

Technical/Commercial presentation

HYBRID S.A.P.S. OFF-GRID SYSTEM

Stand Alone Power System



S.A.P.S. 1-4KW

Description

The **SAPS** Hybrid device can supply isolated users without public mains electricity. The required energy will be drawn by renewable source such as **solar**, **micro** wind and **mini water**. In case that there isn't any renewable source available, the SAPS device is provided of a **diesel generator**. The produced energy will be stored in a battery pack to make it available 24 hours a day to the user through an inverter which is automatically activated when necessary.

Recommended uses:

- ◆ Isolated houses with a daily average consumption from 1 to 10 kwh
- ◆ Radio links and telecom systems with consumption from 1 to 5 kwh/day
- ◆ Isolated monitoring stations with consumption from 1 to 5 kwh/day

Standard Equipment

Engine

- Speed governor
- Oil filter, air filter, diesel filter
- Direct injection
- Anti vibrating mounting pads

Alternator

- AVR Automatic Voltage regulator 24Vdc

Battery

- Battery 24Vdc AGM 230Ah

Canopy

- Soundproof canopy 68dB(A)
- Protection degree IP32

Inverter

- Inverter 24Vdc / 230Vac
- Power from 1KW to 4KW (S.a.p.s. 24V excluded)

Control Panel

- Microprocessor logic for the total system management

Exhaust

- Silenced internal muffler

Fuel supply

- Internal daily tank
- Low fuel level shutdown automatic system
- Fuel gauge
- Anti pollution Bunded base with external draining point

Handling

- Anti-turning forklift pockets and forkliftable on the long side

Protection & connection Panel

- Electronic protection made with an inverter, AC side
- Resettable thermal protection, side DC
- Emergency stop button
- Lateral cabel exit
- Fast connection for solar panels and wind
- Starter battery

Documentation

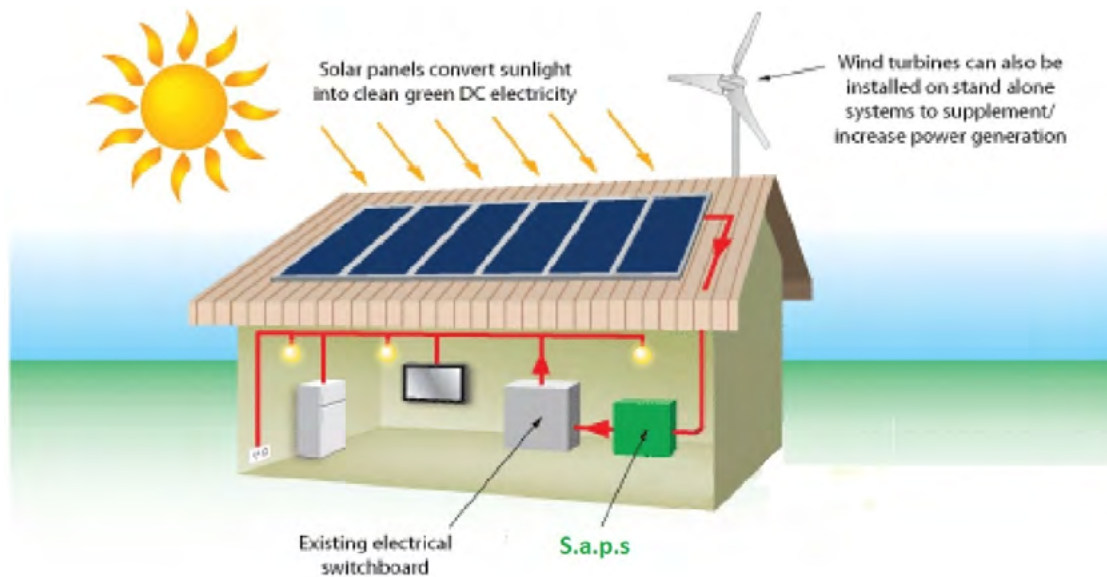
- CE declaration of conformity and User and Maintenance Manual
- Test report (at full load) and wiring diagrams

Normatives

- All ELCOS Generating sets are compliant to CE Marking
- 2004/108/CE Electromagnetic compatibility
- 2000/14/CE Noise Emission for outdoor use
- Factory-designed systems built at Elcos ISO 9001:2008



ADVANTAGES



- ♦ Energetic autonomy for isolated areas without public mains.
- ♦ Easy to install.
- ♦ Small dimensions and low noiselevel, ideal for indoor installations
- ♦ Continuity in energy availability also without renewable sources.
- ♦ Saving on fees for occasional use (holiday houses).
- ♦ Availability of outdoor configuration, kit IP55, without dedicated room.
- ♦ Modularity for further power upgrade, from 1 to 4 kW.

