

AUTROL®

Doc.No.: C3100-E05A

HART
COMMUNICATION PROTOCOL

FOUNDATION

CE

Ex

FM
C APPROVED US

PG
DOPTA met

Kepic

IVP
ASIA COLLEGE

ktil

ABS

Lloyd's Register

CLASSICAL
INDUSTRIES

DNV

Smart Pressure Transmitter

for Differential / Gauge / Absolute Pressure Measurement

MODEL

APT3100



Duon System Co.,Ltd.
www.autrol.com

APT3100



Standard



SST Housing

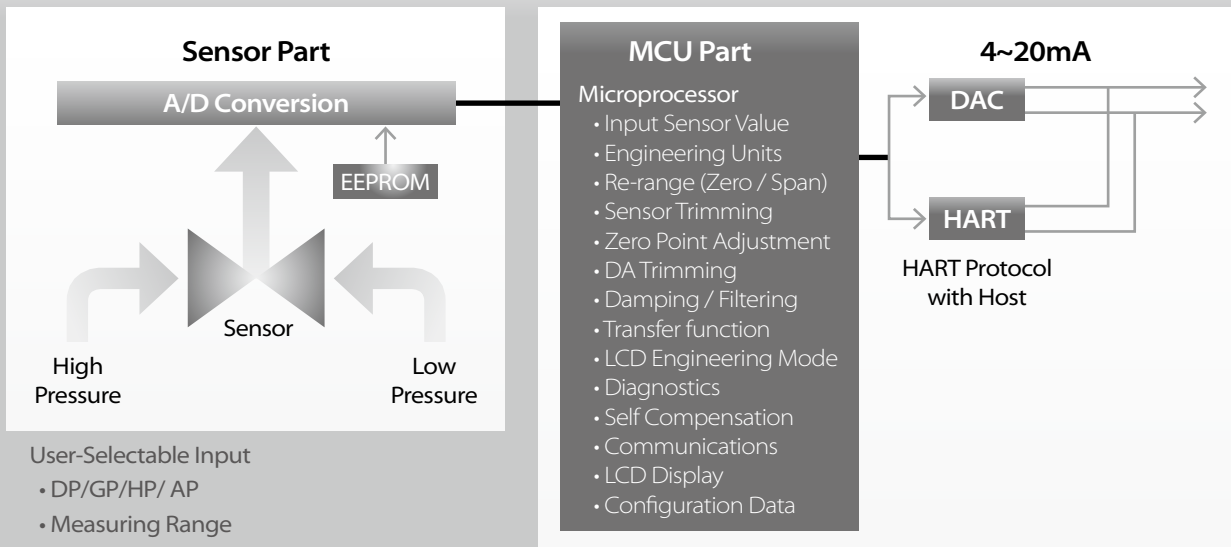
Description of Product

The APT3100 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 various 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 data of sensor is to be input, modified and stored in EEPROM.

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



* Subject to change without notice

Features

» Superior Performance

- High Reference Accuracy : $\pm 0.075\%$ of Calibrated Span
(The option : $\pm 0.04\%$ of *Calibrated Span*)
- for range 2
 $\pm 0.25\%$ of Span for $0.1 \text{ URL} \leq \text{Span} \leq \text{URL}$
 $\pm [0.24 + (0.008 \times (\text{URL}/\text{span}))]\%$ of Span
for $0.05 \text{ URL} \leq \text{Span} < 0.1 \text{ URL}$
- for range 3
 $\pm 0.075\%$ of Span for $0.1 \text{ URL} \leq \text{Span} \leq \text{URL}$
 $\pm [0.025 + (0.005 \times (\text{URL}/\text{span}))]\%$ of Span
for $0.02 \text{ URL} \leq \text{Span} < 0.1 \text{ URL}$
- for ranges 4 to 0
 $\pm 0.075\%$ of Span for $0.1 \text{ URL} \leq \text{Span} \leq \text{URL}$
 $\pm [0.025 + (0.005 \times (\text{URL}/\text{span}))]\%$ of Span
for $0.01 \text{ URL} \leq \text{Span} \leq 0.1 \text{ URL}$
- Long-Term Stability (0.125% URL for 3year)
- High Rangeability (100 : 1)(for the range 4-0)

» 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

ATP3100 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

Function

» 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.(Page 9)
Span must be greater than or equal to the minimum span stated in Table 1.(Page 9)

» Output (Analog Current and Digital Data)

