

APT 3100

Smart Pressure Transmitter

For Differential / Gauge / Absolute Pressure Measurement



PRESSURE



APT 3100

Introduction

The APT 3100 Smart Pressure Transmitter is a micro processor-based high performance transmitter, which has flexible pressure calibration and output, automatic compensation of ambient temperature and process variable configuration of multiple parameters, communication with HART protocol. The application is very various, as measuring liquid, gas or steam flow as well as pressure and liquid level by application method. All sensor data is input, modified and stored in EEPROM.



Standard

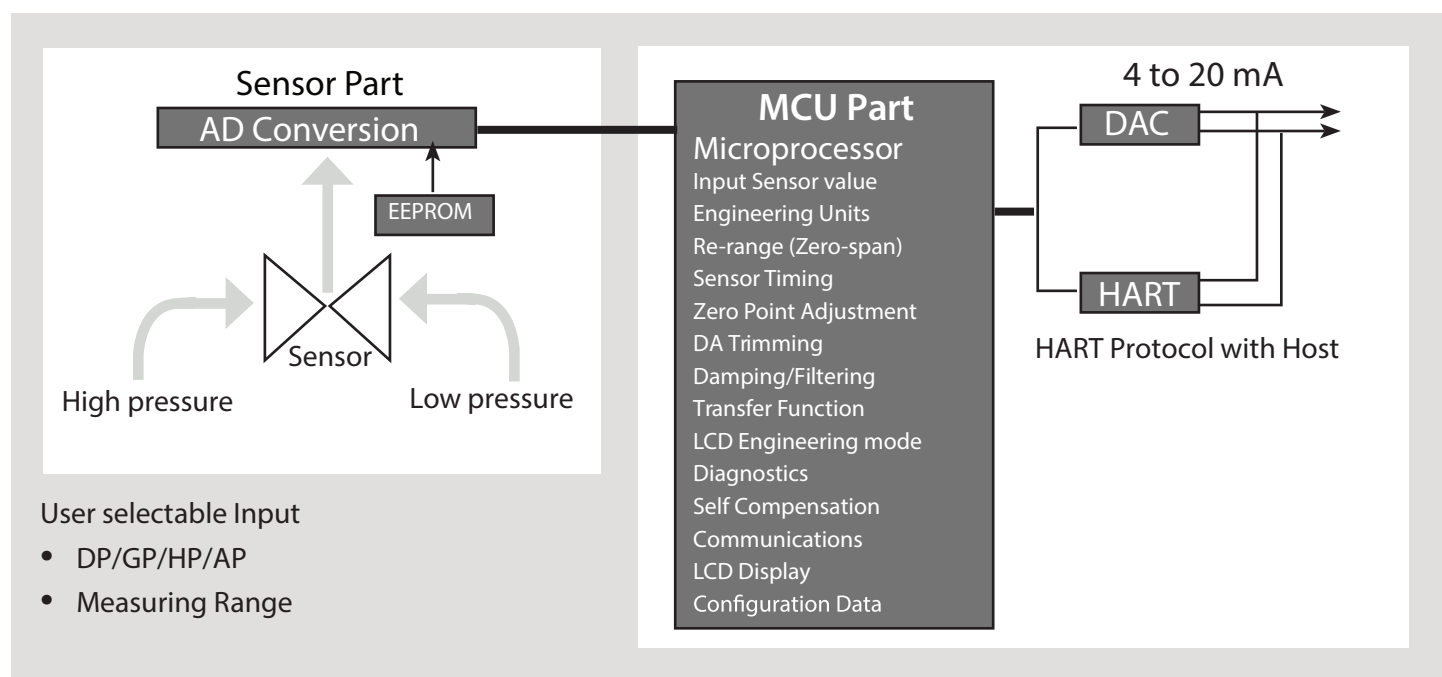


SS Housing

Function

- Flexible Sensor Input : DP, GP, AP, HP
- 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 : ATEX, FM, FMCanada, GOST, KOSHA, KTL, etc.
- Marine Certificate: ABS, LR, BR, DNV

Functional Block Diagram



Features

Superior performance

- Long-Term Stability (0.125% URL for 3year)
- High Range ability (100 : 1)(for the range 4-0)
- Self-diagnostics and data acquisition capability
- High accuracy up to $\pm 0.075\%$ FS

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 (EN50081-2, EN50082-2)

Transmitter Description

ATP 3100 Pressure transmitter can be easily configured from any host that support the HART protocol.

