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NGA 2000

Product Data Sheet
PDS 103-660.A01
September, 1999

PMD Percent Oxygen Analyzer Module

- Improved Null Balance System
- Improved shock and vibration resistant detector
- Modular design allows custom mounting near sample source
- Barometric pressure compensation for improved accuracy on suppressed ranges
- Sensitivity to 0.01% O_2
- Corrosion resistant detector available
- Advanced diagnostic capability

Designed for continuous O_2 measurement the NGA 2000 PMD Percent Oxygen Analyzer Module delivers unmatched measurement accuracy, reliability, ease of use, simplified maintenance, advanced communication capability and enough flexibility to reach well into the next century.

Key to performance attributes is the detector assembly which utilizes paramagnetic technology. This time-tested methodology permits a wide dynamic range of measurement, from 0 to 1% through 0 to 100% O_2, including highly suppressed zero ranges in increments of 1% (e.g., 99 to 100% or 98 to 100%). For highly suppressed ranges, barometric pressure compensation for improved accuracy is a selectable matrix option.

The NGA 2000 PMD Analyzer Module is the industry's first modular paramagnetic oxygen analyzer. It is a self- contained unit complete with detector and microprocessor-based electronics. The Analyzer Module's expandability allows for system integration. The PMD Analyzer Module may be part of a sophisticated network or a stand alone analysis unit when combined with the NGA Platform, MLT or TFID Analyzer I/O Modules.

What makes the family of NGA 2000 Analyzer Modules unique is its communication network which allows identification of and interaction with other modules in the system. Because of this distinctive feature, the PMD Analyzer Module may be either incorporated into a panel/rack or placed near the sample source up to a mile away, thereby reducing sample handling requirements.

FEATURES

In our continuing effort to improve technology, Rosemount Analytical has made significant refinements to our detector design. These improvements include a new Null Balance System and an Electronic Compensation Network.

The new Null Balance System is a redesign of the standard paramagnetic detector. This electro-optical feedback system incorporates an infrared LED source and a sealed dual photocell detector. The LED replaces the standard incandescent light allowing for a more consistent and extended source of light. The new dual photocell design permits easier alignment and replacement and is also less sensitive to motion. Both of these changes have improved drift specifications and serviceability.

Vibration and shock are two parameters that can affect the performance and durability of a paramagnetic oxygen analyzer. Rosemount has developed an electronic signal compensation network which significantly reduces those effects. In this design, an AC/DC coupled differential amplifier attenuates the vibration sensitivity of the detector.

Further improvements include the addition of a flow splitter to reduce sample lag time by allowing a greater volume of sample to reach the analyzer. For corrosive gas samples, the PMD Analyzer Module offers a rhodium-plated current loop option for improved chemical resistance. Also standard to all Analyzer Modules is the monitoring of temperature and flow for improved accuracy.

As technology changes, we also allow you to upgrade your Analyzer Module with the latest advancements without change to other modules. This flexible and expandable modular approach creates a gas analysis system resistant to obsolescence, that will provide the answer to your measurement requirements now and into the next century.

PRINCIPLE OF OPERATION

Compared with other gases, oxygen is strongly paramagnetic, exhibiting a positive magnetic attraction. The volume magnetic susceptibility of the flowing gas sample is sensed in the detector/magnet assembly. A dumbbell-shaped, nitrogen-filled hollow glass test body is suspended on a platinum/nickel alloy ribbon in a non-uniform magnetic field. Because of the magnetic buoyancy effect caused by the presence of O_2, the spheres of the test body are subject to displacement forces, resulting in a displacement torque that is proportional to the volume magnetic susceptibility of the gas surrounding the test body.

Measurement is accomplished by a Null Balance System, where the displacement torque is opposed by an equal, but opposite, restorative torque. The restorative torque is due to electromagnetic forces on the spheres, resulting from a feedback current routed through a titanium current loop. The current required to restore the test body to null position is directly proportional to the original displacement torque and is thus a linear function of the volume magnetic susceptibility of the sample gas.

