BreatheSafe

Part of AireSafe

Handheld Differential Pressure Monitor (HHDPM)
User Manual

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1.0 Overview

1.1 Features

The Handheld Differential Pressure Monitor (HHDPM) is a rechargeable differential pressure sensor. It can be used to record the pressure generated by cabin air filtration systems on the onboard o-led display and/or the graphical user interface. The HHDPM features the following:

- Rechargeable battery
- O-LED Display
- Visualizes pressure data in real time (via application)
- Data logging application for Windows and Mac OS

1.2 Technical Specifications

Parameter	Rating	Units
Pressure range	0 – 2000	Pa
Battery lifetime (1)	110	Hours
Operational temperature (2)	-20 – 60	°C

Notes:

1. The minimum battery lifetime is calculated assuming continuous use.
2. To prevent damage to the battery, do not store in temperatures outside of 0 - 25°C.

Caution:

- The device contains a lithium-polymer battery. Do not open the case or attempt to replace/remove the battery in the case of damage to the case or battery.

Part Number

200142

Required Equipment

Pressure reference tube, used to target pressure sensing location (4mm O.D. nylon hose).

Scan to access this manual online.

https://www.breathe-safe.com.au/manuals/

2.0 Guides

2.1 Calibration of HHDPM

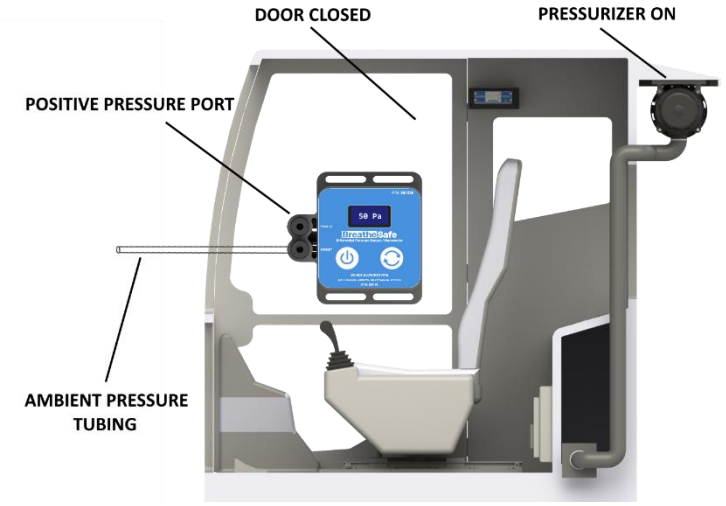
1. Power on the handheld differential pressure sensor.
2. **Connect the 'Ambient' port to the 'Positive' port with a pressure reference tube.**
3. Check the display is reading '0'.
4. If not, re-zero the sensor by pressing .
5. After 5 seconds the display should read 0 Pa.

2.2 Enclosure Pressure

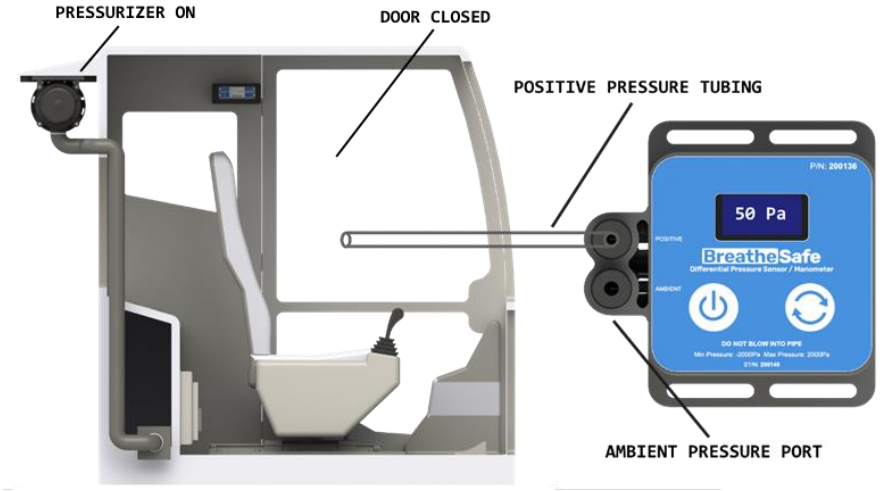
1. The HHDPM measures the pressure differential between two locations. The 'Positive' (top) port measures the pressure level inside the enclosure. This can be done by placing the sensor inside the enclosure or running pressure reference tube from the port to the enclosure.
2. The 'Ambient' (bottom) port measures the reference pressure level outside the enclosure. If the sensor is inside the enclosure, connect one end of the pressure reference tube to the 'ambient' port and run the other end outside the enclosure.
3. Both ports should reference still air, **away from direct airflow such as HVAC vents**.