- LCD Display & ENG Mode
- Two wire 4~20mA
user-configurable for linear or square root 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.
* 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
0 ~ 1500 ohm – Operation
250 ~ 550 ohm – HART Communications

» EMC Conformity Standards

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

» Failure Mode

- Fail High : Current $\geq 21.1 \text{ mA}$
- Fail Low : Current $\leq 3.78 \text{ mA}$

» 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 to 248°F)

Function

» 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
1015 psi (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



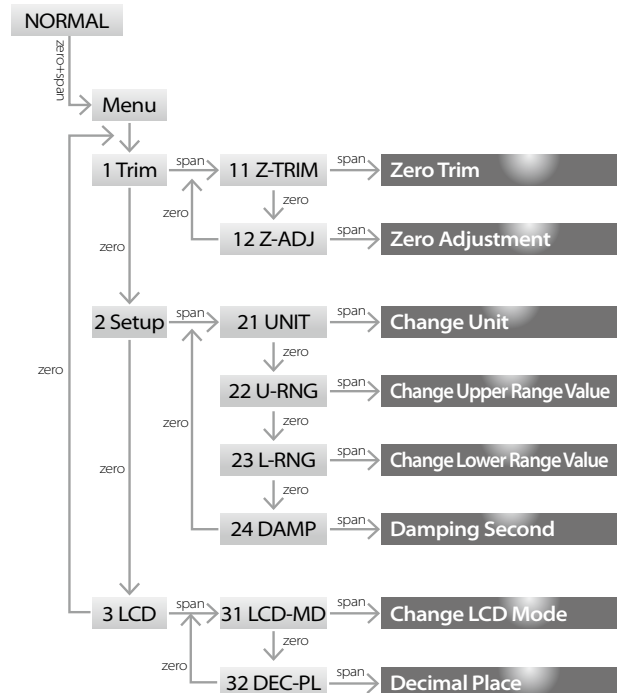
» Change main parameter by Button

- 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

» Button Manu tree



Physical Specifications

» Wetted Materials

- Isolating Diaphragms *316L SST, Monel, Tantalum, HAST-C*
- Drain/Vent Valves *316 SST, HAST-C*
- Flanges and Adapters *316 SST (ASTMCF8M), HAST-C*
- O-ring *Viton, PTFE*

» Non-wetted materials

- Fill Fluid *Silicone oil or Inert fill*
- Bolts *304 SST*
- Electronics Housing *Aluminum or 316L SST (Option) Flameproof and Waterproof (IP67)*
- Cover O-ring *Buna-N*
- Paint *Epoxy-Polyester or Polyuret*
- Mounting Bracket *304SST with U-bolt (304SST) for 2-inch pipe*
- Nameplate *304 SST*

» Electrical connections

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

» Process Connections

- 1/4-18 NPT on 2.126 inch (54.0 mm) centers on flanges for Standard

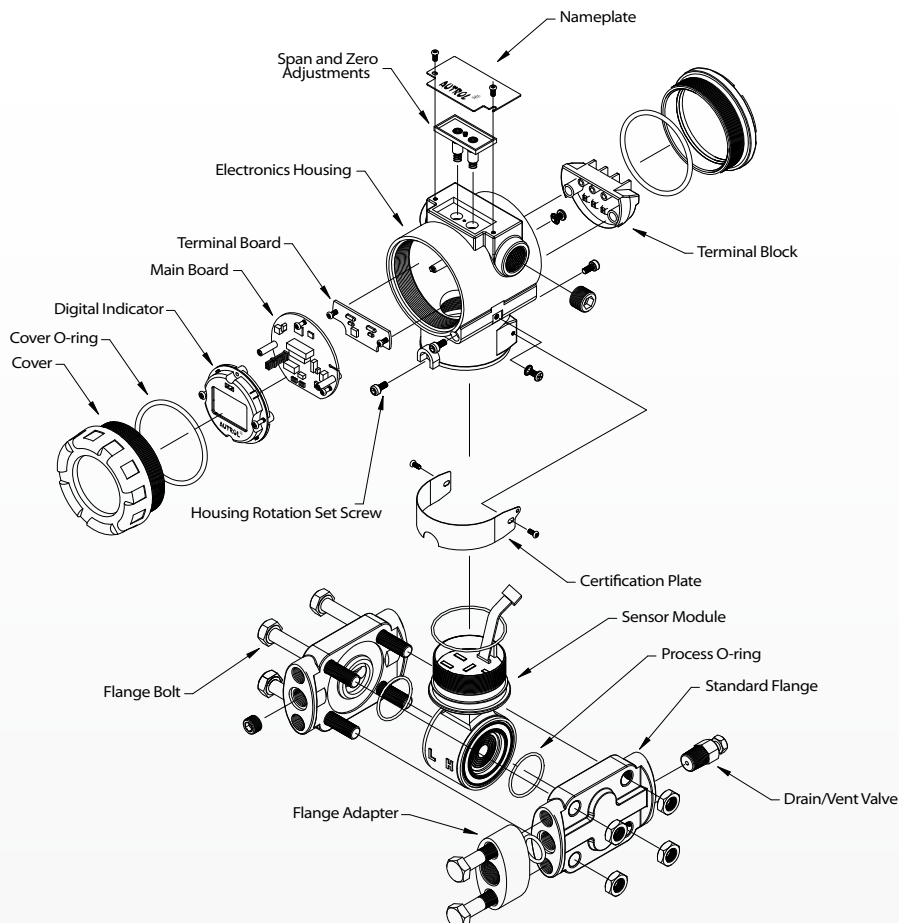
- 1/2-14 NPT on Process Adapter (option)

