

Ultrasonic Flow meter quick start guide

Model: D116



We also have an installation demo video on Youtube
Scan the QR code, search for 'pFlow D116 Flow meter demo'
or use this link: https://youtu.be/Bj_nLR4-DYY



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Introduction:

Please note that this guide will go through basic functions of the flow meter only, for advance functions please see the full manual.

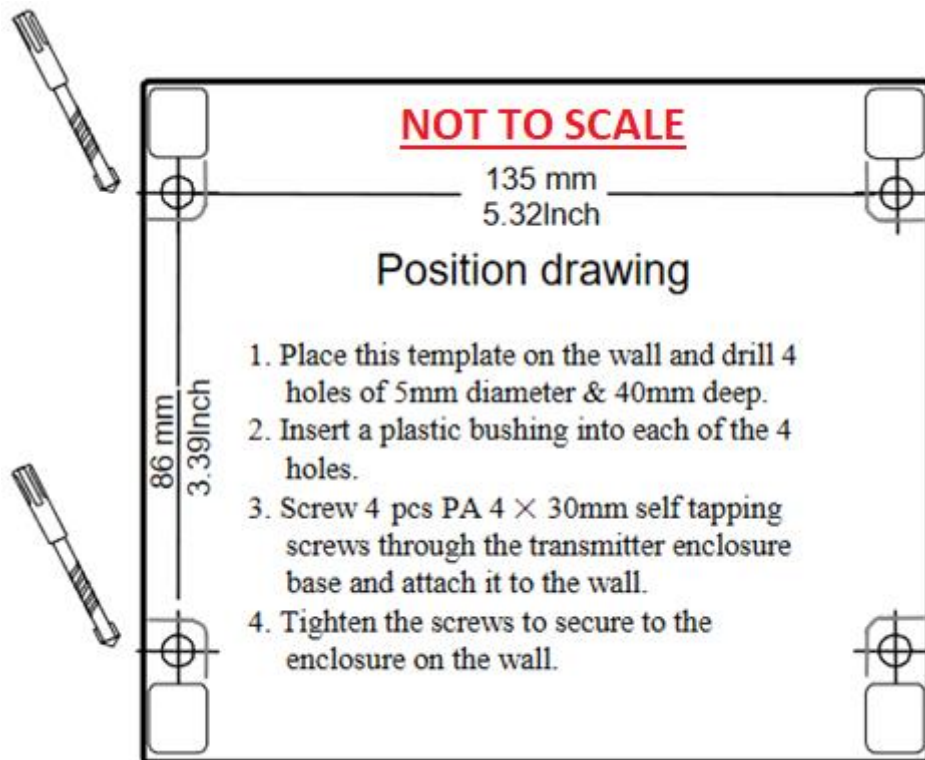
The pFlow D116 is a basic wall mount clamp on ultrasonic flow meter, being the most basic in the range it does have some limitations to be aware of, importantly:

- It is only suitable for measurement water; other liquids are not compatible.
- It is only suitable for certain pipe materials; you cannot set a custom pipe sound speed with this model.
 - (Suitable pipe materials include: Carbon steel, Stainless Steel, Cast Iron, Ductile Iron, Copper, PVC, Aluminium, Asbestos, Fibreglass Epoxy)
- This flow meter does not have data logging capabilities (but does have other output options)
- This flow meter is not suitable for pipes with a liner, there is no option to select the liner spec.

Other models are available without limitations, please contact us with your application and measurement requirements and we can offer a suitable system.

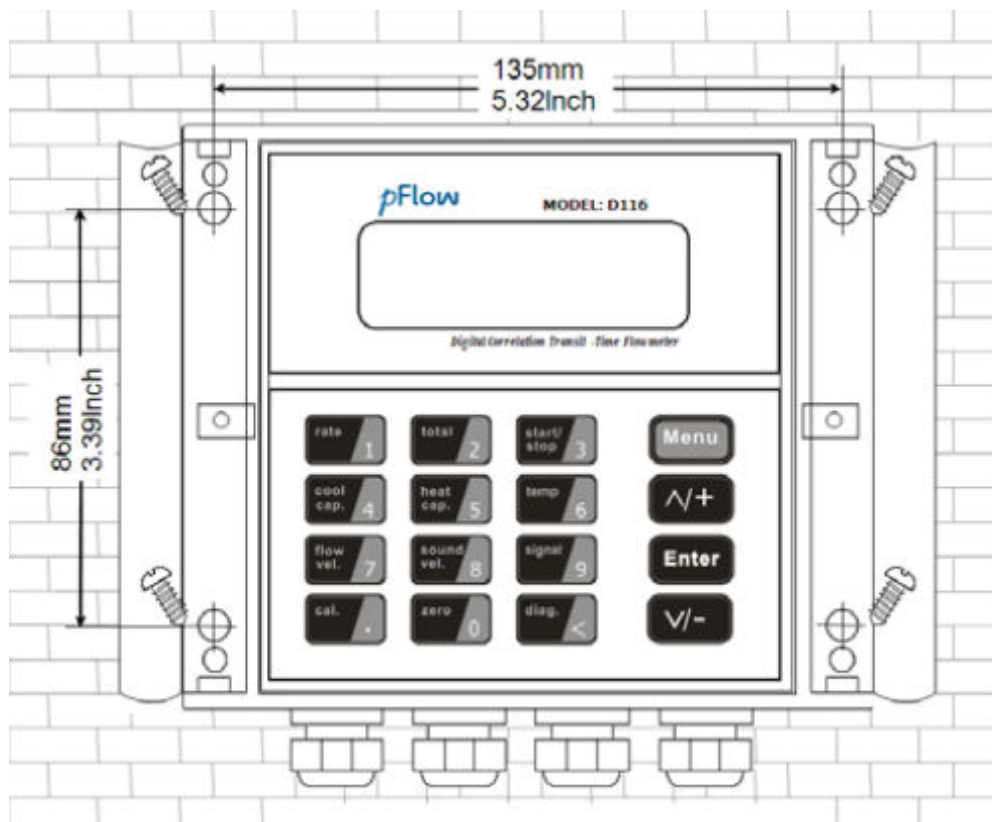
Wall mounting the transmitter:

You will find a "Position Drawing" in the packing. It can be used as a template in the place that you are going to install the Flowmeter. Using a 5.0mm drill bit drill 4 holes at the screws position shown on the drawing.



There are flip open covers on the left and right side which when opened expose the screws to open the enclosure and the holes/mounting points for wall mounting.

Insert the supplied wall plugs into the drilled holes ensuring they sit flush with the wall. Hold the flowmeter in position and secure firmly with the supplied screws.



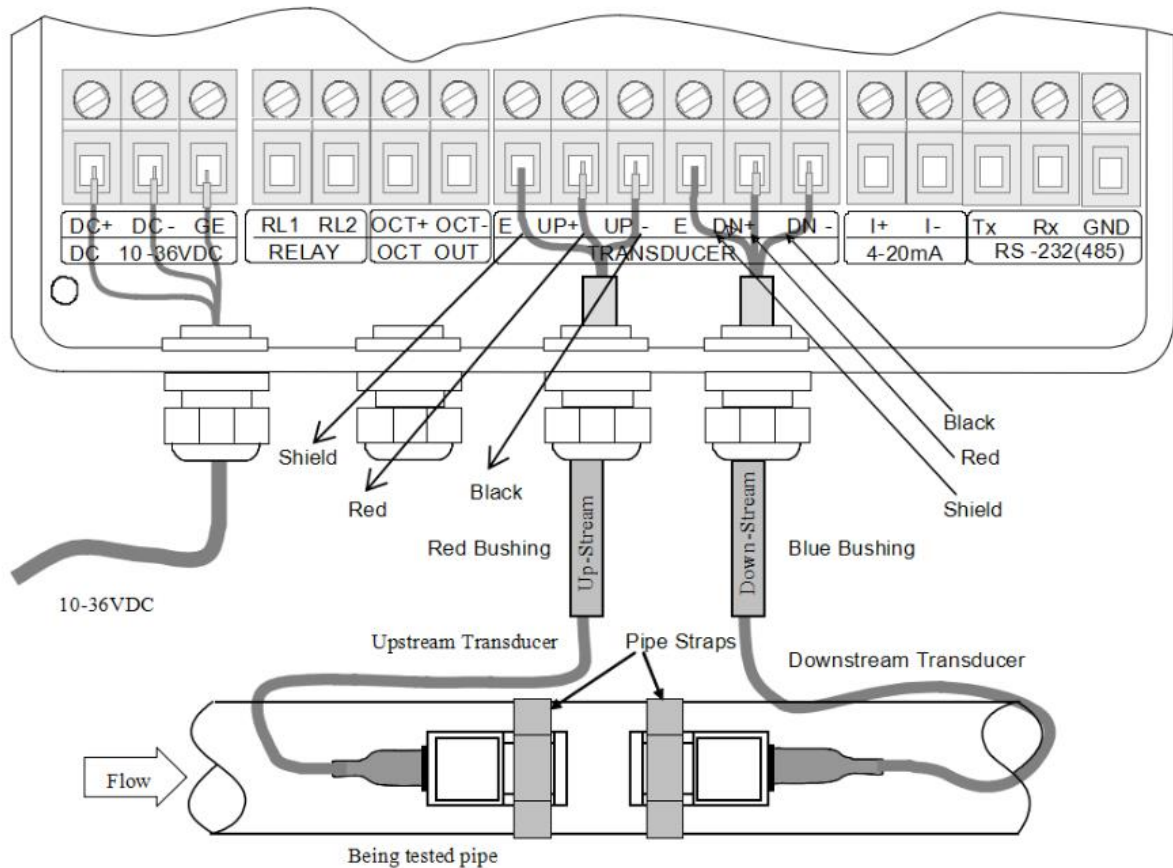
Transmitter Wiring:



Warning:

Wire in all connectors with the power off.

Once the electronics enclosure has been installed, the Flowmeter wiring can be connected. Open the case, you will find the transmitter interfaces labels from left to right as follows: Power supply, Relay output, OCT Output, Upstream transducer, Downstream transducer, 4-20mA, RS485 interface. Refer to the below diagram for specific connection: (your model may have different port positions so please refer to the markings on the actual device)



Please wire in all cables and ensure that all cables are run through the supplied cable glands and tightened up to prevent dust and water ingress.

Please note that a power supply is not supplied with the flow meter.

You can source your own power supply if required or contact us we can quote for a power supply.

