INSTALLER USER MANUAL

AGRÓNIC 4500

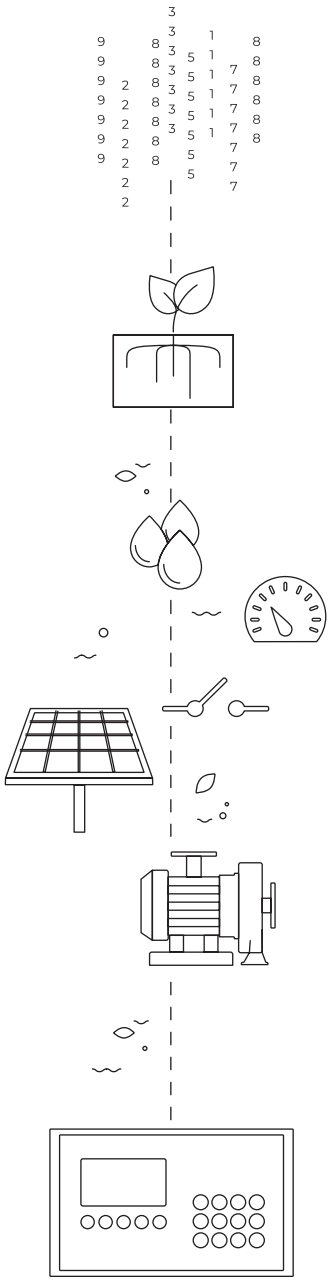
Sections in the manual:

- Functional description
- Features
- Formats, versions, models and options
- Technical specifications
- Parameters
- Input and output coding
- Technical support

The Communication Parameters section is detailed in the Communications Manual.

The sections on Programming, Manual Actions and Consultation are detailed in the User Manual.

SISTEMES ELECTRÒNICS PROGRÉS



Welcome to the Agrónic 4500 manual.

We are pleased to have your experience and skills to install the Agrónic 4500.

This document will guide you through the process, providing details on the controller's features and parameters.

Your experience is essential to teach customers how to effectively use the Agrónic 4500.

Thank you for your work!

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1 FUNCTIONAL DESCRIPTION

The Agrónic 4500 is a modular, expandable controller with versatile applications designed for automating irrigation on medium to large farms (up to 400 irrigation sectors across 4 independent heads). It can open and close sectors and main valves, control fertilizers and acids (hydroponic as well as conventional), operate filters, read several sensor types for monitoring and has programmable irrigation and alarm adjustments. For farms with pivots (maximum of 4) and coverage.

The farm may have pressurized water intake or require a booster pump (electric or drive pump). There may be several irrigation water meters in the main pipes and one for each sector, up to 400.

The four possible heads can have 12 Vdc power supply (with solar cell and battery or battery only) or at 220 Vac (mains or generator set). There is also the option of hybrid solar irrigation, with solar cells and a generator set or mains, where the Agrónic can select which power to use in order to optimize irrigation.

The valves can be 12 Vdc, 24 Vac or latch and can be close to the head and controlled by microtube or cable or remotely via external modules; up to 2 km with Agrónic Radio and AgroBee-L and up to 10 km with Agrónic Monocable.

In the heads, there can be fertilization with a hydraulic pump injector, electric dispenser machines or a Venturis system. Fertilization can be by unit (time or volume) or follow an EC reference.

It reads all sensor types (analog, digital and meter) connected to Agrónic and also remotely via external modules.

The Agrónic 4500 has an internet connection, with mobile telephony or WiFi, to connect to the VEGGA portal or to the Agrónic App application and remotely manage the Agrónic.

For remote management, there is also the Agrónic Windows PC program. The connection can be with direct USB to the PC when it is next to the controller, by radio modem for medium distances or by internet, using WiFi or mobile telephony.

2 FEATURES

The detailed features described below apply to the controller with all of its options and functions activated.

HEAD

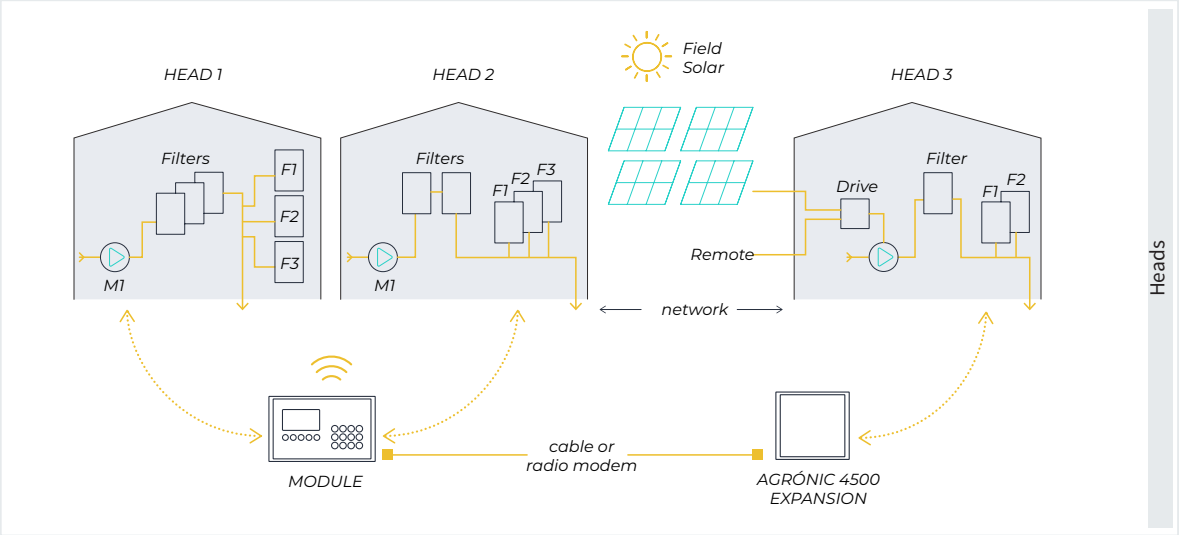
- Basic version: 1 head
- Plus version: 4 heads

It can control up to four independent heads.

The head contains the elements needed to prepare the irrigation water and nutrients for your hydraulic grid.

This includes pumps, general valves, fertilization and filters.

The fertilization, general outputs, filters, pressure regulation, diesel engine and water mixing configurations are independent for each head.



SECTOR

irrigation

- Basic version: up to 99 sectors
- Plus version: up to 400 sectors

Control up to 400 sectors using 99 irrigation programs.

Each sector logs a volume meter, power meter, digital start input, flow detector, pressure reference, area occupied and crop type.

All sectors that a program activates must be on the same head.

From 1 to 400 sectors

Sector groups

- Plus version

Create sector groups with up to 20 sectors each and a maximum of 40 groups.

The sector group is assigned to the program as if it were a single sector, which significantly increases the number of sectors that a program can activate.

Sector groups

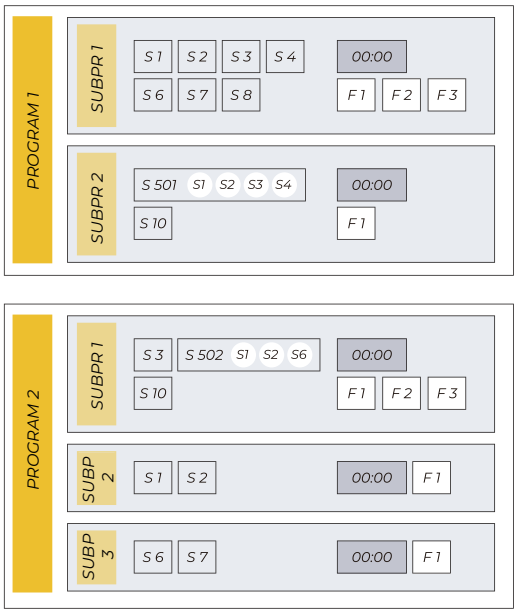
Programs

Type: There are two types of programming: subprogram and linear:

- ► Basic version: up to 12 subprograms or 12 individual sectors per program
- ► Plus version: up to 20 subprograms or 20 individual sectors per program

- Programming by Subprogram: Each program can have up to 20 subprograms with 10 individual sectors each. To increase the number of sectors per subprogram, up to a maximum of 40 sectors, sector groups can be created.

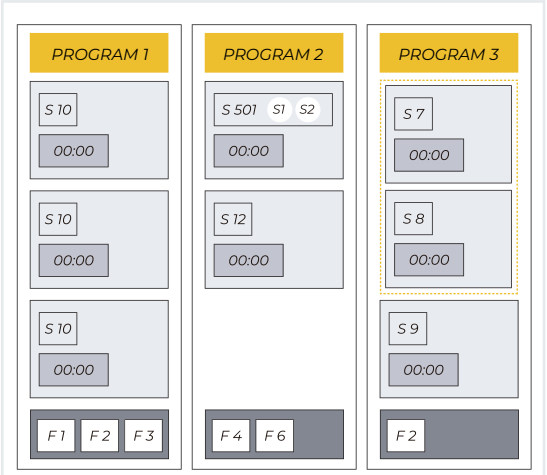
  The sector group is assigned to the program as if it were a single sector. The irrigation amount defined in a subprogram affects all sectors of that subprogram.



Programs with subprograms

- Linear programming: Each program can irrigate 20 individual sectors one after the other or in association with each other (e.g. 2 by 2, 3 by 3, etc.). Sector groups can be created to increase the number of sectors to irrigate simultaneously, up to a maximum of 40 sectors.

  The irrigation amount is programmed and the fertilizer is common to the entire program in each sector.



Linear programs

Start: There are three ways to start a program:

- Schedule start:
  - Days of the week: Selecting the days of the week.

Days of the week: Mon-Wed-Thu-Sa

  - Frequency of days: Repeat irrigation every n days.

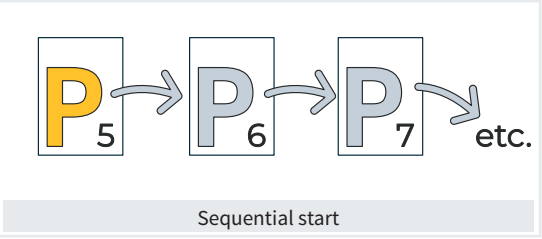
Frequency of days: every 3 days

  - Calendar: Marking specific dates.

Calendar: August 15

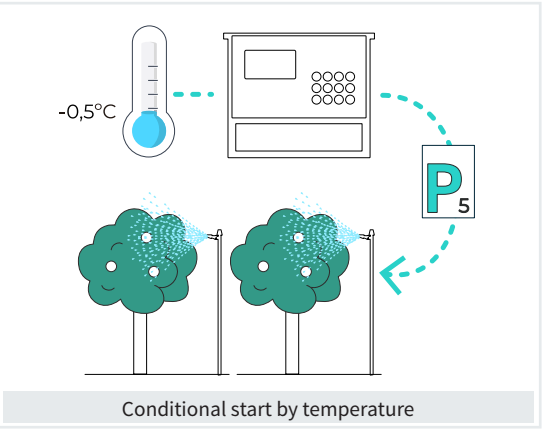
There are up to six start times per program.

- Sequential start: It starts when the previous program has ended. The irrigation values are in the first program in the sequence.

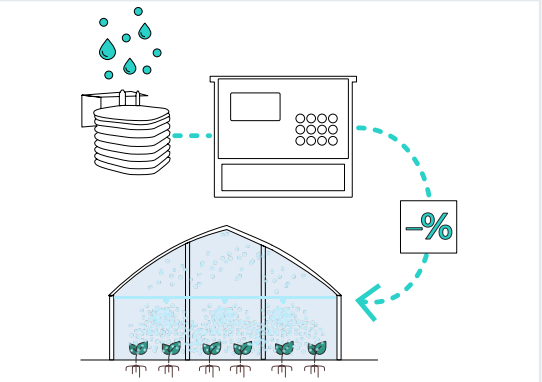


Sequential start

- Conditional start: Up to six determining factors per program. Through logs from different sensor types, the program can be started and stopped, irrigation and fertilization modified, stopped due to alarms, etc. An active schedule can be configured, a safety time between starts, a safety time due to missed starts and a safety irrigation every certain period of time.



Conditional start by temperature



Conditional start due to high VPD

Once the program has started, there is an option to repeat the irrigation every certain amount of time (activations).

When a program starts using any of the three options (schedule, sequential and conditional), the irrigation amount can be modified using the determining factors or daily curves and it can also be stopped permanently or temporarily.

Program units: The units to be irrigated are configured in each program:

- Hours and minutes (hh:mm).
- Minutes and seconds (mm'ss").
- Cubic meters per hectare in time (m^3/ha(t)).
- Cubic meters (m^3).
- Cubic meters per hectare (m^3/ha).
- Millimeters or amount of water (mm).

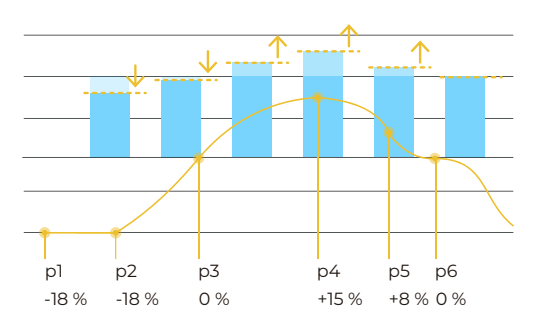
Mass programming from Agrónic APP / VEGGA / Agrónic PC. Irrigation units must be "m^3/ha" or "mm" and the sector must have an assigned surface area and crop.

Irrigation curves: Irrigation operations can be modified using curves: irrigation units, fertilizer units and the time between activations.

When irrigation starts, the unit adjustments configured in the curves for that hour/minute are applied.

If the program operates with activations (pulsed irrigation), it calculates the time for the next activation for each activation.

Six curve points are configured.



Irrigation curve

Irrigation by ETc: The objective of irrigating by ETc (evapotranspiration) is to restore the water consumed by the plant.

To know the amount of water evaporated, each sector linked to a crop receives the evapotranspiration value in time slots from the cloud. This value is corrected by calculating the "effective rainfall".

At the start of irrigation, the first section of a subprogram automatically determines the amount of water based on this value.

FERTILIZATION

Each head controls up to 8 fertilizers, 2 acids and 2 phytosanitary treatments, all in independent tanks.

Each head regulates an acidity set point (pH) and electrical conductivity (mS).

The independent pre-irrigation and post-irrigation values for each subprogram or grouping in a linear program.

The injectors can be cleaned after fertilization.

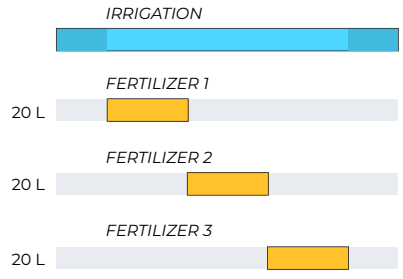
Configured to use mixers or not, with pre-mixing and intermittent or continuous mixing.

For the four heads, the controller can manage 32 fertilizers, 8 acids and 8 phytosanitary treatments.

Fertilizers can be applied in three different ways: serial, parallel and solar.

Serial

One fertilizer after another, with a single injection. It multiple programs can fertilize simultaneously, as long as the fertilizer is not repeated.



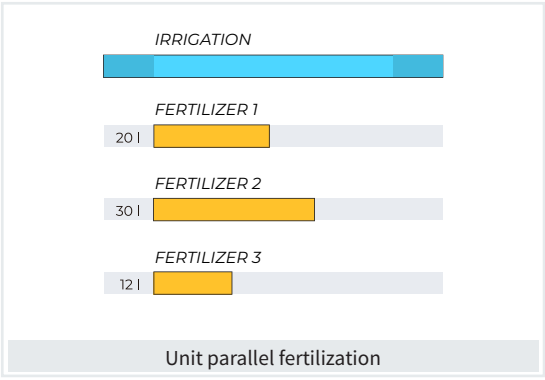
Series fertilization

Units:

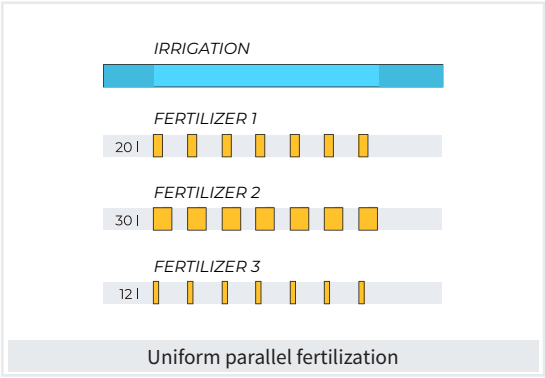
- Hours and minutes (hh:mm).
- Minutes and seconds (mm'ss").
- Liters (L)
- Liters per hectare (L/ha).

Parallel

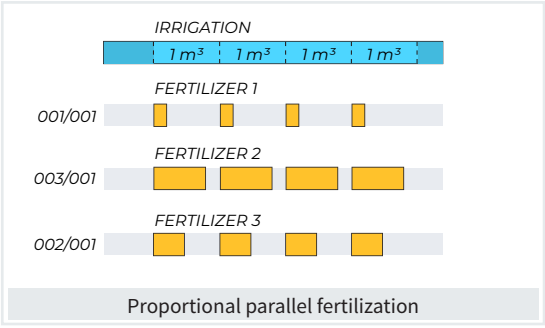
Fertilizers are applied all at once, with one injection for each. The type of fertilization carried out is configured in each program. It can be by unit, uniform, proportional, EC and EC input:



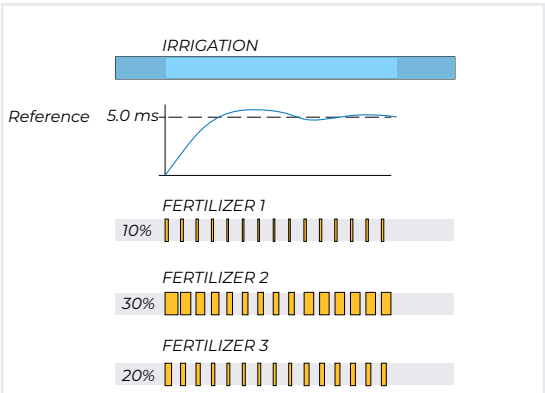
Unit parallel fertilization



Uniform parallel fertilization



Proportional parallel fertilization



EC / EC input parallel fertilization regulation

Units:

Parallel fertilization by unit or uniform:

- Hours and minutes (hh:mm).
- Minutes and seconds (mm'ss").
- Liters (L)
- Liters per hectare (L/ha).

Proportional parallel fertilization L/m³ or cl/L:

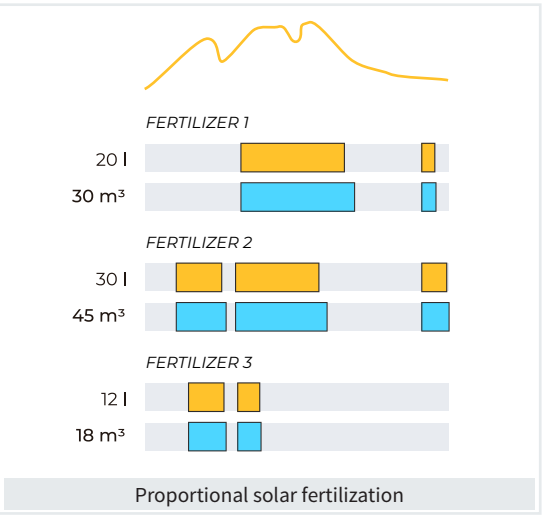
- Pulse meter
- Expected flow

Parallel fertilization by regulation:

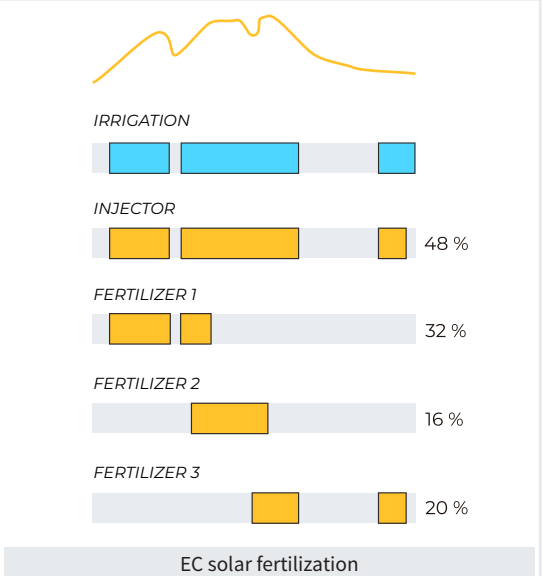
- EC
- Input EC

Solar

It always works as parallel fertilization, applying simultaneous fertilization to irrigation according to the availability of sunlight. It can irrigate and fertilize multiple programs simultaneously using the same fertilizers.



Proportional solar fertilization



EC solar fertilization

Units:

Proportional solar fertilization L/m³ or cl/L:

- Pulse meter
- Expected flow

Solar fertilization by regulation:

- EC
- Input EC

The following concepts can be configured for each fertilization type:

Independent pre-irrigation and post-irrigation values for each subprogram or grouping in a linear program.

Cleaning the injectors after fertilizer.

Fertilization units in time or volume to be programmed are:

- Hours/minutes.
- Minutes/seconds.
- Liters.
- Liters/hectare.

Mixers can be configured, with pre-mixing and intermittent or continuous mixing.

If there are meters on the fertilizers, lack of pulses or leaks can be detected.

Proportional allocation of each meter pulse to the accumulated and historical logs according to the expected flows of the sectors that are fertilizing simultaneously.

Two acids

To apply pH correcting acids.

Two different acids or an acid and a base can be applied.

Two phytosanitary treatments

To apply phytosanitary treatments: root treatments, chelates, amino acids, etc., two outputs can be configured, TF1 and TF2.

The treatment is applied by time or by volume.

After the start of each sector group or subprogram, it waits for the configured time and activates TF1 or TF2. It does not take either pre-irrigation or post-irrigation into account.

PUMPING

Each head has six general irrigation outputs or pumps.

For the four heads, the controller can manage 24 pumps, four diesel engines and four pressure regulations.

- One of the pumps can be a drive pump or generator set (diesel control). The pumps to be associated to each sector can be selected. The pumps activate together with the sector.
- There are time delays to separate the activation of the pump from that of the sector during activation as well as in stop.
- It regulates the irrigation pressure using a PID control (proportional, integral, derivative) or delivers the pressure reference to the variable speed drive so that it can control regulation.
- It activates and stops pumps based on the expected flow required.

FILTER CLEANING

Each head has three independent filter stations with three different rinsing time subgroups. The number of filters is not limited.

For the four heads, the controller can manage 12 filtering stations.

- The start of the rinsing sequence can be:
  - By digital differential pressure gage signal.
  - By the difference in analog signals from two pressure sensors (filter input and output).
  - By time.
  - By water circulation volume.
  - By manual action.
- Whether or not the irrigation sectors and fertilizers are stopped while the filters are being cleaned is configurable.
- Control over malfunctions due to continuous cleanings.
- One general filter output.
- The filters in Head 1 can be used as common filters for all heads.

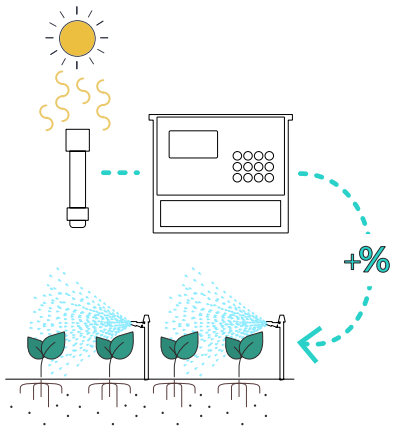
DETERMINING FACTORS

The controller has a total of 120 completely configurable determining factors to trigger actions that take into account certain determining factors or values from digital or analog sensors and meters.

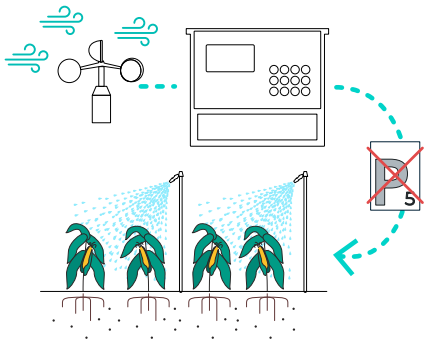
Many different actions can be carried out, such as definitive, temporary or conditional stops for a specific program or for all programs, start and/or stop irrigation, send warnings and adjust irrigation or fertilizer quantities. These adjustments can be made based on either real-time sensor readings or the total value logged since the previous irrigation. Each determining factor can also be configured to generate an error or send an SMS message and an SMS message to another machine.

Examples include stopping irrigation due to a pipe break, delaying irrigation due to low water levels or high winds, adjusting irrigation volume based on soil moisture, the amount of sunlight received by the plants since the last irrigation or evapotranspiration rates. It can also stop irrigation if a certain amount of rainfall has been detected since the last session and send warnings to the owner in case of attempted theft, among other functionalities.

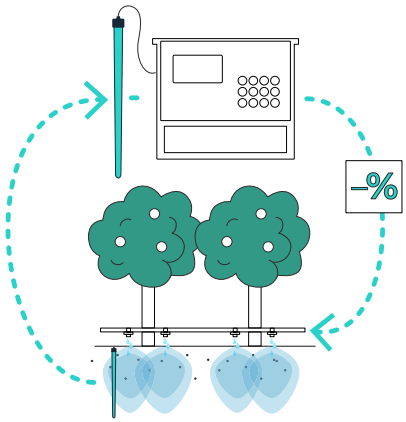
Here are some examples:



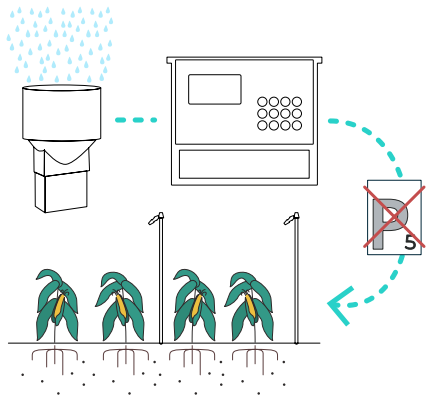
Modify the irrigation volume
in relation to the sunlight received



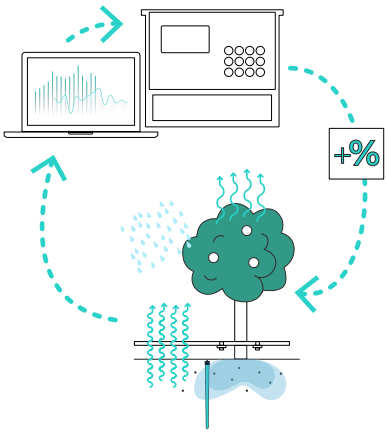
Delay irrigation due to
excessive wind or low level



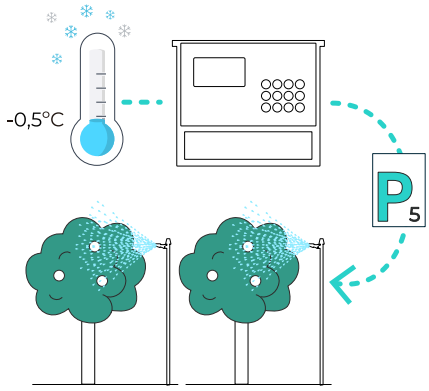
Modify the irrigation volume
in relation to soil water content



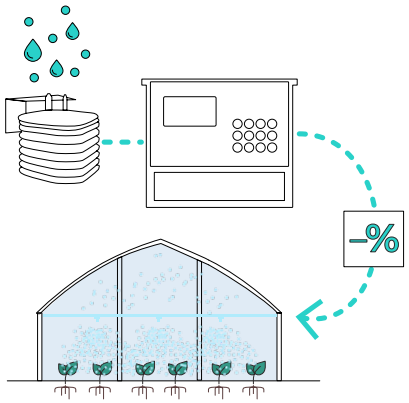
Stop irrigation if there has been a certain
amount of rainfall since the previous irrigation



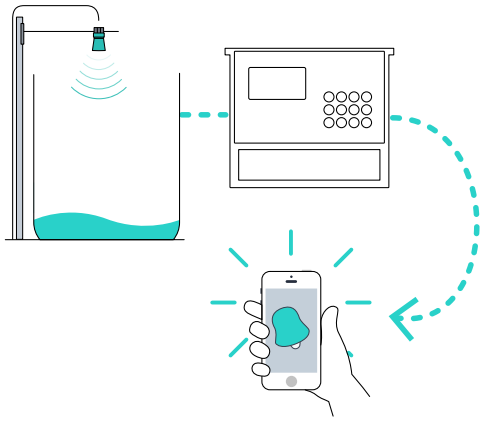
Modify the irrigation volume
in relation to evapotranspiration



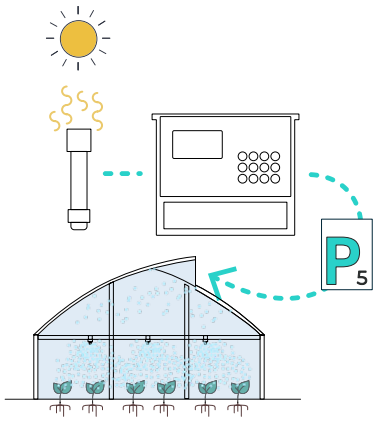
Open the program if the temperature
sensor drops below -0.5º



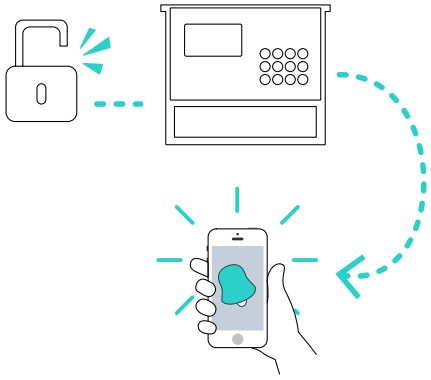
Modify the irrigation volume
in relation to the vapor pressure deficit



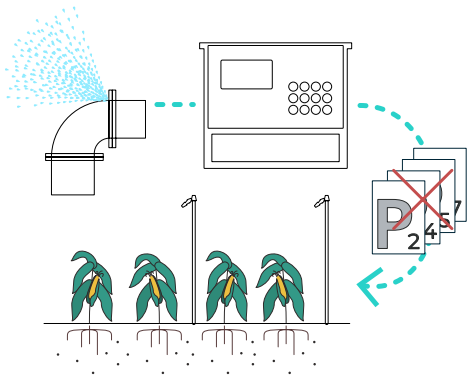
Generate a warning when the fertilizer tank level drops



Open greenhouse windows
if the radiation sensor is high



Generate a warning to the owner in the event of attempted theft



End irrigation due to a broken pipe

Determining factors perform actions on programs based on sensor status or values:

- Digital,
- Analog
- Meters
- Values calculated from several sensors and logical or arithmetic operations.

The actions according to their origin are:

	Definitive stop	Temporary stop	Conditional stop	Start	Start/Stop	Warning	Modify irrigation	Modify EC	Modify frequency
Digital sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Analog sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logical sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Flow meter sensor	✓	✓		✓	✓	✓			
Total meter sensor	✓	✓		✓		✓	✓	✓	✓
Flow error	✓	✓				✓			
EC error	✓	✓				✓			
pH error	✓	✓				✓			
EC at 100%	✓	✓				✓			
pH at 100%	✓	✓				✓			
EC safety	✓	✓				✓			
pH safety	✓	✓				✓			
EC proportion	✓	✓				✓			
EC mix error	✓	✓				✓			
Drainage error	✓	✓				✓			
EC drainage error	✓	✓				✓			
pH drainage error	✓	✓	✓						
Communication		✓	✓						
Schedule	✓	✓				✓			
F. tank						✓			
Meter tank									

FOGGERS

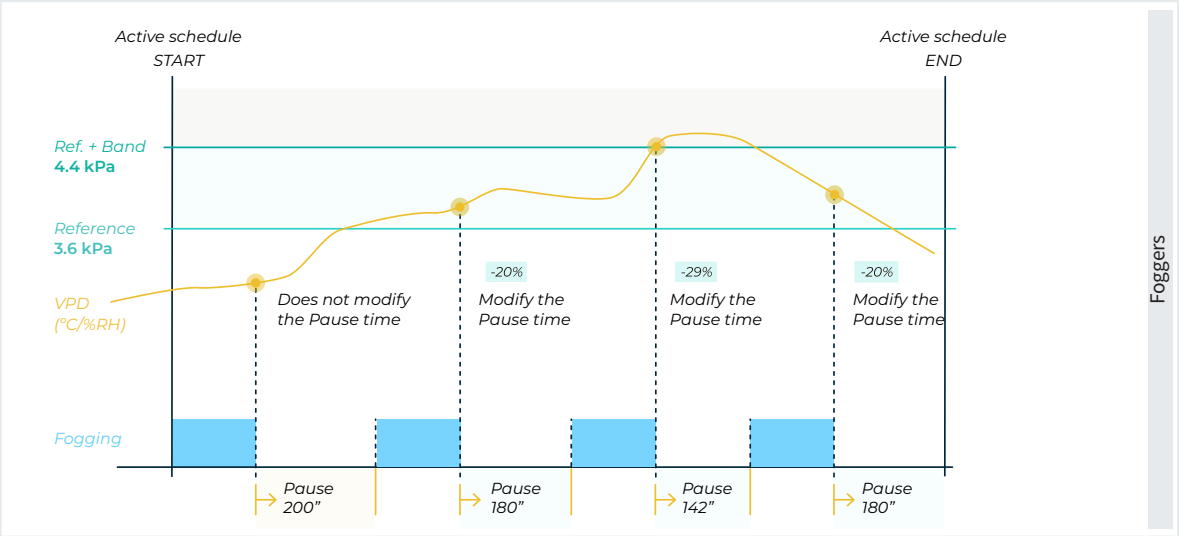
It controls up to eight foggers.

Fogging is used to cool and increase humidity in greenhouses by spraying pressurized water into the environment.

In each fogging, a maximum of eight outputs are configured, which activate sequentially for the time indicated. When it ends, there is a pause time before the cycle starts again.

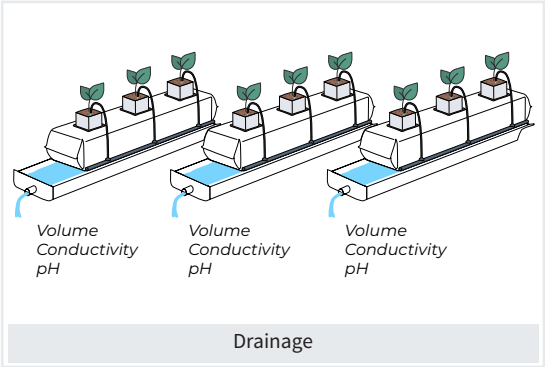
It can be controlled by:

- Temperature
- Humidity
- VPD (Vapor pressure deficit).
- By a determining factor.
- Manual



DRAINAGE

It controls up to 20 drains.



Drainage

Drainage is used in hydroponic crops to rinse salts from the root area or to define irrigation strategies.

Drainage is associated with a program where the percentage of irrigation water that needs to be drained is configured. To achieve this, the irrigation amount can be modified in the same irrigation or the next one or the time between program starts.

It measures the conductivity and acidity of the drainage water, logging it at each irrigation.

SOLAR IRRIGATION

One of the irrigation heads can manage a hybrid power system, solar cells and electric mains or diesel generator.

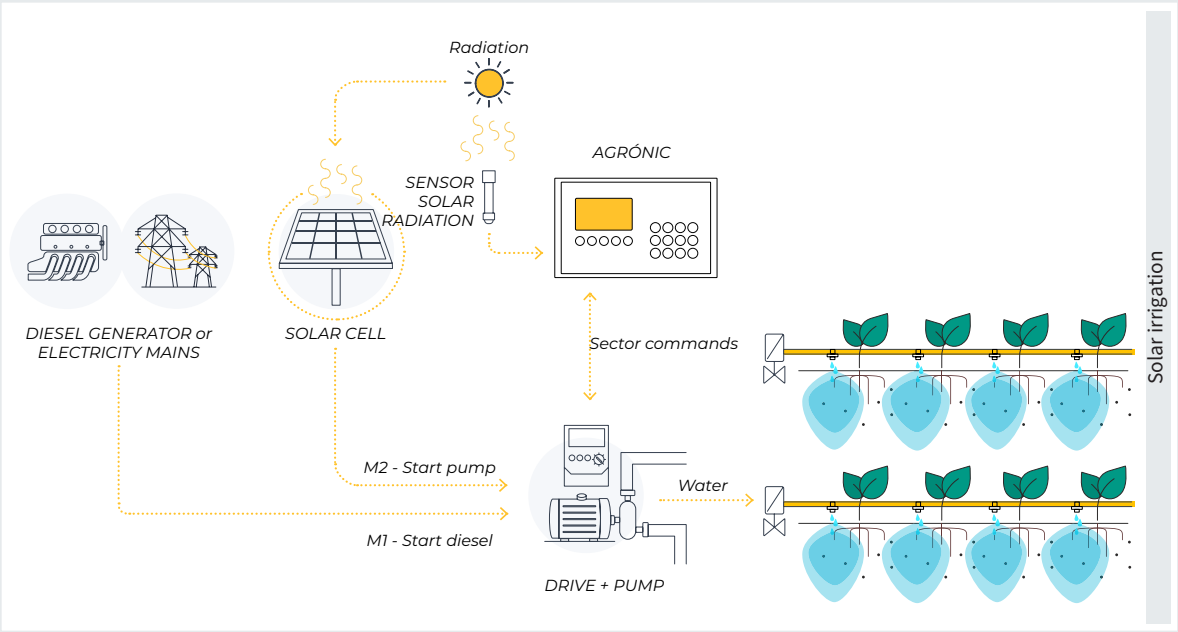
Decide what type of power source will be used to irrigate (solar, mains or generator), depending on the available sunlight or a combination of solar and mains or generator.

Decide on the order in which the programs will irrigate based on:

- The available sunlight
- The power consumption of its sectors
- Program priorities.

Allows the use of the same fertilizer by several programs that are irrigating at the same time.

Configure a schedule for exclusive use of sunlight and if there is any pending irrigation, it ends it outside of this schedule also using power from the mains or generator.



PIVOTS

The Agrónic 4500 enables efficient and customized management of up to four pivots, offering complete control over each one.

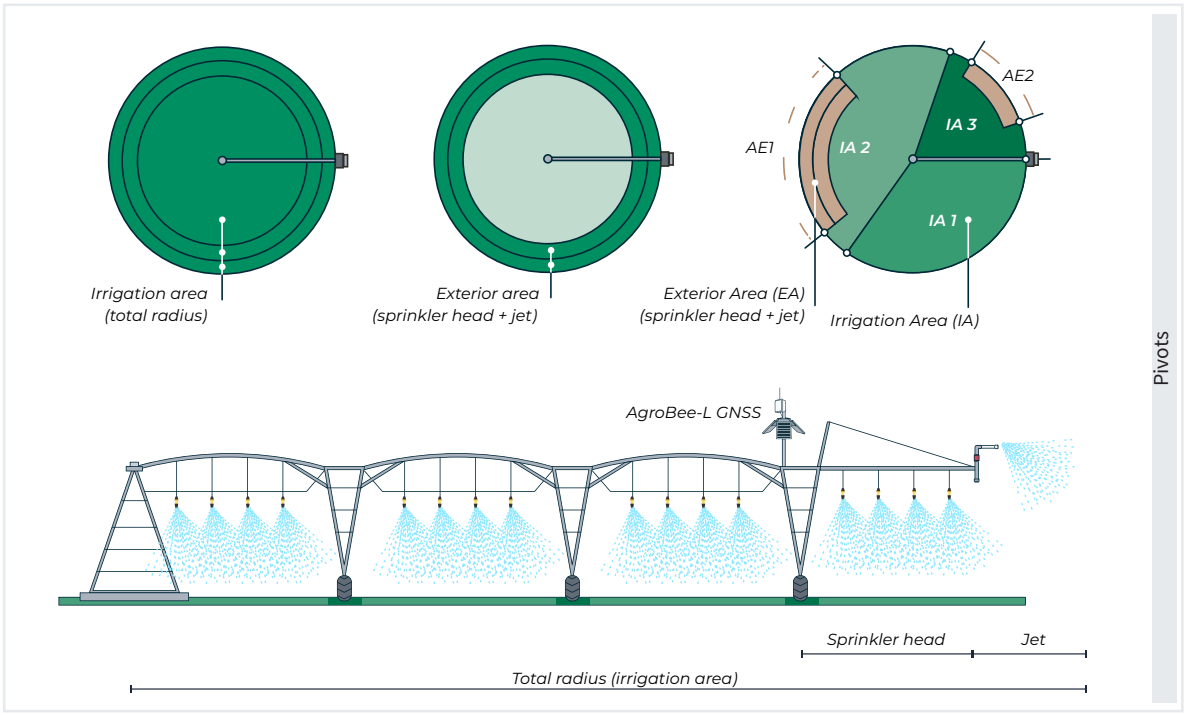
The main control functions are detailed below:

- Start and Stop: Start and stop the operation of each pivot according to your needs.
- Movement direction: Controls the direction in which the pivot moves.
- Movement in dry irrigation: Adjusts speed and forward motion during non-irrigation periods.
- GPS position: Use GPS precision to ensure optimal placement of the pivots.
- Guard control (auto reverse): Manages the automatic opening and closing of the guards in the pivot's path.
- Speed control (rainfall): Regulates the pivot speed based on weather determining factors and rainfall.
- Sector division: Define and control irrigation sectors individually for precise distribution.
- Jet and sprinkler head control: Activate and control the jet and sprinkler head to apply additional irrigation to specific areas.

- Alarms: Configure custom alarms to receive alerts for critical events or determining factors. Irrigation can be by pass or by time.

The Agrónic 4500 irrigation system also offers several programming options:

- Irrigation by passes or time: Irrigation can be scheduled based on the number of pivot passes or a specific time interval.
- Manual movement: Manually adjust pivot compensation when necessary.
- Fertilizer injection: Easily and accurately introduce fertilizers into your irrigation system.
- Diesel engine start: If necessary, start the diesel engine to ensure continuous operation.
- Solar energy: The Agrónic 4500 is compatible with solar energy systems, so that it can operate efficiently and sustainably.



MANUAL

The scheduler allows manual actions to be performed at any time.

- In programs:
  - Start
  - Stop
  - Place out of service (the program is deactivated and stops responding to automatic commands)
  - Interrupt (leave a period of time without the possibility of activation)
  - Stop (pause)
- In sectors:
  - Manual activation
  - Manual stop
  - Automatic
- In controller:
  - Out of service
  - General stop
- Other maneuvers:
  - Start or stop filter cleaning
  - Terminate alarms and malfunctions
  - Modify virtual sensors
  - Sensor calibration
  - Directly activate outputs
  - Etc.

READINGS

The log saves history and event logs with anomalies ordered by date and time, with approximately one week of offline logging.

- The log details all the actions that the controller executes.
- The anomaly readings detail the list of events considered important, ordered by date and time.
- Ten minute periods are saved in the history for:
  - Minimum, maximum and average value of analog and logical sensors.
  - For each irrigation sector, it records total irrigation and fertilization usage in terms of time and volume, as well as flows, deviations, leaks and total energy consumption.
  - Flow and volume (water, fertilizers and power) are logged by a meter.
  - Number of program starts and filter cleanings.
  - There is a history for each program that logs the last program activation, start date and time, irrigation and fertilization quantities, modifying factors, excess irrigation and fertilization, etc.
  - Drainage volumes.
  - Fertilizer tank levels.

EXTERNAL MODULES

For remote management of valves, reading sensors and meters and any type of element within the hydraulic installation, the following options are available:

- AgroBee-L radio systems: It uses 433 MHz, 868 MHz or 915 MHz open bands that do not require legalization for environments of up to 2.5 km depending on topography, with an extensive range of module models. Connect with two coordinators and 20 modules each (40 modules in total).
- Radio systems: It uses a 433 MHz open band that does not require legalization for environments of up to 2.5 km depending on topography, with an extensive range of module models. Connect with 2 ARLs and 60 modules each (120 modules in total).
- Monocable system: It can reach distances of up to 10 km with a two-wire cable and with an extensive range of module models. Connect with two EAMs and 120 modules each (240 modules in total).
- Expansion modules: Connected with a two-wire cable to Agrónic at distances of up to 1 km or via a Radio-Modem link, at greater distances depending on the topography, special controls can be used. Connect up to 15 modules.
- External ModBus devices: Controllers not manufactured by Progrés that can be connected via ModBus protocol to Agrónic to read or write data. For example, reading the power consumed by a pump, passing the pressure reference to a variable speed drive. Connect up to 32 devices.
- SDI-12 controllers: Devices that can be connected via SDI-12 protocol to Agrónic to read different types of probes. Connect up to eight devices.

FEATURE SUMMARY

FROM 1 TO 4 HEADS *Each head has:*	PUMPING	General pumps or valves: 6 Generator set or drive pump: 1 Pressure regulation **Solar pumping, including total of solar and mains power**
	FILTERS	Filter groups with different times: 3 Number of filters: unlimited Pressure reference for filter cleaning
	FERTILIZATION	Fertilizers: 8
		Installation type: series, parallel or **solar**
		Fertilization type: **by EC, by EC input**, Uniform, Proportional or Units (time or volume)
		pH regulation: 1 or **2 (can be base)**
		Phytosanitary treatments: 2 **Mix of two irrigation waters**
		Tank volume control
IRRIGATION	SECTORS	Number of sectors: 99 or **400**
		For each sector: Volume and power meter or flow detector Crop type and area for mass programming Pressure reference for irrigation
	SECTOR GROUP	**Number of groups: 40** **Number of sectors per group: 20**
	PROGRAMS	Number of programs: 40 or **99** Number of subprograms or positions: 12 or **20** Number of sectors in each subprogram: 10 individual or **40 using groups** Maximum number of sectors per program irrigating at the same time: 40
		Number of determining factors: 6
		Start times: 6
		Drainage control **Number of drains for all programs: 20**
	SOLAR HYBRID	**Number of heads with solar irrigation: 1**
SENSORS	DIGITAL	Number of digital sensors: 80
	ANALOG	Number of analog sensors: 120
	METERS	Number of meter sensors: 80 Meters with pulse, analog and frequency output Volume, power and unit measurement Sum of multiple meters
	LOGICAL	**Number of logical sensors: 20** **Number of inputs for each sensor: 5**
		Input types: digital sensor, determining factor, digital output, logical sensor, sector, analog sensor, meter sensor and analog output.
		Addition, subtraction, average, AND and OR operations
DETERMINING FACTORS		Number of determining factors: 120
FOGGING		Number of foggers: 8 Control by humidity / temperature or VPD
PIVOTS		**Number of pivots: 4**
EXTERNAL MODULES	AGROBEE-L	Number of coordinators: 2 Number of modules for each coordinator: 20 Total number of modules: 40
	EXTERNAL MODBUS	**Number of External ModBus devices: 32**
	AGRÓNIC MONOCABLE	Number of EAMs: 2 Number of MAM modules for each EAM: 120 Total number of modules: 240
	AGRÓNIC RADIO	Number of ARLs: 2 Number of ARM modules for each EAM: 60 Total number of modules: 120
	EXPANSION MODULES	Number of Expansion Modules: 15

BASIC version	Black
PLUS version	Blue

PIVOTS function*	Orange
SOLAR function*	Red
HYDRO function	Green

* Features available in PLUS version

3 FORMATS, VERSIONS, MODELS AND OPTIONS

The Agrónic 4500 is a multi-head controller that has models with 24, 40, 56, 72, 88 and 104 configurable outputs, plus 12 digital sensors. Expansion of digital and analog inputs and outputs is available through auxiliary plates and Agrónic Monocable systems, Agrónic Radio, AgroBee-L and expansion modules.

3.1. FORMATS

The Agrónic 4500 is available in three formats:

- Box format With plastic box and transparent door to hang on the wall.
- Built-in format With metal box for building into a cabinet.
- Console format. The relay base and the keyboard are separate and connected by an external cable.

Formats
Box format in Agrónic 4500 from 24 to 40 outputs (1 box)
Box format in Agrónic 4500 from 24 to + 40 outputs (2 boxes)
Built-in format in Agrónic 4500 from 24 to 104 outputs
Console format in Agrónic 4500 from 24 to 104 outputs

3.2. VERSIONS

The Agrónic 4500 is available in two versions, the Basic version and the Plus version, which has the additional features detailed on the previous page.

Versions	Observations
Basic version	
Plus version	Detailed features on the previous page *It activates by code.*

3.3. FRONT

The front panel on an Agrónic 4000 or Agrónic 7000 model can be replaced with that of an Agrónic 4500 model. The relay plates and their connections can thus be reused, making the controller work like an Agrónic 4500.

The available fronts are:

- Agrónic 4500 box front to update the Agrónic 4000 box format.
- Agrónic 4500 built-in front to update the Agrónic 4000 built-in format.
- Agrónic 4500 built-in front to update the Agrónic 7000.

Front	Description	Observations
Agrónic 4500 for base Agrónic 4000 box with modem.	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 4000.	Includes 4G modem. Only valid for controllers with the 55-xxxx series.
Agrónic 4500 for base Agrónic 4000 built-in with modem	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 4000.	Includes 4G modem. Only valid for controllers with the 55-xxxx series.
Agrónic 4500 for base Agrónic 4000 box with WiFi	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 4000.	Includes WiFi modem. Only valid for controllers with the 55-xxxx series.
Agrónic 4500 for base Agrónic 4000 built-in with WiFi	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 4000.	Includes WiFi modem. Only valid for controllers with the 55-xxxx series.
Agrónic 4500 for base Agrónic 7000 built-in with modem	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 7000.	Includes 4G modem.
Agrónic 4500 for base Agrónic 7000 built-in with WiFi	Option to access the features of the Agrónic 4500 Basic version by replacing the keyboard and micro plate of the Agrónic 7000.	Includes WiFi modem.

3.4. MODELS

Power:

- Single 12 Vdc power supply model. It can be connected to an external power supply from 220 Vac to 12 Vdc (included with the 220/24 option).

Valve type:

- Valves at 12 Vdc.
- Valves at 24 Vac.
- 24 Vac and 12 Vdc valves. (Dual voltage)
- Latch valves. Selectable 2- or 3-wire. (12, 19 V)

Number of outputs:

- Models with 24, 40, 56, 72, 88 and 104 outputs.

Models	Observations	
Agrónic 4500-24 220 Vac	Includes 220/12 Vdc 3A power supply	24 Outputs
Agrónic 4500-24 12 Vdc		
Agrónic 4500-40 220 Vac	Includes 220/12 Vdc 3A power supply	40 Outputs
Agrónic 4500-40 12 Vdc		
Agrónic 4500-56 220 Vac	Includes 220/12 Vdc 3A power supply	56 Outputs
Agrónic 4500-56 12 Vdc		
Agrónic 4500-72 220 Vac	Includes 220/12 Vdc 3A power supply	72 Outputs
Agrónic 4500-72 12 Vdc		
Agrónic 4500-88 220 Vac	Includes 220/12 Vdc 3A power supply	88 Outputs
Agrónic 4500-88 12 Vdc		
Agrónic 4500-104 220 Vac	Includes 220/12 Vdc 3A power supply	104 Outputs
Agrónic 4500-104 12 Vdc		

3.5. OPTIONS

Options		Description	Observations
Remote management communication	**Cloud** "Web platform" *(Agrónic APP + VEGGA)*	License to connect the controller to the VEGGA cloud.	The GPRS or WiFi modem option are required. To use the Agrónic APP or VEGGA, the controller must be logged into the cloud and an annual fee paid. ***It activates by code.***
	Cloud + PC "Agrónic PC Program" (Agrónic APP + VEGGA + Agrónic PC)	**Modem and WiFi** - License to connect up to 3 PCs/Servers or to the cloud. **USB, RS485 and Radiolink** – License to connect 1 PC/Server.	The 4G modem option, WiFi, USB, RS485 or a Radio modem controller are required. To use the Agrónic APP or VEGGA, the controller must be logged into the cloud and an annual fee paid. ***It activates by code.***
	Modem link	Option to connect to Agrónic APP, VEGGA and Agrónic PC via 4G modem, and/or receive SMS messages from the controller.	Includes 4G modem with deactivated Movistar M2M SIM card. Includes 5dBi quad-band antenna and 3 meters of cable.
	WiFi link	Option to connect with Agrónic APP, VEGGA and Agrónic PC via WiFi router.	Not compatible with the Modem Link option. Includes 7dBi directive antenna with six meters of cable and 3dBi omni-directional antenna.
	USB link	Option to connect with Agrónic PC via cable.	Includes three meters of cable.
	RS 485 link for PC	Serial port to connect with Agrónic PC with RS485 Link box.	A 220/12 V 2 A power supply and an RS485 + USB link box are required.
Radio control	**AgroBee-L Link 1/2 868 MHz / 915 MHz**	Option to connect with external AgroBee-L modules (Lora technology). Available for one or two coordinators.	Includes coordinator, omni-directional antenna with 10 meters of cable, optionally 15 meters of cable.
	AgroBee-L 1/2 433 MHz Link	Option to connect with external AgroBee-L modules (Lora technology). Available for one or two coordinators.	Includes coordinator, omni-directional antenna with 10 meters of cable, optionally 15 meters of cable.
	RS 485 ME Link	Serial port for connecting expansion modules (15).	
	RS 485 ModBus link	Serial port to connect Radio systems (2), Monocable (2) and other external modules with ModBus protocol (32).	The Plus version needs to be activated to connect external ModBus modules
	Agrónic Radio 433 MHz	Option to connect with external Agrónic Radio modules.	An RS 485 ModBus Link option, ARL and Radio Modules are required. ***It activates by code.***
	Agrónic Monocable	Option to connect with external Agrónic Monocable modules.	An RS 485 ModBus Link option, EAM and Monocable Modules are required. ***It activates by code.***
Control sensors	**Analog inputs/ outputs**	Board with six analog inputs (five 4-20 mA and one 0-20 V) and five analog / pulsed 4-20 mA outputs.	
	Analog inputs/ outputs	Board with six analog inputs (five 4-20 mA and one 0-20 V) and five analog / pulsed 4-20 mA outputs.	

