Instruction sheet

Insertion turbine instruction sheet

Overview

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.

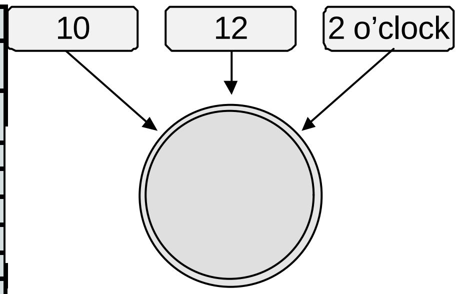
It has a linear measuring range of 0.3~10.0 metres/sec. (1~33 ft/sec.). Minimum detectable flow velocity is 0.15 m/sec. (0.5 ft/sec.). When used in conjunction with a linearising flow rate totaliser NLC feature the linear flow range is extended down to 0.15 m/sec. (0.5 ft/sec.) with an improved linearity.

The meter is constructed from 316 L (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 & inturn this produces frequency outputs proportional to flow rate.

Model No.	DP490SS
Suits pipe sizes	40mm - 900mm (1.5 – 36 inches)
Flow range	0.25 - 6300 litres/sec (4-99600 USGPM)
Process connections	1.5" NPT or BSPT (G1.5)
Velocity range	0.3 - 10 metres/sec. (1 - 33 feet/sec.)
Linearity	typically ± 1.5%
Repeatability	typically ± 0.5%
Pressure (max)	80 Bar (1200PSI)
Temperature range	-40°C to 100°C (-40°F to 212°F) - Optional 204°C (400°F)
Body material	316L stainless steel (1.4404)
Rotor materials	PEEK rotor with graphite-PTFE impregnated PEEK bearing
O-Ring material	VITON - options available
(a) Voltage output (to 100°C)	1.5volt x 10µ sec pulse width, self-generated (2 wire)
(b) Square wave (Hall Effect)	5-24vdc, 3wire NPN open collector (20mA max. current sink)
(c) Reed Switch (to 100°C)	30vdc max. x 20mA max. (output freq. is 1/3 std. K-factor)
Output freq. @ max. velocity	**(a & b)** outputs 220~240 hz **(c)** output 73~80 hz
Output options	I.S. or Ultra high temp. coil 204°C (400°F) or non magnetic
Transmission distance	1000 metres (3300 feet) maximum
Wiring	5 core, screened cable, length 3 metres (10 feet)
Protection class	IP68 submersible (Nema 6X)
Conduit entry	3/8" NPT or PG9
Shipping Weight	1.2 kg (2.7 lbs.)



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

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

Other locations around the pipe are acceptable.

INSTALLATION

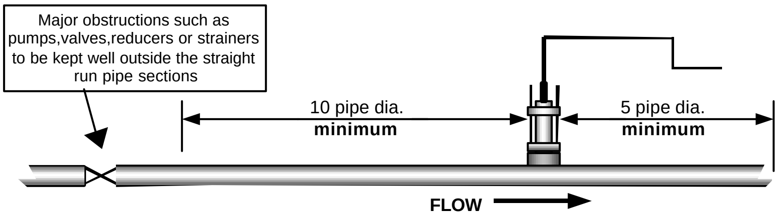
2.1 Meter location

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 & 5 pipe diameters downstream of the meter.
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.



2.3 Height adjustment calculation

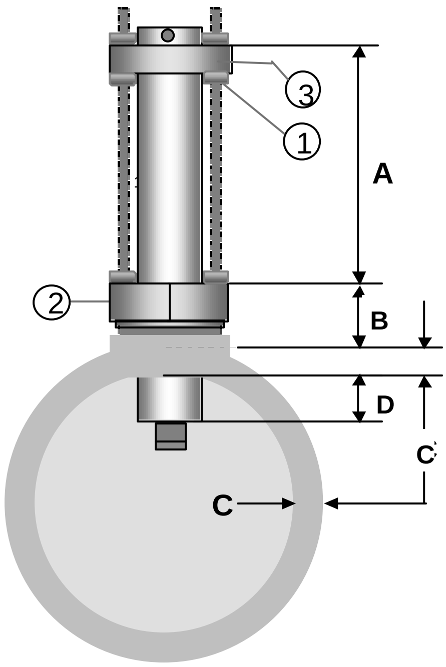
Calculate the adjustment height **A** (or **AA** for the Hot Tap version) as follows:

A (model DP490) = 175mm (6.9") - (B + C + D)

Where :
B = Distance between the top of the pipe & 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).



