

Flexim F601 Ultrasonic Flowmeter

Application Note



BASIC INFORMATION

The Flexim F601 Ultrasonic Liquid Flowmeter measures liquid and energy flow in a pipe. It has clamp-on sensors for non-intrusive installation and measurement, without requiring that probes be physically inserted into the pipe. The F601 has data logging capabilities and a digital display for instantaneous flow measurements.

In mechanical systems, ultrasonic liquid flowmeters are most commonly used for HVAC chilled and hot water applications. They are also useful for measuring domestic, agricultural, and industrial process flows. All applications require that no gas-phase substance is present.

SETUP NOTES

To set up the flowmeter first select an appropriate monitoring location, then prepare the pipe, configure the flowmeter, install the transducers, complete the configuration, and check for proper installation as described below.

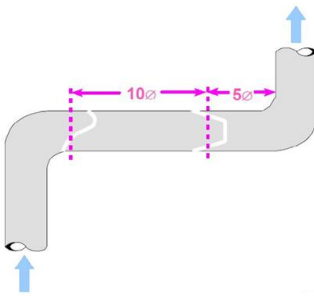


Figure 1: Appropriate Monitoring Location

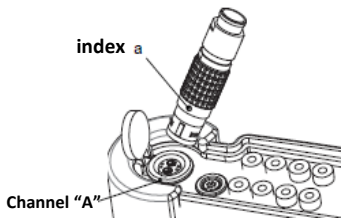


Figure 2: Transducer Attachment

- **Choose a monitoring location** where you expect there to be laminar, undisturbed, flow. This location should be on a horizontal pipe run at least 10 pipe diameters upstream of a pipe feature and 5 pipe diameters downstream of a pipe feature (Figure 1). If you must use a location with vertical flow, ensure that the meter is installed on pipe segment with upward flow.
- **Prepare the pipe** by removing protective covers or insulation. If there is loose paint, rust, or other debris remove it. Sand off any corrosion or rough features, within reason.
- **Connect the flow transducers** to the flowmeter. The red points on the connector and socket must align (Figure 2).
- If you plan to integrate the Flexim flow data with data from other sources taken at the same time, you should synchronize all data to a common clock. Clock settings are found in *Special Functions>System Settings*.
- **Configure the flowmeter** according to the Quick Start Guide provided by Flexim. In the **Parameter menu** you provide information regarding the pipe size and material and liquid properties. Note that we provide a pipe diameter tape to measure the outside diameter of the pipe. You may either measure the pipe thickness with the provided pipe thickness gauge (see Attachment A) or enter the thickness from the provided pipe size data tables.

For all prompts not discussed in the Quick Start Guide you can use the default values provided.



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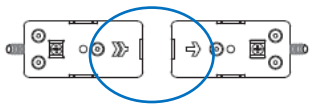


Figure 3: Correct Alignment for Arrows

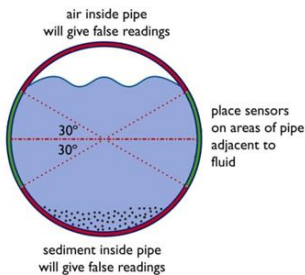


Figure 4: Install Transducers at 3:00 or 9:00 Position

Approximate Memory Capacity

	1 min	78 days	31 days
	10 sec	13 days	5.4 days
	1 sec	31 hrs	13 hrs
	no totalizers		
	one totalizer		

In the **Output Options menu** you specify what parameters you want the flowmeter to measure (e.g. flow volume, flow velocity...) and the units of measurement. You also specify whether you want the flowmeter to record the measurements, and at what frequency. The Quick Start Guide does not address temperature measurements.

If you plan to collect temperature measurements, connect the temperature sensor(s) to the pipe and connect them to the T1 and T2 sockets on the console. When prompted, select “Yes” for each sensor attached. You must also go to the Special Functions menu and select System Settings>Proc Inputs. Then arrow down to select PT100/PT1000. Arrow over to select PT100, press enter, then press BRK to return to main menu. See below for more notes about attaching the temperatures sensors.

Note that for all prompts not discussed in the Quick Start Guide you can use the default values provided.

