

# Dissolved Oxygen Sensor

- INSTALLS in aeration basins or sidestream samples.
- RUGGED CONSTRUCTION.
- EASILY REPLACEABLE MEMBRANE; no special tools required.
- AUTOMATIC COMPENSATION for changes in membrane permeability with temperature.
- AUTOMATIC PRESSURE EQUALIZATION maintains correct membrane tension.
- VARIOPOL CONNECTOR OPTION allows the sensor to be replaced without running new cable.



## FEATURES AND APPLICATIONS

The Model 499ADO sensor is intended for the continuous determination of dissolved oxygen between 0-20 ppm. The primary application is aeration basins in municipal and industrial wastewater treatment plants.

The Model 499ADO is a membrane-covered amperometric sensor. The sensor consists of a gas-permeable membrane stretched tightly over a gold cathode. A silver anode and an electrolyte solution complete the internal circuit. During operation, oxygen diffuses from the sample through the membrane to the cathode. A polarizing voltage applied to the cathode reduces the oxygen to hydroxide. The reaction produces a current, which the analyzer measures. The current is directly proportional to the rate at which oxygen reaches the cathode, which is ultimately proportional to the concentration of oxygen in the sample.

Because the rate of diffusion of oxygen through the membrane depends on temperature, sensor response must be corrected for temperature changes. A Pt 100 RTD in the sensor measures the temperature, and the analyzer automatically performs the correction.

Calibration is easy. Simply expose the sensor to water-saturated air and press a button on the analyzer. The analyzer measures the barometric pressure and calculates the equilibrium solubility of atmospheric oxygen at the prevailing temperature and pressure.

(5081-A, and Xmt-A analyzers require the user to manually enter the barometric pressure.)

Maintenance is fast and easy. Replacing the membrane requires no special tools or fixtures. Simply place a few drops of electrolyte solution in the membrane assembly, place it on the cathode, and screw the retainer in place. To replenish the electrolyte solution, unscrew the fill plug, add the reagent from a squeeze bottle, and replace the plug.

Pressure changes have little influence on sensor response. A flexible bladder in the sensor prevents distortion of the membrane by keeping the pressure inside the sensor equal to the sample pressure.

Several mounting configurations are possible. For aeration basins and tanks, use the handrail mounting. For measuring oxygen in pipes, use a sidestream sample and install the sensor in either the flow tee or the low flow cell.

The Model 499ADO sensor is available with a Variopool (VP) watertight connector. Wire the interconnecting cable to the analyzer and run the cable to the sensor. The sensor plugs into the cable receptacle. To replace the sensor, simply disconnect the Variopool fitting and plug in a new sensor.

## SENSOR SPECIFICATIONS

**Range:** 0 to 20 ppm (mg/L) as O<sub>2</sub>. For measurements at the ppb level choose Model 499A TrDO.

**Wetted Parts:** Noryl<sup>1</sup>, Viton<sup>2</sup>, EPDM, Teflon<sup>3</sup>, (TFE) silicone

**Cathode:** gold (not normally wetted)

**Accuracy:** ±0.2 ppm at 25°C

**Repeatability:** ±0.05 ppm at 25°C

**Response time:** 25 sec to 63% of final reading at 25°C

**Pressure:** 0 to 65 psig (0 to 549 kPa abs)

**Temperature:** 32 to 122°F (0 to 50°C)

**Sample Flow:**

Flow through	1-5 gpm (3.8 to 19 L/min)
Open channel	1 ft/sec (0.3 m/sec)
Low flow cell	2 to 5 gph (7.6 to 19 L/hr)

Agitation produced by bubbles in aeration basins usually provides adequate flow.

**Process Connection:** 1 inch MNPT

**Electrolyte Volume:** 25 mL (approx.)

**Electrolyte Life:** 4 to 6 months (approx.)

**Cable Length (standard integral cable):** 25 ft (7.6 m)

**Cable Length (maximum):** 300 ft (91 m)

**Weight/Shipping Weight:** 1 lb/3 lb (0.5 kg/1.5 kg)

<sup>1</sup> Noryl is a registered trademark of General Electric.

<sup>2</sup> Viton is a registered trademark of E.I. duPont de Nemours & Co.

<sup>3</sup> Teflon is a registered trademark of E.I. duPont de Nemours & Co.

