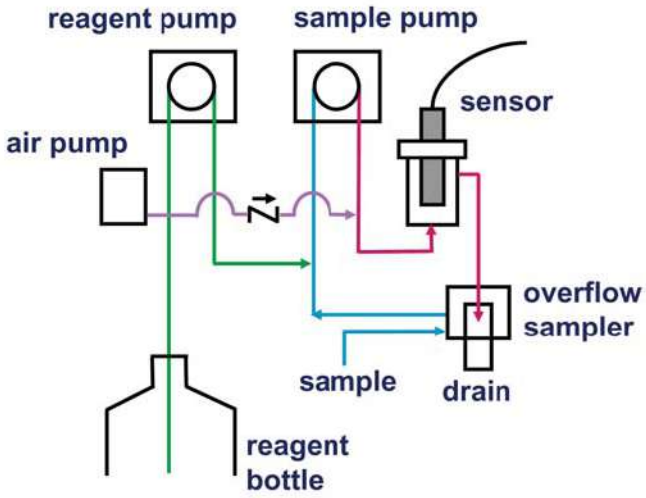
Rosemount™ TCL

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_2.

Contents

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
Power input	
11	115 Vac 50/60 Hz
12	230 Vac 50/60 Hz
Transmitter	
-	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
Sensor	
-	No selection - no sensor
30	Rosemount 499ACL-02-54 Total Chlorine Sensor with standard cable
31	Rosemount 499ACL-02-54-60 Total Chlorine Sensor with optimum EMI/RFI cable
32	Rosemount 499ACL-02-54-VP Total Chlorine Sensor with VP cable connector[1]
Typical model number: TCL-11-280-32	

1. Interconnecting VP cable sold separately.

Specifications

Table 2. Sample Conditioning System Specifications

General	
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 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	0 to 50 °C (32 to 122 °F)
Pumps	EN 09: 1998 CE
Sample requirements	
Inlet connections	Compression fitting, accepts 1/4 in. OD tubing
Drain connection	3/4 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	0 to 50 °C (32 to 122 °F)
Total alkalinity	<300 mg/L as $CaCO_3$. For samples containing <50 mg/L alkalinity, consult the factory.
Sample conditioning system	
Reagent	Potassium iodide in vinegar
Reagent usage	5 gallons (19 L) lasts 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 1056 Transmitter Specifications

Display	Monochromatic back-lit LCD. Main character height 0.6 in. (15 mm). Display is user-programmable.
Case	Polycarbonate, NEMA 4X, CSA4 (IP65)
Languages	English, French, German, Italian, Spanish, Portuguese, and Chinese
Storage temperature	-20 to 60 °C (-4 to 140 °F)
RFI/EMI LVD	EN-61326 EN-61010-1 CE
Alarms	Four alarm relays. Any relay can be configured as a fault alarm instead of a process alarm. Each relay can be configured independently, and each can be programmed with interval timer settings.
Power	-01 option: 115/230 Vac ±15%, 50 to 60 Hz, switching, 10 W -03 option: 84-265 Vac, 47.5 to 65.0 Hz, switching, 15 W ⧈ Equipment protected by double insulation

Outputs	Two 4-20 mA or 0-20 mA isolated outputs. Continuously adjustable. Linear or logarithmic. Maximum load 550 Ω. Output dampening is user-adjustable.
Relay contact ratings	5A at 28 Vdc or 300 Vac 1/8 HP at 120/240 Vac
Relays	Form C, SPDT, epoxy sealed
Terminal connections rating	Power connector (3 -leads): 18 -12 AWG wire size. Current output connectors (2-leads): 24 - 16 AWG wire size. Alarm relay terminal blocks: 18 - 16 AWG wire size
Hazardous location approvals	For more information, refer to the Model 1056 product data sheet. Approvals apply to the transmitter only. The TCL is not suitable for use in hazardous areas.
Weight/shipping weight (rounded up to the nearest 1 lb or 0.5 kg)	3 lb/4 lb (1.5 kg/2.0 kg)