In the **Measuring menu**, select the channel(s) that you will be measuring with, then enter the number of sound paths. For most applications the transducers should be installed on the same side of the pipe and you will need to specify an even number of sound paths – usually 2 or 4. At this point the meter will tell you the spacing to use for the transducers. If a negative value is displayed, increase the number of traverses to the next even number (e.g., from 2 to 4)

- **Install the transducers** at the specified spacing (see below for more notes about mounting fixtures) with a small amount of ultrasonic couplant applied along the center line of the transducers. The spacing is measured between the inside edges of the transducers. Ensure that the engravings on the backs form an **arrow pointing in the direction of flow** (Figure 3). The transducer cables should point in opposite directions. The transducers should be placed on the sides of the pipe at the 3:00 or 9:00 position to ensure they are placed in areas adjacent to fluids (Figure 4).
- With the transducers in place, **check the signal strength** on the flowmeter. It should be at least three bars. If not, then slightly adjust the spacing to maximize the signal strength. You can also check the couplant to be sure there is good contact between the transducers and the pipe. If you change the spacing, enter the adjusted spacing into the meter when requested under the Measuring menu. There is no advantage in having more than three bars of signal strength
- **To enable totalizers**, if desired, press the “8” key once logging has started. Pressing the key three times will clear the totalizer and pressing it once will enable the totalizer. Press the “2” key three times to turn off totalizers.
- **DO NOT press the BRK key** after logging has started, it will stop the logging process
- For **extended logging periods** beyond about 8 hours, the logger must be plugged into an outlet. The battery life is approximately 11 hours, depending on battery condition and logging requirements.
- **Check for proper installation:**
 1. Ensure that the green light for the active channel(s) is illuminated.

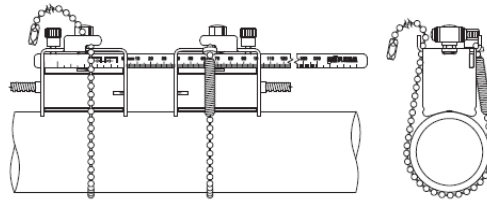


2. Press the “3” and “9” keys to **cycle through selected measurements**. This will confirm that the parameters you intend to measure are being recorded and will provide you with an estimated date that the log will be filled and measurements will be stopped. If this is before your intended stop date you will need to reduce the number of parameters measured to extend your logging period.
3. When cycling through measurements, note the sound speed and confirm that it is approximately the same as the value on the provided sound speed table. For the temperature of the water. Note that sound speed is affected by a number of factors including the presence of minerals and particulates. This number only needs to be approximately the same as that provided in the table.

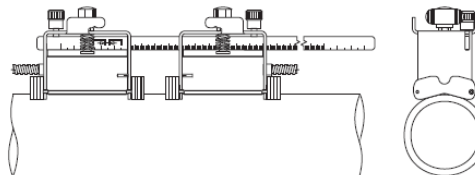
TRANSDUCER MOUNTING FIXTURES

1. The Flexim flow transducers can be mounted to the pipes using one of the three types of mounting kits we provide:

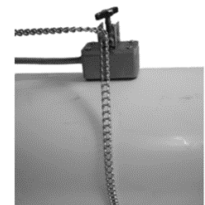
- To use the **fastening shoes with ball chains** (Figure X), insert the transducer into the fixture and lock it in with the screw located on top of the shoe. Then insert the ruler in the lateral slot of the shoes. The transducers can be fixed at the appropriate spacing using the plastic screw on the shoe. The shoe is attached to the pipe using the provided ball chain.



- To use the **fastening shoes with magnets** (Figure x), insert the transducer into the fixture and lock it in with the screw located on top of the shoe. Then insert the ruler in the lateral slot of the shoes. The transducers can be fixed at the appropriate spacing using the plastic screw on the shoe. The shoe is attached to the pipe with the provided magnets, one on each side of the shoe. This method only works with magnetic pipe materials.

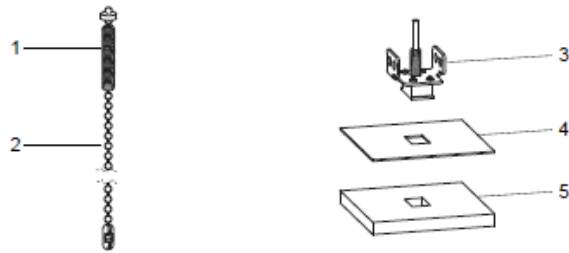


- To use the **ladder chain assembly**, insert the transducer into the slot of the fastening fixture. Attach the transducer to the pipe with the chain assemblies provided, tightening the transducer against the pipe with the tightening screw. With this mounting method, the transducer spacing must be measured with a distance tape measure such as the one provided with the flowmeter. This mounting method can be used in tight spaces that do not have space for the mounting assemblies described above.



