

ACTA POWER 1000 OPERATING MANUAL

Rev. 1.0 – JULY 2013



TOTAL STOCK

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Thank you for choosing the Acta Power self-recharging fuel cell system. Please read through this Operation Manual carefully before using the system for the first time.

The Acta Power system is supplied with the following manuals:

- Installation manual
- Operating manual

The following technical documents are supplied with the product and integrated the Installation and Operating Manuals:







- Front Panel Cabling Diagram – ACP1004V2-FP-01
- Start -up connection instructions – ACP1004V2-SU.2-01
- Start-up sequence diagram – ACP1004V2-SU.1-01
- Water/Gas connections Diagram– ACP_ASM_0001
- Acta Power P&ID
- Led table
- Troubleshooting table

ATTENTION:

The above listed data sheets are included into the documentation folder placed on the cabinet door.

Information on Warnings

The following warnings are used in this manual:

	Warns of dangers of fatal injury
	Warns of danger of injury
	Warns of physical damage to the product
	Do not open or dismantle
	Keep away from sources of heat and ignition. No naked flames
	No smoking

Introduction

Acta Power is a self-recharging fuel cell system, generating its own fuel from water, designed to be a logistics-free backup power solution. It has been developed to meet the back-up requirements of telecom base stations in off-grid or bad grid locations, avoiding the cost and logistical barriers of hydrogen delivery to base stations in remote or inaccessible sites.

Acta Power is a compact system containing a fuel cell, electrolyser and energy management, available with 2 to 4kW power output and with a 500 L/h or 1,000 L/h hydrogen generator. It includes a flexible, wireless GSM communication module for remote management, control, alarm and assistance, and incorporates an award-winning fuel cell system.

Available both in indoor and outdoor versions, depending on applications (roof-top, urban, rural), it works grid-connected or with renewables (solar, wind) in both off-grid and on-grid applications and with different recharge speeds for different grid/no grid stability conditions.

Acta Power provides clean energy and allows users to get rid of batteries and gen-sets thus eliminating fuel logistics, heavy maintenance, frequent substitution and fuel price uncertainty.

Acta Power features flexible, complete remote management and control, from dry contacts to IP based protocol, and a Human Machine Interface with over 30 manageable parameters.

General safety information

Please read and make sure you understand the entire Installation and Operation Manuals before putting the Acta Power into operation.

- Ensure that the manual is accessible at all times.
- Comply with all safety instructions and warnings.
- Store the manual and other documentation in a safe place and pass them on to future owners of the product.
- Comply with all local regulations.

Failure to follow instructions may result in physical injury, death or significant damage to property.



WARNING!

A complete system cabinet weights about 420 kg. You will need at least 2 persons to install the system.

The individual units are designed for easy handling however, due to their weights, in order to move the box is recommended to use an auxiliary device such as a cart with wheels. The manual moving of the single boxes is possible but in this case it is necessary that the box is handled by two persons. To remove the unit from the package and place it to the end-use position, you can handle manually, but It is advisable to operate with at least two persons.

Installation and operation of the Acta Power system must be performed by specialist personnel only. Access by unauthorized persons to the system must be prevented. Only authorized persons may be given access to the cabinet key.

Only an authorized maintenance engineer is allowed to perform maintenance and/or readjustment operations on parts. Any intervention on internal parts (functional, control or safety components) is forbidden. All warranties shall automatically be void, releasing the manufacturer from any and all liability pursuant to existing legislation.

Unauthorized persons must be prevented, using corresponding measures, from installing, operating or maintaining the system. Installation, commissioning, shutdown and maintenance of the hydrogen supply as well as systems that are operated with hydrogen and generate electricity must be carried out by appropriately qualified personnel.

WARNING!



Do not open individual rack units



No smoking



Keep away from sources of heat and ignition. No naked flames

Safety instructions for handling hydrogen

The Acta Power produces compressed hydrogen directly from renewable energy and is designed to replace diesel gen-sets which are traditionally used to provide back-up power at remote telecom sites.

The unit must only be operated for this purpose, according to the specifications and instructions provided in this manual.

Hydrogen

Hydrogen itself is not a hazardous substance – its properties, however, can make it hazardous in interaction with other substances.



Danger of injury due to improper use!

Improper use of the product can result in serious injuries.

- Ensure that the manual is accessible at all times.
- Make sure you have read and understood this manual in its entirety.
- Comply with all safety instructions and warnings.
- Store the manual and other documentation in a safe place and pass them on to future owners of the product.
- Comply with all local regulations.



Danger of death due to explosion!

Escaping hydrogen can ignite and burn the skin.
Escaping hydrogen can reduce the oxygen concentration and cause respiratory difficulties.

- Do not inhale hydrogen.
- The lab/room must be equipped with a suitable ventilation system for the use of hydrogen.
- Incorporate the unit, especially the vent line, into the operational safety concept.
- The lab/room must be equipped for hydrogen monitoring.
- Avoid heat in the vicinity of the system and the hydrogen source.
- No smoking, no naked flames.
- Comply with local safety regulations.
- Comply with regulations for handling of compressed hydrogen cylinders.
- In the case of escaping gas, keep away and keep inflammable materials away.
- Prevent electrostatic charges.
- Ensure proper installation of the hydrogen supply.
- Check the hydrogen lines and connectors regularly for leak tightness

Electrical Safety Instructions

The unit poses no special electrical hazards as long as the following instructions are observed:

- Use only the supply voltage specified on the rating plate.
- Do not short-circuit inputs and outputs.
- Do not reverse the polarity of inputs and outputs.
- Do not insert any mechanical parts, especially metal parts, into the product through the ventilation slots.
- Do not use liquids near the product.
- Never use the product if any part of it has been immersed in water.

