



**AUTOMATED  
METER READING**



# ChronoFlo

## Ultrasonic Flowmeter

The ChronoFLO Rugged Transit Time Ultrasonic Flowmeter uses advanced digital correlation processing techniques to achieve stable flow measurements even in difficult conditions and on most pipe materials.

Easy to install and suitable for clean and waste water pipes because no part of the equipment comes into contact with the fluid inside, the ChronoFLO features internal logging and a graphical LCD display to display information.

### Key Features and Benefits

- **Flexible:**  
Works on wide range of pipe sizes
- **Non-invasive:**  
No disruption to consumers
- **No fluid contact:**  
Suitable for clean and waste water
- No need for zero adjustment
- **Advanced DSP coded signal correlation:**  
Provides highly stable transit timing measurements, even in difficult conditions
- **Real time:**  
Directly measured speed of sound compensation reduces flow error from fluid variations with temperature and pressure
- **External inputs:**  
For thermal energy and external flowmeter logging
- **External outputs:**  
For process control
- **LCD display:**  
To display information



### Applications

The meter displays volumetric flow rate, in both directions, in all common units. The meter also has a totaliser that displays the net flow in both directions. An optional thickness gauge is used to measure the pipe wall thickness. The gauge has two sensors enabling a signal to travel between them when the gauge is held securely on the pipe.

MONITORING ASSETS, DELIVERING DATA, BRINGING CONTROL

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### Measurements

Flow	Measuring principle	Complete coded signal correlation measuring transit time difference
	Range	Bi-directional up to 25 m/sec
	Processor electronics resolution	<ul style="list-style-type: none"> <li>Pipe bore mm 50 200 10000</li> <li>Velocity mm/sec 0.3 0.075 0.015</li> <li>Flow litre/sec 0.0006 0.0025 0.0115</li> </ul>
	Overall Resolution	<ul style="list-style-type: none"> <li>Defined as still water noise time difference, typically <math>&lt; 0.2 \times 10^{-9}</math> seconds peak to peak.</li> <li>For water and different pipe bores this equates to:</li> <li>Pipe bore mm 50 200 1000</li> <li>Velocity mm/sec 6 1.5 0.3</li> <li>Flow litre/sec 0.012 0.05 0.23</li> </ul>
	Zero Bias	<ul style="list-style-type: none"> <li>Time difference for zero flow with internally smooth pipes typically better than <math>1 \times 10^{-9}</math> seconds. For water and different pipe bores this equates to:</li> <li>Pipe bore mm 50 200 1000</li> <li>Zero Bias</li> <li>Velocity mm/sec 30 15 1.5</li> <li>Flow litre/sec 0.06 0.24 1.2</li> <li>If greater accuracy is required, the zero bias can be eliminated by a zero flow check on installation</li> </ul>
	Repeatability	Without moving sensors, typically $\pm 0.15\%$ of reading
Speed of Sound	Accuracy	<ul style="list-style-type: none"> <li>For fully developed and symmetrical flow:</li> <li>Accuracy</li> <li><math>\pm 1</math> to 2% of reading + zero bias, without process calibration</li> <li><math>\pm 0.5\%</math> of reading + zero bias, with process calibration</li> </ul>
	Measuring principle	Complete coded signal correlation measuring mean transit time during normal operation
	Range	800 to 2000 m/sec
	Resolution	2 mm/sec
Wall thickness	Accuracy	$< 0.25\%$ reading
	Measuring principle	Complete coded signal correlation measuring reflection time. Uses separate [optional] wall thickness transducer
	Range	2 - 30 mm
	Resolution	0.05 mm
	Accuracy	$< 0.1$ mm
	Measuring principle	External input from 4-20mA temperature sensors
	Range	-40 to +200 °C
	Resolution	0.1 °C
Fluids	Sediment/air levels	<ul style="list-style-type: none"> <li>Sonically conductive</li> <li><math>&lt; 20\%</math> but volumetric fluid flow will not be accurate with entrained sediment/air</li> </ul>
Pipe	Outside diameter range	<ul style="list-style-type: none"> <li>19 – 75 mm. 4MHz Transducers on fixture with chain fixings (optional).</li> <li>50 – 2000 mm. 1MHz Transducers with chains, straps or magnetic clamps (standard)</li> </ul>
	Wall thickness range	1-100mm
	Material	Metals, glass and sonically conductive polymers/plastics
	Lining	Bitumen, glass, epoxy paint and most concrete liners. Excluding Lining loose liners

