

FIXED LOCATION TRANSIT TIME FLOW METER



* Optional aluminum track assembly shown.

Series TFXD Transit Time Flow Meters feature the world's most advanced non-invasive flow measurement technology available – providing a measuring system with superior accuracy, versatility, low cost of installation and low cost of ownership. The TFXD system installs quickly onto liquid piping systems with its non-invasive, non-fouling transducers and can be configured and operational within minutes.

The TFXD is designed for fixed-location installation on liquid systems and is available in both blind (TFXD1) and display (TFXD2) models. The TFXD2 has a large LCD and an integral keypad that allows field configuration without the use of a computer. The TFXD also provides an optical interface which can be used with the **ULTRALINK™** software utility. The software utility allows simple in-field programming, calibration and software upgrades. All systems utilize digital signal processing, cross-correlation and field replaceable input/output modules.

The TFXD flow measurement system is a cost-effective, versatile investment that can be readily configured for piping 1/2" (12 mm) and higher.

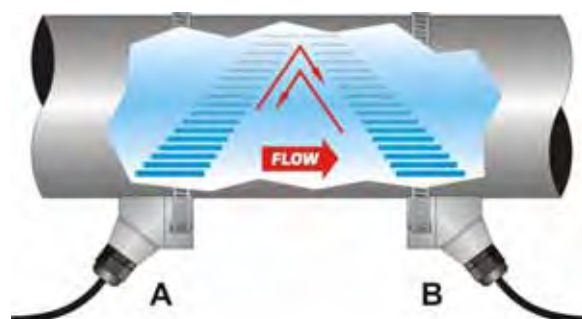
FEATURES

- Non-invasive, NEMA 6P (IP-68) clamp-on transducers are cost-effective and simple to install. Since the transducers do not contact the liquid, fouling and maintenance are eliminated.
- TFXD has a flow measuring range that is much larger than other flow meter technologies. This feature allows the instrument to measure normal process flow rates as well as flows resulting from leaks in piping and valves.
- Inherent flow profile compensation permits improved accuracy over alternate technologies.
- Bi-directional measurements, with totalization in positive, negative, net or batch modes.
- Zero head-loss results in improved pumping efficiency.
- Low power consumption. The TFXD system operates on less than 2.5W, allowing operation on UPS, solar panel and battery operated power sources.
- An integral optical interface and optional Windows® software utility provide complete control of system configuration, calibration and diagnostics – without opening the NEMA 4X (IP-66) enclosure.
- Field-replaceable I/O module options include: 4-20 mA, dual relay, rate pulse, RS232C, RS485, 200K-event data logger, and Heatflow/RTD.
- User configurable rate and totalizer units include: feet, gallons, ft³, million-gal, barrels, acre-feet, lbs, meters, liters, m³, million-liters and kg.

FIXED LOCATION TRANSIT TIME FLOW METER

TFXD transit time flow meters utilize two transducers, shown as elements A and B in Figure 1, which function as both ultrasonic transmitters and receivers. The transducers are clamped on the outside of a closed pipe at a specific distance from each other. (The transducers can be mounted in V-mode as shown in Figure 1, W-mode where sound transverses the pipe four times, or in Z-mode where the transducers are mounted on opposite sides of the pipe. This selection is based on pipe and liquid characteristics.) The flow meter operates by alternately transmitting and receiving a frequency-modulated burst of sound energy between the two transducers. The burst is first transmitted in the direction of fluid flow and then against fluid flow. Since sound energy in a moving liquid is carried faster when it travels in the direction of fluid flow (downstream) than it does when it travels against fluid flow (upstream), a differential in the times of flight will occur. If the fluid is not moving, the time of flight difference will be zero and

Figure 1



Reflect-Mode Configuration
Transit Time

the flow meter will indicate zero flow. The sound's time of flight is accurately measured in both directions and the difference in time of flight is calculated. The liquid velocity (V) inside the pipe can be related to the difference in time of flight (dt) through the following equation:
 $V = K \cdot D \cdot dt$, where K is a constant and D is the distance between the transducers.

