MODEL

# VORTIFOX

## VF3 Insertion

Vortex Shedding Flow Meter

### HIGHLIGHTS

- Measures gas, liquid, and steam
- Multivariable outputs for five process parameters:
    - Mass flow rate
    - Volumetric flow rate
    - Temperature
    - Pressure
    - Density
    - Energy (BTU)
- Single process connection
- Insertion configurations for pipes > 2-inch
- Available for hot-tap installations
- Other vortex manufacturers are inline-only (no hot-tap option)
- Field-configurable ranges, alarms, outputs, and displays
- Configuration via six push buttons or magnet through explosion-proof window
- Smart DSP electronics extends low-flow range down to a Reynolds number of 5,000
- Rangeability up to 100:1
- Temperature up to 750°F (400°C)
- Pressure up to 1,500 psia (100 bara)
- Mass flow equations for real gas, ideal gas, AGA-8 equations for natural gas, API 2540
- Advanced serial communication options: BACnet/IP, Modbus TCP/IP, BACnet MS/TP, and Modbus RTU
- Ideal for steam applications
    - Energy (BTU) monitoring for real-time measurement of energy consumption; compute and output energy use
    - Easy installation & commission; hot tappable — no process shutdown
    - Loop powered to save on energy costs
- FM, FMc, ATEX, IECEx Approval


FOX® THERMAL

OIL & GAS | INDUSTRIAL | BIOGAS | WASTEWATER

# VORTIFOX - VF3 INSERTION

## FAST AND FLEXIBLE LIQUID, STEAM, AND GAS FLOW MEASUREMENT

Fox Thermal's VortiFox unique VF3 insertion vortex shedding flow meter measures the mass flow rate of any gas or liquid and is ideally suited for saturated or superheated steam. The VortiFox offers customers one instrument and one process connection, measuring five process parameters simultaneously: mass flow rate, temperature, pressure, volumetric flow rate, and fluid density.

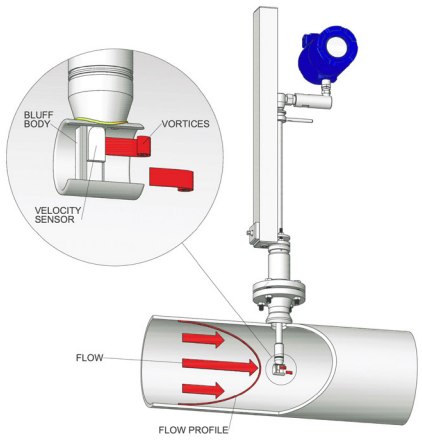
VortiFox is a true high performance, rugged, and reliable flow meter. The VF3 offers an optional hot tap version for easy install with no process shutdown. The VF3 is fully field-programmable, configurable, and features HART, Modbus RTU, Modbus TCP/IP, BACnet/IP, BACnet MS/TP protocols, and Power over Ethernet (PoE).

### THEORY OF OPERATION

Vortex flow meters measure fluid velocity using a principle of operation referred to as the von Kármán effect. It states that when flow passes by an obstruction in the flow path, vortices are generated in a repeating pattern.

In a Vortex flow meter, this obstruction is often referred to as a bluff body. The bluff body causes the process fluid to separate and form areas of alternating differential pressure known as vortices around the backside of the bluff body. In VortiFox vortex flowmeters, a sensitive piezoelectric crystal sensor detects these vortices. The frequency at which the vortices are shed is directly proportional to the flow velocity. With the fluid velocity and area of the pipe known, a volumetric flow rate is calculated.

With optional integrated temperature and pressure sensors, VortiFox vortex flowmeters can provide a compensated mass flow rate. With the energy monitoring option, VortiFox meters can also provide a reliable (BTU) energy measurement of water, thermal oils, and steam.




*VortiFox is available in insertion, inline, and remote styles. A reduced-bore inline style is also available for lower flow rates. See the VortiFox VF4 Inline datasheet for information on inline styles.*

Insertion style vortex flowmeters are a more economical option on large line sizes and can be installed under full process conditions by hot tap.

### VORTIFOX MODEL VF3-VTP

The Model VF3-VTP offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flow rate of gases, liquids, and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analog 4-20 mA outputs of five process measurements, including volumetric flow rate, mass flow rate, pressure, temperature, and density.

### VORTIFOX MODEL VF3-VT

The Model VF3-VT integrates a precision 1000 Ohm platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flow rates of saturated steam.

### VORTIFOX MODEL VF3-V

The Model VF3-V delivers a direct reading of volumetric flow rate — generally the most cost-effective solution for liquid flow monitoring — in applications ranging from general water flows to hydrocarbon fuel flow measurement.

### VORTIFOX MODEL VF3-EM

The Model VF3 Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The meter can be programmed to measure steam, hot water, or chilled water. The Model VF3-VTP flowmeter monitors one side of the process, either sent or returned, and uses the input from a second separate temperature sensor on the opposite leg of the process to calculate the change in energy. Selectable energy units include BTU, joules, calories, watt-hours, megawatt-hours and horsepower-hours. The local or remote electronics indicate two temperatures, delta-T, mass total, and energy total.

### VORTIFOX MODEL VF3-VTEP,VETEP

Similar to VF3-VTP but with the option for an external input (T or P) via RTD or 4-20mA or one of each.

