

# CertiPH<sub>3</sub>os<sup>®</sup>

**Gas Monitor 2240 - PH<sub>3</sub> Phosphine**  
**Measurement range 45...4500 ppm**

## **INSTRUCTION MANUAL**



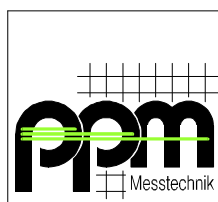
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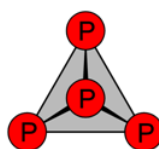
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## **Revision history**

<u>Revision 1.1</u>	March 2011	GSM modem option added Software amendments Printer option removed - option obsolete
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# 1. General Instructions

## 1.1 Indications

This manual contains important information for the operation of **CertiPH<sub>3</sub>os**<sup>®</sup> monitor.

To assure operator safety and the proper use of the monitor, please read, understand, and follow the contents of this manual.

<p><b>Non-observance of these instructions can result in personal injury or death.</b></p> <p><b>Non-observance of these instructions may also lead to the loss of right to claim for damages or warranty!</b></p>	
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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 **CertiPH<sub>3</sub>os**<sup>®</sup> analyser. Non-observance of warnings can result in personal injury or damages to the analyser.



: Avoid actions marked with this sign

Please follow the instructions given. This symbol denotes potential hazard associated with the use of **CertiPH<sub>3</sub>os**<sup>®</sup> analyser. Non-observance of the instructions can result in personal injury or death.

## 1.2 Safety Precautions and Important Instructions for Operation of CertiPH<sub>3</sub>os<sup>®</sup> Monitor

The CertiPH<sub>3</sub>os<sup>®</sup>-Analyser is designed for monitoring, displaying, and logging the levels of PH<sub>3</sub> gas used to fumigate buildings, silos, ship compartments, or other structures for the treatment of living plant material such as fruits, vegetables, grains, and seeds.

The analyser is not intended to be a safety monitor. The CertiPH<sub>3</sub>os<sup>®</sup>-Analyser is not designed for use in potentially explosive environments. Never place and operate the instrument in areas with a potentially explosive atmosphere!

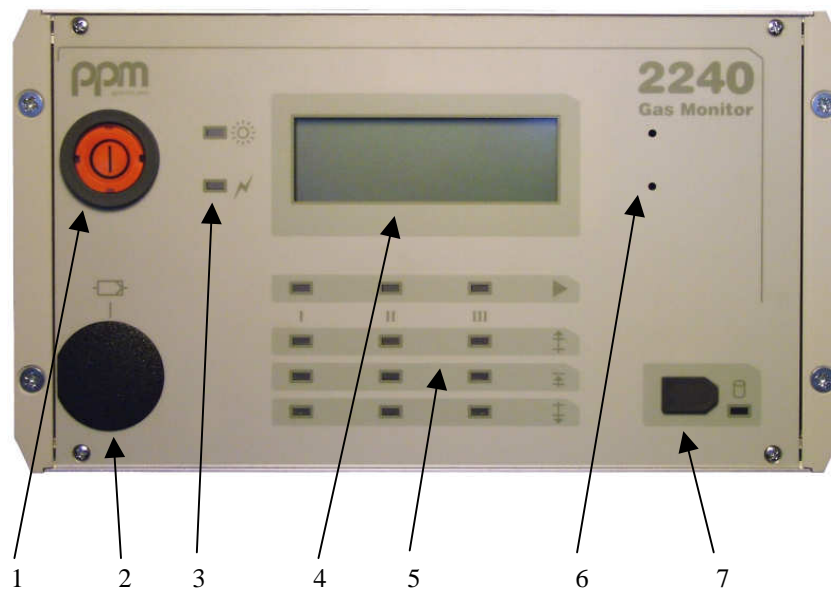
During the fumigation process the CertiPH<sub>3</sub>os<sup>®</sup>-Analyser is used to monitor the fumigant level, thus verifying that the correct level of fumigant is maintained throughout the fumigation process. The Analyser should be used only for this field of application and should be operated only by qualified personnel.

Before entering a confined space that has been fumigated, use a portable PH<sub>3</sub> gas detector to determine the current gas level within that space.

## 2. Description of Gas Monitor M.A.C 2240

### 2.1 Instrument layout

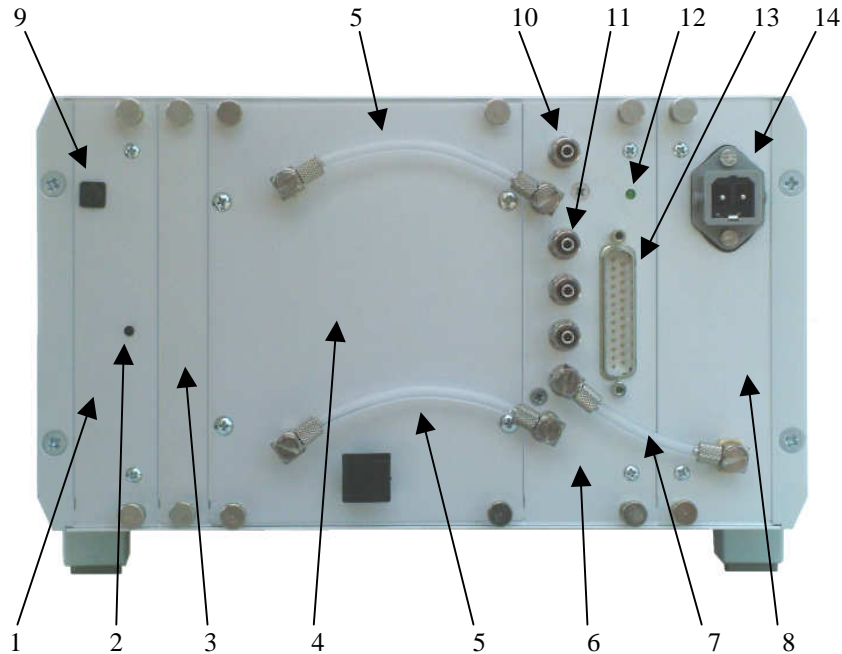
#### 2.1.1 Front view



**Fig. 1 Front View**

- 1 mains switch
- 2 cover of activated carbon filter
- 3 device status display
- 4 LC-Display
- 5 measurement channel status display
- 6 pushbuttons (behind front panel) for instrument setup
- 7 USB-Stick interface (optional)

### 2.1.2. Rear View



**Fig. 2 Rear View**

- |  |  |
|--|--|
| 1 CPU-Module                           | 8 Power supply module                    |
| 2 Reset-Button                         | 9 Service interface connector            |
| 3 Option-Slot                          | 10 Gas outlet                            |
| 4 Sensor-Module                        | 11 Gas inlets (1...3)                    |
| 5 Tubing S/I – Sensor                  | 12 Gas flow control indicator (obsolete) |
| 6 Sampling / Interface module (S/I)    | 13 SUB-D connector control interface     |
| 7 Tubing S/I – activated carbon filter | 14 Mains Power connector                 |

## 2.2 Description of function

### 2.2.1 Description of sensor function

In the monitors type 2240 sensors are used which operate on the principle of Infrared - Spectrometry.

#### *PRINCIPLE*

The physical quality of many gases to react to electromagnetic waves (for instance infrared rays) is being exploited as they respond to a single (or to several) wave length(s) specific to every kind of gas as well as they absorb such energy.

This effect is converted into electric signals by a measuring transducer.

The concentration of the gas component is being calculated via calibration functions filed in the Gas Monitor's configuration library.

### 2.2.2 Description of equipment function

The monitors of type 2240 are equipped with between 1 and 3 gas sampling inlets, which may be controlled either automatically by the equipment software or by an external control unit (e.g. plant control). Two limiting values (alarm levels) for each measuring channel may be set separately in correspondence to existing requirements.

For measurement of the gas concentration at the selected measuring channel the gas to be analyzed is being sucked into the sensor by a built-in diaphragm pump (active sample extraction). During the measuring process a large number of measured values is being integrated. The resulting values show up on the display consecutively and are compared to the limiting values set for the actual measuring channel.

A complete measuring cycle takes about 20 seconds.

An evaluation of the comparison: limit values vs. measured values takes place after a certain delay, preset by the equipment software in order to avoid incorrect readings eventually caused by momentary variations of gas concentration. Mean values are also built only after this delay.

