



# Orifice Plate Flowmeters

## Orifice Plate Flowmetering System (density compensated)

### Description

The Orifice Plate Metering system is suitable for measuring the rate of flow of steam, liquids and most gases. For steam and gas flowmetering applications, it is important to take account of changes in flowing density due to flowing pressure and temperature variations. If ignored these changes in flow density will cause significant measurement errors. Liquids being non-compressible do not suffer from this problem and generally density compensation is not required. Compatible flow computers, pressure and temperature transmitters are listed in the Associated equipment section.

### Options available:

The Orifice Plate Metering package is available in a number of options to suit most requirements. For applications requiring density compensation, select one of the four basic options and add a flow computer and pressure/temperature measuring equipment as required:

<b>Option 1</b>	M410 orifice plate and gaskets
<b>Option 2</b>	M410 orifice plate, gaskets and M610 DP transmitter assembly
<b>Option 3</b>	M410 orifice plate, gaskets, carrier ring assembly and F50C isolation valves
<b>Option 4</b>	M410 orifice plate, gaskets, carrier ring assembly and F50C isolation valves and M610 DP transmitter assembly

### M410 orifice plate

This is installed in the line at the point where the flow is to be measured. It produces a differential pressure proportional to the rate of flow.

### F50C isolation valves

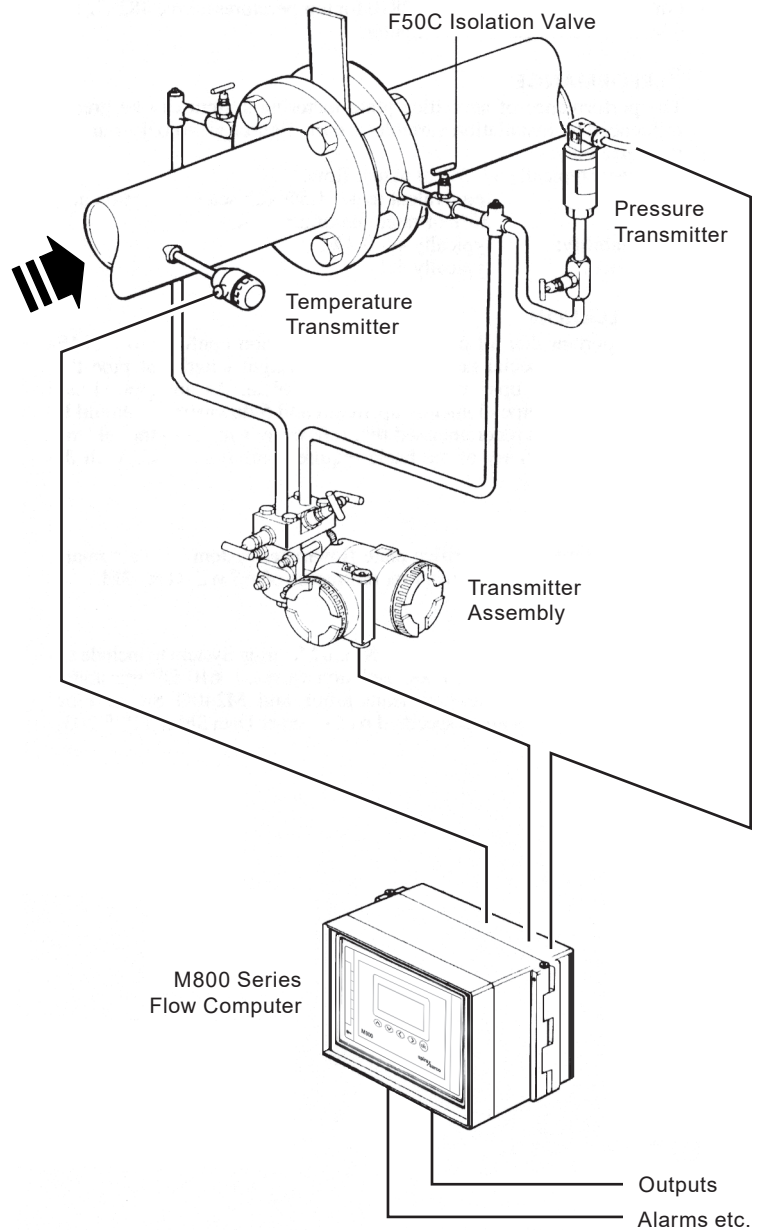
These are used to isolate the impulse lines close to the orifice plate.

### M610 DP transmitter assembly

This is installed close to the orifice plate and converts the differential pressure to a 4-20mA signal for retransmission to other equipment.

The M610 is supplied ready fitted with a 3 way manifold which acts as secondary isolation and pressure equalization valve.

M410 Orifice plate and Carrier assembly



Typical configuration shown here is for a superheated steam application. Gas applications will differ slightly.

## Associated equipment

### EL2600 Pressure transmitter

This is installed in the impulse piping (high pressure side) and provides a pressure signal for density compensation.

### EL2271 Temperature sensor and transmitter assembly

This is installed in the line upstream of the orifice plate and provides a temperature signal for density compensation (Suitable for temperatures up to 250 °C (482 °F)).