# PRODUCT BENEFITS: VortiFox

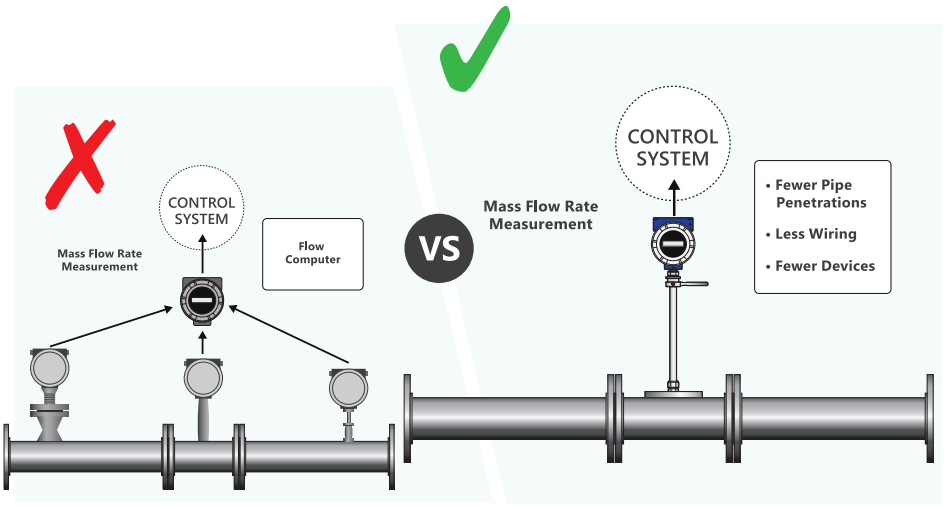
## Multiparameter Mass Flow Meter Benefits

Fewer Process Connections | Expanded Process Diagnostics | Ability to Compensate | Lower Cost Per Measurement

## The VortiFox Advantage

VortiFox simplifies what's needed for accurate and repeatable measurement.

- Insertion-type configurations with hot-tap option allow installation and maintenance without shutting down the process.
- Built-in flow computer with multiple outputs allows users to replace multiple instruments with a single flow meter.
- Single break in piping for lower cost of installation and ownership.
- Vortex shedding principle is stable and reliable because it has no moving parts.
- Capable of measuring at higher pressures than other technologies.
- High Turndown Ratio.
- Calibration is valid for the life of the meter.




## Process Variables & Measurement Outputs

VortiFox simplifies what's needed for accurate and repeatable measurement.

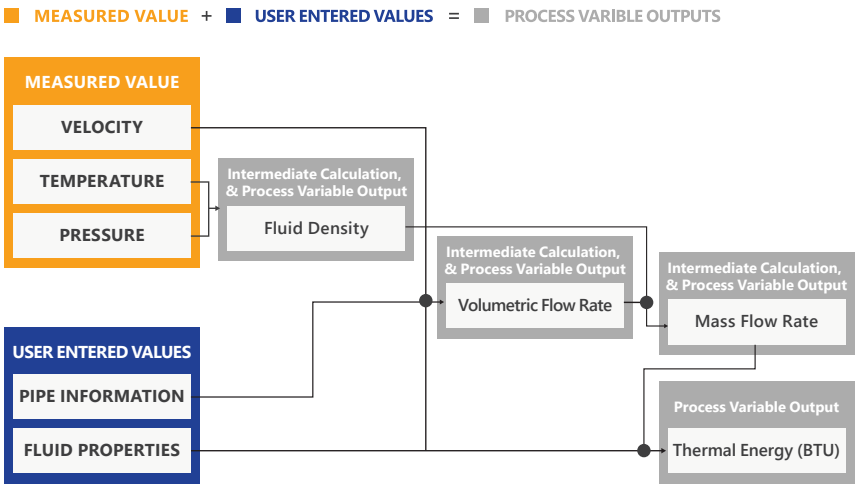
### Multiparameter measurement:

- Flow velocity
- Temperature
- Pressure
- Density
- Volumetric flow
- Mass flow
- Thermal Energy

### Measurement outputs:

- 4-20mA (up to 3, simultaneous)
- HART
- Modbus
- BACnet
- IP Comms
- Alarm Contacts

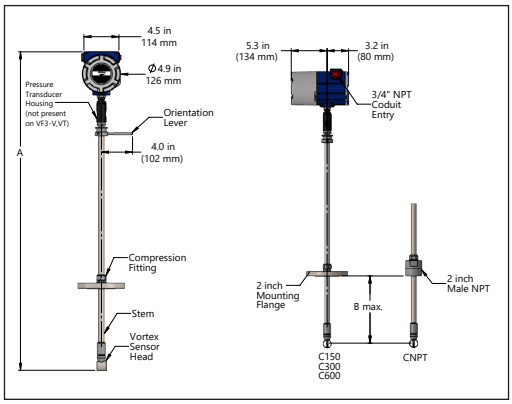
Using a mix of measured and user entered values, a vortex flow meter can provide a variety of process variable outputs.



