Reference Manual
00809-0100-3166, Rev BA
January 2026

Rosemount™ 1066

Smart-Enabled Two-Wire Transmitter

ROSEMOUNT™

EMERSON™

Safety information

Emerson designs, manufactures, and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. You must adhere to the following instructions and integrate them into your safety program when installing, using, and maintaining Emerson's Rosemount products.

⚠ 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. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and may result in fire, electrical hazards, or improper operation.

- Read all instructions prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, contact your Emerson representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the installation instructions of the appropriate Quick Start Guide and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Emerson.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified people, to prevent electrical shock and personal injury.

⚠ WARNING

Risk of electrical shock

- Do not open while the circuit is live.
- Only clean with a damp cloth.

NOTICE

If a HART® Communicator is used with these transmitters, the software within the HART Communicator may require modification. If a software modification is required, please contact your local Emerson Service Group or National Response Center at 1-800-654-7768.

⚠ WARNING

Electrostatic ignition hazard

Special conditions for safe use (when installed in hazardous areas)

- The plastic enclosure, except the front panel, must only be cleaned with a damp cloth. The surface resistivity of the non-metallic enclosure materials is greater than one gigaohm. Take care to avoid electrostatic charge build-up. Do not rub or clean the transmitter with solvents or a dry cloth.
- The panel mount gasket has not been tested for type of protection IP66 or Class II and III. Type of protection IP66 and Class II, III refer to the enclosure only.
- Special condition of use of Rosemount 1066 C FF/FII5 and 1066 T FF/FII5. For use with simple apparatus Rosemount 140, 141, 142, 150, 400, 401, 402, 402VP, 403, 403VP, 404, and 410VP contacting conductivity sensors and Rosemount 222, 225, 226, and 228 toroidal sensors.

⚠ 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.

Contents

1 Description and specifications

1.1 Features and applications

The Rosemount 1066 Transmitter is a loop-powered, multi-parameter device which serves industrial, commercial, and municipal applications with the widest range of liquid measurements available for a two-wire liquid transmitter.

The transmitter supports continuous measurement of one liquid analytical input. The design supports easy internal access and wiring connections.

Analytical inputs

Ordering options for:

- pH/ORP
- Resistivity/conductivity
- Percent concentration
- Total chlorine
- Free chlorine
- Monochloramine
- Dissolved oxygen
- Ozone

Large display

The high-contrast LCD display provides live measurement readouts in large digits and shows up to four additional variables or diagnostic parameters.

Digital communication

HART® and FOUNDATION® Fieldbus options

Menus

Menu screens for calibrating and programming are simple and intuitive. Plain language prompts and ***Help*** screens guide you through the procedures. All menu screens are available in eight languages. The transmitter displays live process values during programming and calibration.

Quick start programming

Popular ***Quick Start*** screens appear the first time you turn on the transmitter. The transmitter prompts you to configure the sensor loop in a few quick steps for immediate commissioning.

Help screens

Fault and warning messages include ***Help*** screens, similar to PlantWeb™ alerts, which provide useful troubleshooting tips. These on-screen instructions are intuitive and easy to use.

Diagnostics

The transmitter continuously monitors itself and the sensor for problems. A display banner on the screen alerts technicians to fault and/or warning conditions.

Languages

Eight languages:

- English
- French
- German
- Italian

- Spanish
- Portuguese
- Chinese
- Russian

Current outputs	HART units include two 4-20 mA electrically isolated current outputs, giving the ability to transmit the live measurement value and the process temperature reported from the sensor.
Input dampening	Automatically enabled to suppress noisy process readings.
Smart-enabled pH	Smart pH capability eliminates field calibration of pH probes through automatic upload of calibration data and history.
Automatic temperature compensation	Most measurements require temperature compensation. The transmitter automatically recognizes Pt100, Pt1000, or 22k NTC resistance temperature detectors (RTDs) built into the sensor.
Smart wireless Thum adapter compatible	Enable wireless transmissions of process variables and diagnostics from hard-to-reach locations.

1.2 General specifications

Enclosure	Polycarbonate, IP66 (Canadian Standards Association [CSA], FM), Type 4X (CSA)
Dimensions	Overall 6.10 x 6.10 x 5.15 in. (154.9 x 154.9 x 130.8 mm) Cutout: ½ DIN 5.45 x 5.45 in. (138.4 x 138.4 mm)
Conduit openings	Six. Accepts 0.5 in. (13 mm) or PG 13.5 conduit fittings.
Display	Monochromatic graphic LCD display. 128 x 96 pixel resolution. Active display area: 2.3 x 3.0 in. (58 x 76 mm) No back light. All fields of the main display are customizable to meet user requirements.
Ambient temperature and humidity	-4 °F (-20.0 °C) to 149 °F (65.0 °C) Relative humidity: 5 to 95 percent (non-condensing)
Storage temperature	-4.0 °F (-20 °C) to 158.0 °F (70 °C)
HART® communication	Primary variable, secondary variable, tertiary variable, and quaternary variable assignable to measurement, temperature, and all live HART diagnostics.
Power	Code -01: 115/230 Vac ±15 percent, 50/60 Hz. 10 W. Code -02: 20 to 30 Vdc. 15 W. Code -03: 85 to 265 Vac, 47.5 to 65.0 Hz, switching. 15 W.(1)
⧈	Equipment protected by double insulation.

(1) Code -02 and -03 power supplies include four programmable relays.

NOTICE

Electromagnetic interference/radio frequency interference (EMI/RFI) effect
Meets all requirements of EN61326.

No effect on the values being given if using a 4-20 mA analog, FOUNDATION™ Fieldbus digital, or HART digital signal with shielded, twisted pair wiring.

Note

During EMI disturbance, maximum deviation is < 0.006 ppm (6 ppb) for models that measure chlorine, dissolved oxygen, and ozone.

Note

During EMI disturbance, maximum deviation is < 18% of reading for model options C and T.

Note

During EMI disturbance, maximum deviation is < 2.5 pH for model option P.

Current output accuracy	±0.05 mA at 77 °F (25 °C)
Terminal connections rating	Power connector (three leads): 24-12 AWG wire size. Signal board terminal blocks: 26-16 AWG wire size. Current output connectors (two leads): 24-16 AWG wire size. Alarm relay terminal blocks: 24-12 AWG wire size (-02: 24 Vdc power supply and -03: 85-265 Vac power supply)
Weight/shipping weight	2 lb (0.9 kg)/3 lb (1.4 kg)

Hazardous location approvals

Table 1-1: Intrinsic Safety (with Appropriate Safety Barrier)

	Class 1, II, III, Div. 1(1) Groups A - G T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C) Enclosure 4X, IP66 For intrinsically safe installation, see Drawing 1400669.
ATEX	IECEx BAS 11.0098X Ex ia IIC T4 Ga T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C)
	CE 1180 II 1 G Baseefa11ATEX0195X Ex ia IIC T4 Ga T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C)

Table 1-1: Intrinsic Safety (with Appropriate Safety Barrier) *(continued)*

FM APPROVED	Class I, II, & III, Division 1, Groups A-G T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C) IP66 enclosure Class I, Zone 0, AEx ia IIC T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C) For intrinsically safe installation, see Drawing 1400670

(1) Additionally approved as a system with Rosemount 140, 141, 142, 150, 400, 400VP, 401, 402, 403, 403VP, 404, and 410VP contacting conductivity sensors and Rosemount 222, 225, 226, and 228 inductive conductivity s.

Table 1-2: Non-Incendive

CSA C US	Class I, Div. 2, Groups A-D(1) Dust ignition proof Class II & III, Div. 1, Groups E and F Class II & III, Div. 1, Groups E-G Type 4/4X enclosure T4 Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C) For non-incendive field wiring installation, see Drawing 1400669.
FM APPROVED	Class I, Division 2, Groups A-D Dust ignition proof Class II & III, Div. 1, Groups EFG Class II & III, Division 1, Groups E-G Tamb = -4.0 °F (-20 °C) to 149.0 °F (65 °C), IP66 enclosure For non-incendive field wiring installation, see Drawing 1400670.

Complies with the following standards:

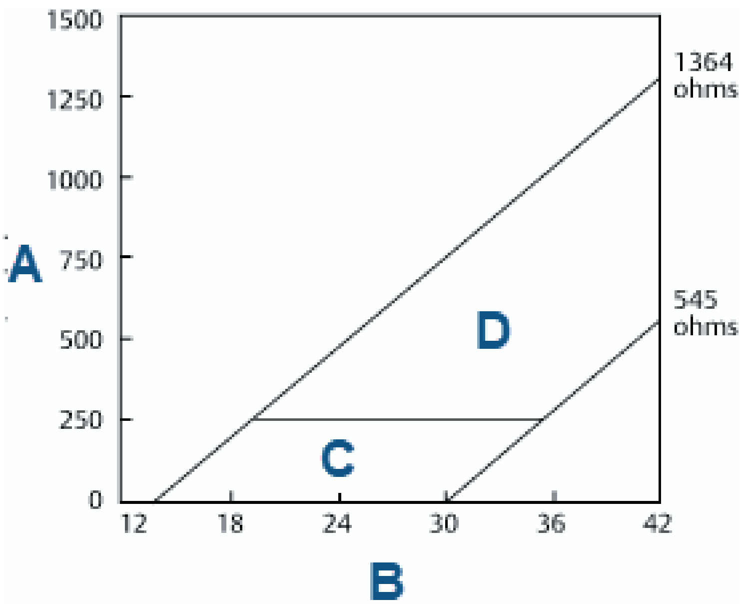
Canadian Standards Association (CSA)	C22.2 No 0 – 10; C22.2 No 0.4 – 04; C22.2 No. 25-M1966: , C22.2 No. 94-M91: , C22.2 No.142-M1987: , C22.2 No. 157-M1992: , C22.2 No. 213-M1987: , C22.2 No. 60529: 05. UL: 50: 11th Ed.; 508: 17th Ed.; 913: 7th Ed.; 1203: 4th Ed.. ANSI/ISA: 12.12.10-2013.
ATEX	EN 60079-0 :2012+A11: 2013, 60079-11: 2012
IECEx	IEC 60079-0: 2011 Edition: 6.0, I EC 60079-11 : 2011-06 Edition: 6.0
FM	3600: 2011, 3610: 2010, 3611: 2004, 3810: 2005, IEC 60529: 2004, ANSI/ISA 60079-0: 2009,ANSI/ISA 60079-11: 2009 Input: One isolated sensor input. Measurement choices of pH/oxidation reduction potential (ORP), resistivity/conductivity/total dissolved solids (TDS), percent concentration, total and free chlorine, monochloramine, dissolved oxygen, dissolved ozone, and temperature. For contacting conductivity measurements, temperature element can be a PT1000 resistance temperature detector (RTD) or a PT100 RTD. Other measurements (except ORP), use PT100 or PT1000 RTDs or a 22k NTC (dissolved oxygen only).

Power and load requirements

Supply voltage at the transmitter terminals should be at least 12.7 Vdc. Power supply voltage should cover the voltage drop on the cable plus the external load resistor required for HART® communications (250 Ω minimum). Minimum power supply voltage is 12.7 Vdc. Maximum power supply voltage is 42.4 Vdc (30 Vdc for intrinsically safe operation). Figure

1-1 shows the supply voltage required to maintain 12 Vdc (upper line)and 30 Vdc (lower line) at the transmitter terminals when the current is 22 mA.

Figure 1-1: Load/Power Supply Requirements



A. Load, ohms
B. Power supply voltage, Vdc, HART option
C. With HART communication
D. Without HART communication

Analog outputs

Two-wire loop powered (Output 1 only). Two 4-20 mA electrically isolated current outputs (Output 2 must be externally powered). Superimposed HART digital signal on Output 1. Fully scalable over the operating range of the sensor.

1.3 pH/oxidation reduction potential (ORP) specifications

Code -P.

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

Measurement choices are:

- pH
- ORP
- Redox

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.

1.3.1 Performance specifications (pH input)

Measurement range (pH)	0 to 14 pH
Accuracy	±0.01 pH
Buffer recognition	• NIST • DIN 19266 • JIS 8802 • BSI
Input filter	Time constant 1 to 999 seconds Default: Four seconds
Response time	Five seconds to 95 percent of final reading

Figure 1-2: General Purpose and High Performance pH Sensors: Rosemount 396PVA and 3300HT

1.3.2 Performance specifications (oxidation reduction potential [ORP] input)

Measurement range (ORP)	-1400 to 1400 mV
Accuracy	±1 mV

Input filter	Time constant: 1-999 seconds, default four seconds
Response time	Five seconds to 95 percent of final reading
Recmmended sensors	All standard ORP sensors

1.4 Contacting conductivity specifications

Code -C

Measures conductivity in the range 0 to 600,000 µS/cm (600 mS/cm). Measurement choices are:

- Conductivity
- Resistivity
- Total dissolved solids
- Salinity
- Percent concentration. When selecting this option, choose from five common solutions:
  - 0 to 12 percent NaOH
  - 0 to 15 percent HCl
  - 0 to 20 percent NaCl
  - 0 to 25 percent or 96 to 99.7 percent H_2SO_4

In addition, the custom curve feature allows you to define a three to five point curve to measure ppm, percent, or a no unit variable.

The conductivity concentration algorithms for these solutions are fully temperature compensated. Three temperature compensation options are available: manual slope (X percent/° C), high purity water (dilute sodium chloride), and cation conductivity (dilute hydrochloric acid). You can disable temperature compensation to allow the transmitter to display raw conductivity. For more information concerning the use and operation of the contacting conductivity sensors, refer to the product data sheets.

Note
The Rosemount 410VP four-electrode high range conductivity sensor is compatible with the Rosemount 1066.

Input filter	Time constant 1 to 999 seconds, default two seconds.
Response time	Three seconds to 95 percent of final reading using the default input filter.
Salinity	Uses Practical Salinity Scale.
Total dissolved solids	Calculated by multiplying conductivity at 77 °F (25 °C) by 0.65.

Figure 1-3: Performance specifications: Recommended Range for Contacting Conductivity

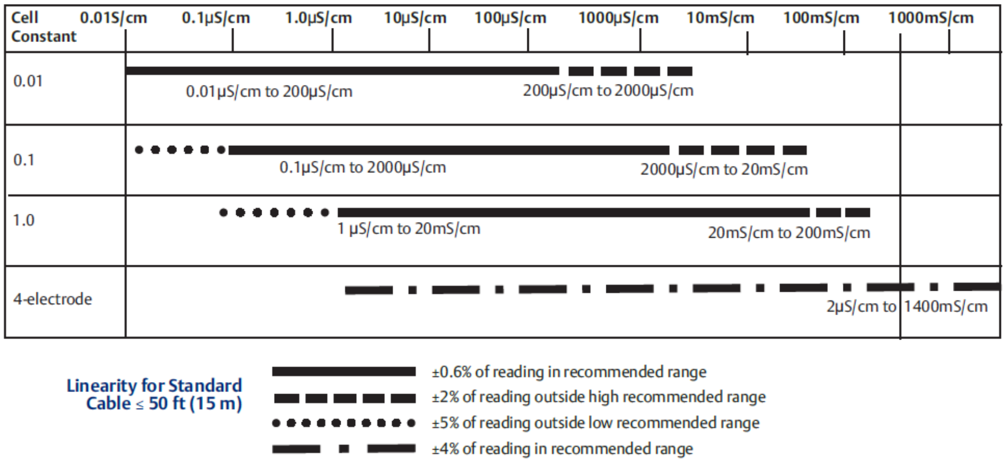


Figure 1-4: ENDURANCE Series of Rosemount Conductivity Sensors

Recommended sensors for conductivity

All Rosemount 400 series conductivity sensors (Pt 1000 resistance temperature detector [RTD]) and 410VP four-electrode sensor.

1.5 Toroidal conductivity specifications

Code -T

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. When selecting this option, choose from five common solutions:
  - 0 to 12 percent NaOH
  - 0 to 15 percent HCl
  - 0 to 20 percent NaCl
  - 0 to 25 percent or 96 to 99.7 percent H_2SO_4

The conductivity concentration algorithms for these solutions are fully temperature compensated. For other solutions, an easy-to-use menu allows you to enter your own data. 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. Two temperature compensation options are available: manual slope X percent/° C) and neutral salt (dilute sodium chloride). You can disable temperature compensation, allowing the transmitter to display raw conductivity. You can also adjust reference temperature and linear temperature slope for optimum results. For more information concerning the use and operation of the toroidal conductivity sensors, refer to the Product Data Sheets.

Repeatability	±0.25 percent, ±5 µS/cm after zero calibration.
Input filter	Time constant 1 to 999 seconds, default two seconds.
Response time	Three seconds to 95 percent of final reading.
Salinity	Uses Practical Salinity Scale.
Total dissolved solids	Calculated by multiplying conductivity at 77 °F (25 °C) by 0.65.

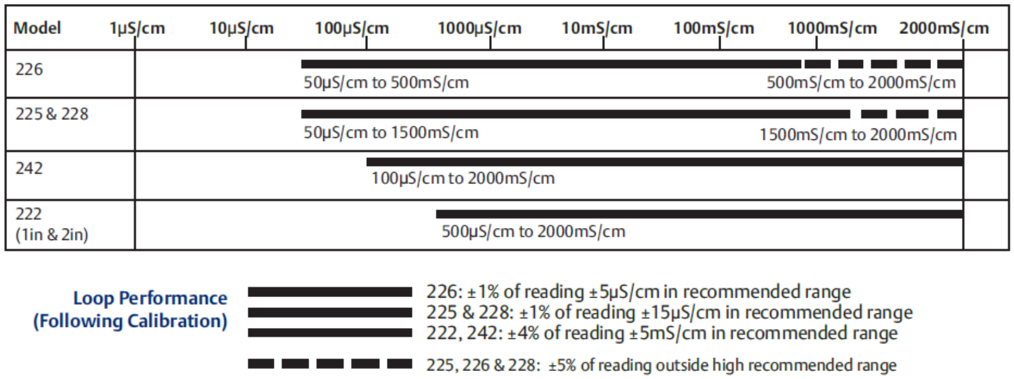
Table 1-3: Temperature specifications

Temperature range	-13 ° to +410 °F (-25 °C to +210 °C)
Temperature accuracy, Pt-100, -13 to +122 °F (-25 °C to +50 °C)	±0.5 °C
Temperature accuracy, Pt-100, +122 to +410 °F (+50 to +210 °C)	±1 °C

Recommended sensors

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

Figure 1-5: Performance Specifications



Recommended range: toroidal conductivity.

Figure 1-6: High performance 225 Toroidal and 226 Conductivity sensors

1.6 Chlorine specifications

Code -CL.

1.6.1 Free and total chlorine specifications

The Rosemount 1066 is compatible with the Rosemount 499ACL-01 free chlorine sensor and the Rosemount 499ACL-02 total chlorine sensor.

You must use the Rosemount 499ACL-02 sensor with the Rosemount TCL total chlorine sample conditioning system. The Rosemount 1066 fully compensates free and total chlorine readings for changes in membrane permeability caused by temperature changes. For free chlorine measurements, both automatic and manual pH correction are available.

For automatic pH correction, select an appropriate pH sensor.

For more information concerning the use and operation of the amperometric chlorine sensors and the Rosemount TCL measurement system, refer to the Product Data Sheets.

Performance specifications

Resolution	0.001 ppm or 0.01 ppm, selectable
Input range	0 nA to 100 µA
Automatic pH correction for free chlorine (user selectable for code -Cl)	6.0 to 10.0 pH

Temperature compensation	Automatic (via resistance temperature detector [RTD]) or manual (32.0 °F (0 °C) to 122.0 °F (50 °C))
Input filter	Time constant 1 to 999 seconds, default five seconds.
Response time	Six seconds to 95 percent of final reading.

Recommended sensors

Chlorine Rosemount 499ACL-01 free chlorine or Rosemount 499ACL-02 total chlorine.

pH Emerson recommends the following pH sensors for automatic pH correction of free chlorine readings:

Rosemount 3900-01, 3900-01-10, and 3900-02-10.

Figure 1-7: Rosemount 499ACL-01 Chlorine Sensor

1.6.2 Monochloramine specifications

The Rosemount 1066 is compatible with the Rosemount 499ACL-03 Monochloramine Sensor.

The transmitter fully compensates readings for changes in membrane permeability caused by temperature changes. Because monochloramine measurement is not affected by pH of the process, no pH sensor or correction is required. For more information concerning the use and operation of amperometric chlorine sensors, refer to the Product Data Sheets.

Performance specifications

Resolution	0.001 ppm or 0.01 ppm, selectable
Input range	0 nA to 100 μA

Temperature compensation	Automatic (via resistance temperature detector [RTD]) or manual (32.0 °F (0 °C) to 122.0 °F (50 °C))
Input filter	Time constant 1 to 999 seconds, default five seconds
Response time	Six seconds to 95 percent of final reading

Recommended sensor

Rosemount 499ACL-03 monochloramine sensor

1.7 Dissolved oxygen specifications

Code -DO.

The Rosemount 1066 is compatible with the Rosemount 499ADO, 499ATrDO, Hx438, Gx438, and Bx438 dissolved oxygen sensors and the Rosemount 4000 Percent Oxygen Gas Sensor.

The Rosemount 1066 displays dissolved oxygen in:The transmitter fully compensates oxygen readings for changes in membrane permeability caused by temperature changes.

Automatic air calibration, including salinity correction, is standard. The only required user entry is barometric pressure.

For more information on the use of amperometric oxygen sensors, refer to the Product Data Sheets.

Performance specifications

Resolution	0.001 ppm; 0.1 ppb for Rosemount 499ATrDO sensor (when O_2 < 1.00 ppm); 0.1 percent
Input range	0 nA to 100 µA
Temperature compensation	Automatic (via resistance temperature detector [RTD]) or manual (32.0 °F (0 °C) to 122.0 °F (50 °C))
Input filter	Time constant 1- 999 seconds, default five seconds.
Response time	Six seconds to 95 percent of final reading.

Recommended sensors

Rosemount amperometric membrane and steam-sterilizable sensors.

Figure 1-8: Rosemount 499ADO Dissolved Oxygen Sensor with Variopol connection

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

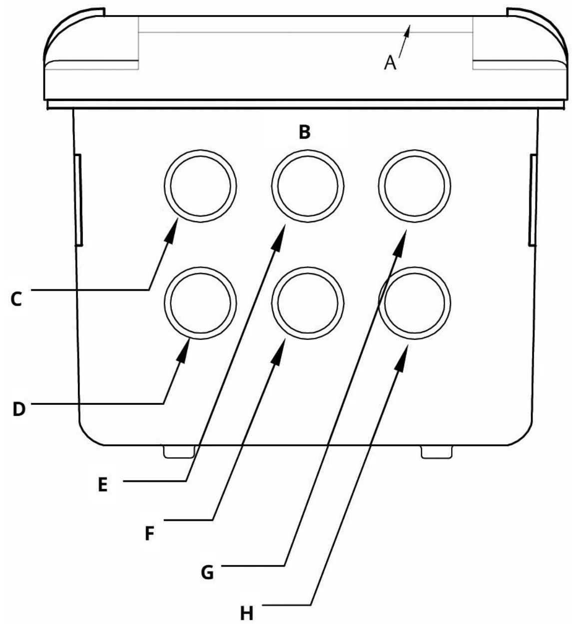
1. Install the transmitter with a sun shield or out of direct sunlight and areas with extreme temperatures.
2. Install the system in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
3. Keep the transmitter and sensor wiring at least 1 ft (0.30 m) from high voltage conductors. Ensure there is easy access to the transmitter and sample conditioning system.
4. The transmitter is suitable for panel, pipe, or surface mounting.
5. The transmitter case has six ½-in. (12.7 mm) conduit openings. Use separate conduit openings for the power/output cable, the sensor cable, and the other sensor cable as needed (pH input for free chlorine with continuous pH correction).
6. Use weathertight cable glands to keep moisture out of the transmitter. If using a conduit, plug and seal the connections at the transmitter housing to prevent moisture from getting inside the instrument.
7. Install cable gland 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.

2.3 Preparing conduit openings

There are six conduit openings in all configurations of the transmitter.

Note
Emerson fits four of the openings with plugs upon shipment.

Figure 2-1: Conduit openings



A. Front panel/keypad
B. Power leads
C. Alarm relay leads
D. Sensor 1 cable
E. 4-20 mA/HART®/Profibus® leads
F. Sensor 2 cable
G. Spare opening

NOTICE

Always use proper cable gland fittings and plugs for wire and cable installations.

Conduit openings accept 0.5 in. (13 mm) conduit fittings or PG13.5 cable glands. To keep the case watertight, block unused openings with Type 4X or IP66 conduit plugs.

To maintain ingress protection for outdoor use, seal unused conduit holes with suitable conduit plugs.

NOTICE

Use watertight fittings and hubs that comply with your requirements. Connect the conduit hub to the conduit before attaching the fitting to the transmitter.

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

2.4 Mounting

NOTICE

Dimensions in the following drawings show inches above and millimeters below.

Figure 2-2: Panel mount front

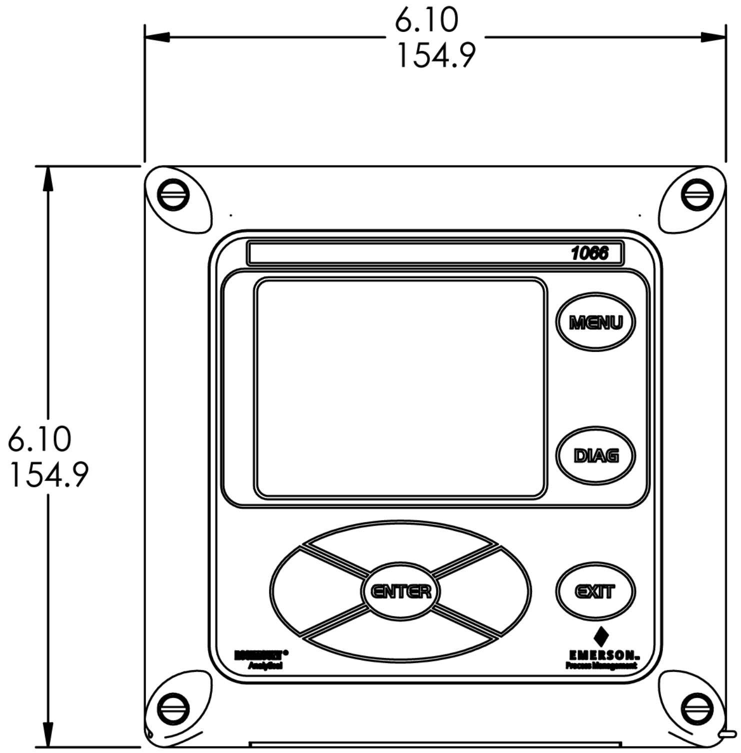
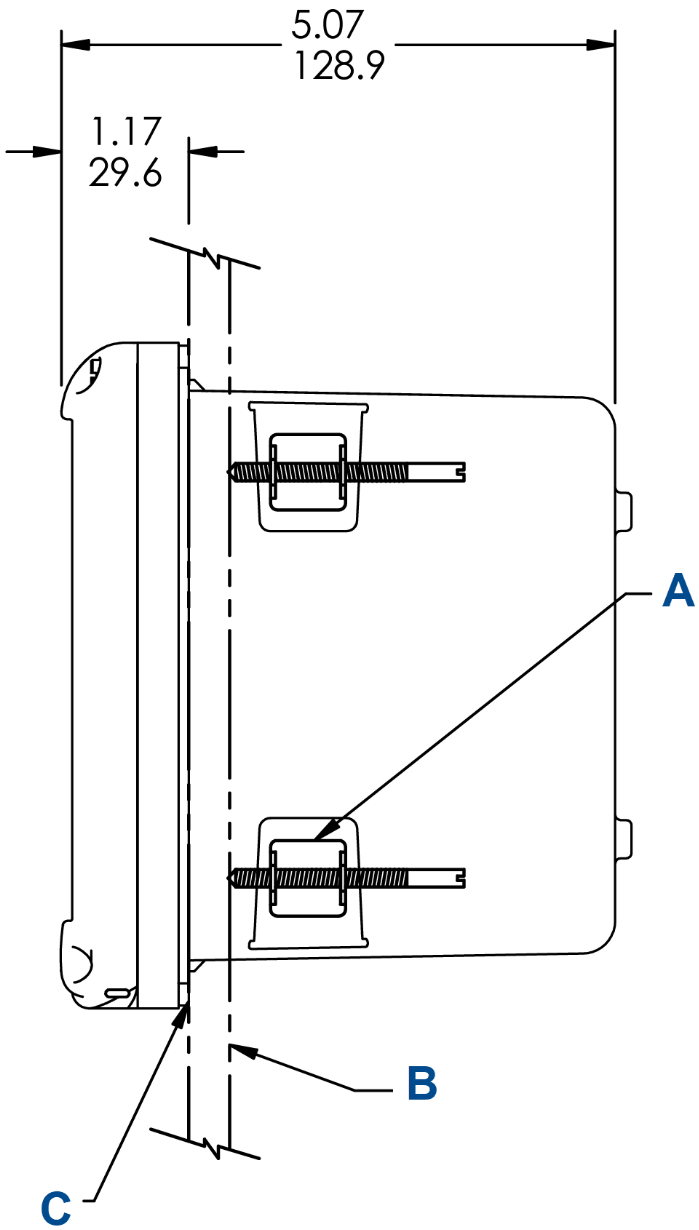
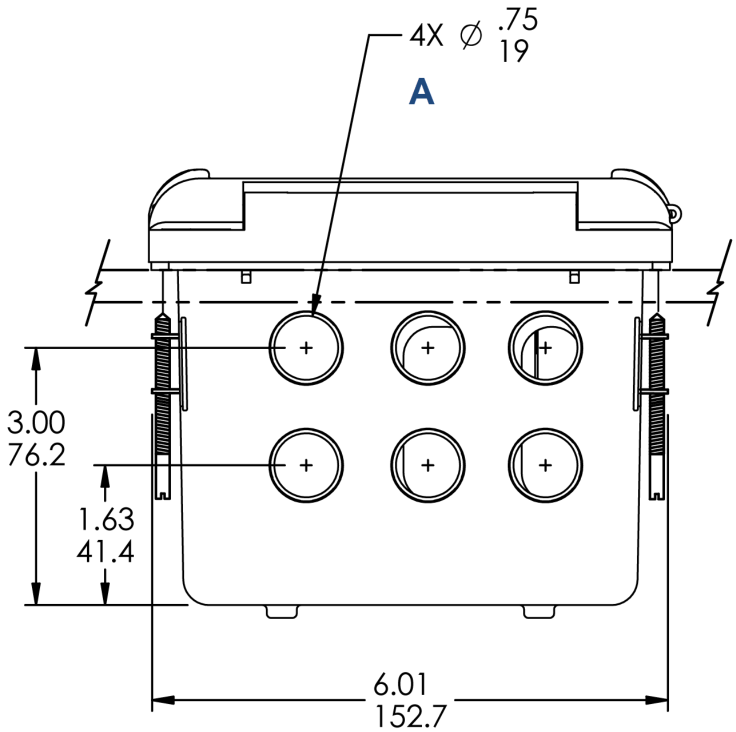


