

# 1066

## Liquid Analytical Transmitter

- Wide range of sensor inputs – measures pH, ORP, Contacting and Toroidal Conductivity, % Concentration, Total Chlorine, Free Chlorine, Monochloramine, Oxygen, Ozone and Temperature
- Large display – large easy-to-read process measurements, user-definable display of measurement diagnostic parameters
- Digital communications – HART® version 7 and FOUNDATION® fieldbus communication protocols available for host monitoring and configuration
- Intuitive menu screens with advanced diagnostics and help screens
- SMART-enabled – automatic calibration with SMART pH sensors
- Two 4-20mA current outputs are standard on the 1066 HART



## Features and Applications

This loop-powered analytical unit serves industrial, commercial and municipal applications with the widest range of liquid measurement inputs available for a two-wire liquid transmitter.

The 1066 SMART transmitter supports continuous measurement of one liquid analytical input. The design supports easy internal access and wiring connections. The large display gives excellent visibility for live measurements and displayed parameters. Conveniently, live process values are always displayed during programming and calibration routines.

**ANALYTICAL MEASUREMENTS:** pH/ORP, Resistivity/Conductivity, % Concentration, Total Chlorine, Free Chlorine, Monochloramine, Dissolved Oxygen, and Ozone.

**LARGE DISPLAY:** The high-contrast LCD provides live measurement readouts in large digits and shows up to four additional variables or diagnostic parameters. The display parameters can be customized to meet user requirements.

**DIGITAL COMMUNICATIONS:** The 1066 HART communications can be switched between HART version 7 and HART version 5 at the transmitter. This makes it possible to take advantage of the new features of HART 7, or maintain compatibility with older HART 5 hosts, which are not yet HART 7 capable. The Fieldbus version of the 1066 transmitters provide the advanced features of ITK 6, along with additional functions blocks to allow them to participate more fully in control in the field.

Архангельск (8182)63-90-72  
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Белгород (4722)40-23-64  
Брянск (4832)59-03-52  
Владивосток (423)249-28-31  
Волгоград (844)278-03-48  
Вологда (8172)26-41-59  
Воронеж (473)204-51-73  
Екатеринбург (343)384-55-89  
Иваново (4932)77-34-06  
Ижевск (3412)26-03-58  
Казань (843)206-01-48

Калининград (4012)72-03-81  
Калуга (4842)92-23-67  
Кемерово (3842)65-04-62  
Киров (8332)68-02-04  
Краснодар (861)203-40-90  
Красноярск (391)204-63-61  
Курск (4712)77-13-04  
Липецк (4742)52-20-81  
Магнитогорск (3519)55-03-13  
Москва (495)268-04-70  
Мурманск (8152)59-64-93  
Набережные Челны (8552)20-53-41

Нижний Новгород (831)429-08-12  
Новокузнецк (3843)20-46-81  
Новосибирск (383)227-86-73  
Орел (4862)44-53-42  
Оренбург (3532)37-68-04  
Пенза (8412)22-31-16  
Пермь (342)205-81-47  
Ростов-на-Дону (863)308-18-15  
Рязань (4912)46-61-64  
Самара (846)206-03-16  
Санкт-Петербург (812)309-46-40  
Саратов (845)249-38-78

Смоленск (4812)29-41-54  
Сочи (862)225-72-31  
Ставрополь (8652)20-65-13  
Тверь (4822)63-31-35  
Томск (3822)98-41-53  
Тула (4872)74-02-29  
Тюмень (3452)66-21-18  
Ульяновск (8422)24-23-59  
Уфа (347)229-48-12  
Челябинск (351)202-03-61  
Череповец (8202)49-02-64  
Ярославль (4852)69-52-93

### Features and Applications, cont.

**MENUS:** Menu screens for calibrating and programming are simple and intuitive. Plain language prompts and help screens guide the user through the procedures. All menu screens are available in eight languages. Live process values are displayed during programming and calibration.

**QUICK START PROGRAMMING:** Popular Quick Start screens appear the first time the unit is powered. The instrument prompts the user to configure the sensor loop in a few quick steps for immediate commissioning.

**USER HELP SCREENS:** Fault and warning messages include help screens similar to Plant Web alerts that provide useful troubleshooting tips to the user. These on-screen instructions are intuitive and easy to use. They allow many installation and operational problems to be solved directly by the user without the need for a manual or a call to technical support.

**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. The dedicated Diagnostic key is available for immediate access to specific fault and warning messages and troubleshooting help screens. Extensive diagnostic data is available for pH including Glass Impedance, Reference Impedance, Slope and Offset.

**LANGUAGES:** Rosemount Analytical extends its worldwide reach by offering eight languages – English, French, German, Italian, Spanish, Portuguese, Chinese and Russian. Every unit includes user programming menus: calibration routines, faults and warnings and user help screens in all eight languages.

**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. Users can assign the live measurement value or temperature to Output 2. Output dampening can be enabled with time constants from 0 to 999 seconds. HART digital communications on current output 1 is standard on all HART-compatible units (option code –HT).

**INPUT DAMPENING:** is automatically enabled to suppress noisy process readings. Default input filtering averages readings for settings between one and four seconds. For very noisy or highly variable process conditions, entering a filter setting of four seconds or higher will allow continuous filtering.

