Model 3244MV

Multivariable Temperature Transmitter with FOUNDATION™ fieldbus

FOUNDATION FIELDBUS CAPABILITY

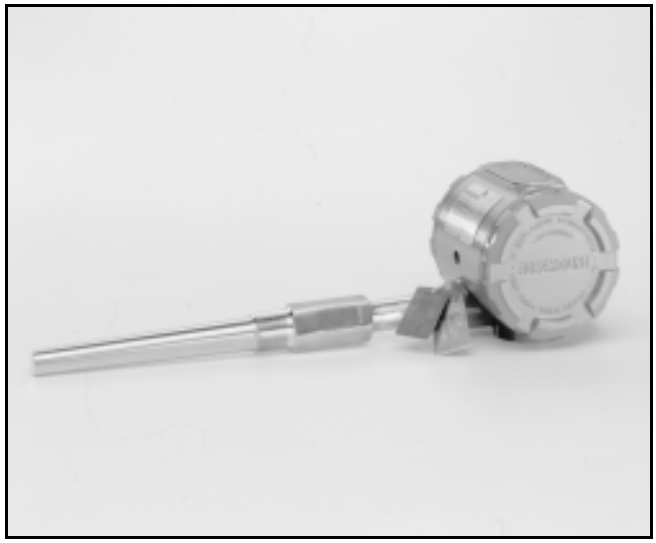
- *Interoperable with other FOUNDATION™ fieldbus instruments*
- *FOUNDATION™ fieldbus function blocks enable "Control Anywhere"*
- *Reduces wiring costs by 60% compared to traditional smart transmitters*
- *Reduces installation, commissioning, operation, and maintenance time by 30 to 60% compared to traditional smart transmitters*

MULTIVARIABLE CAPABILITY PROVIDES MORE THAN JUST THE PROCESS VARIABLE

- *Accepts any combination of multiple sensor types (RTDs, thermocouples, ohms, and mV), for added flexibility*
- *Differential temperature measurement and sensor drift detection capabilities reduce process variability*
- *Input Selector function block provides our unique Hot Backup® feature as well as a variety of other temperature measurements to improve process availability*

SUPERIOR PERFORMANCE AND RELIABILITY

- *Accuracy: ± 0.10 °C (± 0.18 °F) for Pt 100 RTDs*
- *Stability: ± 0.1% of reading or ± 0.1 °C whichever is greater for 24 months for RTDs*
- *18 bit analog-to-digital converter with ambient temperature compensation for outstanding measurement performance and more consistent process quality*



NOTE: Available only when purchased with a FOUNDATION fieldbus conformant Host. Contact your Rosemount Sales Representative for details.

PART OF THE PLANTWEB ARCHITECTURE

- *Enhanced temperature measurements include multivariable and sensor matching capabilities for reduced process variability*
- *Detailed diagnostics include real-time indication of instrument status, which enables proactive instead of reactive process control*
- *"Control Anywhere" results in more uniform, flexible, and robust control strategies*

PlantWeb

FOUNDATION

ROSEMOUNT®

FISHER-ROSEMOUNT™ Managing The Process Better.™

Why FOUNDATION Fieldbus?

Designed for Process Control by Process Control Experts

FOUNDATION fieldbus is an all digital, serial, two-way communication protocol that interconnects field equipment such as transmitters, valves, and controllers. Fieldbus is a Local Area Network (LAN) for instruments used in process control with built-in capability to distribute the control application across the network.

FOUNDATION fieldbus was designed from the ground up specifically for the process control industry by a group of process control experts. The technology is owned and maintained by the Fieldbus Foundation, a not-for-profit organization that consists of more than 100 of the world's leading control and instrumentation suppliers and end users.

Cost Savings

The savings begin with installation and wiring...

Fewer hardware components, a simplified wiring architecture, reduced need for I/O equipment, and the reduced central control requirements of a Fieldbus installation yield sizable labor and material savings compared to traditional (non-fieldbus) control strategies.

For a new installation you can connect up to 16 fieldbus transmitters to a single pair of wires. In an established installation you can *use existing wiring* to connect up to 16 transmitters per measurement loop. With a Fieldbus loop you can easily save 60% in installation costs alone.

...continue with easy commissioning...

To commission the instrument, simply enter the configuration parameters and download the data to all of the applicable devices. Instrument technicians will spend 30 to 60% less time commissioning Fieldbus instruments compared to traditional smart instruments.

...and end with simplified operation and maintenance.

FOUNDATION fieldbus enables greater access to the powerful diagnostics capabilities of the transmitters. These capabilities will help prevent costly unscheduled process downtime by enabling maintenance personnel to quickly identify and solve problems.

Advanced Functionality

Location-Independent Control

FOUNDATION fieldbus allows the implementation of PID control in the field device. Moving control closer to the process improves loop performance, reduces plant variability, and greatly reduces the necessary size of control rooms.

High Speed Communication

Loop execution speed is increased significantly through the regular scheduling of data transmission. Peer-to-peer communication improves the efficiency and reliability of the control system.

Flexible Topology

FOUNDATION fieldbus enables an extremely flexible topology, which is designed and optimized for process control. You can install FOUNDATION fieldbus devices using a tree configuration, a multidrop configuration, or any combination of both.

Truly Interoperable

FOUNDATION fieldbus-compliant instruments from different vendors are interoperable, which allows you to select the best-in-class instruments for each application without having to consider compatibility issues.

True interoperability is achieved through the implementation of standardized function blocks and Device Description Language (DDL) technology. The implementation of standardized function blocks (such as Analog Input, Analog Output, and PID) enables integrated, real-time, deterministic control strategies. DDL technology ensures access to all available device features, and provides a mechanism to support upgrades to future digital enhancements. FOUNDATION fieldbus is the only all-digital communication protocol that uses both of these technologies.

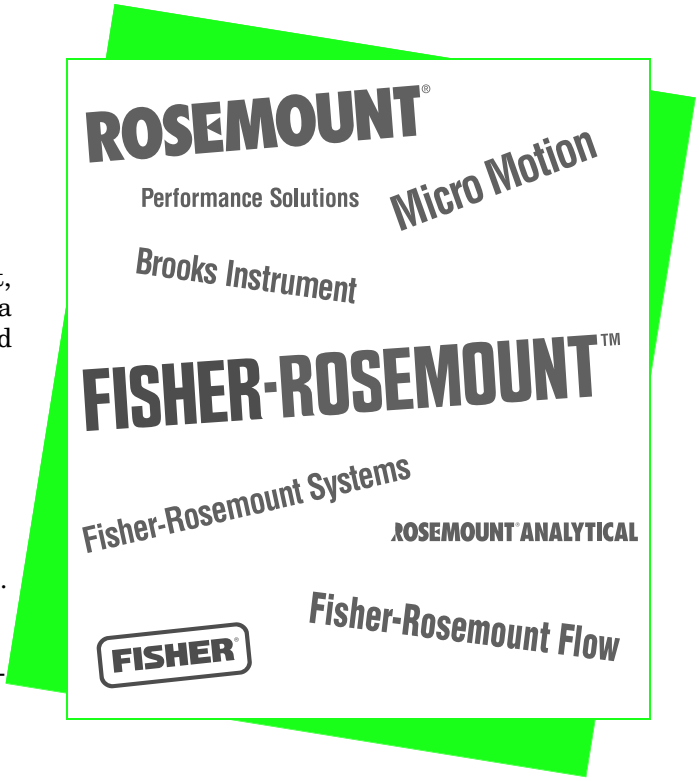
Why Rosemount?

Proven Leadership in the Development of New Technologies

Rosemount Inc. is a member of Fisher-Rosemount, a unique family of companies committed to helping you improve business results by managing the process better.

Individually, each of these companies is a recognized leader in providing one or more of the capabilities needed for better process performance: measurement, analysis, control, and integration. Together, we offer a complete range of best-in-class products, systems, and services, and we offer the engineering expertise to make them all work together.

The Fisher-Rosemount group of companies has a long history of leading the industry with breakthrough technology. Fisher-Rosemount's long-term presence in the process measurement and control marketplace provides in-depth knowledge of the process industries. This knowledge allows each company to constantly develop, improve, and refine emerging and mature technologies. The result: companies within the Fisher-Rosemount group are consistently ahead of the competition in the development of emerging technologies. FOUNDATION fieldbus is no exception; products from Fisher-Rosemount were among the first to pass the Fieldbus Foundation's interoperability test.



Advanced Implementation of FOUNDATION fieldbus Technology

"Control Anywhere" applies PID control algorithms consistently in each device to yield consistent, uniform, and predictable control strategies regardless of whether you implement control in the transmitter, the valve, or the DeltaV Fieldbus configuration tool. "Control Anywhere" is a feature built into only FOUNDATION fieldbus devices from Fisher-Rosemount.

Enhanced Measurement Features include industry-leading accuracy and stability to guarantee high-quality measurements, and advanced multiple-input features to enable multivariable measurement capabilities.

