

Description

Utilising advanced DSP technology, the Portaflow 330 (PF330) is the latest portable flow measurement and recording system to be added to the Micronics range of equipment.

The PF330 can display instantaneous fluid flow rates or velocity, together with totalised values. It also incorporates a data logger that can record up to 98k events which can be output directly to a PC or printer or stored in the instrument's memory for downloading at a later time.

A variable current or pulse output, proportional to the detected flow rate, is also produced by the PF330 to enable it to interface with a range of external control devices such as those found in building management or site monitoring systems.



The PF330 is very much designed with 'ease of use' in mind. An interactive QuickStart menu, which simplifies system installation at any suitable location, together with minimal set-up requirements, means that the system can be installed and brought into service very quickly. Furthermore, the application parameters for a particular site can be saved to non-volatile memory and instantly recalled if a site is revisited for monitoring at a later time - further reducing the set-up time.

The flow sensors, or transducers, connected to the PF330 instrument are attached to the outside of the pipe being monitored and provide totally non-invasive flow measurement without disturbing the existing plant equipment or process operation.

Application benefits:

- Non-invasive installation - the process operation being monitored is in no way interrupted or otherwise affected by the use of this equipment
- Simple installation - there is no overhead for additional fittings, plant modification, or retro-fit expenditure
- Zero fluid contact - no contamination risks of the process fluid and possible exposure of the monitoring equipment to corrosive or toxic liquids

Industries:

- Water
- Building services
- Energy management
- Power generation
- Petrochemical
- Oil/Gas
- Food/drink
- Pharmaceuticals
- Power plants
- Manufacturing

Applications:

- HVAC & energy system audits
- Pump verification
- Metering
- Process control
- Chemical addition
- Hydraulic systems
- Fire systems
- Leak detection
- Boiler testing

Standard features:

- Light-weight, hand-held instrument with large, easy to read graphic display and switchable backlighting
- Flow range 0.33f/s to 65.6f/s bi-directional
- Two types of transducer sets supplied for use with pipes ranging 0.51-78.7 in. outside diameter
- 10 selectable operating languages
- Simple to follow dual function keypad
- Simple 'Quick Start' set up procedure
- Continuous flow monitoring, with 'Totalised' option
- Data logging with up to 98k stored data points
- Data logging can be controlled manually or set-up for timed operation, allowing unattended operation
- Logged data can be viewed as text or graphically, with the ability to scroll to any stored event
- RS232/USB outputs for downloading data logger contents to PC. Live data logging also available at these outputs
- Pulse output, 4-20mA, 0-20mA or 0-16mA output with simple range calibration
- Rechargeable battery with up to 20hrs continuous battery operation depending on load
- Mains/battery operation with battery management

Principles of Operation

When ultrasound is transmitted through a liquid the speed at which the sound travels is accelerated slightly when transmitted in the same direction as the liquid flow and decelerated slightly when transmitted against it. The difference in time taken by the sound to travel over the same distance but in opposite directions is therefore proportional to the flow velocity of the liquid and can be used to calculate the flow rate.

