

# X-STREAM In Situ Oxygen Transmitter

- AccuMax™ enhanced system performance
- Accuracy  $\pm .75\%$  of reading or  $\pm .05\%$  oxygen
- Signal stability of  $\pm .03\%$  oxygen
- Insensitive to process temperature changes  $\pm .02\%$  from 100-700°C
- Calibration validity of better than .02%
- Adaptable to most existing oxygen probe installations
- 2-wire, loop-powered electronics
- HART communications standard
- Extended process temperature range to 850°C (1562°F)
- Advanced sensor diagnostics, including “calibration recommended”
- Oxycore sensor core replacement in minutes
- Stoichiometer feature measures oxygen deficiency during reducing conditions
- Two-year sensing cell warranty
- AMS/PlantWeb® compatible with EDDL

## THE LATEST INNOVATION FROM THE INVENTORS OF THE $ZrO_2$ MEASUREMENT TECHNOLOGY

The X-STREAM In Situ Oxygen Transmitter is a probe-type in situ oxygen analyzer intended for use in measuring the residual oxygen remaining in the flue gases from any combustion process including:

- boilers
- process heaters
- kilns
- recovery boilers
- reheat furnaces



*X-STREAM Transmitter with optional Xi enhanced interface*

Emerson Process Management is the leader in oxygen flue gas analyzer technology. Our in situ, zirconium oxide oxygen analyzers have long been established as industry standards. We've combined our expertise with the latest Rosemount Analytical transmitter technology to create a truly revolutionary package – the X-STREAM In Situ Oxygen Transmitter!

The X-STREAM integrates an oxygen probe and field electronics into a single, compact package. The probe inserts directly into a flue gas duct to measure oxygen in combustion processes. No sampling system is required. A NEMA 4X, IP 66 Rosemount Analytical transmitter housing mounts directly to the probe and contains the transmitter's electronics, replacing common stand-alone field electronics. This integrated design minimizes the cost of installing separate probe cable, conduit and electronics. The X-STREAM electronics also require much less power to operate, reducing heat generated, and extending electronics life.

The HART® communications with EDDL protocol provides a link into Emerson Process Management's PlantWeb® architecture. Setup, calibration and service diagnostics can be performed remotely with a HART 375 hand-held communicator, AMS or via a single or dual channel Xi enhanced interface. The Xi enhanced interface also carries advanced features such as automatic calibration, extended process temperature operation to 850°C (1562°F), Stoichiometer feature and programmable reference.

## One-time Installation

The X-STREAM oxygen transmitter is easy to install. The probe tube can be threaded directly into an economical 2½" NPT thread or also use the more traditional flange mount. Adaptor flanges are available for most competitive probe mounts. Calibration and reference gas lines use ¼ inch compression fittings. AC line voltage directly powers the heater inside the probe and the transmitter electronics are loop-powered by the 2-wire 4-20mA signal. Once the initial installation is complete, the probe and its associated wiring and gas fittings never need to be removed.

## Sensor core swap in minutes

All active sensor components, including diffuser, sensing cell, heater and thermocouple are contained inside a sensor core assembly that can be exchanged in minutes.



The failed sensor core can be completely rebuilt on the bench, including diffuser, cell, heater and thermocouple.



## Xi Enhanced Interface and Advanced Feature Electronics

Interface to the X-STREAM transmitter for setup, calibration and diagnostics can be via HART Communications through a Model 375 Handheld Communicator through Emerson's AMS or through an optional single or dual-channel Xi Enhanced Interface. The Xi Enhanced Interface also carries several advanced features.



