

# **PT-405**

# **User Manual**

Explosion Proof, Heavy Duty Pressure Transmitter

# Table of Contents

<b>Introduction .....</b>	<b>iii</b>
<b>Warranty Statement .....</b>	<b>iv</b>
<b>Chapter 1: Specifications and Options.....</b>	<b>1</b>
Dimensions .....	1
Specifications .....	2
Model Number Configurator.....	3
Electrical Connectors and Pinout Table .....	4
<b>Chapter 2: Installation and Removal Procedures and Notes.....</b>	<b>5</b>
Tools Needed.....	5
Physical Installation Notes .....	5
Mounting Instructions .....	5
Electrical Installation .....	6
Removal Instructions .....	6
<b>Chapter 3: Maintenance .....</b>	<b>7</b>
General Care .....	7
Zero Trimming.....	7
Re-Calibration.....	8
Repair and Returns.....	8
<b>Chapter 4: Hazardous Location Certification.....</b>	<b>9</b>
CSA Certificate of Compliance .....	9-16

# Introduction

Thank you for purchasing a Series PT-405 Explosion Proof Heavy Duty Pressure Transmitter from APG. We appreciate your business! Please take a few minutes to familiarize yourself with your PT-405 and this manual.

Series PT-405 pressure transmitters offer reliability over a wide range of pressures and in harsh industrial conditions and hazardous locations. It is certified explosion proof for hazardous areas in the US and Canada by CSA for Class 1, Division 1 environments and has a single seal for the highest safety factor. The integrated electronics, wide operating temperature range, and durability, make the PT-405 the perfect instrument for static and dynamic pressure measurements with an amplified output signal.

## Reading your label

Every APG instrument comes with a label that includes the instrument's model number, part number, serial number, and a wiring pinout table. Please ensure that the part number and pinout table on your label match your order. The following electrical ratings and approvals are also listed on the label. Please refer to the Certificate of Compliance and Declaration of Conformity at the back of this manual for further details.

## Electrical ratings



Input: 9 to 28 Volts DC; Outputs: 4-20mA / 0-5\* VDC / 0-10 VDC / RS-485 (per order)  
Exia Class I Division 1; Groups C, D T4  
Class I, Zone 0, Group IIB  
AEx d IIB T4: Ta: -40°C to 85°C  
Ex d IIB T4: Ta: -40°C to 85°C  
Single Seal.  
Maximum Working Pressure: 30,000 PSI

PT-405-L1 (4-20mA)

$V_{max} U_i = 28VDC, I_{max} I_i = 110mA, P_{max} P_i = 0.77W, C_i = 0.055\mu F, L_i = 7.95\mu H$

PT-405-L3/L10 (0-5\* / 0-10 VDC)

$V_{max} U_i = 28VDC, I_{max} I_i = 110mA, P_{max} P_i = 0.77W, C_i = 0\mu F, L_i = 0\mu H$

PT-405-L5/L31 (RS-485)

$V_{max} U_i = 28VDC, I_{max} I_i = 110mA, P_{max} P_i = 0.77W, C_i = 0\mu F, L_i = 0\mu H$

\*Note: 0-5 VDC includes 0.5-4.5 VDC and 1-5 VDC output ranges.

**i** IMPORTANT: Your PT-405 MUST be installed according as indicated in Physical Installation Notes (page 5) to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