* Refer to drawing in the last page

» Weight

- 3.9 kg (Standard - excluding options)
- 5.35kg (SST Housing- excluding options)

Exploded drawing of APT3100



Hazardous Location Certifications (option)

» KOSHA Approvals K1 Code :

* KOSHA: Korea Occupational Safety & Health Agency

Flameproof for Class I, Zone 1 : Ex d II C 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

» 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

APT3100 ATEX Certification is according to the below standards : EN 60079-0 : 2006

EN 60079-1 : 2007

» KTL Certification K2 Code :

* Intrinsic Safety: Ex ia IIC T6

Ambient Temperature : -40 to 60°C

Ui=30Vdc, Ii=200mA, Pi=0.9W, Ci=47nF, Li=94μH

» 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

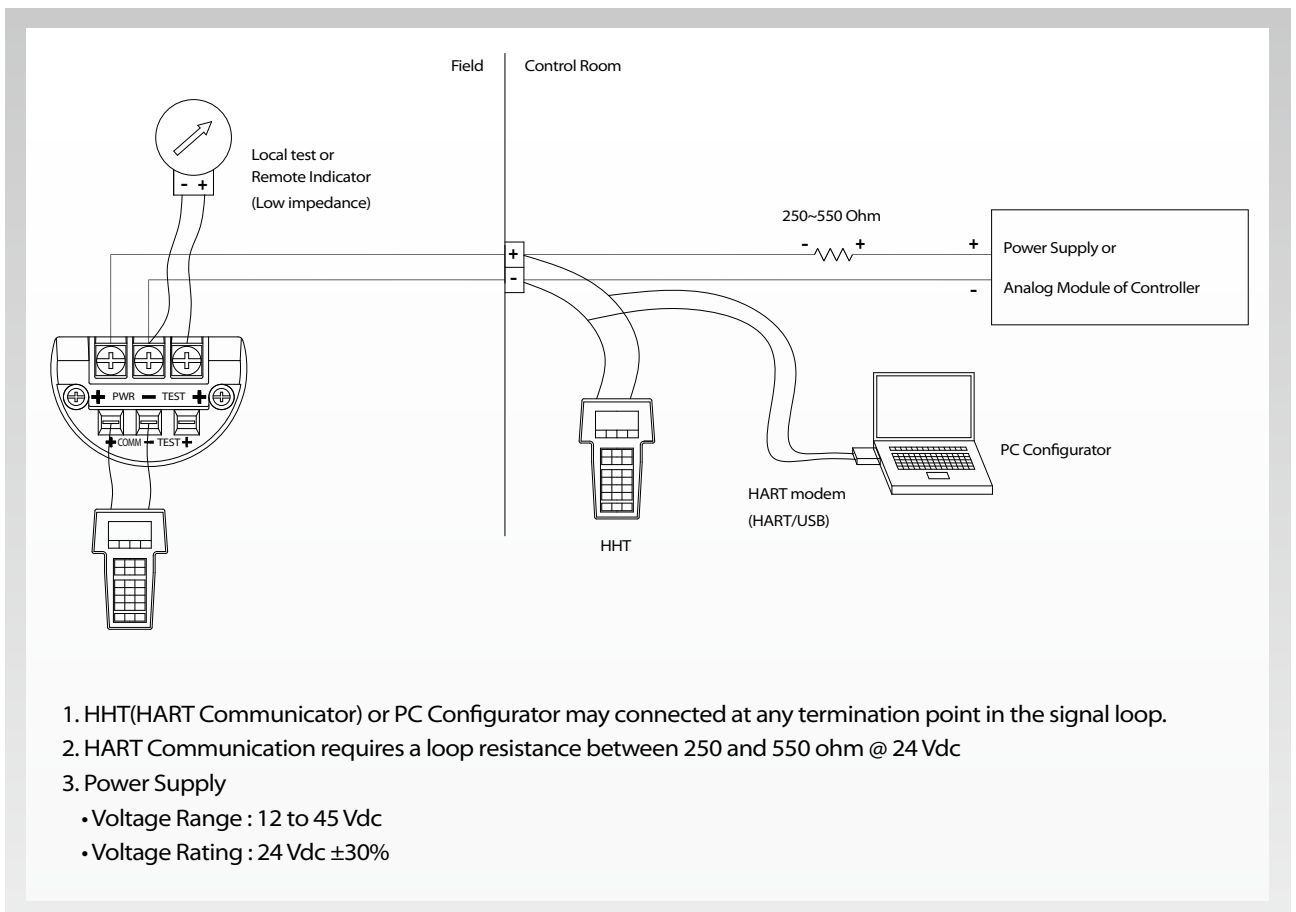
Nonincendive for Class I, Division 2, Groups A, B, C & D;