The restoring current is automatically maintained at the correct level by an electro-optical feedback system. A focused beam of light energy from the LED is reflected off the square mirror attached to the test body and onto the dual photocell. The output current from this combination is equal to the difference between the signals developed by the dual photocell. The difference, which constitutes the error signal, is applied to the input of an amplifier circuit that provides the restoring current.

When the test body is in the null position, both halves of the dual photocell are equally radiated. The error signal is zero, and the amplifier output remains constant.

As soon as the test body begins to rotate the amounts of radiation become unequal, resulting in an error signal to the input of the amplifier circuit.

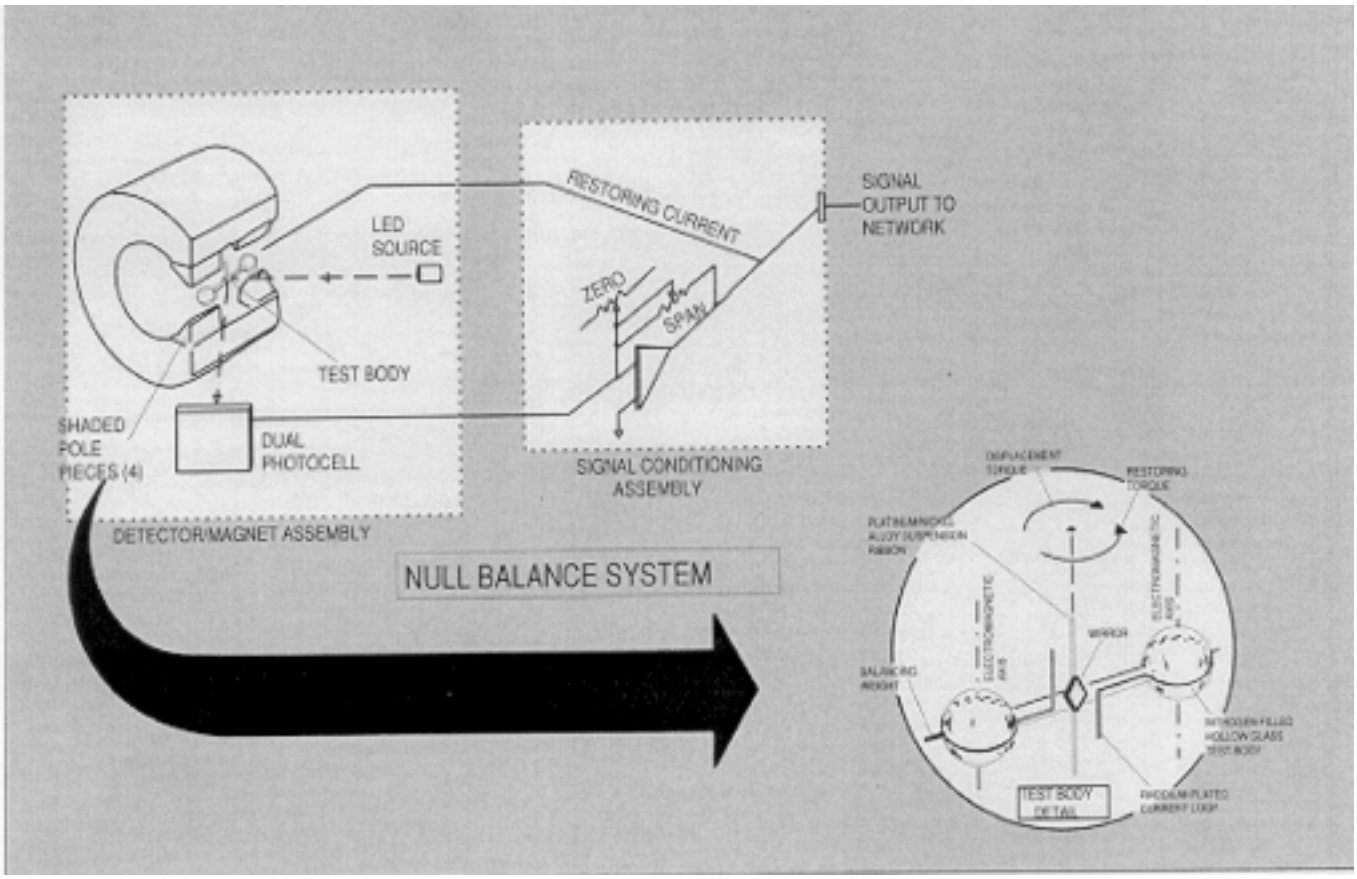
The resultant amplifier output signal is routed through the current loop, thus creating the electromagnetic forces required to restore the test body to null position. The magnitude of the current required to compensate for the torque acting on the test body is a measure of the O_2 concentration in the cell.

