PRODUCT GUIDE

UNINTERRUPTIBLE POWER SUPPLIES (UPS)

SLC X-PERT

80.. 400 kVA

General index.

1. INTRODUCTION.

The **SLC X-PERT** series consists of three-phase UPSs that combine very low total cost of ownership (TCO) with very high efficiency and compact design, providing high-quality uninterruptible power supply for all critical applications. The technology incorporated offers one of the highest efficiencies on the market in VFI mode and 100% of expected battery life.

Representative illustration for 80 to 160 kVA models

Representative illustration for 200 to 300 kVA models

The **SLC X-PERT** series maximises the use of the floor area occupied thanks to its high power density design. Models from 200 kVA have complete front access, precluding the need for side or rear space, making them easy to maintain and installable side by side, back to back or against a wall. The common battery option further enhances the ability of the **SLC X-PERT** series to deliver low footprint solutions, freeing space for other devices.

1.1. APPLICATIONS: GUARANTEED POWER FOR ALL ENVIRONMENTS.

- **Data centres**: They ensure the functionality of environments and prevent losses caused by mains failures.
- **IT networks**: They help minimise costs caused by interruption in availability or loss of information.
- **Financial services**: They maintain the on-line operability of financial transactions.
- **Industrial processes**: They protect productivity in electrically complicated environments.
- **Telecommunications**: They prevent supply failures that could suspend communications between subscribers.
- **Infrastructures**: They safeguard instruments and/or devices and ensure the correct management of systems.

Thus, this series has been designed to maximise the availability of critical loads and to ensure that your business is protected from variations in power distribution line voltage, frequency, electrical noise, cuts and micro-cuts. This is the primary goal of the X-PERT series UPS.

Representative illustration for 400 kVA models

1.2. MAIN FEATURES.

- On-line, double-conversion and DSP control technology.
- Output power factor 1 (kVA=kW)
- Input current distortion rate (THDi) <3%.
- Double input connection to increase availability.
- Input power factor > 0.99.
- High energy efficiency, between 95% and 96% in normal mode and up to 97% in high-efficiency mode.
- No transformer in the inverter, compact design and less weight.
- Parallel system for redundancy or capacity purposes.
- Monitoring and care of batteries with Batt-Watch and longer life in High-Efficiency mode.
- Compatible with power generators.
- 10" touch screen for all models.
- Selectable on-line/Eco-mode operation.
- Calculation of the available backup in case of long duration cuts.
- Extended life for consumables.
- Wide range of options available.
- SLC Greenergy solution.

1.3. HIGH-EFFICIENCY MODE.

High-efficiency operating mode disconnects the DC bus battery when it is fully charged, enabling the DC voltage to be lowered to achieve performance of up to 97% working in on-line mode and in turn protecting and extending the life of the batteries.

1.4. PARALLEL SYSTEMS FEATURING UPSS WITH DIFFERENT POWERS.

For cases in which there is only one UPS and, due to expansion needs, it is necessary to install another device in parallel, the SLC X-PERT series enables two devices with different powers to parallel each other in parallel systems of 2 units. For example, a power of 125 kVA with a 100 kVA device.

1.5. OPTIONAL EXTRAS.

- Parallel/redundant kit.
- Extended backup times.
- Common rectifier/bypass input.
- SNMP adapter.
- NIMBUS adapter for remote management.
- External output voltage synchronism.
- Backfeed protection.
- Transformer.
- Battery temperature sensor.
- Top cable entry.
- External maintenance bypass.
- Modbus protocol.

1.6. SUPPORT & SERVICES.

- Pre and post-sales advice.
- Start-up.
- Telephone technical support.
- Preventative/corrective intervention.
- Maintenance contracts.
- Remote maintenance contracts.
- Training courses.

2. STANDARDS AND ENVIRONMENT.

2.1. STANDARDS.

UPS SLC X-PERT is designed, manufactured and sold in accordance with Quality Management Standard EN ISO 9001. The marking indicates conformity with EC Directives through the application of the following standards:

- **2006/95/EC** Low voltage safety.
- **2004/108/EC** Electromagnetic compatibility (EMC).

In accordance with the specifications of the harmonised standards. Reference standards:

- **EN-IEC 62040-1**. Uninterruptible power supplies (UPS). Part 1-1: General and safety requirements for UPS used in user access areas.
- **EN-IEC 62477-1**. Information technology equipment. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible power supplies (UPS). Part 2: EMC requirements.
- **EN-IEC 62040-3**. Uninterruptible power supplies (UPS). Part 3: Methods for performance specification and test requirements.

2.2. ENVIRONMENT.

This product has been designed to respect the environment and manufactured in accordance with **ISO 14001**.
Recycling of the device at the end of its useful life.
Our company undertakes to use the services of authorised and regulatory companies to treat the set of products recovered at the end of their useful life (contact your distributor).

2.2.1. Packaging.

To recycle the packaging, please comply with any legal requirements in force.

2.2.2. Batteries.

Batteries pose a serious danger to health and the environment. The disposal of them shall be carried out in accordance with the laws in force.

3. PROTECTION.

The commercial power grid cannot guarantee an uninterrupted power supply. For this reason, operators must take measures to ensure the correct operation of their devices. The consequences of these interruptions may vary:

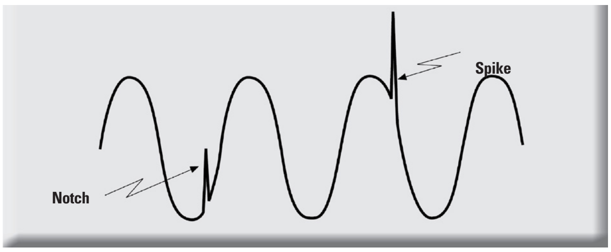
- Equipment failure.
- Information loss (data, applications, etc.).
- Interruption of operation.
- And a long etc.

Despite the substantial improvement of the electricity grid in recent years, there is still an average of 300 minutes per year of poor quality power supply (or lack thereof). This indicates that electrical problems are the major cause of information loss in Computer Systems (45%), as opposed to problems such as viruses (3%). 93% of these problems could be avoided by an uninterruptible power supply (UPS).
In short, it is a loss of opportunity and availability costs that can lead to extremely high expenses.
The phenomena in the electricity grid that result in the loss of information are listed below.

3.1. TRANSIENT NOISES AND IMPULSES: SPIKES AND NOTCHES.

These are voltage disturbances that occur between the active supply conductors (phase and neutral in single-phase systems; phase or phase and neutral in three-phase systems).
If they are frequent and small (tens of volts or in this region), they are called noises. If they are sporadic and large in value (hundreds of volts), they are called pulses, i.e. when they have a duration of less than 2 ms.
Electrical noise is caused by the operation of electrical machines with brushes, arc welders, bells, switches, etc., which are connected at some point near the load being used. They do not damage devices, but they can cause malfunctions. On the other hand, electrical impulses are usually produced through the connection and disconnection of capacitor banks, the operation of electric arc furnaces, machines with brushes, switches, thermostats and via electrical discharges.
Of all disturbances, these are the most random and least predictable. This type of disturbance can cause very serious damage to devices.

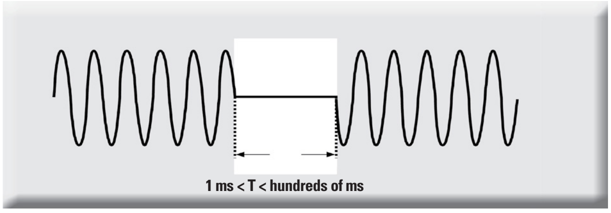
- Spikes: produced by the induction of atmospheric discharges (lightning) in overhead lines.
- Notches: produced by sudden variations of load or short circuit currents on line and transformer inductances.



3.2. DROPOUTS.

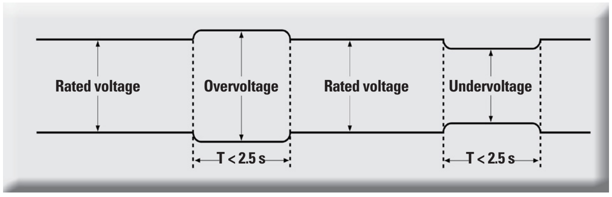
These are deep voltage drops (below 60% of their nominal value) or total drops, with a duration of a few milliseconds (less than one cycle).
They have two different causes:

- Short circuits near the point of consumption, subsequently released by the corresponding protection.
- Supply interruptions caused by line switching.



3.3. TRANSIENT OVERVOLTAGES (SURGES) AND UNDERVOLTAGES (SAGS).

Transient overvoltages are short duration voltage increases due to momentary load decreases in networks with poor regulation (high impedance).
Transient undervoltages are short duration voltage drops due to momentary overloads in the network.



3.4. LONG DURATION OVERVOLTAGE AND UNDERVOLTAGE.

Long duration overvoltages have the same origin as transient overvoltages, but under a permanent regime.
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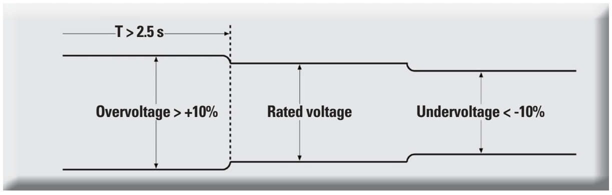
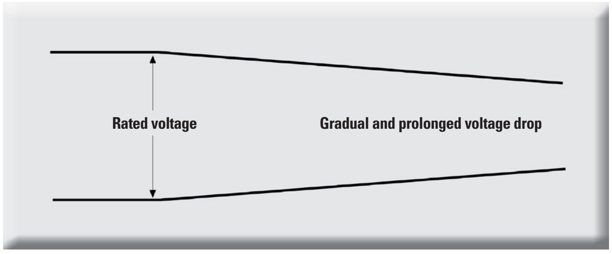


3.5. GRADUAL AND PROLONGED UNDERVOLTAGES (BROWNOUTS).

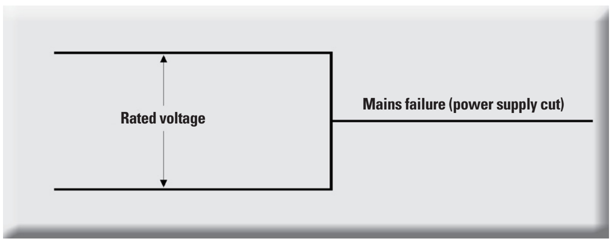
A slow variation in voltage is considered to be that which occurs for a duration of 10 seconds or more. This occurs due to the variation of loads in electrical networks with high short circuit impedance, as well as lack of power, loss of synchronism, etc. If they exceed the static limits allowed by the devices, they can produce failures in its operation. Many times this progressive drop usually ends with a total failure of the power supply.



