

# Rosemount™ 2240S Multi-input Temperature Transmitter



**Provides multiple spot temperature measurement in liquid storage tanks, used for average temperature calculation and stratification correction**

- Obtain outstanding temperature conversion accuracy of  $\pm 0.05$  °C ( $\pm 0.09$  °F)
- Get ultra-stable temperature measurement for precise inventory calculations and custody transfer for API chapter 7.3 compliance
- Connect up to sixteen 3- or 4-wire temperature elements
- Include integrated water level sensor
- Benefit from convenient and safe installation with 2-wire IS bus power supply

# Exact net volume calculations with highest precision average temperature measurement

The Rosemount 2240S Multi-input Temperature Transmitter provides multiple spot temperature measurement in liquid storage tanks. It is used for calculation of the average temperature of the liquid and corrects for stratification.

The Rosemount 2240S is approved for demanding custody transfer applications, which require very accurate level and temperature measurements for net standard volume calculations. It has an ultra high temperature conversion accuracy of  $\pm 0.05$  °C ( $\pm 0.09$  °F). The IP 66/67 and NEMA® 4X certified robust design makes it suitable for installation in harsh environments.

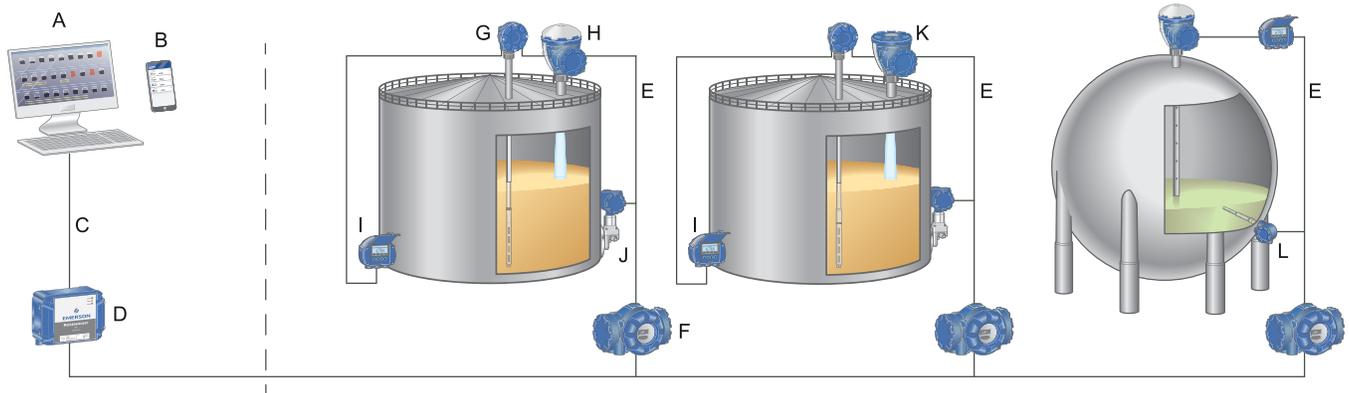
The temperature transmitter supplies measured data, such as temperature and water level, via the intrinsically safe 2-wire Tankbus, to a Rosemount 2410 Tank Hub. Measurement data and status information can be viewed on a PC with the Rosemount TankMaster software, as well as on the integral display of the tank hub and the Rosemount 2230 Graphical Field Display.

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**Figure 1: Tank Gauging System Overview**



- A. Rosemount TankMaster Inventory Management
- B. Rosemount TankMaster Mobile Inventory Management
- C. Modbus® RTU/TCP
- D. Rosemount 2460 System Hub
- E. Tankbus
- F. Rosemount 2410 Tank Hub
- G. Rosemount 2240S Multi-input Temperature Transmitter with Rosemount 765 Multiple Spot Temperature and Water Level Sensor
- H. Rosemount 5900S Radar Level Gauge
- I. Rosemount 2230 Graphical Field Display
- J. Rosemount 3051S Pressure Transmitter
- K. Rosemount 5900C Radar Level Gauge
- L. Rosemount 3144P Temperature Transmitter with Rosemount 114C or 214C Single Point Temperature Sensor

## Highly accurate multiple spot temperature and water level sensors

Rosemount 2240S can connect up to sixteen 3- or 4-wire temperature spot elements and an integrated water level sensor. The value from each individual spot temperature element, in combination with the level value from the radar gauge is used for average liquid temperature calculation.

