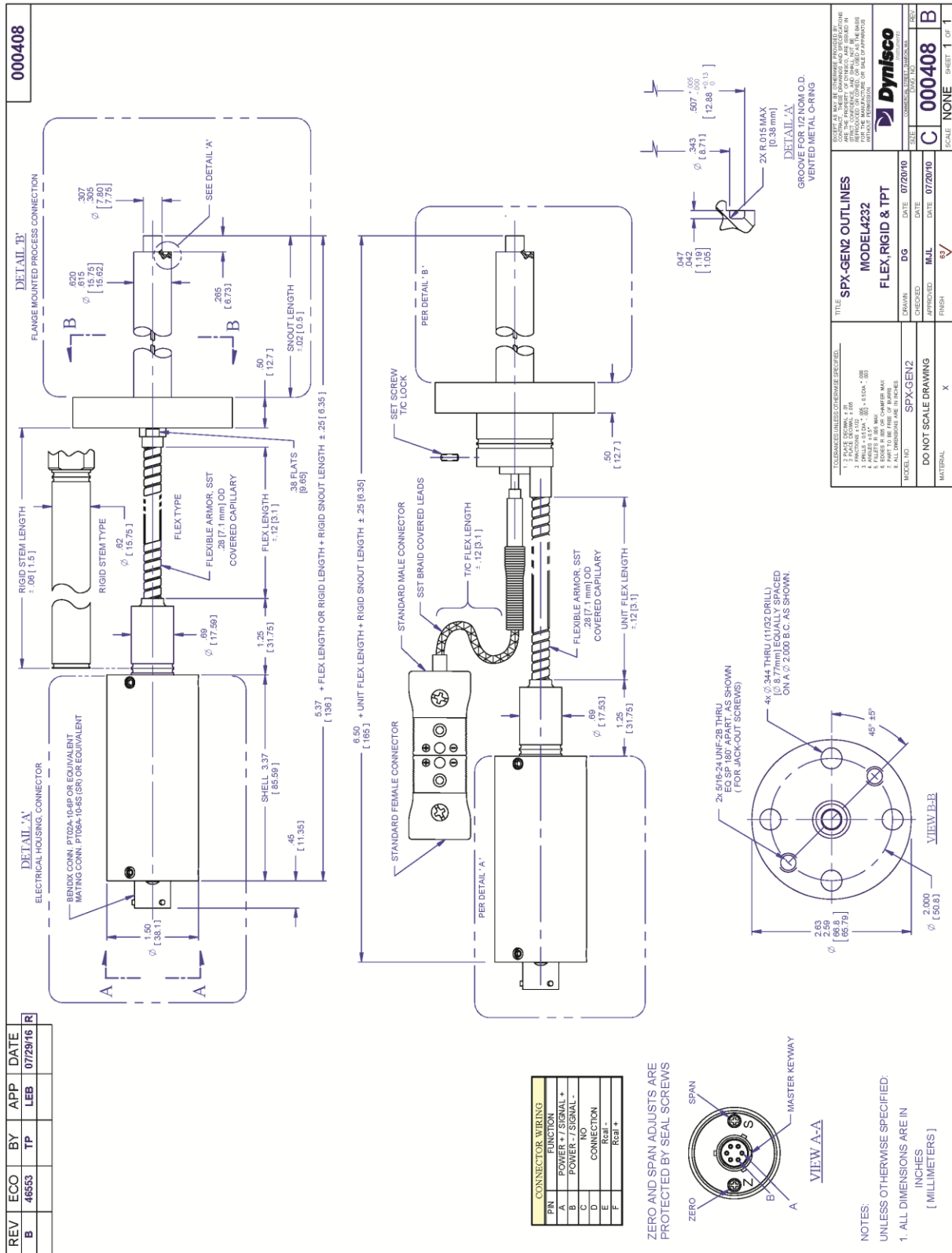
Prior to performing a zero adjustment, it is recommended that the system is installed and the equipment brought to process temperature ($<100^{\circ}\text{C}$) at or near zero pressure. This will allow any gas to be absorbed into the oil and eliminate offset effects.

If a zero adjustment is conducted at less than 100°C (e.g., bench calibration test port), briefly pressurize to $>/=150$ psi/10 bar, then depressurize the system prior to performing the zero adjustment. Pressurizing following by depressurizing will temporarily allow any gas to be absorbed into the oil and eliminate offset effects. Verify that the zero output value will be repeated by reapplying pressure to $>/=150$ psi/10 bar followed by depressurizing.