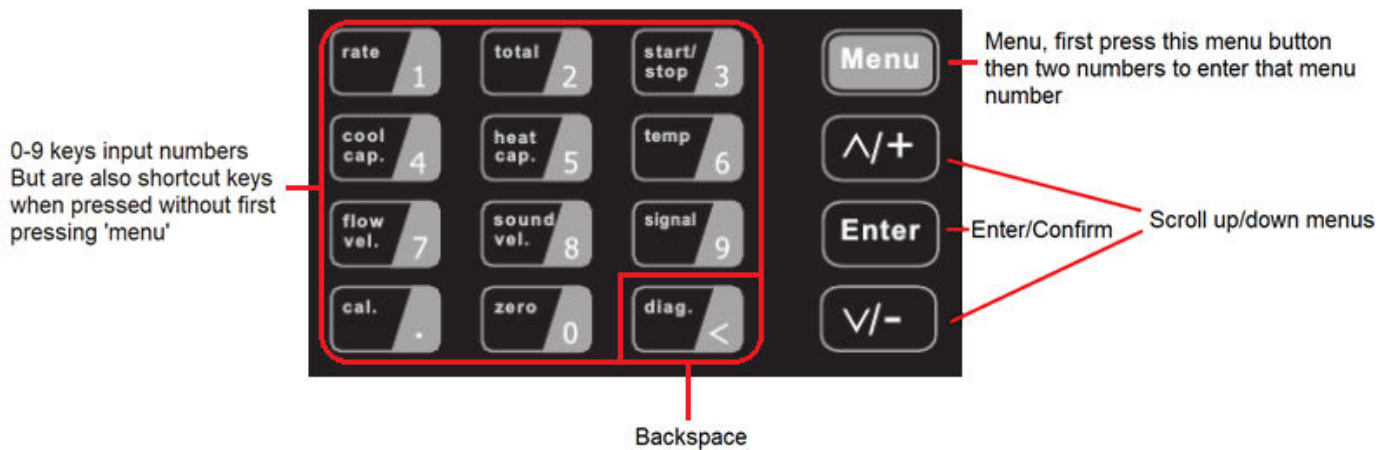
Powering on:

To power on the flow meter, just connect the power source. As soon as the Flowmeter is switched on, the self-diagnosis program will start to run. If any error is detected, an error code will display on the screen (Refer the full manual in 'Error Diagnosis'). The system will default to the last menu at next power on.


As this is the first time use or an install on a new site then you will need to input all installation parameters.


Keypad functions:



The keypad is dual function, the full keypad is pictured below, this will describe basic functionality of the keypad.




0 – 9 keys input numbers, each word printed on the key also is a shortcut to that menu

 is also used as a decimal place button.


 is also used as a backspace.

 and  scrolls up and down menu numbers

The enter a specific menu:

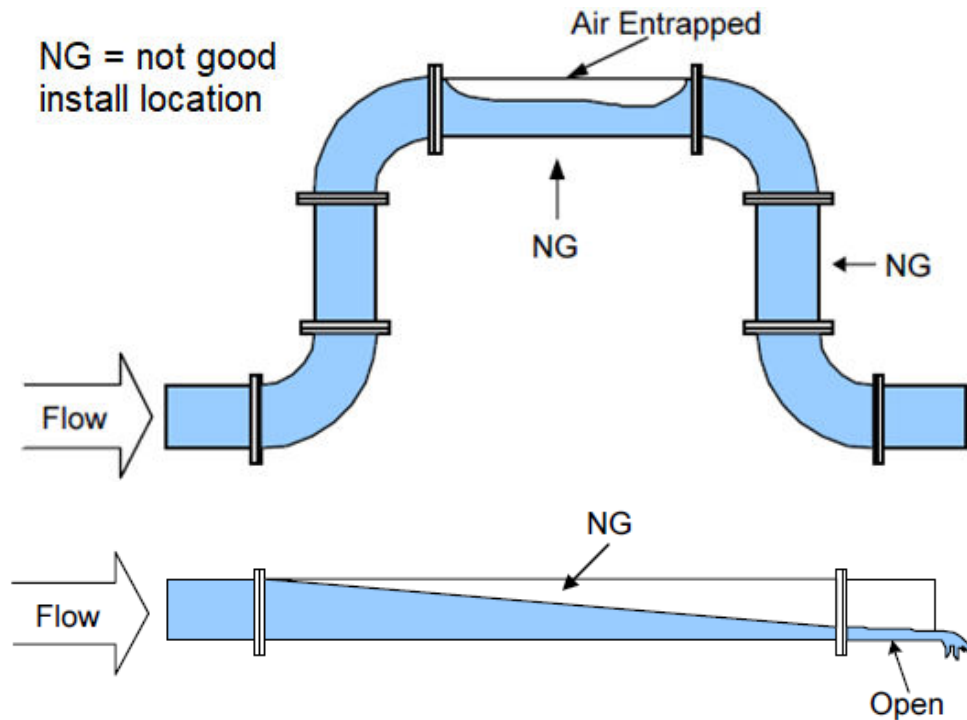
press the  button, then input a two-digit Menu number.

for example, by pressing these buttons:    will enter menu 11

 is enter/confirm

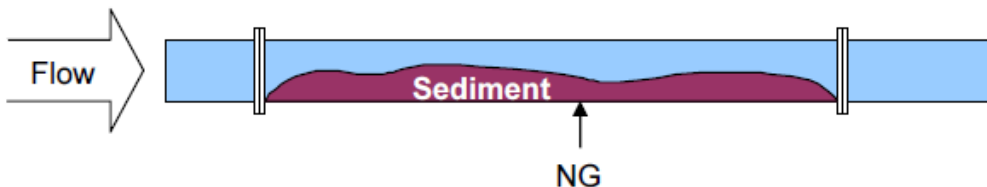
Select installation location:

Measurements cannot be made if pipe is not filled, install transducers in a position that is filled with fluid, even after flow has stopped. Some below examples show areas that would be unsuitable for installation.



