

DESCRIPTION:

- This unit is used to activate solenoids and read meters and sensors from a distance using a 2-wire cable. According to the model, the Agrónic Monocable module (MAM) can connect up to:
 - MAM2-41:
 - 2 latch solenoids of 2 wires (or 1 of 3 wires)
 - 4 digital inputs (2 can be meters)
 - 1 sensor
 - MAM5-71:
 - 5 latch solenoids of 2 wires (or 2 of 3 wires)
 - 7 digital inputs (5 can be meters)
 - 1 sensor
 - MAM8-101:
 - 8 latch solenoids of 2 wires (or 4 of 3 wires)
 - 10 digital inputs (8 can be meters)
 - 1 sensor
- The connection between the MAM and the Agrónic is done through a linking unit, the Agrónic Monocable Link (EAM). A 2-wire cable from the EAM connects all the MAMs. This cable not only communicates the MAM but it also provides them with electrical power.
- Up to 120 MAM modules can be connected to a single EAM.
- The distance between the EAM and the last MAM on the line can surpass 10 km. (under certain conditions).
- The built-in light indicates when the unit is communicating.
- Configuration and consultation using a Modules Reader (or through another reader, the Agrónic Monocable Reader, LAM) with screen and keyboard.
- Two-fold security:
 - The battery in each MAM lasts over 30 hours in the event of a power failure or a power cut in the Monocable.
 - The batteries in the EAM last several hours in the even of a general power failure. With larger capacity batteries, it can keep operating for several days.
- Protection against overloads.



MAM2-41



MAM8-101

TECHNICAL CHARACTERISTICS:

Power supply		
Power source	24Vdc through the Monocable bus, -20% +25%	
Energy consumption:	At rest:	2 mW
	While communicating:	4 W

Outputs	
Number	2 / 5 / 8
Type	12 Vdc or 16 Vdc Trigger time: 80 ms Capacitor charge: 3300 μ F

Inputs		
Digital	Number	4 / 7 / 10
	Type	free power contact
Analog	Number	1 (10 bits)
	Type	analog 4 – 20 mA

Atmosphere	
Temperature	-10 °C to 70 °C
Humidity	< 85%
Height	2000 m
Pollution	Grade II

Weight and size (approximate)		
	MAM	MAM with extension
Weight	0,7 Kg	1 Kg
Height	180 mm	180 mm
Width	182 mm	254 mm
Depth	90 mm	90 mm

DECLARATION OF CONFORMITY

It follows the 89/336/CEE guidelines for the Electromagnetic Compatibility and the 73/23/CEE guidelines of Low tension for the fulfillment of the product security. The fulfillment of the following specifications was demonstrated as indicated in the Official Diary of the European Communities:



Emissions EN 50081-1:94	EN 55022:1994 Type B	Radiated and conducted emissions.
Immunity EN 50082-1:97	EN 61000-4-2 (95)	Immunity to electrostatic discharges.
	EN 61000-4-3 (96)	Immunity to the electromagnetic field of radioelectric frequency.
	EN 61000-4-4 (95)	Immunity to fast transitional in gusts.
	EN 61000-4-5 (95)	Immunity to crash waves.
	EN 61000-4-6 (96)	Current injection.
Low tension guidelines:	EN 61000-4-11 (94)	Variations to the power supply.
	EN 61010-1	Security requirements of measurement electric units, control and use in laboratory.



This symbol indicates that the electrical and electronic equipment should not be disposed of as general household waste at its end-of-life. Instead, the product should be handed over to the applicable collection point for the recycling of electrical and electronic equipment for proper treatment, recovery and recycling in accordance with your national legislation.

OPERATION:

The Agrónic Monocable system operates with a linking unit, the Agrónic Monocable Link (EAM), which connects to the Agrónic using a RS485 bus or RS232 serial port and the *ModBus* communication protocol. The EAM supplies the 24 Vdc which powers the entire Monocable system and distributes it through a 2-wire cable which in turn connects all the Agrónic Monocable Modules (MAM).