Table 4. Rosemount 56 Transmitter Specifications

Display	Full color LCD, 3.75 x 2.20 in. (95 x 56 mm); display can be customized by the user.
Languages	English, French, German, Italian, Spanish, Portuguese, Chinese, Russian, and Polish.
Ambient temperature and humidity	-10 to 60 °C (14 to 140 °F); relative humidity 45 to 95% (non-condensing). Between -5 and 55 °C (23 and 131 °F) there is no visible degradation in display response or performance.
Storage temperature	-20 to 60 °C (-4 to 140 °F)
Power	85 to 265 Vac, 47.5 to 65.0 Hz, 20 W
RFI/EMI LVD	EN 61326 EN 6101-01 CE
Alarms and timers	Four relays, fully configurable as a setpoint alarm, interval timer, TPC, bleed and feed timer, delay timer, date and time timer, and fault alarm.
Control feautures	PID control (analog output) and time proportional control or TPC (relays) are standard.
Data logger	Data automatically stored every 30 seconds for 30 days; older data removed to make room for new data. The following data are automatically stored: data and time, ppm, temperature, and raw sensor current.
Event logger	Stores up to 300 events with data and time stamps: faults, warnings, calibration data, calibration results (pass or fail), power on/off cycles, and hold on/off. Alarm relay activation and deactivation can also be stored. Older events are automatically removed to make room for new events.
Data and event downloading	Through USB port on front panel
Graphical display	Dual graphical display shows measurement data on the Y-axis and time on the X-axis. Y-axis is fully assignable and scalable. X-axis can be set to 1 hour, 1 day, 7 days, or 30 days.
Digital communications	HART
Outputs	Four 4-20 mA or 0-20 mA isolated current outputs; assignable to measurement or temperature; fully scalable; maximum load 550 Ω. HART digital signal is superimposed on output 1.
Relay contact ratings	5A at 28 Vdc or 300 Vac (resistive) 1/8 HP at 120/240 Vac
Relays	Form C, SPDT, epoxy sealed
Case	Polycarbonate
Hazardous location approvals	For more information, refer to the Model 56 product data sheet. Approvals apply to the transmitter only. The TCL is not suitable for use in hazardous areas.
Weight/shipping weight (rounded up to the nearest 1 lb or 0.5 kg)	3 lb/4 lb (1.5 kg/2.0 kg)

Table 5. Rosemount 499ACL-02 Sensor Specifications

Wetted parts	Gold, Noryl[1] (PPO), Viton, EPDM, and silicone
Dimensions	1.0 x 5.6 in. (25.4 x 143 mm)
Temperature rating	0 to 50 °C (32 to 122 °F)
Electrolyte capacity	Approximately 25 mL
Electrolyte life	Approximately 4 months
Cable	25 ft (7.6 m) standard. (Sensor is also available with Variopol quick-disconnect fitting.)
Pressure rating	0 to 65 psig (101 to 549 kPa)
Weight/shipping weight (rounded up to the nearest 1 lb or 0.5 kg)	3 lb/4 lb (1.5 kg/2.0 kg)

1. Noryl is a registered trademark of General Electric.

Table 6. Complete System Specifications

Linear range	0 to 20 ppm (mg/L) as Cl_2 (for higher ranges, consult factory)
Linearity (per ISO 15839)	0-10 ppm; 2%; 0-20 ppm: 3%
Response time	Following a step change in concentration, the reading reaches 90% of final value within 7 minutes at 25 °C (77 °F).
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

