

# DXN Portable Ultrasonic Flow and Energy Meter

The DXN Portable Ultrasonic Flow Meter is a true hybrid ultrasonic flow meter, capable of measuring liquid flow with multiple technologies, including: Doppler, Transit Time and Liquid Thermal (Heat Energy) Flow. DXN is also compatible with a pipe wall thickness gauge, used to verify inside pipe diameter and ensure highly accurate ultrasonic measurements when piping details are unknown or unavailable.

The DXN has a number of advanced features that allow the user to obtain accurate readings while capturing flow surges and high-speed batch operations. DXN captures and records multiple application parameters at one time with an easy-to-use data logging function and provides the power to verify and troubleshoot permanent flow installations with ease.

## Ultrasonic Flow Rate Measurement

**Transit time** flow meters measure the time difference between the travel time of an ultrasound wave going with the fluid flow and then against the fluid flow. This time difference is used to calculate the velocity of the fluid traveling in a closed-pipe system. The transducers used in transit time measurements operate alternately as transmitters and receivers. Transit time measurements are bi-directional and are most effective for fluids that have low concentrations of suspended solids.

**Doppler** flow meters operate by transmitting an ultrasonic wave from a transmitting transducer through the pipe wall and into the moving liquid. The sound wave is "reflected" by suspended particles or bubbles moving with the liquid and ultimately gathered by the receiving transducer. A frequency shift (Doppler effect) will occur that is directly proportional to the speed of the moving particles or bubbles. This shift in frequency is interpreted by the digital signal processor (DSP) and converted to a fluid velocity measurement.

Regardless of the method used to determine velocity, multiplying the pipe's cross sectional area by the fluid velocity produces a volumetric flow rate. The measurement also presumes that the pipe is completely full during the measurement cycle.



**DXN Full Kit** – Includes: meter, transducers, cables, power cord and carrying case.

## Energy Monitoring

Temperature measurements, when used in conjunction with flow measurement, can yield energy usage readings in the form of heat flow. Energy usage is calculated by multiplying the flow rate of the heat transfer fluid by the change of heat content in that fluid after it has done some kind of work, to find the net heat loss or gain.

An ultrasonic meter equipped with heat flow capabilities is designed to measure the rate and quantity of heat delivered or removed from devices such as heat exchangers. The instrument measures the volumetric flow rate of the heat exchanger liquid, the temperature at the inlet pipe and the temperature at the outlet pipe. By applying a scaling factor this heat flow measurement can be expressed in the units of your choosing: BTU, Watts, Joules, Kilowatts, etc.

$$\text{Rate of Heat Delivery} = Q \times (T_{in} - T_{out}) \times C$$

Where

- Q = volumetric flow rate
- T<sub>in</sub> = temperature at the inlet
- T<sub>out</sub> = temperature at the outlet
- C = specific heat of the liquid

## Part Number Construction

### DXN Portable Transit Time/Doppler Ultrasonic Flow Meter

**D X N**   **P**   -         **S**   -   **N**   **N**

Model	Power Cord	Sensor & Hardware Kit	Carrying Case	Approvals	Options
<b>P)</b> Portable	<b>A)</b> North American <b>U)</b> U.K., Singapore <b>E)</b> Euro <b>J)</b> Japan <b>C)</b> China	<b>B)</b> Basic – Small pipe and standard pipe transit time transducers only <b>T)</b> All Transit Time – Basic kit plus large pipe transducers <b>H)</b> Hybrid – Basic kit and Doppler transducers <b>E)</b> Energy – Basic kit and noninvasive RTDs <b>F)</b> Full – Includes all, transit time, Doppler, RTDs and wall thickness gauge	<b>S)</b> Standard – Outer case with shoulder strap	<b>N)</b> CE + General Safety, U.S., Canada, and EU	<b>N)</b> None

## Parts and Accessories

### Power Cords/Cables

Part Number	Description
D005-2109-013	North American plug (2 flat & 1 round prong; NEMA 5/15P)
D005-2109-015	UK plug (3 rectangular prongs; BS1363A)
D005-2109-016	Euro plug (2 round prongs; CEE7/7)
D005-2109-017	Japan plug (2 flat & 1 round, JIS8303, w/ 3-2 prong adapter)
D005-2109-014	China plug (3 flat prongs; GB2099)
D005-2129-020	Transit time Cables, 20' (6m)
D005-2130-020	Doppler Cables, 20' (6m)

