Model RTT80 I/A Series® Temperature Transmitter with FOUNDATION™ Fieldbus Communication Protocol

The Foxboro® brand Model RTT80 is a microprocessor-based temperature transmitter with FOUNDATION fieldbus Communication Protocol. It receives input signals from thermocouples, RTDs, resistance (ohm), or voltage (mV) sources.

FEATURES

▸ Superior accuracy and long term stability from microprocessor-based technology.

▸ One unit configurable for a variety of Thermocouple (TC) and Resistance Temperature Detector (RTD) inputs.

▸ Supports 2-, 3-, or 4-wire RTDs.

▸ Allows average or difference measurement.

▸ Hot sensor backup - switches to the second sensor if the primary sensor fails.

▸ Temperature-dependent switching between sensors which are used in different measuring ranges.

▸ FOUNDATION fieldbus H1, 31.25 kBits/s.

▸ Fieldbus Foundation Interoperability tested (complies with ITK 6.1.0) and registered with the Fieldbus Foundation.

▸ Link Master capable.

▸ Features multiple function blocks to support control in the field.

▸ Drift warning or alarm if the deviation between sensor 1 and sensor 2 is less than or greater than a predefined limit value.

▸ Sensor corrosion detection.

▸ Thermocouple cold junction compensation.

▸ Galvanic isolation 2 kV input to output.

▸ Rich on-board diagnostics.

▸ Optional digital indicator.

▸ Available as a basic module that can mount to a surface or DIN rail, or in explosion-proof universal or dual compartment housings for remote mounting, and integral sensor and thermowell mounting.

▸ Available with a wide selection of sensors and thermowells.

- ▸ Conforms to applicable European Union Directives (product marked with "CE" logo).
- ▸ EMC immunity per EU Directive IEC 61000.
- ▸ Compliant with NAMUR NE 21 criterion for EMC.
- ▸ Meets many testing agency requirements for hazardous area installations.
- ▸ Standard two year warranty.

GENERAL DESCRIPTION

The RTT80 provides a wide range of packaging selections, sensor types, and options along with the FOUNDATION fieldbus communication protocol, thus making this transmitter suitable for most temperature measurement applications. The microprocessor-based electronics minimizes ambient temperature effects and results in high accuracy, repeatability, and linearization of the sensor signal. Ease of mounting and installation makes this transmitter an extremely attractive offering.

I/A Series INTELLIGENT TEMPERATURE TRANSMITTER FAMILY

The RTT80 is part of the Foxboro intelligent temperature transmitter family, which also includes Models RTT15 and RTT30. The RTT80 is also offered with the HART communication protocol; see PSS 2A-1F8 A.
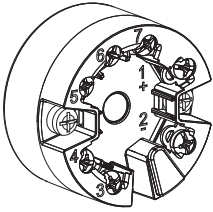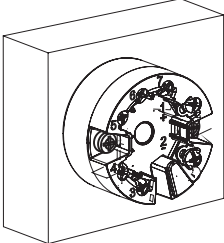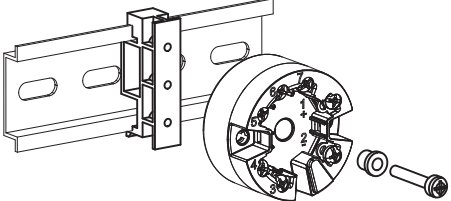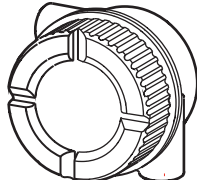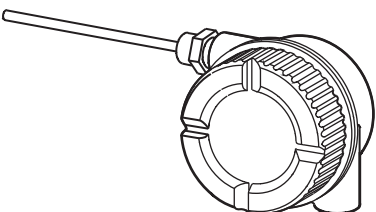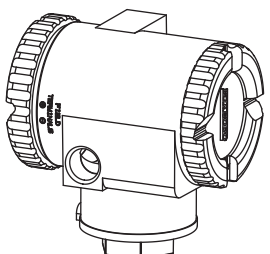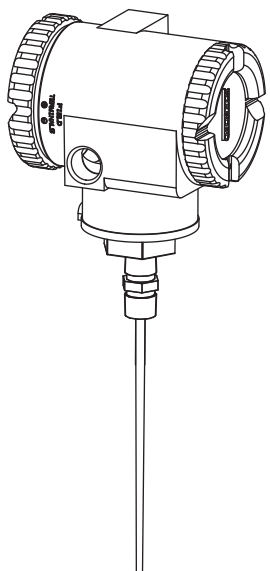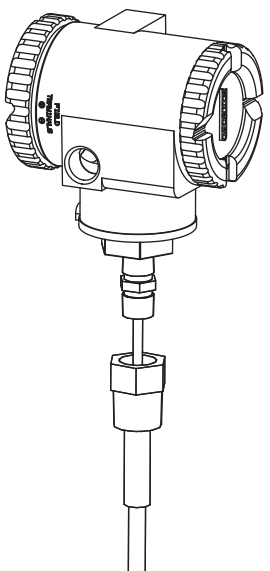
MULTIPLE PACKAGING CONFIGURATIONS

The transmitter is offered in a basic module package or with universal or dual-compartment housing selections.

The DIN B size basic transmitter module is intrinsically safe and is offered for replacement or spare parts purposes, for mounting to a surface, or for mounting to a DIN rail using a simple clip. Alternately, you can select a rugged universal housing for the RTT80, which accommodates the electronics and terminations in a single compartment, or a dual-compartment housing, which isolates and seals the wiring terminals from the electronics compartment. All three housing options provide built-in protection from vibration and RFI.
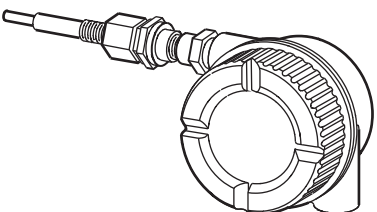
You can mount a transmitter with an integral sensor (and thermowell, if desired) directly to the process. Surface- and pipe-mounted configurations allow the transmitter to be mounted remotely from the process. See Figure 1 for transmitter configurations.

Figure 1. Available Housing and Sensor Mounting Codes

HOUSING AND SENSOR MOUNTING CODES

BASIC MODULE

CODE BB
BASIC MODULE

CODE BB
SURFACE MOUNT

CODE BB
DIN RAIL MOUNT

UNIVERSAL HOUSING

CODES SS AND TT
FOR SURFACE/PIPE MOUNTING

CODES WW AND YY
WITH BARE SENSOR

CODES LL AND MM
WITH SENSOR AND THERMOWELL

DUAL COMPARTMENT HOUSING

CODES GG, HH, QQ, RR
FOR SURFACE/PIPE MOUNTING

CODES CC, DD, JJ, KK,
WITH BARE SENSOR

CODES EE, FF, NN, PP
WITH SENSOR AND THERMOWELL

EFFICIENT AND DURABLE

Industrial-grade integrated circuits and sealed electronics combine to make this microprocessor-based transmitter an efficient and durable device.

