

SMART PRESSURE TRANSMITTER

WITH DIAPHRAGM SEAL



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 APT3100 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 : To measure pressure head and transmit liquid level
- Various output: 4 ~20mA(Analog), Digital Signals
- Automatic Compensation of Ambient Temperature
- Setting Various Parameters: Zero/Span, Fail-mode, Unit, Trim, etc.
- Self Diagnostic Function : Sensor, A/D Converter, Memory Power etc
- Digital Communication with HART protocol, Command.
- 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 APT3100 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

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 APT3100-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 APT3100-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

ATP3100 Pressure transmitter can be easily configured from any host that supports the HART protocol.

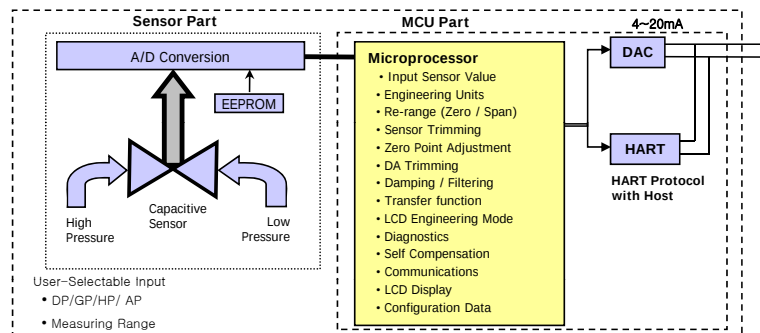
- Operational Parameters
- Operational Parameters.
- 4~20mA Points (Zero/Span)
- Engineering Units
- Damping Time: 0.25 ~ 60 sec
- Tag: 8 alphanumeric characters
- Descriptor: 16 characters
- Message: 32 characters.
- Date: day/month/year

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

General Specifications

1) Diaphragm Sealed Sensor Range (Rangeability: 20: 1)

Class	Code	mmH2O	KPa
Low Level	4	0 ~ 194 to 0 ~ 3800	0 ~ 1.9 to 0 ~ 37.3
Medium Level	5	0 ~ 960 to 0 ~ 19000	0 ~ 9.4 to 0 ~ 186.5
High Level	6	0 ~ 3518 to 0 ~ 70000	0 ~ 34.5 to 0 ~ 690

2) Electrical Specifications

Power Supply	11.9 ~ 45 V dc	Output Signal	4 ~ 20 mA dc /HART
HART loop resistance	250 ~ 550 ohm	Isolation	500 Vrms (707V DC)
Update Time	0.25 Sec	Turn-on Time	5 Sec.

3) Performance Specifications (without seal)

Reference Accuracy	$\pm 0.075\%$ of Span ($0.2URL \leq \text{Span} \leq URL$) $\pm [0.05 + 0.005 \times (URL/\text{Span})]\%$ of Span ($0.05URL \leq \text{Span} < 0.2URL$)	Operating Temp.	-40 ~ +85 °C
		LCD Meter Operating Temp.	-30 ~ +80 °C
		Humidity Limits	5% ~ 98% RH
Ambient Temp. Effect	$\pm [0.025\%URL + 0.125\% \text{ Span}] / 28$ °C	Process Temp. Limit	-40 ~ +205 °C
Stability	$\pm 0.1\%$ URL for 12 Months	Power Supply Effects	$\pm 0.005\%$ of Span per Volt
Static Pressure Effects	$\pm 0.1\%$ of URL per 7MPa (Zero Error) $\pm 0.2\%$ 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	1/2" -14 NPT
Drain & Vent Valve	316 SST	Diaphragm Seal(Flush/Extended)	2" or 3" / 3" or 4"
Flange & Adapter	316 SST	Electrical Connections	1/2" -14 NPT with M4
O-ring	Viton, PTFE	Weight (only transmitter)	3.9 Kg
Electronic Housing	Aluminum	2" Pipe Stanchion Type bracket	Angle or Flat type
Bolts & Bolting Flange	304 SST	Housing Class	Waterproof (IP67)

