2640 PRO EVO

Portable SO2F2 Monitor

INSTRUCTION MANUAL



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www.ppm-mt.com

Revision history

Release 1.0	September 2026	Initial preliminary release

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1. General Instructions

1.1 Indications

This manual contains important information for the operation of the **2640 PRO EVO** SO2F2 monitor.
To assure operator safety and the proper use of the instrument, please read, understand, and follow the contents of this manual.

Non-observance of these instructions can result in personal injury or death. Non-observance of these instructions may also lead to the loss of right to claim for damages or warranty!	

Meaning of signs used in this instruction manual:

CATCHWORDS appear in italics on the right hand margin

 Indication of particular importance

 Warnings

Please follow the instructions given. Warnings denote a potential hazard associated with the use of **2640 PRO EVO** instrument.
Non-observance of warnings can result in personal injury or damages to the instrument.

 Avoid actions marked with this sign

Please follow the instructions given. This symbol denotes potential hazard associated with the use of **2640 PRO EVO** instrument. Non-observance of the instructions can result in personal injury or death.

1.2 Safety Precautions and Important Instructions for Operation of 2640 PRO EVO

The **2640 PRO EVO** is designed for monitoring concentration levels of SO2F2 gas during fumigation for pest control.

The **2640 PRO EVO** instrument is not designed for use in potentially explosive environments. Never place and operate the instrument in areas with a potentially explosive atmosphere!

Further more the **2640 PRO EVO** is not for measuring clearance levels.

The instrument should be used only for the indicated field of application and should be operated only by personnel familiar with its operation.

1.3 Quick start

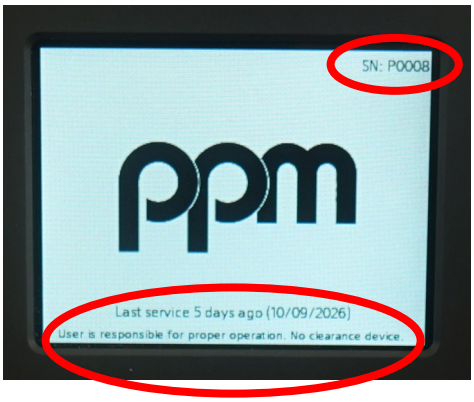
1) Connect power converter and charge instrument.



2) Turn on the device by pressing and holding the power button.



3) Serial number and the date of the last calibration are displayed here.



4) As soon as you are prompted to do so, disconnect any contaminated hoses that may be connected and perform the zero-point measurement. Leave the inline-filter connected, since the quick-connect coupling contains a valve!

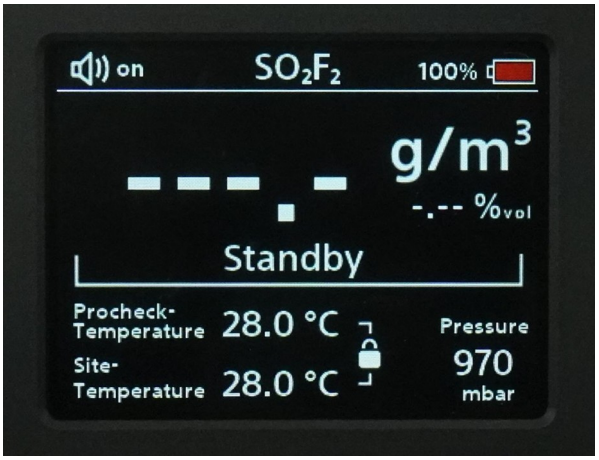


5) After a successful zero-point measurement, the device displays the calculated deviation from the sensor's initial calibration. Deviations greater than 50 ppm result in an error.



Never zero the device in a contaminated atmosphere! **Deviations of more than 50 ppm must be checked by service personnel.**	

6) After a successful zero-point measurement, the device enters standby mode.



5) Press the power button briefly to start the measurement.



6) If necessary, the temperature of the object under gas can be entered (see Chapter 5.4, Measurement Process).