Meanwhile, a rapid change in voltage lasts less than 10 seconds. These occur due to the connection and disconnection of large loads and manoeuvres on power lines. The damage they can cause to devices depends on their amplitude and duration, since a device can withstand a greater amplitude in a shorter time and vice versa. Typical examples of these disturbances are flickers and micro cuts.

3.6. SUPPLY FAILURES (BLACKOUTS).

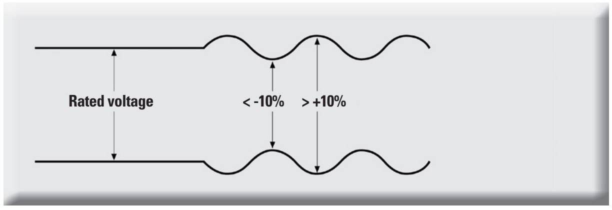
Long outages are mains voltage overruns (or reductions below 50% of their nominal value) lasting longer than one cycle. These are generally caused by faults or disconnections in power lines and by breakdowns in generation and transformation centres.
Obviously, this type of disturbance causes a total failure of the devices being powered; however, some small computers can withstand a short outage (approximately two cycles).
Total supply failures are generally due to the untimely activation of a distribution network protection.



3.7. FLUCTUATIONS OR FLICKERS.

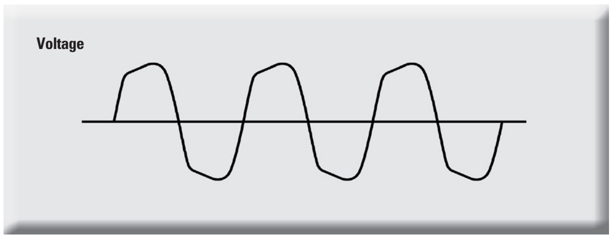
This consists of a modulation of the amplitude of the voltage value, which in lighting installations becomes visible to the human eye. It is usually caused by pulsating voltage drops in power lines, caused by:

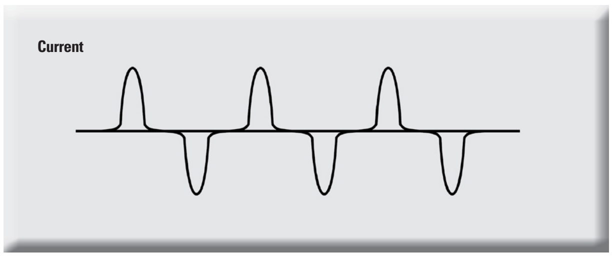
- Inertial resonances of large engines or alternators.
- Pulsating loads (pumps and piston compressors, etc.).
- Unstable regulators.



3.8. DISTORTION. CURRENT AND/OR VOLTAGE HARMONICS.

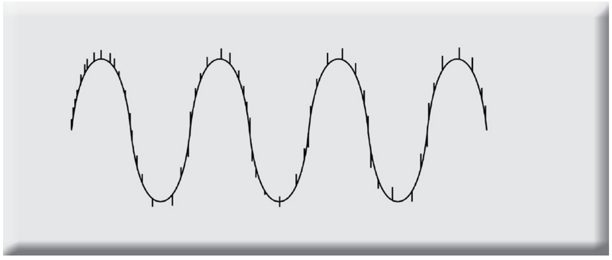
This is a deformation of the voltage waveform, due to the presence of harmonics. Its technical name is Total Harmonic Distortion (THD).
It is mainly caused by the connection of machines with saturated magnetic cores, static converters (controlled and uncontrolled rectifiers, uninterruptible power supplies, switch-mode power supplies) and other non-linear loads to the power grid. Almost all critical loads such as electronic devices can withstand a maximum distortion of 5%.
Certain receivers consume non-linear loads, i.e. harmonic currents. These currents produce harmonic voltage drops that modify the sinusoidal voltage wave produced at the source (in power plant alternators).





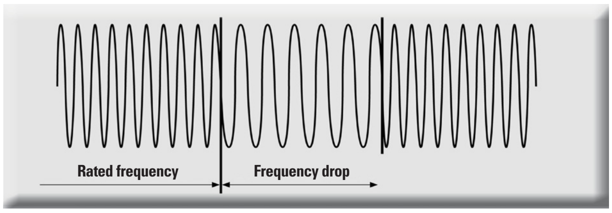
3.9. HIGH FREQUENCY DISTURBANCES.

These are high-frequency signals superimposed on the mains voltage. They can consist of signals of any defined frequency or broadband; stationary, burst or repetitive pulses.
They are the result of unintended coupling of commercial network lines with devices using high frequency or switching technologies. Depending on the type of coupling, they can be in common mode or differential mode.



3.10. FREQUENCY VARIATIONS.

Interconnected continental commercial networks (as are most in Europe) provide a virtually unchanging frequency that is very close to nominal. This is because it is controlled in a megasystem that includes a very large number of synchronous machines, with enormous global power and inertia that tends to infinity.
On the other hand, on many islands and other isolated areas, or in independent facilities with small power plants (or power generators), there are often significant variations in frequency. Variations are almost inevitable when there are connections or disconnections of power of comparable magnitude to the power of the whole system.



4. NOMENCLATURE VERSIONS AND STRUCTURAL SCHEME.

4.1. NOMENCLATURE.

SLC-250-XPERT-P-CB485IRSSYNC B1 3x380V WCO EE116502

EE	Special device (EE)
CO	'Made in Spain' marking on UPS and packaging (for customs purposes)
W	Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc.
3x380 V	Input and output voltage. Disregard if it is 3x400+N
B1	Device with external batteries
3x60AB265	Device with internal batteries (only 80 kVA)
SYNC	External inverter synchronism
S	External battery temperature sensor
IR	Potential-free contacts card
485	RS-485 communications port with Modbus protocol
CB	Common bypass line
P	Parallel kit
XPERT	UPS series
250	Power in kVA

SLC-250-XPERT-P2-CB485IRSSYNC B1 3x380V WCO EE116502

EE	Special device (EE)
CO	'Made in Spain' marking on UPS and packaging (for customs purposes)
W	Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc.
3x380 V	Input and output voltage. Disregard if it is 3x400+N
B1	Device with external batteries for non-standard backup
3x60AB265	Device with internal batteries (only 80 kVA)
SYNC	External inverter synchronism
S	External battery temperature sensor
IR	Potential-free contacts card
485	RS-485 communications port
CB	Common bypass line
P2	Parallel system consisting of two devices
...	
P6	Parallel system consisting of six devices
XPERT	UPS series
250	Power in kVA

MOD BAT XPERT 0/2x62AB999 100A WCO EE116502

EE	Special battery module (EE)
CO	'Made in Spain' marking on UPS and packaging (for customs purposes)
W	Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc.
100 A	Protection size
999	Last three digits of the battery code
AB	Letters of the battery family
2	Number of batteries in a single branch
*x	Number of parallel battery branches in the same cabinet or in all racks. Disregard for a single branch
0/	Battery module without batteries, but with the necessary accessories to install them
XPERT	Battery module series
MOD	Batteries in cabinet
RACK	Batteries in rack

5. GENERAL DESCRIPTION OF THE DEVICE.

The UPS of the **X-PERT** series is on-line, double-conversion; the inverter included in the UPS always supplies power to the load, either with or without the availability of mains power (depending on the battery life).
This configuration guarantees the best service to the user, supplying clean energy in an uninterrupted way, and ensuring voltage and frequency stabilisation at a rated value. Thanks to its double conversion, the critical loads will be completely immune to micro interruptions and mains variations, preventing damage to critical loads (computers, instruments, scientific devices, etc.).
The UPS uses high frequency switching IGBT technology that allows very low distortion of the current feed back into the supply line, as well as high-quality and stable output voltage.
The components used ensure high reliability, excellent efficiency and ease of maintenance.
The following block diagram shows the structure of the devices and their main structural parts.

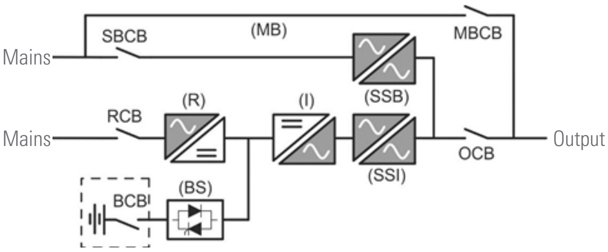


Fig. 1. Block diagram of the SLC X-PERT UPS.

6. OPERATING PRINCIPLE.

6.1. RECTIFIER.

The rectifier converts three-phase AC mains voltage into direct DC voltage. The following figure shows the simplified structure of the rectifier block.

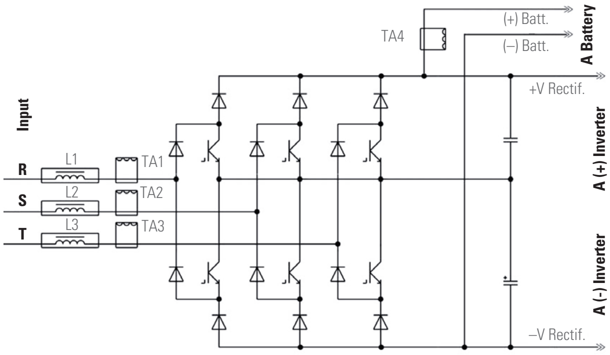


Fig. 2. Rectifier block.

This uses a three-phase rectifier with 3 levels that combines a thyristor bridge and a DC/DC boost, through a fully controlled three-phase IGBT bridge with low harmonic absorption. The switching frequency of the boost stage is 7.5 kHz up to 200 kVA, and 5 kHz for higher powers (250 kVA to 500 kVA).
Line thyristors have the dual function of rectifying the input voltage and preloading the DC bus.
During the first start of the rectifier a soft-start is made, which consists of a gradual increase of the voltage of the DC bus capacitors, and once the bus has a value of about ±270 Vdc, the boost converter is activated to raise the DC voltage to a valid value to be used by the inverter and at the same time to maintain the batteries at a correct voltage level. The batteries are connected in buffer with the DC bus. The maximum voltage at which the bus can be adjusted is 844 Vdc (±422 Vdc).
The control electronics uses a state-of-the-art 32-bit microprocessor DSP that enables reduction of the harmonic distortion of the current absorbed in the mains (THDi) to less than 3%. This ensures that the rectifier does not distort the supply network with respect to the other loads. It also prevents cable overheating caused by circulation of harmonic currents.
The rectifier is designed to power the inverter under full load and also charge the batteries with the maximum recharge current.
It also includes the High Efficiency function, which allows the batteries to be disconnected from the bus according to their state of charge, allowing yields of up to 97% to be obtained.

- In normal operation, the UPS charges batteries with a bus voltage of 819 Vdc for 60 batteries and 846 Vdc for 62 batteries, through the diodes.