# DIMENSIONS

## INSERTION STYLES

VF3 Compression, Flange or Male NPT

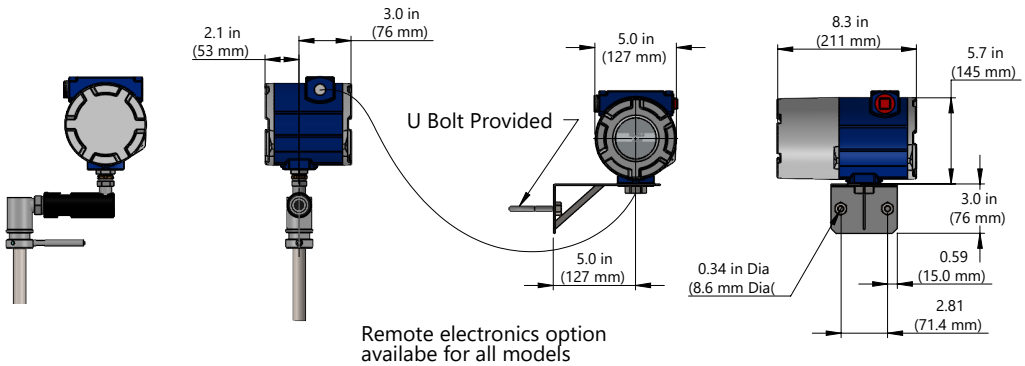



| VortiFox VF3 Insertion Meter Weight | | | |
|---|---|---|---|
| Connection Size | CL | SL | EL |
| CNPT / Compression / 2-in Male NPT | 13 (5.7) | 14.0 (6.2) | 15.0 (6.7) |
| C150 / Compression / 150 lb. Flange | 15 (6.8) | 16.0 (7.3) | 17.0 (7.8) |
| C300 / Compression / 300 lb. Flange | 17( 7.8) | 18.0 (8.3) | 19.0 (8.8) |
| C600 / Compression / 600 lb. Flange | 18 (8.2) | 19.0 (8.7) | 20.0 (9.2) |
| C900 / Compression / 900 lb. Flange | 31.0 (14.1) | 32.0 (14.5) | 33.0 (15.0) |
| C16 / Compression / DN50 PN16 Flange | 15 (6.8) | 16.0 (7.3) | 17.0 (7.8) |
| C40 / Compression / DN50 PN40 Flange | 17( 7.8) | 18.0 (8.3) | 19.0 (8.8) |
| C63 / Compression / DN50 PN63 Flange | 18 (8.2) | 19.0 (8.7) | 20.0 (9.2) |

| VortiFox VF3 Insertion Meter Sizes - V, VT, VTEP, VETEP | | | | | | |
|---|---|---|---|---|---|---|
| Model Code / Probe Seal / Process Connection | Compact Probe | | Standard Probe | | Extended Probe | |
| | A | B | A | B | A | B |
| CNPT / Compression / 2-in Male NPT | 21.6 (549) | 9.8 (249) | 38.0 (965) | 26.2 (665) | 50.0 (1270) | 38.2 (970) |
| C150 / Compression / 150 lb. Flange | 21.6 (549) | 10.9 (277) | 38.0 (965) | 27.3 (693) | 50.0 (1270) | 39.3 (998) |
| C300 / Compression / 300 lb. Flange | 21.6 (549) | 10.8 (274) | 38.0 (965) | 27.2 (691) | 50.0 (1270) | 39.2 (996) |
| C600 / Compression / 600 lb. Flange | 21.6 (549) | 10.4 (264) | 38.0 (965) | 26.8 (681) | 50.0 (1270) | 38.8 (986) |
| C900 / Compression / 900 lb. Flange | 21.6 (549) | 9.9 (251) | 38.0 (965) | 26.3 (668) | 50.0 (1270) | 38.3 (973) |
| C16 / Compression / DN50 PN16 Flange | 21.6 (549) | 10.9 (277) | 38.0 (965) | 27.3 (693) | 50.0 (1270) | 39.3 (998) |
| C40 / Compression / DN50 PN40 Flange | 21.6 (549) | 10.8 (274) | 38.0 (965) | 27.2 (691) | 50.0 (1270) | 39.2 (996) |
| C63 / Compression / DN50 PN63 Flange | 21.6 (549) | 10.4 (264) | 38.0 (965) | 26.8 (681) | 50.0 (1270) | 38.8 (986) |

| VortiFox VF3 Insertion Meter Sizes - VTP | | | | | | |
|---|---|---|---|---|---|---|
| Model Code / Probe Seal / Process Connection | Compact Probe | | Standard Probe | | Extended Probe | |
| | A | B | A | B | A | B |
| CNPT / Compression / 2-in Male NPT | 24.6 (625) | 9.8 (249) | 41.0 (1041) | 26.2 (665) | 53.0 (1346) | 38.2 (970) |
| C150 / Compression / 150 lb. Flange | 24.6 (625) | 10.9 (277) | 41.0 (1041) | 27.3 (693) | 53.0 (1346) | 39.3 (998) |
| C300 / Compression / 300 lb. Flange | 24.6 (625) | 10.8 (274) | 41.0 (1041) | 27.2 (691) | 53.0 (1346) | 39.2 (996) |
| C600 / Compression / 600 lb. Flange | 24.6 (625) | 10.4 (264) | 41.0 (1041) | 26.8 (681) | 53.0 (1346) | 38.8 (986) |
| C900 / Compression / 900 lb. Flange | 24.6 (625) | 9.9 (251) | 41.0 (1041) | 26.3 (668) | 53.0 (1348) | 38.3 (973) |
| C16 / Compression / DN50 PN16 Flange | 24.6 (625) | 10.9 (277) | 41.0 (1041) | 27.3 (693) | 53.0 (1348) | 39.3 (998) |
| C40 / Compression / DN50 PN40 Flange | 24.6 (625) | 10.8 (274) | 41.0 (1041) | 27.2 (691) | 53.0 (1348) | 39.2 (996) |
| C63 / Compression / DN50 PN63 Flange | 24.6 (625) | 10.4 (264) | 41.0 (1041) | 26.8 (681) | 53.0 (1348) | 38.8 (986) |