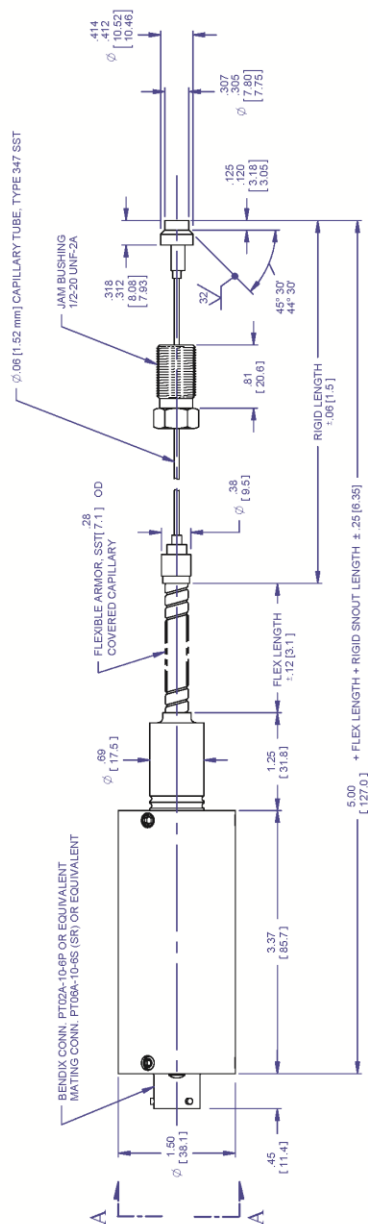
14 OUTLINE DRAWINGS



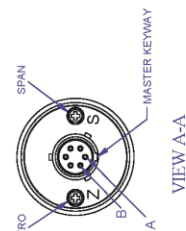


REV	ECO	BY	APP	DATE
B	46553	TP	LEB	07/29/16 R

000411



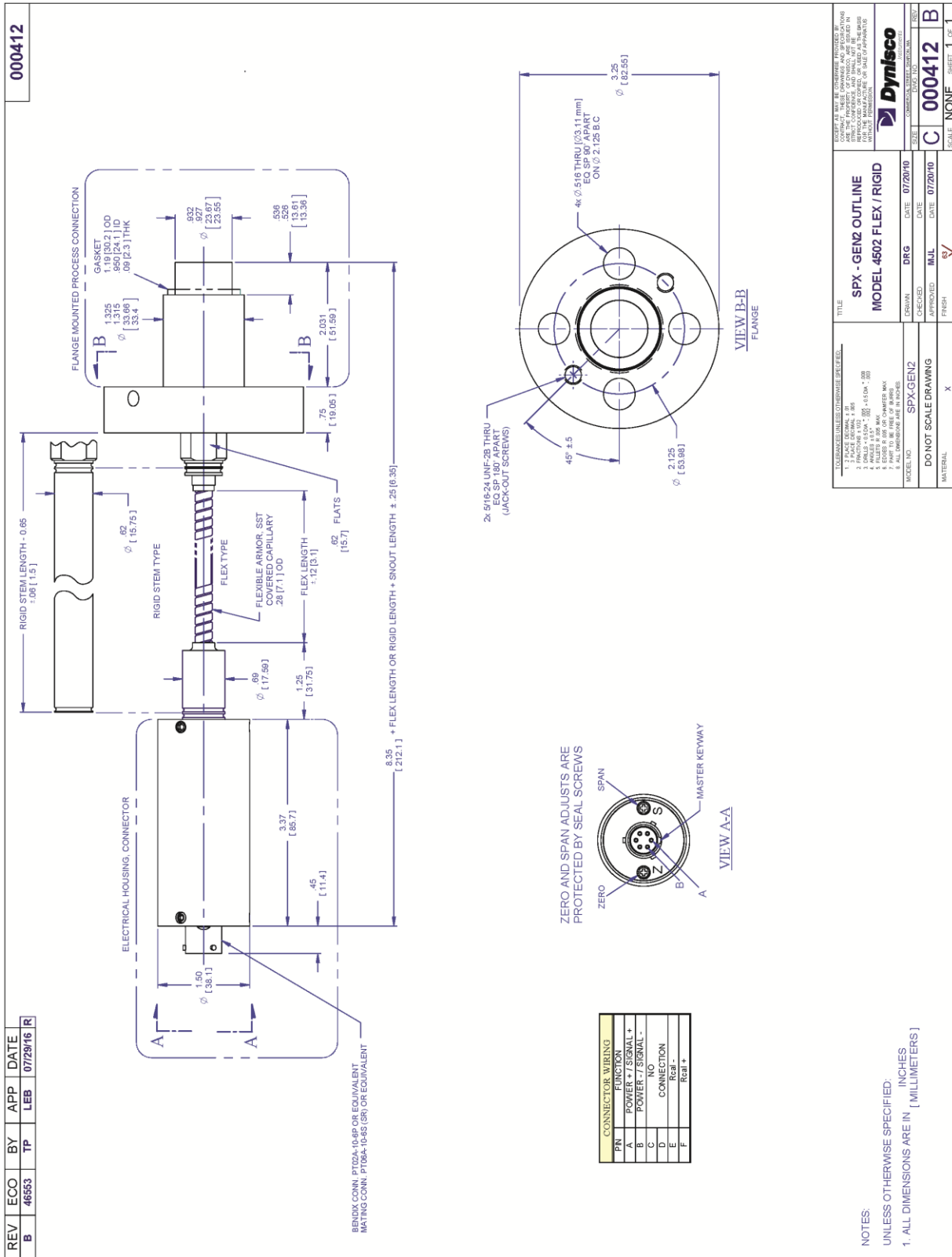
ZERO AND SPAN ADJUSTS ARE PROTECTED BY SEAL SCREWS

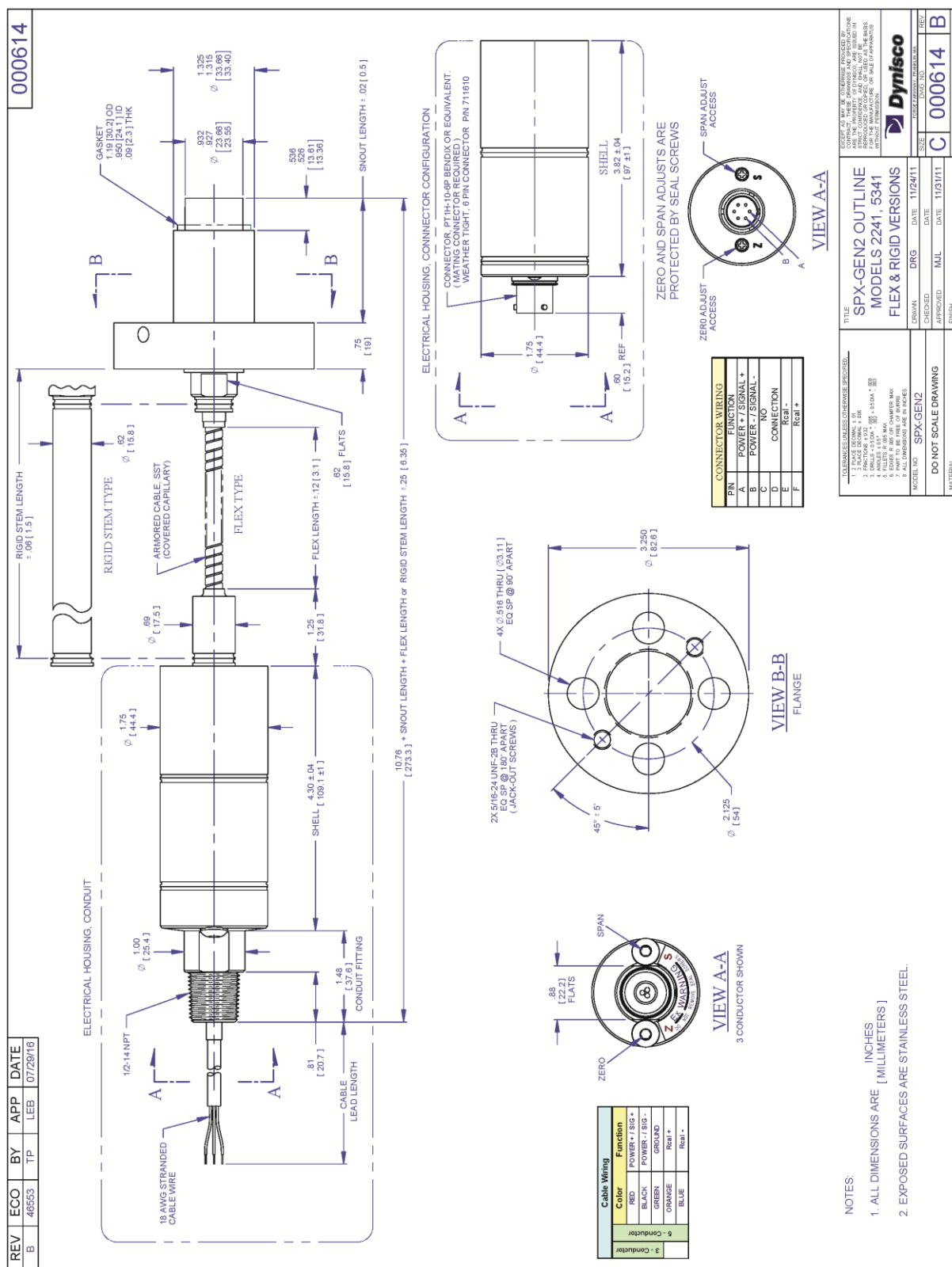


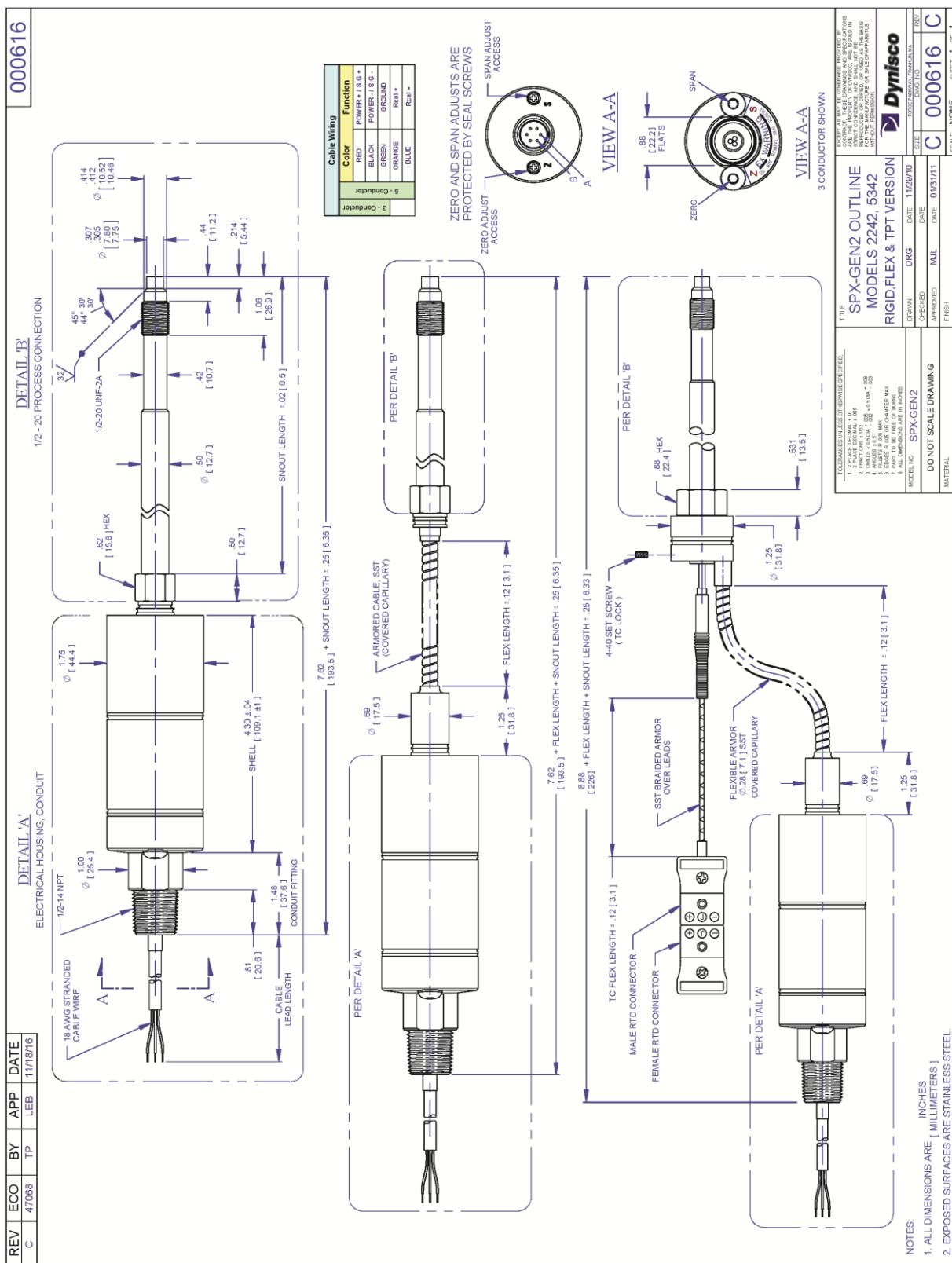
CONNECTOR WIRING	
PIN	FUNCTION
A	POWER + / SIGNAL +
B	POWER - / SIGNAL -
C	NO
D	CONNECTION
E	Rcal -
F	Rcal +