Basic setup

- 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

Specifications

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)

- LCD display & ENG mode
- Two wire 4-20mA user-configurable for linear or square root out put, digital process value superimposed on 4-20mA signal, available to any host that conforms to the HART protocol

EMC conformity standards

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

Power supply & load requirement

- External power supply required.
 - * 250 ohm load - 17.5 Vdc
 - * up to a 550 ohm load -24 Vdc
- Max. loop resistance = $(E - 12) / 0.022$
(E = Power supply voltage)
- Voltage range : 12 to 45 Vdc
- Voltage rating : 24 Vdc $\pm 30\%$
- Loop load : 1-1500 ohm - Operation
250-550 ohm - HART Communications

Failure Mode

- Fail High : Current ≥ 21.1 mA
- Fail Low : Current ≤ 3.78 mA

Storage temperature

- -40°C to 85°C (without condensing)

Process temperature limits

(Range codes and approval codes may effect limits)

- -40°C to 120°C (-104°F to 248°F)

Isolation

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

Working pressure limits (*silicone oil*)

- Model D & G 0-13.79 MPa - # 3-8
- Model G 0-40.00 MPa - # 9
0-75.00 MPa - # 0
- Model H 0-31.02 MPa - # 4-7
- Model A 0-525 KPa - # 4
0-3000 KPa - # 5
0-5250 KPa - # 6

Hydrostatic test pressure

- Model D 3000 psi (20.7 MPa)
- Model H 6750 psi (46.5 MPa)
- Model G 2000 psi (13.8 MPa) - # 3-8
11600 psi (80 MPa) - # 9
11600 psi (80 MPa) - # 0
- Model A 101.5 psi (700 KPa) - # 4
580 psi (4000 KPa) - # 5
1015psi (7000 KPa) - # 6

Burst Pressure

- Model D, G, H 68.9 MPa
G8-9 50 MPa
G0 80 MPa
- Model A4 1050 KPa
A5 4000 KPa
A6 7000 KPa

5 Digit LCD

- Express all pressure unit and flow unit
- Use 5 digit
- Select decimal place (0 to 4)

User define unit function



Change main parameter by button

- Change unit
- Change upper range value
- Change lower range value
- Change the damping second
- Select the decimal place
- Zero trim
- Zero adjustment



Moving within Menu : Zero
Moving to below Menu : Span
Moving Top Menu : Zero+Span

Physical Specifications

Wetted materials

- Isolating diaphragms 316L SS, Monel, Tantalum, HAST-C
- Drain/Vent valves 316 SS, HAST-C
- Flanges and Adapters 316 SS(ASTMCF8M), HAST-C
- O-ring Viton, PTFE

Non-Wetted Materials

- Fill Fluid Silicone oil or Inert fill
- Bolts 304 SS

- Electronics housing Aluminum or 316L SS (Optional)
Flameproof and Waterproof (IP67)
- Cover O-ring Buna-N KPa
- Paint Epoxy-Polyester or Polyuret
- Mounting bracket 304SS with U-bolt
- Nameplate 304SS

Electrical connections

- 1/2-14 NPT conduct with M4 screw terminals

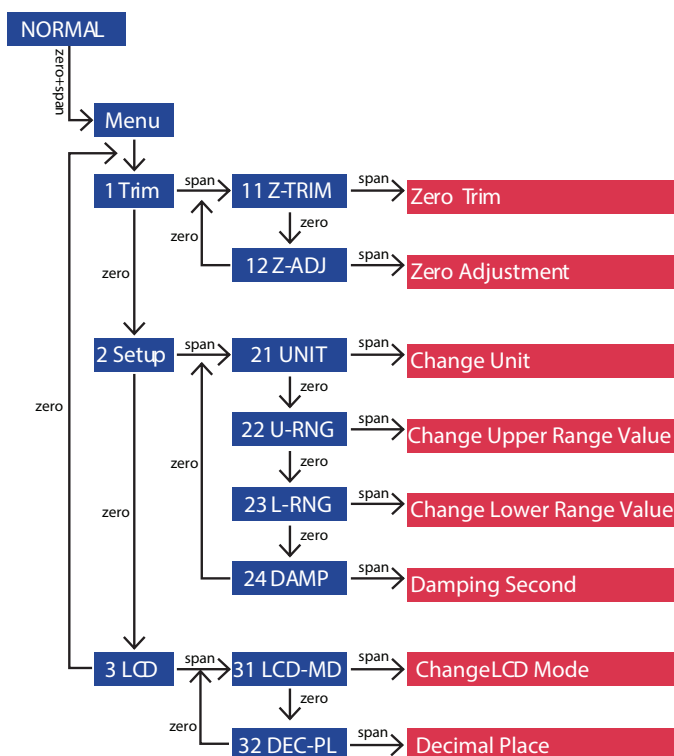
Process connections

- 1/4-18 NPT on 2.126 inch (54.0 mm) centers on flanges for standard
- 1/2-14 NPT on process adapter (option)
*Refer to drawing in the last page

Weight

- 3.9 Kg/8.59 lb (Standard - excluding options)
5.35 Kg/11.79 lb (SS Housing- excluding options)

Button menu tree



Hazardous Location Certifications (option)