Figure 2-3: Panel mount side



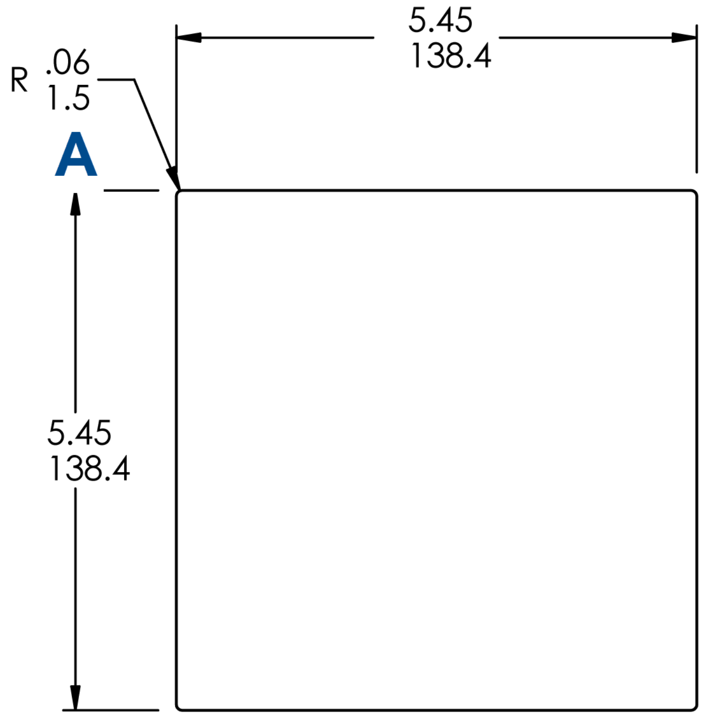
A. Four mounting brackets and screws provided with instrument
B. Panel supplied by others. Maximum thickness: 0.375-in. (9.52 mm)
C. Panel mount gasket

Figure 2-4: Panel mount bottom



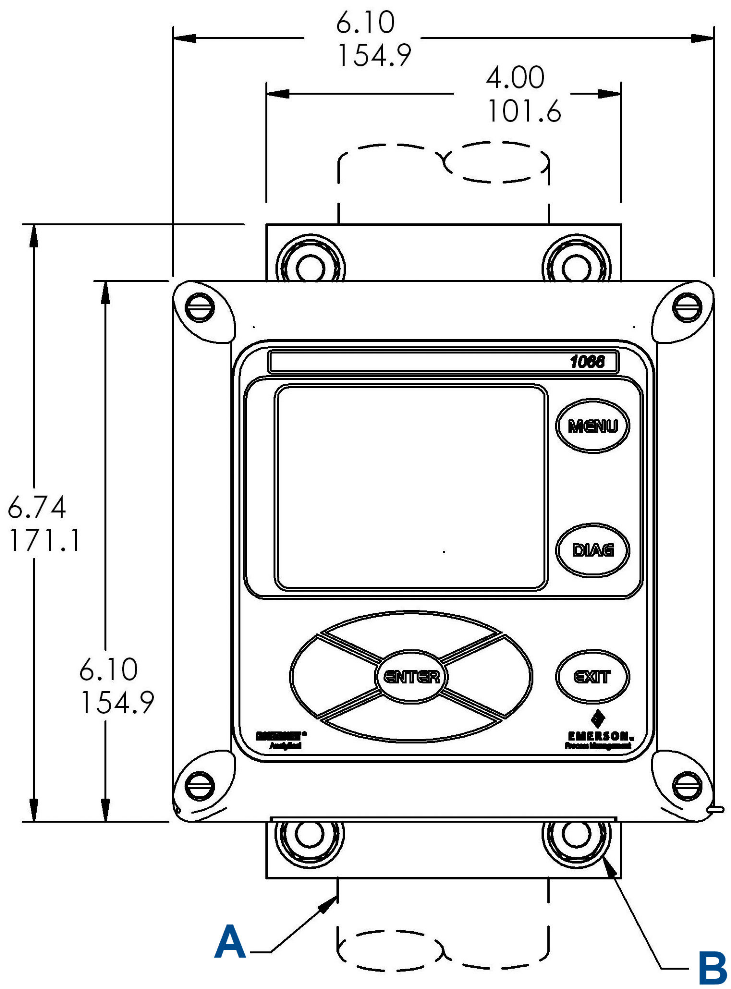
A. Conduit openings

Figure 2-5: Panel cut-out



A. Maximum

Figure 2-6: Wall mount front



A. *2-in. (50.8 mm) pipe supplied by customer*
B. *Four cover screws*

Figure 2-7: Wall mount side

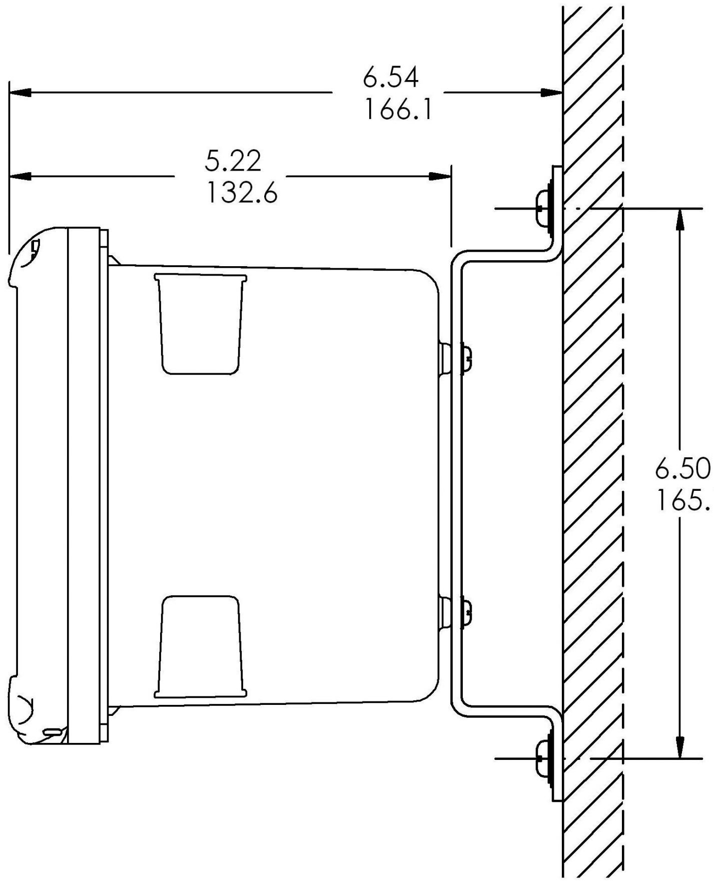
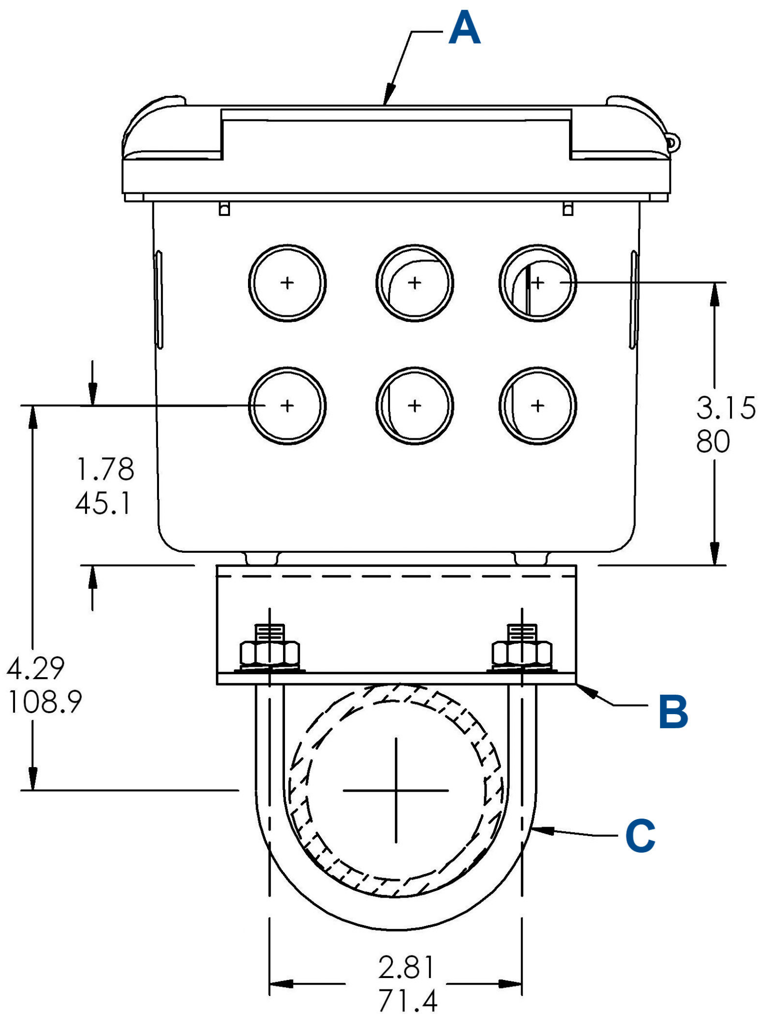
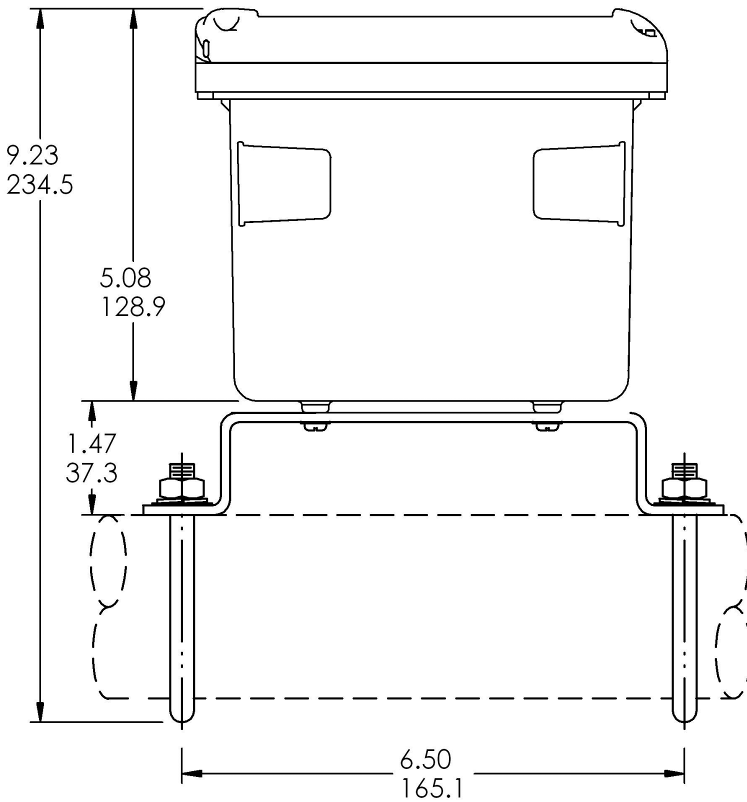


Figure 2-8: Pipe mount bottom



A. *Front panel*
B. *2-in (50.8 mm) pipe mount bracket*
C. *Two sets of U-bolts for 2-in (50.8 mm) pipe in kit PN 23820-00*

Figure 2-9: Pipe mount side



3 Wiring

3.1 General wiring information

All wiring connections are located on the main circuit board. The front panel is hinged at the bottom. The panel swings down for easy access to the wiring locations.

3.2 Digital communication

HART® and FOUNDATION™ Fieldbus communications are available as ordering options for the Rosemount 1066. HART units support Bell 202 digital communications over analog 4-20 mA current output 1.

3.3 Wiring power supply using HART®

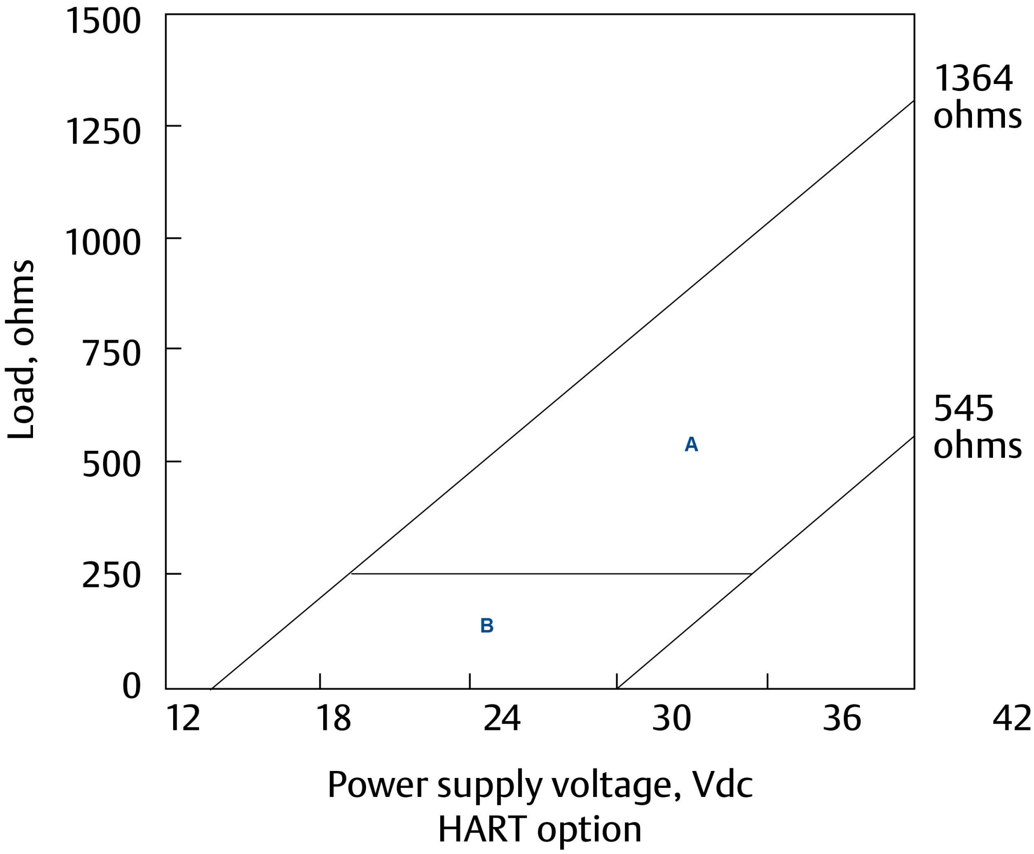
3.3.1 HART® power supply and load requirements

Refer to Figure 3-1. The supply voltage must be at least 12.7 Vdc at the transmitter terminals. The power supply must be able to cover the voltage drop on the cable as well as the load resistor (250 Ω minimum) required for HART communication. The maximum power supply voltage is 42.0 Vdc. For intrinsically safe installations, the maximum power supply voltage is 30.0 Vdc.

Figure 3-1 shows load and power supply requirements. The upper line is the power supply voltage needed to provide 12.7 Vdc at the transmitter terminals for a 22 mA current. The power supply must provide a surge current during the first 80 milliseconds of start-up. The maximum current is about 24 mA.

For digital communication, the load must be at least 250 ohms. To supply the 12.7 Vdc lift off voltage at the transmitter, the power supply voltage must be at least 17.5 Vdc.

Figure 3-1: Load/Power Supply Requirements



A. *With HART communication*
B. *Without HART communication*

3.3.2 HART® power supply - current loop wiring

Refer to Figure 3-2.

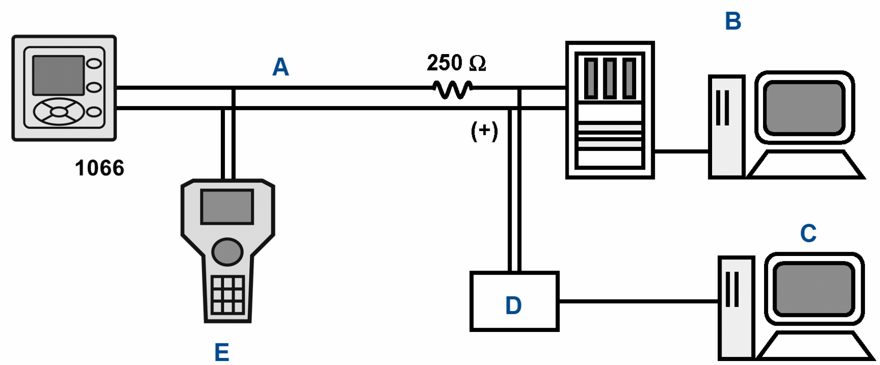
Run the power/signal wiring through the opening nearest TB-2.

For optimum EMI/RFI protection:

1. Use shielded power/signal cable and ground the shield at the power supply.
2. Use a metal cable gland and be sure the shield makes good electrical contact with the gland.
3. Use the metal backing plate when attaching the gland to the transmitter enclosure. The power/signal cable can also be enclosed in an earth-grounded metal conduit.

Note
Do not run power supply/signal wiring in the same conduit or cable tray with loop power lines. Keep power supply/signal wiring at least 6 ft. (2 m) away from heavy electrical equipment.

Figure 3-2: Rosemount 1066 System Block Diagram



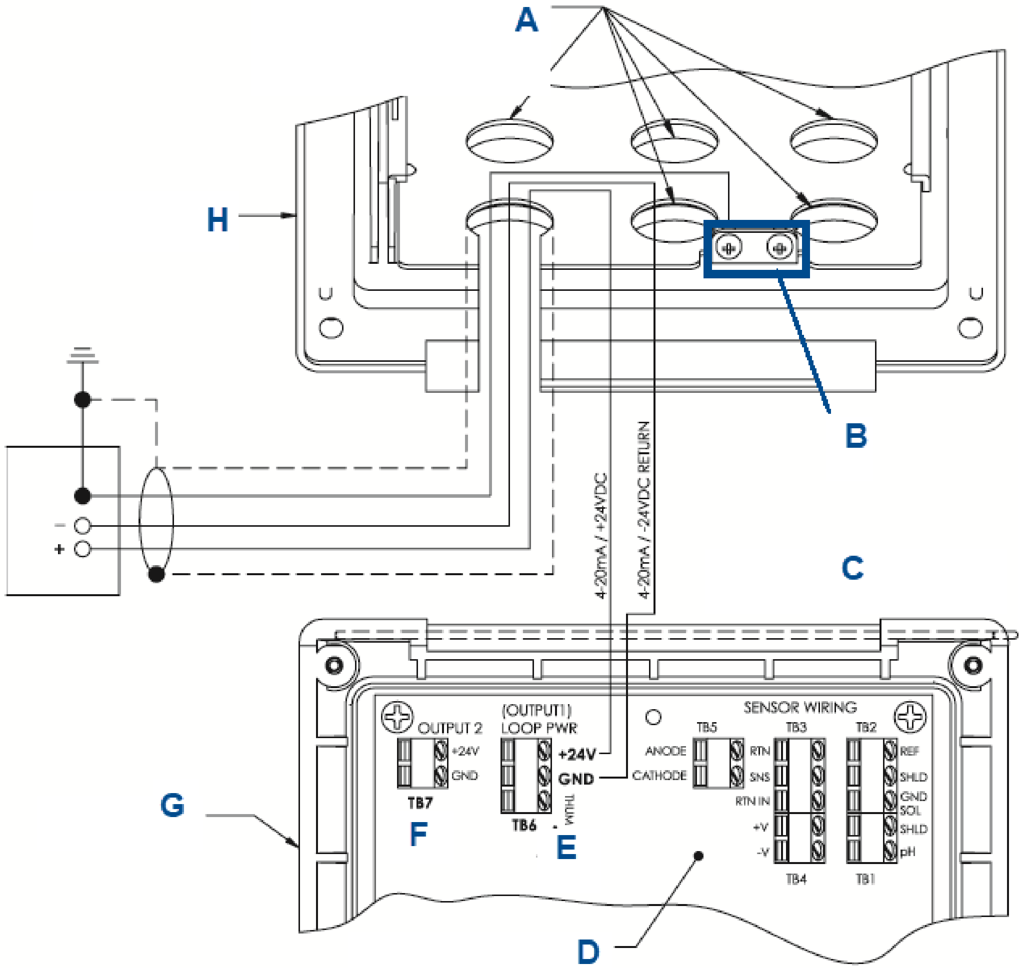
A. 4-20 mA and HART signal
B. Control system
C. Computer
D. Bridge
E. Field Communicator

3.3.3 HART® current output wiring

Emerson ships all instruments with two 4-20 mA current outputs. Current output 1 is the HART communications channel. Current output 2 is available to report process temperature measured by the temperature sensing element or resistance temperature device (RTD) within the sensor.

Wiring locations for the outputs are on the main board, which is mounted on the hinged door of the instrument. Wire the output leads to the correct position on the main board using the lead markings (+/positive, -/negative) on the board.

Figure 3-3: Rosemount 1066 HART loop power wiring



A. Install plugs in all other openings as needed
B. Ground lugs
C. Hinge side of front panel
D. Rosemount 1066 HART circuit board (pH/amperometric) ASSY 24539-00
E. TB5/THUM terminal is only used for wireless THUM adaptor instllations
F. TB7/output 2 requires external DC power
G. Hinged panel
H. Inner enclosure

3.4 Wire FOUNDATION™ Fieldbus power supply

Procedure

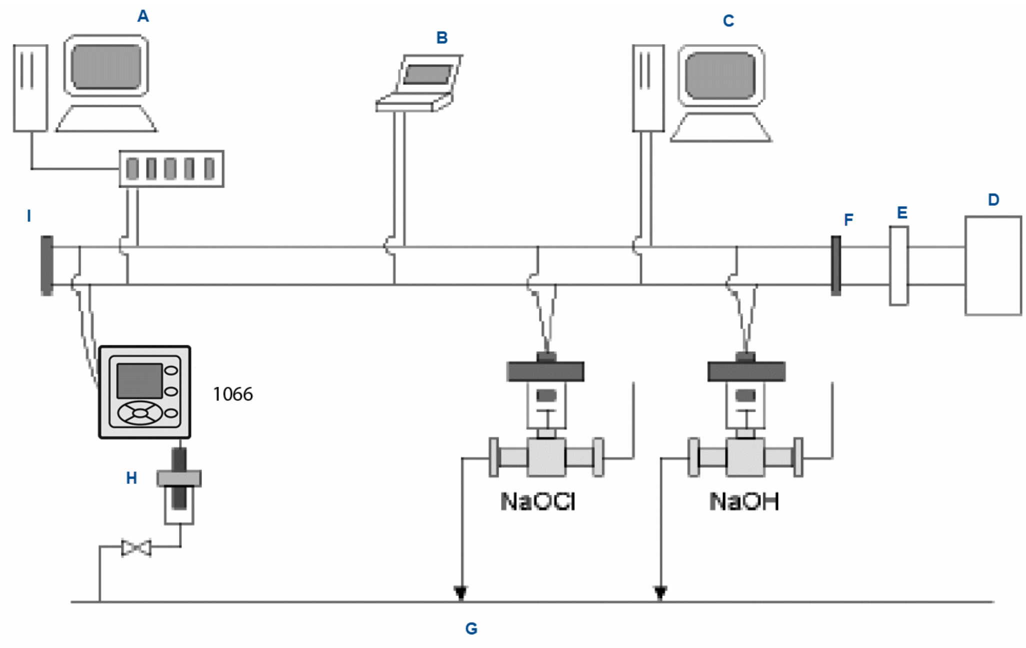
1. Run the power /signal wiring through the opening nearest TB2.
2. Use shielded cable and ground the shield at the power supply.
3. To ground the transmitter, attach the shield to TB2-3.

Note

For optimum electromagnetic interference (EMI) and radio frequency interference (RFI) immunity, shield the power supply/output cable and enclose it in an earth-grounded metal conduit. Do not run power supply/signal wiring in the same conduit or cable tray with loop power lines. Keep power supply/signal wiring at least 6 ft. (2 m) away from heavy electrical equipment.

Figure 3-4 shows the Rosemount 1066PFF being used to measure and control pH and chlorine levels in drinking water. The figure also shows three ways in which Fieldbus communication can be used to read process variables and configure the transmitter.

Figure 3-4: Configuring Rosemount 1066P Transmitter with FOUNDATION Fieldbus



A. *DeltaV configurator and host*
B. *Fieldbus technician configurator*
C. *Other host*
D. *Power supply*
E. *Filter*
F. *Terminator*
G. *Process line*
H. *pH sensor*
I. *Terminator*

3.5 Wire sensor to transmitter

Procedure

1. Wire the correct sensor leads to the main board using the lead locations marked directly on the board.

   Use integral cable SMART sensors or compatible VP8 pH cables to wire the Rosemount SMART pH sensors to the transmitter.

2. After wiring the sensor leads, use wiring diagrams found in the sensor manual to guide you as you carefully take up the excess sensor cable through the cable gland.

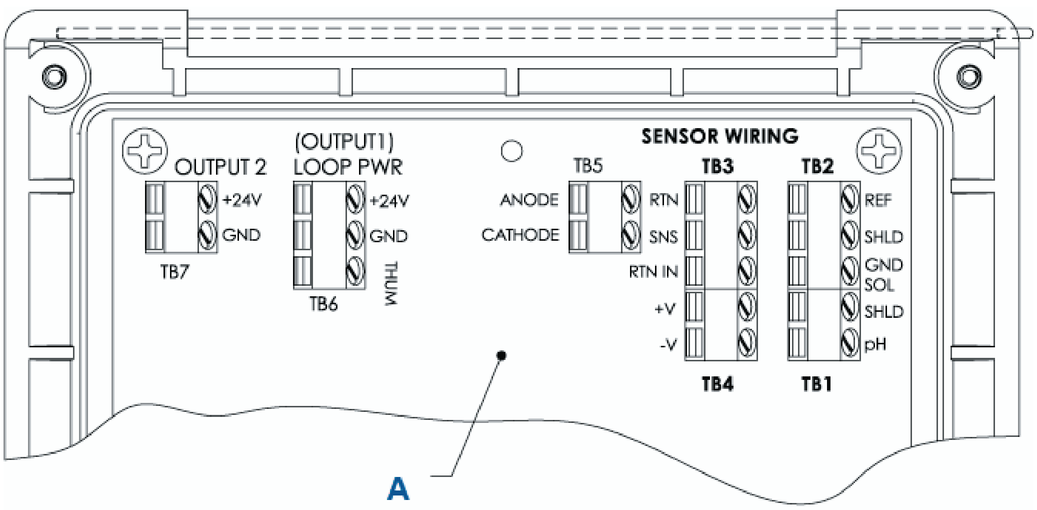
⚠ CAUTION

Keep sensor and output signal wiring separate from loop power wiring. Do not run sensor and power wiring in the same conduit or close together in a cable tray.

When wiring a pH/ORP sensor to the transmitter, follow this order:

1. Wire **TB3**/RTD to the return, sense, and RTD in terminals.
2. Wire **TB2**/reference and solution ground to the reference in, reference shield, and solution ground terminals.
3. Wire **TB4**/preamplifier (if present) to the +volts and -volts terminals.
4. Wire **TB1**/pH input to the pH shield and pH in terminals.

Figure 3-5: pH/ORP Sensor Wiring to the Transmitter Printed Circuit Board



A. Rosemount 1066 circuit board ASSY 24539-00 (HART®)

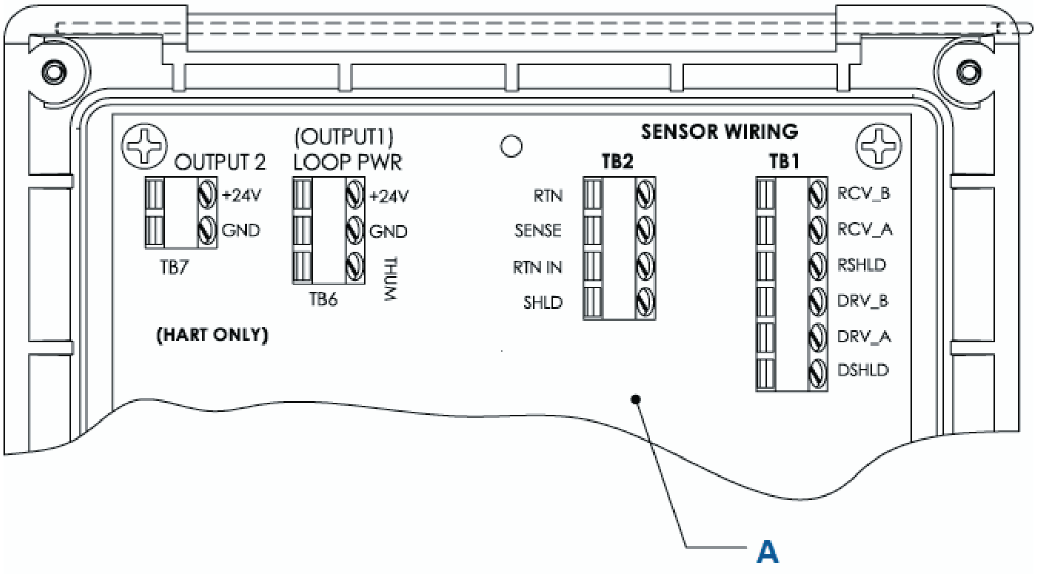
Note

A. If ground lead is present, terminate it to green ground screw on inner enclosure.
B. TB5, TB6, and TB7 are not used for pH/ORP sensor wiring.

