



APG Series PT-500 Analog Output Models User Guide

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APG Series PT-500 Analog Output Models



Product Information

Specifications

- Output Options: 4-20 mA, 0-5 VDC, 1-10 VDC, mV/V
- Manufacturer: APG
- Model: PT-500
- Document Number: 9002823
- Part Number: 200246
- Revision: F
- Date: 09/2023

Introduction

Thank you for purchasing a Series PT-500 Analog Output model submersible pressure transmitter from APG. We appreciate your business! Please take a few minutes to familiarize yourself with your PT-500 and this manual.

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 at the back of this manual for further details.

Electrical ratings

- Input: 10 to 28 Volts DC; Output: 4-20 mA Exia Class I, Division 2; Groups C, D T4
- $V_{max} U_i = 28VDC$, $I_{max} I_i = 110mA$, $P_{max} P_i = 0.77W$, $C_i = 0F$, $L_i = 0H$ Install in accordance with drawing 9002803, sheet 2 (page 10).
- Input: 9 to 28 Volts DC; Output: 4-20mA Exia Class I, Division 1; Groups C, D T4
- $V_{max} U_i = 28VDC$, $I_{max} I_i = 110mA$, $P_{max} P_i = 0.77W$, $C_i = 0.042F$, $L_i = 0.320H$ Install in accordance with drawing 9002803, sheet 1 (page 9).

IMPORTANT: Your 4-20 mA PT-500 MUST be installed according to drawing 9002803 (Intrinsically Safe Wiring Diagram or Non-Incendive Wiring Diagram) as indicated above to meet listed approvals. Faulty installation will

invalidate all safety approvals and ratings.

Warranty and Warranty Restrictions

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.

Product Usage Instructions

- **Chapter 1: Specifications and Options**

This chapter provides detailed specifications and options for the Series PT-500 Analog Output models.

- **Chapter 2: Installation and Removal Procedures and Notes**

This chapter provides step-by-step instructions on how to install and remove the PT-500 Analog Output model. It also includes important notes to consider during the installation process.

- **Chapter 3: Maintenance**

This chapter provides information on how to properly maintain the PT-500 Analog Output model to ensure optimal performance and longevity.

- **Chapter 4: Hazardous Location Installation and Certification**

This chapter provides guidance on installing the PT-500 Analog Output model in hazardous locations. It also includes information on certification for hazardous location installations.

- **Intrinsically Safe Wiring Diagram**

This section provides a wiring diagram specifically for the Analog Output Models of the PT-500 that are intrinsically safe.

- **Non-Incendive Wiring Diagrams**

This section provides non-incendive wiring diagrams for the Analog Output Models of the PT-500.

- **CSA Certificate of Compliance**

This section includes the Certificate of Compliance from CSA (Canadian Standards Association) for the Analog Output Models of the PT-500.

- **Modbus Sensor**

If you have a Modbus sensor, please consult the factory at 1-888-525-7300 or visit our website at <http://www.apgsensors.com/support> for the appropriate manual for your sensor.

FAQ

- **Q: How long is the warranty period for the PT-500 Analog Output model?**

A: The warranty period for the PT-500 Analog Output model is 24 months.

- **Q: What should I do if I need to return my product for warranty service?**

A: Please contact Technical Support to receive a Return Material Authorization before shipping your product back.

Introduction

Thank you for purchasing a Series PT-500 Analog Output model submersible pressure transmitter from APG. We appreciate your business! Please take a few minutes to familiarize yourself with your PT-500 and this manual. PT-500 submersible pressure transmitters offer reliability in harsh industrial conditions and hazardous locations. The

4-20 mA model is certified intrinsically safe for hazardous areas in the US and Canada by CSA for Class I, Division 2, Groups C and D, Class I, Zone 2, Group IIB, and Class I, Division 1, Groups C and D, Class I, Zone 0, Group IIB environments. The small size, integrated electronics, wide operating temperature range, and durability make the PT-500 the perfect instrument for static and dynamic pressure measurement.

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 at the back of this manual for further details.