The water level sensor is factory calibrated. If any adjustment is necessary during installation, it can easily be done with the Rosemount 2240S built-in on-line calibration feature.

Available temperature sensor versions are:

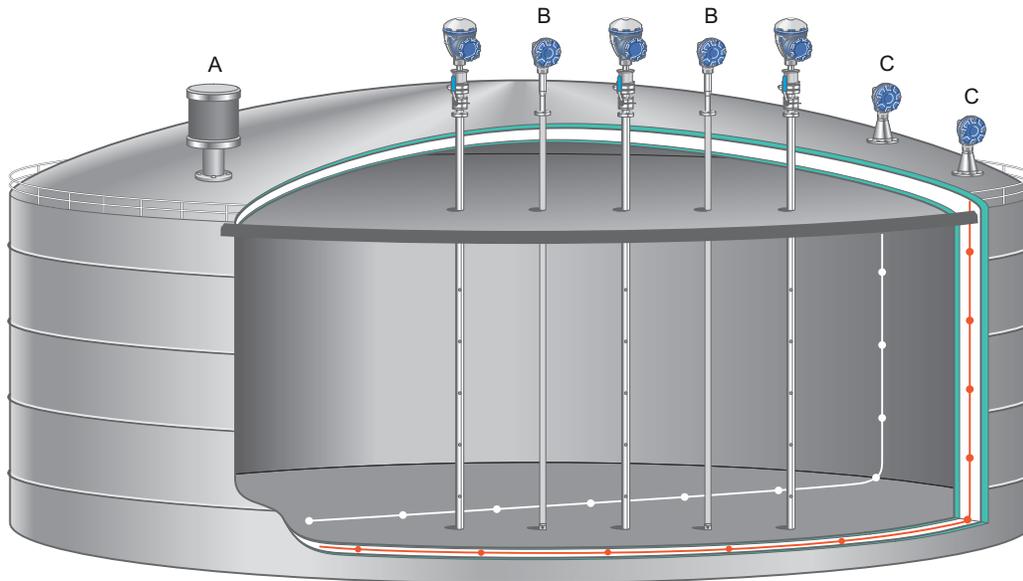
- Rosemount 565 Multiple Spot Temperature Sensor
- Rosemount 566 Multiple Spot Temperature Sensor for cryogenic applications such as LNG
- Rosemount 765 Multiple Spot Temperature Sensor with Integrated Water Level Sensor
- Rosemount 614 Cryogenic Spot Temperature Sensor

## Precise and reliable measurements in cryogenic storage tanks

The Rosemount 2240S Multi-input Temperature Transmitter provides complete temperature measurements for cryogenic and refrigerated full containment storage.

[Figure 2](#) illustrates an LNG Tank Gauging system with temperature transmitters for average liquid temperature measurement and online redundant temperature stratification monitoring. The system also includes temperature transmitters for skin/cool-down temperature measurement (white dotted line) and leak detection (red dotted line).

**Figure 2: Liquefied Natural Gas (LNG) Tank Gauging System**



A. Separate device for temperature and density profiling (LTD)

B. Rosemount 2240S Multi-input Temperature Transmitter with Rosemount 566 Multiple Spot Temperature Sensor

C. Rosemount 2240S Multi-input Temperature Transmitter with Rosemount 614 Cryogenic Spot Temperature Sensor

# Ordering information

## Specifications and options

Specification and selection of product materials, options, and/or components must be made by the purchaser of the equipment.

## Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in [Figure 3](#).

**Figure 3: Model Code Example**

<u>2240S P 16 4 A F I 1 0 A 1 M</u>	<u>WR3 ST</u>
1	2

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

## Ordering information



The ultra-stable Rosemount 2240S is approved for demanding custody transfer applications, which require very accurate temperature measurements for net standard volume calculations. It can be used with a Rosemount 565, 566, or 765 temperature sensor. The Rosemount 2240S connects up to sixteen 3- or 4-wire temperature spot elements and an integrated water level sensor. Rosemount 2240S provides average liquid temperature for net volume calculation based on each individual spot temperature element in combination with the corresponding level value. It has an impressive temperature conversion accuracy of  $\pm 0.05\text{ }^{\circ}\text{C}$  ( $\pm 0.09\text{ }^{\circ}\text{F}$ ).