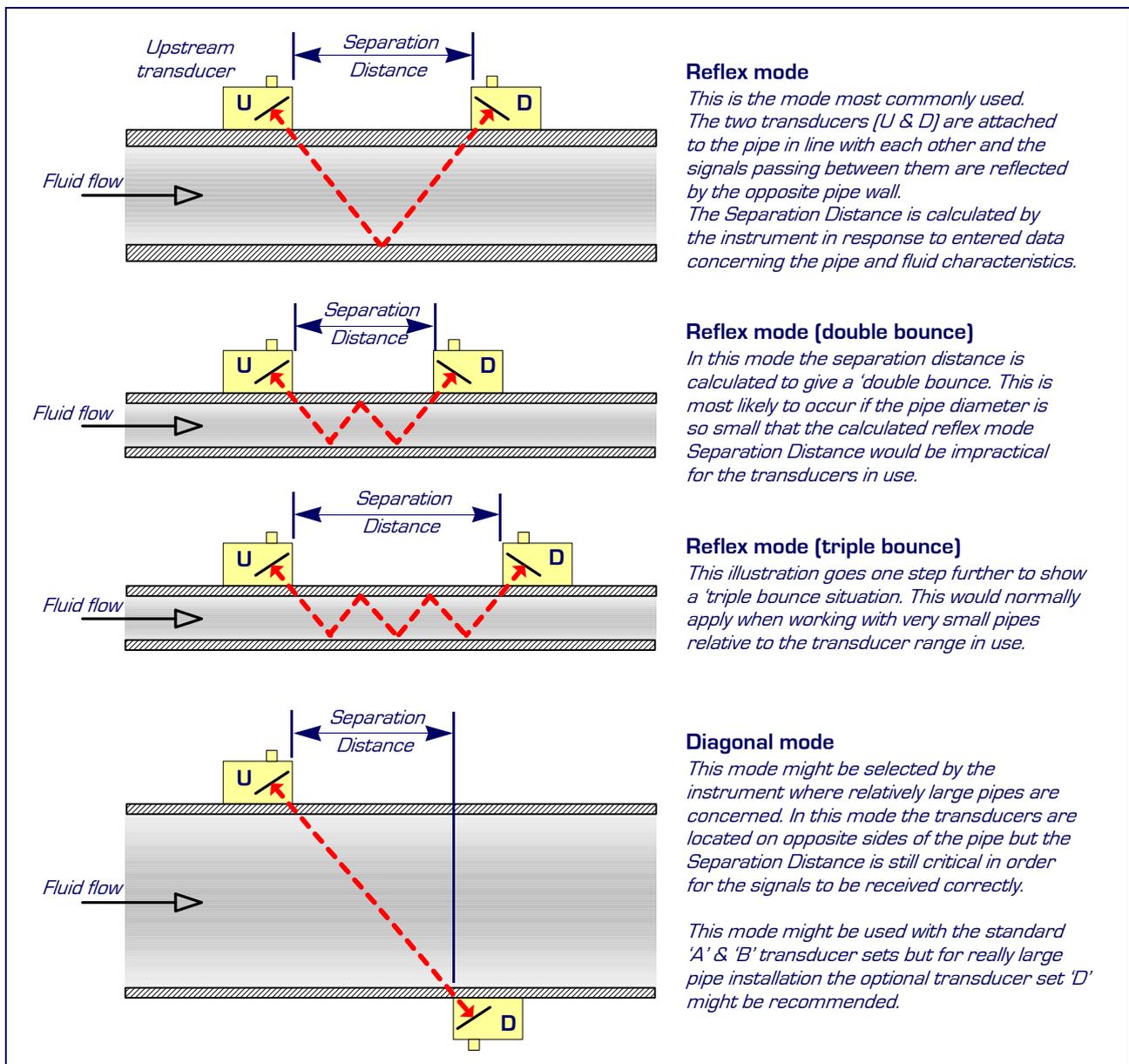
Transit time technique

This technique is known as 'transit time' measurement and is the method used by the Portaflow 330 system to calculate the liquid flow rate. Once the flow velocity is known it is a simple matter for the PF330 to calculate the volumetric flow.

Operating modes

The Portaflow sensors can be set to operate in one of four modes determined mainly by the pipe diameter and the transducer set in use. The diagram below illustrates these modes and shows the importance of applying the correct separation distance between the transducers to obtain the best possible signal.

In practice, the PF330 determines the operating mode and calculates the appropriate transducer separation distance in response to site application data entered by the user.



Reflex mode

This is the mode most commonly used. The two transducers (U & D) are attached to the pipe in line with each other and the signals passing between them are reflected by the opposite pipe wall. The Separation Distance is calculated by the instrument in response to entered data concerning the pipe and fluid characteristics.

Reflex mode (double bounce)

In this mode the separation distance is calculated to give a 'double bounce'. This is most likely to occur if the pipe diameter is so small that the calculated reflex mode Separation Distance would be impractical for the transducers in use.

Reflex mode (triple bounce)

This illustration goes one step further to show a 'triple bounce' situation. This would normally apply when working with very small pipes relative to the transducer range in use.

