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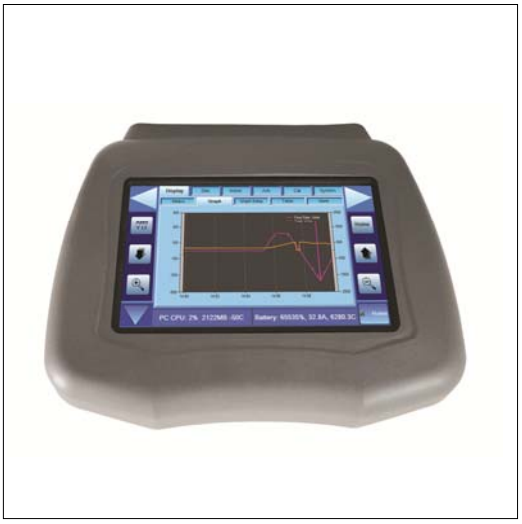
Model DXN

Portable transit-time/Doppler flow and energy meter



Features

- Hybrid technology
- Touch screen
- Full-color graphics
- DN 15 – DN 3000
- Windows® based software
- Integrated data logger
- Wall thickness gauge

Description

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.

Applications

Model DXN is ideal for portable flow measurements on clean, solids-bearing or gaseous liquids in closed full pipes from DN 15 to DN 3000 (½" to 120").

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 sensors used in transit-time measurements operate alternately as transmitter 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 sensor 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 sensor. 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.

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.

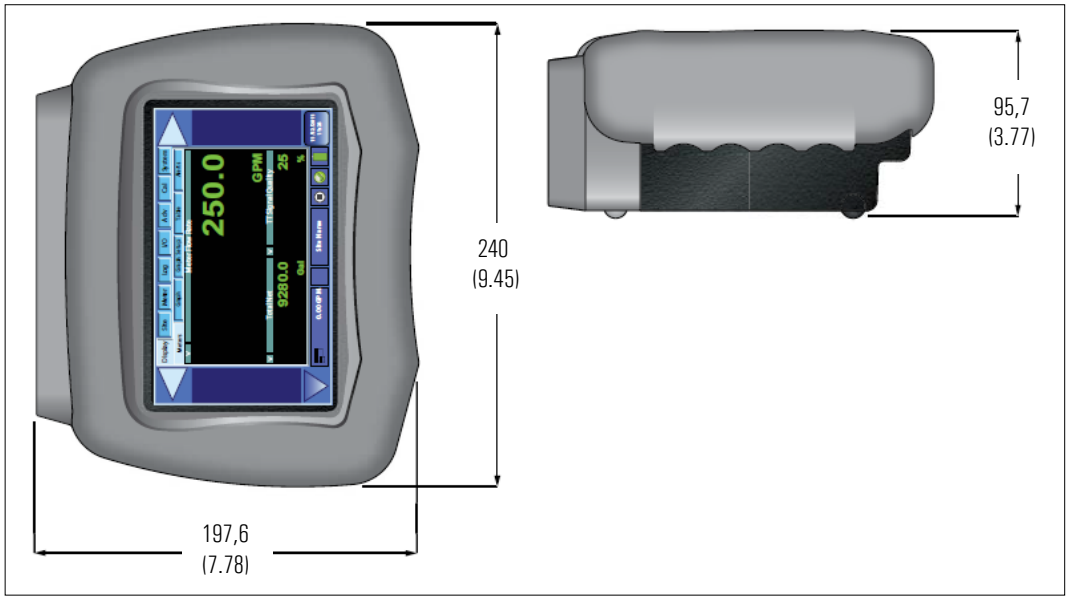
Rate of Heat Delivery = $Q \times (T_{in} - T_{out}) \times C$
Where
Q = volumetric flow rate
T_{in} = temperature at the inlet
T_{out} = temperature at the outlet
C = specific heat of the liquid