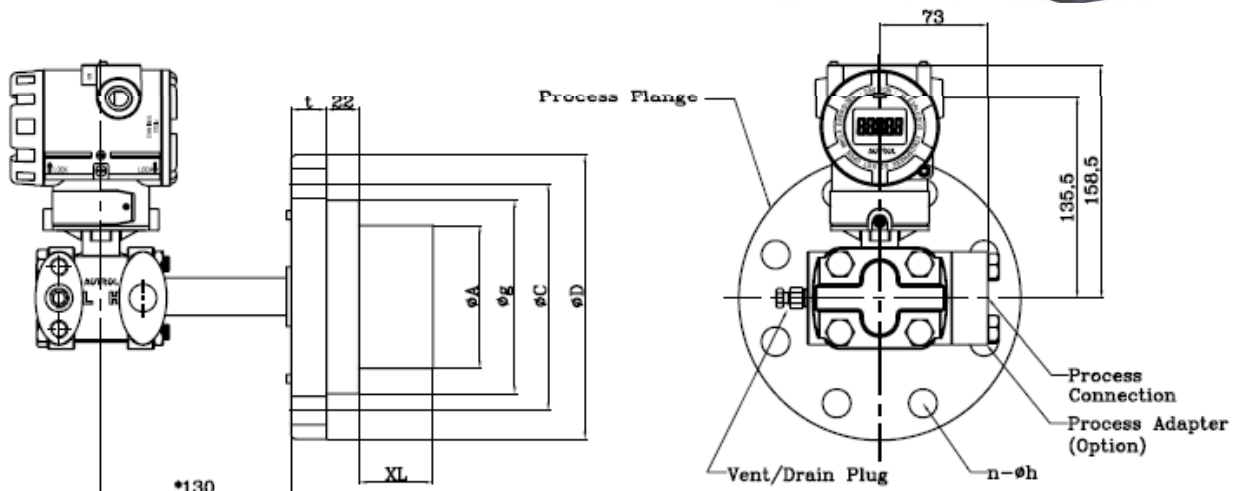
5) Hazardous Location Certifications - Option

Korea Standards Approval	International 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

SMART PRESSURE TRANSMITTER

APT3100LED

Extended Diaphragm Seal and Direct Mount Type Transmitter



Unit: mm

Flange Size: 80mm (3 inch)

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	72	190	24	20	152.5	1.6	127	76	4
ANSI Class300		210	29	22	168.5				8
JIS 10K	72	185	18	19	150	2	126	76	8
JIS 20K		200	22	23	160		132		
DIN PN 10/16	72	200	20	18	160	2	138	76	8
DIN PN 25/40			24						

Flange Size: 50mm (2 inch)

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	47	150	20	20	120.5	2	92	48.3	4
ANSI Class300		165	22.5		127				8
JIS 10K	47	155	16	19	120	2	96	48.3	4
JIS 20K			18						8
DIN PN 10/16	47	165	20	18	125	2	102	48.3	4
DIN PN 25/40									

Diaphragm Extension Length Code	R _L
5	50mm (2 inch)
10	100mm (4 inch)
15	150mm (6 inch)

For application support, quotations, pricing and lead times please contact our sales department directly at sales@autroltransmitters.com. Additional details including product technical specifications can be found online at www.autroltransmitters.com

