



**AUTOMATISMOS Y REGULADORES**  
para generadores y grupos electrógenos

# SAM 713

**Controller for stand-alone generator sets**  
**INSTALLATION, USE AND CONFIGURATION MANUAL**



MANUAL SAM713 02-01  
[05-2011]

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SAM713

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## 1- PRODUCT DESCRIPTION

SAM713



The SAM713 controller is an instrument designed for manual or automatic control of generator sets, and the protection of such systems by means of its different alarms.

The device has been conceived to simplify electrical panel construction as much as possible.

### MAIN FEATURES

- Valid for Diesel and Gasoline engines
- Operation mode selection key:
  - Disconnected: group shutdown and reset
  - Manual: Manual startup and shutdown via button
  - Automatic: Operation/shutdown by means of remote control
- Measuring Instruments:
  - Generator A.C. voltmeter (1 phase)
  - Frequency meter
  - Record of running hours
  - Battery D.C. Voltmeter
- Record of running hours for maintenance management and guarantees
- High solid-state power outputs (20 A) that can avoid the use of intermediate relays.
- Automated unit contactor connection / disconnection
- Management of engine heating process
- Shutdown by solenoid or electro valve
- System protection by means of 10 alarms
- 28 configurable parameters

## 2- WIRING AND INSTALLATION

SAM713

### 2.1 TERMINALS

#### **2.1.1) Terminal features**

Connector type: ..... **Screw**  
 Minimum recommended cable cross-section: ..... **0.75 mm<sup>2</sup>**  
 Maximum admitted cable cross-section:..... **2.5 mm<sup>2</sup>**

#### **2.1.2) Power Supply**

Minimum voltage: ..... **8 Vcc**  
 Startup voltage drop:..... **0cc for 50ms**  
 Maximum voltage:..... **35Vcc (protected up to 60V)**  
 Protection against reverse polarity: ..... **-35 Vcc**

#### **2.1.3) Electrical measurements**

Sampling frequency: ..... **125 Hz**  
 Voltage:..... **135 Vac to 500 Vac**  
 Resolution: ..... **1 Vac**  
 Minimum Frequency: ..... **0 Hz**  
 Maximum Frequency: ..... **75.0 Hz**  
 Frequency Resolution: ..... **0.5 Hz**

#### **2.1.4) Inputs and Outputs**

##### **2.1.4.1) Digital inputs**

Number of inputs ..... **9**  
 Operation: ..... **Operation upon connection of terminal to earth**

##### **2.1.4.3. Digital outputs**

##### **Startup and shutdown output**

Type of output:..... **Transistor**  
 Maximum power:..... **20 Amp. (Peaks up to 50 Amp)**  
 Protection:..... **Short circuit**

##### **Pre-ignition output**

Type of output:..... **Transistor**  
 Maximum power:..... **7 Amp. (Peaks up to 15 Amp)**  
 Protection:..... **Short circuit**

**Unit contactor closing control**

Type of output:..... **Voltage-free relay, Normally Open**  
 Admitted voltage:..... **250 Vac**  
 Admitted intensity:..... **1 Amp**