*Xi Enhanced Interface*

## ADVANCED Xi FEATURES

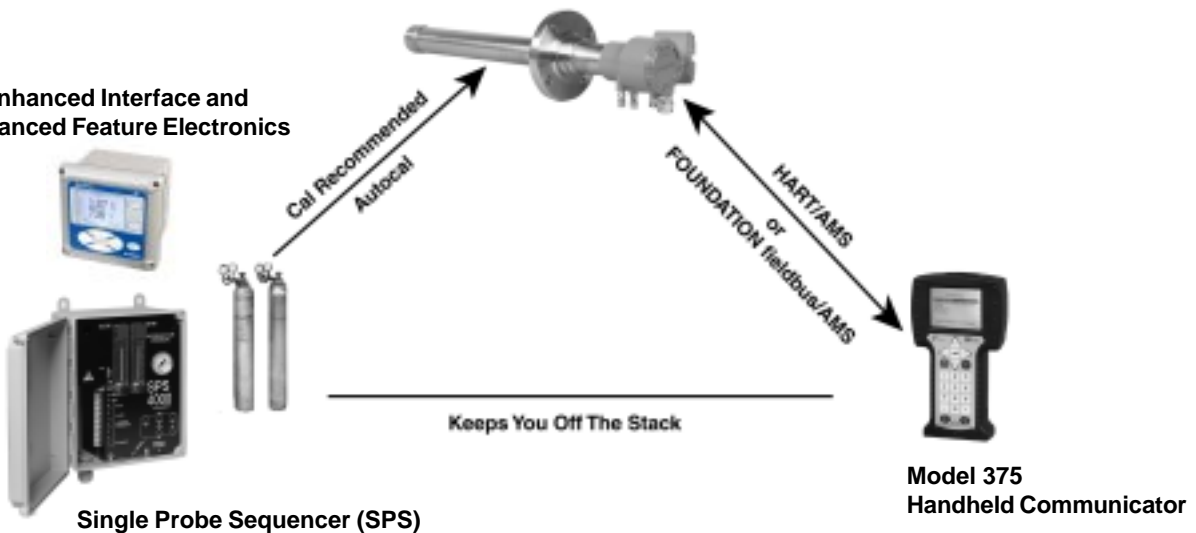
### AUTOMATIC CALIBRATION

Plant personnel often ask how frequently an oxygen analyzer requires calibration. The answer is very application-dependent based upon the fuels being burned, normal levels of oxygen and the sulfur content in the flue gases. The X-STREAM Xi addresses this concern by providing an on-line diagnostic that determines when a calibration should be conducted, eliminating many unneeded calibrations, and the technician and gas resources they consume. The X-STREAM electronics has an on-line impedance measurement for the sensing cell.

This feature can trigger a fully automatic calibration by sequencing solenoids to introduce calibration gases to the sensing cell. The Single Probe Sequencer (SPS) switches CAL gases to a single probe, while a Multi-Probe Sequencer (IMPS) can handle 1 to 4 probes. Many needless calibrations based on "time in service" are eliminated. A contact closure notifies the control room when a calibration is taking place. The oxygen output signal can be held at its last value, or released during calibration. The X-STREAM can also initiate calibrations by traditional methods:

- Contact closure from the user's control room
- Time since last calibration feature – established by the autocalibration system
- Xi enhanced interface
- HART/AMS

### Xi Enhanced Interface and Advanced Feature Electronics



## Extended Process Temperature Range to 850°C (1562°F)

The X-STREAM Oxygen Analyzer employs a heater and thermocouple to maintain a temperature setpoint at 736°C (1357°F). Temperature control is maintained within  $\pm 1^\circ\text{C}$  to process temperatures of about 705°C (1300°F). This is satisfactory for most applications, but excursions to higher temperatures can occur in many processes. In these instances, the heater is turned off and the process temperature is utilized to heat the sensing cell.

## Stoichiometer

Process upsets can sometimes cause a combustion process to go into substoichiometric or reducing conditions. The oxygen readings from one or more probes may decline all the way to zero. The stoichiometer cell will measure the amount of oxygen deficiency during these reducing conditions. The trends in your DCS can be set up for a lower range limit of -1 or -2% oxygen to depict the level of oxygen deficiency.

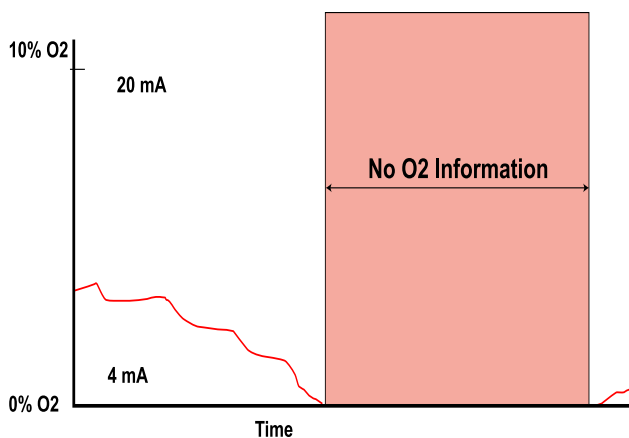
The operator can see if his control actions to recover are having the desired effect. These type of events do not occur frequently, but knowing the parameters of the situation prevents overcorrecting while coming out of the reducing condition.

