VAISALA

USER'S GUIDE

PWA13
Calibration Kit for PWD Series

M211854EN-B

PUBLISHED BY

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CHAPTER 1

GENERAL INFORMATION

This document describes the PWA calibration kit for PWD22/52.

Version Information

Table 1 Document Revisions

Manual Code	Description
M211854EN-B	November 2016. Added note.
M211854EN-A	December 2015. First version.

Documentation Conventions

WARNING!

Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.

CAUTION!

Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

Note highlights important information on using the product.

Trademarks

RAINCAP® is a registered trademark of Vaisala.

Recycling

Recycle all applicable material.

Dispose of batteries and the unit according to statutory regulations. Do not dispose of with regular household refuse.

CHAPTER 2
PRODUCT OVERVIEW

The PWA13 calibration kit helps you check and adjust your PWD22/52.

Figure 1 PWA13 Calibration Kit

The kit contains:

- Two calibrated opaque glass plates (one for the receiver and one for the transmitter) with holders
- Zero-signal plug
- Calibrated optical filter assembly (for the transmitter)
- Tools for opening the instrument
- Calibration certificate
- User's Guide
- Lint-free cleaning cloth
- Space for the optional maintenance cable
- Space for window cleaning detergent

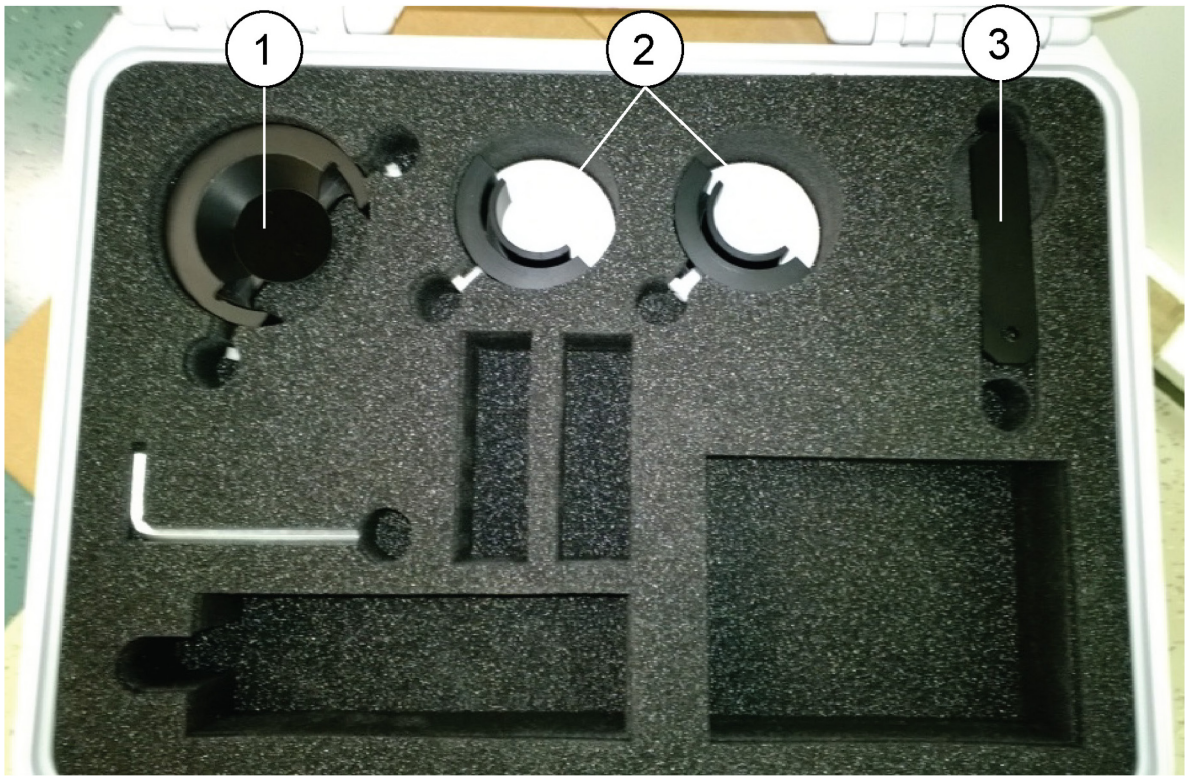

Figure 2 PWA13 Calibration Kit Content

1 = Optical filter assembly
2 = Opaque glass plates
3 = Zero signal plug

CHAPTER 3
OPERATION

Before you can give any commands to PWD22/52, you must assign the communication line in PWD22/52 to the operator. Otherwise, it is assigned to automatic messages or polled communication. You can assign the command mode with the **OPEN** command.

