AUTROL America
SMART TRANSMITTERS

ATT2100/2200

SMART TEMPERATURE TRANSMITTER

ABZAR SANJESH ARIA

ATT 2200

ATT2100

Application Areas:

- *Nuclear*
- *Water & Wastewater*
- *Chemical*
- *Petrochemical*
- *Oil & Gas*
- *Pulp & Paper*
- *Food & Beverage*
- *Pharmaceutical*
- *Power*
- *Renewable Energy*
- *Alternate Fuel*

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HART COMMUNICATION PROTOCOL · FOUNDATION · CE · Ex · FM APPROVED · CSA · PG · Kepic · NP

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"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 AUTROL Smart Temperature Transmitter is a micro-processor based high performance transmitter, which has flexible sensor input and output, automatic compensation of ambient temperature and process parameters, 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.

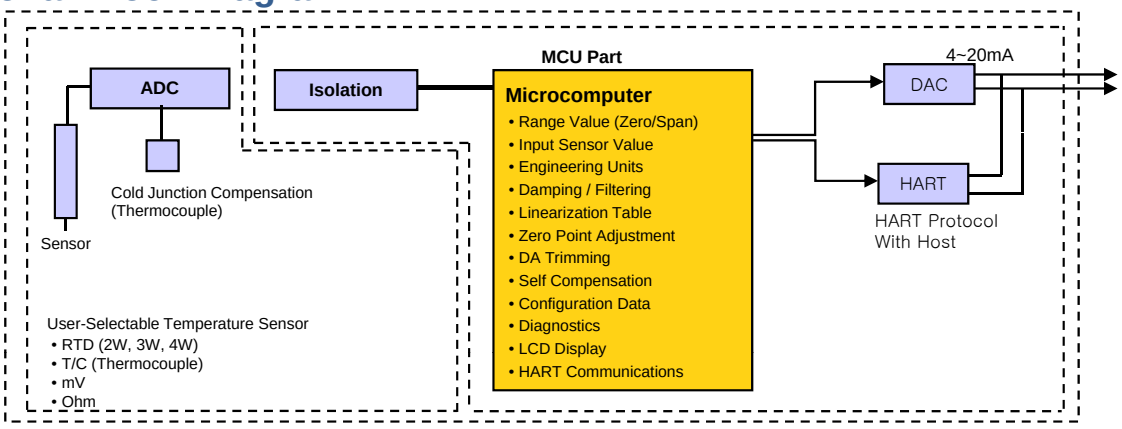
Function

- Flexible Sensor input: RTD, T/C, mV, Ohm
- Various output: 4~20mA (Analog), Digital Signals
- Automatic Compensation by Linearization table in which user can modify the various necessary values
- Automatic Compensation of Ambient Temperature
- Setting Various Parameters: Zero/Span, Unit, Fail-mode, Trim, etc.
- Self Diagnostic Function: Sensor, A/D Converter, Memory, Power, etc.
- Digital Communication with HART protocol.
- Flameproof Approval and Intrinsic Safety Approval: KOSHA, KTL, ATEX, FM (ATT 2100), GOST

Features

- Superior Performance
  - Excellent Accuracy
  - Long-Term Stability
- Flexibility
  - Selection of various T/C, RTD, MV, Ohm.
  - Data Configuration with HART Configurator.
- Reliability
  - Automatic Compression: Linearization of Sensor input, Ambient temperature compensation
  - Continuous Self Diagnostic
  - Fail-mode Process function EEPROM Write Protection
  - I/O Isolation: Grounded Thermocouple
  - CE EMC Conformity Standards (EN50081-2, EN50082-2).

