ATT 2100

ATT 2200

Description of product

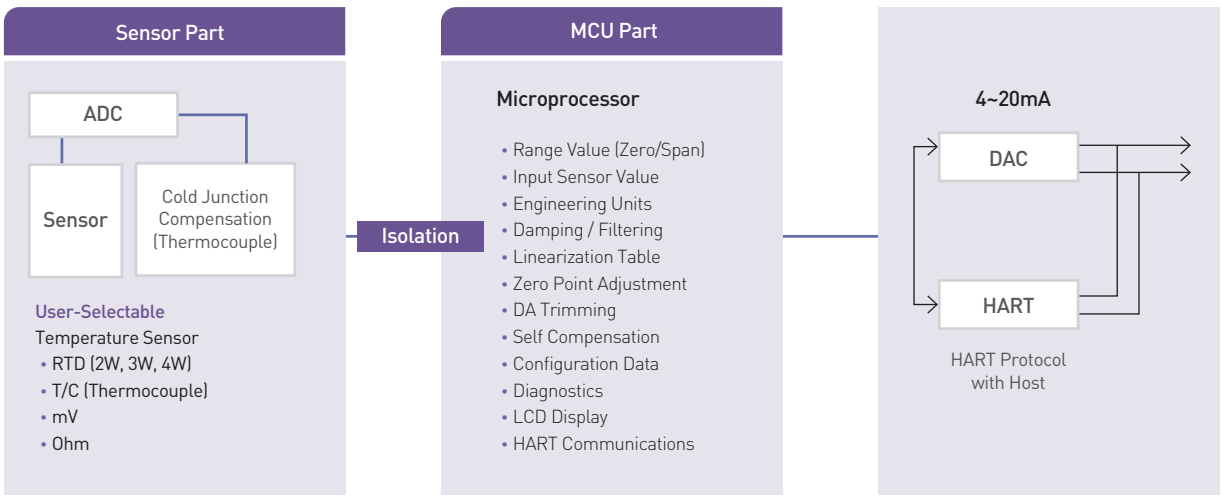
The AURTOL Smart Temperature Transmitter is a microprocessor-based high performance transmitter, which has flexible Dual and Single sensor input and output, automatic compensation of ambient temperature and process parameters, configuration of various parameters, communication with HART protocol. All Data of Sensor (Tag No., type, range etc.) is to be input, modified and stored in EEPROM.

The HART 7 protocol applies on ATT2X00 series for more diverse scalability.
In addition, the "Fast Back-up" function for Dual sensor is introduced. When a problem occurs in a line, another line switched automatically and quickly in order to secure safety and reliability.

Function

- Dual/Single Sensor
- Flexible Sensor input : RTD, T/C, mV, Ohm
- Smart Backup function
- 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 : KCs, ATEX, FM, EAC(Russia, CC TR CU) (ATT2100)
- Marine Certificate : ABS, LR, DNV, BV, KR(ATT2100)
- SIL2 (IEC 61508)

Functional Block Diagram



Features

• Superior Performance

· Excellent Accuracy (Refer to Page 4)
· Long-Term Stability (Refer to Page 4)

• 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 (EN61326-1, EN61326-3)

Transmitter Description

• Sensor Inputs

The model ATT2100 and ATT2200 are compatible with a variety of Dual and Single temperature sensors, including 2W, 3W and 4Wire RTDs, thermocouples, and other resistance and millivolt inputs (see Page 6).
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 configurationare softwareselectable 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-100ohm) : 2, 3, 4 Wires(Single)/2, 3Wires(Dual)
 - Thermocouple : B, E, J, K, N, R, S, T type(Single/Dual)
 - mV : -10~75mV
 - Ohm : 0~340

• 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
· Long Tag : 32 alphanumeric characters
· Descriptor : 16 characters
· Message : 32 characters
· Date : day/month/year

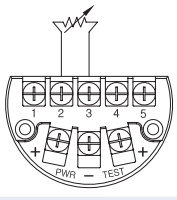
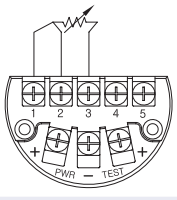
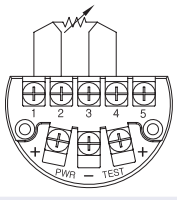
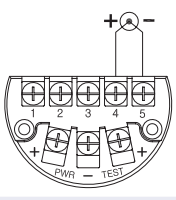
• Calibration and Trimming

