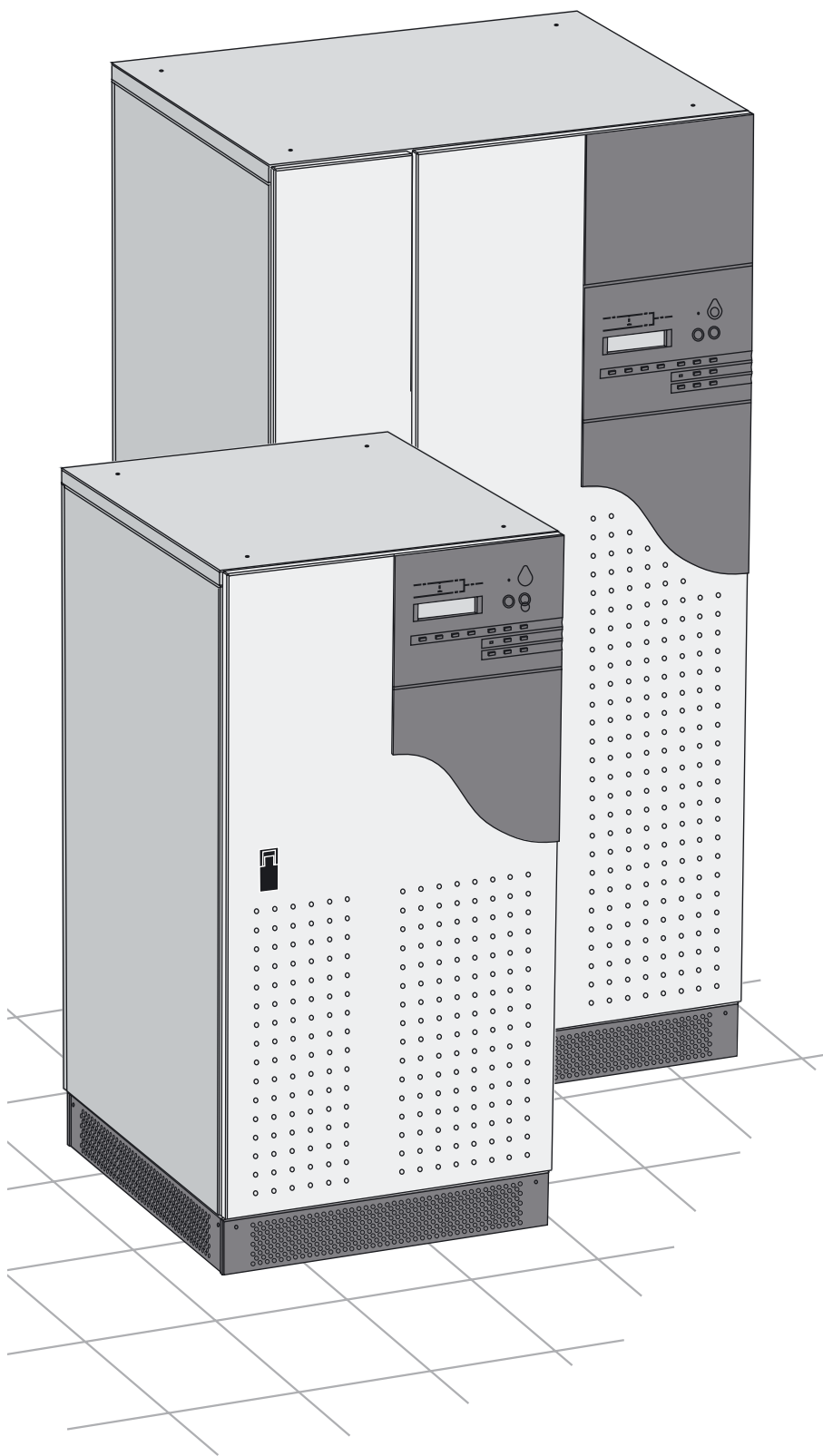


MGE™ Galaxy™ PW

20 - 200 kVA

User manual



APC®

by Schneider Electric

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General characteristics of MGE™ Galaxy™ PW UPSs

UPS power rating in kVA	20	30	40	50	60	80	100	120	160	200	
Normal AC input											
number of conductors	3 phases										
rated voltage and tolerances	380 V or 400 V or 415 V \pm 10% (adjustable to \pm 15%)										
rated frequency and tolerances	50 Hz or 60 Hz / \pm 10%										
THDI with THM filter	< 4%										
power factor with THM filter	up to 0,96										
Bypass AC input											
number of conductors	3 phases + neutral										
rated voltage and tolerances	380 V or 400 V or 415 V / \pm 10%										
rated frequency and tolerances	50 Hz or 60 Hz / \pm 10%										
Load											
number of conductors	3 phases + neutral										
Ph/Ph voltages	380 V or 400 V or 415 V (according to setting)										
Ph/N voltages	220 V or 230 V or 240 V (according to setting)										
voltage fluctuations	\pm 0,5%										
adjustable frequency and tolerances (on battery power)	50 Hz or 60 Hz \pm 0,05 Hz										
synchronisation with bypass	\pm 0,5 Hz (adjustable from \pm 0,25 Hz to \pm 2 Hz)										
voltage variation for 0 to 100% load step change	\pm 2% ((with battery)										
permissible overloads	150% for 1 minute, 125% for 10 minutes										
Isc Ph/Ph (% of I rated)	4.2	2.8	2.1	2.5	2.1	3.1	2.5	2.1	2.6	2.1	
Isc Ph/N (% of I rated)	6.6	4.4	3.3	4	3.3	5	4	3.3	4	3.3	
THDU Ph/Ph and Ph/N for linear load	< 1,5% Ph/Ph, < 2% Ph/N										
THDU Ph/Ph and Ph/N for non-linear load (at 80% of Pn) (1)	< 2% Ph/Ph, < 3% Ph/N										
Battery											
standard battery type	gas-recombination sealed lead-acid battery										
UPS characteristics											
active power (kW)	16	24	32	40	48	64	80	96	128	160	
efficiency at 50% load (%) (values \pm 1%)	87.5	90.5	91.5	92.5	93	91	91.5	92	93	93.2	
efficiency at 100% load (%) (values \pm 1%)	91.5	92	91.5	93	92	92.5	92	91.5	92.8	92.5	
heat losses (2)	in KW	1.5	2.1	3.4	3.6	4.7	6.2	8.1	10.1	12.2	14.8
	in cal./s	360	504	816	864	984	1488	1950	2420	2930	3550
storage temperature range	-25 °C to +70 °C										
operating temperature range	0 °C to 35 °C (40 °C for 8 hours)										
relative humidity	95% maximum										
maximum operating altitude without derating	< 1000 meters										
noise level (dBA)	58	58	58	60	60	62	64	65	67	68	
dimensions (mm)	width	715					1015			1215	
	depth	825									
	height	1400 or 1900 \pm 10					1900 \pm 10				
weight (kg) (3)	450	450	450	490	490	800	800	800	1200	1200	
recommended upstream earth-fault protection	1 A										
standards	design	IEC 146									
	product	ENV 50091									
	safety	IEC 950, ENV 50091									
	protection	IEC 521 (cubicles 1400 mm high = IP 21, cubicles 1900 mm high = IP 20)									
	electromagnetic compatibility	IEC 62040, ENV 50091									

(1): As per standards ENV 50091-3 / IEC 62040-3.

(2): The losses indicated are those produced at full rated load with the battery float charging. They must be taken into account when sizing the ventilation system.

(3): Not including any built-in options, such as harmonic filters or a bypass AC-source isolation transformer.

Introduction (cont.)

System description

(see figure 1)

- ▶ a rectifier/charger module **(A)** converts 3-phase AC power from the normal AC source supply **(1)** into DC power for the normal inverter input and float charges or recharges the battery;
- ▶ a battery unit **(D)** provides backup power for the inverter in the event of a voltage drop or a normal AC source failure;
- ▶ an inverter module **(B)** converts the DC power supplied by the rectifier/charger module or the battery unit into 3-phase AC power for the load;
- ▶ a static bypass module **(C)** ensures the instantaneous transfer of the load to the bypass AC source input in the event of an inverter shutdown (initiated by the user or by a protective device) or a sudden overload;
- ▶ a maintenance bypass isolates the UPS for maintenance and transfers the load to bypass AC source input without interrupting the supply of power. The maintenance bypass is made up of three manual switches (Q3BP, Q4S and Q5N).

Note

- ▶ the normal AC input and the bypass AC input have different functions and, depending on the installation, may be protected differently upstream and/or come from different sources.
- ▶ frequency converters are available without backup batteries;
- ▶ the static bypass line and the maintenance bypass line do not exist in installations where the load frequency and the bypass AC source frequency are different (for example in frequency converters);
- ▶ when increased power is required, several **MGE™ Galaxy™ PW** units may be connected in parallel. In this configuration, an "isolation" function is added for the UPS system as a whole for maintenance purposes, without interrupting the supply of power to the load.

The system may also include :

- ▶ an isolating transformer on bypass AC input;
- ▶ a passive harmonic filter (FAH) on the normal AC input;
- ▶ an active harmonic conditioner on the normal AC input;
- ▶ different remote control, indication and display systems.

Schematic diagram of the MGE™ Galaxy™ PW system

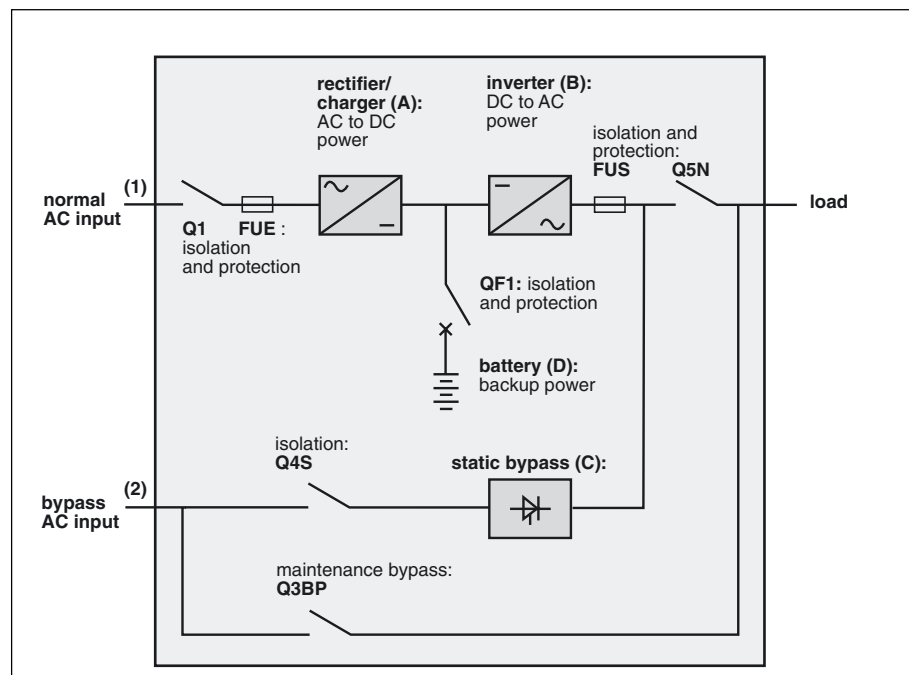


Fig. 1

Different types of MGE™ Galaxy™ PW systems

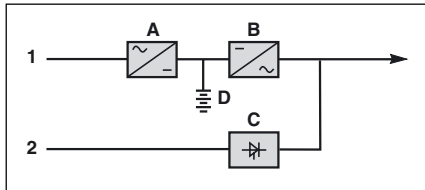


Fig. 2

Single-UPS unit

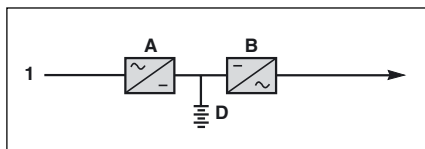


Fig. 3

Frequency converter with battery backup power

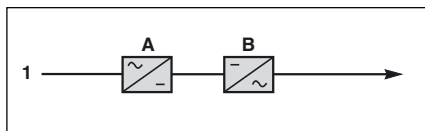


Fig. 4

Frequency converter without battery backup power

Parallel UPS system

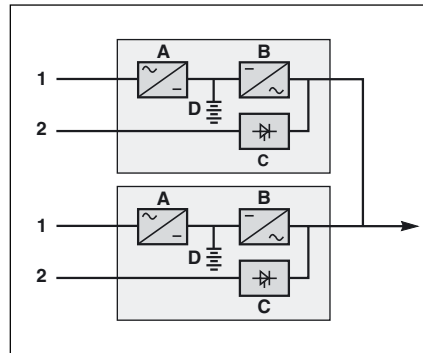


Fig. 5

See figure 5 showing two parallel-connected (redundant) UPS units. A static bypass (C) does not exist in parallel-connected frequency-converter

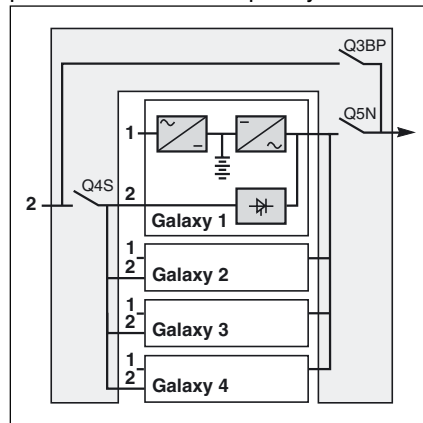


Fig. 6

configurations.

When increased power is required (two to four parallel units), an external bypass must be added (see figure 6).

