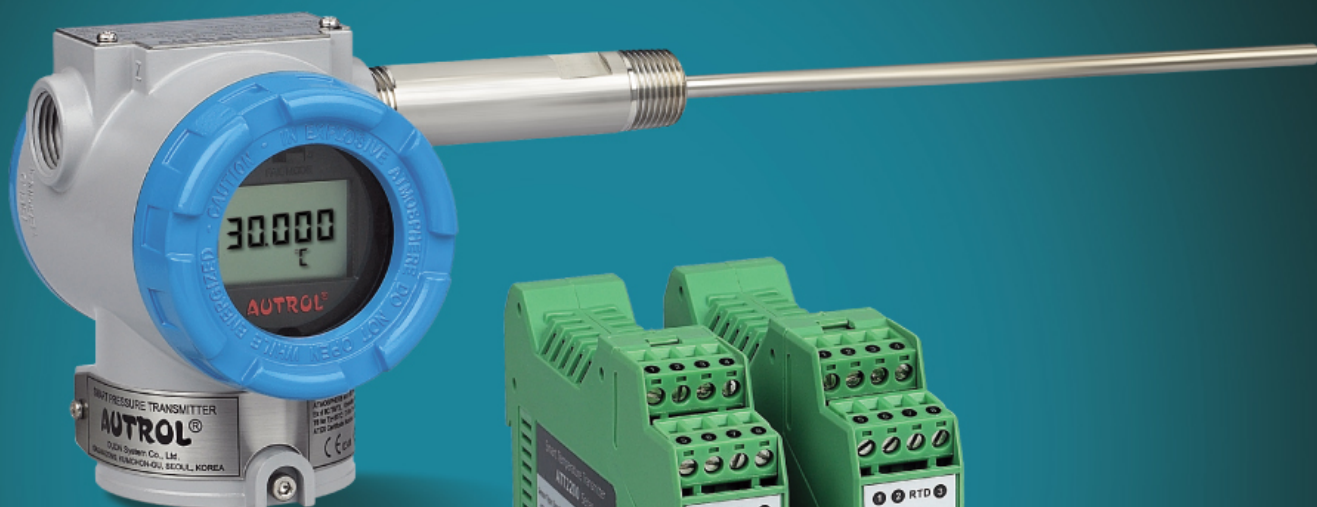


Smart Temperature Transmitter



ATT 2100



ATT 2200

MODEL
ATT 2100/2200

ATT 2100/2200



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

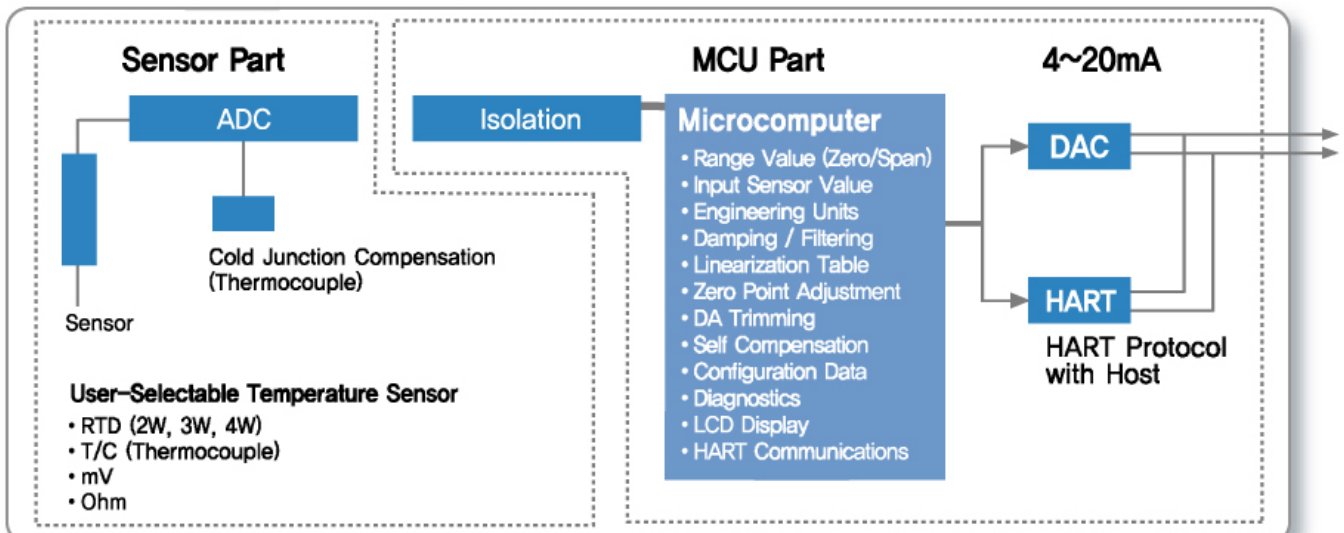
Description of Product

The AURTOL Smart Temperature Transmitter is a microprocessor-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.

Features

- Superior Performance
 - Excellent Accuracy
 - Long-Term Stability
- Flexibility
 - Selection of various T/C, RTD, mV, Ohm
 - Data Configuration with HART configurator
- Reliability
 - Automatic Compensation : 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



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 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 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 into the digital value. The MCU module calculates the process temperature value based on the digital value.

The sensor type and configuration are software-selectable using the Hand-Held terminal and PC configurator.

The sensor modules include the following features

- The software of the transmitter compensates for the thermal effects, improving performance.
- Precise input 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, 4Wire
 - Thermocouple : B, E, J, K, N, R, S, T type
 - mV : -10 ~ 75mV
 - Ohm : 0 ~ 430 Ω

Basic Setup

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

- Sensor Type
- Number of sensor input wires
- 4 and 20mA Points (Zero/Span)
- Engineering Units
- Damping Time
