

# Rosemount™ TCL

## Total Chlorine System



### **A complete system designed to meet your total chlorine needs**

The Rosemount TCL total chlorine system features a complete sample conditioning system that permits a single sensor to measure total chlorine in water. The system can also be used to measure chlorinated sea water.

## Overview

### A robust sample conditioning system

- No metal wetted parts - ideal for sea water.
- Low sample flow (about 15 mL/min) minimizes sample waste.
- Reagent-based system allows true chlorine measurement.
- Continuously measure total chlorine for up to two months on five gallons of reagent.

### Trusted sensor and transmitter

- The Rosemount 1056 Dual Channel Transmitter features a four line, back-lit display with an easy to use interface, two independent outputs, and optional fully programmable alarms.
- The Rosemount 56 Dual Channel Transmitter features a four line, full color display with an easy to use interface, four fully programmable outputs and relays, HART® digital communications, and data logger.
- The 499ACL-02 Total Chlorine Sensor is a robust sensor that is easy to maintain.
- Continuously measure total chlorine for up to two months on five gallons of reagent.

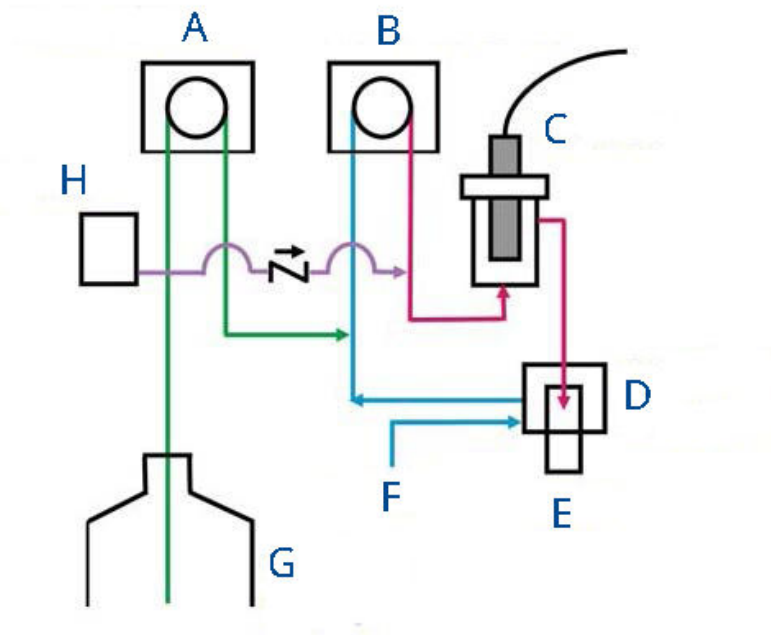
### How it works

- The sample conditioning system continuously injects a solution of acetic acid and potassium iodide in the drawn sample. The acid lowers the pH to between 3.5 and 4.5 and allows total chlorine in the sample to quantitatively react with the potassium iodide to produce iodine. The sensor measures the iodine concentration, and the transmitter displays the total oxidant concentration in ppm as Cl<sub>2</sub>.

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## Contents

Overview.....	2
Ordering information.....	4
Specifications.....	5
Dimensional drawings.....	7
Rosemount TCL engineering specification using Rosemount 1056 transmitter.....	14
Rosemount TCL Engineering Specification Using Rosemount 56 Transmitter.....	16
Accessories.....	18

**Figure 1: Sample conditioning system**

- A. Reagent pump
- B. Sample pump
- C. Sensor
- D. Overflow sampler
- E. Drain
- F. Sample
- G. Reagent bottle
- H. Air pump

## Ordering information



The Rosemount TCL total chlorine system consists of a sample conditioning system, a reagent carboy, a sensor, and a transmitter. Reagent kits for 0 to 5 ppm and 0 to 10 ppm chlorine ranges are available and must be ordered separately (see [Accessories](#)).

**Table 1: Rosemount TCL Total Chlorine System Ordering Information**

Model	Sensor type
TCL	Total Chlorine System
<b>Power input</b>	
11	115 Vac 50/60 Hz
12	230 Vac 50/60 Hz
<b>Transmitter</b>	
-	No selection - no transmitter
270	Rosemount 1056-01-24-38-AN, no relays, analog output
271	Rosemount 1056-01-24-38-HT, no relays, HART®
272	Rosemount 1056-01-24-38-DP, no relays, Profibus DP
273	Rosemount 1056-03-24-38-AN, alarm relays, analog output
274	Rosemount 1056-03-24-38 HT, alarm relays, HART
275	Rosemount 1056-03-24-38-DP, alarm relays, Profibus DP
280	Rosemount 56-03-24-38-HT, relays, analog/HART
281	Rosemount 56-03-24-38-DP, relays, analog/Profibus DP
<b>Sensor</b>	
-	No selection - no sensor
30	Rosemount 499ACL-02-54 Total Chlorine Sensor with optimum EMI/RFI cable
32	Rosemount 499ACL-02-54-VP Total Chlorine Sensor with VP cable connector <sup>(1)</sup>
<b>Typical model number: TCL-11-280-32</b>	

