



**Advanced Instruments Inc.**

*Gas analysis solutions through advanced analyzer and sensor technology*



## ***GPR-1600 MS ppm Oxygen Analyzer***

***Breakthrough Pico-Ion Sensor***

***0-500 ppb or 0-1 ppm Low Range***

***5 ppb Sensitivity,  $\pm 1\%$  Accuracy***

***36 Month Sensor Life, Fast Recovery***

***No Maintenance***

***Communication Link USB or RS232***



# Pico-Ion Sensor Technology



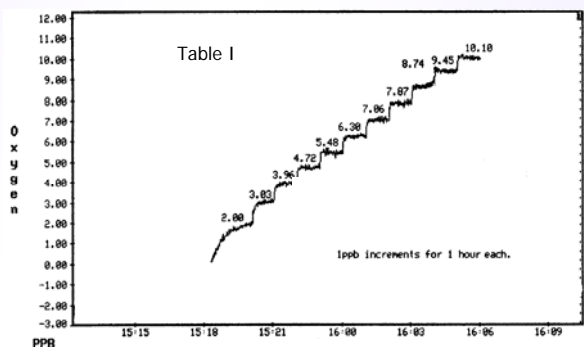
The design of the Pico-Ion oxygen sensor represents a major breakthrough in electrochemical sensor technology. Targeting issues such as sensitivity, long term stability, fast recovery, long service life, no maintenance and low cost of ownership the Pico-Ion sensor provides exceptional performance and value over a wide range of industrial applications concerned with oxygen contamination ranging from sub-parts-per-billion (ppb) to parts-per-million (ppm).

The unique features of the Pico-Ion sensor are a proprietary sensing electrode and a unique gas delivery path. The sensing electrode generates a signal output equal to that of larger wet cells. The gas delivery path maximizes the rate oxygen is reacted. Together they produce a sensor capable of detecting 1 ppb oxygen levels. The Pico-Ion sensor's response to hourly incremental 1 ppb oxygen challenges is illustrated in Table I.

This design also minimizes the evaporation of water from within the sensor when exposed to extremely dry high purity process gases. Reducing the loss of water from the sensor's electrolyte enables the Pico-Ion sensor to provide users with 36 months of continuous service under normal conditions. In contrast, so called "non-depleting" wet cells require the frequent addition of water to the electrolyte. This is important for two reasons. One, the loss of water from the electrolyte can affect the sensor's signal output which can produce false readings. Second, water naturally contains dissolved oxygen from the atmosphere that when added to the electrolyte increases the wet cell's background signal output producing an erroneously high oxygen reading until such time that the oxygen can be reacted.

The gas delivery path also minimizes the temperature dependence of the sensor's signal output contributing to the Pico-Ion sensor's excellent long term stability. This also reduces the amount of unreacted oxygen that can escape and dissolve in the electrolyte. Minimizing the background signal output provides the extremely fast recovery of the Pico-Ion sensor as illustrated in Table II. Competitive sensors can't match the recovery of the Pico-Ion sensor because wet cells have a large electrolyte volume (containing dissolved oxygen) that also can damage the large fragile cathode when transported. Thus users must add electrolyte and purge wet cells before they can be brought on-line. In contrast, the compact Pico-Ion sensor is installed, qualified and shipped inside the analyzer, using the bypass sample system, thereby enabling the analyzer to be brought on-line in minutes after unpacking.

The Pico-Ion sensor technology produces a sensor that can detect changes in oxygen concentrations of less than 1 ppb and provide long stability of less than 1% FS (5 ppb) over six months. 90% FS response time is less than 20 seconds. No maintenance is required over the 36 month service life. The sensor's inherent linearity over all ranges make field calibration a quick and simple exercise.