2.3 Data Logging

1. Open the HHDPM application on a PC to access the graphical user interface.
2. Connect a USB cable to the HHDPM USB port and connect it to a USB port on the computer.
3. Select the HHDPM port on the serial port drop down on the HHDPM application. To check the port on Windows, open 'Device Manager' and navigate to 'Ports (COM & LPT),' the serial port should be labelled 'USB Serial Port (COMX)'.
4. Click 'Start sampling' to begin data acquisition.
5. The collected data can be viewed on the graphical user interface or downloaded by clicking 'Download data'.



Sensor Inside the Cabin: Attach pressure tubing to the **ambient** pressure port and place the other end of the pressure tube outside of the cabin.



Sensor Outside the Cabin: Attach pressure tubing to the **positive** pressure port and place the other end of the pressure tube inside of the cabin.

3.0 Device Features

3.1 Differential Pressure Ports

To correctly measure enclosure pressure, the sensor needs a reference for both the inside and outside pressures. The positive pressure port must reference the inside of the enclosure and the ambient pressure port must reference the environment outside the enclosure.

Kinks and other restrictions in the pressure tubes can affect pressure readings, avoid these if possible. Ensure that there isn't direct airflow on the pressure tube opening as this will affect pressure readings. When connecting a pressure tube to the pressure fitting, ensure that the tube cannot be pulled out of the fitting – this is to allow for a leak-free connection. To release the tube from the fitting, pull the tube while applying downward pressure on the quick connect.

1. Positive pressure port
2. Ambient pressure port
3. Charging LED
4. USB-C port
5. Re-zero button
6. Power button
7. Display

3.2 Power Button

The power button toggles the device's power. After 10 minutes, the device will automatically power off to preserve battery life. To start data-logging, the device must be powered on – it will then automatically power off after 30 minutes.

Holding down the power button will command the sensor to show instructions for data logging which is outlined in section 2.3 and 4.0.

3.3 Re-zero Button

The re-zero ⟳ button forces the device to recalibrate the sensor. During the re-calibration sequence, the user must ensure both pressure ports are reading the same pressure i.e. The differential pressure must be 0 pascals. This can be guaranteed by connecting the two pressure ports together with a tube. Otherwise, it is recommended to have both pressure ports exposed to the same body of air. The pressure offset calculated by the pressure sensor will be shown briefly after a successful recalibration and the message 'Re-zero success!' will be shown on the main display afterwards.

Holding the re-zero button for two seconds resets the minimum and maximum values on the main display. The message 'MIN and MAX reset!' will be shown on the display when successfully reset.

3.4 O-LED Display

When first powered on, the device will initiate a re-zero calibration of the pressure sensor to compensate for sensor drift over time. If the device has been re-zeroed before, it will display the differential pressure reading in pascals on power-up.

Below the differential pressure reading, the minimum and maximum pressure readings can be found. These values reset after each power cycle and can be reset manually by holding the re-zero ⟳ button for 2 seconds.

3.5 Charging Indicator LED

The charging led is located at the bottom of the device beside the USB port. This indicates the charging state of the device. While plugged in, an orange light indicates that the battery is charging. It will take 3 hours to charge the battery to max capacity. A green light indicates that the battery is fully charged.

3.6 USB Port

The USB port allows the HHDPM to charge and log data on the HHDPM Logger application. The supplied usb cable can be used to charge and connect to the HHDPM.