(1) Interconnecting VP cable sold separately,

## Specifications

**Table 2: Sample conditioning system specifications**

Physical characteristics	Specifications
<b>General</b>	
Enclosure	Fiberglass reinforced polyester, NEMA 3 (IP53) suitable for marine environments
Mounting	Wall
Reagent Carboy	5 gal (19 L) dimensions (L x W x H) 12.5 x 9.5 x 13.5 in. (318 x 233 x 343 mm)
Dimensions	See drawing
Ambient humidity	0–90% (non-condensing)
Power	115 Vac, 6.9 W, 50/60 Hz 230 Vac, 7.0 W, 50/60 Hz
Hazardous location	The TCL Sample Conditioning System has no hazardous location approvals.
Weight/shipping weight (rounded up to the nearest 1 lb or 0.5 kg)	14 lb/16 lb (6.5 kg/7.5 kg)
Ambient temperature	32 to 122 °F (0 to 50 °C)
<b>Sample requirements</b>	
Inlet connection	Compression fitting, accepts ¼-in. OD tubing
Drain connection	¾-in. barbed fitting (must drain to open atmosphere)
Inlet pressure	<100 psig (791 kPa abs)
Flow	At least 0.25 gph (15 mL/min)
Temperature	32 to 122 °F (0 to 50 °C)
Total alkalinity	<300 mg/L as CaCO <sub>3</sub> . For samples containing <50 mg/L alkalinity, consult the factory.
<b>Sample conditioning system</b>	
Reagent	Potassium iodide in vinegar
Reagent usage	5 gallons (19 L) last approximately 60 days
Reagent pump	Fixed speed peristaltic pump, about 0.2 mL/min
Sample pump	Fixed speed peristaltic pump, about 11 mL/min

**Table 3: Rosemount 499ACL-02 Total Chlorine sensor specifications**

Physical characteristics	Specifications
Wetted parts	Gold, Noryl <sup>®(1)</sup> (PPO), Viton <sup>®(2)</sup> , EPDM, and silicone
Dimensions	1.0 x 5.6 in. (25.4 x 143 mm)
Temperature rating	32 to 122 °F (0 to 50 °C)
Electrolyte capacity	Approximately 25 mL
Electrolyte life	Approximately 4 months
Cable	25 ft. (7.6 m) standard. (Sensor is available with Variopol quick-disconnect fitting.)

**Table 3: Rosemount 499ACL-02 Total Chlorine sensor specifications (continued)**

Physical characteristics	Specifications
Pressure rating	0 to 65 psig (101 to 549 kPa)
Weight/shipping weight	1 lb/3 lb (0.5 kg/1.5 kg)

(1) *Noryl* is a registered trademark of General Electric.

(2) *Viton* is a registered trademark of DuPont Performance Elastomers.

**Table 4: Complete system specifications**

Physical characteristics	Specifications
Linear range	0 to 20 ppm (mg/L) as Cl <sub>2</sub> (for higher ranges, consult factory)
Linearity (per ISO 15839)	0 to 10 ppm: 2% 0 to 20 ppm: 3%
Response time	Following a step change in concentration, the reading reaches 90% of final value within 7 minutes at 77 °F (25 °C).
Drift	At about 1.5 ppm in clean water and constant temperature, drift is typically less than 0.05 ppm over two weeks.
Detection limit (per ISO 15839)	0.02 ppm (mg/L) in clean water at room temperature

For Rosemount 1056 Transmitter specifications, see the [Rosemount 1056 Transmitter Product Datasheet](#).

For Rosemount 56 Transmitter specifications, see the [Rosemount 56 Transmitter Product Datasheet](#).