[VIEW PRODUCT >](#)

## Required model components

### Model

Code	Description
2240S	Multi-input Temperature Transmitter

### Performance class

Code	Description
P	Premium

### Number of temperature sensor inputs

Code	Description
16 <sup>(1)</sup>	Up to 16xRTD spot elements
08 <sup>(1)</sup>	Up to 8xRTD spot elements
04 <sup>(1)</sup>	Up to 4xRTD spot elements
00 <sup>(2)</sup>	None

(1) Temperature sensors of Pt-100 or Cu-90 type, for use in -200 to 250 °C (-328 to 482 °F), can be connected to the Rosemount 2240S.

(2) Water level sensor only requires Number of temperature sensor inputs code 00, Temperature elements wiring code 0, and Auxiliary inputs code A.

### Temperature elements wiring

Code	Description
4	4-wire or 3-wire (individual or common return)
0 <sup>(1)</sup>	None (for water level only, no temperature sensors)

(1) Water level sensor only requires Number of temperature sensor inputs code 00, Temperature elements wiring code 0, and Auxiliary inputs code A.

### Auxiliary inputs

Code	Description
A <sup>(1)</sup>	Rosemount 765 temperature and water level sensor input
0	None

(1) *Water level sensor only requires Number of temperature sensor inputs code 00, Temperature elements wiring code 0, and Auxiliary inputs code A.*

### Tankbus: Power and communication

Code	Description
F	Bus powered 2-wire FOUNDATION™ Fieldbus (IEC 61158)

### Hazardous location certification

Code	Description
I1	ATEX Intrinsic Safety
I2	Brazil Inmetro Intrinsic Safety
I3	China Intrinsic Safety
I4	Japan Intrinsic Safety
I5	FM-US Intrinsic Safety
I6	FM-Canada Intrinsic Safety
I7	IECEx Intrinsic Safety
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety
IP	KC Intrinsic Safety (South Korea)
NA	No Hazardous Location Certification

### Custody transfer type approval

Code	Description
C <sup>(1)(2)(3)</sup>	PTB (German W&M approval)
K <sup>(2)(3)</sup>	GOST (Kazakhstan)
0	None

(1) *Approval plate, sealing kit and Eich adapter included. One spot position used for external reference.*

*Available spot elements in Number of temperature sensor inputs = 15, 7, or 3.*

(2) *Requires Rosemount 2410 Tank Hub with corresponding Custody transfer type approval.*

(3) *Requires one out of following displays: Rosemount 2410 with integral display, Rosemount 2230 with corresponding Custody transfer type approval, or TankMaster.*

### Housing

Code	Description
A	Standard enclosure (polyurethane-covered aluminum IP 66/67)

### Cable/Conduit connections

Code	Description
1	½-14 NPT, female thread (includes 2 plugs)

Code	Description
2	M20 x 1.5 adapters, female thread (includes 2 plugs, and 3 adapters)
G <sup>(1)</sup>	Metal cable glands (½-14 NPT)
E	Eurofast <sup>®</sup> male connector and ½-14 NPT (includes 2 plugs)
M	Minifast <sup>®</sup> male connector and ½-14 NPT (includes 2 plugs)

(1) *Minimum temperature -20 °C (-4 °F). ATEX / IECEx. Exe approved. Includes 2 plugs, and 3 glands (includes an M32 gland if combined with Mechanical installation code W or P).*

### Mechanical installation

Code	Description
M <sup>(1)</sup>	Prepared for integrated installation with Rosemount 565, 566, or 765 (standard) temperature sensor
W <sup>(2)</sup>	Installation kit for wall mounting
P <sup>(2)</sup>	Installation kit for wall and pipe mounting (1-2 in. vertical and horizontal pipes)

(1) *M33x1.5 female threaded connection. As standard, the transmitter is not pre-assembled with any temperature sensor.*

(2) *For separate installation of temperature sensor and transmitter.*

### Additional options

#### Tag plate

Code	Description
ST	Engraved SST tag plate (tag shall be submitted with order)

#### Conformance certificate

Code	Description
Q1	Certificate of conformance

#### Calibration certificate

Code	Description
Q4	Calibration certificate

#### Hazardous location certificate

Code	Description
Q7	Printed copy of hazardous location certificate

#### Extended product warranty

Rosemount extended warranties have a limited warranty of three or five years from date of shipment.