KCs Approvals K1 Code

Flameproof for class I, Zone 1: Ex d II C T6, IP67
 Operating temperature: -20 to 60°C
 Max. process temperature: 80°C
 Power supply: Max. 45 Vdc
 Output: 4 to 20 mA + HART, Max. 22 mA

ATEX Approvals E1 Code

CE 0344 II 2 G Ex d IIC T6, T5 or T4 operating
 Temperature: -20°C ≤ tamb ≤ 60°C
 T6 for process ≤ 85°C ; T5 for process ≤ 100°C
 T4 ≤ 130°C
 APT 3100 ATEX Certification is according to the
 below standards : EN 60079-0: 2012 EN 60079-1 :
 2007 ATEX Certificate No.: KEMA 07ATEX 0103X
 IECEx Certificate No.: IECEx DEK 15.0071X

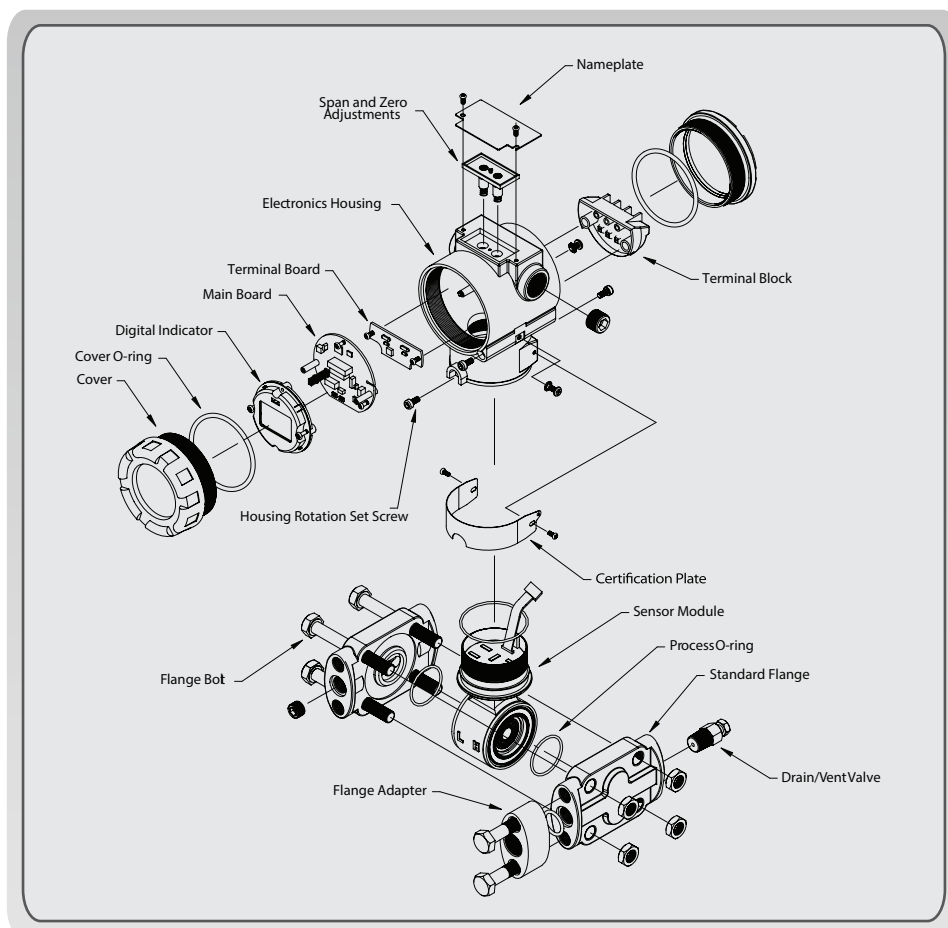
ATEX Certification E2 Code

*Intrinsic Safety: Ex ia IIC T5 or T4
 Operating Temperature: For T5: -30°C to 40°C
 For T4: -30°C to 80°C
 Ui=30Vdc, Ii=200mA, Pi=0.9W, Ci=27nF, Li=104μH
 ATEX Certificate No.: DEKRA 11ATEX0132X

