

PRODUCT DATASHEET



**Fertigation, hidroponic irrigation, fog system
and windows control**





IRRIGATION AND WINDOWS CONTROL

WINDOWS CONTROL AND FOG SYSTEM
Windows control and fog system in greenhouses.

USER FRIENDLY
Due to its 7-inch color touch screen.

LINUX
Embedded Linux operating system.

REPORTS
Irrigation calendar, sensor measurements, etc. (USB Download).

WHAT DOES IT CONTROL? ☒

- Irrigation
- Windows control
- Control of thermal or shading covers
- Fog system
- Pumping
- Fertigation based on pH, EC parameters (electrical conductivity, time, volume and proportional to water volume)
- Fertilizers agitation
- Filter cleaning
- Up to 8 filters + 1 filter master valve
- 2 waters mixture
- Radio activation of valves, motors, etc. (optional)
- Diesel pump & Genset

- Up to 250 irrigation valves or sectors
- 8 Irrigation pumps
- 1 Master valve
- 1 Motorized safety valve
- 1 Master agitator + independent agitator for each fertilizer (up to 8)
- 1 Special treatment by time and volume
- 8 Fertilizers
- 1 Acid
- 1 Rinsing valve
- 1 Filter master valve
- Calculation of VPD (Up to 8 zones).** It allows to identify crops unhealthy conditions derived from the environmental conditions in the greenhouse.
- Connection to METOS weather stations via API
- Remote management on the Internet (optional)

TYPICAL APPLICATIONS ☒

Hydroponic crops, horticulture, strawberry crops, banana crops, citrus and fruit trees crops, ornamental plants...





IRRIGATION AND FOG SYSTEM

- **SMART has 20 independent irrigation and fog system programs** which can be modified in real-time.

You can simultaneously run a irrigation program and a fog system program.



Irrigation programming screen

IRRIGATION



Starting Types

By start times or fixed times (3 starts a day)

Cyclic irrigations

Sequential irrigations (starts at the ending of another irrigation program)

By demand (digital input)

By accumulated solar radiation

By analog input or sensor measurement (temperature, humidity, soil EC, anemometer, etc...)

From remote or external units: The start of the program irrigation is conditioned by the state of the digital inputs or measurements from sensors connected to remote units

Irrigation Program Features

Irrigation programming by day of the week or independent pause days for each program

10 valves per program to be irrigated independently or grouped

The duration of the irrigations can be set up in time (minutes - seconds or in hours - minutes) or volume (m3 liters)

Independent Pre-irrigation and Post-irrigation time in each program: they can be accumulated or deducted from the irrigation time programmed for each valve

2 main irrigation valves: master valve and motorized safety valve

Delay for the closing of valves or sectors at the end of irrigation to avoid water hammers

FOG SYSTEM



Starting types and features

Cyclic fog system

By relative humidity

By temperature

10 valves per program will be activated independently or grouped

The duration of fog system is indicated in time (hours - minutes - seconds)



FERTILIZATION ☒

SMART manages the injection of maximum 8 fertilizers. The fertilization parameters can be modified in real-time.

Acid or base can be used to control the water pH.

Rinsing valve for cleaning the fertilizer injection system.

FERTIGATION TYPES

pH y EC control

pH and differential or incremental EC control

pH control and mixture of 2 waters

Fertigation by continuous time and pH control

Fertigation by distributed time during irrigation time and pH control

Fertigation by continuous volume and pH control

Fertigation by distributed volume during irrigation time and pH control

Fertigation by volume proportional to water volume and pH control

Fixed injection (injection period and % of each fertilizer)

MAIN FEATURES

Fertigation by volume or time: the injection can be serial or parallel.

Fertigation by volume or time continuous: An operating range can be established for fertilization limited by a value of minimum EC and maximum EC for the irrigation water.

