# miniIPS1 Operating Manual


| | |
|---|---|
| Document ID | 0760856 \| issue: 1.1 |
| Date: | July 2024 |



Valeport Ltd
St Peter's Quay
Totnes TQ9 5EW
United Kingdom

Phone: +44 1803 869292
Email: sales@valeport.co.uk
Web: www.valeport.co.uk

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

The intelligent pressure sensor range has undergone incremental upgrades starting with the original ‘miniIPS’ which offered a fixed pressure sensor (available in a range of different accuracies and depths). This was followed by the ‘miniIPS2’ which offers an interchangeable pressure module and more modern command structure. The original miniIPS will be discontinued and replaced with an enhanced product the miniIPS1. The only changes of note are a reduced draw and isolated comms and power.

The ‘Intelligent Pressure Sensor’ (IPS) 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 and 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 miniIPS1 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 600 Bar (approx. 100 m to 6000 m water depth)
- 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 Specifications

## 2.1 Materials

| | |
|---|---|
| Housing & Bulkhead: | Titanium |
| Thread protector: | Acetal |
| Transducer Diaphragm | Dependent on pressure rating mainly stainless steel |
| Connector: | Standard is SubConn type MCBH6F (titanium) |
| Weight: | <1kg (in air) |

## 2.2 Sensors

The miniIPS1 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 millisecond |

## 2.3 Data Acquisition

| | |
|---|---|
| Sampling: | Continuous, Data on demand or Burst |
| Data Rate: | 1, 2 or 4 Hz |

## 2.4 Communications

| | |
|---|---|
| Digital Output: | RS232 & RS485 fitted as standard |
| Protocol: | 4800 to 115200 baud (8,1,N) |
| Formats: | Valeport / NMEA / CSV / Hypack / Digiquartz |
| Analogue output: | 0-5/0-10 V fitted as standard |

RS485 is enabled by grounding pin 9 to pin 5 in the communications lead
see Wiring Information

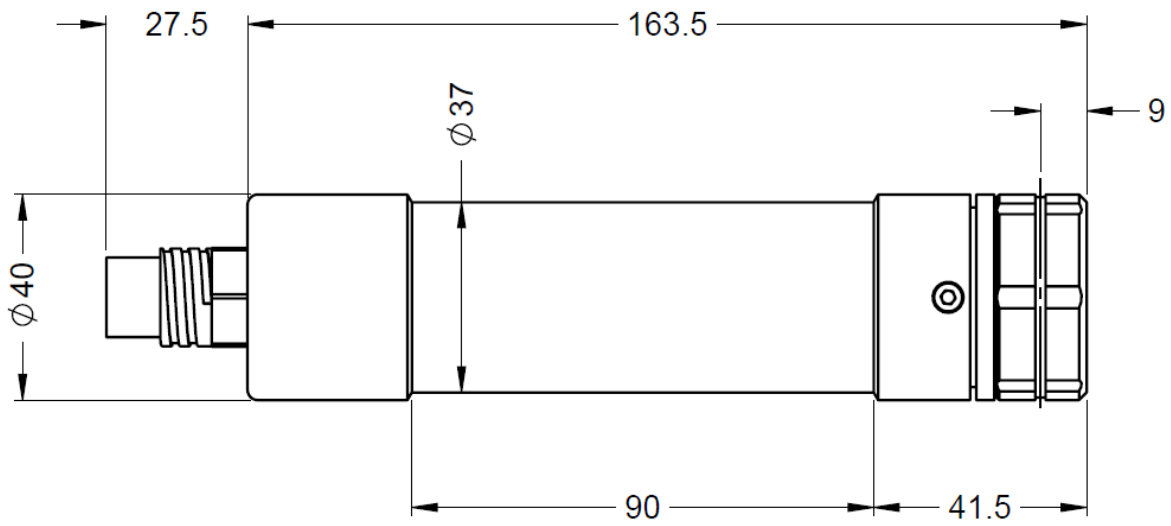
## 2.5 Power Requirements

| | |
|---|---|
| Power Source | External Supply Only |
| Input Range | 9 – 28 V DC (isolated) |
| Consumption | Less than 0.4 W (40 mA @ 12 V DC) |

