

## PORTABLE ENHANCED DOPPLER FLOW METER

The Series 902 Portable Enhanced Ultrasonic Doppler Flow Meter provides accurate and reliable readings on closed full pipe applications containing relatively clean liquids as well as liquids with higher concentrations of suspended solids or aeration. Clamp-on non-invasive transducers permit the instrument to be installed in minutes without interrupting the system pressure or flow, providing a simple and cost-effective solution to flow verification. The Series 902 transducers function on metal or plastic pipes size ¼" (6 mm) and above. They have a NEMA 6P (IP-68) rating, and have the ability to work with temperatures up to +400 °F (+200 °C).

The Dynasonics Series 902 is designed for rugged field use in its NEMA 4 watertight enclosure. The rechargeable battery housed inside of the 902 enclosure provides a full eight hours of continuous operation. A complete 902 flow meter system includes one set of transducers, one tube of acoustic couplant, two mounting straps, a power cord and a 4-20 mA cable.



### FEATURES

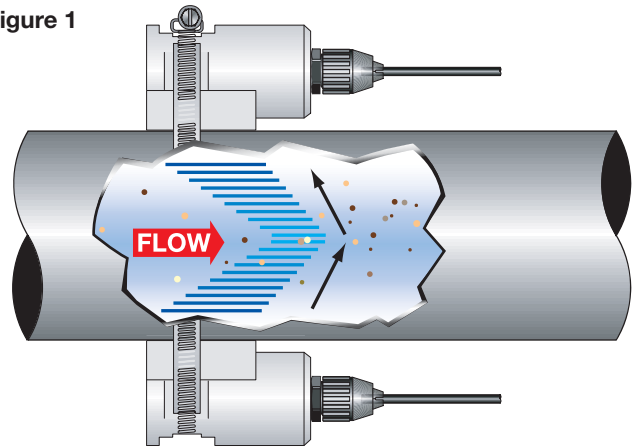
- **Clamp-on non-invasive transducers provide simple and cost effective flow measurement.**
- **NEMA 6P (IP-68) rated transducers and NEMA 4 (IP-65) enclosure.**
- **Reliable readings on closed full pipes size ¼" (6 mm) and above.**
- **Rechargeable battery with eight hours of continuous operation included.**
- **Standard 4-20 mA output.**
- **Ability to measure relatively clean liquids as well as liquids containing higher concentrations of suspended solids or aeration.**
- **Accuracy of ±2% full scale and repeatability of ±0.4% of full scale.**
- **Measures fluid velocities from 0.5 to 20 FPS (0.15 to 6 MPS).**
- **For applications such as ground water, lifting stations, wastewater sludges, and mining recirculate.**

**DYNASONICS**™  
DIVISION OF RACINE FEDERATED INC.

## PRINCIPLE OF OPERATION / TRANSDUCER OPTIONS

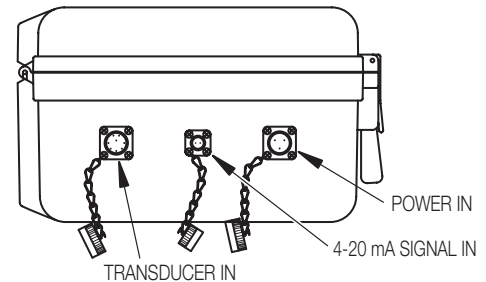
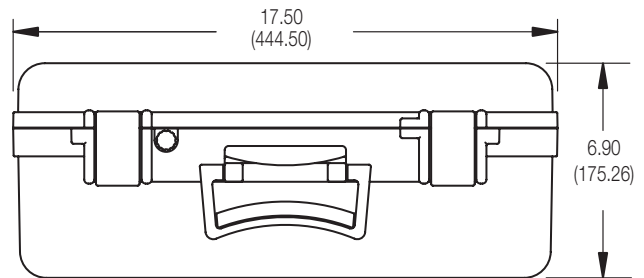
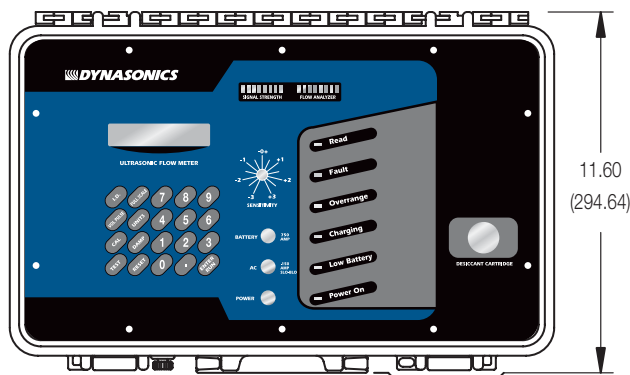
The Series 902 flow meter operates by transmitting ultrasonic sound from its transmitting transducer through the pipe wall into the flowing liquid. Each transducer contains piezoelectric crystals to transmit this signal. The sound will be reflected by useful sonic reflectors suspended within the liquid and recorded by the receiving transducer (see Figure 1). If the sonic reflectors are moving within the sound transmission path, sound waves will be reflected at a frequency shifted (Doppler shift) from the transmitted frequency. The difference between the reflected frequencies and transmitted frequencies is directly proportional to the speed of the sonic reflectors, resulting in a liquid flow rate that is converted to various user defined measuring units.