### EL2270 Temperature sensor

This is a Pt100 temperature sensor that is installed in the line to provide a temperature signal to the remote M800 temperature transmitter. (Suitable for temperatures up to 500 °C (932 °F)).

### M800 Temperature transmitter

This is a remote temperature transmitter for use in conjunction with the EL2270 temperature sensor for applications with temperatures between 250 °C (482 °F) and 500 °C (932 °F).

### M800 Series Steam flow computer

This flow computer is suitable for use with orifice plates on saturated and superheated steam flow applications. It uses the flow, pressure and temperature signals to carry out necessary density compensation calculations for all steam conditions up to a maximum of 42 bar g (609 psi g)/500 °C (932 °F) Outputs to drive the DP, pressure and temperature transmitters are standard.

### M800 Series Gas flow computer

Details as for the M800 gas flow computer except that the M800 gas flow computer is for gas applications.

## Density compensated system requirements

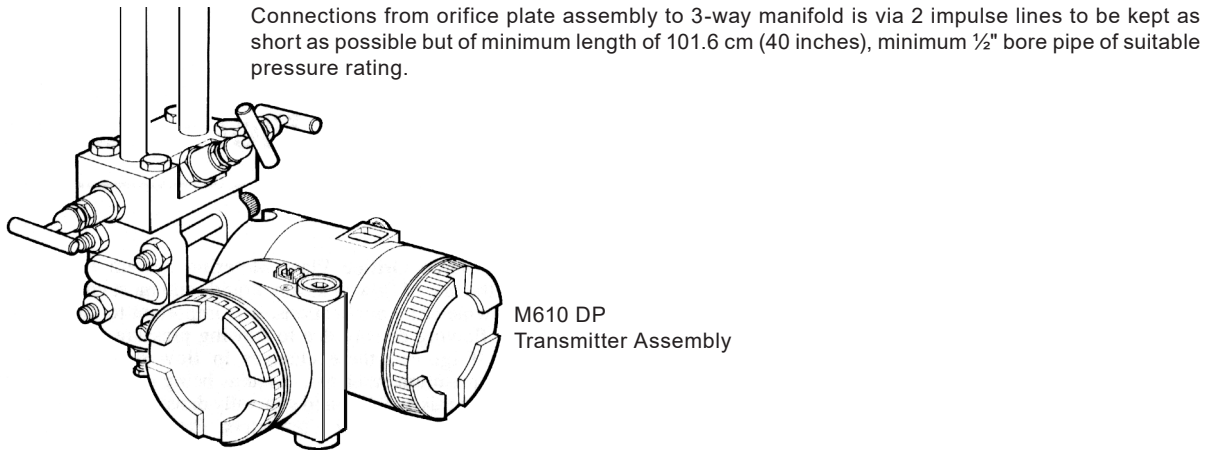
In addition to a M410 assembly (Option 1 - 4), the following components are required:

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<b>Saturated steam</b>	Either a EL2600 pressure transmitter or a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series steam flow computer.
<b>Superheated steam</b>	Both a EL2600 pressure transmitter and a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series steam flow computer.
<b>Gases</b>	Both a EL2600 pressure transmitter and a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series gas flow computer.

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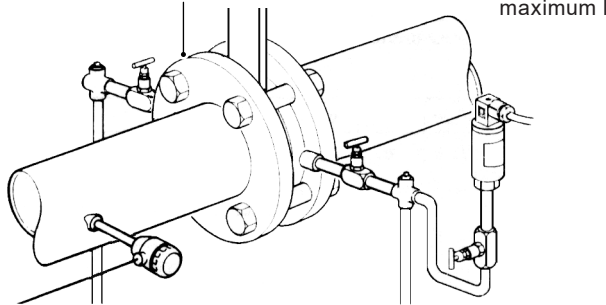
## Typical M610 installation for steam applications



## Configuration showing M410 orifice plate with carrier for steam applications

M410 orifice plate and carrier assembly

Wiring from pressure transmitter to computer (503 m (1650 ft). maximum length) by user/installer. 24 AWG cable or similar



Wiring from the temperature transmitter to computer (503 m (1650 ft). maximum length) by user/installer. 24 AWG cable or similar.

## Performance

The performance of an orifice plate metering system can be greatly influenced by installation variables, so the figures given below are for guidance only:

<b>Accuracy:</b>	typically +/- 3% of actual flow. (equivalent to +/- 1.5% full scale deflection at 50% of rated maximum flow).
<b>Repeatability:</b>	typically +/- 0.3%.
<b>Turndown:</b>	typically 4:1.

## Installation

It is important that all details of the installation conform to ASME-MFC-3M. Of special note, is the long, straight lengths of pipe that must be present upstream of the orifice plate. As an approximate guide, 20 to 30 pipe diameters upstream and 5 downstream should be adequate but it is recommended that reference is made to the relevant standard. A summary of the basic requirements is included with the M410 equipment.

## How to specify

1- M410 Orifice plate flowmeter system with automatic density compensation to meet requirements of ASME-MFC-3M.

## How to order

1- M410 Orifice Plate Steam Metering System to include tab handled plate and carrier, F50C isolation valves, M610 DP transmitter assembly, EL2600 pressure transmitter and M800 Steam Flow Computer.