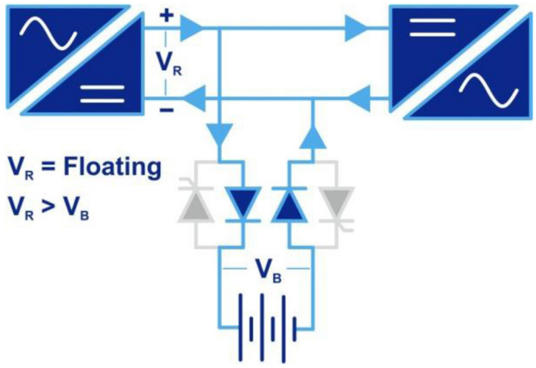


Fig. 3. Battery charging diagram.

- In battery discharge mode, the batteries are connected to the inverter input through the thyristors, with an efficiency of 97% (≤ 160 kVA) and 98% (≥ 200 kVA).

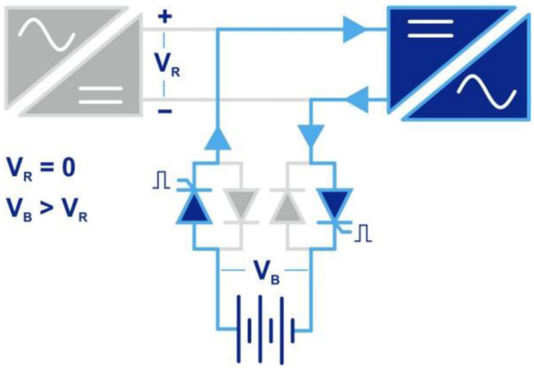


Fig. 4. Battery discharge diagram.

- With the **High Efficiency** mode activated, the bus voltage is reduced to 700 Vdc, and because the battery voltage is higher, the diode disconnects it from the circuit, helping to prolong its average life, as it reduces its ripple, and increasing performance.

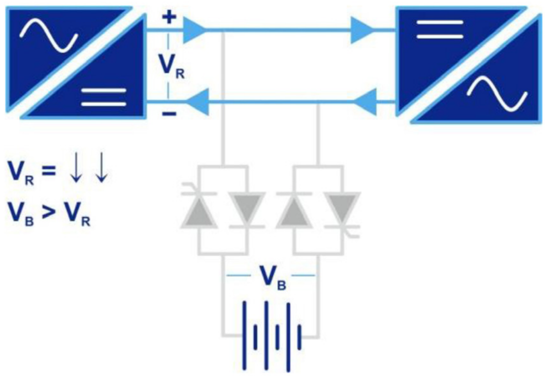


Fig. 5. **High Efficiency** *Mode diagram.*

The rectifier has a soft-start function (power walk-in) which limits the consumption at the rectifier input from 0 to 100% of the nominal power when the input voltage is restored after a mains failure. The ramp time can be adjusted between 5 and 30 s.

The rectifier is in charge of maintaining the correct values of voltage and current in order to carry out an adequate battery charge.

The charging current is controlled by software, using the readings that the battery current and DC voltage transformers send to the controller. The charging current is set to the appropriate value for each unit based on the total capacity of the battery group and with a maximum of 50 A for units up to 160 kVA and 100 A for units up to 400 kVA. The maximum battery charge values imply a degradation of the power available at the inverter output.

The battery charge curve is of the I/U type, constant current-constant voltage according to DIN 41773.

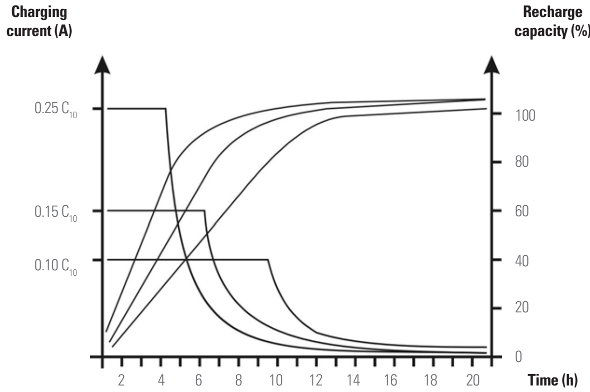


Fig. 6. Battery charging voltage and current chart with a single voltage level.

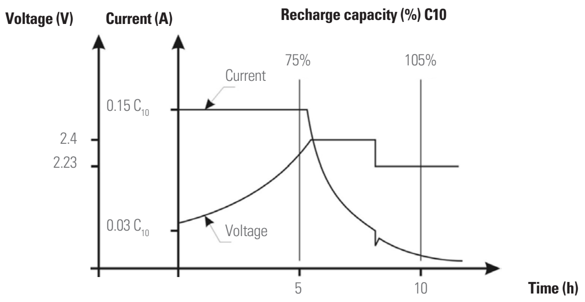


Fig. 7. Battery charging voltage and current graph with two voltage levels.

6.2. INVERTER.

The inverter converts the DC voltage coming from the rectifier or the battery into AC voltage, stabilised in value and frequency. The inverter has a state-of-the-art 32-bit DSP that allows the generated voltage distortion (THDv) to be reduced to values below 1% with linear loads and 5% in non-linear loads.

The inverter topology is semi-bridge IGBTs (Insulated Gate Bipolar Transistor), without a transformer. For powers equal to or greater than 200 kVA, the inverter has 3 levels. The switching frequency of this inverter is 7.5 kHz in all powers.

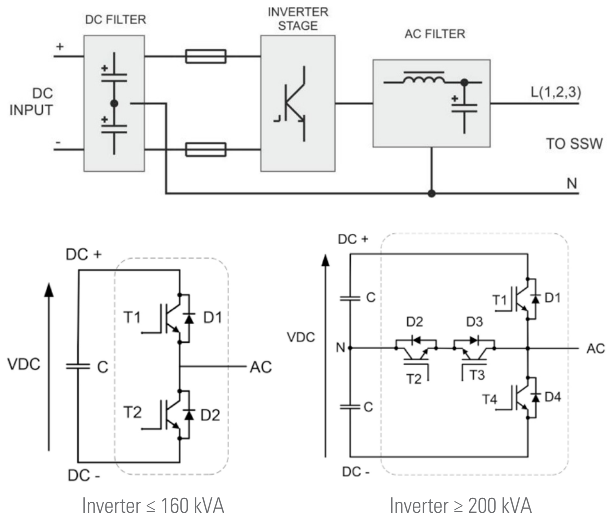


Fig. 8. Inverter diagram.

The inverter has an output current reading that is used by the DSP to activate current limiting and protect the IGBTs.

In the final stage of the inverter there is a low-pass filter with the aim of eliminating high frequency ripple and keeping the harmonic distortion of the output waveform (THDv) below 1% (with linear load).

6.2.1. Operation with non-linear loads.

A non-linear load is characterised by a high current peak in relation to its RMS value which, under normal conditions, causes a distortion in the form of the inverter's output voltage.

The inverter controller of the **SLC X-PERT** series is capable of varying the width of the inverter PWM modulation pulses depending on the type of current waveform absorbed by the loads. With this feature the inverter is able to maintain an output THDv of less than 5% with waveforms with a crest factor of up to 3:1.

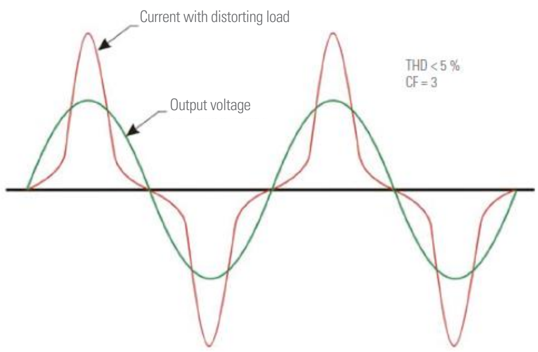


Fig. 9. Output waveform with load currents with Crest Factors up to 3:1.

6.2.2. Overload.

By means of the DSP of the inverter and the current reading of the inverter, overloads per phase are detected. In the event of an overload, once the stipulated time has elapsed, the device transfers the load to a static bypass and after 30 minutes it feeds the load back through the inverter. The permitted times and overloads are:

- Overload for devices of up to 125 kVA:
  - ❒ > 100% ÷ 125%: 10 min.
  - ❒ > 125% ÷ 150%: 30 s.
  - ❒ > 150%: 100 ms.

- Overload for devices ≥ 160 kVA:
  - ❒ > 100% ÷ 110%: 10 min.
  - ❒ > 110% ÷ 125%: 5 min.
  - ❒ > 125% ÷ 150%: 30 s.
  - ❒ > 150%: 100 ms.

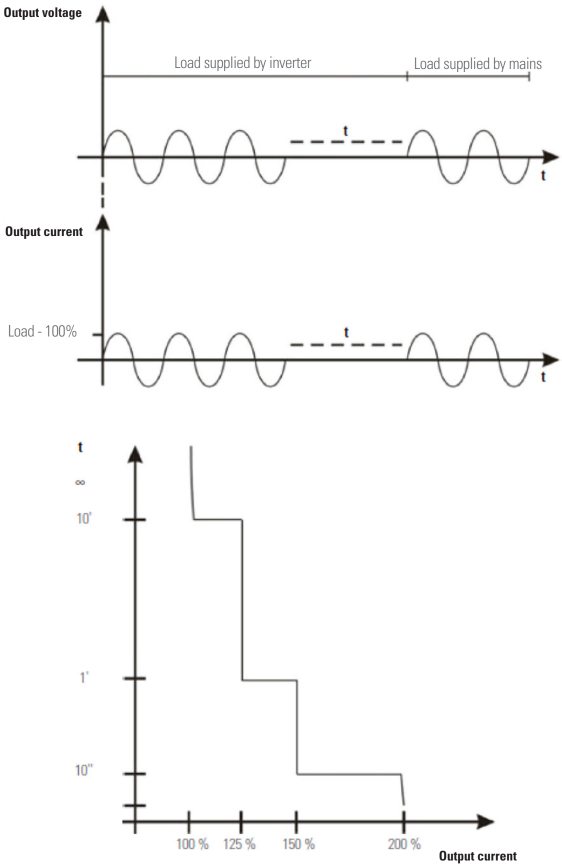


Fig. 10. Behaviour in response to overload.

During overloading, the inverter will feed the loads for the entire established time. When the maximum time is exceeded, the loads will be transferred to the bypass line without interruption. Once the inverter has been blocked due to an overload, it will remain disabled for 30 minutes to ensure proper cooling of the IGBTs and inductors due to the overload.

