

Product Data Sheet

PDS 106-201.A01

July, 2001

Model OPM 2001

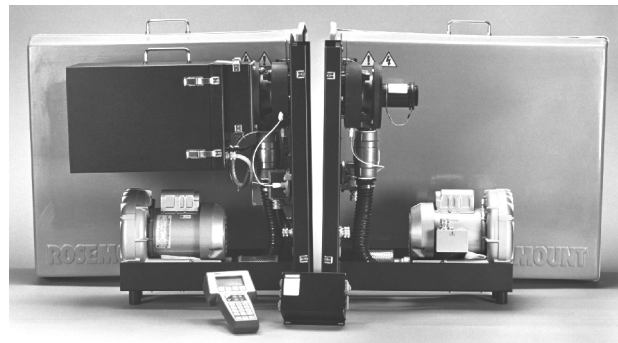
Opacity/Dust Density Transmitter

- Glass liquid crystal windows improve measurement stability and eliminate moving parts
- Single light source and single detector
- Bi-directional digital communications link connects stack-mounted transceiver with intelligent electronics
- EPA audit filter check - single person operation
- Dust concentration, optical density, extinction and opacity - instantaneous and averaged
- Purge air system reduces window cleaning to once every three months
- Digital Communications
 - HART® 275 Handheld Communicator

The Model OPM 2001 Opacity/Dust Density Transmitter provides a continuous in situ measurement of the optical density (extinction) of stack emissions. Designed to meet the requirements of the U.S. Environmental Protection Agency's (EPA) 40 CFR, Part 60, Appendix B, Performance Specification 1 and the Performance Audit requirements of EPA Method 203, the unit's instantaneous and average outputs can be configured to represent stack exit opacity, dust density, optical density or extinction.

The OPM 2001 is a double pass system that transmits a beam of light across the stack to a retroreflector, which in turn reflects the light beam back to the transceiver's optical system. The OPM 2001 uses a patented system of glass Liquid Crystal Windows (LCW) that are transparent when energized and translucent when de-energized. Use of glass LCWs directs the light beam without mechanical choppers or other moving parts, improving measurement stability, reliability and accuracy.

No moving parts makes the OPM 2001 the only true digital, solid state transmissometer on the market.



The OPM 2001 incorporates many self-check features to ensure a reliable measurement. For improved accuracy, the detected signal is compensated for variations such as changes in ambient light in the stack, lamp aging effects and stray light.

The OPM 2001 provides long-term reliability and low maintenance costs. The unit's blower motors supply a continuous flow of clean, filtered air to flush contaminants from the optical system. An internal heater allows the unit to operate in temperatures down to -40°F (-40°C) and helps prevent moisture from condensing on the lens.

The measured signals are digitized for transmission to the intelligent electronics. Transmission of the signal via a digital communications link increases noise immunity and allows the electronics to be located up to 1 mile (1.5 km) from the stack.

The intelligent electronics calculates opacity, transmittance, optical density, extinction and dust density; sends commands to the transceiver and provides an interface via HART communications.

The HART protocol provides a link into Emerson Process Management's PlantWeb field-based architecture. Instrument technicians can interface with the OPM 2001 from the control room or any location (i.e. transceiver) where the signal wires terminate. Service diagnostics and configuration can be performed remotely with a HART handheld communicator.

Typical applications include: conventional power and industrial boilers, steel mill furnaces, refinery process heaters, pulp and paper industry bark boilers, incinerators, marine boilers, cement and lime kilns, electrostatic precipitators, bulk chemical dryers and baghouses.



