Programmable Differential Pressure Gauges, Alarms, Transmitters

C4000 Series

- *Program to Measure Flow and Velocity*
- *LED Pressure Level Indicator and OLED Display*
- *Ranges from ±0.25 inH2O to ±40 inH2O*
- *Accuracies of ±0.25%, ±0.5%, or ±1%*
- *Mounts in Industry-Standard Openings*
- *Power: 24-120 VAC or VDC*
- *Two SPDT 8 Amp Alarm Relays*
- *Optional: 4-20 mA Isolated Output*

Monitor the Following

➤ *Clean Rooms, Room Pressure, Glove Boxes*
➤ *Fan, Blower, or Duct Static Pressure*
➤ *HVAC Filters, Dust Collectors, Cabinet Purging*
➤ *Pneumatic Conveyors, Paint Booths*

Cecomp Electronics

The C4000 series are microprocessor-based programmable digital differential pressure gauges with 2 SPDT alarm contacts. They measure positive, negative, differential pressure using an extremely stable piezoresistive sensor. They can be programmed to measure air flow and velocity when used with a pitot tube. A 4-20 mA isoated output is optional.

The bright ½" high red LED display gives the gauges improved readability and precision. The OLED display is used to set up and indicate setpoints, deadband, units, and flow coefficients.

The pressure level indicator LEDs are designed to mimic the indicating needle of a mechanical gauge. The LEDs will light up from left to right as the pressure moves away from zero.

The C4000 series gauges are designed to be a direct replacements for mechanical gauges that use industry-standard openings ranging from 4-9/16" to 4-13/16" diameter.

Eleven user selectable engineering units are available to give improved versatility and performance over mechanical gauges.

MADE IN USA   CE

ETL LISTED

Ranges
See ordering table. All ranges will read pressure or vacuum.

Resolution
3 or 4 digits, user selectable

Accuracy
±0.25 inH2O, ±60 Pa, ±6 mmH2O ranges
±0.5% or ±1% of full scale

All other ranges
±0.25%, ±0.5%, ±1% of full scale

Thermal effect: ±0.02% FS/°F

Calibration
Non-interactive zero and span

Displays
4 readings per second nominal display update rate
Red LED, ½" (12.7 mm) H digits
3 or 4 digits, user selectable
20 segment process level display
Setpoint and alarm status LEDs
OLED display for programming and indication of
    Set point and deadband for alarms 1 and 2
    Alarm type, Hi/Lo, action, reset, delay, inhibit
    Display peak, valley, dampening, resolution, % reading
    Pressure, velocity or flow modes
    Calibration, 4-20 mA functions, security
    Pressure units selection for inH2O, mmH2O, cmH2O, Pa, kPa, psi, inHg, mmHg, mbar, ftH2O, oz/in2
    Pitot tube velocity in standard ft/min, or meters/sec
    Pitot tube flow in scfm or cubic meters/sec
    Flow coefficient, duct dimensions

Pressure Connections
Push on connections (Lo and Hi)
0.20" diameter for 3/16" ID, 0.188" ID, or 5 mm ID tubing

Maximum Pressure
Ranges -00 to -05:   2 PSI (13.8 kPa)
Ranges -06 to -12:   10 PSI (68.9 kPa)

Media Compatibility
Air and compatible non-combustible, non-corrosive gases

Relay Output
Two independent SPDT form C contact sets
Relay contact rating   8 A @ 250 VAC resistive load
        5 A @ 30 VDC
Use an RC snubber for inductive loads

Isolated 4-20 mA Output (Optional)
Electrically isolated 4-20 mA analog output
Programmable output range
Sourcing 4-20 mA output
Response time: less than 100 milliseconds
Maximum loop resistance: 750 Ω

Power
24 to 120 VAC or VDC, 375 mA
750 mA with 4-20 mA option

Electrical Connections
Rear screw terminals

Housing and Protection
Glass filled nylon
Face: NEMA 4X (IP 65)
Rear: NEMA 4X (IP 65) with optional rear terminal cover

Weight
Approximately 8 ounces, shipping weight 1 pound

Environmental Temperatures
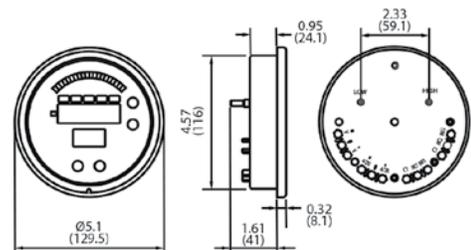Operating: −10° to 140°F (−23° to 60°C)
Compensated: −10° to 140°F (−23° to 60°C)

