EMS

Measurement
Technology

MAC *View*®
Ethylene Analyser

Installation and user manual

This manual is part of the complete product. It contains important instructions about how to put the product into operation and maintenance. Also take this into account when passing this product on to a third party. A basic knowledge of the handling and installation of electronic equipment is assumed throughout this manual.

Please keep this manual in a safe place!

A list of contents, with page number indication, can be found on the following pages.

The product can be operated in two different languages (English and Dutch). Because this manual is written in English, all screen texts, drawings and other indications are in English.

Introduction

Dear customer, with the purchase of this product, the MAC *View*® Ethylene Analyser, you have a state of the art measuring device made with the latest technologies and fabrication methods. This product accurately and reliably measures ethylene gas, even at extremely low concentrations in the ppb (parts per billion) range. Through the built-in logging function of the device you can monitor an entire measuring process afterwards and analyse the results. Apart from that you can also make use of the built-in analogue output for regulation purposes, for example climate control or ethylene dosing.

When there are no sampling pipes connected, the device complies with an IP63 protection class according to NEN-EN-IEC 60529. If sampling pipes are connected, then the protection class conforms with IP65 according to NEN-EN-IEC 60529. This product complies with current European and national CE guidelines. This conformance is recorded. Related documents are open for public inspection at the manufacturer.

$$\mathcal{C}\mathcal{E}$$

EC declaration of type conformity
Déclaration CE de conformité au type
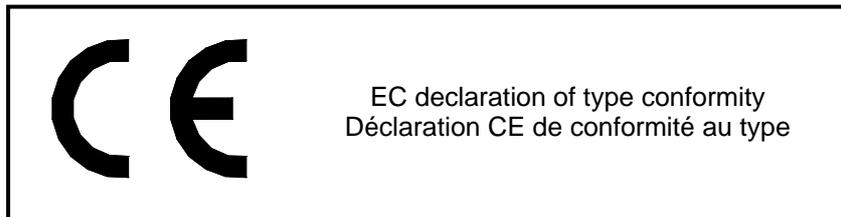
To ensure general safety and safety of use, you, the operator, are to comply with this manual!

For questions you can contact our technical support by phone at +31 (0)166 657200 (during working days from 09.00 – 17.00 hours CET) or at any time by e-mail at info@ems-service.nl

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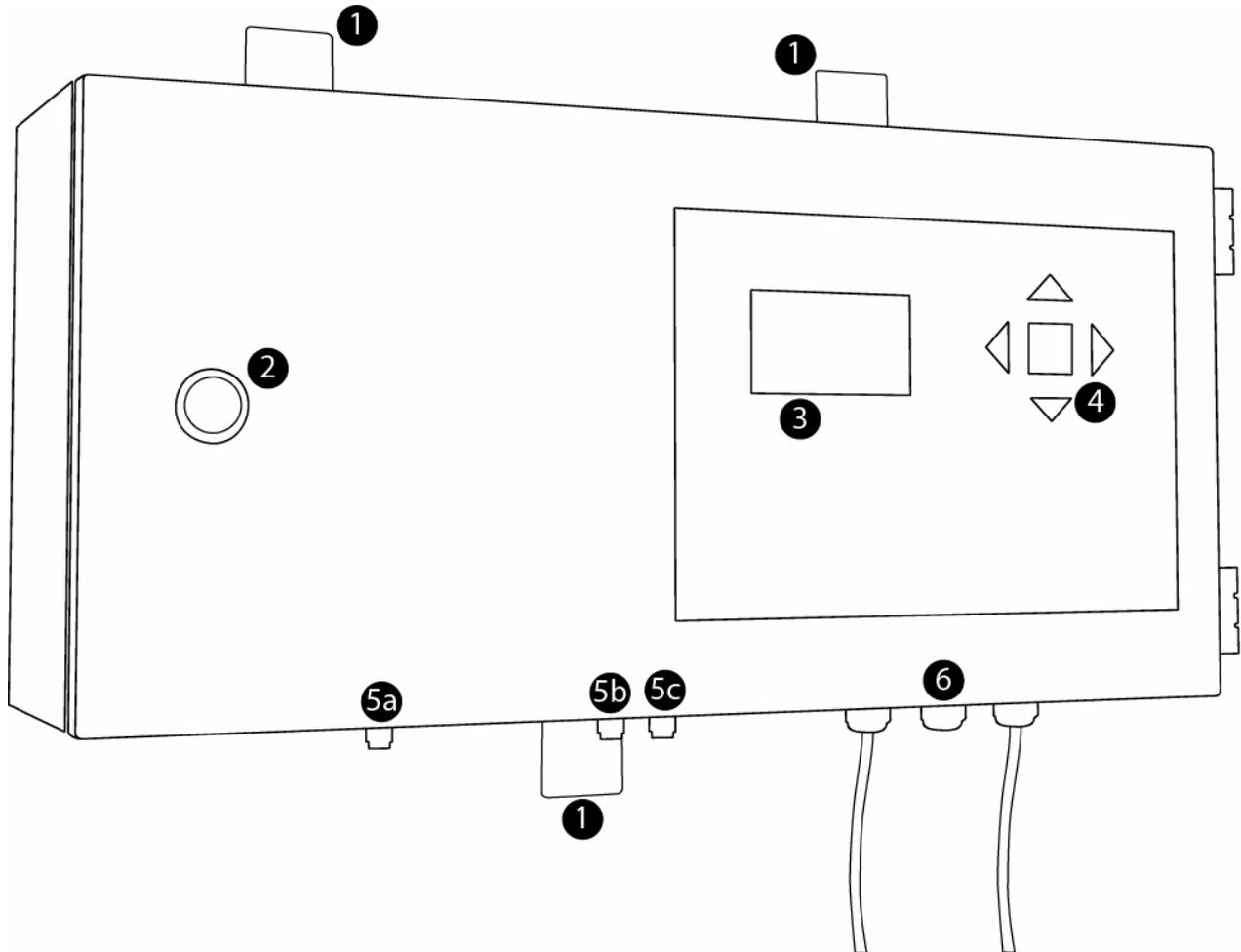
Description of the different elements of the stainless steel housing

1. Fastening points.
2. Door lock.
3. Multifunctional graphical LC-Display with:
   - 4 lines of standard text size and 1 line of larger text size, or
   - 8 lines of standard text size.
4. Control panel, made up of 5 buttons.
5. Mechanical unions for the intake and exhaust of air/gas:
   a. Exhaust channel, the air taken in that has been through the sensor will flow out of the device through this channel.
   b. Intake channel for clean air, clean air flows into the device through this channel.
   c. Intake channel contaminated air, this is the channel through which the air flows with an ethylene concentration that should be measured.
6. Cable coupling screws, for the input of cabling through the stainless steel housing.

Overview of the terminal block
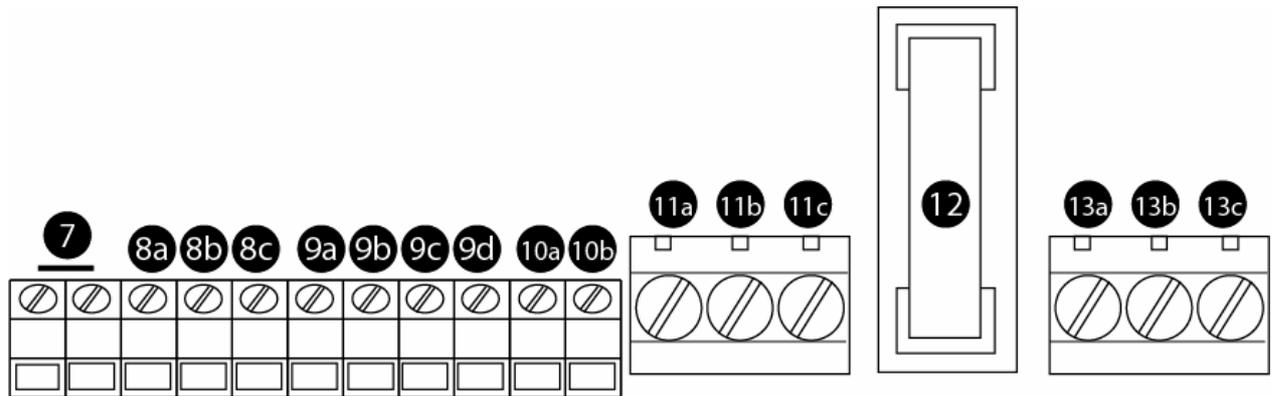
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12.   Fuse
13.   Terminals for power supply:
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    c. A contact. This is the earth point of the system.