Up to 120 MAMs can be connected to a single EAM (depending on the total length and type of cable used). Each MAM is identified by a number and can be placed in any order along the line. This identification can be changed at any time using the Modules Reader.

The MAMs are organized into groups of 10 (from 1 to 10, from 11 to 20, etc.). Every 6.6 seconds the output status is sent to a group and each MAM in this group sends the status of their inputs, totals, sensors, etc. The fewer groups on a line, the faster the communication is between each MAM. In the worst possible case, with 120 MAM connected on a line, it will take 80 seconds to connect to all the MAMs.

MAM with *priority*: if it is necessary that one MAM in particular needs to act very rapidly, either in the solenoid activity or sending the sensor or digital input readings, it can be configured as an "MAM with priority". This module will connect to the EAM every 6.6 seconds. To do this the MAM occupies one communication space for each group, which in turn means the MAMs that occupy its place in each group cannot connect to the line. Example: if MAM 1 has priority, it cannot connect to the line, and nor can 11, 21, 31... or 111.

INPUTS AND OUTPUTS:**DIGITAL INPUTS:**

There are up to 10 digital inputs, D1 to D10, which can function as a digital input. Inputs D3 to D10 can also function as meters. When a meter is connected to a digital input, it has the ability to count up to 5 pulses per second.

The common input return is connected to the terminal marked CD. The inputs corresponding with the terminals run from D1 to D10.

The contacts on the unit that connect to a digital input must be free potential contacts.

SENSOR INPUT:

The MAM has one analog input for reading sensors that emit a 4 – 20 mA signal. The input also has a 200 Ω resistor which can read voltages of 800 mV for the 4 mA and 4000 mV for the 20 mA.

The sensors are powered at 12 Vdc provided by the MAM. The sensor only receives power for the time that has been configured, as for the rest of the time it has no power to it. The time between readings is configured on site, and can differ according to the function of the MAM and the sensors. The sensor power is connected to the 0V and 12V terminals and the sensor reader to A1 terminal.

LATCH SOLENOIDS:

MAM can operate with two or three wires latch solenoids using:

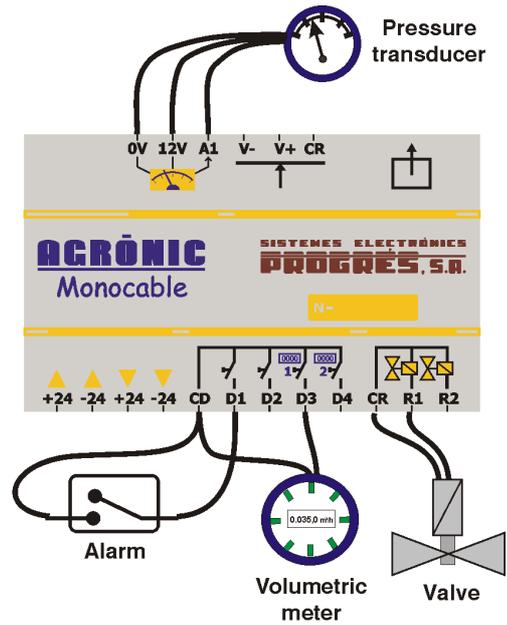
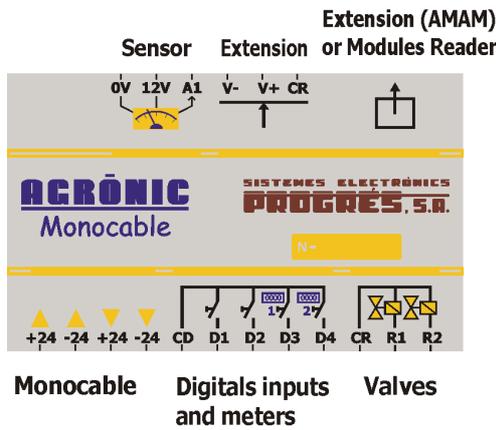
- *2-wire latch solenoids*: the common return of all the solenoids is connected to CR terminal and the other solenoid wire is connected to the terminals marked as R1 to R8.
- *3-wire latch solenoids*: With this type, the number of solenoids that can activate the MAM are cut in half. The solenoid connections will be done at the common return borne at the CR terminal and the start and stop wires at the following terminals:

solenoid 1	start at terminal R1	start at terminal R2
solenoid 2	start at terminal R3	start at terminal R4
solenoid 3	start at terminal R5	start at terminal R6
solenoid 4	start at terminal R7	start at terminal R8

The trigger voltage in the solenoid is programmable, and can be of 12 or 16 V.

Keep in mind that many latch solenoids with 3 wires can function perfectly well with 2 wires, if it were necessary to use them.

AGRÓNIC MONOCABLE MODULE CONNECTIONS:



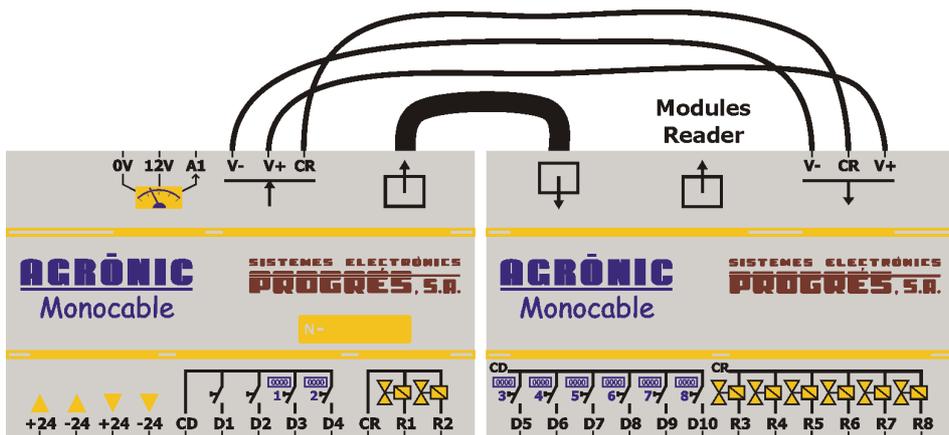
AGRÓNIC MONOCABLE MODULE EXTENSION (AMAM):

When an MAM has more than two outputs, it has an extension module (AMAM) to connect up the inputs and outputs after the second one.

According to the MAM model, this is formed by:

- MAM2-41: main module
- MAM5-71: main module + extension
- MAM8-101: main module + extension

The connection between the main module and its extension is done with the extension connector and the three terminals (“V-“, “CR” and “V+”) located on the side.



CONFIGURATION:

The configuration on the MAM is made using the Modules Reader (or the LAM reader model, Lector Agrónico Monocable,) consisting of a screen and four keys, which is connected to the MAM through the extension connector. It is not necessary to disconnect the MAM in order to connect it.

After connection the Modules Reader, press a key for the screen to display the consultation. To then reach the configuration screen, press the

 key and enter the menu. Change between the menu options with the keys  and . Use the  key to enter the selected menu option.