Class II, Division 2, Groups E, F & G; and Class III,

Division 1,

Enclosure: indoors and outdoors, NEMA Type 4X

Connection Diagram of Signal, Power, HHT for Transmitter



APT3100 MP Option

*Easy
installation
regardless
fluid line
conditions*

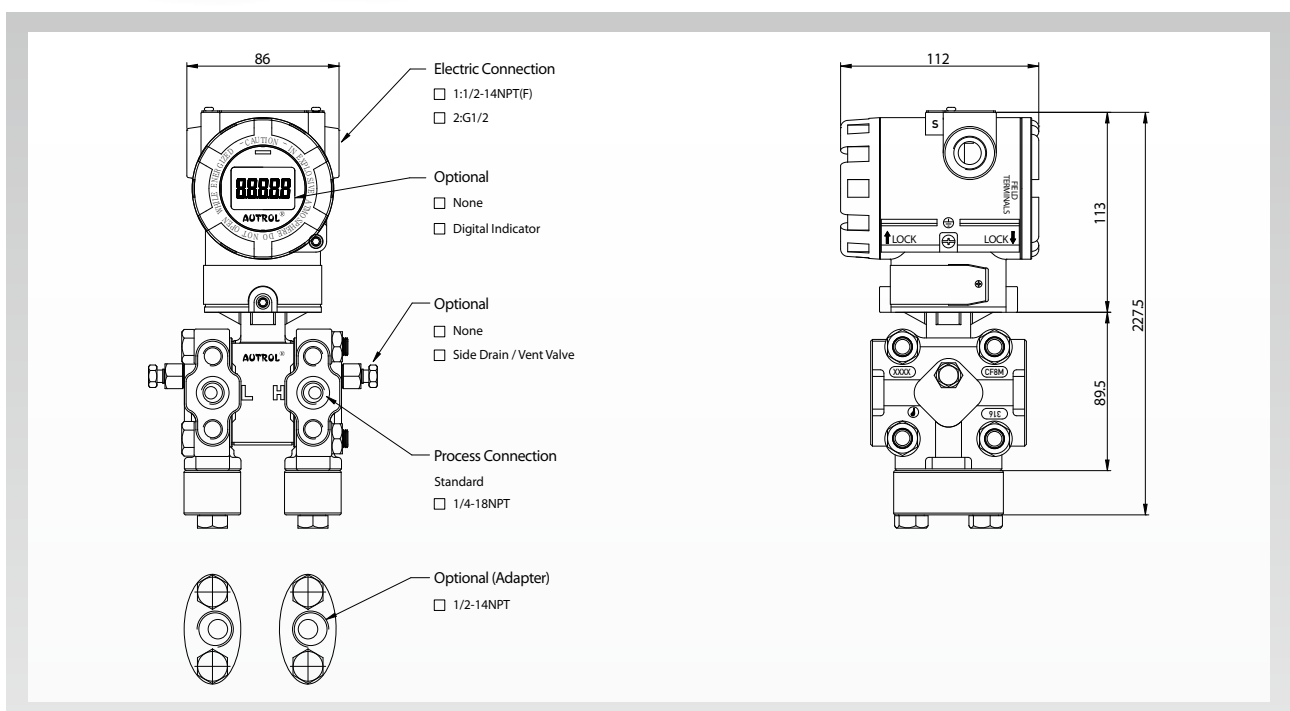


Advantage

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.

