Dynasonics®
Ultrasonic Flow Meters

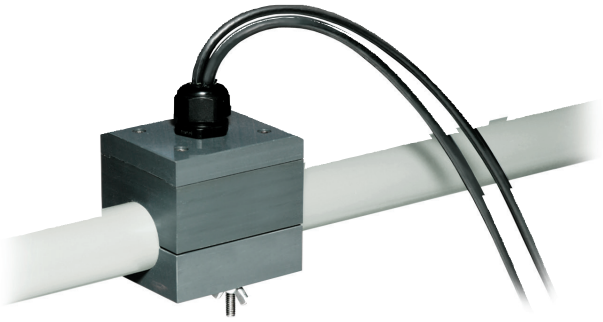
Transducers

Small Pipe, Fixed Size Transit Time Ultrasonic Transducers

INTRODUCTION

This document explains how to install small pipe transit time ultrasonic *integral* transducers and transducers with *remote mounting*. The transducers can be installed vertically or horizontally.

The transducers have integrated transmitter and receiver elements that eliminate the requirement for spacing measurement and alignment.



PRE-INSTALLATION REQUIREMENTS

NOTE: Protect all parts until installation is complete.

Program the Meter

Before the flow meter will be operational, you must select the optimum transmission mode, enter the site information, and enter the fluid and pipe properties into the ultrasonic flow meter. For detailed instructions, see the user manual for your flow meter.

Select a Pipe Location for the Transducers

Select a location for the transducers on a section of pipe that has at least 10 pipe diameters upstream of the transducers and 5 pipe diameters downstream. See *"Figure 2: Piping configuration and transducer positioning" on page 2*.

For example, if a 2 in. pipe is being measured, the minimum upstream pipe in front of the transducer should be 20 in. and the minimum downstream pipe behind the transducer should be at least 10 in.

Pipe runs shorter than the minimums may sometimes be used with reduced accuracy. There is no way to determine how much accuracy is sacrificed without doing in-field testing.

For installations where the 10/5 pipe diameters rule cannot be followed, divide the total length of available straight pipe into thirds and mount the rail with 2/3 of the pipe upstream and 1/3 of the pipe downstream.

A full pipe is absolutely essential for making accurate flow measurements. The flow meter cannot determine if the pipe is full or not. If the pipe is partially full, the meter will over-report the amount of flow by the percentage of the pipe that is not filled with liquid or may not detect any flow.

Install the mounting system in an area where the transducers will not be inadvertently bumped or disturbed.

Avoid installations on downward flowing pipes unless adequate downstream head pressure is present to overcome partial filling of—or cavitation in—the pipe.

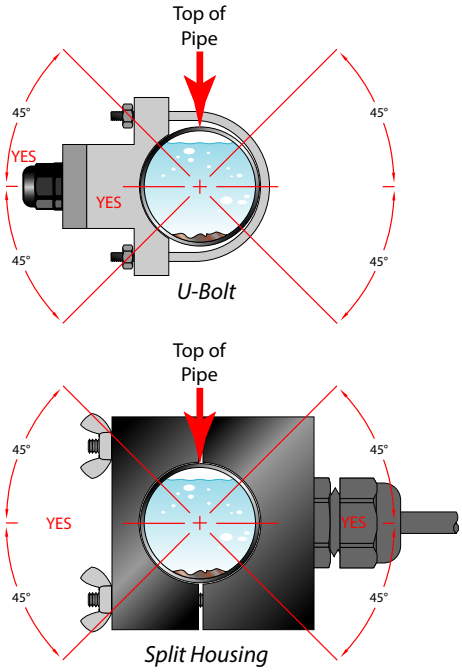


Figure 1: Transducer positioning

Badger Meter

IND-UM-02649-EN-07 (July 2022)

Installation Guide

Piping Configurations and Transducer Positioning

Figure 2 shows the number of pipe diameters required downstream and upstream of the transducers for various piping configurations.

