

MODULATOR M006
MODULATOR M006 MASTER
MODULATOR M010
MODULATOR M010 MASTER



INSTALLATION AND OPERATING INSTRUCTIONS

Warning symbols contained in this service manual



Only applies to type MASTER.



Risk by electric shock.



Risk for the people and/or objects.

WARRANTY AND RECOMMENDATIONS

The product "Modulator M006/M010 and ModulatorM006/M010 MASTER" is guaranteed the first 2 years after its production date.

This guarantee does not include damages in case of an inadequate installation or manipulation.

⚠ Read carefully this instructions manual before installation.

Do not throw away this manual after installation, it can be usefull for later modifications or for solving the different types of alarms.

Hydraulic and electrical installations must be set up by qualified personnel according to the safety prescriptions as well as the standards and legislation of every country. When carrying out the electrical connection it is recommended to use a differential switch of high sensitivity: $I_{\Delta n} = 30 \text{ mA}$ (clase A o AC). It is recommended to use a 16 A magnetothermic switch. It is recommended to use an independent electrical line, with the purpose of avoiding electromagnetic interferences that could create nonwished alterations in household electronic devices.

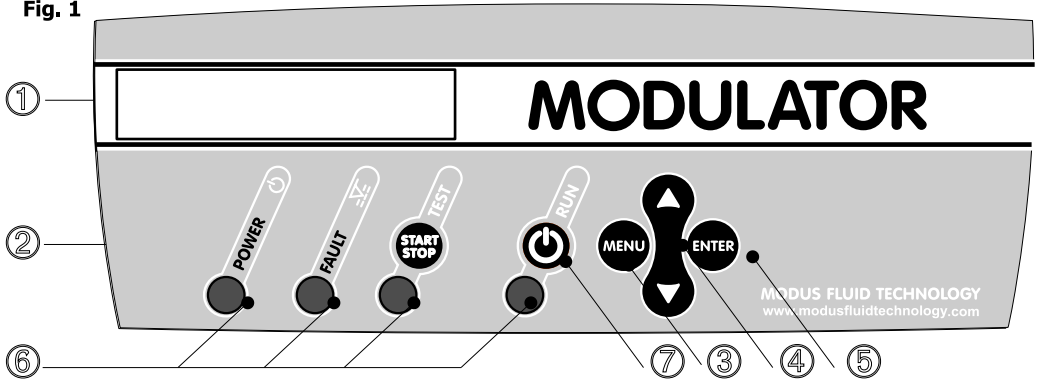
The device must operate with a clean water flow, if there is risk of presence of gravel or small particles (facilities with submersible pumps) is recommended to use a filter to avoid the possibility of blocking the flow sensor.

Modulator should be used only for vehiculation of clean water, it cannot be used for transport of another kind of liquids.

It is recommended to use an expansion tank in order to avoid continuous start-stops due to the deterioration of taps, valves, ... and also to prevent "water hammer" in installations with valves of wide diameter.

⚠ WARNING, before doing any maintenance inside the device, it must be unplugged from the electric supply and wait a minimum of 2 minutes after the disconnection to avoid electrical discharges.

Fig. 1



1- **LCD** screen. Shows the pressure in working mode.

2 - **MANUAL START-STOP** pushbutton.

3 - Pushbutton for **ENTER** or **EXIT** menu.

4 - With these pushbuttons we can change programming values showed in the **LCD** screen (1).

5 - **ENTER** for saving programmed values. Every pulsation is succeeded by a new field of the **CONFIGURATION MENU**. Whenever we want to quit the configuration sequence press **MENU** (3).

6 - Led lights:

- **LINE** green: Electric supply. ON when it is connected.
- **FAILURE** red: Bright or intermittent depending on type of failure.
- **PUMP** yellow: When it is bright means pump working. It is lit with the pump stopped or when the device is not connected.
- **AUTOMATIC** green: it is bright in AUTOMATIC mode. When it is intermittent in MASTER&SLAVE mode it means that this device will be auxiliary in the following cycle.

7- **ON/OFF**: It allows to change from **AUTOMATIC** to **MANUAL** mode or vice versa.