During fumigation it is important, that the concentration range of the fumigant lies within a window between maximum applicable concentration and minimal necessary concentration.

The **CertiPH<sub>3</sub>os**<sup>®</sup> analyser treats the range between PRE-Alarm level and MAIN-Alarm level as such a window. Concentrations within that window are evaluated as "GOOD". No alarm contact is activated.

When concentration is above the MAIN-Alarm level, the corresponding alarm contact will be closed. The traffic light like LED Display signalises "Alarm level superceeded" with a flashing red LED.

If concentration falls below the PRE-Alarm level (the minimum necessary concentration) the corresponding alarm contact will be closed and the traffic light display shows a steady yellow LED.

When the fumigant concentration lies between the both alarm levels, a steady green LED signalises the "GOOD" condition. In this case no alarm contact is activated.

The following table shows the state of the LED traffic light and the state of the alarm contacts at different concentration ranges.

<b>measured concentration</b>	<b>LED Display</b>	<b>Contact MOK(1..3)V</b>	<b>Contact MOK(1..3)H</b>
Value above PRE alarm level and below MAIN alarm level	○ ○ ●	open	open
Value below PRE alarm level	○ ● ○	closed	open
Value above MAIN alarm level	● ○ ○	open	closed

The mean concentration values built over defineable time intervals can be recorded on a USB memory stick for a long period and can be used for evaluation and filing outside the analyser.

An optional GSM modem (built in the analyser) can transmit these values to a database located on the [www.ppm-log.com](http://www.ppm-log.com) website, from where remote monitoring of the fumigation is possible as well as data export to a local PC and SMS or email notification in case of alarm state or equipment failure. The privacy of the data is secured through personal login and password.

## 2.3 Manufacturer-based configuration

For best possible adaptation of instrument to the envisaged task the following parameters of the configuration may be determined by the customer and set at the factory or by authorized service personnel.

- Alarm thresholds Pre- and Main-Alarm (in ppm)
- Cycle time For cyclic measuring mode each channel can be set up with its own time of stay (Manufacturer Setup is 5 minutes for each channel)
- Mean Value Interval 15, 30 minutes, 1, 4, 8 hours
- Cyclic zero value measuring (activated, not activated, time intervals)
- Reference temp. and -pressure Standard: 0 °C and 1013 mbar

## 2.4 Settings at customer's facility

### 2.4.1 Adjustment of local time/ date

At the right-hand side of the display two switches are to be found behind two small bores in the front plate. These switches may be activated with a simple slim screwdriver or with a similar tool (Fig. 1, item 4) in order to set for instance exact local time and calendar date. The setting of time and date is achieved by following steps:

- Switch off instrument
- Keep upper switch in pressed down position and switch on instrument. The input mask will appear. Now release switch. The cursor is blinking at "day".



```
WWW.PPM-MT.COM
MAC 2240 Monitor
Date D:1 M:11 Y:07
Time (24h) h:13 m:40
```

- With the upper switch any full hour between "00 and 23 "may be selected and set
- Confirm the hour setting by briefly pressing the lower switch
- The cursor jumps to the next position ("month"). Proceed in the way described above.

After input of date is finished, the cursor jumps to the time input.

```
www.pfm-mt.com
MAC 2240 Monitor
Date D:14 M:11 Y:07
Time (24h) h:1 m:41
```

- Proceed similar to date adjustment
- After confirmation of the minutes field, the device continues with normal start-up procedure

**If there are any mistakes in the adjustment of date/time, please repeat from the beginning. In that case switch off device first.**




## 2.5. Technical data

Dimensions:	Height approx.:	150 mm = 5.91 in
	Width (standard unit) approx.:	235 mm = 9.25 in
	Depth approx.:	270 mm = 10.63 in
Weight:	approx. 5 kg	
Electrical mains:	Wide range input 90 – 264 Volts AC 47 – 63 Hz	
Power consumption:	max. 65 Watts	
Temperature range:	during storage: between approx. -10°C to +60°C (+14°F to +140°F)	
	during operation: between +10°C to +40°C (+50°F to +104°F)	
Air moisture range:	0 to 95%, non condensing relative humidity	
Digital display:	4-line, 20-character-LCD-display, monochrome	
Measuring principle:	physical, infrared spectroscopy, opto-acoustic sensor	
Compound:	PH <sub>3</sub> , Phospine	
Measuring range:	45...4500 ppm	

### 3. Mounting and Installation


#### 3.1 Mounting

##### *MOUNTING SITE*

<p><b>In order to assure trouble-free functioning of the instrument, mounting it at a site as free of vibrations as possible is of essence. The instrument should be kept at a safety distance of at least 5 cm away from all surrounding walls to ensure free airflow for cooling of the equipment.</b></p> <p><b>The monitor should be installed out of direct sunlight in a clean, dry area that is not subject to temperature or humidity extremes.</b></p>	
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The instrument has been specified for an ambient temperature range from +10°C (+50°F) up to +40°C (+104°F). Condensation of air moisture inside the instrument is to be avoided.

##### *FILTERS*

<p><b>For protection of valves and measuring chamber against pollution all measuring points have to be provided with appropriate filters. The filters must be installed right in front of the sample inlets of the instrument.</b></p>	
--	---

Suitable filters are of such quality that they will neither adsorb molecules of the gas components to be measured in the filter housing nor in the filter element itself. Moreover will they permit filtration of particles the size of 5 micrometers. Particle Filters can be ordered from ppm Messtechnik under order number G03328.

##### *ELECTRICAL CONNECTION*

#### **Electrical connection**

The electric mains for M.A.C 2240 must meet the following requirements:

Nominal voltage:	90 - 264 Volts AC
Frequency:	47 to 63 Hz
Power consumption:	max. 65 watts

**Before connecting instrument to electric mains verify if supply voltage meets those requirements and if it has been expertly fuse protected. Incorrect voltage may cause the fuse of the instrument to blow or damage the instrument itself.**



**WARNING! HIGH VOLTAGE!**

**Prior to opening up of instrument for any reason, its main power supply cable must be unplugged!**

**Non-observance of these instructions can result in personal injury or death.**



*SAMPLE GAS CONNECTIONS*

**Sample gas connections**

The analyser has 1 to 3 sample gas inlets and 1 sample gas outlet (refer also to **Chapter 2.1.2, fig. 2, items 10 and 11**).

The sample gas inlets can be equipped with gas tubes of length up to 120 metres without disturbance of the instruments function. On the sample gas outlet also tubes of length up to 120 metres can be connected.

To avoid clogging of the inlet valves and the measurement chamber the sample gas tubes must be connected to particle filters which are installed directly in front of the corresponding sample gas inlets of the instrument.

**Wrong installation of filters and undue extension of maintenance intervals will inevitably lead to malfunctions or to damages on the measuring instrument!**



**In order to avoid clogging of valves or contamination of measuring chamber, the instrument should only be operated with genuine particle filters!**



## 4. Start of operation

Before connecting the instrument to the mains, make sure that supply voltage strictly corresponds to the requirements detailed in **Chapter 3.2.2**.

Now you may start the instrument by activating the mains switch on the instrument front panel.

## 5. Operation

After the instrument has switched-on, it will automatically run through the following routines before starting the regular measuring operation:

- **Self-Testing**
- **Warm-up period**
- **Auto-zero adjustment**

During the startup-process the green power-light is flashing.

### 5.1 Self-testing of instrument

Immediately after the instrument is switched on, a self-test is made. All optic and acoustic displays are powered for a brief moment. The compound to measure and its over-all measuring range is shown in the LC-display.

During the warm-up period and also while in normal operation (except while in Stand-By-Mode) the instrument will carry out periodically automatic self-testing to check important instrument functions. In case of any malfunction, the warm-up period or the actual measurement cycle will be interrupted with the most probable fault appearing on the display (see **Chapter 6**, - Malfunctions). Simultaneously an acoustic as well as an optical alarm (flashing of display and of fault indicator) will appear, which will stop automatically after 30 seconds. In case of an instrument malfunction, a restart of the instrument is necessary.

