

# ULTRASONIC FLOWMETER

## Portable Enhanced Doppler



Series 902 Portable Enhanced Ultrasonic Doppler Flowmeters measure solids-bearing or aerated liquids in metal or plastic pipe. Proprietary circuitry allows this instrument to operate with lower concentrations of suspended solids than any competitive Doppler flowmeter--expanding the instrument's range of applications and reliability. Clamp-on, non-invasive transducers permit the instrument to be installed in minutes without interrupting system pressure or flow. The watertight case contains a rechargeable battery that can operate the unit continuously for 8 hours. The Series 902 transmitter has a full keypad designed for simple field setup and application versatility. The two-line, backlit, alphanumeric display shows instantaneous flow rate and totalized flows in a variety of user selectable engineering units.

### Features

- The system can be field configured to pipe sizes ranging from 0.25 to 120 inches [6 to 3050 mm]
- Non-fouling transducer is immune to build-up of grease, paraffin and other coating materials
- Solid-state measurement never requires re-calibration and is virtually maintenance-free
- Operates with relatively clean liquids as well as liquids with concentrations of suspended solids or aeration
- Does not require long straight runs of pipe
- Rugged NEMA 4X design permits extended outdoor and rough service use
- Industry standard outputs allow direct interface to loggers and controls systems

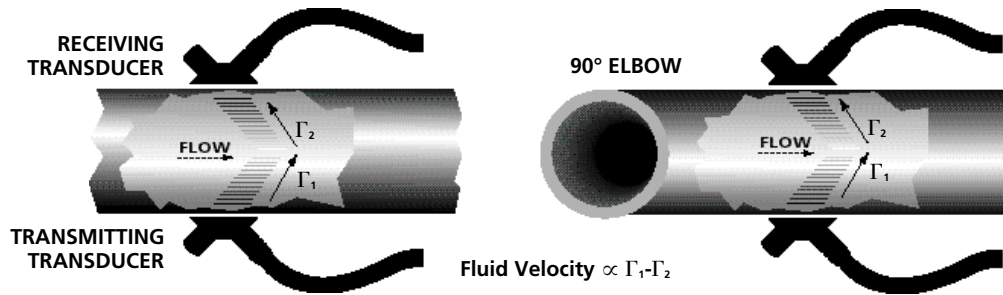
### Applications

- Wastewater sludges
- Ground water
- Flow surveying
- Remote field site flow tests
- Used as a flow prover to other flow technologies
- Mining recirculate
- Pump output verifications
- Sewage lifting station monitoring

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## Principles of Operation

TOP VIEW OF PIPE



Liquids with Suspended Solids or Aeration

Clean, Non-aerated Liquids

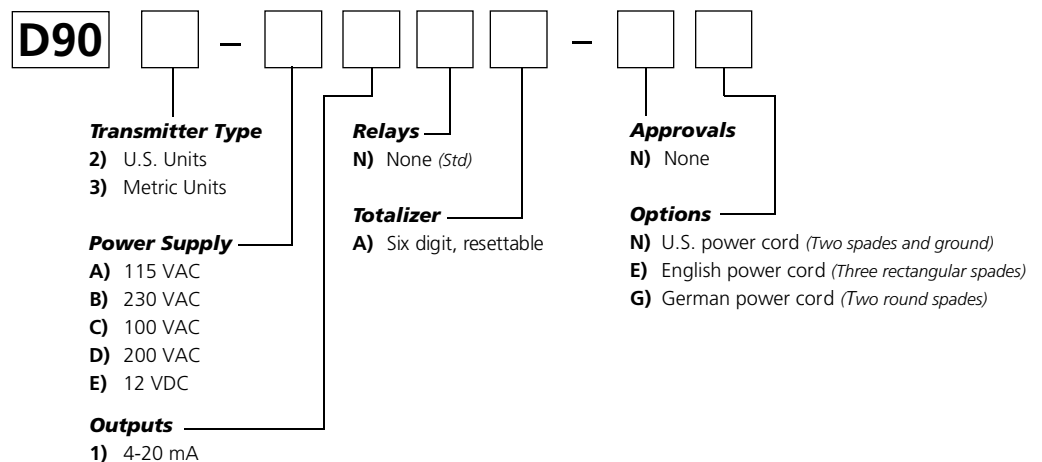
Ultrasonic Doppler flowmeters operate by transmitting and receiving ultrasonic sound signals in liquids. An instrument, such as the Dynasonics Series 902, incorporates dual transducers that are clamped on opposite sides of a liquid filled pipe. Each transducer contains a piezoelectric crystal. Referring to the above illustration, the  $\Gamma_1$  transducer transmits an ultrasonic signal through the pipe wall into the liquid. A portion of this signal is reflected by suspended solids, entrained gases or flow turbulence moving with the fluid, back toward the second transducer,  $\Gamma_2$ . Electronic circuitry compares the transmitted frequency with the received frequency. The difference, or frequency shift, is proportional to fluid velocity, in accordance with principles developed by Christian Johann Doppler. If the liquid is not moving (a zero flow condition) the transmitted and received frequencies are identical.

The Series 902 features advanced signal processing and an exclusive auto-adapting digital filter to produce accurate and stable indications of flow rate and totalized flows. A full function keypad allows field configuration of pipe size, engineering units, the 4-20mA output and all operating parameters.

## Part Number Construction

### TRANSDUCER/TRANSMITTER

(Includes: Accessory pouch, standard transducer, mounting straps, acoustic couplant and power cord.)