INDIVIDUAL ASSEMBLY



Fig. 2a

GROUP ASSEMBLY



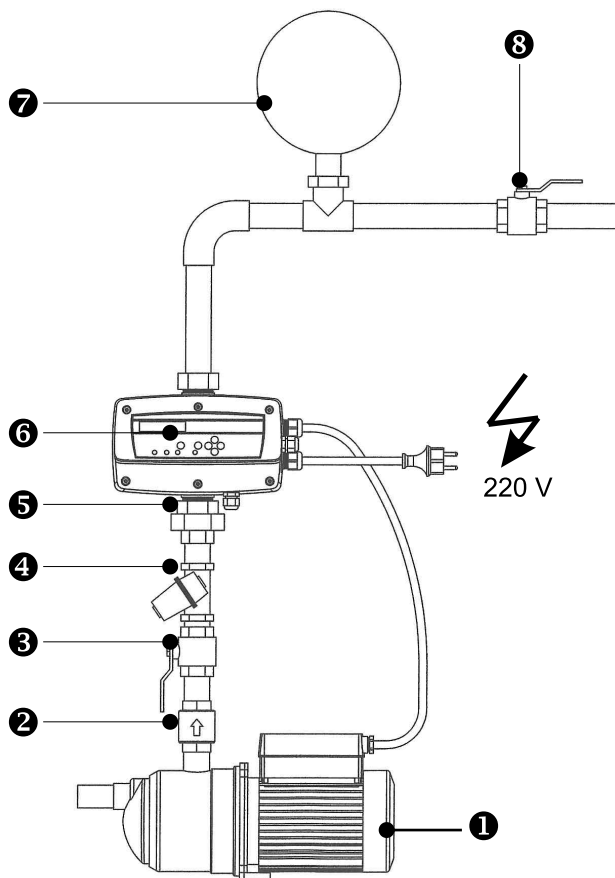
Fig. 2b

INSTALLATION SCHEME

OBSERVATIONS:

A) Accessories ③, ④, ⑤, ⑦ and ⑧ are recommendable but nonessential.

B) In the case of the expansion tank ⑦, its use in facilities is recommended when it is tried to avoid the water hammer.

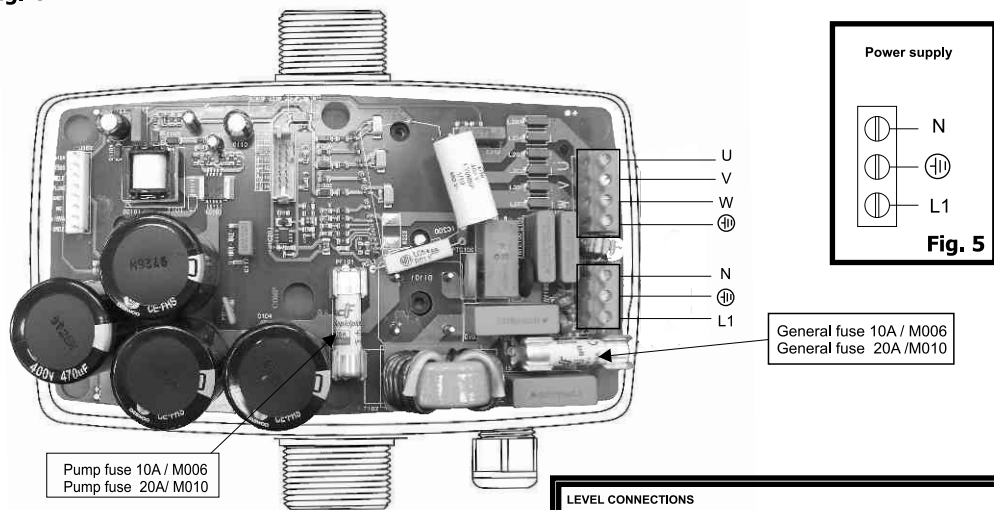


- ①.- Pump
- ②.- Check valve
- ③.- Ball valve
- ④.- Filter
- ⑤.- Quick release coupling
- ⑥.- Modulator.
- ⑦.- Expansion tank
- ⑧.- Ball valve