RUGGED AND RELIABLE SENSORS

Foxboro supplied sensors are of high quality and rugged construction, and provide maximum accuracy and longevity. Sensors designed for use with thermowells include a spring loading mechanism that ensures continuous contact between the sensor tip and thermowell.

INPUT TYPES

The RTT80 is a configurable temperature field transmitter with either one or two temperature sensor inputs for 2-, 3-, and 4-wire resistance temperature detectors (RTD), most popular thermocouples (TC), and resistance and voltage transmitters. The following is a general list of transmitter input types:

▸ Platinum RTDs, 2-, 3-, and 4-wire
▸ Nickel RTD, 3-wire
▸ Thermocouples
▸ Millivolt
▸ Ohm

OUTPUT TYPES

RTT80 outputs include:

▸ Single measurement or dual measurement configured as average, difference, or redundant measurements
▸ Hot sensor backup - transmitter switches to the second sensor if the primary sensor fails
▸ Temperature-dependent switching between sensors that are used in different measuring ranges
▸ Drift alert or alarm if sensor 1 and 2 deviate from one another

Output units can be configured for various temperature units, ohms, or millivolts.

FOUNDATION FIELDBUS INTERFACE

The RTT80-F complies with H1, IEC 61158-2, and current consumption is ≤ 11 mA. The data transmission rate is 31.25 kBits/s with Manchester II signal encoding. Function blocks featured are: Sensor 1 and Sensor 2 Transducer blocks, an Advanced Diagnostics Transducer block, a Display Transducer block, three AI (Analog Input) blocks and three additional AI blocks that can be instantiated, a PID (Proportional, Integral, Derivative) block, and an Input Selector block.

The RTT80-F also supports Link Master functionality, and is offered with Device Descriptors (DDs) and Field Device Tool DTM support.

GALVANIC ISOLATION

2 kV ac Galvanic isolation is provided between input and output.

TRANSMITTER DIAGNOSTICS

Standard available diagnostics include:

▸ Ambient operating temperature out of range detection
▸ Internal electronics diagnostic error detection
▸ Wiring error detection
▸ Sensor cable open circuit or short circuit detection
▸ Measurement over range and under range detection
▸ Sensor corrosion detection

CORROSION DETECTION

Corrosion of the sensor connections can lead to corruption of the measured value. The transmitter is able to detect corrosion on thermocouples and RTDs with a 4-wire connection before measured value corruption occurs. The transmitter avoids false measurement readings and is also able to indicate a warning or error on the display when wire resistance exceeds reasonable values.

USABLE IN HAZARDOUS AREA LOCATIONS

The Model RTT80 Temperature Transmitter meets the requirements of many certifying agencies for use in hazardous area locations. Refer to "ELECTRICAL SAFETY SPECIFICATIONS" on page 15 section for further details.

EMI AND NAMUR COMPATIBILITY

Complies with the Electromagnetic Compatibility requirements of European EMC Directive 2004/108/EC, and also NAMUR Standard NE 21. See "PERFORMANCE SPECIFICATIONS" on page 6.

OPERATING, TRANSPORTATION, AND STORAGE CONDITIONS

Under Reference Operating Conditions unless Otherwise Specified

Influence	Operative Limits	Transportation and Storage Limits
Ambient Temperature (a) Transmitter and Display	-40 and +85°C (-40 and +185°F) (b)	-40 and +100°C (-40 and 212°F)
Relative Humidity Transmitter and Display	0 and 95% (Noncondensing)	0 and 95% (Noncondensing)
Supply Voltage (c)	9 and 32 V dc (c)	Not Applicable
Vibration: Basic Transmitter Module, Housing and Sensor Mounting Code BB	10 to 2000 Hz for 5 "g" per IEC 60 068-2-6	107 mm (42 in) drop in shipping container
Vibration: Housing and Sensor Mounting Codes CC, EE, GG, JJ, LL, NN, QQ, SS, and WW	19 mm (0.75 in) Double Amplitude from 5 to 9 Hz, 0 to 30 m/s^2 (0 to 3 "g") from 9 to 500 Hz	
Vibration: Housing and Sensor Mounting Codes DD, FF, HH, KK, MM, PP, RR, TT, and YY	10 m/s^2 (1 "g") maximum.	

(a) To ensure proper operation, the ambient temperature limits at the housing should not be exceeded. This is particularly relevant when sensors/thermowells are directly connected to the housing and very high process temperatures are being measured. The transfer of heat from the process to the housing can be minimized by use of thermowell extensions, or in extreme cases, by using a remote housing installation.

(b) Refer to "ELECTRICAL SAFETY SPECIFICATIONS" on page 15 for a restriction in ambient temperature with certain agency approvals/certifications.

(c) Maximum voltage is 35 V dc.

PERFORMANCE SPECIFICATIONS[1]

Reference Operating Conditions

Performance specifications apply under the following reference operating conditions, unless otherwise specified:

‣ Cal Temp: +25°C ±5 K (77°F ±9°F)
‣ Supply Voltage: 24 V dc
‣ 4-wire circuit for resistance adjustment

Response Time

1 s per channel, depending on the type of sensor and connection method.

Resolution

Resolution A/D converter = 18 bit

Measurement Accuracy

Sensor Type	Sensor Designation	Measurement Accuracy
RTD	Cu100, Pt100, Ni100, Ni120 Pt500 Cu50, Pt50, Pt1000, Ni1000 Cu10, Pt200	0.1°C (0.18°F) 0.3°C (0.54°F) 0.2°C (0.36°F) 1°C (1.8°F)
Thermocouple	Types E, J, K, L, T, U Types N, C, D Types B, R, S	Typical 0.25°C (0.45°F) Typical 0.5°C (0.9°F) Typical 1.0°C (1.8°F)
Input Source	**Measurement Range**	**Measurement Accuracy**
Resistance Transmitter	10 to 400 Ω 10 to 2000 Ω	±0.04 Ω ±0.8 Ω
Voltage Transmitter	-20 to +100 mV	±10 µV

Non-Repeatability

Input		Non-Repeatability
10 to 400 Ω	Cu10, Cu50, Cu100, Pt50, Pt100, Ni100, Ni120	15 mΩ
10 to 2000 Ω	Pt200, Pt500, Pt1000, Ni1000	100 ppm * measured value
-20 to +100 mV	Thermocouple Types C, D, E, J, K, L, N, U	4 µV
-5 to 30 mV	Thermocouple Types B, R, S, T	3 µV

Ambient Temperature Effect (Temperature Drift)

Ambient temperature effect values listed below are for a 1 K change in ambient temperature within operative limits.

‣ 10 to 400 Ω Input: 0.001% of measured value, minimum of 1mΩ

‣ 10 to 2000 Ω Input: 0.001% of measured value, minimum of 10mΩ

‣ -20 to +100 mV Input: 0.001% of measured value, minimum of 0.2 µV

‣ -5 to +30 mV Input: 0.001% of measured value, minimum of 0.2 µV

---

(1) All performance specifications apply to the transmitter only. Any errors associated with the thermocouple or RTD sensors, or any other millivolt or resistance sensors are additive. For sensor performance specifications, refer to PSS 1-1B6 A for Foxboro thermocouples, PSS 1-1B1 A for Foxboro RTDs, and PSS 3-3E1 A for Foxboro PRMTA configurable sensors.