**WARNING!**

Any servicing, other than cleaning and user maintenance must be performed by specialist personnel and with the power supply switched off. Only an authorised maintenance engineer is allowed to perform maintenance and/or readjustment operations on parts. Any intervention on internal parts (functional, control or safety components) is forbidden. All warranties shall automatically be void, releasing the manufacturer from any and all liability pursuant to existing legislation.

Handling of Chemical Substances

WARNING: The jar of Carbonate/Hydrogen Carbonate powder included in the package must be dissolved in demineralised water in order to obtain a concentration of 1% in weight. These substances are used as a pH buffer solution in the hydrogen generating process. The substances are not harmful to persons, however read carefully the following precautions and avoid contact with eyes and skin.

Please find below some precautions to be taken in the event of physical contact with the undiluted substance.

First Aid Recommendations:

In the event of skin contact, wash with soap and plentiful water.

In the event of eye contact, rinse carefully with plentiful water for at least 15 minutes, and consult a doctor.

If ingested, do not administer anything to persons that have fainted. Rinse mouth with water. Consult a doctor.

The products are deemed not dangerous during transportation.

Chemical products information

Substance: Potassium Carbonate

Dilution: Pure

CAS no.: 584-08-7

CE no.: 209-529-3

Classification: Xn, R22 – R 36/37/38

(see Safety Material Data Sheet included in the shipment)

Substance: Potassium Hydrogen Carbonate

Dilution: Pure

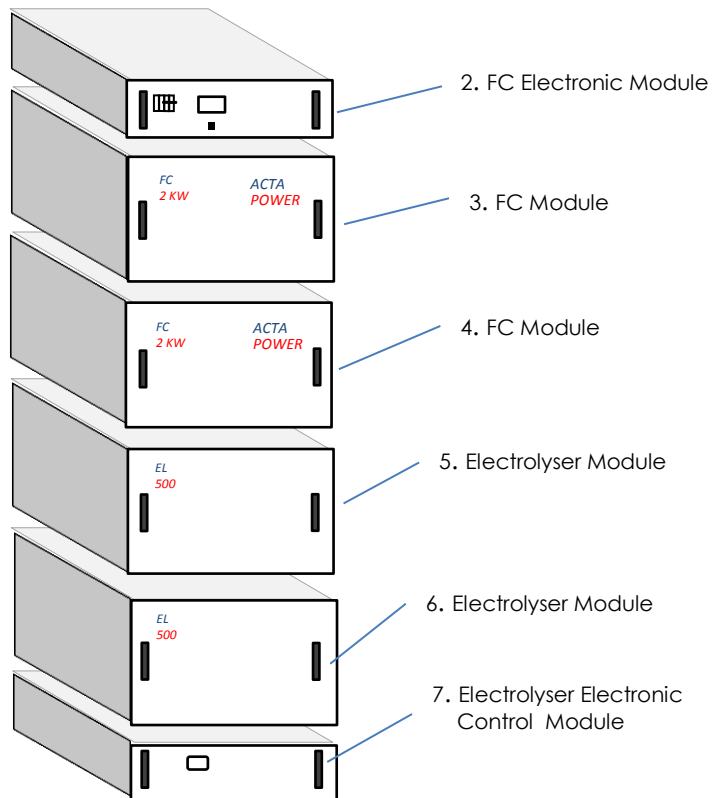
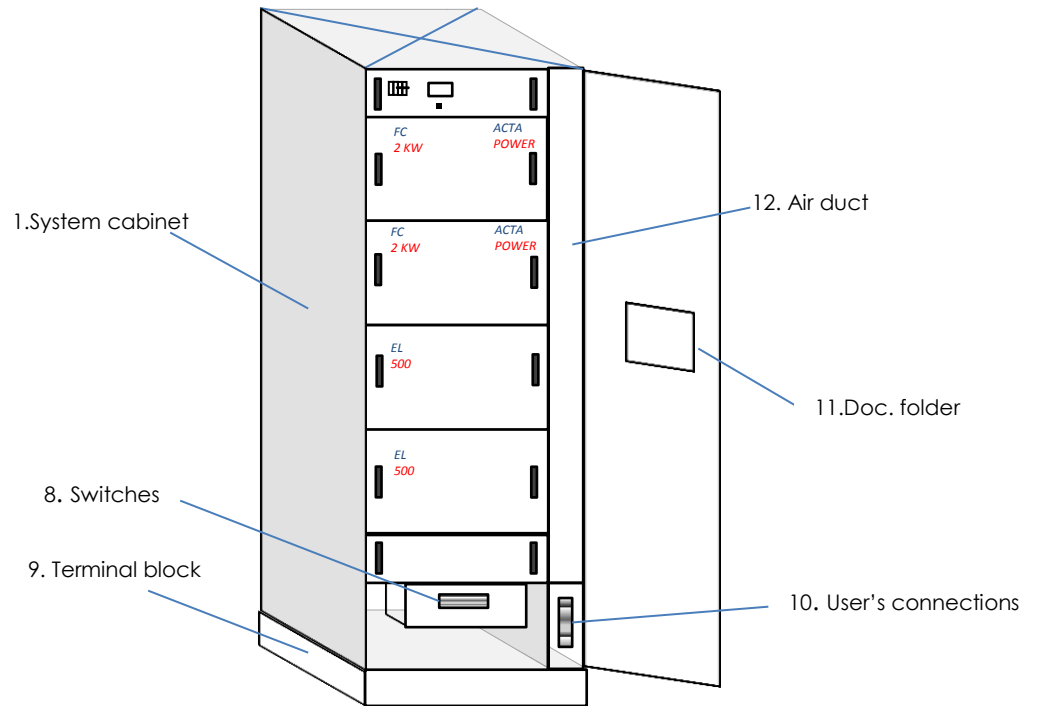
CAS no.: 298-14-6