Diagonal mode

This mode might be selected by the instrument where relatively large pipes are concerned. In this mode the transducers are located on opposite sides of the pipe but the Separation Distance is still critical in order for the signals to be received correctly.

This mode might be used with the standard 'A' & 'B' transducer sets but for really large pipe installation the optional transducer set 'D' might be recommended.

PF330 System components



Standard equipment

- Portaflow 330 instrument with backlit graphic display.
- Power supply - with UK, US, European adapters 110/240VAC
- Transducer cables (x2) 6.6 ft. long
- Transducer set 'A' [Transducers x2]
- Transducer set 'B' [Transducers x2]
- Set of guide rails for use with 'A' or 'B' transducers
- Ruled separation bar (2-piece)
- 4-20mA/Pulse output cable
- USB cable and RS232-C cable
- 2 lengths of chain each at 10.8 ft. long
- Test block
- Ultrasonic couplant and syringe applicator
- Manual (on CD)

Optional equipment

- Transducer set 'D' - used for monitoring pipes of 59-196 in. diameter, over a temperature range -4°F - 176°F Kit is supplied in a separate case and includes the sensors together with ratchet straps and guide rails for attaching to the pipe
- Magnetic guide rail
- IP67 connectors in carrying case

The Portaflow 330 Standard equipment is supplied in a rugged IP67 carrying case fitted with a foam insert to give added protection for transportation.



Application site specifications

When setting-up the PF330 using the QuickStart feature, specific data concerning the pipe construction and fluid conditions must be entered into the instrument in order for it to determine the appropriate transducer selection and fitting details. Once these parameters have been entered they can (optionally) be stored as a 'named site' in the Portaflow's memory and recalled if the equipment is used in the same site location in the future. This facility reduces the set-up time and is useful where the system is used at several site locations on a regular basis. Details for up to 20 sites can be stored in this manner.

The parameters that are required to be entered in the QuickStart menu are shown in the tables below, which also illustrate the range and limits of pipe and fluid conditions with which the system can be used.

Pipe material:

Constructed of any sonic conducting medium such as –

- Carbon Steel
- Stainless Steel
- Copper
- UPVC/PVDF
- Concrete
- Galvanised Steel
- Mild Steel
- Glass
- Brass

Pipe lining materials:

Permitted pipe linings include –

- Rubber
- Glass
- Concrete
- Epoxy
- Steel

Pipe wall thickness:

The pipe thickness must be in the range of 0.04-2.95 in.

Pipe lining thickness:

The pipe lining thickness can be up to 0.4 in.

Pipe diameter:

The maximum permissible pipe outside diameter depends on the type of ultrasonic transducer in use –

- Type 'A' transducer – usable with pipes in the range 0.51-4.5 in.
- Type 'B' transducer – usable with pipes in the range 1.97-78.7 in.
- Type 'D' transducer – usable with pipes in the range 59 - 196 in. (optional equipment)

Fluid types & conditions:

The Portaflow 330 will perform accurately with a wide range of clean liquids or oils that have less than 3% by volume of particulate content. Typical application include –

- river water
- potable water
- demineralised water
- glycol/water mixture
- hydraulic oil
- diesel oil

Pipe wall temperature:

The maximum permissible pipe temperature depends on the type of ultrasonic transducer in use –

- Type 'A-ST' (Standard) transducer -4°F to +275°F
- Type 'B-ST' (Standard) transducer -4°F to +275°F
- Type 'D'* transducer -4°F to 176°F

** Note that these transducers are not part of the standard Portaflow 330 kit but can be ordered as optional equipment.*

If the application parameters at the intended site fall outside those shown above contact Micronics for advice.

Transducers

The PF330 system is supplied with two sets of standard transducers described as 'A-ST' and 'B-ST' (ST = 'Standard'). These transducers are designed for use with pipe diameters ranging from 0.51 - 78.7 in. carrying a fluid with a temperature in the range -4°F to +275°F, which covers the majority of PF330 site applications.

Optional transducers for use with extended pipe diameters up to 196 in. can be obtained from Micronics Ltd and are directly compatible with the PF330 system instrument.