Long Term Stability

$\leq 0.1°C$ (0.18°F) per year in reference operating conditions

Sensitivity

See Table 2 for typical sensitivity of RTDs, and see Table 3 for typical sensitivity of thermocouples.

Table 1. Sensor Input Range

Sensor Type	Input Range
RTD: Cu10, Cu50, Cu100, Ni100, Ni120, Pt50, Pt100	10 to 400 Ω
RTD: Ni1000, Pt200, Pt500, Pt1000	10 to 2000 Ω
Thermocouple: Types B, R, S, T	-5 to +30 mV
Thermocouple: Types C, D, E, J, K, L, N, U	-20 to +100 mV

Table 2. Typical Sensitivity of RTDs

RTD Type	Typical Sensitivity
Pt	0.00385 * R_{nom}/K
Cu	0.0043 * R_{nom}/K
Ni	0.00617 * R_{nom}/K

For example, for Pt100 RTD, typical sensitivity = (0.00385) * (100 Ω/K) = 0.385 Ω/K

Table 3. Typical Sensitivity of Thermocouples

Typical Sensitivity			
TC Type	Sensitivity	TC Type	Sensitivity
B	10 µV/K	L	55 µV/K
C	20 µV/K	N	35 µV/K
D	20 µV/K	R	12 µV/K
E	75 µV/K	S	12 µV/K
J	55 µV/K	T	50 µV/K
K	40 µV/K	U	60 µV/K

Compliance with European Union Directives

The transmitter, when installed in accordance with the applicable installation instruction (MI), complies with the EMC requirements of European EMC Directive 2004/108/EC by conforming to the following EN and IEC Standards: EN 61326-1, IEC 61000-4 (as listed below), and NAMUR Standard NE 21 (as listed below).

▸ Electrostatic Discharge per IEC 61000-4-2:
  6 kV Cont., 8 kV air
▸ Radiated RF Immunity per IEC 61000-4-3:
  0.08 to 4.0 GHz; 10 V/m
▸ High Frequency Transient per IEC 61000-4-4:
  1 kV
▸ Switching and Indirect Lightning Transient (Surge) per IEC 61000-4-5:
  1 kV asymmetrical
▸ Conducted RF Immunity per IEC 61000-4-6:
  0.01 to 80 MHz; 10 V
▸ Interference Immunity requirements per NAMUR NE 21.

Measuring Category

Measuring Category II per IEC 61010-1. The measuring category is provided for measurements at circuits with a direct electrical connection to the low voltage supply.

Degree of Contamination

Degree 2 contamination per IEC 61010-1

Climate Class

Per IEC 60654-1, Class C

FUNCTIONAL SPECIFICATIONS

Input Types, Ranges, and Limits

Table 4. Resistance Thermometers (RTD) Inputs

Type of Input	Designation	Measuring Range Limits	Min Span
Per IEC 60751 (α = 0.00385)	Pt100	-200 and +850°C	10 K
	Pt200	-200 and +850°C	10 K
	Pt500	-200 and +250°C	10 K
	Pt1000	-200 and +250°C	10 K
Per JIS C1604-81 (α = 0.003916)	Pt100	-200 and +649°C	10 K
Per DIN 43760 (α = 0.006180)	Ni100	-60 and +250°C	10 K
	Ni1000	-60 and +150°C	10 K
Per Edison Copper Winding No.15 (α = 0.004274)	Cu10	-100 and +260°C	10 K
Per Edison Curve (α = 0.006720)	Ni120	-70 and +270°C	10 K
Per GOST (α = 0.003911)	Pt50	-200 and +1100°C	10 K
	Pt100	-200 and +850°C	
Per GOST (α = 0.004280)	Cu50	-200 and +200°C	10 K
	Cu100		
–	Pt100 (Callendar-van Dusen)	10 and 400 Ω (a)	10 Ω
		10 and 2000 Ω	100 Ω
–	Nickel Polynomial	10 and 400 Ω	10 Ω
		10 and 2000 Ω	100 Ω
–	Copper Polynomial	10 and 400 Ω	10 Ω
		10 and 2000 Ω	100 Ω
Resistance Transmitter			
–	Resistance Ohms	10 and 400 Ω	10 Ω
		10 and 2000 Ω	100 Ω

(a) The measuring range limits are specified by entering the limit values that depend on the coefficients A to C and R0.

Table 5. Thermocouple Inputs

Type of Input	Designation	Measuring Range Limits	Recommended Temp. Range	Min Span
Per IEC 584 Part 1	Type A (W5Re-W20Re)	0 and +2500°C	0 to 2000°C	50 K
	Type B (PtRh30-PtRh6) (a)(b)	40 and +1820°C	100 to 1500°C	50 K
	Type E (NiCr-CuNi)	-270 and +1000°C	0 to 750°C	50 K
	Type J (Fe-CuNi)	-210 and +1200°C	20 to 700°C	50 K
	Type K (NiCr-Ni)	-270 and +1372°C	0 to 1100°C	50 K
	Type N (NiCrSi-NiSi)	-270 and +1300°C	0 to 1100°C	50 K
	Type R (PtRh13-Pt)	-50 and +1768°C	0 to 1400°C	50 K
	Type S (PtRh10-Pt)	-50 and +1768°C	0 to 1400°C	50 K
	Type T (Cu-CuNi)	-260 and +400°C	-185 to +350°C	50 K
Per ASTM E988	Type C (W5Re-W26Re)	0 and 2315°C	0 to 2000°C	50 K
	Type D (W3Re-W25Re)	0 and 2315°C	0 to 2000°C	50 K
Per DIN 43710	Type L (Fe-CuNi)	-200 and +900°C	0 to 750°C	50 K
	Type U (Cu-CuNi)	-200 and +600°C	-185 to +400°C	50 K
Voltage Transmitter				
–	Millivolt (mV)	-20 and +100 mV	–	–

(a) The measuring error will increase for temperatures lower than 300°C (572°F). See "Measurement Accuracy" on page 6.

(b) When operation conditions are based on a large temperature range, the RTT80 offers the ability to split the range. For example, a Type S or R thermocouple can be used for the low range, while a Type B can be used for the upper range.

