Cecomp® 2-Wire Loop Powered Digital Pressure Transmitters — F16L, F16LN

Ranges and Resolution

See table below. Consult factory for special engineering units. Resolution is fixed as indicated in table. For DPG1000L and F4L series see www.cecomp.com/loop

‡ -HA option not available

PSI	Res	inHg/PSI	Res	mmH_2O	Res
3PSIG‡	.001	–30V15PSIG‡	.1	2100MMH2OG‡	1
5PSIG‡	.001	–30V100PSIG‡	.1	3500MMH2OG‡	1
15PSIA	.01	–30V200PSIG‡	.1	cmH_2O	Res
15PSIVAC‡	.01	inH_2O	Res	210CMH2OG‡	.1
±15PSIG‡	.01	85INH2OG‡	.01	350CMH2OG‡	.1
15PSIG	.01	140INH2OG‡	.1	1000CMH2OA	1
30PSIA	.01	400INH2OA	.1	1000CMH2OVAC‡	1
30PSIG	.01	400INH2OVAC‡	.1	±1000CMH2OG‡	1
60PSIG	.01	±400INH2OG‡	1	1000CMH2OG	1
100PSIA	.1	400INH2OG	.1	2100CMH2OA	1
–15V100PSIG‡	.1	850INH2OA	1	2100CMH2OG	1
100PSIG	.1	850INH2OG	1	kPa	Res
–15V200PSIG‡	.1	ftH_2O	Res	20KPAG‡	.01
200PSIG	.1	7FTH2O‡	.001	35KPAG‡	.1
300PSIG	.1	12FTH2O‡	.01	100KPAA	.1
500PSIG	.1	35FTH2O	.1	100KPAVAC‡	.1
1000PSIG	1	70FTH2O	.1	±100KPAG‡	.1
2000PSIG	1	140FTH2O	.1	100KPAG	.1
3000PSIG	1	230FTH2O	.1	200KPAA	.1
5000PSIG	1	480FTH2O	.1	200KPAG	.1
oz/in^2	Res	700FTH2O	.1	400KPAG	.1
50ZING‡	.01	1150FTH2O	1	700KPAA	.1
80ZING‡	.1	2300FTH2O	1	700KPAG	.1
240ZINA	.1	4600FTH2O	1	–100V700KPAG‡	1
240ZINVAC‡	.1	6900FTH2O	1	1400KPAG	1
±240ZING‡	.1	mmHg	Res	–100V1400KPAG‡	1
240ZING	.1	150MMHGG‡	.1	2000KPAG	1
480ZINA	.1	260MMHGG‡	.1	3500KPAG	1
480ZING	.1	760MMHGA	.1	7000KPAG	1
inHg	Res	760MMHGVAC‡	.1	MPa	Res
6INHGG‡	.001	±760MMHGG‡	1	1.4MPAG	.001
10INHGG‡	.01	760MMHGG	.1	–0.1V1.4MPAG‡	.001
30INHGA	.01	1600MMHGA	1	2MPAG	.001
30INHGVAC‡	.01	1600MMHGG	1	3.5MPAG	.001
±30INHGG‡	.01	Torr	Res	7MPAG	.001
30INHGG	.01	760TORRA	.1	14MPAG	.01
60INHGA	.01	760TORRVAC‡	.1	20MPAG	.01
60INHGG	.01	1600TORRA	1	35MPAG	.01
120INHGG	.1	mbar	Res	g/cm^2	Res
200INHGA	.1	200MBARG‡	.1	200GCMG‡	.1
–30V200INHGG‡	.1	350MBARG‡	.1	350GCMG‡	.1
200INHGG	.1	1000MBARA	1	1000GCMA	1
–30V400INHGG‡	.1	1000MBARVAC‡	1	1000GCMVAC‡	1
400INHGG	.1	±1000MBARG‡	1	±1000GCMG‡	1
600INHGG	.1	1000MBARG	1	1000GCMG	1
1000INHGG	1	2000MBARA	1	2100GCMA	1
2000INHGG	1	2000MBARG	1	2100GCMG	1
4000INHGG	1	bar	Res	kg/cm^2	Res
atm	Res	1BARA	.001	1KGCMA	.001
1ATMA	.001	1BARVAC‡	.001	1KGCMVAC‡	.001
1ATMVAC‡	.001	±1BARG‡	.001	±1KGCMG‡	.001
±1ATMG‡	.001	1BARG	.001	1KGCMG	.001
1ATMG	.001	2BARA	.001	2KGCMA	.001
2ATMA	.001	2BARG	.001	2KGCMG	.001
2ATMG	.001	4BARG	.001	4KGCMG	.001
4ATMG	.001	7BARA	.001	7KGCMA	.001
7ATMA	.001	7BARG	.001	7KGCMG	.001
7ATMG	.001	–1V7BARG‡	.01	–1V7KGCMG‡	.01
–1V7ATMG‡	.01	14BARG	.01	14KGCMG	.01
14ATMG	.01	–1V14BARG‡	.01	–1V14KGCMG‡	.01
–1V14ATMG‡	.01	20BARG	.01	20KGCMG	.01
20ATMG	.01	35BARG	.01	35KGCMG	.01
34ATMG	.01	70BARG	.01	70KGCMG	.01
70ATMG	.01	140BARG	.1	140KGCMG	.1
140ATMG	.1	200BARG	.1	200KGCMG	.1
200ATMG	.1	350BARG	.1	350KGCMG	.1
340ATMG	.1				

