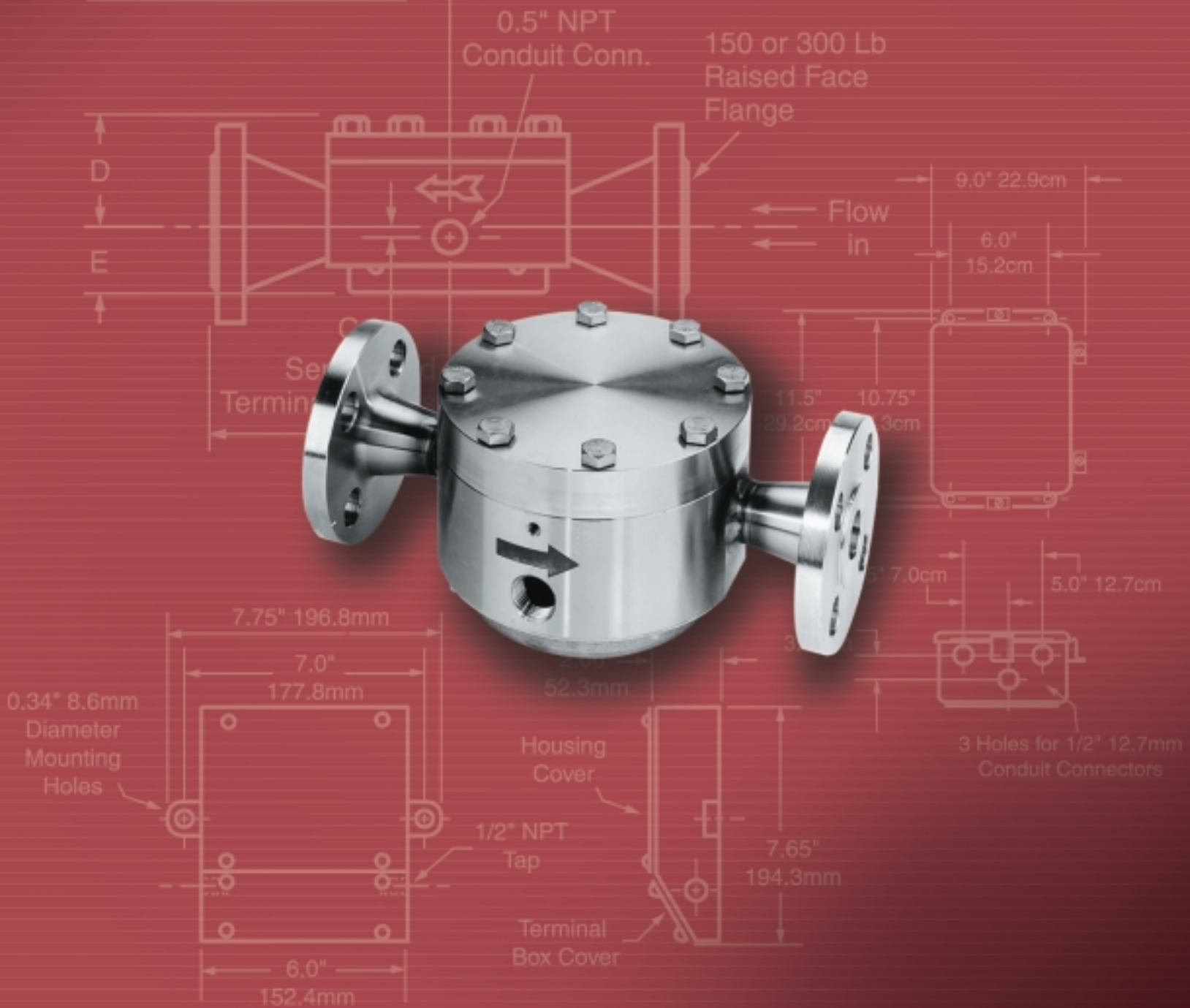


Fluidic Flowmeter

Sensor Technology



OPTIMUX

OPTIMUX V140 Fluidic Flowmeter

FEATURES & BENEFITS

- ▶ Specifically designed for high viscosity/low flow rate measurement
- ▶ Rugged construction, which includes no moving parts, allows for installation in various high industrial stress environments
- ▶ The ability to calculate volumetric flow rate unaffected by fluid density ensures accurate flow measurement
- ▶ Rugged meter body with self-contained deflection sensor allows direct, in-line installation into piping
- ▶ The ability to use the Fluidic Flowmeter Deflection Sensor Signal Converter or Fluidic Flowmeter Two-Wire Transmitter provides versatile output selection
- ▶ Choice of 3/4", 1", and 1-1/2" pipe sizes accommodates a variety of applications
- ▶ High immunity from flow overrange or flow surge damage ensures safe operation

DESCRIPTION

The OPTIMUX V140 is a fluidic flowmeter designed for measurement of both nonconductive and conductive liquids at higher viscosities and lower flow rates than conventional flowmeters. These applications include fuel oils #2 through #6, combustion metering of hot/cold fluid mixes, and those where sensor coating problems may occur.

The OPTIMUX V140 includes a rugged meter body with a self-contained deflection sensor for direct, in-line installation into new or existing piping. It integrates with the Fluidic Flowmeter Deflection Sensor Signal Converter or Fluidic Flowmeter Two-Wire Transmitter to provide an output signal for flow rate totalizing, recording, or controlling applications.

The internal design of the OPTIMUX V140 meter body is a fluidic oscillator producing a frequency that is linear to the volumetric flow rate of fluid through the meter. A strain gauge sensor within the meter body detects the oscillations to produce a signal used as input to the Deflection Sensor Signal Converter or Two-Wire Transmitter.