When assigning both sensor inputs, the following connection combinations are possible:

		Sensor 1			
		2-wire RTD	3-wire RTD	4-wire RTD	Thermocouple
Sensor 2	2-wire RTD	Ok	Ok	N/A	Ok
	3-wire RTD	Ok	Ok	N/A	Ok
	Thermocouple	Ok	Ok	Ok	Ok

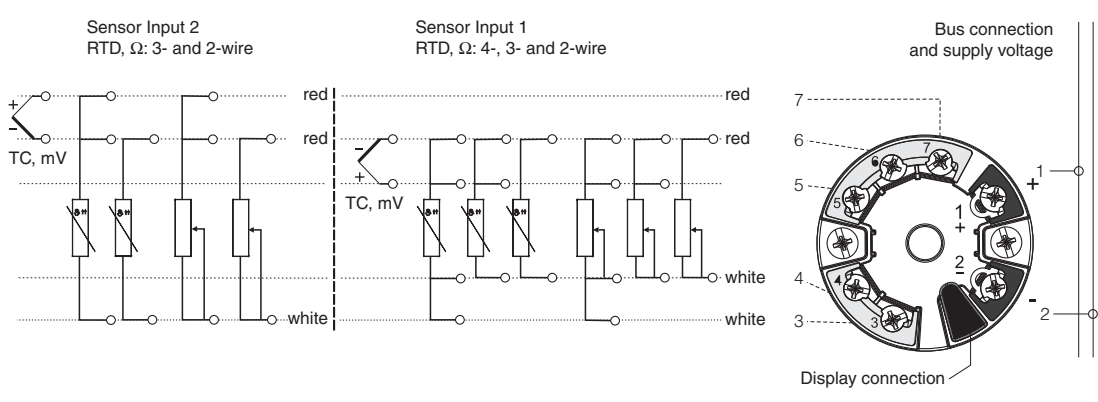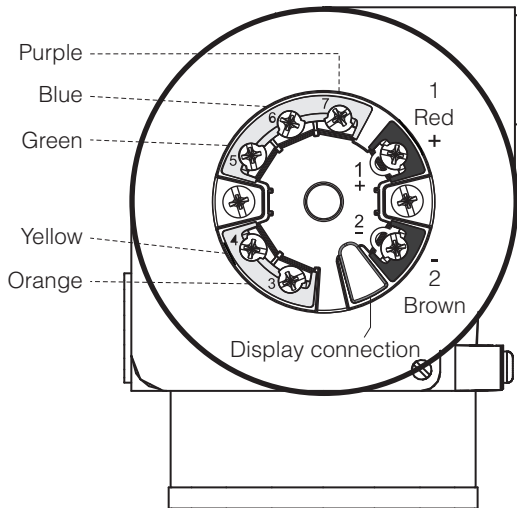*Figure 2. Input Connections – Basic Transmitter and Universal Housing*

Figure 3. Dual Compartment Housing Wiring from the Terminal Block to the Module

Mains Voltage Filter

▸ 50/60 Hz

Galvanic Isolation

▸ U = 2 kV ac (sensor input to output)

Current Consumption

▸ ≤ 11 mA

Switch-On Delay

▸ 8 s

Output Signal

▸ Foundation fieldbus™ H1, IEC 61158-2
▸ FDE (Fault Disconnection Electronic) = 0 mA
▸ Data transmission rate: supported baud rate = 31.25 kBit/s
▸ Communication distance: 1900 m (6235 ft) maximum
▸ Signal coding = Manchester II
▸ Compliance with ITK 6.1.0
▸ Output data: values via AI blocks: temperature (PV), temp sensor 1 + 2, terminal temperature
▸ LAS (link active scheduler), LM (link master) function is supported. Thus, the RTT80 transmitter can assume the function of a link active scheduler (LAS) if the current link master (LM) is no longer available. The device is supplied as a BASIC device. To use the device as an LAS, this must be defined in the distributed control system and activated by downloading the configuration to the device.
▸ In accordance with IEC 60079-27, FISCO/FNICO

Block Execution

▸ Analog Input: 35 ms
▸ PID: 100 ms
▸ Input Selector: 35 ms

Write Protect Function

This function locks out all configurators from making transmitter configuration changes. This makes transmitter suitable for Safety Shutdown System Applications that require this feature. This feature is activated by a DIP switch on the optional local display.

Thermocouple (TC) Cold Junction Compensation

TC cold junction compensated via internal measurement, user-entered constant, or external RTD.

RTD Cable Resistance Compensation – Transmitter-to-Sensor

‣ 4-Wire RTD: Transmitter compensates for cable resistance changes due to ambient temperature changes.

‣ 3-Wire RTD: Transmitter compensates for cable resistance changes due to temperature, as long as cables are exposed to the same ambient temperature.

‣ 2-Wire RTD: Transmitter compensates for constant cable resistance. User may enter resistance value, or transmitter will measure it during setup.

Minimum Immersion

90 mm (3.5 in) is required to minimize thermal conduction errors

Thermocouples (TCs)[2]

‣ TC Type (Foxboro TCs per ASTM E608) base metal types: E, J, K, L, N, T, and U

‣ Platinum metal types: B, R, and S

‣ Tungsten metal types: W3 and W5

Minimum Immersion

90 mm (3.5 in) is required to minimize thermal conduction errors

Thermowells

The thermowells listed in the Model Code are popular selections for industrial use. In addition, Invensys offers other high quality, polished thermowells in a variety of configurations, materials, and sizes. Most application requirements can be met by choosing from the wide selection offered. Specify Thermowell Code TX and see PSS 3-3C1 A for Type W Thermowells, and PSS 3-3D1 A for Type T Thermowells, or contact Invensys. See Figure 4 for a small sample of thermowells available.

Figure 4. Typical W-Series and T-Series Thermowells Shown

---
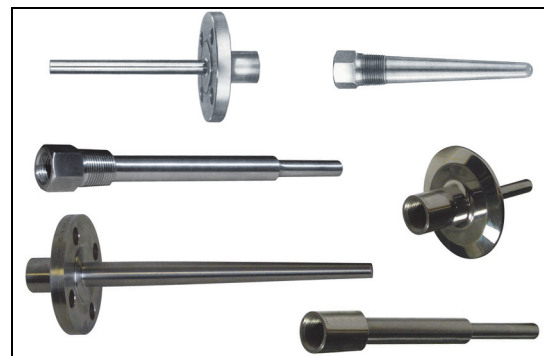
(2) TCs listed are available assembled to RTT80 Transmitter. The transmitter can also be configured for other TC types.

PHYSICAL SPECIFICATIONS

Mounting

The basic transmitter module can be mounted to a DIN rail using the optional mounting clip and self-tapping screw provided by Invensys. The basic module can also be mounted to a surface using user-supplied hardware. See "DIMENSIONS – NOMINAL" on page 19.

The transmitter enclosed in the universal or dual compartment housing (without integral sensors) can be remote mounted to a surface or nominal DN 50 or 2-inch pipe using an optional mounting bracket. See "DIMENSIONS – NOMINAL" on page 19.

