

## USER'S GUIDE

Installation & Operation  
Instructions

# DFM2 FIXED MOUNT DOPPLER FLOW METER



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## Introduction

The Flowmetrix DFM2 Flow Meter measures the velocity of fluids in pipelines using a totally non-intrusive principle.

The DFM2 utilises a high speed, 16-bit microprocessor unit with 32-Kbyte FLASH memory. The user-friendly flowmeter comes with a range of features to ensure easy and reliable flow measurement. The flow signal from the flow sensor is continuously analysed and should the signal quality become unacceptable an error message is displayed.

It is designed for use with sewage, waste water, pulp stock, mining slurries, food products and other fluids which contain in excess of 0,1% suspended solids or bubbles. The particle size for successful operation must be greater than 100 microns.

## Sensor mounting

### Location

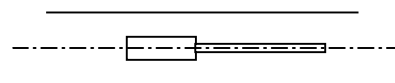
- Select a location for mounting the sensor at a point where the flow profile is fully developed. Generally the principle of 10 pipe diameters of straight pipe upstream, and 5 pipe diameters downstream will suffice, but should valves or bends exist upstream of the sensor, the amount of straight pipe immediately upstream will need to be increased.
- Ensure that the sensor is mounted as far as possible from potential noise sources, such as pumps, control valves etc. and mount the sensor at approximately 3/9 o'clock on the pipe (if horizontal) to avoid errors due to air pockets on top, or sediment at the bottom of the pipe.
- Either vertical or horizontal pipe runs are acceptable for sensor mounting.

### Surface preparation

- Before attaching the transducer head to the pipe surface, an area slightly larger than the flat surface of the transducer must be cleaned to bare metal. (A small amount of pipe pitting, even with spots of paint or rust, will not cause problems).

### Orientation

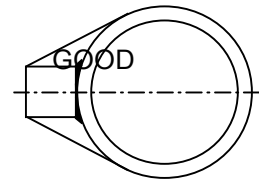
- The transducer must be mounted accurately, parallel to the pipe axis, for correct performance, and transducer to pipe contact should be along the centre line of the transducer head.



SIDE VIEW - 3 O'CLOCK POSITION  
ON PIPE IF HORIZONTAL

### Bonding

- Bonding to the pipe is achieved with silicone coupling compound. Be sure to fill in any air gaps that may remain at the pipe transducer interface with additional compound.
- A pipe clamp kit is included with the flow meter. It includes silicone coupling compound, a Neoprene rubber pad, and straps for pipe diameters up to 300 mm. In applications with excessive vibration it is recommended that the Neoprene rubber pad is inserted between the pipe and the transducer. Coupling compound must be applied to both sides of the pad.



### Keypad System

The DFM2 has an easy to use 4-button programming system.

- The MENU button is used to scroll through the menu structure.
- The SAVE button is used to save entered changes to the flowmeter programme.
- The ► and ▲ buttons are used to change numbers and scroll through options.

### Power Supply

Please ensure that you connect only the supply voltage as per specification.

- The DFM2 is supplied as either AC 115 or 240Volt or alternatively 24VDC.
- Connecting the DFM2 to incorrect power supply will damage the unit beyond repair and void the warranty.  
low and automatically switch off.

### Low power consumption

- The DFM2 is designed for low power consumption.

### Storage

- If the DFM2 is to be stored for an extended time period it should be packed and stored in a dry storage room.

## Menu System DFM2

The DFM2 menu system is easy to use and designed for programming simplicity.

With the DFM2 powered up the DFM2 will test the suitability of the flow signal. If the signal is suitable the flow total and flow rate are displayed, if not an error message is displayed.

<b>00000000 It</b> <b>3.9768 l/s</b>
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### START PROGRAMMING - Press "MENU"

#### Units

<b>Mn_1</b> units? Metric
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Metric and English units of rate and total measurement are available.  
Press ▲ until desired value is displayed and **MENU** to continue.

#### Pipe ID

<b>Mn_2</b> Pipe ID mm 53.4
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The precise dimension of the pipe internal diameter (ID) at the point of measurement must be entered.

Use the ► button to locate the cursor below the number to be changed and press the ▲ button until the desired value is displayed and **MENU** to continue.

#### Rate units

<b>Mn_3</b> rate units? l/s
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Press ▲ until desired unit is displayed and **MENU** to continue.

#### Total units

<b>Mn_4</b> tot units? It
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Press ▲ until desired unit is displayed and **MENU** to continue.