Isolation and protection devices

(See figure 1 on previous page):

- ▶ **Q1** (switch):
 - ▷ isolation of the rectifier/charger (A) from the normal AC source (1);
 - ▷ rectifier/charger (A) start-up;
- ▶ **QF1** (circuit breaker):
 - ▷ battery (D) protection and isolation;
- ▶ **Q5N** (switch):
 - ▷ isolation of the UPS (B) from the load;
- ▶ **Q4S** (switch):
 - ▷ isolation of the static bypass (C) from the bypass AC source (2);
- ▶ **Q3BP** (switch):
 - ▷ bypass switch for maintenance;
- ▶ **FUE** (fuses):
 - ▷ protection of the rectifier/charger (A) from the normal AC source;
- ▶ **FUS** (fuses):
 - ▷ protection of the inverter (B) from the load.

Note:

- ▶ switch Q3BP does not exist on parallel UPS systems constituted to increase available power;
- ▶ the "Q3BP" and "Q4S" switches do not exist on frequency converters;
- ▶ circuit breaker QF1 does not exist on installations without batteries.

External bypass for parallel UPSs and the hot-swap option

See figure 6.

- ▶ **Q5N** (switch): isolation of the inverters of all the parallel UPS systems from the load;
- ▶ **Q4S** (switch): isolation of the static bypasses (C) on each parallel unit from the bypass AC source (2);
- ▶ **Q3BP** (switch): bypass switch for maintenance.

Introduction (cont.)

Operation in on-line mode

Normal operation

Normal AC source power is available (see figure 7).

► lights ①, ④ and ⑤ shine green on the control panel;

► the power necessary for the load is provided by the normal AC source (1) through the rectifier/charger (A) and the inverter (B);

► the rectifier/charger (A) also supplies the power to float charge and recharge the battery if any.

The rectifier/charger output voltage (DC) is regulated to supply:

▷ the float-charging or the recharging voltage for vented lead-acid or Ni/Cd batteries,

▷ a single charge voltage for sealed lead-acid batteries.

The voltages depend on the number of battery cells and the battery manufacturer. Factory set, they may also be adjusted by after-sales support technicians.

An electronic board continuously measures the battery temperature and automatically adjusts the voltages.

Note:

In parallel MGE™ Galaxy™ PW systems, the power drawn by the load is equally shared between the different

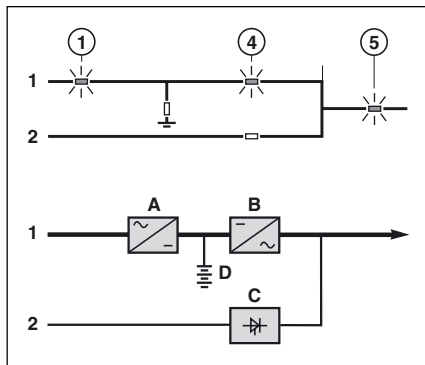


Fig. 7

units.

Operation with the normal AC source down

See figure 8.

In the event of a normal AC source failure or voltage outside specified tolerances of $\pm 10\%$ in amplitude ($\pm 15\%$ optionally), the rectifier/charger (A) stops and the battery (D) supplies the necessary backup power to the load via the inverter (B). The battery, float-connected between the rectifier/charger and the inverter, discharges during this operating mode.

Lights ②, ④ and ⑤ shine green.

The user is warned of battery operation by the slow beeping of the buzzer ⑥ (see figure 19) and the message "LOAD PROTECTED, BATTERY DISCHARGING", followed by the remaining backup time and the percent load.

This information is also available via volt-free changeover contacts for remote control devices.

Note:

In the event of a normal AC source failure, frequency converters without a battery shut down and the load is no

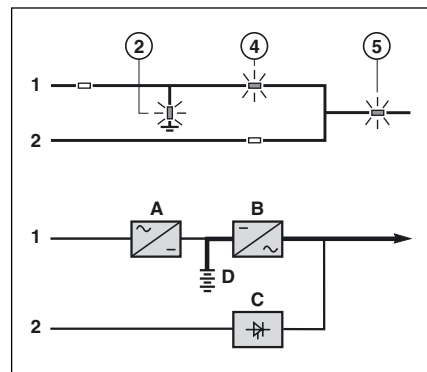


Fig. 8

longer supplied.

Battery time

The available battery time during a normal AC source outage depends on the:

- rated capacity of the battery;
- power consumed by the load;
- temperature of the battery;
- age of the battery.

The specified battery time corresponds to a minimum duration at full rated load. The actual backup time can therefore be greater if the system operates below its full rated load during the normal AC source outage. Operation on battery power can be extended beyond the specified time by reducing the load power consumption (by disconnecting non-critical loads).

A "low battery" warning signal is sent via volt-free changeover contacts for remote control devices when the battery voltage reaches a level slightly above the minimum level. This signal warns the user of the imminent end of battery power. On the device itself, the buzzer beeps rapidly.

The message "LOW-BATTERY SHUTDOWN WARNING" is displayed, followed by the remaining backup time and the percent load. Light ② turns red and flashes.

Battery power stops when the voltage supplied by the battery reaches the minimum threshold (335 V). This results in inverter shutdown and transfer of the load without interruption to the bypass AC source. Light ② shines red (not flashing). The message "LOAD NOT PROTECTED, ON-LINE MODE" is displayed and the buzzer sounds continuously.

If the bypass AC source also fails, the load is no longer supplied. The inverter automatically shuts down when the time on battery power exceeds three times the specified backup time.

Note:

The "low battery shutdown" warning signal can be sent with an adjustable time delay prior to the effective end of battery power.

Operation with the normal AC source restored

See figure 9.

When normal AC source power (1) is restored or its voltage returns to within specified tolerances, the system automatically returns to its normal operating mode described above (on the condition it did not reach the end of battery power). If the end of battery power was reached (with the resulting inverter shutdown), the rectifier/charger (A) restarts automatically, but the inverter (B) must be restarted manually. The rectifier/charger recharges the battery (D) which was discharged during the mains outage. During battery charging, light (2) flashes green. The message "BATTERY CHARGING" is displayed, together with the value of the recharging current and battery voltage.

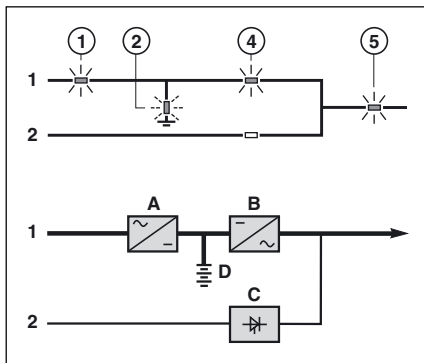


Fig. 9

The battery charge cycle takes place in two steps (see figure 10):

► **step 1:** the battery is recharged at a constant current limited to $0.1C_{10}$ (i.e. 1/10th of the battery capacity specified for a 10 hour discharge). The DC voltage increases with the battery charge until the charge level is reached;

► **step 2:** the battery is recharged at constant voltage equal to the charge level (maximum value 463 V). The charging current gradually decreases until reaching a specified low value (floating current).

For vented lead-acid batteries, the rectifier/charger supplies the charging voltage for 0 to 255 hours (parameter defined by the after-sales support department) and then the floating voltage. For sealed lead-acid batteries, the charging and floating voltages are the same.

Note 1:

If the normal AC source failure is shorter than 0 to 255 seconds (default value = 30 seconds) (parameter defined by after-sales support department), the charger automatically supplies the floating voltage given the low battery discharge.

Note 2:

In frequency converters without battery power, the return of normal AC source power results in the automatic restart of the rectifier/charger and the inverter.

Battery charge cycle

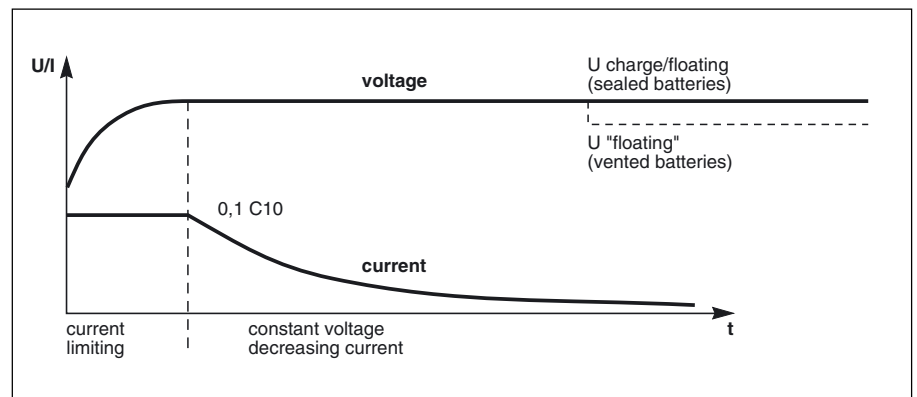


Fig. 10

Introduction (cont.)

Operation in "ECO" mode

Normal operation

See figure 11.

The power required by the load is supplied by the bypass AC source (2), via the static bypass (C). The rectifier/charger (A) supplies the power required to float charge and recharge the battery (D).

Lights (1), (3) and (5) shine green and light (4) flashes green. The message "LOAD PROTECTED, ECO MODE" is displayed.

Operation with the bypass AC source outside tolerances

Whatever the status of the normal AC source, operation of the rectifier/charger (A) with the battery (D) is identical to that presented in the section on on-line mode operation above.

When bypass AC source (2) characteristics are outside tolerances (voltage: $\pm 10\%$; frequency as per personalisation; phase sync with inverter $\pm 3^\circ$), the load is supplied via the inverter (B).

From then on, the minimum operating time on the inverter (B) is 2 minutes even if the bypass AC source returns to within specified tolerances. Refer to figure 7 in the general appendix if the normal AC source is present, and to figure 8 if it is absent. After this 2 minute period, the load is immediately transferred to the bypass AC source when the latter returns to within specified tolerances.

Note:

The maximum transfer time of the load from the static bypass (C) to the inverter (B) is 15 ms.

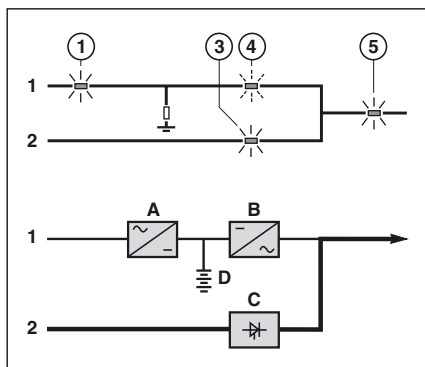


Fig. 11

Operation with bypass AC source restored

no battery discharge (see figure 11). When bypass AC source power supply (2) is restored or returns to within specified tolerances, the load is transferred back to the static bypass (C), without an interruption in the supply of power.

Note: this operating mode does not depend on the status of the normal AC source, which may be within or outside the specified tolerances.

after battery discharge (see figure 12).

Operation of the rectifier/charger (A) with the battery (D) is identical to that presented in the section on on-line mode operation above.

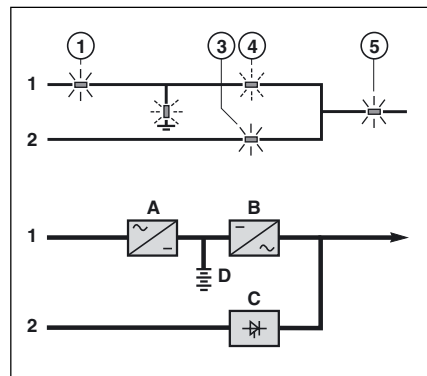


Fig. 12

Forced transfer and return transfer

forced transfer. When the load is supplied via the static bypass (C), it may be transferred to the inverter (B) by pressing pushbutton (20) (see figure 19 in the "control panel" section). The message "FORCED TRANSFER TO INVERTER REQUESTED, POWER TO LOAD MAY BE INTERRUPTED" is displayed. Confirmation by pressing pushbutton (12) is required to effectively force transfer. The message "LOAD FORCED TO INVERTER, ECO MODE" is displayed. Whatever the status of the bypass AC source, a return to normal operation in "ECO" mode is possible only through a forced return transfer to the static bypass (C).

forced disconnection: as the load is supplied by the inverter (B), it can be transferred to the bypass AC source (M2) via the static bypass (C) by pressing the pushbutton (20). The message "FORCED TRANSFER TO M2 REQUESTED, POWER TO LOAD MAY BE INTERRUPTED" is then displayed. Confirmation by pressing pushbutton (12) is required for disconnection.

Note:

There are two possibilities: the bypass AC source is within tolerances or outside tolerances. In the first case, the UPS in "ECO" mode returns to normal operation.

In the second case, the transfer will take place with a power cut to the load if the bypass AC source is present, or the load will cease to be supplied if it is absent. In both cases, the display reads "LOAD NOT PROTECTED, ECO MODE".

Caution:

Return to normal operation of the installation in the "ECO" mode is possible only after the bypass AC source has returned to within specified tolerances.

Inverter shutdown or overload

See figure 13 for devices or installations operating in on-line mode with a bypass AC source.

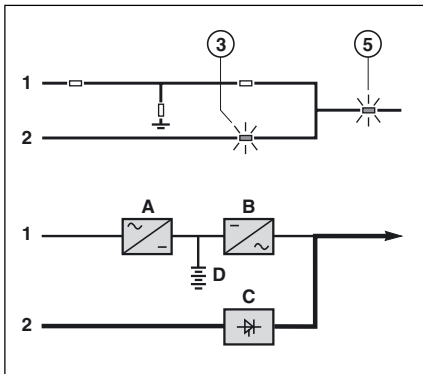


Fig. 13

Single-UPS unit (on-line or "ECO" mode)

▶ in the event of a UPS shutdown (initiated by the user or by an internal protective device), the load is automatically transferred to the bypass AC source. If transfer conditions are satisfied, transfer takes place instantly, without interruption to the load;

Note: transfer conditions are not satisfied when bypass AC source characteristics are outside tolerances (voltage: $\pm 10\%$; frequency as per personalisation; phase sync with inverter $\pm 3^\circ$);

▶ in the event of a major transient overload (greater than $1.65 I_n$), immediate transfer takes place as above, without interruption to the load. The return to the inverter is automatic when the overload disappears if the number of possible returns has not been reached (0 to 255, programmable by personalisation). If this number has been reached, the load continues to be supplied by the bypass AC source. This operating mode allows start-up of load devices causing high inrush currents. This system requires satisfied transfer conditions.