# 3 Physical Characteristics

| | |
|---|---|
| Housing: | Titanium (6000 m rated) |
| Size: | 40 mm max Ø |
| | 37 mm main body Ø |
| | 190 mm length (including connector) |
| Weight: | <1kg(in air) |
| Connector: | SubConn MCBH6F (titanium) |

## 3.1 Dimensions



# 4 Configuration and Operation

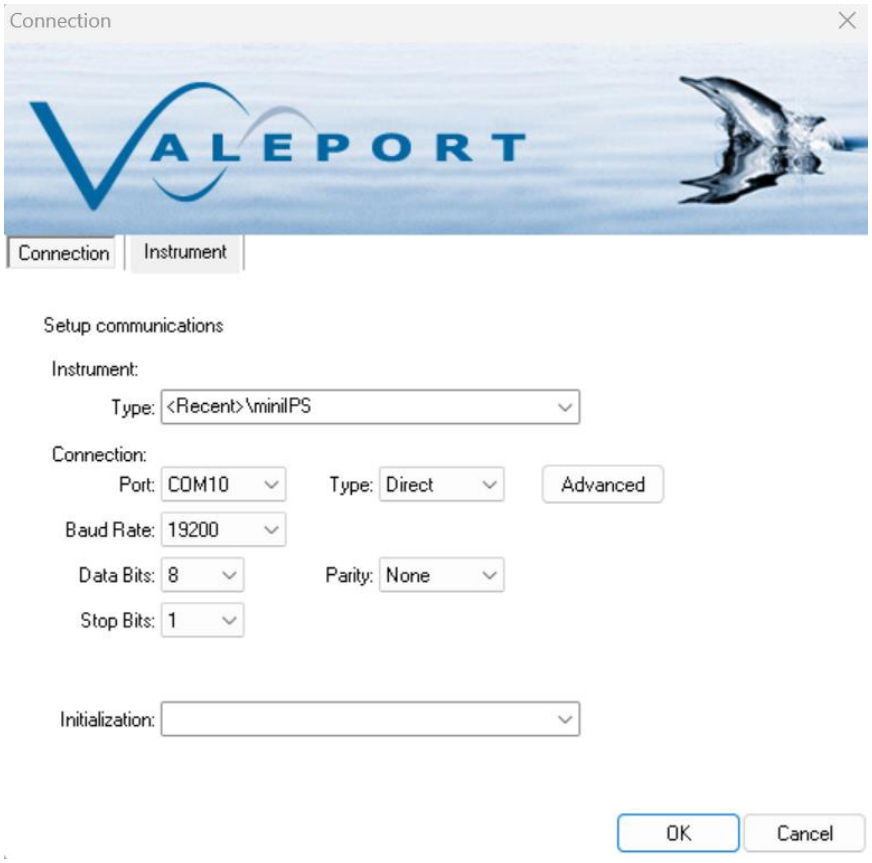
## 4.1 Getting started

The miniIPS1 is compatible with Valeport Datalog X2 and Terminal X2. These can be downloaded from Valeport - Software and are on the USB memory stick provided with this product.

Install the program by opening the install package supplied (or download from https://valeport.download) and follow the on-screen instructions. Once installed, launch the terminal program

To setup communications with the miniIPS1:

1. Connect the USB interface Y-lead to the computer via the USB A connector and to the mini IPS1 via the 6 pin SubConn.
2. Open Valeport Terminal X2 and > select connect
3. > Select the instrument type > Bathymetry >miniIPS
4. > Select > Connection port (the port number can be checked in device manager)
5. Set Type: Direct, Baud Rate: 19200 Data Bits: 8 Parity: None, Stop Bits 1. See Figure 3 1 Serial Communication settings
6. 6. Connect the Banana plugs to a suitable power supply (9 – 28 v DC) >



## 4.2 Welcome message

When power is applied to the miniIPS1, it will normally output a welcome message as follows detailing the firmware version:

```
You are connected to a Valeport MiniIPS1 Sensor
0760714A0 25/05/2023 12:00
Copyright 2023.
```

| Command | Notes |
|---|---|
| #209;OFF (or ON) | This command will disable (or enable) the welcome message when power is applied. |

## 4.3 Data requests and output formats

Control of the miniIPS1 is achieved using '# 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.