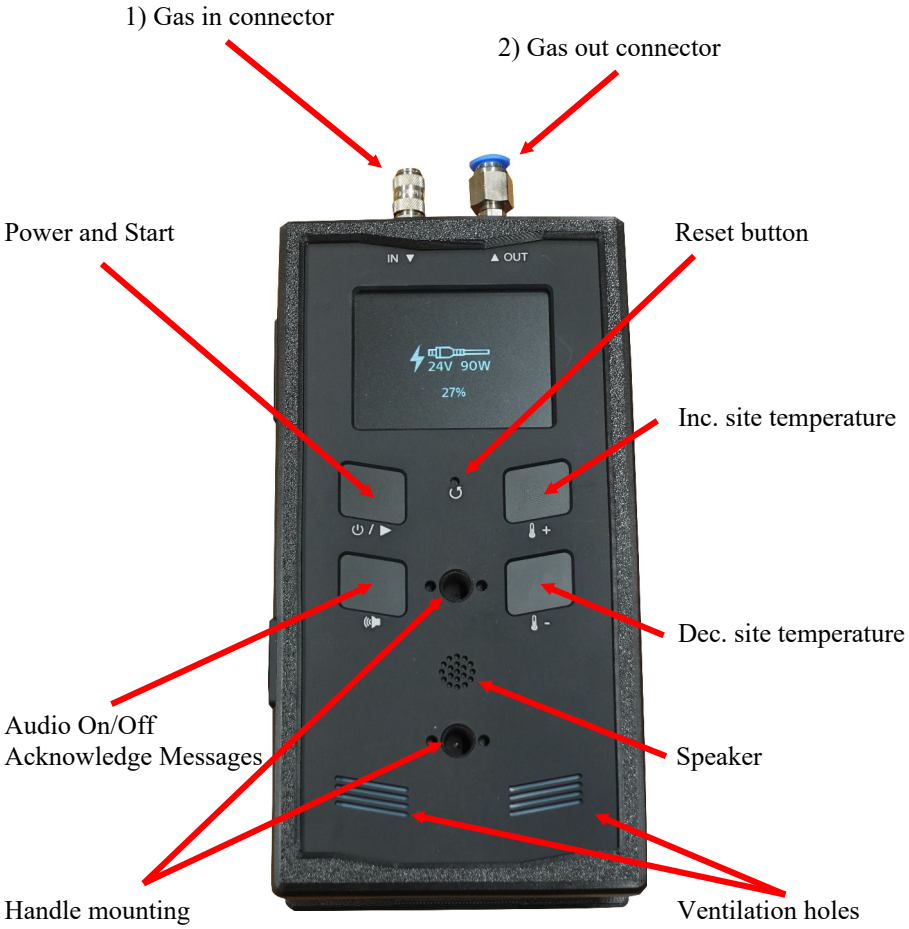


7) Pressing the power button briefly once more returns the device to standby mode. Pressing and holding the power button initiates shutdown. Once you release the power button, the device turns off.

2. Description of 2640 PRO EVO

2.1 Instrument layout

2.1.1 Top view



1) Coupling socket, nominal width 2.7mm
2) Push-in fitting, 6mm or ¼”

2.1.2 Side view

1) Camera handle, removeable



2) Power connector

1) Removable, ARRI-mount 3/8” UNC, can be mounted turned
2) Barrel style connector, 2.5 x 5.5mm

2.2 Description

2.2.1 Description of function

In the **2640 PRO EVO** a measurement cell is used which operates on the principle of Infrared-Spectroscopy.

PRINCIPLE

The physical properties of gases to react to electromagnetic waves, such as infrared rays, is utilized for this detection technology. Each type of gas uniquely adsorbs energy to one or more electromagnetic wavelengths.

This effect is converted into electric signals by a sensor. The concentration of the gas component is calculated via calibration functions filed in the sensor configuration library.

2.2.2 Description of equipment

The **2640 PRO EVO** is equipped with one gas sampling inlet.

For measurement of the concentration the gas to be analyzed must be drawn into the sensor by the built-in pump (active sample extraction). During the measuring process a large number of measured values are integrated. The resulting values are shown on the display.