**SMART-enabled pH:** Rosemount Analytical's SMART pH capability eliminates field calibration of pH probes through automatic upload of calibration data and history. pH probe changes are literally plug and play using SMART pH sensors with VP cables.

**AUTOMATIC TEMPERATURE COMPENSATION:** Most measurements require temperature compensation. The 1066 will automatically recognize Pt100, Pt1000 or 22k NTC RTDs built into the sensor. Temperature compensation algorithms are available and selectable as needed to ensure accurate live measurements.

**SMART WIRELESS THUM™ ADAPTER COMPATIBLE:** Enable wireless transmissions of process variables and diagnostics from hard-to-reach locations. A 250 Ohm load resistor is integrated in-circuit on the main circuit board and a dedicated THUM terminal block is provided for easy wiring connection. When commissioned with the THUM Adapter, 1066 HART units will communicate with all other wireless devices on the Emerson wireless network.

## Specifications - General

**Case:** Polycarbonate. IP66 (CSA, FM), NEMA 4X (CSA)

**Dimensions:** Overall 155 x 155 x 131mm (6.10 x 6.10 x 5.15 in.). Cutout: 1/2 DIN 139mm x 139mm (5.45 x 5.45 in.)

**Conduit openings:** Six. Accepts PG13.5 or 1/2 in. conduit fittings

**Display:** Monochromatic graphic liquid crystal display. No backlight. 128 x 96 pixel display resolution. Active display area: 58 x 78mm (2.3 x 3.0 in.). All fields of the main instrument display can be customized to meet user requirements.

**Ambient temperature and humidity:** -20 to 65°C (-4 to 149°F), RH 5 to 95% (non-condensing).

**Storage Temperature:** -20 to 70°C (-4 to 158°F)

**RFI/EMI:** EN-61326

### Complies with the following Standards:

**CSA:** C22.2 No 0 – 10; C22.2 No 0.4 – 04; C22.2 No. 25-M1966; C22.2 No. 94-M1991; C22.2 No.142-M1987; C22.2 No. 157-M1992; C22.2 No. 213-M1987; C22.2 No. 60529:05

**ATEX:** IEC 60079-0:2011, 60079-11:2011

**IECEx:** IEC 60079-0: 2011 Edition: 6.0, IEC 60079-11 : 2011-06 Edition: 6.0

**FM:** 3600: 2011, 3610: 2010, 3611: 2004, 3810: 2005, IEC 60529:2004, ANSI/IEC 60079-0: 2009, ANSI/IEC 60079-11: 2009

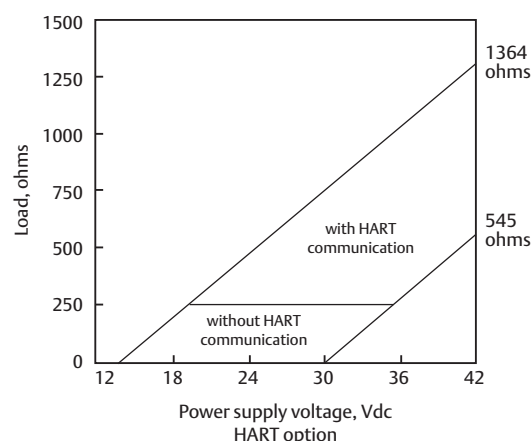


Figure 1. Load/Power Supply Requirements

**Input:** One isolated sensor input. Measurement choices of pH/ORP, resistivity/conductivity/TDS, % concentration, total and free chlorine, monochloramine, dissolved oxygen, dissolved ozone, and temperature. For contacting conductivity measurements, temperature element can be a PT1000 RTD or a PT100 RTD. Other measurements and use PT100 or PT1000 RTDs or a 22k NTC (D.O. only).

**Power & Load Requirements:** Supply voltage at the transmitter terminals should be at least 12.7Vdc. Power supply voltage should cover the voltage drop on the cable plus the external

### Hazardous Location Approvals

Intrinsic Safety (with appropriate safety barrier):



Class I, II, III, Div. 1  
Groups A-G  
T4 Tamb = -20°C to 65°C



ATEX  
CE 1180 II 1 G  
Baseefa04ATEX0195X  
EEx ia IIC  
T4 Tamb = -20°C to 65°C



IECEx BAS 11.90098X  
EEx ia IIC  
T4 Tamb = -20°C to 65°C



Class I, II & III, Division 1, Groups A-G T4  
Tamb = -20°C to 40°C for -FI option  
Tamb = -20°C to 65°C for -HT and -FF options  
Class I, Zone 0, AEx ia IIC T4  
Tamb = -20°C to 40°C for -FI option  
Tamb = -20°C to 65°C for -HT and -FF options

Non-Incendive:



Class I, Div. 2, Groups A-D  
Dust Ignition Proof  
Class II & III, Div. 1, Groups E-G  
NEMA 4/4X Enclosure  
T4 Tamb = -20°C to 65°C



Class I, Division 2 Groups A-D  
Dust Ignition proof  
Class II & III, Division 1, Groups E-G  
IP66 enclosure

load resistor required for HART communications (250  $\Omega$  minimum). Minimum power supply voltage is 12.7Vdc. Maximum power supply voltage is 42.4 Vdc (30 Vdc for intrinsically safe operation). The graph 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.

