

Smart Temperature Transmitter

MODEL

ATT2100

ATT2200



ATT 2100

ATT 2200

Duon System Co.,Ltd.
www.autrol.com

ATT2100

ATT2200



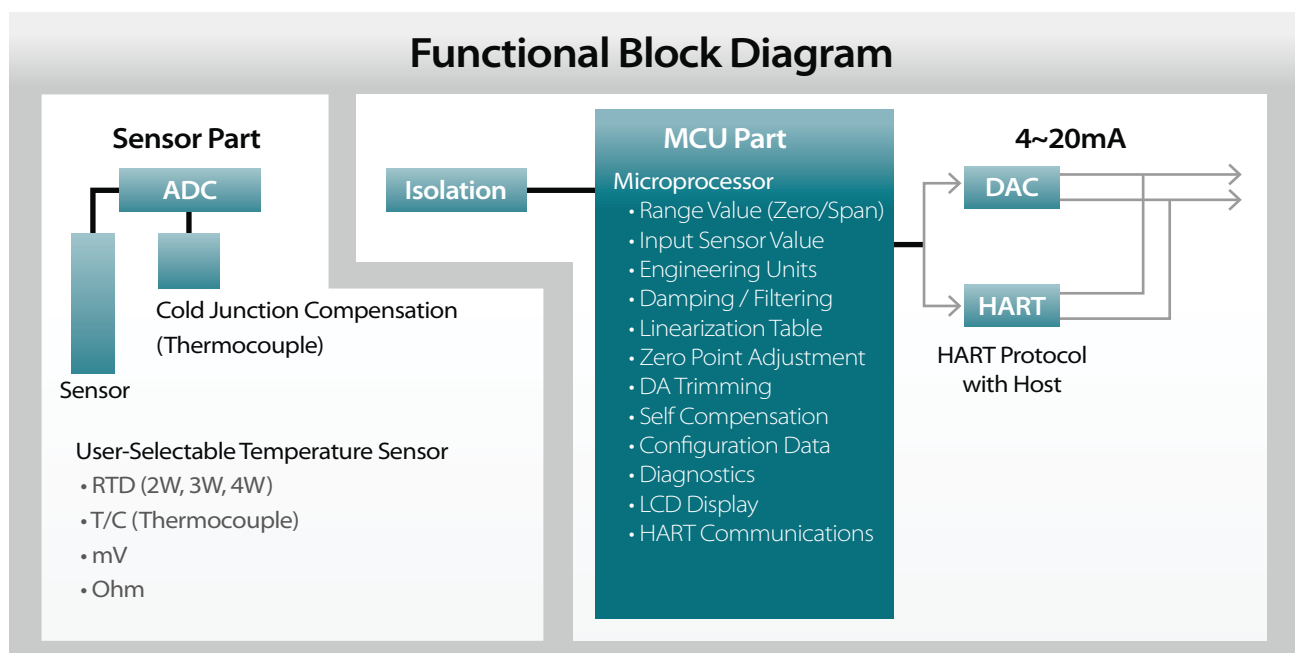
Description of Product

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.

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, GOST(ATT 2100)
- » Marine Certificate : ABS, LR, DNV, BV

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 (EN50081-2,EN50082-2)

Transmitter Description

» Sensor Inputs

The model ATT2100 and ATT2200 are compatible with a variety of 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 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 ~ 340 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