The oxygen reading is adjusted immediately to compensate for the varying process temperatures. It should be noted that cell life will be reduced by continuous operation at temperatures above 705°C (1300°F). If process temperatures are expected to continuously be above 705°C, we recommend the use of a bypass or probe mounting jacket accessory (see page 10).

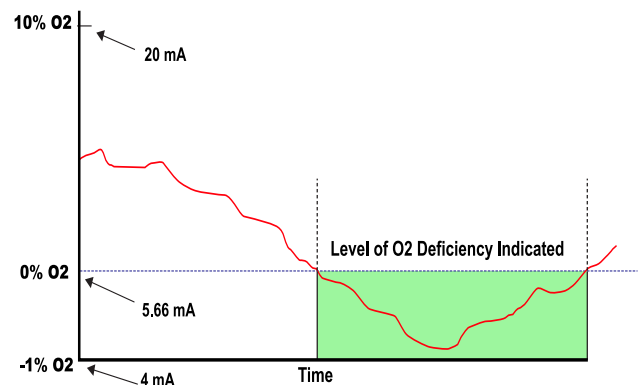


**Acid-resistant Stoichiometer cell**

**DCS Trend During a Reducing Process Event**



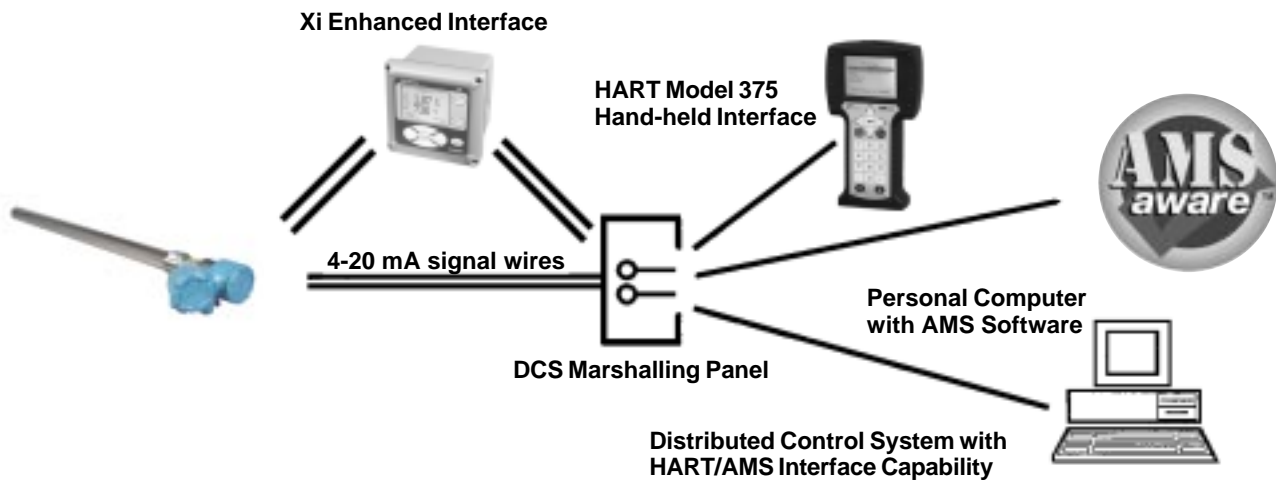
**DCS Trend With X-STREAM Stoichiometer Feature**



## X-STREAM IN-SITU OXYGEN TRANSMITTER FEATURES AND BENEFITS

Features	Benefits
AccuMax™ enhanced system performance	Operate combustion process with confidence. This improves both combustion efficiency and environmental performance of the system.
Integrated oxygen probe and electronics simplifies installation	Eliminates costs of mounting separate electronics. Eliminates cabling & conduit between probe and electronics
In situ design. No sample system, sample probes, scrubbers, or pumps are necessary; test gas calibration check without disturbing the probe	Low installation and maintenance costs
Fast speed of response	Sensor located in flue gases ideal for closed loop control
Stoichometer feature measures the level of oxygen deficiency during reducing combustion conditions	Provides critical information to operators during upset conditions
“Calibration recommended” indication. On-line electrical check indicates need for calibration	Optimizes plant resources; reduces maintenance and calibration costs
Field-replaceable cell quick change Oxycore™ assembly and plug-in electronics module	Reduced down time and maintenance costs
Normal operation in flue gas temperatures up to 1300°F (700°C). Optional configurations increase operation to 1832°F (1000°C).	Ideally suited to any combustion process and optional mounting hardware increases probe operability in high temperature processes
Automatic line voltage selections	Automatically selects from 100 to 240 VAC and 50/60 Hz. without configuration or set-up
Extended process temperature capability to 1562°F (850°C)	Allows seamless excursions in upset conditions without loss of measurement using optional Xi