### 4.3.1 Start/Stop

When power is applied to the miniIPS1, it will immediately begin to operate according to the settings already programmed. The most basic level of Stop/Start control can be done by switching the power on and off.

| Command | Notes |
|---|---|
| # | When the instrument is running, the miniIPS1 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.<br><br>Note: 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. |

### 4.3.2 Communications setup

Communication settings can either be changed using Terminal X2, configure or by # commands in Terminal X2 #command input or a third party terminal program.

| 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 miniIPS1 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<br>Sensor address "03" begin sampling |
| Example: | 00:#028<br>All sensor addresses begin sampling |

### 4.3.3 Sampling pattern

The miniIPS1 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. 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. |

Some examples are provided in the following subsections.

#### 4.3.3.1 Continuous data output at 4 Hz

```
#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).

#### 4.3.3.2 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).

#### 4.3.3.3 Burst mode, 80 readings over 5 seconds, once per minute. Output the average value

```
#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.).

### 4.3.4 Pressure tare

The pressure sensor fitted to the miniIPS1 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.

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 datum 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.

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 datum 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.

| Command | Notes |
|---|---|
| #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 |
| #009 | Unit takes a single reading to use as the Tare value. Output at that pressure should now be approximately zero. |

### 4.3.5 Data output formats

The miniIPS1 has a selection of different data output formats built in, allowing easy interface to software packages and third-party instrumentation.

#### 4.3.5.1 Units

The default output units for the miniIPS1 are deciBar (dBar), equivalent to 0.1Bar, or approximately 1m of seawater. The miniIPS1 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.

| Command | Notes |
|---|---|
| #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<br>Sets latitude to 50.426° (50° 25’ 34”), (Totnes UK). |

All output formats are affected by changing the output units.

#### 4.3.5.2 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 |

#### 4.3.5.3 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 |

#### 4.3.5.4 NMEA format

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

#### 4.3.5.5 HYPACK format

| | |
|---|---|
| Command: | #013;HYPACK |
| Format: | 009.9 0000.0 |
| Notes: | Output Data + Spare field |

#### 4.3.5.6 Digiquartz format

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

#### 4.3.5.7 Digiquartz CDL format

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

### 4.3.6 Information # codes

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

| Command | Notes |
|---|---|
| #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. |

# 5 Care and Maintenance

The miniIPS1 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 use, rinse all parts in fresh water removing any growth or debris as necessary, but take exceptional care not to touch or damage the pressure diaphragm itself if fitted.

Any damage to the diaphragm will render the instrument warranty invalid

| | |
|---|---|
|  | 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.<br>Take exceptional care not to touch or damage the diaphragm itself as irreparable damage can result. |

After cleaning, simply store in the packing case provided.

## 5.1 Calibration

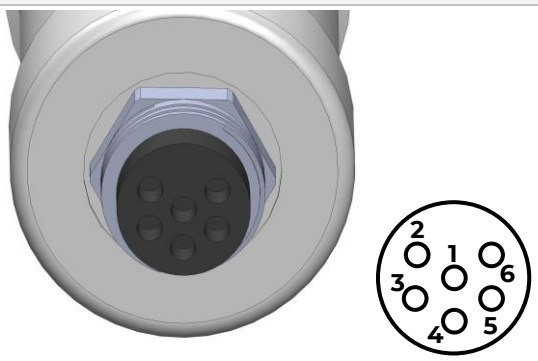
The miniIPS1 may be returned to Valeport or one of its approved laboratories for recalibration, or it may be re-calibrated by the customer using a Class A deadweight tester, or defined standard of the customer's choosing.

To return the instrument to Valeport for calibration, please request an equipment RMA from service@valeport.co.uk.

# 6 Wiring Information

It is advised that continuity checks are performed prior to all terminations.