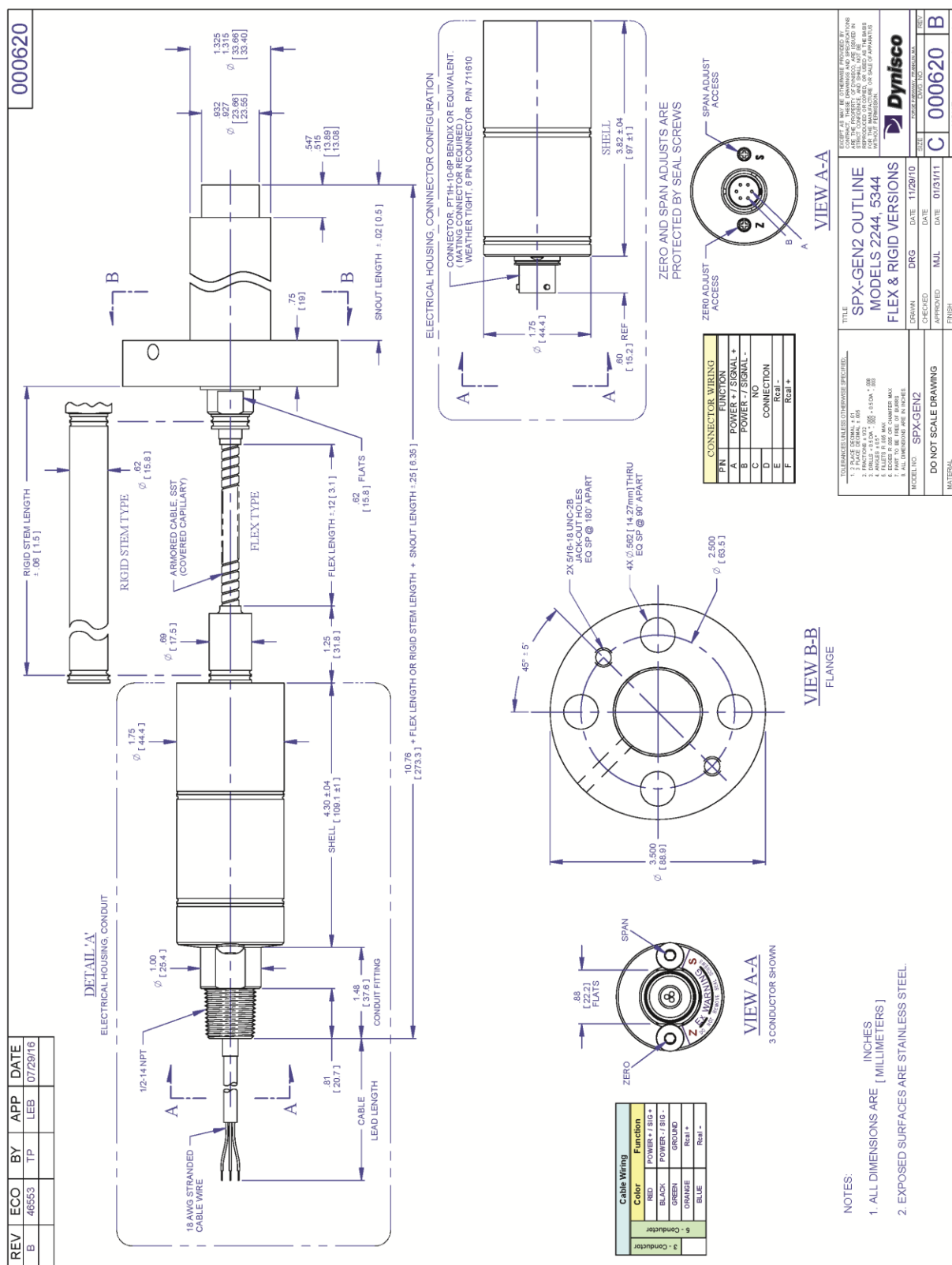
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS ARE IN INCHES
[MILLIMETERS]

