USER'S GUIDE

Installation & Operation
Instructions

SAFSONIC PORTABLE DOPPLER FLOW METER – PDFM3L

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Introduction

The Safsonic Portable Doppler Flow Meter measures the velocity of liquids in pipelines using a totally non-intrusive principle.

The Portable Doppler Flow Meter utilises a high speed, 16-bit microprocessor unit with 32-Kbyte FLASH memory. The user-friendly flowmeter comes with a range of features to ensure easy and reliable flow measurement. The flow signal from the flow sensor is continuously analysed and should the signal quality become unacceptable an error message is displayed.

It is designed for use with sewage, waste water, pulp stock, mining slurries, food products and other fluids which contain in excess of 0,1% **suspended solids or bubbles.** The particle size for successful operation must be greater than 100 microns.

Sensor mounting

Location

- Select a location for mounting the sensor at a point where the flow profile is fully developed. Generally the principle of 10 pipe diameters of straight pipe upstream, and 5 pipe diameters downstream will suffice, but should valves or bends exist upstream of the sensor, the amount of straight pipe immediately upstream will need to be increased.

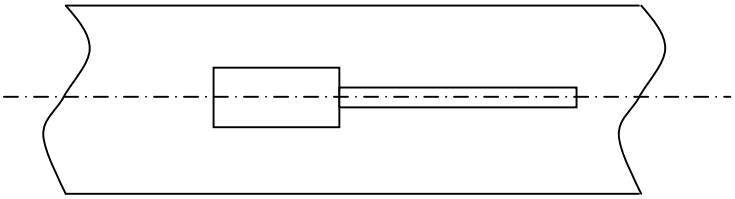
- Ensure that the sensor is mounted as far as possible from potential noise sources, such as pumps, control valves etc. and mount the sensor at approximately 3/9 o'clock on the pipe (if horizontal) to avoid errors due to air pockets on top, or sediment at the bottom of the pipe.

- Either vertical or horizontal pipe runs are acceptable for sensor mounting

.

Surface preparation

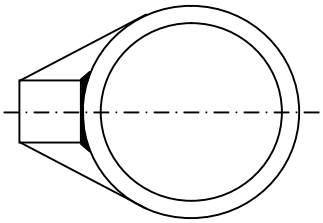
- Before attaching the transducer head to the pipe surface, an area slightly larger than the flat surface of the transducer must be cleaned to bare metal. (A small amount of pipe pitting, even with spots of paint or rust, will not cause problems).



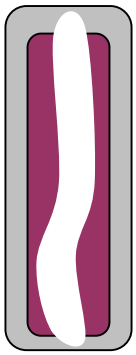
SIDE VIEW - 3 O'CLOCK POSITION ON PIPE IF HORIZONTAL

Orientation

- The transducer must be mounted accurately, parallel to the pipe axis for correct performance, and transducer to pipe contact should be along the centre line of the transducer head.



GOOD



Application of silicon grease coupling to the sensor

Ultrasonic Bonding

- **<u>The sensor must not have any air gap between it and the pipe.</u>** Bonding to the pipe is achieved with silicone grease coupling compound. Be sure to fill in any air gaps that may remain at the pipe/transducer interface with additional compound.

- A pipe clamp kit is included with the flow meter. It includes silicone coupling compound, a Neoprene rubber pad, and straps for pipe diameters up to 600 mm. In applications with excessive vibration it is recommended that the Neoprene rubber pad is inserted between the pipe and the transducer. Coupling compound must be applied to both sides of the pad.

- Steel band strapping tools and steel strapping for installation of sensors provide excellent sensor strap tension, however care should be taken not to damage sensor with excessive force.

Keypad System

Pressing the ON/OFF button turns the flowmeter ON and OFF.

The Portable Doppler Flow Meter has an easy to use 4-button programming system.

- The MENU button is used to scroll through the menu structure.
- The SAVE button is used to save entered changes to the flowmeter programme.
- The ► and ▲ buttons are used to change numbers and scroll through options.

Battery

Recharging and battery care

- The Portable Doppler Flow Meter is supplied with 4 x 1.2V 1000mAh AA size Ni-MH removable cells and a 100-240Vac battery charger.
- Charge battery fully before first use and thereafter recharge only when fully discharged. The Safsonic Portable Doppler Flow Meter will indicate an error message when battery charge is low and automatically switch off.
- The Portable Doppler Flow Meter has a constant current circuit controlling the charge current to 150mA.

CURRENT	CHARGE TIME
150mA	8 hrs

- The Safsonic Portable Doppler Flow Meter should be switched off during charging. THE CELLS MUST NOT BE OVER CHARGED. Under charging of the cells will reduce the life and capacity of the cells.

Low power consumption

- The Safsonic Portable Doppler Flow Meter is designed for low power consumption allowing over 10 hours operation before re-charging the battery. The Safsonic Portable Doppler Flow Meter features a Low Battery warning with automatic power down.

Storage

- If the Safsonic Portable Doppler Flow Meter is to be stored for an extended time period the cells should be removed.

Menu System (Version 1.00)

The Safsonic Portable Doppler Flow Meter menu system is easy to use and designed for programming simplicity.

With the Safsonic Portable Doppler Flow Meter powered up the instrument will test the suitability of the flow signal. If the signal is suitable the flow total and flow rate are displayed, if not an error message is displayed.

00000000 lt 3.9768 l/s

START PROGRAMMING - Press “MENU”

Units

Mn_1 units? Metric

Metric and English units of rate and total measurement are available.
Press ▲ until desired value is displayed and **MENU** to continue.

Pipe ID

Mn_2 Pipe ID mm 53.4

The precise dimension of the pipe internal diameter (ID) at the point of measurement must be entered.
Use the ► button to locate the curser below the number to be changed and press the ▲ button until the desired value is displayed and then press **MENU** to continue.

Rate units

Mn_3 rate units? l/s

Press ▲ until desired unit is displayed and **MENU** to continue.

Total units

Mn_4 tot units? lt

Press ▲ until desired unit is displayed and **MENU** to continue.

Clear total?

Mn_5 clr total? save total

The total can either be cleared or saved.
Press ▲ to either save or clear the total and **MENU** to continue.

Damping

Mn_6 damping? Medium

The level of damping can be selected.
Press ▲ until desired unit is displayed and **MENU** to continue.

Cut-off

Mn_7 % cutoff 2%

The level of cut-off can be entered.
Press the ▲ button until the desired value is displayed and **MENU** to continue.

Pulse width

Mn_8 puls_width 10-200ms

The Safsonic PDFM3 supplies an OCT pulse to the optional logger for every unit of volumetric total eg m3. The pulse width is varied here. The standard is 20ms. The OCT frequency is limited to 100hz, select totaliser units accordingly.