Accuracy

Accuracy includes linearity, hysteresis, repeatability
Standard accuracy: ±0.25% of full scale ±1 least significant digit
HA accuracy option: ±0.1% FS ±1 LSD, see ranges for availability
Sensor hysteresis: ±0.015% FS, included in accuracy
Sensor repeatability: ±0.01% FS, included in accuracy

Display

4 readings per second nominal display update rate
4 digit LCD, 0.5" H and 5 character 0.25" H alphanumeric

Controls and Functions

TEST: When depressed sets loop current and display to user-set output test level, independent of pressure input, to allow testing of system operation.
▲ Up: set test, pass code, and calibration values
▼ Down: set test, pass code, and calibration values

Calibration

User settable pass code required to enter calibration mode
All pressure and absolute models: zero, midpoint, span
All vacuum models: –span, –midpoint, zero
Vacuum/pressure models: –span, zero, +midpoint, +span
±15 psi models: –span, –midpoint, zero, +midpoint, +span

Loop Supply Voltage

Any DC supply/loop resistance that maintains 8-32 VDC at gauge terminals
Reverse polarity protected

Output Characteristics

Current output, 4-20 mA DC
Passive transmitter, requires external loop power
Output drive (compliance) determined by power source
Updated approximately 16 times per second
12,000 counts over sensor range

Weight

9 ounces (approx.),
Shipping wt. 1 pound (approx.)

Housing

F16L: Extruded aluminum case, epoxy powder coated, ABS/ polycarbonate bezel (aluminum bezel optional), front and rear gaskets, polycarbonate label

F16LN: ABS/polycarbonate NEMA 4X case, rear gasket, polycarbonate label

Connection, Material, Media Compatibility

1/4" NPT male fitting, 316L stainless steel
All wetted parts are 316L stainless steel

Overpressure, Burst, Vacuum

Ranges using 3000 psig sensor: 5000 psig
Ranges using 5000 psig sensor: 7500 psig
All others: 2 X pressure range
3000 psi, 5000 psi, and 4 digit ranges 112.5% full scale out-of-range display: 1– – – or l –.–.–.–

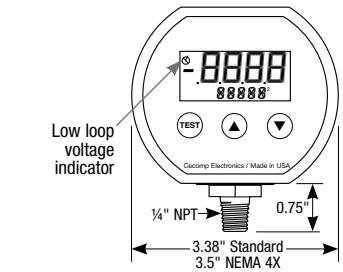
4 X sensor burst pressure rating, or 10,000 psi, whichever is less

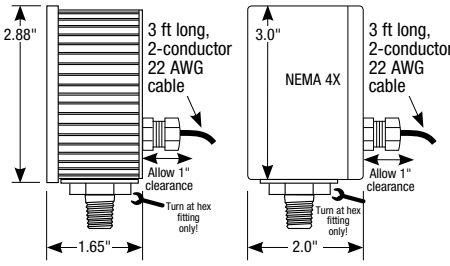
Vacuum service: 15 psia, ±15 psig, 15 psig, 30 psia, 100 psig, 100 psia, 200 psig sensors