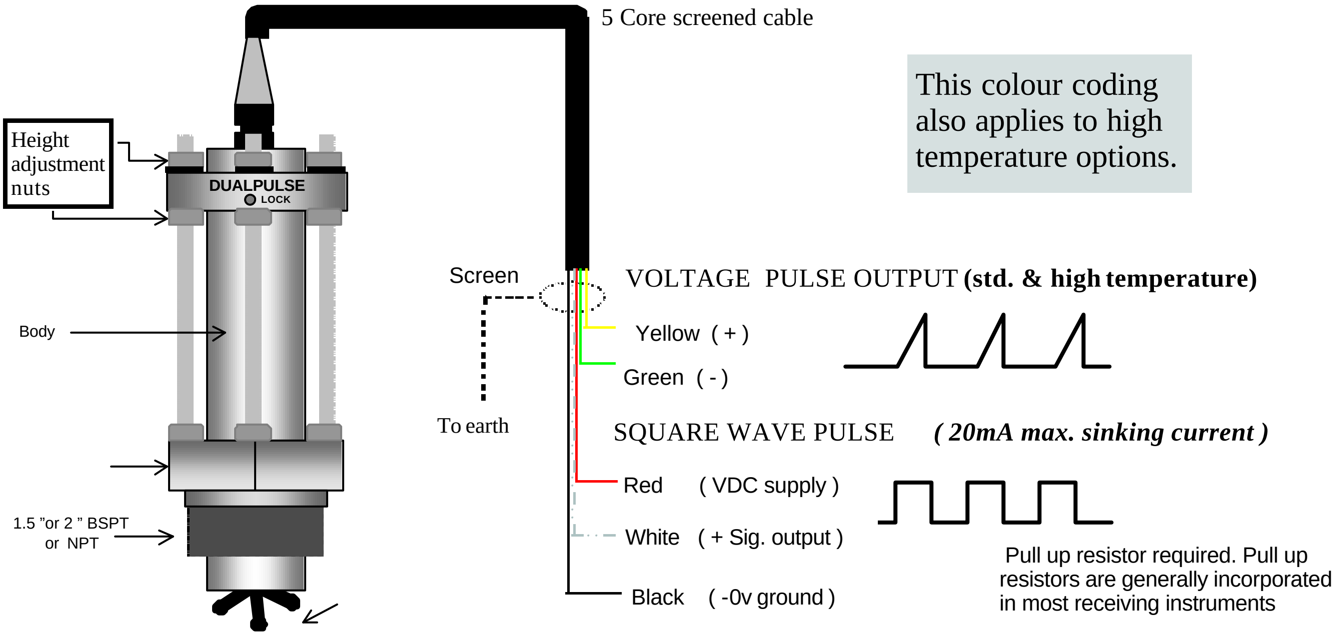
2.4 Flow direction orientation

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.

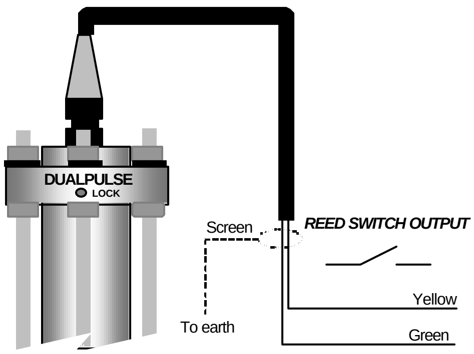
Using a 2mm Hex key, unlock the locking screw located on the positioning collar (3). Using the arrowed alignment recesses at the top of the flow transducer, turn the body until the flow direction guides are parallel with the pipe run and pointing in the direction of the flow (downstream). Retighten the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

3.0 ELECTRICAL CONNECTIONS

3.1 Standard outputs



3.2 Optional Reed switch output



HAZARDOUS AREAS

The REED SWITCH output is classed as a “simple apparatus“ as defined in the CENELEC standard EN50020. 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
(eg. 1/3 the standard K-factor)

3.3 Instrument cable installation requirements

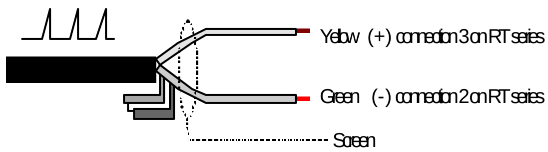
Use twisted multi-core low capacitance shielded instrument cable (22 AWG ~ 7x 0.3 stranded) for electrical connection between the flow meter and the remote instrumentation. The screen should be earthed at the readout instrument end only to protect the transmitted signal from mutual inductive interference.

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 .

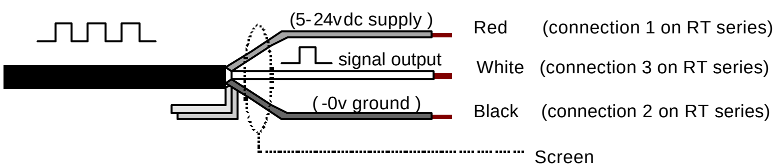
3.4 Pulse output selection

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 7).

High Level Voltage Pulse
A self generating pulse output which produces a strong 1.5 volt voltage spike of approximately 10 micro/ second duration with no dependence on rotor speed.



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.