**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.

**Weight/Shipping Weight:** 2 lbs/3 lbs (1 kg/1.5 kg)

**FOUNDATION fieldbus:** Figures 3 and 4 show how temperature and pressure compensation can use measurements from the bus, brought into the 1066 using its Analog Output (AO) functions blocks. Figure 3, which shows the 1066 Arithmetic and Integrator blocks used to derive accumulated solids from conductivity and flow measurements, is only one of the many applications possible using the function blocks in the 1066.

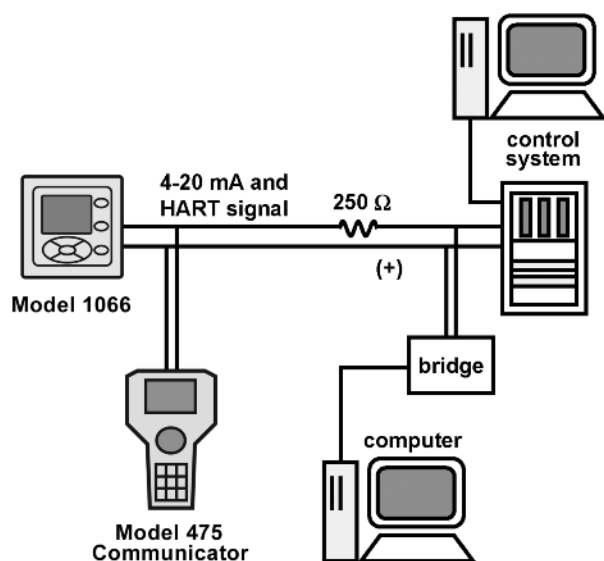


Figure 2. Power Supply-Current Loop Wiring

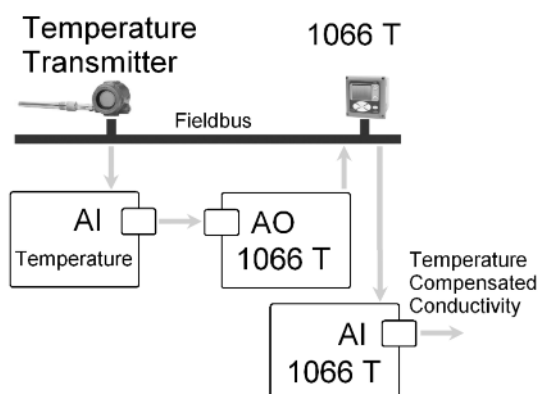


Figure 3. Improving temperature response of toroidal conductivity measurements.

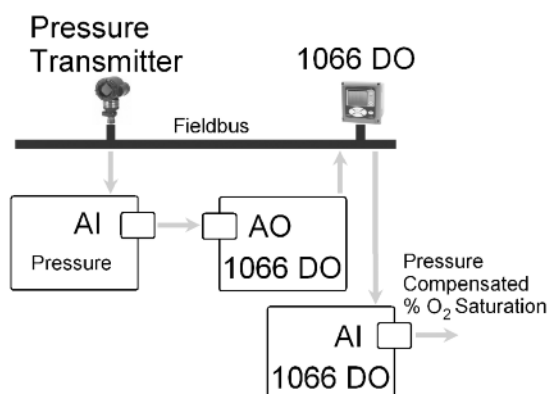


Figure 4. Compensating a dissolved oxygen measurement for pressure changes.

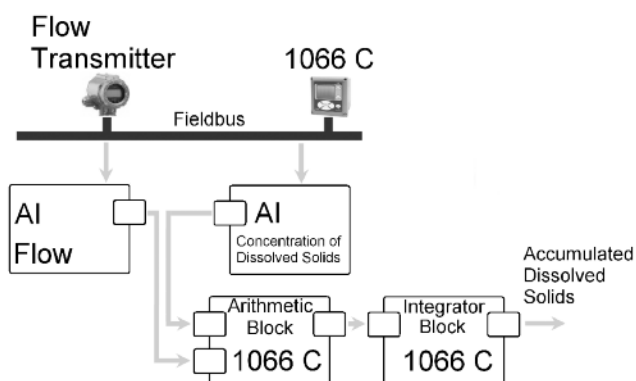


Figure 5. Monitoring the accumulated dissolved solids at the inlet of a water treatment system.

# 1066 HART Transmitters

## Switchable between HART revision 5 and 7

Some legacy host systems cannot communicate with HART revision 7. In these cases the 1066 can be switched to HART revision 5 communications, which provides access to all configuration, calibration, and diagnostic features available with HART revision 7. HART 5 can be used until the host system is upgraded to communicate with HART revision 7, then the 1066 can simply be switched to enjoy all the benefits of HART 7.

**Only One Device Description Needed:** For either HART revision 5 or 7, only one device description is needed to communicate with all the 1066 HART transmitters. This simplifies installation and commissioning of new 1066 transmitters.