Model - Select Range Below	Accuracy	Output
C4100 - Range	±1%	
C4101 - Range	±0.5%	Two SPDT 8 Amp relays
C4102 - Range	±0.25%	
C4110 - Range	±1%	
C4111 - Range	±0.5%	Two SPDT 8 Amp relays, and 4-20 mADC
C4112 - Range	±0.25%	

± Inches of H2O	Range	± Pascals	Range	± mm of H2O	Range
.25*	00	60.0*	00P	6.00*	00M
.50	01	125	01P	12.0	01M
1.00	02	250	02P	25.0	02M
2.00	03	500	03P	50.0	03M
3.00	04	750	04P	75.0	04M
4.00	05	1000	05P	100	05M
5.00	06	1250	06P	125	06M
8.00	07	2000	07P	200	07M
10.0	08	2500	08P	250	08M
15.0	09	3750	09P	375	09M
20.0	10	5000	10P	500	10M
30.0	11	7500	11P	750	11M
40.0	12	9999	12P	1000	12M

* ±0.25% accuracy not available in these ranges

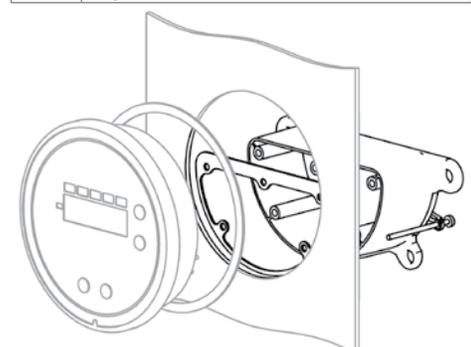## Example

C4112-07M: ±0.25% FS accuracy
        −200 to 200 millimeters H2O
        4-20 mA output (programmable)
        Two SPDT 8 Amp relays (programmable)

2.33 (59.1)
0.95 (24.1)
4.57 (116)
Ø5.1 (129.5)
1.61 (41)
0.32 (8.1)
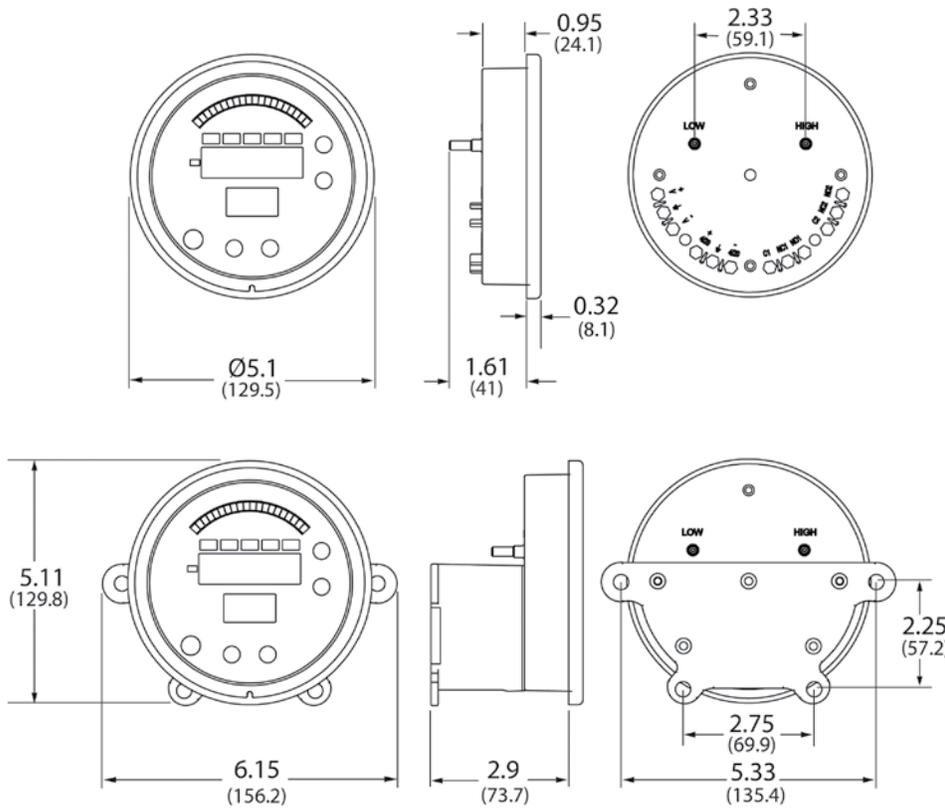
Accessories—order separately	
C-010	PG21 cable gland for use with C-101 cover. Fits 0.354 to 0.630" diameter cable.
C-024	Vinyl tubing 5 feet
C-101	Weatherproof cover, surface mount bracket
C-105	Air filter kit
C-131	Static pressure tip with barbed connection
C-201	Rubber 90° fitting for 3/16" ID tubing
C-202	Short shut off valve
C-203	Long shut off valve