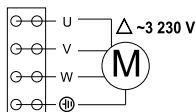
Fig. 3

Fig. 4

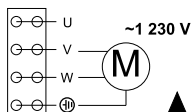
BODY CONNECTIONS M006 / M010



Three-phase motor connection

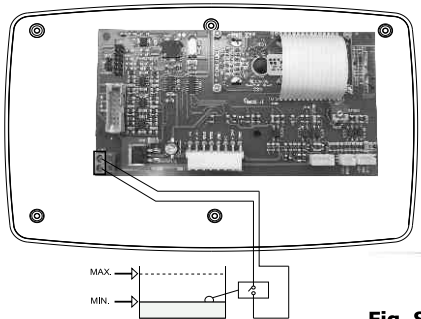


Single-phase motor connection

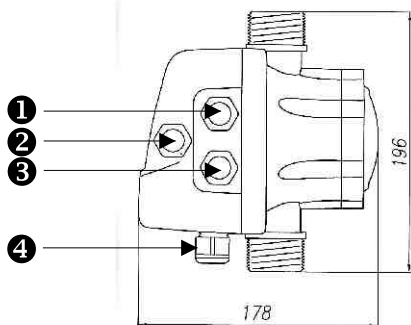


The grey cable should be disabled by its end and isolated electrically using isolating tape.

LEVEL CONNECTIONS



LATERAL CONNECTION



1 Pump

L (m)	S (mm ²)
1 ÷ 5	1
5 ÷ 25	2.5
25 ÷ 50	4

2 Minimal level (optional)

3 Power supply

4

Master&Slave communications cable

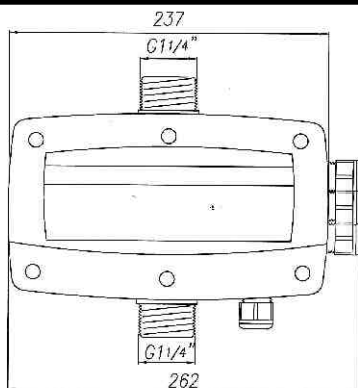


Fig. 7

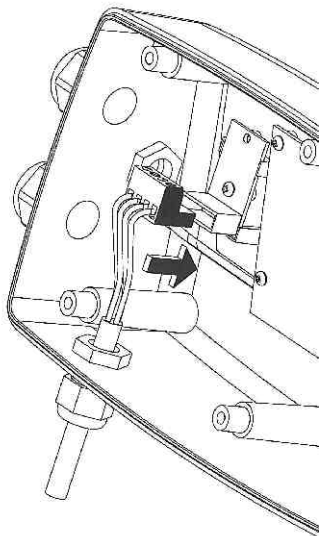
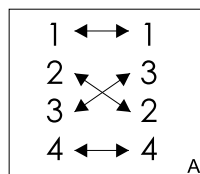
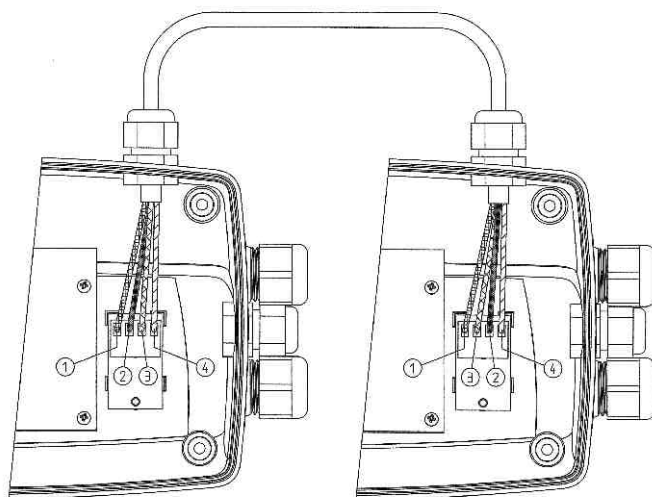


Fig.9a

1. Unscrew the cover and loosen the PG located on its basis.
2. Insert the communications cord through the PG.
3. Remove the connector from its housing.
4. Set up the connection following the schema 9b.
5. Relocate the connectors on its housing. Screw the cover and the PG.

