

SMART PRESSURE TRANSMITTER

For Gauge And Absolute Pressure Measurement

Application Areas:

- Nuclear
- Water & Wastewater
- Chemicals
- Petrochemical
- Oil & Gas
- Pulp & Paper
- Food & Beverage,
- Pharmaceutical
- Power
- Renewable Energy
- Alternate Fuel



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SMART PRESSURE TRANSMITTER

"Autrol America Inc. (AAI) range of transmitters includes a complete range of "intelligent" high performance transmitters for Temperature, Gauge, Absolute, Vacuum & Differential pressure measurements for standalone monitoring and/or closed loop control applications. These "intelligent" microprocessor-based "Smart" transmitters features a two-wire loop powered 4 to 20mA current outputs with "Digital" HART as standard (Foundation Fieldbus optional) communication(s) for seamless integration with a host control system such as DCS, PLC, SCADA, AMS, PDM and/or a local Hand Held Communicator(HHC)."

Description of Product

The APT3200 series of smart transmitters have excellent stability, high accuracy and include features that facilitate easy installation, start up and minimum maintenance thereby lowering process downtime and overall cost of ownership in the long run.

Autrol transmitters are equipments with analog (4/20mA- 2 wire) and digital (HART or Foundation Fieldbus) communication protocols for seamless integration with a host Control System such as DCS, PLC, SCADA, AMS, PDM and/or Hand Held Communicator (HHC). Through Digital HART Protocol one can easily acquire process measured variable, configure and modify its various Parameters (Range, Tag Name and Damping, Transfer Function, Trimming).

These transmitters are equipped with an automatic temperature compensation function integrated into its advanced signal processing circuitry to ensure high reliability and performance corresponding to change of ambient temperature.



Features

- Superior Performance
- High Reference Accuracy : $\pm 0.075\%$ of Calibrated Span
- Long-Term Stability
- High Rangeability (100 : 1)
- Flexibility
- Data Configuration with HART Configurator
- Zero Point Adjustment
- Reliability
- Continuous Self-Diagnostic Function
- Automatic Ambient Temperature Compensation
- Fail-mode Process Function
- EEPROM Write Protection
- CE EMC Conformity Standards(EN5081-2, EN50082-2)

Function

- Flexible Sensor Input : GP, AP, Vacuum
- Various Output : 4 ~20mA , Digital Signals
- Setting Various Parameters : Zero/Span, Trim, Unit, Fail-mode, etc
- Self Diagnostic Function : Sensor, Memory
- A/D Converter, Power, etc
- Digital Communication with HART protocol
- Explosion-proof Approval & Intrinsic Safety Approval : KOSHA, KTL, CSA,FM, ATEX

SMART PRESSURE TRANSMITTER

TRUE SMART

The heart of Autrol smart transmitter is a microprocessor-based high performance module. In addition, each transmitter is ambient temperature characterized using state-of-art technologies to ensure maximum transmitter accuracy and minimized drift over a wide range of operating temperatures.

On integrated sensor models such as in APT3200 series transmitters the characteristics data of its sensor are stored in internal non-volatile EEPROM to minimize measuring error. On non sensor transmitter models such as ATT2100 temperature transmitters, it has a linearization table built in wherein user can modify the various necessary values in field per the added temperature sensor (RTD or T/C) characteristics to get better accuracy from the overall measurement system. Its integral microprocessor module then automatically converts the required value referring to the customized linearization table.

All transmitters include advanced self diagnostic functions for detecting any malfunctions of sensor and/or fault of A/D converter, internal memory and microprocessor. All diagnostic/error status is transmitted to a connected Master by analog current signal (fail mode current 3.75mA or 22mA) or digital HART (or FF) communication.

The transmitters have Last Value Status (L V S) function for safety of instrumentation. When the sensor input occurs in abnormal status, output is fixed to the previous value and when the recovery to normal status, output is updated to the current value. If abnormal status of sensor is being continued during the defined interval, the fault is recognized as a sensor failure & reported accordingly for corrective action.

OPEN ARCHITECTURE

Using a Device Master (AMS, PMD etc) or a hand-held terminal, PC configuration program or HART Compatible DCS, PLC or SCADA the user can change, modify and review parameters of smart transmitter through HART communication. These functions provide convenience for your calibration and maintenance practice.