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 separate adaptor or various types of brackets** regardless of the position of each fluid inflow line.

Dimension



Description

APT3100F is added the totalizing function in APT3100 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
- » APT3100F measures the flow rate by using differential pressure so it is not compensated the temperature and static pressure

External Appearance

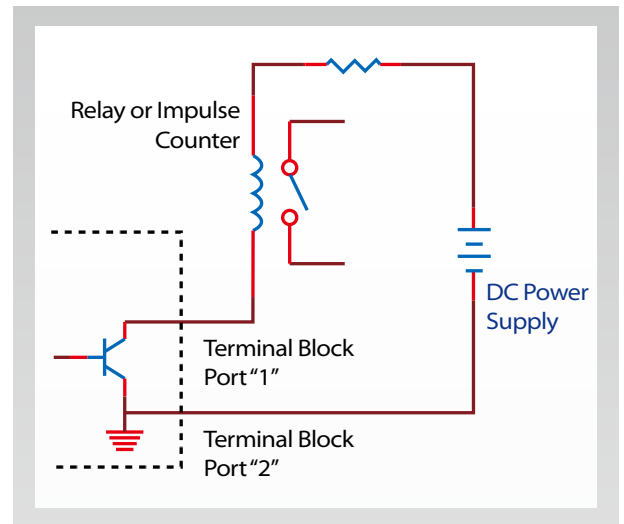
APT3100F is same shape with APT3100 but the terminal block is different.



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

APT3100F

Wiring



In the case of connecting with Relay or Counter.

Pulse specification

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



The picture of STT 20
(Autrol configuration program)

General Specifications

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

1. APT3100 Pressure Sensor Range & URL

<Table 1>

| Range Code | DP / GP / HP / F | | | | | AP | |
|------------|-----------------------|-------------------------|-------------------------|-------|--------|-----------------------|-------------|
| | Calibrated Span (KPa) | Upper Range (URL) (KPa) | Lower Range (LRL) (KPa) | | | Calibrated Span (KPa) | Range (KPa) |
| | | | D.P | G.P | H.P | | |
| 2 | 0.075 ~ 1.5 | 1.5 | -1.5 | -1.5 | NA | NA | NA |
| 3 | 0.15 ~ 7.5 | 7.5 | -7.5 | -7.5 | NA | NA | NA |
| 4 | 0.373 ~ 37.3 | 37.3 | -37.3 | -37.3 | -37.3 | 2.5 ~ 250 | 0 ~ 250 |
| 5 | 1.865 ~ 186.5 | 186.5 | -186.5 | -100 | -186.5 | 15 ~ 1500 | 0 ~ 1500 |
| 6 | 6.9 ~ 690 | 690 | -690 | -100 | -690 | 25 ~ 2500 | 0 ~ 2500 |
| 7 | 20.68 ~ 2068 | 2068 | -2068 | -100 | -2068 | NA | NA |
| 8 | 68.95 ~ 6895 | 6895 | -6895 | -100 | NA | NA | NA |
| 9 | 206.8 ~ 20680 | 20680 | NA | -100 | NA | NA | NA |
| 0 | 413.7 ~ 41370 | 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 | Output Signal | 4 ~ 20 mA dc / HART |
| HART loop resistance | 250 ~ 550 ohm | 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 Temperature | -40 ~ +85°C |
| | | LCD Meter Ambient Temp | -30 ~ +80°C |
| | | Humidity Limits | 5% ~ 100% RH |
| Ambient Temp. Effect | ±[0.019%URL+0.125% Span] / 28°C | Process Temperature Limits | -40°C ~ +120°C |
| Stability | ±0.125% URL for 36 Months | Power Supply Effects | ±0.005% of Span per Volt |
| Static Pressure Effects | ±0.1% of URL per 7MPa (Zero Error) ±0.2% of Reading per 7Mpa (Span Error) | Mounting Position Effects | Zero Shift up to 350Pa No Span Effect |