## Warranty Statement

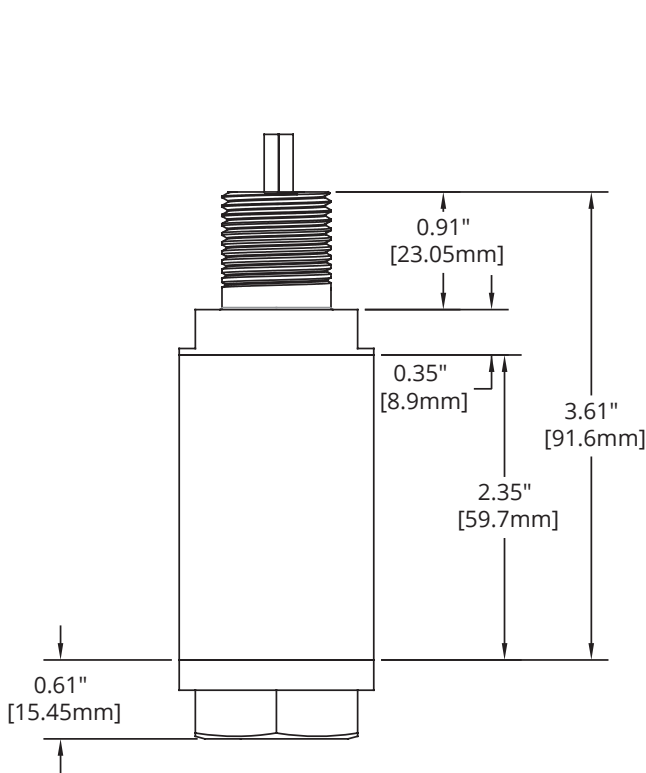
This product is covered by APG's warranty to be free from defects in material and workmanship under normal use and service of the product for 24 months. For a full explanation of our Warranty, please visit <https://www.apgsensors.com/about-us/terms-conditions>. Contact Technical Support to receive a Return Material Authorization before shipping your product back.

Scan the QR code below to read the full explanation of our Warranty on your tablet or smartphone.

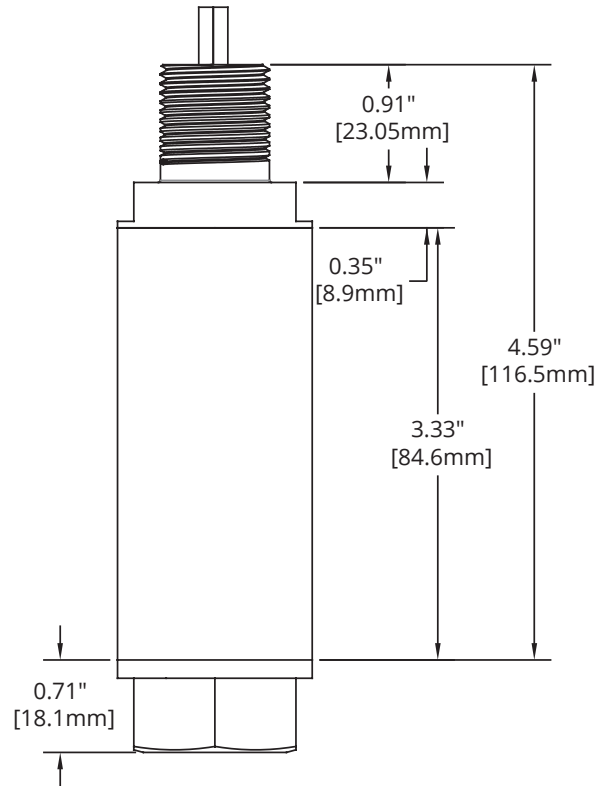


# Chapter 1: Specifications and Options

- Dimensions



PT-405 Short Can (E60 option)  
with NPTF Process connection



PT-405 Long Can (E60L option)  
with NPTF Process Connection

Total length of PT-405 is dependant on Process Connection

## • Specifications

### Performance

Pressure Ranges	-15 to 30K PSI
Analog Output	4-20mA, 0-5VDC, 0.5-4.5 VDC, 1-5 VDC, 0-10VDC
Digital Output	RS-485/Modbus
Over Pressure	1.5X Full Scale or limit of fitting, whichever is less
Burst Pressure	3.0X Full Scale or limit of fitting, whichever is less

### Accuracy

Linearity, Hystereses & Repeatability	±0.25% of Full Scale (BFSL) (1% for pressure ≤ 1 psi)
Thermal Zero Shift	[±0.036% FSO/°C      (±0.02% FSO/°F)]
Thermal Span Shift	[±0.036% FSO/°C      (±0.02% FSO/°F)]