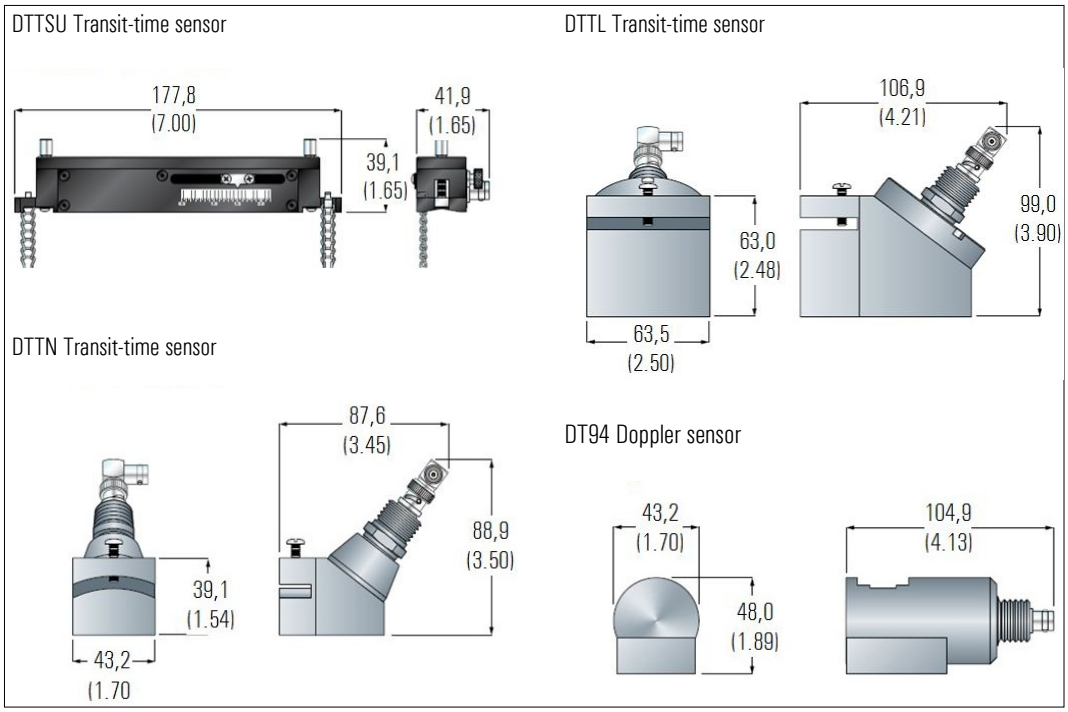
Technical data

Flow meter	
Flow	Ultrasonic transit-time and Doppler (reflection of acoustic signals); hybrid operation.
Pipe wall thickness	Ultrasonic transit-time of acoustic signals
Liquid thermal energy	Energy measurment using optional RTDs
Liquid types	Liquid dominant fluids
Velocity range Transit-time Doppler	 Bi-directional to 12 m/s (40 ft/s) Uni-directional to 12 m/s (40 ft/s)
Flow rate accuracy Transit-time Doppler	 ±1% of reading or ±0,003 m/s (±0.01 ft/s), whichever is greater 2% of full scale
Flow sensitivity	0,0003 m/s (0.001 ft/s)
Repeatability	±0,1% of reading
Temperature accuracy	Absolute 1 °C (0.5 °F); difference 0,5 °C (0.2 °F); resolution 0,01 °C (0.02 °F)
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 supply	10 - 30 VDC via 3-pin connector, 40W min; 3.6A resettable fuse
Supplies	Desktop adapter: 100-240 VAC 50/60 Hz 50W 10V-18V; Cigarette lighter adapter: 5A fused
Power cords North American plug China plug EU plug U.K. plug Japan plug	 2 flat & 1 round prong; NEMA 5/15P 3 flat prongs; GB2099 2 round prongs; CEE7/7 3 rectangular prongs; BS1363A 2 flat & 1 round, JIS8303, with 3-2 prong adapter
Display	800 x 480 WVGA color outdoor readable display; gloved-operation resistive touch screen
Ambient conditions Battery powered Externally powered	 -20 °C to +45 °C (-4 °F to +110 °F) -30 °C to +60 °C (-20 °F to +140 °F)
Storage temperature	Do not exceed +80 °C (175 °F)
Enclosure	Water/dust resistant [IP 64]
User menu	Windows® NET fully integrated user menu; multi-language
Internal PC	500MHz AMD PC, 256 MB RAM, 1 GB user storage; licensed Windows® embedded standard 2009
Logging	>300 sites stored in 1 GB; downloads to USB jump drive
Approvals	CE and General Safety U.S., Canada and EU
Sensors	
Pipe sizes	DN 15 – DN 3000 (½" to 120"); standard pipe tables built into user interface
Housing material DTTSU Connector DTTN / DTTL / DT94 Doppler Connector	 CPVC, Ultem® and anodized aluminum track system Nickel-plated brass with Teflon® insulation CPVC, Ultem® Nickel-plated brass with Teflon® insulation