Save data

Mn_9 save data? Press SAVE

Press **SAVE** to accept all changes made.

Error/Warning Messages

ERROR MESSAGE	ERROR	POSSIBLE SOLUTION
• poor signal	• Poor signal • Flow rate less than minimum flow rate of 0.3m/s	• Increase flow rate • Locate sensor on smaller pipe section
• no signal	• No signal • No flow • Particle size and or concentration out of spec	• Establish flow • Inject air into line
• charge battery	• Battery low	• Charge battery
• total error counts > 100/s	• Totaliser count-rate too high	• Select more suitable total units
• rate overflow	• Rate > 999 999	• Select more suitable rate units

Troubleshooting guide

PROBLEM	POSSIBLE SOLUTION
Meter reading lower than expected	
• Source particles velocity not indicative of average velocity	• Relocate sensor to a position where source particles are expected to be moving at the average velocity
• Incorrect mounting of flow sensor	• Remount sensor correctly
• Programming error	• Review all programmed entries
• Flow rate lower than expected	• Investigate possible causes and confirm flow rate independently
• Insufficient particle size or concentration	• Locate sensor at position where acceptable particle size or concentration is expected. • Inject air into the line
Meter reading when there is no flow	
• Local ultrasonic noise source	• Relocate sensor or remove noise source
• Induced signals into sensor cables, e.g. mains voltage 50hz/60hz frequencies	• Relocate sensor and or cable away from mains cables or remove noise source
"***Poor signal" displayed when flow exists***	
• Insufficient particle size or concentration	• Locate sensor at position where acceptable particle size or concentration is expected. • Inject air into the line
• Sensor coupling to pipe poor	• Remount sensor to pipe correctly
Meter reading higher than expected	
• Programming error	• Review all programmed entries
• Flow rate higher than expected	• Investigate possible causes and confirm flow rate independently
• Particle velocity at sensor not indicative of average velocity	• Relocate sensor to a position where source particles are expected to be moving at the average velocity
• Incorrect mounting of flow sensor	• Remount sensor correctly
• Local electrical noise	• Relocate sensor
Meter reading erratic	
• Particle velocity at sensor not indicative of average velocity and erratic	• Relocate sensor to a position where the velocity profile is expected to be suitable

Features & Specifications

Velocity Range	0.25 to 10m/s (0.82 to 30.5ft/s)
Liquids	Containing 0.01% solids >100micron
Pipes	25-3000mm (1”-120”) Most pipe materials
Accuracy	±2% of Rate for velocities >0.5m/s (1.6ft/s)
Repeatability	±2%
Indication	Rate and Total (password resettable) 2 - Line 16 Character backlit LCD
Units	Rate units: m/s, l/s, l/m, l/hr, m^3/s, m^3/m, m^3/hr, ft/s, ft^3/s, ft^3/m, ft^3/hr, USgps, USgpm, USgph, USmgd Total units: l, m^3, Ml, ft^3, 10^3ft^3, 10^6ft^3, USG, 10^3USG, 10^6USG
Power Supply	4 x AA NICD 1000mA Included
Battery Charger	100-240VAC 50/60Hz Included Plugs Available UK, US, EU, AUS
Carry Case	Holds meter and all accessories included.
Programming	4 Key external keypad
Response Time	3 Selectable levels of damping
Electronics enclosure	Black moulded ABS IP40 (NEMA1) 100 x 196 x 40mm HxWxD (4” x 8” x 1.6”)
Transducer	IP68 (NEMA 6P) Aluminium epoxy-faced 21 x 80 x 28mm HxWxD (0.8” x 3” x 1.1”)
Temperature limits	Sensor -20 to 90ºC (-4 to 194ºF) Electronics -10 to 50ºC (14 to 122ºF)
Cable length	3m (9ft)
Shipping	36 x 20 x 13cm (15” x 10” x 5.2”), 1.4kg (4lbs)
Model No.	PDFM3L
Standards	CE Certified
Calibration	Certificate with each flow meter

FLOW RATE GUIDE

PIPE SIZE	PIPE SIZE	FLOWRATE @ 1m/s (3ft/s)				FLOWRATE @ 10m/s (30ft/s)			
(mm)	(INCH)	(l/s)	m3/hr	ft3/s	gal(US)/s	(l/s)	m3/hr	ft3/s	gal(US)/s
25	1	0.5	1.8	0.02	0.13	5	18	0.18	1.32
40	1.6	1.25	4.5	0.04	0.33	12.5	45	0.44	3.30
50	2	2	7.2	0.07	0.53	20	72	0.71	5.28
65	2.6	3.3	11.9	0.12	0.87	33	118.8	1.17	8.72
80	3.2	5	18.0	0.18	1.32	50	180	1.77	13.2
100	4	8	28.8	0.28	2.11	80	288	2.83	21.1
125	5	12	43.2	0.42	3.17	120	432	4.24	31.7
150	6	18	64.8	0.64	4.75	180	648	6.36	47.5
200	8	31	111.6	1.09	8.19	310	1116	10.95	81.9
250	10	49	176.4	1.73	12.9	490	1764	17.30	129.4
300	12	70	252.0	2.47	18.5	700	2520	24.72	184.9
350	14	96	345.6	3.39	25.4	960	3456	33.90	253.5
400	16	125	450.0	4.41	33.0	1250	4500	44.14	330.1
450	18	159	572.4	5.62	42.0	1590	5724	56.15	419.9
500	20	196	705.6	6.92	51.8	1960	7056	69.22	517.6
600	24	283	1018.8	9.99	74.7	2830	10188	99.94	747.4
700	28	385	1386.0	13.60	101.7	3850	13860	135.96	1016.8
750	30	442	1591.2	15.61	116.7	4420	15912	156.09	1167.3
800	32	500	1800.0	17.66	132.1	5000	18000	176.57	1320.5

Questions and Answers

The pipe vibrates. Will it affect the flow meter?
Common vibration frequencies are far lower than the sonic frequencies used by the flow meter, and will not normally affect accuracy or performance.

Will pipe corrosion affect accuracy of the flow meter?
Yes. Rust, loose paint etc. must be removed from the outside of the pipe to provide a clean mounting area when installing a Doppler sensor. Severe corrosion/oxidation on the inside of the pipe may prevent the ultrasound signal from penetrating into the flow. If the pipe cannot be cleaned, a spool piece should be installed for sensor mounting.

What effect do pipe liners have on the flow meter?
The air gap between loose insertion liners and the pipe wall prevent the ultrasound signal from entering the flow. Better results can be expected with bonded liners such as rubber, epoxy or tar, however an on site test is recommended to determine if the application is suitable for a Doppler flow meter.