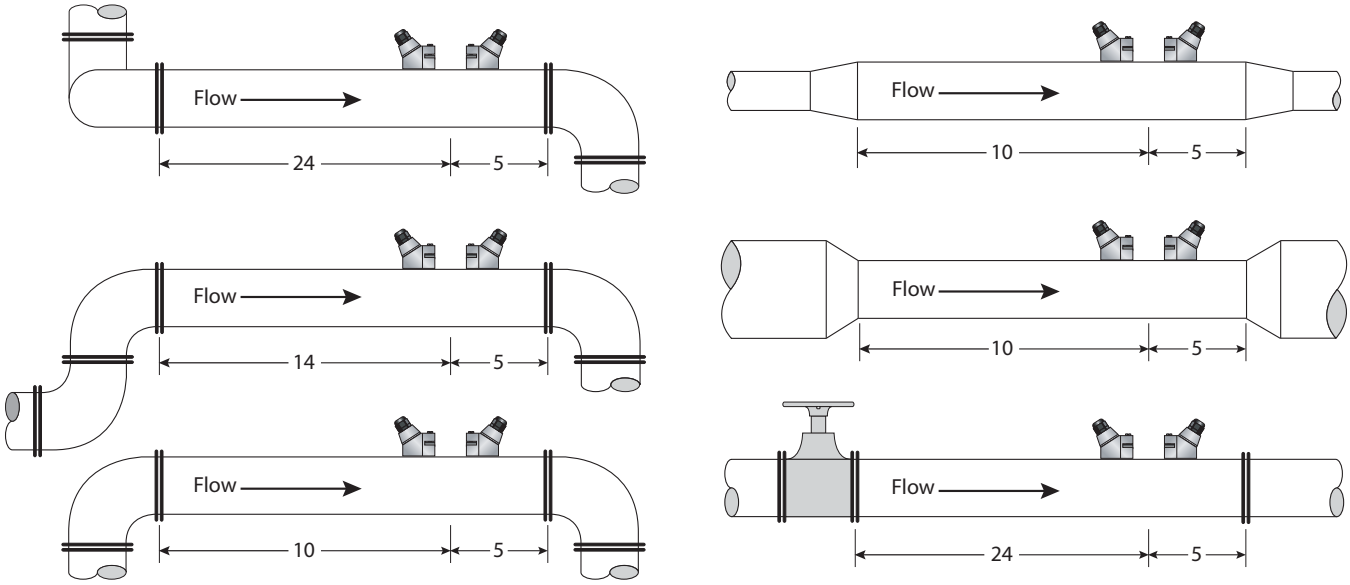


Figure 2: Piping configuration and transducer positioning

The system will provide repeatable measurements on piping systems that do *not* meet these pipe diameter requirements, but the accuracy of the readings may be influenced.

Partially-Filled Pipe Situations

In some locations, the process pipe may be momentarily only partially filled. Examples include: lack of back pressure, insufficient line pressure and gravity flow applications.

To eliminate these situations:

- Do not install the transducers at the highest point of the pipeline.
- Do not install the transducers in a vertical, downward flow section of pipe.
- Always position the ON/OFF valves on the downstream side of the transducers.

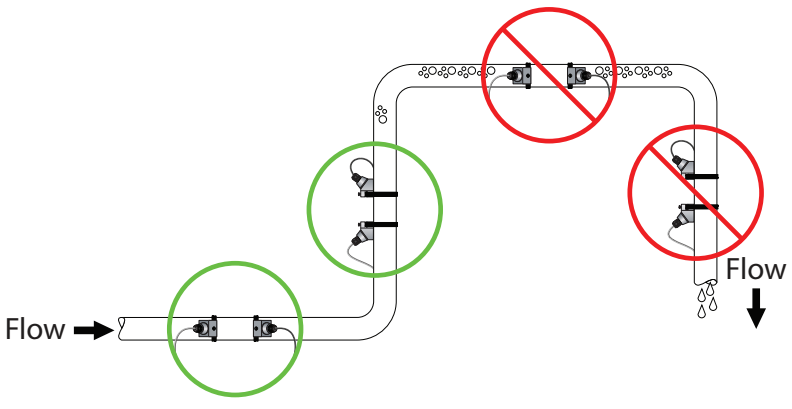
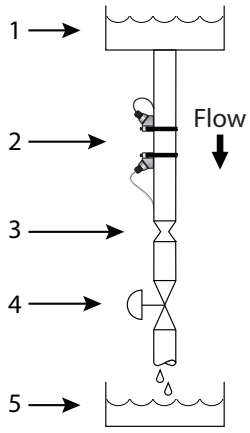


