uvSVP Operating Manual

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As part of our policy of continuous development, we reserve the right to alter, without prior notice, all specifications, designs, prices and conditions of supply for all our equipment.

Contents

1 Introduction

This manual covers the basic specifications, deployment and maintenance procedures for the uvSVP. The instrument can be controlled by sending commands directly, using a suitable terminal emulation program such as Valeport Terminal or HyperTerminal.

The instrument is based on Valeport's existing "mini" sensor range and has been designed to be simple to use and maintain, as well as being small and lightweight for easy handling and deployment.

From April 2021 new firmware has allowed the addition of the Valeport DASH formula to calculate Salinity and, therefore, Density from the measured values of sound speed, pressure and temperature – see DASH Enabled Output Telegram

2 Specifications

2.1 Performance

Sensor		
Sound Velocity	Range	1375 – 1900m/s
	Accuracy	±0.02m/s
	Resolution	0.001m/s
	Frequency	2.5 MHz
Pressure	Range	10, 20, 30, 50, 100, 200 or 300Bar
	Accuracy	±0.01% range
	Resolution	0.001% range
Temperature	Range	-5 to +35°C
	Accuracy	±0.01°C
	Resolution	0.001°C

Certain features of the sensors used in the "mini" range are designed specifically to enable high quality data to be delivered:

2.1.1 Carbon Composite Rods

The carbon composite material used for the sensor spacer rods has been specifically selected to provide 3 features:

   a) Excellent corrosion resistance
   b) Very high strength
   c) Virtually zero coefficient of thermal expansion

This last point is particularly important; accurate sound velocity measurement relies on measuring the time taken for a pulse of sound to travel a known distance. The material selected does not measurably expand over the operating temperatures of the instrument, always ensuring the highest possible accuracy.

2.1.2 Digital Sampling Techniques

Enables a timing resolution of 1/100th of a nanosecond, equivalent to about 0.5mm/sec speed of sound on a 25mm path sensor. In practice, the output is restricted to 1mm/sec resolution.

2.2 Output

Units are fitted with both RS232 and half-duplex RS485 communications as standard, selected by pin choice on the output connector. Protocol is 8 data bits, 1 stop bit, no parity, and no flow control.

- Baud rate is factory set to 19200

- User may choose between 2400, 4800, 9600, 19200, 38400, 57600, 115200

- Sample rate up to 30Hz

fast sampling rates may not be possible with low baud rates

Connection	
	Standard is SubConn type MCBH6F titanium Alternatives may be supplied on request
	Wiring Information is in Section 6

2.3 Power

Power	
External	9 – 28v DC input
	0.36W (30mA @12v)

3   DASH Enabled Output Telegram

From directly measured sound velocity, temperature and pressure, SWiFT calculates Salinity using a proprietary Valeport algorithm developed from extensive laboratory and field work. This Salinity value is then used to compute Conductivity using standard EOS80 formulas.

A new salinity equation for sound speed instruments - Allen - 2017 - Limnology and Oceanography: Methods - Wiley Online Library

https://aslopubs.onlinelibrary.wiley.com/doi/pdf/10.1002/lom3.10203

In order to enable these data fields:

Code	Followed By	Operation
#120	:ON<CR> or ;OFF<CR>	Turns the Density and Salinity calculations ON or OFF Only available in Valeport output format Max 8Hz update rate at 19200 baud rate
#121	<CR>	Reads if Density calculation is fitted.

3.1   Calculated Salinity

Accuracy:	±0.05 PSU
Resolution:	0.001 PSU

3.2   Calculated Density

Accuracy:	±0.05 kg/m^3
Resolution:	0.001 kg/m^3

4 Data Request

The instrument responds to a series of text commands that are detailed below for those users who wish to interface the uvSVP to other systems.

This list is not comprehensive but will allow the standard functions of the instrument to be accessed. For more detailed information, please contact Valeport Ltd.

- All commands must be confirmed using "Carriage Return" or "Enter" on the keyboard, with the exception of the "Stop" command (#).
- All commands are echoed back by the instrument as they are typed

Code	Followed By	Operation
#		Interrupts instrument when running
M	rate<CR>	Performs continuous measurement at set rate. M1 = 1 Hz M2 = 2 Hz M4 = 4 Hz M8 = 8 Hz
S	<CR>	Returns a single reading
#001	;address<CR>	Sets the RS485 address
#002	<CR>	Returns the RS 485 address
#004	<CR>	Read header info
#005	;ON<CR> or ;OFF<CR>	Turns ON or OFF address mode
#006	<CR>	Returns ON or OFF status for address mode
#009	;<CR> or ;VALUE<CR>	Sets the Tare value ;<CR> = a reading is taken to use as Tare ;VALUE<CR> = User entered value in units as set by #018 command
#010	<CR>	Returns the Tare value
#011	;ON<CR> or ;OFF<CR>	Turns Tare function ON/OFF
#012	<CR>	Reads Tare mode
#018	;Pressure units<CR>	Set to either 0 = dBar 1 = Metres 2 = Feet
#019	<CR>	Read pressure units
#026	;Separator<CR>	Sets the output string separator (1 char)
#027	<CR>	Returns the Valeport output string separator
#028	<CR>	Set the unit into run mode
#029	<CR>	Read run mode
#032	<CR>	Returns the software version number.
#034	<CR>	Returns the units serial number

