ultraP and ultraSV
Technical Manual

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Valeport Limited
St Peters Quay
Totnes
Devon, TQ9 5EW
United Kingdom

Tel: +44 1803 869292
e mail: sales@valeport.co.uk
Web: www.valeport.co.uk

1. Introduction

ultra-fast, ultra-compact, ultra-dependable. The next generation of sensors from Valeport.

Redesigned from the connector up, the ultra family offers a truly smart and exchangeable sensor without compromise.

Ideally suited to system integrators and OEM applications, the ultra is a truly exchangeable sensor with all critical electronics contained within the housing.

1.1. ultraP

The pressure sensor fitted to the ultraP is a temperature compensated piezo-resistive sensor, which delivers the performance previously only available from a resonant quartz sensor at a more cost-effective price.

It also brings the added advantages of long term stability, allowing longer intervals between calibration, and a smaller and more robust construction; complex and vulnerable arrangements of diaphragms and oil filled capillaries & reservoirs are therefore no longer necessary.

The ultraP can be re-calibrated by customers using a Class A dead weight tester.

Type:	Temperature compensated piezo-resistive
Range:	10, 30, 50, 100, 300 or 600 Bar
Accuracy:	±0.01% FS
Resolution:	0.0001 Bar

1.2. ultraSV

Each sound velocity measurement is made using a single pulse of sound travelling over a known distance, so is independent of the inherent calculation errors present in all CTDs. Valeport's unique digital signal processing technique virtually eliminates signal noise errors, and gives almost instantaneous response available; the digital measurement is also entirely linear, giving predictable performance under all conditions.

Type:	Direct reading
Range:	1375 – 1900 m/s
Accuracy:	±0.020 m/s
Resolution:	0.001 m/s
Sample Duration:	~30 µS @1500 m/s
Sample Rate:	Up to 300 Hz

2. Data Acquisistion

ultra sensors have three main operation modes:

2.1. M Modes

Data is output at a selected rate between 1Hz and 60Hz depending on the sensor.
No averaging or processing is applied to the data.

2.2. A Modes

Data is output at selected rate between 1Hz and 60Hz depending on the sensor.
Raw data from the sensor is averaged down to reduce noise/jitter.

2.3. S Mode

A single reading is output on request.

2.4. Addressed Operating Mode:

ultra sensors can be operated in a RS485 addressed mode to allow multiple sensors to be wired together in parallel. To prevent data clashes, instruments will only respond to a data request or command preceded with the address of the instrument.

There is a global address of 00 to allow instruments with unknown addresses to be interrogated. The address of a specific instruments can be set from 01 to 99.

To operate in address mode there are two methods.

2.4.1. Synchronous Sampling

00:S
will cause all active instruments to take a reading simultaneously. The readings can then be collected from the instruments by addressing each instrument in turn:

01:#015
will return the data from instrument ID 01

02:#015
will return the data from instrument ID02

etc., etc..

2.4.2. Asynchronous Sampling

Alternatively, data from individual sensors can be requested in turn:

01:S
will take and return a reading from instrument ID 01

02:S
will take and return a reading from instrument ID 02

2.5. Configuration

Note: if sensors are set in Addressed mode, all commands need to be preceded by NN: where NN is the sensor address. If the sensor address is unknown then sensors should respond to a 00: command.

If more than one sensor is connected via an RS485 bus, all will respond to a 00: preceded command.
Configuration of an ultra sensor is done using the supplied Valeport Terminal or DataLog X2 windows software. If manual control of the ultra is required, the following # codes can be used to interrogate and configure the ultra. There are a series of common codes across all ultra instruments, and then some specific codes to ultraP and ultraSV sensors.

To configure the ultra series, the instrument will need to be interrupted. This is achieved by sending a # followed by a Carriage Return. This should be sent until the instrument responds with:

Error
>

All # codes should be entered at the prompt and followed by Carriage Return and a Line Feed.

2.6. Common Codes

Function	# Code	Response / Input	
Set into Run Mode	#028		
Get Serial Number	#034	Integer	
Get Firmware Version	#032	Alphanumeric	
Get Calibration Date	#138	DD;MM;YY	
Set Baud Rate	#059;baud	Default is 115200 Available rates: 19200 35400 57600 115200 230400	
Get RS485 address	#002	Integer: 01 to 99	
Set RS485 address	#001;NN	Integer: 01 to 99, default 01	
Get RS485 address mode	#006	0 – Off 1 – On	
Set RS485 address mode	#005;N	0 – Off 1 – On	NB: password protected, enter: #000;RETAW command first