Functional Block Diagram



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Transmitter Description

Electronics Module

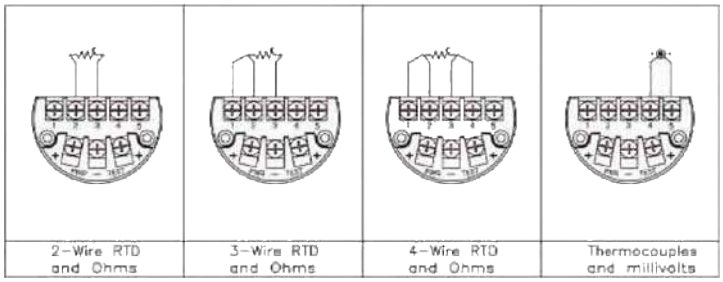
The Electronics module consists of a circuit board sealed in an enclosure. There are a MCU module, a power module, an analog module, a LCD module (for ATT2100) and a terminal module in a transmitter.
The analog module digitize signal from the sensor.
The MCU module acquires the digital value from the analog module and applies 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 has 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 nonvolatile EEPROM in their electronic 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 ATT2100 and ATT 2200 are compatible with a variety of temperature sensors, including 2W, 3W, and 4Wire RTDs, thermocouples, and other resistance and millivolt inputs
(See table 1).
The sensor part module converts the temperature sensor in to the digital valve. The MCU module calculates the process temperature valve based on the digital valve.
The sensor type and configuration are software-selectable using the Hand-Held terminal and PC configurator.



ATT2100 Transmitter Field Wiring and Sensor Wiring Diagrams

The sensor modules include the following features.

- The software of the transimitter compensates for the thermal effects, improving performance.
- Precise iput compensation during operation is achieved with temperature and voltage or resistance correction coefficients that are characterized over the range of temperature sensor and stored in the EEPROM memory.
- Input sensor type
  - RTD (Pt-100 ohm) : 2W, 3W, 4Wir
  - Thermocouple: B, E, J, K, N, R, S, T type
  - mV: -10~ 75mV
  - Ohm: 0~ 430 Q

Basic Setup

AUTROL Temperature Transmitter can be easily configured from any host that supports the HART protocol. Configuration consists of setting the following transmitter operational parameters.

- Sensor type
- Number of sensor input wires
- 4 and 20mA Points (Zero/pan)
- Engineering Units
- Damping Time
- Tag : 8 alphanumeric characters
- Descriptor : 16 characters
- Message : 32 characters
- Date : dav / month / vear

Calibration and Trimming

- Lower/Upper Range (zero/span)
- Sensor Linearization
- Zero Point Adjustment
- DAC Output Triming
- Self-Compensation

Self-Diagnosis and Others

- CPU & Analog Module Fault Detection
- Communication Error
- Fail-mode handling
- LCD Indication (for ATT 2100)

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Performance Specifications

Reference Accuracy
(Refer to Table 1)

Stability
RTDs.
±0.125 of reading or 0.15°C, whichver is greater, for 24 months

Thermocouples
±0.125 of reading or 0.15°C, whichver is greater, for 24 months

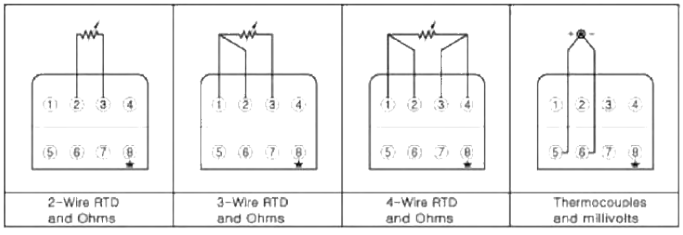
Repeatability
±0.05% of span
Ambient Temperature Effect
(Per 1°C change in ambient temperature.)

Sensor Type	Digital Accuracy	D/A effect
2W, 3W, 4Wire RTD		
Pt 100(a=0.00385)	0.003°C	0.002% of Span
Pt 100(a=0.003916)		
Thermocouple		
NIST Type B	0.046°C	0.002% of Span
NIST Type E,J,K,N	0.005°c +0.00054% Of reading	
NIST Type R,S,T	0.015°C If reading ≥200°C 0.021°C – 0.0032% of reading if not	

Power Supply Effect
Less than ±0.005% of Span

Update Time and Turn On Time
Update Time: 0.5 Seconds
Turn-On Time: 5 Seconds

Failure Mode
The value to which the transmitter drives
Its output in failure is as follows
Fail High: Current≥ 21.1 mA
Fail Low: Current≥ 3.78 mA



Function Specifications

Range and Sensor Limits
(Refer to Table 1)

Zero and Span Adjustments Limits
- Zero and span values can be set any where within the range limits stated in Table 1.
- Span must be greater than or equal to the minium span stated in Table 1