Advanced Diagnostics Capabilities reduce costly unscheduled process downtime by providing more detailed information about the health and status of the device and the process.

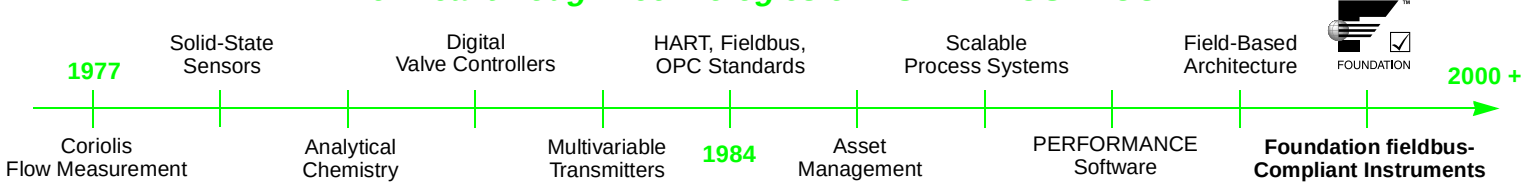
Breadth of Best-in-Class Products ensures the optimal solution for all of your measurement and control needs.

World-Class Service and Support

Doing business with Rosemount Inc. provides you access to Fisher-Rosemount's world-wide service and support network, Foundation Support for PlantWeb Builder. This network provides the essential services for implementation and your first year of operation. Our 24-hour response center and certified customer support solutions specialists assure that your needs are handled efficiently and effectively regardless of which Fisher-Rosemount division manufactured your instrument, and where in the world you are using the instrument.

Fisher-Rosemount offers a broad range of services designed to keep your process up and running. The support network is staffed with highly trained and qualified technical and administrative professionals, who will respond to your calls. Their support helps to achieve faster turnaround times on solutions, and enables your Fisher-Rosemount salesperson to dedicate more time assisting your company, before and after the installation.

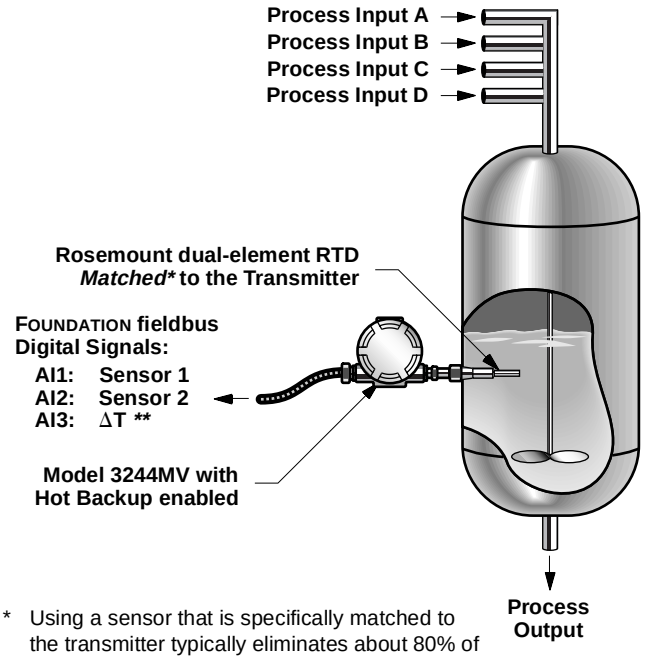
The Breakthrough Technologies of FISHER-ROSEMOUNT



The Ultimate Transmitter for Critical or Noncritical Temperature Measurement Applications

CRITICAL APPLICATIONS

Example: Batch Reactor



* Using a sensor that is specifically matched to the transmitter typically eliminates about 80% of the measurement error.

** AI3 is configured to measure differential temperature for sensor drift detection purposes.

Critical measurement applications involve control, safety interlocks, or any type of critical monitoring points.

Hot Backup feature provides automatic sensor redundancy in case of sensor failure.

Transmitter-to-Sensor Matching eliminates sensor interchangeability error, thereby greatly improving measurement accuracy.

Differential Temperature capability assures uniform process temperature, and can be used to detect sensor drift in a dual-element sensor.

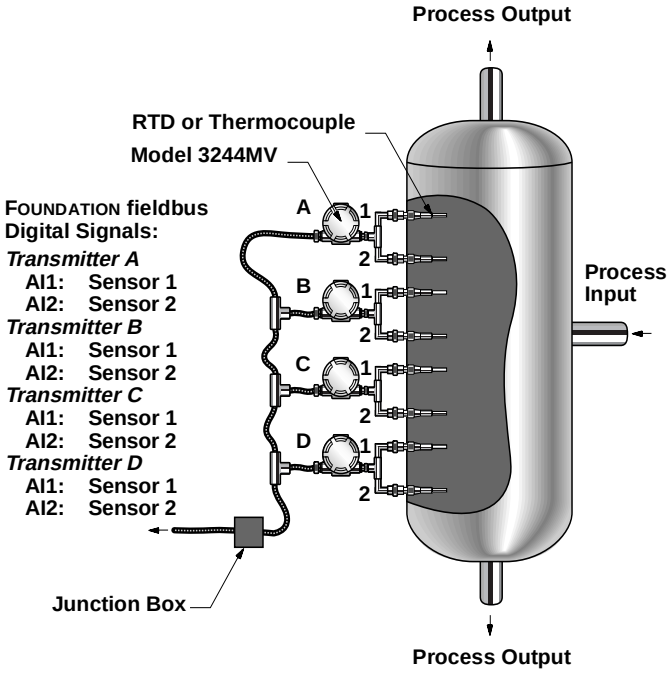
Dual Compartment Housing provides superb reliability in high-humidity, corrosive, and RFI environments.

Integral Transient Protector prevents damage to the transmitter from transients induced on the loop wiring.

Tightest Total Performance Specification combines the effects of transmitter drift, sensor interchangeability error, temperature effects, and reference accuracy to better account for actual process conditions and to assure maximum accuracy.

NONCRITICAL APPLICATIONS

Example: Distillation Column



Noncritical applications involve basic process monitoring.

Dual Input Capability reduces instrument costs by 50%; you can measure two separate and independent temperature points with one transmitter.

Excellent Stability – 0.1% of reading for 24 months – results in fewer necessary calibrations.

Multidrop Capability drastically reduces wiring costs; you can connect up to 16 transmitters to a single pair of wires.

Integrate the Model 3244MV Transmitter into the PlantWeb™ Architecture for Superior Performance

PlantWeb is the architecture that uses the power of intelligent field devices to improve plant performance. Integrating the Model 3244MV with FOUNDATION Fieldbus into the PlantWeb architecture yields the following advantages:

Enhanced Measurement

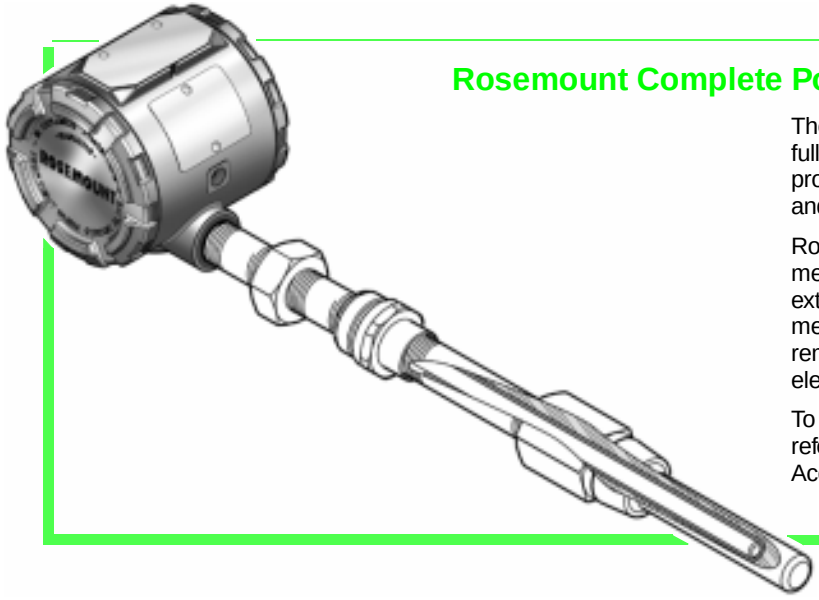
Multivariable capability allows the Model 3244MV to accept simultaneous inputs from two sensors. The two inputs can be used in noncritical applications to simultaneously measure the temperature of two completely independent processes. In critical applications, the two inputs can be used in a Hot Backup strategy, or to calculate the average, minimum, maximum, or differential temperature of a process.

Diagnostics

Real-time indication of instrument status allows the user to closely monitor the process and the operation of the transmitter and sensor. When used with a dual-element temperature sensor, the Model 3244MV provides a unique Hot Backup feature that notifies the user if the primary sensing element fails. And the differential temperature feature can be used to detect sensor drift.