Why is Doppler only recommended for liquids containing suspended solids or gases?
The Doppler sensor transmits ultrasound into the flow stream, which must be reflected back to the sensor to indicate flow velocity. Gas bubbles or suspended solids act as reflectors for the Doppler signal. As a guideline, Safsonic Doppler flow meters are recommended for liquids containing solids or bubbles with a minimum size of 100 microns and a minimum concentration of 100 ppm.

Can the sensor be submerged in water?
Yes, for short periods of time or by accident, but not for continuous operation. The sensor is constructed to withstand submersion without damage, but external liquid moving in contact with the sensor can be interpreted as flow and cause false readings.

Can I change the length of the sensor cable?
No. A 3m cable is supplied with the Safsonic Portable Doppler Flow Meter as standard.

Does the direction of flow matter for Sensor mounting?
The Doppler flow meter will measure and totalize flow in either direction. A check valve should be used in applications where backflow may occur.

Data Logger

Introduction

The PDFM3L is a Portable Doppler Flow Meter with a standard logging module.The PDFM3L uses a Real Time Clock (RTC) to time stamp the logs and ensure an accurate logging interval. The Logger is a serial device that connects to a standard PC running Windows and the PDFM3L Logging Software. This user manual steps through the use of the Logger Software.


Java is required to run the Logger Software. A Java installation file is included on the CD in "java/".

SECTION 2. PDFM3 Logger Software

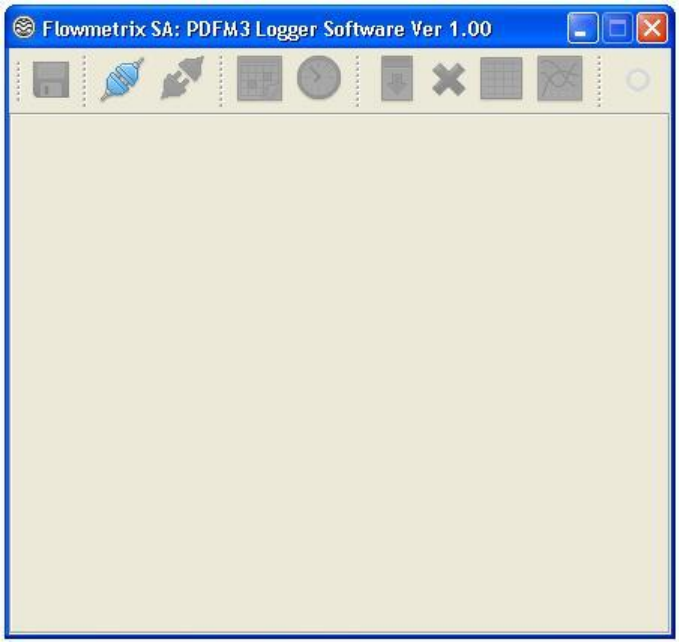
General

To perform logs with the PDFM3L the user needs to connect the PC to the PDFM3L via the serial cable and Logger Software and set the time and date, the log interval and clear the internal memory of the logger.

To retrieve logs from the PDFM3L the user needs to connect to the PDFM3L via the serial cable and Logger Software and download the logs. Once the logs are downloaded the user needs to save them in a '*.csv' file.

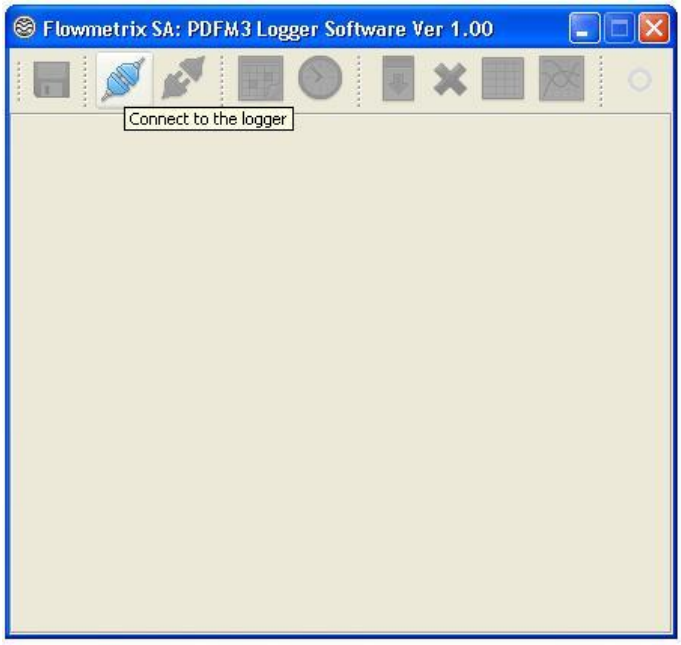

Ensure that the batteries are fully charged before setting up the PDFM3L for logs!


Do not remove the batteries after the PDFM3L has been set up as the setup data will be lost!

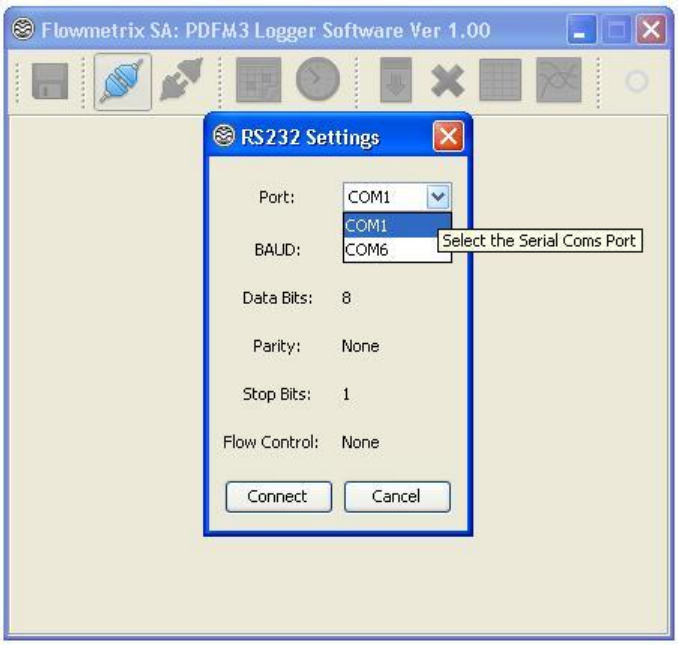


The startup screen of the PDFM3L.