Electrical ratings

 Input: 10 to 28 Volts DC; Output: 4-20 mA
Exia Class I, Division 2; Groups C, D T4
Class I, Zone 2, Group IIB
AEx nC IIB T4: Ta: -40°C to 85°C
Ex nL IIB T4: Ta: -40°C to 85°C
Maximum Working Pressure: 10,000 PSI

$V_{max} U_i = 28VDC$, $I_{max} I_i = 110mA$, $P_{max} P_i = 0.77W$, $C_i = 0\mu F$, $L_i = 0\mu H$
Install in accordance with drawing 9002803, sheet 2 (page 10).

 Input: 9 to 28 Volts DC; Output: 4-20mA
Exia Class I, Division 1; Groups C, D T4
Class I, Zone 0, Group IIB
AEx ia IIB T4: Ta: -40°C to 85°C
Ex ia IIB T4: Ta: -40°C to 85°C
Maximum Working Pressure: 10,000 PSI

$V_{max} U_i = 28VDC$, $I_{max} I_i = 110mA$, $P_{max} P_i = 0.77W$, $C_i = 0.042\mu F$, $L_i = 0.320\mu H$
Install in accordance with drawing 9002803, sheet 1

IMPORTANT: Your 4-20 mA PT-500 MUST be installed according to drawing 9002803 (Intrinsically Safe Wiring Diagram or Non-Incendive Wiring Diagram) as indicated above to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

Warranty and Warranty Restrictions

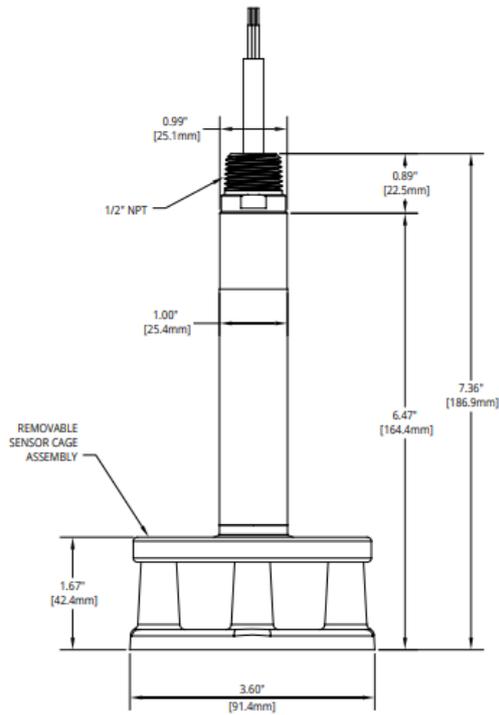
This product is covered by APG's warranty to be free from defects in material and workmanship under normal use and service of the product for 24 months. For a full explanation of our Warranty, please visit <https://www.apgsensors.com/about-us/terms-conditions>. Contact Technical Support to receive a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

