



Installation Operation & Maintenance Instruction Manual

APT 500 Series

ATEX & IECEx Versions

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1. General Information

1.1 Safety instructions

To prevent any damage to the device or any injury to the user it is essential that you read the information in this document and observe applicable national standards and safety requirements.

This document is provided to help facilitate the safe and efficient operation of the instrument.

1.2 Normal operation and maintenance

There is no routine scheduled maintenance requirement for the APT 500. Periodic checks should be made to ensure all wiring/cable glands are in good condition and terminations secure. Where the APT 500 is used in applications liable to sludge or sedimentation, the sensing diaphragm should be examined at appropriate intervals to ensure it is free from contaminants which may obstruct true reading of pressure.

If cleaning is required, then EXTREME CARE must be taken to avoid damage to the diaphragm. Use a solvent or water to loosen and flush the deposits, and on no account use sharp or hard objects to scrape the diaphragm. If necessary, a soft brush may be used with care.

Damage caused to the diaphragm will result in loss of calibration and likely non-linearity / thermal sensitivity to the instrument.

1.3 Product liability and warranty

All apparatus is carefully examined and tested before leaving the PSM workshop and is sent out in perfect order and condition. We, therefore, give the following Guarantee which takes the place of any Guarantee by Statute, common law or otherwise. If within 12 months from date of dispatch, any defect or fault is discovered in any component of our manufacture, due to faulty material or bad workmanship, we undertake to make good the defect without charge, provided that notice is given to us immediately on the discovery of the defect and the defective components or parts thereof, are forwarded to us carriage paid for inspection. This guarantee does not apply to defects caused by ordinary wear and tear, misuse, neglect, or by circumstances over which we have no control.

Full terms and conditions are available from our website: www.psmmarine.com/about-us

1.4 Product returns

All equipment is carefully examined and tested before leaving the PSM workshop and is sent out in perfect order and condition.

Should it prove necessary to return any equipment for inspection, please ensure you follow the process:

- Contact PSM for an RMA form and number.
- Each instrument must be accompanied by an RMA with clear instructions as to the reason for return and what actions are requested.
- An explanation of the apparent fault together with details of the service conditions are also required.
- Health & Safety requirements mean that we must be fully aware of any potential hazards prior to working on returns.

Full terms and conditions are available from our website: www.psmmarine.com/about-us

1.5 EU conformity

This product meets all of the applicable EU Directives and is supplied with an EU Declaration.

2. Product description

2.1 Scope of delivery

Inspect the packaging and immediately report any signs of damage to your local agent or PSM Instrumentation.

- APT 500 Series - Specific model code will depend on your order specification.
- Installation Operation & Maintenance Instruction Manual.
- EU Declaration.

2.2 Instrument Storage

- Store the instrument in a dry location.
- Storage Temperature range -35°C to $+85^{\circ}\text{C}$.

2.3 Instrument Identification

Each instrument is marked with a unique information, that identifies type and construction options.

PSM INSTRUMENTATION LTD BURRELL ROAD HAYWARDS HEATH WEST SUSSEX RH16 1TW WWW.PSMMARINE.COM	MODEL CODE: (1) S/N: (2) RANGE (3) DATE OF MANUFACTURE: (4)	CONNECTION RED: (+) (10) BLACK: (-) (11) SCREEN:  (12)
SPECIFICATION T AMB: -30 --+85°C (5) SUPPLY INPUT: 10-28VDC (6) OUTPUT: 4-20mA (7) CONSTRUCTION: (8)	(9)  XXXX ITS18ATEX203153X APT500/I II (1) G Ui = 28VDC Pi = 0.7W Ex ia IIC T4 Ga li = 93mA Ci = 12nF Li = 0  IECEX ITS 18.0012X APT500/X	
WARNING: NON-METALLIC PARTS MAY PRESENT ELECTROSTATIC HAZARD. REFER TO MANUFACTURER INSTRUCTIONS.		