4. Physical Specifications

| | | | |
|------------------------|----------------------------|------------------------------------|--|
| Isolating Diaphragm | 316L SST | Process Connection Size | 1/4 - 18 NPT |
| Drain & Vent Valve | 316 SST | (Adapter - Option) | 1/2 - 14 NPT |
| Flange & Adapter | 316 SST | Electrical Connections | 1/2 - 14 NPT with M4 |
| O-ring | Viton, PTFE | Weight (excluding Option Items) | 3.9 Kg (Standard) 5.35Kg(SST Housing) |
| Electronic Housing | Aluminum (Option:316L SST) | 2" Pipe Stanchion Type bracket | Angle or Flat type |
| Bolts & Bolting Flange | 304 SST | Housing Class | Waterproof (IP67), 4X |

Ordering Information

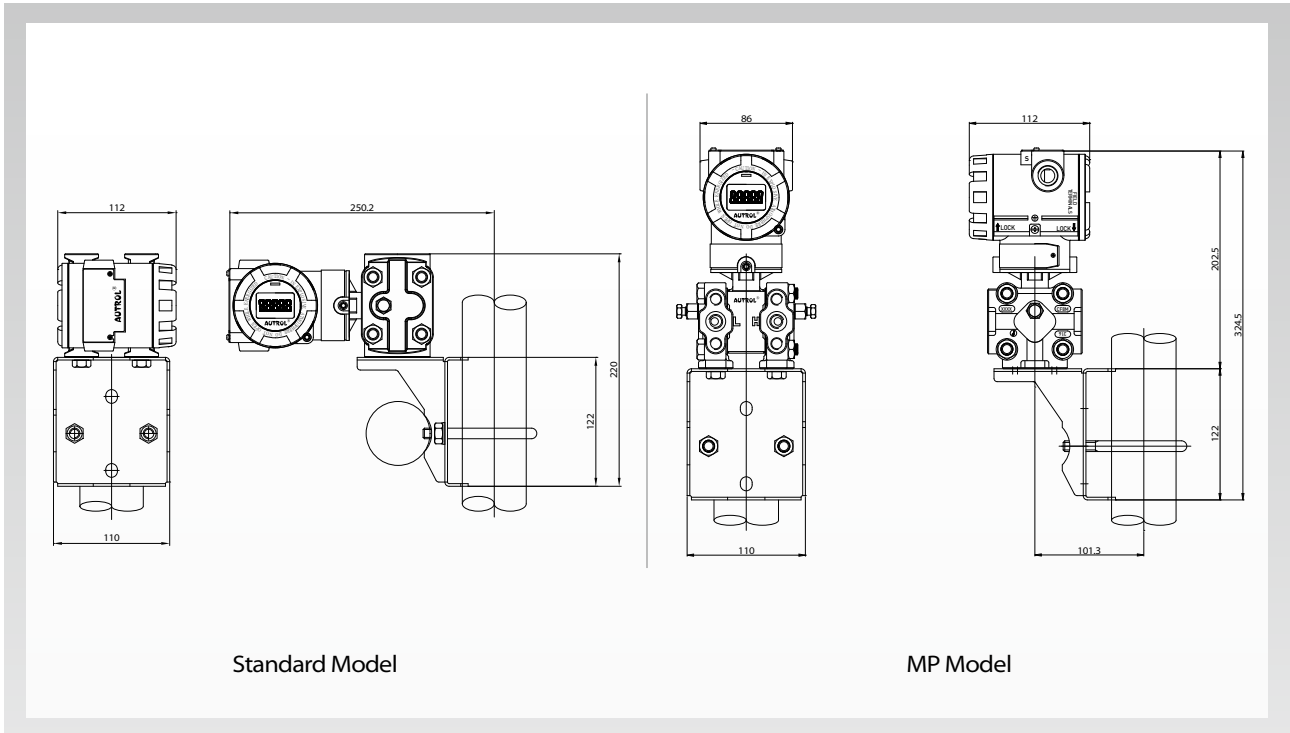
| MODEL | Code | Description | | | | | |
|-----------------------------------|-----------------------------|---|-------------------|---------------------------------|--|---------------------------------|------------|
| APT3100 | -D | Differential Pressure Transmitter (Static Pressure 13.79 MPa / 2000psi) | | | | | |
| | -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 |
| | | | APT3100-D | APT3100-G | APT3100-H | | APT3100-A |
| | 2 | 0.075 ~ 1.5 KPa | -1.5 KPa | -1.5 KPa | NA | 1.5 KPa (6.022 inH2O) | NA |
| | 3 | 0.15 ~ 7.5 KPa | -7.5 KPa | -7.5 KPa | NA | 7.5 KPa (30 inH2O) | NA |
| | 4 | 0.373 ~ 37.3 KPa | -37.3 KPa | -37.3 KPa | -37.3 KPa | 37.3 KPa (150 inH2O) | 0~250 KPa |
| | 5 | 1.865 ~ 186.5 KPa | -186.5 KPa | -100KPa | -186.5 KPa | 186.5 KPa (750 inH2O) | 0~1500 KPa |
| | 6 | 6.9 ~ 690 KPa | -690 KPa | -100KPa | -690 KPa | 690 KPa (100 psi) | 0~2500 KPa |
| | 7 | 20.68 ~ 2068 KPa | -2068 KPa | -100KPa | -2068 KPa | 2068 KPa (300 psi) | NA |
| | 8 | 68.95 ~ 6895 KPa | -6895 KPa | -100KPa | NA | 6895 KPa (1000 psi) | NA |
| | 9 | 206.8 ~ 20680 KPa | NA | -100KPa | NA | 20680 KPa (3000 psi) | NA |
| | 0 | 413.7 ~ 41370 KPa | NA | -100KPa | NA | 41370 KPa (6000 psi) | NA |
| | X | Special | | | | | |
| Mounting Flange /Material | | Body | | Vent Plug | | Diaphragm | |
| | M11 | 316 SST | | 316 SST | | 316L SST | |
| | M12 | 316 SST | | 316 SST | | HAST - C | |
| | M13 | 316 SST | | 316 SST | | Monel | |
| | M14 | 316 SST | | 316 SST | | 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 (SST) : Remote type type | | | 2WF | Flange type | |
| | 3W | 3 Way Manifold (SST) : Remote type type | | | 3WF | Flange type | |
| | 5W | 5 Way Manifold (SST) : Remote type type | | | 5WF | Flange type | |
| | BA | Stainless Steel Bracket (Angle type) with SST Bolts | | | | | |
| | BF | Stainless Steel Bracket (Flat type) with SST Bolts | | | | | |
| | ST | Stainless Steel Housing | | | | | |
| T | Teflon O-Ring (Wetted Part) | | | | | | |
| X | Special | | | | | | |

