PrimeProbe3 SMART

User Manual

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Technical Support

Primayer Limited provides a technical support service to assist on all matters relating to the configuration and use of PrimeProbe3. Customers are encouraged to make use of this service, by contacting support@primayer.co.uk or use contact details provided above.

WARNING: Please note that Primayer Limited cannot support technical enquiries relating to, or caused by problems with, the operating system installed on any PC or internet device.

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1. PRIMEPROBE3

1.1 System Overview

PrimeProbe3 flow meter measures flow rates in closed conduits of clean water, where the liquid being measured has conductivity greater than 5 micro Siemens. PrimeProbe3 is not suitable for dirty/waste water applications or for the measurement of gases, petroleum, or other fluids with low conductivity.

PrimeProbe3 utilises SMART mode technology which enables the probe to change the number of samples taken according to the variation in flow rate, which:

- Gives more accurate results when flow-rate changes rapidly,
- Preserves battery life when flow rates are more stable.

WARNING: Please be careful when removing this product from its original container. Fully inspect the equipment for damage. If damage is noticed, notify the carrier agent and Primayer.

1.2 Model Variants

Model	Insertion length	Overall length	Use in pipe sizes	
			Centre Line	1/8 pipe diameter
Size 0	150 mm	587 mm	≤300mm	≤1200 mm
Size 1	300 mm	737 mm	≤600 mm	≤2000 mm
Size 2	500 mm	937 mm	≤1000 mm	≤4000 mm
Size 3	700 mm	1137 mm	≤1400 mm	≤5600 mm
Size 4	1000 mm	1437 mm	≤2000 mm	≤8000 mm

1.3 Specification

Measurement

- Bidirectional flow measurement
- Measurement range: 0.02m/s to 5m/s (maximum may be lower dependent upon insertion length and position in pipe)
- Accuracy (Point velocity flow):
  - ≥0.4m/s; ± 2 %
  - <0.4m/s; 0.8/velocity(m/s)%
- Flow determination assumes fully developed flow profile (Refer to ISO 7145-1982)
- 4 Measurement sampling options;
  - SMART (16 – 40 seconds)
  - Maximum life (6 minutes)
  - Continuous Power (2 seconds)
  - Average mode (60 seconds)
- Signal output: Pulse proportional to velocity/ flow-rate (Maximum frequency: 32Hz)
- Minimum fluid conductivity: 20µS/cm
- Liquid temperature range: 0 to +60 deg C
- Female quick release pressure tapping
- Maximum pressure rating 25bar
- User defined units

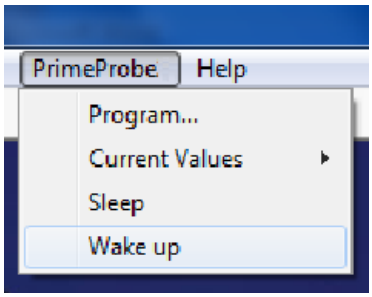
Communication

- Compatible with XiLog+ and PrimeLog+
- Military specification output connector
- Local USB communications

Components

- IP68 (to 1 metre depth)
- 1inch (25mm) BSP
- PEEK sensor material
- SS304 body material
- SS316 electrode material + Body
- Lithium batteries; ≤3 years (dependant on sampling period and usage pattern)
  - Continuous Sampling (2.5 Months)
  - Smart Mode (1.9 to 2.7 Years)
  - Average Mode (3.2 Years)
  - Max Life (4.8 years)
- Safety anti bounce chain
- 5mm adjustment screw (Allen key supplied with kit).

2. PRE-INSTALLATION



2.1 Switch On (Upon delivery from Primayer)

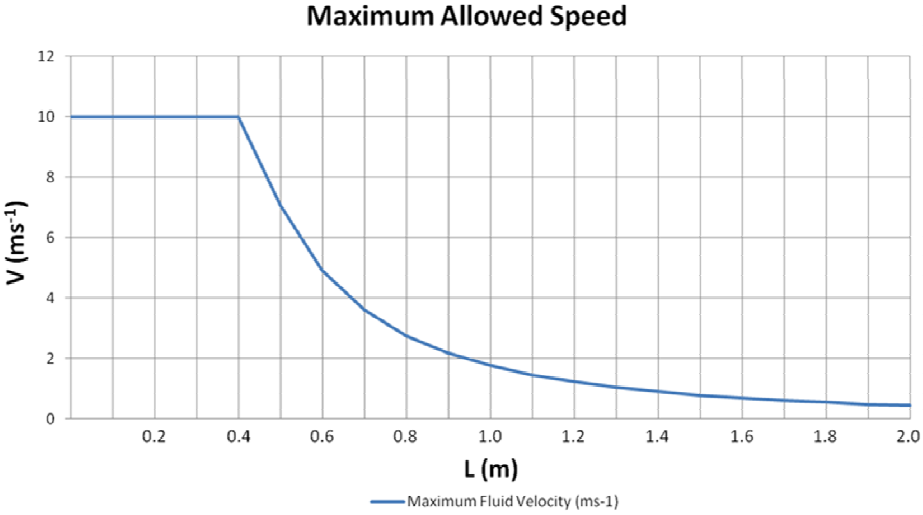
PrimeProbe3 is delivered from the factory in sleep mode. It must be woken up before going to the first site installation. This can be achieved by opening PrimeWorks and then select Wake Up from the PrimeProbe3 menu. A message will then confirm PrimeProbe3 is now awake!

2.2 Probe Size Considerations

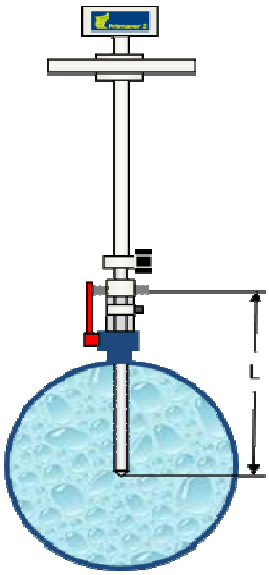
PrimeProbe3 can be used on pipes with internal diameters ranging from 200mm up to 8000mm (at 1/8 insertion), depending on the insertion length of the particular probe that was chosen. The table under section 1.2 Model Variants indicates the 6 different insertion-lengths of PrimeProbe3 and the sizes of pipes in which they can operate.

2.3 Velocity Considerations

The maximum flow velocity in the pipe strictly regulates the maximum permitted inserted length of the probe inside the same pipe (maximum insertion depth). The flow rate and generation of fluid vortices places stress on the probe. The graph below should be used when installing the sensor in the pipe to determine the maximum insertion length and ensure the probe remains within safe operating conditions. The mounting of the probe is important and the probe should be installed following this installation guide and standards defined in UNI 1072700 1998 which seeks to ensure a fully developed, stable flow profile at the measurement point.



L Maximum Insertion Length (m)	V Maximum Fluid Velocity (ms-1)
0	10
0.10	10
0.20	10
0.30	10
0.40	10
0.50	7.06
0.60	4.91
0.70	3.6
0.80	2.76
0.90	2.18
1.00	1.77
1.10	1.46
1.20	1.23
1.30	1.04
1.40	0.9
1.50	0.78
1.60	0.69
1.70	0.61
1.80	0.55
1.90	0.49
2.00	0.44



NOTE: This information is provided as a guide only. Some installations may experience unwanted vibration resonance which may further limit the maximum velocity at which the PrimeProbe3 may be used.

2.4 Insertion Depth Considerations

There are three positions at which PrimeProbe3 can be located: either at 1/2 pipe diameter, or 1/8-pipe diameter or 7/8-pipe diameter. Primayer recommend locating the pipe at 1/2 pipe diameter for most setups. Although there are a couple of exceptions where the probe is suited to another insertion depth:

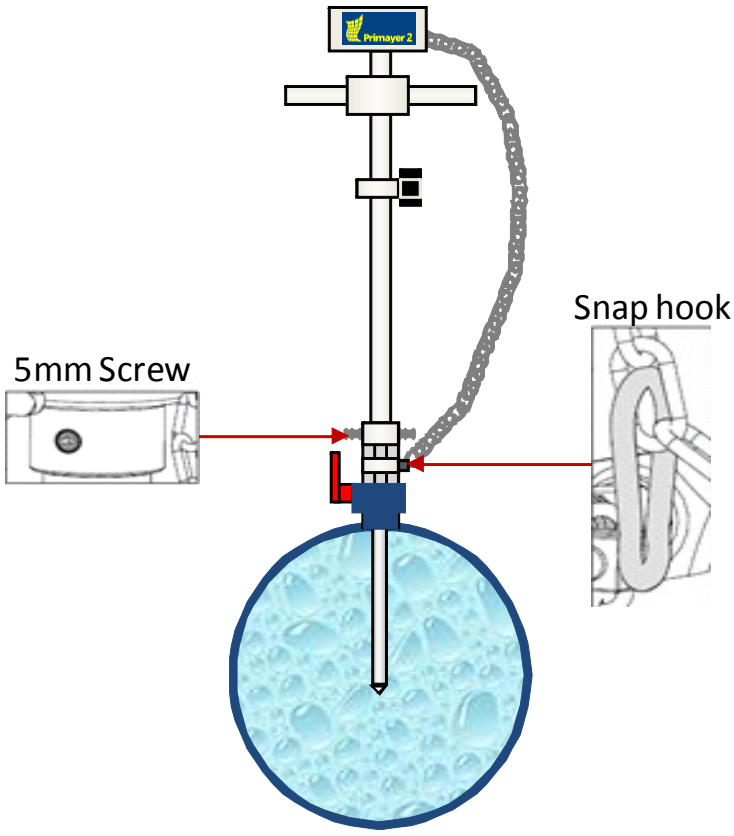
- If the probe is vibrating when installed it should be moved to 1/8 pipe diameter.
- If the pipe contains bubbles or not completely full either install the probe at 1/2 or 7/8 pipe diameter.