Control Anywhere

The Model 3244MV provides control functionality with either one or two PID function blocks in the transmitter. The PID blocks can be used to perform single loop, cascade, or feedforward control in the field.



Rosemount Complete Point Solutions™

The Rosemount Complete Point Solutions program provides fully engineered measurement solutions, combining the best product and practices for improved performance, reliability, and cost of ownership.

Rosemount Inc. will supply the complete temperature measurement assembly, including transmitter, sensor, extension, and thermowell. When you purchase the complete measurement assembly from Rosemount Inc., you need only remove it from the box, tap into the process, and make electrical connections.

To order Rosemount temperature sensors and accessories refer to the Rosemount Temperature Sensors and Accessories product data sheet.

The Rosemount Model 3244MV Transmitter is among the world's first devices to be registered with the Fieldbus Foundation!

FOUNDATION™

The Fieldbus Foundation logo and the accompanying registration checkmark indicate that an instrument is registered with the Fieldbus Foundation, and is fully compatible with FOUNDATION fieldbus communication protocol. Instruments from Rosemount Inc. were among the world's first to pass the Fieldbus Foundation's interoperability tests.

Instruments with the Fieldbus Foundation logo and the accompanying checkmark have passed a series of tests conducted by the Fieldbus Foundation at its independent laboratory, and are interoperable with other registered instruments regardless of manufacturer. The Fieldbus Foundation's comprehensive interoperability test system, unlike tests of other control network protocols, assures end users of the ability to choose the best-in-class device for each measurement or control application without having to consider compatibility issues.

Fisher-Rosemount Inc. has the widest offering of best-in-class FOUNDATION fieldbus-compatible instruments in the world.

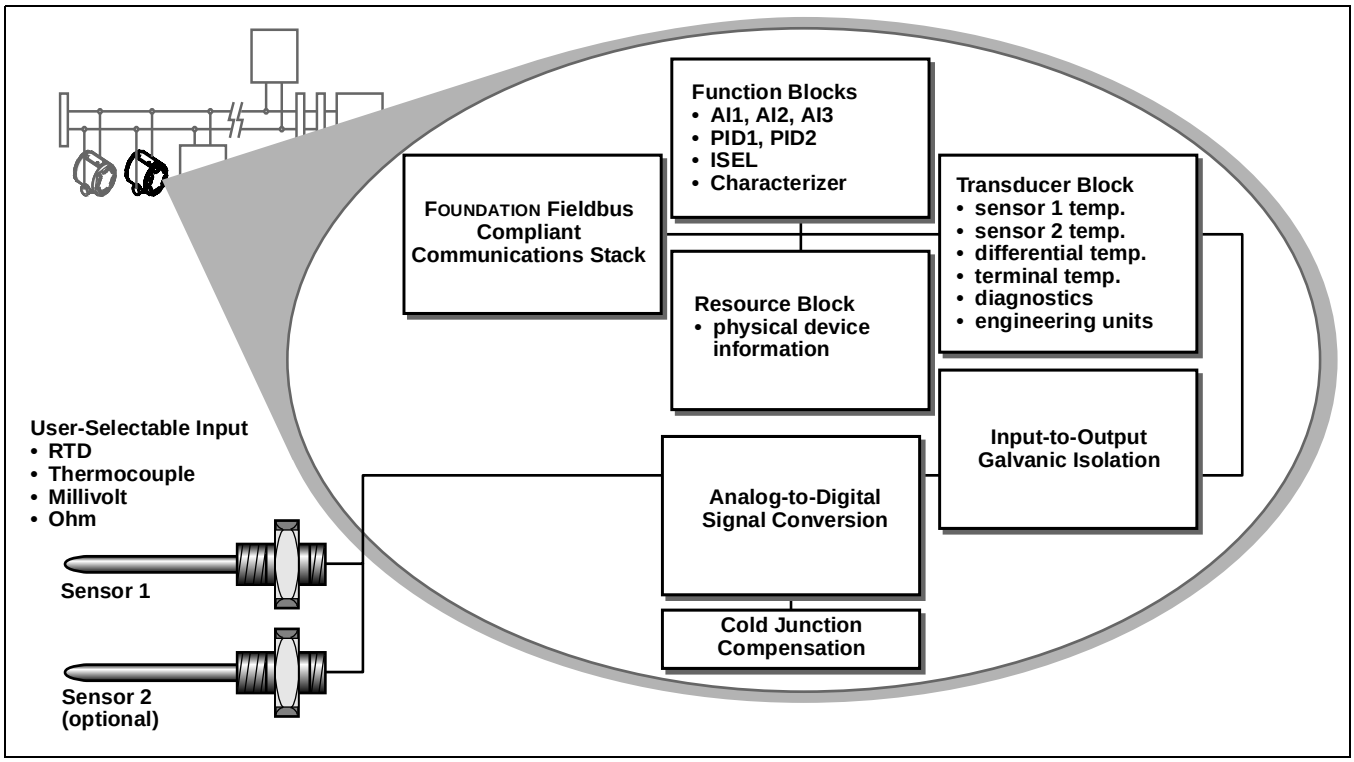


FIGURE 1. Block Diagram for the Model 3244MV Multivariable Temperature Transmitter with FOUNDATION fieldbus.

TRANSMITTER DESCRIPTION

Figure 1 shows a functional block diagram of a Model 3244MV Multivariable Temperature Transmitter with FOUNDATION fieldbus, and illustrates how the temperature signal is channelled through the transmitter.

Inputs

The 3244MV is compatible with a variety of temperature sensors, including 2-, 3-, and 4-wire RTDs, thermocouples, and other resistance and millivolt inputs. In addition, the 3244MV allows any combination of thermocouples and/or 3-wire RTD sensor types to provide a differential temperature output. See Table 1 on page 15 for complete specifications on input configuration options.

The sensor type and configuration are software-selectable using the Fisher-Rosemount DeltaV™ Fieldbus configuration tool, or other suitable FOUNDATION fieldbus-compliant host. In addition, you can select appropriate display scaling for convenient readout directly in engineering units including Celsius, Fahrenheit, Kelvin, Rankine, millivolts, and ohms.

Platinum RTDs

- 2-, 3-, or 4-wire
- Pt 100, Pt 200, Pt 500, Pt 1000: $\alpha = 0.00385$, Pt 100: $\alpha = 0.003916$

Nickel RTDs

- 2-, 3-, or 4-wire
- Ni 120

Copper RTDs

- 2-, 3-, or 4-wire
- Cu 10

Thermocouples

- Type B, E, J, K, N, R, S, T

Millivolts

- –10 to 100 millivolts

Ohms

- 2-, 3-, or 4-wire
- 0 to 2000 ohms

Custom Inputs

- Special RTD or thermocouple calibration schedules
- NIST Type C thermocouple

NOTE

Two independently-grounded thermocouples could create ground loops, which could result in measurement errors. Avoid using two independently grounded thermocouples.

Output

The output signal is linearized with temperature (°C, °F, °R, or K), or linear with input (ohm or mV). Thermocouple inputs are automatically compensated for cold junction variations.

The Model 3244MV with FOUNDATION fieldbus has the unique ability to output multiple digital signals. The transmitter comes standard with three Analog Input (AI) function blocks and one Input Selector (ISEL) function block. Three of the following four outputs, which reside in the transducer block, can be assigned to the three AI function blocks:

- Sensor 1
- Sensor 2
- Differential Temperature
- Terminal Temperature

The ISEL function block can be used to select any one of the following outputs:

- Hot Backup
- Minimum Temperature
- Maximum Temperature
- Midpoint Temperature
- Average Temperature
- First Good Temperature

These outputs are based on two of the three signals assigned to the AI function blocks.

Electronics Module

The electronics module uses digital ASIC, microcomputer, and surface-mount technology. The electronics digitize the input signal from the sensor(s) and apply correction coefficients selected from nonvolatile memory. An optional LCD meter assembly (available at a later date), will easily plug directly into the electronics module.

Data Storage

The transmitter stores configuration data in nonvolatile FLASH memory in the electronics module. This data is retained in the transmitter when power is interrupted, which allows the transmitter to function immediately upon power-up.

The storage of configuration data in nonvolatile memory is also useful for equipment traceability, which is a requirement of ISO 9002.

SOFTWARE CAPABILITIES

The software for the Model 3244MV with FOUNDATION fieldbus permits remote testing and configuration using the Fisher-Rosemount DeltaV Fieldbus configuration tool, or other FOUNDATION fieldbus-compliant host.

Transducer Block

The transducer block contains the actual temperature measurement data, including sensor 1, sensor 2, differential temperature, and terminal temperature. It includes information about sensor type and configuration, engineering units, linearization, reranging, damping, temperature correction, and diagnostics.

Resource Block

The resource block contains physical transmitter information including available memory, manufacturer identification, device type, software tag, and unique identification.