## 5.2 Warm-up period

```
WWW.PFM-MT.COM  
MAC 2240 Monitor  
ooooooooooooo_____ 64%  
Warm-Up.....45.9°C
```

The measuring chamber of the sensor is being heated up until 50°C (122°F) have been reached. This will take approximately 3 minutes at an ambient temperature of 20°C (68°F). A progress bar shows the percentage of completion.

```
WWW.PFM-MT.COM  
MAC 2240 Monitor  
oooooooooooooooooooo__ 83%  
Warm-Up.Stab..50.0°C
```

After 50°C (122°F) have been reached, warming up is being continued a certain time period ('stabilizing') in order to make sure that the whole unit has adopted the desired operating temperature.

At the end of the stabilisation phase the unit starts zero adjustment procedure.

## 5.3 Zero adjustment

Repetitive zero adjustment will compensate possible changes in the sensor equipment (e.g. aging of infrared source) and this way eliminate zero drift. Ambient air is being sucked in through the installed activated carbon filter (fig. 1, item 5) and measured in the sensor. Since in a properly serviced zero filter the activated carbon will adsorb the measurable substance(s), the concentration of substance(s) in the sensor equals zero. A zero measurement in a contaminated atmosphere leads to false measured values!

**To provide error-free zero adjustment, the activated carbon filter must be changed regularly. Used-up activated carbon filters will lead to incorrect measurement results or to error condition!**



Only under the condition that at least 4 **consecutive zero adjustment cycles** are within a specified tolerance, the zero value will be accepted. In case a measured value exceeds the specified tolerance (caused e.g. by a contaminated measuring chamber or by leaks etc.) the number of hitherto measured values will be reset to zero. **CertiPH<sub>3</sub>os<sup>®</sup>** will then renew its effort for zero adjustment.

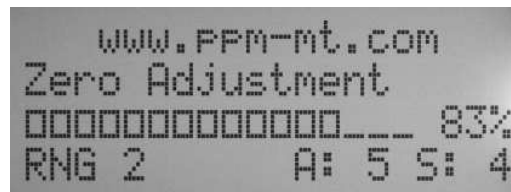
If after 50 attempts less than 4 consecutive values are correct, the instrument will stop zero adjustment and indicate a failure (see **Chapter 6**).

*DURATION OF  
ZERO  
ADJUSTMENT*

Duration of zero adjustment for every internal measuring range is approx. 1 minute in a favorable case. In the most unfavorable case this operation may take up to 15 minutes if e.g. the gas path or the measuring chamber is contaminated. If no correct zero adjustment is being achieved within this time bracket, then a failure indication will be given (see **Chapter 6**).

*DISPLAY*

During the zero adjustment the display will show the measuring range actually under test and additionally the progress of zero adjustment:



**RNG** indicates the actual measuring range, The value after the “A” shows the number of attempts and the value after the “S” shows the number of results lying within the specified tolerance bracket.

After successful zero adjustment the instrument normally switches to "Stand-By-Mode", if neither an automatic measurement channel is configured nor a measurement is requested via the interface.

*AUTOMATIC  
ZERO  
ADJUSTMENT*

**CertiPH<sub>3</sub>os<sup>®</sup>** automatically carries out a zero adjustment procedure after every activation of the mains switch.

*MANUAL ZERO  
ADJUSTMENT*

In those cases where **CertiPH<sub>3</sub>os<sup>®</sup>** has been in operation over a period of more than 5 days **without interruption** and only low gas concentrations are to be measured, a manual zero adjustment is recommended.

The user may trigger such manual zero adjustment by switching off the instrument using the mains switch (see fig. 1, item 1). After a short time of about 5 seconds the instrument can be switched on again and will then initiate the power-up-cycle described in this chapter. This sequence includes zero adjustment procedure.

## 5.5 Externally controlled measurement operation

after successful zero adjustment the instrument switches to "Stand-By"-mode.



No measuring is being done.

While all other components are fully available at this stage, only the pump is switched off for optimization of its service life. Therefore the instrument will resume measuring 15 seconds after receipt of a measurement request.

In "Stand-By"-mode **CertiPH<sub>3</sub>os**<sup>®</sup> is waiting for a measurement request. This request will be sent to the instrument via the external switch-box connected to the interface (for reference see **Annex A2**).

Enclosed in the scope of delivery of the **CertiPH<sub>3</sub>os**<sup>®</sup> monitors there is a switch-box for the measurement inlets 1 to 3 (order number G3508). This box is being plugged on to the 25-pole connector of the interface. With the switches the measurement for the inlets 1 to 3 can be requested. The alarm- and status-contacts are connected through and can be accessed at the rear output connector of the box. For pin assignment of the interface connector refer to **Annex A3**.

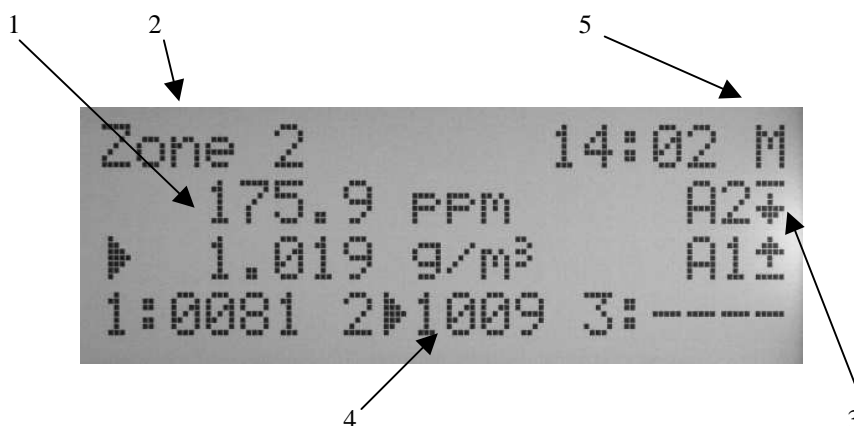
The firmware of the **CertiPH<sub>3</sub>os**<sup>®</sup> analyser is designed for cyclic measurement of the channels requested by the switch-box. The cycle time is factory-set to 5 minutes, but can be individually adapted to the specific needs.

With only one measurement channel requested, the instrument stays at this channel and does continuous measurement. If, for example, the channels 1 AND 2 are requested, the cyclic change-over is done only between these two channels. The same behaviour applies accordingly for request of channels 1 AND 3 or 2 AND 3. If all 3 channels are requested, cyclic changeover follows the pattern 1-2-3-1-2-3 and so on.

## 5.6 Measurement process

### DISPLAY

The instrument display is informing the user continually about the actually measured gas concentration (referring to preset normalized parameters) and other conditions while in measuring process (the picture below is just an example for explanation purposes and does not refer to any specific compound measured).



1. **CertiPH<sub>3</sub>os**<sup>®</sup> analyser displays measurement results in ppm as well as in  $\text{mg/m}^3$  (resp. in  $\text{g/m}^3$ ). If the symbol “<” precedes the measured value, the real measured value lies below the indicated value. On the other hand, if the symbol “>” should appear, the real value is above the over-all measurement range. Normally in this case also the limit value alarms are triggered (if set accordingly).
2. The text "Zone 2" refers to the selected measuring point (here: Measuring point 2). This description of the measuring point can hold up to 12 characters and can be set by authorized personnel.
3. The symbols on the right of ‘A1’ and ‘A2’ inform about the state of the measured value in relation to the adjusted alarm thresholds. Please consider that the limit value ‘A1’ is lower than the limit value ‘A2’. ‘A2’ represents a main alarm state, where ‘A1’ is normally used as a pre-alarm warning threshold. The LED display on the front panel informs like a traffic light about exceeding or falling short of the limit values. In our example the measured value is above the ‘A1’ threshold and below the main alarm threshold ‘A2’.
4. The last line of the display provides a ‘last value’ display for each measuring point. This value can be the result of the previous measurement cycle or the last average value over a preset time period as well as a "sliding" average value over this period. The display mode of the ‘last values’ can be set in instrument’s configuration data (factory setting is “sliding” mean value). The arrow symbol in front of a value denotes the actually updated value.
5. On the right side of the first display line the current time is displayed as well as a status information of the measuring process: ‘M’ for measuring, ‘P’ for purging, ‘W’ for waiting.

**REFERENCE  
CONDITIONS**

The displayed measuring results for mass concentration are normalized to a reference temperature of 0°C (+32°F) and to an atmospheric pressure of 1013 mbar (14.69 psi) by factory setting. Other reference temperatures and -pressures may be preset in the factory. The actual atmospheric pressure on site is being measured inside the instrument used for normalization of the measured values.