The Fluidic Flowmeter Deflection Sensor Signal Converter provides a dual analog/pulse output. Both a 4-20 mA analog output proportional to the flow rate; and a 12V pulse or transistor switch output scaled in field selectable engineering units are provided. It can be located up to 1000 ft. away from the meter body



The Fluidic Flowmeter Two-Wire Transmitter provides a standard 4-20 mA dc output from the OPTIMUX V140 and can be mounted directly on the meter body, or up to 50 ft. away.

The rugged, reliable OPTIMUX V140 contains no moving parts, minimizing maintenance costs. The design of the meter body does not require maintaining a turbulent flow for sustained oscillation, which allows use with high viscosity liquids at low flow rates to Reynolds numbers as low as 75.

SPECIFICATIONS

Performance

Accuracy: $\pm 2\%$ of flow rate above pipe Reynolds number of 500

Repeatability: 0.25% of rate

Pressure Loss:

10 psi at 5.7 GPM (3/4" meter)

10 psi at 12 GPM (1" meter)

10 psi at 40 GPM (1-1/2" meter)

Capacity

Meter Size	Minimum Flow Rate Greater of	Maximum Full Scale Range ¹ US GPM
3/4"	0.02 GPM/cSt ($R_D = 75$) or 0.35 GPM	0-1/0-8
1"	0.04 GPM/cSt ($R_D = 120$) or 0.75 GPM	0-5/0-17
1-1/2"	0.10 GPM/cSt ($R_D = 200$) or 2 GPM	0-15/0-50

NOTE:

(1) Ranges correspond to 4-20 mA output

Specifications are subject to change without notice.

Pressure Rating

Maximum working pressure of connecting flanges rating per ANSI B16.5.

End Connection Pressure	
150# RF Flange	230 psig
300# RF Flange	600 psig

Temperature

Meter Body: -40 to 350°F (-40 to 175°C)
 Signal Converter: -22 to 122°F (-30 to 50°C)
 Two-Wire Transmitter: -40 to 185°F (-40 to 85°C)

