

Rosemount™ 56

Dual Channel Transmitter



Safety information

Read this page before proceeding.

Your instrument purchase from Emerson is one of the finest available for your particular application. These instruments have been designed and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure its continued operation to the design specifications, personnel should read this document thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

⚠ WARNING

Failure to follow the proper instructions may cause any one of the following situations to occur: loss of life, personal injury, property damage, damage to this instrument, and warranty invalidation.

Read all instructions prior to installing, operating, and servicing the product.

⚠ WARNING

Follow installation guidelines.

Failure to follow these installation guidelines could result in death or serious injury. If this equipment is used in a manner not specified by the manufacturer, the protection it provides against hazards may be impaired.

- Follow all warnings, cautions, and instructions marked on and supplied with the product.
 - Install equipment as specified in this document.
 - Ensure that only qualified personnel perform the installation, operation, and maintenance of the product.
 - Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
 - Follow appropriate local and national codes.
 - If you do not understand any of the instructions, contact your Emerson representative for clarification.
-

⚠ WARNING

Risk of electrical shock

Installation and servicing of this product may expose personnel to dangerous voltages.

- Equipment protected throughout by double insulation.
 - Disconnect main power, wired to separate power source, before servicing.
 - Do not operate or energize instrument with case open.
 - Signal wiring connected in this box must be rated at least 240 V for European mains operation.
 - Non-metallic cable strain reliefs do not provide grounding between conduit connections. Use grounding type bushings and jumper wires.
 - Unused cable conduit entries must be securely sealed by non-flammable closures to provide enclosure integrity in compliance with personal safety and environmental protection requirements. Seal unused conduit openings with Type 4X or IP66 conduit plugs to maintain the ingress protection rating (Type 4X).
 - Electrical installation must be in accordance with the National Electrical Code (ANSI/National Fire Protection Association [NFPA]-70) and/or any other applicable national or local codes.
 - Operate only with front panel fastened and in place.
 - Safety and performance require that this instrument be connected and properly grounded through a three-wire power source.
 - Proper use and configuration is the user's responsibility.
-

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental in protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

NOTICE

Ensure that you have received the correct model and options from your purchase order. Verify that this document covers your model and options.

NOTICE

Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.

NOTICE

This product generates, uses, and can radiate radio frequency energy, and this can cause radio communication interference. Improper installation or operation may increase such interference.
As temporarily permitted by regulation, this device has been tested for compliance within the limits of Class A computing devices, pursuant to subpart J of part 15 of Federal Communication Commission (FCC) rules, which are designed to take whatever measures may be required to correct the interference. Operation of this equipment in a residential area may cause interference, in which case the operator, at their own expense, will be required to take whatever measures are needed to correct the interference.

NOTICE

This product is not intended for use in the light industrial, residential, or commercial environments per the instrument's certification in ENG1226-1: 2006.

Contents

Chapter 1	Descriptions and specifications.....	9
	1.1 Features and applications.....	9
	1.2 Enhanced features.....	11
	1.3 General specifications.....	13
	1.4 Contacting conductivity (codes -20 and -30).....	13
	1.5 Toroidal conductivity specifications (codes -21 and -31).....	14
	1.6 pH/oxidation reduction potential (ORP) specifications.....	16
Chapter 2	Installation.....	17
	2.1 Unpack and inspect.....	17
	2.2 General installation information.....	17
Chapter 3	Wiring.....	23
	3.1 General wiring information.....	23
	3.2 Preparing conduit openings.....	24
	3.3 Preparing sensor cable.....	25
	3.4 Power, output, and sensor connections.....	25
Chapter 4	Display and operation.....	27
	4.1 User interface.....	27
	4.2 Instrument keypad.....	27
	4.3 Main display.....	29
	4.4 Menu system.....	29
	4.5 USB data port.....	29
	4.6 Rosemount 56 data logger and event logger download procedures.....	30
	4.7 Software upgrade.....	31
	4.8 Configuration transfer.....	32
Chapter 5	Programming the analyzer - Basics.....	35
	5.1 General.....	35
	5.2 Changing startup settings.....	35
	5.3 Programming temperature.....	36
	5.4 Configuring and ranging the current outputs.....	37
	5.5 Setting a security code.....	37
	5.6 Security access.....	38
	5.7 Using Hold.....	39
	5.8 Resetting factory default settings.....	39
	5.9 Programming alarm relays.....	40
Chapter 6	Programming - Measurements.....	43
	6.1 Programming measurements – Introduction.....	43
	6.2 pH measurement programming.....	44
	6.3 ORP measurement programming.....	45
	6.4 Contacting conductivity measurement programming.....	45
	6.5 Toroidal conductivity measurement programming.....	47