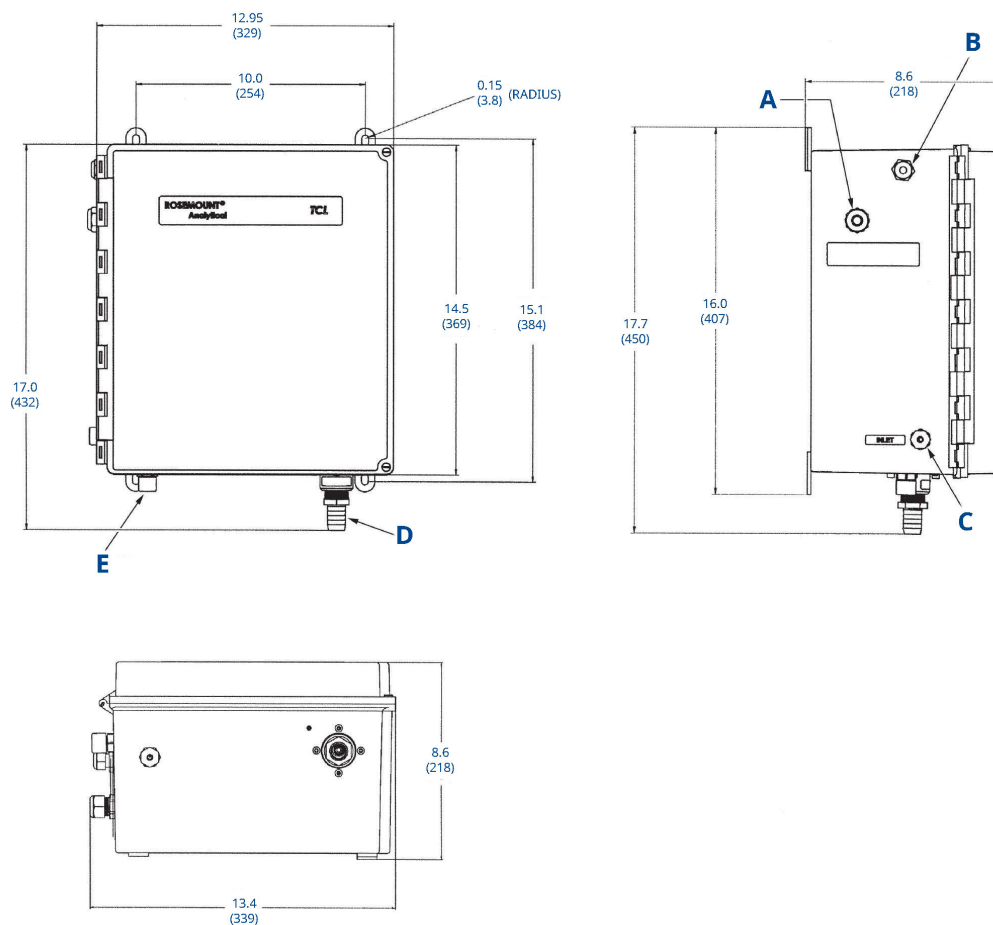
# Dimensional drawings

**Note**

Dimensions in the following drawings are in inches (millimeters).

## Dimensions of TCL case

Figure 2: Dimensions of TCL Case



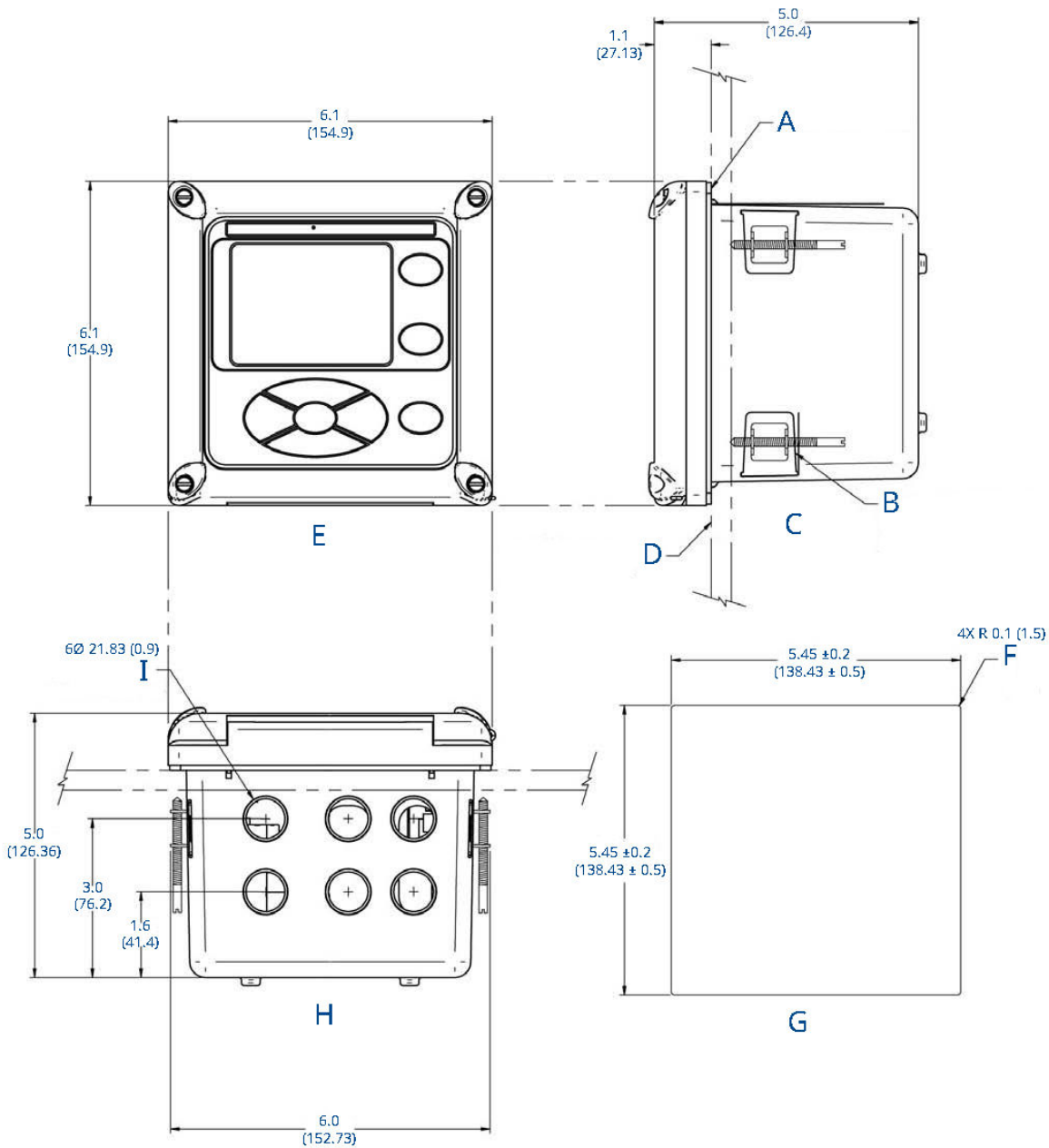
- A. Power cable
- B. Sensor cable
- C. Sample inlet
- D. Drain
- E. Reagent inlet

## Mounting

### Rosemount 1056-24 panel mount installation

The front panel is hinged at the bottom. The panel swings down for easy access to wiring terminals.