Intended use of the product

The product is exclusively intended for the following uses:

- o Measuring or dosing and registering of ethylene gas concentrations (IUPAC-name ethene and chemical formula C_2H_4).
- o Indicating measured concentrations, visually or through switching of the relay.
- o Control of an external system, based on the measured ethylene concentration, through use of an analogue voltage or current.

If the product is not operated as it is intended, then the CE conformance is no longer valid.

In case you want to use the product for a purpose for which it is not originally intended, you can contact the manufacturer for an analysis of this purpose, to see if the product will still conform with all its original guidelines and specifications.

Use of this product in unfavourable environmental conditions is prohibited. Unfavourable environmental conditions are:

- o continuous moisture or a very high relative humidity,
- o high concentrations of dust, flammable gasses, vapours or solvents,
- o lightening storms and comparable weather conditions, like strong electrical fields, etc.,
- o a highly corrosive, chemical, wet or strongly polluted environment,
- o heavy shocks and/or continuous vibrations, or
- o extreme temperatures.

Nothing of the complete system may not be changed or re-built! You are to comply with the directions regarding safety!

Directions regarding safety

o In commercial establishments, you are to comply with the ARBO-laws (Netherlands).

o This product is constructed according to safety class 1. It is equipped with a VDE tested mains cord with grounded plug, therefore it may only be used together with the 230V electricity producing network with grounding. You are to make sure to that the grounding wire (yellow/green) is not interrupted within the cord, nor in the system, nor in the electricity network. An interrupted grounding wire can cause life threatening situations. Furthermore you need to make sure the isolation jacket of the mains cord is not damaged and cannot be damaged. Therefore, make sure to keep the mains cable away from heat, oil, sharp edges and moving parts.

o Do not touch the mains cord, instead immediately remove the plug from the power outlet if the cable becomes damaged or cut through. Never use the product together with a damaged mains cord.

o When opening covers or removing parts, except when possible by hand, live parts can become exposed, this includes connectors as well. When tuning, doing maintenance, incorporating or placing of parts or modules, the system has be disconnected from all power sources prior to any of these activities. If tuning, maintenance or repairs have to be done while the system needs to be open, these activities may only be done by a qualified expert, who is aware of all risks, rules and guidelines involved with such an operation (for example NEN3140).

o Capacitors present in the system can still be charged up, even if the system is powered down or disconnected from all power supplies. Therefore you should never touch parts of the system that may be live.

o If it can be assumed that safe operation of the system is no longer possible, you have to deactivate the system and make sure accidental re-activation by other persons is not possible. You can assume that safe use of the system is no longer possible in the following cases:
   o system is visually damaged,
   o no longer function,
   o stored for long periods of time in unfavourable environmental conditions, or
   o is transported during unfavourable circumstances.

o Do not power up the product immediately after transporting it from cold surroundings into warm surroundings. Formed condensation inside of the system during this transportation can, under certain circumstances, destroy or damage the product. Let the system acclimatize in the new surrounding, while it is powered down. Only after this you can power up the product safely.

o The product contains a relay to indicate an alarm. This relay can only handle a maximum voltage of 250 VAC at a current of 1A. When switching heavier loads, a relay that can handle the heavier load should be used in combination with the relay in the product. If heavier loads are switched with the relay from the product itself, life threatening situations are created, which can damage not only the product itself but also its surroundings, including persons operating the product.

o Only let fully qualified and professional personnel do repairs to the product and only use original spare parts. This ensures the safety and functionality of the product.

Installation and assembly

Placement of the product

Guidelines for placement
Do not place the product in an unfavourable environment, as described in the previous chapter about "Intended use of the product".

The product has to be fastened to a stable, secure, smooth and non-vibrating surface. If a non-vibrating surface is not available, vibration deadening material (like damping rubber) have to be used at the fastening points of the product.

When used in storage cells, the product can be placed inside the storage cell or outside of the cell. Two of the most common setups for storage cells are shown below.
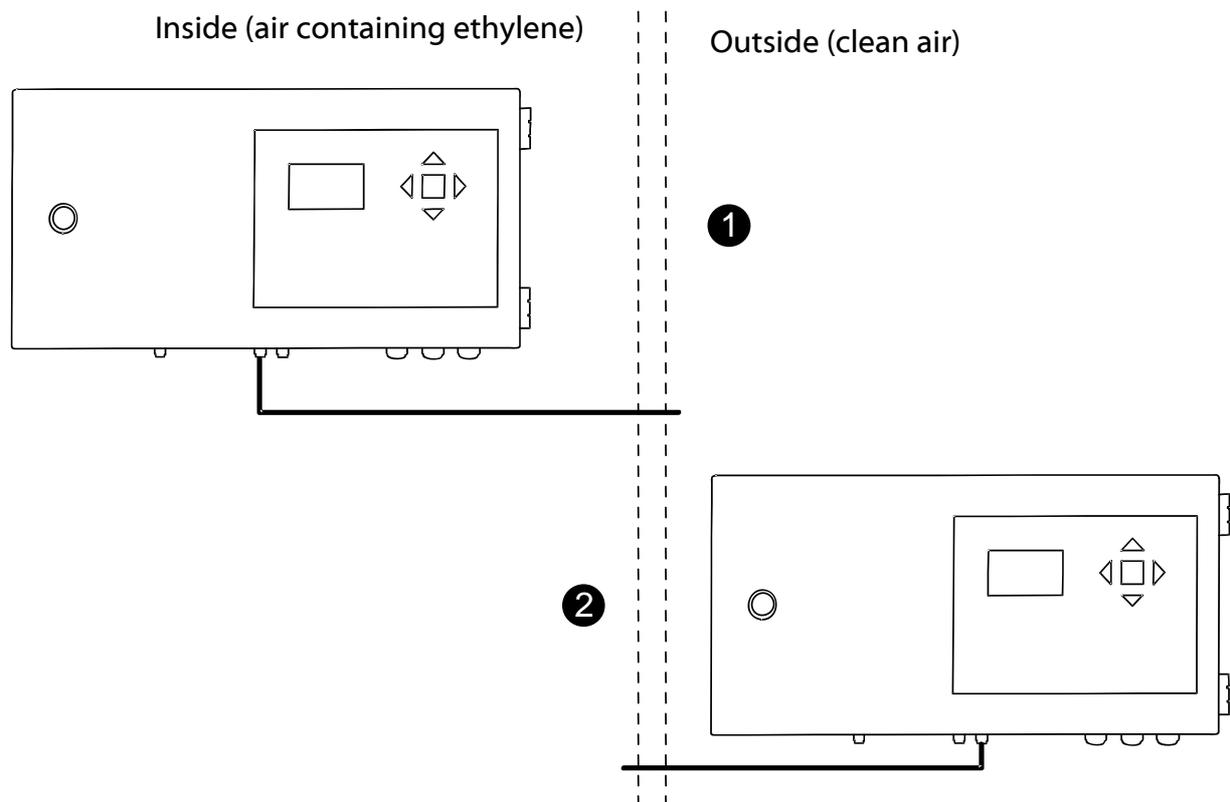
With option 1 (installation inside the storage cell with Ethylene gasses), a sampling pipe has to be installed leading from the clean air inlet (5b), towards an area outside the storage cell which contains clean air.

With option 2 (installation outside the storage cell with Ethylene gasses), a sampling pipe has to be installed leading from the area containing Ethylene gasses, towards the intake channel for contaminated air (5c).

When installing inside of the storage cell, the best place for the intake channel for contaminated air (5c), is in the exhaust of the air ventilation system of the storage cell. This exhaust usually contains a homogeneous mixture of Ethylene gas and air, which gives best measurement results.