## HART Specifications

### HART 5 Device Identification (1066 Revision 1):

**Manufacturer Name:** Rosemount Analytical Inc.

**Model Name:** 1066

**Manufacturer ID:** 46 (0x2E)

**Device Type Code:** 33 (0x0021)

**HART Protocol Revision:** 5.1

**Device Revision:** 1

**Device Description Capabilities:** Supports all 1066 transmitters, including the 1066 pH/ORP, 1066C, 1066T, 1066DO, 1066CL, and 1066OZ

### HART 7 Device Identification (1066 Revision 2):

**Manufacturer Name:** Rosemount Analytical Inc.

**Model Name:** 1066

**Manufacturer ID:** 46 (0x2E)

**Device Type Code:** 11809 (0x2E21)

**HART Protocol Revision:** 7.1

**Device Revision:** 2

**Device Description Capabilities:** Supports all 1066 transmitters, including the 1066 pH/ORP, 1066C, 1066T, 1066DO, 1066CL, and 1066OZ

**NOTE:** When the 1066 transmitter is switched from HART 5 to HART 7, its HART Device Revision changes from Device Revision 1 to Device Revision 2 and vice versa.

## HART Revision 7 Features

The 1066 HART transmitter features HART Revision 7 communications, which is the latest revision of the HART protocol. The added features of HART Revision 7 beyond what is available with HART revision 5 are:

**Long Tag:** Increases software tag length from 8 to 32 characters. This is by far the most requested feature from users. As projects become larger and larger, so do the descriptions necessary to track each unique device.

**Locate Device:** Flashes a unique message on the display of a device “0-0-0-0”. This feature allows the personnel in the field and control room to verify they’re looking at the same device.

**HART Software Lock:** Prevents configuration changes. This is another form of security to prevent device configuration changes by unauthorized personnel.

**Multi-Variable Statuses:** Provides output quality information for all variables. This is particularly important for liquid analyzers, which have a number of secondary measurements such as temperature or millivolts.

**Expanded Manufacturer ID:** Allows new manufacturers to register devices. HART manufacturers have increased beyond initial estimations, and this solves that problem. The expanded manufacturer ID has caused some trouble with device identification in legacy systems.

**Enhanced Multi-Variable Communication (8):** Increases device output capability from 4 to 8 variables. This allows users to access to the secondary measurements in liquid analyzers.

**Changes to Broadcast (Burst) Messaging with HART Revision 7:** Enhanced Broadcast Messaging: A wired HART Revision 7 device improves on the burst capability by adding variable status to the burst message – showing the quality of that measurement.

# 1066 Fieldbus Transmitters

The 1066 Fieldbus transmitters represent a new level in Fieldbus analyzers. Even the local display was designed with Fieldbus in mind, from local display of the Transducer Block mode to notification of actions which will put the Transducer Block in Manual or Out of Service modes.

## Configuration and Diagnostics

The 1066 transmitters are completely configurable using Fieldbus, including all measurement and calibration parameters, which ensures that all digital configuration records are complete.

All diagnostics alerts, which include sensor, transmitter, calibration and event alerts, are also available via Fieldbus per the Field Diagnostic Specification for multibit alarming, and are available as NAMUR NE-107 alerts. For legacy DeltaV systems, these same alerts are provided as PlantWeb II alerts.

## I/O Function Blocks

### Analog Input (AI) Blocks

AI Blocks are provided to publish multiple primary and secondary measurements to the bus for each 1066 transmitter:

#### 1066pH/ORP

Channel 1 – pH/ORP/Redox

Channel 2 – Temperature

Channel 3 – Reference electrode impedance

Channel 4 – Glass electrode impedance

#### 1066C and 1066T

Channel 1 – Conductivity, resistivity, concentration

Channel 2 – Temperature

Channel 3 – Raw conductivity/Raw resistivity

#### 1066DO, 1066CL, and 1066OZ

Channel 1 – Concentration, partial pressure, % Saturation of oxygen

Channel 2 – Temperature

Channel 3 – Sensor Current

Channel 4 – pH (1066CL with Free Chlorine only)

### Analog Output (AO) Blocks for Temperature and Pressure Compensation

AO Blocks, provided, can be used to input temperature or pressure measurements on the bus to provide temperature and/or pressure compensation for the transmitter's primary measurement. A temperature input can be used when a pH sensor does not have a temperature element, when a toroidal conductivity sensor is used, which has a large temperature time constant, or when it is desirable to use a validated temperature measurement.

Concentration of oxygen in gas and % saturation of oxygen measurements are pressure dependent, and the process pressure can be input to provide compensation. This makes it possible to distinguish actual changes in oxygen concentration and % saturation from the effect of an overall pressure change.

Since the AO Blocks' only purpose is to input a measurement from the bus, they do not have to be fully configured. All that is needed is to set the channel in the AO block to either temperature or pressure, and link the block to the temperature or pressure source on the bus.

#### 1066pH/ORP AO Block

Channel 5 – Temperature input

#### 1066C and 1066T AO Block

Channel 5 – Temperature input

#### 1066DO, 1066CL, and 1066OZ AO blocks

Channel 5 – Temperature input

Channel 6 – Pressure input (1066DO with gaseous oxygen or % saturation only)

## Control in the Field

FOUNDATION® fieldbus has long been recognized for its ability to provide control in the field, which is the various control functions residing in the transmitters and final control elements themselves. The advantages of control in the field have been identified for reducing complexity and cost, improving reliability and scalability, increasing flexibility and availability, and providing single loop control. The 1066 transmitters have been provided with a number of function blocks to make it possible for them to participate in control in the field beyond simply furnishing a measurement. These function blocks and some of their applications are:

## Math Function Blocks

### Arithmetic Block

This block can do useful calculations such as using conductivity ratios to calculate reverse osmosis efficiency or steam quality. Mass flow can also be calculated from concentration and mass or volumetric flow.

