

DOC. NO. : C3200-E03A



AUTROL[®]

Smart Pressure Transmitter

for Gauge and Absolute Pressure Measurement



MODEL
APT 3200



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Smart Pressure Transmitter

APT3200



Description of Product

The APT3200 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.

All Data of Sensor (Tag No., type, range etc.) is to be input, modified and stored in EEPROM.

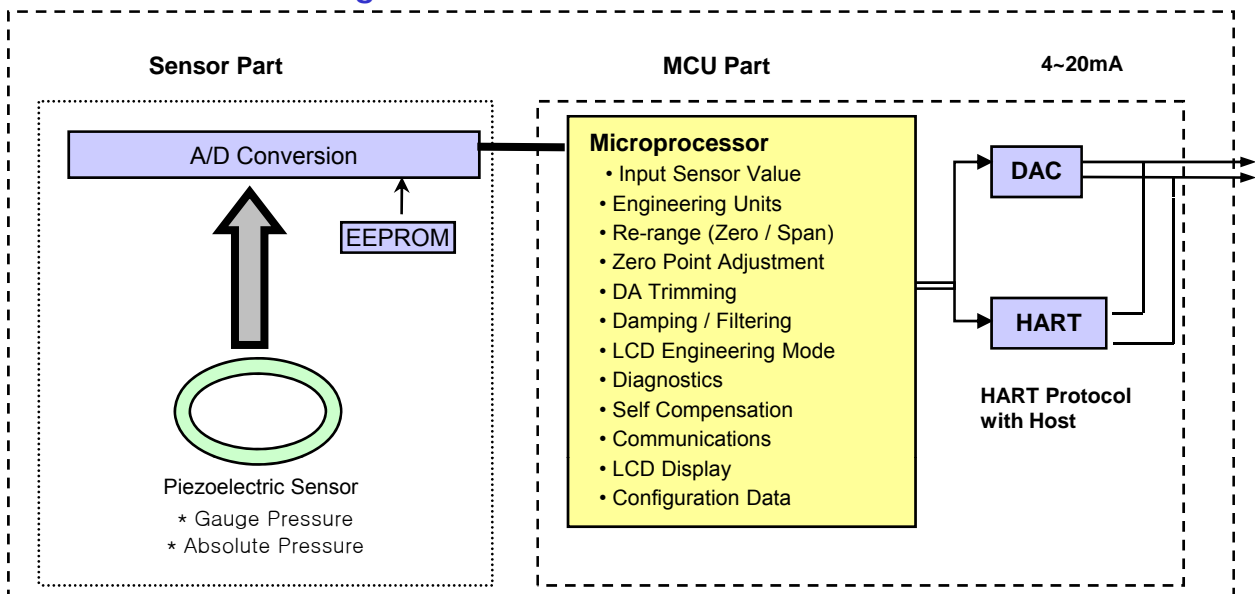
Function

- 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

Features

- Superior Performance
 - High Accuracy : $\pm 0.075\%$ of Calibrated Span
 - Long-Term Stability
 - High Rangeability (100:1)
- Flexibility
 - Measuring GP, AP
 - Data Configuration with HART configurator
- Reliability
 - Continuous Self-Diagnostic Function
 - Automatic Ambient Temperature Compensation
 - Fail-mode Process Function
 - EEPROM Write Protection
 - CE EMC Conformity Standards (EN50081-2, EN50082-2)

Functional Block Diagram



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Transmitter Description

Electronics Module

The Electronics module consists of a circuit board sealed in an enclosure. There are a MCU module, a power module, an analog module, a LCD module and a terminal module in a transmitter. The MCU module acquires 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 module 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.

Configuration Data Storage

The transmitters store configuration data in nonvolatile EEPROM in their electronics modules. This data is retained in the transmitter when power is interrupted, so the transmitters are functional immediately upon power-up

Sensor Inputs

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

The sensor module converts 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 support the HART protocol.