Aforementioned options do not always apply:
- o When in option 1 the air ventilation exhaust is blown into the same area where the measurement system is installed, it can happen that, especially with multiple storage cells ventilating into the same area, the Ethylene gasses heap up in the measurement area. This renders the reference measurement of the clean air useless, as it is contaminated with high concentrations of Ethylene, which makes the reference measurement by definition no cleaner than the air inside of the

storage cell. If this is the case, it is better to lead both inlet channels 5b and 5c, to the inside of the storage cell. **In case you do this, you should contact EMS to make adjustments in the EMS-menu of the product. You will receive a code to make adjustments to the backflush functionality.**

o When in option 2 the air outside the storage cell shows large variations in relative humidity and temperature, the reference measurement will not be done correctly. In this case it is better to keep both inlets of the product inside the storage cell. **In case you do this, you should contact EMS to make adjustments in the EMS-menu of the product. You will receive a code to make adjustments to the backflush functionality.**

Installation at eye level is practical for the operation of the product.

When installing the product you can use the drill sizes as described in the chapter "Technical data" of this manual.

Connection of sampling pipes to the air channels
The prevent clogging of the sampling pipes, you should not install pipes directly through a wall. Instead first install a support pipe through the wall of the cell (like a PVC pipe), then guide the stainless steel sampling pipe through this support pipe. This prevents clogging of the sampling pipe with isolation material or other inner wall materials. Take care that when sawing the pipes, the pipes are not clogged with sawdust or burrs. The used sampling pipes are 1/8" outer diameter stainless steel by Swagelok®.

To prevent unfavourable influences of the measurement, the channels through which air and air containing ethylene flows, should not be polluted with, for example, fingerprints, dust or chemicals. Therefore use protective clothing like gloves, when working with the sampling pipes.

Connecting the wiring

General
The connection of the wiring to the product is done with screw clamps. These screw clamps are clearly marked on the printed-circuit board of the product. Furthermore a numbered overview of this terminal block is given in the chapter "Description of the product".

When installing cables, always keep weak and heavy current cables separated from each other. Weak current cables should never be installed besides or inside of a cable through, that contains heavy current cables. The cables for weak currents have to be installed into a special cable through for instrumentation and/or weak current.

With exception of the mains cable, every other cable is optional. If an associated function is not used, then the cabling can be omitted.

Digital input
The digital input can be switched by applying a direct voltage ranging from 5 to 30 Volt or an alternating voltage ranging from 5 to 24 Volt to the clamps. The connection clamps do not have a polarity and are potential-free. Therefore it does not matter which of the two clamps is used for the positive input and which for the reference input. Neither one of the clamps is through-connected with a reference potential.

RS232 connection
By default, this product is delivered with an RS232 cable attached. Please make sure that when using another cable, the RX (Receive, 8a) and TX (Transmit, 8b) lines are not switched. The RX line of the product is the line for communication from an external system (e.g. a PC) to the product, where the TX line of the product is the line for communication from the product to the external system.
The maximum allowed cable length for the RS232 connection between the product and the external system is 15 meters. For the usage of RS232 cable over longer distances, there are several available solutions. Please consult with EMS in this case. If by default the RS232 cable is not used, then it can be removed from the system by unscrewing the connection clamps to which the RS232 cable is attached in the product. Please keep this cable in a safe place, it might be useful later on.

RS485 connection
This product contains RS485 connection terminals, on which a full duplex RS485 connection can be made. This enables communication over greater distances than what would be possible with RS232: the maximum cable length is 1200 meters. In this case you should use a suitable, 4-wire cable.

The cable has to be connected to terminals 9a (TX-), 9b (TX+), 9c (RX-) and 9d (RX+), terminated with a 120 Ohm resistor between RX+ and RX- and a 120 Ohm resistor between TX+ and TX-. The RX lines of the product are the lines for communication from an external system (e.g. a PC) to the product and the TX lines for communication from the product to the external system.

In order to use RS485 instead of RS232, a system setting has to be changed. Consult with EMS for this. You will receive a code with which you can make this adjustment to the system settings. Usage of RS485 excludes the use of RS232: you cannot use both communication methods at the same time.

Analogue output
The settings for the analogue signal (volts or milliamps) are adjustable in the menu. For an explanation how this works, see the next chapter. The analogue signal is driven on the + terminal (10a), with the GND terminal (10b) as reference to earth.

Relay connection
You can connect the relay in two different ways: as "normally closed" (break connection) or as "normally open" (make connection).
o   When switched as normally closed (NC) the circuit is closed as long as there is no alarm condition. When an alarm condition occurs the circuit will be interrupted. To achieve this you should connect the cables to the NC-terminal (11a) and the C-terminal (11b).
o   When switched as normally open (NO) the circuit is interrupted as long as there is no alarm condition. When an alarm condition occurs the circuit will be closed. To achieve this you should connect the cables to the C-terminal (11b) and the NO-terminal (11c).

The connection terminals of the relay do not have any polarity. It therefore makes no difference which of the terminals is used for the positive connection and which is used for the ground reference.

Mains cable
By default the product is delivered with an attached mains cable. This mains cable has to be used with a grounded outlet.
If using another cable is necessary, instead of the supplied cable, connect the (usually brown) phase wire to the L-terminal (13a), the (usually blue) common wire to the N-terminal (13b) and the (usually yellow-green) earth wire to the A-terminal (13c).

The grounding for the product enclosure through the "A" connection is mandatory! You must be sure that the grounding wire is not interrupted anywhere inside the system or in the rest of the electrical installation, because an interrupted grounding wire can cause life threatening situations. Furthermore if the grounding wire is not connected or broken the system may malfunction.

Starting and checking of the system functionality

When you have installed the MAC *View*® Ethylene Analyser and correctly wired the system, you can start the system. The product will show the EMS logo and the text "MACView Ethylene Analyser" on the display, it will also be lit up by the backlight. It can happen that you can hear several clicking sounds from the air valves and/or the relay. After a few seconds the start-up screen disappears and the screen switches to normal display mode.

If the previous steps do not occur, recheck all the wiring and correct any mistakes that may be found. Furthermore check all the items described in chapter "Troubleshooting" about the product not starting up. If the system still fails to start up, please contact Environmental monitoring Systems (EMS) B.V. The telephone number and e-mail address can be found on the first page of this manual.

Using the MAC *View*® Ethylene Analyser menu

First use: getting familiar with the controls

Starting up

After starting up the product, the EMS logo and text "MAC *View*® Ethylene Analyser" will appear on the display, which will also light up the backlight. It can happen that you can hear several clicking sounds from the air valves and/or the relay. After a few seconds the start-up screen disappears and the screen switches to normal display mode.

The default screen

The display is not illuminated when in normal view and looks like the following during start up:

```
29-11-05          03:46

Warm up sensors
Analog out: 0.0 %

  PPb
  ETHEEN
```
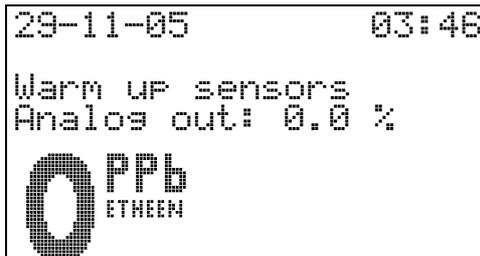
On the top line you can see the current date on the left and the current time on the right.
The second line is reserved for alarm messages. Normally this will be empty.
On the third line is an indication of the current mode the measuring system is in.
Line four displays the status of the analogue output.
The bottom half of the display shows the measured concentration of Ethylene gas, displayed in big fonts.

Activation of the backlight

➢ Press any one of the five buttons.

The backlight of the display will light up. This backlight will automatically shut off when there has been no activity on any of the buttons for 10 minutes.

Operating the menu-selection

The text below is meant to make you familiar with the structure of the menu of the product.

➢ Press the square button in the middle of the control panel.

