

ULTRASONIC DOPPLER FLOWMETER

FD-400 Series



- ✓ Non-Intrusive, Clamp-On Transducer for Most Pipes from 6 to 3050 mm ($\frac{1}{8}$ to 120")
- ✓ Insertion Probe Transducer Also Available
- ✓ Wide Measuring Range of 0.05 to 9 mps (0.15 to 30 fps)
- ✓ Accuracy: $\pm 2\%$ of Calibrated Span
- ✓ Configuration and Total Stored in Non-Volatile Flash ROM
- ✓ NEMA 4X (IP66) Outdoor Enclosure
- ✓ Provisions for Up to 4 Meters in a Single Piping System
- ✓ NIST Certificate

The FD-400 Series ultrasonic doppler flowmeters measure the flow of liquids that contain sound reflectors, suspended solids, or gas bubbles larger than 100 microns. These sophisticated instruments automatically adjust filtering and gain settings to produce reliable readings in a wide range of liquid and reflector conditions.

The FD-400 flowmeter transmits ultrasonic sound through the pipe wall or from the probe tip into the flowing liquid by using piezoelectric crystals contained in the transducer and probe tip. The sound is then reflected by sonic reflectors suspended in the liquid and recorded by the receiver. If the sonic reflectors are moving within the sound transmission path, sound waves will be reflected at a frequency shifted (Doppler frequency) from the transmitted frequency. The difference between the 2 frequencies is directly proportional to the speed of the sonic reflectors, resulting in a liquid flow rate that is converted to various user-defined units.



FD-400, shown smaller than actual size.



FD-400C-SML, shown smaller than actual size.



FD-400C-STD, shown smaller than actual size.

Configuration of the FD-400 is accomplished via the front-panel keypad. A 2-line backlit LCD displays rate and total in user-selected units. Power supply options include AC and DC. Optional outputs include 4 to 20 mA, relays, and rate pulse. Two transducer styles are available. The FD-400C clamp-on, non-intrusive transducer is recommended for most metal or plastic pipes. The FD-400C has a

NEMA 6P (IP68) rating and is available in a high-temperature version, "HT". The user can place these clamp-on transducers up to 305 m (1000') from the display enclosure. The FD-400I insertion probe transducer should be used on piping systems that do not permit ultrasonic penetration. The FD-400I inserts into the pipe wall and comes into direct contact with the flowing liquid.

SPECIFICATIONS

GENERAL

Measuring Principle:

Doppler ultrasonic

Flow Velocity Range:

0.05 to 9 mps (0.15 to 30 fps)

Accuracy:

±2% FS over calibrated span

Liquid Types:

Liquids containing 100 ppm of useful sonic-suspended reflectors greater than 100 microns (see page E-4 for details)

MONITOR

Enclosure: NEMA 4X (IP66), polycarbonate, stainless steel, brass, plated-steel mounting brackets

Dimensions: 178 H x 146 W x 99 mm D (7.00 x 5.75 x 3.88")

Power Supply: 115/230 Vac,

50/60 Hz ±15% @ 5 VA max;

12 to 28 Vdc @ 2.5 VA max

Display: 2-line x 8-character LCD;

LED backlighting; top row, 7-segment

18 mm (0.7"); bottom row, 14-segment

9 mm (0.35"); 8-digit rate, 8-digit total (resettable)

Units: User configured—feet, gallons, ft³, mil-gal, meters, liters, mil ft³, m³, mil-liters, acre-feet, oil barrels (42 gallon), liquor barrels (32.5 gallons), lb, kg

Rate:

Interval—second, minute, hour, day

Totalizer exponent: E⁻² to E⁺⁶

Response Time:

User selectable, 1 to 60 seconds

Outputs: 4 to 20 mA, 800 Ω max;

internal or external power supply;

12-bit resolution; optically isolated

Dual Relay: Independently configured; form "C", 200 Vac @ 0.5 A resistive; rate alarm, totalizer pulse, error

Rate Pulse: 2 output types— 500 mVac or open collector; 2500 Hz max; 12-bit resolution; 500 mV AC into 2 kΩ min; open collector 1 A at 100 V max

Multiple Meters: Synchronization provision included—used for multiple meter/single pipe system; up to 4 meters may be interconnected to 30 m (100') apart

Keypad: 4 pushbutton keys

Operating Temperature: General purpose, 40 to 85°C (40 to 185°F)

TRANSDUCERS

Type: Compression-mode ultrasonic, 625 kHz

Housing Material:

Standard Clamp-On: NEMA 6P (IP68), -40 to 100°C (-40 to 210°F), CPVC, Utem®, nylon, PVC (cable jacket), aluminum (small pipe)

High-Temp Clamp-On:

NEMA 4 (IP65), -40 to 200°C (-40 to 400°F), Vespel®, anodized aluminum, nickel-plated brass, PFA (cable jacket)