OPEN

If no device identifier (ID) is defined, type:

```
OPEN
```

If the ID is defined, for example, as A, type:

```
OPEN A
```

If the ID is defined but forgotten, type:

```
OPEN *
```

If there are two or more different sensors connected to the same RS-485 line, and if the sensors have the same ID, open PWD22/52 by typing the command:

```
OPEN PWD {id number}
```

PWD22/52 responds:

```
LINE OPENED FOR OPERATOR COMMANDS
```

If you do not give input within 60 seconds, PWD22/52 closes the line automatically.

CLOSE

Use the **CLOSE** command to release the line to automatic data messages or polling commands.

PWD22/52 responds:

```
LINE CLOSED
```

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CHAPTER 4
CALIBRATION

PWD22/52 is calibrated at the factory.

PWD22/52 needs recalibration if:

- You change the circuit boards
- There are warnings or alarms

The circuit boards do not need hardware calibration.

Vaisala recommends a periodic check every 6 months to check the visibility calibration using the PWA12 calibration kit. If the check shows less than ±5 % change, recalibration is not recommended, because the change is within the repeatability of the calibration procedure.

If any mechanical damage changes or weakens the optical measurement path, that is, either the receiver or the transmitter, or the cross arm supporting them, PWD22/52 must be replaced.

If the receiver unit (PWC22/52) or the transmitter unit (PWT11) is replaced, both visibility and contamination measurements need recalibration.

Visibility Calibration

You can check and adjust the calibration of a PWD series forward scatter sensor with the PWA13 calibration kit.

The **ZERO**, **CHEC**, and **CAL** commands are used in the procedure.

The calibration procedure checks three points:

- Zero scatter signal
- Very high scatter signal corresponding to a visibility of approximately 10 m
- Scatter signal that corresponds to a visibility of approximately 1000 m.