Figure 1

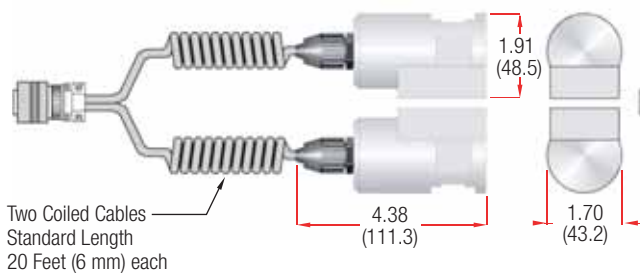


## DIMENSIONAL SPECIFICATIONS

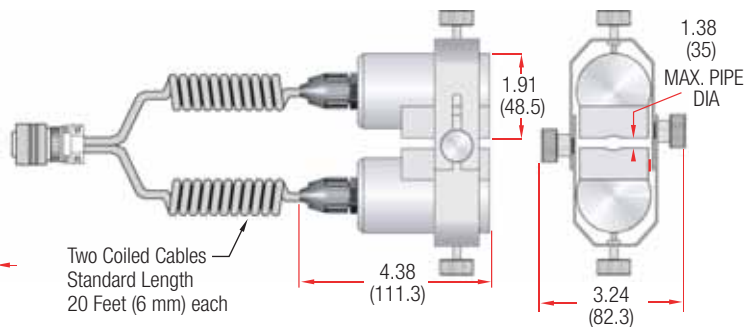
### MECHANICAL DIMENSIONS: INCHES (mm)