- (1) The model code defines the construction of the sensor. Refer to [4.2 Technical Data](#)
- (2) Unique Serial number consisting of the PSM sales order. For example, 260890, followed by two digits that denote the sensors specific identification from the sales order.
- (3) This is the actual range the sensor has been calibrated to, and in what units of measure.
- (4) The date of when the instrument was factory manufactured.
- (5) The operating temperature of the instrument.
- (6) The range of voltage that can be used for the instrument to operate. **
- (7) The signal that the instrument outputs.
- (8) The specific materials that have been used in the construction of the instrument.
- (9) Will identify the certificate number and any other additional conditions when the Instrument is going to be installed into the hazardous area.
- (10) Red is positive (+) of the 4—20mA loop.
- (11) Black is negative (-) of the 4—20mA loop.
- (12) The screen should be terminated 360° within the cable entry gland to the termination enclosure.

** The APT500 is a 2 wire 4-20mA transmitter therefore the maximum load in ohms that can be applied is determined by the available supply voltage based on the following formula

$$\frac{\text{Supply Voltage} - 10}{0.02} = \text{Load in Ohms}$$

Where the supply voltage is insufficient the transmitter will not be able to reach its full scale 20mA output.

2.4 Instrument measurement principle

APT 500 Series transmitters are designed for monitoring pressures on a wide range of applications. The measurement principle is based on a highly accurate and stable pressure sensitive MEMS piezo-resistive cell.

This pressure measurement cell is isolated from the process by a diaphragm with an internal fluid fill transmitting the process pressure to it. Precise temperature compensation and zero correction are applied during manufacture by laser trimming of compensation resistors.

The output from the measurement cell is converted by an internal circuit to an industry standard 4-20mA signal which is scaled to the user requirements.

The assembled sensor is fully encapsulated internally and a choice of construction materials for the wetted parts of the transmitter provide compatibility with most process fluids.

2.5 Instrument calibration

The APT 500 measures gauge pressure and is a fixed calibration sensor and is factory calibrated to either its nominal range or a specific range as specified by the user specified when ordering.

The measurement cell is vented to ambient air pressure through a vent tube in the sensors termination enclosure or DIN plug (whichever is used). This allows the outside ambient air pressure to be applied to the internal side of the cell to balance out ambient barometric pressure. Therefore, a vented gauge pressure sensor reads zero pressure when there is no process pressure applied.

Calibration of the sensors is undertaken at PSM using equipment with accuracy traceable to UKAS standards

3. Installation

3.1 Mechanical installation

Prior to installation it is recommended that the following checks are made:

- That the specific factory calibration is in accordance with the process parameters / tank height and that the APT 500 nominal range is suitable for the intended duty.
- Verify any instrument identification or tag number to ensure it is fitted in the correct location.

Instrument handling

Before and during installation the following precautions should be taken

- Do not touch the measurement cell of the APT 500 level transmitter or attempt to “simulate” a pressure being applied by manipulating the diaphragm. The diaphragm is highly sensitive and has a protective guard permanently attached.
- Do not apply mains voltage to any cable conductor.



Mounting

When mounting the unit, and depending upon the type of mounting, ensure that suitable gaskets or sealants are employed to provide pressure tight seals. The sensor should not be mounted where it will be subject to excessive or continuous vibration, extreme temperature fluctuation or risk of mechanical damage.

Mounting Options

The APT 500 has an 1/2” BSPP process connection with a Viton sealing ring. PSM can provide a number of adapters for alternative mounting of the APT 500, and pressure snubbers for applications where pressure spikes may be expected. Please contact for further details.

Flange options

Model	Flange	Holes	PCD	Bolt Size	A	B
---	DN20 PN16	4	75	M12	105	18
---	DN25 PN16	4	85	M12	115	18
---	DN40 PN16	4	110	M16	150	18
---	DN50 PN16	4	125	M16	165	18