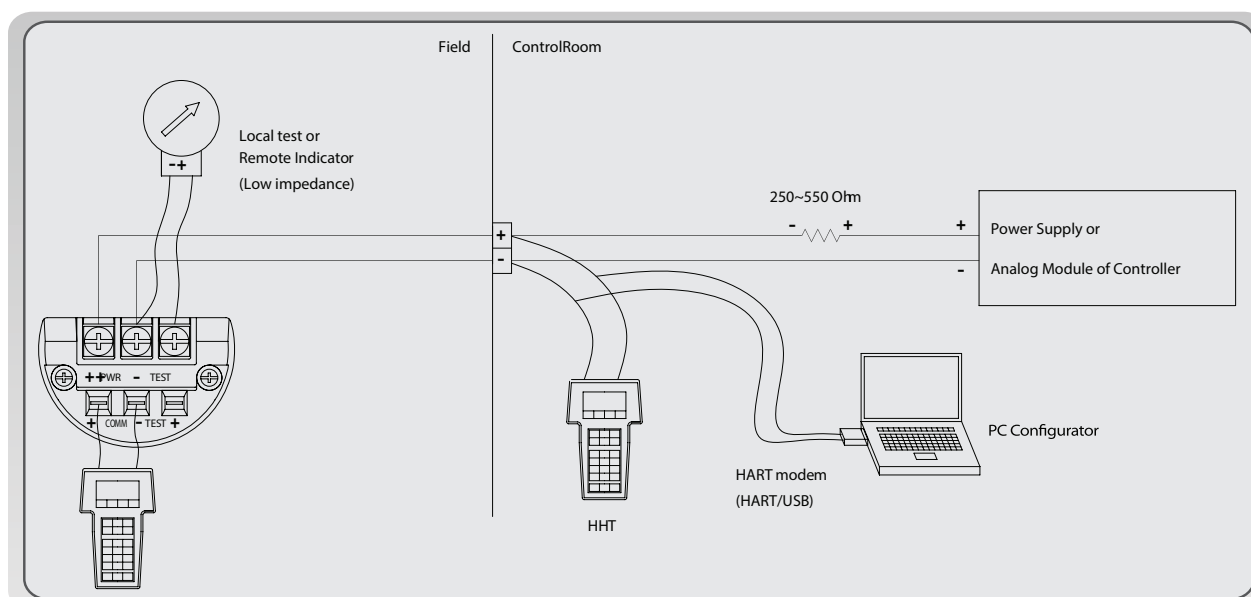
FM and FM Canada Approvals F1 Code

FM: Factory Mutual explosion proof
 FM Canada: Canadian requirements
 Explosion proof for Class I, Division 1
 Groups A, B, C and D
 Dust-ignition proof for Class II/III, Division 1,
 Groups E, F and G
 Non incensive for Class I, Division 2, Groups A, B, C &
 D; Class II, Division 2, Groups E, F & G; and Class III,
 Division 1,
 Enclosure: indoors and outdoors, NEMA Type 4X

Exploded drawing of APT 3100



Connection Diagram of Signal, Power, HHT for Transmitter



1. HHT (HART Communicator) or PC Configurator may be connected at any termination point in the signal loop.
2. HART Communication requires a loop resistance between 250 and 550 ohm @ 24 Vdc
3. Power Supply
 - Voltage Range : 12 to 45 Vdc
 - Voltage Rating : 24 Vdc $\pm$ 30%

APT 3100 MP Option

Easy installation regardless fluid line condition

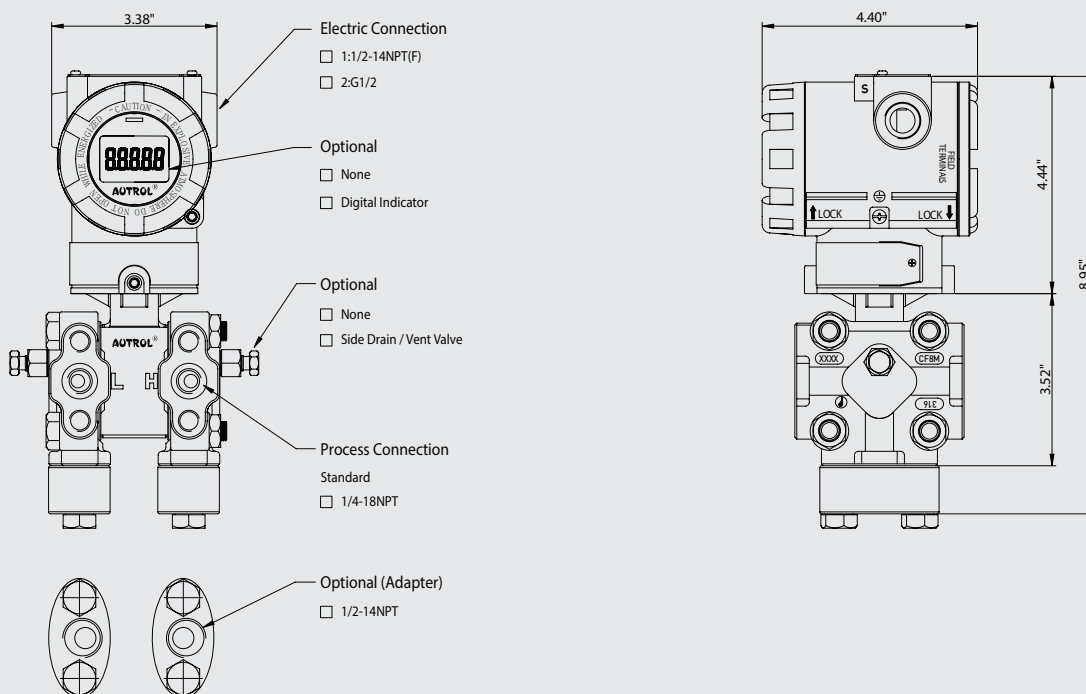
Advantages

Conventionally, in the case where the pressure transmitter should be vertically installed irrespective of the orientation of the fluid inflow lines, modified flanges are required in addition to the basic flanges. As a result, the modified flanges must be additionally provided.