C-101 weatherproof cover kit

C-131
C-202
C-203
C-024

Dimensions

Installation

Flush Mounting

The gauge fits 4-9/16" to 4-13/16" diameter industry standard holes. Mount the new gauge into the existing cutout.

For new applications, cut a 4-9/16" diameter hole in the panel.

Insert the gauge with the provided gasket and secure it to the panel with the included mounting tabs and screws.

Surface Mounting the C-101 Weatherproof Cover

Once the gauge is wired and the cover has been attached, the gauge can be mounted to any flat surface with the four mounting screws provided with the cover.

Flush Mounting the C-101 Weatherproof Cover

The gauge can also be flush mounted with the weatherproof cover. The procedure is the same as above, but utilizes two extra long mounting screws (provided with the weatherproof cover) for the bottom two panel connections.
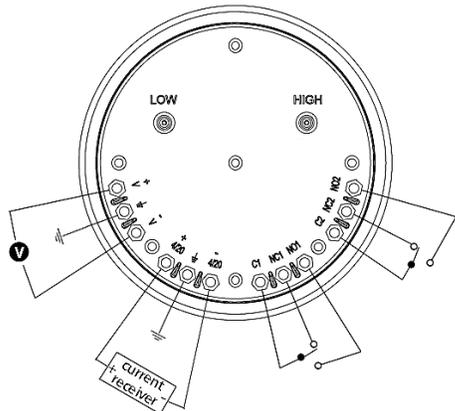
Wiring

Supply voltage is from 24 to120 VAC or VDC.

The C4000 series provides power to the optional 4-20 mA output loop. Maximum allowable loop resistance is 750 Ohms.

Isolation:

Relays: 1000 VAC to all other inputs and outputs

4-20 mA: 5000 VAC to all other inputs and outputs.

The two independent SPDT form C contact sets have a relay contact rating of 8 Amps at 250 VAC resistive load, or 5 Amps at 30 VDC resistive load. Use an RC snubber for inductive loads.
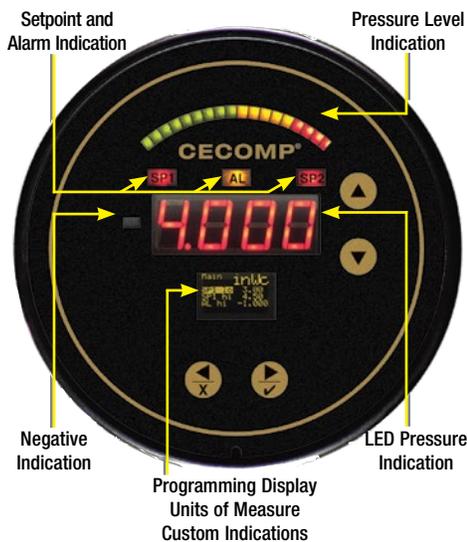

Pressure Connections

Two 3/16" pressure connections are located on the back of the unit, labeled "High" and "Low". For best results, connect 3/16" I.D. tubing to the pressure connections. If the High connection has a greater absolute value than the Low connection, the front display will give a positive value. If the HI connection has a lower absolute value than the LO connection, the front display will give a negative value.
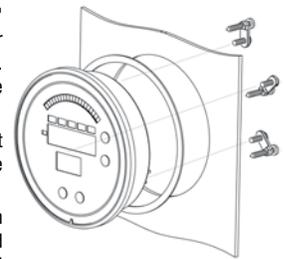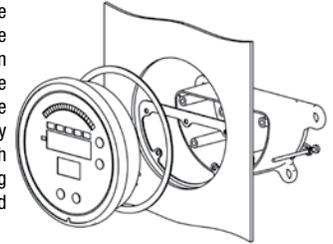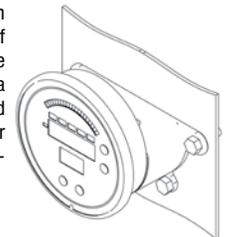
Display

The C4000 series gives the user maximum feedback and flexibility. The process level LEDs are designed to mimic the indicating needle of a mechanical gauge. The process level LEDs will light up from left to right as the pressure moves away from zero. Negative pressure will be indicated by the negative sign the left of the numerical indication.