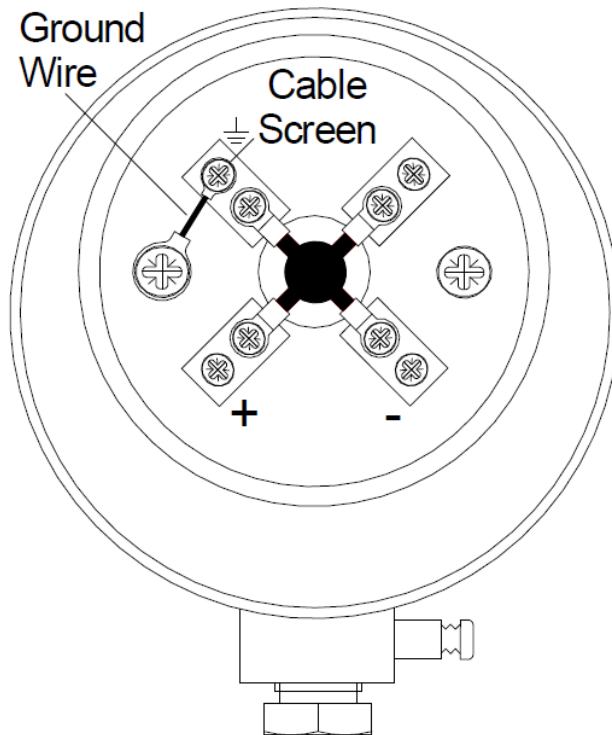
Note A minimum flange thickness of 18mm to prevent the sensor diaphragm from protruding past the face. The sensor should be tightened to 30 N-m and a Loctite 577 thread sealant, or equivalent, used.

3.2 Electrical installation

The APT 500 is 2 wire 4-20mA output transmitter.

Stainless Steel Terminal Head Connections

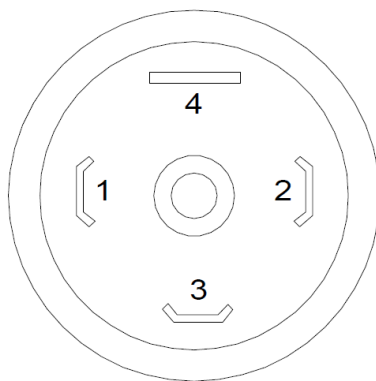
*Removable
Ground
Wire



APT500 CONNECTIONS		
+	Positive	Supply 4-20mA
-	Negative	
⏏	Cable Screen	

*Ground wire to remain fitted if sensor is grounded via its mounting thread and removed if the signal cable screen is used for ground connection.

DIN Plug Connections



APT500 DIN PLUG IDENTS		
Terminal 1	+ Positive	Supply 4-20mA
Terminal 2	- Negative	
Terminal 3	Not Used	
Terminal 4	Not Used	

The APT 500 may also be provided with ATEX or IECEx certification suitable for hazardous area installation. For such applications additional safety components are required to limit the amount of energy that can be transmitted from the safe to hazardous side.

Refer to the applicable sections in **4.1**.

Isolated power supplies

For all installations of the APT 500 it is important that the instrument is powered from an isolated power supply. The use of a non-isolated power source could lead to issues with any onboard earth fault monitoring system, unwanted earth current loops and the possibility of instability / interference caused by any other equipment on the same power supply.

4. Supplement

4.1 ATEX and IECEx requirements

For intrinsically safe installations the APT 500 units in the hazardous area must be connected to the safe area via approved safety barriers. These barriers fall broadly into two categories:

- Zener barriers (based on the shunt diode principle)
- Galvanic isolators

Either type of barrier may be employed subject to it meeting the required safety description. PSM can provide guidance on a range of suitable barriers.

Shunt diode Zener barriers provide a resistor to limit the current flow, a (non-replaceable) fuse to limit power and a Zener diode arrangement to limit voltage levels and provide a safe path to earth. Zener barriers tie the 0v side of the transmitter supply to earth either directly or via a diode arrangement. They must be connected to a high integrity earth to function as intended.

Intrinsically Safe Earth Connections are required to be made but should be made to a separate instrumentation 'Clean Earth'.

There are generally two earthing systems recognised. The so-called 'dirty earth' has all the non-critical data equipment and general equipment attached to it. The 'clean earth' has all the critical data systems attached to it on the basis that less 'noise' will be found on this earth.

Galvanic Isolators provide full galvanic isolation between safe area and hazardous area circuits with power limiting achieved by using a diode resistor network similar to that of a shunt-diode barrier. They do not require a high integrity earth, each side may be earthed independently overcoming potential issues with earth loops.

For all intrinsically safe installations of the APT 500 it is essential that this instrument is powered from an isolated power supply. When a zener barrier is employed for power limiting this will effectively tie the sensor supply 0V to earth, meaning a non-isolated power source can lead to issues with any onboard earth fault monitoring system, resulting in unwanted earth current loops and instability / interference caused by any other equipment on the same power supply.

