TAPT3100

SMART PRESSURE TRANSMITTER

For Differential/Gauge/Absolute/High 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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"TRODEKS 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 TAPT3100 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.

TRODEKS 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 :+/-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 : DP, 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

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TRUE SMART

The heart of TRODEKS 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 TAPT3100 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. There 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

TAPT3100

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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.

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 TAPT3100-D, G, H is available in a differential pressure sensor of a capacitance type. The capacitance pressure sensor measures differential and gauge pressure and is commonly used in flow and level applications. Both sides in the capacitance sensor transmit process pressure from the process isolators to the sensor.

The model TAPT3100-A 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

TATP3100 Pressure transmitter can be easily configured from any host that supports the HART protocol.

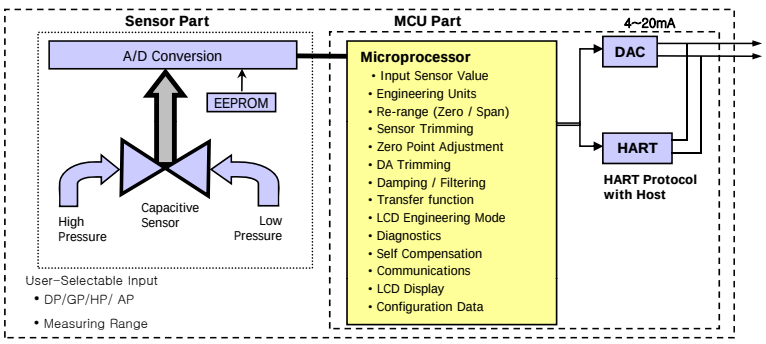
- Operational Parameters
- Operational Parameters.
- 4~20mA Points (Zero/Span)
- Engineering Units
- Damping Time: 0.25 ~ 60 sec
- Tag: 8 alphanumeric characters
- Descriptor: 16 characters
- Message: 32 characters.
- Date: day/month/year

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



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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 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**
  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 ≥ 21.75 mA
- Fail Low : Current ≤ 3.75 mA

Storage Temperature -40℃ to 85℃ (without condensing)

Process Temperature Limits
- (Range codes and approval codes may affect limits)
- -40℃ to 120℃ (-40 to 248 ℉)

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

Working Pressure Limits (silicone oil)

Model DP & GP	0 ~ 13.79 MPa ----------	# 3 ~ 8
Model GP	0 ~ 80.00 MPa ----------	# 9
	0 ~ 80.00 MPa ----------	# 0
Model HP	0 ~ 3 1.02 MPa ----------	# 4 ~ 7
Model AP	0 ~ 700 KPa ----------	# 4
	0 ~ 4000 KPa ----------	# 5
	0 ~ 7000 KPa ----------	# 6

Hydrostatic Test Pressure

Model DP	3000 psi (20.7 MPa)	
Model HP	6750 psi (46.5 MPa)	
Model GP	2000 psi (13.8 MPa)	-- # 3 ~ 8
	11600 psi (80.0 MPa)	--- # 9
	11600 psi (80.0 MPa)	--- # 0
Model AP	101.5 psi (700 KPa)	--- # 4
	218 psi (4000 KPa)	--- # 5
	1015 psi (7000 KPa)	--- # 6

Burst Pressure

Model DP, GP & HP	10000 psi (68.9MPa)
Model AP	2000 psi (13.8MPa)

5 Digits LCD
- Expresses all pressure unit and flow unit in 5 digits.
- Select decimal place (0 to 4)

Physical Specifications

Wetted Materials

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

Non-wetted materials

- Fill Fluid ----------Silicone oil or Inert fill
- Bolts ----------Stainless Steel
- 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

- 1/4-18 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 (excluding options)

Hazardous Location Certifications (option)

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, and D;
Class II, Division 2, Groups E, F, G;
Class IIIT4
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
Ambient Temp. : -20 to 60 °C

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

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 Ⓔx 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

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General Specifications

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

1)TAPT3100 Pressure Sensor Range & URL

Range Code	DP/GP/HP					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	2~250	0~250
5	1.865~186.5	186.5	-186.5	-100	-186.5	10~1500	0~1500
6	6.9~690	690	-690	-100	-690	20~2500	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

1 F

Range Code	KPa	Kg/cm^2	bar	psi	inH_2O@4°C	mmH_2O@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	5.410	149	3804	11.014
5	186.5	1.902	1.865	27.049	749	19018	55.072
6	690	7.036	6.900	100.073	2773	70361	203.750
7	2068	21.088	20.680	299.930	8310	210878	610.660
8	6895	70.309	68.950	1000.009	27708	703097	2036.025
9	20680	210.876	206.800	2999.303	83105	2108781	6106.597
0	41370	421.856	413.700	6000.211	166085	4218566	12216.550