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### Operational

Languages	Selectable: English, French, Turkish
Units	Selectable: feet, metres, ml, litres, m3, ft3, pints, gallons, US gallons, seconds, minutes, hours, days. Plus user defined units and time. Input units in metric or imperial
Internal batteries	NiMH (6 x D) rechargeable, 9 Ah (nominal)
Battery life	<ul style="list-style-type: none"> <li>• 10 hours (LCD on, backlight on continuously)</li> <li>• 80 hours (LCD on, backlight off)</li> <li>• Sleep mode with burst sampling at 5 minute intervals extends life up to 1 month</li> </ul>
External DC	12v @ 1.5A (back-light on, charging)
External AC	External AC/DC adaptor. 100 to 240 v. 50/60Hz. IP40. 30 watts
Recharge time	Fast Charge (meter off): 12 hours. Trickle Charge (meter on): 18-24 hours
External control	RS232 [8 data, 1 stop bit, none] baud rates up to 115200 or half duplex [2 wires] RS485. Both fitted but cannot both be used at the same time
Transit Time/ Sound	2 sensors, single channel
Wall thickness (Input)	External, optional wall thickness sensor for use when setting up. Plugs into one of the sensor connections
Temperature (Input)	2 off 4-20mA isolated inputs (pressure, level, temperature sensors)
Frequency/pulse count (Input)	2 off 0-10 kHz inputs for open collector [or contact closure] outputs from external device
Digital data (Output)	RS232 [8 data, 1 stop bit, none] baud rates up to 115200 or half duplex [2 wires] RS485. Both fitted but cannot both be used at the same time
Analogue (Output)	1 output which can be set as current or voltage. Selectable output ranges 4-20mA, 0-20mA, 0-24mA or 0.5v, isolated. Choice of output under software control so can be set to any parameter measured by flowmeter, range, scale and window
Totaliser (Output)	2 x Opto-isolated open collector outputs. Software set to be either 1 for positive and 1 for negative flow, or set to 1 for flow and 1 for direction. 2500V isolation, 5 kHz max. Max DC voltage 18v
Site information	17 separate sites. Data rate, start/stop times, RTC setting
Settings	4Hz standard update rate, with user set moving average [1 to 999 seconds]. Logging interval user set from 1 to 9999 seconds and average over period is logged
Display	<ul style="list-style-type: none"> <li>• 240 * 128 graphic LCD</li> <li>• On/Off for LED backlight and contrast level control Display</li> <li>• Alpha-numeric and Graphics display output, graphs and logging traces</li> </ul>
Logging	128 k x 16 bit (2Mbit), universal multi-point data logger. 128,000 data points – e.g. flow and temperature = 64,000 records
PC software	Win 95/98/2000/NT/XP
Keypad	16 keys. Keypad ON/OFF on Keypad
Password Protection	3 levels: Master [HWM only], Owner [Change all settings], User [Change settings as defined by owner]
External Connections	Mil-spec connectors are used throughout 1. C1 sensor upstream 2. C1 sensor downstream and wall thickness 3. Analogue I/O (4-20mA) 4. Digital I/O (RS232 or RS485) 5. Open collector inputs/outputs 6. DC charging

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### Logger Features

Operating temperature range	Transducer	-30 to +80 °C.
	Cable	-20 to +80 °C
	Control Unit	-10 to +50 °C
Storage temperature range	Transducer	-40 to +80 °C.
	Cable	-20 to +80 °C
	Control Unit	-20 to +80 °C
Waterproofing	Transducers and cables	IP68
	Control unit	IP67
Transducer cable lengths	Standard	2.9 m
	Optional	30 m
Transducer mounting		Rail mounting for diameters up to 2000 mm. Straps/chains for larger pipes with alternative magnetic blocks for ferrous metal pipes
Dimensions	Control unit	270 x 250 x 125 mm
	Transducers	75 x 30 x 45 mm
Weight	Control unit	2.5 kg
	Transducers	0.1 kg each
Materials	Control unit	ABS
	Transducers	PEEK and Acetal, with aluminium/stainless steel mounting blocks/rails



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### HWM Water Limited

Ty Coch House  
Llantarnam Park Way  
Cwmbran  
NP44 3AW  
United Kingdom

Tel: +44 (0) 1633 489 479  
Fax: +44 (0) 1633 877 857  
Email: [sales@hwm-water.com](mailto:sales@hwm-water.com)

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