

## **190PD portable hand held Dual Mode clamp-on ultrasonic flowmeter**

### **Features**

- Cost effective portable flow measurement.
- Ideal for both dirty and clean fluid applications.
- Analog and digital outputs.
- Data logger with graphical display of data.
- Simple setup and installation.
- Built in help.
- Automatic speed of sound measurement and flow profile correction algorithm.\*
- Measure flow rate within a pipe without cutting the pipe.
- Easy to attach clamp-on sensors.
- Suitable for all commonly used sonically conductive pipe materials and liquids.
- Advanced matrix array Doppler sensor.



- Clearly laid out high tactile response keypad.
- Very large flow measuring range with no complicated upper velocity limits.
- Wide range of special application sensors including sensors suitable for concrete lined pipes\*.
- Latest Doppler and transit time signal measurement system.

### **Description**

The Precision Flow 190PD is a lightweight, high quality, transit time, and Doppler flowmeter designed to meet the flow measurement needs of the service, maintenance and commissioning engineer. The flowmeter has dedicated Doppler and transit time sensors for superior performance. Precision Flow's experience in ultrasonic technology ensures that the 190PD is a high precision instrument, which can be configured and operational within minutes.

Various sensor and clamping options are available for non standard applications. Please contact us for more information.

### Transit time principle of operation

When in transit time mode ultrasonic waves are transmitted in the direction of flow. These are accelerated slightly by the velocity of the liquid in the pipe. When ultrasound is transmitted in the opposite direction, the flow of the liquid causes the transmitted sound to decelerate. The subsequent time difference is directly proportional to the flow velocity in the pipe. Having measured the flow velocity and knowing the cross-sectional area, the volumetric flow can be easily calculated. Time differences are resolved to a resolution of 20 Pico seconds, thus giving extremely good performance in small pipes or in large pipes with low velocity flows.

### Doppler principle of operation

When in Doppler mode the flowmeter utilises the well known Doppler effect, this is named after Christian Doppler, who documented the effect in 1842. In general terms it is the change in frequency and wavelength of a wave as perceived by an observer moving relative to the source of the waves. The Precision Flow 190PD Doppler transducer has an array of piezoelectric crystals, part of the array transmits a beam of high frequency ultrasonic pressure waves so as to form a fixed cross angle with the pipe axis. As the beam travels into the non-homogeneous fluid, some energy is scattered back by solid particles or gas bubbles entrained in the flow. The relative motion of these discontinuities produces a frequency shift of the scattered wave, which is received and analysed by the ultrasonic flow meter. The different frequency is known as the Doppler shift, this is linearly proportional to the fluid velocity. As the internal cross sectional area of the pipe is easily measured so the volumetric flowrate is easily calculated.

### Electronics

The Precision Flow 190PD is easily configured by selecting the options displayed in the main menu and following simple on screen instructions. Flow readings can be achieved at most sites within a few seconds. The use of rechargeable batteries allows the unit to be operated for a period in excess of 10 hours depending on the facilities used. Continuous operation via the PSU is possible while also recharging the battery pack. The graphic display provides flow data in large highly visible characters, which can be enhanced by the use of the back light facility, making it possible to read the flow rate from a distance under extremely poor lighting conditions. Error messages, battery status, signal quality, time and date are all continuously displayed, as well as flow information in either numerical or graph format, keeping the user fully aware of the measurement process.

### Data logger

The built in data logger has the capacity to store 120,000 flow readings. Data can be stored in 5-second to 1 hour intervals. Data from each logging session can be saved with unique name and is stored in the memory until it has been cleared. The stored data can be displayed on the instrument in text or graphical format. The instrument is also capable of downloading the stored data to a PC. Our Logger program Log simple is also included (available for download from our web site)

### Specification

#### Hand Held Electronics

Material : ABS

Weight : < 1.5 Kg

Dimensions : 275 x 150 x 55mm

Display : 240 x 64 graphics LCD with backlight

Keypad : 17 key tactile membrane

Temperature range : 0°C to +50°C (operating) -10°C to +50°C (storage)

Power supply/charger Input : 12VDC

Volumetric flow units : m<sup>3</sup>, gallons (Imperial and US), Litres

Velocity units : metres/sec, feet/sec

Flow velocity range transit time mode : 0.01 m/sec to 25 m/sec to 4 significant figures

Flow velocity range Doppler mode: 0.05 m/sec to 10 m/sec to 4 significant figures