#### Clear total?

<b>Mn_5</b> clr total? save total
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The total can either be cleared or saved.

Press ▲ to either save or clear the total and **MENU** to continue.

### Damping

<p><b>Mn_6 damping?</b> <b>5.0 Sec</b></p>
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The level of damping can be selected.

Press **▲** until desired unit is displayed and **MENU** to continue.

### Cut-off

<p><b>Mn_7 % cutoff</b> <b>2%</b></p>
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The level of cut-off can be entered.

Press the **▲** button until the desired value is displayed and **MENU** to continue.

### Save data

<p><b>Mn_8 save data?</b> <b>Press SAVE</b></p>
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Press **SAVE** to accept all changes made.

## Error/Warning Messages

ERROR MESSAGE	ERROR	POSSIBLE SOLUTION
<ul style="list-style-type: none"> <li>poor signal</li> </ul>	<ul style="list-style-type: none"> <li>Poor signal</li> <li>Flow rate less than minimum flow rate of 0.25m/s</li> </ul>	<ul style="list-style-type: none"> <li>Increase flow rate</li> </ul>
<ul style="list-style-type: none"> <li>no signal</li> </ul>	<ul style="list-style-type: none"> <li>No signal</li> </ul>	<ul style="list-style-type: none"> <li>Establish flow</li> <li>Inject air into line</li> </ul>
<ul style="list-style-type: none"> <li>charge battery</li> </ul>	<ul style="list-style-type: none"> <li>Battery charge low</li> </ul>	<ul style="list-style-type: none"> <li>Charge battery</li> </ul>
<ul style="list-style-type: none"> <li>total error counts &gt; 100/s</li> </ul>	<ul style="list-style-type: none"> <li>Totaliser count-rate too high</li> </ul>	<ul style="list-style-type: none"> <li>Select more suitable total units</li> </ul>
<ul style="list-style-type: none"> <li>rate overflow</li> </ul>	<ul style="list-style-type: none"> <li>Rate &gt; 999 999</li> </ul>	<ul style="list-style-type: none"> <li>Select more suitable rate units</li> </ul>

## Troubleshooting guide

PROBLEM	POSSIBLE SOLUTION
<i>Meter reading lower than expected</i>	
<ul style="list-style-type: none"> <li>• Source particles velocity not indicative of average velocity</li> </ul>	<ul style="list-style-type: none"> <li>• Relocate sensor to a position where source particles are expected to be moving at the average velocity</li> </ul>
<ul style="list-style-type: none"> <li>• Incorrect mounting of flow sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Remount sensor correctly</li> </ul>
<ul style="list-style-type: none"> <li>• Programming error</li> </ul>	<ul style="list-style-type: none"> <li>• Review all programmed entries</li> </ul>
<ul style="list-style-type: none"> <li>• Flow rate lower than expected</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate possible causes and confirm flow rate independently</li> </ul>
<ul style="list-style-type: none"> <li>• Insufficient particle size or concentration</li> </ul>	<ul style="list-style-type: none"> <li>• Locate sensor at position where acceptable particle size or concentration is expected.</li> <li>• Inject air into the line</li> </ul>
<i>Meter reading when there is no flow</i>	
<ul style="list-style-type: none"> <li>• Local ultrasonic noise source</li> </ul>	<ul style="list-style-type: none"> <li>• Relocate sensor or remove noise source</li> </ul>
<i>"Poor signal" displayed when flow exists</i>	
<ul style="list-style-type: none"> <li>• Insufficient particle size or concentration</li> </ul>	<ul style="list-style-type: none"> <li>• Locate sensor at position where acceptable particle size or concentration is expected.</li> <li>• Inject air into the line</li> </ul>
<ul style="list-style-type: none"> <li>• Sensor coupling to pipe poor</li> </ul>	<ul style="list-style-type: none"> <li>• Remount sensor to pipe correctly</li> </ul>
<i>Meter reading higher than expected</i>	
<ul style="list-style-type: none"> <li>• Programming error</li> </ul>	<ul style="list-style-type: none"> <li>• Review all programmed entries</li> </ul>
<ul style="list-style-type: none"> <li>• Flow rate higher than expected</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate possible causes and confirm flow rate independently</li> </ul>
<ul style="list-style-type: none"> <li>• Particle velocity at sensor not indicative of average velocity</li> </ul>	<ul style="list-style-type: none"> <li>• Relocate sensor to a position where source particles are expected to be moving at the average velocity</li> </ul>
<ul style="list-style-type: none"> <li>• Incorrect mounting of flow sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Remount sensor correctly</li> </ul>
<ul style="list-style-type: none"> <li>• Local electrical noise</li> </ul>	<ul style="list-style-type: none"> <li>• Relocate sensor</li> </ul>
<i>Meter reading erratic</i>	
<ul style="list-style-type: none"> <li>• Particle velocity at sensor not indicative of average velocity and erratic</li> </ul>	<ul style="list-style-type: none"> <li>• Relocate sensor to a position where the velocity profile is expected to be suitable</li> </ul>