When wiring a contacting or toroidal conductivity sensor to the transmitter, follow this order:

1. Wire **TB2**/RTD to the return, sense, RTD in, and shield terminals.
2. Wire **TB1**/conductivity to the receive B, receive A, shield, drive B, drive A, and shield terminals.

Figure 3-6: Contacting and Toroidal Conductivity Sensor Wiring to the Transmitter Circuit Board

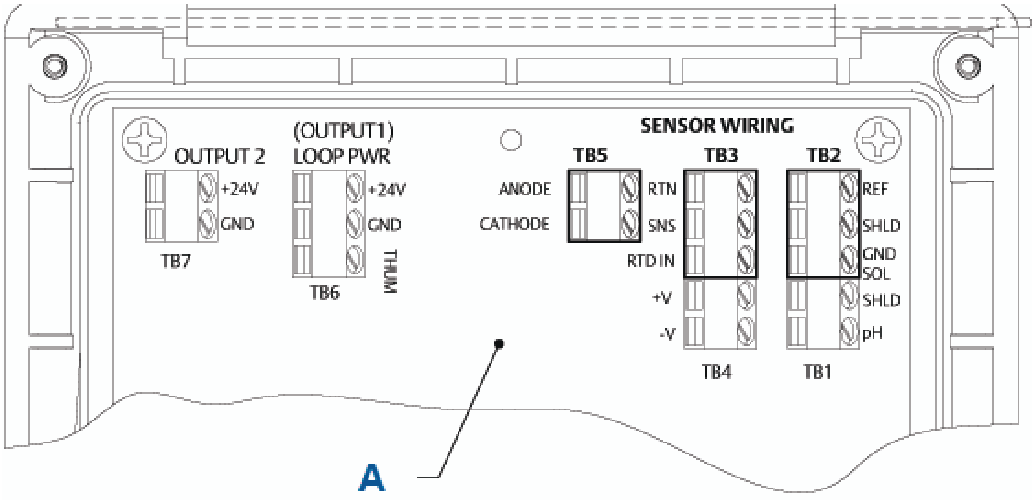


A. *Rosemount 1066 circuit board ASSY 24638-00 (HART)*

When wiring a chlorine, oxygen, or ozone sensor to the transmitter, follow this order:

1. Wire **TB5**/anode and cathode to the anode and cathode terminals.
2. Wire **TB3**/RTD to the return, sense, and RTD in terminals.
3. Wire **TB2**/solution ground to the solution ground terminal.

Figure 3-7: Chlorine, Oxygen, Ozone Sensor Wiring to Transmitter Printed Circuit Board

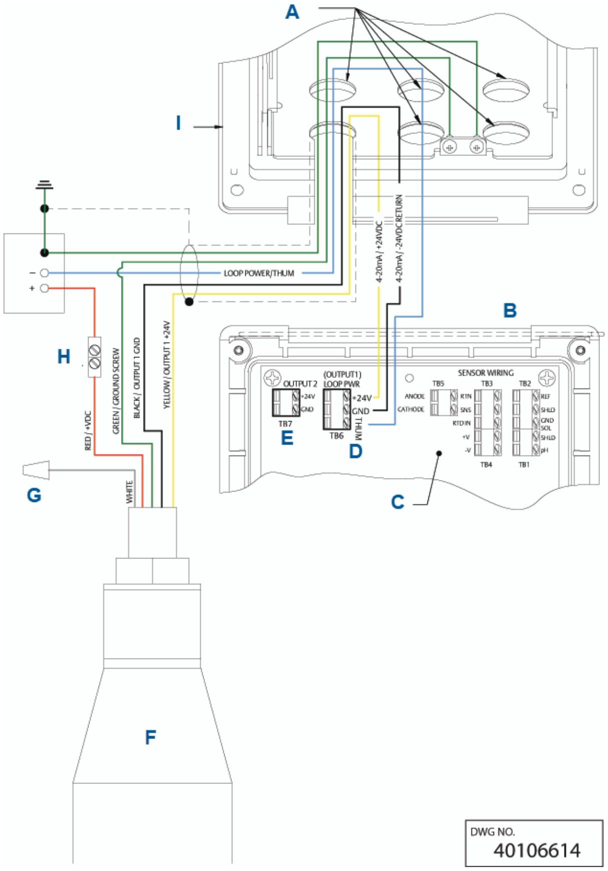


A. *Rosemount 1066 circuit board ASSY 24406-xx*

Note

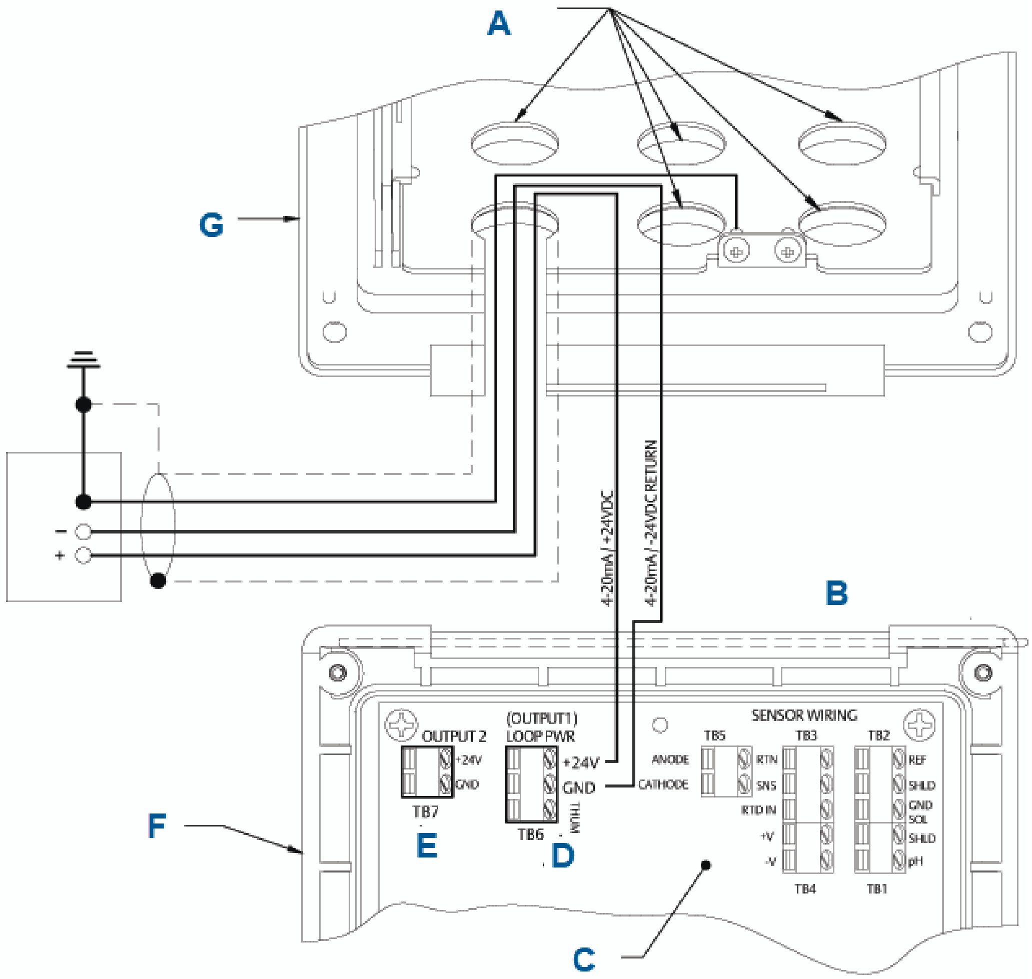
A. *TB1, TB4, TB6, and TB7 not used for oxygen and ozone sensor wiring.*

Figure 3-8: Power/Current Loop Wiring with Wireless THUM™ Adapter



A. *Install plugs in all other openings as needed.*
B. *Hinge side of front panel*
C. *HART circuit board (pH/chlorine/dissolved oxygen/ozone) ASSY 24406-xx*
D. *TB6/THUM terminal is used only for wireless THUM adapter installations. 250 ohm resistor is pre-installed in-circuit.*
E. *TB7/output 2 requires external DC power*
F. *Wireless THUM adapter*
G. *Wire nut*
H. *Splice connector - provided by end user*
I. *Inner enclosure*

Figure 3-9: HART Loop Power Wiring



A. *Install plugs in all other openings as needed*
B. *Hinge side of front panel*
C. *HART circuit board (pH/chlorine/dissolved oxygen/ozone) ASSY 24406-xx*
D. *TB6/THUM terminal is used only for wireless THUM adapter installations*
E. *TB7/output 2 requires external DC power*
F. *Hinged panel*
G. *Inner enclosure*

For recommended wire entry points, see Figure 2-1.

4 Navigating the display

4.1 User interface

The transmitter has a large display which shows the measurement readout and temperature in large digits and up to four additional process variables or diagnostic parameters concurrently. You can customize the displayed variables to meet your requirements. This is called display format.

The intuitive menu system allows access to Calibration, Hold (of current outputs), Programming, and Display functions. In addition, a dedicated **DIAG** button is available to provide access to useful operational information on installed sensor(s) and any problematic conditions that might occur. The display flashes **Fault** and/or **Warning** when these conditions appear. ***Help*** screens are displayed for most fault and warning conditions to guide you in troubleshooting. During calibration and programming, key presses cause different displays to appear. The displays are self-explanatory and guide you step-by-step through the procedure.

4.2 Instrument keypad

There are four function keys and four selection keys on the instrument keypad.

Function keys

Four top-level menu items appear when you press **MENU**.

Calibrate	Calibrate the attached sensor(s) and analog output(s).
Hold	Suspend analog outputs.

Program Program outputs, measurements, temperature, and security. You can also reset the transmitter.

Display Program display format, language, warnings, and contrast.

Press **MENU** to display the ***Main Menu*** screen. Press **MENU** followed by **EXIT** to display the main display.

Pressing the **DIAG** key displays active faults and warnings and provides detailed instrument information and sensor diagnostics, including: faults, warnings, sensor information, Out 1 and Out 2, the current values, model configuration string (e.g. 1066-P-Ht-60), and instrument software version. Pressing **DIAG** on Sensor 1 or Sensor 2 provides useful diagnostics and information (as applicable): measurement, sensor type, raw signal value, cell constant, zero offset, temperature, temperature offset, selected measurement range, cable resistance, temperature sensor resistance, and software version.

Press **ENTER** to store numbers and settings and move the display to the next screen.

Press **EXIT** to return to the previous screen without storing changes.

Selection keys

Surrounding the **ENTER** key, four selection keys - **Up**, **Down**, **Right**, and **Left** - move the cursor to all areas of the screen while using the menus.

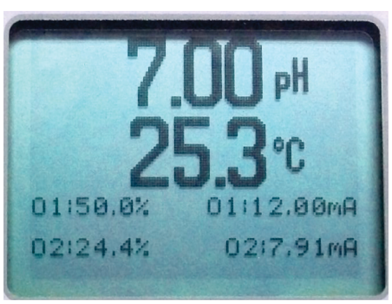
Selection keys are used to:

1. Select items on the menu screens.
2. Scroll up and down the menu lists.
3. Enter or edit numeric values.
4. Move the cursor to the right or left.
5. Select measurement units during operation.

4.3 Main display

The transmitter displays: the primary measurement value and temperature and up to four secondary measurement values, a fault and warning banner, and a digital communications icon.

Process measurements



One process variable and process temperature are displayed by default. For all configurations, the upper display area shows the live process variable, and the center display area shows the temperature (default screen settings).

Secondary values

Up to four secondary values are shown in display quadrants at the bottom half of the screen. You can program all four secondary value positions to any displayable parameter available.

Fault and Warning banner

If the transmitter detects a problem with itself or the sensor, then the word **Fault** or **Warning** will appear at the bottom of the display. A fault requires immediate attention. A warning indicates a problematic condition or an impending failure. For troubleshooting assistance, press **DIAG**.

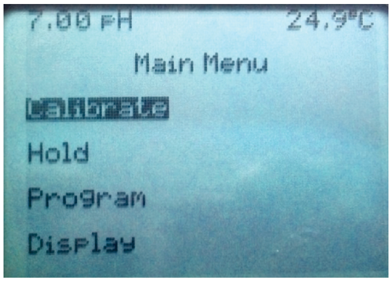
Formatting the main display

You can program the main display screen to show primary process variables, secondary process variables, and diagnostics.

1. Press **MENU**.
2. Scroll down to **Display**. Press **ENTER**.
3. **Main Format** is highlighted. Press **ENTER**.
4. The Sensor 1 process value is highlighted in reverse video. Press the selection keys to navigate down to the screen sections that you wish to program. Press **ENTER**.
5. Choose the desired display parameter or diagnostic for each of the four display sections in the lower screen.
6. Continue to navigate and program all desired screen selections. Press **MENU** and **EXIT**. The screen returns to the main display.

The default display shows the live process measurement in the upper display area and the temperature in the center display area. You can elect to disable the display of temperature in the center display area using the Main Format function.

4.4 Menu system



The transmitter uses a scroll and select menu system. Pressing the **MENU** key at any time opens the top-level menu including Calibrate, Hold, Program, and Display functions.

To find a menu item, scroll with the up and down keys until the item is highlighted. Continue to scroll and select menu items until the desired function is chosen.

To select the item, press **ENTER**. To return to a previous menu level or to enable the main live display, press the **EXIT** key repeatedly. To return immediately to the main display from any menu level, simply press **MENU** and then **EXIT**.

The selection keys have the following functions:

- The **Up** key (above **ENTER**) increments numerical values, moves the decimal point one place to the right, or selects units of measurement.

- The **Down** key (below **ENTER**) decrements numerical values, moves the decimal place one place to the left, or selects units of measurement.
- The Left key (left of **ENTER**) moves the cursor to the left.
- The Right key (right of **ENTER**) moves the cursor to the right.

To access desired menu functions, use the Quick Reference Guide. During all menu displays (except main display format and Quick Start), the live process measurement and temperature value are displayed in the top two lines of the upper display area. This conveniently allows display of the live values during important calibration and programming operations. Menu screens will time out after two minutes of inactivity and return to the main live display.

5 Start up transmitter

Procedure

1. Wire sensor(s) to the signal boards.

   See Wiring for wiring instructions. Refer to the sensor Quick Start Guide for additional details. Make current output, alarm relay, and power connections.

2. Once connections are secured and verified, apply DC power to the transmitter.

   This symbol identifies a risk of electical shock.

   This symbol identifies a potential hazard. When this symbol appears, consult the manual for appropriate action.

   When the transmitter is powered up for the first time, ***Quick Start*** screens will appear. Quick Start operating tips are as follows:

   - A highlighted field shows the position of the cursor.
   - To move the cursor left or right, use the keys to the left or right of the **ENTER** key. To scroll up or down or to increase or decrease the value of a digit, use the keys above and below the **ENTER** key. Use the **Left** or **Right** keys to move the decimal point.
   - Press **ENTER** to store a setting. Press **EXIT** to leave without storing changes. Press **EXIT** during Quick Start to return the display to the initial startup screen (***Select language***).

3. Choose the desired language and press **ENTER.**
4. Choose measurement and press **ENTER**.
5. For pH, choose preamplifier location.
   a) Select **Analyzer** to use the integral preamplifier in the transmitter.
   b) Select **Sensor/J-Box** if your sensor is SMART or has an integral preamplifier or if you are using a remote preamplifier located in a junction box.
6. If applicable, choose units of measurement.
7. For contacting and toroidal conductivity, choose the sensor type and enter the numeric cell constant using the keys.
8. Choose temperature units: °F or °C.
   The main display appears. The outputs are assigned to default values.
9. To change output settings, to scale the 4-20 mA current outputs, to change measurement-related settings from the default values, and to enable pH diagnostics, press **MENU**. Select **Program** and follow the prompts.

   Refer to the appropriate menu.

10. To return the transmitter to the factory default settings, choose **Program** under the ***Main Menu*** and then scroll to **Reset**.

    If you need further support, see Emerson.com/global.

6 Programming the transmitter

6.1 General programming information

Typical programming steps include the following procedures.

- Change the measurement type, measurement units, and temperature units.
- Choose temperature units and manual or automatic temperature compensation mode.
- Configure and assign values to the current outputs.
- Set a security code for two levels of security access.
- Access menu functions using a security code.
- Enable and disable Hold mode for current outputs.
- Reset all factory defaults, calibration data only, or current output settings only.

6.2 Changing start-up settings

To change the measurement type, measurement units, or temperature units you initially entered in Quick Start, select **Reset** or access the ***Program*** menus for the sensor.

Table 6-1 displays the choices for specific measurement type and measurement units available for each sensor measurement board.

Table 6-1: Measurements and Measurement Units

Signal board	Available measurements	Measurement units
pH/oxidation reduction potential (ORP) P	• pH • ORP • Redox	• pH • mV (ORP, redox)
Contacting conductivity C	• Conductivity • Resistivity • Total dissolved solids (TDS) • Salinity • NaOH (0-12%) • HCl (0-15%) • Low H_2SO_4 • High H_2SO_4 • NaCl (0-20%) • Custom curve	• µS/cm • mS/cm • S/cm • % (concentration)

Table 6-1: Measurements and Measurement Units *(continued)*

Signal board	Available measurements	Measurement units
Toroidal conductivity T	• Conductivity • Resistivity • TDS • Salinity • NaOH (0-12%) • HCl (0-15%) • Low H_2SO_4 • High H_2SO_4 • NaCl (0-20%) • Custom curve	• µS/cm • mS/cm • S/cm • % (concentration)
Chlorine Cl	• Free chlorine • Total chlorine • Monochloramine	• ppm • mg/L
Oxygen DO	• Oxygen (ppm) • Trace oxygen (ppb) • Percent oxygen in gas	• ppm • mg/L • ppb • µg/L • % saturation • Partial pressure • % oxygen in gas • ppm oxygen in gas
Ozone OZ	Ozone	• ppm • mg/L • ppb • µg/L

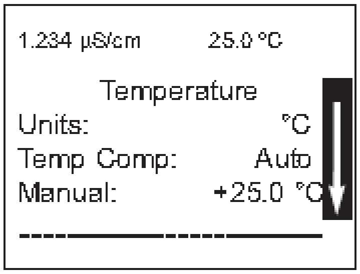
To reconfigure the transmitter to display new measurements or measurement units, refer to Reset factory default settings. To change the specific measurement or measurement units, refer to Programming the transmitter.

6.3 Choose temperature units and automatic/ manual temperature compensation

Most liquid measurements (except oxidation reduction potential [ORP] and redox) require temperature compensation.

The Rosemount 1066 performs temperature compensation automatically by applying internal temperature correction algorithms. You can also turn off temperature correction. If the temperature correction is off, the transmitter uses the temperature you enter in all temperature correction calculations.

Figure 6-1: Temperature Screen



6.4 Configuring and ranging the current outputs

6.4.1 Purpose of configuring and ranging the current outputs

The Rosemount 1066 has two analog current outputs.

Ranging the outputs means assigning values to the low (0 or 4 mA) and high (20 mA) outputs.

NOTICE

Always configure the outputs before ranging them.

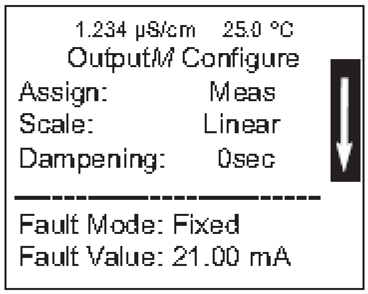
6.4.2 Definitions of outputs

Current outputs	The transmitter provides a continuous output current (4-20 mA or 0-20 mA) directly proportional to the process variable or temperature. You can set the low or high current outputs to any value.
Assigning outputs	Assign a measurement or temperature to Output 1 or Output 2.
Dampen	Output dampening smooths out noisy readings. It also increases the response time of the output. Output dampening does not affect the response time of the display.
Mode	You can make the current output directly proportional to the displayed value (linear mode) or directly proportional to the common logarithm of the displayed value (log mode).

6.4.3 Configure outputs

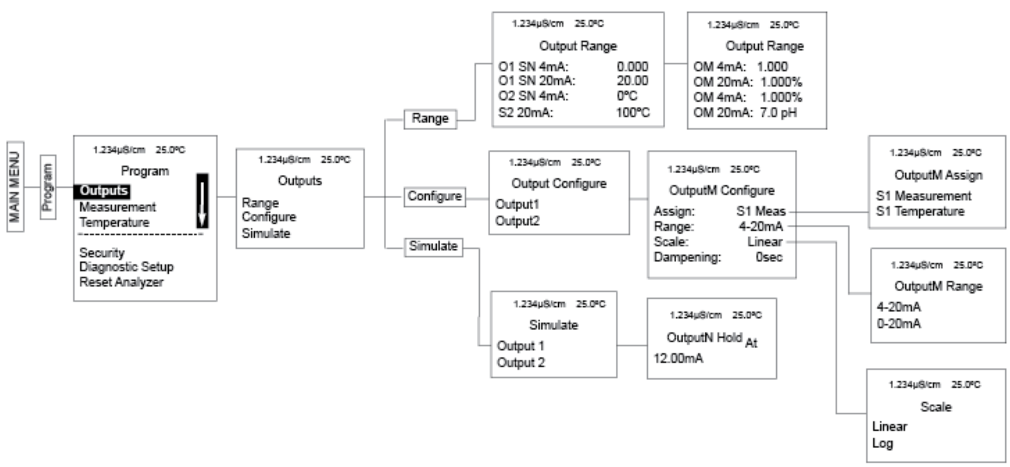
Under the ***Program/Outputs*** menu, Figure 6-2 appears to allow configuration of the outputs.

Figure 6-2: Configure Output Screen



Follow the menu screens in Figure 6-3 to configure the outputs.

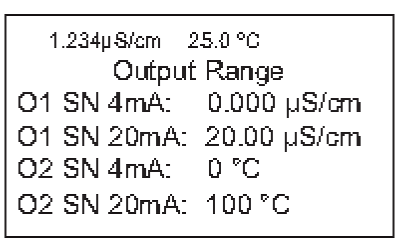
Figure 6-3: Configure and Range the Current Outputs



6.4.4 Range current outputs

Go to **Program** → **Output** → **Range**.

Figure 6-4: Output Range Screen



Enter a value for 4 mA and 20 mA (or 0 mA and 20 mA) for each output.

Follow the menu screens in Figure 6-3 to assign values to the outputs.

6.5 Set security code

The Rosemount 1066 has two levels of security codes to control access and use of the transmitter. The two levels of security are:

All	This is the supervisory security level. It allows access to all menu functions, including programming, calibration, hold, and display.
Calibration/Hold	This is the operator or technician level menu. It allows access to only calibration and hold of the current outputs.

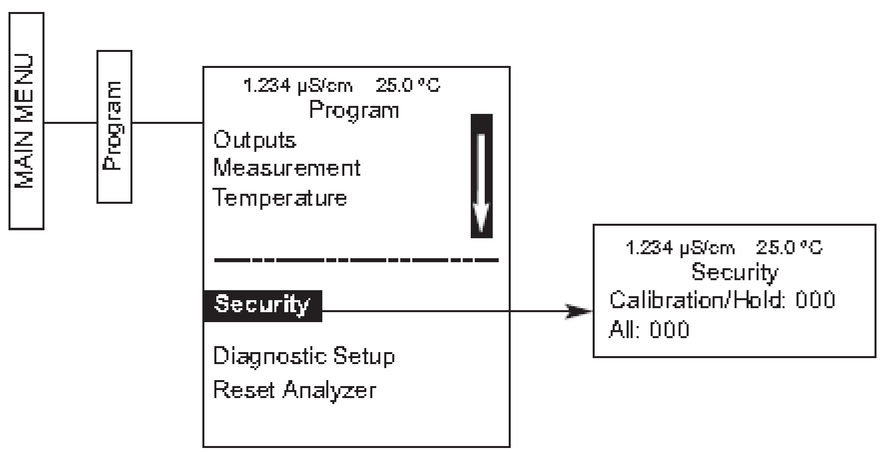
Procedure

1. Press **MENU**.
   The ***Main menu*** screen appears.
2. Select **Program**.
3. Select **Security**.
   The ***Security*** screen appears.
4. Enter a three digit security code for each of the desired security levels.
   The security code takes effect two minutes after the last key stroke.
5. Record the security codes for future access and communication to operators or technicians as needed.

The display returns to the ***Security*** menu screen.

Figure 6-5 displays the security code screens.

Figure 6-5: Setting a Security Code



Postrequisites

Press **EXIT** to return to the previous screen. To return to the main display, press **MENU** and then **EXIT**.

6.6 Security access

6.6.1 How the security code works

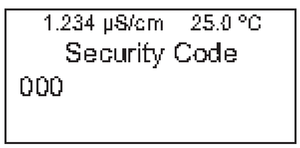
To access the ***Calibration*** and ***Hold*** menus, enter the correct access code for the Calibration/Hold security level. This allows operators or technicians to perform routine maintenance. This does not allow access to the ***Program*** or ***Display*** menus.

To access all menu functions, including programming, calibration, hold, and display, enter the correct access code for the All security level.

6.6.2 Use a security code

If someone has programmed a security code, selecting the Calibrate, Hold, Program, or Display top menu items causes the ***Security Code*** screen to appear.

Figure 6-6: *Security Code* Screen



Procedure

Enter the three-digit security code for the appropriate security level.

If the entry is correct, the appropriate menu screen appears. If the entry is incorrect, the ***Invalid Code*** screen appears. The ***Security Code*** screen reappears after two seconds.

6.7 Using hold

6.7.1 Purpose of hold

The transmitter output is always proportional to measured value. To prevent improper operation of systems or pumps that are controlled directly by the current output, place the transmitter on hold before removing the sensor for calibration and maintenance.

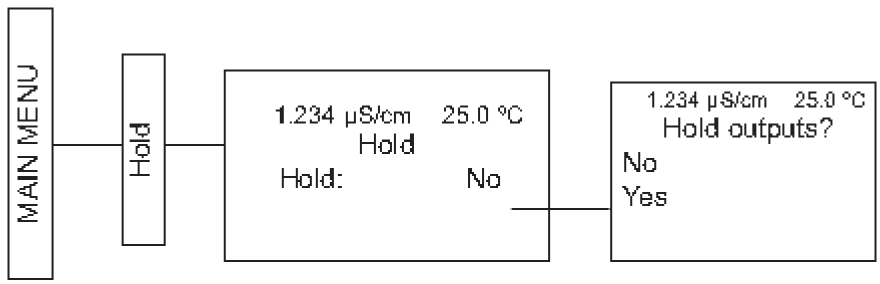
Be sure to remove the transmitter from hold once you have finished calibrating the sensor. During hold, both outputs remain at the last value.

NOTICE

Once on hold, all current outputs remain on hold indefinitely.

6.7.2 Put outputs on hold

Figure 6-7: Hold Menu Tree



Procedure

1. Press **MENU**.
   The ***Main Menu*** screen appears.
2. Select Hold.

   The ***Hold Outputs?*** screen appears.
3. Select Yes to place the transmitter on hold. Select No to take the transmitter out of hold.

The ***Hold*** screen appears.

NOTICE

Hold will remain on indefinitely until someone disables it.

6.8 Resetting factory default settings

6.8.1 Purpose of resetting factory default settings

Resetting factory default settings also clears all fault messages and returns the display to the first ***Quick Start*** screen.

The Rosemount 1066 offers three options for resetting factory defaults:

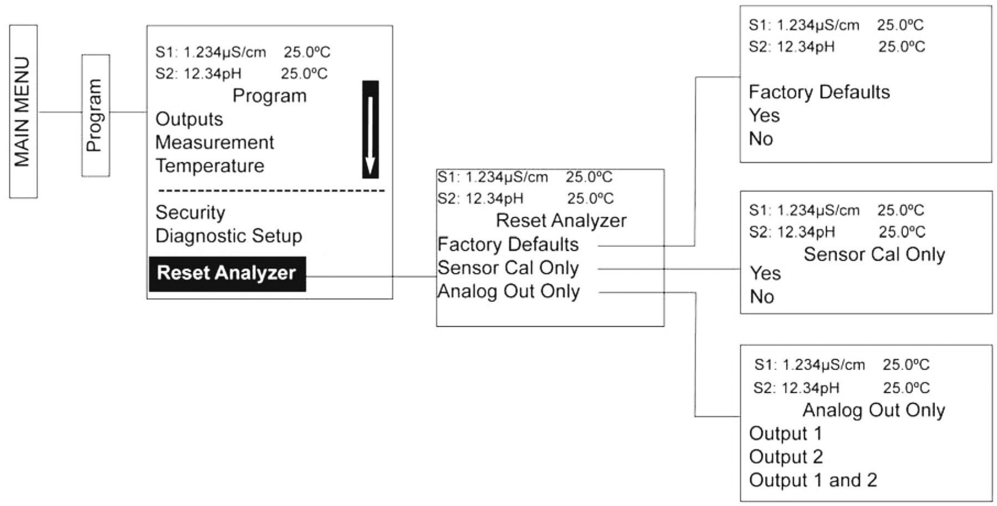
- Reset all settings to factory defaults.
- Reset sensor calibration data only.
- Reset analog output settings only.

6.8.2 Reset factory default settings

Procedure

To reset factory defaults, reset calibration data only, or reset analog outputs only, follow Figure 6-8.

Figure 6-8: Resetting Factory Default Settings Menu Tree



7 Programming measurements

7.1 Introduction to programming measurements

The Rosemount 1066 automatically recognizes the measurement input upon first power-up and each time the transmitter is turned on.

Completing ***Quick Start*** screens upon first power-up enables measurements, but you may have to take additional steps to program the transmitter for the desired measurement application. This section covers the following programming and configuration functions:

1. Select measurement type or sensor type.
2. Identify the preamp location (Program pH measurement).
3. Enable manual temperature correction and enter a reference temperature.
4. Enable sample temperature correction and enter temperature correction slope.
5. Define measurement display resolution (pH and amperometric).
6. Define measurement display units.
7. Adjust the input filter to control display and output reading variability or noise.
8. Select a measurement range (Program contacting conductivity measurement and Program toroidal conductivity measurement).
9. Enter a cell constant for a contacting or toroidal sensor (Program contacting conductivity measurement and Program toroidal conductivity measurement).
10. Create an application-specific concentration curve.
11. Enable automatic pH correction for free chlorine measurement (Program chlorine measurement.