TYPICAL APPLICATIONS

The NGA 2000 PMD Analyzer Module can be used for many applications. Typical applications include:

- Chemical and Petroleum
  - Ethylene Oxide Manufacturing
  - Ammonia Manufacturing
  - Hydrogen Peroxide Manufacturing
  - Vinyl Chloride Manufacturing
  - Catalytic Reforming
  - CEMS/Combustion Efficiency
- Foods, Pharmaceuticals, Agriculture
  - Fermentation
  - Brewing
  - Food Processing/Ripening
  - Off-Gas in Silos
- Metals and Ceramics
  - Steel Converting
  - Cement Manufacturing
  - Heat Treating
  - Rotary Kiln Roasting
  - Tin Plant Annealing
  - Aluminum Powder Processing
- Respiratory Physiology
  - Diving/Space Chamber
  - Lung Function Research
- Internal Combustion Engine Emissions
- Gas Purity Monitoring
- Paper and Pulp
  - Lime Kilns
  - Black Liquor Furnaces
  - Power Generation
  - Boiler Combustion Efficiency

NULL BALANCE SYSTEM



PLATFORM WITH INTERNAL ANALYZER MODULE

Several Analyzer Modules may be integrated with a single Platform, either mounted inside or located externally. (Platform shown here with top removed.) See Platform Bulletin for more details

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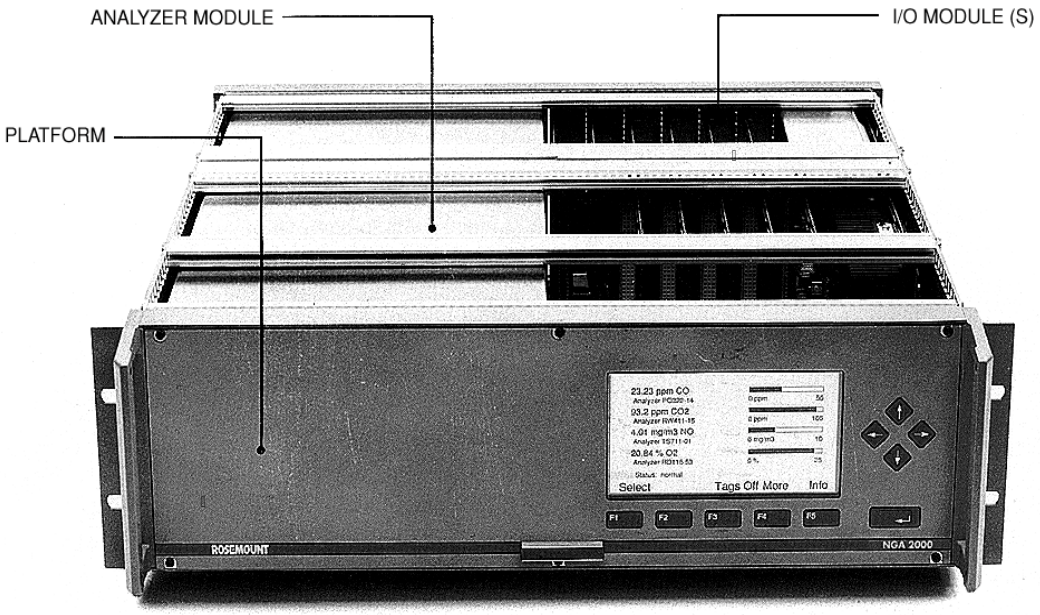