- Tag : 8 alphanumeric characters
- Descriptor : 16 characters
- Message : 32 characters
- Date : day / month / year

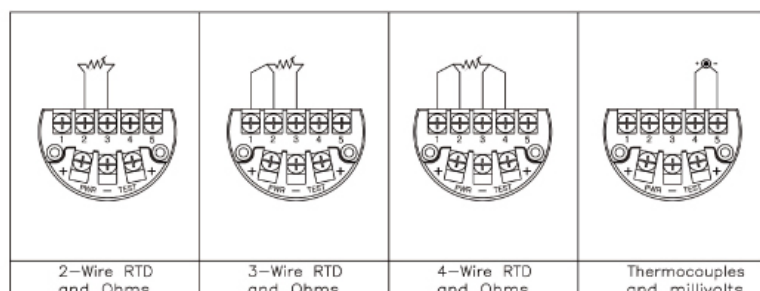
Calibration and Trimming

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

Self-Diagnosis and Others

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

ATT2100 Transmitter Field Wiring and Sensor Wiring Diagrams



Smart Temperature Transmitter

ATT 2100/2200

Performance Specifications

Reference Accuracy

(Refer to Table 1)

Stability

RTDs.

±0.12% of Reading or 0.15°C, whichever is greater, for 24 months

Thermocouples

±0.12% of Reading or 0.15°C, whichever is greater, for 12 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 per Volt

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 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 , 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.

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 = $(E - 11.9) / 0.022$
(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 Ω for Operation

250 to 550 Ω 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)

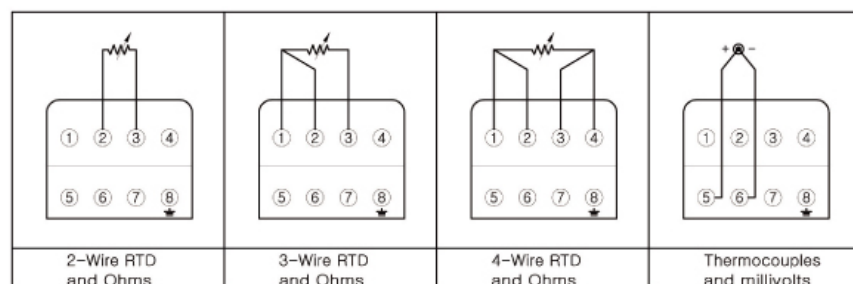
Storage Temperature

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

Isolation

Input / output isolated to 500Vrms (707 Vdc)

ATT2200 Transmitter Field Wiring and Sensor Wiring Diagrams



Physical Specifications

Electrical connections

1/2-14 NPT conduit with M3.5 Screw Terminals

Materials of Construction

Electronics Housing : Low-copper aluminum

Flameproof and waterproof (IP67)