2.5 Safety Considerations

WARNING: Before opening the valve to insert or retract the PrimeProbe3, be sure that the safety mechanism is engaged.

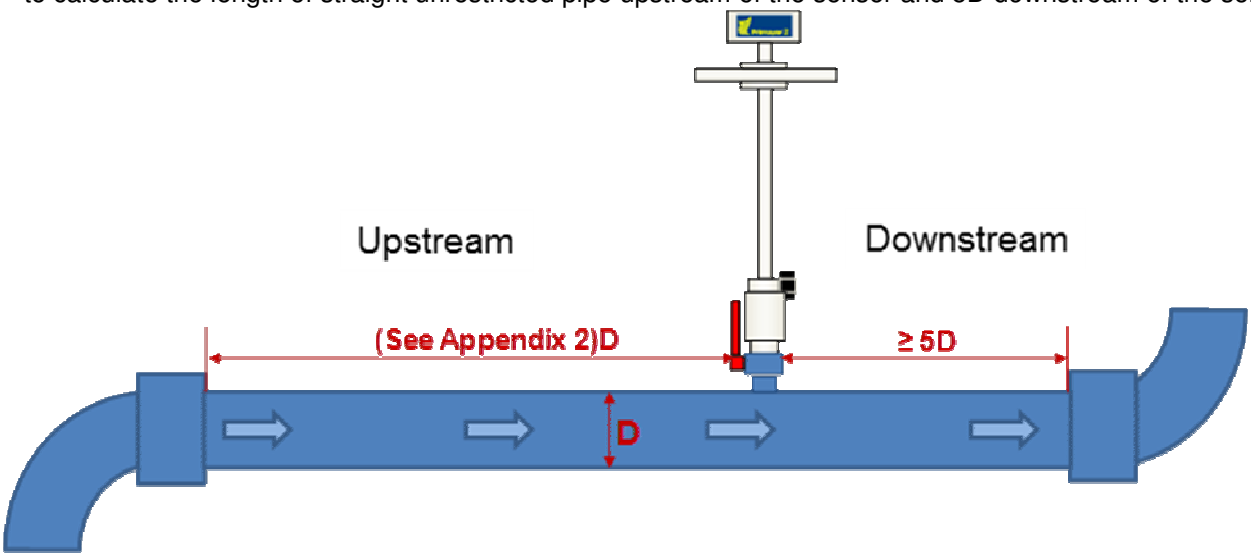
1. Ensure the 5mm screws are tightened.
2. Clip the excess chain to the snap hook and ensure the remaining safety chain is taut.
3. Open valve.

Some pipes are under considerable pressure, and failure to lock-down the probe could cause the sensor to be forced upwards and injure the operative. For sites that exceed 10bar it is recommended that the pipeline is depressurized during the installation of the probe.

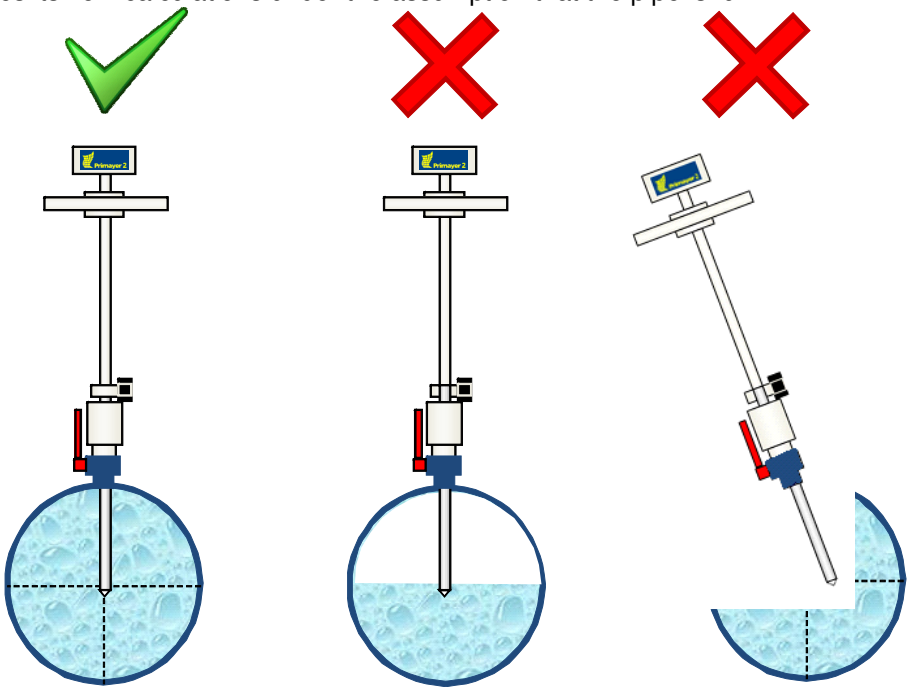


2.6 Site considerations - *Do's and Don'ts*

- The sensor should be installed away from any bends in the pipe, and away from any hydraulic fittings (disturbances). For best results, the sensor of the PrimeProbe3 should be installed in accordance to ISO7145 International standard of flow measurement (See Appendix 2). By using the pipe diameter (D) it can be used to calculate the length of straight unrestricted pipe upstream of the sensor and 5D downstream of the sensor.

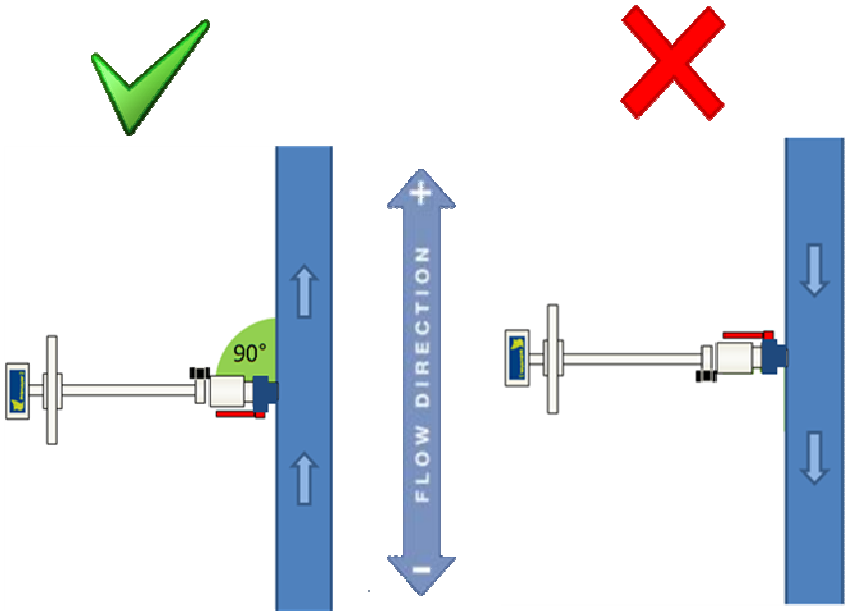


- As with all flow meters, during operation of the PrimeProbe3 the pipe must be completely full of water. The converter makes its flow-calculations under the assumption that the pipe is full.