If the devices are provided with the communication cable, it governs the following color code: 1-black, 2-brown, 3-blue and 4-yellow / green. They will be connected by following detail A:

Fig.9b



MODULATOR M006 - MODULATOR MOO6 MASTER - MODULATOR M010 - MODULATOR M010 MASTER

BEFORE INSTALLATION AND USE READ THE FOLLOWING INSTRUCTIONS CAREFULLY. THE MANUFACTURER DECLINES ALL RESPONSABILITY IN THE EVENT OF ACCIDENT OR DAMAGE DUE TO NEGLIGENCE OR FAILURE TO OBSERVE THE INSTRUCTIONS DESCRIBED IN THIS MANUAL OR IN CONDITIONS THAT DIFFER FROM THOSE INDICATED ON THE DEVICE.

OPERATION

MODULATOR is a compact automatic control device (see fig.2) designed for the single and three-phase pump 's automation, with an electronic system managed by a software responding to the rigorous requirements of efficiency and safety of the most important builders of pumps. It includes a frequency inverter that regulates the speed of the pump in order to keep constant the pressure independently of the flow given.

The system incorporates a LCD screen where the parameters configuration is very easy and intuitive. Once the configuration parameters are introduced, the MODULATOR manages the start-up of the pump and the frequency inverter. It assures a constant pressure and an important costs reduction because at any time the control will feed the system with the right and necessary output, obtaining a maximum energetic efficiency. In order to establish the ideal pressure in the installation is suitable to consider following criteria:

Hm: Max. water column height in m. It depends on the number of floors and it corresponds to the height from the pump to the last floor. Every 10 m of height corresponds approximately to 1 bar (0.98) bar.

Pw: Available minimum pressure in last floor (usually 1.5 bar).

Pc: Pressure drop. It can be considered with a simplified criteria as 0.033 bar/m.

Prmin: Minimum resultant pressure. It is the sum of the previous pressures and it will be the operating pressure of the pump.

Example for a 5 floors building (15 m) with pump placed at level 0:

Hm =15 m \cong 1.5 bar Pw = 1,5 bar Pc=15 x 0,033 bar \cong 0,5 bar Prmin = 1,5 + 1,5 + 0,5 = 3,5 bar

MASTER AND SLAVE OPERATION

The group MASTER-SLAVE is constituted by a device configured as MODULATOR M006/M010 MASTER - responsible of the group 's control - and a MODULATOR M006/M010 configured as SLAVE controlled by the master device.

Due to the alternating sequence of operation, the MODULATOR configured as MASTER began the first cycle as MAIN device - its pump is the first to start - but in the next cycle it becomes SECONDARY - its pump is the second to start - and so on.


Therefore, the fact that a device is configured as MASTER involves control of the group but this fact does not avoid its work alternately as SECONDARY device.

CLASSIFICATION AND TYPE

According to EN-60730-1 the MODULATOR is a device of independent assembly, type 1B with software of class A.

MAIN CHARACTERISTICS

- DN inlet port G1 1/4 " male ISO 228.
- DN outlet port G1 1/4 " male ISO 228.
- Frequency inverter for the pump control.
- Control and safety system against over-intensities.
- Control and safety system against dry operation.
- **ART** function (Automatic Reset Test). If the device has been stopped due to the action of the safety system against over-intensities, the **ART** tries to connect the pump, with a programmed periodicity because the water supply could have been restored
- Automatic restore system after an interruption of power supply. System is activated in AUTOMATIC mode keeping the configuration parameters (see "CONFIGURATION" chapter).
- Inside pressure transducer.
- Control panel (Fig.1):
 - LCD screen, for alarm menu with permanent pressure indication.
 - START/STOP push-button to act by hand each one of the pumps
 - ENTER pushbutton to save data in memory.
 - ON/OFF pushbutton to change rom AUTOMATIC to MANUAL mode or vice versa.
 - MENU push-button
 - Keyboard for the access to programming menu.
 - Digital gauge.
- Connections for detection of minimum water level in aspiration tank. This system is independent of the safety against dry operation. Is optional.
- **AIS** function (Anti-Ice System). If temperatures under 5 °C are detected it will start periodically the circulation of the water in the hydraulic network, avoiding its freezing.

 Mode MASTER & SLAVE. Communication with another device MODULATOR to work in group. Optional.

- Register of operational controls: information about operating hours, counter of starts, counter of connections to the power supply.
- Register of alarms: information about type and number of alarms since the starting up of the device.