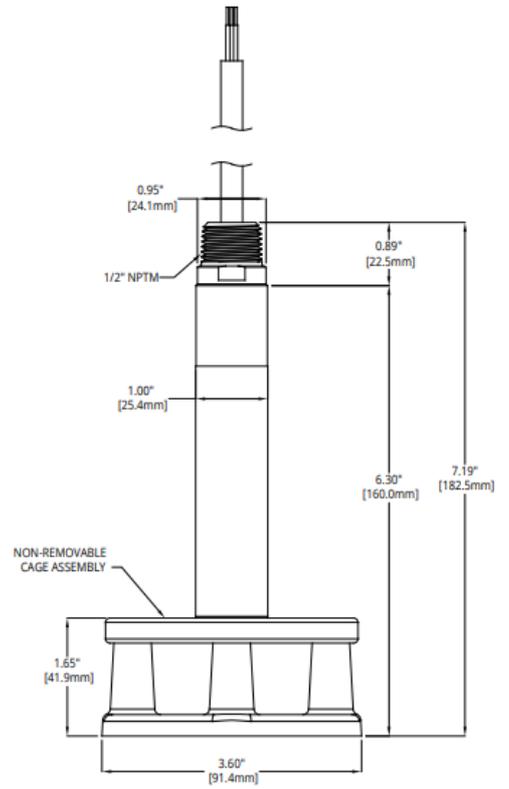


Specifications and Options

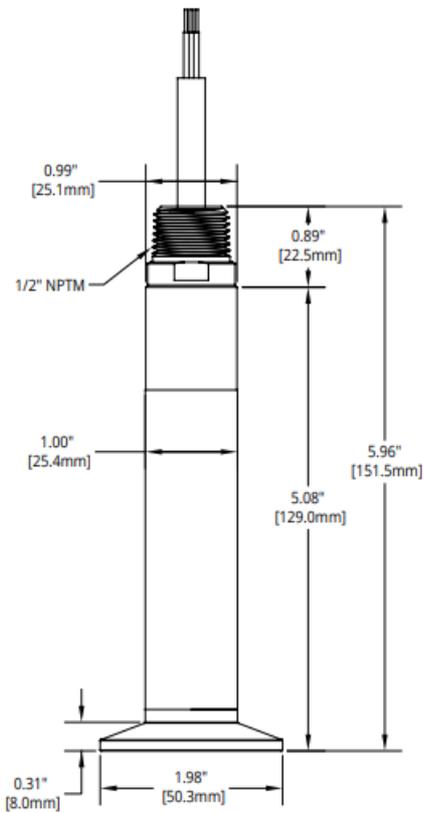
Dimensions



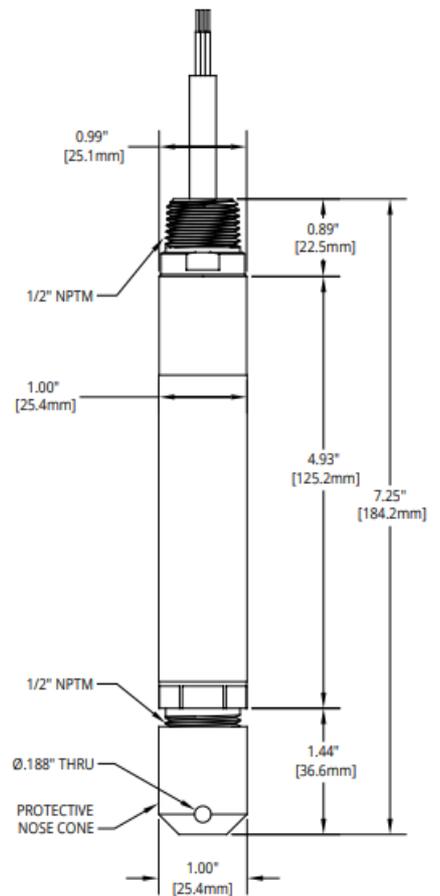
PT-500 with Reusable Cage



PT-500 with Welded Anti-s snag Cage



PT-500 with Tri-clover Sanitary Fitting



PT-500 with Removable Plastic Nose Cone

Specifications

• **Performance**

- **Pressure Ranges** 0 to 250 PSI
- **Analog Outputs** 4-20mA, 0/1-5VDC, 1-10VDC, mV/V
- **Over Pressure** 2X FSO
- **Burst Pressure** 3.0X FSO
- **1 Year Stability** 0.75% FSO

• **Accuracy**

- **Linearity, Hystereses & Repeatability** ±0.25% of Full Scale (BFSL) up to ±0.1% of Full Scale ±1.0% for 1 psi
- **Thermal Zero Shift @ 70 °F** ±0.045% FSO/°C (±0.025% FSO/°F)
- **Thermal Span Shift @ 70 °F** ±0.045% FSO/°C (±0.025% FSO/°F)

• **Environmental**

- **Operating Temperature** -40 – 85°C / -40 to 185°F
- **Compensated Temperature**
 - < 10 psi: 0° – 60°C / 32° – 140°F
 - > 10 psi: -10° – 70°C / 14° – 158°F
- **Maximum Submersible Depth** 575 ft / 175.25 m / 250 psi

• **Electrical**

Supply Voltage (at sensor)	4-20 mA: 9-28 VDC	1-10 VDC: 14-28 VDC
	0/1-5 VDC: 9-28 VDC	mV/V: 10 VDC*
Output Signal @ 21°C	3-30 mA max.	
Protection	Reverse Polarity and Surge (per IEC 61000-4-5)	
Load Limitation	$R_{(max)} = ((V_s - 12V)/0.02A) - (0.042\Omega \text{ per ft. of cable})$	
Startup Time	4-20 mA: 100 ms	1-10 VDC: 300 ms
	0/1-5 VDC: 300 ms	
Current Draw	4-20 mA: 3-30 mA	1-10 VDC: 3 mA
	0/1-5 VDC: 3 mA	