The menu selection of the users menu will appear on the screen:

```
      USERS MENU
   1 Leave menu
   5 Setpoint anal.out
   6 Programme choice
   7 Start aft.backfl.
   8 Reset backfl.time
   9 Last calibration
```
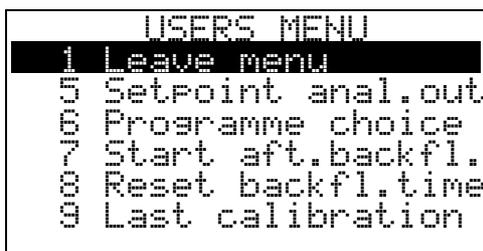
You can navigate this menu selection with the arrow buttons:
➢ Press the arrow down button once for a short period of time.
The black selection bar will drop one line down.
➢ Place the black selection bar on the sixth menu item, and shortly press the arrow down button again.
The menu selection scrolls further down to the bottom, to the next menu items. You can scroll down until there are no more menu items available in the menu selection.
➢ Press and hold the arrow down button.
Pressing and holding the arrow down button accelerates the navigation through the menu listing. The selection bar quickly scrolls through the list to the last menu item.
➢ Press the arrow up button.
This shifts the menu selection bar one menu item up.

> ➢ Press the arrow left button.

The menu selection instantly returns to the very first menu item.

> ➢ In the user menu press the arrow right button.

The screen will switch from the menu selection of the users menu to the menu selection of the service menu:

```
      SERVICE MENU
 20 Password
```

Such as you can see, there is only one menu item available. This is because the service menu is password protected. Further explanation of the items in this menu and the password security can be found further on in this manual.

> ➢ Press the arrow right button again.

The screen now switches to the menu selection of the EMS menu:

```
        EMS MENU
 40 Password
```

This menu too, is protected with a password. The items of this menu may only be changed by EMS personnel or when specifically instructed to by EMS personnel. Further explanation of this menu is therefore outside the scope of this manual.

> ➢ Press the arrow left button.

Because the selection bar was already positioned on the first menu item, the screen will switch back to the service menu.

> ➢ Press the arrow left button again.

The screen switches back to the users menu, with the selection bar positioned on the first menu item.

> ➢ Place the selection bar on menu item 1.
> ➢ Press the square centre button.

This action leaves the menu selection and returns to the normal display view.

Operating a view menu
The text written below is meant to help you to familiarize yourself with menus that only have a view structure.

> ➢ Return to the menu selection and position the selection bar to item number 9.
> ➢ Press the square centre button.

You will see the following screen:

```
        USERS MENU
 9 Last calibration


 Date: 05-12-04
```
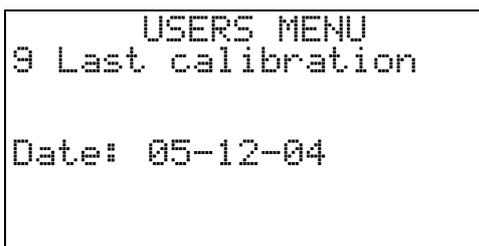
This is a view menu. In this type of menu you can only view a value (the date of the last calibration). In this type of menu you cannot change any values.

> ➢ Press the square centre button or the left arrow button.

This action will leave the view menu and return to the menu selection.

Operation of a menu with acknowledgement
The text written below is meant to help you familiarize yourself with menus that have a selection for accepting or cancelling certain actions.

> ➢ Re-position the selection bar to menu item number 8
> ➢ Press the square centre button.

You will now see a menu which needs an acknowledgement to perform an action:

```
        USERS MENU
8 Reset backfl.time




▓ cancel ▓  accept
```

> ➢ Press the arrow right button.

The selection arrows on the screen will re-position around "accept".

> ➢ Press the arrow left button.

The selection arrows on the screen will re-position back around "cancel".

> ➢ Press the square centre button.

Because the selection arrows are positioned around "cancel", the desired action (resetting the backflush time) will be cancelled (not performed). The screen will return to the menu selection.

If you had positioned the arrows around "accept" and pressed the square centre button, the requested action (resetting the backflush time) would have been performed.

You can only leave this type of menu by making either choice, "cancel" or "accept", by which the desired action is not performed or performed respectively.

Operating a settings menu without step size
The text written below is meant to help you familiarize yourself with menus that have a view display structure by which numbers can be entered.

> ➢ Select menu item number 7.

You will see a settings menu:

```
        USERS MENU
7 Start aft.backfl.

old : 16 hour
New : 16 hour


```

At both "old" and "new" the currently set value is displayed.

> ➢ Press the arrow up button once.

The value behind "new" will be increased by 1, while the "old" value is not changed. The value behind "new" is the new value to be set.

> ➢ Press the arrow up button for a longer period.

The "new" value will increase rapidly, with steps of 1. If you press the button longer than 5 seconds, the value will rapidly increase in steps of 10.

> ➢ Press the arrow down button.

The "new" value will now be lowered. The lowering of the value can be accelerated as well, by pressing and holding the arrow button for a longer time.

> ➢ Press and hold the arrow down button.

Every settings menu has a limit for the maximum and minimum value that can be set. The minimum and maximum differs per menu.

> ➢ Press the arrow left button.

The value "new" jumps back to the currently set value (the "old" value). The change is undone.

If there is no difference between the "old" and "new" value, you can leave the menu with the arrow left or the square centre button, just as with a view menu.

> ➢ Change the "new" value to 12.
> ➢ Press the square centre button.

With this action you indicate that this is the correct value that should be set. The screen will now ask you for an acknowledgement of your input:

```
        USERS MENU
7 Start aft.backfl.

old : 16 hour
New : 12 hour

▓ cancel ▓  accept
```

The operation of this acknowledgement works the same way as that of a menu with acknowledgement. Arrow buttons to the left and right to make a selection between cancel and accept and acknowledgement of this choice by pressing the square centre button. If you choose accept, the setting will be saved and adjusted to the new value.

> ➢ Select cancel.

The screen returns to the menu selection, without changing the settings.

Operating a settings menu with step size

The text written below is meant to help you familiarize yourself with menus that have a view display structure by which numbers can be entered that are so large, they have to be entered per digit.

> ➢ Select menu item number 5.

You will see a settings menu with step size:

```
        USERS MENU
5 Setpoint anal.out
step: 1
old : 2000 ppb
New : 2000 ppb
```

The way this menu works is roughly the same as that of a settings menu without step size. However here you can enter how large the steps should be, with which the value should change. For this you use the arrow left and right buttons.

> ➢ Press the arrow up button once.

The value behind "new" will be increased with the step size (1).

> ➢ Press the arrow left button twice.

The step size ("step") will First change to 10 and then to 100. Pressing the arrow left button increases the step size times 10. Pressing the arrow right button decreases the step size times 10.

> ➢ Press the arrow up button once.

The value behind "new" will be increased with the step size (100).

You can hold the buttons for longer periods of time to accelerate the change of the numbers.

The only way you can leave a settings menu with step size, is by pressing the square centre button.

> ➢ Change the "new" value to 1500.
> ➢ Press the square centre button.

The screen will ask you for an acknowledgement:

```
          USERS MENU
5 Setpoint anal.out
step: 1
old : 2000 ppb
New : 1500 ppb

▓ cancel ▓  accept
```

The operating of this acknowledgement works in the same way as that of a menu with acknowledgement: arrow left and right buttons to make a choice for cancelling or accepting and confirming with the square centre button. If you choose to accept, the setting will be saved and adjusted to the new value.
  ➢ Choose to cancel.
The screen will return to the menu selection.

Leaving the menu
You can leave a menu and the menu selection, by selecting menu 1. If you do not use any of the buttons for 5 minutes, the screen will jump back to the standard screen, no matter where you are in the menu selection or menus at that moment.