The Multi-planar pressure transmitter has been made in an effort to solve the problems occurring in the related art, and an object of this multi-planar is to provide a pressure transmitter, capable of being vertically installed without a separate adapter or various types of brackets regardless of the position of each fluid inflow line.



Dimension



APT3100F

Description

APT 3100F is added the totalizing function in APT 3100 transmitter. So it is available to check the flow rate and total flow.

- Measuring & express flow rate and total flow
- Pulse output by accumulation of total flow
- APT 3100F measures the flow rate by using differential pressure so it is not compensated by the temperature and static pressure

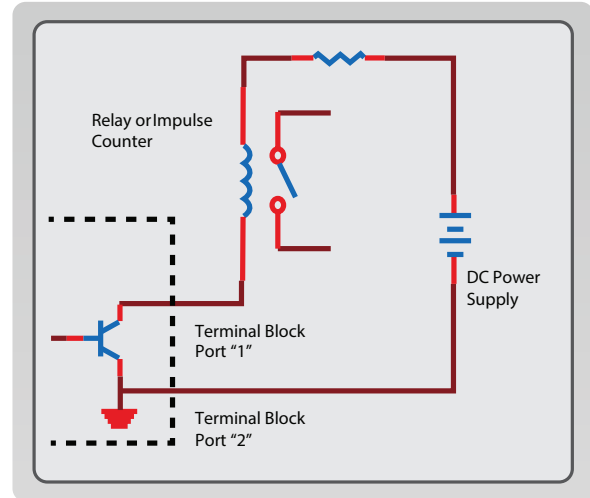
External Appearance

APT3100F is the same shape with APT 3100 but the terminal block is different.



- 1: Pulse out +
- 2: Pulse out -

Wiring



In the case of connecting with Relay or Counter.

Pulse Specification

- Scaled Pulse : A single pulse is an output for a specified flow amount
- Pulse Width : 10ms, 50ms, 100ms selectable (negative going pulse)
- Duty Cycle : Max. - 49 Pulse/sec.
- Output Type : Open collector, 30V, 500mA Max.

General Specification

(Rangeability : #2=20:1 / #3=50:1 / 4-0=100:1)

1. APT 3100 Pressure sensor range & URL

Range Code	Calibrated Span (psi)	DP / GP / HP / F				AP	
		Upper range (URL) (KPa)	Lower range (LRL) (KPa)			Calibrated span (KPa)	Range (KPa)
			D.P	G.P	H.P		
2	0.01-0.217	1.5	-1.5	-1.5	NA	NA	NA
3	0.02-1.087	7.5	-7.5	-7.5	NA	NA	NA
4	0.054-5.41	37.3	-37.3	-37.3	-37.3	2.5-250	0-250
5	0.270-27	186.5	-186.5	-100	-186.5	15-1500	0-1500
6	1-100.073	690	-690	-100	-690	25-2500	0-2500
7	2.999-299.93	2068	-2068	-100	-2068	NA	NA
8	10-1000	6895	-6895	-100	NA	NA	NA
9	29.99-2999.303	20680	NA	-100	NA	NA	NA
0	60-6000.211	41370	NA	-100	NA	NA	NA

Range Code	KPa	Kg/cm ²	bar	psi	inH ₂ O@4°C	mmH ₂ O@4°C	inHg@0°C
2	1.5	0.015	0.015	0.217	6	152	0.442
3	7.5	0.076	0.075	1.087	30	765	2.215
4	37.3	0.38	0.373	5.41	149	3804	11.014
5	186.5	1.902	1.865	27.049	749	19018	55.072
6	690	7.036	6.9	100.073	2773	70361	203.75
7	2068	21.088	20.68	299.93	8310	210878	610.66
8	6895	70.309	68.95	1000.009	27708	703097	2036.025
9	20680	210.876	206.8	2999.303	83105	2108781	6106.597
0	41370	421.856	413.7	6000.211	166085	4218566	12216.55

2. Electrical specifications

Power supply	12 to 45 Vdc
HART loop resistance	250-550 ohm
Output signal	4-20 mA dc / HART
Isolation	500 Vrms (707 Vdc)

