USER MANUAL | EN

POWER CPS (TM3/TT3)

Online Double Conversion UPS

3:3

30 kVA

Threephase / Threephase

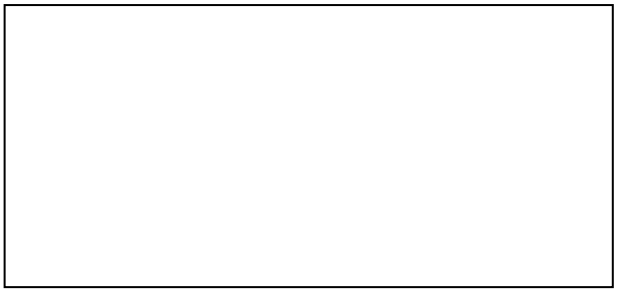
AVAILABLE MODELS

CPS030KTT3

Access the link and use the password to download the manual in English

http://gtec-power.eu/en/power-cps-user-manual/

PASSWORD: GTCPCS610022



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Thank you for choosing our product.

The CPSs of this series are high quality products, carefully designed and manufactured to ensure optimum performance.

Symbols used in the manual

In this manual, some operations are shown by graphic symbols to alert the reader to the dangerous nature of the operations:

	*Possibility of serious injury or substantial damage to the device, unless adequate precautionary countermeasures are taken.*
	*This symbol indicates some important information which must be read with care.*
	*It is recommended to read this part of the manual.*

N.B. In the picture or table the word CPS means CPS.

Protective equipment to be worn

No maintenance operations must be carried out on the device without wearing the Personal Protective Equipment (PPE) described below.

Personnel involved in the installation or maintenance of the equipment must not wear clothes with wide sleeves or laces, belts, bracelets or other items that may be dangerous, especially if they are metallic. Long hair must be tied in such a way as to ensure that it is not a hazard.

The following signs show the protective equipment that should be worn. The various items of PPE must be selected and sized according to the nature of the hazard (particularly electrical) posed by the equipment.

	**Accident prevention footwear** Use: always		**Protective eyewear** Use: always
	**Protective clothing** Use: always		**Helmet** Use: When there are suspended loads
	**Work gloves** Use: always		

Definition of “operator” and “specialized technician”

The professional figure responsible for accessing the equipment for ordinary maintenance purposes is defined with the term ***operator***.
This definition covers personnel that know the operating and maintenance procedures for the equipment, and that have been:

1. trained to operate in accordance with the safety standards relating to the dangers that may arise where electrical voltage is present;
2. trained to use Personal Protective Equipment and to carry out basic first aid.

The professional figure responsible for the installation and start-up of the equipment, and for any extraordinary maintenance, is defined with the term ***specialized technician***.
This definition covers personnel that, in addition to the requirements listed above for a general operator, must also:

1. have been suitably trained by the manufacturers or their representative.
2. be aware of installation, assembly, repair and service procedures, and have a specific technical qualification.
3. must have a background of technical training, or specific training relating to the procedures for the safe use and maintenance of the equipment.

Emergency interventions

The following information is of a general nature.

First aid interventions

Company regulations and traditional procedures should be followed for any first aid intervention that may be required.

Firefighting measures

1. Do not use water to put out a fire, but only fire extinguishers that are suitable for use with electrical and electronic equipment.
2. If exposed to heat or fire, some products may release toxic fumes into the atmosphere. Always use a respirator when extinguishing a fire.

GENERAL PRECAUTIONS

This manual contains detailed instructions for the use, installation and start-up of the CPS . Read the manual carefully before installation. For information on using the CPS , the manual should be kept close at hand and consulted before carrying out any operation on the device.

This device has been designed and manufactured in accordance with the standards for the product, for normal use and for all uses that may reasonably be expected. It may under no circumstances be used for any purposes other than those envisaged, or in any other ways than those described in this manual. Any interventions should be carried out in accordance with the criteria and the time-frames described in this manual.

PRECAUTIONS AND SAFETY REGULATIONS

Refer to the **"Safety and Compliance Manual"** supplied with the CPS (0MNA141_NE).

ENVIRONMENTAL PROTECTION

In the development of its products, the company devotes abundant resources to analysing the environmental aspects.
All our products pursue the objectives defined in the environmental management system developed by the company in compliance with applicable standards.
No hazardous materials such as CFCs, HCFCs or asbestos are used in this product.
When evaluating packaging, the choice of material has been made favouring recyclable materials.
For correct disposal, please separate and identify the type of material of which the packaging is made in the table below.
Dispose of all material in compliance with applicable standards in the country in which the product is used.

DESCRIPTION	*MATERIAL*
Box	Cardboard
Protective bag	Polythene
Accessories bag	Polythene

DISPOSING OF THE PRODUCT

The CPS contain electronic cards and batteries which are considered TOXIC and HAZARDOUS waste. When the product reaches the end of its operating life, dispose of it in accordance with applicable local legislation.
Disposing of the product correctly contributes to respecting the environment and personal health.

No reproduction of any part of this manual, even partial, is permitted without the authorization. We reserves the right to modify the product described herein, in order to improve it, at any time and without notice.

1. STORAGE

If the CPS is not to be installed immediately it must be stored within the original packaging and protected from moisture and weather. The area used to store the equipment must have the following characteristics:

Temperature:	-25°÷ + 60°C (-13°÷140°F)
Relative humidity:	90% max

The recommended storage temperature is between +10° to 30°C (+50° e 86°F).

2. INSTALLATION ROOM

The CPS and its battery cabinet are designed for indoor installation. The following points should be observed when choosing the place of installation:

- avoid dusty environments;
- ensure that the floor is level and able to support the weight of the CPS and the battery cabinet;
- avoid sites that are too narrow as this may impede normal maintenance operations;
- the ambient relative humidity must not exceed 95%, non-condensing;
- avoid positioning in sites exposed to direct sunlight or hot air;
- ensure that the ambient temperature, with the CPS operating, remains between :

operating temperature:	0 ÷ + 40 °C
maximum temperature for 8 hours a day:	+ 40°C
mean temperature for 24 hours:	+ 35°C

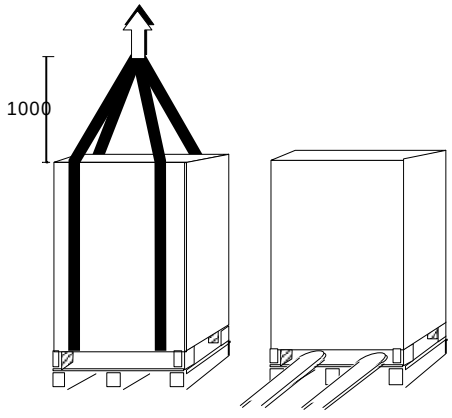
Note: - The recommended operating temperature for the CPS and for the batteries life is between 20 and 25°C.
To keep the temperature of the installation room within the range indicated above, a system has to be provided to remove the dissipated heat (for the value of the kcal/kW dissipated by the CPS refer to the "SPECIFICATIONS").

3. PRELIMINARY OPERATIONS

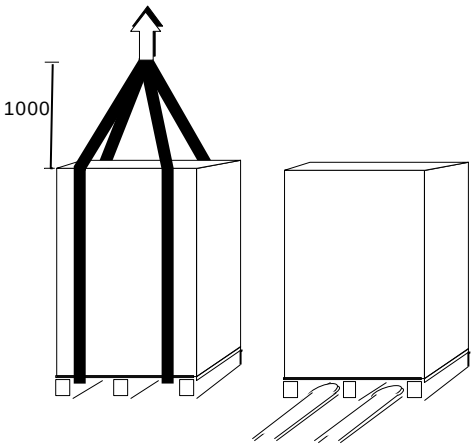
3.1 Checking the packaging

When you receive the CPS check that the packaging has not been damaged during transportation. Confirm that neither of the two anti-shock/tilt devices fixed to the packaging have been activated. If this has happened follow the instructions provided on the packaging. Be careful when removing the packaging materials so as not to scratch the CPS cabinet.
The equipment must be handled with care as it could be damaged if it is dropped or banged.
The CPS is supplied with:

- user instruction manual
- CD-ROM with the CPS management software & communications cable



RIMOZIONE DEL PALLET / TO REMOVE THE PALLET



MOVIMENTAZIONE CON IMBALLO / HANDLING WITH PACKING

3.2 Positioning

The air enters the CPS through ventilation grills located in the front door and exit through the fan grills located on the rear panel. The following should be taken into account when choosing a position for the CPS:

- a space of at least one meter must be kept clear in front of the equipment for start-up/shutdown operations and any maintenance operations that may be required
- leave a minimum distance of 60cm between the top of the CPS and the ceiling of the room, to enable adequate circulation of the air exiting from the system

- leave a minimum distance of 30cm between the rear of the CPS and the relative wall of the room, to enable adequate circulation of the air exiting the system
- The AC-DC INPUT/OUTPUT cables enter from the bottom of the CPS. Access to the power and auxiliary terminals and the switchgear is from the front.

For the mechanical dimension of the CPS refer to the installation diagram supplied with the USER MANUAL
The installation diagram identifies:
- the position of the holes in the base plate through which the equipment can be bolted to the floor;
- the base view to design a pedestal (if the CPS is to be located on a raised floor);
- cable entry position;
- position of the fans on the rear of the CPS.

4. SETTING UP THE ELECTRICAL SYSTEM

4.1 Protection to be installed:

- Connection table -

		30			
INPUT (F)					
Imax (*)	[A]	87			
Fuse gG type	[A]	100			
BYPASS (G) (*)					
Current	[A]	52			
Fuse gG type	[A]	63			
OUTPUT					
Rated current	[A]	43			
BATTERY					
Battery eq. permanent current	[A]	80			

(*) 120% load, nominal input voltage and battery recharging. External protection can be inserted at the CPS input..

Ac input

On the incoming mains supply of the the CPS, in the distribution cabinet, must be install a overcurrent protections.
This protection shall be made with fuse type as shows in the table or with equivalent circuit breaker.
For dual incoming supplies, separate protective devices must be installed for the Rectifier and the Bypass inputs.

Battery

ATTENTION

Any battery cabinet must have its own fuses on its output terminals "+" and "-".
Remember that those fuses must be able to open the dc voltage.

If using the "Rapid" fuse, type gG/gL NH,
the MAXIMUM size of the battery fuse must be below 2 times the nominal battery capacity.
If using the "Ultra Rapid" fuse, type aR NH,
the MAXIMUM size of the battery fuse must be below 2.5 times the nominal battery capacity.

For example: battery type 150Ah we can use 250A gG/Gl or 315A aR.

4.1.1 Residual Current Detector (RDC)

A differential switch (RCD) must be inserted into the mains supply input (CPStream).
The differential switch located CPStream must have the following characteristics:

- Sensitivity 500mA;
- sensitive to d.c and unidirectional pulses (class B)
- insensitive to transient current pulses
- class A or class B
- delay greater or equal to 0,1s

In the standard version, where there is no isolation transformer in the by-pass line, the neutral input from the mains supply is directly connected to the output from the CPS.

INPUT NEUTRAL CONNECTED TO OUTPUT NEUTRAL
THE ELECTRICAL SYSTEMS LOCATED CPSTREAM AND DOWNSTREAM OF THE CPS ARE IDENTICAL

When operating in the presence of mains supply, a differential breaker (RCD) installed on the input will intervene as the output circuit is not isolated from the input circuit.
When operating without mains supply (from battery) the input differential breaker will intervene only if it is able to switch as a result of leakage current without any voltage at its poles (for example a differential breaker with an auxiliary relay is not suitable). However it is possible to install additional differential breakers on the output of the CPS, possibly coordinated with those on the input.

4.2 Mains, load and battery connections

THE FOLLOWING OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY TRAINED PERSONNEL.

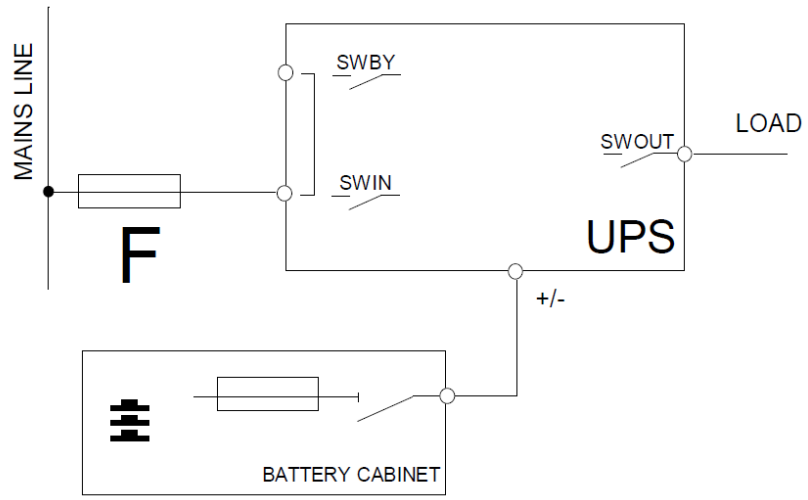
THE FIRST CONNECTION TO BE MADE IS THE GROUND/EARTH CONNECTION TO THE TERMINAL MARKED 'PE'. THE CPS CANNOT OPERATE WITHOUT CONNECTION TO THE GROUND/EARTH SYSTEM.

Before connecting, ensure that that the CPS equipment is totally isolated from any external power sources, battery and mains line, and that all of the CPS switches are open, in particular:

- *the CPS mains supply input is completely isolated*
- *all of the switches on the CPS: SWIN, SWBY, SWOUT, SWMB, are in the OFF position*
- *the output switch of the battery cabinet is in the open position*
- *always ensure that no hazardous voltages are present by measuring with a multi-meter.*

For the power cable connection to the CPS terminal board refer to installation diagram supplied with USER MANUAL.

4.2.1 Configuration with single mains supply



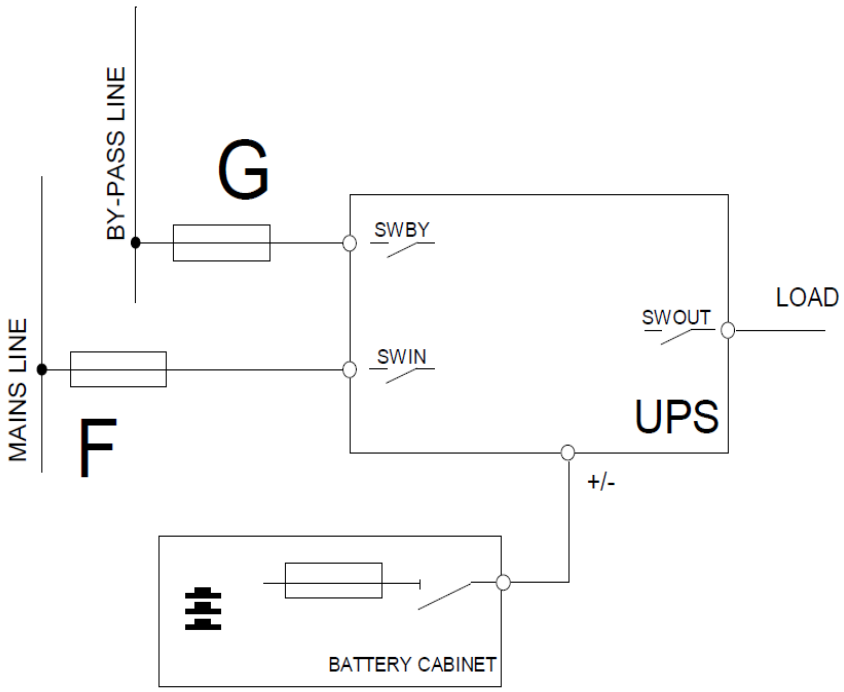
NOTE: The feed must be three-phase with neutral. ***The CPS cannot work without input neutral (*).***

F - For the installation of the protective devices on the input, refer to the "***connection table"***.

(*)The operation without input neutral is admitted only with transformer (delta-star) on the input line .

The links between the SWIN and SWBY switches are pre-fitted.
The cables must be terminated using pre-insulated crimp terminals and should be connected as shown in installation diagram supplied.

4.2.2 Configuration with split bypass input



NOTE: The by-pass supply must be three-phase with neutral. ***The CPS cannot work without input neutral on the by-pass line (*).***

F - For the installation of the protective devices on the input, refer to the "***connection table"***.

(*) The operation without input neutral is admitted only with transformer (delta-star) on the input bypass line .

- remove the links between mains line and by-pass line
The cables must be terminated using pre-insulated crimp terminals and should be connected as shown in installation diagram supplied.

4.3 Backfeed protection

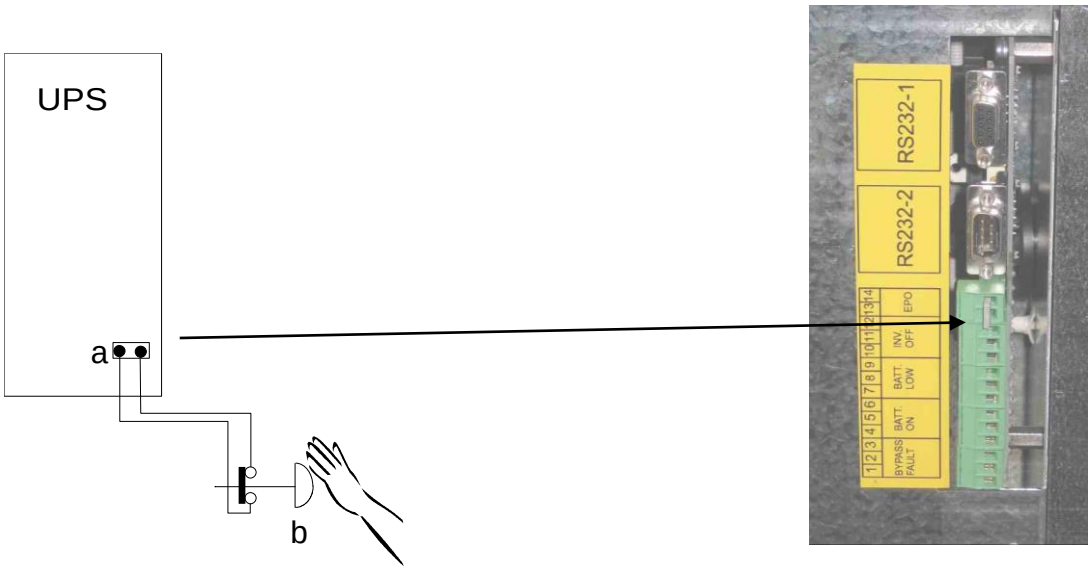
The CPS is provided with a device to prevent voltage backfeed on the input line due to an internal fault. This protection device works by switching off the inverter if the current flow is faulty, thereby causing voltage backfeed on the by-pass line during operation from the inverter. If the fault occurs when the CPS is operating from the battery, the load will not be powered.