These are the following options in the menu:

- *Consultation*
- *Configuration*
- *Manual*

Consultation:

- Product name and program version
- Status of solenoids 1 to 8
- Status of digital inputs 1 and 2
- Status of digital inputs 3 to 10
- Totals stored in the MAM and EAM sending protocol. 8 screens.
- Instantaneous flow (time between meter pulses, 1=30ms). 4 screens
- Analog sensor reading (in millivolts).
- Status of MAM communication:
 - o Syncr: no . Not synchronizing with the EAM, there is no communication.
 - o Syncr: -- . Synchronizing with the EAM.
 - o Syncr: yes. Synchronized with the EAM, the communication is okay.
 - o Vdc: wait Waiting five second delay to enter Vdc: no.
 - o Vdc: no. No voltage from the Monocable line.
- Last communication received from EAM:
 - o okay. Last communication received correctly.
 - o error timeout. Nothing received in last connection.
 - o error checksum. Last communication received with erroneous data.
 - o error group. Last communication received is from other MAM group.
 - o l. c. syncr. Last communication received while synchronizing.
 - o error config. Error occurred due to communication configuration.
 - o change group. The total number of groups has changed.
- Status of the last eight communications: 0 marks all the communications which were erroneous and 1 marks those which were correct. The number appearing to the right of the screen indicates the phase-out time between the EAM and MAM.
- Latch voltage: shows the voltage applied to the latch solenoid in the last activation or deactivation that took place. The voltage level is shown in millivolts.



Configuration:

- *MAM number:* a value from 1 to 120 is used to distinguish the 120 possible modules which can be connected to an EAM.
- *3W Valve:* a “no” response indicates that 2-wire latch solenoid will be used; with “yes”, 3-wire latch solenoid is used.
- *Latch at 16V:* a “no” response indicates that the voltage to activate the latch solenoid is 12 volts; with “yes” the voltage is 16V.
- *T. sensor:* indicates, in minutes, the sensor reading frequency. Setting it to 0 means no reading will take place. The maximum time between readings is 200 minutes.
- *T. r. sen:* this is the time needed to power sensor 1 so the reading will be done correctly. The unit of time is 0.01 seconds. 12V of power are sent using the 12V terminal. Setting it to 0 means the sensor does not make a reading. The maximum time is $200 \times 0.01 = 2$ seconds.
- *Delay m.:* This is the minimum time needed to activate the meter pulse for it to increase the total. A pulse at a lesser time will not increase the total. The time is indicated in seconds and a decimal. The default value is 1.0”.
- *Close R1:* setting at “1” indicates that the solenoid connected to R1 will close in the event of a power cut in the Monocable line.
- *Priority:* setting to “yes” means the MAM will have a rapid response time; setting it to “no” means the MAM will respond in its turn according to the number of groups per line. Only the MAM from 1 to 10 can be priority units. If MAM 1 is a priority unit, it cannot be connected to the line, and nor can 11, 21, 31... or 111. This occurs with other numbers as well.

Manual:

In this menu option, the solenoids can be activated manually. We cannot exit this menu option if one of the solenoids is being manually activated.

PRACTICAL TIPS:

- The maximum No. of MAM’s that can connect to an EAM is 120, although this number may be lower, according to the section of 2-wire cable used and the total line distance.
- For long distances it is better for MAM in the same group not to be connected consecutively along the line.
- When the voltage at the end of the line is less than 20 Vdc, it is better not to name all the MAM’s in one group. For example, set the MAM’s as 1, 4, 8, 11, 14, 18, and do not set 2, 3, 5, etc. In this way we can make sure the voltage on the line remains uniform.
- When the voltage is insufficient at the end of the line, the voltage at the EAM input can be raised to 29 Vdc.
- **The EAM and non encapsulated MAM’s must be installed in a place which are protected against sunlight and rain.**
- Encapsulated MAM’s are protected against inclement weather, but if they are kept from direct sunlight, the resistance of the box will be maintained over time.

