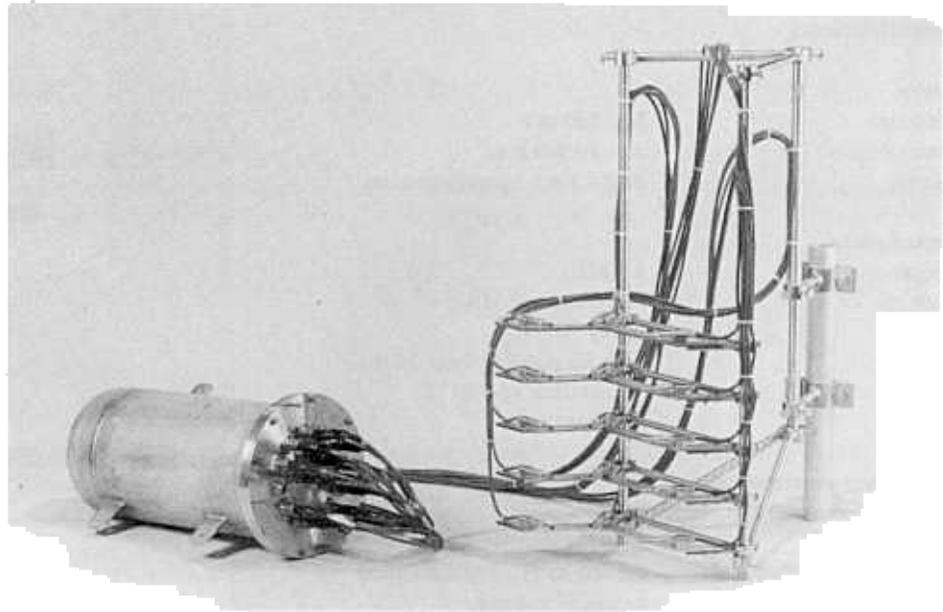


## 2-D USTM

### 2-dimensional ultrasonic sand transport meter



#### applications

The 2-dimensional ultrasonic sand transport meter (2-D USTM) has been developed for in-situ measurement of suspended sand transport. The design was made for a sand grain size range of 50 to 500  $\mu\text{m}$  and a concentration range of 50 to 10,000 mg/l, velocity range 0.03 to 3 m/s.

#### features

- simultaneous measurement of concentration and velocity
- measures velocity and direction
- not sensitive to fine silt (turbidity)
- wide velocity and concentration range
- concentration calibration is approximately constant for 100 to 200  $\mu\text{m}$  grain size range
- vertical resolution 20 mm
- RS-232c communication
- Delta Works proven reliability

#### custom built with options

- transducer configuration
- number of channels
- supporting frame
- housing of computing electronics

#### principle

The measuring principle of the 2-D USTM is based on the scattering and attenuation of ultra-sound waves by suspended sand particles. The concentration and velocity of these particles are simultaneously and continuously determined from the amplitude and the frequency shift of the scattered signal.

By using a special compensating method for the attenuation by the sand particles, based on two scatter measurements with different sound paths, the linear concentration range extends up to 10,000 mg/l.

The 2-D USTM sensor consists of three ultrasonic transducers. The sensor shape can be determined in consultation with the client. For profile measurements a vertical line of sensors can be applied, as shown in the picture. Measurements can be made simultaneously but a minimum vertical spacing of about 0.05 m has to be observed.

The sensors are connected with a maximum of 5 m cable to the computing electronics which can be housed in an immersible container or in a standard 19" housing (UCC-cabinet).



**specifications**

**range**  
 grain size 50 - 500  $\mu\text{m}$   
 concentration 50 - 10,000 mg/l  
 velocity 0.03 - 3 m/s omnidirectional

**transducers**  
 frequency 4.5 MHz  
 materials stainless steel 316,  
 epoxy  
 fully immersible (max 20 m),  
 temperature +5/+30  $^{\circ}\text{C}$   
 cable 5 m (max)

**computing electronics**  
 conversion rate - 2 readings/s  
 outputs RS-232c port for data  
 transfer to PC, baudrate 9600  
 - analogue voltage:  
 concentration 0 - 10 V  
 velocity -10/0/+10 V  
 housing - immersible down to 20 m or  
 UCC-cabinet  
 power - 24 VDC (immersible housing)  
 - 220/110 VAC (UCC-cabinet)  
 cable - power/communication cable 25m