Transmitter Housings

Housing Code	Material and Finish	IEC/NEMA Rating	Explosion-proof and Flameproof	Mounting Configuration	Field Wiring Entrances on Housing
Basic Module					
BB	Encapsulated plastic	IP20 (a)	No	Basic Transmitter Module (b) (DIN Form B package)	None
Universal Housing					
LL	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Universal housing with integral sensor and thermowell	1/2 NPT (c)
MM	Stainless steel	IP66/67 NEMA 4X	Yes	Universal housing with integral sensor and thermowell	1/2 NPT (c)
SS	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Universal housing for surface or pipe mounting, remote sensor (d)	1/2 NPT (c)
TT	Stainless steel	IP66/67 NEMA 4X	Yes	Universal housing for surface or pipe mounting, remote sensor (d)	1/2 NPT (c)
WW	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Universal housing with integral bare sensor	1/2 NPT (c)
YY	Stainless steel	IP66/67 NEMA 4X	Yes	Universal housing with integral bare sensor	1/2 NPT (c)

Transmitter Housings (Continued)

Housing Code	Material and Finish	IEC/NEMA Rating	Explosion-proof and Flameproof	Mounting Configuration	Field Wiring Entrances on Housing
Dual Compartment Housing					
CC	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral bare sensor	M20
DD	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral bare sensor	M20
EE	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral sensor and thermowell	M20
FF	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral sensor and thermowell	M20
GG	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing for surface or pipe mounting, remote sensor (d)	M20
HH	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing for surface or pipe mounting, remote sensor (d)	M20
JJ	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral bare sensor	1/2 NPT
KK	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral bare sensor	1/2 NPT
NN	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral sensor and thermowell	1/2 NPT
PP	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing with integral sensor and thermowell	1/2 NPT
QQ	Low copper aluminum alloy; epoxy coated	IP66/67 NEMA 4X	Yes	Dual-compartment housing for surface or pipe mounting, remote sensor (d)	1/2 NPT
RR	Stainless steel	IP66/67 NEMA 4X	Yes	Dual-compartment housing for surface or pipe mounting, remote sensor (d)	1/2 NPT

(a) The basic module, although encapsulated, has exposed terminals not protected from the environment.

(b) The basic module is typically used for replacement and spares purposes; it can also be mounted to a surface or to a DIN rail using a clip (Option -D1).

(c) Optional conduit threads available; see Model Code.

(d) Surface or pipe mounted using mounting set options -M1 or -M2.

Dimensions

Refer to "DIMENSIONS – NOMINAL" on page 19
and to the Dimensional Print DP 020-580.

Approximate Transmitter Mass

Housing Codes	Housing Material	Direct or Remote Mounting	Approximate Mass			
			Standard		With Optional Display	
			kg	lb	kg	lb
Basic Transmitter Module						
BB	N/A	N/A	0.05	0.11	0.01	0.02
Universal Housing						
LL (a)	Aluminum	Direct	1.4	3.1	1.4	3.1
WW (b)						
SS (c)		Remote				
MM (a)	316 ss	Direct	3.2	7.1	3.2	7.1
YY (b)						
TT (c)		Remote				
Dual Compartment Housing						
EE and NN (a) CC and JJ (b)	Aluminum	Direct	1.3	2.8	1.3	2.8
GG and QQ (c)		Remote	1.3	2.8	1.3	2.9
FF and PP (a) DD and KK (b)	316 ss	Direct	2.9	6.4	2.9	6.5
HH and RR (c)		Remote	2.9	6.5	3.0	6.6

(a) Includes module, but sensor and thermowell mass and connecting hardware not included.

(b) Includes module, but bare sensor mass and connecting hardware not included.

(c) Surface or pipe mount housing; remote sensor.

ELECTRICAL SAFETY SPECIFICATIONS

The transmitter has been designed to meet the Electrical Safety descriptions listed in the table below. Contact Invensys for information on status of testing laboratory approvals or certifications. Refer to the Instruction Manual for application conditions and connectivity requirements.

Testing Laboratory, Type of Protection, and Area Classification	Model Code Option
Non-hazardous area	ZZ
CSA IS, I/1+2/ABCD	CA
CSA NI, 1/2/ABCD	CN
CSA Explosionproof, Class I, Division 1, BCD; Dust-ignitionproof, Class II, Division 1, EFG, Class III, Division 1. Also zone certified, Cl I, Zone 1, Ex d IIC (a)	CD
ATEX II 1G Ex ia IIC T4/T5/T6 (a)	AA
ATEX II 2 G Ex d T6 Gb Ta = -40°C to +70°C II 2 D Ex tb T85C Db (a)	AD
IECEx Ex ia IIC T4/T5/T6 (a)	EA
IECEx Ex d T6 Gb Ta = -40°C to +70°C Ex tb T85C Db (a)	ED
FM IS, I/1+2/ABCD	FA
FM NI, I/2/ABCD	FN
FM Explosionproof, Class I, Division 1, Groups B, C, and D; Dust-ignitionproof, Class II, Division 1, Groups E, F, and G, Class III Division 1 (a)	FD

(a) Not available with the basic module (Housing and Sensor Mounting Code BB).

MODEL CODE

Description	Model
I/A Series Temperature Transmitter	RTT80
Communications	
for use with FOUNDATION fieldbus digital communications	-F
Input/Output Configuration	
Configured for Single Sensor Input	1
Configured for Dual Sensor Input – PV is Sensor 1 (a)	2
Configured for Dual Sensor Input – PV is average of Sensor 1 and Sensor 2 (a)	3
Configured for Dual Sensor Input – PV is difference between Sensor 1 and Sensor 2 (a)	4
Configured for Dual Sensor Input – Sensor 2 is hot backup for Sensor 1 (a)	5
Configured for Dual Sensor Input – PV is average with sensor backup (a)	6
Housing and Sensor Mounting	
Basic Module for DIN Rail or Surface Mounting or Replacement	BB
Dual compartment aluminum housing, 1/2 NPT conduit with sensor (b)	JJ
Dual compartment ss housing, 1/2 NPT conduit with sensor (b)	KK
Dual compartment aluminum housing, 1/2 NPT conduit with sensor and thermowell mounting (b)	NN
Dual compartment ss housing, 1/2 NPT conduit with sensor and thermowell mounting (b)	PP
Dual compartment aluminum housing, 1/2 NPT conduit for use with remote sensor (c)	QQ
Dual compartment ss housing, 1/2 NPT conduit for use with remote sensor (c)	RR
Dual compartment aluminum housing, M20 conduit with sensor (b)	CC
Dual compartment ss housing, M20 conduit with sensor (b)	DD
Dual compartment aluminum housing, M20 conduit with sensor and thermowell mounting (b)	EE
Dual compartment ss housing, M20 conduit with sensor and thermowell mounting (b)	FF
Dual compartment aluminum housing, M20 conduit for use with remote sensor (c)	GG
Dual compartment ss housing, M20 conduit for use with remote sensor (c)	HH
Universal aluminum housing for use with remote sensor (c)	SS
Universal ss housing for use with remote sensor (c)	TT
Universal aluminum housing with bare sensor (b)	WW
Universal ss housing with bare sensor (b)	YY
Universal aluminum housing with sensor and thermowell mounting (b)	LL
Universal ss housing with sensor and thermowell mounting (b)	MM

MODEL CODE (CONTINUED)