Under-range display (non-vacuum sensors): –Err

Environmental

Storage temperature: –40 to 203°F (–40 to 95°C)
Operating temperature: –4 to 185°F (–20 to 85°C)
Compensated temperature: 32 to 158°F (0 to 70°C)





- *±0.25% Test Gauge Accuracy*
- *316L Stainless Steel Wetted Parts*
- *4-20 mA Analog Output*
- *Output Test Function*

MADE IN USA

F16L

NEMA 4X Housing

F16LN

Quick Link: cecomp.com/loop

How to Specify	Type
F16L *range - options*	Standard housing
F16LN *range - options*	NEMA 4X housing

Range—see table at left

psi = PSI	torr = TORR	mbar = MBAR
inHg = INHG	mmH_2O = MMH2O	bar = BAR
oz/in^2 = ZIN	kg/cm^2 = KGCM	cmH_2O = CMH2O
inH_2O = INH2O	g/cm^2 = GCM	atm = ATM
ftH_2O = FTH2O	kPa = KPA	
mmHg = MMHG	MPa = MPA	

G = gauge reference pressure
VAC = gauge reference vacuum
A = absolute reference

Options—add to end of model number	
HA	High accuracy, ±0.1% FS ±1 LSD. See table at left for availability.
PM	Panel mount, 4.1" x 4.1", n/a NEMA 4X
CC	Moisture resistant circuit board conformal coating
CD	Calibration data; 5 test points and date
NC	NIST traceability documentation, 5 points and date

SCR14SS
Filter screen fitting keeps debris out of gauge sensor. Use for food vacuum packaging applications. 303 SS body, 100 micron 304 SS screen.

1220 American Way Libertyville, IL 60048
800-942-0315
cecomp.com

Installation Precautions

- ✔ Read these instructions before using the gauge. Configuration may be easier before installation. Contact the factory for assistance.
- ✔ These products do not contain user-serviceable parts. Contact us for repairs, service, or refurbishment.
- ✔ Gauges must be operated within specified ambient temperature ranges.
- ✔ Outdoor or wash down applications require a NEMA 4X gauge or installation in a NEMA 4X housing.
- ✔ Use a pressure or vacuum range appropriate for the application.
- ✔ Use fittings appropriate for the pressure range of the gauge.
- ✔ Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.
- ✔ For contaminated media use an appropriate screen or filter to keep debris out of gauge port.
- ✔ Remove system pressures before removing or installing gauge.
- ✔ Install or remove gauge using a wrench on the hex fitting only. Do not attempt to turn gauge by forcing the housing.
- ✔ Good design practice dictates that positive displacement liquid pumps include protection devices to prevent sensor damage from pressure spikes, acceleration head, and vacuum extremes.
- ✘ Avoid permanent sensor damage! Do not apply vacuum to non-vacuum gauges or hydraulic vacuum to any gauges.
- ✘ Avoid permanent sensor damage! NEVER insert objects into gauge port or blow out with compressed air.
- ⚠ Gauges are not for oxygen service. Accidental rupture of sensor diaphragm may cause silicone oil inside sensor to react with oxygen.
- ✘ NEVER connect the gauge wires directly to 115 VAC or permanent damage will result.

Cecomp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. See cecomp.com for latest product information. Consult factory for your specific requirements.

WARNING: This product can expose you to chemicals including lead, nickel and chromium, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

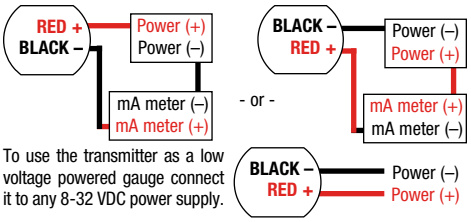
Electrical Connection

All operating power is supplied by the 4-20 mA current loop using the 2-wire cable at the gauge rear. The F16L can be used as an indicating transmitter in any 4-20 mA current loop or as a DC powered gauge. Reversing the connections will not harm the gauge but it will not operate with incorrect polarity.