Figure 3: Rosemount 1056-24 panel mount installation



A. Panel mount gasket

B. Four sets mounting brackets and screws provided with instrument

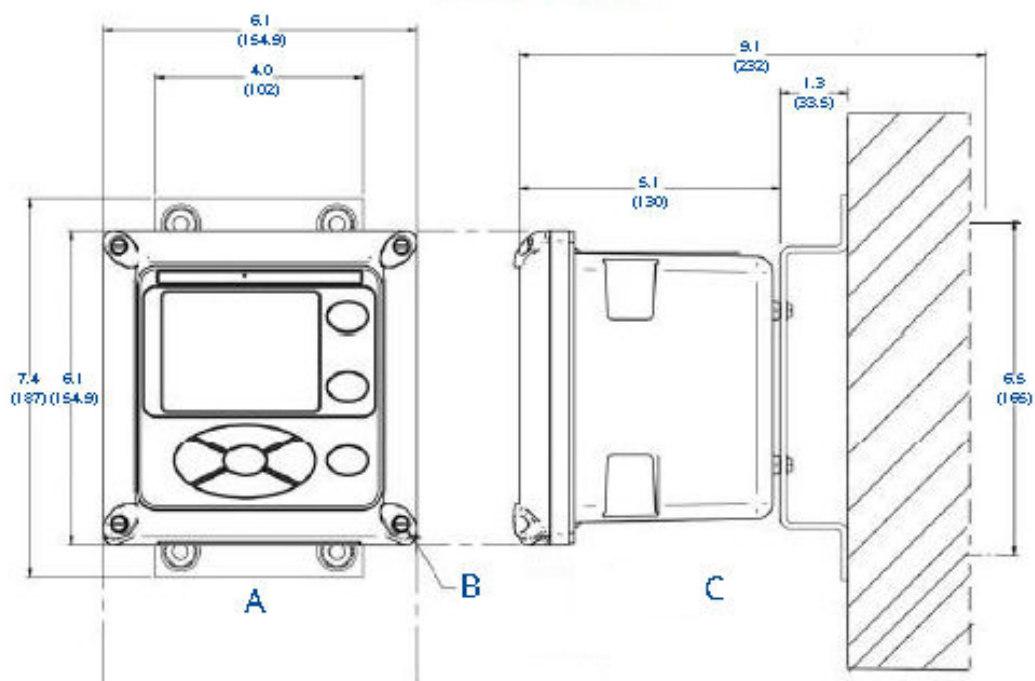


- C. Side view
- D. Panel supplied by others. Maximum thickness 0.375 in. (9.52 mm)
- E. Front view
- F. Maximum radius
- G. Panel cut-off
- H. Bottom view
- I. Conduit openings

### Rosemount 1056-24 pipe/wall mount installation

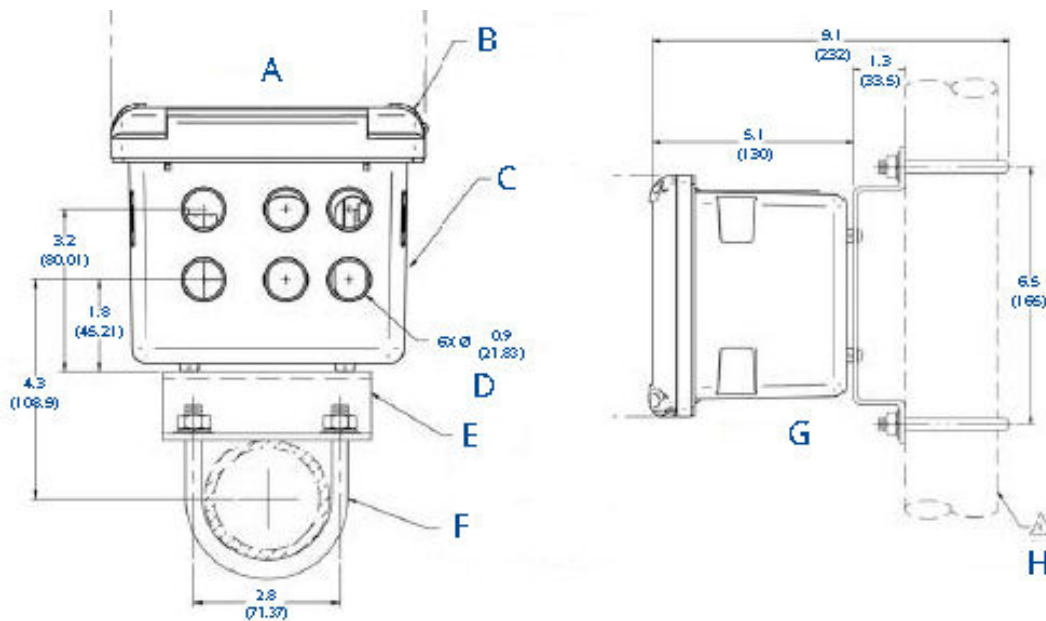
The front panel is hinged at the bottom. The panel swings down for easy access to wiring terminals.