VF3 Remote

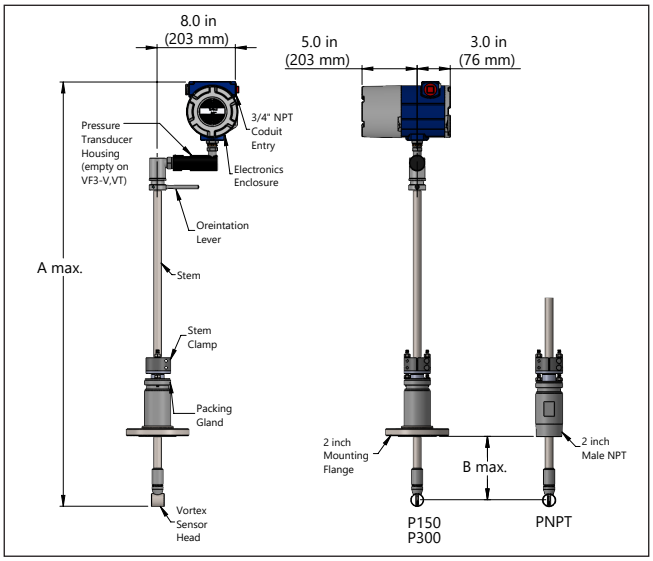



Remote electronics option availabe for all models

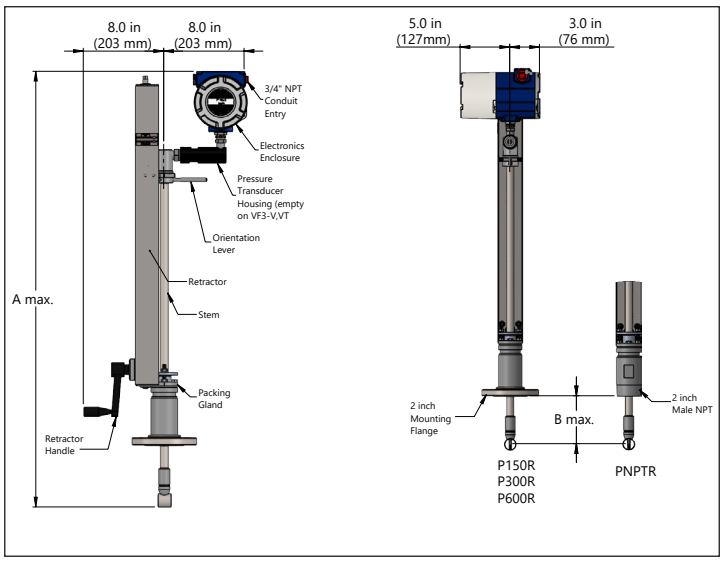
# DIMENSIONS

## INSERTION STYLES

VF3 Packing Gland, Flange or Male NPT




VF3 Packing Gland, Flange or Male NPT, Retractor




| VortiFox VF3 Insertion Meter Weight in lbs (kg) | | |
|---|---|---|
| Connection Size | SL | EL |
| **PNPT / Packing Gland / 2-in Male NPT** | 16.0 (7.1) | 17.0 (7.8) |
| **P150 / Packing Gland, 150 lb Flange** | 21.0 (9.4) | 22.0 (9.9) |
| **P300 / Packing Gland, 300 lb Flange** | 25.0 (11.3) | 26.0 (11.8) |
| **P16 / Packing Gland / DN50 PN 16 Flange** | 21.0 (9.4) | 22.0 (9.9) |
| **P40 / Packing Gland / DN50 PN40 Flange** | 25.0 (11.3) | 26.0 (11.8) |
| **PNPTR / Packing Gland / 2-in Male NPT w/ Retractor** | 25.0 (11.5) | 32.0 (14.5) |
| **P150R / Packing Gland / 150 lb. Flange w/ Retractor** | 30.0 (13.7) | 37.0 (16.7) |
| **P300R / Packing Gland / 300 lb. Flange w/ Retractor** | 34.0 (15.5) | 41.0 (18.5) |
| **P600R / Packing Gland / 600 lb Flange w/ Retractor** | 35.0 (16.0) | 42.0 (19.0) |
| **P16R / Packing Gland / DN50 PN16 Flange w/ Retractor** | 30.0 (13.7) | 37.0 (16.7) |
| **P40R / Packing Gland / DN50 PN40 Flange w/ Retractor** | 34.0 (15.5) | 41.0 (18.5) |
| **P63R / Packing Gland / DN50 PN63 Flange w/ Retractor** | 35.0 (16.0) | 42.0 (19.0) |

| VortiFox VF3 Insertion Meter Sizes | | | | |
|---|---|---|---|---|
| Model Code / Probe Seal / Process Connection | Standard Probe | | Extended Probe | |
| | A | B | A | B |
| **PNPT / Packing Gland / 2-in Male NPT** | 40.5 (1029) | 21.5 (546) | 52.5 (1334) | 33.5 (851) |
| **P150 / Packing Gland / 150 lb. Flange** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P300 / Packing Gland / 300 lb. Flange** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P16 / Packing Gland / DN50 PN 16 Flange** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P40 / Packing Gland / DN50 PN40 Flange** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **PNPTR / Packing Gland / 2-in Male NPT w/ Retractor** | 40.5 (1029) | 21.5 (546) | 52.5 (1334) | 33.5 (851) |
| **P150R / Packing Gland / 150 lb. Flange w/ Retractor** | 40.5 (1029) | 21.1 (546) | 52.5 (1334) | 33.1 (841) |
| **P300R / Packing Gland / 300 lb. Flange w/ Retractor** | 40.5 (1029) | 21.1 (546) | 52.5 (1334) | 33.1 (841) |
| **P600R / Packing Gland / 600 lb Flange w/ Retractor** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P16R / Packing Gland / DN50 PN16 Flange w/ Retractor** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P40R / Packing Gland / DN50 PN40 Flange w/ Retractor** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |
| **P63R / Packing Gland / DN50 PN63 Flange w/ Retractor** | 40.5 (1029) | 21.1 (536) | 52.5 (1334) | 33.1 (841) |

# PERFORMANCE SPECIFICATIONS

## ACCURACY

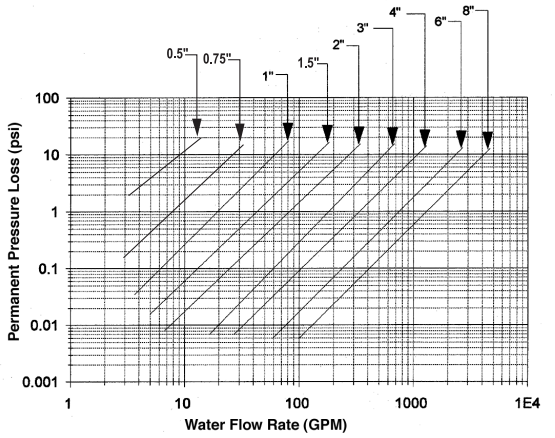
| Process Variables | VF3 Insertion Meters[1] | |
|---|---|---|
| | Liquids | Gas and Steam |
| **Mass Flow Rate** | ± 1.5% of rate over a 30:1 range[3] | ± 2.0% of rate[2] over a 30:1 range[3] |
| **Volumetric Flow Rate** | ± 1.2% of rate over a 30:1 range[3] | ± 1.5% of rate over a 30:1 range[3] |
| **Temperature** | ± 2°F (± 1°C) | ± 2°F (± 1°C) |
| **Pressure** | ± 0.3% of transducer full scale | ± 0.3% of transducer full scale |
| **Density** | ± 0.3% of reading | ± 0.5% of reading[2] |