CE no.: 206-059-0

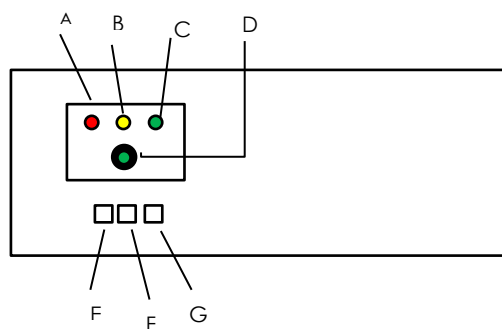
Classification: no dangerous according to Directive 67/548/EEC

(see Material Safety Data Sheet included in the shipment)

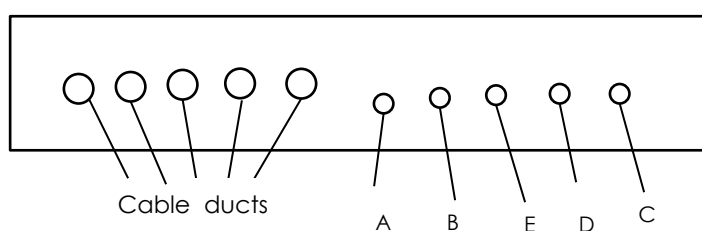
System overview



7. Electrolyser Electronic Control Module



9. Terminal block – rear view



Description

1. Acta Power system cabinet
2. Fuel Cell Electronic Control Module
3. Fuel Cell Module
4. Fuel Cell Module
5. Electrolyser Module
6. Electrolyser Module
7. Electrolyser Electronic Control Module
 - A. Status led (red light)
 - B. Status led (yellow light)
 - C. Status led (green light)
 - D. Start/Stop H₂ (button + green light)
 - E. USB port for external memory storage (optional)
 - F. USB port for Internet Key
 - G. Ethernet port
8. Switches
(see ACP1004V2-FP-01 and ACP1004V2-SU.1-01 diagrams)
9. Terminal block (H₂ and H₂O connections)
(see Water/Gas connections Diagram – ACP_ASM_0001)
 - A. Water refilling port
 - B. Water overfilling
 - C. H₂ purge
 - D. H₂ outlet (from Acta Power to storage tank)
 - E. H₂ inlet (from storage tank to Fuel Cell module)
10. User's Connections
(see ACP1004V2-FP-01 and ACP1004V2-SU.2-01 diagrams)
11. Documentation folder
12. Air duct

System description

The Acta Power system is available in two configurations: Acta Power 500, made up of one Fuel Cell Module and one Electrolyser Module and Acta Power 1000, made of one or two Fuel Cell Modules and two Electrolyser Modules. Those modules are monitored and controlled respectively by the Fuel Cell and the Electrolyser Electronic Control Modules.

The components are housed in a 19 inch system cabinet (1) which also contains the operational elements for the hydrogen supply, the routing of air flow and the electrical interfaces.

The individual rack units must be fitted into the system by sliding them into the cabinet, following exactly the order described on pg. 8.

The Fuel Cell Electronic Control Module (2) and the Electrolyser Electronic Control Module (7) must be connected manually by the User, while the Fuel Cell Modules (3-4) and the Electrolyser Modules (5-6) are equipped with quick coupling connectors placed on the back of the modules: when the User plugs the modules into the cabinet in the correct position, the connections are automatically established (see ACP1004V2-SU.2-01 diagram).

The terminal block, to which all customer input and output signals are connected, is located in the lower part of the cabinet (9).

The rack units are air-cooled. Cooling and reactive air is sucked into the system via an intake in the lower part of the cabinet back. Exhaust air is expelled through the upper part of the back wall of the cabinet. Within the system cabinet, air is laterally distributed to the individual rack units. The rack units have fitted fans that suck in the required cooling and reactive air from the lateral air supply duct and expel waste air via the exhaust duct located on the opposite side.

Fuel Cell Module Description

While the system is on standby, the FC Electronic Module will monitor the voltage in the power supply system and detect any fall of the voltage below the limits stored in the system. If such an event occurs, the startup procedure take place, and the green LED will begin to flash slowly (3s on, 2s off).

During startup, the energy storage device will supply power until the fuel cell systems are ready to supply the required power.

The system will remain in its normal operating mode for as long as the voltage remains below the limits stored in the system. Power will be supplied by the fuel cell system and the energy storage devices. The green LED will glow continuously in normal operating mode.

The system will switch back to standby as soon as the power supply system regains its required voltages.

Using the Acta Power for the first time

When using the device for the first time, the following activities need to happen:

- Removal of the protections from the unit, where present
- Preparation of the pH buffer solution
- Plug in of the supplied patch for the pH buffer solution refilling (if not already connected)
- First refilling of the water tank
- First use of the hydrogen storage tank

Preparation of the pH buffer solution

Prepare in a separate vessel the pH buffer solution by solving the total content of the 2 supplied jars (containing 30 gr of chemical substances each) into 6 L of demineralized water.

Attention: use a dedicated vessel, do not use the external water tank.

This is the first electrolyte solution that has to be filled into the Hydrogen Generator through a separate vessel in one go.

Since the electrolytic process consumes only water, it is required replenishment with the conditioning pH buffer solution only when the device is used for the very first time or after a complete emptying of the internal water tank. The refill must be done using demineralized water only.