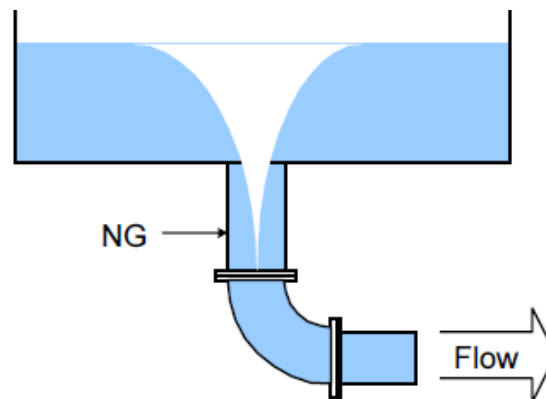
Sediment

Sediment accumulation at the transducer position may cause measurement errors. Countermeasures include installation of closing flange, etc.



Entrained air

Measurement may not be possible if there is entrained air at the transducer position.



Vertical pipes

If installing on vertical pipes, it should not be used where flow direction is downward, as the pipe may not be completely full, it would work best on a vertical pipe where the flow direction is from bottom to top.

When selecting a measurement site, it is important to select an area where the fluid flow profile is fully developed to provide an accurate measurement. Use the following guidelines to select a proper installation site.

a) Choose a section of pipe that is always full of liquid, such as a vertical pipe with flow in the upward direction, or a full horizontal pipe.

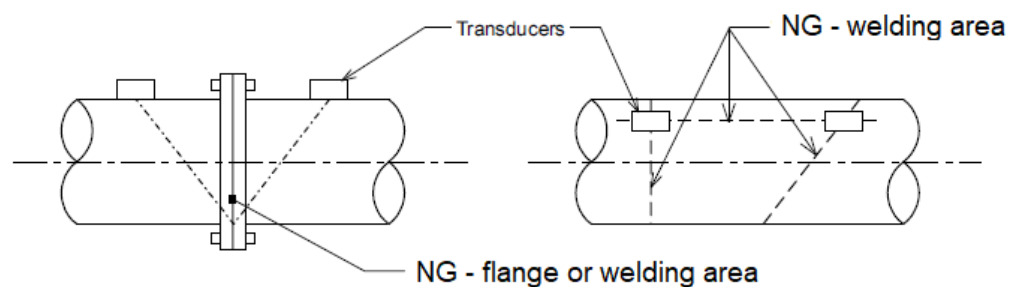
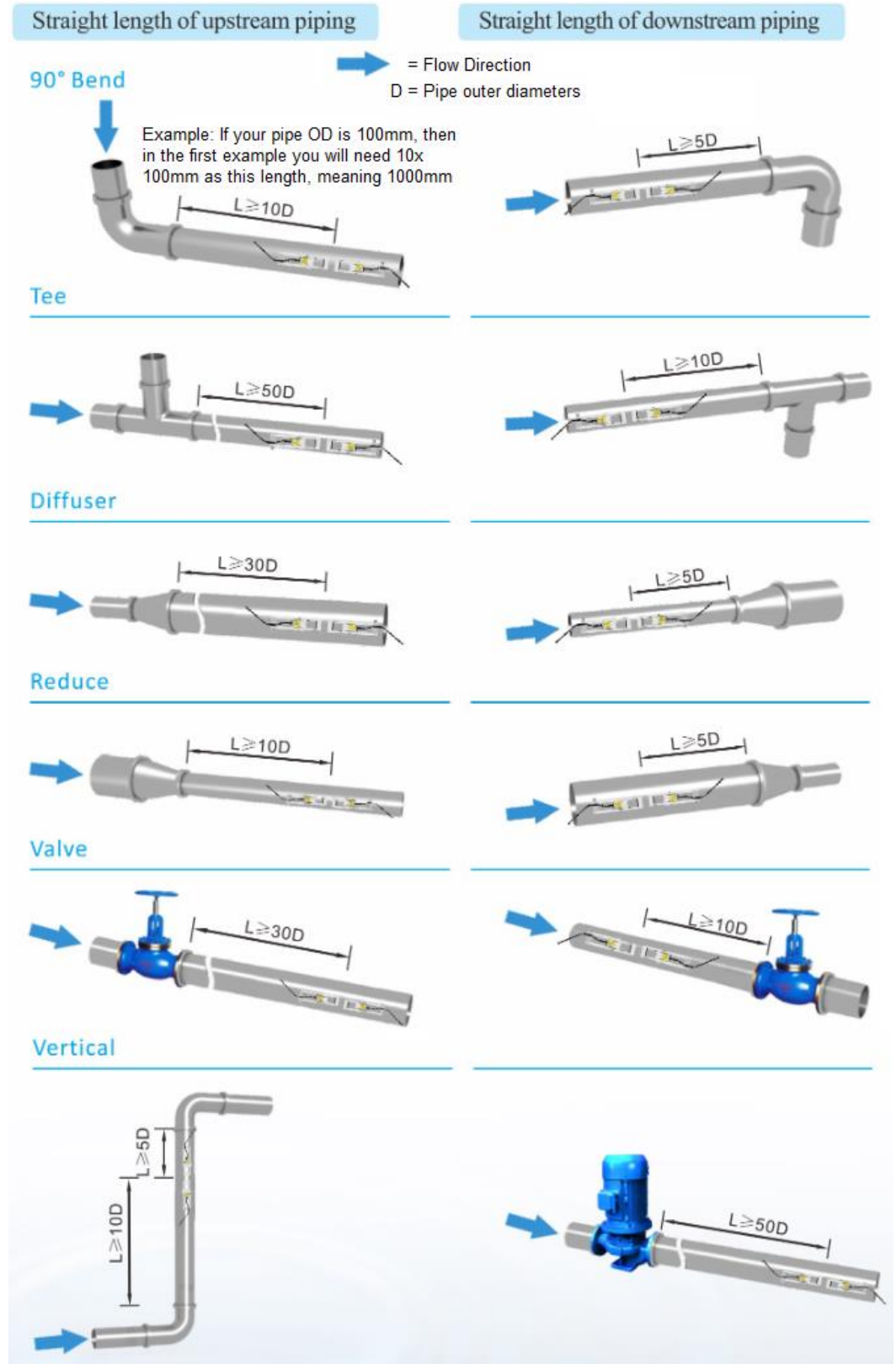
b) Ensure enough straight pipe length before and after the transducers so that the flow is non turbulent inside the pipe