## OTHER SPECIFICATIONS

**LOW FLOW CELL** PN 24091-00

**Wetted Parts:** polycarbonate, polyester, 316 stainless steel, silicone

**Process Connection:** 1/4-inch OD tubing compression fitting or 1/4-inch FNPT

**Maximum Pressure:** 90 psig (722 kPa abs)

**Maximum Temperature:** 158°F (70°C)

**Note:** The pressure and temperature specifications for the low flow cell exceed the pressure and temperature specifications for the sensor.

**FLOW-THROUGH TEE** (1-1/2 inch body) PN 23567-00

**Wetted Parts:** CPVC and Buna N; body is schedule 80 CPVC

**Process Connection:** 1-1/2 inch socket

**Maximum Pressure:** 65 psig (549 kPa abs)

**Maximum Temperature:** 122°F (50°C)

**FLOW-THROUGH TEE** (2 inch body) PN 915240-03, 04, 05

**Wetted Parts:** PVC and Buna N; body is schedule 80 PVC

**Process Connection:** 3/4-inch NFPT, 1 inch NFPT, or 1-1/2 inch NFPT

**Maximum Pressure:** 60 psig (515 kPa abs)

**Maximum Temperature:** 120°F (49°C)

**SPRAY CLEANER** PN 12707-00

**Wetted Parts:** PVC, polypropylene, 316 stainless steel

**Connection for Cleaning Fluid:** compression fitting for 1/4-inch tubing

**VALVED ROTAMETER** PN 9390004  
for use with Low Flow Cell

**Flow:** 0.4 to 5 gph (1.5 to 19 L/hr)

**Wetted Parts:** acrylic, 316 stainless steel, Viton

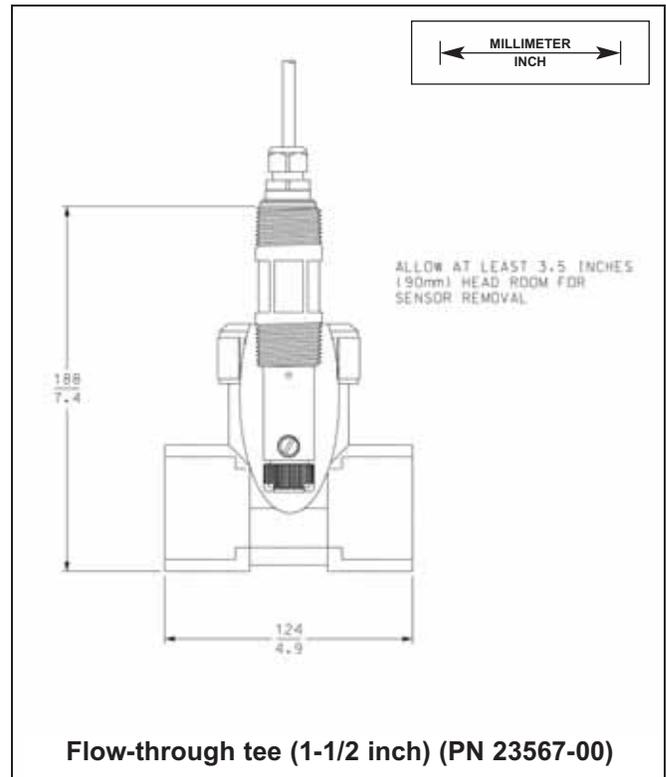
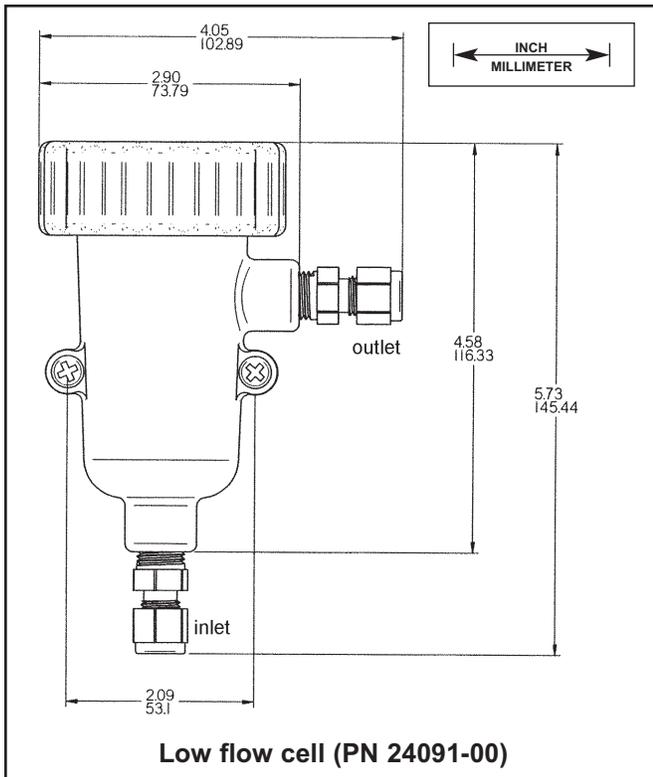
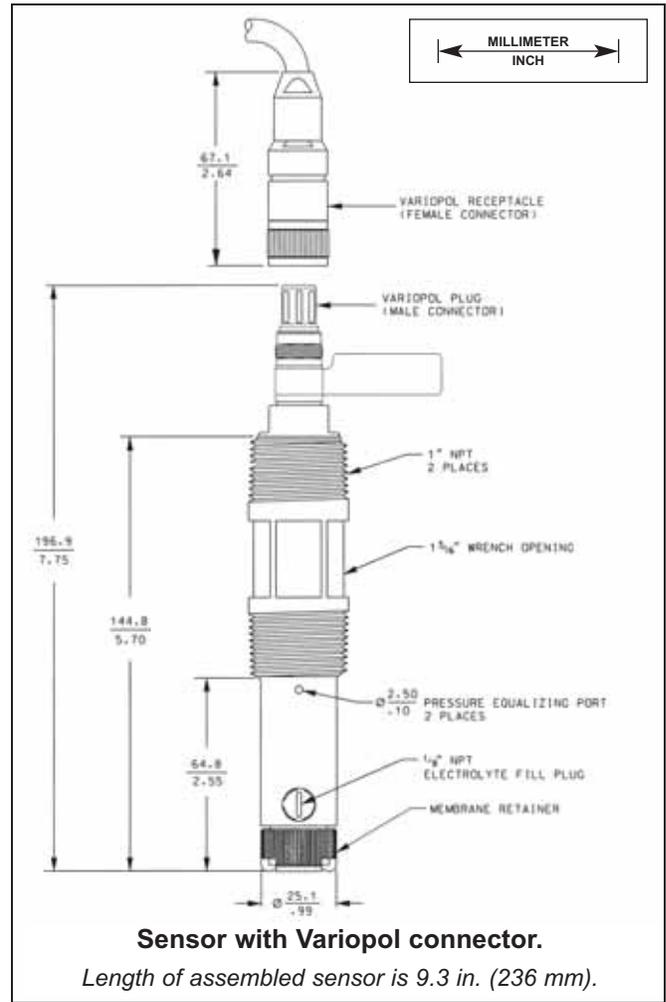
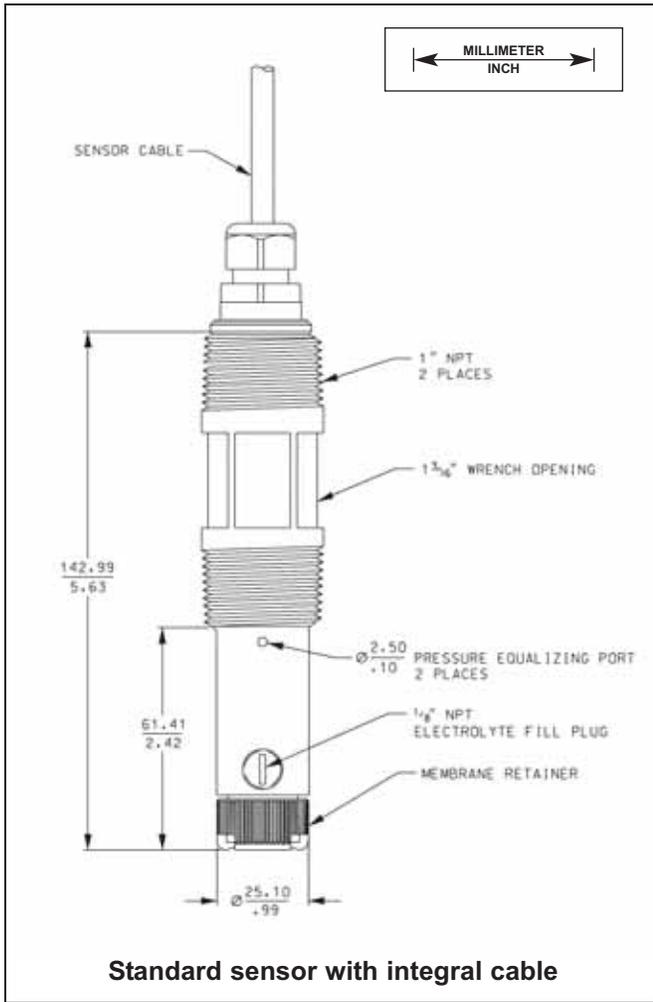
**Process Connection:** 1/4-inch NFPT (316 SS)

