

## AUTOMATIC/MANUAL CONTROL PANEL (ACP) – Model AC-3000

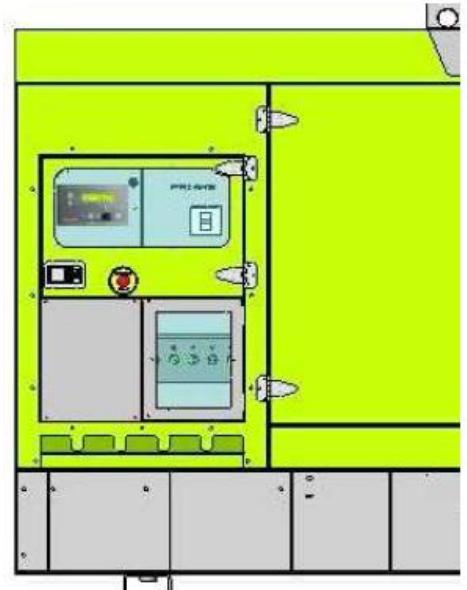
### Overview

The Automatic/Manual Control Panel model AC-3000 is fitted within the generating-set, fully integrated and connected to the machine.

The panel integrates a compact control board, micro-processor based, type PRAMAC AC-3000, which embeds the logic devices to control the generator in either Automatic Start (providing Mains-Failure detection) mode, or manual-operation.

The control-panel is realized in a dedicated metal-cabinet, integrated in the side of the generating set. The cubicle is built with galvanized steel plates, coated with high-resistance epoxy layer, in order to guarantee the highest duration against atmospheric agents.

The control electronic board AC-3000 is placed on the front panel, behind lockable metal door, which is provided with transparent window (to allow reading of measurements displayed on the panel) and opening for Emergency-Stop button.



### Main Components

- 1) ON/OFF KEY OPERATED SELECTOR-SWITCH
- 2) CONTROL BOARD AC-3000
- 3) AUTOMATIC BATTERY STATIC-CHARGER
- 4) POWER-CIRCUIT
- 5) EMERGENCY-STOP PUSH BUTTON
- 6) PLINTH-ROW FOR AUXILIARY DEVICES CONNECTION.
- 7) MAINS/GEN-SET CHANGEOVER PANEL (SUPPLIED SEPARATE AS AN OPTIONAL ITEM, VERSIONS ACP + LTS)

#### 1. ON/OFF Key Operated Selector Switch

The selector, placed on the front of the control panel, activates the DC power supply to the control unit



#### 2. Control Board AC-3000

##### 2.1 System Description

The Automatic Control Board AC-3000 enables either the Manual Start/Stop of the generating set (with direct control from the operator), or the Automatic operation, following the direct sensing of mains failure (through embedded controls and separate switchgear Genset/Mains panel LTS).

By selecting the **Manual** operation, through the proper switch, the Start (I) Stop (O) buttons are activated and local generator control is enabled.

When the operation selector switch is set on **Automatic**, the mains failure detection system is activated and the Generating-Set is automatically started whereas mains voltage gets out of bounds of preset thresholds. Once nominal operating condition of the generating-set are reached, the electronic control unit switches the change over switchgear (LTS supplied in a separate cabinet as an optional item) in order to power the load.



As the Mains voltage is restored, and stabilized for a pre-settable time, the AC-3000 control unit controls the return of power supply from Generator to the main grid and, after a cooling delay, stops the generating-set.

The Control Board AC-3000 is provided with RS232C (Serial) Communication-Port to be interfaced with PC or Laptop for remote control-monitor through wire or modem.

## 2.2 Functions – Selector

From the selector switch placed on the front panel it is possible to select one of the following functioning modes:

### OFF/RESET

The generator is inhibited from operation. If this option is selected when the generating-set is running, the stop-sequence is activated and the switchgear panel is forced on MAINS SUPPLY position.

### PROGRAM

The AC-3000 board is provided with all parameter pre-set on default values. Those can be modified through a 2-level access protection with password (1°password for installer, 2°password for operator).

### MANUAL

This functioning mode permits the manual start and stop of the generating-set through the local operation push buttons.