PMD ANALYZER MODULE SPECIFICATIONS

GENERAL SPECIFICATIONS

Measurement Species: Oxygen (O_2)

Ranges: 0 to 100 % O_2

Four (4) fullscale selectable output ranges in 1% increments (including suppressed zero ranges, e.g. 0-1 %, 0-2 %, 0-25 %, 99-100 %, etc.)

Minimum Detectable Level: 0.01 % O_2

Repeatability: +/- 0.01% O_2 absolute or +/- 1% of fullscale, whichever is greater (at constant temp.)

+1-0.02% O_2 Absolute for 49-100% O_2

Noise: < 1% of fullscale, peak to peak

Linearity: Better than 1% of fullscale

Response Time: 20 seconds for 90 % of fullscale (typical)

Drift (at constant temp.):
Zero and Span: < +/- 1 % of fullscale/24 hrs;
< +/- 2 % of fullscale/week

Zero and Span (99-100% range): < +/- 2 % of fullscale/24 hrs;
< +/- 4 % of fullscale/week

Effect of Temperature on Drift: < +/- 1 % of fullscale over any 10°C change, max. rate of change 10°C/hour
≤+ 1-2% of fullscale for 49-100% O_2

Warm-up Time: < 60 minutes

Ambient Operating Temperature: 0°C to 45°C (32°F to 113°)

Pressure Compensation: Oxygen readout automatically corrected to better than +/- 1% of fullscale for barometric pressure variations within +/- 3% of target value (at constant temperature)

ELECTRICAL SPECIFICATIONS

Supply Voltage and Frequency: 24 VDC +/- 5 %, 50 Watts max., direct to Analyzer Module
Ripple and Noise: <100 mVpp

Output: Refer to I/O Bulletin and ordering matrix.

SAMPLE REQUIREMENTS

Sample Temperature: 10°C to 66°C (50°F to 150°F)

Sample Flow Rate: 800 to 1400 ml/min. (recommended 1000 ml/min.)

Sample Pressure: 668 to 1703 hPa (9.7 psia to 10 psig)

Particulates: < 2 microns

Sample Dryness: Sample dewpoint below 43°C (110°F), sample free of entrained liquids

Materials in Contact with Sample: Glass, 316 stainless steel, rhodium, Paliney No 7*, resin Viton A**, platinum, nickel and MgF_2

PHYSICAL SPECIFICATIONS

Case Classification: General purpose for installation in a weather protected area-IP20 equivalent

Agency Approvals: FM, CSA, NRTL, CE

Maximum Separation: (Analyzer Module to Platform) 1600 m (5280 ft.)

Gas Connections: 1/4" tube fittings

Weight:
Analyzer Module: 6.8 kg (15.0 lbs.)

Dimensions:
Analyzer Module: 108 mm x 208 mm x 501 mm (4.25" x 8.18" x 19.73") HWD

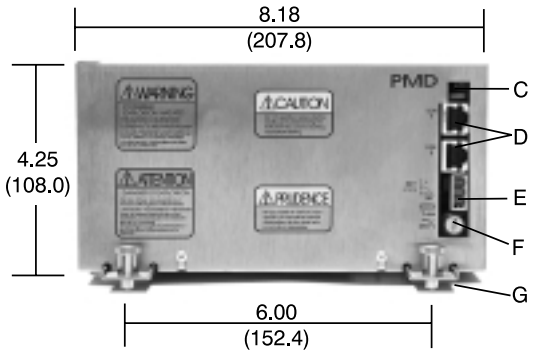
Mounting: Mounted inside a Platform (19.0" rack mountable) or custom installed in a panel