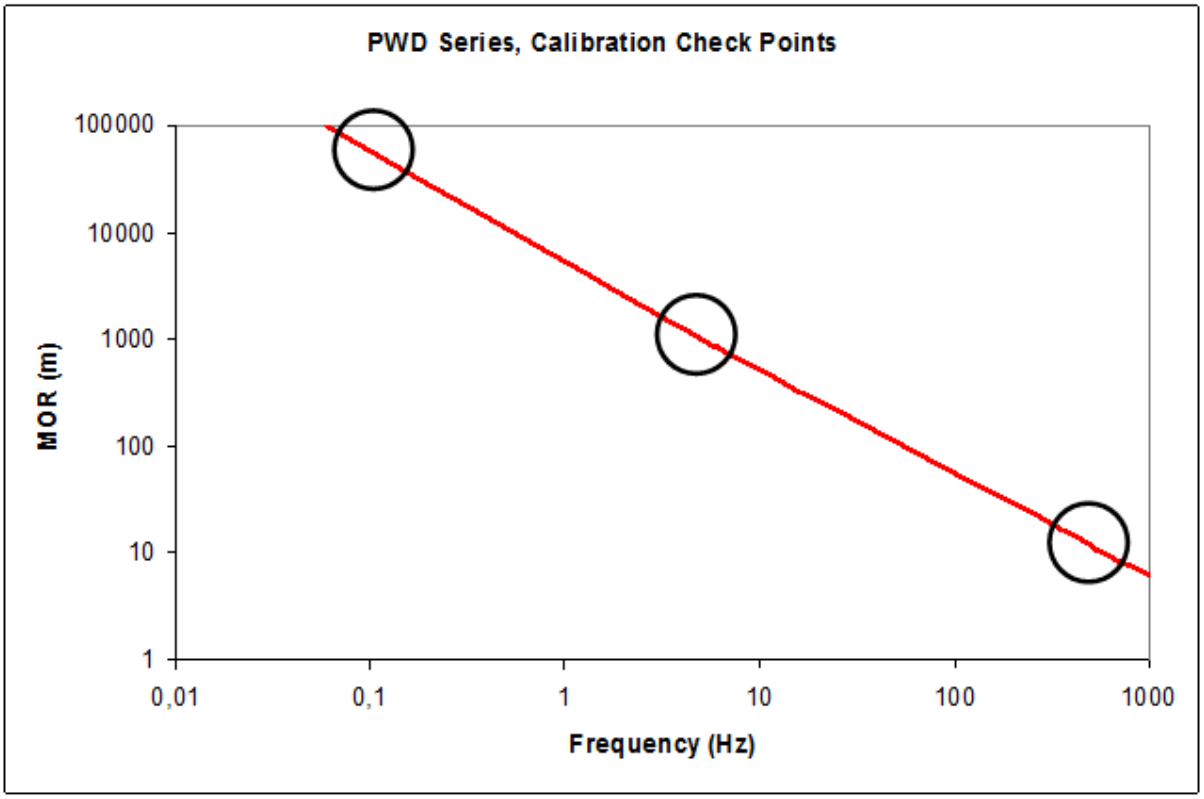

Figure 3 Three Calibration Checkpoints

During the calibration, check the scatter signals are displayed as proportional frequencies on the screen of the connected terminal (higher scatter signal = higher frequency = higher extinction coefficient = lower MOR).

The zero signal is obtained using a zero signal plug, the high signal using opaque glass plates, and the mid-range signal by using the opaque glass plates with additional optical filter assembly on the transmitter side.

When calibrating visibility measurement, make sure that visibility is 500 meters or higher. Calibration is not recommended in heavy rain or in bright sunlight. Bright sunlight on the calibrator plates will increase noise in the scatter measurement and make the **CHEC** command output less stable. However, light rain does not matter.

Calibration Check

Before performing the calibration check:

- Clean the lenses following the instructions in Cleaning Lenses and Hoods on page 17.
- Check the opaque glass plates and clean them if necessary.

First Calibration Point (Zero Signal)

To check the first calibration point:

1. Block the light by placing the zero signal plug in the receiver hood and wait for 30 seconds.
2. Type ZERO.
   PWD22/52 responds:
   ```
   ZERO SIGNAL: OK>
   ```
3. Remove the zero signal plug.

Second Calibration Point (High Signal)

To check the second calibration point:

1. Install the opaque glass plates to the lens hoods.

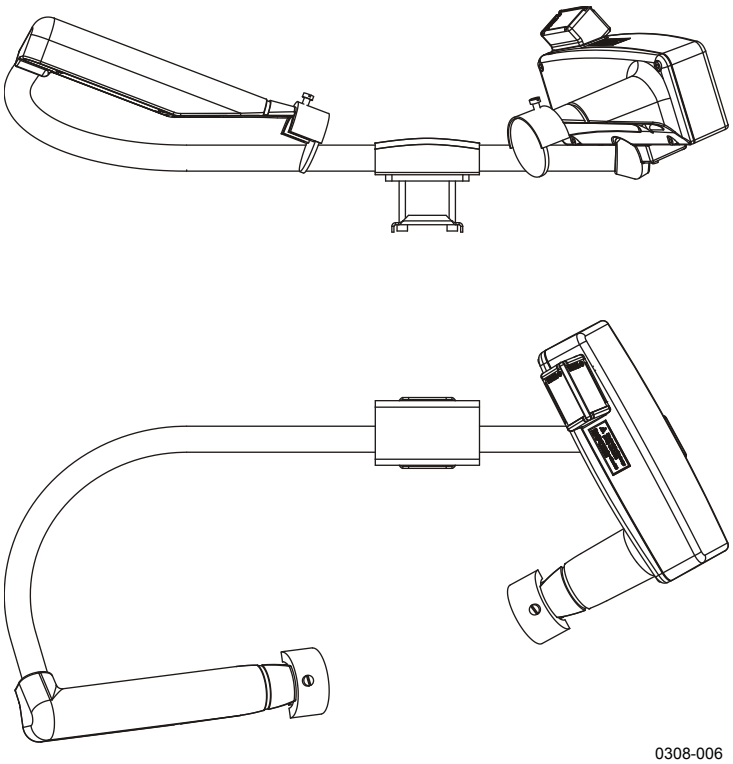

Figure 4 Assembling Opaque Glass Plates

2. Fasten the opaque glass plate holders to the hoods. Note the signal value printed on the plates, you will need it during the following steps.
3. Move away from the optical path and wait for 30 seconds.
4. Give the **CHEC** command.
5. After one minute, read the displayed signal.
6. The signal value must be close to the one printed on the plates. If the difference is less than 5 %, calibration is correct. If not, continue with the calibration procedure.

Third Calibration Point (Mid-signal)

The optical filter assembly is used with the opaque glass plates to check the signal value that represents a visibility of approximately 1000 m.

The signal value is printed on the optical filter assembly.

For the check of the third calibration point, give the **CHEC** command with both opaque glass plates (see Figure 4 on page 13) and then install the optical filter assembly on the transmitter opaque glass plate (see Figure 5 below).

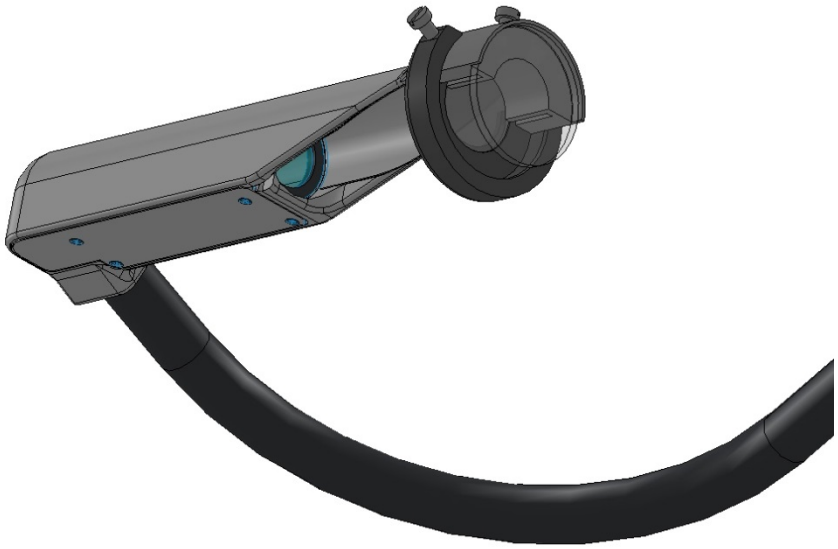

Figure 5 Optical Filter Assembly Mounted on Transmitter

Check that the **CHEC** process runs and displays signal frequency values on the terminal screen.

1. Fasten the optical filter assembly to the opaque glass plate that is installed on the transmitter hood. Mount the optical filter assembly on the opaque glass plate holder from the rear and fix with the two clamping screws. Note the signal value printed on the optical filter assembly, you will need it during the following steps.
2. Move away from the optical path and wait for 30 seconds.
3. After one minute, read the displayed signal.
4. The signal value must be close to the one printed on the optical filter assembly. If the difference is less than 10 %, the check is successful. If not, continue with the calibration as instructed below.
5. Terminate the **CHEC** command by pressing the **ESC** key.

Calibrating PWD22/52

If calibration is needed according to the calibration check, calibrate PWD22/52:

1. Give the command:

   CAL *calibrator signal value*

   For example: `CAL 485`
   The calibrator signal value is printed on the labels of the opaque glass plate holders. Typically, the signal is close to 500 Hz. PWD22/52 calculates a new scaling factor and stores it in the non-volatile memory (EEPROM).

2. Write **CHEC** to verify that the new scaling factor is in use. The displayed signal value must be equal to the calibrator signal value. If the difference between the new scaling factor and the factory calibrated one is more than 20 %, the **CAL** command is ignored. Check PWD22/52 and the calibrator for hardware or mechanical errors. Contact Vaisala.
   If the optical units PWD22/52 or PWT11 have been replaced, the new scaling factor can change more than 20 % from the original scaling factor value and the **CAL** command is ignored. In that case, use the **FCAL** command (factory calibration) during the calibration.
3. Continue with the check procedure for the third calibration point.

