

# **PPM Formaldemeter™ *htV***

## **3 Parameter IAQ Monitor**

# **Operation Manual**

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## 1 INTRODUCTION

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The PPM Formaldemeter™ *ktV* is an easy-to-use, hand held three parameter indoor air quality monitor, designed for the rapid measurement of airborne formaldehyde levels, along with temperature and humidity readings.

The PPM Formaldemeter™ *ktV* is capable of displaying readings in both ppm (parts per million) and mg/m<sup>3</sup> (milligrams per cubic metre).

The PPM Formaldemeter™ *ktV* is designed, using built in data analysis functions, to compensate for high humidity readings, which can act as interference to the instrument's readings.

Please read these instructions carefully and familiarise yourself with the instrument before use. This operating manual will provide you with all the necessary information for the correct use of your Formaldemeter™ *ktV*.

Please note that PPM Technology Limited shall not be liable for errors that may appear herein or for incidental or consequential damages in connection with or arising from the use of this material.

### 1.1 Initial Receipt of the PPM Formaldemeter™ *ktV* Kit

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Your PPM Formaldemeter™ *ktV* kit has been packaged carefully and includes all the components necessary for full operation. Immediately upon receipt, please examine the kit contents carefully to ensure that you have received the following items in good condition.

#### Component list

The instrument kit contains:

- Formaldemeter™ *ktV* instrument with battery installed
- Formaldemeter calibration standard
- Thermometer
- Vial of phenol filters (10)
- Ball point pen
- Certificate of calibration
- Operation manual

Please report any missing items to your dealer.

#### Damage

Inspect all items carefully. Any damage must be reported immediately to both the carrier and your dealer.

### 1.2 General Description

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Unlike other formaldehyde monitoring devices such as colour stain tubes and badges, the Formaldemeter™ *ktV* is capable of measuring many samples consecutively without the need for inconvenient ancillary equipment. Being ultra compact and battery operated, the instrument is truly field portable.

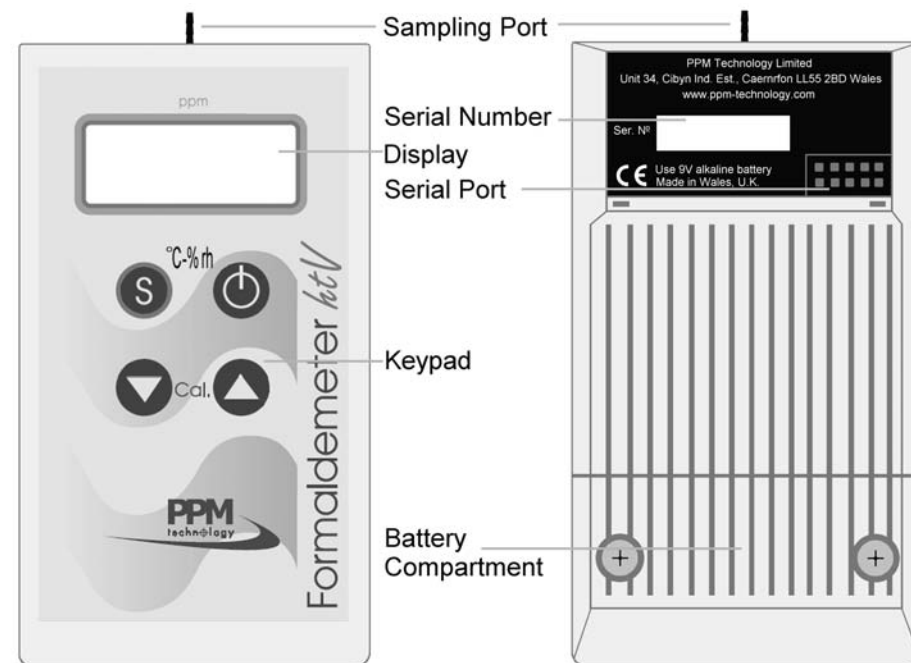
The Formaldemeter™ *ktV* is extremely simple to use and provides immediate, semi-quantitative readings of atmospheric formaldehyde concentration displayed on a digital read-out, in both ppm and mg/m<sup>3</sup>.