Software can be Upgraded in the Field

Software for the Model 3244MV with FOUNDATION fieldbus will be easy to upgrade in the field. Users will be able to take advantage of software enhancements by simply downloading new features to the transmitter memory.

FOUNDATION fieldbus Function Blocks

Analog Input

The Analog Input (AI) function block processes the measurement and makes it available to other function blocks. It also allows filtering, alarming, and engineering unit changes.

Input Selector

The Input Selector (ISEL) function block is used to select between outputs using specific selection strategies such as minimum, maximum, midpoint, or average temperature. Since the temperature value always contains the status of the measurement, the ISEL block also allows the selection to be restricted to the first “good” measurement, or for the selection to incorporate a Hot Backup strategy.

Proportional/Integral/Derivative

The Proportional/Integral/Derivative (PID) function block provides a sophisticated implementation of the universal PID algorithm. It features input for feedforward control, alarms on the process variable, and control deviation. Two PID blocks are available with the Model 3244MV allowing temperature cascade control capability. The PID type (series or ISA) is user-selectable on the derivative filter.

Arithmetic

The arithmetic function block performs basic arithmetic computations based on the transmitter input. Examples of computations include averaging, converting temperature to density for liquids, and using temperature to calculate steam quality.

Characterizer

The characterizer function block changes the characteristic of the input signal. Common uses of the characterizer block include converting temperature to density or humidity and converting millivolts to temperature for an IR sensor.

Diagnostics and Service

The transmitter automatically performs continuous self diagnostics, and the user can perform on-line testing of the transmitter, digital signal, and sensor.

Basic Setup

Basic setup requires connecting the transmitter to a power supply (see Figure 2), connecting sensors (see Figure 3), and defining operational parameters.

The transmitter can easily be configured using the Fisher-Rosemount DeltaV Fieldbus configuration tool, or other FOUNDATION fieldbus-compliant host.

The following are some examples of user-configurable parameters:

- Sensor type
- Number of sensor input wires
- Damping
- Engineering unit selection

Tagging information can be entered into the transmitter to allow identification and a physical description. 30-character tags are provided for identification of the transmitter and each function block.

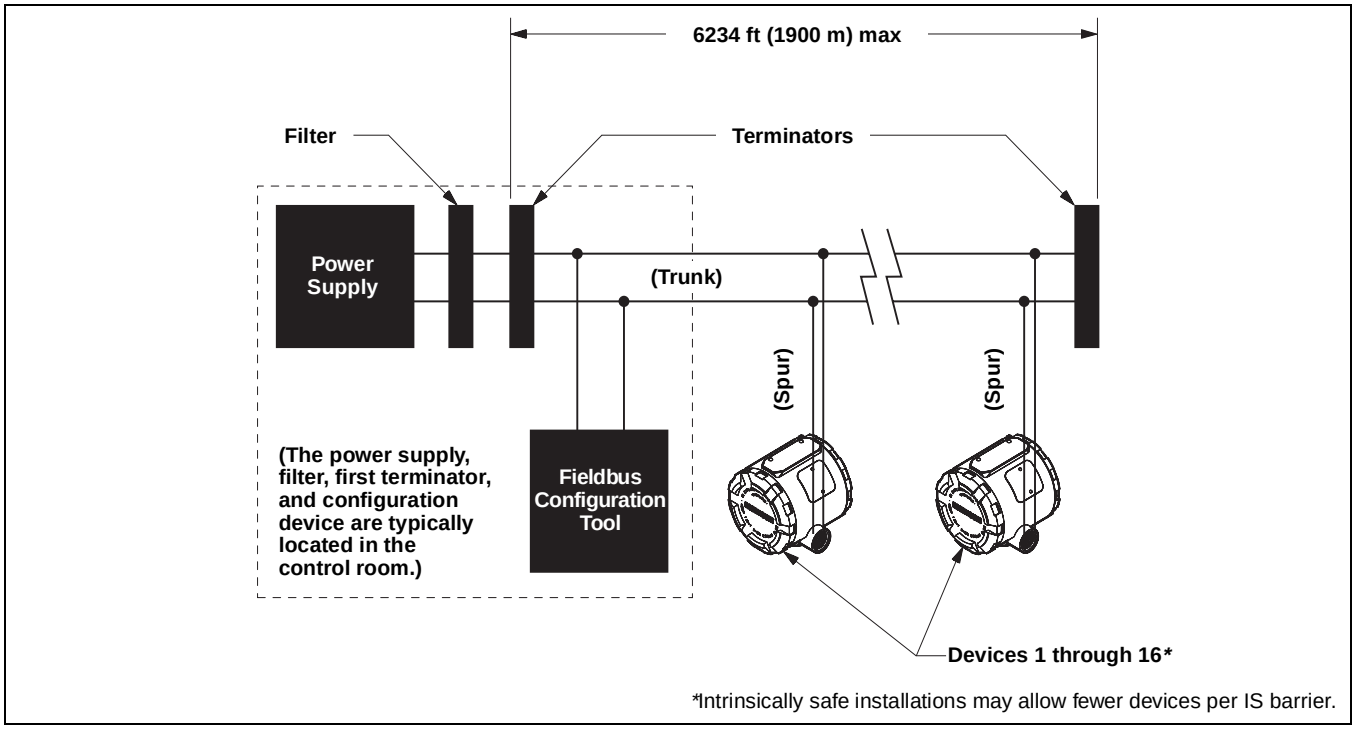


FIGURE 2. Model 3244MV Transmitter Field Wiring.

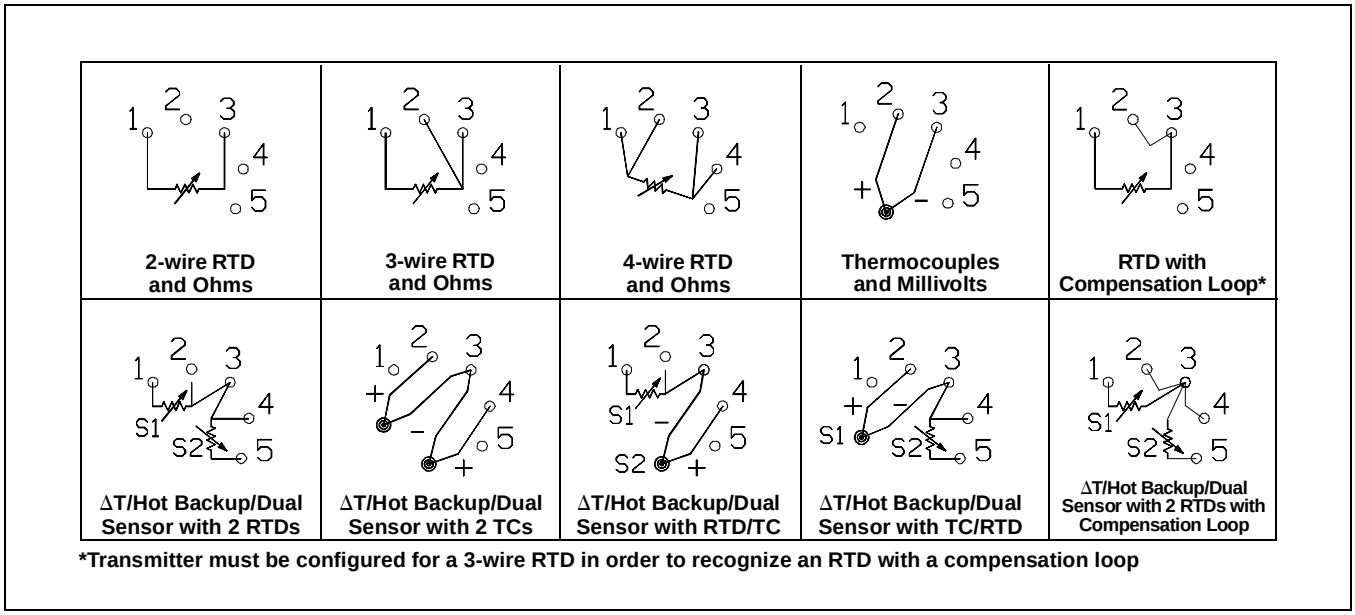


FIGURE 3. Transmitter Sensor Wiring.

Detailed Setup

The transmitter can easily be configured for advanced features such as Hot Backup, Transmitter-to-Sensor matching, and the ability to adjust the transmitter digital electronics to a plant standard. Other features include a 50 or 60 Hz line filtering option.

Hot Backup Feature

The Model 3244MV has the unique capability to accept two sensor inputs. The digital signal provides several temperature readings including sensor 1 and sensor 2. The Hot Backup feature sets the transmitter to automatically use sensor 2 as the primary variable if sensor 1 fails. The switch-over from sensor 1 to sensor 2 is completed without any effect on the signal. In addition, a warning message is communicated to the FOUNDATION fieldbus-compliant host that sensor 1 has failed.