### Transducers (Heads with case)

Part Number	Description	Minimum Pipe O.D.	Maximum Pipe O.D.
D010-2200-002-C	DTTSU universal small pipe	.5" (12 mm)	2.4" (60.3 mm)
D071-0110-000-C	DTTN standard pipe	2" (50 mm)	98" (2500 mm)
D071-0110-200-C	DTTL large pipe	16" (400 mm)	120" (3050 mm)
D071-0112-001-C	DT94 Doppler transducer	1" (25 mm)	60" (1524 mm)

### RTDs/Accessories/Spare Parts

Part Number	Description
D002-2007-004	0-200 °C RTD Silicon stretch tape
D002-2007-001	36 inch SS Hose clamp / transducer strap
D002-2007-005	72 inch SS Hose clamp / transducer strap
D002-2011-001	Acoustic couplant, grease (Dow 111), +150 °F (+65 °C) 5.3 oz. tube
D002-2011-011	Acoustic couplant, paste high temperature, 142 gram tube, +392 °F (+200 °C)
D010-3000-128	Building Automation RTD Kit, <sup>1</sup> 1000 Ohm, +392 °F (+200 °C); 20' (6m) cable
D010-3000-129	Industrial RTD Kit, <sup>1</sup> 1000 Ohm, +266 °F (+130 °C); 20' (6m) cable

<sup>1</sup> RTD Kits include: 2 RTDs, heat sink compound and installation tape.

## System

### Measurement Type:

**Flow:** Ultrasonic transit time and Doppler (reflection of acoustic signals); Hybrid operation.

**Pipe wall thickness:** Ultrasonic transit time of acoustic signals.

**Liquid thermal energy**

### Liquid Types:

Liquid dominant fluids.

### Velocity Range:

**Transit Time:** Bi-directional to 40 FPS (12 MPS)

**Doppler:** Uni-directional to 40 FPS (12 MPS)

### Flow Rate Accuracy:

**Transit Time:**  $\pm 1\%$  of reading or  $\pm 0.01$  FPS (0.006 MPS), whichever is greater

**Doppler:** 2% of full scale

### Flow Sensitivity:

0.001 FPS (0.001 MPS)

### Repeatability:

$\pm 0.1\%$  of reading

### Temperature Accuracy:

Absolute 0.5 °F (1 °C); Difference 0.2 °F (0.5 °C);

Resolution 0.02 °F (0.01 °C)

### Measurement Update:

0.1 to 10 seconds update/filter rate. Transit Time, up to 50Hz high speed mode

### Battery:

Internal 11.1V lithium ion battery, 75W-hr. Provides 6-9 hrs of continuous operation with battery and indefinitely on external power. Charging (0 to 40 °C), 12 hours while in use; 4 hours maximum powered off

### Power Requirements:

10-30 VDC via 3-pin connector, 40W min; 3A resettable fuse

**Supplies:** Desktop adapter: 100-240 VAC 50/60 Hz 50W 12V-18V; Cigarette lighter adapter: 3A fused

### Power Cords:

North American plug (2 flat & 1 round prong; NEMA 5/15P); China plug (3 flat prongs; GB2099); Euro plug (2 round prongs; CEE7/7); U.K. plug (3 rectangular prongs; BS1363A) Japan Plug (2 flat & 1 round, JIS8303, w/ 3-2 prong adapter)

### Display:

800 × 480 WVGA Color Outdoor Readable Display;

Gloved-operation resistive touch screen

### Ambient Conditions:

Battery powered: -4 °F to +110 °F (-20 °C to +45 °C);

Externally powered: -20 °F to +140 °F (-30 °C to +60 °C)

### Storage Temperature:

Do not exceed +175 °F (80 °C)

### Enclosure:

Water/Dust resistant [IP 64]

### User Menu:

Windows .NET fully integrated user menu; Multi-language

### Internal PC:

500MHz AMD PC, 256 MB RAM, 1GB user storage;