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MODEL OPM 2001 OPACITY/DUST DENSITY TRANSMITTER

Features	Benefits
Stack Mounted Unit Continuous, across the stack reading	Meets the compliance requirements of EPA 40 CFR 60, APP. B, PS1.
Glass liquid crystal windows	No moving parts, maintenance free, insensitive to ambient light and lamp aging and temperature fluctuation. The only true digital, solid-state transmissometer on the market.
Digital, solid-state design	No moving parts and no mechanical isolation shutters. Provides increased uptime during both normal operating and upset conditions.
High efficiency isolating air lens/purge system	Laminar flow air lens design greatly reduces service interval for cleaning window and reflector surfaces. Eliminates the need for dirty window compensation.
The replacement "standard"	Easily facilitates the upgrade of older, more costly opacity monitors.
Internal heater	Allows unit to operate in below-zero temperatures.
Intelligent Electronics Continuous opacity, optical density, extinction and dust concentration readings, instantaneous and average	Meets certificate of compliance requirements for certifying entire Continuous Opacity Monitoring System (COMS).
Automatic zero/span calibration check	Assures instrument is always in calibration.
Isolated analog outputs	Can be sent to recorder, controller or computer.
Adjustable ranges and alarm setpoints	User-configurable on site.

WHY MEASURE VISIBLE EMISSIONS?

Opacity monitors designed to meet the requirements of EPA 40 CFR specifications provide a continuous record of visible stack emissions. As a result, opacity monitors are typically installed to meet the requirements of pollution control agencies. However, opacity data can also be related to process performance. Data can be used to indicate a need for maintenance or repair and also serve as a rough indicator of process efficiency. Opacity monitors can detect broken bags in baghouses, time rapping cycles for electrostatic precipitators (ESP), detect failing ESP electrodes and detect the effectiveness of injecting flue gas conditioning agents used to improve ESP performance.

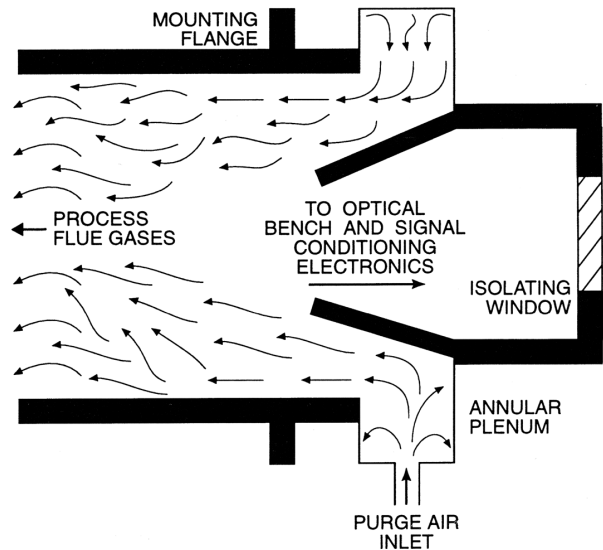
DESCRIPTION OF OPERATION

Particles present in the flue gas stream will scatter and absorb a certain amount of light as it passes through the stack. As the particulate content of the flue gas increases, the percentage of light that is blocked increases. This property is the basis of the OPM 2001 Opacity Transmitter double pass, visible light beam system. By measuring the signal produced by the light before and after it is transmitted across the stack, the percentage of opacity in the stack can be calculated.

AIR PURGING SYSTEM

A unique air lens assembly design in the OPM 2001 keeps the monitor's isolating windows free from dirt.

The improved air purge design of the OPM 2001 straightens the flow stream (see figure below). A laminar air flow is introduced through an annular opening in the unit's air lens assemblies, which minimizes the turbulent eddies that can drag in dust from the flue. This design greatly extends the service interval for cleaning the window and reflector surfaces and eliminates the need for dirty window compensation.



TYPICAL STACK INSTALLATION

The OPM 2001 consists of a transceiver and a retro-reflector module that are mounted on opposite sides of the stack. The intelligent electronics monitors and controls the OPM 2001 Opacity/Dust Density Transmitter. A bi-directional digital communications link connects the intelligent electronics processor and the transceiver module (see figure below). A backlit pushbutton at the transceiver provides off-line calibration, along with reading and storage of neutral density filter readings. The instrument technician can interface at the transceiver via the HART 275 Communicator. This reduces startup time.