c) Transducers should be mounted on the 3 or 9 o'clock position of the pipe section (at the side of the pipe) this is to avoid sediment at the bottom of a pipe or air bubbles at the top

d) Ensure that the pipe surface temperature at the measuring point is within the transducer temperature limits

e) Consider the condition of the pipe inside and out. Select a section free of excessive corrosion or scaling.

f) Avoid flanges and welding areas and select a smooth portion of the pipe to install the transducers.



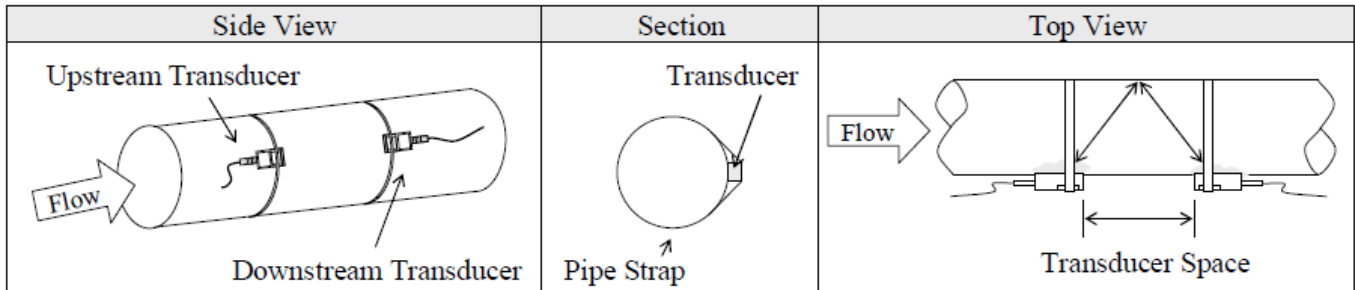
Transducer mounting methods:

Three transducer mounting methods are available, **V method**, **Z method** and **N method**.

V method

The V method is considered the standard method. It usually gives a more accurate reading and is used on pipe diameters ranging from 25mm to 400mm. It is also the most convenient to use and setup.

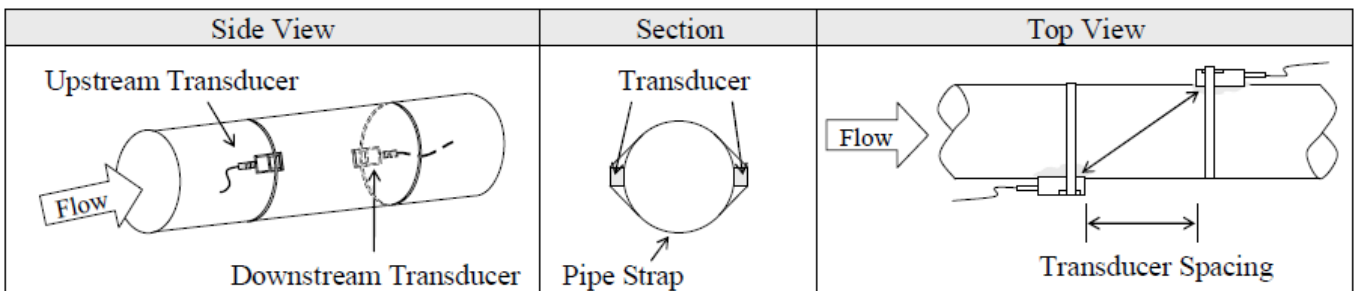
V method – can be used for 25mm to 400mm pipes



Z Method

The signal transmitted in a Z method installation has less attenuation than a signal transmitted with the V method, therefore is good to use when the pipes are large, there are some suspended solid in the fluid, or if the scaling is too thick. This is because the Z method utilizes a directly transmitted (rather than reflected) signal which transverses the liquid only once. While the Z method can measure on pipe diameters over 100mm, it is recommended to use this method for pipe diameters over 300mm.