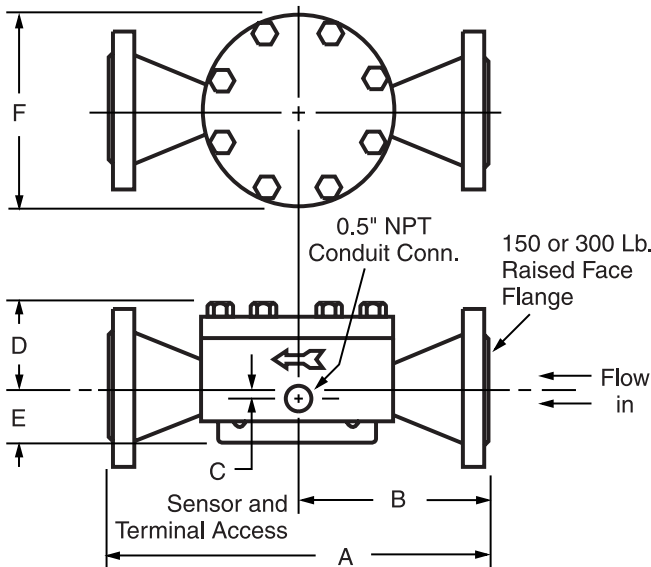
Signal Cable

Signal Converter:
 Meter body must be located within 1000 ft.
 Two-Wire Transmitter:
 Meter body must be located within 50 ft.
 Cable Type: 3-wire, shielded cable, Belden 8771 (or equivalent). This cable is rated for use at temperatures up to 140°F (60°C). For use at higher temperatures, consult OPTIMUX.

Materials of Construction

Process Wetted Parts: 316L SS, Hastelloy C, Viton

MOUNTING DIMENSIONS



Meter Size	Flange Rating	A	B	C	D	E	F
3/4"	150 lb.	9.45	4.72	0.67	2.08	2.18	5.44
	300 lb.	9.83	4.92	0.67	2.08	2.18	5.44
1"	150 lb.	9.75	4.95	0.28	2.50	1.80	5.44
	300 lb.	10.25	5.19	0.28	2.50	1.80	5.44
1-1/2"	150 lb.	12.72	6.36	0.47	2.92	1.91	7.97
	300 lb.	13.20	6.60	0.47	2.92	1.91	7.97

MODEL SELECTION

V140 Model V140 Fluidic Flowmeter

A Liquid Service

Meter Size
 08 3/4"
 10 1"
 15 1-1/2"

Material
 S Stainless Steel (Type 316L)

End Connections
 1 150# RF Flange
 3 300# RF Flange

Connection Type
 W Welded-On Flanges

Sensor Style
 1 Standard
 2 Long Leads

Electrical Classification
 N Not Required
 F1 FM Approved²

V140 A 08 S 1 W 1 N *Sample Model Number*

NOTES:

- (1) Order cannot be entered without complete process information.
- (2) FM Approved for the following hazardous locations: Class I, Division 1, Groups A, B, C & D; Class II, Division 1, Groups E, F & G; and Class III, Division 1, when connected per OPTIMUX Drawing 15032-1419 (for Model Q/I Converter) or 15032-1420 (for Two-Wire Transmitter) and installed per manufacturers' instructions.

OPTIMUX V141 Fluidic Flowmeter

FEATURES & BENEFITS

- ▶ The ability to calculate volumetric flowrate that is unaffected by fluid density ensures accurate measurement
- ▶ Rugged construction, which includes no moving parts, allows for installation in various high industrial stress environments
- ▶ Rugged meter body with self-contained deflection sensor allows direct, in-line installation into piping
- ▶ Output selection (analog, scaled pulse, transistor switch) provides application versatility
- ▶ The ability to use the Deflection Sensor Signal Converter or Two-Wire Transmitter provides versatile output selection

DESCRIPTION

The OPTIMUX V141 Fluidic Flowmeter is a rugged, reliable instrument available for a wide variety of fluid measurement applications. Its meter bodies can be selected for a broad range of flow rates, pipe sizes, and pressure ratings. The integral, one-piece design eliminates moving parts, making it ideal for installations subject to vibration. The ability to separately select either a two-wire transmitter or signal converter designed specifically for the OPTIMUX V141 allows the widest flexibility in choosing outputs. Flow measurement applications to be implemented at a minimum of cost, time, and equipment.

The OPTIMUX V141 includes a single-piece, cast meter body with a self-contained sensor available for mounting directly in-line with new or existing process piping. The OPTIMUX V141 operates with the Fluidic Flowmeter Deflection Sensor Signal Converter or the Fluidic Flowmeter Two-Wire Transmitter to provide a signal for recording, indicating, or controlling flow.