4.0 Data Logging Software

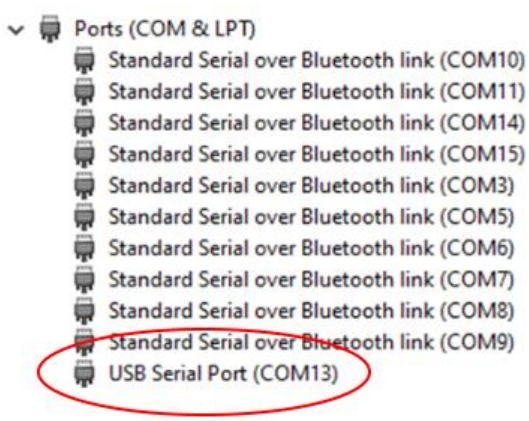
4.1 Application Overview

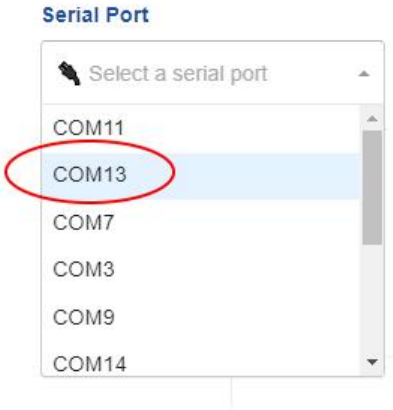
The data-logging software allows the user to visualize pressure data while the HHDPM is connected to a PC. Data acquisition begins when the user selects a serial port and clicks 'Start sampling' while the HHDPM is turned on. The user can select a time range for measurements using the start/end time input boxes to view a specific time frame. To download the measured data in a .csv format, the user can click the 'Download Data' button.

4.2 User Interface Elements

4.2.1 Serial Port

After connecting the HHDPM to a PC or Laptop, the connected serial port must be identified. The serial port can be identified by opening 'device manager' on a Windows machine and navigating to the heading 'Ports (COM & LPT)', the serial port should be labelled 'USB Serial Port (COMX)'. Select this COM port in the 'Serial Port' dropdown in the app.



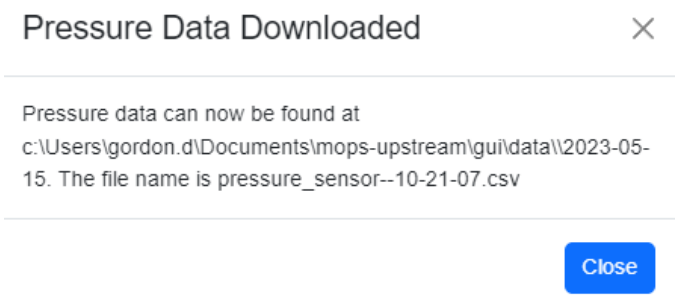


4.2.2 Start/End Time

The start and end time can be specified in the respective input boxes. The specified start/end times need to be specified in 24-hour time. The start-time must be specified. The end-time can be left empty to graph the data from the start-time to the last sampled value.

4.2.3 Download Data

When there is data available, the option to download data will be available. Downloading the data will save sampled pressure readings to a .csv file with the file structure “pressure sensor--hh:mm:ss.csv” located in the downloads folder. The data will be formatted as follows: date, time, pressure. The data is sampled and saved with a one second resolution.



date	time	pressure
26/04/2023	11:27:10	0
26/04/2023	11:27:11	0
26/04/2023	11:27:12	0
26/04/2023	11:27:13	0
26/04/2023	11:27:14	1
26/04/2023	11:27:15	58
26/04/2023	11:27:16	0
26/04/2023	11:27:17	0
26/04/2023	11:27:18	0
26/04/2023	11:27:19	0
26/04/2023	11:27:20	0
26/04/2023	11:27:21	61
26/04/2023	11:27:22	147
26/04/2023	11:27:23	212
26/04/2023	11:27:24	257
26/04/2023	11:27:25	291
26/04/2023	11:27:26	313
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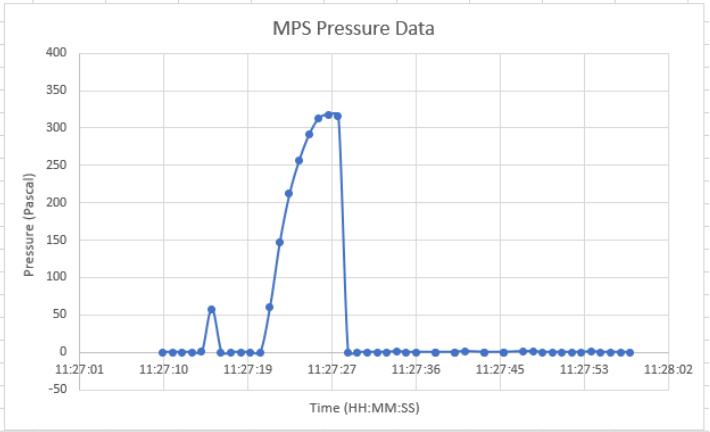
26/04/2023	11:27:28	316
26/04/2023	11:27:29	0



4.2.4 Start/Stop Sampling

After a serial port has been selected, the user can toggle the start/stop sampling button to start and stop data acquisition on the GUI. The device must be connected before beginning data sampling.