4 TECHNICAL SPECIFICATIONS

General power supply		Controllers for direct power
Voltage		12 Vdc ±10%
Power consumption		Less than 12 W
Fuse	Input	Thermal (PTC) 1.1 Amp. at 25°C, auto-resettable

Output power source		Direct/alternate power
Voltage		From 12 to 24 Vdc or Vac (maximum 30 V)
Fuse	Input “R+”	Thermal (PTC) 6 Amp. at 25°C, auto-resettable

Outputs		
Digital	Number	24, expandable to 40, 56, 72, 88, 104
	Type	Per relay contact, with 24 VAC potential (external transformer).
	Limits	30 Vac / 30 Vdc, 1 Ampere, 50-60 Hz, CAT II (per output)
Analog/Pulsed (Option)	Number	5 or 10
	Type	4-20 mA (galvanically isolated)
All outputs have double isolation in respect to the mains input.		

Inputs		
Digital	Number	12
	Type	Optocoupled, operate at 12 or 24 Vdc or Vac
Analog (option)	Number	5 or 10
	Type	4-20 mA (galvanically isolated)
	Number	1 or 2
	Type	0-20 mA (galvanically isolated)

Environment	
Temperature	-5°C to 45°C
Humidity	< 85%
Altitude	2000 m
Pollution	Grade 2

Weight	
Box format	From 2.0 kg to 3.0 kg
Built-in format	From 3.0 kg to 4.5 kg
Console format	From 1.5 kg to 3.0 kg

Memory and clock safeguard	
Memory	No maintenance, 10 years for parameters and programs in FRAM memory and FLASH memory logs
Clock	48 hours without power

Statement of compliance	
Complies with Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/EEC for Product Safety Compliance. Compliance with the following specifications was demonstrated as indicated in the European Community Official Gazette.	CE

Symbols that may appear on the product							
	Protective ground terminal		Danger, risk of electric shock		Ground terminal		Double isolation

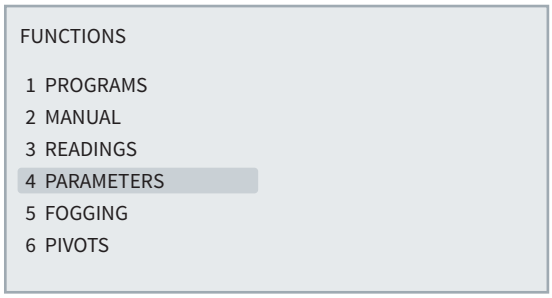
This symbol indicates that electronic devices should not be disposed of along with household waste at the end of their useful life. The product must be taken to the corresponding collection point for electric and electronic controller recycling and correctly processed pursuant to Spanish legislation.

If an Agrónic 4000 or Agrónic 7000 is upgraded to Agrónic 4500, the technical specifications of the original controller are maintained.

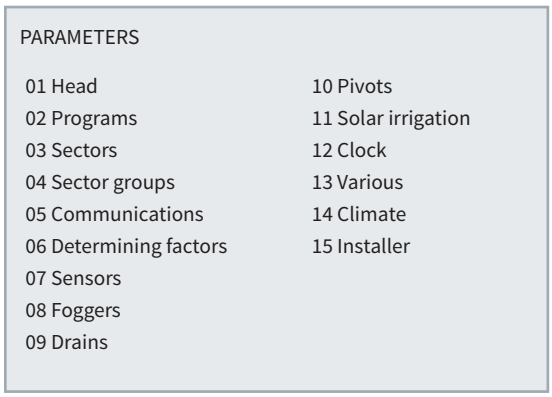
5 PARAMETERS

To configure the controller, parameters must be entered and it must be adapted to the needs of each installation.

To access the menu press 'Function' on the keyboard, select '4. Parameters', 'Enter.'



This menu is divided into 14 sections. To enter each of them, press the corresponding index number or scroll with the arrow keys and then press 'Enter'.



To configure these parameters, the following types of configurations must be entered:

- Configurations with values in units within the established margins.

Example

Timeout time *(0050 ... 0500 ... 9999)*

- Configurations to select from according to the options available in the controller.

Example

Fertilization *(Parallel | Series | Solar)*

- Select using the keys ‹ ›

- Configurations with affirmative or negative response.

Example

Stop the sectors *(yes | no)*

- ✓ : This key is used to configure 'Yes.'
- × : This key is used to configure 'No.'

- Eight-digit configurations applicable to all digital and analog signal inputs and outputs.

Example

Fertilizer output: 00000000

The underlined item is the value that comes configured by default at the factory.

In the configurations where the following additional texts appear, they mean:

- PV: Indicates that the 'Plus Version' must be activated.
- PF: Indicates that the 'Pivot Function' must be activated.
- SF: Indicates that the 'Solar Function' must be activated.
- HF: Indicates that the 'Hydro Function' must be activated.

Example

Number of pivots PV *(0 ... 4)*

5.1. HEAD

The head, which includes pumps, valves, fertilization and filter, prepares the irrigation water and nutrients for the hydraulic grid. It can control up to four independent heads, with separate configurations for fertilization, outputs, filters, pressure, diesel engine and water mixing. In the basic version, head options are not available.

HEAD PARAMETERS

1 Head 1
2 Head 2
3 Head 3
4 Head 4

First, select the head number to be configured and validate with the 'Enter' key. In the head configuration, the following six sections can be configured:

HEAD PARAMETERS 1

1 Fertilization
2 General
3 Filters
4 Pressure regulation
5 Diesel engine
6 Mix of two waters

5.1.1 Fertilization

Each head can control:

- 8 fertilizers and 2 acids. The second acid can be a base. Depending on the base unit connected, the fertilizer outputs are either fixed or not.
  - Agrónic 4500 base unit: the outputs are not fixed, they can be any output.
  - Agrónic 4000 base unit: the outputs are not fixed, they can be any output.
  - Agrónic 7000 base unit: the analog outputs are fixed, but only for Head 1, for the others they have to be configured.
- Two phytosanitary treatments. Two outputs, TF1 and TF2, can be configured to apply phytosanitary treatments (root treatments, chelates, amino acids, etc.).
- Eight mixers. One per fertilizer. To remove fertilizer tanks before and during fertilizer.
- Eight fertilizer cleaning outputs. One per fertilizer. When a fertilizing has ended, clean water can be applied for a while to clean the head. Cleaning is completed at the end of each fertilizer.

FERTILIZATION PARAMETERS HEAD 1

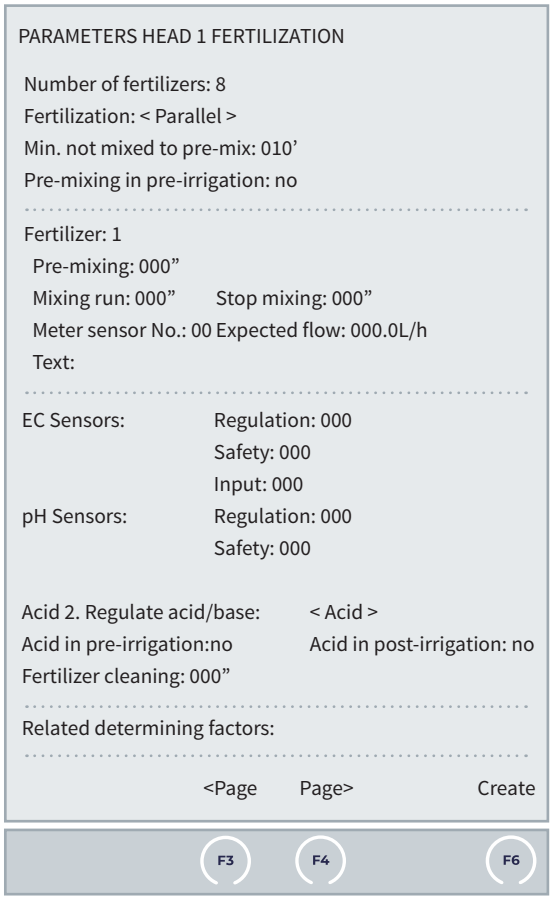
1 Fertilizers
2 Volumes in tanks
3 Phytosanitary treatments

This section defines the way in which irrigation head fertilization works, while the elements that act and the output and input assignments are configured as explained in the following considerations:

- All the output assignments of the elements involved in fertilization (injectors, mixers, etc.) are configured in another section: 'FUN - 4. Parameters - 1. Head - (head no.) - 2. General - 3. Fertilizers'.
- All the digital input assignments for the fertilizer meter and phytosanitary treatments are configured in another section: 'FUN - 4. Parameters - 7. Sensors - 3. Meters'.
- The type (units, uniform, proportional, EC regulation and EC input) and fertilization unit (hh:mm, mm' ss", liters and liters/ha) are configured in each program in another section: 'FUN - 4. Parameters - 2. Programs'.
- The volume unit format (number of fertilization decimals) is configured in another section: 'FUN - 4. Parameters - 15. Installer - 6. Various'.
- The regulation adjustment (PID) is configured in another section: 'FUN - 4. Parameters - 15. Installer - 3. Head - Regulations - (Head No.)'.
- The modulation cycle for pH/EC regulation and uniform fertilization is configured in another section: 'FUN - 4. Parameters - 15. Installer - 3. Head - Regulations - 5. Modulation cycles'.
- The outputs of the TF1/TF2 phytosanitary treatments are configured in another section: 'FUN - 4. Parameters - 1. Head - (Head No.) - 2. General - 5. Phytosanitary treatments'.

5.1.1.1 Fertilization

To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 1. Fertilizers' and always confirm with the 'Enter' key.



No. of fertilizers *(0 ... 8)*: Indicate to the controller the number of fertilizers installed on the head. Leave the value at 0 if there are none.

Fertilization *(Parallel | Series | Solar):* choose the fertilization type for the installation.

- Parallel: fertilizers are applied all at once. The type of fertilization carried out is configured in each program; it can be 'by EC', 'EC input', 'Uniform', 'Proportional' or 'Unit'.

Important

If fertilization is in parallel or solar and there is more than one injector:

- Injector outputs: Configure to 'Fertilizers.'
- Fertilizer valve outputs: Configured as 'Auxiliary.'
- Fertilizer cleaning outputs: One configured for each fertilizer.

- Series: fertilizers are applied one after the other. The fertilization type can only be by unit of time or volume. Several programs can fertilize at the same time if the same fertilizer is not repeated.

Important

If fertilization is serial:

- Fertilizer auxiliaries: They are not used. The 'General Output' is used as the only injector.
- Fertilizer cleaning output: The same is repeated at all fertilizer cleaning outputs.

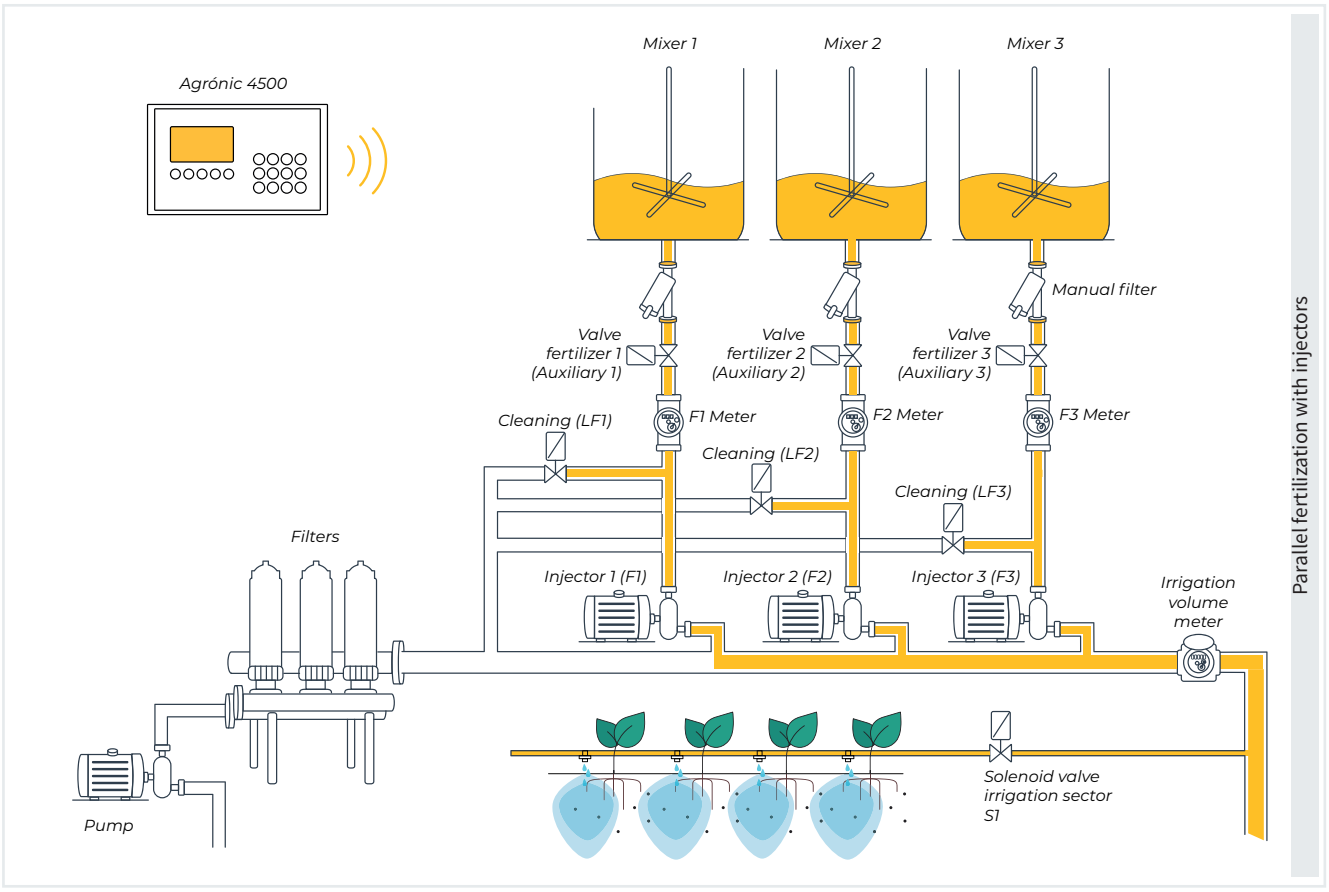
If fertilizer is serial and with more than one fertilizer meter:

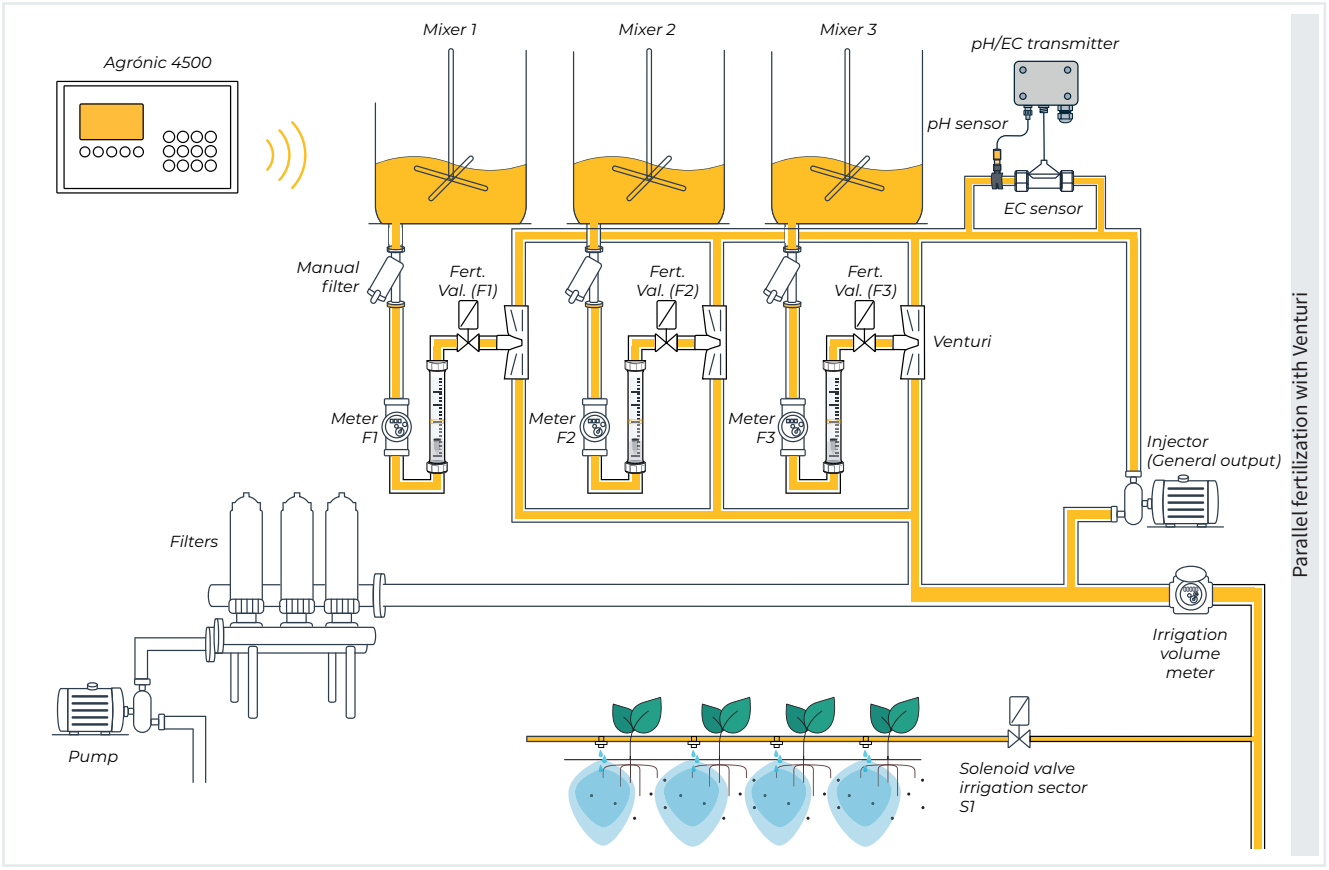
- Number of meter sensors: A different sensor is configured for each fertilizer.

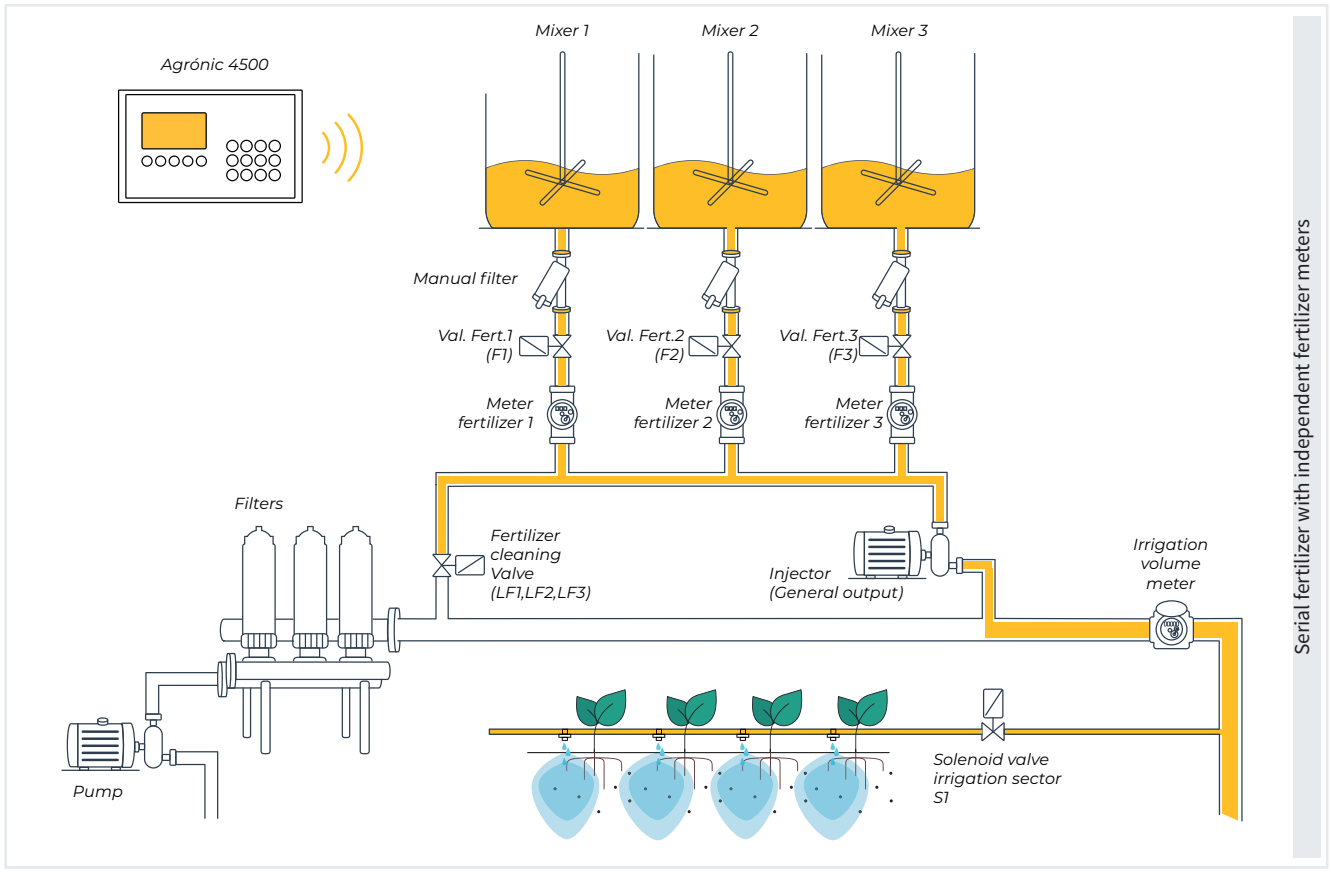
If fertilizer is serial and with a single fertilizer meter:

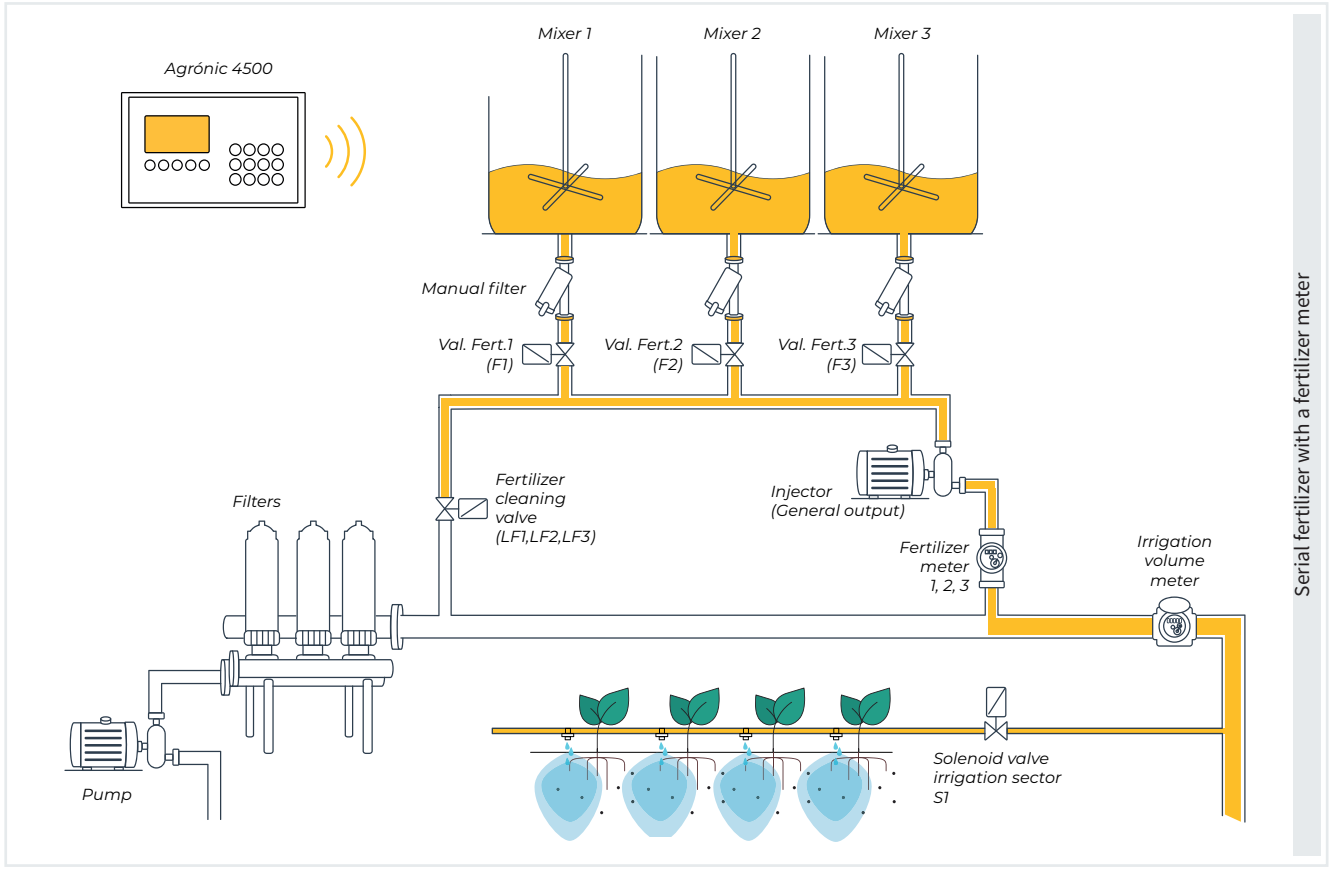
- Number of meter sensors: The same number is repeated on all fertilizer meters (1 to 80).

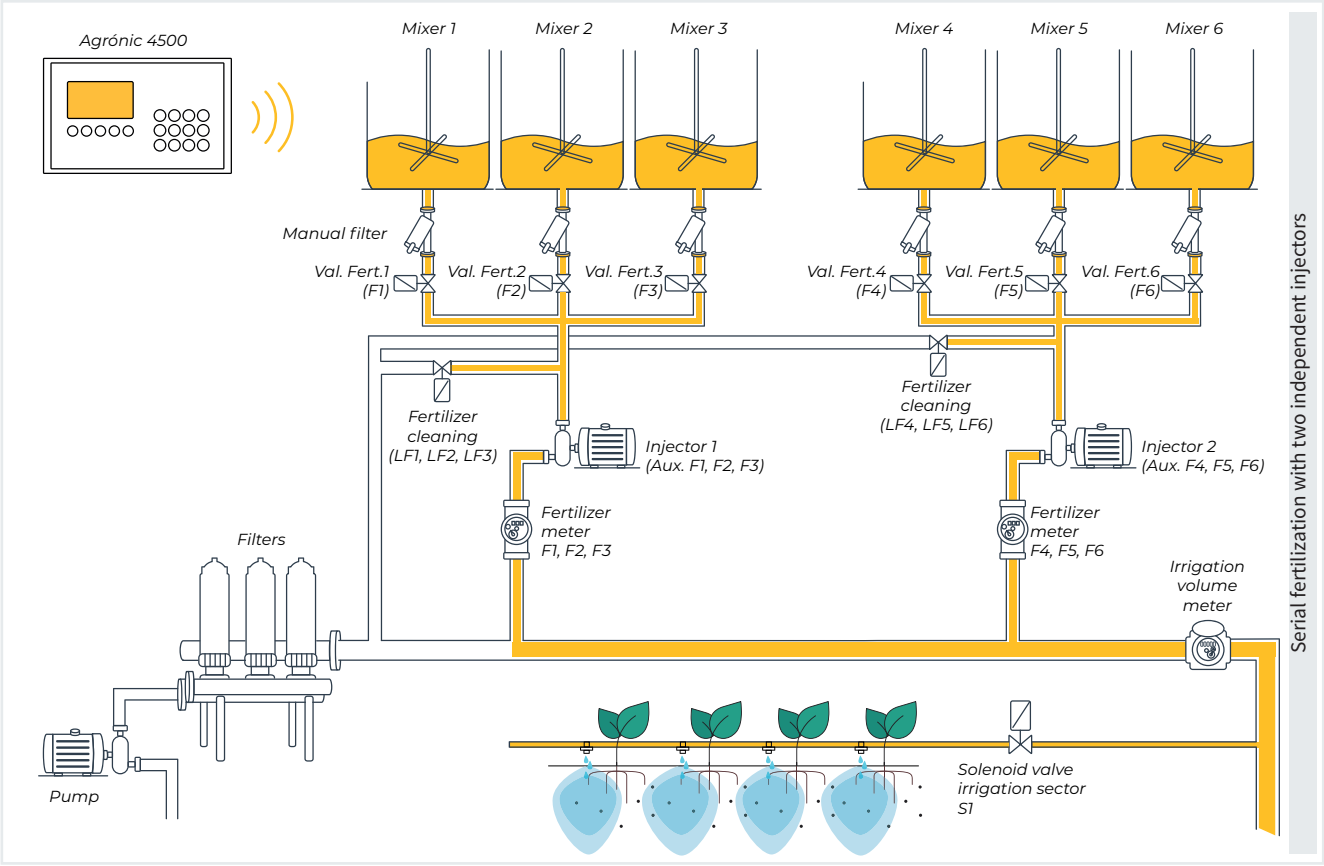
- Solar: only used when the head is configured to 'Hybrid Solar Irrigation.'
  - It can be used when the installation has a hybrid power system: mains or diesel and solar cells. In this mode, the fertilizers are applied all at once.
  - The type of fertilization carried out is configured in each program; it can be 'by EC', 'EC input' or 'Proportional'.
  - Several programs can fertilize at the same time using the same fertilizer. In practice, the programs that are fertilizing will match the type and the instructions. If they don't match, they are left waiting to enter.
  - It can be paused, along with irrigation, due to lack of sunlight.


Mixer 1
Mixer 2
Mixer 3
Agrónic 4500
Manual filter
Valve fertilizer 1 (Auxiliary 1)
Valve fertilizer 2 (Auxiliary 2)
Valve fertilizer 3 (Auxiliary 3)
Cleaning (LF1)
F1 Meter
F2 Meter
F3 Meter
Cleaning (LF2)
Cleaning (LF3)
Filters
Injector 1 (F1)
Injector 2 (F2)
Injector 3 (F3)
Irrigation volume meter
Pump
Solenoid valve irrigation sector S1
Parallel fertilization with injectors


Mixer 1
Mixer 2
Mixer 3
pH/EC transmitter
Agrónic 4500
pH sensor
EC sensor
Manual filter
Fert. Val. (F1)
Fert. Val. (F2)
Fert. Val. (F3)
Venturi
Meter F1
Meter F2
Meter F3
Injector (General output)
Filters
Irrigation volume meter
Pump
Solenoid valve irrigation sector S1
Parallel fertilization with Venturi

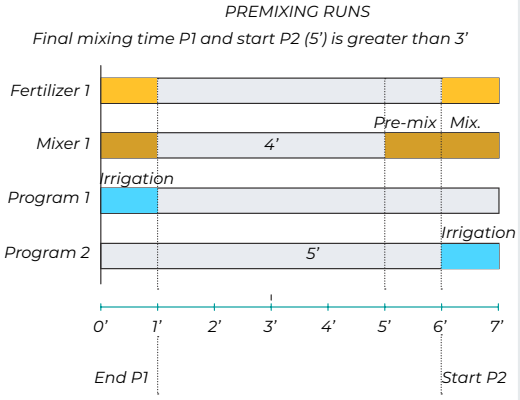

Agrónic 4500
Mixer 1
Mixer 2
Mixer 3
Manual filter
Val. Fert.1 (F1)
Val. Fert.2 (F2)
Val. Fert.3 (F3)
Meter fertilizer 1
Meter fertilizer 2
Meter fertilizer 3
Filters
Fertilizer cleaning Valve (LF1,LF2,LF3)
Injector (General output)
Irrigation volume meter
Pump
Solenoid valve irrigation sector S1
Serial fertilizer with independent fertilizer meters


Agrónic 4500
Mixer 1
Mixer 2
Mixer 3
Manual filter
Val. Fert.1 (F1)
Val. Fert.2 (F2)
Val. Fert.3 (F3)
Filters
Fertilizer cleaning valve (LF1,LF2,LF3)
Injector (General output)
Fertilizer meter 1, 2, 3
Irrigation volume meter
Pump
Solenoid valve irrigation sector S1
Serial fertilizer with a fertilizer meter



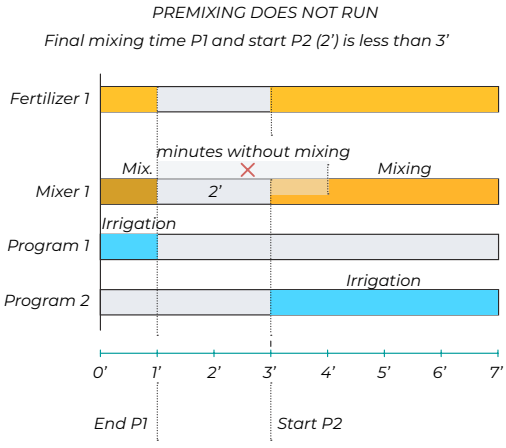
Minutes without mixing to pre-mix *(000 ... 010 ... 250)*: configure the number of minutes that must transpire since the last mixing to activate pre-mixing in the next program or subprogram.

- In the following example, pre-mixing is carried out because the time transpired from the end of the mixing of Program 1 and the start of Program 2 is greater (5') than the configured time (3').



Minutes without mixing to pre-mix 003'
Pre-mixing: 060"
Pre-irrigation: 00'

- In the following example, pre-mixing is not carried out because the time transpired from the end of the mixing of Program 1 and the start of Program 2 is less (2') than the configured time (3').

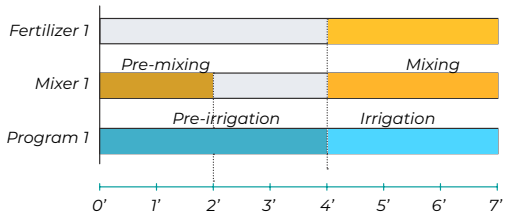


Minutes without mixing to pre-mix 003'
Pre-mixing: 060"
Pre-irrigation: 00'

If the configured fertilization type is parallel, the following question is prompted.

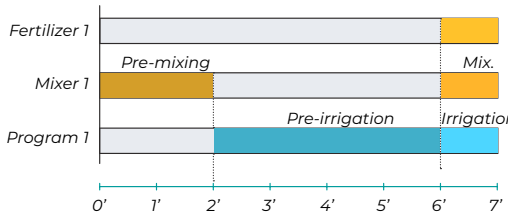
Pre-mixing in pre-irrigation *(Yes ... No)*:

- Yes: pre-mixing is performed during pre-irrigation unless the determining factor of the previous question is not met (Minutes without mixing to pre-mix)



Pre-mixing in pre-irrigation: Yes
Pre-mixing: 120"
Pre-irrigation: 04'

- No: pre-mixing is performed before starting pre-irrigation unless the determining factor of the previous question is not met (Minutes without mixing to pre-mix)

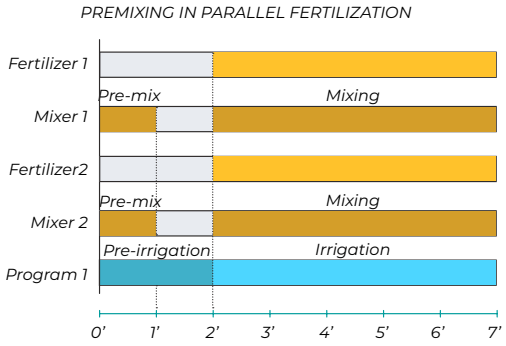


Pre-mixing in pre-irrigation: No
Pre-mixing: 120"
Pre-irrigation: 04'

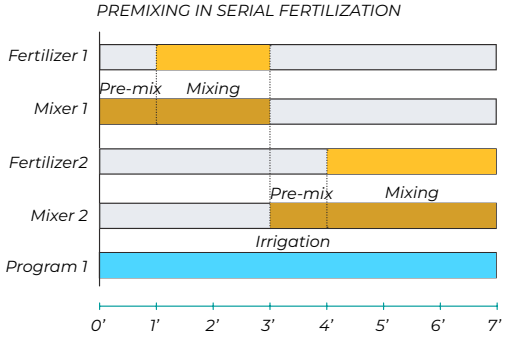
Depending on the number of fertilizers in the previous section, the following parameters will need to be configured for each of them:

Pre-mixing *(000 ... 999)*: time, in seconds, that the fertilizers will be mixed before starting fertilizer.

- Parallel fertilization: pre-mixing starts before the program starts or during pre-irrigation as configured.
- Serial fertilizer: pre-mixing is carried out during irrigation before each of the fertilizers is added, unless the 'Minutes without mixing to pre-mix' determining factor is not met.



Pre-mixing: 060"
Pre-irrigation: 02'



Pre-mixing: 060"
Pre-irrigation: 00'

Run mixing *(000 ... 999)*: time, in seconds, that it will be mixing before a pause.

Stop mixing *(000 ... 999)*: time, in seconds, that the mixing stops after a period of running.

If continuous mixing is desired, with no pauses, configure a minimum mixing on time of 1 second and a mixing off time of zero.

Mixing run: 030"
Mixing stop: 060'

Meter sensor No. *(00 ... 80)*: meter sensor number associated with the fertilizer.

Expected flow *(0 ... 999.9)*: maximum injection flow for this fertilizer. The flow format is configured in 'FUN - 4. Parameters - 7. Sensors - 3. Meters', if there is no meter, the meter format will be '000.0 L/h'.

Text *(0 ... 9 characters)*: text identifying the fertilizer.

Press the 'F4' key to access more configuration parameters.

To assign EC sensor functions, the sensor number must be configured:

EC Sensor Regulation HF *(000 ... 120)*: analog sensor number that is configured for regulation and 'EC Error' determining factor.

EC Safety Sensor HF *(000 ... 120)*: analog sensor number that is configured for the 'EC safety' determining factor.

EC Sensor Input HF *(000 ... 120)*: analog sensor number that is configured to measure the EC of the water input. It is used to regulate the input EC and water mixing.

To assign the pH sensor functions, the sensor number must be configured:

pH regulation sensor *(000 ... 120)*: analog sensor number that is configured for regulation and 'pH error' determining factor.

pH safety sensor *(000 ... 120)*: analog sensor number that is configured for the 'pH safety' determining factor.

To configure the acid for pH regulation, the following must be configured:

Acid 2. Regulate acid/base HF *(Acid | Base)*:

- Acid: an acid is applied. When injected, the pH drops.
- Base: a base is applied. When injected, the pH rises.

Pre-irrigation acid HF *(Yes ... No)*:

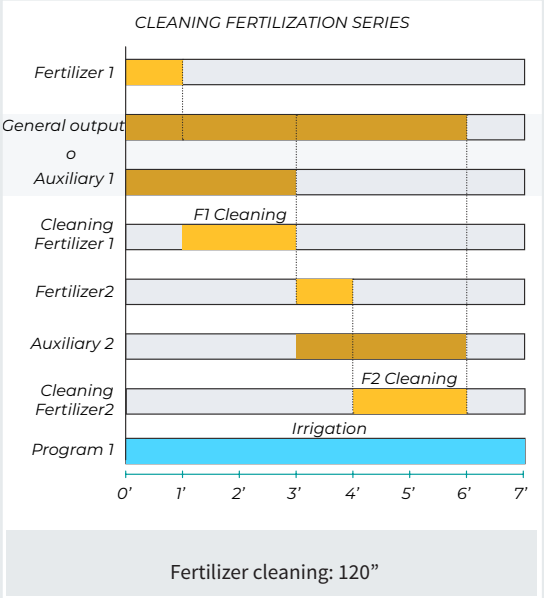
- Yes: pH is regulated during pre-irrigation.
- No: pre-irrigation is only with water.

Acid in post-irrigation HF *(Yes ... No)*:

- Yes: pH is regulated during post-irrigation.
- No: pre-irrigation is only with water.

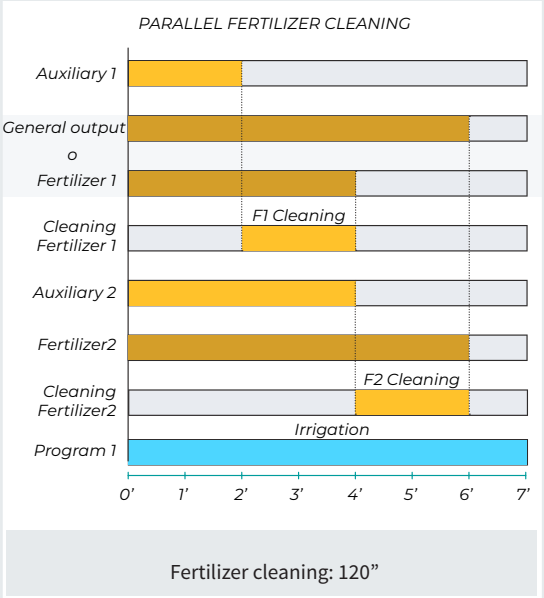
Fertilizer cleaning *(000 ... 999)*: time in seconds to clean the injector. This time is common to all fertilizings. Cleaning runs at the end of each fertilizing. It is recommended to do so during irrigation or post-irrigation time.

In serial fertilizer cleaning, the general fertilizer output or the auxiliary output of each fertilizer and its cleaning output ise used.



Fertilizer cleaning: 120"

When cleaning fertilizers in parallel, the general fertilizer output or the output of each fertilizer (injector) and the cleaning output of each fertilizer is used.



Fertilizer cleaning: 120"

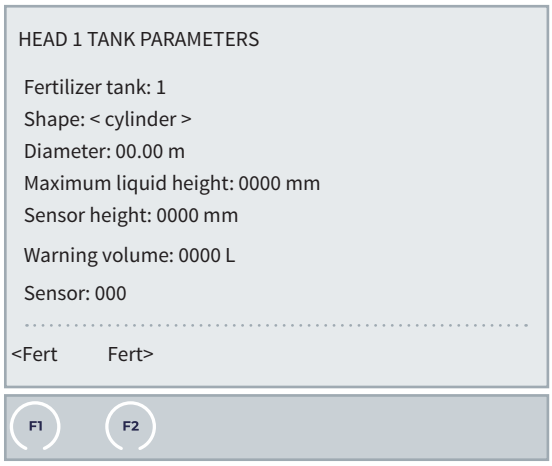
Press the 'F4' key to go to the next screen where you can consult, edit and create the determining factors associated with fertilization.

It can also be configured in the section 'FUN - 4. Parameters - 6. Determining factor'.

Some determining factors that can be created are:

- EC error, pH error, 100% EC, 100% pH, EC ratio.
- Modify EC fertilizer or units.

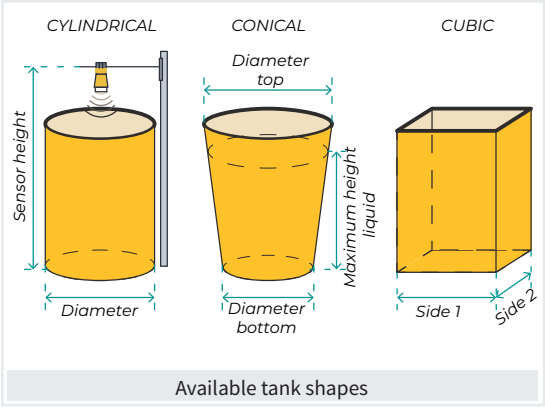
5.1.1.2 Volumes in tanks



To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 2. Volumes in tanks' and always confirm with the 'Enter' key.

Fertilizer tank *(0 ... 8)*: select the fertilizer tank number for which the volume measurement is to be configured. A number greater than the number of fertilizers configured cannot be entered.

Shape *(cylinder | conical | cubic)*: select the shape of the tank to determine the volume relative to the height of the liquid.



Available tank shapes

It is configured depending on the shape of the tank.

- Dimensions of the cylindrical tank
  - Diameter *(00.00 ... 99.99): in meters.*
- Dimensions of the conical tank
  - Top diameter *(00.00 ... 99.99): in meters.*
  - Bottom diameter *(00.00 ... 99.99): in meters.*
- Dimensions of the cubic tank
  - Side 1 *(00.00 ... 99.99): in meters.*
  - Side 2 *(00.00 ... 99.99): in meters.*

Maximum liquid height *(0000 ... 9999)*: in millimetres, the height at which the maximum capacity is reached is configured.

Sensor height *(0000 ... 9999)*: in millimetres, the height between the sensor and the bottom of the tank is configured.

Warning volume *(0000 ... 9999)*: in liters, this parameter determines the volume level from which an alert is logged [8.2]. The alert is reactivated if the value exceeds the configured level by 5% for a period longer than 60 seconds.

In 'FUN - 4. Parameters - 15. Installer - 2. Events' can be configured to take any of the following actions:

- Activate an alarm output
- Send a notification
- Send an SMS

Sensor *(000 ... 120)*: sensor number that measures the level by ultrasound connected to an AgroBee-L transmitter or module.

5.1.1.3 Phytosanitary treatments

This section is only available with the 'Hydro Function.' To access it, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 3. Phytosanitary treatments' and always confirm with the 'Enter' key.

PARAMETERS HEAD 1 PHYTOSANITARY T.

Units: < L >
Treatment volume format: < 000.00 L >
TF1 Meter: 00
TF1 text:
TF2 Meter: 00
TF2 Text:

Units HF *(hh:mm | mm'ss" | L | L/ha)*: determines the units of phytosanitary treatments. It is common for all programs whose sectors are assigned to this head.

- hh:mm: hours and minutes.
- mm'ss": minutes and seconds.
- L : liters, a meter sensor must be configured.
- L/ha : liters per hectare, a meter sensor must be configured in the fertilizers and the area of each sector. Summing the total area of the sectors to be irrigated calculates the amount of fertiliser in litres.

If the units are configured to L (liters), configure:

Treatment volume format HF *(000.00 L | 0000.0 L | 00000 L)*: determines the number of decimals in the phytosanitary treatment programming.

TF1 Meter HF *(00 ... 80)*: number of the meter sensor associated with phytosanitary treatment 1.

TF1 text HF *(0 ... 9 characters)*: text identifying the treatment 1.

TF2 Meter HF *(00 ... 80)*: meter sensor number associated with phytosanitary treatment 2.

TF2 text HF *(0 ... 9 characters)*: text identifying the treatment 2.

5.1.2 General

This section defines the assignment of outputs and timings of the equipment that makes up an irrigation head (general pumps or valves, fertilizers, etc.)

When an output is not used it should be left at 0.

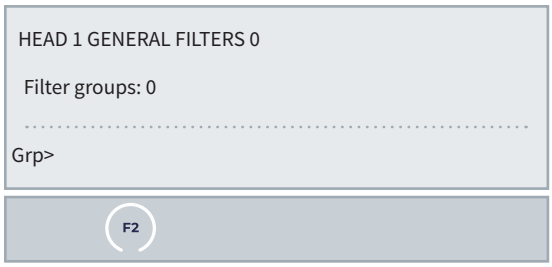
Refer to the 'Input and output coding' section to learn how to code the outputs and consult the coding table.

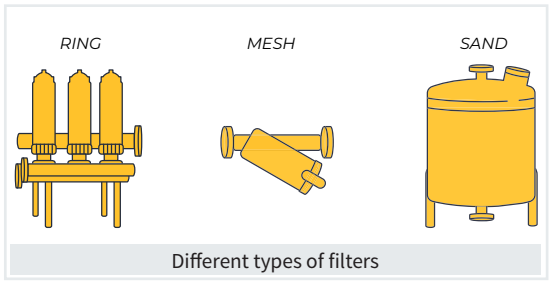
GENERAL PARAMETERS HEAD 1

1 Filters
2 Pumps
3 Fertilizers
4 Acids
5 Phytosanitary treatments
6 Alarm
7 Mix of two waters
8 Diesel

5.1.2.1 Filters

To access, go to '**FUN - 4. Parameters - 1. Head - 1. Head 1 - 2. General - 1. Filters**' and confirm with the '**ENTER**' key.



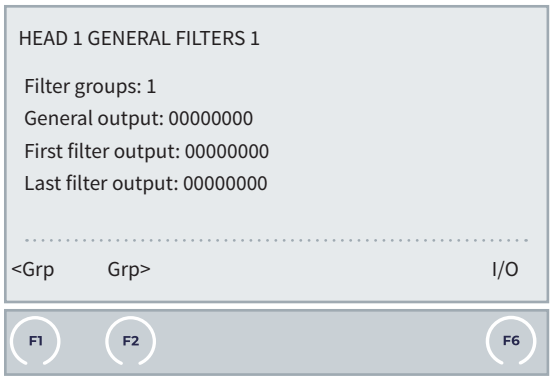


Different types of filters

Determines the outputs where the general filter and filter cleaning valves should be connected.

Filter group *(0 ... 3)*: filter group number to configure.

For each head, there are three independent filter stations (groups) and the following outputs can be configured for each of them.



General output: output of the general valve for cleaning the filters. It activates throughout the cleaning process, even during the pause between filters.

First filter output: output of filter 1 cleaning valve.

Last filter output: output of the last filter cleaning valve.

The correlative outputs between the first and last filter determine the number of filters, with no limitation.

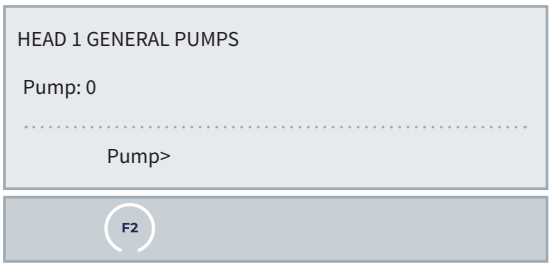
Example

There are 4 filters configured as follows:
First filter output: 00000010
Last filter output: 00000014

Filters must be connected to the following outputs:
Filter 1:10
Filter 2: 11
Filter 3: 12
Filter 4: 14

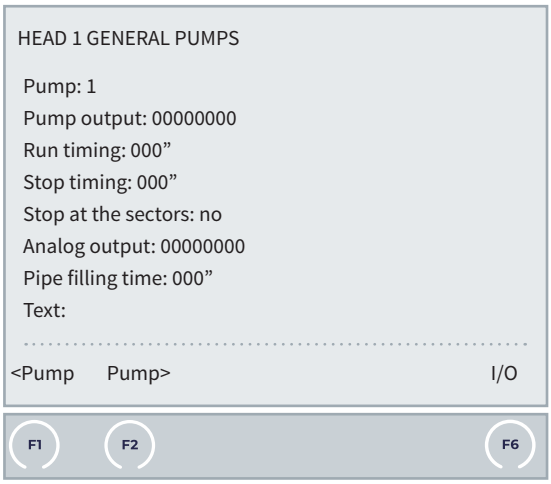
The number of outputs between the one assigned to the first filter and the last determines the number of filters.

5.1.2.2 Pumps



To access, go to 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 2. General - 2. Pumps' and confirm with the 'ENTER' key.

For each of the six main pumps or valves, an output must be assigned with the timings associated with their start and stop.