The geometric design of the meter body produces a continuous, self-induced oscillation at a frequency corresponding to the velocity of fluid passing through the meter. Oscillations are detected by an enclosed deflection sensor that produces a pulse upon each oscillation. Signals from the sensor are then converted into a scaled pulse and 4-20 mA analog signal (converter) or a single 4-20 mA analog signal (transmitter).

Fluid attaches to one of the side walls within the meter body. A small portion of flow is diverted through a feedback passage to the control port (shown to the right). This feedback flow bends the main flow to the opposite side wall-repeating feedback action and producing oscillation within meter body. Flow-in feedback passage cycles be-



tween zero and maximum. Enclosed deflection sensor varies electrical resistance in response to condition. Resulting signal from the sensor detects frequency of oscillation that is linear to velocity. As such, it detects volumetric flow of fluid through meter.

The Fluidic Flowmeter Deflection Sensor Signal Converter provides both a scaled pulse for flow totalizing and a 4-20 mA signal linearly proportional to the flow rate. Housed in a NEMA 4 enclosure, it can be located up to 1000 ft. away from the meter installation. The Fluidic Flowmeter Two-Wire Transmitter provides a 4-20 mA analog signal proportional to the flow rate. Also housed in a NEMA 4 enclosure, it can be mounted directly on the meter body or connected via cable up to 50 ft. away.

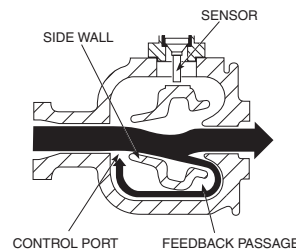


Figure 1

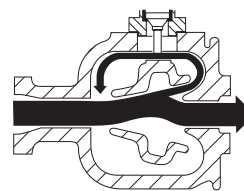


Figure 2

SPECIFICATIONS

Flow Rates

Meter Size	Minimum Flow Rate (GPM)
1"	3.25
1-1/2"	7.6
2"	10.5
3"	23.0
4"	40.0

Listed flow ratings are for water at 60°F, 1 centistoke. To determine flow rates of other fluids, divide the value listed above by the square root of the fluid's specific gravity.

Capacity

Meter Size	Full Scale Calibration Range ¹	
	Minimum GPM	Maximum GPM
1"	0-10	0-55
1-1/2"	0-22	0-130
2"	0-40	0-210
3"	0-125	0-460

Pressure Rating

Maximum working pressure equals connecting flange rating per ANSI B16.5

Meter Size	Connecting Range
1"	150, 300, 600 lb.
1-1/2"	150, 300, 600 lb.
2"	150, 300 ² , 600 lb. ²
3"	150, 300 lb. ² .

Temperature

Meter Body: -40 to +350°F (-40 to +177°C)
 Signal Converter: -22 to +122°F (-30 to +50°C)
 Two-Wire Transmitter: -40 to +185°F (-40 to +85°C)

Materials

Meter Body: Cast Stainless steel
 1" size, type 316 SS (ASTM A296 grade CF8M); 1-1/2", 2" & 3" sizes, type 316L SS (ASTM A296 grade CF3M)
 Sensor: Stainless steel, type 316L SS, and Hastelloy C-276
 Gasket: Teflon, O-Ring: Viton

NOTES:

- Ranges correspond to 4-20 mA output.
- Requires optional welded-on flanges.
- FM approved for intrinsically Safe for Class I/II/III, Div. I, Groups A, B, C, D, E, F, G when used with approved barriers and converters listed on OPTIMUX Dwg. #15032-1419 and -1420 and when installed per OPTIMUX's instructions.
- Dimensions in inches.

Specifications subject to change without notice.