Licensed Windows Embedded Standard 2009

### Logging:

>300 sites stored in 1 GB; downloads to USB jump drive

## Transducers

### Pipe Sizes:

½" and larger; standard pipe tables built into User Interface

### Housing Material:

**DTTSU:** CPVC, Ultem®, and anodized aluminum track system;

**Connector:** Nickel-plated brass with Teflon® insulation

**DTTN/DTTL/DT94 Doppler:** CPVC, Ultem®;

**Connector:** Nickel-plated brass with Teflon® insulation

### Pipe Surface Temperature:

**DTTSU/DTTN/DTTL:** -40 °F to +250 °F (-40 °C to +121 °C)

**DT94 Doppler:** -40 °F to +212 °F (-40 °C to +100 °C)

### Transducer Frequency:

**DTTSU:** 2MHz, **DTTN:** 1MHz, **DTTL:** 500kHz

**DT94 Doppler:** 625kHz

### Cable Length:

**Transit Time:** 20 feet (6 meters) paired coaxial cable, BNC to BNC,

**Doppler:** 20 feet (6 meters) paired coaxial cable, BNC to 4-pin

### Diagnostics:

Open, Short, Nominal (transit time only)

### Pipe Thickness:

Dual mode transducer with 6 feet (1.8 meters) of cable (BNC ends)

### RTDs:

2x platinum 385, 1000 Ohm, 3-wire PVC jacketed cable;

20 feet (6 meters) cable standard with quick connector

## Process Monitoring Inputs/Outputs

### Connector:

15-pin high-density DSUB

### Breakout Box:

.2" quick disconnect screw terminal; 15 pin to adapter box;

6 feet (1.8 meters) of cable (DSUB to DSUB connectors)

### Inputs/Outputs:

#### Energy/Temperature:

2x RTDs PT1000 tab type; -122 °F to +570 °F (-85 °C to +300 °C) measurement range

#### Current Output:

4-20mA active/passive 1% accuracy

#### Sensor Supply:

14V @ 50mA max for powering current or voltage sensors

#### Digital Output:

Open collector, External pull-up

Rate or Total pulse user selectable

**Rate pulse:** 0 to 1000Hz

**Total pulse:** 33mSec duration

#### Digital Input:

Totalizer reset, External pull-up

#### Auxiliary Inputs:

Voltage input. 0 – 5V or 0 – 10V, 1% accuracy

Software scaling and control

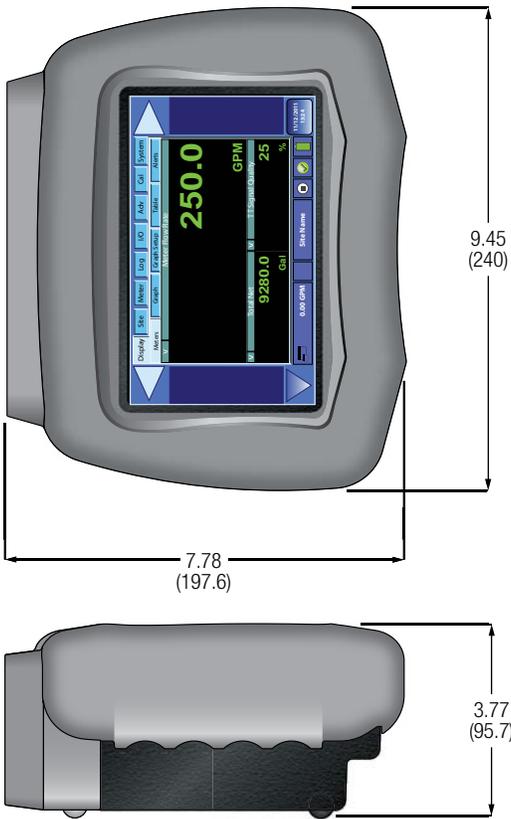
80k Ohms input impedance

#### Voltage Output:

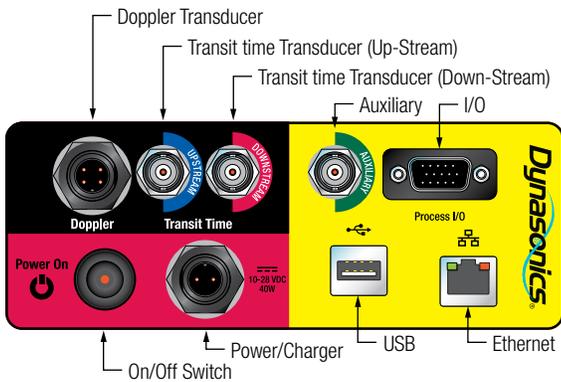
0 – 5V or 0 – 10V output voltage, 1% accuracy