**Alarm grouping or buzzer**

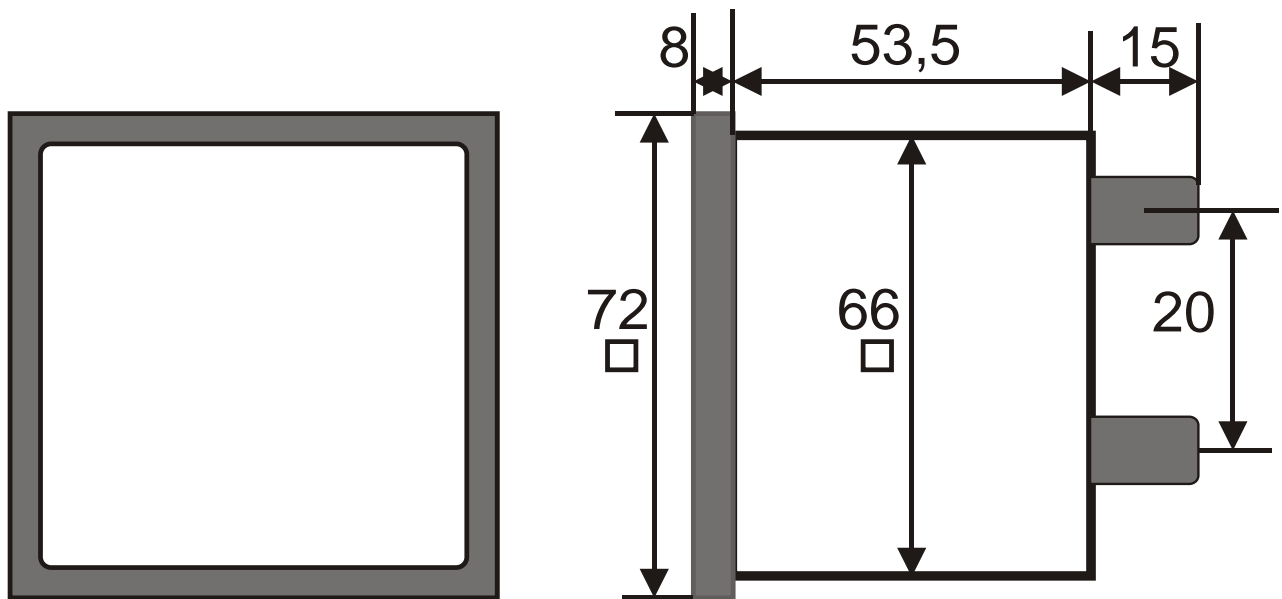
Type of output:..... **Transistor**  
 Maximum power:..... **1 Amp. (Peaks up to 4 Amp)**  
 Protection:..... **Short circuit**

**AUTO mode selector**

Output type:..... **Direct**  
 Maximum power..... **0.1 Amp**  
 Protection:..... **None**

**2.2 MOUNTING AND DIMENSIONS**

The exterior dimensions and required perforation for mounting are given below:



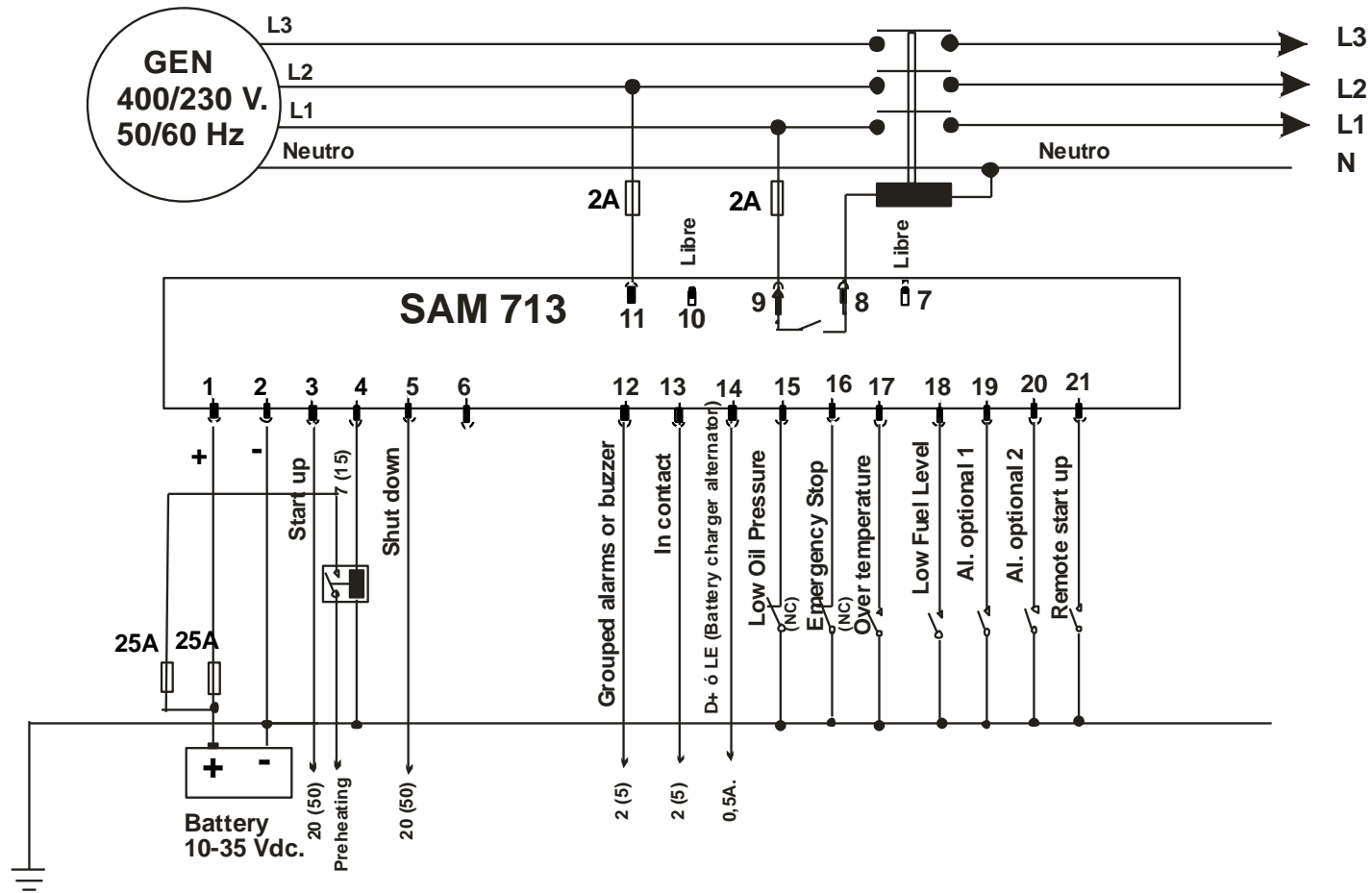
The SAM713 controller contains IP40; as such it must be installed within an electrical panel equipped with a door or cover.