MODEL SELECTION

V141 Fluidic Flowmeter with Deflection Sensor

Meter Body Materials

S Stainless Steel

Meter Size

10 1"
 15 1-1/2"
 20 2"
 30 3"

End Connections

A Water (Flangeless), Standard
 B Welded-on Flanges, ANSI Class 150#
 C Welded-on Flanges, ANSI Class 300#
 D Welded-on Flanges, ANSI Class 600#²

Deflection Sensor Style

A Standard Leads
 B Long Leads

Options

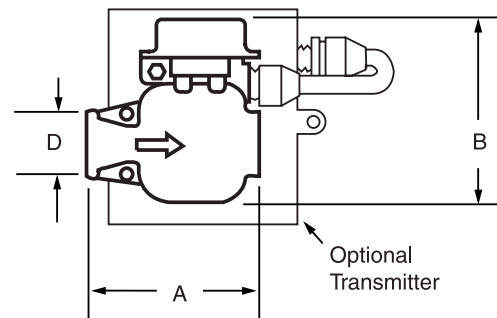
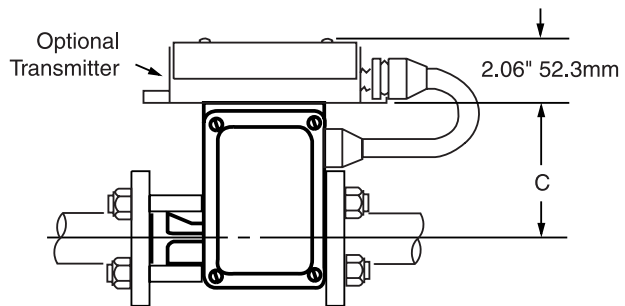
N None
 A With Mounted 2-Wire Transmitter

Electrical Approval

N Not Required
 F² FM Approved

V141 S 10 A A N N *Sample Model Number*

DIMENSIONS



Meter Size ⁴	A	B	C	D
1"	5.50	5.88	4.12	2.00
1-1/2"	7.63	7.57	4.25	3.25
2"	8.06	8.04	4.25	4.00
3"	11.72	10.88	4.25	5.00

Fluidic Flowmeter Two-Wire Transmitter

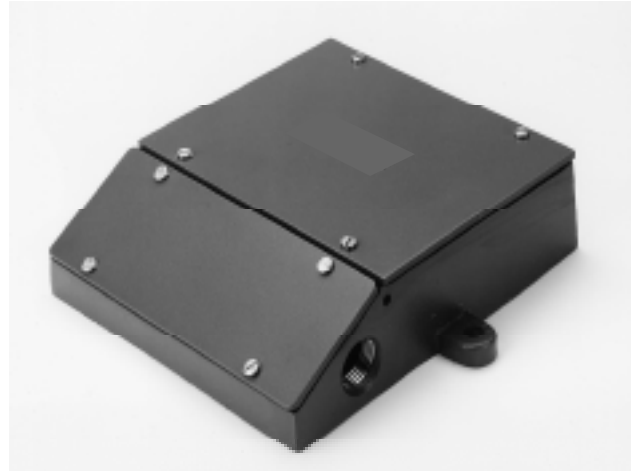
FEATURES & BENEFITS

- ▶ Provides accurate, reliable metering of process fluids
- ▶ Provides a standard 4-20 mA signal for use with electronic indicators, recorders, or controllers
- ▶ The ability to operate in hazardous areas accommodates installation in high industrial stress areas
- ▶ Accurate frequency source, multi-meter, and 10-40 Vdc power supply facilitate easy wiring connections, calibration, and adjustment
- ▶ High rangeability
- ▶ Wall, pipe, and meter body installation options provide application versatility

DESCRIPTION

The Fluidic Flowmeter Two-Wire Transmitter provides a standard 4-20 mA_{dc} electronic signal from the OPTIMUX V140 and V141 Fluidic Flowmeters. This sturdy, one-piece unit can be installed in a variety of locations, including hazardous areas, to provide reliable, cost-effective flow measurement. As such, it can serve as an input for the flow rate to a wide variety of electronic indicating, recording, or controlling equipment. The self-induced oscillation of fluid within the meter body is detected by the deflection sensor, which generates pulses proportional to the rate. The transmitter converts the frequency of pulses into a corresponding analog signal.