If the conditions are not satisfied, the inverter will current limit to 165% of its rated current for 1 second before stopping;

▶ in the event of a small but extended overload (i.e. a continuous level of power exceeding the full rated load), the inverter will continue to supply power for a period depending on the magnitude of the overload (10 minutes for a 125% overload, 1 minute for a 150% overload). See the overload curve in figure 14;

▶ in all three of the above cases, inverter shutdown and supply of the load via the bypass AC source results in the following on the control panel:

- ▷ light (4) goes off,
- ▷ activation of the buzzer (continuous beep),
- ▷ light (3) shines green,
- ▷ the message "LOAD NOT PROTECTED, ON-LINE MODE" is displayed.

Parallel UPSs without redundancy

The shutdown of one inverter results in overload on the other inverters in operation. Two cases may then arise:

- ▶ if the overload on each remaining inverter is \geq than $1.65 I_n$, the load is immediately transferred to the bypass AC source;
- ▶ if the overload is less than $1.65 I_n$, the remaining inverters support the overload (see curve in figure 14), and the load is transferred to the bypass AC source;
- ▶ after this transfer:
 - ▷ the light (4) goes off,
 - ▷ the buzzer is activated and sounds continuously,
 - ▷ the light (3) goes on and turns green,
 - ▷ the message "LOAD NOT PROTECTED, PARALLEL ON-LINE MODE" is displayed.

Parallel UPSs with redundancy

▶ the shutdown of one UPS unit is of no consequence for the load. The others each take up an equal amount of load power and the load continues to be supplied normally;

Unit shutdown results in the following on the control panel:

- ▷ lights (4) and (5) go off,
- ▷ activation of the buzzer (continuous beep),
- ▷ the message "LOAD NOT PROTECTED, PARALLEL ON-LINE MODE" is displayed;
- ▶ in the event of an overload, the system only loses its redundancy as long as the overload is less than the total rated power of the functioning units. If the overload is greater, the operating mode is that previously described for systems without redundancy.

Frequency converters

▶ in the event of a shutdown, the load is no longer supplied with power;

▶ in the event of a major transient overload (greater than $1.65 I_n$), the inverter will current limit to 165% of their rated current for 1 second before stopping;

▶ in the event of a smaller but prolonged overload, the inverter respects the same overload curve as the single inverter and shuts down;

▶ in all three of the above cases, inverter shutdown results in the following:

- ▷ lights (4) and (5) go off,
- ▷ activation of the buzzer (continuous beep),
- ▷ the message "LOAD NOT PROTECTED, ON-LINE MODE" is displayed.

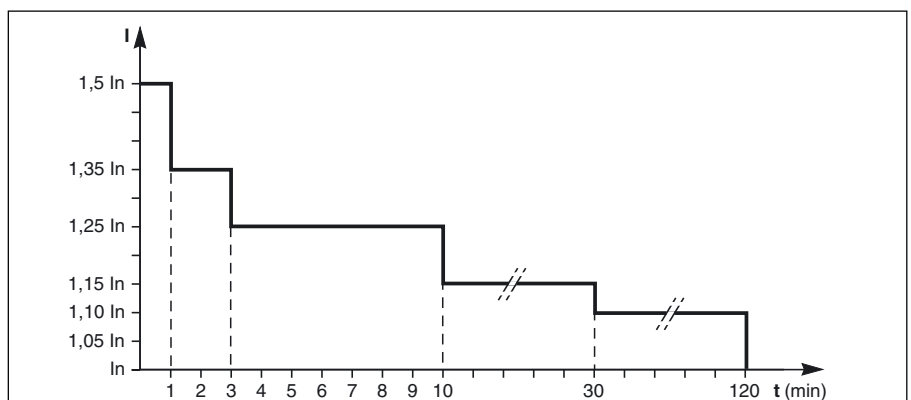


Fig. 14

Introduction (cont.)

Operation with an engine generator set

See figure 15 below.

If a stand-by generator is included in the installation, it is generally started automatically in the event of a normal AC source failure and connected to the main low voltage switchboard. It is disconnected when normal AC source power is restored.

With such a system, the required battery time may be reduced to the time necessary for starting and bringing on line the stand-by generator. The battery (D) supplies power to the inverter (B) during the transfers:

- ▶ normal AC source to the generator;
- ▶ generator to the normal AC source.

The transfer sequences described above (normal AC source → battery, battery → generator, generator → battery, and battery → normal AC source) are fully automatic. They in no way affect the load and require no manual operation by the user.

Note:

To avoid load surges on the generator, the rectifier/charger is started with a 10 second maximum current consumption walk-in (lasting 3 to 10 seconds, depending on the percent load).

To avoid overloading an undersized engine generator set, it is possible to set a maximum power level drawn by the normal AC input. Any additional power required is supplied by the battery. This modification can be made on site by an APC by Schneider Electric technician.

Output voltage quality and continuity

The output voltage is stable in amplitude and frequency and is free of interruptions or transients outside specified tolerances, irrespective of normal AC source or load disturbances (outages, load step changes, etc.).

Steady state voltage regulation

For stable or slowly varying load conditions, the inverter output voltage is regulated to within $\pm 0.5\%$ in amplitude. The frequency of the output voltage can theoretically be regulated to within 0.1% of the rated value, however the output frequency range may be intentionally extended to a maximum of ± 2 Hz so that the inverter can remain synchronised with the bypass AC source and its inherent frequency fluctuations, thus enabling transfer of the load to the bypass line at any time.

Note:

The output frequency range can be personalised and if necessary modified on the customer site by a qualified APC by Schneider Electric support technician from ± 0.25 Hz to ± 2 Hz in 0.25 HZ steps.

When the bypass AC source voltage moves outside this frequency range, the inverter is desynchronised and operates in "free running" mode, with the output frequency regulated to a high level of accuracy by a quartz oscillator.

When the bypass AC source frequency returns to within the specified tolerances, the inverter is gradually re-synchronised to the bypass line at a rate of 0.5 Hz to 2 Hz/s (as per the value personalised by the after-sales support department), thus avoiding exposing the load to sudden frequency variations.

Transient voltage regulation

The inverter output voltage is not notably affected by instantaneous major variations in load characteristics. This is made possible by the PWM (Pulse Width Modulation) chopping technique and the microprocessor-based regulation system that instantly compensates for any variation. In particular, the inverter output voltage remains within $\pm 2\%$ of the rated voltage for load step changes of 0 to 100% or of 100 to 0%.

Example of an installation with an engine generator set

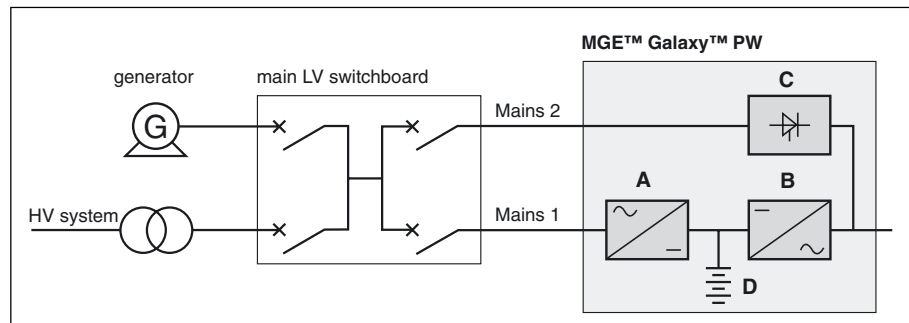


Fig. 15

Description of MGE™ Galaxy™ PW cubicles

UPS cubicle

The rated outputs for **MGE™ Galaxy™ PW** UPSs (or frequency converters) are 20, 30, 40, 50, 60, 80, 100, 120, 160 and 200kVA. See figure 16 for the layout of the various cubicle components.

Legend for figure 16:

- 1 - rectifier/charger module,
- 2 - inverter module,
- 3 - static-bypass module,
- 4 - cage for electronic control boards,
- 5 - rectifier/charger input fuses "FUE",
- 6 - inverter output fuses "FUS",
- 7 - normal AC input switch Q1,
- 8 - bypass AC input switch Q4S (single or redundant parallel UPSs),
- 9 - maintenance bypass switch Q3BP (single or redundant parallel UPSs),
- 10 - output switch Q5N,
- 11 - display board,
- 12 - Media Contacts 11 remote indications board.

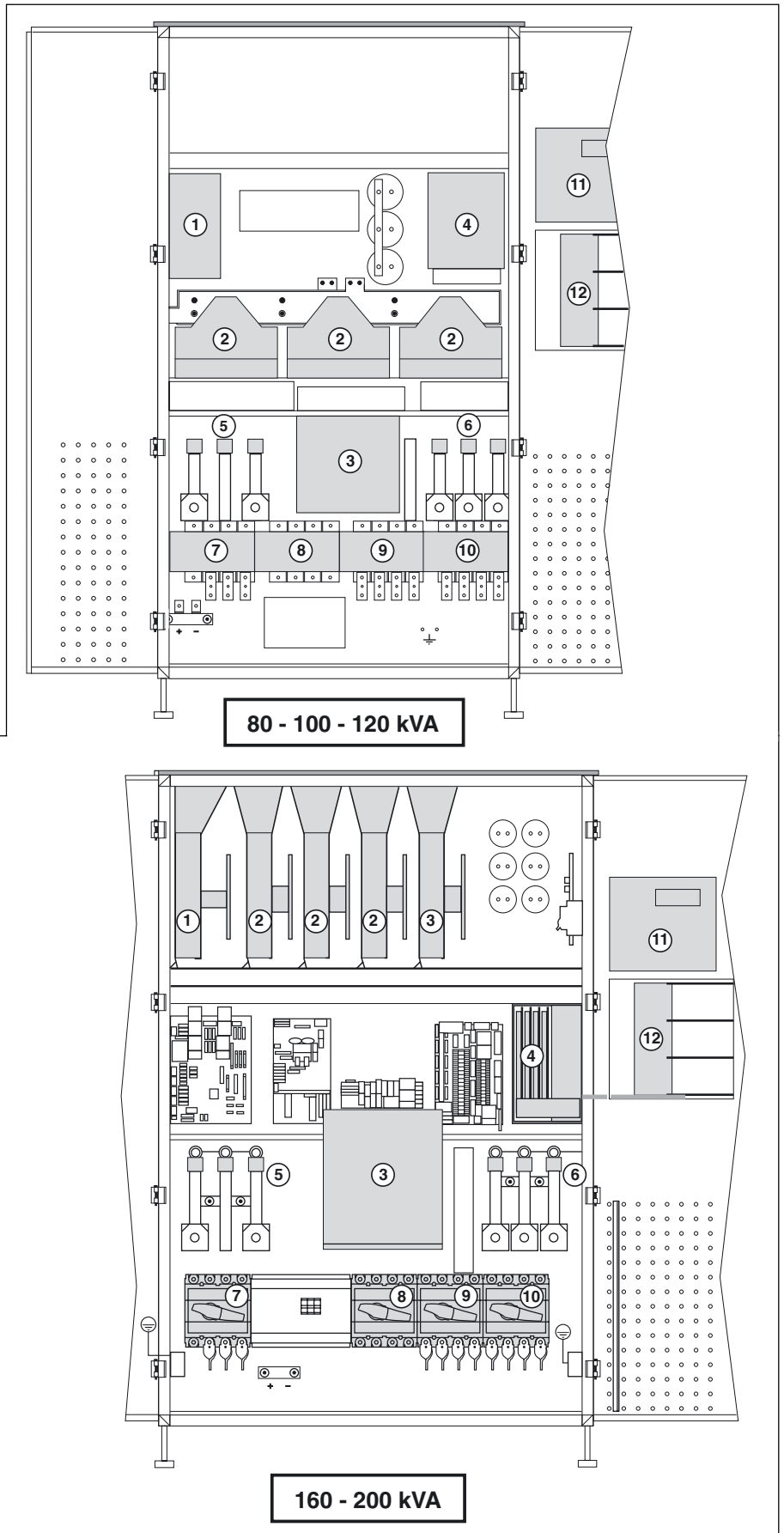


Fig. 16

Control panel

Battery cubicle

Figure 17 shows an example of component layout in a battery cubicle or a battery circuit-breaker enclosure.

Legend for figure 17:

- 1 - battery isolation and protection circuit breaker QF1,
- 2 - battery cells.

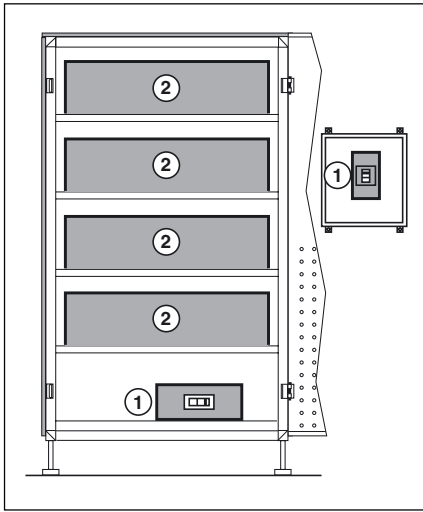


Fig. 17

General

The control panel on **MGE™ Galaxy™ PW** UPSs comprises the basic controls and indications required to check the general status of the system (see figure 19).

Located in the upper right part of the cubicle front, the control panel is designed to provide an easy and rapid overview of system status (see figure 19 on next page).