Code	Followed By	Operation
#039	;ModeValue<CR>	Set mode without putting unit into run mode Where M1 = 1 Hz continuous output M2 = 2 Hz continuous output M4 = 4 Hz continuous output M8 = 8 Hz continuous output M16 = 16 Hz continuous output
#040	<CR>	Read operating mode.
#042	;ON or OFF	Enable/disable leading separator
#043	<CR>	Read leading separator (on or off)
#044	;ON or OFF	Enable/disable trailing separator
#045	<CR>	Read trailing separator (on or off)
#059	;baud_rate<CR>	Sets the units baud rate 2400,4800,9600,19200,38400;57600;115200
#082	;3 or MSUBS or MSUBS2	Set the output string
#083	;0 or 1 or 2 or 3	Setup the pressure output format Where 0=not fitted, 1=PPPP.P, 2=PPP.PP, 3=PP.PPP
#084	<CR>	Returns the pressure range
#091	;ON<CR> or ;OFF<CR>	Sets startup mode. OFF=No readings at startup, ON=Readings at last rate at startup
#102	;ON or OFF<CR>	Sets RS485 mode
#103	<CR>	Sends RS485 mode

5   Output Format

Real time data follows the format described below.

Use #091 to control whether the instrument starts sampling as soon as power is applied or waits for a command, e.g.

>   10.351 21.488 1506.739

- The data separator is a space (this may be altered if required).

- Leading and trailing spaces are enabled (this can be altered if required).

- Data is presented in the order:
    - Pressure
    - Temperature
    - Sound Velocity

- Pressure data format is dependent on sensor range, and may be any of the following. Leading zeroes are included, so it is a fixed length string:
    - PPPP.P (e.g. 0123.4 dBar)
    - PPP.PP (e.g. 012.34 dBar)
    - PP.PPP (e.g. 12.345 dBar)

- The temperature data is given to 3 decimal places. Value is in °C and leading zeroes are included; signed if negative:
    - 21.456
    - 02.769
    - -01.174

- Sound Velocity is given in m/s, as a fixed length string with 3 decimal places
    - In air, the sensor reads 0000.000

5.1   Standard Format

from April 2021:

Command:	#082;3
Format:	x.xxx t.ttt cccc.ccc (DASH disabled #120;0) x.xxx t.ttt cccc.ccc ssss.sss dddd.dd (DASH enabled #120;1)
Notes:	<table><tr><td>Field</td><td>Format</td></tr><tr><td>Pressure | Depth (d | M | f)</td><td>x.xxx</td></tr><tr><td>Temperature (°C)</td><td>t.tttt</td></tr><tr><td>Sound Speed (ms⁻¹)</td><td>cccc.ccc</td></tr><tr><td>Salinity (PSU)</td><td>ssss.sss</td></tr><tr><td>Density (kg/m³)</td><td>dddd.ddd</td></tr></table>

Output String Examples

with DASH disabled
09.812 20.571 1504.164
09.821 20.572 1504.164

with DASH enabled
09.812 20.571 1504.164 0017.811 1011.610
09.821 20.572 1504.164 0017.810 1011.609

5.2 Data String #1

A dual output string - Customer specific requirement

Command:	#082;MSUBS
Format:	xxxx.xxx ccccccc $PSGDS,ADSVP,xxxx.xxx,cccc.ccc,tt.tttt,dddd.dd*zz
Notes:	**First String:**

Field	Format
Pressure	Depth (d | M | f)	xxxx.xxx
Speed of Sound	ccccccc

Second String:

Field	Format
NMEA Header	$XXXXX,XXXXX
Pressure	Depth (d | M | f)	xxxx.xxx
Speed of Sound (ms^{-1})	xxxx.xxx
Temperature (°C)	xx.xxx
Density (kg/m^3)	xxxx.xxx

Output String Examples

0009.919 1505340
$PSGDS,ADSVP,0009.919,1505.340,21.972,1130.56*1E
0009.830 1504058
$PSGDS,ADSVP,0009.830,1504.058,21.959,1130.80*1D
0009.829 1504131
$PSGDS,ADSVP,0009.829,1504.131,21.964,1130.85*10

5.3 Data String #2

Customer specific requirement

Command:	#082;MSUBS2
Format:	$PVUV2,xxxx.xxx,cccc.ccc,tt.tttt,dddd.dd,ss.sss*zz
Notes:	

Field	Format
Pressure	Depth (d | M | f)	xxxx.xxx
Speed of Sound (ms^{-1})	cccc.ccc
Temperature (°C)	tt.ttt
Density (kg/m^3)	dddd.dd
Salinity (mS/cm)	xx.xxx

