thermoscientific

Compatible Sensors for Smart-Vue Pro Duo / Quatro Data Logger

Emerald Wireless Remote Sensor
Triple - CO_2, Temperature and Humidity Sensor
Differential Pressure Sensor

Supplemental User Guide

331942H01 • Revision B • 12/21/2020

IMPORTANT Read this instruction manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION All internal adjustments and maintenance must be performed by qualified service personnel.

Material in this manual is for informational purposes only. The contents and the product it describes are subject to change without notice. Thermo Fisher Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo be held liable for any damages, direct or incidental, arising from or related to the use of this manual.

Contents

Notices and Safety

Smart-Vue Pro Data Logger

IMPORTANT NOTE: Do not use this product for protection or as part of an automated emergency system or as for any other application that involves protecting people and/or property. This product is designed for use in environments where children are not likely to be present. Customers and users of Thermo Scientific products are responsible for ensuring that the product is fit for the intended usage. Do not open the product casing and do not disassemble or modify internal components in any manner. Thermo Scientific products do not contain any internal components that require user intervention or repair. If the device shows signs of improper operation, disconnect it immediately from its power source or remove the battery and contact Thermo Scientific technical services.

Electrical Warning

CAUTION: To reduce the risk of electric shock, do not open or remove the product casing. No user serviceable parts inside. Refer servicing to qualified service personnel. The lightning flash with arrowhead symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to a person.

Battery Warning

CAUTION: This product contains two non rechargeable 3.6V lithium batteries. Plugging the device into the AC adapter (USB) does not recharge the batteries. Ensure you respect polarity (+/-) as indicated inside the battery compartment while inserting batteries into Thermo Scientific devices. Reversing polarity by inserting the batteries incorrectly can cause the product to heat up and may lead to battery liquid leakage. Use only batteries recommended by Thermo Scientific. Do not use a different type of battery such as rechargeable, alkaline and magnesium or use batteries of different brands or even different types of batteries of the same brand. Never dispose of batteries in fire. Do not charge regular batteries that are not specifically rechargeable. When the battery is low or in case the battery-operated device in question remains unused for a lengthy period of time remove the battery from the device in order to avoid any risk of battery liquid leakage. Never leave batteries within the reach of children. In case of a battery leak, avoid all contact with the liquid present on the batteries. Rinse with clear water immediately in case the battery liquid comes into contact with the eyes, mouth or skin. Contact a doctor or emergency service immediately. Battery liquid is corrosive and can damage vision or cause blindness or chemical burns.

Device Maintenance

CAUTION: Do not attempt to disassemble the device. There are no user serviceable parts inside.

CAUTION: Do not misuse the device. Follow instructions on proper operation and only use as intended. Misuse could make the device inoperable, damage the device and / or other equipment or harm users.

CAUTION: Do not apply excessive pressure or place unnecessary weight on the device. This could result in damage to the device or harm to users.

CAUTION: Do not use this device in explosive or hazardous environments.

CAUTION: Do not expose your device to any extreme environment where the temperature or humidity is high. Such exposure could result in damage to the device or fire.

CAUTION: Do not expose the device to water, rain, or spilled beverages. It is not waterproof. Exposure to liquids could result in damage to the device.

CAUTION: Do not place the device alongside computer discs, credit or travel cards or other magnetic media. The information contained on discs or cards may be affected by the device.

CAUTION: Using accessories, such as antennas, that Thermofisher has not authorized or that are not compliant with Thermofisher accessory specifications may invalidate the warranty.

Emerald Wireless Remote Sensor

Disclaimer and Limitation of Liability

OCEASOFT assumes no responsibility for any loss or claims by third parties which may arise through the use of this product. In particular, users must not use the product in any manner not specifically indicated by OCEASOFT. OCEASOFT shall not be held liable for improper use of this product. This document is non-contractual and subject to change without notice.

Safety Instructions

IMPORTANT NOTE: Do not use this product for protection or as part of an automated emergency system or as for any other application that involves protecting people and/or property. Customers and users of OCEASOFT products are responsible for making sure that the product is fit for the intended usage. Do not open the product casing and do not disassemble or modify internal components in any manner. OCEASOFT products do not contain any internal components that require user intervention or repair. If the device shows signs of improper operation, disconnect it immediately from its power source and contact OCEASOFT technical services.

Battery Warning

CAUTION: This product contains a lithium battery. Make sure you respect polarity (+/-) when inserting batteries into OCEASOFT devices. Reversing polarity by inserting the batteries incorrectly can cause the product to heat up, and may lead to battery liquid leakage. Use only batteries recommended by OCEASOFT. Do not change battery types, such as rechargeable, alkaline and magnesium, or use batteries of different brands, or even different types of batteries of the same brand. Incorrect batteries may cause the device to heat up, and may result in a fire or battery liquid leakage. Never dispose of batteries in fire. Do not charge regular batteries that are not specifically rechargeable. When the battery is low, or in case the battery-operated device in question remains unused for a lengthy period of time, remove the battery from the device in order to avoid any risk of battery liquid leakage. Never leave batteries within the reach of children. In case of a battery leak, avoid all contact with the liquid present on the batteries. Rinse with clear water immediately in case the battery liquid comes into contact with the eyes, mouth or skin. Contact a doctor or emergency service immediately. Battery liquid is corrosive and can damage vision or cause blindness or chemical burns.

Certifications and Compliance

Smart-Vue Pro Data Logger

FCC Statements

FCC part 15 modular qualification:

FCC IDs:

- Contains Bluetooth component 2AA9B04.
- Contains LoRaWAN™ component XTLCMABZ.

This paragraph pertains to 915 MHz Smart-Vue Pro™ wireless devices. This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should not be less than 20 cm (8 inches) during normal operation. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IC Statements

Industry Canada RSS-210 modular qualification.

IC:

- Contains Bluetooth component 12208A-04.
- Contains LoRaWAN™ component 9337A-CMABZ.

This paragraph pertains to 915 MHz Smart-Vue Pro™ wireless devices. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

CE - Conformity with European Regulations

This paragraph pertains to 868 MHz Smart-Vue Pro™ wireless devices. The Thermo Scientific product (contains Bluetooth component BMD-300, LoRaWAN component CMWX1ZZABZ) is compliant with the essential requirements and other relevant requirements of the following standards and/or normative documents.

Directives:

- 2014/53/EU Radio Equipment Directive (RED)
- 2014/30/EU EMC Directive
- 2014/35/EU Low Voltage Directive
- 2011/65/EU and the amendment of (EU) 2015/863 Restriction of Hazardous Substances Directive.

In application of the following standards:

- ETSI EN 300 220-2 V3.1.1
- EN 301 489-1 V2. 2.1
- EN 301 489-3: V2.1.1
- EN 301 489-17 V3. 2.1
- EN 300 328 V2. 2.2
- EN 61326-1:2013
- UL/CSA 61010-1: 2012 3rd edition and
- IEC/EN 61010-1: 2010 3rd edition.

CAUTION: Any changes or modifications not expressly approved by Thermo Scientific could void the user's authority to operate the equipment.

RoHS Compliance

The wireless device is in compliance with the EU Directive 2011/65/EU (Restriction of the Use of Certain Hazardous Substances in Electronic and Electrical Equipment) and the amendment of (EU) 2015/863. Do not dispose of this product with household trash. Thermo Scientific recycles this product under certain conditions. Contact us for more information.

Emerald Wireless Remote Sensor

FCC Statements

FCC part 15 modular qualification:

FCC ID: 2AA9B04

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC CAUTION: Any changes or modifications to this equipment not expressly approved by OCEASOFT may cause, harmful interference and void the FCC authorization to operate this equipment.

FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IC Statements

Industry Canada RSS-210 modular qualification.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

CE - Conformity with European Regulations

OCEASOFT Emerald (bluetooth component BMD-300) is compliant with the essential requirements and other relevant requirements of the following standards and / or normative documents.

Directives:

- 2014/53/EU Radio Equipment Directive (RED)
- 2014/30/EU EMC Directive
- 2014/35/EU Low Voltage Directive

In application of the following standards:

- EN 300 220-2 V3.1.1
- EN 300220 -1 V3.1.1
- EN 300328 V2.2.2
- IEC 61010-1: 2010 AMD1:2016
- IEC 62368-1: 2014 (2nd Edition)
- EN 61326-1: 2013
- IEC 60950-1:2005 (2nd Edition)+ A1:2009 + A2:2013
- EN 301 489-17 V3.2.1
- EN 301 489-3: V2.2.1
- EN 301 489-1 V2.2.1
- EN 61000-6-2: 2005
- EN 61000-6-4: 2007 / A1: 2011
- IEC 62311: 2017 Recommandation 1999/519/CE Directive 2013/35/UE

MIC (Japan)

This equipment contains specified radio equipment that has been certified to the Technical Regulation Conformity Certification under the Radio Law.