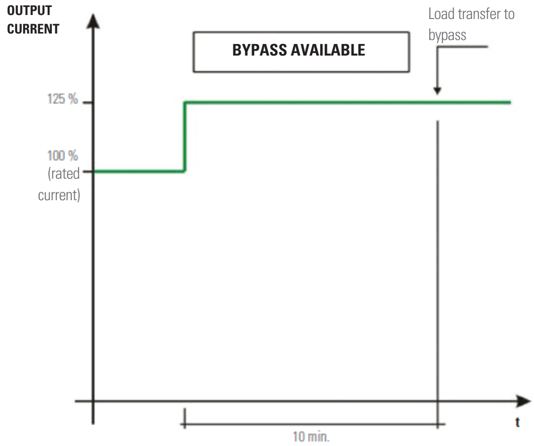


Fig. 11. Transfer to Bypass with 125% overload.

In the event that the bypass line is not available after the overload limit values have been reached, the inverter will be blocked to prevent irreversible damage to the internal components of the UPS. As soon as the bypass line is restored, the loads will be supplied by the auxiliary network.
After 30 minutes, the inverter will be activated again and the loads will be fed back into the primary grid.

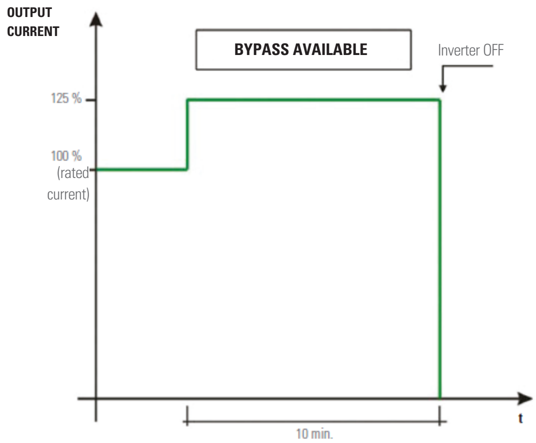


Fig. 12. Behaviour with Bypass not available.

6.2.3. Short circuit.

In the event of a short circuit downstream of the inverter, the UPS will transfer the load to the auxiliary bypass line. If the short circuit disappears, the inverter will restart and the loads will be retransferred automatically. In case the bypass is not available and a short circuit occurs at the inverter output, the output voltage will be reduced to maintain an output current between 250% and 300% of its nominal value (depending on the model) for 70 ms, and 150% for 5 seconds. If the short circuit persists after this time, the inverter will be blocked (according to EN 62040-3 / EN 50091-3).

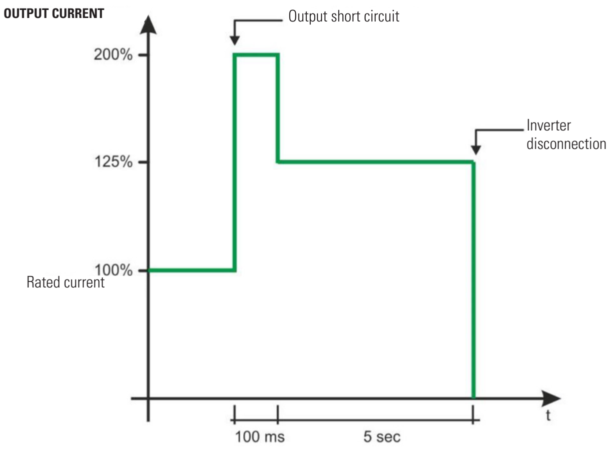


Fig. 13. Short-circuit behaviour.

6.3. BATTERIES.

The **SLC X-PERT** series UPS range offers the installation of batteries inside the UPS itself for 80 kVA, and in independent cabinets or racks for the whole range. The number of cabinets required will depend on the power of the model and/or the required backup and in any case they will be installed as close as possible, with a homogeneous distribution on each side of the device in systems with several cabinets.

The control logic of the battery charger is fully integrated within the rectifier control board.

The batteries are charged according to DIN 41773 standard, whenever they have been partially or completely discharged due to a power failure. To prevent self-discharge, the batteries are always kept at float voltage, even after charging (except when in high efficiency mode).

6.4. STATIC BYPASS.

The static bypass allows the load(s) to be fed through the inverter or the bypass network and vice versa, with very short switching times. As power switching elements, it uses thyristors (SCR).

The **SLC X-PERT** series incorporates as standard a bypass line independent of the rectifier line in all its models.

As an option, a cable kit can be supplied to make the common connection of bypass and rectifier.
The UPS constantly monitors the availability between the inverter and the bypass to make the transfers between them.
The Bypass block is based on six double thyristors in semipack format working as AC switches, three of which are for the switching of the bypass input independently on the output and the other three for the switching of the inverter on the output. The semiconductors are protected by fast-acting fuses.
The devices have a redundant power supply capable of activating the transfer in the event of a failure in the main power supply (and therefore in the control).
To ensure continuity of power supply to loads, the bypass block is designed to allow a continuous overload of 150% and up to 1000% for 20 ms.
The control algorithm for the thyristor excitation signals ensures zero transfer time, preventing short-circuits between the bypass and inverter thyristors (current switching passing through zero).

6.4.3.1. Transfer from inverter to bypass.

During normal operation of the devices, the transfer from inverter to bypass is performed automatically, provided the bypass line is available and within acceptable range, in the following situations. The switching time is less than 0.5 ms.

Cases in which automatic transfer to bypass occurs:

- A short circuit occurs at the output.
- A fault occurs in the inverter or the inverter voltage is out of range.
- The DC bus voltage is above or below its limit values.
- The internal temperature of the UPS exceeds its maximum value.
- The maximum overload value or the maximum time at a certain overload level is exceeded.

The inverter transfer can also be done manually for maintenance or test purposes.

6.4.3.2. Bypass to inverter transfer.

Bypass to inverter transfer will be performed automatically as soon as the inverter and the bypass line are synchronised and within acceptable values. The transfer takes less than 1 ms.

In the event that 6 bypass transfers to the inverter occur within 5 minutes, the loads will be permanently fed by the bypass. In this case, a manual reset will be necessary to transfer the loads to the inverter.

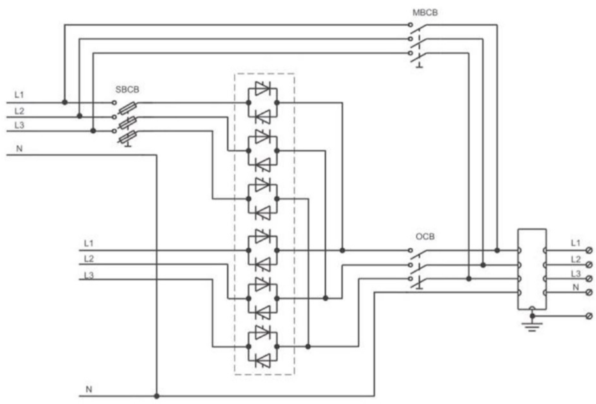


Fig. 14. SRC's diagram of the Static Bypass.

6.5. MANUAL BYPASS.

In order to facilitate the maintenance and repair of the units, the **X-PERT** series UPS incorporate a manual bypass disconnector inside the UPS cabinet itself for all models.

The transfer to manual bypass mode can be done without cutting off the power supply to the loads. When the devices are in maintenance bypass mode, all the verification and testing tasks of the devices can be carried out in complete safety for the operators.

7. OPERATING MODES.

The UPS has four operating modes:

- Normal operation.
- Bypass operation.
- Battery operation (backup mode).
- Operation in manual or maintenance bypass mode.

7.1. NORMAL OPERATION.

In normal operation all switches/disconnectors are in the ON position, except the MBCM (maintenance bypass).

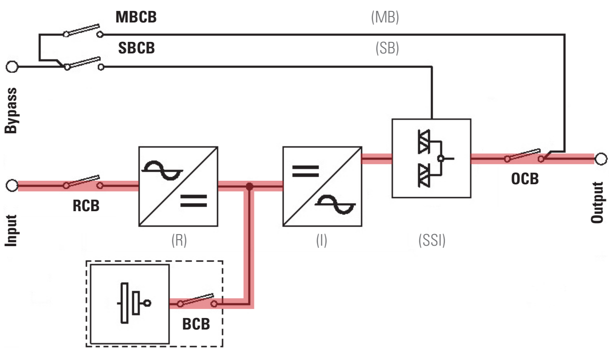


Fig. 15. Power flow in normal operation.

The rectifier is powered by three-phase AC input voltage and this in turn powers the inverter and compensates for the variation in the mains voltage and load, thus keeping the DC voltage constant.
It is also responsible for keeping the batteries in an optimum state of charge (floating or quick charging depending on the type of battery). The inverter converts the DC voltage into a stabilised sinusoidal AC voltage and frequency and feeds the load through its static switch (SSI).

7.2. STATIC BYPASS OPERATION.

The load can be transferred to static bypass either automatically or manually. In both cases the transfer is done by the solid state static switch (SB). In the event of a fault or failure in the supply of the bypass line, the load is transferred back to the inverter, all without interruption and without altering the supply to the loads.

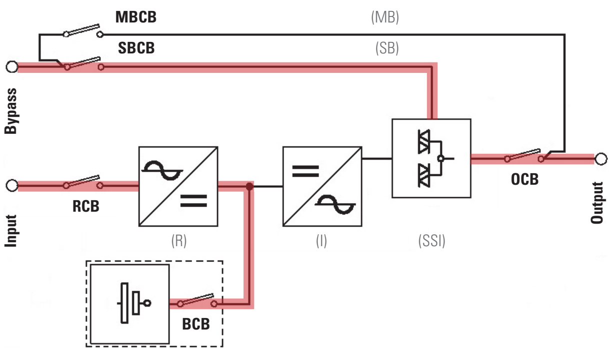


Fig. 16. Static Bypass operating power flow.

7.3. BATTERY OPERATION (BACKUP MODE).

In the event of a mains failure, incorrect input voltage and/or frequency or rectifier failure, the battery set will supply the inverter. The battery voltage decreases as a function of the amplitude of the discharge current. The drop in voltage does not affect the output voltage, which remains constant thanks to pulse width modulation (PWM).

In case of return of the UPS supply network or if the voltage and/or frequency is restored to the nominal values before the batteries are completely discharged, the system automatically returns to normal operation. Otherwise, the inverter will be blocked when the discharge voltage limit is reached as a measure of battery protection. The load will be transferred to the bypass line (bypass operation).

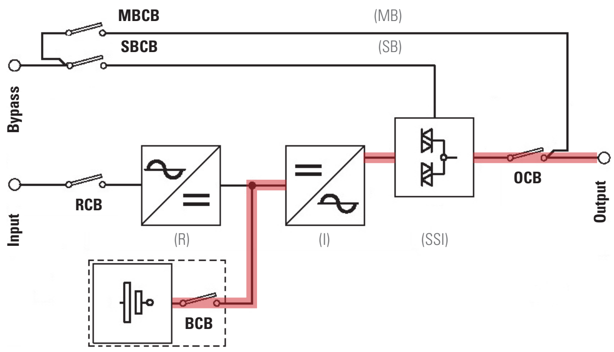


Fig. 17. Operating power flow from the batteries.