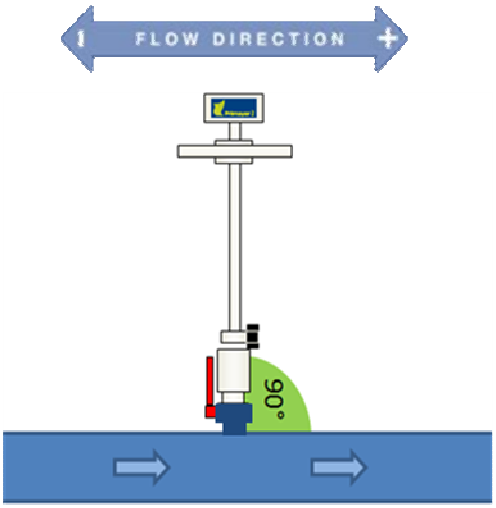


- Although it is not necessary that the sensor should always be installed at the "12 o'clock" position on the pipe, it is in all cases necessary that the probe be installed perpendicular (90°) to the pipe.

- For installation on vertical pipes ensure the direction of flow is upwards.



- Before installing the PrimeProbe3, determine the direction of flow in the pipe. It is imperative that the PrimeProbe3 is installed in the correct direction.
- Using the nameplate located on top of the transmitter as a reference, flow direction is positive when the flow direction is from – to +.

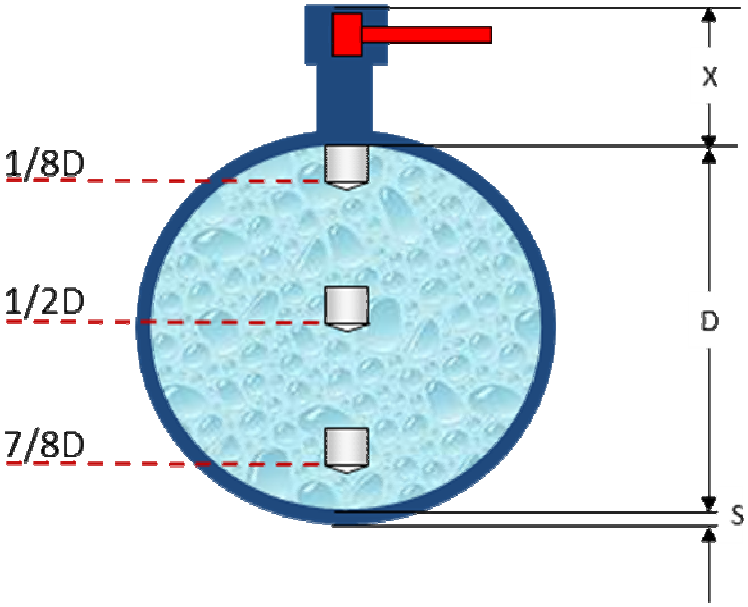


- If the flow direction is reversed after installation, it is advised to reverse the probe by rotating through 180 degrees, so that positive symbol is pointing in the direction of the flow of water.

2.7 Mechanical Considerations

The probe is installed into the pipe work through a pre-drilled 25mm hole which is enclosed in a boss type fitting. Alternatively a 1.5 inches or 2 inches may be used with reducers.

WARNING: Ensure that a maximum of 140mm for X is achieved between the pipe outer surface and above the locking handle after installing boss/collar type fitting.



NOTE: Different methods are used for installing on plastic or AC pipes with smaller diameters and for larger-diameter pipes constructed of steel.

Plastic or AC pipes (fitting gate valve)

Plastic or AC pipes require a gate valve; no welding is required to install the gate valve to a plastic or AC pipe with diameters 200 to 400mm. Simply fit a saddle to the existing pipe work, tighten the lug nuts, and connect the 40mm gate valve. Note that a 40mm drill bit must be used when boring a hole in the pipe. No reducer valves can be fitted if they will interfere with the protrusion of the drill bit.

Steel Pipes (fitting gate valve)

To connect a gate valve to large-diameter steel pipes, the installer must first weld a boss directly to the pipe work (the boss should be made of carbon steel). After the boss is welded to the pipe work, and the weld is pressure-tested, attach a 40mm gate valve.

NOTE: A Carbon Steel boss cannot be welded effectively to a Ductile Iron pipe. When using PrimeProbe3 with Ductile Iron pipes, a pipe saddle should be used.

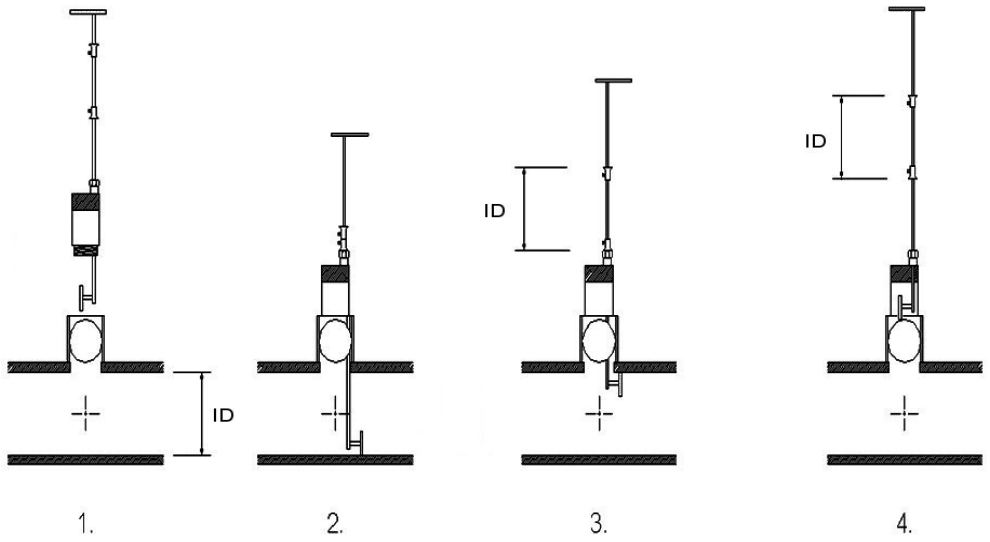
2.8 Measuring Internal Pipe Diameter

It is critical to take an accurate measurement of the internal diameter of the pipe (pipe I.D.) before deploying the probe into the pipe work. It is required to produce an accurate flow rate by the probe. Measuring the internal pipe diameter can be done by either using:-

- Tape measure (If a cross section of the pipe of the same material and size is available)
- Gauging rod

Gauging Rod

The internal diameter (I.D.) of the pipe can be measured using a gauging rod.



1. With the valve closed, connect the gauging rod to the ball valve. Be sure that the measuring arm is aligned correctly with the pipe work (as shown in fig.1 above)

2. Open the valve completely, and lower the gauging rod until it touches the bottom of the pipe. With the gauging rod touching the bottom of the pipe, rotate the gauging rod 180-degrees. Now you can lock-down the upper measuring-lip.

3. Withdraw the gauging rod until it touches the top pipe wall. With the gauging rod touching the top of the pipe wall, lock-down the bottom measuring lip. The distance between the two knife-edges of the measuring lips is the internal diameter of the pipe.

4. Rotate the gauging rod 180-degrees. Withdraw the Gauging Rod the rest of the distance (i.e. clear the valve). Close the ball valve completely. Remove the gauging rod.

3. INSTALLATION

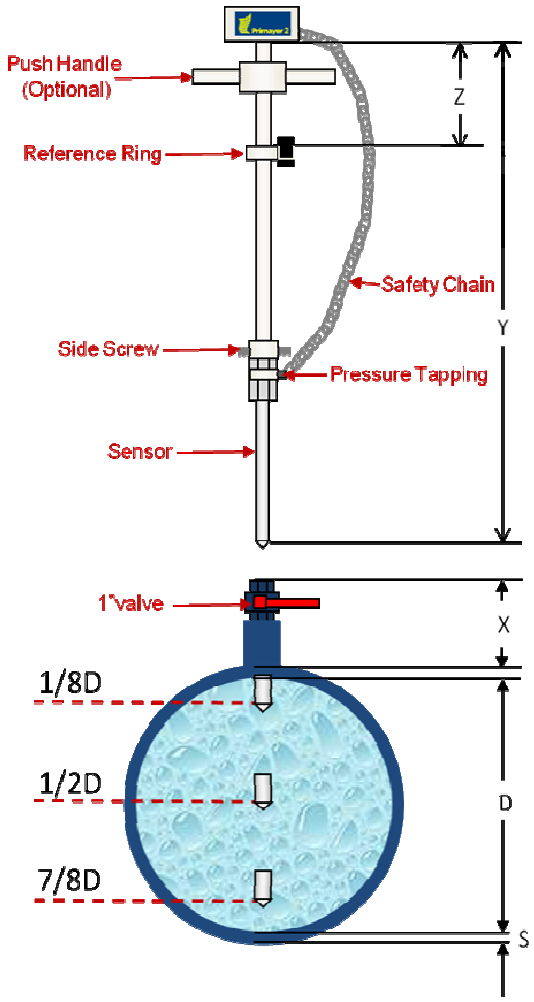
1. Choosing an Insertion Depth

First decide whether PrimeProbe3 is to be measured on the centre-line of the pipe (1/2-pipe) or at the mean velocity point (1/8 or 7/8-pipe).