The effects of pressure and temperature fluctuations on the measured values are fully compensated internally in accordance with the ideal gas law, but can be adjusted to suit the environmental conditions (see Chapter 5.4).

In addition, the gas flow is continuously monitored, and any problems are indicated by an error message.

The handle can be removed, rotated, or attached on a second mount. The handle’s mounting is compatible with a camera handle featuring an ARRI mount (ARRI is one of the world’s largest film camera manufacturers, alongside Panavision). This means that other handles with the same mounting can also be attached.

To protect against damage, the device is equipped with a rubber edge guard that runs all the way around it. The material is not simply rubber, but TPU (TPU primarily stands for thermoplastic polyurethane).

The device's lithium-ion battery represents the current state of the art. Its capacity has been selected to maximize the available range so that (based on current knowledge) it is not subject to any restrictions when the device is shipped (by air, sea, or land).

If a safety data sheet or UN test report is required for the battery, please contact ppm Messtechnik GmbH.

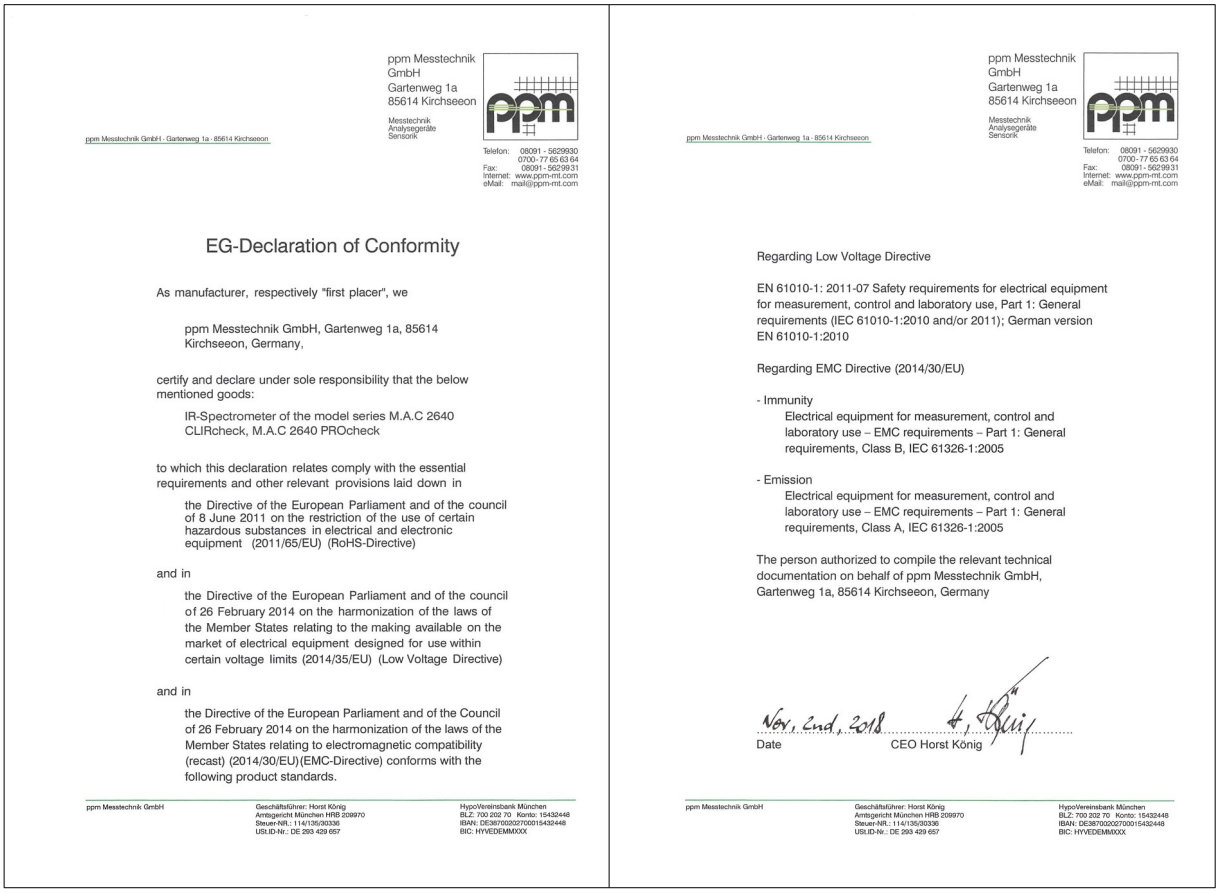
The sensor in the device is manufactured by ppm Messtechnik GmbH. It provides stable measurement results across a wide temperature range and offers an outstanding service life. Cross-sensitivity to other gases is eliminated or significantly reduced due to the measurement principle. However, the possibility that a gas may cause cross-sensitivity cannot be completely ruled out. If in doubt, please contact ppm Messtechnik GmbH.