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CHAPTER 5

MAINTENANCE

PWD22/52 is calibrated at the factory. No initial calibration is required.

The periodic maintenance of PWD22/52 includes:

- Cleaning the transmitter and receiver lenses and hoods every six months

  Cleaning the RAINCAP Rain Detector
- Checking the visibility calibration and calibrating it, if necessary.

PWD22/52 is designed to operate continuously for several years without other maintenance than cleaning of the lenses and the RAINCAP sensing surface.

Cleaning

It is important to clean PWD22/52. No specific operations are necessary before cleaning and it is possible to use the service terminal during the cleaning. If any erroneous data is generated, restart PWD22/52 after cleaning by pressing power OFF/ON.

Cleaning Lenses and Hoods

PWD22/52 transmitter and receiver lenses must be clean to get reliable results. Dirty lenses give too good visibility values.

Clean the lenses and hoods at least every six months, more often if the conditions require it (for example, if there are roads nearby).

The hardware alarm field of the data message (2nd character on the message) indicates when cleaning is needed.

- Number 3 = backscatter alarm indicates that the contamination level is too high and you must clean the sensor at once. The measurement values are not shown in the data message.
- Number 4 = backscatter warning indicates that the contamination level has increased and you must clean the sensor in the near future. The measurement values are still reliable and shown in the data message.

To clean the lenses and hoods:

1. Moisten a soft, lint-free cloth with isopropyl alcohol and wipe the lenses. Be careful not to scratch the lens surfaces. Confirm that the lens heating works by checking that the lenses dry after wiping.
2. Check that the hoods and lenses are free of condensed water, or ice and snow deposits.
3. Wipe the dust from the inner and outer surfaces of the hoods.
4. After the optical surfaces are properly cleaned, give the **CLEAN** command.

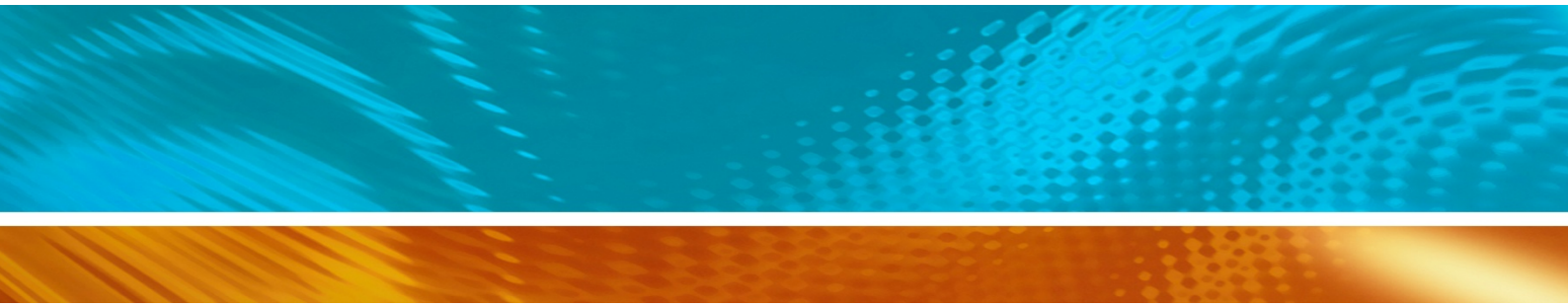
It is not necessary to give the **CLEAN** command after every cleaning. Alternatively, give the **STA** command and check that the Backscatter **CHANGE** value of both the receiver and the transmitter is close to zero (set to zero by the previous **CLEAN** command).).

Cleaning RAINCAP

Clean Vaisala RAINCAP Rain Sensor at least every six months, more often if local conditions require it.

The measuring principle does not allow for proper ESD protection of the RAINCAP electronics, so you must follow the following instructions:

- Ground your hand first by touching grounded metallic parts of the installation to remove excessive static charges from your body.
- Clean the RAINCAP rain detector carefully with a soft, lint-free cloth moistened with mild detergent. Be careful not the scratch the surface.
- Check that the detector is free of ice and snow deposits.



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