RECOMMENDATIONS FOR INSTALLING THE MONOCABLE BUS:

- **Unit distribution:**

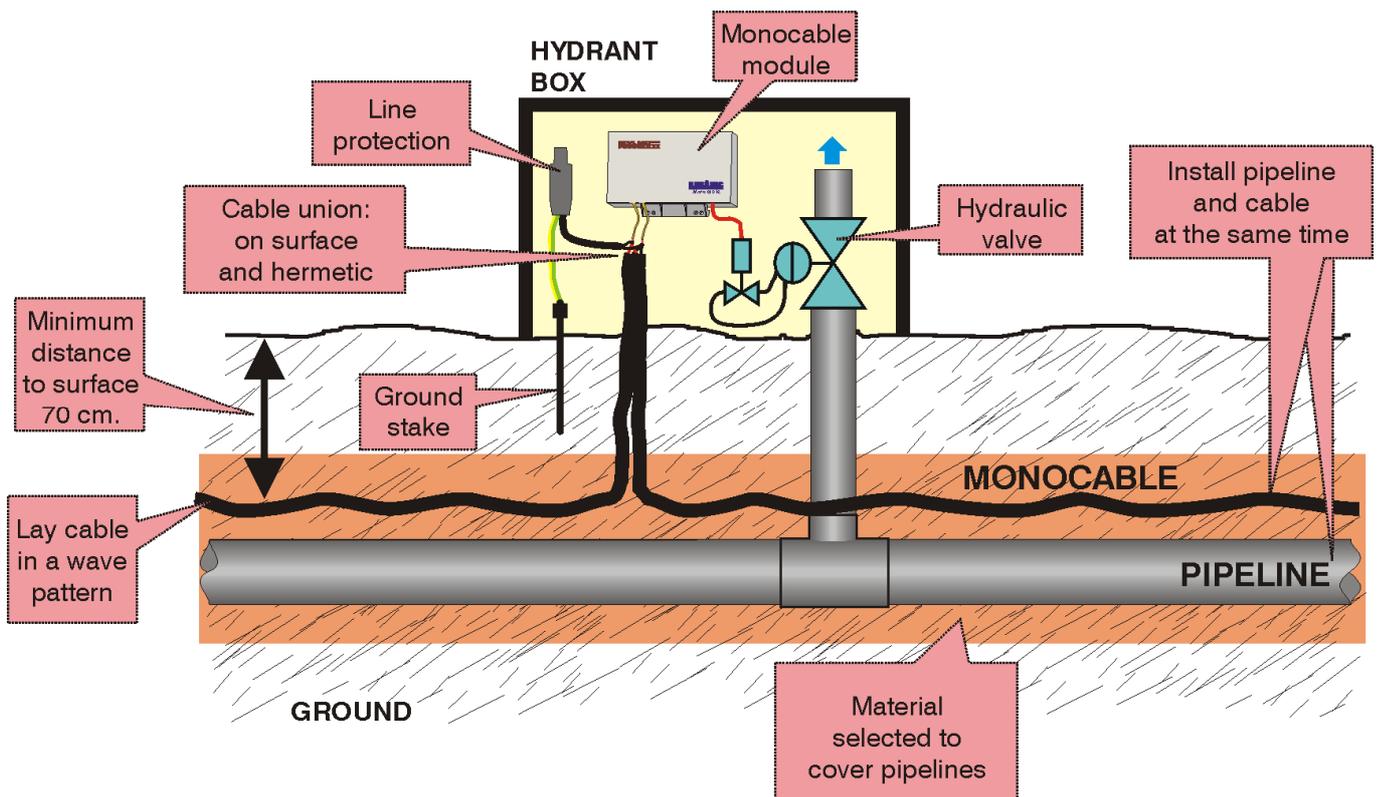
- Have a map or sketch with the location of the modules to make them easier to install and start up, taking into consideration the configuration Sistemas Electrònics Progrés S.A. has provided regarding the distance between the Agrònic and the modules.
- Have strategically placed line protections on branch ends, forks, and sections over 500 meters, with their corresponding grounding connection.