**MEASURING  
CYCLE**

Each measurement cycle consists of the following consecutive steps:

1. The measurement cell is being flushed with actual measuring gas for about 5 seconds. Status indicator shows “**P**”
2. Then the instrument goes on hold for about 3 seconds to let gas pulsation calm down (“**W**”).
3. Now the measurement is carried out (“**M**”). The result of the measurement is a mean value over quite a number of single measurements.
4. The measurement result is being compared with the preset alarm threshold values. If it lies within the defined window, no alarm indication is activated on front panel and alarm contacts remain open.

If the result falls short of the PRE-Alarm level, the corresponding contact (MOK(1...3)V) is being closed. If the result exceeds the MAIN-Alarm level, the corresponding contact MOK(1...3)H is being closed (please refer to Annex A2 for further information). In both cases the appropriate indicator on the front panel is activated.

The evaluation period, i.e. time during which the result must steadily overshoot or undershoot the predefined alarm levels, before a contact is activated, depends on the appropriate regulations. It can be changed in factory. The standard setting is 2 measurement cycles.

## 6. Operational Failures

### 6.1 Messages on instrument display

Error messages are shown on the LCD-Display.

Simultaneously the contact PMSR (instrument ready for measurement) on the machine-interface (see also **Annex A, fig. A2 and A3**) is opened and the contact ALARM will be closed. The alarm may be quitted via the input AQUIT (quit alarm, external control) or it will terminate after 30 seconds automatically. In case of malfunctions of the instrument (e.g. IR-source defect), PMSR will not be closed again and operation of the instrument cannot be continued right away. In the event of other errors, continuation of operation is possible in normal cases (see below).

**There are two kinds of messages to be differentiated:**

*WARNINGS*

#### 6.1.1 Warning messages

Warning messages are indicating a critical operational state of the instrument or warning about critical ambient conditions.

**Warning messages should cause the operator in charge to take corrective action regarding the termination of critical state.**



**If the critical condition is terminated, the warning will come off automatically.**

**“Pneumatic error”** – only with option V252 installed

Cause:

- One of the sampling tubes is clogged, pump cannot transport sampling gas to the device.
- The gas outlet tube is clogged, pump cannot transport gas off the device.
- The pump itself is faulty, bad or no transport of gas.

This warning message can occur 5 times (for each inlet channel), giving an error message on display and a warning tone, then continuing measurement.

If more than 5 times the pneumatic error comes up, an error record ist written to the USB memory (if present) or sent via the GSM modem (if present), and the measurement channel is locked out for a subsequent period of approx. 30 minutes.

The normal instrument cycle at the channel affected continues **WITHOUT** any measurement taken; display shows a 'locked out' message.

Normal measurement will take place on the other channels, if requested.

The mean values during the programmed interval will be recorded, too (even those of the affected measurement channel, which have been measured before the error state).

**The lock is bound to the measurement cycles at the affected channel. That means, if no measurement request comes after the error, the lock counter will not be incremented**  
**The lock counter is set to approx. 90 measurement cycles, which must be performed until the lock is released.**



If more than 1 channel shows a flow error and is then locked due to that, the lock counter is divided by the number of channels locked - e.g. if two channels are locked, each of them has to perform only 45 cycles until released again.

A lock of all three channels can only occur, if the gas outlet of the device is blocked or the pump stops working during measurement operation.

After release of the locked measurement channel, the instrument tries to continue normal measurement there.

If the flow error still comes up, another lock takes place (after recording the error state to the USB-Stick or the GSM modem) and so on.

**“USB-Stick missing”** – only with option V253 installed

Cause:

- Data storage device missing

If right after switching on of the equipment no storage medium is discovered, the warning is displayed.

The storage medium can be inserted or removed later during operation.

Corrective action:

Insert USB-Stick

**“Modem no antenna”** – only with option V260 installed

Cause:

- the front panel mounted antenna for the operation of the GSM modem is missing

Corrective action:

Mount the antenna.

**“Modem no network”** – only with option V260 installed

Cause:

- the network strength is too weak, no service or low service is provided for the modem.

Corrective action:

Choose a location with better network strength for the device. In some locations there may be no sufficient coverage of the chosen network.

**“Modem not online”** – only with option V260 installed

Cause:

- the modem could not dial into the network and therefore the database of the target website could not be accessed. The last record of data could not be transmitted and has been lost.

Corrective action:

Choose a location with better network strength for the device. Make sure that your standard network is accessible at the current location.

### 6.1.2 Failure messages

Failure messages are indicating (with acoustic alarm and blinking failure-indicating lamp) that a direct return to normal operation of the program is not possible. The instrument must be switched off. After successful elimination of cause for failure or breakdown instrument may be switched on again for normal start-up procedure.

**WARNING! HIGH VOLTAGE!**

**Prior to opening up of instrument for any reason, its main power supply cable must be unplugged!**

**Non-observance of these instructions can result in personal injury or death.**



**If the option V253, USB Memory Stick, or the option V260, GSM Modem, are installed, every occurrence of an error is directly recorded to the memory stick or sent via the modem to the target website.**



**It is self-evident that errors concerning the modem can not be transmitted to the target website and will be recorded only on the USB-memory stick, if present. Idem applies for hard errors concerning the USB-memory stick; those errors would only be recorded if a GSM modem is present.**

#### **"IR-Source"**

Explanation:

Evidently no power consumption at infrared source

Probable causes:

- Electronic control defect
- Infrared source defect
- Transportation damage (filament broken)

Corrective action:

- send instrument for repair (manufacturer)

### **"Compensation"**

Explanation:

Measurement amplifier defect or instrument-integrated calibration data destroyed (stored on EEPROM) or measuring cell defect

Corrective action:

- send instrument for repair (manufacturer)

### **"Main signal"**

Explanation:

Measurement amplifier defect or instrument-integrated calibration data destroyed (stored on EEPROM) or measuring cell defect

Corrective action:

- send instrument for repair (manufacturer)

### **"Zero setting unstable"**

Explanation:

Sensor unable to conform preset value within determined tolerances during zero setting.

Probable causes:

- Zero-gas filter used-up
- Measurement chamber leakage at inlet/outlet gate valve because of insufficient dust filtration or excessive suction (higher than 50 mbar = 0.7 psi)
- Excessive suction may also be caused by tube lengths exceeding permissible length.

Corrective action:

Replace zero-gas filter (activated-carbon filter on instrument front panel). If problem re-occurs, exchange of measuring cell is required (manufacturer).

**Incorrect installation of filter and undue extension of maintenance intervals will cause malfunctions or damages of measuring instrument.**



### **"Operating temperature too low"**

Explanation:

Ambient temperature lower than 10° C resp. 58°F

Probable causes:

- Instrument or ambient temperature is too low (outside of the operating parameters).

Corrective action:

- At occurrence of this error message, operator in charge should at first check if external influences are causing this critical situation, and if applicable, eliminate those negative influences.
- In case error message was not caused by external influences, defect module(s) should be replaced (manufacturer)

### **"Operating temperature too high"**

Explanation:

Ambient temperature higher than 40° C resp. 104°F

Probable causes:

- Instrument is directly exposed to external heat sources (inadequate ventilation, high solar radiation, problematic installation site).

Corrective action:

- At occurrence of this error message, operator in charge should at first check if external influences are causing this critical situation, and if applicable, eliminate those negative influences.
- In case error message was not caused by external influences, defect module(s) should be replaced (manufacturer).

### **"Sensor temperature too high"**

Explanation:

Sensor temperature higher than 55° C resp. 119°F

Probable causes:

- Instrument is directly exposed to external heat sources (inadequate ventilation, high solar radiation, problematic installation site).
- Blower-fan (or fan control) defect
- Electronic control of heater defect

Corrective action:

- At occurrence of this error message, operator in charge should at first check if external influences are causing this critical situation, and if applicable, eliminate those negative influences.
- In case error message was not caused by external influences, defect module(s) should be replaced (send instrument for repair to manufacturer).

**"Pneumatic system"**– only with option V252 installed

If occurrence is detected after Power-ON or hardware test this failure leads to a "hard" error, resp. instrument malfunction. During normal operation this is a serious error, which leads to lock-out of the channel, where the error occurred, for a certain period (see also "Pneumatic System" Warning **Chapter 6.1.1**).