• **Materials of Construction**

- **Wetted Materials** 316L Stainless Steel
- **Anti-s snag Cage** 316L Stainless Steel
- **Cable** Urethane, PVC, or Hytrel
- **Protective Nose Cone** Delrin
- **Seal** Viton ETP-s

• **Mechanical**

- **Pressure Connection** See model number configurator for a complete list
- **Cable Tensile Strength** Up to 200 pounds

• **Patents**

- US Patent No. 7,787,330

Model Number Configurator

Model Number: PT-500 _____ - _____ - _____ - _____ - _____ - _____ - _____ - _____ - _____
A B C D E F G H I

A. Cable Type

- ▲ Urethane - Blue
- B Hytrel .31" Ø - Black
- C PVC - Black
- D Hytrel .25" Ø - Black

B. Pressure Range

- Specify range in desired unit of measure

_____ Max Water Depth
575 ft. (175.25 m), 250 psi

C. Standard Units of Measure

- PSI
- FTH2O
- INH2O
- MMH2O

D. Pressure Type (Venting) Range

- G Gauge (open vent tube) -- 0 - 250 psi
- A Absolute (sealed vent tube) -- 10 - 200 psi
- S Sealed (sealed vent tube) -- 4 - 20 psi

E. Output

- L1 ▲ 4-20 mA, 2-wire
- L3 0-5V, 4-wire*
- L9 10 mV/V, 4-wire*
- L12 1-5V, 4-wire*
- L21 1-10V, 4-wire*

- L5 Modbus RTU, 4-wire RS-485*†
Pressure reading only

- L31 Modbus RTU, 4-wire RS-485 *†
Level calculations, tank volume

Note: *Indicates this option does not yet have CSA Approvals.

Note: †Indicates Field Adjustable Zero feature is not included.

F. NPTM

- E0 ▲ 1/2" NPTM fitting for conduit, with pigtail
- E5 Pigtail without conduit connection

G. Process Connection

- P1 ▲ 1/2" NPTM with removable plastic nose cone
- P5 1/4" NPTF
- P37 Welded Cage (anti-snag 1 piece fitting)
- P38 1-1/2" tri-clover with 3/4" diaphragm
- P39 Reusable Cage (includes P38 fitting)

H. Accuracy

Greater than 1 PSI

- N0 ▲ ±0.25%
- N1 ±0.25% with NIST certification
- N2 ±0.1% with NIST certification

1 PSI and Below

- N3 ±1%
- N4 ±1% with NIST certification

I. Cable Length

- (specify length of cable needed in feet)

Note: ▲ Indicates this option is standard.

Electrical Pinout Table and Supply Power Table

PT-500 Analog Output Models Pin Out Table

		4-20 mA	Voltage
Pigtail	Red	+ Power/Signal	+ Power
	Black	- Power/Signal	- Power
	Green	-	+ Out
	White	-	- Out
	Shield Drain	Case Gnd	Case Gnd

Note: Either transducer case OR shield drain wire must be physically connected to low-impedance earth ground.

PT-500 Analog Output Models Supply Power Table

	4-20 mA	0-5 VDC	0-10 VDC	mV/V
Power Supply	9-28 VDC	9-28 VDC	14-28 VDC	10 VDC*

* mV/V output calibrated to 10 VDC input

Installation and Removal Procedures and Notes

Tools Needed

- Wrench-sized appropriately for your PT-500's process or conduit connection.
- Thread tape or sealant compound for threaded connections.

Physical Installation Notes

The PT-500 should be installed in an area—indoors or outdoors—that 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 NH₃, SO₂, Cl₂ etc.)
- Ample space for maintenance and inspection
- Class II power supply

Mounting Instructions

Your PT-500 can be mounted in three ways: via NPT process connection, free-hanging suspension, or conduit mounted. 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. Unravelling 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.
- For suspension mounting the PT-500, drill a 3/16" hole into a 1/2" NPTF to 1/2" NPTF hex coupler and secure it to the 1/2" NPTM coupler fitting of the PT-500. Attach a .060" diameter 316L SS cable of desired length to the hex coupler and secure the steel cable according to your application requirements.

NOTE: If your PT-500 has a vent tube, do not seal, cover, or close the vent tube with anything other than an APG-provided venting cap or desiccant drying cartridge (See Fig-ure 3.3 and 3.4). Unapproved seals or covers will prevent proper sensor operation.