Description	Model
Input Measurement Type (d)	
Thermocouple, Type B (e)	B
Thermocouple, Type C (e)	C
Thermocouple, Type D (e)	D
Thermocouple, Type E	E
Thermocouple, Type J	J
Thermocouple, Type K	K
Thermocouple, Type L (e)	L
Thermocouple, Type N	N
Thermocouple, Type R (e)	R
Thermocouple, Type S (e)	S
Thermocouple, Type T	T
Thermocouple, Type U (e)	U
2-wire RTD, 100 ohm platinum IEC 751 (ASTM-B Standard Accuracy) (e)	2
3-wire RTD, 100 ohm platinum IEC 751 (ASTM-B Standard Accuracy)	Q
4-wire RTD, 100 ohm platinum IEC 751 (ASTM-B Standard Accuracy) (f)	4
3-wire RTD, 100 ohm platinum IEC 751 (ASTM-A High Accuracy)	A
4-wire RTD, 100 ohm platinum IEC 751 (ASTM-A High Accuracy) (f)	6
3-wire RTD, 100 ohm nickel DIN 43760 (e)	F
Ohms input	P
Millivolt input	M
3-wire RTD Platinum (Callendar-van Dusen)	W
Other (factory configuration for an Input Measurement Type not listed above) (g)	Z
Thermowell Assembled to Housing	
No Thermowell or Thermowell is supplied separately (h)	NA
Thermowell Series "T-" assembled to housing; specify child thermowell (i)	TK
Thermowell Series "W-" assembled to housing; specify "W-" model code (j)	TX
Hazardous Area Certifications (k)	
Non-hazardous area	ZZ
CSA IS, I/1+2/ABCD	CA
CSA NI, 1/2/ABCD	CN
CSA Explosionproof, Class I, Division 1, BCD; Dust-ignitionproof, Class II, Division 1, EFG, Class III, Division 1. Also zone certified, CL I, Zone 1, EX d IIC (l)	CD
ATEX II 1G Ex ia IIC T4/T5/T6	AA
ATEX II 2 G Ex d T6 Gb (l)	AD
IECEx Ex ia IIC T4/T5/T6 (l)	EA
IECEx Ex d T6 Gb (l)	ED
FM IS, I/1+2/ABCD	FA
FM NI, I/2/ABCD	FN
FM Explosionproof, Class I, Division 1, Groups B, C, and D; Dust-ignitionproof, Class II, Division 1, Groups E, F, and G, Class III Division 1 (l)	FD
Optional Selections	
Housing Features	
Custody Transfer Lock and Seal (l)	-A1
Metric M20 Conduit Adapter (1/2 NPT by M20x1.5) (n)	-A3
Housing Connection to Thermowell	
Stainless Steel Union and Fittings (m)	-S3

## MODEL CODE (CONTINUED)

Description	Model
Mounting Sets	
Mounting Set for Universal Housing – Painted Steel (n)	-M1
Mounting Set for Universal Housing – Stainless Steel (n)	-M2
Mounting Set for Dual Compartment Housing – Painted Steel (o)	-M3
Mounting Set for Dual Compartment Housing – Stainless Steel (o)	-M4
Mounting Set for Dual Compartment Housing – Rugged Painted Steel (p)	-M5
Mounting Set for Dual Compartment Housing – Rugged Stainless Steel (p)	-M6
Clip for DIN rail mounting of the basic module	-D1
Other Optional Features	
Custom Database Configuration	-C2
Omit FoxDoc CD-ROM	-K1
With Local Indicator	-L1
Cleaned and Prepared for Oxygen Service (l)	-C5
Wake Frequency Calculations (q)	-WF
NACE Compliant Thermowell (q) (r)	-N1

(a) Input measurement must be the same for both sensors. Dual 4-wire RTD is not permitted. Only Input 1 can be configured for 4-wire RTD.

(b) This option initiates the PRMTA configurable sensor model code. If you are ordering a PRMTA configurable sensor, be sure that the RTT80 Input Measurement Type ordered matches the PRMTA Configurable Sensor Input Measurement Type.

(c) Sensor ordered separately.

(d) Transmitter is factory configured for the measurement type specified whether the sensor is included or not. You can change the configuration to a different type using appropriate configuration software for the selected protocol, or specify -C2 Option for custom factory configuration. On dual sensor input (Sensor Input = 2), both inputs are configured the same, unless specified via the -C2 configuration form.

(e) Only available with the basic module or a module for use with a remote sensor (Housing and Sensor Mounting Codes BB, QQ, RR, GG, HH, SS, TT).

(f) Only available with single sensor input (Input/Output Configuration Code 1).

(g) This option requires selection of the Custom Database Configuration (Model Code Option -C2) under "Other Optional Features".

(h) This option is required for all housing options that are not configured for thermowells (Housing and Sensor Mounting Codes BB, JJ, KK, QQ, RR, CC, DD, GG, HH, SS, TT, WW, and YY).

(i) This option allows you to select a PRMTA configurable sensor with TT, TF, TS, or TW thermowell codes.

(j) Refer to PSS 3-3C1 A for available W Series thermowells.

(k) Transmitter has been designed to meet the Electrical Safety descriptions listed in this table. Contact Invensys for information and status of testing laboratory approvals or certifications

(l) Not available with the basic module (Housing and Sensor Mounting Code BB).

(m) Optionally available with aluminum housings configured for sensor and thermowell mounting (Housing and Sensor Mounting Codes NN, EE, and LL). Standard on ss housings configured for sensor and thermowell mounting (Housing and Sensor Mounting Codes PP, FF, and MM).

(n) Only available with universal housings (Housing and Sensor Mounting Codes SS, TT, WW, YY, LL, MM).

(o) Only available with aluminum dual compartment housings (Housing and Sensor Mounting Codes CC, EE, GG, JJ, NN, QQ).

(p) Required for ss dual compartment housings (Housing and Sensor Mounting Codes KK, PP, RR, and DD) if a mounting set is desired. Also available with aluminum dual compartment housings (Housing and Sensor Mounting Codes JJ, NN, QQ, and CC) if a mounting set is desired.

(q) Requires universal or dual compartment housings with sensor and thermowell mounting options (Housing and Sensor Mounting Codes NN, PP, EE, FF, LL, or MM).

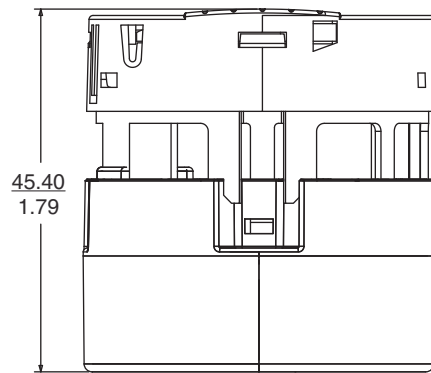(r) Only available with Thermowell Option Code TK ("T-" thermowell assembled to housing).

