PORTABLE TRANSIT TIME FLOW METER

Series TFXP Portable Transit Time Flow Meters feature the world's most advanced non-invasive flow measurement technology – providing a measuring system with unsurpassed accuracy, versatility, ease of installation and dependability. Although designed primarily for cleaner liquids, the flow meter can reliably measure liquids containing moderate amounts of suspended solids or aeration. TFXP is designed for long- or short-term flow measurement surveys on full-pipe liquid systems and is ideal for verifying calibration of permanently mounted flow meters of all types.

The flow meter features a tactile keypad, 24-hour battery (rechargeable), removable 200,000-event data logger (optional) and a 128 x 64 pixel, back-lit graphics display – all integrated into a rugged, watertight enclosure. TFXP systems utilize Dynasonics' proprietary dual time-base time expansion algorithm, advanced DSP and digital cross-correlation. TFXP also provides an optical interface that allows operation of the Windows® **ULTRA**LINK™ software utility. The software utility allows simple in-field programming, calibration and software upgrades.

The cost-effective and versatile TFXP flow meter comes complete with all accessories necessary for measuring piping systems 2" [50 mm] and higher.

FEATURES

- A removable 200,000-event data logger module is optional. The logger has an integral DB-9 connection that plugs directly into a PC serial port for very fast 57.6K data uploads.

- Automatic Reynolds Number compensation ensures accurate measurements through the laminar, transition and turbulent system flow regions.

- Integral 24-hour rechargeable battery allows extended operation when AC power is not available. Both AC and "auto" socket style power adapters (battery chargers) are included.

- Compartmentalized and padded carrying case keeps the TFXP meter and all of its accessories organized and protected.

- TFXP has a flow measuring range that exceeds 4000:1. This feature allows the instrument to measure normal process flow rates as well as flows resulting from leaks in piping and valves.

- User-configurable rate and totalizer units include: feet, gallons, ft^3, million-gal, barrels, acre-feet, lbs, meters, liters, m^3, million-liters and kg.

- Non-invasive clamp-on transducers are simple and cost-efficient to install. Since the transducers do not contact the liquid, fouling and maintenance are eliminated.

- An integral optical interface and optional Windows® software utility provide complete control of system configuration, calibration and diagnostics – without connecting any wires.

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™

DIVISION OF RACINE FEDERATED INC.

PORTABLE TRANSIT TIME

TFX 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 the 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 the flow meter will indicate zero flow.
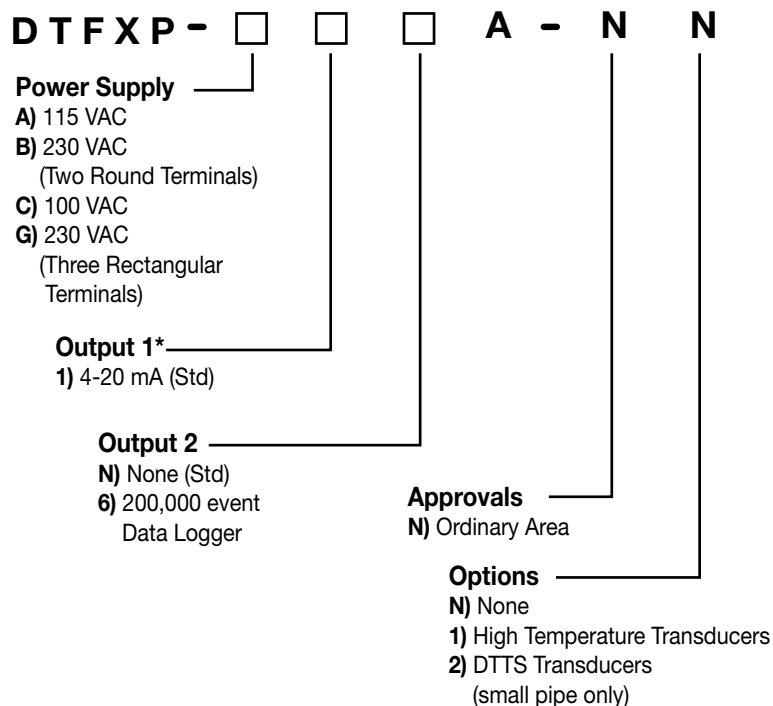
Figure 1