**Figure 4: Wall/surface mount**



- A. Front view
- B. Four cover screws
- C. Side view

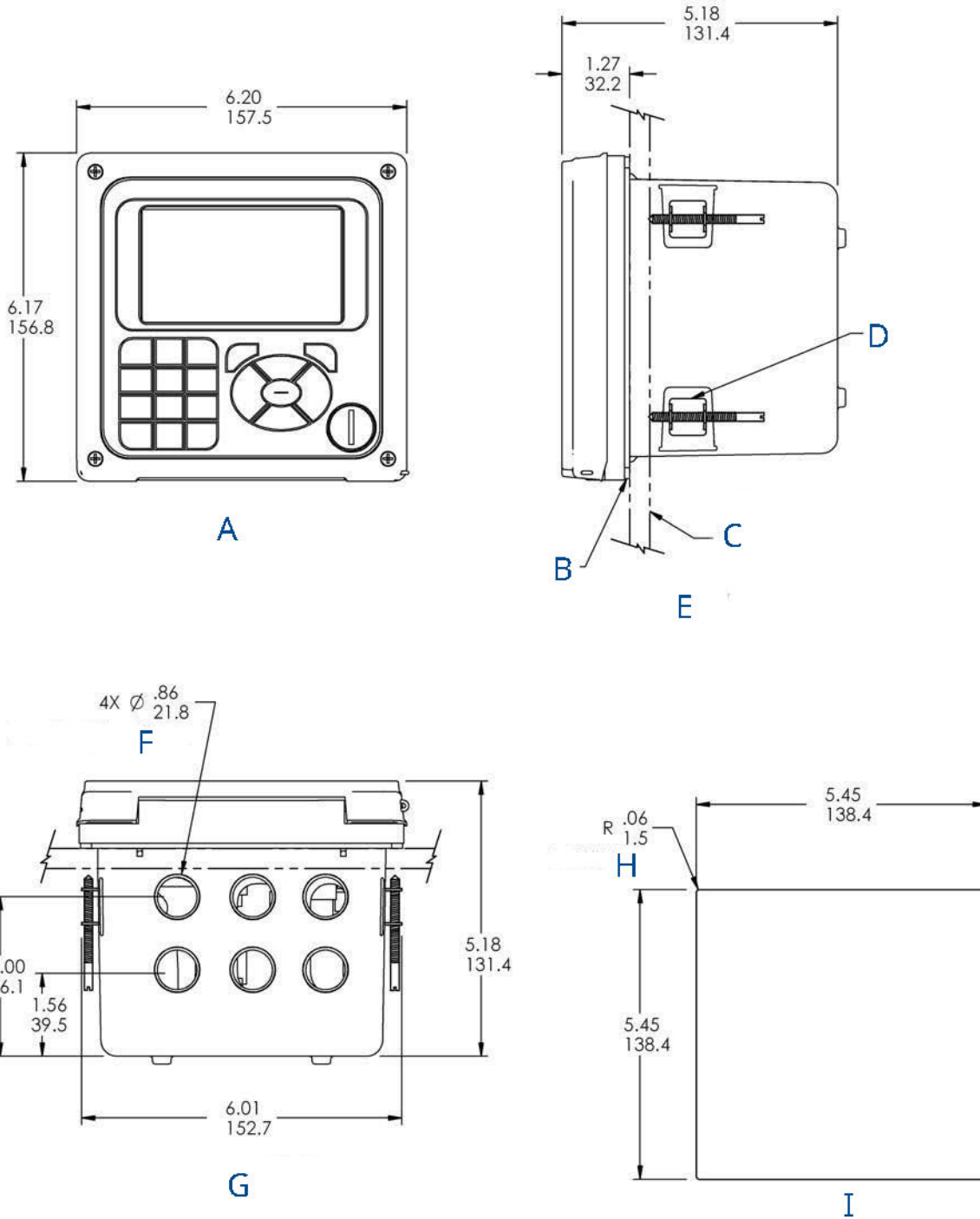
Figure 5: Pipe mount



- A. Bottom view
- B. Front panel
- C. Panel and pipe mount enclosure
- D. Conduit openings
- E. 2-in. (51 mm) pipe mount bracket
- F. Two set U-Bolts for 2-in. pipe in kit PN 23820-00