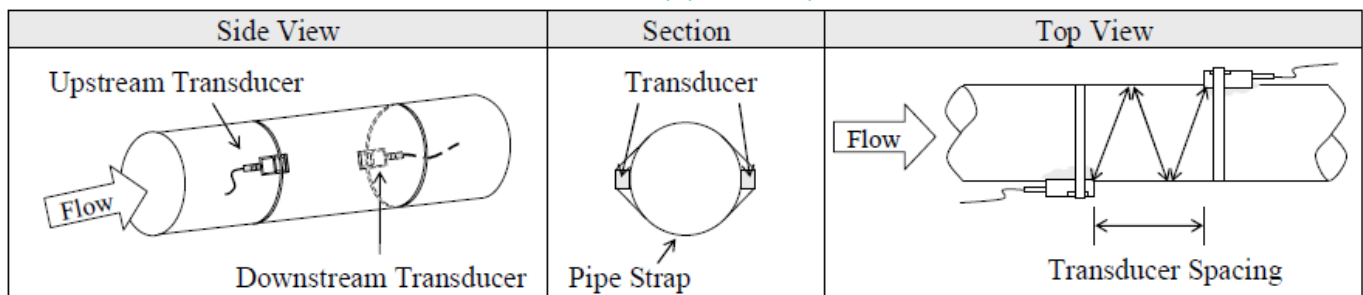
Z method – can be used on pipes over 100mm (better to be over 300mm)



N Method (uncommonly used)

With the N method, the sound waves traverse the fluid three times and bounce twice off the pipe walls. It is suitable for small pipe diameter measurement. The measurement accuracy can be improved by extending the transit distance with the N method which this helps to achieve better signal on small pipes

N method – while uncommon – it can be used on small pipes usually under 50mm






Parameters setting:

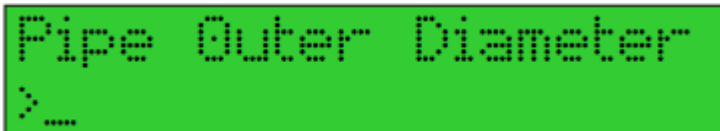


This guide will only tell you about the most basic menu's – for a full description about each menu's function please see the full manual





Now that a suitable installation location has been decided, and by now you should select the best mounting method for your pipe, we will need to program the pipes parameters into the flow meter, follow the below steps.


Pipe outer diameter (Menu 11)

Press    to enter menu 11, it will appear as below:



You will now need to change the pipe outer diameter to match your pipe, for example if your pipe was 90mm OD then do the following:






Enter first, then type the diameter '90', then enter again to confirm -    

Hint:  scrolls up and down menu numbers, so as the next menu of importance is 12, using this is a quick method to change to that menu




Pipe Wall Thickness (Menu 12)


Press    to enter menu 12

You will now need to change the pipe wall thickness to match your pipe, for example if your pipe was 5.2mm then do the following:

Enter first, then type the thickness '5.2', then enter again to confirm -     




Pipe material (Menu 14)

Press    to enter menu 14



You can select from the preconfigured materials: Carbon steel, Stainless Steel, Cast Iron, Ductile Iron, Copper, PVC, Aluminium, Asbestos, Fibreglass Epoxy

To select your material first press 

then  or  to scroll up and down selectable options, then  again to confirm

Hint: If you have a different pipe material that is not listed as an option this flow meter is unfortunately not suitable, higher spec models can work with more pipe materials and custom sound speed pipes.

Please note this flow meter is also not suitable if the pipe has a liner inside, you will need to user a higher spec model suitable for pipe liners.

Transducer type (Menu 23)

This should remain set as 0.Standard unless otherwise directed

Transducer mounting (Menu 24)

Press    to enter menu 24





See page 9 (Transducer mounting methods) for more info on selecting the best mounting method, three mounting methods are available.

V – most common, can be used for 25mm to 400mm pipes

Z - can be used if the signal is poor, can be used on pipes over 100mm (but better to be over 300mm)

N - while uncommon to use this, it can be used on small pipes usually under 50mm

To select the mounting method

Press  then  or  to scroll up and down selectable options, then  again to confirm

Transducer spacing (Menu 25)

Press    to enter menu 25

After setting all the relevant parameters previously, this menu will display the distance that the transducers should be spaced apart.

Install the transducer according to the displayed transducer mounting spacing and the selected mounting method.

Other Menu numbers are listed below:

01~08	Flow Totalizer Display: to display flow rate, positive total, negative total, net total, velocity, date & time, present operation, and flow results today, etc.
10~29	Initial Parameter Setup: to enter pipe outside diameter, pipe wall thickness, transducer type, transducer mounting method and spacing, etc.
30~38	Flow Units Options: to select the flow unit such as cubic meter, litre, or other units, can turn totalizers on/off and reset totalizers, etc.
40~49	Setup options: Scaling factor, system lock (Window M47), etc.
55~89	Input and output setup: date and time, ESN, communication baud rate setting, etc.
90~98	Diagnoses: Signal strength and signal quality (Window M90), TOM/TOS*100 (Window M91), flow sound velocity (Window M92), total time and delta time (Window M93), Reynolds number and factor (Window M94), etc.
+0~+5	Appendix: power on/off time, total working hours, on/off times, and a single-accuracy function calculator

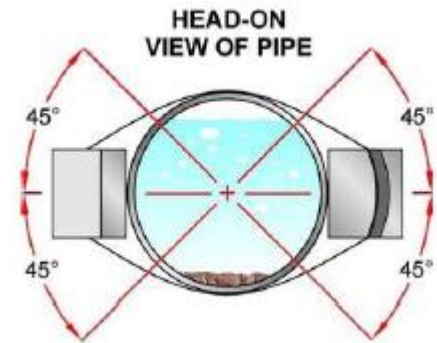
Pipe preparation

This carries on from page 7 & 8 of selecting an installation location, so by now you should have already selected the ideal location to install the flow meter transducers.

Remember to consider the possibility of sedimentation at the bottom of the pipe and the presence of an air pocket at the top of the pipe.

Because of this it is best to install the transducers on the side of the pipe usually within 45° of a horizontal pipe, as shown.

