VALEPORT LIMITED

MODUS SVS
Through-Hull Sound Velocity Sensor

Operation Manual

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INTRODUCTION

This manual covers the operation and basic maintenance of the Valeport MODUS SVS Through – Hull Sound Velocity Sensor, and contains instrument specific documentation such as calibration details and guarantee certificate:

MECHANICAL DETAILS

- Sensor specification
- Mechanical specification
- Installation details
- Basic maintenance procedures
- Wiring information
- Calibration information
- Guarantee certificate

SOFTWARE (SEPARATE MANUAL)

The DataLog Express software supplied is suitable for use with any Valeport Series 400 instrument (including the MODUS SVS), regardless of specification. The operation of this software is covered in a separate manual which is also supplied with the instrument.

Functions of the software covered include:

- Installation
- Establishing communications
- Instrument setup
- Data extraction
- Data display

CONTACT INFORMATION

If you have any questions about the operation of the instrument, which are not answered by this manual, please contact Valeport Ltd at the following address:

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CHAPTER	DESCRIPTION	PAGE

1 <u>INTRODUCTION</u>

This document covers the specifications, installation and maintenance of the Valeport MODUS SVS Through-Hull Sound Velocity Sensor. Details of the operation of this device with with DataLog Express software are covered in a separate Datalog Express Manual.

1.1 HARDWARE

The MODUS SVS has been specially adapted to fit through a vessel hull to provide real time measurement of sound velocity in the external environment, and optionally pressure and temperature parameters as well. The instrument is supplied with a watertight mounting arrangement for fixing to a PN10 ball valve (100mm nominal bore), which may be supplied with the device or free-issued to Valeport by the customer. The system may be deployed through the ball valve whilst the vessel is afloat, and likewise removed for cleaning or servicing.
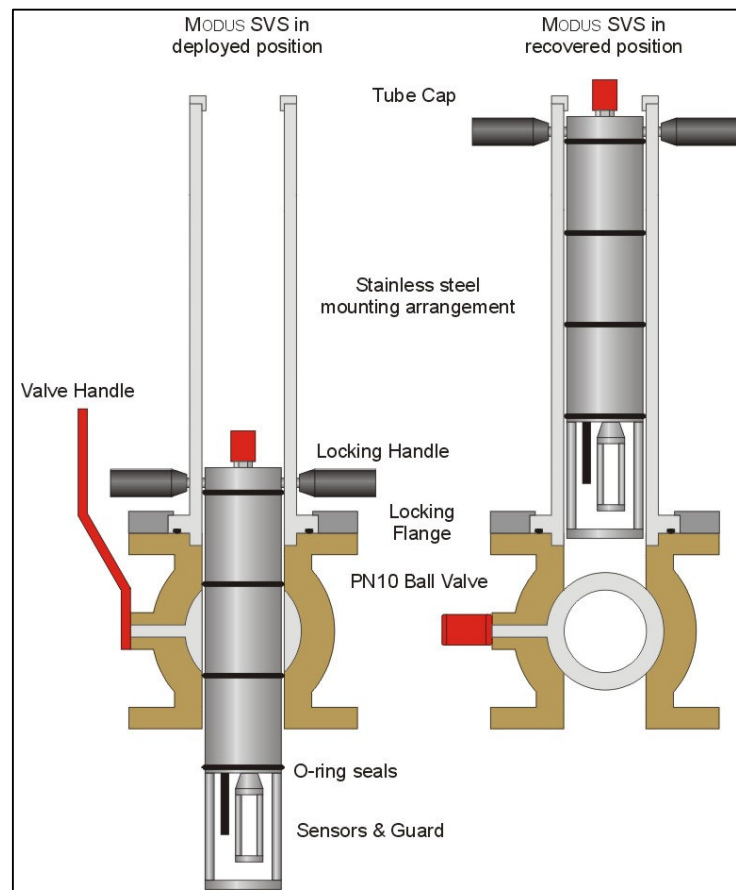
The instrument has a choice of digital communication methods built in to offer flexibility for configuration and use with a wide number of cable types and lengths. Data is in ASCII text format and may be displayed on PC using Valeport's own DataLog Express software, or easily interfaced to a third party device or software package.

The diagram below shows the generalised system arrangement (not to scale).

The instrument housing is made from titanium for mechanical strength and corrosion resistance, and includes a titanium sensor guard. The sound velocity transducer is made from titanium, carbon composite and polycarbonate. The temperature sensor (if fitted) is made from titanium and is protected from damage caused by handling by a plastic guard. The main instrument guard offers further physical protection.

The PN10 ball valve should be made from stainless steel or aluminium bronze to comply with regulations for shipside hull valves.

The instrument mounting fixture and locking flange are manufactured in 316 grade stainless steel. The seal between the instrument housing and the valve bore is a multiple o-ring seal. These, together with the o-ring seal between the valve flange and the mounting fixture are specified in Section 3.2.

