MiniIPS Operating Manual

Document ID	MANUAL-2060676762-1 | issue: 1.3
Date:	January 2022

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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

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1. Introduction

The Valeport miniIPS “Intelligent Pressure Sensor” is designed to measure water pressure and provide a real time output of that data. Suitable for use in a variety of subsea applications (ROV’s, construction, monitoring, positioning), one of the key development drivers was to provide a cost-effective alternative to the use of resonant quartz pressure sensors. Using the very latest technology in temperature compensated piezo-resistive transducers, the miniIPS offers several advantages over resonant quartz sensors, with similar performance.

- No external diaphragms, oil reservoir or oil-filled tubes
- Easy to clean – no salt build-up
- Titanium construction
- Pressure ranges from 10 to 600Bar (approx 100m to 6000m water)
- Long term calibration stability
- May be recalibrated by customers using standard Class A deadweight tester (requires optional adapter)
- RS232 or addressable RS485 data output
- Choice of calibrated data formats
- Choice of sampling modes

2. Sensors

2.1. Pressure

The miniIPS is fitted with the following sensors:

- A high accuracy (0.01%), temperature compensated piezo-resistive pressure transducer

Type:	Strain Gauge
Range:	5, 10, 30, 50, 100, 300 or 600 Bar (factory fit option)
Resolution:	0.001% of full range
Accuracy:	±0.01% or full range
Response Time:	1 milliseconds

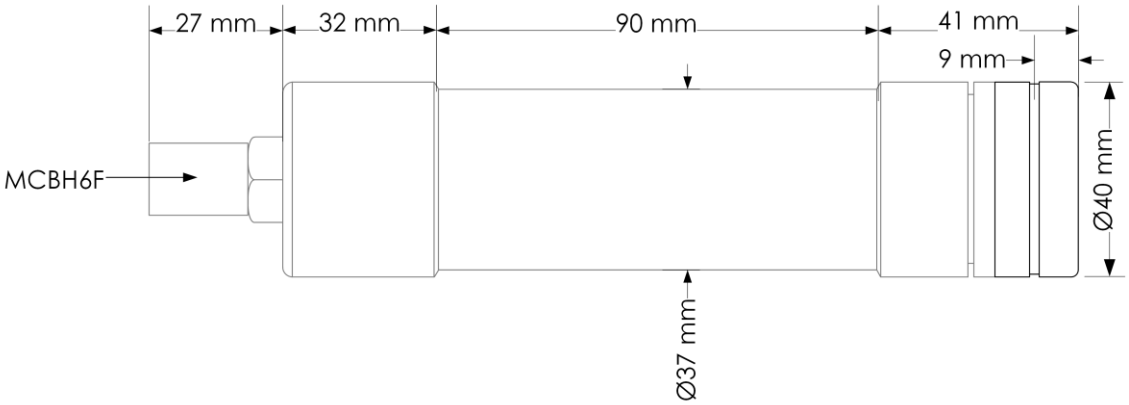
3. Physical Characteristics

3.1. Materials

Housing & Bulkhead:	Titanium
Sensor Cap:	Acetal
Transducer Diaphragm	Stainless Steel
Connector:	Standard is SubConn type MCBH6F (titanium)
	Alternatives may be supplied on request
Weight:	<1kg (in air)

3.2. Dimensions

Please refer to factory for detailed dimensions if required.



4. Communications

4.1. Welcome Message

When power is applied to the miniIPS, it will normally output a welcome message detailing the software version:

You are connected to a Valeport Mini IPS Sensor

0760700B 14/09/2021 07:00	
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#209;OFF (or ON)	This command will disable (or enable) the welcome message when power is applied.

4.2. Data Requests and Output Formats

Control of the miniIPS is achieved through the use of "# codes", as described below.