- 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. 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. 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 21.75 mA
- Fail Low : Current \leq 3.75 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 (-40 to 248 °F)

Isolation

Input/output isolated to 500Vrms (707 Vdc)

Overpressure Limits (silicone oil)

Model G, R	-100 ~ 1500 KPa	----- # 4
	-100 ~ 7,500 KPa	----- # 5
	-100 ~ 30,000 KPa	----- # 6
	-100 ~ 60,000 KPa	----- # 7

Model A, K	0 ~ 1500 KPa	----- # 5
	0 ~ 3000 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

Process Connections

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

Electrical connections

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

Weight

- 1.7 kg (excluding options)

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Hazardous Location Certifications (option)

KOSHA Approvals

(KOSHA: Korea Occupational Safety & Health Agency)

K1 Code :

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

KTL (KTL: Korea Testing Laboratory) Certification

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
Nonsparking 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

*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 : KEMA06ATEX0135

CE 0344  II 2 G

Ex d IIC T6

Operating Temperature: -20°C ≤ Tamb ≤ +60°C
T6 for process < 85°C; T5 for process < 100°C; T4 for
process < 120°C

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

General Specifications

1. APT3200 – G/R/A/K Pressure Sensor Range (Rangeability = 100 : 1 or 20:1) <Table 1>

	APT3200 – G & APT 3200 - R			APT3200 - A & APT3200 -K		
	Range (KPa)	Calibrated Span (KPa)		Range	Calibrated Span (KPa)	
	G & R	G	R	A & K	A	K
4	-100 ~ 1,000	10 ~ 1,000	50 ~ 1,000	0 ~ 200	2 ~ 200	10 ~ 200
5	0 ~ 5,000	50 ~ 5,000	250 ~ 5,000	0 ~ 1,000	10 ~ 1,000	50 ~ 1,000
6	0 ~ 20,000	200 ~ 20,000	1,000 ~ 20,000	0 ~ 2,000	20 ~ 2,000	50 ~ 1,000
7	0 ~ 60,000	600 ~ 60,000	3,000 ~ 60,000	NA	NA	NA

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 (707 Vdc)

3. Performance Specifications

Reference Accuracy	APT3200 – G/APT 3200 - A $\pm 0.075\%$ of Span ($0.1URL \leq \text{Span} \leq URL$) $\pm [0.025 + 0.005 \times (URL/Span)]\%$ of Span ($0.01URL \leq \text{Span} < 0.1URL$) APT3200 – R/APT 3200 - K $\pm 0.15\%$ of Span ($0.2URL \leq \text{Span} \leq URL$) $\pm [0.1 + 0.01 \times (URL/Span)]\%$ of Span ($0.05URL \leq \text{Span} < 0.2URL$)	Ambient Temperature	-40 °C ~ +85 °C
		LCD Meter Ambient Temp	-30 ~ + 80 °C
		Humidity Limits	5% ~ 98% RH
		Process Temp. Limit	-30 °C ~ +100 °C
Ambient Temp. Effect	APT3200 – G/APT 3200 - A $\pm [0.019\%URL + 0.125\% \text{ Span}] / 28 \text{ }^\circ\text{C}$ APT3200 – R/APT 3200 - K $\pm [0.025\%URL + 0.125\% \text{ Span}] / 28 \text{ }^\circ\text{C}$	Power Supply Effect	$\pm 0.005\%$ of Span per Volt
		Stability	APT3200-G/APT3200 – A $\pm [0.125\%URL \text{ for 12 months}]$ APT3200-G/APT3200 – A $\pm [0.135\%URL \text{ for 12 months}]$

4. Physical Specifications

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


5. Hazardous Location Certifications (option)

Korea Standards Approval	CSA (Canadian Standards Association) Approval
Flameproof Approval : Ex d IIC T6 (KOSHA)	Explosion-proof / DIP for Class I, II, III Div. 1, 2 Groups A~G
Intrinsic Safety Approval : Ex ia IIC T5 (KTL)	Flameproof for Zone 1, Ex d II C T6..T4
	Type of Protection "nA" for Zone 2, Ex nA IIC T4