2.3 Technical data

All dimensions +/- 1,27 mm = 0,05 inch

Dimensions:	Height (incl. handle):	150 mm = 5.9 in
	Width:	110 mm = 4.3 in
	Depth (incl. fittings):	230 mm = 9.1 in
Weight:	approx. 2.0 kg = 4.4 lbs	
Housing:	Anodized aluminum housing, rubber bumpers	
Ingress Protection Code:	IP54	
Power Supply Unit:	internal, LiIon-Battery-Pack (14.4 V – 99 Wh)	
Transport:	UN3480, LiIon-Battery in Equipment	
Power Supply Charger:	100–240 Volt / 47-64 Hertz / max. 90 Watts	
Working time:	with new and charged battery: ~24 hrs	
Charge time:	approx. 1 hr (depending on surroundings)	
Temperature range:	during storage: -10°C to +60°C (+14°F to +140°F) during operation: 0°C to +50°C (+32°F to +122°F)	
Air moisture range:	0 to 95 %, non condensing relative humidity	
Measuring principle:	physical, infrared, SOFIE® - NDIR	
Compound:	SO2F2 (Vikane®, Profume®)	
Display:	2.8 inch, 240x320 pixels, IPS-TFT	
Measuring range:	0 g/m³ up to 150 g/m³ (g/m³ = oz/1000 ft³)	
Accuracy:	± 1 % of measured value plus ± 0.5 g/m³	
Resolution:	0.1 g/m³	

2.4 CE-Declaration



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EG-Declaration of Conformity

As manufacturer, respectively "first placer", we

ppm Messtechnik GmbH, Gartenweg 1a, 85614 Kirchseeon, Germany,

certify and declare under sole responsibility that the below mentioned goods:

IR-Spectrometer of the model series M.A.C 2640 CLIRcheck, M.A.C 2640 PROcheck

to which this declaration relates comply with the essential requirements and other relevant provisions laid down in

the Directive of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (2011/65/EU) (RoHS-Directive)

and in

the Directive of the European Parliament and of the council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (2014/35/EU) (Low Voltage Directive)

and in

the Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (recast) (2014/30/EU)(EMC-Directive) conforms with the following product standards.

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Regarding Low Voltage Directive

EN 61010-1: 2011-07 Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements (IEC 61010-1:2010 and/or 2011); German version EN 61010-1:2010

Regarding EMC Directive (2014/30/EU)

- Immunity
  Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements, Class B, IEC 61326-1:2005

- Emission
  Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements, Class A, IEC 61326-1:2005

The person authorized to compile the relevant technical documentation on behalf of ppm Messtechnik GmbH, Gartenweg 1a, 85614 Kirchseeon, Germany

Nov, 2nd, 2018 .....
Date CEO Horst König

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3. Setup and Installation

3.1 Mechanical setup

GENERAL USE

The instrument should be used in a clean, dry area that is not subject to temperature or humidity extremes.	

The instrument has been specified for an ambient temperature range from +0°C (+32°F) up to +50°C (+122°F). Condensation of air moisture inside the instrument is to be avoided. When possible, avoid exposing the instrument to direct sunlight for an extended time.