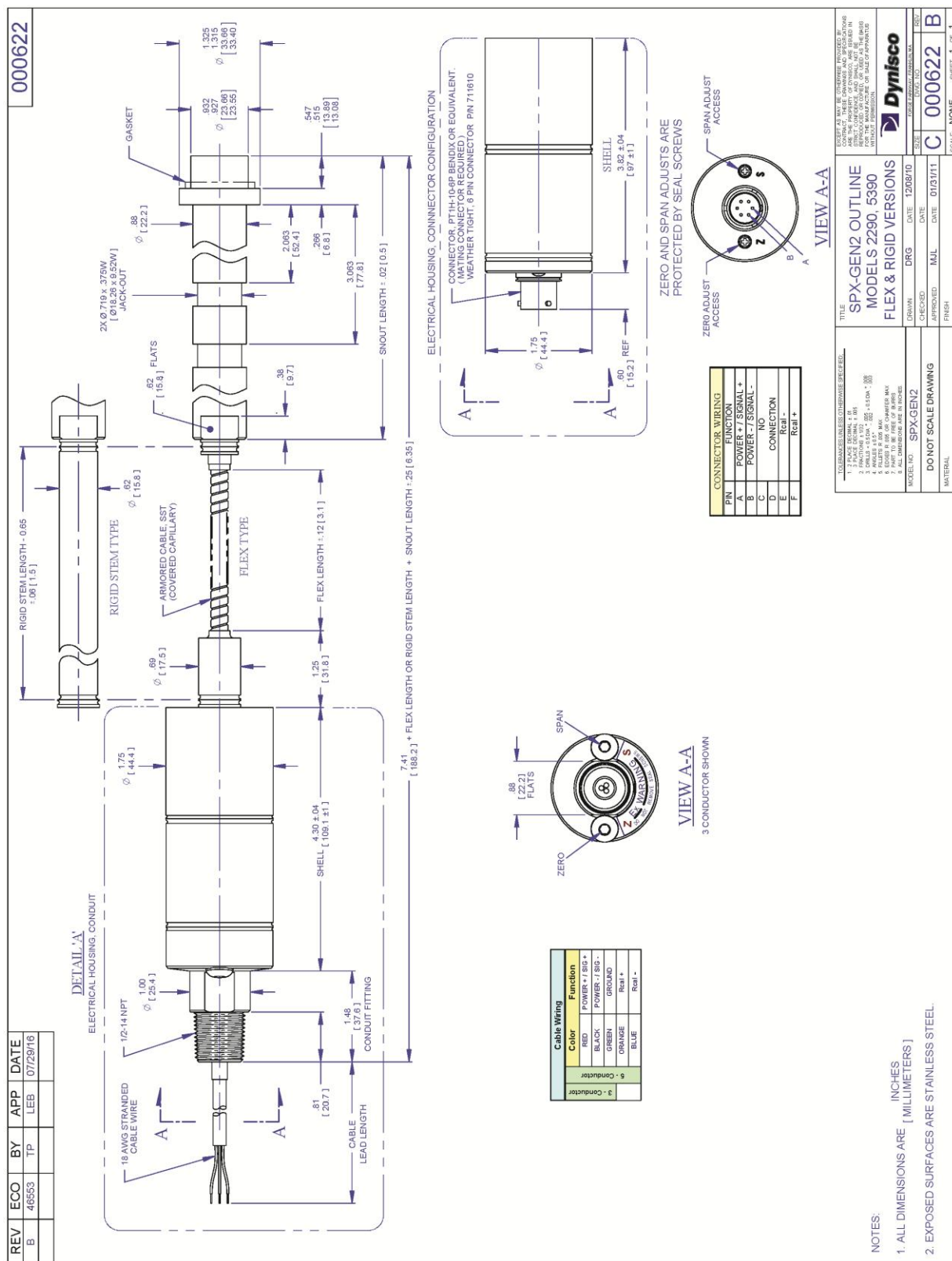
TITLE	TO ORDER DATE: 03/28/2012 1. QUANTITY: 1000 2. PRICE: \$1000.00 3. QUANTITY: 1000 4. PRICE: \$1000.00 5. QUANTITY: 1000 6. PRICE: \$1000.00 7. QUANTITY: 1000 8. PRICE: \$1000.00 9. QUANTITY: 1000 10. PRICE: \$1000.00 11. QUANTITY: 1000 12. PRICE: \$1000.00 13. QUANTITY: 1000 14. PRICE: \$1000.00 15. QUANTITY: 1000 16. PRICE: \$1000.00 17. QUANTITY: 1000 18. PRICE: \$1000.00 19. QUANTITY: 1000 20. PRICE: \$1000.00 21. QUANTITY: 1000 22. PRICE: \$1000.00 23. QUANTITY: 1000 24. PRICE: \$1000.00 25. QUANTITY: 1000 26. PRICE: \$1000.00 27. QUANTITY: 1000 28. PRICE: \$1000.00 29. QUANTITY: 1000 30. PRICE: \$1000.00 31. QUANTITY: 1000 32. PRICE: \$1000.00 33. QUANTITY: 1000 34. PRICE: \$1000.00 35. QUANTITY: 1000 36. PRICE: \$1000.00 37. QUANTITY: 1000 38. PRICE: \$1000.00 39. QUANTITY: 1000 40. PRICE: \$1000.00 41. QUANTITY: 1000 42. PRICE: \$1000.00 43. QUANTITY: 1000 44. PRICE: \$1000.00 45. QUANTITY: 1000 46. PRICE: \$1000.00 47. QUANTITY: 1000 48. PRICE: \$1000.00 49. QUANTITY: 1000 50. PRICE: \$1000.00 51. QUANTITY: 1000 52. PRICE: \$1000.00 53. QUANTITY: 1000 54. PRICE: \$1000.00 55. QUANTITY: 1000 56. PRICE: \$1000.00 57. QUANTITY: 1000 58. PRICE: \$1000.00 59. QUANTITY: 1000 60. PRICE: \$1000.00 61. QUANTITY: 1000 62. PRICE: \$1000.00 63. QUANTITY: 1000 64. PRICE: \$1000.00 65. QUANTITY: 1000 66. PRICE: \$1000.00 67. QUANTITY: 1000 68. PRICE: \$1000.00 69. QUANTITY: 1000 70. PRICE: \$1000.00 71. QUANTITY: 1000 72. PRICE: \$1000.00 73. QUANTITY: 1000 74. PRICE: \$1000.00 75. QUANTITY: 1000 76. PRICE: \$1000.00 77. QUANTITY: 1000 78. PRICE: \$1000.00 79. QUANTITY: 1000 80. PRICE: \$1000.00 81. QUANTITY: 1000 82. PRICE: \$1000.00 83. QUANTITY: 1000 84. PRICE: \$1000.00 85. QUANTITY: 1000 86. PRICE: \$1000.00 87. QUANTITY: 1000 88. PRICE: \$1000.00 89. QUANTITY: 1000 90. PRICE: \$1000.00 91. QUANTITY: 1000 92. PRICE: \$1000.00 93. QUANTITY: 1000 94. PRICE: \$1000.00 95. QUANTITY: 1000 96. PRICE: \$1000.00 97. QUANTITY: 1000 98. PRICE: \$1000.00 99. QUANTITY: 1000 100. PRICE: \$1000.00 101. QUANTITY: 1000 102. PRICE: \$1000.00 103. QUANTITY: 1000 104. PRICE: \$1000.00 105. QUANTITY: 1000 106. PRICE: \$1000.00 107. QUANTITY: 1000 108. PRICE: \$1000.00 109. QUANTITY: 1000 110. PRICE: \$1000.00 111. QUANTITY: 1000 112. PRICE: \$1000.00 113. QUANTITY: 1000 114. PRICE: \$1000.00 115. QUANTITY: 1000 116. PRICE: \$1000.00 117. QUANTITY: 1000 118. PRICE: \$1000.00 119. QUANTITY: 1000 120. PRICE: \$1000.00 121. QUANTITY: 1000 122. PRICE: \$1000.00 123. QUANTITY: 1000 124. PRICE: \$1000.00 125. QUANTITY: 1000 126. PRICE: \$1000.00 127. QUANTITY: 1000 128. PRICE: \$1000.00 129. QUANTITY: 1000 130. PRICE: \$1000.00 131. QUANTITY: 1000 132. PRICE: \$1000.00 133. QUANTITY: 1000 134. PRICE: \$1000.00 135. QUANTITY: 1000 136. PRICE: \$1000.00 137. QUANTITY: 1000 138. PRICE: \$1000.00 139. QUANTITY: 1000 140. PRICE: \$1000.00 141. QUANTITY: 1000 142. PRICE: \$1000.00 143. QUANTITY: 1000 144. PRICE: \$1000.00 145. QUANTITY: 1000 146. PRICE: \$1000.00 147. QUANTITY: 1000 148. PRICE: \$1000.00 149. QUANTITY: 1000 150. PRICE: \$1000.00 151. QUANTITY: 1000 152. PRICE: \$1000.00 153. QUANTITY: 1000 154. PRICE: \$1000.00 155. QUANTITY: 1000 156. PRICE: \$1000.00 157. QUANTITY: 1000 158. PRICE: \$1000.00 159. QUANTITY: 1000 160. PRICE: \$1000.00 161. QUANTITY: 1000 162. PRICE: \$1000.00 163. QUANTITY: 1000 164. PRICE: \$1000.00 165. QUANTITY: 1000 166. PRICE: \$1000.00 167. QUANTITY: 1000 168. PRICE: \$1000.00 169. QUANTITY: 1000 170. PRICE: \$1000.00 171. QUANTITY: 1000 172. PRICE: \$1000.00 173. QUANTITY: 1000 174. PRICE: \$1000.00 175. QUANTITY: 1000 176. PRICE: \$1000.00 177. QUANTITY: 1000 178. PRICE: \$1000.00 179. QUANTITY: 1000 180. PRICE: \$1000.00 181. QUANTITY: 1000 182. PRICE: \$1000.00 183. QUANTITY: 1000 184. PRICE: \$1000.00 185. QUANTITY: 1000 186. PRICE: \$1000.00 187. QUANTITY: 1000 188. PRICE: \$1000.00 189. QUANTITY: 1000 190. PRICE: \$1000.00 191. QUANTITY: 1000 192. PRICE: \$1000.00 193. QUANTITY: 1000 194. PRICE: \$1000.00 195. QUANTITY: 1000 196. PRICE: \$1000.00 197. QUANTITY: 1000 198. PRICE: \$1000.00 199. QUANTITY: 1000 200. PRICE: \$1000.00 201. QUANTITY: 1000 202. PRICE: \$1000.00 203. QUANTITY: 1000 204. PRICE: \$1000.00 205. QUANTITY: 1000 206. PRICE: \$1000.00 207. QUANTITY: 1000 208. PRICE: \$1000.00 209. QUANTITY: 1000 210. PRICE: \$1000.00 211. QUANTITY: 1000 212. PRICE: \$1000.00 213. QUANTITY: 1000 214. PRICE: \$1000.00 215. QUANTITY: 1000 216. PRICE: \$1000.00 217. QUANTITY: 1000 218. PRICE: \$1000.00 219. QUANTITY: 1000 220. PRICE: \$1000.00 221. QUANTITY: 1000 222. PRICE: \$1000.00 223. QUANTITY: 1000 224. PRICE: \$1000.00 225. QUANTITY: 1000 226. PRICE: \$1000.00 227. QUANTITY: 1000 228. PRICE: \$1000.00 229. QUANTITY: 1000 230. PRICE: \$1000.00 231. QUANTITY: 1000 232. PRICE: \$1000.00 233. QUANTITY: 1000 234. PRICE: \$1000.00 235. QUANTITY: 1000 236. PRICE: \$1000.00 237. QUANTITY: 1000 238. PRICE: \$1000.00 239. QUANTITY: 1000 240. PRICE: \$1000.00 241. QUANTITY: 1000 242. PRICE: \$1000.00 243. QUANTITY: 1000 244. PRICE: \$1000.00 245. QUANTITY: 1000 246. PRICE: \$1000.00 247. QUANTITY: 1000 248. PRICE: \$1000.00 249. QUANTITY: 1000 250. PRICE: \$1000.00 251. QUANTITY: 1000 252. PRICE: \$1000.00 253. QUANTITY: 1000 254. PRICE: \$1000.00 255. QUANTITY: 1000 256. PRICE: \$1000.00 257. QUANTITY: 1000 258. PRICE: \$1000.00 259. QUANTITY: 1000 260. PRICE: \$1000.00 261. QUANTITY: 1000 262. PRICE: \$1000.00 263. QUANTITY: 1000 264. PRICE: \$1000.00 265. QUANTITY: 1000 266. PRICE: \$1000.00 267. QUANTITY: 1000 268. PRICE: \$1000.00 269. QUANTITY: 1000 270. PRICE: \$1000.00 271. QUANTITY: 1000 272. PRICE: \$1000.00 273. QUANTITY: 1000 274. PRICE: \$1000.00 275. QUANTITY: 1000 276. PRICE: \$1000.00 277. QUANTITY: 1000 278. PRICE: \$1000.00 279. QUANTITY: 1000 280. PRICE: \$1000.00 281. QUANTITY: 1000 282. PRICE: \$1000.00 283. QUANTITY: 1000 284. PRICE: \$1000.00 285. QUANTITY: 1000 286. PRICE: \$1000.00 287. QUANTITY: 1000 288. PRICE: \$1000.00 289. QUANTITY: 1000 290. PRICE: \$1000.00 291. QUANTITY: 1000 292. PRICE: \$1000.00 293. QUANTITY: 1000 294. PRICE: \$1000.00 295. QUANTITY: 1000 296. PRICE: \$1000.00 297. QUANTITY: 1000 298. PRICE: \$1000.00 299. QUANTITY: 1000 300. PRICE: \$1000.00 301. QUANTITY: 1000 302. PRICE: \$1000.00 303. QUANTITY: 1000 304. PRICE: \$1000.00 305. QUANTITY: 1000 306. PRICE: \$1000.00 307. QUANTITY: 1000 308. PRICE: \$1000.00 309. QUANTITY: 1000 310. PRICE: \$1000.00 311. QUANTITY: 1000 312. PRICE: \$1000.00 313. QUANTITY: 1000 314. PRICE: \$1000.00 315. QUANTITY: 1000 316. PRICE: \$1000.00 317. QUANTITY: 1000 318. PRICE: \$1000.00 319. QUANTITY: 1000 320. PRICE: \$1000.00 321. QUANTITY: 1000 322. PRICE: \$1000.00 323. QUANTITY: 1000 324. PRICE: \$1000.00 325. QUANTITY: 1000 326. PRICE: \$1000.00 327. QUANTITY: 1000 328. PRICE: \$1000.00 329. QUANTITY: 1000 330. PRICE: \$1000.00 331. QUANTITY: 1000 332. PRICE: \$1000.00 333. QUANTITY: 1000 334. PRICE: \$1000.00 335. QUANTITY: 1000 336. PRICE: \$1000.00 337. QUANTITY: 1000 338. PRICE: \$1000.00 339. QUANTITY: 1000 340. PRICE: \$1000.00 341. QUANTITY: 1000 342. PRICE: \$1000.00 343. QUANTITY: 1000 344. PRICE: \$1000.00 345. QUANTITY: 1000 346. PRICE: \$1000.00 347. QUANTITY: 1000 348. PRICE: \$1000.00 349. QUANTITY: 1000 350. PRICE: \$1000.00 351. QUANTITY: 1000 352. PRICE: \$1000.00 353. QUANTITY: 1000 354. PRICE: \$1000.00 355. QUANTITY: 1000 356. PRICE: \$1000.00 357. QUANTITY: 1000 358. PRICE: \$1000.00 359. QUANTITY: 1000 360. PRICE: \$1000.00 361. QUANTITY: 1000 362. PRICE: \$1000.00 363. QUANTITY: 1000 364. PRICE: \$1000.00 365. QUANTITY: 1000 366. PRICE: \$1000.00 367. QUANTITY: 1000 368. PRICE: \$1000.00 369. QUANTITY: 1000 370. PRICE: \$1000.00 371. QUANTITY: 1000 372. PRICE: \$1000.00 373. QUANTITY: 1000 374. PRICE: \$1000.00 375. QUANTITY: 1000 376. PRICE: \$1000.00 377. QUANTITY: 1000 378. PRICE: \$1000.00 379. QUANTITY: 1000 380. PRICE: \$1000.00 381. QUANTITY: 1000 382. PRICE: \$1000.00 383. QUANTITY: 1000 384. PRICE: \$1000.00 385. QUANTITY: 1000 386. PRICE: \$1000.00 387. QUANTITY: 1000 388. PRICE: \$1000.00 389. QUANTITY: 1000 390. PRICE: \$1000.00 391. QUANTITY: 1000 392. PRICE: \$1000.00 393. QUANTITY: 1000 394. PRICE: \$1000.00 395. QUANTITY: 1000 396. PRICE: \$1000.00 397. QUANTITY: 1000 398. PRICE: \$1000.00 399. QUANTITY: 1000 400. PRICE: \$1000.00 401. QUANTITY: 1000 402. PRICE: \$1000.00 403. QUANTITY: 1000 404. PRICE: \$1000.00 405. QUANTITY: 1000 406. PRICE: \$1000.00 407. QUANTITY: 1000 408. PRICE: \$1000.00 409. QUANTITY: 1000 410. PRICE: \$1000.00 411. QUANTITY: 1000 412. PRICE: \$1000.00 413. QUANTITY: 1000 414. PRICE: \$1000.00 415. QUANTITY: 1000 416. PRICE: \$1000.00 417. QUANTITY: 1000 418. PRICE: \$1000.00 419. QUANTITY: 1000 420. PRICE: \$1000.00 421. QUANTITY: 1000 422. PRICE: \$1000.00 423. QUANTITY: 1000 424. PRICE: \$1000.00 425. QUANTITY: 1000 426. PRICE: \$1000.00 427. QUANTITY: 1000 428. PRICE: \$1000.00 429. QUANTITY: 1000 430. PRICE: \$1000.00 431. QUANTITY: 1000 432. PRICE: \$1000.00 433. QUANTITY: 1000 434. PRICE: \$1000.00 435. QUANTITY: 1000 436. PRICE: \$1000.00 437. QUANTITY: 1000 438. PRICE: \$1000.00 439. QUANTITY: 1000 440. PRICE: \$1000.00 441. QUANTITY: 1000 442. PRICE: \$1000.00 443. QUANTITY: 1000 444. PRICE: \$1000.00 445. QUANTITY: 1000 446. PRICE: \$1000.00 447. QUANTITY: 1000 448. PRICE: \$1000.00 449. QUANTITY: 1000 450. PRICE: \$1000.00 451. QUANTITY: 1000 452. PRICE: \$1000.00 453. QUANTITY: 1000 454. PRICE: \$1000.00 455. QUANTITY: 1000 456. PRICE: \$1000.00 457. QUANTITY: 1000 458. PRICE: \$1000.00 459. QUANTITY: 1000 460. PRICE: \$1000.00 461. QUANTITY: 1000 462. PRICE: \$1000.00 463. QUANTITY: 1000 464. PRICE: \$1000.00 465. QUANTITY: 1000 466. PRICE: \$1000.00 467. QUANTITY: 1000 468. PRICE: \$1000.00 469. QUANTITY: 1000 470. PRICE: \$1000.00 471. QUANTITY: 1000 472. PRICE: \$1000.00 473. QUANTITY: 1000 474. PRICE: \$1000.00 475. QUANTITY: 1000 476. PRICE: \$1000.00 477. QUANTITY: 1000 478. PRICE: \$1000.00 479. QUANTITY: 1000 480. PRICE: \$1000.00 481. QUANTITY: 1000 482. PRICE: \$1000.00 483. QUANTITY: 1000 484. PRICE: \$1000.00 485. QUANTITY: 1000 486. PRICE: \$1000.00 487. QUANTITY: 1000 488. PRICE: \$1000.00 489. QUANTITY: 1000 490. PRICE: \$1000.00 491. QUANTITY: 1000 492. PRICE: \$1000.00 493. QUANTITY: 1000 494. PRICE: \$1000.00 495. QUANTITY: 1000 496. PRICE: \$1000.00 497. QUANTITY: 1000 498. PRICE: \$1000.00 499. QUANTITY: 1000 500. PRICE: \$1000.00 501. QUANTITY: 1000 502. PRICE: \$1000.00 503. QUANTITY: 1000 504. PRICE: \$1000.00 505. QUANTITY: 1000 506. PRICE: \$1000.00 507. QUANTITY: 1000 508. PRICE: \$1000.00 509. QUANTITY: 1000 510. PRICE: \$1000.00 511. QUANTITY: 1000 512. PRICE: \$1000.00 513. QUANTITY: 1000 514. PRICE: \$1000.00 515. QUANTITY: 1000 516. PRICE: \$1000.00 517. QUANTITY: 1000 518. PRICE: \$1000.00 519. QUANTITY: 1000 520. PRICE: \$1000.00 521. QUANTITY: 1000 522. PRICE: \$1000.00 523. QUANTITY: 1000 524. PRICE: \$1000.00 525. QUANTITY: 1000 526. PRICE: \$1000.00 527. QUANTITY: 1000 528. PRICE: \$1000.00 529. QUANTITY: 1000 530. PRICE: \$1000.00 531. QUANTITY: 1000 532. PRICE: \$1000.00 533. QUANTITY: 1000 534. PRICE: \$1000.00 535. QUANTITY: 1000 536. PRICE: \$1000.00 537. QUANTITY: 1000 538. PRICE: \$1000.00 539. QUANTITY: 1000 540. PRICE: \$1000.00 541. QUANTITY: 1000 542. PRICE: \$1000.00 543. QUANTITY: 1000 544. PRICE: \$1000.00 545. QUANTITY: 1000 546. PRICE: \$1000.00 547. QUANTITY: 1000 548. PRICE: \$1000.00 549. QUANTITY: 1000 550. PRICE: \$1000.00 551. QUANTITY: 1000 552. PRICE: \$1000.00 553. QUANTITY: 1000 554. PRICE: \$1000.00 555. QUANTITY: 1000 556. PRICE: \$1000.00 557. QUANTITY: 1000 558. PRICE: \$1000.00 559. QUANTITY: 1000 560. PRICE: \$1000.00 561. QUANTITY: 1000 562. PRICE: \$1000.00 563. QUANTITY: 1000 564. PRICE: \$1000.00 565. QUANTITY: 1000 566. PRICE: \$1000.00 567. QUANTITY: 1000 568. PRICE: \$1000.00 569. QUANTITY: 1000 570. PRICE: \$1000.00 571. QUANTITY: 1000 572. PRICE: \$1000.00 573. QUANTITY: 1000 574. PRICE: \$1000.00 575. QUANTITY: 1000 576. PRICE: \$1000.00 577. QUANTITY: 1000 578. PRICE: \$1000.00 579. QUANTITY: 1000 580. PRICE: \$1000.00 581. QUANTITY: 1000 582. PRICE: \$1000.00 583. QUANTITY: 1000 584. PRICE: \$1000.00 585. QUANTITY: 1000 586. PRICE: \$1000.00 587. QUANTITY: 1000 588. PRICE: \$1000.00 589. QUANTITY: 1000 590. PRICE: \$1000.00 591. QUANTITY: 1000 592. PRICE: \$1000.00 593. QUANTITY: 1000 594. PRICE: \$1000.00 595. QUANTITY: 1000 596. PRICE: \$1000.00 597. QUANTITY: 1000 598. PRICE: \$1000.00 599. QUANTITY: 1000 600. PRICE: \$1000.00 601. QUANTITY: 1000 602. PRICE: \$1000.00 603. QUANTITY: 1000 604. PRICE: \$1000.00 605. QUANTITY: 1000 606. PRICE: \$1000.00 607. QUANTITY: 1000 608. PRICE: \$1000.00 609. QUANTITY: 1000 610. PRICE: \$1000.00 611. QUANTITY: 1000 612. PRICE: \$1000.00 613. QUANTITY: 1000 614. PRICE: \$1000.00 615. QUANTITY: 1000 616. PRICE: \$1000.00 617. QUANTITY: 1000 618. PRICE: \$1000.00 619. QUANTITY: 1000 620. PRICE: \$1000.00 621. QUANTITY: 1000 622. PRICE: \$1000.00 623. QUANTITY: 1000 624. PRICE: \$1000.00 625. QUANTITY: 1000 