Use, modes en programs of the MAC*View*® Ethylene Analyser

Protection of the sensor

As stated in the chapter about the intended use of the product, the measuring system has to be protected from unfavourable circumstances. In particular the internal sensors of this product are sensitive parts, because the ethylene concentrations measured are very low concentrations in the ppb (parts per billion) range and therefore have to be protected from the following environmental conditions:

- o Exposure to silicone vapours
  If silicone vapours are absorbed on the surface of the sensor, the sensor will permanently lose its sensitivity. Avoid contact with silicone based solvents like hairspray or substances that contain silicones/rubber.
- o Exposure to substances that have a contaminating nature, or after drying leave an oil film or otherwise a film on a surface.
- o Exposure to substances that are strongly oxidizing, like acid or lye vapours.
- o Exposure to substances that are solvents (hydrocarbons).
- o Exposure to substances that have a strong smell.
- o Highly corrosive environments.
  By exposing the product to high concentrations of corrosive substances like H_2S, SO_x, Cl_2, HCl etc., both the sensor and the system itself will become permanently damaged.
- o Contact with alkaline metals.
  The sensor shows drift when it comes in contact with alkaline metals, like in salt water.
- o Contact with non-organic elements.
  The sensor shows drift when it comes in contact with non-organic elements.
- o Contact with water.
  The sensor shows drift when it comes in contact with water.
- o Congelation.
  If fluids freeze on the surface of the sensor, this will result in permanent damage to the sensor.
- o Very heavy shocks.
  The internals of the sensor can become permanently damaged by very heavy shocks.

  If you are going to use chemicals that can penetrate the measuring system, the internal sensors can be protected from unintentional contact with chemicals by manually activating the backflush program. For more information about preventive protection of the measuring system, read the "backflush program" and "backflush mode" in this chapter.

Measuring process

Sequence of the different modes
The measuring process of the MAC*View*® Ethylene Analyser runs through a number of different modes to get the final measurement result. To determine the concentration, first the verification mode and then the measuring mode are processed. Before this, the system will first be warmed up after start up and the startup mode will be processed. After starting up the system the phases or modes will look like the following:
- o Warm up sensors
- o Startup mode
- o Measurement mode
- o Verification mode
- o Measurement mode
- o Verification mode
- o Etc.

Besides this there are the following separate manually adjustable or automatic modes:
- o Backflush mode (Manually or automatically)
- o Standy mode (Manually only)

The process only switches to another mode in certain circumstances. For example the warming up will only happen after the system has been powered down.

Warm up sensors

After powering on the system the sensor needs a certain time to warm up. This time is automatically determined by the MAC *View*® and can vary from two minutes when briefly powered down, up to several hours after lengthy power down times. During this mode you will see the following text on the third line of the screen:

```
Warm up sensors
```

Because no valid measurements can be done yet, the screen will display both a measured concentration and analogue output value of 0.

After this mode is done, the measuring process will always go into the startup mode.

Startup mode

Both after warming up the sensors and after a period of backflushing the process will enter startup mode. On the third line of the screen a seconds counter will appear:

```
Startup mode 299
```

This counter will display the remaining time in seconds, that the system will at least stay in this current mode. In the above example the startup mode will still last for 299 seconds. If the system needs more time, then the counter will go into negative values.

Because no valid measurements can be done yet, the screen will display both a measured concentration and analogue output value of 0.

After this mode is done, the measuring process will switch over to the measurement mode.

Measurement mode

In the measuring mode the concentration of the Ethylene gas in the air mixture that is supplied to the "contaminated air inlet" (5c in the overview of the systems housing), is determined. This mode will normally last 5 minutes (300 seconds). On the third line of the screen besides a text, also a seconds counter will appear:

```
Measurement mode 299
```

This counter will display the remaining time in seconds, that the system will at least stay in this current mode. In the above example the startup mode will still last for 299 seconds. If the system needs more time, then the counter will go into negative values.

When 180 seconds have passed, the value of the measured concentration on the screen will be updated.

After this mode is done, the measuring process will switch over to the verification mode.

Verification mode

In the verification mode the measurement from the previous mode will be verified, with the help of clean air from the "clean air inlet" (5b in the overview of the systems housing). This mode will normally last for 5 minutes (300 seconds). On the third line of the screen besides a text, also a seconds counter will appear:

```
Verification mode 299
```

This counter will display the remaining time in seconds, that the system will at least stay in this current mode. In the above example the startup mode will still last for 299 seconds. If the system needs more time, then the counter will go into negative values.

After this mode is done, the measuring process will switch over to the measurement mode.

Backflush mode

The backflush mode is a special mode to prevent the sensor from being exposed to chemicals (also check subsection "Sensor").

The process scan enter this mode for three reasons:
- o Automatically, if substances are detected that are harmful for the sensor. This detection is only guaranteed for the detection of Actellic®! (For other substances, please contact EMS)
- o Automatically, if the digital input is activated for a longer period of time. You can use this method for example, to remotely activate backflush if you plan to use substances in the environment of the measurement system that are harmful to the sensor. An example of this, is putting the system in backflush when gassing tulip bulbs or when using Actellic® in storage cells for tulip bulbs. The digital input can be driven by a control or climate computer or by a remote pushbutton.
- o Manually, by setting the process into backflush mode in the menu "Programme choice".

During this mode the system pump can stop running after a few seconds. This depends on a setting in the EMS menu. The pump will at least run the first ten seconds, to remove possible harmful gasses from the system, that might be currently present.

If the process is in backflush mode, this will be shown on the third line of the screen. If the system went into this mode automatically, it will also indicate the time that the system will stay in this mode:

```
Backflush mode 12 hours
```

The backflush mode can be ended by:
- o A backflush which was started through "Programme choice", can only be left if another program is chosen in "Programme choice".
- o If the process went into backflush mode automatically, then this mode will be left when the time (set in menu "start aft.backfl.") has passed. This duration is set to 12 hours by default.
- o If the backflush mode was activated through the digital input of the system, then this mode will be left when after removal of the signal on the digital input, the time (set in menu "start aft.backfl.") has passed.
- o With the help of menu "Reset backfl.time" a backflush can be aborted, provided that the signal on the digital input is not present anymore. The process will leave the backflush mode straightaway.

After this mode the measuring process will switch to the measurement mode or the startup mode, depending if the pump was active.

Standby mode

The accuracy and lifespan of the system is best guaranteed, when the system is in continuous operation. This means that even when the system is not used, it is best to keep the system online. There is a special mode for this case, which can be activated manually to set the system in standby mode. The following text will appear on the third line of the screen:

```
Standby
```

For more detailed information about the standby mode, see below: "Program settings" subsection "Standby program".

Program settings

Overview of program settings

The system supports 4 different programs:

- o Normal program
- o Dose program
- o Backflush program
- o Standby program

The system can only handle one program at a time. The program can be selected in the menu "Programme choice". An explanation of each of the programs that the system can run, is detailed below.

Normal program

The normal measurement program is most commonly used. This program encloses the standard steps to perform ethylene measurements. By selecting "Normal" from the menu "Programme choice", the program will start measuring immediately. In case the system was running another program than "Normal", then the process will first go into startup mode and switch to measurement mode after that.

Dose program

By means of the menu "Programme choice", the system can be set to the dosing program. The dosing program is meant for a special application of the system, by which the system is used to get the ethylene concentration in the environment to a certain level and keep it at that level. Hereby the relay is used to operate a dosing installation or valve.

When the ethylene concentration is too low the relay will activate. This is to bring ethylene into the room to get the concentration back to the set level. The relay will deactivate again when the concentration is back to a high enough level. The concentration at which the relay activates and deactivates, can be set in the menus "relay lower limit" and relay upper limit". You can set a delay in the menu "relay delay", which will delay the activation of the relay. For fast dosing processes it is useful to set the delay to 0 seconds.

The screen is mostly the same as the regular measuring program, during the dosing program. Only when the relay is activated, the following text will appear on the second line of the screen:

```
Dose...
```

If in the menu "Programme choice" the dosing program is set back to the normal measurement program, then the measurement program will start over in the startup mode.

Backflush program

I fit is already known that the system will or can be exposed to chemical substances that are harmful for the internal sensors, then it is possible to (pre)set the system to backflush mode. When activating the menu "Programme choice " and then selecting the "Backflush" choice, the system will be directly forced into the backflush, no matter in which state/program it currently is.
During the backflush program the following text will show on line two of the screen:

```
Backflush mode
```

The backflush mode can be ended by selecting another program in the "Programme choice" menu.

After this mode the measuring process will switch over to the startup mode.

Standby program

The accuracy and lifespan of the system is best guaranteed, when the system is in continuous operation. This means that even when the system is not used, it is best to keep the system online. There is a special mode for this case, which can be activated manually to set the system in standby mode.