Dimensional Drawings

Figure 1. Dimensions of TCL Case

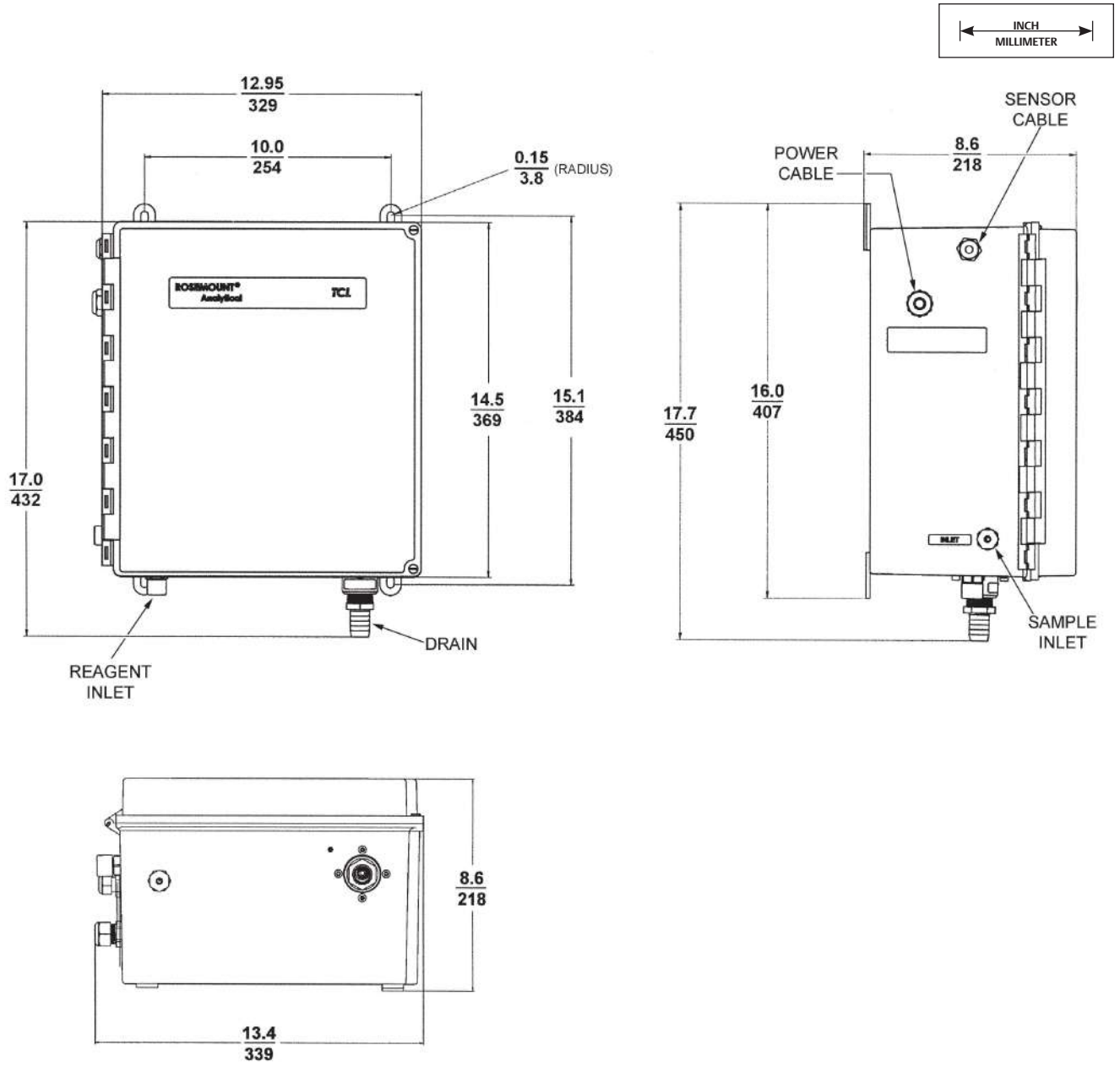


Figure 2. Rosemount 1056-24 Panel Mount Installation