TECHNICAL CHARACTERISTICS.

	M006	M010
■ Power supply voltage	~1x230 Vca (160÷250 V)	~1x230 Vca (160÷250 V)
■ Frequency	50/60 Hz	50/60Hz
■ Max. current each phase	6 A (~3 230 V) / 5A (~1 230 V)	10A (~3 230 V) / 9A (~1 230 V)
■ Max. peak of current	20% during 10"	20% during 10"
■ Max. operating pressure	10 bar	15 bar
■ Max. set pressure	8 bar	12 bar
■ Protection index	IP55	IP55
■ Max. water temperature	40°C	40°C
■ Max. environment temperature	50°C	50°C
■ Max. flow	10.000 l/h	15.000 l/h

* There is a 10 A fuse for the INVERTER and another 10 A fuse for the main supply. (M006)

* There is a 20 A fuse for the InVERTER and another 20 A fuse for the main supply. (M010)

⚠ HYDRAULIC CONNECTIONS (fig. 2 y 3)

Before proceeding with hydraulic connection it is essential to install a non-return valve in the pump's inlet.

In case of assembly in group, it must be mounted a collector for the communication of the devices water outputs. The inlet can proceed from a common or independent origin for each device.

The MODULATOR control device must be connected in vertical position (Fig.2), the inlet port (1 1/4" male) directly to the main pump discharge and the outlet port (1 1/4" male) at the main network.

If the pump is operating in full aspiration, is strongly recommended to install the external level detector (Fig. 8) because the inner flow sensor of the Modulator will protect the pump but it will not avoid loss priming in case of dry-running.

⚠ ELECTRIC CONNECTION (fig. 4, 5, 6, 7, 8 and 9)

Before doing manipulations inside the device, it should be disconnected of the electric supply and after disabling, wait for 2 minutes in order to avoid electrical discharges.

- Use cables type H07RN-F with section enough to the power installed:
- Power supply: $s \geq 1,5 \text{ mm}^2$.
- Motor supply: $s \geq 1 \text{ mm}^2$ depending on the cable length (see fig.7).
- Verify if the power supply is 220/240 V. Dismount the cover of the electronic circuit and carry out the connections according to the indications located on the connection strip base.
- Do the power supply connection (being sure there is a good earth connection): **L1 N** Ⓢ Do the connection by mean of magnetothermic switch in OFF mode.
- The earth conductor must be longer than the others. It will be the first one to be mounted during the assembly and the last one The earth conductor must be longer than the others. It will be the first one to be mounted during the assembly and the last one to disconnect during disassembling.
- Do the pump connection (Fig. 4 and 6). For the connection of the device to a single-phase motor, the grey cable corresponding to "U" will not be connected as indicated in 5b diagram (in order to disable the blue cable the rest will be cut until the jacket of the cable gland and it will be isolated using the insulating tape) - THE INSIDE OF THE DEVICE SHOULD NOT BE MANIPULATED.
- Min. level control (optional). There is an input for stopping the pump as soon as is disconnected the external switch of minimum level. See fig.8

M → Connection of 2 devices (optional): for the communication of 2 devices it will be used a cable of 4x0.25 mm², it will be inserted throw the PG cable gland located in the bottom of the device. See Fig.9.

WARNING! Wrong connections could spoil the electronic circuit. The manufacturer declines all responsibility in damages caused by wrong connection.

⚠ START UP (SINGLE DEVICE).

- Be sure that the pump is correctly primed
- Connect the SPEEDMATIC 101165 to the electric supply with the magnetothermic switch, FAILURE led light will be ON. Wait for 10 seconds while the SPEEDMATIC is doing the autotest. Once it finishes, led light FAILURE is OFF and led light LINE is ON. The LCD screen will show message "SPEEDMATIC" and immediately the language display of the configuration mode.
- The device is ready for being configured.

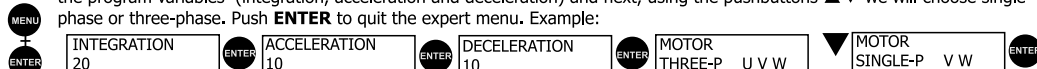
M → START UP (2 DEVICES ASSEMBLY).