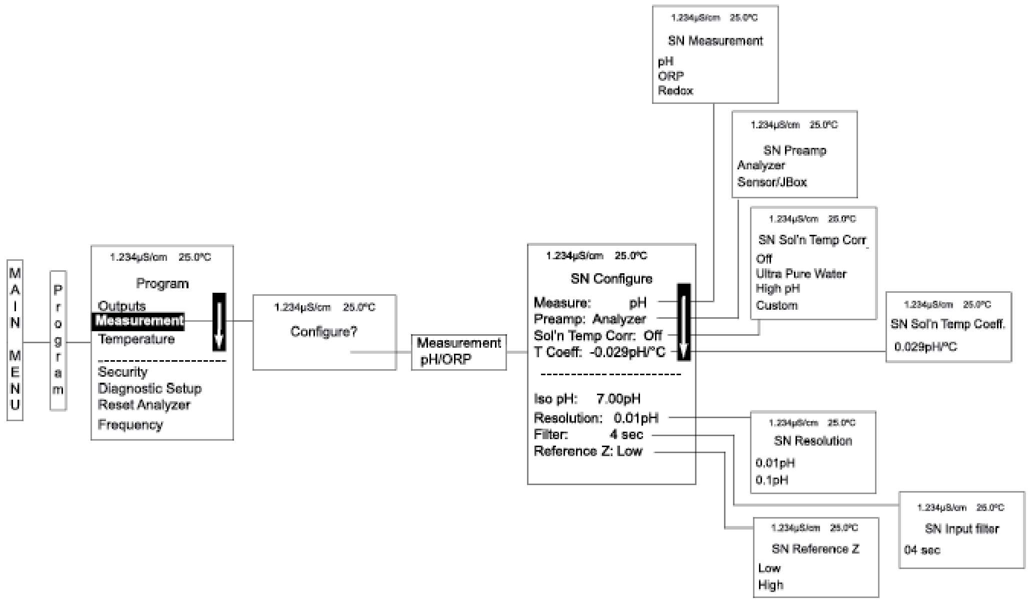
To fully configure the transmitter for each installed measurement board, you may use the following:

1. Reset Analyzer function to reset factory defaults and configure the measurement board to the desired measurement. Follow the ***Reset Analyzer*** menu to reconfigure the transmitter to display new measurements or measurement units.
2. Program menus to adjust any of the programmable configuration items.

7.2 Program pH measurement

Figure 7-1 is a detailed flow diagram for pH programming to guide you through all basic programming and configuration functions.

Figure 7-1: Flow Diagram for pH and Oxidation Reduction Potential (ORP) Programming

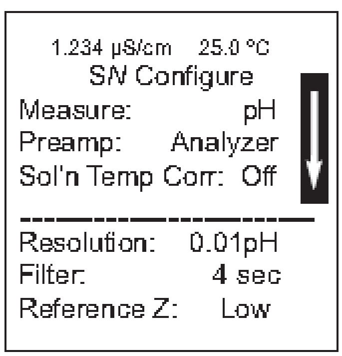


To configure the pH measurement board:

1. Press **MENU**.
2. Go to **Program** → **Measurement**.

Figure 7-2 appears; factory default settings are shown.

Figure 7-2: Configure pH Screen

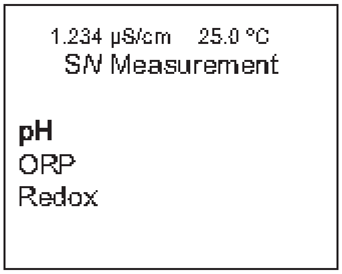


To change any setting, scroll to the desired item and press **ENTER**.

7.2.1 Select measurement type

Figure 7-3 displays the screen where you can choose the measurement type.

Figure 7-3: Measurement Screen

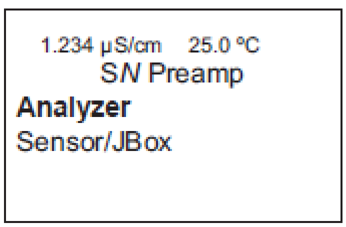


The default value (pH) is displayed in bold type. Refer to Figure 7-1 to select a measurement type.

7.2.2 Select pH preamplifier location

Figure 7-4 shows the screen from which you can select the preamp location.

Figure 7-4: Preamp Screen



The default location (Analyzer) is in bold.

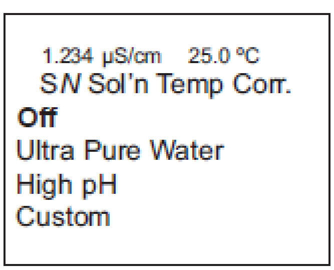
Procedure

Refer to Figure 7-1 to select a preamplifier location.

7.2.3 Select solution temperature correction

Figure 7-5 displays the screen on which you can enter a custom solution temperature coefficient .

Figure 7-5: Solution Temperature Correction Screen



The default value (Off) is displayed in bold.

Procedure

Refer to Figure 7-1 to select a solution temperature correction algorithm.

7.2.4 Enter custom solution temperature coefficient

Figure 7-6 displays the screen on which you can enter a custom solution temperature coefficient.

Figure 7-6: Solution Temperature Coefficient Screen

The default value (-0.032 ph/°C) is displayed in bold.

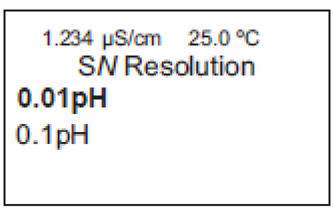
Procedure

Refer to Figure 7-1 to enter a custom solution coefficient.

7.2.5 Select pH display resolution

Figure 7-7 displays the screen from which you can select a display resolution.

Figure 7-7: Resolution Screen



The default value (0.01pH) is displayed in bold.

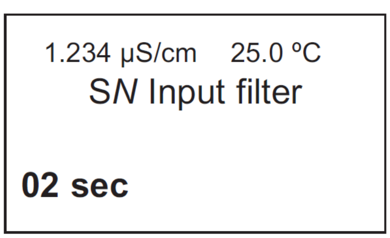
Procedure

Refer to Figure 7-1 to select a resolution.

7.2.6 Enter input filter value

see Figure 7-8 displays the screen on which you can enter the input filter value in seconds.

Figure 7-8: Input Filter Value Screen



The default value (04 sec) is displayed in bold.

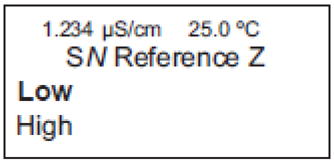
Procedure

Refer to Figure 7-1 to enter the input filter value.

7.2.7 Select reference impedance

Figure 7-9 displays the screen from which you can select the reference impedance.

Figure 7-9: Reference Impedance Screen



The default value (Low) is displayed in bold.

Procedure

Refer to Figure 7-1 to select the reference impedance.

7.3 Program oxidation reduction potential (ORP) measurement

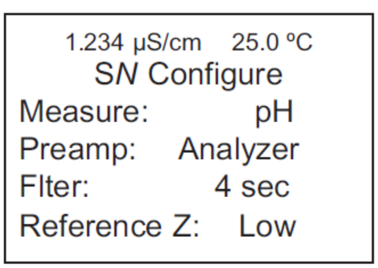
Figure 7-1 is a detailed flow diagram for pH programming to guide you through all basic programming and configuration functions.

To configure the ORP board:

1. Press **MENU**.
2. Go to **Program** → **Measurement**.
3. Select Sensor 1 or Sensor 2 corresponding to ORP, then press **Enter**.

Figure 7-10 appears; factory default settings are shown.

Figure 7-10: Configure pH Screen

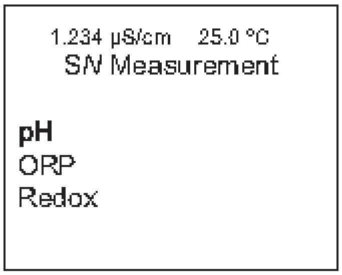


To change any setting, scroll to the desired item and press **ENTER**.

7.3.1 Select measurement type

Figure 7-11 displays the screen where you can choose the measurement type.

Figure 7-11: Measurement Screen

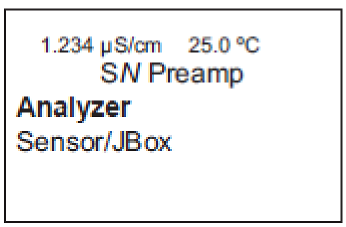


The default value (pH) is displayed in bold type. Refer to Figure 7-1 to select a measurement type.

7.3.2 Select pH preamplifier location

Figure 7-12 shows the screen from which you can select the preamp location.

Figure 7-12: Preamp Screen



The default location (Analyzer) is in bold.

Procedure

Refer to Figure 7-1 to select a preamplifier location.

7.3.3 Enter input filter value

see Figure 7-13 displays the screen on which you can enter the input filter value in seconds.

Figure 7-13: Input Filter Value Screen

The default value (04 sec) is displayed in bold.

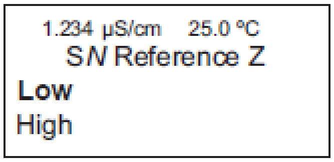
Procedure

Refer to Figure 7-1 to enter the input filter value.

7.3.4 Select reference impedance

Figure 7-14 displays the screen from which you can select the reference impedance.

Figure 7-14: Reference Impedance Screen



The default value (Low) is displayed in bold.

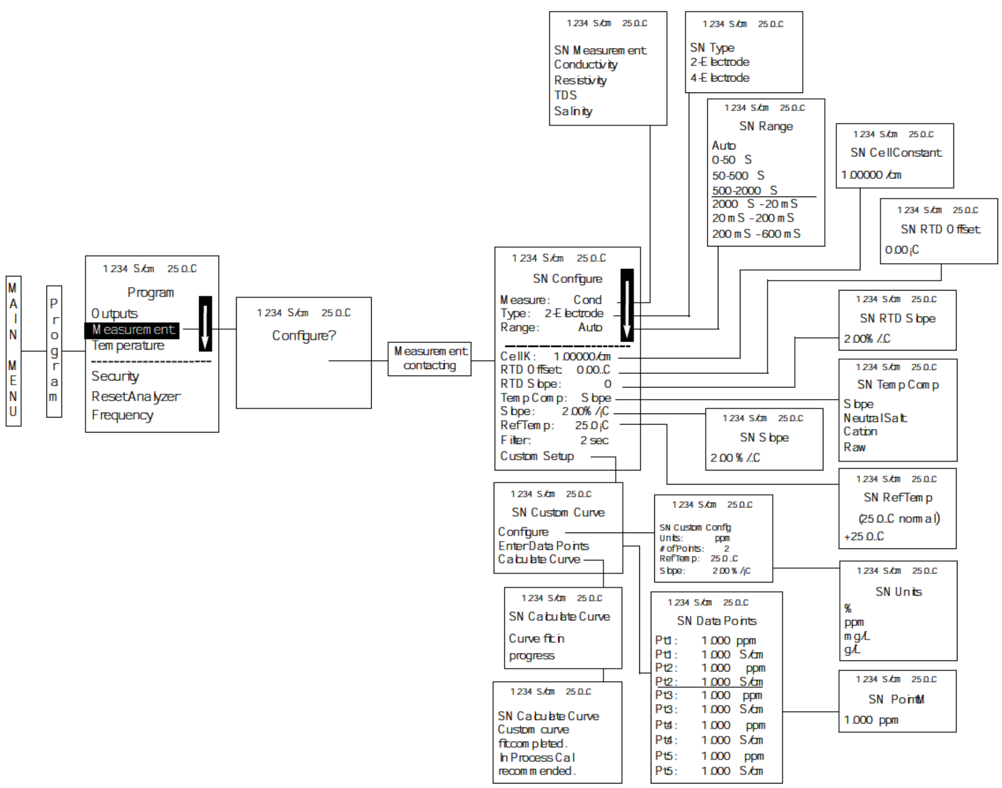
Procedure

Refer to Figure 7-1 to select the reference impedance.

7.4 Program contacting conductivity measurement

Figure 7-15 is a detailed flow diagram for pH programming to guide you through all basic programming and configuration functions.

Figure 7-15: Flow Diagram for Configure Contacting Programming

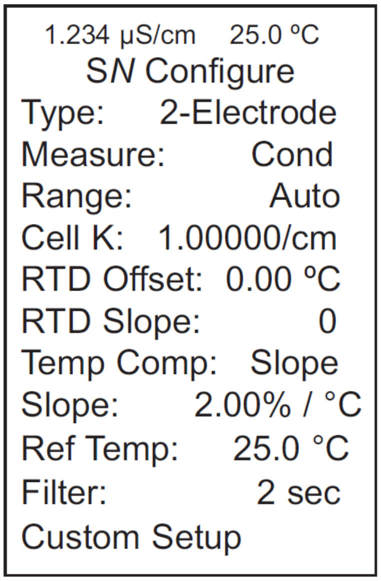


To configure the pH measurement board:

1. Press **MENU**.
2. Go to **Program** → **Measurement**.
3. Select Sensor 1 or Sensor 2 corresponding to contacting conductivity. Press **ENTER**.

Figure 7-16 appears; factory default settings are shown.

Figure 7-16: Configure pH Screen

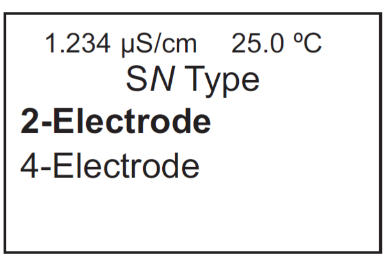


To change any setting, scroll to the desired item and press **ENTER**.

7.4.1 Select sensor type

Figure 7-17 displays the screen from which you can select the sensor type.

Figure 7-17: Sensor Type Screen



The default value (2-Electrode) is in bold.

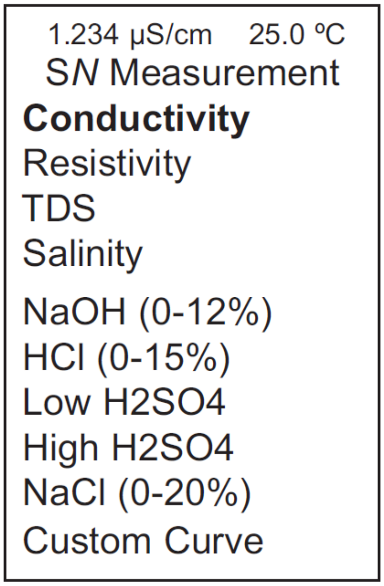
Procedure

Refer to Figure 7-15 to select a sensor type.

7.4.2 Select measurement type

Figure 7-18 displays the screen from which you can select the measurement type.

Figure 7-18: Measurement Screen



The default value (Conductivity) is in bold.

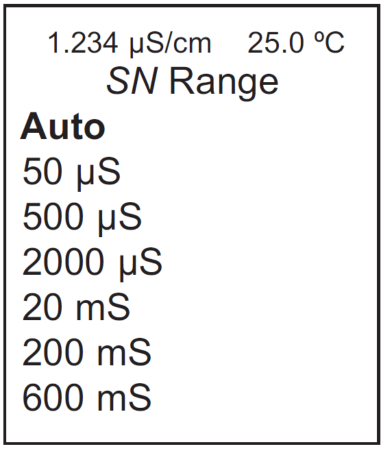
Procedure

Refer to Figure 7-15 to select a measurement type.

7.4.3 Select range

Figure 7-19 displays the screen from which you can select the sensor range.

Figure 7-19: Range Screen



The default value (Auto) is in bold.

Note
Ranges are shown as conductance, not conductivity.

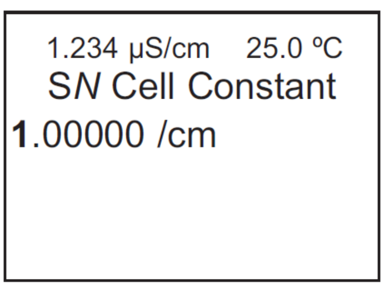
Procedure

Refer to Figure 7-15 to select a range.

7.4.4 Enter cell constant

Figure 7-20 displays the screen on which you can enter the cell constant.

Figure 7-20: Cell Constant Screen



The default value (1) is in bold.

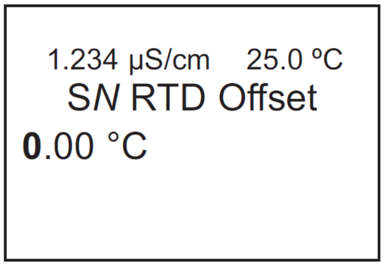
Procedure

Refer to Figure 7-15 to enter a cell constant.

7.4.5 RTD offset

Figure 7-21 displays the screen from which you can enter the RTD offset for a contacting conductivity sensor.

Figure 7-21: RTD Offset Screen



The default value (0) is in bold.

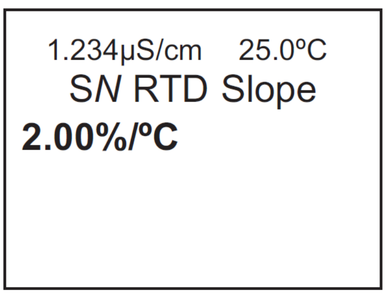
Procedure

Refer to Figure 7-15 to enter a RTD offset.

7.4.6 RTD slope

Figure 7-22 displays the screen from which you can enter the RTD slope.

Figure 7-22: RTD Slope Screen



The default value (2.00%/°C) is in bold.

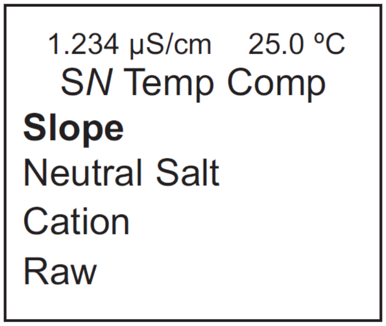
Procedure

Refer to Figure 7-15 to enter a RTD slope.

7.4.7 Enter temperature compensation

Figure 7-23 displays the screen from which you can select the temperature compensation.

Figure 7-23: Temperature Compensation Screen



The default value (Slope) is in bold.

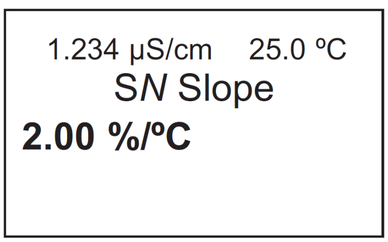
Procedure

Refer to Figure 7-15 to select a temperature compensation.

7.4.8 Enter slope

Figure 7-24 displays the screen on which you can enter the slope.

Figure 7-24: Slope Screen



The default value (2.00%/°C) is in bold.

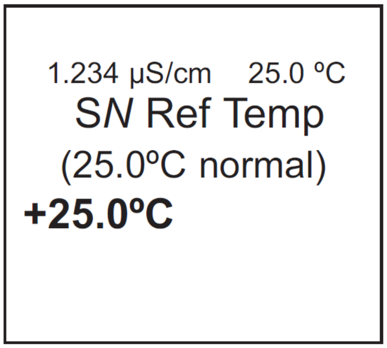
Procedure

Refer to Figure 7-15 to enter the slope.

7.4.9 Enter reference temperature

Figure 7-25 displays the screen on which you can enter the reference temperature manually.

Figure 7-25: Reference Temperature Screen



The default value (+25.0 °C) is in bold.

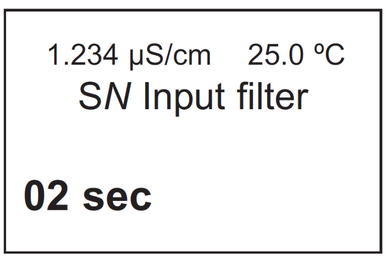
Procedure

Refer to Figure 7-15 to complete this function.

7.4.10 Enter input filter value

Figure 7-26 displays the screen on which you can enter the input filter value in seconds.

Figure 7-26: Filter Screen



The default value (02 sec) is in bold.

Procedure

Refer to Figure 7-15 to enter the input filter value.

7.4.11 Create custom curve

Figure 7-27 displays the screen from which you can create a custom curve for converting conductivity into concentration.

Figure 7-27: Custom Curve Screen

1.234µS/cm 25.0ºC
SN Custom Curve
Configure
Enter Data Points
Calculate Curve

Procedure

1. Refer to Figure 7-15 to create a custom curve.
2. Enter the custom curve data. Press **ENTER**.

   The display will confirm the determination of a custom curve fit to the entered data by displaying Figure 7-28.

   Figure 7-28: Calculate Curve Screen

   1.234 µS/cm 25.0 ºC
   SN Calculate Curve
   Custom curve
   fit completed.
   In Process Cal
   recommended.

   Note
   If the custom curve fit is not completed or is unsuccessful, Figure 7-29 appears. The transmitter returns to the screen shown in Figure 7-27.

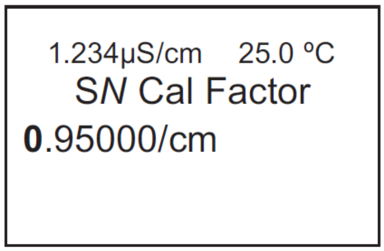
   Figure 7-29: Calculate Curve Failure Screen

   1.234 µS/cm 25.0 ºC
   SN Calculate Curve
   Failure

7.4.12 Enter cal factor

Upon initial installation and power up, if 4-electrode was selected for the sensor type in the ***Quick Start*** menus, enter a ***Cell Constant*** and a ***Cal Factor*** using the instrument keypad. The cell constant is needed to convert measured conductance to conductivity as displayed on the transmitter screen. The ***Cal Factor*** entry is needed increase the accuracy of the live conductivity readings, especially at low conductivity readings below 20 uS/cm. Both the Cell Constant and the ***Cal Factor*** are printed on the tag attached to the 4-electrode sensor/cable.

Figure 7-30: Cal Factor Screen



7.5 Program toroidal conductivity measurement

Configure the transmitter for conductivity measurements using inductive/toroidal sensors.

Figure 7-31: Toroidal Conductivity Flow Diagram

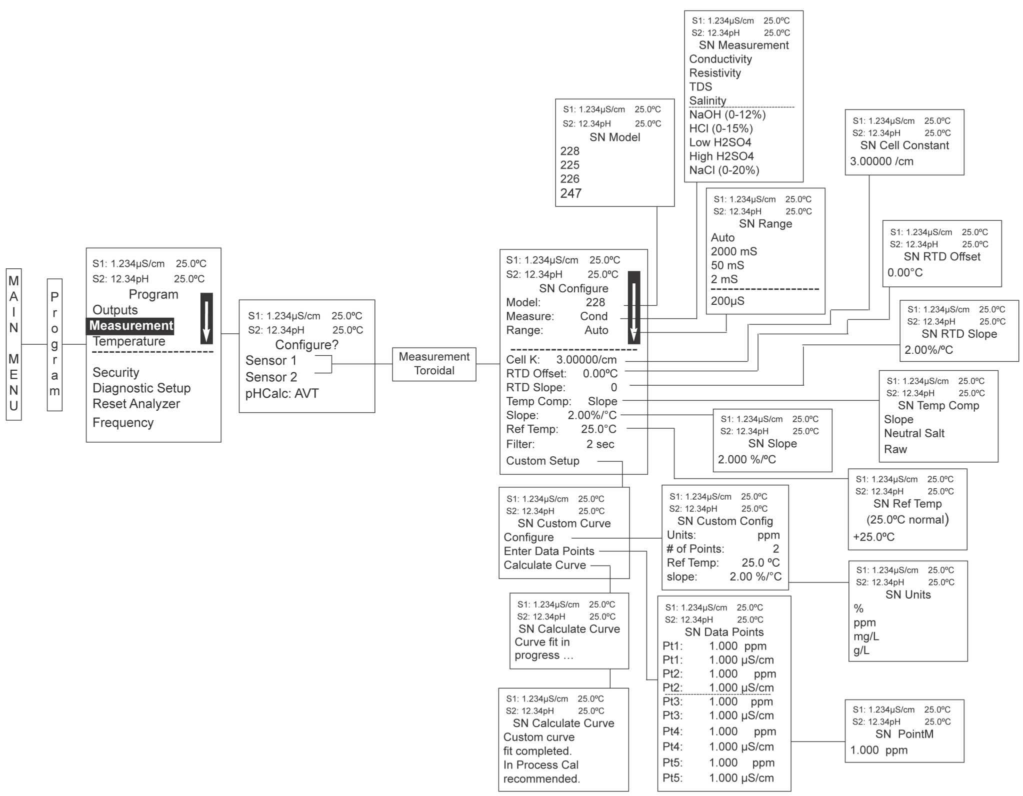


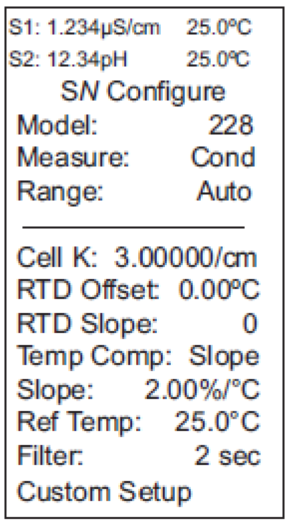
Figure 7-31 is a detailed flow diagram for programming toroidal conductivity.

To configure the toroidal conductivity measurement board:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to toroidal conductivity. Press **ENTER**.
   Figure 7-32 appears; factory default settings are shown.

Figure 7-32: Configure Toroidal Conductivity Sensor Screen

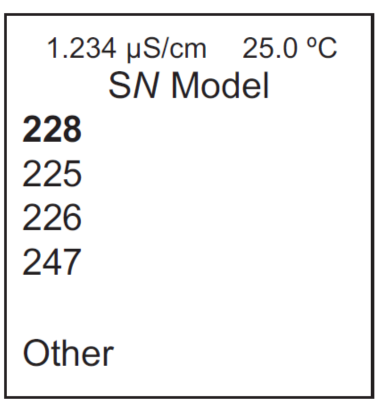


5. To change any setting, scroll to the desired item and press **ENTER**.

7.5.1 Select sensor model

Figure 7-33 displays the screen from which you can select the sensor model.

Figure 7-33: Sensor Model Screen

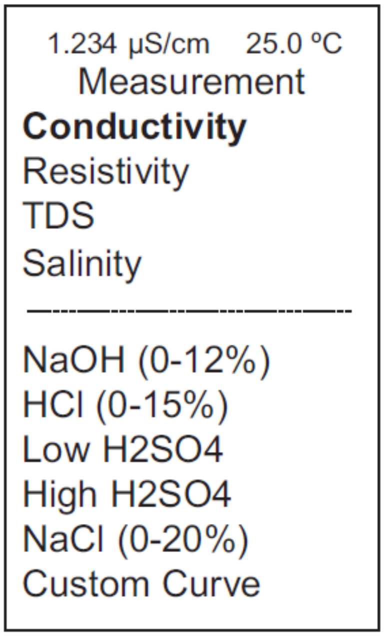


The default value is displayed in bold type. Refer to Figure 7-31 to select a sensor model.

7.5.2 Select measurement type

Figure 7-34 displays the screen from which you can select the measurement type.

Figure 7-34: Measurement Type Screen

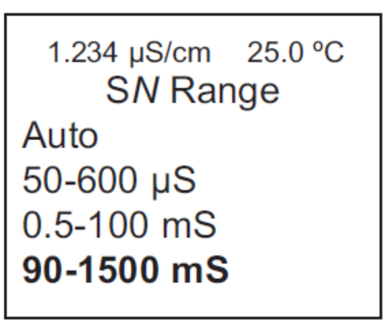


The default value is displayed in bold type. Refer to Figure 7-31 to select the measurement type.

7.5.3 Select sensor range

Figure 7-35 displays the screen from which you can select the sensor range.

Figure 7-35: Range Screen



The default value is displayed in bold type.

Note
Ranges are shown as conductance, not conductivity.

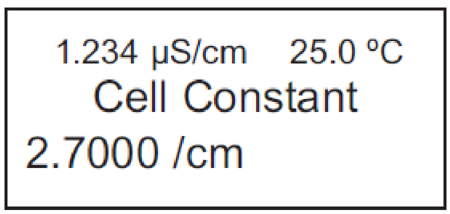
Refer to Figure 7-31 to select a range.

Note
when manually changing ranges, a Zero calibration and recalibration in a solution of known conductivity must be performed with the toroidal sensor wired to the instrument. Refer to Zero toroidal conductivity sensor and Calibrate toroidal conductivity sensor in a conductivity standard (in process calibration).

7.5.4 Enter a cell constant

Figure 7-36 displays the screen from which you can enter the cell constant.

Figure 7-36: Cell Constant Screen



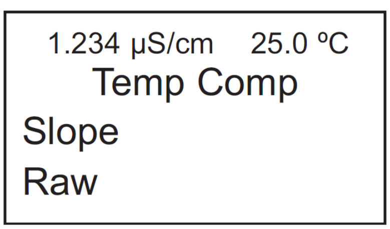
The default value is displayed in bold type. Refer to Figure 7-31 to enter the cell constant.

Note
When manually changing ranges, the Cell Constant may change through the calibration process.

7.5.5 Select temperature compensation

Figure 7-37 displays the screen from which you can select the temperature compensation.

Figure 7-37: Temperature Compensation Screen

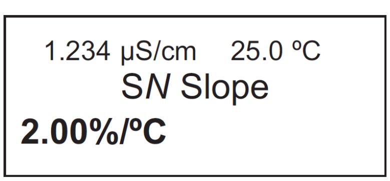


Refer to Figure 7-31 to select the temperature compensation.

7.5.6 Enter slope

Figure 7-38 displays the screen on which you can enter the conductivity/temperature slope.

Figure 7-38: Slope Screen

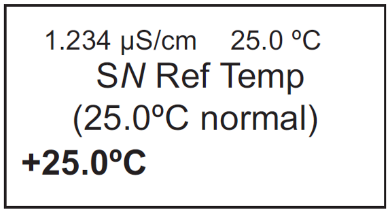


The default value is displayed in bold type. Refer to Figure 7-31 to enter the slope.

7.5.7 Enter the reference temperature

Figure 7-39 displays the screen on which you can manually enter the reference temperature.

Figure 7-39: Reference Temperature Screen



The default value is displayed in bold type. Refer to Figure 7-31 to enter the reference temperature.