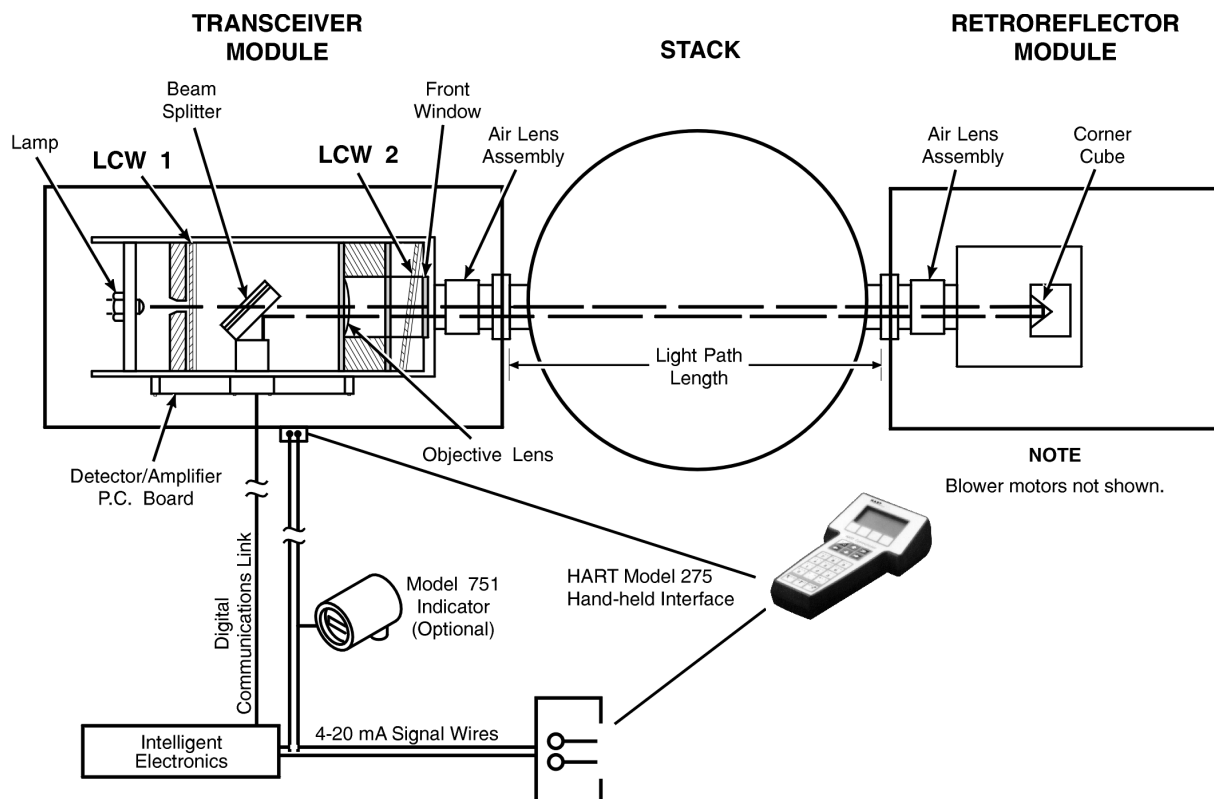
INTELLIGENT ELECTRONICS

The OPM 2001 intelligent electronics accepts a digital input to start a zero/span check. Three (3) analog outputs and six (6) discrete output contacts are available from the intelligent electronics. An operator/instrument technician can interface with the OPM 2001 at the transceiver or from the relay/control room. As a result, start-up and check-out time is minimized.

ONE HOUR QUARTERLY AUDIT FILTER CHECK

Neutral density filters are inserted into a zeroing jig/filter holder and are placed in front of the window of the OPM 2001 transceiver housing to check the operation of the transmissometer. A switch and indicating light on the transceiver allows one person to check the operating system. The switch sets the intelligent electronics into its filter check cycle. The indicating light directs the operator when to install and remove the filter. The operator can then check the VIEW EPA DATA menu on the HART 275 Communicator. The electronics stores the most recent 30 filter readings along with the time the measurement was made. The zero jig can also be used to simulate "off line" zero calibration. The automatic storage of filter values allows EPA filter audits to be performed by a single person in less than one hour!