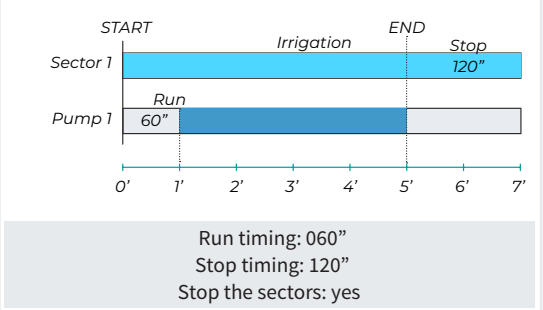
Pump output *(00000000)*: output where the pump is connected.

Run timing *(000 ... 250)*: in seconds, the time that the pump activation is delayed when irrigation starts.

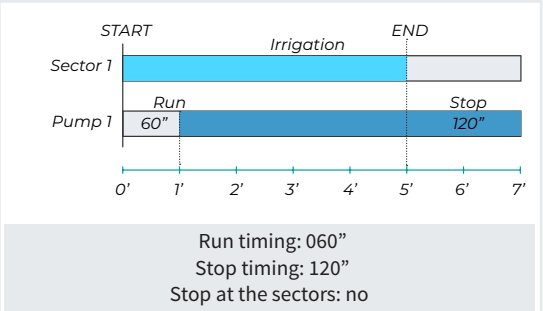
Stop timing *(000 ... 250)*: in seconds, the time that the pump deactivation is extended at the end of irrigation.

Stop the sectors *(no | yes)*:

- Yes: to stop the pump at the end of irrigation with the sectors remaining open for the seconds configured in stop timing.
- No: to stop the sectors at the end of irrigation and have the pump remain open for the seconds configured in stop timing.



Run timing: 060"
Stop timing: 120"
Stop the sectors: yes



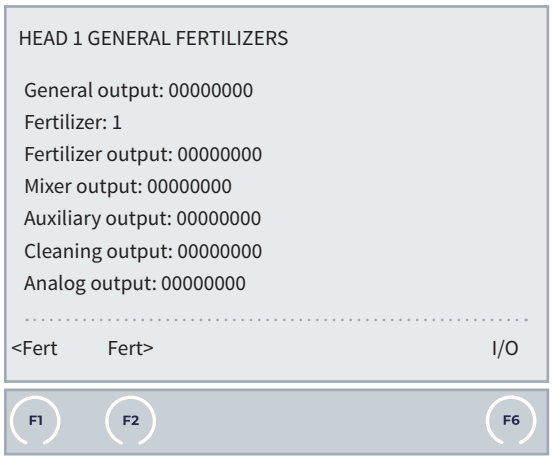
Run timing: 060"
Stop timing: 120"
Stop at the sectors: no

Analog output: 4-20 mA (or 0-10 V) output corresponding to 0 to 100% of the drive or the reference for pumps 1 and 2. The analog output of Pump 2 always follows the same value as Pump 1, to perform the 'multi follower' function (not available on the Agrónic 7000 base).

Pipe filling time *(000 ... 250)*: in seconds, this is the time that the pump activation is delayed when irrigation starts (when the pumps start for the first time). Useful, for example, to enable pumps to start in a scaled sequence during pipe-filling operations. If other pumps are already running when the pump starts, 'Run Timing' applies instead of this time.

Text TF2 *(0 ... 9 characters)*: Pump identification text.

5.1.2.3 Fertilizers



To access, go to 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 2. General 3. Fertilizers' and confirm with the 'ENTER' key.

General output *(00000000)*: pump output for injection or general fertilizer valve. It is not activated by phytosanitary treatments.

For each of the eight fertilizers the following outputs can be configured:

Fertilizer output *(00000000)*: output where the fertilizer valve (or injector or Venturi) is connected.

If the fertilizer type is by EC regulation, the 'Fertilizer analog output' can also be used.

This output is used in uniform and with a long modulation cycle.

Mixer output *(00000000)*: output where the mixer is connected. The same output can be repeated on other mixers (if a single blower common to all of them is used. In this case, the start and stop timings must be identical).

Auxiliary output *(00000000)*: auxiliary output that activates whenever the fertilizer activates. It can be repeated with other auxiliaries.

- Parallel fertilization: the auxiliary output is configured as the fertilizer tank.
- Serial fertilization: the auxiliary output is configured as the dispenser output.

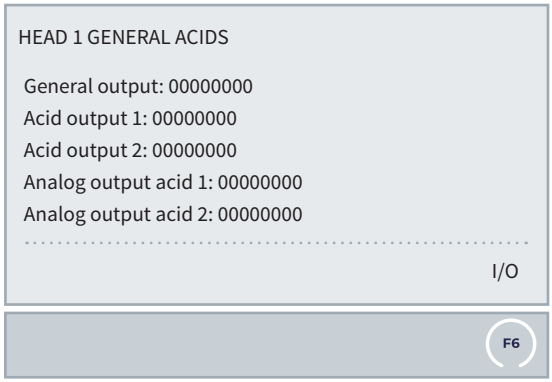
Cleaning output *(00000000)*: fertilizer cleaning output. It can be repeated between them.

Analog output *(00000000)*: when the fertilization type is by EC regulation, uniform or proportional to the expected flow, it is possible to work with a 4-20 mA/0-10 V output or by rapid pulses (short modulation cycle), which corresponds to 0 to 100% injection.

Text TF2 *(0 ... 9 characters)*: text identifying the fertilizer.

For further information, see the images in the 'Head - Fertilization' section.

5.1.2.4 Acids



To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 4. Acids' and always confirm with the 'Enter' key.

General output *(00000000)*: pump output for acid injection. The same output as the one configured in 'General fertilizer output' can be assigned.

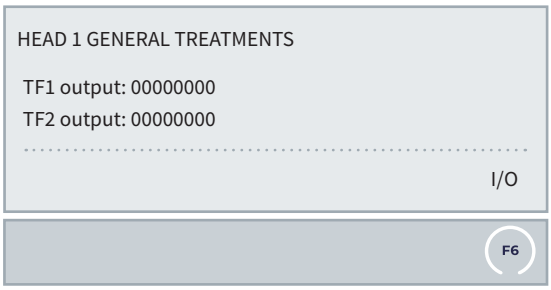
Acid output 1 *(00000000)*: output where the acid Valve 1 is connected and which activates whenever it is regulating the injection.

Acid output 2 *(00000000)*: output where the acid Valve 2 is connected and which activates whenever it is regulating the injection.

Acid 1 analog output *(00000000)*: 4-20 mA/0-10 V or pulsed output corresponding to 0 to 100% injection.

Acid 1 analog output *(00000000)*: 4-20 mA/0-10 V or pulsed output corresponding to 0 to 100% injection.

5.1.2.5 Phytosanitary treatments

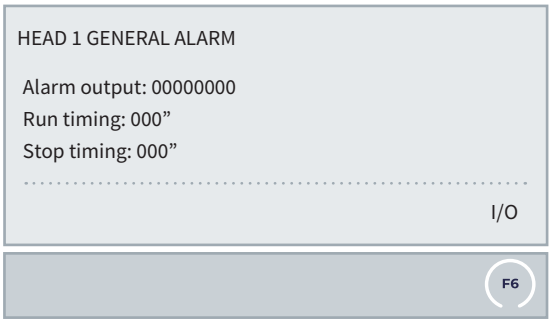


This section is only available with the 'Hydro Function.' To access it, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 5. Phytosanitary treatments' and always confirm with the 'Enter' key.

TF1 output HF *(00000000)*: output where the phytosanitary treatment Valve 1 is connected.

TF2 output HF *(00000000)*: output where the phytosanitary treatment Valve 2 is connected.

5.1.2.6 Alarm



To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 6. Alarm' and always confirm with the 'Enter' key.

The alarm activates when an event occurs that has alarm activation configured or a determining factor activates. The list of events is in the section 'FUN - 3. Readings - 2. Log' and in 'FUN - 4. Parameters - 15. Installer - 2. Events' where activations are configured. The determining factors are configured in 'FUN - 4. Parameters - 6. Determining factors'.

The alarm is manually deactivated in 'FUN - 2. Manual - 5. End Stops and Malfunctions'.

If the alarm has an assigned output, it activates continuously or sometimes intermittently. A light, a siren, etc. can be connected to this to warn that an event has occurred that requires immediate attention. The alarm is common to all four heads and the setting is requested in the first one.

Alarm output *(00000000)*: output where the alarm is connected.

Run timing *(000 ... 250)*: in seconds, the time that the alarm output activates.

Run timing *(000 ... 250)*: in seconds, the time that the alarm output will be stopped. It is used to generate intermittent signals on the alarm output when activated.

5.1.2.7 Mix of two waters

HEAD 1 GENERAL MIX OF TWO WATERS

Valve: < 1 >
Open output: 00000000
Close output: 00000000
General output V1: 00000000

Valve>

F2

This section is only available with the 'Hydro Function.' To access it, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 2. General - 7. Mix of two waters' and confirm with the 'ENTER' key.

If a mix of two waters with different salinity is used, the outputs must be assigned to open and close the regulating valves.

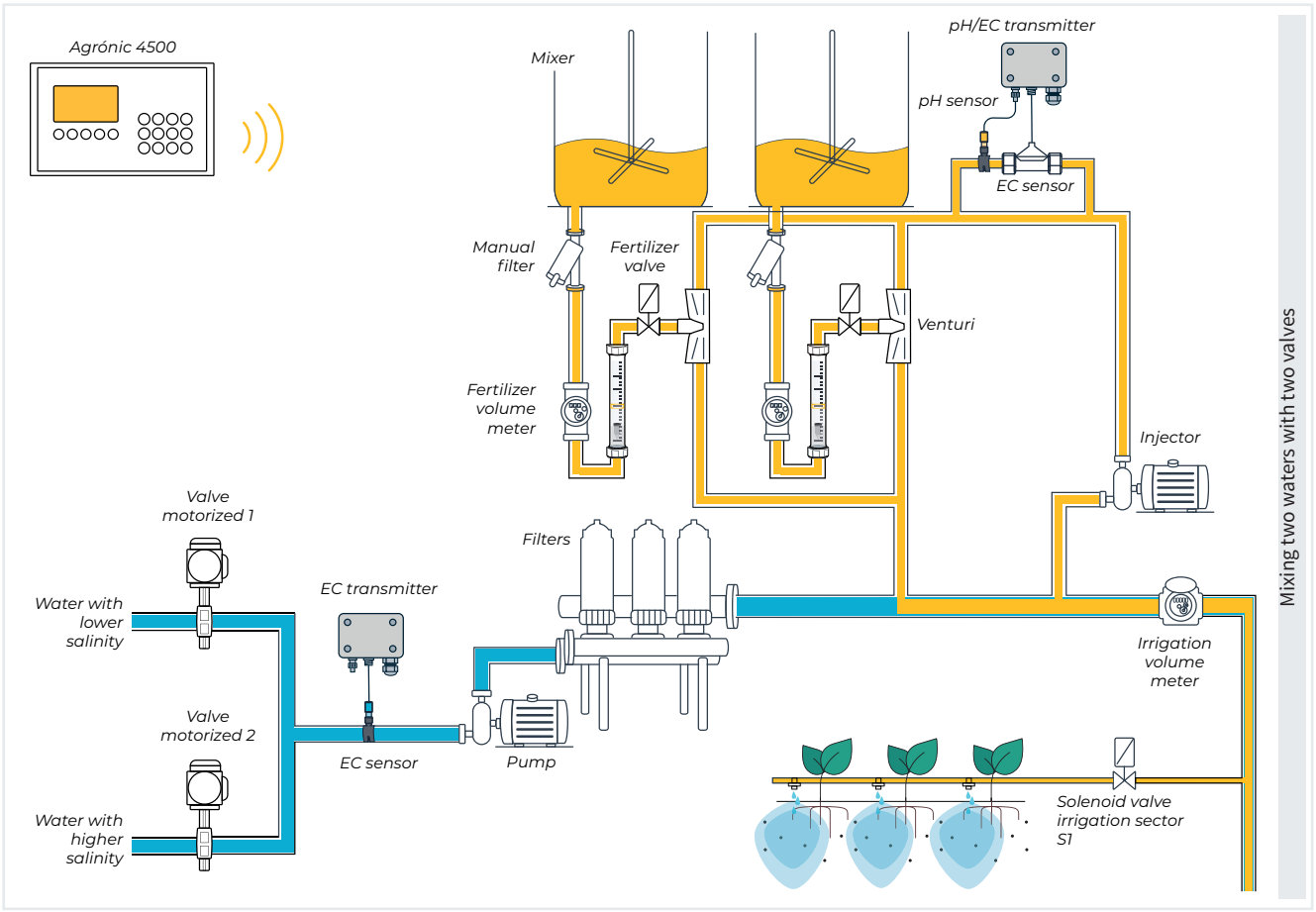
- The outputs must be on the base or on the ME expansion modules, not on external modules.
- Valve 1 corresponds to water with lower salinity and Valve 2 to water with higher salinity.
- Valve 2 may not exist. In that case, leave the outputs at 0.

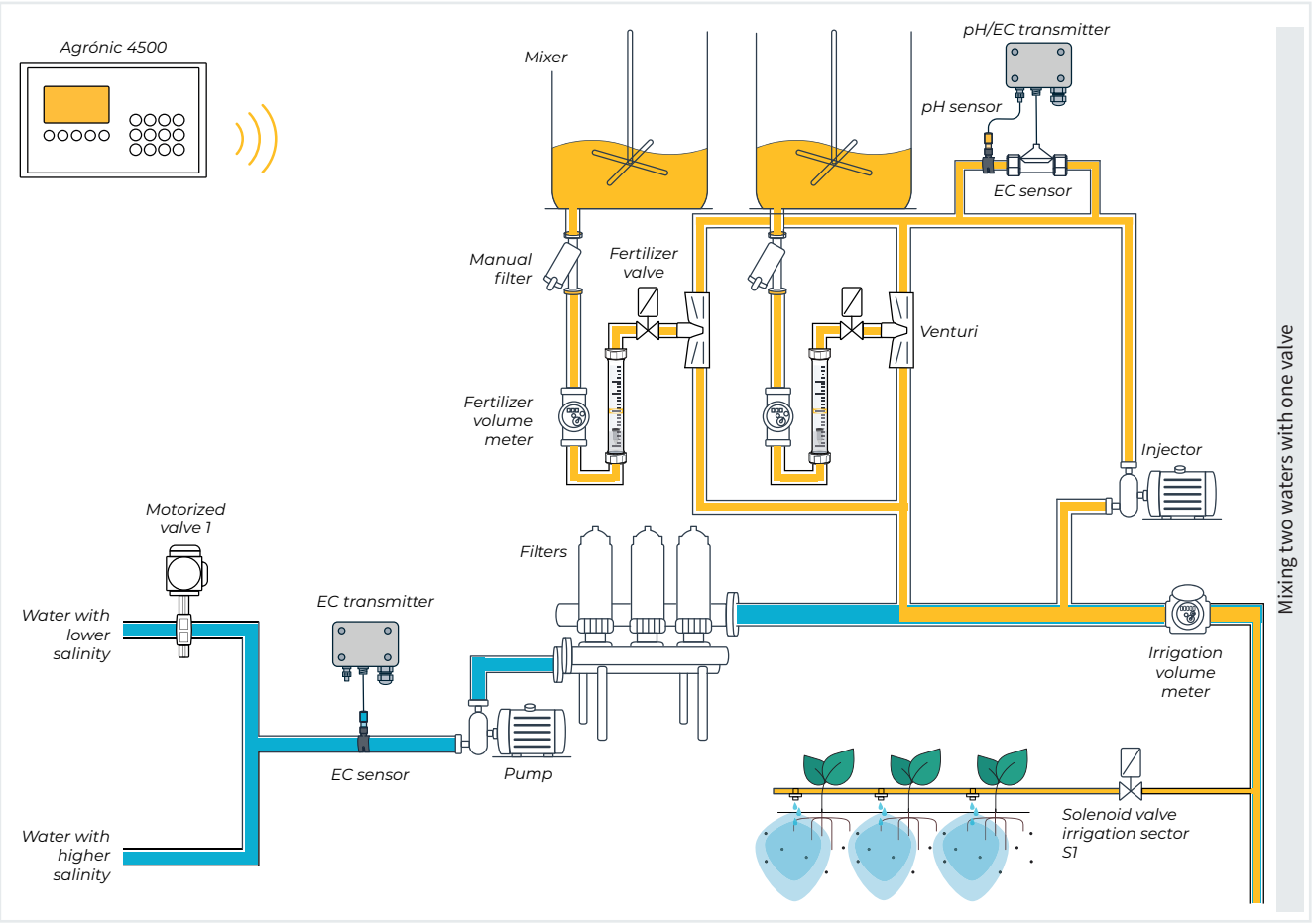
Valve 1 open output *(00000000)*: output where the command to open Valve 1 is connected.

Valve 1 close output *(00000000)*: output where the command to close Valve 1 is connected.

Valve 2 open output *(00000000)*: output where the command to open Valve 2 is connected.

Valve 2 close output *(00000000)*: output where the command to close Valve 2 is connected.




Agrónic 4500
Mixer
pH/EC transmitter
pH sensor
EC sensor
Manual filter
Fertilizer valve
Venturi
Fertilizer volume meter
Injector
Motorized valve 1
Filters
Water with lower salinity
EC transmitter
Irrigation volume meter
EC sensor
Pump
Water with higher salinity
Solenoid valve irrigation sector S1
Mixing two waters with one valve

5.1.2.8 Diesel

HEAD 1 GENERAL DIESEL

Start output: 00000000
Stop output: 00000000
Contact output: 00000000
Preheating output: 00000000

I/O

F6

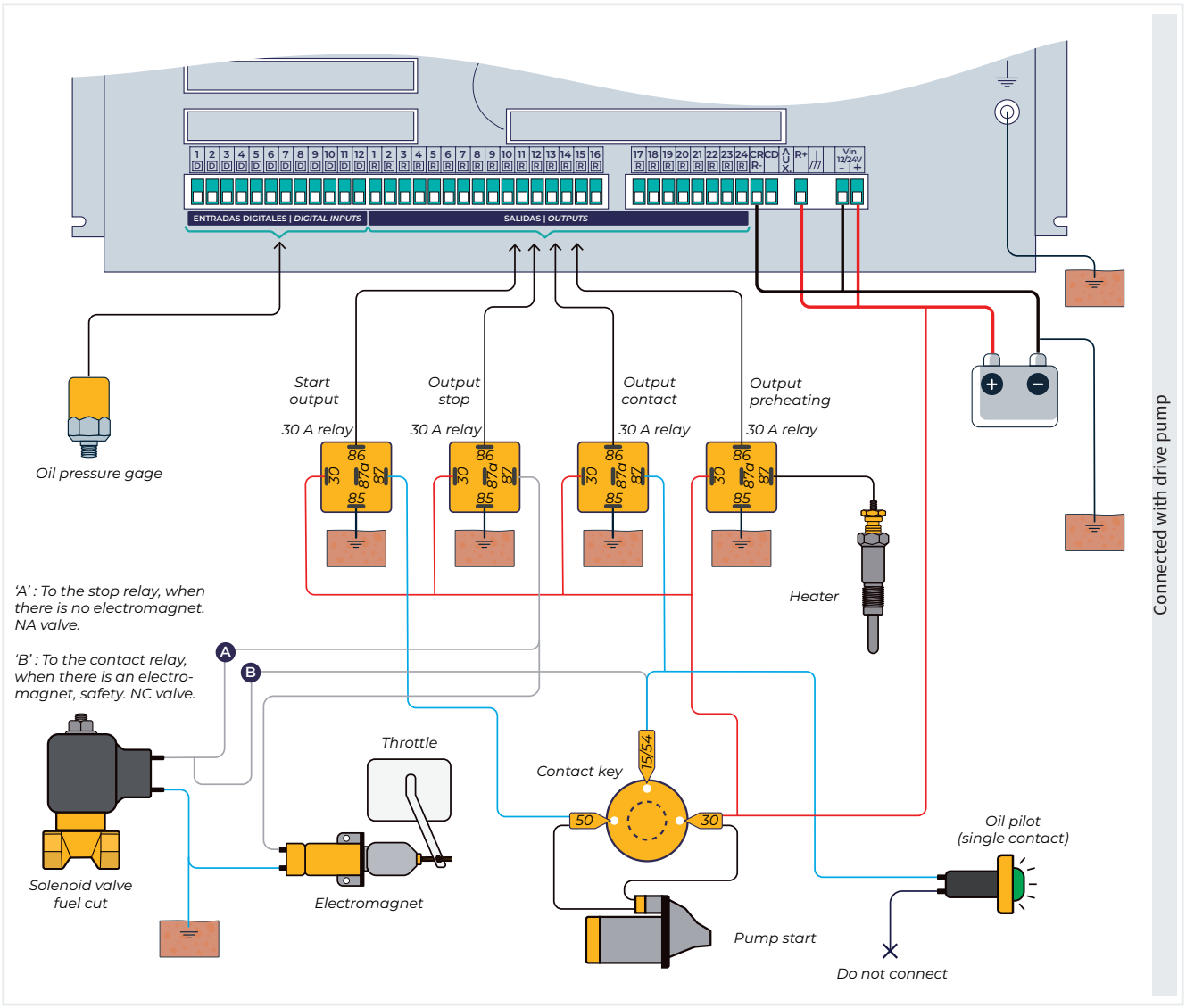
The outputs can only be assigned on the base or expansion modules. To access it, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 2. General - 8. Diesel' and confirm with the 'ENTER' key.

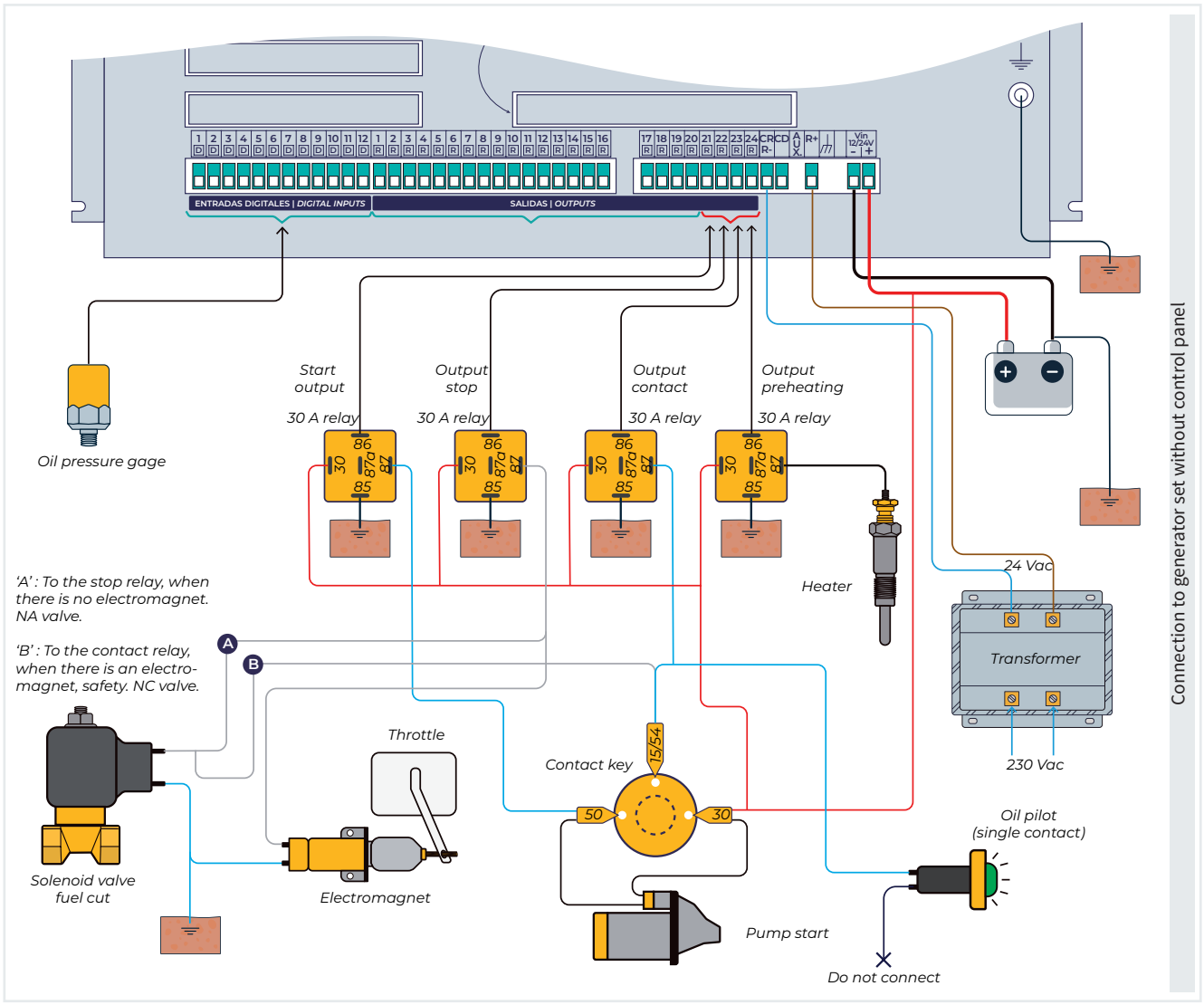
Start output *(00000000)*: output where the starter is connected.

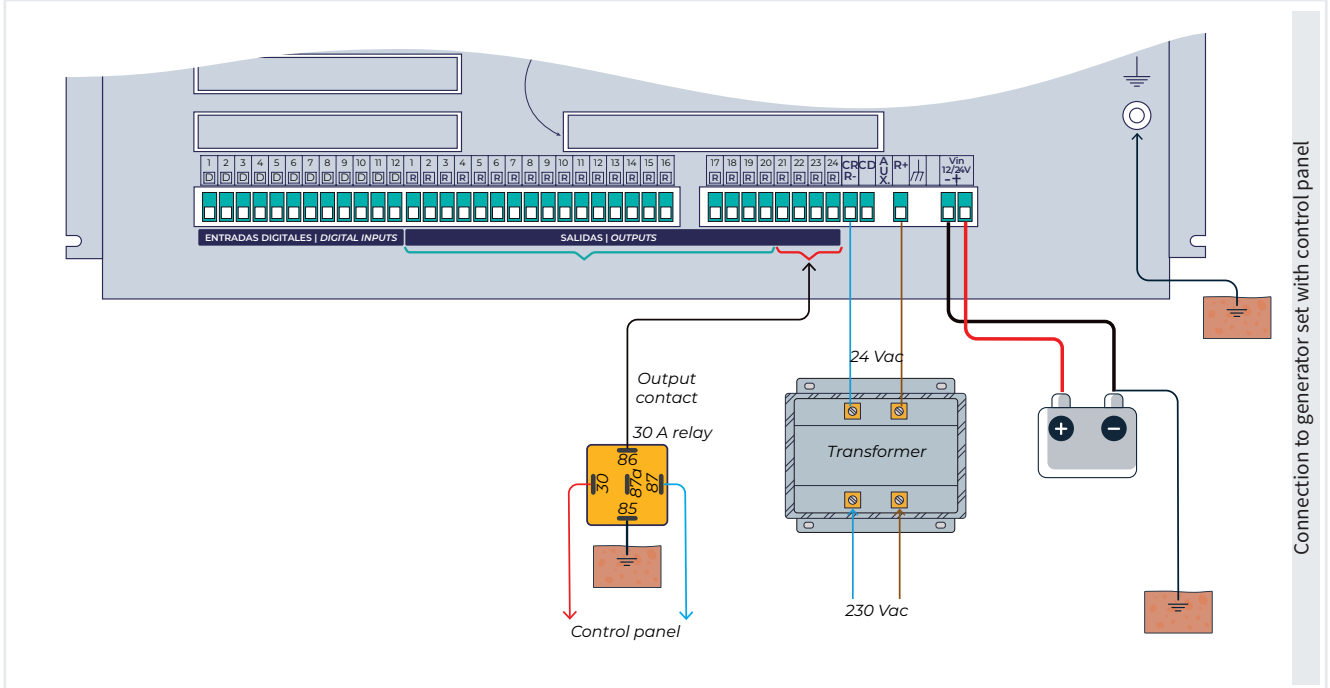
Stop output *(00000000)*: output where the stop is connected.

Contact output *(00000000)*: output where the contact is connected.

Preheating output *(00000000)*: output where the pre-heating is connected.




ENTRADAS DIGITALES | DIGITAL INPUTS
SALIDAS | OUTPUTS
Start output
Output stop
Output contact
Output preheating
30 A relay
Oil pressure gage
'A' : To the stop relay, when there is no electromagnet. NA valve.
'B' : To the contact relay, when there is an electro-magnet, safety. NC valve.
Heater
24 Vac
Transformer
230 Vac
Throttle
Contact key
Solenoid valve fuel cut
Electromagnet
Oil pilot (single contact)
Pump start
Do not connect
Connection to generator set without control panel


ENTRADAS DIGITALES | DIGITAL INPUTS
SALIDAS | OUTPUTS
Output contact
30 A relay
24 Vac
Transformer
230 Vac
Control panel
Connection to generator set with control panel

5.1.3 Filters

PARAMETERS FILTER HEAD 1

1 Filter group 1
2 Filter group 2
3 Filter group 3

To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 3. Filters' and always confirm with the 'Enter' key.

PARAMETERS HEAD 1 FILTERS 1

General filter to all heads: no

Subgroup 1: Number of filters 00
Activation time per filter: 000"

Subgroup 2: Number of filters 00
Activation time per filter: 000"

Subgroup 3: Number of filters 00
Activation time per filter: 000"

Initial delay: 000"
Pause between filters: 00"
Units between cleanings
Volume: 0000 m^3
Time: 0000'
Filter pressure gage
Input No.: 00000000
Delay: 000"

Pressure differential
Input sensor number: 000
Output sensor number: 000
Pressure reference: 00.0 bar
Delay: 000"
Maximum number of consecutive cleanings: 5
Clean: <During irrigation>
Stop at the sectors: no
Stop at the fertilizers: no

Head 1 relation with pumps:
M1: no M2: no M3: no M4: no M5: no M6: no

<Page Page>

F3 F4

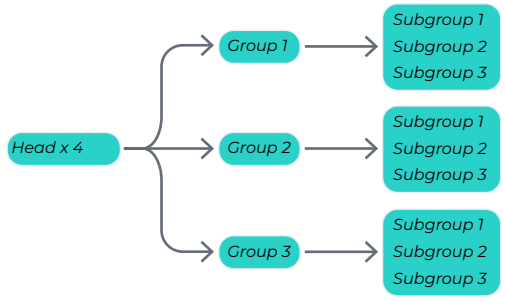


Diagram of filters in the heads

The head can control cleaning a large number of filters that can be divided into up to three independent filtering stations (groups), each with three cleaning time subgroups, which can be started manually or automatically.

- Automatic start: it starts by a differential pressure gage, by the difference between two analog pressure sensors or by a certain amount of time or volume of water passing through the filters. It only starts if the general function assigned to the filters is activated. In other words, when there is a program irrigating.
- Manual start: can be done any time from 'FUN - 2. Manual - 7. Filters'.

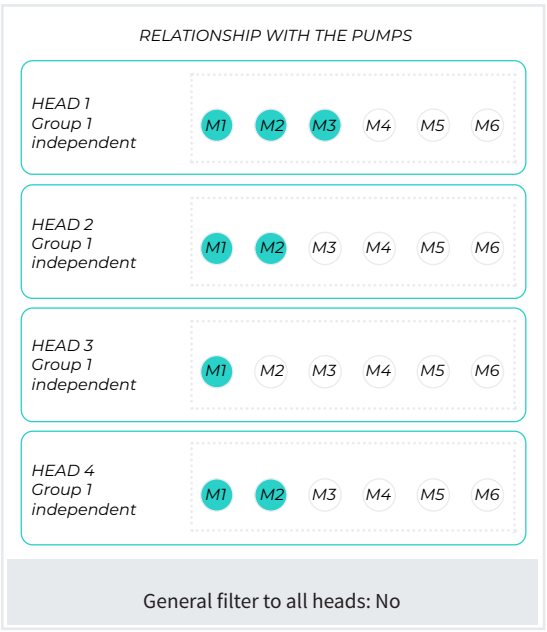
Important

The total number of filters in the output assignment is configured in the section 'FUN - 4. Parameters - 1. Head - No. Head - 2. General - 1. Filters - Filter Group'

The following parameters are requested for each of the three possible filter groups:

General filter to all PV *heads (no | yes)*: this question is only prompted on Head 1.

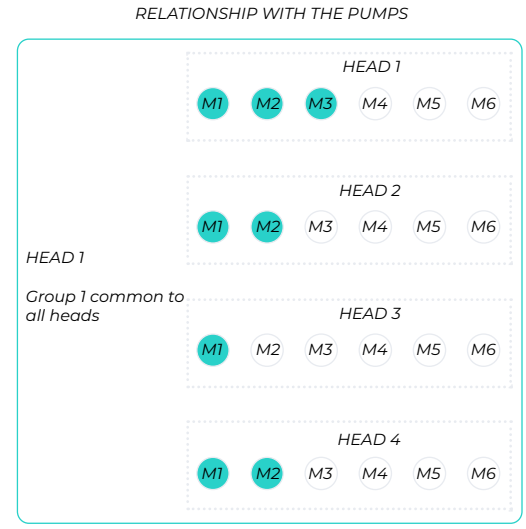
- No: Filters can only be associated with the pumps of Head 1 that are configured.



General filter to all heads: No

- Yes: the three filter groups in Head 1 are common to all irrigation heads. Filters can be associated with the pumps of each head.

In the following diagram, filter group 1 shares different pumps from the four possible heads.



General filter to all heads: Yes

For each group of head filters, three different rinsing time subgroups can be configured. If a subgroup is not needed, leave the values at 0.

Subgroup 1/2/3: Number of filters *(00 ... 99)*: number of filters to which the same cleaning time is assigned. Three subgroups can be configured with independent times. If a group is not needed, leave the values at 0.

Activation time by filter *(000 ... 999)*: time in seconds that the water passes through each filter to clean it.

Example

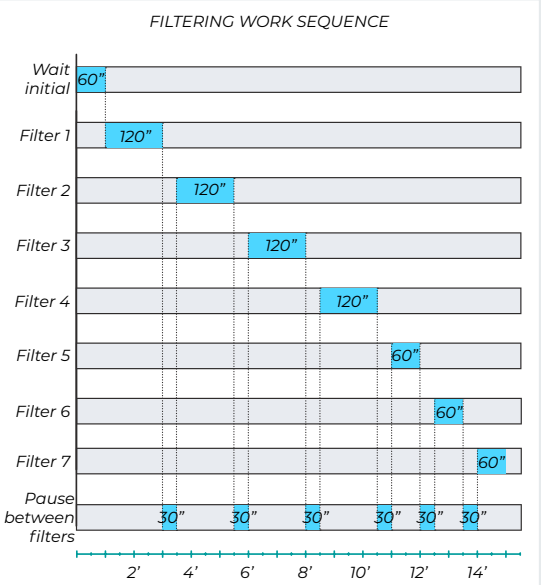
There are seven filters configured as follows:
First filter output: 00000010
Last filter output: 00000016

Subgroup 1: Number of filters 4
Activation time: 120”
Subgroup 2: Number of filters 3
Activation time: 060”

The first subgroup of filters goes from 1 to 4 and will clean 120” each. The second subgroup goes from filter 5 to 7 and will clean 60” each.

Initial delay *(000 ... 999)*: the delay time between activating the general filter and start cleaning the first subgroup 1 of filters.

Pause between filters *(000 ... 999)*: delay time between closing the cleaning of one filter and activating the next one.



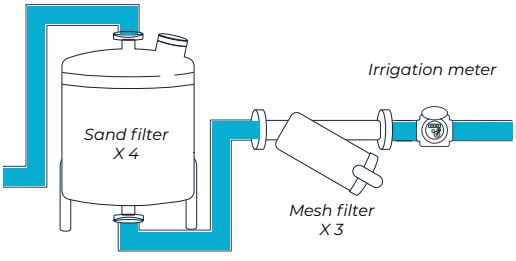
Initial delay time: 060”
Subgroup 1 time from Filter 1 to 4: 120”
Subgroup 2 time from Filter 5 to 7: 060”
Pause between filters: 30”

The start of filter cleaning can be initiated automatically for two reasons:

- By unit: because a certain amount of water has passed through the filters or a certain amount of time.
- By sensor: because there is a sensor that indicates that it needs to be cleaned.

Units between cleanings

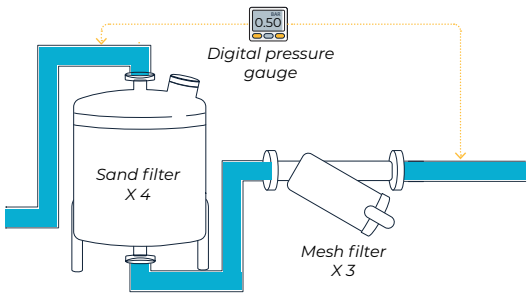
- Volume *(0000 ... 9999)*: irrigation volume that must pass through the filters for automatic cleaning to start.
- Time *(0000 ... 9999)*: minutes of irrigation that must pass through the filters for an automatic cleaning to start.



Cleaning by time or irrigation volume

Filter pressure gage. Difference between the pressure at the filter input and output. Activates cleaning when the configured pressure differential is exceeded.

- Input No.: digital input where the pressure gage is connected.
- Delay *(000 ... 999)*: delay, in seconds, in detecting the pressure gage input.

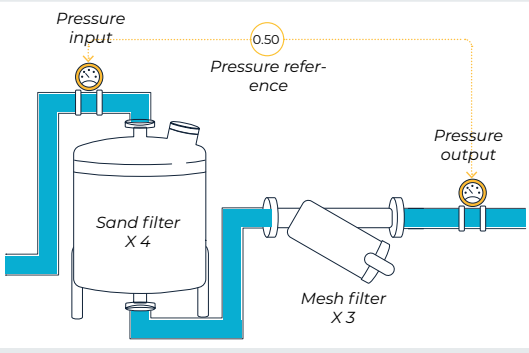


Filter pressure gage cleaning

Pressure differential. Difference between the pressure at the filter input and output. Activates cleaning when this pressure difference reaches the reference. It is only checked when it is irrigating. The formats and units of the two sensors must be the same.

Pressure differential

- Input sensor number *(000 ... 120)*: number of analog sensors connected to the filter input. The sensor must be connected to an input on the base.
- Output sensor number *(000 ... 120)*: number of analog sensors connected to the filter output. The sensor must be connected to an input on the base.
- Pressure reference *(00.0 ... 20.0)*: pressure difference above which cleaning will start. The reference must be the input pressure minus the output pressure.
- Delay *(000 ... 999)*: time, in seconds, that the pressure differential must remain above the reference to start cleaning.



Cleaning by difference of analog sensors

Maximum number of consecutive cleanings *(0 ... 9)*: maximum number of consecutive cleanings before malfunction occurs. If the configured value is '0' it never goes into malfunction.

Cleaning is considered continuous if it takes less than five minutes from end to start.

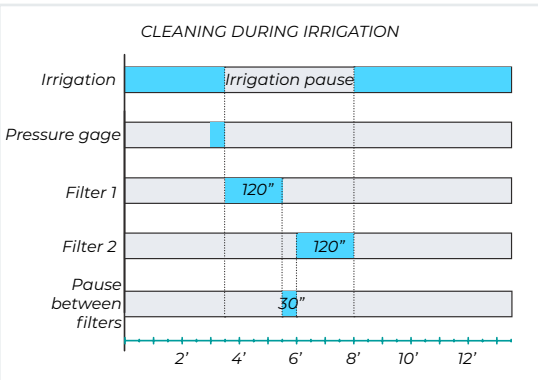
To reset the cleaning, go to 'FUN - 2. Manual - 5. End Stops and Malfunctions' or to 'FUN - 2. Manual - 7. Filters'.

Example

If cleaning starts by pressure gage or by analog sensor differential and is always activated, it will run at most the cleanings configured here. Then it will go into malfunction and will not run any more cleanings until it is manually reset.

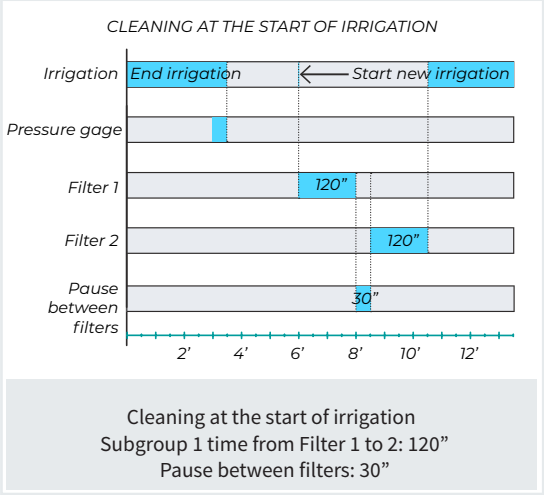
Clean *(during irrigation | start of irrigation)*: the moment the controller is cleaning. Automatic cleaning only occurs if the units have been between cleanings or the pressure indicates so. The program that is irrigating must also have a cleaning-related pump activated.

- During irrigation: cleaning takes place when indicated by the pressure or the units between cleanings. If the program ends with a filter cleaning that has not ended, the cleaning will pause and continue from the same point at the next irrigation start.



Cleaning during irrigation
Subgroup 1 time from Filter 1 to 2: 120"
Pause between filters: 30"

- Start of irrigation: it cleans at the start of a new irrigation program. The start cleaning determining factor must have been met during the previous irrigation.



Cleaning at the start of irrigation
Subgroup 1 time from Filter 1 to 2: 120"
Pause between filters: 30"

Stop the sectors *(no | yes)*: select whether or not to delay irrigation while cleaning the filters.

- No: the programs remain active during cleaning and the irrigation sectors are not closed.
- Yes: programs that have sectors related to the pump that use cleaning are delayed. When the programs end, they continue from where they were left. It is used when sectors must be closed during cleaning to maintain pressure. Fertilization also stops when the sectors stop.

Stop the fertilizers *(no | yes)*: select whether or not to delay fertilizer during irrigation. The sectors continue to irrigate. If cleaning is run at the start of irrigation, it does not matter because fertilisation will never occur at this stage. Includes fertilization, acid application and treatments.

- No: the fertilizer remains active during cleaning.
- Yes: fertilization is delayed for programs that include zones related to the pump used for cleaning. When cleaning is complete, fertilization continues. Irrigation does not stop. It is used so that fertilizer is not lost during cleaning.

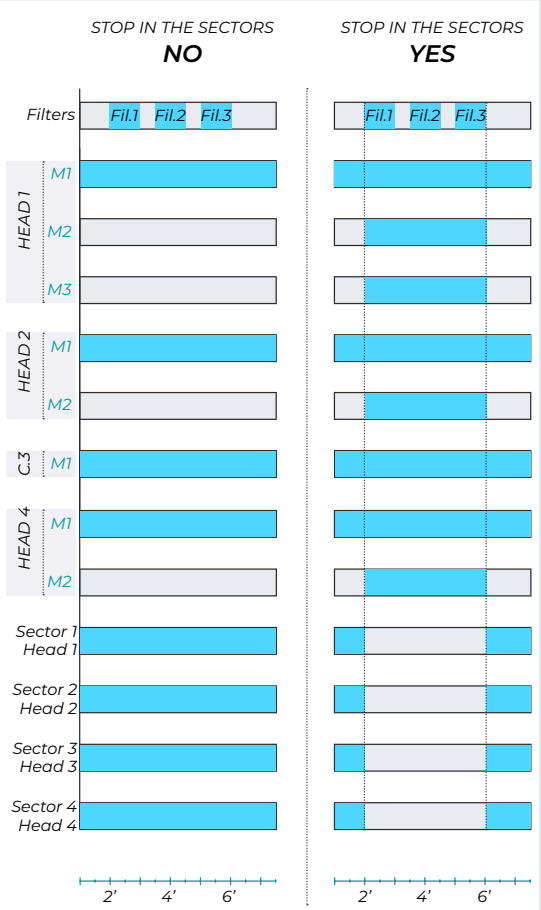
Head 1 relation with pumps:

M1: *(no | yes)* M2: *(no | yes)* M3: *(no | yes)* M4: *(no | yes)* M5: *(no | yes)* M6: *(no | yes)*: indicates which main pump/valve drives or opens the water that passes through the filters.

The allocation of the pumps involves the following features:

- Log the time that each of the pumps assigned here take to perform the cleaning.
- Count the volume circulating through the filters while using any of the pumps assigned here.
- Start the assigned pumps when the 'Stop sectors' question is configured to 'Yes'.
- Activate the pressure gage or pressure difference when some of the pumps are being used.

If you are configuring Head 1 and it has been configured as 'General filter for all heads: Yes' enter the relationship of the pumps to be activated for each head.



All sectors with M1 assigned.

Head 1: M1:yes | M2:yes | M3:yes | M4:no | M5:no | M6:no
Head 2: M1:yes | M2:yes | M3:no | M4:no | M5:no | M6:no
Head 3: M1:yes | M2:no | M3:no | M4:no | M5:no | M6:no
Head 4: M1:yes | M2:yes | M3:no | M4:no | M5:no | M6:no

Behavior according to the pumps | head ratio

5.1.4 Pressure regulation

PARAMETERS HEAD 1 PRESSURE REGULATION

Regulation sensor: 000
Pressure from the sectors: <Maximum>

Filter cleaning pressure 1: 00.0 bar
Manual filter cleaning pressure 1: 00.0 bar
Filter cleaning pressure 2: 00.0 bar
Manual filter cleaning pressure 2: 00.0 bar
Filter cleaning pressure 3: 00.0 bar
Manual filter cleaning pressure 3: 00.0 bar

To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 4. Pressure regulation' and always confirm with the 'Enter' key.

The head can regulate irrigation pressure and filter cleaning with an analog output connected to a speed controller.

In irrigation, the desired pressure is configured in the sector, in filter cleaning it is configured in this section. To indicate that a sector or filter cleaning will use pressure regulation, Pump 1 is assigned to it.

If an analog output is configured for Pump 2, it will also regulate by copying the output of Pump 1 (Pump 1 follower mode).

A minimum regulation output value can be configured, to ensure that it does not fall below that value and to maintain the pump at a minimum speed.

There are two ways to regulate pressure:

- The Agrónic controls regulation using a PID control: The pressure sensor is connected to the Agrónic, which sends a 4-20 mA current signal to the drive. This signal varies depending on the pressure configured for the sectors and filters. The Agrónic continuously compares the pressure sensor reading with the configured pressure and adjusts the speed of the drive based on this comparison, until the configured pressure is reached and maintained. The regulation adjustment (PID) is configured in the section 'FUN - 4. Parameters - 15. Installer - 3. Head-Regulations - Head No.'
- The drive controls regulation: The pressure sensor is connected directly to the drive and the Agrónic provides a fixed reference (4-20 mA signal) to the drive. This fixed signal establishes the desired working pressure for the different sectors and for cleaning the filters, allowing the drive to regulate the pressure constantly.

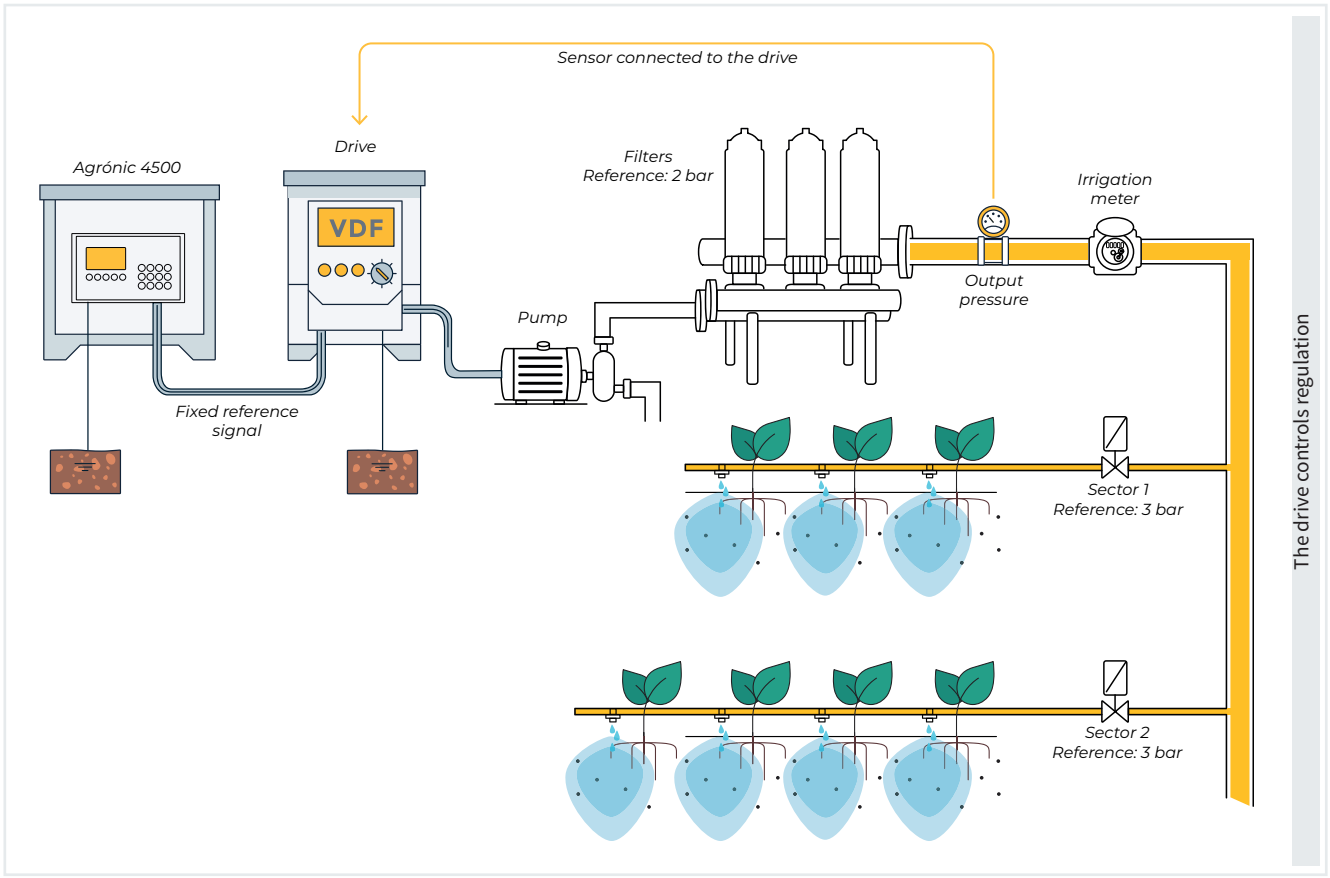
Regulation sensor *(000 ... 120)*: analog sensor No. where the pressure sensor to be used for pressure regulation is connected.

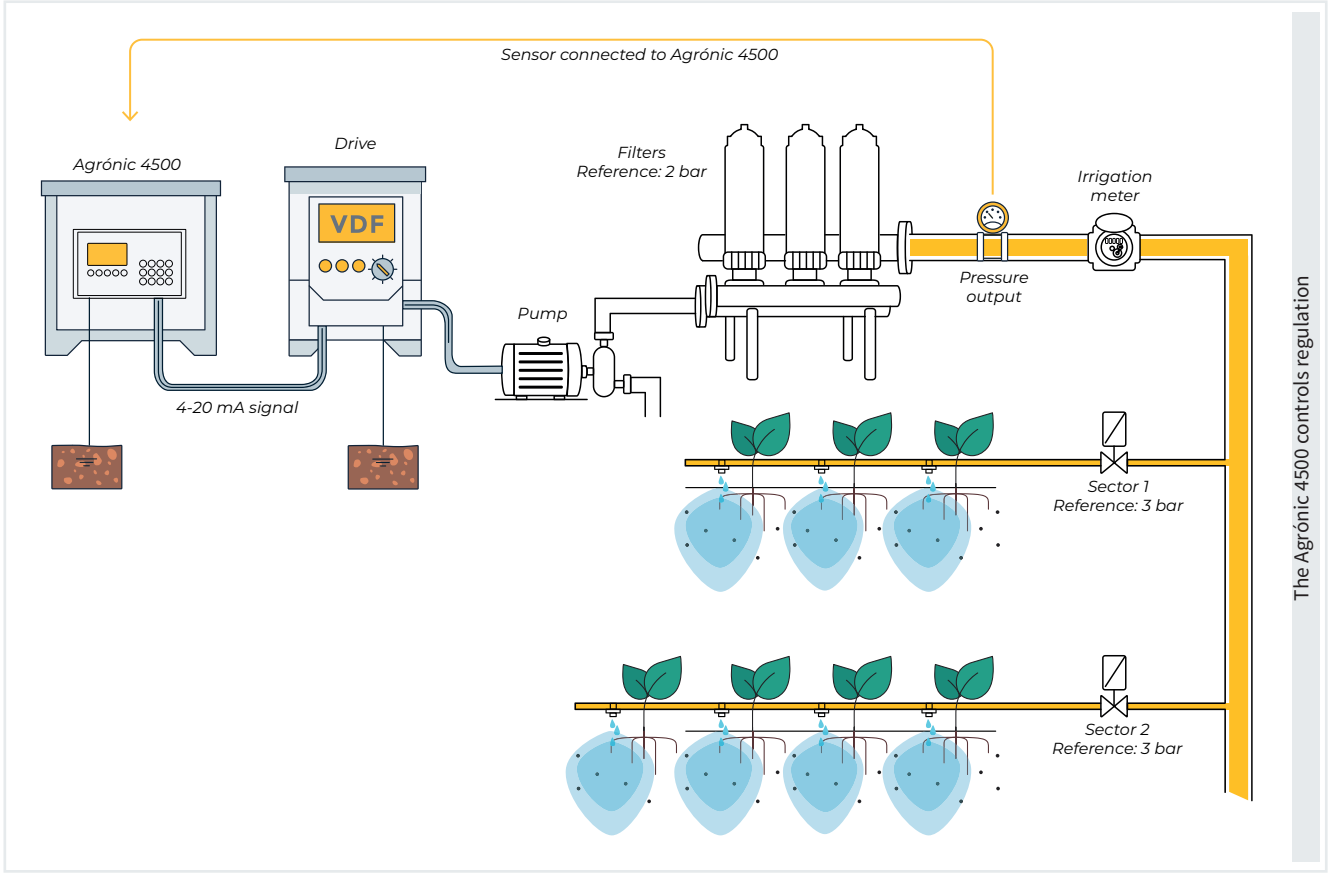
Sector pressure *(Maximum | Minimum)*: when there is more than one sector irrigating, each with its configured pressure, select which one to use as a reference.