If the bypass line is not available or out of tolerance limits, the power supply to the load will be disconnected. When power is resumed, the rectifier recharges the battery. In the standard configuration, power to the load will be resumed as soon as the mains is available via the static switch (SSB). The inverter will restart when the batteries have recovered part of their capacity. This restart from the condition of discharged batteries can be customised according to the needs of the device in three ways:

- Bypass. Supply the loads as soon as the bypass is available (factory setting).
- Inverter. The inverter supplies the loads, even if the bypass network is available, when the battery voltage has reached the programmed level after the restart of the rectifier.
- Manual inverter. The output power is not restored automatically; the system requests confirmation of restart, which can be done manually by an operator through the front panel.

7.4. OPERATION IN MANUAL OR MAINTENANCE BYPASS MODE.

In manual bypass mode for preventive maintenance, break-down or repair, the UPS will be shut down and the load(s) will be fed directly from the manual bypass line. Depending on whether the supply of this line comes from a utility company (same as the main network that feeds the rectifier or a second utility company), or from a generator, the quality of the supply will vary and, consequently, also the incidences derived from the supply of the load or loads.

It is advisable to carry out from time to time a functionality test of the manual bypass to guarantee the correct operation in future maintenance or repair works.

The operations of the manual bypass disconnector for its transfer to the maintenance bypass and the return to normal operation, will be carried out respecting the steps established in the respective chapter of this document. The user will be solely responsible for any faults caused to the UPS, loads and/or installation, due to incorrect actions.

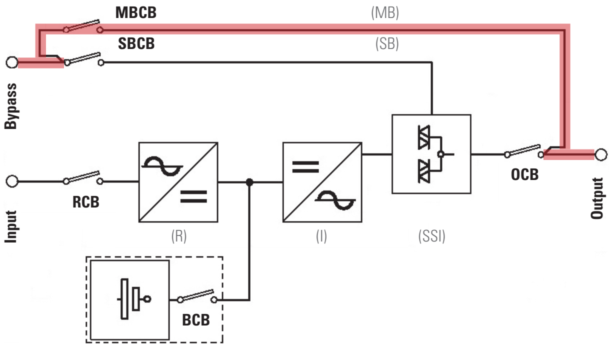


Fig. 18. Operating power flow in manual maintenance bypass.

8. USER INTERFACE.

The **SLC X-PERT** series UPS are provided with the following devices to facilitate the communication between the UPS and the user and between the UPS and external devices.

- Front panel.
- Serial interface.

8.1. FRONT PANEL.

The front panel is composed of a 10.1" touch screen that allows for the comprehensive monitoring of the UPS. It has a series of screens to display measurements, alarms, settings and information about the device.

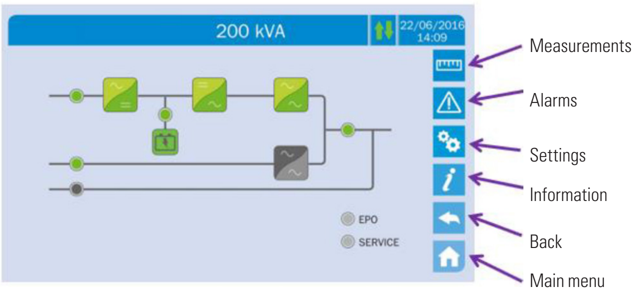


Fig. 19. Main menu.

The menu is available in the following languages: Spanish, English, French, German, Italian, Polish, Portuguese, Turkish, Chinese and Russian.

8.1.1. Available sizes.

The following table shows the different sub-menus, the information displayed and the accuracy of the measurements.

Sub-menu	Display Information	Accuracy
INPUT	Input voltage (F-N)	1 V
	Input current	1 A
	Frequency	0.1 Hz
	Input power	1 kVA
OUTPUT	Input voltage (F-N)	1 V
	Current	1 A
	Load percentage	1%
	Active power	1 kW
	Apparent power	1 kVA
	Frequency	0.1 Hz
BYPASS	Voltage (F-N)	1 V
	Frequency	0.1 Hz
INVERTER	Voltage (F-N)	1 V
	Frequency	0.1 Hz
AC / DC	Rectifier output voltage	1 V
BATTERY	Voltage and current	1 V / 1 A
	Rated capacity	1 Ah
	Autonomy	1 min / 1%
TEMPERATURE (Optional)	Battery (Optional)	0.1 °C
		0.1 °C

Table 1. Information displayed on the screen.

8.1.2. Alarms and states.

- Alarms.

Code	Description
A1	MAINS FAILURE
A2	IN. PHASE ROT. ERR
A3	BOOSTER STOPPED
A4	BOOSTER FAILURE
A5	DC VOLTAGE FAILURE
A6	BATTERY TEST
A7	BCB OPEN
A8	BATTERY DISCHARGED
A9	END BATT. BACKUP
A10	BATTERY FAILURE
A11	SHORT CIRCUIT
A12	SHUTDOWN DUE TO SHORT-CIRCUIT
A13	INV. OUT OF TOL.
A14	BYP. PHASE ROT. ERROR
A15	BYPASS FAILURE
A16	BYP -> LOAD TRANSFER
A17	RETRANSFER DISABLED
A18	MBCB CLOSED
A19	OCB OPEN
A20	OVERLOAD
A21	THERMAL IMAGE
A22	BYPASS SWITCH
A23	EPO PRESSED
A24	HIGH TEMPERATURE
A25	INVERTER OFF
A26	COMMUNICATION ERROR
A27	EEPROM ERROR
A28	CRITICAL FAILURE
A29	MAINT. REQUIRED
A30	COMMON ALARM
A31	MBCB BUS CLOSED
A32	EPO BUS CLOSED
A33	ASYMMETRIC LOAD
A34	SERVICE REQUIRED
A35	DIESEL MODE
A36	RAPID DC SHUTDOWN
A37	OCBD OPEN
A38	INVERTER --> LOAD
A39	INVERT. LOOP ERR.
A40	SSI FAILURE
A41	RECT. LOOP VOLT. ERR.
A42	LOSS OF RECTIFIER REDUNDANCY
A43	RECTIFIER THERMAL IMAGE
A44	INVERTER DESAT
A45	HIGH TEMPERATURE IN SSW
A46	REDUNDANCY LOST
A47	PARAMETER SEND ERR.
A48	E2P PARAMETER RECEP. FAIL.

Code	Description
A49	TEST MODE ERROR
A50	INPUT OVERLOAD
A51	BATTERY TEMPERATURE
A52	INVERTER DISABLED
A53	FIRMWARE ERROR
A54	CAN ERROR
A55	PARALL. CAB. DISCONN.
A56	IN. MAINS UNBAL.
A57	IN. CURR. UNBAL.
A58	INV. CURR. UNBAL.
A59	BACKFEED RL ON
A60	RECTIFIER DESATURATION
A61	MAX VDC
A62	MAINS OVERVOLTAGE
A63	STARTUP SEQ. FAILURE
A64	MAINS UV TRANSIENT

Table 2. Alarm code and description.

- States.

Code	Description of state
S1	BOOSTER OK
S2	BATTERY OK
S3	INVERTER OK
S4	INVERTER --> LOAD
S5	INV. BYP. SYNCHRONISED
S6	BYPASS OK
S7	BYPASS --> LOAD
S8	MAST. INV. SYNCHRONISED
S10	RECTIFIER IN STANDBY
S11	INVERTER IN STANDBY
S12	BATTERY IN STANDBY
S13	UHE CONDITION KO
S14	BATT. CHARGING I
S15	BATT. CHARGING U
S23	RTC ERROR

Table 3. Operating state codes and description.

8.2. SERIAL INTERFACE.

The communications (COM) line is a very low voltage safety circuit. To preserve the quality, it must be installed separately from other lines carrying dangerous voltages (power distribution line). The UPS has the following serial interfaces for external communication of operating states and operating parameters:

- RS-232/USB: Used for connection to proprietary programming and control software.
- MODBUS (optional): Intended for data transmission to the outside via a MODBUS protocol (RS-485).
- PARALLEL (optional): Used for communication between UPSs in parallel configuration.
- SWITCH: NORMAL/BYPASS.
- SNMP SLOT: Intended for inserting an SNMP communications card (card not included).
- TEMPERATURE PROBE: Transducer to detect the temperature of the battery set. Standard length: 10 m.
- RELAY INTERFACE CARD (optional).

9. OPTIONAL EXTRAS.

9.1. OPTIONS INCLUDED AS STANDARD (FACTORY SETTING OR BY **T.S.S**).

The devices incorporate a series of functions and features, which require either activation or adjustment (in the factory or in-situ) to be indicated on the order, or the intervention of a qualified technician during installation. These functions and features are:

- Diesel generator
- Eco-mode
- Backfeed protection (Detection)
- Programmable soft-start ramp (Walk-in)
- Sequential start for parallel systems
- Frequency converter
- Increase in the battery charge current with output power derating
- Boot selection after end of backup

9.1.1. Diesel generator.

The Diesel Generator function limits the output voltage of the rectifier so as not to recharge the batteries during generator operation. In this way, the rectifier needs less energy to feed the loads and the energy consumption upstream is considerably reduced. In this way, the power of the generator can be reduced. For operation, this signal must be fed into the SLC X-PERT device via the terminals intended for this function XD1-XD2.

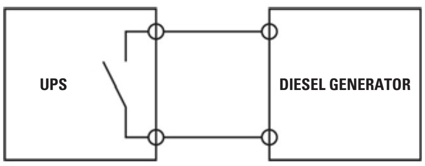


Fig. 20. Connection of the SLC X-PERT with a diesel generator.

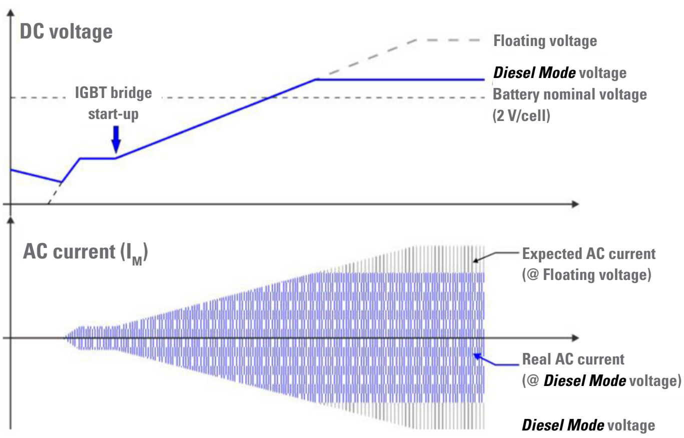


Fig. 21. Voltage and current evolution in Diesel mode.