7.5.8 Enter input filter value

Figure 7-40 displays the screen on which you can enter the input filter time in seconds.

Figure 7-40: Input Filter Screen

Note

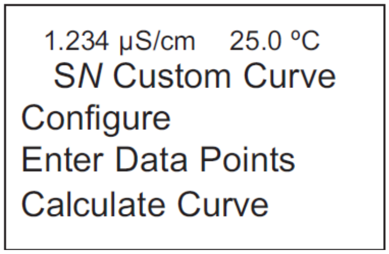
Using the highest range (90 mS to 1500 mS) in very low conductivity processes below 100 µS (conductance) might generate a high noise value relative to the actual process value. In these cases, Emerson recommends increasing the input filter setting above the default value of 2 seconds to suppress the effect of noise.

The default value is displayed in bold type. Refer to Figure 7-31 to enter the input filter time.

7.5.9 Create custom curve

Figure 7-41 displays the screen from which you can create a custom curve to convert conductivity to concentration.

Figure 7-41: Custom Curve Screen

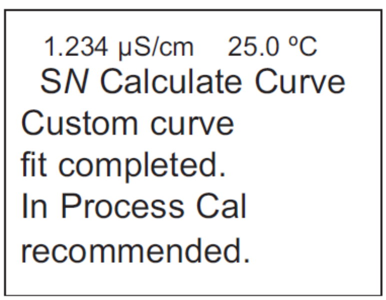


Refer to Figure 7-31 to complete this task.

Procedure

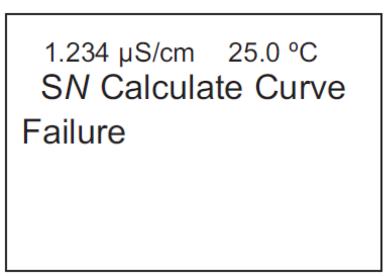
Enter the custom curve data and press **ENTER**.
The display confirms the determination of a custom curve fit to the entered data by displaying Figure 7-42.

Figure 7-42: Calculate Curve Screen



If the custom curve fit is not completed or is unsuccessful, Figure 7-43 appears and the transmitter returns to the screen shown in Figure 7-41.

Figure 7-43: Curve Failure Screen



7.6 Program chlorine measurement

With a chlorine measurement board installed, the transmitter can measure any of three variants of chlorine.

- Free chlorine
- Total chlorine
- Monochloramine

7.6.1 Program free chlorine measurement

Configure the Rosemount 1066 transmitter for free chlorine measurement using amperometric chlorine sensors.

Figure 7-44: Chlorine Measurements Flow Diagram

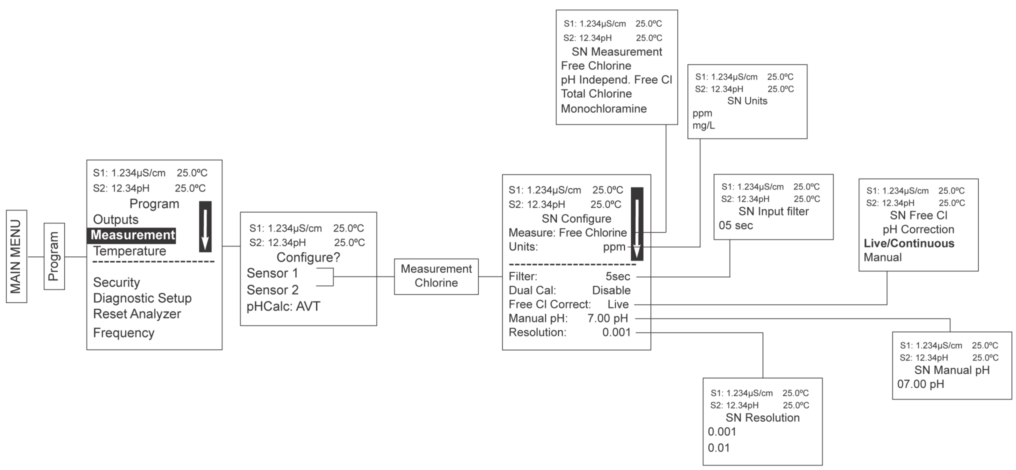


Figure 7-44 is a detailed flow diagram to guide you through all basic programming and configuration functions.

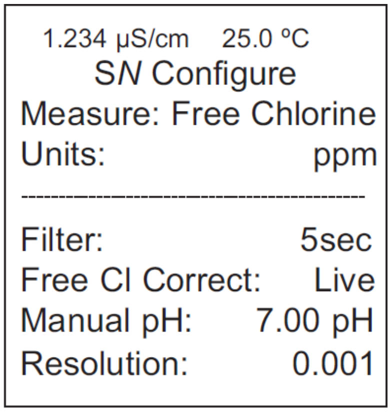
To configure the measurement board for free chlorine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.

4. Select Sensor 1 or Sensor 2 corresponding to free chlorine. Press **ENTER**.
   Figure 7-45 appears; factory default settings are shown.

Figure 7-45: Configure Free Chlorine Screen

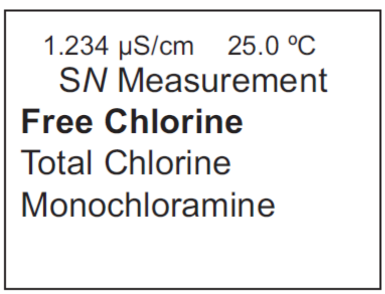


5. To change any setting, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 7-46 displays the screen from which you can select the measurement type.

Figure 7-46: Measurement Screen



The default value is displayed in bold type.

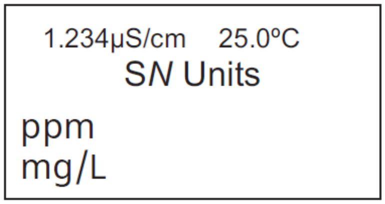
Procedure

1. Select Free Chlorine.
2. Press **ENTER**.

Select measurement unit

Figure 7-47 displays the screen from which you can select a measurement unit.

Figure 7-47: Units Screen



The default value is displayed in bold type.

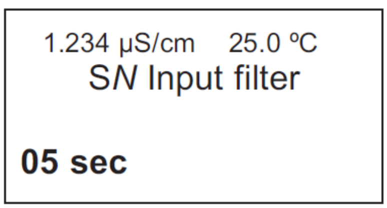
Procedure

Refer to Figure 7-44 to select a measurement unit.

Enter input filter value

Figure 7-48 displays the screen on which you can enter the input filter value for free chlorine in seconds.

Figure 7-48: Input Filter Screen



The default value is displayed in bold type.

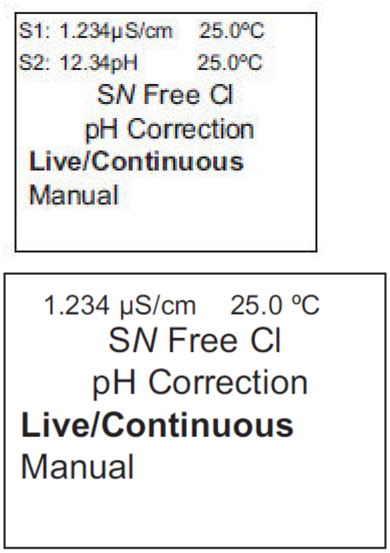
Procedure

Refer to Figure 7-44 to enter an input filter value.

Select pH correction

Figure 7-49 displays the screen from which you can select live/continuous pH correction or manual pH correction.

Figure 7-49: Free Chlorine pH Correction Screen



The default value is displayed in bold type.

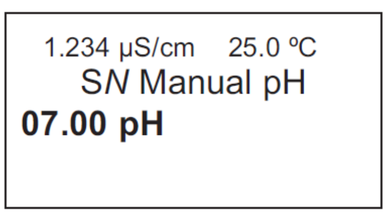
Procedure

Refer to Figure 7-44 to select the pH correction.

Enter pH correction manually

Figure 7-50 displays the screen on which you can manually enter the pH value of the measured process liquid.

Figure 7-50: Manual pH Screen



The default value is displayed in bold type.

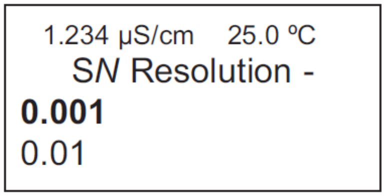
Procedure

Refer to Figure 7-44 to enter a pH value manually.

Select display resolution

Figure 7-51 displays the screen from which you can select a display resolution.

Figure 7-51: Resolution Screen



The default value is displayed in bold type.

Procedure

Refer to Figure 7-44 to select a display resolution.

7.6.2 Program total chlorine measurement

Configure the transmitter for total chlorine measurement using amperometric chlorine sensors.

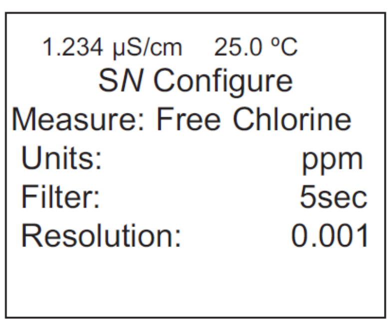
Figure 7-44 is a detailed flow diagram for programming all chlorine measurements.

To configure the chlorine measurement board for total chlorine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to chlorine. Press **ENTER**.
   Figure 7-52 will appears; factory default settings are shown.

   Figure 7-52: Configure Chlorine Screen

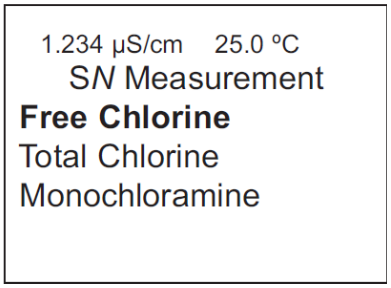
   

5. To change any setting, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 7-53 displays the screen from which you can select the type of chlorine measurement.

Figure 7-53: Measurement Screen



The default value is displayed in bold type.

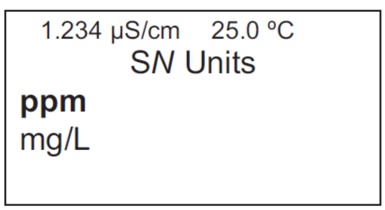
Procedure

Refer to Figure 7-44 to select a measurement type.

Select measurement units

Figure 7-54 displays the screen from which you can select measurement units as ppm or mg/L.

Figure 7-54: Units Screen



The default value is displayed in bold type.

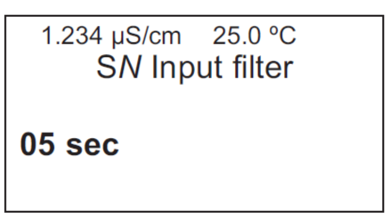
Procedure

Refer to Figure 7-44 to select measurement units.

Enter input filter value

Figure 7-55 displays the screen on which you can enter the input filter value in seconds.

Figure 7-55: Input Filter Screen



The default value is displayed in bold type.

Procedure

Refer to Figure 7-44 to enter the input filter value.

Select display resolution

Figure 7-56 displays the screen from which you can select the display resolution.

Figure 7-56: Resolution Screen

The default value is displayed in bold type.

Procedure

Refer to Figure 7-44 to select the display resolution.

7.6.3 Program monochloramine measurement

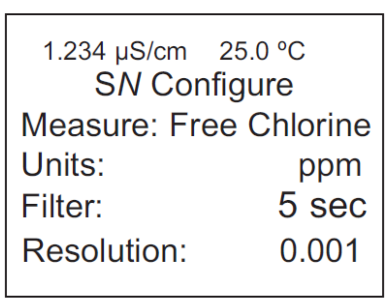
Configure the transmitter to measure monochloramine using amperometric chlorine sensors.

To configure the chlorine measurement board for monochloramine:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to chlorine. Press **ENTER**.
   Figure 7-57 appears; factory default settings are shown.

   Figure 7-57: Configure Chlorine Screen

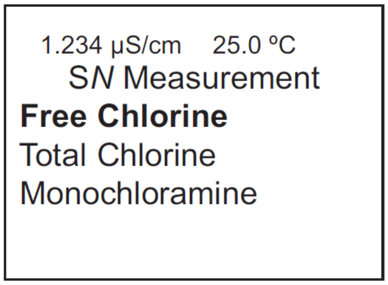
   

5. To change any settings, scroll to the desired item and press **ENTER**.

Select measurement type

Figure 7-58 displays the screen from which you can select the type of chlorine to measure.

Figure 7-58: Measurement Screen



The default value is displayed in bold type.

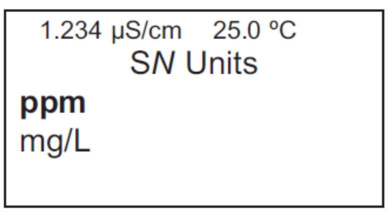
Procedure

Refer to Figure 7-44 to select the monochloramine measurement type.

Select measurement units

Figure 7-59 displays the screen from where you can select measurement units: ppm or mg/L.

Figure 7-59: Units Screen



The default value is displayed in bold type.

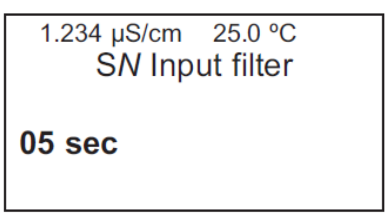
Procedure

Refer to Figure 7-44 to select measurement units.

Enter input filter value

Figure 7-60 shows the screen on which you can enter the input filter value in seconds.

Figure 7-60: Input Filter Screen



The default value is displayed in bold type.

Procedure

Refer to Figure 7-44 to enter the input filter value.

Select display resolution

Figure 7-61 displays the screen from which you can enter the display resolution.

Figure 7-61: Resolution Screen

The default value is displayed in bold type.

Procedure

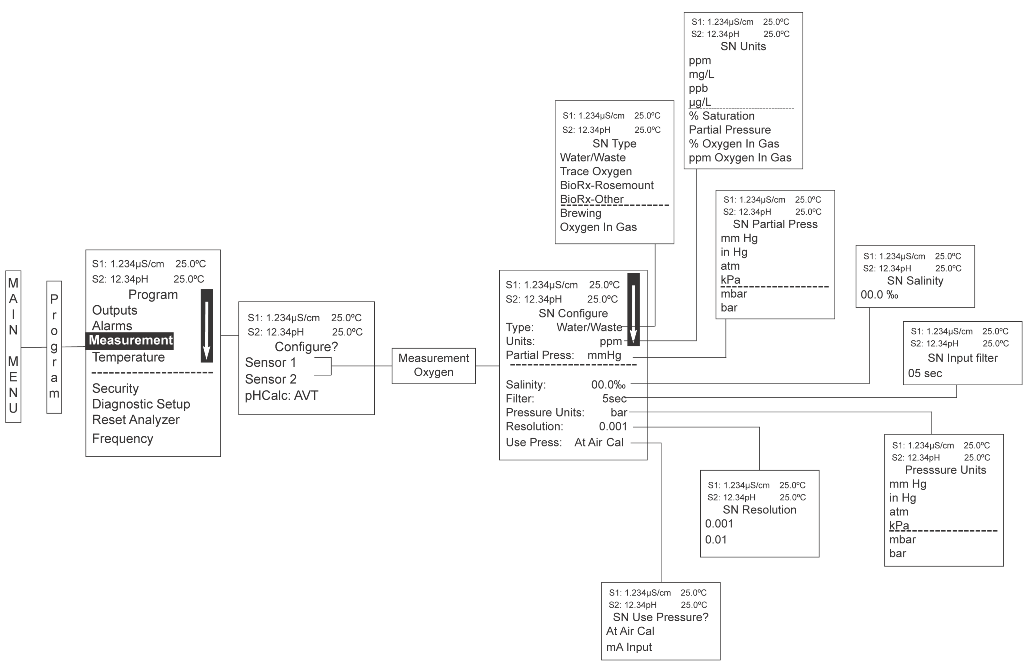
Refer to Figure 7-44 to select the display resolution.

7.6.4 Program oxygen measurement

You can configure the Rosemount 1066 transmitter to measure dissolved and gaseous oxygen using amperometric oxygen sensors.

Figure 7-62 is a detailed diagram for oxygen programming to guide you through all basic programming and configuration functions.

Figure 7-62: Programming Oxygen Measurement

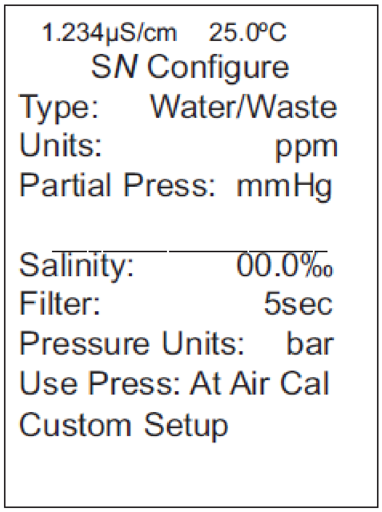


To configure the oxygen measurement board:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to oxygen. Press **ENTER**.
   Figure 7-63 appears; factory default settings are shown.

Figure 7-63: Configure Oxygen Screen



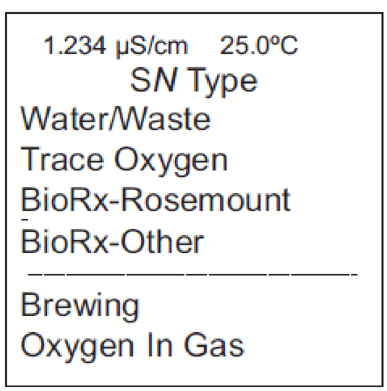
5. To change a setting, scroll to the desired item and press **ENTER**.

Select oxygen measurement application

Procedure

1. From the ***Configure Oxygen*** screen, select Type.
   Figure 7-64 appears.

Figure 7-64: Type Screen



2. Refer to Figure 7-62 to select the application.

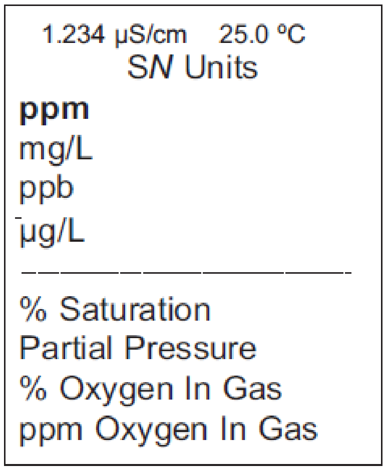
Select measurement units

The default value is displayed in **bold type**.

Procedure

1. From the ***Configure Oxygen*** screen, select Units.
   Figure 7-65 appears.

   Figure 7-65: Units Screen

   Measurement unit options are:

   - ppm
   - mg/L
   - ppb
   - µg/L
   - % Saturation
   - Partial Pressure
   - % Oxygen in Gas
   - ppm Oxygen in Gas

2. Refer to Figure 7-62 to select a measurement unit.

Select partial pressure units

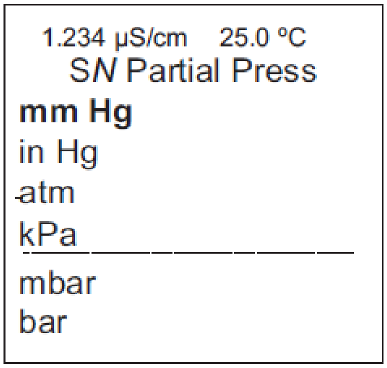
If you select Partial Pressure as the measurement unit on the ***Units*** screen, you need to select the partial pressure measurement units.

Procedure

1. From the ***Configure Oxygen*** screen, select Units.
   The ***Units*** screen appears.

2. Select Partial Pressure.
   Figure 7-66 appears.

Figure 7-66: Partial Pressure Screen



Partial pressure options are:

- mm Hg
- in Hg
- atm (atmospheric)
- kPa
- mbar
- bar

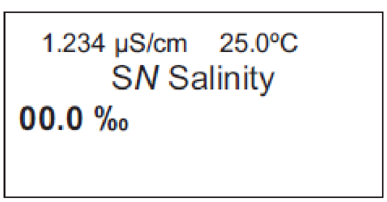
3. Refer to Figure 7-62 to select a partial pressure unit.

Enter salinity

Procedure

1. From the ***Configure Oxygen*** screen, select Salinity.
   Figure 7-67 appears.

Figure 7-67: Salinity Screen



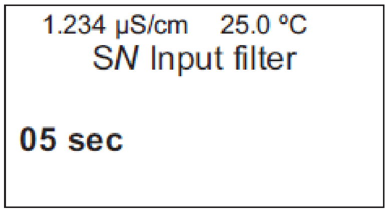
2. Enter the percentage of salinity in the process liquid.
   Refer to Figure 7-62.

Enter input filter value

Procedure

1. From the ***Configure Oxygen*** screen, select Filter.
   Figure 7-68 appears.

Figure 7-68: Input Filter Screen



2. Refer to Figure 7-62 to enter the input filter value in seconds.

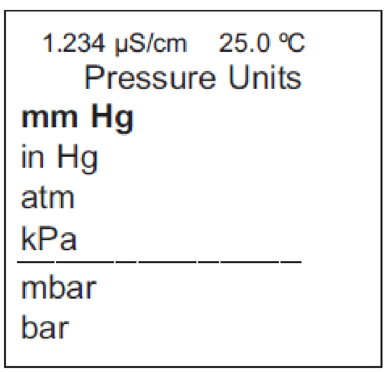
Select atmospheric pressure units

Select atmospheric pressure units to determine how the transmitter will display atmospheric pressure measured by the pressure transducer on the oxygen measurement board.

Procedure

1. From the ***Configure Oxygen*** screen, select Pressure Units.
   Figure 7-69 appears.

Figure 7-69: Units Screen



Pressure unit options are:

- mm Hg
- in Hg
- atm (atmospheric)
- kPa
- mbar
- bar

2. Refer to Figure 7-62 to select the atmospheric pressure unit.

7.7 Program ozone measurement

You can configure the Rosemount 1066 transmitter to measure ozone using amperometric ozone sensors.

Figure 7-70: Ozone Measurement Flow Diagram

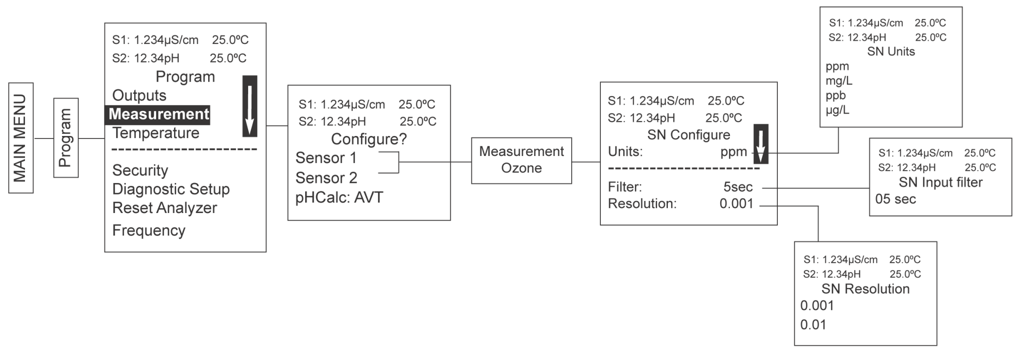


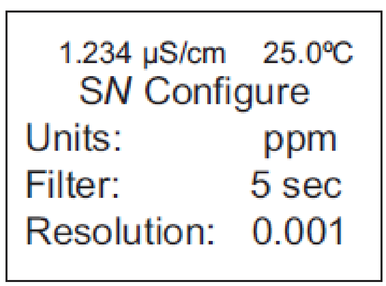
Figure 7-70 is a detailed flow diagram for ozone programming to guide you through all basic programming and configuration functions.

To configure the ozone measurement board:

Procedure

1. Press **MENU**.
2. Scroll down to Program. Press **ENTER**.
3. Scroll down to Measurement. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to ozone. Press **ENTER**.
   Figure 7-71 appears; factory default settings are shown.

Figure 7-71: Configure Ozone Screen



5. To program any displayed function, scroll to the desired item and press **ENTER**.

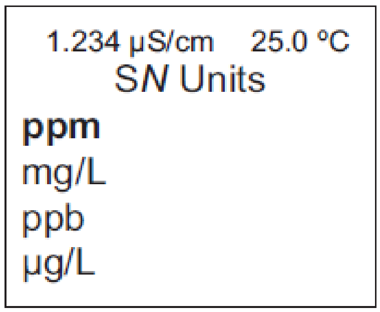
Note
The transmitter automatically detects ozone measurement boards. You don't need to select a measurement type.

7.7.1 Select measurement units

Procedure

1. From the ***Ozone Configure*** screen, select Units.
   Figure 7-72 appears.

Figure 7-72: Units Screen



Ozone measurement unit options are:

- ppm
- mg/L
- ppb
- µg/L

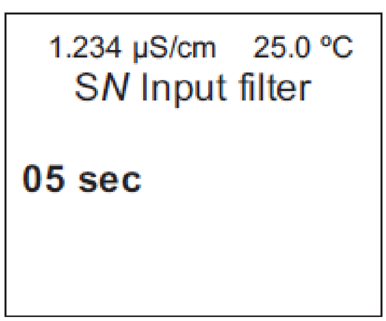
2. Refer to Figure 7-70 to select a measurement unit.

7.7.2 Enter input filter value

Procedure

1. From the ***Ozone Configure*** screen, select Filter.
   Figure 7-73 appears.

Figure 7-73: Input Filter Screen



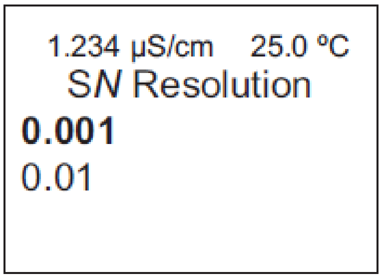
2. Refer to Figure 7-70 to enter the input filter value in seconds.

7.7.3 Select display resolution

Procedure

1. From the ***Ozone Configure*** screen, select Resolution.
   Figure 7-74 appears.

Figure 7-74: Resolution Screen



2. Refer to Figure 7-70 to select the display resolution.

8 Calibration

Calibration is the process of adjusting or standardizing the transmitter to a lab test or a calibrated laboratory instrument or standardizing to some known reference, such as a commercial buffer.

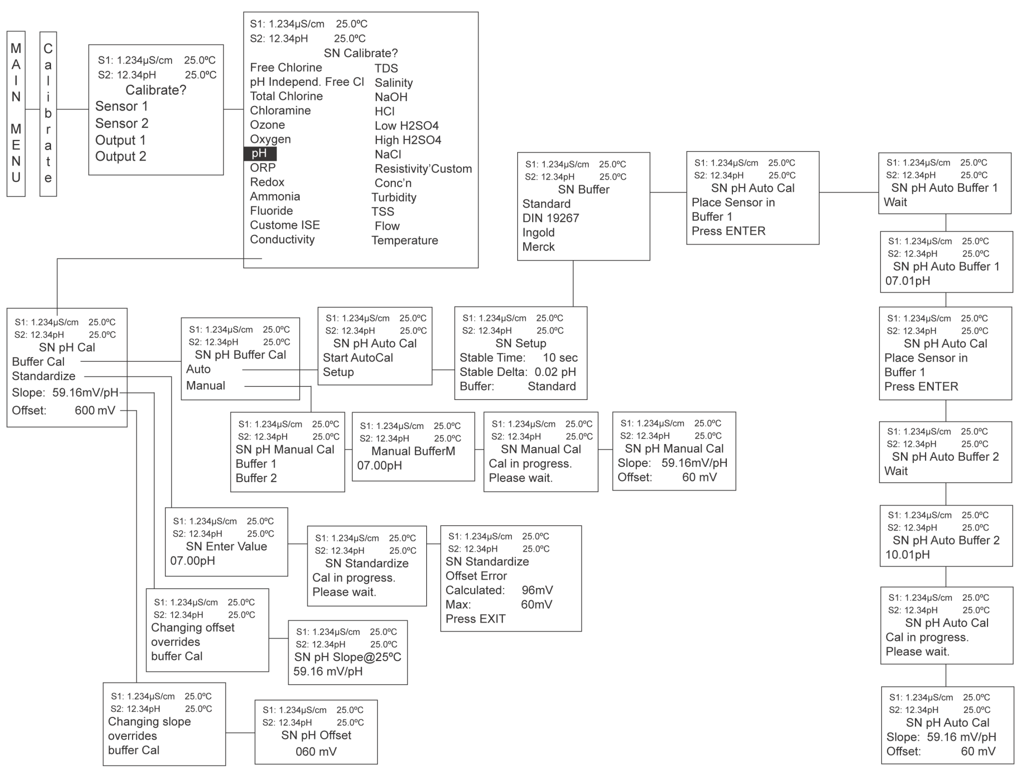
The transmitter's auto-recognition feature will enable the appropriate calibration screens to allow calibration for any single sensor configuration or dual sensor configuration. Completing the Quick Start when first powering up the transmitter enables live measurement, but does not ensure accurate readings in the lab or in process. Calibrate with each attached sensor to ensure accurate, repeatable readings.

8.1 Calibrate pH sensors

Calibrate new sensors before use and regularly recalibrate them.

Use auto calibration instead of manual calibration. Auto calibration avoids common pitfalls and reduces errors. The transmitter recognizes the buffers and uses temperature-corrected pH values when calibrating. Once the transmitter successfully completes calibration, it calculates and displays the calibration slope and offset. The slope is reported as the slope at 77 °F (25 °C).

Figure 8-1: pH Calibration Menu Tree

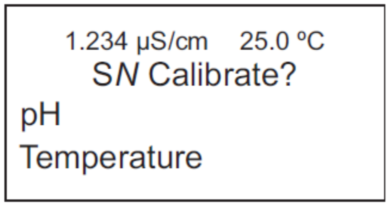


Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.

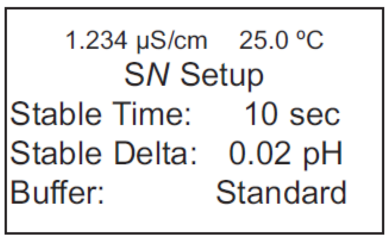
3. Select Sensor 1 or Sensor 2 corresponding to pH. Press **ENTER**.
4. Select pH. Press **ENTER**.