COMMUNICATE WITH THE OPM 2001 FROM ALMOST ANYWHERE VIA HART COMMUNICATIONS



SPECIFICATIONS ¹⁾

ELECTRICAL

Input voltage requirements: 100/115/220/240 VAC, 50/60 Hz
Power requirements: 400 watts to transceiver, including 300 watt heater. The blowers are separately powered and rated at 1/2 HP @ 60 Hz or 1/3 HP @ 50 Hz.

Wiring: 2 twisted pair (Belden 8162, 8163 or equivalent). Maximum 5000 feet of cable between transceiver and control room unit.

Electrical classification: Category II

ENVIRONMENTAL

Ambient operating temperature: -40° to 130°F (-40° to 55°C)

Flue gas temperature: Maximum 1000°F (538°C) ³⁾

Minimum 220°F (104°C)

Non-condensing

Flue gas pressure: Maximum 10 in. (254 mm) WC with supplied blowers

Path length: User-definable from 3 to 26 ft. (0.9 to 7.9 m)

PHYSICAL

Optical system: Double pass, multiple lens optical system with solid-state electronic light modulation

Light source: Gas filled incandescent bulb.

Total shipping weight: 356 lbs (161.5 kg)

TRANSCEIVER AND RETROREFLECTOR

Enclosure type: Moisture-proof, designed for NEMA 4X (IP56) environments

Dimensions

Height: 28.77 in. (731 mm)

Width: 12.50 in. (318 mm)

Depth: 33.94 in. (862 mm)

Weight: 80 lbs (36.3 kg) Transceiver

40 lbs (18.1 kg) Retroreflector

Optical alignment sight: Visual alignment sighting indicator

AIR LENS ASSEMBLY

Mounting: Flange mounted to stack or duct and enclosures

Dimensions

Diameter: 11 in. (280 mm)

Length: 6 in. (150 mm)

Weight: 18 lbs (8 kg)

Blower motor: Maximum volume 40.0 cfm @ 10 in. H₂O

Weight: 29 lbs (13 kg)

INTELLIGENT ELECTRONICS

Enclosure type: General Purpose; Optional Type 4X

Ambient operating temperature: 40° to 120°F (4° to 50°C)
-40° to 120°F (-40° to 50°C) for Type 4X
(with Heater and Thermostat)

Dimensions:

Height: 2.72 in. (69.1 mm)

Width: 7.00 in. (177.8 mm)

Depth: 5.13 in. (130.3 mm)

Weight: 10 lbs (4.54 kg)

Voltage: 24 VDC

Power: 25 watts

Contact rating: 30 VDC, 2A; 110 VDC, 0.3A; 125 VAC, 0.5A

OPERATIONAL

The OPM 2001 meets EPA design and performance requirements as specified in 40 CFR, Part 60, Appendix B, Performance Specification 1. The OPM 2001 also meets the Performance Audit requirements of EPA Method 203.

Output ranges: Continuously adjustable (field adjustable)

Accuracy ²⁾: + 1% opacity

Resolution: <0.1% opacity

Response time: <10 seconds

Calibration error: <2% opacity

Zero drift: <2% opacity in 3 months

Calibration drift: <2% opacity in 3 months

Spectral response: 400-700 nm (less than 10% outside of this region) 500-600 nm peak and mean spectral response

Angle of view: <2 degrees

Angle of projection: <2 degrees

Zero: Automatic verification

Span: Automatic verification

Calibration filter access: Provided for EPA verification

Measurement units: Opacity, transmittance, optical density, extinction, dust concentration

Signal averaging: 13 selectable averages: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60, and 0.25 minutes