- **Choosing the cable:**

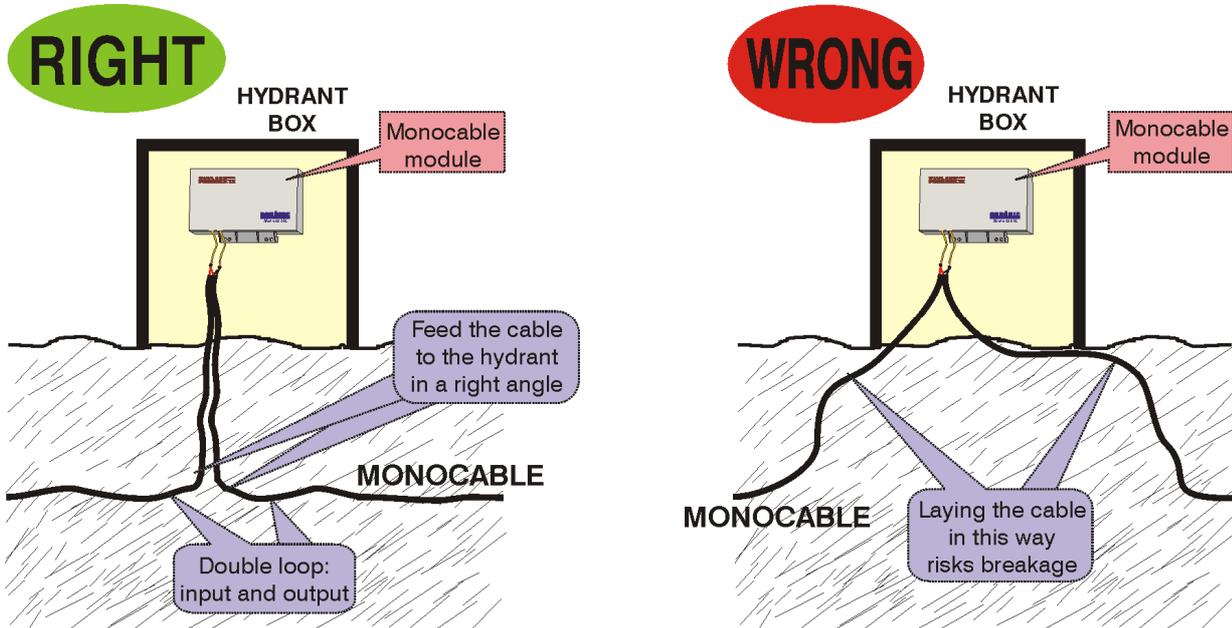
- 2-wire section cable between 1.5 mm^2 and 2.5 mm^2 , according to the distance and number of modules to install.
- Reticulated polyethylene (RV-K)** insulation should be used between wires to ensure a low mutual capacity. Insulation voltage of 500V.
- Cable of lower mutual capacity possible. To ensure 10 km distances, we should choose cable of less than 60 nanofarads/kilometer (nF/km) and never more than 80 nF/km. If this is not given on the cable specifications, request them from the manufacturer.
- For installations with breakage risks due to improper handling or ground settling, flex cable (RVFK) is recommended.
- In areas with high levels of electromagnetic interference or installations with two or more parallel cables, shielded cable (RVMK) is recommended.
- Using flex or shielded cable means having greater mutual capacity, which will reduce reach capacity.

- **Cable laying:**

- Do not connect any wires from the Monocable bus to the ground.
- Install the cable in the same trench as the pipelines and at the same depth to prevent breakage from agricultural machinery or rodents, not to mention the corresponding costs. Coil the length of cable without stretching it, which may cause breakage if the terrain settles.