Should it be required to avoid the shutting down of the inverter in order to keep the load powered by the inverter even in the event of a double fault, the system can be customized to control the opening coil of a switch located CPStream by reprogramming one of the relays on the "REMOTE COMMANDS AND ALARMS" card.

The control logic allows the function of the relay to be reconfigured, for example for the backfeed alarm, and then the free voltage contact can be used to control the triggering of a switch located on the CPS input.

4.3.1 Emergency power off device (EPO)

The CPS is pre-set to be connected to a remote emergency power off device as laid down in standard EN 62040-1-2. If the remote device (not supplied with the equipment) is activated, the inverter output voltage is cut.
The connection procedure is shown below.



a - EPO terminal board located on the CPS
b - EPO switch (not provided).

On the CPS , the jumper on the EPO terminals (page 16) must be removed, and the wires from the auxiliary contact of the button must be connected in place of the jumper.
The contact must be closed with the button in the rest position and must open when the button is pressed.

4.4 Mains, load and battery connections

The operations described in this chapter must be carried out exclusively by a ***specialized technician***. The first connection to be made is the earth conductor.

THE CPSMUST NOT OPERATE WITHOUT AN EARTH CONNECTION

Before making the connection, open all the switches on the device and ensure that the CPS is completely isolated from the power sources: battery and AC power line. More specifically, check that:

- the CPS input line or lines are completely isolated;
- the battery cabinet disconnector / fuse (if present) is open;
- all the CPS disconnectors - SWIN, SWBY, SWOUT and SWMB - are in the open position;
- check with a multimeter that there are no dangerous voltages on the terminal board.

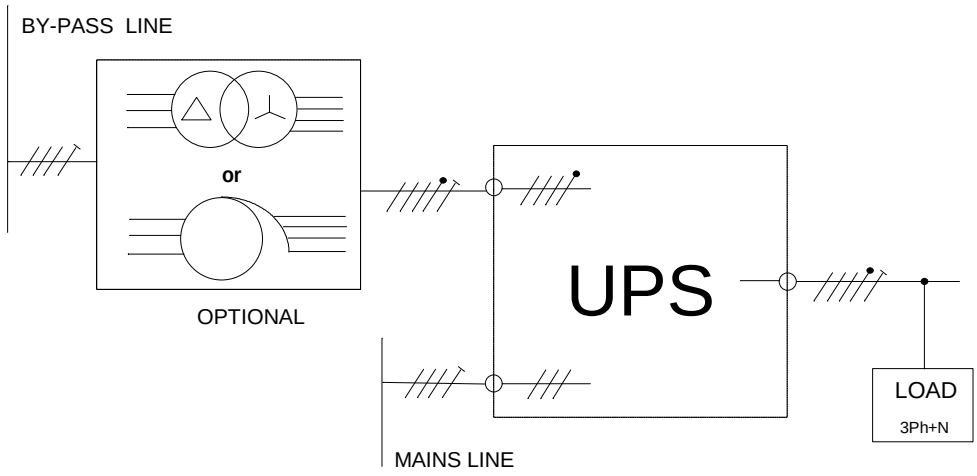
For connection of the power cables to the terminal boards, refer to the "INSTALLATION DRAWINGS" provided with the CPS and with the battery cabinet, if present.

Input neutral

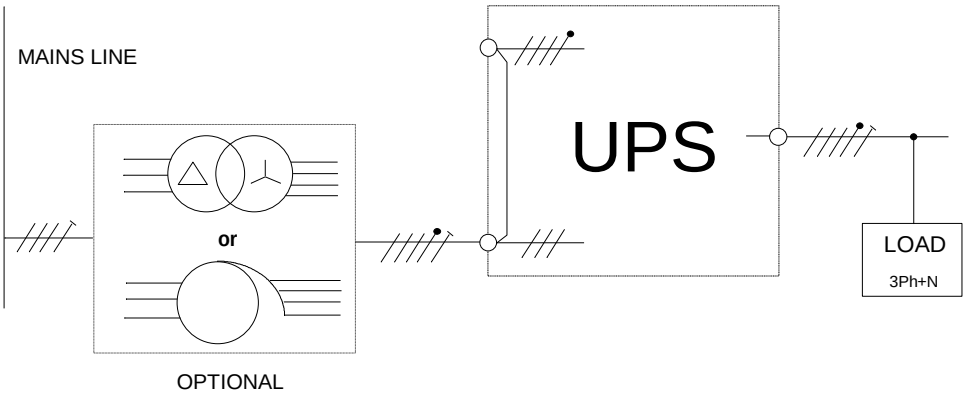
The power supply to the CPS input (by-pass line) must be three-phase with neutral. The neutral conductor is necessary only on by-pass line.

Input line without neutral.

The transformer must be inserted either on the mains supply line or on the by-pass line (as shown in the drawings).



-transformer on the bypass line only

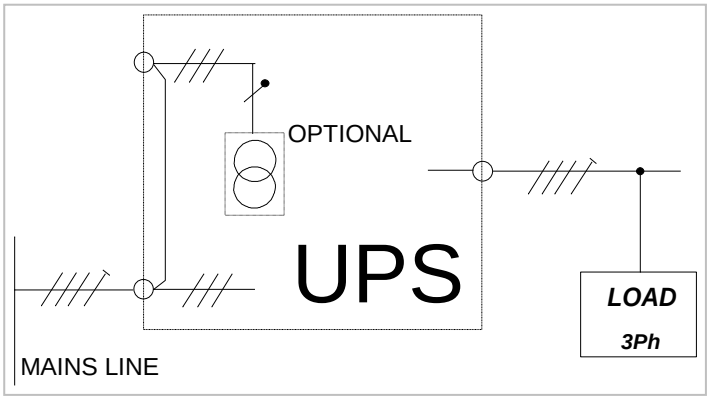


-The transformer supply bypass and mains lines

\

Input and output line without neutral

If the input line and the load are ***three-phase without neutral*** type (and only in this case), a kit to create the signal neutral (optional) may be used. The kit may only be used by a specialized technician.

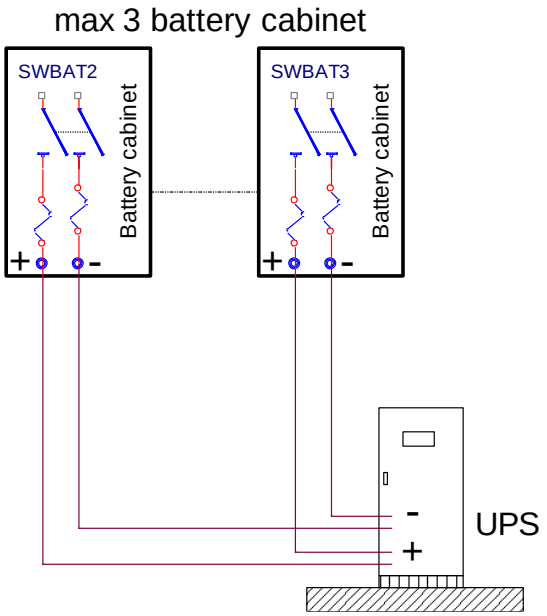


4.5 External Battery connections

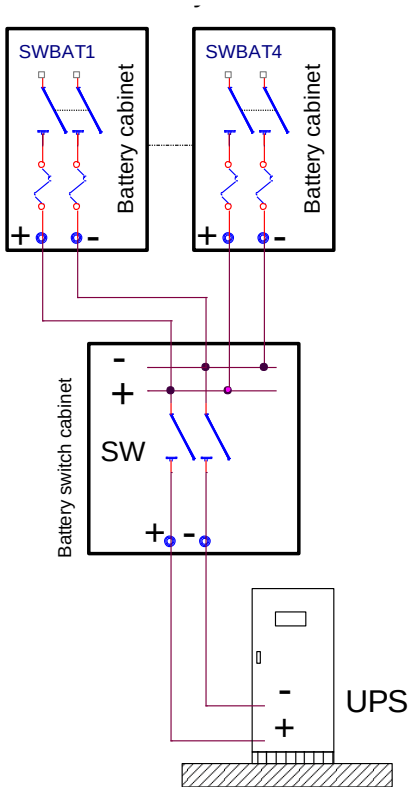
BATTERY CABINET if present:

The battery cabinet ***must*** be provided with a fuses to be connected to the CPS.

Up to 3 battery cabinets can be connected in parallel, in accordance with the diagram below.



CABINET DISCONNECTOR
For systems with 4 or more battery cabinets, use a ***Battery switch cabinet*** where the cables can be parallel-connected (refer to the marketing department). For the sizing of the cables and connection procedures, refer to the “INSTALLATION DRAWING” attached to the battery cabinet.

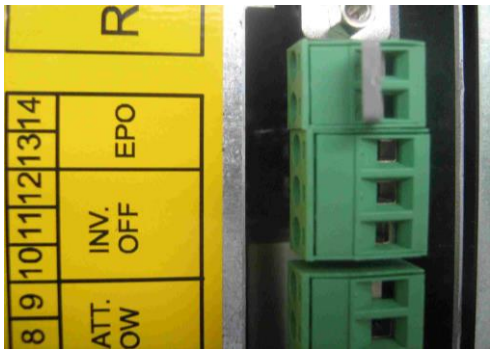


For back-up times requiring a greater number of Battery cabinets, contact the marketing department.

4.6 Connection of signals and remote commands

To the position of the signal and remote connection, refer to the ***"INSTALLATION DRAWINGS"*** supplied with the CPS.

4.6.1 EPO connector (emergency power off control)



If the jumper on the connector is opened, the voltage on the CPS output will be cut.
The CPS is factory-fitted with the EPO terminals shortcircuited. If this input is used, the CPS can be shut down in a hazardous situation from a remote position simply by pressing a button.
If only the power supply is removed, for example by opening the switch of the power supply panel, the CPS will keep the load powered using the energy in the batteries.

4.6.2 REMOTE COMMANDS AND ALARMS

The card is equipped with a terminal board with 12 positions which has the following:

POWER SUPPLY	1 power supply 12Vdc 80mA(max.) [pins 10 and 11];
ALARMS	3 potential-free change-over contacts for alarms;
COMMAND	1 command programmable from the panel [pins 11 and 12];

The functions of the three contacts and the command may be reprogrammed via the display panel. The ALARMS and the COMMAND are factory-set in the following way:

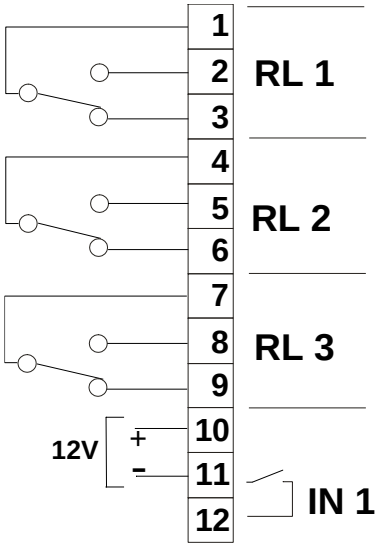
- ALARMS

- RL1	Bypass / fault, the contact changes position when the CPS switches the load onto the by-pass line either during normal operation (e.g. due to overload) or as a result of a fault in the inverter stage;
- RL2	Battery discharging, the contact changes position when the load is powered from the battery due to a mains power failure;
- RL3	End of battery discharge, the contact changes position when, during a mains outage, the remaining time for battery discharge has reached the minimum value defined. Once this time has passed, the load will remain unpowered (the factory-set end of discharge pre-alarm value is 5 minutes);

- COMMAND

IN 1	Inverter OFF. Connect pin 11 to pin 12 (for at least 2 seconds) . - In "NORMAL OPERATION", if the INVERTER OFF command is received, the CPS switches the power supply of the load onto the by-pass line (load is not protected should there be a mains outage). - In "EMERGENCY OPERATION", if the STOP INVERTER command is received, the CPS shuts down (load is not powered). With the jumper present, the CPS remains switched on the by-pass line when the mains power supply is restored. With no jumper present, the CPS will restart in NORMAL OPERATION.

The position of the contacts shown is without the alarm present. **The contacts can take a max. current of 1A with 250Vac.**



Please refer to APPENDIX A for the list of alarms and commands that can be programmed. The change of function may be made by the technical support personnel.

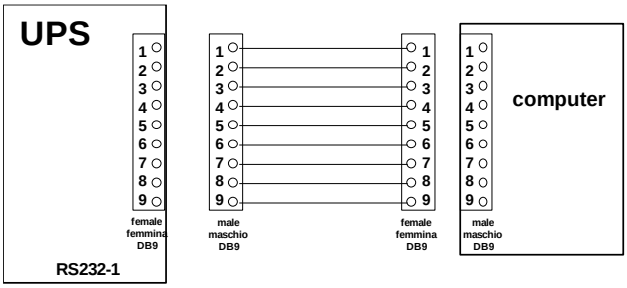
4.6.3 RS232

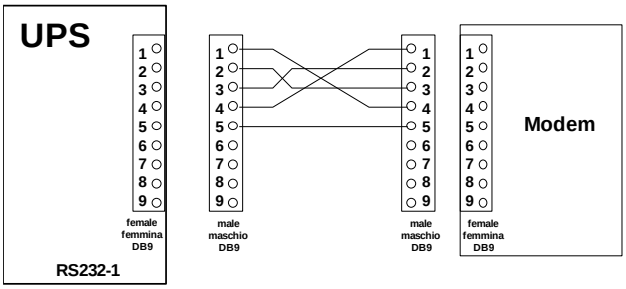
Nr. 2 DB9 connectors are available for RS232 connection. The factory-set transmission protocol is the following:

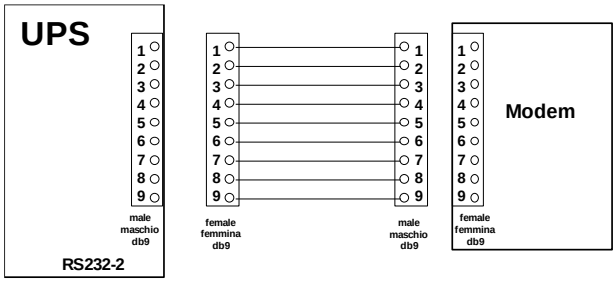
9600 baud, -no parity, -8 bits, -1 stop bit.

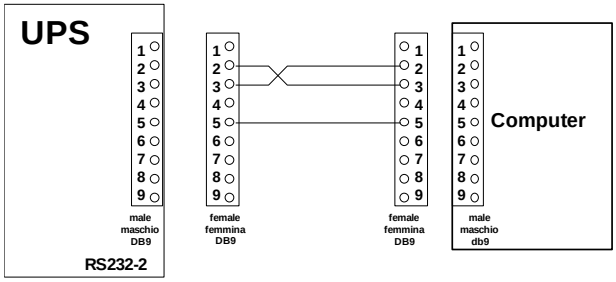
The transmission speed may be varied from 1200 to 9600 baud, using the PERSONALIZATIONS menu on the CONTROL PANEL. Depending on the distance of transmission, the recommended values for the transmission speed are: 9600 baud 50m, 4800 baud 100m, 2400 baud 200m, 1200 baud 300m.
See the diagrams below for the connection procedure.

DB9 female RS232-2
For connection with a computer use a standard RS 232 cable. See the diagram for connection with a modem.









DB9 male RS232-1

For connection with a modem use a cable standard.
See the diagram for connection with a modem.

4.6.4 Parallel (optional)

To be used for the connection of CPSs in parallel configuration. See the chapter “parallel version” on page 33.

4.6.5 SLOTS 1-2 , the following cards may be inserted (optional):

NetMan 102 Plus (on SLOT 1 main or SLOT 2 aux)
Device for the management of the CPSs on the Ethernet. It can send information on the status of the device with various protocols:

TCP/IP UDP (compatible with Watch&Save);
SNMP (for communications with NMS or with PowerNETGuard);
HTTP (to display the status with a browser);
TFTP (to configure or update the device when connected to the network).

The main function of this device is to integrate the CPS into the LAN network ensuring a high level of reliability of communication with the server to enable full management and control of the CPS.

- MULTICOM card (on SLOT 1 main or SLOT 2 aux)

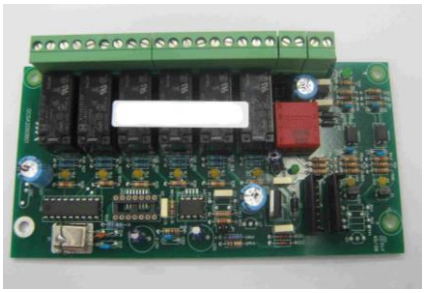
This device may be used to:

- add a serial port to the CPS;
- monitor the CPS using MODBUS/JBUS protocol on RS485 or PROFIBUS (Multicom 401)

N.B. each card connected precludes the use of a standard RS232 port, as follows.
the use of SLOT 2 (aux) inhibits the use of RS232-2

For the full and updated list of communication accessories, please see the GTEC website www.gtec-power.eu or ask to your supplier

4.6.6 REMOTE ALARMS (optional card)



Nr. 6 outputs: potential-free contacts for alarms (programmable from the display panel), 2 inputs (programmable from the panel) and one 12V DC maximum 100mA auxiliary input.

4.6.7 MULTI I / O (optional)

The function of this accessory is to convert external signals from the CPS(e.g. temperature of environment, temperature of battery premises, etc.) into signals by means of relay contacts or via serial output RS485 in MODBUS protocol.
It has the following characteristics:

- 8 inputs (e.g. humidity, smoke, etc. sensors)
- communication with the CPS via serial port
- 8 relays configurable with 8 events on the CPS
- RS232 output port with configurable messages
- RS 485 output port MDBUS /JUBUS with configurable messages.

4.6.8 REMOTE PANEL (OPTIONAL)

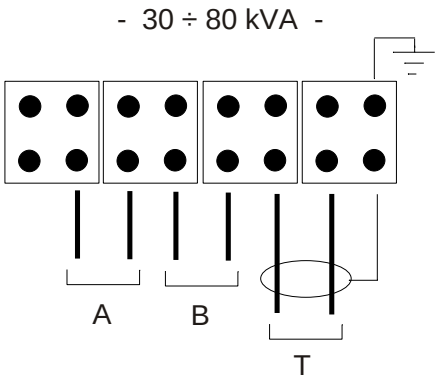
The remote panel allows the CPS to be monitored from a distance and the user to have a detailed overview of the state of the machine in real time. Using this device, it is possible to keep the electrical mains, output and battery measurements etc, under control and to detect any alarms.