SAMPLE GAS CONNECTION

The analyzer has one sample gas inlet and one sample gas outlet. The gas inlet is equipped with a quick-connect coupling with a nominal diameter of 2.7mm. Further more, the quick-connect fitting on the gas inlet has a built-in valve. Therefor the inlet filter must always be in place for measurement of any kind. The gas outlet has a direct hose connector, designed for hoses with an outer diameter of 6mm or ¼ inch, depending on model. (refer also to **Chapter 2.1.1**).

Always connect the inlet filter on the device! The quick-connect fitting is valve blocked without proper connected filter.	

The sample gas inlet and outlet can be equipped with gas sample tubes of lengths up to 100 meters or 330 feet without adversely affecting instrument operation (provided that the tubes have an inner diameter of at least 4mm or 0.16 inch).

To avoid clogging of the internal filter and the measurement chamber, the sample gas tube must be connected to a particle filter which is installed on the intake end of the sample gas inlet.

Incorrect installation of filter and exceeding recommended maintenance intervals will inevitably lead to malfunction or damage to the instrument!	

In order to avoid contamination of the internal filters and measuring chamber, the instrument may only be operated with filter protecting the gas sampling tube. The filters are to be placed on the intake end of the sample gas inlet.	

Installing the filter protects the instrument against damage from particulate contaminants. Suitable filters must neither adsorb measurable gas components in the filter element nor in the filter housing. As an additional feature the filters must permit the filtration of particles 5 micrometers and larger in size. Proper filters can be ordered from ppm Messtechnik GmbH under the order number G04044 (see Chapter 7.5).

Take utmost care to prevent liquids and moisture condensation from being drawn into the measuring chamber. Equally important is the avoidance of humidity condensation in the measuring cell. Any such event will immediately lead to the destruction of the sensor system!	

3.2 Electrical connection

3.2.1 Electrical Power Connection (Charger)

The internal battery pack is charged by the supplied external power supply converter. The converter is connected on the 2 pole power jack (refer also to **Chapter 2.1.2**).

The charger electronics work with a supply voltage of 24 V-DC. The external converter is rated to a voltage level of 100–240 V-AC.

Only connect the specified external converter to the instrument. Before connecting instrument or converter to electric power, verify if supply voltage meets the requirements. Incorrect voltage may cause the fuse of the instrument or converter to blow or damage the instrument itself.	

3.2.2 USB Interface

The instrument is equipped with a USB-C port. This port is used for calibrating and configuring the device.

Adjusting and calibration should only be conducted by ppm Messtechnik GmbH or their authorized service providers.

Never connect an improper data cable to this port. **This may lead to serious damage on the instrument.**	

4. Start of operation

Before using the unit the first time, connect the external converter to the charger input (see also Chapter 3.2.2) and charge the internal battery until full. This could take up to 1 hour.	

The instrument is turned on by pressing and holding the power button. As soon as the instrument is powered up, it will start with normal operation.

5. Operation

After the instrument has been powered up, it will automatically run through the following routines before starting the regular measuring operation:

- **Self-Test**
- **Triggered-zero adjustment**

This process will take less than 2 minutes for the PRO EVO instrument, including purging of the instrument.

The instrument must be in fresh air, free from contaminants (such as the fumigant) during the zero adjustment process!	

5.1 Self-test of instrument

Immediately after the instrument is powered up, a self-test is performed.

During normal operation the instrument will carry out periodically automatic self-tests to check important instrument functions. In case of any malfunction, the actual measurement cycle will be interrupted with the fault message (see **Chapter 6,** malfunctions). If an error occurs, the message can be acknowledged by briefly pressing the audio button. If the error is serious, you will need to restart the device.

5.2 Zero adjustment

Repetitive zero adjustment will compensate possible changes in the sensor equipment (e.g. aging) and this way eliminate zero drift. Zero gas is drawn through the sensor and the response measured is taken as new zero level.

This can easily be done by providing fresh air during zero adjustment.

A zero-point adjustment in contaminated air will inevitably result in incorrect readings! Deviations of more than 50 ppm result in an error message.	