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

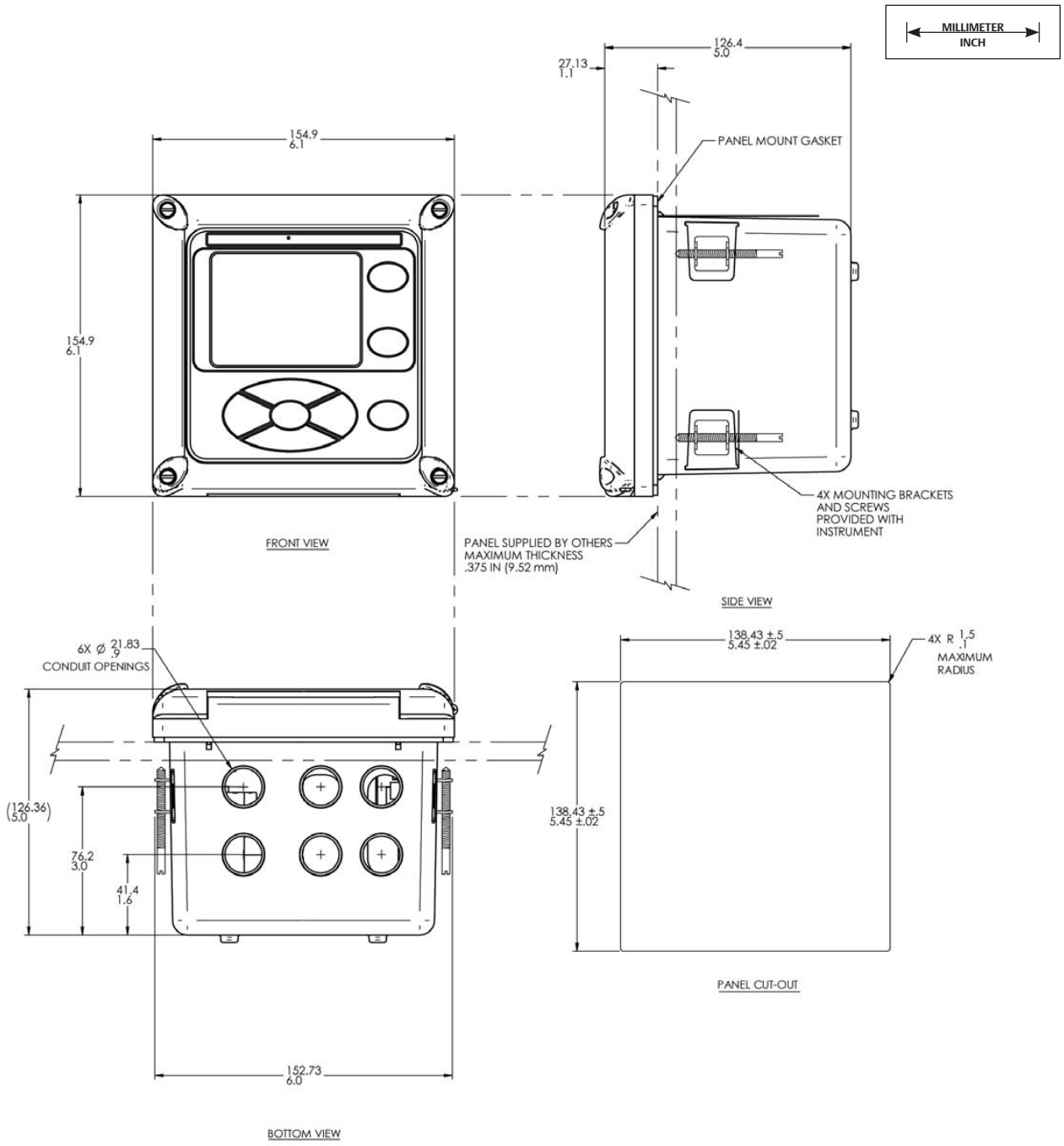


Figure 3. Rosemount 