Explanation:

Pump does not supply measuring gas (no pump noise audible) or gas tube blocked

Probable causes:

- Pump defect
- Gas return-tube or -valve is blocked

Corrective action:

- replace MG-MIF-module (manufacturer)
- remove circulation blockage in gas system.

**"RTC"**

Servicing required. Send instrument for repair

**"AD-converter"**

Servicing required. Send instrument for repair

**"EEPROM"**

Servicing required. Send instrument for repair

**"CFG"**

Probable causes:

- Defect in data-/program - memory or manipulated data

Corrective action:

- Servicing required. Send instrument for repair

**“USB-Stick“**– only with option V253 installed

Cause:

- Error on USB-Stick, no writing possible.

Corrective action:

- Exchange data storage device

**"CFG-Mode active “**

Cause:

- Wrong operation of instrument
- Access to internal configuration

Corrective action:

- Switch off instrument and wait for 20 seconds. Then turn on the instrument again.

## 6.2 Communication problems between instrument and external control

Below some malfunctions are listed which may occur during communication between external control and the **CertiPH<sub>3</sub>os<sup>®</sup>** monitor.

### 6.2.1 Errors caused by external control

- **MRQ(1..3)-Signal not constant during request for measurement**  
If significant voltage breakdowns (longer than 50 ms) occur, unintentional switch-over to a non-selected channel may happen.
- **No reaction of instrument**  
In case the signal „**CRON**“ has not been set by the external control, instrument will not react to any requests for measurement.
- **Alarm-reaction of instrument on channel changeover**  
If, at a changing-over of channels, the control lamp of the channel left starts blinking alternating with the control lamp of the consecutively selected channel and if at the same time the audible alarm comes on, then this channel change-over has presumably been initiated at a moment when either gas concentration was in excess of limit or the evaluation time was too short. In such case the external control obviously performed an automatic switch-over without waiting for the MOK(1..3)H-signal from the instrument.  
The MOK(1..3)V-Signals are disregarded during changeover.

## 6.2.2 Error on interface cable

- **No reaction of instrument**  
Broken wires on interface cable or on plug

## 6.2.3 Error on Gas Monitor - interface module

- **No reaction of instrument on request for channel change**  
If the instrument does not change measuring channels, although the control signals MRQ(1..3) and CRON have correctly been set at the control side, at first the interface cable has to be inspected for defects. If no defect can be located there, the interface module has to be replaced (manufacturer).
- **No reaction of instrument even if results remain below limit**  
In case the instrument does not evaluate results respectively does not acknowledge signal, although at control side the control signals MRQ(1..3) and CRON are found to be o.k., check first if the red - or the green light of the channel concerned is activated on the instrument front panel or not. If no such light is on, measuring time should be extended. If situation is not improved thereby, verify if result signal contacts are properly connected at control side. If this is found to be correct, the interface cable should be inspected for possible wire damage. In case no defect is found on cable either, the interface module has to be replaced (manufacturer).

## 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 instrument housing may be cleaned with a smooth cloth which has been wetted with water and only a few drops of cleansing agent.

**Never use organic solvents (e.g. PERC, TRI, Acetone). Organic solvents may be harmful to instrument front panel and painted surfaces.**



### 7.2 Exchange of Activated Carbon filter

*ACTIVATED  
CARBON  
FILTER  
EXCHANGE*

In order to receive flawless zero adjustments, the activated carbon filter must be changed regularly. The exchange interval will strongly depend on:

- Dust content and concentration of components to be measured as well as content of chemical combinations in the ambient air which may be adsorbed by activated carbon. The higher the contents, the sooner an exchange of the filter element will become necessary.
- The frequency of zero adjustments (among others dependent on operating period of instrument).

**We recommend to change the activated carbon filter every 3 months.**

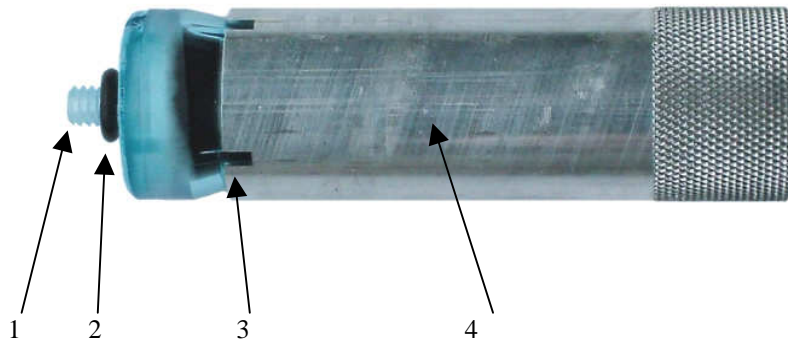


**Wrong installation of activated carbon filter or postponement of due maintenance will lead to malfunctions of the instrument!**



For filter change proceed as follows:

- The activated carbon filter (zero filter) is located behind the circular cover plate on the front panel, Figure 1, Item 2.
- Lift up this circular cover plate by carefully levering it open with a small screw driver.
- Insert the supplied filter-exchange tool into the opening. Turn it carefully until it clicks into place. Now unscrew filter from its socket by turning tool counterclockwise.



**Fig. 7**

- 1 thread
- 2 rubber gasket
- 3 click-in-pins on filter
- 4 filter-exchange tool

- Insert new filter into filter-exchange tool .Make sure that the rubber gasket (fig. 7, item 2) of the filter cartridge is in place. Insert tool with filter into opening on instrument front panel.
- Screw in filter clockwise into its panel-mounted socket. Tighten filter **applying gentle effort only**.

**Never tighten filter too much - otherwise thread might break off!**



- Let circular cover (fig 1, item 5) snap back into front panel.
- Complete printed text on supplied sticker by filling in actual date into line reading

"last filter change on....."

and apply sticker right on top of the cover. This allows easy control over the desired filter change schedule.

**Always keep a sufficient quantity of the genuine Activated Carbon filters and of dust filters available on stock.**



**Used-up dust- and Activated Carbon filter-cartridges may be returned to ppm Messtechnik or to service shop for proper disposal.**

Spare Part	Order No.
Activated Carbon filter	G01538
Particle filter 2 (2 fittings)	G03328

Subject to change

### 7.3 Exchange of sample gas filters (particle filter)

Appropriate sample gas filters are of such nature as they will 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, of sample gas tubing, and of the measuring cell, the instrument should exclusively be operated using genuine particle filters supplied by ppm!  
The filters must be installed right in front of the sample inlets of the instrument.**



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.
- 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!**



- Write down actual calendar date on filter label. This allows easy control of filter-change schedule.

**We recommend to exchange particle filters every 3 months.**



### 7.5 Calibration of Instrument

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



The possibility for re-calibration of the 2240 **CertiPH<sub>3</sub>os**<sup>®</sup> is by default included in the scope of functions of the firmware. For reference see separate calibration instructions for service personal.

In case of availability of adequate equipment the calibration may be done by authorized service personnel under adherence to the appropriate safety rules.

A factory calibration is required every 24 months. The calibration normally is done besides a complete instrument maintenance.

## 8. Options

### 8.2 Serial interface

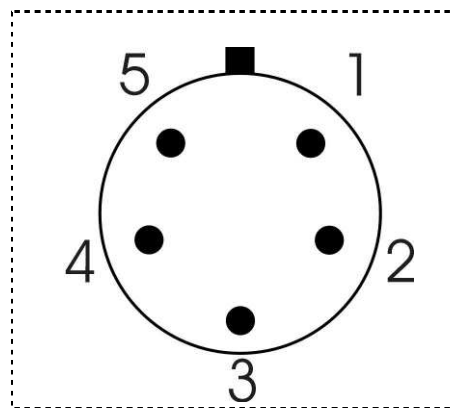
The measuring instrument is by default equipped with a serial interface for service personnel and configuration of the unit.

Optionally a second serial interface can be implemented. This RS-232C interface can be used for data transmission of up to 15m (50 ft) distance.

#### 8.2.1 RS-232C Interface

The instrument can be equipped at the factory with a serial RS-232C interface for data transfer. The 5-pole connector (type Binder 719) is located on the back of the CPU-assembly, (fig. 2, item 1.) right under the interface for the service personal. Pin assignment see fig. 10.