Auxiliar fertilizer outputs for each fertilizer

Auxiliar acid output

Possibility of using a master injection pump

Injection of contributions or special treatments, programming the start time and duration of it. Duration can be programmed in time or volume

Fertilizers Agitation: on / off, pre-agitation and continuous. One output can be configured for a general or master agitator and outputs for one agitator for each fertilizer

Irrigation or fertigation stopping due to the following anomalies: pH error, EC error, fault of fertilizer or acid

Rinsing valve. Valve that remains open during the pause of serial fertilization in order to clean the hydraulic system between fertilizers injected by time or volume

Master filter valve. Valve that remains open during the filtering process

STOP CONDITIONS ☒

Stop conditions can stop the current irrigation before the programmed time or volume has elapsed. You can set up to 3 independent stop conditions per each program:

- By the status of a certain controller digital input or remote unit digital input
- Sensor measurement connected to the controller or remote unit
- In both cases, a delay in seconds can be set up to accept the stop condition

The fog system programs have only 2 stop conditions.



FILTERS CLEANING

Up to 8 outputs can be set up as filters. The activation of the filter system cleaning is settable, starting cleaning the first condition that is reached of the following:

1. Irrigated time
2. Irrigated volume
3. Differential pressure switcher

It offers the possibility of stopping the fertilizer and closing the irrigation valves during cleaning. In addition, it has the option of setting up the cleaning time and the pause time between filters.

A **master filter cleaning** valve can be set up to work during a filter cleaning operation.





WINDOWS CONTROL

SMART allows you to control the opening and closing of the zenithal or side windows of a greenhouse.

SMART can control up to 8 zones

In each zone you can control up to 6 windows (3 groups of 2 windows), zenithal or side

The opening and closing of windows can be conditioned by the following sensors: wind vane, anemometer, humidity, temperature, rain detector and solar radiation

The **anemometer** allows to modulate the position of the windows depending on the wind speed

The **wind direction sensor** defines which windows are upwind and which are downwind.

***ALL IN ONE CONTROLLER.** In addition to irrigation, it allows you to automate fog system and windows.*

SCHEDULES

You can define up to 5 different schedules, each with different control setpoints:

Day schedule. The schedule can be set by the user or by the controller automatically using an astronomical clock (every day it calculates the time of sunrise and sunset)

Night schedule. The schedule can be set by the user or by the controller automatically using an astronomical clock (every day it calculates the time of sunrise and sunset)

Special schedule 1. The schedule is set by the user

Special schedule 2. The schedule is set by the user

Thermal inversion schedule. Schedule established by the user where it is allowed to increase the temperature inside the greenhouse with respect to the outside by opening windows, as long as the inside temperature is lower than the outside





SHADE CLOTH / THERMAL CLOTH CONTROL

The equipment can regulate shade cloths or thermal cloths. A cloth is displayed in the greenhouse window if the selected control area has a cloth configured. The cloth will be represented according to its current state, indicating its percentage of extension.



In the programming of the cloths, we can edit the parameters for controlling the cloth of each control zone. For each control zone:



SHADE CLOTH

SHADE CLOTH BY SOLAR RADIATION

Programming the position of the shade cloth based on the received **solar radiation** at any given time

SHADE CLOTH BY SCHEDULE

Indicates the positioning of the shade cloth at **specific hours**.

You can also use the option '**Use astronomical clock**' to have the controller calculate and set the daily sunrise and sunset times



THERMAL CLOTH BY SOLAR RADIATION

This is a screen that prevents the escape of the heat that accumulates inside the greenhouse during the hours of highest solar radiation. For this type of cloths, control is carried out by programming solar radiation references.



THERMAL CLOTH BY TEMPERATURE

This is a thermal screen where **temperature** is used as a reference for control.



CONSULT HISTORICAL AND OTHER DATA



HISTORICAL

Irrigation
Fogging
Valves
Fertilizers
Treatments
Programs
Possibility to download re-
ports in Excel format, using
USB