Software scaling and control

100 Ohms output impedance



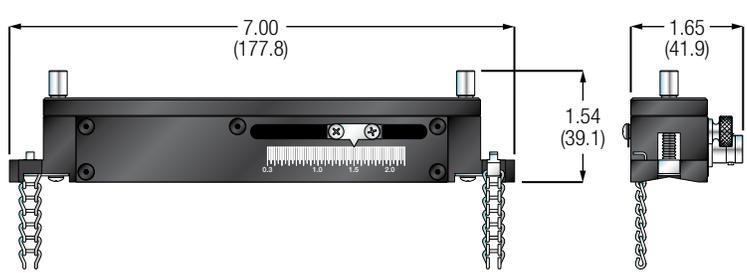
**DXN Connection Panel**



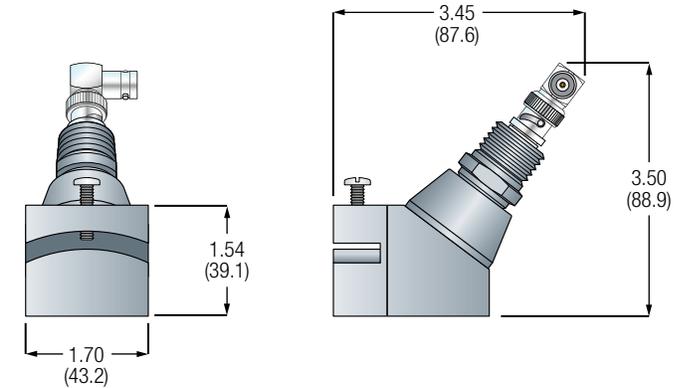
**Transducer Pipe Size Requirements**

	Minimum Pipe O.D.	Maximum Pipe O.D.
DTTSU	.5" (12 mm)	2.4" (60.3 mm)
DTTN	2" (50 mm)	98" (2500 mm)
DTTL	16" (400 mm)	120" (3050 mm)
DT94	1" (25 mm)	60" (1524 mm)

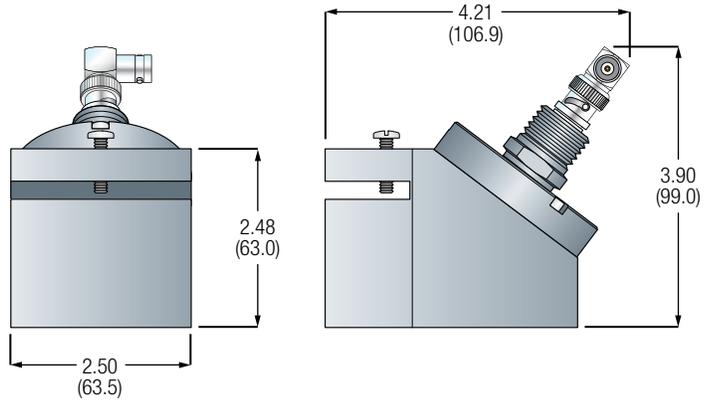
**DTTSU Transit Time Transducer**



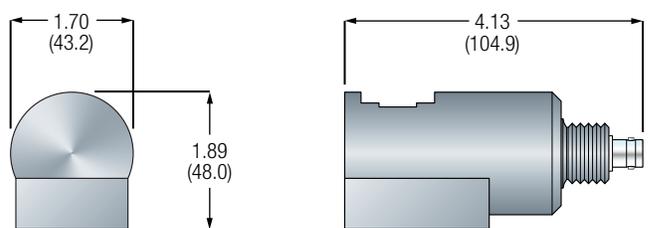
**DTTN Transit Time Transducer**



**DTTL Transit Time Transducer**



**DT94 Doppler Transducer**



8635 Washington Avenue, Racine, WI 53406-3738 U.S.A.  
 Tel: 262-639-6770 800-535-3569 US & Canada  
 Fax: 262-639-2267 800-732-8354 US & Canada  
 E-mail: info@dynasonics.com  
 dynasonics.com

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