HOW IT WORKS

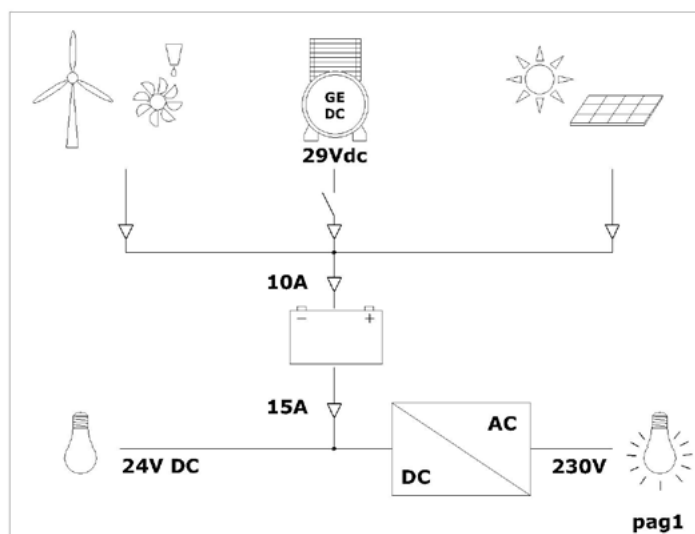
The **S.A.P.S.** unit have a battery system which will be reloaded from diverent renewable sources:

- Solare
- Micro wind
- Micro water

These sources can operate separately or can be combined with each other. If the energy stored in the batteries (from renewable sources) is not sufficient, a diesel generator backup supports the system charging the batteries and supplys it at the same time.

The batteries release energy to the system in two ways:

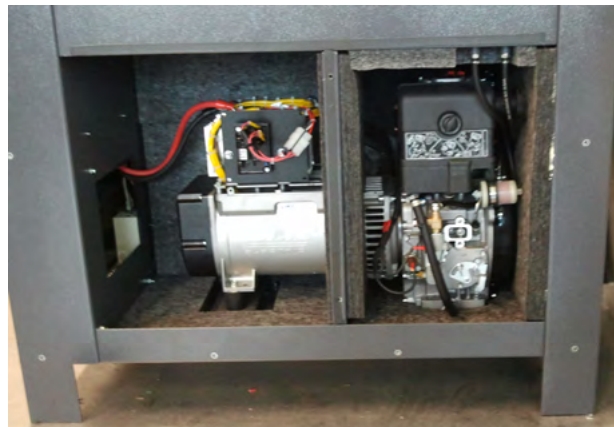
- 24Vdc 30A
- 230Vac from 1 to 4KW (from Inverter)



EQUIPMENT AND FEATURES

◆ **Diesel engine:**

Easily accessible for maintenance operations



◆ **24 Vdc Alternator:**

Provides for the direct charging of the battery and supply the inverter when the battery is low.

◆ **Diesel tank:**

81 liters tank guarantee 250hr of power supply when the renewable sources are not available.



◆ **Inverter DC/AC:**

provide transformation of 24V DC power in 230V AC, necessary to supply home devices. The inverter is automatically activated only when energy is needed by the user by limiting consumption to a minimum. The system is composed of four 1000 W modular units and is therefore possible to choose between 4 power from a minimum of 1Kw to a maximum of 4Kw, so the system is expandable also in a second time in the case in which increase the loads connected to the SAPS. The activation and the adjustment is done with a simple knob.



◆ **Battery pack AGM:**

230Ah 24Vdc without maintenance for the storage of the produced energy. On request battery pack from 300Ah installed in the same compartment. The AGM battery (Absorbed Glass Mat) is a lead-acid accumulator in which the electrolyte is absorbed in the separators, consist of a spongy mass of glass fiber. The condition of the electrolyte, the sealed container using special pressure valves and the internal chemical reaction "recombination" (VRLA) that minimizes the escape of gases typical of the electrolyte liquid (especially when subjected to intense cycles of charge-discharge) make these batteries:

- really without maintenance (MF – "Maintenance Free");
- immune from the risk of accidental spillage of acid liquid;
- suitable for installation in close proximity to people and of electronic devices.