Output (Analog current and Digital Data)
Two wire 4~20mA, Digital process, Digital Process valve 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. With 250 ohm load, 17.4 Vdc power supply is required with 24 Vdc Supply, up to a 550 ohm load can be used
Max. Loop Resistance = (E-11.9) / 0022
(E = Power Supply Voltage)

Supply Voltage
11.9 to 45 Vdc for Operation
17.4 to 45 Vdc for HART Communications

Loop Load
0 to 1500 Q for Operation
250 to 550 Q for HART Communications

Ambient Humidity Limits
5% ~ 100%RH (Relative Humidity)

Ambient Temperature Limits
- -40°C ~ 85°C (without condensing for ATT2100)
- -20°C ~ 85°C (without condensing for ATT2200)
- -30°C ~ 80°C (with LCD module)

Storage Temperature
- -40°C ~ 85°C (without condensing)
- -20°C ~ 85°C (without condensing for ATT2200)

Isolation
Input/ output isolated to 500Vms (707Vdc)

ATT2200 Transmitter Field Wiring and Sensor Wiring Diagrams

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Physical Specification

Electrical Connections
½-14 NPT conduit with M3.5 Screw Terminals

Materials of Construction
Electronics Housing: Low-copper aluminium
Flame proof and Waterproof (IP67)
Paint: Epoxy-Polyster or Polyurthane
Cover 0-ring: Buna-N
Mounting Bracket: 2-inch Pipe, 304 SST,
Painted Carbon Steel with 304 SST U-bolt
Nameplate: 304 SST

Weight
1.2 kg below (excluding options)

Hazardous Location Certifications (Option)

KOSHA Approvals
(KOSHA: Korea Occupational Safety & Health Agency)
K1 Code:
Flame proof for class 1, Zone 1: Ex d цC T6, IP67
Ambient Temperature: -20 to 60°C
Power Supply: Max.45 Vdc
Output: 4 to 20 mA + HART, Max.22mA

KTL Certification
(KTL: Korea Testing Laboratory)
K2 Code:
Intrinsic Safety: Ex ia ц C T5
Ambient Temperature: -20 to 60°C
Enity Parameter: Umax = 40Vdc
IMAX = 165 mA, max = 0.9W

FM (Factory Mutual explosion proof) **Approvals**
F1 Code

Explosion proof for Class 1, Division 1
Groups A, B, C, and D
Dust-ignition proof for class ц, Division 1
Groups E, F, and G
Dust-ignition proof for class ц, 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 1, Division 2,
Groups A, B, C & D; Class ц, Division 2,
Groups E, F, G; and Class ш, 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: KEMA08ATEX
CE 0344 ц 2 G Ex d цC T6, T5 or T4
Operating Temperature: -20°C≤ Tamb ≤+60°C
T6 for process ≤ 85°C; T5 for process ≤+100°C
T4 for process ≤+135°C

EMC Conformity standards

a) EMI(Emission) – EN50081-2:1993				
Test Item			Frequency Range	Basic Standard
1	Applicable Electromagnetic Radiation Disturbances		30~1000MHz	EN55011:1988 (Class A Group)
b) For EMS(Immunity) – EN50082-2:1995				
	Test Item	Test Specification	Basic Standard	Performance Criteria
1	Electrostatic Discharge	±4KV (Contact) ±8KV(air)	EN61000-4-2 :1995A +A1 : 1998	A
2	Radio Frequency Electromagnetic Field Amplitude Modulated	80 MHz ~ 1GHz 1KV,80%AM	EN61000-4-3 :1996A ENV50204 : 1995	A
3	Radio Frequency Electromagnetic Field Pulse Modulated	900 MHz ±5MHz,A 10V/m , 200Hz 50% Duty Cycle PM		A
4	Electrical Fast Transients /BurstImmunity	±2KV (power line) 5KHz / 15ms /1minute	EN61000-4-4 :1995A	A
5	Immunity to conducted Disturbance Induced by Radio Frequency Fields	150KHz ~ 80MHz 10V/m,80%AM (1KHz)	EN61000-4-6 :1995A	A