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the gauge will have at least 8 VDC at its terminals but not over 32 VDC.

For correct operation and to avoid erratic or erroneous readings, the gauge terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output. The minimum loop supply voltage may be calculated from the formula:

$$V_{min} = 8V + (20mA \times \text{Total loop resistance})$$



To use the transmitter as a low voltage powered gauge connect it to any 8-32 VDC power supply.

Operation

The F16L is designed for continuous operation. Warm-up time is negligible. When power is first applied, the F16L will set the loop current to maximum and check the voltage available. If there is sufficient voltage available to power the unit, all active segments will be displayed briefly.

Then the full scale pressure range and engineering units are displayed. All active segments will again displayed briefly. Then the display will show the system pressure, and the loop current will be linearly proportional to the pressure/vacuum.

The output is a 12,000 count analog 4-20 mA signal. The output is filtered to improve noise immunity and is updated approximately 16 times per second.

Sensor Range	Full vacuum	"0" on display	Full pressure
Gauge reference pressure	n/a	4 mA	20 mA
Gauge reference vacuum	20 mA	4 mA	n/a
Compound –30inHg/15psi	4 mA	12 mA	20 mA
Compound –30inHg/100psi	4 mA	5.5 mA	20 mA
Compound –30inHg/200psi	4 mA	4.8 mA	20 mA
Absolute reference	4 mA	4 mA	20 mA
Bipolar ±	4 mA	12 mA	20 mA

Test Function

When the TEST button is held depressed, the display and loop current are switched, independent of the actual pressure, to a level determined by the test setting. When the button is released, normal operation is resumed. This test mode will allow setup and testing of the current loop without having to alter the system pressure.

To set the test output level, press and hold the front-panel TEST button and press the up or down arrow buttons to adjust the test output to the desired pressure setting. When the TEST button is released the setting is stored in non-volatile memory.

Calibration Preparation

Gauges are calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it into service.

Calibration should only be performed by qualified individuals using appropriate calibration standards and procedures. Gauges can be returned to factory for certified recalibration and repairs. NIST traceability is available.

Calibration intervals depend on your quality control program requirements and as-found data. Many customers calibrate their equipment annually.

The calibration equipment should be at least four times more accurate than the gauge being calibrated. The calibration system must be able to generate and measure pressure and/or vacuum over the full range of the gauge.

A vacuum pump able to produce a vacuum of 100 microns (0.1 torr or 100 millitorr) or lower is required for vacuum and absolute gauges.

Use a stable DC power supply and an accurate mA meter for calibration of loop powered transmitters.

Allow the gauge to equalize to normal room temperature for at least 20 minutes before calibration.

Calibration

The F16L series uses a user-modifiable calibration pass code to enter the calibration mode. In the calibration mode, the gauge automatically recognizes the calibration region corresponding to the applied pressure. There are 3, 4, or 5 calibration regions depending upon the pressure range of the gauge. All gauges have Zero, +Midpoint, and +Span regions. Vacuum/pressure gauges will also have a –Span region, and a ±15 psig sensor will have a –Midpoint region as well.

Calibration of the loop output coordinates the 4-20 mA output to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the output. Calibration of the output coordinates the loop output to the display indication, and normally does not need to be adjusted.

Entering the Calibration Mode

1. While pressing and holding the ▼ button, press the TEST button to enter the calibration mode. The upper section of the display will indicate CAL.
2. When all buttons are released, the upper section of the display will indicate _ _ _ _ with the left-most position blinking, and the lower section will indicate PASS. To exit and return to the normal operating mode, press and release the TEST button.
3. Enter the user-modifiable calibration pass code (3510 factory default)

   Use ▲ or ▼ to set the left-most digit to 3.

   Press and release the TEST button to move to the next position. The 3 will remain, and the second position will be blinking. Use ▲ or ▼ to select 5.

   Press and release TEST to move to the next position. 3 5 will remain, and the third position will be blinking. Use ▲ or ▼ to select 1.

   Press and release the TEST to move to the next position. 3 5 1 will remain, and the fourth position will be blinking. Use ▲ or ▼ to select 0.
4. Press and release the TEST button to proceed with calibration.

If an incorrect pass code was entered, the gauge will to exit to the normal operating mode.

