

# Doppler ultrasonic velocity sensors

## True average velocity measurement with MASP Technology

MACE velocity sensors use continuous wave Doppler ultrasound to measure the speed of dirt, bubbles and other particles in the stream flow.

*MACE Doppler ultrasonic sensors "see" particles in water like turning on a flashlight in fog.*

In a full pipe, electromagnetic or mechanical insertion devices "see" a golf ball sized velocity profile and then use complex algorithms to calculate velocity. By contrast, MACE Doppler ultrasonic velocity sensors utilizing MACE Advanced Signal Processing (MASP) technology "see" across the entire stream profile to give a true average velocity.



## Doppler ultrasonic insert velocity sensor



*For use in full pipes or partially full pipes when used in conjunction with an EchoFlo ultrasonic depth sensor.*

Insertion sensors measure velocity only and require access to the outside wall of the pipe in which the sensor is to be mounted.

### Installation

These sensors can be installed into existing pipework through a 2" ball valve (recommended) or just through a 2" female thread fitting.

### Compatibility

The Doppler ultrasonic insert velocity sensor is compatible with the following MACE meters:

- MACE AgriFlo XCi (Requires a Doppler card)
- MACE FloPro XCi (Requires a Doppler card)
- HVFlo Logging Flow Meter

### TECHNICAL SPECIFICATIONS:

Patents:	US Patent No. D544,803 AUS Patent No. AU 301464 S
Pipe size:	0.1 to 2.54m (4" to 100") diameter
Process fitting:	2" BSP or 2" NPT
Max. process fitting pressure: <sup>1</sup>	1034 kPa (150psi)
Max. operating pressure: <sup>2</sup>	253kPa (37psi)
Shaft dimensions:	33cm (L) x 2cm (D) 13" (L) x 0.8" (D)
Head dimensions:	4.5cm (D) x 2.5cm (H) 1.8" (D) x 1" (H)
Wetted materials:	Nickel plated brass and epoxy
Pipe intrusion area:	11.25cm <sup>2</sup> (1.75 sq.")

<sup>1</sup> The pipe **must be de-pressurized** prior to insertion or removal

<sup>2</sup> The stream flow may be suitable for Doppler ultrasonic flow measurement in pressures >253kPa (37psi) if it contains **at least** 100 parts per million of suspended solids that are >75 microns in size.

### VELOCITY MEASUREMENT:

Method:	Submerged Ultrasonic Doppler
Range:	±0.025 to ±8.0 m/s (±0.08 to ±26ft/s)
Resolution:	1mm at 1.0 m/s (0.04" at 3.3ft/s)
Accuracy:	±1% up to 3.0 m/s (±1% up to 10ft/s)
PVC sensor cable:	9mm (D) up to 50m (L) (0.35" (D) up to 164ft (L))
Min. operating depth:	40mm (1.57")
Max. operating temp.:	60° C (140° F)

## Doppler ultrasonic velocity sensor

*ZX SnapStrap mounted, velocity sensor for use in full pipes or open channels when used in conjunction with a depth sensor*



This sensor is used to measure velocity only in full pipes when access to the pipe is available and the pipe can be emptied when installation or maintenance is required. It can also be used in partially full pipes or open channels in situations where the user is measuring depth by a third party or ultrasonic depth sensor.

### Installation

Use a MACE ZX SnapStrap to install this sensor inside a pipe in minutes. The polycarbonate ZX Snapstrap is tough, secure, does not foul and can be easily removed to take the sensor to another site.

### Compatibility

The Doppler ultrasonic area/velocity sensor is compatible with the following MACE meters:

- MACE AgriFlo XCi (Requires a Doppler card)
- MACE FloPro XCi (Requires a Doppler card)
- HVFlo Logging Flow Meter

### TECHNICAL SPECIFICATIONS:

Pipe size	0.15 to 2.54m (6" to 100") diameter
Max. channel width *	3m (10ft.)
Dimensions	12.5cm (L) x 5cm (W) x 1.6cm (H) 5" (L) x 2" (W) x 0.63" (H)
Wetted materials	PVC and epoxy
Pipe intrusion area	8cm <sup>2</sup> (1.25 sq.")