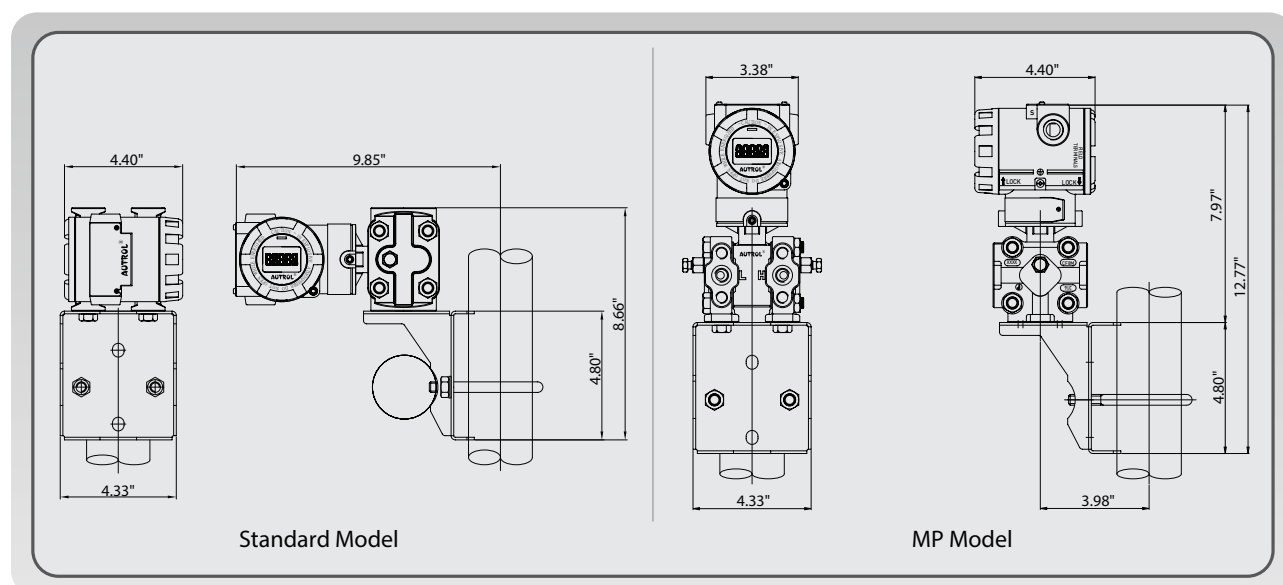
3. Performance Specifications

Reference accuracy	± 0.075% of Span (0.1URL ≤ Span ≤ URL), ± [0.025 + 0.005x(URL/Span)]% of Span (0.01URL ≤ Span < 0.1URL)
Ambient temp. effect	± [0.019%URL + 0.125% Span] / 28°C
Stability	± 0.125% URL for 36 Months
Ambient temperature	-40°C - 85°C (-40°F - 185°F)
LCD meter ambient temp.	-30°C - 80°C (-22°F - 176°F)

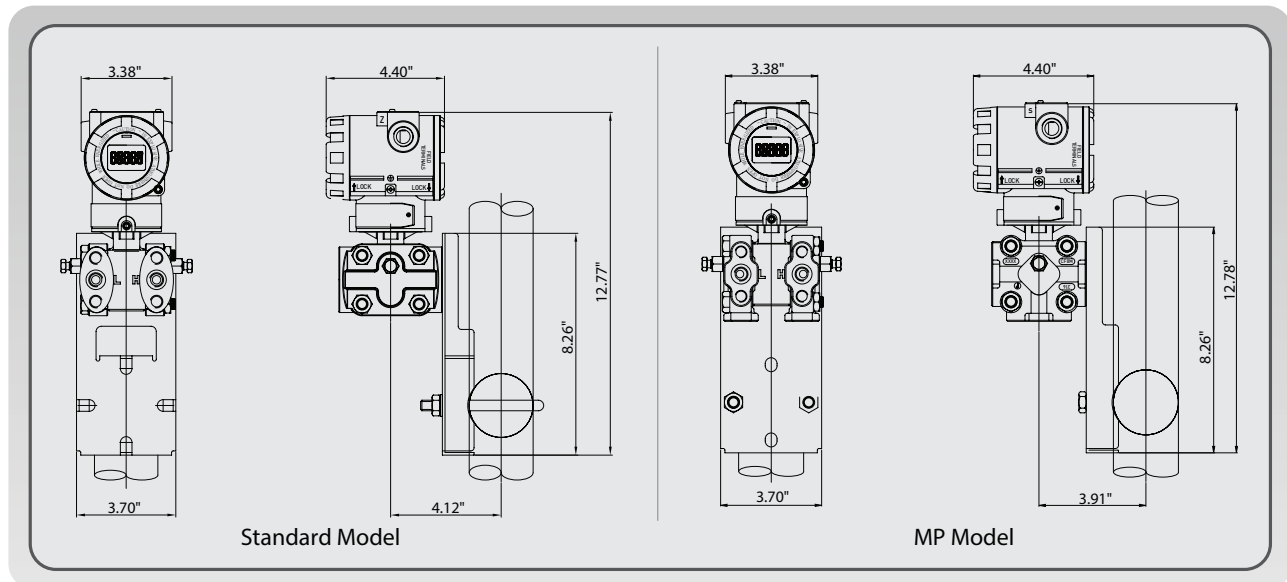
Static pressure effects	±0.1% of URL per 1015 psi (Zero Error) ±0.2% of Reading per 1015 psi (Span Error)
Humidity limits	5%-100% RH
Process temperature limits	-40°C-120°C
Power supply effects	±0.005% of Span per Volt
Mounting position effects	Zero Shift up to 1.40 in wc No Span Effect
4. Physical specifications	
Isolating diaphragm	316L SS
Drain & vent valve	316L SS
Flange & adapter	316L SS
O-ring	Viton or PTFE
Electronic housing	Aluminum (Option: 316L SS)
Bolts & bolting flange	304 SS
Process connection size	1/4 - 18 NPT
Adapter – Option	1/2 – 14 NPT
Electrical connections	1/2 – 14 NPT
Weight (excluding option items)	3.9 Kg (Standard) 5.35Kg(SS Housing)
2" Pipe stanchion type bracket	Angle or Flat type
Housing class	Waterproof (IP67), 4X