*Paliney No. 7 is a trademark of J.M. Ney Co., Hartford, CT

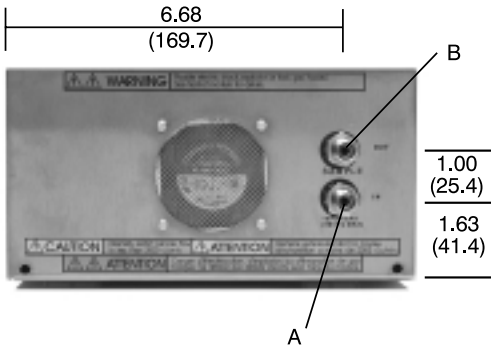
**Viton A is a trademark of E.I. duPont de Nemour Co.

OUTLINE AND MOUNTING DIMENSIONS

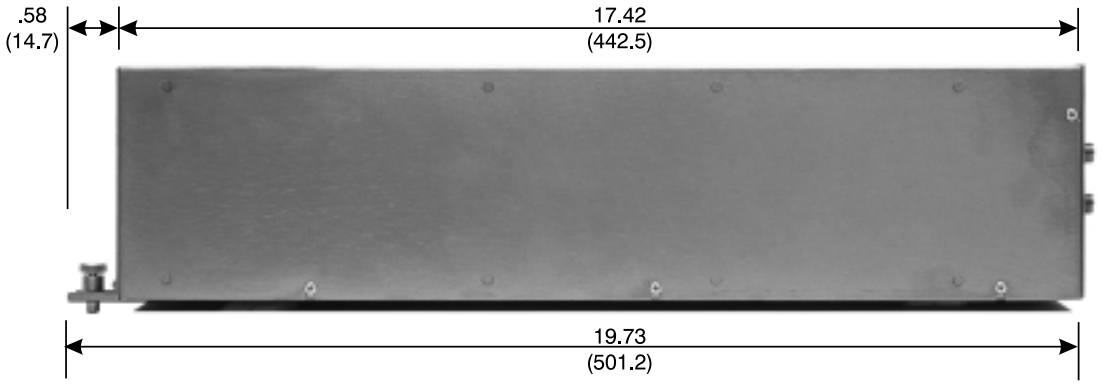
Front View



Rear View



Side View



A. Sample In: 1/4” Tube Fitting
B. Sample Out: 1/4” Tube Fitting
C. Power Indicator Light
D. Network Cable Connection(s)
E. 24 VDC Power Input
F. Fuse
G. Mounting Pins

Dimensions=Inches
(Millimeters)

ORDERING INFORMATION

P	NGA 2000 OXYGEN ANALYZER - PMD (ANALYZER MODULE)

Code	Language
A	English
X	Special

Code	Configuration Identifier[1]
A10	Calibrated Standard Ranges: 0-5, 0-10, 0-25, 0-100%
A15	Calibrated Standard Ranges: 0-1, 0-5, 0-10, 0-25%
A20	Calibrated Standard Suppressed Ranges/Barometric Pressure Compensation: 90-100, 95-100, 98-100, 99-100%
X99	Special Calibration Ranges

Code	Detector Type[2]
A00	Rhodium Plated Current Loop
Z00	Titanium Current Loop (Standard)

ZZ	No Selection

Code	Software Version
Z	Standard
9	Special (Earlier Version)

Z	No Selection

P	A	A10	Z00	ZZ	Z	Z	Example

Notes:

(1) Ranges indicated within the configuration identifier are standard. Non-standard ranges within the identifier can be changed by the user or factory calibrated at a charge of 1420 Units.

(2) Rhodium plated current loop used when sample stream contains chlorinated hydrocarbons/chlorine.

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