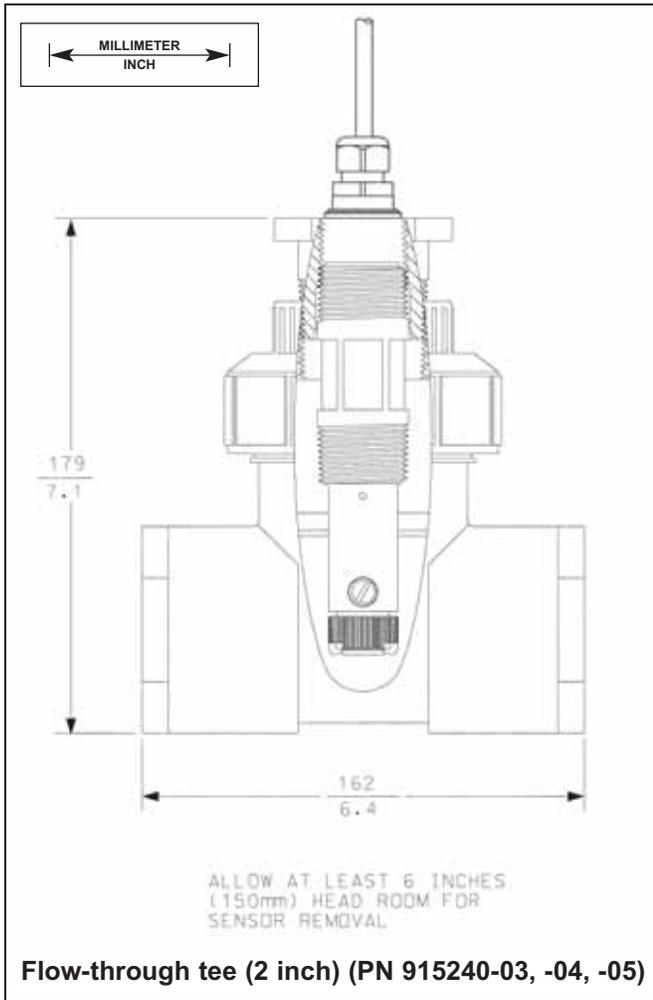
**Maximum Pressure:** 100 psig (858 kPa abs)