1056-24 Pipe/Wall Mount Installation

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

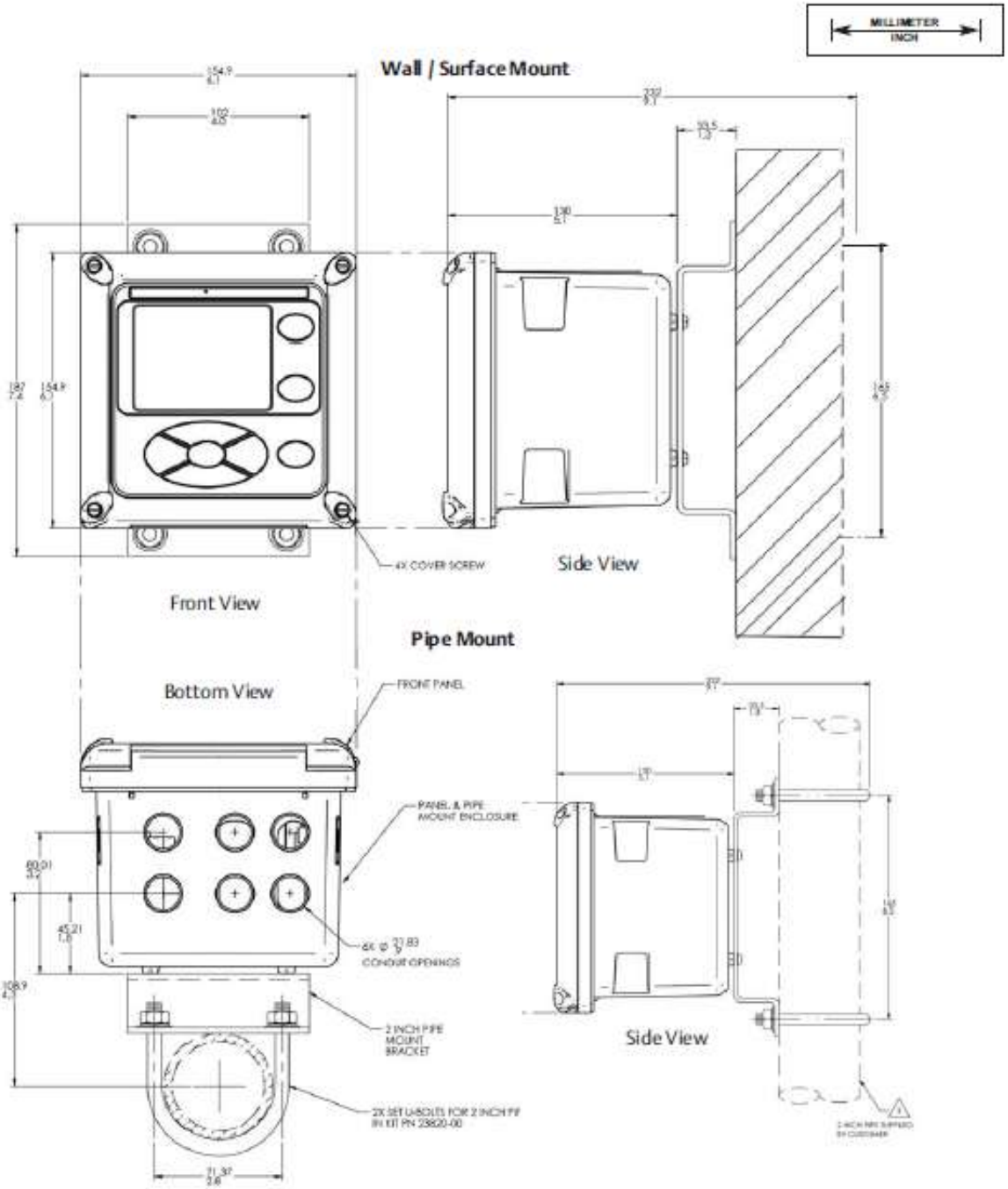