DIMENSIONS – NOMINAL
mm
in

BASIC TRANSMITTER
HOUSING CODE BB

$\frac{33.0}{1.3}$

$\frac{44.0}{1.7}$

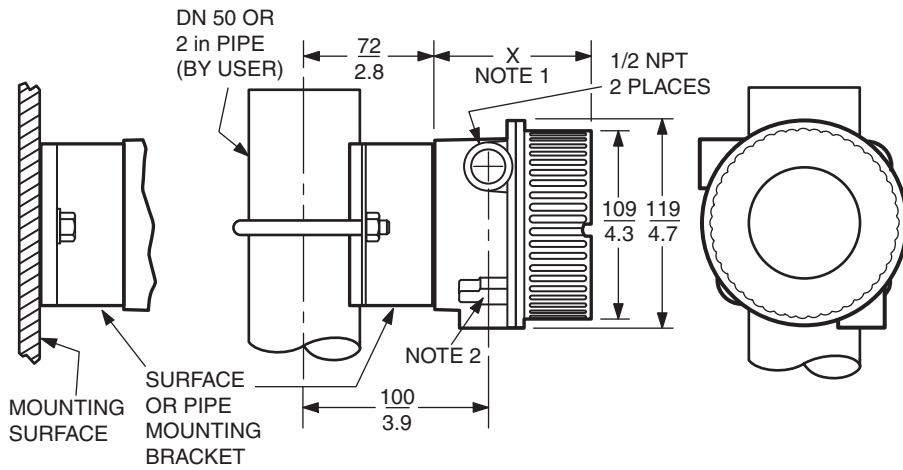$\frac{24.1}{0.9}$

$\frac{45.40}{1.79}$
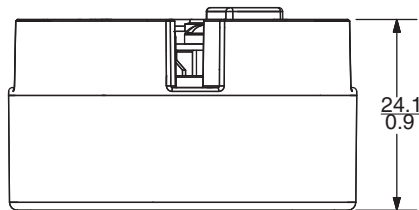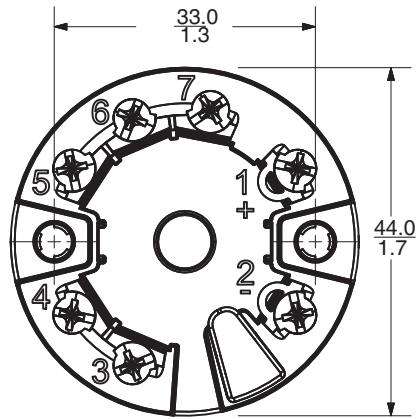
WITHOUT LCD INDICATOR

WITH LCD INDICATOR

mm
in

UNIVERSAL HOUSING FOR SURFACE OR PIPE MOUNT WITH REMOTE SENSOR
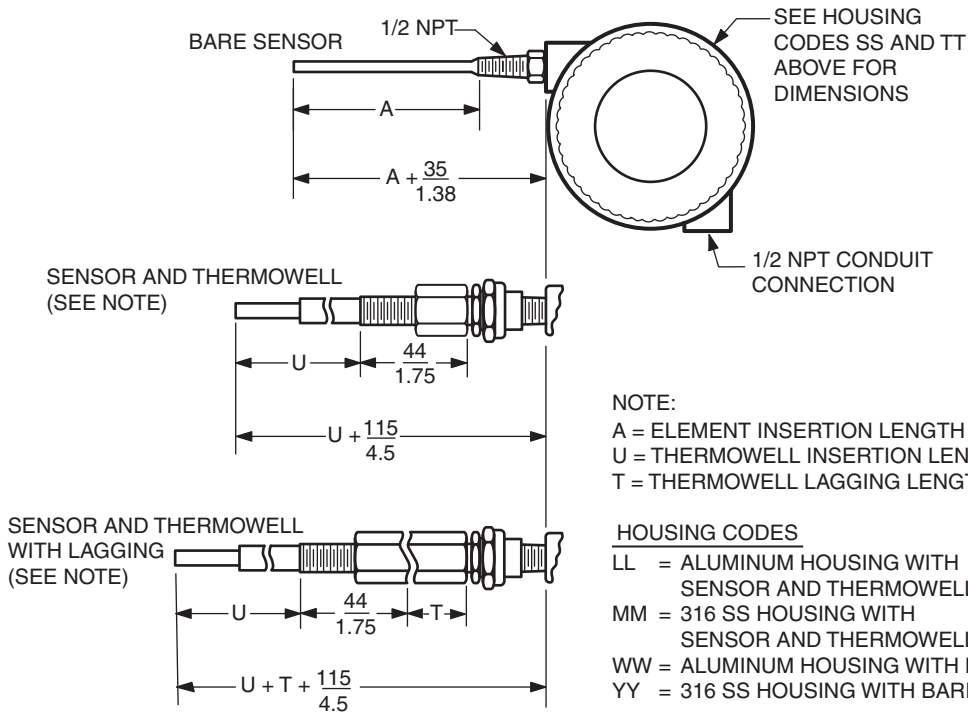HOUSING CODES SS AND TT

HOUSING CODES
SS = ALUMINUM
TT = 316 ss

DIMENSION X (NOTE 1)	
WITHOUT INDICATOR	WITH INDICATOR
87	99
3.4	3.9

NOTES
1. ALLOW 51 mm (2 in) CLEARANCE FOR COVER REMOVAL.
2. EXTERNAL COVER LOCK AND GROUND SCREW WHEN APPLICABLE.

UNIVERSAL HOUSING WITH INTEGRAL SENSOR AND/OR SENSOR AND THERMOWELL
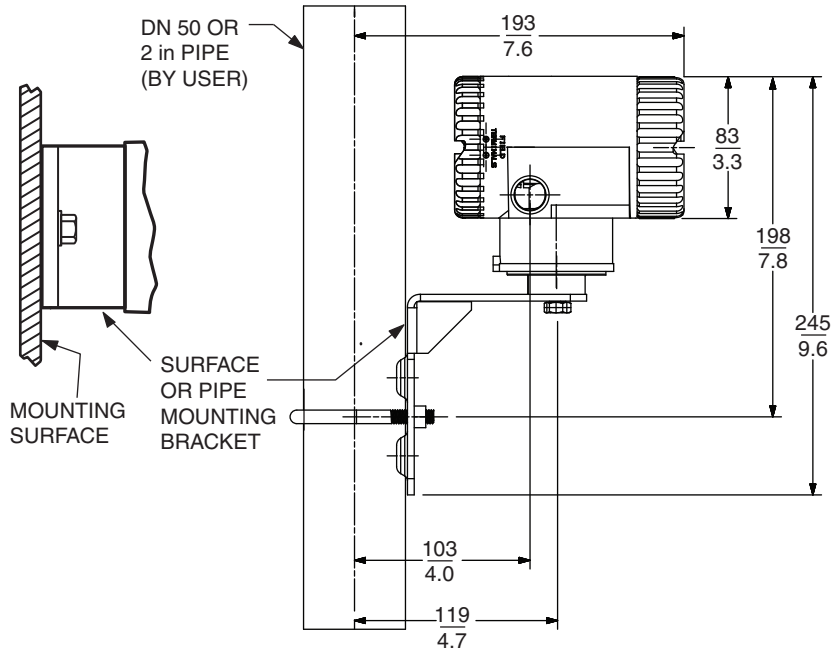HOUSING CODES LL, MM, WW, AND YY