The use of an isolated supply means that there is no direct connection between the 0 volts / I.S. earth at the sensor and the 0 volts at the ships supply.

APT 500/I ATEX Approval

The optional intrinsically safe version of the APT 500/I is covered by the following certification for use in hazardous areas.

Approval Certification

- ITS18ATEX203153X



Ex ia IIC T4 (T amb -30°C to +85°C)

ia Intrinsic Safety
IIC Acetylene & Hydrogen (Presence of Flammable/Combustible gas)
T4 135°C (Maximum Surface Temperature)

Barrier selection

When selecting a Barrier the following parameters must be complied with:

Ui = 28Vdc
Ii = 93mA
Pi = 0.7W
Li = 0
Ci = 12nF

Conditions of Certification

Non-metallic parts on the exterior of the pressure transmitter may present an electrostatic charging hazard.

Warning – Potential electrostatic charging hazard. Clean only using a damp cloth.

Where external parts of the pressure transmitter incorporate light metal components (i.e. in excess of 10 % in total of aluminium, magnesium, titanium and zirconium), the sensor must be protected from impact such that impact / friction sparks cannot occur, taking into account rare malfunction.

Installation requirements

The following standard should be followed when carrying out a hazardous area installation:
60079 Part 14.

Strictly no modifications or user repairs are allowed.

If any problems occur with the equipment, please contact PSM Instrumentation.

APT 500/X IECEx Approval

The optional intrinsically safe version of the APT 500/X is covered by the following certification for use in hazardous areas.

Approval Certification

- IECEx ITS 18.0012X

Ex ia IIC T4 (T amb –30°C to +85°C)

ia Intrinsic Safety

IIC Acetylene & Hydrogen (Presence of Flammable/Combustible gas)

T4 135°C (Maximum Surface Temperature)

Barrier selection

When selecting a Barrier the following parameters must be complied with:

Ui = 28Vdc

Ii = 93mA

Pi = 0.7W

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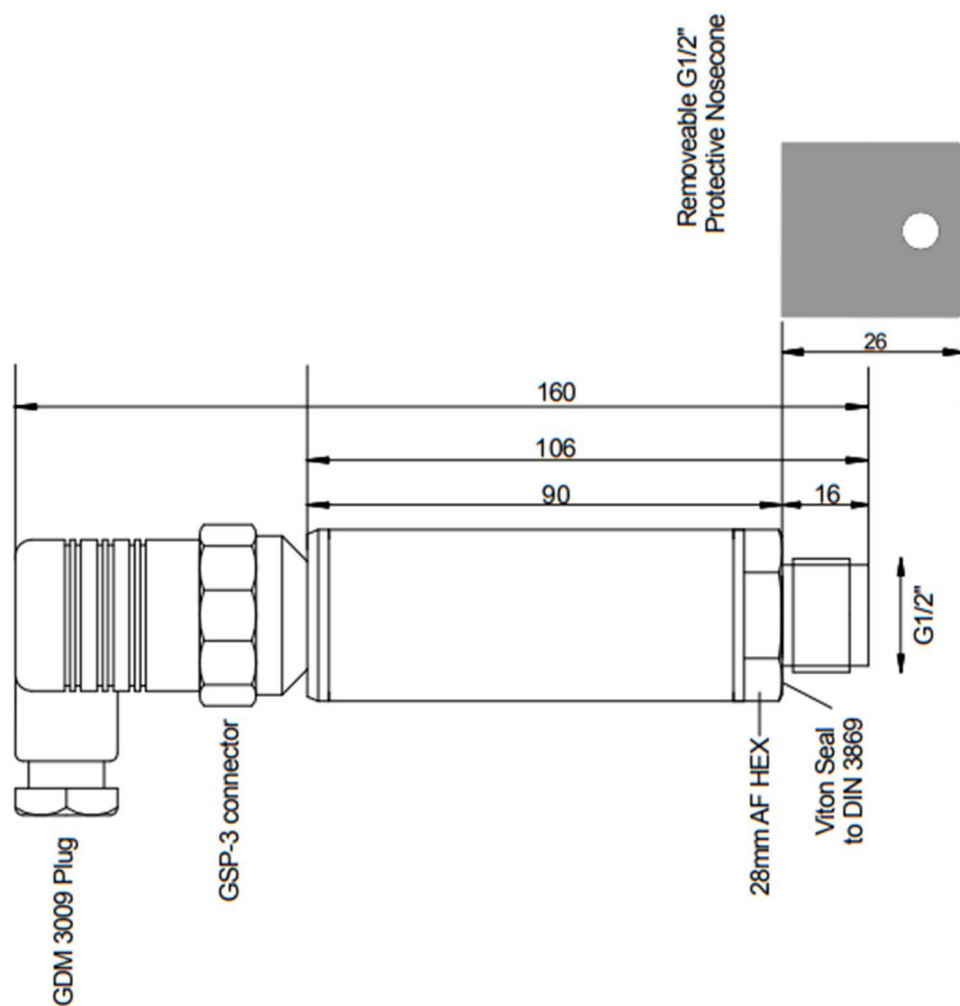
4.2 Technical Data