Figure 4. Rosemount 56-24 Panel Mount Installation

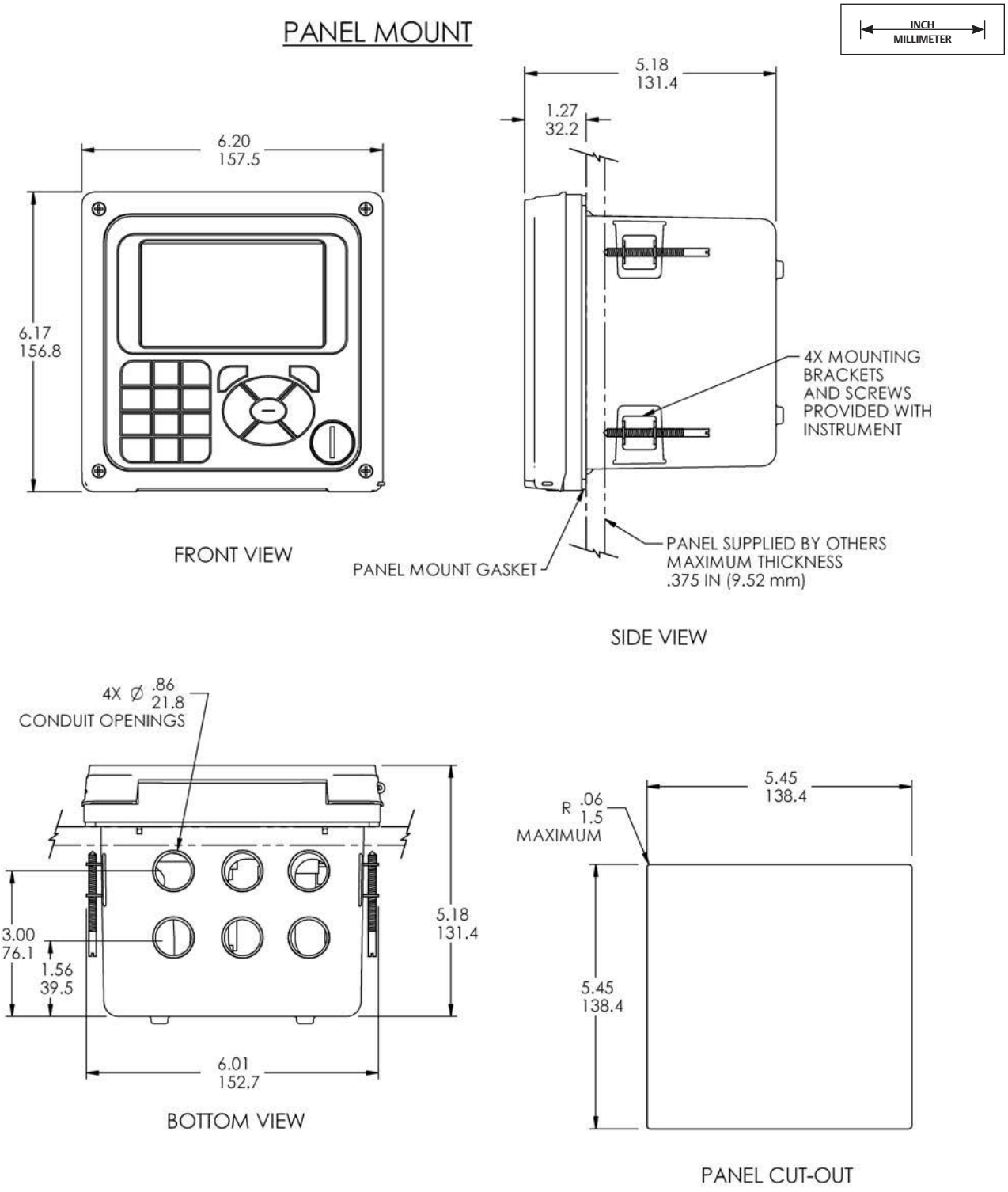
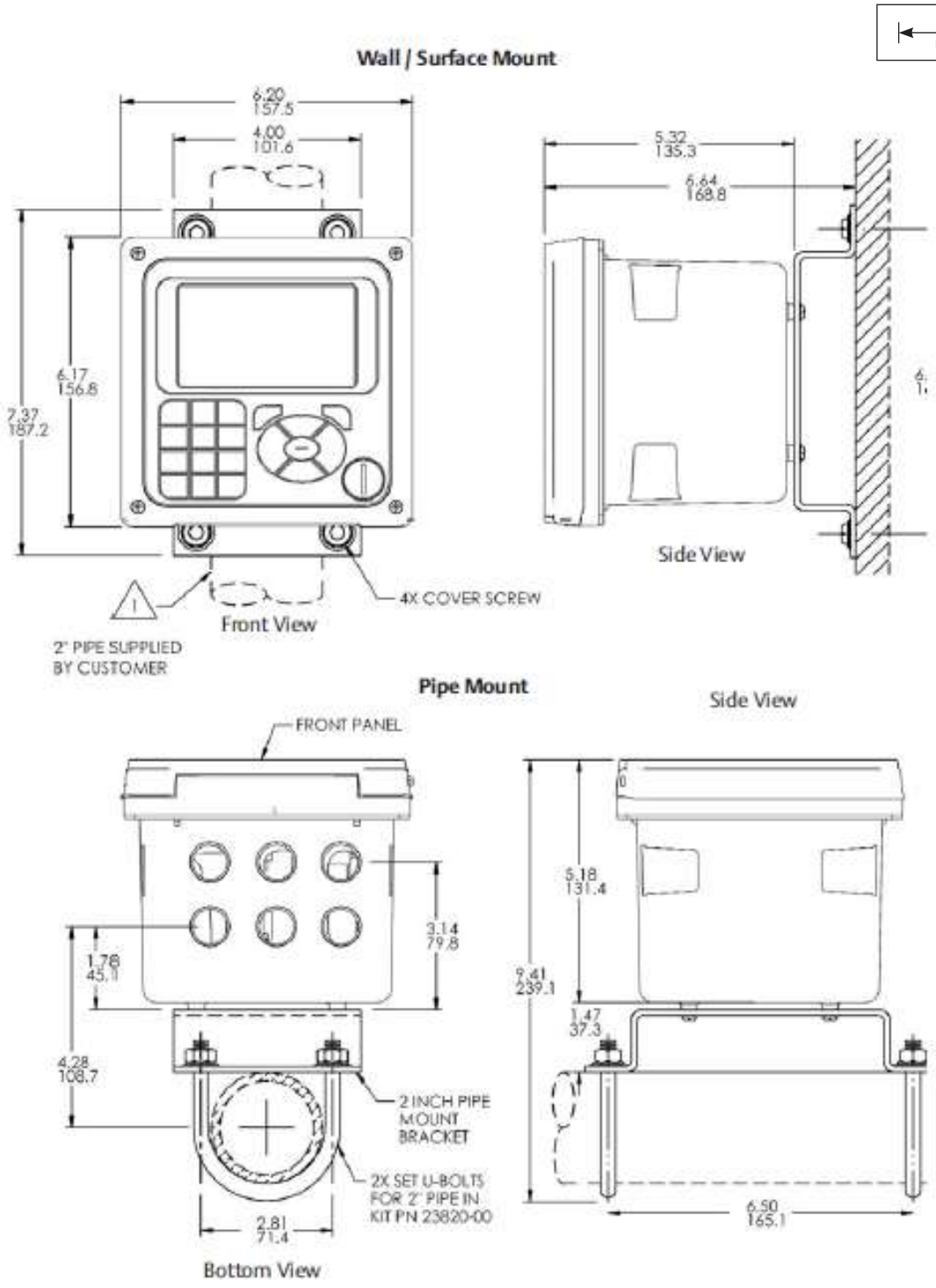