The Formaldemeter™ *ktV* is designed to measure the concentration of formaldehyde in snatch (discrete) samples of air and should be employed primarily as a screening device.

**Important points**

It is important that you are aware of the following points when using the instrument

- The Formaldemeter™ *ktV* is temperature compensated to operate most accurately in the range 10 – 30°C.
- The results obtained with the PPM Formaldemeter™ *ktV* are instantaneous spot readings. A single reading is not necessarily representative of long term personal exposure. A series of readings taken at short intervals is preferable to infrequent tests.
- Avoid smoking in the environment to be analysed – tobacco smoke contains aldehyde.
- Care must be taken to ensure that fluid or dust is not drawn into the instrument. This could permanently damage the sensor.
- The Formaldemeter™ *ktV* has been designed to be sufficiently robust for everyday field use. However, should the unit sustain a severe physical shock, the operation and calibration of the instrument should be checked using the supplied formaldehyde calibration standard.

**1.3 Instrument Features****Fig 1.1 Instrument Diagram****Sampling Port**

The brass sampling port is the inlet through which the sample is drawn into sensor.

**Display**

The liquid crystal display (LCD) shows the formaldehyde concentration of the sample in 0.01 ppm increments. The display also shows text messages during certain operations.

**Keypad**

The instrument is operated by four buttons, some of which have multiple functions. The button switches are located beneath the membrane and are operated by pressing firmly where indicated.

**Display Key**

----	sensor recovering
000	sensor ready
run	sampling
CAL	taking calibration sample
SET	set calibration level
bAt	replace battery
SET CAL	instrument not calibrated

**Battery compartment**

The battery compartment is located beneath a cover at the bottom rear of the instrument. To gain access to the battery, simply remove the cover by unscrewing the two screws. A flat battery is indicated by the display flashing:



See **Section 5.1** for guidance on battery replacement.

**Serial port**

This socket can be used for connecting your Formaldemeter™ *ktV* to the PPM AMS-2 or SPC-1 for automated continuous monitoring applications. Please see **Section 8** for more details on these and other accessories.

**2 TECHNICAL INFORMATION**

**2.1 Principle of Operation**

**Electrochemical formaldehyde sensor**

The PPM Formaldemeter™ *ktV* uses proven electrochemical sensing technology for determining the concentration of formaldehyde in air samples. The instrument contains an electrochemical formaldehyde sensor comprising two noble metal electrodes and a suitable electrolyte.

When air is drawn into the sensor by means of the internal sampling system, a small voltage is generated which is directly proportional in magnitude to the concentration of formaldehyde in the sample.

This voltage is produced as a result of the electrooxidation of formaldehyde at one of the catalytically active electrodes.

The signal is fed to a precision electronic amplifier and output on the instrument's display, when calibrated, as formaldehyde concentration in ppm (parts-per-million by volume).

All the electronic systems are based on modern, integrated circuitry employing the latest surface mount technology to ensure that the Formaldemeter™ *ktV* is an exceptionally robust and reliable instrument.

## 2.2 Interference

### Phenol & Resorcinol

The presence of phenol in the air can give a reading on the Formaldemeter™ *ktV*. When monitoring formaldehyde in situations where phenolic resins are used, the phenol filters provided should be used. These fit on to the sampling port of the instrument. The filters will completely remove phenols from the sample even at concentrations in excess of 1000 ppm without affecting the formaldehyde reading.

### Phenol Filter Life

Each filter should be used no more than five times and then discarded. Partially used filters should not be stored in the vial with unused filters. Replacement filters can be ordered from PPM or through your local distributor.

### Alcohols & Aldehydes

As is found with other portable detection equipment, the meter is not totally specific to formaldehyde alone, being susceptible to a degree of interference from a small range of other chemicals. Other aldehydes and alcohols such as methanol and ethanol in the atmosphere can cause cross-interference effects.

### Sensor Background Reading

Due to the high sensitivity of the sensor a background reading can often be produced even when sampling in an atmosphere considered to be free of interference.