1.2 SENSORS

The sensors fitted are as follows:

Sound Velocity

Type:	Valeport proprietary "time of flight" sound velocity sensor, using Digital Signal Processing techniques and temperature & pressure compensation to give high resolution, high accuracy data. Choice of sensor path lengths; 100mm, 50mm or 25mm.
Range:	1375 – 1900m/s
Accuracy:	100mm path ±0.017m/s 50mm path ±0.019m/s 25mm path ±0.020m/s
Resolution:	0.001m/s

Pressure (Optional)

Type:	Strain Gauge
Range:	3.5Bar (abs) standard, other on request
Accuracy:	±0.1% range
Resolution	0.005% range

Temperature (Optional)

Type:	Fast repsonse PRT
Range:	-5°C to +35°C
Accuracy:	±0.01°C
Resolution:	0.005°C

1.3 POWER

The unit requires an external power supply in the range of 9 to 30vDC. At 12 volts, the current drain for a unit with sound speed, temperature and pressure sensors is approximately 70mA whilst communicating and 80mA when sampling.

1.4 CUSTOMER SUPPLY

The customer will need to supply the computer for communications with the instrument. An IBM compatible PC of 166MHz or above is required, with Windows 95 or above. It is advisable to have at least 32Mbyte RAM fitted. The system will operate with less RAM, but running too many applications may cause the computer to "hang up".

2   INSTALLATION, DEPLOYMENT & RECOVERY

2.1   INSTALLATION

The MODUS SVS is supplied as a complete item, but will need to be assembled into the mounting fixture on site. Please refer to the illustration on page 3 for a guide as to what the completed assembly should look like.

1) Fix the PN 10 ball valve to the hull flange opening. You will see that one flange on the valve is machined to accept the Valeport mounting fixture – the other flange should be fixed to the hull. Ensure that the valve is in the closed position.

2) Silicon grease and fit the o-ring to the bottom of the fixture tube, and gently lower the mounting fixture into position. If possible, twist the tube on the valve until the handle slots lie fore and aft. This will give the best flow of water past the sensors when the instrument is deployed.

3) Lower the locking flange over the tube and secure to the valve flange.

4) Grease the 4 outer o-rings on the MODUS SVS housing with silicon grease, and slide the instrument into the mounting fixture. The connector should be at the tube end of the fixture, and the sensors at the flange end.

5) Rotate the instrument in the fixture tube until the handle holes are visible in the tube slots. Screw the handles into these holes, tightening the handles core using the M10 spanner provided. These handles are used for raising the lowering the instrument through the valve, and also for securing the instrument in position. They should be loosened to allow movement, and then tightened against the tube to secure. There are counterbores in the side of the tube to locate the handles.

6) Fit the tube cap to the top of the tube, and secure.

7) Finally, fit the signal cable to the connector on the top of the instrument.

8) To de-install the MODUS SVS from the valve, simply reverse the above steps, or loosen the locking flange and remove the entire assembly.

Take care to ensure that the valve is in the closed position before de-installing the instrument.

2.2   DEPLOYMENT

Deployment of the MODUS SVS is a two step process:

1) Open the ball valve by rotating the handle 90°.

2) Loosen the two black instrument handles, and push the instrument through the valve until the handles hit their stops. Tighten the handles into the counterbores to secure in position.

2.3   RECOVERY

Recovery of the MODUS SVS is a reversal of this procedure.

1) Loosen the two black instrument handles, and pull the instrument through the valve until the handles hit their stops. Tighten the handles into the counterbores to secure in position.

2) Close the ball valve by rotating the handle 90°.

3   MAINTENANCE

3.1   CLEANING

The external housing of the meter is manufactured from Titanium and is therefore corrosion resistant. The Valeport "time of flight" sound velocity sensor is made from a polycarbonate window, Carbon composite rods and a titanium mirrored reflector.

The time of flight path length can be affected by the build up of growth, film and debris on the polycarbonate window and mirrored reflector. For this reason it is important to recover and clean the instrument on a regular basis. The frequency of cleaning will depend on the season, local climate, and vessel operation – a stationary vessel in tropical waters in summer will be subject to high growth, a moving vessel in polar waters in winter will be subject to very little growth. It is suggested that a monthly cleaning regime is implemented initially, and adjusted according to the observed state of the sensor and the anticipated conditions.

3.2   O-RING SIZES

Please refer to the illustration for o-ring sizes. Note that the final 4 digits signify the material of the o-ring – if o-rings are being sourced from somewhere other than Valeport, ensure that they are made from this material.