For details relative to use and connection, refer to the specific manual.

4.6.9 Dual Bus System – UGS (optional)

Two independent systems may be configured with Dual Bus with a single source or a separate source.
The synchronization option (UGS) keeps the outputs of the two systems always synchronized, regardless of the input variations and when the system is running from the battery. Each system may be made up of a maximum of 4 parallel-connected CPSs. This system has been designed for configurations using STSs (Static Transfer Switches) since this guarantees switching from one uninterruptible source to another without affecting the loads.

4.6.10 SWOUT and SWMB aux - External temperature sensor(optional).



A = connection to external output CPS switch auxiliary;
B = connection to external bypass CPS switch auxiliary ;
T = external temperature sensor connection.

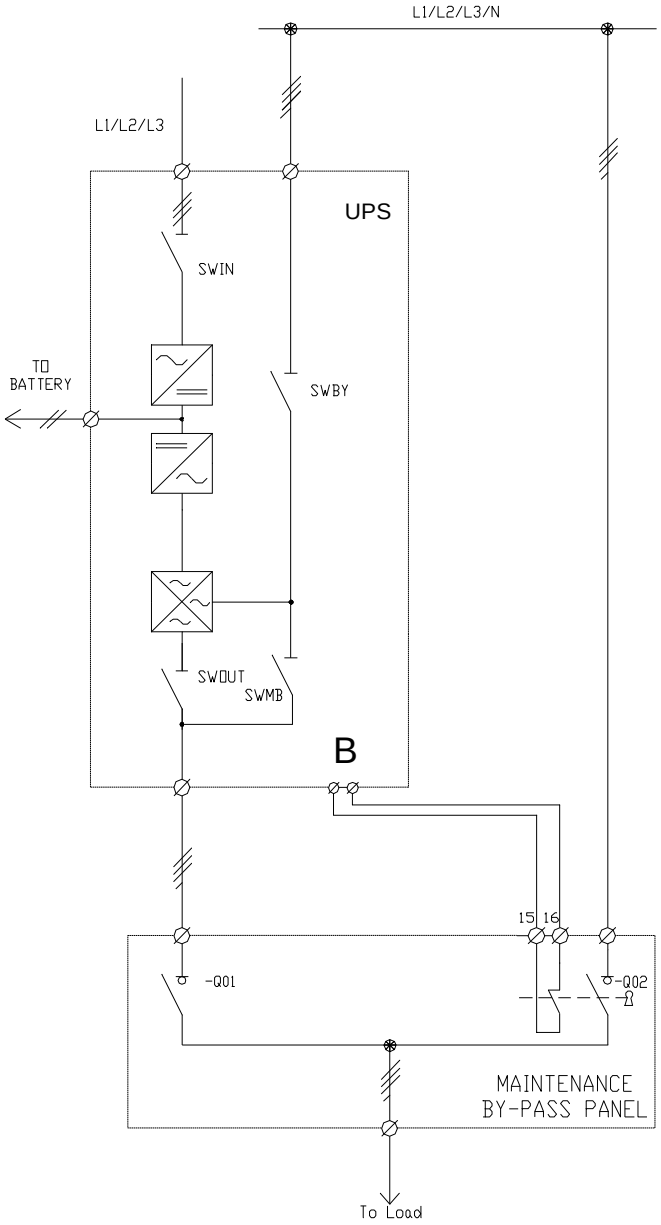
SWOUT and SWMB aux

Terminals to be used for the connection of the auxiliary contacts of switches inserted in the CPS system, see also the section on “Insertion of additional system sectioning devices” on page 35.

Inserting additional disconnectors to supplement those already in the CPS means that the whole equipment can be replaced without interrupting the power supply to the load.

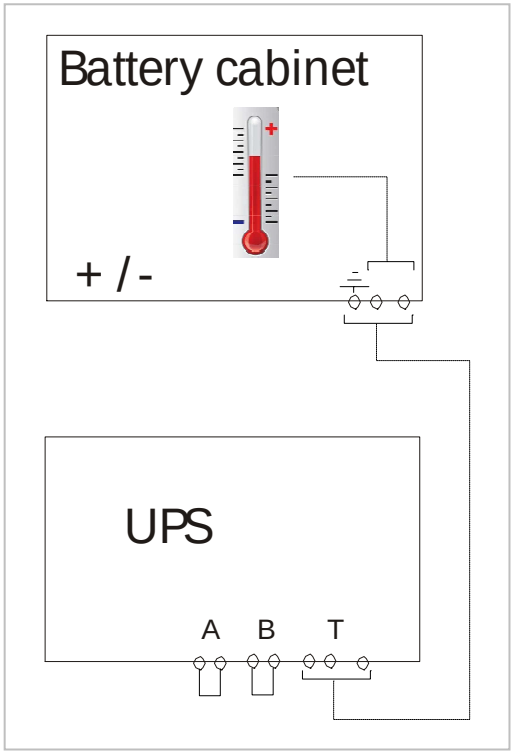
- Q01 additional output disconnector, Q02 additional disconnector of the external maintenance by-pass.

The auxiliary contacts Q02 must be connected to terminals B.
Contact Q02 must be in the opposite position (auxiliary open with switch closed, vice versa with switch open)



External temperature sensor (terminal T)

The use of the temperature sensor allows the CPS control logic to regulate the load voltage values and keep the battery working temperature constant.



.

It is necessary to use the specific kit supplied by the manufacturer only: any uses which do not comply with the specifications may cause malfunctioning or breakage to the appliance.

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4.7 Start-up procedure

The operations described in this chapter must be carried out exclusively by a ***specialized technician***.

mains power supply

The mains power supply has to be present in order to start up the CPS

The CPSoutput terminals will be powered in this phase and all applications connected will receive voltages. All users must therefore be warned before carrying out the start-up procedure.

BATTERY CABINET if present:

The battery cabinet ***must be*** provided with fuses device for it to be connected to the CPS.

Once the INPUT/OUTPUT and battery cables have been connected to the CPS terminals and before putting the switch cover back in place, check that:

- all the input/output terminals are securely tightened;
- all the fuseholders have the fuse inserted, and are in the closed position;
- the input and output protection conductor is connected correctly (yellow/green earth cable);
- check the polarity of the battery connections.

Replace the switch cover.
For the first start-up, the following operations should be carried out in this order:

1) close input disconnector SWIN,
2) press button 1 twice, select the language and then press button 8 to return to the basic menu,
3) close by-pass line disconnector SWBY,
4) close output disconnector SWOUT.
5) close the battery cabinet disconnector

Configure the value of the battery capacity according to the instructions on “Display and control panel” manual.

battery capacity

It is important to insert the correct battery capacity value, since this value is used by the system logic to calculate the backup time.
If not set otherwise, this value is assumed to be equal to the CPS power. e.g. at 100kVA the value set by default is 100Ah .

After the start-up operations have been completed, perform a manual battery test:
press button 3 and then 2 on the control panel. At the end of the test, after approx. 8 seconds, with the CPS started correctly and with the battery connected on the signals and control panel, the two green input and output LEDs must be on constant.

SWMB

The disconnector SWMB must not be closed during normal operation of the CPS.
SWMB should only be closed during CPS maintenance operations in order to keep the load powered (see the instructions on page 27).

When the CPS is first started up, it is in on-line mode (see page 25). See “Display and control panel” manual, to set Standby-on / Smart active operating mode.

configurations
Contact the technical support personnel for other operating modes.

Once the CPS has been installed, check that the message NORMAL OPERATION appears on the first line of the display panel and that the CPS model is displayed in the left-hand corner of the second line according to the coding shown below:

X000YZZ

X CPS model

000 output power [kVA]

Y output frequency:

- Y = _ output 50Hz
- Y = A output 60Hz

Z configuration mode:

- Z = __ output frequency = input frequency
- Z = _ C frequency converter with battery
- Z = KS frequency converter without battery
- Z = N standby on
- Z = F stand by off
- Z = S stabilizer
- Z= P or p parallel version
- Z= B or b parallel version with single battery

4.7.1 Battery operation check

Carry out only with battery present.

After installation, a mains outage even of just a few seconds can be simulated to check operation (the battery does not need to be charged).

With the CPS in normal operation, open switch SWIN located at the CPS input (rectifier). The buzzer should sound immediately (with 5=ON) while OUT. (green LED) and BATT. (yellow LED) on the Signals and Commands Panel should be constantly on.
Check that the load connected to the CPS is powered. In this state, the power supplied to the load is the same as the energy that was previously accumulated in the batteries. Close input disconnector SWIN to return to normal operation. The IN. and OUT. LEDs on the CONTROL PANEL will be GREEN.
The batteries will recharge automatically.

Battery backup time
Before a battery discharge test can be carried out, several hours have to pass (at least eight hours for standard backup times or longer for batteries sized for long backup times) to allow the batteries to charge. The backup time obtained on the first discharge may be slightly less than expected; a number of charge and discharge cycles are needed to improve this value. Battery capacity does not remain constant over time, but increases after some charge and discharge cycles; it then remains constant for several hundreds of cycles before decreasing permanently.

4.8 Operating modes

The various equipment operating modes are described below.

setting

The operating mode is set when the CPS is installed; it may be changed subsequently but this should always be done by a ***specialized technician.***

4.8.1 On - line - factory setting -

load always powered by inverter, in the event of an input mains failure the load continues to be powered from the inverter using the energy stored by the batteries.

On – line:

The load is always powered by the inverter, with stabilized voltage and frequency, using the energy from the mains power supply (INPUT). If there is a fault in the INPUT, the CPS will switch to the batteries in zero time and the batteries will supply energy to the inverter to keep the load powered (for the backup time of the batteries). When the INPUT is restored the batteries will be automatically recharged by the rectifier.

4.8.2 Standby-on / Smart active

load powered from the mains, in the event of an input mains failure the load is powered from the inverter using the energy stored by the batteries.

In ***Standby On*** or ***smart active***, the load is powered from the by-pass line (if the power supply line is in the acceptance field); if there is a fault on the power supply line, the load switches automatically onto the inverter, powered by the battery

Standby On:

the switch from inverter to by-pass line may be immediate (time set = 0) or delayed (up to 180 minutes). For the switch to take place, the by-pass line has to remain in the acceptance field for the time set. In ***Standby On*** mode, the rectifier remains powered and keeps the batteries charged. If the by-pass line voltage or the frequency go out of the acceptance field, the load is automatically switched onto the inverter output. With ***Standby On*** operation, the energy dissipated by the system can be reduced, leading to considerable saving. Before using this function it must be ensured that, in the event of a mains outage, the load powered can accept an interruption of the power supply of around 2-5 ms, and that it can support any mains interference.
This operating mode is normally used for loads that are not particularly sensitive.
The letter ***N*** will be displayed on the second line of the BASIC MENU, near the CPS model.

Smart Active:

the CPS autonomously activates ***On-Line*** or ***Standby-On*** operation according to the quality of the power supply (see the "PERSONALIZ. SMART ACTIVE OPERATION" menu). When Smart Active mode is activated, the power supply is monitored for a few minutes, after which, if the voltage has remained within the pre-set values, the output is switched onto the by-pass line; otherwise the load remains powered by the inverter, while the observation time is approx. one hour. After this time, provided there has been no interference, the load switches onto the by-pass line; otherwise the logic starts monitoring again for approx. one hour. The advantage of this operating mode is its efficiency, which is greater than 98%.
SMART A will be displayed on the first line of the BASIC MENU, and the letter ***M*** will appear in the second line of the BASIC MENU, near the CPSmodel.

4.8.3 Standby-off (with mains present the load is not powered)

load not powered, in the event of an input mains failure the load is powered from the inverter using the energy stored by the batteries.

Standby-Off:

if there is a mains power supply, CPS output is zero. The RECTIFIER remains on and keeps the battery charged. The output voltage is only present when the mains power supply fails. The system remains with output voltage = 0V while the voltage and the input frequency are within the acceptance field. When the power supply line is restored, the CPS is automatically repositioned in ***Standby-Off*** mode.

The letter ***F*** will be displayed on the second line of the BASIC MENU, near the CPS model.

4.8.4 Stabilizer (operation in on-line mode without battery)

load powered from the inverter, if there is a mains failure the load is not powered, the batteries are not present.

Stabilizer:

The load is always powered through the inverter, with stabilized voltage and frequency, using the energy from the input mains. The batteries are not present. In the event of an input mains failure, the output of the STABILIZER is not powered.

The letter ***S*** is displayed on the second line of the BASIC MENU, near the CPS model.

4.8.5 Frequency converter (from 50 to 60Hz or vice versa)

load powered from the inverter with output frequency different from the input frequency; in the event of an input mains failure the load may be powered from the inverter using the energy stored by the batteries, if present.

Frequency converter:

MAINS present, load powered. The load is always powered through the inverter, with stabilized voltage and frequency, using the energy from the input mains. The by-pass line is disabled and must not be connected (the connections between the main supply line and the by-pass line on the input bars must be removed).

SWMB

Do not use disconnector SWMB when the CPS is configured as a Frequency Converter.

N.B.: the disconnector can be padlocked in order to ensure that it is not used.

4.9 Personalizations

Using the CONTROLS PANEL (from the basic menu press keys 3 and 5 and the access code 436215), the following factory-set electrical parameters can be modified within a certain field:

- Language,
- value of the RATED VOLTAGE OUTPUT ,
- BATTERY parameters,
- end of battery discharge pre-alarm,
- shutdown due to power lower than a set value (AUTO-OFF in power),
- daily programmed shutdown (AUTO OFF time),
- acceptance frequency and voltage field on the BY-PASS line,
- by-pass frequency field,
- modem configuration,
- RS232-1 and RS232-2 ports,
- standby-on operation (see page 25),
- Smart active operation (see page 25),
- date and time.

4.10 Procedure to transfer the load from CPS onto maintenance by-pass.

Procedure not applicable in the frequency converter

With several CPSs connected in parallel, follow the procedure described in the section on "bypass for maintenance" of chapter "Parallel version".

The sequences of operations to be carried out to place the CPS in maintenance bypass are shown below. The procedure varies depending on the initial state of the CPS.

- CPS in NORMAL OPERATION
  procedure a) *the power supply to the load is not interrupted in any way*;

- CPS with output not synchronized with the by-pass line
  procedure b) *the power supply to the load is interrupted*
  (therefore this operation should be effected only if absolutely necessary).

Procedure a)

the by-pass line is present and its frequency and voltage are suitable *the CPS display panel indicates* NORMAL OPERATION.

1) close disconnecting switch SWMB (the control logic automatically disables the inverter)
2) open all the switches on the device (SWIN, SWOUT, SWBY and the battery cabinet disconnectors/fuses) and keep only disconnecting switch SWMB (maintenance by-pass line) closed. The control panel remains off.

N.B.: After carrying out the operations indicated above, personnel must wait around ten minutes for the capacitors to discharge before working on the inside of the CPS.

In this situation (during maintenance operations), any disturbance (such as a blackout) on the CPS supply line would have an effect on the equipment powered (since the batteries are deactivated in this state).

Procedure b)

The by-pass line is outside the acceptance field; the following message is seen on the display panel:
BYPASS VOLTAGE FAIL or SWBY OFF and green LED 1 will flash (See "Display and control panel" manual

1) open all the switches on the device (SWIN, SWOUT, SWBY and the battery cabinet disconnectors/fuses). The control panel will remain off.
2) before closing switch SWMB to connect the loads, ensure that both the frequency and voltage of the supply line are sufficient to power the connected loads.

N.B.: After carrying out the operations indicated above, personnel must wait around ten minutes for the capacitors to discharge before working on the inside of the equipment.

After all the maintenance operations, restart the CPS following the instructions in the section on START-UP PROCEDURE (see page 23). Then open disconnector SWMB (if it was previously closed).
The CPS will return to NORMAL OPERATION.

4.11 CPS and load shutdown

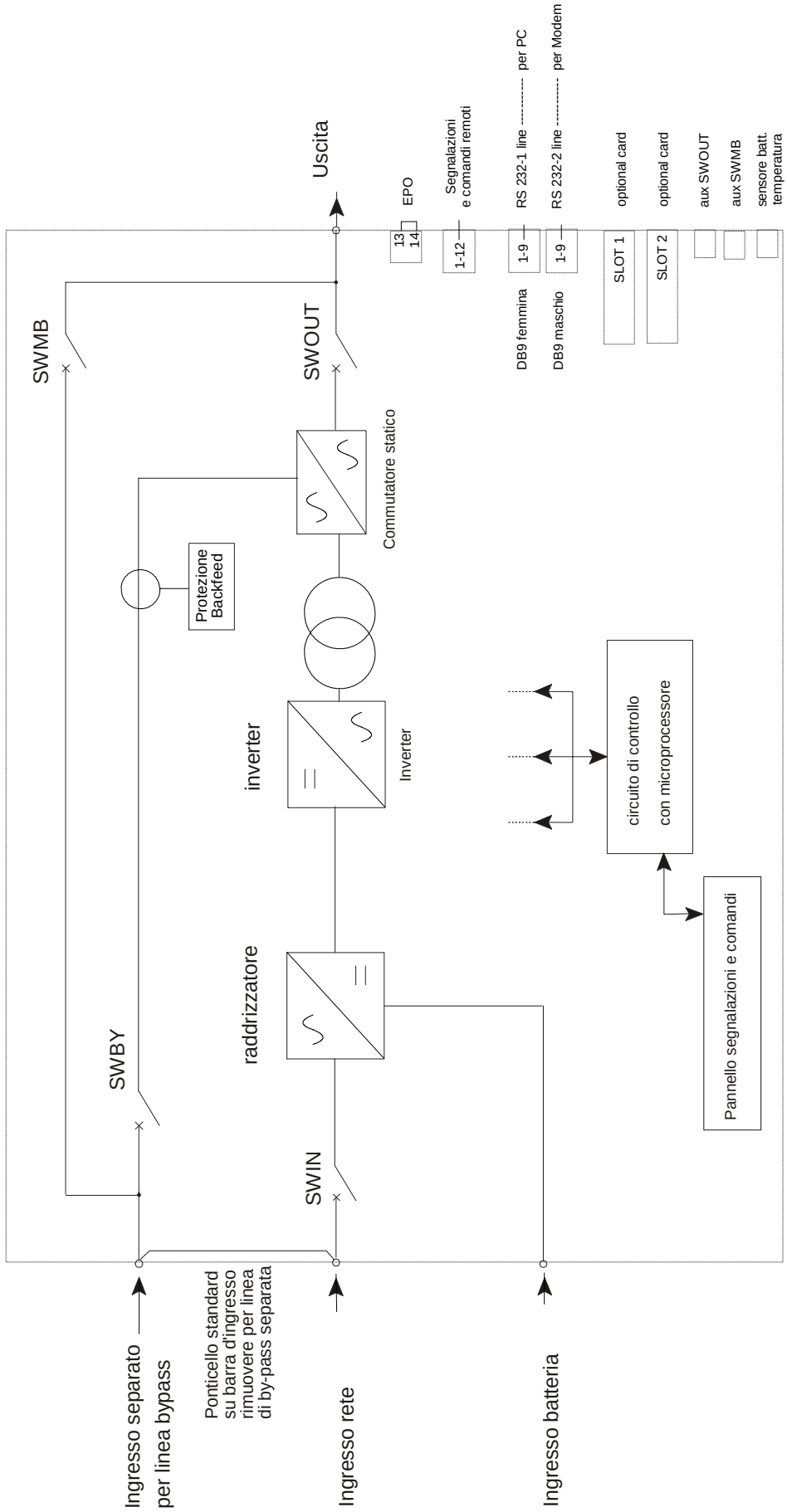
This operation will cause the shutdown of the load connected on the output. In parallel versions each procedure must be carried out on all the CPSs:

open the battery cabinet switch/fuse;
open the switch of the load;
open SWOUT, output disconnector;
open SWIN, input disconnector;
open SWBY, by-pass line disconnector;
.