In addition, avoid flanges and welding areas and select a smooth portion of the pipe to install the transducers.



Transducer mounting methods:

V method is considered the standard method but [please see page 9](#) about the different mounting methods that are available. Then the transducers can be mounted accordingly.



This guide will demonstrate the basic and most common V method mounting. If using Z or N method please see the full manual for a full description.

Now that you know how far to space the transducers apart from the previous step (M25), and you have selected a suitable location for the installation with enough distance upstream and downstream away from bends, pumps, valves etc... you can prepare the pipe for mounting the transducers.

Using a polisher or sandpaper make the mounting position clean of all rust, mud, scale, painting etc.

Ensure the polished area is larger than transducer surface area.



Polish one mounting area first. Then input proper parameters in M11 to M24, M25 will display the mounting distance value and then you can polish the other area accordingly.

A clean, polished mounting surface is very important for good signal.

For plastic pipe, clean it of painting, sticky oil, adhesives, etc.

Ensure that the pipe surface temperature at the measuring point is within the transducer temperature limits.



Transducer installation and fixing

Now the transducers can be installed onto the pipe.

The mounting conditions and positioning directly influences the flow value accuracy and system long-term operation reliability so it is important to mount the transducers correctly and accurately, the transducers should be spaced apart at the distance specified on menu 25.

Included with the flow meter is some stainless-steel straps and couplant.

Apply a wide band of sonic coupling compound down the centre of the face of each transducer as well as on the pipe surface to ensure there are no air bubbles between the transducers and the pipe wall.

Prepare the stainless-steel straps on the pipe leaving enough slack to slide the transducer into place and tighten up.

Then slide the transducer into position and tighten down the stainless strap. (ensure you place upstream and downstream transducers in accordance with flow direction)



Note: The two transducers should be mounted at the pipe's centreline on horizontal pipes. Make sure that the transducer mounting direction is parallel with the flow. During the installation, there should be no air bubbles or particles between the transducer and the pipe wall.

Installation Warnings:

1. Pipe parameters entered must be accurate otherwise the flowmeter will not work properly.
2. During the installation, apply enough coupling compounds to stick the transducers onto the pipe wall. While checking the signal strength and Q value, move the transducers slowly around the mounting site until the strongest signal and maximum Q value can be obtained.
3. Check to be sure the mounting spacing is accordance with the display in Window M25 and the transducer is mounted at the pipe's centreline on the same diameter.
4. Pay special attention to those pipes that formed by steel rolls (pipe with seams), since such pipe is always irregular. If the signal strength is always displayed as 0.00, that means there is no signal detected. Thus, it is necessary to check that the parameters (including all the pipe parameters) have been entered accurately. Check to be sure the transducer mounting method has been selected properly, the pipe is not worn-out, and the liner is not too thick. Make sure there is indeed fluid in the pipe, or the transducer is not too close to a valve or elbow, and there are not too many air bubbles in the fluid, etc. With the exception of these reasons, if there is still no signal detected, the measurement site has to be changed.
5. To make sure that the Flowmeter can run properly with high reliability please make sure a strong signal strength is reached. If there is interference from ambient electromagnetic waves or the signal detected is too poor, the flow value displayed will not be reliable; consequently, the capability for reliable operation is reduced.

Checking signal strength, ratio, and Delta time

Check Signal strength (Menu 90)

Press  shortcut or press    to enter menu 90

Signal strength indicates a detected strength of the signal both from upstream and downstream directions.

The relevant signal strength is indicated by numbers from 00.0 – 99.9

00.0 represents no signal detected while 99.9 represents maximum signal strength. The stronger the signal strength detected, the better the instrument reliability will be. It will also result in a more stable measurement value.

Ensure all the previous setup steps have been carried out and ensure enough couplant has been applied. Adjust the transducer position during the installation to obtain the maximum signal strength.

Normal system operation **requires signal strength over 65.0** from both upstream and downstream directions. If the signal strength detected is too low, the transducer installation position and the transducer mounting spacing should be re-adjusted and the pipe should be re-inspected. If necessary, re-consider the mounting method of Menu 24 or you can also check the troubleshooting steps outlined in the troubleshooting section.

Transit time ratio (Menu 91)

Enter the transit time menu by pressing    to enter menu 91

Transit time ratio indicates if the transducer mounting spacing is accurate. The **normal transit time ratio should be 100±3** if the installation and parameters and been completed correctly.

If the transit time ratio is over 100±3 it is necessary to check:



- If the parameters are entered correctly (pipe outside diameter, wall thickness, pipe material, liner, etc.)
- If the transducer mounting spacing is in accordance with the display in Window M25
- If the transducers are mounted correctly
- If the scale is too thick or the pipe mounting is distorted in shape, etc.
- You can also check the troubleshooting steps outlined in the troubleshooting section.

Total time and Delta time (Menu 93)

Enter the menu by pressing    to enter menu 93

"Total Time and Delta Time", which displays in Window M93, indicates the condition of the installation. The measurement calculations in the Flowmeter are based upon these two parameters. Therefore, when "Delta Time" fluctuates widely, the flow and velocities fluctuate accordingly, this means that the signal quality detected is too poor. It may be the result of poor pipe-installation conditions, inadequate transducer installation or incorrect parameter input. Generally, "Delta Time" fluctuation should be less than $\pm 20\%$. Only when the pipe diameter is too small or velocity is too low can the fluctuation be wider.

View the flow rate measurement:

To view your flow rate measurement, press the  shortcut or press    to enter menu 1.