FIELD PROGRAMMABLE

All Autrol transmitter have a fully programmable front panel from which users can directly input values (e.g. range, zero/span, sensor type, thermocouples, RTD and mV and automatic temperature compensation) to reduce cost of installation and commissioning eliminating need of a additional configuration tools.

Stable Measurable Accurate Reliable Transmitters

SMART PRESSURE TRANSMITTER

Electronics Module

The Electronics module consists of a circuit board sealed in an enclosure. There is a MCU module, a power module, an analog module, a LCD module and a terminal module included within the transmitter. All circuit boards are tropicalised suitable for hot and humid, and damp and cold climates.

The MCU modules acquire the digital value from the analog module and apply correction coefficients selected from EEPROM. The output section of the power module converts the digital signal to a 4~20 mA output. The MCU module communicates with the HART-based Configurator or Control Systems such as DCS. The Power modules have a DC-to-DC Power conversion circuit and an Input/output isolation circuit. An optional LCD module plugs into the MCU module and displays the digital output in user-configured unit.

Sensor Inputs

The model APT3200 is available in an absolute pressure sensor of a piezo-resistive type and measures absolute pressure.

The sensor module converts the capacitance or the resistance to the digital value. The MCU module calculates the process pressure based on the digital value.

The sensor modules include the following features

- +/-0.075% accuracy, the most accurate sensor in the industry.
- The software of the transmitter compensates for the thermal effects, improving performance.
- Precise Input Compensation during operation is achieved with temperature and pressure correction coefficients that are characterized over the range the transmitter and stored in the sensor module EEPROM memory.

- EEPROM stores sensor information and correction coefficients separately from MCU module, allowing for easy repair, reconfiguration and replacement

Basic Setup

ATP3200 Pressure transmitter can be easily configured from any host that supports the HART protocol.

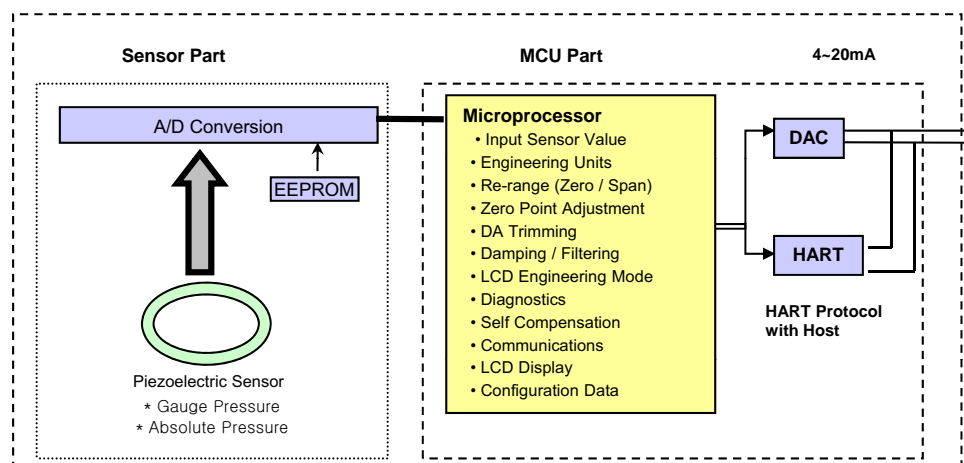
- Operational Parameters
- Operational Parameters.
- 4~20mA Points (Zero/Span)
- Engineering Units
- Damping Time: 0.25 ~ 60 sec
- Tag: 8 alphanumeric characters
- Descriptor: 16 characters
- Message: 32 characters.
- Date: day/month/year

Calibration and Trimming

- Lower/Upper Range (zero/span)
- Sensor Zero Trimming
- Zero Point Adjustment
- DAC Output Trimming
- Transfer Function
- Self-Compensation

Self-Diagnosis and Others

- CPU & Analog Module Fault Detection
- Communication Error
- Fail-mode Handling
- LCD Indication
- Temperature Measurement of Sensor Module