**Maximum Temperature:** 150°F (65°C)

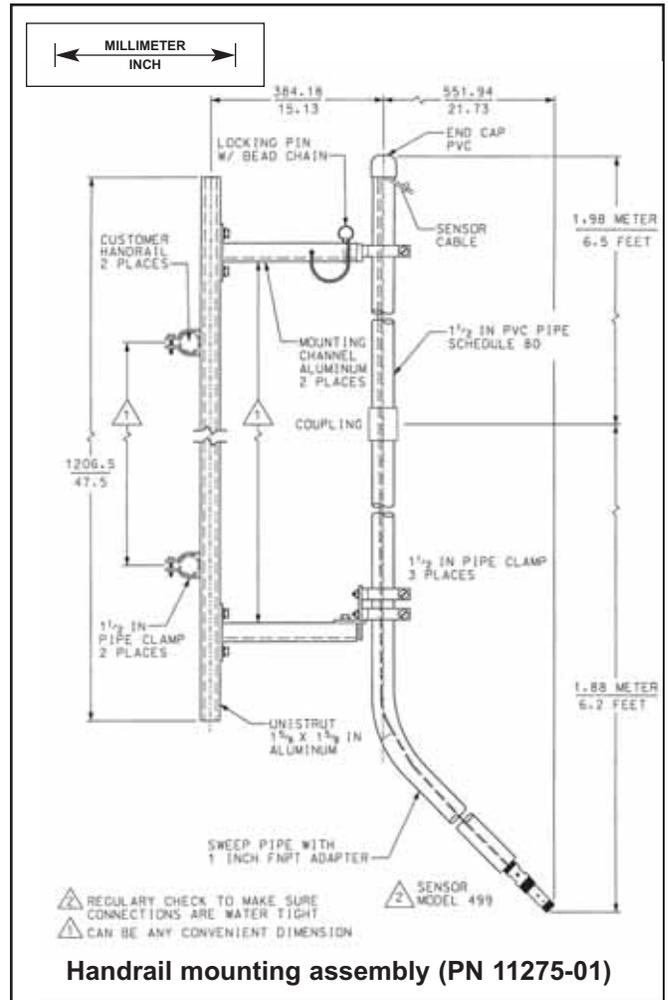
## RECOMMENDED ANALYZERS

Use Model 499ADO with Models 1056, 56, 54eA, 5081-A, 1066, and Xmt-A.

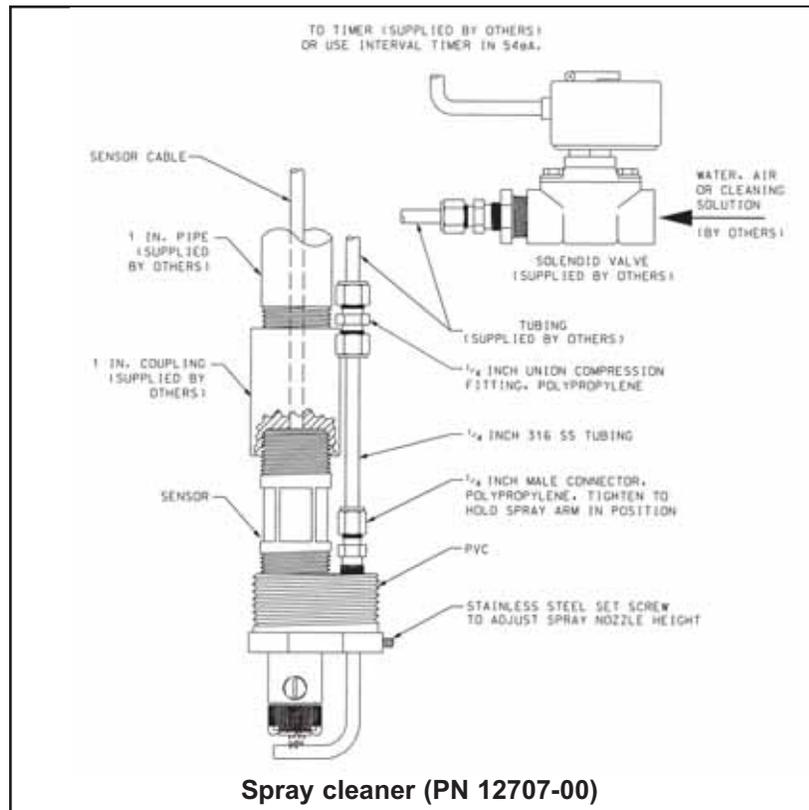




**Flow-through tee (2 inch) (PN 915240-03, -04, -05)**



**Handrail mounting assembly (PN 11275-01)**



## ORDERING INFORMATION

The **Model 499ADO sensor** is intended for the determination of dissolved oxygen at the ppm level. The sensor can be immersed directly in aeration basins using the handrail mounting assembly, or the sensor can be mounted in a variety of flow cells. The sensor is available with either an integral cable or a VP6 quick disconnect fitting. Three replacement membrane assemblies, three o-rings and a 4-oz (125 mL) bottle of electrolyte solution are provided with each sensor.

<b>MODEL 499ADO DISSOLVED OXYGEN SENSOR</b>	
<b>CODE</b>	Required selection
54	For use with Model 1056, 56, 54eA, 5081-A, 1066, and Xmt-A analyzers
<b>CODE</b>	Optional selection
60	Optimum EMI/RFI cable (not available with -VP option)
VP	Sensor with Variopol 6 connector (interconnecting cable must be ordered separately)
<b>499ADO</b>	<b>-54 -VP EXAMPLE</b>

## FOR FIRST TIME VARIOPOL INSTALLATIONS

<b>PART #</b>	<b>DESCRIPTION</b>
23747-06	Interconnecting cable, VP 6, 2.5 ft (0.8 m)
23747-04	Interconnecting cable, VP 6, 4 ft (1.2m)
23747-02	Interconnecting cable, VP 6, 10 ft (3.0 m)
23747-07	Interconnecting cable, VP 6, 15 ft (4.6 m)
23747-08	Interconnecting cable, VP 6, 20 ft (6.1 m)
23747-09	Interconnecting cable, VP 6, 25 ft (7.6 m)
23747-10	Interconnecting cable, VP 6, 30 ft (9.1 m)
23747-03	Interconnecting cable, VP 6, 50 ft (15.2 m)
23747-11	Interconnecting cable, VP 6, 100 ft (30.5 m)