NOTE:
A = ELEMENT INSERTION LENGTH
U = THERMOWELL INSERTION LENGTH
T = THERMOWELL LAGGING LENGTH

HOUSING CODES
LL   = ALUMINUM HOUSING WITH SENSOR AND THERMOWELL
MM = 316 SS HOUSING WITH SENSOR AND THERMOWELL
WW = ALUMINUM HOUSING WITH BARE SENSOR
YY   = 316 SS HOUSING WITH BARE SENSOR

mm
in

DUAL COMPARTMENT HOUSING FOR SURFACE OR PIPE MOUNT WITH REMOTE SENSOR
HOUSING CODES GG, HH, QQ, AND RR

DN 50 OR
2 in PIPE
(BY USER)

$\frac{193}{7.6}$

$\frac{83}{3.3}$

$\frac{198}{7.8}$

$\frac{245}{9.6}$

SURFACE
OR PIPE
MOUNTING
BRACKET

MOUNTING
SURFACE

$\frac{103}{4.0}$
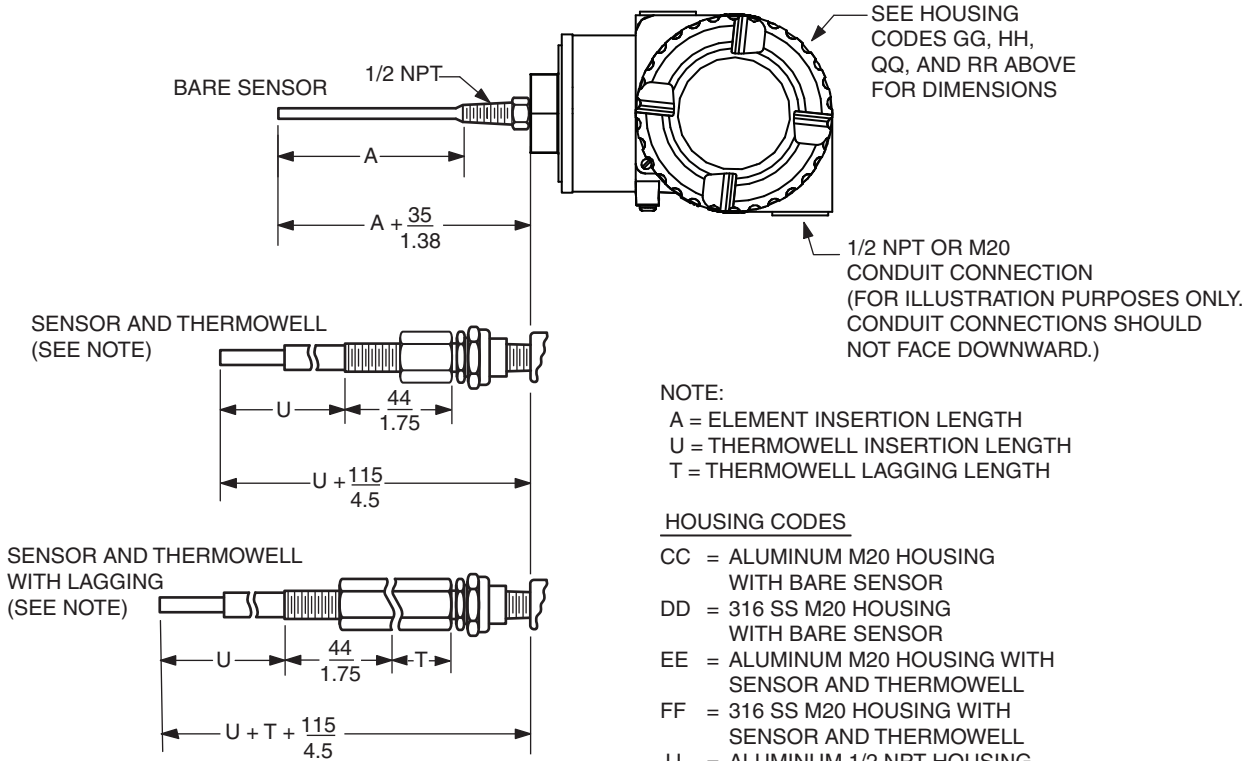
$\frac{119}{4.7}$

HOUSING CODES

GG = ALUMINUM M20 HOUSING FOR
        REMOTE SENSOR
HH = 316 SS M20 HOUSING FOR
        REMOTE SENSOR
QQ = ALUMINUM 1/2 NPT HOUSING FOR
        REMOTE SENSOR
RR = 316 SS 1/2 NPT HOUSING FOR
        REMOTE SENSOR

NOTES

1. ALLOW 51 mm (2 in) CLEARANCE FOR
   COVER REMOVAL.
2. EXTERNAL COVER LOCK AND GROUND
   SCREW WHEN APPLICABLE.

$$\frac{mm}{in}$$

DUAL COMPARTMENT HOUSING WITH INTEGRAL SENSOR AND/OR SENSOR AND THERMOWELL
HOUSING CODES CC, DD, EE, FF, JJ, KK, NN, AND PP

SEE HOUSING
CODES GG, HH,
QQ, AND RR ABOVE
FOR DIMENSIONS

BARE SENSOR   1/2 NPT

A

$A + \dfrac{35}{1.38}$

1/2 NPT OR M20
CONDUIT CONNECTION
(FOR ILLUSTRATION PURPOSES ONLY.
CONDUIT CONNECTIONS SHOULD
NOT FACE DOWNWARD.)

SENSOR AND THERMOWELL
(SEE NOTE)

U $\dfrac{44}{1.75}$

$U + \dfrac{115}{4.5}$

NOTE:
 A = ELEMENT INSERTION LENGTH
 U = THERMOWELL INSERTION LENGTH
 T = THERMOWELL LAGGING LENGTH

SENSOR AND THERMOWELL
WITH LAGGING
(SEE NOTE)

U $\dfrac{44}{1.75}$ T

$U + T + \dfrac{115}{4.5}$

HOUSING CODES

CC = ALUMINUM M20 HOUSING
       WITH BARE SENSOR
DD = 316 SS M20 HOUSING
       WITH BARE SENSOR
EE = ALUMINUM M20 HOUSING WITH
       SENSOR AND THERMOWELL
FF = 316 SS M20 HOUSING WITH
       SENSOR AND THERMOWELL
JJ = ALUMINUM 1/2 NPT HOUSING
       WITH BARE SENSOR
KK = 316 SS 1/2 NPT HOUSING
       WITH BARE SENSOR
NN = ALUMINUM 1/2 NPT HOUSING
       WITH SENSOR AND THERMOWELL
PP = 316 SS 1/2 NPT HOUSING
       WITH SENSOR AND THERMOWELL

NOTES

ORDERING INSTRUCTIONS

1. Model Number
2. Configured Range
3. Tag Number

OTHER M&I PRODUCTS

Invensys provides a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, positioners, temperature, controlling and recording. For a listing of these offerings, visit our web site at:

www.invensys.com

MB 010   0214

invensys™