### Rosemount 56-24 panel mount installation

Figure 6: Rosemount 56-24 panel mount installation

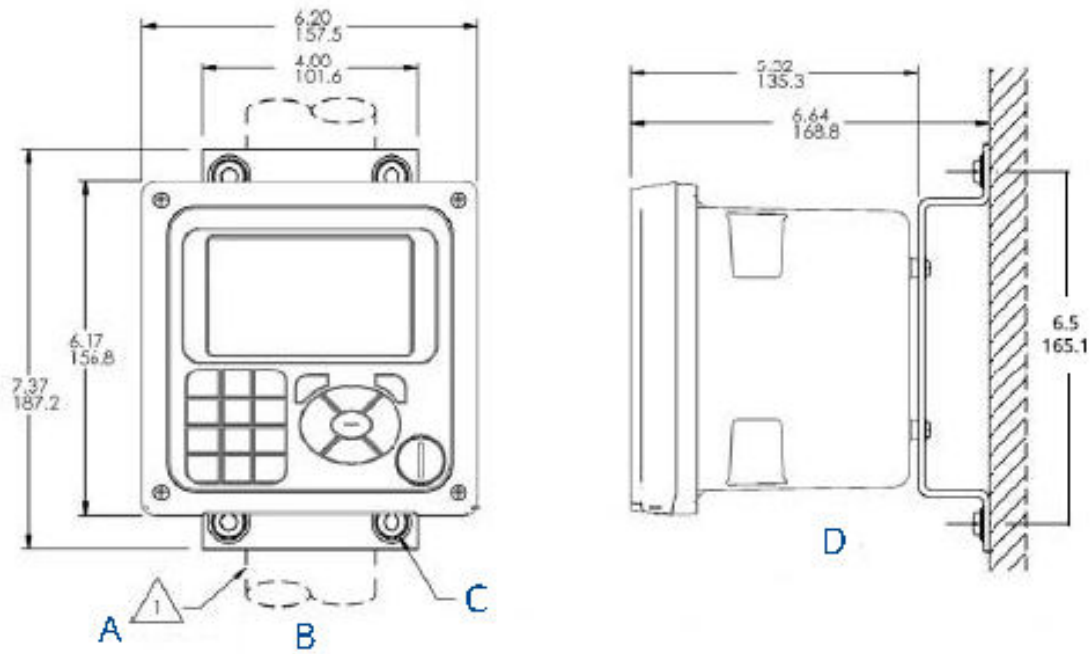


- A. Front view
- B. Panel mount gasket
- C. Panel supplied by others. Maximum thickness 0.375 in. (9.52 mm)

- D. Four mounting brackets and screws provided with instrument
- E. Side view
- F. Conduit openings
- G. Bottom view
- H. Maximum
- I. Panel cut-out

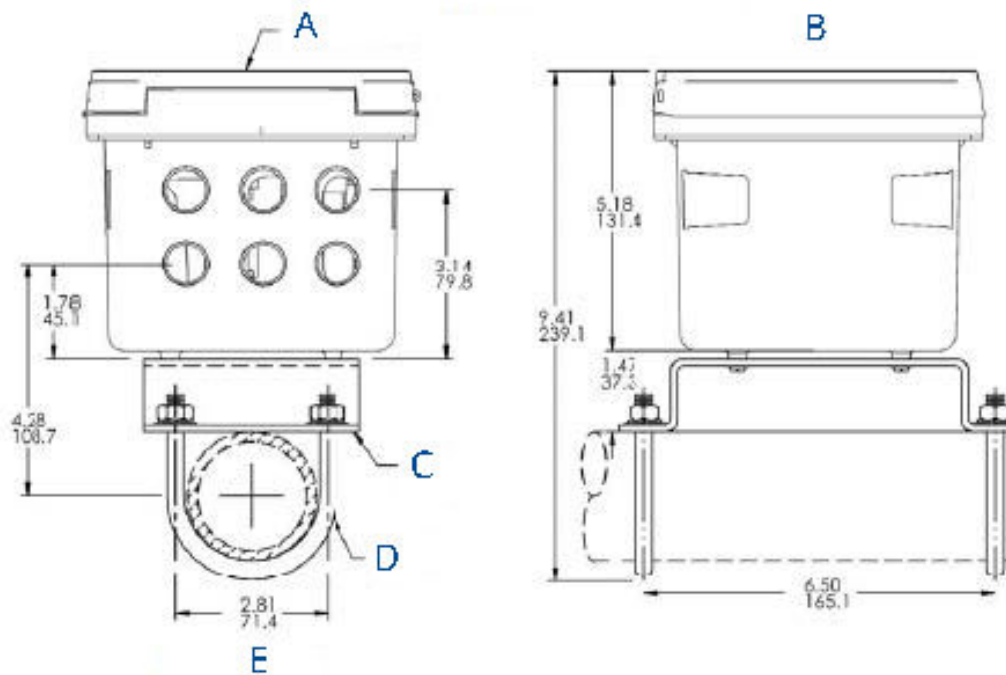
**Rosemount 56-24 pipe/wall mount installation**

**Figure 7: Wall/surface mount**



- A. 2-in. pipe supplied by customer
- B. Front view
- C. Four cover screws
- D. Side view

Figure 8: Pipe mount



- A. Front panel
- B. Side view
- C. 2-in. pipe mount bracket
- D. Two sets U-Bolts for 2-in. pipe in kit PN 23820-00
- E. Bottom view