◆ **Solar panel control:**

Switch off automatically the power from panel when the battery is full charged, avoiding battery damage. This system can control up to 6 panel (commercial size from 190W up to 250W).

Data and technical specifications are subject to change in order to update or improve the products.

EQUIPMENT AND FEATURES

- ◆ **Plug and Play** sockets:
 - N°1 output 24 Vdc (32A)
 - N°1 output 230 Vac (16A) to power loads from 1kW to 4kW according to the model.
 - N°1 input 24 vdc (32A) to connect other power sources as micro wind or mini hydro.
 - N°6 input for solar panels from 190 to 250W/each at 72 cells.



- ◆ **System control panel:** LCD display that show the system state



AVAILABLE CONFIGURATIONS

S.A.P.S.

The Diesel generator charge alone the battery that provide the energy to the user. The storage system optimize the use of the generator.

S.A.P.S. + SOLAR

The batteries are charged from the solar panels and from the diesel generator when necessary; in this configuration the system have the maximum efficiency.

S.A.P.S. + SOLAR + WIND

This system require minimum 4m/s wind velocity to obtain the correct value of efficiency.

S.A.P.S. + SOLAR + HYDRO

When river is available.

Technical data	Model	24V	1000	2000	3000	4000
Maximum power	W	760	1000	2000	3000	4000
Peak power max 5sec with batteries 230Ah	W	2000	2500	3500	4500	5500
Output voltage AC	Vac	-	230			
Output voltage accuracy	%	-	+/-10			
Min/max output voltage DC	Vdc	23 / 29				
Maximum output current AC	Aac	-	4.5	9	13.5	17
Maximum output current DC	Adc	30				
Output frequency	Hz	-	50			
Pressure level @ 10mtrs	dB(A)	68	68	68	68	69
Protection degree	IP	32				
Dry weight with batteries	Kg	675	684	693	702	711
Operating power	°C	-10 +30				
Fuel						
Fuel type	Type	Diesel				
Tank capacity	Lt	81				
Autonomy during the batteries charging phase	h	260				
Fuel consumption	g/kWh	260				
Consumption during the batteries charging phase	lt/h	0.42				
Engine						
Brand		LOMBARDINI				
Emission		Stage 2				
Model		15 LD 350				
Speed governor		Mechanical				
Cooling system	Type	Aria				
Speed	rpm	3000				
Mechanical power*	kWm	4.6				
Injection	Type	Direct				
Numbers of cylinders	n°	1				
Oil consumption	Kg/h	0.0032				
Oil sump capacity	lt	1.2				
Ordinary maintenance interval	h	250				
1° Interval of extraordinary maintenance	h	5000	5000	5000	5000	4000
2° Interval of extraordinary maintenance	h	7500	7500	7500	7500	6000
Engine lifetime**	h	10000				

* Above 30°C, there is a derate by an additional 1% per 100 m, and 2% per 5°C

** Considering the regular operations of ordinary and extraordinary maintenance

Alternator						
Nominal output voltage	V	24VDC				
Nominal output current (max)	A	200				
Voltage regulator	Type	Electronic				
Poles	n°	2				
Cooling system	Type	Ventilating				
Control of the charging current	Type	Electronic				

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Battery bank		
Capacity	Ah	230
Number of batteries	N°	2
Batteries voltage	V	12
BUS voltage	V	24
Batterie lifetime	Years	10
Charge and discharge cycles (DOD 50%)	nr.	1200
Operating temperature	°C	-20/ + 50
Battery type	Type	AGM
Standard operating environmental conditions		
Ambient temperature	°C	25
Relative Humidity	%	30
Max altitude	mt/asl	1000

EXAMPLE:

Data in the table below are referred for an irradiation of 4,06Kwh/m2 (April and September), n.4 solar panels of 230W/each, 6Kw/h of daily consumption and 250h of maintenance engine interval.

The following data can be understood as average values over the period of a calendar year (January to December) and can be used as calculation for routine maintenance costs (cost of diesel, filters, batteries).

MODEL		SAPS 3000		
Daily consumption	Kwh/Day	6	8	10
Fuel consumption	lt/Kwh	0,2	0,22	0,25
	lt/Day	1,2	1,76	2,5
Internal fuel tank	litres	81	81	81
Fuel refilling interval	Days	67	46	32
Time of engine operation	h/Day	1,5	2	2,5
Maintenance interval	Days	166	125	100
Engine lifetime	Years	18*	13*	11*
Maximum number of solar panels connectable	nr x W	6 X 190	6 X 190	6 X 190
Charge and discharge cycles of the batteries	Nr/Day	2	3	4
Batteries lifetime	Years	1,5**	1**	0,8**

* Considering 10.000 hours of engine life and having performed regular ordinary and extraordinary maintenance.