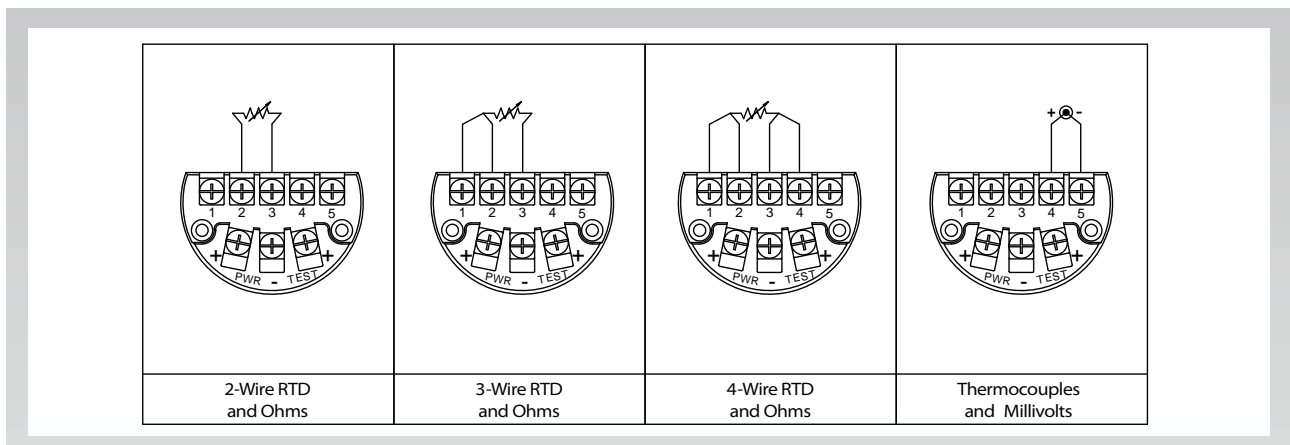
» Calibration and Trimming

- 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



Performance Specifications

» Reference Accuracy

(Refer to Table 1)

» Stability

RTDs.

$\pm 0.12\%$ of Reading or 0.15°C , whichever is greater, for 24 months

Thermocouples

$\pm 0.12\%$ of Reading or 0.15°C , whichever is greater, for 12 months

» Repeatability

$\pm 0.05\%$ 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 $^{\circ}\text{C}$ | 0.002% of Span |
| Pt 100(a=0.003916) | | |
| Thermocouple | | |
| NIST Type B | 0.046 $^{\circ}\text{C}$ | 0.002% of Span |
| NIST Type E, J, K, N | 0.005 $^{\circ}\text{C}$ +0.00054% of reading | |
| NIST Type R, S, T | 0.015 $^{\circ}\text{C}$ If reading $\geq 200^{\circ}\text{C}$ 0.021 $^{\circ}\text{C}$ - 0.0032% of reading if not | |

» Power Supply Effect

Less than $\pm 0.005\%$ 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 ≥ 21.75 mA

Fail Low: Current ≤ 3.75 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.

* 250 ohm load – 17.5 Vdc

* up to a 550 ohm load – 24 Vdc

Max. Loop Resistance = $(E-12) / 0.022$

(E = Power Supply Voltage)

- Voltage Range : 12 to 45 Vdc
- Voltage Rating : 24 Vdc $\pm 30\%$

» 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 (without condensing)
- -30°C ~ 80°C (with LCD module)

» Storage Temperature

- -40°C ~ 85°C (without condensing)

» Isolation

Input / output isolated to 500Vrms (707 Vdc)

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 : 304SST with U-bolt (304SST)
for 2-inch pipe

Nameplate : 304 SST

» Weight

1.2 kg below (Standard-excluding options)

2.6kg (SST Housing-excluding options)

Hazardous Location Certifications (option)

» KCs Approvals 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

» ATEX Approvals E1 Code :

CE 0344  II 2 G Ex d IIC T6, T5 or T4

Operating Temperature: $-20^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$

T6 for process $\leq 85^{\circ}\text{C}$; T5 for process $\leq 100^{\circ}\text{C}$

T4 for process $\leq 130^{\circ}\text{C}$

FM & FM Canada Approvals F1 Code :