## 6.1 SubConn MCBH6F

| Pin | Function | View (sensor connector) |
|---|---|---|
| 1 | RS232 GND |   |
| 2 | RS232 Tx (out of sensor) or RS485A(-) | |
| 3 | RS232 Rx (into sensor) or RS485B(+) | |
| 4 | Sensor power +V | |
| 5 | Enable 485<br>N/C for RS232 | |
| 6 | Sensor Power -V | |

## 6.2 USB Interface Y lead

Systems are supplied with a short (50cm) USB interface Y lead for testing

| SubConn 6 pin male (MCIL6M) | | USB 4 mm Banana |
|---|---|---|
| Pin | Function | Pin |
| 1 | RS232 GND | USB |
| 2 | RS232 Tx (out of sensor) or RS485A(-) | |
| 3 | RS232 Rx (into sensor) or RS485B(+) | |
| 4 | Power +V | Red banana plug |
| 5 | Link to Pin 1 for RS485.<br>N/C for RS232 | |
| 6 | Power -V | Black banana plug |

# 7 Part Numbers

| | |
|---|---|
| 0760023-xx | miniIPS1<br>Fitted with:<br>• 0.01% piezo-resistive sensor<br>Supplied with:<br>• Interface lead<br>• Operating manual and transit case |
| Notes:<br>XX denotes pressure transducer range. Select from 10, 20, 30, 50, 100, 200, 300, 400 or 600 Bar | |
| **Spares** | |
| 0760054 | Thread protector (black) |
| 0650102 | Transducer cover/cap |
| 0650344 | Transducer cover tool |
| 0652EA1-USB | USB interface cable |
| CAUSB12 + CAUSB12TC | USB card drive and case |
| SG1 | Silicone grease |
| **Accessories** | |
| 0760055 | Calibration Adaptor<br>(Also needs BS010MS Dowty seal) |

# 8 Declarations of Conformity

## 8.1 EU Declaration of Conformity - CE Marking

### EU Declaration of Conformity

| | |
|---|---|
| Manufacturer: | Valeport Ltd |
| Address: | St Peter's Quay, Totnes, Devon, TQ9 5EW |
| Certification marking: | CE |
| Product Description: | miniIPS1 |

We the manufacturer declare that the product miniIPS1, 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 4.1b) | BS EN IEC 63000:2018 |

| | |
|---|---|
| Name: | Den Lakin |
| Position: | Development Engineer |
| Place of Issue: | Valeport Ltd, Totnes, UK |
| Date of Issue: | 02/12/2022 |
| Signature: | D.Lakin |

**Valeport Limited**
St. Peters Quay, Totnes, Devon TQ9 5EW UK
+44 1803 869 292
sales@valeport.co.uk | **valeport.co.uk**

VAT No: GB 165 8753 67 | Registered in England No: 10535323

## 8.2 UK Declaration of Conformity - UKCA Marking

# UK Declaration of Conformity

| | |
|---|---|
| Manufacturer: | Valeport Ltd |
| Address: | St Peter's Quay, Totnes, Devon, TQ9 5EW |
| Certification marking: | UKCA |
| Product Description: | miniIPS1 |

We the manufacturer declare that the product miniIPS1, is in conformity with the following UK Statutory requirements and designated standard(s):

| Electromagnetic Compatibility Regulations 2016 | Standards |
|---|---|
| EMC<br>(SI 2016 No.1091) | BS EN 61326-1:2013 (Basic Level),<br>BS EN 60945:2002 |

| RoHS Directive 2015/863/EU | Standards |
|---|---|
| Prevention (Article 4.1b) | BS EN IEC 63000:2018 |

| | |
|---|---|
| Name: | Den Lakin |
| Position: | Development Engineer |
| Place of Issue: | Valeport Ltd, Totnes, UK |
| Date of Issue: | 02/12/2022 |
| Signature: | D.Lakin |

**Valeport Limited**
St. Peters Quay, Totnes, Devon TQ9 5EW UK
+44 1803 869 292
sales@valeport.co.uk | **valeport.co.uk**

VAT No: GB 165 8753 67 | Registered in England No: 10535323