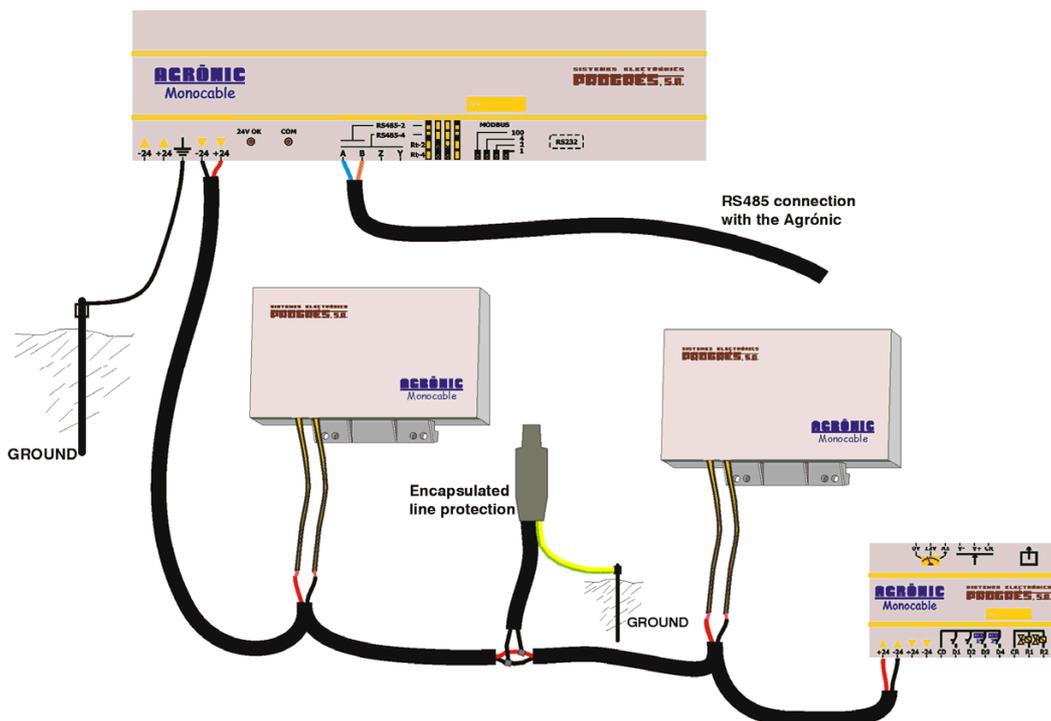
- c) Avoid scrapes or slight cuts in the cable as it can cause variations in the cable magnitude (capacities, inductances, resistances, etc.) which directly affect communication signals. As a cable covering material, use the same soil bed where the pipelines have been laid.
- d) Respect the safety distances in the cable when connecting the modules to prevent machinery from breaking it.