- BMD-300 Type Acceptance Number: 210-106799

Australia / New Zealand

The BMD-300 radio equipment in this device has been tested to comply with the AS/NZS 4268:2012 / AMDT 1:2013, radio equipment and systems – short range devices – limits and methods of measurement.

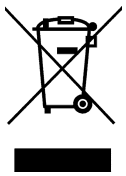
Bluetooth

- RF-PHY Component (Tested) – DID: D030629
- QDID: 81876

WEEE Compliance

This wireless device complies with the essential requirements and other relevant provisions of the Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE Directive).

Environmental Protection



Respect local regulations concerning disposal of packaging, unused wireless devices and their accessories and promote their recycling.

RoHS Compliance

RoHS Compliant

The wireless device complies with the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2011/65/EU, 2015/863 Restriction of Hazardous Substances Directive (RoHS Directive). Do not dispose of this product with household trash. OCEASOFT recycles this product under certain conditions. Contact us for more information.

Differential Pressure Smart Sensor; Temperature, Humidity and CO_2 Smart Sensor

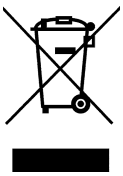
California Proposition 65

CAUTION: This product can potentially expose you to chemicals including lead, which is known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov

WEEE Compliance

This device complies with the essential requirements and other relevant provisions of the Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE Directive).

Environmental Protection



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Introduction

This user guide covers three Smart Sensor models that are compatible with the Smart-Vue Pro data logger:

- Emerald Bluetooth connected wireless remote sensor
- Triple - CO_2, Temperature and Humidity sensor
- Differential pressure sensor.

The focus in this document is mainly on physical / hardware aspects of the Smart Sensors listed above.

Where to go for more information:

- For general instructions for using your Smart-Vue Pro data logger, see the Smart-Vue Pro data logger user guide.
- For details about configuration and data logging, see the Smart-Vue Pro web application user guide.

Emerald Bluetooth Enabled Wireless Remote Sensors

Smart-Vue Pro data loggers are equipped with Bluetooth low energy connectivity to use Emerald sensors as wireless remote sensors. Emerald sensors can have an integrated temperature sensor or an external Pt100 probe. This enables you to monitor and manage equipment in hard-to-access locations or where it is impractical to connect wired sensors to your Smart-Vue Pro data logger.

CAUTION: Emerald Bluetooth sensors must have firmware version 2.3.2 or higher to function as wireless remote sensors with Smart-Vue Pro data loggers as described in this chapter.

Wired and wireless remote sensors connected to a Smart-Vue Pro data logger offer the same web application usage and functionality.

Figure 1. Smart-Vue Pro data logger with Emerald Wireless Remote Sensor (Integrated Temperature Sensor)

Figure 2. Emerald with external Pt100 sensor

You can use any combination of wired or wireless remote sensors with your Smart-Vue Pro data loggers with up to two active wireless remote sensors on Smart-Vue Pro Duo or up to four on Smart-Vue Pro Quatro.

For the Smart-Vue Pro data logger to detect your nearby Emerald wireless remote sensor, you must first activate Bluetooth on the sensor as described below. The Smart-Vue Pro data logger cannot discover a wireless remote sensor if it is disabled or in standby mode.

Wireless Remote Sensor Calibration

It is important to calibrate the sensors on your Smart-Vue Pro data loggers to fine-tune the accuracy of readings. The calibration procedure for wireless remote sensors is typically handled by a qualified metrology laboratory which determines precise correction coefficients and loads them directly in the Emerald wireless remote sensor's memory.

CAUTION: Calibration parameters are stored directly in Emerald sensors to adjust readings for maximum accuracy. Calibration parameters cannot be edited via the Smart-Vue Pro web application.

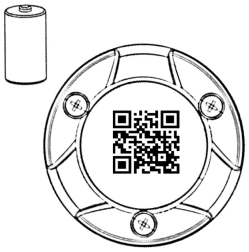
Key Specifications

- **Measured Ranges**:
  - Emerald with internal sensor: -40°C to +85°C.
  - Emerald with external Pt100 probe (available for) -50°C to +200°C or -200°C to +50°C.
- **Protection index**: Conforms to IP44 for Emerald with internal sensor, IP40 for Emerald with external sensor + PT100 sensor, ABS / polycarbonate.
- Operating environment for internal and external Emerald sensor without Pt100 probe:
  - -40°C to +85°C.
  - 0 to 90% relative humidity non-condensing.

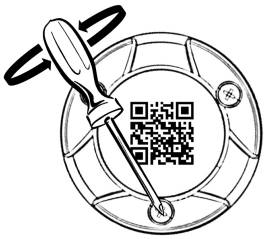
Inserting the Battery into your Emerald Sensor

Emerald wireless remote sensors feature a replaceable battery. Follow these steps to insert or replace the battery.

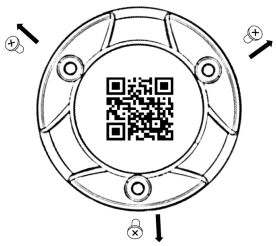
1. The Lithium battery is provided in the product box.



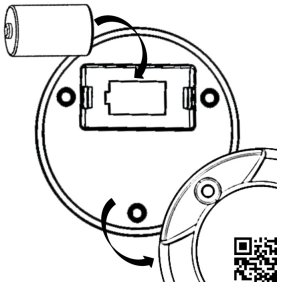
2. Unscrew the three screws on the back of the sensor (turn counterclockwise).



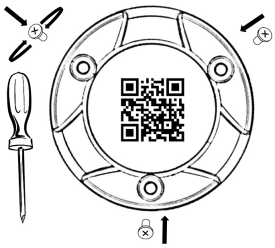
3. Remove the screws.



4. Place the battery in the slot, respecting polarity.



5. Replace screws (turning them clockwise). Ensure that the rubber seal is well seated.
6. Your sensor is ready to use.



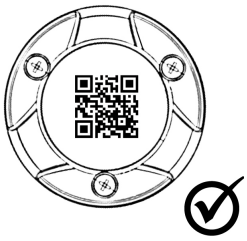


Figure 3. Inserting the battery in your emerald sensor

Activating an Emerald Wireless Remote Sensor

In order for a Smart-Vue Pro data logger to be able to detect an Emerald wireless remote sensor, you must first activate the sensor as described here:

1. Place the “strong” side of the magnet (the side without the adhesive tape) in the circular recess on the back of the Emerald sensor and leave it there until the Smart-Vue Pro data logger detects it. The non-adhesive side of the magnet is noticeably stronger than the other.

Figure 4. Place the magnet on the sensor module to activate bluetooth

2. Bluetooth connectivity is enabled and the LED blinks blue. Once Smart-Vue Pro data logger discovers the Emerald sensor, you may remove the magnet.

When within wireless range, the wireless remote sensor appears in the sensor pairing screen of the Smart-Vue Pro data logger. You may connect to it at any time as described in **Pairing a Bluetooth Wireless Remote Sensor**.

Identifying the Strong Side of the Magnet

The magnet has a “weak” side and a “strong” side. Here is a hint to help you identify which side is which: the metal ring inside the hole is close to the edge on the “weak” side of the magnet. The deeper recess on the other side indicates the “stronger” side.