Reflect-Mode Configuration
Transit Time
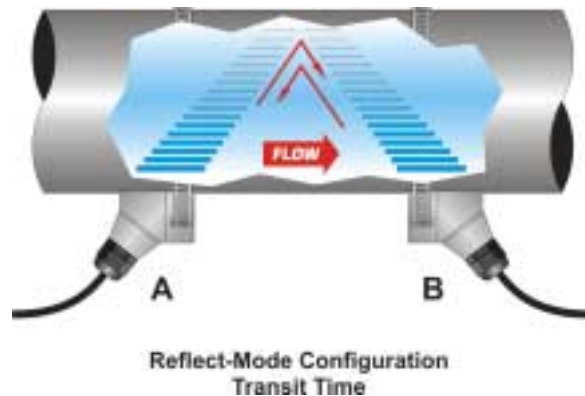
The sound's time of flight is accurately measured in both directions and the difference in time of flight is calculated. The liquid velocity (V) inside the pipe can be related to the difference in time of flight (dt) through the following equation:

$V = K*D*dt$, where K is a constant and D is the distance between the transducers.

PART NUMBER CONSTRUCTION

All TFXP systems include the following: Padded carrying case, TFXP meter, ultrasonic transducer set, 20 ft. [6 m] transducer interconnection cable, 1 tube of acoustic couplant, mounting hardware, AC power converter, auto-style 12 VDC converter, infrared adapter and **ULTRA**LINK™ software utility, 4-20 mA interface cable and operations manual.

D T F X P - ☐ ☐ ☐ A - N N

Power Supply
A) 115 VAC
B) 230 VAC
   (Two Round Terminals)
C) 100 VAC
G) 230 VAC
   (Three Rectangular Terminals)

Output 1*
1) 4-20 mA (Std)

Output 2
N) None (Std)
6) 200,000 event Data Logger

Approvals
N) Ordinary Area

Options
N) None
1) High Temperature Transducers
2) DTTS Transducers
   (small pipe only)

DTFXP Replacement Parts	Part Number
Data Logger 200,000-event	D020-1045-104
Padded carrying case	D003-1012-002
Transducers, set of two	D071-0105-000
Transducer Cable, 20 ft. [6 m]	D005-2112-020
Acoustic Couplant temporary mount	D002-2011-001
Mounting Track, w/measuring scale	D010-2102-010
36 inch SS hose clamp	D002-2007-001
Power converter, 115 V U.S.	D005-2502-001
Power converter, 230 V European	D005-2502-002
Power converter, 230 V U.K.	D005-2503-003
Power cord, 12 V auto-style	D005-2116-002
4-20 mA interconnect cable	D005-2116-001
Infrared communicator and **ULTRA**LINK™ (DB-9)	D005-2115-100
Manual, TFXP flow meter	DTFXP O&M

* Additional input/output options are available. Consult the local sales rep or the Dynasonics factory.