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General Specifications

1. Temperature Range and Sensor Accuracy

Sensor Type	Sensor Reference	Input Range	Minimum Span	Digital Accuracy	D/A Accuracy Of Span
2W,3W, 4Wire RTD					
Pt-100	KSC 1603-1991 (a=0.00385)DIN	- 200 ~ 650°C	15°C	±0.17°C	±0.17°C
Pt-100	KSC 1604-1981 (a=0.00391)	- 200 ~ 500°C		±0.16°C	
Thermocouple					
NIST Type B	KSC 1602-1982	100 ~ 1820°C	25°C	±0.77°C	±0.17°C
NIST Type E		-200 ~ 1000°C		±0.20°C	
NIST Type J		-200 ~ 1200°C		±0.25°C	
NIST Type K		-200 ~ 1350°C		±0.35°C	
NIST Type N		-200 ~ 1300°C		±0.40°C	
NIST Type R		0 ~ 1760°C		±0.60°C	
NIST Type S		0 ~ 1740 °C		±0.50°C	
NIST Type T		-200 ~ 4000°C		±0.25°C	
Millivolt Input		-10 ~75mV	2mV	±0.012mV	
Ohm Input		0 ~ 4302	20Q	±0.35Q	

{Note} 1) RTD input : a=0.00385 : KS, JIS, DIN, IEC, A=0.00391 : US
2) Thermocouple input : KSC 1602-1982, JISC 1602-1982, ANSI MC96.1-1982

Ambient Temperature Effects(per1°C change in Ambient temperature)			
Sensor Type		**Digital Accuracy**	**D/A effectper**
RTD 2W,3W,4-Wire	Pt 100(a=0.00385)	0.003°C	0.002% of Span
	Pt 100(a=0.003916)		
Thermocouple	NIST Type B	0.046°C	
	NIST Type E,J,K,N	0.005°C+0.00054% of reading	
	NIST Type R,S,T	0.015°C If reading	
		0.021°C-0.0032% Of reading if not	

2. Electrical Specifications

Power Supply	11.9~ 45Vdc	**Output Signal**	4 ~ 20 mA/HART
HART loop resistance	250~550 Ohm (24 Vdc)	**Isolation**	500 Vrms (707 DC)

3. Performance Specifications

Accuracy	Refer to item No.1	Operating Temperature	-40 ~ +85°C
Stability for 2 year	±0.1% o Reading or 0.1°C whichever is greater	LCD Meter Operating Temp.	-30 ~ +80°C
Ambient Temp. Effect	±0.05% of Span/10°C	Humidity Limits	5% ~ 98% RH
Repeatability	±0.05% of Span	Power Supply Effects	±0.005% of Span/V

4. Physical Specification (for ATT2100)

Electrical Connections	½-14NPT(w/M3.5)	**Weight(excluding Option items)**	1.5Kg below
Electronics Housing	Aluminium	**2" Stanchion Type Bracket**	Angle or Flat Type
O-rings	Buna-N	**Housing Class**	Waterproof(IP67)

5. Hazardous Location Certifications-Option (ATT2100)

Korea Standards Approval	Overseas Standards Approval
Flame proof Approval: Exd цC T6 (KOSHA) Intrinsic Safety Approval: Exia цC T5 (KTL)	FM Explosion proof Approval ATEX Flame proof Approval

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Ordering Information

Model No.	Code	Description
ATT2100	S	Single Element
	D	Dual Elements
Housing Materials and Electrical Connection Size	1	½-14NPT Epoxy Coated-Alminium
	2	G1/2 Epoxy Coated-Alminium
	X	Special
Hazardous Location Certifications	K0	Maker Standard(Waterproof : IP67)
	K1	KOSHA Flameproof Approval : ExdцC T6
	K2	KTL Intrinsic Safety Approval : ExdцC T5
	E1	CENELEC(KEMA) Flame proof
	*E2	CENELEC(KEMA) Intrinsic Safety
	F1	FM /FMC Explosion proof for USA & Canada
	*F2	FM Intrinsic Safety -
Local Indicator (Meter) Temperature Sensor, Thermowell	M1	LCD Indicator - -
	ST	Stainless Steel (SUS 316) Housing
	BA	Stainless Steel Bracket(Angletype) with SST Bolts
	BF	Stainless Steel Bracket(Flat type) with SST Bolts
	X1	Assembly Option(Element/Well)

Example: ATT2100-S-1-K1-M1
Note: Request to manufacture for items marked••• before order

