



# MACView<sup>®</sup>

## GREENHOUSE GAS ANALYSER

**The solution for measuring harmful gas in greenhouses**

The MACView<sup>®</sup>-Greenhouse Gas Analyser is an extreme sensitive gas measurement device for monitoring harmful gases in greenhouses. The gas measurement device measures in ambient air NO, NO<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, CO and CO<sub>2</sub> with a very high precision. The MACView<sup>®</sup>-Greenhouse GA displays the amount of gas in the range of ppb (Parts Per Billion). This device assist the grower to become more conscious and gives more insight into the amount of harmful gas around crop. The allowable concentrations and time for crop are known as maximum allowed concentrations over time.

### **Monitoring**

While using CO<sub>2</sub> fertilisation in greenhouses, there is a possibility of amassment or pile up of harmful gas. The reason for this pile up is that CO<sub>2</sub> is consumed by the crop, and harmful gas is not immediately broke down. A small amount of (harmful) gas which is present in the greenhouse for a relative short period of time, would (normally) not be detrimental for the crop. However, exposing the crop to a minimum of gas for a relative long period of time could damage the crop. This is also dependent of kind of crop, cultivar, age and improving stress conditions like light, temperature, RH etc. around the crop.

## MACView®- Greenhouse Gas Analyser



### Gases

The MACView®-Greenhouse GA measures 5 types of gases at the same time which have all known effects on crop.

**NO (Nitric Oxide):** This type of gas is most of the time submitted by combustion processes. This processes could be: engines (cogeneration), boilers, stoves, fire, motor-vans/Cars. Crop can handle a certain amount of NO. Above that amount, NO becomes toxic for the crop. The crop the waste energy to break down the toxic..

**NO<sub>2</sub> (Nitrogen Dioxide):** NO<sub>2</sub> is often produced as a result of incomplete combustion . Crop can handle a certain amount of NO<sub>2</sub>. Above that amount, NO<sub>2</sub> becomes also toxic for the crop.

**C<sub>2</sub>H<sub>4</sub> (Ethylene or Ethene):** Like NO and NO<sub>2</sub>, Ethylene is also submitted by (incomplete) combustion processes. Ethylene is a well known plant hormone. Unlike to the previous gases, ethylene is also produced in nature. The crop is capable of producing a little amount of ethylene. In practice, these little amounts aren't enough to make a clearly measurement. Ethylene at higher levels can cause premature senescence, flower abortion and unwanted colouring of leaves.

**CO (Carbon Oxide):** Normally CO isn't that bad for plants. However where NO, NO<sub>2</sub> and ethylene are produced during combustion processes, there's also most of the time CO available which causes incomplete combustion. With this parameter it would be possible to detect the reason of air pollution in greenhouses.

**CO<sub>2</sub> (Carbon dioxide):** In contrast to NO<sub>x</sub>, ethylene and CO, CO<sub>2</sub>

is the wanted component to fertilize the Crop. The ratio between harmful gas components and CO<sub>2</sub> is thus important.

### Connection to the Climate computer

The MACView®-Greenhouse GA monitors gas on the level of the crop. In this way, the climate in the greenhouse can be controlled with the gathered information. It is recommended to connect the MACView®-Greenhouse GA to a climate computer to compare for example with the CO<sub>2</sub> dosing, running engine, opening/closing windows. This can be done in different ways. Which type of connection is the best, is to be determined in consultation. The different ways of connection are:

- Analog outputs (5 connections)
- Digital interface connection via RS485
- Remote interface via internet or database

Growers who won't use a connection between the MACView®-Greenhouse GA and a climate computer, can use a wireless- or wired internetconnection at collected data daily is send in graphs.





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The MACView®-Greenhouse Gas Analyser assists the grower by interpreting the way the gas conditions in the greenhouse are in relation to the valuable product in the greenhouse.



Klimaatcomputer /  
Database

### Reasons of existing gases

As a reason of present harmful gases in greenhouses, people often blame potential polluters like cogeneration, engines and boilers. Nevertheless, because of those are well-known reasons, those systems are built with extreme care and preventive sanctions are taken. Most of the time there are unknown insidious reasons. Possible reasons of pollution are the position of the greenhouse in relation to a (high)way, chimneys, petrol stations, mud(pits), dung hills etc. Another mindsets are the position of the air inlet, possible leaks, the use of forklifts, loading docks, terminals, the use of pulsfog etc. In principle "fresh air" coming inside by the windows could be a potential source of pollution nobody thought about.