Doppler Probe:

NEMA 6 (IP67) -40 to 100°C (-40 to 210°F); 700 psi (48 bar) max, 316 SS, Utem®, FKM, nylon, PVC (cable jacket)

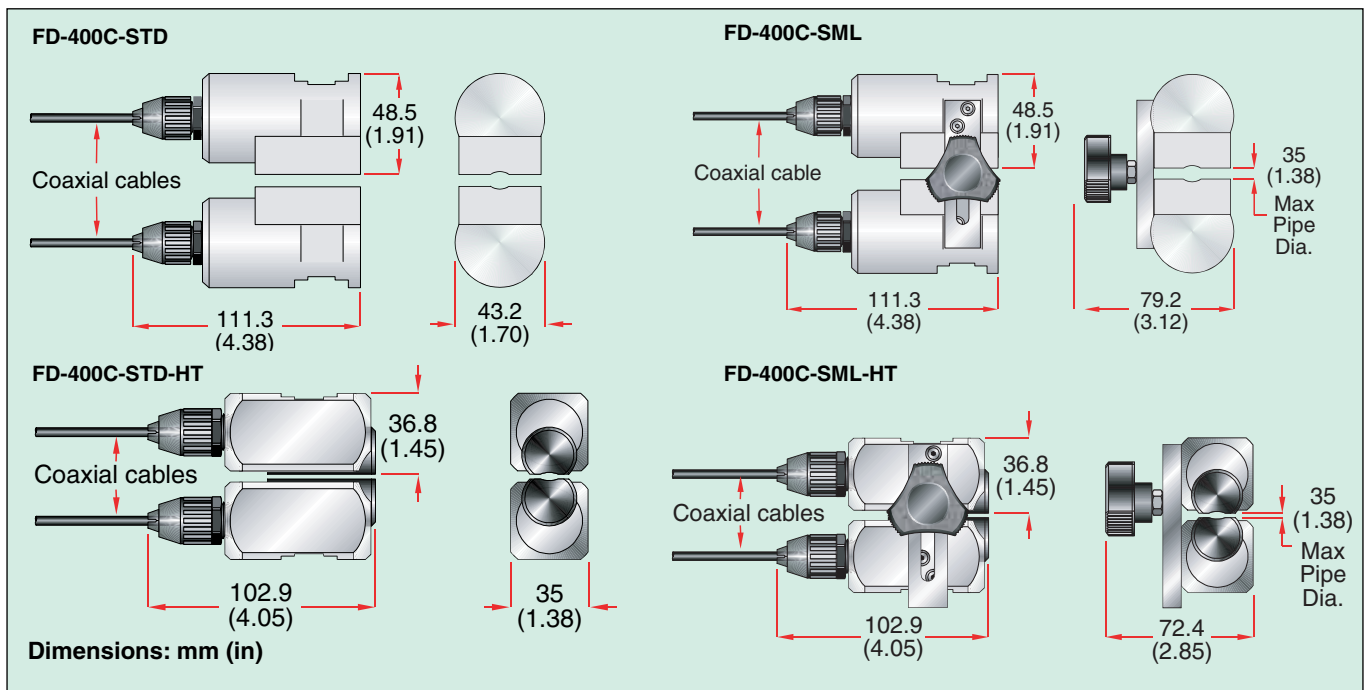
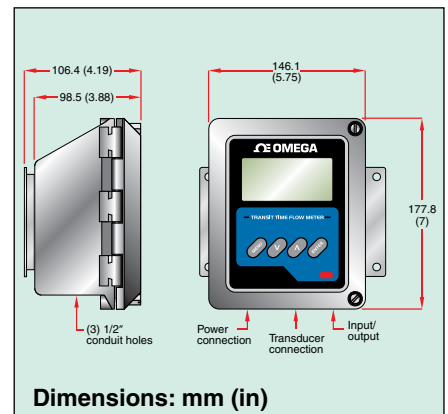
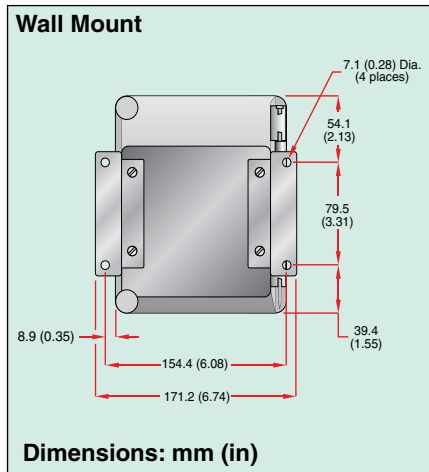
Optional Flexible Armored Conduit:

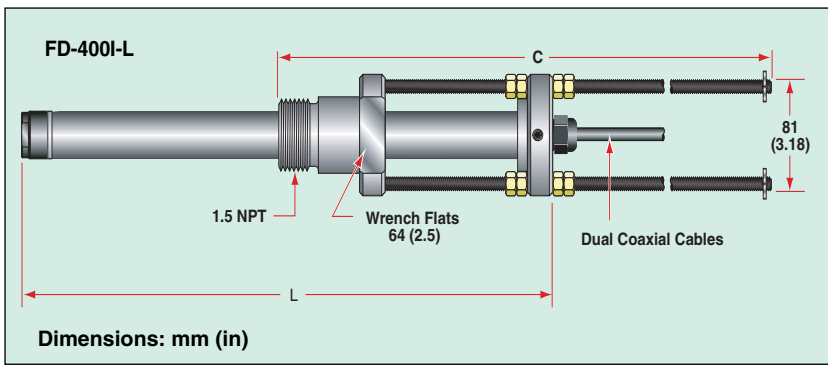
Zinc-plated steel, PVC

Cable Length:

Standard Lengths:

6 m (20') standard





Model	L mm (in)	C mm (in)
FD-400I-8	241 (9.50)	287 (11.31)
FD400I-18	495 (19.50)	541 (21.31)
FD-400I-28	749 (29.50)	795 (31.31)
FD-400I-38	1003 (39.50)	1049 (41.31)
FD-400I-48	1257 (49.50)	1303 (51.31)

Rate Indicator/Totalizer (Transducer Sold Separately)

To Order Visit omega.com/fd-400 for Pricing and Details

Model No.	Description
FD-400	Ultrasonic rate and totalizer
FD-410	Rate and totalizer with 4 to 20 mA output
FD-411	Rate and totalizer with two 4 to 20 mA outputs
FD-412	Rate and totalizer with 4 to 20 mA and 2 relay outputs
FD-413	Rate and totalizer with 4 to 20 mA and pulse outputs
FD-420	Rate and totalizer with 2 relay outputs
FD-422	Rate and totalizer with 4 relay outputs
FD-423	Rate and totalizer with 2 relays and a pulse output
FD-430	Rate and totalizer with pulse output
FD-433	Rate and totalizer with 2 pulse outputs

Comes complete with wall mount bracket, NIST certificate and operator's manual.

For units with 230 Vac power, add "-230VAC" to the model number, no extra charge.

For units with 24 Vdc power, add "-24VDC" to the model number, no extra charge.

Ordering Example: FD-400-230VAC, ultrasonic rate and totalizer with 230 Vac power supply.

Clamp-On Transducers and Accessories

Model No.	Description
FD-400C-STD	Standard-size clamp-on transducer set, 25 mm to 3 m (1 to 120")
FD-400C-SML	Small-pipe clamp-on transducer set, 6 to 25 mm (¼ to 1")
FD-400C-STD-HT	Standard-size clamp-on transducer set, 25 mm to 3 m (1 to 120")
FD-400C-SML-HT	Small-pipe clamp-on transducer set for up to 200°C (400°F), 6 to 25 mm (¼ to 1")

For transducers with 50' cable, add "-50FT" to the model number for additional cost.

For transducers with 100' cable, add "-100FT" to the model number for additional cost.

Armored cable and longer lengths available; consult Engineering.

Ordering Example: FD-400C-STD-50FT, standard-size clamp-on transducer set and 50' cable.

Insertion-Style Transducers and Accessories

Model No.	Description
FD-400C-STD	Standard-size clamp-on transducer set, 25 mm to 3 m (1 to 120")
FD-400C-SML	Small-pipe clamp-on transducer set, 6 to 25 mm (¼ to 1")
FD-400C-STD-HT	Standard-size clamp-on transducer set, 25 mm to 3 m (1 to 120")
FD-400C-SML-HT	Small-pipe clamp-on transducer set for up to 200°C (400°F), 6 to 25 mm (¼ to 1")
FD-400I-8	Insertion transducer sensor 203 mm (8")
FD-400I-18	Insertion transducer sensor 457 mm (18")
FD-400I-28	Insertion transducer sensor 711 mm (28")
FD-400I-38	Insertion transducer sensor 965 mm (38")
FD-400I-48	Insertion transducer sensor 1.2 m (48")
FD-400I-CR-18	Insertion crank for FD-400I-18
FD-400I-CR-28	Insertion crank for FD-400I-28
FD-400I-CR-38	Insertion crank for FD-400I-38
FD-400I-CR-48	Insertion crank for FD-400I-48
FD-400I-BV	Bronze valve isolation kit 1½ NPT
FD-400I-SSV	Stainless steel valve isolation kit 1½ NPT

For transducers with 15 m (50') cable, add "-50FT" to the model number for additional price..

For transducers with 130 m (100') cable, add "-100FT" to the model number for additional cost.

Armored cable and longer lengths available; consult Engineering.

Ordering Example: FD-400I-8-50FT, insertion transducer sensor 8" and 50' cable.