Increased Sensor Accuracy (Transmitter-to-Sensor Matching)

A significant improvement in temperature measurement accuracy can be realized by using a temperature sensor that is matched to a specific temperature transmitter. The Model 3244MV transmitter is designed to accept Callendar-Van Dusen constants from an RTD calibration schedule. These constants can be entered at the factory using Option Code C2, or they can be entered or changed any number of times in the field using the Fisher-Rosemount DeltaV Fieldbus configuration tool, or other FOUNDATION fieldbus-compliant host.

SAMPLE SYSTEM ACCURACY COMPARISON AT 150 °C

Standard Series 68 Sensor		Matched Series 68 Sensor	
Model 3244MV	±0.10 °C	Model 3244MV	±0.10 °C
Standard 68 RTD	±1.05 °C	Matched 68 RTD	±0.18 °C
Total	±1.15 °C	Total	±0.28 °C

SPECIFICATIONS

Functional Specifications

Inputs

User-selectable (see Table 1 on page 15).

Output

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02.

Isolation

Input/output isolated to 500 V rms (707 V dc).

Power Supply

External power supply required. Transmitters operate on 9.0 to 32.0 V dc, 17.5 mA nominal.

Hazardous Locations Certifications

Factory Mutual (FM) Approvals

E5 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 III, Division 1 hazardous locations. Non-Incendive for Class I, Division 2, Groups A, B, C, and D (T4A). Indoor and outdoor use. Ambient Temperature Limit: –50 to 85 °C. Explosion Proof approval only when connected in accordance with Rosemount drawing 03144-0220. For Group A, seal all conduits within 18 inches of enclosure; otherwise, conduit seal not required for compliance with NEC 501-5a(1).

K5 Combination of E5 and the following: Intrinsically Safe for Class I, II, and III, Division 1, Groups A, B, C, D, E, F, and G. Non-Incendive Field Circuit for Class I, II, III; Division 2, Groups A, B, C, D, F, and G. Ambient Temperature Limit: –50 to 60 °C. Intrinsically safe and Non-Incendive field circuit approval only when installed in accordance with Rosemount drawing 03144-0221.

Canadian Standards Association (CSA) Approvals

E6 Explosion Proof for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations. Class I, Division 2, Groups A, B, C, and D. Factory sealed. Ambient Temperature Limit: –50 to 85 °C.

C6 Combination of E6 and the following: Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations when installed in accordance with Rosemount drawing 03144-0222.
Ambient Temperature Limit: –50 to 60 °C

Institut Scientifique de Service Public (ISSeP)/ CENELEC Flameproof Approval

E9 EEx d IIC T6 (T_{amb} = –20 to 60 °C).

British Approvals Service for Electrical Equipment in Flammable Atmospheres (BASEEFA) Approvals

N1 Type N Approval,
EEx ia IIC T5 (T_{amb} = –40 to 70 °C).

Special Conditions for Safe Use (x):

The transmitter is not capable of withstanding the electrical strength test required by BS 6941, Clause 6.1 (1988). This condition must be taken into account during installation.

I1 CENELEC Intrinsic Safety,
EEx ia IIC T6 (T_{amb} = –60 to 60 °C)

Input Entity Parameters:
Power/Loop
$U_{max:in}$ = 30 V dc
$I_{max:in}$ = 300 mA
$P_{max:in}$ = 1.3 W
C_{eq} = 0.005 µF
L_{eq} = 20 µH

Special Conditions for Safe Use (x):
The transmitter is not capable of withstanding the insulation test required by EN50 020, Clause 5.7 (1977). This condition must be taken into account during installation.

NOTE
Additional Approvals Pending.

Temperature Limits

Ambient

–40 to 185 °F (–40 to 85 °C).

Storage

–60 to 250 °F (–50 to 120 °C).

Transient Protection Option (available at a later date)

The transient protector helps to prevent damage to the transmitter from transients induced on the loop wiring by lightning, welding, heavy electrical equipment, or switch gears. The transient protection electronics are contained in an add-on assembly that attaches to the standard transmitter terminal block.

The transient protector has been tested per the following standard:

ASME B 16.5 (ANSI)/IEEE C62.41-1991
(IEEE 587), Location Categories A2, B3.
1kV peak (10 × 1000 mS Wave)
6kV / 3kA peak (1.2 × 50 mS Wave 8 × 20 mS Combination Wave)
6kV / 0.5kA peak (100 kHz Ring Wave)
4kV peak EFT (5 × 50 nS Electrical Fast Transient)

Loop resistance added by protector: 22 ohms max.
Nominal clamping voltages: 90 V (common mode), 77 V (normal mode)

Alarms

The AI block allows the user to configure the alarm to HI-HI, HI, LO, or LO-LO, with a variety of priority levels and hysteresis.

Status

If self-diagnostics detect a sensor burnout or a transmitter failure the status of the measurement will be updated accordingly. Status may also send the PID output to a safe value.

Humidity Limits

0–100% relative humidity.

Turn-on Time

Performance within specifications is achieved less than 10.0 seconds after power is applied to the transmitter.

Update Time

Approximately 0.5 seconds for a single sensor (1.0 second for two sensors).

Performance Specifications

The Model 3244MV maintains a specification conformance of at least 3σ.

Accuracy

Refer to Table 1 on page 15.

Stability

±0.1% of reading or 0.1 °C, whichever is greater, for 24 months for RTDs.

±0.1% of reading or 0.1 °C, whichever is greater, for 12 months for thermocouples.

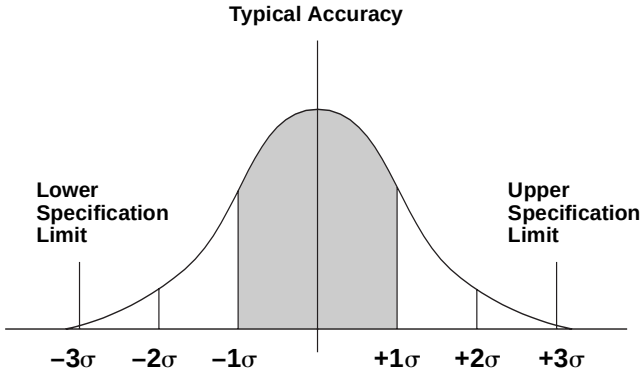
Rosemount Conformance to Specifications

You can be confident that a Rosemount product not only meets our published specifications, but probably exceeds them. Our advanced manufacturing techniques and use of Statistical Process Control provides specification conformance to at least ± 3 σ.(1) In addition, our commitment to continual improvement ensures that product design, reliability, and performance get better every year.

For example, the Reference Accuracy distribution for the Model 3244MV Temperature Transmitter with Foundation Fieldbus is shown to the right. Our specification Limits are ± 0.10 °C, but, as the shaded area shows, approximately 68 percent of the units perform three times better than the limits. It is therefore very likely that you will receive a device that performs much better than our published specifications.

Conversely, a vendor who "grades" product without using Process Control, or who is not committed to ±3 σ performance, will ship a much higher percentage of units that are barely within (or even outside of) advertised specification limits.

(1) Sigma (σ) is the Standard Deviation of a statistical distribution, and describes the dispersion (spread) of the distribution.



3144-Graph

Sensor Lead Resistance Effect

RTD

Sensor	Approximate Error
2-wire RTD	1.0 Ω in reading per ohm of lead resistance
3-wire RTD	±1.0 Ω in reading per ohm of unbalanced lead resistance(1)
4-wire RTD	none (independent of lead resistance)

(1) Unbalanced lead resistance = maximum imbalance between any two leads.

Examples of Approximate Error Calculations:

Given: 300 m cable with 0.05Ω/m
0.5 Ω of unbalanced lead resistance at 0 °C

Results: 2-wire error = 77.7 °C
3-wire error = ±1.3 °C
4-wire error = 0 °C

Thermocouple and Millivolt Input

dc input impedance > 10M ohms.

Example of Approximate Error Calculation:

$$\text{Approx. Error} = \left(\frac{\text{Total Snsr. Lead Res.}}{\text{10M ohms}}\right) \times \text{Abs. Val. of Reading in mV}$$

RFI Effect

Worst case RFI Effect is equivalent to the transmitter's nominal accuracy specification per Table 1 on page 15 when tested in accordance with EN 61000-4-3, 10 V/m, 80 to 1000 MHz, and 30V/m, 26-500 MHz (Increased NAMUR), with twisted shielded cables (Type A FOUNDATION fieldbus type).

Vibration Effect

Transmitters tested to the following specifications with no effect on performance:

Frequency	Acceleration
10–60 Hz	0.21 mm peak displacement
60–2000 Hz	3 g's

Self Calibration

The transmitter's analog-to-digital circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

Ambient Temperature Effect

Transmitters may be installed in locations where the ambient temperature is between –40 and 85 °C. Each transmitter is individually characterized over this ambient temperature range at the factory in order to maintain excellent accuracy performance in dynamic industrial environments. This special manufacturing technique is accomplished through extreme hot and cold temperature profiling with individual adjustment factors programmed into each transmitter. The transmitter automatically adjusts for component drift caused by changing ambient temperature conditions (see Table 1 on page 15).