PART NUMBER CONSTRUCTION

TRANSMITTER – Wall mount bracket kit included

DTFXD ☐ - ☐ ☐ ☐ ☐ - ☐ ☐

Transmitter Type ☐

1) Blind
2) Rate and Totalizer Display

Power Supply ☐

A) 115 VAC
B) 230 VAC
E) 10-28 VDC

Input/Output 1 ☐

N) None
1) 4-20 mA
2) Dual Relay
3) Rate Pulse
4) RS232C
5) RS485
6) Data Logger
7) Heatflow/RTD

Input/Output 2 ☐

Same as Selecting Input/Output 1

Totalizer ☐

N) (Std on DTFXD1) None
A) (Std on DTFXD2) Eight Digit Resettable

Options ☐

N) None
2) 2 MHz DTTS transducer

Installation ☐

N) General Purpose

TRANSDUCER – Pipes larger than 2" (50 mm)

DTT ☐ - ☐ ☐ ☐ ☐ - ☐ ☐ ☐ ☐ - ☐

Construction ☐

N) Standard (CPVC, Ultem®)
H) High Temp (PTFE, Vespel®)

Cable Length ☐

020) 20 feet (6.1 m)
050) 50 feet (15 m)
100) 100 feet (30 m)
Maximum length: 990 feet (300 m) in 10 ft. (3 m) increments

Conduit Type ☐

N) None - RG59 Cable
A) Flexible Armored

Conduit Length ☐

(Standard Construction: Conduit Length = Cable Length)
000) None
020) 20 feet (6.1 m)
050) 50 feet (15 m)
100) 100 feet (30 m)
Maximum length: 990 feet (300 m) in 10 ft. (3 m) increments

Installation ☐

N) General Purpose
F) Class I Div. 1, Groups C & D

Small Pipes – 1/2" to 2" (12 mm to 50 mm)

DTTS ☐ ☐ - ☐ ☐ ☐ - ☐ ☐ ☐ ☐

Nominal Pipe Size ☐

D) 1/2"
F) 3/4"
G) 1"
H) 1-1/4"
J) 1-1/2"
L) 2"

Pipe Type ☐

P) ANSI Pipe
C) Copper Pipe
T) Tubing

Cable Length ☐

020) 20 feet (6.1 m)
050) 50 feet (15 m)
100) 100 feet (30 m)

Conduit Type ☐

N) None - RG59 Cable
A) Flexible Armored

Conduit Length ☐

000) None
020) 20 feet (6.1 m)
050) 50 feet (15 m)
100) 100 feet (30 m)