Centre-line installation is the preferred method as it allows for a greater margin of error if the installation is not exactly on the centre-line.

1/8 or 7/8 pipe (mean velocity) should only be chosen if the PrimeProbe3 is not long enough to reach centre-line or if the velocity of the fluid inside the pipe is considered excessive. (See 1.2 Model variants)

NOTE: Consideration should be taken when performing 7/8 insertion on larger diameter pipes as excessive velocity can contribute to vortex shedding (See 2.3 Velocity considerations)



2. Use the diagram on the previous page as a guide and determine the appropriate Z-value for the selected insertion-depth. Secure the reference ring at that value.

Insertion Depth	"Z-value"
1/8D	Y - (X + S + 1/8D + 110)
1/2D	Y - (X + S + 1/2D + 110)
7/8D	Y - (X + S + 7/8D + 110)

D = Internal Diameter of pipe

S = Pipe Thickness

X = Collar length (See 2.7 Mechanical considerations diagram)

Y = Length to measurement electrodes.

Z = distance between top edge of reference ring and bottom edge of converter box

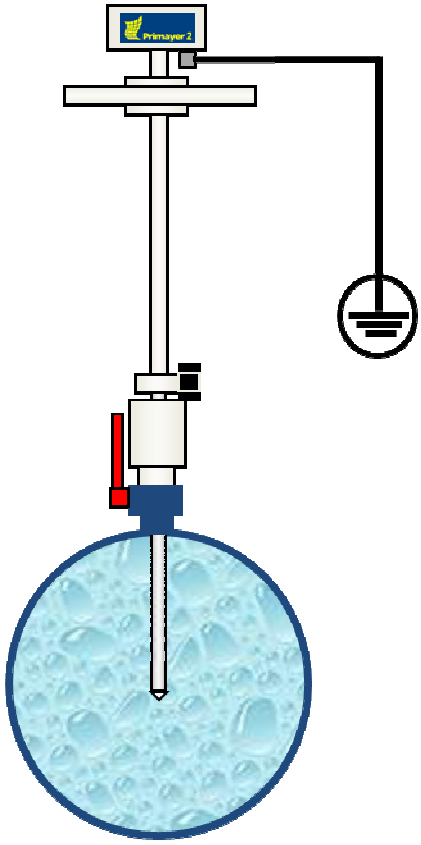
Size	Insertion Length	Y
0	150 mm	510 mm
1	300 mm	660 mm
2	500 mm	860 mm
3	700 mm	1060 mm
4	1000 mm	1360 mm
5	2000 mm	2360 mm

WARNING: Before continuing ensure that the anti-bounce chain is attached and secure. For safety reasons do not remove or modify the lock chain.

3. With PrimeProbe3 fully retracted, screw the 1inch (25mm) sensor sleeve into the pipe.
4. Make sure chain is at its full extent.
5. Slowly open the ball valve. Ensure that the valve is 100% open.
6. Slowly push the sensor through the open valve into the pipe until the reference ring touches the locking collar.
7. Verify that the Push Handles of the PrimeProbe3 are in alignment with the pipe's axis (±2 degrees).
8. Tighten the two side-screws.

3.1 Grounding the Sensor and the Converter

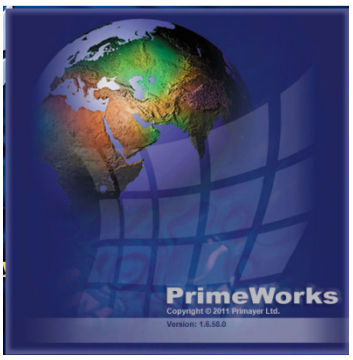
Swinging flow rates are usually an indication of poor earthing. For accurate results, it is necessary that the sensor and the liquid are equipotential. To achieve this, always connect both the sensor and the transmitter to earth. The grounding input is located underneath the transmitter labelled with a yellow grounding symbol.



NOTE: For pipes with cathodic protection, please contact Primayer Ltd.

4. OPERATIONS

4.1 Software Requirements



PrimeWorks PC software is used to program PrimeProbe3. It can also be used to view and report upon data logged from PrimeProbe3 and other Primayer data products.

User Requirements

In order to install PrimeWorks software the installer must have sufficient authority to write to the Registry (administration privileges).

Software Requirements

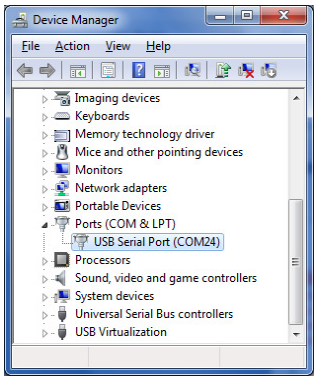
- Windows XP or later
- Microsoft .NET Framework v3.5 SP 1

As with any software application, the higher the specification of the host system, the better the software will operate.

Software Updates

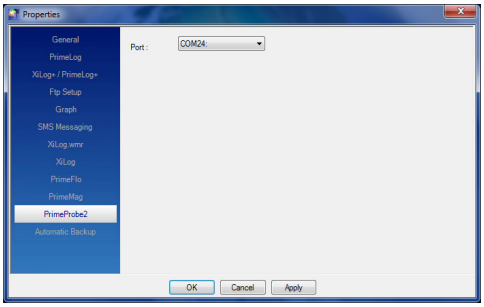
We provide software licence free and all updates can be located on the users section through www.primayer.com

4.2 Setup PrimeWorks to recognise PrimeProbe3



PrimeProbe3 is supplied with a communication cable that is USB converted from a RS232 connection. This means PrimeWorks needs to be pointed at the correct COM port.

1. First find which PC port the PrimeProbe3 is connected to by opening Device manager in Windows. The connected PrimeProbe3 be displayed in the hierarchy under Ports with the port number in brackets.
2. Then open Properties in the PrimeWorks File menu

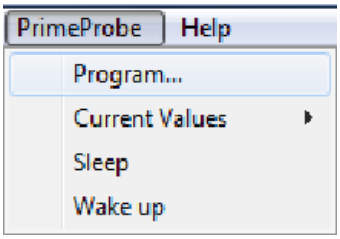


3. Select PrimeProbe3 from the Left hand side menu

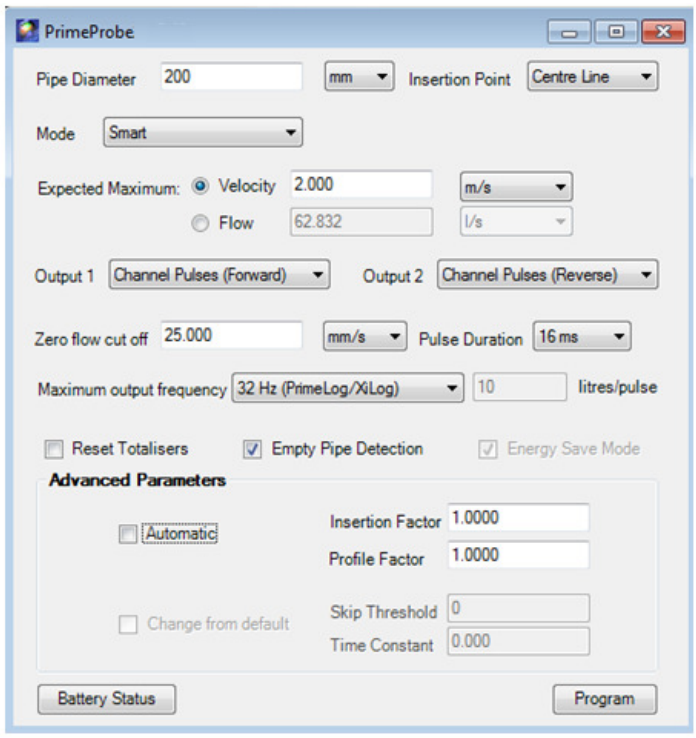
4. Select the Port number to match what is displayed in Device manager. Then click Apply.

4.3 Programming the Probe

Start the PrimeWorks software and select the PrimeProbe3 menu, then subsequently select Program...



Clicking on the program menu will open the following dialog box.



Pipe Diameter

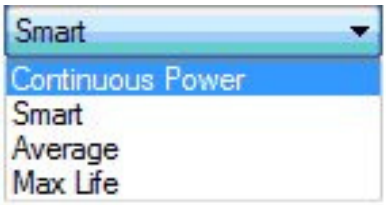
This specifies the internal diameter (D) of the pipe in which the probe is inserted. This can be specified using mm or inches from the drop down menu.