- Maximum: the reference is the maximum of the sectors that are irrigating.
- Minimum: the reference is the minimum of the sectors that are irrigating.

Filter cleaning pressure 1/2/3 *(00.0 ... 20.0)*: pressure reference to be maintained when cleaning filters. With a value of '00.0', the pressure assigned to the sectors is used.

Manual filter cleaning pressure 1/2/3 *(00.0 ... 20.0)*: pressure reference for manual filter cleaning if there are no active sectors. It only prompts if the previous question 'Filter cleaning pressure' is not configured.


Sensor connected to the drive
Drive
Agrónic 4500
VDF
Filters
Reference: 2 bar
Irrigation
meter
Output
pressure
Pump
Fixed reference
signal
Sector 1
Reference: 3 bar
Sector 2
Reference: 3 bar
The drive controls regulation


Sensor connected to Agrónic 4500
Drive
Agrónic 4500
VDF
Filters
Reference: 2 bar
Irrigation
meter
Pressure
output
Pump
4-20 mA signal
Sector 1
Reference: 3 bar
Sector 2
Reference: 3 bar
The Agrónic 4500 controls regulation

5.1.5 Diesel engine

HEAD PARAMETERS 1 DIESEL ENGINE

Activate: yes
Pressure gage input: 00000000
Delay: 00”

Preheating: 00”
Start-up: 00”
Stop: 000”
Pump input: 000”
Pump end: 000”

I/O

F6

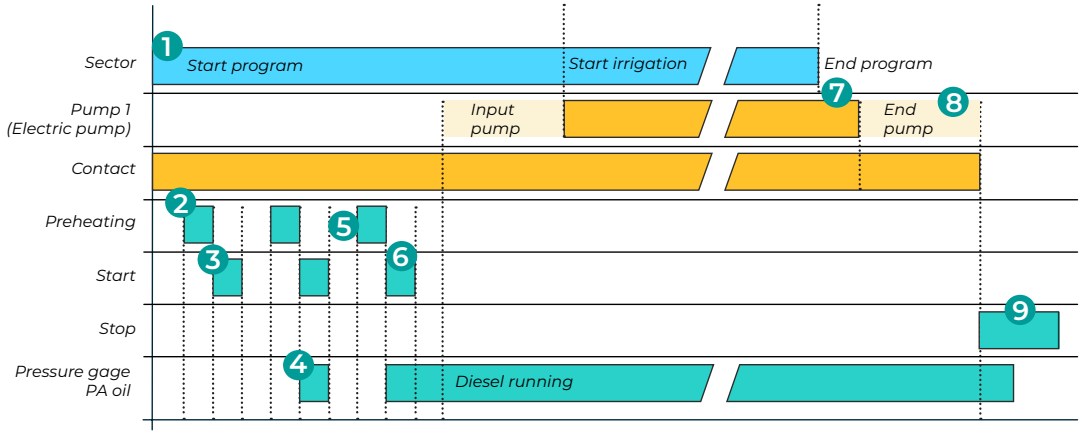
To access, press ‘FUN - 4. Parameters - 1. Head - 1. Head 1 - 5. Diesel engine’ and always confirm with the ‘Enter’ key.

Agrónic manages the start, stop and malfunction control of a drive pump or generator set. The pump can be diesel or gasoline and must have an electric start.

Relationship of diesel engine with Pump 1

The diesel engine is linked to Pump 1 so that it starts when a sector using this pump opens and stops when the last one using it closes.

Activate *(no | yes)*: the use of either a diesel drive pump control or a generator set must be confirmed.



DIESEL ENGINE START PROCESS

1. *First, the program starts with the irrigation sector.*
2. *After waiting the time required to prevent water hammer, the contact output and the diesel engine preheating activate.*
3. *Once preheating is complete, the diesel engine start output activates.*
4. *If the pressure gage input activates, it means that the diesel engine has started and irrigation can start.*
5. *If the diesel engine does not start after the configured start time, wait 30 seconds and try again to start. If the diesel engine fails to start after four attempts, the stop output activates, it enters the ‘Malfunction’ state and the malfunction is logged.*
6. *The pump will attempt to start again at the next irrigation start.*

   If the start time is ‘0’, the above start process does not run.

END OF IRRIGATION AND PUMP SHUTDOWN

7. *At the end of irrigation, the sectors and the pump close.*
8. *There is a time delay to prevent water hammer.*
9. *Once the time scheduled as ‘End pump’ has transpired, the stop output activates to stop the diesel engine.*

   The section ‘CON - 13. Heads’ shows the status of diesel engine.

Start/Stop operation diagram

Pressure gage input *(00000000)*: digital input where the diesel pressure gage is connected. The input must be on the base or on an expansion module (ME1 or ME2).

Delay *(00 ... 99)*: delay, in seconds, in detecting the pressure gage input.

Preheating *(00 ... 99)*: time, in seconds, that the pre-heating output is activated before starting the diesel engine.

Start *(00 ... 20)*: time, in seconds, that the start output is activated to start the diesel engine.

Stop *(000 ... 999)*: time, in seconds, that the stop output is activated to stop the diesel engine.

Pump input *(000 ... 999)*: time that transpires, in seconds, from when the diesel engine is running and the 'Pump 1' output activates.

End pump *(000 ... 999)*: time that transpires, in seconds, from when the 'Pump 1' output stops and the diesel engine stops.

5.1.6 Mix of two waters

Hydro Function

To access, press 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 6. Mix of two waters' and always confirm with the 'Enter' key.

This control allows two waters of different salinity to mix to achieve a certain conductivity. The mix is made by regulating one or two motorized valves. The desired conductivity reference is configured in the program; when the program starts, water mixing is also activated. There cannot be two active programs using the mixing at the same time.

When the program starts, the valves are placed in the position they were in during the last irrigation. If it is the first time irrigating, Valve 1 (lower salinity) opens to 50%, and Valve 2 (higher salinity) opens to 100%.

If only using one valve, use Valve 1 (low EC).

The mix uses the input EC sensor and is configured in 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 1. Fertilizers - EC Sensor: Regulation'.

Activate *(no | yes)*: the use of the mixing must be confirmed.

Delay at start *(000 ... 999)*: time in seconds to wait before regulation starts. When water mixing starts, the valves are in the initial position.

Margin *(0.0 ... 1.0)*: in ms, to avoid continuous valve movements. If the EC sensor reading is not above reference + range or below reference + range, the valves do not move.

Example

EC Reading: 2.3 ms
EC reference: 2.5 ms
EC margin: 0.2 ms

In this case, the valves will not move because:

- The EC sensor reading is not higher than the reference + range.
  - Reading (2.3 ms) does not exceed Reference (2.5 ms) + Margin (0.2 ms) = 2.7 ms
- The EC sensor reading is not lower than the reference + range.
  - Reading (2.3 ms) is not lower than Reference (2.5 ms) - Margin (0.2 ms) = 2.3 ms

Position by *(Time | Sensor)*: select the system to position the valves.

- Time: the total opening time of the valve is indicated and the controller calculates its position based on how long it has been moving. This system may have position errors.
- Sensor: the valves have an analog sensor that indicates their position to the controller. It is a system with no position errors and faster than the previous one.

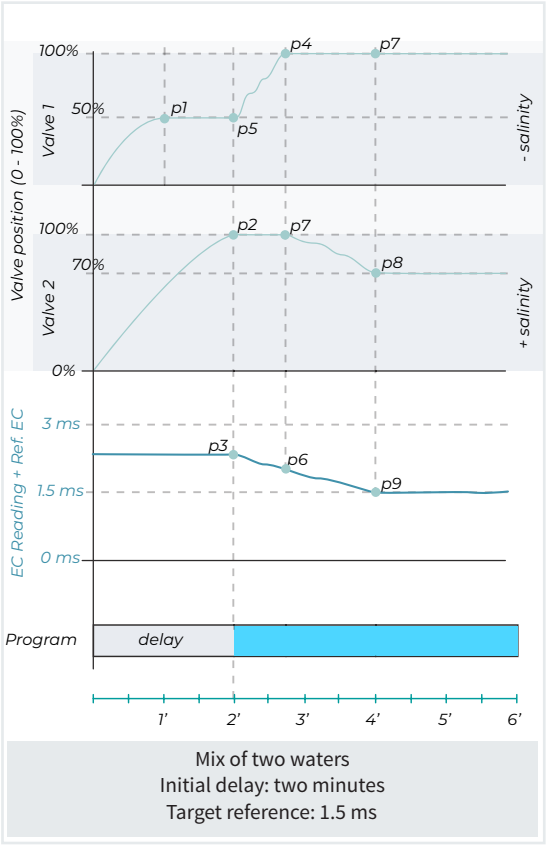
Valve position at the end

- Maintain position *(yes ... no)*: select the option change.
  - Yes: the position of the valves is maintained at the end of irrigation.
  - No: the position from the values of the next question is set.
- Position V1 and V2 *(000 ... 100)*: position, expressed in %, in which the valves will remain at the end of the regulation, only if it has been configured not to close the valves at the end.

For each valve:

- Opening time *(000 ... 999)*: time, in seconds, that the valve takes to go from fully closed (0%) to fully open (100%). The only prompt is whether the position is time-based. The minimum time to make a correct regulation is 60".
- Position sensor *(000 ... 120)*: number of the analog sensor where it has been connected. It only prompts if the 'Position is: Sensor'. The sensor has to be from 0% (valve closed) to 100% (valve open).
- Minimum movement *(00 ... 20)*: value expressed in %, corresponds to the minimum value that must be exceeded to move the valve.
- Pause time *(01 ... 99)*: delay time after a movement, in seconds, to make the next movement.
- Minimum opening *(00 ... 99)*: value expressed in % corresponding to the minimum closing value when the valve is in regulation.

The diagram below explains how the two valves work in irrigation and with a conductivity reference.



Mix of two waters
Initial delay: two minutes
Target reference: 1.5 ms

During the configured delay time of two minutes, Valve 1 opens to 50% (p1) and Valve 2 opens fully to 100% (p2).

After this delay, the irrigation and regulation program (p3) starts to reach the target reference of 1.5 ms.

The conductivity reading is initially higher than the target reference so Valve 1 opens to 100% (p4). It is observed that the conductivity reading has dropped but the reference (p6) has not yet been reached, so Valve 2 starts to close (p7).

Finally, Valve 1 remains open at 100% (p7) and Valve 2 remains open at 70% (p8), since the target reference value (p9) has been reached.

Related water mixing determining factors: Shortcut to 'edit or create the determining factors' linked to the head water mixing. They can also be created in the section 'FUN - 4. Parameters - 6. Determining factors'.

The only possible determining factor to create for water mixing is:

- EC mix error

5.2. PROGRAMS

The programs are those that manage crop irrigation and fertilization. They control sector opening and closing, fertilization and determining factors.

PROGRAM PARAMETERS
Program: 01
Program type: < Subprogram >
Alternating: no* Sequential start: no
Group each: 01*
Irrigation days: < Weekly >
Irrigation units: < hh:mm >
Fertilization type: < Units >
Proportional fertilization, use: < Meter pulses >*
Fertilizer units: < L >
What acid to use: < Acid 1 >
TF1 treatment: no
TF2 treatment: no
TF1 delay: 00'00"
TF2 delay: 00'00"
Safety time between starts: 00:00
Safety time due to lack of starts: 00:00
Safety irrigation every: 00:00
End outside active schedule: <stop>
Priority operation: < Exclusive >
Group: 00 Priority: 01 Sub-priority: 01*
Use irrigation curves: no
Text:
Determining factors:
000
000
000
000
000
000
<Prog Prog> <Page Page> Edit Create

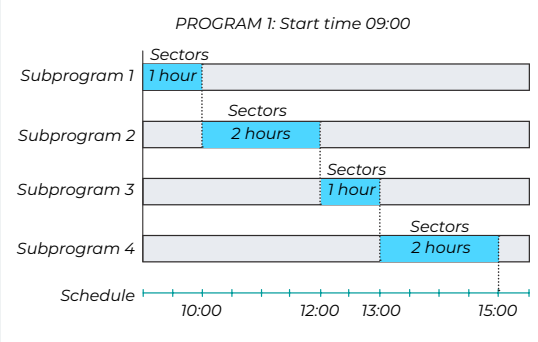
F1 F2 F3 F4 F5 F6

Prompts marked with an '*' are visible depending on the different options selected.

Program *(00 ... 99)*: program number to configure.

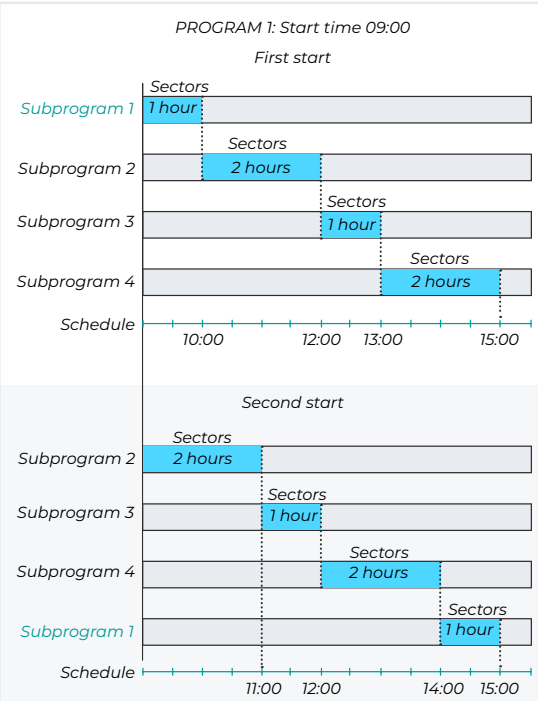
Program type *(Subprogram | Linear)*: there are two program types depending on how the sector and fertilization activation is organized.

- Subprogram: works like Agrónic 4000. There are 12 or 20 (PV) subprograms with the option of configuring up to 10 sectors or sector groups for each subprogram. Once the first one has ended, the second one starts and so on sequentially. Irrigation and fertilization are indicated in each program.



Program 1 with 4 subprograms

- Alternating *(yes ... no)*: If 'Yes' is selected at each program start, the subprogram that starts automatically alternates, preventing the same subprogram from always operating in the same time period. To use this option, more than one subprogram must be configured in the same program and select the 'Subprogram' type.



Program 1 with 4 alternating subprograms

Example

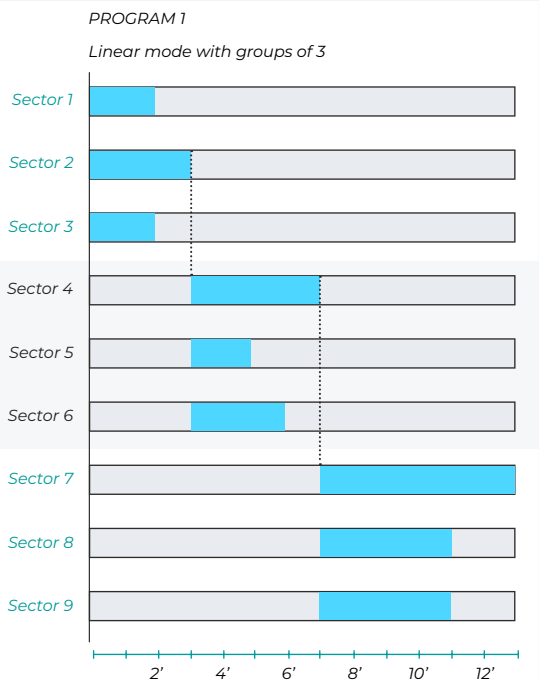
The work sequence in the 'First start' is:

- Subprogram 1 | 2 | 3 | 4

The work sequence in the 'Second start' will be:

- Subprogram 2 | 3 | 4 | 1

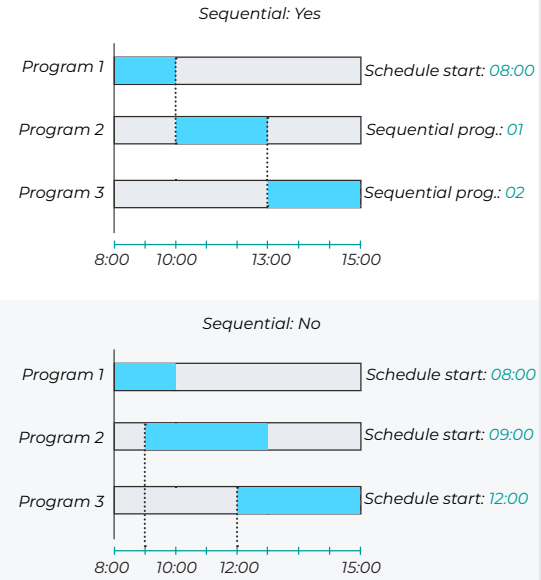
- Linear: works like the Agrónic 7000. For each program, 12 or 20 (PV) sector groups can be configured that can be grouped as desired to irrigate together. Enter the irrigation units in each sector. Fertilization is unique for all sectors.
  - Group each *(01 ... 20)*: number of sectors of the group that are activated together. When the irrigation of one group ends, the next one activates. If the sectors of one group have different quantities, the next group is not activated until the last sector of the group is ended. With 1, one sector after another activates, with 2, two at a time activate, etc.



Linear Program 1 with groups of 3

Sequential start *(yes ... no)*:

- Yes: the program starts when another program ends.
- No: the program starts based on time determining factors (hours/dates) or sensors.



Configuration 3 programs in sequential and schedule

Irrigation Days *(Weekly | Frequency | Calender)*: only prompted if the program is not configured to sequential.

- Weekly: the program prompts for the days of the week.

Days of the week: Mon-Wed-Thu-Sa

- Frequency: the program irrigates according to the frequency of days.

Frequency of days: every 3 days

- Calender: the program prompts for five days of irrigation in day/month format.

Calendar: August 15

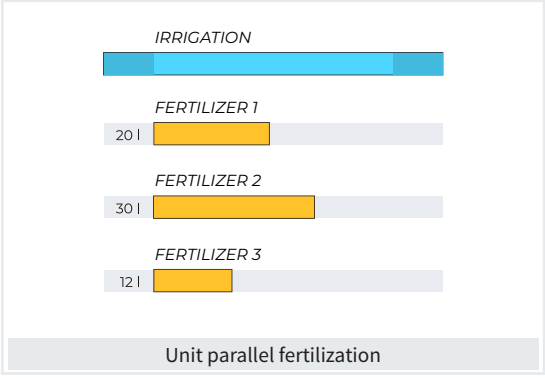
Irrigation units *(hh:mm | m³ | m³/ha | mm'ss" | m³/ha(t) | mm)*: determines which units the program uses for irrigation:

- hh:mm *(00:00 ... 99:59)*: expressed in hours and minutes.
- m³: as configured in 'FUN - 4. Parameters - 14. Installer - 6. Various - Irrigation volume format', enter the value using the following formats:
  - 00000 *(00000 ... 65000): Four integer digits.*
  - *0000.0 (0000.0 ... 6500.0): Four integer digits and one decimal place.*
  - *000.00 (000.00 ... 650.00): Three integer digits and two decimal places.*
- m³/ha *(0 ... 650.00)*: the area of each sector needs to be configured. Summing the total area of the sectors to be irrigated in the program determines the m³ of the program.
- mm'ss" *(00:00 ... 99:59)*: expressed in minutes and seconds.
- m³/ha(t) *(0 ... 650.00)*: the expected flow and the area of each sector must be configured. Irrigation programming is in 'm³/ha' but irrigation will be in time 'hh:mm'. Summing the total area and the expected flows of the sectors to be irrigated converts the m³ of the program into irrigation time.
- mm *(0 ... 99.00)*: Millimetre or amount of water (1 mm = 10 m³/ha). The area of each sector needs to be configured. Summing the total area of the sectors to be irrigated in the program determines the m³ of the program.

When the units are volume (m³, m³/ha or mm), a meter sensor must be configured in the sectors. In each subprogram or position (linear mode), there must be at least one sector with an assigned meter, otherwise it will not irrigate.

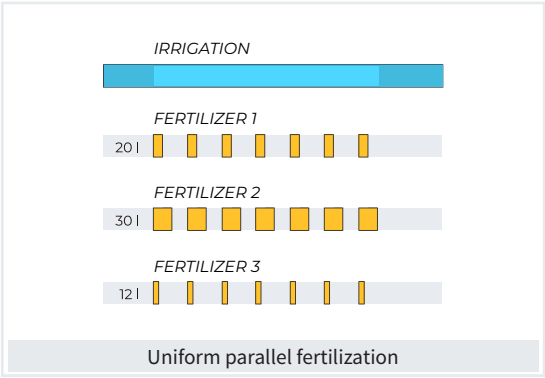
Fertilization type *(units | uniform | proportional L/m³ | proportional cl/L | EC regulation | EC input)*: fertilization type that the program will run if parallel fertilization is used. The fertilization type is linked to the fertilization system configured in 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization - 1. Fertilizers'.

- Units: applies a set amount of each fertilizer continuously. The quantity can be in time or volume. If it is by volume, a meter is required for each fertilizer. If fertilization is serial it should always be by 'units'.



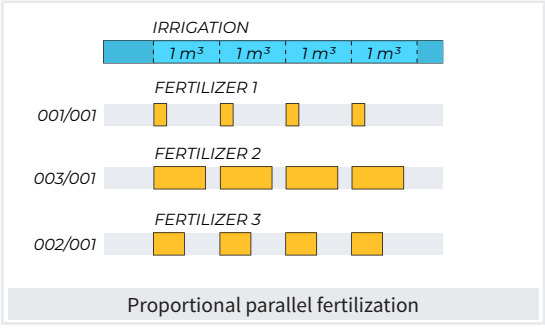
Unit parallel fertilization

- Uniform: a set amount of each fertilizer is applied by injecting it in small doses throughout the irrigation process. The quantity can be in time or volume. If it is by volume, a meter is required for each fertilizer.



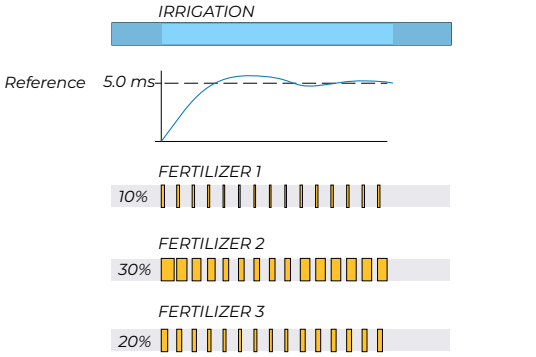
Uniform parallel fertilization

- Proportional L/m³: a proportion between fertilizer and irrigation is applied. Apply a certain number of liters of fertilizer for every m³ of irrigation. Fertilizer units must be in volume.
- Proportional cl/L: a proportion between fertilizer and irrigation is applied. Apply a certain number of centiliters of fertilizer for every liter of irrigation. Fertilizer units must be in volume.



Proportional parallel fertilization

- EC regulation HF: an EC reference is followed when injecting fertilizer. Configure the proportion to be followed between the eight fertilizers.
- EC input HF: an EC reference is followed when injecting fertilizer. The reference is calculated from the EC value of the water input. Configure two reference points and two water input value points. Two straight lines are made for calculating the reference to follow. Configure the proportion to be followed between the eight fertilizers.



EC / EC input parallel fertilization regulation

Fertilizer units *(hh:mm | mm'ss" | L | L/ha)*: determines the fertilizer units for this program. In proportional fertilization, the units are always 'Liter'. In EC regulation, no units are configured, it is regulated by the value of the EC sensor.

- hh:mm: hours and minutes.
- mm'ss": minutes and seconds.
- L : liters. A meter sensor must be configured.
- L/ha: liters per hectare. A meter sensor must be configured on the fertilizers and area of each sector. Summing the total area of the sectors to be irrigated calculates the amount of fertiliser in litres.

Which acid is used HF *(Acid 1 | Acid 2)*: configure which of the two acids in the head to use. For a program to use acid, it must have a reference configured in the programming section.

- Acid 1: regulates using acid 1.
- Acid 2: regulates using acid 2 or base.

Treatment F1 HF *(yes ... no)*: treatment 1 is used.

Treatment F2 HF *(yes ... no)*: treatment 2 is used.

TF1 delay HF *(00'00" ... 99'59")*: delay between the start of each irrigation group of the program or subprogram and the start of treatment 1.

TF2 delay HF *(00'00" ... 99'59")*: delay between the start of each irrigation group of the program or subprogram and the start of treatment 2.

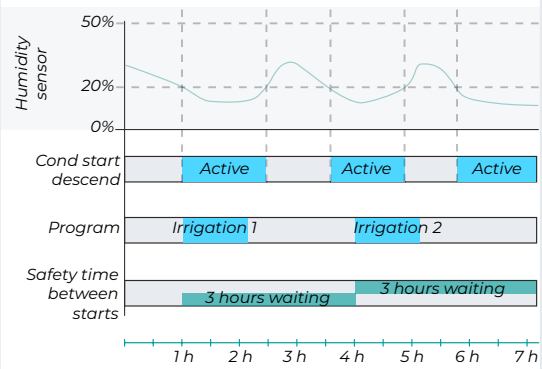
START BY DETERMINING FACTOR

If the program starts by determining factor, the following controls can be configured:

Safety time between starts *(00:00 ... 23:59)*: the time that must transpire for the program to start again due to a determining factor. It is a safeguard to avoid continuous irrigation if the sensor malfunctions. Only operates during the active schedule.

Example

When the soil moisture sensor value falls below the configured reference (20%), irrigation starts and will not start again until three hours have transpired and the reference is once again below 20%.



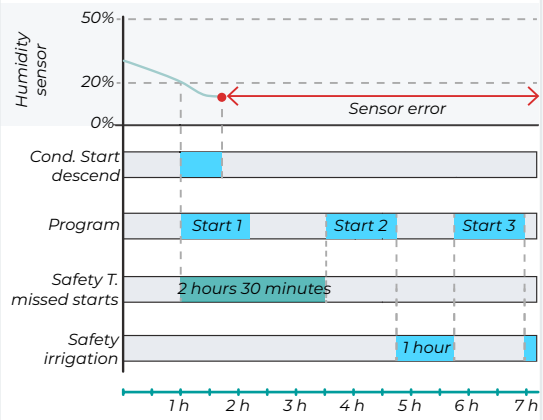
Program start determining factor
Program: 1 hour 15 minutes of irrigation
Safety time between starts: 3 hours

Safety time due to lack of starts *(00:00 ... 23:59)*: the time that must transpire without irrigation when the program starts due to a determining factor. This parameter is a safeguard to prevent irrigation from stopping in the event of a sensor malfunction. It only acts when it is within the active schedule or day.

Safety irrigation every *(00:00 ... 23:59)*: the safety irrigation interval. This irrigation is only considered if the previous question, 'Safety time due to lack of starts,' is met. To end the safety irrigation go to 'FUN - 2. Manual - 6. Programs - End safety irrigation'.

Example

The sensor gives an error in the reading. Once the configured safety time is exceeded (2 hours 30 minutes) the program activates again. From that moment on, the safety irrigation starts every hour and the program starts until the malfunction is resolved.



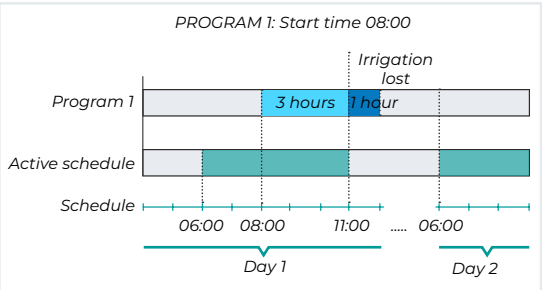
Program start determining factor
Program: 1 hour 15 minutes of irrigation
Safety time for missed starts: 2 hours 30 minutes
Safety irrigation every: 1 hour

End outside of active schedule *(stop | do not stop | delay)*: upon exiting the active schedule, the following options can be selected.

- Stop: ends the irrigation program.

Example

Program 1 starts irrigation at 08:00 with four hours of irrigation. Irrigation can only run during the first three hours because it is outside of the active schedule. Irrigation will not run in the pending hour.



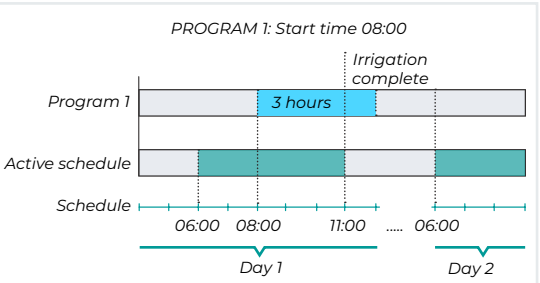
Program 1: 4 hours of irrigation
Active schedule: 06:00 to 11:00
End outside of active schedule: stop

- Do not stop: continue with the scheduled irrigation

In the following example, Program 1 starts irrigation at 08:00, but in this case, irrigation runs for four hours even though the program is outside of the active schedule.

Example

Program 1 starts irrigation at 08:00, but in this case, the irrigation runs for four hours even though the program is outside of the active schedule.

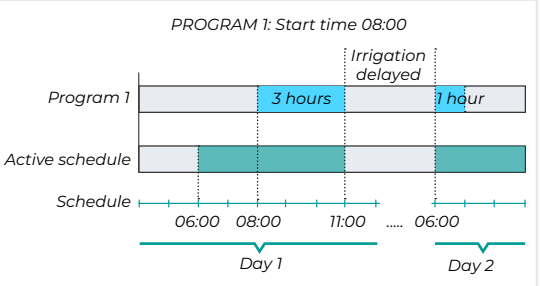


Program 1: 4 hours of irrigation
Active schedule: 06:00 to 11:00
End outside of active schedule: do not stop

- Delay: delays irrigation. The program ends when it is back within the active schedule.

Example

Program 1 starts irrigation at 08:00 with four hours of irrigation. In this case, when the program enters outside of the active schedule, irrigation is delayed and continues the next day when it enters the active schedule again.



Program 1: 4 hours of irrigation
Active schedule: 06:00 to 11:00
End outside of active schedule: delay

PRIORITIES

The purpose of this feature is to be able to command the programs to select the irrigation sequence when several programs irrigate at the same time.

It is applied to programs at their start time and enables irrigation to be delayed or continued.

Priority can be applied to subprograms as well as linear programs.

The priority is linked to all programs regardless of the irrigation heads.

This operation is organized by group, priority and sub-priority.

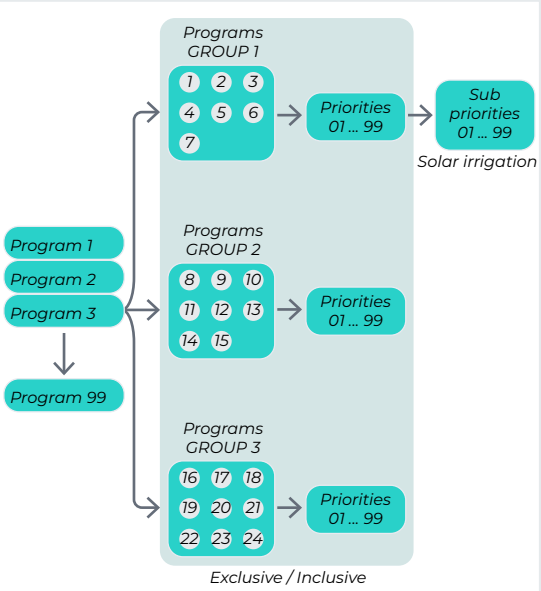


Diagram of groups, priorities and sub-priorities in the programs

Two operational modes can be selected: the exclusive mode, which does not allow programs within the same group to irrigate simultaneously, and the inclusive mode, which does allow it.

Priority operation *(exclusive | inclusive):* select the required operation.

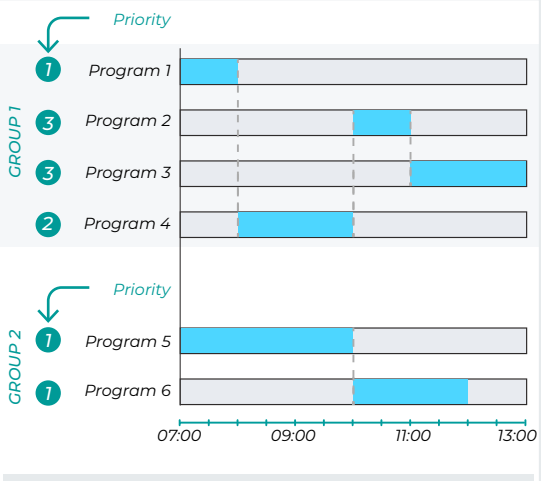
- Exclusive: no program from the same group irrigates at the same time, creating a sequence of program starts by priority.
  - Group *(00 ... 99)*: group number to which the program belongs. If left at '0' it does not belong to any group and will always irrigate.
    - Two or more programs from different groups can irrigate at the same time.
    - Two or more programs in the same group cannot irrigate at the same time; the one with the highest priority always irrigates. If they share the same priority, the one that has been delayed or waiting the longest goes first. If they share priority and have been waiting for the same amount of time, the program with the lowest ordinal number enters first.
  - Priority *(01 ... 99)*: priority level number assigned to the program. The value '1' corresponds to the highest priority while '99' corresponds to the lowest priority. When a program starts and there are others in the same group irrigating, the one with the highest priority irrigates and the others are delayed. As soon as they can start irrigation, the ones that have been delayed the longest will run.

Example

All six programs have the same start time (07:00). Programs 1 and 5 start simultaneously because they belong to different groups and have a higher priority compared to the other programs in the same group.

Program 4 starts after Program 1, because, being in the same group, it has higher priority over Programs 2 and 3.

Programs 2 and 3 have the same priority, but Program 2 starts before 3 because its program number is lower. The same goes for Programs 5 and 6.

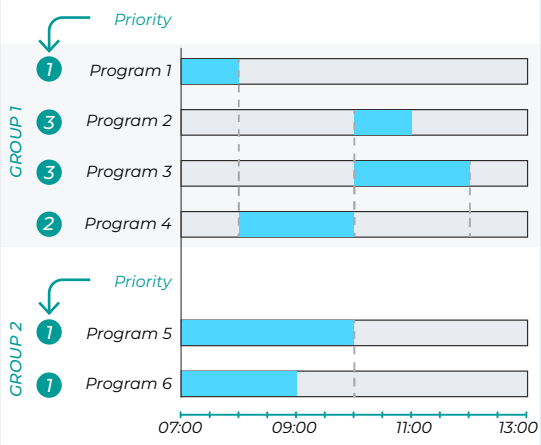


Operative: Exclusive

- Inclusive in normal irrigation: programs from the same group can irrigate at the same time if they have the same priority.
  - Group *(00 ... 99)*: group number to which the program belongs.
    - Two programs from different groups can irrigate at the same time.
    - Two programs of the same group can irrigate at the same time as long as they have the same priority and do not share sectors or fertilizers.
  - Priority *(01 ... 99)*: priority level number assigned to the program. The value '1' corresponds to the highest priority while '99' corresponds to the lowest priority. When a program starts and there is another one from the same group irrigating, the one with the highest priority irrigates and the other is delayed. If they have the same priority, they both irrigate.

Example

All six programs have the same start time (07:00) with the inclusive option and share the same groups and priorities. Unlike the previous example, Programs 2 and 3 start simultaneously as they have the same priority. The same goes for Programs 5 and 6.



Operative: Normal inclusive

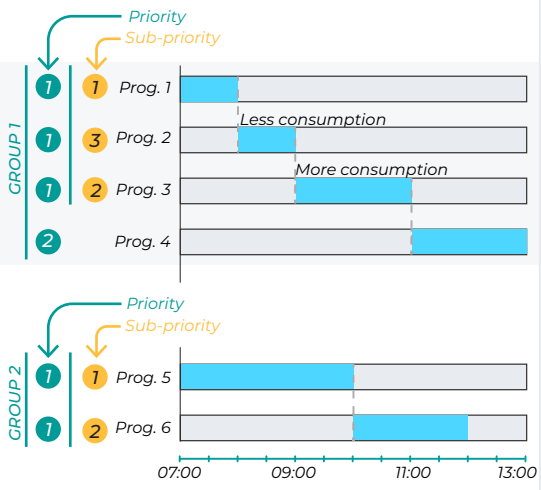
- Inclusive in solar irrigation (only operational with 'Solar function')
  - Group *(00 ... 99)*: group number to which the program belongs.
    - Two programs from different groups can irrigate at the same time.
    - Two programs of the same group can irrigate at the same time as long as they have the same priority, the available power allows it and they do not share sectors or fertilizers with different pH/EC values or proportions.
  - Priority *(01 ... 99)*: priority level number assigned to the program. The value '1' corresponds to the highest priority while '99' corresponds to the lowest priority. When a program starts and there is another one from the same group irrigating, the one with the highest priority irrigates and the other is delayed. If they have the same priority, they both irrigate.
  - Sub-priority *(01 ... 99)*: number of the sub-priority level assigned to the program. The value '1' corresponds to the highest sub-priority while '99' corresponds to the lowest sub-priority. When there is sufficient power, the programs with the highest sub-priority can run. Programs with lower sub-priority can also enter if the higher sub-priority ones consume more of the available power.

Example

The six programs have the same start time (07:00), but programs 1, 2, and 3 share the same priority, with different sub-priorities.

Program 1, having a higher sub-priority, starts before Program 3, but Program 3 starts after Program 2, despite having a sub-priority, because it consumes more than what is available.

Programs 5 and 6 share the same priority, but since Program 5 has a sub-priority of 1 (maximum) with respect to Program 6 with sub-priority of 2, Program 5 enters first.



Operative: Inclusive solar

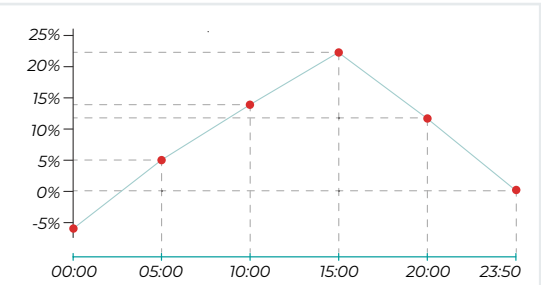
IRRIGATION CURVES

Using the irrigation curve, irrigation and fertilization can be modified depending on the time of day when the program starts. The curves are configured in the programming.

Use irrigation curves *(Yes | No)*: select the option.

- Yes: the program will take the irrigation curve into account. The curve is entered into the programming.
- No: the program does not take the irrigation curve into account. The curve does not appear in the programming.

In the following example, six points are configured that, depending on when the program starts, apply a higher or lower percentage of irrigation, fertilizer and/or frequency of program activations.



Irrigation curve operation

(Pending) Irrigation by Etc *(Yes | No)*: this feature is only possible if irrigation by 'Frequency of days' has been configured and the programmed irrigation units are 'mm', 'm³/ha' or 'm³/h(t)'.

When irrigating by ETc (evapotranspiration of the crop), the objective is to restore the water consumed by the plant. Each irrigation sector is configured with a crop type and parameters from the Cloud (ETo, effective rainfall, vegetative stage day for Kc, correction factor, etc.).

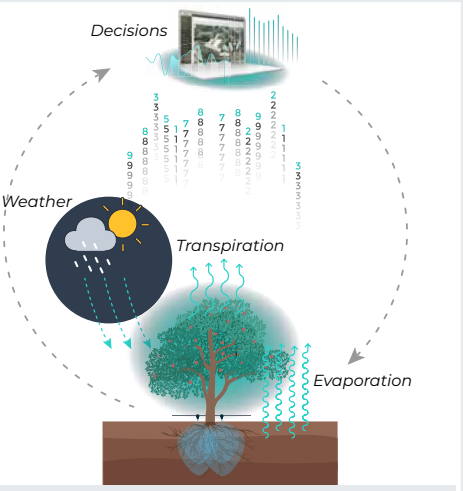
To determine the amount of evaporated water, the evapotranspiration value is received from the cloud in time slots for each sector linked to a crop. This value is corrected by calculating the 'effective rainfall.' When irrigation starts for the first sector of a subprogram, the amount of water is automatically determined.

For each crop, a minimum and maximum irrigation value, as well as safety irrigation in case of communication failure, can be configured from the cloud.

If the program irrigates by 'm³/h' or 'mm', the meter sensors must be configured in the sectors.

If time-based irrigation is required, irrigation can run by 'm³/ha(t)', which, based on the mm of ETc received and the expected sector flows, converts the irrigation value to 'hh:mm'.

Irrigation should start based on a set day frequency and have a single start time. Multiple activations can be configured. In this case, the irrigation value is divided between them. Irrigation curves are not operational under this condition.



Etc Diagram

Text *(0 ... 9 characters)*: program identification text.

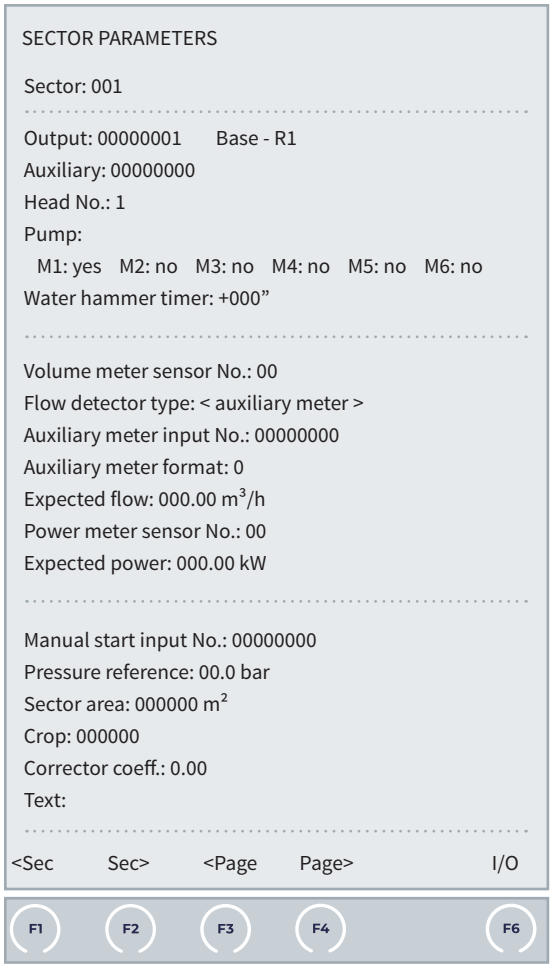
Determining factors *(000 ... 120)*: determining factor number associated with a program. Up to six determining factors can be configured to affect the program.

Use the determining factors to start and stop the program, modify irrigation and fertilization, stop due to alarm, etc. Programs with sequential start cannot have start determining factors.

From this screen, the determining factors associated with the program can be edited or created, the same as in the section 'FUN - 4. Parameters - 6. Determining factors'.

5.3. SECTORS

Sectors are the areas being irrigated, usually controlled by a valve, and where water and fertilizer units are logged. Several variables can be configured for optimal management of the installation. The sectors are configured in the programs.



Sector *(000 ... 400)*: sector number to configure.

Output *(00000000)*: coding of the digital output where the solenoid valve is connected, which may be in the same controller or in remote modules. See the ‘Input and output coding’ section.

This output cannot be assigned to any other sector or general.

Auxiliary *(00000000)*: digital output coding that may be common with other sectors. It activates whenever any of the sectors has it configured and is active.

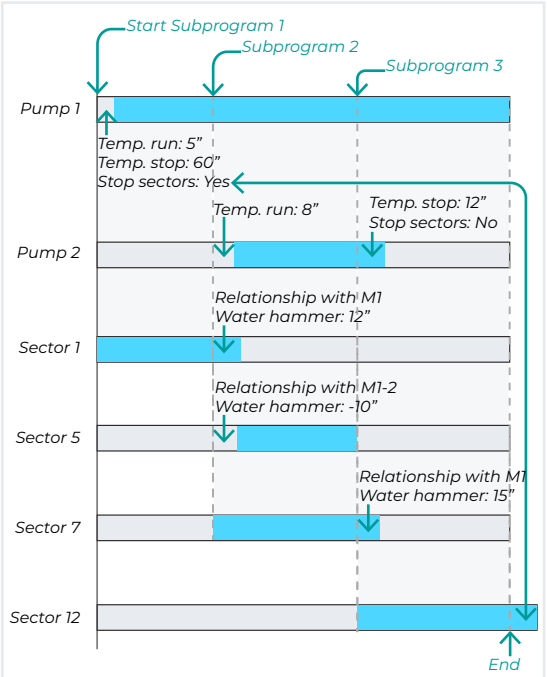
Head No. PV *(0 ... 1 ... 4)*: head number associated with the sector. ‘0’ is not associated with any head and will not fertilize or activate pumps.

M1/2/3/4/5/6 *(Yes | No)*: Enter ‘Yes’ for the sector to activate the pumps. If the sector is not associated with a head, the program does not prompt for pumps.

The pumps are associated with the head.

Water hammer timer: *(-999 ... 000 ... 999)*: seconds delay between opening and closing consecutive sectors and with respect to the general ones.

- Positive value: the valve opens immediately when irrigation starts and remains open for the number of seconds programmed when it ends.
- Negative value: delays opening for the programmed seconds and closes immediately upon completion. An exception may occur if the sector is the last in an irrigation sequence, in which case the pump shutdown delay is applied.



Water hammer timings between sectors

Volume meter sensor No. *(00 ... 80)*: irrigation water meter sensor number. It can be shared by several sectors and the volume is distributed among all those that are open in proportion to the expected flow.

If the auxiliary meter is configured, the meter configured here is not used.

The accumulated total of the meter can be consulted in ‘FUN - 3. Readings - 3. History - 2. Meter sensor’.

FLOW DETECTOR

Each sector can have a sensor that indicates whether water is passing through the sector. This allows for the detection of water flow when the sector is closed (leak) or no water flow when the sector is open. In these cases, a log is recorded and if it is irrigating it can be stopped (temporary stop).

Flow detector type *(Digital detector | Auxiliary meter)*: select the desired option.

- Digital detector: digital sensor of the probe or pressure gage type (pressure detector).
  - Flow detector input No.: digital input coding where the sensor is connected. The detection delay is configured in 'FUN - 4. Parameters - 15. Installer - 4. Sectors - 1. Flow Detector - Delay digital detectors' and is common for all inputs.
- Auxiliary meter: meter sensor that cannot be shared with any other sector. It is used to discount the irrigation volume and total in the sector's history.
  - Auxiliary meter input No.: coding of the digital input where the meter sensor is connected.
  - Auxiliary meter format *(1 ... 4)*: enter the format number previously configured in 'FUN - 4. Parameters - 15. Installer - 4. Sectors - 1. Flow detector - Auxiliary meters format No.'

Expected flow *(000.00 ... 650.00)*: flow, in m^3/h, consumed by the set of drip emitters or sprinklers that irrigate the sector where this flow is assigned. It is used to distribute irrigation and fertilization volumes in the logs of the sectors that irrigate at the same time and share the same general meter.

Important

- If one of the irrigation sectors of the same meter does not have the expected flow configured, the volume is distributed equally to all of them.
- If the sector has its own meter (sector auxiliary meter), the total volume is taken directly from this meter's reading.

Example

Installation with three sectors and two of them are irrigated, Sector 2 and 3, with the following expected flows.

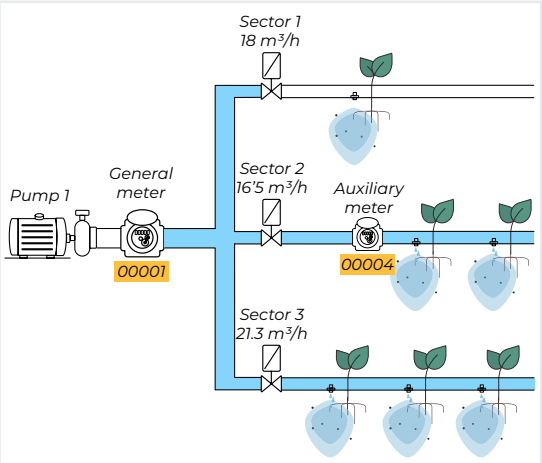
Sector 2: 16.5 m^3/h Sector 3: 21.3 m^3/h

- In irrigation: Sector 2 (auxiliary meter) and Sector 3 (general meter)
- 'General Meter' pulse value: 1000 liters
- 'Auxiliary meter' pulse value: 100 liters

When a pulse is received on the general meter, the controller detects that 1000 liters have passed. Of this amount and according to the planned flow configured, Sector 3 consumes 563.49 liters. The theoretical calculation is as follows:

Total Sector 3: $\frac{1000 \times 21'3\ m^3/h}{16'5 + 21'3\ m^3/h}$:563.49 L

Sector 2 totals the volume detected by its own auxiliary meter. In this case, for each pulse emitted by the general meter, the auxiliary meter emits four pulses.



Distribution of total amounts with two meters

Power meter sensor No. *(00 ... 80)*: the power meter sensor number that is associated with the sector.

The amount of power passing through the electric meter is distributed proportionally to the 'expected consumption' of the sector. The amount of power can be consulted in 'FUN - 4. Readings - 3. History - 1. Sector'.

Expected power *(000.00 ... 650.00)*: corresponds to the power, in kW/h, required to run irrigation according to the expected flow and pressure. It is used for solar irrigation.

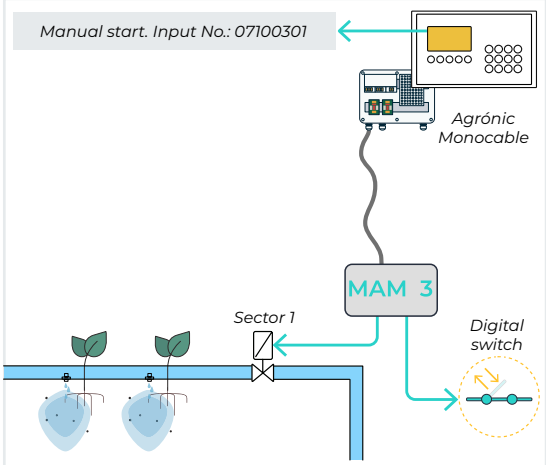
Manual start. Input No. *(00000000)*: digital input coding. Each sector can have a switch connected that starts it manually.

The sector remains in 'Manual - Digital run' as long as the switch activates.

Example

Sector 1 is controlled by a MAM 03 (Monocable Module), which also has a digital sensor connected (digital switch).

- When the switch contact is closed, the sector and the associated pumps activate.
- When the switch contact is open, the sector and the associated pumps stop.



Sector activation by digital input

If a sector has a 'Manual Stop/Start' command, configure it in the section 'FUN - 2. Manual - 8. Sectors', this has a higher priority than the digital input.

Pressure reference *(00.0 ... 25.5)*: pressure, in bar, required to irrigate this sector. It is used to regulate head pressure.

Sector area *(000000 ... 999999)*: Area, in m^2, that the sector will irrigate. The sector area is used when irrigating by m^3/ha or in mm. (1ha = 10000 m^2)

Crop *(000000)*: Crop type that the sector irrigates. A value of '0' indicates that it is not used.

