



## PRODUCT DATASHEET

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# OPM 4001

## Opacity/Dust Density Monitor

The OPM 4001 Opacity/Dust Density Monitor is a high performance opacity monitoring system with double-pass transmissometer that meets or exceeds Revised 40 CFR 60 B, PS-1 and ASTM D 6216

### Features

- **Digital display** instant percent opacity, average percent opacity and time to next calibration
- **Alphanumeric display** for system set-up and fault diagnostics display
- **3 User selectable displays** (instant opacity, average opacity and optical density)
- **U.S. Environmental Protection Agency (EPA) approved** approved zero/span calibration technique
- **Communications** Modbus (RS-485 )
- **Stack exit correlation** permanent factory setting
- **Sensor location service module** digital display for percent correlated opacity, T2, manual zero and span initiate and transceiver current loop test jacks
- **Insensitive** to ambient light
- **Double pass** optical system
- **Thru-the-lens** (TTL) alignment
- **Light source** rated for greater than 5 years
- **Electronic modulated** light source
- **Two 4-20mA signals** for instantaneous opacity, and 6 minute average
- **Calibration cycle control** remote, manual and timed
- **System and fault** diagnostics display
- **Path length** of 3-50 feet

**ROSEMOUNT®**  
Analytical



*Transmissometer/Cover assembly*



*Standard Controller*

  
**EMERSON™**  
Process Management

## OPM 4001 Opacity/Dust Density Monitor

Emerson's Rosemount Analytical OPM 4001 high performance opacity monitoring system with double-pass transmissometer uses field-proven and time-tested optics and circuitry that is simple, yet accurate. Each monitor and all its components are of the highest quality; pre-tested at the factory to your site specifications. The simple instructions will have your monitor up and running in just a few hours.

Emerson has taken the approach to design equipment with accuracy, maintenance and serviceability as the most important features. The Rosemount Analytical OPM 4001 Opacity/Dust Density Monitor is designed with state-of-the-art modular packaging that keeps ease-of-service in mind. The OPM 4001 offers a built-in TTL (through-the-lens) alignment system, where the alignment target can be viewed through a window on the transceiver. Adjustments to changes in alignment are provided by a 3-point alignment system that is integral to the air plenum. This ensures optimum reliability while enabling the system to be easily serviced and maintained in the field by plant service personnel.

### Service Module with Digital Display

The service module is used to pass signals to and from the transceiver and control unit, display opacity via digital meter, initiate maintenance zero and span cycles and insertion of external current meter in the transceiver to control unit 4-20 mA loop. The service module is very useful for trouble shooting or during environmental audits as the correlated opacity can be displayed on the DPM. This feature eliminates the necessity for a second person and sometimes difficult communication between the control unit and the sensor locations.

### Swing Away Sensor

The swing away sensor makes cleaning the windows a breeze. Both sensors have alignment pins to assure no change in alignment after the sensors have been opened and closed. Large, heavy-duty latches make for an air and water-tight seal. The sensors are attached to the air plenum by two drop-on pivot pins. This makes for easy installation. Should service ever be required, the sensors can be removed; just swing open and lift-off the pivot pins.

## Specifications

### Control unit

#### Enclosure

Panel mounted IP65/NEMA4X Dimensions 96x96x64 mm (3.8"x3.8"x2.5"). Power 20.4 to 28.8VDC < 10% ripple, 400mA.

#### Approvals

CE and UL Listed

#### Digital Display

Selectable pages, LCD backlight

#### Ambient Temperature Range

0 to +50° C (+32° to 122° F)

#### Power Requirements

24 VDC +/- 10%

#### Alarm Time Delay & set point

6 Relays for alarms

#### Alarm Reset

Manual or Automatic

#### Analog Outputs

Two 12-bit Analog outputs 4-20mA, Field selectable. 0-100% opacity (mg/m<sup>3</sup> and O.D. available with dust option)

#### Maximum range

Opacity 0-99.9% or  
Optical Density 0-2000mg/m<sup>3</sup> selectable via matrix or menu in the enhanced controller (only)

#### Calibration check options

Manual zero and span calibrate with dedicated zero reflector or Zero with clear stack condition.