SMART PRESSURE TRANSMITTER

Range and Sensor Limits

Refer to Table 1

Zero and Span Adjustment Limits

- Zero and span values can be set anywhere within the range limits stated in Table 1.
- Span must be greater than or equal to the minimum span stated in Table 1

Output (Analog Current and Digital Data)

- Two wire 4~20mA user-configurable for linear output, digital process value superimposed on 4~20mA signal, available to any host that conforms to the HART protocol

Power Supply & Load Requirement •

- **External power supply required**
Transmitters operate on 11.9 to 45 V dc.
* 250 ohm load-- 17.4 Vdc
* Up to a 550 ohm load -- 24 Vdc
Max. Loop Resistance = $(E - 11.9)/0.022$
(E = Power Supply Voltage)
- **Supply Voltage**
11.9 ~ 45 Vdc -- operation
17.4 ~ 45 Vdc -- HART Communications
11.9 ~ 42 Vdc -- CSA Approval
- **Loop Load**
0 ~ 1500 ohm – Operation
250 ~ 550 ohm -- HART Communications

EMC Conformity Standards

- EMI (Emission) – EN50081-2:1993
- EMS (Immunity) – EN50082-2:1995

Update Time and Turn-On Time

- Update Time : 0.12 seconds
- Turn-On Time : 3 seconds

Failure Mode

- Fail High : Current \geq 21.1 mA
- Fail Low : Current \leq 3.78 mA

Storage Temperature

- -40⁰ C to 85⁰ C (without condensing)

Process Temperature Limits

(Range codes and approval codes may affect limits)

- -40⁰ C to 120⁰ C (-40 to 248⁰ F)

Isolation

- Input/output isolated to 500Vrms (707 Vdc)

Overpressure Limits (silicone oil)

Overpressure Limits (silicone oil)

Model G	-100 ~ 400 KPa	----- # 3
	-100 ~ 4000 KPa	----- # 4
	0 ~ 14,000 KPa	----- # 5
	0 ~ 70,000 KPa	----- # 6
	0 ~ 80,000 KPa	----- # 7
Model A	0 ~ 700 KPa	----- # 4
	0 ~ 4000 KPa	----- # 5
	0 ~ 7000 KPa	----- # 6

Physical Specifications

Wetted Materials

- Isolating Diaphragms ----316L SST, Monel, Tantalum, HAST-C

Non-wetted materials

- Fill Fluid -----Silicone oil
- Electronics Housing ---Aluminum, Flameproof and Waterproof (IP67)
- Cover O-ring -----Buna-N
- Paint -----Epoxy-Polyester or Polyurethane
- Mounting Bracket -----2-inch Pipe, 304 SST, Painted Carbon Steel
with
304 SST U-bolt
- Nameplate -----304 SST

Electrical connections

- 1/2-14 NPT conduit with M4 Screw Terminals

Process Connections

- 1/2-14 NPT Female
- 1/4-18 NPT (option)

Weight

- 1.7 kg (excluding options)

SMART PRESSURE TRANSMITTER

Hazardous Location Certifications (option)

KOSHA Approvals (KOSHA: Korea Occupational Safety & Health Agency)

K1 Code:

Flameproof for Class I, Zone 1: Ex d IIC T6, IP67
Ambient Temperature: -20 to 60 °C
Max. Process Temperature: 80 °C
Power Supply: Max. 45 Vdc
Output: 4 to 20 mA + HART, Max. 22 mA

KTL Certification (KTL: Korea Testing Laboratory)

K2 Code:

Intrinsic Safety: Ex ia IIC T5
Ambient Temperature: -20 to 60 °C
Max. Process Temperature: Max. 100 °C
Entity Parameter: Umax=40Vdc, Imax=165mA,
Pmax = 0.9W

CSA (Canadian Standards Association) Approvals

C1 Code:

“SEAL NOT REQUIRED”

Explosion proof for Class I, Division 1,
Groups A, B, C & D
Dust-ignition proof for Class II, Division 1,
Groups E, F & G; Class III
Flameproof for Class I, Zone 1: Ex d IIC
“T6, See Instruction for temperature code if
process temperature above 85 °C”
Class I, Division 2, Groups A, B, C, D;
Class II, Division 2, Groups E, F, G;
Class III T4
Non sparking Equipment for Class I Zone 2:
Ex nA IIC T4
Enclosure: Type 4x, IP66
Power Supply: 11.9 to 42 Vdc Max.
Output Signal: 4 to 20 mA + HART