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Ordering Information

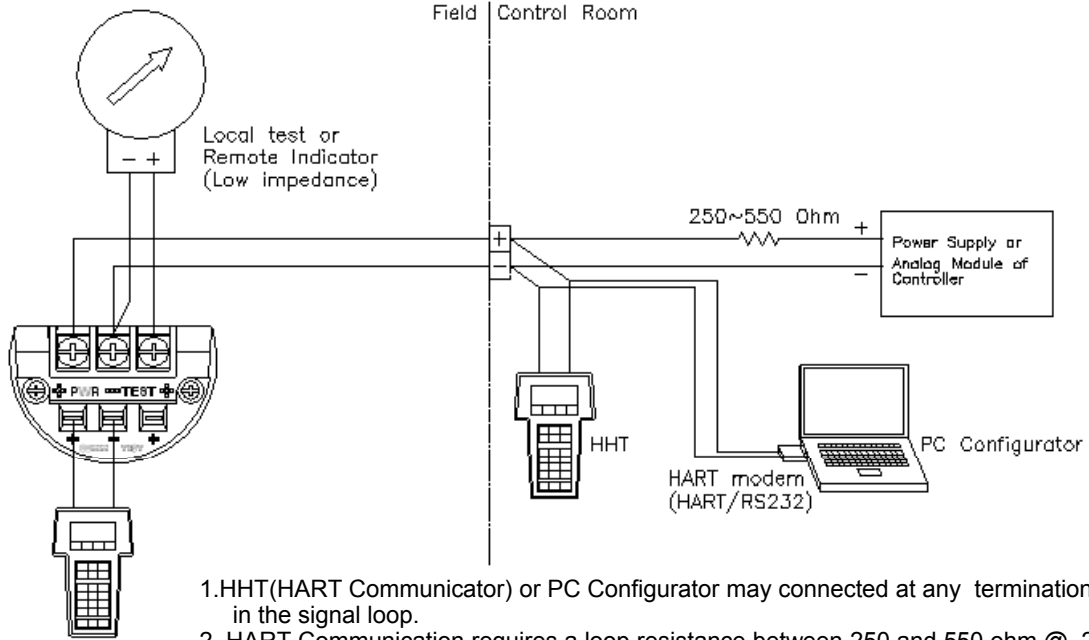
MODEL	Code	Description				
APT3200	-GP	Gauge Pressure Transmitter (reference accuracy : 0.075 % of span)				
	-AP	Absolute Pressure Transmitter (reference accuracy : 0.075 % of span)				
	-RP	Gauge Pressure Transmitter (reference accuracy : 0.15 % of span)				
	-KP	Absolute Pressure Transmitter (reference accuracy : 0.15 % of span)				
Range		GP / RP				
		AP / KP				
		Range (KPa)	Min.Span (KPa)			
		GP	RP			
	4	-100 ~ 1,000	10 50	0 ~ 200	2	10
	5	0 ~ 5,000	50	250	0 ~ 1000	10
6	0 ~ 20,000	200	1000	0 ~ 2000	20	100
7	0 ~ 60,000	600	3000	NA	NA	NA
X	Special					
Mounting Flange Size /Material		DIAPHRAGM	OTHER			
	M11	316 SST	316 SST			
	*M12	HAST-C	316 SST			
	*M21	HAST - C	HAST - C			
Hazardous Location Certifications	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 Explosion proof		
	*C1	CSA Explosion proof	*F2	FM Intrinsic Safety		
	*C2	CSA Intrinsic Safety				
Fill Fluid	1	Silicone				
	*2	Inert fill				
Process Connection	S	1/2 – 14 NPT Female (standard)				
	O	1/4 - 18 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	LP	Lighting Protector		
	C6	Engineering Unit	ET	External Terminal Block		
	K	Oil Free Finish				
	2WF	2 way manifold Flange type				
	BA	Stainless Steel Bracket (Angle type) with SST Bolts				
	BF	Stainless Steel Bracket (Flat type) with SST Bolts				
	CA	Painted Steel Mounting Bracket (Angle Type) with SST Bolts				
	CF	Painted Steel Mounting Bracket (Flat Type) with SST Bolts				

Example : APT3200-G5-M11-K0-1-S-1-M1

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

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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)