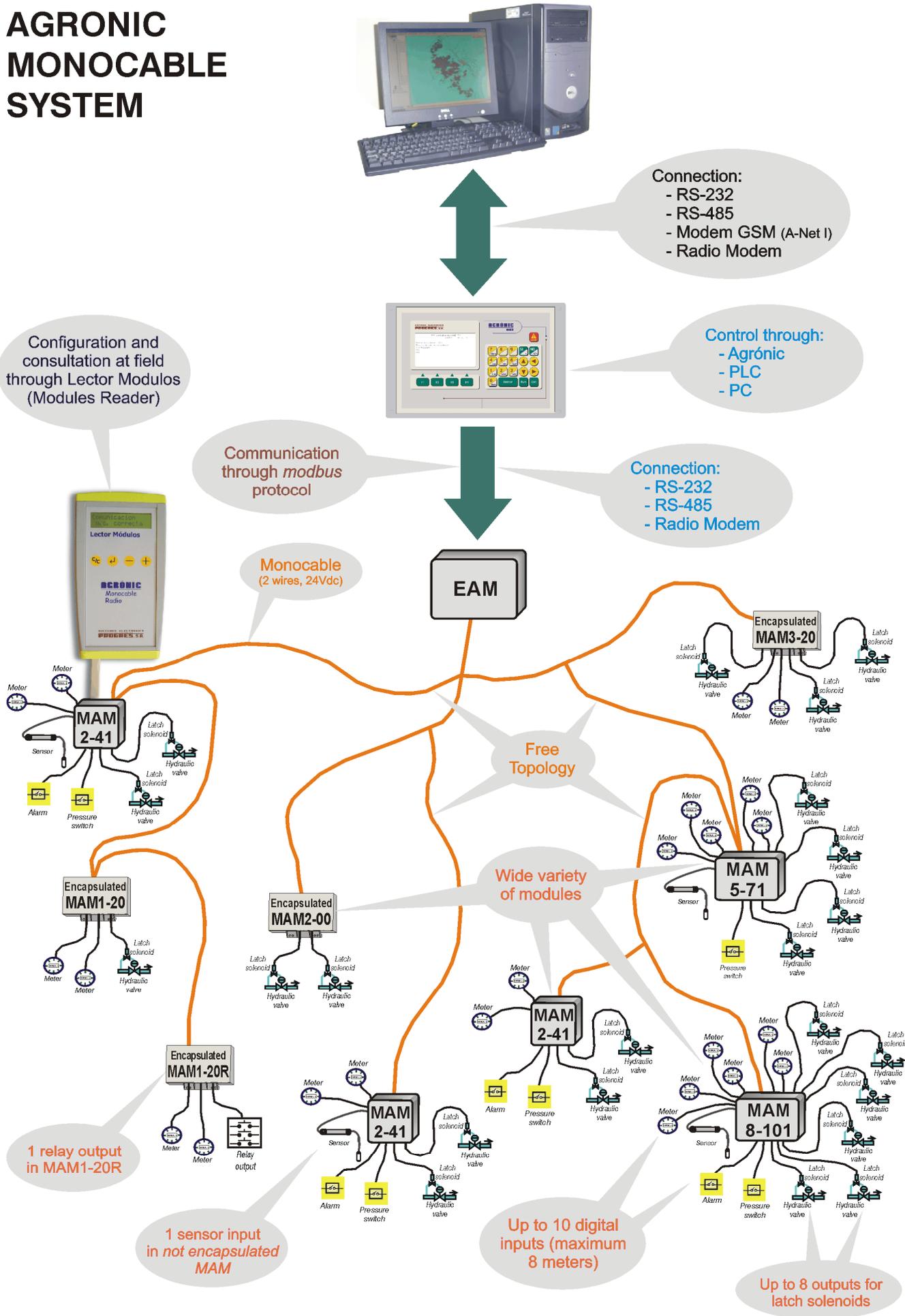
- e) The union of the roller end with the next one is always done at the surface. If not, the union must be completely watertight using thermo-retracting terminals with sealant or resin unions.

- **Connecting and verifying the installation:**

- a) Begin the connections along the line protections and the EAM at the top, with its ground line, to safeguard the installation against electric shocks at all time.
- b) Leave a sufficiently loose wire coil where the connection modules will be installed, avoid buried unions and always respecting the depth level of the buried cable.
- c) Make continuity and ground insulation tests for each branch or splice points.



AGRONIC MONOCABLE SYSTEM



Connection:
- RS-232
- RS-485
- Modem GSM (A-Net I)
- Radio Modem

Control through:
- Agronic
- PLC
- PC

Connection:
- RS-232
- RS-485
- Radio Modem

Configuration and consultation at field through Lector Módulos (Modules Reader)

Communication through modbus protocol

Monocable (2 wires, 24Vdc)

EAM

Free Topology

Wide variety of modules

1 relay output in MAM1-20R

1 sensor input in not encapsulated MAM

Up to 10 digital inputs (maximum 8 meters)

Up to 8 outputs for latch solenoids

ATTENTION:

- ✓ It is extremely important to keep the box watertight
- ✓ Close the lid properly
- ✓ Insert the cable hose through the compression gland and tighten it as much as possible
- ✓ If several cables are inserted through one compression gland, seal the gland to keep it watertight
- ✓ Cover the glands that have no cables
- ✓ Protect the case against sunlight and water (rainfall or irrigation)