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 Dualpulse 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

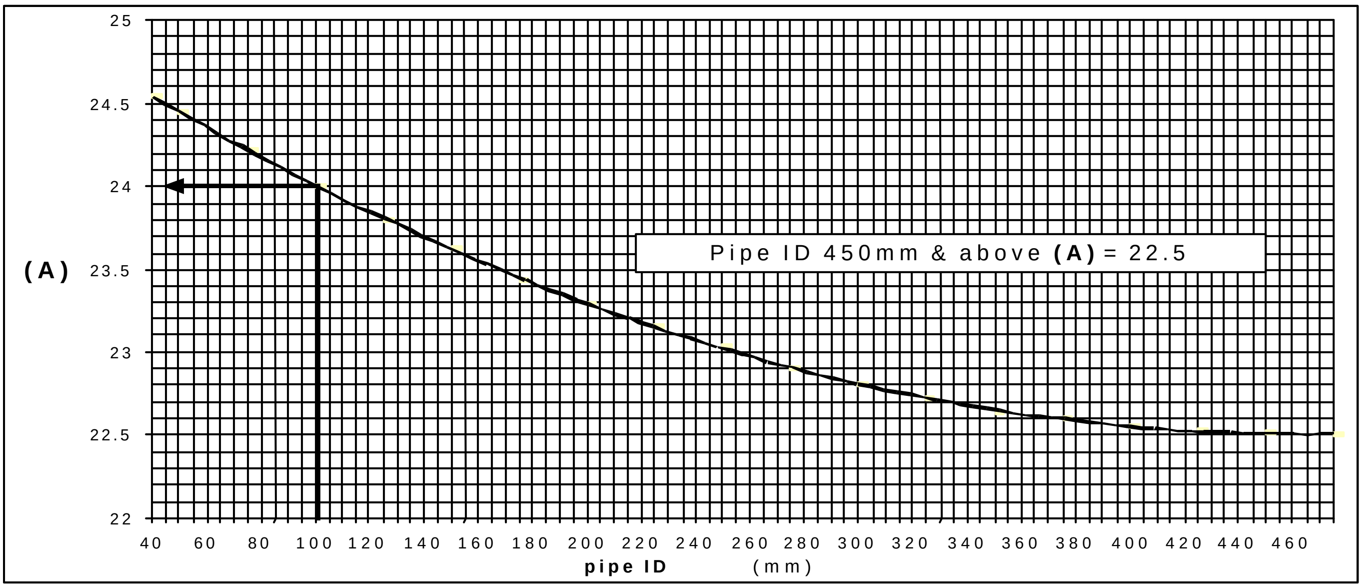
Pipe detail		K-factors (standard K-factors for voltage & square wave outputs)					
NB	pipe ID	Schedule 40 pipe			Schedule 80 pipe		
inches	mm	p / litre	p / m3	p / USgal	p / litre	p / m3	p / USgal
1.5"	40.9	18.678	18678	70.695	21.524	21524	81.468
2"	52.6	11.238	11238	42.534	12.818	12818	48.517
2.5"	62.7	7.880	7880	29.824	8.899	8899	33.682
3"	78.0	5.062	5062	19.161	5.676	5676	21.485
3.5"	90.2	3.768	3768	14.263	4.200	4200	15.896
4"	102.4	2.912	2912	11.021	3.233	3233	12.237
5"	128.3	1.839	1839	6.959	2.025	2025	7.665
6"	153.9	1.268	1268	4.798	1.402	1402	5.307
8"	203	0.719	719.0	2.721	0.787	787.2	2.980
10"	255	0.450	450.3	1.705	0.496	495.9	1.877
12"	303	0.316	316.0	1.196	0.347	347.4	1.315
14"	333	0.261	260.5	0.986	0.286	285.7	1.081
16"	381	0.198	198.0	0.750	0.217	217.0	0.821
18"	429	0.156	155.8	0.590	0.171	170.6	0.646
20"	478	0.125	125.4	0.475	0.138	137.8	0.521
24"	575	0.087	86.64	0.328	0.095	95.39	0.361

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

NOTE : K-factors for Reed Switch output option are 1/3 the standard factors of voltage pulse output.

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 :

$$\textbf{Pulses / litre} = \frac{1273.2 \times \textbf{(A)} \text{ from graph}}{\text{pipe ID}^2 \text{ (mm)}}$$

Example 'a' :
K-factor for 100mm pipe: **1)** from graph 100mm ID **(A)** = 24.0

2) pulses/litre. $= \frac{1273.2 \times 24.0}{10000} =$ **3.056** p/litre

K-factor for m³ : multiply by 1000 eg. K = 3056 p/m³
K-factor for megalitres : multiply by 1000000 eg. K = 3056000 p/megalitre

NOTE : K-factors for Reed Switch output option are 1/3 the standard factors of voltage pulse output.

Voltage Pulse Connection to family instruments