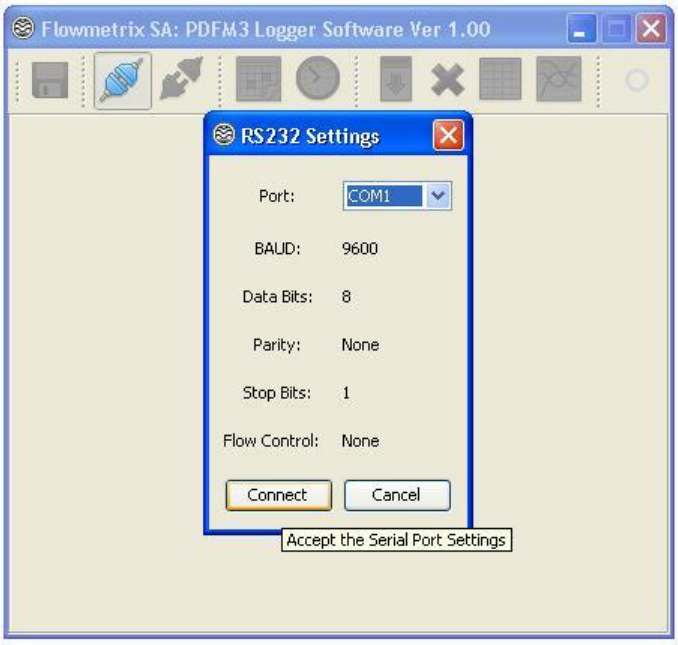
Connection and Disconnection



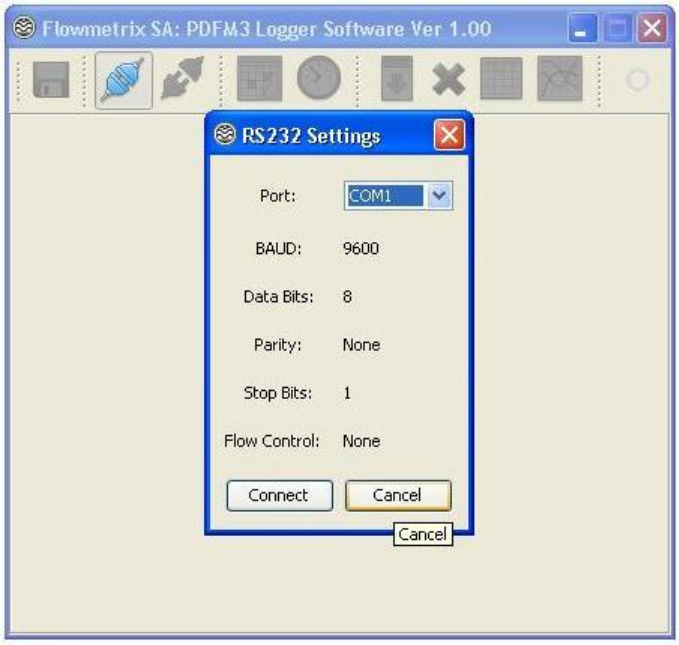
To connect to the PDFM3L click on the connection button.



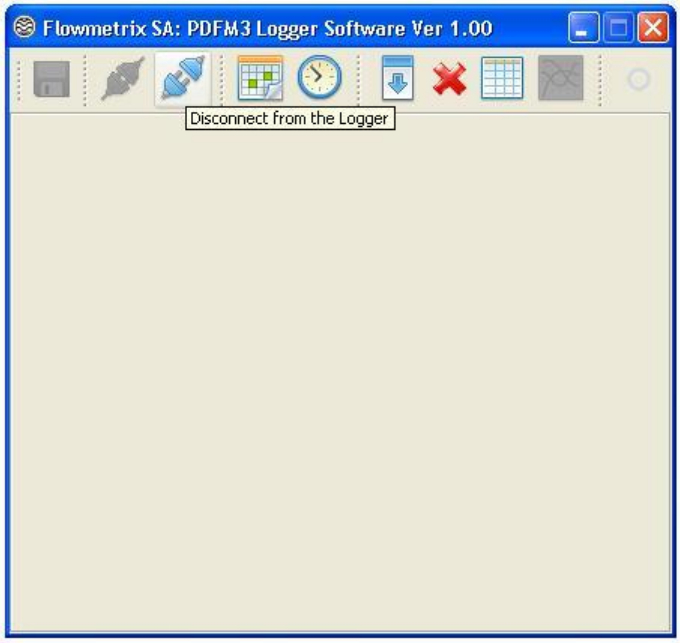
In the RS232 Settings dialog select the com port that the serial cable is connected to.



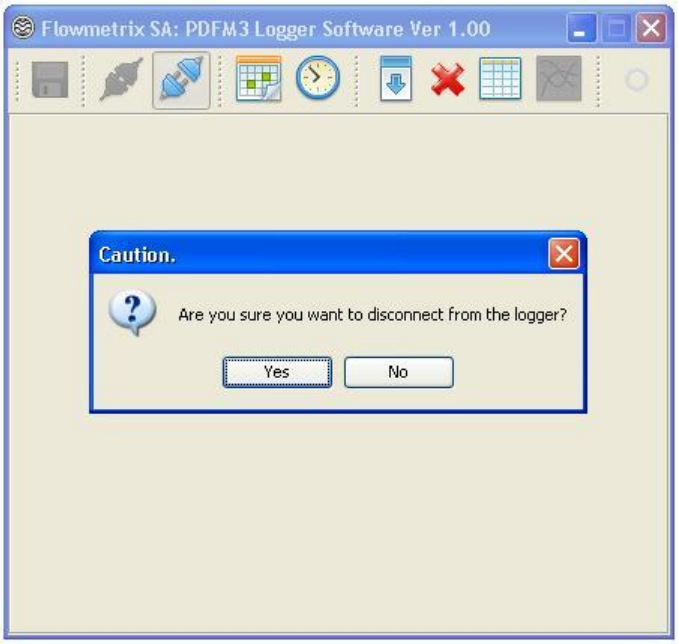
To connect click on the ‘Connect’ button.



To cancel click on the ‘Cancel’ button.