Corrector coefficient *(0.00 ... 2.55)*: corrector coefficient value of the default irrigation value. It is only used if the program where the irrigation sector is configured is by 'm^3/ha' or in 'mm'.

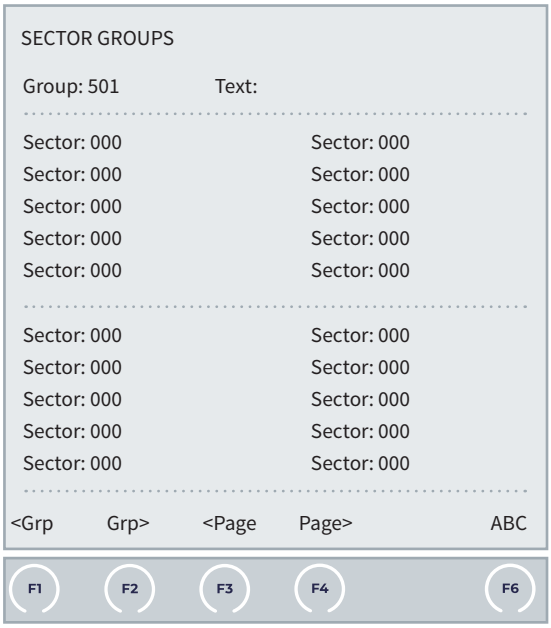
The irrigation amount of the program is multiplied by this coefficient. If a program has more than one sector configured, the coefficient of the first sector is used.

Text *(0 ... 9 characters)*: text identifying the sector.

5.4. SECTOR GROUPS

Configuring sector groups makes it easier to assign more sectors to programs. A total of 40 sector groups can be configured and up to 20 sectors can be grouped in each group.

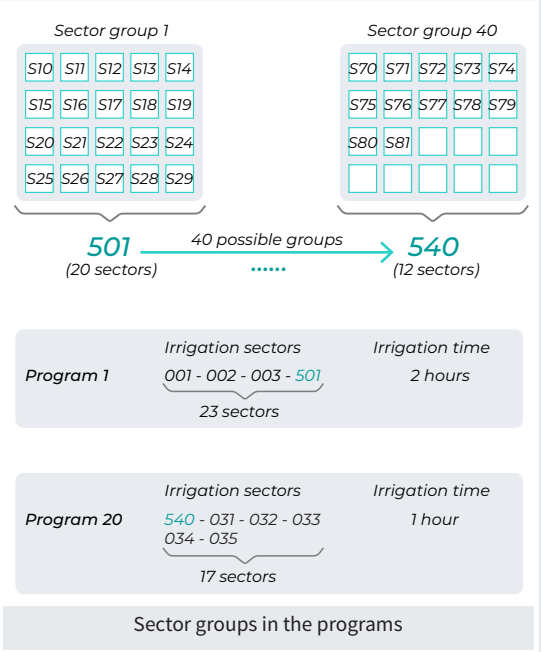
In programming, the group number (501 a 540) is configured in the same way as the individual sector numbers (0 to 400).



Example

In Program 1, there are three sectors configured plus a grouping of sectors (501) made up of 20 sectors. When the program starts, there will be 23 sectors irrigating at the same time for two hours.

In Program 2, the same occurs but with a group (540) of 12 sectors. When the program starts, there will be 17 sectors irrigating for 1 hour.



Sector groups in the programs

Group *(501 ... 540)*: group number to be configured.

Text *(0 ... 9 characters)*: text identifying the group.

Sector *(000 ... 400)*: number of sectors that make up the group. Up to 20 sectors can be configured within a group.

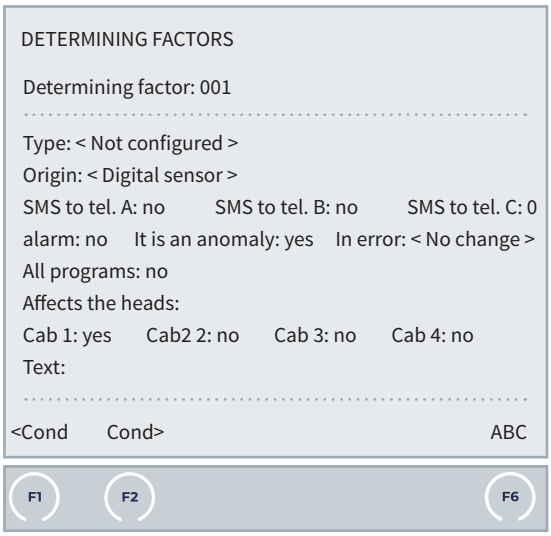
5.5. COMMUNICATIONS

The communications consultation section is detailed in the communications manual *2407*

5.6. DETERMINING FACTORS

The determining factors are controls that act on irrigation programs and logs based on the value or status of the sensors.

A determining factor is assigned a specific operative (stop, start, modify, warning, etc.), an origin (digital, analog, meter, flow sensor, etc.), certain references to be entered in the operatives, the log type and whether an SMS is sent.



Determining factor *(000 ... 120)*: determining factor number to configure.

Type *(Not configured | definitive stop | Temporary stop | Conditional stop | Start | Start/Stop | Warning | Modify irrigation | Modify fert. | Modify freq.)*: operation of the determining factor.

- Not configured: the determining factor is not used.
- Definitive stop: stops irrigation, fertilization or only the pH of the associated programs until manually reset.
- Temporary stop: for irrigation, fertilization or only the pH of the current subprogram or group (in linear programming) for the programs associated with this determining factor. Irrigation continues with the next subprogram or linked program that is not affected by this determining factor.
- Conditional stop: for associated programs while the determining factor is active.
- Start: when the determining factor activates, the associated programs start.
- Start/Stop: when the determining factor activates, the associated programs start and when it is deactivated, they stop.
- Warning: when the determining factor activates or deactivates, a log is recorded.
- Modify irrigation: when a program starts, the irrigation amount can be modified.
- Modify fert.: when a program starts, the EC reference, if fertilizer by EC, or the fertilizer units.
- Modify freq.: when a program starts and it has several activations, the time to enter the next activation can be modified.

Origin *(Digital sensor | Analog sensor | Logical sensor | SC Flow | SC total | Flow error | EC error | pH error | EC 100% | pH 100% | EC safety | pH safety | EC prop. | EC mix error | Drainage error | EC drainage error | pH drainage error | Communication | F. Tank | Meter tank)*: signal type, sensor or output associated with the determining factor.

- Digital sensor: associated with a digital sensor.
- Analog sensor: associated with an analog sensor.
- Logical sensor: associated with a logical sensor. These sensors can act as a digital sensor or as an analog sensor depending on the configuration.
- SC flow: associated with a meter sensor. Use the instantaneous flow reading.
- SC total: associated with a meter sensor. Uses the total.
- Flow error: associated with a meter sensor (high and low flow errors, not receiving pulses when irrigating, receiving pulses when not irrigating).
- EC Error: associated with the analog EC sensor used to regulate EC.
- pH error: associated with the analog pH sensor used to regulate the pH.
- EC 100%: associated with the fertilizer injection output.
- pH 100%: associated with the acid injection output.
- EC safety: associated with the difference between the analog EC regulation and safety sensors.
- pH safety: associated with the difference between the pH regulation and safety analog sensors.
- EC prop.: associated with the actual volume of fertilizers injected to detect that it does not comply

with the proportion.

- EC mix error: associated with the analog EC sensor used for mixing two waters.
- Drainage error: associated with drainage (drained volume/applied irrigation ratio).
- EC drainage error: associated with the analog EC sensor used in drainage.
- pH drainage error: associated with the analog pH sensor that is connected to the drainage.
- Communication: associated with the communication status with the AgroBee-L, Radio and Monocable modules or with the PC-Cloud.
- Schedule: associated with a schedule and days of the week.
- F. tank: associated with a schedule and days of the week.
- Meter tank: associated with one or more fertilizers from a head to determine a decrease in volume.

Depending on the origin of the determining factor, the sensor associated with it is requested. There are cases in which it is not requested because it is associated with an output or because the sensor is already defined by default.

digital sensor number.

Analog sensor No. *(000 ... 120)*: analog sensor number.

Meter sensor No. *(00 ... 80)*: meter sensor number.

Logical sensor No. *(00 ... 20)*: logical digital sensor number.

Type	Stop Definitive	Stop Tempor.	Stop Conditional	Start	Start/ Stop	War- ning	Modify irrigat.	Modify fert.	Modify freq.
Digital sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Analog sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logical sensor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Flow meter sensor	✓	✓		✓	✓	✓			
Total meter sensor	✓	✓		✓		✓	✓	✓	✓
Flow error	✓	✓				✓			
EC error	✓	✓				✓			
pH error	✓	✓				✓			
EC at 100%	✓	✓				✓			
pH at 100%	✓	✓				✓			
EC safety	✓	✓				✓			
pH safety	✓	✓				✓			
EC proportion	✓	✓				✓			
EC mix error	✓	✓				✓			
Drainage error	✓	✓				✓			
EC drainage error	✓	✓				✓			
pH drainage error	✓	✓				✓			
Communication	✓	✓	✓						
Schedule		✓	✓						
Fertilizer tank	✓	✓				✓			
F. tank meter						✓			

PARAMETERS COMMON TO THE DETERMINING FACTORS

SMS to tel. A *(Yes | No)*: when the determining factor activates, send an SMS to phone A.

SMS to tel. B *(Yes | No)*: when the determining factor activates, send an SMS to phone B.

SMS to tel. C *(0 ... 6)*: when the determining factor activates, send an SMS to phone C with the selected text.

alarm *(Yes | No)*: select 'Yes' to activate the alarm output. The alarm is manually deactivated in 'FUN - 2. Manual - 5. Terminate stops and malfunctions'.

It is an anomaly *(Yes | No)*: select 'Yes' to log an anomaly when the determining factor activates.

It is an error *(No change | Not active | Active)*: select the action to take if there is an error in the sensor associated with the determining factor.

- No change: the determining factor maintains the state at the time the sensor fails.
- Not active: the determining factor deactivates.
- Active: the determining factor activates.

All programs *(Yes | No)*:

- Yes: the determining factor is associated with all of the programs of the head indicated below. It is not assigned to 'Start' or 'Start/Stop' types or to fogging.
- No: the determining factor is associated with the desired programs within 'FUN - 4. Parameters - 2. Programs'.

Affects the heads:

- Cab 1/2/3/4 *(Yes | No)*: select 'Yes' for the determining factor to affect the programs or elements that are linked to the head. There is no prompt about the drainage determining factors since they are associated from 'FUN - 4. Parameters - 9. Drainage'.

Text *(0 ... 9 characters)*: text identifying the determining factor.

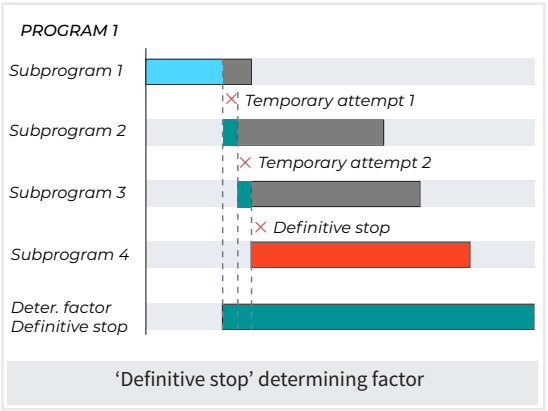
5.6.1 Definitive/Temporary stop

DEFINITIVE STOP

Stops associated programs until manually reset.

To reset it, go to 'FUN - 2. Manual - 5. End Stops and Malfunctions', 'FUN - 2. Manual - 6. Programs' or FUN - 2. Manual - 9. Determining factors'. When it is reset, it also prompts whether to continue with the programs that have been stopped from the point where they were.

It can only be activated if there is an irrigation program associated. A certain number of temporary stops can be made before making a definitive stop.



'Definitive stop' determining factor

Example

Program 1 has four subprograms configured.

When the determining factor activates in Subprogram 1, the scheduler attempts to start the other subprograms. After two temporary attempts (start Subprogram 2 and 3) the 'Definitive stop' determining factor activates.

To reset, the malfunction must be finalized.

TEMPORARY STOP

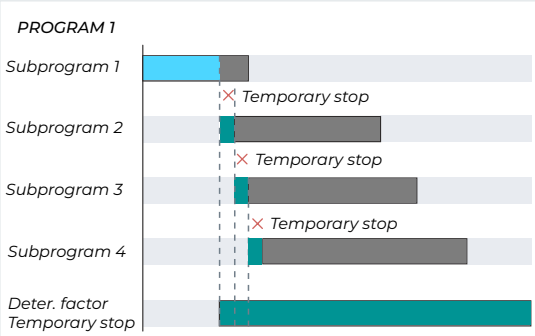
When the temporary stop activates, it ends the irrigation, fertilization or only the pH regulation of the current subprogram or active group to continue with the next one. It can only be activated if there is an irrigation program associated.

Example

Program 1 has four subprograms configured.

When the determining factor activates in Subprogram 1, the controller attempts to start the other subprograms. If it fails, the program ends.

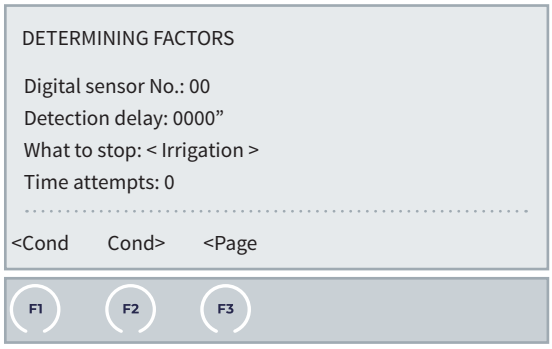
Program 1 restarts when the configured start determining factors are met.



'Temporary Stop' determining factor

The determining factor activates when the digital or analog sensor activates for a configurable time. If it is a logical sensor, it must have a digital output (operation: and/or).

Origin digital sensor / Digital logic



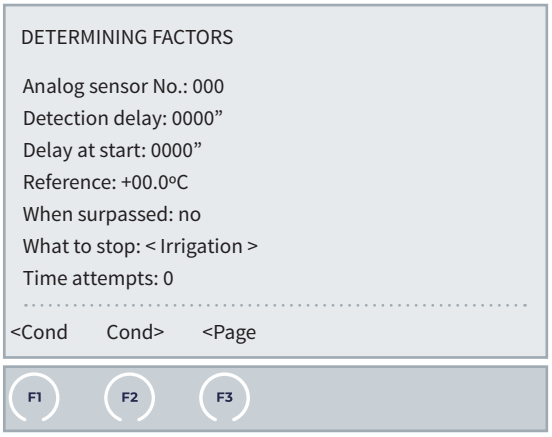
Digital sensor No. *(00 ... 80)*: digital or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Analog sensor origin / Analog logic



Analog sensor No. *(000 ... 120)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in seconds, that must transpire before the determining factor is triggered to activate or deactivate.

Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

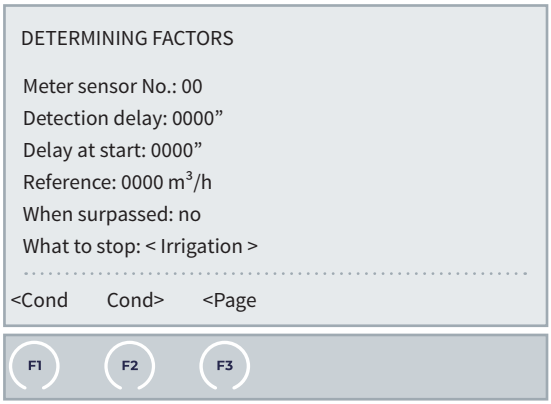
When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Flow meter sensor origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in seconds, that must transpire before the determining factor is triggered to activate or deactivate.

Reference *(0000)*: sensor value from which the determining factor activates or deactivates.

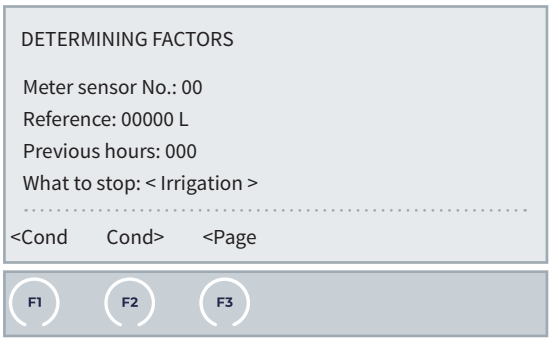
When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Total meter sensor origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

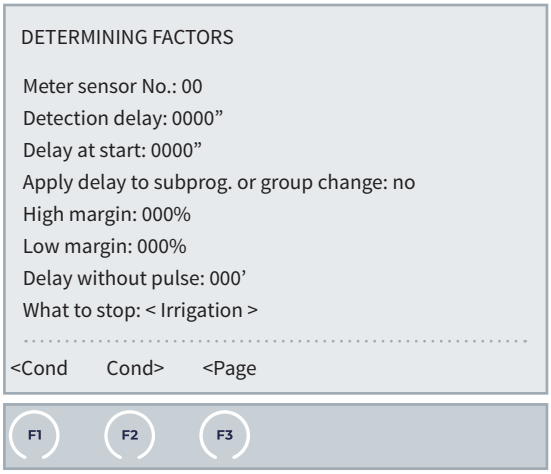
Reference *(00000 ... 65535)*: sensor value, in liters, from which the determining factor activates or deactivates.

Previous hours *(000 ... 250)*: the total of the last few hours is used to calculate the determining factor. The number of hours back to be taken into account is configured here.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Flow error origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in seconds, that must transpire before the determining factor is triggered to activate or deactivate.

Apply delay to subprog. or group change *(Yes | No)*:

- Yes: the start timing is delayed every time the program affected by the subprogram or grouping determining factor changes.
- No: the delay timing at the start is configured when irrigation starts on the meter.

High margin *(000 ... 100)*: the determining factor activates when the instantaneous flow is higher than the expected flow in this %.

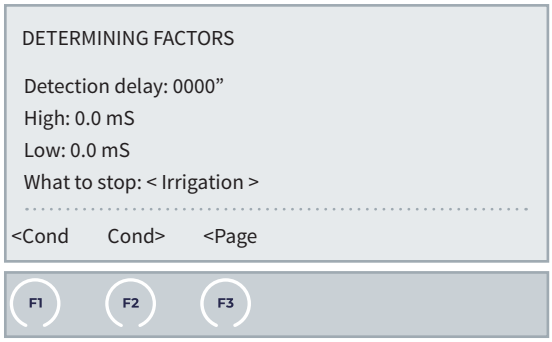
Low margin *(000 ... 100)*: the determining factor activates when the instantaneous flow is lower than the expected flow in this %.

Delay without pulse *(000 ... 255)*: time, in minutes, that must transpire without receiving pulses from the meter to activate the determining factor.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC error origin



The EC error only works when fertilization is by EC regulation. When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

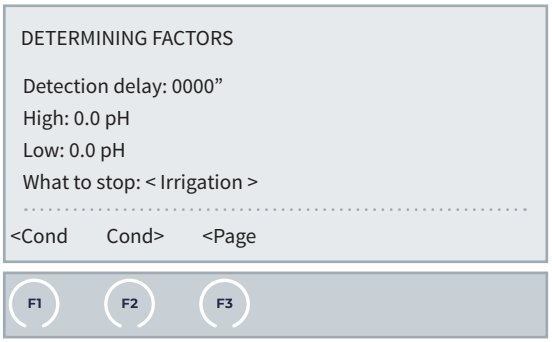
High *(00.0 ... 05.0)*: Margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 05.0)*: Margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

pH error origin



The pH error only works when fertilization is by pH regulation. When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 05.0)*: Margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 05.0)*: Margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

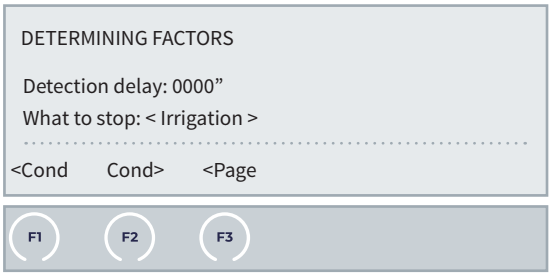
What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

100% EC origin

The determining factor activates when fertilizer or acid is being injected at 100% for a period of time. 100% EC only works when fertilization is by EC regulation.

It is configured to a head and acts whenever fertilization or EC regulation runs.



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

pH origin 100%

The determining factor activates when fertiliser or acid is injected at 100% for a period of time. 100% pH only works when fertilisation is by pH regulation.

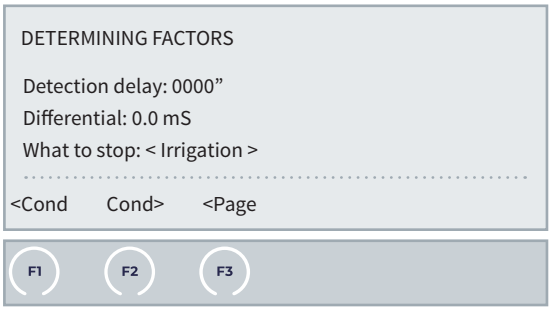
It is configured to a head and acts whenever fertilization or pH regulation runs.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC safety origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

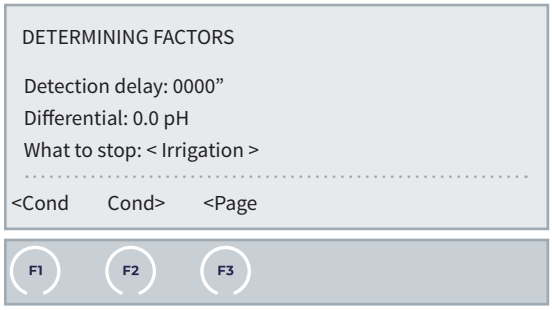
Differential *(00.0 ... 05.0)*: when the difference between the regulation sensor and the safety sensor is greater than this value, the determining factor activates

It is configured to a head and acts whenever fertilization or EC regulation runs.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

pH safety origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

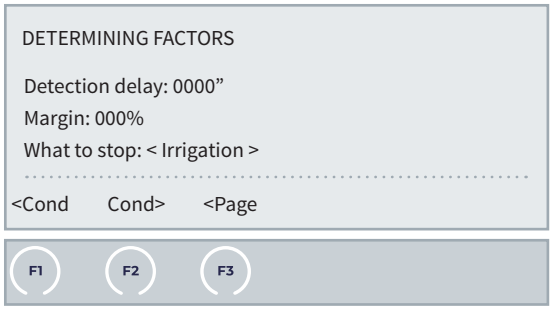
Differential *(00.0 ... 05.0)*: when the difference between the regulation sensor and the safety sensor is greater than this value, the determining factor activates

It is configured to a head and acts whenever fertilization or pH regulation runs.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC proportion origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Margin *(000 ... 100%)*: the determining factor activates when the actual volume applied of any of the fertilizers deviates greater than the % margin of the proportion.

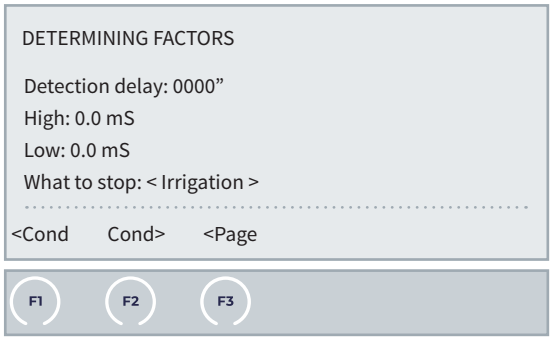
Useful for detecting clogged filters or faulty valves. Meters are required on each of the fertilizers. A ‘detection delay’ of several minutes is recommended to ensure good control.

It is configured to a head and acts whenever EC fertilization runs.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC mix error origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 05.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

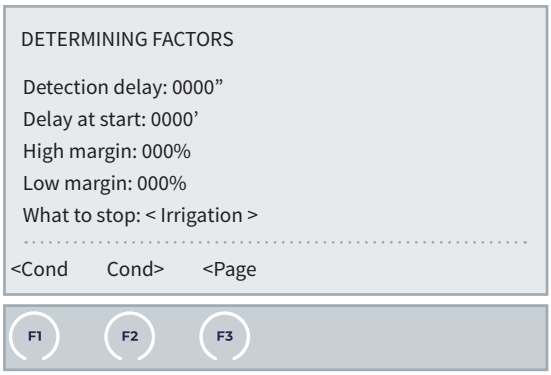
Low *(00.0 ... 05.0)*: margin of error for high alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

It is configured to a head and acts whenever EC fertilization runs.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continue with fertilization and irrigation.

Drainage error origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in minutes, that must transpire before the condition starts to activate or deactivate the determining factor.

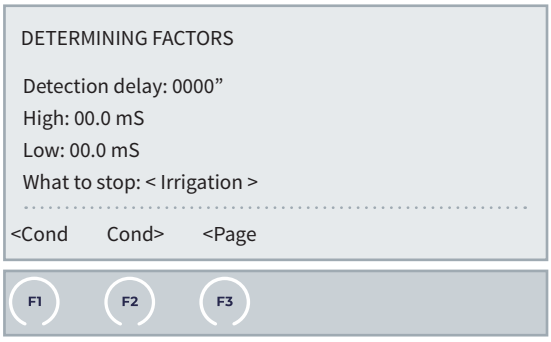
High margin *(00.0 ... 05.0)*: the determining factor activates when the instantaneous flow is higher than the expected flow in this %.

Low margin *(00.0 ... 05.0)*: the determining factor activates when the instantaneous flow is lower than the expected flow in this %.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC drainage error origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

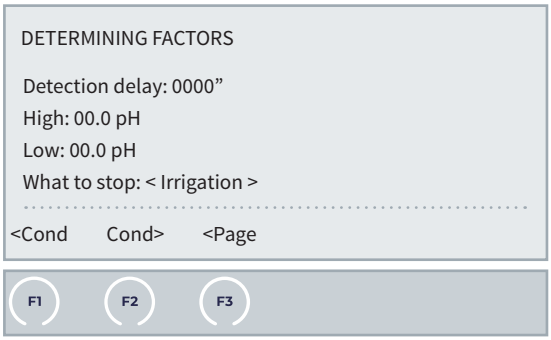
High *(00.0 ... 15.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 15.0)*: margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

EC drainage error origin



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

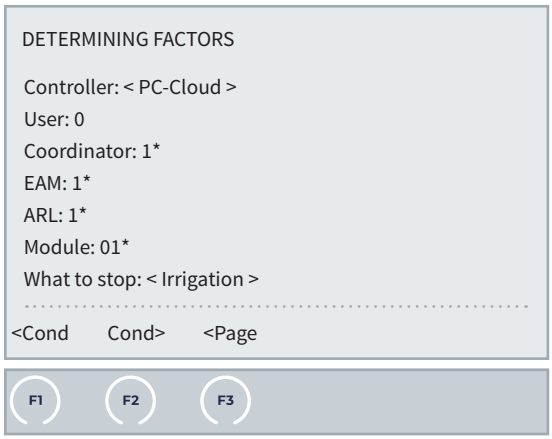
High *(00.0 ... 15.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 15.0)*: margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continue with fertilization and irrigation.

Communication origin



Prompts marked with an '*' are visible depending on the different options selected.

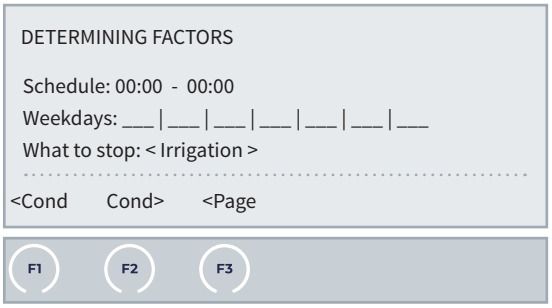
Controller *(PC-Cloud | AgroBee-L | AM120 | AR433)*: select the controller or system to configure.

- PC/Cloud: the determining factor activates when Agrónic does not have communication with Agrónic PC, Agrónic APP or VEGGA.
  - User *(1 ... 3)*: the determining factor activates when there is no communication with the user number selected here.
- AgroBee-L: the determining factor activates when the Agrónic does not have communication with the AgroBee-L system.
  - Coordinator *(1 | 2)*: defines which of the two possible radio coordinators are to be configured.
  - Module *(01 ... 20)*: defines the module number to be configured.
- AM120: the determining factor activates when the Agrónic has no communication with the monocable system.
  - EAM *(1 | 2)*: defines which of the two possible monocable links are to be configured.
  - Module *(001 ... 120)*: defines the module number to be configured.
- AR433: the determining factor activates when the Agrónic has no communication with the radio system.
  - ARL *(1 | 2)*: defines which of the two possible radio links are to be configured.
  - Module *(01 ... 60)*: defines the module number to be configured.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Schedule origin



The affected program stops when the determining factor falls within the time band and on the selected day.

Schedule *(00:00 ... 23:59)*: two schedules are configured in hours and minutes where the time band between the two schedules allows the determining factor to be activated.

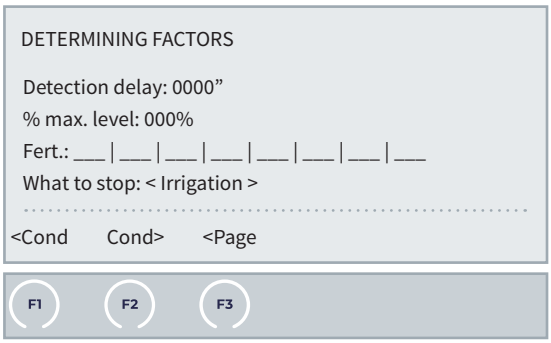
The values '00:00 to 00:00' or also '00:00 to 23:59' conditionally set all hours of the day.

Days of the week *(1=Mon | 2=Tue | 3=Wed | 4=Thu | 5=Fri | 6=Sat | 7=Sun | 8=Daily)*: Select the days of the week. A day of the week match plus a time match will activate the determining factor.

What to stop *(Irrigation | Fertilizer | pH)*: select what you want to stop.

- Irrigation: for irrigation, fertilizer and pH.
- Fertilizer: for fertilizer and continued with acid regulation and irrigation. Not for TF1 and TF2 treatments used for phytosanitary treatments.
- pH: for acid regulation and continues with fertilization and irrigation.

Fertilizer tank origin



The affected program stops when the level of a tank falls below the configured percentage (%).

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

% of maximum level *(000 ... 100)*: margin, in %, of the maximum capacity below which the determining factor activates.

Fert *(1=Fert.1 | 2=Fert.2 | 3=Fert.3 | 4=Fert.4 | 5=Fert.5 | 6=Fert.6 | 7=Fert.7 | 8=Fert.8)*: select the fertilizers to apply the configured %.

Common to all the determining factors of the definitive stop

Temporary attempts *(0 ... 9)*: number of temporary stops before a ‘Definitive Stop’. If the determining factor is assigned to a fogging, this parameter is not used. Once the ‘Definitive Stop’ has occurred, it will not irrigate, fertilize or apply acid again until the user manually resets it in ‘FUN - 2. Manual - 5. End Stops and Malfunctions’ or ‘FUN - 2. Manual - 6. Programs’ or ‘FUN - 2. Manual - 9. Determining factors’.

The number of temporary attempts that are counted can be modified in ‘FUN - 2. Manual - 9. Determining factors’.

5.6.2 Conditional stop

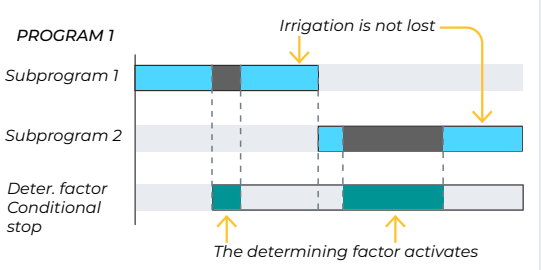
For associated programs while the determining factor is active. When the determining factor changes to ‘Not active’, the program continues at the point where it was.

Example

Program 1 has two subprograms configured.

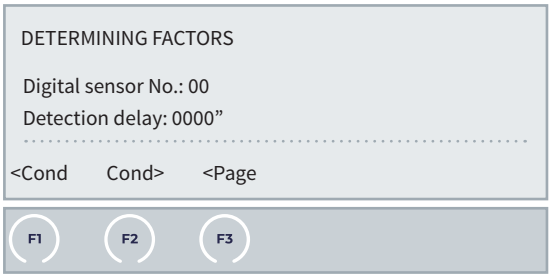
When the determining factor activates in Subprogram 1, irrigation is paused at that point and does not resume until the determining factor is deactivated. The same goes for Subprogram 2.

In this type of ‘Stop’ the irrigation of the programs is not lost.



‘Conditional Stop’ determining factor

Origin digital sensor / Digital logic

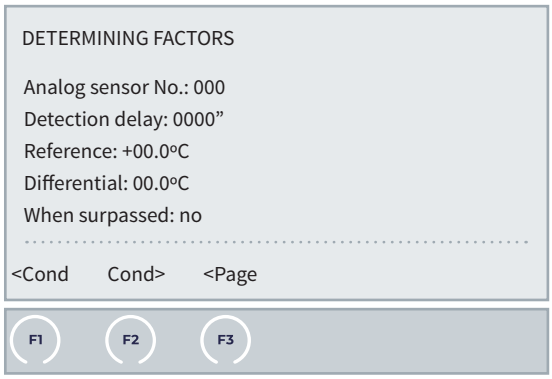


The determining factor activates when the digital sensor activates for a period of time. If it is a logical sensor, its result must be a digital value (on/off).

Digital sensor No. *(00 ... 80)*: digital or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Analog/Logical sensor origin



If it is a logical sensor, its result must be an analog value.

Analog sensor No. *(000 ... 120)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

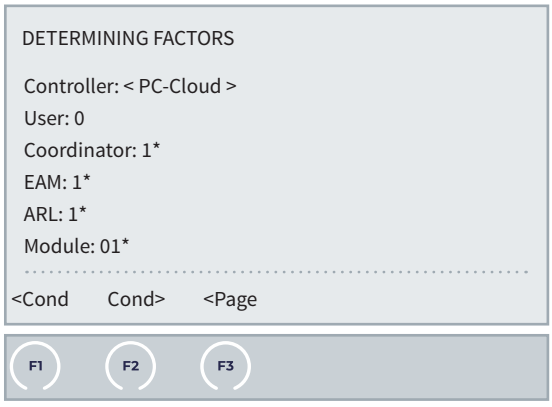
Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

Differential *(00.0)*: margin between activation and deactivation of the determining factor.

When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

Communication origin

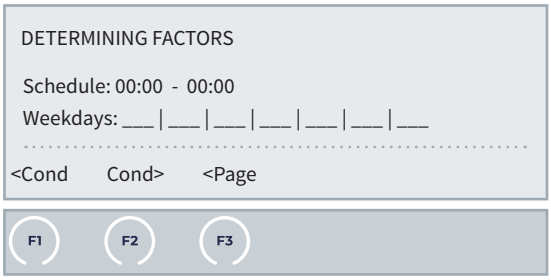


Prompts marked with an ‘*’ are visible depending on the different options selected.

Controller *(PC-Cloud | AgroBee-L | AM120 | AR433)*: select the controller or system to configure.

- PC/Cloud: the determining factor activates when Agrónic does not have communication with Agrónic PC, Agrónic APP or VEGGA.
  - User *(1 ... 3)*: the determining factor activates when there is no communication with the user number selected here.
- AgroBee-L: the determining factor activates when the Agrónic does not have communication with the AgroBee-L system.
  - Coordinator *(1 | 2)*: defines which of the two possible radio coordinators are to be configured.
  - Module *(01 ... 20)*: defines the module number to be configured.
- AM120: the determining factor activates when the Agrónic has no communication with the monocable system.
  - EAM *(1 | 2)*: defines which of the two possible monocable links are to be configured.
  - Module *(001 ... 120)*: defines the module number to be configured.
- AR433: the determining factor activates when the Agrónic has no communication with the radio system.
  - ARL *(1 | 2)*: defines which of the two possible radio links are to be configured.
  - Module *(01 ... 60)*: defines the module number to be configured.

Schedule origin



The affected program stops when the determining factor falls within the time band and on the selected day.

Schedule *(00:00 ... 23:59)*: two schedules are configured in hours and minutes where the time band between the two schedules allows the determining factor to be activated.

The values '00:00 to 00:00' or also '00:00 to 23:59' conditionally set all hours of the day.

Days of the week *(1=Mon | 2=Tue | 3=Wed | 4=Thu | 5=Fri | 6=Sat | 7=Sun | 8=Daily)*: Select the days of the week. A day of the week match plus a time match will activate the determining factor.

5.6.3 Start - Start/Stop

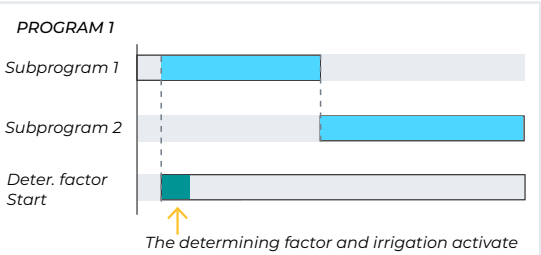
START

Starts the associated programs when the determining factor activates. 'All programs' cannot be selected. It must be assigned to the desired programs.

Example

When the determining factor activates, Program 1 irrigation starts with its two configured subprograms.

Even if the determining factor is deactivated during irrigation, it will not stop.



'Start' determining factor

START/STOP

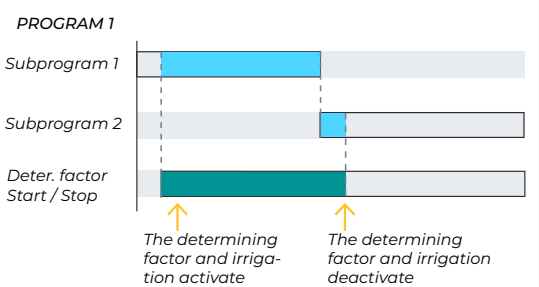
Starts the associated programs when the determining factor activates and stops them when the irrigation units are deactivated or terminated.

The determining factor may restrict its start if the program is not within the active time, active period, specific days of the week, day frequency or calendar schedule.

Example

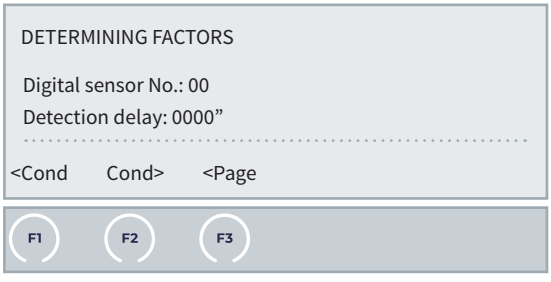
When the determining factor activates, Program 1 irrigation starts with its two configured subprograms.

In Subprogram 2, the determining factor is deactivated and irrigation stops. If the determining factor were to be activated again, irrigation would start from the beginning.



'Start/Stop' determining factor

Origin digital sensor / Digital logic

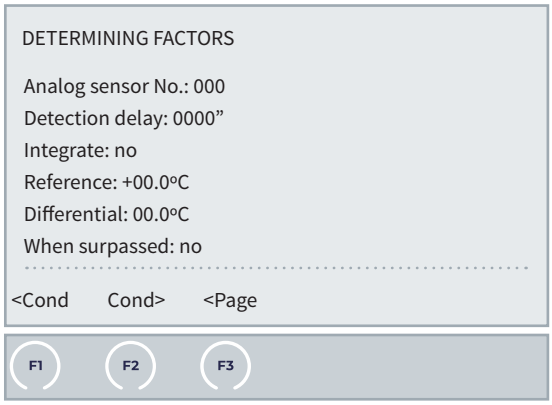


The determining factor activates when the digital sensor activates for a period of time. If it is a logical sensor, its result must be a digital value (on/off).

Digital sensor No. *(00 ... 80)*: digital or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Analog/Logical sensor origin



If it is a logical sensor, its result must be an analog value.

Analog sensor No. *(000 ... 120)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Integrate *(Yes | No)*: when working by integration, it is very important to associate the determining factor to a single program. Outside of active program hours, the integration value is ‘ 0 ’. Within the schedule, it integrates until irrigation starts and the integration value is reset to integrate again.

- Yes: the determining factor takes the integrated value into account.
- No: the determining factor takes the instantaneous value into account.

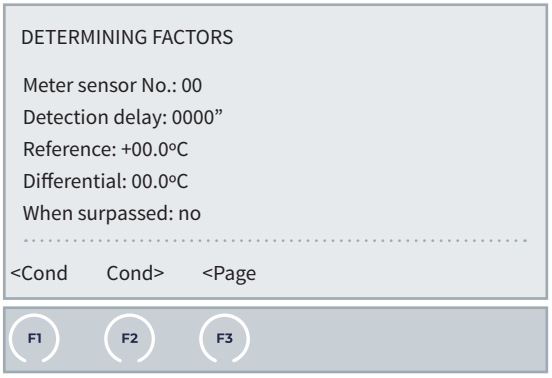
Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

Differential *(00.0)*: margin between activation and deactivation of the determining factor.

When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

Flow meter sensor origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

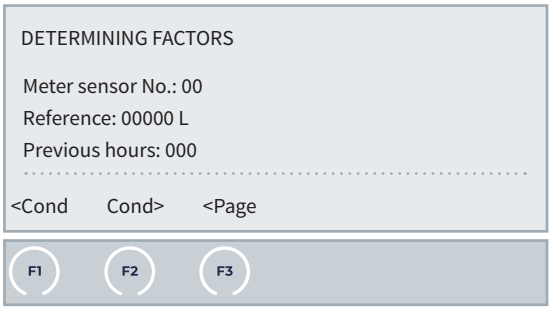
Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

Differential *(00.0)*: margin between activation and deactivation of the determining factor.

When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

Total meter sensor origin



This origin is only available for the start determining factor.

Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Reference *(00000 ... 65535)*: volume, in liters, from which the determining factor activates.

Previous hours *(000 ... 250)*: number of hours backwards that must be considered to calculate the determining factor, using the total of the last hours.

5.6.4 Warning

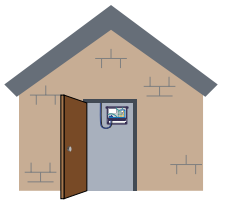
The warning determining factor does not act on programs. It only records a log when it activates and another when it deactivates. This log can be used to send an SMS (only when enabled and not when disabled).

With the warnings, anti-theft, anti-freeze, warn about pipe breaks, errors in meters, etc. can be configured.

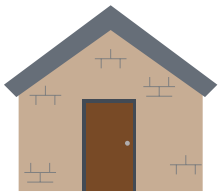
Example

When the head or hydrant door is opened, the determining factor with a digital sensor origin activates and logged.

When the door is closed, the determining factor deactivates and also records a log.



The warning determining factor activates

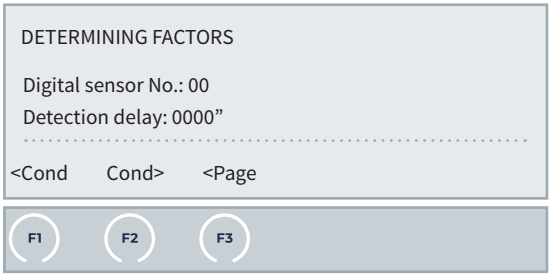


The warning determining factor deactivates

'Warning' determining factor

Origin digital sensor / Digital logic

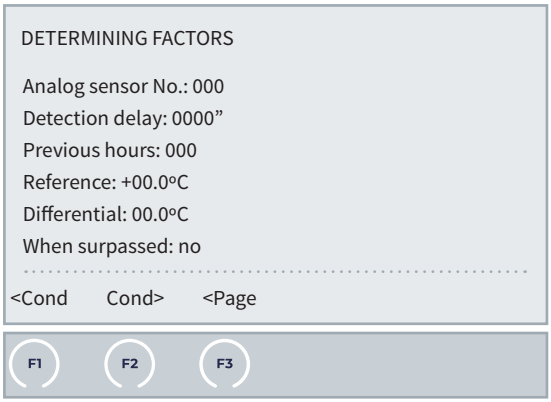
The determining factor activates when the digital sensor activates for a configurable period of time. If it is a logical sensor, it must have a digital output (operation: and/or).



Digital sensor No. *(00 ... 80)*: digital or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Analog sensor origin / Analog logic



Analog sensor No. *(000 ... 120)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Previous hours *(000 ... 250)*: number of hours that the determining factor will integrate. If the value is left at '000', it does not integrate and uses the last sensor reading. The integration value increases every 10 minutes, only for the analog sensor. When integration is performed, the detection delay is not applied.

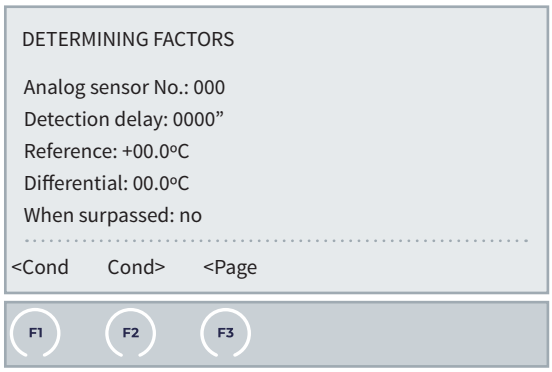
Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

Differential *(00.0)*: margin between activation and deactivation of the determining factor.

When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

Flow meter sensor origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

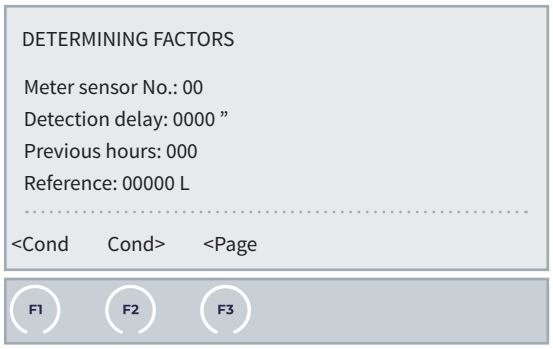
Reference *(00.0)*: sensor value from which the determining factor activates or deactivates.

Differential *(00.0)*: margin between activation and deactivation of the determining factor.

When surpassed *(Yes | No)*:

- Yes: the determining factor activates if the sensor value is higher than the configured reference.
- No: the determining factor activates if the sensor value is lower than the configured reference.

Total meter sensor origin



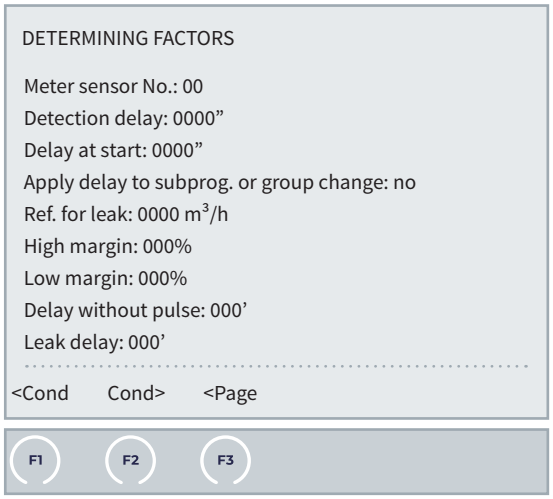
Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Previous hours *(000 ... 250)*: number of hours backwards that must be considered to calculate the determining factor, using the total of the last hours.

Reference *(00000 ... 65535)*: volume, in liters, from which the determining factor activates.

Flow error origin



Meter sensor No. *(00 ... 80)*: meter sensor number that has been previously configured associated with this determining factor.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in seconds, that must transpire before the determining factor is triggered to activate or deactivate.

Apply delay to subprog. or group change *(Yes | No)*:

- Yes: the start timing is delayed every time the program affected by the subprogram or grouping determining factor changes.
- No: the delay timing at the start is configured when irrigation starts on the meter.

Ref. for leak *(0000 ... 9999)*: if there is no irrigation order using the meter, the leak control will run, generating an alert when the leak flow reference is exceeded.

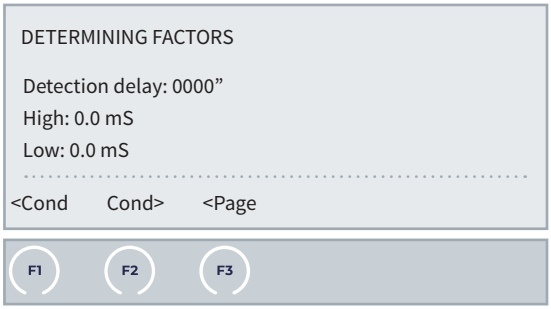
High margin *(000 ... 100)*: the determining factor activates when the instantaneous flow is higher than the expected flow in this %.

Low margin *(000 ... 100)*: the determining factor activates when the instantaneous flow is lower than the expected flow in this %.

Delay without pulse *(000 ... 255)*: time, in minutes, that must transpire without receiving pulses from the meter to activate the determining factor.

Leak delay *(000 ... 255)*: time, in minutes, that the leak flow must remain for the warning to be given.

EC error origin



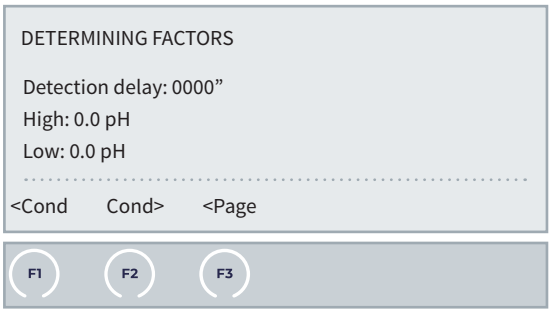
The EC error only works when fertilization is by EC regulation. When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 05.0)*: Margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 05.0)*: Margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

pH error origin



The pH error only works when fertilization is by pH regulation. When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

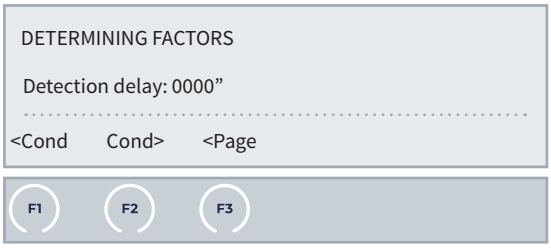
High *(00.0 ... 05.0)*: Margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 05.0)*: Margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

100% EC origin

The determining factor activates when fertilizer or acid is being injected at 100% for a period of time. 100% EC only works when fertilization is by EC regulation.

It is configured to a head and acts whenever fertilization or EC regulation runs.



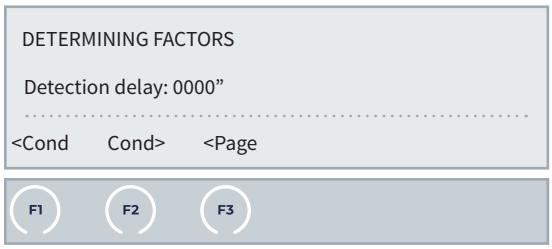
Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

pH origin 100%

This determining factor must be assigned to a program for it to act.

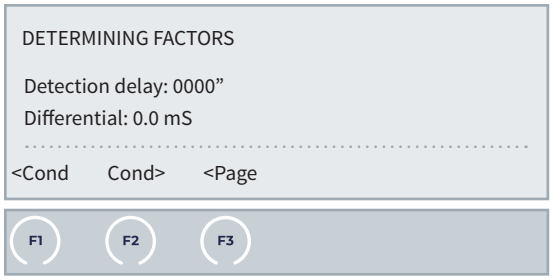
The determining factor activates when fertilizer or acid is being injected at 100% for a period of time.

When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.



Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

EC safety origin

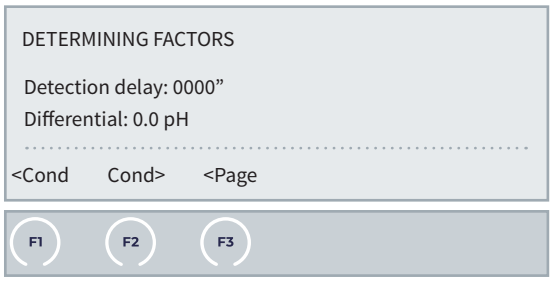


Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Differential *(00.0 ... 05.0)*: when the difference between the regulation sensor and the safety sensor is greater than this value, the determining factor activates

When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

pH safety origin

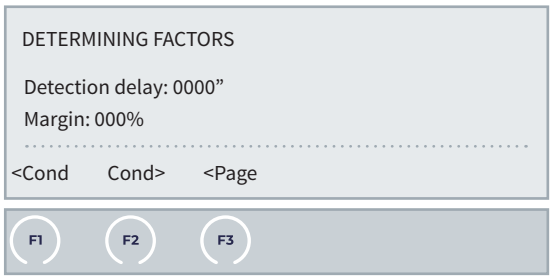


Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Differential *(00.0 ... 05.0)*: when the difference between the regulation sensor and the safety sensor is greater than this value, the determining factor activates

When configuring the determining factor, the head it is linked to is indicated. It cannot be assigned to multiple heads at the same time.