Insertion Point

Use the drop down to select at which point the probe is inserted in the pipe.

Mode

There are four modes that can be selected to suit flow conditions and the application. These modes give a trade off between response time for sampling and battery life.



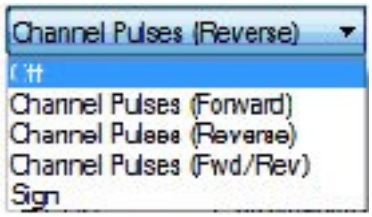
Mode	Sample Interval	Response time	Application
Continuous Power	10 Hz	2 seconds	For best possible accuracy, example application = flow profiling - but gives minimum battery life
Smart	variable	16 - 40 seconds	Optimum accuracy with managed battery life
Average	3 secs	1 minute	Average performance between Max. Life and Continuous Power
Maximum Life	15 secs	6 minutes	For maximum battery life

See Chapter 6 for battery life information

Expected Maximum

This is the maximum velocity/flow that the pipe which PrimeProbe3 is installed upon can achieve. This value scales your maximum flow accordingly.

NOTE: If maximum flow rate is unknown, leaving the default value of 2 m/s is a recommended.



Channel Pulses

The following options are available for Output 1 and Output 2:

Output 1 and Output 2 – PrimeProbe3 is preconfigured to provide both forward and reverse pulses via a Primayer digital cable. There should be no need for the user to change these unless connection to a different device is required. Then Output 1 and 2 become device dependent. (If unsure please contact Primayer Support). Please see the following table for a definition of each setting:

Option	Definition
Off	Provides no output pulses
Channel Pulses (Forward)	Provides output pulses when flow is in positive direction
Channel Pulses (Reverse)	Provides output pulses when flow is in negative direction
Channel Pulses (Fwd/Rev)	Provides output pulses when flow is in either direction
Sign	When channel pulses (Fwd/Rev) are used on one output, the other should be set to sign in order for the logger to calculate totals correctly

Zero flow cut-off

This is the velocity level below which the probe cannot measure due to a lack of flow (which can affect the polarity of the sensors). When the velocity drops below this value, the flow rate is assumed to be zero, therefore totalisers and outputs will register zero.

Pulse Duration

This parameter sets the duration of the output pulses. This could require changing depending upon the output device connected to the probe. This should be set to match the input pulse duration expected by the connected device. When in use with Primayer data loggers, it is recommended to set this to 16ms.

Maximum Output Frequency

Maximum Output Frequency sets the frequency for connected output devices. For XiLog+, PrimeLog+ and XiLog.wmr there are predefined options for quick programming which should be adhered to. Select the appropriate Primayer device from the drop down menu. For other devices Expected Maximum can be overridden by the user defining pulse per litre for the probe.

NOTE: PrimeProbe3 can only achieve a maximum frequency output of 32Hz

Reset Totalisers

Checking this box will reset the internal flow totals in PrimeProbe3 on programming.

Empty Pipe Detection

Checking/Un-checking this option will turn on/off the empty pipe detection feature.

If checked, the Empty Pipe alarm will be set which can detect that the pipe is empty. This will be reflected in the flow rate, and totalisers as a zero.

NOTE: The empty pipe alarm is internal to PrimeProbe3 only, and will not be output to a connected logger.

Energy Save Mode

This option is automatically set by the software. It is on in all modes except Continuous mode.

Advanced Parameters

Uncheck the Automatic box if you wish to modify the Insertion Factor and Profile Factor values.

Advanced Parameter	Definition
Insertion Factor	Specifies the ratio of probe to pipe cross sectional area. This allows the probe to correct the reading, as the probe affects the reading according to how far it is inserted.
Profile Factor	PrimeProbe3 uses internal tables for this value and would be left at 1.000.

NOTE: both these values are calculated using the flow profiling software; otherwise they should be left at the default values. (See Chapter 4.7 Default values)

Skip Threshold and Time constant are only available for change on older probes, and will be greyed out unless applicable.

Advanced Parameter	Definition
Skip Threshold	This threshold is a specified percentage of the full scale maximum flow (Flow rate at a velocity of 5m/s dependent on pipe diameter entered). If the change of flow rate (between 2 sample intervals) is above this the change in output frequency will be instantaneous, otherwise the time constant will be applied.
Time Constant	This affects the response time between the measured value and the output value.

Battery Status

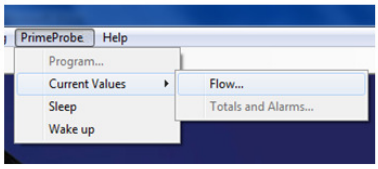
This will show the battery status of PrimeProbe3.

Program button

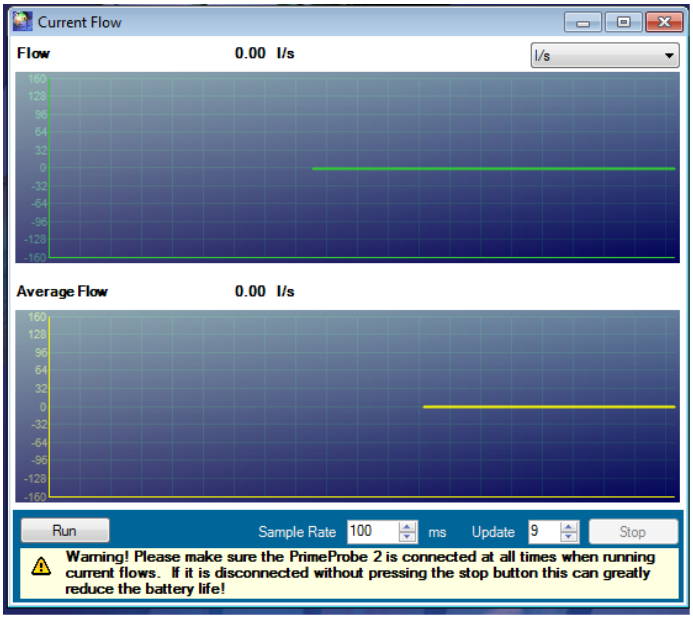
Clicking on the Program button will program the current settings in the software to PrimeProbe3.

4.4 Current Values

Flow...



This menu option allows the user to view the current flow values from PrimeProbe3.



The top graph displays how the current flow rate is changing over time.

The bottom graph shows the average flow rate over time.

Run

Starts the current values readback from PrimeProbe3.

Sample Rate

Changes the rate of sampling for the flow measurements.

Update

Changes the update rate of the average flow graph.

Stop

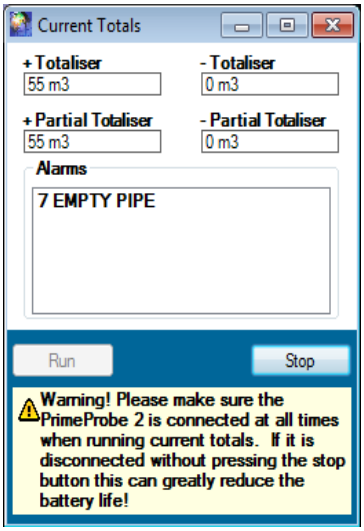
Stops the current values readback.

WARNING: Please make sure PrimeProbe3 is connected at all times when running current flows. If it is disconnected without pressing the stop button this can greatly reduce the battery life!

Totals and Alarms...

The Totals and Alarms screen shows the user the current status of the internal totalisers and alarms of PrimeProbe3.

In the example shown the Empty Pipe alarm is active, meaning that no output pulses will be generated and the totalisers will not be advancing.

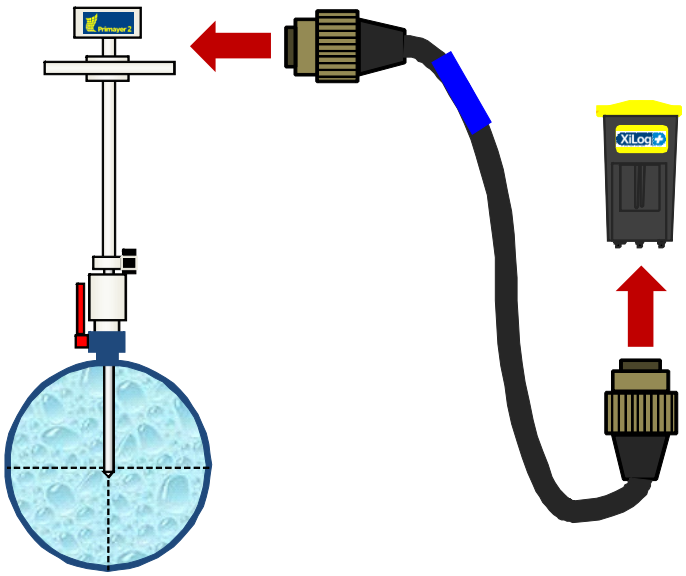


Totaliser Type	Definition
+ Totaliser	Shows totaliser for positive flows
- Totaliser	Shows totaliser for negative flows
+ Partial Totaliser	Shows partial totaliser for positive flows (will always be the same as + Totaliser)
- Partial Totaliser	Shows partial totaliser for negative flows (will always be the same as - Totaliser)

Click Run to continuously update current values, and Stop to end.