A summary of the available transducer specifications is shown in the table below.

Standard transducers:

Temperature range -4°F to +275°F

- 'A-ST' (2MHz) – used with 0.51 to 4.5 in. pipe o.d.
- 'B-ST' (1MHz) – used with 1.97 to 78.7 in. pipe o.d.

Optional transducers:

Temperature range -4°F to 176°F

- 'D' (0.5MHz)* – used with 59 to 196 in. pipe o.d.

* Note these transducers are not part of the standard Portaflow 330 kit but can be supplied as optional equipment.

Transducer mounting

Type 'A' & 'B' transducers are fitted to adjustable guide rails which are secured to the pipe using wrap-around chains and mechanically connected together by a steel separation bar. The separation bar also acts as a ruler to allow the distance between the transducers to be set to the value calculated by the Portaflow instrument.

A thumb-wheel is used to adjust the chain tension until the assembly is held firmly in place. The transducers are then inserted into the guide rails and secured in place by a knurled screw. This illustration shows a completed assembly with a transducer fitted to the left-hand guide rail only.

The transducers are connected to the PF330 instrument by means of a 6.6 ft. mini-coaxial cable.

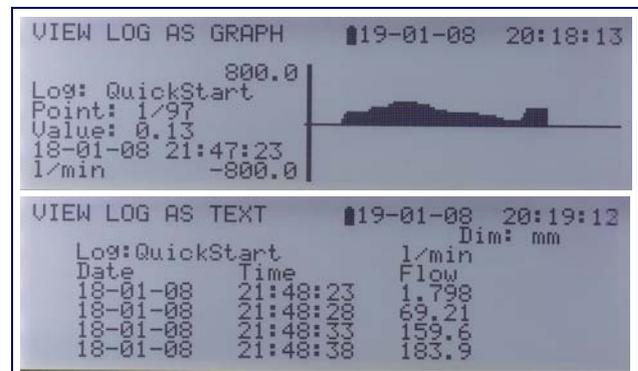


Data logger

The Portaflow 330 can record and store up to 98,000 (98k) logged events which can be displayed on the instrument either graphically or as text. Logged data comprises date & timed stamped flow values together with the unit of measurement and can be downloaded to a PC using the inbuilt RS232 or USB interface. The interval between logged events can be set between 5 secs and 1 hour.

All data is saved to non-volatile memory and is retained even if the battery totally discharges.

When viewing the data in either mode any stored event can be accessed and displayed using the instrument's scroll keys – see the attached illustration.



If logging is taking place at a 'named site' the log is saved with same 'name' as the site name and can be recalled under that name as and when required. This allows the instrument to be used at several site locations and the results can be downloaded independently at a later, convenient time.

When used in this way the total 98k event memory is shared between the 'named' sites as needed and if the memory becomes full the instrument can be configured to either stop logging altogether or continue logging by overwriting the earlier stored data on a first-in first-out basis for the site in use.

Logging can be controlled manually using Start/Stop menu options or set to operate automatically on a timer. The timer option is useful if logging is required during unattended operation.

A summary of the data logger specification is shown on the following page.

Data logger specification:

Logged data -	Time-stamped flow rate. Units may be changed at time of download by selecting the corresponding unit on the keypad (e.g l, gals, USgals, m³).
Number of data points -	98,000 (98k) logged events distributed across up to 20 sites. All free memory is allocated by demand.
Programmable logging interval -	5s to 1hr. The screen updates to show the end time of memory remaining as sample units are selected.
Manual/Auto control -	Logging can be started and stopped manually or set for automatic (timer) operation.
Memory overflow -	User selectable to either overwrite old data or stop logging.
Download log -	Logged data can be downloaded to PC using RS232/USB interface (see below). Data can be downloaded directly to facilitate 'live' logging, or recalled from memory to download at any time.
Portagraph II -	Portagraph II logging software is supplied.