SPECIFICATIONS

Series TFXD

TRANSMITTER

DESCRIPTION	SPECIFICATION
Power Requirements	(Std.) 10-28 VDC @ 2.5 VA max.; 115/230 VAC 50/60 Hz $\pm 15\%$ @ 5 VA max.
Velocity	-40 to +40 FPS (-12 to +12 MPS)
Inputs/Outputs	All modules are optically isolated from earth and system grounds; maximum of two modules may be installed
Optional	4-20 mA 800 Ohms max.; 12-bit resolution; passive or active Dual Relay Two separate Form C relays, 200 VAC max. @ 0.5 A resistive Rate Pulse FET output (open collector action), 0-2,500 Hz maximum, 1 A maximum RS232C data rate to 57.6K RS485 supports up to 126 drops Data Logger 200,000 event, 16-bit, DB-9 connection, can be removed and installed without disconnecting system power Heatflow (see TFX BTU-Pro data sheet); Supports two 1000 Ω RTDs, multiplexed, 12-bit resolution
Display [TFXD2 only]	2 line x 8 character LCD, back lit. Top row: 7-segment digit height 0.7 inches (18 mm), Bottom row: 14-segment digit height 0.35 inches (9 mm); 8 digit rate, 8 digit totalizer (resettable)
Units	User configured - feet, gallons, ft ³ , Mil-gal, barrels, acre-feet, lbs., meters, liters, m ³ , Mil-liters, Kg
Rate	Rate time: sec, min, hr, day
Totalizer	Forward, reverse, batch and net total
Ambient Conditions	-40 °F to +185 °F (-40 °C to +85 °C), 0-95% relative humidity, non-condensing
Enclosure	NEMA 4X (IP-66), polycarbonate, SS, brass and plated steel. 7.00H x 5.75W x 3.88D inches (178H x 146W x 99D mm)
Accuracy Flow Rate	$\pm 0.5\%$ of reading at rates > 1 FPS (0.3 MPS) for field calibrated systems; $\pm 1\%$ of reading at rates > 1 FPS (0.3 MPS) uncalibrated; 0.1 FPS (0.03 MPS) at rates < 1 FPS (0.3 MPS)
Sensitivity	Flow: 0.001 FPS (0.0003 MPS)
Repeatability	$\pm 0.01\%$ of reading
Response Time	Flow: 0.3-30 seconds, user configured, to 100% of value, step change in flow
Security	Keypad lockout, user selected four digit access code
ULTRALINK™ Utility	IBM compatible, Windows® 95/98/2000/XP operating system

TRANSDUCER

DESCRIPTION	SPECIFICATION
Liquid Types Supported	Virtually all non-aerated liquids
Transducer to Transmitter Distance	(Std.) 20, 50, 100 feet (6, 15, 30 meters), (Opt.) lengths to 990 feet (300 meters) RG59 - 75 OHM Coaxial cable
Pipe Sizes	(Std.) 1/2 inch (12 mm) and higher
Environment	NEMA 6 (IP-68)
Pipe Surface Temperature	DTTN: -40 °F to +300 °F (-40 °C to +121 °C); DTTH: -40 °F to +380 °F (-40 °C to +193 °C) DTTS: -40 °F to +185 °F (-40 °C to +85 °C)
Ambient Temperature	-40 °F to +185 °F (-40 °C to +85 °C), 0-95% relative humidity, non-condensing
Housing Material	DTTN: CPVC, Ultem® and Nylon; DTTH: PTFE, Vespel®, Nickel-Plated Brass DTTS: PVC, Ultem® and Nylon
Mounting	(Std.) Stainless strap P.N. D002-2007-001; (Opt.) Aluminum track assemblies w/graduated scales
Installation	(Std.) General purpose; (Opt.) Class I Division 1, Groups C and D (includes intrinsic safety barrier)

ISO-MOD INPUT/OUTPUT MODULES

Field-Replaceable Electronic Modules for System Integration

General

ISO-MODs are epoxy-encapsulated electronic input/output modules that are simple to install and replace in the field. All modules are 2,500 V optically isolated from TFXD power and Earth grounds – eliminating the potential for ground loops and reducing the chance of severe damage in the event of an electrical surge.

Seven ISO-MOD options are available including: 4-20 mA, dual relay, rate pulse, RS232C, RS485, 200K event data logger and Heatflow/RTD (see TFX BTU-Pro data sheet). TFXD supports any two ISO-MOD input/output modules. All modules are field-configurable by utilizing the keyboard or **ULTRALINK™** interface. Field wiring connections to ISO-MODs are quick and easy using pluggable terminals. Features of the various ISO-MODs are described below.