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SMART PRESSURE TRANSMITTER

Ordering Information

MODEL NO.	Code	Description
APT3100	LED	Extended Diaphragm Seal and Direct Mount Type Transmitter
Ranges	4	0-194 to 0-3800mmH ₂ O (0-1.9 to 0-37.3 KPa)
	5	0-960 to 0-19000mmH ₂ O (0-9.4 to 0-186.5 KPa)
	6	0-3518 to 0-70000mmH ₂ O (0-34.5 to 0-690 KPa)
	X	Special
Mounting Flange Size/Material	S2	2-inch (50mm) SST
	S3	3-inch (80mm) SST
	XX	Special
Mounting Flange Rating	A1	ANSI Class 150
	A2	ANSI Class 300
	J1	JIS 10K
	J2	JIS 20K
	D1	DIN PN 10/16
	D2	DIN PN 25/40
	XX	Special
Extension Length	5	50mm (2 in.)
	10	100mm (4 in.)
	15	150mm (6 in.)
	XX	Special
Wetted Parts Material Diaphragm/Others		DIAPHRAGM
	S	316L SST
	PT	PTFE + 316L SST
	H	Hastelloy C-276
	T	Tantalum
	X	Special
Fill Fluid		FILL FLUID
	2	D.C Silicone 200
	7	D.C Silicone 704
	X	Special
Materials of Construction		FLANGE
	SS	316 SST
Low Side	W	without Process Adapter (1/4-18 NPT on the cover flange)
	N	with 1/2-14 NPT Process Adapter (316 SST)
	X	Special

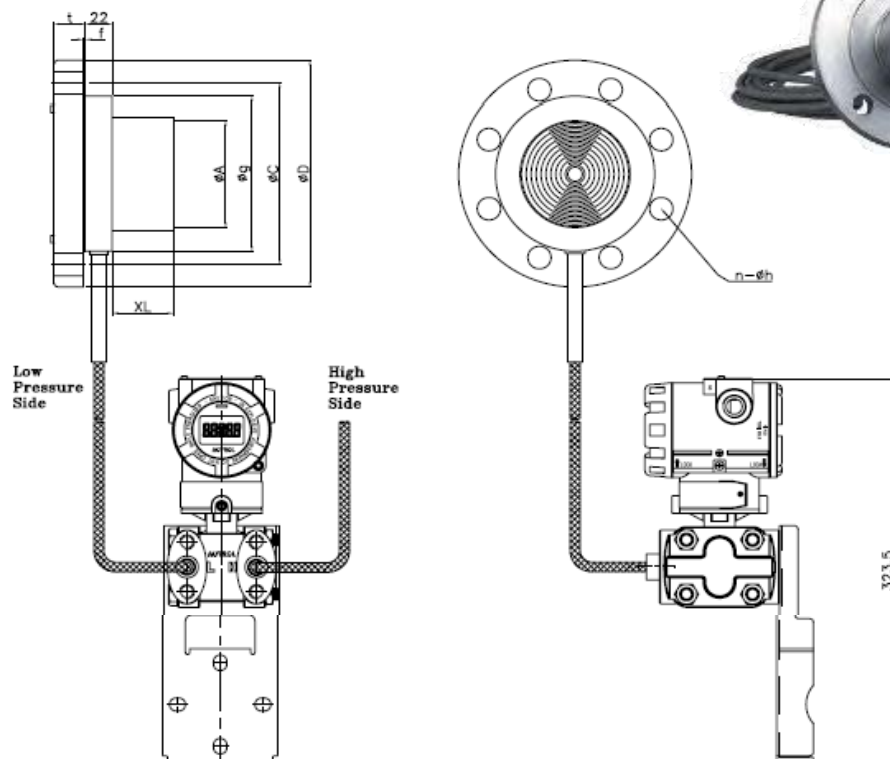
SMART PRESSURE TRANSMITTER

Electrical Connection		ELECTRICAL CONNECTION	MATERIAL
	1	1/2-14NPT	Epoxy Coated-Aluminum
	2	G1/2	Epoxy Coated-Aluminum
	X	Special	
Hazardous Locations Certifications (Option)	K0	Maker Standard (Waterproof : IP67)	
	K1	KOSHA Flameproof Approval: Ex d IIC T6.	
	K2	KTL Intrinsic Safety Approval : Ex ia IIC	
	E1	ATEX(KEMA) Flameproof	
	*E2	ATEX(KEMA) Intrinsic Safety	
	F1	FM/FMC Explosion proof (for USA & Canada)	
	*F2	FM Intrinsic Safety	
	M1	LCD Indicator	
	LP	Lighting Protector (Internal Type)	
	K	Oil Free Finish	
	X	Special Order	