Installation with mounting bracket

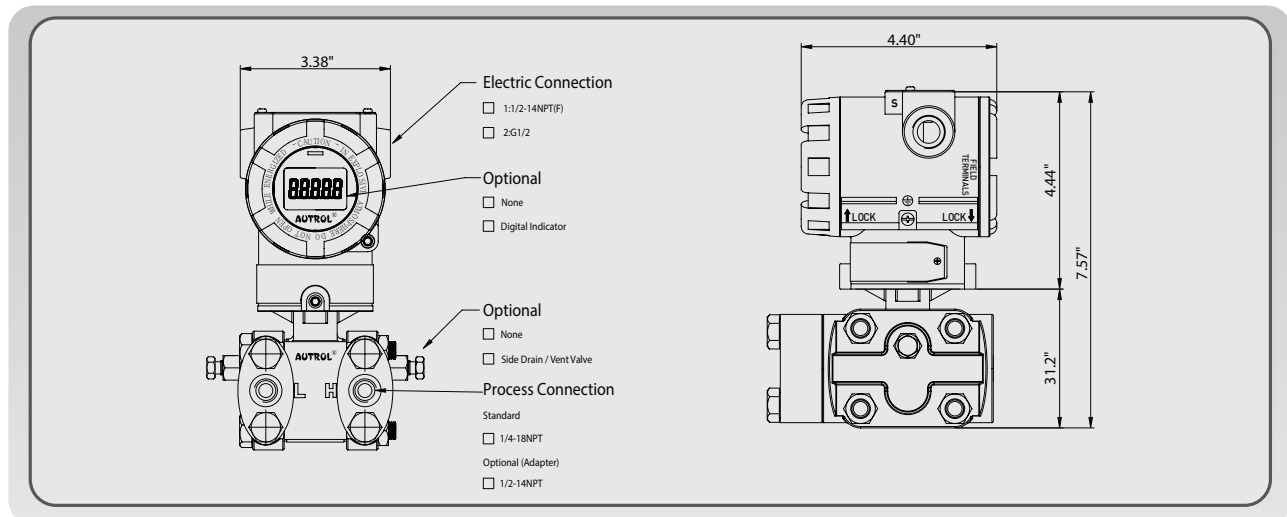
2" Pipe mounting bracket model angle type



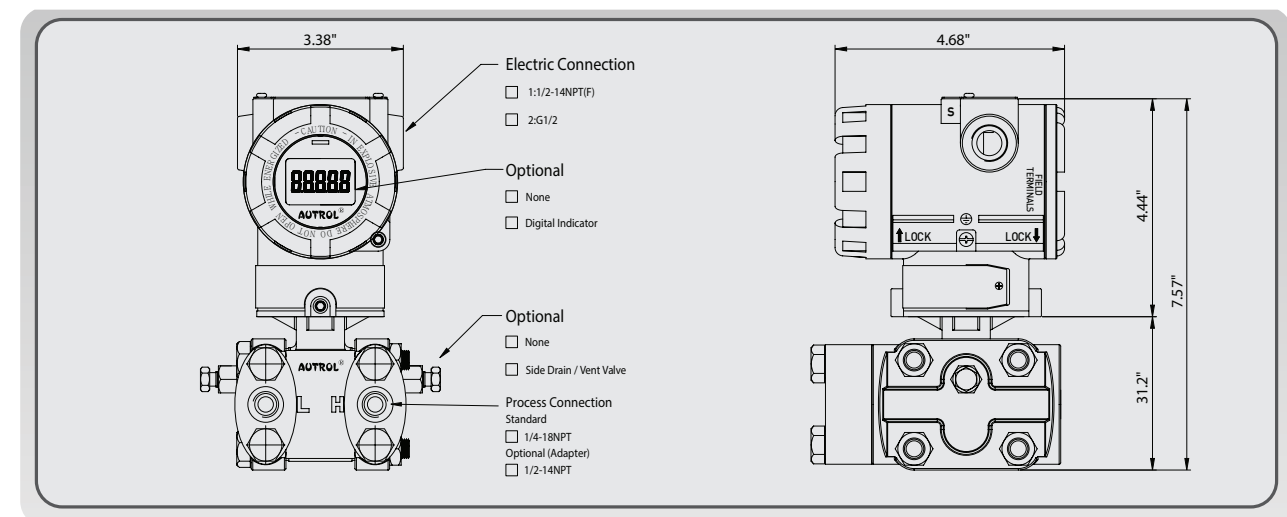
2" Pipe mounting bracket model flat type