4-20 mA Output Module

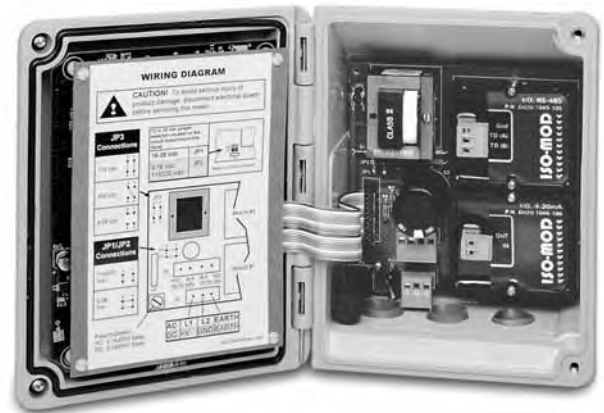
Easily configured via jumper selections into either an internally powered or externally powered mode, the 4-20 mA Output Module interfaces with virtually all recording and logging systems by transmitting an analog current signal that is proportional to system flow energy rate. Independent 4 mA and 20 mA span settings are established in software. These settings can span negative and positive flow directions to output bi-directional flow data. Output resolution of the module is 12-bits (4,096 discrete points) and because of its low insertion loss characteristics (less than 5 V typical) the module can drive more than 800 Ohms of load with a 24 V power source.

Dual Relay Module

Two independent SPDT (single-pole, double-throw, Form C) relays are contained in this module. The relay operations are user-configured via software to act in either a flow rate alarm, signal strength alarm, water meter pulser or totalizer/batching mode. The relays are rated for 200 VAC max. and have a current rating of 0.5 A resistive load (175 VDC @ 0.25 A resistive). It is highly recommended that a secondary relay be utilized whenever the Control Relay ISO-MOD is used to control inductive loads such as solenoids and motors.

Rate Pulse Output Module

The Rate Pulse Output Module is utilized to transmit information to external counters and PID systems via a frequency output that is proportional to system flow energy rate. Independent Zero and Span settings are established in software using the Flow Measuring Range entries. These settings can span negative and positive flow directions to output bi-directional flow data. Output resolution of the module is 12-bits (4,096 discrete points) and the maximum output frequency setting is 2,500 Hz – other frequency ranges may be available, please consult the Dynasonics factory. The module has a MOSFET output with an “On” resistance of 0.21 Ohms and is rated at 100 V, 1 A continuous operation.



RS232C Input/Output Module

The RS232 Module can be interfaced with the serial communication ports of PCs, PLCs and SCADA systems that are used to monitor flow rate information in piping systems. The RS232 Module may also be used to form a hardwire connection to a PC that is running the **ULTRALINK™** software utility. Baud rates up to 57.6K are supported.

RS485 Input/Output Module

The RS485 Module allows up to 126 TFX systems to be placed on a single three-wire cable bus. All meters are assigned a unique serial number that allows all of the meters on the cable network to be independently accessed. Baud rates up to 57.6K and cable lengths to 1,000 feet (300 meters) are supported.

Data Logger Module

This powerful 200,000-event data logger/electronic stripchart recorder is available as an option in the TFXD system and can be configured to match user applications. The logger stores time-stamped, high resolution (16-bit) data at user-selected intervals ranging from 1 to 1,000 seconds. Configuration of and data retrieval from the logger can be accomplished in two ways:

- The module can be removed and carried in a shirt pocket back to the office and plugged into a PC serial port via the module's integral DB9 connector. This eliminates the requirement to carry a laptop computer to the flow meter site.
- A computer can be connected to the DB9 connector without removing the logger from the flow meter. Data can be extracted via the supplied Windows® software utility.



Windows®-based Software Utility. A complete meter configuration, calibration and troubleshooting tool.

- Provides quick access to all configuration parameters with pop-up windows and pull-down menus.
- Assists in selection of proper position and mounting locations of transducers.
- Selection of units of measure and measuring range.
- Contains a powerful in-field multi-point calibration routine.
- Displays error codes and logs reset functions.
- Stores meter configurations to a file that can be archived or used to configure additional meters.



User-Friendly Operations. Configuration of the TFXD is provided through a simple menu structure. Selections for units of measure, measuring range, input/output options and configurations storage are available.

Designed with the user/operator in mind, configuration and calibration of ultrasonic flow meters have never been as simple and straight forward as with Series TFXD. Integration of your PC, the TFXD flow meter and **ULTRALINK™** provides the ultimate in operator control.