### Environmental

Operating Temperature	-40 to 85°C / -40 to 185°F
Compensated Temperature	
≤ 10 psi:	0° - 60°C / 32° - 140°F
10 < x ≤ 1000 psi:	-10° - 70°C / 14° - 158°F
> 1000 psi:	-17° - 54°C / 0° - 130°F
Enclosure Protection	IP65

### Electrical

Supply Voltage (at sensor)	4-20 mA:      9-28 VDC
	0 to 5 VDC:    9-28 VDC
	0.5 to 4.5 VDC: 9-28 VDC
	1 to 5 VDC:    9-28 VDC
	0 to 10 VDC:   12.5-28 VDC
	RS-485:        9-28 VDC
Output Signal @ 21°C	4-20 mA:      3-30 mA max.
	0 to 5 VDC:    7mA max
	0 to 10 VDC:   14mA max

### Materials of Construction

Wetted Materials	316L Stainless Steel ( ≤ 1,000 psi) 17-4 Stainless Steel ( > 1,000 psi) Incoloy (10,000 - 30,000 psi)
Enclosure	316L Stainless Steel

### Mechanical

Pressure Connection	See model number configurator for complete list
Weight	408 - 680 g (0.9 - 1.5 lbs.)



- **Electrical Connectors, Pinout Table, and Supply Power Table**

PT-405 Series Pin Out Table

	<b>4-20 mA</b>	<b>0-5 / 0.5-4.5 / 1-5 VDC</b>	<b>0-10 VDC</b>	<b>RS-485</b>
Pigtail	Red	+ Excitation	+ Excitation	+ Excitation
	Grn	No wire	+ Output	B (Tx-)
	Wht	No wire	- Output	A (Tx+)
	Blk	- Excitation	- Excitation	- Excitation
	Grn/ Ylw	Case Ground	Case Ground	Case Ground

N/C indicates no connection  
 For alternate pinouts, please consult factory

PT-405 Series Supply Power Table

	<b>4-20 mA</b>	<b>0-5 / 0.5-4.5 / 1-5 VDC</b>	<b>0-10 VDC</b>	<b>RS-485</b>
Power Supply	9-28 VDC	9-28 VDC	12.5-28 VDC	9-28 VDC

**i** **IMPORTANT:** Some Modbus manufacturers use reversed Tx+/Tx- pins. When connecting to your system, ensure A to A and B to B connections.



# Chapter 2: Installation and Removal Procedures and Notes

## • Tools Needed

- Wrench sized appropriately for your PT-405's process connection.
- Thread tape or sealant compound for threaded connections.

## • Physical Installation Notes

The PT-405 should be installed in an area--indoors or outdoors--which meets the following conditions:

- Ambient temperature between -40°C and 85°C (-40°F to +185°F)
- Relative humidity up to 100%
- Altitude up to 2000 meters (6560 feet)
- IEC-664-1 Conductive Pollution Degree 1 or 2
- IEC 61010-1 Measurement Category II
- No chemicals corrosive to stainless steel (such as NH<sub>3</sub>, SO<sub>2</sub>, Cl<sub>2</sub> etc.)
- Ample space for maintenance and inspection
- Explosion proof conduit, with seal installed within 18 inches, must be used for cable connection to PT-405.
- Class II power supply

**i** IMPORTANT: Incorrectly connecting your PT-405 Pressure Transmitter to explosion proof conduit, or using unapproved conduit, will void the protection rating of your PT-405.


## • Mounting Instructions

Mounting your pressure transducer is easy if you follow a few simple steps:

- Never over-tighten the sensor. This can compress the diaphragm, changing how it reacts to pressure. In all cases, tighten the sensor as little as possible to create an adequate seal. On straight threads, tighten only until you feel the o-ring compress - making sure you don't damage or extrude the o-ring.
- Always use thread tape or sealant compound on tapered threads. Wrap thread tape in the opposite direction of the threads so it does not unravel as you screw the sensor into place. Unraveling can cause uneven distribution and seal failure. For straight threads use an o-ring.
- Always start screwing in your sensor by hand to avoid cross-threading. Thread failure can be a problem if you damage threads by over-tightening them or by crossing threads.