Interpretation of symbols is very simple and requires no particular training. The information concerns only the cubicle on which the panel is located. The panel indicates:

- ▶ normal operation (load protected);
- ▶ operation with load on battery power;
- ▶ abnormal situations (operating problem);
- ▶ dangerous situations (load not protected).

Note:

The information on the bypass AC source provided below does not concern frequency converters. Information on batteries does not concern frequency converters without batteries.

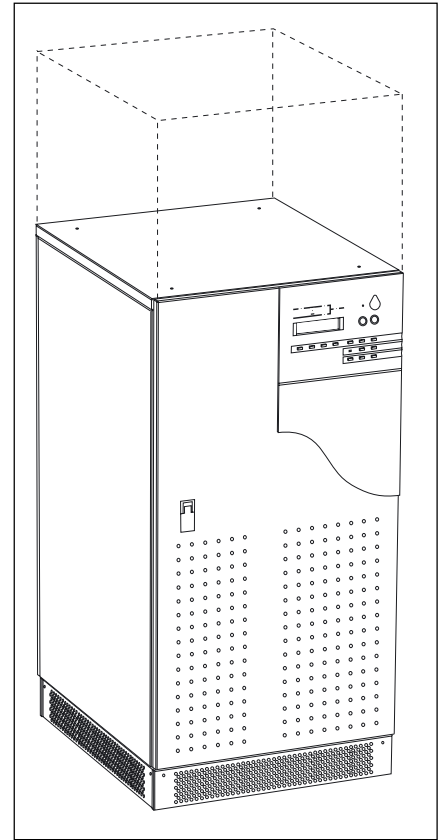


Fig. 18

Presentation

See figure 19.

"Rectifier/charger" light ①

- ▶ light off: rectifier/charger OFF;
- ▶ light shines green: rectifier/charger ON;
- ▶ light shines red: rectifier/charger fault, the stored alarm indicates one or several of the following faults:
 - ▷ input switch Q1 open,
 - ▷ protection fuse at the rectifier/charger input (FUE) blown,
 - ▷ abnormally high internal rectifier/charger temperature,
 - ▷ abnormally high battery charge current,
 - ▷ abnormally high battery voltage,
 - ▷ fault, non-calibration or non-personalisation of the electronic control board for the rectifier/charger,
 - ▷ fault on the electronic power-supply board.

"Battery light" ②

- ▶ light off: battery float charging;
- ▶ light flashing green: battery recharging;
- ▶ light shines green: load on battery power;
- ▶ light flashing red: low-battery shutdown warning;
- ▶ light shines red: battery at end of backup time and circuit breaker QF1 open, or battery fault.

"Static-bypass" light ③

- ▶ light off: bypass AC source within specified tolerances and static bypass open;
- ▶ light shines green: static bypass closed;
- ▶ light shines red: the stored alarm indicates one or several of the following faults:
 - ▷ bypass AC source voltage or frequency outside specified tolerances,
 - ▷ static-bypass fault,
 - ▷ abnormally high internal static-bypass temperature,
 - ▷ static-bypass ventilation fault,
 - ▷ power-supply fault for the static-bypass control function,
 - ▷ fault on the electronic board controlling the transfer function,
 - ▷ non-calibration or non-personalisation of the electronic control board for the inverter,
 - ▷ fault on the electronic power-supply board,
 - ▷ fault on monitoring the "inverter ready" response channels (parallel UPS system).

"Inverter" light ④

- ▶ light off: inverter OFF;
- ▶ light flashing green: inverter starting, inverter ON but not connected to the load;
- ▶ light shines green: normal inverter operation;
- ▶ light shines red: inverter fault, the stored alarm indicates one or several of the following faults:
 - ▷ inverter shutdown due to inverter output voltage outside specified tolerances,
 - ▷ protection fuse at the inverter output (FUS) blown,
 - ▷ abnormally high inverter-output transformer temperature,
 - ▷ abnormally high inverter temperature,
 - ▷ output-voltage fault (amplitude or phase) (parallel UPSs),
 - ▷ fault, non-calibration or non-personalisation of the electronic control board for the inverter,
 - ▷ fault on the electronic power-supply board.

"Load" light ⑤

- ▶ light off: load not supplied;
- ▶ light shines green: load supplied via the inverter or the bypass AC source (via the static bypass).

Buzzer ⑥

The buzzer sounds in the following situations:

- ▶ load supplied by the bypass AC source;
- ▶ load on battery;
- ▶ operating problems.

It sounds slowly and discontinuously for a minor problem or when the inverter is on battery power.

When the alarm "LOW BATTERY SHUTDOWN" is activated, the buzzer sounds more rapidly. Finally, if the inverter shuts down, the beep is loud and continuous. The buzzer may be reset by pressing a button. If the buzzer is reset, a higher level alarm will set it off again.

"Full-shutdown" button ⑦

Pressing this button shuts down the entire UPS (shutdown of the inverter and rectifier/charger, opening of the battery circuit breaker and activation of a relay contact on the Media Contacts 11 board).

"Inverter ON" button ⑧

This button is used to start the inverter locally.

"Inverter OFF" button ⑨

This button turns the inverter off locally.

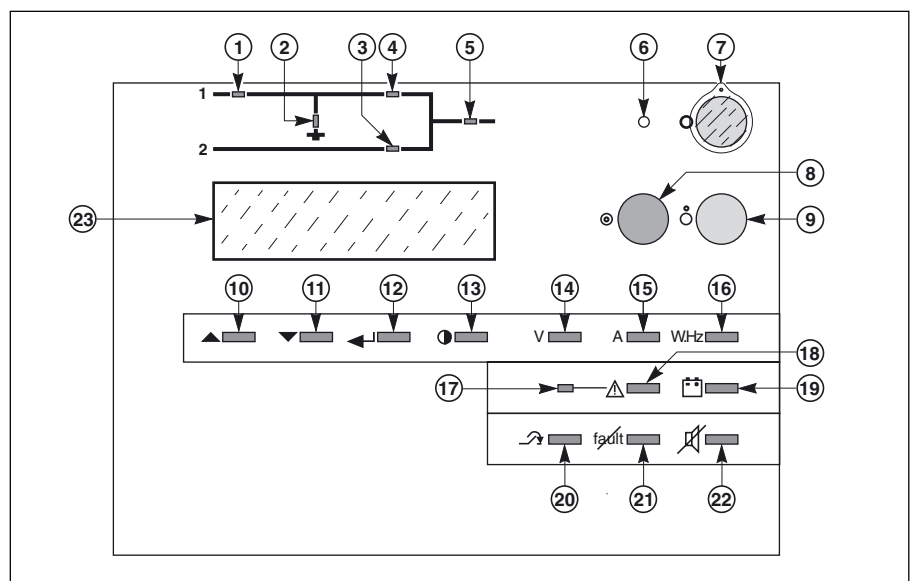


Fig. 19

Control panel (cont.)

Keys ⑩ and ⑪

These keys are used to select commands in the main menu and access the secondary messages.

Key ⑫

This key is used to validate the user's choice.

Key ⑬

This key is used to access the main menu: display language, display-contrast setting, sound level of the buzzer, lamp test, date and time settings, inverse-video and event log.

"V" key ⑭

This key is used to access voltage measurements:

- ▶ normal AC source phase-to-phase voltages;
- ▶ bypass AC source phase-to-phase and phase-to-neutral voltages;
- ▶ load phase-to-phase and phase-to-neutral voltages.

"A" key ⑮

This key is used to access current measurements:

- ▶ normal AC source, bypass AC source and load currents;
- ▶ percent load;
- ▶ load crest factor.

"W.Hz" key ⑯

This key is used to access other measurements:

- ▶ normal AC source, bypass AC source and inverter frequencies;
- ▶ level of active and apparent power drawn by the load;
- ▶ load power factor;
- ▶ inverter load level (percent).

"Anomaly" indicator light ⑰

This indicator light indicates the presence of anomalies.

key ⑱

This key is used to access the primary messages.

"Battery" key ⑲

This key is used to access battery measurements:

- ▶ battery voltage (or the DC voltage on frequency converters without a battery);
- ▶ battery current (charge or discharge);
- ▶ battery temperature;
- ▶ available battery backup time;
- ▶ inverter load level (percent).

"Forced-transfer" key ⑳

This key is used to voluntarily transfer the load to the inverter or from the inverter to the static bypass (return transfer). Transfer and return transfer are carried out only following confirmation requested by the system display and a warning as to the risk of an interruption in the supply of power to the load.

"Alarm reset" key ㉑

This key is used to reset stored alarms. The system accepts resetting only when alarms have been cleared.

"Buzzer reset" key ㉒

This key is used to stop the buzzer. However, new alarms set the buzzer off again.

Display ㉓

The display continuously indicates the system operating status.

System start-up

Single-UPS unit or redundant parallel UPS or UPS in "ECO" mode

See figure 20.

Proceed in the following order:

- ▶ close the upstream switches supplying normal and bypass AC source power (on the LV switchboard);
- ▶ close normal AC input switch Q1.

The system powers up:

- ▷ the rectifier/charger automatically starts,
- ▷ green light ① on the control panel goes on,
- ▷ light ② turns red;
- ▶ close bypass AC input switch Q4S;
- ▷ green lights ③ and ⑤ on the control panel go on;
- ▶ close inverter output switch Q5N;
- ▶ close battery circuit breaker QF1;
- ▷ light ② goes off;
- ▶ open maintenance bypass switch Q3BP;
- ▶ press the "inverter on" button ⑧ on the control panel:
- ▷ the green "inverter" light ④ flashes,
- ▷ the inverter starts, then, if the bypass AC source transfer conditions are satisfied, the load is transferred to the inverter if the on-line mode is selected, or the load remains on the static bypass if the "ECO" mode is selected,
- ▷ the green "static-bypass" light ③ goes off,
- ▷ the green "inverter" light ④ shines for on-line mode or flashes for "ECO" mode.

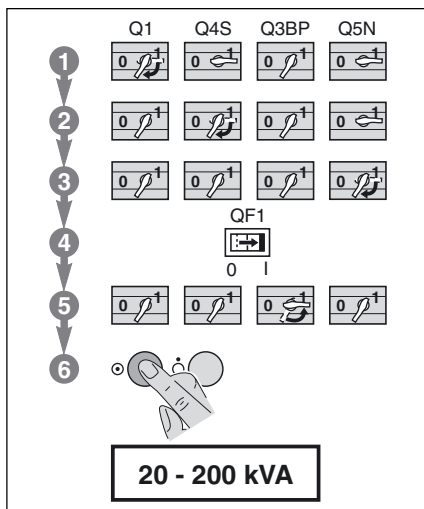


Fig. 20

Parallel UPS unit for increased output

See figure 21.

Proceed in the following order:

- ▶ check that all load devices are off or that the load is disconnected;
- ▶ close the upstream switch supplying normal AC source power (on the LV switchboard);
- ▶ close the normal AC input switches Q1 on the UPS units. The system powers up:

- ▷ the rectifier/chargers automatically start,
- ▷ the green "rectifier/charger" lights ① in the control panels go on,
- ▷ lights ② turn red;
- ▶ close the battery circuit breakers QF1;
- ▷ lights ② go off;
- ▶ close Mains 2 input switch Q4S in the external bypass unit:
- ▷ green lights ③ and ⑤ on the control panels go on;
- ▶ close output switches Q5N for the inverters and in the external bypass unit;
- ▶ open maintenance bypass switch Q3BP in the external bypass unit;
- ▶ press the "inverter on" button ⑧ on each control panel:
- ▷ the green "inverter" lights ④ flash;
- ▶ when a sufficient number of inverters are ready, the inverter-output contactors close:
- ▷ the green "inverter" lights ④ shine permanently green;
- ▷ the "static-bypass" lights ③ go off.

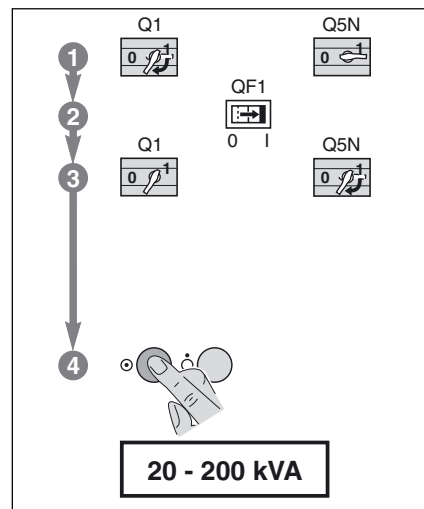


Fig. 21

Single-converter unit or redundant parallel converter unit

See figure 21.

Proceed in the following order:

- ▶ close the upstream switch supplying normal AC source power (on the LV switchboard);
- ▶ close normal AC input switch Q1.

The system powers up:

- ▷ the rectifier/charger automatically starts,
- ▷ green light ① on the control panel goes on;
- ▶ close battery circuit breaker QF1;
- ▶ close inverter output switch Q5N;
- ▶ press the "inverter on" button ⑧ on the control panel:
- ▷ the green "inverter" light ④ flashes,
- ▷ the inverter starts up, then connects. The load is then supplied by the inverter,
- ▷ the green light ④ shines permanently, and light ⑤ turns green.

Note:

Each time a device is switched on, a lamp test is run: all the lights turn orange for roughly 1 second. The message "autotest OK" is displayed until the first primary message is sent.

Start-up (cont.)

Start-up of a module

Start-up of a rectifier/charger

► rectifier/charger start-up is automatic when the normal AC input switch Q1 is closed:

- ▷ the green "rectifier/charger" light ① on the control panel goes on;
- close battery circuit breaker QF1.

Start-up of an inverter

When the rectifier/charger is on:

- press the "inverter ON" button ⑧ on the control panel;
- ▷ the green "inverter" light ④ flashes.