The 4 "bore seal" o-rings should be checked regularly for damage and replaced if necessary. Damage is more likely the more often the device is moved in and out of the valve.
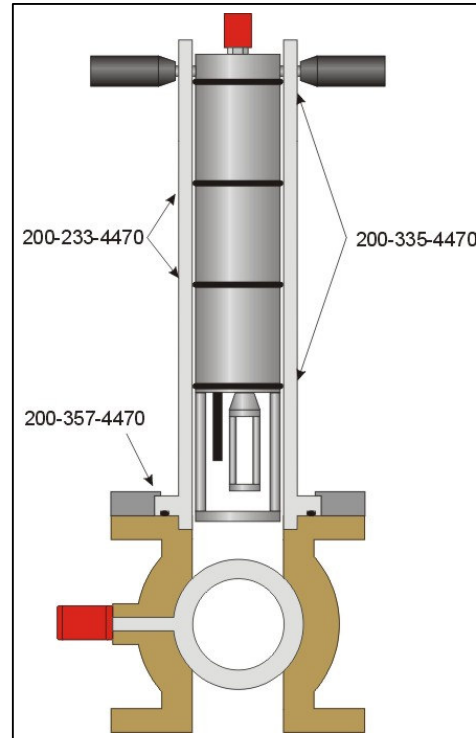
With prolonged exposure to the water outside the ship's hull (particularly surface water where sunlight and marine organisms are both at the highest concentrations), organic matter such as barnacles can build up on the sensor guard and sensor housing. Build up such as this can inhibit the smooth entry and exit of the sensor through the gate valve, possibly damaging the O-rings on the body tube.

Although anti fouling paint may prevent the build up of growth in the short term, regular cleaning of the sensor housing is the only certain answer to this problem. The regularity of any cleaning routine will be dependant upon the growth rate of the organic matter which, in turn, will depend on many other factors (water temperature, hours of sunlight, local water conditions, etc). However, we recommend that cleaning is undertaken every two weeks in the first instance and any adjustments to this procedure be made according to experience

When cleaning the housing, an abrasive pad such as Scotchbrite may be used on all titanium parts but should not be used on either the sensor face (the white disc) or the carbon composite legs. A light application of silicon grease will aid the passage of the sensor through the valve.

The flange o-ring should be checked every time the device is de-installed, but should not require regular replacement. It is suggested that two-yearly replacement of this seal is sufficient, unless any damage is found.

Note that the device is fitted with 4 internal o-rings which prevent water ingress into the actual instrument. The user should have no need to open the instrument for regular maintenance, but it is suggested that these o-rings are checked and/or replaced at two yearly intervals. These o-rings are size 200-143-4470, and a spare set is supplied with the instrument.

APPENDIX 1 CABLE WIRING SCHEMES

10 Way Male Subconn	3m Blue Polyurethane Cable	1m White Cable	4mm Banana Plugs	1m Grey Cable	9 Way D Type	Function
1	WHITE	BLUE	BLACK			Power Ground
2	PINK	BROWN	RED			Power +V
3	N/C					
4	N/C					
5	N/C					
6	N/C					
7	GREY			YELLOW	2	RS232 Tx (To PC)
8	BLUE			BLUE	3	RS232 Rx (From PC)
9	GREEN			GREEN	5 (link to 1,6,8,9)	RS232 Ground
	SCREEN			SCREEN	SHELL	
10	YELLOW					Internal Battery Enable Link to RS232 Ground

APPENDIX 2 CALIBRATION DATA

Inserted After This Page

APPENDIX 3 PRE-DELIVERY EQUIPMENT CHECKLIST

Serial No.		Model No.	MODUS SVS
Customer		Contract No.	
		Customer Ref.	
		Delivery Note	
		Calibration Certificate	

Item	Items Req.		Qty	Serial No.
	Yes	No		
MODUS SVS Sound Velocity .…...mm Sensor				
Temperature Sensor				
Pressure sensor …….. dBar				
Subconn "Y" lead ……….m				
Instrument Locking Handles				
PN10 Ball Valve				
Stainless Steel Fixture Tube				
Stainless Steel Locking Flange				
Operating Manual				
DataLog 400 CD				
Titanium grease and Syringe				
Silicon grease and Syringe				
Spare screws/allen key/screwdriver				
Spare o-ring set				

Signed..   Date…………………………

<u>APPENDIX 4 GUARANTEE CERTIFICATE</u>

All goods are subject to a 36-month guarantee against faulty materials and bad workmanship. Any faults to be declared within 36 months from date of despatch, in writing to Valeport Limited, who will replace or repair (at their option) any faulty items caused by bad workmanship or materials, (except displays and semiconductors which are only guaranteed for a 3 month period, and pressure and temperature sensors which are only guaranteed for a 12 month period).

Valeport Limited shall be under no liability for:

1) Any consequential loss or damage of any kind whatsoever.

2) For any defect or deficiency judged by Valeport Limited to be caused by wear and tear or of improper or unskilled handling of the goods or by any repair or attempted repair or dismantling by any one other than Valeport Limited or persons authorised to do so by Valeport Limited.

3) Batteries and other consumables supplied with the equipment, which are not covered by this guarantee.

Due to the specialised nature of the instrument it should, if possible, be returned to the factory for repair or servicing. The type and serial numbers of the instrument should always be quoted, together with full details of any fault or the service required.

Equipment returned to Valeport Limited for servicing must be adequately packed, preferably in the special box supplied and shipped with transportation charges prepaid. Return transport charges are also to the account of the customer.

Note: Any items supplied as part of a system, which are not manufactured by Valeport Limited, are covered by the individual manufacturer's guarantee of the equipment supplied.

MODEL NUMBER................................   SERIAL NUMBER ....

DATE OF DESPATCH ....   SIGNATURE...