#### Communications

Modbus – RS485 port

#### Battery Backup

7 years typical

### Transceiver Service module

#### Display

5/8 inch (15.9 mm), 4-digit LED, selectable for percent opacity and percent transmittance

#### Local Zero/Span

Manual on demand

#### Test Jacks

Transceiver to remote control current loop

#### Diagnostics

Loss of power, current loop open, maintenance mode

## Specifications (cont)

### Transceiver/Reflector

**Enclosure**

NEMA 4 watertight enclosure power

**Path Length**

3-50 feet, 0.9 to 12 meters standard

**Optical System**

Double pass

**Light Source Aging Compensation**

Automatic

**Light Source Life**

> 5 years

**Alignment Verification**

Passive built-in, through-the lens system

**Standard Mounting Flanges**

3 inch IPS, 150 lb. flange, standard

**Ambient Light Immunity**

Solid-state electronic light modulation

### Design and Performance

**Ambient temperature limits**

-40°F to 130°F (-40°C to 54°C)

**Maximum process temperature**

750°F (400°C)

**Maximum stack pressure**

+5-inch WC, with the proper installation of purge blowers

**Peak and Mean Spectral Response**

Photopic; 515 to 585 nm, less than 10% of peak response outside 400 to 700 nm

**Relative Spectral Response**

<10%

**Angle of View**

< 4.0° from optical axis

**Angle of Projection**

< 4.0° from optical axis

**Calibration Error/Accuracy**

< +1% of full scale

**Response time**

< 10 second

**Zero Drift**

< 0.5%

**Calibration Drift**

< 0.5%

**Zero/Span Calibration**

Manual or automatic with zero mirror and neutral density filter

## Electronic Display Options

**Both are EPA 40 CFR B PS-1 and ASTM D 6216 compliant**

### OPM 4001

- Dual beam measurement
- Automatic or manual online calibration
- User friendly microprocessor controller
- 3 user selectable numerical displays
- Sensor located service module with a digital display for % correlated Opacity and %T<sup>2</sup>
- Communications via 4-20 mA and RS485 MODBUS



*OPM 4001*

### Additional features with Enhanced Touch screen

- Intuitively designed 5.7" color touch screen user interface with expanded diagnostics
- 5 numerical and 2 trend display screens
- Standard SD card for program and data backup
- Automatic, manual or external online calibrations