FM (Factory Mutual explosion proof) Approvals

F1 Code:

Explosion proof for Class I, Division 1
Groups A, B, C and D
Dust-ignition proof for Class II, Division 1,
Groups E, F and G
Dust-ignition proof for Class II, Division 1
“T6, see instruction for temperature code if
Process temperature above 85°C”
Ambient Temperature: -20 to 60°C
Enclosure: indoors and outdoors, NEMA Type 4X
Conduit seal required within 18” for Group A only.
Nonincendive for Class I, Division 2, Groups A, B,
C & D
Class II, Division 2, Groups E, F & G; and Class
III, Division 1,
Temperature Code T4
Ambient Temperature: -20 to 60°C
Enclosure: indoors and outdoors, NEMA Type 4X

ATEX Approvals

E1 Code:

ATEX Certificate number: KEMA07ATEX0103
CE0344  II 2 G
Ex d IIC T6 or T5

Operating Temperature: -20°C ≤ Tamb ≤ +60°C
T6 for process < 85°C; T5 for process < 100°C

** If you need to order the model with the certificate of CSA, FM and ATEX, Please contact the manufacturer before order.*



SMART PRESSURE TRANSMITTER

General Specifications

1) APT3200 –G/A Pressure Sensor Range (Rangeability = 100 : 1)

Table 1

	APT3200 – G		APT3200 - A	
	Range (KPa)	Calibrated Span (KPa)	Range (KPa)	Calibrated Span (KPa)
3	-100 ~ 150	1.5 ~ 150	NA	NA
4	-100 ~ 1,500	15 ~ 1,500	0 ~ 250	2.5 ~ 250
5	0 ~ 5,000	50 ~ 5,000	0 ~ 1,500	15 ~ 1,500
6	0 ~ 25,000	250 ~ 25,000	0 ~ 2,500	25 ~ 2,500
7	0 ~ 60,000	600 ~ 60,000	NA	NA

2)Electrical Specifications

Power Supply	11.9 ~ 45 Vdc	Output Signal	4 ~ 20 mA dc/HART
HART loop resistance	250 ~ 550 ohm	Isolation	500 Vrms (707 Vdc)

3)Performance Specifications

Reference Accuracy	$APT3200 - G/APT 3200 - A$ $\pm 0.075\%$ of Span ($0.1URL \leq Span \leq URL$) $\pm [0.025 + 0.005 \times (URL/Span)]\%$ of Span ($0.01URL \leq Span < 0.1URL$)	Ambient Temperature	-40°C ~ +85°C
		LCD Meter Ambient Temp.	-30°C ~ +80 °C
		Humidity Limits	5% ~ 98% RH
Ambient Temperature Effect	$APT3200 - G/APT 3200 - A$ $\pm [0.019\%URL + 0.125\% Span] / 28^\circ C$	Process Temperature Limits	-30°C ~ +100°C
		Power Supply Effects	$\pm 0.005\%$ of Span per Volt
		Stability	$APT3200-G/APT3200 - A$ $\pm 0.125\%URL$ for 12 months

4)Physical Specifications

Isolating Diaphragm	316L SST	Process Connection Size	1/2 – 14 NPT Female
Electronic Housing	Aluminum(Option: SST)	Electrical Connections	1/2 – 14 NPT with M4
Housing Class	Waterproof (IP67)	2" Pipe Stanchion Type bracket	Angle or Flat type
		Weight (excluding Option Items)	1.7 Kg

5)Hazardous Location Certifications (option)

Available Approval
Flameproof Approval : Ex d IIC T6 (KOSHA) Intrinsic Safety Approval : Ex ia IIC T5 (KTL) CSA (Canadian Standards Association) FM Explosion proof approval ATEX Flame proof Approval