DURATION OF ZERO ADJUSTMENT

Before performing the zero-point adjustment, the device should be purged with clean air for a short time. For this purpose, the gas pump runs immediately after the device is turned on. Duration of zero-point adjustment is approx. 5 seconds in a favorable case.

The sensor's deviation is then displayed, providing an indication of possible contamination. High deviations of more than 50ppm should generally be investigated and indicate contamination.

After a successful zero-point measurement, the device switches to "Stand-By-Mode".

MANUAL ZERO ADJUSTMENT

In those cases where **2640 PRO EVO** is operated with power converter connected, over a period of more than 5 days **without interruption**, a manual zero adjustment is recommended. The user may trigger such manual zero adjustment by disconnecting the gas connector and continue to draw fresh air for one or two minutes to flush the sensor, shutting off the instrument for a few seconds. After restart the instrument will zero at fresh air. Reconnect the hoses and continue operation after zeroing.

5.3 Measurement operation

After successful zero adjustment the instrument switches to ”Stand-By” mode.

No measuring is being done.

In “Stand-By” mode **2640 PRO EVO** is waiting for a measurement request. This request will be activated by a short press of the power button (for reference see **Chapter 2.1.1**).

5.4 Measurement process

REFERENCE CONDITIONS

According to the ideal gas law, the mass concentration depends on temperature and pressure.

The measurement result for mass concentration is initially based on the device’s internal temperature and the ambient pressure (see the device’s temperature and pressure on display).

While the ambient pressure for the instrument and the object under gas is usually the same, the temperature may differ. To account for this, the temperature used to calculate the mass concentration can be adjusted on the instrument.

Pressing the buttons to increase or decrease the temperature adjusts the calculation of the mass concentration (in g/m³) accordingly. When the device is turned on, the instrument temperature is used for this calculation, as indicated by the lock symbol on the display right beside the temperatures. The calculation will then follow the device temperature.

The percentage reading is internally pressure- and temperature-compensated. The temperature compensation ensures that the measurement accuracy remains stable over a temperature range of -5°C, 23°F up to 55°C, 131°F.

Example for 28°C and 970mbar (minor deviations on the percentage value are due to gas fluctuations and fall within the device's margin of accuracy):

This is the nominal readout of the instrument at a gas level of 1.84%. Converted into mass concentration at 970mbar and 28°C this equals to 72.7 grams / cubic meter. Note the key symbol between "Procheck-Temperature and "Site-Temperature".



An increase in temperature inevitably leads to a lower mass per unit volume due to increased gas motion.



Similarly, a decrease in temperature leads to reduced molecular motion and, consequently, to a higher mass concentration per volume.



During the measurement process, the sensor is continuously purged with gas. The large number of measured values is averaged, and the result is displayed after compensation and adjustment to the reference conditions.

In addition, the gas flow is monitored to alert the user in the event of a blockage in the gas path, a clogged filter, or a faulty gas pump.

5.5 End of operation

Before the instrument is switched off, the user should take care to flush the sensor a few minutes with fresh air. This prevents contamination of the internal gas path and possible memory effects.

The power button must be pressed for at least 3 seconds to switch off the instrument. Unintended switch-off is thereby prevented.

To protect the battery from deep discharge, the instrument is equipped with a protection circuit. If the instrument is kept switched on even after "LOW BAT" warning, an emergency shut-down is activated.

5.6 Charging

The converter for charging can always be connected, even during operation. Charge state is indicated on the display, also if the instrument is off. During operation a flash on the battery symbol indicate charging in progress.

If other power supplies used than the one included, make sure it has the required power output; see Section 2.3, Technical Specifications.

If the instrument was stored on a cold place and moved to a much warmer place the air humidity may condense on the surface of the unit. Always let the unit acclimate! Otherwise serious damage to the instrument is likely!	

Charging a completely discharged battery takes about one hour. Depending on environmental conditions or temperature, this process may take slightly longer.