EC proportion origin



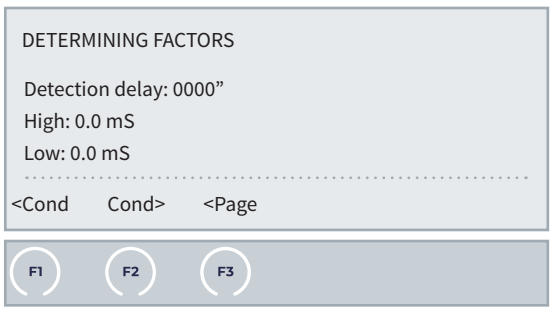
Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Margin *(000 ... 100%)*: the determining factor activates when the actual volume applied of any of the fertilizers deviates greater than the % margin of the proportion.

Useful for detecting clogged filters or faulty valves. Meters are required on each of the fertilizers. A ‘detection delay’ of several minutes is recommended to ensure good control.

It is configured to a head and acts whenever EC fertilization runs.

EC mix error origin



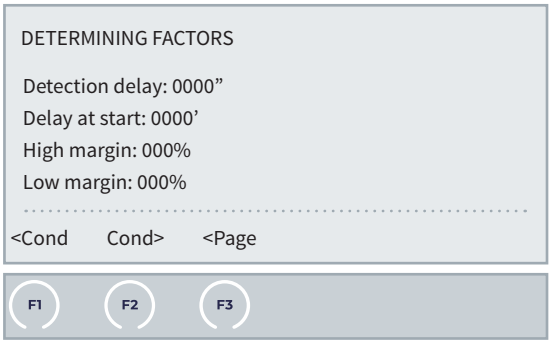
Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 05.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 05.0)*: margin of error for high alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

It is configured to a head and acts whenever EC fertilization runs.

Drainage error origin



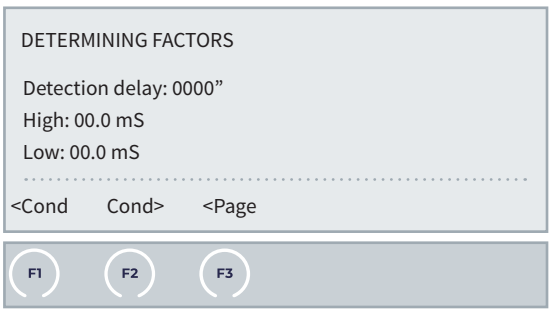
Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Delay on start *(0000 ... 9999)*: time, in minutes, that must transpire before the condition starts to activate or deactivate the determining factor.

High margin *(00.0 ... 05.0)*: the determining factor activates when the instantaneous flow is higher than the expected flow in this %.

Low margin *(00.0 ... 05.0)*: the determining factor activates when the instantaneous flow is lower than the expected flow in this %.

EC drainage error origin

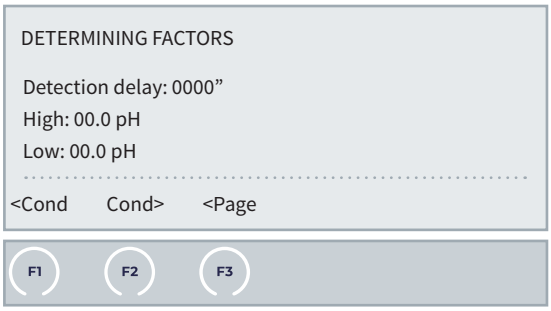


Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 15.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 15.0)*: margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

Origin of drainage pH error

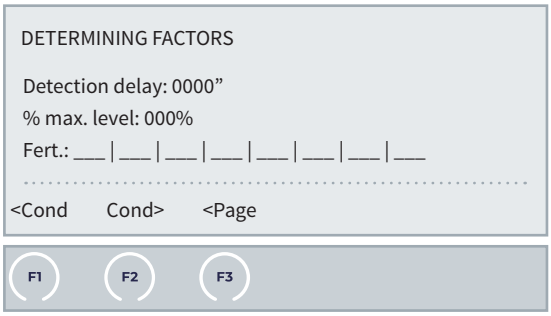


Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

High *(00.0 ... 15.0)*: margin of error for high alarm. This value is added to the reference. If the reading on the regulation sensor is higher than this value, the determining factor activates.

Low *(00.0 ... 15.0)*: margin of error for low alarm. This value is subtracted from the reference. If the reading on the regulation sensor is lower than this value, the determining factor activates.

Fertilizer tank origin



The affected program stops when the level of a tank falls below the configured percentage (%).

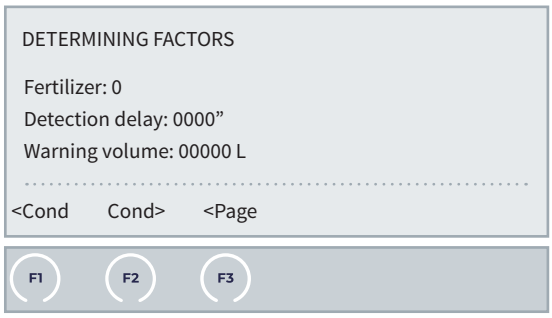
Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

% of maximum level *(000 ... 100)*: margin, in %, of

the maximum capacity below which the determining factor activates.

Fert *(1=Fert.1 | 2=Fert.2 | 3=Fert.3 | 4=Fert.4 | 5=Fert.5 | 6=Fert.6 | 7=Fert.7 | 8=Fert.8)*: select the fertilizers to apply the configured %.

Origin fertilizer tank meter



A warning is generated when the level of a tank falls below the configured reference volume in litres. Control is based on the volume that passes through the meter associated with the fertilizer.

Fertilizer *(0 ... 8)*: margin, in %, of the maximum capacity below which the determining factor activates.

Detection delay *(0000 ... 9999)*: time, in seconds, that the condition must remain in order to activate or deactivate the determining factor.

Warning volume *(00000 ... 65535)*: level, in liters, below which the warning is generated.

To configure the current tank volume (for example after refilling), enter a manual command in ‘FUN - 2. Manual - 9. Determining factors’.

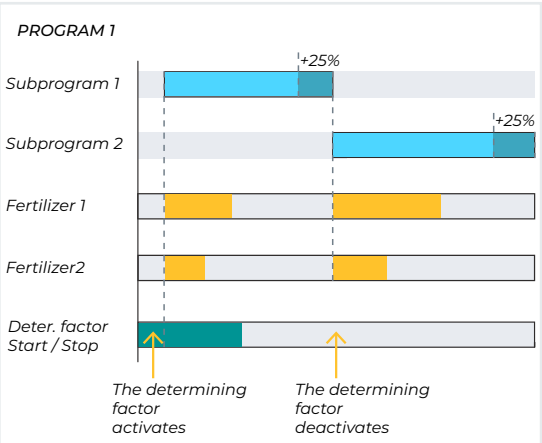
5.6.5 Modify irrigation / fertilizer / frequency

MODIFY IRRIGATION

Increase or decrease the irrigation units depending on the value of the determining factor. The modification is made when the program starts.

Example

When Program 1 starts, the determining factor with digital sensor origin activates and applies 25% more irrigation to the configured units.



‘Modify irrigation’ determining factor
Digital sensor origin: +025%

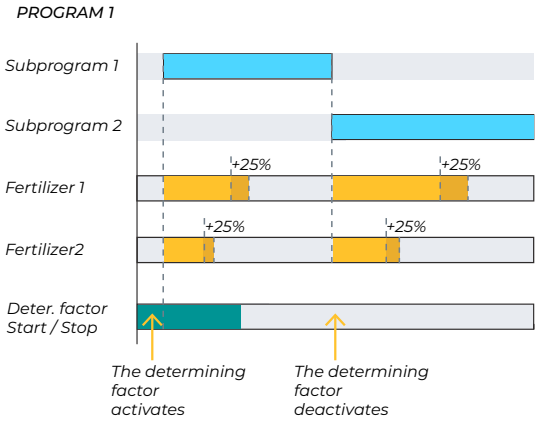
MODIFY FERTILIZER

- If fertilization is by EC: increase or decrease the EC reference depending on the value of the determining factor.
- If fertilizer is uniform: increase or decrease the fertilizer units depending on the value of the determining factor.

The modification is made when the program starts.

Example

When Program 1 starts, the determining factor with digital sensor origin activates and applies 25% more fertilizer to the configured units.



'Modify fertilizer' determining factor
Digital sensor origin: +025%

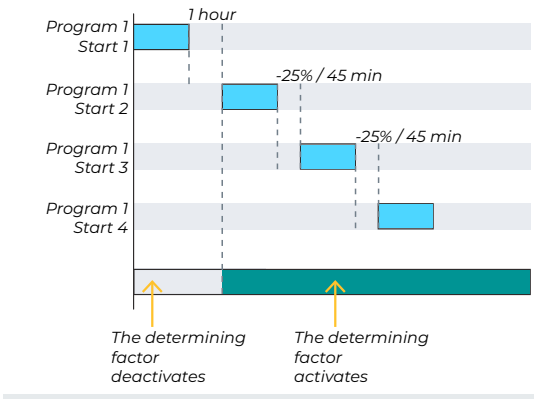
MODIFY FREQUENCY

If the program has several activations, the time between starts increases or decreases depending on the value of the determining factor.

The modification is made for each activation, according to the value integrated in the previous hours or the instantaneous time is modified for the next activation.

Example

Program 1 starts four times every hour but on the third activation, when the determining factor activates, the time between starts reduces by 25% to 45 minutes.



'Modify frequency' determining factor
Digital sensor origin: -025%

Origin digital sensor / Digital logic

DETERMINING FACTORS

Digital sensor No.: 00
% to modify: 000%

<Cond Cond> <Page

F1 F2 F3

The determining factor activates when the digital sensor activates for a period of time. If it is a logical sensor, its result must be a digital value (on/off).

Digital sensor No. *(00 ... 80)*: digital or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

% to modify *(000 ... 100)*: if the determining factor activates when the program starts, it adjusts the irrigation, fertilizer or activation frequency according to the indicated percentage, whether positive or negative.

Analog sensor origin / Analog logic

DETERMINING FACTORS

Analog sensor No.: 000
Previous hours: 000
Point 1:
  Reference: 0000 W/m²
  % to modify: +000%
Point 2:
  Reference: 0000 W/m²
  % to modify: +000%

<Cond Cond> <Page

F1 F2 F3

Analog sensor No. *(000 ... 120)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Previous hours *(000 ... 250)*: number of hours backwards that must be considered to calculate the determining factor, using the total of the last hours.

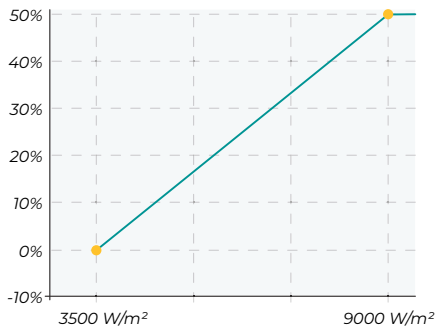
Reference *(0000)*: start and end values of the integration line.

% to modify *(000 ... ± 100)*: start and end values of the irrigation, fertilizer or frequency modification line.

Example

The determining factor will be active as long as the sensor value is between 3500 and 9000 W/m².

The % to be modified, between 0% and 50%, is the percentage based on the sunlight detected.



'Modify irrigation' determining factor
Analog sensor origin

Analog sensor origin / Analog logic

DETERMINING FACTORS

Meter sensor No.: 00
Previous hours: 000
Point 1:
  Reference: 000 L
  % to modify: +000%
Point 2:
  Reference: 000 L
  % to modify: +000%

<Cond Cond> <Page

F1 F2 F3

Meter sensor No. *(00 ... 80)*: analog or logical sensor number *(00 ... 20)* which has been previously configured associated with this determining factor.

Previous hours *(000 ... 250)*: number of hours backwards that must be considered to calculate the determining factor, using the total of the last hours.

Reference *(000)*: start and end values of the integration line.

% to modify *(000 ... ± 100)*: start and end values of the irrigation, fertilizer or frequency modification line.

5.7. SENSORS

```
SENSOR PARAMETERS

1 Digital
2 Analog
3 Meters
4 Logical
```

There are four sensor types:

- Digital *(00 ... 80)*: on/off sensors connected to digital inputs.
- Analog *(000 ... 120)*: current (4-20 mA) or voltage (0-20 V) sensors connected to analog inputs.
- Meters *(00 ... 80)*: sensors for measuring volume (water, fertilizer, rain, etc.) or quantities (electricity). They can be connected to digital, analog, ModBus, virtual or calculated inputs. (Meters specific to each sector are not included)
- Logical *(00 ... 20)*: sensors whose value is obtained by applying mathematical or logical operations to the value of other sensors or determining factors.

5.7.1 Digital sensors

A digital sensor acts by opening and closing a contact (pressure gages, thermostats, tank levels, open door detector, etc.)

```
DIGITAL SENSOR PARMETERS

Sensor: 00

<Sen        Sen>
```

F1 F2

```
DIGITAL SENSOR PARAMETERS

Sensor: 01

Input No.: 00000000
State, normally open: yes
Log: no
Text:

Related determining factors:

<Sen        Sen>        <Page        Page>                I/O
```

F1 F2 F3 F4 F6

Input No. *(00000000)*: digital input No. where the sensor is connected. See the section 'Input and output coding' or press the 'F6' key with the text 'I/O' to access a form that will guide you step by step to easily encode the value.

Status, normally open *(Yes | No)*:

- Yes: the sensor marks ' 1 ' when there is continuity between 'CD' and the configured digital input
- No: the sensor marks ' 0 ' when there is no continuity between 'CD' and the configured digital input.

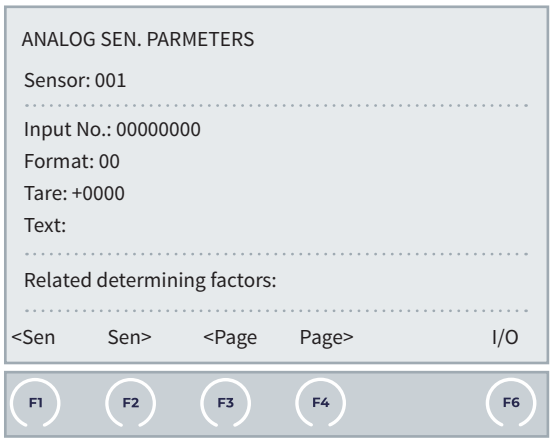
Log *(Yes | No)*: Selecting 'Yes' logs the sensor status change in the action log. It is logged every time the sensor state changes.

Text *(0 ... 9 characters)*: sensor identification text.

5.7.2 Analog sensors

An analog sensor acts by delivering a current or voltage proportional to what it measures (temperature, radiation, pressure, wind, humidity, etc.).

SENSORS



Input No. *(00000000)*: analog input number where the sensor is connected. See the section 'Input and output coding' or press the 'F6' key with the text 'I/O' to access a form that will guide you step by step to easily encode the value.

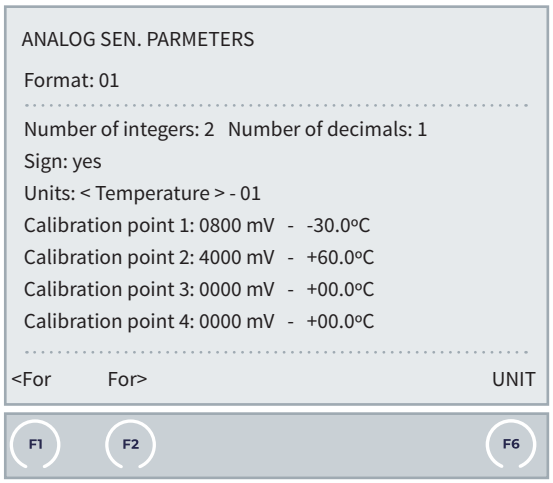
Format *(01 ... 31)*: number of the format used by the previously configured sensor. Pressing the 'F6' key with the text 'List' shows a pop-up form for selection. There are internal sensors or AgroBee-L sensors whose format is configured automatically.

Tare : value, positive or negative, to be added or subtracted from the sensor reading.

Text *(0 ... 9 characters)*: sensor identification text.

FORMATS

The format indicates the sensor units and the relationship between the voltage read by the input and the sensor reading values.

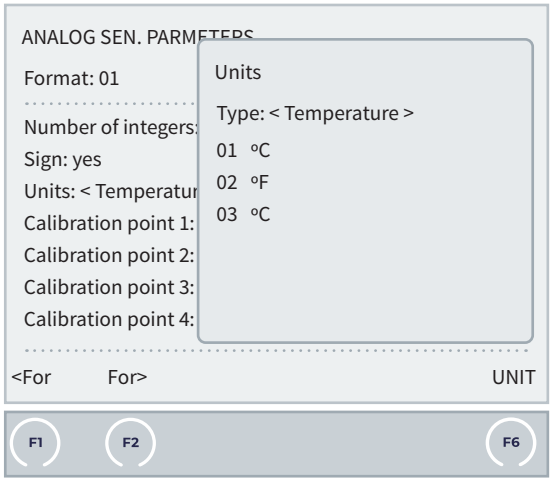


Format *(01 ... 31)*: sensor number to be configured.

Sign *(Yes | No)*:

- Yes: the sensor reading may be negative.
- No: the sensor reading is always positive.

Units *(Select type)*: descriptive text of the units. Select the 'Type' and index within each family or access the pop-up form by pressing the 'F6' key.



- Generic:
  - 01: No text
  - 02 (%): Percentage
  - 03 (u): Units
- Temperature:
  - 01 (ºC): Degrees Celsius

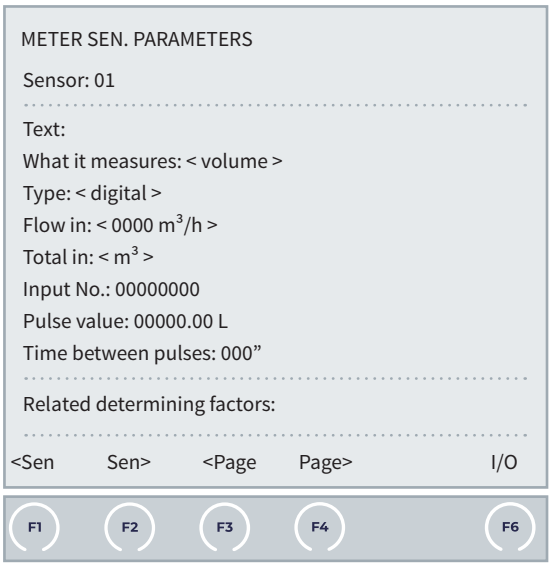
  - 02 (ºF): Degrees Fahrenheit
  - 03 (ºC): Thermal sensation
- Humidity:
  - 01 (%HR): Relative humidity
- Speed:
  - 01 (m/s): Meters per second
  - 02 (km/h): Kilometers per hour
  - 03 (rps): Revolutions per second
  - 04 (rpm): Revolutions per minute
- Volume:
  - 01 (m^3): Cubic meter
  - 02 (L): Liter
  - 03 (mL): Milliliter
  - 04 (l/m^2): liters per square meter
  - 05 (mm): Millimeters
- Flow:
  - 01 (m^3/h): Cubic meters per hour
  - 02 (m^3/s): Cubic meters per second
  - 03 (L/h): Liters per hour
  - 04 (L/s): Liters per second
  - 05 (GPM): Gallons per minute
- Mass:
  - 01 (g): Gram
  - 02 (kg): Kilogram
  - 03 (mg): Milligram
  - 04 (mol): Amount of substance
- Density:
  - 01 (kg/m^3): Kilogram per cubic meter
  - 02 (ppm): Part per million
  - 03 (mg/L): Milligrams per liter
- Force:
  - 01 (N): Newton
- Area:
  - 01 (m^2): Square meters
  - 02 (a): Area (1a = 100 m^2)
  - 03 (ha): Hectare (1 ha = 10000 m^2)
- Angle:
  - 01 (º): Sexagesimal degree
  - 02 (rad): Degree radian
- Pressure:
  - 01 (bar): Cubic meters per hour
  - 02 (cbar): Cubic meters per second
  - 03 (mbar): Liters per hour
  - 04 (Pa): Liters per second
  - 05 (kPa): Gallons per minute
  - 06 (mH2O): Water column
  - 07 (mm Hg): Mercury column
- Light:
  - 01 (W/m^2): Solar radiation
  - 02 (Lux): Brightness
  - 03 (J/cm^2): Solar energy
  - 04 (WH/m^2): Solar energy
  - 05 (NDVI): Normalized difference vegetation index
  - 06 (PRI): Photochemical reflectance index
  - 07 (UVI): UV index
- Frequency:
  - 01 (Hz): Hertz
- Power:
  - 01 (W): Watts
  - 02 (kW): Kilowatts
  - 03 (mW): Milliwatts
  - 04 (VA): Volt-ampere
  - 05 (W/h): Watts per hour
  - 06 (kW/h): Kilowatt per hour
- Voltage:
  - 01 (V): Volt
  - 02 (mV): Millivolt
- Current:
  - 01 (A): Amp
  - 02 (mA): Milliamp
- Resistance:
  - 01 (ohm): Ohm
- Meter Water:
  - 01 (%): Soil moisture
  - 02 (m^3/m^3): Cubic meter per cubic meter
  - 03 (VWC): Volumetric water content

Calibration points : There are up to four calibration points, allowing non-linear sensors to be configured. If they are not used, they can be left at 0.

- Actual value *(0000 ... 4000)*: analog input reading in millivolts. If it is by current, it must be converted taking into account that there is a resistance of 200 ohm. (4 mA=800 mV - 20 mA=4000 mV)
- Logical value *(0000)*: logical value that corresponds to the previous real value. It goes in the previously defined units and format.

FORMATS – Default configuration											
No.	Units	Description	Sign Integers Decimals	P1 Real (mV)	P1 Logic	P2 Real (mV)	P2 Logic	P3 Real (mV)	P3 Logic	P4 Real (mV)	P4 Logic
1	°C	Temperature	+/- 3.1	800	-30.0	4000	+60.0	0	0	0	0
2	W/m²	Radiation	4.0	800	0	4000	2000	0	0	0	0
3	cbar	Soil moisture	3.1	800	0	2326	40.2	3422	85.5	4000	120.0
4	%RH	Relative humidity	3.0	800	0	4000	100	0	0	0	0
5	km/h	Speed	3.0	800	0	4000	160	0	0	0	0
6	%	Percentage	3.0	800	0	4000	100	0	0	0	0
7	u	Units	4.0	0	0	5000	5000	0	0	0	0
8	mm	Distance	3.0	800	0	4000	100	0	0	0	0
9	L	Volume	4.0	800	0	4000	1000	0	0	0	0
10	L/m²	Precipitation	2.1	800	0	4000	20.0	0	0	0	0
11	m³/h	Flow	3.1	800	0	4000	200.0	0	0	0	0
12	bar	Pressure	2.1	800	0	4000	16.0	0	0	0	0
13	mS	Conductivity	2.1	800	0	4000	20.0	0	0	0	0
14	pH	Acidity	2.1	800	0	4000	14.0	0	0	0	0
15	mm/d	Evaporation	1.2	800	0	4000	5.00	0	0	0	0
16	º	Direction	3.0	800	0	4000	360	0	0	0	0
17	rpm	Revolutions	4.0	800	0	4000	5000	0	0	0	0
18	mm	Movement	+/-1.1	800	-2.5	4000	+2.5	0	0	0	0
19	V	Voltage	2.1	800	0	4000	50.0	0	0	0	0
20	%	Soil moisture content	3.0	800	0	4000	50	0	0	0	0
21	mA	Current	2.2	0	0	4000	20.00	0	0	0	0

5.7.3 Meter sensors



A meter sensor receives information about the volume and flow of water passing through the pipe. In the case of rain gauges, about the rainfall or the volume drained, and in the case of power meters, about the power consumed in a period and the power currently being consumed.

The meter sensors can be connected to a digital input (digital meter), to a digital frequency input (frequency meter and rainfall gage), to an analog input (analog meter) or read from another electronic device via RS485 and ModBus protocol.

Sensor *(01 ... 80)*: meter sensor number to be configured.

Text *(0 ... 9 characters)*: sensor identification text.

What it measures *(volume | power | units)*: meter sensors can measure liquid volumes or power quantities.

- Volume: measures volume and flow.
  - Flow: units in which the flow is displayed.
    - 0000 m^3/h *(0000 ... 9999)*: cubic meters per hour.
    - 000.0 m^3/h *(000.0 ... 999.9)*: cubic meters per hour.
    - 00.00 m^3/h *(00.00 ... 99.99)*: cubic meters per hour.
    - 0000 L/h *(0000 ... 9999)*: liters per hour.
    - 000.0 L/h *(000.0 ... 999.9)*: liters per hour.
    - 00.00 L/h *(00.00 ... 99.99)*: liters per hour.
    - 0000 m^3/s *(0000 ... 9999)*: cubic meters per second.
    - 000.0 m^3/s *(000.0 ... 999.9)*: cubic meters per second.
    - 00.00 m^3/s *(00.00 ... 99.99)*: cubic meters per second.
    - 0000 L/s *(0000 ... 9999)*: liters per second.
    - 000.0 L/s *(000.0 ... 999.9)*: liters per second.
    - 00.00 L/s *(00.00 ... 99.99)*: liters per second.
  - Total *(m^3 | L | cl):* units in which the volume total in history is displayed.
- Power *(0000 | 000.0 | 00.00):* measures the amount of power in kW/h.
- Units *(0000 ... 9999):* units per hour (U/h) in which it is displayed. The total is always logged in units (U).

Type *(digital | analog | frequency | sum)*:

- Digital: the meter closes a contact, producing a pulse each time a known volume of water passes. The flow is calculated by counting the time between two pulses. It must be connected to a digital input on the Agrónic or external modules.

```
Type: < digital >
Flow in: < 0000 m³/h >
Total in: < m³ >
Input No.: 00000000
Pulse value: 00000.00 L
Time between pulses: 000”
```

  - Input No. *(00000000)*: Digital input No. where the meter is connected.
  - Pulse value *(00000.00 ... 90000.00)*: value or power that each pulse measures.
  - Time between pulses *(000 ... 999)*: maximum time that must transpire between pulses. If more than this time passes after receiving a pulse, the instantaneous flow rate or energy flow drops to 0.
- Analog: the meter has a 4-20 mA analog output that indicates the flow passing through the pipe at any given time. It must be connected to an analog input of the Agrónic or external modules.

Type: < analog >
Flow in: < 0000 m^3/h >
Total in: < m^3 >
Input No.: 00000000
Calibration point 1: 0000 mV - 0000 m^3/h
Calibration point 2: 0000 mV - 0000 m^3/h

- Input No. *(00000000)*: analog input number where the meter is connected.
- The two calibration points establish the relationship between mA and the flow or power flow.
  - Actual value *(0000 ... 4000)*: value, in millivolts, read by the analog input.
  - Logical value *(0000 ... 9999)*: value displayed on the screen when the previously entered real value is read in the analog input.

- Frequency: the meter has an impeller that delivers a pulse train (frequency) proportional to the flow rate passing through. It must be connected to a digital input that is suitable for reading frequencies.
  - Agrónic 4500 Base: It can be connected from digital input 1 to digital input 9 and/or 12.
  - Agrónic 4000 Base: It can be connected from digital input 1 to digital input 7.

Type: < frequency >
Flow in: < 0000 m^3/h >
Total in: < m^3 >
Input No.: 00000000
Cycles per Liter/W: 0000.000 Hz

- Input No. *(00000000)*: Digital input No. where the meter is connected.
- Cycles per Liter *(0000.000 ... 1500.00)*: frequency, in hertz, emitted by the meter for each unit of volume or power that passes. (Maximum instantaneous frequency per second of 500 Hz)

- Sum: sum of multiple meters. It must be taken into account that the total amount and the flow do not exceed the maximum permitted amounts. The sum will be of all the meter sensors that are between the first and the last. All sensors that are part of the sum must measure the same thing (volume or power) and have the same flow or power flow format.

Type: <sum>
Total in: < m^3 >
First sensor: 01
Last sensor: 00

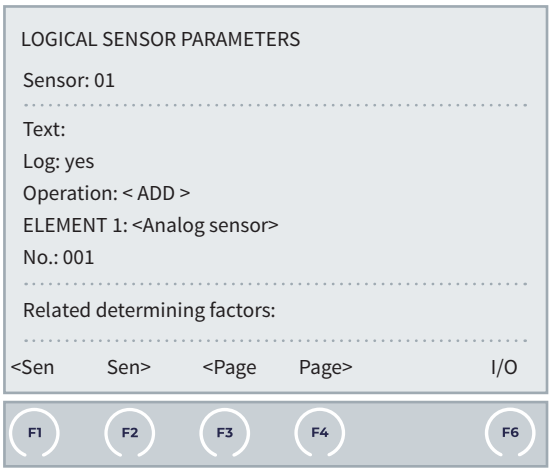
- First sensor *(01 ... 80)*: number of the first sensor of the sum.
- Last sensor *(01 ... 80)*: number of the last sensor of the sum.

- Rainfall gage: the rainfall gage has a tipping cup that fills with rain or drainage. It is automatically emptied when it is full, generating a pulse. Each pulse is equivalent to a quantity of water per m^2. It must be connected to a digital input that is suitable for this type of pulse.

Type: < rainfall gage >
Flow in: < 000.00 L/m^2 >
Input No.: 00000000
Pulse value: 00.00

- Input No. *(00000000)*: digital input number where the rainfall gage is connected.
- Pulse value *(00.00 ... 99.99)*: amount of rainfall, in liters/m^2 or mm, corresponding to each filling of the rainfall gage tipping cup.

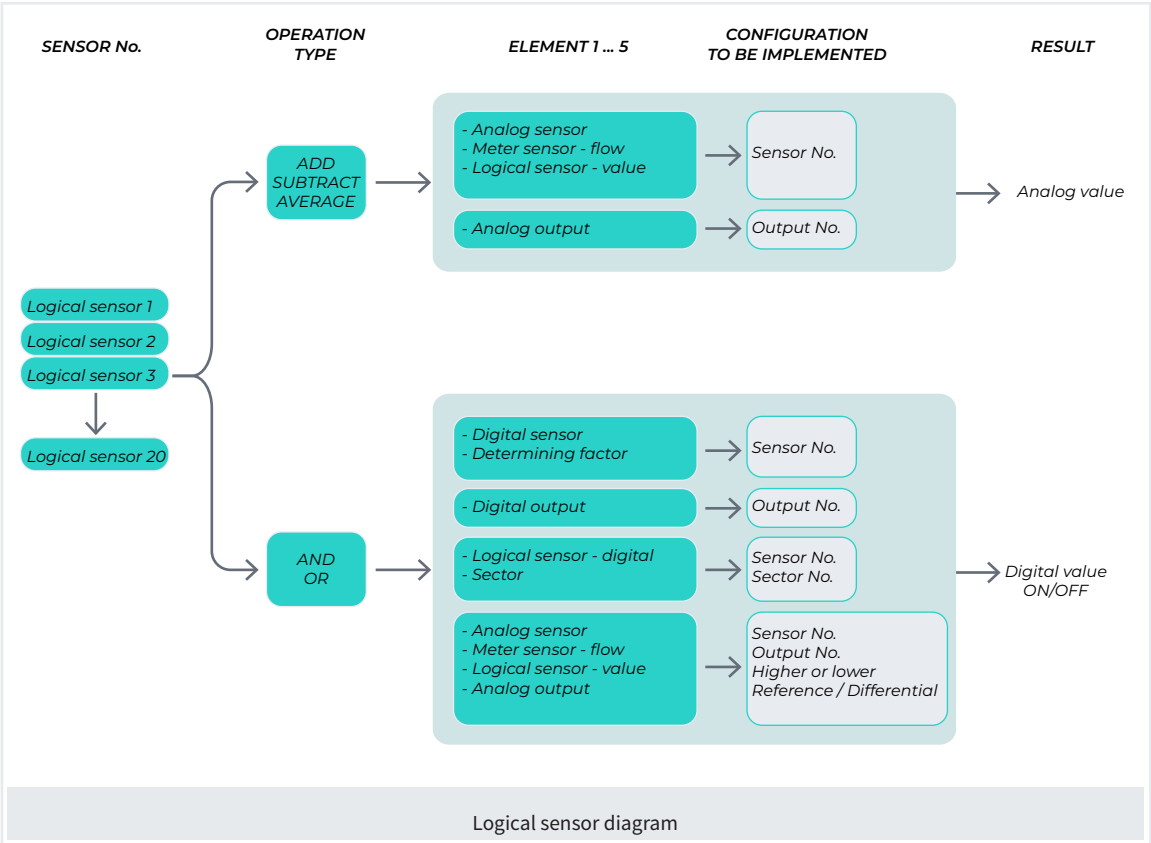
5.7.4 Logical sensors



The value of logical sensors is obtained by applying mathematical operations (addition, subtraction, average) or logical operations (and, or) to the values of elements such as sensors, sectors, determining factors, outputs, etc. The result or output can be a digital on/off value or an analog value. Its state can be applied to a determining factor or another logical sensor. If the result is a digital value, it can be assigned to an output of the Agrónic.

Up to five elements and one operation can be configured for each logical sensor.

This functionality enables the controller to determine actions by reading several simultaneous values.



Logical sensor diagram

Sensor *(01 ... 20)*: logical sensor number to be configured.

Log *(No | Yes)*: 'Yes' to log the sensor value in history. If the result is a digital value, each status change is logged; if the result is an analog value, the average, the maximum and the minimum value for the 10 minutes are logged every 10 minutes.

Text *(0 ... 9 characters)*: sensor identification text.

Operation *(add | subtract | average | and | or)*: select the desired operation.

- Add: adds the values of the selected elements. The inputs must be analog values and all have the same format and units. The result is an analog value.
- Subtract: subtracts the rest of the selected elements from the first element. The inputs must be analog values and all have the same format and units. The result is an analog value.
- Average: average of the values of the selected elements. The inputs must be analog values and all have the same format and units. The result is an analog value.

- And: logical operation. Inputs must be digital values. The result is a digital value.
- Or: logical operation. Inputs must be digital values. The result is a digital value.

FOR EACH ELEMENT

Each element can have five inputs or elements. All five must have the same type of output (digital or analog value) and the analog sensors must also have the same format.

The following must be configured for each input or element:

Element type 1 *(Digital sensor | Determining factor | Digital output | Logical sensor | Sector | Analog sensor | Flow meter sensor | Logical-value sensor | Analog output)*: select the required type.

- Digital sensor: whether the digital sensor is activated or deactivated (on/off) is taken into account.
- Determining factor: whether the determining factor is activated or deactivated (on/off) is taken into account.
- Digital output: whether the digital output is activated or deactivated (on/off) is taken into account.
- Logical sensor: whether another logical sensor is activated or deactivated (on/off) is taken into account.
- Sector: whether the sector is activated or deactivated (on/off) is taken into account.
- Analog sensor: the resulting value is taken into account (add, subtract or average) or if the configured greater/less determining factor is met (on/off).
- Flow meter sensor: the resulting value is taken into account (add, subtract or average) or if the configured greater/less determining factor is met (on/off).
- Logical-value sensor: the resulting value is taken into account (add, subtract or average) or if the configured greater/less determining factor is met (on/off).
- Analog output: the resulting value is taken into account (add, subtract or average) or if the configured greater/less determining factor is met (on/off).

The 'And / Or' operation, using the 'Determining factor: Active / Not Active' prompt, indicates when the status of the element is considered valid to meet the condition.

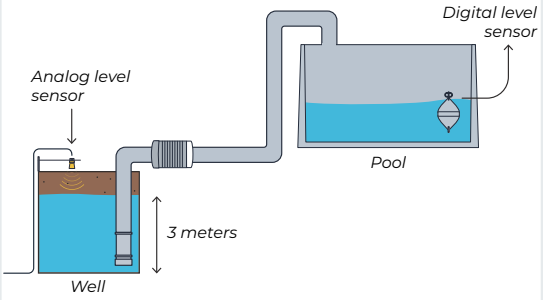
Element number: element number to configure. Depending on the input type, the number will correspond to the analog sensor, the meter sensor, the logical sensor, the determining factor or the sector. Input limit varies by type.

- Output *(00000000)*: output number to activate when the result of the operation is a digital value (on/off). This output must not be configured in any sector or general output.

Example 1

The pond filling program only starts when the following two determining factors are met:

- The digital sensor on the pool activates, indicating a low level.
- The analog well sensor measures a level greater than 2 meters.



1 *Configuration of the two sensors (analog and digital), from 'FUN - 4. **Parameters** - 7. Sensors'.*

2 *Checking the sensor reading from '**Consultation** - 7. Sensors'.*

3 *Logical sensor configuration from '**FUN - 4. Parameters - 7. Sensors - 4. Logic**'.*

LOGICAL SENSOR PARAMETERS

Sensor: 01

Text: Filled
Log: yes
Operation: < AND >
Output to activate: 00000000
ELEMENT 1: < Digital sensor>
No.: 001
Determining factor: <Active>

ELEMENT 2: <Analog sensor>
No.: 001
Determining factor: <higher>
Reference: 2000 mm Differential: 0000 mm

4 *Create the determining factor to start the filling program when logical sensor 01 activates.*

DETERMINING FACTORS

Determining factor: 001

Type: <Start>
Origin: <Logical sensor>
Logical sensor No.: 01
Detection delay: 0010”

5 *Associate the created determining factor with the desired program number to start to fill the pool. Go to ‘**FUN - 4. Parameters - 2. Programs**’.*

PROGRAM PARAMETERS

Program: 01

Determining factors:
001 Filling

Logical ‘AND’ sensor configuration for filling from the pool

LOGICAL SENSOR PARAMETERS

Sensor: 02

Text: Average humidity
Log: yes
Operation: < AVERAGE >
ELEMENT 1: <Analog sensor>
No.: 003

ELEMENT 2: <Analog sensor>
No.: 004

4 *Create the determining factor to receive the notification when the value is less than 15% humidity.*

DETERMINING FACTORS

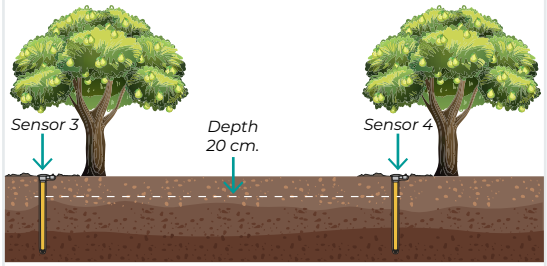
Determining factor: 002

Type: <Warning>
Origin: <Logical sensor>
Logical sensor No.: 02
Detection delay: 0010”
Previous hours: 000
Reference: 15.0 %
Differential: 00.0 %
When surpassed: no

Configuring the logical sensor ‘AVERAGE’ to receive a warning when the value falls below the reference.

Example 2

To receive a notification when the average soil moisture at two points is less than 15% and at a depth of 20 cm.



1 *Configuring the two analog sensors, from ‘FUN - 4. **Parameters - 7. Sensors - 2. Analog**’.*

2 *Checking the sensor reading from ‘**Consultation - 7. Sensors**’.*

3 *Logical sensor configuration from ‘**FUN - 4. Parameters - 7. Sensors - 4. Logic**’.*

5.8. FOGGERS

Hydro Function

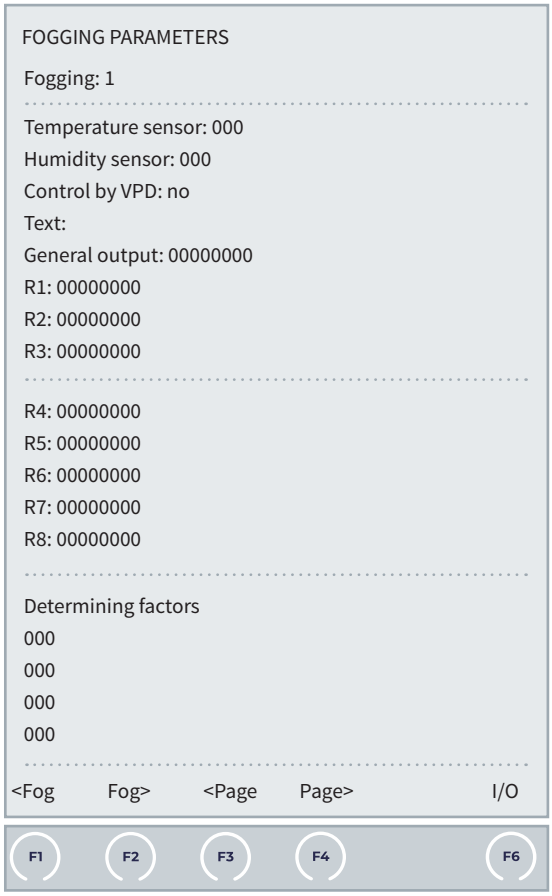
Fogging is used to cool and increase humidity in greenhouses by applying pressurized water. It can be controlled by VPD (vapor pressure deficit), by temperature and/or humidity or by a determining factor.

Up to eight different foggings can be created. In each one, a maximum of eight outputs are configured, which activate sequentially for the time indicated. When it ends, there is a pause time before the cycle starts again.

The pause time can be automatically modified based on the value of the sensors. See the 'Fogging' section of the User Manual.

Fogging can be started in two ways:

- Automatic: when, within an active schedule, it is activated by a determining factor or falls outside of the specified temperature, humidity or VPD ranges.
- Manual: in the section 'FUN - 2. Manual - 12. Foggings' are configured to 'Manual: Run'. Determining factors or sensors don't have to be configured to start manually.



Fogging *(0 ... 8)*: Number of foggings to be configured.

Temperature sensor *(000 ... 120)*: temperature sensor number.

Humidity sensor *(000 ... 120)*: humidity sensor number.

Control by VPD *(No | Yes)*: to control by 'Vapor pressure deficit' when both sensors (temperature and humidity) have been configured, the VPD is calculated in units of '00.0 kPa'.

Text *(0 ... 9 characters)*: fogger identification text.

General output *(00000000)*: output number that activates whenever fogging is running.

Output R1 to R8 *(00000000)*: there can be up to eight outputs for each fogger, each with its activation time. Enter the output to be activated here. These outputs activate sequentially.

Determining factors *(000 ... 120)*: determining factor number that affects fogging, with the option to configure up to four determining factors.

The determining factors that can be assigned to a fogger are 'Definitive stop', 'Conditional stop', 'Start' and 'Start/Stop'.

For a determining factor to affect a fogger it must be assigned here.

> **Important**
>
> - The determining factors that are marked for all programs do not affect fogging.
> - The 'Definitive stop' determining factor does not take any temporary attempts assigned to it into account.

Automatic fogging can be controlled by humidity and temperature sensors or a VPD sensor calculated by Agrónic.

In both cases and from the section 'FUN - 5. Fogging' A reference value and a regulation band are configured in the fogging program. For temperature, the band is added to the reference value. For humidity, it is subtracted.

If the sensor values are within this range, the system adjusts the pause between activations proportionally according to the percentage configured in 'Modify Pause.'

If the values are outside of the range, that percentage is applied directly.

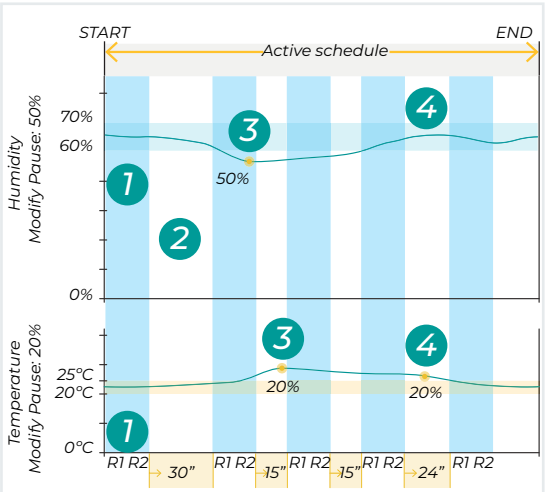
If humidity as well as temperature are out of range, the highest 'Modify Pause' value is used.

This information is explained in further detail in the fogging section of the user manual.

Example 1

Between a configured active schedule, fogging runs with two outputs, each operating for 10 seconds. In each fogging cycle (20 seconds in total), a 30 second pause is configured. The following are also configured:

- A humidity reference of 70% with a 10% band (range between 60% and 70%).
- A temperature reference of 20ºC with a 5ºC band (range between 20ºC and 25ºC).



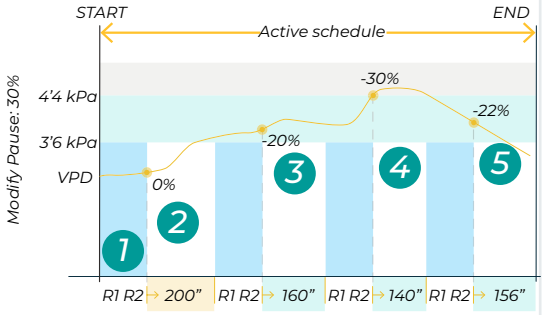
1. *The two relay outputs operate for 10 seconds each for a total cycle duration of 20 seconds.*
2. *The 30-second pause time is met because both sensors are within range.*
3. *The humidity sensor is out of range and the temperature sensor is also out of range, but it selects the highest '**Modify Pause**' value, i.e. 50% of the humidity. The result is 50% of the configured pause, i.e. 15 seconds.*
4. *Humidity is back in range but temperature is not. A '**Modify Pause**' value of 20% is now applied, i.e. 24 seconds.*

Fogging with humidity and temperature sensor

Example 2

Fogging runs with two outputs, each operating for 10 seconds. In each fogging cycle (20 seconds in total), a pause of 200 seconds is configured. The following are also configured:

- A humidity reference of 3.6 kPa with a 0.8 kPa band (range between 3.6 and 4.4 kPa).



1. *The two relay outputs operate for 10 seconds each for a total cycle duration of 20 seconds.*
2. *The VPD value is below the reference and the pause time is modified by '0%', i.e. 200 seconds.*
3. *The VPD value is within the configured range and the % value to be modified is calculated proportional to the detected VPD value, in this case 20%, reducing the time of the next activation to 160 seconds.*
4. *Any VPD value equal to or greater than the reference + band will be modified by 30%. In this case the next activation is reduced to 140 seconds.*
5. *According to the detected VPD value, the time is modified by 22%, this time to 156 seconds.*

Fogging with calculated VPD sensor

5.9. DRAINAGE

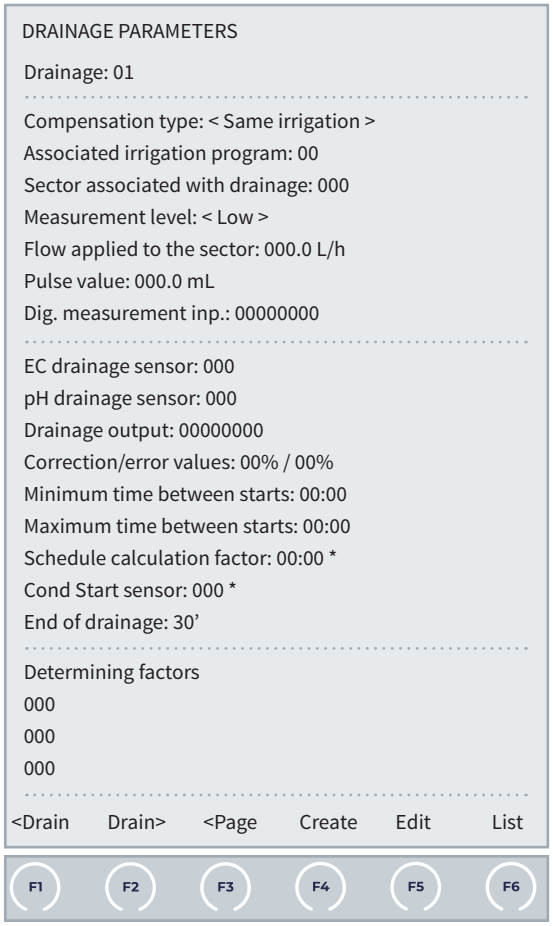
Hydro Function

Drainage control irrigation is a widespread technique in modern agriculture to define an adjusted irrigation dose in hydroponic crops. It can also monitor and control of the state of the substrate, through continuous analysis of the pH and electrical conductivity of the drainage water. The Agrónic 4500 has up to 20 drainage controls, including measurement of drained volume, electrical conductivity, pH and tray level.

Each drainage is related to an irrigation program and a sector in which the drainage tray with the associated sensors is located. This sector goes first in the irrigation order and once its irrigation is ended, the same adjustments are applied to the sectors that follow to achieve the drainage objective. Drainage control is not performed outside of the 'Active schedule' of the program.

The control indicates the % of the irrigation water volume to drain. The target drainage volume can be configured in five ways:

- Modifying the program's current irrigation amount.
- Modifying the irrigation amount based on previous irrigation.
- Modifying the time between program starts.
- Modifying the reference of a direct sensor (tensiometer or solar energy) through a program start determining factor.
- Modifying the reference of an inverse sensor (capacitive soil moisture) using a program start determining factor.



Prompts identified with an '*' are visible only if 'Direct sensor' and 'Inverse sensor' compensation is selected.

Drainage *(01 ... 20)*: drainage number to be configured.

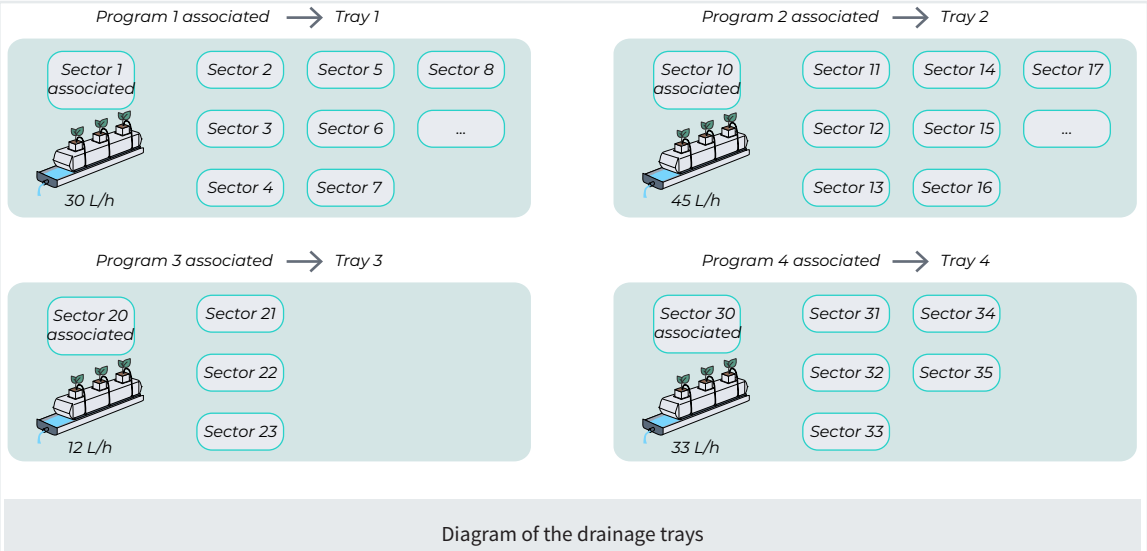


Diagram of the drainage trays

Compensation type *(Same irrigation | Next Irrigation | Activations | Direct sensor | Inverse sensor)*:

- Same irrigation: attempt to comply with drainage in the same irrigation. Increase or decrease the irrigation amount for the program sectors.
- Next irrigation: attempt to complete drainage at the next irrigation. Depending on the drainage in the previous irrigation, the amount of the next irrigation increases or decreases.
- Activations: attempt to comply with the drainage by modifying the 'Time between activations', without modifying the irrigation amount. It is only possible if the program works with activation frequency.
- Direct sensor: attempt to comply with drainage by modifying the reference of a sensor (tensiometer or solar energy) through a program start determining factor.
- Inverse sensor: attempt to comply with drainage by modifying the reference of a sensor (capacitive) through a program start determining factor.

Associated irrigation program *(00 ... 99)*: corresponds to the program number where the target drainage is entered. The first sector to irrigate must include the sector from the next question.

Sector associated with drainage *(000 ... 400)*: sector number where drainage control is performed and where the measurement sensors are located. Assign it in the first position of the program sectors.