Figure 8-2: pH Calibration Screen



5. If desired, change the auto calibration criteria.

Figure 8-3: Set up Auto Calibration Screen



You can adjust the following:

- Stabilization time (default 10 seconds)
- Stabilization pH value (default 0.02 pH)
- Type of buffer used for auto calibration (default is standard, non-commercial buffers)

The transmitter recognizes the following commercial buffer tables:

- Standard (NIST plus pH 7)
- DIN 19267
- Ingold
- Merck

Figure 8-4 appears if the auto calibration is successful:

Figure 8-4: pH Auto Calibration Screen

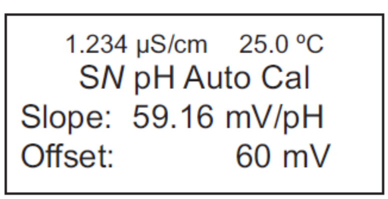


Figure 8-5 through Figure 8-7 may appear if the auto calibration is unsuccessful.

Figure 8-5: High Slope Error

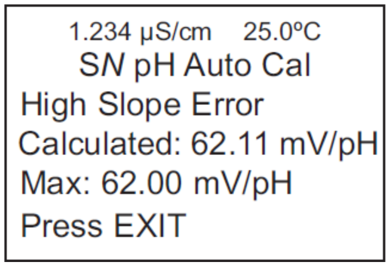


Figure 8-6: Low Slope Error

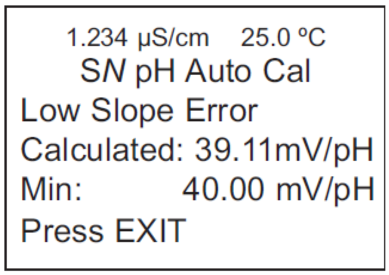
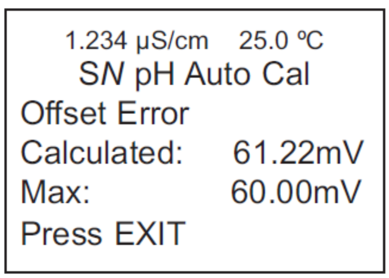


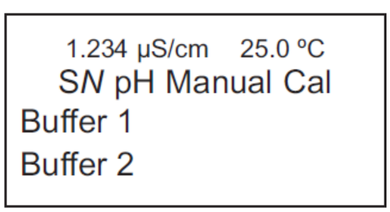
Figure 8-7: Offset Error



8.1.1 Calibrate pH sensors manually

Use manual calibration only if using non-standard buffers. Otherwise, use auto calibration. Auto calibration avoids common pitfalls and reduces errors.

Figure 8-8: Manual Calibration Screen

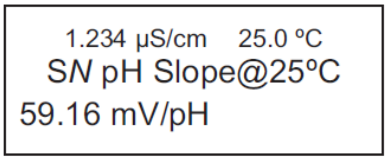


8.1.2 Enter a known slope value for pH sensors

Procedure

If you know the electrode slope from other measurements, enter it directly in the transmitter.

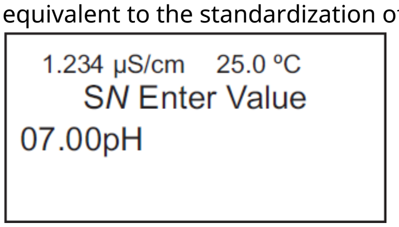
Enter the slope as the slope at 77.0 °F (25 °C).



8.1.3 Standardize pH sensors

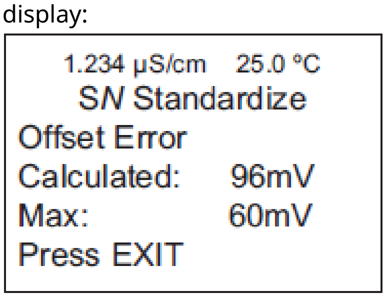
You can change the pH measured by the transmitter to match the reading from a second or referee instrument. The process of making the two readings agree is called standardization.

During standardization, the difference between the two pH values is converted to the equivalent voltage. The voltage, called the referee offset, is added to all subsequent measured cell voltages before they are converted to pH. If you place a standardized sensor in a buffer solution, the measured pH will differ from the buffer pH by an amount equivalent to the standardization offset.



Note

This screen may appear if pH Cal is unsuccessful. An Offset Error will generate this screen display:

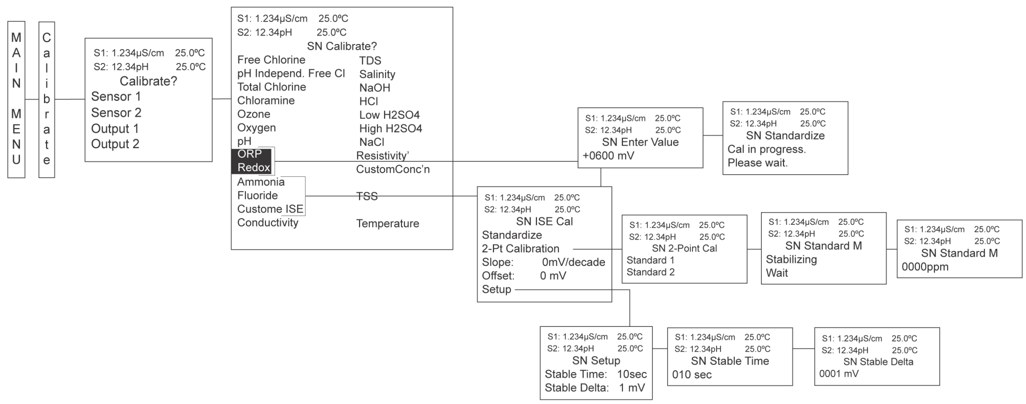


If the pH Cal is successful, the screen will return to the Cal submenu.

8.2 Calibrate oxidation reduction potential (ORP) sensors

For process control, it is often important to make the measured ORP or Redox agree with the ORP or Redox of a standard solution. During calibration, the measured ORP or Redox is made equal to the ORP or Redox of a standard solution at a single point.

Figure 8-9: Calibrate ORP Menu Tree



Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to ORP. Press **ENTER**.

   1.234 µS/cm 25.0 ºC
   SN Calibrate?
   ORP
   Temperature

4. Select ORP. Press **ENTER**.

   1.234 µS/cm 25.0 ºC
   SN Enter Value
   +0600 mV

Figure 8-10 may appear if ORP calibration is unsuccessful.

Figure 8-10: Offset Error

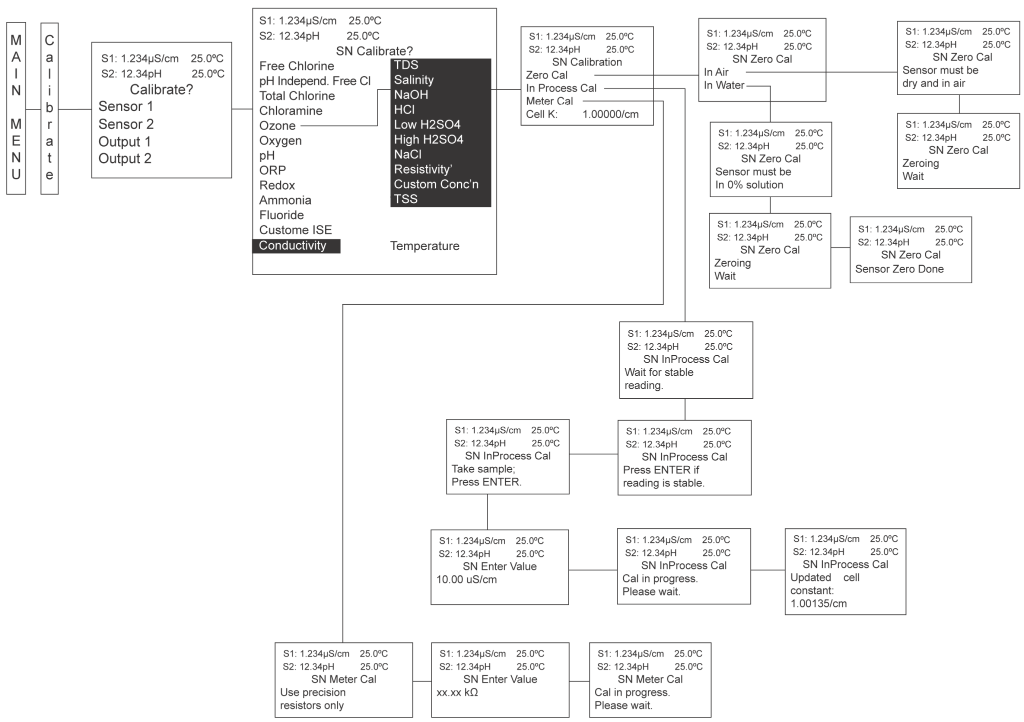
1.234 µS/cm 25.0 °C
SN Standardize
Offset Error
Calculated: 61.22mV
Max: 60.00mV
Press EXIT

8.3 Calibrate contacting conductivity sensors

Placing a new conductivity sensor in service

New conductivity sensors rarely need calibration. The cell constant printed on the label is accurate enough for most applications.

Figure 8-11: Calibrate Conductivity Sensors Menu Tree



Calibrating an in-service conductivity sensor

After a conductivity sensor has been in service for a period of time, you may need to recalibrate it. There are three ways to calibrate a conductivity sensor:

1. Use a standard instrument and sensor to measure the conductivity of the process stream. You don't need to remove the sensor from the process piping. The temperature correction used by the standard instrument may not exactly match the temperature correction used by the Rosemount 1066. To avoid errors, turn off temperature correction in both the transmitter and the standard instrument.

2. Place the sensor in a solution of known conductivity and make the transmitter reading match the conductivity of the standard solution. Use this method if you can easily remove the sensor from the process piping and have a standard available. Be careful using standard solutions with conductivity less than 100 µS/cm. Low conductivity standards are highly susceptible to atmospheric contamination. Avoid calibrating sensors with 0.01/cm cell constants against conductivity standards with conductivity greater than 100 µS/cm. The resistance of these solutions may be too low for an accurate measurement.

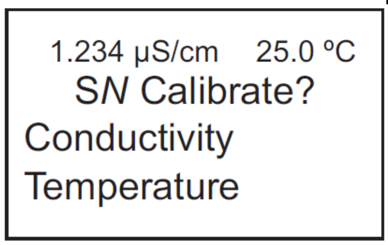
3. To calibrate a 0.01/cm sensor, check it against a standard instrument and another 0.01/cm sensor while both sensors are measuring water with conductivity between 5 and 10 µS/cm. To avoid drift caused by absorption of atmospheric carbon dioxide, saturate the sample with air before taking measurements.

   To ensure adequate flow past the sensor during calibration, take the sample downstream from the sensor. For best results, use a flow-through standard cell. If the process temperature varies greatly from the ambient temperature, keep the connecting lines short and insulate the flow cell.

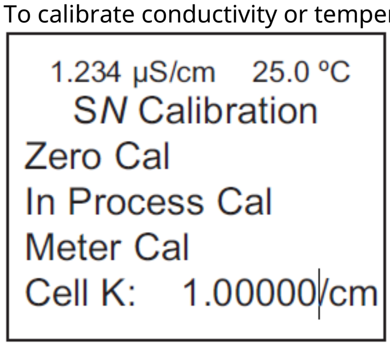
To calibrate the Rosemount 1066 with an attached conductivity sensor:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to conductivity. Press **ENTER**.

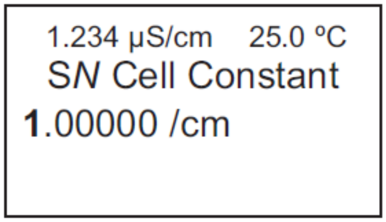


4. To calibrate conductivity or temperature, scroll to the desired item and press **ENTER**.



5. Enter a cell constant only if you are installing the sensor for the first time, replacing the probe, or troubleshooting.

   This procedure sets up the transmitter for the probe type connected to it. Each type of probe has a specific cell constant.



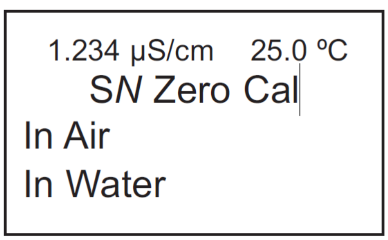
8.3.1 Zero the transmitter

The purpose of zeroing the transmitter is to compensate for small offsets to the conductivity signal that are present even when there is no conductivity to be measured. This procedure is affected by the length of extension cable. Always repeat it if you make any changes in the extension cable or sensor.

Prerequisites

⚠ CAUTION

Ensure that the probe is dry.

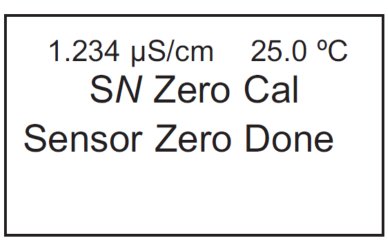


Procedure

1. Zero the transmitter by electrically connecting the conductivity probe as it will actually be used and placing the measuring portion of the probe in the air.
2. Select Zero Cal from the ***Conductivity Calibration*** screen.

If zero calibration is successful, Figure 8-12 appears.

Figure 8-12: Successful Zero Calibration



The transmitter returns to the ***Conductivity Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-13 may appear.

Figure 8-13: Zero Calibration Unsuccessful

```
1.234 µS/cm    25.0 ºC
SN Zero Cal
Sensor Zero Fail
Offset too high

Press EXIT
```

8.3.2 Calibrate the sensor in a conductivity standard (In Process Cal)

Use this procedure to check and correct the transmitter's conductivity reading to ensure it is accurate. To do this, calibrate the sensor and transmitter against a solution of known conductivity.

Prerequisites

- Clean the probe.
- If necessary, check and standardize the temperature reading using a calibrated thermometer.

Procedure

1. Submerge the probe in a sample of known conductivity.
2. If necessary, adjust the displayed value to correspond to the conductivity value of the sample.
3. Turn temperature correction off and use the conductivity of the standard.
4. Select In Process Cal from the ***Conductivity Calibration*** screen.

```
1.234 µS/cm    25.0 ºC
SN InProcess Cal
Wait for stable
reading.
```

If in process calibration is successful, Figure 8-14 appears and the transmitter returns to the ***Conductivity Calibration*** screen.

Figure 8-14: In Process Calibration Successful

```
1.234 µS/cm    25.0 °C
SN InProcess Cal
Updated    cell
constant:
1.00135/cm
```

If in process calibration is unsuccessful, Figure 8-15 may appear.

Figure 8-15: Calibration Error

```
1.234 µS/cm    25.0 °C
SN InProcess Cal
Calibration
Error

Press EXIT
```

8.3.3 Calibrate the sensor to a laboratory instrument (Meter Cal)

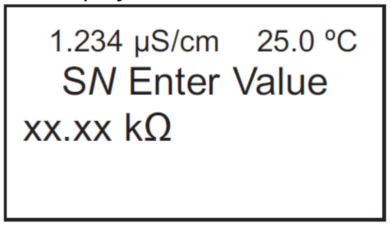
Use this procedure to check and correct the conductivity reading of the transmitter using a laboratory conductivity instrument.

Procedure

1. Submerge the conductivity probe in a bath.
2. Measure the conductivity of a grab sample of the same bath water with a separate laboratory instrument.
3. Adjust the transmitter reading to match the conductivity reading of the lab instrument.
4. Select Meter Cal from the ***Conductivity Calibration*** screen.

```
1.234 µS/cm    25.0 °C
SN Meter Cal
Use precision
resistors only
```

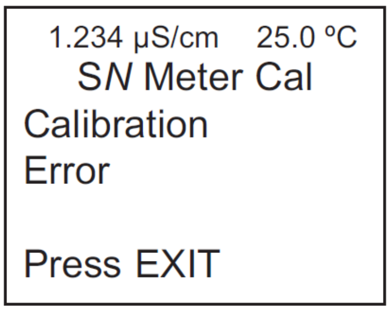
5. Press **ENTER**.
   The display shows the live value measured by the sensor.



If the meter calibration is successful, the screen returns to the ***Conductivity Calibration*** screen.

If meter calibration is unsuccessful, Figure 8-16 appears.

Figure 8-16: Meter Calibration Error

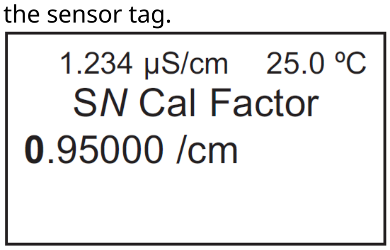


8.3.4 Enter calibration factor

If you selected 4-electrode for the sensor type in the ***Quick Start*** menus upon initial installation and power up, you need to enter a cell constant and a calibration factor into the transmitter.

The cell constant is needed to convert measured conductance to conductivity as it is displayed on the transmitter screen. The calibration factor entry is needed to increase the accuracy of the live conductivity readings, especially at low conductivity readings below 20 µS/cm. Both the cell constant and the cal factor are printed on the tag attached to the four-electrode sensor/cable.

If necessary after initial installation and start-up, enter the calibration factor as printed on the sensor tag.



8.4 Calibrate toroidal conductivity sensors

Procedure

1. Press **MENU**.

2. Select Calibrate.
3. Press **ENTER**.
4. Select Sensor 1 or Sensor 2 corresponding to toroidal conductivity.
5. Press **ENTER**.
6. Select Conductivity.
   The following screen appears.

   1.234 µS/cm 25.0 °C
   Calibration
   Zero Cal
   In Process Cal
   Cell K: 2.7000/cm

Postrequisites

The following sections show the initial display screen that appears for each calibration routine. Use the live screen prompts to complete calibration.

8.4.1 Entering cell constant

New conductivity sensors rarely need calibration. The cell constant printed on the label is sufficient for most applications.

Enter the cell constant:

- When you install the transmitter for the first time
- When you replace the probe
- When troubleshooting

Setting up the cell constant sets up the transmitter for the probe type connected to it. Each type of probe has a specific cell constant.

For toroidal conductivity sensors, the default value is 2.7000/cm.

1.234 µS/cm 25.0 °C
Cell Constant
2.7000/cm

8.4.2 Zero toroidal conductivity sensor

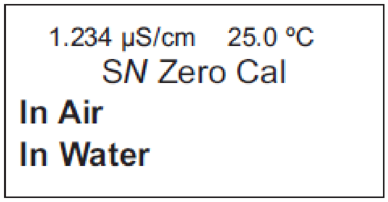
This procedure is used to compensate for small offsets in the conductivity signal that are present even when there is no conductivity to be measured.

This procedure is affected by the length of extension cable. Always repeat it after making any changes in extension cable or sensor.

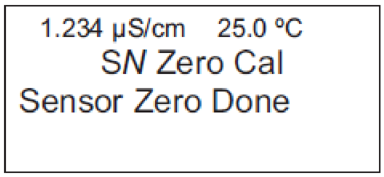
Procedure

1. Electrically connect the conductivity probe as it will actually be used and place the measuring portion of the probe in air.

2. From the ***Conductivity Calibration*** screen, select Zero Cal.
   The following screen appears.

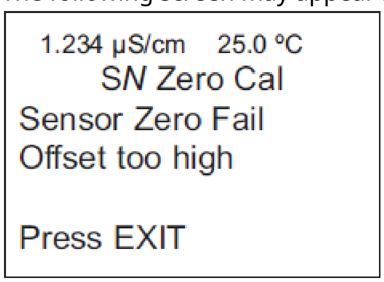


If zero calibration is successful the following screen appears.



The screen returns to the ***Conductivity Calibration*** menu.

The following screen may appear if the zero calibration is unsuccessful.



8.4.3 Calibrate toroidal conductivity sensor in a conductivity standard (in process calibration)

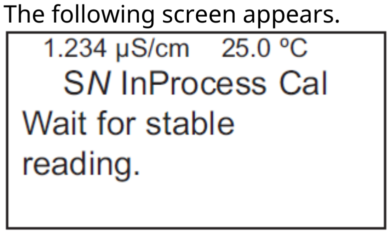
This procedure is used to check and correct the conductivity reading of the Rosemount 1066 to ensure that the reading is accurate.

Prerequisites

Clean the probe and check and standardize the temperature reading before performing this procedure.

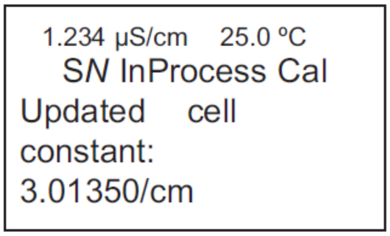
Procedure

1. Submerge the probe in a sample of known conductivity.
2. Select In Process Cal from the ***Conductivity Calibration*** screen.
   The following screen appears.



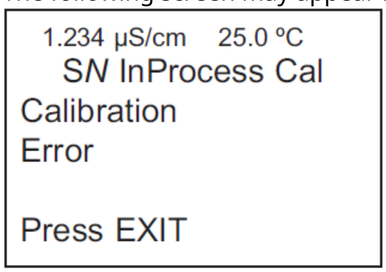
3. Adjust the displayed value on the transmitter, if necessary, to correspond to the conductivity value of the sample.

The following screen will appear if in process calibration is successful.



The screen returns to the ***Conductivity Calibration*** menu.

The following screen may appear if in process calibration is unsuccessful.



The screen returns to the ***Conductivity Calibration*** menu.

8.5 Chlorine calibration

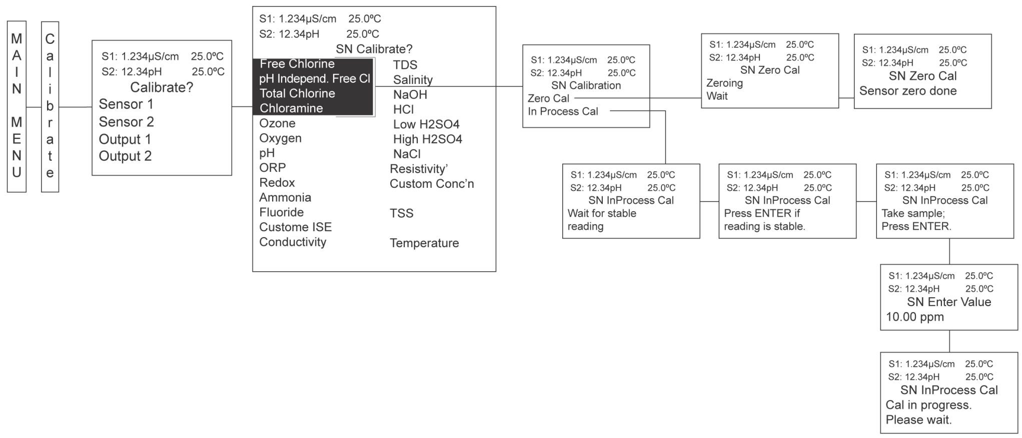
With a chlorine measurement board and the appropriate sensor, the transmitter can measure any of the four variants of chlorine.

- Free chlorine
- Total chlorine
- Monochloramine
- pH-independent free chlorine

The following calibration routines are covered in the family of supported chlorine sensors:

- Air calibration
- Zero calibration
- In process calibration

Figure 8-17: Calibrate chlorine menu tree



8.5.1 Calibrate free chlorine sensors

A free chlorine sensor generates a current directly proportional to the concentration of free chlorine in the sample. Calibrating the sensor requires exposing it to a solution containing no chlorine (zero standard) and to a solution containing a known amount of chlorine (full-scale standard).

Zero calibration is necessary, because chlorine sensors, even when no chlorine is present in the sample, generate a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a chlorine value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution.

Either of the following makes a good zero standard:

- Deionized water containing about 500 ppm sodium chloride. Dissolve 0.02 oz. (0.5 g) of table salt in one liter of water.

⚠ CAUTION

Do not use deionized water alone for zeroing the sensor.
The conductivity of the zero water must be greater than 50 µS/cm.

- Tap water known to contain no chlorine. Expose tap water to bright sunlight for at least 24 hours.

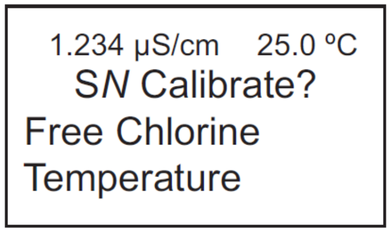
The purpose of in process calibration is to establish the slope of the calibration curve. Because stable chlorine standards do not exist, calibrate the sensor against a test run on a grab sample of the in process liquid. Several manufacturers offer portable test kits for this purpose. Observe the following precautions when taking and testing the grab sample:

- Take the grab sample from a point as close to the sensor as possible. Be sure that taking the sample does not alter the flow of the sample to the sensor. It is best to install the sample tap just downstream from the sensor.
- Chlorine solutions are unstable. Run the test immediately after taking the sample. Try to calibrate the sensor when the chlorine concentration is at the upper end of the normal operating range.

To calibrate free chlorine:

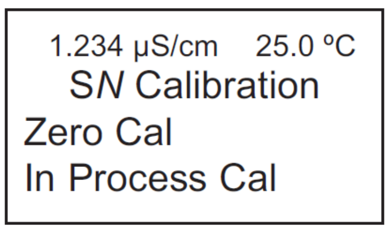
Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to free chlorine. Press **ENTER**.
4. Select Free Chlorine. Press **ENTER**.



After you select Free Chlorine, Figure 8-18 appears.

Figure 8-18: Calibration Screen



Related information

Zero sensor
Calibrate sensor in process

Zero sensor

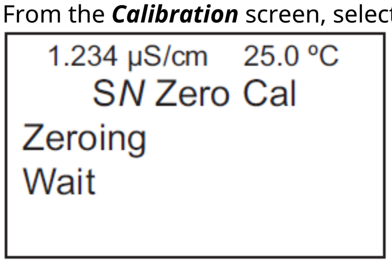
This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

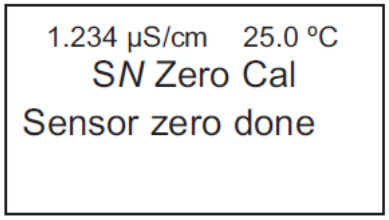
Procedure

From the ***Calibration*** screen, select Zero Cal.



If zero calibration is successful, Figure 8-19 appears.

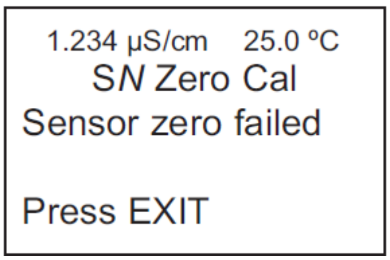
Figure 8-19: Zero Calibration Successful



The transmitter returns to the ***Amperometric Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-20 may appear.

Figure 8-20: Zero Failed

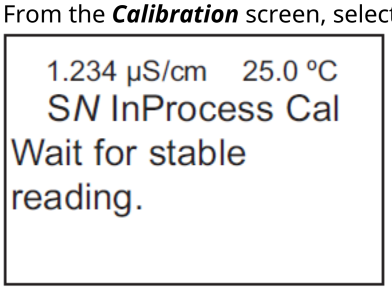


The transmitter returns to the ***Amperometric Calibration*** screen.

Calibrate sensor in process

Procedure

From the ***Calibration*** screen, select In Process Cal.



If the in process calibration is successful, the transmitter returns to the ***Calibration*** screen.

If calibration is unsuccessful, Figure 8-21 may appear.

Figure 8-21: Calibration Error

1.234 µS/cm 25.0 °C
SN InProcess Cal
Calibration
Error

Press EXIT

The transmitter returns to the ***Amperometric Calibration*** screen.

8.5.2 Calibrate total chlorine sensors

Total chlorine is the sum of free and combined chlorine.

The continuous determination of total chlorine requires two steps. First, the sample flows into a conditioning system (TCL) where a pump continuously adds acetic acid and potassium iodide to the sample. The acid lowers the pH, which allows total chlorine in the sample to quantitatively oxidize the iodide in the reagent to iodine. In the second step, the treated sample flows to the sensor. The sensor is a membrane-covered amperometric sensor, whose output is proportional to the concentration of iodine. Because the concentration of iodine is proportional to the concentration of total chlorine, you can calibrate the transmitter to read total chlorine. Because the sensor really measures iodine, calibrating the sensor requires exposing it to a solution containing no iodine (zero standard) and to a solution containing a known amount of iodine (full-scale standard).

Zero calibration is necessary because the sensor, even when no iodine is present, generates a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a total chlorine value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution. The best zero standard is deionized water.

Measure in process calibration with the Rosemount TCL Total Chlorine Sample Conditioning System.

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to total chlorine. Press **ENTER**.
4. Select Total Chlorine. Press **ENTER**.

1.234 µS/cm 25.0 °C
SN Calibrate?
Total Chlorine
Temperature

5. To calibrate total chlorine or temperature, scroll to the desired item and press **ENTER**.

   1.234 µS/cm 25.0 °C
   S*N* Calibration
   Zero Cal
   In Process Cal

Related information

Zero sensor
Calibrate sensor in process

Zero sensor

This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

Procedure

From the ***Calibration*** screen, select Zero Cal.

1.234 µS/cm 25.0 °C
S*N* Zero Cal
Zeroing
Wait

If zero calibration is successful, Figure 8-22 appears.

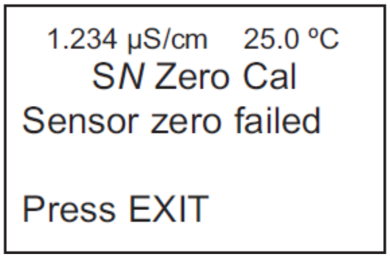
Figure 8-22: Zero Calibration Successful

1.234 µS/cm 25.0 °C
S*N* Zero Cal
Sensor zero done

The transmitter returns to the ***Amperometric Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-23 may appear.

Figure 8-23: Zero Failed

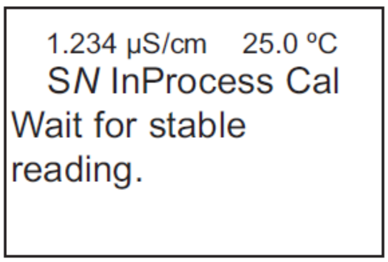


The transmitter returns to the ***Amperometric Calibration*** screen.

Calibrate sensor in process

Procedure

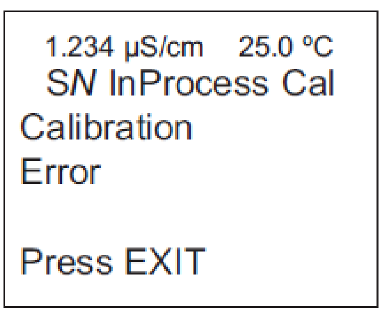
From the ***Calibration*** screen, select In Process Cal.