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## 2.3 WIRING

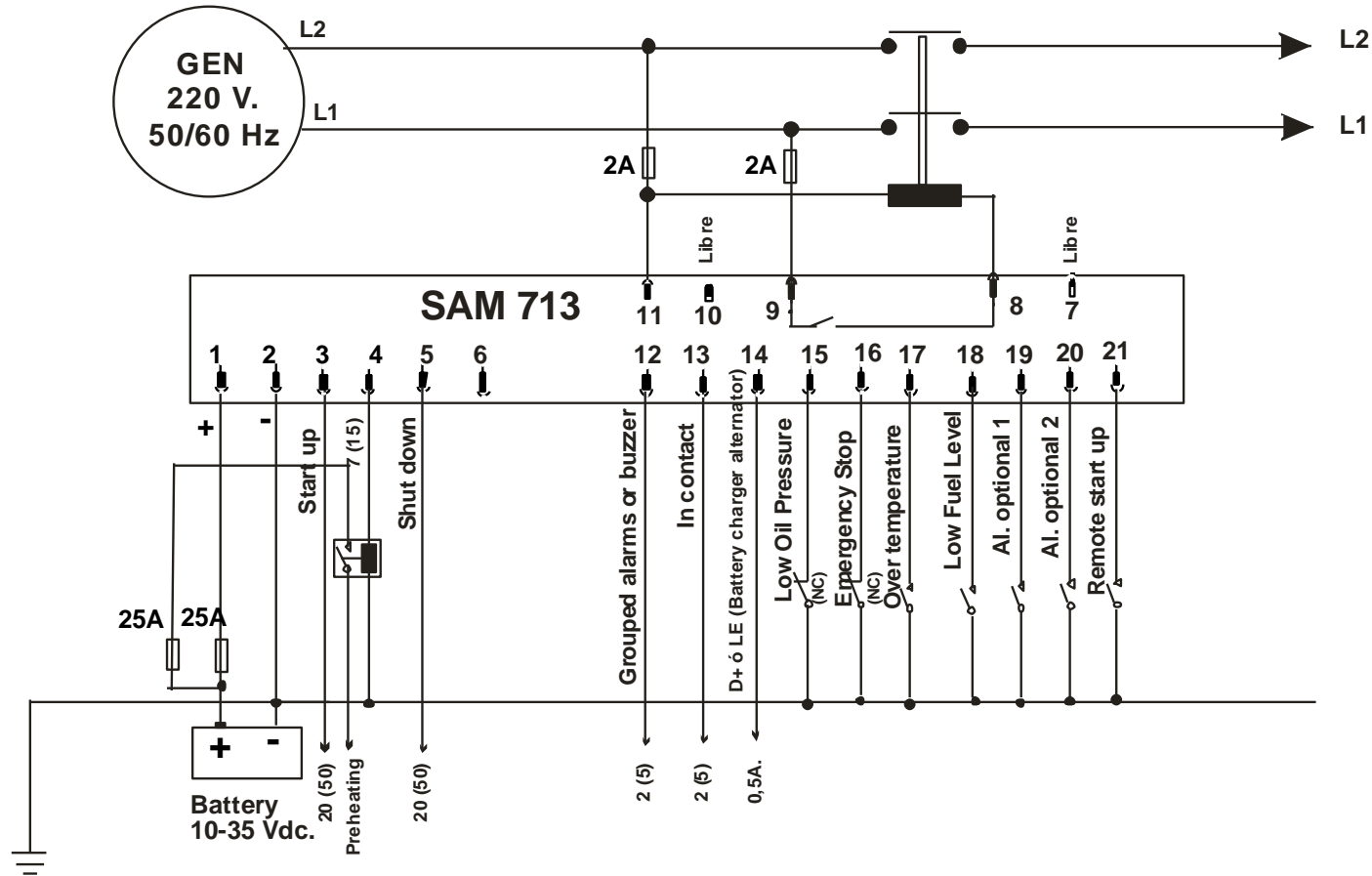
### 2.3.1 THREE PHASE WIRING 400/230 Vac. 50/60 Hz.