ORDERING INFORMATION

APT3200 SERIES -SMART PRESSURE TRANSMITTERS				G	A		
APT3200-G Gauge Pressure Transmitters				Y	X		
APT3200-A Absolute Pressure Transmitters				X	Y		
SENSOR RANGE CODES MINIMUM (LRL) TO MAXIMUM (URL)// MINIMUM SPAN (URL-LRL)							
APT3200-G		Minimum SPAN		APT3200-A			
				Minimum Span			
3	-14.5 to 21.5 psig	0.215 psig/6.02 inH2O		NA	NA		
4	-14.5 to 217.5 psig	2.17 psig/ 60.2 inH2O		0 to 36 psi	0.36 psig/10.03 inH2O		
5	0 to 725 psig	7.25 psig/ 500 mbar		0 to 217 psi	2.17 psig/ 60.2 inH2O		
6	0 to 3625 psig	36.25 psig/ 2.5 bar		0 to 362 psi	3.62 psig/100.3 inH2O		
7	0 to 8700 psig	87.02 psig/ 6 bar		NA	NA		
XX	Special			Special			
MOUNTING - FLANGE SIZE/MATERIAL							
FLANGE/ADAPTERS		DRAIN/VENT		DIAPHRAGM			
M11	316SST	316SST		316LSST			
M12	316SST	316SST		Hast-C			
M13	316SST	316SST		Monel			
M21	Hast-C	Hast-C		Hast-C			
XX	Special						
HAZARDOUS LOCATION CERTIFICATIONS							
K0	General Purpose (IP67/ NEMA4X)				Y	Y	
K1	KOSHA Flameproof Approval : Ex d IIC T6				Y	Y	
K2	KTL Intrinsic Safety Approval : Ex ia IIC				Y	Y	
E1	ATEX (KEMA) Flameproof Ex d IIC T6 or T5				Y	Y	
E2	ATEX (KEMA) Intrinsic Safety (pending)				Y	C.F	
F1	FM/FMC Explosion proof (for USA & Canada) Class I/II/III , Division 1/2 , Group A-D/E-G				Y	Y	
F2	FM Intrinsic Safety (pending)				C.F	C.F	
FILL FLUID							
1	Silicone DC200				Y	Y	
2	Inert fill Fluid (Halocarbon Oil)				CF	CF	
XX	Special				CF	CF	
PROCESS CONNECTION							
S	1/2 - 14 NPT Female (Standard)				Y	Y	
O	1/4 - 18 NPT Female (Adapter)				Y	Y	
XX	special				CF	CF	
ELECTRICAL CONNECTION							
1	1/2 - 14NPT		(Epoxy Coated-Aluminium)			Y	Y
2	G1/2		(Epoxy Coated-Aluminium)			Y	Y
NA	Special				CF	CF	
OPTIONS							
M1	LCD Indicator				Y	Y	
LV ⁽¹²⁾	Low Voltage 1-5v, 4 wire (FM pending)				Y	CF	
K	Oil Free Finish				Y	Y	
LP	Lighting Protector (Internal Type)				Y	Y	
2WR	2 Way Manifold (SST) Remote Type				Y	Y	
2WF	2 Way Manifold (SST) Flange Type				Y	Y	
BA	Stainless Steel Bracket (Angle type) with SST Bolts				Y	Y	
BF	Stainless Steel Bracket (Flat type) with SST Bolts				Y	Y	
BH	Stainless Steel Bracket (Angle type) with SST Bolts for Horizontal pipe mounting				Y	Y	
UBA ⁽⁵⁾	Angle Bracket Shipped Loose, Box packed, includes bracket + U Bolt + Mounting Screws				Y	Y	
UBF ⁽⁵⁾	Flat Bracket Shipped Loose, Box packed, includes bracket + U Bolt + Mounting Screws				Y	Y	
ST	Stainless Steel (SUS 316) Housing- w/ General Purpose approvals, FM pending				Y	Y	
TCB	Tropicalised Circuit Board				Y	Y	
ABS	Certificate of Conformance for Marine Approvals				Y	Y	
NC	Certificate of Conformance to NACE MR0175: 2002				Y	Y	
MC	Positive Material Identification (PMI) Material Certificate				Y	Y	
FC	Factory Calibration to customer specified measurement range. (Standard Cal. is full published range code).				Y	Y	
TAG	SS Tag (Must specify Tag# on order)				Y	Y	
CPC#	Custom Product Code (Special Construction CPC # XXX)				CF	CF	
WX5 ⁽⁴⁾	Extended Warranty for total 5 years from Supply				Y	Y	
CDE ⁽⁶⁾	Certified Drawing (electronic)				Y	Y	
CDP ⁽⁶⁾	Certified Drawing (Printed)				Y	Y	
OM	Printed Operation and Maintenance Manuals-1 Set. (Standard Electronic copy @ No cost)				Y	Y	
CC	Printed Calibration Certificate-1 Set. (Standard Electronic copy@ No cost)				Y	Y	
DXC2 ⁽³⁾	APT3200 Diaphragm Seal Assemblies (Requires full model code refer DXC2 pricesheet)				*DXC2 Configsheet		