### Communicate with the X-STREAM from almost anywhere via the HART™ Protocol



# SPECIFICATIONS<sup>1</sup>

## X-STREAM OXYGEN TRANSMITTER

### Measurement Specifications

**Net O<sub>2</sub> Range:** 0 to 50% O<sub>2</sub> user scalable  
-2 to 50% O<sub>2</sub> user scalable with stoichiometer

**Accuracy in oxidizing conditions:** ±0.75% of reading or 0.05% O<sub>2</sub>, whichever is greater

**Lowest detectable limit:** .01% O<sub>2</sub>

**Signal Stability:** ±.03% O<sub>2</sub>

**Process Temperature Effect:** <0.05% O<sub>2</sub> from 100°C to 700°C

**System Speed of Response to Calibration Gas:** Initial response in less than 3 seconds  
T<sub>∞</sub> in less than 8 seconds  
Response to process gas changes will vary, depending on velocity and particulate loading of the diffuser

**Calibration Validity:** Presentation of calibration gases matches the normal process to within ±.02% O<sub>2</sub>

**Accuracy in reducing conditions:** ±10% of reading, or .1% O<sub>2</sub>

**System Response in Reducing Conditions:**  
going from oxidizing to reducing  
-T<sub>90</sub> in 120 sec.  
going from reducing to oxidizing  
-T<sub>90</sub> in 30 sec.

**Ambient temperature effect on Transmitter 4-20mA signal:**  
<.005% per degree C

**Ambient temperature effect on Xi 4-20mA signal:**  
<.0025% per degree C

### Environmental Specifications

**Transmitter Probe:** Process-wetted materials are 316L or 304 Stainless steel

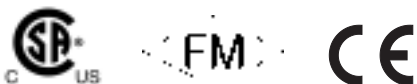
### Process

**Temperature Limits:** 0° to 850°C (32° to 1562°F) \*  
\*Reduced cell life can be expected if operated continuously at temperatures above 705°C (1300°F)  
(optional bypass and jacket accessories permit operation to 1100°C (1922°F))

### Transmitter

**Electronics Housing:** Low copper aluminum  
NEMA 4X, with reference air exhaust port piped to clean area

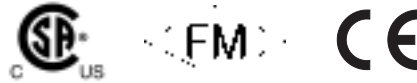
General Purpose  
Certifications:



Ambient Temp. Limits: -40° to 80°C (-40° to 176°F)  
-40° to 85°C (-40° to 185°F)  
as measured inside electronics

### Xi Enhanced Interface:

NEMA 4X, Polycarbonate Material  
General Purpose  
Certifications:



Ambient Temp. Limits: -20° to 55°C (-4° to 131°F)  
-20° to 70°C (-4° to 158°F) as measured inside electronics

### Xi LCD display:

Ambient Temp. Limits: 20°C to 55°C (131°F)

### Installation Specifications

#### Probe Mounting:

Vertical or horizontal – 2 ½ NPT or flanged  
Spool pieces are available, P/N 3D39761G02, to offset transmitter housing from hot ductwork.

#### Probe Lengths, and Approximate Shipping Weights:

18 in (457 mm) package:	25 lbs.	(11.3Kg)
3 foot (0.91 m) package:	27 lbs.	(12.2Kg)
6 foot (1.83 m) package:	38 lbs.	(17.2Kg)
Optional ANSI/DIN Flange	10 lbs.	(4.5Kg)

#### Reference Air (required):

.2 scfh (1 i/m), clean, dry, instrument-quality air (20.95% O<sub>2</sub>), regulated to 5 psi (34 kPa)