If we wish to mount 2 devices for working in groups, previous point should be exactly followed - the order of connection is irrelevant. During the configuration process we will be able to choose which device is the **MASTER**.

⚠ CONFIGURATION OF THE MOTOR SUPPLY (single-phase / three-phases):

The device is supplied by default for connection to an three-phase motor. If it must be connected to a single-phase motor the following steps should be followed:

- The electrical connection will be done following the indications of the section "ELECTRICAL CONNECTION" for single-phase motors. (see scheme fig.5).
- Once the device is connected, we will press simultaneously the pushbuttons, **MENU + ENTER**, to enter in the expert menu. In this menu can be modified variables of the program (integration, acceleration and deceleration) and also to be chosen the type of supply of the motor. It is not recommended the modification of the variables.
- Values are changed using **▲▼** and pushing **ENTER** to memorize changes. Use **ENTER** 3 times to confirm the initial values of the program variables (integration, acceleration and deceleration) and next, using the pushbuttons **▲▼** we will choose single-phase or three-phase. Push **ENTER** to quit the expert menu. Example:



- The device must be unswitched from the electric supply and wait until the LCD will be off. Turn on the device again.



CONFIGURATION. Using ▲▼ we can change the values and press **ENTER** for validation. Whenever we want to quit the configuration sequence press **MENU**. After every **ENTER** it will appear automatically the different screens that constitute the configuration sequence.

P LINE INPUT P 00,0 bar 00,0	To start configuration sequence push MENU during 3".	MENU
SET UP MENU	Being inside configuration menu we are having access to the phase of installation	3"
LANGUAGE ENGLISH	By mean of keys ▲▼ we can choose the languages: "LANGUAGE ENGLISH", "LANGUE FRANÇAISE", "LINGUA ITALIANA" and "IDIOMA ESPAÑOL".	ENTER
MAX. INT. PUMP OFF	By mean of keys ▲▼ input the nominal intensity value in A of pump 1 enabling the thermal protection. This value is located over the characteristics plate of the motor. Press ENTER for validation.	ENTER
ROTATION SENSE 0 Hz	Using the START/STOP pushbutton verify the rotation sense. By mean of keys ▲▼(0/1) we can change it. Press ENTER for validation.	ENTER
MIN. SPEED 15 Hz	Using ▲ we can increase the lower limit of the speed of rotation of the pump's motor.	ENTER
LEVEL PROBE NO	If the installation does not have level probe press ENTER to validate NO. If the installation has a level probe, use keys ▲▼ to change NO by YES.	ENTER
PROGRAMMING	Being inside configuration menu we are having access to the phase of programming.	ENTER
SET POINT 2,0 bar	This will be the system operating pressure. Use keys ▲▼ for modify the initial value (2 bar). WARNING ! The input pressure must be at least 1 bar lower than the maximum pressure of the pumps. NOTE: In case of group assembly, all the system operates at the pressure set in the MASTER device, so that the configuration of set pressure in the slave device is superfluous.	ENTER
DIF. START 0,3 bar	The default value is 0,3 bar. This value of pressure is the one that the system will subtract to the input pressure, resulting the final pressure to which the system will set in motion when the hydraulic network has a demand. Using keys ▲▼ to modify the initial value. It is recommended to maintain this value between 0,3 and 0,6 bar. Example: - Input pressure: 2 bar. - Differential start: 0,3 bar. - Final start pressure: 2 - 0,3 = 1,7 bar. The value should be greater as much as smaller be the accumulation and vice versa.	ENTER
TIMER STOP 5 s	TIMER STOP default value is 5". This will be the employed time by the system in stopping once ceased the consumption in all the installation. Using keys ▲▼ we can modify the initial value.	ENTER
VIEW MODE NORMAL	There are 2 view modes to choose: - NORMAL: it is visualized "P LINE" (real pressure of the installation) and "INPUT P" (configured pressure). - SERVICE: it is visualized "Hz" (working frequency of the inverter), "REF" (configured pressure), "PRESS" (real pressure of the installation) y "FL" (flow sensor state).	ENTER
SERIAL CONTROL SLAVE	The MODULATOR M006/M010 is configured by default as "SLAVE". In case of individual assembly just confirm "SLAVE" by pushing ENTER . In case of group assembly (M-S), we will do the same for the slave device. For the "MASTER" device we will change "SLAVE" by "MASTER" pushing ▼. In case of assembly of more than 2 devices, we will change "SLAVE" by "SPEEDCENTER" pushing ▼ twice - see instructions of our station SPEEDCENTER .	ENTER
DIRECTION CH 1	It allows to set the communication channel. Push ENTER .	ENTER
P LINE INPUT P 00,0 bar 00,0	After pressing ENTER pushbutton, the system will remain configured showing the type of view chosen in the previous section, Press AUTOMATIC in order to quit manual mode. In case of group assembly press AUTOMATIC only in the device configured as MASTER.	AUTOMATIC