1) X - Not Available for specified configuration

2) CF- Consult Factory for Pricing & delivery. Minimum Order quantities may apply.

3) Use DXC2 for ordering diaph. Seal option shipped from factory- Requires full model code refer DXC2 pricesheet

4) Standard Warranty is two (2) years from supply

Doc # APT3200.DS.ver2011v01

ORDERING INFORMATION

5) Angle/Flat Bracket Shipped Loose, separate box(6X5X4), includes bracket + U Bolt + Mounting Screws for 3100&3200/2100

6) Information included on Certified Drawing will be: Customer: PO Number*, Customer Name :*, Project : (if applicable),

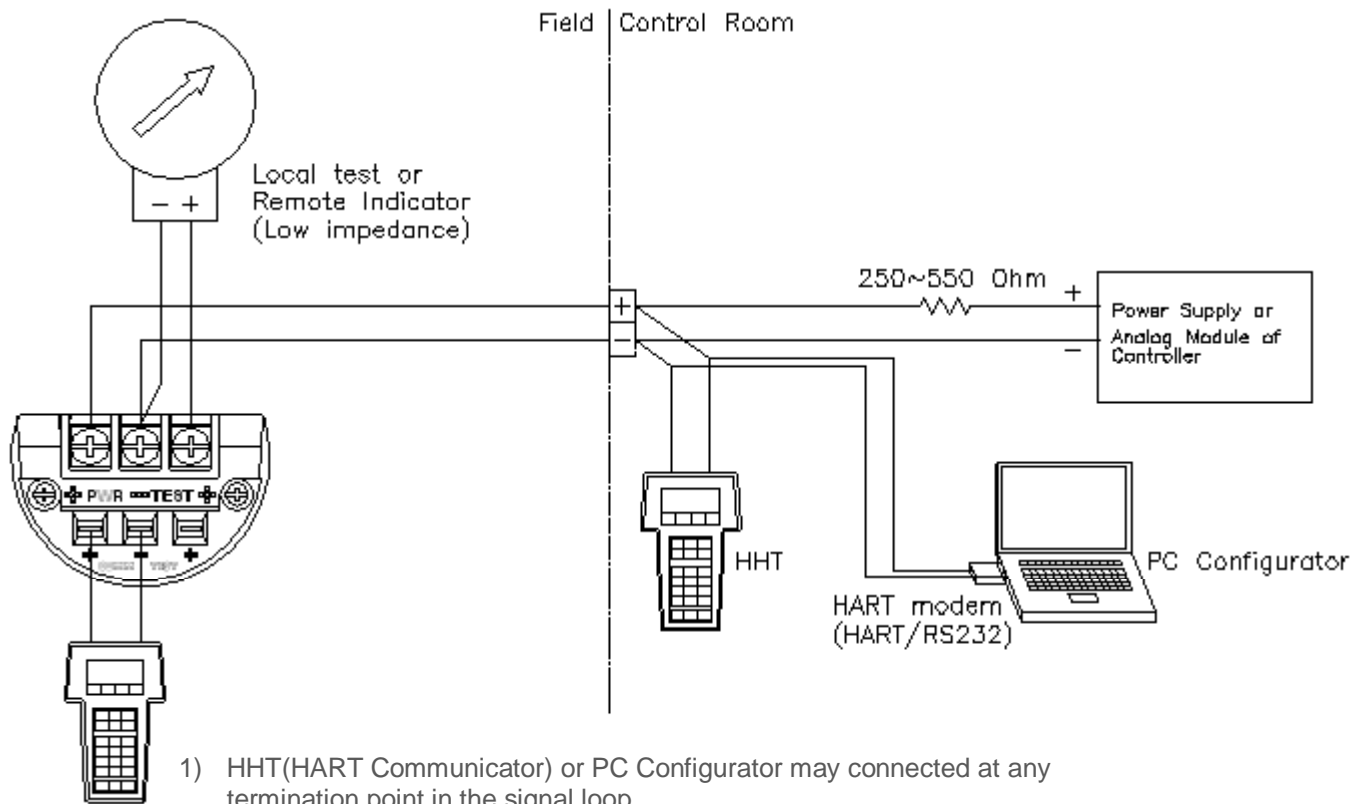
MODEL /OPTION code: (model code being ordered), TAG or TAG(s) : if applicable Calibration Range : Shipped Cal Range