- **Electrical Installation**

- Check the pinout table on your PT-405 against your order.
- Check that your electrical system wiring matches the pinout table on your PT-405.
- Connect cable from PT-405 to your control system.

 **DANGER:** Incorrectly connecting your PT-405 Pressure Transmitter to your control system could result in injury or death.

- **Removal Instructions**

Removing your PT-405 from service must be done with care. It's easy to create an unsafe situation, or damage your sensor, if you are not careful to follow these guidelines:

- Make sure the pressure is completely removed from the line or vessel where your sensor is installed. Follow any and all procedures for safely isolating any media contained inside the line or vessel.
- Remove the sensor with an appropriately sized wrench (per your process connection).
- Clean the sensor's fitting and diaphragm of any debris (see General Care) and inspect for damage.
- Store your sensor in a dry place, at a temperature between -40° F and 180° F.

 **DANGER:** Removing your PT-405 Pressure Transmitter while there is still pressure in the line could result in injury or death.

# Chapter 3: Maintenance

## • General Care

Your PT-405 series pressure transmitter is very low maintenance and will need little care as long as it is installed correctly. However, in general, you should:

- Keep the transmitter and the area around it generally clean.
- Avoid applications for which the transmitter was not designed, such as extreme temperatures, contact with incompatible corrosive chemicals, or other damaging environments.
- Inspect the threads whenever you remove the transmitter from duty or change its location.
- Avoid touching the diaphragm. Contact with the diaphragm, especially with a tool, could permanently shift the output and ruin accuracy.
- Clean the diaphragm or the diaphragm bore with extreme care. If using a tool is required, make sure it does not touch the diaphragm.

## • Zero Trimming

- Remove unit from Hazardous Location prior to performing Zero Trimming procedure.
- Remove the protective screw.
- Ensure that the transmitter is at 0 psig or 0 psia (vacuum if absolute). For compound ranges, i.e., -15 psi to 30 psi, the 4 mA, 0 V, 0.5 V, or 1 V set point is also at vacuum.
- Using a jeweler's screwdriver or a suitable instrument, adjust the "Z" pot until you have a 4 mA, 0 V, 0.5 V, or 1 V output.

**i** IMPORTANT: Do not make changes to the Span adjustment (the "S" pot to the right, see Figure 3.1) as part of the zero trimming. The Span should only be changed as part of the recalibration of a gauge with a known pressure source.

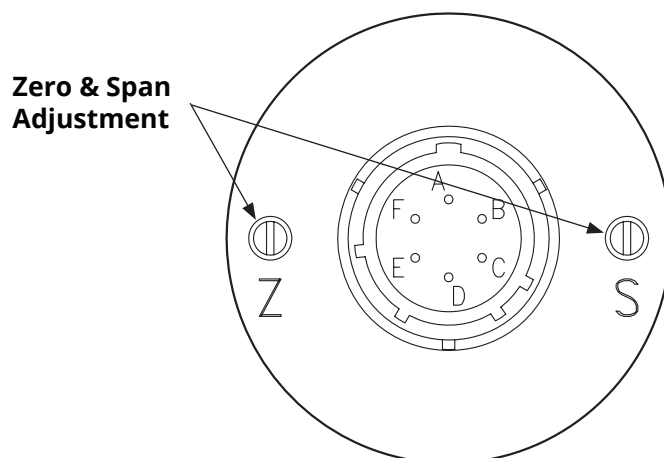



Figure 3.1

## • Re-Calibration

This procedure requires a known pressure source of at least  $\pm 0.1\%$  accuracy in order to fully utilize the accuracy potential of the PT-405. (If not available, you can return it to the factory for re-calibration.)

- Remove unit from Hazardous Location prior to recalibration.
- Ensure that the transducer is at 0 psig or 0 psia (vacuum if absolute), and adjust zero as per instructions for zero trimming.
- Apply full scale pressure to the pressure port and adjust the Span ("S") pot (on the right of Figure 3.1) until the full scale signal is reached.
- Re-check zero and re-adjust the zero ("Z") pot if required
- Repeat previous two steps until no further adjustment is required.