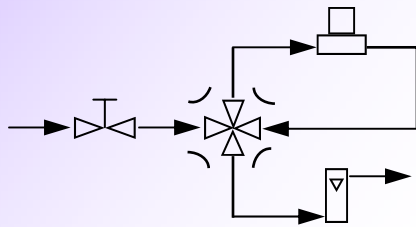


| <u>O<sub>2</sub> Exposure</u> | <u>Duration</u> | <u>O<sub>2</sub> Target</u> | <u>Recovery</u> |
|-------------------------------|-----------------|-----------------------------|-----------------|
| Air                           | 30 sec          | 1 ppm                       | 45 min          |
| 9 ppm                         | 2 min           | 100 ppb                     | 3 min           |
| 2 ppm                         | 2 min           | 10 ppb                      | 10 min          |
| 1 ppm                         | 5 sec           | 10 ppb                      | 15 min          |

# Flexible Analyzer Platform

The GPR-1600MS ppm Oxygen Analyzer from Advanced Instruments Inc. is the most cost effective high performance oxygen analyzer available. Technological advantages that have been combined to produce a single analyzer versatile enough to meet today's demand for analyzing trace oxygen contamination levels ranging from less than 1 ppb to 1000 ppm with long term stability of less than 1% FS (5 ppb) drift include:

- ▶ Proprietary highly sensitive Pico-Ion sensor developed by parent company Analytical Industries Inc.
- ▶ Simple intuitive digital user interface laden with productivity enhancing features.
- ▶ Stainless steel sample system complete with flow valve, 3-way sample/bypass and shut-off valves.
- ▶ Benchtop, 19" rack, panel or wall mount enclosure configurations.



Stability is enhanced by an integral temperature controlled heater system that includes insulating the enclosure, a precise PID controller and thermal runaway protection that maintains the sample and sensor at a preset temperature. As a result, signal drift is less than 1 ppb oxygen during day and night cycles where ambient temperature fluctuations are typically  $\pm 10$  °F.

The software that controls the GPR-1600MS provides the user with an interface that is very intuitive, efficient and greatly reduces their dependence on instruction manuals. The menu is displayed on a large graphical LCD display which the user navigates via four control keys. The bi-directional RS232C serial port enables operators to access and operate the GPR-1600MS remotely using an IBM compatible personal computer.

Increasing productivity is yet another feature of the GPR-1600MS from Advanced Instruments:

- ▶ Automatic ranging with manual override facilitates trending of upset conditions and remedial action.
- ▶ Data storage of a fixed number of points documents oxygen readings for quality control purposes.
- ▶ Fine tuning the temperature compensation using a factor determined from the tracking feature.
- ▶ A "weak sensor" warning displayed on the LCD indicates when the sensor should be replaced.

Why is this all important? Because only the Pico-Ion sensor offers users the unique combination of high performance and a significantly lower cost of ownership in analyzing low concentrations of oxygen.

The Pico-Ion sensor has the sensitivity and stability of larger wet cells. Ten times less expensive than larger wet cells requiring frequent maintenance, the Pico-Ion sensor has a 36 month service life with no maintenance and an unconditional 1 year warranty on materials and workmanship. In contrast, "non-depleting" wet cells promote a 5 year warranty that in reality is prorated after the first year.

The unsurpassed recovery properties, see Table II, of the Pico-Ion sensor are augmented by the sample system described above. Only the Pico-Ion sensor based GPR Series analyzers maximize productivity and minimize downtime.