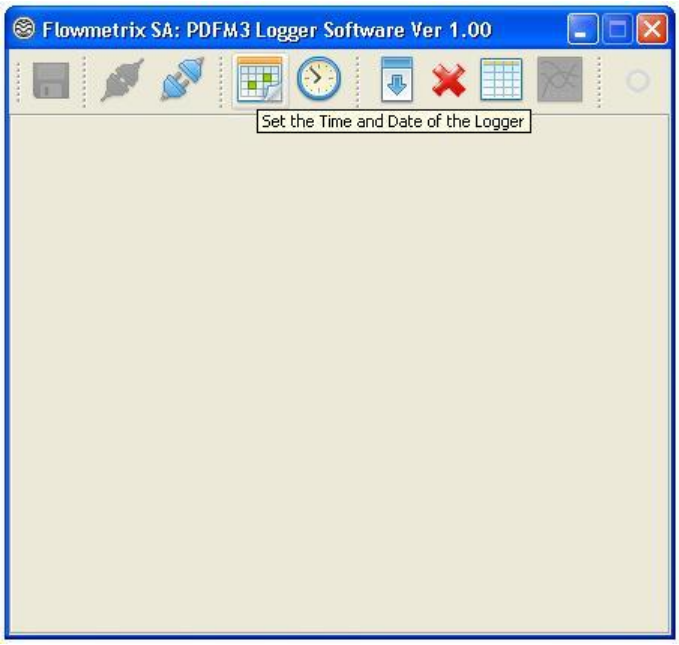


Once a connection has been established to the PDFM3L the disconnection button, date/time button, log interval button, download button, clear button and table button become available. To disconnect from the PDFM3L click on the disconnect button



When attempting to disconnect from the PDFM3L a confirmation dialog will appear. Click on ‘Yes’ to disconnect or ‘No’ to remain connected.

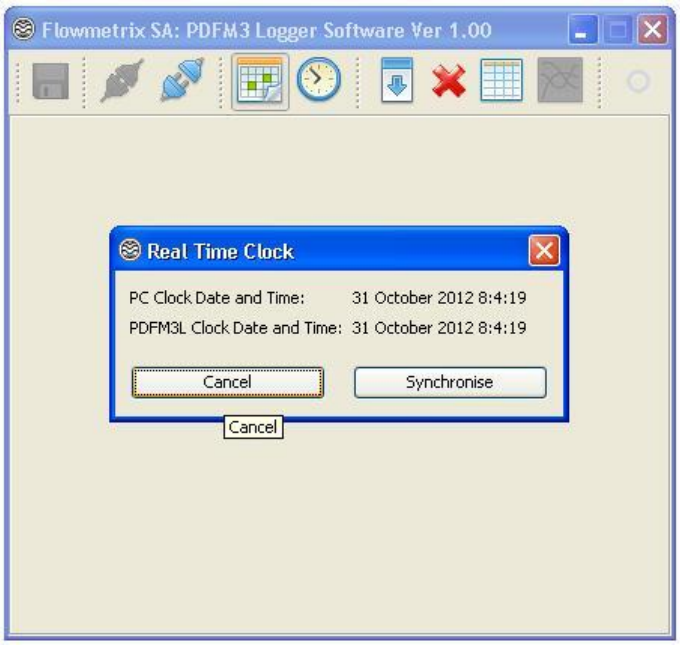
Logger Setup



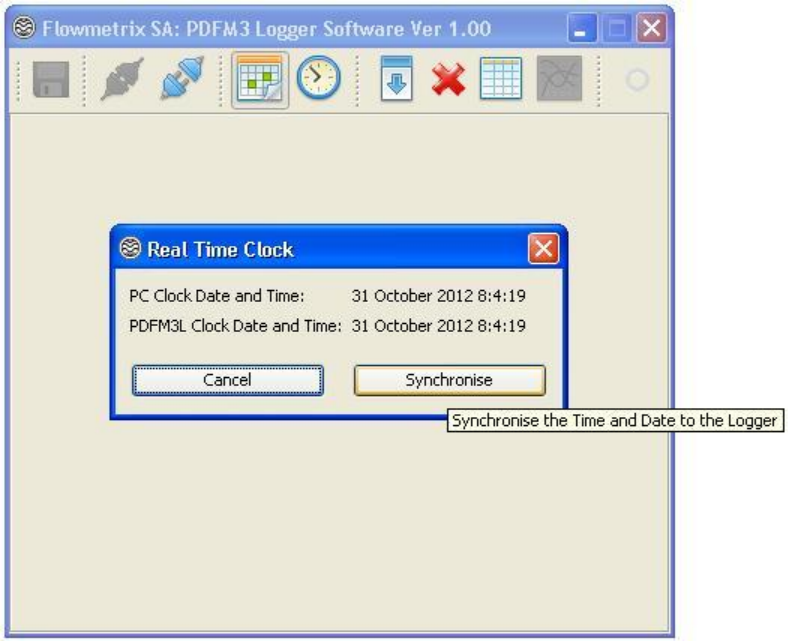
The date and time of the PDFM3L needs to be setup in preparation for logs.

Do not setup the date and time before retrieving the logs first.

Always setup the date and time before clearing the internal memory in preparation for logging.



In the Real Time Clock setup a snapshot of the PC clock and a snapshot of the PDFM3L is presented. If the date and time are the same click the ‘Cancel’ button.



If the date and time differ click the ‘Synchronise’ button to update the PDFM3L.

The Real Time Clock must be setup correctly for proper logging of logs
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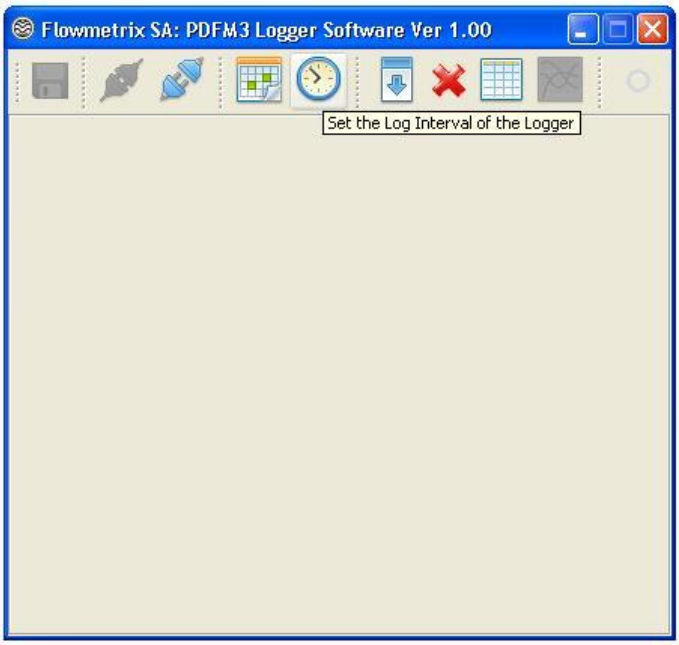