2.7. Specific ultraP Codes

Function	# Code	Response / Input
Get Calibration Coefficients	#086	Integer;Integer;Integer
Get Pressure Tare	#010	Float
Set Pressure Tare	#009;	Takes reading from pressure sensor to set Tare
	#009;value	Sets pressure Tare to value.
Get Pressure Tare Mode	#012	0 = Pressure Tare Mode off 1 = Pressure Tare Mode on
Set Pressure Tare Mode	#011;value	0 = Pressure Tare Mode off 1 = Pressure Tare Mode on
Get Sampling Mode	#040	Value="M1" Name="Discrete 1 Hz output" Value="M2" Name="Discrete 2 Hz output" Value= "M4" Name="Discrete 4 Hz output" Value="M8" Name="Discrete 8 Hz output" Value="M16" Name="Discrete 16 Hz output" Value="M32" Name="Discrete 32 Hz output" Value="A1" Name="Averaged 1 Hz output" Value="A2" Name="Averaged 2 Hz output" Value="A4" Name="Averaged 4 Hz output" Value="A8" Name="Averaged 8 Hz output" Value="A16" Name="Averaged 16 Hz output" Value=”S” Name=”Single Reading”
Set Sampling Mode	#039;value	Value="M1" Name="Discrete 1 Hz output" Value="M2" Name="Discrete 2 Hz output" Value= "M4" Name="Discrete 4 Hz output" Value="M8" Name="Discrete 8 Hz output" Value="M16" Name="Discrete 16 Hz output" Value="M32" Name="Discrete 32 Hz output" Value="A1" Name="Averaged 1 Hz output" Value="A2" Name="Averaged 2 Hz output" Value="A4" Name="Averaged 4 Hz output" Value="A8" Name="Averaged 8 Hz output" Value="A16" Name="Averaged 16 Hz output" Value=”S” Name=”Single Reading”

2.8. Specific ultraSV Codes

Function	# Code	Response / Input
Get FPGA firmware	#114	Alphanumeric
Get Calibration Coefficients	#023	Integer;Integer
Get Sampling Mode	#040	Value="M1" Name="Discrete 1 Hz output" Value="M2" Name="Discrete 2 Hz output" Value= "M4" Name="Discrete 4 Hz output" Value="M8" Name="Discrete 8 Hz output" Value="M16" Name="Discrete 16 Hz output" Value="M32" Name="Discrete 32 Hz output" Value="M60" Name="Discrete 60 Hz output" Value="A1" Name="Averaged 1 Hz output" Value="A2" Name="Averaged 2 Hz output" Value="A4" Name="Averaged 4 Hz output" Value="A8" Name="Averaged 8 Hz output" Value="A16" Name="Averaged 16 Hz output" Value="A32" Name="Averaged 32 Hz output" Value="A60" Name="Averaged 60 Hz output"
Set Sampling Mode	#039;value	Value="M1" Name="Discrete 1 Hz output" Value="M2" Name="Discrete 2 Hz output" Value= "M4" Name="Discrete 4 Hz output" Value="M8" Name="Discrete 8 Hz output" Value="M16" Name="Discrete 16 Hz output" Value="M32" Name="Discrete 32 Hz output" Value="M60" Name="Discrete 60 Hz output" Value="A1" Name="Averaged 1 Hz output" Value="A2" Name="Averaged 2 Hz output" Value="A4" Name="Averaged 4 Hz output" Value="A8" Name="Averaged 8 Hz output" Value="A16" Name="Averaged 16 Hz output" Value="A32" Name="Averaged 32 Hz output" Value="A60" Name="Averaged 60 Hz output"

3. Electrical

ultra sensors are powered by a 5 volt regulated (±3%) DC supply.

This can be supplied to the instrument via a USB lead where the power is drawn from the USB port of the connected PC.

Communications are via RS485 with a default configuration of 19200 Baud, 8N1.
(The ultraSV can also be provided with a TTL comms capability as an alternative to RS485.)
An available test lead will install as an FTDI USB serial port and allow communications via the supplied Valeport Terminal or DataLog X2 package.

3.1. Cable Format

3.1.1. RS 485

END 1: MCIL6M SubConn			FUNCTION
CONNECTOR	PIN	WIRE COLOUR	
6Way SubConn with In line cable	6	BLUE	Power GND
	5		Not Connected
	4	GREEN	+5V
	3	RED	RS485BB(+)
	2	WHITE	RS485A(-)
	1	BLACK	RS485 GND

3.1.2. TTL

END 1: MCIL6M SubConn			FUNCTION
CONNECTOR	PIN	WIRE COLOUR	
6 Way SubConn with In line cable	6	BLUE	Power GND
	5		Not Connected
	4	GREEN	+5V
	3	RED	RxD (Into sensor)
	2	WHITE	TxD (Out of sensor)
	1	BLACK	TTL GND

4. Communications

ultra Sensor RS485 output.