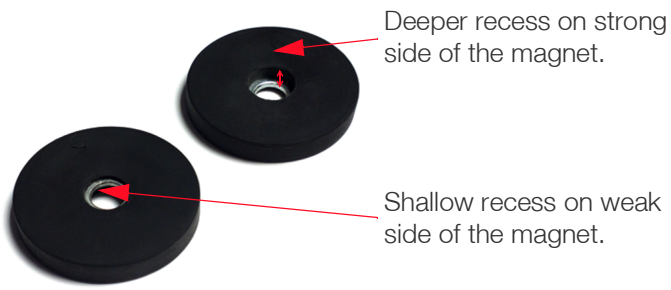


Figure 5. Strong vs weak side of the magnet

Mounting your Emerald Sensor

Using the Magnet

You may use the magnet to mount your sensor on appropriate surfaces (wood, plaster, etc.). To do this, run a screw through the central hole to fasten the magnet with the strong side (non-adhesive) facing the Emerald then place the sensor onto the magnet as shown here:

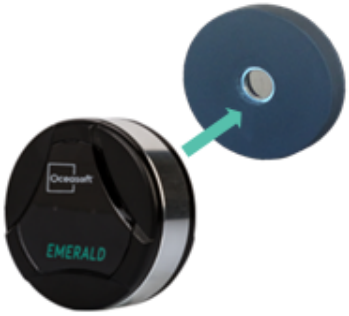


Figure 6. Mount the sensor on the magnet after fastening it to a suitable surface

Using Adhesive Tape

You may also choose to mount the Emerald sensor using the provided adhesive tape.

Note: Clean the magnet before using the adhesive tape on it.

Using Wireless Remote Sensors with your Data Loggers

Pairing a Bluetooth Wireless Remote Sensor

The Smart-Vue Pro data logger supports both wired and wireless remote sensors. As mentioned previously, wired sensors are detected and configured automatically by the data logger when they are physically plugged into the unit.

Pairing the Smart-Vue Pro data logger with a wireless remote sensor is easy when following the guided touch screens below:

CAUTION: This section covers supported Emerald Bluetooth sensors (firmware version 2.3.2 or higher; check with your authorized representative if you need more information).

To pair your wireless remote sensor:

1. Tap the menu icon ☰ ⇨ Sensors ⇨ Remote sensors.
2. Enter your PIN code as configured in the Smart-Vue Pro web application and tap **OK**.
3. Tap **Pair remote sensors**.

4. The Smart-Vue Pro data logger searches for compatible sensors within wireless remote range. At first, if no sensors are found, you may see this message:

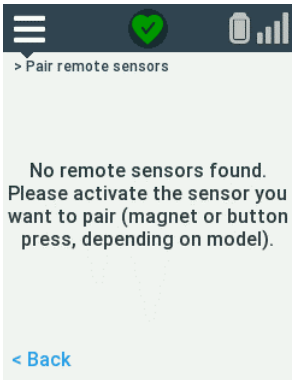


Figure 7. Message pending bluetooth sensor discovery

Only sensors with Bluetooth activated can be discovered. If your wireless remote sensor does not appear in the list or if you do not know how to activate it, refer to the instructions in **Activating an Emerald Wireless Remote Sensor**. If the Emerald module is activated, you may need to wait a few seconds before it is discovered and listed by the Smart-Vue Pro data logger.

5. When discovered, your sensor is displayed on the screen.

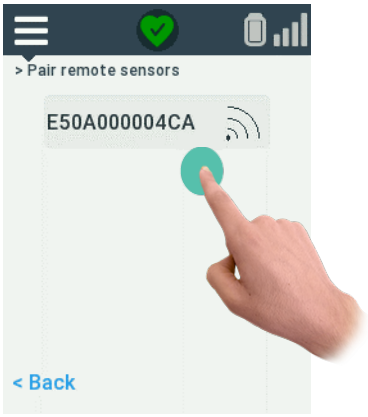


Figure 8. Tap to pair the wireless remote sensor

Note: Sensors with data logging currently activated or already connected to another Smart-Vue Pro data logger cannot be paired.

6. Tap the sensor and confirm the connection by tapping **OK**.
7. Wait until pairing is complete which may take a few seconds. Once pairing is successful, tap **OK**. The wireless remote sensor is now paired with your data logger and shown just like any other sensor connected to the data logger ☰ ➪ Sensors ➪ Show sensors.

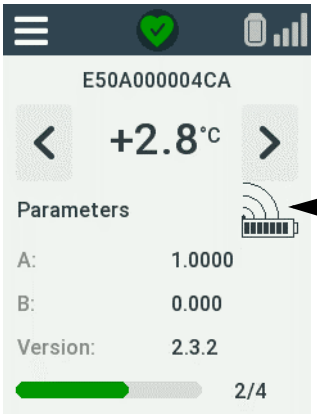


Figure 9. Wireless remote sensor indicated by battery counter and wireless icon

8. Repeat the above steps if you want to pair additional Bluetooth data loggers.
9. Tap the menu icon ☰ to return to the home screen.

If a problem occurs during the pairing procedure, check the instructions in **Appendix 1 - Troubleshooting** before attempting to pair again.

Unpairing an Emerald Wireless Remote Sensor

To unpair your Emerald sensor:

1. Tap the menu icon ☰ ➪ Sensors ➪ Remote sensors
2. Enter your PIN code and tap **OK**.
3. Tap Unpair remote sensors.
4. Choose the sensor you want to unpair and press **OK** to confirm unpairing:

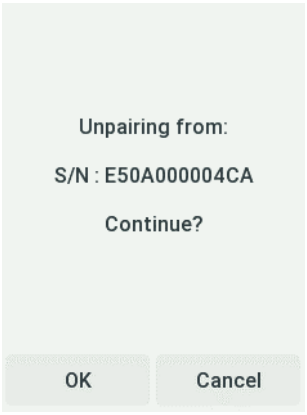


Figure 10. Unpairing a wireless remote sensor

5. Wait until the unpairing process is complete which may take a few seconds then tap **OK**. The wireless remote sensor is removed from the list.

Resetting a Wireless Remote Sensor's Battery Counter

To reset the Emerald wireless remote sensor's battery counter (only after removing or replacing batteries), use the Reset battery option on your Smart-Vue Pro data logger.

CAUTION: Only perform this action if you actually install a new battery in your Emerald wireless remote sensor module.

To reset the wireless remote sensor's battery counter:

1. Tap the menu icon ☰ ⇨ Sensors ⇨ Remote sensors.
2. Enter your PIN code and tap **OK**.
3. Tap Reset battery.
4. Sensors that are currently paired with the Smart-Vue Pro data logger are displayed. Tap to select the serial number of the sensor whose battery you have changed and wish to reset.

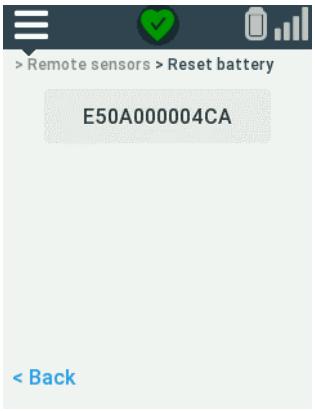


Figure 11. Resetting a wireless remote sensor's battery counter

5. Tap **OK** to confirm that you want to reset the battery counter.
6. Tap again on **OK** to return to the remote sensors menu when done.

CAUTION: The above instructions only affect the battery contained in Emerald wireless remote sensors, not the Smart-Vue Pro data logger itself.

Swapping Sensors

The purpose of the Smart-Vue Pro Swap sensor feature is to replace a Bluetooth wireless remote sensors while it is currently being used for data logging.

Wired Sensors

With your Smart-Vue Pro data logger, you may directly swap wired sensors that are physically connected to your data logger such as for recalibration or to replace damaged cables. Wired sensors may be replaced at any time whether data logging is running or not. You must ensure that the existing and replacement sensors are identical in type.
The process is completely transparent and guarantees continuity while avoiding down-time or interruptions.

Emerald Wireless Remote Sensors

With wireless remote sensors connected via Bluetooth, you must use the Smart-Vue Pro data logger interface to swap wireless remote sensors. To do this, the following conditions must be met:

- Data logging must be currently running using the wireless remote sensor you want to replace.
- The new wireless remote sensor must also be paired with the Smart-Vue Pro data logger (up to four remote sensors may be paired with Quatro data logger).
- The two wireless remote sensors must be of the same type.
  For example, both must be the same type of Emerald internal or external (with Pt100 probe) sensor.

Note: When Four (4) maximum wireless remote sensors are paired with the Smart-Vue Pro data logger, data logging needs to be stopped for at least one wireless remote sensor in order to use the swap functionality.

To swap sensors:

1. Tap the menu icon ☰ ⇨ Sensors ⇨ Remote sensors.
2. Enter your PIN code and tap **OK**.
3. Tap **Swap sensor**.
4. Tap to select the sensor to replace and tap **OK** to confirm.