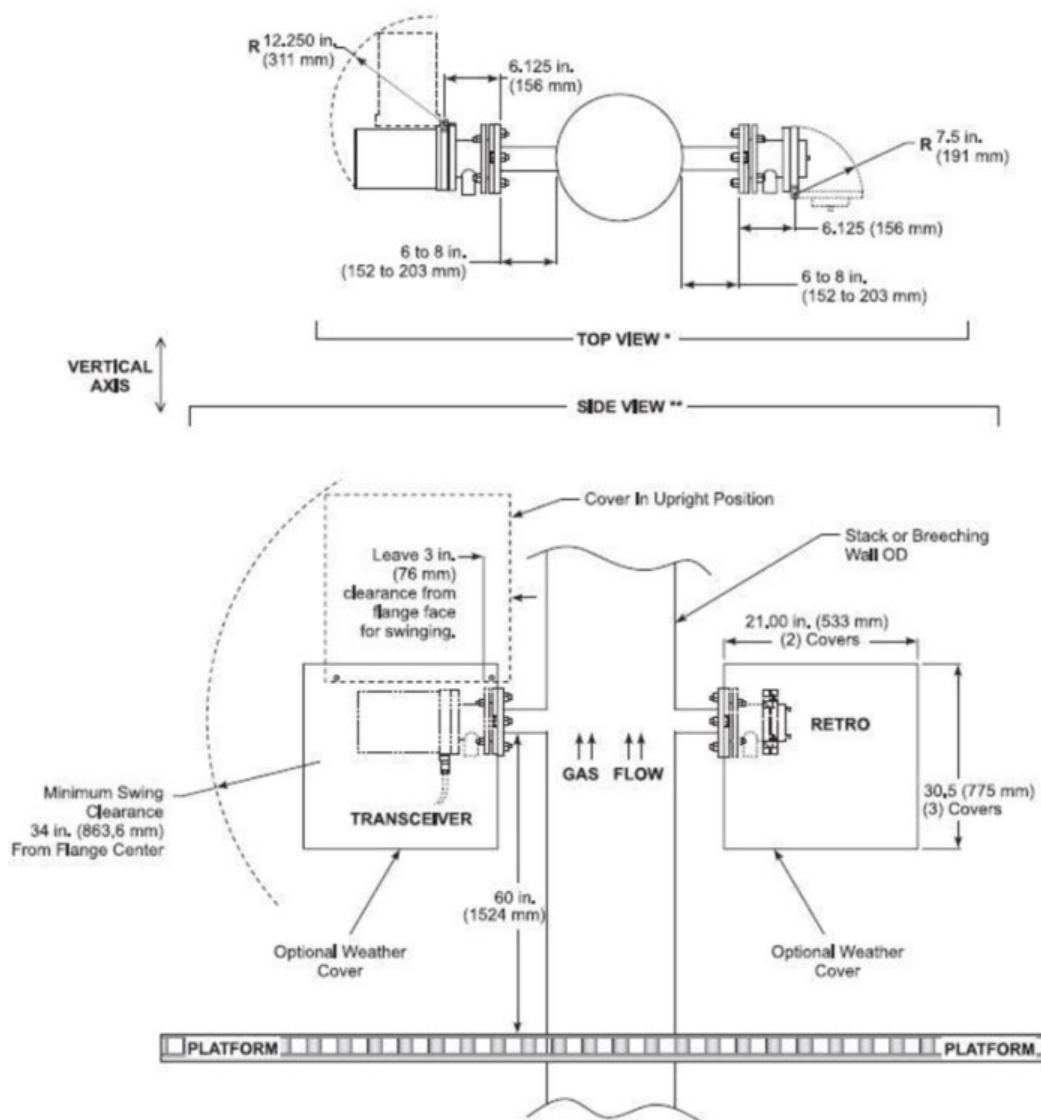


*Enhanced Touch Screen*

## Electronic Display Comparsion Chart

|                                                                 | w/Touch<br>Screen<br>Option | Standard<br>OPM 4001 |
|-----------------------------------------------------------------|-----------------------------|----------------------|
| ASTMK D 6216 and PS-1 compliant                                 | ✓                           | ✓                    |
| Communications via 4-20 mA and RS MODBUS                        | ✓                           | ✓                    |
| Automatic or manual online calibration                          | ✓                           | ✓                    |
| Microprocessor controller                                       | ✓                           | ✓                    |
| 5 numercial display screens                                     | ✓                           |                      |
| Intuitively designed icon driven navigation                     | ✓                           |                      |
| Standard 4 analog outputs                                       | ✓                           |                      |
| 5.7" color touch screen user interface                          | ✓                           |                      |
| Standard program includes % opacity, mg/m <sup>3</sup> and O.D. | ✓                           |                      |
| Standard 2GB SD card for program and data backup                | ✓                           |                      |
| Real-time diagnostics for testing outputs and relays            | ✓                           |                      |
| Two selectable trend screen displays                            | ✓                           |                      |
| Easy to read color coded fault screen                           | ✓                           |                      |
| User display customization available                            | ✓                           |                      |