ULTRALINK™ is a Windows® 95/98/2000/XP software utility that communicates with TFXD flow meters through a PC serial communications port and infrared serial adapter (Dynasonics P.N. D005-2115-001 shown below). Since the communication link is infrared light, the user need only be within 10 feet (3 meters) of the TFXD meter – interconnection wires are not necessary.

Note: Model TFXD2 (with integral keypad and display) does not require **ULTRALINK™** or the use of a computer for configuration. Model TFXD1 (without keypad and display) does require the software and computer for system configuration. The software and computer are requirements for in-field calibration of TFXD systems and to access advanced features of the TFXD system.



Real-Time Infrared Communications. Configuration and calibration are quick and simple using **ULTRALINK™** and your PC. Dynasonics Infrared Serial Adapter (P.N. D005-2115-001) allows full programming access.



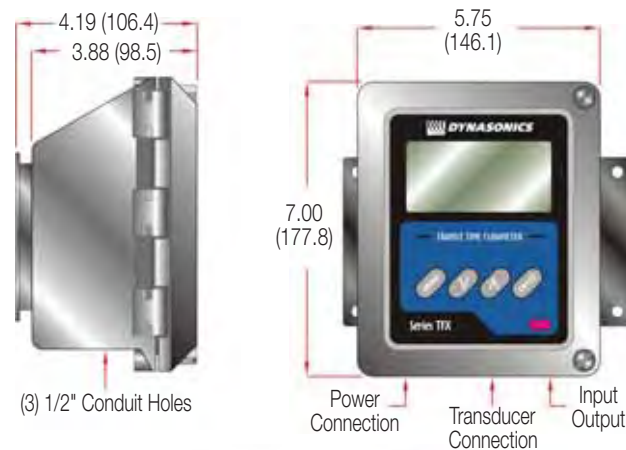
Infrared Serial Adapter. Dynasonics P.N. D005-2115-001 transmits and receives data from TFXD flow meters from up to 10 feet (3 meters) away. Simply point the front of the adapter at the TFXD and start **ULTRALINK™** on your PC.

Series TFXD

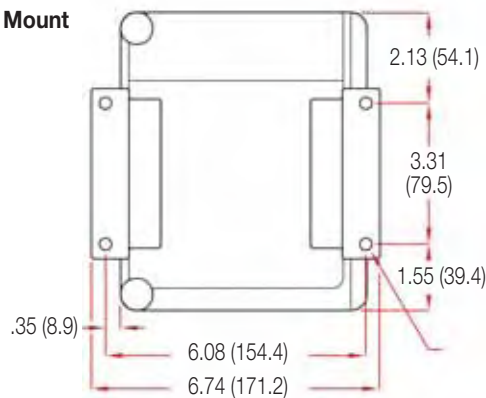
DIMENSIONAL SPECIFICATIONS

MECHANICAL DIMENSIONS: INCHES (mm)

TFXD2 Transmitter Shown



Wall Mount



Intrinsic Safety Barrier

(Included with Class I Div. I, Groups C and D transducers)