All commands must be "sent" by pressing the Enter key, with the exception of the single '#' character required to enter set up mode

You must use the main Enter key on the keyboard, not the smaller number pad Enter key. The large key actually sends two instructions – "Carriage Return" (or <CR>) and "Line Feed" (or <LF>). The miniIPS requires both these instructions to terminate a command. The smaller Enter key on a keyboard only sends the <CR> instruction

4.2.1. Start / Stop

When power is applied to the miniIPS, it will immediately begin to operate according to the settings already programmed. The most basic level of Stop / Start control is, therefore, by switching power on and off.

#	When the instrument is running, the miniIPS may be put into set up mode at any time by typing the '#' character. The device will respond with a command prompt '>' and wait the next instruction. **Note:** that there is a "watchdog" function here – if the unit is interrupted with the '#' character, and no further command is received for a period of 5 minutes, the sensor will automatically begin sampling data using the existing settings
#028	Starts sampling from set up mode, or takes a single reading if unit is in "Single" sampling mode.

4.2.2. Communications Setup

Command	Notes
#059;{baud rate}	Sets the sensor baud rate as required. Available baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.
Example:	#059;9600
#001;nn	Sets the sensor address to any number from 01 to 99
#002	Responds with current sensor address
#005;ON (or OFF)	Turns the miniIPS address mode on (or OFF). In address mode, the sensor will only respond to commands prefixed by its address, or the global address “00”.
Example:	03:#028 Sensor address “03” begin sampling
Example:	00:#028 All sensor addresses begin sampling

4.2.3. Sampling Pattern

The miniIPS will operate in 3 different modes:

CONT	Continuous mode, where data is output at a fixed frequency from 1 to 16Hz
SINGLE	Single mode is effectively “Sample on Demand” – when instructed, the sensor will measure and report a single reading
BURST	Burst mode is useful for longer term deployments, where data is measured for a number of samples, and the sensor then “sleeps” for a defined period of time. The measured data may be averaged or output as it is.

In each case, the sampling mode is set using the command #003.

Note also that the command #004 will return the current sampling pattern.

The command string to set the sampling parameters is as follows:

#003;mode;rate;period;interval;average;length where:

Mode:	Enter CONT, SINGLE or BURST as required
rate:	Enter 1, 2, 4, 8 or 16 as the required sampling rate in Hz. Note that this value must be included in the string for SINGLE mode, even though it is not used.
period:	This value defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter the number of samples that should be taken in the Burst, from 1 to 65535
interval:	This value defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter the number of seconds between the start of each measurement burst, from 1 to 65535
average:	This parameter defines the Burst sampling mode, but must be entered for the other modes even though it is not used. Enter FIXED, MOVING or NONE as required. Fixed averaging means that a single average number of all the readings in the burst will be output. Moving average is a sliding window of defined duration, averaging several data points within the burst, and updating with each single reading. None means that no averaging should be done, with each data point in the burst being output as it is measured.

length:	Defines the number of samples in the “sliding window” of the Moving Average. Enter a value from 1 to 120. Note that this value is part of the definition of Burst mode, but must also be entered for the other modes, even though it is not used.

4.2.3.1. Examples

1: Continuous data output at 4Hz

#003;CONT;4;*1;1;NONE;1*

Note: that the characters shown in italics must be included, even though they are not part of the definition of Continuous mode. It does not matter what values are used here, provided they fit within the general constraints defined above (1 to 65535 etc).

2: Data on demand

#003;SINGLE;*1;1;1;NONE;1*

Note: that the characters shown in italics must be included, even though they are not part of the definition of this mode. It does not matter what values are used, as long as they fit within the general constraints for each term defined above (1 to 65535 etc).

3: Burst Mode, 80 readings over 5 secs, once per minute. Output average value only

#003;BURST;16;80;60;FIXED;*1*

Note: that the last value (shown in italics) must be included, even though it is not part of the definition of Fixed Averaging. It does not matter what values is used here, provided it fits within the general constraints defined above (1 to 120 etc.).