6. Operational Failures

6.1 Failure messages

Error messages are displayed on the screen. A distinction should be made between errors that the user may be able to resolve on their own (such as a blocked gas flow) and errors that can only be resolved by the manufacturer or an authorized dealer.

6.1.1 ”Instrument Error”

A serious error has occurred.

In addition, an error code is displayed that provides authorized support with information about the source of the error. If the error persist even after a restart, the device must be inspected by ppm Messtechnik GmbH or an authorized support provider.

Please contact your local service provider or ppm Messtechnik GmbH.

6.1.2 ”Warning: Low Flow”

The pneumatic path is blocked and/or gas is not being supplied.

A filter must be installed at the gas inlet; otherwise, the inlet valve will not open. This results in a vacuum.

You should also check whether any connected hoses are blocked.

It is also possible that the internal gas pump is defective. This can only be replaced by an authorized service provider or by ppm Messtechnik GmbH. Please contact your dealer for assistance.

6.1.3 ”Zero calibration ERROR!”

The deviation between the known zero point and the new zero point exceeds the limit values. The deviation is displayed. The device does not tolerate deviations of more than 50 ppm.

Make sure you are not working in a contaminated environment! Also, remove any connected hoses that may be contaminated. The device must always be zeroed in clean, uncontaminated air.

The instrument must be in fresh air, free from contaminants (such as the fumigant) during the user-triggered zero adjustment process!	

7. Maintenance

7.1 General hints

The instrument has been designed for optimum maintainability. A skilled user may perform all conditioning maintenance work himself if required.

CLEANING

The exterior instrument housing may be cleaned with a smooth cloth which has been dampened with water and only a few drops of cleansing agent, e.g. dish washing detergent or similar.

Never use organic solvents (e.g. PERC, TRI, Acetone). Organic solvents may be harmful to instrument.	

7.2 Exchange of sample gas filters (particle filter)

Appropriate sample gas filters must neither adsorb molecules of the sample gas components in the filter element nor in the filter housing. Furthermore must they permit filtration of 5 micrometer particle size.

In order to avoid contamination of valves, sample gas tubing and the measuring cell, the instrument should exclusively be operated using genuine particle filters supplied by ppm! The filters must be installed right on the intake end of sample inlet.	

When changing sample gas filters, proceed as follows:

- In order to avoid contamination of sample gas tubing during changing of filters, switch off instrument.
- Unscrew the dust filter screw caps (if present)
- Insert the new dust filter. A label attached to it is showing an arrow indicating the flow direction of sample gas.

The arrow must point towards instrument gas inlets! **We recommend exchanging particle filters every 3 months.**	

Refer to chapter 7.5 for spare parts.

7.3 Calibration of Instrument

The instrument-integrated functions concerning avoidance of zero-drift are described in Chapter 5.3 of this instruction manual.	

For re-calibration of the **2640 PRO EVO** a special software is necessary. For reference get in contact with our authorised service provider or ppm Messtechnik GmbH.
In case of availability of adequate equipment the calibration may be done by authorised service personnel under adherence to the appropriate safety rules.

A complete recalibration is required every 12 months. Calibration is usually performed as part of routine equipment maintenance.

7.4 Recycling

Devices that are scrapped must not be disposed of with household waste.

ppm Messtechnik GmbH is required to take back the devices it manufactures.

Please contact us for the return. The collection of old devices from mainland Europe is initiated by ppm Messtechnik GmbH at no cost to the customer. Nevertheless, the old device must be packed securely.

Return shipments from other parts of Europe must be handled by the customer.

For old devices outside Europe, please contact your responsible distributor.

Returned devices will be recycled or disposed of at the discretion of ppm Messtechnik GmbH in accordance with the statutory provisions.

7.5 Spare parts

Order number	Description
P04030	Coupling plug, nominal width 2.7mm, for 6mm or ¼” hose 
F04031	AC/DC-Converter for charging of instrument 
G04044	In-line particle filter with fast coupler (6mm or ¼” hose) 
G03566	Coarse dust filter (6mm or ¼” hose) 
P03314	Dust filter elements for G03566 (3 ea) 