SPECIFICATIONS

TRANSMITTER

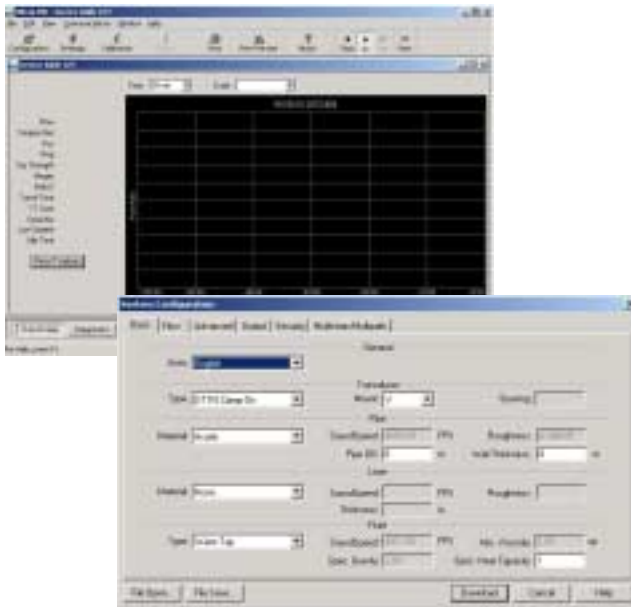| DESCRIPTION	SPECIFICATION
Power Requirements	Internal 12 V lead-acid Gel Cell battery provides 24 hrs. of continuous operation @ 20 °C. Charging: Wall mount power converter. 115 or 230 VAC 50/60 Hz ± 15% @ 5 VA max.; 12-15 VDC @ 2.5 VA max.
Velocity	-40 to +40 FPS [-12 to +12 MPS]
Inputs/Outputs	All output modules are optically isolated from earth and system grounds. A maximum of two modules may be installed.
Standard Options:	**4-20 mA** 800 Ohms max.; 12-bit resolution; passive or active **Data Logger** 200,000 event, 16-bit, integral DB-9 RS232C connection, can be removed and installed without disconnecting system power, data transfer rates to 57.6K.
Other Options:	**Pulse Output** MOFSET, 0.21 Ohms, 100 V max., 0-2,500 Hz **Relay** Two separate Form C relays, 200 VAC max. @ 0.5 A resistive **RS232C** data rate to 57.6K **RS485** supports up to 119 drops
Display	128 x 64 pixel graphics LCD, LED back lit. Two user selectable font sizes 0.35" [8.9 mm], 8 digit rate, 8 digit totalizer (resettable)
Units: **Rate** **Totalizer**	User configured Feet, gallons, ft^3, mil-gal, barrels, acre-feet, lbs., meters, liters, m^3, mil-liters, kg (with Heatflow option: BTUs, calories, Watts) [rate time: sec, min, hr, day] (NET, FWD, REV or BATCH) gallons, ft^3, barrels, acre-feet, lbs., liters, m^3, kg (with Heatflow option: BTUs, calories, Watts)
Ambient Conditions	-40 ° to +185 °F [-40 ° to +85 °C], 0-95% relative humidity, non-condensing
Enclosure	NEMA 4X [IP-66] while open, NEMA 6 [IP-68] while closed, ABS with SS hardware. Electronic enclosure: 14.00W x 6.06H x 10.56D inches [355.6H x 153.9W x 268.2D mm]; 14.8 lbs. [6.7 Kg]
Accuracy Flow Rate	±0.5% of reading at rates > 1 FPS for field calibrated systems; ±1% of reading at rates > 1 FPS [0.3 MPS] uncalibrated; ±0.1 FPS [0.003 MPS] at rates < 1 FPS [0.3 MPS]
Sensitivity	Flow: 0.001 FPS [0.0003 MPS]
Repeatability	±0.01% of reading
Response Time	Flow: 0.3-30 seconds, user configured, to 100% of value, step change in flow
Security	Keypad lockout, four digit user selected access code
Approvals	Ordinary Area
***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 Feet [6.09 meters], (Opt.) lengths to 990 feet [300 meters]
Pipe Sizes	(Std.) 2 inches [50 mm] and higher
Environment	NEMA 6
Pipe Surface Temperature	DTTN: -40 ° to +300 ° F [-40 ° to +121 °C]; DTTH: -40 ° to +400 °F [-40 ° to +200 °C]
Ambient Temperature	-40 ° to +185 °F [-40 ° to +85 °C], 0-95% relative humidity, non-condensing
Housing Material	DTTN: CPVC, Ultem™ and Nylon; DTTH: PTFE, Vespel™, Nickel-Plated Brass
Approvals	(Std.) Ordinary Area; (Opt.) Class I Div. 1 Groups C and D; Class II Div. 1 Groups E, F and G (pending)

Series TFXP

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 system 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.**

Designed with the user/operator in mind, configuration and calibration of portable ultrasonic flow meters have never been as simple and straight-forward as with Series TFXP. Integration of your PC, the TFX flow meter and *ULTRALINK*™ provide the ultimate in operator control. *ULTRALINK*™ is a Windows® 95/98/2000/XP software utility that communicates with TFXP 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 TFXP meter – interconnection wires are not necessary.

Note: Model TFXP does not require *ULTRALINK*™ or the use of a computer for configuration. The software and a computer are requirements for altering the TFXP factory calibration to match existing in-field flow meters.

Order Dynasonics P.N. D005-2115-100. Kit includes *ULTRALINK*™ software and one infrared serial adapter.

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.

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


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

TFXP ACCESSORIES PACKAGE

TFXP flow meter comes complete with all accessories necessary for measuring flow rates in piping systems 2" [50 mm] and higher. All of the components of the system are stored neatly in a compartmentalized and padded carrying case [A] (see picture at left). Items included with the TFXP system: TFXP meter [B], ultrasonic transducer set [C], 20 ft. [6 m] transducer interconnection cable, 1 tube of acoustic couplant [D], mounting hardware [E], AC power converter [F], auto-style 12 VDC converter, infrared adapter and **ULTRA**LINK™ software utility [G], 4-20 mA interface cable and operations manual.

INSTALLATION AND OPERATION
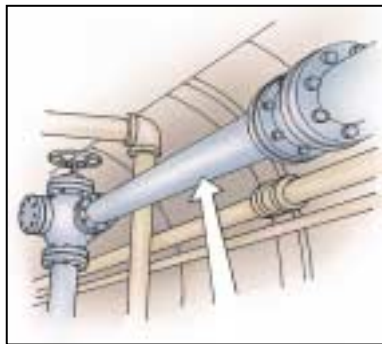
Select the optimum location on the piping system.