Measurement level *(Low | High)*:

- Low: the irrigation flow applied to the crop sample where drainage is measured in liters (000.0 L/h). The drained volume meter or measurement is milliliters (000.0 ml).
- High: the irrigation flow applied to the crop sample where drainage is measured in cubic meters (000.0 m^3/h). The drained volume meter or measurement is liters (000.0 L).

Flow applied to the sector *(000.0 ... 999.9)*: in L/h (low flow) or in m^3/h (high flow) corresponds to the volume applied by the drip emitters in the area of the sector where the drained water is measured. It can be measured on the entire crop in the sector or a part of it.

Pulse value *(000.0 ... 999.9)*: in milliliters (low flow) or in Liters (high flow) corresponds to the value of each pulse and is used to measure the volume drained from the rainfall gage or similar.

Dig. measurement inp. *(00000000)*: digital input where the sensor is connected.

EC drainage sensor *(000 ... 120)*: analog sensor number used for EC measurement in the drainage.

pH drainage sensor *(000 ... 120)*: analog sensor number used for pH measurement in drainage.

Emptying output *(00000000)*: output that activates for two minutes when irrigation starts to empty the container where the sensors are located.

Correction/error values *(00 ... 99)*: value, in %, of correction to be applied in irrigation or time between irrigations for an error value in drainage.

Minimum time between starts *(00:00 ... 12:00)*: minimum time that must transpire from the start of the previous irrigation to calculate a new drainage correction factor. If not, the previous correction factor is maintained. (Question not available with 'Direct sensor' and 'Inverse sensor' compensation type)

Maximum time between starts *(00:00 ... 12:00)*: maximum time that must transpire from the start of the previous irrigation to calculate a new drainage correction factor. If not, the previous correction factor is maintained. (Question not available with 'Direct sensor' and 'Inverse sensor' compensation type)

End of drainage *(01 ... 30 ... 99)*: time, in minutes, to complete drainage once irrigation has ended. The drainage, EC and pH values are logged at this moment. If the program performs a new activation before this time ends, it is considered an end of drainage. (Question not available with 'Direct sensor' and 'Inverse sensor' compensation type)

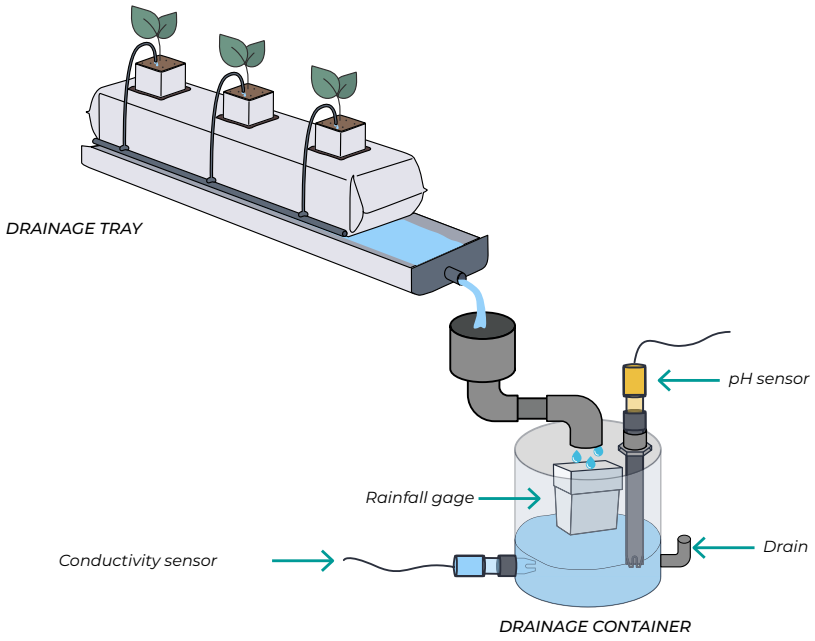
Factor calculation schedule *(00:00 ... 23:59)*: this is the schedule in hours and minutes at which the correction factor is calculated to modify the reference of the direct sensor or inverse sensor.

Cond. Start sensor *(000 ... 120)*: 'Start' type determining factor number on which the drainage control modifies the start reference based on the calculated correction factor.

Drainage determining factors: the determining factors linked to drainage control can be edited or created. They can also be edited and created in the section 'FUN - 4. Parameters - 6. Determining factors'. The options are:

- Drainage error, EC drainage error, pH drainage error.

5.9.1 Compensation types



Example of a drainage tray installation diagram

5.9.1.1 Same irrigation

The objective of the process is to adjust the current irrigation duration to achieve the target drainage. To do this, a value called 'Partial drainage' is taken as a reference, which is calculated as the average of the 'Partial drainage' over the last five irrigations. In other words, from when the irrigation water is no longer supplied until the configured 'End of drainage' time has transpired (by default 30 minutes).

There are two ways to perform this compensation:

Reduce scheduled irrigation

- Once irrigation has started and one minute has transpired, the system monitors the drainage that is currently occurring along with the estimated 'partial drainage' that is expected to occur at the end of irrigation.
- If the total drainage at this point (drainage in progress + partial drainage) exceeds the desired level, irrigation will stop for the sectors that are in progress and the irrigation duration is adjusted for the remaining sectors in the program.
- At this point, the tray consultation displays the value of the compensation that has been made. As long as a new irrigation is not started, the tray consultation also shows the value of the 'partial drainage' that is taking place.

Increase scheduled irrigation

- If the current drainage plus the 'partial drainage' does not reach the target drainage level at the end of the scheduled irrigation, the system increases the irrigation duration. This increase can be up to 50% of the initially programmed value, with the aim of achieving the target drainage.

Important details to keep in mind

- The sector containing the tray should be the first in the sequence of an irrigation program.
- If several sectors are grouped together to be irrigated at the same time, it is preferable that they all have the same number of irrigation units.
- Sequential programs should not be configured, as the system will not compensate for drainage in programs following the first one.
- Post-irrigation should not be used as it may interfere with drainage adjustment.

- If irrigation is time controlled, it is more appropriate to use a minute/second format to make corrections, as the hour/minute format involves full minute jumps, which may be too wide to accurately compensate.
- If there is no partial drainage average calculated (for example, at the first irrigation after a full erasure), the system will not compensate on that irrigation.
- It is important to avoid stopping irrigation (using a 'Stop' or 'Conditional stop' command, for example) on the sector containing the tray, as this could affect the correct drainage compensation calculation.
- In a program with linear operations and grouping of more than one sector, the same units must be programmed in all of them.
- The first irrigation after a full erasure or controller start-up will not apply drainage, as there are no previous references.

Important

- The 'Target Drainage' value is configured in the 'FUN - 1.- Programs - Program No.' section and is explained in the 'Agrónic 4500 User manual.'

PROGRAM 1

Starts: 09:00 11:00 13:30
16:00 18:00 00:00
Days of the week: Mon. | Mar. | Wed. | Thu. | Fri. | Sat. | Sun.
Activations: 00 every: 00:00
Active schedule: 00:00 to 00:00
Active period: 00:00 to 00:00

Manual factor: +00% Drainage: 10%

Example of 'Same Irrigation' compensation

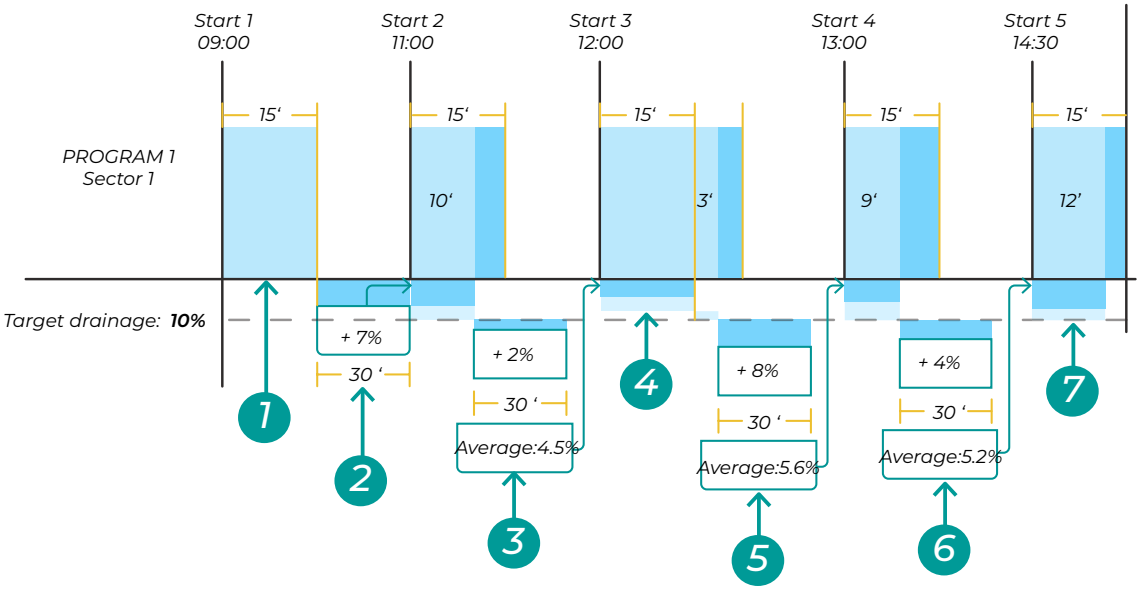
The aim is to establish a 10% drainage baseline over several starts in an irrigation program, each with a 15-minute duration.

To ensure that drainage is maintained within this target, 'Partial drainage' is used.

This refers to the amount of water that is drained from the irrigation system over a specific period of time after irrigation has stopped.

It is a value that is logged to evaluate how much excess water remains after each irrigation.

This partial drainage is used to adjust and plan subsequent irrigations.



PREVIOUS CONFIGURATION IN 'FUN - 4. Parameters - 9. Drainage'.

Compensation type: *Same irrigation*
Associated program: *01*
Sector associated with drainage: *001*
End of drainage: *30'*

PREVIOUS CONFIGURATION IN 'FUN - 1. Programs - Program 1'

Starts: *09:00 - 11:00 - 12:00 - 13:00 - 14:30*
Days of the week: *Mon - Tue - Wed - Thu - Fri - Sat - Sun*
Drainage: *10%*
Irrigation: *15'*
Sector 1

1. *The **first irrigation** of the day starts, but the target drainage of 10% is not reached.*
2. *During the configured 30 minutes, a '**Partial drainage**' of 7% is logged at the first irrigation.*
3. *The **second irrigation** starts with a 7% drainage from the previous irrigation. After 10 minutes, the target drainage of 10% is reached and irrigation stops.*
   In the next 30 minutes, an additional partial drainage of 2% is logged.
   *For the next irrigation, the initial drains will be the average of the two previous partial drains, i.e. **(7% + 2%) / 2 = 4.5%***
4. *The **third irrigation** starts with 4.5% drainage. However, if the target drainage of 10% is not reached within the 15 minutes of irrigation, the irrigation time is increased by 50%, adding 7.5 minutes.*
   After three minutes, the target drainage is reached and irrigation stops.
5. *In the next 30 minutes, a partial drainage of 8% is logged. The average of the last three partial drains is calculated, i.e. **(7% + 2% + 8%) / 3 = 5.6%***
6. *The **fourth irrigation** starts with an initial drainage of 5.6%. After nine minutes, the target drainage of 10% is reached and irrigation stops.*
   Subsequently, a partial drainage of 4% is logged in the next 30 minutes.
   *The average of the last four drains is calculated, i.e. **(7% + 2% + 8% + 4%) / 4 = 5.2%***
7. *The fifth irrigation starts with an initial drainage of 5.2%. Stops 12 minutes after reaching the target drainage of 10%.*

Compensation type: Same irrigation

5.9.1.2 Next irrigation

To achieve the target drainage, the irrigation units can be adjusted, i.e. the irrigation time. In the section 'FUN - 4. Parameters - 9. Drainage, there is the 'Correction/error' margin, by which the drainage error is automatically corrected at each irrigation. A correction percentage is established to be applied based on the error percentage detected.

When an irrigation starts, a 'Drainage correction factor' is applied to the sectors, adjusting their irrigation units. This factor is previously calculated according to the drainage obtained in the previous irrigation. The correction value can be consulted in 'CON - 8. Drainage' and, if necessary, modified in the option FUN - 2. Manual'.

Each time a new irrigation starts, the drainage is calculated and compared with the programmed drainage. If there is a difference, the 'Correction/Error' calculation is applied to the 'Correction factor.' This new correction factor, expressed as a percentage, adjusts the scheduled irrigation to ensure that the stipulated drainage is maintained in the crops.

The minimum and maximum times between the start of irrigation are used to determine whether a new drainage correction factor will be calculated. If the time transpired from the start of the previous irrigation is within this range, a new correction factor is calculated; otherwise, the previous factor is maintained.

In this mode, irrigation can start by determining factor or by schedule. As they are executed, the irrigation units in each sector of the program are adjusted to achieve adequate drainage. Therefore, depending on the drainage obtained in the previous irrigation, the system increases or reduces the irrigation time in each sector according to the programmed correction/error.

Important

- The 'Target Drainage' value is configured in the 'FUN - 1.- Programs - Program No.' section and is explained in the 'Agrónic 4500 User manual.'

PROGRAM 1

Starts: 09:00 11:00 13:30
16:00 18:00 00:00
Days of the week: Mon. | Mar. | Wed. | Thu. | Fri. | Sat. | Sun.
Activations: 00 every: 00:00
Active schedule: 00:00 to 00:00
Active period: 00:00 to 00:00

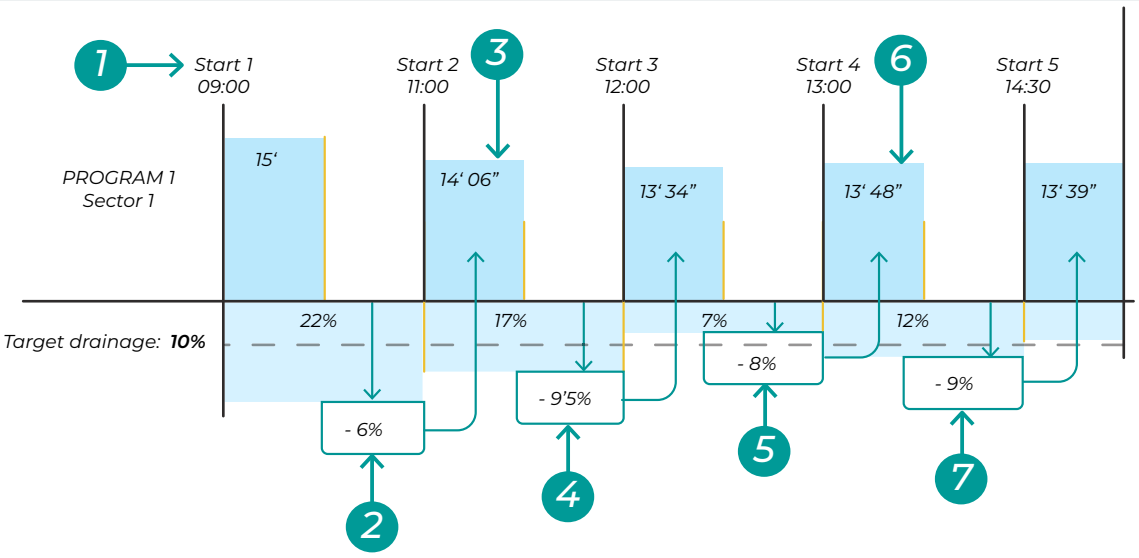
Manual factor: +00% Drainage: 10%

Example of compensation 'Next Irrigation'

The aim is to establish a 10% drainage baseline over several starts in an irrigation program, each with a 15-minute duration.

To ensure that drainage remains at this target, a proportional correction is applied based on the error detected.

The correction ratio is 5% for every 10% of error detected.



PREVIOUS CONFIGURATION IN 'FUN - 4. Parameters - 9. Drainage'.

Compensation type: *Next irrigation*
Associated program: *01*
Sector associated with drainage: *001*
Correction/error values: *05% / 10%*

PREVIOUS CONFIGURATION IN 'FUN - 1. Programs - Program 1'

Starts: *09:00 - 11:00 - 12:00 - 13:00 - 14:30*
Days of the week: *Mon - Tue - Wed - Thu - Fri - Sat - Sun*
Drainage: *10%*
Irrigation: *15'*
Sector 1

1 *The **first irrigation** of the day starts, since there is no total drainage, a complete irrigation of 15 minutes is carried out, obtaining drainage of 22%.*

2 *The correction factor is calculated based on the target drainage, which is 10%. The difference is 10% - 22% = -12%. A 5% correction is applied for every 10% error, so the calculation is:*

Difference between the target drainage and the drainage obtained

$$\frac{-12\% \times 5\%}{10\%} = -6\%$$

% value to correct for every 10% error

% value of detected error

% correction value

3 *In the **second irrigation**, the irrigation duration is adjusted by -6% resulting in irrigation of 14 minutes and 6 seconds.*

4 *Drainage of 17% is obtained and the correction factor is recalculated, considering the previous adjustment of -6%. The new calculation is: 10% - 17% = -7%. The correction calculation is applied again:*

$$\frac{-7\% \times 5\%}{10\%} = -3.5\ \%$$

The previous adjustment is added to this value. In other words, -6% - 3.5% = -9.5%, which will be the new adjustment for the next 15-minute irrigation.

5 *The same calculations are made again, but this time it is observed that the target drainage of 10% is not achieved. The new calculation is: 10% - 7% = 3%. The correction calculation is applied again:*

$$\frac{3\% \times 5\%}{10\%} = 1.5\ \%$$

Considering the previous adjustment, the new value is: -9.5% + 1.5% = -8%.

6 *The **fourth irrigation** starts by applying the -8% setting, which results in irrigation with a 13-minute and 48-second duration. The calculation is repeated: 10% - 12% = -2%*

$$\frac{-2\% \times 5\%}{10\%} = -1\%$$

Considering the previous adjustment, the new value is: -8% -1% = -9%.

7 *In the **fifth irrigation**, the -9% adjustment is applied to the scheduled time.*

Compensation type: Next irrigation

5.9.1.3 Activations

To achieve the expected drainage, the activation frequency between irrigations can also be modified. As in the previous section, a 'Correction/Error' margin is established from the section FUN - 4. Parameters - 9. Drainage' used to automatically adjust the drainage error in each irrigation.

When an irrigation starts, the system applies the correction factor by adjusting the frequency between irrigations. This factor is previously calculated, based on the drainage in the previous irrigation. The correction value can be consulted from the consultation section 'CON - 8. Drainage' and manually modified from 'FUN - 2. Manual'.

If there is a difference, the 'Correction/Error' calculation is applied on the correction factor.

If the result is positive it means that there is excess drainage and the time between activations must be increased.

If the result is negative it means that the drainage is insufficient and the time between activations must be reduced.

For drainage by activation, follow these steps for correct operation:

- Set an active schedule to consider drainage only during that period.
- Configure a start time before the active schedule to moisten the soil.
- It carries out pulse irrigation, scheduling a number of activations.
- The system automatically adjusts the time between activations to achieve the target drainage.
- Schedule more activations than required; the extra ones are automatically erased at the end of the day.
- The system will not increase the frequency by more than 150% or reduce it by more than 75%.
- This mode keeps the irrigation duration constant, modifying only the delay time between cycles.

Important

- The 'Target Drainage' value is configured in the 'FUN - 1.- Programs - Program No.' section and is explained in the 'Agrónic 4500 User manual.'

PROGRAM 1

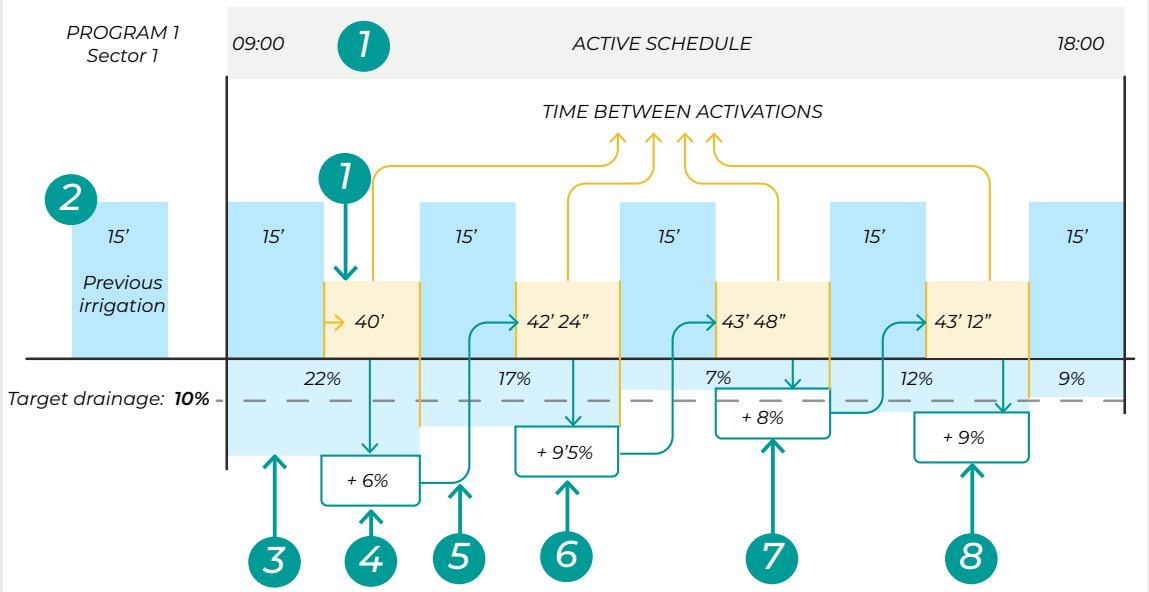
Starts: 08:00 00:00 00:00
00:00 00:00 00:00
Days of the week: Mon. | Mar. | Wed. | Thu. | Fri. | Sat. | Sun.
Activations: 25 each: 00:40
Active schedule: 00:00 to 00:00
Active period: 00:00 to 00:00

Manual factor: +00% Drainage: 10%

Example of compensation 'Activations'

The aim is to establish a 10% drainage baseline over several activations of a 15-minute irrigation schedule.

The correction ratio is 5% for every 10% of error detected.



PREVIOUS CONFIGURATION IN 'FUN - 4. Parameters - 9. Drainage'.

Compensation type: *Activations*
Associated program: *01*
Sector associated with drainage: *001*
Correction/error values: *05% / 10%*

PREVIOUS CONFIGURATION IN 'FUN - 1. Programs - Program 1'

Starts: *08:00 - 00:00 - 00:00 - 00:00 - 00:00*
Days of the week: *Mon - Tue - Wed - Thu - Fri - Sat - Sun*
Activations: *25 every 00:40*
Drainage: *10%*
Irrigation: *15'*
Sector 1

1. *An active schedule is configured so that the drainage operates only within that period and a time between activations of 40 minutes.*

2. *Before the active schedule starts, pre-irrigation runs, programmed by schedule, to moisten the soil. From that moment on, activations start, but drainage is only considered within the configured period.*

3. *The second irrigation starts, which has a 15-minute duration. Once ended, wait the configured time of 40 minutes before starting the next irrigation. During this interval, 22% drainage is detected.*

4. *The correction factor is calculated based on the error, comparing the actual drainage with the target of 10%. The difference is 22% - 10% = 12%.*
A 5% correction is applied for every 10% error, so the calculation is:

Difference between the target drainage and the drainage obtained

$$\frac{12\% \times 5\%}{10\%} = 6\%$$

% value to correct for every 10% error

% value of detected error

% correction value

5. *The third irrigation starts, also with a 15-minute duration. Once ended, the delay time for the next irrigation is configured. As the drainage was greater than expected, the time between activations is extended by 6% to 42 minutes and 24 seconds.*

6. *The correction factor is recalculated based on the new drainage (17%). The difference is 17% - 10% = 7%.*

$$\frac{7\% \times 5\%}{10\%} = 3.5\ \%$$

The previous adjustment is added to this value. In other words,
6% + 3.5% = 9.5%, which will be the new setting for the next activation waiting time.

7. *After the **fourth irrigation**, the correction factor is recalculated based on the new drainage (7%). The difference is 7% - 10% = -3%.*

$$\frac{-3\% \times 5\%}{10\%} = -1.5\ \%$$

Considering the previous adjustment, the new value is: 9.5% - 1.5% = 8%.

8. *After the **fifth irrigation**, the correction factor is recalculated based on the new drainage (12%). The difference is 12% - 10% = 2%.*

$$\frac{2\% \times 5\%}{10\%} = +1\%$$

Considering the previous adjustment, the new value is: 8% +1% = 9%. This value will be taken into account for the next irrigation as long as it is between the minimum and maximum time between starts.

Compensation type: Activations

5.9.1.4 Direct sensor

To achieve the expected drainage, the reference of a start determining factor by tensiometer can also be modified, thus increasing or decreasing the frequency of irrigation starts. As in the previous sections, a 'Correction/Error' margin is established from the 'FUN - 4. section. Parameters - 9. Drainage', which is used to automatically adjust the drainage error when calculating the correction factor.

In this mode, irrigation must be started by determining factor, with an analog sensor such as a tensiometer. The control logs all drainage throughout the day, so that when the time configured by the user is reached, the correction calculation is made and the start determining factor reference is modified to achieve the target drainage. Therefore, depending on the drainage obtained from the previous day's irrigation, the system increases or reduces the determining factor reference according to the programmed correction/error.

The correction value can be consulted from the consultation section in 'CON - 8. Drainage'.

If the correction factor is positive: this means that it has drained less and therefore the tensiometer reference decreases.

If the correction factor is negative: this means that too much has drained and therefore the tensiometer reference increases.

Important details to keep in mind

- The start of irrigation must be based on the start determining factor. The analog sensor must be of the 'tensiometer' or 'Solar energy' type.
- The first irrigation of the day should carried out by schedule before start the 'active schedule' to ensure the bags are filled correctly.
- The system automatically updates the reference once per day, in the schedule set by the user, to achieve the target drainage.
- Establish an active schedule to avoid activations due to determining factors outside of the allowed time.
- When working with start determining factors, the 'safety time between starts' program parameters can be used to delay starts if desired.
- The system will not modify the reference more than 100%.
- This mode keeps the irrigation duration constant, modifying only the start determining factor reference.

Important

- The 'Target Drainage' value is configured in the 'FUN - 1.- Programs - Program No.' section and is explained in the 'Agrónic 4500 User manual.'

PROGRAM 1

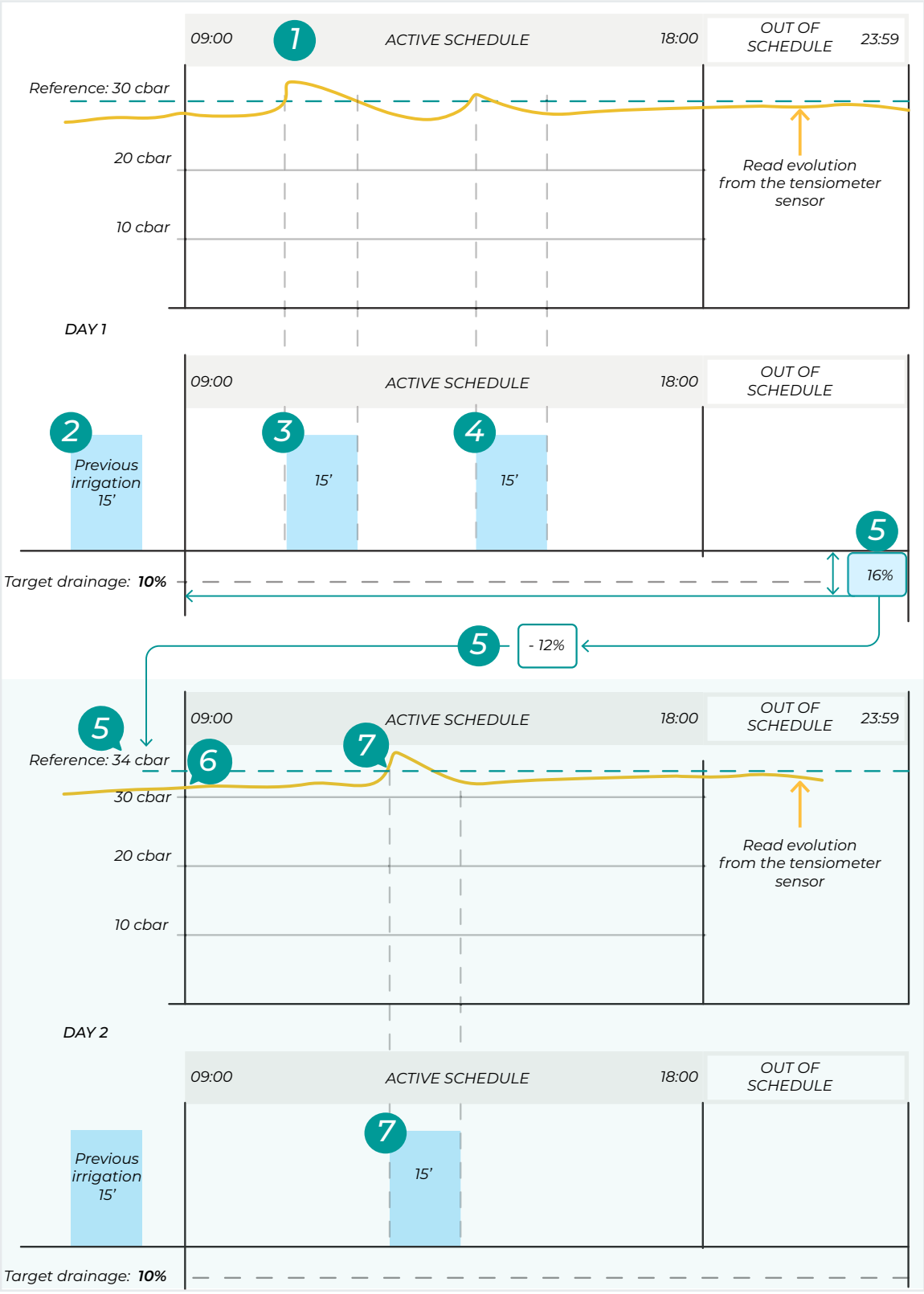
Starts: 08:00 00:00 00:00
00:00 00:00 00:00
Days of the week: Mon. | Mar. | Wed. | Thu. | Fri. | Sat. | Sun.
Activations: 00 every: 00:00
Active schedule: 09:00 to 18:00
Active period: 00:00 to 00:00

Manual factor: +00% Drainage: 10%

Example 'Direct sensor'

The objective is to irrigate in 15-minute intervals whenever the tensiometer value exceeds the reference configured in a 'Start' type determining factor.

The correction is applied at a rate of 20% for every 10% of error detected. The target drainage is 10% and the initial determining factor reference is 30 cbar.



PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 9. Drainage'.

Compensation type: Tensiometer
Associated program: 01
Sector associated with drainage: 001
Correction/error values: 20% / 10%

PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 6. Deter. factors - Determining factor 1'

Type: Start
Origin: Analog sensor
Analog sensor No.: 001
Reference: 30 cbar
When surpassed: yes

PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 2. Programs - Program 1'

Irrigation units: mm' ss"
End outside of active schedule: <stop>
Determining factors: Determining factor 1

PREVIOUS CONFIGURATION IN
'FUN - 1. Programs - Program 1'

Starts: 08:00
Days of the week: Mon - Tue - Wed - Thu - Fri - Sat - Sun
Drainage: 10%
Irrigation: 15'
Sector 1

1. An active schedule is configured so that the drainage operates only within that period.

2. Before the active schedule starts, pre-irrigation runs, on a schedule, to moisten the tray.

3. The first 15-minute irrigation starts by the start determining factor, because the configured tensiometer reference is 30 cbar and the current sensor reading indicates 35 cbar.

4. The second irrigation starts by the start determining factor, because the configured tensiometer reference is 30 cbar and the current reading on the sensor indicates 33 cbar.

5. At the time scheduled by the user, 23:59, the detected drainage was 16%. The correction factor is calculated based on the error by comparing the actual drainage with the target of 10%. The difference is 10% - 16% = -6 %.

Difference between the target drainage and the drainage obtained

% value to correct for every 10% error

$$\frac{-6\% \times 20\%}{10\%} = -12\%$$

% value of detected error

% correction value

This correction factor modifies the tensiometer reference in the start determining factor by -12%. So the calculation for the new value is:

$$\frac{30 \text{ cbar} \times (-12)}{100} = -3.6\ \%$$

$$30 \text{ cbar} - (-3.6\%) = \mathbf{34 \text{ cbar}}$$

New reference value

By increasing the tensiometer reference, the program will not start as frequently.

6. The next day, again within the active schedule, the sensor marks 32 cbar, but irrigation does not start because it is below the start determining factor reference.

7. The first irrigation of the day starts by start determining factor, because the tensiometer reference is 34 cbar and the sensor indicates 37 cbar.

Compensation type: Direct sensor

5.9.1.5 Inverse sensor

To achieve the expected drainage, the reference of a start determining factor can also be modified by an inverse sensor (capacitive soil moisture sensor), thus increasing or decreasing the frequency of irrigation starts. As in the previous sections, a 'Correction/Error' margin is established from the 'FUN - 4. section. Parameters - 9. Drainage', which is used to automatically adjust the drainage error when calculating the correction factor.

In this mode, irrigation must be started by determining factor, with a capacitive type analog sensor. The control logs all drainage throughout the day, so that when the time configured by the user is reached, the correction calculation is made and the start determining factor reference is modified to achieve the target drainage. Therefore, depending on the drainage obtained from the previous day's irrigation, the system increases or reduces the determining factor reference according to the programmed correction/error.

The correction value can be consulted from the consultation section in 'CON - 8. Drainage'.

If the correction factor is positive: this means that there has been less drainage and therefore the soil moisture sensor reference increases.

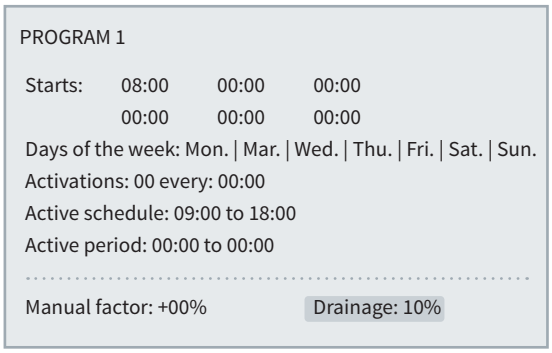
If the correction factor is negative: this means that there has been more drainage and therefore the soil moisture sensor reference decreases.

Important details to keep in mind

- The start of irrigation must be based on the start determining factor. The analog sensor must be the 'capacitive' type (Teros 10, Teros 12, Aquacheck, etc.).
- The first irrigation of the day should carried out by schedule before start the 'active schedule' to ensure the bags are filled correctly.
- The system automatically updates the reference once per day, in the schedule set by the user, to achieve the target drainage.
- Establish an active schedule to avoid activations due to determining factors outside of the allowed time.
- When working with start determining factors, the 'safety time between starts' program parameters can be used to delay starts if desired.
- The system will not modify the reference more than 100%.
- This mode keeps the irrigation duration constant, modifying only the start determining factor reference.

Important

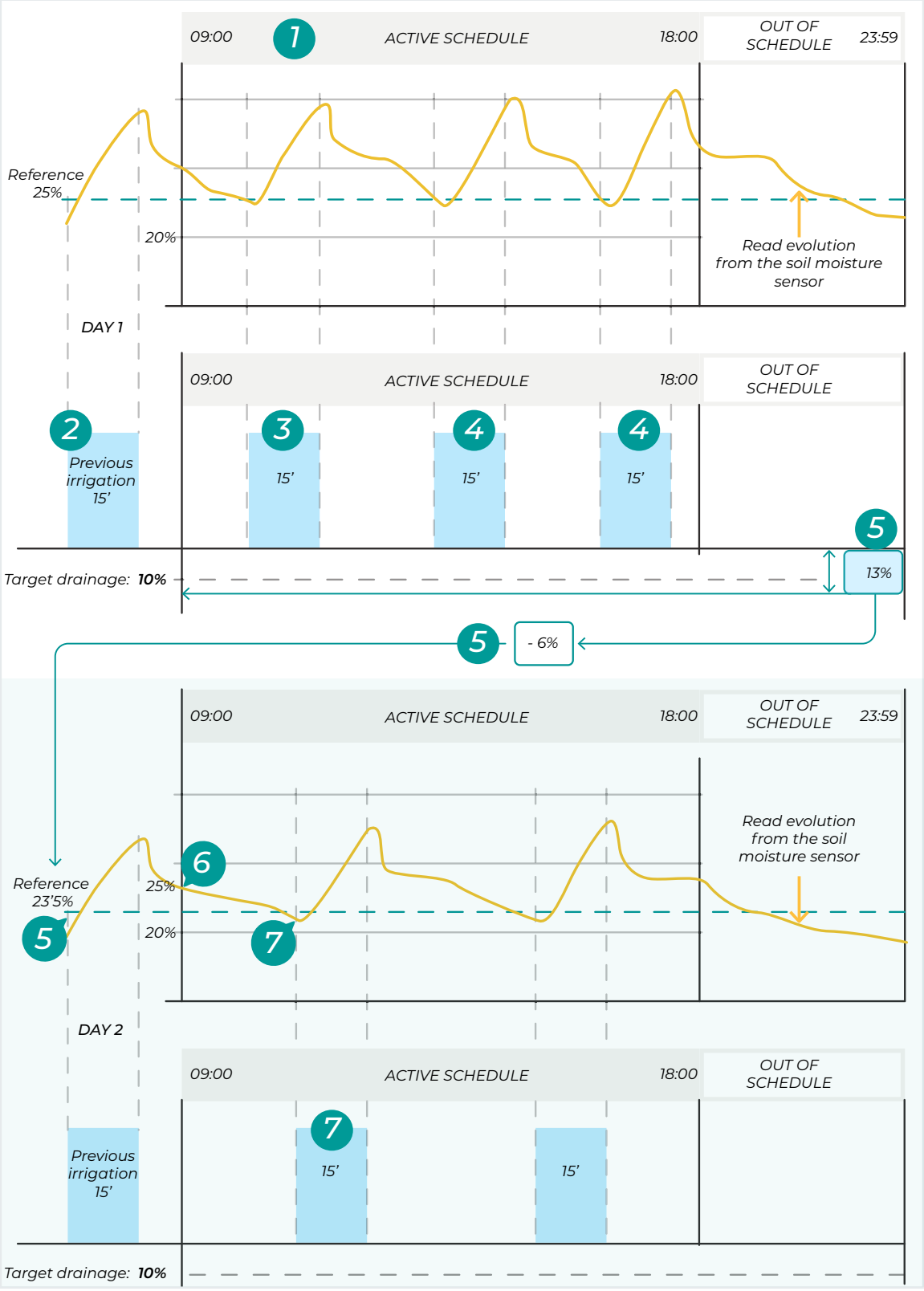
- The 'Target Drainage' value is configured in the 'FUN - 1.- Programs - Program No.' section and is explained in the 'Agrónic 4500 User manual.'



Example 'Inverse sensor'

The objective is to irrigate in 15-minute intervals whenever the capacitive sensor value exceeds the reference configured in a 'Start' type determining factor.

The correction is applied at a rate of 20% for every 10% of error detected. The target drainage is 10% and the initial determining factor reference is 25%.



PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 9. Drainage':

Compensation type: Inverse sensor
Associated program: 01
Sector associated with drainage: 001
Correction/error values: 20% / 10%

PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 6. Deter. factors - Determining factor 1'

Type: Start
Origin: Analog sensor
Analog sensor No.: 001
Reference: 25%
When surpassed: no

PREVIOUS CONFIGURATION IN
'FUN - 4. Parameters - 2. Programs - Program 1'

Irrigation units: mm' ss"
End outside of active schedule: <stop>
Determining factors: Determining factor 1

PREVIOUS CONFIGURATION IN
'FUN - 1. Programs - Program 1'

Starts: 08:00
Days of the week: Mon - Tue - Wed - Thu - Fri - Sat - Sun
Drainage: 10%
Irrigation: 15'
Sector 1

1. An active schedule is configured so that the drainage operates only within that period.

2. Before the active schedule starts, pre-irrigation runs, on a schedule, to moisten the tray.

3. The first 15-minute irrigation starts by the start determining factor, because the configured sensor reference is 25% and the current sensor reading indicates 24%.

4. The second and third irrigation starts by the start determining factor, because the configured sensor reference is 25% and the current sensor reading is lower.

5. At the time scheduled by the user, 23:59, the detected drainage was 13%. The correction factor is calculated based on the error by comparing the actual drainage with the target of 10%. The difference is 10% - 13% = -3 %.

Difference between the target drainage and the drainage obtained

% value to correct for every 10% error

$$\frac{-3\% \times 20\%}{10\%} = -6\%$$

% value of detected error

% correction value

This correction factor modifies the sensor reference in the start determining factor by -6%. So the calculation for the new value is:

$$\frac{25\% \times (-6)}{100} = -1.5\ \%$$

$$25\% + (-1.5\%) = 23.5\ \%$$

New value of reference

By decreasing the sensor reference, the program will not start as frequently.

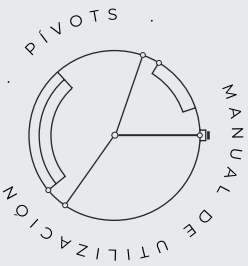
6. The next day, again within the active schedule, the sensor marks 25% but irrigation does not start because it is above the start determining factor reference.

7. The first irrigation of the day starts by the start determining factor, because the sensor reference is 23.5% and the sensor indicates 21%.

Compensation type: Inverse sensor

5.10. PIVOTS

Pivot function



Manual pivots *r2406*

Intended for installers and end users who use the controller for pivot control.

Provides essential instructions for installing, programming and maintaining the pivots.

5.11. HYBRID SOLAR IRRIGATION

Solar function

PLUS version

This operation is used when the installation has a hybrid system: power from the mains or diesel and solar cells together with a drive that supports alternate power and direct power input.

With solar irrigation activated, the Agrónic selects, based on the configured parameters, where it has to use the power through the pumps:

- M1: activated when the power is from the mains or diesel and only when it is outside of sunlight hours except when sectors need to be closed in order to pressurize the installation within sunlight hours.
- M2: activated when the power is solar and within sunlight hours. It can also be activated outside whenever you want to add power sources.
- M1 and M2: they activate when there are multiple power supplies.

In hybrid solar irrigation programs, the sectors and filters must have the following parameters configured:

- Assign the two pumps (M1 and M2)
- Specify the expected power consumption (kW/h).
- Define the expected flow (m^3/h).
- Set the working pressure.

The following configurations are also required:

- Configure the table of available power generated by the solar field, adjusted according to sunlight, with a hysteresis margin for deactivating the programs.

Optionally configure the flow table according to the pumping pressures to activate the system operation.

Select the 'Solar' fertilization mode in 'FUN - 4. Parameters - 1. Head - 1. Head 1 - 1. Fertilization'. It is only operational for fertilization in 'EC regulation' or in 'proportional'. Programs that can irrigate at the same time must have the same fertilization formula. Pre- and post-irrigation is not used.

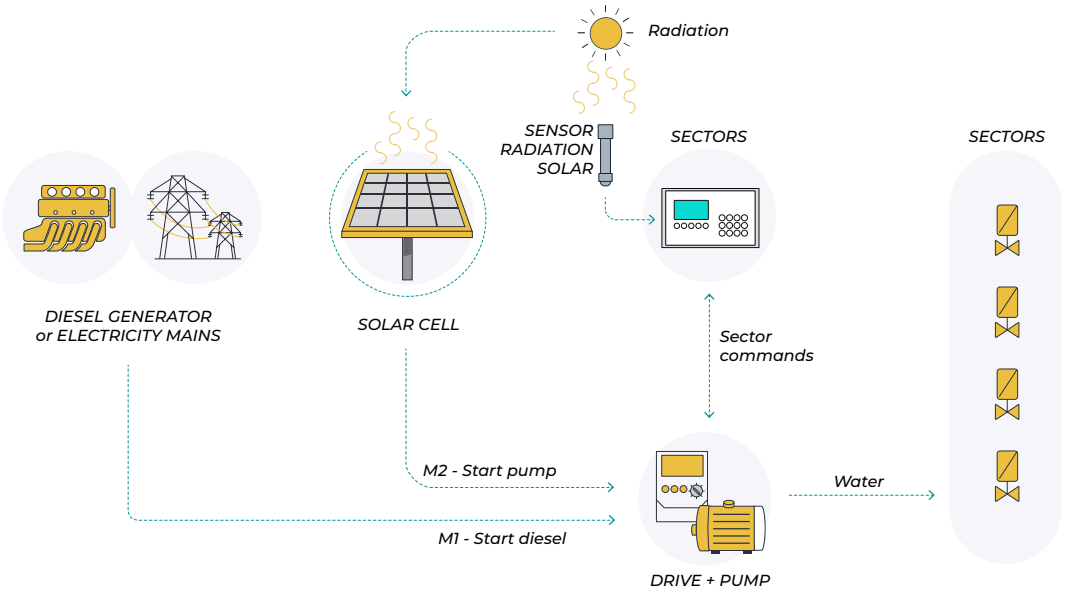
In the 'Solar' fertilization mode, it is not possible to operate in 'water mixing' or with treatments.

Conventional fertilization can be used, although the functionality of solar irrigation is not available, since only one program can irrigate at a time.

Solar irrigation control operation

The objective of solar irrigation is to optimize power consumption based on the power available at any given time. To achieve this, the controller allows delaying the start or activation of programs, depending on the expected power requirements of the sectors configured in each program and the solar energy available at any given time.

> **Important**
>
> It is advisable to configure programs with few sectors for more efficient operations.
>
> The operation always acts on programs and not directly on the sectors.



Installation diagram with hybrid system (solar energy + mains power or diesel)

HYBRID SOLAR IRRIGATION PARAMETERS

Activate: yes

Schedule: 00:00 - 00:00
Radiation sensor: 000
Safety radiation sensor: 000
Temperature sensor: 000
Temperature coefficient: -00.44%/ºC
Seconds integration: 01

Add solar energy plus mains/diesel: yes
Mains or diesel power: 0000 kW
Digital solar Sen. operational: 00
Analog power sensor: 000
Head No.: 1
Scaling time: 000"

Table of generated power versus solar energy:

Point	Solar radiation	Power gen.	Hysteresis
1	0000 W/m²	0000 kW	00 kW
2	0000 W/m²	0000 kW	00 kW
3	0000 W/m²	0000 kW	00 kW
4	0000 W/m²	0000 kW	00 kW
5	0000 W/m²	0000 kW	00 kW
6	0000 W/m²	0000 kW	00 kW

Flow versus pressure table in pumping:

Point	Pressure	Flow
1	00.0 bar	000.0 m³/h
2	00.0 bar	000.0 m³/h
3	00.0 bar	000.0 m³/h
4	00.0 bar	000.0 m³/h
5	00.0 bar	000.0 m³/h
6	00.0 bar	000.0 m³/h

Use filter pressure: no
Expected consumption G1 filters: 000.00 kWh
Expected consumption G2 filters: 000.00 kWh
Expected consumption G3 filters: 000.00 kWh

<Page Page>

F3 F4

Activated *(No | Yes)*: select the desired option.

- Yes: the installation has a hybrid power system.
- No: the installation has a single power system. Normal use of Agrónic.

Schedule 00:00 to 00:00 *(23:59)*: in hours and minutes, configure the time band in which solar energy is used. Outside of these hours, both types of power can be used. If it is left at '00:00' all day, both types of power is used.

Radiation sensor *(000 ... 120)*: analog sensor number used to detect available power. It is recommended to connect the sensor to the base of the controller to have a new sensor reading every second.

Safety radiation sensor *(000 ... 120)*: analog sensor number used if the main radiation sensor goes into 'error'. In this case, the safety sensor is used to determine the available power. If there is no radiation sensor available, then the available power from 'Mains' or 'Diesel' is used until the malfunction is resolved.

Temperature sensor *(000 ... 120)*: analog sensor number used to compensate for the effect of temperature on solar cell performance.

The sensor is usually located in the panel infrastructure.

Temperature coefficient > 25ºC *(-99.99 ... 00.44 ... 99.99)*: value in %, indicates how the radiation value is adjusted when the solar cell temperature exceeds 25ºC. For each additional degree above 25ºC, the radiation value is reduced by a specific percentage.

Example

The radiation sensor measures 800 W/m² and the panel temperature is 42ºC, so the temperature has exceeded the 25ºC threshold by 17ºC (42ºC - 25ºC).

The adjustment is calculated as 17 degrees, i.e.

17ºC x 0.44 = 7.48%

This value of 7.48% is applied to the original radiation value of 800 W/m², resulting in a radiation reduction of 740 W/m².

800 - (7.48%) = 740 W/m²

Sensor integration seconds *(00 ... 99)*: in seconds, configure the time period over which the average of the radiation sensor readings is calculated.

Useful for reducing peaks that may exist at certain times due to the effects of clouds.

Example

If 20 seconds is configured, the average of the last 20 sensor readings is taken.

Combine solar energy plus mains/diesel *(No | Yes)*: outside of sunlight hours, power sources can supply

the system at the same time.

- Yes: the power sources can act at the same time. A drive is required that performs the function of adding two power sources.
- No: power sources cannot act at the same time. The controller selects one or the other based on consumption and giving priority to solar.

Power available from Mains or Diesel *(0000 ... 9999)*: in kW. The power available to irrigate when operating outside of the solar schedule window.

Digital solar Sen. operational *(00 ... 80)*: digital sensor number through which the drive sends its status to the Agrónic. It is timed for 60 seconds.

The origin of this signal can come from the base, from an AgroBee-L module, from an external module, etc.

Analog power sensor *(000 ... 120)*: analog sensor number that takes readings of the power generated by the drive.

The origin of this signal can come from the base, from an AgroBee-L module, from an external module, etc.

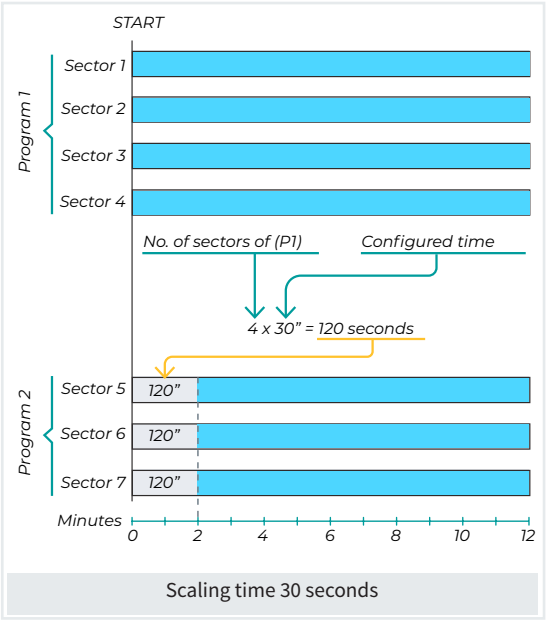
Head No. *(1 ... 4)*: configure the number of heads that will operate with hybrid solar irrigation.

Scaling time *(000 ... 999)*: when new programs activate due to an increase in available power, a timer will be set in seconds to prevent multiple programs from starting simultaneously. To achieve this, the delay time is multiplied by each sector that activates, so that the input of each new program is progressively delayed.

Example

Important to be able to fill the pipes in a scaled sequence.

In the graph, two programs start at the same time but only Program 1 starts immediately, while Program 2 is delayed. This delay will be a few seconds, calculated by multiplying the time configured in 'Scaling time' by the number of sectors in Program 1.



Scaling time 30 seconds

Table of generated power versus solar energy: it is essential to complete this table to be able to calculate the power available at any given time. For each point, the theoretical values of sunlight and the theoretical power generated in the installation are filled in and a hysteresis can also be configured.

This hysteresis serves to modulate the output of irrigation sectors.

Solar irrigation starts working from the first point. Enter the values from lowest to highest.

* A history is maintained of the value of 'Solar energy generated.'

Example

In a program that has two irrigation sectors with 80 kW power each, according to point 3 of the following table, this program stops when the radiation drops below 500 W/m^2 and the available power is less than the value configured at that point (160 kW) less the configured hysteresis (11 kW). In other words, less than 149 kW.

The values between solar energy, generated power and hysteresis vary linearly and the controller automatically calculates the intermediate values based on these variations.