* FM: Factory Mutual explosion proof

* FM Canada: Canadian requirements

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,

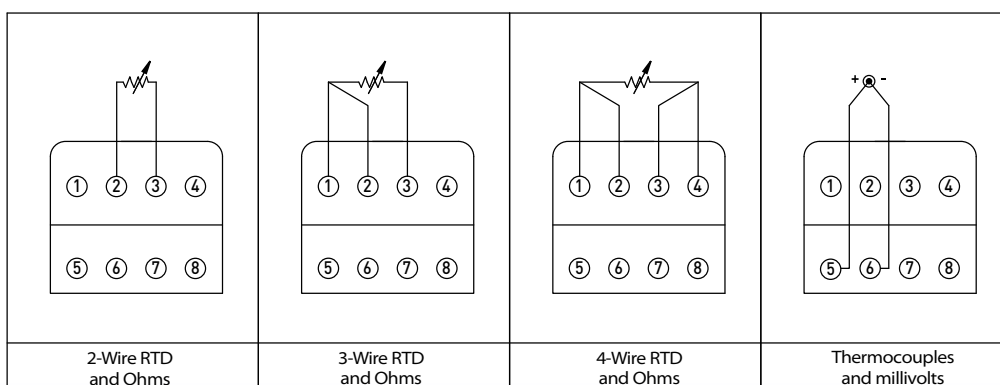
Temperature Code T4

Ambient Temperature : -20 to 60°C

Enclosure: indoors and outdoors, NEMA Type 4X

Supply Voltage : 1.9~42Vdc

ATT2200 Transmitter Field Wiring and Sensor Wiring Diagrams



General Specifications

1. Temperature Sensor Range & Accuracy

<Table 1>

| 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 | KSC1602-1982 | 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 | |
| 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 0.021°C - 0.0032% of reading if not | |

2. Electrical Specifications

| | | | |
|----------------------|--|---------------|---------------------|
| Power Supply | Voltage Range : 12 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 | ±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% ~ 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/M3.5) | Weight (excluding Option Items) | 1.2Kg below (standard) 2.6Kg (SST Housing) |
| Electronics Housing | Aluminum | 2" Pipe Stanchion Type bracket | Angle or Flat Type |
| O-rings | Buna-N | Housing Class | Waterproof (IP67) |

Ordering Information

| MODEL NO. | Code | Description | |
|---|----------------------------|--|------------------------------------|
| ATT2100 | -S | Single Element | |
| | -D* | Dual Elements | |
| Housing Materials and Electrical Connection | 1 | 1/2 - 14 NPT | Epoxy Coated-Aluminum |
| | 2 | G1/2 (Adapter) | Epoxy Coated-Aluminum |
| | X | Special | |
| Process Connection | 1 | 1/2 - 14 NPT | |
| | 2 | G1/2 (Adapter) | |
| | X | Special | |
| Sensor Position | H | Horizontal Type | |
| | V | Vertical Type | |
| Sensor Type | A <input type="checkbox"/> | RTD (PT100[Ω]) / <input type="checkbox"/> (with Wires) | |
| | T <input type="checkbox"/> | Thermocouple / <input type="checkbox"/> (with Type) | |
| | R | Resistor | |
| | M | Mili-volt | |
| Hazardous Locations Certifications | K0 | Maker Standard (Waterproof : IP67) | |
| | K1 | KCs Flameproof Approval : Ex d IIC T6. | |
| | *K2 | KCs Intrinsic Safety Approval : Ex ia IIC T5 | |
| | E1 | ATEX Flameproof | |
| | F1 | FM & FM Canada Explosion proof | |
| | *F2 | FM & FM Canada Intrinsic safety | |
| Option | M1 | LCD Indicator | 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 | |
| | X1 | Assembly Option (Element/Well) | |