**Calibration:** Semi-automatic or automatic

**Cal Gases:** .4% O<sub>2</sub> and 8%, balance N<sub>2</sub> recommended

**Cal Gas Flow:** 5 scfh (2.5 l/m)

#### Heater Electrical Power:

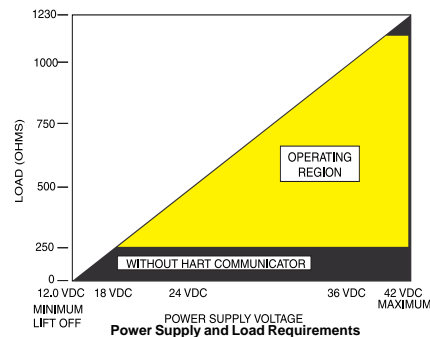
100 – 240V, ±10% 50/60 Hz  
1/2" – 14 NPT conduit ports

#### Power Consumption

**of Probe Heater:** 175VA maximum during warm-up  
20VA nominal during operation

#### Transmitter Electrical Power:

12 – 42VDC, (loop-powered from the control room or from the Xi box)



#### Electrical Power for Xi:

100 to 240V, ±10% 50/60 Hz

#### Power Consumption of Xi:

10 watts maximum

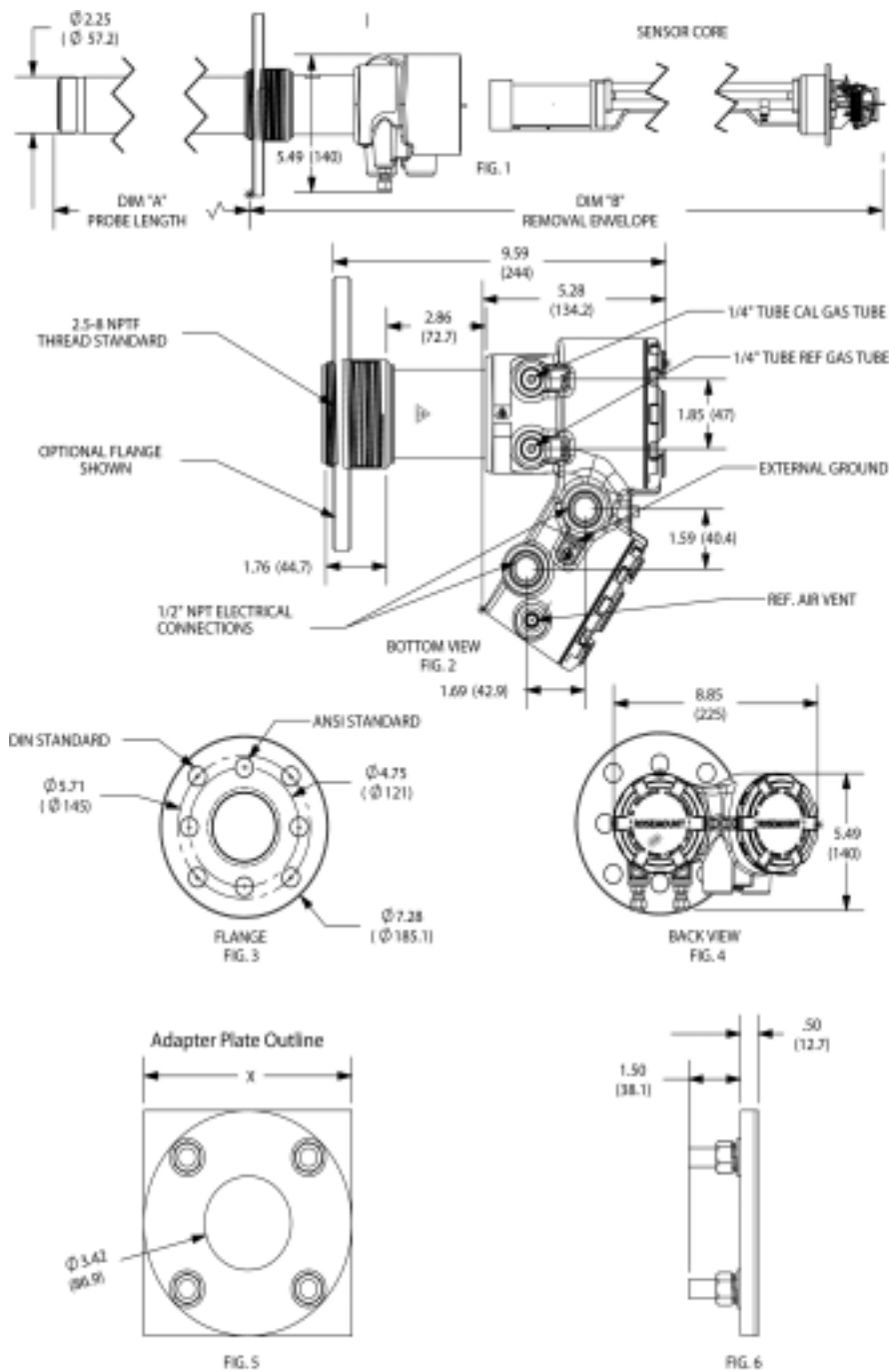
#### Alarm Relays:

2 provided – 2 amps, 30 VDC

**CE** Emerson Process Management has satisfied all obligations coming from the European legislation to harmonize the product requirements in Europe.