The most critical step in obtaining an accurate flow reading is proper selection of the location to mount the ultrasonic transducers. In general, choose a transducer mounting location that guarantees a full pipe of liquid and contains a minimum of ten pipe diameters (lineal distance equal to ten times the pipe internal diameter) of straight pipe located upstream, toward the source of flow, and five diameters downstream. Obtain or measure the pipe outside diameter and wall thickness.

Enter the pipe and liquid information into the flow meter.

The following information is entered into the TFXP flow meter via the keypad or on a PC operating the **ULTRA**LINK™ software utility:

- Pipe Outside Diameter
- Pipe Wall Thickness
- Pipe Material (select from list)
- Pipe Liner Thickness (if present)
- Liner Material (if present)
- Fluid Type (select from list)

After entry, the TFXP will calculate and display the proper distance to place the transducers apart on the pipe.
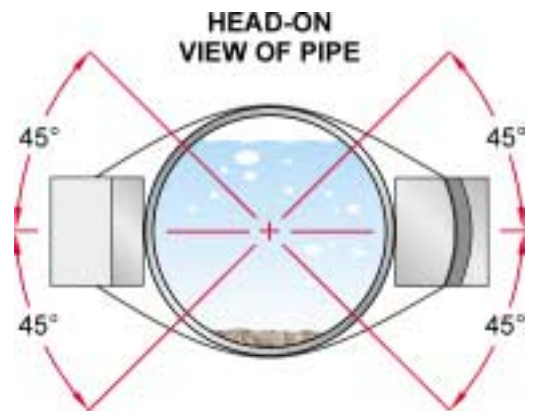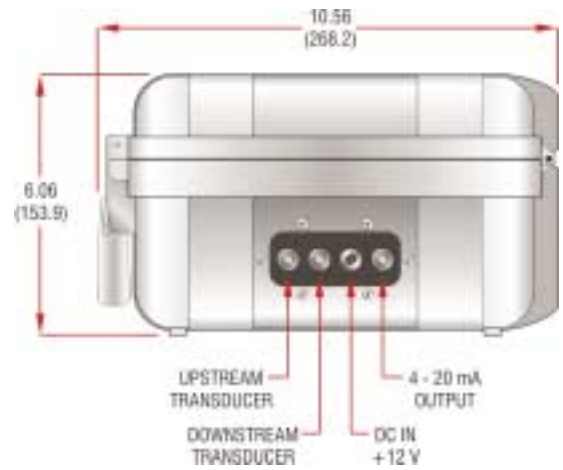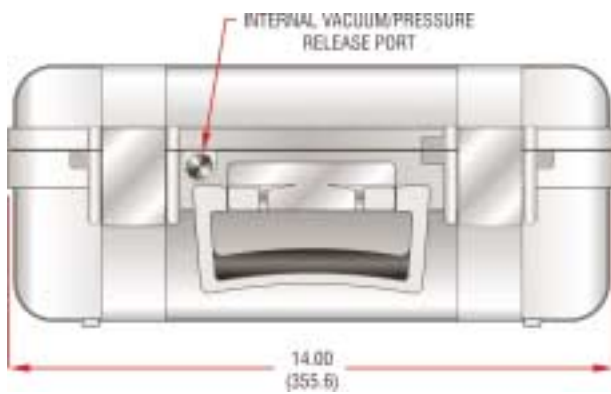
Mount the transducers onto the pipe.

Remove loose paint, rust or scale from the pipe in the two areas where the transducers will be mounted. Attach the applicable transducer mounting hardware to the pipe with the enclosed straps. Apply a bead of acoustic couplant to the face of each transducer and clamp them to the pipe. Connect the transducer cables between the transducers and the TFXP flow meter. Press the ON button and select desired measuring units. The TFXP will begin to measure flow.

DIMENSIONAL SPECIFICATIONS

MECHANICAL DIMENSIONS: INCHES (MM)

INTERNAL VACUUM/PRESSURE
RELEASE PORT

14.00
(355.6)

10.56
(268.2)

6.06
(153.9)

UPSTREAM TRANSDUCER

DOWNSTREAM TRANSDUCER

4 - 20 mA OUTPUT

DC IN
+ 12 V

DYNASONICS

Series TFX

HEAD-ON
VIEW OF PIPE

45°   45°

45°   45°

19.20
(489.0)

TOP VIEW
OF PIPE

PIPE 2" TO 10" (50 - 250 mm) DIA

2.95
(74.9)

3.00 (76.2) MIN
CLEARANCE

2.75
(69.8)

TOP VIEW
OF PIPE

Windows is a registered trademark of Microsoft Corp.

FORM TFXP 7/04

iAC

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