	6.6 Chlorine measurement programming.....	48
	6.7 Free chlorine measurement programming.....	49
	6.8 Total chlorine measurement programming.....	50
	6.9 Monochloramine measurement programming.....	51
	6.10 Oxygen measurement programming.....	52
	6.11 Ozone measurement programming.....	52
	6.12 Turbidity measurement programming.....	53
	6.13 Flow measurement programming.....	54
	6.14 Current input programming.....	54
Chapter 7	PID control.....	57
	7.1 Introduction.....	57
	7.2 PID setup.....	61
Chapter 8	Time proportional control.....	65
	8.1 Introduction.....	65
Chapter 9	Alarm relay functions.....	69
	9.1 High/Low concentration alarm.....	69
	9.2 Delay Timer.....	70
	9.3 Bleed and Feed timer.....	72
	9.4 Totalizer Based Relay Activation.....	74
Chapter 10	Calibration.....	79
	10.1 Introduction to calibration.....	79
	10.2 pH calibration.....	79
	10.3 ORP calibration.....	80
	10.4 Contacting conductivity calibration.....	81
	10.5 Toroidal conductivity calibration.....	83
	10.6 Chlorine calibration.....	84
Chapter 11	HART® communications.....	95
	11.1 Introduction to HART® communication.....	95
	11.2 Physical installation and configuration.....	96
	11.3 Measurements available via HART®	98
	11.4 Diagnostics available via HART®	98
	11.5 HART® hosts.....	99
	11.6 Wireless communication.....	102
	11.7 Field Device Specification (FDS).....	102
Chapter 12	PROFIBUS® communications.....	103
	12.1 General.....	103
	12.2 PROFIBUS® features.....	103
	12.3 PROFIBUS® communications.....	104
	12.4 Data transmission.....	108
	12.5 Installation and wiring.....	126
Chapter 13	Maintenance.....	131
	13.1 Maintenance.....	131
	13.2 Transmitter maintenance.....	131
	13.3 USB port.....	131

Appendix A	HART® and Device Variables.....	133
Appendix B	HART® Status Bits.....	139

1 Descriptions and specifications

1.1 Features and applications

The Rosemount 56 Dual Channel Transmitter is an adaptable, multi-parameter device with a high-resolution color display, designed for a wide range of liquid measurement applications, featuring dual sensor inputs, multiple language support, and advanced diagnostics, with various digital communications options including HART® and PROFIBUS®.

This multi-parameter transmitter serves industrial, commercial and municipal applications with the widest range of liquid measurement inputs and digital communications available.

The Rosemount 56 Dual Channel Transmitter supports continuous measurement of liquid analytical inputs from one or two sensors. The modular design allows signal input boards to be field replaced, making configuration changes easy. The high resolution full-color display gives unsurpassed visibility and functionality for liquid analytical instrumentation.

Dual input instrument

Single or dual measurement of the following:

- pH/ORP
- Resistivity/Conductivity
- % Concentration
- Total Dissolved Solids
- Total Chlorine
- Free Chlorine
- Monochloramine
- Dissolved Oxygen
- Dissolved Ozone
- Turbidity
- Pulse Flow
- Temperature
- 4-20 mA Input

Full color display

The high resolution full-color display allows at-a-glance viewing of process readings — indoors or outdoors. Six additional process variables or diagnostic parameters are displayed for quick determination of process or sensor condition. You can adjust the contrast of backlit display and customize the main screen to meet your requirements.

Digital communications

HART version 5 and 7 digital communications are available on the transmitter. An optional PROFIBUS DP digital communications board is available for Profibus installations. HART transmitters communicate with the 475 HART handheld communicator and HART hosts, such as AMS Intelligent Device Manager. PROFIBUS transmitters are fully compatible with PROFIBUS DP networks and Class 1 or Class 2 masters. HART and PROFIBUS DP configured transmitters will support any single or dual measurement transmitter configurations.