### Integrator Block

This block can totalize reagent and general flow. It can be used with conductivity measuring dissolved solids in combination with a flow measurement and the arithmetic block to calculate the total accumulated dissolved solids in a demineralizer.

## Analog Control Blocks

### Input Selector Block

This block can select the middle value of 3 measurements. In wide ranging conductivity applications, it can select the most accurate of two conductivity technologies (contacting and toroidal), based on the measurement, to provide the most accurate measurement.

### Signal Characterizer Block

This block can convert a concentration in weight to weight basis to weight to volume concentration. It can linearize non-linear measurements.

### PID Control Block

The PID control block has the necessary logic function to perform PID control. It supports the standard and series forms of the PID equation.



**Control Selector Block**

This block can select the low, middle, or high value of control block outputs, and can provide override control using a second control block.

**Output Splitter Block**

This block takes a single input and calculates two outputs based on specified coordinate values. It can be used with two control valves to provide control for a non-linear control problem, such as pH control.

**General Specifications:****1066-P-FF pH Fieldbus Transmitter**

**Type:** pH/ORP/Redox Transmitter

**Device ITK Profile:** 6 (Released for ITK 6.0.0 / 6.0.1)

**Manufacturer Identification (MANUFAC\_ID):** 0x524149

**Device Type (DEV\_TYPE):** 0x4089

**Device Revision (DEV\_REV):** 0x01

**Physical Layer Profiles:** 111,113,511

**Linkmaster:** Yes

**Number of Link Objects:** 20

**VCR's supported:** 20

**1066-C-FF/1066-T-FF Conductivity Fieldbus Transmitters**

**Type:** Contacting and Toroidal Conductivity Transmitters

**Device ITK Profile:** 6 (Released for ITK 6.0.0 / 6.0.1)

**Manufacturer Identification (MANUFAC\_ID):** 0x524149

**Device Type (DEV\_TYPE):** 0x4091

**Device Revision (DEV\_REV):** 0x01

**Physical Layer Profiles:** 111,113,511

**Linkmaster:** Yes

**Number of Link Objects:** 20

**VCR's supported:** 20

**1066-DO-FF / 1066-CL-FF / 1066-OZ-FF Amperometric Fieldbus Transmitters**

**Type:** Dissolved Oxygen / Chlorine / Ozone Transmitters

**Device ITK Profile:** 6 (Released for ITK 6.0.0 / 6.0.1)

**Manufacturer Identification (MANUFAC\_ID):** 0x524149

**Device Type (DEV\_TYPE):** 0x4090

**Device Revision (DEV\_REV):** 0x01

**Physical Layer Profiles:** 111,113,511

**Linkmaster:** Yes

**Number of Link Objects:** 20

**VCR's supported:** 20

**Common Mandatory Features**

- Resource Block
- Alarm and Events
- Function Block Linking
- Trending
- Multi-Bit Alert Reporting
- Field Diagnostics

**Common Additional Features**

- Common Software Download
- Block Instantiation
- Supports DeltaV Auto Commissioning
- Supports DeltaV Auto Replacement
- Supports DeltaV Firmware Live Download
- PlantWeb Alerts with re-annunciation / multibit
- Supports Easy Configuration Assistant

**Function Blocks (Execution Time):**

- 4 – Analog Input Blocks (15 ms) (3–AI Blocks 1066-C and 1066-T)
- Analog Output Block (20 ms)
- Proportional Integral Derivative Block (25 ms)
- Arithmetic Block (25 ms)
- Input Selector Block (25 ms)
- Integrator Block (25 ms)
- Signal Characterizer Block (30 ms)

**Custom Function Blocks (Execution Time):**

- Control Selector Block (15 ms)
- Output Selector Block (20 ms)

**Power:**

- Two Wire Device; Fieldbus Polarity Insensitive
- Current Draw: 18 mA (9 to 32 VDC)
- Device Certifications: IS / FISCO
- Maximum certified input Voltage for IS: 30V
- Maximum certified input current for IS: 300mA
- Maximum certified input power for IS: 1.3W
- Internal Capacitance (Ci): 0 nF
- Internal Inductance (Li): 0  $\mu$ H

### pH/ORP (Ordering Code – P)

For use with any standard pH or ORP sensor. SMART pH sensor with SMART pre-amplifiers from Rosemount Analytical. Measurement choices are pH, ORP, or Redox. The automatic buffer recognition feature uses stored buffer values and their temperature curves for the most common buffer standards available worldwide. The transmitter will recognize the value of the buffer being measured and perform a self stabilization check on the sensor before completing the calibration. Manual or automatic temperature compensation is menu selectable. Change in pH due to process temperature can be compensated using a programmable temperature coefficient.