SMART PRESSURE TRANSMITTER

APT3100LEC

Extended Diaphragm Seal and
Capillary Type Transmitter



Flange Size: 80mm (3 inch)

Unit: mm

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	72	190	24	20	152.5	1.6	127	76	4
ANSI Class300		210	29	22	168.5				8
JIS 10K	72	185	18	19	150	2	126	76	8
JIS 20K		200	22	23	160		132		
DIN PN 10/16	72	200	20	18	160	2	138	76	8
DIN PN 25/40			24						

Flange Size: 50mm (2 inch)

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	47	150	20	20	120.5	2	92	48.3	4
ANSI Class300		165	22.5		127				8
JIS 10K	47	155	16	19	120	2	96	48.3	4
JIS 20K			18						8
DIN PN 10/16	47	165	20	18	125	2	102	48.3	4
DIN PN 25/40									

Diaphragm Extension Length Code	R _L
5	50mm (2 inch)
10	100mm (4 inch)
15	150mm (6 inch)

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SMART PRESSURE TRANSMITTER

Ordering Information

MODEL NO.	Code	Description
APT3100	LEC	Extended Diaphragm Seal and Capillary Type Transmitter (Two Remote
Ranges	4	0-194 to 0-3800mmH2O (0-1.9 to 0-37.3 KPa)
	5	0-960 to 0-19000mmH2O (0-9.4 to 0-186.5 KPa)
	6	0-3518 to 0-70000mmH2O (0-34.5 to 0-690 KPa)
	X	Special
Mounting Flange Size/Material	S2	2-inch (50mm) SST
	S3	3-inch (80mm) SST
	XX	Special
Mounting Flange Rating	A1	ANSI Class 150
	A2	ANSI Class 300
	J1	JIS 10K
	J2	JIS 20K
	D1	DIN PN 10/16
	D2	DIN PN 25/40
	XX	Special
Extension Length	5	50mm (2 in.)
	10	100mm (4 in.)
	15	150mm (6 in.)
	XX	Special
Wetted Parts Material Diaphragm/Others		DIAPHRAGM OTHERS
	S	316L SST 316L SST
	PT	PTFE + 316L SST 316L SST
	H	Hastelloy C-276 316L SST
	T	Tantalum 316L SST
	X	Special Special
Fill Fluid		FILL FLUID TEMPERATURE LIMITS
	2	D.C Silicone 200 -40 to 205 °C(-40 to 400 °F)
	7	D.C Silicone 704 15 to 205 °C(60 to 400 °F)
	X	Special
Capillary Length (m)		Capillary length from 1 to 12 mm (Example for 3m : 03)
Materials of Construction		FLANGE VENT/DRAIN VALVE
	SS	316 SST 316 SST
Electrical Connection		ELECTRICAL CONNECTION MATERIAL
	1	1/2-14NPT Epoxy Coated-Aluminum
	2	G1/2 Epoxy Coated-Aluminum
	X	Special