Menus

Easily-managed window screens for easy navigation to local configuration and routine calibration. **Quick Start** and all menu screens are available in multiple locally displayed languages. Alphanumeric keypad allows easy entries during configuration and calibration.

Quick Start programming

Popular Quick Start screens appear the first time the transmitter is powered. The transmitter auto-recognizes each measurement input type and prompts you to configure each sensor loop in a few quick steps for immediate commissioning.

Help screens

A complete user guide and troubleshooting manual is embedded in the transmitter's memory and easily accessed via the **INFO** key on the local display. Detailed instructions and troubleshooting tips in multiple languages are intended to provide adequate guidance to resolve most problems on site.

Hazardous area approvals and safety approvals

None.

Enclosure

The transmitter enclosure fits standard ½ DIN panel cutouts. The versatile enclosure design supports panel-mount, pipe-mount, and surface/wall-mount installations.

No enclosure ratings.

Security access codes

Two levels of security access are available. Program one access code for routine maintenance and hold of current outputs; program another access code for all configuration menus and functions.

Diagnostics

The transmitter continuously monitors itself and the sensor(s) for `Fault` and `Warning` conditions. To visually alert field personnel, a display banner flashes:

- Red to indicate a `Fault` condition
- Yellow for a `Warning` condition

To access details and troubleshooting information for any specific `Fault` or `Warning` press the **INFO** key.

Local languages

Emerson extends its worldwide reach by offering nine menu languages:

- English
- French
- German
- Italian
- Spanish
- Portuguese
- Chinese
- Russian

- Polish

Every transmitter includes the following in all nine languages:

- Programming menus
- Calibration routines
- Faults and Warnings
- **Help** screens

Current outputs

Every transmitter includes four 4–20 mA or 0–20 mA electrically isolated current outputs, giving the ability to transmit the measurement value and the temperature for both sensors. Users have wide latitude to assign any measurement value or live diagnostic to any current output for reporting. You can enable output dampening with time constants from 0 to 999 seconds. HART digital communications transmitted via current output 1 is standard on all transmitters (option code HT).

1.2 Enhanced features

The Rosemount 56 is a versatile instrument that provides high-resolution trending graphs, extensive data logging, USB data transfer, Proportional, Integral, and Derivative (PID) control, programmable alarm relays, specialized timer functions, and wireless capability with the THUM™ Adapter. The transmitter supports advanced measurement functions for a variety of sensors.

Process trending graphs

You can display high-resolution color graphs of measurement data on-screen to pinpoint process disruptions or measurement problems and to estimate probe maintenance frequency. The transmitter has the ability to zoom in to a specific narrow time frame of process measurements for detailed on-screen evaluation.

Data logger and event logger

Extensive onboard data storage captures measurement data from both channels every 30 seconds for 30 days for on-screen display or local upload to a USB 2.0 memory device. 300 significant transmitter events are recorded, including:

- Start-up time
- Calibrations
- Hold outputs
- Configurations
- Alarms
- Power interruptions
- Faults

All process data and events are time/date stamped.

USB 2.0 data transfer port

A USB port is built in to allow local data transfer of process data and events using a standard USB memory device. Cleanly formatted EXCEL data is useful for evaluation of process data on a computer and identification of critical alarm or fault events.

PID control

PID settings allow the analog current outputs to adjust a control device that has continuous adjustability by acting on process measurements or temperature. PID is typically used on modulating control devices, such as automated control valves or variable volume pumps. You can program any current output can be programmed for PID functions.

Alarm relay capabilities

Four single pole double throw alarm relays are fully assignable and programmable to trigger alarms upon reaching measurement or diagnostics setpoints or fault conditions. Further relay settings include time Proportional Control (TPC), synchronized interval timers, and four specialized timer functions described below. All relays are independently activated. Failsafe operation and programming of relay default state (normally open or normally closed) is software selectable.

Timer functions

Basic TPC settings are available. Interval timers set relays by interval time, on-time, and recovery time for discrete on/off control devices based on measurement inputs. In addition, four real-time clock relay functions are implemented including:

- Bleed and feed
- Day and time interval timers
- Delay timer
- Flow totalizer

These advanced timer features support a number of specialized applications that normally require dedicated timer control devices or Distributed Control System (DCS) programming.

Wireless THUM adapter cap

Enable wireless transmissions of process variables and diagnostics from hard-to-reach locations where it is impractical to run wires for current outputs. When commissioned with the THUM Adapter, HART® transmitters can communicate on Emerson wireless networks using HART 7 wireless protocol.