### D-902 ACCESSORIES

- D070-1006-001 High Temp Transducer
- D070-1004-003 Small Pipe Transducer
- D010-0200-100 Transducer cable extension, 20 feet [6 m]

## Portable Enhanced Doppler

### Specifications

#### TRANSMITTER

DESCRIPTION	SPECIFICATION
POWER REQUIREMENTS	Internal Lead acid Gel Cell battery provides 8 hrs of continuous operation. AC charging: (Std) 115/230 VAC 50/60 Hz $\pm$ 10%. (Opt) 100/200 VAC 50/60 Hz $\pm$ 10%. (Opt) 12 VDC
VELOCITY	0.5 - 20 FPS [0.15 - 6.08 MPS]
OUTPUTS	4-20 mA, 600 Ohms max., isolated.
INDICATORS	Power, Signal Strength, Flow Analyzer, Fault, Over-range, Read, Low Battery, Charge
DISPLAY	2 line x 20 character alphanumeric LCD (backlit). Digit height 0.2 inches [5 mm], 6 digit rate, 6 digit totalizer (resettable)
UNITS:	User configured
RATE U.S. [METRIC]	FPS, GPM, MGD [MPS, LPM, M <sup>3</sup> /hr]
TOTALIZER U.S. [METRIC]	Gallons [liters, M <sup>3</sup> ]
AMBIENT CONDITIONS	-22 to 160°F [-30 to 70 °C], 0-95% relative humidity, non-condensing.
ENCLOSURE	NEMA 4X, [IP-65] ABS with SS hardware. 11W x 17L x 8D inches [279W x 432L x 203D mm]
NON-LINEARITY (ACCURACY)	$\pm$ 2% Full Scale
SENSITIVITY	0.4% of Full Scale
REPEATABILITY	$\pm$ 0.4% of Full Scale
RESPONSE TIME	5-50 seconds, user configured, to 90% of value, step change in flow.

#### TRANSDUCER

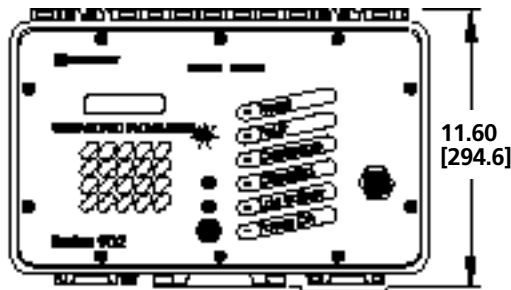
DESCRIPTION	SPECIFICATION
LIQUID REQUIREMENTS	25 ppm of 30 micron size* suspended solids or entrained gases (air). *Less than this minimum will require transducer mount downstream of a 90° elbow.
TRANSDUCER TO TRANSMITTER DISTANCE	(Std) 20 feet [6.08 meters], retractable cord.
PIPE SIZES	(Std) 1 - 120 inches [25 - 3050 mm] Pipe I.D. (Opt.) 0.25 - 1 inch [6 - 25 mm], Small Pipe Transducer
TEMPERATURE	(Std) -40° to 250°F [-40° to 121°C]. (Opt) -40° to 400°F [-40° to 204°C]
HOUSING MATERIAL	(Std) Aluminum, Ultem™ w/epoxy encapsulation (High Temp) Vespel™, Aluminum

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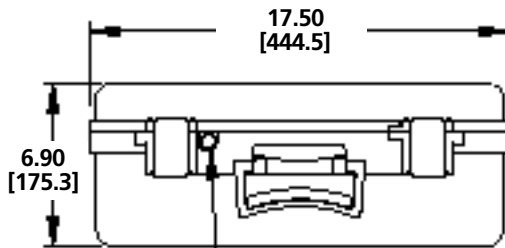
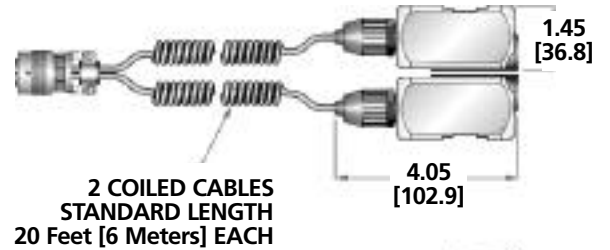
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### Dimensional Specifications

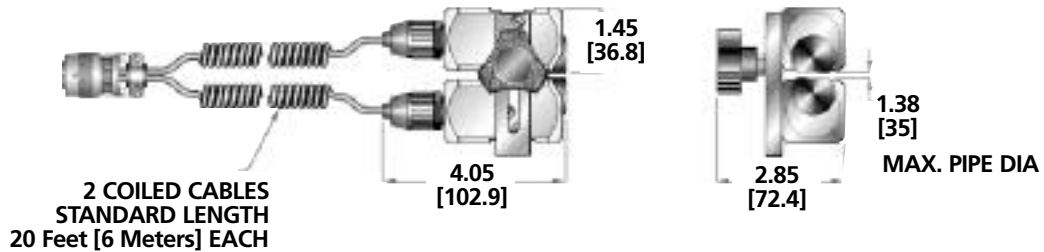
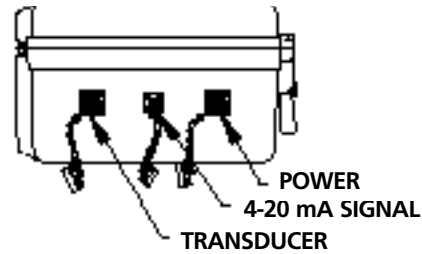
Inches  
[mm]



#### STANDARD CABLES & TRANSDUCERS CONFIGURATION



INTERNAL  
VACUUM/PRESSURE  
RELEASE PORT



#### OPTIONAL SMALL PIPE TRANSDUCER AND CABLE ASSEMBLY



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