Example : APT3100-D5-M11-E1-1-S-1-M1-BA

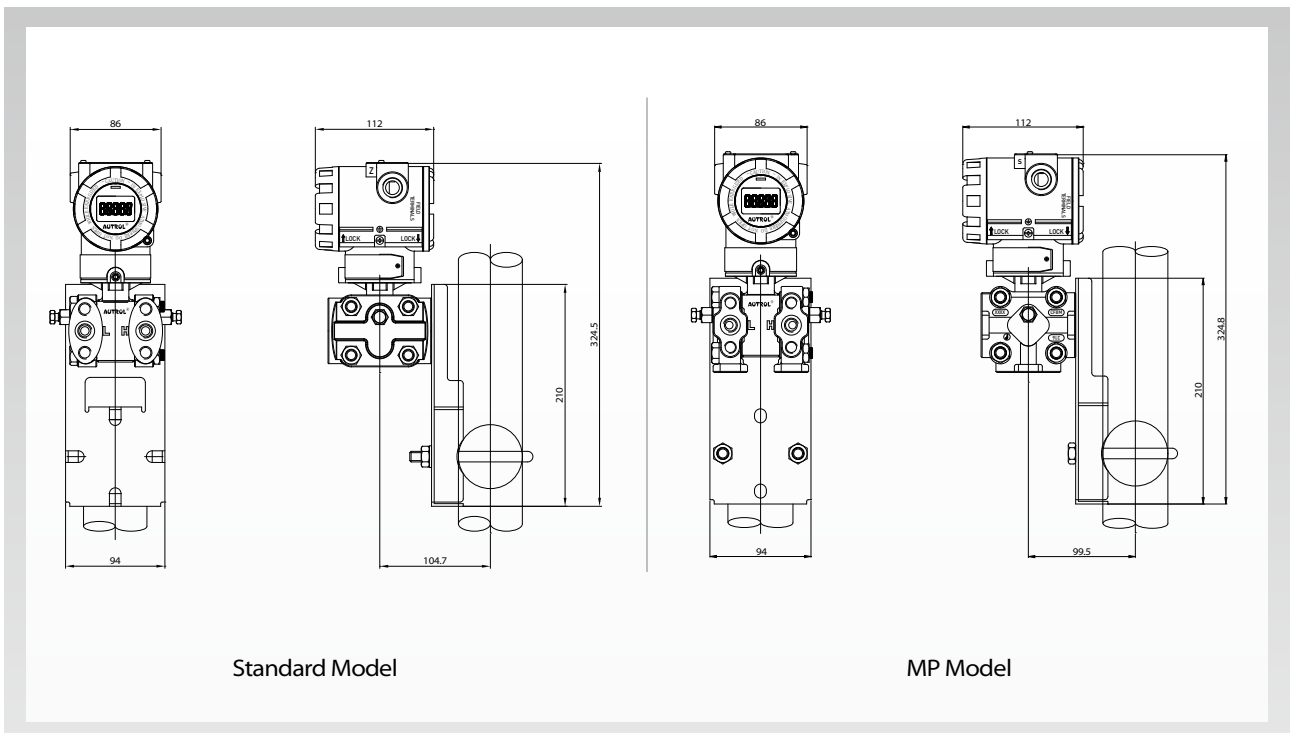
Note 1 : Request to manufacturer for Draft Range, Absolute (small pressure and vacuum) and Items marked "*" before order.