The Fluidic Flowmeter Two-Wire Transmitter consists of a one-piece cast aluminum enclosure with separate compartments for the terminal block for field wiring and a single printed circuit board that converts pulse frequency into the analog signal. Two screw-mounted gasketed, removable panels allow access for wiring connections, calibration, and adjustment. The Two-Wire



Transmitter can be surface mounted or pipe-mounted with an accessory bracket. It can also be mounted directly to the OPTIMUX V140 meter body with a 1/2" pipe nipple or bolted to the OPTIMUX V141 meter body. Two 1/2" NPT connections in the enclosure allow wiring or a conduit to be installed for connections to the meter body, power supply, and external device. Intrinsically safe operation in hazardous areas can be implemented with installation of appropriate energy limiting barriers.

Calibration and adjustment of the transmitter are easily performed using an accurate frequency source, a multimeter, and 10-40 Vdc power supply. Switches on the board provide coarse span resistance. Jumper plug connections allow selection or change of response time from 10 to 4 seconds. Static pressure and hysteresis adjustment are accessible directly on the board with no further equipment or disassembly required.

SPECIFICATIONS

Accuracy

Calibration Accuracy: ±0.10%, full scale.

Analog Output

4-20 mA, standard calibration.

Power Supply

Requirements: 10 Vdc at 0 ohm load (min.)
40 Vdc at 1500 ohm load (max.)

Field Connections

Six position terminal block. Accessible from sealed, removable panel.

Sensor Cable

Transmitter may be located within 50 ft. of meter body with 3-wire, shielded cable, Belden 8771 (or equivalent). This cable is rated for use at temperatures up to 140°F (60°C). For use at higher temperatures, consult OPTIMUX.

Enclosure

NEMA 4

Construction

Cast Aluminum

Environmental

Temperature Range: -40 to +185°F (-40 to +85°C)
Relative Humidity: 5% to 100%

Electrical Classification

FM approved as intrinsically safe for operation in: Class I, II, III, Div. 1, Groups A, B, C, D, E, F & G when used with approved barriers listed on OPTIMUX Dwg. #15032-1420, and installed per OPTIMUX's instructions.

ACCESSORIES

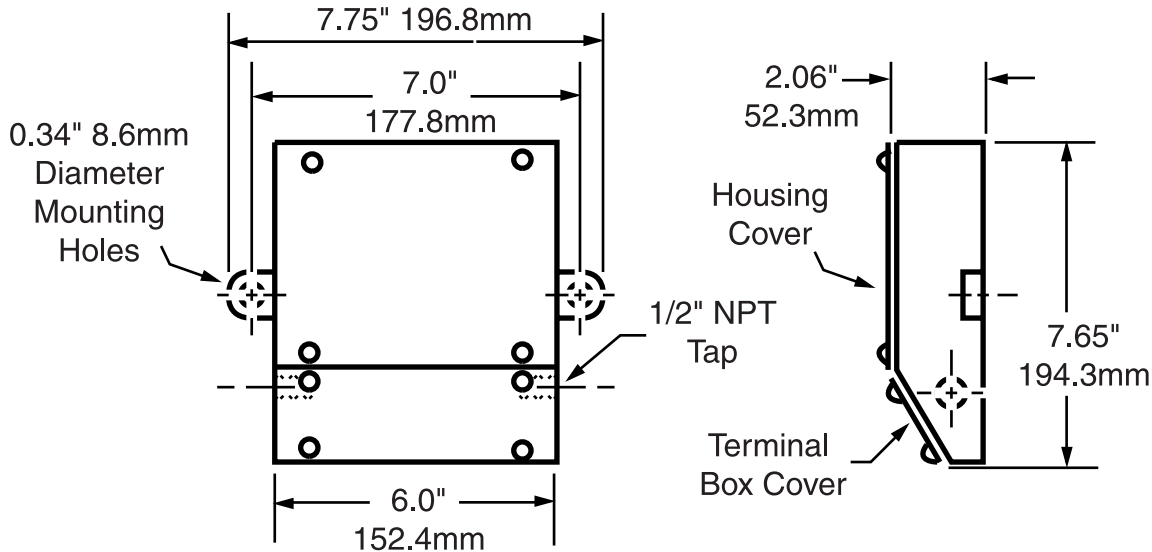
Pipe Mounting Kit

Includes universal bracket, U-bolt and all associated hardware.