NOTICE

Any time that the internal water tank is completely emptied, (for ex. in case of servicing) it is necessary to prepare the pH buffer solution as per the following table:

Volume solution	K ₂ CO ₃ (potassium carbonate)	KHCO ₃ (potassium hydrogen carbonate)
6 L	40 g	20 g



First refilling of the water tank

IMPORTANT: Follow carefully the steps listed below:

1. Switch off the device
2. Check carefully that the device has been correctly installed and completed with tubing and cables, in particular:
3. If not already connected, connect the supplied patch into clamps S15 – S17 normally dedicated to the external water tank level sensor (see ACP1004V2-FP-01 diagram);
4. Insert one end of the rigid tubing into the water refilling port **(9.A)** and the other end into the external vessel. Notice: the pump draws up to 1,5 meters in height and in floor, therefore place the tank at a lower distance.
5. Fill the dedicated water tank with the pH buffer solution (see the above paragraph "Preparation of the pH buffer solution");
6. Switch On the device: see ACP1004V2-SU.1-01 diagram). Attention: all the other switches must be Off
7. The refilling pumps will start drawing the solution and they will automatically fill the internal water tanks up to the maximum level.
8. When the refilling is completed, switch off the Acta Power.
9. Remove the patch (see ACP1004V2-FP-01 diagram)
10. Connect the external water tank level sensor

Now the device is ready to start.

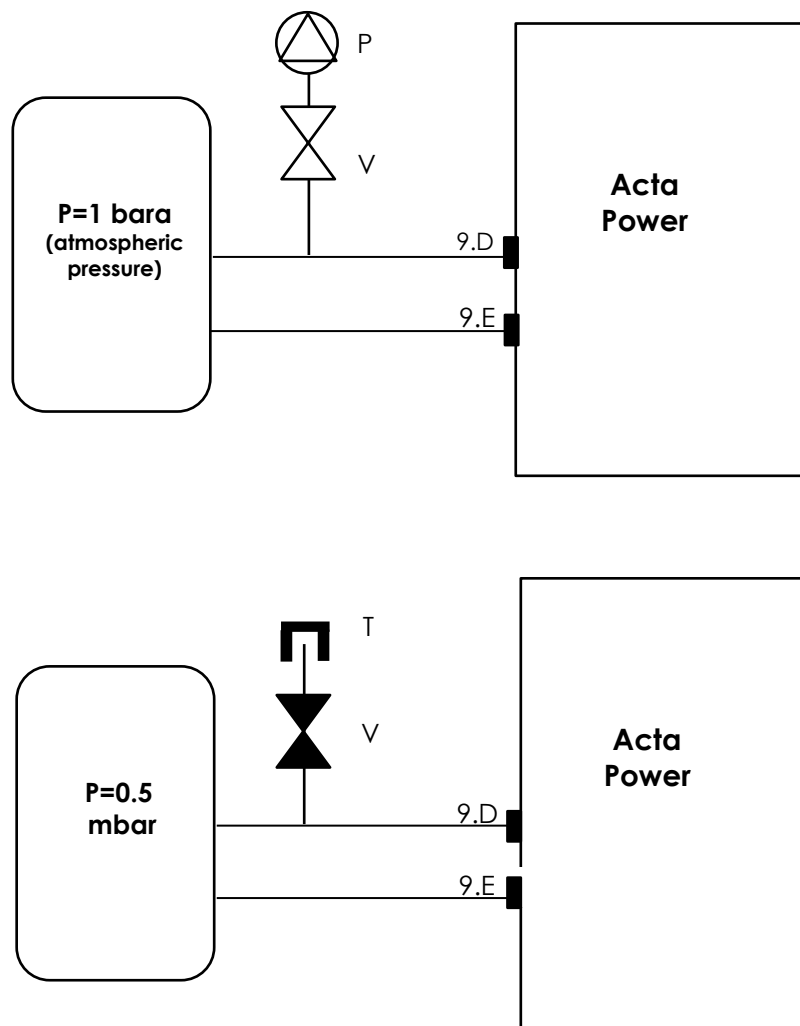
Acta decline any responsibility in case of damage due to the failure to re-enable the water tank level sensor.

First use of the Gas cylinder

Before using the gas cylinder for the first time, the User must perform a procedure in order to extract the air from it as follows:

1. Connect a vacuum pump "P" (not included) to valve "V"
2. Open valve "V"
3. Switch on and operate vacuum pump "P"
4. Wait until the pressure inside the cylinder reaches 0.5 mbar
5. Switch off vacuum pump "P"
6. Close valve "V"
7. Disconnect vacuum pump "P"
8. Place cap "T" (not included) on the pump outlet

See pictures below:



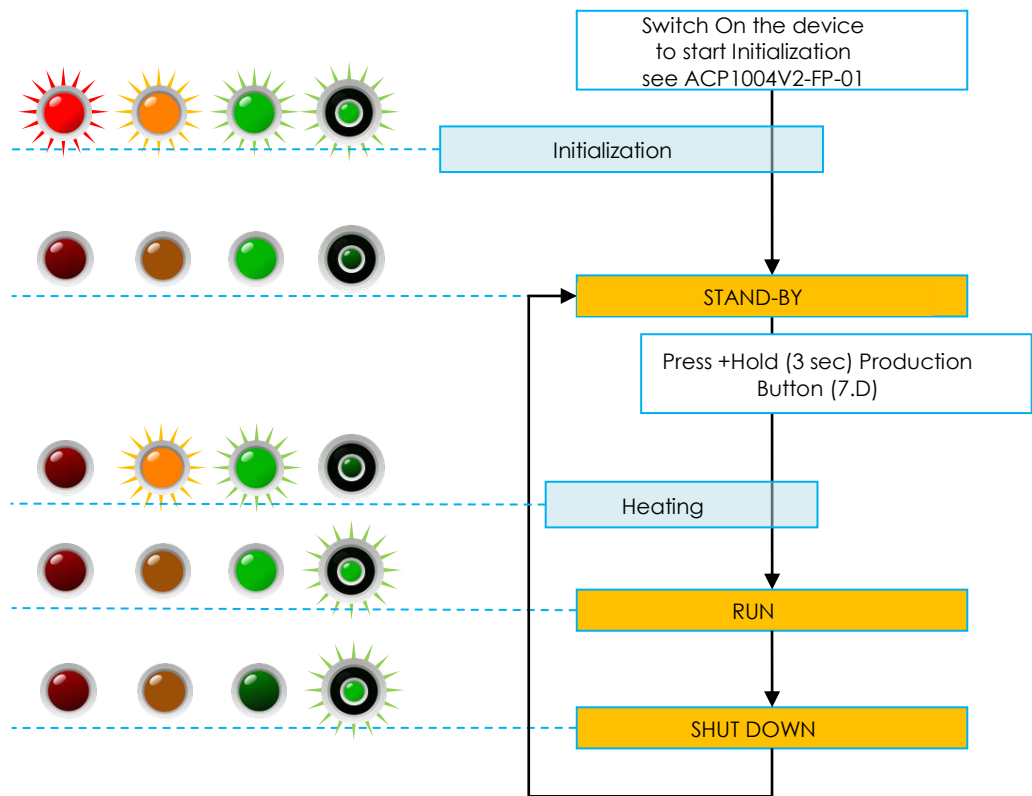
9.D = H₂ outlet (from Acta Power to storage tank)