626. PRICE: \$1000.00 627. QUANTITY: 1000 628. PRICE: \$1000.00 629. QUANTITY: 1000 630. PRICE: \$1000.00 631. QUANTITY: 1000 632. PRICE: \$1000.00 633. QUANTITY: 1000 634. PRICE: \$1000.00 635. QUANTITY: 1000 636. PRICE: \$1000.00 637. QUANTITY: 1000 638. PRICE: \$1000.00 639. QUANTITY: 1000 640. PRICE: \$1000.00 641. QUANTITY: 1000 642. PRICE: \$1000.00 643. QUANTITY: 1000 644. PRICE: \$1000.00 645. QUANTITY: 1000 646. PRICE: \$1000.00 647. QUANTITY: 1000 648. PRICE: \$1000.00 649. QUANTITY: 1000 650. PRICE: \$1000.00 651. QUANTITY: 1000 652. PRICE: \$1000.00 653. QUANTITY: 1000 654. PRICE: \$1000.00 655. QUANTITY: 1000 656. PRICE: \$1000.00 657. QUANTITY: 1000 658. PRICE: \$1000.00 659. QUANTITY: 1000 660. PRICE: \$1000.00 661. QUANTITY: 1000 662. PRICE: \$1000.00 663. QUANTITY: 1000 664. PRICE: \$1000.00 665. QUANTITY: 1000 666. PRICE: \$1000.00 667. QUANTITY: 1000 668. PRICE: \$1000.00 669. QUANTITY: 1000 670. PRICE: \$1000.00 671. QUANTITY: 1000 672. PRICE: \$1000.00 673. QUANTITY: 1000 674. PRICE: \$1000.00 675. QUANTITY: 1000 676. PRICE: \$1000.00 677. QUANTITY: 1000 678. PRICE: \$1000.00 679. QUANTITY: 1000 680. PRICE: \$1000.00 681. QUANTITY: 1000 682. PRICE: \$1000.00 683. QUANTITY: 1000 684. PRICE: \$1000.00 685. QUANTITY: 1000 686. PRICE: \$1000.00 687. QUANTITY: 1000 688. PRICE: \$1000.00 689. QUANTITY: 1000 690. PRICE: \$1000.00 691. QUANTITY: 1000 692. PRICE: \$1000.00 693. QUANTITY: 1000 694. PRICE: \$1000.00 695. QUANTITY: 1000 696. PRICE: \$1000.00 697. QUANTITY: 1000 698. PRICE: \$1000.00 699. QUANTITY: 1000 700. PRICE: \$1000.00 701. QUANTITY: 1000 702. PRICE: \$1000.00 703. QUANTITY: 1000 704. PRICE: \$1000.00 705. QUANTITY: 1000 706. PRICE: \$1000.00 707. QUANTITY: 1000 708. PRICE: \$1000.00 709. QUANTITY: 1000 710. PRICE: \$1000.00 711. QUANTITY: 1000 712. PRICE: \$1000.00 713. QUANTITY: 1000 714. PRICE: \$1000.00 715. QUANTITY: 1000 716. PRICE: \$1000.00 717. QUANTITY: 1000 718. PRICE: \$1000.00 719. QUANTITY: 1000 720. PRICE: \$1000.00 721. QUANTITY: 1000 722. PRICE: \$1000.00 723. QUANTITY: 1000 724. PRICE: \$1000.00 725. QUANTITY: 1000 726. PRICE: \$1000.00 727. QUANTITY: 1000 728. PRICE: \$1000.00 729. QUANTITY: 1000 730. PRICE: \$1000.00 731. QUANTITY: 1000 732. PRICE: \$1000.00 733. QUANTITY: 1000 734. PRICE: \$1000.00 735. QUANTITY: 1000 736. PRICE: \$1000.00 737. QUANTITY: 1000 738. PRICE: \$1000.00 739. QUANTITY: 1000 740. PRICE: \$1000.00 741. QUANTITY: 1000 742. PRICE: \$1000.00 743. QUANTITY: 1000 744. PRICE: \$1000.00 745. QUANTITY: 1000 746. PRICE: \$1000.00 747. QUANTITY: 1000 748. PRICE: \$1000.00 749. QUANTITY: 1000 750. PRICE: \$1000.00 751. QUANTITY: 1000 752. PRICE: \$1000.00 753. QUANTITY: 1000 754. PRICE: \$1000.00 755. QUANTITY: 1000 756. PRICE: \$1000.00 757. QUANTITY: 1000 758. PRICE: \$1000.00 759. QUANTITY: 1000 760. PRICE: \$1000.00 761. QUANTITY: 1000 762. PRICE: \$1000.00 763. QUANTITY: 1000 764. PRICE: \$1000.00 765. QUANTITY: 1000 766. PRICE: \$1000.00 767. QUANTITY: 1000 768. PRICE: \$1000.00 769. QUANTITY: 1000 770. PRICE: \$1000.00 771. QUANTITY: 1000 772. PRICE: \$1000.00 773. QUANTITY: 1000 774. PRICE: \$1000.00 775. QUANTITY: 1000 776. PRICE: \$1000.00 777. QUANTITY: 1000 778. PRICE: \$1000.00 779. QUANTITY: 1000 780. PRICE: \$1000.00 781. QUANTITY: 1000 782. PRICE: \$1000.00 783. QUANTITY: 1000 784. PRICE: \$1000.00 785. QUANTITY: 1000 786. PRICE: \$1000.00 787. QUANTITY: 1000 788. PRICE: \$1000.00 789. QUANTITY: 1000 790. PRICE: \$1000.00 791. QUANTITY: 1000 792. PRICE: \$1000.00 793. QUANTITY: 1000 794. PRICE: \$1000.00 795. QUANTITY: 1000 796. PRICE: \$1000.00 797. QUANTITY: 1000 798. PRICE: \$1000.00 799. QUANTITY: 1000 800. PRICE: \$1000.00 801. QUANTITY: 1000 802. PRICE: \$1000.00 803. QUANTITY: 1000 804. PRICE: \$1000.00 805. QUANTITY: 1000 806. PRICE: \$1000.00 807. QUANTITY: 1000 808. PRICE: \$1000.00 809. QUANTITY: 1000 810. PRICE: \$1000.00 811. QUANTITY: 1000 812. PRICE: \$1000.00 813. QUANTITY: 1000 814. PRICE: \$1000.00 815. QUANTITY: 1000 816. PRICE: \$1000.00 817. QUANTITY: 1000 818. PRICE: \$1000.00 819. QUANTITY: 1000 820. PRICE: \$1000.00 821. QUANTITY: 1000 822. PRICE: \$1000.00 823. QUANTITY: 1000 824. PRICE: \$1000.00 825. QUANTITY: 1000 826. PRICE: \$1000.00 827. QUANTITY: 1000 828. PRICE: \$1000.00 829. QUANTITY: 1000 830. PRICE: \$1000.00 831. QUANTITY									
-------	--	--	--	--	--	--	--	--	--	--