4.2.4. Pressure Tare

The pressure sensor fitted to the miniIPS measures absolute pressure, i.e. it includes atmospheric pressure. The pressure tare function allows the atmospheric pressure (as measured by the sensor before deployment) to be removed from the readings, so the output is simply pressure of water. Note also that by taking a tare reading at any fixed point in the water column, readings will then be output relative to that point.

The pressure tare should be taken with the sensor in the same orientation as it will be deployed (horizontal, pointing up or pointing down) to negate any effects of the weight of the sensing element itself. Whilst this effect is small, it is an unnecessary contribution to the error budget.

The location of the sensor (i.e. the point relative to which all measurements are made) is indicated by a groove and cross in the acetal sensor cap

#009	Unit takes a single reading to use as the Tare value. Output at that pressure should now be approximately zero.
#009;0	Tare value is removed (i.e. set to zero)
#009;nnnn	Sets specific tare in dBar or Bar (max resolution of 0.000001) depending on units selected by #020 command.
Example:	#009;10.325 sets tare to 10.325dBar
#010	Unit responds with current Tare value

4.2.5. Data Output Formats

The miniIPS has a selection of different data output formats built in, allowing easy interface to software packages and third party instrumentation.

4.2.5.1. Units

The default output units for the miniIPS are deciBar (dBar), equivalent to 0.1Bar, or approximately 1m of seawater. The miniIPS can also output pressure in PSI. It is also possible to present the data in units of metres or feet of seawater, calculated using the UNESCO Simple Pressure / Depth relationship, which assumes “standard” water density.

#020;M	Outputs data in Metres
#020;F	Outputs data in Feet
#020;B	Output data in Bar (firmware version m onwards)
#020;D	Outputs data in dBar
#020;P	Outputs data in PSI
#135;{latitude}	Sets the local operating latitude in decimal degrees. This is required for an accurate pressure / depth conversion, since the relationship is partially dependent on local gravity, which varies with distance from the equator. Positive / negative signing for North / South of the equator is not relevant.
Example:	#135;50.426 Sets latitude to 50.426° (50° 25’ 34”), (Totnes UK).

All output formats are affected by changing the output units.

4.2.5.2. Valeport Format

Command:	#013;VALEPORT	
Format:	0009.914	DBAR

Default separator is TAB. This may be changed to any chosen character using the command #026.

Example:	#026;/
	0009.914/DBAR

4.2.5.3. CSV Format

Command:	#13;CSV
Format:	00/00/00, 00:00:00, 0009.9, 0.0, 00.0
Notes:	DD/MM/YY, HH:mm:SS, Output Data, Spare, Spare

4.2.5.4. NMEA Format

Command:	#013;NMEA
Format:	$PIPS,0009.91, M*78
Notes:	NMEA Identifier, Output Data, Units + Checksum Last three characters are a checksum

4.2.5.5. HYPACK Format

Command:	#013;HYPACK
Format:	009.9 0000.0

Notes:	Output Data + Spare field

4.2.5.6. Digiquartz Format

Command:	#013;DIGIQUARTZ
Format:	*00019.914
Notes:	This format emulates the Paroscientific Digiquartz sensor output

4.2.5.7. Digiquartz CDL Format

Command:	#013;DIGIQUARTZ_CDL
Format:	*0001+0009.9139318
Notes:	This format emulates the Paroscientific Digiquartz CDL sensor output

4.2.6. Information #Codes

The following commands will cause the sensor to report back various pieces of information, as described:

#032	Software version number
#034	Instrument serial number
#093	PCB serial number
#138	Year of manufacture, month and year of last inspection/service
#202	Maximum transducer pressure range
#900	Outputs a full list of all command codes applicable to the sensor. Note that not all of these codes are covered by this manual – use this feature with care.

4.2.7. Calibration

The miniIPS may be returned to Valeport or one of its approved laboratories for recalibration, or it may be re-calibrated by the customer using a Class A deadweight tester, or defined standard of the customer's choosing.