· 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 Sensor Wiring Diagrams

Single				
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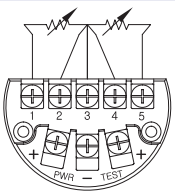
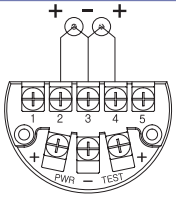
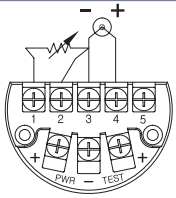
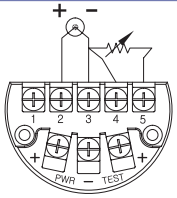
Dual				
	2 or 3-Wire Dual and Ohms	TC Dual	RTD + TC	TC + RTD

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

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.
* 250 ohm load Single : 15.5 Vdc
* up to a 550 ohm load - 24 Vdc
Max. Loop Resistance =
(E-10.5/0.022)
(E = Power Supply Voltage)
· Voltage Range : 10.5 to 45 Vdc
· Voltage Rating : 24 Vdc ± 30%

• 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 (ATT2100)
-40°C~ 85°C (ATT2200)
-30°C~ 80°C (with LCD module)

• Isolation

Input / output isolated to 500Vrms (707 VdC)

• Failure Mode

The value to which the transmitter drives it's output in failure is as follows

	Normal	NAMUR NE43
Low Alarm	≤3.78 mA	≤3.6 mA
Low Saturation	3.9 mA	3.8 mA
High Saturation	20.8 mA	20.5 mA
High Alarm	≥21.1 mA	≥21.1 mA

• Update Time and Turn-On Time

Update Time : 0.5seconds
Turn-OnTime : 5seconds

• Power Supply Effect

Less than ±0.005% of Span Volt

• Storage Temperature

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

• HART option

Device	HART version	
ATT2100	5	7(Option)
ATT2200	Δ (Compatible)	7(Default)

* Device type of ATT2100 & ATT2200 will indicate ATT2X00 on Hand-held-Terminal while HART 7 communication.

• Dual Sensor option

Smart & Fast Backup function

The advantage of using dual sensors at the critical line is to keep a reliable measurement system. The latest version of the ATT2XX0 series supports Backup, Average, and Differential functions when you select the Dual sensor code.

Backup: This function automatically switches to a normal sensor in the event of sensor failure such as a damaged/ broken/ lost signal while measuring the temperature.
Without failure, the primary measurement is from sensor #1 and sensor #2 will be the 'Backup' element if both sensors are in a normal condition. (Basic Option)

Average: This function measures the average value from the sum of each of the two sensor values by dividing its number. The Alarm will be automatically arise from output signal or S-FL on LCD if there is any sensor failure.

Differential: The function is to measure the difference between each of the sensor values. The Alarm will be automatically arise from output signal or S-FL on LCD if there is any sensor failure.

* For more detailed setting and usage instructions, please refer to the ATT2X00 manual.

Physical Specifications

• Electrical connections(ATT2100)

1/2-14 NPT conduit with M4 Screw Terminals

• Weight

- ATT2100
  1.2 kg (Standard without options)
  2.6 kg (SST Housing without options)
- ATT2200
  0.15kg (Plastic Housing)

• Materials of Construction(ATT2100)

Electronics Housing : Low-copper aluminum Flame proof and waterproof(IP66/67)
Paint : Epoxy-Polyester
Cover O-ring : NBR
Mounting Bracket : 304 SST with U-bolt(304SST) for 2-inch pipe
Nameplate : 304SST

Hazardous Location Certifications (ATT2100)

• KCs Flameproof / Dust Ignition-proof K1 Code :

Flameproof for Class I, Zone1 : Ex d IIC T6, IP67, IP66/67
Dust Ignition-proof : Ex tD A20 T85˚C IP67
Ambient Temperature : -20 to 60˚C
Power Supply : Max. 45Vdc
Output : 4 to 20mA + HART, Max. 22mA

• ATEX Flameproof E1 Code :

Ⓔx II 2G 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 ≤ 130˚C

• EAC Flameproof R1 Code:

1Ex d IIC T6 ... T4 Gb X
Ambient Temperature : -60°C +60°C
T6 for process ≤ 75°C
T5 for process ≤ 90°C
T4 for process ≤ 130°C

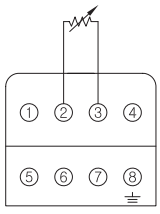
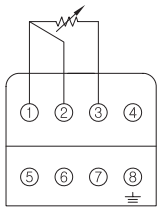
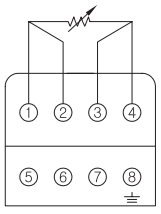
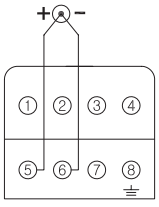
• FM Explosion-proof F1 Code :

* FM : Factory Mutual explosion proof
Explosion proof for Class I, Division1 Groups A, B, C and D
Dust-ignition proof for Class II, Division1, Groups E, F and G
Dust-ignition proof for Class II, Division1
"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
Voltage : 11.9~42Vdc

• NDK Approval Certification

· Türkiye Nuclear Regulatory Authority
· Safety Class 3 (ATT2200), 4 (ATT2100)
· Code # : TR-1M0-154
· Certi # : E-70469638-120.02-15701

ATT2200 Transmitter Sensor Wiring Diagrams

Single				
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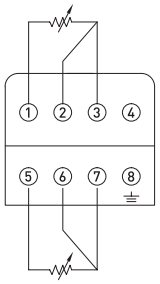
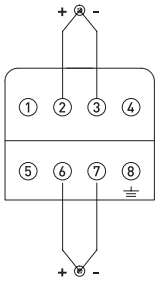
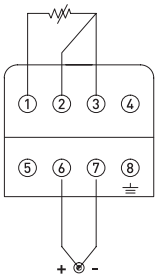
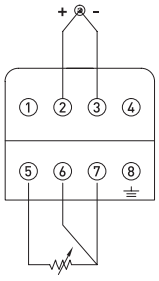
Dual				
	2 or 3-Wire Dual and Ohms	TC Dual	RTD + TC	TC + RTD

General Specifications

1. Temperature Sensor Range & Accuracy

Sensor Type	Sensor Reference	Input Range	Minimum Span	Digital Accuracy	D/A Accuracy of Span
RTD					
Pt-100	KSC 1603 -1991 (a=0.00385) DIN	-200 ~ 650°C	15°C	± 0.17°C	± 0.03%
Pt-100	JISC 1604 - 1981 (a=0.00391)	-200 ~ 650°C		± 0.16°C	
Thermocouple					
NIST Type B	KSC 1602 - 1982	100 ~ 1,820°C	25°C	± 0.77°C	± 0.03%
NIST Type E		-200 ~ 1,000°C		± 0.20°C	
NIST Type J		-200 ~ 1,200°C		± 0.25°C	
NIST Type K		-200 ~ 1,350°C		± 0.35°C	
NIST Type N		-200 ~ 1,300°C		± 0.40°C	
NIST Type R		0 ~ 1,760°C		± 0.60°C	
NIST Type S		0 ~ 1,740°C		± 0.50°C	
NIST Type T		-200 ~ 400°C		± 0.25°C	
Millivolt Input	-	-10 ~ 75 mV	2 mV	± 0.012 mV	
Ohm Input	-	0 ~ 340 Ω	20 Ω	± 0.35 Ω	

[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
3) Digital accuracy for Type B is ± 3.0 °C from 100 to 300 °C
4) Digital accuracy for Type K is ± 0.50 °C from -180 to -90 °C

Ambient Temperature Effects (per 1°C change in Ambient temperature)			
-	Sensor Type	Digital Accuracy	D/A effect per
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 ≥ 200°C	
		0.021°C - 0.0032% of reading if not	

2. Electrical Specifications

Power Supply	Voltage Range : Single 10.5 to 45 Vdc, Dual 12.5 to 45 Vdc Voltage Rating : 24 Vdc ± 30%	**Output Signal**	4 ~ 20 mA dc / HART
HART Loop Resistance	250 ~ 550 ohm (24 Vdc)	**Isolation**	500 Vrms (707 Vdc)