Code	Description
WR3	3-year limited warranty
WR5	5-year limited warranty

# Specifications

## Performance specifications

### Temperature conversion accuracy

±0.05 °C (±0.09 °F)

Over measuring range and ambient temperature 20 °C (68 °F)

### Ambient temperature effect

±0.05 °C (±0.09 °F) within the total range; -40 to 70 °C (-40 to 158 °F)

### Temperature measuring range

Supports -200 to 250 °C (-328 to 482 °F) for Pt-100

### Resolution

± 0.1 °C (± 0.1 °F) according to API chapter 7 and 12

### Update time

4 seconds

## General specifications

### Material selection

Emerson provides a variety of Rosemount products with various product options and configurations, including materials of construction that can be expected to perform well in a wide range of applications.

The product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options, and components for the particular application. Emerson is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration, or materials of construction selected.

### Number of spot elements and wiring

Up to 16 RTD spot elements or averaging sensors can be connected to a Rosemount 2240S.

#### Rosemount temperature / water level sensors (models 565, 566, and 765)

Three wiring types can be used:

- 3-wire RTD with common return (1-16 spot elements)
- 3-wire RTD individual:
  - 1-16 spot elements with Rosemount 565 and 566
  - 1-14 spot elements with Rosemount 765

- 4-wire RTD individual:
  - 1-16 spot elements with Rosemount 565 and 566
  - 1-10 spot elements with Rosemount 765

### **Rosemount 614 Cryogenic Spot Temperature Sensor**

The following wiring types can be used:

- 3-wire RTD individual (1-16 spot elements)
- 4-wire RTD individual (1-16 spot elements)

### **Standard temperature sensor types**

Supports Pt-100 (according to IEC/EN60751, ASTM E1137) and Cu-90

### **Metrology sealing possibility**

Yes

### **Write protect switch**

Yes

## **Configuration specifications**

### **Configuration tool**

TankMaster WinSetup is the recommended tool for easy configuration of Rosemount 2240S. The Tankbus autoconfiguration feature, handled by the Rosemount 2410 Tank Hub, supports Rosemount 2240S.

### **Configuration parameters (examples)**

#### **Temperature**

- Number of temperature sensor elements
- Temperature element type (spot or average)
- Temperature element position in tank

#### **Water level sensor**

- Level offset (difference between tank zero level and water zero level)
- Probe length (autoconfigured by Rosemount 765)

### **Output variables and units**

Spot and average temperature: °C (Celsius), and °F (Fahrenheit)

Free water level (FWL): meter, centimeter, millimeter, feet, or inch

## FOUNDATION™ Fieldbus characteristics

### Polarity sensitive

No

### Quiescent current draw

30 mA

### Lift-off minimum voltage

9.0 VDC

### Device capacitance inductance

See [Product certifications](#)

### FOUNDATION Fieldbus class (basic or Link Master)

Link Master (LAS)

### Number of available VCRs

Maximum 20, including one fixed

### Links

Maximum 40

### Minimum slot time / maximum response delay / minimum intermessage delay

8/5/8

### Blocks and execution time

Block	Execution time
1 Resource	N/A
3 Transducer (Temperature, Register, AVG_Temp)	N/A
2 Multiple Analog Input (MAI)	15 ms
6 Analog Input (AI)	10 ms
1 Analog Output (AO)	10 ms
1 Signal Characterizer (SGCR)	10 ms
1 Proportional/Integral/Derivate (PID)	15 ms
1 Integrator (INT)	10 ms
1 Arithmetic (ARTH)	10 ms
2 Input Selector (ISEL)	10 ms
1 Control Selector (CS)	10 ms
1 Output Splitter (OS)	10 ms

For more information, see the FOUNDATION™ Fieldbus Blocks [Manual](#).

### Instantiation

Yes

### Conforming FOUNDATION™ Fieldbus

ITK 6

### Field Diagnostics support

Yes

### Action support wizards

Restart/stop measurement, write protect device, factory reset - measurement configuration, reset statistics, start/stop device simulation

### Advanced diagnostics

Failures/Maintenance/Advisory alerts: Software, memory/database, electronics, internal communication, simulation, auxiliary device, auxiliary device measurement, ambient temperature, average temperature measurement, temperature measurement, configuration

## Electrical specifications

### Power supply

FISCO: 9.0 - 17.5 VDC polarity insensitive (for example from Rosemount 2410 Tank Hub)

Entity: 9.0 - 30.0 VDC polarity insensitive

### Internal power consumption

0.5 W

### Bus current draw

30 mA

### Tankbus cabling

0.5-1.5 mm<sup>2</sup> (AWG 22-16), twisted shielded pairs

### Built-in Tankbus terminator

Yes (to be connected if required)

### Tankbus to sensor isolation

Minimum 700 VAC

## Auxiliary sensor input

Digital bus connection for water level sensor

## Mechanical specifications

### Housing material

Polyurethane-coated die-cast aluminum

### Cable entry (connection/glands)

Three ½ - 14 NPT entries for cable glands or conduits. Two metal plugs to seal any unused ports are enclosed in the delivery.