Paint : Epoxy-Polyester or Polyurethane

Cover O-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 :

Flameproof for Class I, Zone 1 : Ex d IIC T6, IP67

Ambient Temperature : -20 to 60 °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

Entity Parameter : Umax = 40Vdc,

I_{max} = 165mA, max = 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 : KEMA08ATEX

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 for process ≤ 135°C

EMC Conformity Standards

a)EMI(Emission) – EN50081-2:1993				
	TestItem		FrequencyRange	Basic Standard
1	Applicable Electromagnetic Radiation Disturbance		30~1000MHz	EN55011:1988 (Class A Group 1)
b)ForEMS(Immunity) – EN50082-2:1995				
	TestItem	Test Specification	Basic Standard	Performance Criteria
1	Electrostatic Discharge	± 4 KV (contact) ±8KV(air)	EN61000-4-2 : 1995 A +A1 : 1998	A
2	Radio Frequency Electromagnetic Field Amplitude Modulated	80 MHz ~ 1GHz 1KV,80%AM	EN61000-4-3 : 1996 A 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

ATT 2100/2200

General Specifications

1. Temperature Sensor Range & Accuracy

(Table 1)

Sensor Type	SensorReference	InputRange	Minimum Span	Digital Accuracy	D/A Accuracy Of Span
2W, 3W, 4Wire RTD					
Pt-100	KSC1603-1991 (a=0.00385)DIN	200 ~ 650℃	15℃	±0.17℃	±0.03℃
Pt-100	KSC1604-1981 (a=0.00391)	200 ~ 500℃		±0.16℃	
Thermocouple					
NIST Type B	KSC1602-1982	100 ~ 1,820℃	25℃	±0.77℃	±0.03℃
NIST Type E		-200 ~ 1,000℃		±0.20℃	
NIST Type J		-200 ~ 1,200℃		±0.25℃	
NIST Type K		-200 ~ 1,350℃		±0.35℃	
NIST Type N		-200 ~ 1,300℃		±0.40℃	
NIST Type R		0 ~ 1,760℃		±0.60℃	
NIST Type S		0 ~ 1,740℃		±0.50℃	
NIST Type T		-200 ~ 400℃		±0.25℃	
MillivoltInput		-10 ~ 75mV	2mV	±0.012mV	
Ohm Input		0 ~ 430Ω	20Ω	±0.35Ω	
ⓘ(Note) 1) RTD input : a=0.00385 : KS, JIS, DIN, IEC, a=0.00391 : US. 2) Thermocouple input : KSC 1602-1982, JISC 1602-1981, 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 readingifnot	

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 Temp.	-40 ~ +85°C
Stability for 2 year	±0.1% of 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 Effect	±0.005% of Span/V

4. Physical Specifications (for ATT 2100)

Electrical Connections	1/2-14NPT(w/M3.5)	Weight(excluding Option Items)	1.5Kg below
Electronics Housing	Aluminum	2" Pipe Stanchion Type bracket	Angle or Flat Type
O-rings	Buna-N	Housing Class	Waterproof (IP67)

5. Hazardous Location Certifications-Option (for ATT 2100)

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

Ordering Information

MODEL NO.	Code	Description		
ATT2100	S	Single Element		
	*D	Dual Elements		
Housing Materials and Electrical Connection Size	1	1/2-14NPT	Epoxy Coated-Aluminum	
	2	G1/2	Epoxy Coated-Aluminum	
	X	Special		
Hazardous Locations Certifications	K0	Maker Standard(Waterproof : IP67)		
	K1	KOSHA Flameproof Approval : ExdII C T6.		
	K2	KTL Intrinsic Safety Approval : ExiaII C T5		
	*E1	CENELEC(KEMA) Flame proof		
	*E2	CENELEC(KEMA) Intrinsic Safety		
	F1	FM Explosion proof		
	*F2	FM Intrinsic Safety	LP	Lighting Protector
Local Indicator (Meter) Temperature Sensor, Thermowell	M1	LCD Indicator	ET	External Terminal Block
	C7	Custom Calibration		
	BA	Stainless Steel Bracket(Angle type) with SST Bolts		
	BF	Stainless Steel Bracket(Flat type) with SST Bolts		
	X1	Assembly Option(Element/Well)		