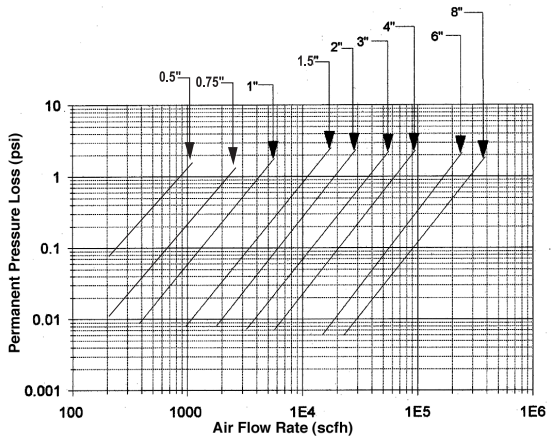
Notes: (1) Accuracies stated are for the total mass flow through the pipe. (2) Over 50 to 100% of the pressure transducer's full scale. (3) Nominal rangeability is stated. (4) Precise rangeability depends on fluid and pipe size.

## PROCESS TRANSDUCER PRESSURE

| Pressure Sensor Ranges [1] psia (bara) | | | |
|---|---|---|---|
| Full Scale Operating Pressure | | Maximum Over-Range Pressure | |
| psia | (bara) | psia | (bara) |
| 30 | 2 | 60 | 4 |
| 100 | 7 | 200 | 14 |
| 300 | 20 | 600 | 40 |
| 500 | 35 | 1000 | 70 |
| 1500 | 100 | 2750 | 175 |

Note: (1) To maximize accuracy, specify the lowest full scale operating pressure range for the application. To avoid damage, the flow meter must never be subjected to pressure above the over-range pressure shown above.




## REPEATABILITY

Mass Flow Rate . . . . . ± 0.2% of reading
Volumetric Flow Rate . . . . . ± 0.1% of reading
Temperature . . . . . ± 0.2° F (± 0.1° C)
Pressure . . . . . ± 0.05% of full scale
Density . . . . . ± 0.1% of reading

## STABILITY OVER 12 MONTHS

Mass Flow Rate . . . . . ± 0.2% of reading maximum
Volumetric Flow Rate . . . . . Negligible error
Temperature . . . . . ± 0.9° F (± 0.5° C) maximum
Pressure . . . . . ± 0.1% of full scale maximum
Density . . . . . ± 0.1% of reading maximum

## RESPONSE TIME

Adjustable from 1 to 100 seconds

**Differential Pressure Requirements, △ P**
**Low permanent pressure drop.**

## MATERIAL COMPATABILITY

Any gas, liquid or steam compatible with 316L stainless steel. Not recommended for multi-phase fluids.

## VELOCITY RANGE

Smart electronics corrects for lower flow down to a Reynolds number of 5000. The Reynolds number is calculated using the fluid's actual temperature and pressure monitored by the meter. Rangeability depends on the fluid, process connections, and pipe size. Consult factory for your application. Velocity rangeability under ideal conditions is as follows:

Liquids 30:1
1 foot per second velocity minimum
30 feet per second velocity maximum

Gases 30:1
300 feet per second velocity maximum
Minimum is fluid dependent: range must be calculated using below equations:

$$\frac{5}{\sqrt{\text{density (lb/ft}^3\text{)}}} \qquad \frac{6.1}{\sqrt{\text{density (kg/m}^3\text{)}}}$$

## PRESSURE DROP EQUATIONS

$\Delta P = 0.00024 \rho V^2$ English Units ($\Delta P$ in psi, $\rho$ in lb/ft$^3$, V in ft/sec)
$\Delta P = 0.00011 \rho V^2$ Metric Units ($\Delta P$ in bar, $\rho$ in kg/m$^3$, V in m/sec)

## INSTALLATION SPECIFICATIONS

| Straight Pipe Length Requirements upstream/downstream (in number of internal diameters, D) | | |
|---|---|---|
| | Up | Down |
| One 90° elbow before meter | 10 D | 5 D |
| Two 90° elbows before meter | 15 D | 5 D |
| Two 90° elbows before meter out of plane (If three 90° bends present, double recommended length) | 30 D | 10 D |
| Reduction before meter | 10 D | 5 D |
| Expansion before meter | 20 D | 5 D |
| Regulator or valve partially closed before meter (If valve wide open, base length requirements on fitting directly preceding it.) | 30 D | 10 D |

# PERFORMANCE SPECIFICATIONS

## WETTED MATERIALS
316L stainless steel
Teflon® packing gland below 500°F (260°C)
Graphite packing gland above 500°F (260°C)
Teflon-based thread sealant on pressure transducer

## ENCLOSURE
NEMA 4X/7 (IP66) cast enclosure

## ELECTRICAL PORTS
Two 3/4-inch female NPT ports

## PROCESS CONNECTIONS
2" MNPT, 150-lb, 300-lb, 600-lb, 900-lb

Note: Refer to Model Codes and Accessories for compatibility of process connections with other features.