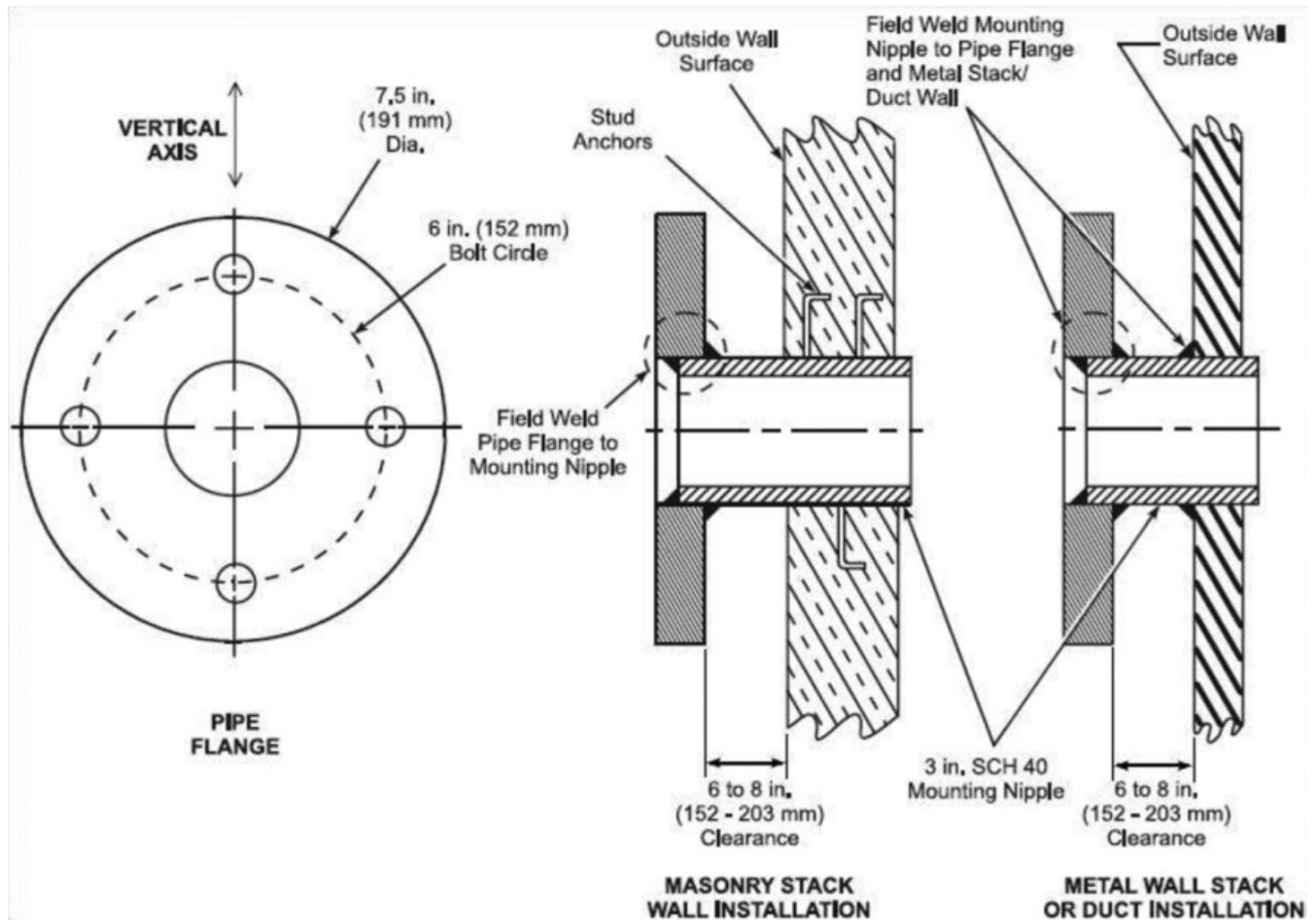
## Air purge/Weather cover mechanical installation



\*Note 1: The top view represents the transceiver and retro reflector assemblies with their swing clearances. Optional weather covers are not shown.

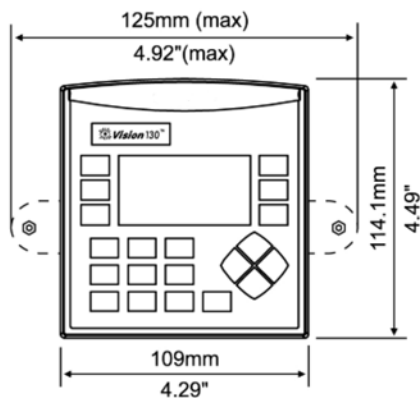
\*\*Note 2: The side view represents the installation and swing clearance dimensions for the optional weather covers.