 NOTE: You may also return the PT-405 to the factory for repair and/or adjustment.

 IMPORTANT: Do not adjust Zero or Span potentiometer while your PT-405 is installed in a Hazardous Location. Removing the protective screws to access the potentiometers invalidates the Hazardous Location approvals until they are replaced.

## • Repair and Returns


Should your PT-405 series pressure transmitter require service, please contact the factory via phone, email, or online chat. We will issue you a Return Material Authorization (RMA) number with instructions.

- Phone: 888-525-7300
- Email: [sales@apgsensors.com](mailto:sales@apgsensors.com)
- Online chat at [www.apgsensors.com](http://www.apgsensors.com)

Please have your PT-405's part number and serial number available. See Terms & Conditions (<https://www.apgsensors.com/about-us/terms-conditions>) for more information.

# Chapter 4: Hazardous Location Installation and Certification

- CSA Certificate of Compliance




## Certificate of Compliance

Certificate: 1984045	Master Contract: 237484 (237484)
Project: 70159942	Date Issued: 2018-03-29

Issued to: **Automation Products Group Inc**  
1025 West 1700 North  
Logan, Utah 84321  
USA  
Attention: Joseph James

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.*



Issued by: *Albert Jansen*  
Albert Jansen

**PRODUCTS**  
**CLASS 2258 03** - Process Control Equipment - Intrinsically Safe and Non Incendive systems - For Hazardous Locations  
**CLASS 2258 83** - Process Control Equipment - Intrinsically Safe and Non Incendive systems - For Hazardous Locations - Certified to US Standards

**Class I, Div. 2, Groups C and D**  
**Class I, Zone 2, Group IIB**  
**Ex nL IIB T4; -40°C ≤ Ta ≤ +85°C**  
**AEx nC IIB T4; -40°C ≤ Ta ≤ +85°C**

- Model PT-400-L1xxxx Pressure Transmitter. Rated 9-28VDC, 4-20mA; Maximum Ambient 85° C; Temperature Code T4; Maximum Working Pressure 10,000 PSI. Enclosure type: IP65. Installed as per Drawing 9002794. Single Seal. Non-Incendive with the following Entity Parameters:  
  
Vmax, Ui = 28V  
Imax, Ii = 110mA  
Pmax, Pi = 0.77W  
Ci = 0.055µF  
Li = 7.95µH

DQD 507 Rev. 2016-02-18 Page 1



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

- Model PT-400-L3/L10xxxx Pressure Transmitter. Rated 9-28VDC, 0-5V, 20mA or 0-10V, 20mA; Maximum Ambient 85° C; Temperature Code T4; Maximum Working Pressure 10,000 PSI. Installed as per Drawing 9002794. Single Seal. Non-Incendive with the following Entity Parameters:

$V_{max}, U_i = 28V$   
 $I_{max}, I_i = 110mA$   
 $P_{max}, P_i = 0.77W$   
 $C_i = 0\mu F$   
 $L_i = 0\mu H$

- Model PT-500-xxxx Pressure Transmitter, Rated 10-28VDC, 4-20mA; Maximum Ambient 85° C; Temperature Code T4; Maximum Working Pressure 10,000 PSI; Single Seal. Non-Incendive with the following Entity Parameters:

$V_{max}, U_i = 28V$   
 $I_{max}, I_i = 110mA$   
 $P_{max}, P_i = 0.77W$   
 $C_i = 0\mu F$   
 $L_i = 0\mu H$

**Conditions of Acceptability:** PT-400, PT-500

1. The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety.
2. These devices must be connected to a suitably certified and approved apparatus that provides non-incendive outputs either equal to or less than those as indicated by the applicable control drawings. This certified apparatus must be located in a safe area.
3. The equipment must be connected to a certified class 2 power supply