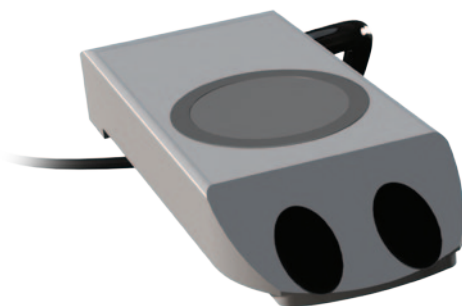
\* MACE Doppler ultrasonic sensors **will** operate in wider channels, but a reliable stream gauging **must** be performed for best system accuracy.

### VELOCITY MEASUREMENT:

Method:	Submerged Ultrasonic Doppler
Range:	±0.025 to ±8.0 m/s (±0.08 to ±26ft/s)
Resolution:	1mm at 1.0 m/s (0.04" at 3.3ft/s)
Accuracy:	±1% up to 3.0 m/s (±1% up to 10ft/s)
PVC sensor cable:	9mm (D) up to 50m (L) (0.35" (D) up to 164ft (L))
Min. operating depth:	40mm (1.57")
Max. operating temp.:	60° C (140° F)

## Doppler ultrasonic area/velocity sensor

*ZX SnapStrap mounted, combined velocity and depth sensor for use in partially full pipes or open channels.*



This sensor is used in open channels or pipes that run partially full. This sensor is used to measure depth (using a capacitive pressure diaphragm) and velocity. Access to the monitoring point is required for installation and maintenance.

### Installation

Use a MACE ZX SnapStrap to install this sensor inside a pipe in minutes. The polycarbonate ZX Snapstrap is tough, secure, does not foul and can be easily removed to take the sensor to another site.

### Compatibility

The Doppler ultrasonic area/velocity sensor is compatible with the following MACE meters:

- MACE AgriFlo XCi (Requires a Doppler card)
- MACE FloPro XCi (Requires a Doppler card)
- HVFlo Logging Flow Meter

### DEPTH MEASUREMENT:

Method:	Ceramic pressure transducer with large flat sensing diaphragm which allows straight, undeflected flow over the sensing area to reduce drawdown effects at high stream velocities and provides for self cleaning with an impervious Alumina ceramic surface.
Full scale range:	4m (13ft) above the transducer face
Accuracy:	0.2% of full scale at constant temperature in a static stream. 1% of full scale over a stream 5 to 55° C (41 to 130° F)
Resolution:	1mm (0.04")
Overrange:	60m (200ft) without damage
Min. operating depth:	17mm (0.67")

### VELOCITY MEASUREMENT:

Method:	Submerged Ultrasonic Doppler
Range:	±0.025 to ±8.0 m/s (±0.08 to ±26ft/s)
Resolution:	1mm at 1.0 m/s (0.04" at 3.3ft/s)
Accuracy:	±1% up to 3.0 m/s (±1% up to 10ft/s)
PVC sensor cable:	9mm (D) up to 50m (L) (0.35" (D) up to 164ft (L))
Min. operating depth:	40mm (1.57")
Max. operating temp.:	60° C (140° F)

### TECHNICAL SPECIFICATIONS:

Pipe size:	0.15 to 2.54m (6" to 100") diameter
Max. channel width: *	3m (10ft.)
Dimensions:	12.5cm (L) x 5cm (W) x 1.6cm (H) 5" (L) x 2" (W) x 0.63" (H)
Wetted materials:	PVC, Alumina ceramic and epoxy
Pipe intrusion area:	8cm <sup>2</sup> (1.25 sq.")

\* MACE Doppler ultrasonic sensors **will** operate in wider channels, but a reliable stream gauging **must** be performed for best system accuracy.