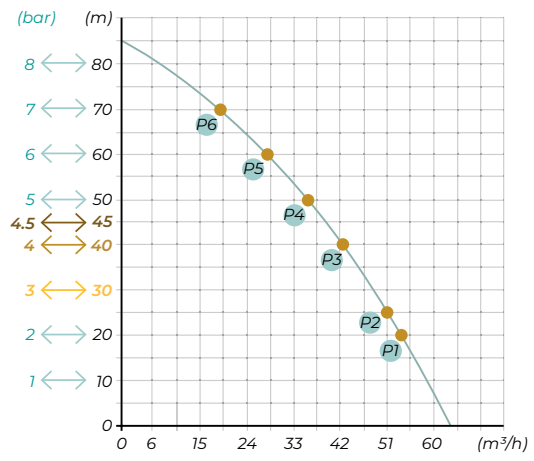
Solar energy vs. generated power			
Point	Solar radiation	Generated power	Hysteresis
1	200 W/m²	50 kW	5 kW
2	300 W/m²	75 kW	8 kW
→ 3	**500 W/m²**	**160 kW**	**11 kW**
4	700 W/m²	210 kW	21 kW
5	900 W/m²	240 kW	25 kW
6	1050 W/m²	270 kW	28 kW

Finalize point one with mains power *(No | Yes)*: if solar energy falls below the first threshold within the solar schedule, the active sectors will be shut off using mains or diesel power (Pump 1), provided that Pump 2 (solar) has a value assigned to 'Stop timing' and the 'Stop the sectors' timing is set to 'No'.

Flow versus pressure table in pumping: for the selected head, six points are prompted to generate a pressure curve (supply height) and its flow limit (Q). Useful for limiting the input of irrigated sectors when the hydraulic limit of the installation cannot exceed a flow at a given pressure according to the theoretical specifications of the pump. Enter the values from lowest to highest.

Example

Below is an example of a graph of an irrigation pump and its configuration table to establish its flow limits based on the required pressure.



Example of pump hydraulic curve

Flow vs. pressure in pumping		
Point	Pumping pressure	Flow
1	2 bar	53 m³/h
2	2.5 bar	51 m³/h
3	4 bar	43 m³/h
4	5 bar	35 m³/h
5	6 bar	28 m³/h
6	7 bar	20 m³/h

Example

A program is configured with three sectors, each with an expected flow of 15 m³. According to the above flow vs pressure table, when irrigating at 4 bar pressure, a total flow of 43 m³ is obtained. In this case, the program stops due to insufficient flow.

To comply with this control, the working pressure and the expected flow must be configured in each sector in the section 'FUN - 4. Parameters - 3. Sectors' and whether the maximum or minimum value is used in the section 'FUN - 4. Parameters - 1.- Head - Head No. - 4. Pressure regulation'.

Use filter pressure *(No | Yes)*: select 'Yes' to use filter pressure for flow limit control. This is taken into account when cleaning the filters.

Example

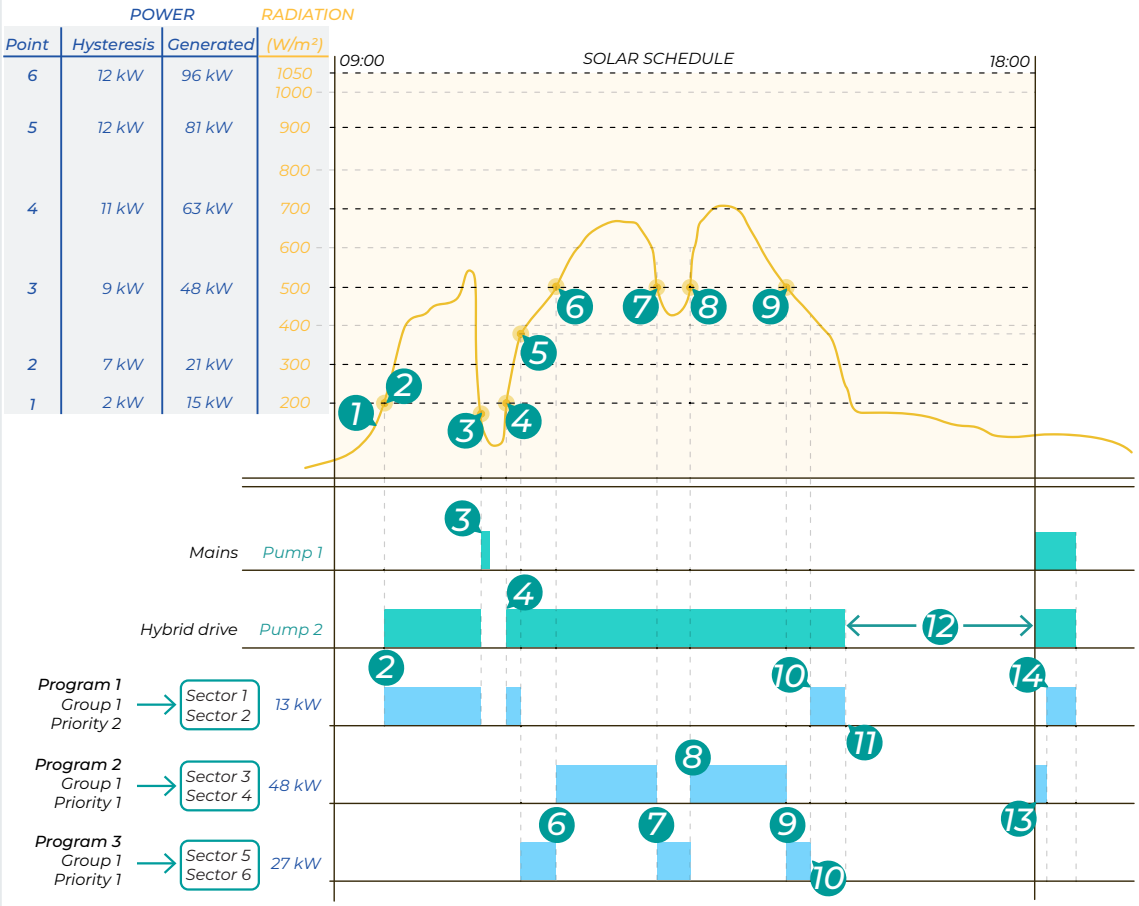
If 4 bar of pressure is required to clean the filters and 'Yes' is selected in the option to use filter pressure, the maximum available flow will be 43 m³. Programs that require more flow will not run or will be paused. Otherwise, if it is configured to 'No', the filters will be cleaned at the pressure configured in the sectors.

Expected filter consumption G1/2/3 *(000.00 ... 655.35)*: in kWh. The power required to perform the cleaning at the expected flow and pressure.

Solar irrigation control operation

Example

The process of solar irrigation is described with three programs, each with two configured sectors, where the expected power and flows and the working pressures have been configured.



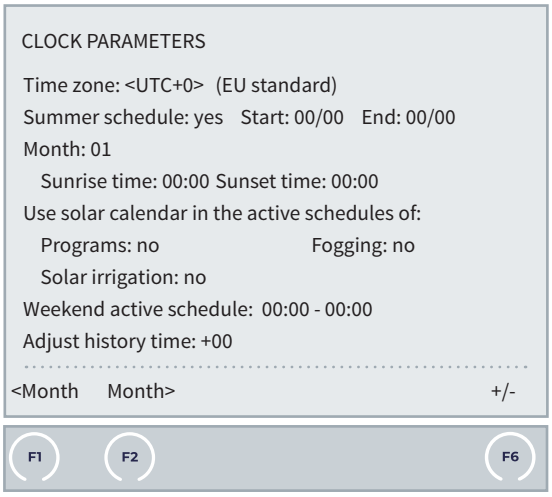
Relationship of sectors with programs			
Program	Sectors	Group	Priority
No. 1	1 - 2	1	2
No. 2	3 - 4	1	1
No. 3	5 - 6	1	1

Configurations in the sectors			
Sector	Expected power	Expected flow	Pressure
1	7 kW	10 m^3/h	2 bar
2	6 kW	15 m^3/h	2 bar
3	21 kW	25 m^3/h	4 bar
4	27 kW	30 m^3/h	4 bar
5	17 kW	12 m^3/h	3 bar
6	10 kW	14 m^3/h	3 bar

1. *At that point on the graph, there is already sufficient power to activate '**Program 1**' (7kW + 6kW = 13 kW), but as it has not yet reached the configured point 1 (15 kW), it cannot start.*
2. *Radiation of 200 W/m² with 15 kW power is detected, which allows **Program 1** to start. Although it has a lower priority than **Programs 2 and 3**, it is the only one that can be started due to the available power.*
3. *After a few minutes, the radiation decreases and so does the power generated, reaching the '**Hysteresis**' value configured at point 1 (15 kW - 2 kW = 13 kW).*
   *Thus, **Pump 2** is turned off, activating **Pump 1** (Mains) to pause '**Program 1**' and close the sectors that need pressure to close.*
   This is possible because it has been previously configured:
   *- '**Yes**' in 'End point one with mains power'.*
   *- On '**Pump 2**' have a time configured in '**Stop Timing**' and the '**Stop at sectors**' option configured to '**No**'.*
4. *The radiation increases again until it reaches point 1, reactivating the irrigation of '**Program 1**.'*
5. *Radiation and power increase to 27 kW, which stops **Program 1**'and activates '**Program 3**' as it has a higher priority.*
6. *Upon detecting 48 kW power, '**Program 3**' is paused to start '**Program 2**'. The two programs have the same priority but the program that requires more power prevails.*
7. *The radiation and generated power decrease, causing '**Program 2**' to pause and continue irrigation with **Program 3**'.*
8. *With the increase in radiation and power, '**Program 3**' is paused again to resume '**Program 2**'.*
9. *As the day progresses, the radiation and power decrease, pausing **Program 2**' and reactivating '**Program 3**'.*
10. *'**Program 3**' ends irrigation and '**Program 1**' resumes because there is sufficient power.*
11. *'**Program 1**' ends irrigation.*
12. *Since there is insufficient power and it is still within daylight saving schedule, neither of the two pending programs can be started.*
13. *Outside of sunlight hours, pumps M1 and M2 activate, since the option to add the power of both pumps has been previously configured. There are two programs pending completion (1 and 2), but because '**Program 2** has a higher priority, it starts first.*
14. *Finally, '**Program 2**' ends and '**Program 1**' starts to end as well.*

Installation diagram with hybrid system (solar energy + mains power or diesel)

5.12. CLOCK



Configuring clock and calendar parameters. To change the time, go to 'FUN - 2. Manual - 10. Clock'.

Time zone: select the time zone in which the controller is installed.

Daylight saving schedule *(No | Yes)*: selecting 'Yes' will automatically change from winter to summer schedule and vice versa on the change date. If the change dates are left at 00/00, the EU standard is applied, starting on the last Sunday in March and ending on the last Sunday in October.

Solar calendar

The sunrise and sunset times are entered for the 1st of each month. The information can be obtained from https://meteogram.es/sol/.

This calendar can be used to modify the active schedules of programs, fogging and solar irrigation.

Example of a farm in Zaragoza (Spain)		
Day / Month	Sunrise time	Sunset time
01/01	08:30	17:43
01/02	08:15	18:19
01/03	07:37	18:53
01/04	07:45	20:28
01/05	06:59	21:01
01/06	06:31	21:21
01/07	06:33	21:41
01/08	06:58	21:21
01/09	07:29	20:37
01/10	08:00	19:45
01/11	07:35	17:58
01/12	08:11	17:34

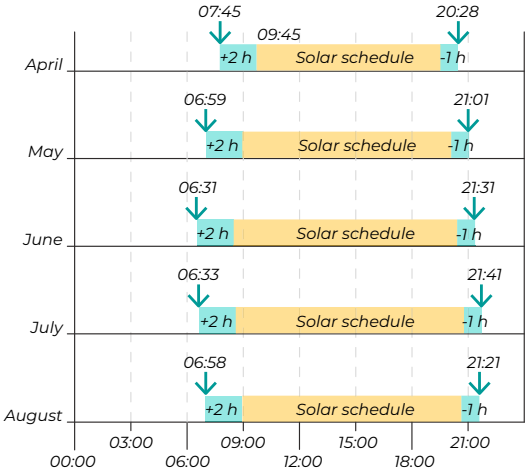
On the remaining days of each month, sunrise and sunset times are automatically recalculated.

Use solar calendar in the active schedules of:

- Programs, Fogging, Solar irrigation *(No | Yes)*
  - No: it prompts in 'hhmm to hhmm' format, direct value of hours and minutes.
  - Yes: it prompts in '±h:mm to ±h:mm' format. Here, the active schedule enters the sunrise time plus or minus the configured value and the same for sunset.

Example

According to the example in the table above, 'use solar calendar during active schedules' is configured with +2 hours at sunrise and -1 hour at sunset. From April to August, for example, the diagram would be as follows:



Behavior of the solar calendar in the active schedules

Active weekend schedule *(00:00 ... 23:59)*: in hours and minutes. When entering this schedule, it is used to replace Saturdays and Sundays in all programs that have their active controller schedule. Useful when there is a different electricity tariff on the weekend. If the programs use solar, this schedule is not prompted.

Adjust history time *(00 ... 12)*: when reviewing historical data, the log view for all elements in the history can be shifted positively or negatively, displayed in a format such as irrigation day. If it is -2 hours in 'Adjust time', then the values in the history will show as from 22:00 the previous day to 21:59 today.

5.13. VARIOUS

VARIOUS PARAMETERS

Screen:
Automatic power-off: no
Lighting level: 5

Keyboard:
Sound level: 2

Security PIN:
PIN code: 0000

Default consultation screen: < GENERAL >

Screen

Auto power off *(No | Yes)*:

- Yes: the screen turns off after five minutes of no key having been touched.
- No: the screen is always on.

Auto power off *(0 ... 5)*: screen illumination level where 0 is lowest and 5 is highest.

Keyboard

Sound level *(0 ... 5)*: duration of the sound when pressing a key where 0 is lower and 5 is higher.

Security PIN

Like mobile phones, the Agrónic can be protected with a PIN code so that it cannot be used if it is stolen. If the Agrónic is without power for more than 10 minutes, the PIN code will be requested when it is powered again.

If the correct code is not entered three times, the Agrónic is blocked and the deactivation code (PUK) is requested. To obtain the code, please contact Progrés. Even if the Agrónic is blocked, the programs continue to run normally and it will operate normally if there is a connection to PC/Cloud.

To change the PIN code, first enter the current PIN, otherwise it cannot be changed.

PIN code *(0000 ... 9999)*: security code number 0000 means that PIN protection is not used.

Default consultation screen *(General | Programs | Sectors | Fertilization | Filters | Determining Factors | Sensors | Drains | Pivots | Solar irrigation | Mixing | Fogging | Heads | Communications | Modules | Agrónic)*: select the default when the controller starts.

5.14.INSTALLER

INSTALLER PARAMETERS

01 Erasure	10 Activation options
02 Events	11 Hardware
03 Head-Regulations	12 Update software
04 Sectors	13 Exchange ModBus
05 Communication	
06 Various	
07 Access codes	
08 Backup copy	
09 Language	

This section shows the least-common parameters to change once the controller has been installed.

The input to this section is protected with an access code that, if needed, must be requested from Progrés.

5.14.1 Erasure

INSTALLER PARAMETERS

01 Programs	10 Drainage
02 Sectors	11 Log
03 Determining factors	12 Total
04 Digital sensor	13 RAM memory
05 Analog sensor	
06 Meter sensor	
07 Logical sensor	
08 Pivot	
09 Pumps	

Different parameters of the controller can be erased.

The log, total and RAM memory erasure sections should not be used unless instructed to do so by Progrés technical personnel.

The 'Full erasure' option may take a few seconds.

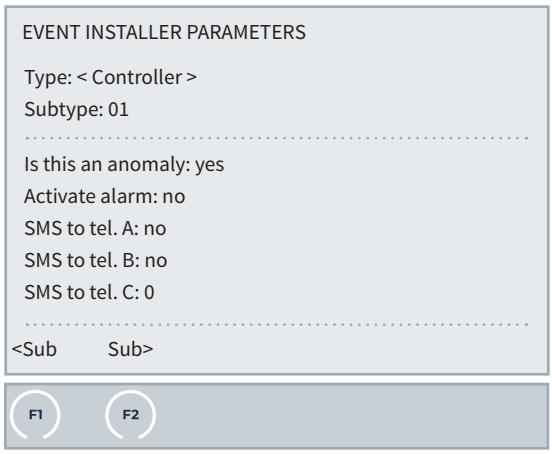
PROGRAMS ERASED

Erase all: no
Erase element: 01
Erase RAM: no

1. Programs *(all | element | RAM)*
2. Sectors *(all | element | RAM)*
3. Determining factors *(all | element)*
4. Digital sensor *(all | element | RAM)*
5. Analog sensor *(all | element)*
6. Meter sensor *(all | element)*
7. Logical *(all | element)*
8. Pivot *(all | element)*
9. Pumps *(all | element)*
10. Drainage *(all | element)*
11. Log
12. Total
13. RAM memory

- Erase all *(No | Yes)*: selecting 'Yes' erases the parameters, consultation and working data from all elements.
- Erase element *(000 ... xxx)*: erases the parameters, consultation and job data, only from the indicated element.
- Erase RAM *(No | Yes)*: erases consultation and working data for all elements.

5.14.2 Events



For each event that Agrónic logs, the type and subtype are configured with the actions carried out when they occur.

The actions of the events that result from the type 6.1 to 6.12 'determining factors' are configured in each of the determining factors in the section 'FUN - 4. Parameters - 6. Determining factors'.

The complete list of events can be seen in the section 'FUN - 3. Readings - 2. Log' in the user manual.

Event type *(Controller | Manual | Program | Sector | Sensor | Determining factor | Communication | Fertilizer | Filter | Mix | Diesel | Fogging | Drainage | Pivot | Solar):* select the event type to be configured.

Subtype *(00 ... 99)*: the subtype number (specific event) to be configured.

It is an anomaly *(No | Yes)*:

- No: the event is logged as an action. It is shown in the action log section. It is used for events that are not important to see when they occur.
- Yes: the event is logged as an anomaly. When it occurs it is indicated in the general consultation. It is shown in the anomalies section and in the action log. It is used for events that require a quick view of when they occur.

Activate alarm *(No | Yes)*: if 'Yes' is selected, the alarm output activates when the event occurs.

The alarm is configured in 'FUN - 4. Parameters - 1. Head - Head No. - 2. General - 6. Alarm' and is manually deactivated in 'FUN - 2. Manual - 5. Terminate stops and malfunctions'.

The next section is only prompted if the GPRS modem is installed.

SMS to tel. A *(No | Yes)*: when the event occurs, send an SMS to phone A.

SMS to tel. B *(No | Yes)*: when the event occurs, send an SMS to phone B.

SMS to tel. C *(0 ... 6)*: When the event occurs, send an SMS to Telephone C with the selected text.

5.14.3 Head - Regulations

HEAD INSTALLER PARAMETERS

1 Head 1
2 Head 2
3 Head 3
4 Head 4
5 Modulation cycles

Configuration for each head of EC, pH and pressure regulations. First select the head and then what will be configured.

5.14.3.1 Head

INSTALLER PARAMETERS HEAD 1

1 EC PID regulation
2 pH PID regulation
3 Compensate for planned flow
4 Pressure regulation
5 Pump/Flow scaling

5.14.3.1.1 EC PID Regulation
5.14.3.1.2 pH PID regulation

INST. PAR. HEAD 1 PID REGULATION OF EC / pH

Kp: 07
Ki: 03
Kd: 00
Initial delay: 00”
Calculation time: 2”

Kp *(00 ... 07 ... 10)*: proportional gain, this operation increases the output percentage as the difference between the sensor reading and the reference value increases.

Ki *(00 ... 03 ... 10)*: integral gain, this operation increases the injection as the total error over time increases.

Kc *(00 ... 10)*: derivative gain, increases the output percentage as the pH/EC value decreases.

Initial delay *(00 ... 30)*: at the start of regulation, the injection is set to the same value as the last irrigation for the time configured here. After this time, the PID calculates the injection..

Calculation time *(0 ... 2 ... 9)*: the frequency with which the injection is calculated. This value is important for the integral and derivative calculations. Typically this is the time it takes for water to circulate from the point where the fertilizer is injected until it reaches the EC or pH sensor.

Important

It is on the screen ‘CON - 4. Fertilization’:

- Press the ‘1’ key to see the PID consultation that regulates the EC.
- Press the ‘2’ key to see the PID consultation that regulates the pH.

The values of the proportional gains (Kp), integral (Ki) and derivative (Kd) can be modified in this consultation screen.

This is helpful for regulating EC and pH regulation. Press key ‘3’ to show the control for the proportions of the eight fertilizers, indicating the proportion programmed between them, the actual proportion and the injected volume.

5.14.3.1.3 Compensate by expected flow

INST. PAR. HEAD 1 COMP. BY EXPECTED FLOW

P1: 000.0 m^3/ha 00%
P2: 000.0 m^3/ha 00%

EC and pH injection can be increased as calculated by the 'PID', in relation to the expected flow of the irrigated sectors. Two flow points are required for an increase in injection percentage.

P1 *(000.0 ... 999.9)*: in m^3/h, minimum flow at which the injection percentage starts to increase.

P1 *(00 ... 50)*: in %, minimum injection value that starts to increase when it reaches the previously configured flow.

P2 *(000.0 ... 999.9)*: in m^3/h, maximum flow above which the injection percentage will not increase any further.

P2 *(00 ... 50)*: in %, maximum injection value when it reaches the previously configured flow.

5.14.3.1.4 Pressure regulation

INST. PAR. HEAD 1 PRESSURE REGULATION

What controls regulation: < Agrónic >
Kp: 07
Ki: 03
Kd: 00
Calculation time: 2"
Initial delay: 000"
Minimum operating regulation: 000%

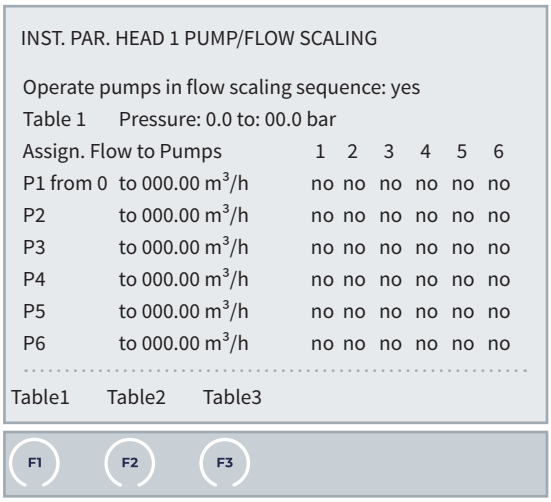
The Agrónic can control regulation through a PID control or directly deliver the reference to the drive so that it can control regulation.

It can be configured to either have the Agrónic control regulation or to deliver the reference to the controller to control regulation.

What controls the regulation *(Agrónic | Drive)*:

- Agrónic: the Agrónic controls regulation, the analog output varies according to the PID.
  - Kp *(00 ... 07 ... 10)*: proportional gain, this operation increases the output percentage as the difference between the sensor reading and the reference value increases.
  - Ki *(00 ... 03 ... 10)*: integral gain, this operation increases the injection as the total error over time increases.
  - Kc *(00 ... 10)*: derivative gain, increases the output percentage as the pressure value decreases.
  - Calculation time *(0 ... 2 ... 9)*: frequency with which the output is calculated. This value is important for the integral and derivative calculations.
  - Initial delay *(000 ... 255)*: when the pressure regulation starts it is configured to the 'Minimum operating regulation' value for the time configured here. After this time, the PID calculates the injection.
  - Minimum operating regulation *(000 ... 100)*: % minimum pressure regulation percentage below which it will never drop, even if the PID is below this level. Useful for the pump/drive operation.
- Drive: the drive performs the regulation, the analog output indicates the reference.
  - Maximum pressure value *(00.0 ... 25.5)*: in bar, the reference value for calculating the analog output scaling sequence at 100%. The rest of the variables linked to the analog outputs are found in the section 'FUN - 4. Parameters - 15. Installer - 11. Hardware'.

5.14.3.1.5 Pump/Flow scaling



To start or stop the pumps automatically based on the expected flow required by the active sectors at any given time during irrigation, enter the variables provided in the list below.

Since the scaled flow values may vary (due to the pump or engine specifications) depending on the working pressure range, up to three scaling tables can be configured, one for each different working pressure range in the sectors.

It can be configured to either have the Agrónic control regulation or to deliver the reference to the controller to control regulation.

Operate pumps in flow scaling sequence *(No | Yes)*:

- No: this operation is not taken into account.
- Yes: there are six scaling points per table. The first setting ranges from 0 m^3/h to an initial flow rate value, allowing for the pump assignment to enter at this initial scaling stage. The second point goes from the flow of the first point to the value entered in the second and so on...

The 'water hammer' timings will be met at the start or end of each of them.

The 'pressure regulation' or the diesel engine (generator set) can also operate on the M1 together with flow scaling, in which case it must be assigned at each of the points.

Pump M2 also has a pressure regulation output, to perform the 'multi-follower' function. In this case, the M2 regulation analog output follows exactly the same value as that of M1.

> **Important**
>
> The sectors that will operate with the scaled pumps must have the same pumps assigned to them as in the table. If there is any sector that, for example, irrigates by natural pressure, then a pump/general not provided for in the table is assigned.

The pump input can be delayed during initial pipe filling (when they start for the first time). To do this, configure the 'Pipe filling time' in 'FUN - 4. Parameters - 1. Head - No. Head - 2. General'.

Pressure *(00.0 ... 25.5)*: the pressure range in which each scaling table is applied is indicated.

Table 1 goes from 0.0 bar to the indicated pressure.

Table 2, from the pressure in Table 1 to the indicated value.

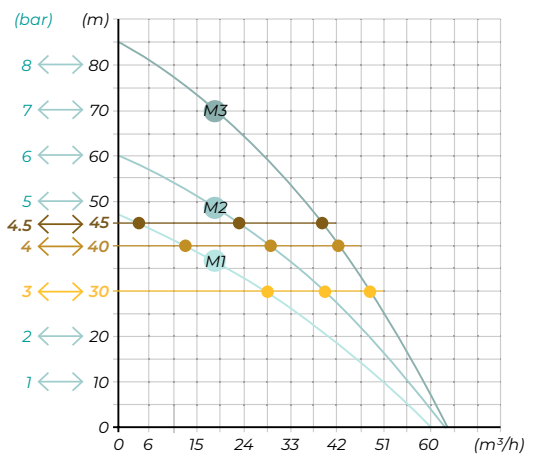
Table 3, from the pressure in Table 2 to the indicated value.

P1, P2, P3, P4, P5 and P6 *(000.00 ... 999.99)*: flow range, in m^3/h, used to determine which pumps should be activated when irrigation starts. This range is compared with the sum of the expected flows of the configured sectors. The pumps to be activated are determined based on the range in which this total sum falls.

1, 2, 3, 4, 5 and 6 *(No | Yes)*: configure which pumps starts when irrigation starts based on the expected flow.

Example

According to the hydraulic curve of three pumps, the parameters of three different irrigation pressures are configured.



Example of a three-pump hydraulic curve

First, consult the pump's working curve to determine the flow that each pump can provide according to the desired working pressure. This is crucial to be able to decide, based on the expected flow in the different irrigation sectors, which pumps should be activated at any given time.

Pump/flow ratio according to pressure/height			
Pump No.	3 bar	4 bar	4.5 bar
Pump 1	29 m^3/h	14 m^3/h	4 m^3/h
Pump 2	40 m^3/h	28 m^3/h	22 m^3/h
Pump 3	48 m^3/h	41 m^3/h	38 m^3/h

In the sector parameters, the following configurations need to be made for each sector:

- Pump allocation and expected flow: All sectors must have the three available pumps assigned and their expected flow configured.
- Pressure configuration: All sectors must have the required working pressure configured.

SECTOR PARAMETERS
Sector: 001
Output: 00000001 Base - R1
Auxiliary: 00000000
Head No.: 1
Pump:
→**M1: yes M2: no M3: no** M4: no M5: no M6: no
Water hammer timer: +000"
→Expected flow: 000.00 m^3/h
→Pressure reference: 00.0 bar

With this data to hand, the three tables can be completed, each representing a working range with its respective flows, according to the pump's working curve. It is important to note that as the required pressure increases, the flow that the pump can deliver decreases.

INST. PAR. HEAD 1 PUMP/FLOW SCALING

Operate pumps in flow scaling sequence: yes
Table 1 Pressure: 0.0 to: 03.0 bar

Assign. Flow to Pumps	1	2	3	4	5	6
P1 from 0 to 029.00 m^3/h	yes	no	no	no	no	no
P2 of 29 to 040.00 m^3/h	no	yes	no	no	no	no
P3 of 40 to 048.00 m^3/h	no	no	yes	no	no	no
P4 of 48 to 069.00 m^3/h	yes	yes	no	no	no	no
P5 of 69 to 088.00 m^3/h	no	yes	yes	no	no	no
P6 of 88 to 117.00 m^3/h	yes	yes	yes	no	no	no

Table1 Table2 Table3

INST. PAR. HEAD 1 PUMP/FLOW SCALING

Operate pumps in flow scaling sequence: yes
Table 2 Pressure: 3.0 to: 04.0 bar

Assign. Flow to Pumps	1	2	3	4	5	6
P1 from 0 to 014.00 m^3/h	yes	no	no	no	no	no
P2 from 14to 028.00 m^3/h	no	yes	no	no	no	no
P3 from 28to 041.00 m^3/h	no	no	yes	no	no	no
P4 from 41to 042.00 m^3/h	yes	yes	no	no	no	no
P5 from 42to 069.00 m^3/h	no	yes	yes	no	no	no
P6 from 69to 083.00 m^3/h	yes	yes	yes	no	no	no

Table1 **Table2** Table3

INST. PAR. HEAD 1 PUMP/FLOW SCALING

Operate pumps in flow scaling sequence: yes
Table 3 Pressure: 4.0 to: 04.5 bar

Assign. Flow to Pumps	1	2	3	4	5	6
P1 from 0 to 004.00 m^3/h	yes	no	no	no	no	no
P2 from 4 to 022.00 m^3/h	no	yes	no	no	no	no
P3 from 22to 026.00 m^3/h	no	no	yes	no	no	no
P4 from 26to 038.00 m^3/h	yes	yes	no	no	no	no
P5 from 38to 042.00 m^3/h	no	yes	yes	no	no	no
P6 from 42to 072.00 m^3/h	yes	yes	yes	no	no	no

Table1 Table2 **Table3**

5.14.3.2 Modulation cycles

INST. PAR. MODULATION CYCLE HEAD

Short modulation cycle: 1.5”
Long modulation cycle: 010”

Short modulation cycle *(1.5 ... 5.0)*: the time in which the injection pulses are repeated, in the fast outputs.

> **Example**
>
> If the configured time is 2 seconds and the injection is at 50%, the injection valve will open for 1 second and close for 1 second.

If the output is 4-20 mA or 0-10 V type, this time is not used.

It is used in EC regulation, pH regulation, in uniform fertilization if rapid pulses are required or in proportional fertilization in the injection mode proportional to the flow.

Long modulation cycle *(001 ... 010 ... 255)*: indicates the frequency of fertiliser injection, used exclusively for uniform fertilisation. Normal outputs from the base are used.

The modulation cycle times are common to all four heads.

5.14.4 Sectors

SECTOR INSTALLER PARAMETERS

1 Flow detector
2 Sector fertilizer

Some parameters directly related to the sectors are configured in this section.

5.14.4.1 Flow detector

FLOW DETECTOR INSTALLER

Stop program: no
Delay digital detectors: 02'00"
Auxiliary meter format No.: 1
Pulse value: 0000.00 L
Time between pulses: 000"
Flow in: <0000 m^3/h>
Total in: <m^3>
High margin: 000%
Low margin: 000%
Margin detection delay: 00'00"

< For For >

F1 F2

The flow detectors that the sectors can have are configured in this section. They can be digital (on/off) or flow (meter).

The parameters of these detectors are common to all sectors of the controller. There can be up to four different formats for the meters.

The sector enters into error due to flow detector in two cases:

- The sector is closed and water is passing through.
- The sector is open and no water is passing through.

In the case of the flow meter detector, it may enter into error due to flow outside of the range.

It is also configured if the sector will be used as fertilizer. These parameters are configured for each sector.

The flow detector in the sector can be by 'Digital detector' or by 'Auxiliary meter'.

Stop program *(No | Yes)*: the program can be stopped when the open sector error occurs and no water is passing or, in the case of the auxiliary meter if it is in error due to flow outside of the margin.

- Yes: for the program corresponding to the sector in error.
- No: not for the program, only a log is recorded.

When the program is stopped (temporary stop), it will resume with the next subprogram, the next position of a linear unit or a possible sequential program.

Digital flow detector

It can be a probe-type sensor or a pressure gage. The digital contact is open when no water passes through and closed when water passes through.

Detection delay *(00'00" ... 99'59")*: when the sector changes from open to closed, this controller waits for the configured time before checking that no water passes through.

When the sector changes from closed to open, this is the delay time before checking that water is passing through.

Delays caused by communications if there are modules or by filling pipes must be taken into account.

Flow detector by meter (auxiliary meter)

There can be one meter in each sector. All meters assigned to sectors must be the same within four possibilities.

It is considered that water is passing through the sector when pulses are received from the meter and that no water is passing through if no pulses are received.

There is also a flow and leak error control if there is no irrigation order.

Meter format No. *(1 ... 4)*: different meters can be assigned to different sectors. Each format includes the following variables.

Pulse value *(0000.00 ... 9999.99)*: in liters, value that each pulse measures.

Time between pulses *(000 ... 999)*: waiting time, in seconds, to set the flow to ' 0 ' since the last pulse.

Flow in *(0000 m^3/h | 000.0 m^3/h | 00.00 m^3/h | 0000 L/h)*: select the unit in which the meter displays.

- 0000 m^3/h: cubic meters per hour.
- 000.0 m^3/h: cubic meters per hour.
- 00.00 m^3/h: cubic meters per hour.
- 0000 L/h: liters per hour.

Total in *(m^3/h | L | cl)*: units in which the volume total in history is stored.

High Margin *(000 ... 100)*: the flow error activates when the instantaneous flow is higher than the expected flow by that %.

Low margin *(000 ... 100)*: the flow error activates when the instantaneous flow is lower than the expected flow by that %.

For this control, an 'Expected flow' must be assigned in 'FUN - 4. Parameters - 3. Sectors'.

Margin delay detection *(00'00" ... 99'59")*: delay, in minutes - seconds, that must be met to log the flow error and stop the program. When the sector has no irrigation order, this timing is used; once it transpires, the system will check for an initial pulse from the meter, which will then log a leak indication. 'FUN - 3. Readings - 3. History - 1. Sector' displays the leak units.

5.14.4.2 Sector fertilizer

SECTOR FERTILIZATION INSTALLER

Sector: 001
F1: no F2: no F3: no F4: no

When a sector is configured as a fertilizer, it only activates when the assigned fertilizer activates. It is configured for each sector and can only be done with the first four fertilizers.

Sector *(000 ... 400)*: sector number to which the fertilizer is assigned.

Assigned fertilizers *(No | Yes)*: when a separate network is set up in the irrigation network for one or more fertilisers, this feature allows the fertiliser valve to open in one or more sectors, while only irrigation or a different fertiliser is applied in others.

5.14.5 Communication

Communications Manual *r2407*

Intended for installers who configure communications with the cloud for VEGGA and Agrónic App or with the Agrónic Windows PC program. There is an explanation of the different communication systems.

5.14.6 Various

VARIOUS

In volume irrigation, prompt for time: no
Irrigation volume format: <0000.0 m^3>
Fertilizer volume format: <0000.0 L>
Default fertilizer units: <hh:mm>
Pre and post-irrigation by subprogram or sector: yes
Average reading EC and pH: 01
Integrated radiation format: <Wh/m^2>

Max. logs per hour: 0500

Back-torque filter: 00.0

Parameters that affect programs

In volume irrigation prompt for time *(No | Yes)*: selecting 'Yes' when irrigating by volume will prompt for a maximum irrigation time. This time is given for safety in case no pulses are received from the meter or a maximum irrigation time is to be set for a certain volume.

Irrigation volume format *(00000 m^3 | 0000.0 m^3 | 000.00 m^3)*: when irrigation units are measured by volume in 'm^3,' this setting determines the input format.

Fertilizer volume format *(00000 L | 0000.0 L | 000.00 L)*: when fertiliser units are measured by volume, this setting determines the input format.

Default fertilizer units *(hh:mm | mm'ss" | L | L/ha)*: determines the default fertilizer units.

For each program, it can be modified in 'FUN - 4. Parameters - 2. Programs'.

- hh:mm: hours and minutes.
- mm'ss": minutes and seconds.
- L: liters. A meter sensor must be configured.
- L/ha: liters per hectare. A meter sensor must be configured in the fertilizers and the area of each sector. Summing the total area of the sectors to be irrigated calculates the amount of fertiliser in litres.

Changing this parameter automatically changes the fertilizer units of all empty programs (that have no sectors configured).

Pre- and post-irrigation by subprogram or sector *(No | Yes)*:

- Yes: if the program type is 'subprograms', the pre-irrigation and post-irrigation settings are specified for each subprogram. If it is 'linear', the pre-irrigation and post-irrigation settings are specified for each group of linear positions.
- No: the pre-irrigation and post-irrigation settings apply to the entire program and will be a single value applied to each subprogram or linear mode group. With this option, the T/V key is not displayed in 'FUN - 1. Programs' since all subprograms must have the same irrigation units. Pre-irrigation and post-irrigation are not permitted in hybrid solar irrigation.

Average reading EC and pH *(01 ... 10)*: configure the number of readings used to calculate the average. The reading on the regulation sensors shown in the consultation is the average of the last readings. It is used to make the reading more stable in the consultation and is not used for control. A reading is taken every second.

Integrated radiation format *(Wh/m^2 | J/cm^2)*: select the unit that is used in the start, warning or modification determining factors of 'irrigation/fertilizer/time between activations' for an integrated radiation value.

Log limit

Max. logs per hour *(0000 ... 0500 ... 2000)*: to avoid excessive numbers of the same log, a general limit can be configured to avoid collapsing communications with repetitive events.

It can occur due to a programming error, communication error in modules, sensors, etc.

Once the maximum limit has been reached, no new event logs are recorded until there is a change of day or a manual command is given. Upon reaching the limit, a log is made indicating the situation.

Filters in the meters

Back-torque filters *(00.0 ... 10.0)*: a back-torque filter time is defined for the digital inputs of the Agrónic 4500 type base. This value is the minimum time that a meter pulse needs to be active for the total value to increase. Applies to all inputs on the base. A lower pulse does not increase the total. If the value is configured to 00.0, there is no filter.

5.14.7 Access codes

INSTALLER ACCESS CODE

SMS code: 0000
PAR code: 0000
FUN code: 0000

SMS code *(0000 ... 9999)*: code number that an SMS command must include for it to be accepted. The code '0000' means that a code does not need to be entered.

PAR code *(0000 ... 9999)*: code number to enter Parameters. The code '0000' means that a code does not need to be entered.

FUN code *(0000 ... 9999)*: code number to enter Functions. The code '0000' means that a code does not need to be entered.

5.14.8 Backup copy

BACKUP INSTALLER

Save backup copy: no

Restore backup copy: no

Last backup copy: 02/02/24 16:05

Once all the controller parameters and programs are configured, a backup copy can be saved within the controller. This backup can be recovered at any time. This enables parameters to be reset in a single step if they are modified by mistake or if reverting to a previous configuration is desired.

It is very important to make regular backups to save data and protect it from possible errors.

Save backup copy *(No | Yes)*: selecting 'Yes' will perform the backup. This action may take a few seconds.

Restore backup copy *(No | Yes)*: selecting 'Yes' recovers the last backup copy on the date and time detailed below.

5.14.9 Language

INSTALLER PARAMETER LANGUAGE

Language: <Spanish>

Language *(Spanish | Portuguese | English | French | Italian)*: select the desired language.

5.14.10 Activate options

ACTIVATE OPTIONS		
Cloud + PC code	00000000	Activated
Cloud code	00000000	
PLUS code	00000000	Activated
HYDRO code	00000000	Activated
PIVOT code	00000000	
SOLAR code	00000000	
CLIMA code	00000000	
Monocable code	00000000	Activated
Radio code	00000000	

Options that activate will appear with the text 'Activated'.

PC + Cloud Code *(00000000)*: activation code number for communication with the 'Agrónic PC' program. Includes communication with the cloud (Agrónic App and VEGGA).

Cloud code *(00000000)*: activation code number for communication with the cloud (Agrónic App and VEGGA).

PLUS code *(00000000)*: activation code number to increase the number of heads, sectors and programs, group sectors, irrigation by ETo, logical sensors, hybrid solar irrigation and connection to controller via ModBus.

HYDRO code *(00000000)*: activation code number that includes fertilization by EC regulation, two phytosanitary treatments, drainage control, water mixing and fogging management.

PIVOT code *(00000000)*: code number that includes control of up to four pivots.

SOLAR code *(00000000)*: code number that includes Solar Irrigation control.

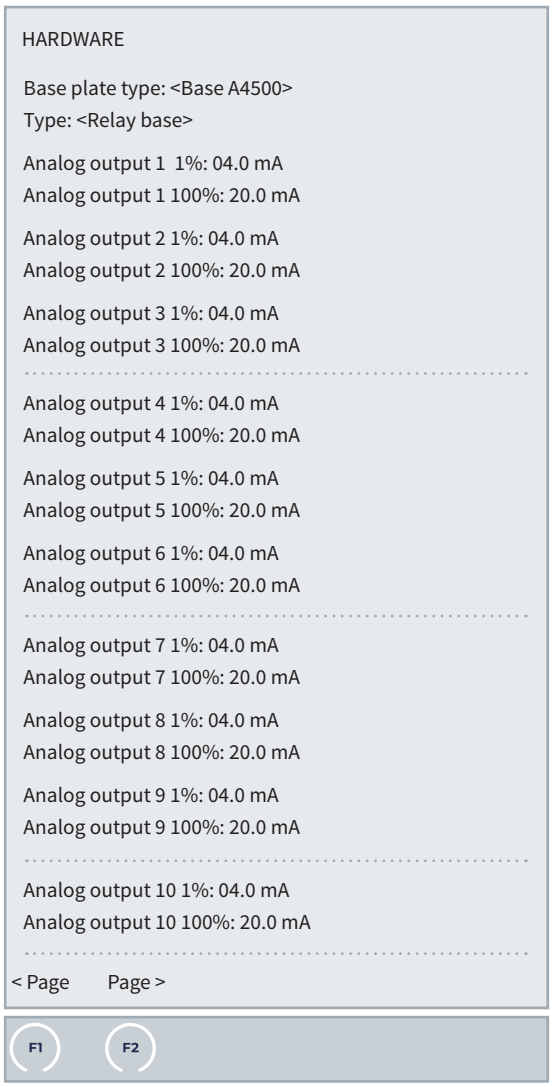
CLIMA code *(00000000)*: in preparation.

Monocable code *(00000000)*: code number that includes the activation of this option to link with the Agrónic Monocable 120 modules.

Radio code *(00000000)*: code number that includes the activation of this option to link with the Agrónic Radio 433 modules.

The activated options can be seen in 'CON - 18. Agrónic'.

5.14.11 Hardware



The Agrónic hardware is divided into two parts:

- The micro plate: this is where the screen and keyboard are connected and where the controller's control software is located.
- The base plate: this is where the inputs and outputs are connected. This base plate includes the default Agrónic 4500 model, with the option to use base plate models from an Agrónic 4000 or Agrónic 7000 in existing installations.

Base plate type *(Base 4500 | Base 4000 | Base 7000)*: select the base plate that is connected.

- A4500 base: Agrónic 4500 base.
- A4000 base: Agrónic 4000 base.
- A7000 base: Agrónic 7000 base.

Type *(Relay base | Latch base 3h | Latch base 2h | Latch base 2h inv)*: select the type of base plate outputs. Only for Agrónic 4500 and Agrónic 4000.

- Relay base: outputs for 12 Vdc or 24 Vac valves.
- Latch base 3h: outputs for 3-wire latch solenoids.
- Latch base 2h: outputs for 2-wire latch solenoids.
- Latch base 2h inv: outputs for 2-wire inverted latch solenoids.

The expansion of analog outputs requires no configuration; simply install the plates. There are a total of 10 analog outputs (5 on each plate).

For each of the analog outputs, the value corresponding to 1% and the value corresponding to 100% is configured. Values are given in mA as the output ranges from 0 to 20 mA.

Output at 1% *(00.0 ... 04.0 ... 25.0)*: value from 0 to 20 mA corresponding to 1%.

Output at 100% *(00.0 ... 20.0 ... 25.0)*: value from 0 to 20 mA corresponding to 100%.

Agrónic 7000 base plate

The expansion of analog outputs requires no configuration; simply install the plate. There are a total of 12 analog outputs from 0 to 10 V.

For each of the analog outputs, the value corresponding to 1% and the value corresponding to 100% is configured. Values are given in 'V' as the output is 0 to 10 V.

Output at 1% *(00.0 ... 04.0 ... 25.0)*: value from 0 to 10 V corresponding to 1%.

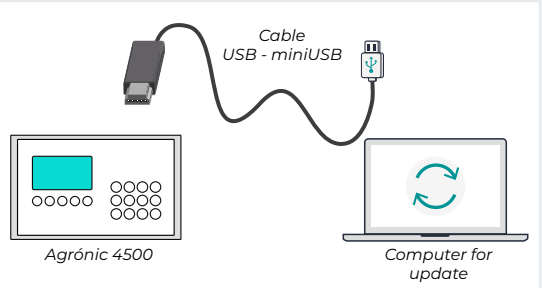
Output at 100% *(00.0 ... 20.0 ... 25.0)*: value from 0 to 10 V corresponding to 100%.

5.14.12 Update software

SOFTWARE UPDATE

1 USB
2 Wireless

USB



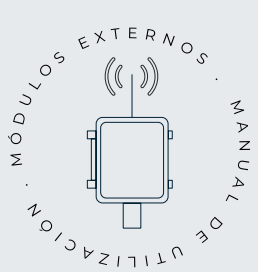
USB to miniUSB cable connection

To update the internal software of the Agrónic via USB, a PC with the Agrónic update application provided by Progrés and a USB to miniUSB cable are required.

Wireless

The option to update the controller wirelessly is not available, but will be available soon.

5.14.13 ModBus Exchange



External modules manual

Intended for installers who configure the irrigation system through external modules. It details all the parameters required to configure and encode the inputs and outputs of the external modules.

6 CODING INPUTS AND OUTPUTS

The inputs and outputs are coded with 8 numbers for easy location.

The inputs and outputs are coded with 8 numbers for easy location.

Its configuration logic is as follows:

00000000: The first two indicate whether they are in Agrónic, are virtual or are in external modules.

00000000: The next one indicates which mains is being used if there is more than one.

00000000: The next three are the mains module number.

00000000: The last ones indicate the input or output.

Example

Output 2 of module 34 of the system Agrónic Monocable 1

SECTOR PARAMETERS

Sector: 001

Output: 07103402
Auxiliary: 00000000
Head No.: 1
Pump:
M1:yes M2:no M3:no M4:no M5:no M6:no
Water hammer timer: +000”

Digital outputs

Module type 00000000	Number of device 00000000	Module number 00000000	Output number 00000000	Description
00 Base	0	00	001 - 120	Agrónic 4500 Base: maximum 104 outputs Agrónic 4000 Base: maximum 96 outputs Agrónic 7000 Base: maximum 120 outputs
03: AgroBee-L	1 - 2	001 - 020	01 - 09	AgroBee-L 1 and 2
06: ModBus	0	001 - 032	01 - 15	Exchange table 32 controller outputs 15 values maximum
07: Agrónic Monocable	1 - 2	001 - 120	01 - 08	Agrónic Monocable 120. EAM1 and EAM2
10: Agrónic Radio 433	1 - 2	001 - 060	01 - 16	Agrónic Radio 433. ARL1 and ARL2
11: Expansion modules	0	001 - 015	01 - 99	Expansions from the base

Examples

03100102: Output 2 of module 1 of AgroBee-L 1

07201001: Output 1 of MAM 10 of Agrónic Monocable 2

10100302: Output 2 of MAR 3 of Agrónic Radio 1

Digital inputs

Module type 00000000	Number of device 00000000	Module number 00000000	Input number 00000000	Description
00 Base	0	000	01 - 32	Agrónic 4500 base: maximum 12 inputs Agrónic 4000 base: maximum 12 inputs Agrónic 7000 base: maximum 32 inputs
		001	01 02	Agrónic 4500 Base: voltage at the inputs Agrónic 4500 Base: voltage at the outputs
02: Virtual	0	000	01	Unique code to indicate that the sensor is virtual.
03: AgroBee-L	1 - 2	001 - 020	01 - 06	AgroBee-L 1 and 2
06: ModBus	0	001 - 032	01 - 08	Exchange table Inputs 32 controllers 15 values maximum
07: Agrónic Monocable	1 - 2	001 - 120	01 - 10	Agrónic Monocable 120. EAM1 and EAM2 Inputs 1 and 2 cannot be used as meters
10: Agrónic Radio 433	1 - 2	001 - 060	01 - 16	Agrónic Radio 433. ARL1 and ARL2
11: Expansion modules	0	001 - 015	01 - 12	Expansions from the base

Examples

06000102 Digital input 2 of ModBus device 1

03200201 Digital input 1 of AgroBee-L module 2

Analog inputs

Module type 00000000	Number of device 00000000	Module number 00000000	Input number 00000000	Description
00 Base	0	000	01 - 32	Agrónic 4500 base: maximum 12 inputs Agrónic 4000 base: maximum 12 inputs Agrónic 7000 base: maximum 16 inputs
		001	01 02	Agrónic 4500 Base: voltage at the inputs Agrónic 4500 Base: voltage at the outputs
02: Virtual	0	000	01	Unique code to indicate that the sensor is virtual.
03: AgroBee-L	1 - 2	001 - 020	01 - 16	AgroBee-L 1 and 2 01 to 13: depends on the AgroBee-L model 14: Battery voltage, 15: Panel voltage 16: Radio signal level
05: Davis Station	0	000	01 - 33	Davis weather station. Gateway Davis Pro is required
06: ModBus	0	001 - 032	01 - 15	Exchange table Inputs 32 controllers 15 values maximum
07: Agrónic Monocable	1 - 2	001 - 120	01 - 02	Agrónic Monocable 120. EAM1 and EAM2
10: Agrónic Radio 433	1 - 2	001 - 060	01 - 02	Agrónic Radio 433. ARL1 and ARL2
11: Expansion modules	0	001 - 015	01 - 16	Expansions from the base
12: SDI-12	0	001 - 008	01 - 24	Connected sensors

Analog outputs

Module type 00000000	Number of device 00000000	Module number 00000000	Output number 00000000	Description
00: Base	0	000	01 - 12	Agrónic 4500 base: maximum 10 (0 - 20 mA) Agrónic 4000 base: maximum 10 (0 - 20 mA) Agrónic 7000 base: maximum 12 (0 - 10 V)
06: ModBus	0	001 - 032	01 - 15	Exchange table Inputs 32 controllers 15 values maximum
11: Agrónic expansion	0	001 - 015	01 - 10	Expansions from the base

7 TECHNICAL SUPPORT

Apart from this manual, the Agrónic 4500 has other manuals, tips and frequently asked questions on the Progrés website, Technical Support section.

Assembly and connection manual *r2448*

Intended for those who physically install the Agrónic on the farm or in the electrical panel. Shows the dimensions and how the different connection options must be wired.

End user's manual *r2444*

Intended for the Agrónic end user. It details the most common use of programming, manual actions and consultations. The parameters are not explained in this manual.

External modules manual

Intended for installers who configure the irrigation system through external modules. It details all the parameters required to configure and encode the inputs and outputs of the external modules.

External ModBus manual

This manual is intended for those who install irrigation systems with auxiliary devices, providing details on configuring and coding inputs and outputs on external devices.

Expansion Module 1 Manual

Intended for those who physically install the Expansion Module on the property or in the electrical panel.

Shows the dimensions and how the different connection options must be wired.

Expansion Module 2 Manual

Intended for those who physically install the Expansion Module on the property or in the electrical panel.

Shows the dimensions and how the different connection options must be wired.

Update software *r2517*

This manual will guide you through the steps required to update the software effectively, safely and smoothly.

Keep the controller up to date with this essential resource.

Installing the options

Installation option GPRS Modem

USB option Installation

WiFi option Installation

Installation option AgroBee-L 1/2

Installation option analog inpts

Installation option RS485 ME/MB

SPACE RESERVED FOR THE USER

Use this space to record information such as the parameters entered into the controller, drawings, program information, determining factors, alarms, etc.

Warranty

The Agrónic 4500 complies with the EC marking directives.
Products manufactured by Progrés have a two-year warranty against any manufacturing defect.
Compensation for direct and indirect damage caused by the use of the controllers is excluded from the warranty.

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