2)Electrical Specifications

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

3)Performance Specifications

Reference Supply	± 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 ℃
		LCD Meter Ambient Temp.	-30 ~ +80 ℃
		Humidity Limits	5% ~ 100% RH
Ambient Temp. Effect	±[0.019%URL+0.125% Span] / 28 ℃	Process Temperature Limits	-40℃ ~ +120 ℃
Stability	±0.125% URL for 12 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
Electronic Housing	Aluminum	2” Pipe Stanchion Type bracket	Angle or Flat type
Bolts & Bolting Flange	304 SST	Housing Class	Waterproof (IP67), 4X, IP66

5)Hazardous Location Certifications (option)

Korea Standards Approval	Overseas Standards Approval
Flameproof Approval : Ex d IIC T6 (KOSHA) Intrinsic Safety Approval : Ex ia IIC T5 (KTL)	CSA Explosion proof Approval FM Explosion proof Approval ATEX Flame proof Approval

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Ordering Information

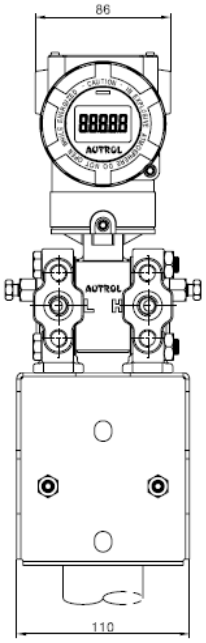
Model	Code	Description					
TAPT3100	D	Differential Pressure Transmitter (Static Pressure 13.79 MPa / 2000psi)					
	G	Gauge Pressure Transmitter					
	H	Differential Pressure Transmitter for High Line Pressure (Static Pressure 31.02MPa / 4500psi)					
	A	Absolute Pressure Transmitter					
Ranges		DP/GP/HP					*AP
		Calibrated Span Min. to Max	Lower Range Limit			Upper Range Limit	Range
			TAPT3100-D	TAPT3100-G	TAPT3100-H		TAPT3100-A
	2	0.075 1.5 Kpa (0.302~6.022 inH2O)	-1.5 Kpa (-6.022 in H2O)	-1.5 Kpa (-6.022 in H2O)	NA	1.5 Kpa (6.022 in H2O)	NA
	3	0.15 ~ 7.5 Kpa 0.6~30 inH2O)	-7.5 Kpa (-30 inH2O)	-7.5 Kpa (-30 inH2O)	-7.5 Kpa (-30 inH2O)	7.5 Kpa (30 inH2O)	NA
	4	0.373 ~ 37.3 KPa (1.5~150 in H2O)	-37.3 KPa (-150 inH2O)	-37.3 KPa (-150 inH2O)	-37.3 KPa (-150 inH2O)	37.3 KPa (150 inH2O)	NA
	5	1.865 ~ 186.5 KPa (7.5~750 inH2O)	-186.5 KPa (-750 inH2O)	-100KPa (-14.6 psi)	-186.5 KPa (-750 inH2O)	186.5 KPa (750 inH2O)	0~200 KPa
	6	6.9 ~ 690 KPa (1~100 psi)	-690 KPa (-100 psi)	-100KPa (-14.6 psi)	-690 KPa (-100 psi)	690 KPa (100 psi)	0~1000 KPa
	7	20.68 ~ 2068 KPa (3~300 psi)	-2068 KPa (-300 psi)	-100KPa (-14.6 psi)	-2068 KPa (-300 psi)	2068 KPa (300 psi)	0~2000 KPa
	8	68.95 ~ 6895 Kpa (10~1000 psi)	-6695 KPa (-1000 psi)	-100KPa (-14.6 psi)	NA	6895 Kpa 1000 psi)	NA
	9	206.8 ~ 20680KPa (30~3000 psi)	NA	-100KPa (-14.6 psi)	NA	20680 KPa (3000 psi)	NA
	0	413.7 ~ 41370 KPa (60~6000 psi)	NA	-100KPa (-14.6 psi)	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			
Approvals	K0	Maker Standard (Waterproof : IP67)	E1	ATEX(KEMA) Flameproof			
	K1	KOSHA Flameproof Approval : Ex d IIC T6	*E2	ATEX(KEMA) Intrinsic Safety			
	*K2	KTL Intrinsic Safety Approval : Ex ia IIC T5	F1	FM/FMC Explosion proof for (USA & Canada)			
	*F2	FM 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	X	Special	
Option	M1	LCD Indicator(5digit)					
	MP	Multi-Planar					
	LP	Lighting Protector (Internal Type)					
	K	Oil Free Finish					
	F1	Side Vent / Drain Top					
	F2	Side Vent / Drain Bottom					
	2W	2 Way Manifold (SST)					
	3W	3 Way Manifold (SST) Add Remark "Remote Type"					
	5W	5 Way Manifold (SST) Add Remark "Remote Type"					
	BA	Stainless Steel Bracket (Angle type) with SST Bolts					
	BF	Stainless Steel Bracket (Flat type) with SST Bolts					
	ST	Stainless Steel (SUS 316) Housing					
	T	Teflon O-Ring (Wetted Part)					