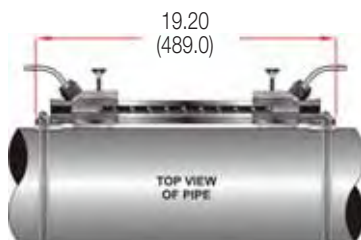


Pipe Size	Pipe Material	A	B	C	D	Measuring Range
1/2"	ANSI	2.46 (62.5)	2.36 (59.9)	2.66 (67.6)	0.84 (21.3)	.5 - 25 GPM 2 - 100 LPM
	Copper	2.46 (62.5)	2.36 (59.9)	3.33 (84.6)	0.63 (15.9)	.5 - 25 GPM 2 - 100 LPM
	Tubing	2.46 (62.5)	2.28 (57.9)	3.72 (94.5)	0.50 (12.7)	.5 - 25 GPM 2 - 100 LPM
3/4"	ANSI	2.46 (62.5)	2.57 (65.3)	2.66 (67.6)	1.05 (26.7)	1 - 55 GPM 4 - 200 LPM
	Copper	2.46 (62.5)	2.50 (63.5)	3.56 (90.4)	0.88 (22.2)	1 - 55 GPM 4 - 200 LPM
	Tubing	2.46 (62.5)	2.50 (63.5)	3.56 (90.4)	0.75 (19.0)	1 - 55 GPM 4 - 200 LPM
1"	ANSI	2.46 (62.5)	2.92 (74.2)	2.86 (72.6)	1.32 (33.4)	2 - 100 GPM 8 - 375 LPM
	Copper	2.46 (62.5)	2.87 (72.9)	3.80 (96.5)	1.13 (28.6)	2 - 100 GPM 8 - 375 LPM
	Tubing	2.46 (62.5)	2.75 (69.9)	3.80 (96.5)	1.00 (25.4)	2 - 100 GPM 8 - 375 LPM
1-1/4"	ANSI	2.80 (71.0)	3.18 (80.8)	3.14 (79.8)	1.66 (42.2)	4 - 150 GPM 15 - 570 LPM
	Copper	2.46 (62.5)	3.00 (76.2)	4.04 (102.6)	1.38 (34.9)	4 - 150 GPM 15 - 570 LPM
	Tubing	2.46 (62.5)	3.00 (76.2)	4.04 (102.6)	1.25 (31.8)	4 - 150 GPM 15 - 570 LPM
1-1/2"	ANSI	3.02 (76.7)	3.42 (86.9)	3.33 (84.6)	1.90 (48.3)	5 - 220 GPM 18 - 830 LPM
	Copper	2.71 (68.8)	2.86 (72.6)	4.28 (108.7)	1.63 (41.3)	5 - 220 GPM 18 - 830 LPM
	Tubing	2.71 (68.8)	3.31 (84.1)	4.28 (108.7)	1.50 (38.1)	5 - 220 GPM 18 - 830 LPM
2"	ANSI	3.70 (94.0)	3.42 (86.9)*	5.50 (139.7)	2.375 (60.3)*	8 - 400 GPM 30 - 1500 LPM
	Copper	3.70 (94.0)	3.38 (85.9)*	5.50 (139.7)	2.125 (54.0)*	8 - 400 GPM 30 - 1500 LPM
	Tubing	3.21 (81.5)	3.85 (98.0)	4.75 (120.7)	2.00 (50.8)	8 - 400 GPM 30 - 1500 LPM

* Varies due to U-bolt configuration

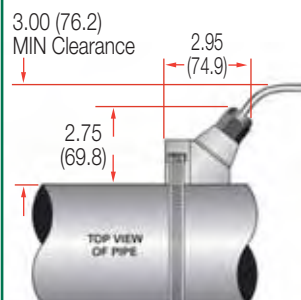
10" (250 mm) Scaled Mounting Track

[Optional 16" (405 mm) track also available]



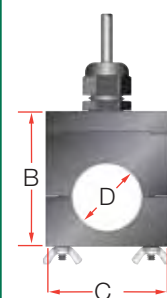
DTTN

Pipe 2" (50 mm) and higher



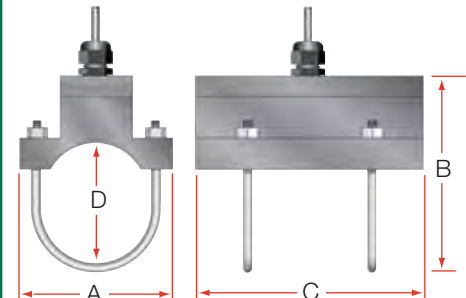
DTTS

Pipe 1/2" to 2" (12 mm to 50 mm)



DTTS U-Bolt Connections

[ANSI & Copper 2" (50 mm) Models]



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