Model No.	Code	Description
ATT2200	S	Single Element
	*D	Dual Element (Special Order, Request to manufacture if necessary)
Housing Materials	1	Plastic
	X	Special
Hazardous Locations Certifications	K0	Maker Standard
	*K2	KTL Intrinsic Safety Approval : ExdцC T5
Connection Type	L2	Two wires
	L3	Three Wires
	L4	Four Wires
Sensor Type	C1	Custom Calibration
	R1	RTD (Pt 100 ohm)
	R2	Resister
	M1	Milli-volt
	TM	Thermocouple Type (X: B,E,J,K,N,R,S,T)
Sensor Fail Mode	D	Downscale
	U	Upscale

Example: ATT2200-S-1-K0-L2-C1-D
Note: Request to manufacture for items marked••• before order

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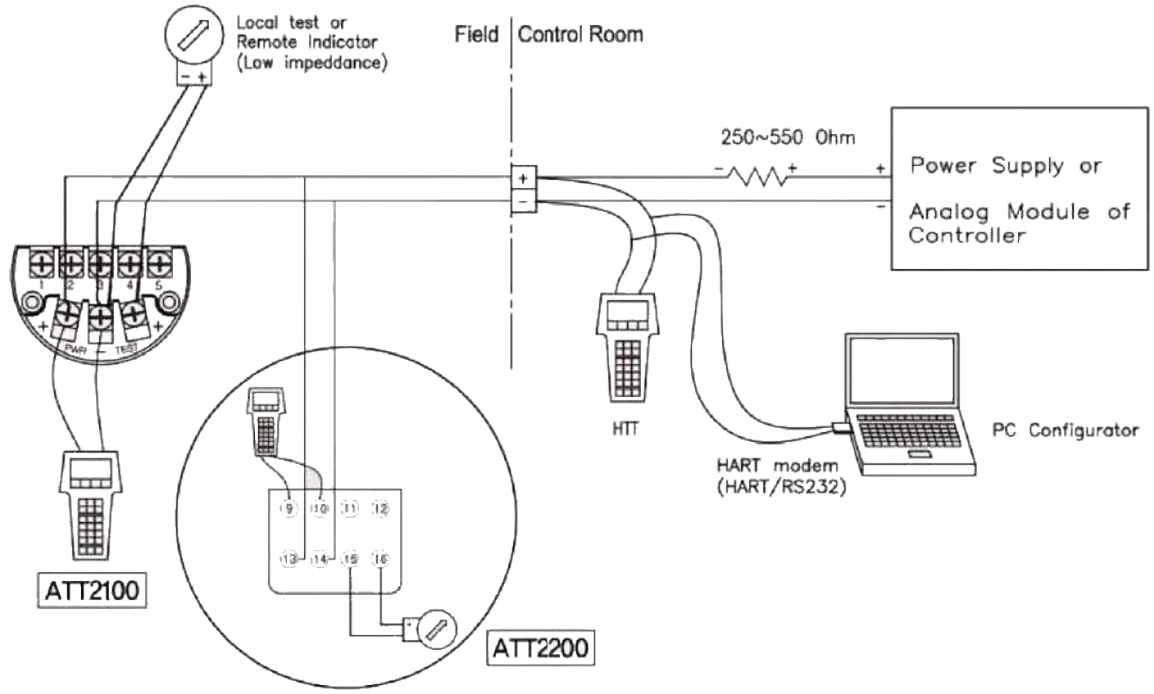
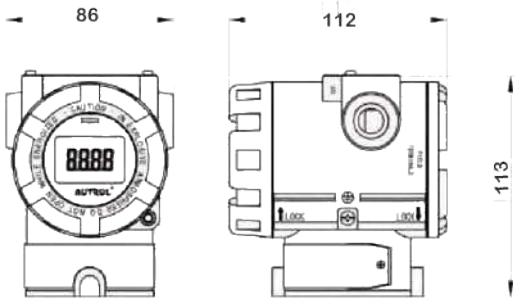
Connection Diagram of Signal, Power, HHT for Transmitter



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 @24Vdc.
3. Transmitter operates on 11.9 to 45.0 Vdc transmitter terminal voltage.[Applier Power]
   - 11.9~45.0 Vdc for General Operation
   - 17.4~45.0 Vdc for HART Communication

Dimensions of Transmitter (mm)

ATT2100



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