Single-UPS unit

► the inverter starts, then, if the bypass AC source transfer conditions are satisfied, the load is transferred to the inverter if the on-line mode is selected, or the load remains on the static bypass if the "ECO" mode is selected. For on-line mode:

- ▷ the green "inverter" light ④ remains on,
- ▷ the "static-bypass" light ③ goes off.
- For "ECO" mode:
 - ▷ the green "inverter" light ④ flashes,
 - ▷ the "static-bypass" light ③ remains on.

Parallel UPS unit

► the inverter starts and awaits the start of the other inverters;

► when they are all on or enough have been started to supply the rated load power, the output switch for each running inverter closes and the load is supplied with power:

- ▷ the green "static-bypass" light ③ goes off,
- ▷ the green "inverter" light ④ on the control panels of the running inverters goes on.

Single-converter unit

► the inverter starts up, then connects. The load is then supplied by the inverter:

- ▷ the green lights ④ and ⑤ go on.

Parallel-converter unit

► the inverter starts and awaits the start of the other inverters;

► when they are all on or enough have been started to supply the rated load power, the output switch for each running inverter closes and the load is supplied with power:

- ▷ the green lights ④ and ⑤ on the control panels of the running inverters go on.

Shutdown of the inverter

- ▶ press the "inverter OFF" button ⑨ on the control panel for three seconds (see figure 19).

Single-UPS unit

- ▶ the green "inverter" light ④ on the control panel goes off;
- ▶ the green "static-bypass" light ③ goes on;
- ▶ the inverter stops;
- ▶ if bypass AC source (Mains 2) transfer conditions are satisfied, the inverter shuts down and the load is transferred to the bypass AC source;
- ▶ if bypass AC source (Mains 2) transfer conditions are not satisfied, the inverter does not shut down. The message "MAINS 2 OUTSIDE TOLERANCES, TRANSFER DISABLED" is displayed.

UPS in "ECO" mode

- ▶ the green "inverter" light ④ on the control panel goes off;
- ▶ if the load was on the static bypass, nothing is changed;
- ▶ if the load was on the inverter:
 - ▷ the green "static-bypass" light ③ goes on,
 - ▷ if bypass AC source (Mains 2) transfer conditions are satisfied, the inverter shuts down and the load is transferred to the bypass AC source,
 - ▷ if bypass AC source (Mains 2) transfer conditions are not satisfied, the inverter does not shut down. The message "MAINS 2 OUTSIDE TOLERANCES, TRANSFER DISABLED" is displayed.

Single-converter unit

- ▶ the green lights ④ and ⑤ on the control panel go off;
- ▶ the inverter stops.

Parallel UPS unit

- ▶ if the system is redundant, i.e. the other parallel-connected inverters can supply the load on their own, the inverter shuts down and the green "inverter" light ④ goes off. The load is not affected in that the other inverters continue to supply it normally;
- ▶ if the system is not redundant, the other inverters go to overload status. If overload conditions are overrun, the load is transferred to the bypass AC source:
 - ▷ the green lights ③ turn green,
 - ▷ the green "inverter" light ④ goes off.

Parallel-converter unit

- ▶ the redundant system means that the other parallel inverters can supply the load unassisted. The inverter shuts down and the green "inverter" light ④ goes off. The load is not affected in that the other inverters continue to supply it normally;

Shutdown of a rectifier/charger

Except in frequency converters without a battery, it is recommended not to stop the rectifier/charger because the battery will no longer be charged. Except in the case of a test of the inverter on battery power, the rectifier/charger should be shutdown after the inverter to avoid unnecessary battery discharge.

Proceed in the following order:

- ▶ open battery circuit breaker QF1;
- ▶ open normal AC input switch Q1:
 - ▷ the rectifier/charger shuts down,
 - ▷ the green "rectifier/charger" light ① goes off.

Note:

In a frequency converter without a battery, rectifier/charger shutdown automatically results in inverter shutdown.

Control-panel display

General organisation

The display is structured around primary and secondary messages, measuring tables and setting screens. As a rule, the message displayed on the screen is always a primary one. The secondary messages, if any, are accessed by pressing keys (10) ▲ and (11) ▼ (see figure 19).

The presence of secondary messages is indicated by the arrow ↓ at the end of the primary message. Return to the primary messages is automatic if the keypad is not used for 2 minutes, or direct by pressing key (18) (see figure 19). The display screen lights up when a key is pressed, and goes off if no key is pressed for 5 minutes.

Note:

Most functions may be directly accessed. For example, when voltage measurements are currently displayed, it is possible to directly access current measurements by pressing the "A" button.

Display of messages

In addition to keypad operations, the graphical display brings up a window giving the overall device status. The message displayed is then said to be primary (see list in the paragraph below). A primary message can be used to access the measuring tables using keys (14), (15), (16) and (19) on the keypad (see figure 21 in the general appendix). The configuration screens can be accessed by pressing key (13). A flashing arrow appears at the end of a primary message if there is a problem or an alarm; secondary messages can be accessed by pressing key (10) on the keypad (see the list of secondary messages). The presence of another message is indicated by the arrows ↓ and ↑ at the end of the secondary message. They can be accessed by pressing keys (10) and (11) on the keypad.

The return to the primary message is automatic after a 2 minute time delay or by pressing key (18) on the keypad.

Display of alarms

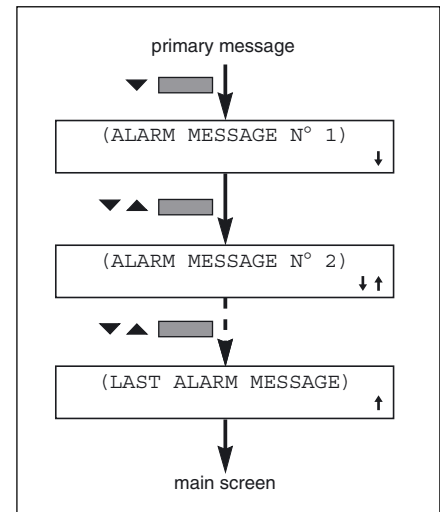


Fig. 22

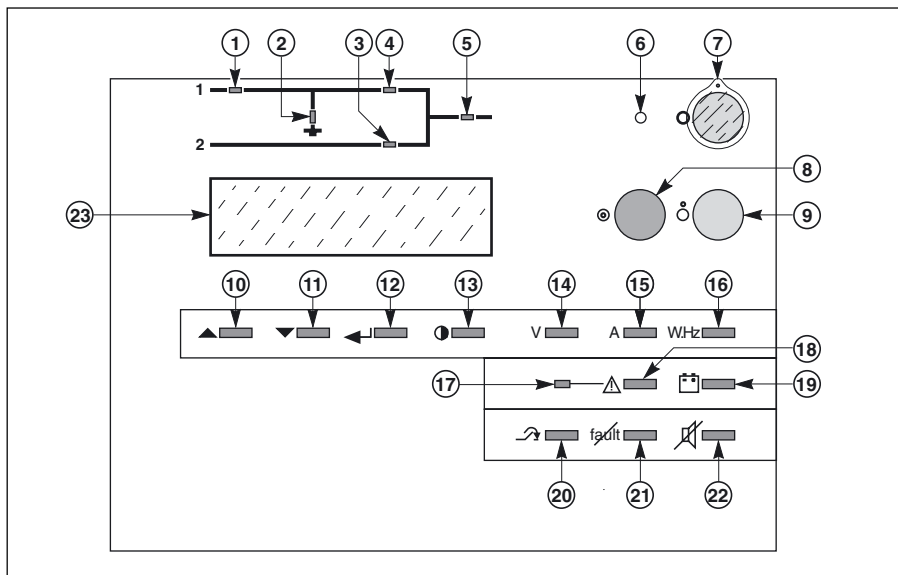


Fig. 19

List of primary messages

LOAD PROTECTED
ON-LINE MODE

This is the normal display when there are no alarms or problems and the load is correctly supplied by the inverter, in on-line mode.

LOAD PROTECTED
PARALLEL ON-LINE MODE

This is the normal display when there are no alarms or problems and the load is correctly supplied by the inverter in a parallel UPS system, in on-line mode.

LOAD NOT PROTECTED
ON-LINE MODE ↓

This display indicates that the load is not supplied by the inverter, or that there is no battery backup. The arrow ↓ indicates the presence of one or more problems specified in secondary messages.

The buzzer sounds continuously.

LOAD NOT PROTECTED
PARALLEL ON-LINE MODE ↓

Situation identical to that in the previous screen, but for parallel UPS systems.

LOAD PROTECTED
BATTERY DISCHARGING
Remaining battery time (min) = XX
% kW used = XXX

The load is supplied by the inverter, but the normal AC source is down or outside tolerances and power is supplied by the battery.

This message indicates the remaining battery time in minutes prior to inverter shutdown and the percent load. The battery time calculation takes into account:

- ▶ the percentage of full rated load power currently being drawn;
- ▶ the type of battery;
- ▶ battery temperature;
- ▶ battery age.

The buzzer sounds slowly and discontinuously.

LOAD PROTECTED,
LOW-BATTERY SHUTDOWN
WARNING,
Remaining battery time (min) = XX
% kW used = XXX

This message replaces the preceding if the power outage persists and the warning level has been reached.

The user is warned that the battery is about to shut down.

The buzzer sounds rapidly and discontinuously.

LOAD PROTECTED
ECO MODE

This is the normal display when there are no problems: the load is supplied by the inverter or the bypass AC source, and battery backup is available.

LOAD NOT PROTECTED
ECO MODE ↓

This display indicates that the load is supplied but has no battery backup. The arrow ↓ indicates the presence of one or more problems specified in secondary messages.

The buzzer sounds continuously.

LOAD FORCED TO INVERTER
ECO MODE

The load has been transferred to the inverter following a specific request by the user.

Control-panel display (cont.)

List of secondary messages

LOAD ON MAINS 2

The load has been transferred to the bypass AC source (M2) and is no longer protected (only in on-line mode). The buzzer sounds continuously.

MAINS 2 OUTSIDE TOLERANCES TRANSFER DISABLED CHECK MAINS 2

The bypass AC source (M2) frequency or voltage is outside tolerances and the inverter is unable to synchronise. Transfer of the load from the inverter to the bypass AC source (M2) or vice-versa will result in an interruption of the supply of power to the load. The buzzer sounds slowly and discontinuously.

BATTERY OVERTEMPERATURE, CHECK VENTILATION

The battery temperature is outside tolerances. The buzzer sounds slowly and discontinuously.

BATTERY ROOM VENTILATION FAULT, CHECK VENTILATION

A fault requiring servicing has occurred in the battery room ventilation system. The rectifier/charger shuts down after a 30-second time delay.

The user must take steps to re-establish correct operation of the ventilation system.

If a harmonic filter is present in the installation, this message also signals an abnormally high temperature in the filter inductor.

The buzzer sounds slowly and discontinuously.

MAINS 1 OUTSIDE TOLERANCES, CHECK MAINS 1

The normal AC source (M1) frequency or voltage is outside specified tolerances and the rectifier/charger has shut down. The inverter is on battery power.

MAINS 1 INPUT SWITCH Q1 IS OPEN

The normal AC input (M1) switch Q1 is open. It must be closed for rectifier/charger start-up. The buzzer sounds slowly and discontinuously.

INTERNAL UPS FAULT, LOAD TRANSFER FAULT, CALL MAINTENANCE

A fault has occurred in the static switch that transfers the load between the inverter and the bypass AC source (M2). Servicing by the after-sales support department is required. The buzzer sounds continuously.

OVERLOAD RATED CURRENT PER PHASE = XXX A CHECK LOAD LEVEL

This display informs the user that load current is greater than rated current, and gives the value. The buzzer sounds continuously.

UPS SHUTDOWN DUE TO AN OVERLOAD, CHECK LOAD LEVEL

This message follows the preceding when the overload persists. The UPS has shut down and the buzzer sounds continuously.

INVERTER NOT IN PHASE WITH MAINS 2. TRANSFER DISABLED, CHECK MAINS 2

The phase difference between the inverter and the bypass AC source (M2) is outside tolerances. Transfer of the load between the inverter and the bypass AC source (M2) will result in an interruption in the supply of power to the load.

For parallel UPSs, this message should be interpreted as meaning the phase difference between the inverter for which the message is displayed and the other inverters is outside tolerances.

UPS SHUTDOWN BY AN EXTERNAL COMMAND

The inverter has received a command to shut down. The command is in the form of a signal from received the remote-indications relay board which has been set for this function.

FREQUENCY CHANGE BY AN EXTERNAL COMMAND

The inverter has received a command to change its output frequency (50 Hz or 60 Hz). This command is not effective unless the inverter has first been shut down. The frequency is changed when the inverter is started again.

MAINS 2 INPUT SWITCH Q4S IS OPEN

The bypass AC source (M2) input switch Q4S is open, i.e. backup power for the load via the bypass AC source (M2) is not available.

INVERTER OUTPUT SWITCH Q5N IS OPEN

Inverter output switch Q5N is open, i.e. the load cannot be supplied via the inverter.

Control-panel display (cont.)

BYPASS SWITCH Q3BP
IS CLOSED

Maintenance bypass switch Q3BP is closed. The system is in maintenance configuration and the load is supplied by the bypass AC source.

STATIC SWITCH (M2) OFF
DUE TO AN OVERLOAD

The load is no longer supplied by the bypass AC source (M2), due to an extended overload. The buzzer sounds continuously.

BATTERY CHARGING
I BAT. = XXX A U BAT. = XXX V

The battery is currently being recharged.

BATTERY AT END OF SERVICE
LIFE
CALL MAINTENANCE

The battery is nearing the end of its estimated service life. This information is based on average service-life calculations since its initial installation. The buzzer sounds slowly and discontinuously.