Figure 5. Rosemount 56-24 Pipe/Wall Mount Installation



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 $CaCO_3$).
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 Cl_2. Between 0 and 10 ppm, the linearity shall be at least 2%; between 0 and 20 ppm, the linearity shall be at least 3%.
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 corrrect it for temperature effects. Results shall be displayed as ppm 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 0 and 55 °C (32 and 131 °F) and between 5 and 95% 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 $CaCO_3$).
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 Cl_2. Between 0 and 2 ppm, the linearity shall be at least 2%; between 0 and 20 ppm, the linearity shall be at least 3%. 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 corrrect it for temperature effects. Results shall be displayed as ppm 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 7. Sample Conditioning System Accessories

Part number	Description
24134-00	Air pump, 115 Vac, 50/60 Hz
24134-01	Air pump, 230 Vac, 50/60 Hz
9160578	Air pump repair kit
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)
9380094	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
24135-00	Reagent uptake tubing, 6 ft (1.8 m), includes weight
9380090	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 8. 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 9. Sensor Accessories

Part number	Description
23501-02	Total chlorine membrane, includes 1 membrane assembly and 1 O-ring
23502-02	Total chlorine membrane kit, includes 3 membrane assemblies and 3 O-rings
9210438	Total chlorine sensor fill solution, 4 oz (120 mL)

Table 10. 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)

Global Headquarters
Emerson Automation Solutions
8200 Market Blvd.
Chanhassen, MN 55317, USA
+1 800 999 9307 or +1 952 906 8888
+1 952 949 7001
Liquid.CSC@Emerson.com

Latin America Regional Office
Emerson Automation Solutions
1300 Concord Terrace, Suite 400
Sunrise, FL 33323, USA
+1 954 846 5030
+1 952846 5121
RFQ.RMD-RCC@Emerson.com

Europe Regional Office
Emerson Automation Solutions Europe GmbH
Neuhofstrasse 19a P.O. Box 1046
CH 6340 Baar
Switzerland
+1 954 846 5030
+1 952846 5121
RFQ.RMD-RCC@Emerson.com

Asia Pacific Regional Office
Emerson Automation Solutions Asia Pacific Pte LTD
1 Pandan Crescent
Singapore 128461
+65 6777 8211
+65 6777 0947
Enquiries@AP.Emerson.com

Middle East and Africa Regional Office
Emerson Automation Solutions
Emerson FZE P.O. Box 17033
Jebel Ali Free Zone - South 2
+971 4 8118100
+971 4 88665465
RFQ.RMTMEA@Emerson.com

Analyticexpert.com

Linkedin.com/company/Emerson-Automation-Solutions

Twitter.com/Rosemount_News

Facebook.com/Rosemount

Youtube.com/user/RosemountMeasurement

Google.com/+RosemountMeasurement