These insertion flow transducers provide a cost effective and simple means of measuring the flow of a wide range of low viscosity liquids. Installation is quick and inexpensive in pipe sizes ranging from 40mm to 900mm (1.5-36") and up to 2500mm (100") nominal bore for the Hot tap model DP525SS.

It has a linear measuring range of 0.3–10.0 m/sec (1–33 ft/sec.). Minimum detectable flow velocity is 0.15 m/sec. (0.5 ft/sec.). When used in conjunction with a Metra-Smart the linear flow range is extended down to 0.15 m/sec. (0.5 ft/sec.) with an improved linearity.

The meter is constructed from 316L (1.4404) stainless steel enabling use in many applications for metering water and low viscosity chemicals.

Two independent pulse outputs are provided suitable for direct input to a wide range of ancillary instruments, PLC’s and computers. Both pulse outputs display a high level of immunity to electrical interference. Options include a reed switch.

Flow passes through a pipe causing the rotor to spin. Magnets installed in the rotor pass by pulse sensors within the transducer body and in turn, this produces frequency outputs proportional to flow rate.
2.1 Meter location
Choose an appropriate section of horizontal or vertical pipe as per the guidelines below. With vertical pipe installations the media should be pumped up through the pipe past the flow sensor so that any entrained air will pass freely.

The flow sensor requires a fully developed turbulent flow profile to ensure maximum measurement accuracy and repeatability. This is achieved by installing the flow transducer in a straight run of pipe. We recommend at least 10 straight pipe diameters upstream and 5 pipe diameters downstream of the meter. See diagram on right.

Major obstructions such as pumps, valves or strainers will require longer straight runs before and after the device.

2.2 Meter installation & orientation
Cut a 40mm diameter hole (1.6") on either the 2, 10 or 12 o’clock positions of the pipe. If there is any likelihood of air entrainment in a horizontal pipe do not locate the flow transducer in the 12 o’clock position.

Install a female threaded weld on fitting (threadolet) or service saddle.

Wrap the threads of the insertion turbine with Teflon tape or sealing compound and screw the unit into the installed fitting.

Other locations around the pipe are acceptable.

2.3 Height adjustment calculation
Calculate the adjustment height A (or AA for the Hot Tap version) as follows:

\[ A \text{ (model 400-003)} = 175mm (6.9") - (B + C + D) \]

Where:

- \( B \) = Distance between the top of the pipe and the top of the hex adaptor.
- \( C \) = Pipe wall thickness
- \( D \) = Insertion depth (pipe ID ÷ 8)

Examples:
- For 40mm pipe ID (D=5.0 mm)
- For 50mm pipe ID (D=6.25 mm)
- For 100mm pipe ID (D=12.5 mm)
- For 400mm pipe ID (D=50.0 mm)

Turn the height adjustment nuts (1) as required so that the distance between the top of the hex adaptor (2) and the top of the positioning collar (3) equals your calculated distance A. Retighten the height adjustment nuts (1).

2.4 Flow direction orientation
The unit is bi-directional however it is always good practice to orientate the unit with the flow directional arrow pointing in the direction of flow. The paddle wheel must be aligned with the direction of flow.

Using a 2mm Hex key, unlock the locking screw located on the positioning collar (3). Using the arrowed alignment recesses at the top of the flow transducer, turn the body until the flow direction guides are parallel with the pipe run and pointing in the direction of the flow (downstream). Retighten the locking screw.
3.1 Standard outputs

- 5 Core screened cable
- Voltage pulse output
  - Yellow (+)
  - Green (-)
- Square wave pulse
  - Red (Vdc supply)
  - White (+, Sig. output)
  - Black (-0v ground)

This colour coding also applies to high temperature options.

3.2 Optional reed switch output

- Reed Switch output
  - Yellow (+)
  - Green (-)

3.3 Instrument cable installation requirements

Use twisted multi-core low capacitance shielded instrument cable (22 AWG ~ 7x 0.3 stranded) for electrical connection between the flow meter and the remote instrumentation. The screen should be earthed at the readout instrument end only to protect the transmitted signal from mutual inductive interference.

The cable should not be run in a common conduit or parallel with power and high inductive load carrying cables as power surges may induce erroneous noise transients onto the transmitted pulse signal. Run the cable in separate conduit or with other low energy instrument cables.

3.4 Pulse output selection

Each standard flowmeter has two independent pulse output signals that are linearly proportional to volumetric flow rate. Pulse transmission can be up to 1000 metres (3300 ft.). An optional I.S. Reed Switch output is available (see page 3).

**Square Wave Pulse** (connections also apply to the non-magnetic output)

An NPN open collector transistor pulse output produced by a solid state Hall Effect device. This three wire Hall effect requires 5~24Vdc and produces an NPN square wave output (20mA max. sink). The Hall Effect output requires a pull up resistor, pull up resistors are generally incorporated in most secondary instruments. Pulse width is 2~75 mSec.
HAZARDOUS AREAS
The REED SWITCH output is classed as a “simple apparatus” as defined in the CENELEC standard EN50020 and recognised IEC and ATEX directive. It can be connected to an approved I.S. secondary instrument with both being located in the hazardous area.