RS232/USB Output

The Portaflow 330 has a single RS232/USB output facility that can be used to download logged data to a PC or printer. Two, 6.6 ft. interface cables are supplied with the equipment. The RS232 cable is terminated with a standard 9-pin D-type connector suitable for connecting to the serial port of a PC/printer. The USB cable is terminated with a standard USB connector. In each case these cables connect to an 8 pin LEMO connector on the top of the PF330 instrument.

USB interface:

Protocol -	The USB output supports full speed (12Mbits/sec) data connection
Software -	USB driver software can be downloaded from the internet

RS232 printer/terminal interface:

Protocol -	The PF330 has inbuilt Serial RS-232 communications facilities including handshaking	
Pin Configuration -	LEMO	D-TYPE
	1	6 DSR (red)
	2	4 DTR (black)
	3	5 Gnd. (screen)
	4	2 TXD (green)
	5	3 RXD (white)

Control Outputs

The PF330 provides analogue and pulse outputs that are designed to be used in conjunction with external control and site monitoring applications such as those typically found in building management systems. These outputs can be calibrated to suit a required flow operating range and a high-flow alarm level.

Both outputs are connected to a single (green), 7-pin LEMO socket located on the top of the PF330 instrument. A single 6.6 ft. cable is provided that can be adapted for use for either of these output functions. The 'tails' on the free end of the cable must be terminated to suit the intended application

Cable termination

Red -	4-20mA positive
Black -	4-20mA negative
White -	Pulse output (+)
Green -	Pulse return (-)
Brown -	Set Point (not in present use)
Blue -	Set Point return (not in present use)
Thick Black -	Cable screen

Analogue output:

Range -	4-20mA 0-20mA 0-16mA
Resolution -	0.1% of full scale
Alarm current -	Adjustable between 0-26mA
Isolation -	1500V Opto-isolated
Maximum load -	620 Ohms

Pulse output:

Output type -	One open collector opto-isolated digital output
Pulse repetition -	Up to 500 pulses/sec (depending on pulse width)
Pulse width -	500ms for 1 pulse/s 5ms for 100 pulses/s
Max current -	150mA

Technical data
General specification:

DSP measurement technique -	The PF330 uses 'transit time' measurement with a sampling resolution of 50 picosecond, with a continuous signal level indication to the display
Flow velocity range (bi-directional) -	<ul style="list-style-type: none"> • Minimum velocity 0.33f/s • Max velocity 65.6f/s
Flow measurement accuracy -	<ul style="list-style-type: none"> • $\pm 0.5\%$ to $\pm 2\%$ of flow reading for flow rate $> 0.66f/s$ and Pipe ID > 2.95 in. • $\pm 3\%$ of flow reading for flow rate $> 0.66f/s$ and Pipe ID in range 0.51 - 2.95 in. • $\pm 6\%$ of flow reading for flow rate $< 0.66f/s$ • Flow velocity corrected for Reynolds number over entire velocity range
Repeatability -	<ul style="list-style-type: none"> • $\pm 0.5\%$ of measured value or $\pm 0.06m/s$ whichever is the greater
Response time -	<ul style="list-style-type: none"> • $< 500ms$ depending on pipe diameter
Selectable flow units -	<ul style="list-style-type: none"> • VELOCITY: m/sec, ft/sec • VOLUME: l/s, l/min, l/h, gal/min, gal/h, USgals/min, USgals/h, Barrel/h, Barrel/day, m^3/s, m^3/min, m^3/h
Selectable volume units -	<ul style="list-style-type: none"> • l, gal, USgals, Barrel, m^3
Total volume -	<ul style="list-style-type: none"> • 12 Digits - forward and reverse
Display languages -	<p>The following operator languages can be selected from the PF330 set-up menu</p> <ul style="list-style-type: none"> • English • French • German • Swedish • Italian • Spanish • Portuguese • Russian • Norwegian • Dutch

Electrical

Supply voltage:

Input voltage range – 9–24Vdc
 Power consumption – 10.5W

Battery:

Technology – 5-cell NiMH
 Capacity – 3.8Ahr
 Operating time – Typically 20 hours continuous with backlight and 4-20mA output OFF
 Recharge time – 6.5 Hours
 Service life – >500 charge/discharge cycles

Power supply charger:

Manufacturer – Model ECO-181WP12
 Input voltage range – 90–264Vac
 Input frequency range – 47–63Hz
 Output voltage – 12Vdc
 Max. Output current – 1.5A
 Approvals – UL, CUL, TUV, CB & CE

Mechanical & miscellaneous data

All components are contained in a hard-wearing IP67 rated carrying case with a protective moulded foam insert.