Figure 3: Transducer orientation



1	Supply Tank
2	Transducers
3	Pipe Restriction
4	Valve
5	Batching Tank

Figure 4: Transducer vertical mount, flow down

Pipe Material

Pipes must be good conductors of ultrasound and not block or scatter the signal. Most pipe materials will allow the signal to pass through. They include: stainless steel, PVC, CPVC, ABS, polypropylene, PVDF, copper, copper nickel, ductile iron and aluminum.

Wound fiberglass and concrete pipes typically trap air and are not suitable for these transducers. Some galvanized pipes may scatter the ultrasonic signal. Sometimes, relocating the transducers or mounting the transducers in a Z mode (1 transverse) will improve the signal strength.

Any liners in the pipe need to adhere to the the pipe walls. Total wall thickness and liner should not exceed 10 in. (254 mm). New mortar-lined ductile iron pipes may have air trapped in the lining initially. Letting the pipe soak will allow water to displace the air and allow the signal to pass through.

Paint with good adhesion to the pipe typically allows the ultrasonic signal to pass through. If there is blistering or peeling paint, sand the paint off before installing the transducers.

Test the signal strength before permanently installing the transducers.

Mounting Configuration

The mounting configuration for these transducers is **V**-Mount, where the sound traverses the pipe twice. **V**-Mount is a compromise between travel time and signal strength.

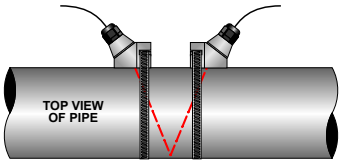


Figure 5: V-mount configuration

The frequency setting depends on the pipe material.

Pipe Size	Frequency Setting	TFX-500w/TFX-5000 Transducer	Pipe
1/2 in.	2 MHz	D*-*-CA	ANSI
		D*-*-CG	Copper
		D*-*-CM	Stainless Steel
3/4 in.	2 MHz	D*-*-CB	ANSI
		D*-*-CH	Copper
		D*-*-CN	Stainless Steel
1 in.	2 MHz	D*-*-CC	ANSI
		D*-*-CT	Copper
		D*-*-CP	Stainless Steel
1-1/4 in.	2 MHz	D*-*-CD	ANSI
		D*-*-CJ	Copper
		D*-*-CQ	Stainless Steel
1-1/2 in.	2 MHz	D*-*-CE	ANSI
		D*-*-CK	Copper
		D*-*-CR	Stainless Steel
2 in.	1 MHz	D*-*-CF	ANSI
		D*-*-CL	Copper
	2 MHz	D*-*-CS	Stainless Steel

Table 1: Transducer frequency settings

Remote System with Small Pipes

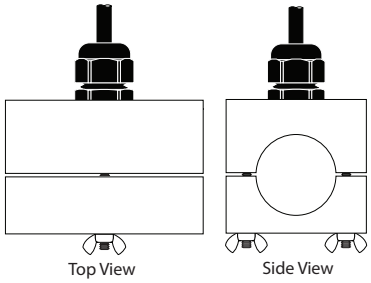


Figure 6: Pipes and tubing 1/2…2 in.

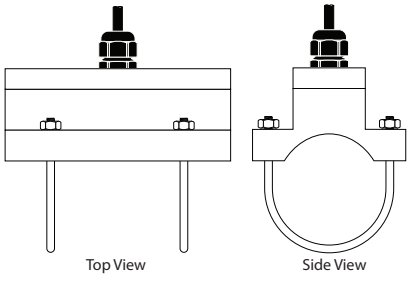


Figure 7: U-bolt connections, ANSI and copper 2 in.