Automatic lamp compensation: Included

Automatic calibration verification: User-selectable, 1 to 1440 minutes

Analog outputs: Three linear isolated outputs, 4-20 mA 900 ohms maximum (user definable)

Digital input rating: Integrated with 5VDC @ 1mA, on < 0.5 VDC, off > 2.0 VDC

Contact outputs: Six jumper selectable SPST relays, including two configurable alarms

Contact output rating: Six jumper selectable SPST relays, including two configurable alarms

Digital communications link: Communications link between Transceiver and Intelligent Electronics Processor, 78 k baud

Selectable parameters: Measurement units
Signal averaging
Optical Path Length Ratio (OPLR)
Analog output signal selection
Alarm settings
Manual calibration
Computer assisted EPA filter check

Certification: Supplied with Manufacturers EPA Certificate of Compliance (option)



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

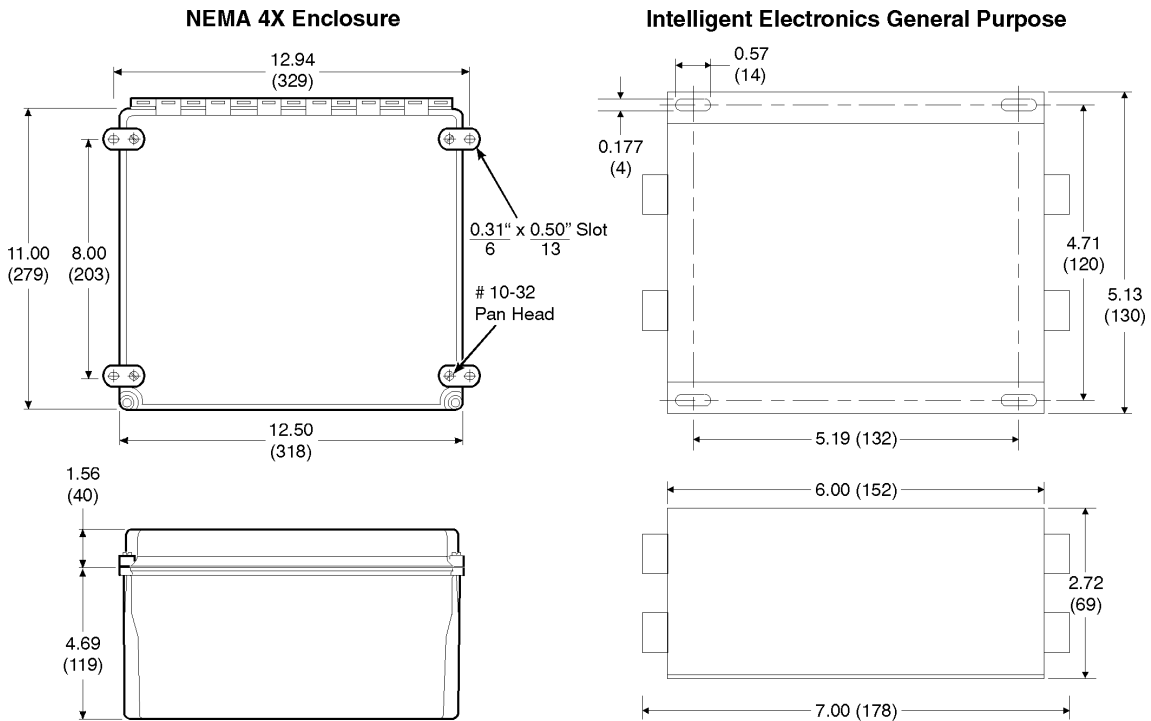
¹⁾ Specifications are subject to change without notification. Our policy is one of continuous product improvement, and we reserve the right to change specifications.

²⁾ Accuracy of ±1% opacity in normal operating areas, up to 70% opacity reading. Above 70% opacity reading, accuracy of ±2% opacity absolute.