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## 2.3.2 ONE PHASE WIRING 400/230 Vac. 50/60 Hz.



## 3- DISPLAY AND MEASUREMENT INSTRUMENTS

SAM713

The parameters represented on the display correspond to the LED that is illuminated. The desired parameter is selected by means of and .

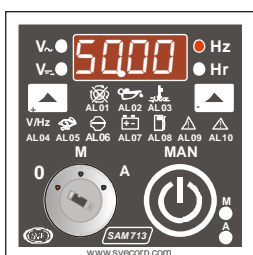
### 3.1 GENERATOR VOLTAGE



The screen will display the voltage recorded between terminals 9 and 11 of the SAM713 controller

- Minimum represented voltage:.....**140 Vac**
- Maximum represented voltage:.....**500 Vac**
- Resolution:.....**1 Vac**

### 3.2 FREQUENCY



Visualizes the generator frequency detected between terminals 22 and 23 of SAM713

- Minimum represented frequency:.....**0 Hz**
- Maximum represented frequency: .....**75Hz**
- Resolution:.....**0.5Hz**

### 3.3 RUNNING TIME



The SAM713 controller can be used to record generator running hours, for the purpose of managing both guarantees and routine preventive maintenance.

When the LED labeled "Hr" is shining, the figure that appears indicates the total running hours of the generator from the first connection of the SAM713 controller.

If this number surpasses 9999 hours, the screen scrolls to 0000 hours. The tally will continue but a point will appear, indicating that a 1 is needed in front the represented hours (1 - 0000). Two points indicates a 2 must be placed in front of the figure (2-0000), and so on.

**MAINTENANCE SIGNAL**

When the programmed period of time has elapsed (see CONFIGURATION), the Hr. LED will blink to warn that the periodic maintenance of the group is required.

**RESET MAINTENANCE SIGNAL:**

To reset the maintenance signal complete the following:

- Engine off.
- Selector key switched to M (MAN).
- Hr. LED lit.
- Press and simultaneously for 3 seconds

**3.4 BATTERY VOLTAGE**



This function visualizes the voltage of the battery supplying the SAM713 controller. It is recommended that the same battery be used for generator start-up so that this visualization can be used as an indicator of remaining voltage for both functions.

- Min. Voltage represented:..... **5.00 Vcc**
- Max. Voltage represented: ..... **50.00 Vcc**
- Resolution:..... **0.10 Vcc**

## 4- OPERATION

SAM713

When the SAM713 controller is activated in MAN or AUTO mode, positive potential is generated at terminals 13 (in contact) and 5 (fuel valve), if shutdown by de-excitation is configured.

### 4.1 MANUAL MODE

Turn the selector key to M (MAN)

#### 4.1.1 Manual Startup (MAN)

Press the  button ("START/ STOP".)

Following the first pressing of this button, the start-up procedure commences, according to the steps outlined below:

- Preheating (if configured)
- Start-up
- Pause

The start-up order ceases automatically as soon as it is detected that the engine is running. Following the configured pause (see CONFIGURATION) unit contactor connection is ordered.

If engine start-up does not occur, the SAM713 controller initiates another start-up cycle. The number of start-up cycles that will be ordered is set in the CONFIGURATION.

#### 4.1.2 Manual Shutdown (MAN)

Manual shutdown is triggered by pressing the  (START/STOP) button when the genset is in operation or when the startup order is being given

The shutdown sequence is as follows:

- Disconnection of group contactor
- Shutdown order given. The shutdown order will continue for the programmed period of time to ensure the engine stops completely. During the shutdown sequence the "ON" LED will flash.