Integral Systems with Small Pipes

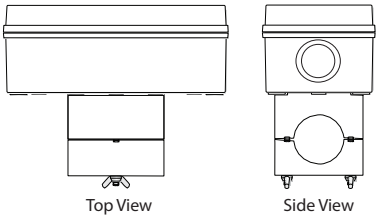


Figure 8: Integral

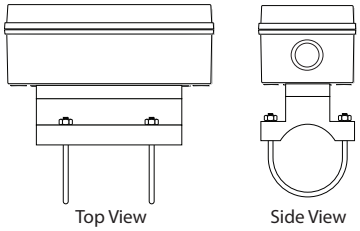


Figure 9: Integral with u-bolt

INSTALLATION PROCEDURE

The small pipe transducers are fixed to pipe sizes between 1/2…2 in. Do not attempt to mount the transducers onto a pipe that is either too large or too small for the transducer.

1. Clean the surface of the pipe. If the pipe has external corrosion or dirt, wire brush, sand or grind the mounting location until it is smooth and clean. Paint and other coatings, if not flaked or bubbled, need not be removed. Plastic pipes typically do not require surface preparation other than soap and water cleaning.
2. Apply a thin coating of acoustic coupling grease to the half of the housing where the transducer will contact the pipe. See *Figure 10*.
   Generally, a silicone-based grease is used as an acoustic couplant, but any good quality grease-like substance that is rated to not flow or shrink at the operating temperature of the pipe is typically acceptable.

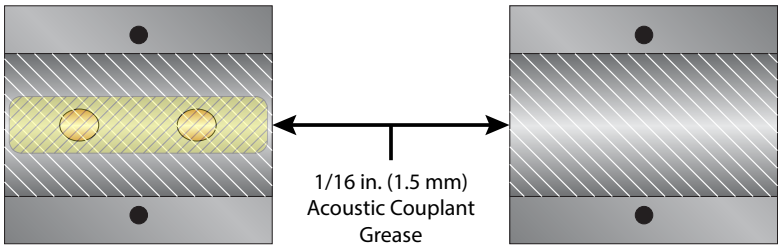


Figure 10: Application of acoustic couplant

Conditions	Couplant	Timeframe
Pipe surface temperature under 130° F (55° C), dry pipe	P.N. D002-2011-001 or D002-2011-008 Dow Corning 111 Grease	1 year
Pipe surface temperature under 350° F (177° C), dry or submerged, permanent mount	P.N. D002-2011-002 Dow Corning 732 multi-purpose sealant	Product life
Pipe surface temperature under 350° F (177° C), dry pipe	P.N. D002-2011-011 or D002-2011-012 Dow Corning 340 heat sink compound	Product life
Pipe surface temperature under 350° F (177° C), dry pipe, silicone not permitted	P.N. D002-2011-009 Molykote G-N; non-silicone	1 year
Pipe surface temperature under 120° F (49° C), dry pipe	P.N. D002-2011-014 Aquasonic 100 water soluble ultrasound transmission gel	Less than 4 hours

Timeframes are based on conditions where the transducers and couplant are not disturbed.
To check the condition of the couplant, monitor for any decreases in the signal strength and check for any physical changes to the couplant.

3. On horizontal pipes, mount the transducer in an orientation so the cable exits at ±45 degrees from the side of the pipe. Do not mount with the cable exiting on either the top or bottom of the pipe. See *Figure 1 on page 1*. On vertical pipes, the orientation does not matter.
4. Verify that the transducer is true to the pipe and all air is expelled out of the gap between the transducer faces and the pipe as necessary.
5. Tighten the wing nuts or U-bolts enough to hold the transducers in place, but not so tight that all of the couplant squeezes out of the gap between the transducer faces and the pipe or from the gap between the transducer halves.
6. Route the remote transducer cables back to the flow meter location, avoiding high voltage cable trays and conduits.