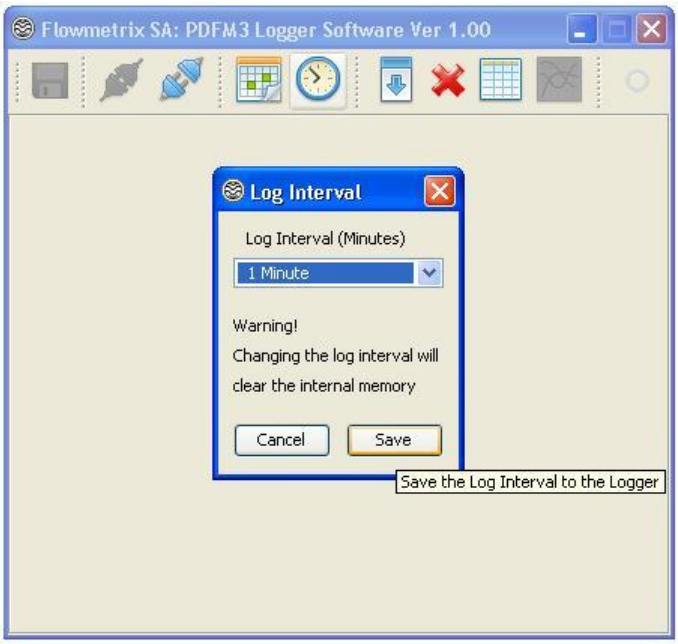
The log interval of the PDFM3L needs to be setup in preparation for logs.

Do not setup the log interval before retrieving the logs first.

Always setup the log interval before clearing the internal memory in preparation for logging.

Select the log interval as required. The log interval is the rate at which logs are taken and saved.The setup of the Log Interval can be cancelled

.

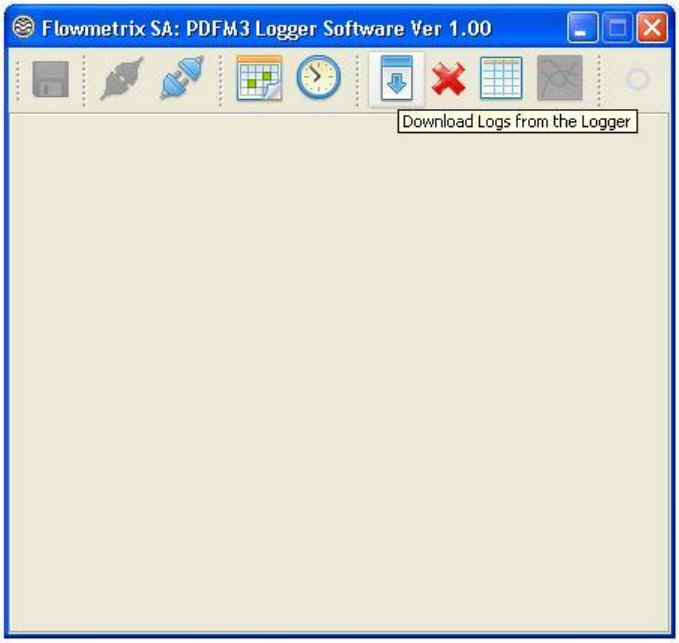


The log interval can be saved to the PDFM3L to complete the setup of the Logging.

The Log Interval must be setup correctly for proper logging of logs.

Changing the log interval will clear the internal memory of the PDFM3L and begin new logs with the current log interval and date/ time. Do this only once the saved logs have been read from the PDFM3L or data loss will occur.

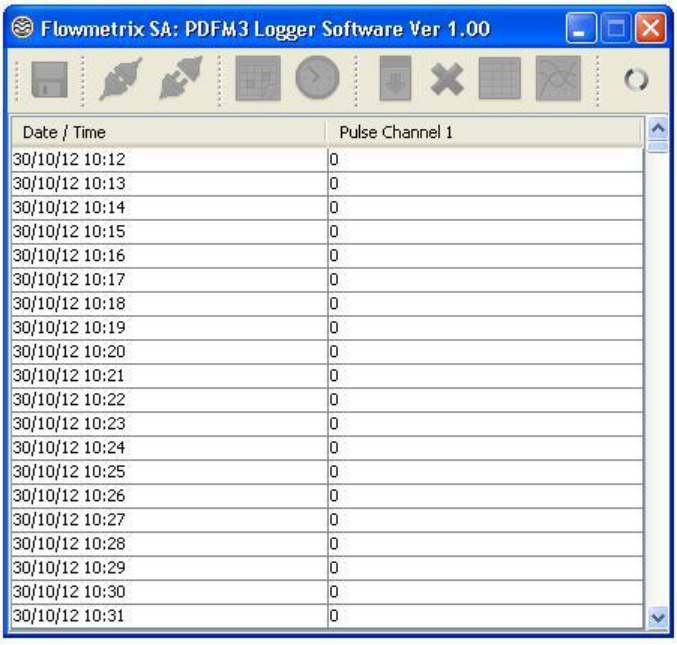
Logger Data



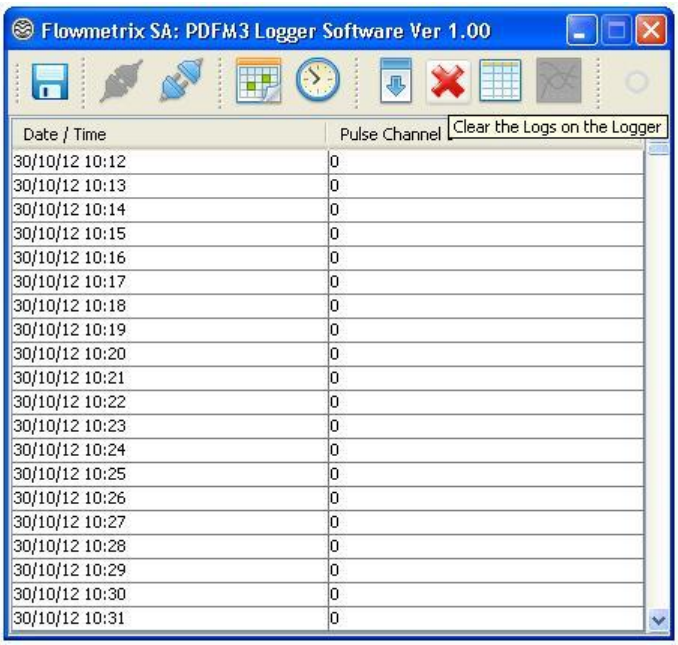
To download logs that have been taken and saved click on the download button.

Do not setup the log interval before retrieving the logs first.

Do not setup the date and time before retrieving the logs first.



During the download the table will appear and begin filling with the logs. The circle in the corner indicates that the software is still busy retrieving logs.