Electrical Installation

- Attach the wires of your PT-500 to your control system according to the pinout table on page 4.

IMPORTANT: For lightning transient/surge protection to be effective, either PT-500 case OR shield drain wire, but not both, must be physically connected to low-impedance earth ground.

Removal Instructions

Removing your PT-500 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:

- For sensors installed via NPT process connection, make sure the pressure is completely removed from the line or vessel. 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).
- For suspended sensors, retrieve the sensor from the vessel. Follow any and all procedures for safely isolating any media contained inside the line or vessel.
- Carefully 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 process-connected PT-500 Pressure Transmitter while there is still pressure in the line could result in injury or death.

Maintenance

General Care

Your PT-500 series pressure transmitter is very low maintenance and will need little care as long as it is installed correctly. However, in general, you should:

- For process-connected sensors, 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 only with extreme care. If using a tool is required, make sure it does not touch the diaphragm.

IMPORTANT: Any contact with the diaphragm can permanently damage the sensor. Use extreme caution.

Zero Adjust (4-20 mA, 0-5 VDC, and 0-10 VDC only)

- The zero output (4mA, or 0 VDC) can be adjusted by holding a magnet perpendicular to the can, approximately 1-1/2" from the top or bottom of the can.
- Holding the magnet close to the top of the can increases the output (See Figure 3.1). Holding the magnet close to the bottom of the can decreases the output (See Figure 3.2).
- If the zero output values do not change right away, hold the magnet in place near the top of the can until the

values change, for up to two minutes.

- If there is no change, repeat the procedure near the bottom of the can. If there is still no change, consult the factory.
- Unvented PT-500 transmitters do not automatically adjust to changes in barometric pressure. We recommend that PT-500 transmitters be zeroed upon receipt and after major weather events.



Figure 3.1



Figure 3.2

NOTE: Span calibration must be done at the factory for all analog models.

Vent Tube Drying

- Condensation in the vent tube can damage the electronics in your sensor, resulting in unreliable readings. APG offers two methods of preventing vent tube condensation: a venting cap, and a desiccant drying cartridge.
- The venting cap is a PVC tube with a hydrophobic patch that allows moisture to pass out of the tube without allowing water in (See Figure 3.3). The cap is sealed by an o-ring, and is easily installed in the field.
- The desiccant drying cartridge with vent tube adapter absorbs any moisture in the vent tube to keep vapour from condensing (See Figure 3.4). The installation of the desiccant drying cartridge is quick and easy.
- Common installation methods are cable tie, Velcro, and cable clamps.



Figure 3.3



Figure 3.4

NOTE: Desiccant crystals change from blue to pink as they become saturated. Cartridge must be replaced when all crystals have saturated.

IMPORTANT: Do NOT use a desiccant cartridge in the presence of vapours or liquids containing phosphate esters, synthetic lubricants, hydrocarbon solvents, methanol, acetone, lacquer solvents, or other organics.