9.E = H₂ inlet (from storage tank to Fuel Cell Module)

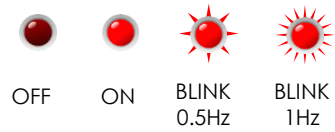
See "System Overview" on pg.8 and Technical Data Sheet "Water/Gas connections Diagram" ACP_ASM_0001

Operation

Control system behavior



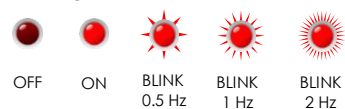
LED LEGEND



Led table

	INITIALIZATION
	STAND-BY
	STAND-BY Achievement max. pressure
	Power conditions OK
	Achievement max. pressure
	No power supply
	No power supply and achievement max. pressure
	Waiting delay
	Waiting delay and achievement max. pressure
	Pressure auto start
	Pressure auto start achievement max . pressure
	Hydration
	RUN
	SHUT DOWN
	SHUT DOWN Achievement max. pressure
	Heating
	Refilling
 Blinking in sequence	Low batteries
	Tank empty
	High temperature
	Low Temperature (*)
 Inverted 1Hz	Serious Alarm Contact Acta Help Centre

LED LEGEND



(*) For devices not equipped with a heater

Process description

Switch On the Acta Power strictly following the sequence shown on the technical data sheet ACP1004V2-SU.1-01 included into the documentation folder placed on the cabinet door.

The initialization process starts (all LEDs start blinking 1 Hz - see Led Table).

When ready, the LEDs stop blinking and the device comes to the Stand-by condition, indicated by the green led that shines steadily.

Press + hold for 3 seconds (or press) the Production button (**7.D**) to start the electrolysis process.

The device performs an internal check of the power supply given to Fuel Cells, Electrolyser, batteries and eventual solar panels. If every component is correctly powered, the Heating phase, indicated by the yellow and green LEDs that shine 1 Hz, starts.

Now the device comes to the Run condition: the Hydration phase starts, the green led shines steadily and the green light on the Production button flashes 1 Hz. The device starts producing hydrogen.

The device remains or returns in the Stand-by condition in the following situations:

- One or more components of the device are not sufficiently powered (the red led blinks 1Hz).
- The device is in a forced stand-by mode (the red led blinks 0,5 Hz and the green led shines 1Hz): the User can set a timer to set the time after which the machine can try again to start the Hydrogen production in case of stop due to the non-occurrence of a certain condition; if after the set time the error has been solved, the production starts automatically; otherwise both the red led and the green led shine 1Hz and the device remains into the Stand-by condition.
- the hydrogen storage tank has reached the maximum pressure (the yellow led shines steadily).

If the Production Button is On, as soon as the error condition has been solved, the production re-starts automatically.

The device produces hydrogen until the accumulator reaches a pressure of 30 bar. This status is indicated by the yellow led that shines steadily. The production stops automatically. Unless the pressure of the accumulator drops below the maximum, it is not possible to re-start the production.

When the pressure inside the accumulator drops below 20 bar, the hydrogen production re-starts automatically unless the Production button (**7D**) has been released by the User.

The refilling of the process water tank is automatic and independent from the hydrogen production, while during the heating phase the production stops for the required time.

To put the device in Stand-by mode during the hydrogen production phase, press the Production Button (**7D**). The residual hydrogen will be expelled from pipes.

The User can shut-down definitely the device or re-activate the production by pressing the Production button. In this way all parameters will be reset.

During the manual shut-down phase, all LEDs are Off while the green light on the Production button flashes 1 Hz. If the shut-down phase is automatic (due to the achievement of the maximum pressure), the yellow light is On and the green led blinks 1Hz to indicate that the production will start automatically as soon as the pressure drops below the threshold.

To completely switch off the system, turn all the master switches to the OFF position.