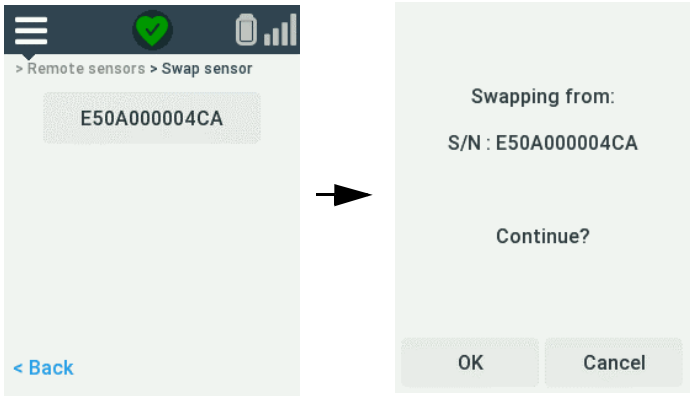


Figure 12. Choose the current wireless remote sensor you want to replace

5. Tap to highlight the sensor to use (which must already be paired with your Smart-Vue Pro data logger) and tap **OK** to confirm.

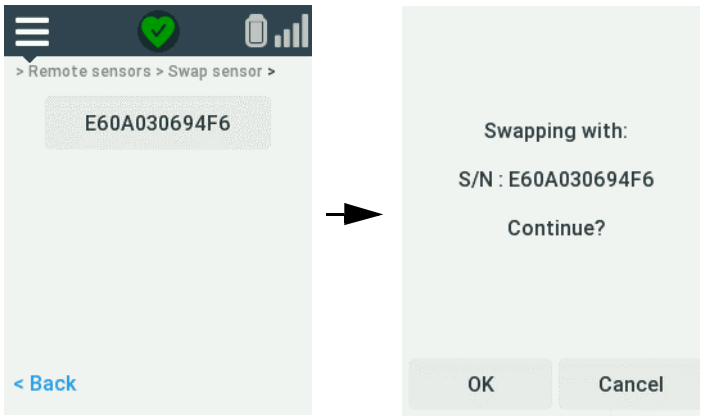


Figure 13. Choose the new wireless remote sensor

6. A confirmation message is shown when the process is complete.

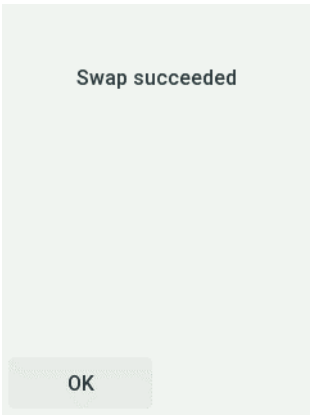


Figure 14. Confirmation message that the swap process is complete

7. Tap **OK** ⇨ menu icon ☰ to return to the home screen.

The new sensor serial number is also taken into account automatically by the Smart-Vue Pro web application.

CAUTION: You may choose to unpair the first sensor if you do not expect to use it again on the same Smart-Vue Pro data logger. If data logging is not currently running, you may simply unpair the previous sensor and pair the new one.

Wireless Remote Sensors in Smart-Vue Pro Web Application

This section provides additional information regarding the use of wireless remote sensors in the Smart-Vue web application. The procedures mentioned here are described in complete detail in the Smart-Vue web application user guide.

Wireless remote sensors function identically to wired sensors in the Smart-Vue Pro web application. There are a few subtle differences to indicate that a wireless remote sensor is being used but behavior and usage are the same as for other wired sensors.

Wireless Remote Sensor on the Data Logger

If not done already:

1. Pair the wireless remote sensor with your Smart-Vue Pro data logger as described in **Pairing a Bluetooth Wireless Remote Sensor**.
2. Create the Smart-Vue Pro data logger in the web application by entering its serial number. Then either:
   - Click Refresh sensors to request an update of the sensor list (upon the next data transfer interval) or
   - Use the Smart-Vue Pro data logger synchronize function to update immediately, then click Refresh in the web application.
3. Once updated, the data logger (via the data logger menu) displays the wireless remote sensor with the Bluetooth logo as shown here:

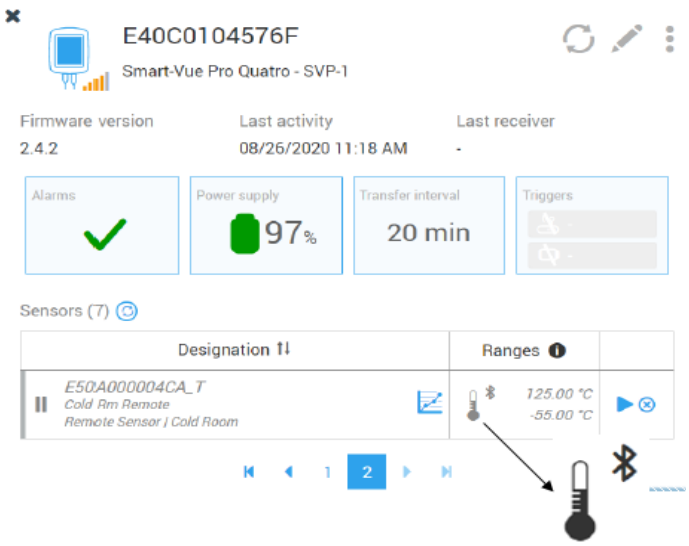


Figure 15. Wireless remote sensor shown on data logger

Wireless Remote Sensor in the Sensor List

In the sensor list, wireless remote sensors are indicated by their serial number and the Bluetooth logo, as shown here:

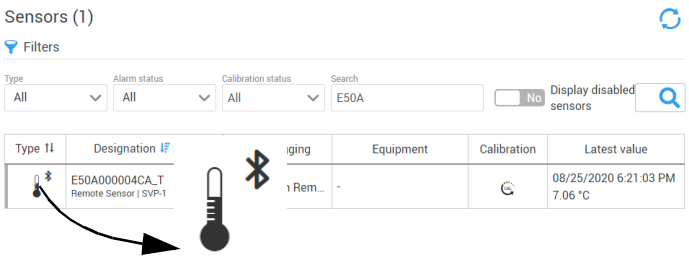


Figure 16. Wireless remote sensor shown in sensor list

Starting Data Logging with a Wireless Remote Sensor

To run a data logging session with this sensor, the process is identical to that for using a wired sensor (as described in more detail in the Smart-Vue Pro web application user guide):

1. Create equipment.
2. Assign the wireless remote sensor to it:

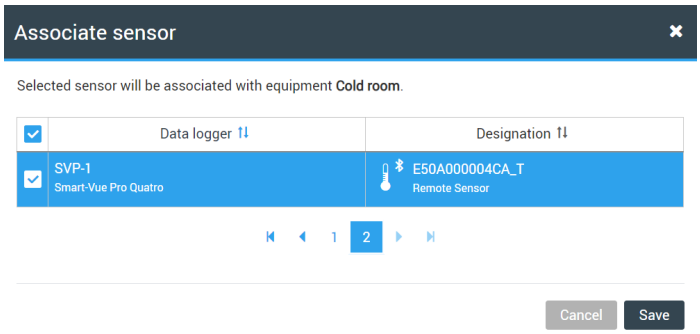


Figure 17. Assigning a wireless remote sensor to equipment

3. Click Start data logging:

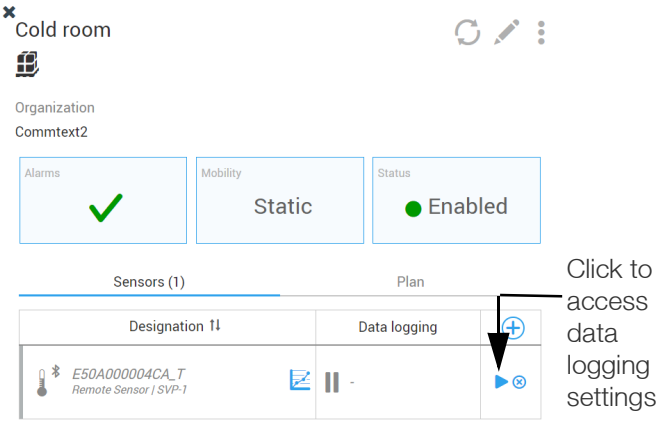


Figure 18. Click to configure and launch data logging

4. Enter your password and define settings as necessary for your data logging session.
5. Click Start to launch data logging using the wireless remote sensor.