The load is no longer powered, and after a few seconds the signal panel will also shut down.
Use a multimeter to check that no voltages are present on the terminal board.

Follow the instructions in the section on START-UP PROCEDURES (see page 23) to restart the CPS.

4.12 Block diagram



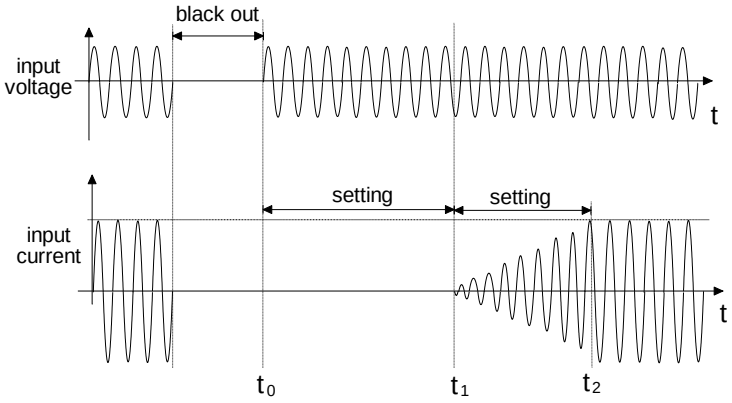
4.13 Components of the block diagrams

The CPSis made up of the following sub-assemblies:

RECTIFIER

This represents the input stage and its function is to convert the alternating voltage of the power supply line into direct voltage.

Rectifier start-up can be programmed from the display panel. The following in particular can be set:
The delay in start-up t0 –t1 (this allows a non simultaneous start-up of several CPSs connected to the same mains);
The time for the start-up, t1–t2 (this avoids oversizing any generator that may be located at the CPS input).



The rectifier carries out the following functions:

- feeds the inverter with direct voltage;
- automatically charges the battery;
- optimizes the input power factor by means of an automatic charging system.

The system for the cyclical recharging of the battery has two phases.
The first phase consists in recharging the battery with limited current and increasing voltage (up to the preset charge value “Vb_max”). This phase is maintained until the battery is fully charged (Batt=100%Ah), which is detected by measuring the current entering the battery.
In the second phase, with the battery fully charged, the battery charger is deactivated so as to remove any residual current in the battery in order to lengthen its lifespan and to prepare the rectifier for the optimization of the input power factor.

A cycle is also automatically effected to check the state of charge and to reintegrate the normal battery auto discharge.

BATTERY

This is the energy reserve to power the load when power is no longer supplied to the CPS. It is housed in one or more additional cabinets. The battery cabinet ***must be provided with*** a sectioning device and a protection device (magneto-thermal switch or disconnector with fuses).

The load is powered with the energy accumulated in the battery when there is no MAINS present (black out), or when the mains goes outside the acceptance field (frequency or voltage). In this phase of operation the energy required by the equipment connected to the CPS output is supplied by the battery, which has previously been charged. The alphanumeric PANEL at the front of the CPS shows the expected residual BACKUP TIME, calculated according to the power supplied and the state of charge of the batteries. The value provided is merely indicative, since the power required by the connected load may change during discharging. The backup time can be increased by disconnecting some of the connected equipment. When the remaining backup time goes lower than the value preset as the END OF BACKUP TIME PRE-ALARM (factory-set at 5 minutes), the buzzer increases the sound frequency while the yellow BATTERY LED starts flashing; in these conditions it is advisable to save any work in progress. After this time the CPSwill interrupt the power supply to the loads.
When the MAINS is restored, the CPS automatically restarts and starts recharging the batteries.

INVERTER

This is the output stage, the function of which is to convert the direct voltage from the RECTIFIER or from the BATTERY into stabilized sinusoidal alternating voltage. The inverter output is isolated from the input and from the batteries by a galvanic isolation transformer. The inverter is always working, since the load connected to the CPS output is always powered by the INVERTER (in NORMAL OPERATION)

STATIC SWITCH

This device allows the synchronized switch, automatic or manual, and in zero time, of the power supply to the load from a protected line (inverter output) to an unprotected line (by-pass line) or vice versa.

The CPSis provided with a device to prevent the backfeed of voltage to the input line after an internal fault, known as "***BACKFEED PROTECTION".***

MANUAL MAINTENANCE BY-PASS (SWMB)

This is a maintenance disconnector. The CPS can be excluded by closing SWMB and opening the other disconnectors SWIN, SWBY, SWOUT while keeping the load on the output powered. This operation is necessary when maintenance operations must be carried out inside the equipment without interrupting the power supply to the load.
The disconnector is sized for the rated power of the CPS.

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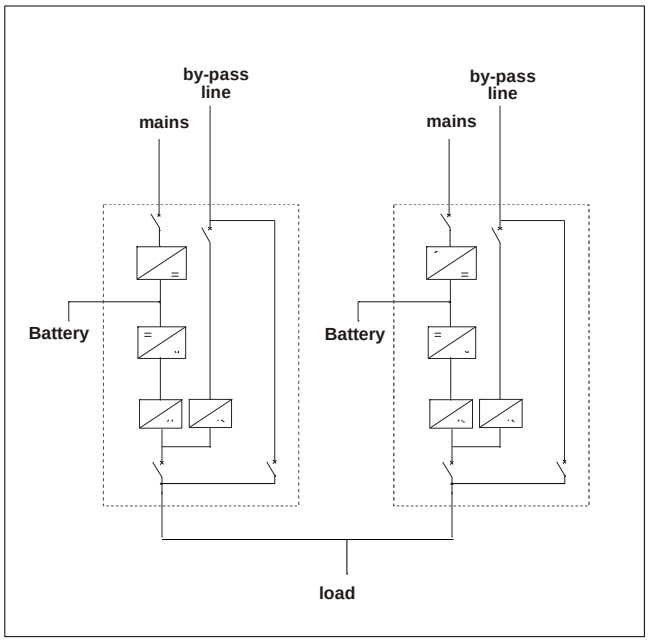
5. CPS in parallel configuration

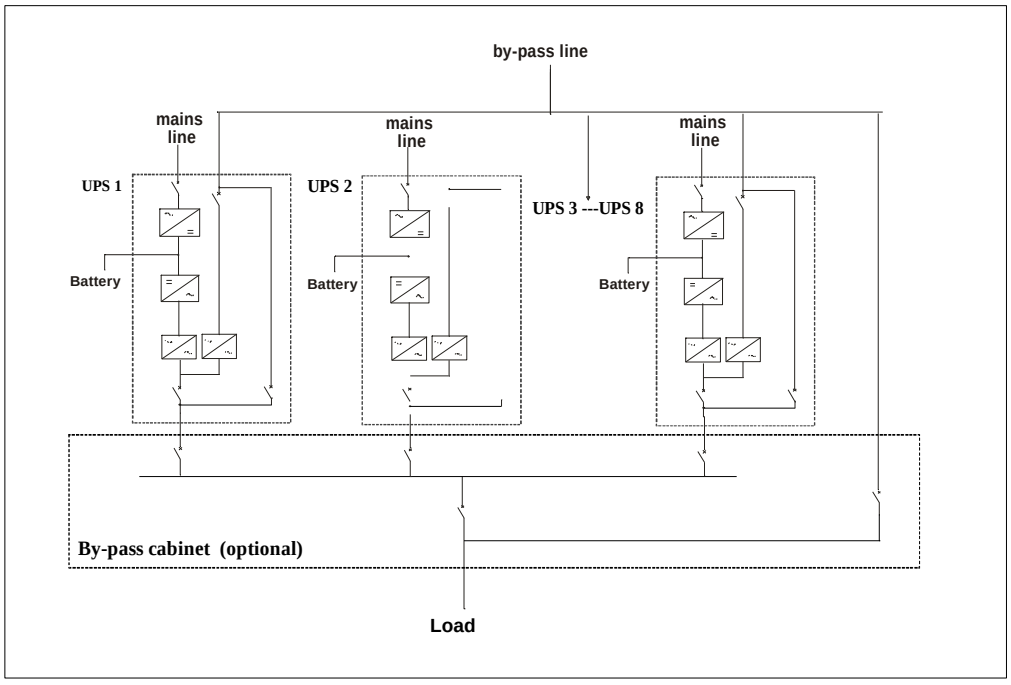
5.1 Introduction

CPSmay be connected in a parallel configuration to increase both the reliability of the power supply to the load and the power available in output. Up to 8 CPSs can be parallel-connected. It is recommended to connect units of the same power.



The load that can be applied to a system with several units connected in parallel may be greater than the load that can be supported by each individual unit, thanks to automatic power sharing. The reliability is only increased provided that the total power of the system with one unit deactivated remains greater than the required power. This condition can be achieved by always adding a redundant unit.

Having a redundant unit means having one more CPS than the minimum number of elements required to power the load, so that if a faulty unit is automatically excluded, power is still supplied correctly. The CPSs connected in parallel are coordinated by a card which ensures the interchange of information. The information is exchanged between the CPSs via a cable connecting them in a loop. The loop connection provides redundancy in the connection cable (communication in the cables between the individual units). This is the most reliable means of connecting the CPS and also allows the hot insertion or disconnection of a CPS. Each CPS has its own controller that continuously communicates with the whole system so as to guarantee the operation of the system. The cable transmits the signals from a "Master" CPS to the other "Slaves" using an opto-isolated system in order to keep the control systems electrically isolated from each other. The operating logic envisages that the first unit that is activated becomes the "Master" and takes control of the other "Slaves". In the event of a fault in the "Master" unit, control is immediately switched to a "Slave" which then becomes the "Master". The current system provides basic operation, each unit having its own battery. The system may be personalized (by means of a code inserted on the display panel) with all the units connected to a single battery.



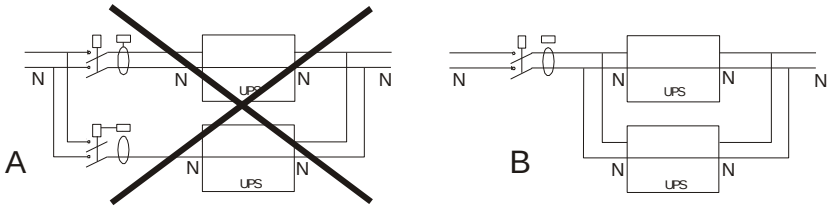
5.2 Electrical system set-up

All the information contained in the section on electrical system set-up in relation to the CPS (page **Errore. Il segnalibro non è definito.**) remains valid with the addition of the information set out below.

5.2.1 Input

The instructions seen in the first part of the manual for a single CPS remain valid; each unit must be protected with equivalent fuses or switches.

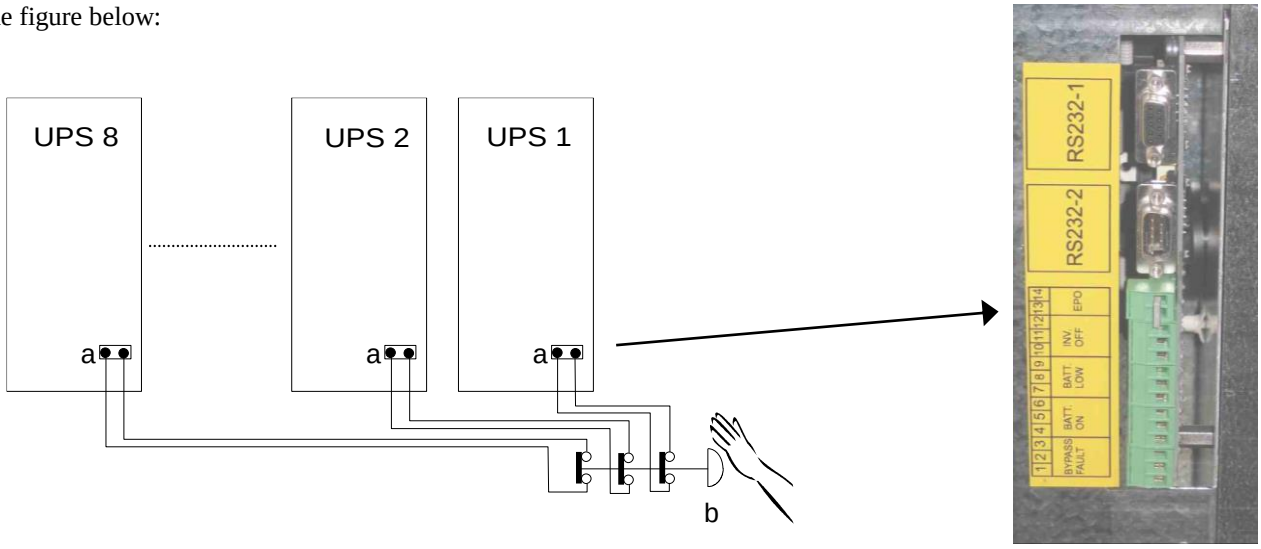
5.2.2 Differential



In order to avoid unnecessary interventions, versions with several parallel-connected devices must have a single differential switch inserted at the input of the whole system, as shown in figure B.

5.2.3 Emergency power off device (EPO)

When several devices are connected in parallel, the EPO command must be sent to all CPSs simultaneously, as shown in the figure below:

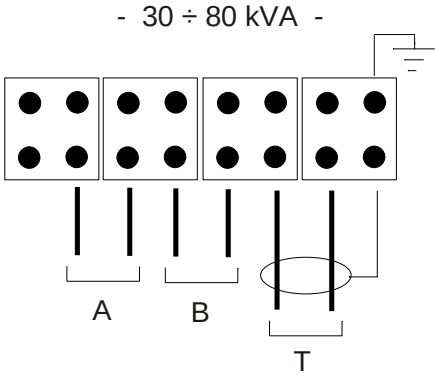


a - EPO terminal board on the CPS
b- EPO switch with auxiliary contacts (not provided).

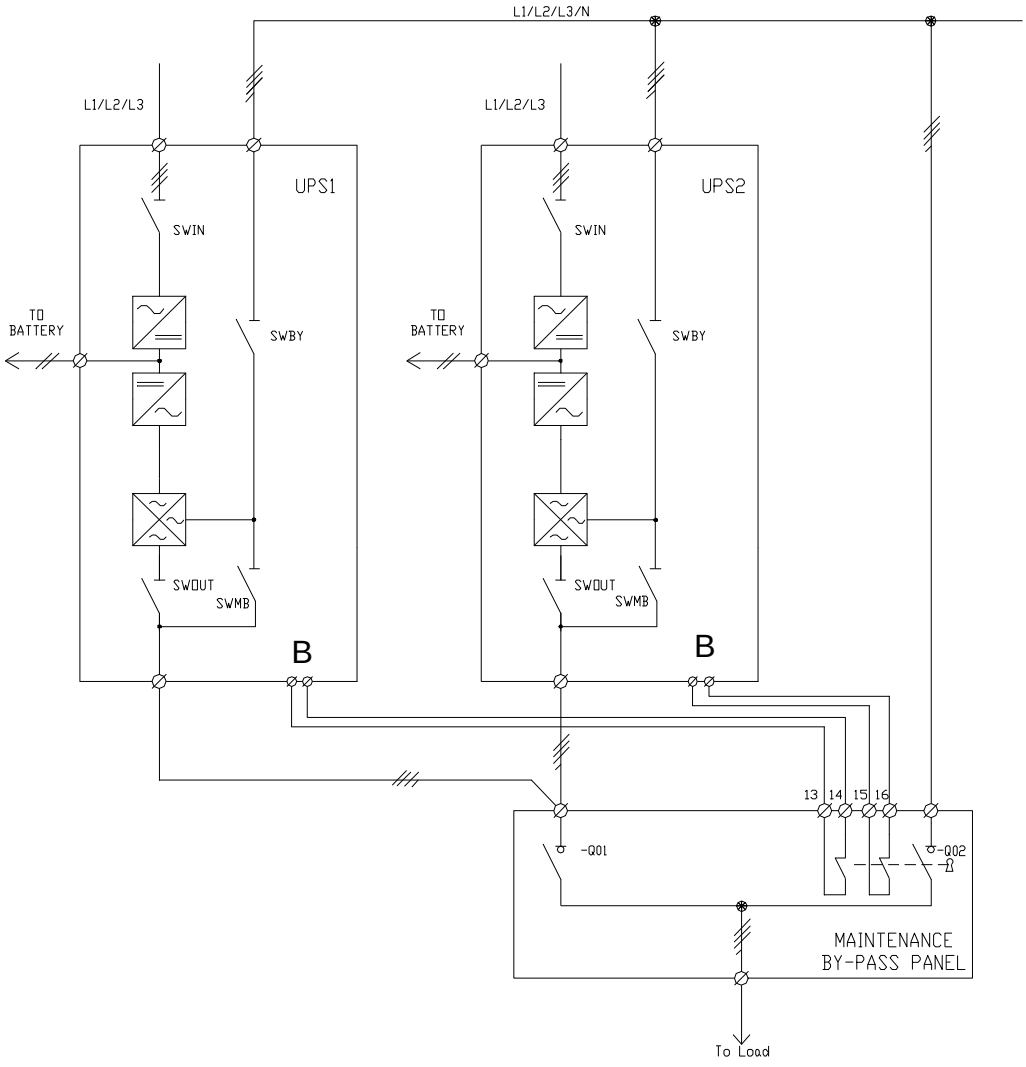
The button must have the same number of auxiliary contacts as the number of parallel CPSs. Each CPS must have the jumper on the EPO terminals (page 16) removed and the wires from the auxiliary contact of the button must be connected instead of the jumper.
The contact must be closed with the button in the rest position and be opened when the button is pressed.
The connection must be made with the CPSs switched off.