Example : ATT2100-S-1-K1-M1

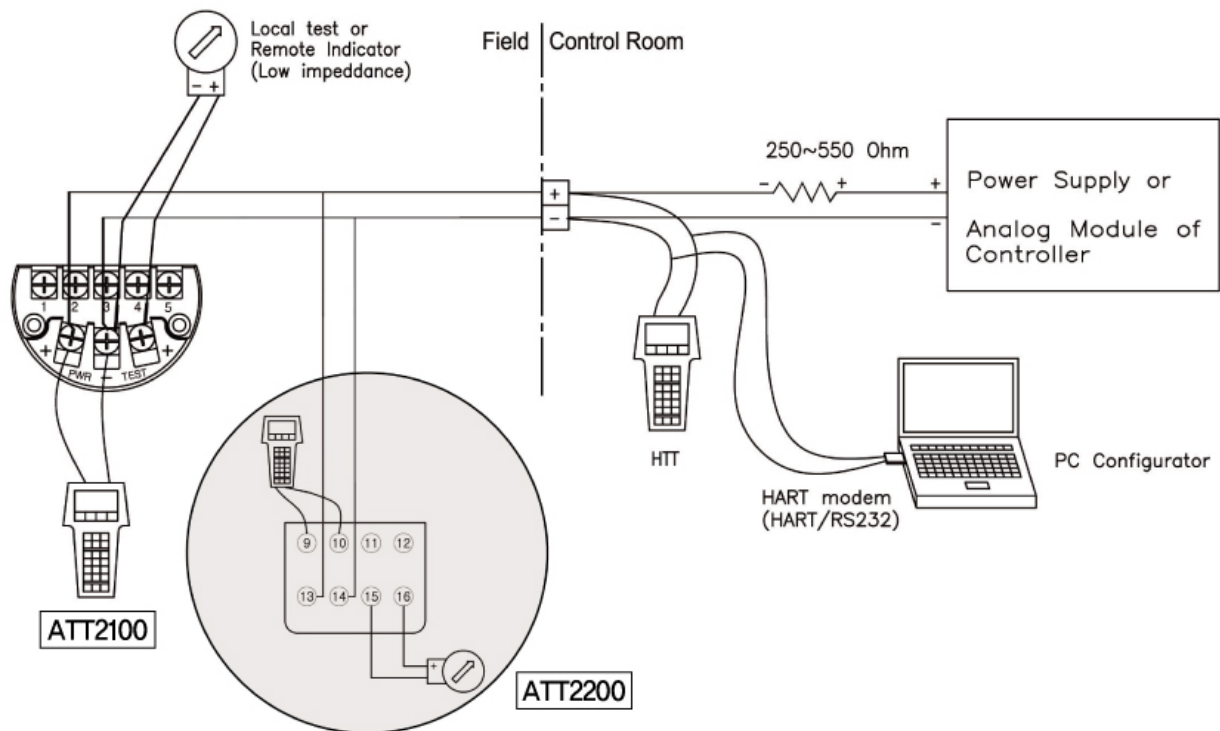
Note : Request to manufacturer for items marked "*" before order.

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

Example : ATT2200-S1-K0-W2-R1-D

Note : Request to manufacturer for item "*" "

Connection Diagram of Signal, Power, HHT for Transmitter



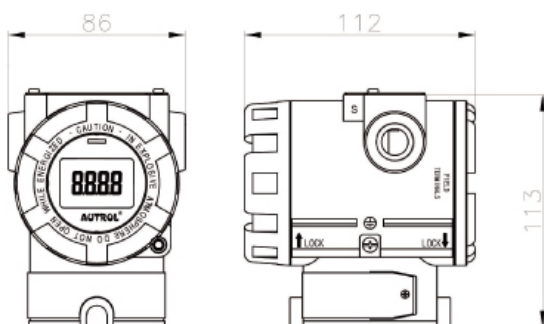
1. HHT(HART Communicator) or PC Configurator may connected at any termination point in the signal loop.
2. HART Communication requires a loop resistance between 250 and 550 ohm @ 24 Vdc
3. Transmitter operates on 11.9 to 45.0 Vdc transmitter terminal voltage.

[Applied Power]

- * 11.9 ~ 45.0 Vdc for General Operation
- * 17.4 ~ 45.0 Vdc for HART Communication

Dimensions of Transmitter(mm)

ATT2100



ATT2200