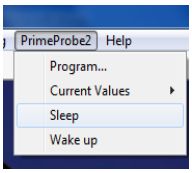
WARNING: Please make sure PrimeProbe3 is connected at all times when running current flows. If it is disconnected without pressing the stop button this can greatly reduce the battery life!

4.5 PrimeProbe3 Output



WARNING: When connecting a data logger to PrimeProbe3, ensure that the output cable is connected the correct way round. Ensure the blue end is connected into PrimeProbe3.

4.6 Sleep



On first receipt of the probe, it must be woken up before any other actions can be performed. Use the PrimeProbe3 menu located in PrimeWorks to do this.

If the probe is being uninstalled and will not be used for a period of time; use the sleep mode to conserve battery life.

4.7 Default Values

This section details default values. If no changes are made in the programming of PrimeProbe3 then the following parameters will be set.

Pipe diameter	200mm
Insertion Point:	Centre Line
Mode:	Smart
Expected Maximum:	Velocity 2.0 m/s
Output1:	Pulses forward
Output 2:	Pulses Reverse
Zero Flow cut off:	25 mm/s
Pulse Duration	16ms
Maximum output frequency	50Hz
Reset totalisers:	off
Empty Pipe Detection:	on

5. FLOW PROFILING SOFTWARE

PrimeProbe3 flow profiling software has the following applications:

- Performs individual velocity profiles
- Validation of flow meters
- Auditable records
- Saves all velocity profiles and settings

A flow profile is a vector diagram that measures velocity across a cross section of a pipe. By measuring the velocity across an odd number of points we can determine the true velocity across a pipe. The centre line has the highest velocity as it's the point which should have minimal resistance to flow. The measurement points closer to the pipe wall will have more resistance, therefore a lower velocity. It is this variation in velocity across the cross section that needs to be taken into account when calculating flow rate. This is reflected by using a Profile factor (Kp) in the flow rate formula used by PrimeProbe3:

$$Q = A(Ki)(Kp)V$$

Q = Flow rate

A = Area

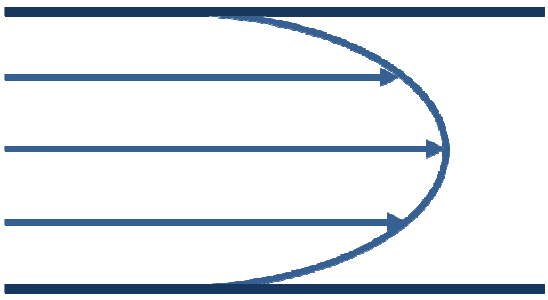
Ki = Insertion factor (a Geographical coefficient of the insertion probe that obstructs flow in relation to the full size diameter)

Kp = Profile factor (the relationship between the centre line 1/2 to the mean points 1/8 & 7/8)

V = Velocity

Laminar flow within a pipe increases accuracy. Laminar flow is when water moves in homogeneous manner. Therefore adhering to ISO7145 international standard of flow measurement (Appendix 3) can help achieve this. Realistically this cannot always be maintained due to tuberculation, pipe sedimentation or even some installations have impractical site conditions. This tends to cause more turbulent flow where water moves unsteadily. Flow profiling can create a profile factor (Kp) that can reflect turbulent flows and produce a true flow rate.

A typical laminar flow will tend to form a parabolic vector.

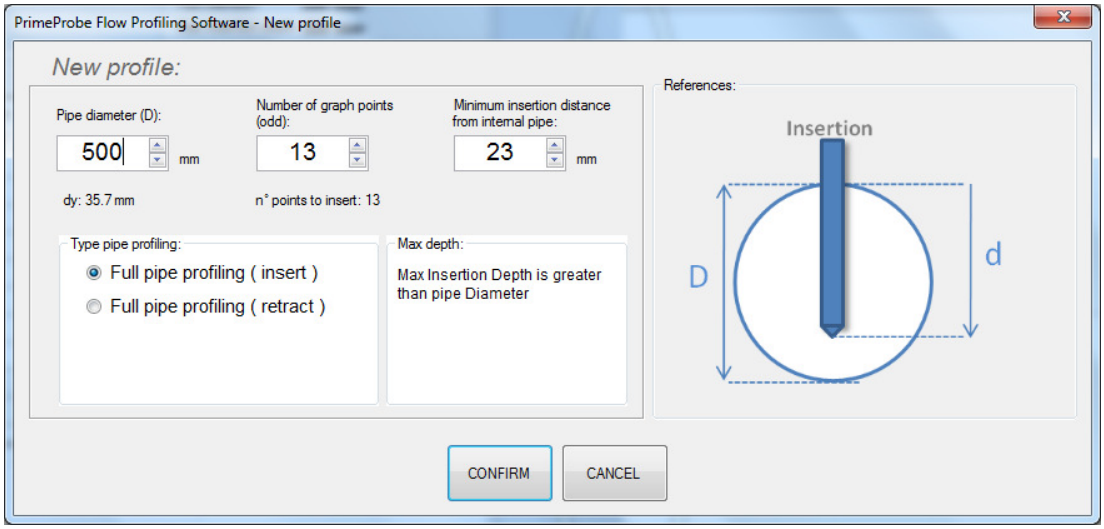


A typical turbulent flow will produce a flatter curve.

Create New Flow Profile

Select New from Flow Profiling menu

Under Pipe diameter, enter the exact internal pipe diameter.



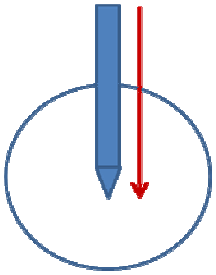
Enter an odd number of graphs points with a value between 7 to 29. This ensures a middle measurement falls upon the centre line.

NOTE: The greater the graph points the more accurate the profile will be.

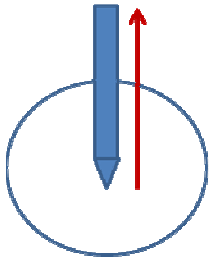
Insert 23mm for minimum insertion distance from internal pipe. Do not measure nearer than 23mm from the pipe wall as this affects the magnetic field of the probe.

Type pipe profiling allows the user to choose which order the measurements are being taken.

INSERT



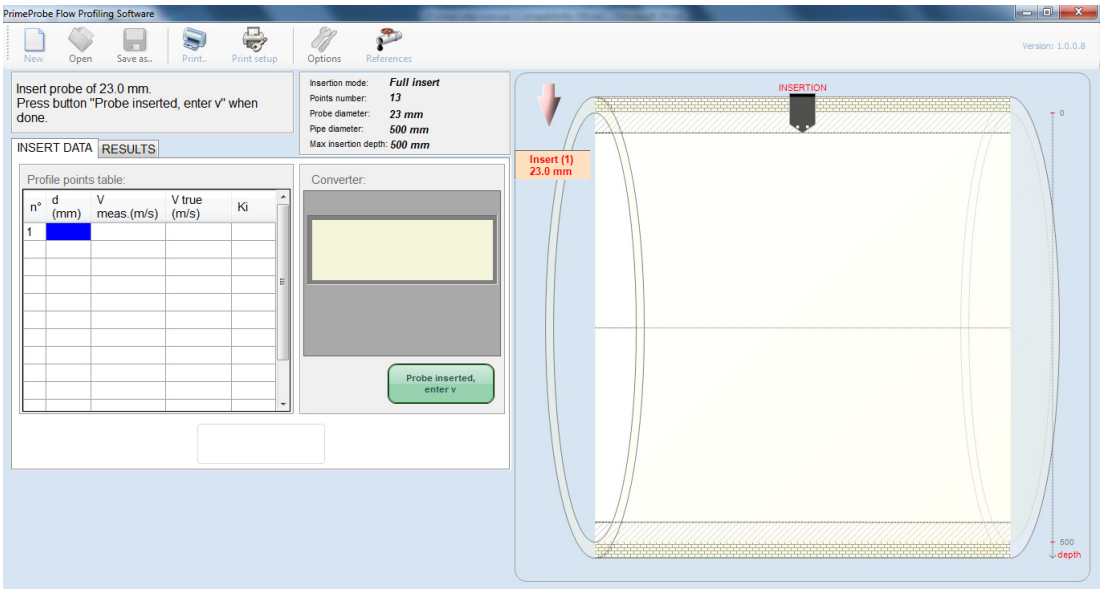
RETRACT



Once all details have been entered click confirm to save settings. The insert data screen will be displayed.