** Considering DOD at 50%

Table of the Daily consumption: **6Kwh/day:**

UTILITIES	NR.	CONSUMPTION	H/DAY	DAYS/WEEK	CURRENT	POWER	ENERGY
Light	1	50 W	7:00	7 days	0,61 A	14,58 Ah/g	350 Wh/g
Fridge	1	250 W	10:00	7 days	4,34 A	104,17 Ah/g	2500 Wh/g
Television	1	200 W	5:00	7 days	1,74 A	41,67 Ah/g	1000 Wh/g
Router/Modem	1	5 W	24:00	7 days	0,21 A	5,00 Ah/g	120 Wh/g
Washer	1	1000 W	1:00	7 days	1,74 A	41,67 Ah/g	1000 Wh/g
Computer	1	200 W	1:00	7 days	0,35 A	8,33 Ah/g	200 Wh/g
Maintenance	1	100 W	0:30	7 days	0,09 A	2,08 Ah/g	50 Wh/g
Standby	1	30 W	24:00	7 days	1,25 A	30,00 Ah/g	720 Wh/g
Charge regulator	1	8 mA	24:00	7 days	0,01 A	0,19 Ah/g	4,61Wh/g
TOTAL						247,69 Ah/g	5944,61 Wh/g

Data and technical specifications are subject to change in order to update or improve the products.

Description

The new control module MC4-H Elcos is designed for Hybrid systems applications. It offers the complete managing and monitoring of the system.

The module incorporates a number of advanced features to meet the most demanding on-site applications.

It includes a USB port and an RS485 port for Mod BUS Communication.

Applications

- ◆ Telecom
- ◆ Stand alone system without Mains
- ◆ 24Vdc system
- ◆ Monitoring isolated system



FEATURES

→ Controls

- Manual start up and stop
- Automatic start up and stop from low battery voltage
- Lock
- Alarms reset
- Emergency stop button

→ Engine Measures

- Fuel level %
- Total operating hours
- Partial operating hours (resettable)
- Hours to maintenance
- Start up counter

→ Communication Interfaces

- Modem for SMS managing
- USB port for saving parameters and firmware updates
- RS485 serial output for remote panel

→ Equipment

- Microprocessor logic
- Backlit refractive display
- 16-event alarm history list
- Multi-language management
- Troubleshooting with suggestions

→ Alternator and inverter Measures






- Inverter AC singlephase voltage
- Alternator voltage DC
- Charging batteries current DC
- Discharging batteries current DC
- Output current from Inverter AC
- Input current from solar panels (if connected)
- Input current from wind system (if connected)
- Frequency
- Genset apparent power KVA
- Genset actual power KW
- Genset reactive power KW_r
- Genset KWh
- Genset power factor cosφ

→ Signals/Protections





- Failed to start-up
- Failed to stop
- Low oil pressure
- Generator battery charger
- No fuel
- Low fuel level (pre-alarm)
- Start up
- Stop
- Battery connected
- Battery charging
- Battery undervoltage
- Battery overvoltage
- Genset overvoltage
- Genset undervoltage
- Genset overload
- Genset short circuit
- Genset connected
- Emergency button pressed