(option higher if required)

Total volume : 12 digits forward and reverse\*

Continuous battery level indication

Continuous signal quality indication

ERROR messages

Analogue 4-20mA into 750 Ohms : User definable scaling

Resolution : 0.1% of full scale

Pulse 5 Volts User definable scaling

Serial RS232 USB

Data Logging memory capacity 120,000 data points

Data Logging output Via RS232 or displayed graphically/numerically

Protection Classes: Case IP66, Electronics pack IP54, Transducers IP64

Repeatability transit time mode:  $\pm 0.5\%$  with unchanged transducer positions

Accuracy Transit time mode:  $\pm 1\%$  to  $\pm 2\%$  or  $\pm 0.02$  m/sec whichever is the greater, depending on application.

Repeatability Doppler mode:  $\pm 0.2\%$  of F.S.

Accuracy Doppler mode: Typically better than  $\pm 1\%$  to  $\pm 3\%$  of F.S or  $\pm 0.03$  m/sec. Which ever is the greater, depending on application.

The specification assumes turbulent flow profile with Reynolds numbers above 4000



**Standard Transducer options:**

<b>WPG pipe size range: 15mm-300mm</b> General service temp short term :-30 to 130 °C General service temp long term :-30 to 105 °C	<b>Order code WPG</b>
<b>XPG pipe size range: 50mm-1200mm</b> General service temp short term :-30 to 130 °C General service temp long term :-30 to 105 °C	<b>Order Code XPG</b>
<b>YPG pipe size range: 100mm-6500mm</b> General service temp short term :-30 to 130 °C General service temp long term :-30 to 105 °C	<b>Order Code YPG</b>
<b>YPGD pipe size range: 1200mm-6500mm</b> General service temp short term :-6 to 75 °C General service Storage :-10 to 75 °C	<b>Order Code YPGD</b>
<b>V Type (Doppler) pipe size range: 20 mm-1200mm</b> General service temp short term :-6 to 125 °C General service temp long term :-6 to 105 °C	<b>Order Code VT190</b>



WPG, XPG, YPG and YPGD transducers operate in transit time mode and are for clean fluid applications. The YPG transducers are especially good with lined pipes\* and applications above 100mm.

V type and VT190 Doppler probes are for fluids with particulates, slurries or applications with aeration. High temperature options are available for each transducer type please contact us for availability. All transducer sets are supplied with interconnecting cables and suitable mounting hardware for their pipe size range.

**Standard sets and variants:**

All kits include: main electronics pack, robust water proof carry case, data download cable, power adapter, ultrasonic coupling compound, transducers detailed manual and suitable transducer mounting hardware.

<b>Precision flow 190PD WPG (190P LT equivalent)</b> Transit time instrument set with WPG transducers for pipe sizes between 15mm to 300mm	<b>Order code 190PDWPG</b>
<b>Precision Flow 190PD XPG</b> Transit time instrument set with XPG transducers for pipe sizes between 50mm to 1200mm	<b>Order code 190PD XPG</b>
<b>Precision Flow 190PD YPG</b> Transit time instrument set with YPG transducers for pipe sizes between 100mm to 6500mm	<b>Order code 190PD YPG</b>
<b>Precision Flow 190PD VT190</b> Doppler instrument set with VT190 transducers for pipe sizes between 20mm to 1200mm	<b>Order code 190PD VT190</b>
<b>Precision Flow 190PD WPG XPG</b> Transit time instrument set with both WPG and XPG transducers	<b>Order code 190PD WPG XPG</b>
<b>Precision Flow 190PD WPG YPG</b> Transit time instrument set with both WPG and YPG transducers	<b>Order code 190PD WPG YPG</b>

To add Doppler transducer to any unit with WPG transducers (extra mounting hardware required)  
**Order code: VT190-PW**

To add Doppler transducers to any unit with YPG/XPG transducers (shares some mounting hardware)  
**Order code: VT190-PX**

To add the integrated heat meter option to any of the above instrument set options  
Including a pair of temperature probes and mounting straps.  
**Order code: +E**

**The 190PD is available with any combination of transducers and mounting hardware please contact us to discuss your requirements.**

**Fixed meters are also available please see separate data sheet.**

Special application transducer design service is available please contact Precision Flow for details.  
\* lining must be sonically conductive and bonded to pipe wall. If in doubt please contact our technical applications engineer.  
\*\*Reverse Flow and speed of sound correction only in transit time mode.