**The length of the connecting cable must not exceed 15 meters (50 feet)!**



Pin 1: GND

Pin 3: TXD

Pin 3: RXD

**Fig. 10**

5-pin Binder-Connector, female, pin assignment RS-232C

The data transfer rate is set to 9600 baud, no parity bit, 8 data bit, 1 stop bit (9600,N,8,1) by the manufacturer. The standard software does not support serial interfaces!

**The data is transmitted without hardware/software handshake!**

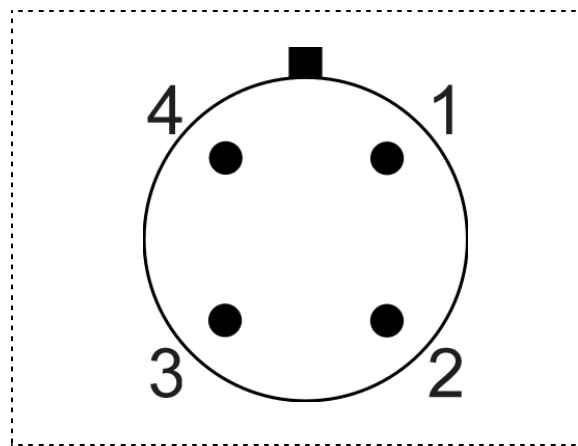


## 8.3 Analog-outputs

### 8.3.1 Options V218/V219 - analog recorder output 0-20mA / 4-20mA

When option V218/V219 is installed, 2240 monitor is equipped with a galvanically separated current output.

Resolution of the output current is dependent on sensor type installed and on the preset spreading. During warm-up period and zero adjustment the recorder output is set to 0mA respectively 4mA. This corresponds to a concentration of 0 g/m<sup>3</sup>. During actual measuring the recorder output is set - prior to every pumping cycle - to the current which corresponds to the actually measured concentration. If an underflow of the measuring range occurs, the output is set to that current value which corresponds to the lower limit of the measuring range.



Pin 1: GND  
Pin 3: Signal

**Fig. 11**

4-pin Binder-Connector, pin assignment analog out

Depending on the total measuring range the following values arise as a result of spreading:

Spreading 1:

The entire range is scaled on 0/4mA to 20mA.

Spreading 10:

A tenth of the entire range is scaled on 0/4mA to 20mA.

Spreading 100:

A hundredth of the entire range is scaled on 0/4mA to 20mA.

The following settings (adjustments) can be made on the card:

**Jumper**

J6                      graduation of spreading 1/10/100  
J3, J4                  output current range 0-20mA/4-20mA

- **Spreading:**

The spreading of the output current is set with the Jumper J6.  
The following settings are possible:

Pin 1-2	Pin 3-4	Spread
OFF	OFF	1
OFF	ON	10
ON	OFF	100

ON:                      Jumper shorted  
OFF                      Jumper open

- **Current output 0-20 mA/4-20mA:**

With Jumpers J3 and J4 the card is adjusted for output current 0-20mA respectively 4-20mA. Always **both** Jumpers have to be set for the **same** mode of operation.

Jumper on Pin 1-2 results in 0-20mA  
Jumper on Pin 2-3 results in 4-20mA

### 8.3.2 Option V220 - analog recorder output 0-10V

When option V220 is installed, 2240 monitor will be equipped with a galvanically separated voltage output.

The resolution of the output voltage is depending on sensor types installed and on the preset spreading. During warm-up time and zero point measuring the recorder output is set to 0 V. This corresponds to a concentration of 0 g/m<sup>3</sup>. During actual measurement the recorder output is being set prior to every pump cycle to that voltage which corresponds to the actually measured concentration. If an underflow of the measuring range occurs, the output is set to that voltage which corresponds to the lower limit of the measuring range.

The pin assignment is identical to option V218/219.  
See also fig. 11.

As a result of spreading the following values results:

Spreading 1:        The entire range is scaled on 0V to 10V.  
Spreading 10:      A tenth of the entire range is scaled on 0V to 10V.  
Spreading 100:    A hundredth of the entire range is scaled on 0V to 10V.

## 8.4 Option V252 – Internal Gas Flow Control

On demand the gas sampling unit can be equipped with gas flow control.

The advantage of this optional equipment lies in the surveillance of the whole pneumatic system including functional control of the internal sample gas pump.

The internal gas flow control circuit reacts on following conditions:

- Gas inlet tubing restricted or blocked
- Gas outlet tubing restricted or blocked
- Malfunction of the internal pump
- Internal valves faulty
- positive- or negative pressure over the Sensor too high (flow resistance of tubing too high, tubes too long)

If malfunction of the internal pump is the reason for flow-alarm, pump must be changed by the manufacturer or authorized service personnel.

**Please refer to Annex A3**



## 8.5 Option V253 - Additional Memory (USB-Memory Stick)

With option V253 it is possible to store average values permanently. As storage medium a commercial USB-Stick is used.

The maximum number of recordable average values depends on the capacity of the USB-Stick used:

with a capacity of	256 Mbytes approx.	4 million values
with a capacity of	512 Mbytes approx.	8 million values
with a capacity of	1024 Mbytes approx.	16 million values

The number of resulting operation hours depends on the chosen average-time, the available capacity on the USB-Stick and the number of already stored data files.

The values are recorded in text-file format (ASCII). The readout can easily be done by a USB-interface on e.g. your PC. With the PC the transferred data can be processed by numerous spreadsheet programs.

### 8.5.1 Storage of average values

The average values are stored automatically, if the USB-Stick is inserted.

If the instrument is switched off, the USB-Stick may be changed at any time.

Some USB-Sticks are equipped with a write protection switch. If this switch is on, this will result in an error message “**USB-Stick error**” and the measuring operation will be continued without storing data. To continue storing, the switch must be turned off and the instrument must be restarted.

If there is no memory stick inserted during the startup of the M.A.C 2240, a warning message “**USB-Stick missing**” together with a 5 second acoustical signal is put out. Subsequently the instrument automatically continues with the normal start up procedure.

Insertion of the memory stick during normal operation is possible at any time.

Removal during normal operation is possible, as long as the green LED on the right side of the memory stick is lit steadily.

**Removal of the USB-Stick during operation may not be done, if the green LED at the right side is not lit steadily! Non-observance will cause the total loss of stored data!**



A ready-for-use USB-Stick is attached to each equipment, which is delivered with the option V253-USB.

**Any other USB stick must be formatted with the file system FAT before usage.  
Please perform this using your PC.**



If during the writing procedure a malfunction of the USB-Stick is encountered, the instrument issues an error message “**USB-Stick error**” on the display and the storage operation is discontinued.

The files which hold the measured values are being stored in the subdirectory "DATA" of the USB stick. If the subdirectory does not exist, it will be generated automatically. The filename consists of the 'starting calendar date' in the form YYMMDD and the ending CSV.

The file directory will look like:

```
e.g.          100901.CSV      File of 01.09.2010
              .
              .
              171006.CSV      File of 06.10.2010
```

Once recording has started, no new file will be created until the unit is switched off. This assures that during a fumigation over a period of some days all measured mean values are recorded under the same filename.

The values are stored after each completion of the configured averaging interval. The values are stored in the following format:

```
dd:mm:jj;hh:mm:ss;0000,0;0000,0;0000,0;00000;00,0;0;0;9999; CRLF
(Date;Time;Zone1;Zone2;Zone3;Patm;tBOX;C;E;SEN; CRLF)
```

where **Patm** is atmospheric pressure [mbar],  
**tBox** is the instruments temperature [°C],  
**C** is a code for measurement unit [ppm=1, mg=2]  
**E** is an Error Code,  
**SEN** is the sensor's serial number

The error code is masked by ASCII code, starting with 65, that is the 'A'. The channel, which was active, when the error occurred, is marked with a value of '999999' in the error record.