EMERGENCY OFF OR FULL
SHUTDOWN

This message is displayed when either the external emergency-off pushbutton or the full-shutdown button (7) on the control panel are pressed. The result is:

- ▶ shutdown of the inverter;
- ▶ shutdown of the rectifier/charger;
- ▶ opening of the battery circuit breaker;
- ▶ activation of a relay contact on the remote-indications relay board.

To fully de-energise the installation, these functions must also open the external, upstream circuit breakers on the normal and bypass AC supply lines. The buzzer sounds continuously.

THE BATTERY C.B. QF1 IS OPEN,
CHECK THE INSTALLATION

Battery circuit breaker QF1 is open. The load is no longer protected because battery power is no longer available in the event of a normal AC source outage. The buzzer sounds continuously.

LOW BATTERY SHUTDOWN

The inverter has shut down at the end of battery power. The buzzer sounds continuously.

INTERNAL UPS FAULT,
INVERTER FAULT,
CALL MAINTENANCE

A fault has occurred in the inverter. Servicing by the after-sales support department is required. The buzzer sounds continuously.

INTERNAL UPS FAULT,
CHARGER FAULT,
CALL MAINTENANCE

A fault has occurred in the rectifier/charger. Servicing by the after-sales support department is required. The buzzer sounds slowly and discontinuously.

FORCED TRANSFER TO INVERTER
REQUESTED, POWER TO LOAD
MAY BE INTERRUPTED,
CONFIRM YOUR REQUEST WITH
KEY ←

The requested transfer to the inverter may provoke an interruption in the supply of power to the load if Mains 2 characteristics are not within the specified tolerances.

THE NUMBER OF UPS READY IS
INSUFFICIENT,
LOAD TRANSFER IN STAND BY

This message may be displayed in non-redundant, parallel UPS systems, when the number of ready inverters is not sufficient to supply the load.

INVERTER NOT CONNECTED

This message may be displayed in parallel UPS systems, when the inverter is not connected to the load.

PARALLEL UPS,
FORCED TRANSFER INHIBITED

This message is displayed when forced connection is requested on a parallel UPS system for a power extension.

INTERNAL UPS FAULT,
SELF-TEST FAULT

Communication between the system and the display is faulty. The buzzer sounds slowly and discontinuously.

FORCED TRANSFER TO M2
REQUESTED,
POWER TO LOAD MAY BE
INTERRUPTED
CONFIRM YOUR REQUEST WITH
KEY ←

This message is displayed following pressing of the "forced-transfer" key (20), when the load is supplied via the inverter.

UPS SUPPLIED BY A GENERATOR
SET

This message informs the user that the UPS has received the order to limit the current drawn by the rectifier/charger. It is displayed when the corresponding signal is transmitted by the remote indications board which must be configured for this function.

Control-panel display (cont.)

Measurement system

The display (23) may be used to read a number of input and output measurements made at different points in the system. See, in the Appendix, figure 23.

normal AC source (1)

- D phase-to-phase voltages,
- D currents of the three phases,
- D frequency;

bypass AC source (2)

- D phase-to-neutral voltage,
- D phase-to-phase voltages,
- D frequency,
- D currents of the three phases;

battery (3)

- D voltage;
- D charge or discharge current;
- D remaining battery time (for the UPS unit concerned);
- D battery temperature;

inverter output (4)

- D frequency;

total load (6)

- D phase-to-neutral voltage,
- D phase-to-phase voltages,
- D currents of the three phases,
- D frequency,
- D active and apparent power.

Note:

Frequency converters without batteries are not concerned by the battery measurements. The displayed battery voltage corresponds to the DC voltage at the rectifier/charger output. Bypass AC source (2) measurements are not displayed on frequency converters

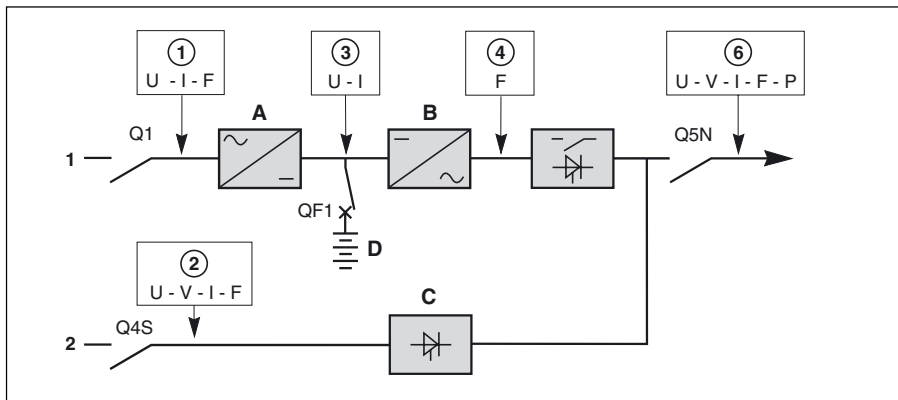


Fig. 23

Voltage measurements

These measurements may be accessed by pressing the "V" key (14). The following data is displayed.

Note:

- M1: normal AC source
- M2: bypass AC source

RMS	M1	M2	LOAD	RMS	M2	LOAD
U12	----	----	----	V1	----	----
U23	----	----	----	V2	----	----
U31	----	----	----	V3	----	----

Current measurements

These measurements may be accessed by pressing the "A" key (15). The following data is displayed.

Note:

- CF: crest factor

RMS	M1	M2	LOAD	FC-LOAD	I-LOAD/I-NOM
I1	----	----	----	-.-	---- %
I2	----	----	----	-.-	---- %
I3	----	----	----	-.-	---- %

Power and frequency measurements

These measurements may be accessed by pressing the "W.HZ" key (16). The following data is displayed.

Note:

- PF: power factor

LOAD	KW	KVA	PL/PN = --- %	FREQ.HZ
P1	----	----		M1 --.-
P2	----	----		M2 --.-
P3	----	----	FP.LOAD = -.-	INV --.-

Battery measurements

These measurements may be accessed by pressing the "battery" key (19). The following data is displayed.

BATTERY			
U	= ---- V	REMAINING TIME	= ---- MIN
I	= ---- A	PL / PN	= ---- %
T°	= ---- °C		

Selections and settings

These selections and settings may be accessed by pressing the "contrast" key (13). The following menu is displayed.

CHOOSE LANGUAGE	DATE AND TIME
CONTRAST SETUP	INVERSE VIDEO
BUZZER SETUP	PAST EVENTS
LAMP TEST	BATTERY TEST

► Selecting the language:

FRENCH	SPANISH
ENGLISH	DUTCH
GERMAN	SWEDISH
ITALIAN	PORTUGUESE

► Adjusting the display contrast:

DISPLAY CONTRAST SETUP
CHOOSE WITH KEYS ▲ OR ▼
VALIDATE WITH KEY ←

► Adjusting the buzzer volume:

BUZZER VOLUME SETUP
CHOOSE WITH KEYS ▲ OR ▼
VALIDATE WITH KEY ←

► Lamp test:

When this function is selected, all the lights shine orange for three seconds.

► Set date and time:

Use the "▲▼" keys to enter the data and confirm using the "←" key.

DATE AND TIME SETUP			
YEAR	----	MONTH	--
DAY	--	HOURS	--
MINUTES	--	SECONDS	--

Control-panel display (cont.)

► Inverse video:

When this function is selected, the text and background colours are reversed (white text on black or black text on white).

► Past events:

See section "logging and time-stamping".

► Battery test:

▷ the screen opposite is displayed when a battery test is requested. It indicates the battery charge status and the remaining service life. A manual or automatic test may be requested,

▷ the screen opposite is displayed during a battery test, whether manual or automatic,

▷ the screen opposite is displayed following a positive, manual battery test,

▷ the screen opposite is displayed following a negative, manual battery test,

▷ the screen opposite is displayed following a positive, automatic battery test. It indicates the time since the last test and provides access to test settings,

▷ the screen opposite is displayed following a negative, automatic battery

▷ the screen opposite is displayed when the user requests access to the automatic test settings. It is possible to modify the interval between two automatic tests,

CHARGE LEVEL = -- %
REMAINING SERVICE LIFE = -- MONTH
► MANUAL TEST press key ←
► AUTO TEST press key ←


TESTING BATTERY
U BATTERY = --- V

BATTERY TEST RESULT OK

BATTERY TEST RESULT NOT OK

TIME SINCE LAST TEST
WEEK -- DAY -- HOUR --
LAST BATTERY TEST RESULT OK
NEW PARAMETERS YES = ▲ NO = ▼

TIME SINCE LAST TEST
WEEK -- DAY -- HOUR --
LAST BATTERY TEST RESULT NOT OK
NEW PARAMETERS YES = ▲ NO = ▼

SELECT TIME OF NEXT TEST WITH KEYS ▲ ▼ ,
CHANGE UNITS WITH ←
WEEK -- DAY -- HOUR --
confirm with key 

Control-panel display (cont.)

▷ the screen opposite is displayed when the battery test cannot be completed.

TEST INTERRUPTED
CHECK PRESENCE OF THE BATTERY
CHECK ALARMS

Alarms

General

The autodiagnostic system considers any system status other than normal as a problem.

Before taking any action, note down the messages displayed on the control panel.

Certain problems may prevent the control panel from functioning.

In this case, it is strongly recommended to call the APC by Schneider Electric after-sales support department.

- ▶ If the load is still correctly supplied with power, it has probably been transferred to the bypass AC source (static bypass) and is therefore no longer protected (if the system is in on-line mode);

- ▶ if the load is no longer supplied with power, transfer it manually to the maintenance bypass (see section below).

Maintenance bypass

This operation is possible only if the system includes a bypass AC source. It results in the load being directly supplied by the bypass AC source via maintenance bypass switch Q3BP, thus ensuring a higher level of security in the event of a malfunction.

Switching procedures are explained on drawings next to each switch in the UPS cubicle and the external bypass unit. See section "maintenance configuration".

Terminals XR2, XR3, XR4 and XR5 on the "Media Contacts 11" board of each type of unit can be used to receive signals from the operating environment and to transmit signals concerning the operating status of the UPS (see figure 16 for the position of the board, item 12).

Signal reception

The signals should be provided by volt-free contacts.

► **emergency off:**

An NC contact causes shutdown of the inverter and the rectifier/charger, opening of the battery circuit breaker and activation of a relay contact on the "Media Contacts 11" board;

► **battery room ventilation fault:**

An NO contact causes shutdown of the rectifier/charger;

► **battery circuit breaker QF1 closed:**

An NO contact prevents inverter start-up if the circuit breaker is open;

► **battery temperature:**

A PC-board, placed near the battery, supplies information on the battery temperature, thus enabling the rectifier/charger to regulate the battery voltage;

► **"auxiliary" signals:**

Depending on the selected settings, these signals may be used to provoke:

▷ forced shutdown of the inverter (whatever the status of the bypass AC source),

▷ protected shutdown of the inverter (load transfer to the bypass AC source),

▷ a change in the inverter output frequency (50 Hz or 60 Hz).

▷ limiting of the current drawn by the rectifier/charger (programmable value) when supplied by an engine generator set with an insufficient power rating.

The additional power required by the inverter is supplied by the battery which discharges,

▷ limiting of the battery charge current (programmable value) if the normal AC source is replaced by an engine generator set with an insufficient power rating.

Signal transmission

► **an auxiliary 24 V power supply**, isolated and backed up, is used to supply:

▷ the undervoltage release of the battery circuit breaker(s) QF1,

▷ the board that measures the temperature in the battery room;

► **"low battery" warning signal** (volt-free changeover contact) indicating that battery time is about to run out. The warning threshold may be personalised;

► **"load on UPS" signal** (volt-free changeover contact) indicating that the load is supplied by the inverter. For a single-UPS unit, one volt-free changeover contact may be used to indicate that the load is supplied by the bypass AC source;

► **"load on battery power" signal** (volt-free changeover contact)

indicating that the inverter is supplied by the battery in the following cases:

▷ normal AC source outage or voltage drop,

▷ rectifier/charger shutdown,

▷ rectifier/charger current limiting.

This signal, which may be used to initiate process saving and shutdown procedures, is time-delayed 30 seconds to avoid unnecessary operations following micro-breaks;

► **"maintenance position" signal** (volt-free changeover contact) indicating that:

▷ maintenance bypass switch Q3BP is closed,

▷ bypass AC source input switch Q4S is open,

▷ inverter output switch Q5N is open,

▷ battery circuit breaker QF1 is open;

► **signal to open battery circuit**

breaker(s) QF1 in the event the "emergency off" button is pressed or to avoid an excessive battery discharge (lasting more than three times the rated backup time plus two hours);

► **full-shutdown contact** (volt-free changeover contact) used to trip switching devices in the event of an emergency shutdown or a full shutdown (button 7).

► **"general alarm" information** (volt-free changeover contact) which includes:

▷ internal faults,

▷ information on temperatures outside tolerances in the battery room (optional),

▷ overload information (> I_n),

▷ static-switch ventilation and power-supply faults.

Note:

► The maximum breaking capacity of the changeover contacts is 5A at 250V;

► information on the battery is not supplied to frequency converters without a battery.

Logging and time-stamping

Presentation of event time-stamping by MGE™ Galaxy™ PW

Time-stamping of events by MGE™ Galaxy™ PW makes it possible to:

- ▶ log the events;
- ▶ consult the last 500 events that occurred on the MGE™ Galaxy™ PW UPS;

- ▶ consult general statistical data on UPS operation;
- ▶ consult measurement records for a number of physical values concerning system operation.

The time-stamping information may be accessed via the MGE™ Galaxy™ PW keypad and display (standard equipment). This information may also be forwarded for the Teleservice function using the JBUS RS232/485 communications board.