Physical Specifications

Conduit Connections

½–14 NPT, PG13.5 (PG11), M20 × 1.5 (CM20), or JIS G ½ conduit.

Materials of Construction

Electronics Housing

Low-copper aluminum or CF-8M (cast version of 316 Stainless Steel).

Paint

Polyurethane.

Cover O-rings

Buna-N.

Mounting

Transmitters may be attached directly to the sensor. Optional mounting brackets permit remote Mounting (see Figure 6 on page 14).

Weight

Aluminum: 2.5 lb (1.1 kg)
Stainless Steel:7.2 lb (3.3 kg)

Add 1.0 lb (0.5 kg) for bracket options.

Enclosure Ratings

NEMA 4X and CSA Enclosure Type 4X, IP66, IP68.

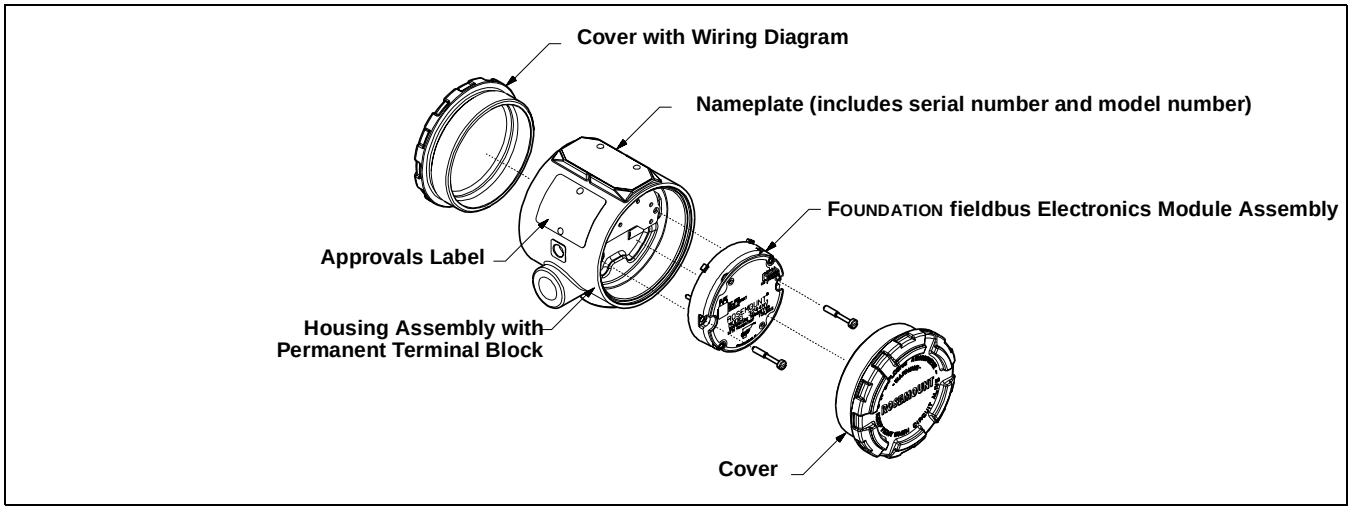


FIGURE 4. Transmitter Exploded View.

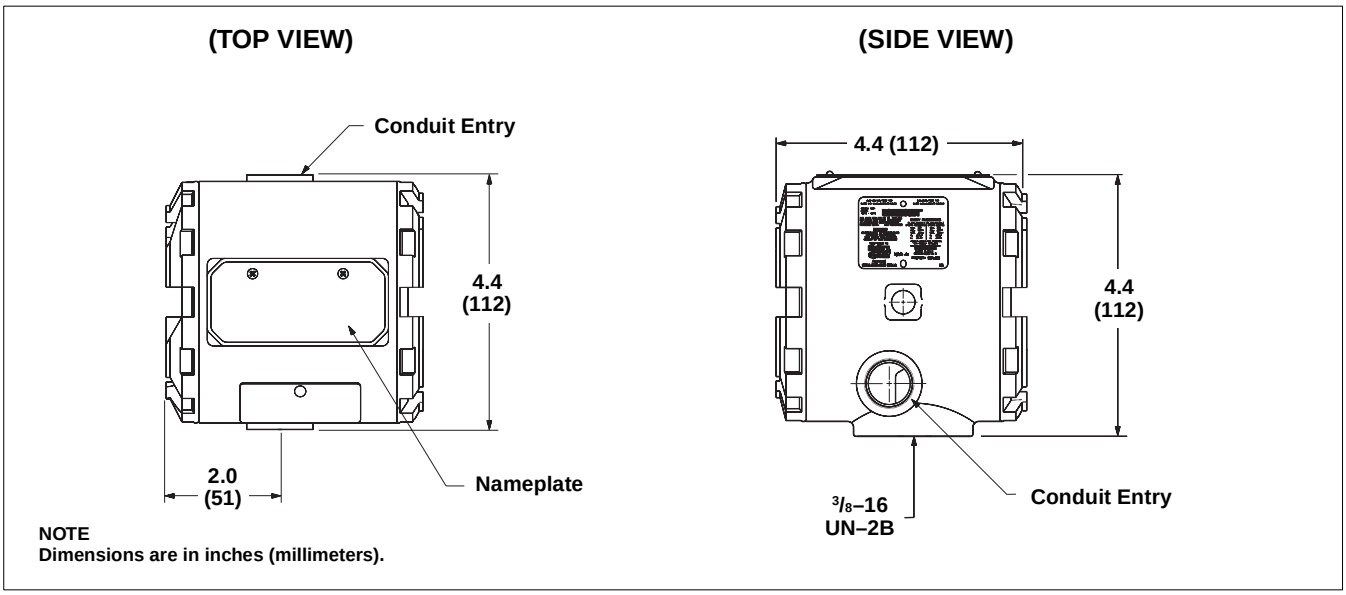


FIGURE 5. Transmitter Dimensional Drawings.

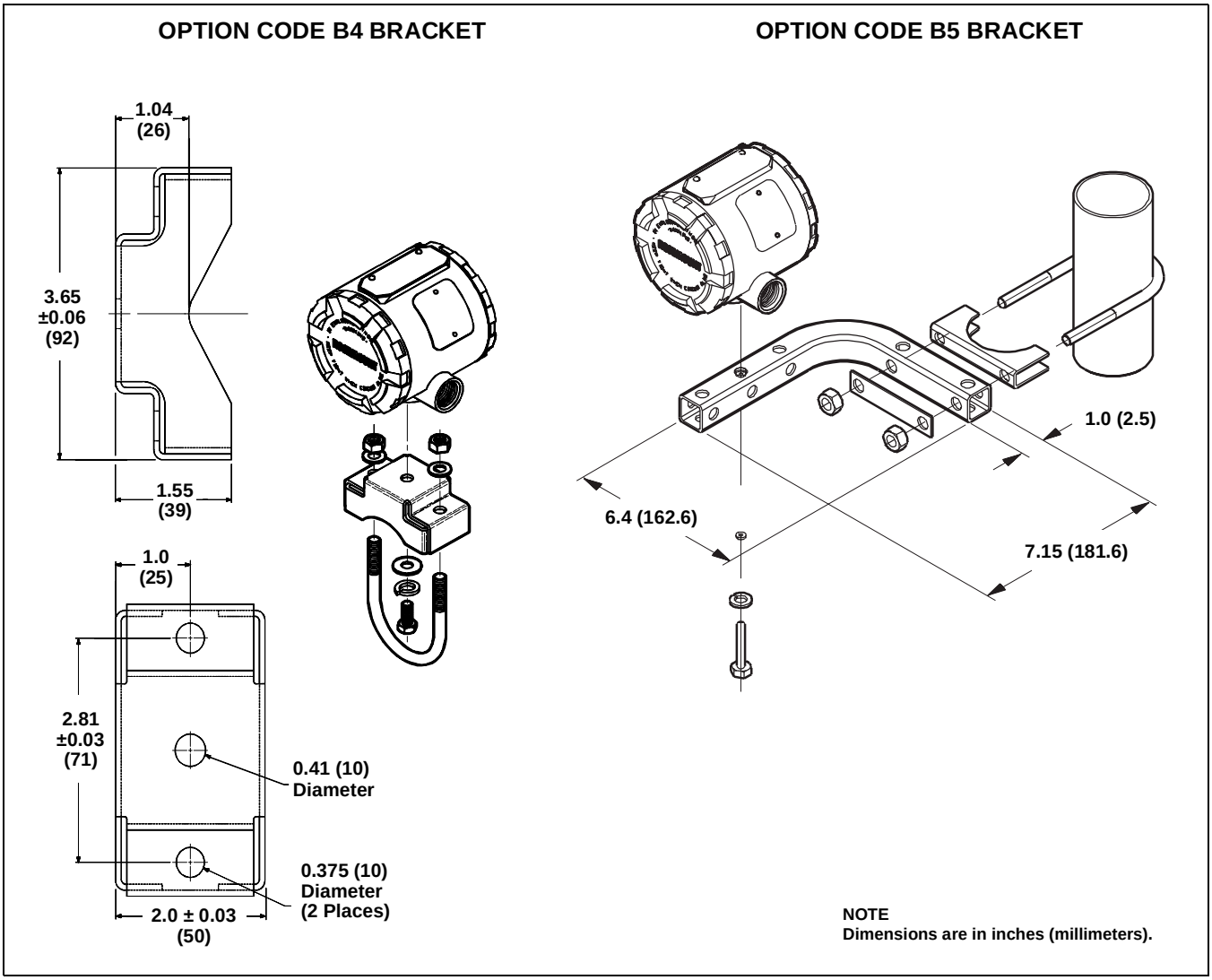


FIGURE 6. Optional Transmitter Mounting Brackets.