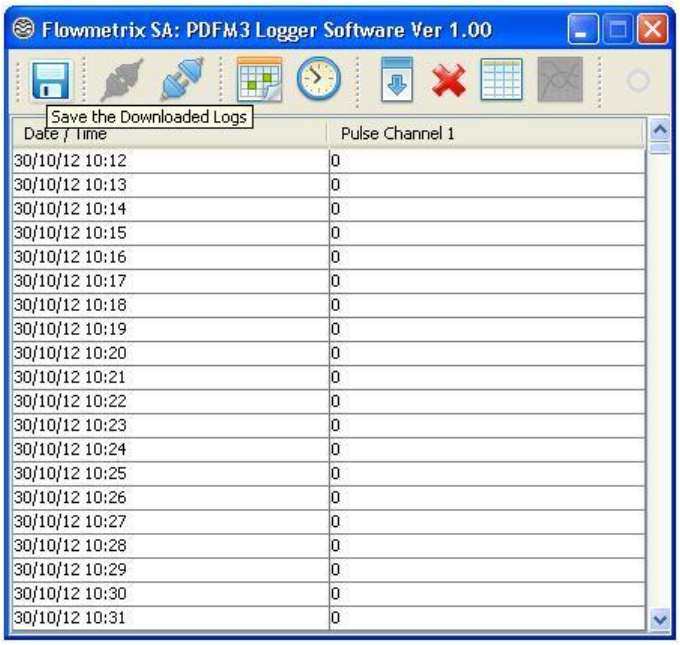


To clear the PDFM3L internal memory for new logs click on the clear logs button.

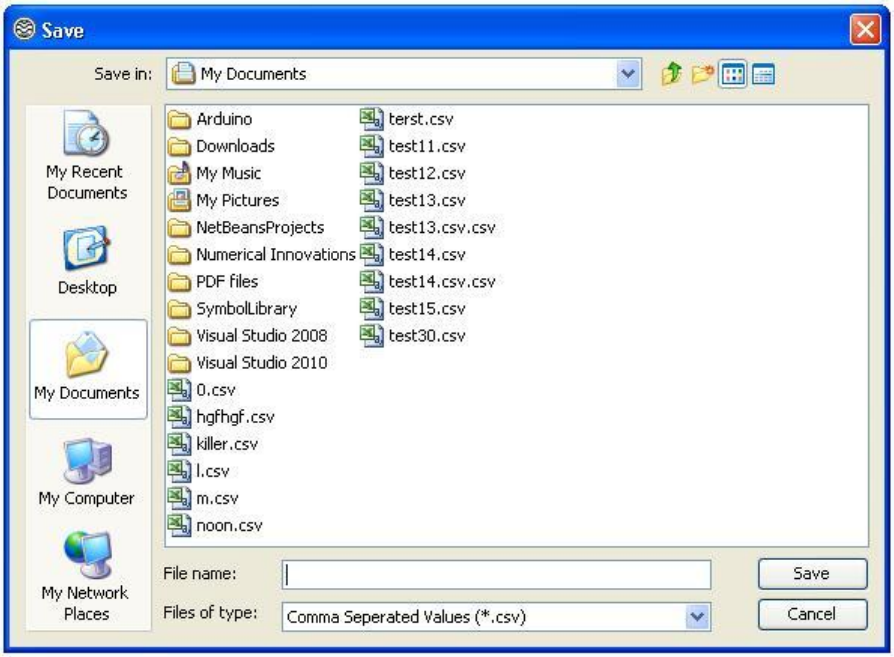
Do not clear the PDFM3L internal memory before saved logs have been retrieved.

Clearing the PDFM3L internal memory does not delete the logs that have been downloaded via the software. However save the downloaded logs as soon as possible to prevent data loss.

File Saving



To save the downloaded logs to a file click on the save button.



A file save dialog will appear. Type in a filename or select an existing file that has already been created by the PDFM3 Logging Software. If the file does not exist it will be created. If the file does exist it will be appended to.

DUPLICATE data can be created if it exists in both the existing file and the data logger.

ASA steel pipe schedules

			ANSI B36.19								ANSI B36.10			
			Schedule											
	Outside diameter		5S		10S		40S/STD		80S/XS		STD		XS	
			Wall thickness and weight kg/mm											
DN	mm	NPS	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m
8	10.3	1/8			1.24	0.28	1.73	0.37	2.41	0.48				
8	13.7	1/4			1.65	0.50	2.24	0.64	3.02	0.81				
10	17.2	3/8			1.65	0.64	2.31	0.86	3.20	1.12				
15	21.3	1/2	1.65	0.81	2.11	1.01	2.77	1.28	3.73	1.64				
20	26.7	3/4	1.65	1.03	2.11	1.3	2.87	1.71	3.91	2.23				
25	33.4	1	1.65	1.31	2.77	2.12	3.38	2.54	4.55	3.28				
32	42.2	1 1/4	1.65	1.67	2.77	2.73	3.56	3.44	4.85	4.53				
40	48.3	1 1/2	1.65	1.92	2.77	3.15	3.68	4.11	5.08	5.49				
50	60.3	2	1.65	2.42	2.77	3.99	3.91	5.51	5.54	7.59				
65	73.0	2 1/2	2.11	3.74	3.05	5.34	5.16	8.75	7.01	11.6				
80	88.9	3	2.11	4.58	3.05	6.55	5.49	11.5	7.62	15.5				
100	101.6	3 1/2	2.11	5.25	3.05	7.52	5.74	13.8	8.08	18.9				
100	114.3	4	2.11	5.92	3.05	8.49	6.02	16.3	8.56	22.6				
125	141.3	5	2.77	9.60	3.40	11.7	6.55	22.1	9.53	31.4				
150	168.3	6	2.77	11.5	3.40	14.0	7.11	28.7	10.97	43.2				
200	219.1	8	2.77	15.0	3.76	20.2	8.18	43.1	12.70	65.6				
250	273.0	10	3.4	22.9	4.19	28.2	9.27	61.1	12.70	82.7				
300	323.9	12	3.96	31.7	4.57	36.5	9.53	74.9	12.70	98.8				
350	355.6	14	3.96	34.8	4.78	41.9					9.53	82.5	12.70	109
400	406.4	16	4.19	42.1	4.78	48.0					9.53	94.6	12.70	125
450	457	18	4.19	47.4	4.78	54.1					9.53	107	12.70	141
500	508	20	4.78	60.2	5.54	69.6					9.53	119	12.70	157
	559	22	4.78	66.2	5.54	76.7					9.53	131	12.70	173
600	610	24	5.54	83.7	6.35	95.9					9.53	143	12.70	190
	660	26									9.53	155	12.70	206
700	711	28									9.53	167	12.70	222
	762	30	6.35	120	7.92	149					9.53	179	12.70	238
800	813	32									9.53	191	12.70	254
	864	34									9.53	204	12.70	270
900	914	36									9.53	216	12.70	286
	965	38									9.53	228	12.70	303
1000	1016	40									9.53	240	12.70	319
	1067	42									9.53	252	12.70	335
	1118	44									9.53	264	12.70	351
	1168	46									9.53	276	12.70	367
	1219	48									9.53	288	12.70	383
	1321	52									9.53	313	12.70	417
	1422	56									9.53	339	12.70	449
	1524	60									9.53	362	12.70	482
	1626	64									9.53	387	12.70	514

The table shows the ANSI B36.19 and a part of the B36.10 standard;

some of these dimensions are outside AST's production programme.