3. Performance Specifications

Accuracy		Refer to item No.1	**Operating Temp**	-40 ~ +85°C
Stability for 2 year	**RTDs**	± 0.12% of Reading or 0.15°C whichever is greater, for 24 months	**LCD Meter Operating Temp**	-30 ~ +80°C
	T/Cs	± 0.12% of Reading or 0.15°C whichever is greater, for 12 months	**Humidity Limits**	5% ~ 100% RH (ATT2100)
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/M4)	**Weight (excluding Option Items)**	1.2Kg below (standard) 2.6Kg (SST Housing)
Electronics Housing	Alloy, 316 SST	**2" Pipe Stanchion Type bracket**	Angle or Flat Type
O-rings	NBR	**Housing Class**	Ex, IP66/67

Ordering Information

MODEL NO.	Code	Description		
ATT2100	-S	Single Element		
	-D	Dual Elements (Default : Fast Back-Up / Available : Ave, Diff)		
Electrical Connection and Housing Materials	1	1/2"-14NPT F Epoxy Coated - Aluminum		
	2	G1/2" F(Adapter) Epoxy Coated - Aluminum		
	X	Special		
Process Connection	1	1/2"-14NPT F		
	2	G1/2" F(Adapter)		
	X	Special		
Sensor Position	H	Horizontal Type (Ex condition)		
	V	Vertical Type		
Sensor Type	A□	RTD (PT100[Ω]) / □ (2, 3, 4 Wires (Select one))		
	T□	Thermocouple / □ (B, E, J, K, N, R, S, T (Select one))		
	R	Resistor		
	M	Mili-volt		
Hazardous Locations Certifications	K0	Maker Standard (Waterproof : IP66/IP67)		
	K1	KCs Flameproof / KCs Dust Ignition-proof Approval		
	E1	ATEX Flameproof		
	F1	FM Explosion-proof		
	R1	EAC Flameproof		
Option	M1	LCD Indicator	M2	Back Light LCD Indicator
	LPI	Lightning Protector (Internal)	LPE	Lightning Protector (External)
	BA	Stainless Steel Bracket (Angle type) with SST Bolts		
	BF	Stainless Steel Bracket (Flat type) with SST Bolts		
	ST	Stainless Steel Housing		
	MR	Marine & Offshore Type approval by DNV-GL, LR, BV, ABS, KR (shall use LPI option)		
	SL	SIL2 (IEC 61508, Area Code) *		
	X1	Assembly Option (Element / Well)		
	H7	HART 7		
	N4	NAMUR NE43 Alarm & Saturation Output *		