Installation With Mounting Bracket

2" Pipe Mounting Bracket Model Angle Type

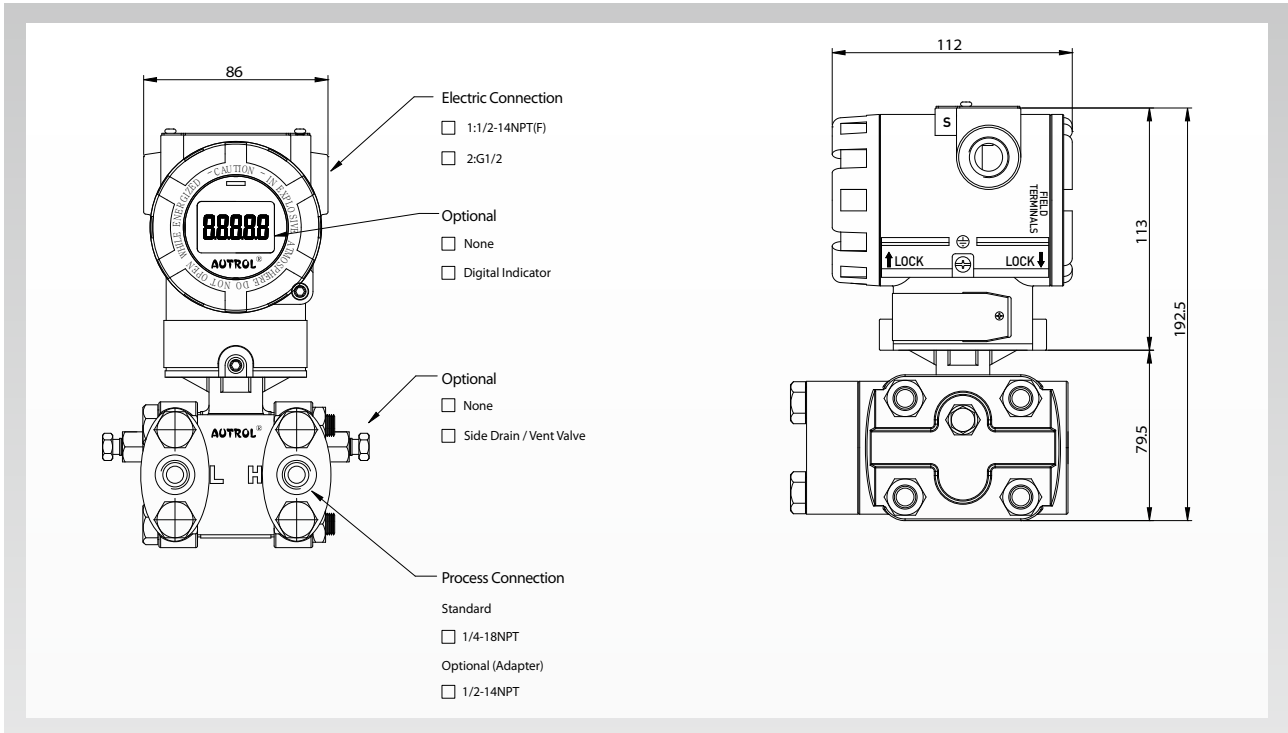


2" Pipe Mounting Bracket Model Flat Type



Dimensions of Transmitter (mm)

Standard Model



Intrinsically safe Model