Error codes, translation

A: 'Pneumatic System'	K: 'EEPROM'
B: 'Infrared Source'	L: 'Error CFG-Data'
C: 'Chopper Motor'	M: - not used -
D: 'Sensor Heater'	N: 'Sys.in.Conf.Mode'
E: 'Zero Setting'	O: 'USB-Stick Fault'
F: 'Err Factory Cal.'	P: 'No USB-Stick'
G: 'Secondary Signal'	Q: - not used
H: 'RTC'	R: 'Modem offline'
I: 'Cell Temperature'	S: 'Modem no service'
J: 'AD Converter'	T: 'Modem no antenna'

If no error, error code is '0' (Zero)

Example of recorded values:

```
01.09.2010;13:45:07; 126,6 ; 0 ; 0 ; 963 ; 26,5;2;0;5888
01.09.2010;13:50:07; 0 ; 38,1 ; 0 ; 963 ; 26,5;2;0;5888
01.09.2010;13:55:07; 0 ; 0 ; 378,4 ; 963 ; 26,5;2;0;5888
07.09.2010;14:00:07; 126,6 ; 0 ; 0 ; 963 ; 26,5;2;A;5888
```

In the example above the averaging time is five minutes and instrument is cyclically measuring on all three points. The atmospheric pressure is 963 mbar and the temperature inside the instrument is 26.5°C.

### 8.5.2 Readout and erasure of Memory-Stick

Readout and erasure of the USB-Stick is performed using the USB-interface on your computer. Please follow the instructions of the PC's manufacturer when performing such a job.

## 8.6 Option V260 – Internal GSM Modem

With option V260 it is possible to transmit average values to a personalized account on [www.ppm-log.com](http://www.ppm-log.com). A customer-selected GSM network is used for transmission. The instrument is equipped with an built-in modem, where the user-supplied SIM-card is installed at the manufacturer's facilities. The modem is programmed to work only with this specific SIM-card to avoid abuse. The antenna is panel-mounted directly on the instrument.

**For error-free operation of the modem it is of essential imperative that the antenna is mounted correctly to the connector on front panel. Hand-tighten the mounting thread and put the antenna in an upright position.**



### **WARNING! STRONG RF FIELD!**

**During operation of the CertiPH<sub>3</sub>os<sup>®</sup> monitor always keep a minimum distance of 25 cm (10") from the antenna to your body or the bodies of other persons!  
Non-observance of these instructions can result in personal injury.**



### 8.6.1 Transmitted values and additional services

The transmitted data records correspond to those, recorded by the USB-memory option V253 (refer to 8.5 Additional Memory USB-Memory Stick). The preset time interval for the mean values applies for modem operation, too

Additionally, the monitor's serial number is transmitted to allocate the appropriate device table in the website's database.

The Error codes are translated to clear text by the website's database.

Furthermore it is possible to get alarm and error messages via SMS and/or eMail, almost in real time. The SMS- and eMail-service is user defineable directly on the admin pages of the user's account(s).

### 8.6.2 Operating frequencies

The modem applied is a quad-band-modem and able to work worldwide. The main operating frequencies are fixed by the firmware of the modem and depend on the area of operation. They are GSM 900 and DCS 1800 (Europe) or GSM 850 and PCS 1900 (USA, South America).

### 8.6.3 International roaming

The modem is able to carry out 'International Roaming' (within the available programmed frequency band). Due to the possibly arising high connection and operating cost this function is deactivated by default. The function could be activated upon request.

### 8.6.4 Operation

After POWER ON of the **CertiPH<sub>3</sub>os<sup>®</sup>** monitor the modem attempts to set up a permanent connection to the [www.ppm-log.com](http://www.ppm-log.com) website. After the stabilization phase of the sensor temperature a message is displayed informing the user about the network strength (if network is available). If network is not available or network strength is too weak, an error message will be displayed.

In case of a bad connection the modem permanently attempts to set up a new connection (independent of the normal measurement operation of the **CertiPH<sub>3</sub>os<sup>®</sup>** monitor).

The data transfer volume depends on the preset time interval for the mean values. If 30-minute mean values are chosen, the data transfer volume lies below 5 MB per month, even if the monitor is operated continuously over 24 hours a day.

## Annex A: Installation

### 1. Installation site.

**In order to assure trouble-free functioning of the instrument, mounting it at a site as free of vibrations as possible is of essence. The monitor should be installed out of direct sunlight 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 +10°C (+50°F) up to +40°C (+104°F). Condensation of air moisture inside the instrument is to be avoided. An integrated protection mechanism will switch off the measuring operation if the maximum permissible internal temperature is exceeding a limit of + 55°C (135°F). In this case the instrument will issue a malfunction message.

For cooling purposes the instrument must be set up in such a manner that free circulation of the ambient air is unobstructed. On the other side it must also be protected from exposure to very dusty environment or to splash-water.

**The instrument should be kept at a safety distance of at least 5 cm away from all surrounding walls to ensure free airflow for cooling of the equipment**



The installation location is to be selected in such a manner that the instrument may be operated and read with ease. It is equally important that the activated carbon filter installed behind the instrument's front panel is easily accessible for scheduled filter replacement.

### 2. Electric connection

Nominal Supply voltage:	90 - 264 Volt AC
Frequency:	47 - 63 Hz
Power Consumption:	max. 65 W

Connection of the instrument to the mains should be secured with a safety fuse (e.g. automatic fuse 8 A) and it should be separated from the mains connection of the plant resp. machine. If both connections are circuited together there is a danger of disturbances EM-pulses. Securing the mains connection against EM pulses would be an alternative.

### 3. Sample gas connection

The sample-gas feed tubes must be provided with one each dust filter version 2 (see also **chapter 7.3**). The filters must correspond to the requirements as per Chapter 3.1 and be installed direct in front of the gas inlets of the instrument. Applying the filters protects the instrument against pollution. Suitable filters are of such quality that they will 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 size 5 micrometers.

**In order to avoid pollution of valves and of measuring chamber, the instrument may only be operated with filters protecting all measuring channels. The filters are to be placed right in front of the gas inlets of the instrument.**



**For protection of valves and measuring chamber please use genuine particle filters supplied by ppm**



The inlet tubing and the exhaust tubing may not exceed a length of 120 metres (360 ft).

**Take utmost care to prevent liquids from penetrating 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!**



### 4. Interface Cable

The electrical connection between instrument and external control is provided by a cable configured by ppm Messtechnik. For details please see **figures. A4 and A5** on the subsequent pages.

The standard length of the Interface-cable is 5 m (16 ft). Other cable lengths available on request.

## A2: Description of Interface 2240 monitor - external control

### a) Signals from external Control to 2240 monitor:

Description	Code Signal	24 V to Pin No.	GND to Pin No.	Action M.A.C 2040
External Control ON	CRON	13	10	Request for measurement will be accepted if ready for measuring
Request for measurement on channel CHA1	MRQ1	12	10	starts measuring cycle on channel CHA1 Pin 6+19 open
Request for measurement on channel CHA2	MRQ2	24	10	starts measuring cycle on channel CHA2 Pin 5+17 open
Request for measurement on channel CHA3	MRQ3	11	10	starts measuring cycle on channel CHA3 Pin 3+16 open
Alarm is acknowledged	AQUIT	23	10	Alarm is reset Pin 2+14 open

These signals are available, when the switch-box G3508 is **not** connected to the interface

### b) Signals from M.A.C 2240 to Plant Control:

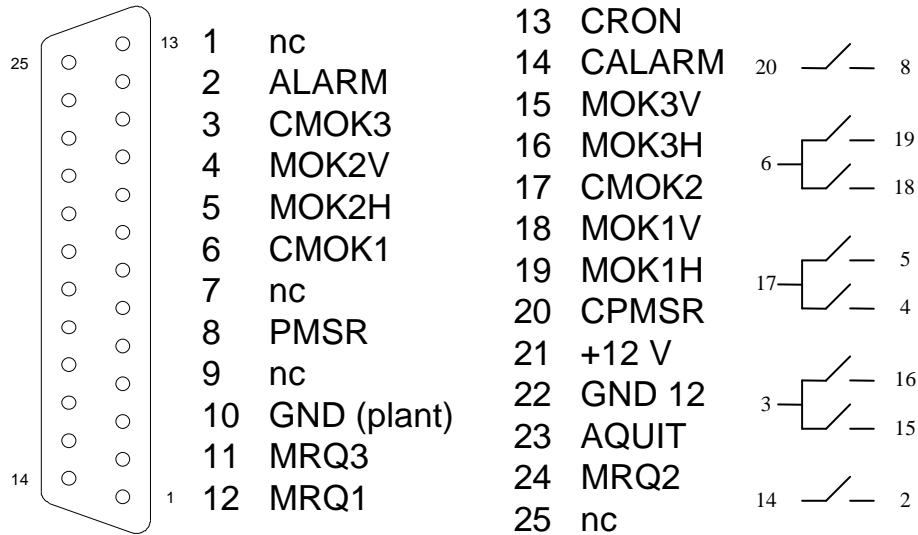
Description	Code Signal	Output
Instrument. ready for measurement	PMSR	Pin 8+20 closed
Result on channel CHA1 is < main alarm	MOK1H	Pin 6+19 open
Result on channel CHA2 is < main alarm	MOK2H	Pin 5+17 open
Result on channel CHA3 is < main alarm	MOK3H	Pin 3+16 open
Result on channel CHA1 is < pre alarm	MOK1V	Pin 6+18 closed
Result on channel CHA 2 is < pre alarm	MOK2V	Pin 4+17 closed
Result on channel CHA3 is < pre alarm	MOK3V	Pin 3+15 closed
Alarm or Failure	ALARM	Pin 2+14 closed

During alarm condition, the contacts are closed. As long as the concentration range lies within the predefined window, the contacts remain open.