The standby mode is a special mode in which the measuring process is halted. This mode is useful when the measuring system will not be used for longer periods of time. The system then switches to a safe state for the sensors and the wear of certain parts is reduced to a minimum. The sensors hence stay warmed up and well-conditioned, so the measuring process can be directly resumed if needed.

When the system is not used for longer periods of time, it is recommended to put the system in standby mode. This reduces wear of moving parts to a minimum and the sensors are preserved best.

The system will go into this mode at one of the following conditions:
- o If the user selects this mode in the "Programme choice" menu
- o If the digital input is excited longer than 5 seconds, but shorter than 1 minute.

When the system is in standby mode, the following text will appear on the third line of the screen:

```
Standby
```

The standby mode can be ended by leaving the standby program in the "Programme choice" menu (choose a different program), or by giving the digital input another pulse of at least 5 seconds and at most 1 minute.

After this mode the measuring process will switch to the startup mode.

Settings and menu options of the MAC*View*® Ethylene Analyser

Digital input

By means of the digital input, you can force the system into the backflush mode or into standby mode.

You can remotely, with the aid of a push button or a climate or control computer, switch the system into backflush mode if you are going to use substances in the environment, which are harmful for the sensor. To achieve this, a pulse of at least 1 minute should be given on the digital input. The system will stay in this mode while the digital input is excited and will leave this mode once the digital input is released. An example of this use is the usage of Actellic® or the so-called "gasses" in storage cells for tulip bulbs.

If the digital input is excited longer than 5 seconds, but shorter than 1 minute, then the system will go into standby mode. To leave this mode, the digital input can be excited again for longer than 5 seconds, but shorter than 1 minute.

The digital input can be excited by applying a DC voltage ranging from 5 to 30 Volt, or by a AC voltage ranging from 5 to 24 Volt, to the input terminals. The presence of a voltage difference corresponds with "active" or "on" and no voltage difference corresponds with "not active" or "off".

Analogue output

The analogue output of the system can be used based on the measured ethylene concentration, to control an external system. You can think of a climate computer, control computer, an adjustable air valve, a frequency controller, or an external readout unit. The coupling of the system to, for example, a climate computer can have multiple aims. For one it is possible to link back the measured ethylene concentrations back to the ventilation or circulation of the air. The less ethylene is measured, the less ventilation is needed. Another purpose can be that with the climate computer all parameters including the ethylene concentrations can be measured, displayed and if desired be alarmed.

In the menu "Setpoint anal.out" the range of the signal can be set. If for example 2000 ppb (parts per billion) is set in this menu, the system will for example at a value of 60 ppb ethylene, drive the analogue output at 3 %: 60 / 2000 = 3 %. The drive of the analogue output is a percentage, so a higher measured value than the set value, will give a drive of 100 % and not higher.

This percentage is output at the terminals in the form of a voltage drive or current drive, depending on the settings of the service menu "Mode analog out". In this menu the analogue output can be configured in several different ways:
- 0-10 Volt
- 0-20 mA
- 4-20 mA
- 4-20 mA & status
- EMS Specific

Below is a description of every configuration.

Mode 0-10V
In this configuration the terminals of the analogue output will drive a voltage varying from 0 to 10 Volt, by which 0 Volt corresponds with 0 % and 10 Volt with 100 % drive.

The voltage on the terminals is given by the following formula:

V_{out} = 10 Volt * (measured concentration / setpoint concentration)

The maximum load resistance in this configuration is 600 Ohm.

> **Warning! This mode cannot signal warnings or critical errors on the analogue output! In case of a critical error, the output will fall back to 0 Volt.**

Mode 0-20mA

In this configuration the analogue output drives a current on the terminals, ranging from 0 up to 20 milliamps, by which 0 mA corresponds with 0 % and 20 mA with 100 % drive.

The current on the terminals is given by the following formula:

I_{out} = 20 mA * (measured concentration / setpoint concentration)

The maximum load resistance in this configuration is 450 Ohm.

The advantage of this method of current driving compared to voltage driving, is that the cable lengths practically do not matter. The cable can have a virtually unlimited length as long as the resistance of the cable an application together do not exceed 450 Ohm. Cables can be seen as series resistance.

> **Warning! This mode cannot signal warnings or critical errors on the analogue output! In case of a critical error, the output will fall back to 0 mA.**

Mode 4-20mA

In this configuration the analogue output drives a current on the terminals, ranging from 4 to 20 milliamps, by which 4 mA corresponds with 0 % and 20 mA with 100 % drive.

The current on the terminals is given by the following formula:

I_{out} = 4 mA + 16 mA * (measured concentration / setpoint concentration)

The maximum load resistance in this configuration is 450 Ohm.

The advantage of this method compared to the 0-20 mA driving is:
- o Errors like a broken cable, hardware failure or critical error mode can be automatically detected and will, accordingly, not be interpreted incorrectly as a concentration of 0 ppb ethylene.
- o Zero point errors in the signal can be calibrated away.

> **Warning! This mode cannot signal warnings on the analogue output!**

Mode 4-20mA with status information

This configuration is equal in functionality to the 4-20 mA driving above, with an addition. This addition means that special status signals can be sent over the analogue output. These status signals show which mode the measurement system currently is in. These status signals are in the range between 0 and 4 mA. The following overview shows the amperage and meaning of each of the signals.

Signal	Status	Explanation
0 mA	Off	The system is shut down or broken, or malfunction of signal cable.
0,5 mA	Calibration alarm	The system will give an alarm, because it has been more than 14 months since last calibration. If the system gives this warning it is urgently advised to have your system calibrated.
1 mA	Critical error	The system has an error that needs attention of the supplier. Look at the display for a possible message.
1,5 mA	Standby	The system is in standby mode.
2 mA	Warning	The system has an error that has to be reset manually. The system could be working ok in this condition, but certain parts are however in an error state. It could be that the system tries to cancel out the errors. However if the error appears again the supplier should be notified. This signal can be sent during verification mode.
2,5 mA	Startup	The system is currently in warm up or startup mode.
3 mA	Backflush	The system is currently in backflush mode.
3,5 mA	Verificatie	The system is currently in verification mode.
4-20 mA	Measurement	The system is currently in measurement mode and returns the measured concentration with the 4-20mA signal.

EMS specific mode

In this configuration an EMS specific signal is driven on the terminals of the analogue output. This signal form can be used in combination with other EMS products and/or modules, like the MAC*View*® IPR card, by which the analyser can be read out through the intranet or internet. Please consult your supplier for these options.

> **Warning! This mode cannot signal warnings or critical errors on the analogue output! In case of a critical error, the output will fall back to concentration value of 0 ppb.**

Relay

The product contains a relay, which can signal a error notice, create an on/off regulation, or which can empty an air cooler / dehumidifier in special applications. It is recommended to always make use of one of the functions!

For controlling and alarming, you can connect the relay in two different ways: as "normally closed" (break connection) or as "normally open" (make connection). When using the relay as a "normally closed" (NC) relay, the circuit with the relay is normally closed. It will be interrupted when an alarm situation occurs. When the relay is switched as "normally open" (NO), the circuit will be interrupted as long as there is no alarm situation, it will be closed when an alarm situation occurs. For a detailed description of the wiring of these two configurations, please consult the chapter "Installation and assembly".

In case the relay is used to signal errors, an alarm will occur when a warning is active and when the system enters critical error mode. This way an error in the system can be detected.

> **This function of reporting errors through the relay, is the standard setting and is important to be able to detect any errors that may be in the system. Not using the relay, or changing the function of the relay into a different function, is at your own risk!**

For the on/off control, the alarm will occur when the measured concentration, set in the menu "Relay upper limit", is higher and lasts longer than the time set in the menu "Relay delay". An active alarm immediately switches off if the measured concentration falls below the border value set in menu "Relay lower limit".

In case the relay is used to empty condensation water from an air cooler / dehumidifier, connected to the "normally open" (NO) contact, is a valve which empties the air cooler during the beginning of the verification mode. This application needs an adjustment in the EMS menu, please consult EMS for this. The menus "Relay upper limit", "Relay lower limit" and "Relay delay" are not visible in this application.

The relay can switch a maximum of 250 VAC at 1A. When switching heavier loads a heavier relay capable of switching the load needs to be used in conjunction with the system relay.