The 4 digit LED displays the numerical pressure reading and will show either 3 or 4 digits based on user preference. The OLED display is used for programming and displaying the unit of measure and up to 4 other user selected program parameters. The LED indicators for SP1, SP2, and Alarm give indication when the parameter is in the actuated state.

Setpoint and Alarm Indication

Pressure Level Indication

Negative Indication

Programming Display Units of Measure Custom Indications

LED Pressure Indication

Key Functions

The C4000 has 4 buttons located on the face of the gauge used for programming.

up arrow | down arrow | left arrow cancel | right arrow accept

To move from one program menu to another, hold the up arrow or down arrow for one second to move up or down one menu level. The gauge will start in the "Main" menu, one level up is the "Set-Up" menu, and one more level up is the "Secure" menu.

The up and down arrows are used to navigate up and down through the parameters in each menu. To change a parameter, use the up and down arrows until the parameter is highlighted, then press the right arrow. This will advance you to another screen where you can change the parameter.

There are two different types of parameter change screens, option selection, or numerical value change. To change a number, the left and right arrows are used to select the digit you would like to change, the up and down arrow will increase or decrease the value by the amount selected.

Once you have made the change, you can accept the change by holding the accept button for three seconds. This will accept the change and take you back to the menu you were in.

At any point while in a parameter change screen, you can hold the cancel button for one second to return to the previous menu without accepting a change to that parameter.

The factory default menu structure for all of the available variables is shown in the table on the next page.

Based on the user selections in the Set-Up Menu, some of the variables may not be visible. Note that alarms and analog output are optional, and will affect menu options.

It is also possible to change the menu structure by moving variables from one menu to another. See Moving Program Variables.

Bold are factory default parameters.

Main Menu	Code	Setting
Set Point 1 Low	SP1 lo	value
Set Point 1 High	SP1 hi	value
Set Point 1	SP1	value
Set Point 1 db	SP1 db	value
Set Point 2 Low	SP2 lo	value
Set Point 2 High	SP2 hi	value
Set Point 2	SP2	value
Set Point 2 db	SP2 db	value
Alarm Low	AL lo	value
Alarm High	AL hi	value

Set-up Menu	Code	Setting
Control	Ctrl	1SP, **2SP**, SPAL, AL
Set Point 1 Setting	Set 1	db, **lohi**
Actuation 1	1 act	**dir**, rev
Set Point 1 Delay	SP1 D	value (**1.0** sec)
Set Point 2 Setting	Set 2	db, **lohi**
Actuation 2	2 act	**dir**, rev
Set Point 2 Delay	SP2 D	value (**1.0** sec)
Alarm	AL	lo, hi, hilo
Alarm Reset	AL Rs	Manual, Auto
Alarm Inhibit	AL ih	Off, On
Alarm Delay	AL D	value
Peak	Peak	value
Valley	Valy	value
Mode	Mode	**Pres**, Vel, Flow
Units	Units	inWc, mmWc, cmWc, Pa, kPa, PSI, inHg, mmHg, mBAR, ftWc, oz in, SFPM, M/S, SCFM, M3/S
Resolution	Res	**3 dig**, 4 dig
Display	Dis	**std**, pct
Dampening	Damp	value (**0.50** sec)
Screen Saver	Saver	Off, **On**
Contrast	Contr	N-lo, **N-med**, N-hi, I-lo, I-med, I-hi
K Factor	Kfact	value
Duct Shape	Xsect	circ, rect
Duct Diameter	diam	value
Duct Width	X dim	value
Duct Height	Y dim	value

Secure Menu	Code	Setting
Zero	Zero	Reset
Span	Span	value - Reset
Access	Access	Main, Set-up, **Secure**, none
Factory Default	Reset	**No**, Yes
Process Output Lo	pol	value (**0**)
Process Output Hi	poh	value (**full scale**)

Menu Parameters

Main Menu parameters will be dictated by the Control type selected in the Set-Up Menu and the options ordered. These parameters will be displayed on the OLED during normal operation if the Screen Saver is set to Off.