It will display the flow rate.

Changing the units





Flow rate unit can be changed on menu 31

Totaliser unit can be changed on menu 32

Reset the totaliser:

To reset the totaliser back to 0L, go to Menu 37

It shows: "Totaliser Reset?"

Press  then  or  to scroll up and down selectable options, then  again to confirm

Basic Troubleshooting

If you are having problems acquiring or maintaining strong signal over 65

- Pipe parameters entered must be accurate; otherwise, the flowmeter will not work properly.
- During the installation, apply enough coupling compound to the transducer to ensure adequate contact with the pipe wall.
- Check to be sure the mounting spacing is accordance with the display in Menu 25 and the transducer is mounted at the pipe's centreline.
- While checking the signal strength and Q value, if required you can move the transducers slowly around the mounting site until the strongest signal and maximum Q value can be obtained.
- Ensure the pipe surface is sanded/polished and free from dirt where the transducers are mounted.
- Keep the flowmeter away from the electromagnetic interference area to ensure its proper operation. Heavy vibrations on a pipe can also cause issues.
- Ascertain there is not too much air or solids in the fluid, etc.
- if there is still none or poor signal detected, the measurement site must be changed.

If the signal strength is always displayed as 0.00 there is no signal detected.

- Check that the parameters have been entered accurately.
- Check to be sure the transducer mounting method has been selected properly, the pipe is not worn-out, and the liner is not too thick.
- Make sure there is indeed fluid in the pipe, or the transducer is not too close to a valve or elbow
- Make sure the cables are connected correctly, and to the correct upstream/downstream ports
- Make sure the transducers are correctly mating to the pipe surface and all in the correct orientation.

If signal strength value Q displayed in M90 is less than 65, following methods are recommended:

- Relocate a better location noting the recommendations on page 6.
- Try to polish the outer surface of the pipe and use enough coupling compound to increase the signal strength.
- The transducers spacing should be the same as M25 value, you can try to adjust the position slightly to increase signal.
- Please check that the power supply voltage is stable, sometimes the power supply can cause some electronic interference, you can try a different power supply.
- You can also try another mounting method instead, V mounting method is most common to use, however it requires the signal to "bounce" off the pipe and therefor can degrade the signal or if the pipe is pitted slightly the signal may bounce unreliably. If you instead use Z method for example the transducers are mounted on opposite sides of the pipe and therefor no "bouncing" is required and should provide a stronger signal when setup correctly in the correct circumstances.



You may need to reference the full manual for further installation instructions.

Frequently asked Questions and Answers

Question: New pipe, high quality material, and all installation requirements met: why still no signal detected?

Answer: Check pipe parameter settings, installation method and wiring connections. Confirm if the coupling compound is applied adequately, the pipe is full of liquid, transducer spacing agrees with the screen readings and the transducers are installed in the right direction.

Question: Old pipe with heavy scale inside, no signal or poor signal detected: how can it be resolved?

Answer: Check if the pipe is full of fluid. Try the Z method for transducer installation (If the pipe is too close to a wall, or it is necessary to install the transducers on a vertical or inclined pipe with flow upwards instead of on a horizontal pipe). Carefully select a good pipe section and fully clean it, apply a wide band of coupling compound on each transducer face (bottom) and install the transducer properly. Slowly and slightly move each transducer with respect to each other around the installation point until the maximum signal is detected. Be careful that the new installation location is free of scale inside the pipe and that the pipe is concentric (not distorted) so that the sound waves do not bounce outside of the proposed area.

For pipe with thick scale inside or outside, try to clean the scale off, if it is accessible from the inside. (Note: Sometimes this method might not work, and sound wave transmission is not possible because of a layer of scale between the transducers and pipe inside wall).

Question: Why is the flow rate still displayed as zero while there is fluid obviously inside the pipe and a symbol of "R" displayed on the screen?

Answer: Check to see if "Set Zero" was carried out with fluid flowing inside the pipe (Refer to Window M42) If an incorrect "Set Zero" has been carried out, do it again correctly or recover the factory default in Window M43.

Question: The pipe is not full of liquid or there is no flow in the pipe, but still displays an unstable or wrong reading?

Answer: Pipe must be full of liquid, if not, enter the menu 29 to setup an Empty Pipe Q Value less than normal Q value (pipe is full of liquid), cut off abnormal reading, the flow meter will display zero reading.

Question: The pipe is full and flowing, but only at a very low speed, why is the flow meter is displaying 0 flow?

Answer: The data in M41 is Low Flow cut-off Value. If the flow rate falls below the low flow cut-off value, the flow indication is deemed to be ZERO. This can prevent nuisance readings causing the totaliser to accumulate the flow when the actual flow is "0" after a pump was shut down for example. Generally, 0.03m/s is recommended to enter as the flow cut-off point.

The low flow cut-off value has no relation to the measurement results once the velocity is higher than the flow cut-off value.

Question: Why is the flow reading on the display not the same as a trusted known flow rate?

Answer: If you have a known flow rate on a pipe and this flow meter is not reading as expected then the flow meter may need to be "tared" or "zeroed". Just like scales for example, the zero point sometimes needs to be reset. First, the zero may have accidentally been set to an incorrect point, in which case you can re-set the zero point to the factory point using Menu 43.

Alternatively, if you install the flow meter on a full pipe with no flow you can use Menu 42 to set a new zero point. See the full manual for more information on this.

If the zero point is fine, your flow meter may need re-calibration, it is recommended to have the flow meter calibrated regularly to maintain best accuracy.