> **If heavier loads are switched without the use of a second relay capable of switching this load, life threatening situations may arise and the product can become broken!**

Log memory

Inside of the system is a log memory, in which the measured concentrations, temperature and humidity are recorded. This log can be read through the PC software that comes with this product.

In the service menu "Memory recording" can be set if this log memory should be used and if so, how should it be used. That is, the log memory can be used in two different ways: as one continuous memory with a beginning and an end, or as a circular memory without end.

If the log memory is used in continuous mode with beginning and end, then the logging will stop once the maximum number of records are written in the memory. In this case a warning will be issued on the screen:

```
Log memory full!
```

If the log memory is used as a circular memory without end, then the logging will continue after the maximum number of records have been written in the memory. The oldest log record will then be overwritten if a new log record is going to be written. The advantage of this method is that the latest amount of measured data is always available in the analyser. Older less relevant data is however overwritten. New relevant data is always available.

The maximum number of records that can be logged is 6720 records. At a measuring interval of 10 minutes this corresponds to over 46 days worth of information. The following information is stored into the log memory:
- o Ethylene concentration in ppb (parts per billion)
- o Relative humidity in % (percentage) (**Be careful!** This is the relative humidity inside the measuring system and is therefore not equal to the relative humidity in the surrounding environment.)
- o Temperature in °C (degrees Celsius) (**Be careful!** This is the temperature inside the measuring system and is therefore not equal to the temperature in the surrounding environment.)
- o Date (day:month:year)
- o Time (hours:minutes:seconds)
- o Mode in which the system is operating (startup, measurement, verification or backflush mode)

In the menu "Memory usage" the total amount of log records in the memory and the used percentage of the total memory, can be viewed.

The log memory can be erased with the menu "Erase memory", no matter if the memory is used as continuous or circular memory. This menu could be switched off through the EMS menu.

Date and time

In the system, the date and time are adjustable. This set date and time will be used for logging and for the internal system functions.

The date and time can be set by means of the corresponding service menus. When setting the time, the seconds counter will be set to zero.

PC software

For the reading out of the log memory and to easily adjust the settings of the system, you can make use of the accompanying PC software. The system communicates with the computer through a built-in RS232 or RS485 connection.

The RS232 or RS485 connection is configured by default to work with a connection speed of 115200 baud. This connection speed can be set with the help of a service menu to 57600, 19200 or 9600 baud. For example to enable communications over longer distances.

> **The lowering of the communication speed without good reasons, is strongly discouraged.**

Display and warnings

On the second line of the screen, different alarm notices can be displayed. If multiple warnings are active, only the most important one is displayed. Below is a summary of the possible alarms, in order of priority (least priority first). In all cases the backlight of the screen will blink.

Warning log memory full
If the log memory is full, the following warning will be displayed:

```
Log memory full!
```

This message can be cleared by erasing the log memory or by setting the memory to the circular memory structure.

> **Be careful! When clearing the memory, you will lose all measurement data stored. Therefore it is recommended to first read out the memory through the PC software to secure you measured data.**

If the warning "log memory full!" is displayed, the system will still function properly.

Warning calibration expired
If the system is in need of calibration, then the next message will be displayed:

```
Calibration expired
```

In this case you should contact the manufacturer to get the system calibrated.

The moment this warning is displayed, the system will still function properly. This warning means however, that the system will need to be calibrated again within at most 2 months. In case the system is not calibrated within this term, the measurement values are no longer guaranteed to be correct.

Warnings with an error code
If internal errors occur in the system, a warning with an error code is displayed, for example:

```
EC: 00000000000A0000
```

Contact the manufacturer in case this warning is continuously or periodically active. In this state the measurements made by the system cannot be guaranteed to be correct. The displayed concentration can turn out to be incorrect. In this mode it can also mean that the backflush protection against Actellic® or chemicals is not working properly.

The error code is made up of 8 groups of two letters or numbers. If the characters of a certain group are not both zero ("0"), there is an error in this group. From left to right, these are the groups:
  o Memory check errors
  o Memory read/write errors
  o Errors related to sensor 1
  o Errors related to sensor 2
  o Errors related to the temperature or relative humidity
  o Flow errors
  o Time errors
  o Other errors

In the above example, there are one or more errors related to the flow.

If a warning from the flow Group stays active or periodically appears:
  o Check if the air inlets and outlets are clogged.
  o If possible check the pressure difference in the rooms where the inlet channels and outlet channels are at.
If one of these errors stays active, the system will switch over to critical error mode. In critical error mode also the cause will be displayed that led to the error, by means of displaying a second error code. This error code has the same structure as with the warnings above.

Display backlight

The backlight of the display has a few different functions:
  o The lighting up of the display to, when operating the system controls, make the system better readable.
  o Signalling of the activation of the relay.
  o Signalling in case of warnings.

If the backlight is switched off, this can be activated by pressing a random button on the control panel of the system. The light will automatically shut off again after 10 minutes of inactivity of the control panel.

In the menu "Backlight alarm" a choice can be made if the display should also blink if the relay is activated.

If a warning is active, the backlight will blink.

View menus for users

In the menu are several view menus for users. Below you will find a description of each of these menus.

Last calibration date
In the menu "Last calibration" the user can view which date the last calibration has been done.

Version numbers
In the menu "Version numbers" are a few version numbers that can be viewed:
- o Series number of the system
- o Compiler version used to compile the embedded software of the system
- o Software version of the system software
- o Hardware version of the system

These numbers can be important for correspondence with the manufacturer.

Running hours
In the menu "Running hours" the user can view the total number of hours that the system has been up and running.

Hours since last calibration
In the menu "Running hrs s cal" the user can view the total number of hours the system has been up and running since the last calibration.

Passwords for the Service menu and EMS menu

To get access to the service menu and the EMS menu, a password has to be entered into the system. These passwords are numeric codes: to determine the password you have to use the accompanying PC software. To acquire a correct password the set date of the system and the PC has to be the same.

Language settings

In the menu "Language", settings can be made for the screen language displayed to be in Dutch or in English.

If the system displays all texts in Dutch, you can use this menu to set the language back to the English language: the Dutch name of this menu is "Taal".

Usage for specific applications

This chapter will give pointers for specific target applications of the system, that are important for that specific application.

Storage cells for flower bulbs

Energy savings and quality improvement for flower bulbs

Out of fear for ethylene more often than not environments are ventilated more than is needed, because a lot of ethylene gas can lead to gumming, weight loss, splitting and flower bulb dehydration. Too much ventilation and circulation costs you too much energy and besides that also leads to dehydration and related to that weight loss of the flower bulbs.

In this application the measuring system can be used to ventilate the storage cell, based on the ethylene concentrations inside the storage cell. Because the ethylene concentration is a good measure for the amount of bulbs turning sour. With the help of this system there is no need for too much ventilation. This leads to big savings on ventilation and heating costs and prevents dehydration and related weight loss of the flower bulbs. The quality improvement of the bulbs is also an important advantage when using this system.

After a very thorough research, it appears that the MAC*View*® Ethylene Analyser is a very precise and reliable ethylene measuring device that can measure in the ppb (parts per billion) range. Data of this is available at request from your supplier.

Based on the measured ethylene level, the climate computer adjusts the intake valve for the air intake of the ventilation system. With this the ventilation can be regulated without exceeding dangerous ethylene levels for the bulbs. The cost savings achieved this way can be over 50% averaged over the entire season.

The MAC*View*® Ethylene Analyser is registered for the fiscal arrangement EIA, which means that 44% energy investment deduction is possible! Along with the continuously rising energy costs, you will earn back the purchasing costs of the system within a very short time span. The EIA application will have to be done by the purchaser himself/herself. The allotment of the application is also entirely the responsibility of the purchaser.

Installation advice and connection to a climate computer

When installing the system, you have to consider the placement of the inlet and outlet channels very well. Sometimes attics are used for the outlet of all different storage cells. Therefore this should not be the place where the "clean air" will be taken from! With larger cells the product has to be placed on the roof in the centre of the storage cell.