### Humidity Extremes

As the sensor is very sensitive, it is possible that extremes of humidity (generally, anything outside 40-60% Rh) may cause a background reading on Formaldemeter instruments. The Formaldemeter™ *ktV* is specially designed to compensate for this problem, as it uses the humidity reading from its sensor, along with built in data analysis functions, to compensate for the presence of humidity extremes.

A list of common chemicals which can cause interference is available on request.

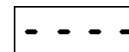
## 3 USING THE PPM FORMALDEMETER™ *ktV*

### 3.1 Taking a Sample

#### Power on

Press the **ON-OFF** button once.

The following display will flash for 3 seconds as the instrument checks the sensor:



followed by:

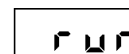


This indicates that the instrument is ready to take a sample.

#### Sampling

Hold the instrument in the atmosphere to be sampled. Press and release the **SAMPLE** button.

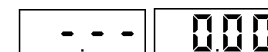
The display will show:



The internal pump should be heard running for almost two seconds as it samples the air.

#### Display reading

The display will flash between the following two screens for 10 seconds:



The display will then show a flashing, increasing value as the sample is analysed. After 60 seconds, the display will show a non-flashing value, which is held until the instrument is switched off. This indicates the formaldehyde concentration in ppm.

In the event that high levels of interference is present (see **Section 2.2**), the instrument will give a reading in around 10 seconds, to avoid the sample being affected by the interference.

**Alternative Settings**

The two durations listed above (10 and 60 seconds), may vary depending on the specifications of the supplier or customer, but these values are the default set by the instruments manufacturer. For further details please contact your local distributor.

**Other Readings**

By holding down the ▼ the display will show the time taken to reach the displayed concentration.

By holding down the ▲ button the instrument will show the reading in mg/m<sup>3</sup> alternating with the following screen:

**Power off**

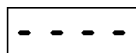
Switch the instrument off by pressing the **ON-OFF** button once.

If you forget to switch the instrument off after a test, the PPM Formaldemeter™ *ktV* will automatically switch itself off after 5 minutes.

**3.2 Sensor Recovery Period****Sensor clearing**

Between samples, the instrument should be left switched off for a few minutes to allow the sensor to clear of any residual formaldehyde. As a general rule, the higher the reading obtained, the longer it takes for the sensor to clear.

If the instrument is switched on before the sensor has cleared, the pump will not operate and the display will flash:



The cell is clear only when the following display is shown for three seconds without interruption:



The instrument is now ready to take the next sample.

If the instrument does not clear after approximately 5 minutes, then refer to troubleshooting in **Section 6.2**.

**4 CALIBRATION CHECK AND ADJUSTMENT**

Please read this section thoroughly before attempting to check or adjust calibration. Users are strongly advised to familiarise themselves with the instrument before attempting to adjust the calibration and should follow the instructions carefully.

**4.1 General Information****Check calibration regularly**

Sensor sensitivity can change very gradually with time, so periodic recalibration may be required. It is advisable to check calibration regularly to ensure that the instrument is functioning correctly.

A quick calibration check can be carried out by drawing a formaldehyde vapour sample of known concentration into the instrument's sensor and noting whether the displayed reading agrees with the expected concentration value.

The PPM Formaldemeter™ *ktV* is supplied complete with a formaldehyde calibration standard and a thermometer, which are essential components for checking and adjusting calibration.

It is recommended that calibration check or adjustment be carried out at the approximate operational temperature.

**4.2 The Formaldemeter Calibration Standard**

The PPM Formaldehyde Calibration Standard consists of formaldehyde absorbed on a substrate in a glass tube from which a headspace vapour sample can be drawn. Each standard is carefully manufactured to a high tolerance.

**Effect of temperature**

The concentration of formaldehyde vapour generated in the calibration standard varies with temperature and for this reason, a thermometer and temperature/concentration table is supplied.



Due to the effect of body temperature, handle the calibration standard only by the yellow end caps, to ensure temperature equilibrium.

**Temperature equilibrium**

The calibration standard should always be allowed to stabilise within the recommended temperature range of 15-29°C for at least 1 hour before use.

**Calibration Standard Expiry**

Each calibration standard may be used for a maximum of 6 months (as indicated by the given expiry date), or a maximum of 100 samples. New calibration standards can be ordered from PPM or through your local distributor.