Wireless Remote Sensor in Data Logger List

When you add a wireless remote sensor to a Smart-Vue Pro data logger then list data loggers via the data logger menu in the web application, you will also see the wireless remote sensor listed as a data logger device as shown here:

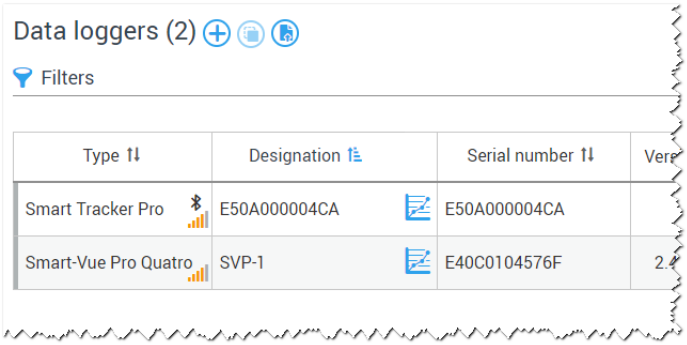


Figure 19. Click to configure and launch data logging

The wireless remote sensor is also indicated here as “Smart Tracker Pro” and is displayed purely for future use.

Wireless Remote Sensor Battery Indication

The wireless remote sensor battery percentage is shown under Smart Tracker Pro as below:

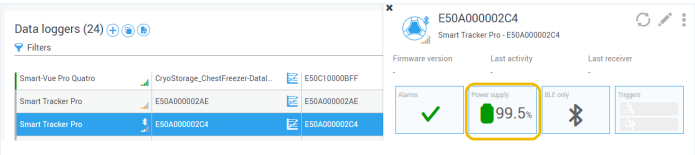


Figure 20. Wireless remote sensor battery indication

Emerald Battery

- User-replaceable lithium battery.
- Battery life upto 52 weeks with 1 minute read interval.
- To benefit from a full year of operation we recommend storing emerald modules between about 20°C and 30°C (68°F and 86°F).

Maintaining your Emerald Wireless Remote Sensors

Cleaning Instructions

You occasionally may need to clean your Emerald modules depending on site or environmental conditions.

Here are some recommendations and guidelines for cleaning your modules:

- Clean using a soft cloth with water, a detergent or isopropanol.
- Do not use any aggressive cleaning agents or scratching cleansers that might cause damage to your data logger.

CO_2, Temperature and Humidity Smart Sensor

Overview

The CO_2, temperature and humidity Smart Sensor is a triple-function device with three sensors. This Smart Sensor is designed to be placed upright inside an incubator and connected via the provided ribbon cable to a Smart-Vue Pro data logger placed outside the incubator.

CAUTION: Do not place the data logger inside the incubator. Remove the CO_2, temperature and humidity sensor from inside the incubator during decontamination procedures (which may expose the sensor to damaging heat/environment).

CAUTION: Failure to remove sensor from incubator during decontamination cycle will result in damage to the sensor, requiring complete sensor replacement, and is not covered under warranty.

Figure 21. Ribbon cable connecting to sensor unit inside incubator

The complete kit is shown here (Smart-Vue Pro data logger sold separately):

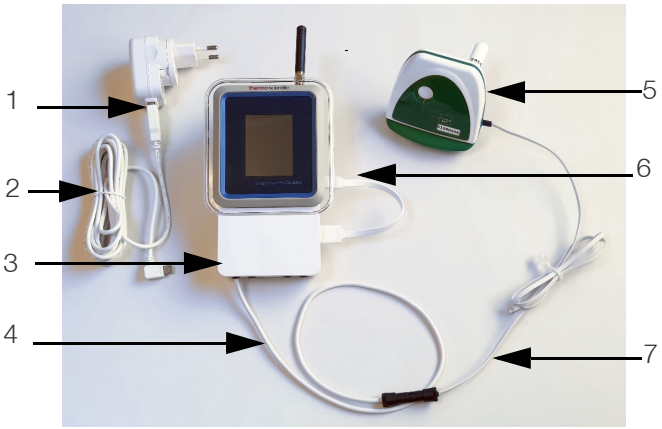


Figure 22. Complete CO_2, Temperature and Humidity Sensor Assembly

The various components in the **Figure 22** are as follows:

Table 1. Description of Figure 22

S. No	Description
1	AC adapter, provided with several international plugs.
2	USB charging cable, plugged into AC adapter on left-hand side of Smart Sensor extension.
3	Smart Sensor extension cradle, connected to the bottom of the Smart-Vue Pro data logger.
4	Smart Sensor extension connector cable.
5	Triple CO_2, temperature and humidity sensor.
6	USB junction cable from Smart Sensor extension providing power to Smart-Vue Pro data logger.
7	4-wire flat ribbon cable to connect sensor with Smart Sensor extension.

The CO_2 sensor is contained inside the casing with the dual temperature and humidity sensor attached to the back, as shown here:

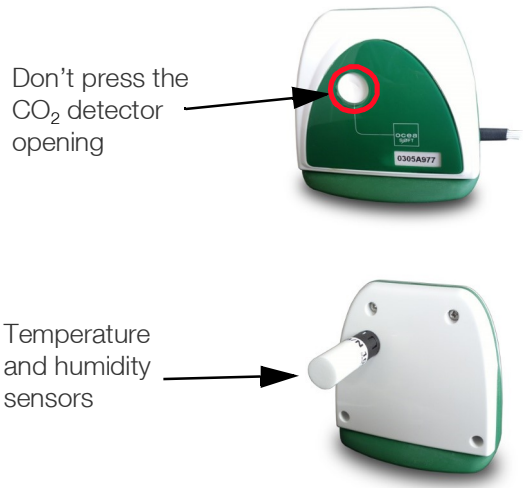


Figure 23. Sensor locations on unit

CAUTION: CO_2 detector opening is not a button and therefore should not be pressed with fingers or other objects.

Key Specifications

- **Measured ranges**
  - **CO_2:** 0 to 9.99% CO_2
  - **Temperature:** 0°C to +50°C (+32° to +122°F)
  - **Humidity:** 0 to 95% RH non-condensing
  - **Dimensions (sensor unit):** 3.1 x 3.0 x 1.8 inches (80 x 77 x 46 mm)
- Flat cable length: 37.40 inches (950 mm)
- IP44 protection, plastic casing (ABS, Polycarbonate) with PTFE filter
- **Operating environment**
  - 0°C to 50°C (32° to 122°F)
  - 0 to 90% RH non-condensing for indoor use

Contact your Thermo Fisher Scientific representative for details regarding sensor accuracy, drift and calibration.

Placing the Sensor and Smart-Vue Pro Data Logger

Follow these instructions to assemble and place your triple sensor unit.

1. Place the sensor unit upright inside the chamber to be monitored being sure to place the flat ribbon cable flush with the door joint.

Note: Your cable may be different than that shown in the following figure.

Figure 24. Ribbon cable lays flat beneath door joint

2. Ensure that the sensor unit stays in an upright position.

Figure 25. Sensor unit inside incubator

3. Clip the Smart Sensor extension firmly onto the bottom of the Smart-Vue Pro data logger.

Figure 26. Slide the Smart-Vue Pro data logger onto the extension cradle

4. Plug one end of the longer USB charging cable into the AC adapter and the other end into the left-hand side of the Smart Sensor extension (1), then plug the adapter into a wall socket with power. Plug the shorter USB charging cable into the Smart Sensor extension and the Smart-Vue Pro data logger (2) – this cable provides power to the Smart-Vue Pro data logger.