Figure 6. General purpose and high performance pH sensors 3900VP, 396PVP and 3300HT

### Performance Specifications - Transmitter (pH input)

**Measurement Range [pH]:** 0 to 14 pH

**Accuracy:**  $\pm 0.01$  pH

**Buffer recognition:** NIST, DIN 19266, JIS 8802, and BSI.

**Input filter:** Time constant 1 - 999 sec, default 4 sec.

**Response time:** 5 seconds to 90% of final reading

### Performance Specifications - Transmitter (ORP input)

**Measurement Range [ORP]:** -1400 to +1400 mV

**Accuracy:**  $\pm 1$  mV

**Input filter:** Time constant 1 - 999 sec, default 4 sec.

**Response time:** 5 seconds to 90% of final reading

### Recommended Sensors

**ORP:** All standard ORP sensors.

**pH:** All standard pH sensors. Supports SMART Rosemount Analytical pH sensors.



## Contacting Conductivity (Ordering Code –C)

Measures conductivity in the range 0 to 600,000  $\mu\text{S}/\text{cm}$  (600mS/cm). Measurement choices are conductivity, resistivity, total dissolved solids, salinity, and % concentration. In addition, the “Custom Curve” feature allows users to define a three to five point curve to measure ppm, %, or a no unit variable. The % concentration selection includes the choice of five common solutions (0-12% NaOH, 0-15% HCl, 0-20% NaCl, and 0-25% or 96-99.7%  $\text{H}_2\text{SO}_4$ ). The conductivity concentration algorithms for these solutions are fully temperature compensated. Three temperature compensation options are available: manual slope ( $\text{X}/^\circ\text{C}$ ), high purity water (dilute sodium chloride), and cation conductivity (dilute hydrochloric acid). Temperature compensation can be disabled, allowing the transmitter to display raw conductivity. For more information concerning the use of the contacting conductivity sensors, refer to the product data sheets.

NOTE: The 410VP 4-electrode high-range conductivity sensor is compatible with the 1066.

## Performance Specifications

**Measurement Range:** see table below

**Input filter:** time constant 1 - 999 sec, default 2 sec.

**Response time:** 3 seconds to 95% of final reading using the default input filter

## Recommended Sensors

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



Figure 7. ENDURANCE™ series of conductivity sensors

## PERFORMANCE SPECIFICATIONS

### Recommended Range – Contacting Conductivity

| Cell Constant | 0.01S/cm   | 0.1 $\mu\text{S}/\text{cm}$ | 1.0 $\mu\text{S}/\text{cm}$ | 10 $\mu\text{S}/\text{cm}$ | 100 $\mu\text{S}/\text{cm}$ | 1000 $\mu\text{S}/\text{cm}$ | 10mS/cm | 100mS/cm | 1000mS/cm |
|---------------|--|-----------------------------|-----------------------------|----------------------------|-----------------------------|------------------------------|---------|----------|-----------|
| 0.01          | <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> <p>0.01<math>\mu\text{S}/\text{cm}</math> to 200<math>\mu\text{S}/\text{cm}</math>      200<math>\mu\text{S}/\text{cm}</math> to 2000<math>\mu\text{S}/\text{cm}</math></p> |                             |                             |                            |                             |                              |         |          |           |
| 0.1           | <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> <p>0.1<math>\mu\text{S}/\text{cm}</math> to 2000<math>\mu\text{S}/\text{cm}</math>      2000<math>\mu\text{S}/\text{cm}</math> to 20mS/cm</p>                               |                             |                             |                            |                             |                              |         |          |           |
| 1.0           | <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> <p>1 <math>\mu\text{S}/\text{cm}</math> to 20mS/cm      20mS/cm to 200mS/cm</p>   |                             |                             |                            |                             |                              |         |          |           |
| 4-electrode   | <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> <p>2<math>\mu\text{S}/\text{cm}</math> to 1400mS/cm</p>   |                             |                             |                            |                             |                              |         |          |           |

### Linearity for Standard Cable $\leq 50$ ft (15 m)

|             |  |
|-------------|--|
| <div></div> | $\pm 0.6\%$ of reading in recommended range        |
| <div></div> | $\pm 2\%$ of reading in recommended range          |
| <div></div> | $\pm 5\%$ of reading outside low recommended range |
| <div></div> | $\pm 4\%$ of reading in recommended range          |

### Temperature specifications:

|   |                         |
|---|-------------------------|
| Temperature range                           | 0 to 200°C              |
| Temperature Accuracy, Pt-1000, 0-50°C       | $\pm 0.1^\circ\text{C}$ |
| Temperature Accuracy, Pt-1000, Temp. > 50°C | $\pm 0.5^\circ\text{C}$ |

# Toroidal Conductivity (Ordering Code –T)

Measures conductivity in the range of 1  $\mu\text{S}/\text{cm}$  to 2,000,000  $\mu\text{S}/\text{cm}$  (2 S/cm). Measurement choices are conductivity, resistivity, total dissolved solids, salinity, and % concentration. The % concentration selection includes the choice of five common solutions (0-12% NaOH, 0-15% HCl, 0-20% NaCl, and 0-25% or 96-99.7% H<sub>2</sub>SO<sub>4</sub>). The conductivity concentration algorithms for these solutions are fully temperature compensated. For other solutions, a simple-to-use menu allows the customer to enter his own data. The transmitter accepts as many as five data points and fits either a linear (two points) or a quadratic function (three to five points) to the data. Reference temperature and linear temperature slope may also be adjusted for optimum results. Two temperature compensation options are available: manual slope (X%/°C) and neutral salt (dilute sodium chloride). Temperature compensation can be disabled, allowing the transmitter to display raw conductivity. For more information concerning use of the toroidal conductivity sensors, refer to the product data sheets.