# Rosemount TCL engineering specification using Rosemount 1056 transmitter

1. The system shall be suitable for the determination of total chlorine in water. The system shall consist of a transmitter, sensor, reagent carboy, and sample conditioning system.
2. The system shall be suitable for use in a marine environment. All wetted materials must be plastic.
3. To ensure determination of total chlorine, the system must be reagent-based. The reagents shall consist of a solution of potassium iodide in vinegar (acetic acid). Total chlorine transmitters in which the acid and potassium iodide are stored in separate containers are not acceptable. Total chlorine transmitters that do not use vinegar are not acceptable.
4. 5 gallons (19 L) of reagent shall last about two months.
5. The system shall be able to measure total chlorine in samples containing as much as 300 ppm total alkalinity (as  $\text{CaCO}_3$ ).
6. To avoid wasting water, the required sample flow shall be no more than about 0.25 gallons per hour (15 mL/min). A sample overflow cup shall be used to divert excess sample to waste.
7. The linear range of the system shall be 0 to 20 ppm (mg/L) total chlorine as  $\text{Cl}_2$ . Between 0 and 10 ppm, the linearity shall be at least 2 percent; between 0 and 20 ppm, the linearity shall be at least 3 percent.
8. The sensor shall be a membrane-covered, two-electrode amperometric device, having a gold cathode, silver/silver chloride anode, and a silicone membrane.
9. Expected sensor electrolyte life shall be about four months.
10. No special tools shall be required to change the membrane or to perform routine maintenance.
11. The sensor shall be available with a quick disconnect fitting to permit it to be replaced without removing and rewiring the cable.
12. The transmitter shall receive the raw signal from the sensor and automatically correct it for temperature effects. Results shall be displayed as ppm  $\text{Cl}_2$ . A dual input transmitter shall also be available if the user wishes to use a single transmitter to measure two parameters, for example, total chlorine and pH.
13. The transmitter shall require single point calibration. A correction for the sensor zero current shall also be available.
14. The transmitter shall have a four line, back-lit display. The display shall show ppm chlorine and temperature on one screen. The user shall be able to program the display to show additional information, such as raw sensor current.
15. The transmitter shall be capable of operating between 32 and 131 °F (0 and 55 °C) and between 5 and 95 percent relative humidity (non-condensing).
16. The transmitter shall have dual 0/4–20 mA isolated outputs. Outputs shall be fully scalable and assignable independently of chlorine or temperature.
17. Digital communications using either HART® or Profibus DP shall be available as options.
18. The transmitter shall have four (optional) alarm relays, fully programmable for logic (high or low operation), dead band, and set point. Relays shall also be configurable to energize when the transmitter detects a fault with the sensor itself.
19. All transmitter programming shall be through a front panel membrane keypad. The language (English, Spanish, Italian, Portuguese, German, French, or Chinese) used in the menu screens shall be selectable by the user.
20. The transmitter shall have a security feature to prevent unauthorized tampering with calibration and configuration settings.

21. The transmitter shall be Rosemount Model TCL with Model 1056 Transmitter and 499ACL-02 Total Chlorine Sensor or approved equal.

# Rosemount TCL Engineering Specification Using Rosemount 56 Transmitter

1. The system shall be suitable for the determination of total chlorine in water. The system shall consist of a transmitter, sensor, and sample conditioning system.
2. The system shall be suitable for use in a marine environment. All wetted materials must be plastic.
3. To ensure determination of total chlorine, the system must be reagent-based. The reagents shall consist of a solution of potassium iodide in vinegar (acetic acid). Total chlorine transmitters in which the acid and potassium iodide are stored in separate containers are not acceptable. Total chlorine transmitters that do not use vinegar are not acceptable.
4. 5 gallons (19 L) of reagent shall last about two months.
5. The system shall be able to measure total chlorine in samples containing as much as 300 ppm total alkalinity (as  $\text{CaCO}_3$ ).
6. To avoid wasting water, the required sample flow shall be no more than about 0.25 gallons per hour (15 mL/min). A sample overflow cup shall be used to divert excess sample to waste.
7. The linear range of the system shall be 0 to 20 ppm (mg/L) total chlorine as  $\text{Cl}_2$ . Between 0 and 2 ppm, the linearity shall be at least 2 percent; between 0 and 20 ppm, the linearity shall be at least 3 percent. One sensor shall be able to cover the entire range.
8. The sensor shall be a membrane-covered, two-electrode amperometric device, having a gold cathode, silver/silver chloride anode, and a silicone membrane.
9. Sensor electrolyte life shall be about four months.
10. No special tools shall be required to change the membrane or to perform routine maintenance.
11. The sensor shall be available with a quick disconnect fitting to permit it to be replaced without removing and rewiring the cable.
12. The transmitter shall receive the raw signal from the sensor and automatically correct it for temperature effects. Results shall be displayed as ppm  $\text{Cl}_2$ . A dual input transmitter shall also be available if the user wishes to use a single transmitter to measure two parameters, for example, total chlorine and pH.
13. The transmitter shall require single point calibration. A correction for the sensor zero current shall also be available.
14. The transmitter shall have a four line, back-lit display. The display shall show ppm chlorine and temperature on one screen. The display shall be programmable to show additional information, such as raw sensor current.
15. The transmitter shall have dual 0/4–20 mA isolated outputs and HART® digital communications as a standard feature. Outputs shall be fully scalable and assignable independently of chlorine or temperature. PID control shall be available as a standard feature. Profibus DP digital communications shall be optional.
16. The transmitter shall have four (optional) alarm relays, fully programmable as a high/low alarm with adjustable deadband or as a timer. Timer functions shall include an interval timer, bleed and feed timer, delay timer, and date and time timer. Time-proportional control shall also be available. In addition, relays shall be configurable to energize when the transmitter detects a fault with itself or the sensor.
17. All transmitter programming shall be through a front panel membrane keypad. The language (English, Spanish, Italian, Portuguese, German, French, Russian, Polish, or Chinese) used in the menu screens shall be selectable by the user.
18. The transmitter shall have a data logger that automatically stores data every thirty seconds for thirty days, with older data being discarded to make room for newer data. In addition to storing date and time, chlorine concentration, and temperature, the transmitter shall store raw sensor current (chlorine sensor). Stored data shall be downloadable through a USB port.