The value chosen for each set point will determine the switch point for that respective variable. Below are factory default program parameters.

SP1 lo Set Point 1 Low
SP1 hi Set Point 1 High
SP1 Set Point 1
SP1 db Set Point 1 Deadband
SP2 lo Set Point 2 Low
SP2 hi Set Point 2 High
SP2 Set Point 2
SP2 db Set Point 2 Deadband
AL lo Alarm Low
AL hi Alarm High

To change the displayed parameters on the OLED during normal operation, see Moving Program Variables.

Alarm Setup

Ctrl Control type selection will determine which parameters are available in the remainder of the Set-up Menu as well as the Main Menu. Example: If 1 Set Point is selected, there will be no parameters for Set Point 2 programming.

1SP For control with one SPDT relay.
2SP For control with two independent SPDT relays.
SPAL Set Point Alarm for one SPDT alarm relay.
AL Alarm operation only.

Set 1, Set 2 Set Point Settings. Each set point can be entered as a high and low value for the turn-on and turn-off point or as a set point with a floating dead band.

lohi Low-High operation is best suited for applications that have a set turn-on and turn-off point.
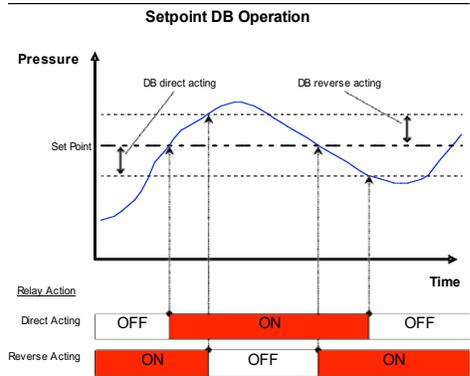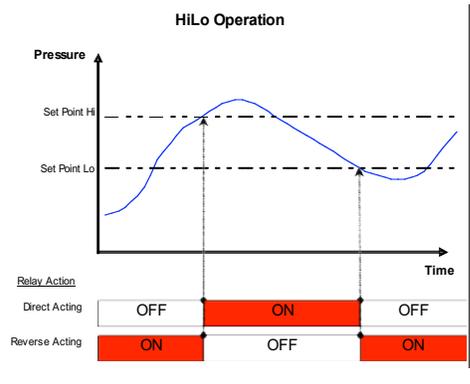
SP db Set point with a floating dead band is for applications that may require changing the set point without changing the deadband. The graphs below illustrate the differences.

1 act, 2 act Actuation parameters determine whether the relays will react to increasing or decreasing pressure. This parameter also affects the status of the LED indicators on the front of the gauge. The graphs below illustrate the differences.

Direct The relays turn on with increasing pressure.
Reverse The relays turn on with decreasing pressure.

SP1 D, SP2 D Set Point Delay sets the minimum amount of time that the process must be above or below the set point for the switch state to actuate.

value Time in seconds.

HiLo Operation

Setpoint DB Operation

Alarm Type

AL Three different alarm types that can be selected: high alarm, low alarm, or high and low alarm.
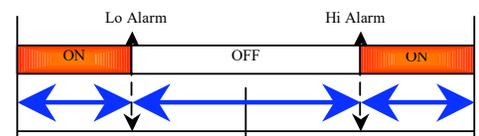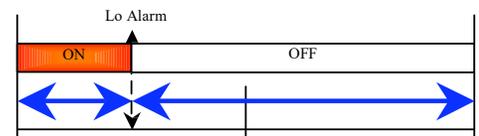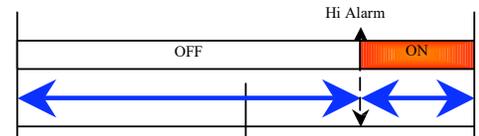
The high alarm will actuate the relay when the process is above the high alarm set point.

The low alarm will actuate the relay when the process is below the low alarm set point.

The high and low alarm can be used together so the alarm relay is actuated when the process is above or below the high alarm and low alarm set points respectively.

The selection will dictate which alarm parameters are shown in the Main Menu. The illustrations below show the three alarm types.

hi High alarm
lo Low alarm
hilo High and low alarm

Alarm Reset

AL Rs Alarm Reset can be set to automatic or manual clearing of an alarm condition.