Repair and Returns

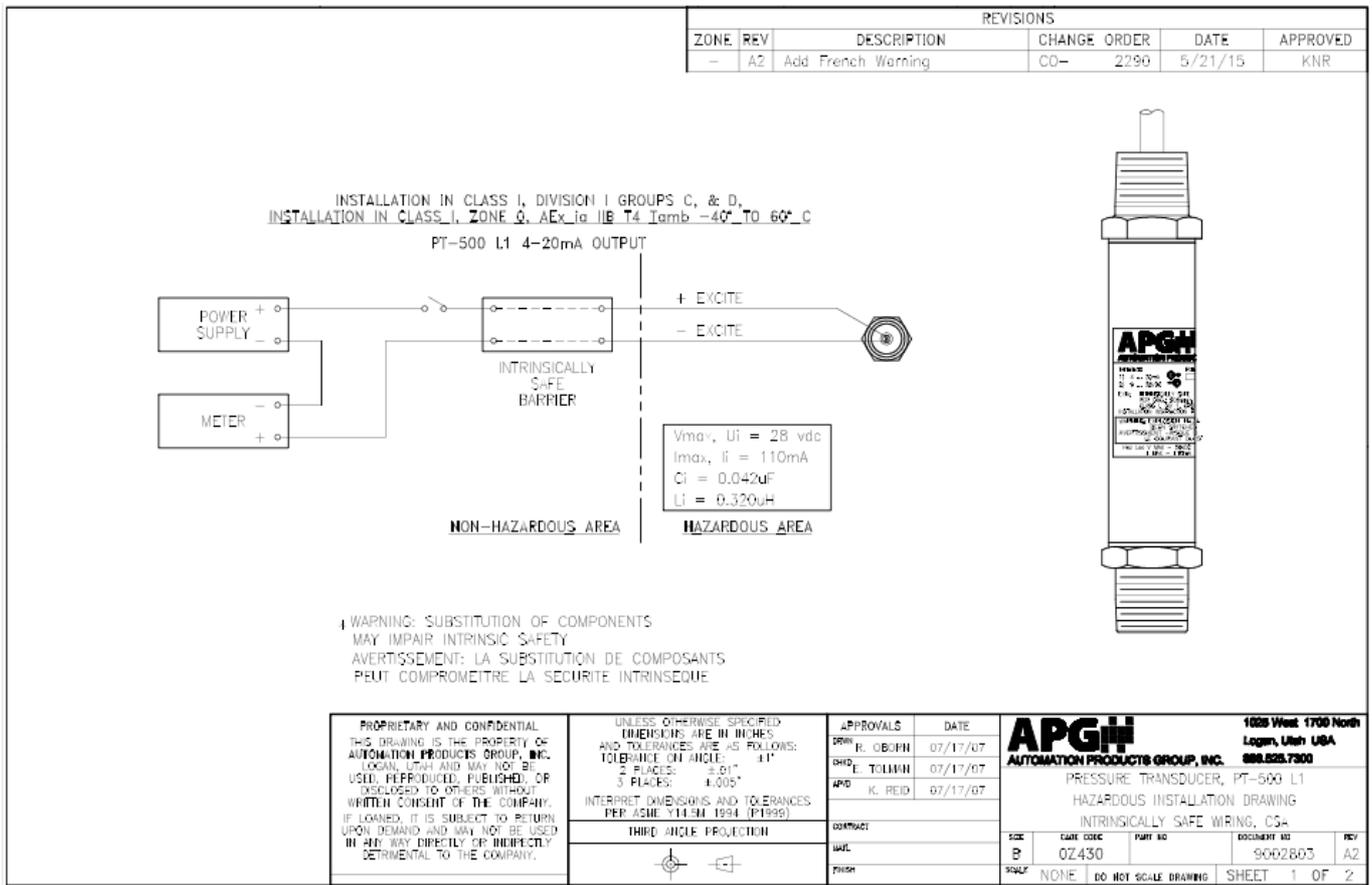
Should your PT-500 series pressure transmitter require service, please contact the factory via phone, email, or online chat. We will issue you a Return Material Authorization (RMA) number with instructions.

- **Phone:** 888-525-7300
- **Email:** sales@apgsensors.com
- **Online chat at** www.apgsensors.com