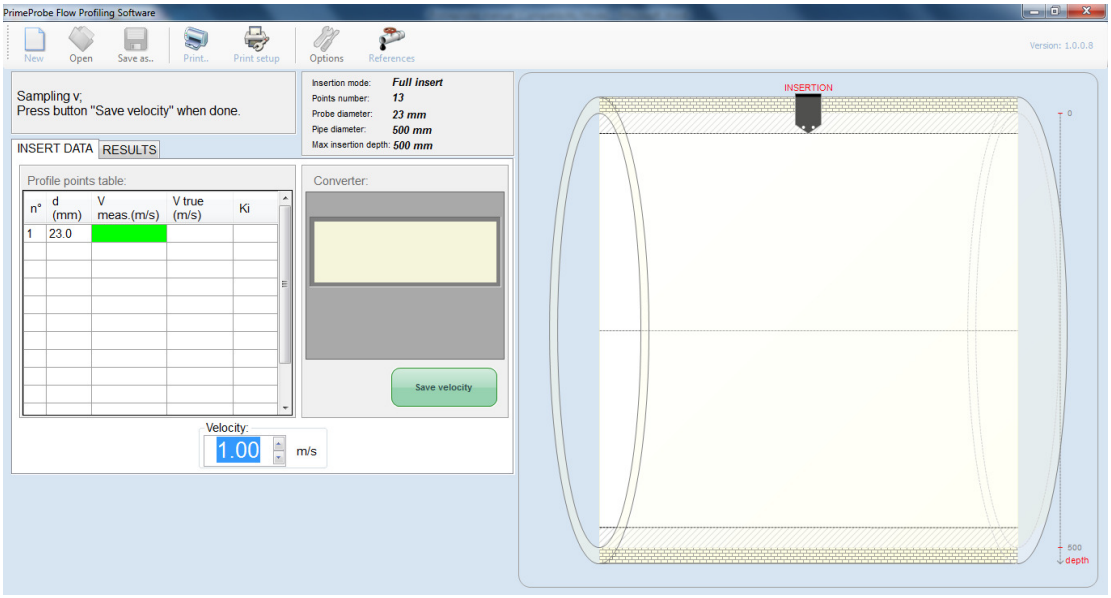
Insert Data

Once a new profile has been confirmed the software will instruct the user to insert the probe according to options selected in New Profile.



The first measurement will be taken at the minimum insertion distance from internal pipe wall. (For PrimeProbe3 the recommended value is 23mm).

Once the probe is at the correct insertion point click the green button labelled Probe inserted, enter v to start sampling at that point.



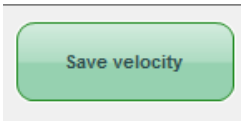
There are two methods of inputting the V meas (m/s):

1. Enter the value manually.

Or

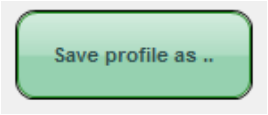
2. Automatically and column V mean. (m/s) will be populated direct by PrimeProbe3 once the sampling has been completed.

Please refer to Chapter 5.1 Flow profiling Options for instruction on how to select the input method of Vmeas (m/s)



Once that segment is populated with a velocity then click the green button labelled save velocity.

The previous steps will be repeated according to the number of graph points entered in the New Profile window. Each measurement point is calculated by the software and will continue to guide the user throughout the whole process.



Once all graph points have been sampled, the option to save the profile is given, providing the measured data is within acceptable limits.

n°	d (mm)	V meas.(m/s)	V true (m/s)	Ki
1	23.0	1.000	1.107	1.1070
2	98.7	1.300	1.405	1.0811
3	174.3	1.400	1.477	1.0552
4	250.0	1.500	1.544	1.0293
5	325.7	1.400	1.405	1.0034
6	401.3	1.300	1.271	0.9775
7	477.0	1.000	0.952	0.9516

n° - Graphing point

d (mm) – Distance from internal pipe wall

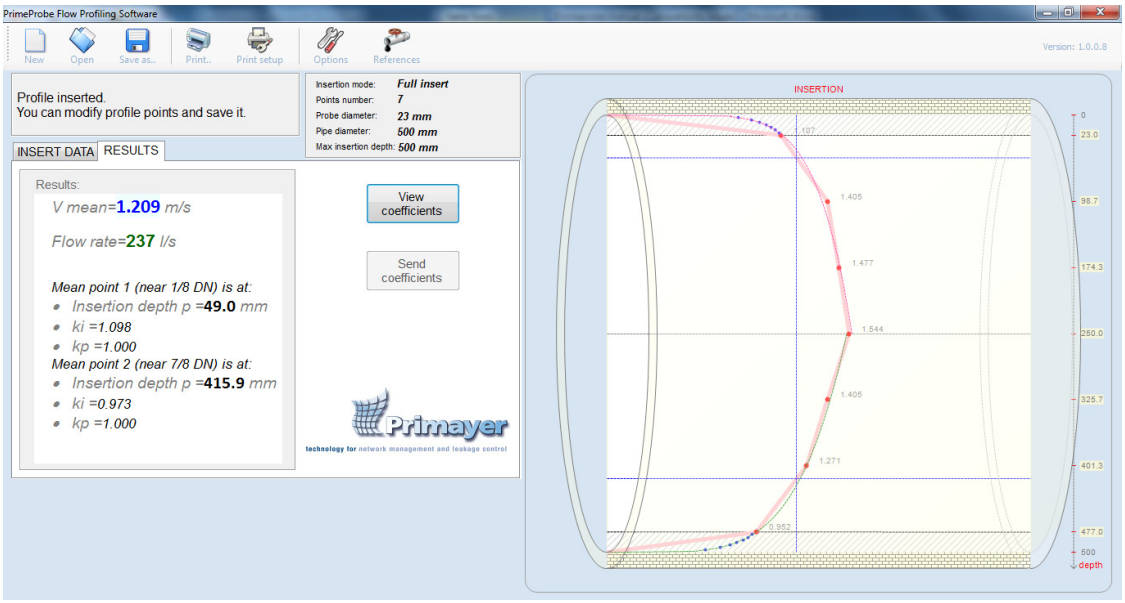
V meas.(m/s) – Actual measured velocity

V true (m/s) – True velocity

Ki - Insertion factor

Flow Profiling Results

Once all graphing points have been sampled, the results page displays an average velocity and correct coefficients of profile factor (Kp) and insertion factor (Ki) when the flow profile is not to its true profile.



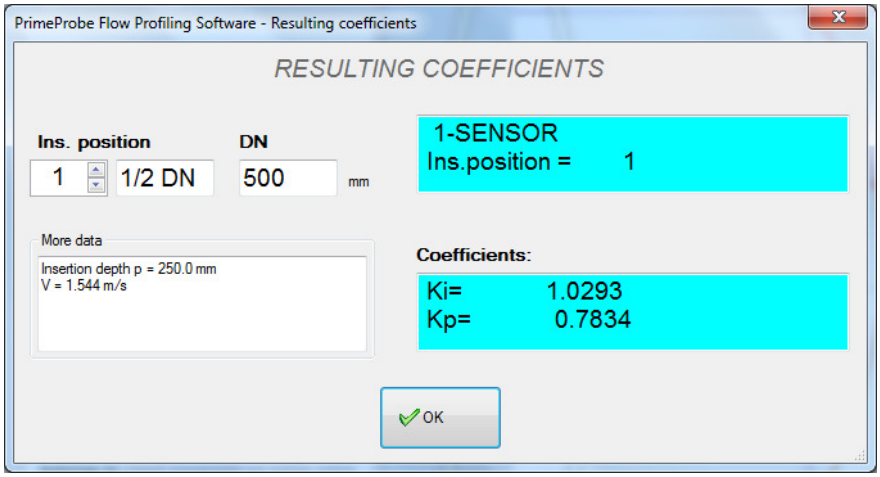
V mean – is the calculated average velocity across the profile.

Flow rate – is the amount of fluid over a point in time.

Mean point 1 & 2 – provides the average flow insertion point positions in the pipe along with their insertion factors.