5. Electrical

5.1. Power

9 – 28V DC input (isolated)

Draws approximately 40mA at 12vDC

5.2. Output

Units are fitted with both RS232 and RS485 communications as standard. RS485 is enabled by grounding a pin in the communications lead (refer to Section 4). Protocol is 8 data bits, 1 stop bit, no parity, no flow control.

Baud rate is factory set to 19200. User may choose between 2400, 4800, 9600, 19200, 38400, 57600 or 115200.

Note that fast data rates may not be possible with low baud rates

5.3. 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

6. Software

The miniIPS is fully compatible with Valeport DataLog X2 and Terminal X2. These can be downloaded from Valeport's website: https://valeport.download/

7. Care & Maintenance

The miniIPS is remarkably robust, being primarily constructed of titanium. The only maintenance required, other than periodic recalibration as necessary, is to keep the sensor as clean as possible.

- After deployment, remove the outer acetal sensor cap.
- Use the tool supplied to carefully unscrew the inner protective cap, exposing the sensor diaphragm.
- Rinse all parts in fresh water removing any growth or debris as necessary
- Take exceptional care not to touch or damage the diaphragm itself as irreparable damage can result

Any damage to this diaphragm will render the instrument warranty invalid

After cleaning, simply reassemble the sensor and store in the packing case provided.

8. Ordering and Part Numbers

Part No.	DESCRIPTION
	Standard System
0760001-XX	mini IPS Fitted with: 0.01% accuracy piezo-resistive pressure sensor. Supplied with: Interface lead Calibration adapter fitting Operating manual and transit case. Note: XX on code denotes pressure transducer range select from 5, 10, 30, 50, 100, 300 or 600 bar
0760005-XX	mini IPS - OEM remote sensor and PCB Fitted with: 0.01% accuracy piezo-resistive pressure sensor Supplied with: Interface lead Calibration adapter fitting Operating manual and transit case. Note: XX on code denotes pressure transducer range select from 5, 10, 30, 50, 100, 300 or 600 bar
Components and Spares	
0760EA1	Replacement Titanium SubConn bulkhead connector (SubConn part MCBH6F - Specify Titanium)
0652EA1	Housed system 0.5m pigtail (SubConn parts MCIL6M and MCDLSF) Fitted with: 4mm bunch pins for power 9 pin D type for communications.
0760002	Calibration adapter fitting

9. Declarations of Conformity

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

9.1. UK Declaration of Conformity – UKCA Mark

UK Declaration of Conformity

Manufacturer:	Valeport Ltd
Address:	St Peter's Quay, Totnes, Devon, TQ9 5EW
Certification marking:	UKCA
Product Description:	miniIPS

We the manufacturer declare that the product **miniIPS** is in conformity with the following UK Statutory requirements and designated standard(s):

Electromagnetic Compatibility Regulations 2016	**Standards**
EMC (SI 2016 No.1091)	BS EN 61326-1:2013 (Basic Level)

ROHS Regulations 2012	**Standards**
SI 2012 No. 3032	BS EN IEC 63000:2018

Name:	Surya Dinesh
Position:	Product Support Manager
Place of issue:	Valeport Ltd, Totnes, UK
Date of issue:	13 October 2021
Signature:	

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Registered in England No. 1950444

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9.2. EU Declaration of Conformity – CE Mark

EU Declaration of Conformity

Manufacturer:	Valeport Ltd
Address:	St Peter's Quay, Totnes, Devon, TQ9 5EW
Certification marking:	CE
Product Description:	miniSVS-Series consisting of: miniSVS (Sound Velocity Sensor) miniSVS/T (Sound Velocity & Temperature Sensor) miniSVS/P (Sound Velocity & Pressure Sensor)

We the manufacturer declare that the product **miniSVS-SERIES** 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 2015/863/EU	**Standards**
Prevention (Article 4.1)	BS EN IEC 63000:2018

Name:	Surya Dinesh
Position:	Product Support Manager
Place of issue:	Valeport Ltd, Totnes, UK
Date of issue:	13 October 2021
Signature:	

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