Sensors (cont.)		
Pipe surface temperature DTTSU / DTTN / DTTL DT94 Doppler	 -40 °C to +120 °C (-40 °F to +250 °F) -40 °C to +120 °C (-40 °F to +250 °F)	
Sensor frequency DTTSU DTTN DTTL DT94 Doppler	 2MHz 1MHz 500kHz 625kHz	
Cable length Transit-time Doppler	 6 m (20 ft) paired coaxial cable, BNC to BNC 6 m (20 ft) paired coaxial cable, BNC to 4-pin	
Diagnostics	Open, short, nominal (transit-time only)	
Pipe thickness	Dual mode sensor with 1,8 m (6 ft) of cable (BNC ends); for most common pipe materials	
RTDs	2x platinum 385, 1000 ohms, 3-wire PVC jacketed cable, 6 m (20 ft) cable standard with quick connector	
Inputs / outputs		
Connector	15-pin high-density DSUB	
Breakout box	5,08 mm (0.2") quick disconnect screw terminal; 15 pin to adapter box 1,8 m (6 ft) of cable (DSUB to DSUB connectors)	
Energy / temperature	2x RTDs PT1000 tab type; -85 °C to +300 °C (-122 °F to +570 °F) 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	33 milliseconds 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	

Dimensions in mm (inches)





Sensor pipe size requirements

	Minimum pipe O.D.	Maximum pipe O.D.
DTTSU universal small pipe	DN 12 (½")	DN 60 (2.4")
DTTN standard pipe	DN 50 (2")	DN 2500 (98")
DTTL large pipe	DN 600 (24")	DN 3000 (120")
DT94 Doppler sensor	DN 25 (1")	DN 1500 (60")

Ordering matrix*

DXN	P	-	☐	☐	S	-	N	N

Model
P) Portable
(Includes universal AC power converter; 95-264 VAC 50/60 Hz - C14 connection, DXN shoulder strap & outer carrying case)

Power cord
A) North America
U) U.K., Singapore
E) EU
J) Japan
C) China

Sensor & hardware kit
B) Basic – small pipe and standard pipe transit-time sensors only
T) All transit-time basic kit plus large pipe sensors
H) Hybrid-basic kit and Doppler sensors
E) Energy basic kit and non-invasive RTDs*
F) Full kit – includes transit-time, Doppler, RTDs and wall thickness gauge, outer case with shoulder strap

Carrying case
S) Standard – outer case with shoulder strap

Approvals
N) CE + general safety, U.S., Canada and EU

Options
N) None

*Includes building automation RTD kit part D010-3000-129)

Parts and accessories

Power cords / cables

Part number	U.S. part number	Description
480003	D005-2109-013	North American plug (2 flat & 1 round prong; NEMA 5/15P)
480004	D005-2109-015	UK plug (3 rectangular prongs; BS1363A)
480005	D005-2109-016	EU plug (2 round prongs; CEE7/7)
480006	D005-2109-017	Japan plug (2 flat & 1 round, JIS8303, with 3-2 prong adapter)
480007	D005-2109-014	China plug (3 flat prongs; GB2099)
480008	D005-2129-020	Transit-time cables, 6m (20ft)
480009	D005-2129-050	Transit-time cables, 15m (50ft)
480010	D005-2129-100	Transit-time cables, 30m (100ft)
480011	D005-2130-020	Doppler cables, 6m (20ft)
480012	D005-2130-050	Doppler cables, 15m (50ft)
480013	D005-2130-100	Doppler cables, 30m (100ft)

Sensors (head with case)

Part number	U.S. part number	Description	Pipe size
280029	D010-2200-002-C	DTTSU universal small pipe	DN 15 to DN 60 (½" to 2.4")
280030	D071-0110-000-C	DTTN standard pipe	DN 50 to DN 2500 (2" to 98")
280031	D071-0110-200-C	DTTL large pipe	DN 600 to DN 3000 (24" to 120")
280028	D071-0112-001-C	DT94 Doppler sensor	DN 25 to DN 1500 (1" to 60")
280027	DWT-1	Pipe wall thickness gauge	-

RTDs / accessories / spare parts

Part number	U.S. part number	Description
480014	D002-2007-004	0 - 200 °C RTD silicone stretch tape
480015	D002-2007-001	36" SS hose clamp / sensor strap
480016	D002-2007-005	72" SS hose clamp / sensor strap
480001	D002-2011-001	Acoustic couplant, grease (Dow 111), +65 °C +(150 °F) 5.3 oz. tube
480002	D002-2011-011	Acoustic couplant, paste high temperature, 142 gram tube, +200 °C (+392 °F)
480017	D010-3000-128	Industrial RTD kit[1], 1000 ohms, +200 °C (+392 °F); 6m (20 ft) cable
480018	D010-3000-129	Building automation RTD kit[1], 1000 ohms, +130 °C (+266 °F); 6m (20ft) cable

[1] RTD kits include: 2 RTDs, heat sink compound and installation tape

[1] RTD-Kit beinhaltet: 2 RTDs, Wärmeleitpaste und Montageband