<sup>1</sup> All static performance characteristics are with operating variables constant. Specifications subject to change without notice.

# OUTLINE DIMENSIONS FOR X-STREAM IN SITU OXYGEN TRANSMITTER



**Table I. Mounting Plate (Fig. 5)**

	Dimensions Dia. In. (mm)	
	ANSI	DIN
Mtg. Plate (X)	6.0 (153)	7.5 (190)
Stud Size	5/8"-11	M16 x 2
4 Studs Eq. Sp.on BC	4.75 BC (121) BC	5.71 BC (145) BC

\* If a Ceramic/Hastalloy Diffuser is used add 6" (152.5mm) to the Dimensions.

**Table II. Installation/Removal (Fig. 1)**

Probe Length	Dim "A" Insertion Depth	Dim. "B" Removal Envelope
18 in. (457 mm) Probes	16.00 (407)	29.00 (738)
3 ft. (0.91 m) Probes	34.00 (864)	47.00 (1196)
6 ft. (1.83 m) Probes	70.00 (1778)	83.00 (2111)

## ORDERING INFORMATION – X-STREAM IN-SITU OXYGEN TRANSMITTER

Model	Description
XS-O2	X-STREAM O2 Oxygen Transmitter

Level 1	Probe Type
1	Snubber Diffuser, for process gas temperatures to 500°C (942°F), Standard Sensing Cell
2	Snubber Diffuser, for process gas temperatures to 500°C (942°F), Acid-Resistant Stoichiometer Sensing Cell for SO <sub>2</sub> /HCl service. Includes Hastelloy calibration gas line.
3	Ceramic Diffuser for process gas temperatures to 850°C (1562°F)*, Standard Sensing Cell
4	Ceramic Diffuser for process gas temperatures to 850°C (1562°F)*, Acid-Resistant Stoichiometer Sensing Cell for SO <sub>2</sub> /HCl service. Includes Hastelloy calibration gas line.
5	Hastelloy Diffuser, for process gas temperatures to 850°C (1562°F)*, Standard Sensing Cell
6	Hastelloy Diffuser, for process gas temperatures to 850°C (1562°F)*, Acid-Resistant Stoichiometer Sensing Cell for SO <sub>2</sub> /HCl service. Includes Hastelloy calibration gas line.

Level 2	Probe Length
1	18" Probe, Normal Probe Tube
2	18" Probe, Abrasion Resistant Probe Tube
2	3' Probe, Normal Probe Tube
3	3' Probe, Abrasion Resistant Probe Tube
4	6' Probe, Normal Probe Tube
5	6' Probe, Abrasion Resistant Probe Tube

Level 3	Mounting Plate
00	None
01	New Installation – 2-1/2" NPT Weld Fitting
02	New Installation – Square Weld Plate with 2-1/2" NPT Tapped hole
03	Flange for OXT/WC General Purpose Mounting (ANSI/DIN)
04	New Installation – Square Weld Plate with 2"-150# Studs & Flange
99	Special Adapter

Level 4	Electronics
01	Transmitter Electronics – HART
02	Direct Replacement, No Electronics
03	Direct Replacement, YEW Electronics

Level 5	Manual Calibration Accessories
00	None
01	Calibration & Reference Flowmeters & reference Regulator/Filter
02	Calibration/Reference Panel

\* Cell life is reduced in processes operating above 705°C (1300°F)



## ORDERING INFORMATION – X-STREAM OXYGEN REMOTE

Model	Description
XI	X-STREAM O2 Operator Interface and Advanced Feature Electronics
<b>Level 1 Remote Type</b>	
01	Single channel X-STREAM Interface, receiving a 4-20 mA signal from an XS-O2 Probe Transmitter Electronics
03	Dualchannel X-STREAM Interface, receiving two 4-20 mA signal from an XS-O2 Probe Transmitter Electronics
<b>Level 2 Mounting</b>	
00	No Hardware
01	Panel Mount Kit with Gasket
02	2" Pipe/Wall Mount Kit
<b>Level 3 Future</b>	
00	None
<b>Level 4 Stoichiometer Function</b>	
00	No
01	Yes
<b>Level 5 Programmable Reference Function</b>	
00	No
01	Yes
<b>Level 6 850 Deg C Process Function</b>	
00	No
01	Yes