## 4.2 AUTOMATIC MODE

Turn the selector key to A (AUTO). The "ON" LED will shine.

### **4.2.1.) Start-up sequence in AUTO**

The SAM 713 controller can start the generator when it receives the remote start-up signal (terminal 21: remote start-up, connected to negative.)

The start-up sequence will initiate according to the following steps:

- Pre-ignition (if configured).
- Start-up order given
- Pause

The start-up order ceases automatically as soon as it is detected that the engine is running. Following the configured pause (see CONFIGURATION) unit contactor connection is ordered.

If engine start-up does not occur, the SAM713 controller initiates another start-up cycle.

The number of start-up cycles that will be ordered is set in the CONFIGURATION

### **4.2.2.) Shut-down sequence in AUTO**

The shut-down sequence commences when terminal 21 (remote start-up) is released from negative.

Shut-down occurs as follows:

- Group contactor release is ordered immediately. The genset will continue in operation until the programmed period of no-load running has elapsed.
- As soon as the cooling period has ended the shut-down order is activated. This order will remain throughout the programmed period of shut-down time in order to ensure that the engine stops completely.

*During the shut-down sequence the "ON" LED will flash*

## 4.3 ALARMS

One of the basic functions of the SAM713 controller is the protection of the genset engine-alternator system. This is achieved through permanent monitoring of electrical and mechanical variables and subsequent activation of alarms where appropriate.

The presence of an alarm will always be shown on the display of the SAM713 controller. Output 12 (grouped alarms) will also be activated and where necessary group shutdown will be ordered.

The available alarms, together with their meaning and action, are described below:

### **ALD1 Start-up failure:**

**Cause:**

- The maximum of 3 start-up attempts (number of attempts is configurable) have been completed without detection of engine running
- Disappearance of engine running signals without SAM713 controller having ordered the shutdown.
- After engine running for the configured time, presence of alternator frequency has not been detected

**Action:**

- Warning signal at terminal 12 and immediate shutdown.

### **ALD2 Low oil pressure:**

**Cause:**

- Low oil pressure signal detected at terminal 15. This is only processed after 10 secs of engine running time.

**Action:**

- Warning signal at terminal 12 and immediate shutdown

### **ALD3 Water over-heating:**

**Cause:**

- Coolant thermostat detection (terminal 17)

**Action:**

- Warning signal at terminal 12 and immediate shutdown

### **ALD4 Alternator failure:**

**Cause:**

- Voltage and/or frequency outside the configured limits:
  - Frequency: 50Hz (47-56Hz); 60Hz (57-63Hz)
  - Voltage: See configuration

**Action:**

- Warning signal at terminal 12 and immediate shutdown

**AL05 Overspeed:**

**Cause:**

- Obtained from generator frequency reading; indicates engine runaway. Alarm is generated internally in the SAM713 controller upon detection of frequencies above 120% of the nominal frequency, for 1.5 seconds. De-activation of this alarm can be programmed.

**Action:**

- Warning signal at terminal 12 and immediate shutdown

**AL06 Emergency Stop button:**

**Cause:**

- Emergency stop activation by terminal 16 (Configurable: N.O. or N. C.)

**Action:**

- Warning signal at terminal 12 and immediate shutdown

**AL07 Low battery/battery charger alternator failure:**

**Cause:**

- Battery voltage detected at 20% below  $V_n$  for at least 2 minutes
- Lack of signal detection at terminal 14

**Action:**

- Programmable: Warning at terminal 12 only; or warning plus shutdown

**AL08 Low fuel:**

**Cause:**

- Fuel level buoy contact detected at terminal 18

**Action:**

- Programmable: Warning at terminal 12 only; or warning plus immediate shutdown

**AL09 Generator overload (optional alarm 1):**

**Cause:**

- Detection of overload relay activation by terminal 19

**Action:**

- Programmable: Warning at terminal 12 only; or warning plus immediate shutdown.

**AL 10 Optional alarm 2:**

**Cause:**

- Detection of optional contact at terminal 20

**Action:**

- Programmable: Warning at terminal 12 only; or warning plus immediate shutdown

**ALARM RESET**

Alarms that produce a warning signal only will be reset automatically as soon as the cause of the alarm is removed.