Utilisation via the MGE™ Galaxy™ PW display

Main menu

The time and date can be set for the UPS via the main menu on the display (see below), using the DATE AND TIME command. The time-stamping information, statistics and measurement records are also available via the same menu, using the PAST EVENTS command.

Simply select the desired command with the ">" sign that can be moved using the ▲ and ▼ keys. The selected command can be confirmed

DATE AND TIME SETUP				
> YEAR	1997	MONTH	9	
DAY	8	HOURS	8	
MINUTES	11	SECONDS	42	▲ ▼

by pressing the ← key.

General instructions for using most screens

You can display the desired information and enter commands using the ▲, ▼ and ← keys.

Press the ▲ key to exit the time-stamping consultation mode and return to the main menu. If no commands are entered for five minutes, the system automatically returns to the normal display mode.

You can scroll through the screens displaying information. Press the ▲

and ▼ keys to scroll up and down through the screens.

For time-stamped events, the display begins with the last event logged. To access older events, press the ▼ key. If during consultation, you wish to review more recent events, press the ▲ key.

Setting the date and time for the UPS

When the DATE AND TIME command is selected, the screen presented opposite is displayed:

- ▶ the current values are automatically displayed;
- ▶ you can modify any of the displayed values;
- ▶ position the ">" sign opposite the value to be modified. Then press the ← key;
- ▶ use the ▲ and ▼ keys to modify the value;
- ▶ the ▲ key increments the value by one;
- ▶ the ▼ key decrements the value by one;
- ▶ the selected value can be confirmed by pressing the ← key. A second value may then be selected for modification, again using the ▲ and ▼ keys;
- ▶ modifications are made and confirmed value by value;
- ▶ press the ▲ key at any time to exit the DATE AND TIME function.

Logging and time-stamping (cont.)

That is the only means to leave the function.
If no modifications to values are confirmed, exiting the function corresponds to cancelling the request.

Consulting logged (time-stamped) events

When the PAST EVENTS command is selected, the system displays a screen indicating the last event logged. Log screens are very similar to those displayed for current events. However, log screens include a line indicating the corresponding date and time with the mention "Appearance of" or "Disappearance of", followed by the standard text for the event (see example opposite). Consult the user manual for indications on the meaning of events.

The complete log may comprise up to 500 events. If over 500 events have occurred, only the last 500 may be consulted:

- ▶ press the ▼ key to display the event that occurred just before the displayed event. If the displayed event is the oldest in the list, the display is not modified;
- ▶ press the ▲ key to display the event that occurred just after the displayed event. If the displayed event is the most recent in the list, the display is not modified.

Consulting statistics

See the screen opposite.

- ▶ **total backup time (h):** this is the total time of operation on battery power since initial startup of the UPS. It is expressed in hours;
- ▶ **total time on static switch (h):** this is the total time of operation on the static switch since initial startup of the UPS. It is expressed in hours;
- ▶ **total time on UPS (d):** this is the total time that the load has been supplied by the UPS since initial startup. It is expressed in days;

DATE AND TIME SETUP				
> YEAR	1997	MONTH	9	
DAY	8	HOURS	8	
MINUTES	11	SECONDS	42	▲ ▼

Example:

02/09/1997	07:25:03	Appearance:	
MAINS 1 INPUT SWITCH Q1 IS OPEN			

Note: numerical values are never indicated in screens for time-stamped events.
For example:

03/09/1997	15:30:23	Disappearance:	
OVERLOAD			
RATED CURRENT PER PHASE		=	_ _ _ A
CHECK LOAD LEVEL			

FIGURES SINCE COMMISSIONING	
total backup time (h):	0
total time on static switch (h):	0
total time on UPS (d):	3627
total time with T _{batt} >25°C (h):	1
FIGURES SINCE RESET	
last reset:	05/09/1997
elapsed backup time (min):	0

Logging and time-stamping (cont.)

- ▶ **total time with T_{batt} > 25° C (h):** this is the total time of operation with the battery temperature greater than 25° C since initial startup of the UPS. It is expressed in hours;
- ▶ **last reset:** this is the date that the information was last set to zero by the Teleservice function;
- ▶ **elapsed backup time (min):** this is the total time of operation on battery power since the last reset. It is expressed in minutes.
- ▶ **nb of backups:** this is the number of times the load was supplied by the UPS from battery power since the last reset;
- ▶ **nb of backups < 1 min:** this is the number of times the load was supplied by the UPS from battery power for less than one minute, since the last reset;
- ▶ **1 min < nb of backups < 3 min:** this is the number of times the load was supplied by the UPS from battery power for more than one minute and less than three minutes, since the last reset;

Use the ▲ and ▼ keys to shift between the beginning and the end of the display.

FIGURES SINCE RESET	
nb of backups:	0
nb of backups < 1 min:	0
1 min < nb of backups < 3 min:	0
nb of backups > 3 min:	0
nb of overloads < 5 s:	0
nb of overloads > 5 s:	0
nb of times TBatt. > 25°C:	0

- ▶ **nb of backups > 3 min:** this is the number of times the load was supplied by the UPS from battery power for more than three minutes, since the last reset;
- ▶ **nb of overloads < 5 s:** this is the number of times the UPS was overloaded (output current greater than I_n) for less than five seconds, since the last reset;
- ▶ **nb of overloads > 5 s:** this is the number of times the UPS was overloaded (output current greater than I_n) for more than five seconds, since the last reset;
- ▶ **nb of times TBatt. > 25° C:** this is the number of times the battery temperature was measured at over 25° C, since the last reset.

Consulting recorded measurements

Recorded measurements are presented in the same manner (see opposite):

- ▶ the lists indicate the last 30 measurements recorded for the given parameter. The chronological order of the measurements is indicated in the figure opposite;
- ▶ the most recent measurement is presented first, in the upper left-hand corner of the list. The following measurement is listed just below, and so on until the 30th value listed in the bottom right-hand corner of the list;
- ▶ the period T between two successive measurements is 30 days.

The displayed measurements are instantaneous values.

Note: when this screen is selected, approximately ten seconds are required to call up and display the information. If the number of measurements is greater than 30, only the last 30 (the most recent) are displayed.

PARAMETER NAME (units)					T=30 days
▼ last read: 05/09/1997					
M(t+29T)	M(t+23T)	M(t+17T)	M(t+11T)	M(t+05T)	
M(t+28T)	M(t+22T)	M(t+16T)	M(t+10T)	M(t+04T)	
M(t+27T)	M(t+21T)	M(t+15T)	M(t+09T)	M(t+03T)	
M(t+26T)	M(t+20T)	M(t+14T)	M(t+08T)	M(t+02T)	
M(t+25T)	M(t+19T)	M(t+13T)	M(t+07T)	M(t+T)	
M(t+24T)	M(t+18T)	M(t+12T)	M(t+06T)	M(t)	

Logging and time-stamping (cont.)

The battery capacity is the value measured by the UPS microprocessor. It is expressed in Ampere-hours. This value changes over time depending on the parameters of the battery itself and its environment. This measurement is used to check that the battery is capable of supplying the rated power in the event of a mains outage.

BATTERY CAPACITY (Ah)				T=30 days	
▼ last read: 05/09/1997					
97	0	0	0	0	0
96	0	0	0	0	0
95	0	0	0	0	0
94	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

The backup time is the value calculated by the UPS microprocessor on the basis of measurements carried out on the battery. It is expressed in minutes. The calculation uses the percent load and the battery charge status at the time of the measurement.

BACKUP (min)				T=30 days	
▼ last read: 05/09/1997					
120	0	0	0	0	0
115	0	0	0	0	0
110	0	0	0	0	0
105	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

The load level is the ratio between the power supplied by the UPS to the load at the time of the measurement and the rated output of the UPS. It is expressed as a percentage.

OUTPUT LOAD LEVEL (%)				T=30 days	
▼ last read: 05/09/1997					
63	0	0	0	0	0
52	0	0	0	0	0
63	0	0	0	0	0
63	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Utilisation via Teleservice

When the optional JBUS RS232/485 communications board is installed, the time-stamped information can be sent to the Teleservice centre.

The centre can remotely consult the same information and carry out the same modifications as the user locally on the display. Note that only the Teleservice centre can reset the counters for the statistical data.

Maintenance

Maintenance configuration

Single-UPS unit or UPS in "ECO" mode

See figure 24. During maintenance, the UPS must be isolated from the normal and bypass AC source, the battery and the load.

► UPS isolation

Proceed in the following order (see figure 25):

▷ shut down the inverter (press the "inverter OFF" button ⑨ for three seconds),

▷ close bypass switch Q3BP,

▷ open isolating switches Q5N, Q4S, QF1 and Q1.

The UPS is powered down once the capacitors have discharged (a few minutes);

► start-up

Following servicing, proceed in the following order (see figure 26):

▷ close switch Q1, then after approximately ten seconds, switches QF1, Q5N and Q4S,

▷ open bypass switch Q3BP,

▷ start the inverter (press the "inverter ON" button ⑧).

Caution

► work should be carried out in accordance with applicable safety regulations;

► to avoid interrupting the load, the various switching operations must be carried out in the correct order.

Operations are explained in diagrams placed next to the switches;

► the system cubicle is only partially powered down. The load is still supplied via the bypass AC source and switch Q3BP.

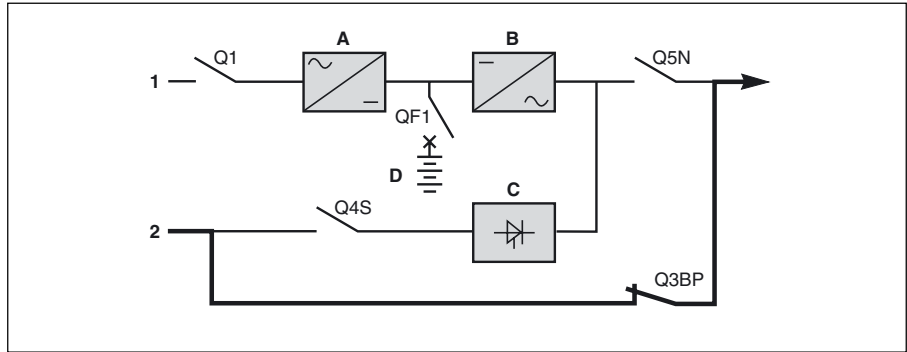


Fig. 24

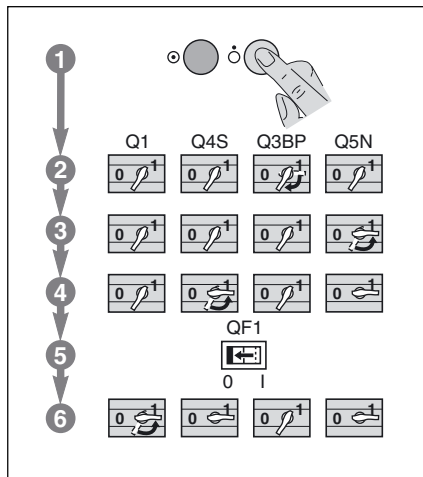


Fig. 25

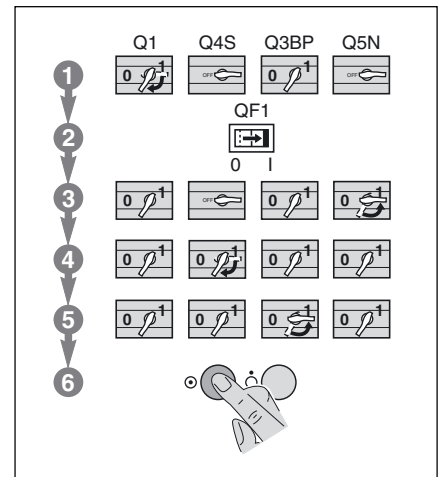


Fig. 26

Redundant, parallel UPS

See figures 27 and 28 in the Appendix. During maintenance, a UPS unit must be isolated from the normal AC source, its battery and the output circuits of the other UPS units.

► isolate one UPS (see figure 27)

Proceed in the following order (see figure 25 **without Q3BP**):

- ▷ shut down the inverter (press the "inverter OFF" button **9** for three seconds),
- ▷ open isolating switches Q5N, Q4S, QF1 and Q1.

The UPS unit is powered down once the capacitors have discharged (a few minutes);

► start-up

Following servicing, proceed in the following order (see figure 26 **without Q3BP**):

- ▷ close switch Q1, then after approximately ten seconds, switches QF1, Q5N and Q4S,
- ▷ start the inverter (press the "inverter ON" button **8**).

⚠ Note: if the load is still supplied by an inverter, the Q3BP switch on the unit undergoing maintenance must not be closed.

To fully isolate the installation, proceed as indicated below:

► isolate all UPSs (see figure 28)

Proceed in the following order (see figure 25):

- ▷ shut down the inverters (press the "inverter OFF" buttons **9** for three seconds),
- ▷ close the Q3BP switches used to bypass the units (no units have priority),
- ▷ open isolating switches Q5N, Q4S, QF1 and Q1.

The UPS units are powered down once the capacitors have discharged (a few minutes).

► start-up

Following servicing, proceed in the following order (see figure 26):

- ▷ close switches Q1, then after approximately ten seconds, switches QF1, Q5N and Q4S,
- ▷ open the Q3BP switches,
- ▷ start the inverters (press the "inverter ON" buttons **8**).