**4.3 Calibration Check Procedure****Temperature equilibrium**

Place the instrument, thermometer and calibration standard together in a place where the temperature is stable for at least one hour before commencing the calibration check procedure to allow thermal equilibration.

**Sensor check**

Before carrying out a calibration check, the sensor must be clear of formaldehyde vapour from any previous samples. See **Section 3.2** for further details.

**Procedure**

1. Place the calibration standard with the thermometer on a work surface. Handle the calibration standard as little as possible to avoid heating the tube, holding it by the yellow end caps. Remove both end plugs.
2. Switch the instrument on by pressing the **ON-OFF** button once. Wait for the display to show:

3. Insert the nozzle into the sampling end of the tube (see **fig 1.2** on P17). Ensure a good seal around the instrument nozzle by pushing the calibration standard tube firmly against the instrument when taking a sample.
4. Press the **SAMPLE** button and wait until the internal sampling pump stops before removing the standard from the instrument. Replace the end plugs in the calibration standard securely.

5. The display will flash between the following two screens for 10 seconds:

6. The display will then show a flashing, increasing value as the sample is analysed. After 60 seconds, the display will show a non-flashing value, which is held until the instrument is switched off. This indicates the formaldehyde concentration in ppm. For more information on this sampling period see **Section 3.1**.
7. Refer to the Temperature/Concentration look-up table on the standard tube. If the reading is within 10% of the value shown in the table, then no recalibration is required.
8. If recalibration is required, follow the procedure in **Section 4.4**.

Leave the instrument switched off for approximately 5 minutes to recover before commencing another atmospheric analysis or calibration adjustment, for more details see **Section 3.2**.

**4.4 Calibration Adjustment Procedure**

Please read this section thoroughly before attempting to check or adjust calibration. Users are strongly advised to familiarise themselves with the instrument before attempting to adjust the calibration and should follow the instructions carefully.

Under normal operating conditions, instrument calibration should require only minimal periodic adjustment. To see whether a full recalibration is required, perform a calibration check first as described in **Section 4.3**.

## Temperature equilibrium

Leave the instrument and calibration standard in a room where the temperature is constant for at least one hour before calibrating to allow thermal equilibration.

## Procedure

1. Place the instrument, calibration standard and thermometer on a work surface. Handle the calibration standard only by the yellow end caps.

2. Press the **ON-OFF** button once to switch the instrument on.

3. Wait for the display to show:

0.0.0

4. Remove the yellow plugs from both ends of the calibration standard.

5. Insert the instrument nozzle into the sampling end of the calibration standard (indicated by the black arrow).

To maintain airtight contact between the nozzle and the standard, push the standard firmly against the instrument.

6. Simultaneously depress and release both Cal ▲ and ▼ buttons.

7. The pump will be heard drawing a vapour sample and the screen will briefly show:

CAL

8. When the pump stops, remove the calibration tube and replace both yellow end plugs.

9. The display will show an increasing, flashing value for 60 seconds, followed by:

5.66 1.75

10. Read the temperature on the thermometer and determine the required concentration reading from the lookup table on the calibration standard, for example:

Temperature: 21°C

Reading: 1.47 ppm

11. Now use the Cal ▲ and ▼ buttons to adjust the display reading to the required concentration.

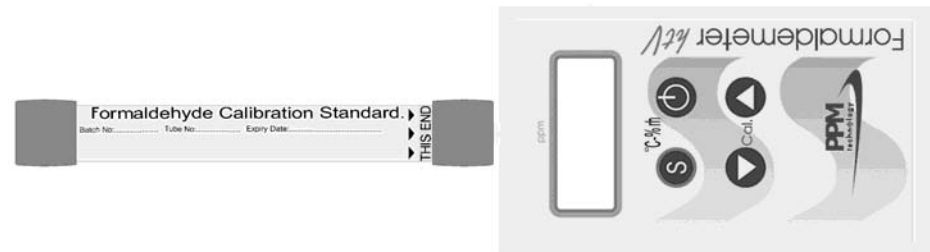
12. Press the SAMPLE button to store this calibration value. The display will show:

CAL

followed by:

End

The Formaldemeter™ *ktV* will then switch off automatically. The instrument has now been recalibrated.