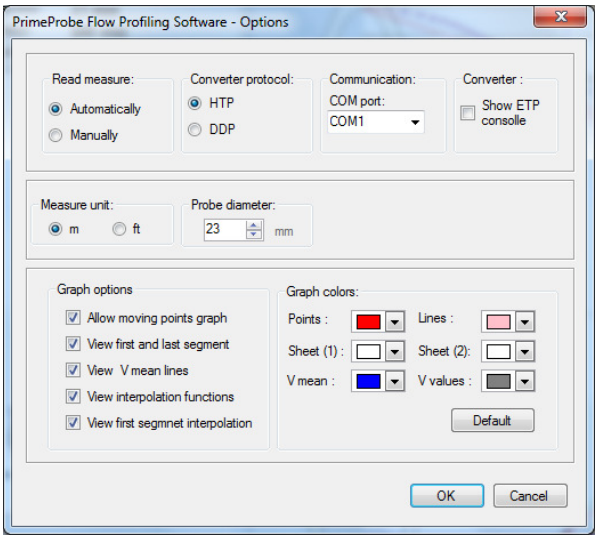
Insertion depth (p) – the point the measurement was taken

Clicking on the View Co-efficient will allow viewing of the 1/8, 1/2 & 7/8 values and allow them to be written automatically into PrimeProbe3.



5.1 Flow profiling Options

Opening options provides basic operation settings.



- **Read Measure**

Manually – Allows users to type the velocity for each point manually by reading values upon a display (only applicable to probes with a display).

Automatically – The velocity data is populated by PrimeProbe3 directly.

- **Converter Settings**

When using PrimeProbe3, ensure HTP is selected under converter protocol.

Select the COM port PrimeProbe3 is connected to on the PC (See Chapter 4.2 on identifying COM port settings in Windows)

Ensure Show ETP consolle remains unticked, as shown above.

- **Measurement settings**

Choose preferred units of measurement and define PrimeProbe3's sensor diameter. PrimeProbe3 has a 23mm sensor diameter; please ensure this value is entered.

- **Graph Options**

This section changes the aesthetic view of the graph.

Allow moving points graph – This gives users the ability to adjust the profile on the graph

View first and last segment – Allows the user the choice on whether to include the data for first and last segments

View V mean lines – This displays the average velocity points of the profile.

View interpolation functions – View the exponential lines for that profile.

View first segment interpolation – View the exponential line for first and last segments

Graph colours - Allows the user to customise the colours upon the graph data.

- **Open existing Profiles**

Click Open from the Flow profiling menu to access saved profiles.

- **Save Profiles**

To save current profile select Save as.. from Flow profiling menu.

- **Printing Profiles**

Select the points required and click Print.

To adjust general print settings please use Print Setup.

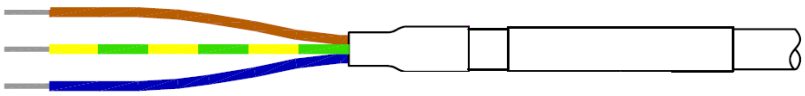
- **Reference**

Select reference to view a legend of the flow profile calculated.

6. PART NUMBERS

RXG 820	PrimeProbe – USB Communications Cable
RXG 826	PrimeProbe output cable to bare wires
RXG 871	PrimeProbe3; insertion length 150mm
RXG 872	PrimeProbe3; insertion length 300mm
RXG 873	PrimeProbe3; insertion length 500mm
RXG 874	PrimeProbe3; insertion length 700mm
RXG 875	PrimeProbe3; insertion length 1000mm
RXG-876	PrimeProbe3; insertion length 2000mm
RXG 921	PrimeProbe3; output to PrimeLog+/XiLog+
TXG 101/3	Gauging Rod – 25mm BSP thread; length 500mm
TXG 101/6	Gauging Rod – 25mm BSP thread; length 1000mm

APPENDIX 1: Output Bare Wire Connection



A		
B	Ground	Green/yellow
C	Output 1	Brown
D	Output 2	Blue

APPENDIX 2: International Standard of Flow Measurement

The table following is an extract from ISO 7145 (BS 1042) Section 2.2 1982 reproduced with their kind permission. Complete copies are available from BSI Publications, Linford Wood, Milton Keynes, MK14 6LE.

Type of disturbance upstream from the measuring cross-section	Minimum upstream straight length*	
	For a measurement at the point of mean axial velocity	For a measurement on the axis of the conduit
90 degree elbow or a t-bend	50	25
Several 90 degree coplanar bends	50	25
Several 90 degree non-coplanar bends	80	50
Total angle convergent 18 to 36 degrees	30	10
Total angle divergent 14 to 28 degrees	55	25
Fully opened butterfly valve	45	25
Fully opened plug valve	30	15

** Expressed in multiples of the diameter of the conduit.*

APPENDIX 3: Lithium batteries contained in equipment

Important transport safety data

1. Introduction

Lithium metal batteries are fitted into some Primayer products as single cell or multi-cell batteries. These batteries are classified as *dangerous goods* for the purpose of transportation and must be handled in accordance with the regulations governing air, road and sea transportation *(see section 3 below).* In addition to this transportation requirement, prior to being transported each type of lithium battery (used in the products) must have already successfully been certified to UN test requirements *(see section 4 below).* Primayer specifies only cells that meet the relevant UN certification.

This is a guide and should not be used as an alternative to the official regulations. The regulations are subject to change and this document is not intended to track those changes.

2. Primayer products containing lithium metal batteries

Current and recent Primayer products with lithium metal batteries are listed with lithium content;

Product	Lithium content (grams)
PrimeLog - single and dual channel	2.5
PrimeLog - four channel	5.0
PrimeLog+	5.0
XiLog+	10.0
XiLog+ double battery pack version	20.0
XiLog	10.6
XiLog double battery pack version	20.6
XiLog-S - single, dual and four channel	10.0
XiLogEco	3.0
XiLog.wmr - IP66 and IP68	10.6
Xstream	10.0
Phocus2 / Phocus.sms / Phocus.hr logger	2.5
Enigma logger	3.15
PrimeProbe3	10.0
Socrates	20.0
ZetaCorr logger	2.5

3. Transportation

3.1 Applicable Regulations

The primary authorities responsible for issuing dangerous goods regulations are:

- **Air** - International Air Transport Association (IATA), Dangerous Goods Regulations (DGR)
- **Road** - European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
- **Sea** - International Maritime Organisation (IMO), International Maritime Dangerous Goods Code (IMDG)

Dangerous goods are assigned to UN numbers and proper shipping names according to their hazard classification. For Primayer's products the lithium metal batteries are contained in the equipment and the regulations identified by UN classification ***UN3091 Lithium metal batteries contained in equipment, Class 9, Packing Group II, Packing Instruction 970***

Batteries used in Primayer products must not be transported separately from the equipment. Separate freighting is covered by another UN classification and not covered in this document.

Lithium batteries transported within the United States are subject to additional limitations as specified in the US national dangerous goods regulations contained in Code of Federal Regulations Title 49 (49 CFR). These limitations are not covered in this document.

3.2 Requirements

The person/company wanting to transport the goods is termed *The Shipper* and they must choose a *Freighting Agent* who is familiar with the UN3091 packing instruction. Only qualified personnel are permitted to process the packing and shipping of dangerous goods to ensure the correct packing and labeling are met as follows and as detailed in the applicable regulations.

- Correct packing of product
- Maximum quantity of lithium not exceeded
- Correct labelling of package which should include Class 9 hazard label and markings that identify *UN3091 Lithium metal batteries contained in equipment*
- Completion of a Shipper's Declaration for Dangerous Goods
-

3.3 Transportation from Primayer

Primayer Limited (UK) holds certification for meeting the above requirement. All new or repaired products leaving Primayer are packed in accordance with the regulations. If the product(s) is to be transported to a second destination (after leaving Primayer) it must be declared as *Dangerous Goods* to the *Freighting Agent* together with the information required by the above regulations. It is the responsibility of *the Shipper* to ensure they are working to the current regulations.

3.4 Transportation other than at 3.3 above

Lithium batteries that have been damaged or have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport. Therefore before equipment is transported it is essential that it is opened and the battery examined. If any sign of battery damage, or ingress of water to the product, is observed then the battery must be removed before transportation. For advice do contact ***Primayer Customer Support*** (contact details below).

4. UN test requirements and design safety

Primayer specifies Tadiran SL-700 and SL-2700 cells in sizes AA, C and D and Saft LSH20 cells only in battery packs. Tadiran and Saft cells are safety tested in accordance with International Standard IEC 60086-4. Alternatives may be approved only by Primayer Limited (UK

5. Disposal

All batteries and cells must be disposed in accordance with local regulations.

For further information on air-freighting these products or the air-freighting regulations, please contact Primayer as follows:

Primayer Customer Support
Telephone: +44 (0)23 9225 2228
Email: support@primayer.com

Technical Note Reference: IXD-613-TN iss5