TABLE 1. Model 3244MV Input Options/Accuracy.

Sensor Options	Sensor Reference	Input Ranges		Accuracy [9]	
2-, 3-, 4-Wire RTDs	(See Notes)	**°C**	**°F**	**°C**	**°F**
Pt 100 (α = 0.00385)	1	–200 to 850	–328 to 1562	± 0.10	± 0.18
Pt 100 (α = 0.003916)	2	–200 to 645	–328 to 1193	± 0.10	± 0.18
Pt 200	1	–200 to 850	–328 to 1562	± 0.22	± 0.40
Pt 500	1	–200 to 850	–328 to 1562	± 0.14	± 0.25
Pt 1000	1	–200 to 300	–328 to 572	± 0.08	± 0.14
Ni 120	3	–70 to 300	–94 to 572	± 0.08	± 0.14
Cu 10	4	–50 to 250	–58 to 482	± 1.00	± 1.80
Thermocouples		**°C**	**°F**	**°C**	**°F**
NIST Type B	5, 6, 7	100 to 1820	212 to 3308	± 0.75	± 1.35
NIST Type E	5, 7	–50 to 1000	–58 to 1832	± 0.20	± 0.36
NIST Type J	5, 7	–180 to 760	–292 to 1400	± 0.25	± 0.45
NIST Type K	5, 7	–180 to 1372	–292 to 2502	± 0.50	± 0.90
NIST Type N	5, 7	0 to 1300	32 to 2372	± 0.40	± 0.72
NIST Type R	5, 7	0 to 1768	32 to 3214	± 0.60	± 1.08
NIST Type S	5, 7	0 to 1768	32 to 3214	± 0.50	± 0.90
NIST Type T	5, 7	–200 to 400	–328 to 752	± 0.25	± 0.45
Millivolt Input	8	–10 to 100 mV		± 0.015 mV	
2-, 3-, 4-Wire Ohm Input		0 to 2000 ohms		±0.35 ohm	

NOTES:
1. IEC 751; α = 0.00385, 1995.
2. JIS 1604, 1981.
3. Edison Curve No. 7.
4. Edison Copper Winding No. 15.
5. NIST Monograph 175.
6. Accuracy for NIST Type B T/C is ±3.0 °C (5.4 °F) from 100 to 300 °C (212 to 572 °F).
7. Total accuracy for thermocouple only: sum of accuracy +0.25 °C (cold junction accuracy).
8. Millivolt inputs are not approved for use with CSA Option Code I6.
9. The transmitter's accuracy is valid for the entire input range of the sensor.

ADDITIONAL NOTES:
Differential capability exists between any two sensor types.
For all differential configurations, the input range is X to +Y where X = Sensor 1 min. – Sensor 2 max. and Y = Sensor 1 max. – Sensor 2 min.
Accuracy for differential configurations
Sensor types are similar (e.g.: both RTDs or both T/Cs): Accuracy = 1.5 times worst case accuracy of either sensor type.
Sensor types are dissimilar (e.g.: one RTD, one T/C): Accuracy = Sensor 1 accuracy + Sensor 2 accuracy.
Using Thermocouples in noncritical and differential temperature applications:
Two independently-grounded thermocouples could create ground loops, which could result in measurement errors. Avoid using two independently grounded thermocouples.

TABLE 2. Model 3244MV Ambient Temperature Effects.

Sensor Options	Accuracy per 1.0 °C (1.8 °F) Change in Ambient[1]
2-, 3-, 4-Wire RTDs	
Pt 100 (α = 0.00385)	0.0015 °C
Pt 100 (α = 0.003916)	0.0015 °C
Pt 200	0.0023 °C
Pt 500	0.0015 °C
Pt 1000	0.0010 °C
Ni 120	0.0010 °C
Cu 10	0.015 °C
Thermocouples	
NIST Type B	0.014 °C if reading ≥ 1000 °C 0.029 °C – 0.0021% of (reading–300) if 300 °C ≤ reading < 1000 °C 0.046 °C – 0.0086% of (reading–100) if 100 °C ≤ reading < 300 °C
NIST Type E	0.004 °C + 0.00043% of reading
NIST Type J	0.004 °C + 0.00029% of reading if reading ≥ 0 °C 0.004 °C + 0.0020% of abs. val. reading if reading < 0 °C
NIST Type K	0.005 °C + 0.00054% of reading if reading ≥ 0 °C 0.005 °C + 0.0020% of abs. val. reading if reading < 0 °C
NIST Type N	0.005 °C + 0.00036% of reading
NIST Type R	0.015 °C if reading ≥ 200 °C 0.021 °C – 0.0032% of reading if reading < 200 °C
NIST Type S	0.015 °C if reading ≥ 200 °C 0.021 °C – 0.0032% of reading if reading < 200 °C
NIST Type T	0.005 °C if reading ≥ 0 °C 0.005 °C + 0.0036% of abs. val. reading if reading < 0 °C
Millivolt Input	0.00025 mV
2-, 3-, 4-Wire Ohm Input	0.007 Ω

(1) Change in ambient is in reference to the calibration temperature of the transmitter (20 °C (68 °F) typical from factory).

Temperature Effects Example: When using a Pt 100 (α = 0.00385) sensor input with a 30 °C ambient temperature,
Temp Effects would be: 0.0015°C × [(30 – 20)] = 0.015 °C
Worst Case Error would be: Sensor Accuracy + Temp Effects = 0.10 °C + 0.015 °C = 0.115 °C
Total Probable Error = $\sqrt{(0.10^2 + 0.015^2)}$ = 0.101 °C

ORDERING INFORMATION

Model 3244MV with FOUNDATION fieldbus

Model	Product Description	
3244MVF	Temperature Transmitter with Dual Sensor Input and *Foundation fieldbus* Digital Signal[1]	
Code	**Housing**	**Conduit Thread**
1	Aluminum	½–14 NPT
2	Aluminum	M20 × 1.5 (CM20)
3	Aluminum	PG 13.5 (PG 11)
4	Aluminum	JIS G ½
5	Stainless Steel	½–14 NPT
6	Stainless Steel	M20 × 1.5 (CM20)
7	Stainless Steel	PG 13.5 (PG 11)
8	Stainless Steel	JIS G ½
Code	**Hazardous Location Certifications**	
E5	FM Explosion-Proof Approval	
K5	FM Intrinsic Safety and Explosion-Proof Approval Combination	
E6	CSA Explosion-Proof Approval	
C6	CSA Intrinsic Safety and Explosion-Proof Approval Combination	
E9	ISSeP/CENELEC Flameproof Approval	
N1	BASEEFA Type N Approval	
I1	BASEEFA/CENELEC Intrinsic Safety Approval	
NA	No Approval Required	
Code	**Options**	
	***PlantWeb* Software Functionality**	
A01	Proportional/Integral/Derivative (PID) Function Block	
B01	Two (2) PID Function Blocks	
	Accessory Options	
B4	Universal Mounting Bracket for 2-inch Pipe and Panel Mounting - SST Bracket and Bolts	
B5	Universal "L" Mounting Bracket for 2-inch Pipe Mounting - SST Bracket and Bolts	
G1	External Ground Lug Assembly	
	Configuration Options	
C1	Factory Configuration of Date, Descriptor, and Message Fields (completed CDS 00806-0100-4769 required with order)	
C2	Trim to Specific Rosemount RTD Calibration Schedule (Transmitter-to-Sensor Matching)	
C4	5-Point Calibration (Combine with Q4 option to obtain a 3- or 5-Point Calibration Certificate)	
C7	Trim to Special Non-Standard Sensor (Special Sensor - Customer Must Provide Sensor Information)	
F5	50 Hz Line Voltage Filter	
	Assembly Options	
X1	Assemble Transmitter to a Sensor Assembly (hand tight, PTFE tape where appropriate, fully wired)[2]	
X2	Assemble Transmitter to a Sensor Assembly (hand tight, no PTFE tape, unwired)	
X3	Assemble Transmitter to a Sensor Assembly (wrench tight, PTFE tape where appropriate, fully wired)[2]	
	Calibration Certification Options	
Q4	Calibration Certificate (3-Point standard; use C4 with Q4 option for a 5-Point Calibration Certificate)[3]	
Typical Model Number:	**3244MVF 1 E5 A01 B4 X1[4]**	

(1) Includes three Analog Input (AI) function blocks and one Input Selector (ISEL) function block.