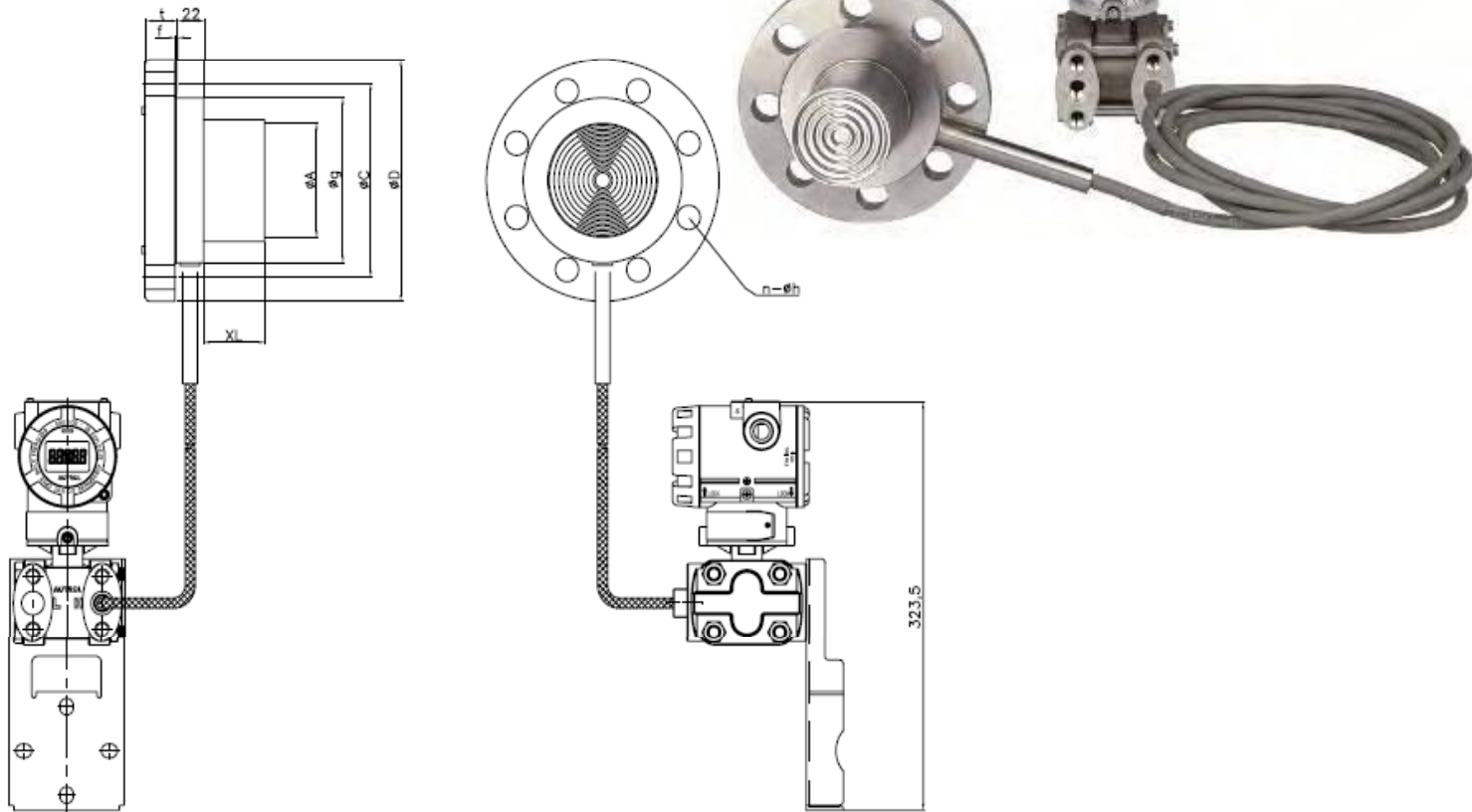
SMART PRESSURE TRANSMITTER

Hazardous Locations Certifications (Option)	K0	Maker Standard (Waterproof : IP67)
	K1	KOSHA Flameproof Approval: Ex d IIC T6.
	K2	KTIL Intrinsic Safety Approval : Ex ia IIC
	E1	ATEX(KEMA) Flameproof
	*E2	ATEX(KEMA) Intrinsic Safety
	F1	FM/FMC Explosion proof (for USA & Canada)
	*F2	FM Intrinsic Safety
	M1	LCD Indicator
	LP	Lighting Protector (Internal Type)
	ET	External Terminal Block
	K	Oil Free Finish
	BA	Stainless Steel Bracket (Angle type) with SST Bolts
	BF	Stainless Steel Bracket (Flat type) with SST Bolts
	X	Special Order