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

**CLASS 2258 04** - Process Control Equipment - Intrinsically Safe, Entity - For Hazardous Locations  
**CLASS 2258 84** - Process Control Equipment - Intrinsically Safe, Entity - For Hazardous Locations - Certified to US Standards

**Class I, Div. 1, Groups C, D**  
**Class I, Zone 0, Group IIB**  
**Ex ia IIB T4;  $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$ ,**  
**AEx ia IIB T4;  $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$ ,**

- Model PT-400-L1xxxx Pressure Transmitter. Rated 9-28VDC, 4-20mA. Maximum Working Pressure: 10,000 PSI. Installed as per Drawing 9002794. Ambient Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . Enclosure type: IP65. Single Seal. Intrinsically safe with the following entity parameters:

$V_{\text{max}}, U_i = 28\text{V}$   
 $I_{\text{max}}, I_i = 110\text{mA}$   
 $P_{\text{max}}, P_i = 0.77\text{W}$   
 $C_i = 0.055\mu\text{F}$   
 $L_i = 7.95\mu\text{H}$

- Model PT-500-xxxx Pressure Transmitter; Maximum Ambient  $85^{\circ}\text{C}$ ; Temperature Code T4; Maximum Working Pressure 10,000 PSI; Single Seal. Entity parameters as follows:

$V_{\text{max}}, U_i = 28\text{V}$   
 $I_{\text{max}}, I_i = 110\text{mA}$   
 $P_{\text{max}}, P_i = 0.77\text{W}$   
 $C_i = 0.042\mu\text{F}$   
 $L_i = 0.320\mu\text{H}$

**Conditions of Acceptability:** PT-400, PT-500

1. The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety.
2. These devices must be connected to a NRTL approved safety barrier (located in a safe area).
3. The equipment must be connected to a certified class 2 power supply



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

**CLASS 2258 02** - Process Control Equipment - For Hazardous Locations  
**CLASS 2258 82** - Process Control Equipment - For Hazardous Locations - Certified to US Standards

**Class I Div. 1 Groups C and D**

Model PT-405-xxxxxxxx Pressure Transmitter. Rated 9-28V<sub>DC</sub>, 4-20mA. Maximum working pressure (MEMS): 1,000 psi). Maximum working pressure (Foil): 30,000psi. Ambient Range: -40°C to +85°C. Single Seal.

**Conditions of Acceptability**

1. The equipment must be connected to a certified class 2 power supply
2. The conduit connected to the equipment must be sealed within 18 inches of the equipment enclosure.
3. The "x" in the model designation may be any alpha-numeric character, to denote minor mechanical or electrical options, not affecting safety.





**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

**APPLICABLE REQUIREMENTS**

C22.2 No 0 - M1991	General Requirements - Canadian Electrical Code Part II.
C22.2 No 0.4 - M2004	Bonding and Grounding of Electrical Equipment (Protective Grounding).
C22.2 No. 30 – M1986	Explosion-proof enclosures for use in Class I hazardous locations
C22.2 No 157 - M1992	Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations.
C22.2 No 213 - M1987	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations.
CAN/CSA-C22.2 No. 60079-0:11	Explosive Atmospheres - Part 0: Equipment - General requirements
CAN/CSA-C22.2 No. 60079-11:11	Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety "i"
CAN/CSA-C22.2 No. 60079-15:12	Electrical apparatus for explosive gas atmospheres - Part 15: Construction, test and marking of type of protection "n" electrical apparatus
CAN/CSA-C22.2 No. 60529:05	Degrees of protection provided by enclosures (IP Code)
CAN/CSA-C22.2 No. 61010-1-12	Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements
UL 508, 17 <sup>th</sup> Edition	Industrial Control Equipment.
UL 913, 7 <sup>th</sup> Edition	Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, II, III, Division 1, Hazardous (Classified) Locations.
UL 1203, 5 <sup>th</sup> Edition	Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
UL 61010-1	Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements
ANSI/ISA-12.12.01-2007	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
ANSI/ISA-12.27-01-2003	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
ANSI/UL 60079-0:09	Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements
ANSI/UL 60079-11:09	Electrical apparatus for Explosive Gas Atmospheres - Part 11: Intrinsic Safety "i"
ANSI/UL 60079-15:09	Electrical apparatus for Explosive Gas Atmospheres - Part 15: Type of Protection "n"
ANSI/IEC 60529:2004	Degrees of Protection Provided by Enclosures (IP Code)



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

## MARKINGS

The manufacturer is required to apply the following markings:

- Products shall be marked with the markings specified by the particular product standard.
- Products certified for Canada shall have all Caution and Warning markings in both English and French.