**Fig 1.2 Formaldemeter™ *ktV* with Calibration Standard Inserted**

## 5 ADDITIONAL FEATURES

### 5.1 Temperature & Humidity Sensor

1. Hold down the **SAMPLE** button and press the **ON-OFF** button once. Release the **SAMPLE** button.
2. The Instrument will briefly display:

HEAT

3. The instrument will then show the temperature reading, followed by:

22.0 °C

4. The instrument will then display the humidity (in % Rh), followed by:

90%RH

5. The instrument will cycle through these four screens until it is either switched off manually, or it will switch itself off after 30 seconds.

The Sensor used for these readings is accurate to within  $\pm 2.0$  %Rh for humidity, and  $\pm 0.4$  °C for temperature, within the operational limits for the instrument. To ensure the accuracy of the instrument the temperature & humidity sensor is replaced with the instruments annual service.

### 5.2 Data Retrieval

#### Accessing The Data

1. Hold down the **SAMPLE** button and press the **ON-OFF** button once. Release the **SAMPLE** button.
2. The Instrument will briefly display:

HEAT

The instrument will then flash between displaying the following two screens:

22.0 °C

3. Once the Instrument is in this mode press both the **Cal** (**▲** and **▼**) buttons at the same time and release. The display will briefly show:

DATA

4. The display will then flash between the following two screens (as an example):

run0 0.56

The first screen indicates which previous sample is being displayed, the most recent first, from **run0** (most recent), to **run9** (the oldest). Use the **Cal** (**▲** and **▼**) to move to the desired sample reading.

By pressing the **SAMPLE** button when viewing a reading, the instrument will display the reading in  $\text{mg}/\text{m}^3$ , as shown below:

ALTO 0.56

Press the **ON-OFF** button when done to turn the instrument off.

The PPM Formaldemeter™ *kkV* has sufficient memory capacity to log the last 10 samples.

#### Clearing The Memory

While viewing the data, hold down both the **Cal** (**▲** and **▼**) buttons at the same time, until the display has run through all the following screens:

CLr3 CLr2 CLr1  
CLr0 [ ]

The memory will now be clear.

## 6 MAINTENANCE

With the exception of the battery, your PPM Formaldemeter™ *ktV* has no user-serviceable components. It is important that no attempt is made to open the instrument other than to replace the battery. Any evidence of tampering with the instrument will invalidate the warranty.

If you find that your instrument requires service or repair, please return it to PPM Technology or an authorised PPM Service Centre.

### Cleaning the Formaldemeter™ *ktV*



On no account should the Formaldemeter™ *ktV* be immersed in liquid. Any fluid entering the instrument will destroy the sensor and the electronic circuitry.

If the instrument's enclosure requires cleaning, it should be wiped with a damp cloth. Never use abrasive or solvent based cleaning agents.

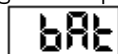
### Storage

When not in use, your Formaldemeter™ *ktV* should be stored in the supplied carrying case in a clean, dry environment and away from extremes of temperature.

### 6.1 Instrument Battery

#### Low battery indicator

When the battery voltage becomes too low, and the battery needs replacing the display will flash:



#### Battery Replacement

The instrument requires a 9V PP3 / MN1604 / 6LR61 type alkaline battery.

To replace the battery, simply remove the battery compartment cover at the bottom rear of the instrument by unscrewing the two screws. Clip a new battery to the connector and place the battery in the compartment.

## 7 TROUBLESHOOTING

### '----' flashes on display and the instrument will not let me sample

The three main reasons for this problem are:

1. The instrument has been accidentally calibrated when no calibration standard was present.
2. The calibration standard used for calibration has expired.
3. The instrument has been damaged and will need to be repaired.

To determine which of the reasons applies to your case follow the procedures shown below (Note - quoted values are for tests performed at 25°C):

1. Make sure that the instrument has been turned off for about 5-minutes.
2. Hold down the Left-hand calibration button whilst turning the instrument on.
3. 'E5E' will appear on the display. Release all the buttons.
4. A four-digit value will appear ( #.### ). Give the instrument a few seconds to stabilise.
5. Note the initial value and an approximate rate of change over a minute.