### AUTOMATIC

Selecting this operation mode, the AC-3000 control panel enables the Mains Failure detection device with automatic start of the Generating set in case of anomalies on the grid power supply.

The generation starting sequence involves a cycle of starting attempts and resting-time pre-set on the control board.

As the generating-set is successfully started the signal to switch the power supply from Mains to Generator is sent to the changeover-panel. The status of engine and generator is continuously monitored by the AC-3000 control-board during the running time of generating-set. In case of malfunctioning, an alarm is reported on the LCD screen of the control board and, if necessary, the machine is disconnected and stop-sequence initiated.

### TEST

This function, exercises the machine for periodic test, when the generating-set is in mains-standby. All protections are activated and the generating-set is run without supplying the load. The Mains/Generator changeover switchgear is forced to keep the supply to load from Mains.

## 2.3 Functions – Selector

- ☐ Selector Off/Reset/Program – Manual – Automatic
- ☐ Gen-set Start
- ☐ Gen-Set Stop
- ☐ Changeover Switchgear manual management
- ☐ Buzzer silencing button
- ☐ Up/Down scroll button

## 2.4 Auxiliary Services

The control panel is complete with:

- ☐ Acoustic-alarm (buzzer)
- ☐ Exerciser – Programmable periodic test of the machine
- ☐ Visualization of generating-set operating parameters
- ☐ Earth Fault protection 1 – 40 A (protection of the machine)
- ☐ Automatic fuel transfer pump management with re-fueling forcing operation (Fuel Pump kit available as a supplement)
- ☐ Engine Water Jacket heater power supply 50/60Hz, 230V (Pre-Heater available as a supplement)
- ☐ Display language selection (English, Italian, French, Spanish, German, Portuguese)
- ☐ Remote Start from VFC availability.

- ☐ Tele-management
- ☐ Historical event log

## 2.4 Measurements

- ☐ Generator Voltage: L1/L2 – L2/L3 – L3/L1
- ☐ Mains Voltage: L1/L2 – L2/L3 – L3/L1 (when changeover panel is connected)
- ☐ Generator current: I1 – I2 – I3
- ☐ Generator frequency-meter (Hz)
- ☐ Generator speed-meter (rpm)
- ☐ Fuel level (%)
- ☐ Battery voltage (V)
- ☐ Engine oil pressure (Pa)
- ☐ Engine coolant temperature (°C)

## 2.4 Calculated Values

- ☐ Active Power (kW)
- ☐ Reactive Power (kVAr)
- ☐ Apparent Power (kVA)
- ☐ Power Factor
- ☐ Energy-meter (kWh)
- ☐ Start-attempt counter
- ☐ Running-hours meter (1 off engine, 1 off control board)
- ☐ Running-Hours counter (for either servicing intervals or gen-set rental)

## 2.4 Visual signaling and protections

The AC-3000 control unit embeds visual status signalization and protections:

### STAUS

- ☐ Mains presence
- ☐ Generator on
- ☐ Mains contactor closed
- ☐ Gen-set contactor closed
- ☐ Engine running

### ALARMS (w/o shutdown)

- ☐ Starting battery failure
- ☐ Pre-alarm low engine oil pressure
- ☐ Pre-alarm high engine water temperature
- ☐ Pre-alarm low fuel level

### ALARMS (with shutdown)

- ☐ High engine water temperature
- ☐ Low engine oil pressure
- ☐ Over-speed
- ☐ Engine crank-cycle failure
- ☐ Battery charger failure
- ☐ Overload
- ☐ No fuel
- ☐ Emergency stop activated

All alarms that lead to complete shutdown of the generating-set are stored in the control board. Only the manual reset of the control panel can restore the normal operation.

#### ALARMS DISPLAYED

- ☐ Engine belt failure
- ☐ Overload and short circuit (electronic protections)
- ☐ Nominal operating condition not reached
- ☐ Generator under-voltage
- ☐ Generator Over-Voltage
- ☐ Generator Under-Frequency
- ☐ Generator Over-Frequency
- ☐ Maximum Power
- ☐ Reverse Power
- ☐ Changeover switchgear failure
- ☐ Gen-set stop failure

### 2.4 Remote management interface

The Automatic Control Panel AC-3000 is provided with RS232 communication port, suitable for connection to the remote-management kit (which can be supplied as an accessory), for remote management/control from PC. Connection to PC or laptop can be achieved through wire (10 m maximum length) or through wireless modem (GSM). It is also possible to remotely control the generating-set and command it through the sending/receiving of SMS, properly coded, by means of common mobile-phone.