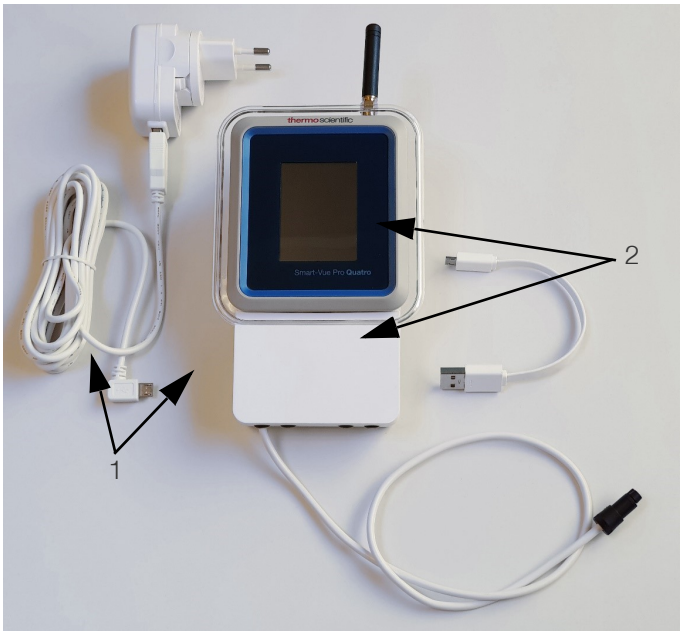


Figure 27. Power connections for triple sensor unit

5. Connect the Smart Sensor extension cable to the sensor ribbon cable:

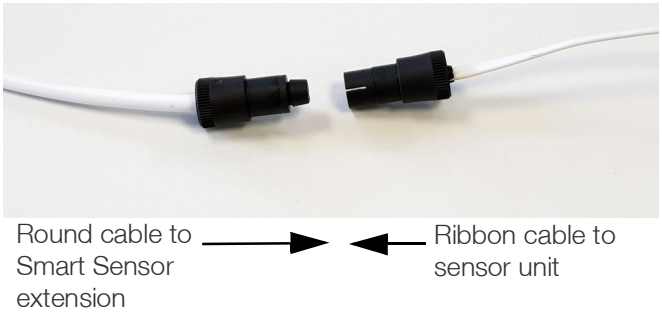


Figure 28. Join the sensor cables together

6. Connect the temperature humidity sensor unit to the back of the casing.

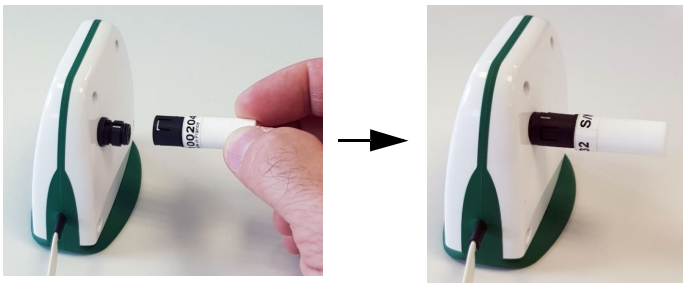


Figure 29. Place the Temperature / Humidity sensor behind the unit

7. The full kit looks like this:

Figure 30. Fully connected triple sensor assembly

8. Mount your Smart-Vue Pro data logger outside the incubator as described in the Smart-Vue Pro data logger

user guide and use the provided cable holders to attach or coil the excess cable neatly.

CAUTION: When routing sensor cables, avoid direct contact with or close proximity of sensor cabling with any high voltage wiring. Cabling should be placed with no less than a minimum of 2 inches (50 mm) distance from high voltage components. Also, avoid running the sensor cable in parallel with high voltage wiring. Contact your Thermo Fisher Scientific representative for instructions regarding proper sensor and cable placement.

Differential Pressure Smart Sensor

Overview

The differential pressure Smart Sensor extension clips on to the bottom of your Smart-Vue Pro data logger enabling you to compare the difference in pressure between two physically separated spaces. The sensor detects the difference in atmospheric pressure between where the Smart-Vue Pro is located and other spaces.

CAUTION: The USB port on the side of the Smart Sensor is not used at this time.

Figure 31. Smart-Vue Pro extension with differential pressure sensor

Usage

The Differential Pressure Smart Sensor is often used for monitoring in two different types of laboratory scenarios. In many laboratories, ambient air pressure is used to control the direction of particle flow. The differential pressure data logger is placed outside the cleanroom so that people know it is safe to enter, as shown in these two examples:

1. High pressure cleanrooms such as vaccine and organ transplant laboratories in which the ambient pressure is higher than the neighboring room, hallway or airlock in order to help keep particles from entering the cleanroom.

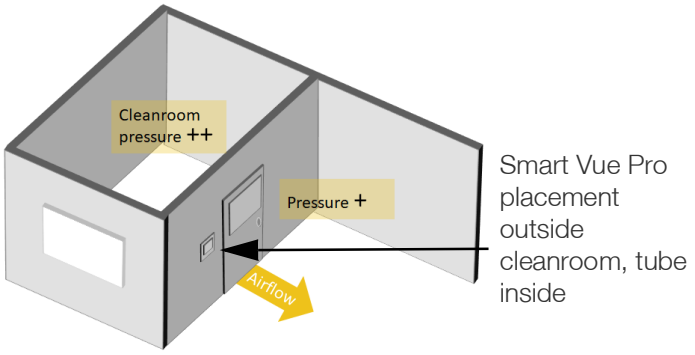


Figure 32. High pressure cleanroom keeps particles from flowing in

2. Low pressure cleanrooms such as virology laboratories in which the ambient pressure is lower than the neighboring room, hallway or airlock in order to help keep particles from exiting the cleanroom.

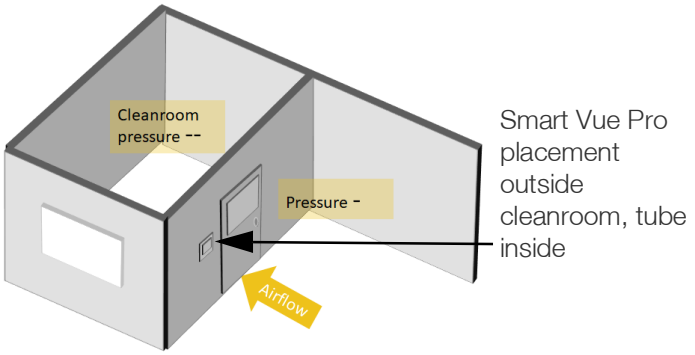


Figure 33. Low pressure cleanroom keeps particles from flowing out

You may cascade pressure control with an airlock before entering the cleanroom. Two differential pressure sensors could be used in this case.

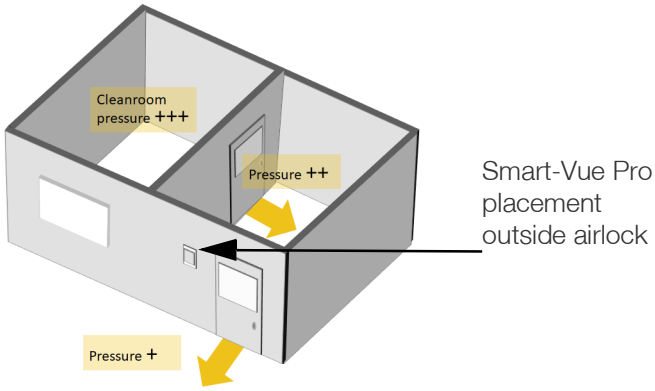


Figure 34. High pressure cleanroom with an airlock

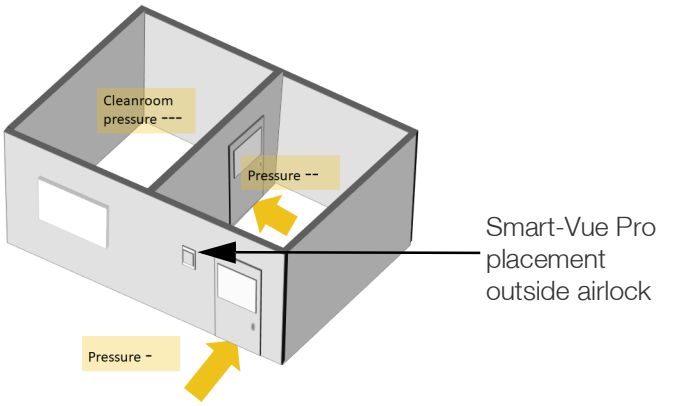


Figure 35. Low pressure cleanroom with an airlock

Tube Placement

With the Differential Pressure Smart Sensor:

- Air flowing into the high (+) opening produces a positive value on the display.
- Air flowing into the low (-) opening produces a negative value on the display.

A common way to use this sensor is therefore to plug the tube onto the high (+) connector and under normal conditions obtain positive values when monitoring high pressure cleanrooms and negative values when monitoring low pressure cleanrooms.