SMART-enabled pH

Rosemount SMART pH capability can eliminate field calibration of pH probes through automatic upload of calibration data and history — fully calibrating the pH loop. pH probe changes are literally plug and play using SMART pH sensors with Variopol (VP) cables connections.

Advanced functions

Among the several specialty measurements supported are:

- High reference impedance pH
- Ion selective electrode measurements
- pH loop calibration by entering pH slope and reference offset
- Isopotential point for pH
- Inferred pH determination using dual contacting conductivity inputs
- Differential conductivity
- Differential flow
- Totalized flow

- Current input from any 4–20 mA source
- Dual range calibration for chlorine sensors
- Programmable polarizing voltage for amperometric oxygen sensors
- Software selectable normally open or normally closed alarm relays

1.3 General specifications

Refer to the [Rosemount 56 Dual Channel Transmitter Product Data Sheet](#) for specifications.

1.4 Contacting conductivity (codes -20 and -30)

Measures conductivity in the range 0 to 600,000 $\mu\text{S}/\text{cm}$ (600 mS/cm).

Measurement choices are:

- Conductivity
- Resistivity
- Total dissolved solids
- Salinity
- % concentration

You can disable temperature compensation can be disabled, allowing the transmitter to display raw conductivity.

Note

When two contacting conductivity sensors are used, the transmitter can derive an inferred pH value. Inferred pH is calculated pH, not directly measured pH. Inferred pH is calculated from straight and cation conductivity. It is applicable only if the alkalizing agent is NaOH or NH_3 and the major contaminant is NaCl. It is strictly an application for power plants.

Performance specifications - Analyzer

Measurement Range:	See Figure 1-1 .
Solution temperature compensation:	Manual slope ($\text{X}\% / ^\circ\text{C}$), high purity water (dilute sodium chloride), and cation conductivity (dilute hydrochloric acid).
Salinity:	Uses Practical Salinity Scale.
Total Dissolved Solids:	Calculated by multiplying conductivity at 25 $^\circ\text{C}$ by 0.65.
Five percent concentration curves:	0-12% NaOH, 0-15% HCl, 0-20% NaCl, 0-25% or 96-99.7% H_2SO_4 . The conductivity concentration algorithms for these solutions are fully temperature compensated.
Four temperature compensation options:	Manual slope ($\text{X}\% / ^\circ\text{C}$), high purity water (neutral salt), cation conductivity (dilute hydrochloric acid) and raw.
Input filter:	Time constant 1 - 999 sec, default 2 sec.

Response time: 3 seconds to 95% of final reading

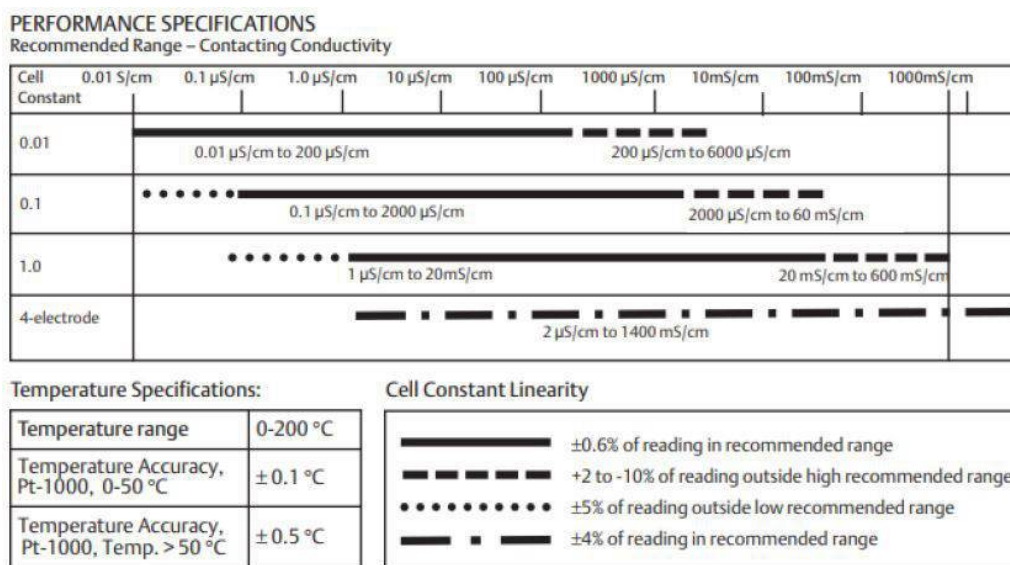
Recommended sensors for contacting conductivity

All Rosemount ENDURANCE 400 series conductivity sensors (Pt 1000 RTD) and 410VP 4-electrode high-range conductivity sensor.

