

# **TELEDYNE ANALYTICAL INSTRUMENTS**



## **MODEL 3020M** *Explosion Proof Paramagnetic Oxygen Analyzer*

- Fully explosion proof enclosure
- Microprocessor based
- Exceptional performance, price value
- Advanced paramagnetic sensor
- Designed for petrochemical industry

Teledyne's Model 3020M Paramagnetic Percent Oxygen Analyzer is a versatile, microprocessor based instrument specifically designed to detect oxygen in a variety of gases. The 3020M is a precise, cost effective instrument capable of measuring percent oxygen in as low as the 0-1% range. Drawing on the solid performance of Teledyne's highly successful 3000 series control platform, the 3020M provides the user with a wide variety of features and options to satisfy virtually any application.

### **PRINCIPLE OF MEASUREMENT**

The physical property distinguishing oxygen from other gases is its paramagnetism which is significantly greater than that of common gases. Consequently the molecules of oxygen are attracted by strong magnetic fields which can be used in detection.

A paramagnetic sensor consists of two spheres arranged in the form of a dumbbell suspended in a symmetrical, non-uniform magnetic field. When the surrounding gas contains oxygen, the dumbbell spheres rotate out of the magnetic field by the relatively strong attraction of oxygen.

A light beam focused on a mirror attached to the dumbbell reflects asymmetrically onto two photo diodes resulting in a voltage shift. The voltage difference produces a current used to drive the dumbbells back to the original

position. The current flow required to maintain the null position is directly proportional to the oxygen concentration and is shown linearly in volume percent oxygen in the display. Properly maintained paramagnetic sensors last for years with little or no attention making them ideal for critical measurements in the low percent range.

### **FLEXIBILITY**

The 3020M offers three dynamic, user-configurable ranges plus autoranging, and can be calibrated in any range. The instrument is linear on all three ranges, eliminating the need to recalibrate while switching between ranges. The analyzer comes standard with an isolated 4-20 mADC output for oxygen concentration and range identification. Additionally, a bi-directional RS-232C serial communication interface provides for remote monitoring and control of span and zero functions. Teledyne provides auto-calibration capabilities as a standard feature in the 3000 series platform.

### **APPLICATIONS**

This instrument is designed specifically for the detection of percent oxygen in petrochemical applications for process control, quality assurance, and safety related purposes. Typical petrochemical plants requiring the 3020M are:

- Ethyl Benzene / Styrene Monomer (EB / SM)
- Pure Terephthalic Acid (PTA)
- Caprolactum
- Phenol / Cumene
- Polycarbonate
- Polyethylene
- Polystyrene
- Ethylene Oxide / Ethylene Glycol (EO / EG)
- Methyl Methacrylate (MMA)
- Ammonia / Urea Fertilizer
- Refinery FCC Unit and flare gas applications
- Marine Vapor Recovery (MVR)

### **THE LEADER IN OXYGEN**

The 3020M can be ordered as a standard unit or as part of a larger analytical system. With over 50 years of analytical instrument experience, Teledyne supplies sensors, custom engineered analyzers and complete monitoring systems to satisfy unique applications. From portables to on-line units, in microprocessor based or analog configurations, no other manufacturer comes close to matching Teledyne's breadth of instrumentation.

### **ADVANTAGES**

- Linearity of analysis across three user-selectable ranges
- Autoranging to follow process upsets
- Auto-calibration electronics standard
- No purge gas requirements

**Built for Reliability and Performance**

# MODEL 3020M PARAMAGNETIC OXYGEN ANALYZER

## STANDARD FEATURES

- Proven, robust paramagnetic sensor
- Explosion proof NEMA 4/7 rated enclosure (Class I, Div 1, Group B)
- Three user-selectable ranges plus cal range
- Signal and Range ID output: isolated 4-20 mA DC
- Programmable autoranging
- Two fully adjustable concentration alarm set points with programmable relay functions, Form C contacts, 3A resistive
- Calibration contact span/zero, Form A normally open contact, 3A resistive
- Self diagnostics with Form C failure alarm contacts
- Full duplex RS-232C communication link
- Five digit oxygen concentration LED display
- 2x20 alphanumeric vacuum fluorescent display for set up and diagnostics
- Stainless steel sample passages and fittings
- Universal power supply: 100-240 VAC / 50-60 Hz
- Remote calibration digital inputs

## OPTIONS

- C Electronically operated cal/zero valves
- F Flame arrestors for Class I, Div 1, Group C/D service
- G Flame arrestors for Class I, Div 1, Group C/D service with cal valves
- H Flame arrestors for Group B (hydrogen) service
- I Flame arrestors for Group B service with cal valves

## SPECIFICATIONS

Ranges:	3 user selectable ranges; typical ranges 0-5% to 0-100%; autoranging with ID output (lower ranges available)
Calibration range:	0-25%
Accuracy:	±1% of full scale at constant temperature; ±5% of full scale over operating temperature range on factory default analysis ranges, once thermal equilibrium has been achieved.
Response time:	90% of full scale in < 10 seconds at 77°F (25°C)
Linearity:	0.1% O <sub>2</sub>

Zero drift:	0.05% O <sub>2</sub> / 1 Month
Span drift:	1% FS / 1 Month
Repeatability:	0.1% / FS
Operating temp:	32 to 113°F (0 to 45°C)
Outputs:	Two 0-1 VDC & two 4-20 mA DC isolated (concentration and range ID)
Alarms:	One system-failure alarm contact to detect power failure; two adjustable concentration threshold alarms with fully programmable setpoints.
Analysis display:	5 digit red LED, 3/5" high numerals
Menu display:	20 character, 2 line vacuum fluorescent
Digital interface:	Full duplex RS-232C communications port
Power requirements:	Universal AC input ranges, 100 to 240 VAC, 50 / 60 Hz, 70 watts max
Oxygen sensor:	Paramagnetic
Sample connections:	User specified 1/4" or 6mm fittings
Enclosure:	Explosion proof U/L and CSA listed housing for Class I, Div 1, Group B, C & D service; NEMA 4/7 rated with baked powder epoxy finish for corrosion resistance
Mounting:	Bulkhead mount
Dimensions:	15.25" W x 25.63" H x 11" D (387.35 mm x 651 mm x 279.4 mm)

## SAMPLE GAS CONDITIONING REQUIREMENTS

Sample inlet pressure:	5 to 20 psig (regulate to fixed inlet pressure)
Sample flow:	1 to 2 SCFH
Sample dewpoint:	Non-condensing at ambient temperature
Sample temperature:	0 to 50°C
Detector wetted parts:	Glass, steel, gold, viton, acrylic glass, epoxy resin

For complete turnkey systems, please contact Teledyne or your local representative

## TELEDYNE ANALYTICAL INSTRUMENTS

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## Warranty

Instrument is warranted for 1 year against defects in material or workmanship

NOTE: Specifications and features will vary with application. The above are established and validated during design, but are not to be construed as test criteria for every product. All specifications and features are subject to change without notice.