Dimensions of transmitter Standard model



Intrinsically safe model



Model Chart

MODEL	Code	Description					
APT 3100	-D	Differential Pressure Transmitter (Static Pressure 13.79 MPa / 2000psi)					
	-F	Flow Transmitter (on the principle of Differential Pressure Use and only for Head)					
	-G	Gauge Pressure Transmitter					
	-H	Differential Pressure Transmitter for High Line Pressure (Static Pressure 31.02MPa / 4500psi)					
	-A	Absolute Pressure Transmitter					
Ranges		DP/GP/HP					*AP
		Calibrated Span Min. to Max	Lower Range Limit			Upper Range Limit	Range
			APT 3100-D	APT 3100-G	APT 3100-H		APT 3100-A
	2	0.01-0.217 psi	-1.5 KPa	-1.5 KPa	NA	1.5 KPa (6.022 inH2O)	NA
	3	0.02-1.087 psi	-7.5 KPa	-7.5 KPa	NA	7.5 KPa (30 inH2O)	NA
	4	0.054-5.41 psi	-37.3 KPa	-37.3 KPa	-37.3 KPa	37.3 KPa (150 inH2O)	0-250 KPa
	5	0.270-27 psi	-186.5 KPa	-100KPa	-186.5 KPa	186.5 KPa (750 inH2O)	0-1500 KPa
	6	1-100.073 psi	-690 KPa	-100KPa	-690 KPa	690 KPa (100 psi)	0-2500 KPa
	7	2.999-299.93 psi	-2068 KPa	-100KPa	-2068 KPa	2068 KPa (300 psi)	NA
	8	10-1000 psi	-6895 KPa	-100KPa	NA	6895 KPa (1000 psi)	NA
	9	29.99-2999.303 psi	NA	-100KPa	NA	20680 KPa (3000 psi)	NA
	0	60-6000.211 psi	NA	-100KPa	NA	41370 KPa (6000 psi)	NA
	X	Special					
Mounting Flange /Material		Body		Vent Plug		Diaphragm	
	M11	316 SS		316 SS		316L SS	
	M12	316 SS		316 SS		HAST - C	
	M13	316 SS		316 SS		Monel	
	M14	316 SS		316 SS		Tantalum	
	*M21	HAST - C		HAST - C		HAST - C	
	*M22	HAST - C		HAST - C		Monel	
	*M23	HAST - C		HAST - C		Tantalum	
Hazardous Location Certifications	K0	Maker Standard (Waterproof : IP67)					
	K1	KOSHA Flameproof Approval		*K2	KTL Intrinsic Safety Approval		
	E1	ATEX(KEMA) Flameproof		E2	ATEX(KEMA) Intrinsic Safety		
	F1	FM & FM Canada Explosion proof		*F2	FM & FM Canada Intrinsic Safety		
Fill Fluid	1	Silicone (DC200)		2	Inert fill fluid (Halocarbon oil)		
Process Connection	S	1/4 - 18 NPT (Standard)	O	1/2 - 14 NPT Female (Adapter)		X	Special
Electrical Connection	1	1/2-14NPT Epoxy-Polyester Painted Aluminum	2	G1/2 Epoxy- Polyester Painted Aluminum (Adapter)		X	Special
Option	M1	LCD Indicator (5digit)					
	MP	Multi-Planar					
	LPI	Lightening Protector (Internal)		LPE	Lightening Protector (External)		
	K	Oil Free Finish					
	F1	Side Vent / Drain Top					
	F2	Side Vent / Drain Bottom					
	2W	2 Way Manifold (SS) : Remote type type		2WF	Flange type		
	3W	3 Way Manifold (SS) : Remote type type		3WF	Flange type		
	5W	5 Way Manifold (SS) : Remote type type		5WF	Flange type		
	BA	Stainless Steel Bracket (Angle type) with SS Bolts					
	BF	Stainless Steel Bracket (Flat type) with SS Bolts					
	ST	Stainless Steel Housing					
	T	Teflon O-Ring (Wetted Part)					
	X	Special					

Example: APT 3100-D5-M11-E1-1-S-1-M1-BA

Note 1: Request to manufacturer for Draft Range, Absolute (small pressure and vacuum) and Items marked " * " before order.

Customer Service and Support



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