If the initial value or the rate of change is over 0.300 then it is likely that your sensor has been damaged - contact your service center or PPM Technology Ltd. for further details. If the readings look OK then continue with the instrument still in the 'E5E' mode:

1. With the sample nozzle inserted into a valid calibration standard take a sample.
2. The display should be set to '0.00' as the pump starts to run and then rise up to a maximum as the sample is drawn in.
3. Press and hold the Left-hand calibration button - the display will show a time value ( E.#.# ). Make a note of this.
4. Press and hold the Right-hand calibration button - the display will show the peak value. Make a note of this too.
5. Turn the instrument off. Leave the instrument off for 5-minutes before repeating the tests.

If the peak value is less than 5.000 or has a time value less than 5 seconds then there may be problem with the sampling system or your sensor. Contact your service center or PPM Technology Ltd. for further details.

1. Make sure that the instrument is turned off.
2. Hold down the Right-hand calibration button whilst turning the instrument on.
3. '99.9' will appear on the display . Release all the buttons.
4. A four-digit value will alternate with a three-digit exponent on the screen ( ##### / E### ).
5. Note both numbers. The instrument will power down after a few seconds.

If the Exponent value is between E015 and E013 then you may have used an expired standard - check your standard expiry date and re-read **Section 4.4** on how to calibrate the instrument. When you are ready carry out a RE-SET, as described below, and recalibrate the instrument.

If the Exponent value is less than E013 then you may have accidentally calibrated without a calibration standard being present. Carry out a RE-SET as described below.

### Performing a full RE-SET of the instrument

Make sure that you have a valid calibration standard to hand before performing this procedure as your current calibration will be deleted and there is no way of 'undoing' the RE-SET procedure once it has been performed.

1. Make sure that the instrument is turned off.
2. Hold down both **Cal** (▲ and ▼) buttons whilst turning the instrument on.
3. 'rSEt' will appear on the display. Release all the buttons.
4. 'SEt'/'CAL' will now appear on the display followed by the '0.00' display.
5. Turn the instrument off and back on again to complete the procedure. You will now need to calibrate the instrument as shown in **Section 4.4**.

If, after a RE-SET, you are still experiencing problems then contact PPM Technology Ltd. to arrange a service.

## 8 ACCESSORIES

**Mounting Systems** Several options for mounting the Formaldemeter™ *hclV* are available, including a desk mount for display purposes, and a wall mount for more permanent monitoring.

**AMS-2 Base Station** When connected to an AMS-2 Base Station, the Formaldemeter™ *hclV* can be used for stand alone continuous monitoring, with its built in printer giving direct output of results in graphical format. The AMS-2 can also be programmed to trigger alarms if various conditions are met, such as Peak, STEL (Short Term Exposure Limit) and TWA (Time Weighted Average) readings.

It is also possible, with the separate PC Download Kit, to access the data stored on the AMS-2 with a computer, which then allows manipulation and analysis of the data with software such as MS Excel.

**SPC-1 Single Point Controller** The SPC-1 allows the Formaldemeter™ *hclV* to connect directly to a computer, allowing programmable continuous monitoring via the computer.

All the data obtained by the Formaldemeter™ *hclV* is stored on the connected computer and, as with the AMS-2, can be manipulated and analysed as required.

For more details on these and other accessories, please contact your local distributor, or PPM Technology directly.

## **9 WARRANTY**

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The PPM Formaldemeter™ *kkV* is warranted to be free of defects in materials and workmanship under proper and normal use and service for a period of 1 year from the date of purchase. This warranty is limited to repair or replacement (at our option) of any part that proves defective in material or workmanship under normal use and service, provided the product is returned to PPM Technology Limited, shipment charges prepaid.

Damage due to defacement, misuse, tampering, lack of prescribed maintenance or use in violation of the instructions furnished by PPM Technology Limited is not covered.

This warranty is in lieu of all other warranties, express or implied, including but not limited to merchantability or fitness for a particular purpose. In no event shall we be liable for any incidental or consequential damages of any nature.

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## **NOTES**

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