### 3. Automatic battery static-charger

An automatic battery static-charger is fitted within each Generator control panel. It is complete with voltage transformer, rectifier and charge-control device.

Voltage power supply 230V

Frequency 50/60Hz

Power 45VA

Nominal Current 1.5A



The front panel of the battery charger presents the following LED: Voltage on charger output, low charging current, reversed polarity.

### 4. Power circuit

The Generator Control Panel comprises the power circuit, from the alternator to terminal bus bars. Every control panel includes a thermal-magnetic Molded-Case Circuit Breaker for protection of the generator. The circuit breaker, mounted with the Control Panel offers a 3-poles trimming as standard (4 poles MCCB are available as optional) and the control-lever is accessible from the front of the control panel.

MCCB are mounted of the following brands, according to the rating:

CB brand	Model	Nominal Current I
Bticino	Megatiker - 7314	400/630A
GE	FK800/FK1250	800/100A



Through a release-coil the Circuit Breaker can be fitted with Earth Fault protection 1 -40 A (protection of the machine).

Copper Bus bars distribution, properly sized, is installed to from the Circuit Breaker to permit an easy access with power cables. Rod ends can be easily connected through a dedicated hinged door on the front of the main panel, provided with transparent plate to allow visualization of the connections.

A separate cable entry is realized trough an opening on the lower side of the control panel and is designed with comb-profile for power-wires holding.

NB. Under request a Socked Kit, complete with 5 off sockets, is available.



## 5. **Emergency-Stop push button**

The emergency-stop push button is installed on the front f the control panel.

An opening on the front lockable door makes it always accessible. The opening is sealed with rubber protecting coat.



## 6. **Plinth Row for auxiliary devices connection (Changeover Panel LTS connection)**

The connection of auxiliary deices is made easy through a separate plinth mounted inside the Control Panel. Access to the plinth row is extremely easy as the portion of control panel is hinged on the side and can be opened; all wires are routed through special passage to the lower opening.



To LTS panel

## 7. **Mains/Gen-Set Changeover Panel (supplied separate as an optional item, versions ACP + LTS)**

To operate the Generating set in Mains-Standby applications, and in order to use the Mains Failure functions of the AC-3000 Control Unit, a Changeover Switchgear panel (LTS) can be provided.

Changeover contactors, which are sized upon power of Mains and Generator, are mounted within a metal cabinet, which is supplied separate from the generating set.



The switchgear device includes 4-poles contactors mechanically and electrically interlocked. Access to the panel is obtained through an opening on the bottom-side of the box. Internally the Changeover panel LTS presents terminal bus bars for connection of the power cable from Mains and Generator and connection of cables to the load. An internal row allows the connection of the changeover panel to the Generator's control panel, which also provides the control of Automatic Load Transfer.

Contactors and changeover devices are from the following brands, depending on the size:

Contactors brand	Model	Size	Dimensions (LxHxW) [mm]
ABB	EK	400 A	(800 x 1000 x 300)
ABB	EK	500 A	(800 x 1000 x 300)
ABB	EK	700 A	(1000 x 1600 x 400)
ABB	EK	1000 A	(1000 x 1600 x 400)

Further details can be provided under request.

**SUPPLEMENTS (To be ordered with the generating-set)**

- ☐ PHS – Water Jacket Heater
- ☐ TIF – 4 Poles Thermal Magnetic protection
- ☐ AFP – Automatic Re-fueling kit (from storage fuel tank)
- ☐ SKB – Socket Kit

**ACCESSORIES**

- ☐ RGC – Direct PC connection through wire
- ☐ RGC – GSM Kit for remote genset control via PC
- ☐ LTS – Mains/Gen-Set Changeover Switchgear panel
- ☐ TLP – Volt Free Contacts (VFC) for remote signalization