Specifications		
Materials	Sensor body	316L Stainless Steel or Titanium
	Diaphragm	As above
	Terminal Head	DIN Plug - ABS : Terminal Head - 316L St. Steel
Standard Measurement Ranges (Bar)	0.5, 1.0, 2.5, 4.0, 10, 25, 40.	
Measurement type	Vented Gauge	
Overload	2 x Nominal range with no effect	
Span accuracy	0.2% within compensated range	
Zero accuracy	0.2% within compensated range	
Total Error Band	± 0.2% of Nominal range at reference conditions of 25°C	
Thermal compensation	Max ± 0.0075% of Nominal range for Zero & Span /°C from reference	
Long term stability	Error not exceeding 0.1% Per Annum	
Max / Min process temperature	-30 to +85°C	
IP Rating	IP65 DIN Plug - IP67 Terminal Head	
IECEX certification	IECEX ITS180012X.0 Ex ia IIC T4 Ga -30°C ≤ Ta ≤ +85°C	
ATEX certification	ITS18ATEX203153X Issue 0 Ex ia IIC T4 Ga -30°C ≤ Ta ≤ +85°C	
Signal Output / Power supply	4-20mA / 18-30V DC	
Reverse Polarity Protection	Yes	
Maximum load	Supply dependant. Vs-18/0.02 = Load in Ohms	
Weight	0.35 - 0.5Kg (typical)	

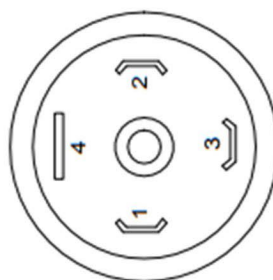
4.3 Model Code

APT 500 Series Analogue 4-20mA Pressure Transmitter			
500D	APT 500 Level / Pressure Transmitter with Din Plug 43650		
500H	APT 500 Level / Pressure Transmitter with Stainless Steel Terminal Head		
I.S. Certification			
S	Hazardous Area Approval NOT APPLICABLE		
I	Certified Intrinsically Safe to ATEX - Hazardous Area Approved		
X	Certified Intrinsically Safe to IECEx - Hazardous Area Approved		
U	Certified Intrinsically Safe to UKCA - Hazardous Area Approved		
IX	Dual Certification ATEX / IECEx - Hazardous Area Approved		
Measurement Type			
G	Gauge		
Nominal Range			
B	0.5 Bar		
C	1.0 Bar		
D	2.5 Bar		
E	4.0 Bar		
F	10 Bar		
H	25 Bar		
I	40 Bar		
Process Connections / Fitting Options			
1	G1/2" Male (Standard)		
Transmitter Body Material			
TI	Titanium (Body & Diaphragm) with Din Plug 43650		
	Titanium (Body & Diaphragm) with Stainless Steel Terminal Head		
SS	Stainless Steel (Body & Diaphragm)		
Orientation - Applicable to 0.5 & 1Bar Transmitters Only			
H	Horizontal (Default)		
V	Vertical with Diaphragm Facing Down		
U	Vertical with Diaphragm Facing Up		
4-20mA Calibrated Range			
N	Calibrated to Nominal Range		
Y	Calibrated Range Specified		
Optional Pressure Snubber			
100934	Pressure Snubber / Spike Suppressor - G 1/2 Female to G 1/2 Male		