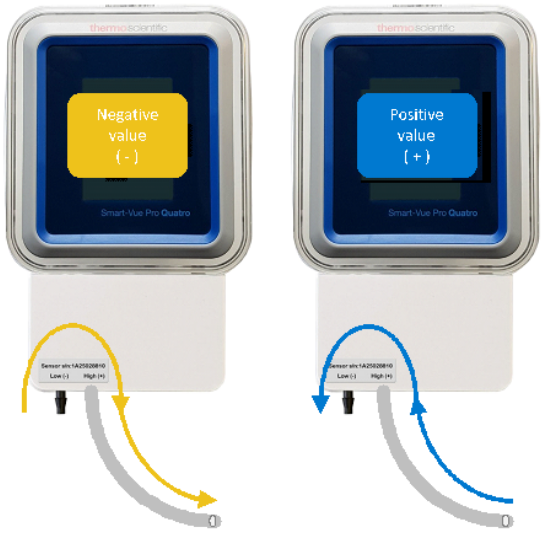


Figure 36. Monitoring a high pressure cleanroom and low pressure cleanroom

CAUTION: One of the input pairs must always be left open.

The complete kit is shown here (Smart-Vue Pro data logger sold separately):

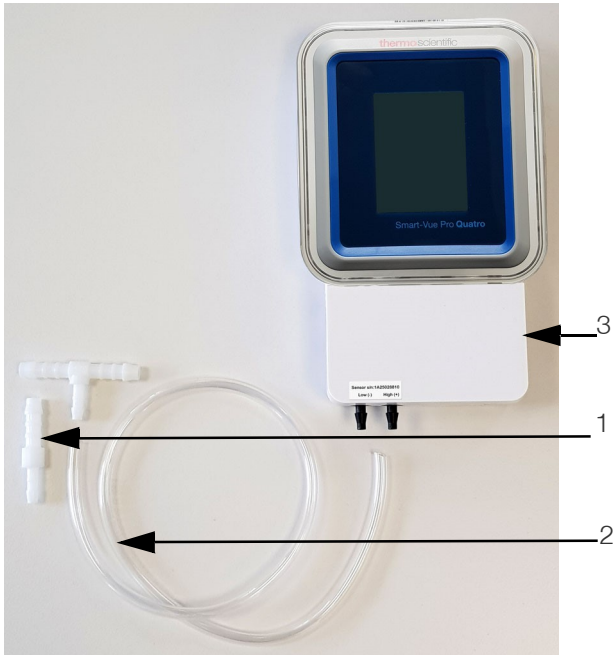


Figure 37. Complete differential pressure sensor assembly

The various components in the **Figure 37** are as follows:

Table 2. Description of Figure 37

S.No	Description
1	Internal diameter of 0.15748 to 0.19685 inches (4 to 5 mm) straight adapter; Internal diameter of 0.15748 to 0.19685 inches (4 to 5 mm) “T” adapter.
2	Clear Tygon® hose (diameter: Internal diameter of 0.15748 inches (4 mm); length: 19.685 inches (500 mm)) which can be connected to an existing pressure monitoring system. **Note:** Air flow through the sensor creates a dependence on the tube length. Contact us if you need assistance with this issue.
3	Smart Sensor extension cradle, connected to the bottom of the data logger.

Key Specifications

CAUTION: The Differential Pressure Smart Sensor draws its power from the Smart-Vue Pro data logger and thus does not require an additional power supply / battery. We recommend using the optional AC adapter for the data logger.

- Pressure measurable from -500 Pa to +500 Pa -2.0 to +2.0 inches H_2O (-50 mm to +50 mm H_2O).
- Provided Tygon® hose L: 19.685 inches (500 mm), Ø: Internal diameter of 0.15748 inches (4 mm); Internal diameter of 0.15748 to 0.19685 inches (4 to 5 mm straight adapter and “T” adapter).
- Full compatibility in air, Nitrogen (limited in O_2).
- Allowed overpressure: 1 bar (1,000 hPa, 4 inches (101.6 mm H_2O).

The Differential Pressure Smart Sensor can be integrated with tubing provided by an existing system. Tube length and diameter have a direct effect on pressure readings.

Contact your Thermo Fisher Scientific representative for details regarding sensor accuracy, drift, calibration and hose length.

Placement and Assembly

1. Place the differential pressure module in the appropriate location for your needs. Connect one end of the tube in the room to be monitored and connect the other end to the appropriate (+ or -) connector on the data logger.
2. Clip the Smart Sensor extension firmly onto the bottom of the Smart-Vue Pro data logger.

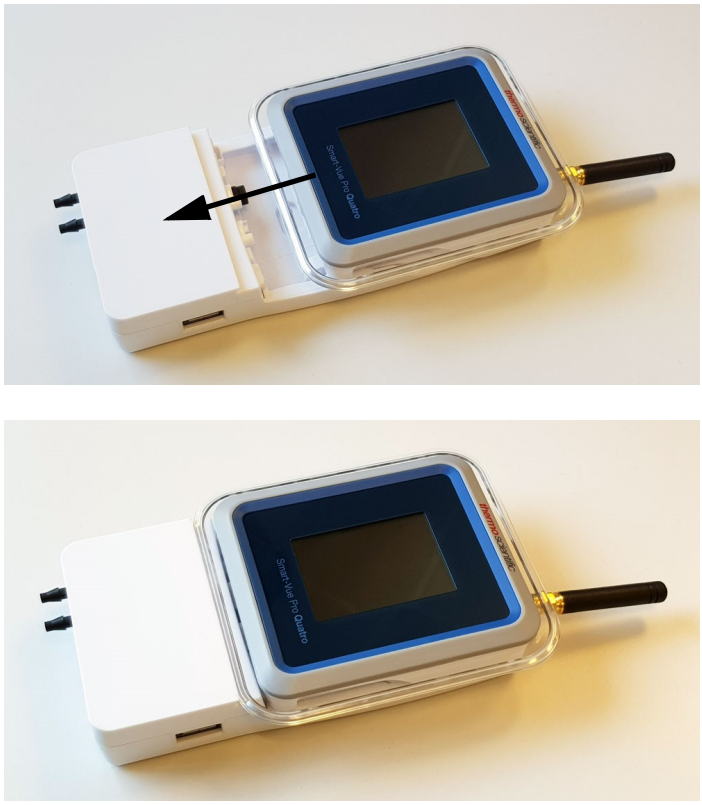


Figure 38. Slide the smart sensor extension onto Smart-Vue Pro data logger

3. Mount the Smart-Vue Pro data logger as desired for your situation.
4. Place the Tygon tubing firmly onto the appropriate connector, generally High (+), as described in **Tube Placement**.
5. Mount your Smart-Vue Pro module outside the cleanroom or airlock as appropriate.

Velcro location on Extension box

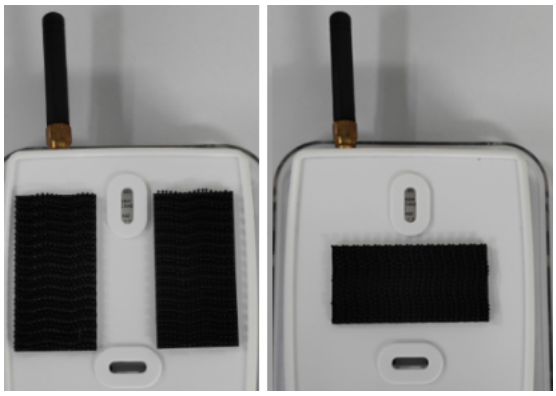


Figure 39. Velcro location

Appendix 1 - Troubleshooting

If you are having difficulties with your configuration, refer to these frequently asked questions before contacting technical support.

The wireless remote sensor I wish to pair does not appear on the Smart-Vue Pro data logger screen. What should I do?

To make a wireless remote sensor visible to your Smart-Vue Pro data logger ensure Bluetooth is enabled on the sensor as described in **Emerald Bluetooth Enabled Wireless Remote Sensors**, then follow the instructions in **Pairing a Bluetooth Wireless Remote Sensor** to pair both devices.

My Smart-Vue Pro data logger does not seem to be able to detect an Emerald Bluetooth module that I want to use as a wireless remote sensor.

In order to use an Emerald module as a wireless remote sensor on your Smart-Vue Pro data logger, the Emerald module must be compatible with the Smart-Vue Pro solution. Compatible modules are marked with an "X" on the sticker on the module, above the product name.

"X" indicates compatibility for use as wireless remote sensor

Figure 40. Compatible wireless remote sensors indicated by "X"

I cannot pair a wireless remote sensor that was previously discovered by my Smart-Vue Pro data logger. What should I do?

During pairing, the wireless remote sensor may enter "remote" mode internally but cannot be detected by your Smart-Vue Pro data logger. This can happen in case of a radio communication failure or when a factory reset is performed.