Table 1-1: Temperature specifications:

Temperature specifications	0-200 °C
Temperature Accuracy, Pt-1000, 0-50 °C	± 0.1 °C
Temperature Accuracy, Pt-1000, Temp. > 50 °C	± 0.5 °C

Figure 1-1: Performance specifications



1.5 Toroidal conductivity specifications (codes -21 and -31)

The transmitter measures conductivity in the range of 1 µS/cm to 2,000,000 µS/cm (2 S/cm).

Measurement choices are:

- Conductivity
- Resistivity
- Total dissolved solids
- Salinity
- Percent concentration

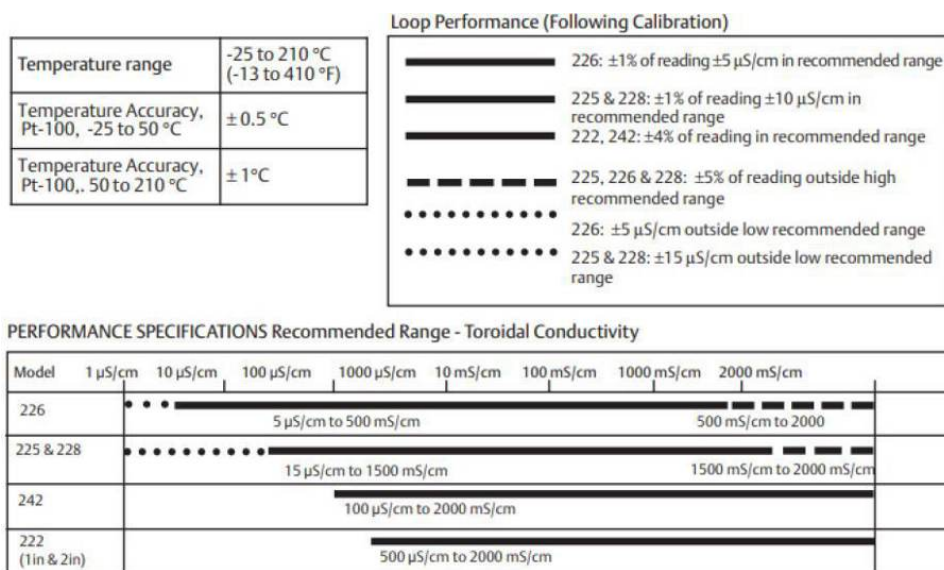
You can disable temperature compensation, allowing the transmitter to display raw conductivity.

For more information concerning the use and operation of toroidal conductivity sensors, refer to the sensor product data sheets.

Transmitter performance specifications

Measurement range See [Figure 1-2](#).

Figure 1-2: Performance specifications



Repeatability ±0.25 percent ±5 µS/cm after zero calibration

Salinity Uses Practical Salinity Scale

Total dissolved solids Calculated by multiplying conductivity at +77 °F (+25 °C) by 0.65

Five percent concentration curves 0-12 percent NaOH

0-15 percent HCl

0-20 percent NaCl

0-25 percent or 96 -99.7 percent H₂SO₄

The conductivity concentration algorithms for these solutions are fully temperature compensated. For other solutions, the transmitter accepts as many as five data points and fits either a linear (two points) or a quadratic function (three or more points) to the data. You can also adjust reference temperature and linear temperature slope for optimum results.

Three temperature compensation options Manual slope (X%/° C)
Neutral salt (dilute sodium chloride)
Raw

Input filter Time constant: 1 - 999 seconds, default 2 seconds

Response time 3 seconds to 95 percent of final reading

Recommended sensors All Rosemount submersion/immersion and flow-through toroidal sensors

1.6 pH/oxidation reduction potential (ORP) specifications

Codes -22 and -32. Code -P.

You can use the transmitter with any standard pH or ORP sensor.

For use with any standard pH or ORP sensor, including SMART pH sensors with SMART preamplifiers from Emerson.