9.1.2. Eco-mode.

For loads less sensitive to fluctuations in the commercial mains, these can be supplied directly by the static bypass switch as long as this is within the acceptable voltage and frequency ranges. The inverter will be operating with the output disconnected, but maintaining its voltage and phase parameters the same as those of the bypass network. In this way, only the losses of the bypass itself plus those of the converters working at no load will be produced, which will allow us to achieve an efficiency of more than 98%.
In the event of a mains failure, the inverter will take over, powered by the batteries and connecting its output to the loads through the static bypass switch, with a transfer time of 2-3 ms.

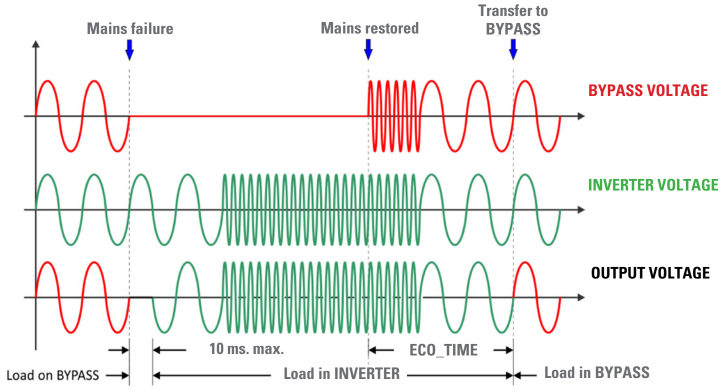


Fig. 22. Eco-mode sequence diagram.

9.1.3. Backfeed protection.

The device incorporates return energy signaling terminals as standard, and requires either an external tripping element or the optional internal tripping element of the bypass switch for operation.

9.1.4. Programmable soft-start ramp (Walk-in).

The rectifier soft-start ramp function allows modification of the rectifier input current absorption ramp and the set value for battery charging or floating voltage. Together with the delay time to start the rectifier, they allow to reduce the disturbances caused by the UPS to the power generator that feeds them.
The range of values to which the ramp can be adjusted is from 5 to 30 s.

9.1.5. Sequential start for parallel systems.

Sequential starting of the rectifiers is useful when different UPS in parallel are powered by the same power generator, as it avoids overloading the generator during the restart of the rectifiers. The rectifiers will each start with the programmed delay.
The range of values to which the sequential start can be adjusted is from 1 to 300 s.

9.1.6. Frequency converter.

The frequency converter mode allows an output frequency of 60 Hz to be provided, while the input frequency is 50 Hz, or vice versa. When this function is activated, the bypass is automatically disabled, since synchronisation between the two voltages is not possible.

9.1.7. Increase in the battery charge current with output power derating.

By activating this feature, it is possible to increase the battery charge current above its nominal value up to a defined maximum value that depends on the SLC X-PERT model.

Maximum charging current according to the following table:

	Device power (kVA)							
	80	100	125	160	200	250	300	400
Nominal ibat	15 A		20 A		30 A	40 A		50 A
Ibat with output power derating	50 A				100 A			

Table 4. Maximum battery charging current with output power derating.

The additional current allows large capacity battery sets to be charged as long as the charges do not require it. It is useful in applications where it is not required to use 100% of the power continuously, allowing some of the excess power to be used to charge the batteries.

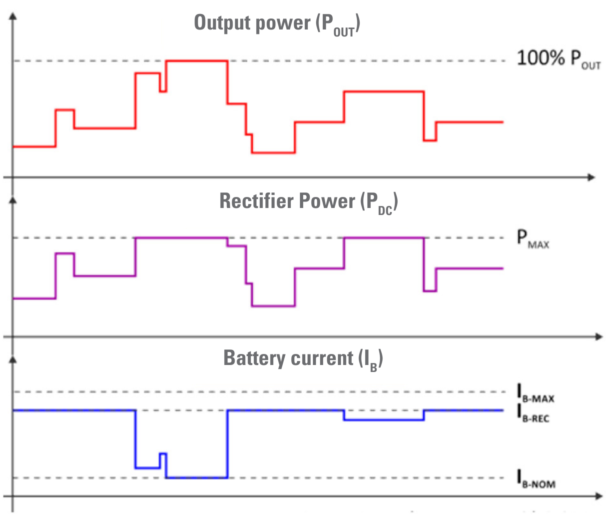


Table 5. Battery current diagram as a function of output power.

9.1.8. Boot selection after end of backup.

When the battery is completely discharged and the DC voltage drops below the selected threshold, the inverter disconnects.
Once the power is restored, the rectifier starts charging the battery and the DC voltage is gradually increased according to the battery state. The output power of the UPS can be restored in 3 different ways, depending on the value selected in the variable RST_DISC.

1. **From the bypass.**
   This is the standard operation as to how to restore the output power of the UPS after a complete discharge of the battery.
   The power is restored immediately from the bypass, as soon as the network is available. The inverter only restarts when the DC voltage exceeds the reset threshold (RSTA_INV).
   In the event of a power failure during this period, the load is not supplied.

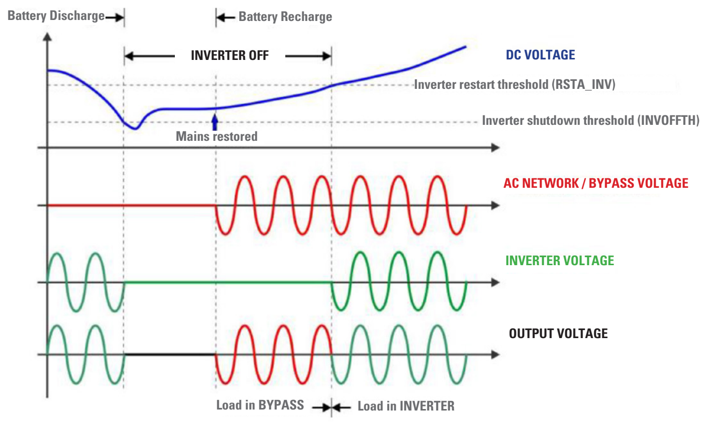


Fig. 23. Diagram for start-up from the Bypass after an end of backup.

2. **From the Inverter.**
   The output supply is only restored when the DC voltage exceeds the inverter's restart threshold (RSTA_INV) and the inverter is enabled to start. The threshold must be set so that the battery has regained sufficient capacity to sustain the inverter in the event of a short power failure after the reset.

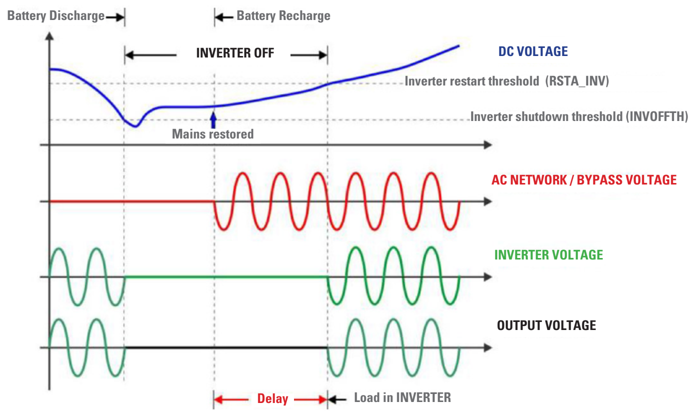


Fig. 24. Diagram for start-up from the Inverter after a runtime end.

Particular attention should be paid to the correct setting of the RSTA_INV inverter restart threshold.
After a discharge, the battery has a "buffer" effect, so that the voltage increases as soon as the load is no longer applied. Therefore, after the inverter has been switched off, the battery voltage starts to rise and may exceed the RSTA_INV threshold even if the grid is not available.
If this happens, the inverter will restart unpredictably and the AC voltage will be available at the UPS terminals for

some time, which depends on how fast the battery voltage falls below the shutdown level of the inverter. This effect can be very dangerous when technicians are working on the UPS line.

3. **Manual reset.**
   In the case of particularly sensitive loads, the operator may require that they do not automatically restart after a power failure; this is possible with the MANUAL restart mode.
   As soon as the DC voltage exceeds the restart threshold of the inverter (RSTA_INV), the display shows a message and the inverter can be restarted manually by pressing a button.

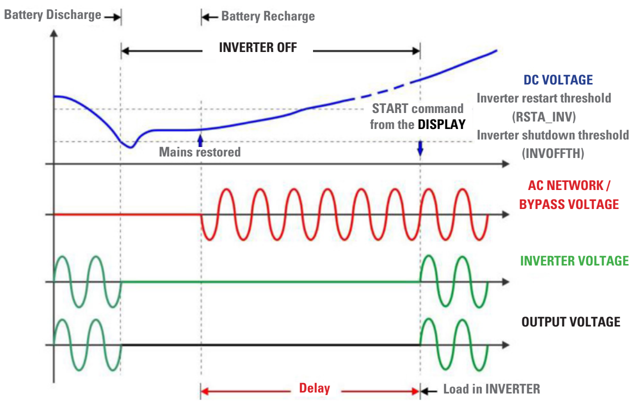


*Fig. 25. **Diagram for manual reset after end of runtime.***

9.2. OPTIONAL EXTRAS AVAILABLE ON REQUEST.

In addition, the SLC X-PERT series can be supplied with other options, not included in the standard devices, which allow to adapt to the most demanding needs.

- Compensation of battery voltage according to temperature
- Isolation transformer on bypass line
- Autotransformer for adjusting input/output voltage
- Relay interface card
- RS-485 communications port (MODBUS protocol)
- SNMP card
- Remote panel
- Parallel kit
- Battery cabinets
- Battery protection in external wall box
- Special colour
- Load-sync bus kit for single devices
- Load-sync bus kit for parallel devices
- Back-feed protection
- BPME (External Manual Bypass)
- IP31 protection grade

9.2.1. Battery voltage compensation according to temperature.

This option incorporates a temperature probe that must be installed near the location of the batteries for proper operation. The reading provided by the temperature probe will inform the control logic of the rectifier and modify its floating voltage, following a typical curve provided by the battery manufacturer.
Its main use is in sealed batteries, particularly sensitive to temperature changes. The measurement provided by the probe can be monitored on the display and, in the event that it is outside its acceptable range, an alarm will be activated.
The probe is supplied with an interconnecting cable that allows it to be installed at a distance of up to 15 metres.