The Reed Switch may also be connected through an approved I.S. barrier.

Note: The Reed switch produces 1/3 the normal pulse output value (E.g. 1/3 the standard K-factor).

COMMISSIONING

4.0 K-Factors
The K-factor (pulses / litre, gallon etc.) will vary in relation to the bore size of the pipe in which the Insertion turbine is installed.

The K-factors and formula shown are a result of factory testing using smooth bore piping under ideal conditions. Variations to the given K-factors may occur when using rough bore piping or inadequate flow conditioning on either side of the flow transducer.

4.1 Flow transducer K-factors for common pipe sizes

<table>
<thead>
<tr>
<th>Pipe detail</th>
<th>K-factors (standard K-factors for voltage and square wave outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB</td>
<td>Schedule 40 pipe</td>
</tr>
<tr>
<td>inches</td>
<td>mm</td>
</tr>
<tr>
<td>1.5&quot;</td>
<td>40.9</td>
</tr>
<tr>
<td>2&quot;</td>
<td>52.6</td>
</tr>
<tr>
<td>2.5&quot;</td>
<td>62.7</td>
</tr>
<tr>
<td>3&quot;</td>
<td>78.0</td>
</tr>
<tr>
<td>3.5&quot;</td>
<td>90.2</td>
</tr>
<tr>
<td>4&quot;</td>
<td>102.4</td>
</tr>
<tr>
<td>5&quot;</td>
<td>128.3</td>
</tr>
<tr>
<td>6&quot;</td>
<td>153.9</td>
</tr>
<tr>
<td>8&quot;</td>
<td>203</td>
</tr>
<tr>
<td>10&quot;</td>
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</tr>
<tr>
<td>20&quot;</td>
<td>478</td>
</tr>
<tr>
<td>24&quot;</td>
<td>575</td>
</tr>
</tbody>
</table>

4.2 K-factors for large pipes 460mm ID (18") and above use:

Pulses per litre = 28647 + pipe ID² (mm)
Pulses per M3 = 28647000 + pipe ID²
4.3 Calculating K-factors (litres or m³)

Calculate K-factor (pulses / litre) using the above graph and the metric constant of 1273.2 as follows:

\[
Pulses / \text{litre} = \frac{1273.2 \times (A)}{\text{Pipe ID}^2} \quad \text{(mm)}
\]

Example ‘a’: K-factor for 100mm pipe:
1) from graph 100mm ID (A) = 24.0
2) \[\text{pulses/litre} = \frac{1273.2 \times 24.0}{10000} = 3.056 \text{ p/litre}\]

K-factor for m³: multiply by 1000
e.g. K = 3056 p/m³

K-factor for mega litres: multiply by 1000000
e.g. K = 3056000 p/mega litre

NOTE: K-factors for Reed Switch output option are \(\frac{1}{3}\) the standard factors of voltage pulse output.

4.4 Voltage Pulse Connection to Metra instruments

Flow instruments or a terminal box can be directly mounted to the turbine using special stem mounting kits contact your supplier for details.

Flow instruments or a terminal box can be directly mounted to the turbine using special stem mounting kits contact your supplier for details.

Metra-View
Metra-Smart
or Metra Batch

DIP switch 1 in the ON position (2Khz max)

The turbine cable should not be run with other high energy cables (clause 3.3)
INSTALLATION GUIDELINES

1. GENERAL
The flow profile must be uniform at the point where the flowmeter is to be installed, otherwise inaccurate and unstable readings will result.

British standard: BS 1042 gives a full insight into flow conditioning for inferential flow devices.

The general rule is to have a minimum of 10 diameters of straight pipe run before the flowmeter (upstream) and 5 diameters after (downstream). These straight runs must not contain any other items such as valves, bends, tees, probes or reducers etc. Any valves immediately outside the straight runs requires doubling the straight run lengths.

2. COMMON CAUSES OF NON-UNIFORM FLOW

- Partially closed valve
- Check valve
- Sharp increase in line size
- Restrictive valve or fittings
- Pipe bends
- Tee junctions
- Junctions
INSTALLATION GUIDELINES

3. PRECAUTIONS FOR AVOIDING NON-UNIFORM FLOW

A. Allowing adequate length of straight pipe for flow to stabilise and return to uniform state before passing flow element. Refer to 4 below.

B. Installation of flow meter prior to cause of non-uniform flow.

4. RECOMMENDED LENGTHS OF STRAIGHT PIPE FOR TYPICAL CASES

Depending on the magnitude of disruption, recommendations are as follows:

A. Valves and filters: Minimum of 20 diameters of straight pipe from the flowmeter.
B. Elbows: Minimum of 20 diameters of straight pipe prior to flowmeter.
C. Increase of line size: 10 diameters of straight pipe depending on increase of line size.
D. Concentric decrease in line size: Minimum of 5 diameters of straight pipe prior to flowmeter (as shown below).

5. RECOMMENDED SOLUTIONS FOR RESTRICTED CASES

When installation flexibility is restricted, use of concentric reducers prior to the flowmeter can assist in stabilising flow.