³⁾ Thermo Isolators are generally required when stack gas is above 600°F (315°C). See page 7,

INSTALLATION DIMENSIONS

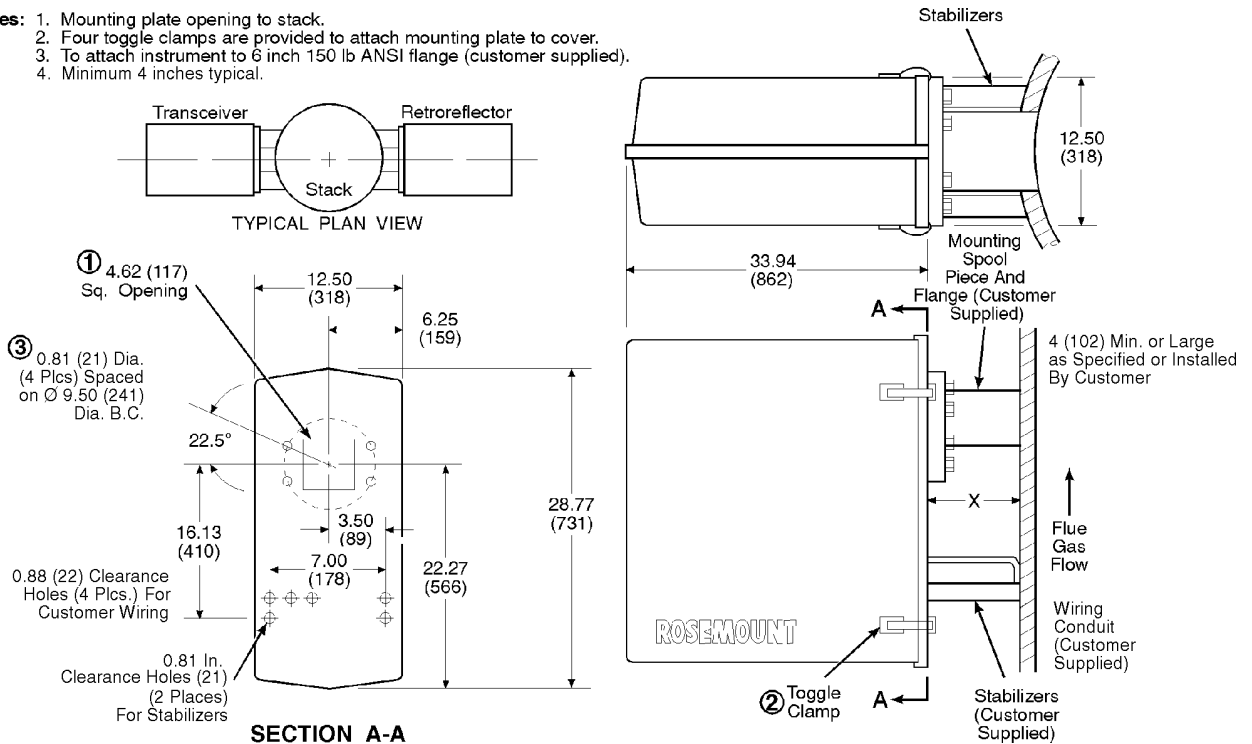
INTELLIGENT ELECTRONICS



Note: Dimensions are in inches with millimeters in parentheses. Dimensional drawings are subject to change without notification.

STACK UNIT

- Notes:**
1. Mounting plate opening to stack.
 2. Four toggle clamps are provided to attach mounting plate to cover.
 3. To attach instrument to 6 inch 150 lb ANSI flange (customer supplied).
 4. Minimum 4 inches typical.