Sensor Cable Kit

Includes 50 ft. of 3 wire shielded cable and mounting hardware.

INSTALLATION DRAWING



Dimensions are in Inches (Millimeters)

Fluidic Flowmeter Deflection Sensor Signal Converter

FEATURES & BENEFITS

- ▶ Provides dual analog/pulse output options for application versatility
- ▶ Field selectable engineering units of pulse output provides flow totalizing
- ▶ Accurate frequency source and digital multimeter facilitate easily accessible wiring connections, calibration, and adjustment.
- ▶ The ability to be located up to 1000 ft. away from meter body provides application versatility

DESCRIPTION

The Fluidic Flowmeter Deflection Sensor Signal Converter provides a dual analog/pulse output from the OPTIMUX V140 and V141 Fluidic Flowmeters. Both a standard 4-20 mA signal and a 12V pulse or transistor switch output are provided proportional to the flowrate. These outputs can be used with other instruments for a wide variety of process totalizing, recording, indicating, or control applications.

The oscillation of fluid through the body produces a signal in the deflection sensor proportional to the flowrate. The Fluidic Flowmeter Deflection Signal Converter filters and conditions the signal and converts it to the corresponding analog and pulse outputs.

The Converter consists of two printed circuit boards and electrical connections mounted in a NEMA 4 enclosure. Switch and jumper plugs allow output pulses to be scaled in engineering units. Pulses can be selected as positive-going, 12V scaled pulses referenced to circuit common; or negative-going 12V scaled/unscaled pulses referenced to +12V. Additionally, circuit board and user wiring changes can be made for high/low impedance loads, or to an open collector transistor switch. Output, input, and power wiring are connected via screw terminals within the enclosure. Calibration can be performed with an accurate frequency source and digital multimeter.



MODEL SELECTION

14CNB	Deflection Sensor Signal Converter
	Range Designation
00-99	(Selected by OPTIMUX based on meter size and flow rate.)
	Output Response
S	Standard
	Power Supply
1	120 Vac, 50-60 Hz
	Electrical Approval
F1	FM Approved
14CNB16 S 1 F1	<i>Sample Model Number</i>

SPECIFICATIONS

Accuracy

Analog Output: $\pm 0.1\%$, full scale

Input

Fluidic Flowmeter Deflection Sensor
(Models V140 and V141)

Output

Analog

Type: Isolated 4-20 mA_dc
 Maximum Load: 600 ohms
 Maximum Current: 35 mA_dc
 Maximum Voltage: 18.9 V_dc
 Span Adjustment: 30% of Maximum span

Pulse

Load Resistance: 60 ohms (max.)
 Maximum Current: 200 mA_dc
 Maximum Voltage: 35 V_dc
 Saturation Voltage: 0.4 V_dc at 100 mA

Open Collector Pulse

Load Resistance: 60 ohms (min.)
 Maximum Current: 200 mA_dc
 Maximum Voltage: 35 V_dc
 Pull-Up Voltage: 12 V_dc, 5%

Pulse Characteristics

Rise/Fall Time: 1 msec. with 0.005 mF (max.)
 Unscaled Pulse Width: 2-10 msec.
 (Depending on meter size)
 Scaled Pulse Width: 50-70 msec.

Power Supply

Requirements:
 120V, +10%, -15%, 50-60 Hz. 13W (max.)

Enclosure

NEMA 4

Sensor Cable

Signal Converter can be located within 1000 ft. of meter body with 3-wire, shielded cable, Belden 8771 (or equivalent). This cable is rated for use at Temperatures up to 140°F (60°C). For use at higher temperatures, consult OPTIMUX.

ENVIRONMENTAL

Temperature: -22 to +122°F (-30 to +50°C)
 Relative Humidity: 5% to 100%

Electrical Classification

FM approved as non-incendive for Class I, Div. 2, Groups A, B, C & D. Has intrinsically safe connections for Class I, Div. 1, Groups A, B, C & D without energy limiting barriers when used with OPTIMUX V140 and V141 Fluidic Flowmeters having a deflection type sensor and installed per OPTIMUX's instructions.

MOUNTING DIMENSIONS