Auto Automatically resets the alarm when the alarm condition no longer exists.

Manual Hold the left arrow and right arrow simultaneously on the face of the gauge to clear the alarm.

Alarm Inhibit and Delay

AL ih Alarm Inhibit allows the user to suspend the alarm during power up until the process moves through the low alarm set point. If alarm inhibit is off, and an alarm condition exists at power up, it may possibly require manual reset.

On Alarm Inhibit is on.
Off Alarm Inhibit is off.

AL D Alarm Delay sets the minimum amount of time that the process must be above or below the alarm before the switch state changes.

value time in seconds.

Peak and Valley

Peak   The peak is the highest value the gauge has reached since the last time it was reset.

value   Allows the user to manually reset the value.

Valy   Valley is the lowest value the gauge has reached since the last time it was reset.

value   Allows the user to manually reset the value.

Display Mode

Mode   The gauge is capable of measuring and displaying pressure, velocity, or flow. For velocity and flow, a flow sensing device such as a pitot tube, or orifice plate with a know flow coefficient is required. For flow, it is also necessary to know the dimensions of the duct that the flow is being measured in so the gauge can calculate the area.

Pres   Display pressure.
Vel   Display air velocity.
Flow   Display air flow.

Units

Units   The engineering units selected will be displayed on the OLED during programming and normal operation of the gauge. The selected unit of measure will be used for displaying the pressure, velocity, or flow readings as well as all programming variables.

If the units are changed after programming has occurred, all values will automatically be changed to the corresponding value of the new unit of measure. The available units of measure are shown below.

Pressure—see table below for ranges
inWc   Inches of water column
mmWc   Millimeters of water column
cmWc   Centimeters of water column
Pa   Pascals
kPa   Kilopascals
PSI   Pounds per square inch
inHg   Inches of mercury
mmHg   Millimeters of mercury
mBAR   Millibars
ftWc   Feet of water column
oz in   Ounces per square inch
Velocity
SFPM   Standard feet per minute
M/S   Meters per second
Flow
SCFM   Standard cubic feet per minute
M3/S   Cubic meters per second

Flow and Velocity readings are based on standard conditions: dry air at 70° F and a barometric pressure of 29.92 inches of mercury.

Flow and Velocity readings will automatically switch to x10 or x100 for velocity or flow when the reading exceeds four digits. This will be indicated on the LED by alternating the flow or velocity reading with the "x10" or "x100" symbol.

The maximum displayed velocity or flow will be 9999 x100 regardless of units.

Resolution

Res   Resolution of the LED display can be set to 3 or 4 digits. In some cases, the fourth digit may be outside of the accuracy specification resulting in fluctuations of the last digit.

3 dig   3 digit display
4 dig   4 digit display
Dis   The display can may be set to read a percent output.
std   Displays selected engineering unit
pct   Displays 0-100% instead of an engineering unit.

Dampening and Sampling Rates

Damp   The dampening coefficient tells the gauge how many readings to average before displaying the value. The gauge takes a pressure sample every 100 milliseconds. Displaying readings with too few averaged samples may cause unstable readings as a result of external vibrations or fast pressure fluctuations.

value   Number of samples averaged for the displayed value.

OLED Display Parameters

Saver   Screen Saver. When the gauge is in normal operation the screen saver displays only the units of measure on the OLED display.

When the screen saver is in use, touching any button on the face of the gauge will display the main menu. If turned off, the programming screen will display the parameters in the main menu.

Off   Turns the screen saver function off
On   Turns the screen saver function on
WARNING: NOT USING THE SCREEN SAVER MAY CAUSE THE OLED DISPLAY TO BURN IN.

Contr   Adjust the contrast of the programming display
N-lo   Normal image, low contrast
N-med   Normal image, medium contrast
N-hi   Normal image, high contrast
I-lo   Inverted image, low contrast
I-med   Inverted image, medium contrast
I-hi   Inverted image, high contrast

K Factor

Kfact   For flow and velocity, it is necessary to enter the flow coefficient of the flow sensing device you are using (pitot tube, orifice plate, etc.). This value should be specified by the manufacturer of the device.

value   Coefficient (0.01 to 99.99)

Duct Dimensions

For flow measurement, it is necessary to enter duct dimensions so the area of the duct can be calculated. Enter the duct dimension at the measurement point.