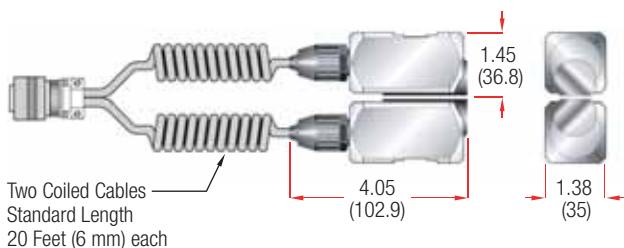
### D902/D903



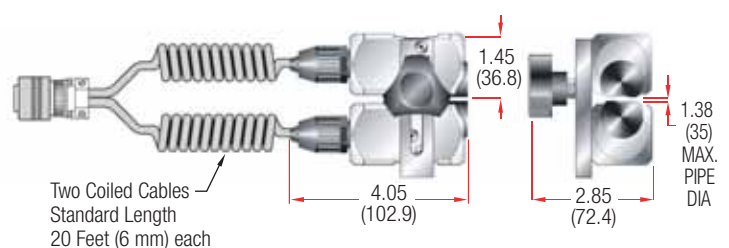
### D922/D923



### D912/D913



### D932/D933



## SPECIFICATIONS

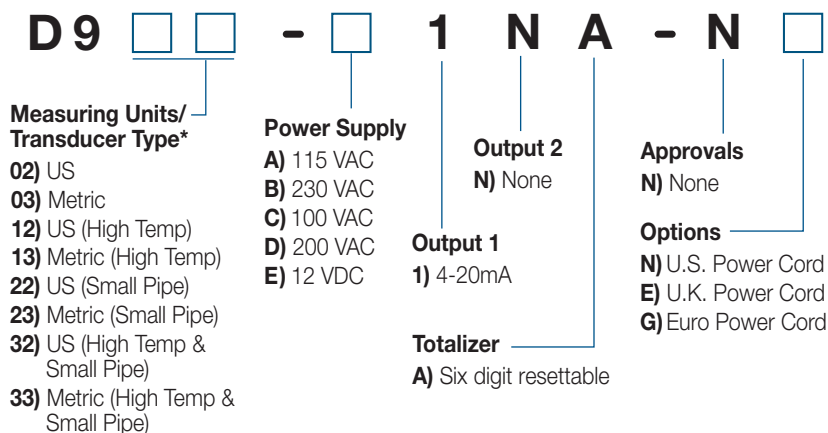
### TRANSMITTER

DESCRIPTION	SPECIFICATION
<b>Power Requirements</b>	Internal Lead acid Gel Cell battery provides 8 hours 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
<b>Flow Range</b>	0.5 to 20 FPS (0.15 to 6 MPS)
<b>Outputs</b>	4-20 mA, 600 Ohms max. isolated
<b>Indicators</b>	Power, Signal Strength, Flow Analyzer, Read Fault, Overrange, Charging and Low Battery
<b>Display</b>	2 line $\times$ 20 character alphanumeric LCD (backlit). Digit height 0.2 inches (5 mm), 6 digit rate, 6 digit totalizer (resettable)
<b>Units</b>	User configured
<b>Rate U.S. (Metric)</b>	FPS, GPM, MGD (MPS, LPM, M <sup>3</sup> /hr)
<b>Totalizer U.S. (Metric)</b>	Gallons (liters, M <sup>3</sup> )
<b>Ambient Conditions</b>	-22 to +160 °F (-30 to +70 °C), 0-95% relative humidity, non-condensing.
<b>Enclosure</b>	NEMA 4, (IP-65) ABS with SS hardware. 11W $\times$ 17L $\times$ 8D inches (279W $\times$ 432L $\times$ 203D mm)
<b>Accuracy</b>	$\pm$ 2% Full Scale
<b>Sensitivity</b>	0.4% of Full Scale
<b>Repeatability</b>	$\pm$ 0.4% of Full Scale
<b>Response Time</b>	5-50 seconds, user configured, to 90% of value, step change in flow

### TRANSDUCERS

DESCRIPTION	SPECIFICATION
<b>Liquid Requirements</b>	25 ppm of 30 micron size suspended solids or entrained gases.
<b>Transducer Cable</b>	(Std) 20 feet (6 mm), retractable cord.
<b>Pipe Sizes</b>	(Std) 1 inch (25 mm) and above (Small pipe) 1/4 to 1 inch (6 to 25 mm)
<b>Housing Material</b>	Standard Clamp-On: NEMA 6P (IP-68) -40 °F to +210 °F (-40 °C to +100 °C) CPVC, Ultem®, Nylon, PVC (Cable Jacket), Aluminum (small pipe) High Temp Clamp-On: NEMA 4 (IP-65) -40 °F to +400 °F (-40 °C to +200 °C) Vespel®, Anodized Aluminum, Nickel-plated brass, Teflon® (Cable Jacket)

## PART NUMBER CONSTRUCTION



### SPARE PARTS AND ACCESSORIES

Description	Part Number
Std Temp/Std Pipe Transducer	D070-1004-001
High Temp/Std Pipe Transducer	D070-1006-001
Std Temp/Small Pipe Transducer	D070-1004-003
High Temp/Small Pipe Transducer	D070-1004-005
Gel Cell Battery	D005-1201-001
Couplant, Silicone (for temporary mounting)	D002-2011-001
U.S. Power Cord	D005-2109-002

\*High Temp (+400 °F)  
Small Pipe (1/4" - 1")

Note: The Series D902 is shipped with one set of standard transducers, acoustic couplant, two mounting straps, power cord and a 4-20mA cable.

**Liquid Type** (in order of increasing % of suspended solids)

Ultrapure Liquids		Transit Time		
Deionized Water				
Water Filter-Bed Effluent				
Hydraulic Oil				
Refined Hydrocarbons				
Beverages				
Well Water				
Reclaimed Water				
Cooling Tower				Enhanced Doppler
Ground Water				
Raw Sewage				
Gray Water				
Beverages - Carbonated				
Waste Activated Sludge				
Return Activated Sludge				
Mining Slurries				
Filter Backwash		Doppler		
Paper Pulp Stock				
Dredging Applications				
Preprocessed Crude Oil				
Primary Sludge				
Lime Sludge				
Digested Sludge				
Concrete				

This guide provides general rules for the selection of an appropriate Dynasonics ultrasonic technology – it is neither exhaustive nor absolute. System factors such as temperature, pipe materials, suspended solid composition and liquid velocity can influence product selection. It is best to present application information to a Dynasonics Sales Representative or to the Dynasonics factory for evaluation.

Dynasonics offers the most comprehensive line of ultrasonic transit time and Doppler flow meters in the world. These meters are clamp-on, non-invasive flow meters that require a good acoustical path between the outside of the pipe and the liquid inside. In some instances, such as non-saturated concrete pressure pipe, ultrasonic energy will not readily pass. For these installations, Dynasonics offers the Series MFX MagProbe™.

Please consult a Dynasonics Sales Representative or the Dynasonics factory to discuss the use of these products in your flow measurement application.