4.2.5 Reset Time Range

The start time and end time can be reset to beginning of data acquisition and last sample respectively by clicking ‘Reset time range’. This is the standard time range unless specified otherwise with the start/end time input boxes.

SENSOR VALIDATION

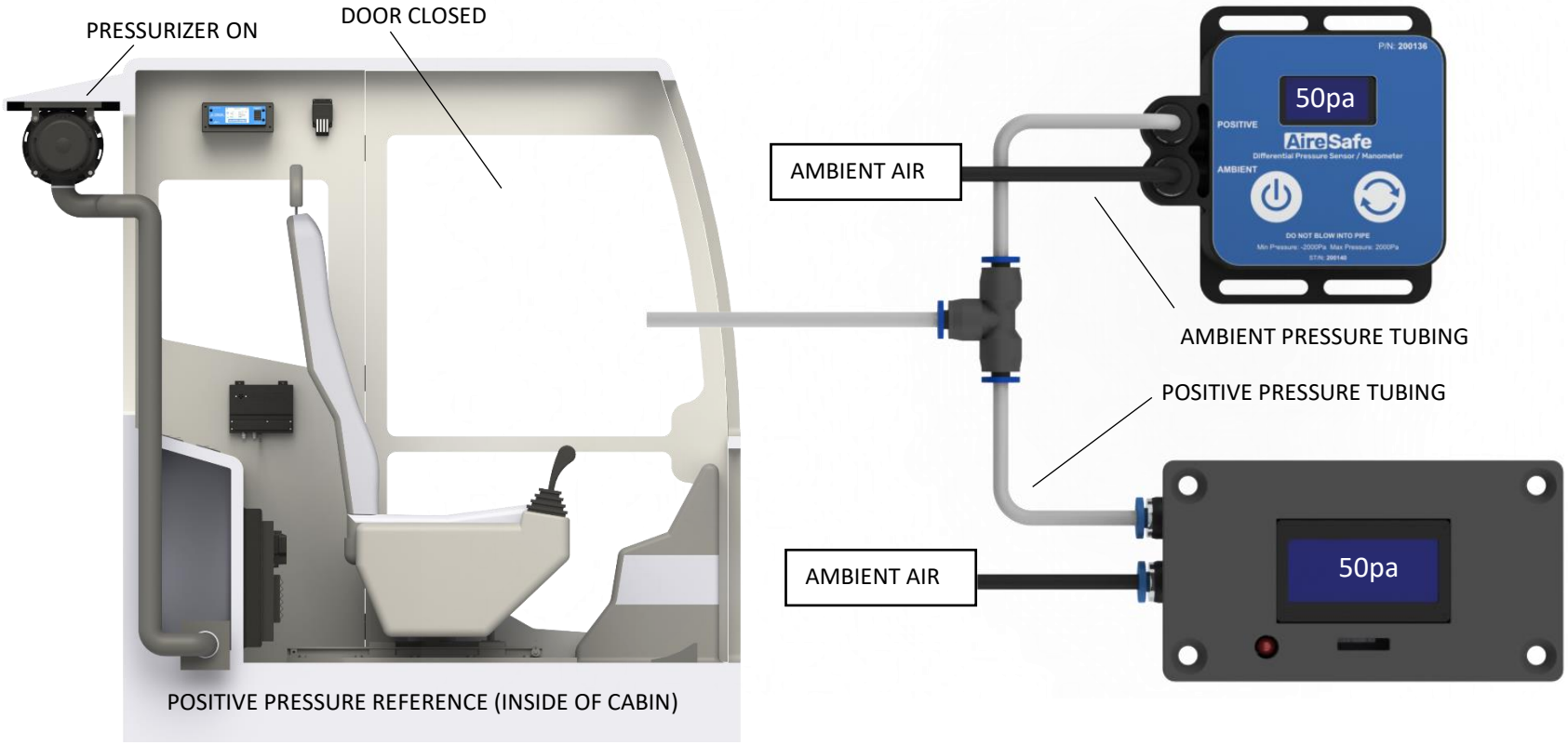
5.0 Quick Cabin Pressure Sensor Validation using HHDPM

The Handheld Differential Pressure Monitor (HHDPM) can be used to quickly check a pressure controllers calibration through the following method.

1. Calibrate the HHDPM through the steps detailed in section 2.1.
2. Using the provided T-pieces, share the positive pressure ports between the controller and HHDPM as shown in the diagram below.
3. Power on the controller and HHDPM, ensuring that the cabin is sealed and pressuriser running.
4. If the pressure readings differ by more than 5pa, the controller requires calibration.