## Performance Specifications

**Measurement Range:** see table below  
**Input filter:** time constant 1 - 999 sec, default 2 sec.  
**Response time:** 3 seconds to 95% of final reading

## Recommended Sensors

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



Figure 8. High performance toroidal conductivity sensors 226 and 225

## PERFORMANCE SPECIFICATIONS

### Recommended Range - Toroidal Conductivity

| Model              | 1 $\mu\text{S}/\text{cm}$ | 10 $\mu\text{S}/\text{cm}$ | 100 $\mu\text{S}/\text{cm}$              | 1000 $\mu\text{S}/\text{cm}$ | 10mS/cm | 100mS/cm | 1000mS/cm              | 2000mS/cm |
|--------------------|---------------------------|----------------------------|--|------------------------------|---------|----------|------------------------|-----------|
| 226                |                           |                            | 15 $\mu\text{S}/\text{cm}$ to 500mS/cm   |                              |         |          | 500mS/cm to 2000mS/cm  |           |
| 225 & 228          |                           |                            | 15 $\mu\text{S}/\text{cm}$ to 1500mS/cm  |                              |         |          | 1500mS/cm to 2000mS/cm |           |
| 242                |                           |                            | 100 $\mu\text{S}/\text{cm}$ to 2000mS/cm |                              |         |          |                        |           |
| 222<br>(1in & 2in) |                           |                            | 500 $\mu\text{S}/\text{cm}$ to 2000mS/cm |                              |         |          |                        |           |

### LOOP PERFORMANCE (Following Calibration)

- Model 226:  $\pm 1\%$  of reading  $\pm 5\mu\text{S}/\text{cm}$  in recommended range
- Models 225 & 228:  $\pm 1\%$  of reading  $\pm 15\mu\text{S}/\text{cm}$  in recommended range
- Models 222, 242:  $\pm 4\%$  of reading  $\pm 5\text{mS}/\text{cm}$  in recommended range
- Models 225, 226 & 228:  $\pm 5\%$  of reading outside high recommended range

### Temperature specifications:

|  |                             |
|--|-----------------------------|
| Temperature range                          | -25 to 210°C (-13 to 410°F) |
| Temperature Accuracy, Pt-100, -25 to 50 °C | $\pm 0.5^\circ\text{C}$     |
| Temperature Accuracy, Pt-100, 50 to 210°C  | $\pm 1^\circ\text{C}$       |

## Chlorine (Codes – CL)

### Free and Total Chlorine

The 1066 is compatible with the 499ACL-01 free chlorine sensor and the 499ACL-02 total chlorine sensor. The 499ACL-02 sensor must be used with the TCL total chlorine sample conditioning system. The 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 TCL measurement system, refer to the product data sheets.

### Performance Specifications

**Resolution:** 0.001 ppm or 0.01 ppm – selectable

**Input Range:** 0nA – 100µA

**Automatic pH correction for Free Chlorine:** (user selectable for code -CL): 6.0 to 10.0 pH

**Temperature compensation:** Automatic (via RTD) or manual (0-50°C).

**Input filter:** Time constant 1 - 999 sec, default 5 sec.

**Response time:** 8 seconds to 90% of final reading

### Recommended Sensors

**Chlorine:** 499ACL-01 Free Chlorine or 499ACL-02 Total Residual Chlorine

**pH:** These pH sensors are recommended for automatic pH correction of free chlorine readings: 3900-02-10, 3900-01-10, and 3900VP-02-10 or any Rosemount Analytical SMART or conventional pH sensor.



Figure 9. 499ACL-01 Chlorine sensor

## Monochloramine

The 1066 is compatible with the 499A CL-03 Monochloramine sensor. The 1066 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 the amperometric chlorine sensors, refer to the product data sheets.

## Performance Specifications

**Resolution:** 0.001 ppm or 0.01 ppm – selectable

**Input Range:** 0nA – 100µA

**Temperature compensation:** Automatic (via RTD) or manual (0-50°C).

**Input filter:** Time constant 1 - 999 sec, default 5 sec.

**Response time:** 8 seconds to 90% of final reading

### Recommended Sensors

Rosemount Analytical 499ACL-03 Monochloramine sensor

## Dissolved Oxygen (Codes – DO)

The 1066 is compatible with the 499ADO, 499ATrDO, Hx438, Gx438 and Bx438 dissolved oxygen sensors and the 4000 percent oxygen gas sensor. The 1066 displays dissolved oxygen in ppm, mg/L, ppb, g/L, % saturation, % O<sub>2</sub> in gas, ppm O<sub>2</sub> in gas. 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:** 0.01 ppm; 0.1 ppb for 499A TrDO sensor (when O<sub>2</sub> <1.00 ppm); 0.1%

**Input Range:** 0nA – 100µA

**Temperature Compensation:** Automatic (via RTD) or manual (0-50°C).

**Input filter:** Time constant 1 - 999 sec, default 5 sec.

**Response time:** 8 seconds to 90% of final reading

### Recommended Sensors

Rosemount Analytical amperometric membrane and steam-sterilizable sensors listed above



Figure 10. Dissolved Oxygen 499ADO sensor with Variopool connection

## Ordering Information

The 1066 2-Wire Transmitter is intended for the continuous determination of pH, ORP (Redox), conductivity, (both contacting and toroidal), and for measurements using membrane-covered amperometric sensors (oxygen, ozone, free and total chlorine, and monochloramine). For free chlorine measurements, which often require continuous pH correction a second input for a pH sensor is available. Two 4-20mA analog outputs are standard on HART® units. The 1066 is compatible with SMART pH sensors from Rosemount Analytical. HART digital communications is standard and FOUNDATION® fieldbus digital communications is offered as an option.