Web Interface

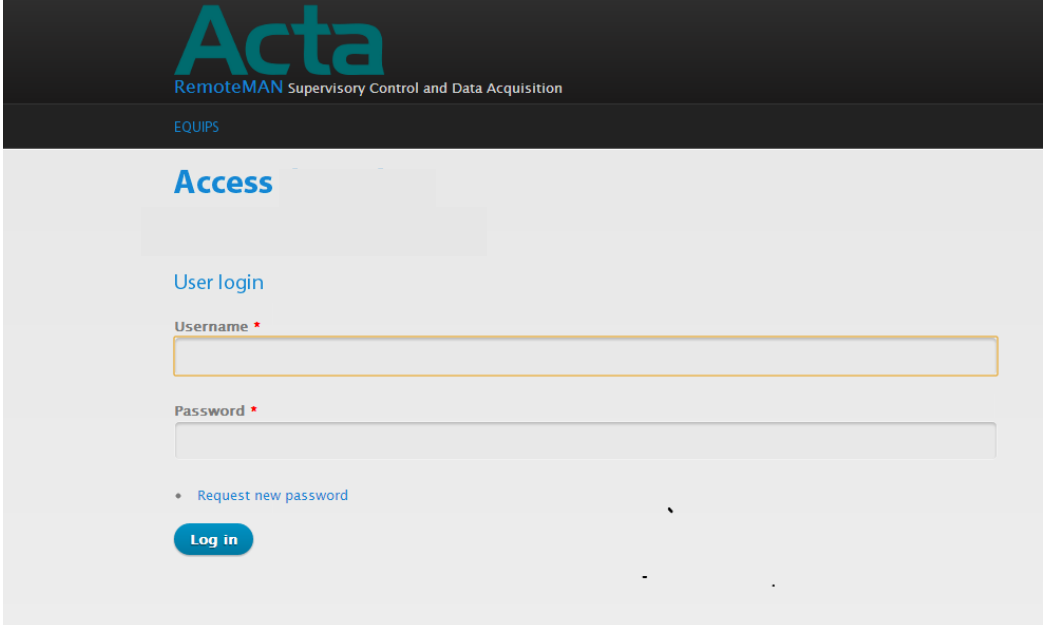
The Acta Power's Web Interface allows the User to monitor the system remotely, and offers the following features:

- Indication of operating mode
- Information on the system's configuration
- Indication of important measured values and operating parameters
- Download of system data and warning/alarm messages

Installation of the Internet key

- Insert your SIM card into the supplied Internet Key
- Connect the Internet Key to the USB port **7F** placed on the Electronic Electrolyser Module - see paragr. "System Overview" on pg. 8
- Wait until the blue light on the Internet key becomes green steadily, then you are connected

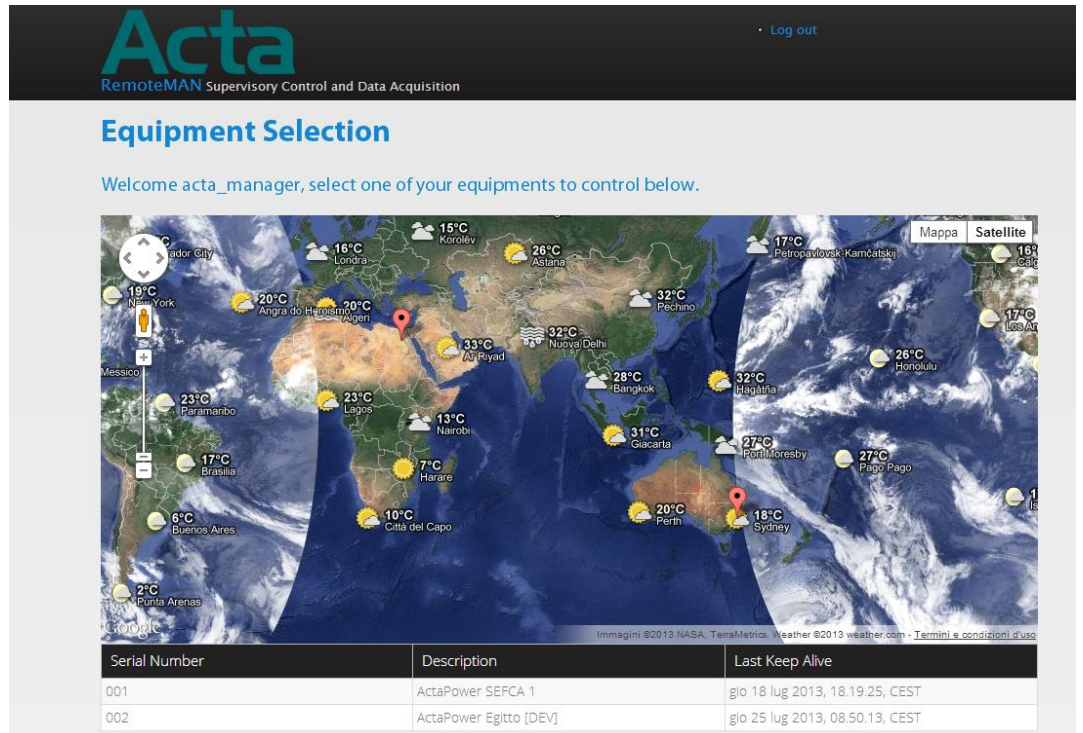
With a separate document, the User will receive all required details to access the web interface with customized login and password.



The screenshot shows the Acta RemoteMAN web interface. At the top, the Acta logo is displayed in teal, with the text "RemoteMAN Supervisory Control and Data Acquisition" below it. Underneath, the word "EQUIPS" is visible. The main heading is "Access". Below this, there is a "User login" section. It contains two input fields: "Username" and "Password", both marked with a red asterisk. Below the password field, there is a link that says "Request new password". At the bottom of the login section, there is a blue "Log in" button.

After the login, the User can select the required installation by selecting it directly on the map or with a click on the bottom list.

The User will automatically access to the Equipis page, showing the technical details relating to the installation.



The screenshot displays the Acta RemoteMAN web interface. At the top, the logo "Acta RemoteMAN" is visible, along with the text "Supervisory Control and Data Acquisition" and a "Log out" link. Below the header, the page title "Equipment Selection" is shown, followed by a welcome message: "Welcome acta_manager, select one of your equipments to control below." The main content area features a world map with various weather icons and temperature readings for different cities. Below the map is a table with three columns: "Serial Number", "Description", and "Last Keep Alive".

Serial Number	Description	Last Keep Alive
001	ActaPower SEFCA 1	gio 18 lug 2013, 18.19.25, CEST
002	ActaPower Egitto [DEV]	gio 25 lug 2013, 08.50.13, CEST

In the "Main" section the User can monitor all the technical information about the Acta Power system, including a chronological list of alarms and events.