9.2.2. Isolation transformer.

The isolation transformer provides galvanic isolation in order to completely isolate the output from the input and/or change the neutral point treatment. The placement of an electrostatic screen between the primary and secondary windings of the transformer provides a high level of electrical noise attenuation.
The isolation transformer can be physically placed at the input or output of the UPS depending on the technical conditions of the whole system (device supply voltage and/or load voltage, their characteristics or type, etc.). This optional extra can be installed within the 80 kVA device, connecting the batteries externally. For the rest of the range (or 80 kVA if required) it will be supplied as a peripheral component, external to the device itself, in a separate box.

9.2.3. Autotransformer for adjusting input/output voltage.

In case the input or output voltages are different from the nominal voltages of the devices, it is possible to supply autotransformers to adapt the output voltages to those required by the loads or to adapt the network voltages to the input nominal of the device.
If galvanic isolation is required, isolation transformers can also be supplied.
All transformers and autotransformers shall be located in cabinets that are external to the device.

9.2.4. Relay interface card.

The optional relay communication port provides digital signals in the form of potential-free contacts with a maximum applicable voltage and current of:

- 1 A (resistive load) 50 V DC.
- 1 A 120 V AC.

This channel makes a dialogue between the devices and other machines or devices possible.

The electrical connection is made directly to the terminal block on the optional extra's card itself, which is supplied with one changeover contact for each of the eight alarm relays available for free use.

The most common use of these types of ports is to provide the necessary information to the file-closing software.

Relay	Alarm/State	States	M1 Pins	M1 State in normal operation	LED Name	LED State in normal operation
RL1	A30: Common alarm	No voltage if there is an alarm	2-3	Closed	DL1	ON
			1-2	Open		
RL2	A1: Input failure	No voltage if there is an alarm	5-6	Closed	DL2	ON
			4-5	Open		
RL3	A3: End of battery backup	No voltage if there is an alarm	8-9	Closed	DL3	ON
			7-8	Open		
RL4	A13: Inverter out of tolerance	No voltage if there is an alarm	11-12	Closed	DL4	ON
			10-11	Open		
RL5	Normal mode A16: Bypass → Load	No voltage if there is an alarm	13-14	Closed	DL5	ON
			14-15	Open		
	Eco Mode S7 state: Bypass → Load	With voltage if there is state	14-15	Closed		
			13-14	Open		

9.2.5. RS-485 communications port (MODBUS protocol).

This consists of an additional card that is installed on the front of the device. This card is provided with a three-pole connector and a SUB-D9 connector, and both connectors perform the function of RS-485 port indiscriminately. The conversion of the UPS parameters to MODBUS protocol is done on this card.

9.2.6. SNMP card.

The device comes standard with a slot for inserting an SNMP card for integrating the UPS into the customer's LAN or WAN computer network.

There are different types of SNMP cards available depending on the customer's needs. In all of them, the internal protocol of the UPS is converted to SNMP (Simple Network Management Protocol) and it is possible to monitor the state and values of the UPS.

It is also possible to configure the SNMP card as RCCMD (Remote Console ComManD) to start the process of shutting down one or more PCs/servers when the UPS is close to its end of backup or has some problem. To do this, a little software is required on each PC. The SNMP card itself includes a licence. If more units are required, they can be purchased separately.

9.2.7. Remote panel.

The remote panel allows for the monitoring of 3 independent alarms (Mains Failure, End of Backup, Inverter out of range) and 1 General Alarm. Each event activates the blinking of the last 'General Alarm' LED and an acoustic alarm, which can be deactivated by the user. In normal conditions, the 'UPS OK' LED is on.

9.2.8. Parallel kit.

The parallel kit integrates all the components to convert a device configured as a single device into a device ready to be integrated into a parallel system.

- It allows for up to 6 devices to be paralleled.
- Standard 15 metre cable.
- In devices up to 160 kVA, it allows paralleling devices with different power levels.
  - ❒ Two units maximum.
  - ❒ It distributes the load in proportion to the power of each unit.

9.2.9. Battery cabinets.

The batteries, in 60-62 12 VDC block configuration, are always supplied in an external cabinet with IP20 protection.

The battery cabinets and batteries are shipped in separate packages and are assembled during installation. Please consult your distributor for assembly conditions.

The battery cabinets include protection with disconnector + fuses integrated in the same battery cabinet up to a power of 200 kVA. For powers equal or superior to 250 kVA the batteries are mounted on IP00 racks, with the protections inside a wall box.

The length of the battery cabling is 3.5 m when the batteries are in the cabinet. For the racks, the connection cable is not included. Consult your distributor for different lengths.

9.2.10. Battery protection in external wall box.

As an optional extra, battery protection can be ordered in an external wall box. This option is particularly useful when the customer already has the batteries and only requires the protection. This option does not include wiring between the UPS and the protection box or between the box and the battery set. Consult your distributor for more information.

9.2.11. Special colour.

The devices can be supplied with the covers painted in any RAL colour, on request and with modification of the delivery time.

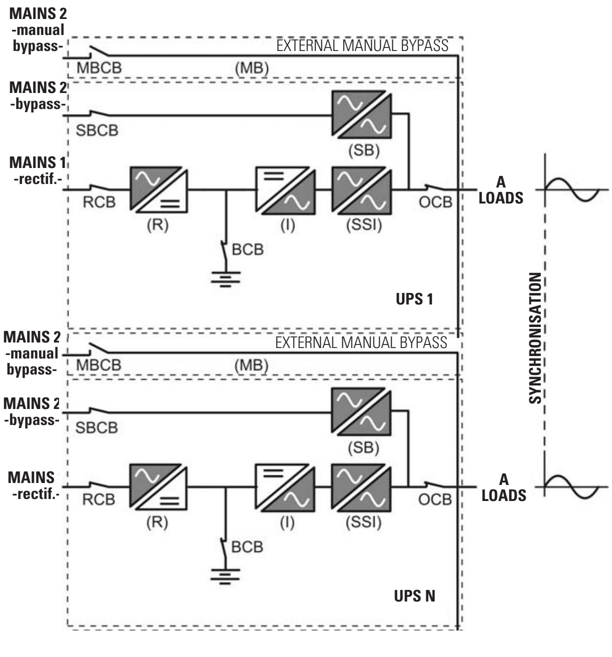
9.2.12. Load-sync bus kit for single devices.

The ‘load-sync-bus’ for single devices is only available for two UPSs.

This option allows the devices to supply the two synchronised outputs in the different operating modes. As far as loads are concerned, the behaviour of the UPS is as if they were single units independent from each other. Therefore, the outputs of the UPS cannot be connected in parallel.

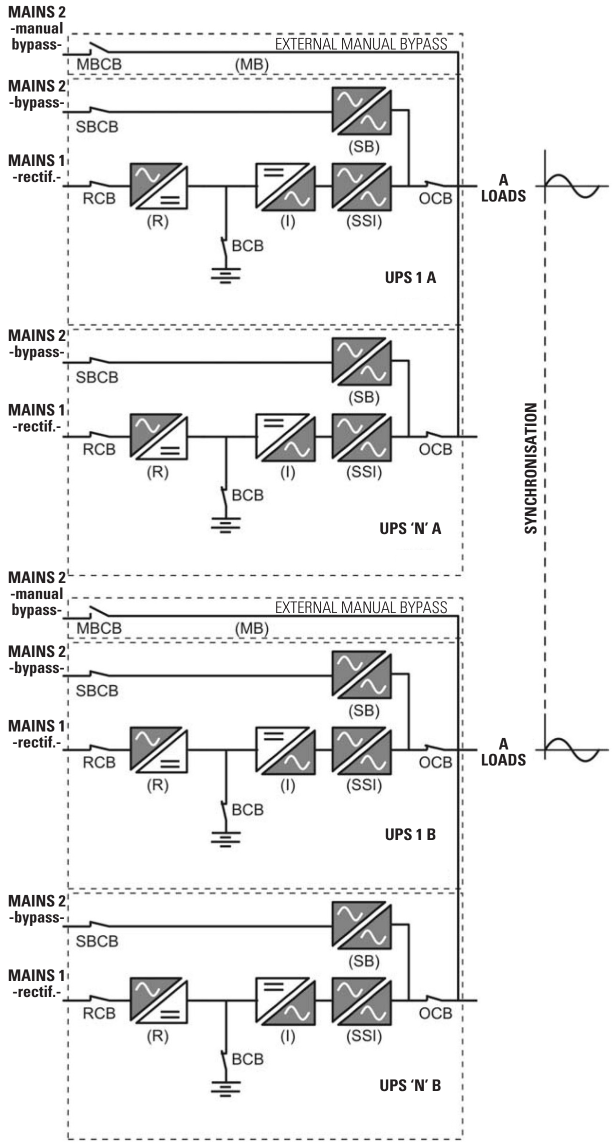
As soon as one of the units has the bypass network available, which must be the same for the two units connected with the ‘load-sync-bus’ kit, the other unit will synchronise its output voltage with that of the auxiliary bypass line that is present.

The bypass line will be available only for the devices where this is present.



9.2.13. Load-sync bus kit for parallel devices.

The ‘load-sync-bus’ is also available for parallel systems up to 6 units. The figures below show the connection of the two systems A and B with the kit.



This option allows the parallel systems to supply the two synchronised outputs in the different operating modes. As far as loads are concerned, the behaviour of the UPS is as if they were two totally independent systems. Therefore, the outputs of systems A and B cannot be connected.

The external synchronisation box is connected via CANBUS to system A and system B. Once the ‘Sync load’ function has been enabled, the two outputs of each system will be synchronised.

9.2.14. Back-feed protection.

This option avoids the risk of a voltage return upstream due to a failure in the bypass thyristors.
A signalling relay is fitted as standard, and the trip coil can optionally be installed in the bypass circuit breaker. It requires a manual reset.

9.2.15. BPME (External Manual Bypass).

The purpose of this option is to electrically isolate the devices from the input and output networks without the need to cut off the power supply, so that maintenance or repair operations can be carried out without interrupting the power supply to the protected system, while avoiding unnecessary risks to technical personnel.
The basic difference between this option and the manual bypass integrated into the device's own enclosure consists of greater operability, since it allows total disconnection of the UPS from the installation.

9.2.16. IP31 protection grade.

As an optional extra, the devices can be supplied with IP31 protection. Consult your distributor for more information.

10. INSTALLATION.

Compliance with all safety instructions in the user manual sent with the device is mandatory and the user is legally responsible for ensuring that they are observed. Read them carefully and follow the steps indicated in the order established. Local electrical regulations and different restrictions in the customer's location may invalidate some recommendations contained in the manuals. Where discrepancies exist, the user must comply with the relevant local regulations.