TEMPERATURE PROBE MOUNTING

1. Fix the provided protection plate and insulation foam to the temperature probe.
2. Take the spring end of the ball chain and insert the first ball into one of the slots on the upper sided of the temperature probe.
3. Place the chain around the pipe. Tighten the chain and insert it into the other slot of the temperature probe,




- 1 – spring end
- 2 – chain
- 3 – temperature probe
- 4 – protection plate
- 5 – insulation foam

DOWNLOADING DATA

You must use Flux Diag Reader, free software from Flexim, to download data from the Fluxim F601 flowmeter. This software is available for free on Flexim's web site: [FLEXIM Software | Flow Meter Measurement Software](#). Be sure to download from Flexim's website to avoid suspicious downloads.

With FluxDiag Reader open:

1. Connect the flowmeter to your computer using the provided serial cable. We provide a USB adapter to connect via USB. Be sure to align the keyway in the connector properly with the socket.
2. Select the "Device" option at the opening screen
3. Select "Fluxus x0x" under device generation.
4. Select "COM" for connection type. Expand the connection settings on the right side of the screen and be sure that the connection settings are the same as the connection set up on your computer
5. Click on "Connect", a message in green indicates that connection to the device was successful. If the connection is unsuccessful, ensure that the Keyspan Serial Assistant is running and you have selected the correct serial interface.
6. Click on the Data Logger tab and click on "Read data logger" to download data. The download take some time, but the progress bar will show how the download is proceeding. A group box will appear showing the downloaded data sets, including measurement dates and number of measurements.
7. Select a data set to show a graph providing an overview of the collected data.
8. To save the data click on "Save" and select the appropriate location for your data file to reside on your computer.
9. In the measurement view tab  you can explore data views preconfigured by Flexim. You can also download the data from the data view in a text-based table format by clicking on the "Export" button. You can import the exported file to Excel or another data analysis tool for further analysis.
10. If you need help at any point, press F1 for help. There are also help documents available in FluxDiag Reader for you to explore other features of this software.



ATTACHMENT A USING THE PIPE WALL THICKNESS PROBE

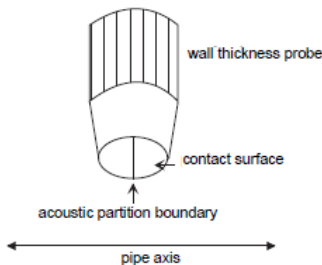
If the pipe wall thickness is unknown and cannot be determined by look up charts, use the ultrasonic thickness probe provided to measure the wall thickness.



Wall thickness probe



Close-up of probe's acoustic partition boundary



1. Plug the probe in the console's B channel and watch for the message identifying the device.
1. Push BRK key to go to top menu if necessary
2. Go to the Parameter menu [ENTER]
3. Select Channel B [ENTER]
4. Select Pipe material [ENTER]
5. Write down C-long value if desired [ENTER]. You must hit [ENTER] for this value to be recorded.
6. Hit BRK, then go to Measuring menu [ENTER]
7. At "wall T-inch?" prompt, make measurement by applying a small amount of couplant to the probe face then placing the sensor face on the pipe with the acoustic partition boundary perpendicular to the pipe axis. Apply even pressure and slightly move the sensor until the reading stabilizes, maintaining good contact with the pipe face at all times.
8. Confirm measurement and record for later use [ENTER]. You may wish to compare the measurement with values found in the pipe size data sheet for comparable pipe material.
9. At "Transfer Data?" select YES [ENTER], but note that the value transfers only to current B channel and must be re-entered for Channel A.
10. Remove the wall thickness probe from Channel B (to avoid damage, do NOT pull on the cable, and pull only on the LEMO style connector!)
11. Hit BRK
12. When prompted for the wall thickness during configuration of the flowmeter, enter the value recorded in Step 8.