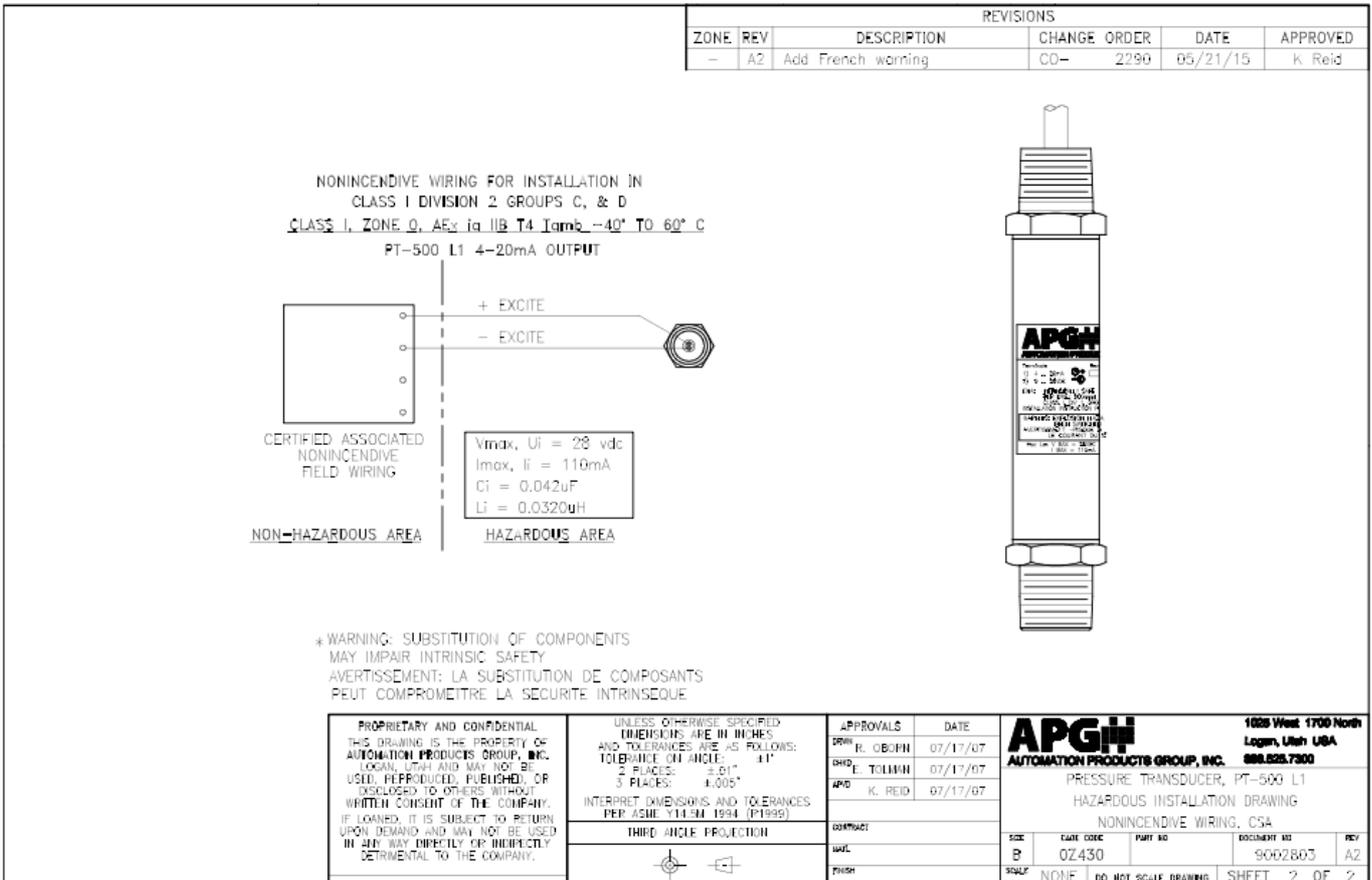
Please have your PT-500's part number and serial number available. See Warranty and Warranty Restrictions for more information.

Hazardous Location Installation and Certification

Intrinsically Safe Wiring Diagram



Non-Incendive Wiring Diagram



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; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$

AEx nC IIB T4; $-40^{\circ}\text{C} \leq \text{Ta} \leq +85^{\circ}\text{C}$

- 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



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

- The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety.
- 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.
- 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; $-40^{\circ}C \leq T_a \leq +85^{\circ}C$,

AEx ia IIB T4; $-40^{\circ}C \leq T_a \leq +85^{\circ}C$,

- 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°C to +85°C. Enclosure type: IP65. Single Seal. Intrinsically safe with the following entity parameters:

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

- Model PT-500-xxxx Pressure Transmitter; Maximum Ambient 85° C; Temperature Code T4; Maximum Working Pressure 10,000 PSI; Single Seal. Entity parameters as follows:

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

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 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_{DC}, 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.

Tel: 1/888/525-7300
Fax: 1/435/753-7490
www.apgsensors.com
sales@apgsensors.com

Documents / Resources

 <p>Series PT-500 - Analog Output Models User Manual 1-2018-03-29 10:00:00 AM</p> <p>APG#</p>	<p>APG Series PT-500 Analog Output Models [pdf] User Guide Series PT-500 Analog Output Models, Series, PT-500 Analog Output Models, Analog Output Models, Output Models</p>
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References

- [Industrial Sensor Manufacturer | APG, Inc.](#)
- [Contact Us | Automation Products Group, Inc.](#)
- [Privacy Policy | APG Sensors](#)
- [User Manual](#)

[Manuals+](#), [Privacy Policy](#)