* Hence if ordering for specific end user/project please include this information else we will use default (PO #)

7) LV - 1-5V is currently available on on 3200G series and requires special HART modem (to be purchased directly) to be used with the STT20

SMART PRESSURE TRANSMITTER

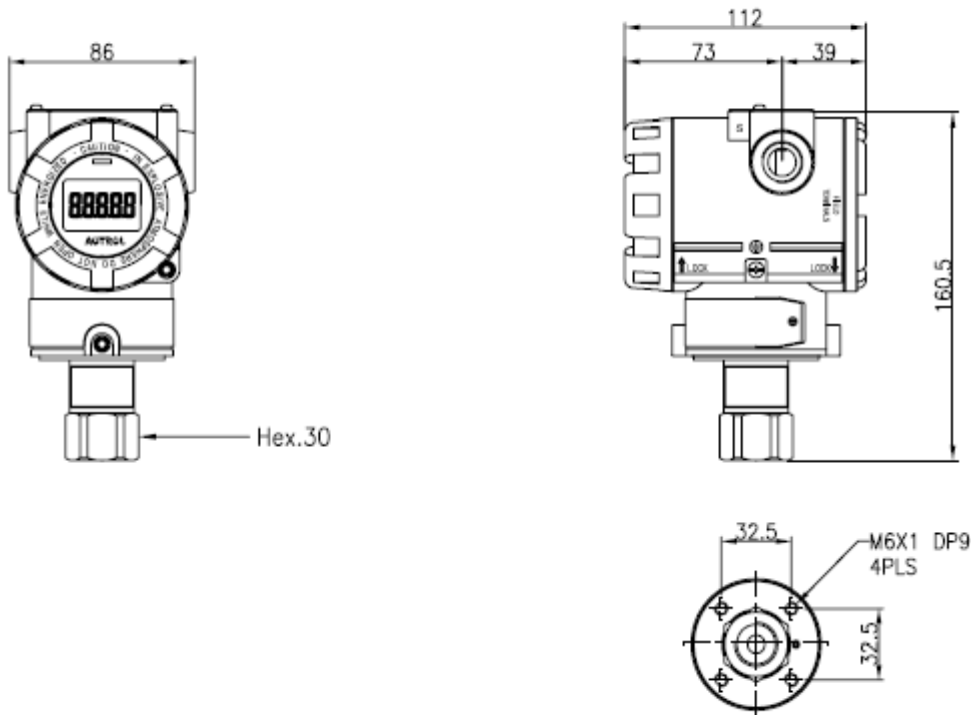
Connection Diagram of Signal, Power, HHT for Transmitter



- 1) HHT(HART Communicator) or PC Configurator may connected at any termination point in the signal loop
- 2) HART Communication requires a loop resistance between 250 and 550 ohm @ 24 Vdc
- 3) Transmitter operates on 11.9 to 45.0 Vdc transmitter terminal voltage.
 [Applied Power]
 - * 11.9 ~ 45.0 Vdc for General Operation
 - * 17.4 ~ 45.0 Vdc for HART Communication
 - * 17.4 ~ 42.0 Vdc for CSA Approval (Power supply must not exceed 42.0 Vdc)

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Dimensions of Transmitter (mm)



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