5.2.4 External maintenance by-pass.

In some cases, in order to facilitate maintenance operations of the individual units making up the system, it may be advisable to install an external maintenance by-pass.
The new disconnector located on the by-pass line (Q2) must be provided with auxiliary contacts (one for each CPS). The position of the contact is opposite to the position of the switch, thus the contact must be closed when the disconnector is open.



The contacts of each disconnector must be connected to the corresponding CPS terminals, as shown in the diagram.



5.3 Mains, load and battery connections

Mains, load and battery connections.

All the information contained in the section “Mains, load and battery connections” (page **Errore. Il segnalibro non è definito.**) in relation to the CPS remains valid with the addition of the information set out below.

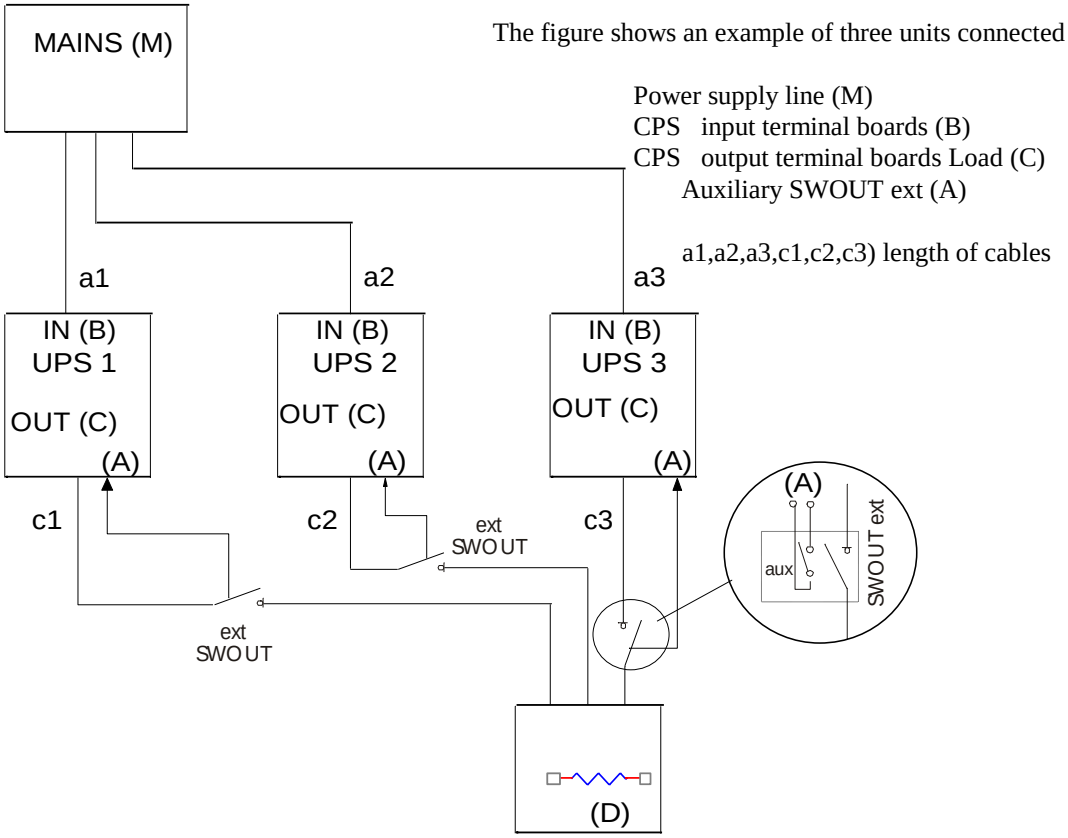
5.3.1 CPS AC input / output power connection

Refer to the INSTALLATION DRAWINGS manual for information on how to select the cable sections for **each CPS**.

Observe the phase connections
Phase L1 of the system must be connected to input phase L1 on all the CPSs; all the output phases L1 must be connected together and with phase L1 of the load. The connections must be observed for phases L2, L3 and for the input and output neutral.

parallel connect the CPS s as follows:

- Connect the power supply phases L1,L2,L3,N to the ***corresponding*** input phases of each CPS L1,L2,L3,N.
- Connect the load phases L1,L2,L3,N to the ***corresponding*** output phases of each CPS L1,L2,L3,N.



NOTE: “SWOUT ext” must be provided with an auxiliary contact (open with the switch open and closed with the switch closed).

Length of the cables
The sum of the lengths of the power supply and output cables must be the same for all units. With reference to the drawing, these must be: a1+c1 = a2+c2 = a3+c3 a = length of input line cables b = length of output line cables The same rule must also be observed with separate power lines: the lengths of the cables of the by-pass line + output line must be the same between all the CPS connected in parallel.

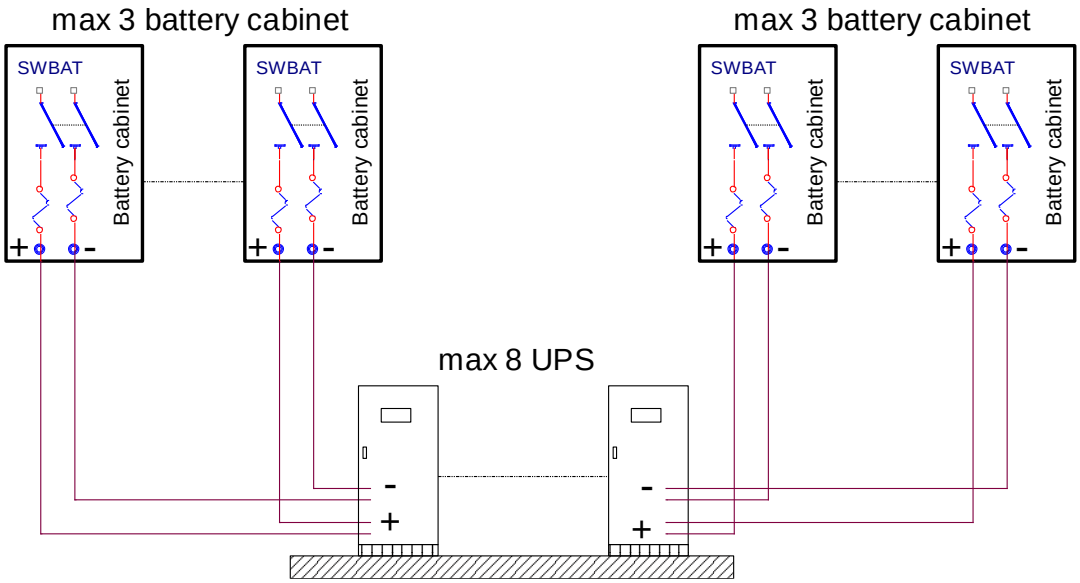
Lack of compliance with this rule may cause a current imbalance between the CPSs when the load is powered through the by-pass line. An overload on the by-pass line of one CPS will lead to a deterioration of the components on that line, both internal and external to the CPS: that is, the disconnector cables and electronic power components.

5.3.2 Power connections battery side.

BATTERY CABINET if provided:

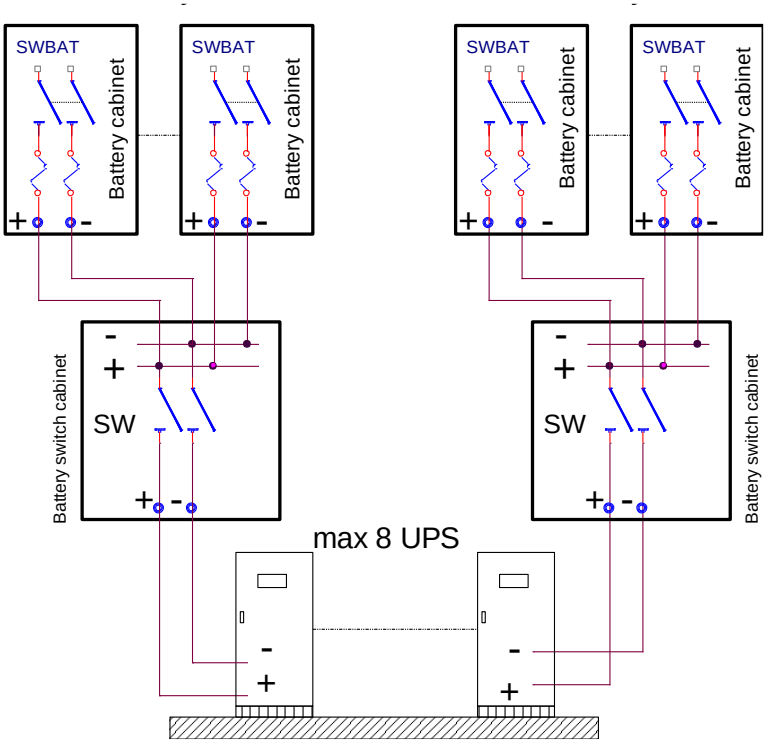
In order for the battery cabinet to be connected to the CPS, it ***must be*** provided with a fuses device.

Each CPS with its own battery cabinet



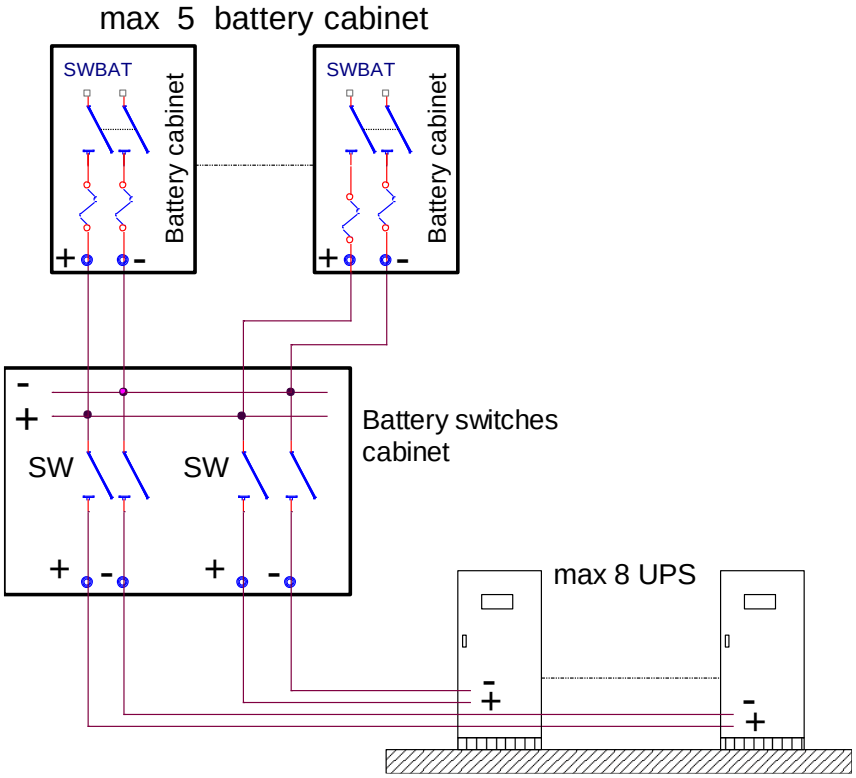
DISCONNECTOR CABINET

For systems with 4 or more battery cabinets, it is necessary to use a ***Battery switch cabinet*** where the cables can be connected in parallel (consult the commercial department). For the sizing of the cables and for the connection procedure refer to the "INSTALLATION DRAWING" attached to the battery cabinet.



TO CONNECT MORE CPS IN PARALLEL WITH ONLY ONE BATTERY:

Between battery cabinets and the CPS must be positioned a ***Battery switches cabinet*** , to allow the single CPS maintenance, as shows the picture.

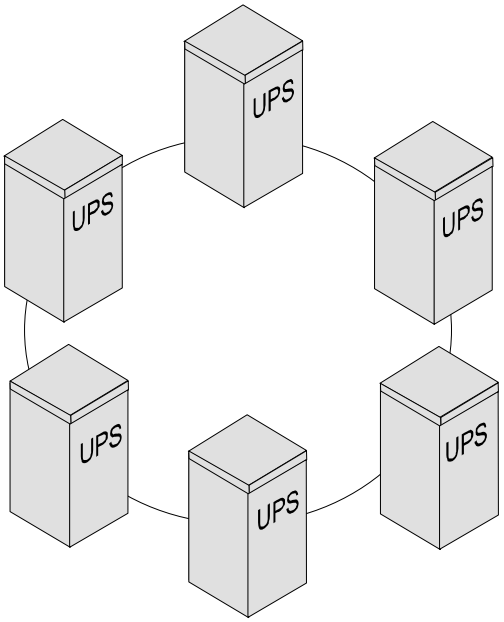


Consult the commercial department for backup times that require a greater number of battery cabinets.

5.4 Connection of signals

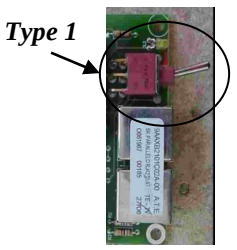
The signals of several parallel CPSs are connected in a closed loop configuration; if the loop is interrupted at any point, either due to a fault or for maintenance, operation of the system is not compromised, and the system continues to operate normally, as will be shown repeatedly below.

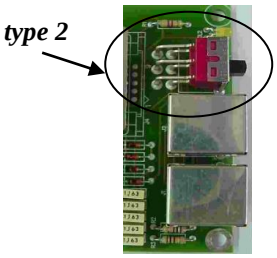
The various CPSs are connected through the “signals RJ45-flat-adapter” parallel card, located in the lower part of the CPS (in the area for signal and command connections as shown in the section on SIGNALS and REMOTE COMMANDS).

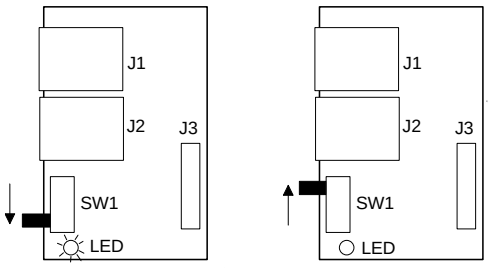


- RJ45-flat-adapter signals parallel card.

N.B.: the CPSmay be provided with two versions of parallel card that differ in the type of switch used (type 1 or type 2). The difference between the two switches is the position of the control lever.







LED side *connector side*

J1 RJ45 type connector
J2 RJ45 type connector

SW1	***start position***	*connector side(type 1)*	*LED side (type 2)*
	Cont position	*LED side (type 1)*	*connector side (type 2)*
LED	*on*	*SW1 start position*	
	off	*SW1 Cont position*	

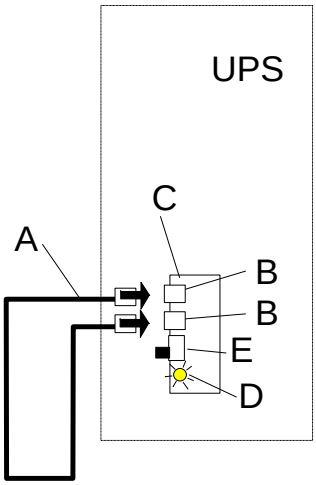
Firmware update
All the parallel-connected CPSs must have the same firmware version. Press key 7 from the basic menu on the display panel to display the firmware version installed. For the expansion of an existing system, check that the system has the same firmware version as the new CPS.

Using the cable with two RJ45 terminals provided with each CPS (***A***), make the connections as shown below:

single CPS configured in parallel

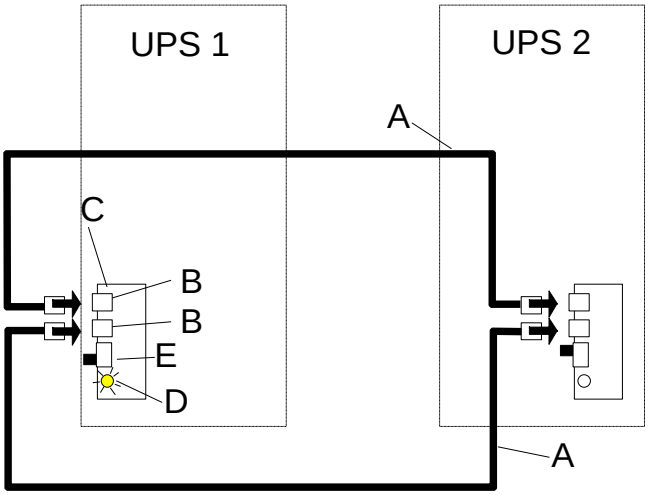
If it is required to use a CPS that has been configured as a parallel unit on its own, the signal card must be jumpered with the cable provided as shown below.

A CPS PARALLEL CABLE
B RJ45 type connector
C RJ45-flat-adapter signal parallel card
D LED on
E SW1 start position.



two CPSin parallel

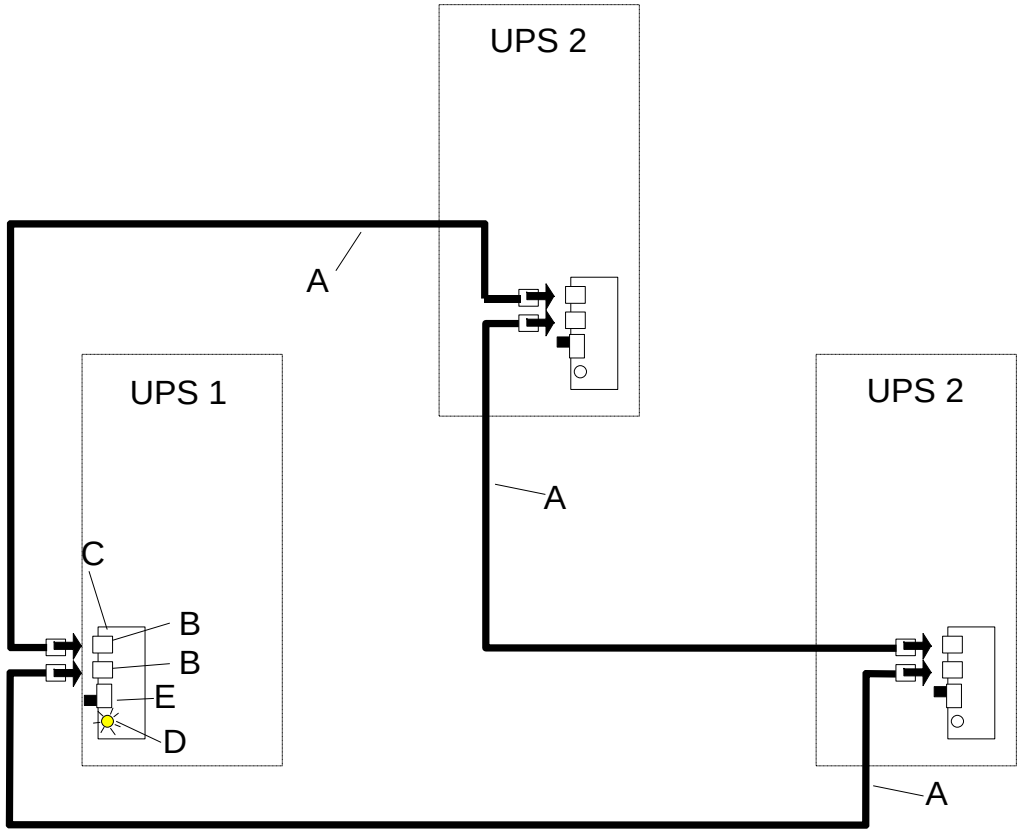
D CPS1 LED on, CPS2 LED off
E SW1 start position. CPS1, SW1 cont position CPS2.