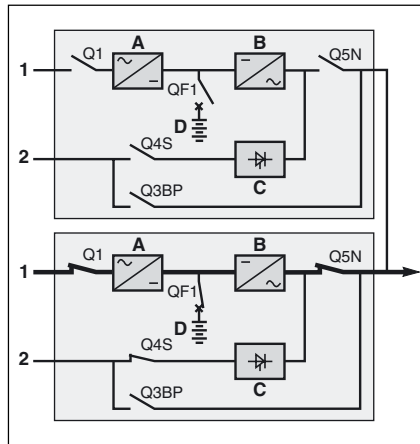


Fig. 27

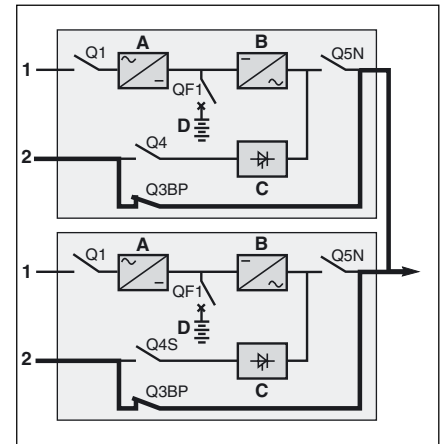


Fig. 28

Maintenance (cont.)

Parallel UPS for increased output

See figure 29.

► isolate all UPSs

Proceed in the following order (see figure 30):

Ⓛ shut down the inverters (press the "inverter OFF" buttons ⑨ for three seconds),

Ⓛ close switch Q3BP and open switches Q5N and Q4S in the parallel-connection unit,

Ⓛ open switches Q1, QF1 and Q5N on the UPS units.

► start-up

Following servicing, proceed in the following order (see figure 31):

Ⓛ close switches Q5N on the UPS units,

Ⓛ close switch Q4S, then switch Q5N, in the parallel-connection unit,

Ⓛ open switch Q3BP in the parallel-connection unit,

Ⓛ close switches Q1 and QF1 on the UPS units,

Ⓛ start the inverters (press the "inverter ON" buttons ⑧).

Note:

We recommend that you call on the after-sales support department to carry out these operations.

Note that for parallel UPSs for increased output, the entire installation must be bypassed because it is not possible to isolate just one UPS unit.

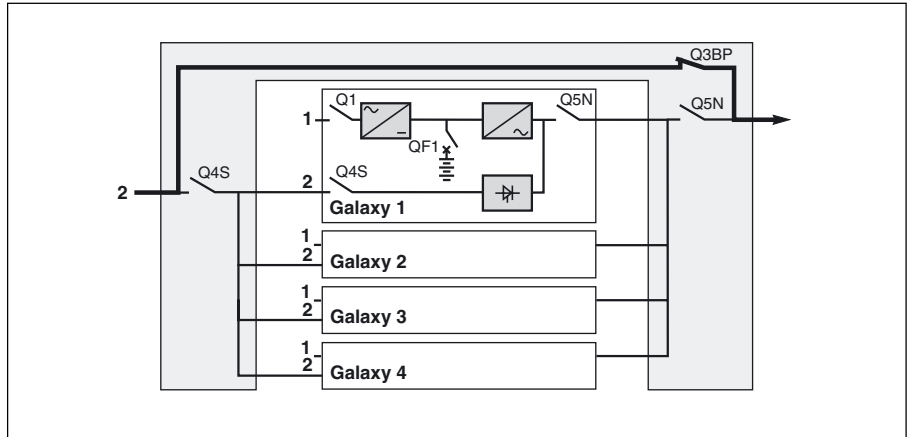


Fig. 29

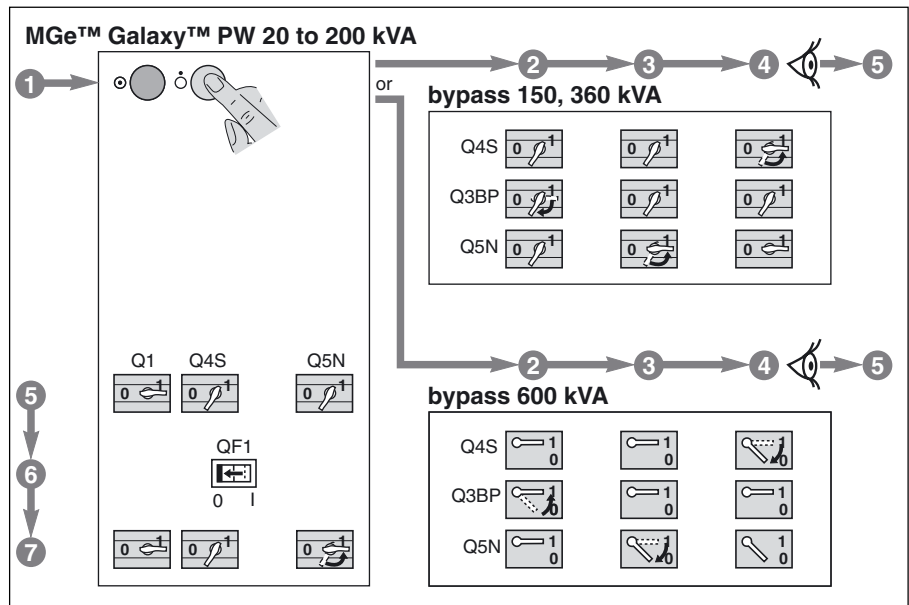


Fig. 30

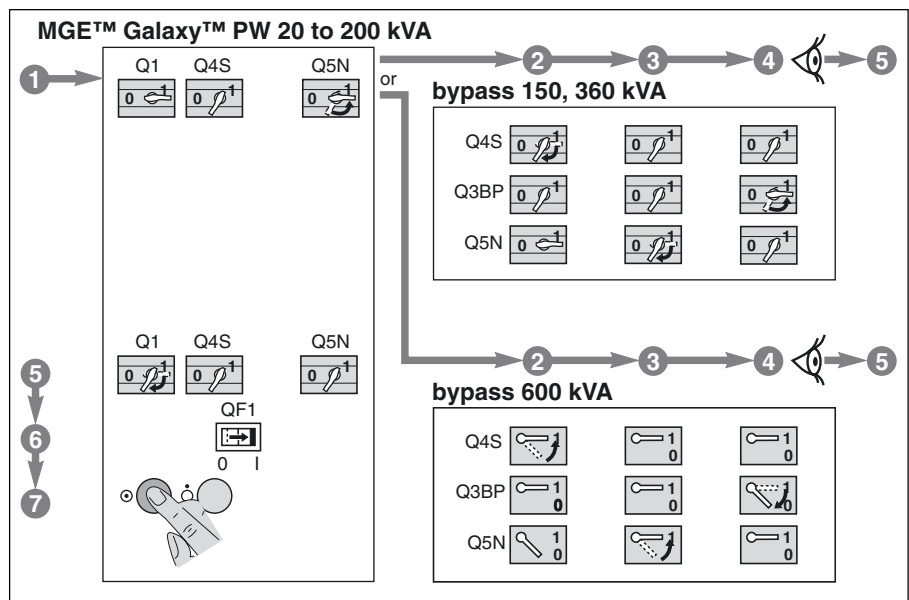


Fig. 31

Battery maintenance

Consult the instructions supplied by the battery manufacturer. Below are a few general indications:

▶ **sealed lead-acid batteries:** these batteries require no maintenance, but check the terminals of each cell from time to time and clean if necessary;

▶ **vented lead-acid batteries:**

▷ check the electrolyte level regularly and add water if necessary,

▷ check the voltage of each cell to determine if it is necessary to equalise the battery,

▷ check the terminals of each cell and clean if necessary.

Caution:

Battery maintenance is undertaken with the system powered up. Operations must be carried out in accordance with applicable safety regulations by qualified personnel using insulated tools, gloves and safety goggles.

Batteries contain dangerous substances that will harm the environment if thrown away. If you change the batteries yourself, call on qualified organisations for battery recovery and recycling.

Visual check

▶ Power down the system prior to any maintenance operations.

Note: in redundant, parallel UPS systems and frequency converters, the check may be carried out successively on each UPS unit without interrupting the load. In other configurations, the load must be supplied via the maintenance bypass (see "maintenance bypass" in the "Alarm" section);

▶ clean the system regularly, particularly the air inlet and outlet grills. Check that the air circulates freely in the cubicles. Use a vacuum cleaner if necessary;

▶ check that nothing hinders the ventilation at the top and at the back of the system;

▶ check that all the fans operate correctly.

Functional check

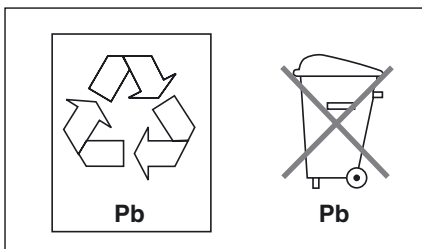
▶ Check that lights ①, ② and ③ on the control panel are not red, to avoid an interruption in the supply of power to the load due to incorrect transfer conditions or a battery problem;

▶ press the "inverter OFF" button and check that the buzzer and control panel lights function correctly (see the section on operating modes in the introduction);

▶ press the "inverter ON" button and check again that the control panel lights function correctly;

▶ run a transfer to battery test. With the inverter on, open input switch Q1. The orange "battery" light on the control panel should light. After two minutes on battery power, close input switch Q1. The rectifier/charger should automatically restart and the orange "battery" light on the control panel should go off;

▶ in parallel systems, run these tests on each UPS unit.



Maintenance (cont.)

Training center

To allow you to use APC by Schneider Electric products effectively and carry out basic maintenance, we offer a complete range of technical training courses in English and French.

Training centers Schneider Critical Power & cooling services 50 Hz :

France Training Centre
140, Avenue Jean Kuntzmann
Innovalée
38334 - St Ismier Cedex
France

Tel: +33 (0)4 76 18 34 14
Fax: +33 (0)4 76 18 45 21

Singapore Training Centre
10 Ang MO Kio Street 65, #03-06/10
Techpoint Building
Singapore 569059
Singapore

Tel: +65 6389 6792

China Training Centre
No. 999, Shen Fu Road
Min Hang District
Shanghai 201108
P.R. China

Tel: +86 21 3407 3365
Fax: +86 21 3407 4526

Training center Schneider Critical Power & cooling services 50-60 Hz :

United States Training Centre
132 Fairgrounds Road
West Kingston - RI02892
U.S.A

Tel: +1 877 800 4272

Internet : [Http://powerlearning.apc.com](http://powerlearning.apc.com)
On-line catalogue and registration.

Isolating and voltage matching transformer for the normal and bypass AC source and the load

This transformer, placed in the 1.9 meter high UPS cubicle up to 60 kVA and in an auxiliary cubicle for higher values, may be used to match the bypass AC voltage to that of the inverter, to create galvanic insulation between the load and the AC sources or to create the appropriate system earthing arrangement.

Harmonics filter and power factor improvement

This option, placed on the normal AC input upstream of the UPS in the 1.9 meter high UPS cubicle for UPSs up to 120 kVA and in an auxiliary cubicle for higher ratings, reduces the reinjection of harmonic currents into the normal AC source. Harmonic reinjection, produced by the rectifier/charger, increases distortion on the normal AC source. The amount of the increase depends on the source impedance. The reduction in distortion reduces the risk of disturbing other sensitive loads connected to the mains. The filter can also increase the power factor upstream of the inverter.

Three types of filter are available:

- ▶ uncompensated filter for the advantages listed above;
- ▶ compensated filter for the advantages listed above and to limit the capacitive current absorbed by the filter (additional inductance), in the event the UPS is supplied by an engine generator set;
- ▶ active harmonic conditioner, the most effective solution because it provides the harmonics drawn, thus allowing the normal AC source to supply a perfectly sinusoidal current. The conditioner may be installed in an auxiliary cubicle or wall-mounted.

Safety of life and property

- ▶ backfeed protection. This option, installed upstream of the static bypass, is used to mechanically disconnect the bypass AC source when the system has shifted to battery power or when the bypass AC source has failed. This system is intended to enhance the safety of life and property.

Options (cont.)

Empty cubicles

Cubicles may be supplied empty, thus enabling users to make up their own auxiliary cubicles (battery cubicles or other) or panels and meet the particular demands of each installation. In this way, the entire electrical installation will have a uniform appearance.

The following cubicles are available:

- ▶ battery cubicles, 815 and 1015 mm wide, 1.4 and 1.9 meters high;
- ▶ auxiliary cubicles, 815 mm wide, 1.4 and 1.9 meters high.

Electrical supervision

"Teleservice"

"Teleservice" is a contract offering continuous remote supervision and maintenance of UPS systems via a modem. Real-time communication is established with our "Teleservice" centre for communication of all alarms and events occurring in the installation.

GTC board

This electronic board provides user access to the J-Bus communications protocol. Using the data and address tables provided, the user can customise his installation.

GTC + software

The user has access to the J-Bus protocol and, in addition, the associated software acquires system parameters (measurements, status conditions) and transforms them into diagrams, alarm messages and tables. With the click of a mouse, the user can locally or remotely supervise the UPS system (comprising one or many UPS units).

Management of computer networks

Integrated SNMP agent

This electronic board, installed in the UPS system, enables direct connection to all Ethernet networks using TCP/IP. The UPSs may then be supervised via the computer network. Furthermore, they can be used to close system files without having to add an external SNMP agent.

This board is fully compatible with "Solution Pac™" software.

The RJ45 connector of the communications option delivers information using the SNMP protocol. The sticker located on the board indicates the UPS MAC address.



- ▶ your MAC address is written in the following way : 0080C8 ZZ XX YY ;
- ▶ your default IP address is 168.8.xx.yy (xx and yy are decimal values of XX and YY).

For example, MAC address 00 80 C8 AB AA 01 is related to IP address 168.8.170.1.

Please refer to the "userman.doc" user manual contained in the directory "emb/galaxy/snmp/release3.xx" of the Solution-Pac CD-ROM in order to discover the management capabilities of your SNMP **MGE™ Galaxy™ PW UPS**. Please contact your sales representative for more detailed information.

Two-channel network board

This electronic board comprises two ports, each of which may be user set, either for the U-Talk protocol or as a relay contact.

U-Talk is the protocol required to establish contact with the communications software.

Relay contacts may be used for specific network applications (IBM AS400, Novell, etc.).