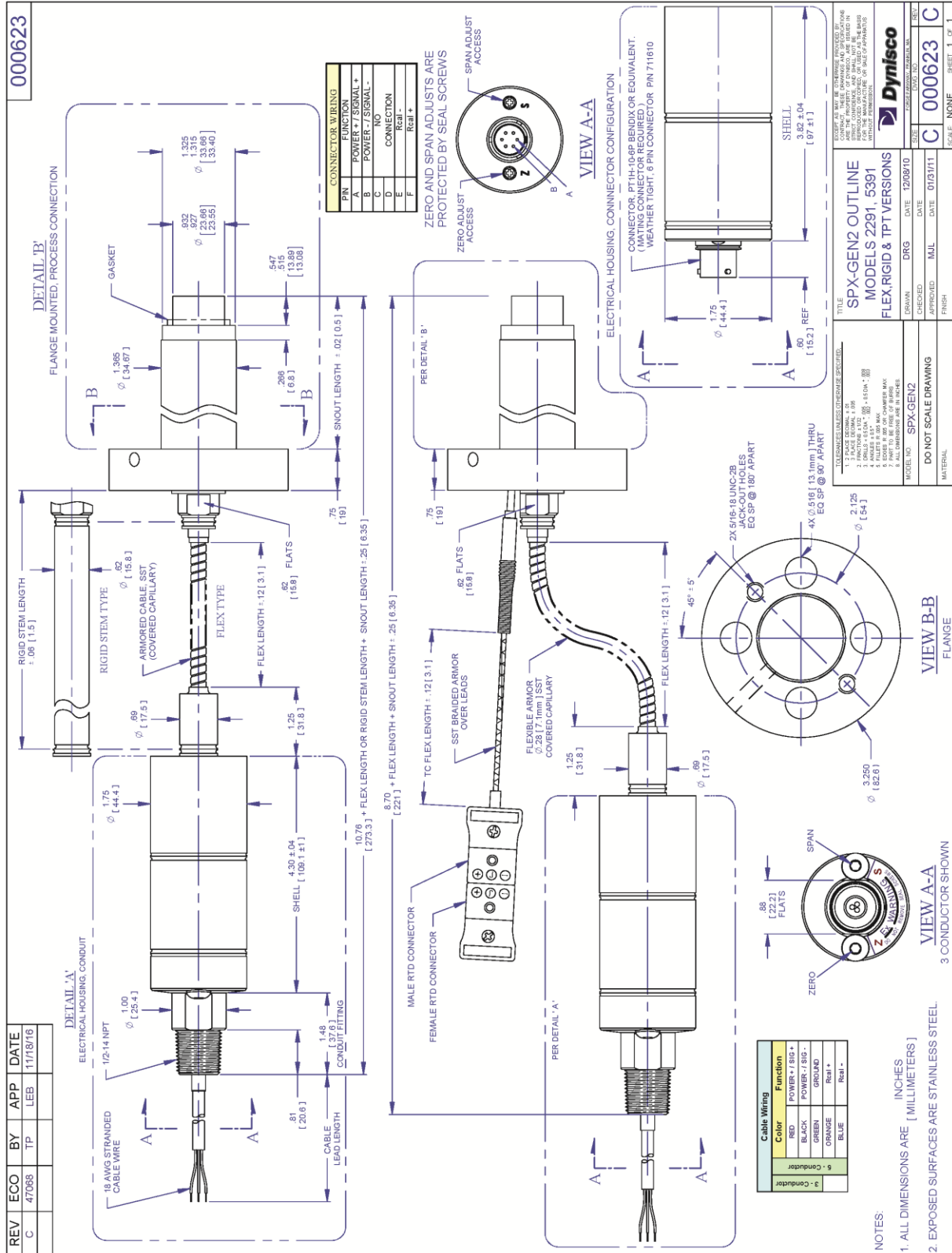


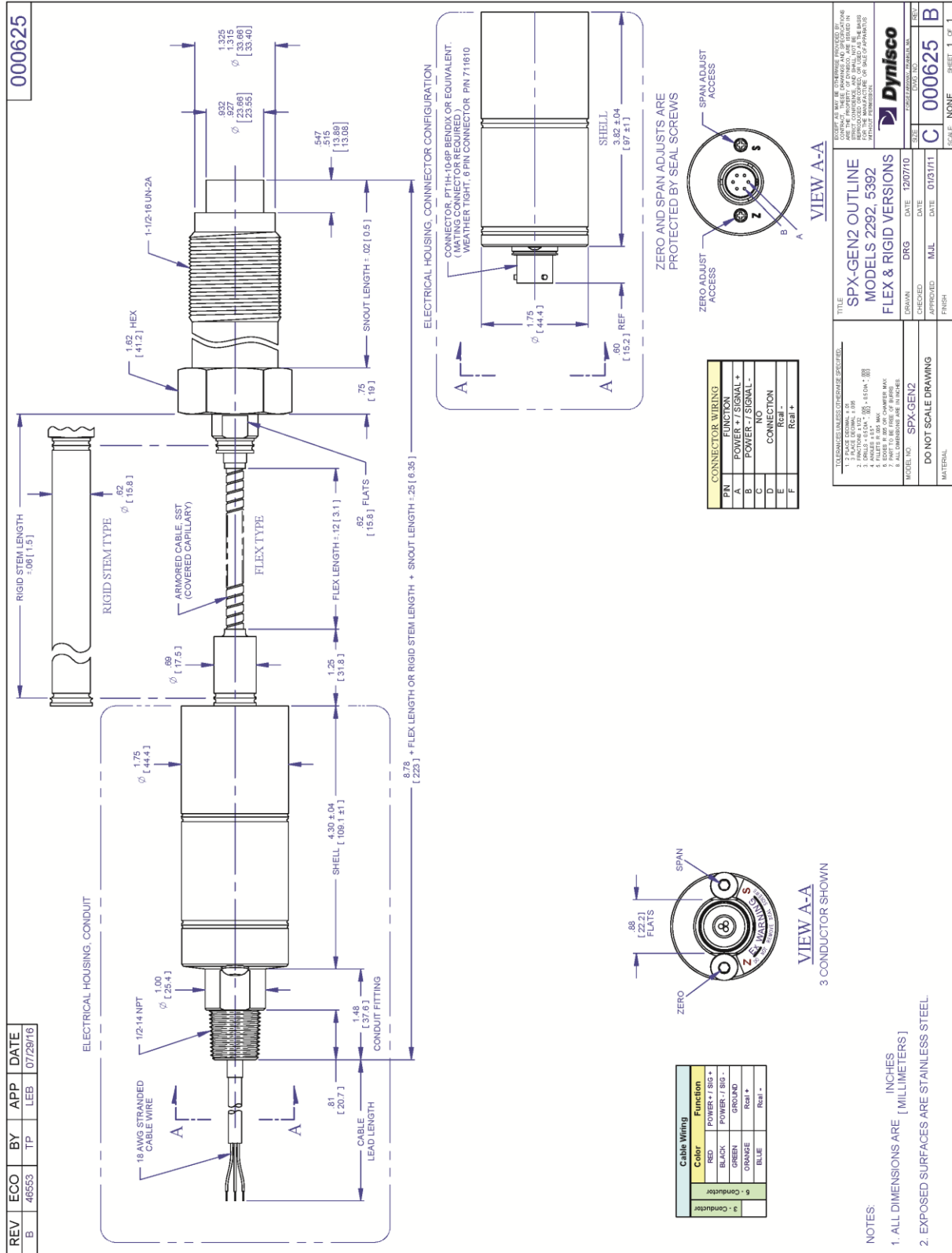




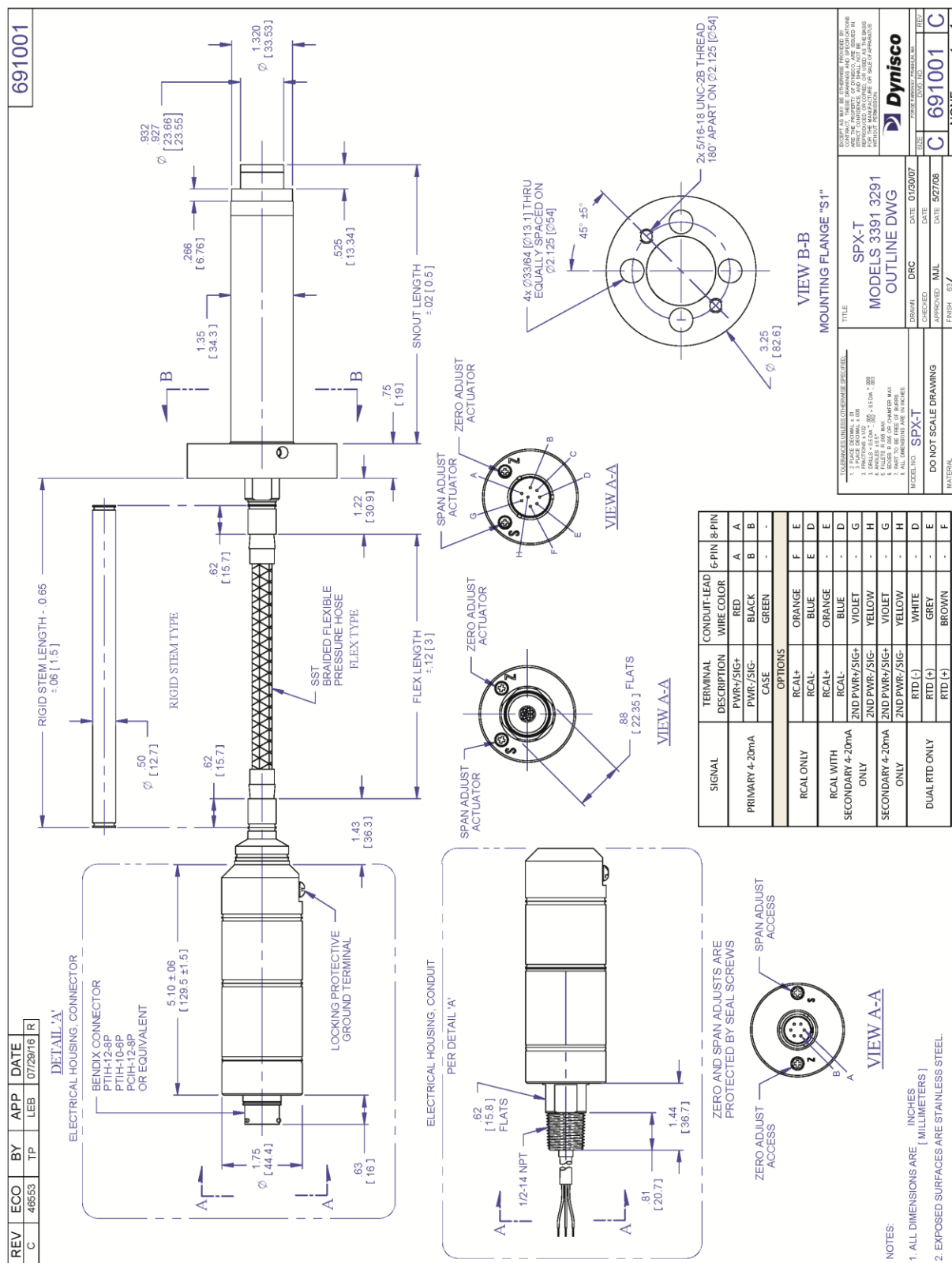












REV	ECO	BY	APP	DATE
A	46553	TP	LEB	07/29/16 R
B	51000	TP	ML	11/14/19

000652

8 - PIN PC
O-RING WITH PUSH BUTTONS
PCIH-12-8P
(4XXX SERIES)

8 - PIN PC
WELDED WITH PUSH BUTTONS
PCIH-12-8P
(2XXX SERIES)

8 - PIN PC
WELDED WITH HALLS
PCIH-12-8P
(2XXX SERIES)

NOTE:
1. THESE CONNECTOR OPTIONS ARE AVAILABLE ON MOST OF THE CONFIGURATIONS SHOWN ON THE PREVIOUS SHEETS.

GUARDIAN CONNECTOR WIRING	
PIN	FUNCTION
A	POWER +
B	SIGNAL -
C	POWER -
D	NO CONNECTION
E	Rcal -
F	Rcal +
G	RELAY CONTACT
H	RELAY CONTACT

TOLERANCES UNLESS OTHERWISE SPECIFIED:		TITLE	
1. FRACTIONS ± 1/32	2. DECIMALS ± .005	GUARDIAN SERIES CONNECTORS	
3. HOLE DIA. ± .005	4. HOLE DIA. ± .005	DRAWN	TP
5. RADIUS ± .005	6. RADIUS ± .005	CHECKED	DATE
7. HOLE DIA. ± .005	8. HOLE DIA. ± .005	APPROVED	DATE
9. RADIUS ± .005	10. RADIUS ± .005	FINISH	DATE
11. HOLE DIA. ± .005	12. HOLE DIA. ± .005	DO NOT SCALE DRAWING	
13. HOLE DIA. ± .005	14. HOLE DIA. ± .005	MATERIAL	
15. HOLE DIA. ± .005	16. HOLE DIA. ± .005	X	

DYNISCO	
SIZE	DWG. NO.
B	000652
REV	REV
B	B
SCALE	SHEET 1 OF 1



*From lab to production,
providing a window into the process*



15 DYNISCO CONTACT INFORMATION

Please visit our website for up to date contact information:

www.dynisco.com