## MOUNTING CONNECTIONS
Meter must be perpendicular within ± 5° of the pipe centerline

## APPROVALS
**FM, FMC Approval**
Explosion proof for Class I, Division 1,
Groups B, C & D.
Dust-ignition proof for Class II/III, Division 1,
Groups E, F & G.
NEMA Type 4X and IP66
T6 at Tamb = -40°F to 60°C

**ATEX Approval**
II 2 G Ex d IIB + H2 T6
II 2 D EX tD A21 IP66 T85°C, Ta = -40°F to 60°C

**IECEx Approval**
Ex d IIB + H2 T6
Ex tD A21 IP66 T85°C, Ta = -40°F to 60°C

**CE Approval**

**Optional Certifications**
Construction and inspection (ANSI/ASME B31.3)

Materials (NACE MR-01-75(90)

# OPERATING SPECIFICATIONS

Any gas, liquid, or steam compatible with 316L stainless steel, C276 hastelloy, or A105 carbon steel. Not recommended for multi-phase fluids.

## POWER REQUIREMENTS
DCL option: 12-36 VDC, 25mA, 1W max, loop powered (single output)
DCH option: 12-36 VDC, 300 mA, 9W max, (multiple outputs)
DCHPOE option: 12-28 VDC or Power over Ethernet, 5W max (multiple outputs)
AC option: 100-240 VAC, 50/60Hz line power, 5W (multiple outputs)

## MULTIPARAMETER MASS OPTIONS
Specific power supply and wiring recommendations are dependent on the process requirements and stack type/electronics ordered. Refer to the model codes section for power requirements stated for each stack type.
Use a Class 2 isolated power supply that is grounded, provides DC output, and has no more than 10% output ripple.

Installation (Over-voltage) Category II for transient over-voltages.

AC & DC Mains supply voltage fluctuations are not to exceed ±10% of the rated supply voltage range.

User is responsible for the provision of an external disconnect means, disconnect line 1 and line 2 when 220 / 240 VAC power is used, also provide over-current protection for the equipment (both AC and DC models).

## DISPLAY
Alphanumeric 2 line x 16 character LCD digital display.
Six push buttons for full field configuration.
Pushbuttons can be operated with magnetic wand without removal of enclosure covers.
Switches (up, down, right, left, enter, exit).
Display can be mounted in 90° to 180° intervals for better viewing.

## PROCESS FLUID TEMPERATURE

| | |
|---|---|
| Process Fluid | Standard Temperature Sensor:<br>-330°F to 500°F (-200°C to 260°C)<br>High Temperature Sensor:<br>Up to 750°F (400°C) |

## AMBIENT TEMPERATURE

| | |
|---|---|
| Ambient | Operating:<br>-40°F to 140°F (-40° to 60°C)<br>Storage:<br>-40°F to 185°F (-40° to 85°C)<br>0-98% relative humidity, noncondensing conditions |

## OUTPUT SIGNALS[(1)]

| | |
|---|---|
| Analog | One to three field rangeable, simultaneous linear 4-20 mA output signals (1000 ohms maximum loop resistance) selected by user from the six parameters—mass flow rate, volumetric flow rate, temperature, pressure, density, and total/totalizer count. |
| Pulse | Pulse output for totalization is a 50-millisecond duration pulse operating a solid-state relay capable of switching 40 VDC, 40 mA maximum HART standard, optional MODBUS RTU. |
| Frequency | Frequency output is used for a remote counter. It can be scaled to output a 1 to 10 kHz signal proportional to mass or volume flow, temperature, pressure, or density. |

Note: (1) All outputs are optically isolated and require external power for operation.

# OPERATING SPECIFICATIONS

## ALARMS
Up to three programmable solid-state relays for high, low, or window alarms capable of switching to 40 VDC, 40 mA maximum

## TOTALIZER
Based on user-determined flow units, nine full digits, with rollover at 999,999,999; total stored in non-volatile memory.

## VOLUMETRIC OR LOOP POWERED MASS
One analog, one totalizer pulse, HART
HART (with DD)
Modbus
BACnet

## TURNDOWN
Turndown is application dependent. Consult Fox Thermal Sizing Program for exact values.
Turndown can exceed 100:1.

## FLOW RATES
Typical mass flow ranges are given in the following table. Precise flow ranges depend on the fluid and pipe size. VF3 insertion meters are applicable to pipe sizes from 2 inches and greater. Consult factory for sizing program..

| Water Minimum and Maximum Flow Rates | | | | | | |
|---|---|---|---|---|---|---|
| | 3-inch | 6-inch | 8-inch | 12-inch | 16-inch | 24-inch |
| **gpm** | 21<br>618 | 81<br>2437 | 142<br>4270 | 317<br>9501 | **501**<br>**15043** | **1138**<br>**34144** |
| | 80 mm | 150mm | 200mm | 300mm | 400mm | 600mm |
| **$m^3$/hr** | 5.2<br>157 | 20.4<br>614 | 35.4<br>1062 | 79.2<br>2337 | 125<br>3753 | 284<br>8537 |

| Saturated Steam Minimum and Maximum Flow Rates (lb/hr) | | | | | | |
|---|---|---|---|---|---|---|
| Pressure | 3-inch | 6-inch | 8-inch | 12-inch | 16-inch | 24-inch |
| **5 psig** | 205<br>2721 | 800<br>10633 | 1385<br>18412 | 3099<br>41196 | 4893<br>65039 | 11132<br>147954 |
| **100 psig** | 468<br>14246 | 1831<br>55674 | 3170<br>96407 | 7092<br>215703 | 11197<br>340546 | 25472<br>774698 |
| **200 psig** | 632<br>25948 | 2471<br>101405 | 4278<br>175595 | 9572<br>392880 | 15111<br>620268 | 34377<br>1411029 |
| **300 psig** | 762<br>37652 | 2976<br>147145 | 5153<br>254799 | 11530<br>570093 | 18203<br>900047 | 41410<br>2047489 |
| **400 psig** | 873<br>49494 | 3412<br>193420 | 5908<br>334930 | 13219<br>749382 | 20870<br>1183103 | 47477<br>2691404 |
| **500 psig** | 974<br>61543 | 3805<br>240507 | 6588<br>416468 | 14741<br>931816 | 23272<br>1471125 | 52942<br>3346615 |