Baud Rate:	2,400 to 23,400 NB. low baud rates may limit data update rate
Protocol:	8 data bits 1 stop bit No parity No flow control

4.1. Data Telegram Formats

The ultra has a single data output format which is a proprietary NMEA style string:

NMEA Style Format	
Format ultraP:	$PVPTU, PXXX, serial number, sample mode, data, checksum<CR><LF>
Format ultraSV:	$PVPTU, SV, serial number, sample mode, data, checksum<CR><LF>

Where:

Instrument	PXXX (Pressure) XXX is the sensor depth rating - P600 would indicate 600bar pressure sensor
	SV (Sound Velocity)
Serial Number:	serial number of the instrument
Sample Mode:	data collection method
Data:	in the sensor units to 3 decimal places
Check Sum	An exclusive OR sum between all characters between the '$' and the '*' of the string

Example ultraP:
$PVPTU,P600,012345,M1,1527.789,*1D

Example ultraSV:
$PVPTU,SV,012346,M1,1493.123,*1E

4.2. Units

The output units for the ultraP are deciBar (dBar)
equivalent to 0.1Bar, or approximately 1m of seawater.

The output units for the ultraSV are metres per second (ms^{-1})

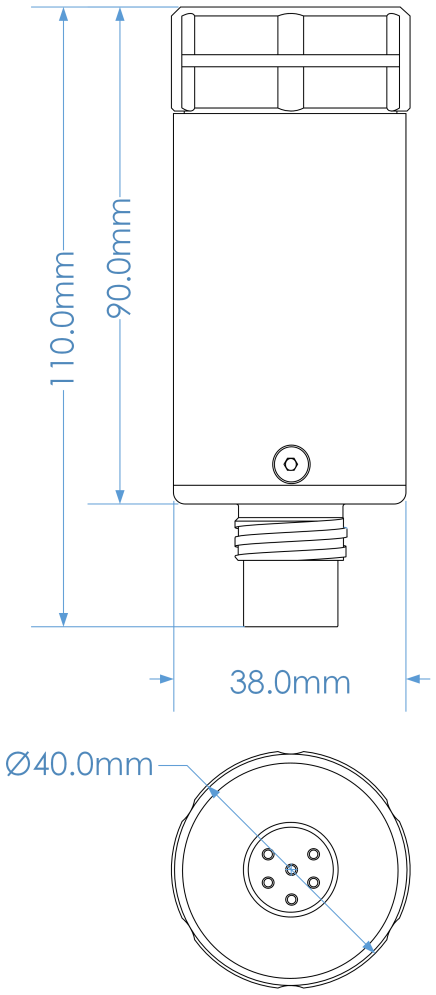
5. Physical Characteristics

5.1. ultraP

Please refer to factory for detailed dimensions if required

Housing & Bulkhead:	Titanium
Depth Rating:	6000m (may be restricted by sensor range)
Size:	Ø40mm
	90.0mm (excluding connector)
Weight:	<0.3kg
Connector:	SubConn MCBH6F (Titanium)

5.1.1. Dimensions

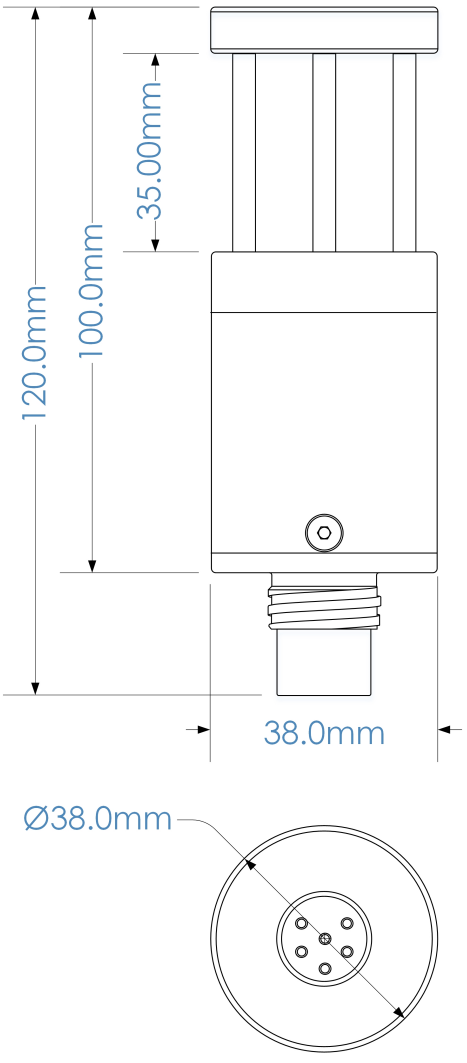


5.2. ultraSV

Please refer to factory for detailed dimensions if required

Housing & Bulkhead:	Titanium
Transducer Window:	Titanium
Sensor Legs:	Carbon Composite
Baseline Length:	35mm
Reflector Plate:	Titanium.
Depth Rating:	200m
Size:	Ø38mm
	100.0mm (excluding connector)
Weight:	<0.3kg
Connector:	SubConn MCBH6F (Titanium)

5.2.1. Dimensions



6. Ordering Information

Part No.	Description
0760009-XX	ultra P pressure sensor - Titanium housing, 6000m rated Fitted with: • 0.01% accuracy pressure sensor • SubConn Connector Note: XX on code denotes pressure transducer range select from 10, 30, 50, 100, 300 or 600 bar
06520550	ultra SV sound velocity sensor - Titanium housing, 200m rated Fitted with: • Carbon composite time of flight sound velocity sensor • SubConn connector