## Flange to stack installation

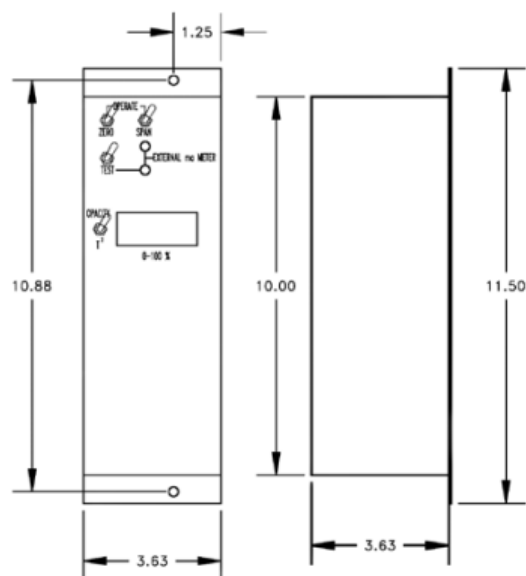




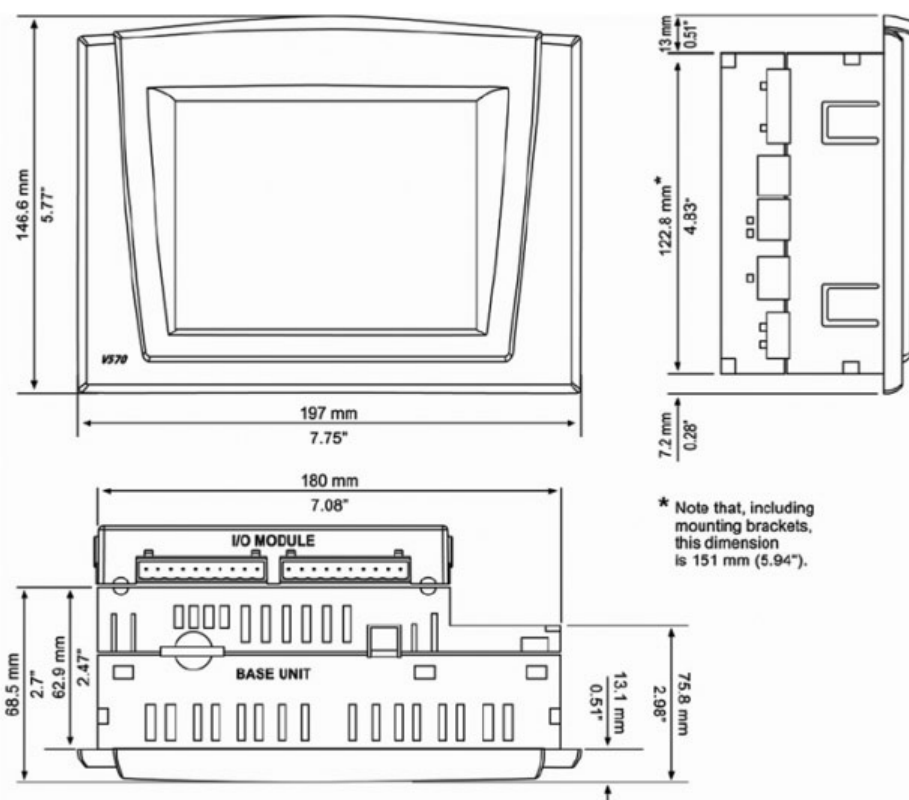
## Installation Dimensions



OPM 4001 Standard Control Unit



OPM 4001 Service Module



OPM 4001 Enhanced Control Unit

## Ordering information

**OPM 4001 Opacity/Dust Density Monitor - High performance opacity monitoring system with double-pass transmissometer.**

| Model                              | Product Description                                                                                           |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| OPM 4001                           | Opacity monitor                                                                                               |
| <b>Intelligent Electronics</b>     |                                                                                                               |
| 01                                 | Basic Unit - Digital Display, (2) 4-20mA Outputs, (6) Alarm Relays, RS 232/485, Modbus                        |
| 02                                 | Enhanced Control Unit with 5.7" LCD graphic color touch screen, icon-driven menu with SD memory card          |
| <b>Transceiver and Path Length</b> |                                                                                                               |
| 11                                 | 3-15' Path Length                                                                                             |
| 12                                 | >15-21' Path Length                                                                                           |
| 13                                 | >21-40' Path Length                                                                                           |
| 14                                 | >40-50' Path Length                                                                                           |
| <b>Weather Cover and Blower</b>    |                                                                                                               |
| 00                                 | None                                                                                                          |
| 01                                 | Weather covers only                                                                                           |
| 02                                 | Weather covers and single blower/Tee                                                                          |
| 03                                 | Weather covers and dual blowers                                                                               |
| <b>Zero Jig Type</b>               |                                                                                                               |
| 01                                 | Zero Jig and Neutral Density filters                                                                          |
| 02                                 | Zero Jig Only                                                                                                 |
| <b>Calculation</b>                 |                                                                                                               |
| 01                                 | Opacity calculation                                                                                           |
| 02                                 | Dust density calculation (mg/m <sup>3</sup> ), Optional for basic controller, standard on enhanced controller |
| 03                                 | Opacity or Dust Density, User Selectable (requires Enhanced Control Unit)                                     |

## Ordering Information

### Technical Details required at time of order

Customer Company Name: \_\_\_\_\_

Location:.....