SMART PRESSURE TRANSMITTER

APT3100LES

Extended Diaphragm Seal and Capillary Type Transmitter



Unit: mm

Flange Size: 80mm (3 inch)

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	72	190	24	20	152.5	1.6	127	76	4
ANSI Class300		210	29	22	168.5				8
JIS 10K	72	185	18	19	150	2	126	76	8
JIS 20K		200	22	23	160		132		
DIN PN 10/16	72	200	20	18	160	2	138	76	8
DIN PN 25/40			24						

Flange Size: 50mm (2 inch)

Flange Rating	Mb	D	b	d2	k	f	d4	d5	x
ANSI Class150	47	150	20	20	120.5	2	92	48.3	4
ANSI Class300		165	22.5		127				8
JIS 10K	47	155	16	19	120	2	96	48.3	4
JIS 20K			18						8
DIN PN 10/16	47	165	20	18	125	2	102	48.3	4
DIN PN 25/40									

Diaphragm Extension Length Code	R _L
5	50mm (2 inch)
10	100mm (4 inch)
15	150mm (6 inch)

SMART PRESSURE TRANSMITTER

Ordering Information

MODEL NO.	Code	Description	
APT3100	LES	Extended Diaphragm Seal and Capillary Type Transmitter (One Remote Seal)	
Ranges	6	0-3518 to 0-70000mmH ₂ O (0-34.5 to 0-690 KPa)	
	7	0-10565 to 0-211300mmH ₂ O (0-103.4 to 0-2068 KPa)	
	8	0-35217 to 0-704340mmH ₂ O (0-344.8 to 0-6895 KPa)	
	X	Special	
Mounting Flange Size/Material	S2	2-inch (50mm)	SST
	S3	3-inch (80mm)	SST
	XX	Special	
Mounting Flange Rating	A1	ANSI Class 150	
	A2	ANSI Class 300	
	J1	JIS 10K	
	J2	JIS 20K	
	D1	DIN PN 10/16	
	D2	DIN PN 25/40	
	XX	Special	
Extension Length	5	50mm (2 in.)	
	10	100mm (4 in.)	
	15	150mm (6 in.)	
	XX	Special	
Wetted Parts Material Diaphragm/Others		DIAPHRAGM	OTHERS
	S	316L SST	316 SST
	PT	PTFE	316 SST
	H	Hastelloy C-276	316 SST
	T	Tantalum	316 SST
	X	Special	Special
Fill Fluid		FILL FLUID	TEMPERATURE LIMITS
	2	D.C Silicone 200	-40 to 205 °C(-40 to 400 °F)
	7	D.C Silicone 704	15 to 205 °C(60 to 400 °F)
	X	Special	
Capillary Length (m)		Capillary length from 1 to 12 mm (Example for 3m : 03)	
Materials of Construction		FLANGE	VENT/DRAIN VALVE
	SS	316 SST	316 SST
Electrical Connection		ELECTRICAL CONNECTION	MATERIAL
	1	1/2-14NPT	Epoxy Coated-Aluminum
	2	G1/2	Epoxy Coated-Aluminum
	X	Special	

SMART PRESSURE TRANSMITTER

Hazardous Locations Certifications (Option)	K0	Maker Standard (Waterproof : IP67)
	K1	KOSHA Flameproof Approval : Ex d IIC T6.
	K2	KTL Intrinsic Safety Approval : Ex ia IIC
	E1	ATEX(KEMA) Flameproof
	*E2	ATEX(KEMA) Intrinsic Safety
	F1	FM/FMC Explosion proof (for USA & Canada)
	*F2	FM Intrinsic Safety
	M1	LCD Indicator
	LP	Lighting Protector (Internal Type)
	K	Oil Free Finish
	BA	Stainless Steel Bracket (Angle type) with SST Bolts
	BF	Stainless Steel Bracket (Flat type) with SST Bolts
	X	Special Order

SMART PRESSURE TRANSMITTER



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