If the in process calibration is successful, the transmitter returns to the ***Calibration*** screen.

If calibration is unsuccessful, Figure 8-24 may appear.

Figure 8-24: Calibration Error



The transmitter returns to the ***Amperometric Calibration*** screen.

8.5.3 Calibrate monochloramine sensors

A monochloramine sensor generates a current directly proportional to the concentration of monochloramine in the sample. To calibrate the sensor, expose it to a solution containing no monochloramine (zero standard) and to a solution containing a known amount of monochloramine (full-scale standard).

Zero calibration is necessary because monochloramine sensors, even when no monochloramine is in the sample, generate a small current called the residual or zero current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a monochloramine value.

To calibrate monochloramine:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to monochloramine. Press **ENTER**.
4. Select Monochloramine. Press **ENTER**.

   ```
   1.234 µS/cm    25.0 ºC
   SN Calibrate?
   Monochloramine
   Temperature
   ```

5. To calibrate monochloramine or temperature, scroll to the desired item and press **ENTER**.

After you select Monochloramine, Figure 8-25 appears.

Figure 8-25: Calibration Screen

```
1.234 µS/cm    25.0 ºC
SN Calibration
Zero Cal
In Process Cal
```

Related information

Zero sensor
Calibrate sensor in process

Zero sensor

This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

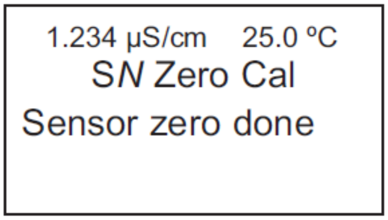
Procedure

From the ***Calibration*** screen, select Zero Cal.

```
1.234 µS/cm    25.0 ºC
SN Zero Cal
Zeroing
Wait
```

If zero calibration is successful, Figure 8-26 appears.

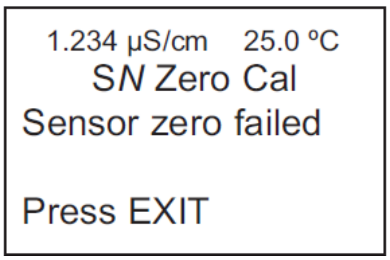
Figure 8-26: Zero Calibration Successful



The transmitter returns to the ***Amperometric Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-27 may appear.

Figure 8-27: Zero Failed

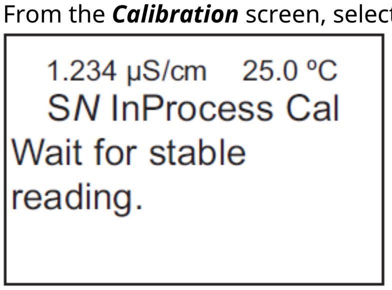


The transmitter returns to the ***Amperometric Calibration*** screen.

Calibrate sensor in process

Procedure

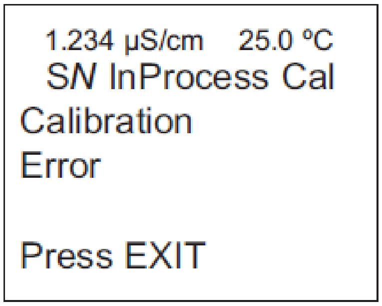
From the ***Calibration*** screen, select In Process Cal.



If the in process calibration is successful, the transmitter returns to the ***Calibration*** screen.

If calibration is unsuccessful, Figure 8-28 may appear.

Figure 8-28: Calibration Error

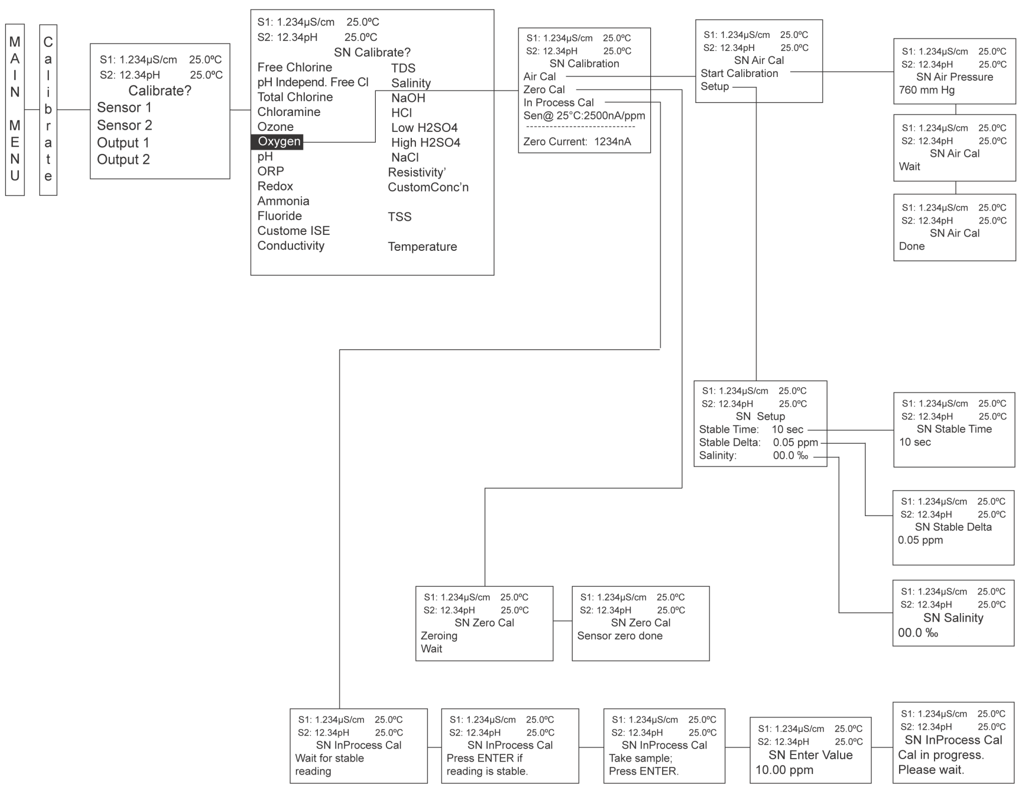


The transmitter returns to the ***Amperometric Calibration*** screen.

8.6 Calibrate oxygen sensors

Oxygen sensors generate a current directly proportional to the concentration of dissolved oxygen in the sample. To calibrate an oxygen sensor, you must expose it to a solution containing no oxygen (zero standard) and to a solution containing a known amount of oxygen (full-scale standard).

Figure 8-29: Calibrate Oxygen Sensor Menu Tree



Zero calibration is necessary because oxygen sensors, even when no oxygen is present in the sample, generate a small current called the residual current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to a dissolved oxygen value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution. The recommended zero standard is five percent sodium sulfide in water, although you can also use oxygen-free nitrogen. The Rosemount 499ATrDO sensor, used to determine trace (ppb) oxygen levels, has very low residual current and does not normally require zeroing. The residual current in the Rosemount 499ATrDO sensor is equivalent to less than 0.5 ppb oxygen.

The purpose of in process calibration is to establish the slope of the calibration curve. Because the solubility of atmospheric oxygen in water as a function of temperature and barometric pressure is well known, the natural choice for a full-scale standard is air-saturated water. However, air-saturated water is difficult to prepare and use, so the universal practice is to use air for calibration. From the point of view of the oxygen sensor, air and air-saturated water are identical. The equivalence comes about because the sensor really measures the chemical potential of oxygen. Chemical potential is the force that causes oxygen molecules to diffuse from the sample into the sensor where they can be measured. It is also the force that causes oxygen molecules in air to dissolve until the water is saturated with oxygen. Once the water is saturated, the chemical potential of oxygen in the two phases (air and water) is the same.

Oxygen sensors generate a current directly proportional to the rate at which oxygen molecules diffuse through a membrane stretched over the end of the sensor. The diffusion rate depends on the difference in chemical potential between oxygen in the sensor and oxygen in the sample. An electrochemical reaction, which destroys any oxygen molecules entering the sensor, keeps the concentration (and the chemical potential) of the oxygen inside the sensor equal to zero. Therefore, the chemical potential of oxygen in the sample alone determines the diffusion rate and the sensor current.

When you calibrate the sensor, the chemical potential of oxygen in the standard determines the sensor current. Whether the sensor is calibrated in air or air-saturated water is immaterial. The chemical potential of oxygen is the same in either phase. Normally, to make calculating solubility in common units (like ppm dissolved oxygen) simpler, it is convenient to use water-saturated air for calibration. Automatic air calibration is standard. Simply expose the sensor to water-saturated air. The transmitter measures the sensor current. When the current is stable, the transmitter stores the current and measures the temperature using a temperature element inside the oxygen sensor. Enter the barometric pressure.

From the temperature, the transmitter calculates the saturation vapor pressure of water. Next, it calculates the pressure of dry air by subtracting the vapor pressure from the barometric pressure. Using the fact that dry air always contains at least 20.95 percent oxygen, the transmitter calculates the partial pressure of oxygen. Once the transmitter knows the partial pressure of oxygen, it uses the Bunsen coefficient to calculate the equilibrium solubility of atmospheric oxygen in water at the prevailing temperature. At 77.0 °F (25 °C) and 29.92 in (760 mm) Hg, the equilibrium solubility is 8.24 ppm. Often, it is too difficult or messy to remove the sensor from the process liquid for calibration. In this case, you can calibrate the sensor against a measurement made with a portable laboratory instrument. The laboratory instrument typically uses a membrane-covered amperometric sensor that has been calibrated against water-saturated air.

To calibrate oxygen:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to oxygen. Press **ENTER**.

4. Select Oxygen. Press **ENTER**.

```
1.234 µS/cm    25.0 °C
SN Calibrate?
Oxygen
Temperature
```

5. To calibrate oxygen or temperature, scroll to the desired item and press **ENTER**.

```
1.234 µS/cm    25.0 °C
SN Calibration
Air Cal
Zero Cal
In Process Cal
Sen@ 25 °C:2500nA/ppm
Zero Current:  1234 nA
```

6. Select Air Cal to adjust air calibration criteria.
   You can adjust the following:
   - Stabilization time (default 10 sec)
   - Stabilization pH value (default 0.05 ppm)
   - Salinity of the solution to be measured (default 00.0 parts per thousand)

```
1.234 µS/cm    25.0 °C
SN  Setup
Stable Time:  10 sec
Stable Delta:  0.05 ppm
Salinity:    00.0 ‰
```

Related information

Zero sensor
Calibrate sensor in air
Calibrate sensor in process

8.6.1 Zero sensor

This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

Procedure

From the ***Calibration*** screen, select Zero Cal.

1.234 µS/cm 25.0 °C
SN Zero Cal
Zeroing
Wait

If zero calibration is successful, Figure 8-30 appears.

Figure 8-30: Zero Calibration Successful

1.234 µS/cm 25.0 °C
SN Zero Cal
Sensor zero done

The transmitter returns to the ***Amperometric Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-31 may appear.

Figure 8-31: Zero Failed

1.234 µS/cm 25.0 °C
SN Zero Cal
Sensor zero failed

Press EXIT

The transmitter returns to the ***Amperometric Calibration*** screen.

8.6.2 Calibrate sensor in air

Procedure

From the ***Oxygen Calibration*** screen, select Air Cal.

1.234 µS/cm 25.0 °C
SN Air Cal
Start Calibration
Setup

If air calibration is successful, Figure 8-32 appears.

Figure 8-32: Air Cal Done

1.234 µS/cm 25.0 °C
SN Air Cal
Done

The transmitter returns to the ***Amperometric Calibration*** screen.

If air calibration is unsuccessful, Figure 8-33 appears.

Figure 8-33: Air Cal Failure

1.234 µS/cm 25.0 °C
SN Air Cal
Failure
Check Sensor

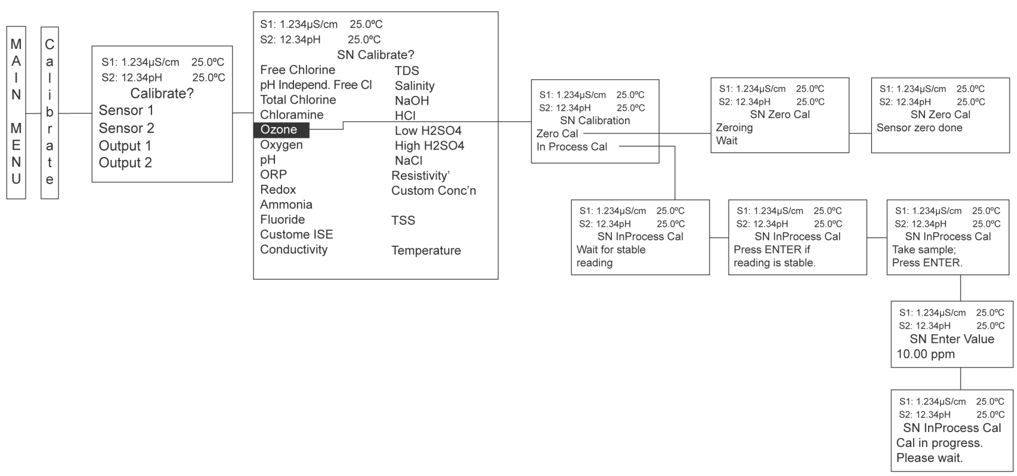
Press EXIT

The transmitter returns to the ***Amperometric Calibration*** screen.

8.7 Calibrate ozone sensors

An ozone sensor generates a current directly proportional to the concentration of ozone in the sample. To calibrate an ozone sensor, you must expose it to a solution containing no ozone (zero standard) and to a solution containing a known amount of ozone (full-scale standard).

Figure 8-34: Calibrate Ozone Sensor Menu Tree



Zero calibration is necessary because ozone sensors, even when no ozone is in the sample, generate a small current called the residual or zero current. The transmitter compensates for the residual current by subtracting it from the measured current before converting the result to an ozone value. Zero new sensors before placing them in service and whenever you replace the electrolyte solution. The best zero standard is deionized water.

To calibrate ozone:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to ozone. Press **ENTER**.
4. Select Ozone. Press **ENTER**.

   1.234 µS/cm 25.0 ºC
   SN Calibrate?
   Ozone
   Temperature

5. To calibrate ozone or temperature, scroll to the desired item and press **ENTER**.

1.234 µS/cm 25.0 ºC
SN Calibration
Zero Cal
In Process Cal

Related information

Zero sensor
Calibrate sensor in process

8.7.1 Zero sensor

This procedure applies to amperometric sensors only.

Prerequisites

Run the sensor in the zero solution for at least two hours before zeroing.

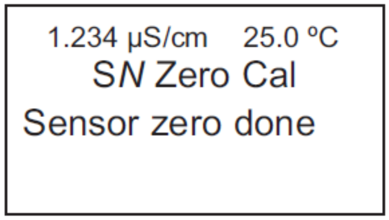
Procedure

From the ***Calibration*** screen, select Zero Cal.

1.234 µS/cm 25.0 ºC
SN Zero Cal
Zeroing
Wait

If zero calibration is successful, Figure 8-35 appears.

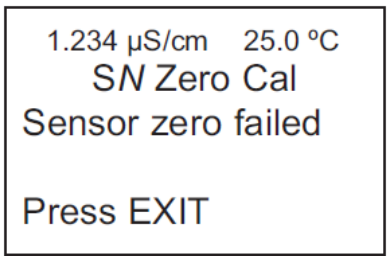
Figure 8-35: Zero Calibration Successful



The transmitter returns to the ***Amperometric Calibration*** screen.

If zero calibration is unsuccessful, Figure 8-36 may appear.

Figure 8-36: Zero Failed

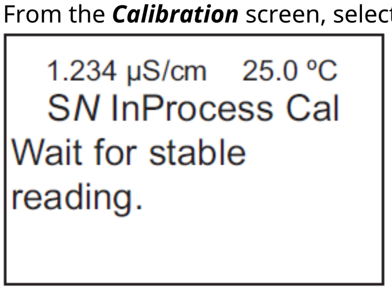


The transmitter returns to the ***Amperometric Calibration*** screen.

8.7.2 Calibrate sensor in process

Procedure

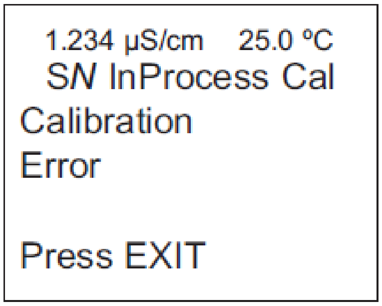
From the ***Calibration*** screen, select In Process Cal.



If the in process calibration is successful, the transmitter returns to the ***Calibration*** screen.

If calibration is unsuccessful, Figure 8-37 may appear.

Figure 8-37: Calibration Error



The transmitter returns to the ***Amperometric Calibration*** screen.

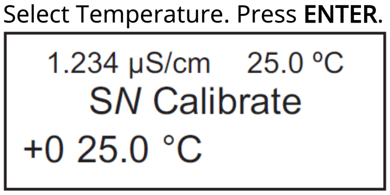
8.8 Calibrate temperature

Most liquid analytical measurements (except oxidation reduction potential [ORP]) require temperature compensation. The transmitter automatically compensates for temperature by applying internal temperature correction algorithms. You can also turn off temperature correction. If you turn temperature correction off, the transmitter uses the manual temperature you enter in all temperature correction calculations.

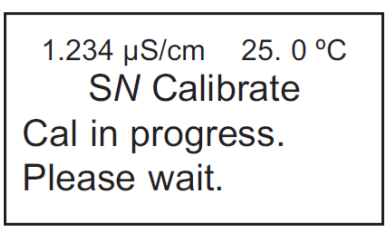
To calibrate temperature:

Procedure

1. Press **MENU**.
2. Select Calibrate. Press **ENTER**.
3. Select Sensor 1 or Sensor 2 corresponding to the desired measurement. Press **ENTER**.
4. Select Temperature. Press **ENTER**.

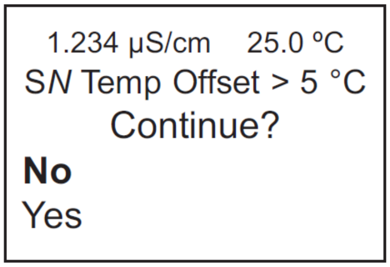


5. The transmitter calibrates temperature.



6. If the temperature offset is greater than 5 °C from the default value, Figure 8-38 may appear.

Figure 8-38: Temperature Offset Screen



7. To continue, select Yes. To suspend the operation, select No.

If the temperature calibration is successful, the transmitter returns to the ***Calibration*** screen.

Related information

Enter temperature compensation

9 HART® Communications

9.1 Introduction

The 1066 transmitter can communicate with a HART® host using HART Revision 5 or HART Revision 7. The revision of HART used by the 1066 can be selected using the keypad/display or a HART master such as AMS or the HART Communicator. The default version of HART is Revision 5. Since some HART hosts cannot accommodate HART 7, the choice of HART Revision should be based on the capabilities of the host, and should be chosen as a first step in configuration. If HART Revision 7 can be used with the host, it does offer a number of advantages over Revision 5, including long tag name, time stamped data, and measurement status, and enhanced burst mode.

When HART 5 is chosen, the Device Revision of the 1066 is Device Revision 1; when HART 7 is chosen the Device Revision is Revision 2 (or greater). The Device Revision of the DD (Device Driver) and install files for AMS and DeltaV™ used should be the same as the Device Revision of the 1066.

A single HART 5 (Device Revision 1) or HART 7 (Device Revision 2 or greater) DD (Device Driver) is used for all model codes of the 1066, which include the pH/ ORP, conductivity, oxygen, chlorine, and ozone transmitters. All 1066 transmitters have the same HART device identification, as outlined below:

HART 5 Device Identification (1066 Revision 1):

Manufacturer Name:	Emerson
Model Name:	46 (0x2E)
Device Type Code:	33 (0x0021)
HART Protocol Revision:	5.1
Device Revision:	1

HART 7 Device Identification (1066 Revision 2):

Manufacturer Name:	Emerson
Model Name:	1066
Manufacturer ID:	46 (0x2E)
Device Type Code:	11809 (0x2E21)
HART Protocol Revision:	7.3
Device Revision:	2

9.2 Physical installation and configuration

9.2.1 HART® Wiring and Output Configuration

HART communications is superimposed on Analog Output 1 for all of the measurements and parameters of the 1066.

9.2.2 HART® multidrop (bus) configuration

The HART Polling Address should be left at its default value of `0`, unless the 1066 is used in a Multidrop configuration with up to 14 other transmitters. When the Polling Address is greater than `0`, the 4-20 mA output is held at 4 mA or below, and does not change in response to changes in the measurement in HART 5.

In HART 7, Loop Current Mode should be set to `Off` to hold the current output to a minimum value.

9.2.3 HART® configuration

To access the HART Configuration screens, select the **HART** menu item in the Main Menu. If HART 7 is chosen (Univ Cmd Rev = 7), the following controls are available:

Figure 9-1: HART 7 Configuration Screen: Basic Definitions

Univ Camd Rev:	**7**
Polling Address:	**0**
Loop Current Mode:	**Off**
Find Device Cmd:	**Off**
Burst Message 0:	**Off**
Burst Message 1:	**Off**
Burst Message 2:	**Off**

Univ Cmd Rev Toggles between HART version 5 and HART version 7. If the HART host being used can accommodate HART 7, HART 7 should be chosen due to its larger feature set. If the host can only use HART 5, then HART 5 must be chosen.

Note
If the 1066 is connected to a HART host and the HART version is changed, the host will likely detect the transmitter as a new transmitter with a different device revision number.

Polling address Choose `0` unless Multidrop is being used. If Multidrop is being used, each transmitter should have its own polling address of from 1 to 15.

Loop current mode Set Output 1 current to a minimum value for multidrop applications (HART 7 only).

Find Device Cmd Setting Find Device to `On`, enables the 1066 to be identified by the host. The transmitter returns identity information including device type, revision level, and device ID (HART 7 only).

Burst Message 0, 1, 2 Toggles burst messages 0, 1, and/or 2 on or off (HART 7 only). See the end of section 10.2 for the HART burst commands available.

If HART 5 is chosen (Univ Cmd Rev = 5), the following controls are available:

Figure 9-2: HART 5 Configuration Screen: Basic Definitions

Univ Camd Rev:	**5**
Polling Address:	**0**
Burst Mode:	**Off**

Univ Cmd Rev Toggles between HART version 5 and HART version 7. If the HART host being used can accommodate HART 7, HART 7 should be chosen due to its larger feature set. If the host can only use HART 5, then HART 5 must be chosen.

Note
If the 1066 is connected to a HART host and the HART version is changed, the host will likely detect the transmitter as a new transmitter with a different device revision number.

Polling address Choose `0` unless Multidrop is being used. If Multidrop is being used, each transmitter should have its own polling address of from 1 to 15.

Burst Mode Toggles the single HART 5 burst message on or off. See below for the HART burst commands available.

Burst Commands available in HART® 5 and HART 7

If burst messages are enabled by setting the burst messages to on, the information in the burst message can be selected using a HART host from the following commands:

Burst command:

Off Turns burst mode off

Cmd 1 Bursts the Primary Value

Cmd 2 Bursts Loop Current + % of range of the Primary Value

Cmd 3 Bursts Dynamic Variables (Primary variable [PV], secondary variable [SV], tertiary variable [TV], and quaternary variable [QV]) + Loop Current

Cmd 9 Bursts up to 8 Device Variables with time stamp and status and Cmd 48 Additional Transmitter Status (HART 7 only)

Cmd 33 Bursts 4 Device Variables

Cmd 48 Bursts Additional Transmitter Status Bits (HART 7 only)

Cmd 93 Bursts Trend Data (HART 7 only)

9.3 Measurements Available via HART®

A number of live measurements are made available by HART in addition to the main measurements, such as pH or Conductivity. All of these measurements are called Device Variables, which can be mapped to the Dynamic Variables primary variable (PV), secondary variable (SV), tertiary variable (TV), and quaternary variable (QV) for regular reading by the typical HART host.

Each 1066 transmitter type, 1066P, 1066C, etc. will have its own set of Device Variables, based on the secondary measurements used in making the main measurement. Device variables shows the Device Variable for the each transmitter type, and the Dynamic Variables, which they can be mapped to.

9.4 Diagnostics Available via HART®

9.4.1 Status Information – Device Status Bits

Bit 0 Primary Variable out of Limits:

This bit is set when PV is out of its limits.

Bit 1 Non-primary Variable out of Limits:

This bit is set when any active device variable other than the Primary variable is out of its limits.

Bit 2 Loop Current Saturated:

This bit is set when Analog Output 1 is not fixed, and it is less than 3.8 mA or greater than 22.0 mA.

Bit 3 Loop Current Fixed:

This bit is set when Analog Output 1 is being simulated, calibrated, or when a device failure is detected and the Analog Output 1 is configured to output a fixed value.

Bit 4 More Status Available:

The `more status available` bit will be set when the device status condition occurs (i.e. bit goes from 0 to 1) on at least one of the Additional Transmitter Status bits are set.

Bit 5 Cold Start:

This bit is set when a Master Reset is performed either by Command 42, or a power cycle. 2 bits are maintained internally, for primary and secondary masters.

Bit 6 Configuration Changed:

This bit is set when a configuration or calibration parameter is changed either through a write command or a local interface command. 2 bits are maintained internally, for primary and secondary masters.

Bit 7 Field Device Malfunction:

This bit is set when a fault condition is detected in the device electronics or sensor.

9.4.2 Status Information – Extended Device Status Bits (HART® 7 only)

Bit 0 Maintenance Required:
This bit is set when a device fault is detected.

Bit 1 Device Variable Alert:
This bit is set when any enabled device variable status is not good.

Bit 2 Critical Power Failures:
This bit is not supported and will always be cleared on 1066.

9.4.3 Additional Transmitter Status (Command 48)

Additional Transmitter Status provides diagnostic status bits specific to the condition of sensors, electronics, and the memory of the 1066. Calibration errors and notification of events, such as calibration in progress and relay activation are also indicated by status bits. Additional transmitter status – command 48 status bits shows these bits organized according to the 1066 transmitter measurement type.

9.5 HART® Hosts

A HART host can access live measurements, diagnostic messages, and provide a tool for configuring the measurement and calibrating the 1066. The configuration parameters for the 1066 transmitter are listed in 1066 HART® Configuration parameters. Two examples of HART hosts are shown below.

9.5.1 AMS Intelligent Device Manager

The AMS Device Intelligent Device Manager is member of the AMS Suite of asset management applications, which provides tools for configuration, calibration, diagnosing, and documenting transmitters and valves. The following AMS windows are examples of these functions:

Figure 9-3: Main Measurement and Overall Status

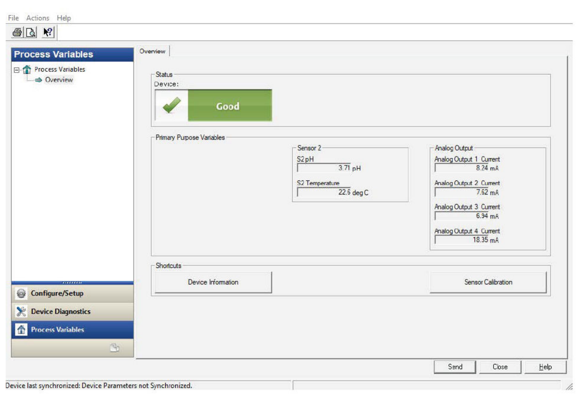


Figure 9-4: Diagnostic Messages (Additional Transmitter Status)

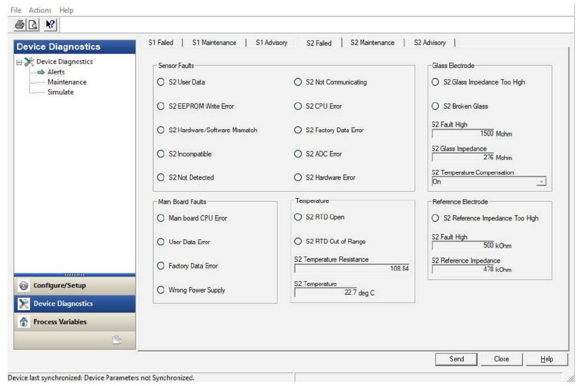


Figure 9-5: Configuration

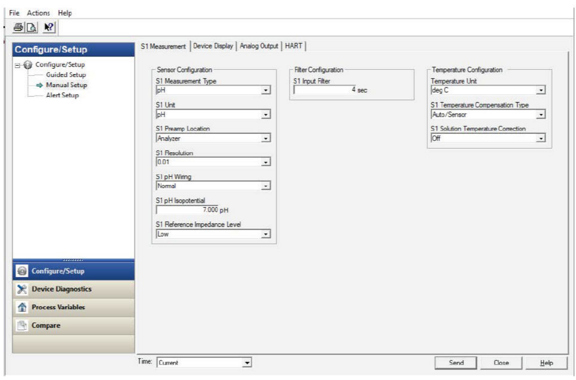
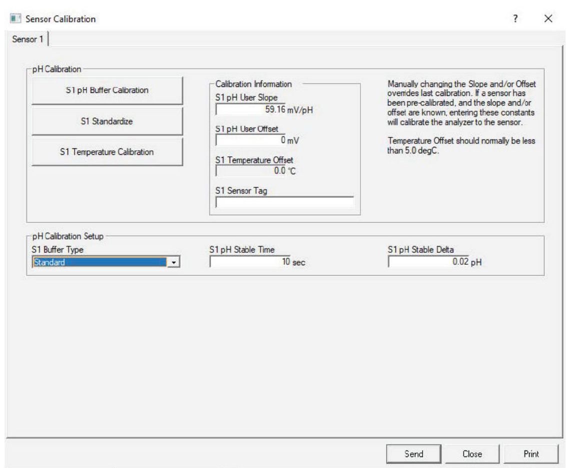


Figure 9-6: Calibration



9.5.2 HART® communicator

HART (and Fieldbus) devices can be accessed in the field using the HART communicator, which provides the same basic functionality as the AMS Intelligent Device Manager.

Asset management information can be uploaded into the AMS database from the HART communicator for a common database for asset management data. The HART communicator uses a color menu driven display. The HART communicator Menu for the 1066 appears in Diagnostics Available via HART®.