Calibration

Upon successful calibration pass code entry, the upper display will indicate the applied pressure in the configured engineering units with the corresponding loop current.

The lower display will alternate between CAL and the calibration region corresponding to the applied pressure (ZERO, +MID, +SPAN, –MID, or –SPAN).

Note: To store the calibration parameters and exit calibration mode at any time, press and hold the TEST button until the display indicates – – – – .

Loop Current Calibration

Loop current calibration coordinates the loop current to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the loop current.

Note: During any of the following calibration steps if the TEST button is held depressed for longer than 2 seconds, the display will change to indicate – – – – , and the gauge will exit the calibration mode when all buttons are released.

4 mA loop current

Press the TEST button and release it when the display indicates LCAL.

The upper display segments will indicate the pre-configured pressure corresponding to a 4 mA loop current.

The lower display segments will alternate between CAL and 4 MA.

Use ▲ or ▼ to adjust the actual loop current to 4 mA.

20 mA loop current

Press the TEST button and release it when the display indicates HCAL.

The upper display segments will indicate the preconfigured pressure corresponding to a 20 mA loop current.

The lower display segments will alternate between CAL and 20 MA.

Use ▲ or ▼ to adjust the actual loop current to 20 mA.

Pressure Calibration

The pressure calibration procedure simultaneously adjusts both the display indication and the loop current to correspond to the actual applied pressure.

Note: During any of the following calibration steps if the TEST button is held depressed for longer than 2 seconds, the display will change to indicate – – – – , and the gauge will exit the calibration mode when all buttons are released.

Zero calibration

Press the TEST button and release it when the display indicates CAL.

Apply zero pressure.

The lower display will alternate between CAL and ZERO.

Use ▲ or ▼ to adjust the upper display to indicate zero.

Span calibration

Apply full-scale pressure.

The lower display will alternate between CAL and +SPAN.

Use ▲ or ▼ to adjust the upper display to indicate the applied pressure.

Midpoint non-linearity calibration

Apply 50% full-scale positive pressure.

The lower display will alternate between CAL and +MID.

Use ▲ or ▼ to adjust the upper display to indicate the applied pressure.

Negative span calibration (bipolar and compound ranges only)

Apply full-scale negative pressure.

The lower display will alternate between CAL and –SPAN.

Use ▲ or ▼ to adjust the upper display to indicate the applied pressure.

Negative midpoint non-linearity calibration (±15 psi bipolar range)

Apply 50% full-scale negative pressure.

The lower display segments will alternate between CAL and –MID.

Use ▲ or ▼ to adjust the upper display to indicate the applied pressure.

Save and exit

To store the calibration parameters and exit calibration mode, press and hold the TEST button until the display indicates – – – – .

Calibration Pass Code

1. While pressing and holding the ▲ button, press the TEST button to enter the configuration mode. The upper section of the display will indicate CFG.
2. When all buttons are released, the upper section of the display will indicate _ _ _ _ with the left-most position blinking, and the lower section will indicate PASS. To exit and return to the normal operating mode, press and release the TEST button.
3. Enter factory pass code 1220

   Use ▲ or ▼ to set the left-most digit to 1.

   Press and release the TEST button to index to the next position. Use ▲ or ▼ to select 2.

   Press and release the TEST button to index to the next position. The third position will be blinking. Press use ▲ or ▼ to select 2.

   Press and release the TEST button to index to the next position. The fourth position will be blinking. Use ▲ or ▼ to select 0.
4. Press and release the TEST button to proceed to the configuration parameters. Note: If an incorrect pass code was entered, the gauge will exit to the normal operating mode.
5. The upper display section will indicate the calibration pass code. The lower section will display UDPCD.
6. To change the calibration pass code, press and release the ▲ or ▼ button. The first character of the pass code will begin to blink.

   Use ▲ or ▼ to set the blinking character to the desired value, then press and release the TEST button to move to the next character. Repeat for each character position.
7. When the calibration pass code is displayed with no characters blinking, press and release the TEST button to save the new pass code and restart the gauge. Note: To make a correction to the new calibration pass code before saving and restarting, press either the ▲ or ▼ button to return to the UDPCD code entry sequence.