Acta
Log out

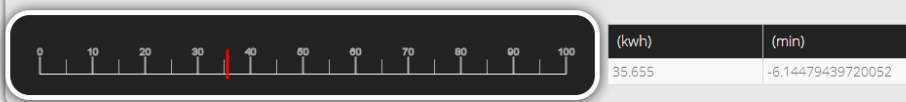
RemoteMAN Supervisory Control and Data Acquisition

EQUIPS MAIN OTHER CONTROLS STATUS CONFIGURATION ▾


Equipment 001

Communication Status: **ERROR** (Last Data Update on Jul 18 2013 18:26:00)

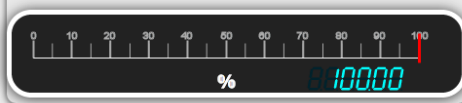
Autonomy



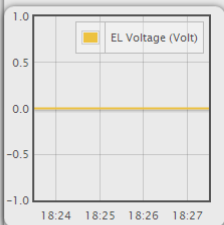
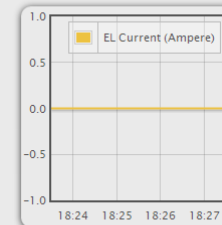
Cylinder Pressure



Battery

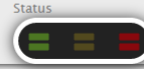


Electrolyser

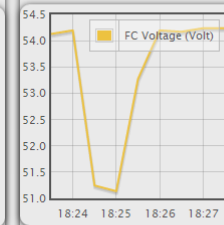
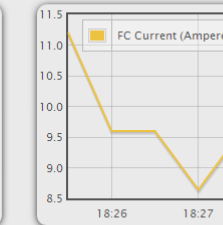



Power (kw)	H2 Prod (l/h)
0	0

Status




Fuel Cell





Power (kw)
-350.580867908031

Status




Water Level



(liters)	(min)
0.00152590218966964	0.00152590218966964

Alarms		Events	
Time	Message	Time	Message
2013-07-29 08:09:00	Electrolyser ALARM	2013-07-29 08:09:00	Electrolyser OUT of StandBy
2013-07-29 08:09:00	Electrolyser ERROR	2013-07-29 08:09:00	Fuel Cell now RUNNING
2013-07-29 08:09:00	Fuell Cell ERROR		

Asyut



- Clear sky
- Temperature: 31 °C
- Wind: South (180°), 1.9 km/h
- Pressure: 1008 hPa
- Rel. Humidity: 24%
- Visibility: 10 km
- Sunrise: 05:20
- Sunset: 18:45
- METAR data:

```

HEAT 010800Z 18001KT
CAVOK 01/08 Q1008
NOSIG
            
```

Location of this weather station:
94 km East (98°)

Reported on:
Wed, 07/31/2013 - 10:00

In the Menu "Other", you will find general info about the system, the Electrolyser and the Fuel Cell and current details about the Hydrogen produced, the run time, the eventual errors and so on.

Acta
RemoteMAN Supervisory Control and Data Acquisition

· Log out

EQUIPS MAIN OTHER CONTROLS STATUS CONFIGURATION ▾

Equipment 001

Communication Status: **ERROR** (Last Data Update on Jul 18 2013 18:26:00)

Acta Power		
Serial (No)	Air Intake Temperature (°C)	Total Energy Generated (kwh)
1	29.94	0

Electrolyser				
Serial (No)	Firmware Version (No)	Bios Version (No)		
1	200	201		
Run Time (sec)	On Counter (No)	Countdown to restart (sec)	Total H2 (L)	Partial H2 (L)
0	4	0	30517.5781015878	30517.5781015878

Partial H2

RESET

On the page "Controls" you can set FC and Electrolyser parameters.

Acta
RemoteMAN Supervisory Control and Data Acquisition

· Log out

EQUIPS MAIN OTHER CONTROLS STATUS CONFIGURATION ▾

Equipment 002

Communication Status: **ERROR** (Last Data Update on Jul 27 2013 16:40:00)

Fuel Cell

Control

ON **OFF**

Lower Threshold (mV)

48000

SET

Higher Threshold (mV)

51000

SET

Electrolyser Control

ON OFF

Alarms		Events	
Time	Message	Time	Message
2013-07-29 08:09:00	Electrolyser ALARM	2013-07-29 08:09:00	Electrolyser OUT of StandBy
2013-07-29 08:09:00	Electrolyser ERROR	2013-07-29 08:09:00	Fuel Cell now RUNNING
2013-07-29 08:09:00	Fuell Cell ERROR		

In the "Status" page, you can find all details about the equipment.

Acta
RemoteMAN Supervisory Control and Data Acquisition

Log out

EQUIPS MAIN OTHER CONTROLS STATUS CONFIGURATION

Equipment 001

Communication Status: **ERROR** (Last Data Update on Jul 18 2013 18:26:00)

Equip status

```
eth0 Link encap:Ethernet HWaddr 00:00:00:00:17:fd
inet addr:192.168.1.168 Bcast:192.168.1.255 Mask:255.255.255.0
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:22359 errors:70 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:2189765 (2.0 MiB) TX bytes:3667638 (3.4 MiB)

lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:90 errors:0 dropped:0 overruns:0 frame:0
TX packets:90 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:6276 (6.1 KiB) TX bytes:6276 (6.1 KiB)

ppp0 Link encap:Point-to-Point Protocol
inet addr:62.18.3.155 P-t-P:10.64.64.64 Mask:255.255.255.255
UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1500 Metric:1
RX packets:5897 errors:0 dropped:0 overruns:0 frame:0
TX packets:6523 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:3
RX bytes:1023988 (999.9 KiB) TX bytes:1046214 (1021.6 KiB)
```

"Configuration" shows identification details about the installations.