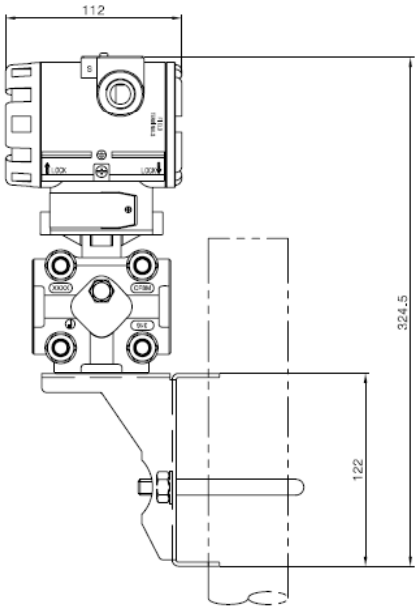
Example: TAPT3100-D5-M11-C1-1-S-1-M1-W-BA

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

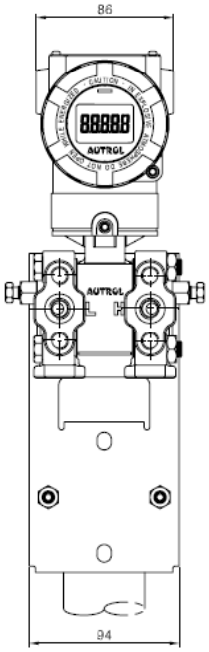
Installation with mounting bracket

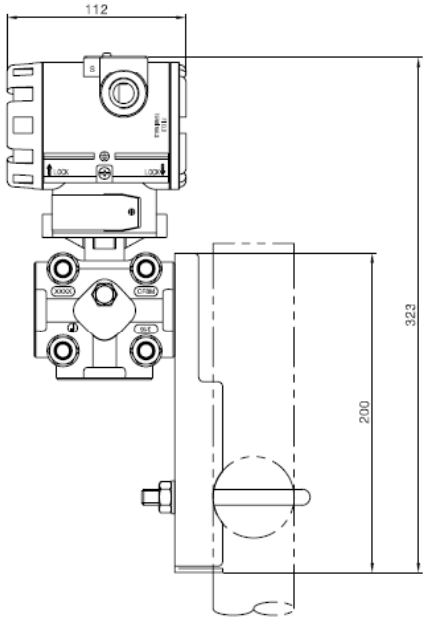
2” Pipe Mounting Bracket Model Angle Type



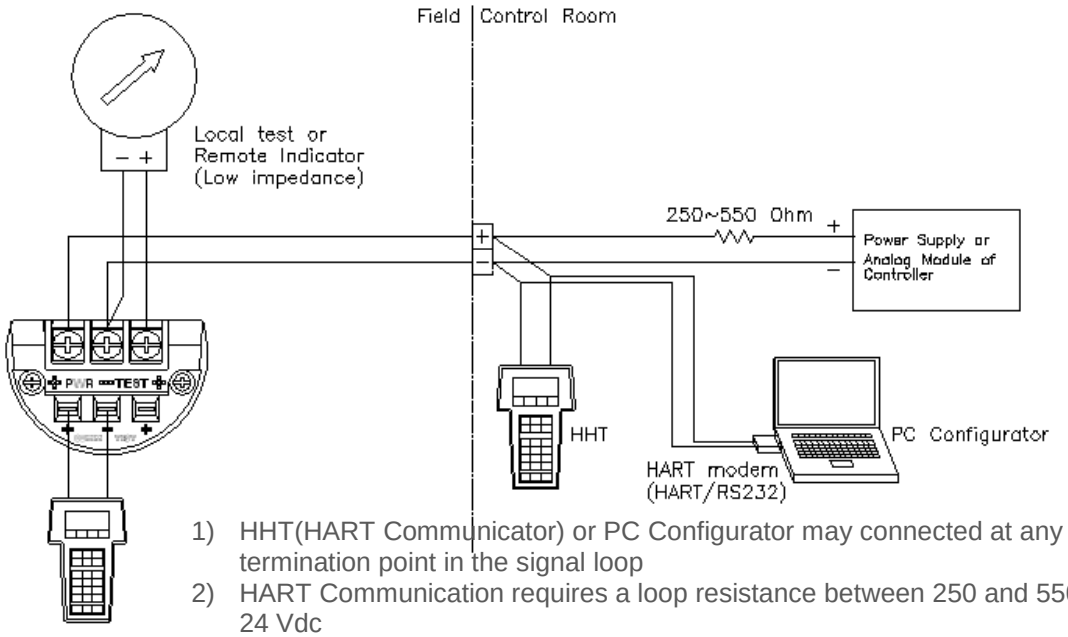


2” Pipe Mounting Bracket Model Flat Type





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)

Dimensions of Transmitter (mm)