## ACCESSORIES

PART #	DESCRIPTION
23567-00	1-1/2 in. flow through tee with 1-1/2 socket connections
914240-03	2-in. flow through tee with 1-in FNPT connections
915240-04	2-in. flow through tee with 1-in FNPT connections
915240-05	2-in. flow through tee with 1-1/2-in FNPT connections
24091-00	Low flow cell
9390004	Rotameter: 0.5 - 5.0 gph
11275-01	Sensor handrail mounting assembly: includes 10 ft (3.0 m) Schedule 80 1-1/2 in PVC pipe with sweep ell and all mounting hardware
12707-00	Spray cleaner
23550-00	Junction box, 12 terminals
9200266	Extension cable for option -54, unterminated (specify length)
9200275	Extension cable for optimum EMI/RFI cable, unterminated (specify length)
23747-00	Extension cable for optimum EMI/RFI cable, terminated (specify length)
2001492	Stainless steel tag
23501-00	Dissolved oxygen membrane assembly: includes one membrane assembly and O-ring.
23502-00	Dissolved oxygen membrane assembly: includes three membrane assemblies and three O-rings.
9210264	#1 Dissolved oxygen sensor fill solution, 4 oz (125 mL)

## COMPATIBLE ANALYZERS AND TRANSMITTERS

**The Model 1056 Dual Input Analyzer** offers the choice of single or dual sensor inputs in any combination of pH/ORP, contacting or toroidal conductivity, chlorine, oxygen, or ozone. The analyzer features completely automatic air calibration for dissolved oxygen measurements.



Simply expose the 499ADO sensor to water-saturated air and press a button. The analyzer measures the temperature and barometric pressure and automatically completes the calibration. The analyzer has two fully programmable analog outputs. Four fully programmable alarm relays are available as an option. The high contrast display shows measurement results in large, easy-to-read digits, and the user can customize the display to show additional process variables or diagnostic information. Menu screens for programming are simple and intuitive. Plain language prompts (in seven user-selectable languages) guide the user through the procedures. The analyzer continuously monitors itself and the sensor for faults and alerts the user when it detects a problem. Basic troubleshooting assistance for faults and warnings is available at the touch of a button. HART and Profibus digital communications are also available. HART allows the user to communicate with the analyzer through AMS (Asset Management Solutions) from a host anywhere in the plant.

**The Model 5081-A Transmitter** can be used with the 499ADO sensor to measure dissolved oxygen in a variety of applications, particularly where a robust, explosion-proof enclosure is needed. The dissolved oxygen reading is shown in large numerals in the top line of a two-line, seven-segment display. Local communication with the 5081-A is through a handheld infrared remote controller. Two digital communication protocols are also available: HART and Foundation Fieldbus. Digital communications allows the user to communicate with the transmitter through AMS (Asset Management Solutions) from a host anywhere in the plant.



**The Model 56 Dual Input Analyzer** offers the choice of single or dual sensor inputs in any combination of pH/ORP, contacting or toroidal conductivity, chlorine, oxygen, or ozone. The analyzer features completely automatic air calibration for dissolved oxygen measurements.



Simply expose the sensor to water-saturated air and press a button. The analyzer measures the barometric pressure and temperature and automatically completes the calibration. The analyzer has four fully programmable analog outputs and four fully programmable alarm relays, including PID and TPC control. The high contrast, full color display shows measurement results in large, easy-to-read digits. Menu screens for programming and calibration are simple and intuitive. Information screens, offering detailed explanation of programming features and calibration methods as well as troubleshooting assistance, are available at the touch of a button. An event and data logger and a dual graphical display are also standard. HART and Profibus DP digital communication are optional.

**The Model Xmt-A Transmitter** can be used with the 499ADO sensor to measure dissolved oxygen in a variety of applications, particularly in applications where loop power is needed. The Xmt-A has a two line display that can be configured to meet user requirements. Menu screens (in six languages) for configuring and calibrating are simple and intuitive. Two digital communication protocols are available: HART and Foundation Fieldbus. Digital communications allows the user to communicate with the transmitter through AMS (Asset Management Solutions) from a host anywhere in the plant.





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