Measurement choices are:

- pH
- ORP
- Redox
- Ammonia
- Fluoride
- Custom ISE

The automatic buffer recognition feature uses stored buffer values and their temperature curves for the most common buffer standards available worldwide. The transmitter recognizes the value of the buffer being measured and performs a self stabilization check on the sensor before completing the calibration. You can select manual or automatic temperature compensation from the menu. You can use a programmable temperature coefficient to compensate for a change in pH due to process temperature coefficient.

For more information concerning the use and operation of the pH or ORP sensors, refer to the sensor Product Data Sheets.

The transmitter can also derive an inferred pH value called pHCalc (calculated pH). The transmitter can derive and display pHCalc when using two contacting conductivity sensors (Rosemount 1056-0X-20-30-AN).

The transmitter can also derive an inferred pH value. The transmitter can derive and display inferred pH when you use two contacting conductivity sensors.

2 Installation

2.1 Unpack and inspect

Procedure

Inspect the shipping container.

- If it is damaged, then contact the shipper immediately for further instructions.
- If there is no apparent damage, then unpack the container. Ensure all items shown on the packing list are present. If items are missing, then notify Emerson immediately.

2.2 General installation information

Install the transmitter in shaded areas away from extreme temperatures using a sunshield. Mount the transmitter away from interference and high voltage, ensure it's accessible and properly sealed and that it complies with electrical codes to prevent shock.

⚠ WARNING

Risk of electrical shock

Electrical installation must be in accordance with the National Electrical Code (ANSI/ National Fire Protection Association [NFPA]-70) and/or any other applicable national or local codes.

- Although the transmitter is suitable for outdoor use, Emerson does not recommend installation in direct sunlight or in areas of extreme temperatures unless using a sunshield. Note the ambient temperature specifications in the [Rosemount 56 Dual Channel Transmitter Product Data Sheet](#). Do not operate the transmitter in ambient (shaded) conditions greater than +140 °F (+60 °C).
- Install the transmitter in an area where vibration and electromagnetic and radio frequency interference are minimized or absent.
- Keep the transmitter and sensor wiring at least 12 in. (30.5 cm) from high voltage conductors. Verify that there is easy access to the transmitter.
- The transmitter is suitable for panel, pipe, or surface mounting.
- Install cable fittings and plugs as needed to properly seal the transmitter on all six enclosure openings. The USB port cover must be fully installed on the front cover to ensure proper transmitter sealing.

Installation dimensions

Note

Dimensions are displayed with inches above and millimeters below.

Figure 2-1: Panel mount front view

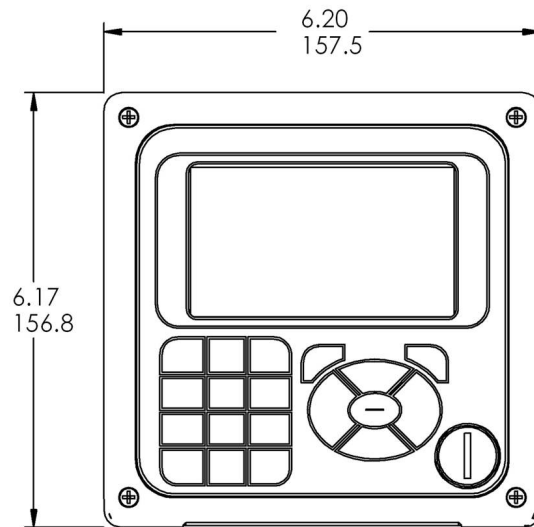
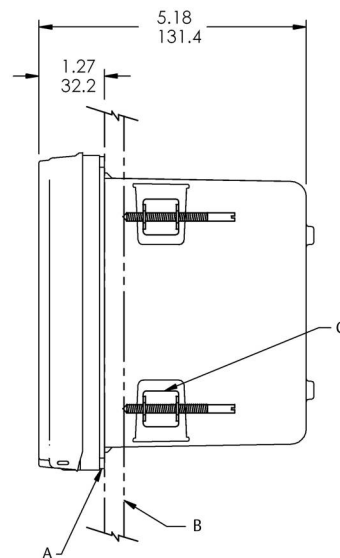


Figure 2-2: Panel mount side view



- A. Panel mount gasket
- B. Panel supplied by others. Maximum thickness: 0.375 in. (10 mm)
- C. Four mounting brackets and screws provided with transmitter