Example : ATT2100-S11HA3K1-M1BA

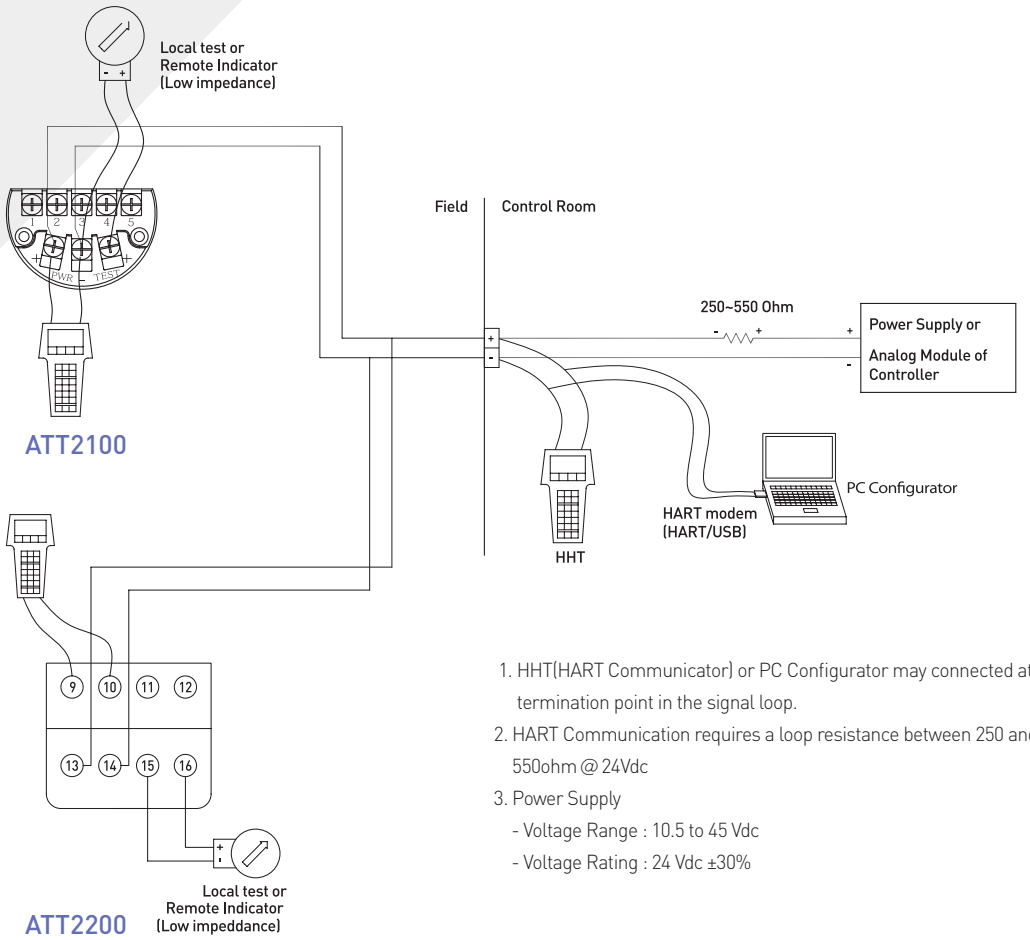
* Consult Manufacturer

MODEL NO.	Code	Description	
ATT2200	-S	Single Element	HART 7 (Default)
	-D	Dual Elements (Default : Fast Back-Up / Available : Ave, Diff)	
Housing Materials	1	Plastic (Standard)	
	X	Special	
Hazardous Locations Certifications	K0	Maker Standard	
Sensor Type	A□	RTD (PT100[Ω] / □ (2, 3, 4 Wires (Select one))	
	T□	Thermocouple / □ (B, E, J, K, N, R, S, T (Select one))	
	R	Resistor	
	M	Mili-Volt	
Sensor Fail Mode	D	Down Scale (Current ≤ 3.75 mA)	
	U	Up Scale (Current ≥ 21.75 mA)	
Option	LPI	Lightening Protector (Internal)	
	SL	SIL2 (IEC 61508, Area Code) *	
	N4	NAMUR NE43 Alarm & Saturation Output *Single Only (Default: Alarm Down 3.6 mA) *	

Example : ATT2200-S1K0A3-D

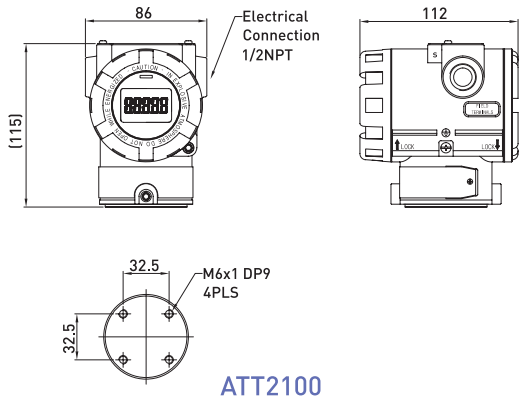
Smart Temperature Transmitter

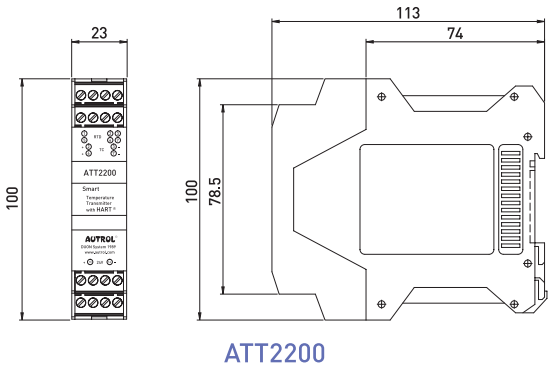
[Connection Diagram of Signal, Power, HHT for Transmitter]



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 550ohm @ 24Vdc
3. Power Supply
   - Voltage Range : 10.5 to 45 Vdc
   - Voltage Rating : 24 Vdc ±30%

[Dimensions of Transmitter (mm)]





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