## Technical Specifications

|                      |   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
|----------------------|---|-----------------------|----------------------------|-----------------------|----------------------------|-----|------------|-------|------------|-------|-----------|--------|------------|-------|-----------|--------|------------|
| Accuracy:            | < 1% of FS range under constant conditions  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Analysis:            | 0-1 ppm, 0-10, 0-100, 0-1000 ppm FS ranges; auto-ranging or manually lock on single range   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Application:         | Oxygen analysis from 10 ppb to 1000 ppm in inert, helium, hydrogen, mixed gas streams   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Approvals:           | CE  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Area Classification: | General purpose   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Alarms:              | 2 adjustable form C relay contacts non-latching; "weak sensor" indicator; power failure; system failure   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Calibration:         | Certified gas of O <sub>2</sub> balance N <sub>2</sub> approximating 80% of range above analysis range recommended for optimum results  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Compensation:        | Barometric pressure and temperature; heated sample system and sensor housing  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Connections:         | 1/4" compression tube fittings  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Controls:            | Water resistant keypad; menu driven range selection, calibration, alarm and system functions  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Data Acquisition:    | Selectable data point intervals   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Display:             | Graphical LCD 5 x 2.75; resolution .001 ppm; displays real time ambient temperature and pressure  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Enclosure:           | Painted aluminum 13.9" x 9.9" x 13.4" benchtop  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Flow Sensitivity:    | None between 1-3 SCFH, 2 SCFH recommended   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Linearity:           | > .995 over all ranges  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Pressure:            | Inlet - regulate to 20-50 psig, max 150 psig; vent - atmospheric not to exceed ±5" water column   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Power:               | Universal; specify 100/120 or 220/240 VAC with heater   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Recovery Time:       | <table border="0"> <tr> <td>O<sub>2</sub> Level</td> <td>Duration</td> <td>O<sub>2</sub> Target</td> <td>Recovery on N<sub>2</sub></td> </tr> <tr> <td>Air</td> <td>30 seconds</td> <td>1 ppm</td> <td>45 minutes</td> </tr> <tr> <td>9 ppm</td> <td>2 minutes</td> <td>10 ppb</td> <td>10 minutes</td> </tr> <tr> <td>1 ppm</td> <td>5 minutes</td> <td>10 ppb</td> <td>15 minutes</td> </tr> </table> | O <sub>2</sub> Level  | Duration                   | O <sub>2</sub> Target | Recovery on N <sub>2</sub> | Air | 30 seconds | 1 ppm | 45 minutes | 9 ppm | 2 minutes | 10 ppb | 10 minutes | 1 ppm | 5 minutes | 10 ppb | 15 minutes |
| O <sub>2</sub> Level | Duration  | O <sub>2</sub> Target | Recovery on N <sub>2</sub> |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Air                  | 30 seconds  | 1 ppm                 | 45 minutes                 |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| 9 ppm                | 2 minutes   | 10 ppb                | 10 minutes                 |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| 1 ppm                | 5 minutes   | 10 ppb                | 15 minutes                 |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Response Time:       | 90% of final FS reading < 20 seconds  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Sample System:       | Flow control and sample/bypass valves; flow indicator   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Sensitivity:         | < 0.5% of FS range  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Sensor Model:        | GPR-12-2000MS - requires no maintenance   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Sensor Life:         | 36 months at 25°C and 1 atm; average O <sub>2</sub> < 100 ppm   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Signal Output:       | 4-20mA isolated and 0-1V  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Temp. Range:         | 5° to 45°C  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Warranty:            | 12 months analyzer; 12 months sensor  |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |
| Wetted Parts:        | Stainless steel   |                       |                            |                       |                            |     |            |       |            |       |           |        |            |       |           |        |            |

## Optional Equipment

- Bezels for 19" rack mounting; wall mount NEMA 4, 4X enclosures
- Integral sample, span and zero valves for analyzer controlled auto-calibration
- Voltage contacts for external controlled auto-calibration (requires valves)



## GPR-1600 MS Process ppm O<sub>2</sub> Analyzer

### Pico-Ion™ Sensor Technology

- Accuracy < 1% FS Range
- Sensitivity < 0.5% FS Range
- Fast Recovery to ppb Levels
- Excellent Stability
- 36 Month Expected Life
- No Maintenance

- Internal Auto Zero, Span Calibration
- Voltage Contacts for External Auto-cal
- 4 Standard Analysis Ranges
- Auto-ranging or Manual
- SS Bypass Sample System
- Remote Communication Link
- Certified ISO 9001 QA System