## ORDERING INFORMATION – AUTOCALIBRATION ACCESSORIES

Model	Description
XSO2CAL	X-STREAM O2 Autocalibration Accessories
<b>Level 1 Single Probe Sequencers Autocalibration options</b>	
1	SPS 4001 Single Probe Sequencer, general purpose NEMA X, includes check valve for probe
2	(Future) SPS 4001 Single Probe Sequencer, Hazardous Area EExd IIB + H2 (CSA Class I Div. I Gr. B,C,D). includes check valve for probe
<b>Level 2 Intelligent Multiprobe Sequencers (IMPS)</b>	
1	IMPS Intelligent Probe Sequencer, single-probe, general purpose NEMX 4X, includes valve for probe
2	IMPS Intelligent Probe Sequencer, two-probe, general purpose NEMX 4X, includes valve for probe
3	IMPS Intelligent Probe Sequencer, three-probe, general purpose NEMX 4X, includes valve for probe
4	IMPS Intelligent Probe Sequencer, four-probe, general purpose NEMX 4X, includes valve for probe
5	IMPS Intelligent Probe Sequencer, single-probe, 115V heated general purpose NEMX 4X, includes valve for probe
6	IMPS Intelligent Probe Sequencer, two-probe, 115V heated general purpose NEMX 4X, includes valve for probe
7	IMPS Intelligent Probe Sequencer, three-probe, 115V heated general purpose NEMX 4X, includes valve for probe
8	IMPS Intelligent Probe Sequencer, four-probe, 115V heated general purpose NEMX 4X, includes valve for probe
9	IMPS Intelligent Probe Sequencer, single-probe, 220V heated general purpose NEMX 4X, includes valve for probe
10	IMPS Intelligent Probe Sequencer, two-probe, 220V heated general purpose NEMX 4X, includes valve for probe
11	IMPS Intelligent Probe Sequencer, three-probe, 220V heated general purpose NEMX 4X, includes valve for probe
12	IMPS Intelligent Probe Sequencer, four-probe, 220V heated general purpose NEMX 4X, includes valve for probe

## X-STREAM ACCESSORIES

### HART® Hand-held 375 Communicator

The FOUNDATION™ fieldbus 375 Communicator is an interface device that provides a common communication link to HART®/FOUNDATION fieldbus compatible instruments, such as the Sulfur-Resistant Oxymitter. HART® Communications Protocol permits all the information available from the Sulfur-Resistant Oxymitter electronics to be transmitted over standard 4-20 mA signal wires or FOUNDATION fieldbus wires. By attaching the hand-held communicator at a termination point along the signal line, a technician can diagnose problems and configure and calibrate the Sulfur-Resistant Oxymitter as if he or she were standing in front of the instrument.



### Bypass Packages

The specially designed Rosemount Analytical Bypass Package for oxygen analyzers has proven to withstand the high temperatures in process heaters while providing the same advantages offered by the in situ sensor. Inconel tubes provide effective resistance to corrosion, and the other components common to other sampling systems.



### Oxygen Calibration Gas Kits

Rosemount Analytical's Oxygen Calibration Gas and Service Kits have been carefully designed to provide a more convenient and fully portable means of testing, calibrating, and servicing Rosemount Analytical's oxygen analyzers. These lightweight, disposable gas cylinders eliminate the need to rent gas bottles.



### APPLICATION DATA SHEETS

- ADS 106-340A – Minimizing the Total Life-Cycle Cost of an Oxygen Analyzer Installation
- ADS 106-300D – Using Oxygen Analyzers As a Predictive Maintenance Tool for Air Heaters
- ADS 106-300E – Optimizing Catalyst Regeneration with an In Situ Oxygen Probe
- ADS 106-300F – Oxygen Measurement Improves Efficiency and Product Quality in Cement Kilns
- ADS 106-340D – In Situ Oxygen Measurement Ensures Product Quality in Annealing Processes

For more information, call Rosemount Analytical at:

800-433-6076 (US)  
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