| Saturated Steam Minimum and Maximum Flow Rates (kg/hr) | | | | | | |
|---|---|---|---|---|---|---|
| Pressure | 80 mm | 150mm | 200mm | 300mm | 400mm | 600mm |
| **0 barg** | 81<br>938 | 316<br>3667 | 548<br>6350 | 1226<br>14209 | 1936<br>22432 | 4404<br>51039 |
| **5 barg** | 187<br>4986 | 729<br>19486 | 1263<br>33742 | 2826<br>75495 | 4461<br>119189 | 10151<br>271187 |
| **10 barg** | 249<br>8859 | 972<br>34620 | 1683<br>59949 | 3767<br>134132 | 5947<br>211764 | 13530<br>481821 |
| **15 barg** | 298<br>12700 | 1164<br>49629 | 2016<br>85939 | 4510<br>192283 | 7120<br>303570 | 16200<br>690705 |
| **20 barg** | 340<br>16550 | 1329<br>64676 | 2301<br>111995 | 5148<br>250581 | 8128<br>395609 | 18493<br>900119 |
| **30 barg** | 413<br>24357 | 1612<br>95187 | 2791<br>164827 | 6246<br>368789 | 9860<br>582234 | 22435<br>1324739 |

| Air Minimum and Maximum Flow Rates (scfm)<br>Air at 70° F and 1 atmosphere. | | | | | | |
|---|---|---|---|---|---|---|
| Pressure | 3-inch | 6-inch | 8-inch | 12-inch | 16-inch | 24-inch |
| **0 psig** | 56<br>924 | 220<br>3611 | 381<br>6253 | 852<br>13991 | 1345<br>22089 | 3059<br>50250 |
| **100 psig** | 157<br>7236 | 615<br>28379 | 1065<br>48696 | 2383<br>109564 | 3763<br>172977 | 8560<br>393500 |
| **200 psig** | 216<br>13588 | 843<br>53101 | 1460<br>91950 | 3266<br>205732 | 5156<br>324804 | 11729<br>738886 |
| **300 psig** | 262<br>19974 | 1022<br>78059 | 1770<br>135169 | 3960<br>302430 | 6251<br>477467 | 14221<br>1086176 |
| **400 psig** | 301<br>26391 | 1175<br>103136 | 2034<br>178593 | 4551<br>399588 | 7186<br>630859 | 16346<br>1435121 |
| **500 psig** | 335<br>32834 | 1310<br>128314 | 2269<br>222191 | 5077<br>497136 | 8015<br>784865 | 18233<br>1785464 |

| Air Minimum and Maximum Flow Rates (nm3/hr)<br>Air at 20° C and 1 atmosphere. | | | | | | |
|---|---|---|---|---|---|---|
| Pressure | 80 mm | 150mm | 200mm | 300mm | 400mm | 600mm |
| **0 barg** | 89<br>1463 | 347<br>5716 | 601<br>9897 | 1345<br>22145 | 2124<br>34962 | 4833<br>79547 |
| **5 barg** | 217<br>8702 | 847<br>34006 | 1467<br>58885 | 3282<br>131751 | 5181<br>208004 | 11788<br>473266 |
| **10 barg** | 294<br>15975 | 1148<br>62430 | 1987<br>108105 | 4446<br>241878 | 7020<br>381870 | 15972<br>868857 |
| **15 barg** | 355<br>23280 | 1385<br>90979 | 2399<br>157542 | 5368<br>352487 | 8474<br>556497 | 19282<br>1266182 |
| **20 barg** | 407<br>30615 | 1589<br>119642 | 2751<br>207175 | 6156<br>463539 | 9718<br>731823 | 22112<br>1665095 |
| **30 barg** | 495<br>45361 | 1934<br>177268 | 3349<br>306961 | 7493<br>686801 | 11829<br>1084302 | 26915<br>2467081 |

## PROCESS FLUID PRESSURE

| VF3 Sizes | | | | |
|---|---|---|---|---|
| Probe Seal | Process Connection | Material | Rating | Ordering Code |
| **Compression Fitting** | 2-inch male NPT | 316L SS | ANSI 600 lb | CNPT |
| | 2-inch 150 lb flange | 316L SS | ANSI 150 lb | C150 |
| | 2-inch 300 lb flange | 316L SS | ANSI 300 lb | C300 |
| | 2-inch 600 lb flange | 316L SS | ANSI 600 lb | C600 |
| | 2-inch 900 lb flange | 316L SS | ANSI 900 lb | C900 |
| **Packing Gland** | 2-inch male NPT | 316L SS | 50 psig | PNPT |
| | 2-inch 150 lb flange | 316L SS | 50 psig | P150 |
| | 2-inch 300 lb flange | 316L SS | 50 psig | P300 |
| **Packing Gland & Removable Retractor** | 2-inch male NPT | 316L SS | ANSI 300 lb | PNPT, RR |
| | 2-inch 150 lb flange | 316L SS | ANSI 150 lb | P150, RR |
| | 2-inch 300 lb flange | 316L SS | ANSI 300 lb | P300, RR |
| **Packing Gland & Permanent Retractor** | 2-inch male NPT | 316L SS | ANSI 600 lb | PNPTR |
| | 2-inch 150 lb flange | 316L SS | ANSI 150 lb | P150R |
| | 2-inch 300 lb flange | 316L SS | ANSI 300 lb | P300R |
| | 2-inch 600 lb flange | 316L SS | ANSI 600 lb | P600R |