-

three CPS in paralell

D CPS1 LED on, CPS2 LED off, CPS3 LED off
E SW1 start position CPS1, SW1 cont position CPS2, CPS3



To add other parallel CPSs, a "*CPS PARALLEL CABLE" must be added for each new CPS connected*.

The signal connection must not be removed when one CPS is shut down

5.5 Start-up procedure

Before starting up the whole system for the first time, some tests have to be performed to check that the CPSs are connected to each other correctly.

A) open all the switches and disconnectors on the CPSs (SWIN, SWBY, SWOUT and SWMB) and on the battery cabinets.

B) Close SWMB on one unit and check that on all the units:

- The voltage present between the corresponding input and output terminals of each CPS is <2Vac. If not, check that the CPSs are connected to each other correctly.
- Once the operation has terminated, open SWMB.

C) Start up CPS1 by closing SWIN, SWBY and SWOUT. Wait until the message "NORMAL OPERATION" appears on the display.

D) Close SWIN, SWBY on all the other CPSs.

E) Check that all the parallel-connected CPSare on.

F) close the disconnector or the fuses on the battery cabinets

FOR OPERATION WITH A SINGLE BATTERY ONLY

Check the letter "X" on the second line of the display panel:
Example: "CPS type", "X" OUT=YYY%VA, BATT=YYY%Ah, 5=ON(or OFF)
N.B.: the CPS with a capital "X" (B or P) is the MASTER unit
The "X" on the MASTER unit may be:

- X= B, the parallel battery code has already been inserted.

Only the battery capacity value has to be inserted (see below).

- X= P the parallel battery code must be inserted by pressing keys 3, 5 in sequence on the control panel and the code 467123 (repeat the same sequence to disable the parallel).

The CPSs connected to the one in which the code is inserted will be automatically configured through the parallel cable (the letter "b" will be displayed on all the CPSs).
This configures the value of the battery capacity only; this value must be inserted on the MASTER CPS, which will send the information to the other units via the signal cable.

G) Close SWMB of CPS 1 and check that the whole system switches onto the by-pass line (the bypass LED on unit1 will flash while it must be on steady on the other CPSs), then open switch SWMB again. Wait a few seconds then check that the CPS1 returns to "NORMAL OPERATION".
Repeat this operation for the other units connected.
If this check is positive, close SWOUT on all the units.
Replace the switch block on all the SWMBs so that they are blocked in the open position.

H) At the end of the start-up phase, all the CPSs must be in the "NORMAL OPERATION" condition.

I) Wait approx. one minute from the insertion of the last CPS, then check that with the load not connected the output power indicated by each unit is <3%.

L) Connect the load in output, wait approx. one minute and then check that the power shared between the various units is within ±2%.

5.6 Operating modes

Several CPS units connected in parallel share the current absorbed by the load between them.
In a system with several CPSs connected in parallel, there is a single MASTER unit and the remaining units will be SLAVES. The CPSs are all exactly the same and the MASTER is chosen on start-up. The MASTER unit is shown on the display panel by the capital letter “P” (or “B” in the case of a single battery). The MASTER and SLAVE units may exchange roles. If a unit goes out of service, e.g. due to an inverter fault, it will automatically be excluded. The load at this point is shared between the units that are still active; if the power in output is excessive for the remaining CPSs, the system logic switches all the units, including the CPS that was excluded, onto the by-pass line.

All the information contained in the section on “operating modes” (page 25) in relation to the CPS remains valid with the addition of the information set out below.

ON LINE OPERATION
The message: “NORMAL OPERATION” is shown on the display panel of each CPS and the letter “P” appears in the bottom left-hand corner near the indication of the model. This letter is in upper case if the equipment in question is the MASTER, while a lower case character is displayed if the CPS is a SLAVE.

STAND-BY ON OPERATION
The sharing of the load between the CPSs is linked to the length of the cables, and the rules on the length of the connections indicated in the section “connections” must be observed. In the event of a mains power failure, the load is passed onto all the parallel-connected CPSs.

STAND-BY OFF OPERATION
In this mode, if there is a mains power outage, the devices share the load equally; the load is not powered with the mains present.

STABILIZER WITHOUT BATTERY OPERATION
In this mode, the devices share the load equally.

BATTERY OPERATION

One battery for each CPS
Each unit draws the energy from its own battery. At the end of its backup time each CPS excludes itself. The load remains unpowered if the duration of the mains outage is greater than the backup time of the whole system. When the mains is restored the system will restart automatically. Each CPSrecharges its own battery.

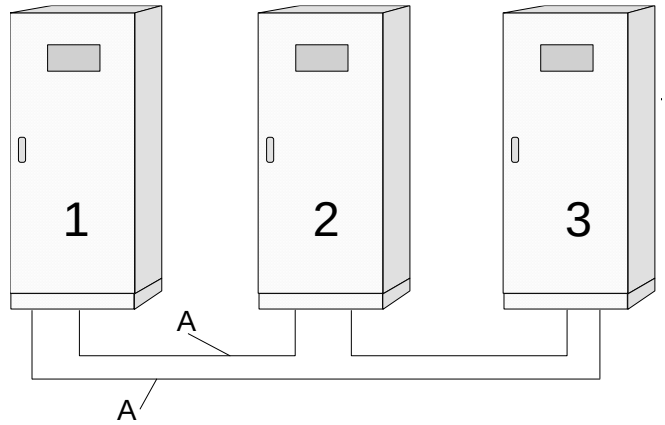
One battery for all the CPSs.
Each unit draws the energy from the common battery. At the end of the backup time, the whole system excludes itself. The load remains unpowered if the duration of the mains outage is greater than the backup time of the whole system. When the mains is restored the system will restart automatically. Each CPS recharges the common battery.

OVERLOAD
In this mode too, the devices share the overload equally.
If the load applied to the system is not reduced, the whole system will switch onto the by-pass line. When the overload is removed, all the units will automatically return to normal operation. If the overload persists, however, it triggers the external protection devices located at the CPS input on the by-pass line. In this case the load would remain unpowered.

Example of parallel operation

For the sake of simplicity, the instructions shown below refer to a system with three CPSs, but are equally valid for more complex systems.

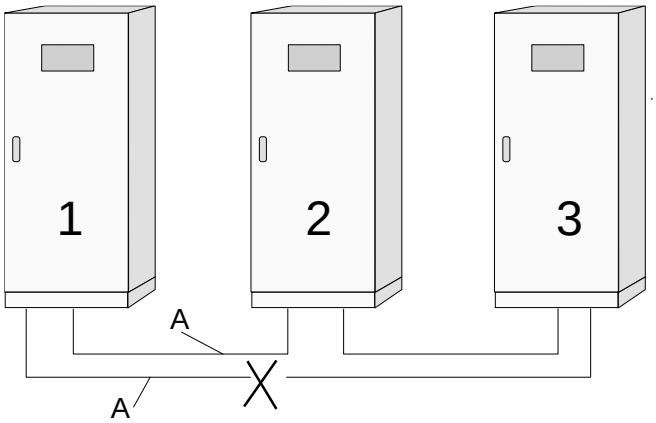
Let us assume that the signal cable is not damaged and that the CPSs are in the following state:



CPS STATUS
1) Normal operation, Master unit
2) Normal operation, Slave unit
3) Normal operation, Slave unit

A CPS PARALLEL CABLE type RJ45
1,2,3 Parallel-connected CPSs

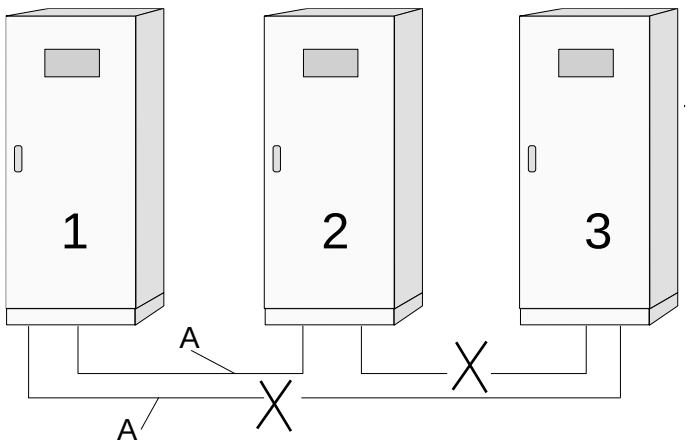
If the signal cable between CPSs 1 and 3 is open (CPS PARALLEL CABLE type RJ45).



CPS STATUS
1) Normal operation, Master unit with message "Parallel signal cable fault" appears on the panel
2) Normal operation, Slave units with message "Parallel signal cable fault" on the panel
3) Normal operation, Slave units with message "Parallel signal cable fault" on the panel

N.B.: in this situation the load is powered correctly. All the CPS supply power to the load.

Let us assume that the signal cables between CPSs 1, 3 and 2,3 are opened.



CPS STATUS
1) Normal operation, Master unit with message "Parallel signal cable fault" on the panel
2) Normal operation, Slave units with message "Parallel signal cable fault" on the panel
3) Disconnected (TLI open, SCRs off), Slave units with message "INTERNAL FAULT 10" on the panel
N.B.: In this situation the load is only powered correctly by CPSs 1 and 2.

To restore the broken signal cable, first the CPS with the message "INTERNAL FAULT 10" on the panel has to be shut down.

5.7 By-pass for maintenance

observe the following precautions when operating SWMB
SWMB must not be closed on a CPS that is off and that is connected in parallel with other units operating normally. This operation may cause a fault on the CPSs which may create a dangerous voltage at the output. SWMB may be closed with the CPSoperating by following the procedure described in the section "Operating modes" .

operation not to be executed
If disconnector SWMB is closed on any unit, the whole system switches onto by-pass. If all the switches are then opened to allow maintenance operations to be carried out, all the power required by the load will switch onto the maintenance by-pass line of the unit in which SWMB has been closed. ***WARNING: both the automatic and the maintenance by-pass line of each CPS is sized for the rated power of the single unit.*** ***N.B. To carry out maintenance on all the CPS, the switches SWMB of all the units must be closed.***

maintenance on a single unit

This is the procedure to carry out maintenance operations **on a single unit** (e.g. CPS1):
open switches SWBY, SWOUT, SWIN and the battery cabinet disconnector on unit 1 only.
If the active CPSs can power the load, the system remains in normal operation, and the maintenance can be carried out on CPS1.

maintenance on the whole system

The sequences of operations to be carried out to place the system in maintenance bypass are described below. The procedures vary depending on the initial state:

- All the CPS are in NORMAL OPERATION
  procedure a) *the power supply to the load is not interrupted in any way*;
- whole system with output not synchronised with the by-pass line
  procedure b) *the power supply to the load is interrupted*
  (therefore this operation should be effected only if absolutely necessary).

Procedure a)

the by-pass line is present and its frequency and voltage are suitable *the CPS display panel indicates* NORMAL OPERATION.

1. Pressing keys 3, 6, 4, 7, 2, 6, 3 in succession as shown on the display activates the command for by-pass with shutdown of the inverter (the CPSs connected to the one in which the code is inserted will be automatically configured through the parallel cable);
2. check that the whole system switches onto the by-pass line;
3. close all the disconnectors SWMB;
4. open all the switches on the device (SWIN, SWOUT, SWBY and the battery cabinet disconnectors/fuses) and keep only disconnectors SWMB (maintenance by-pass line) closed. The control panel remains off.

N.B.: After carrying out the operations indicated above, personnel must wait around ten minutes for the capacitors to discharge before working on the inside of the CPS.

In this situation (during the maintenance operations), any disturbance (such as a blackout) on the CPS supply line would have an effect on the equipment powered (since the batteries are deactivated in this state).

Procedure b)

The by-pass line is outside the acceptance field; the following message is seen on the display panel:

BYPASS LINE VOLTAGE FAIL or SWBY OFF

1. open all the switches on the device (SWIN, SWOUT, SWBY and the battery cabinet disconnectors/fuses). The control panel will remain off.
2. before closing switches SWMB and connecting the loads, ensure that both the frequency and voltage of the supply line are sufficient to power the connected loads.

N.B.: After carrying out the operations indicated above, personnel must wait around ten minutes for the capacitors to discharge before working on the inside of the CPS.

After the maintenance operations have finished, restart the CPS.

Close SWIN, SWBY, SWOUT on all the CPSs.
Close the disconnector or the fuses on the battery cabinets
Check that all the parallel-connected CPS are on.
Open all disconnector SWMB.

After a few seconds all the CPS will return to NORMAL OPERATION.

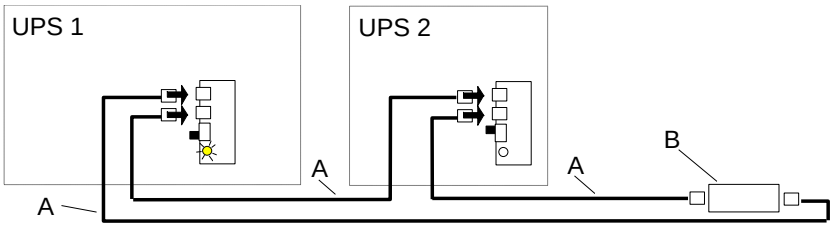
Insertion and removal with CPSs operating (hot swap)

The hot insertion and removal of the CPS can only take place if the system is configured with the **RJ45 female/RJ45 female shielded adaptor cable** (as shown in the figures below).

The hot insertion and removal of the CPS makes technical support easier and improves the reliability of the system.
With this procedure it is not necessary to shut down all the CPSs in order to add or remove a unit.
Hot insertion and removal can only be done on systems comprising CPSs with the following characteristics:
The CPS system must be prearranged with a distribution panel (for power connections)
The CPS system must be prearranged with a RJ45 female/RJ45 female shielded adaptor cable (not provided with the CPS). All the CPSs in the system must have the same firmware version.

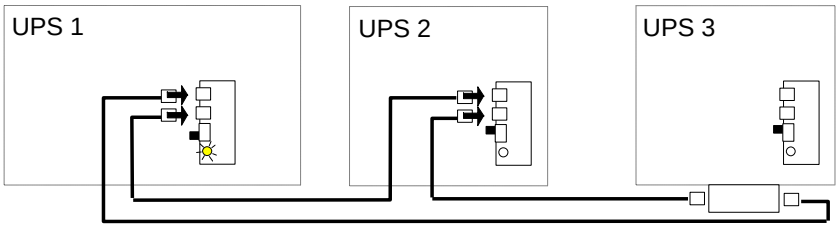
Example of hot insertion

I



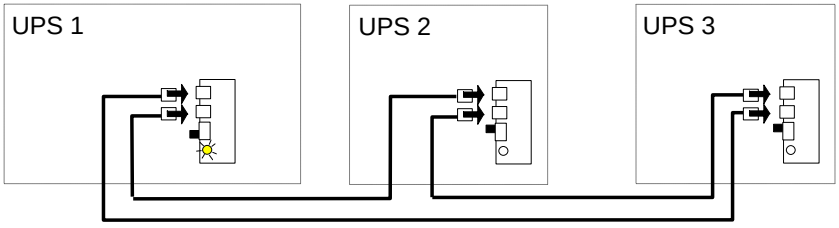
A)CPS parallel cable type RJ45
B) RJ45 female/RJ45 female shielded adaptor cable *CPS BY-PASS CABLE*

II



phase II Insert the new CPS (power connections in the distribution panel) and keep it switched off.
CPS 3: SW1 cont position.

III

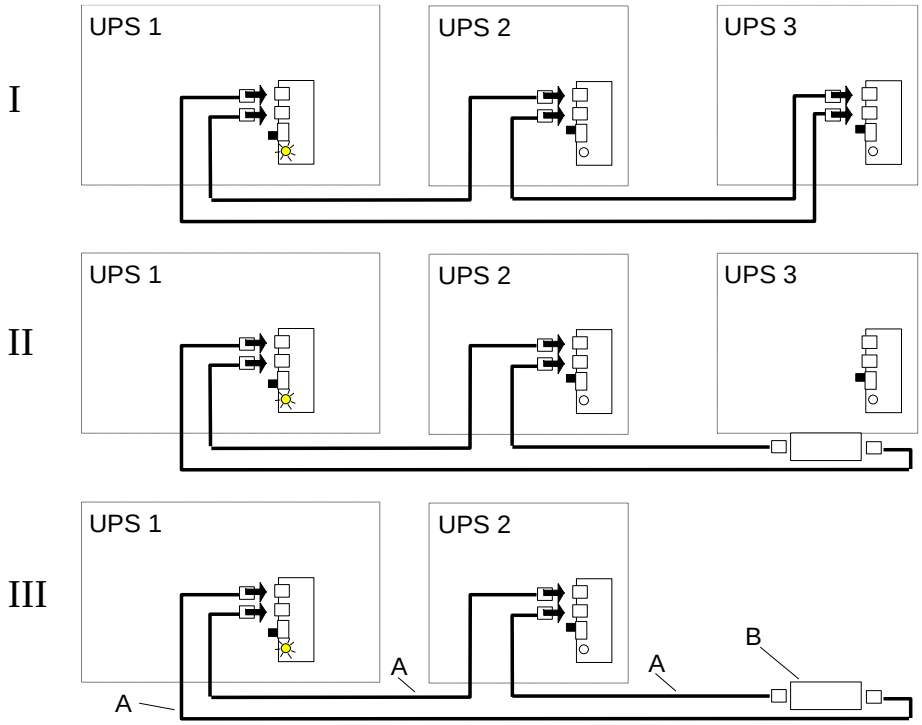


Phase III Remove adaptor B and insert the new CPS instead of the adaptor.