#### Notes:

- 1.) The voltage on CRON, MRQ(1..3) and AQUIT may be 24 V DC as well as 24 V AC.
- 2.) Max. admissible load at output contact: 48 V , 0,3 A
- 3.) The output contacts for measuring channels which have not been requested for measurement remain in the state set before

### A3: Pin Assignment of Machine-Interface Connector M.A.C 2240



**Fig. A5**

output of external control, input to M.A.C 2240  
 24 V DC or 24 V AC  
 Pins 11, 12, 13, 23, 24 against GND, Pin 10

output of M.A.C 2240, input to machine control  
 potential free contacts  
 Pins 2, 14 (Alarm)  
 Pins 6, 19 (MOK1H) - 5, 17 (MOK2H) - 3, 16 (MOK3H)  
 Pins 8, 18 (MOK1V) - 4, 17 (MOK2V) - 3, 15 (MOK3V)  
 Pins 7, 20 (PMSR)

**max. contact load 0,3 A, 48 V**

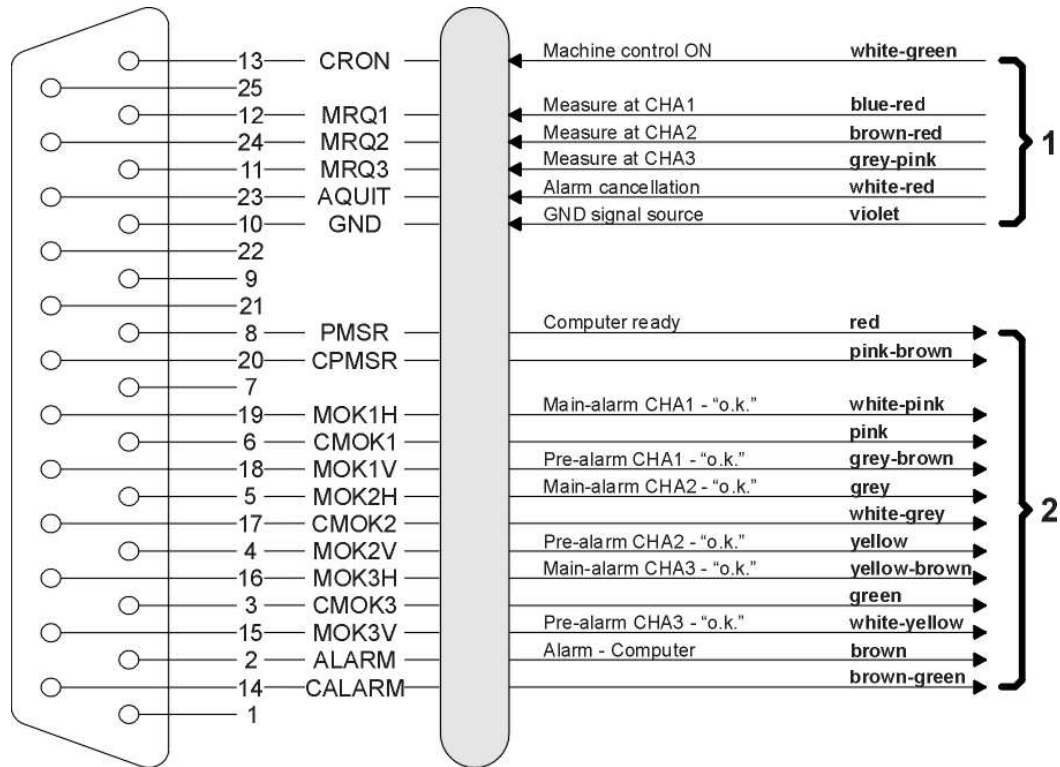
**Warning:**

**The voltage of 12 V DC at pin 21 (+12V) and pin 22 (GND 12) is provided for use with the switch-box G3508 only!**

**Never connect any external devices! There would be a galvanically connection to the instruments electronics! In case of short circuit or overload the Sampling unit can be damaged!**



**A4: Pin Assignment of Standard-Interface-Cable for monitor 2240**  
(Order-no. G03501)



**Fig. A2**

connector, female, series sub-d, 25 pins  
with connecting cable, 16 wires (LiYCY 0.34 mm<sup>2</sup>)  
total length of I/F cable l = 5000 mm, with 200 mm free cable endings  
soldering point protected by shrinking hose sleeve

- 1 output of machine control, input to M.A.C 2240  
24 V DC or 24 V AC
- 2 output of M.A.C 2240, input to machine control  
potential free contacts  
@ standard cable only the normally open contacts are wired  
contact load max. 0.3 A, 48 V

## Annex B: Technical Specifications GSM Modem (Option V260)

**Indication of restriction in use:**  
**The use of this equipment requires a minimum distance from the body (25cm or 10”).**



### 1. Safety recommendations

**The use of this product may be dangerous and has to be avoided in the following areas:**  
**Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.**  
**Where there is risk of explosion such as gasoline stations, oil refineries, etc.**



It is responsibility of the user to enforce the country regulations and the specific environment regulations.

Do not disassemble the product; any mark of tampering leads to loss of warranty.

Every unit has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (25cm).

### 2. Conformity Assessment Issues

The Telit GC864-Quad-PYT GSM/GPRS-modems are conforming to the following European Union Directives:

- R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments)
- Low Voltage Directive 73/23/EEC and product safety Directive 89/336/EEC for conformity for EMC

Furthermore the used Telit GC864-Quad-PYT GSM/GPRS-Modem is FCC Approved.

The GSM/GPRS-Modem is conforming with the following US Directives:

- Use of RF Spectrum. Standards: FCC 47 Part 24 (GSM 1900)
- EMC (Electromagnetic Compatibility). Standards: FCC 47 Part 15

To meet the FCC's RF exposure rules and regulations:

- The system antenna used for this transmitter must be installed to provide a separation distance of at least 20cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The system antenna used for this module must not exceed 1.4dBi (850MHz) and 3.0dBi (1900MHz) for mobile and fixed or mobile operating configurations.
- Users must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

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

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

Registration codes:

- Anatel: 0745-08-2618
- FCC ID: RI7GC864
- IC: 5131A-GC864

### 3. Declaration of Conformity

**Declaration of Conformity for  
Telit GC864-Quad-PYT GPRS/GSM-Modem,  
optionally installed in IR-Spectrometer M.A.C 2240:**

We, ppm Messtechnik, Gartenweg 1a, 85614 Kirchseeon, Germany, declare that our optional accessory GPRS/GSM-Modem (Telit GC864-Quad-PYT), used in our IR-Spectrometer M.A.C 2240, is in conformity with the appropriate standards

- ETSI EN 301 511: v.9.0.2
- CENELEC EN 60950:2001
- ETSI EN 301 489-1: v.1.4.1
- ETSI EN 301 301-7: v.1.2.1

following the provisions of Radio Equipment and Telecommunication Terminal Equipment directive **1999/5/EC**.

Kirchseeon, March 2011



A handwritten signature in black ink, appearing to read 'H. König', with a long, sweeping flourish extending upwards and to the right.

Horst König,  
CEO of ppm Messtechnik