Example : ATT2100-S-K1-1-1-H-A3-M1-BA

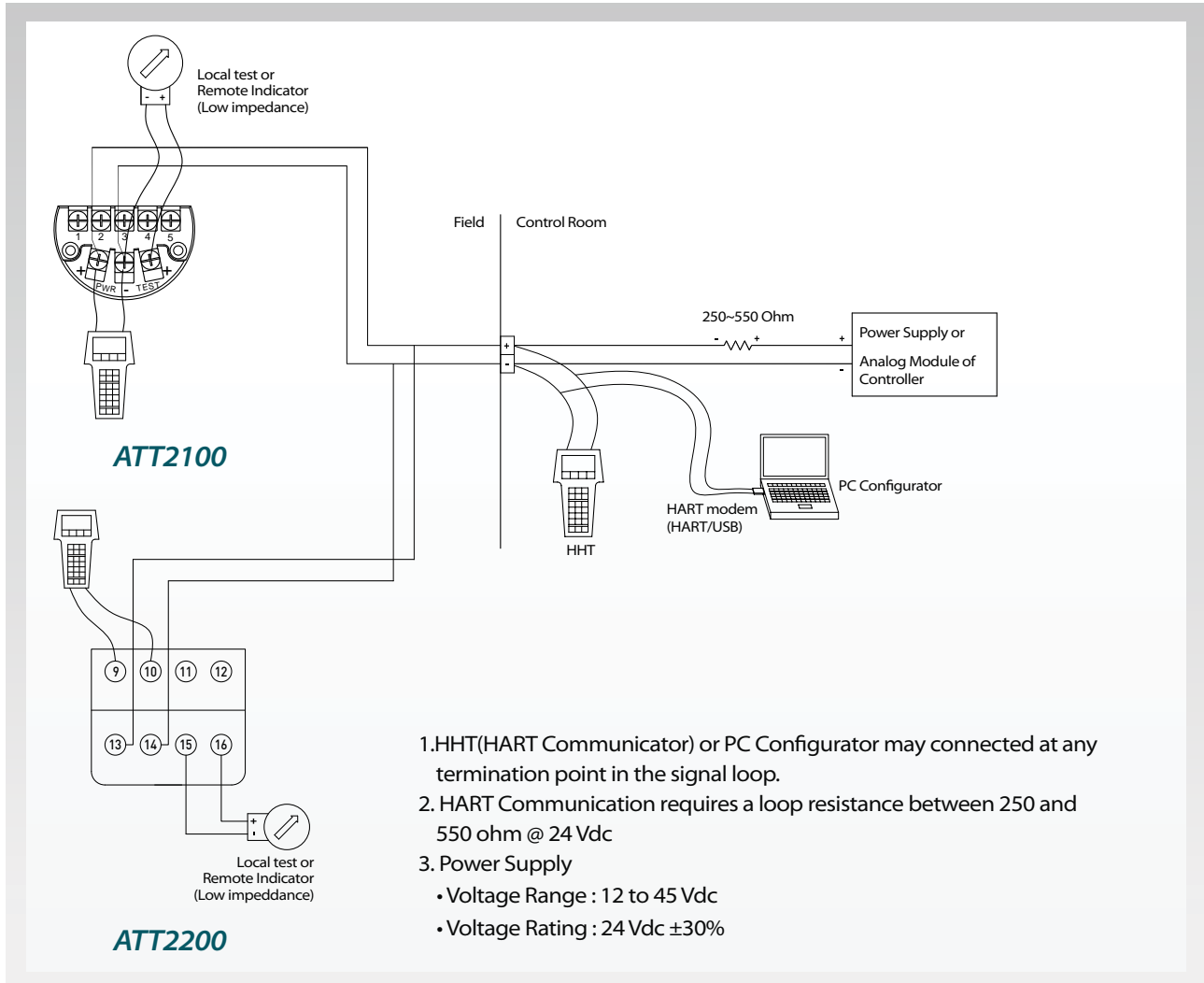
Note: Request to manufacturer for the codes marked with "*" before order.

| 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 | |
| Sensor Type | A <input type="checkbox"/> | RTD (PT100[Ω]) / <input type="checkbox"/> (with Wires) | |
| | T <input type="checkbox"/> | Thermocouple / <input type="checkbox"/> (with Type) | |
| | R | Resistor | |
| | M | Mili-volt | |
| Sensor Fail Mode | D | Downscale | |
| | U | Upscale | |

Ex) : ATT2200-S-1-K0-A3-D

Note: Request to manufacturer for the codes marked with "*" before order.

Connection Diagram of Signal, Power, HHT for Transmitter



Dimensions of Transmitter (mm)