ORDERING INFORMATION

OPM 2001	Model OPM 2001 Opacity/Dust Density Transmitter
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Code	Intelligent Electronics
1	Basic Unit
2	Basic Unit with 751 Indicator
3	Basic Unit with 275 HART Communicator with 4 mb memory ⁽⁴⁾
4	Basic Unit with 275 HART Communicator with 4 mb memory and 751 Indicator ⁽⁴⁾

Code	Intelligent Electronics Power Supply Options
0	None
1	115 VAC / 24 VDC Power Supply
2	220 VAC / 24 VDC Power Supply
3	115 VAC / NEMA 4X Enclosure with Power Supply
4	220 VAC / NEMA 4X Enclosure with Power Supply
5	115 VAC / NEMA 4X Enclosure with Power Supply and Heater/Thermostat
6	220 VAC / NEMA 4X Enclosure with Power Supply and Heater/Thermostat

Code	Transceiver Type and Power Supply Option ⁽¹⁾
11	100 VAC
12	115 VAC
13	220 VAC
14	240 VAC

Code	Pathlength - Flange to Flange Distance ⁽²⁾
11	3 to 5 ft (0.9 to 1.5 m)
12	5 to 10 ft (1.8 to 3 m)
13	10 to 20 ft (3.3 to 6.1 m)
14	20 to 26 ft (6.1 to 7.9 m)

Code	Zero Jig Type, Pathlength Options
00	None
01	3 to 20 ft (0.9 to 6.1 m)
02	20 to 26 ft (6.1 to 7.9 m)

Code	Factory Certification Certificate
00	None
01	Certificate of Compliance

Code	Alignment Sight Option
00	None
01	With Alignment Sight

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ORDERING INFORMATION (CONTINUED)

Other options (order as separate line item):

Code	Description
4842B89H03	Thermo Isolators for flue gas temperatures above 600°F (315°C) (Two required) Thermo isolators can be used in incinerators as well as hot stack applications where flue gas temperatures are above 600°F (315°C). The Thermo Isolators insulate the OPM 2001 Opacity Monitor's six inch mounting flange from the customer's mounting flange.

Code	Neutral Density Filter (NDF) Kit Option
	None
4846B98G01	(3) (8) (20) Nominal % Opacity Values (NOV)
4846B98G02	(20) (37) (50) Nominal % Opacity Values (NOV)
4846B98G03	(20) (50) (60) Nominal % Opacity Values (NOV)
4846B98G04	(20) (50) (75) Nominal % Opacity Values (NOV)
4846B98G05	(20) (60) (80) Nominal % Opacity Values (NOV)
4846B98G06	(20) (60) (88) Nominal % Opacity Values (NOV)
4846B98G07	(8) (20) (37) Nominal % Opacity Values (NOV)

Filters have serial numbers and are mounted in holders.
Filter sets include a carrying case.

The following can be ordered separately:

Code	Description
1A97952H02	Communication Cable
62122DP3NB	Retroreflector Pressure Switch Cable
1A98827H01	Remote Indicator (mounted in transceiver or shipped separately)
4849B22G01	Purge Air Heater Kit, 110 VAC ⁽³⁾ (1000 Watts)
4849B22G02	Purge Air Heater Kit, 220/240 VAC ⁽³⁾ (1000 Watts)
4849B22G03	Purge Air Heater Kit, 220 VAC (3000 Watts)
LATER	Upgrade existing Model 275 with OPM 2001 device driver (DD)

NOTE: The following data is also required at time of order in addition to the model number:

Distance from customer's Transceiver mounting flange to customer's Retroreflector mounting flange	_____ in. (+1/2 in.)
Stack or Duct internal diameter at installation point	_____ in.
Stack Atmospheric exit internal diameter	_____ in.
Estimated flue gas temperature	_____ °F
For Field Service Engineering and Startup Assistance	Consult Factory
Spare Parts List	Refer to PL 100-005A

⁽¹⁾ The OPM 2001 can be ordered without the blower motors and/or weather covers.

⁽²⁾ Light Path Distance is the distance from the Transceiver to Retroreflector mounting flanges.

⁽³⁾ Purge air heaters are recommended for processes that use fuel with a high moisture content (such as wood, wood chips, etc.) and where flue gas temperatures are less than 147°C (300°F), or where ambient temperatures can be expected to be below -20°F (7°C).

⁽⁴⁾ The OPM 2001 must interface via HART 275 Communicator. For multiple units at a single site, only one HART 275 Communicator would be required.

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