The system should preferably be placed in the exhaust air of the storage cell and not in the air that is ingested into the cell. The reason for this, is that the clean air entering the cell has too much variation in the relative humidity (RH). This can go up to 40% variation. A strong variation of the RH can influence the measurements in a negative way.

When using Actellic® or "gasses" in the storage cell in which the measurements are done it is well-advised to manually put the system into backflush mode, despite the fact the system can automatically detect this. This increases the life span and guaranteed proper operation of the product.

To control a possibly present climate computer base don ethylene concentrations, the analogue signal of the MAC*View*® Ethylene Analyser has to be connected to the climate or control computer. The analogue output of the system then has to be set to a mode the climate computer can interpret.

Of course the connection to a climate computer remains the best option for ventilation, as well as circulation, registering and alarming. The climate computer is able to find an optimal control setting between the measured values and valve positions and possibly other parameters like relative humidity and temperature. If no climate computer is present the relay and analogue output of the Ethylene Analyser can be used to control valves, frequency controllers or alarms directly.

Some climate computers also have a so-called "gas program" or a program in which one can "gas". This program is capable of fully automatic "gassing". It is possible to install a cable from the climate computer to the digital input of the MAC *View*® Ethylene Analyser to automatically activate the backflush mode.

When interpreting the ethylene concentrations it is encouraged to watchful of possible ethylene sources. Practice shows that there are low concentrations of ethylene in the open air, which can increase rapidly to higher concentrations in certain situations. Possible sources are:
- Traffic, emission of exhaust gasses
- Dung heaps
- Fires
- Recently harvested fields, which leaves "wounded" plant materials
- Chimneys of heating installations

Transport, storage and removal

After receiving the product you are to immediately check the product for possible damage during transport or handling. Any damage has to be immediately reported to your supplier.

This product has to be stored in a suitable protected location and may not experience influences from the weather, moisture or strange materials. The product is to be stored at a temperature between at least + 5°C (+41°F) and at most +40°C (+104°F).

Remove a product that became unusable according to the requirements by law! This product, accessories/attachments and protective wrapping are to be recycled in an environmentally friendly way.

Troubleshooting

Despite the high quality techniques used in this product, malfunctions can occur. Below are a few possible failures listed, that you can effortlessly solve yourself.

Problem	Possible solution
The system does not start up.	➢ Check the supply voltage: is it switched on and is the cabling proper? ➢ Check if the fuse is not broken and replace it if needed (F500mA L250V).
All texts are in Dutch	➢ Set in the menu "Taal" the language to the English language.
Date and/or time are incorrect.	➢ Set the date and time correctly with the help of the relevant menus.
Menu password is not accepted.	➢ Check the date and time settings of both the system and the PC. These have to match to be able to generate a valid password.
The system gives an error in the group "flow errors".	➢ Check if the inlet and outlet channels of the product are clogged. Unclog if needed. ➢ Check if there are no extreme pressure differences between the inlet and outlet channels.
The system gives a notice "Backflush mode xx hours".	➢ Probably the measurement system detected a harmful chemical compound used in the area of the inlet channel. Go to the menu "Reset backflush" and reset the situation with this.
Communication with the system is not working.	➢ Check if all cables are properly connected. ➢ Check if the system is not for RS232 but RS485, or the other way around. ➢ Check the baudrate: possible baudrates are 9600, 19200, 57600 and 115200. By default the system is set for 115200 baud.

> **Be careful!**
> **Always take a very good notice of the involved safety procedures!**

Maintenance and calibration

The product and the display window can be cleaned with a soft, moist cloth.

When replacing the fuse follow the instructions below:
- o **Remove all supply voltages from the system!**
- o Open up the system.
- o Remove the protective cover from the fuse holder. This fuse holder is positioned in the bottom right of the product housing, item 12 in terminal Block overview.
- o Replace the fuse with an item of the same type: F500mA L250V.
- o Place back the protective cover onto the fuse.
- o Reconnect the system and power it back up.

Be careful!
When replacing the fuse make very sure you replace it with the same type! If a different type is used, life threatening situations can occur and can severely damage the product and its surroundings.

To guarantee the accuracy of the measurements for longer periods of time, the product has to be calibrated at least once a year. The system will give a warning when the calibration has expired. For the calibration of the system you can contact Environmental Monitoring Systems (EMS) B.V. To guarantee that the system is calibrated once a year you can get a calibration contract with EMS. Ask for the terms and conditions and a concept of the contract. You can make a request through the website, telephone or fax below.

Calibration service:

Environmental Monitoring Systems (EMS) B.V.
http://www.ems-service.nl
info@ems-service.nl
Tel. +31 (0)166-654500
Fax. +31 (0)166-657210

Overview of technical data of the MAC*View*® Ethylene Analyser

Technical data

|	
Supply:	220-240 V alternating voltage
Net frequency:	50 Hz
Power consumption:	max. 30 W
Display:	Multifunctional graphical display
Max. measuring speed:	Measuring cycle of 300 seconds, 300 seconds of verification
Operating temperature:	-10 up to + 60 °Celsius
Storage temperature:	+5 up to +40 °Celsius
Relative humidity:	10 up to 90%, non-condensating
Norms and standards:	NEN-EN-IEC 61000-6-1 through 4, CE
Housing material:	High quality stainless steel
Protection class:	IP63 without air channels connected / IP65 with air channels
Dimensions:	W 525 x H 270 x D 154 mm, with coupling screws, without fastening points
Weight:	approx. 6 kg
Installation:	Installation through fastening points

Accompanying software
- o MACregister software package to read out the measurement values from the log memory and to adjust system settings through the communication port of the PC. The software program is suited for the use on a PC running Windows® 95, 98, ME, NT, 2000 or Windows® XP. On the condition that there is a free serial communication port available.

Available options

- o Calibration contract, for calibration of the measurement system.
- o MAC*View*® IPR card, enabling logging of data through the intranet / internet and to read out the MAC*View*® Ethylene Analyser through a web browser.
- o Swagelok® 1/8" stainless steel sampling pipes for the air channels (inlet/outlet).
- o Communication extension cord, up to a length of 15 meters.
- o RS232 to RS485 converter, to extend the RS232 communication lines beyond 15 meters.
- o RS232 to USB converter, to communicate with a PC that does not have a serial port (available), but instead does have an USB port available.
- o UPS to make the system mobile. The capacity (500 VA) is sufficient to supply the system with power for 3 hours.

Dimensions for mounting

When mounting the system you can make use of plugs or threads (with a maximum diameter of 6 mm)
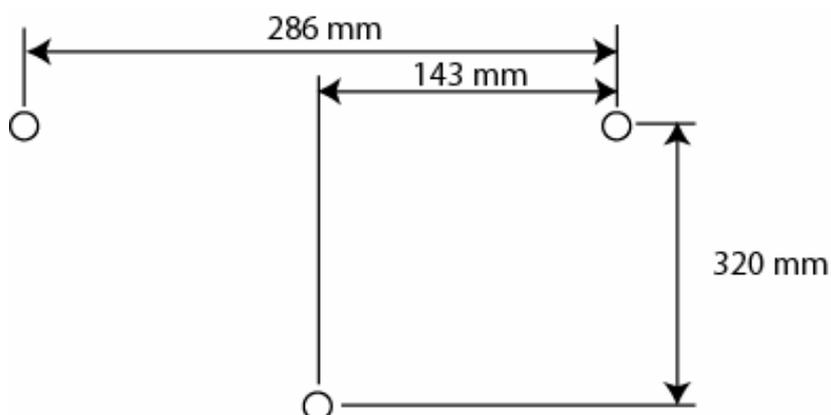
according to the measurements as indicated on the drawing below.

Warranties

Environmental Monitoring Systems (EMS) B.V. guarantees that this product is free of construction and/or material errors, for the duration of 1 year starting from the date of purchase. This warranty only applies to the first owner of this product and is not transferable. This warranty expires immediately in case of damage by accidents, neglect, abuse, modifications, improper and/or careless use or use for which the product is not intended. Resellers are not authorized to extend the warranty on behalf of Environmental Monitoring Systems (EMS) B.V. To claim warranty during the period that the warranty is valid, you are to contact Environmental Monitoring Systems (EMS) B.V.

Imprint

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Measurement Technology

MAC*View*®

EMS

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