19. The transmitter shall have a dual graphic display that allows data to be viewed over one hour, one day, seven days, and one month intervals.
20. The transmitter shall have a data logger that stores up to 200 events.
21. The transmitter shall have help screens, available at the touch of a button, that provide information about configuration, calibration, and troubleshooting.
22. The transmitter shall have a security feature to prevent unauthorized tampering with calibration and configuration settings.
23. The transmitter shall be Rosemount Model TCL-11 (or -12) -280 (analog/HART) or TCL-11 (or-12) -281 (Profibus DP) or approved equal.

## Accessories

**Table 5: Sample Conditioning System accessories**

Part number	Description
24548-00	Air pump, 115 Vac, 50/60 Hz
24548-01	Air pump, 230 Vac, 50/60 Hz
9322052	Check valve for air injection line
24153-00	Carboy for reagent, 5 gal/19 L, includes cap
9100204	Fuse, 0.25 A, 250 V, 3 AG, slow blow for option-11 (115 Vac)
9100132	Fuse, 0.125 A, 250 V, 3 AG, slow blow for option -12 (230 Vac)
D0000419-01	Reagent pump, 115 Vac, 50/60 Hz
9380095	Reagent pump, 230 Vac, 50/60 Hz
9380091	Reagent pump replacement tubing
24151-00	Reagent tubing replacement kit for TCL with 230 Vac reagent pump
D0000420-01	Reagent tubing replacement kit for TCL with 115 Vac reagent pump
24135-00	Reagent uptake tubing, 6 ft. (1.8 m), includes weight
D0000418-01	Sample pump, 115 Vac, 50/60 Hz
9380093	Sample pump, 230 Vac, 50/60 Hz
9380092	Sample pump replacement tubing
24152-00	Sample tubing replacement kit
24164-00	Potassium iodide, 25 g, sufficient for 5 gallons (19 L) of vinegar (0–5 ppm total chlorine)
24164-01	Potassium iodide, 50 g, sufficient for 5 gallons (19 L) of vinegar (0–10 ppm total chlorine)
24165-00	Acetic acid, 2 x 2.5 gal (9.5 L) bottles/case, with 25 g potassium iodide (0–5 ppm total chlorine)
24165-01	Acetic acid, 2 x 2.5 gal (9.5 L) bottles/case, with 50 g potassium iodide (0–10 ppm total chlorine)

**Table 6: Rosemount 1056 and 56 Transmitters accessories**

Part number	Description
23554-00	Cable glands (qty 5 of PG 13.5)
23820-00	Wall and 2-in. pipe mounting kit
240048-00	Stainless steel tag (specify marking)

**Table 7: Sensor accessories**

Part number	Description
23501-02	Total chlorine membrane, includes one membrane assembly and one O-ring

**Table 7: Sensor accessories (continued)**

Part number	Description
23502-02	Total chlorine membrane kit, includes three membrane assemblies and three O-rings
9210438	Total chlorine sensor fill solution, 4 oz (120 mL)
23747-06	Interconnecting cable, VP 6, 2.5 ft. (0.8 m)
23747-04	Interconnecting cable, VP 6, 4 ft. (1.2 m)
23747-02	Interconnecting cable, VP 6, 10 ft. (3.0 m)
23747-07	Interconnecting cable, VP 6, 15 ft. (4.6 m)
23747-08	Interconnecting cable, VP 6, 20 ft. (6.1 m)
23747-09	Interconnecting cable, VP 6, 25 ft. (7.6 m)
23747-10	Interconnecting cable, VP 6, 30 ft. (9.1 m)

**Table 8: For first time variopol installations**

Part number	Description
23747-06	Interconnecting cable, VP 6, 2.5 ft. (0.8 m)
23747-04	Interconnecting cable, VP 6, 4 ft. (1.2 m)
23747-02	Interconnecting cable, VP 6, 10 ft. (3.0 m)
23747-07	Interconnecting cable, VP 6, 15 ft. (4.6 m)
23747-08	Interconnecting cable, VP 6, 20 ft. (6.1 m)
23747-09	Interconnecting cable, VP 6, 25 ft. (7.6 m)
23747-10	Interconnecting cable, VP 6, 30 ft. (9.1 m)

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

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