To reset the alarms that also trigger genset shutdown, complete the following:

- Put selector in 0 "OFF" position
- Rectify the cause of the problem

## 5- PARAMETER CONFIGURATION

SAM713

The SAM713 controller offers an extraordinary capacity for adaptation to different types of engines and generators as well as to the specific needs of individual users.

The SAM713 controller can be adapted to the particular demands of each installation through the appropriate programming of its modifiable parameters.



These configurable parameters and their possible values are given below. Bold and/or underlines type indicates default values (factory configuration).

	PARAMETER	VALUE: 00	VALUE: 01
01	Motor type	<b>Diesel</b>	Petrol
02	Generator frequency	<b>50 Hz</b>	60 Hz
03	Shutdown type	<b>De-excitation</b>	Excitation
04	Motor running time prior to activation of frequency monitoring	<b>2 sec</b>	10sec
05	Minimum voltage (monitoring)	Window:16-52 (160 – 520 V) <b>34 (340 V)</b>	
06	Maximum voltage (monitoring)	Window 16-52 (160 – 520 V) <b>42 (420 V)</b>	
07	Permitted genset frequency variance with respect to nominal frequency	<b>5%</b>	10%
08	Withdrawal of startup for battery charge alternator (D+)	No	<b>Yes</b>
09	Withdrawal of startup for low oil pressure	<b>No</b>	Yes
10	Number of startup attempts	00 –99 <b>(3)</b>	
11	With/without priming of battery charger alternator or magnetic plate regulator	Without priming	<b>With priming</b>
12	Overspeed monitoring	No	<b>Yes</b>
13	Low fuel alarm	Warning	<b>Shutdown</b>
14	Alarm for battery charger alternator failure-broken belt	Warning	<b>Shutdown</b>
15	Emergency stop alarm contact	NO	<b>NC</b>
16	Optional Alarm 09		
17	Optional Alarm 10	Warning	<b>Shutdown</b>
18	Output for centralised alarms (pemanent) or buzzer (programmed duration)	Buzzer	<b>Centralised alarms</b>
19	Buzzer duration	0–99 min. <b>3 min.</b>	
20	Preignition time (sparkplug heating) (deisel motors only)	00-99 seg. <b>15 sec.</b> (00 No preig)	
21	Starter duration (petrol motors only)	00-9.9 sec. <b>1.5 sec.</b> (00 no start)	
22	Generator contactor connection delay	0-99 sec. <b>5 sec.</b>	
23	No-load running time	0-99 min. <b>1 min.</b>	
24	Shut-down time in AUTO	2-99 sec. <b>15 sec.</b>	
25	Periodic maintenance reminder frequency	0 – 99 (0-990 h) <b>25: (250h)</b>	
26	Delay before first maintenance reminder	0 – 99 (0-990 h) <b>10 (100h)</b>	
27	Delay in frequency failure alarm activation	0-99 sec. <b>60 sec.</b> (00 no alarm)	
28	Delay in frequency failure alarm activation	0-99 sec. <b>60 sec.</b> (00 no alarm)	

Procedures to access, change, and save configurable values, and to finalize the configuration process, are given below.

## 5.1 INITIATING CONFIGURATION MODE

Starting conditions:

- Genset stopped (if the SAM713 controller is not connected to the group, it is necessary to simulate the inputs)
- SAM713 supplied by battery
- Selector key in "M" position (MANUAL)
- Display selector LED must *not* be in Hr
- Press  and  for 3 seconds

SAM713 controller will enter configuration mode and display the message **Pr0\_**. The first modifiable parameter is displayed according to the TABLE above (that is: **0 1.00** )

## 5.2 MODIFYING THE CONFIGURATION

The two first digits correspond to the N° of the parameter; the following digits correspond to the assigned value.

Each time the  button is pressed the chosen value is stored and the next parameter selected.

The buttons  and  modify values displayed for each parameter.

## 5.3 EXITING CONFIGURATION MODE



Once the desired values for each configurable parameter have been set, exit configuration mode as follows:

- Press  and  for 3 secs

The SAM713 controller will exit configuration mode, displaying the message **Fl n**. The equipment is now ready for operation.

## 5.4 RESET TO FACTORY VALUES

The following procedure must be followed if for any reason you wish to return the SAM713 controller to its default factory values:

- Enter into configuration mode as indicated above
- Set selector key to "0": The device will display the message **PF00**
- Press  and  for 3 seconds.

*Genset running hours will not be erased.*



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