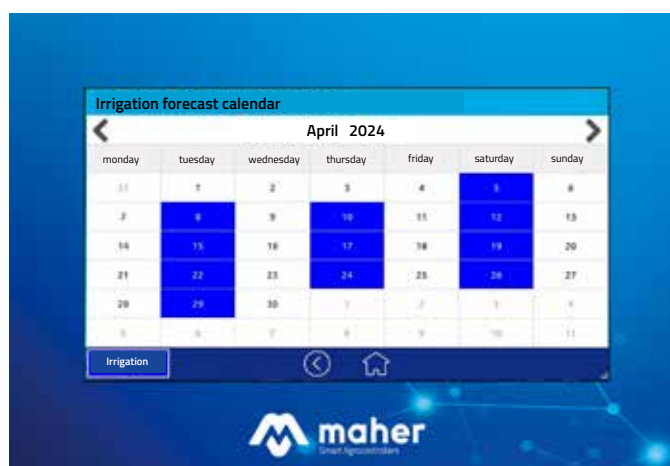


CONSULT DATA

Actual irrigation
Anomalies
Program status
Equipment information
Actual fogging
Mix of 2 waters
Diesel group
Remote units



IRRIGATION FORECAST



Forecasted irrigation calendar screen



IRRIGATION FORECAST FOR TODAY

Irrigation forecast: A irrigation calendar is presented where days scheduled for watering are shown in dark blue.

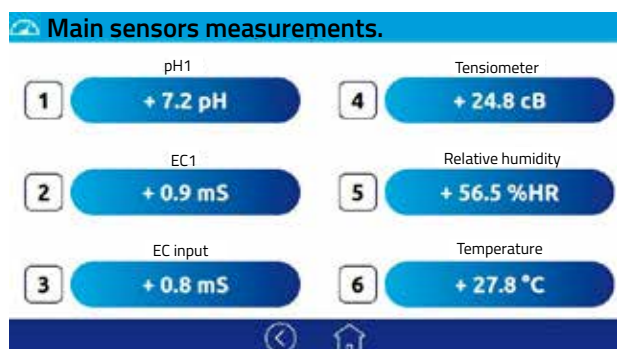
Very useful for checking and ensuring that irrigation schedules have been programmed correctly.

Detailed information: Detailed Information: When clicking on a day with scheduled irrigation, a new window will appear with more details: Program number, type and start time, fertilization type, programmed valves, etc



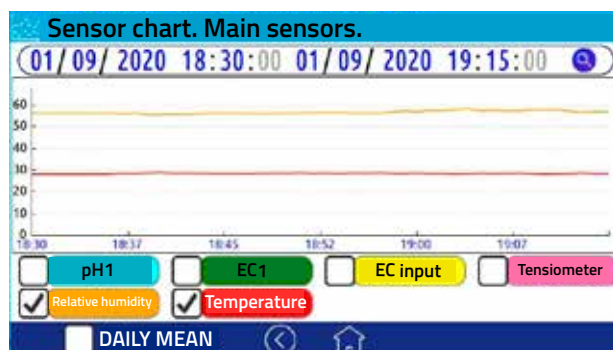
MEASUREMENTS AND GRAPH OF SENSORS

- Display the sensors measurements connected to the controller



Sensors reading screen

- Queries for a custom time period
- Mark / unmark sensors for their visualization in the graph
- Daily average: daily average value of the selected sensor



Sensors graphical screen

USB PORT for software update and data download (backups, sensor measurements, irrigation records, etc.)

MANUAL ACTIONS

Start an irrigation or fog system program

Stop an irrigation or fog system

Activate fertilizer and acid injection

Stop injection of fertilizers or acid

Stop alarm

Change controller state: Stop <=> Active

Stop and restart treatment



1

Start program n°1



1

Stop irrigation in execution



Active - Stop

INPUTS

Analog Inputs



6 analog inputs can be used for connecting a wide variety of sensors to the controller. These inputs can be set up both in signal range and input voltage range.

4-20 mA or 0-5V= output sensors are suitable for being connected to the controller. **The function of each of these inputs is programmable.**

- pH, EC, secondary pH and EC sensor, clean water EC sensor, pressure sensor, solar radiation sensor, tensiometer, soil moisture and EC, humidity and temperature, wind speed and direction, etc.

- Any analog sensor can be connected, as the controller's switched inputs and switched input expansion boards are configurable.

Digital Inputs



10 optocoupled digital inputs that are activated at a low level can be set up. All of them can be delayed for avoiding errors due to false contacts.