Xsect   The first step is to determine the shape of the duct.
rect   For a rectangular or square duct.
circ   For a circular duct.
diam   For circular ducts, enter the duct diameter.
value   Diameter in inches (or meters).
X dim   For rectangular ducts, enter the width of the duct.
Y dim   For rectangular ducts, enter the height of the duct.
value   Height and width in inches (or meters).

Calibration

Calibration may be checked annually or as your quality control program dictates. Check calibration if the gauge was accidentally over-pressurized or if liquids entered the gauge ports. Your calibration standard must be 4 times more accurate than the gauge.

Zero   To re-zero the gauge, disconnect both pressure connections so they are open to atmospheric pressure and reset the value by holding the accept key.

Cancel   This cancels the zero operation.

Reset   This will reset the zero point of the gauge. Zero pressure must be maintained during the zero operation.

Span   To calibrate the span, first enter the full scale pressure value you will be calibrating to, then apply that pressure to the high pressure port, and reset the value by holding the accept key. The pressure must be maintained at the set value during span calibration.

Accept   This will reset the span of the gauge

Security

Access   Security Access allows you to prevent users from accessing menus to prevent tampering. Once this parameter is set, a security code must be entered to regain access to the locked menus as shown in the below table. This feature can be used in conjunction with "Custom Menus" to grant or restrict access to specific variables.

Secure   User access to all menus.
Set-up   User access to the Main menu and the Set-up menu.
Main   User access to the Main menu.
None   User can view main menu parameters, but not make any changes.
Security Codes
Main   2312
Set-up   4534 (allows access to Main)
Secure   6756 (allows access to all Menus)

Factory Reset

Reset   Factory default reset will be configured the gauge back to the original factory settings. This includes set values and menu structure.

Cancel   Cancel the factory default.
Reset   Accept the factory default and reset the gauge.

4-20 mA Output Scaling

This applies to units ordered with the 4-20 mA output option.

pol   Process Output Low allows the 4-20 mA output to be scaled. The value set for this parameter will correspond to the 4 mA output. The default setting is 0, but it can be set at any value lower than Output High.

value   The pressure that corresponds to 4 mA output.

poh   Process Output High allows the 4-20 mA output to be scaled. The value set for this parameter will correspond to the 20 mA output. The default setting will be the full scale pressure reading of the gauge, but can be set at any value higher than Output Low.

value   The pressure that corresponds to 20 mA output.

Custom Menus

The programming menu can be fully customized by the user. Parameters can be moved from one menu to another. This allows the user to reorganize the menu structure to better fit their needs or to put unused or unwanted parameters in one menu and then lock that menu so that those variables can not be accessed.

To move a program parameter to another menu, highlight the parameter to be moved and hold down the left arrow for one second and the following screen will appear:

New Menu

Main   Moves the parameter to the Main menu.
Setup   Moves the parameter to the Set-up menu.
Secure   Moves the parameter to the Secure menu.

Select the menu you would like the parameter to be moved to and press accept.

Maximum Displayed Pressures										
inWc	ftWc	mmWc	cmWc	PSI	inHg	mmHg	mBAR	Pa	kPa	oz in
0.250	0.021	6.350	0.635	0.009	0.018	0.467	0.623	62.27	0.062	0.145
0.500	0.042	12.70	1.270	0.018	0.037	0.934	1.245	124.5	0.125	0.289
1.000	0.083	25.40	2.540	0.036	0.074	1.868	2.491	249.1	0.249	0.578
2.000	0.167	50.80	5.080	0.072	0.147	3.737	4.982	498.2	0.498	1.156
3.000	0.250	76.20	7.620	0.108	0.221	5.605	7.473	747.3	0.747	1.734
4.000	0.333	101.6	10.16	0.145	0.294	7.473	9.964	996.4	0.996	2.312
5.000	0.417	127.0	12.70	0.181	0.368	9.342	12.45	1245	1.245	2.890
8.000	0.667	203.2	20.32	0.289	0.588	14.95	19.93	1993	1.993	4.624
10.00	0.833	254.0	25.40	0.361	0.736	18.68	24.91	2491	2.491	5.780
15.00	1.250	381.0	38.10	0.542	1.103	28.02	37.36	3736	3.736	8.671
20.00	1.667	508.0	50.80	0.723	1.471	37.37	49.82	4982	4.982	11.56
30.00	2.500	762.0	76.20	1.084	2.207	56.05	74.73	7473	7.473	17.34