In case of group assembly, after pressing **AUTOMATIC** in the MASTER device, the **AUTOMATIC LED LIGHT** of the SLAVE device will start to flash intermittently, indicating that communication between both devices is ready. If this does not happen verify the connection (fig 9).

ALARMS FOR SINGLE ASSEMBLY:

In case of simultaneous alarms, quit the automatic mode and go to manual mode, pressing the pushbutton **AUTOMATIC ON/OFF** (led light PUMP will turn off). Using key **▲** will be displayed the successive alarms. Once visualized, for leaving the menu, press **ENTER** returning to **MANUAL** mode.

TYPE	DESCRIPTION	SYSTEM REACTION	SOLUTION
A1 ● Failure verification ● Final failure	If the system detects dry running during more than 10 seconds, it will stop the pump and the ART (Automatic ResetTest) will be activated.	After 5 minutes ART system will start again the pump during 30 seconds, trying to restore the system. In case of persistent lack of water, it will try it again every 30 minutes for 24 hours. If after all these cycles , the system still detects lack of water, pumps will remain permanently out of order until the damage will be repaired.	Dry running, it has been activated the safety system: you should verify the feeding of the hydraulic network. The pumps can be primed using the push-button START/STOP (the led light AUTOMATIC should be off, if it is not, press the push-button to disable it). Special case: If the pump cannot provide the programmed pressure (configuration mistake) the Speedmatic reacts as it was dry-running.
A2 ● Failure verification ● Final failure	The system pumps are protected against over currents by mean of the intensity values established in the installation menu. These over currents are produced generally by dysfunctions in the pump or in the electric supply.	When detecting the thermal failure, the pump will be automatically stopped. The system will try again to restart the pump when the demand of consumption require it. The control system will carry out 4 attempts in this circumstances. If the system remain locked after the 4th attempt, the pump will remain definitively out of order.	Verify the state of the pump, for example the impeller could be blocked. Verify intensity values introduced in the configuration menu. Once the problem have been solved the operation will be restored going to the "SET Up" menu (see the chapter configuration) and configuring the adequate intensity values.
A3 ● Final failure	The MODULATOR has an electronic safety system against short circuits as well as a 10 A fuse.	The device is disconnected.	The wound of the motor and the pump consumption should be verified. Once the problem have been solved the operation will be restored going to the "SET Up" menu (see the chapter configuration) and introducing the adequate intensity values. Verify the 10 A fuses (see Fig.3), in case of being melt contact with technical service.
A5 ● Final failure	The transducer damages are showed in the MODULATOR 's LCD screen.	The device operation is interrupted.	
A6 ● Final failure	The system has a cooling device to keep the INVERTER in optimum working conditions.	If an excessive temperature is reached the own system leaves the inverter out of service and as consequence the pump too.	Verify the temperature of the water, it should be under 40 °C and the temperature environment should be under 50 °C. Contact with technical service.
A7 ● Final failure	The Modulaoor has an electronic system for protection against short circuits as well as a fuse of 10 A.	The pump remains stopped for 10". Then it starts again ~4 attempts. If the problem is not solved, the pump will remain definitively out of order.	Check the pump, if the problem persists, contact the technical service.
A8 ● Failure verification	The MODULATOR has an electronic safety system against overvoltages.	In case of overvoltage the system remains stopped until an adequate value of voltage is reached. In this case, the system is automatically restored.	Check the electric supply.
A9 ● Failure verification	The MODULATOR has an electronic safety system against too low supply voltages.	In case of undervoltage the system remains stopped until an adequate value of voltage is reached. In this case, the system is automatically restored.	Check the electric supply.
BLANK SCREEN	Blank screen.		Check the electric supply 230 V. In case of being in right conditions, the general fuse (10/20A), located in the main plate (fig 3) should be verified.