Additional bilingual markings not covered by the product standard(s) may be required by the Authorities Having Jurisdiction. It is the responsibility of the manufacturer to provide and apply these additional markings, where applicable, in accordance with the requirements of those authorities.

The products listed are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and U.S. Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only.

The following markings must appear on the **PT-400-xxxx** and **PT-500-xxxx** as applicable.

- 1) Submitter's name, trademark, or the CSA file number (adjacent to the CSA Mark).
- 2) Catalogue / Model designation.
- 3) Complete electrical rating (Entity parameters).
- 4) Date code / Serial number traceable to month and year of manufacture.
- 5) Hazardous Location designations.

Class I, Division 2, Groups C and D	Class I, Division 1, Groups C,D
Class I, Zone 2, Group IIB	Class I, Zone 0, Group IIB
Ex nL IIB T4; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$	Ex ia IIB T4; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$
AEx nC IIB T4; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$	AEx ia IIB T4; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$
- 6) The symbol "Ex ia".
- 7) The words "INTRINSICALLY SAFE / SECURITE INTRINSEQUE".
- 8) Temperature code T4
- 9) Maximum ambient 85°C
- 10) The CSA Mark with the "c" and "us" qualifiers.
- 11) Reference to the installation drawings
- 12) The marking "Single Seal"
- 13) The following bilingual cautions: (May be located on the installation drawing)  
WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY: and,  
AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SECURITE INTRINSEQUE".
- 14) The warning: "Must be connected to a Class 2 power supply"

The following markings must appear on the **PT-405-xxxxxxxx** as applicable.

- 1) Submitter's name, trademark, or the CSA file number (adjacent to the CSA Mark).
  - 2) Catalogue / Model designation.
  - 3) Complete electrical rating
  - 4) Date code / Serial number traceable to month and year of manufacture.
  - 5) Hazardous Location designations.

Class I, Division 1, Groups C and D
-------------------------------------
  - 6) Temperature code T4
  - 7) Minimum ambient -40, ,maximum ambient 85°C
  - 8) The CSA Mark with the "c" and "us" qualifiers.
  - 9) Reference to the installation drawings
- The marking "Single Seal"



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

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10) The warnings

1. EXPLOSION HAZARD – ENSURE SET SCREWS ARE FULLY TIGHTENED, AND DO NOT DISCONNECT OR CALIBRATE EQUIPMENT, UNLESS POWER HAS BEEN SWITCHED OFF OR AREA IS KNOWN TO BE NON-HAZARDOUS.
2. SEAL WITHIN 18”
3. Must be connected to a Class 2 power supply



**Certificate:** 1984045  
**Project:** 70159942

**Master Contract:** 237484  
**Date Issued:** 2018-03-29

### *Supplement to Certificate of Compliance*

**Certificate:** 1984045

**Master Contract:** 237484 (237484)

*The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.*

### **Product Certification History**

<b>Project</b>	<b>Date</b>	<b>Description</b>
70159942	2018-03-29	Update CSA 142 to 61010 3rd Ed. 2. Add new explosionproof model PT-405 for Class I, Division 1, Groups C&D. Add "Single Seal" marking to PT-400, PT-405, and PT-500.
2587208	2012-12-17	Update to include revised documentation.
2517306	2012-08-22	Update to include revised schematics for the PT400-L1xxxx pressure sensor.
1984045	2008-03-04	PT-400 and PT-500 Pressure Transducers for use in Hazardous Locations as Intrinsically Safe and Non-Incendive





**Automation Products Group, Inc.**

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