Output String Examples

$PVUV2,0012.123,1501.123,21.123,1012.00,32.021*2E

6 Dimensions and Materials
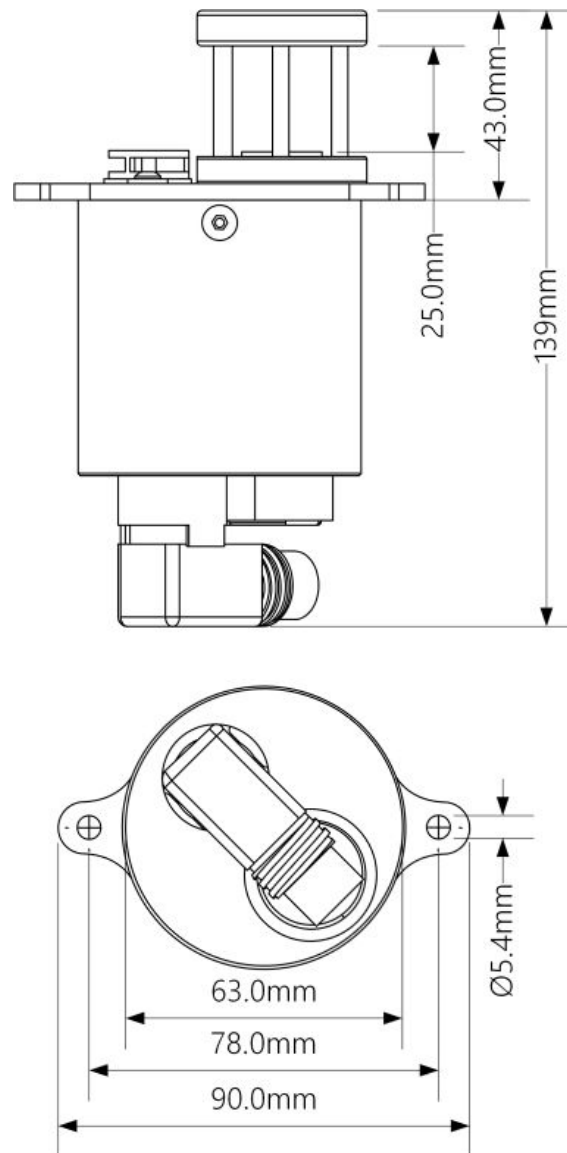
Housing Ø	Mounting bulkhead Ø	Overall length	Weight in Air
63mm	90mm	139mm	0.726 Kg

Materials:

Part	Material
Main housing	Titanium
Sensor bulkhead	Titanium
Connector	Titanium SubConn MCBH6F Right Angle
Sound Velocity Sensor	Carbon Composite legs, Titanium Body, Ceramic Transducer behind polycarbonate window
Temperature sensor	Titanium
Pressure sensor	Hastelloy

7 Wiring Information

Wiring colours are correct at the time the manual was printed. However, it is advised that continuity checks are performed prior to all terminations.

Systems are supplied with a short (50cm) lead for splicing or testing

Subconn 6 pin male line (MCIL6M)		9 Way D Type	4mm Banana Plugs
Pin	**Function**	**Pin**	**Pin**
1	RS232 GND	5 (Link to 1,6,8,9)	
2	RS232 Tx (Out of sensor) or RS485A	2	
3	RS232 Rx (Into sensor) or RS485B	3	
4	+V		Red Plug
5	Link to Pin 1 for RS485. N/C for RS232		
6	Power GND		Black Plug

8 Ordering and Part Numbers

Part No.	Description

06520549-XX	uvSVP
	Fitted with:
	  25mm Carbon composite time of flight SV sensor
	  0.01% accuracy piezo-resistive pressure sensor
	  PRT Temperature Sensor
	    Supplied with:
	      Interface lead
	      USB Y lead
	      Operating manual and transit case

9 EU Declaration of Conformity - CE Marking

Any changes or modifications to the product or accessories supplied, that are not authorised by Valeport Ltd, could void the CE compliance of the product and negate your authority to operate it. This product has demonstrated CE compliance under conditions that include the use of shielded cables. It is important that you use shielded cables compliant with the product's conformance, to protect from potential damage and reduce the possibility of interference to other electronic devices

EU Declaration of Conformity

CE Marking

Manufacturer:	Valeport Ltd
Address:	St Peter's Quay, Totnes, Devon, TQ9 5EW
Certification marking:	CE
Product Description:	UV-SVP, Sound Velocity Profiler.

We the manufacturer declare that the product **UV-SVP**, is in conformity with the following EU Directives and harmonised standard(s):

EMC Directive 2014/30/EU	Standards
EMC (Article 3.1b)	BS EN 61326-1:2013 (Basic Level)

RoHS Directive 2011/65/EU	Standards
Prevention (Article 4.1)	BS EN 50581:2012

Name:	Jason Horsell
Position	Development Engineer
Place of issue:	Valeport Ltd, Totnes, UK
Date of issue:	09th January 2018
Signature:	