Contact:.....

**NOTE: Please submit separate forms per monitor ordered.**

The Opacity Monitor you have purchased will be individually built according to the information requested below. While utilizing a basic design each unit is set up and adjusted to meet the requirements set forth by your parameters. The unit is then tested based on these strict requirements to be able to perform at these parameters. If the actual parameters are in fact not the same as those stated below, the unit may need to be returned, readjusted and retested at significant cost to the customer's account. It is for this reason that we ask you to carefully fill out the information requested in this form.

This completed sheet should be sent with PO to Rosemount Analytical for fastest delivery, otherwise a delayed delivery may be expected. PH: 800-433-6076, FX: 440-914-1262, Email: Gas.CSC@Emerson.com

Information Supplied by (name): \_\_\_\_\_

**NOTE: These items must be filled in! All measurements must be identified as Inches, Ft, mm, cm, etc.**

| Description                                                                    | Selection |
|--------------------------------------------------------------------------------|-----------|
| Unit identification (i.e., boiler 1, Unit 2B, etc.):                           | _____     |
| Stack exit I.D. (A) on page 2:.....                                            | _____     |
| Flange - to - Flange distance (B) on page 2:.....                              | _____     |
| I.D. at measuring point (C) page 2:.....                                       | _____     |
| Correlate opacity to "A" or "C" dimension?.....                                | _____     |
| Sensor: 120 or 220 Vac (50/60 Hz)?.....                                        | _____     |
| Accessory power such as air purge blower if ordered: 120 or 220 Vac (50/60 Hz) | _____     |

**NOTE: If Modbus information is not filled in, our default values will be used. Only Modbus I.D. is field selectable. Other parameters are fixed at time of final test according to the values given above or default. If changes to the communications are required after the system is shipped changes to the program must be made. All labor and shipping costs to make changes will be charged to the customer.**

| Description                                    | Selection |
|------------------------------------------------|-----------|
| Communication RS/485, Baud rate (default 9600) | _____     |
| Modbus: Data Bits (default 8) .....            | _____     |
| Parity (default none) .....                    | _____     |
| Flow Ctrl (default none).....                  | _____     |
| Time out (default 0.5 seconds).....            | _____     |
| Field selectable Node I.D.# (default 1).....   | _____     |

**All measurements must be identified as Inches, Ft, mm, cm, etc.**

A, B & C are necessary. Enter measurement information on page 1.

(A) Stack Exit ID Measurement:.....

(B) Flange-to-Flange Measurement: Min/Max: 36 inches to 46 feet (91 cm to 12 meters,) over 15 feet (4.5m) requires optional reflectors.....