ANSI B36.10

			Schedule													
	Outside diameter		10		20		30		40		60		80		120	
			Wall thickness and weight kg/mm													
DN	mm	NPS	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m
8	10.3	1/8	1.24	0.28					1.73	0.37			2.41	0.48		
8	13.7	1/4	1.65	0.50					2.24	0.64			3.02	0.81		
10	17.2	3/8	1.65	0.64					2.31	0.86			3.20	1.12		
15	21.3	1/2	2.11	1.01					2.77	1.28			3.73	1.64		
20	26.7	3/4	2.11	1.30					2.87	1.71			3.91	2.23		
25	33.4	1	2.77	2.12					3.38	2.54			4.55	3.28		
32	42.2	1 1/4	2.77	2.73					3.56	3.44			4.85	4.53		
40	48.3	1 1/2	2.77	3.15					3.68	4.11			5.08	5.49		
50	60.3	2	2.77	3.99					3.91	5.51			5.54	7.59		
65	73.0	2 1/2	3.05	5.34					5.16	8.75			7.01	11.6		
80	88.9	3	3.05	6.55					5.49	11.5			7.62	15.5		
100	101.6	3 1/2	3.05	7.52					5.74	13.8			8.08	18.9		
100	114.3	4	3.05	8.49					6.02	16.3			8.56	22.6	11.13	28.7
125	141.3	5	3.40	11.7					6.55	22.1			9.53	31.4	12.70	40.8
150	168.3	6	3.40	14.0					7.11	28.7			10.97	43.2	14.27	55.0
200	219.1	8	3.76	20.2	6.35	33.8			8.18	43.1	10.31	53.8	12.70	65.6	18.26	91.7
250	273.0	10	4.19	28.2	6.35	42.3	7.8	51.7	9.27	61.1	12.70	82.7	15.09	97.3	21.44	135
300	323.9	12	4.57	36.5	6.35	50.4	8.38	66.1	10.31	80.9	14.27	110	17.48	134	25.40	190
350	355.6	14	6.35	55.5	7.92	68.9	9.53	82.5	11.13	95.9	15.09	128	19.05	160	27.79	228
400	406.4	16	6.35	63.5	7.92	78.9	9.53	94.6	12.7	125	16.66	162	21.44	206	30.96	291
450	457	18	6.35	71.6	7.92	88.9	11.13	124	14.27	158	19.05	209	23.83	258	34.93	369
500	508	20	6.35	79.7	9.53	119	12.70	157	15.09	186	20.62	251	26.19	316	38.10	448
	559	22	6.35	87.8	9.53	131	12.70	173			22.23	298	28.58	379	41.28	534
600	610	24	6.35	95.9	9.53	143	14.27	213	17.48	259	24.61	360	30.96	448	46.02	649
	660	26	7.92	129	12.70	206										
700	711	28	7.92	139	12.70	222	15.88	276								
	762	30	7.92	149	12.70	238	15.88	296								
800	813	32	7.92	159	12.70	254	15.88	317	17.48	348						
	864	34	7.92	170	12.70	270	15.88	337	17.48	370						
900	914	36	7.92	179	12.70	286	15.88	357	19.05	426						
	965	38	9.53	228	12.70	302	15.88	377								
1000	1016	40	9.53	240	12.70	319	15.88	397								
	1067	42	9.53	252	12.70	335	15.88	417								
	1118	44	9.53	264	12.70	351	15.88	438								
	1168	46	9.53	276	12.70	367	15.88	458								
	1219	48	9.53	288	12.70	383	15.88	478								
	1321	52	9.53	313	12.70	416	15.88	518								
	1422	56	9.53	337	12.70	448	15.88	558								
	1524	60	9.53	361	12.70	480	15.88	599								
	1626	64	9.53	385	12.70	512	15.88	639								

Warranty

Flowmetrix SA CC warrants to the purchaser that the equipment to be delivered hereunder will be free from defects in materials, workmanship and title and will be of the kind and quality designated in the proposal.
The foregoing warranty is exclusive and in lieu of all other warranties whether express or implied including any warranty of merchantability or of fitness for a particular purpose.

Warranties other than the above will only be effective if written and signed by an officer of Flowmetrix SA CC

If within 1 (one) year from the date of delivery, the equipment delivered hereunder does not meet the warranties specified above, Flowmetrix SA CC shall thereupon correct such defects, at its sole discretion, either by repairing or by replacing the instrument in its entirety.
The costs of returning the equipment to Flowmetrix SA CC and for the repaired or replaced item being returned to the purchaser shall be for the account of the purchaser.
The liability of Flowmetrix SA CC is conditioned upon the equipment covered hereunder being handled, installed, operated, maintained, stored or used, as the case may be, in strict accordance with the written instructions or technical direction supplied by Flowmetrix SA CC, and is further conditioned upon the purchasers prompt written notice (within 30 days) to Flowmetrix SA CC of such defects.
Flowmetrix SA CC makes no warranties which extend to the items covered hereby due to improper handling, installation, operation, maintenance, storage or use; abnormal or undisclosed environmental conditions; or operating or use in an otherwise improper manner.

The liability of Flowmetrix SA CC to the purchaser, except as to title, arising out of the supplying of the equipment or its use, under this warranty article, shall not, in any case, exceed the cost of correcting defects in the equipment as herein provided and upon the expiration of the warranty described herein, all such warranty liability shall terminate. The foregoing shall constitute sole warranty remedy of the purchaser and the sole warranty liability of Flowmetrix SA CC.

Goods Return Procedure
Damaged or defective equipment should be returned to the supplier prepaid. Do not return goods until written authorisation to do so has been obtained. Returned goods must have accompanying them a letter stating the following:

- Your company name and order number
- The contact person at your company
- Serial number and name of product
- Description of damage and cause if known
- Nature of any repair attempted by the user
- Type of repair, replacement or adjustment requested