Important points:

- Pressure readings may be heavily influenced by the presence of wind using this test method
- Turbulent ambient air will effect pressure readings
- Discrepancies in pressure tube length should be avoided if possible
- Ensure pressure tube is not damaged or kinked.



WARRANTY

Express Warranty

All BreatheSafe products carry a warranty against defects in materials or workmanship, provided the defects are not from factors outside of BreatheSafe's control (including neglect, lack of maintenance, improper installation or operation, unauthorized servicing repair, etc.). BreatheSafe will replace goods defected in material or workmanship at our Queensland factory or designated branch*. All parts deemed as failed or faulty must be returned to BreatheSafe for evaluation unless otherwise stated in writing.

Note- Systems must be installed and commissioned as per BreatheSafe installation and commissioning instructions. Once commissioned, the online commissioning sheet must be filled in, extending the components warranty as below. In addition, the system must be serviced and maintained correctly and by trained and qualified personnel. This requisite includes BreatheSafe technicians, qualified automotive air-conditioning technicians, or qualified auto electricians.

Warranty period – Standard

- 1 year or 10,000 hours (whichever occurs first).
- Controllers – 1 year no extended warranty option.
- Warranty Period Extension when commissioning documents are registered online within 28 days of installation
- Extended warranty** only offered if commissioning maximum pressure test reaches at least 250Pa.
- Brushless motor fixed speed two years, or 10,000 hours (whichever occurs first).
- Variable speed brushless motor 15,000 hours, or 3 years** (whichever occurs first).

Must be supplied with a variable speed pressure controller, data download required for 3-year warranty option. Link to online Commissioning and Extended Warranty Registration form https://www.breathe-safe.com.au/commission/

What is not covered under Express Warranty?

- Failures are due to incorrect application.
- Damage resulting from neglect, misuse, lack of maintenance, improper installation, or operation, inappropriate or abnormal use, accidental or unauthorized servicing repair.
- Failures are due to parts not being sold or approved by BreatheSafe.
- Failures arising from any other cause that is not directly related to a defect in material or workmanship.

This Express Warranty is VOID if the product is altered, modified, or used in the manner it was not designed for, also including unauthorized repairs, or using maintenance and repair parts other than those supplied by BreatheSafe.

BreatheSafe responsibilities

If there is a defect in material or workmanship not caused by the excluded failures during the warranty period, BreatheSafe will either replace the defective goods at our Queensland factory, or designated branch. *

Alternatively, BreatheSafe may elect to provide new replacement parts, BreatheSafe approved repair parts or assembled components needed to repair the defect. BreatheSafe reserves the right to provide a refund of the purchase price in lieu of replacement or repair at BreatheSafe's discretion. The replacement or repaired product will be sent to you freight prepaid by the customer or made available for pick-up on site.

Users Responsibilities

The customer should ensure that the system is maintained according to BreatheSafe service requirements and only authorized parts must be used to service and maintain BreatheSafe systems. In the event of a suspected warranty claim, BreatheSafe should be contacted in the first instance to arrange the repair or to assist with diagnosis. Claims should be made within one week of the repair.

After contacting BreatheSafe, you may be required to deliver or send the parts to BreatheSafe's Queensland factory or designated branch. * Link to online Warranty claim form https://www.breathe-safe.com.au/warranty/

Exclusion and Limitations on Damages and Remedies

This warranty is provided in lieu of all other warranties, written or oral, whether expressed by affirmation, promise, description, drawing, model, or sample. To the extent allowed by law, all warranties other than this warranty, whether express or implied, including implied warranties of fitness for a particular purpose, are disclaimed. The maximum liability of BreatheSafe under this warranty shall not exceed the original purchase price of the product. Interference with the equipment by or abuse, or by operating the equipment at ambient temperatures or with electrical power characteristics outside the ranges indicated in our specification shall be excluded from this warranty, as shall consequential damages.

Excluded from any express warranty are costs incurred in relation to service outside our factory our designated service branch, including traveling time, waiting time, transport costs, mechanical and overtime payments required. As per Australian Consumer Law: You are entitled to choose a refund or replacement for major failures with goods. If a failure with the goods or service does not amount to a major failure, you are entitled to have the failure rectified in a reasonable time. If this is not done, you are entitled to a refund for the goods and to cancel the contract for the service and obtain a refund of any unused portion. You are also entitled to be compensated for any other reasonably foreseeable loss or damage from a failure in the goods or service.

***This express warranty gives you specific legal rights, and you may also have other rights that vary from country to country.**