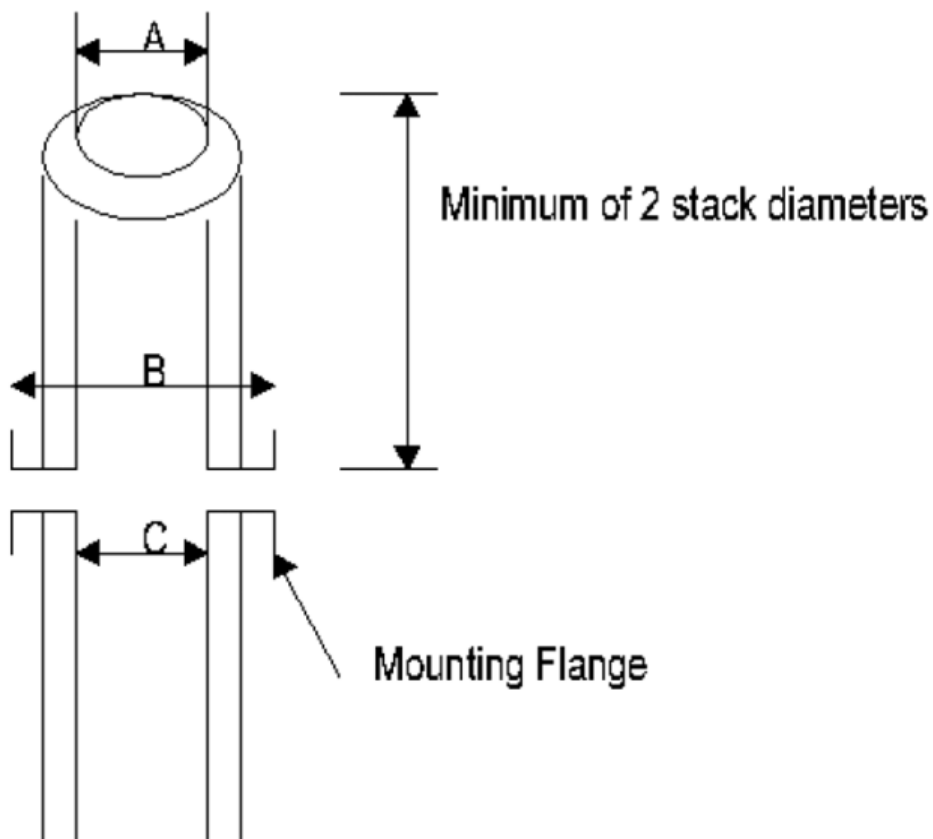
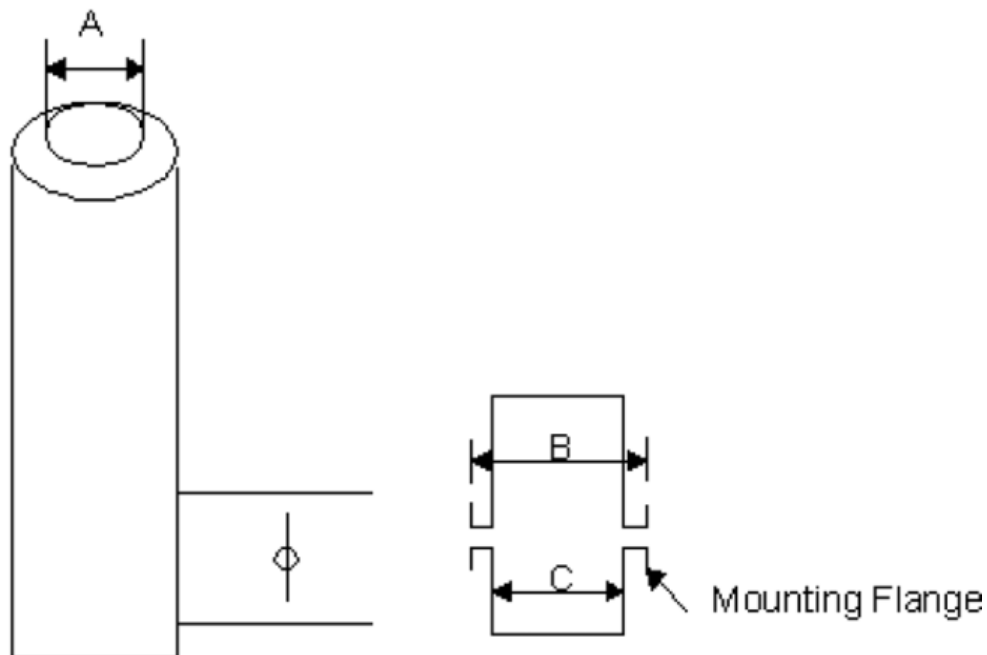
(C) ID at Measuring Point: Ratio range of  $A/2 \times C$  must fall between 0.3 and 1.5 \_\_\_\_\_

The mounting flanges to the stack or duct O.D. should be a minimum of 6 inches to allow for installation of flange bolts.

Measurement tolerance A, B and C must be +/- 1 inch (254mm) or 1% of the total whichever is the smaller. In all cases the mounting flanges are to be installed >2 exit diameters away from the stack exit because of Gas flow turbulence.

## Ordering Information (con't)

Choose the drawing below that best fits the installation.



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|                                                                                     |                                 |                                                                                      |                         |
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|  | Temperature Measurement         |  | Flow Measurement        |
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|  | Liquid Analysis                 |  | Flame and Gas Detection |
|  | Tank Gauging                    |  | Wireless Infrastructure |
|  | Acoustic & Discrete             |  |                         |

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