M → ALARMS FOR GROUP ASSEMBLY:

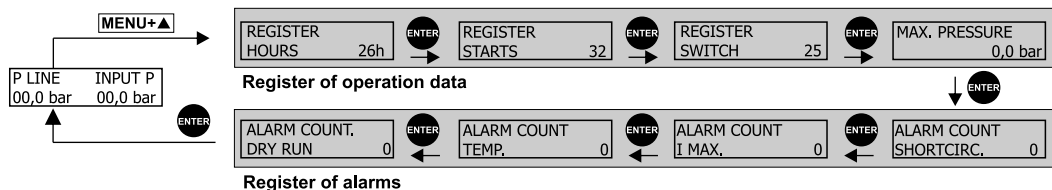
The alarms for assembled devices, are similar to those of the individual one with the specific particularities of operation with 2 communicated devices. Depending on the system's reaction there are 4 types of alarm:

- 1 - **COMMUNICATION FAILURE:** not any alarm is activated. Both devices continue operating independently as MODULATOR M006/M010.
- 2 - **LACK OF WATER:** if there is a lack of water alarm in a single pump, the other one assumes the role of "main device", if there is an over-demand during next working cycles, the system will try to restore the device in failure. If the device is restored in these conditions then it will be also restored the alternated working mode. If there is lack of water on both devices, the system will activate the ART system in the MASTER unit.
- 3 - **MINIMAL LEVEL IN THE TANK:** the alarm "LACK OF WATER" is activated and the device remains in failure. It will be automatically restored when the level sensor detects water again.
- 4 - **REST OF ALARMS:** If the alarm has occurred in a single device, the other will act as "main device". The system will try to restore the disabled device only in case of over demand, after 4 successive attempts without success the device is turned off, it should be restored manually. In case of alarms in both devices the system performs 4 restore attempts, if it does not succeed the system is disabled.

To restore manually a device disabled by an alarm push **AUTOMATIC ON / OFF** in MASTER device and then **ENTER** in the device with the alarm.

REGISTER OF OPERATION DATA AND ALARMS.

By using simultaneously **MENU + ▲** during 3" is acceded to **REGISTER OF OPERATION DATA AND ALARMS**, by mean of **ENTER** we can advance through the sequence, once finished the sequence we come back to the main display. This is all the sequence:



- **REGISTER HOURS.** Counter of total time that the pump has been operating.
- **REGISTER STARTS.** Number of cycles of operation, a cycle is a start and a stop.
- **REGISTER SWITCH.** Number of connections to the electric supply.
- **MAX PRESSURE.** Maximum pressure reached by the installation. It allows the detection of water hammer.
- **ALARM COUNT. SHORTCIRC.** Number of short circuit alarms.
- **ALARM COUNT I MAX.** Number of overcurrent alarms.
- **ALARM COUNT. TEMP.** Number of alarms by excessive temperature.
- **ALARM COUNT DRY RUN.** Number of dry-running alarms.

All the records are saved even if the device has been disconnected from the electric supply.

"CE" STAMENT OF COMPLIANCE.

MODUS FLUID TECHNOLOGY. We state, on our's own responsibility, that all materials herewith related comply with the following European standards:

2006/95/EC Low Voltage Directive on Electrical Safety
 2004/108/CE Electromagnetic Compatibility.
 2002/95/CE RoHS Directive

Product's name/Type: MODULATOR MOO6/M010

As per the European Standards:

UNE EN 60730-1:1998+A11:1998+A2:1998+A14:1998+A15:1998+A16:1998+A17:2001+ERRATUM A1:2001+A18:2003
 UNE EN 60730-2-6:1997+A1:1998+A2:1999+CORR A1:2001+CORR A2:01
 UNE EN 61000-6-2:2002
 UNE-EN 61000-6-4:2002
 UNE-EN 61000-3-2:2001
 UNE-EN 61000-3-3:1997+CORR:1999+A1:2002