The function of each of them is configurable to detect the following failures or malfunctions:

- High and low pressure, fertilizer level, oil pressure, diesel group error, differential pressure switch, external stop to stop the irrigation (rain detector, water level, etc.), 5 inputs for demand to start an irrigation, volumetric water pulse meter, external pause to set the controller in stop, volumetric fertilizer pulse meter for fertilizers and special treatments injection by volume, etc.

Send notifications **via SMS** (If GPRS connection is available). Up to 2 telephone number: start, end of irrigations and anomalies.

The **delay time** to detect and confirm each anomaly or alarm is configurable.



OUTPUTS

- Controller outputs are 10A at 24 V_{AC} relay outputs. The function of each of them is fully configurable. It is available in versions with 16 and 24 outputs, expandable up to 250.
- An **internal transformer 24 V_{AC} / 1,25A**, however, if higher current intensity would be necessary, an external transformer could be used.
- **Different voltages are allowed to be used at the outputs.** Each output card can be connected to different voltages. For example, to start a Genset a 12 V_{DC} voltage power can be connected and once it has been started 24 V_{AC} voltage will be available for use in the rest of the output cards.

POWER AND CONSUMPTION

- Touch screen operating voltage: 12Vdc 3A.
- Power box operating voltage: 220Vac 1A or 12Vdc 2A, on demand.

MODELS

- **Outputs number:** from 16 to 250 (expandable in groups of 8 outputs)
- **Supply voltage and outputs**
 - + 220 V_{AC} power supply and 24 V_{AC} outputs
 - + 12 V_{DC} power supply 12 V_{DC} outputs / 12 V_{DC} 2-wire latch (configurable on the device)
- **Surface or fitting installation:** Embedded controller, fertigation equipment and in cabinet



Embedded controller



Fertigation equipment



Cabinet



OPTIONAL APPLICATIONS

SOFTWARE



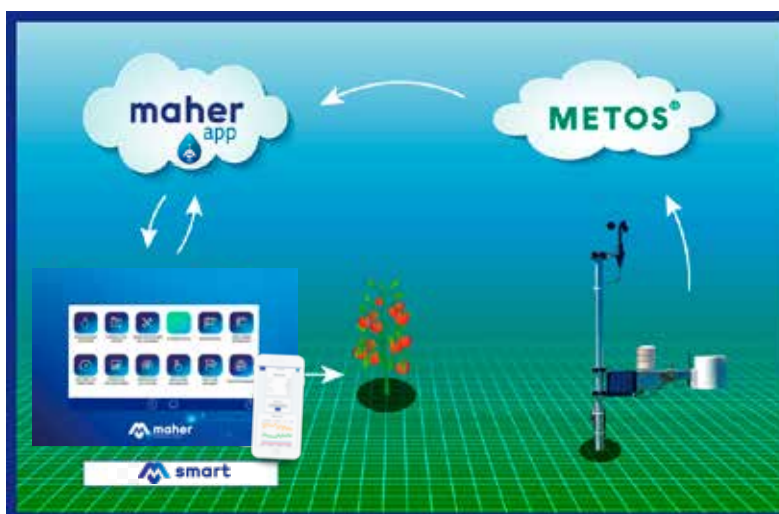
* **Activation of extra options by code.**

- **Windows control.** It allows to control the opening and closing of the greenhouse windows automatically.
- **Control of thermal or shading covers.** It allows for the automatic opening and closing of greenhouse covers.
- **Maher App.** Maher App application allows remote access to the controller from any device with an Internet connection, such as a Smartphone, Tablet, PC, Smart TV... It also allows sending SMS messages to 1 or 2 configured mobile phones in the controller to notify anomalies and irrigation starting or irrigation ending.

HARDWARE



- **Outputs expansion.** The controller includes 16 outputs by default, and the number of outputs can be increased to a maximum of 250.
- **Extension of analog inputs.** The controller incorporates 6 analog inputs by default, and the number of analog inputs can be increased to a maximum of 54.
- **GPRS o Ethernet modem.** GPRS or Ethernet modem allows controller to be connected to Maher App server.



MAHER Radio

Radio communication
with remote units



MAHER App

Remote control of
controller remote
management



maher

smart

Advanced functions for the automation of
irrigation, fog system and ventilation in
greenhouses

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