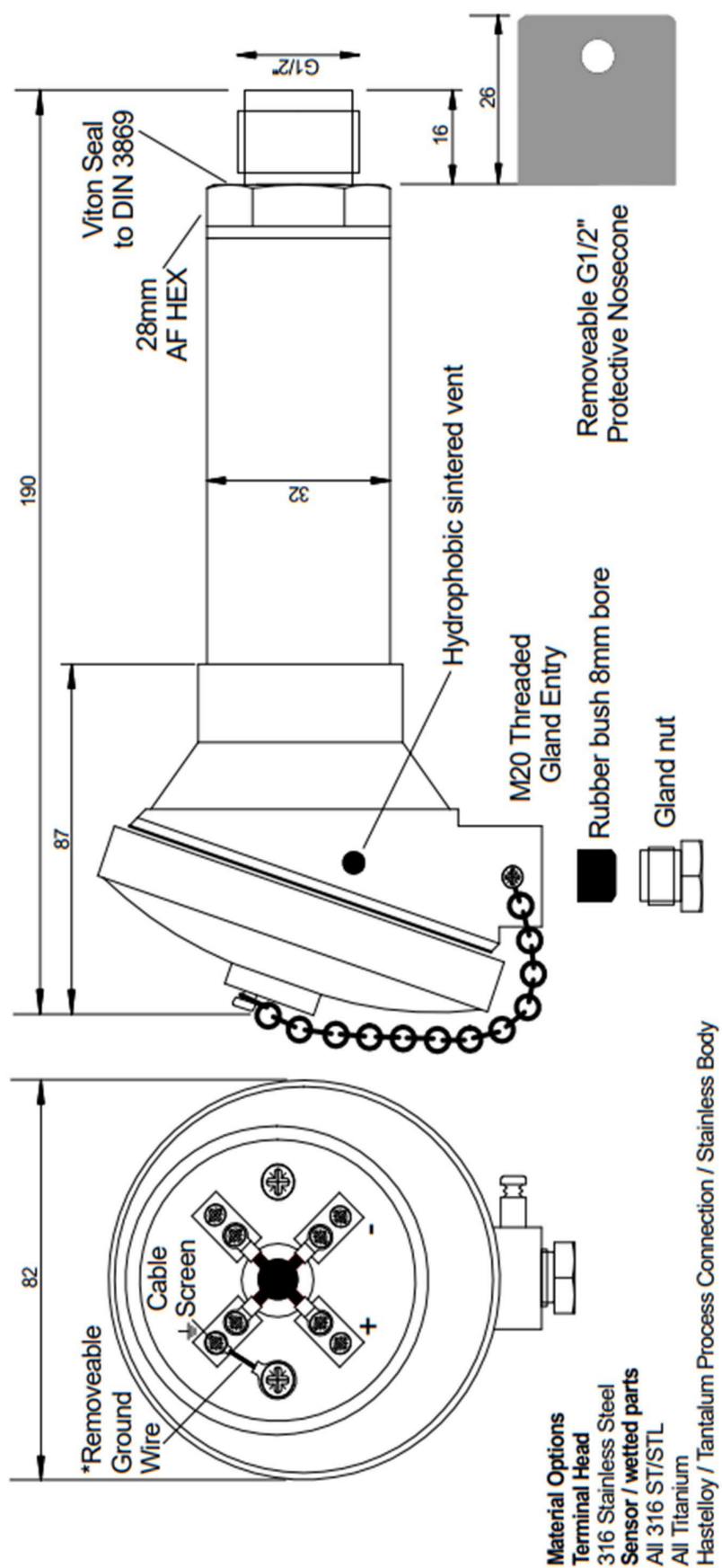
4.4 Dimensions—DIN terminal head version



APT500 DIN PLUG IDENT'S			
Terminal 1	+ Positive	Supply	4-20mA
Terminal 2	- Negative		
Terminal 3	Not Used	RS485	Data
Terminal 4	Not Used		



4.5 Dimensions—Stainless Steel terminal head version



PSM WEEE Producer Registration No WEE/HC0106WW

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