Optional:

- M20 x 1.5 conduit / cable adapter
- Cable glands in metal (½ - 14 NPT)
- 4-pin male eurofast connector or A size Mini 4-pin male minifast connector

### Rosemount 565/566/765 connection

M33 x 1.5 female threaded connection

Optional:

- An M32 adapter or M32 gland can be used if the Rosemount 2240S is installed away from the sensor

### Rosemount 614 connection

Optional cone with M33 x 1.5 female threaded connection

## Installation

The Rosemount 2240S can be installed directly on top of the temperature / water level sensor or remotely installed on a 33.4-60.3 mm (1 to 2-in) pipe or on a wall

## Weight

2.8 kg (6.2 lbs)

## Environmental specifications

### Ambient temperature

-40 to 70 °C (-40 to 158 °F)

Minimum start-up temperature -50 °C (-58 °F)

### Storage temperature

-50 to 85 °C (-58 to 185 °F)

## Humidity

0-100% relative humidity

## Ingress protection

IP 66 and 67 (NEMA® 4X)

## Transient / built-in lightning protection

According to IEC 61000-4-5, level 1 kV line to ground.

Complies with IEEE 587 Category B transient protection and IEEE 472 surge protection.

# Product certifications

See the Rosemount 2240S [Product Certifications](#) document for detailed information on the existing approvals and certifications.

## European Directive Information

The most recent revision of the EU Declaration of Conformity can be found at [Emerson.com/Rosemount](https://www.emerson.com/Rosemount).

## Ordinary location certification

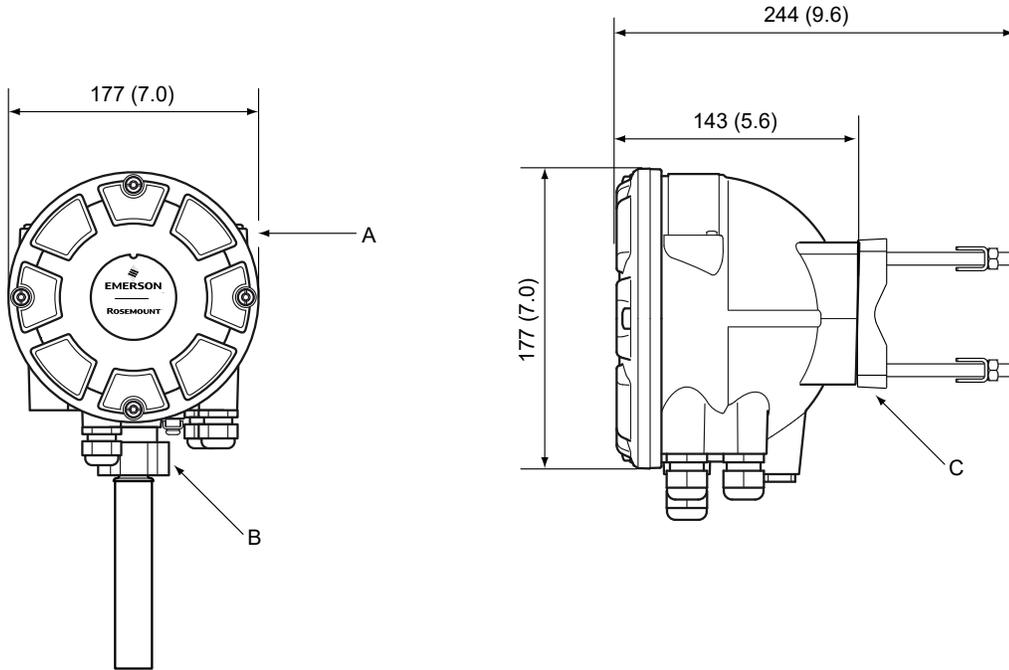
As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

## Installing equipment in North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

# Dimensional drawings

Figure 4: Rosemount 2240S



- A. *Optional tag plate*
- B. *M33*
- C. *Optional mounting kit*

Dimensions are in millimeters (inches).

### Installation options

- Installed with a multiple spot temperature sensor
- Installed separately on a 33.4-60.3 mm (1 to 2-in.) pipe, or on a wall

For more information: [Emerson.com/global](https://emerson.com/global)

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