(2) This option is not available with CSA approvals.

(3) Calibration range will be based on the specified alarm limits (LO-LO to HI-HI).

(4) See pages 17 and 18 for standard configuration. Include calibration information or the Model 3244MV Multivariable Temperature Transmitter with FOUNDATION fieldbus *Configuration Data Sheet, pub. no. 00806-0100-4769, if a non-standard configuration is required.*

FOUNDATION fieldbus Interoperable Device

TRANSMITTER CONFIGURATION

The Model 3244MV with FOUNDATION fieldbus is available from the factory with one of three standard configuration settings, including critical, noncritical, and single sensor applications.

NOTE

If you wish to configure the transmitter for a critical or noncritical application, or a custom configuration, indicate the appropriate configuration on the Configuration Data Sheet (CDS – 00806-0100-4769). If you do not indicate a critical or noncritical application, or complete the attached CDS, the transmitter will be configured for a single-sensor application.

Configuration for Critical Application

Configuration for a critical application optimizes the transmitter for use in some type of control strategy, for use with safety interlocks, or for use in a critical monitoring application. The configuration settings are as follows:

Sensor type:	Dual Element Sensor
Primary Sensing Element (Sensor 1):	RTD, Pt 100, α = 0.00385, 3-wire
Secondary Sensing Element (Sensor 2):	RTD, Pt 100, α = 0.00385, 3-wire
Damping:	2 seconds
Units:	°C
Output:	Linear with temperature
Line Voltage Filter:	60 Hz
Software Tag:	See “Tagging” on page 18
Block Tags:(1)	AI1 ISEL AI2 TB AI3 RB
ISEL Configuration:	Hot Backup
Alarm Range	
Sensor 1:	0 to 100 °C
Sensor 2:	0 to 100 °C
Alarm Limits of AI1 and AI2:	HI-HI 100 °C HI 95 °C LO 5 °C LO-LO 0 °C

(1) AI = Analog Input Block; ISEL = Input Selector Block; TB = Transducer Block; RB = Resource Block.

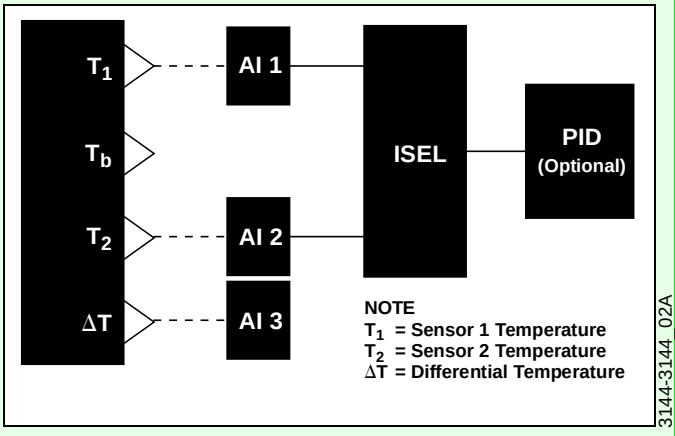


FIGURE 7. Configuration of Function Blocks for a Critical Application.

Configuration for Noncritical Application

The configuration for a noncritical application optimizes the transmitter for use in a basic process monitoring application. The configuration settings are as follows:

Sensor type	
Sensor 1:	RTD, Pt 100, α = 0.00385, 3-wire
Sensor 2:	RTD, Pt 100, α = 0.00385, 3-wire
Damping:	2 seconds
Units:	°C
Output:	Linear with temperature
Line Voltage Filter:	60 Hz
Software Tag:	See “Tagging” on page 18
Block Tags:(2)	AI1 TB AI2 RB AI3
Alarm Range	
Sensor 1:	0 to 100 °C
Sensor 2:	0 to 100 °C
Alarm Limits of AI1 and AI2:	HI-HI 100 °C HI 95 °C LO 5 °C LO-LO 0 °C

(2) AI = Analog Input Block; TB = Transducer Block; RB = Resource Block.

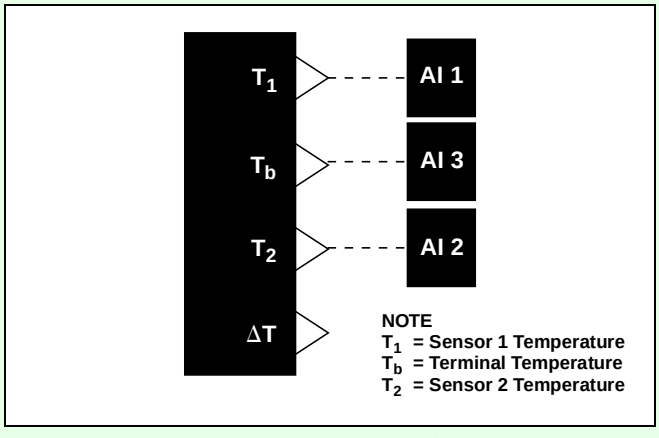


FIGURE 8. Configuration of Function Blocks for a Noncritical Application.

Configuration for Single-Sensor Application (Default)

The Model 3244MV can be configured for use with a single temperature sensor. **If the transmitter is not specified for use in a critical or noncritical application, it will be shipped with the following configuration**:

Sensor type:	RTD, Pt 100, α = 0.00385, 4-wire	
Damping:	2 seconds	
Units:	°C	
Output:	Linear with temperature	
Line Voltage Filter:	60 Hz	
Software Tag:	See "Tagging" below	
Block Tags:(1)	AI1	TB
	AI2	RB
Alarm Range	0 to 100 °C	
Alarm Limits of AI1 and AI2:	HI-HI	100 °C
	HI	95 °C
	LO	5 °C
	LO-LO	0 °C

(1) AI = Analog Input Block; TB = Transducer Block; RB = Resource Block.

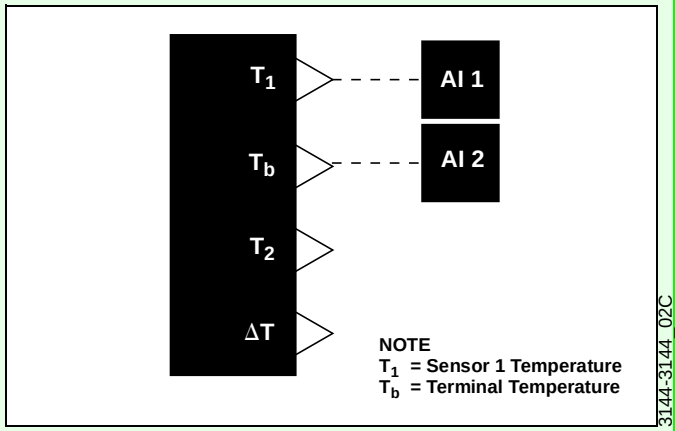


FIGURE 9. Configuration of Function Blocks for a Single-Sensor Application.

Customers will receive the standard configuration items at no charge. The software tag (30 characters maximum) is left blank unless specified. All standard configuration settings may be changed using the Fisher-Rosemount DeltaV Fieldbus configuration tool, or other FOUNDATION fieldbus-compliant host.

Custom Configuration

Option Code C1

If Option Code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters:

Date:	day, month, year
Descriptor:	16 alphanumeric characters
Message:	32 alphanumeric characters

Option Code C2 (Transmitter-to-Sensor Matching)

If Option Code C2 is ordered, the customer must specify and order a Rosemount Series 65, 68, or 78 RTD sensor with a special calibration schedule.

Option Code C4

If Option Code C4 is ordered, the transmitter will be calibrated and verified at 0, 25, 50, 75, and 100% digital output points. Use with Rosemount Calibration Certificate Q4 to generate a 5-point calibration certificate.

Option Code C7 (Special Sensor)

Use Option Code C7 for non-standard sensors, adding a special sensor, or expanding input ranges listed in Table 1 on page 15. If Option Code C7 is ordered, the customer must supply the non-standard sensor information.

Tagging

Hardware Tag

The transmitter will be tagged at no charge in accordance with customer requirements. All tags are stainless steel. The standard hardware tag is permanently attached to the transmitter. Tag character height is 1/16-inch (1.6 mm).

Software Tag

In addition to the hardware tag, the transmitter can store up to 30 characters in its memory. The transmitter can be ordered with different software and hardware tags. However, if the software tag characters are not specified, the software tag will default to the first 30 characters of the hardware tag.

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