Communication with the 1066 is through:

- Local keypad interface
- 475 HART® and FOUNDATION fieldbus Communicator
- HART protocol version 7
- FOUNDATION® fieldbus
- AMS (Asset Management Solutions) Aware
- Smart Wireless THUM™ Adapter for WirelessHART™ networks

| Description                      |   |
|----------------------------------|---|
| <b>1066 Two-Wire Transmitter</b> |   |
| Measurement                      |   |
| P                                | pH/ORP  |
| C                                | Contacting Conductivity                                   |
| T                                | Toroidal Conductivity                                     |
| CL                               | Chlorine  |
| DO                               | Dissolved Oxygen  |
| OZ                               | Ozone   |
| Communication                    |   |
| HT                               | HART® Digital Communication Superimposed on 4-20mA Output |
| FF                               | FOUNDATION™ fieldbus Digital Output                       |
| FI                               | FOUNDATION™ fieldbus Digital Output with FISCO            |
| Agency Approval                  |   |
| 60                               | None Required   |
| 67                               | FM Approved, Intrinsically Safe, and Non-Incendive        |
| 69                               | CSA/CUS Approved, Intrinsically Safe, and Non-Incendive   |
| 73                               | ATEX/IECEx Approved, Intrinsically Safe                   |

| Accessories (Weights are rounded up to nearest whole lb or 0.5 kg) |   |               |               |
|--|---|---------------|---------------|
| Part #   | Description   | Weight        | Shipping Wt   |
| 23820-00   | Pipe mounting kit, includes U-bolts, mounting bracket, nuts, washers, and screws (complete) | 2 lb (1.0 kg) | 4 lb (2.0 kg) |
| 23554-00   | Gland fittings, PG 13.5, 5 per package  | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 9240048-00   | Tag, stainless steel (specify marking)  | 1 lb (0.5 kg) | 1 lb (0.5 kg) |

### pH INPUT

|         |                                 |               |               |
|---------|---------------------------------|---------------|---------------|
| 9210014 | Buffer Solution, 4.01 pH, 1 pt. | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 9210013 | Buffer Solution, 7.0 pH, 1 pt.  | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 9210012 | Buffer Solution, 10.0 pH, 1 pt. | 1 lb (0.5 kg) | 2 lb (1.0 kg) |

### Dissolved Ozone (Codes –OZ)

The 1066 is compatible with the 499AOZ sensor. The 1066 fully compensates ozone readings for changes in membrane permeability caused by temperature changes. For more information concerning the use and operation of the amperometric ozone sensors, refer to the product data sheets.

### Performance Specifications

**Resolution:** 0.001 ppm or 0.01 ppm – selectable

**Input Range:** 0nA – 100µA

**Temperature Compensation:** Automatic (via RTD) or manual (0-35°C)

**Input filter:** Time constant 1 - 999 sec, default 5 sec.

**Response time:** 8 seconds to 90% of final reading

### Recommended Sensors

Rosemount Analytical 499A OZ ozone sensor



Figure 11. Dissolved Ozone 499AOZ sensors with Variopol connection.

Архангельск (8182)63-90-72  
Астана +7(7172)727-132  
Белгород (4722)40-23-64  
Брянск (4832)59-03-52  
Владивосток (423)249-28-31  
Волгоград (844)278-03-48  
Вологда (8172)26-41-59  
Воронеж (473)204-51-73  
Екатеринбург (343)384-55-89  
Иваново (4932)77-34-06  
Ижевск (3412)26-03-58  
Казань (843)206-01-48

Калининград (4012)72-03-81  
Калуга (4842)92-23-67  
Кемерово (3842)65-04-62  
Киров (8332)68-02-04  
Краснодар (861)203-40-90  
Красноярск (391)204-63-61  
Курск (4712)77-13-04  
Липецк (4742)52-20-81  
Магнитогорск (3519)55-03-13  
Москва (495)268-04-70  
Мурманск (8152)59-64-93  
Набережные Челны (8552)20-53-41

Нижний Новгород (831)429-08-12  
Новокузнецк (3843)20-46-81  
Новосибирск (383)227-86-73  
Орел (4862)44-53-42  
Оренбург (3532)37-68-04  
Пенза (8412)22-31-16  
Пермь (342)205-81-47  
Ростов-на-Дону (863)308-18-15  
Рязань (4912)46-61-64  
Самара (846)206-03-16  
Санкт-Петербург (812)309-46-40  
Саратов (845)249-38-78

Смоленск (4812)29-41-54  
Сочи (862)225-72-31  
Ставрополь (8652)20-65-13  
Тверь (4822)63-31-35  
Томск (3822)98-41-53  
Тула (4872)74-02-29  
Тюмень (3452)66-21-18  
Ульяновск (8422)24-23-59  
Уфа (347)229-48-12  
Челябинск (351)202-03-61  
Череповец (8202)49-02-64  
Ярославль (4852)69-52-93

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