10.1. MINIMUM DISTANCES AROUND THE DEVICE FOR CORRECT VENTILATION AND AIR FLOW.

	A (mm)	B (mm)	C (mm)	D (mm)
UPS with internal batteries				
Recommended spaces	50	1200	600	600
Minimum spaces	0	1200	600	400
UPS with external battery cabinet				
Recommended spaces	50	1200	400	600
Minimum spaces	0	1200	0	400

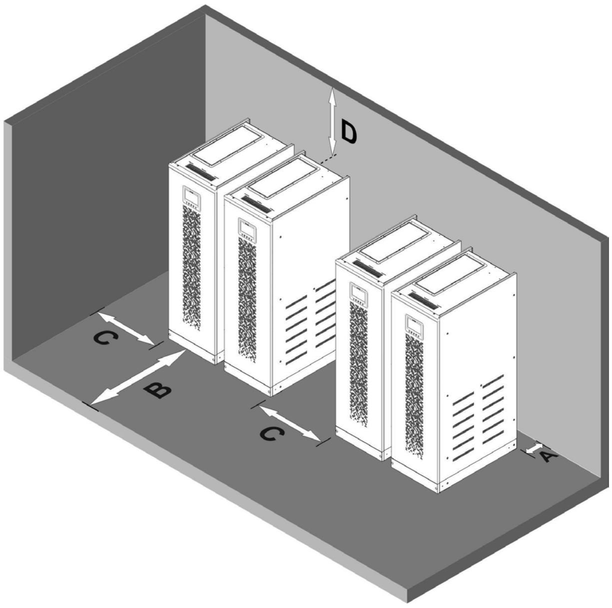
Taula 6. Minimum and recommended spaces for 80... 160 kVA devices.

	A (mm)	B (mm)	C (mm)	D (mm)
Recommended spaces	50	1200	50	600
Minimum spaces	0	1200	0	400

Table 7. Minimum and recommended spaces for 200... 300 kVA devices.

	A (mm)	B (mm)	C (mm)	D (mm)
Recommended spaces	50	1200	50	600
Minimum spaces	0	1200	0	400

Table 8. Minimum and recommended spaces for 400 kVA devices.



The following table shows the volume of air required for optimum ventilation and cooling of the UPS.

Power (kVA)	80	100	125	160	200	250	300	400
Air volume (m^3/h)	1200	1200	1500	1500	1800	2200	2300	4000

Table 9. Volume of air required to properly ventilate the UPS.

11. MECHANICAL CHARACTERISTICS.

11.1. MATERIALS.

All materials in the X-PERT series are the current high quality materials in production and have not been used previously (completely new), except as required during the verification of the device. All device components are solid-state.

11.2. CABINET.

The set of rectifier, charger, batteries, inverter, static bypass, maintenance bypass and control panel, etc. are located inside compartmentalised cabinets, built in steel plate.
The X-PERT series is mounted in cabinets with IP20 protection degree according to the UNE 2032478IR standard and are self-supporting.
It is painted with Epoxy type paint in RAL9005 for all devices up to 400 kVA.
The cabinet ventilation is forced to ensure that all the components of the UPS are within the appropriate temperature ranges. The device has temperature probes to monitor the most important temperatures. The X-PERT series cabinet is structurally designed to be transported by a forklift.

11.3. WIRING.

The internal wiring of the device complies with EC marking regulations. All electrical connections are tightened to the required torque and marked with a visual indicator.
The wiring is arranged in flexible single-pole copper cable hoses and each end has a tight terminal with an anti-shear and non-release system.
The cable entry to the inside of the cabinet is from the bottom-front.

12. COMMUNICATION PROTOCOLS.

The communication protocol included as standard on all SLC X-PERT models is private and is used for serial communication with the UPS programming and control software.

The MODBUS protocol can also be supplied by RS-485 or by Ethernet connection, which allows the communication of the UPS with other devices. You can request the MODBUS map from your distributor.

13. TECHNICAL SPECIFICATIONS.

13.1. TECHNICAL SPECIFICATIONS.

Model		**SLC X-PERT**							
Power (kVA)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
Active power (kW)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
GENERAL									
UPS type		On-line double-conversion							
Efficiency (%) (VFI: on-line double-conversion)	25% load	93.0	93.0	93.0	93.0	94.5	94.5	94.5	> 94.8
	50% load	94.5	94.5	94.5	94.5	95.5	95.5	95.8	96.0
	75% load	95.0	95.0	95.0	95.0	96.0	96.0	96.0	> 96.0
	100% load	95.0	95.0	95.0	95.0	≥95.5	95.5	95.5	> 95.8
Efficiency (%) (VFD ECO MODE) load ≥50%		≥98.0							
Losses with rated load (kW)		4.2	5.3	6.6	8.4	9.4	11.8	14.1	17.5
Ambient eorking temperature (°C)	UPS Battery	0... 40 0... 25							
Storage temperature (°C)	UPS Battery	-10... 70 -10... 60				-10... 70 -15... 40			
Relative humidity, non-condensing (%)		<95							
Maximum working altitude (m)		<2400 masl							
Ventilation		Forced							
Cooling air flow (m^3/h)		1000	1200	1200	1500	1800	2200	2300	4000
Noise (dB)		<60				<65			<72
No. battery cells (lead)		360... 372							
Protection rating		IP20							
Electromagnetic compatibility		EN-IEC 62040-2 (EC marking)							
Safety		EN-IEC 62040-1							
Operation and test		EN-IEC 62040-3							
Quality and Environment		ISO 9001 – ISO 14001							
Colour		RAL 9005							
Accessibility		Front and side access				Front access			
Installation		Against the wall							
Overall dimensions (mm)	Depth	940				970			970
	Width	560				880			1450
	Height	1500	1800			1978			1978
Weight (without batteries) (kg)		300	320	360	380	720	850	900	1080
Weight (with batteries) (kg)		850	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Input/output terminals		Input cables from below							
Handling		Base for forklift							
Storage and transportation conditions		According to EN 62040-3							
Front panel		10" touch screen							
Potential-free contacts interface		Optional for signalling/alarms							
Serial communication interface		Standard: RS-232/USB Optional: RS-485 (MODBUS RTU Protocol)							
Parallel configuration (optional)		Up to 5+1 (redundant parallel) Up to 6 (parallel with power)[1]							
RECTIFIER AND BATTERY CHARGER									
Input		3 phases/4 wires							
Three-phase rated input voltage (Vac)		3x400							
Tolerance (%)		-20... +15							
Input frequency (selectable) (Hz) Tolerance (%)		50 - 60 ±10							

Model		**SLC X-PERT**							
Power (kVA)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
Active power (kW)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
Input power factor		>0.99							
Input current harmonic distortion (at rated voltage and THDv <0.5%) (%)	25% load 50% load 75% load 100% load	<5 <4 <3 <3							
Output voltage static stability (%)		±1							
Output voltage ripple (%)		<1 (rms)							
Battery recharging characteristics		Intermittent load with prevailing state of complete standby and control of the state of the IU batteries (DIN 41773)							
Maximum battery recharging current (A) - With rated output load - Maximum current with DCM function		15 50	15 50	20 50	20 50	30 100	40 100	40 100	50 100
Rectifier bridge type		IGBT – PFC							
Input protections		Fuses							
Rated input current (A) (with rated load and charged batt.)		122	152	190	243	302	378	453	603
Maximum input current with minimum voltage (A) (with rated load and maximum recharging current)		175	212	267	334	423	518	611	829
Soft-start ramp time (Walk-in) (s)		5… 30 (programmable)							
Sequential startup (hold off) (s)		1… 300 (programmable)							
BATTERIES									
Battery type (standard)		Sealed lead acid (VRLA - maintenance free)							
Number of cells		360… 372							
Float voltage at 25 °C (Vdc)	360 el. 372 el.	812 840							
Minimum discharge voltage (Vdc)	360 el. 372 el.	620 632							
Power consumed by the inverter (kW) (with rated load cosφ=1)		82.5	103.1	128.9	164.9	204.1	255.1	306.1	407.7
Power consumed by the inverter (with rated load and minimum discharge voltage) (A)		133	166	208	266	329	411	494	658
Protection		Fuses							
Test		Included as standard							
INVERTER									
Inverter bridge		IGBT (high frequency PWM)							
Rated apparent power cosφ=1 (kVA)		80	100	125	160	200	250	300	400
Rated active power cosφ=1 (kW)		80	100	125	160	200	250	300	400
Efficiency (%) DC/AC	25% load 50% load 75% load 100% load	96.0 97.0 97.0 98.1							
Output		3 phases/4 wires							
Three-phase rated output voltage (Vac)		3x380 / 3x400 / 3x415							
Output voltage stability - Static (balanced load) (%) - Static (unbalanced load) (%) -Dynamics (load: 20%-100%-20%) (%) - Voltage recovery after load change (ms) - Classification according to EN-IEC 62040-3		 ±1 ±2 ±5 <20 VFI-SS-11							
Phase shift (°) - Balanced load - Unbalanced load (100%-0%-0%)		 ±1 ±1							
Output frequency (Hz)		50 - 60							

Model		SLC X-PERT							
Power (kVA)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
Active power (kW)		**80**	**100**	**125**	**160**	**200**	**250**	**300**	**400**
Output frequency stability - Internal clock (mains not present) (Hz) - Inverter synchronised with mains (Hz) - Max. synchronisation frequency (Hz/s)		±0.001 ±2 <1							
Rated output current (@400 Vac) (A)		115	144	180	231	289	361	433	577
Permissible overload									
(min)	>100... 110%	10			10				
(min)	>110... 125%				5				
(s)	>125... 150%	30							
(ms)	>150%	100							
Short-circuit current (A)		330	400	490	640	720	900	1050	1400
Short-circuit characteristics		Limited current with electronic protection Automatic shutdown after 5 seconds							
Output waveform		Sine wave							
Total harmonic distortion THDv - With linear load (%) - With non-linear load (%) - EN-IEC 62040-3		<1 <5 Requirement compliance							
Max. crest factor without degradation		3:1							
BYPASS									
Automatic bypass		Electronic thyristor							
Input		3 phases/4 wires							
Protection		Fuses							External
Three-phase rated input voltage (sel.) (Vac) Tolerance (selectable) (%)		3x380 / 3x400 / 3x415 ±10							
Input frequency (selec.) (Hz) Tolerance (selectable) (%)		50... 60 ±10							
Transfer mode		Uninterrupted							
Transfer from inverter to bypass		In case of: - Short-circuit - Discharged batteries - Inverter test - Inverter failure							
Retransfer from bypass to inverter		Automatic Bypass disabled in case of 6 transfers in 2 min, restart by screen							
Overload capacity (%)		150% permanently 1000% for 1 cycle							
Manual bypass (maintenance)		Electronically controlled Assisted restart procedure without interruption							
Backfeed protection		NC contact for control of an external device							
Automatic bypass		Uninterrupted							

REF. JN021A01 **REV.** A **CODE** 401*

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