Figure 9-7: HART Communicator

9.5.3 Wireless communication using the 1066

The 1066 can communicate by *Wireless*HART® using the Smart Wireless THUM™ Adapter and the 1410 Gateway. All the information available with the wired device can be accessed wirelessly, making it possible to have the measurements and benefits of HART communication in locations where running cable would be difficult or prohibitively expensive. Although HART 5 or HART 7 can burst the Dynamic Variables (primary variable (PV), secondary variable (SV), tertiary variable (TV), and quaternary variable (QV), HART 7 should be used with the THUM because up to 8 Device Variables can be continually burst using Command 9.

Figure 9-8: Wireless Communication using the 1066

9.5.4 Field Device Specification (FDS)

For more details on the implementation of HART® in the 1066 and its command structure, the Field Device Specification for the relevant Device Revision should be consulted. Download it from www.Emerson.com/global.

A Device variables

A.1 1066 ph device variables

Device variable name	Assignable to dynamic variables	Variable range
Primary value type:		
pH (1)	Primary variable (PV), secondary variable (SV), tertiary variable (TV), or quaternary variable (QV)	0 to 14 pH
ORP (2)	PV, SV, TV or QV	-1,500 to 1,500 mV
Redox (3)	PV, SV, TV or QV	-1,500 to 1,500 mV
Other Device variables:		
Temperature	SV, TV or QV	5 to +360 °F -15 to +200 °C
Sensor mV input	TV or QV	-750 to 750 mV
Sensor Glass impedance	TV or QV	0 to 2,000 Mµ
Sensor Reference impedance	TV or QV	0 to 10,000 kµ

A.2 1066 contacting and 1066 toroidal device variables

Device variable name	Assignable to dynamic variables	Variable range
Primary Value Type:		
Conductivity (7)	Primary variable (PV), secondary variable (SV), tertiary variable (TV), or quaternary variable (QV)	0 to 2,000,000 µS/cm
Resistivity (8)	PV, SV, TV or QV	0 to 50,000,000 µ -cm
% Concentration:		
NaOH (9)	PV, SV, TV or QV	0 to 12%
HCl (10)	PV, SV, TV or QV	0 to 15%
Low H_2SO_4 (11)	PV, SV, TV or QV	0 to 25%
High H_2SO_4 (12)	PV, SV, TV or QV	96 to 99.7%
NaCl (13)	PV, SV, TV or QV	0 to 25%
Custom Concentration (14)	PV, SV, TV or QV	0 to 1,000 ppm 0 to 1,000 mg/L 0 to 100 mg/L 0 to 100 % 0 to 1,000 None
Total dissolved solids (TDS) (15)	PV, SV, TV or QV	0 to 10,000 ppm

Device variable name	Assignable to dynamic variables	Variable range
Salinity (16)	PV, SV, TV or QV	0 to 36 ppth
Other Device Variables:		
Temperature	SV, TV or QV	-13 to +360 °F -25 to +200 °C
Conductance	TV or QV	0 to 2,000,000 µS
Input resistance	TV or QV	0 to 500 kµ
Raw Conductivity	TV or QV	0 to 2,000,000 µS/cm
Raw Resistivity	TV or QV	0 to 50,000,000 ohm-cm

A.3 1066 dissolved oxygen device variables

Device variable name	Assignable to dynamic variables	Variable range
Primary value type:		
Oxygen (17)	Primary variable (PV), secondary variable (SV), tertiary variable (TV), or quaternary variable (QV)	0 to 100 ppm 0 to 1,000 ppb 0 to 100 mg/L 0 to 1,000 µg/L 0 to 300 % Saturation 0 to 760 mmHg 0 to 30 inHg 0 to 1 bar 0 to 1,000 mbar 0 to 100 kPa 0 to 1 atm
Other device variables:		
Temperature	PV, SV, TV or QV	+5 to +360 °F -15 to +200 °C
Temperature resistance	TV or QV	0 to 100,000
Sensor input current	PV, SV, TV or QV	0 to 100,000 nA

A.4 1066 ozone device variables

Device variable name	Assignable to dynamic variables	Variable range
Primary value type:		
Ozone (18)	Primary variable (PV), secondary variable (SV), tertiary variable (TV), or quaternary variable (QV)	0 to 20 ppm 0 to 1,000 ppb 0 to 20 mg/L 0 to 1,000 µg/L
Other Device variables:		
Temperature	PV, SV, TV or QV	+5 to +360 °F -15 to +200 °C

Device variable name	Assignable to dynamic variables	Variable range
Temperature resistance	TV or QV	0 to 100,000 µ
Sensor input current	PV, SV, TV or QV	0 to 100,000 nA

A.5 1066 chlorine device variables

Device variable name	Assignable to dynamic variables	Variable range
Primary value type:		
Chlorine (19)	Primary variable (PV), secondary variable (SV), tertiary variable (TV), or quaternary variable (QV)	0 to 20 ppm 0 to 1,000 ppb 0 to 20 mg/L 0 to 1,000 µg/L
Other Device variables:		
Temperature	PV, SV, TV or QV	+5 to +360 °F -15 to +200 °C
Temperature resistance	TV or QV	0 to 100,000
Sensor input current	PV, SV, TV or QV	0 to 100,000 nA
pH (free chlorine pH compensation)	SV, TV or QV	0 to 14 pH

B Additional transmitter status – command 48 status bits

B.1 1066 ph device variables

Byte/Bit	Meaning/Class	Device Status Bits Set
1/0	Cpu Error/Error The software checksum is not as expected. The central processing unit (CPU) memory has been corrupted.	4 – More status available 7 – Field Device Malfunction
1/1	Self-Test Fail/Error An electronic component is out of specification.	4 – More Status available 7 – Field Device Malfunction
1/2	Factory Data Error/Error An error was detected in the factory segment of the non-volatile memory. At least one factory configuration parameter has been corrupted.	4 – More Status available 7 – Field Device Malfunction
1/3	Hardware/Software Mismatch/Error The software is not compatible with the hardware.	4 – More Status available 7 – Field Device Malfunction
1/4	Internal Communications Error/Error The analog input electronics is non-responsive.	4 – More Status available 7 – Field Device Malfunction
3/0	Keypad Error/Warning At least one key in the device keypad is stuck. This condition makes the local operator interface unuseable. If no other alerts are present, the device can still perform its other functions normally.	4 – More Status available
3/1	User Data Error/Warning An error was detected in the non-volatile memory. One or more user configuration parameter may be corrupted. Reset analyzer to factory defaults and re-configure the device. If the problem persists, replace	4 – More Status available
3/2	Need Factory Calibration/Warning The device's non-volatile memory has been corrupted. The device measurements may be out of specification.	4 – More Status available
3/3	Software Mismatch/Warning The input CPU software is not fully compatible with the main CPU software.	4 – More Status available
3/7	Reset In progress/Other The transmitter's configuration is being reset to factory defaults.	4 – More Status available
6/6	Maintenance Required/Other	4 – More Status available
6/1	Device variable alert/Other	4 – More Status available
8/0	Simulation active/Mode A device variable is being simulated.	4 – More Status available
8/1	Non-volatile Memory Defect/Warning	4 – More Status available
8/2	Volatile Memory Defect/Error	4 – More Status available
8/3	Watchdog Reset Executed/Other	4 – More Status available

Byte/Bit	Meaning/Class	Device Status Bits Set
8/4	Power Supply Condition Out Of Range/Warning	4 – More Status available
8/5	Environmental Condition Out Of Range/Warning	4 – More Status available
8/6	Electronic Defect/Error Reset device or turn power off then on. If problem persists, replace device.	4 – More Status available
8/7	Device locked/Mode Locked device prevents all host modifications. Unlock device to make changes to the device.	4 – More Status available
10/0	Analog Channel 1 Saturated/Warning The primary variable is outside the analog output range. 1. Check the primary value. 2. Check the analog output scaling.	4 – More Status available
10/1	Analog Channel 2 Saturated/Warning The secondary variable is outside the analog output range. 1. Check the secondary value. 2. Check the analog output scaling.	4 – More Status available
13/0	Analog Channel 1 Fixed/Mode Output 1 is either being tested, calibrated, or accidentally left on hold. A fault condition could also set the analog output to a fixed value. If there is no active fault, wait for test or calibration to end or take Output 1 out of hold mode.	4 – More Status available
13/1	Analog Channel 2 Fixed/Mode Output 2 is either being tested, calibrated, or accidentally left on hold. A fault condition could also set the analog output to a fixed value. If there is no active fault, wait for test or calibration to end or take Output 2 out of hold mode.	4 – More Status available

B.2 Temperature status bits

Byte / Bit	Meaning / Class	Device Status Bits Set
0/0	Temperature Error / Error The temperature measuring circuit is open or shorted. Check the wiring and the temperature element in the sensor. If the temperature element in the sensor is open or shorted, replace the sensor.	4 – More Status available 7 – Field Device Malfunction
2/0	Temperature high/Warning The measured temperature is above the temperature range of the transmitter and can damage the sensor. The temperature limits are: • 1066P / 1066DO, CL, and OZ: Temperature > 150 °C • 1066C and 1066T: Temperature > 300 °C 1. Check process temperature. 2. Check sensor and its wiring.	1 – Non-primary variable out of limits 4 – More Status available

Byte / Bit	Meaning / Class	Device Status Bits Set
2/1	Temperature low/Warning The measured temperature is below the temperature range of the transmitter and can damage the sensor. The temperature limits are: • 1066P / 1066DO, CL, and OZ: Temperature < -15 °C • 1066C and 1066T: Temperature -25 °C 1. Check process temperature. 2. Check sensor and its wiring.	1 – Non-primary variable out of limits 4 – More Status available
2/2	RTD Sense line Open / Warning The sense line of the temperature sensor is not connected. 1. Check sensor wiring. 2. If a 2-wire RTD is being used for temperature compensation, use wire jumper to connect sense and return terminals.	4 – More Status available
5/1	Temperature Calibration In progress/Other A temperature calibration is or has been performed.	4 – More Status available

B.3 1066 ph/ORp status bits

Byte/Bit	Meaning/Class	Device Status Bits Set
0/1	Reference Impedance Too high/Error The reference impedance is above the high fault setpoint. The reference electrode may be coated or plugged. 1. Clean or replace the sensor. 2. Check sensor wiring. 3. Increase the setpoint value. 4. Set the reference impedance level to high.	4 – More Status available 7 – Field Device Malfunction
0/2	Glass Impedance Too high/Error The glass impedance is above the high fault setpoint. The glass electrode may be severely coated.	4 – More Status available 7 – Field Device Malfunction
0/3	Broken ph Glass/Error The glass impedance is too low. The glass electrode of the pH sensor may be cracked.	4 – More Status available 7 – Field Device Malfunction
2/3	ph voltage Too high/Warning The sensor voltage is outside the expected range for a pH measurement. 1. Check sensor wiring. 2. Replace sensor.	4 – More Status available

<table>
<tr><th>Byte/Bit</th><th>Meaning/Class</th><th>Device Status Bits Set</th></tr>
<tr><td>4/0</td><td>ph Slope Too high / Warning
The pH slope calculated during buffer calibration exceeded the maximum slope limit.
1. Check the buffers used and retry buffer calibration.
2. Increase the maximum slope limit (default is 62 mV/pH).
Note
A slope of 62 mV/pH or greater indicates that there has been an error made during calibration or a faulty pH sensor.
3. Replace sensor.</td><td>4 – More Status available</td></tr>
<tr><td>4/1</td><td>ph Slope Too low / Warning
The pH slope calculated during buffer calibration was below the minimum slope limit. The pH electrode may be worn out, damaged, or coated.
1. Check and clean sensor, then retry buffer calibration.
2. Decrease minimum slope limit (default is 40 mV/pH). Note that a pH sensor with a slope less than 50 mV/pH is usually near the end of its useful life.</td><td>4 – More Status available</td></tr>
<tr><td>4/2</td><td>zero Offset Error / Warning
The zero offset from a buffer calibration or single point standardization has exceeded the limit. The reference electrode may be poisoned or plugged.
1. Check and clean sensor, then retry buffer calibration.
2. Increase maximum offset limit (default is 60 mV). Note that a pH sensor with an offset of 60 mV or greater is likely poisoned and has to be replaced.
3. Replace sensor.</td><td>4 – More Status available</td></tr>
<tr><td>4/3</td><td>Calibration Error/Warning</td><td>4 – More Status available</td></tr>
<tr><td>5/4</td><td>ph Standardization In progress/Other
A pH standardization is being or has been performed.</td><td>4 – More Status available</td></tr>
<tr><td>5/5</td><td>Buffer Calibration In progress/Other
A pH buffer calibration is being or has been performed.</td><td>4 – More Status available</td></tr>
<tr><td>5/6</td><td>Stabilization In progress/Other
A pH sensor is stabilizing or has been stabilizing.</td><td>4 – More Status available</td></tr>
<tr><td>2/5</td><td>Need zero Calibration / Warning
The sensor offset is too high resulting in a negative reading. This trigger point for this alert is dependent upon the conductivity measurement technology:
• 1066C: (conductance - zero offset) < -2 µS
• 1066T: (conductance - zero offset) < -50 µS
A sensor zero calibration should be performed.</td><td>4 – More Status available</td></tr>
</table>

Byte/Bit	Meaning/Class	Device Status Bits Set
2/6	Concentration Out Of Range/Warning The measured concentration is outside the conductivity range where a valid concentration can be derived for the following 5 concentrations: • 0 to 20% NaCl • 0 to 12% NaOH • 0 to 15% HCl • 0 to 25% H_2SO_4 • 96 to 99.7% H_2SO_4 If there are no other fault conditions check process temperature and check that the actual concentration is outside the range for which curve is defined.	
2/7	Input Out Of Range/Warning The input is outside the device measurement range. the range limits are: • 1066C (2- electrode conductivity): Conductance > 500 mS • 1066CT (4- electrode conductivity): (Conductance > 3000 mS) or (Vcond < 0 mV) • 1066T: Conductance > 1500 mS 1. Check sensor wiring. 2. Replace sensor.	4 – More Status available
4/3	Calibration Error/Warning An error occurred in the last calibration procedure. 1. Check sensor. 2. Repeat the calibration procedure.	4 – More Status available
4/4	Sensor zero Error/Warning An error occurred in the last calibration procedure. 1. Check sensor. 2. Repeat the calibration procedure.	4 – More Status available
5/2	Sensor zero in progress/other A sensor zero is being or has been performed.	4 – More Status available
5/3	Zero Cal In Water in progress/other A zero calibration in water is being or has been performed.	4 – More Status available
5/4	Meter Calibration in progress/other A meter calibration is being or has been performed.	4 – More Status available
5/5	Curve Fit in progress/other A curve fit is being or has been performed.	4 – More Status available

B.4 1066 dissolved oxygen, 1066 chlorine, 1066 ozone status bits

Byte/Bit	Meaning/Class	Device Status Bits Set
2/4	SENSOR_CURRENT > 300 na for OXYGEN BioRx - Other SENSOR_CURRENT > 800 nA for OXYGEN Brewing SENSOR_CURRENT > 106 uA for OXYGEN Oxygen in Gas SENSOR_CURRENT > 350 nA for Ozone SENSOR_CURRENT > 5 uA for Free Chlorine SENSOR_CURRENT > 40 uA for Total Chlorine SENSOR_CURRENT > 20 uA for Monochloramine 1. Make sure the device configuration matches the sensor being used. 2. Check sensor wiring. 3. Replace sensor.	4 – More Status available
2/5	Need zero Calibration/Warning The sensor offset is too high resulting in a negative reading. The sensor zero limits are: • PV < -0.5 if unit is ppm or mg/L • PV < -50 if unit is ppb or ug/L • PV < -2.0 % for % Saturation • PV < -2.0 % for Concentration in Gas • PV < -20 ppm for Concentration in Gas • PV < -30 mmHg for Partial Pressure Perform sensor a zero calibration.	4 – More Status available
4/3	Calibration Error/Warning There has been a calibration error. 1. Check the sensor.	4 – More Status available
4/4	Sensor zero Error/Warning An error occurred in the last sensor zero procedure. 1. Check sensor. 2. Repeat sensor zero procedure.	
5/2	Sensor zero In progress/Other A sensor zero is being or has been performed.	4 – More Status available
5/3	Air Cal In progress/Other An air calibration is being or has been performed.	4 – More Status available
5/6	Stabilization In progress/Other The sensor is stabilizing or has stabilized.	4 – More Status available

C 1066 HART® Configuration parameters

C.1 Parameters common to all 1066 transmitters

	Type	Enumeration/ Range	Read/Write	Default
input_filter_type Selects between continuous and adaptive filtering of the measurement.	ENUM	Adaptive Continuous	R/W	Adaptive
pv_damping_value Provides the filter time constant.	FLOAT	0.0 -- 99.0 seconds	R/W	0
instrument_software_version The software version of the main processor.	FLOAT	N/A	R	N/A
input_software_version The software version of the input processor.	FLOAT	N/A	R	N/A
Display parameters:				
loi_language Selects the language to be displayed by the 1066.	ENUM	English Italiano Français Português Español Chinese Deutsch Russian	R/W	English
loi_warnings Enables or disables the display of transmitter warnings.	ENUM	Enable Disable	R/W	Enable
loi_configuration_code Locks and unlocks access to configuration from the keypad display of the 1066. "000" disables.	UINT (2)	N/A	R/W	0
loi_calibration_code Locks and unlocks access to calibration from the keypad display of the 1066. "000" disables.	UINT (2)	N/A	R/W	0
loi_main_display_upper Selects the measurement displayed on the upper portion of the main display.	ENUM	Assign primary variable Blank	R/W	Assign PV
loi_main_display_center Selects the measurement displayed on the center portion of the main display.	ENUM	Compensating pH (free chlorine) Temperature PV Blank	R/W	Temperature
loi_main_display_left Selects the measurement or output displayed on the left portion of the display.	ENUM	Valid List per 1066 Model	R/W	N/A

	Type	Enumeration/ Range	Read/Write	Default
loi_main_display_lower_left Selects the measurement or output displayed on the lower left portion of the display.	ENUM	Valid List per 1066 Model	R/W	N/A
loi_main_display_right Selects the measurement or output displayed on the right portion of the display.	ENUM	Valid List per 1066 Model	R/W	N/A
loi_main_display_lower_right Selects the measurement or output displayed on the lower right portion of the display.	ENUM	Valid List per 1066 Model	R/W	N/A
	1066ph/ORp	Valid list Input mv Glass Impedance Ref Impedance Slope zero Offset	N/A	N/A
	1066 contacting/ toroidal conductivity	Valid list Raw Conductivity Raw Resistivity	N/A	N/A
	1066 dissolved oxygen/ chlorine/ozone	Valid list Input Current ph (if free chlorine)	N/A	N/A
	All 1066	Valid list AO 1 Current AO 1 Output AO 2 Current AO 2 Output	N/A	N/A

C.2 1066 temperature parameters

	Type	Enumeration/Range	Read/Write	Default
rtd_offset The temperature offset resulting from a temperature calibration.	FLOAT	N/A	R/W	0
rtd_slope The slope (dimensionless) resulting from a two point temperature calibration. (Valid for cell constants < 0.02 1/cm)	FLOAT	N/A	R/W	1
temp_comp_mode Selects automatic or manual temperature compensation.	ENUM	Manual Automatic	R/W	Automatic
manual_temperature If manual temperature compensation is chosen, provides a constant temperature value used by the transmitter.	FLOAT	N/A	R/W	77 °F (25.0 °C)

C.3 1066 ph/ORp

	Type	Enumeration/ Range	Read/Write	Default
zero_offset The zero offset of a pH sensor resulting from a calibration.	FLOAT	N/A	R/W	0.0 mV
ph_slope The slope of a pH sensor resulting from a buffer calibration.	FLOAT	40 -- 62 mV/pH	R/W	59.16 mV/pH
zero_offset_limit The maximum value of the zero offset allowed for a successful calibration.	FLOAT	N/A	R/W	60
min_ph_slope The minimum value of the slope allowed for a successful calibration.	FLOAT	40 -- 62 mV/pH	40 mV/pH	40 mV/pH
max_ph_slope The maximum value of the slope allowed for a successful calibration.	FLOAT	40 -- 62 mV/pH	R/W	62 mV/pH
ph_stabilization_time The period of time used to determine stability of a pH sensor during automatic calibration.	FLOAT	0 -- 99 seconds	R/W	10 seconds
ph_stabilization_value The pH change used to determine stability of a pH sensor during automatic calibration.	FLOAT	0.01 -- 1.0 pH	R/W	0.02 pH
ph_buffer_standard The types of pH buffers available for automatic calibration.	ENUM	Standard / Nist DIN 19267 Ingold Merck Fisher	R/W	Standard / Nist
preamp_location The location of the preamplifier in a pH measurement.	ENUM	Analyzer sensor / junction box	R/W	N/A
reference_impedance_level Configures the transmitter to use reference electrodes with impedances less than 500 kohm (low) or greater than 500 kohm (high).	ENUM	Low High	R/W	Low
ph_solution_temperature_correction Configures the transmitter to correct the pH measurement for changes in the pH of the solution with temperature.	ENUM	Off ultra pure water high pH ammonia custom	N/A	Off
ph_solution_temperature_coefficient The coefficient used to correct solution pH when using custom solution pH temperature correction.	FLOAT	-9.999 -- 9.999 pH / °C	R/W	0.000 pH / °C
ph_display_resolution Changes the resolution of the displayed pH value.	ENUM	0.01 pH 0.1 pH	R/W	0.01 pH

	Type	Enumeration/ Range	Read/Write	Default
ph_sensor_isopotential The pH at which the millivolt output of the pH sensor remains constant with temperature changes; virtually always 7.00 pH.	FLOAT	0.00 -- 14.00 pH	R/W	7.00 pH
refz_high_fault_setpoint The high setpoint that triggers a reference electrode mpedance alert.	FLOAT	0.0 -- 9,999.0 kohm	R/W	500.0 kohm
glassz_high_fault_setpoint The high setpoint that triggers a glass pH electrode impedance alert.	FLOAT	0.0 -- 9,999.0 Mohm	R / W	1,500 Mohm
diagnostics_switch Turns the glass and reference electrode impedance measurements on and off.	ENUM	Off On	R/W	Off
glassz_temperature_correction Turns temperature correction of the glass impedance measurement on and off.	ENUM	Off On	R/W	Off
glassz_measurement_type Toggles between a basic glass impedance measurement, and an advanced impedance measurement that is more accurate.	ENUM	Advanced Basic	R/W	Advanced
calculated_offset The preliminary zero offset calculated by a pH calibration before it is accepted by the transmitter.	FLOAT	N/A	R/W	N/A
calculated_slope The preliminary slope calculated by a pH calibration before it is accepted by the transmitter.	FLOAT	N/A	R/W	N/A

C.4 1066 contacting conductivity and 1066 toroidal conductivity

	Type	Enumeration/ Range	Read/Write	Default
conductivity_unit The conductivity unit used by the measurement.	ENUM	µS/cm mS/cm	R/W	µS/cm
cell_constant The cell constant of the conductivity sensor being used, typically determined by calibration.	FLOAT	0.0001-- 100.0 /cm	R/W	1.00 /cm
cable_correction Selects automatic or manual cable resistance correction.	ENUM	Manual Automatic	R/W	Automatic
manual_cable_resistance The known cable resistance used in manual cable correction.	FLOAT	0.0 -- 99.99 ohm	R/W	0.0 ohm
zero_offset_in_air The zero offset determined by a zero calibration in air.	FLOAT	N/A	R only	0.0 µS
zero_offset_in_soln The zero offset determined by a zero calibration in a solution.	FLOAT	N/A	R only	0.00%

	Type	Enumeration/ Range	Read/Write	Default
custom_curve_num_data_points The number of conductivity and concentration points to be used to calculate a custom concentration curve.	ENUM	2 3 4 5	R/W	3
Custom Curve Concentration Data points:				
custom_curve_concentration_1	FLOAT	N/A	R/W	N/A
custom_curve_concentration_2	FLOAT	N/A	R/W	N/A
custom_curve_concentration_3	FLOAT	N/A	R/W	N/A
custom_curve_concentration_4	FLOAT	N/A	R/W	N/A
custom_curve_concentration_5	FLOAT	N/A	R/W	N/A
Custom Curve Conductivity Data points:				
custom_curve_conductivity_1	FLOAT	N/A	R/W	N/A
custom_curve_conductivity_2	FLOAT	N/A	R/W	N/A
custom_curve_conductivity_3	FLOAT	N/A	R/W	N/A
custom_curve_conductivity_4	FLOAT	N/A	R/W	N/A
custom_curve_conductivity_5	FLOAT	N/A	R/W	N/A

C.5 1066 contacting conductivity

	Type	Enumeration/ Range	Read/Write	Default
electrode_type Type of contacting conductivity sensor being used by the transmitter.	ENUM	2-Electrode 4-Electrode	R / W	2-Electrode
cond_range Selects a particular range for the conductivity measurement or automatic ranging for 2 and 4 electrode sensors.	ENUM	N/A	R / W	Automatic
	2-Electrode:	Automatic 0-50 µS 40-500 µS 400-2000 µS 1.8-20 mS 18-200 mS	N/A	N/A
	4-Electrode:	Automatic 0-42µS 36-200µS 180-1000µS 0.9-10mS/cm 9-600mS/cm	N/A	N/A
series_cap_correction Turns capacitance correction on and off.	ENUM	Off On	R / W	Off

	Type	Enumeration/ Range	Read/Write	Default
cell_factor The second calibration constant used by a 4 electrode sensor in addition to cell constant.	FLOAT	N/A	R / W	N/A
temp_comp_type The type of temperature compensation used by the transmitter.	ENUM	Linear slope Neutral salt Cation Raw / None	R / W	Linear slope
temp_comp_slope Provides a slope value used in linear temperature compensation.	FLOAT	0.2 -- 9.99 % / °C	R / W	2.0% / °C
reference_temperature The temperature that temperature compensation corrects to. It is usually 25 °C.	FLOAT	N/A	R / W	25 °C

C.6 1066 toroidal conductivity

	Type	Enumeration/ Range	Read/Write	Default
toroidal_sensor_model Selects the model of toroidal sensor being used for enhanced accuracy.	ENUM	228 225 226 247 Other	R / W	228
cond_range Selects a particular range for the conductivity measurement or automatic ranging for toroidal sensors.	ENUM	Automatic 50-600 µS 0.5-100 mS 90-1500 mS	R / W	Automatic
temp_comp_type The type of temperature compensation used by the transmitter.	ENUM	Linear slope Raw/None	R / W	Linear slope
temp_comp_slope Provides a slope value used in linear temperature compensation.	FLOAT	N/A	R / W	2.0% / °C

C.7 1066 ozone/chlorine/dissolved oxygen

	Type	Enumeration/ Range	Read/Write	Default
polar_voltage The polarization voltage used by the transmitter; automatically set by sensor selection.	FLOAT	N/A	R/W	0
temp_coeff The temperature coefficient used to compensate temperature; automatically set by sensor selection.	FLOAT	N/A	R/W	0
amp_sensor_sensitivity The response of the sensor to changes in concentration, determined by calibration.	FLOAT	0.1 -- 1,000,000.0 nA/ppm	R/W	2,500 nA/ppm

	Type	Enumeration/ Range	Read/Write	Default
amp_sensor_zero_current The current output of the sensor when the concentration is 0. It is determined by a zero calibration.	FLOAT	-999.9 -- 999.9 nA	R/W	0.0 nA

C.8 1066 ozone

	Type	Enumeration/ Range	Read/Write	Default
chlorine_type The resolution of the displayed ozone measurement.	ENUM	0.001 0.01	R/W	0.001

C.9 1066 chlorine

	Type	Enumeration/ Range	Read/Write	Default
chlorine_type The type of chlorine being measured.	ENUM	Free Chlorine Total Chlorine Chloramine	R/W	Free Chlorine
chlorine_resolution The resolution of the displayed chlorine measurement.	ENUM	0.001 ppm 0.01 ppm	R/W	0.001 ppm
ph_correction_mode Turns automatic pH compensation of free chlorine measurements on and off.	ENUM	On Off	R/W	Off
manual_ph Provides a constant pH value, if manual pH compensation of a free chlorine measurement is used.	FLOAT	0.00 -- 14.00 pH	R/W	7.00 pH

C.10 1066 disolved oxygen

	Type	Enumeration/Range	Read/Write	Default
oxygen_sensor_type The type of oxygen sensor used.	ENUM	Water/Waste Trace Oxygen BioRx-Rosemount BioRx-Other Brewing Oxygen In Gas	R/W	Water/Waste
oxygen_measurement_type The type of oxygen measurement being made.	ENUM	Concentration in Liquid Percent Saturation Partial Pressure Concentration in Gas	R/W	Concentration in Liquid

	Type	Enumeration/Range	Read/Write	Default
oxygen_salinity The salinity of the process solution, which is used by the transmitter to correct for the effect of salinity on the oxygen measurement.	FLOAT	0.0 - 99.9 ppth	R/W	0.0 ppth
pressure_units The units of pressure used by the oxygen measurement.	ENUM	mmHg inHg psi atm kPa mbar bar	R/W	mmHg
oxygen_process_pressure The process pressure used by the transmitter to calculate percent oxygen in gas or % saturation.	FLOAT	N/A	R/W	760.0 mmHg
oxygen_air_pressure The barometric pressure used by the transmitter during an air calibration.	FLOAT	N/A	R/W	760.0 mmHg
oxygen_units The available units used for the various oxygen measurement types.	ENUM	N/A	R/W	N/A
	Concentration in liquid:	Units: ppm ppb mg/l m g/l	N/A	ppm
	Percent Saturation	Units:		%
	Partial pressure	Units: mmHg	kpa inhg	mbar psi
	Oxygen In Gas	Units: ppm		%
air_cal_stabilization_time The period of time used to determine stability of an oxygen sensor during an air calibration.	FLOAT	0 -- 99 seconds	R/W	10 seconds
air_cal_stabilization_value The change in the oxygen measurement used to determine stability of an oxygen sensor during an air calibration.	FLOAT	0.001 -- 9,999.0	R/W	0.05
air_cal_stabilization_value_unit The unit used during an air calibration.	FLOAT	N/A	R/W	ppm

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