Acta
RemoteMAN Supervisory Control and Data Acquisition

Log out

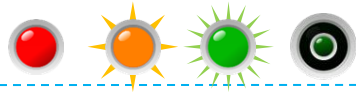
EQUIPS MAIN OTHER CONTROLS STATUS CONFIGURATION

Equipments Configuration

Equipments							+ Add new record	
Serial Number	Customer ID	Description	IP	Latitude	Longitude	keepalive		
001								
002								

Available Customers		+ Add new record	
ID	Name		
2			
4			

Troubleshooting



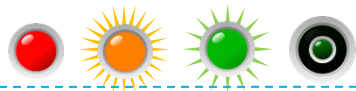
Alarm – Tank empty

- The liquid for the process has reached the minimum level. The process is automatically interrupted.
- Refill the external water tank with demineralized water
- Switch on the unit (Press Start/Stop H₂ button **7.D**)



Alarm – High Temperature

- The internal temperature is higher than the maximum allowed.
- Shut down the device (Press Start/Stop H₂ button **7.D**)
- Wait until the device comes to the Stand-by condition.
- To re-start the process press Start/Stop H₂ button (**7.D**)



Alarm – Low Temperature (*)

- The internal temperature is lower than the minimum allowed.
- Shut down the device: press Start/Stop H₂ button (**7.D**)
- Wait until the device comes to the Stand-by condition.
- To re-start the process press Start/Stop H₂ button (**7.D**)



Serious Alarm Contact Acta Help

- Shut down the device by pressing the Start/Stop H₂ button (**7.D**) and switch off the Master Switch
- Remove the device from the mains
- Contact Acta Help Center.

LED LEGEND




(*) For devices not equipped with a heater

Maintenance and Service

Maintenance and Service

In the event of malfunctions and intervention requests, contact an Acta Spa Help Centre or contact directly your reseller, giving the serial number and data present on the label placed on the **Acta Power** unit.

		Manufactured by:
Model		Acta S.p.A.
S/N		Via di Lavoria 56/G
Batch		56040 Crespina (PI) ITALY
Year		T. +39 050 644 281
Input Voltage:		MADE IN ITALY
Input Power:		

ATTENTION: For each maintenance/adjustment/repairing activity must be contacted a Acta Help Centre, which will operate using specialized personnel enrolled by Acta SpA. Maintenance/adjustment/repairing, as well as the risks of using the machine, can cause a cut/wound by hand tools used in the assembly and/or removal phase, risk of contact with substances used in internal equipment, electrical hazards, fire or explosion. The operations will be conducted by qualified personnel who are aware of the risks and safety procedures that must be applied.

Cleaning

The internal components of the Acta Power do not need to be cleaned and should not be accessed by the user for cleaning. To clean the outside of the unit, only use a damp cloth (no detergents, acids or aggressive or abrasive substances).

Empty the water tank

In case it is necessary to empty the Electrolyser internal water tanks, (for transport, servicing etc.), remove the Electrolyser Modules from the cabinet (Attention: the Acta Power must be completely switched off). Remove the red cap from the water drain ports placed on the rear of the modules by pushing it down with two fingers and pull the cap. Connect immediately a 10 mm diameter piping. Water start pouring immediately, please wear some gloves to avoid any contact. After the emptying, re-insert the cap.

Long time storage

If the Generator is not used, or stored for more than 2 weeks, it is very important to fill the water tank at least to half full. This will avoid the dry-out of the cell. Don't leave new generators in the packing for more than a week, this can damage the cell.

Warning: dried out cells will cause damage, which is not covered by warranty!

Shipping instructions

If the unit has to be transported or returned to the factory for repair, make sure that the water tank is completely empty and place the protections supplied with the unit.

Important: the company Acta SpA will not accept the unit if returned without the original shipping boxes.

The unit has to be transported in an upright position and this warning label should be clearly visible on the outside of the packaging.

Attention: in winter the shipping box has to be additionally marked with a special label informing the shipping agent that the generator may not be exposed to temperatures below 2°C (35°F) at any time.

Disposal

At the end of its life, the device is a non-hazardous waste product requiring appropriate disposal. For such reason do not disperse after use but return to the manufacturer or distributor from whom it had been purchased, which will dispose according to Regulations.

By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health.



Technical Specification

	ACTA POWER 500	ACTA POWER 1000
Fuel Cell Power output	2kW or 4kW	2kW or 4kW
Fuel Cell Voltage output	48V DC	
Electrolyser Voltage production	500l/h	1000 l/h
Hydrogen storage pressure	30 bar	
Electrolyser Voltage input	220V AC 50 Hz - 48V DC	
Electrolyser power consumption	2,3 Kw	5,9 Kw
Water specification (*)	5-10 (at 25°C) µS/cm	
Communication & Alarms: remote monitoring and control	MODBUS over RS232/Ethernet, SMS alert (GSM-GPRS)	
Operating temperature	from -4 to +45°C	
Cabinet dimensions (WxDxH)	900x900x2300 mm	
System weight	350 kg	420 kg
FC Electronic Control module dimensions (WxDxH)	483x500x133 mm	
EL Electronic control module dimensions (WxDxH)	483x500x177 mm	
FC Module dimensions (WxDxH)	483x500x310 mm	
Electrolyser Module dimensions (WxDxH)	483x500x310 mm	
Max hydrogen flow rate@20°C/1bar:	500 NI/h	1000 NI/h
Max outlet pressure:	30 bar	
Purity of hydrogen:	99.95% @ 30bar	
Operative power consumption:	2,9 Kw	5,7 Kw
Ambient conditions: - Temperature: - Relative humidity: - Storage temperature:	5°C (59° F) – 40°C (104°F) 0-80% non-condensing Min. 2°C (35°F)	
pH buffer solution:	K2CO3 solution 40 g + KHCO3 solution 20 g in 6 L of demineralized water	
Max water consumption:	0.4 l/h	0.8 l/h
Index of protection:	IP54	IP54
Sound pressure level:	56 dB(A)	

(*) Rainwater option available