# INSERTION CONFIGURATIONS

Features

VF3 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

**Parent** 1 2 3 4 5 6 7 8 9

Instructions: To order a VF3 please fill in each number block by selecting the codes from the corresponding features below and following pages.

| Feature 1: Multivariable Options | |
|---|---|
| Code | Description |
| V | Base Velocity Flowmeter for liquid, gas, and steam |
| VT | Velocity and Temperature Sensors |
| VTP | Velocity, Temperature, and Pressure Sensors |
| VTEP | Velocity, Temperature, and External 4-20mA input (T or P) |
| VETEP | Velocity, External RTD Temperature input, External 4-20mA input (T or P) |
| VT-EM | Energy output options |
| VTP-EM | Energy options with Pressure Sensor |
| VTEP-EM | Velocity, Temperature, and External 4-20mA input (T or P) |
| VETEP-EM | Velocity, External RTD Temperature input, External 4-20mA input (T or P) |

| Feature 2: Probe Length | |
|---|---|
| Code | Description |
| SL | Standard Length |
| CL | Compact Length |
| EL | Extended Length |

| Feature 3: Electronics Enclosure | |
|---|---|
| Code | Description |
| L | NEMA 4X, IP66 Enclosure |
| R ( ) | Remote Electronics NEMA 4X, IP66, Specify cable length in parenthesis |

| Feature 4: Diplay Options | |
|---|---|
| Code | Description |
| DD | Digital Display and Programming Buttons |

| Feature 5: Input Power | |
|---|---|
| Code | Description |
| DCL | 12-36 VDC, 25mA, 1W max. required on loop powered meters, 1AHL only |
| DCH | 12-36 VDC, 300mA, 9W max. - use with 1AH, 1AM, 3AH, 34AM |
| DCHPOE | 12-28 VDC or Power over Ethernet, 5 Watts max, required on 1AMIP, 1ABIP, 3AMIP, 3ABIP |
| AC | 100-240 VAC, 50/60 Hz line power, 5W max. - use with 1AH, 1AM, 3AH, 3AM |

| Feature 6: Output | |
|---|---|
| Code | Description |
| 1AHL | Loop powered option - one analog output (4-20mA), one scaled frequency, one pulse, HART, DCL input power only |
| 1AH | One analog output (4-20mA), one alarm, one pulse, HART Communication Protocol, DCH or AC option only* |
| 1AM | One analog output (4-20mA), one alarm, one pulse, MODBUS RTU Communication Protocol, DCH or AC option only* |
| 1AMIP | One analog output (4-20mA), one alarm, one pulse, MODBUS TCP/IP Communication Protocol, DCHPOE ONLY* |
| 1AB | One analog output (4-20mA), one alarm, one pulse, BACnet MS/TP Communication Protocol, DCH or AC option only* |
| 1ABIP | One analog output (4-20mA), one alarm, one pulse, BACnet/IP Communication Protocol, DCHPOE ONLY* |
| 3AH | Three analog outputs (4-20mA), three alarms, one pulse, HART (VT,VTP only), DCH or AC option only* |
| 3AM | Three analog outputs (4-20mA), three alarms, one pulse, MODBUS RTU (VT,VTP only), DCH or AC option only* |
| 3AMIP | Three analog outputs (4-20mA), three alarms, one pulse, MODBUS TCP/IP (VT,VTP only), DCHPOE ONLY* |
| 3AB | Three analog outputs (4-20mA), three alarms, one pulse, BACnet MS/TP (VT,VTP only), DCH or AC option only* |
| 3ABIP | Three analog outputs (4-20mA), three alarms, one pulse, BACnet/IP (VT,VTP only), DCHPOE ONLY* |

*includes scaled frequency output

# INSERTION CONFIGURATIONS

| Feature 7: Temperature Options | |
|---|---|
| Code | Description |
| ST | Standard temperature, Process Temperature - 330 to 500°F (-200 to 260°C) |
| HT | High temperature, Process Temperature to 750°F (400°C) |

| Feature 8: Pressure Options | |
|---|---|
| Code | Description |
| P0 | No pressure sensor |
| P1 | Maximum 30 psia (2 bara), Proof 60 psia (4 bara) |
| P2 | Maximum 100 psia (7 bara), Proof 200 psia (14 bara) |
| P3 | Maximum 300 psia (20 bara), Proof 600 psia (41 bara) |
| P4 | Maximum 500 psia (34 bara), Proof 1000 psia (64 bara) |
| P5 | Maximum 1500 psia (100 bara), Proof 2500 psia (175 bara) |

| Feature 9: Process Connections | |
|---|---|
| Code | Description |
| CNPT | Compression, 2 inch NPT |
| C150 | Compression, 2 inch 150lb Flange |
| C16 | Compression, DN50 PN16 Flange |
| C300 | Compression, 2 inch 300lb Flange |
| C40 | Compression, DN50 PN40 Flange |
| C600 | Compression, 2 inch 600lb Flange |
| C63 | Compression, DN50 PN63 Flange |
| C900 | Compression, 2 inch 900lb Flange |
| PNPT | Packing Gland, 2 inch NPT |
| P150 | Packing Gland, 2 inch 150lb Flange |
| P16 | Packing Gland, DN50 PN16 Flange |
| P300 | Packing Gland, 2 inch 300lb Flange |
| P40 | Packing Gland, DN50 PN40 Flange |
| PNPTR | Packing Gland, 2 inch NPT, Retractor |
| P150R | Packing Gland, 2 inch 150lb Flange, Retractor |
| P16R | Packing Gland, DN50 PN16 Flange, Retractor |
| P300R | Packing Gland, 2 inch 300lb Flange, Retractor |
| P40R | Packing Gland, DN50 PN40 Flange, Retractor |
| P600R | Packing Gland,  2 inch 600lb Flange, Retractor |
| P63R | Packing Gland, DN50 PN63 Flange, Retractor |

JIS flanges are available upon request.

Make downtime a thing of the past.

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