Now switch on CPS 3 (the added CPS).
With the lever of SW1 in the start position in one CPS only and the lever in the cont position on all the others, check that all the CPSs are operating normally and that the system is sharing the output power.

Example of hot removal

With hot removal, it is not necessary to shut down all the CPSs of the system in order to remove one.



A)CPS parallel cable type RJ45
B) RJ45 female/RJ45 female shielded adaptor cable *CPS BYPASS CABLE*

N.B.: if the CPS to be removed has SW1 in the start position, one of the other CPSs (CPS 1 or CPS2) must be in the start position.

One CPS in the system must have SW1 in the start position and LED

Phase I Shut down the CPS (3) that is to be removed. Remove the signal cables of the CPS to be removed.

Phase II-III Connect the RJ45 female/RJ45 female shielded adaptor cable (not provided) between cables A.

Check that all the CPS are operating normally and that the system is sharing the output power.

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6. Maintenance

The uninterruptible power supply is designed and produced to last a long time even in the most severe service conditions. It should be remembered however that this is electrical power equipment, which requires periodic controls. Moreover, some components have a limited lifespan and as such must be periodically checked and replaced should conditions so dictate: in particular the batteries, the fans and in some cases the electrolytic condensers. It is therefore recommended to implement a preventive maintenance programme, which should be entrusted to specialized personnel authorized by the manufacturers.
Our Technical Support Service will be happy to recommend the various personalized options for preventive maintenance.

Periodic operations (to be carried out by trained personnel and with doors closed)
The following operations (which must be done with the doors closed) should be carried out periodically (e.g. once a month, or more frequently in particularly difficult environmental conditions):

- Ensure that the air intake slots (located on the front door and at the back of the cabinet) and the output grilles located on the top of the cabinet are clean;
- Ensure that the CPS is working properly (the message "NORMAL OPERATION" will appear on the display panel). If an alarm message is displayed, check the meaning in the manual before contacting the technical support service;
- Perform a battery test with the display panel.

Maintenance inside the CPS (trained personnel only)

Maintenance inside the CPS may only be carried out by trained personnel.
High voltage is present inside the CPS even when the power supply and the battery have been disconnected

An electronic board contains lithium cell, this card and all the other card must be replace only by trained personel.

After disconnecting the power supply line and the battery cabinet, the trained personnel must wait around ten minutes for the capacitors to discharge before working on the inside of the equipment.

Ordinary maintenance for batteries (trained personnel only)
The system automatically controls the efficiency of the batteries every 24 hours, and sounds an alarm when the efficiency is lower than that calculated according to the stored capacity value.
The lifespan of the batteries is linked to the operating temperature and to the number of charge and discharge cycles effected.
The capacity is not constant, but increases after some charge and discharge cycles; it then remains constant for several hundreds of cycles before decreasing permanently.
Preventive maintenance of the battery entails:

- keeping the operating temperature within the field 20 - 25°C;
- performing two or three discharge and charge cycles during the first month of use;
- carrying out this operation every six months after the first month of use.

Since the batteries are a source of energy, opening the battery disconnector does not eliminate the voltage inside the batteries. DO NOT TRY TO ACCESS THE INSIDE OF THE BATTERY CABINET. THERE ARE ALWAYS DANGEROUS VOLTAGES AROUND THE BATTERIES. If the batteries are thought to be faulty in any way, please contact the technical support service.

If the batteries need to be replaced, this must be done by a ***specialized technician***. The replaced parts must be sent to a specialized company for disposal by means of recycling. Batteries are classified by law as "toxic waste".

7. SPECIFICATIONS

SYSTEM	***30***
rated power: [kVA]	30
[kW]	27
leakage current max.: [mA]	500
remote signalling:	three volt free contacts (battery low, battery discharging, by-pass/fault), aux output 12Vdc 80mA
standard:	EPO (emergency power off), Nr.2 x RS232 interfaces Nr.1 I/0 expander card
optional:	parallel, 2 x netman plus or multicom cards 2 x remote alarm cards, modem, battery temperature sensor.
operating temperature:	0 ÷ + 40 °C
maximum temperature for 8 hours a day	+ 40°C
mean temperature for 24 hours	+ 35°C
relative humidity at +20°C	20÷90 %
cooling:	forced ventilation
maximum operating altitude:	1000 m at rated power An (-1% An for each 100m over 1000m) max 4000m
acoustic noise, as measured at 1m from the front of the equipment:	65 dBA
input cable :	from the bottom

RECTIFIER	***30***
rated voltage: [V]	400V 3 phase
voltage tolerance:	-25% +20% (-10% +20% for battery recharge)
rated frequency: [Hz]	50 / 60 Hz auto sensing
frequency tolerance: [Hz]	45 ÷ 65
rated input current (*): [A]	49
power walk-in 0-100%	0÷120s (configurable)
power walk-in delay timer	0÷120s (configurable)
standard battery type:	lead sealed
blocks (12V)/ element number (lead sealed):	32/ 192
battery rated voltage:	396 V
ripple voltage:	< 1%
static stability of the rectifier output voltage:	± 1 %
maximum recharge battery current at: [A]	
nominal load	28
load 90%	34
load≤ 80%	38
current distortion, power factor (THDV < 2%) (*):	
	25%, ≥ 0,9

(*) load 100%, rated input voltage, and full charge battery.

INVERTER OUTPUT		***30***			
rated power p.f. 0,9 inductive:	[kVA]	30			
active power pf 1:	[kW]	27			
rated voltage:	[V]	400 (380 – 415) 3 phase + N			
rated current (with 400V output)):	[A]	43,3			
phase voltage setting:		360 ÷ 420 V			
rated frequency:	[Hz]	50 / 60			
wave form:		sinusoidal			
output voltage distortion Linear load: Non linear load (reference load EN62040-3):		 ≤ 2% ≤ 3 %			
output voltage static stability:		± 1%			
phase voltage dissymmetry with balanced load:		± 1%			
line voltage dissymmetry with 100% unbalanced load:		± 1 %			
stability voltage at transient state (load 0 to 100%)		as EN 62040 - 3, class 1			
frequency stability: without synchronisation		± 0,05 %			
with synchronisation		±2 % (configurable ± 1 ÷ 6 % from the control panel)			
frequency slew rate		1Hz/s			
three-phase transient power overload: [Power/power rating]		 120% continuos 130% for 60’ , 145% for 10’ , 170% for 1’			
single-phase transient overload:		200% rated power for 7”			
short circuit current phase-phase (**):		1.8 In for 1s			
short circuit current phase-neutral (**):		3 In for 1s			

(**) without bypass line

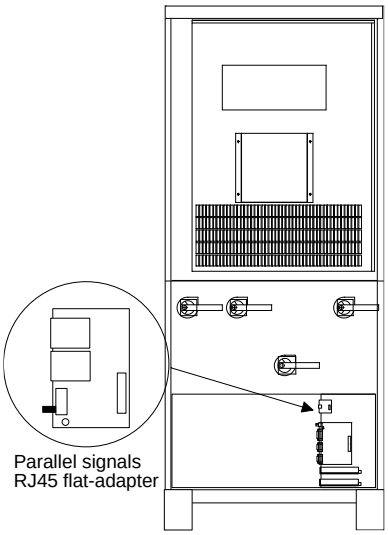
BY PASS LINE		***30***			
rated output current (with 400V output):	[A]	43,3			
rated voltage:	[V]	400 (380-415) 3 phase + N			
input voltage tolerance:		±15 % (configurable ± 10 % , ± 25 % from the control panel)			
rated frequency:	[Hz]	50 / 60			
frequency tolerance:		±2 % (configurable ±1 ÷ ± 6 % from the control panel)			
“STAND-BY ON” (by-pass to inverter) transfer switch time:		2 ÷ 5ms			
i²t SCR bypass (25°C, 8÷10ms)	[A²s]	11 k			
overload [Power/power rating]		120% continuos 130% for 60’ , 145% for 10’ , 170% for 1’			
current admitted (for short time): I/In	1s	9			
	500ms	10			
	200ms	10			
	100ms	12			
	10ms	16			
standard:		Backfeed Protection; bypass line separable			

8. Parallel version

8.1.1 Introduction

It is possible to connect multiple CPS systems parallel in order to increase the reliability and/or the total output power availability. It's advisable to always connect units of the same power rating. When using multiple CPS, the connected load is shared amongst the individual systems, this method increases the overall reliability of the supply to the connected load as the load is being supplied from multiple systems instead of a single system. The reliability is further increased by adding an additional redundant CPS; therefore if one of the CPS systems fails the load will continue to be supplied by the remaining systems without any disruption being caused. A redundant system is created by adding an additional CPS to the minimum number of CPS necessary to supply the load, thus if a unit is disconnected or fails the remaining units will adequately support the load. The CPS connected in parallel are controlled via a card, this card exchanges data and synchronisation information which ensure a stable and controlled operation. The information exchange between the CPS systems is via a data cable which forms a closed loop connection. The closed loop connection creates a redundant signal cable which enables all of the CPS systems to continue to operate even if one of the cables are damaged, an added benefit of this system is that it allows the hot insertion or hot disconnection of a CPS, without the need for down time. Each CPS uses its very own dedicated controller that continuously communicates with the other systems to ensure perfect operation and management of the power. The data cable is used to transmit all of the necessary information from the "Master" CPS to the "Slave" CPS, the data cables are fully opto isolated, this provides total electrical isolation between the control systems.

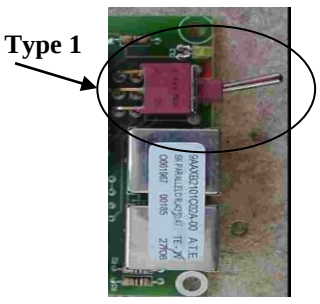
When the parallel system is initialised the first CPS to start assumes the roll of the "Master" which then takes control of the "Slaves". If the "Master" unit malfun-ctioned the control is automatically switched over to one of the "Slaves" which becomes the new "Master". The system requires (in standard form) that every unit connected is provided with its own battery, however it is possible to configure the CPS systems to share a common battery (by inserting the appropriate code on the control panel).

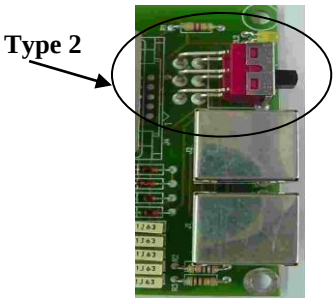


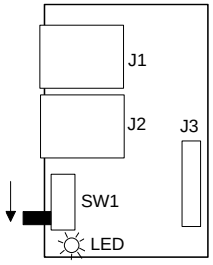
8.1.2 Installation

8.1.2.1 - Parallel signals RJ45-flat-adapter card

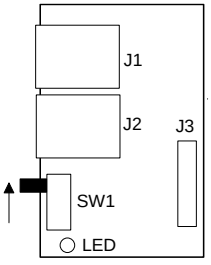
may be used two RJ45 card type with different switch (type 1 or 2)







side led



side connector

J1	external connection RJ45 type		
J2	external connection RJ45 type		
J3	internal connection		
SW1	side connector (type 1) side led	(type 2)	**Start position**
	side led (type 1) side connector	(type 2)	**Cont position**
Led	lit switch in Start position		
	off switch in Cont position		

8.1.2.2 Firmware update

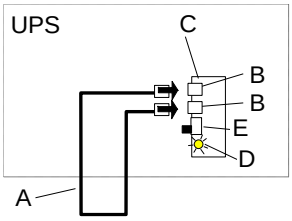
All of the CPS connected together must have the same firmware release.
Press key 7 on the control panel to display the firmware release.

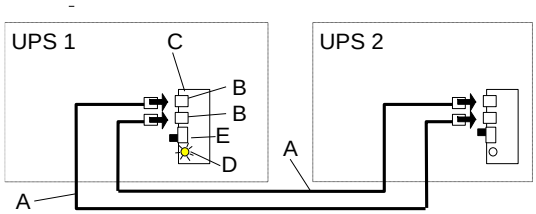
8.1.2.3 Signal connection

The labels CPS1, CPS2, CPS3 in the pictures must be considered as: CPS1, CPS2, CPS3.

Example of the signal connections of a single CPS

A *CPS parallel cable*
B RJ45 connectors
C Parallel signal RJ45-flat-adapter card
D lilted (lit)
E SW1 Start position





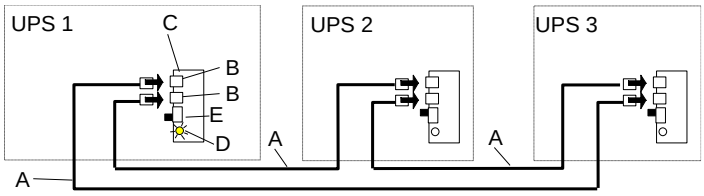
Example of the signal connections between two CPS

D LED (lit) CPS1, LED (off) CPS2
E SW1 Start position CPS1, SW1 Cont position CPS2

Example of the signal connections between three CPS

D LED(lit) CPS1, LED(off) CPS2 and CPS3
E SW1 Start position CPS1, SW1 Cont position CPS2 and CPS3

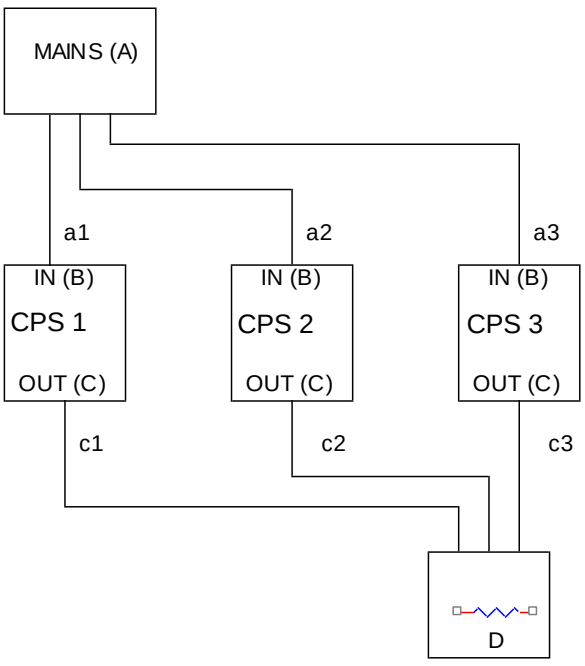
Only an additional CPS PARALLEL CABLE is required to connect more CPS.



The connectors must remain connected even if the CPS is switched off

8.1.2.4 Power connection "input/output CPS" AC

To calculate the dimensions of the required cabling refer to the "SETTING UP THE ELECTRICAL SYSTEM" section.
The dimension of the cables must be rated for the individual units being connected.



Connect the input to each of the CPS as follows:

- Connect the mains supply phases L1, L2, L3 and N to the inputs of each of the CPS.

Connect the CPS output as follows:

- Connect the output load phases L1, L2, L3 and N to the outputs of each of the CPS.

The following diagram shows an example of a parallel system connection using three units.

A) Mains supply
B) CPS input terminal
C) CPS output terminal
D) Load

a1,a2,a3,c1,c2,c3) Cable length

When carrying out the power connections to the CPS, it is important to adhere to the following (this is to ensure equal power sharing during bypass operation):

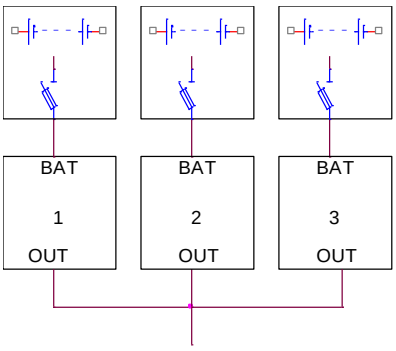
- The sum of the total length of the input and output cables must be the same for each unit. Therefore:

a1+c1 = a2+c2 = a3+c3

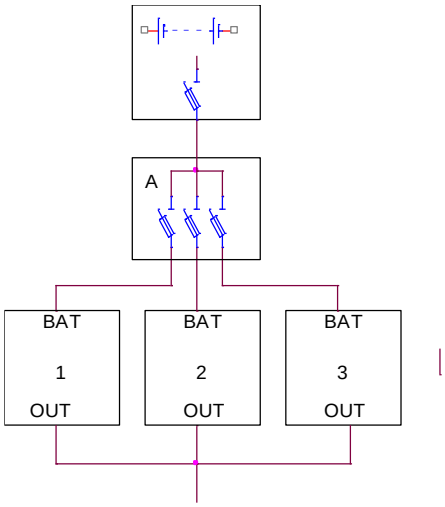
N.B. If you want to connect a isolators on the output of each CPS refer to paragraph “additional sectioning”.

8.1.2.5 Battery Connections

8.1.2.6 1) Individual batteries”standard connection”



BAT) CPS battery input connection
OUT) CPS output connection
1,2,3) Parallel CPS.
Each CPS has a battery connected



8.1.2.7 2) Single battery (enter code “467123”)

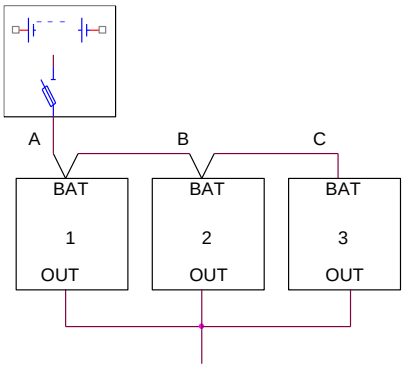
Star connection

BAT) CPS battery input connection
OUT) CPS output connection
1,2,3) Parallel CpS.
A) Battery switch cabinet terminal board (optional)

The battery cables must be rated to suit the individual CPS
Use this solution for a high battery discharge current.

Series connection

BAT) CPS battery input connection
OUT) CPS output connection
1,2,3) Parallel CPS.
A,B,C) Battery connections



Wire “A” must be sized for the total CPS battery current
(CPS1 current + CPS2 current + CPS3 current)
Wire “B” must be sized for the CPS2 current + CPS3 current
Wire “C” must be sized for the CPS3 current
Use this solution for a low battery discharge current.

8.1.3 Initial start up

WARNING:

When closing the SWMB always observes the following precautions:
- Do not close the SWMB on a CPS that is switched off and in parallel with other units in normal operation. This operation can cause the CPS to fail, and create a dangerous voltage on the CPS output.
The SWMB can be closed when a CPS is in "Normal Operation" provided that the information in the paragraph "FUNCTIONING MODES" is followed. It is possible to lock the SWMB switch to prevent unauthorised use.