To pair the wireless remote sensor with your Smart-Vue Pro data logger, follow these instructions:

1. Remove the battery from the Emerald module and replace the battery (to deactivate "remote" mode).
2. Wait for the Smart-Vue Pro data logger to automatically pair the sensor.

My wireless remote sensor's calibration parameters are incorrect in the Smart-Vue Pro web application. What should I do?

During pairing, the Smart-Vue Pro data logger downloads calibration parameters from the wireless remote sensor. If wireless remote communication fails during the pairing process, the calibration parameters may be invalid in the web application. To fix this issue, use the Settings ➪ Sensors ➪ Refresh sensors function on the Smart-Vue Pro data logger to update sensor calibration parameters.

The unit or temperature range for my sensor is not displayed correctly in the Smart-Vue Pro web application. What should I do?

Under rare conditions, it may happen that the sensor's physical parameter (unit) or temperature does not appear properly in the Smart-Vue Pro web application. If that occurs, resynchronize the information by unplugging the sensor from the Smart-Vue Pro data logger and pressing Settings ➪ Refresh Sensors. Then plug the sensor back into the data logger and press on Settings ➪ Refresh Sensors again to push updated information to the web application.

Can external sensors be submerged in glycol?

Yes, for all metal-tipped sensors, but not the dual temperature/humidity sensor (with the white Teflon/PTFE casing). To "absorb" sudden variations in temperature, such as those caused by opening and closing the chamber door, you may submerge the metal part of the sensor in glycol or glycerol. This limits inconsequential temperature variations recorded by the sensor. Check your laboratory's quality guide for recommendations and make sure to use a volume of glycol that corresponds to the volume of product(s) you are monitoring. To achieve the same results, you may also delay the transmission of alarms via the software and leave the sensors exposed.

When the Emerald is used as a sensor, in what scenarios can the sensor failure alarm be observed in the Smart-Vue Pro web application?

Sensor failure can be observed in the following scenarios:

1. Sensor unpairing from the data logger.

2. When the battery is removed / discharged completely. This is observed as sensor unreachable in Smart-Vue Pro data logger.
3. When the Emerald goes out of range from the Smart-Vue Pro data logger.This is observed as Sensor unreachable in Smart-Vue Pro data logger.
4. When the External Emerald PT100 is removed / damaged.
5. When any other wired sensor is connected other than the external Emerald PT100.

Will the instant reading be displayed on the Smart-Vue Pro data logger when tapped on the screen after unpairing the wireless remote sensors from the Smart-Vue Pro data logger?

Instant reading screen is not displayed on the Smart-Vue Pro data logger when the wireless remote sensors are unpaired from the data logger during data logging.

In Smart-Vue Pro web application, why is the remove option disabled for the wireless remote sensors in the sensors page and enabled in the data logger page of the Smart-Vue Pro web application?

The Emerald has a specific handling in the sense that it has a battery (as opposed to the other sensors) and moreover, it can be a data logger too and not only a passive sensor. The very same module can have the 2 different ways of working, data logger VS sensor (but not simultaneously). So that's why it is shown in the data logger section too. Emerald data logger feature support is for future use.

Can the remote sensors be unpaired from the Smart-Vue Pro data logger during data logging when the remote sensors are unreachable from the Smart-Vue Pro data logger?

Yes, the remote sensors which are unreachable from the Smart-Vue Pro data logger can still be unpaired from the Smart-Vue Pro data logger with an error message display on the Smart-Vue Pro data logger "Operation incomplete: Remote sensor only unpaired locally.Reset your remote sensor to finish unpairing." To reset the remote sensor, disconnect the battery and connect the battery back again. then that particular remote sensor shall be visible in pairing list again.

During data logging, remote sensor is in out of range condition from the Smart-Vue Pro data logger and then the Emerald is unpaired from the Smart-Vue Pro data logger. Then how do we pair the remote sensor again when brought back within range of the Smart-Vue Pro data logger?

If the user tries to unpair the remote sensor which is in out of range from the Smart-Vue Pro data logger, a message is displayed on the Smart-Vue Pro data logger to reset the remote sensor to finish unpairing. So when the remote sensor is brought within range of the Smart-Vue Pro data logger, the user needs to reset the sensor (remove the battery and insert back again) to complete the unpairing process. Then user can pair the sensor again to the Smart-Vue Pro Duo/Quatro.

When the Emeralds are used as remote sensors, will the remote sensors store the data in the module during a Bluetooth network outage condition between Smart-Vue Pro data logger and the Emeralds?

In this case, this is exactly like a disconnected Smart Sensor: the remote sensor is unreachable and this is a sensor failure. There is no local reading storage in the Emerald in this scenario: readings are lost during this out of coverage period (exactly like a disconnected Smart Sensor).

How many maximum number of Emeralds can we pair to Smart-Vue Pro Quatro / Duo (not starting data logging, only pairing)?

Maximum 4 can be paired to both the Smart-Vue Pro Quatro and Smart-Vue Pro Duo. 4 can be started with the Smart-Vue Pro Quatro, 2 with the Smart-Vue Pro Duo.

When the battery of Emerald is low, will there be a low battery alarm generated or a communication failure alarm after the battery is completely discharged?

A low battery alarm is generated in the Smart-Vue Pro web application for the Emerald.

When the Emerald is operating in the low battery condition, will it accurately read the temperature until the battery drops to zero completely or will there be a difference in the temperature read?

The low battery condition of Emerald does not effect the reading accuracy of the sensor.

In the Smart-Vue Pro web application, how is the remote sensor icon shown on the watch mode tile?

In Smart-Vue Pro web application watch mode, remote sensor shall be shown as temperature icon without any Bluetooth symbol.

What happen for triple sensor when temperature / humidity sensor is removed?

When the temperature / humidity probe is removed from the triple sensor, a sensor failure is detected for the temperature and humidity parameters while the CO_2 parameter is in normal state logging the data as usual.

How does the user start data logging for triple and differential pressure sensors in the Smart-Vue Pro web application?

Triple sensor and Differential pressure sensor data logging procedure is similar to any other wired sensor used in the Smart-Vue Pro web application.

Does the Emerald device send a low battery alert to the data logger?

Emerald low battery indication is not shown on Smart-Vue Pro Duo/Quatro data logger, but Emerald low batery status / level are send to Webapp as described in section **Wireless Remote Sensor Battery Indication**.

Appendix 2 – Emerald Battery Life

Many factors have an influence on Emerald battery life, both during use and in storage before being used. Here are the main considerations to take into account when evaluating product battery life:

- **Ambient temperature:**

  Battery capacity is diminished when subject to very cold operating and/or storage conditions.

- **Wireless remote communications:**

  Bluetooth connections consume battery power. However, it is worth noting that the Smart-Vue Pro data logger reads Bluetooth advertising frames from the Emerald sensor without establishing power consuming connections.

Note: The reading frequency does not have significant impact on battery life.

Battery Details

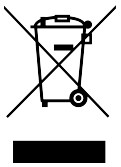
- **Type:** User-replaceable battery
- **Type Number:** ER ½ AA
- **CEI Designation:** 14250
- **System:** Primary Li-Thionyl / Chloride / LiSOCl2

CAUTION: Use only batteries recommended by Thermo Scientific. Incorrect batteries may cause the device to heat up, and may result in a fire or battery liquid leakage.

WEEE Compliance

Great Britain

WEEE Compliance. This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol. Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on our compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at www.thermofisher.com/WEEERoHS.

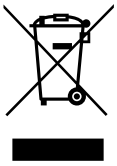


Deutschland

WEEE Konformittät. Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2012/19/EU erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Fisher Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen widerverwetet oder entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Scientific, dieVerwerter und Hinweise die Ihnen nützlich sein können, die Thermo Fisher Scientific Produkte zu identizfizieren, die unter diese RoHS. Anweisungfallen, finden Sie unter www.thermofisher.com/WEEERoHS.

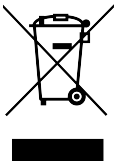
Italia

Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell' Unione Europea 2012/19/EU in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo. Thermo Fischer Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Fisher Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito www.thermofisher.com/WEEERoHS.



France

Conformité WEEE. Ce produit doit être conforme à la directive euro-péenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devraitêtre collecté ou recyclé par celles-ci.
Davantage d'informations sur laconformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider le détection des substances sujettes à la directive RoHS sont disponibles sur www.thermofisher.com/WEEERoHS.



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