### EMS B.V.

EMS is a manufacturer of gas measurement devices for agricultural applications. The development of the MACView®-Greenhouse Gas Analyser is a new development, based on earlier developed ethylene gas measurement devices working in the ppb range. Since 2003 EMS develops this type of measurement systems for agricultural applications. It is developed with the growers wishes and requirements. EMS handles R&D, production, service and marketing itself. Distribution is usually performed by our appreciated distributors and resellers.

### Calibration / Maintenance

The MACView®-Greenhouse Gas Analyser is an instrument that needs to be calibrated 2 times a year. EMS performs this calibration itself. We can offer you a maintenance contract in which we provide all the maintenance and calibration.

### Tests provided by WUR

The predecessor of the MACView®-Greenhouse Gas Analyser (Bulb / Postharvest Ethylene Analyser) was tested by the WUR. ("Wageningen University & Research"). The PPO flowerbulbs department and the Agrotechnology Food Sciences Group (Postharvest) department have tested this predecessor of the Gas Analyser. These tests were carried out by a comparison with a gaschromatograph. The conclusion resulted in the fact that the precision of the tested system was better than the lowest detection level (10 ppb) of the gaschromatograph. Also the WUR was looking for a quality product which can handle measurements in the ppb range and which is suitable for agricultural industry. The MACView®-Greenhouse Gas Analyser is made for high temperature locations with a high humidity, present in greenhouses. To summarise: Be aware of harmful gases for your crop, and monitor them!





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# TECHNICAL SPECIFICATIONS

## MACView®-Greenhouse Gas Analyser

Type of Gas Analyser	MACView®-Greenhouse Gas Analyser
Type of Sensors	NO (Nitric Oxide) measurement range 0-2.000 ppb NO <sub>2</sub> (Nitrogen Dioxide) measurement range 0-2.000 ppb C <sub>2</sub> H <sub>4</sub> (Ethylene) measurement range 0-2.000 ppb CO (Carbon Oxide) measurement range 0-2.000 ppb CO <sub>2</sub> (Carbon Dioxide) level 0-2.000 ppm
Resolution:	1 ppb for NO, NO <sub>2</sub> , C <sub>2</sub> H <sub>4</sub> and 10 ppm for CO <sub>2</sub> Minimum inaccuracy ±1% below a level of 200 ppb Maximum inaccuracy ±2% between the 200 and 2000 ppb
Measurement interval	4 to 6 measurements in a hour
Inlet / Outlet of the flow	2 inlets; sampling on 2 different levels; inlet can be elongated with a tube of 3 meter for sampling in top of the crop
Type of Housing	White painted stainless steel; Protection class IP54
(Safety / EMC) Standards	NEN-EN-IEC 61000-6 -1,-2,-3,-4; CE
Measurement Modus	Measure mode, Zero mode, Standby, Flushing mode (Full-automatic safety which protects the sensors against damage unwanted chemicals)
Settings of Detection and Alarm	Hysteresis for setting the relays , status notifications, power, failures
Analog Outputs	5: Both has the possibility of: 0-20mA; 4-20mA; 0-10V
Data interface / service interface	Choice: Webportal internet connection by WiFi or GPRS/UMTS or Ethernet cable
Data Storage	Internal data storage. Up to 10.000 records. Read-out software included
Powering	110 - 230 VAC 2.35A
Working Temperature	-10 ~ 45°C, Working Humidity 5 - 99% (not-condensed)
Software	Included, compatible with every climate computer, Letsgrow compatible, Webportal internet connection for use with internetbrowser
Languages	English and Dutch
Control Panel	1 Graphic Display on GA and 1 additional for control and read-out on long distance with backlight and menu
Dimensions Greenhouse GA	Housing: l x w x d 150 cm x 16 cm x 12 cm
Dimensions IO-BOX	Housing: l x w x d 34 cm x 22 cm x 10 cm
Weight	25.0 Kg

### Sales and distribution:

EMS B.V.

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