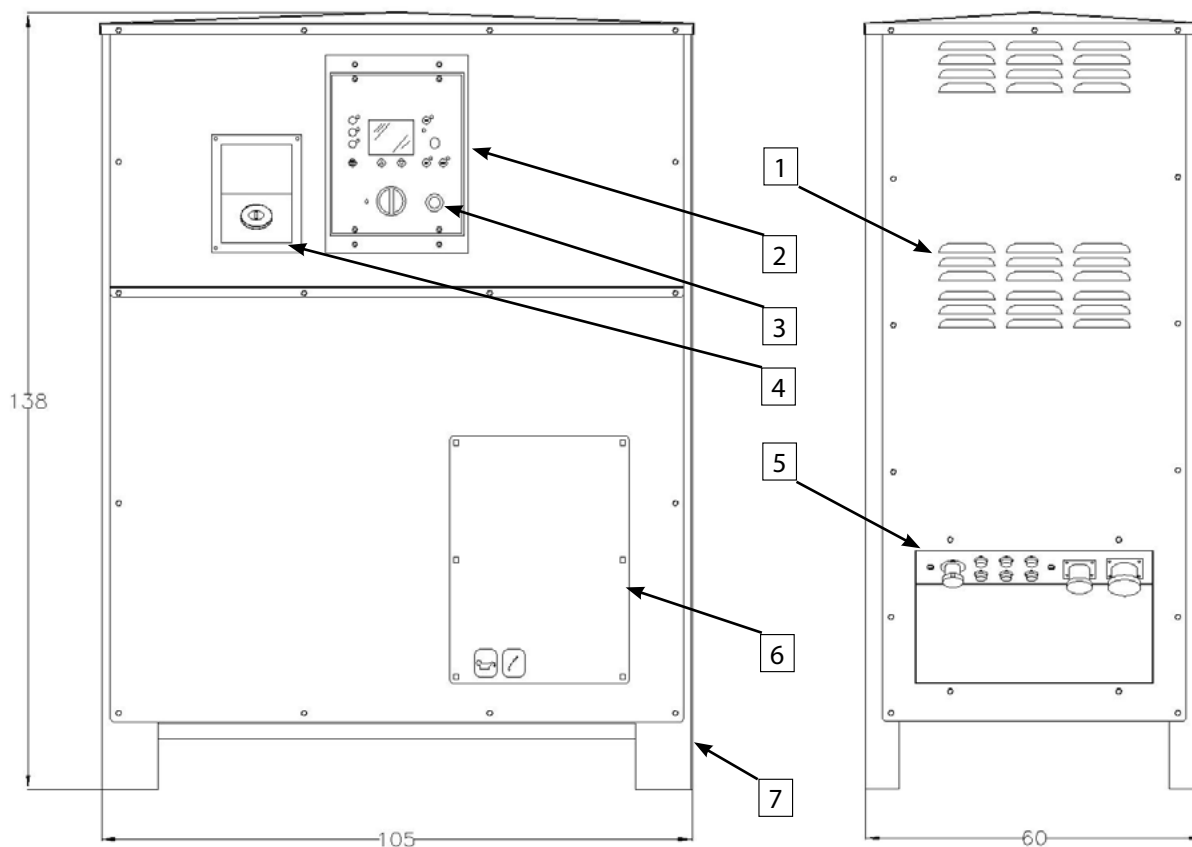
Additional optionals

<p>KIT SOLAR - K01</p>		<ul style="list-style-type: none"> • Solar Panel, commercial sizes from 190W to 250W 72 cell complete with cable and quick connector for direct connection to the saps, max. nr.6 solar panels.
<p>KIT WIND - K02</p>		<ul style="list-style-type: none"> • Wind kit 24Vdc 400W consist of wind generator, controller, cable with quick connector for direct connection to the Saps.
<p>KIT POLE - K03</p>		<ul style="list-style-type: none"> • Pole kit consists of a modular support structure anchored to the Saps (H max= 6m) for the installation of the wind turbine at the top of the pole and 4 solar panels are fixed directly on the main pole.
<p>KIT MODEM - K04</p>		<ul style="list-style-type: none"> • GSM modem for remote management for control and alams from the SAPS via SMS
<p>KIT IP45 - K05</p>		<ul style="list-style-type: none"> • Panel for IP45 (suitable for outdoor installation)

Additional optionals

<p>Kit BIG BATTERIES - K06</p>		<ul style="list-style-type: none"> • Larger batteries to replace the standard, 300 Ah typ AGM 2v
<p>KIT MINI HYDRO - K07</p>		<ul style="list-style-type: none"> • Micro hydro turbine 500 w 24 vdc with regulator and 10 meters of cable with connector for connection to the saps
<p>KIT PANNELLO REMOTO - K08</p>		<ul style="list-style-type: none"> • Remote touchscreen panel for complete remote management of the system and visualization of the main operating parameters.
<p>KIT EXHAUST - K09</p>		<ul style="list-style-type: none"> • The exhaust kits are managing the disposal of the fumes produced by the generator, carrying them outside through a flexible hose.

OVERALL DIMENSIONS



LEGEND

1. Ventilation
2. Control Module MC4
3. Emergency button
4. Hatch for filling the fuel in the tank
5. socket module with quick couplings
6. Inspection hatch for engine maintenance
7. Support feet with holes for anchoring to the floor



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