Before starting the parallel system for the first time it is necessary to carry out several tests in order to verify that the connection between the CPS are correct.

A) Check that all of the switches (SWIN, BATTERY, SWBY, SWOUT and SWMB) on each CPS are open.

B) Close the SWMB on a single unit and confirm that on the other units the:

- Voltage between the corresponding input and output terminals of each CPS is <2Vac. If the voltages exceeds this value, locate and correct the error.
- Following this test open the SWMB.

C) Switch on CPS1 by closing SWIN, BATTERY, SWBY and SWOUT and wait until the message "NORMAL OPERATION" is displayed.

D) On the remaining units close the SWIN, SWBY and BATTERY.

E) Confirm that all of the CPS in the parallel system are on.

F) If only one battery system is to be connected
Confirm that on the second row of the display panel the "X" character is:
Example: "type CPS", "X" OUT=YYY%VA, BATT=YYY%Ah, 5=ON(or OFF)
Note: For CPS where the "X" character is a capital B or P means that the unit is the master unit.
The "X" character on the master unit denotes:

- X = B, a capital B is displayed if the system has been configured for a parallel battery and the appropriate code has been entered and the total battery capacity has been set (see below).
- X = P, a capital P is displayed if the system has individual battery packs connected, therefore if a parallel battery system is to be used the parallel battery code needs to be entered, to do this press key 3, followed by 5, and then enter the code 467123 (to disable the parallel function repeat the key sequence).

This code only has to be entered into one of the CPS as the data link cable will automatically update the remaining units, once the code has been entered the display panels of the remaining units will display a lower case b or p meaning that these are the slave units.
Only insert the value of the single battery capacity. This operation is only required to be performed on the Master unit which will send the information through to the other systems automatically.

G) Close the SWMB on CPS 1 and confirm that all of the CPS systems switch to bypass operation (the by-pass LED on CPS 1 will flash and on the remaining units the LED will light steady), open the SWMB and wait few seconds and confirm that CPS1 switches to "NORMAL OPERATION".
If all of the checks are successful close the SWOUT on all of the units.
Fit the locking device onto all of the SWMB switches to prevent unauthorised operation.

H) Confirm that all of the CPS are reporting "NORMAL OPERATION".

I) One minute after the last CPS was switched on, confirm that with no load connected the output load on each CPS is < 3% W o 5% VA.

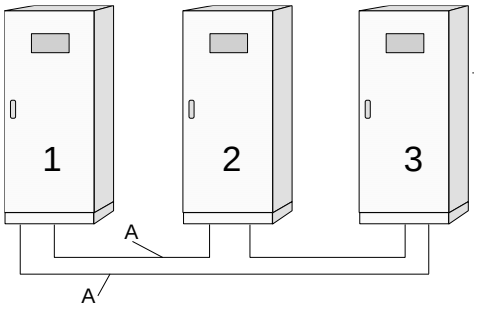
L) Once the load is connected to the output, confirm that the power shared between each CPS is within the range of +/- 2%.

Testing the bypass operation

Connect a load to the output of the system, ensuring that each CPS indicates a load of greater than 5%.
Switch the CPS into bypass operation from the control panel by pressing key 3 followed by 6, and then by entering the bypass sequence 47263 as shown on the display panel. After a couple of seconds all of the CPS will switch to by-pass operation, whilst in bypass verify that the load percentage on each display panel is even to or less than 5%. Whilst operating on the by-pass supply the power being shared between the CPS will depend upon the length of the cables, therefore it is preferred to maintain identical cable lengths.
If it is discovered that the load is unbalance when operating on the bypass supply, the overall power of the system will have to be degraded. For example if the unbalance during by-pass is approximately 20%, then the maximum available power from the system will have to be reduced to 90% of the total nominal power.

8.1.4 Modes of operation

Multiple CPS connected in parallel to provide a high power capacity.
Within a system comprising of more than one CPS connected in parallel there is only ever one MASTER unit, with the remaining units operating as slaves.
The CPS are all identical, however at the initial switch on the system will automatically set one of the units as the MASTER, the MASTER unit can be recognised by the capital letter P (or capital letter B for CPS system with a shared battery**)** shown on the display panel, if required the MASTER and SLAVE units can be interchanged.
If one of the units fails and therefore can no longer supply power to the load, this unit will be automatically disconnected. In this situation the load is shared amongst the remaining operational units, however if the output load exceeds the capacity of these units all of them (including the failed unit) will switch to bypass operation to ensure that the power to the load remains connected. The following diagrams only show three units in parallel, however the information below also applies to more complex systems.

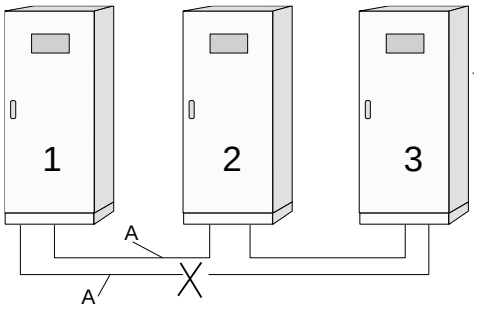


Closed loop connection and function
When all cables are intact the system will operate as follows:

A CPS parallel cable (type RJ45)
1, 2, 3 CPS operating in parallel

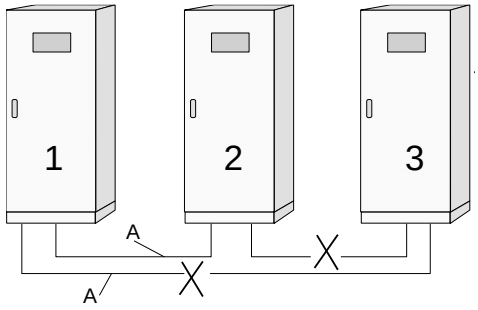
CPS STATUS
1) Normal Operation, Master unit
2) Normal Operation, Slave unit
3) Normal Operation, Slave unit

Assuming now that the signal cable between the CPS 1 and 3 is damaged (*CPS parallel cable failure*), the system will operate as follows.



CPS STATUS
1) Normal Operation, Master unit with a panel message "Signal parallel cable fault"
2) Normal Operation, Slave unit with a panel message "Signal parallel cable fault"
3) Normal Operation, Slave unit with a panel message "Signal parallel cable fault"
Note: During this situation the load is supplied normally with all of the CPS systems delivering power to the load, even if the mains supply fails.

Assuming now that the signal cable between the CPS 1 - 3 and 2 - 3 is damaged (*CPS parallel cable failure*); the system will operate as follows.



CPS STATUS
1) Normal Operation, Master unit with a panel message "Signal parallel cable fault"
2) Normal Operation, Slave unit with a panel message "Signal parallel cable fault"
3) Disconnection mode (TLI open, SCR off), Slave unit with panel message "INTERNAL FAULT 10"
Note: During this situation the load is supplied normally but only by CPS 1 and 2.
Before restoring the broken signal cable it is necessary to switch off the CPS with panel message "INTERNAL FAULT 10".

8.1.4.1 ON LINE MODE

The most common method of operation is On line, when the systems are operating in the mode the message "NORMAL OPERATION" will be displayed on the display panel, on the bottom line of the display panel the letter P will be displayed (or the letter "B" for parallel batteries), this letter will be lower case for SLAVE units.
During this mode of operation the load will be equally shared between the connected units.

8.1.4.2 STAND-BY ON MODE

When in STAND-BY ON mode the power shared between the units will depend upon the length of input and output cables connected to the systems, therefore to ensure an even power share always use cable of equal distance, for more information refer to the "connection" paragraph.

8.1.4.3 STAND-BY OFF MODE

When in STAND-BY OFF mode the output from the system will only be activated when the incoming mains supply fails, therefore when the mains supply fails the load will be equally shared between the units.

8.1.4.4 STABILISER MODE WITHOUT BATTERY

When in STABILISER mode the power is shared equally between the units, however if the incoming mains supply fails the output will be switched off.

8.1.4.5 BATTERY MODE

One battery pack for each CPS.
During battery mode each CPS will draw power from its own connected battery when the incoming mains supply fails.
As each battery pack becomes depleted the connected CPS unit will automatically disconnect itself from the system and switch off.

If the mains supply failure exceeds the autonomy time of the battery pack the entire system will be switched off.
When the incoming mains supply returns the system will automatically restart, supply power to the load and recharge the battery.

Only one battery for all the CPS.

During battery mode each CPS will draw power from the common battery pack when the incoming mains supply fails.
As the common battery pack becomes depleted the connected CPS units will switch off.
If the mains supply failure exceeds the autonomy time of the battery pack the entire system will be switched off.
When the incoming mains supply returns the system will automatically restart, supply power to the load and recharge the battery.

8.1.4.6 OVERLOAD

During an OVERLOAD condition the overload is shared equally between the units.
If the overload exceeds the specification of the CPS the system will be switched off.
If the overload condition is not reduced the entire system will switch onto the by-pass line.
Once the overload is reduced all of the units will automatically return to normal operation.
If the overload continues whilst on the bypass line the CPS bypass line input protection will blow. If this happens the power supplied to the load will be lost.

8.1.4.7 BY-PASS FOR MAINTENANCE

a) *Maintenance of the entire system*

WARNING: THIS OPERATION MUST NOT BE CARRIED OUT

If during normal operation the SWMB switch on one of the CPS units is switched on, all of the CPS units will switch onto their by-pass lines. If at this point all of the CPS are switched off in order to carry out maintenance, the total connected load will pass through the maintenance BY-PASS LINE of the unit with the SWMB switch closed.

WARNING: Both the maintenance and by-pass lines of each CPS units are sized in accordance with the nominal power rating for the individual unit.

In order to carry out maintenance on the entire system it is necessary to close all of the SWMB switches on all of the CPS units.

In order to carry out maintenance on the entire system it is necessary to:

- close all of the SWMB switches on all of the CPS units
- open all of the SWIN, SWBY, SWOUT and BATTERY switches on all of the CPS units

When all of the SWMB switches are closed the power shared between the units will depend upon the length of input and output cables connected to the systems, therefore to ensure an even power share always use cable of equal distance.

b) Maintenance of a single unit

In order to carry out maintenance on a single unit it is necessary to:

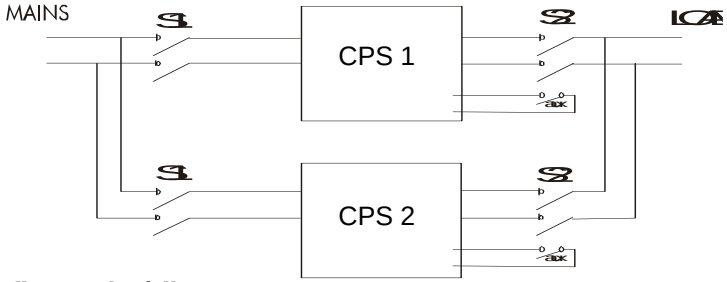
- open the SWOUT, SWIN, SWBY and BATTERY switches on the CPS to be maintained

If the remaining units can supply the load then the system will remain in normal operation with the load being shared equally between them. During this time the excluded CPS can be maintained.
Once the maintenance is completed in order to return the CPS to the system close the SWIN, SWBY, SWOUT and BATTERY switches, after a short period the CPS will automatically switch itself back into circuit and continue sharing the load.

8.1.4.8 Additional sectioning

If it is necessary to have the capability to remove a CPS unit from the circuit without causing disruption to the connected load, this is possible by connecting additional isolation devices to both the input and outputs of the CPS units in parallel (see below). This connection method enables a single CPS module to be removed without the need for the entire system to be switched to bypass, refer to the "hot disconnection "paragraph latter in this manual.

MAINS) Incoming mains supply
LOAD) Connected load
S1) Input switch.
S2) Output switch.
AUX) S2 output switch auxiliary.
1, 2) CPS units in parallel



If circuit breakers are to be used the positions 1 and 2 adhere to the following:

- Switch S1 is only opened if the corresponding CPS is switched off.

- Switch S2 must be provided with an auxiliary contact (open with the switch open and closed with the switch closed), this is electrically connected in series with the auxiliary contact present on the SWOUT switch of the CPS.

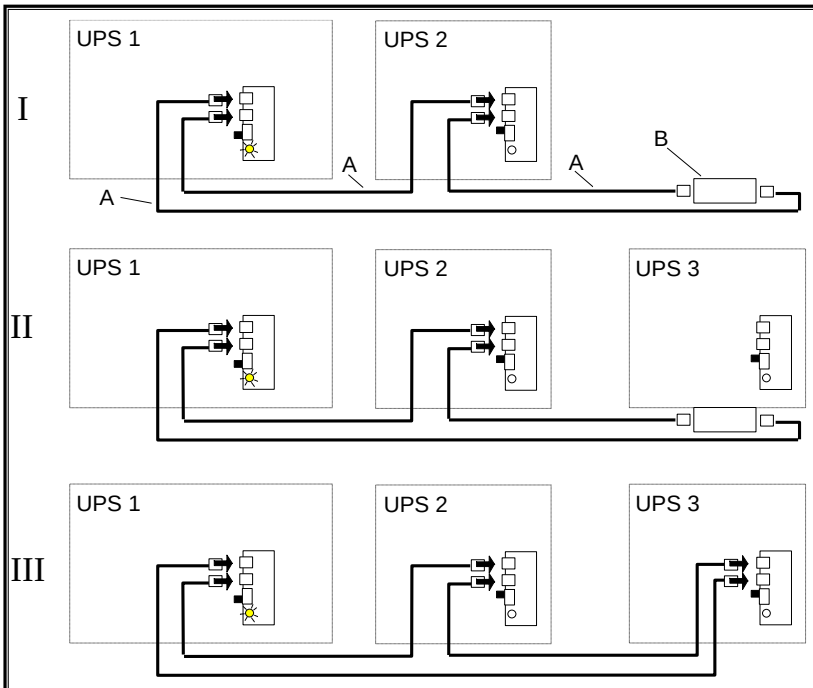
8.1.4.9 CPS hot addition/remove

Hot addition/remove are possible only if the signal loop cable system is configured with the **RJ45 female/RJ45 female shielded adapter** (as shown below).

The CPS hot addition/remove method, improves the system serviceability and reliability.
Using hot insertion and disconnection there is no need to switch off all of the CPS, if another CPS is to be added to the parallel system. Hot insertion and disconnection are only applicable to CPS systems with the following characteristics:

- The electrical system is prepared to except an additional CPS unit.
- The CPS unit is prepared with the **RJ45 female/RJ45 female shielded adapter** (not supplied with the CPS).
- All of the CPS in the system have the same firmware version.
- The labels CPS1, CPS2, CPS3 in the pictures must be considered as: CPS1, CPS2, CPS3.

Example of Hot addition



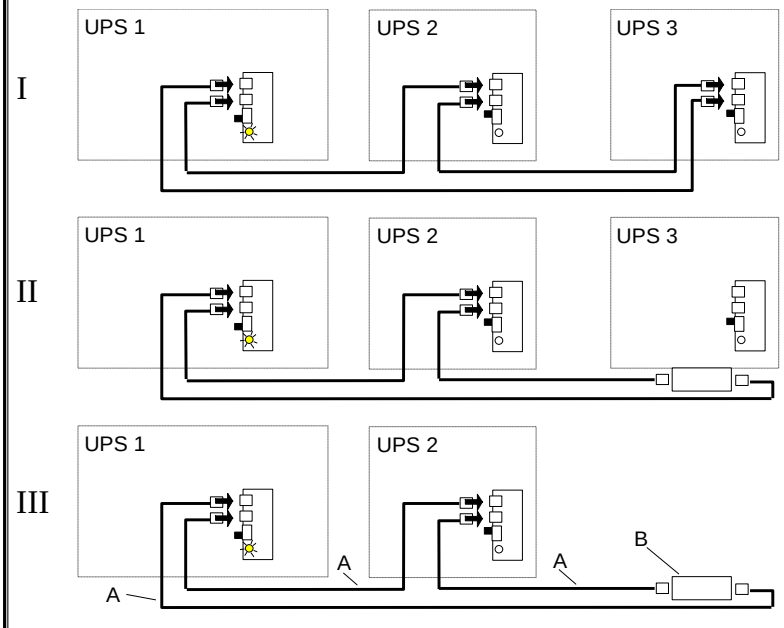
A CPS parallel cable
B RJ45 female/RJ45 female shielded adapter

Step I & II Position the new CPS and leave it switched off.
On CPS3: change SW1 to the Cont position .

Step III Remove the **RJ45 female/RJ45 female shielded adapter** from between the two CPS parallel cables type RJ45.
Connect the CPS parallel cables to the new CPS.
Turn on the new CPS (CPS3)
Finally verify that SW1 is in the Start position (bottom position and led on) only on one CPS, and that on all of the other CPS the SW1 is in the Cont position (upper position and led off).
Confirm that all of the CPS are reporting normal operation and that the system output power is being shared.

Example of hot remove

Using the hot remove there is no need to switch off all of the CPS, if one of the CPS is to be removed.



A CPS parallel cable
B RJ45 female/RJ45 female shielded adapter

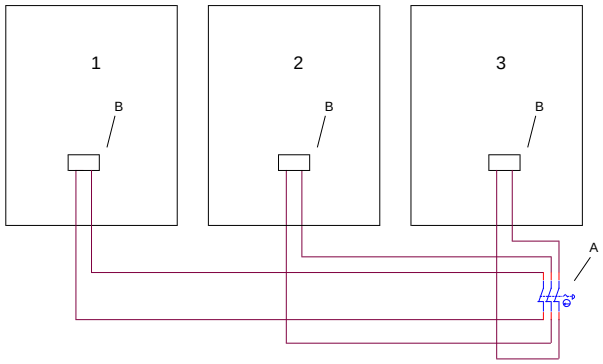
NOTE: if the CPS to be removed has the SW1 switch in the START position (bottom position with led on) it is necessary to switch the SW1 to the START position an any of the remaining units (CPS1 or CPS2).
At least one CPS must have the SW1 switch in the START position and led on within the parallel system.

Step I Turn off the CPS to be removed (CPS 3). Remove the cables that connect the CPS to the system.

Steps II & III Connect the RJ45 female/RJ45 female shielded adapter (not supplied) between wires A.

Confirm that the remaining units are showing normal operation and that they are equally sharing the load.

Emergency power off (epo) connection
To connect an EPO switching device to the entire system, refer the drawing below (3 CPS example):



A) EPO switch (refer to the “REMOTE CONTROL & SIGNALS” section earlier in this manual status to determine the relevant connection pins)

B) EPO connector

1,2,3) CPS in parallel