Instrument enclosure:

Material – Flame retardant injection moulded ABS
 Dimensions – 104 in. x 6.6 in. x 1.97 in.
 Weight – 2.43 lb. (including battery)
 Number of Keys – 16
 Display – 240 x 64 pixel graphic display, high contrast black-on-white, with backlight.
 Viewing angle: Min 30°, typically 40°

Shipping information:

Box dimensions – 16.9 in. x 14.2 in. x 8.7 in.
 Weight – 16.5 lb.
 EMC – BS EN 61326 - 1:2006, BS EN 61326-2-3:2006
 Volumetric weight: 12.6 lb.

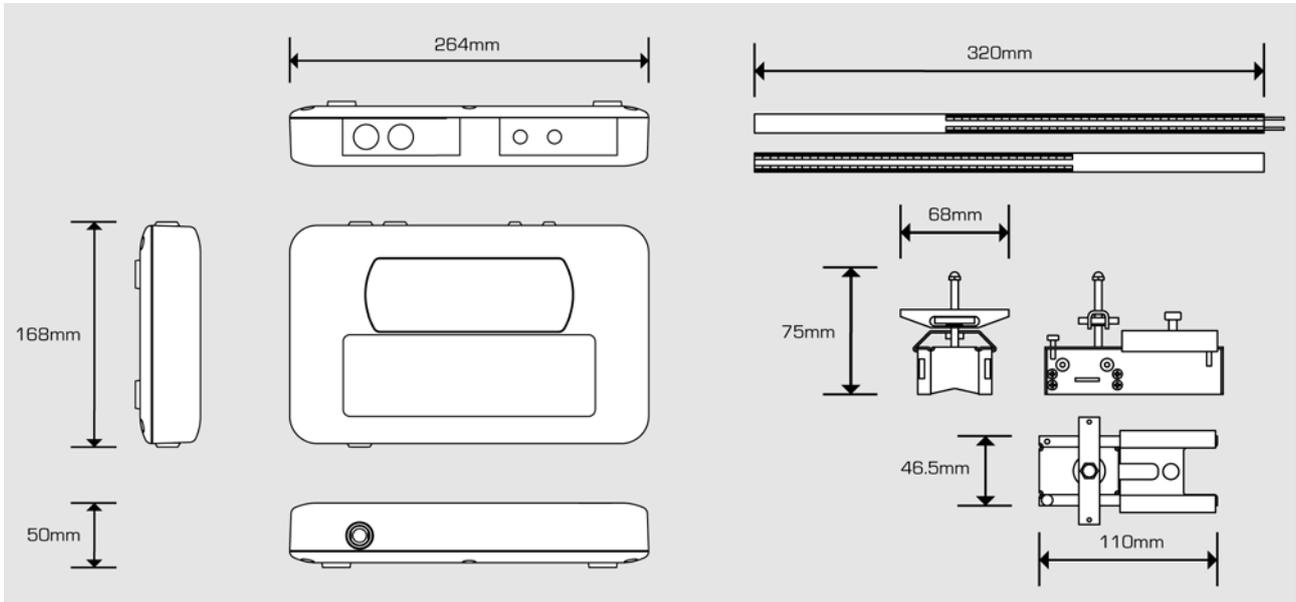
Environmental:

Operating temperature – -4°F to 122°F
 Storage temperature – -13°F to 149°F
 Operating humidity – 90% RH MAX at 122°F

Approvals:

Safety – BS EN 61010
 Battery charger – EN61204 - 3
 EMC – BS EN 61326 - 1:2006, BS EN 61326-2-3:2006

Dimensions



***Micronics reserve the right to alter any specification without notification.
PORTAFLOW™ 330 and PF330 are identical.***