## **Questions and Answers**

*The pipe vibrates. Will it affect the flow meter?*

Common vibration frequencies are far lower than the sonic frequencies used by the flow meter, and will not normally affect accuracy or performance.

*Will pipe corrosion affect accuracy of the flow meter?*

Yes. Rust, loose paint etc. must be removed from the outside of the pipe to provide a clean mounting area when installing a Doppler sensor. Severe corrosion/oxidation on the inside of the pipe may prevent the Doppler signal from penetrating into the flow. If the pipe cannot be cleaned, a spool piece should be installed for sensor mounting.

*What effect do pipe liners have on the flow meter?*

The air gap between loose insertion liners and the pipe wall prevent the Doppler signal from entering the flow. Better results can be expected with bonded liners such as rubber, epoxy or tar, however an on site test is recommended to determine if the application is suitable for a Doppler flow meter.

*Why is Doppler only recommended for liquids containing suspended solids or gases?*

The Doppler sensor transmits sound into the flow stream, which must be reflected back to the sensor to indicate flow velocity. Gas bubbles or suspended solids act as reflectors for the Doppler signal. As a guideline, Flowmetrix Doppler flow meters are recommended for liquids containing solids or bubbles with a minimum size of 100 microns and a minimum concentration of 100 ppm.

*Can the sensor be submerged in water?*

Yes, for short periods of time or by accident, but not for continuous operation. The sensor is constructed to withstand submersion without damage, but external liquid moving in contact with the sensor can be interpreted as flow and cause false readings.

*Can I change the length of the sensor cable?*

Yes. A 3m cable is supplied with the DFM2 as standard, an inbuilt pre amp allows up to 100mts

*Does the direction of flow matter for Sensor mounting?*

The DFM2 Doppler flow meter will measure and totalize flow in either direction. A check valve should be used in applications where backflow may occur.

## Warranty

*Omni Instruments warrants to the purchaser that the equipment to be delivered hereunder will be free from defects in materials, workmanship and title and will be of the kind and quality designated in the proposal.*

*The foregoing warranty is exclusive and in lieu of all other warranties whether express or implied including any warranty of merchantability or of fitness for a particular purpose.*

*Warranties other than the above will only be effective if written and signed by an officer of Omni Instruments.*

*If within 1 (one) year from the date of delivery, the equipment delivered hereunder does not meet the warranties specified above, Omni Instruments shall thereupon correct such defects, at its sole discretion, either by repairing or by replacing the instrument in its entirety.*

*The costs of returning the equipment to Omni Instruments and for the repaired or replaced item being returned to the purchaser shall be for the account of the purchaser.*

*The liability of Omni Instruments is conditioned upon the equipment covered hereunder being handled, installed, operated, maintained, stored or used, as the case may be, in strict accordance with the written instructions or technical direction supplied by Omni Instruments, and is further conditioned upon the purchasers prompt written notice (within 30 days) to Omni Instruments of such defects.*

*Omni Instruments makes no warranties which extend to the items covered hereby due to improper handling, installation, operation, maintenance, storage or use; abnormal or undisclosed environmental conditions; or operating or use in an otherwise improper manner.*

*The liability of Omni Instruments to the purchaser, except as to title, arising out of the supplying of the equipment or its use, under this warranty article, shall not, in any case, exceed the cost of correcting defects in the equipment as herein provided and upon the expiration of the warranty described herein, all such warranty liability shall terminate. The foregoing shall constitute sole warranty remedy of the purchaser and the sole warranty liability of Omni Instruments.*

## Goods Return Procedure

Damaged or defective equipment should be returned to the supplier prepaid. Do not return goods until written authorisation to do so has been obtained. Returned goods must have accompanying them a letter stating the following:

- Your company name and order number
- The contact person at your company
- Serial number and name of product
- Description of damage and cause if known
- Nature of any repair attempted by the user
- Type of repair, replacement or adjustment requested